

POPULAR MECHANICS

MAGAZINE

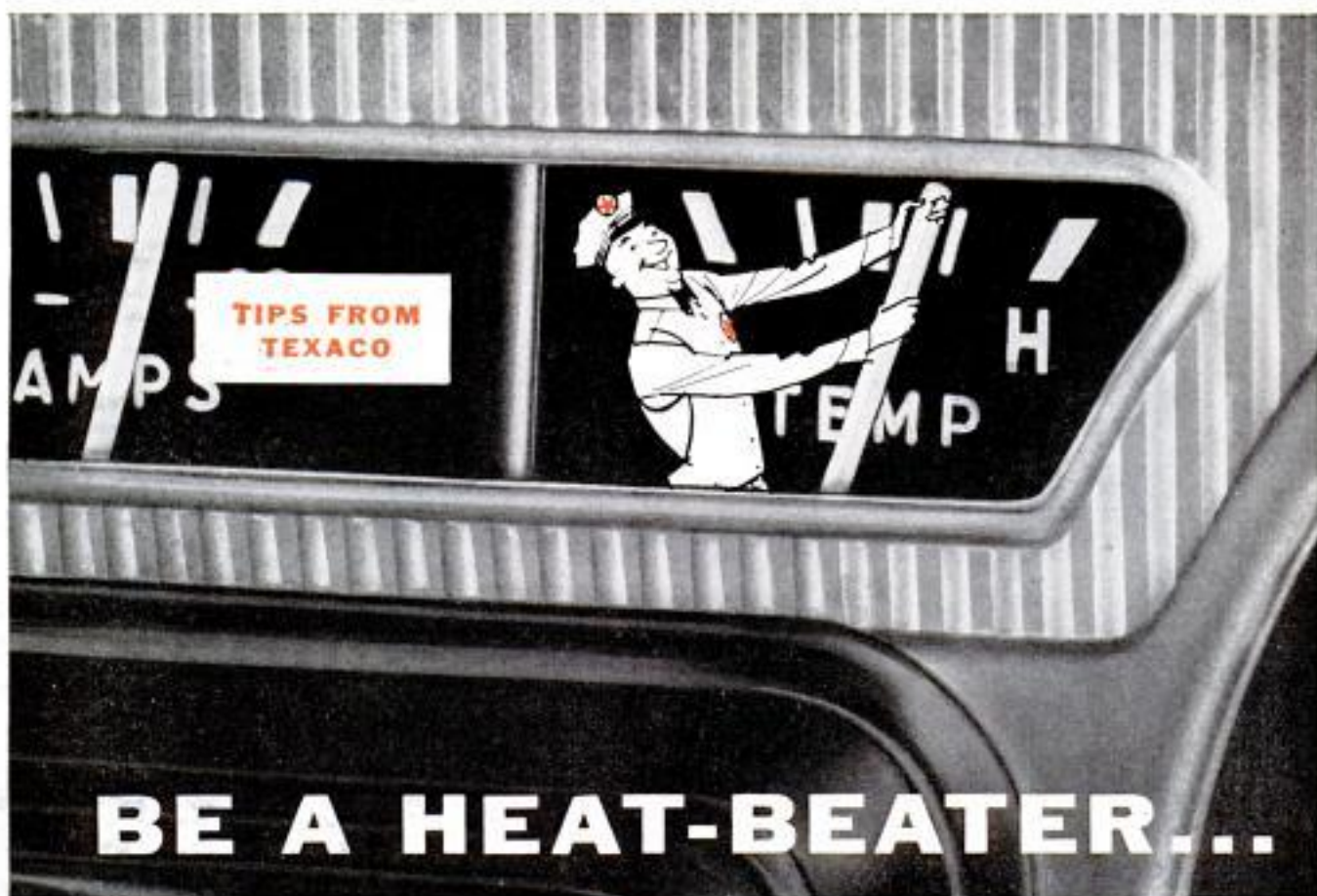
WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK, GPO AT WASHINGTON, D.C.

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Here it is— **The EDSEL**
—page 92





SIZZLING PAVEMENTS! Drivers swelter! *Cars suffer, too . . . need good care . . . like this:*

Item: Battery water takes wing fast . . . check it weekly . . . keep the level $\frac{3}{8}$ " above the plates. Use *distilled* water for longer battery life.

"TEMP" shows hot! Oil level okay? Water level okay? Maybe the fan belt needs tightening. Perhaps outside of radiator is clogged

with bugs, leaves, etc. Cooling system may be clogged with rust and require flushing. Dirty air cleaners can air-starve the engine. See "Mr. Service" at the Texaco station.

Watch tire pressure. Inflate correctly in the morning when cool. Low-pressure flexing overheats tires . . . shortens life, causes blow-outs. Your Texaco Dealer will be glad to check your tires.



THERMOMETER-BEATING OIL

Heat thins ordinary motor oils. Now, thanks to Texaco research, a new Havoline Special 10W-30 oil that stays full-bodied and full-lubricating to protect your engine at sizzling temperatures, yet stays fluid to give easier starts in sub-zero weather. Use this *one grade* the year 'round. More than that, this remarkable oil keeps engines clean for full power-packed performance. Get it from your Texaco Dealer, *the best friend your car has ever had.*

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THE TEXAS COMPANY



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

"Europe, here I come! First, I'm going to visit cousins I've never seen outside of London. Then I'll just travel about. All my life I've been wanting to go to Europe, and at last I have the time—and the money to do it. How can I afford to spend savings for this trip? You see, I have a lifetime income—a check for \$300 a month as long as I live.

"Come to think of it, a young English cousin was indirectly responsible for my being retired now. Back in 1940, during the Battle of Britain, we took Paul to live with us. He was ten. He often talked about his home—the village my family came from. The more I listened, the more I wanted to go to England after the war.

"I had a good job at the time, with a promising future. But when I actually got down to considering going to Europe, I realized I'd never be able to take off more than two weeks at a time unless I could retire someday. Yet retiring seemed impossible. I had never saved much. I was nearly forty.

"But, one day, while I was waiting at the barber's for Paul and my boys, I happened to be glancing through a magazine and noticed an ad about a way to retire. It was called the Phoenix Mutual Retirement Income Plan. It said if I started young enough—in my forties or sooner—this plan

could provide an income of \$10 to \$300 a month for life. I sent for the booklet that very morning.

"In a few days the booklet arrived in the mail. My dreams suddenly became possibilities. This plan was made specifically for someone like me. Why I'd even be able to retire earlier than I had ever expected.

"Of course, I compared Phoenix Mutual to other retirement methods. But the more I compared, the more clearly I saw it was best for me. Just as soon as I could, I applied and qualified for my Phoenix Mutual Retirement Income Plan.

"To think I'm actually on my way to see Paul! It's hard to believe he's grown up now, and married. My next check for \$300 is waiting for me in London. I've never felt so care-free in my life. And I'm still young, with years to look forward to."

Send for Free Booklet. This story is typical. Assuming you start at a young enough age, you can plan to have an income of \$10 a month to \$3,600 a year or more—beginning at age 55, 60, 65 or older. Send the coupon and receive, by mail and without charge, a booklet which tells all about Phoenix Mutual Plans. Similar plans are available for women—and for employee pension programs. Don't delay. Send for your copy now.



ESTABLISHED 1851

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FOR BUSINESS AND FAMILIES

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SEPTEMBER 1957

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227 Elm Street, Hartford 15, Conn.

Please send me, without obligation, your free 28-page book showing new retirement income plans.

Plan for Men Plan for Women

Name _____

Date of Birth _____

Business Address _____

Home Address _____

This One



GTNG-4PP-G1TW

DOWN
IN BED



DOWN IN
THE MOUTH

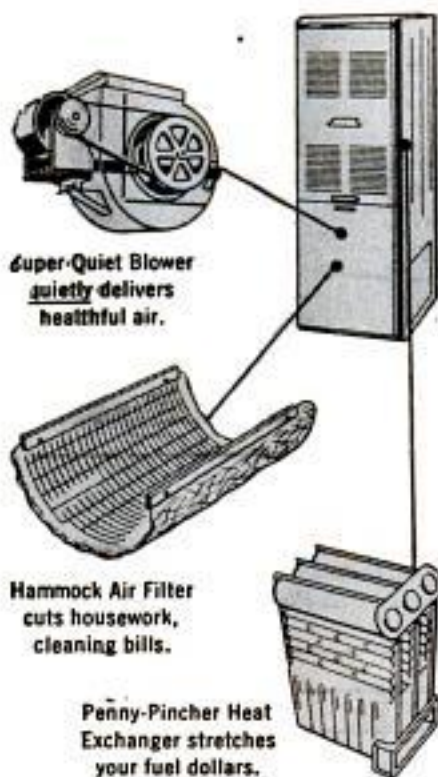


DOWN IN
THE POCKET



A long winter's ahead . . . don't let it get you down!

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for better winter living



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Hammock Air Filter
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Get set now for happier, healthier
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comfort. Costs less than you may think!—and you're all
set to add summer air conditioning!

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fort Craftsman, your community's heating and air condi-
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Volume 108

SEPTEMBER 1957

Number 3

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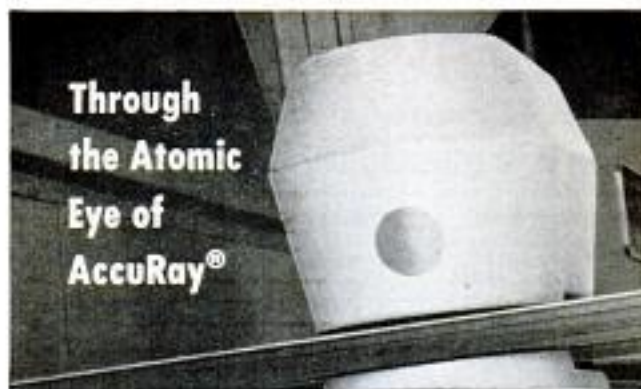
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Next Month...

HOMES, HOMES, HOMES — 50 pages of them and everything pertaining to them will be a special feature in the October issue. The full-color pages will introduce two new PM homes, one in sleek modern style and the other in modified Cape Cod with a prairie-farmhouse flavor





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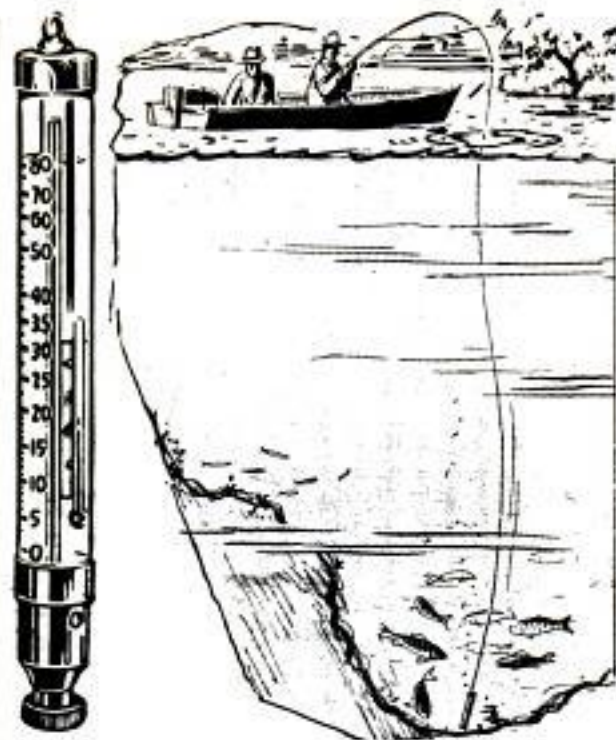


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Thermometer for Fishermen Helps Prove Theory

Anglers who believe that fish are caught at certain depths and water temperatures can prove this theory with a combination depth-gauge-and-thermometer unit. It consists of a plastic tube containing a thermometer and two calibrated scales. Attached to a fishing line, this tube is lowered into water. The level of water trapped inside registers on the larger scale as depth in feet. The thermometer scale indicates water temperature at that depth. Water may be drained by turning a valve and shaking the tube.

Self-Adjusting Watch

Setting its hands to the correct time is all that's needed to speed up or slow down a new watch, regulating it automatically. Inside the case is a mechanism that controls shifts of the regulator within one hundredth millimeter. The device does this without affecting normal winding or setting the hands if the watch runs down.

Roller-Tripod Carries Pail

Buckets of water now can be moved easily across the floor on a tripod attachment. The tripod rolls on three pneumatic tires that turn in a full circle.



Black & Decker® U-3

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GEARED CHUCK same as used by industry for extra holding power and accuracy.



HIGH-QUALITY HELICAL GEARS give quieter, smoother flow of power from motor.



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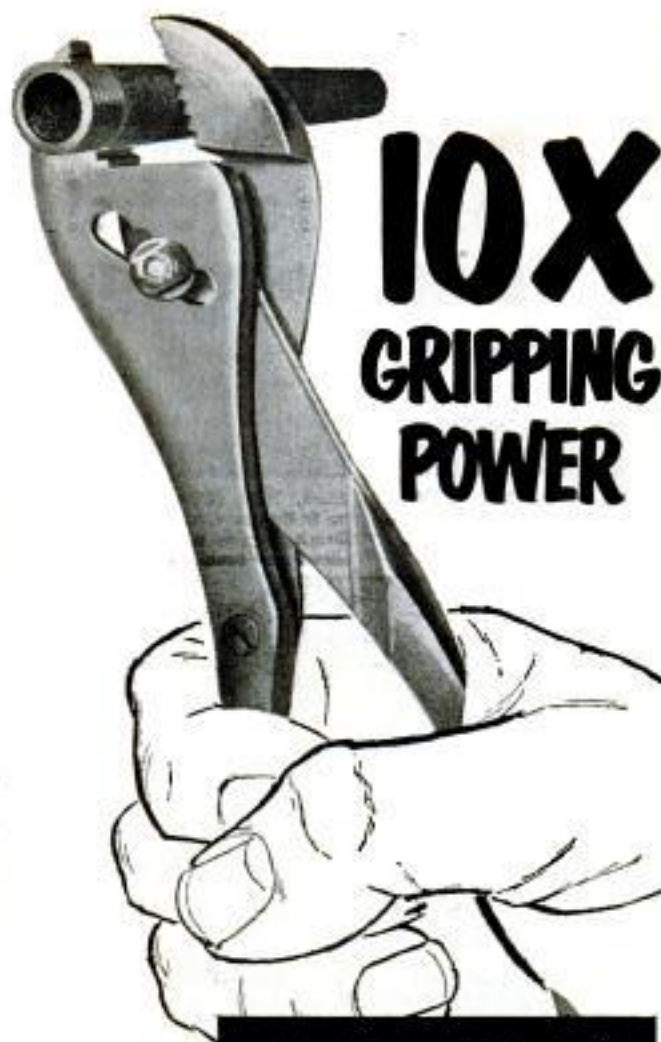
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Please send me a copy of your "Handy Tips" booklet. I enclose 25c to cover cost of handling and mailing.

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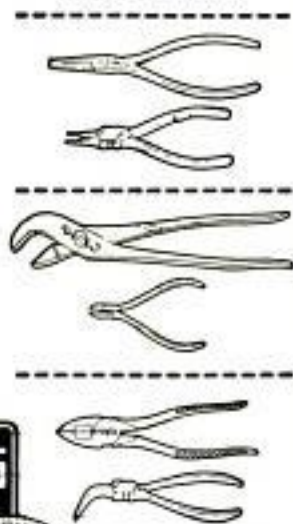


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ACROSS THE DESK



To the Editor:

I have just read the article entitled "Protect Yourself Against Windstorm Damage," by Mr. E. R. Haan, in the June 1957 issue of *Popular Mechanics*.

I am very impressed with this article and, if possible, would like to have permission to use it for Civil Defence purposes.

Civil Defence in Canada is organized on a voluntary basis, except for a few key personnel representing either municipal, provincial or federal government. The writer is a representative of the Ontario Provincial Government in charge of a region consisting of six counties. From time to time he is called upon to give lectures to voluntary trainees on the subject of "Home Protection Under Atomic Attack" and "Home Protection in Natural Disaster."

The manner in which the subject article would be of value is as a basis for a lecture on home protection in a natural disaster and a précis of lecture notes to be handed to the trainees. Should your approval be forthcoming, the diagrams illustrated, the type of joints to be used in home construction and the type of shelters to be constructed would be reproduced in this précis. The précis would not be sold, but would be issued gratis to the Civil Defence volunteers attending the lecture.

It would be necessary to submit a copy of this précis to Civil Defence Headquarters, Ontario, for approval and it is quite possible that should the chief training officer for Civil Defence in the province of Ontario approve of this précis, he would wish to submit it to the Dominion of Canada Civil Defence Authorities for issuance to Civil Defence formations across the country. In all cases the précis would be issued free of charge to enrolled Civil Defence volunteers.

I have read a considerable number of articles on this subject and have no hesitation in stating that Mr. Haan's article is much superior to anything that I have read before. I sincerely hope that you will be able to give me permission to make use of the article as a basis for lecture purposes.

B. F. C. Houston,
Co-ordinator, Region #3,
Dept. of Planning and Development,
Civil Defence Branch,
Province of Ontario

Permission granted and thanks for the compliments.—Ed.

(Continued to page 8)

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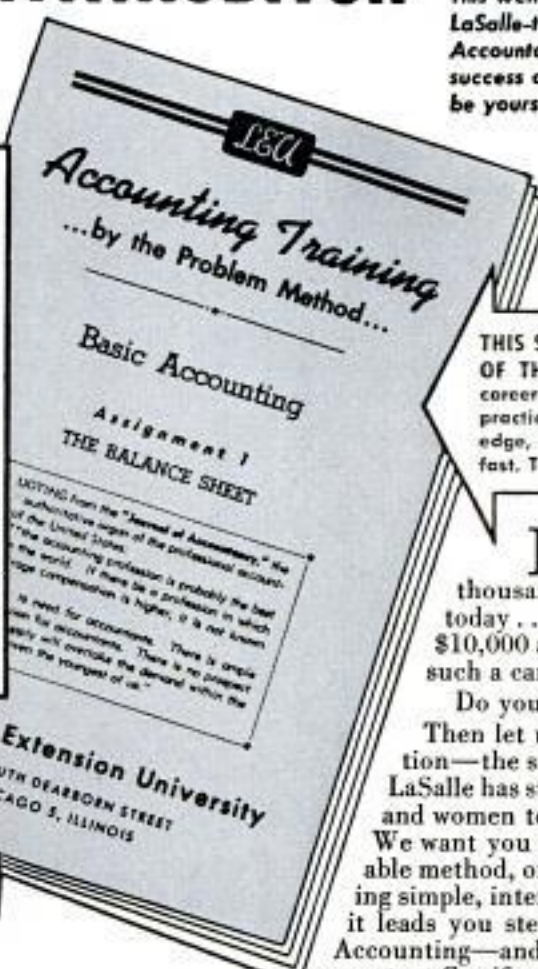


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Wartime Jeeps Take to Rails

Many wartime Jeeps declared surplus by the Allied Forces Headquarters in Europe are still serving in civilian and police jobs in Europe. The Italian State Railways have put some of the veteran Jeeps into service hauling materials for construction and repair over the iron road. The four wheels with tires were replaced by four small railway wheels. Private companies own these

rail-Jeeps and haul maintenance material under contract with the Italian State Railways.

Francis C. Fuerst,
Pieve Ligure, Italy

To the Editor:

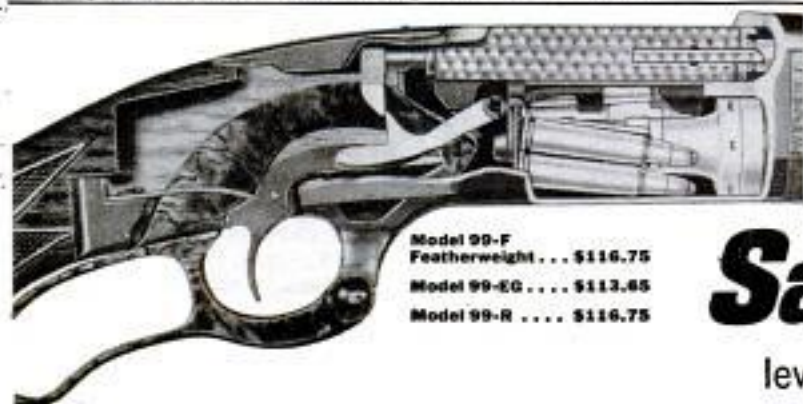
What happens in case of power failure when the Hiller cloud car (July 1957 PM) is in the air?

Barney Barnes,
Mountain View, Calif.

Hiller Helicopters of Palo Alto, Calif., who are developing the ducted-fan air sedan described in the July issue, answer this one: "The matter of safety

in event of power failure was an immediate problem with the original Flying Platform, and there appear to be two ways around it: (a) use the principle of multiengine power so that the craft will fly in event of one engine out and (b) equip passengers with parachutes which will open at low altitudes. On the prototype version of our Flying Platform we are using the multiengine

(Continued to page 10)



Model 99-F
Featherweight . . . \$116.75
Model 99-EG . . . \$113.65
Model 99-R . . . \$116.75

inside story
on the

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POPULAR MECHANICS



This man is a "security risk"!

Age, 29. Married. Two children. High school education. Active in local lodge, church, veterans' organization. Employed by large manufacturing concern. Earns \$82 a week.

Sounds like an Average Joe. And he is. Too average! He's got a job. It pays fairly well. He's satisfied.

But here's the catch. With the right kind of training, this young

man could be stepping into better jobs. He could be making \$7-8000 a year. He could be cashing in on those spare-time hours he now wastes.

As it stands now, he's stuck in his job. Can't seem to make any headway. He's reluctant to try. So he just hangs on.

This man is a "Security Risk" to his wife and children.

His family probably will never enjoy the comforts, the prestige, the good living that could be theirs. If hard times come, they are almost sure to be hurt. For an Average Joe can't expect to compete with trained men when the chips are down.

A man like this would do well to start a planned program of self-improvement. In his spare time. In a field related to his interests and abilities. Right NOW!

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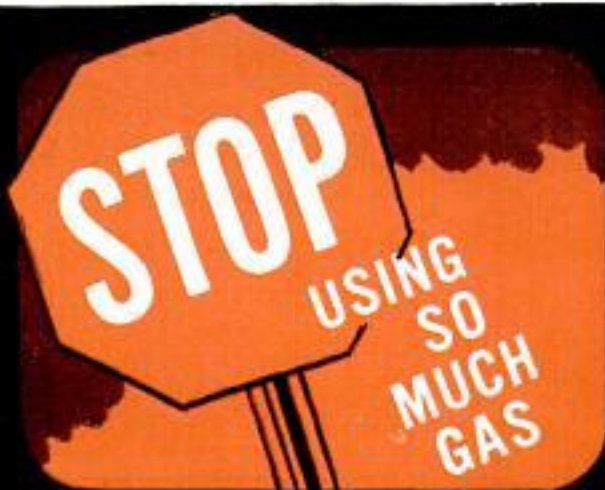
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Light and Power <input type="checkbox"/> Practical Electrician <input type="checkbox"/> Practical Lineman <input type="checkbox"/> Professional Engineer (Elec) <p>HIGH SCHOOL</p> <ul style="list-style-type: none"> <input type="checkbox"/> High School Diploma | <ul style="list-style-type: none"> <input type="checkbox"/> Good English <input type="checkbox"/> High School Mathematics <input type="checkbox"/> Short Story Writing <p>LEADERSHIP</p> <ul style="list-style-type: none"> <input type="checkbox"/> Industrial Foremanship <input type="checkbox"/> Industrial Supervision <input type="checkbox"/> Personnel-Labor Relations <input type="checkbox"/> Supervision <p>MECHANICAL and SHOP</p> <ul style="list-style-type: none"> <input type="checkbox"/> Diesel Engines <input type="checkbox"/> Gas-Elec. 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(Continued from page 8)

technique, and probably this same approach would be used for other wingless craft of the future."

To the Editor:

I have made about a dozen of your radio projects and a few dozen of your wood-working projects. The biggest hit with me was your *Crusette* (May 1954). I have made *Crusette* on a 1:10 scale (toy boat with minimotor), on a 1:5 scale (radio-controlled boat) and on a 4:5 scale. The remarkable thing about *Crusette* plans is



that they give you a good boat, no matter what scale. This is most unusual. It is well known among modelers that, e.g., a 1:20 scale airplane won't fly or at least won't give performance.

The 4:5 scale *Crusette* is a very pleasant craft. Weighing only 150 pounds, I can carry it on the top of the car (small European make). With a 5.5 horsepower outboard motor I have clocked her at 16 m.p.h. I had to lower the spray rails, though, to keep her from diving too deep at the stern.

Thanks for all the satisfaction your projects have given me through the years. I think I'll go for the *Sea Knight* now (May, June, July 1957).

M. De Clercq,
Teacher of Mathematics,
Gentbrugge, Belgium

To the Editor:

Concerning your article "Everybody's Going Sailing" in July, a more appropriate title would be "Everybody's Going Swimming." It should read, "In heavy weather, you'll be hiking over the windward rail"—not lee rail.

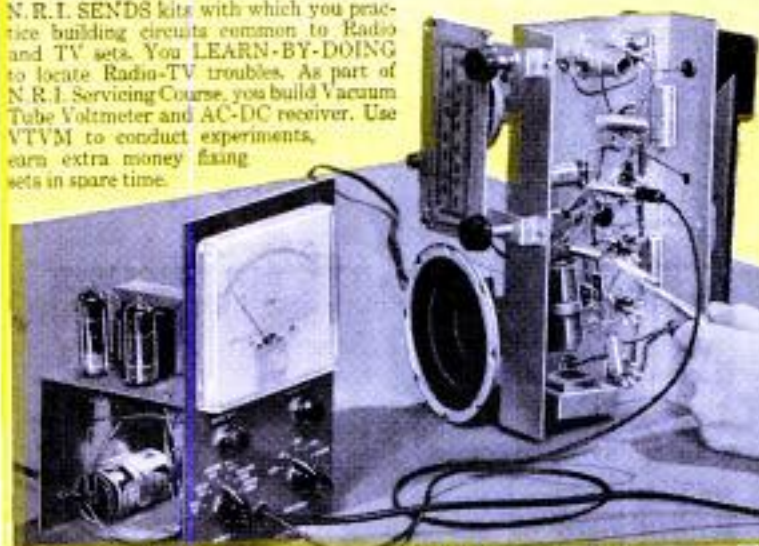
Thomas Adams,
Suffern, N. Y.

We're all wet.—Ed.

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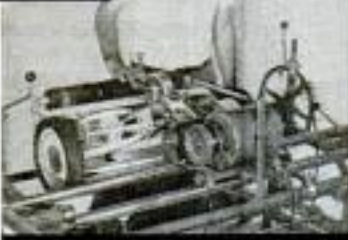
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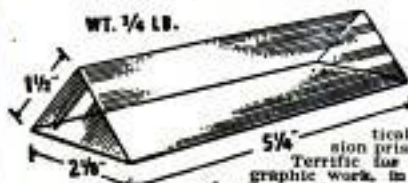
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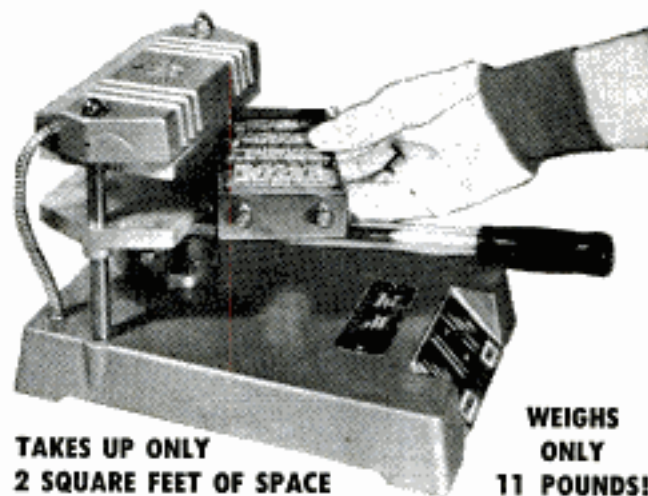
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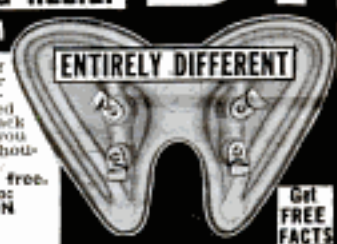
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Even though we as a people make up only 7% of the world's population and live on a mere 6% of the world's land, we own 76% of the world's automobiles, watch 78% of its television sets, and are busy producing about one-half of the free world's material goods.

There's a reason for our vast material ownership and for our amazing volume of production. Credit can be given to a creative group no larger than one-half of one percent of our population; namely, the 950,000 scientists and engineers working in America today. From their labors have come the formulas and designs that have developed our technology to the point where a few are able to create and effect production of so much for so many. The other half of the production team is the 8.7 million skilled craftsmen who apply the scientific and engineering principles to the building of modern homes, assembly lines, jet aircraft and the like.

These specialists are the creators and builders of American industry. Our future progress depends on them. However, rapid discoveries in science, and technology, constant improvements in production technique, consumer pressure for new products, our expanding defense requirements, and the search for substitutes for our dwindling resources, have created a demand for scientists, engineers, technicians and skilled craftsmen far beyond our supply.

At no other time since World War II has the need for skilled manpower been so great, nor the opportunities for employment so attractive. And the future appears unlimited! Men willing to master a skill or specialize in one of the engineering fields will be able to write their own ticket! A major company recently predicted that within a few years 60% of its production will be devoted to products for which there is no use at the present time. In America, every 10 minutes someone develops a new product or improvement, and a patent is granted.

But right now industry wants men who will

become the skilled masters of automation; men to design and install electronic-controlled manufacturing; men with the vision to make atomic energy a constructive tool of industry. An estimated 66,700 new scientists and engineers are wanted next year; and 1965 will see a need for 429,000 more than today. Some 210 atomic reactor operators will be at work by 1960; and by 1980, about 18,670 will be required. At least 250,000 skilled craftsmen must be trained every year just to maintain our present work force.

Men with vision, who like to plan their future, will begin to prepare themselves for these and the thousands of other skilled jobs that must be filled. Why not measure your interests and ambitions against the opportunities waiting for you?

Guide yourself by the industries showing the greatest employment increases over past years. This indicates growth. Industries shown below are expected to continue expanding.



Take a look at the five occupations on the opposite page. According to the U. S. Department of Labor, there are serious shortages of specialists and skilled men in these classifications. What kind of work is of greatest interest to you?

Lay plans for your future, and then take the kind of action that will guarantee it. Qualify as a specialist, a technician or skilled craftsman by going after the proper education and training. This experience can be gained easily from several sources, including the nationally known trade or vocational schools who are preparing many of industry's top-paid men. We suggest you look for these excellent schools in the pages of Popular Mechanics and examine their courses.

The challenge has been made by American industry to all men of ambition who seek a good job, interesting work and an important role in our advancing technology. In the traditional American way, meet the challenge of opportunity with the training to match the job. The future can belong to you if you're prepared for it.

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Industry	Employment Growth Record	Percentage Increase	Total 1956 Employment
AIRCRAFT	239,000 565,000	236.4	804,000
AUTOMOBILE MANUFACTURING	776,000 15,000	1.9	791,000
ATOMIC ENERGY	49,000 101,000	206.1	150,000
CONSTRUCTION	1,982,000 1,055,000	53.2	3,037,000
ELECTRONICS	336,000 229,000	68.2	565,000
INDUSTRIAL CHEMICALS	299,000 128,000	42.8	427,000
MACHINERY MANUFACTURING	2,111,000 260,000	12.3	2,371,000

Legend:  Indicates number of employees within industry during 1947  Indicates growth in number of employees within industry between 1947 and 1956

THOSE PREPARED FOR IT"

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Engineering is the inventive and development arm of industry and is truly the profession of the future. Aeronautical, Chemical, Electrical and Mechanical Engineers are wanted in unprecedented numbers, and never have so many industries vied so strongly with each other for engineering talent. Starting salaries are excellent; there's no limit to advancement except ability and eagerness to accept responsibility and work. A graduate degree with all the education and training it implies is fundamental to success in this field today.

TECHNICIANS

Referred to as industry's semiprofessional, the technician assists the engineer in every stage of production, from theory and research to drawing board, construction and finished product. Presently, 5 to 7 technicians are needed for every engineer in industry or laboratory. Draftsmen, Diesel, Air Conditioning, Laboratory, Tool Design, Electronics, and Instrumentation Technicians are wanted in large numbers. Qualifications are mathematics, physical science and specialized training in chosen field. Employment outlook is excellent due to emphasis by industry on research and development in which technicians play a major role.



Ford Motor Co. photo

MECHANICS AND REPAIRMEN

One of the fastest growing occupations in America today, skilled mechanics and repairmen are critically needed in almost every industry. The trend toward increased automation of production, the use of more expensive and complicated machinery, plant expansion, broader application of electronics including computers, expanding use of office machines, and of course increased sales of air conditioning, refrigeration, automobiles, etc., have opened thousands of jobs for men with skilled training. There is a special need for Automobile and Airplane Mechanics, Business Machine Servicemen, Electronic Servicemen, Diesel Mechanics, Maintenance Electricians, Refrigeration-Air Conditioning Mechanics and skilled men to install and maintain heavy industrial machines. Training is a must, for complexity of many machines requires a high degree of skill.



SEPTEMBER 1957



Official U. S. Navy photo

MACHINING OCCUPATIONS

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See also Revised 1957 Edition of "Occupational Outlook Handbook" written by U. S. Department of Labor and available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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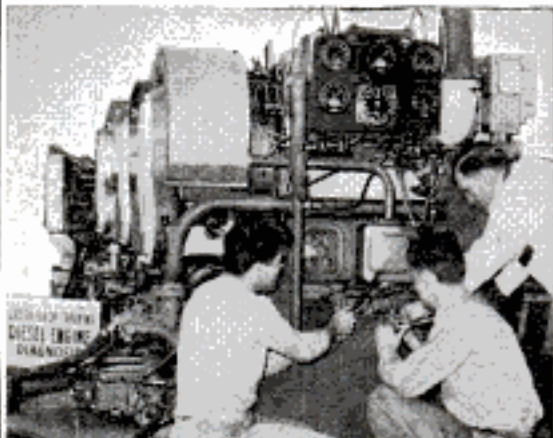
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BIGGEST Book buy—"Colt Firearms." Free literature. Serven Books, Santa Ana, Calif.

PENCIL Collectors. 200 different advertising pencils. 20 unused pencils \$1.00. Price list included. Hobbies Inc., Box 744, Sterling, Colo.

WANTED Old cigarette cards. Write Charles Bray, East Bangor, Penna.

NAZI Navy flag \$10.50. National flag \$6.50. Both \$15.00. Catalog 35¢. Griffin and Gray, B-2, 72-05 67th Street, Glendale 27, N. Y.

PRECIOUS STONES, MINERALS

LARGEST Gem and mineral magazine tells how to have profitable fun with rocks, gems, jewelry. Monthly, \$3.00 year. Sample 25¢. Gems & Minerals, Dept. A-9, Mentone, California.

MINERAL Specimens for collectors. All varieties, world wide localities. Choice quality, lowest prices. List free. Plummer's, 4720 Point Loma Ave., San Diego 7, California.

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SAPPHIRE, Topaz, tourmaline, garnet, peridot. Five uncut gem specimens, \$1.00. Ten polished gems, baroque shaped, \$1.00. Free bargain list jewelry, gems. Profitable, easy "do-it-yourself" projects. O'Brien's, 1118M Wilcox, Hollywood 33, Calif.

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FLORIDA Manufacturer seeks new product or process, preferably related to ceramic field, but will consider any patented item with good market possibilities. Will purchase outright or license. Send full information to Methods Engineering Council, 199 S. E. 24th St., Fort Lauderdale, Fla.

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WE Establish you in your own mail order discount business. Catalogs, sales letters, etc., printed your name can cost you nothing. No stock investment. We ship orders. Sell gifts, appliances, housewares, cookware, cutlery, dinnerware, silverware, jewelry, watches, etc., at big discounts. Catalog, details free. Topval Corp., Lindenhurst 818, N. Y.

GROW Expensive herbs for us! Big profits home-business of your own. Year around profitability! We supply everything necessary! Send for free rare seeds and revealing plan. National Herb Exchange, Dept. SR, Gardena, Calif.

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\$10.00 PER Hour net profit in monument cleaning business. Free details. X-Pert Monument Cleaning Company, 465 Potomac, P88, Buffalo 13, N. Y.

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ADVERTISING Executive now reveals tested, authentic mail order instructions offering amazing profit opportunities at home. Write Holiday Publications, 2301 Greysolon Road, Duluth, Minnesota.

EARN Money at home. Learn invisible reweaving at home. Licensed, approved school. Free details. Eastern School of Reweaving, 73 Main Street, Dept. P97, Hempstead, N. Y.

INTERNATIONAL Mailorder business. Complete setup service—Not just instructions. Hermes, 152 West 42, New York City 36.

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PLASTERCRAFT Molds, liquid rubber, plasters, floccs, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

"MAILORDER Laws and Regulations." \$1.00. Explains necessary licenses, different taxes, legal requirements, etc. "Mail-order Rules for Beginners." \$1.00 additional. Tasker, 1603 Peach Street, Alexandria, Virginia.

WANTED: Home producers, to be subcontractors. Cast plastic products for manufacturers in our clearing house service. Thousands of easily made items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 9-PM, East Boston 28, Massachusetts.

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FREE Book "305 Odd, Successful Businesses." Work home. Pacific, Oceanside, Calif.

EARN \$3.00 Hour taking orders of appliances, etc. at discount prices. Beauchamp Company, 856 East 156 St., Bronx, N. Y.

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OUR Plans are money makers; sell church groups, business men, newlyweds. Press, Portage, Ohio.

MARY-Mac agency—motorized vibrator. Cushions, chairs, tables, belts. Mary-Mac Factory, 1012 Powhattan, Dallas, Texas.

FREE Folder, "How to Make \$3,000 Yearly. Sparetime, Backyard, Raising Earthworms!" Oakhaven 38, Cedar Hill, Texas.

BOOKLETS—\$1.00. How to sell by mail order. 1957 business cycle advertising chart. Economist, 343 Fairfield Avenue, Bridgeport, Connecticut.

OPERATE Restaurant or diner. Free booklet reveals plan. Write Restaurant Arts, 19-BU, Fremont, Ohio.

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CLEAN Clogged drains electrically. Do it yourself. Write Electric Drain Cleaning Co., Allston 34, Mass.

\$5,000 YEARLY. Spare time at home. Nothing to buy. No local selling. Dignified. Guaranteed. Home Harvest, Rt. 3, Box 3491-A, Albuquerque, New Mexico.

DUPULISCALER. Engraving, carving attachment opens wide new profitable business-hobby field! Details, work sample 25¢. Desco Distr's. 5262-C Van Nuys, Van Nuys, Calif.

GOLD, Silver, platinum: how to refine, test, make alloys, solders, etc. "The Jeweler's Melting Pot." Formerly \$5.00, now \$3.90. No c.o.d.'s. Frank Herman, 1529 Liberty St., Los Angeles 26, Calif.

BE Your own boss. Learn how to start making money spare time using U. S. government approved methods. \$1.00 sent to Ace, Box 155-A, Danville, Calif., can start a carefree future for yourself and family.

MEN-Women! An income for life! Work at home. Spare-full time. Big money. Number of companies will buy all you produce for them. Easy work. \$5.00-\$15.00 hour possible. Start now. Send only \$1.00 for copyrighted "Money-Maker." Lynn Publishers, Lynn 5, Mass.

SAVE Those newspapers! They may contain information worth real money! Inquire: Publishers-E, Cedar Hill, Texas.

MAKE Your fortune with post cards! Amazing home work opportunity. Brings in the dollars! Free exciting particulars. Harvey A. Sales, 5713 Euclid Avenue, Cleveland 3, Ohio.

LIFETIME Repeat income home mail business with only \$2.50 capital. Send \$1.00 for manual sample included. F. Marcusky, 538 W. Mahanoy, Mahanoy City, Penna.

\$26,500 BY Mail order in two weeks! Amazing radio-mail order method using powerful stations. Start fabulous business on low capital. Product sources supplied. Free details. Broadcast Service, 1412-C1 Great Northern Bldg., Chicago 4.

FREE "How to Start Your Own Mail Order Business." Exclusive franchise! Your own catalogs. We ship hundreds of top mail order items for you. Write now! Mail Order Associates, Rochelle Park 22, New Jersey.

START Home business. Absolutely new. Never before offered. Amazing money making opportunity. Physical handicap no obstacle. Unlimited opportunities. Free samples and information. Peter J. Hahn & Sons Co., 4445 W. Belmont Ave., Chicago 41, Illinois.

MONEYMAKING OPPORTUNITIES

START Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM-2-J, Chicago 26, Ill.

\$100.00 WEEKLY Spare time with a tape recorder! Proven facts free! Dixieland Publishers, Asheboro 4, N. C.

MEN And women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to \$9.80 an hour without previous experience. Full particulars free by mail. Send postcard to Roberts, 1512 Jarvis, Room CR-2-S, Chicago 26, Ill.

ATTENTION Typewriter owners. Make handsome profits. Write today. Groves Company, 682, Hastings 8, Nebraska.

DO It yourself. What? Repair TV, build furniture, make barbecue, plumbing repairs, build boats, do house wiring, remodel home, lay tile, modernize kitchen, repair home, and scores of other things you can do yourself. Books covering each subject, only 25c. Send for descriptive list. It's free. Popular Mechanics Press, 200-LB East Ontario St., Chicago 11, Ill.

BUY Wholesale! 30-80% discounts! Appliances, gifts, typewriters, tools, watches, sporting goods, jewelry, cameras, housewares, etc. Consolidated Distributors, Clifton 28, New Jersey.

ADS Running under this heading sell printing. Ask me for proof. I'll gladly send you amazing facts. Ask for Folder "P." F. W. Johnson, 200 E. Ontario St., Chicago 11, Ill.

AMAZING Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, 333 North Michigan, Chicago 1.

FREE Folio "\$5,000-\$45,000. Unlimited Vacations." No merchandise. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

GENERAL Contest Bulletin. Lists contests monthly. Sample, 25¢. 1809½ East 5th, Duluth, Minn.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

BIG Money raising, fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

EARN Money evenings copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

SELL Titania gems. Far more brilliant than diamonds. Catalog 10¢. Diamonite, 2420-M 77th, Oakland 5, California.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 27, 715 Ensor Street, Baltimore 2, Maryland.

FREE Book "505 Odd, Successful Businesses." Work home. Pacific, Oceanside, Calif.

PRIZE Contests provide fabulous and confidential home income opportunities! Here's how and where to win your share! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

DOLLARS Every day! It's magical—You keep all the dollars. Setup free. Otto Miller, Box 388-W, Oshkosh, Wis.

JOIN The prosperity parade with a mail order bookshop in your own home. Valuable information free. Practical Publications, 3974-P Milwaukee, Chicago 41, Ill.

MAKE Money, mailing sample business cards. Vosacek Printing, 4444PI Ute, San Diego 17, Calif.

MEN—Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-S, 1512 Jarvis, Chicago 26, Ill.

THEY Hand him \$100! Free packet. "Secret Journal." 919 secrets-plans! Work home. Publicco, Oceanside, Calif.

DOLLARS For you in mailorder. Dime brings magazines, information. Palm, Box 1221, Baton Rouge, La.

\$60.00 WEEKLY Sparetime. Start home Venetian blind laundry. Protected territory. Interesting information free. Burt, 2434ER, Wichita 13, Kansas.

SELL Merchandise by mail using four color catalogs! Fifty fast selling items! Orders filled for you! Sample, plans free! NMMA, 618 Washington, Boston 24-A, Massachusetts.

FREE Literature, big money mailorder opportunity. L Aircraft, Box J-5008, Detroit 35, Michigan.

OVER 1500 Men, women, children in one state make money at home. Full time, spare time. Free details. Mall-Towne, 9 Murray St., New York 7, N. Y.

MAKE Money writing short paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27-J, 7464 Clark, Chicago 26.

EXECUTIVE Secrets revealed! Learn about business. How to earn profits. How to operate your own business. How to better yourself and your family's income. Taught by experts. Free details write. National Business Consultants, Office P9C, Los Angeles 61, Calif.

\$250.00 WEEK Spare time profit possible. Earn at home with new fascinating printing method. \$3 starts you, send no money now. Free confidential facts and valuable samples. Screen-Print, 29C, Los Angeles 61.

WE Pay \$3.50 lb. dried. Grow mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We have 25,000 customers. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Wash.

MAKE Big profits. Sell imported gift items. Van Gordon Imports, Box 3203, Fort Worth 5, Texas.

\$100.00 WEEKLY Spare time with a tape recorder! Fabulous new business. Entire country wide open! Record weddings, parties, sports events, stereophonic sound, sound-on-sound multiple recordings. Make radio commercials, sound effects. Have fun and make big money in the glamorous business of tape recording. Money-making facts free! Dixieland Publishers, Asheboro 2, N. C.

"50 NEW Home-Business Ideas" booklet free. Coast Industries, B9C, Los Angeles 61.

I can teach you how to direct money-raising campaigns for churches, hospitals, institutions. Earned \$3,065 in six weeks on my first campaign. Started spare time on \$50. Two months course guaranteed by thirty years experience. Low cost. Unlimited field. William Henry Arboqast, 229 East Mason Avenue, Alexandria, Va.

TRUE Wholesale prices. Any size orders. No service charges. Catalog \$2, refundable. House of Better Buys, 722 East Silver Spring, Milwaukee 17, Wisconsin.

MAILORDER—Brokerage, proven money-making lines. Elichs, 3635 Marvin, Toledo, Ohio.

"MAKE More money with less work." Your original, exclusively created Sloganeers' slogan will produce results. Write: Sloganeers, 232-5th Ave. No., St. Petersburg 1, Fla.

MAKE Big easy profits making costume jewelry at home in spare time! Quick, easy to make; easier to sell! Details free! Don-Bar, 3511 W. Armitage, Dept. J-192, Chicago 47, Ill.

FOOD Supplements booming! Sell super-potent "Supervite." Vitamin Specialties, 5522½ Hollywood, Los Angeles 28.

EASY Extra money selling unusual Christmas ornaments. Seven Seas, New Hyde Park, N. Y.

YOUR Own business—Learn what method will turn your \$9.60 into \$96.00 or \$20.00 into \$240.00. Details free. Pittman, Box 992-D, Porterville, Calif.

NEWEST Product report included in oldest mail order magazine "Home Business Digest." Hurry, find out the newest products on market! 12 issues \$3.00, 6 issues \$2.00. Sample copy 35¢. Distributors wanted. Send \$1.00. M. R. Brown, 616 N. Cayuga St., Ithaca, N. Y.

END Money worries—Sell latest popular ties and boxed tie-handkerchief sets. Free details. Olect Ties, 397 E. 47th, New York City.

\$100.00 WEEKLY Spare room. Raise redworms soilless way. Odorless. Charlie Morgan, Box 118E, Bushnell, Florida.

STEADY income: Earn top money. Genealogy, Information \$1.00. 1 Little Smith Street, Poughkeepsie, N. Y.

INDEPENDENCE. Write for information, you'll be glad you did. E. B. Chamberlain, Box 173, Hicksville, Ohio.

OWN-Operate profitable home mailorder business. \$20,000 yearly not unusual. Masters, 5145 Norwood, Arlington, Calif.

CASH in on contests now; get facts that help. Write Sanders & Co., 1762 Euclid, Lincoln, Nebr.

WE Buy all varieties, snakes, lizards, turtles, toads, frogs. Details 25¢. Biological Exchange, Dept. 16b, 1211 Wagner Way, El Paso, Texas.

IN 1952 I had no job and little money. Today I am retired, own a home, car, and bank account. Anyone can do this regardless of age or education. Free information write Norris Cole, 217 49th Street West, Bradenton, Florida.

BUY Wholesale! Save 66-2/3%! 100,000 name brand appliances, housewares, clothing, furniture, tools, sporting goods—Everything! Free catalogs! National Buyers Service, Box 3338EB, San Francisco, Calif.

HOTTEST Mail order plan ever! Sell photos, films, art novelties. Huge proven profits! Free details! A.M.P.R.O., Dept. 1A, 429 South Western, Los Angeles 5, California.

MAKE \$15,000 Yearly at home on \$5.00 and 3 hours weekly. No experience necessary. Proof, details, complete plan only \$1.00. Satisfaction or refund. Columbia Enterprises, #203 Grubb Rd., Silver Spring, Maryland.

BIG Home earnings for you simply answering questions! Leroy Hoda, 2170 Quesada Ave., San Francisco 24, Calif.

OFFICE Men. Good money year after year, preparing income tax returns spare time at home. No lessons. Only fourteen hours study evenings. Amazingly simplified. Write, Reynard, Box 1265-A, Peoria, Illinois.

\$1,000.00 MONTHLY For 26 years! Stay home and enjoy life with the most fascinating mailorder business ever conceived. The postman has put over \$250,000.00 into one mailbox with this plan! Learn how you too can start right now. Facts free! Dixieland Publishers, Asheboro 61, N. C.

\$1200.00 MONTHLY Proved! Rid homes, farms, businesses of termites, rodents, pests. New shortcut methods! Learn everything two weeks! Free success plan. A.P.C.O.A., Dept. 1A, 429 South Western, Los Angeles 5, California.

FORMULAS, PLANS, ETC.

LATE, Modern manufacturing formulas. List free. Moon Chemical, Martville, New York.

FORMULAS For latest money-making discoveries. New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

SILICONE. The best waterproofing wood, cement, leather, paper. Information. Sonic Chemicals, 181, Rushsylvania, Ohio.

LIFETIME Business! Manufacture extremely profitable products! Lists free! Thermolab, Peoria 4, Ill.

FREE Formula catalog. Anything analyzed. Reasonable. Western Chemical, Salem, Oregon.

FORMULAS: All kinds, latest, best. Literature free. Kemikal, Park Ridge, Ill.

PRACTICAL Formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

CHEMISTRY

HIGHEST Quality chemicals in small quantities; chemistry sets, apparatus and laboratory supplies. 25th year. John H. Winn Co., Inc., 134M West 23 St., New York 11, N. Y. Catalog 25¢.

60 PAGE Booklets! "Beginners Chemistry," "Chemistry," "Physics," "Relativity," "Light," "Astronomy," "Electricity," "Radio," "Useful Tables," "Scientific Oddities," 10¢ each. Franks, 3121 South Racine, Chicago 8.

CHEMICALS, Supplies catalog. 25¢. Laboratory Sales, Box 161-A, Brighton, Mass.

AMAZING New Book of Science, Experiments, formulas, and catalogue of laboratory supplies. Only 25¢. National Scientific Co., Dept. PM-9 500 West Road, Lombard, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25¢. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20¢. Tracey Laboratories, Evanston, Illinois.

PLASTICS

LEARN Plastics fabrication for spare time income. Low cost home training now available. Write for free booklet, Interstate Training Service, Dept. D-3, Portland 13, Ore.

LAMINATING Supplies. Free price list. Solomonson, 45 Cornhill, Boston 8, Mass.

PLEXIGLAS, Fiberglass, polyester, epoxy, acetate, vinylite, styrofoam, acrylic, instructive wholesale-retail catalog, free. Gem-O-Lite, 5529 Cahuenga, North Hollywood, Calif.

BOXES, Plastic. Free list. Aithor, 170 Bay 23 Street, Brooklyn, N. Y.

NEW Liquid casting plastic, clear, colors. Embed real flowers, coins, photos. New manual shows fine things you can make at home and sell at big profit. Send 25¢. Castolite, Dept. K-101, Woodstock, Illinois.

PLEXIGLAS. Square foot cost: 1/16", \$1.20; 1/8", \$1.52; 3/16", \$1.86; 1/4", \$2.21; 3/8", \$3.23; 1/2", \$4.36. Colors add 10%. Send 15¢ for postage. Aristocrat Plastics, 23-25 Sussex Ave., Newark, N. J.

AGENTS WANTED

RUN Spare-time greeting card and gift shop at home. Show friends samples of our new 1957 Christmas and all occasion greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 70, Ferndale, Michigan.

AGENTS Sell fur-like cape stoles. Large profits. Free photos. J. A. Mig. Co., 1740 Westwood Avenue, Long Branch, N. J.

EXCLUSIVE Line of personal initialed buckles, belts, cap badges, 3,000 emblems, uniforms, shirts, caps, etc. Hook-Fast, Dept. PM, Roanoke, Virginia.

WHOLESALE Catalog! Clothing, linens, housewares. Write Bostonian, 14 Dock Sq., Boston 8, Mass.

AGENTS — 300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 1217-D West Newport, Chicago.

YOUR Ad in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A" right now. P. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

GOLDMINE Of 600 money makers. Copy free. Specialty Salesman Magazine, Desk 5-B, 307 N. Michigan, Chicago 1.

GOLD Or silver letters, numbers. Windows, doors, trucks, 1" to 6". 500% profits. Free samples. Atlas-T, 344 West 79th, Chicago 20.

PRINTING, Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Ralco, XL, Boston 19, Mass.

YOUR Own business—Used suits \$1.50, overcoats 85¢, mackinaws 35¢, shoes 12½¢, ladies coats 30¢, dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 605-AA West 12th Place, Chicago 7.

EASY Handwork makes fast-selling articles. Sample free. Sunmade Company, Brockton 84, Massachusetts.

MAKE Money quick, easy, taking subscriptions from every family in your community. Liberal commissions. We tell you how, furnish all supplies free. Write McGregor Magazine Agency, Dept. 100, Mount Morris, Illinois.

TREMENDOUS Profits! Every man, woman and child a customer. Used suits \$1.50, pants 35¢, dresses 20¢, shoes 20¢. Operate from store, home, car. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

SELL Famous \$3 fire extinguishers. Fast sales, liberal profits. Write Fire-Killer, Box 182, Hazleton, Penna.

CHRISTMAS Cards—Impressive albums of deluxe and popular-priced greetings with customer's name imprinted. 150 lavish designs for business and personal use. Wide selection for every taste and budget. You can earn \$300 to \$500 commissions, even in spare time, between now and Christmas. Sales experience unnecessary. We furnish free fully equipped sales kit complete with albums and easy-to-follow selling instructions. Dependable service guaranteed by old established manufacturer. Write Process Corp., 1952 S. Troy, Dept. PB, Chicago 23, Illinois.

RIFLE Pen, new, distinctive, exclusive (patented), receptive market, self seller, a thing of beauty, simulated gold plated finish, rifle action mechanism, tremendous sales potentials, samples two for \$1.00, postpaid. Jomar, Dept. 11, Box 727, Round Lake, Illinois.

SELL By mail and direct to offices, stores, homes, schools, churches, clubs Nifty sealer and moistener for envelopes, labels, trading stamps and anything that sticks. Sample \$1.00 refundable. Mailing circulars \$1.95 M. 110% profit. Amberland, P.O. Box #91, So. Boston, Mass.

NEW Christmas card discount selling plan pays you more! Make \$100 cash easy in spare time. 250 finest gift and card sellers. Many exclusive! Personal album free, other samples on approval. \$1.25 gift free for promptness. Cardinal, 1400 State, Dept. 79-D, Cincinnati 14.

BEAUTIFUL Feather pictures. 200% profit! Free details; sample 20¢ stamps. Sylviak, Apartado 9036, Mexico City.

MAKE Money! New, different commission circulars. Free samples. Damm, Inc., Box 148, Flushing 52, N. Y.

MAKE \$50-\$300 Extra money fast. Show big value \$1.00-\$1.25 Christmas, everyday greeting card assortments, gift wrappings, costume jewelry, gifts, stationery. Profits to 100%. Cash bonus. Write for newest assortments on approval, free gift offer, free album name imprinted Christmas cards, catalog, details. Hedenkamp, 361 Broadway, Dept. PM-52, New York City.

DRYCLEANS Clothing for only 10¢ per garment. Lightning seller. Saves dry-cleaning bills. Samples sent on trial. Kristee 68, Akron, Ohio.

\$1,000.00 A Month for making dramatic 3-second demonstration of amazing lightweight Presto fire extinguisher. New chemical used by airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd, Dept. P-58A, New York City 16.

MAKE \$50-\$75-\$100 Again and again. Show friends new idea Christmas, all occasion boxed assortments, gift wrappings. Profits to \$1.00 per box. Write for feature boxes on approval, 64 free personal Christmas card, stationery samples, free catalog. Sensational free offer. New England Art Publishers, North Abington M-95, Mass.

80% PROFIT On cosmetics—Famous nationally advertised Hollywood cosmetics pay 80%. Make \$25 day up. Hire others. For free samples, details, write Studio Girl, Glendale, Calif., Dept. 1279G.

NEED Money? \$50 yours. Sell only 100 boxes new Christmas cards. Other amazing offers. Free samples imprinted cards. Feature box assortments on approval; free catalog. 100 profitable items. Work with a national leader. Write today. Pen-N-Brush, Dept. PM9, 139 Duane Street, New York City 13.

IF You want to earn money fast, I'll send you free sample stocking of newest stretch DuPont nylons to sell at only \$1 a pair. American Mills, Dept. 624, Indianapolis 7, Ind.

MEN, Women, make money spare time plus new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1½ years, or replaced free. Write Wilkmit, 1779 Washington, Greenfield, Ohio.

TURN Your spare time into profits! Friends, neighbors, relatives buy these unusual gifts, gadgets, toys, jewelry, gift wraps and greeting cards on sight. Over 600 terrific new items—Up to 100% profit! Send for sensational money-making free catalog now. Start to make big money immediately on Christmas sales! Samples on approval. Write Greetings Unlimited, 7-42 Park Square, St. Paul, Minnesota.

SEEKING New products? Get my outfit 47 money-making specialties. Latest conveniences for home, car. Send no money. Just your name. Kristee 69, Akron, Ohio.

GUARANTEED — Moneymaking. 10¢. Charles R. Williams, Route 2, Clarksville, Tennessee.

PRIVATE Eye door lookout. You see intruders. They can't see you. Sells like wildfire. Big profit. Free literature. Michael Broado, Box 231, Duluth, Minn.

\$2.00 PAYS \$56.00. Capitalize on new discovery of metallurgical chemists. Perfect business for life. Write—Miracle Products, P.O.B. 1544, Oakland, California.

SELL Sparkling glitter! Decorate ornaments, gifts, greeting cards, etc.; 6 sparkling colors in shaker cans with glue, mounted on blister display card. 100% selling profit. Send \$1.00 for sample, sales details. Ames, Box 709, Selma, Alabama.

YOUR Photo on stamps. No investment—No stock. Big profits. Free samples. Miniature Photostamps, Box 44-F, New York City 67.

BIG Wholesale catalogue free. Discounts to 80%. Reliable Distributors, 2931-M Derbigny St., Metairie, Louisiana.

SELL Aluminum embossed name plates for mailboxes, lawn, posts. Write: Star-metal Company, Stirling Rd., Warren Twp., Plainfield 3, New Jersey.

ROBOT Pens—Automatic. Sample \$1.00. Exclusives, Box 601, Rome, New York.

EARN To \$3 hour writing orders for appliances, dinnerware, cutlery, watches, cookware, etc. At post paid discount prices. Catalog and details free. Reidler's Sales, 501 Parkway, Schuylkill Haven, Penna.

CLOSEOUTS! Bankrupt stock! Bargains galore. Nationally advertised merchandise as low as 10¢ on the dollar. "Bargain Magazine" tells you where. Sample 25¢. Glass, Ellwood City 1, Penna.

CHRISTMAS Music cards. Dorby Music Cards, Box 354, Morristown, New Jersey.

HOW To make more money quickly. Sell fast selling Biblical "good luck" jewelry. Buy direct. Free plan. Olect Mfrs., 305 E. 47, New York City.

SELL Rubber stamps, printing. Big profits. Free kit. Barber, Marengo, Ohio.

A Gold mine! New Jiffy fire extinguisher. Latest scientifically developed chemical powder smothers fires instantly. Priced low. Guaranteed. Details free. S & S Manufacturing Co., 2516 Noriega, San Francisco.

RETRACTABLE Pens. Many styles. 3 samples 50¢. Nucleus Trade, 2440 Amsterdam Ave., New York City 33.

SCHOOL Seniors—Be popular with classmates. Have spending money galore. Details free. Craftcards, Box 235-L, Pittsburgh 19, Pennsylvania.

ALL New Scripture-text Christmas cards, stationery and exciting gift items. Free information. Cicero Bible Press, 2301-X Roosevelt Road, Broadview, Illinois.

BUY IT WHOLESALE

BUY Wholesale! Standard brands. Housewares, sporting goods, appliances, jewelry, etc. Catalog \$1.00 refundable on first purchase. Charles Campbell, P.O. Box 1037, Gardena, California.

WHOLESALE Catalog \$1.00, \$3.00 refunded. Hayes, 3039 Durt Rd., Barberton, Ohio.

FREE Wholesale catalog. Gifts, appliances, housewares, cookware, cutlery, watches, dinnerware, silverware, jewelry, etc. Discounts to 80%. Topval Corp., Lindenhurst 624, N. Y.

BARGAINS, Joblots, closeouts. 2000 items. Tremendous savings, clothing, toys, gifts, jewelry, television, etc. 25¢ brings wholesale catalog. \$1.00 merchandise certificate included free. Reliable Jobbing, 311-B North Desplaines, Chicago.

BUY Wholesale! Discounts to 80%! Appliances, tools, typewriters, clothing, watches, housewares! Midwest, IMP-156, Pontiac, Illinois.

DISCOUNTS To 75%. Name brands. Postcard gets \$1.00 credit. catalog. United, M-450 Broad, Newark, N. J.

BIG Multicolor wholesale catalog! Housewares, appliances, clothing, silverware, cookware, luggage, binoculars, radios, phonographs, cameras, recorders, projectors, typewriters, shavers, sporting goods, toys, tools, sewing machines, watches, jewelry. Name brands. Huge discounts. Postcard: Selbyco, Decatur 180, Illinois.

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin PMW, Covina, Calif.

USED And new watches \$2 up. Free list. Southern Watches, Gray, Georgia.

BUY Wholesale! Over 10,000 nationally advertised products. Appliances, cameras, sporting goods, housewares, watches, typewriters, tools, clothing, etc. Send postcard today. Buy-Rite, Box 258, Hawthorne 4, New Jersey.

TERRIFIC Discounts. Catalogue \$1.00 (refundable). Billera, 38 Circle, Hicksville, New York.

BUY Wholesale, appliance, houseware, watches, catalog \$1.00. Hobby, 48A, W.H.P., Goldsboro, N. C.

SALESMEN—DISTRIBUTORS

SELL Electrical waterproofing necessity factories, shops. Typical order, \$17.50 profit. Box 5672, Cleveland, Ohio.

FAST Selling revolutionary knife sharpener. Last a lifetime and fully guaranteed. Will sharpen stainless steel. Send \$1.00 for sample and information or \$6.00 for dozen. 100% profit. Min-It Knife Sharpener Co., 4667 1/2 York Blvd., Los Angeles 41, Calif.

AMAZING Insecticide line. Safe indoors, outdoors. Sells fast. Demonstrates. Great repeater. Wonderful profits. Distributors opportunity. Write Sayer Associates, 428P3 Portland Bldg., NW, Washington 5, D. C.

EARN \$200 Weekly distributing our amazing Acorn magnetic card holder line. County franchises available. Standard, 120 Broad, Newark 4, N. J.

ANYONE Can sell famous Hoover uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics, nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. J-160, New York 11, N. Y.

AD Matches! Sell amazing designs—10, 20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-93, Chicago 32, Illinois.

\$1,000.00 A Month for making dramatic 3-second demonstration of amazing lightweight Presto fire extinguisher. New chemical used by airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd, Dept. P-58A, New York City 18.

EXCLUSIVE "Trade-in sale" of old shoes sells new Air Cushion shoes for you! Highest commission, bonus. Paid vacation. Samples supplied. Charles Chester Shoes, 944 Brockton, Massachusetts.

CALENDARS, Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. Fleming Calendar Co., Sales Division, 6539 Cottage Grove, Chicago 37, Ill.

MAKE Extra money. Cash commissions. Everybody buys easy-to-sell advertising book matches. Union label. All sizes. Cuts for all businesses. Powerhouse selling kit free. Steady repeat business. No experience necessary. Superior Match Co., Dept. M-957, 7528 S. Greenwood, Chicago 19.

SOFT, A unique powdered toilet soap, with coconut oil, for shaving, shampoo, bathing. Send \$3.00 for each dozen cans. Distributors, jobbers write for maximum schedule. Adams Soap Mfg., Schodack Landing, New York.

MONEY-Making opportunity! Take big profit orders for world famous patented varieties fruit trees. Also flowering shrubs, roses, vines. Big sales outfit free. Stark Bro's, Desk 30198, Louisiana, Missouri.

IF You're interested in making money in selling, see the hundreds of exceptional opportunities in Salesmen's Opportunity Magazine. Send name for your copy, absolutely free. Tell us what you're selling now. Opportunity, 648 N. Dearborn, Dept. 17, Chicago 10, Illinois.

100% PROFIT. Fast money for you! Take orders for Sweet Georgia Brown cosmetics. Colored people buy it quick. Free sample. Write Valmor, 2451-PF Michigan, Chicago 16.

BIG Earnings! 1000 job opportunities! Write. George Lucas, Bellevue, Wash.

MONEY Back low priced trading stamp plan pays you bigger spot cash profits with steady year 'round income from re-order commissions. Every grocery, gas station, drug store, etc., are "quick" buyers. Free pocket sales kit. Worthmore, P-9, 1825 South Michigan Avenue, Chicago 16, Illinois.

NEW, Amazing collection system. Collects old bills speedily. Sells fast to merchants, doctors, manufacturers. Wonderful profits. Free details. Nationwide, North Madison 5, Ohio.

\$200 WEEKLY Calling on businesses! Victor, Dept. 1419, Box 231, Wausau, Wis.

OUTSTANDING Sales opportunity, introducing new completely guaranteed product, 7 years research make it best in field. Tremendous market. Territory and earnings unlimited. Sales training for you and your crews. Write for details, R. L. Barton, Barton Bldg., Galesburg, Illinois.

EMPLOYMENT INFORMATION

UNLIMITED Job opportunities. Details free. Personnel Associates, Box 1018, Edinburg, Texas.

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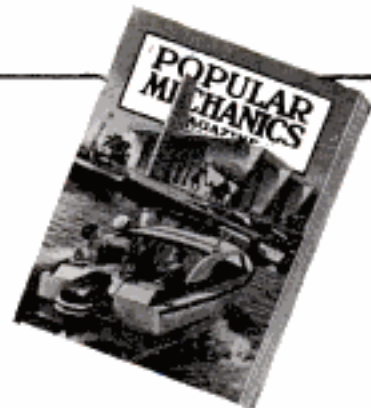
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1



2



3

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4



5



6

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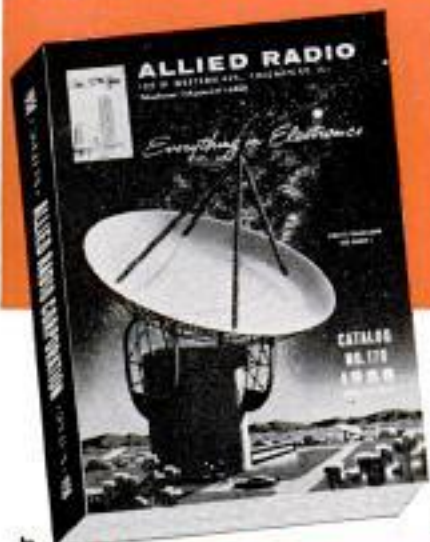
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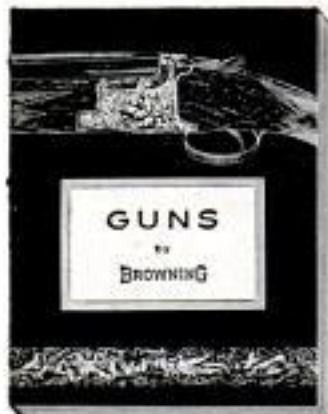
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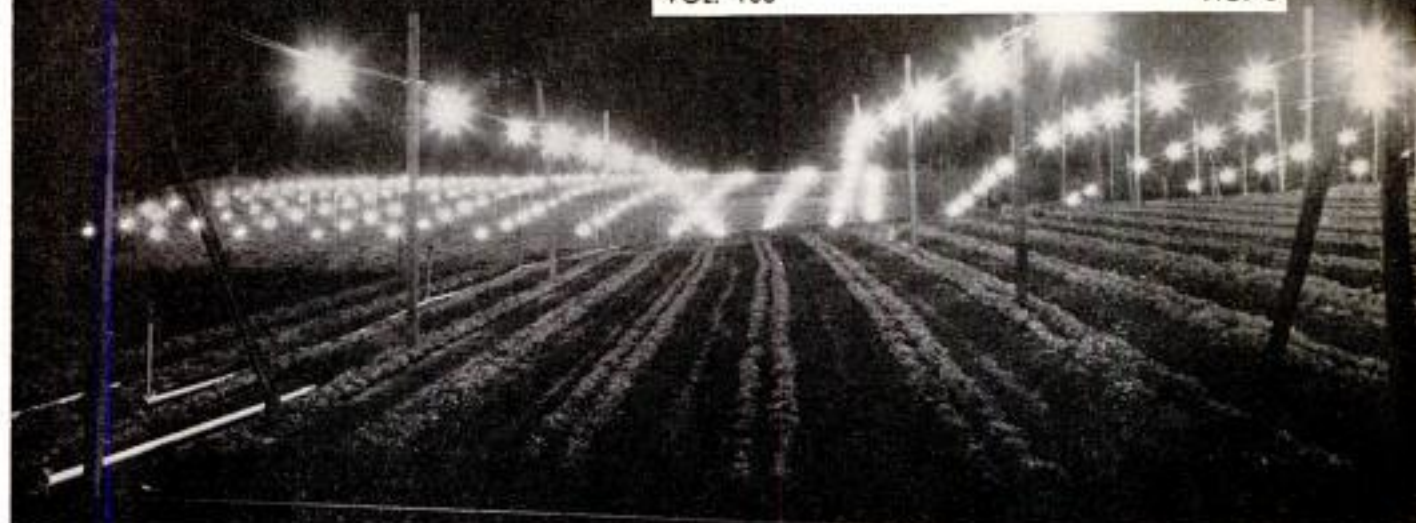
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FINEST HAND AND POWER TOOLS MADE FOR HOME AND INDUSTRY



General Electric photo

Chrysanthemum growers shorten nights by brief period of artificial light, postponing flowering until desired

Polka-dot tomatoes and midsummer chrysanthemums? Nothing to it if you know how to control the light switch nature has built into your plants. By playing with lights you'll find

You Can Make a Plant Do Tricks

By Clifford B. Hicks

HERE IS NEWS for anyone with a green thumb. Scientists of the U. S. Department of Agriculture have come up with a startling and basic discovery about plants. Using this discovery, you can make chrysanthemums bloom in midsummer and surprise your neighbors with polka-dot tomatoes. You can force one seed to germinate and prevent an identical seed from sprouting.

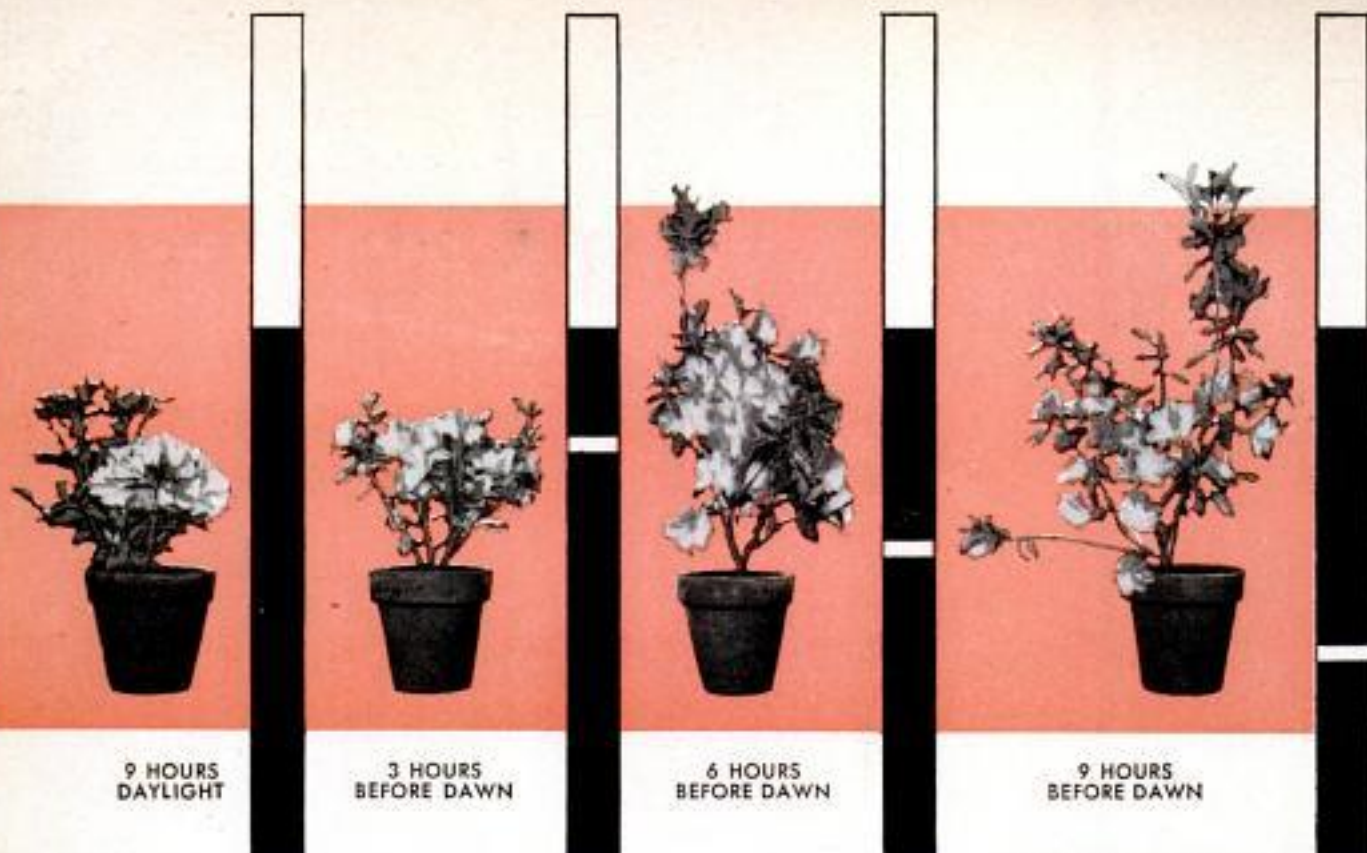
So little is known about this truly basic discovery that any home gardener can learn further facts for himself. It's a fine opportunity for the amateur to perform basic research with no more equipment than a few electric bulbs.

This is the discovery: Many plants and

seeds have a built-in "switch" (or perhaps a group of switches), and by "turning on" this switch at the right time you can cause the seeds to germinate and the plants to blossom. By "turning off" the switch you produce the opposite effect. Actually, the switch can be flicked on and off indefinitely, and the plant or seed will always respond to the last position of the switch!

All you need to flick this switch is a relatively short shot of artificial light.

The effect of artificial light on plants has been investigated for decades, but until recently little was known about how the night-day, on-off cycle causes plants to blossom. This light-dark influence on plants is called photoperiodism. A somewhat



U. S. Department of Agriculture photos

Shortening the night has a big effect on azaleas. Vertical bar represents 24 hours, black section the night period. Small white sections show short periods of artificial light to "wake up" the plant early

similar response to light causes some seeds to germinate and fruits to color.

The first hint of the importance of photoperiodism cropped up back in 1920, when two USDA scientists found that a certain type of tobacco would flower only when the daylight period was short and the night was long, regardless of any variations in temperature and humidity. Apparently something happened to the tobacco plant

during the short day to cause it to flower. Other plants showed the same reaction, so scientists began splitting plants into two categories, "short day" and "long day," depending upon the duration of daylight which caused them to flower. A few plants apparently were not influenced by the length of the day.

Within the past several years Dr. H. A. Borthwick and his associates at the Plant

Laboratory at Beltsville has 106 fluorescent tubes as well as filament bulbs to test effects of light



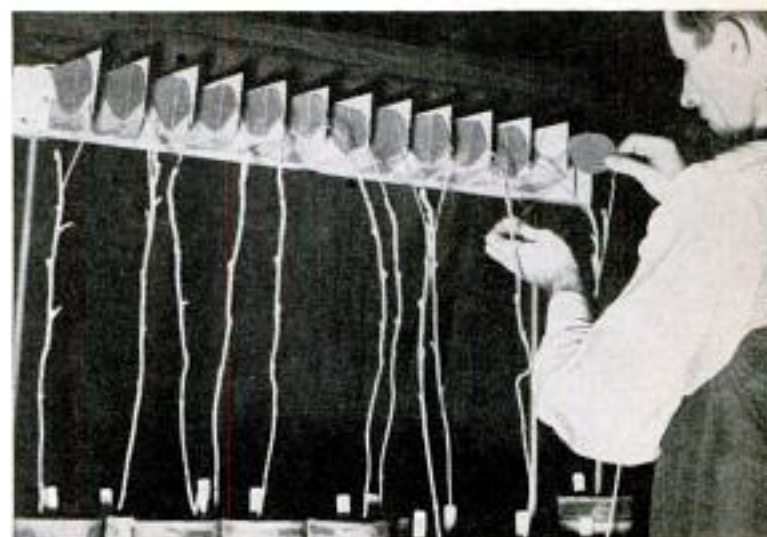
Industry Station, Beltsville, Md., have carried through experiments which prove to them that earlier researchers were on the right track but were riding the wrong train. Actually it is the *length of night* instead of the duration of daylight that causes plants to flower. At first glance it would appear that they simply are looking at the other side of the same coin. But here's the critical difference, and the one simple fact that throws open a wide field of research, even to the amateur: If you break the night period in the middle with even a short shot of artificial light (a few seconds to an hour, depending upon the plant) you can cause short-night plants to flower and prevent the flowering of long-night plants. In effect, you set off the alarm clock to wake up the plant, even though it still may undergo a good many hours of darkness before dawn.

Flowering is just one of the effects you can produce by setting off the alarm to fool the plant. A shot of light near the middle of the night promotes bulbing in onions, prevents the flowering of chrysanthemums and poinsettias, and induces runnering of strawberries. It will cause pea seedlings to put on a spectacular burst of growth and some seeds to germinate—all out of season.

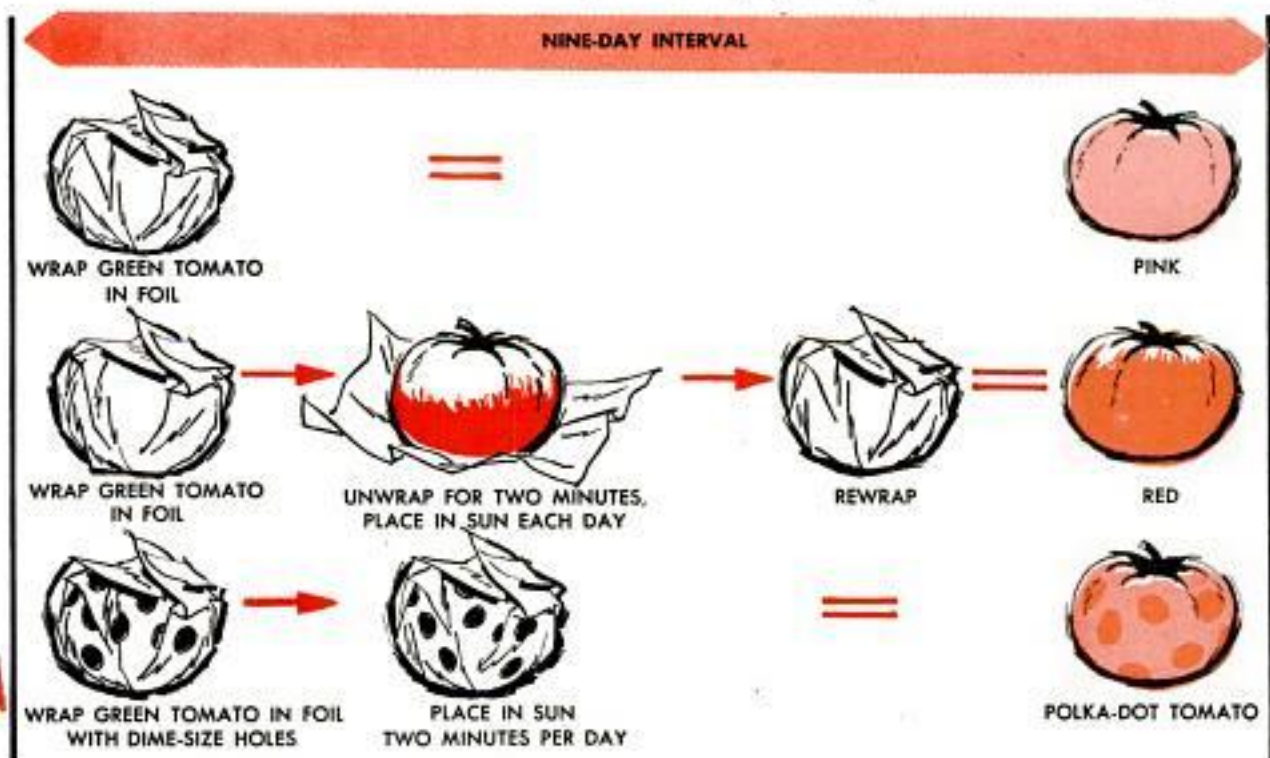
A gardener in Haiti who knew something of photoperiodism came to Doctor Borthwick a few years ago for suggestions on putting the phenomenon to work in his garden. As a result, he floodlighted his flower beds. Then he turned on the lights for a few minutes in the middle of each night. His flowers (they happened to be



U. S. Department of Agriculture photos
Spectrograph at Beltsville gave first clue to wavelength that produces the effects. It breaks white light into spectrum. When various wavelengths were tested on plant leaves, red was found to be the key



In experiments with the spectrograph, individual leaves of different plants are mounted so each leaf receives a specific wavelength. Effects on each plant then are noted. Drawing below shows how you can make pink, red or polka-dot tomatoes from green ones





Lengthen the night to make your mums flower in midsummer. Cover them late in afternoon, uncover in morning

short-night varieties) bloomed spectacularly. The hundreds who came to see the sight wondered why their gardens wouldn't bloom out of season, too.

Using this same basic discovery, commercial chrysanthemum growers have multiplied their income. The chrysanthemum, a late-fall plant, requires a long night to bloom. Today, when the nights are long, the grower switches on floodlights for a few minutes in the middle of the night to prevent the plants from blossoming, so he can force them to blossom later, out of season. When the nights are short he covers the plants for a while in the late afternoon or early morning, extending the period of darkness to bring the plants to

blossom. Thus he can send them to market in full flower almost the year 'round. There are more than 600 varieties of mums, with specific lighting instructions for each.

Obviously it isn't the total amount of light energy that causes a chrysanthemum to flower or not to flower. A few minutes of low-level artificial light will convince the plant that it's not yet time to produce a blossom. This amount of radiation, compared to the total radiation from the sun during daylight hours, is a drop in the solar bucket. So scientists at Beltsville asked themselves the next logical question: What is it, in white light, that produces these effects?

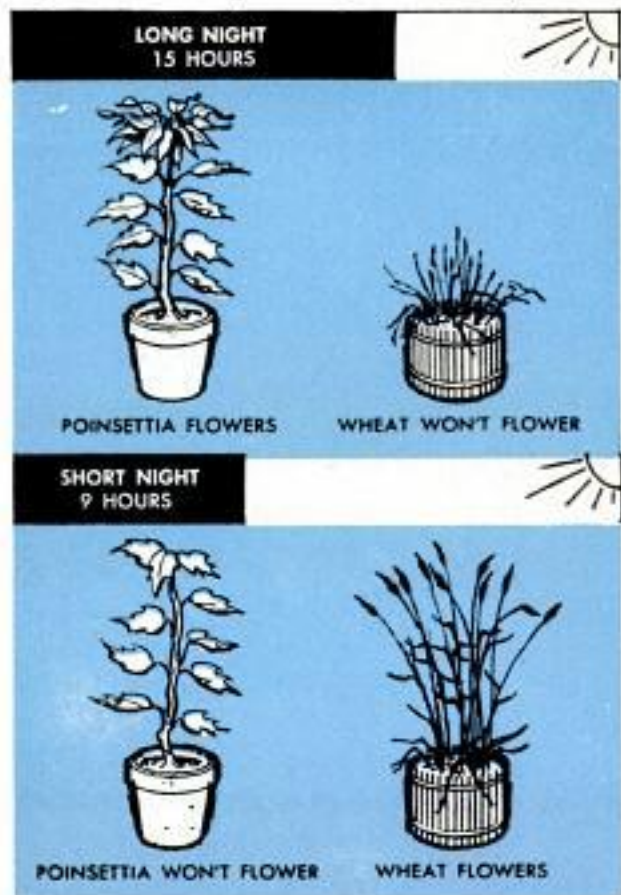
Red Light Is the Key

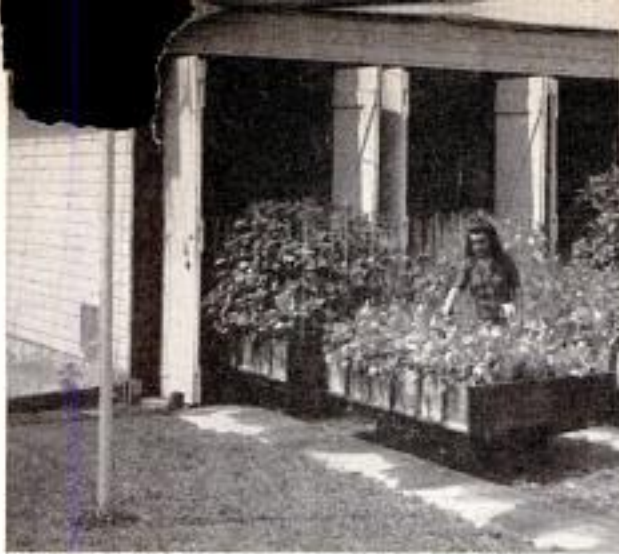
White light, of course, is a mixture of all colors (wavelengths) of the spectrum. When the researchers began experimenting with individual colors, they soon found that red light was the key. Red was so effective that an exposure of only 20 seconds would "close the switch" to prevent long-night soybeans from flowering. The same wavelength also "opens the switch" to cause short-night plants to blossom.

But the strangest discovery of all by Doctor Borthwick and his workers was that the reaction is reversible. Some years ago scientists, experimenting with lettuce seed, found that red light woke up the seed, causing it to germinate, but far-red light, just between red and infrared, put the awakened seeds back to sleep again. The Beltsville scientists then discovered that seeds would respond, time after time, to the last position of the switch, and this same on-off effect also applies to the flowering of plants. The logical conclusion is that the red and far red in natural sunlight flick the switch at dawn, one way or the other, depending upon the position of the switch through the night.

This reversible effect of red and far-red light is also shown in the ripening of tomatoes. What makes an off-season tomato pink instead of the rich orange-red of the

Opposite flowering effects of long nights and short nights are shown by ordinary wheat and poinsettia





U. S. Department of Agriculture photo

At Beltsville, length of night is varied by wheeling trucks loaded with plants in and out of a shed

in-season one? Off-season tomatoes are usually picked green and ripened in the dark. In the skin of the tomato is a pigment, colorless until the tomato ripens. Red light causes this pigment to turn yellow, and the pink of the flesh viewed through the yellow pigment produces the bright orange-red color of a fine tomato. Exposing the tomato to far-red light undoes the work of the red, keeping the skin colorless. At Beltsville they reverse this effect repeatedly, then let the tomato ripen. It always has the color characteristic of the last position of the switch.

Because such research requires little equipment, it's an open invitation to the man with the green thumb.

Fun for Amateur Gardeners

"Any amateur gardener can have fun experimenting with these effects in his own home," says Dr. Robert J. Downs, plant physiologist at Beltsville. "All you need are some seeds, plants or green tomatoes and some lights. You'll need two kinds of lights—fluorescent lamps and some ordinary incandescent bulbs. Fluorescent supplies an adequate amount of red, but practically no far red. Incandescent supplies an abundance of both red and far red.

"In some experiments you may want only red light. You can get it simply by wrapping fluorescent tubes with red cellophane, which prevents wavelengths shorter

than red from reaching the test object. If you want far red only, you must either use incandescent bulbs or the sun itself, and filter this light through two layers of red and two layers of blue cellophane. This filters out all the wavelengths shorter than far red. In fact, you'll swear you're getting practically no light at all, which is true. Since incandescent bulbs become quite hot, you can't actually wrap them in cellophane. Instead, place your test object in a cardboard box and fasten the cellophane over the top."

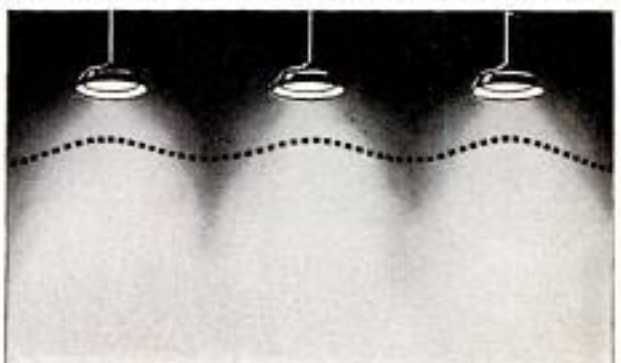
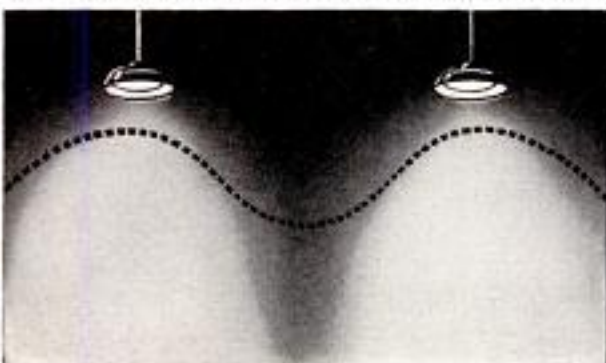
The easiest way to picture the effects you are producing is to think of the dimmer switch on your auto headlights. Regardless of whether the lights are bright or dim, a press of the button will produce just the opposite effect. In plants, natural sunlight throws the switch one way or the other, depending upon the type of plant. With a shot of artificial light at midnight, you press the button to throw it in the opposite direction. The plant uses either the red or the far-red part of the spectrum, depending upon how nature has set its switch.

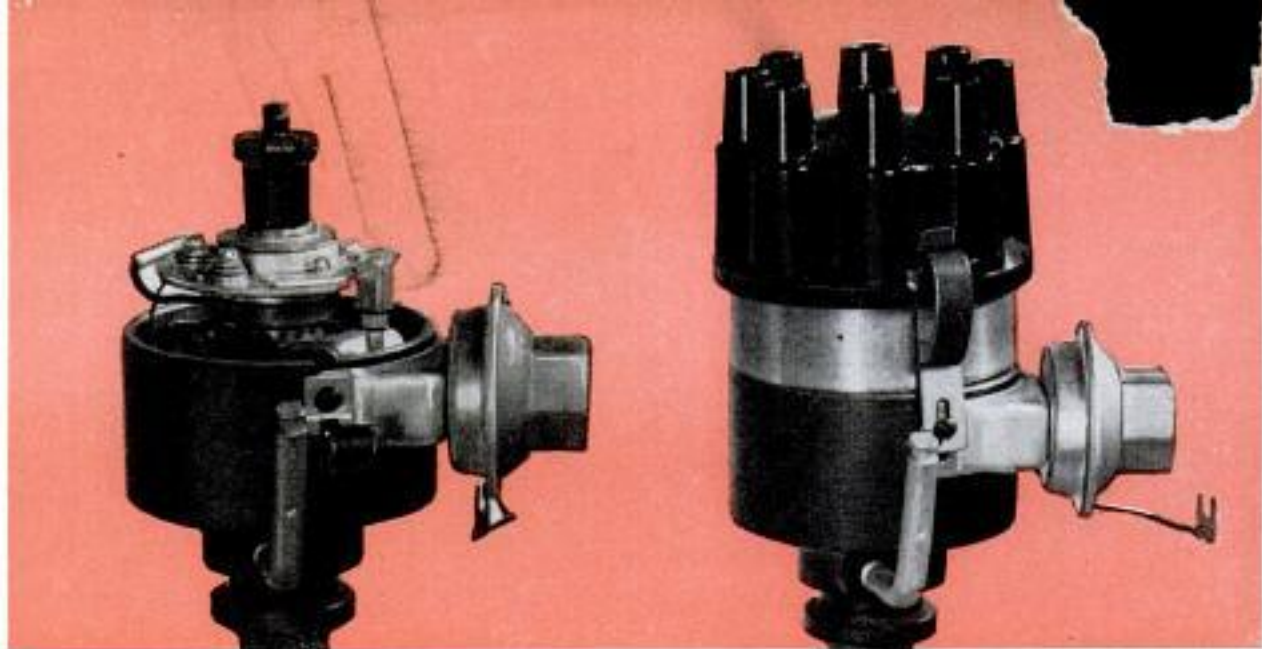
Basement Laboratory

If the basement of your home has a reasonably stable temperature you can use it for your experiments. For most warm-season flowers and vegetables a temperature of 60 to 68 degrees is ideal. However,

(Continued to page 232)

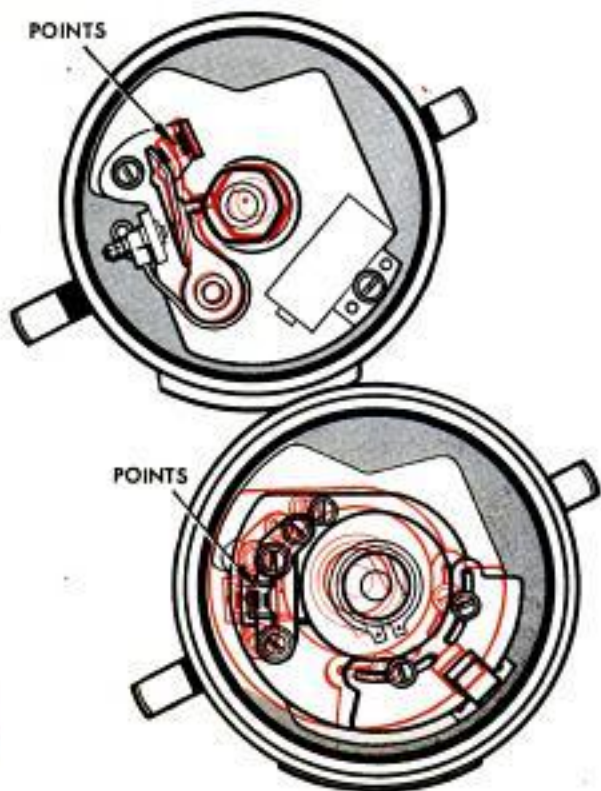
In your home experiments, avoid hot spots shown at left by installing incandescent bulbs close together





Left, Hy-Fy-R unit installed in distributor. Right, metal spacer ring and cap-clip adapters are part of unit

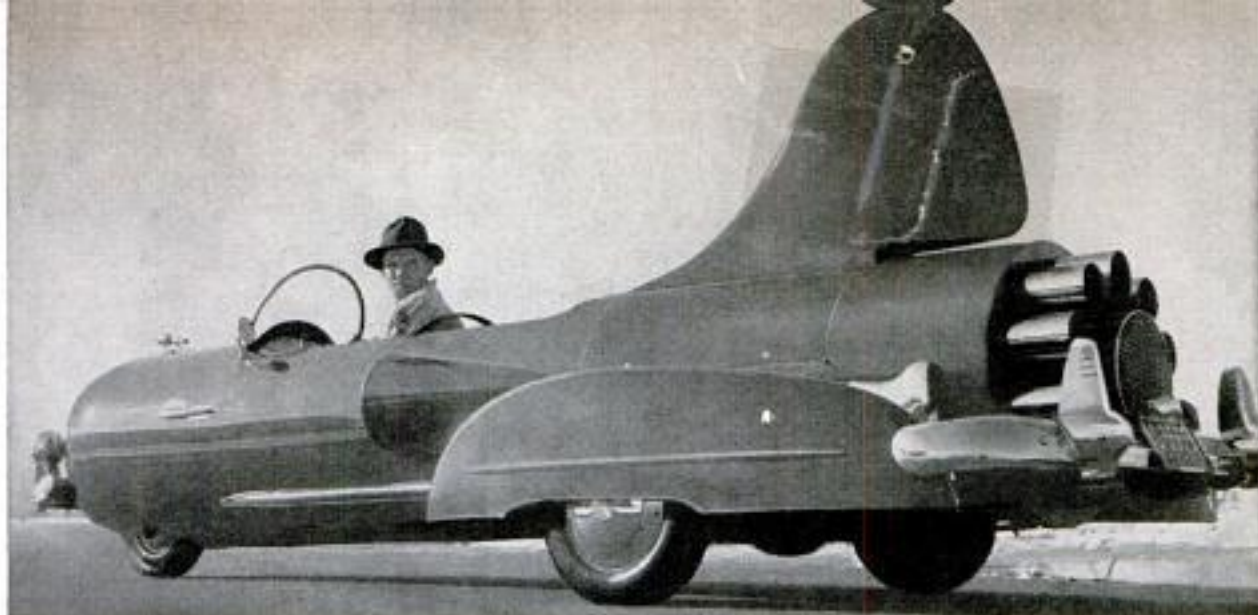
Hy-Fy-R Gives Hotter Spark



INCREASED HORSEPOWER, better gasoline mileage and smoother idling are claimed as the advantages of the Hy-Fy-R ignition system for automobiles by its manufacturer. Roller bearings open and close the points in this unit, which fits into a regular distributor without changing it in any way. Points are preset at the factory at .010 in., and never need adjusting. Spring pressure on the points is 6 lb. instead of the usual ounces in a standard distributor, which assures faster closing of the points. A single roller bearing on the point assembly is actuated by roller bearings on the inner race of the unit, one bearing taking the place of each of the lobes on the cam of a standard distributor. Because the ignition points are in a separate unit, the gap between them remains constant even though the distributor shaft may wobble. In a standard distributor, a wobbling shaft causes the points to be too close when it is in one position, too far apart when it is in another. Should the Hy-Fy-R at anytime cause trouble, removing one wire and a rubber block between the regular points brings back stock ignition.

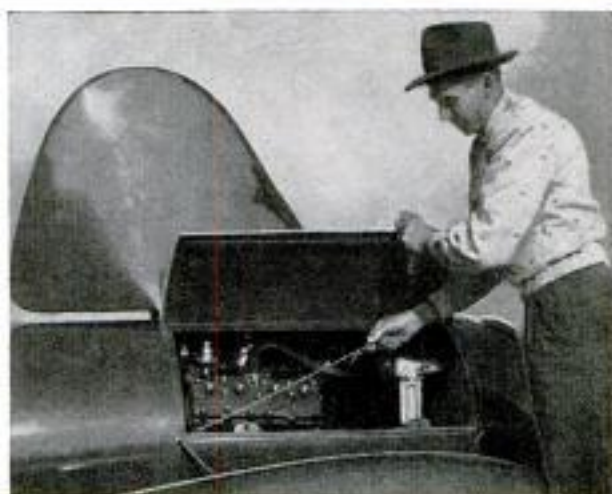
Above, effect of wobbling shaft on standard and Hy-Fy-R ignition. Below, Hy-Fy-R is disassembled easily





Homemade Sports Car Looks Jet-Propelled

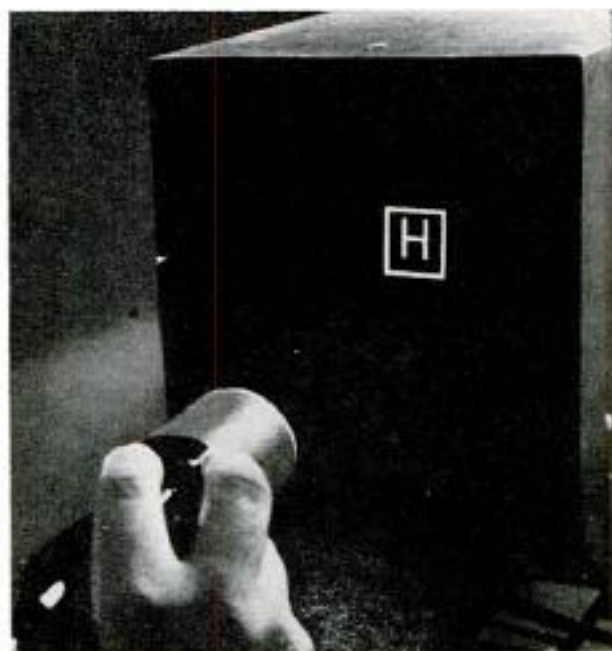
Motorists around Grove City, Ohio, are startled by the sight of a bright-red jet-propelled auto cruising down the highway. Actually the car isn't jet-propelled, but a ring of exhaust pipes at the tail gives that impression. The novel sports car was built over a period of six years by Stanley Eakin. It is a three-wheeled two-seater powered by a rear-mounted 60-horsepower engine. Although the car is only 36 inches high, a huge rear fin sweeps up to a height of more than 67 inches.



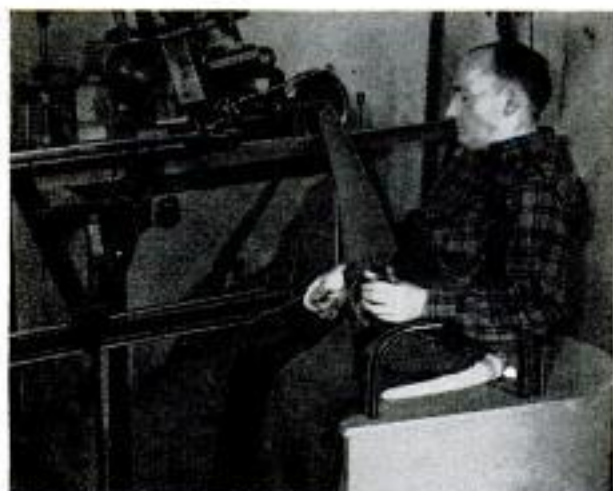
Panels Produce Images From Electrical or Optical Signals

Images and other visual displays are produced on flat glass panels through a new process developed by Sylvania. On one type of panel a mobile dot can be manipulated electrically. Another type can "remember" the track of a mobile spot of light, and still another can reproduce a motion picture. The panels have thin coatings of materials

which are sensitive either to electricity or light. When electrical or optical signals and a power source are applied to the panels, visual displays or images are produced which correspond to the signals. Such displays could represent information for computers, radar, air-traffic control systems and various instruments.



Handicapped Team Develops Wheelchair



Sightless George Spurgeon (top right) and John Tracey, who has polio-impaired legs, teamed up to make the motorized wheelchair in which Tracey sits. An earlier model is in front of them. Tilting of a control rod steers the chair. In "neutral" gear the wheels are locked so Tracey can work at his automatic saw-filing machine (left). About 38 inches long and 22½ inches wide, the chair has a wrap-around bumper, motors for each wheel and a battery charger.



Frameless Dutch Motorbike Assembled From Steel Plate

Aerodynamic design is featured in the construction of a 1.6-horsepower motorcycle, left, from parts of pressed steel. The manufacturer, in Holland, claims this type of body is stronger than a conventional motorbike frame. The motor is concealed in the body in front of the pedal position. The fuel tank holds 1.5 gallons but the vehicle reportedly gets 160 miles per gallon. There are saddles for two passengers. By tipping up the front saddle, you'll find a tool compartment. The rear fork has hydraulic springing for easier riding with heavy loads or on bumpy roads. An adjusting ring allows the operator to set the beam of the headlight for full or dim light. The machine also has a two-speed gear.

EDSEL'S HERE (see page 92) and we await public reaction. This is an uncertain year to be invading the middle-price field, a field that was booming when Edsel plans were okayed in 1955, but is down sharply today.

American Motors feels good and with reason. Rambler is going well. Its six-cylinder models are sold out for the year. Dealers are crying for more. In today's market, that's enough to make any car maker feel good and especially American Motors. But there's more good news. At least a part of the industry is admitting AM has been right all along about the unit body.

Unitized construction, long an American Motors feature, will be used in the 1958 Lincoln and Thunderbird. And Ford engineers are discovering its advantages: Rigidity, reduced weight, more room, better door fits, easier quality control.

And, too, American Motors chief, George Romney, is understandably pleased about the trend toward small cars. Harlow H. Curtice, president of General Motors, has been saying for years that when the small-car market becomes big enough to be important, GM would be in it. Well, as you know, GM is in it so it must be important.

Smaller Rambler

However, even Romney lacked enough confidence in the small car. He stopped building his 100-inch-wheelbase Rambler two years too early. You'll soon be seeing the revival of that model. The 100-inch wheelbase made the original Rambler a success, but it was dropped in favor of the 108-inch model to make room for four doors.

The decision to bring back the smaller Rambler indicates the increasing strength of the small-car market. We have not (at this writing) seen the new model, but we'll guess it will be the same car that was built two years ago with minor changes. It would be impossible as well as foolhardy for American Motors to tool up now for a new shell. They may be able to use the new overhead-valve Six, but even that might not be possible (or necessary). That two-door 1955 Rambler was mighty stylish and, if it sells for about \$1700, it will be a strong competitor for the foreign cars.

Next year's Thunderbird will be a breed apart. It is unlike the present model. For one thing, it's a bigger car. It seats four. And its unitized body will be built for Ford by an outside company (Budd). It's hard to see how Ford can continue the "personal" label on this bigger car which, incidentally, is surprisingly dignified in appearance.

Not just the T-Bird is bigger. Chevrolet will be bigger, Lincoln will be bigger, Mercury, Cadillac and Pontiac, too. There will be a flood of new engines—all bigger. How-

Detroit Listening Post



By Art Railton

ever, the engines will be lighter as engineers work out simpler, cheaper designs.

All this bigness is confusing at a time when Rambler plans to revive its little car, when Studebaker claims its Scotsman is on back order (incidentally there will be no Mercedes-engined Studebaker in 1958), and Buick and Pontiac dealers grab at the limited number of Vauxhall-Opel franchises. A mixed-up business? You said it.

Who Will Get Hurt?

Question: Will the new Americanized imports cut into foreign-car sales or into sales of Ford, Chevrolet and Plymouth?

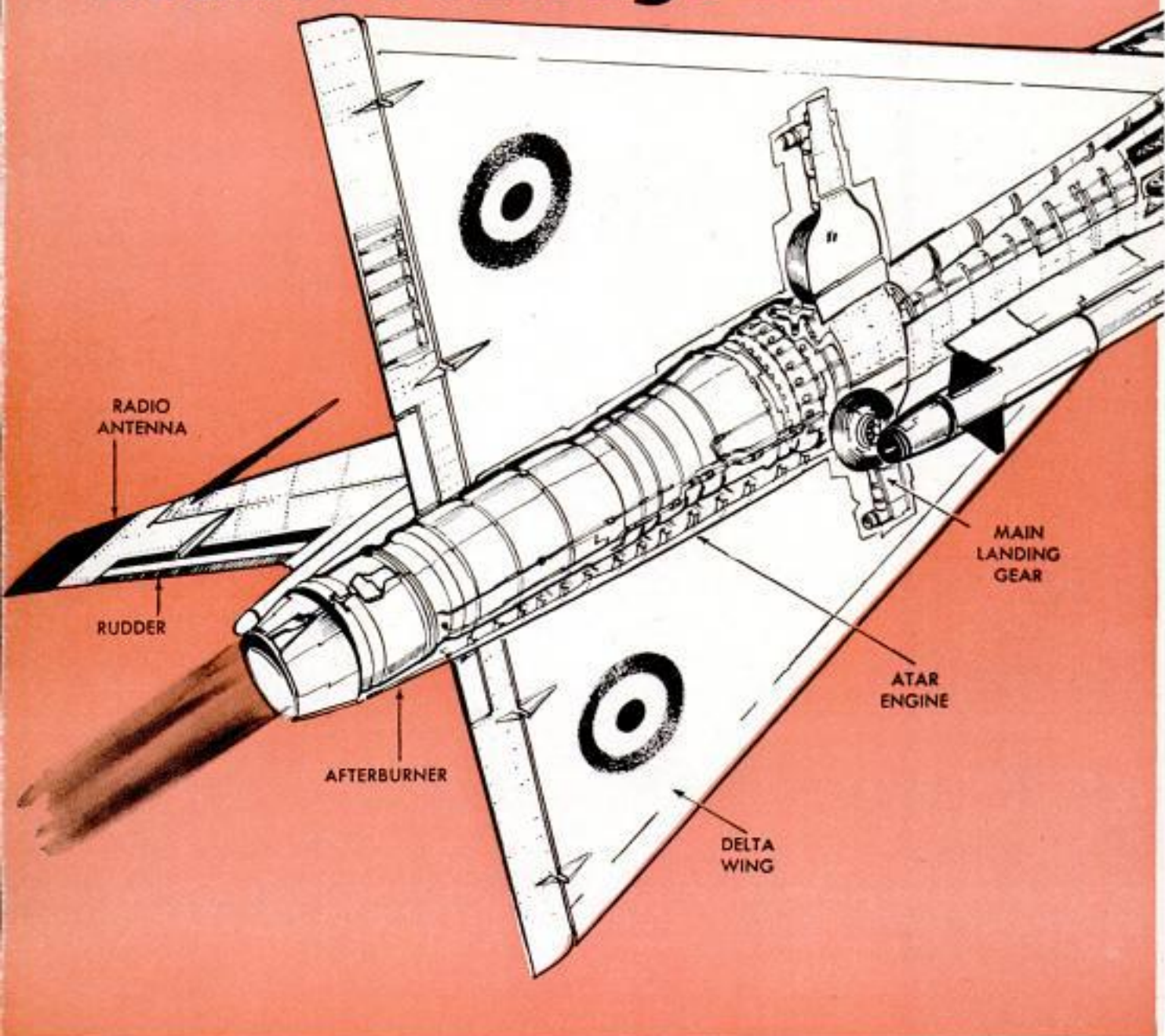
Answer: Who knows? Some Detroit planners predict the American-backed imports will squash the mushrooming foreign-car business. Importers disagree. They claim that these small cars, such as the Vauxhall and Opel, will make foreign cars more desirable. General Motors, they claim, has now made ownership of the small European car socially acceptable.

Volkswagen finally admits that its cars do back up. Shortly it will enlarge its rear window so drivers can see behind them.

Four headlights will be common in 1958, a fact that could aggravate an already serious glare problem. When was the last time you had your headlights aimed? It takes only a dent in a fender to throw headlight aim off dangerously. With bumpers and fenders interrelated in today's cars, even a minor bumper collision may throw off headlight aim. With brighter four-lamp illumination, the problem is intensified and the lighting industry is justifiably concerned. You check your tires—why not check your lights?

Rear-end styling of some 1958 cars may frighten you at first. Stylists have jazzed up the rear end so, on at least one make, it looks exactly like a front grille from a distance. When you see it down the road ahead of you, you think it's some nut in the wrong lane. Maybe we'll soon be burning taillights in the daytime so we'll know which end is which! ★ ★ ★

Lightweight With a Heavyweight's Punch - - - France's *Mirage III*



S MALL, LIGHT, FAST and high-flying but with the striking power of a heavyweight is France's newest jet interceptor, *Mirage III*.

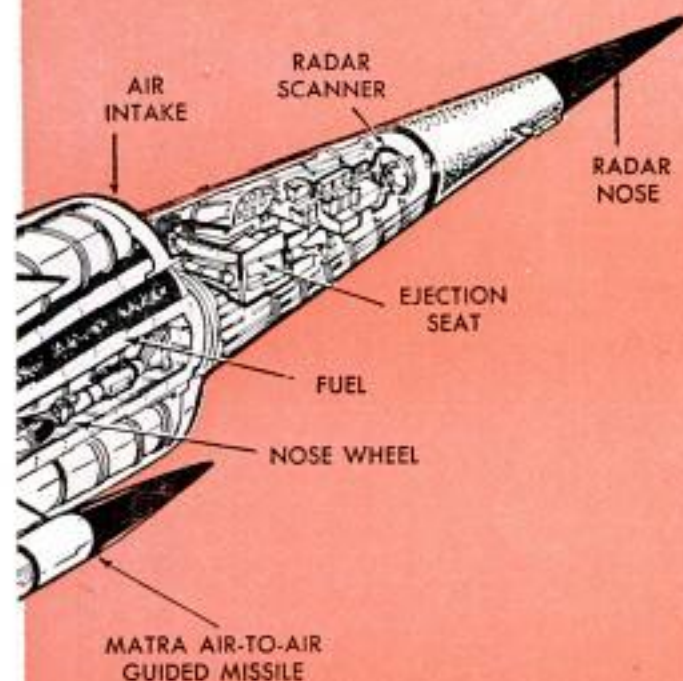
It's a delta wing and looks like a miniature U. S. Air Force F-102. The mighty midget has a horizontal flight potential of Mach 2, twice the speed of sound, and in recent tests it hit Mach 1.5. Its ceiling is 80,000 feet.

Designed to knock out high-flying enemy bombers, *Mirage III* is tiny by American

standards—26-foot wingspan, 37-foot fuselage and a mere 10 feet high. Its armament is two 30-mm. cannon, or bombs, or an air-to-air homing missile, the latter carried externally under the fuselage.

The missile shown in the above cutaway drawing is a Matra RO15 air-to-air guided rocket. It's 10 feet long, weighs 330 pounds and is powered by a two-stage engine.

Mirage III, which was manufactured by the Dassault Company, is powered by a Snecma Atar 101G axial-flow turbojet en-



Illustrated by
Thomas Turner



gine with afterburner. Its thrust is 9700 pounds, and the engine is also used in the Super Mystere, France's equivalent of the U. S. Super Sabre.

The cockpit is well forward in an unusually small nose compared to other aircraft of this category. The canopy is not the conventional balloon type, but is based on cross sections resembling the Norman arch of French architectural tradition. This provides better visibility than most other modern interceptors, and the knife-edged windshield allows excellent aerodynamic flow. The fairing of the canopy extends into a long dorsal fin that may contain fuel in its forward compartment.

Two Air Intakes

The semicircular air intakes are on either side of the pilot. They converge into a central duct just forward of the engine. The main fuel tanks are housed behind the pilot and between these ducts.

Like the F-102, *Mirage III* has "area rule" (Coke-bottle effect) applied to its fuselage, enabling the aircraft to slip through the higher drag regions. The plane's low wing makes possible a short and light main landing gear. The legs fold inward toward each other, and the nosewheel is long, due to the tail-down landing approach necessary with delta-wing aircraft.

Wing Edge Has Sharp Sweepback

The sweepback of the wing leading edge is about 60 degrees. The trailing-edge flaps and ailerons have external fairings on control pickups due to the thinness of the wing at that point. Trim tabs are on the inboard side of the wing. The vertical stabilizer is the same general shape as the wing, but with a slight sweepback to the trailing edge to give the aircraft a sleek look.

Although intended for the French Army Air Force, the country's navy is also interested in *Mirage III* for carrier use. ★ ★ ★

Looking like a small U. S. F-102 (see drawings at left). France's *Mirage III* prepares for a take-off



Here it is --



IF SOMEONE SAID to you, "Here's \$250,000,000—go out and build a car that will sell in the medium-price field," what kind of a car would you build?

Just such a problem faced the Ford Motor Company back in 1948 when it decided it needed another line of cars to help Mercury fill the gap between Ford and Lincoln.

Years of planning followed. There were the usual setbacks and delays (some were unusual, such as a two-year slackening of effort during the Korean conflict).

Then, in 1954, stylists were ordered to go to it. "Let's see what it would look like," the top brass said.

What they saw, they must have liked because a year later the project was given the final okay. What up to then had been planning and speculation, now became rolling-for-keeps, chips-are-down reality.

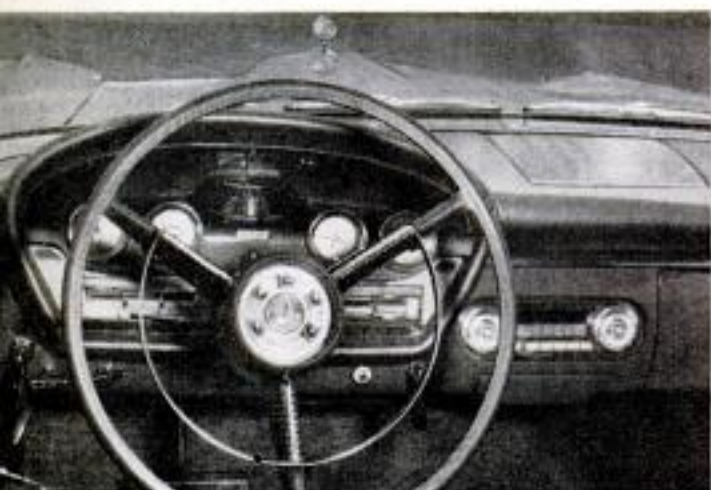
Since that April day in 1955, Richard E. Krafve, general manager of the new division, has been up to his ears (and at times he may have felt over his head) in a car which turned out to be the Edsel.

The Edsel planners started out by insisting that the styling be distinctive (but not bizarre, they cautioned). The car must be easily identified. They wanted folks to say every time one went by—"There's the new Edsel."

In a business like this, they reasoned, there's no time for slow starters, especially in a race against veterans like Pontiac, Dodge and Oldsmobile.

Nor could there be any confusion with other makes in the Ford family of cars. Family resemblances were fine—even essential, but no more than that. There's no market for cars that look alike.

Distinctive without being ostentatious, the grille has an inner ring designed to withstand minor bumps



Tapering bulge atop hood makes it seem a block long. Transmission buttons are in steering wheel



the EDSEL

By
Arthur R. Railton

The Edsel looks different. Grilles on most American cars are low and horizontal, Edsel's is high and vertical. Other cars tend toward the vertical in the rear, Edsel is horizontal. Front or rear, coming or going, it is distinctive.

You will have to decide for yourself if it is attractive. That's a personal judgment. But all will agree that it's quickly recognizable. And it was planned that way.

The long-range planners demanded that the E-car (as it was called then) provide comfortable, relaxed performance at highway speeds. There was no intention of building the "draggin-est" or the fastest. Good performance, yes, but no spinning tires, no roaring exhausts.

Their aim was to appeal to the up-and-coming, young executive, not to the flashy sport nor the ultraconservative old fossil.

The Edsel does perform well at highway speeds. It runs quietly and comfortably. It handles easily and responds agilely in traffic. If necessary, it will "scat," but it's not a car for the wheel spinner.

Edsel comes in four series plus a station-wagon line: Ranger and Pacer on the low-price end using the "A" shell (shared with Ford); Corsair and Citation on the top end using the "B" shell (shared with Mercury).

You can spot the B-shell by its flat, sharply cutoff roof with the indented center trough. The curved, thicker roof without indentation is the A-shell. Wheelbases are different: From axle to axle, the A-shell is

118 inches long; the B-shell is 124 inches.

Station wagons are built on a 116-inch wheelbase shared with Ford wagons. Its exterior styling is very similar to the Ford, except for its front end, which is typically Edsel.

First thing you notice when you slip behind the wheel is the control panel for the push-button transmission. It is where the horn button used to be, right in the hub of the steering wheel. The push buttons are electric, not mechanical as on Mercury and Chrysler cars.

Incidentally, in case you're concerned, the panel doesn't rotate with the wheel. The hub remains stationary as the wheel spins around it.

A safety device makes the control virtually childproof. You can now leave the car parked on a hill and not worry that the kids might set it rolling. The ignition key locks the Park button so it can't be disengaged until the key is turned.

The Edsel is a comfortable car and one reason is its seat design. The seat is shaped to feel like an easy chair at your rich uncle's club. Instead of fading off at the top, the back cushion angles forward slightly against the shoulders. Edsel engineers have a term for the new seat shape. It is designed to conform to the "modern slump," they say.

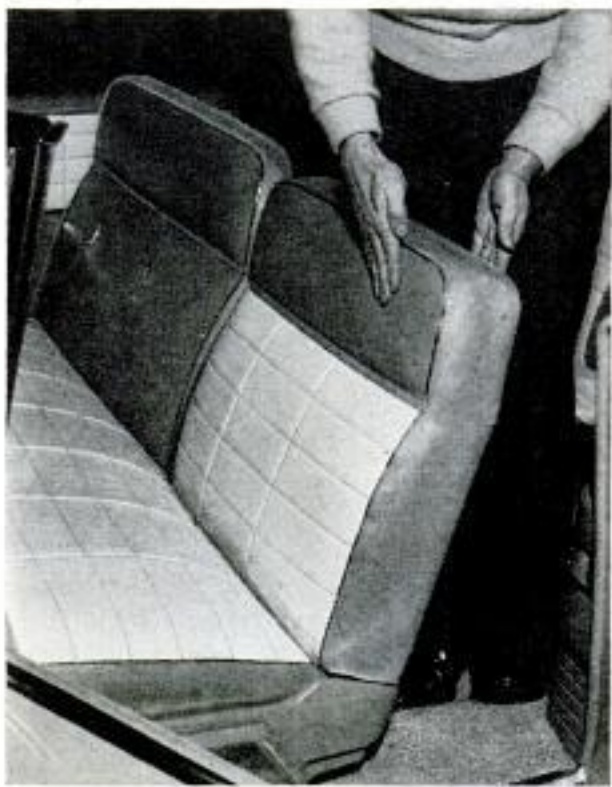
The instrument panel is different, too. Its speedometer looks more like the boxed compass on a ship than a miles-per-hour

Horizontal taillights and concave rear fenders quickly identify the Edsel. This is the Citation hardtop





Cable (under fingers) pulls lever which turns cogwheel (end of pencil) to adjust brake automatically



Top portion of seat back slants forward to provide shoulder support—secret of the comfortable seats

Manhole view of Edsel's stern emphasizes horizontal taillights. Half of each extends into the trunk lid



meter on a car. A horizontal drum about six inches in diameter rotates on a vertical pivot like the compass on a ship. The weight of the big drum dampens out annoying surges often present in needle-type instruments. It gave the engineers some headaches before they designed out the inertia lag on acceleration and deceleration.

Any dashboard is a temptation to the accessory lover. Edsel's especially. The factory will install any of the following in a special opening in the dashboard if you so desire: A tachometer, a compass or an inside-outside thermometer. There is also a speedometer light that changes colors as speed increases to warn you of danger. Another effortsaving accessory is a remote trunk latch that unlocks the trunk at a touch of a button.

Edsel has horsepower, too, although the industry is not supposed to talk about it above a whisper this year. One engine is the 361-cubic-inch V8 of 303 horsepower. The other is the 410-cubic-inch V8 of 345 horsepower. Compression ratio on both is 10.5 to 1.

As far as the chassis is concerned, the Edsel is conventional—no radical innovations here. Sharing frames with Ford and Mercury as it does, the Edsel must share underpinning, too.

There will be air suspension, but not on Job One (as Detroit calls the first production models to come off the line). It will be offered as an extra-cost item available sometime around mid-October.

Edsel's air-bag system will be based on a trailing-arm rear suspension. Air bags on all four wheels (complete with automatic leveling valves) provide the ultimate solution to the problem of compromising for light and heavy loads, rough and smooth pavements. But it's not ready now and you won't find it on the Edsels you peek under on announcement day. You'll have to wait a couple of months for it to materialize.

Self-adjusting brakes come with every Edsel. Every time you back the car up and apply the brakes a cogwheel inside the brake drum "senses" whether the brake needs adjustment. If it does, an adjusting lever nudges the cogs, taking up the brake. It operates only when backing up to prevent overadjusting that might result after successive panic stops during which overheated drums would have expanded to give a false "reading" to the sensing mechanism about lining clearances.

Engine accessibility has been improved in the new Edsel engines. Distributor, fuel pump, coil, oil filter and dipstick are moved forward to be more easily reached. (Of course, the fact that the hood now hinges

(Continued to page 256)



Edsel's station wagons share the Ford shell. This is the Bermuda, the top line of wagons



Distributor (pencil points to it) is mounted forward on the engine, designed for service accessibility



Front-hinged hood is a safety factor, but it does limit accessibility of forward-mounted distributor

Ranger is low-price series. It shares the Ford body shell and is nine inches shorter than the big Edsel



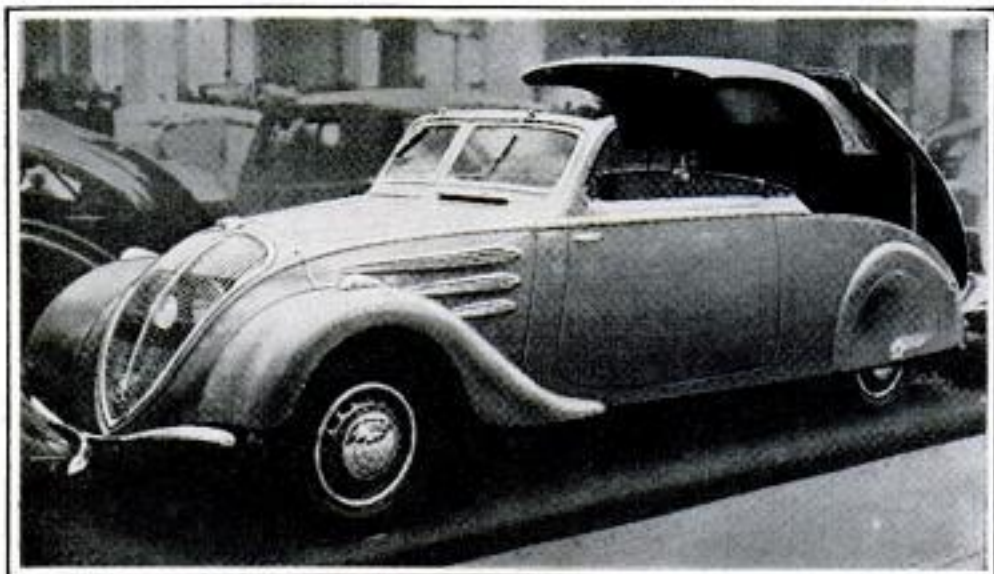
ONE OF OUR READERS picked up his phone the other day and dialed our Editorial Department. He had been looking at the 1957 Ford Skyliner, the convertible with the disappearing steel top.

"Take a look at page 43 of your January 1936 issue," he said.

We did. The 21-year-old story is reproduced here.

It only confirms the old adage—there's nothing new under the sun.

Latest Foreign Auto Has a Disappearing Top



One of the Latest Foreign-Built Motor Cars Features Disappearing Top; Note How Cover of Rear Deck Rises to Make Space for the Top; the Cover Then Lowers When the Top Is in Place

Automatic disappearing top and concealed head lamps are two features of the latest model Peugeot, a French automobile. The lamps are set closer together than on American cars and are inclosed,

and partially hidden, by a radiator grille. Controls in the driving compartment cause the top to slide automatically to the rear where it fits compactly into the rear deck, converting the vehicle into an open car.

Use Electric Drill to Start Power Mower



More than 50 million magnets are produced and used in the United States each year. One bomber takes over 200 magnets to keep its instruments functioning.

Now you can start your small combustion engines—in power mowers, garden tractors, outboard motors or chain saws—with your electric drill. A device on the market is held in the chuck of the drill, with the other end applied to the nut of the flywheel shaft. The starter also can be used on engines equipped with recoil-type starters by removing the recoil mechanism.

Antibiotic Kills Housefly

Flavensomycin, a new antibiotic that kills both fungi and insects, has been found by researchers at Milan, Italy. When tested as an insecticide, the antibiotic proved 10 times more effective against the common housefly than DDT.

Fast-Acting Thermometer

Temperature changes are registered one millionth second after they occur with an industrial thermometer developed by Cornell Aeronautical Laboratory, Inc. Household thermometers lag about 10 to 30 seconds behind changes in temperature.

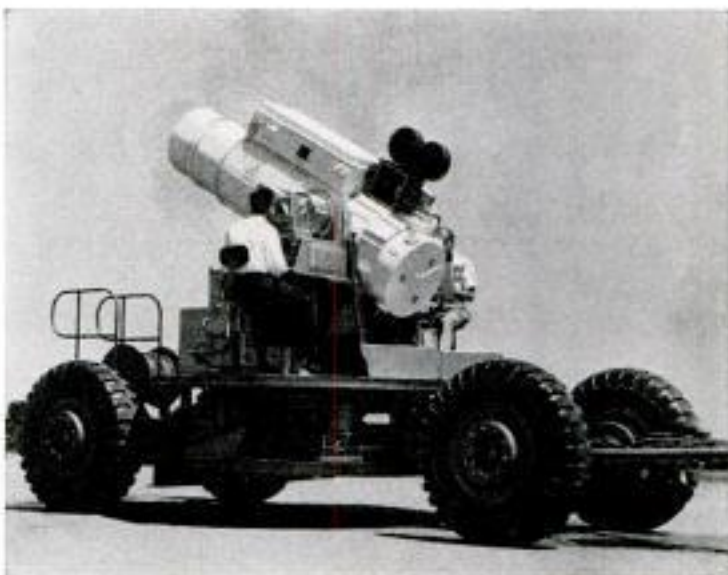
Missile Truck Totes Corporal

Multiton radar-guided missiles like the Corporal, shown in the photo at right, can now be rushed to launching sites and raised to firing position by a vehicle designed for that purpose. The British government has ordered an undisclosed number of the missile haulers. All the wheels of the vehicle are driven by separate electric motors which, in turn, are powered by diesel generators. Six other electric motors are located over the machine for steering and missile-handling functions of the boom. After raising the missile to a vertical position, the hauler eases it onto a launcher. The operator then lowers the boom and returns for more missiles.



Tracker "Sees" Tiny Object Four Miles up in Air

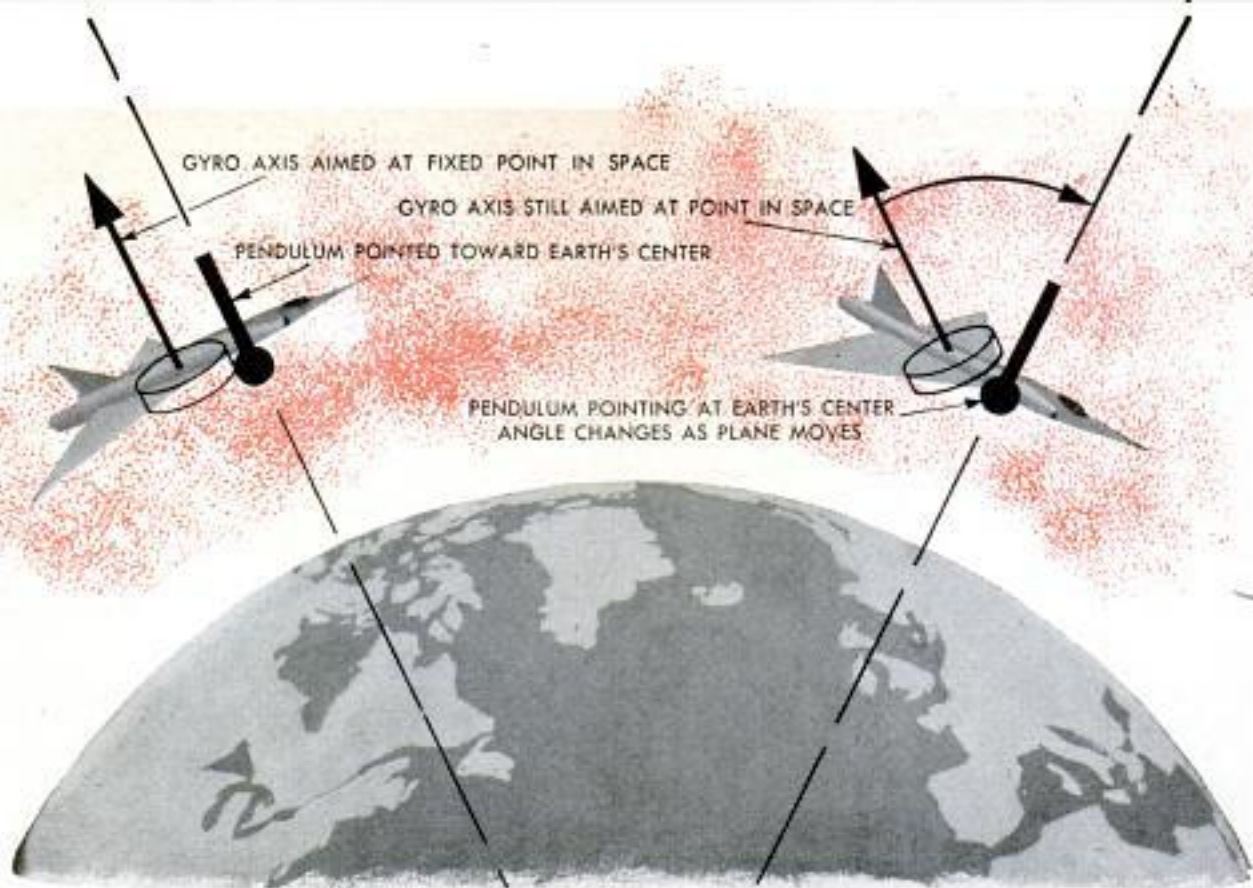
Flight performance of missiles, aircraft and bombs, now is being recorded by the nation's first completely mobile optical-tracking system—the telescopic photographic recorder. This six-ton unit is capable of photographing an object, two by seven inches, at an altitude of four miles. All similar-type optical systems used for missile tracking are mounted on stationary platforms. This unit, delivered to Eglin Air Force Base, Fla., can be operated remotely or directly by trained personnel.



Next Month---Homes

To celebrate our fifth annual Home Section we are presenting two new *PM* houses designed specially for our readers—one Modern and the other Traditional. Plans for both are available. Also featured in the 50-page section of the October issue are interesting new building materials and unusual wall coverings, ways to add that needed extra room to your house, and *PM's* Parade of Homes.





As plane moves, angle of gyro and pendulum changes. Autopilot makes corrections to keep plane on course

Brains for Planes

Massachusetts Institute of Technology photo



By Richard F. Dempewolff

IF THE WIZARDS working over complex diagrams of aviation's newest electronic brains have their way, it won't be long before you'll climb aboard a transcontinental airliner in any weather at all. You'll ride almost noiselessly, close to the speed of sound, straight as an arrow to your destination. And you'll land right on time—in blizzard, rain or fog—even though the clouds are sitting right on the airstrip. "Stacking," while tower technicians work feverishly to bring you in or send you to an alternate airport, will be an old-fashioned problem of the "pioneer days." Most startling of all is the fact that there won't be any pilot in the cabin of your plane. Gyros, transistors, vacuum tubes and humming condensers will do the flying.

Equipment to do the job is no drawing-board dream. It's already flying planes. While the human pilot sits back and looks at the view below, two of these hair-raising systems will navigate his plane anyplace over the earth without any prompting from pilot or ground-based signal stations. One uses a unique type of radar to do the job; the other, gyros that always know where

Engineer Draper shows action of pendulum (large arrow) and gyroscope mounted on large plane model



RADAN, a smaller version of "66," has a switch panel and dial indicating drift angle and ground speed



Rotating antennas, tucked in the belly of a jet fighter, throw out twin beams ahead of the craft

they are. Another new brain even saves a pilot the trouble of landing his plane. Invisible gremlins nudge the controls this way or that, setting down the plane in a perfect landing no matter what the weather or ceiling. If the strip happens to be the heaving deck of an aircraft carrier, his electronic chauffeur will make split-second corrections and decisions—even to the point of taking a wave-off if the deck drops away at the crucial instant of touchdown.

One jet pilot whose plane is a flying laboratory of such electronic gear summed it up neatly. "That thing has grown up," he said. "It doesn't really need me any more."

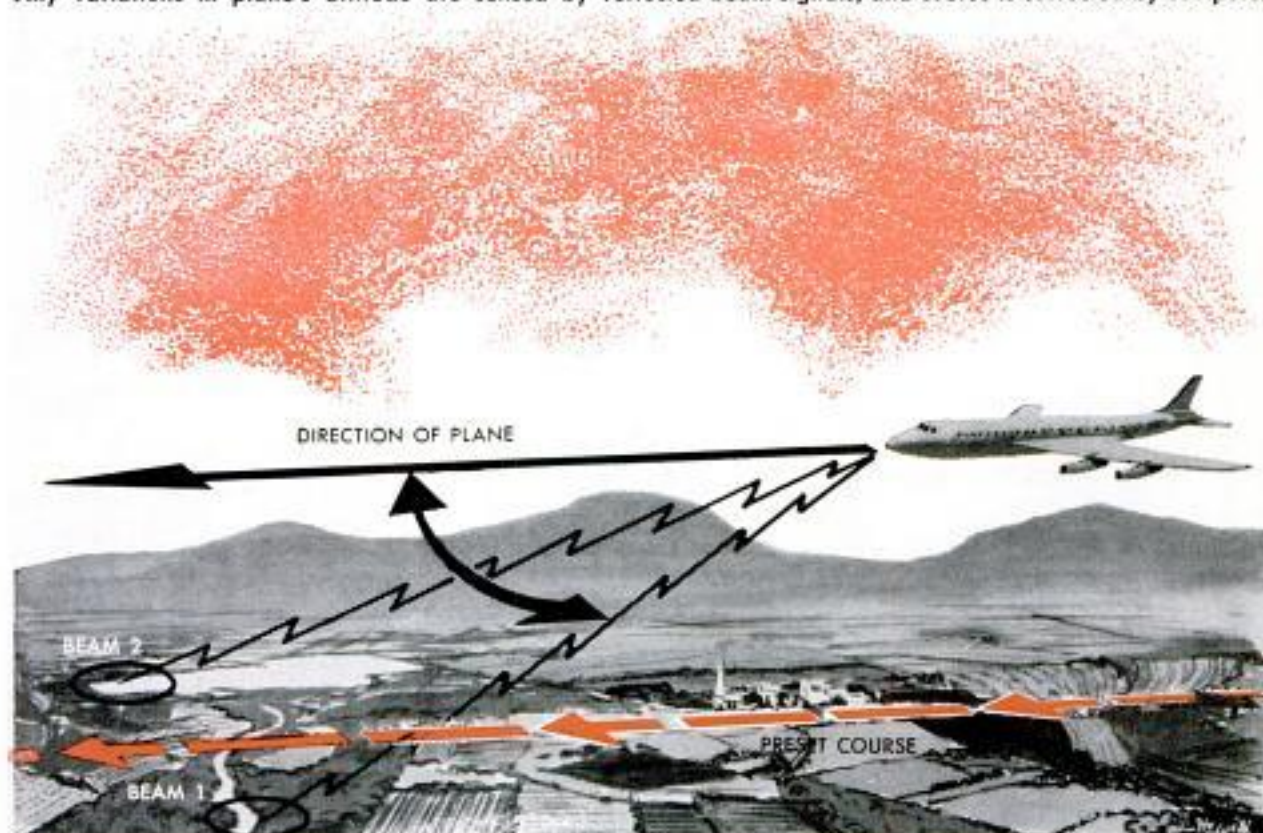
Some of the new air-minded brains are eerily efficient. Early this year, a B-47 bomber with Maj. Mont Smith at the controls, took off from March Air Force Base

in California, poked its nose into the wandering jet stream and followed it all the way to Hanscom Air Force Base in Massachusetts. The big jet bomber made the 2700-mile trip in three hours and 47 minutes at an average ground speed of 714 miles per hour.

Plane Follows Jet Stream

More remarkable than the unofficial record he set was the fact that Smith had managed to stay in the wandering jet stream. The big wind, six or seven miles high, twists and turns with unpredictable whimsey. Few pilots can stay with it for long even if they do find it. But Major Smith's free ride on the 165-mile-per-hour tail wind was no stroke of luck. "The '66' put me in the stream and kept me there,"

Any variations in plane's attitude are sensed by reflected-beam signals, and course is corrected by computer





With radar beams bouncing off the landing gear, Navy fighter makes perfect landing without pilot's help

he said. The major referred to a collection of black boxes in the bomber's cramped cabin.

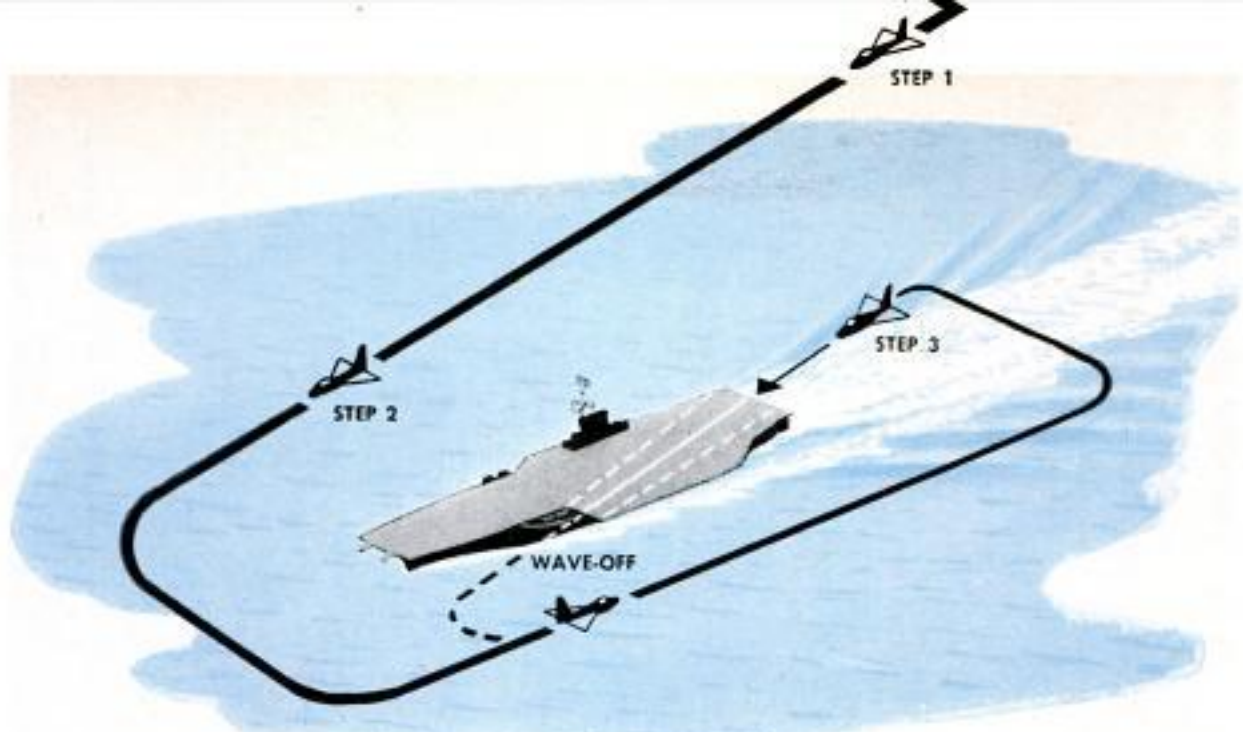
The 66, known officially as AN/APN-66, is a complicated affair developed by General Precision Laboratory in Pleasantville, N. Y. Its secret lies in the harnessing of a strange physical phenomenon known as the Doppler effect. Sound waves from swiftly moving objects have a curious habit of changing pitch in the ears of a fixed observer. Nearly everyone has noticed the swift fall in the wail of a locomotive whistle as the train roars past. That change in pitch is Doppler effect. Scientists have known for a long time that electromagnetic waves do

the same thing, and it is this fact that GPL engineers employ in their family of new navigational brains—including the complex 66, a simpler 85-pound version that is known as RADAN, and several other variations for special jobs.

In each type a transmitter sends out two radar beams—like the long antennae of an insect—toward the ground ahead of the plane. By sensing the amount of frequency change in the signal that bounces back to the plane, the gadget's brain (a miniature electronic computer used in conjunction with the 66) can tell if the plane is shifting to left or right, and by how much. The computer instantly passes the word to an

Equipment for ACLS is mounted in a trailer for tests. Computer sends out orders as radar locates the plane





Step 1: Radar locates the plane. Step 2: Computer directs plane into the landing pattern. Step 3: The plane is landed by automatic control. Step 4: If conditions are not right, plane is automatically waved off

automatic pilot that nudges the controls and steers the plane back where it belongs.

That's not all. Using the same radar pulses, the device's brain also measures the plane's actual ground speed by calculating the degree of frequency change. The faster the plane goes, the greater the frequency shift becomes in the reflected signal.

The pilot isn't flying the plane anyway. The 66 is telling the autopilot where to go, and it is flying the plane. If Major Smith wants to fly a great-circle course from Dallas to New York, for instance, he turns a little knurled knob on an instrument,

System requires only one man to watch equipment. So far it has completed more than 1200 landings in tests

setting it at the proper latitude and longitude of the Dallas airport. Then he sets another row of numbers on an adjacent counter to the latitude and longitude of, say, Mitchel Field on Long Island. After take-off he can lock the autopilot to the 66 and pull out a good book to read while the plane flies itself to Mitchel Field. Nobody needs to check wind changes or plot corrections for compass variations en route, because the 66 is conveniently sensing all these changes and feeding them to the computer, which directs the autopilot to make proper course corrections. If the pilot should suddenly decide to head in at Baltimore or go on to Montreal, all he needs to do is set up the proper coordinates on his destination dial, and the computer will automatically feed the new course and steering signals to the autopilot.

Light Announces Destination

But let's assume Major Smith continues to New York as planned. As the craft moves along, the dial that was set at the latitude and longitude of Dallas airport is constantly changing. At any instant of flight its reading gives the precise location of the plane at that point. If the major is otherwise occupied when the plane arrives over New York, he doesn't need to worry. A red light flashes on the instrument panel announcing "destination reached."

Military security prevents the use of specific figures regarding the accuracy of the 66, but GPL engineers readily admit that on a flight of several thousand miles, the electronic wizard will bring an aircraft so close to its precise destination that, when the light goes on, the pilot can look down

(Continued to page 250)





Marine Division, Falls City Flying Service, Louisville, Ky.

Eight feet wide and 28 feet long, this aluminum *Marinette* can move at speeds of 12 to 15 miles per hour

Homes Afloat

THOUSANDS OF HOUSEBOATS now moving along our nation's more protected, shallower waterways testify to an American trend toward amphibious living. To build these "water-borne, power-pro-

pelled apartments," do-it-yourselfers can buy bare hulls or complete houseboat kits. The purchaser who wants a finished craft can choose from sizes chiefly in the popular 20 to 30-foot lengths of scow or twin hulls made of plywood (plain or glass-fiber covered), aluminum and steel. Prices in the popular sizes vary from \$1200 to around \$7000, depending on furnishings and motors. Some of the fancier models cost \$75,000 or more.

Installed singly or in tandem, motors are a question of personal preference. Many manufacturers construct houseboats to take motors of 25 horsepower, with maximum speeds of about 12 miles per hour.

Twenty-foot boats will accommodate most families, with folding berths above regular berths, cooking stove, sink, storage space and a marine toilet.

In the 30-foot class, a houseboat may

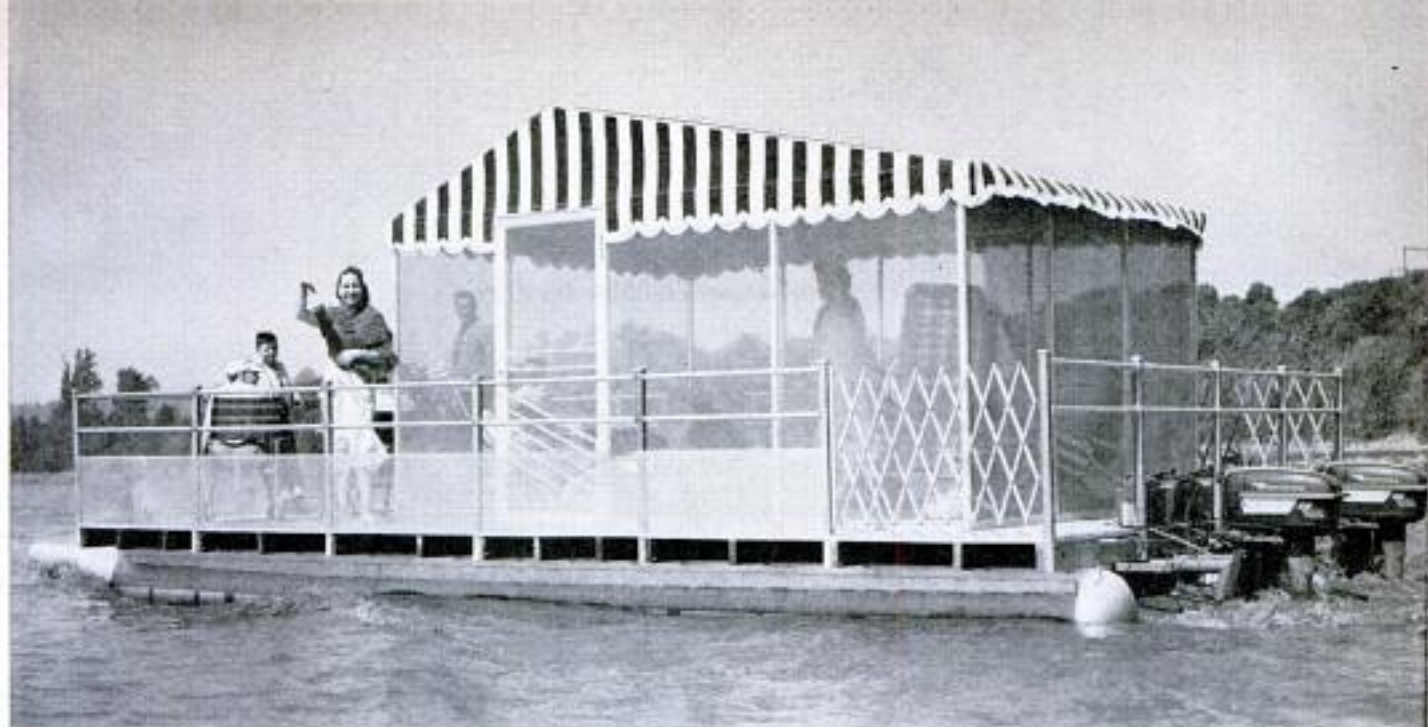


Typical floor plan shows: 1. Sun deck; 2. Bed; 3. Lounge; 4. Galley; 5. Dinette; 6. Closet; 7. Bath; 8. Rear cabin; 9. Berths; 10. Rear deck; 11. Controls

This 30-foot houseboat serves as blind for shooting ducks as well as floating home for relaxed living

River Queen Boat Works, Gary, Ind.





Harley Sales Co., Kansas City, Mo.

Looking like water-borne screened porch, this craft has an entertainment area extending 16 by 24 feet

have all the conveniences of a modern city home, including hot water heater, LPG refrigerator and range, pressure water system and electric-lighting plant.

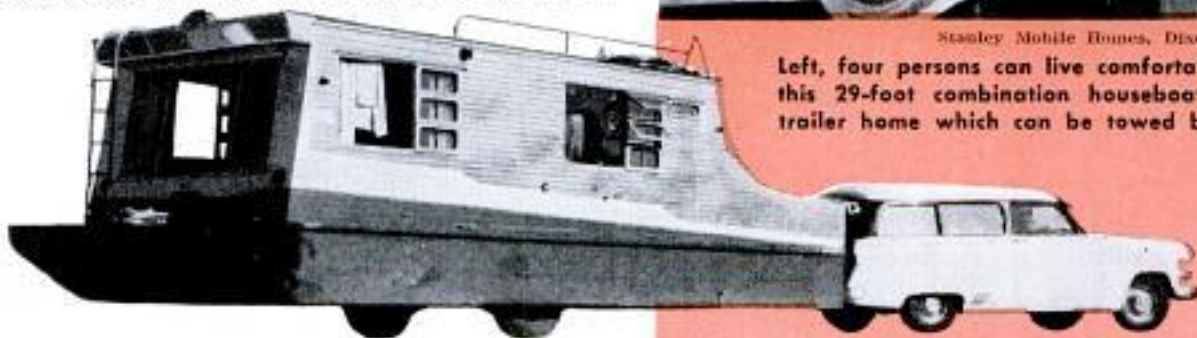
Then, there is the two-story, 59-foot, 65-ton houseboat owned by Julian Burch of Miami, Fla. It has three bedrooms, galley, dinette and two baths on the lower deck. Above are two sun decks and a 40-foot lounge. ★ ★ ★

Right, comfortable houseboat boasts a dinette, galley, upper and lower berths and lots of elbow room



Stanley Mobile Homes, Dixon, Ill.

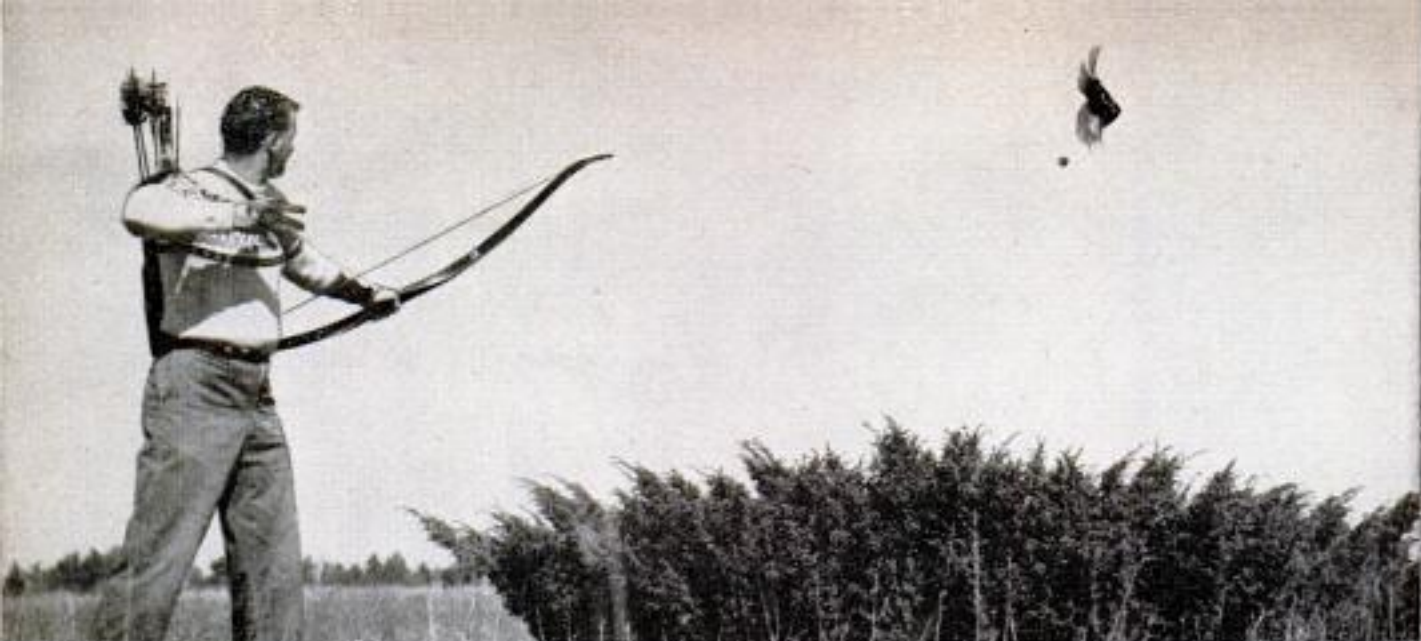
Left, four persons can live comfortably in this 29-foot combination houseboat and trailer home which can be towed by car



This trailer-boat is at home on land or water. It is 28 feet long and requires draft of only 5½ inches

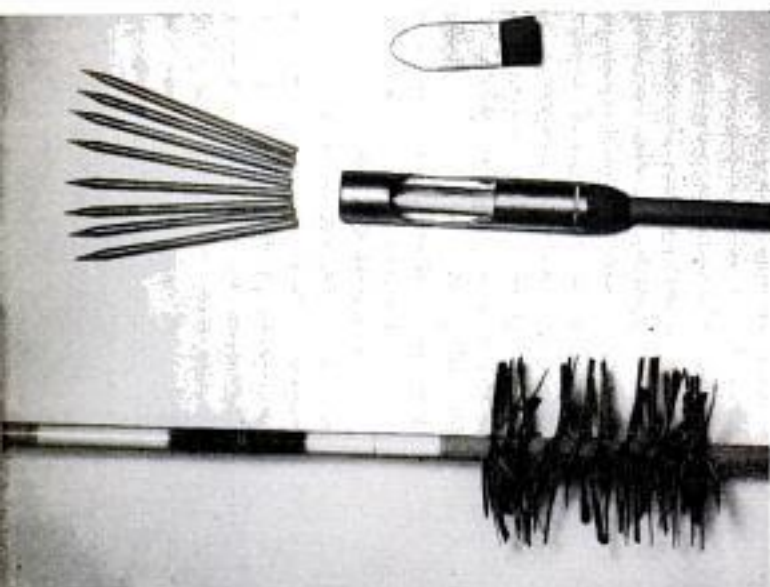
Neptuna Corp., Glendale, Calif.





Pheasant begins to fall after being hit by "shotgun arrow" missiles. Feathered shaft is dropping below bird

Archers Test "Shotgun Arrow"



Above, parts of shotgun-arrow are: top, clip; middle, missiles and hollow head; bottom, feathered shaft

Below, Alex Martin, inventor of the shotgun-arrow, checks the pattern of missiles fired at a target



BOW HUNTERS will find themselves on an equal footing with "shotgunners" this fall, thanks to a projectile called the "shotgun arrow."

Alex Martin, Traverse City, Mich., has developed this new arrow after three years of research. The arrow carries 8 to 12 steel-tipped missiles which fit in an expendable clip inside a hollow container. A cluster of feathers on a standard shaft acts as an air brake, allowing the missiles to outrun the parent arrow after it has been fired. However, this pompon does not affect the arrow's accuracy or striking power.

The cluster of missiles will spread about 18 inches at 12 yards, considered a good pattern for most running or flying small game. Points can penetrate a wooden backstop to $\frac{1}{2}$ -inch depth if blunt missiles are used; the hunting heads have barbs.

When an archer shoots, the shotgun-arrow starts to drop almost immediately, held back by the feathers. The missiles speed on in a straight line.

Shotgun-arrow patterns are similar to patterns of a shotgun shell. In fact, clay pigeons can be downed with this arrow. And the cost of an arrow is roughly comparable to the cost of a shotgun shell.

In trapshooting with this weapon, archer Bob Thomas of Cadillac, Mich., broke 50 percent of the clay pigeons tossed aloft by Ken Uptegraft, another archer, on the first day Thomas tried shotgun-arrows.

Tested for killing power in a game preserve, the shotgun-arrow has proved equal to its trapshooting record. Steel-tipped missiles were deadly on flying pheasants.

This fall, bowmen will fire the arrow at small game. Confident of the missiles' effect, Thomas says: "Alongside clay pigeons, small game should be a cinch!"



KEEPING UP WITH THE ATOM



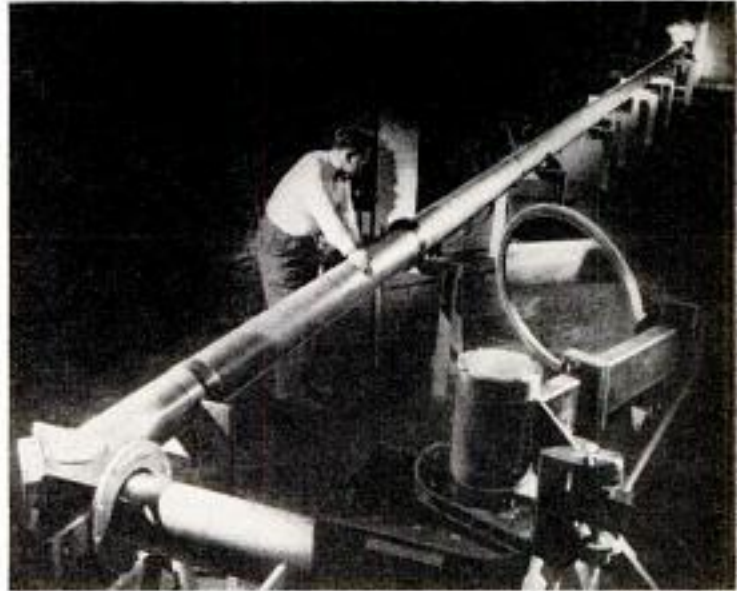
SCIENTISTS CAN take a mighty long look around corners through that tube shown at right. Believed to be the world's longest periscope, the 90-foot tube permits engineers to sit safely in a shielded room and observe a hot reactor in operation. The periscope, installed at the AEC's National Reactor Testing Station, will be used in development work on a nuclear engine for aircraft.

☆☆☆

EARTHQUAKE WAVES caused by H-bomb explosions pass through the inner core of the earth, according to two British scientists. The waves were recorded at stations halfway around the world from the point of H-bomb detonation, and help prove that the earth possesses an inner core. From the information available from seismographs, scientists can reconstruct the exact moment when the fireball was formed.

☆☆☆

PILLS TO PROTECT humans from death by radiation are under development at the College of Medicine, University of Tennessee. The protective chemical in the pill has been found to be 100 percent effective in mice exposed to lethal doses of radiation. Human trials are under way. The biggest remaining problem is to find a way to keep a high level of it in the body tissues, since



General Electric photo

it is quickly excreted by the kidneys.

In a similar field of research, two University of British Columbia scientists have demonstrated that a high calcium diet will reduce the absorption of strontium 90 from atomic fallout. When the body takes in too much calcium, it begins to reject it, and strontium 90 is rejected at the same time.

☆☆☆

TAMING THE H-BOMB is the goal of a scientific search launched by the General Electric Research Laboratory. A research team is studying the fusion process because "it employs the most basic technical skills of the electrical industry." Dr. Guy Suits, vice president and director of research, points out that the program cannot compare in scope with the AEC's famous Project Sherwood, but will focus the skills of the electrical industry on the problem. "My own view," Doctor Suits has stated, "is that five additional years of research will be required to make possible a realistic appraisal of the fusion process; in 10 years we may be at the point of technical feasibility; pilot-plant production of fusion power will not begin for 20 years; and competitive power production lies beyond that."

☆☆☆

RADIOACTIVE GOLD, left, is serving science at Sutter's Mill, Calif., where gold was discovered in 1849 to touch off the famous rush. The gold is dropped in the river upstream and detected by a geiger counter in studies which will aid irrigation and land-reclamation work.



Are winters getting milder than in the good old days? Are summers hotter and springs wetter? Tornadoes, hurricanes, droughts and floods more frequent? *Popular Mechanics* invited three of the foremost weather experts in the United States to tell you

What's Happening To the Weather

The Panel: Dr. H. E. Landsberg, Director, Office of Climatology, U. S. Weather Bureau, Washington, D. C.; Dr. Sverre Petterssen, Professor of Meteorology and Director, Weather Forecasting Research Center, University of Chicago, and Dr. Hurd C. Willett, Professor of Meteorology, Massachusetts Institute of Technology, Cambridge, Mass. The Place: Popular Mechanics Building, Chicago.

QUESTION: Before we launch into our big question on what is ahead in weather for the next 50 years, it might be a good idea to get your reactions to weather cycles—both long-range and short. Do these cycles tell you anything about future weather conditions?

LANDSBERG: No, I don't think so, because we know little about the underlying factors which cause today's weather rhythms. Hence, we can't say that the same factors will still influence the same weather tomorrow.

WILLETT: However, I believe you will agree these factors have some suggestion of recurrence on a rough timetable.

PETTERSSSEN: Actually, I don't think we have enough accurate records for a

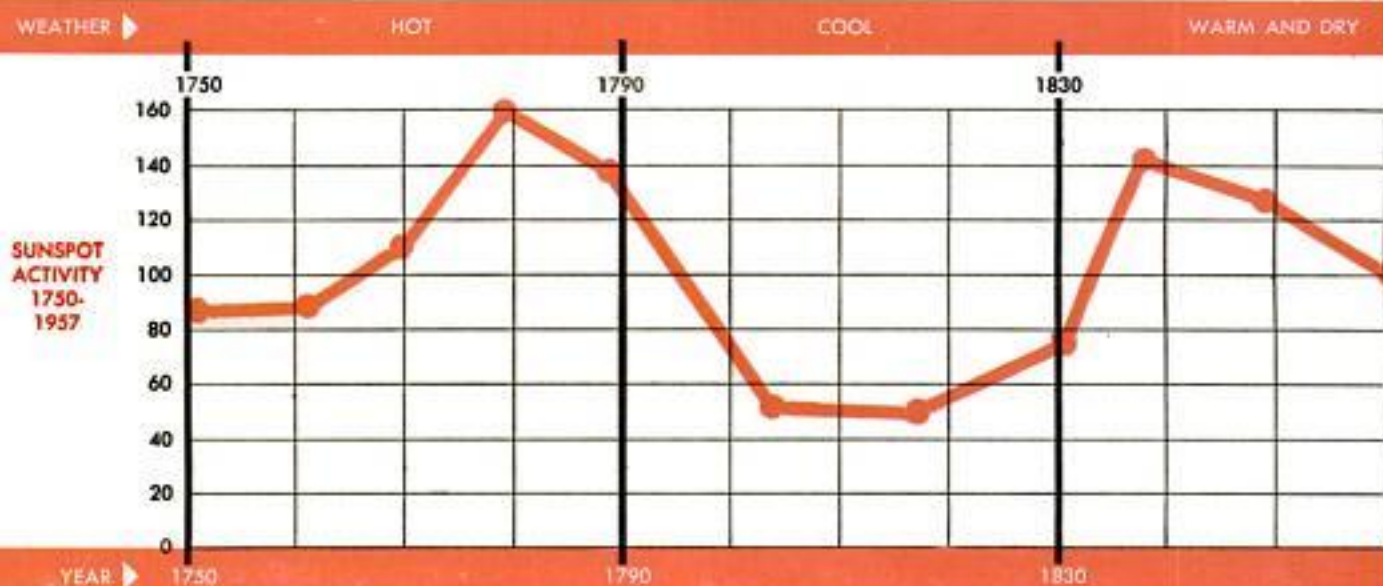
long enough period of time to tell with certainty. Also, from what we know, climate changes have been more radical in this century than in the last.

Q: Does this mean we are near the end of a weather cycle?

WILLETT: For about 30 years at the end of the 18th century it was quite warm in eastern North America and in western Europe. Then, following 1790, it turned colder in Europe, and afterward in the United States. The peak of the warmth here was 10 or 15 years after Europe. This is very similar to what seems to be happening right now and during the past 40 years.

LANDSBERG: The warm spell you refer to probably wasn't as extreme as the one we are in. For example, there is con-

Chart by Dr. Willett compares sunspot activity with the weather, predicts a cold-and-wet period ahead





Panelists include a top government weather expert and two prominent university professors of meteorology

siderable melting and breaking up of the North Pole ice which was not observed before. This indicates *we are undoubtedly in the warmest period of almost 1000 years.*

Q: To what extent are these weather variations connected with sunspot activity?

WILLETT: They seem to occur in cycles of about 40 years. For example, the period 1755-1795 was one of relatively high sunspot activity, similar to the one we're in now. In fact, the activity pattern of that period so closely resembles the present one that we can use it to forecast current sunspot variations. We have been in a period of high sunspot activity, accompanied by high temperatures and dry weather since about 1915. It is my opinion that *we are now entering a period of much lower sunspot activity, indicating that*

cooler and wetter weather lies ahead.

LANDSBERG: I basically agree with this. We have some correlation between the weather and sunspot activity. However, we do not know what it is since the sunspot is only a symptom of something going on in the sun, and not a real cause-and-effect relationship with the weather here.

Q: What exactly are sunspots?

WILLETT: They are cool areas on the surface of the sun. The net effect of sunspot disturbance, but not of the spots themselves, is to send us more radiation in the shorter wavelengths—ultraviolet—than we get during a period of little activity. Also, during periods of high sunspot activity the earth is bombarded with more corpuscular radiation (electrical particles) from the sun.





Photos courtesy American Geographical Society

Sequence of photos shows how Arctic warmth has melted one glacier. Above is Alaskan glacier in 1889



Same glacier in 1935 had lost 3900 feet of its "tail" since 1889. Even vegetation made an appearance

Photo taken in 1950 from same location as 1935 shows the glacier almost gone, another 2600 feet melted



Q: Since the earth's winds have such a strong influence on the weather, have there been any spectacular changes in them the past 40 years?

LANDSBERG: Yes, there has been a tremendous increase in the volume and intensity of air movements around the world in a westward direction, the so-called "westerly circulation."

PETTERSEN: And in a north-south direction, too. Since the beginning of this century, air movements have been faster into the Arctic and faster out of it. Also, the weather and temperatures are very dependent on how many cyclones (low-pressure systems) and anticyclones (high-pressure systems) there are. *In the past 40 years the number of cyclones has increased about 50 percent over the northern part of the North Atlantic, and the number of anticyclones has increased over Europe.* This has caused a major warming of the Arctic.

Q: What are some of the other unusual weather occurrences during the warm period that is supposed to be ending now?

PETTERSEN: In the first place, we don't know for sure if it is ending. It might be another 10 or 15 years before we can verify it. If the warm trend continues there will be some remarkable changes. *Already the North Pole ice has decreased something like 40 percent in volume. If this continues till the end of the century there will be very little summer ice in the Arctic, or only small patches of it.* Another 50 years and the weather will be the same as about 2000 years ago. With this, of course, would be a northward migration of vegetation, fish and animal life. Actually, this has been going on for the last 30 or 40 years. Halibut, cod and other fish are found farther north every year, and I understand the cardinal is now a regular inhabitant of Ontario.

Q: What else would happen if the warm trend continues?

PETTERSEN: Cyclones would continue to move northward. With this might go a northward spread of the anticyclones in the middle latitudes, which we know are drying out the climate in the lower latitudes. I think the changes would be quite severe.

LANDSBERG: To a certain extent, this is already happening. Some areas in the Middle Eastern part of the world have become drier in the past 40 years. Practically the same thing is happening in our own Southwest, where there have been marked tendencies toward drier spells, such as in the 1930s and the droughts of recent years.

Q: If we are in an extremely warm period now, why is it we can get bitter-cold weather at times?

LANDSBERG: In the history of weather,

during warm periods there have been record snowfalls and low temperatures and, conversely, during cold periods there have been some heat waves. This indicates there is a lot of latitude in the weather with respect to specific instances without affecting the long-range trend.

Q: Are there any manmade causes for the recent drought in the Southwest?

LANDSBERG: Not the drought itself. It was caused by changes in the general circulation of air. But in some areas you will find the drought has been held back by good farming and conservation practices.

Q: What happens to ground-water levels in a drought area?

LANDSBERG: It depends on irrigation. The unfortunate thing is that in some areas of the Southwest the ground-water levels have been lowered as much as 100 feet in some places by large-scale irrigation operations.

PETTERSEN: *I think our water problem is more serious than most people realize. With increasing population, increasing use per capita and taking water*



DR. PETTERSEN: *"If the current warm trend continues there will be some remarkable changes in the weather. Already the North Pole ice has decreased something like 40 percent in volume. If this continues, there will be very little summer ice in the Arctic."*

out faster than nature can replace it we are already in a mild crisis, and 50 years from now I think we shall not be better off.

LANDSBERG: The situation is not entirely hopeless. We still have the ocean water. I foresee the day when it will be distilled and sent all over the country by pipelines.

Q: How bad was the recent drought in the Southwest compared to other droughts?

WILLETT: It was about average. Droughts seem to occur approximately every 20 years, together with high sunspot activity. They shift north and south with this cycle. The drought of the 1930s was the farthest north of any of our recurrent droughts, and also the worst. The more recent one has occurred farther to the south. *I believe there will be a lessening of the drought in the Southwest. It has been through its extreme phase.*

Q: How will the earth satellite help in providing weather information and in forecasting?

LANDSBERG: In two ways. One is that

we no longer will have to rely on sunspots to determine solar activity. We will be able to make continuous measurements of solar intensities without atmospheric interference. The other is heat balance. We will be able to measure the exact amount of solar energy reflected back by the earth.

WILLETT: The satellite will not aid weather forecasting directly. But it will

DR. WILLETT: "We are now entering a period of much lower sunspot activity, indicating cooler and wetter weather ahead . . . I believe there will be a lessening of the drought in the Southwest, for it has been through its extreme phase."



help us understand how the earth's atmospheric system works, and must eventually lead to improvement in forecasting.

Q: Is it generally agreed among meteorologists that all weather on earth has its origin in the sun?

LANDSBERG: It certainly starts with the incoming radiation.

PETTERSSEN: The sun is the only source of energy. Although it is this energy that drives the entire machinery of our weather, you can't blame any particular change in the weather on solar activity. All the sun does is supply us with energy. How it is used in the atmosphere, the oceans and in the earth is something else again.

Q: Will observations from the satellite be able to track such weather phenomena as the hurricanes which have recently plagued the East Coast?

LANDSBERG: No, not immediately. You know, on the average we have had more hurricanes in the past five years than in the preceding 25 years. In some years, the hurricanes have been off their usual tracks. The northward motion and intensification of the belt of westerly winds have pushed them farther north than usual. Also there has been a warming of the ocean waters, which helps intensify them.

WILLETT: As you know, I say we are entering a colder, wetter weather period. This means more west winds in the lower latitudes. That will terminate the high-pressure ridge on the Atlantic Coast which has been bringing northward warm water and hurricanes. So according to my forecast, the hurricanes will tend to return to their tracks of earlier years, either in the Gulf of Mexico or staying off the Atlantic Coast, not affecting the Middle and North

Atlantic states to the extent that they have recently.

Q: Do you all accept the sunspot interpretation of climatic change?

WILLETT: That is the basis of my long-range forecasts. I accept it to a degree of say 70 percent.

LANDSBERG: I would stick closer to 55 percent.

PETTERSSEN: It is difficult to translate these things into figures, but there should be a better-than-even chance.

Q: What is your opinion of manmade methods of changing the weather, such as seeding a cloud to make it rain?

PETTERSSEN: I believe most scientists will agree that we have no conclusive evidence. Seeding, as you know, has worked well to dissolve shallow clouds. But experiments with deep clouds, and you have to have a deep one to get any amount of rain, have not been so convincing. The basic thing is that in seeding you can only hope to achieve results when the cloud is almost ready to let loose rain anyway. Then it is extremely difficult to determine if you have done anything useful. It's of little use just taking out the moisture that is in a cloud. What you want is for the cloud to reproduce itself in moisture content.

LANDSBERG: It's a matter of cost. After all, if you have to carry enough seed in the form of dry ice up to a cloud to get moisture out of it, there's a breaking point in making it a profitable undertaking.

WILLETT: It will never be important in drought situations. The essential charac-



DR. LANDSBERG: "We are undoubtedly in the warmest period of almost 1000 years . . . On the average we have had more hurricanes in the past five years than in the preceding 25 years . . . In some years, hurricanes have been off their usual tracks."

teristic of a drought is the absence of clouds. So you wouldn't have anything to seed in the first place.

Q: Do atomic explosions affect the weather?

LANDSBERG: No. Only within the explosion itself.

PETTERSSEN: They have little effect even in their near vicinity. The amount of energy in an A-bomb is no more than that of a medium-size thunderstorm.

(Continued to page 246)



Inventor Lerici, right, finds drilling spot where his underground camera will reveal tomb's contents



Flash camera at end of tube is lowered into tomb, where 24 exposures are made in a complete circle

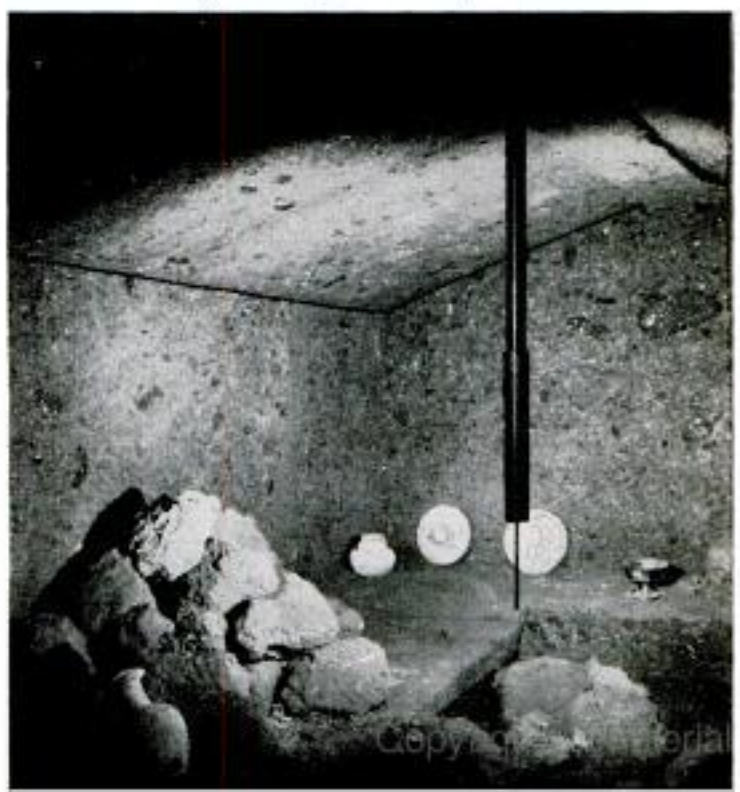
"Mole" Camera Photographs Tomb Before Excavation

ANCIENT TOMBS, hidden from the eyes of man for centuries, are being photographed by a unique camera previous to excavation to determine if the expensive and time-consuming work will be worthwhile. The camera, invented by Carlo L. Lerici, wealthy Italian industrialist and amateur archeologist, is a revolving flash

camera at the end of a tube. It is lowered into a tomb through a drilled hole. The camera makes 24 exposures as it travels in a complete circle. Aerial photographs and sound-wave devices locate the burial sites. Lerici calls his invention the "Eye of Minos," after the mythical judge of the underworld.

Relics of a long-dead civilization, these valuable vases were excavated after discovery by camera

Revolving camera with probing needle at end of tube is inserted through the top of 2500-year-old tomb





How to travel without leaving home. Trailer-Jeep combination drives through front wheels with controls inside the kitchen

Trailer-Jeep Steers From Kitchen

Few motorists can duplicate the rare feat of H. Paul Prigg of Miami, Fla., who has driven from Coast to Coast while sitting in the kitchen of his home. The home is an 8 by 20-foot house trailer welded to a Jeep. The steering wheel, controls and instruments are fastened to a kitchen wall. A folding chair serves as the driver's seat. The trailer body is made of aluminum sheet fastened to steel channel. Cruising speed is 40 miles per hour. The trailer contains a complete bathroom, gas range, refrigerator and beds for two children and two adults.



Toss-Away Filters For Home Pools

Homeowners with backyard swimming pools now can filter the water supply with replaceable cartridges which are inserted in the filter housing. They remove algae and dirt particles and can be discarded when loaded with deposit. The complete filter system, available in four models, can be installed in either a surface or a sunken pool.

Off-Road Transport

All-wheel drive gives a new vehicle the ability to haul 70,000 pounds of freight through territory barren of roads or railroads. An electric motor is geared to each wheel. When one wheel loses traction, its share of the machine's horsepower is transferred to other wheels. The driver pushes a finger switch to steer.



Fastest Jet Day Fighter?

Lockheed Aircraft's XF-104 Starfighter is reported to be the fastest jet day fighter in the world. Top speed is still secret. Test pilot for this plane is Tony LeVier, director of flying operations at Lockheed's California division. This aircraft (*Popular Mechanics*, Sept. 1954, page 104) is 55 feet long and 21 feet 11 inches from wing tip to wing tip. Pods at the ends of the drooping, knife-edge wings are fuel tanks. The plane is powered by a Curtiss-Wright J-65 jet engine.



Big Squeegee for Hangars

Pulled by a diesel tractor, a 15-foot-wide squeegee saves 400 man-hours weekly in sweeping hangars free of water at the Marine Corps Air Station at Kaneohe Bay, Hawaii. Sgt. Larry F. Stutts made the device from large timbers, discarded rubber strips and a few pieces of angle iron. Two men can now do the cleanup job in half a day. It formerly took a crew of 50 an entire day to clean a single hangar.



Dirt and Compost Mixer

Compost is mixed with dirt by a small power machine developed in Germany. The dirt and compost are shoveled into a hopper and emerge on the other side of the machine, thoroughly mixed by two rotating knives. The machine handles material as fast as two men can shovel it. The gasoline engine also powers the single wheel which moves the machine from place to place.





FLYING FOREST-FIRE FIGHTERS

Using road as a firebreak, tanker plane widens firebreak area by spraying brush with water and chemical

By Thomas E. Stimson, Jr.

Testing helicopter against spot fires, pilot uses pull line to open valve in flexible-plastic tank

ON A RECENT AFTERNOON a group of forest rangers drove into the mountains to look over a remarkable sight. They went to see with their own eyes a new fire-fighting technique that had stopped a raging brush fire in its tracks only a few hours before.

Making their way through tinder-dry brush, they reached an area where the bushes and clumps of trees were coated white. This was the borate line, the insulated belt. Beyond it the fire had burned everything in sight; on this side of the belt the brush hadn't been touched. The wide swath of chemical had been laid down that morning by a pair of small tanker aircraft, right in front of the flames.

Air attack was used against 25 forest fires in the West last year. It was a deciding factor in stopping 14 of the fires, a definite help in 10 more. Only once was it a failure. On this occasion, a pilot missed his target in the smoky atmosphere and laid his chemical in front of the backfire instead of on the main fire line.

Forest pilots have tried water-bombing a conflagration but much of the water turns to mist in the hot air over the flames. Drenching the area in front of the fire is better, though some of the water evaporates when fire reaches it.

Best of all is to lay down a mixture of water and sodium calcium borate. The sticky boraxlike suspension adheres to everything it touches and covers leaves, twigs and branches with a fire-retarding coat. Sprayed from the air to cover a 75-foot-wide area, it slows down a hot fire until it can be fought from the ground, or creates sidelines across which a fire can't creep.

Last year seven agricultural crop dusters fought forest fires in California all the way from the Oregon border to San Diego. They operated from roads or small landing strips, even from meadows. They had 125-gallon dump tanks.

Most of the fire-fighting planes are biplanes that were built as military trainers and later converted into dusters. They have limited capacity as tankers. A new low-wing monoplane designed especially for agricultural and forestry work is now undergoing tests. Called the Transland AG-2, it is based on studies made at Texas A. & M. College to develop the best all-around design for an airplane for crop dusting, spraying fire-fighting and similar work. As a tanker it can carry 200 gallons of water or chemical and can operate very close to the ground at 58 percent of engine power.

In addition to using airplanes, the Forest Service is studying helicopters as another fire-fighting aid. The whirlybirds have already shown that they can rapidly transport small crews across country to a fire. Now they are being tested for such jobs as laying lightweight linen hose and for knocking out small spot fires. ★ ★ ★



Helicopter, above, is used in Forest Service experiments to lay as much as 1500 feet of linen hose across rough country



Air view shows borate line across tinder-dry brush. Fire burned up to insulated line, did not get across to heavy growth

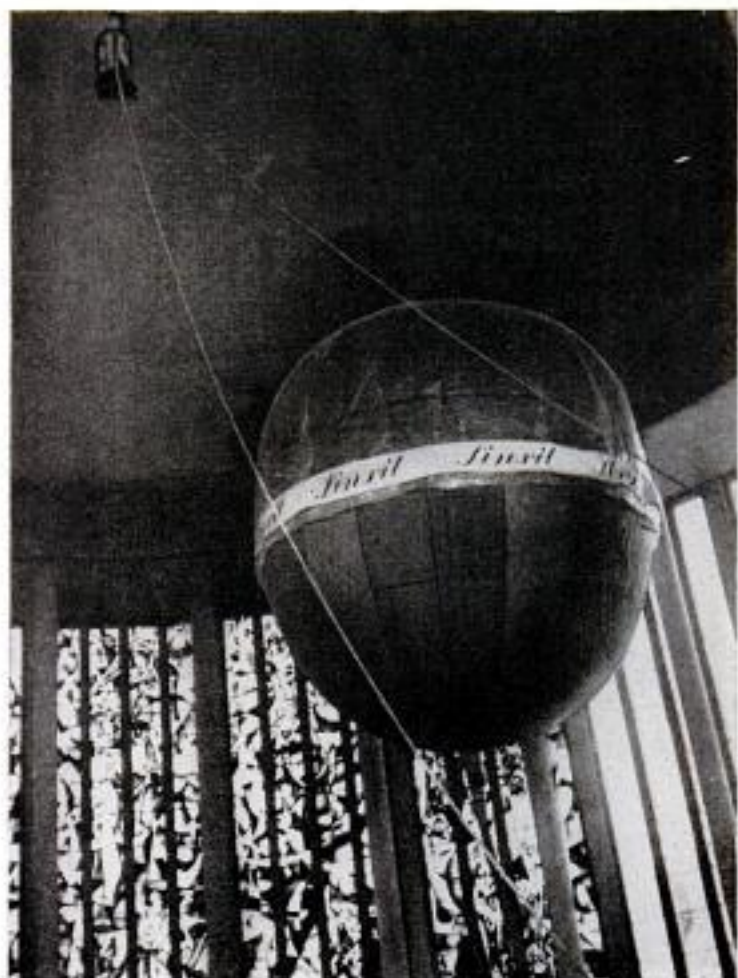
Airplane, below, is laying a water-borate line in advance of flames. Some planes carry 200 gallons of chemical and water





Balloon Used for Scaffold

Standing on a platform erected at the top of a balloon 24 feet in diameter, a painter has decorated the dome inside St. Peter's Church in Yvetot, France. The contractor borrowed a French Air Force balloon, built a small "porch" on the deflated bag, filled it with hydrogen, and sent painter and scaffold to the ceiling, where the job was accomplished.



Plastic Bags Replacing Glass Bottles for Blood

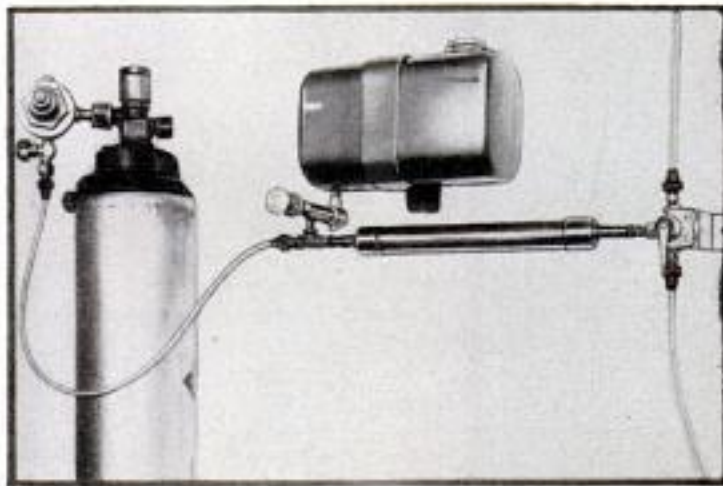
Plastic bags are replacing glass bottles as containers for blood transfusions in the U. S. Army Medical Corps. They are unbreakable, disposable and occupy less stor-

age space. A bag is placed under the shoulder of a patient and the weight of his body forces the blood to flow at an even rate into his arm.

Mosquitoes Killed by Fog-Spray System Attached to House

Insecticide, sprayed from fog nozzles in plastic tube encircling a building, rids an area of mosquitoes for about seven hours. A valve-operated tank releases compressed gas to force insecticide from another tank

through piping to the nozzles. There the droplets are ejected as an almost invisible fog. Three-minute treatments will blanket shrubbery and other hiding places without harming humans, animals or vegetation.





Automatic Machine Sorts 15,000 Letters Per Hour

Able to handle 15,000 letters per hour, the first automatic mail-sorting machine in the United States postal service has been installed at Silver Spring, Md. Five operators, seated at control boards on the top deck, send the mail to 300 pigeonholes beneath them by pressing the appropriate

symbol keys. By comparison, five men working fast by hand can sort about 7500 letters into 75 pigeonholes. The machine weighs 31,000 pounds, is 50 feet long, 13 feet high and 10 feet wide. It was designed and built in Europe, and is similar to others now in use there and in Canada.

Solar Batteries Power Helmet Radio for Use Day or Night

Long rows of silicon wafers on the crown of a military helmet convert solar energy into electricity to power a two-way radio. The tiny solar cells also charge four nickel-cadmium storage batteries for nighttime operation. A completely transistorized power converter was designed by U. S. Army

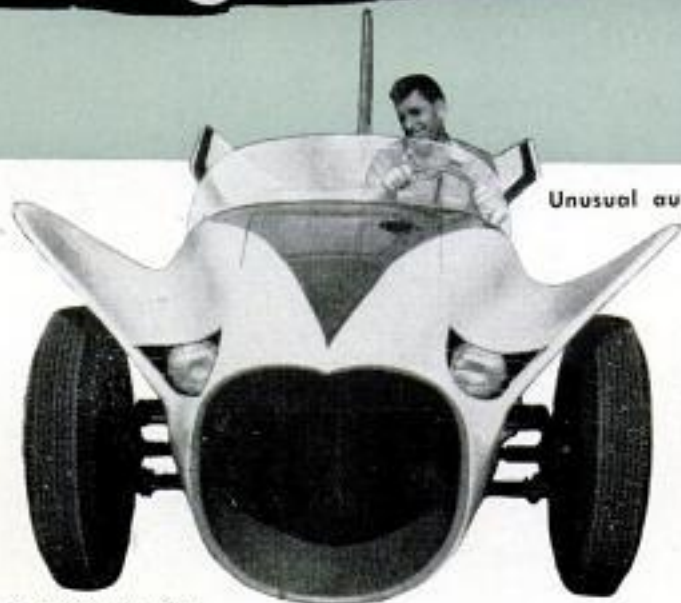
Signal Corps engineers to raise the approximately 4.5 volts of the solar nickel-cadmium battery combination to the 50 volts needed to operate the transmitter. The helmet radio previously used dry cells which were good for only one day if used continuously.





James Verde photo

Unusual automobile bears striking resemblance to real plane



Burke Johnson photo

You'd expect the automobile "mascot" of an air squadron to be built of scrapped-aircraft parts. This time an ancient British car was transformed into a

Sabre Jet for the Road

RESIDENTS OF Phoenix, Ariz., are no longer startled when they drive along a highway and meet what looks like an F-86 Sabre Jet airplane coming at them. They know it's only the unusual automobile "mascot" of a nearby Air National Guard unit.

The aluminum three-wheel Sabre Jet car, with clipped winglike fenders, nose air scoop and tail section inspired by the actual aircraft, was entirely designed and built by members of the Arizona 197th "Copperheads" Fighter Interceptor Squadron. They did it in their spare time, involving 864 man-hours over a period of six months.

The project began when Lawrence Bell, assistant adjutant general of the Guard, saw a 1934 British-built B.S.A. (Birmingham Small Arms Co.) car for sale. It was a high, boxlike machine resembling a 1917 Dodge coupe, but he thought it could be fixed up as a squadron mascot and as a unique recruiting device that could be used

for parades and other special occasions.

When the car arrived at squadron headquarters and it was explained what General Bell had in mind, there was much shaking of heads among the men. But T/Sgt. Richard Bell, an artist and a squadron crew chief, grasped the idea and designed a body. Then someone thought of presenting the car to General Bell at the Copperheads' 10th anniversary celebration in six months.

So by the time the car was stripped to its essentials, it had grown into a squadron project. When the time came to build a seat, one of the men, an upholsterer, made it. The beautifully constructed body was provided by a pair of brothers, T/Sgt. Donald Cunningham and Capt. William Cunningham, a pilot. They own an automobile-body shop near Phoenix.

Although they came so close to the deadline that the car's paint was still wet, still it was ready for presentation to General Bell at the squadron's anniversary banquet. Later it was exhibited at a Phoenix auto-



Three-wheel Sabre Jet car was built of aluminum from an old British auto, can travel 80 miles per hour

mobile show, and attracted more attention than some of the new cars.

The car seats three passengers, and its top speed is 80 miles per hour. The water-cooled B.S.A. four-cylinder engine transmits power through a three-speed gearbox to the swing axles of the two front wheels. It will average 30 to 35 miles per gallon of gasoline and the tank holds 5½ gallons.

Suspension in front is by a system of transverse leaf springs, and the single rear wheel has a leaf-spring and tube setup. Shock absorbers are the friction type. The mechanical brakes work off the differential

in front, and are the standard drum and shoe in the back.

The body was fabricated from aluminum sheets, .064 inch in thickness, which were formed and welded over a frame of welded tubular aluminum. Then the body was sandpapered and lacquered.

The car's jetlike tail is 6 feet, 4 inches high and its over-all length is 17 feet, 4 inches.

The wheels are the same size, being a conversion of the B.S.A. center hubs and the rims from a 1952 Buick. The body rides only 5½ inches off the ground. ★ ★ ★

Three of the men who worked on the car are, from left: Thomas Bernard, Richard Bell, Donald Cunningham



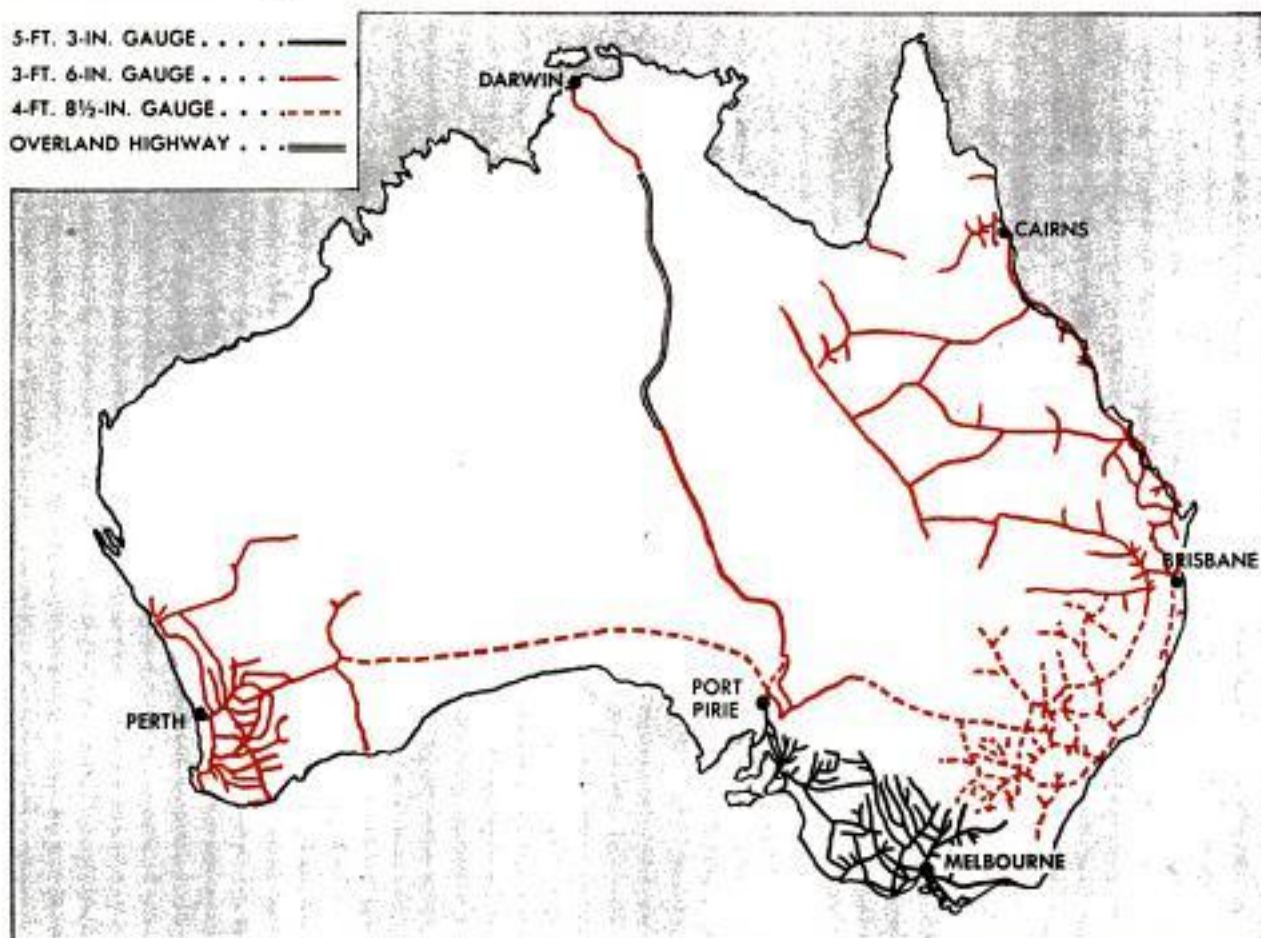


Double Piggyback for Australian Trains

BECAUSE AUSTRALIA'S railroads run on five different gauges of track, broad-gauge trains sometimes carry narrow-gauge equipment to save the time and expense of unloading and reloading shipments. The double-piggyback train, above, was photographed at Copley, in South Australia. The map, below, shows the three

major track widths now in use. In addition, there are railways with gauges of 2 feet 6 inches, in Victoria, and 2 feet, in Queensland. Australia's multiple-gauge problem is the result of independent development of railways by the various states in the 19th Century. A campaign now under way would make 4 feet 8½ inches standard.

5-FT. 3-IN. GAUGE
 3-FT. 6-IN. GAUGE
 4-FT. 8½-IN. GAUGE
 OVERLAND HIGHWAY





"Drag racing" the hard way. If the rider drops the rope or his partner slips off the hide, they lose the race

Field Day

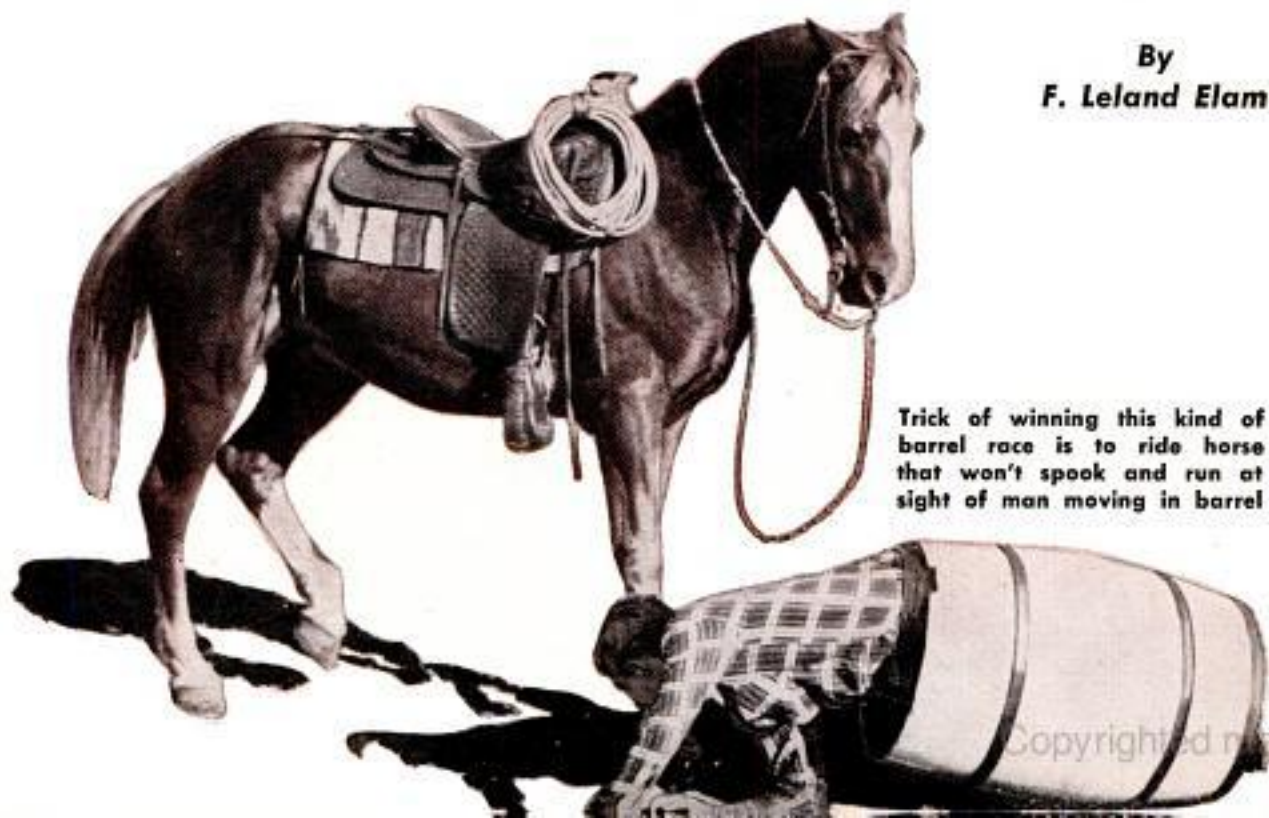
IN THE SADDLE

WHILE OUR MOTORIZED AGE has virtually eliminated the horse from farm work, this beautiful friend of man has become one of his principal means of recreation. The modern equestrian can

have almost unlimited fun from the back of his horse.

He has become quite adept at devising new kinds of races and team competitions. A group of horsemen may get together for

By
F. Leland Elam



Trick of winning this kind of barrel race is to ride horse that won't spook and run at sight of man moving in barrel



Only the horses are allowed to touch the big ball as opposing teams try to push it across the finish line



In keyhole race, horse must dash through corridor, turn around, run out again without stepping over line

an afternoon of fun and put their horses through all kinds of competitive events. These are called play days. There is also the gymkhana which is set up as a definitely organized competition, similar to horse shows.

Play days generally include such events as team competition and exceptionally unusual races which do not fit into the gymkhana plan, as well as any of the gymkhana-type events. An excellent example of the team competition is "palmetto polo," a game developed by fun-loving horsemen in Florida. Some feel it is a legalized form of mayhem. It is a game similar to standard or society polo but with certain rules which make it more appealing to ordinary horsemen. Theoretically at least, it is less dangerous than the society





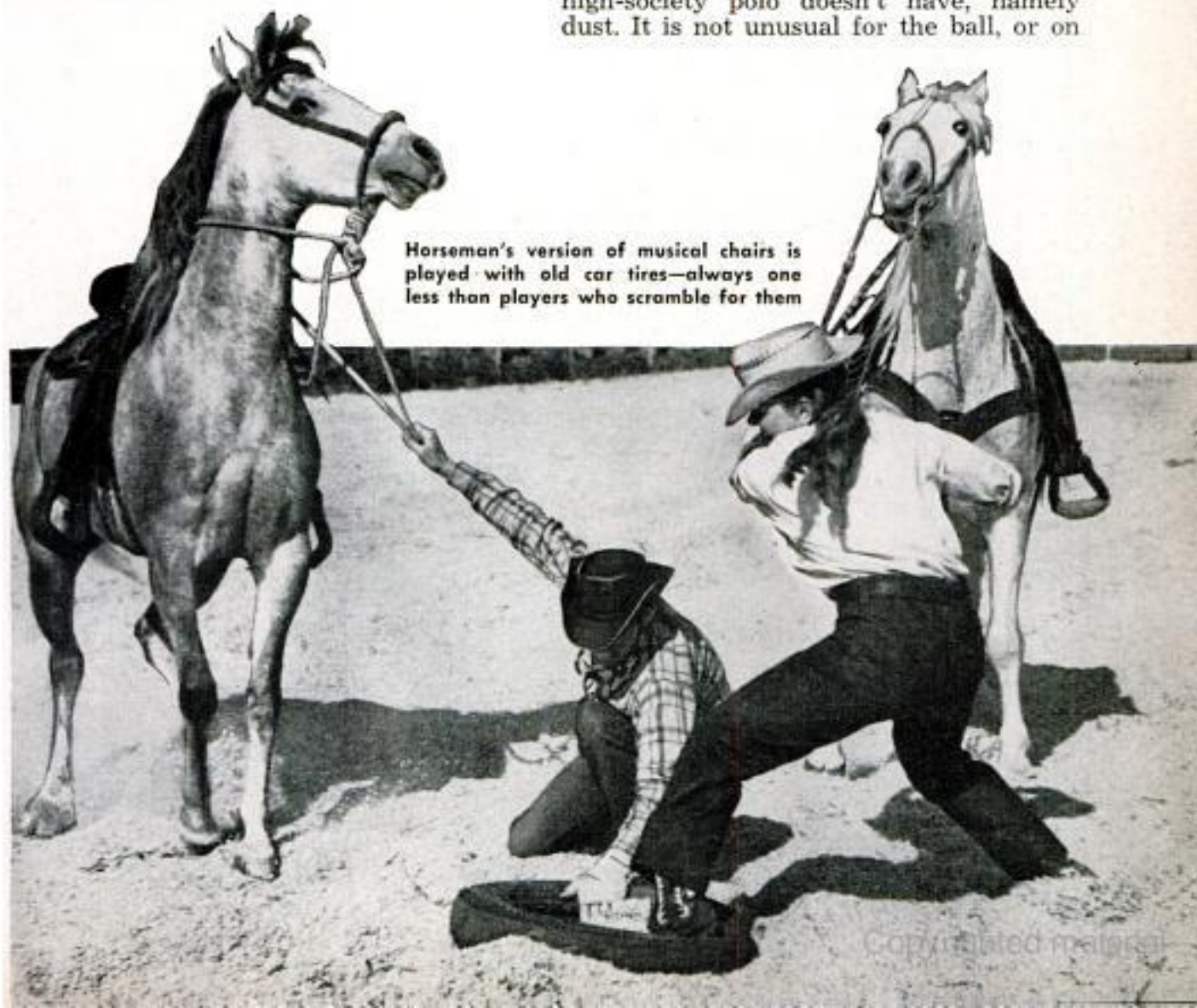
Ever try to spear a two-inch ring with a six-foot pole? You need complete control of horse, hand and eye

type of polo. But seeing one match will convince anyone that it is possible for a player to get his head battered.

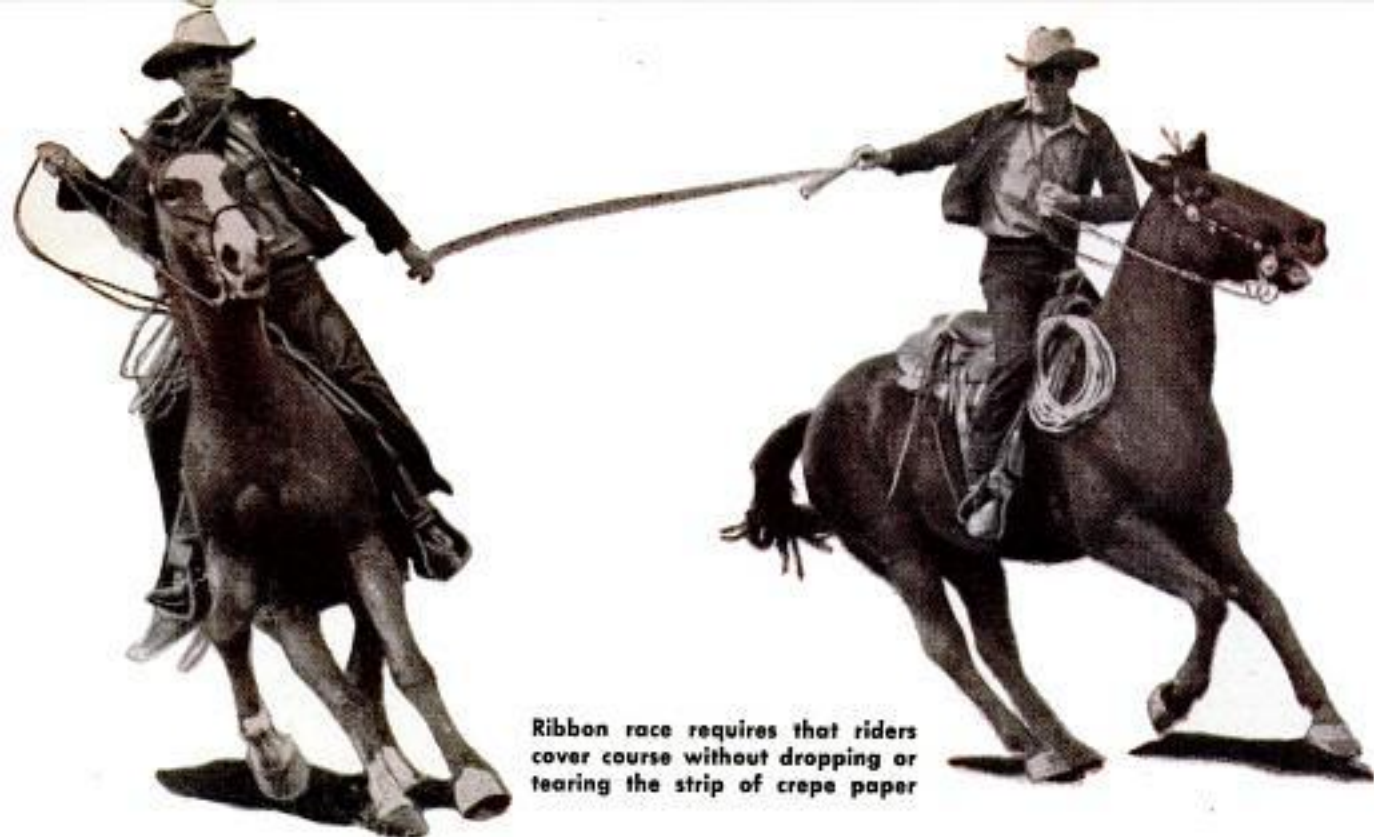
The game is played with special mallets having a wedge-shaped hard-rubber tip and an air-filled rubber ball about 10 inches in diameter. The field is 240 feet long, 120 feet wide and divided into five

zones. One man from each team is in each zone and cannot cross the dividing lines. Goals are scored as in normal polo, by knocking the ball between goal posts at either end of the field.

In most places where this game is played the arenas are dry and dusty. This adds a certain something to palmetto polo that high-society polo doesn't have, namely dust. It is not unusual for the ball, or on



Horseman's version of musical chairs is played with old car tires—always one less than players who scramble for them



Ribbon race requires that riders cover course without dropping or tearing the strip of crepe paper

occasion even a player, to get lost in clouds of dust.

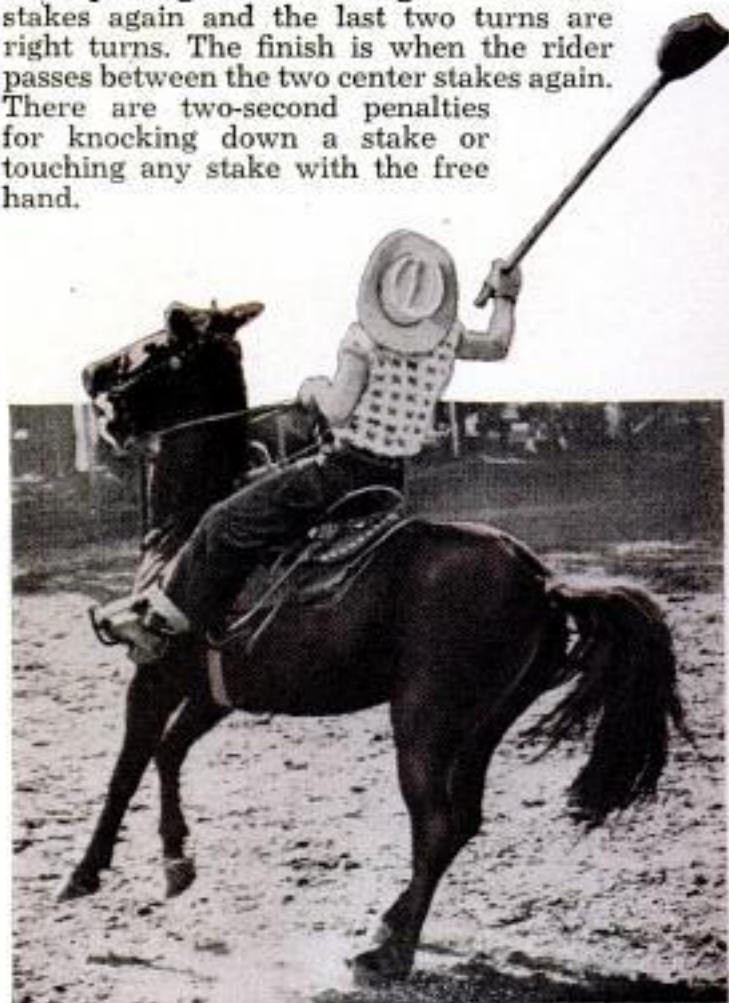
The original gymkhana were old Anglo-Indian (East Indian) meets where various types of races were held. These races were short and perhaps were the foundation from which developed the modern quarter-mile dash for quarter horses. Later a second variety, the pagol, or "funny races," were added to the meets. The Indian term pagol has been dropped and all such races come under the category of the gymkhana.

One game that has become quite popular in the Western states is pushball in which a giant leather air-filled ball, obtained through war-surplus stores, is pushed about a field by teams of five men. To start the game, the ball is placed in the center of the field. The teams rush toward it and attempt to push it across the goal line of the opposing team. Pushing is done by horses only and they seem to thoroughly enjoy the experience. The game is played in 10-minute quarters. The team scoring the most goals wins.

The usual events in a modern gymkhana include ring spearing, five-man relay, key-hole race, pole bending and quadrangle stake race. To these are generally added some of the funny races.

In pole bending and the quadrangle stake race, upright poles are used as markers to guide the horse along the proper course. The poles used in all such events are round pine, 1½ inches in diameter and 7 feet high. The bottom is inserted in a stand that will hold the stake rigid but which will tip when hit by animal or rider. One of the best methods of holding the pole is to insert it in a can filled with concrete.

In the quadrangle stake race, the course is around four stakes placed in the form of a 25-yard square. Two stakes in the center, 5 yards apart, form the starting line. A running start is made from 20 feet back. The first two turns are left turns around stakes, then passing down through the center stakes again and the last two turns are right turns. The finish is when the rider passes between the two center stakes again. There are two-second penalties for knocking down a stake or touching any stake with the free hand.





Rider going over pole-bending course swings to the left of one pole, then to the right of the next pole

The course in pole bending is 100 feet long, with six poles in a straight row spaced 20 feet apart. A contestant moves to a starting line 20 feet back from the first stake and is then on course. The rider may pass the first pole on either side, then pass successive poles on alternate sides, turn the sixth pole and return in the same manner. Start and finish timing is done as the horse's nose passes the pole. The timer lines

up at the first pole. Penalty is two seconds for either knocking a pole down or touching it with a free hand.

The keyhole race is an event that is unusually good for turning a horse in a small area. The course is shaped somewhat like a huge keyhole. There is a 20-foot-diameter circle. Entry to the circle is via a four-foot-wide, four-foot-long corridor. The keyhole

(Continued to page 238)

Polo with brooms, less dangerous than mallets, is widely enjoyed





Doughnut Plane Waits for Helium

When inflated with helium, this doughnut-shaped plane is expected to travel straight up, hover and fly horizontally at speeds up to 50 miles per hour. Jim West of Atlanta, Ga., the plane's inventor, used a vacuum cleaner to inflate the aircraft's wing for demonstration. However, government restrictions on helium have grounded Jim and his plane indefinitely.

Pupils Study Math With Calculators

Fifth grade pupils at Cedar Grove, N. J., Memorial School use pint-sized calculating machines to help them learn to add, subtract, multiply and divide. Educators claim children using machines gain half a year in computation and reasoning over pupils taught by conventional methods. Students work problems first by pencil; check answers on the machine.



Does Harry Graus Have the World's Smallest Garden?

Raising plants in thimbles and caps from toothpaste tubes and bottles is a hobby for Harry Graus of Brooklyn, N. Y. He waters with an eye dropper, rakes with a tooth-

pick, and uses a barley-and-tea fertilizer mixture. Below left is his coleus and ivy plant in a thimble. Below right, he waters his boxwood plant.

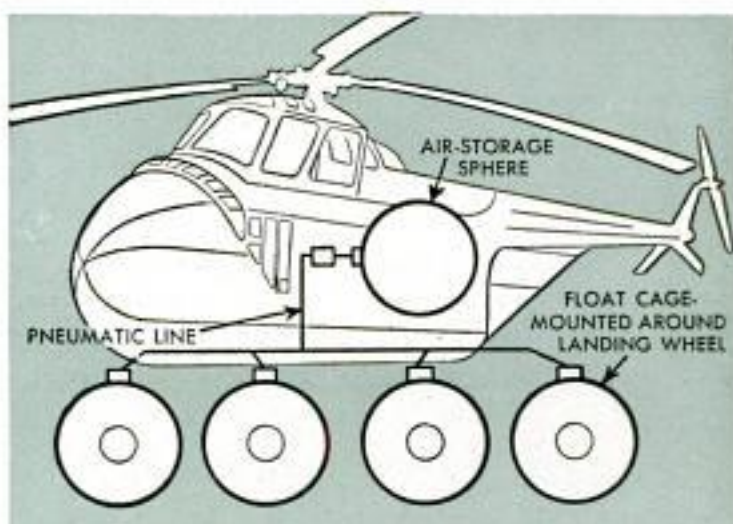




Sikorsky S-55 helicopter makes simulated emergency landing on water with inflated, rubberized "doughnuts"

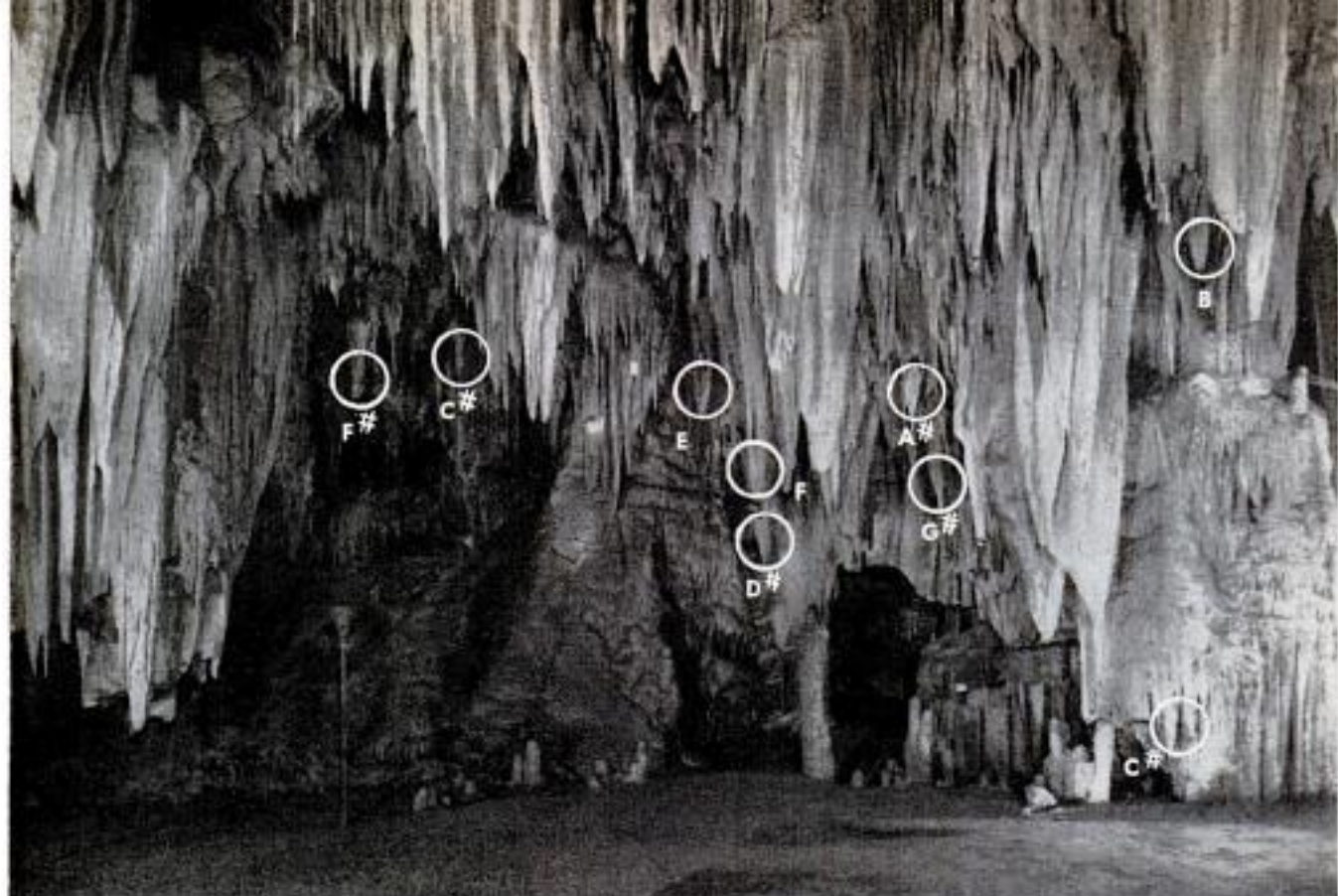
Landing Helicopters Depend on "Doughnuts"

INFLATABLE LANDING GEAR now permits helicopters to alight safely on water or ground in routine and emergency situations. Power for the flotation equipment flows from a supply of 3000-pounds-per-square-inch compressed air. This is stored in a 900-cubic-inch steel or glass-fiber sphere in the copter. The pilot pushes a button in the cabin to work electrically a valve that allows compressed air to flood via pneumatic line to each wheel. Here, the air discharges from perforations in a ring-shaped unit and forces free air to inflate four rubberized-nylon-fabric landing "doughnuts." At 1¼-pounds-per-square-inch pressure, the rear floats contain 66 cubic inches of air, while the nose floats—planed for taxiing—contain 58 cubic inches of air. Full inflation requires four to five seconds. The self-regulated pneumatic apparatus, weighing less than 50 pounds, prevents over and under-inflation. With floats, the entire system totals 170 pounds. After each doughnut landing, the floats are manually deflated after which they are re-folded for future use.



Above, diagram indicates storage chamber with 3000 pounds per square inch of compressed air and pneumatic lines to floats around wheels. Below, copter uses floats in ground landing





Heart of organ is the huge "ballroom." Circled stalactites are carefully selected for their tone and pitch

The Organ That

Inventor Sprinkle, who is also an accomplished organist, sits at console deep underground. Stalacpipe Organ covers 2½ acres

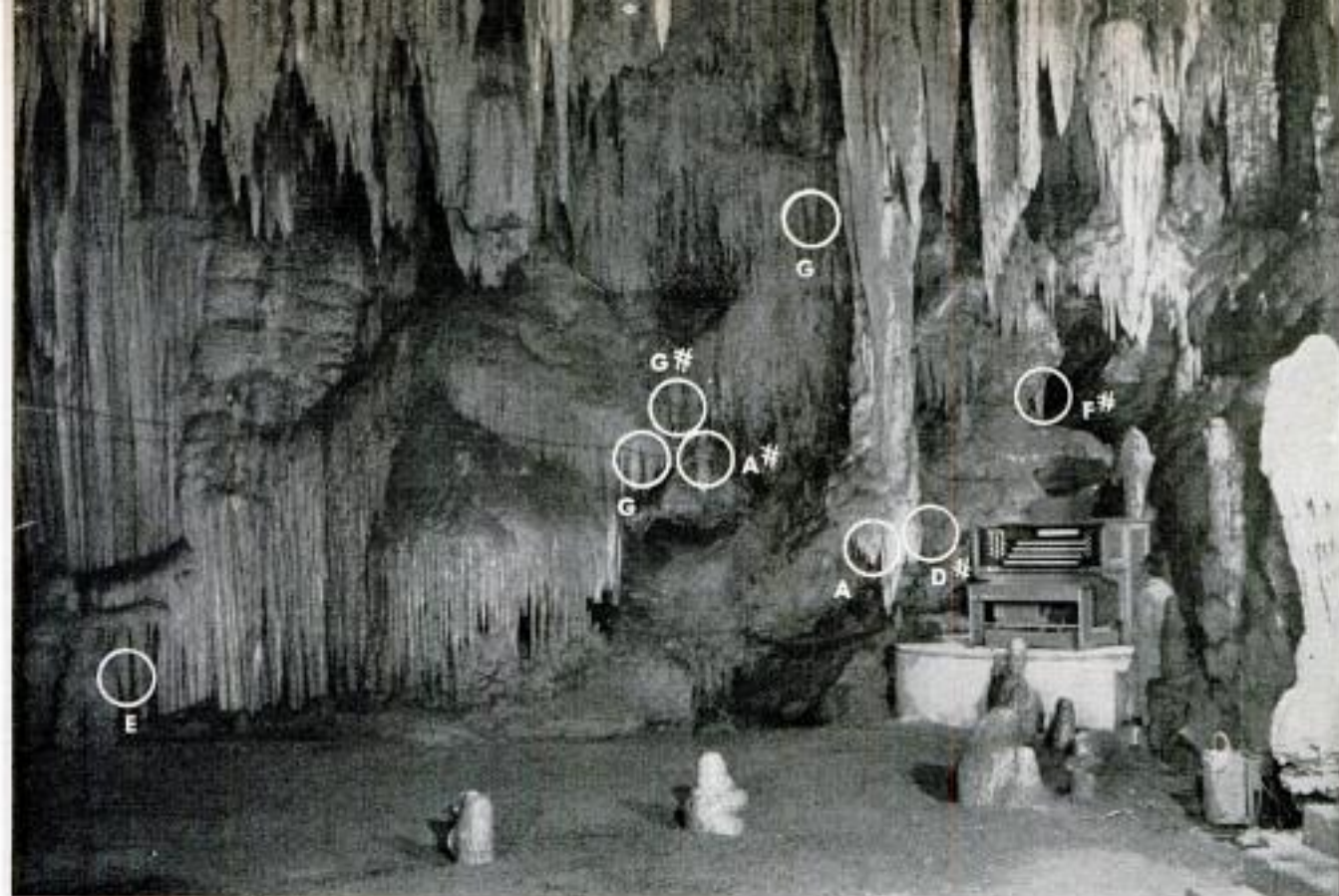
By F. Dorothy Wood

THREE YEARS AGO a distinguished scientist took his young son to Luray Caverns, in Virginia, as a special treat on the lad's fifth birthday. During the escorted tour of the cave, their guide struck a stalactite at just the right spot to bring forth a deep, rich musical tone. To the scientist, who is also an accomplished musician, the sound was the vibrant, rich tone of an organ.

From this incident has come one of the world's most impressive musical instruments, the Stalacpipe Organ. Today, as you walk through the great "ballroom" of the cavern 250 feet down, you literally walk into the heart of this remarkable instrument, for you are surrounded by stalactites that play the individual tones. Visitors stand enthralled as melody and chords play all around them. No tinkly tunes these, but full-throated music rolling through the cavern.

The man who visited the cave that day with his five-year-old son





Plays Stalactites

Photos by Michael Lackovitch

is Leland W. Sprinkle, electronic scientist at Air Force Headquarters in the Pentagon, with a full-time job that includes operation of the Air Force UNIVAC. For the past three years he has spent every spare-time minute developing and building the Stalacpipe Organ.

Basically, the music is produced by rubber-tipped plungers striking stalactites Sprinkle has carefully selected. The plungers, electrically powered and electronically controlled, are actuated in one of two ways: Manually, by playing the console, which is very much like that of a standard organ; or automatically, by turning a plastic belt into which holes have been melted.

To Sprinkle, the organ is far from finished despite its ability to produce fascinating music. He feels, after three years of work, that he has made a fairly good start!

Now in operation are three octaves of an ultimate five, in one division, and a few additional tones

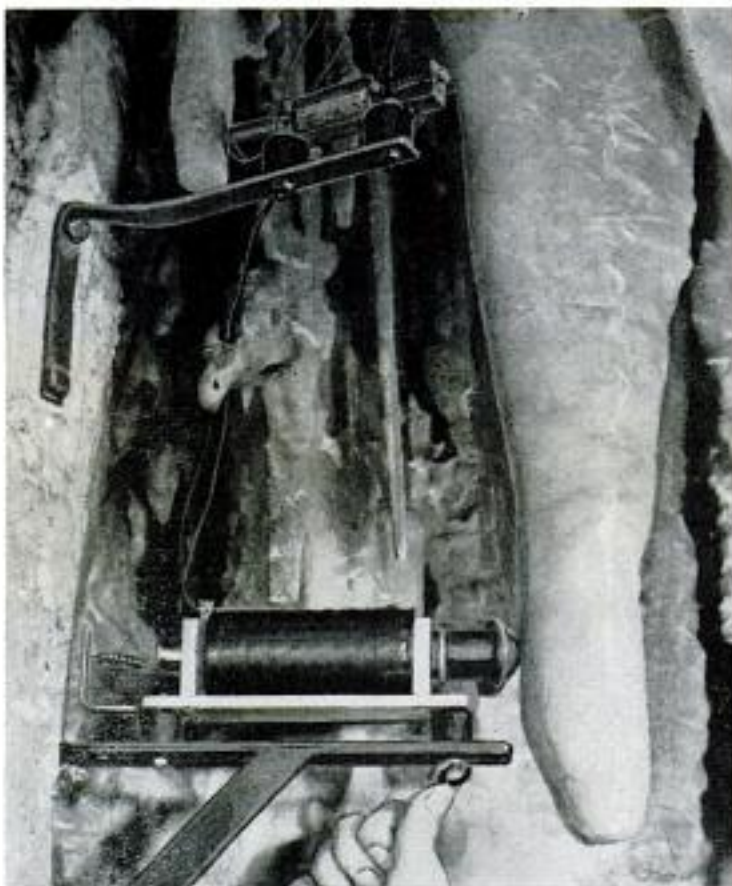
Sprinkle grinds a stalactite to bring it up to exact pitch. Skillful grinding frequently improves the tone quality, too





Visitors literally stand in the middle of the organ as they listen to combinations of stalactites sound chords around them

Rubber-tipped plunger, triggered by solenoid, strikes stalactite a sharp blow to produce the tone, precisely on pitch



and couplers. This is about $\frac{1}{50}$ of the console's potential. Sprinkle selects, tunes and wires a separate stalactite for each note of every octave, and each flat or sharp.

Finding the Stalactites

First he prospects the walls for a stalactite that is highly resonant. Not all of them are; in fact, only an occasional one produces a tone beautiful enough to make it a candidate. (The most beautiful formations are likely to be duds, musically.) Sprinkle tests a potential "prize" with a tuning fork to see if it comes near a desired pitch.

Once such a stalactite is found, one other requirement must be met: There must be a neighboring formation near enough so that a plunger can be attached to it, since no wiring or metal can come in contact with the vibrating pipe.

Then Sprinkle brings the stalactite to exact pitch by grinding it at the tip to shorten it. Sometimes the amount taken off is quite a chunk, sometimes only a fraction of an inch. The gauge used here is no tuning fork but a set of precision oscillators, to which each note is compared directly and brought to exact concert pitch.

With the pipe in tune, Sprinkle next mounts the plunger assembly, a tailor-made solenoid. The plungers themselves and their tips vary in size according to the structure of the stalactites.

When the solenoid is securely in place, it can be fired by a quick burst of direct current. The plunger shoots forward, strikes the stalactite and springs back to cocked position. Result: A clear, vibrant tone, loud or soft depending upon the force of the blow. With an octave of these, you can finger out a tune; with three octaves the Stalacpipe Organ is born.

But an organ is an instrument of great versatility, producing at one moment the volume and incredible range of a magnificent choir, at another the isolated, pure tones of a solo flute. How could solid rock be employed to develop a comparable versatility?

Five Divisions on Console

To answer this challenge, Sprinkle has installed five divisions on the Stalacpipe Organ's



Unknown passage through the cave was discovered when assistants searched for route to lay electrical cables

console: Cathedral, solo, echo, pedal and harmonic. These are tailored not only to meet the special handicaps of the cave, but to take advantage of its opportunities. It is a real experience in stereophonic sound to stand in the heart of the instrument and listen to harmonic or cathedral effects roll in from all directions.

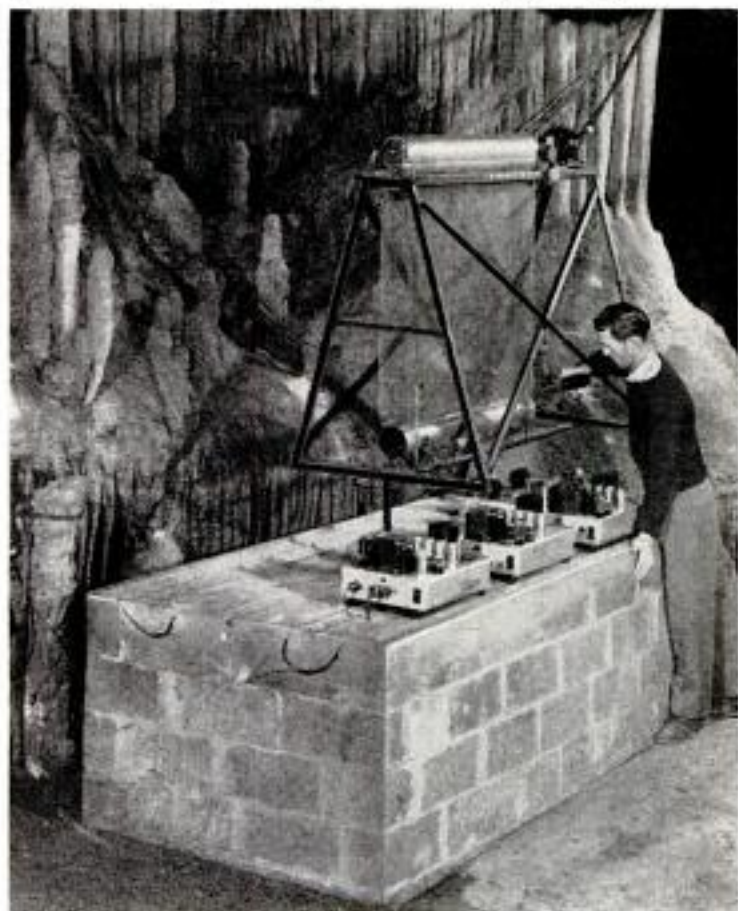
The console itself, manufactured to order by the Klann Organ Supply Company, has stops that are not named but numbered, to match the numbered ranks of stalactites.

Numerous stalactites for virtually all stops have been tuned and tagged and will be used in additional development. The present organ covers about 2½ acres; the potential organ, through use of speakers, could cover some 64 acres. Sprinkle hopes to continue the development with the aid of Grafton Campbell and Julian Taylor, two young men from the cavern's staff who have helped him for the past three years.

High above the ballroom is the control room of the organ, a cavern about the size of Constitution

(Continued to page 242)

Each octave has a separate electronic assembly on the control platform. Roll of punched plastic is recording of organ number





Ladder Platform and Hoist Provide Convenient Workspace

Erection of a 30-pound metal platform on the top of a standard ladder will provide convenient workspace. A hoist attachment facilitates raising of tools and materials to a worker on the platform. One man can



build the "shelf" in a few seconds. Made of rustproof magnesium, the three-by-three-foot unit folds compactly for transport or storage. Two ladders and two platforms can serve as the base for a plank scaffold.

Nylon Saves Weight for Navy

By using molded nylon in certain electrical fittings on aircraft carriers, the Navy is saving 30 to 45 tons of weight in each new carrier.

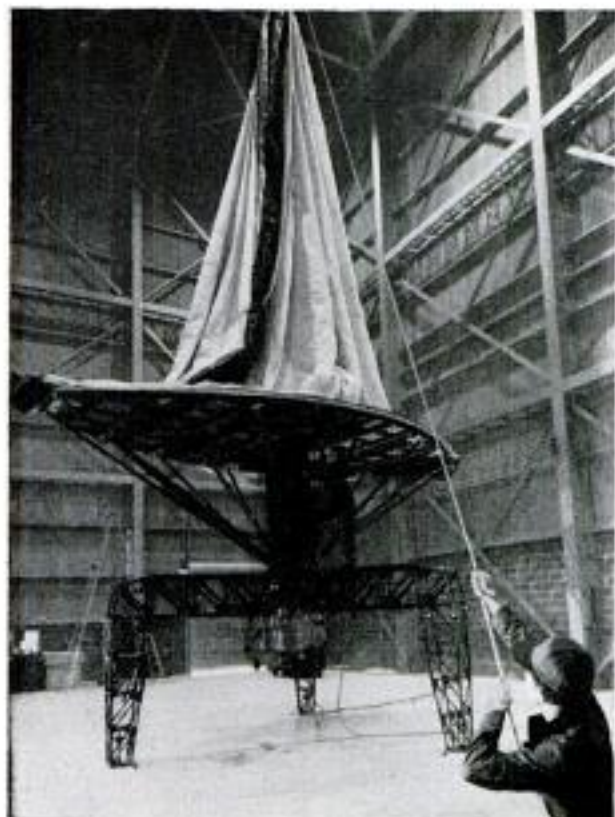
Air Conditioning From Paper

Wastepaper fires a boiler that generates steam to operate a 700-ton air-conditioning system for a department store at White Plains, N. Y.

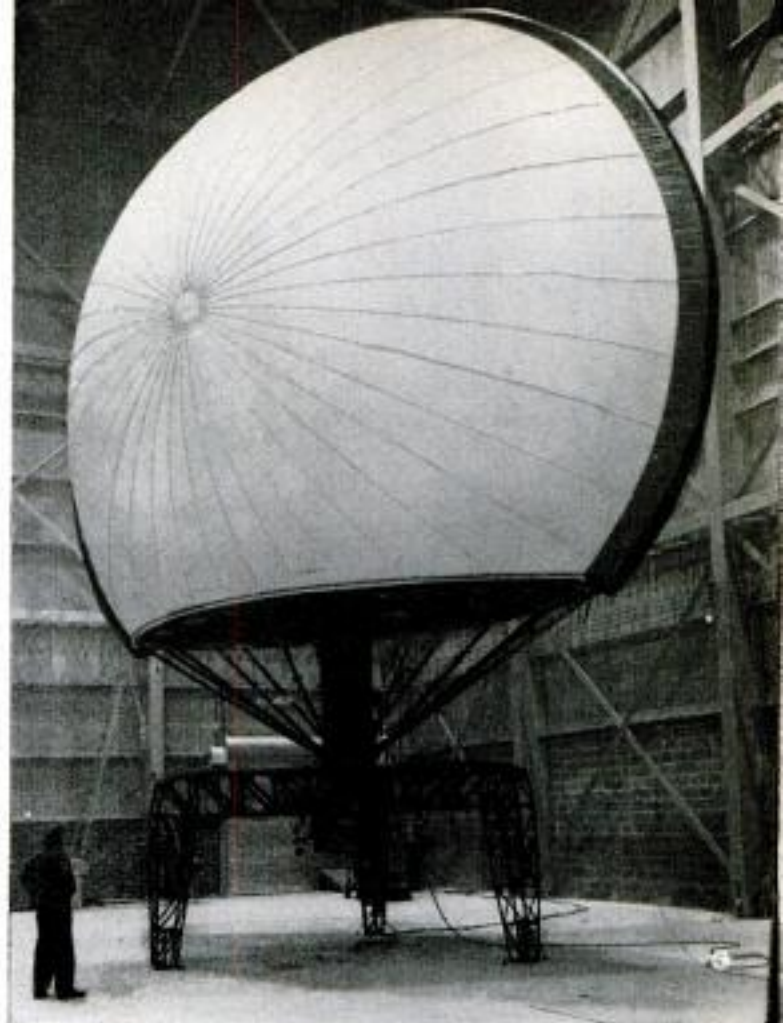


Archer Shoots Telephone Lines Across Canyons

Modern day Robin Hood in the photo, left, is about to shoot an arrow to another telephone pole, 400 feet away. Attached to the arrow is a nylon line which is fastened to a rope. The rope, in turn, is attached to a telephone wire. The archer helps the Pacific Telephone Company string wire across California canyons infested with rattlesnakes and poison oak. The nylon line uncoils at the rate of 150 feet per second as the arrow pulls it over the terrain, so rugged that even the 30-foot poles have to be carried to the site on the shoulders of linemen.



Designed for air-drops in combat areas, this antenna weighs 1690 pounds, compared to 10,000 pounds for equivalent existing metal antennas and supports



Air-Dropped Radar Antennas Are Inflated at Combat Area

Inflated radar antennas made of vinyl-coated glass-fiber cloth can be air-dropped into tactical areas with lightweight radar sets. Protected by an air-supported radome, 30-foot-high antennas detect hostile aircraft. A magnesium structure supports the antenna, which is preformed to the shape of a double parabolic reflector coated on one inside surface with vaporized alumi-

num to reflect radar waves. This antenna weighs 1690 pounds, compared with 10,000 pounds for equivalent metal antennas and support structures. Disassembled in minutes and packed in 200-pound, airlift containers, the antenna, radome and radar elements are dropped on a target. Gunfire will not easily disable these units, as a constant stream of air maintains inflation.

Mobile Half-Track Radio Station

Radio news broadcasts, ranging from sports to disaster topics, originate from a rebuilt Army surplus half-track vehicle operated by station WHLM of Bloomsburg, Pa. The mobile unit has its own radio equipment and generator, soup kitchen, refrigerated food, medical supplies and an emergency heater.

Old Wood Strong as New

Recent testing of the floor joists of a 105-year-old building in Washington, D. C., prove that old wood is just as strong as new wood, the U. S. Forest Products Laboratory reports.



OWNERS REPORT:



Dodge owners in 42 states took part in this Owners Report

CORONET SIX

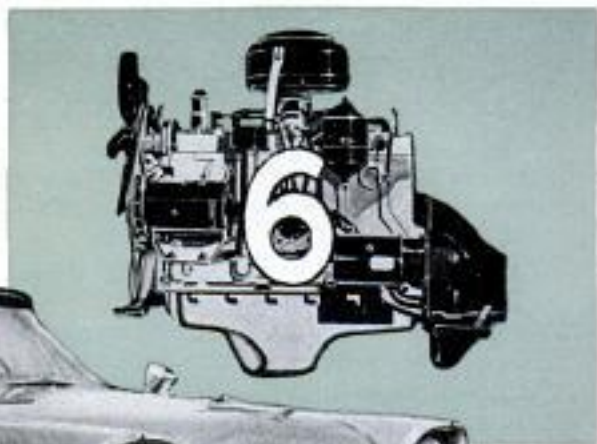
Over-All Rating

Excellent	Average	Poor
44.7%	36.7%	18.6%

THE OWNER of the low-price Dodge Coronet Six is less happy with his car than the V8 owner. However, he is more satisfied with its gas economy.

He is less enthusiastic about the car's good points than the V8 owner and seems to get poorer service from his dealer. He praises Dodge's exterior styling most of all and complains most about water leaks.

HERE'S WHAT DODGE SIX OWNERS SAY



HERE'S WHAT DODGE V8 OWNERS SAY

THE OWNER of the low-price Coronet V8 has had less trouble than the Six owner. He is well-satisfied with the car's top speed and acceleration.

He bought his Dodge because of its sleek styling and he generally approves of the styling trend of the industry. He would like better workmanship in his next Dodge and also more gasoline economy.

CORONET V8

Over-All Rating

Excellent	Average	Poor
53.9%	39.9%	6.2%



Seitzmann photo

Dodge owners complain most about water leaks. Here, a four-door sedan is undergoing the PM splash-pan test

Owners Praise Dodge's Styling, Handling Ease

By Dodge Owners

NORMALLY, A PM Owners Report asks owners in all price levels about their cars—from the cheapest model in each line to the most expensive. This coverage provides a sampling of what any buyer can expect.

But in our 1957 Dodge survey, all owners are in the low-price Coronet line. This is Dodge's price leader. It is only \$100 or so above the "low price three's" deluxe models.

By limiting our survey to Coronets we can compare the relative merits of the Six and the V8 because Dodge offers the Six only in this price class.

Which is the better value for the money, the Six or the V8? Is it smart to buy a low-price model in any line? We hope this survey will help answer these questions.

Our Dodge Owners Report does show there is apparently more reason than just power for the increasing demand for V8 engines. In virtually every category, Dodge V8 owners are happier with their cars than owners of the Dodge six-cylinder models.

"Excellent over-all," is the way 53.9 percent of the V8 owners describe their cars (compared with 44.7 percent of the six-cylinder owners). "Poor over-all," say 6.2 percent of the V8 owners (compared with 18.6 percent of the six-cylinder owners).

It is this way all along the line. The V8 owners like their cars better than the six-cylinder owners, apparently with reason.

Nearly twice as many six-cylinder owners as V8 owners have had "considerable" engine trouble (12.3 percent for the Six, 6.2 percent for the V8). It appears that the six-cylinder engine is not as trouble-free as you would assume.

Generally, though, these owners register the same likes and dislikes. The differences are of degree only, for the most part. Both groups state overwhelmingly that they bought this new Dodge because of its styling: 44.1 percent of the V8 owners and 35.7 percent of the six-cylinder owners say styling is the one feature that most convinced them to buy Dodge.

Previous ownership ranks second with both groups of owners, although only half as many V8 owners give this reason as six-cylinder owners.

The best-liked feature of both Six and V8 owners is also exterior styling. Here again the V8 owners are more enthusiastic. Six-cylinder owners place riding comfort second on the best-liked list, handling ease and roadability third and fourth in that order.

V8 owners place handling ease second, riding comfort third and power or performance fourth on the list.

As you might expect, performance failed to place very high on the six-cylinder list, being in tenth place.

Also as you might expect, more owners of the six-cylinder models want faster acceleration (although the figure is only 28.8

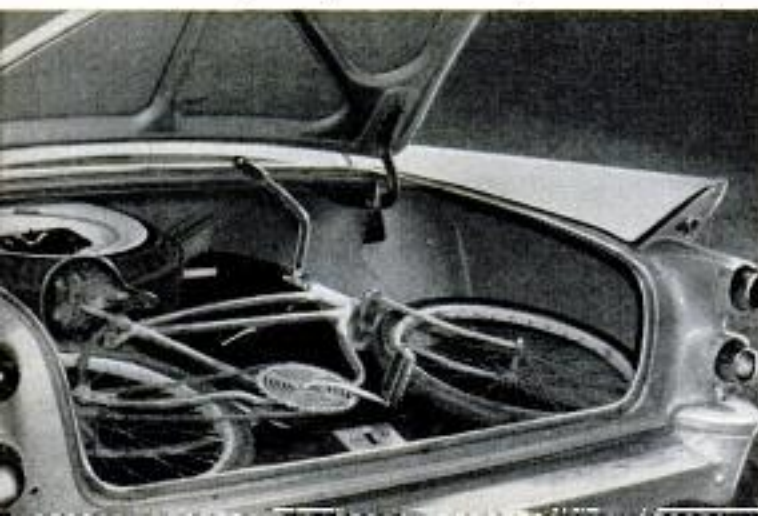


Owners praise Dodge's styling highly, but complain about the narrow opening into the rear seat. There is only nine inches clearance with door wide-open



Dodge taillights extend almost as far back as bumper, making them extremely vulnerable to damage

By mounting the spare far forward, Dodge provides a trunk big enough to swallow up a full-size bicycle



percent at that). Only 18.2 percent of the V8 owners ask for more acceleration.

As for higher top speed, neither group seems to want it very much, 10.8 percent of the six-cylinder owners and 8.5 percent of the V8 owners requesting it.

Both groups want the entire industry to provide better body workmanship. V8 owners want more miles per gallon and many six-cylinder owners want even less horsepower. There is a surprisingly important percentage in each group that would like the industry to build smaller cars.

The Owners Talk

Here are quotations that illustrate what the owners have to say, good and bad, about their 1957 Dodges:

"I like its advanced styling. It makes other cars look like ice wagons built in the year 1900."—Texas salesman.

"During three months' ownership I have almost daily had passers-by take unusual notice of car. Could be termed a 'head turner.'"—Massachusetts engineer.

"I gave my wife a choice of anything less than Cadillac's price. She took to the Dodge looks and I can't say that I blame her."—Arkansas physician.

"You only have to sit behind the wheel and all the world stops, watches and admires. You feel like a king, you are so proud."—Ohio widow.

"Handles like a baby carriage."—New York inspector.

"Easy to handle on the road and you don't have a tired feeling after a long trip."—Missouri airline employee.

"Easy for a woman to handle. Never seems bulky."—Illinois owner.

"Completely relax when driving it."—Illinois telephone employee.

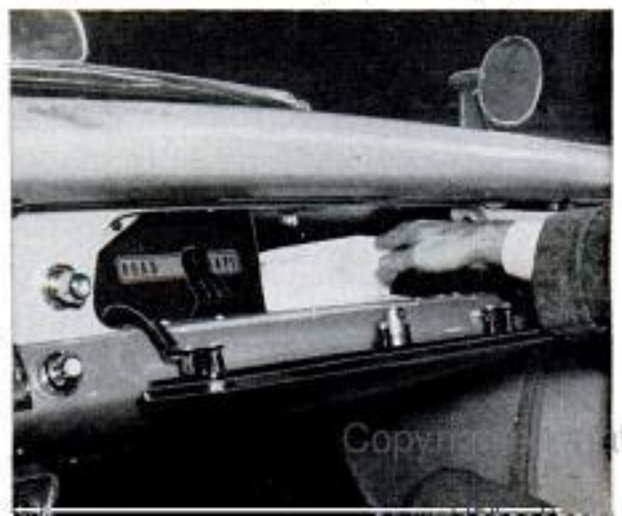
"Particularly like the way the car rides. No swing or sway."—Ohio foreman.

"Like the Torsion-Aire ride most."—Illinois farmer.

"Excellent power and getaway in the V8 engine."—Ohio housewife.

"V8 engine gives me the jump I want to

Much of the glove box is useless because the hinges are apt to crush whatever you put in it, say owners



take off. Am not interested in speeds over 65, merely the jump."—Maryland student.
 "Feeling of security on curves at high speeds."—Illinois factory manager.
 "I get a feeling of being part of the car."—Wisconsin forester.

But They Complain

"The car leaks water. It's impossible to sit in right-front seat in even the mildest storm."—New York teacher.

"It is necessary for me to wear boots to use the car on rainy days."—Florida housewife.

"Leaks. During winter months, there were blocks of ice six inches high on each side inside the trunk."—Illinois teacher.

"Ruined \$200 worth of vitamin samples because trunk gets flooded in any rain."—Rhode Island salesman.

"Designers did a fine job on the body, but they ought to spend a little more time on building the car better. Body construction and painting carelessly done. If the car was inspected, which seems unlikely, someone is guilty of gross negligence."—Chicago janitor.

"I, myself, put in nine bolts that were missing. Dodge should have been ashamed to let my car pass inspection."—Maryland owner.

"Poor attention to interior finish. Padded dash material cut too short and has pulled away from windshield molding. Roof upholstery cut too skimpy, pulled away."—New York accountant.

"Low gas mileage. With gas prices on the increase and miles per gallon on the decrease I have been toying with the idea of buying a foreign car."—Texas engineer.

"Gas mileage very poor. I will not buy another car that doesn't get over 13 miles per gallon if I can help it."—Illinois farmer.

"The salesman sold us on the Six (we preferred the V8) because of gas economy. We have found that the Six burns nearly half again as much gas as the V8."—Texas bookkeeper.

"Rattles. Also can't stop brakes from squealing."—New York bookkeeper.

"Brake drums had to be turned at 800 miles, at 1300 miles and are still not right."—Colorado Air Force captain.

"Quite a lot of paint chipping."—California owner.

"Had a defective coil which made this six-cylinder engine hard to start."—Minnesota businessman.

More Compliments

"Window area is surprising. It seems at first almost like sitting outdoors."—Vermont electrician.

"Corners beautifully at high speeds. No

(Continued on page 228)

What Coronet Owners Say About the 6 V8

Had trouble with engine!		
No trouble	59.1%	69.1%
Some trouble	28.6%	24.7%
Considerable trouble	12.3%	6.2%
Would like faster acceleration!		
Yes, would	28.8%	18.2%
No, would not.....	58.6%	72.5%
Undecided, no answer.....	12.6%	9.3%
Would like more top speed!		
Yes, would	10.8%	8.5%
No, would not.....	54.5%	73.3%
Undecided, no answer.....	34.7%	18.2%
How is dealer service!		
Excellent	34.6%	36.4%
Average	30.8%	40.5%
Poor	34.6%	23.1%
Would buy from him again!		
Yes, would	33.2%	38.9%
No, would not.....	37.8%	26.3%
Undecided, no answer.....	29.0%	34.8%
What car will buy next time!		
Another Dodge	35.0%	46.2%
Other Chrysler product.....	14.1%	8.5%
General Motors make.....	12.0%	9.3%
Ford Motor make.....	4.7%	4.5%
Other makes	4.7%	3.2%
Don't know yet.....	29.5%	28.3%
What make was traded this time!		
Another Dodge	32.9%	27.1%
Other Chrysler make.....	21.4%	17.0%
General Motors make.....	15.4%	25.1%
Ford Motor make.....	10.2%	15.8%
Other make	8.1%	6.5%
No trade, no answer.....	12.0%	8.5%
Why did they pick Dodge!		
Exterior styling	35.7%	44.1%
Previous ownership	20.0%	11.2%
Price	4.3%	5.6%
Trade-in allowance	3.8%	4.3%
What should be changed!		
Nothing at all.....	25.2%	33.5%
Wider-opening rear door.....	13.8%	5.0%
Better body work.....	12.4%	13.7%
Improve seat design.....	1.4%	9.9%
Rear-view mirror	7.1%	5.0%
Stop body leaks.....	5.7%	5.6%
Lower floor hump.....	5.2%	5.6%
More gas economy.....	1.7%	5.6%
Best-Liked Features		
Exterior styling	34.3%	44.7%
Riding comfort	31.4%	36.0%
Handling ease	24.8%	37.9%
Roadability	16.2%	18.6%
Visibility	15.2%	13.0%
Performance, power	8.1%	26.1%
Most-Frequent Complaints		
None at all	17.6%	14.3%
Water leaks	37.6%	34.8%
Poor body assembly	21.4%	19.3%
Rattles	14.8%	13.7%
Speedometer trouble	10.5%	7.5%
Brake trouble	9.0%	11.2%
Poor gas economy	8.6%	18.6%
Do They Approve Industry Style Trends?		
Yes, approve	75.2%	87.0%
No, disapprove	11.7%	8.5%
No answer	13.1%	4.5%

An Engineer Analyzes the 1957 Dodge V8

By Dale Kelly SAE, Registered Professional Engineer

MODEL TESTED: Four-door sedan with D-500 engine, four-barrel carburetor, dual exhausts, TorqueFlite automatic transmission, power steering and power brakes.

Rear-axle ratio: 3.18 to 1. Wheelbase: 122 inches. Tires: 8.50 by 14. Weight: 4122 pounds with gas

tank half-full (56 percent of weight on front wheels, 44 percent on the rear).

Mileage on car at time of test: 650 miles. Barometer: 29.10 inches. Temperature: 68 degrees F. Pay load: 200 pounds.



ACCELERATION TIME FROM STANDING START IN SECONDS

	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Ignition timed for regular gas (90 octane Research)	2.7	7.6	12.3	22.0	18.8
Ignition timed for premium gas (97 octane Research)	2.5	7.3	11.7	21.0	18.5
Ignition timed for super fuel (105 octane Research)		7.3	11.5		



FUEL ECONOMY IN MILES PER GALLON

	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Ignition timed for regular gasoline (90 octane Research)	19.6	15.9	13.0	10.0
Ignition timed for premium gasoline (97 octane Research)	19.0	16.2	13.7	9.7

On the traffic route the car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$193 for 10,000 miles



SPEEDOMETER ERROR (Miles per hour)

Speedometer speed	20	30	40	50	60	70	80
True speed	22	31	41	50	58	68	77

ODOMETER ERROR

Distance registered for an actual 100 miles: 104.5 miles



DRIVER'S VISION (for an average driver—5 feet 9 inches tall)

Distance at which part of road in front of car could be seen (A in sketch)	19 feet
Distance at which full width of road in front of car could be seen (B in sketch)	24 feet



GROUND CLEARANCE (unloaded car)

Radius of worst dip that could be crossed (solid line)	31.5 feet
Radius of worst hump that could be crossed (dotted line)	18.5 feet
Deepest rut car could be driven in	7.4 inches
Curb clearance for door opening	13.5 inches

MISCELLANEOUS

STEERING

Wheel turns from straight ahead to steer outside front wheel in a 100-foot-diameter circle: 0.75 turn.

Diameter of smallest circle in which wheels could complete a circle (curb-to-curb): 43 feet.

Diameter of smallest walled circle within which the entire car could complete a circle: 46 feet.

Steering-wheel turns, lock-to-lock: 3.7 turns.

Steering-wheel diameter: 17 inches.

TRUNK CAPACITY

Number of standard cartons (1 cubic foot each) that could be packed into trunk: 17 cartons.

CENTER OF GRAVITY (unloaded car)

Height of center of gravity: 23.0 inches.

WATER RESISTANCE

Pair. In splash pan and high-pressure car wash, the brakes were not affected and practically no water entered the car. However, in splash pan, water got into two spark-plug wells and had to be siphoned out before the engine would run on all cylinders.

OVER-ALL DIMENSIONS

Length: 212 in. Width: 78 in. Height: 59.6 in.

OBSERVATIONS

Instruments: All gauges have needle pointers. Speedometer is unorthodox. I fail to see that it is any

better. Readability of all instruments is good and would be excellent except for chromed panel in which they are set.

Transmission: TorqueFlite is a torque converter followed by a gearbox with three speeds, one direct and two through planetary gears. The test car, accelerating wide open from a standstill in Drive, shifted from 1st to 2nd at 25 m.p.h., from 2nd to 3rd at about 60. With a light throttle, the same shifts occurred at 7 m.p.h. and 12 m.p.h., respectively. Downshifts are possible at any speed up to about 60 by flooring the accelerator.

Spare tire: The spare, located at extreme front of trunk, may be more difficult to put in and take out, but its location provides much more usable luggage room.

Vision: Good, except that the view straight back from outside rear-view mirror consists largely of the tailfin of one's own car and any view of a following car can be seriously obscured.

General: After gas gauge read "Empty," car went about 30 miles before actually running out of gas. This is about what one should expect. Power-brake vacuum reserve provided two to three full applications with engine dead. Park brake held on a 14 percent grade.



Driving the DODGE CORONET V8

By Floyd Clymer

THE CORONET four-door hardtop V8 was driven a distance of 651 miles in my test.

I found it had tremendous zip and performance. Many may rate styling as Dodge's best point, but I consider handling and roadability outstanding. I have never driven a car that performed better or handled with less effort around sharp curves and over rough back roads. Dodge's torsion-bar front suspension reduces sideways and body roll sharply. There is less "floating" or bouncing than in previous models. The shocks do a good job of controlling the ride. There is excellent rear-end stability.

Regardless of the speed at which I drove, there was minimum engine and body vibration. Even on rough roads there was but slight front-fender vibration, less than on most cars. No squeaks or rattles developed.

The four-barrel carburetor is partly responsible for this car's good acceleration. Even in 112-degree desert heat, there was no overheating.

Dodge brakes are excellent. There was very little fade. There seems to be less grab than in most brakes.

TorqueFlite is a thoroughly sturdy and dependable transmission and has been perfected to the point where I would rate it the best of all automatics.

I found it best to use premium gas and the three-speed transmission helped gasoline economy somewhat.

The driving position is comfortable although the brake pedal should be nearer the floor, in my judgment. It is too high above the throttle. Instruments are well-located, directly in front of the driver, and there is no vision obstruction. I like Dodge's needle indicators better than the flashing lights that are common today. The electric wipers have variable speeds.

The speedometer has no needle indicator. Speed is indicated by an unusual red band that is not a ribbon, but rather a series of red columns that move upward in five-mile graduations to form a horizontal column. It is not as good as a needle or as a straight sliding ribbon.

The hand brake operates independently of the wheel brakes in the Chrysler Corporation tradition. It works on a drum around the drive shaft just behind the transmission.

The door to the glove compartment is wide, but the compartment itself is small.

The center rear-view mirror is mounted at the cowl front and there is considerable blockage of vision when there are three persons in the front seat. Another mirror mounted on the left side of the body just ahead of the windshield gives good rear vision, except that a car directly behind is difficult to see because of the extremely high rear-fender tip.

In most instances I found these high Dodge fender tips to be helpful when parking or backing out of driveways, but I think they are too big. They should be about two inches lower and somewhat narrower.

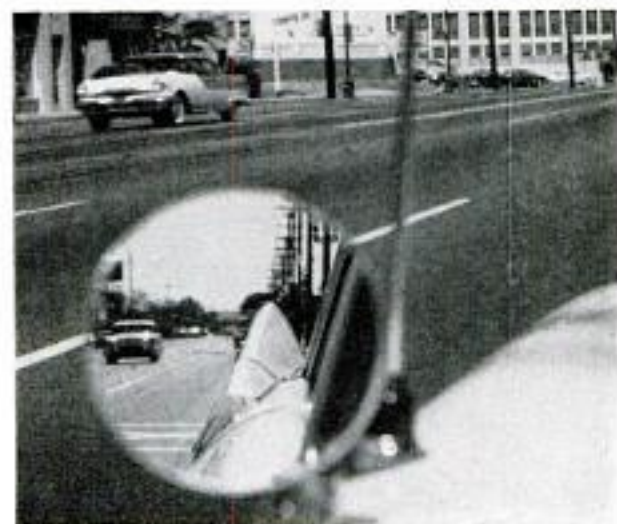
The metal cover over the steering-wheel spokes, although having a satin finish, causes too many reflections in the driver's eyes when the sun is in a certain position. I especially noticed this at midday in the hot sun of the Mojave Desert.

I don't like the outside door handles. You open the door by pulling a bar outward and upward. This is rather awkward and requires too much hand movement.

The trunk is spacious. The spare tire position is unconventional, being mounted horizontally far forward on the shelf above the rear axle.

The lock to the trunk lid should be improved. It also should be self-locking, in my opinion. I don't like the idea of having to use a key to lock the lid each time I close it.

Photograph shows how the dramatic rear fender does block view of driver through outside rear mirror





Mobile Automatic Laundry Follows Yosemite Campers

Now vacationers in California's Yosemite National Park can hike through the forests all day and toss their clothing into an automatic washer at the end of the trail. This bit of civilization for campers is provided by a semitrailer, called a Laundrecar, that follows a regular weekly route through the various campgrounds in Yosemite Valley. Inside the trailer are 10 automatic washing machines and two gas driers. Eight electric outlets for irons are mounted in the exterior wall. Ironing boards are provided by the Laundrecar. Heat for the gas driers and the wash water is provided by LP gas carried on the trailer.



Custom Sprinkler Has Plastic Pipe and Push-in Nozzles

For an area of the yard needing frequent sprinkling there's a plastic pipe now available that can be made to fit most any situation. Small self-threading nozzles are inserted in the pipe at desired locations, and an area up to four feet wide can be watered.

The length it can be made depends upon water pressure. Anchor pins hold the pipe on the ground. The nozzles produce a flat spray, designed to water the base of plants. The pipe, which can be left in place the year 'round, connects to a garden hose.

Easily inserted, push-in-type nozzles, below left, can be placed at points along plastic pipe where needed



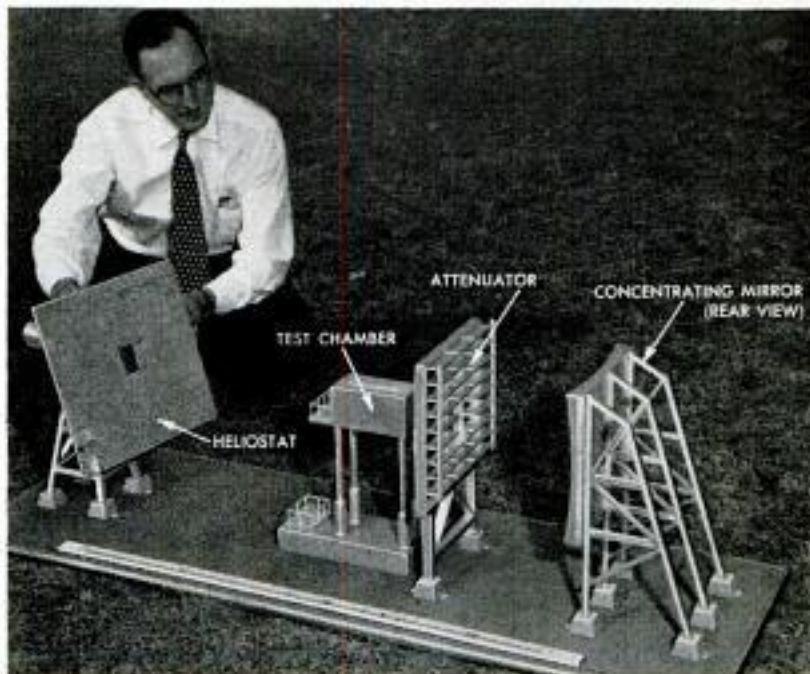
Traffic Radar Unit Monitors Pitched Balls

Radar "scouts" electronically check the exact speeds of pitched or batted balls for the Kansas City Athletics in early training. This speed meter weighs 26 pounds, is operated by a 12-volt storage battery, and is set up beside or behind the catcher. When a baseball is pitched, a beam traveling at the speed of light is transmitted from the radar set and reflected simultaneously from the moving ball back to the same antenna and a calibrated dial, which indicates the speed.



Solar Furnace to Test Atomic Heat Effects

Concentrated heat comparable to an atomic explosion will be generated by a solar furnace under construction by the U. S. Army. It will test materials for use by soldiers to protect them from the heat effects of nuclear and other weapons. The flat-mirror heliostat reflects the sun's rays to the concentrating mirror. Then they are bounced back through the attenuator, which controls their intensity, to be focused in a four-inch-diameter beam inside the test chamber. When the device is completed, it will be 125 feet long by 40 feet wide. It is being built at Natick, Mass.



Rubberized Houseboat → At German Fair

From a tent and a war-surplus rubber raft, a German exhibitor improvised a houseboat. Frames hold up the tent, which is attached to the sides of the boat. The idea was demonstrated recently at a trade fair in Leipzig, Germany.

Largest Reservoir In Asia

Reputed to be the largest man-made lake in Asia is the Hirakud Reservoir, recently completed, which covers 288 square miles of India's Mahanadi River valley. The project will furnish irrigation water and electric power. The dam, at Orissa, is three miles long and is flanked by 13 miles of dikes.

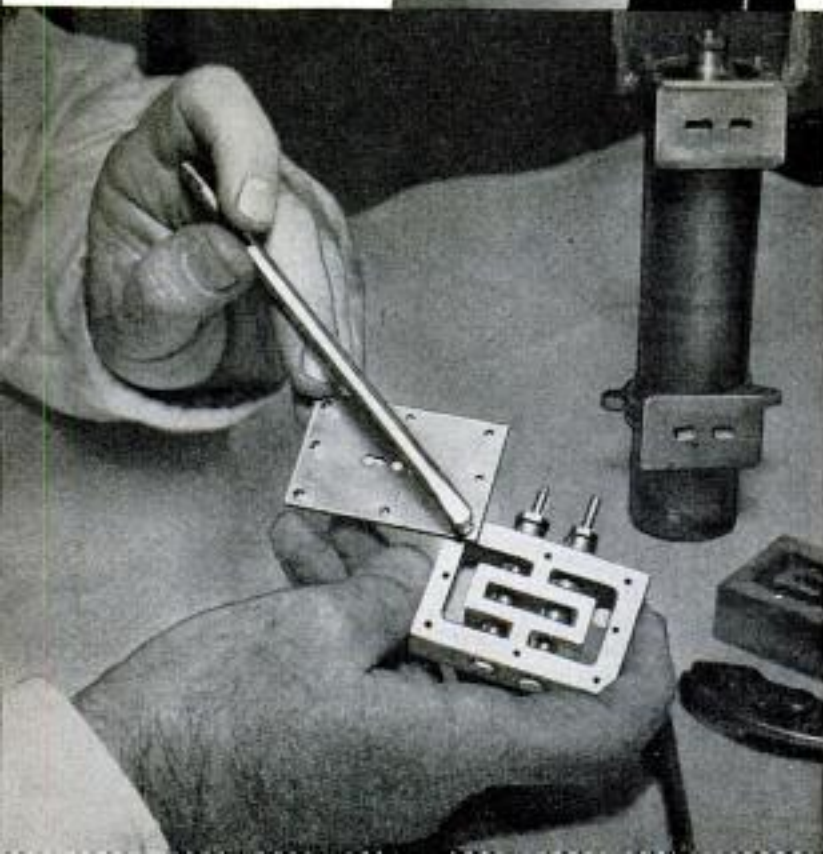


After the last patient has gone, this dentist uses his office as a workshop to bring the old side-wheeler Sausalito back to life . . . as a model



Top, soap solution is painted around wax figure before completion of plaster die. Wax, melted out, then is replaced with dental plastic

Center above, Dr. Thomas I. J. Snead swaps places with his patients after hours to work on parts for his model of the ferryboat *Sausalito*



Left, using a dental tool with a section of an Allen wrench welded to its handle, Doctor Snead attaches cover to valve chest for model's engine



Above, the dentist adjusts the pilot house on the 64-inch-long, 40-pound scale model of the *Sausalito*

Below, the original ferryboat *Sausalito*, shown here in an old photo, was built in 1896 to carry 3000 passengers



A Dentist Builds a Ferryboat

By George S. Wells

Photos by Ken Molino

A FAIRFAX, CALIF., DENTIST has built an exact scale model of a famous old San Francisco Bay ferryboat almost entirely with the materials and tools of his profession.

Such a model ordinarily would go under glass. But Dr. Thomas I. J. Snead has powered this vessel with a handmade scale model of the craft's vertical-beam engine. Using this type of power, now obsolete on America's waterways, the side-wheeler *Sausalito* can steam about on its own.

Dental Lab Is Workshop

Doctor Snead spent more than four years on his project to bring back to life the romantic ferryboat he rode as a boy. Except for the hull, turned out in his shop at home, the model is the product of his dental laboratory where he worked at night after the last of his patients had gone.

With no blueprints available, he had to settle for a set of specifications, which he found to be incomplete and partially inaccurate. A combination of trigonometric calculations, scale projection and tracing of

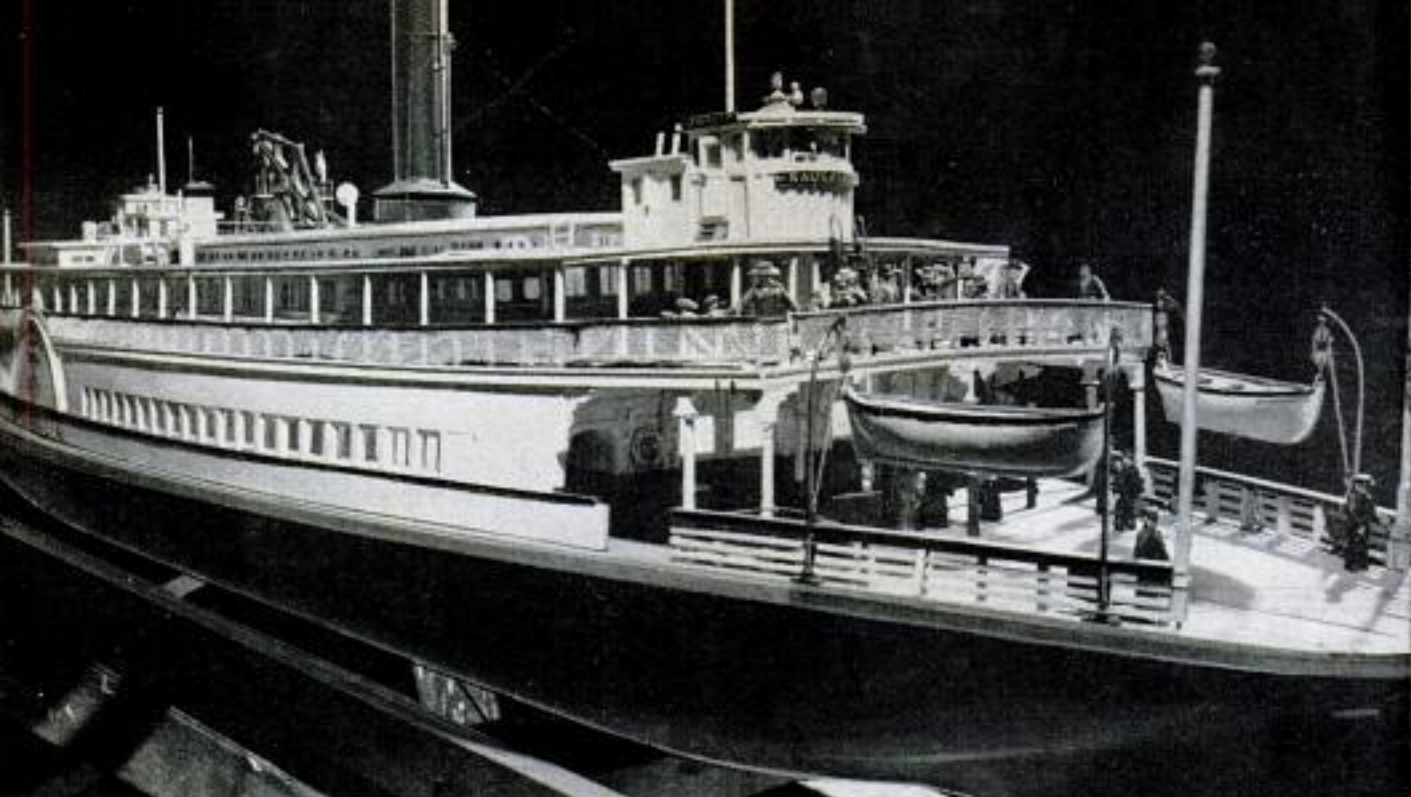
photographs helped him work out missing details.

Duplicating the archaic engine was a problem until Doctor Snead ran across a diagram of it in an 1878 encyclopedia. Following the diagrams and his list of specifications, he formed engine parts in dental wax with dental tools and then cast the parts in brass.

Tiny windows, deck posts, railings and other fittings also were carved first in dental wax. Dies were made of a fireproof material that normally is used to make crowns and bridges; brass counter dies then were cast. Most fittings finally were cast in acrylic, a clear plastic used to make palates, and painted or colored.

Dental Drill Becomes "Lathe"

Doctor Snead carved his engine parts, such as cylinder heads, valve chests and valves, in wax or turned them by handling his dental drill as a makeshift lathe. Final casts were made in the centrifugal-casting machine that usually serves in making crowns and partial dentures. The only



Close-up of model shows some of careful detail including copper mesh installed below upper-deck railings

engine part not made from scratch in his lab is the boiler which he "located through ads in *Popular Mechanics*."

Small figures stand on the decks. Like the ferryboat, these are scaled $\frac{1}{4}$ inch to the foot. Each individual is an authentic copy of a real person appearing in photographs of the ferry taken during its days of operation from 1896 to 1931.

The original *Sausalito* had a length of 256 feet; beam of 68 feet 3 inches; and a

hull 15 feet deep and 34 feet wide. It floated 7 feet 6 inches deep in the water. Doctor Snead's 64-inch-long model weighs 40 pounds, including the 15-pound engine. Draft, horsepower and action in the water duplicate scalewise those of the original ferryboat. Only variation in the engine model is the addition of lead weights to the flywheels to prevent duplication of the old *Sausalito's* penchant for "hanging on dead center." ★ ★ ★

Lifelike scale figures ride the model. Man on upper deck reads newspaper with World War I headlines





Locomotives Wrapped in Cocoons Stand by for Emergency

When emergency strikes, 100 locomotives at the U.S. Army depot, Ogden, Utah, literally will be removed from cocoons for action. At a cost of \$2200 per engine, whose average value is \$90,000, cocoons cover

locomotives ranging from 45 to 131 tons. Cocooning consists of a layer of burlaplike cloth wound around the engine, three coats of plastic sprayed on, a coating of tar and an outside film of aluminum paint.

Lightweight Helicopter Operates From Truck

Four men can lift and carry the 1800-pound British Fairey Ultra Light helicopter. This whirlybird can fly 105 miles per hour and will cruise at 85 miles per hour. The copter can be carried complete with pilot, fuel, spare parts and provisions, on a standard British Army three-ton truck, which also serves as the landing and take-off deck for this aircraft.



World's Longest Military Truck Totes 40-Ton Tanks

Two 560-horsepower air-cooled gasoline engines power the U.S. Army's experimental tank transporter, believed to be the world's largest military highway vehicle. Four drivers, two front and two back, use

a telephone to coordinate movement of the 90-foot truck. The big truck can carry a 40-ton tank on the transporter but it can haul emergency loads up to 60 tons. With side platforms, it's 11 feet 6 inches wide.



Magic

By Edward Janicki



Recil Bordner, partner of Percy Abbott in their magic business, enters the plant through a decorated wall

Family act finds Percy Abbott pushing a sword through a box, as Mrs. Abbott, daughter Linda, and son Jules assist in trick





An Abbott customer performs the suspension trick at one of the firm's annual "Magical Get-Togethers"

SOME OF THE WEIRDEST THINGS this side of darkest Africa happen in Colon, Mich. Once, you could have seen a human body "crucified." At another time a person was "burned alive."

Colon residents have stoically learned to take such things in stride. These citizens are well aware that Percy Abbott or a colleague may be behind these doings.

Abbott runs one of the world's most unusual businesses—a magic factory, devoted to making the apparatus with which a magician works. The "crucifixion" and "burning alive" dramas are among hundreds of magical acts performed at Abbott's annual "Magical Get-Together." This event brings wizards from various parts of the world to swap tales, get new magic tricks, and bewilder each other and the public.

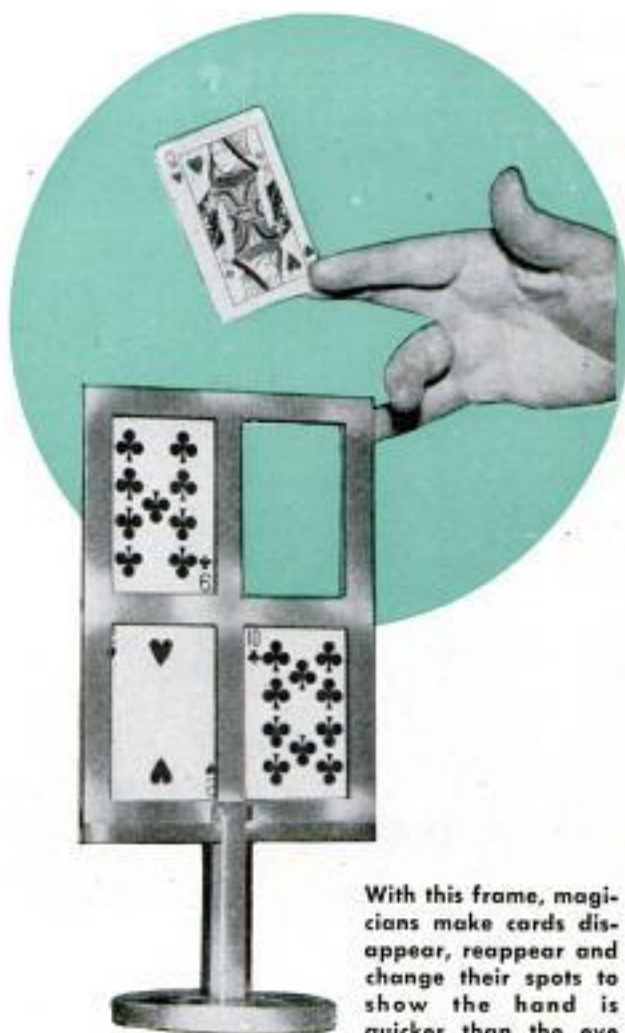
Regarding the crucifixion trick, all Abbott will admit is that the act depends on the little-understood Yogi philosophy as presented by a Peruvian Inca. A celebrated conjurer, Marvelo the Magician offered the burning-alive spectacle.

While Abbott's firm is operated primarily for the amateur magician, many professionals use his devices. His catalogue lists more than 3000 tricks and illusions, ranging in price from a few cents to custom-built equipment costing more than \$1000.

The factory is not operated on an assembly-line basis but aims at fine craftsmanship. In fact, on some occasions one item has been made for the sole use of a single professional magician. Abbott estimates that he has turned out between 150 and 200 original effects per year in the past 25 years.

Son of a magician, Abbott was born 70 years ago in Australia. After mastering

magical skills from his father, he one day became a professional sorcerer himself. As such, he pulled rabbits out of everything from a Bowery bowler to an Egyptian fez. He visited India, China and other countries, picking up new knowledge of magic.

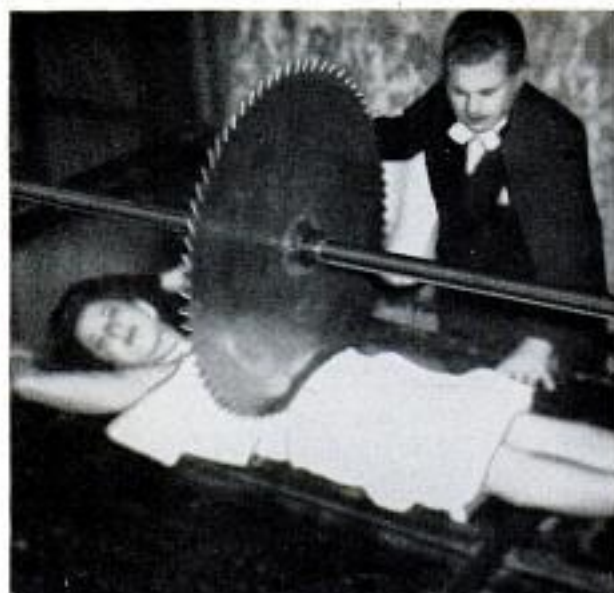


With this frame, magicians make cards disappear, reappear and change their spots to show the hand is quicker than the eye



Abbott's son, Jules, allows himself to be chained, then walks away. "It's muscular control," he says

Below are Abbott stock-in-trade items: disappearing golf balls, lemons, oranges and handkerchiefs



Carefully guided by a magician, this circular saw "cuts" through the body of a beautiful assistant

How did he get into the business of making magic tricks? "Show business was all I had ever known," he recalls, "and I did not want to travel and raise a child with my American wife." One night he was looking over an accumulation of bits of string, rope, playing cards, thimbles, safety pins and other gear well known to magicians. Suddenly, he had an idea for a new trick based on a new principle in magic. Hurriedly, he built "the thing."

Abbott called in his wife, who was preparing their meal, and said "Will you look at a trick, honey? We're going to start a magic business by making tricks, and this is the first one." The device consisted of the instant disappearance of a glass of liquid. Abbott called the ruse "Squash" after an Australian drink of the same name. And his business was born.

Magical Get-Togethers attract professionals and many eager amateurs, including doctors, lawyers, artists, professors and newspapermen, Abbott says.

He recalled the time when "several of our charming rogues" framed a brash young novice who had done too much bragging about his magical abilities. The conspirators allowed him to put another person (wise to the scheme) into a deep "sleep." However, when it came time for the unsuspecting novice to arouse his victim, the sleeper didn't respond.

Horrified, the young magician called on his colleagues to help him awaken the man from his trance. None would oblige. One onlooker suggested that the novice call an ambulance and rush the victim to the hospital "since the stunt could be fatal." This scared the performer so effectively that, on the pretext of dashing madly away for an ambulance, he left town. ★ ★ ★

World Spanner And Helmet Radio

In the picture at right, according to the Army, are the world's mightiest long-range radio transmitter and the world's smallest field radio. Both were developed by the U. S. Army Signal Corps Laboratories. The transmitter can beam vital messages to any spot on earth. Its effective power is 24 million watts. The miniature helmet radio hardly covers a hand.



Vendors on Trains Use Chef's Carts

Passenger-train attendants who walk the aisles with a basket of sandwiches and a pot of coffee are giving way to men pushing stainless-steel and plastic chef's carts. A tinkling bell signals the approach of a cart, fitted with vacuum-insulated containers to keep the coffee hot and the soft drinks cold. The Pennsylvania Railroad has acquired the carts for use on its New York-Philadelphia-Washington trains.



TWA's "Flying Maintenance Base" Uses Jet-Assist Power

First commercial application of jet-assist power reportedly has been made by Trans-World Airlines at Orly Field, Paris, France. A 1000-pound-thrust Fairchild J-44 jet engine has been installed atop the fuselage

for added takeoff, climb and in-flight power. This TWA jet and propeller-powered Fairchild C-82 serves as a "flying maintenance base" carrying spare parts, engines, commissary and other equipment.



Tomorrow's Outboard— What Shape Will It Be?

Outboard-motor designers have been experimenting with all kinds of shapes—flat fours and sixes, radials, Vs, even jets. Here's a quick look at some of their concoctions.

MANUFACTURERS OF outboard motors, contrary to their counterparts in the auto industry, settled years ago on a basic type of engine—the in-line. Without doubt there are significant differences between the makes of motors. But over the years the in-line generally has been favored, whether it was a two, four or—in the case of this year's Mercury Mark 75—a six-cylinder job. With one or two exceptions over the years, cylinders have simply

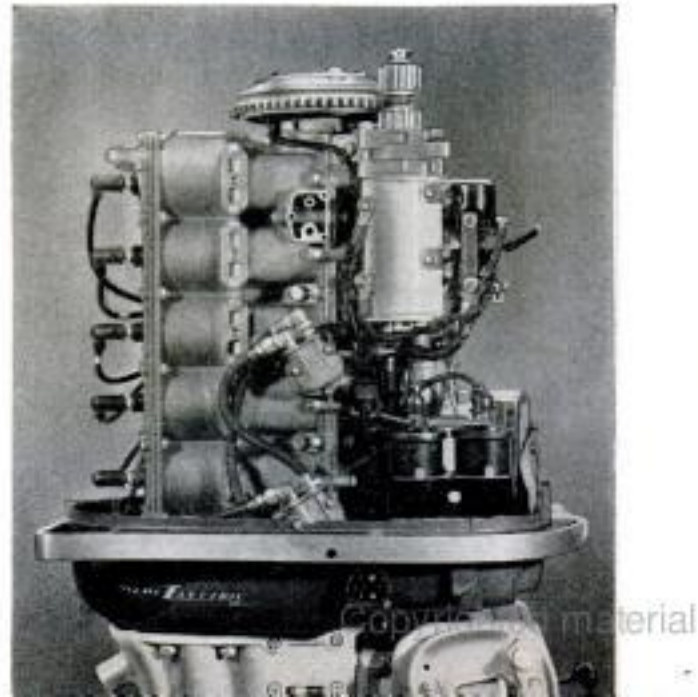
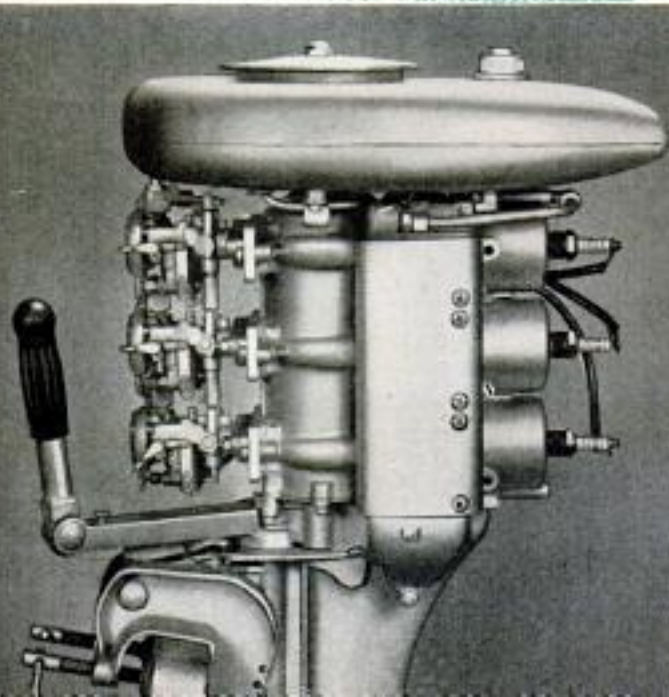
been stacked directly on top of each other.

But designers haven't been resting on the past. Through the years, engineers of the Kiekhaefer Corporation have built a good many test motors of unusual types. They've even tried jets, though they feel a true jet is too dangerous for outboard use. On these pages are a few of their experimental motors. But nothing stands still. It's a sure bet that in the near future some firm will turn to one of the types below. ★ ★ ★

In-line Motors

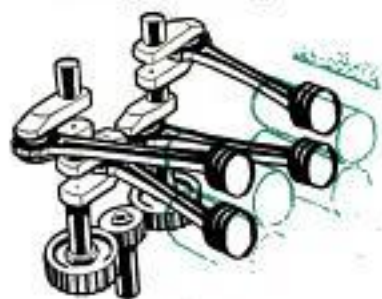


These are the current stand-bys. The diagram shows how cylinders, fired in sequence, rotate crankshaft. As more cylinders are added, the motor becomes smoother because there are more firing impulses per revolution. Until recently, most manufacturers stayed with alternate-firing twins, increasing the bore size for greater horsepower. Mercury, however, expanded upward into the four, and last year into the six-cylinder engine shown below right. The experimental motor below left is a three-cylinder job. Tests showed it would require three carburetors or a complicated manifolding system. Alternate-firing in-line engines are the most compact in width for the horsepower, are smooth-running, idle well and are economical to build. However, they become higher in silhouette as cylinders are added

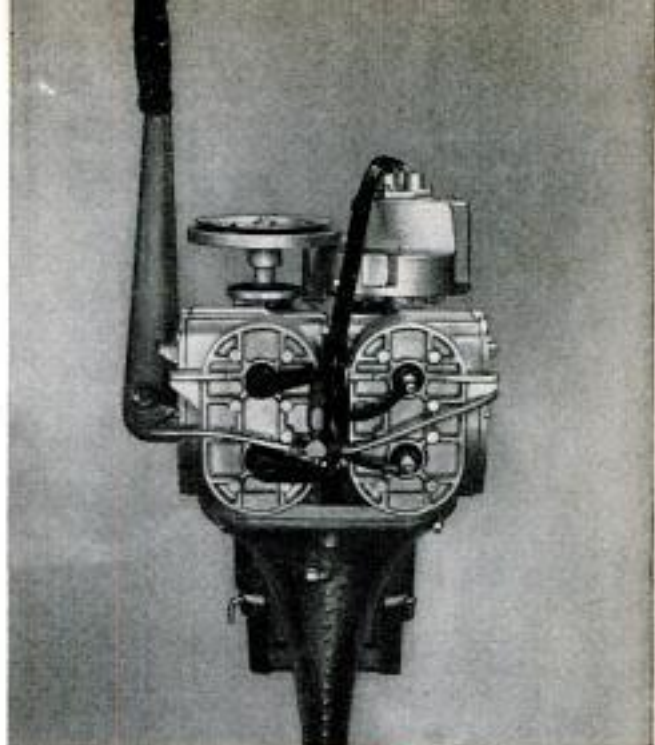


"Flat" or "Square" Motors

A "square" motor is, in effect, two in-line motors geared together to turn a common driveshaft. The photo shows an experimental flat or square four, which actually was made by welding together a pair of two-cylinder in-line engine blocks. Each pair of cylinders turns its own crankshaft, and the two shafts are geared to turn the driveshaft. The resulting engine is extremely compact, and basically is inexpensive to manufacture because the blocks and many of the parts are common to existing in-line engines. However, the one additional part

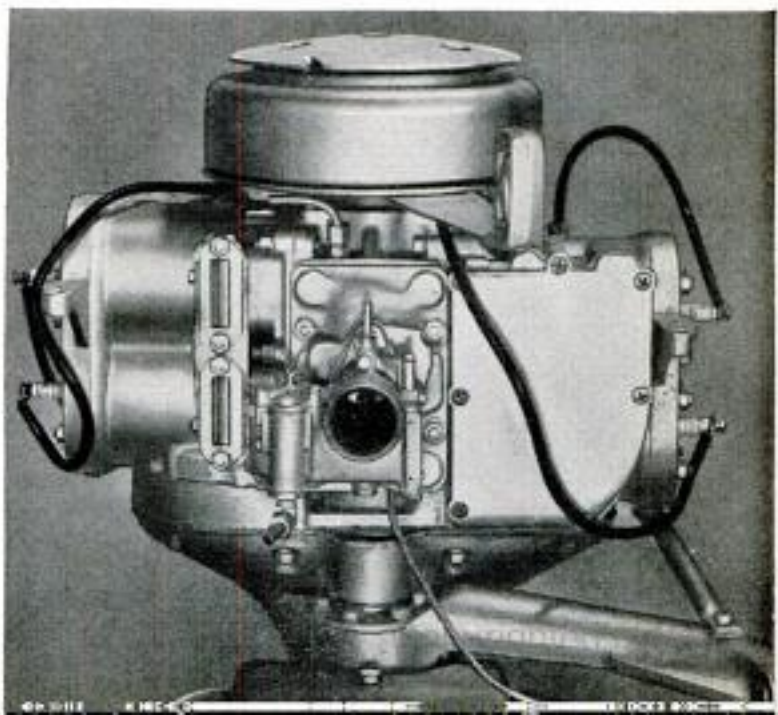
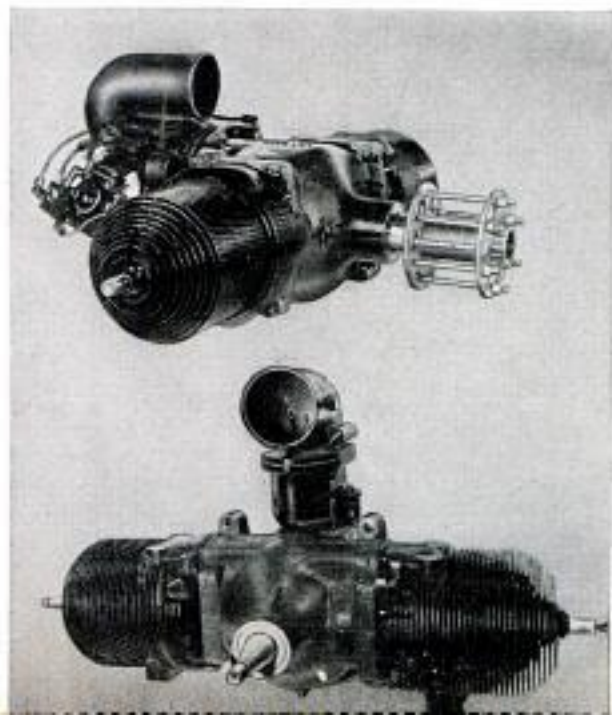


necessary is a gearing system, and this is the major disadvantage of the flat or square-type motor. The required gearing tends to be both noisy and expensive. For this reason the square type probably will never see service as an outboard motor



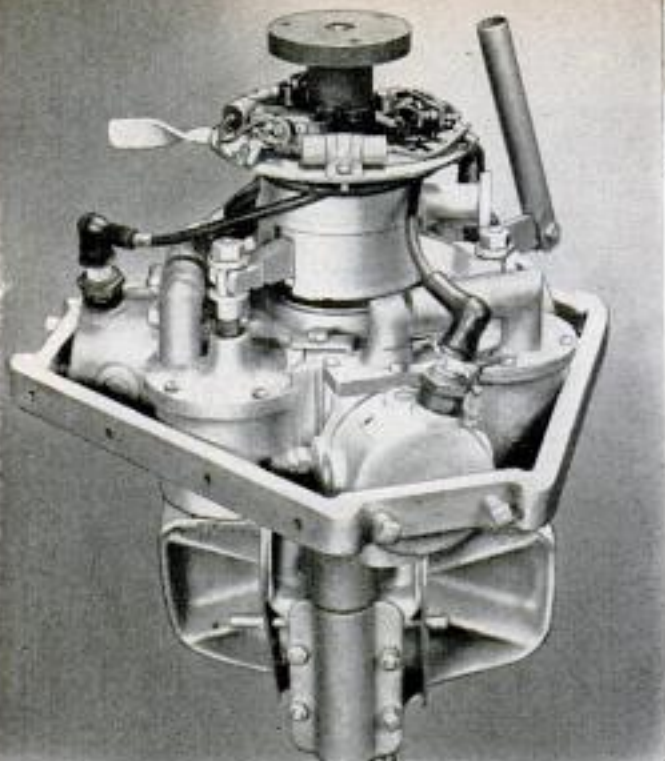
Opposed Motors

These motors, sometimes called split singles, have pairs of cylinders operating in opposition from throws of a crankshaft that are 180 degrees apart. This makes a highly efficient, perfectly balanced motor with a short crankshaft, relatively inexpensive to manufacture. It has obvious advantages for some portable power requirements. Below left are shown small two-cylinder opposed motors which were built to power aircraft-target planes but which could easily be adapted to outboard use. Below (right) is an experimental opposed four, showing cylinders obviously mounted in pairs in staggered relation to each other. The biggest disadvantage of an opposed twin is the need for a larger flywheel, which in turn causes more shake. An opposed four is difficult—and besides can be dangerous—to crank



Radial Motors

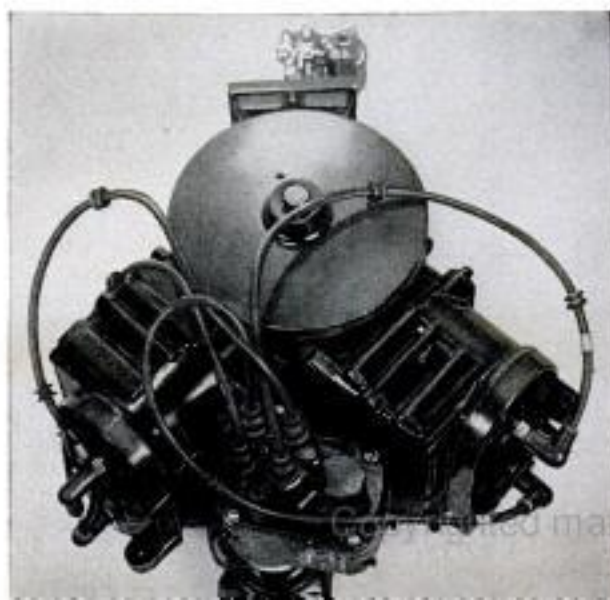
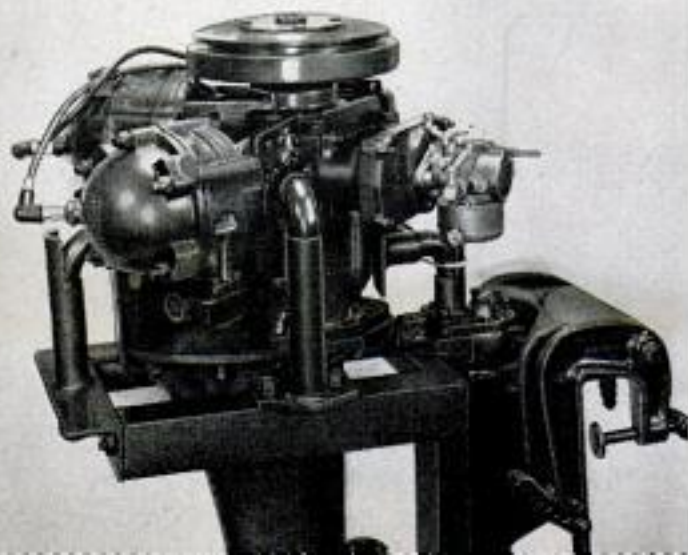
This type of motor is the old stand-by of the aircraft industry. Regardless of the number of cylinders, they all operate off the same throw of the crankshaft, as illustrated in the diagram of the three-cylinder radial below. At left is an experimental three-cylinder radial. In view of its efficiency as an aircraft engine, why wouldn't such a motor be ideal for outboard use? Mainly because absence of the usual pumping action in the cylinders makes costly superchargers necessary. The cost of an efficient supercharger can run as high as the cost of the rest of the motor. This would make a radial outboard motor too expensive



V-Type Motors



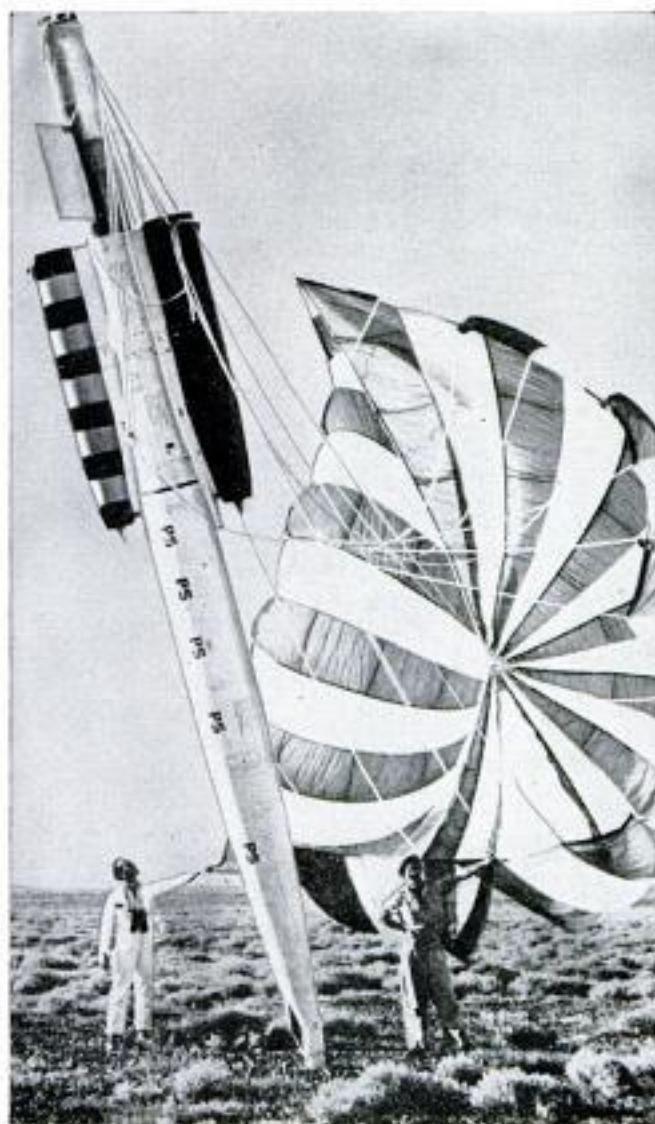
Most popular of the automobile engines today is the V-type. Why not an outboard V? A possible arrangement for such a motor is diagrammed at left. The photos below show an experimental V2 and an experimental V4. A V-design permits a shorter crankshaft, which has two advantages. A short crankshaft does not tend to "wind up" under stress, as a longer one may do. And the shorter shaft, in the case of an outboard motor, permits a lower silhouette. However, when the cylinders are spread into a vee, the resulting motor becomes wider. Thus a V-type outboard, when one is produced, will be both lower and wider than an in-line engine of comparable horsepower. Because of the rigidity of the short crankshaft and the popularity of V-type auto motors, the vee seems the most likely candidate for a new type of outboard, a type that might make its bow any time





Parachute Lands British Rocket

TAKING OFF at the Woomera Rocket Range in South Australia, above, is the new British ramjet-powered Bobbin. The Bobbin was designed to be recoverable for examination after firing by providing a parachute that opens near the end of the flight. The parachute slows the rate of descent, thus minimizing damage to the missile when it lands on its spiked nose. The test missile is powered by Thor Motors and is produced by Bristol Aircraft Ltd. and Bristol Aero-Engine.



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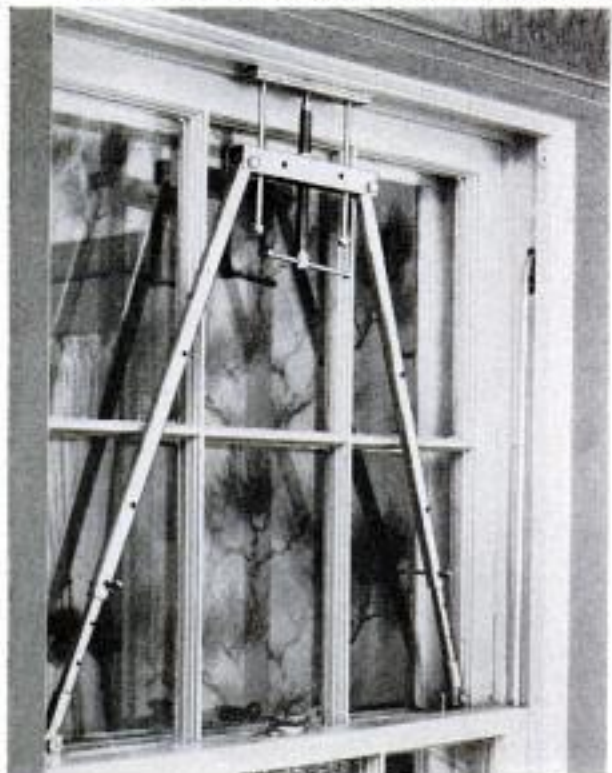
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WHAT'S NEW FOR Your Home



WINDOW JACK applies uniform pressure to open most any type of stuck window. Tension legs are adjustable from 21 to 40 inches and larger windows can be opened with the use of a block. The manufacturer reports the all-metal jack does not damage sash because it allows windows to open gradually

Nestar Products Co., 6509 Hough Ave., Cleveland 3, Ohio



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WORLD GLOBE turns in all directions for viewing of any area topside. Like a gyroscope, the globe is mounted in a metal ring completely encircling it and this is attached to a half ring. Turning the full ring determines which half of the world is on top, and the globe spins in the usual way

Replote Globes, Inc., 1901 N. Narragansett Ave., Chicago 39

KITCHEN-CABINET doors and drawer fronts can be easily and quickly changed to provide a new decor or to match and contrast with other color schemes. Of nonwarping wood and available in six colors, no tools are needed to change either the doors or drawer fronts since they slide on and off steel frames

Whirlpool-Seeger Corp., St. Joseph, Mich.

SUGAR DISPENSER will release any amount desired by pressing a button. Imported from Holland, it will hold 90 teaspoons of sugar, is made of spun metal, weighs 2¾ ounces, is insect, moisture and spill-proof, and its mechanism is guaranteed for one year. The dispenser is available for \$2 postpaid

Freeman Enterprises, 109 Church St., Laconia, N. H.



POPULAR MECHANICS

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LIGHT SWITCH, above, permits "tuned in" illumination. Turning dial adjusts incandescent bulbs to four levels of lighting. The switch is mounted on a transparent panel, under which can be placed inserts to harmonize or blend with the wall colors

Minneapolis-Honeywell Regulator Co.,
2753 Fourth Ave. S., Minneapolis 8, Minn.



INDOOR BARBECUE is built into a kitchen cabinet and gives meat a smoky flavor without using charcoal. It cooks with a bed of ceramic "coals" heated by a 4000-watt 220-volt electric element, and is fitted with a hardwood top when not in use

Stanthony Corp., 5341 San Fernando Rd., W.,
Los Angeles, Calif.

NEEDLE THREADER is so accurate that it can insert four threads simultaneously through a needle eye small enough to require a dozen tries by human hand. Thread is looped over the hook and when plunger is pulled back needle is threaded

Wink Needle Threader Co.,
P.O. Box 252, Cos Cob, Conn.



PICNIC TABLE is six-sided and features a Lazy Susan in the center. Able to accommodate up to 12 people, it is built of white pine, supported by 1½-inch steel tubing, occupies an area less than eight feet square and weighs 168 pounds

Midwest Metal Stamping Co., Kellogg, Iowa





Beach Pipeline To Aid Marines

Movement of heavy fuel drums across assault beaches by Marines has been replaced by a pipeline with collapsible tanks and small pumps. Buoyant fuel lines extend from supply ship to bulk-fuel unloading stations ashore.

Frostbite Remedy From Citrus Fruits

Hesperidin, found in citrus fruits, has the ability to reduce significantly the amount of gangrene resulting from frostbite in animals. Biologists will attempt to duplicate these experiments on humans, according to Dr. J. Morton Beiler of the National Drug Company, Philadelphia, Pa.

Plastic Capsules Hold Hooks

Snagproof, unbreakable hook holders will remove one blight from an angler's life. The hollow plastic balls snap open to receive a hook and when closed, prevent snagging of clothing. Hooks, ranging in sizes from 6 through 16, fit the holders. These colored spheres also can be used to code favorite hooks or leaders.



Golf Meter Measures Drive

Australian golfers can measure distance and direction of each drive on a device that permits them to hit the golf ball only three feet. When they drive, the ball pulls on a nylon cord and spring attached to a meter. This measures the distance of the drive up to 300 yards. If the ball is hit off center, the meter swivels to record the direction.





A Build-Your-Own Variable-Reluctance Pickup for Hi-Fi Experimenters

By John E. Turner

THERE ARE comparatively few components in a high-fidelity music system that an individual can build from "scratch." Equipment manufacturers tend to lull the audiophile into a sense of do-it-yourself with a vast array of kits for the home builder. But, in most cases, these kits are so well engineered that one requires only a set of screwdrivers, a pair of pliers and just a little mechanical ability to complete such a project. To start with the basic materials, do one's own layout, cutting and drilling, and finally to complete the assembly and adjustments of the finished product is far more challenging.

The variable-reluctance pickup described in this article is the result of several months' effort to develop a unit which can be constructed by the home experimenter, and whose performance characteristics will compare favorably with those of better quality commercial pickups. It is built, for the most part, with materials which are easily obtainable, and it can be fabricated in its entirety with only a few basic hand tools.

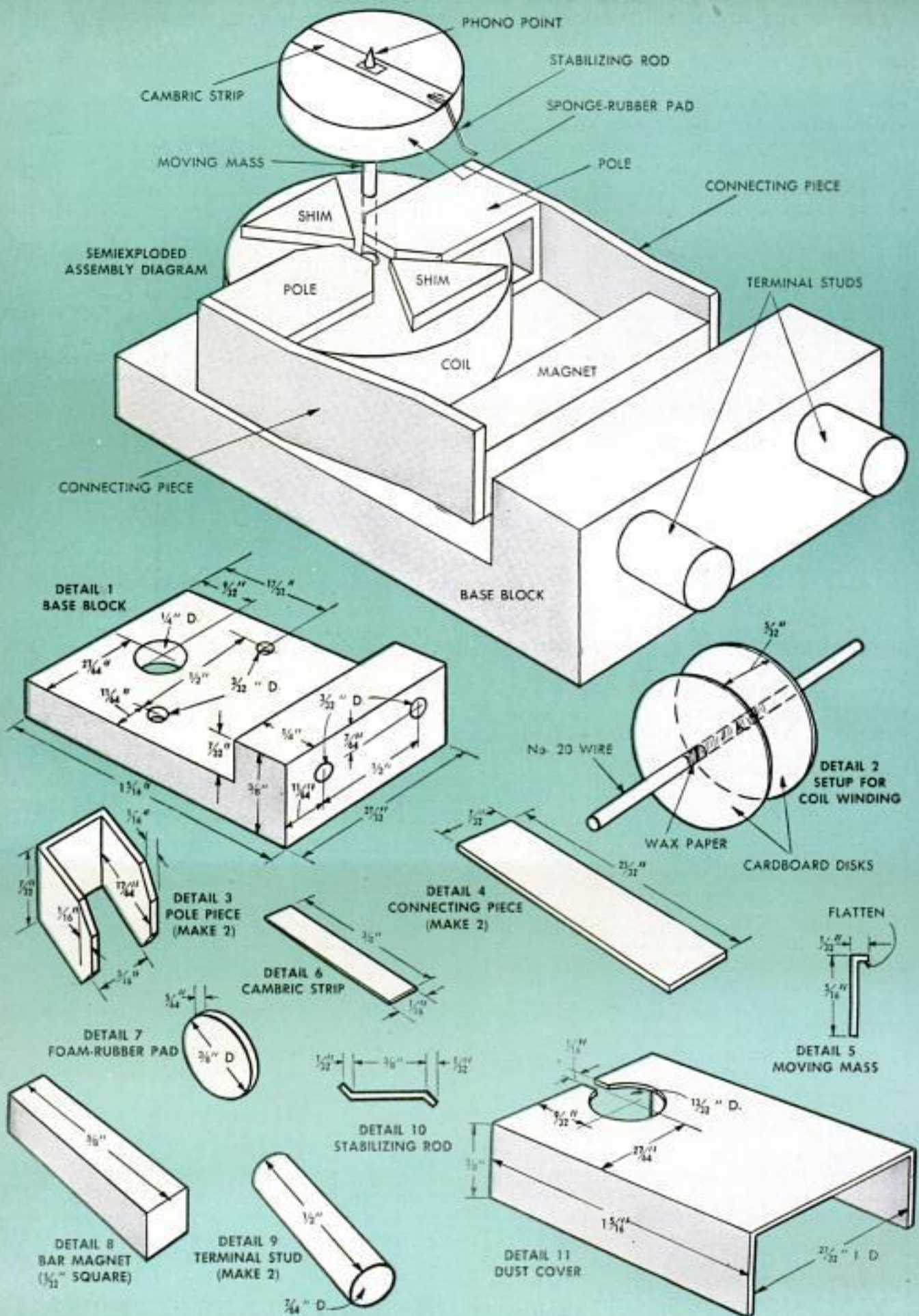
To obtain satisfactory results it is imperative that the hobbyist follow the dia-

grams with reasonable care. In particular, the dimensions of the moving mass and the cambric strip, the diameter of the foam-rubber pad and of the coil center hole, and the quality of the dampening jelly are rather critical. On the other hand, the resistance of the coil, the size of the bar magnet, the thickness and width of the pole pieces, and the thickness of the foam-rubber pad can vary somewhat from the specifications without causing any serious difficulty.

Although this is definitely not a project for a rank beginner, the more experienced hobbyist should have little difficulty in duplicating the original model and obtaining satisfactory performance. Construction is facilitated by following the sequence of steps given below.

Preparation of Materials

STEP 1. BASE BLOCK. Prepare a balsa-wood block in accordance with the dimensions given in the drawing of detail 1. The two $\frac{3}{32}$ -in. holes (just to the right of the $\frac{1}{4}$ -in. hole) will eventually be used for fastening the pickup to the tone-arm head. If the standard spacing indicated in the drawing does not match tapped mounting



holes in the head with which the pick-up will be used, appropriate changes should be made at the time the block is laid out for drilling.

STEP 2. COIL. Coil winding is simplified by the setup illustrated in detail 2. Use a length of No. 20 wire, or a $\frac{3}{16}$ -in. drill, as a mandrel. First, wrap a strip of wax paper, about $\frac{1}{16}$ in. wide, around the mandrel, not more than two layers thick, and secure it in place with a dab of airplane cement at the outer edges. Next, cut out two $1\frac{1}{2}$ -in.-dia. disks from a file folder or similar cardboard material, and pierce the centers of the disks with a heavy sewing needle to such a diameter that they will fit snugly over that portion of the mandrel which is covered with the wax paper. After the disks are oriented perpendicularly to the mandrel, and properly spaced, apply a small amount of airplane cement to the outside junctions of the disks and the wax paper so that the disks will remain in place.

After the cement is thoroughly dry, coil winding can begin. Wrap about 2 in. of No. 40 enameled wire around the left side of the mandrel and fasten it in place with a small piece of cellulose tape. This forms one lead of the coil which will be soldered later to one of the terminal studs. Actual coil winding is accomplished simply by grasping the mandrel between thumb and forefinger of each hand and rotating the assembly, in either a clockwise or counterclockwise direction, until the space between the two cardboard disks is filled flush to the outside circumference of the disks. Maintain moderate tension on the wire so that a tight coil will result.

After the winding is completed, cut the wire, leaving about 2 in. for the second lead. Tightly wrap the completed coil with cellulose tape to prevent it from unraveling and from falling apart as the coil is removed from the mandrel.

To free the coil from the mandrel, take a razor blade and carefully cut the glued joints at the junction of the cardboard disks and the wax paper. Remove the severed end of the wax paper from one side of the mandrel and slide the coil off toward the same end. The center hole of the coil

should be clean, but if any pieces of the wax paper or glue have become lodged in it, they should be carefully removed since they will interfere with the insertion and functioning of the moving mass.

The resistance of the completed coil will vary somewhat, depending on how tightly it was wound, but it should be in the vicinity of 380 ohms.

STEP 3. POLE PIECES (detail 3). The pole pieces are made from the laminations of a discarded radio-receiver output transformer, or similar unit. As mentioned earlier, the dimensions of these pieces may vary slightly in thickness and width, as this is of little consequence. The soft iron of the laminations is easily formed with a pair of needle-nose pliers, and it can be cut to the desired size with an ordinary pair of diagonal cutters.

STEP 4. CONNECTING PIECES (detail 4). The comments for step 3 also apply here. In addition, the connecting pieces may have to be bent slightly (see assembly diagram) if the pole-piece assembly and the magnet are not of the same width.

STEP 5. MOVING MASS (detail 5). The moving mass is made of No. 28 soft iron wire. The base should be flattened with a pair of needle-nose pliers to provide a place for the attachment of the phono point. The dimensions should not exceed those indicated in detail 5, lest the mass be increased appreciably.

STEP 6. FOAM-RUBBER PAD AND CAMBRIC STRIP. The foam-rubber pad is made from a large earring pad cut to the diameter shown in detail 7. When purchased, the earring pads are usually mounted on cambric, which can be used to prepare the $\frac{1}{16}$ in. x $\frac{3}{8}$ -in. strip shown in detail 6.

STEP 7. STABILIZING ROD (detail 10). This part is also made from No. 28 soft iron wire. Its function, in conjunction with the cambric strip just described, is to limit the front-to-rear movement of the moving mass.

STEP 8. PERMANENT MAGNET (detail 8). Of all the components used, the magnet may be the most difficult to procure. However, such parts are frequently obtainable from electronic equipment dealers and houses specializing in the merchandising of surplus goods. The magnets supplied with some small magnetic door latches are suitable.

STEP 9. TERMINAL STUDS (detail 9). These can be made from an ordinary 6d nail with the cut ends filed to remove burrs. Tinning the entire stud will improve conductivity and facilitate the eventual soldering of the coil leads to the studs.

FINAL ASSEMBLY. Press the terminal studs into the balsa block so that they

LIST OF MATERIALS

Balsa-wood block.
Bar magnet, approximately $5/8$ in. x $5/32$ in. sq.
Foam-rubber earring pad with cambric backing.
Soft-iron laminations from discarded transformer.
6d nail.
File folder or similar cardboard material.
No. 20 wire, used as coil-winding mandrel.
No. 28 soft iron wire.
No. 40 enameled copper wire.
Wax paper.
Wheel-bearing grease.
Airplane cement.
Rubber cement.
Cellulose tape.
Diamond or sapphire stylus.

protrude about $\frac{1}{16}$ in. on the coil side of the block. Apply a little airplane cement to the opposite ends of the studs at the points where they emerge from the block.

Slip the two pole pieces over the coil and push them together towards the center until the front edges of the pole pieces are just aligned with the center hole of the coil. If all dimensions have been carefully observed, the coil will just fill the pole pieces when aligned as directed.

Apply airplane cement to one face of the pole pieces and mount the coil assembly on the balsa block so that the center hole of the coil is concentric with the $\frac{1}{4}$ -in. hole in the upper part of the block. The purpose of the latter hole is to permit the ultimate alignment of the moving mass.

Apply cement to one face of the magnet and affix it to the block at a point about $\frac{1}{16}$ in. above, and perpendicular to the terminal studs.

Attach the connecting pieces between the pole pieces and the two ends of the bar magnet, bending them as necessary to insure good contact at all points. Although the magnetic flux of the magnet may appear to be strong enough to hold the connecting pieces in position, it is best to apply a little airplane cement at all four points to assure permanency of the joints.

Using rubber cement, affix the cambric strip to the foam-rubber pad.

Snip the phono point of a diamond or sapphire needle from its shank and cement the point to the flattened tang of the moving mass. (It is not always feasible to remove the phono point, alone, from its shank. Experience has shown that it is better to snip off a small portion of the shank with the point. This should be done underwater to eliminate the possibility of losing such a minute mass.)

Place the foam-rubber pad, with the cambric strip up, on a piece of balsa wood and, aligning the moving-mass assembly at a point central and perpendicular to the pad, press it all the way through the pad with a pair of needle-nose pliers. The flattened tang of the moving mass should now rest on the cambric strip and cement should be applied sparingly to this juncture.

Cut two triangular-shaped cardboard shims, the same thickness as the pole pieces, and fasten these to the coil with rubber cement in the position shown in the assembly drawing.

Fill the center hole of the coil with a good grade of wheel-bearing grease to serve as a dampening agent. (Because of the small hole diameter, a hypodermic syringe is very convenient for inserting the grease. In the absence of such apparatus, a small toothpick may be used in

order to accomplish the same purpose.)

Apply a small amount of rubber cement to the exposed surfaces of the cardboard shims and to the pole pieces throughout an area approximately equal to that of the lower surface of the rubber pad. Position the rubber pad, together with its associated moving mass, over the coil assembly and insert the shank of the moving mass in the center hole of the coil. This is the most critical part of the entire assembly since the tolerances are very small and the mass must be perfectly centered in the hole to insure distortionless performance. Alignment can be observed from the back of the balsa block through the $\frac{1}{4}$ -in. hole. A 10 or 20-power magnifying lens will be most helpful in successfully completing this part of the assembly.

Cement the stabilizing rod in position, with one end resting on the edge of the cambric strip and the other resting on the bar magnet, as shown in the photograph.

Complete the assembly by soldering the coil leads to the ends of the terminal studs. Before soldering, the enamel insulation must be removed from the ends of the coil leads. This can be easily accomplished with a small piece of steel wool. When the soldering is completed, coil continuity should be checked with an ohmmeter, if such an instrument is available.

All that remains to be done is the mounting of the pickup in its pickup head and the final test. The drawing of a suitable dust cover is given in detail 11, but it is best not to install this until after the unit is tested and you are certain that no further adjustments are required. The dust cover simply slips over the base block and is secured with a little rubber cement. (*Editor's Note:* The dust cover illustrated was for an earlier model in which the stabilizing rod was mounted on the front edge of the cambric strip. With the rod in its present position, the $\frac{1}{16}$ -in. slot shown in the cover must extend toward the rear of the $\frac{1}{32}$ -in. hole in order to clear the stabilizing rod.)

Construction Hints

Cement, wherever called for, should be applied sparingly to create a strong bond and provide a neat appearance.

The use of insufficient dampening agent (wheel-bearing grease) may result in excessive "needle talk" and subsequent distortion. For best results, the coil center hole must be filled to capacity.

This pickup was found to track satisfactorily with a stylus pressure of about 6 grams, and best undistorted output was obtained with the pickup working into a 100,000-ohm load. ★ ★ ★

8 4 82

WTM 59

The CRAFTSMAN



An Occasional Piece for Colonial Furnishings

STORAGE PLANTER

By John Bergen

USED AS A ROOM DIVIDER or merely placed against a wall, this attractive planter serves a dual purpose. Its greenery adds a charming touch to a colonial setting and its base provides a roomy storage compartment that can be put to good use in every home.

Where a low planter is preferred, the piece can be made without the trellis. You have a choice of several appropriate woods, namely, knotty pine, redwood and cypress. The material list below gives the sizes and

number of pieces needed, all of which are stock lumber, and the pull-apart drawing on the following page shows clearly how the whole affair goes together.

Since the back will show when the planter is used as a room divider, construction details will vary somewhat in adding 3/4-in. paneling all around. Also, all four corners of the base should be mitered and both front and back rails scrollsawed. Otherwise, construction remains unchanged. Start with the base. Notice in section details E

MATERIAL LIST

(KNOTTY PINE, REDWOOD OR CYPRESS)

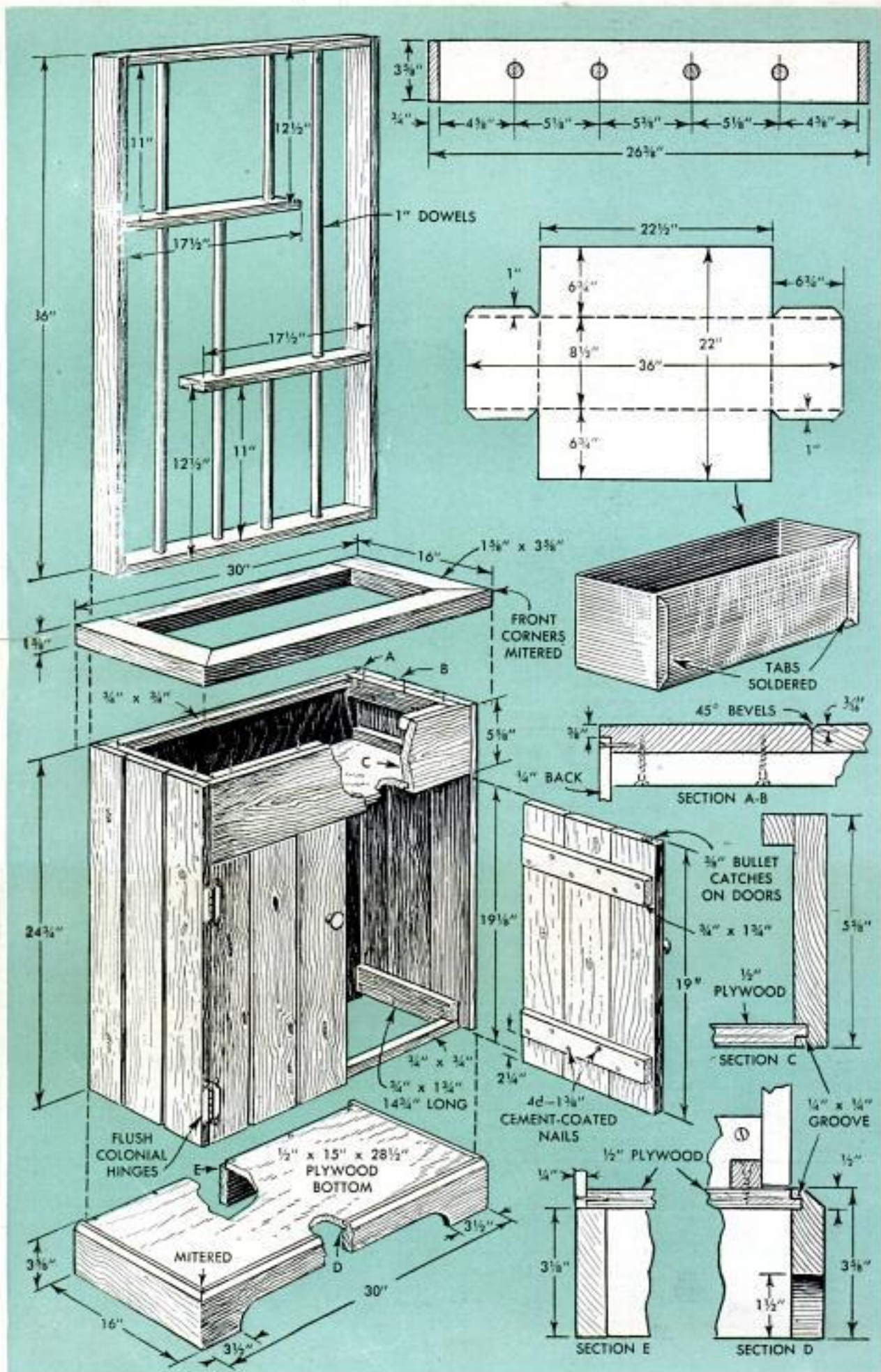
BASE

- 2 pcs.—2 x 4 x 16 in.—Rim side rails
- 1 pc.—2 x 4 x 30 in.—Rim front rail
- 1 pc.—2 x 4 x 22 3/4 in.—Rim back rail
- 6 pcs.—1 x 6 x 24 3/4 in.—Side members
- 6 pcs.—1 x 6 x 19 in.—Door members
- 1 pc.—1 x 2 x 108 in.—Cleat material
- 1 pc.—3/4 x 2 3/4 x 108 in.—Cleat material
- 1 pc.—3/4 x 3 3/4 x 28 1/2 in.—Back base
- 1 pc.—3/4 x 3 3/4 x 30 in.—Front base
- 1 pc.—3/4 x 3 3/4 x 16 in.—Side bases
- 1 pc.—1/2 x 14 x 27 in.—Shelf (fir plywood)

- 1 pc.—1/2 x 15-3/16 x 28 1/2 in.—Bottom
- 1 pc.—1/4 x 27 3/4 x 25 1/4 in.—Back (hardboard)
- 4 flush-type colonial hinges
- 2 1 1/4-in.-dia. colonial knobs
- 2 3/8-in.-dia. bullet catches with strikes
- 1 pc.—sheet metal 22 x 36 in.—Plant trough

TRELLIS

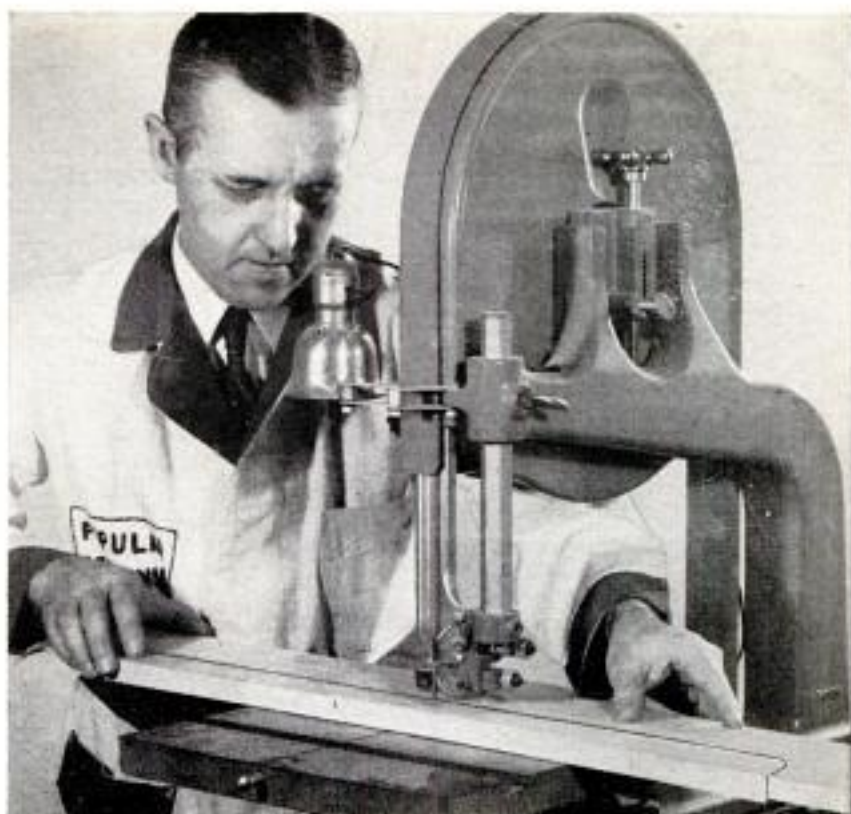
- 2 pcs.—1 x 4 x 36 in.—Ends
- 2 pcs.—1 x 4 x 24 1/2 in.—Top and bottom
- 2 pcs.—1 x 4 x 17 1/2 in.—Shelves
- 4 dowels—1-in.-dia. x 36 in. long



and D that the plywood used for the top is fitted flush with the top edges of the side rails. Three edges are rabbeted to fit grooves in the inner faces of the rails, while the back edge is left square for nailing into the 3 $\frac{1}{8}$ -in. back rail. This forms a rabbet along the rear edge to house the $\frac{1}{4}$ -in. back panel. The chamfered edge around the three sides of the base can be planed after assembly.

The pieces that make up the ends of the storage compartment are made into 15 $\frac{1}{4}$ -in. panels by screwing them to cleats placed at top and bottom. The cleats are made 1 in. shorter than the width of the built-up ends to allow for the thickness of the back and the doors. Note in section detail A-B that a rabbet is cut along the rear edge of each end panel and that a V-joint is formed between the individual boards by prechamfering the meeting edges slightly.

The trough compartment is formed by gluing and nailing the built-up ends to an L-shape assembly made up of a front board and a bottom board, joined in the manner shown in detail C. A $\frac{3}{4}$ -in.-sq. cleat at each end provides support for the bottom board. Similar cleats along the front and back at the top take the screws that anchor the rim. The latter is made as a separate frame from 2 x 4 material. If the planter is to be used as a room divider, all four corners of the rim should be mitered to look best. Otherwise, the rear corners need only be butted. Dowels or splines at the mitered joints make the best construction, but an easier way is to simply glue and nail them and later conceal the nailheads with wood putty. The rim is placed flush at the back and centered so it overhangs $\frac{3}{4}$ in. at the sides and front. Glue it in place first and then drive the screws up through the cleats in predrilled holes. A short stubby screwdriver will do best here. As a room divider it might look better to let the rim overhang all around in which case the width of the rim frame should be increased to 16 $\frac{3}{4}$ in. The doors are made up in the same manner as the ends, chamfering the edges of random pieces to produce V-joints and gluing and screwing them to cleats placed across the back. If you don't care to make the sheet-metal liner yourself, take



Toe-hole cutout in base apron is quickly cut with bandsaw. Both front and back aprons should be similarly cut when planter is room divider

the pattern given to your local tin shop. If you make it yourself, buy a sheet of 22-gauge metal and cut it just like the pattern. By clamping a board 8 $\frac{1}{2}$ in. wide and 36 in. long to the middle of the sheet metal, you can do a neat job of bending up the sides and tabs. You'll have no trouble in bending the ends inward. Notice that the tabs are on the outside.

The base is attached to the upper part of the planter by driving screws up through the plywood top and into the end cleats. Additional rigidity is gained in nailing the back panel in the rabbet at the back. A $\frac{3}{4}$ -in.-sq. cleat is fitted across the front to provide a ledge strip for the doors. If you wish, shelves can be added to the storage compartment. In doing so, cleats should be first screwed to the ends to support the shelves. They can be left loose or glued.

The trellis section is a simple affair that is made from 1 x 4 material and 1-in. dowels. To assure perfectly aligned holes in the four cross pieces for the dowel uprights, stack the pieces in their respective positions, clamp, and drill through the four members at one time. By drilling through from the bottom, you can easily make blind holes in the members the dowels do not pass through. The dowels are locked in place by cross nailing, and the butted corners of the frame are merely glued and nailed. A couple of roundheaded screws will hold the trellis to the rim of the planter, flush with the back. ★ ★ ★



Molding Strip on Garage Door Carries off Rainwater

A one-piece overhead garage door sometimes will catch and hold rainwater when left open so that the person closing it may receive an unexpected shower. To prevent this, tack a strip of picture-frame molding near the bottom edge of the door to serve as an "eaves trough."

Jar Is Weatherproof Note Holder

Notes to the milkman are kept safe from rain and wind when they are slipped into a glass jar that screws onto its own lid which is fastened to the wall near the door.



More Efficient Mousetrap

An ordinary mousetrap is made more efficient by driving a tack into the underside near one end and allowing it to project, so the trap can be hung vertically on the edge of a baseboard as indicated in the photograph.



Use the dusting brush of your vacuum cleaner to clean phonograph records as they are rotated on the turntable.

Dummy Wall Receptacle Provides "Safe" for Valuables



Few intruders would suspect a wall receptacle of being a hiding place for rings and other jewelry. The dummy receptacle consists of an outlet box installed in the wall horizontally in the usual way just above the baseboard. The receptacle is attached permanently to the cover plate by a single screw. The attachment ends of the receptacle are altered so they can be hooked over the heads of screws projecting from the box.

Glass Kept Mud-Free by Grass

You can prevent mud from splashing your windows every time it rains by simply spreading lawn clippings or peat moss over the soil in window boxes and potted plants on a window sill. The clippings or moss also help retain moisture for the plants and make excellent mulch.

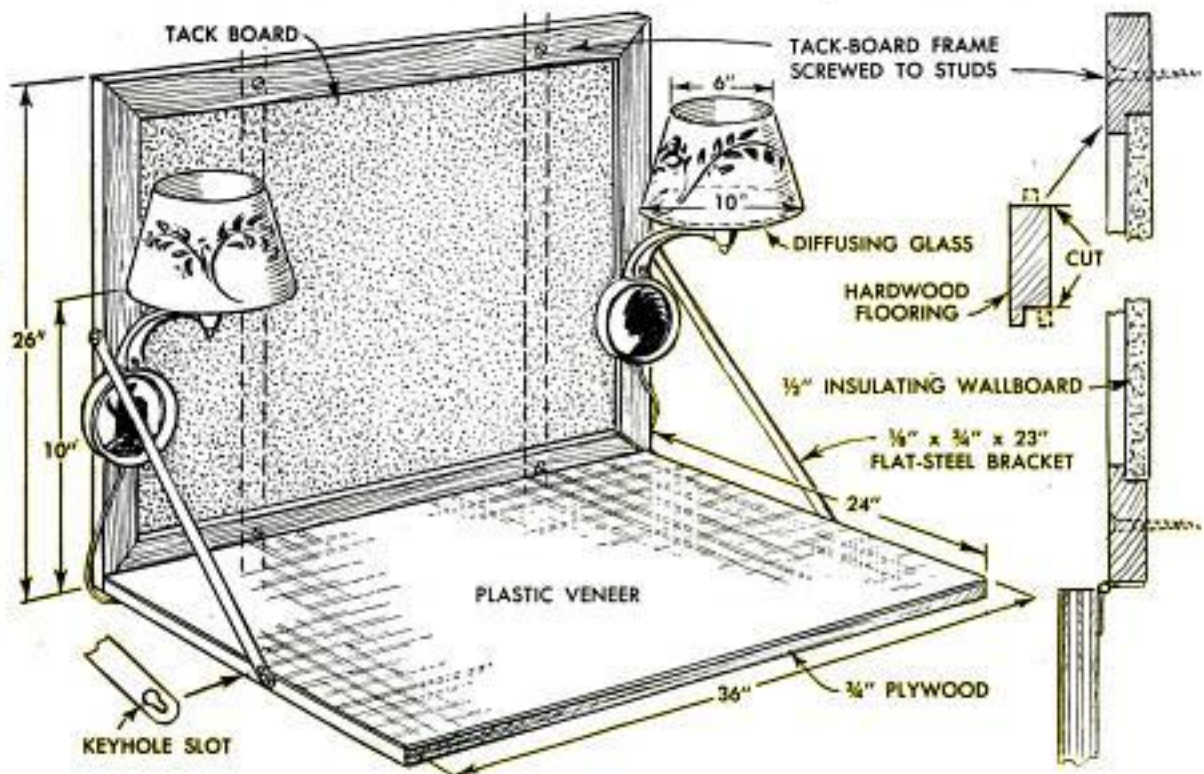


Photo courtesy General Electric Corp.

Fold-Down Desk Features Ideal Lighting for Study

Space-saving and attractive, this student's desk has a plywood top covered with easily cleaned plastic laminate. The tack board—or bulletin board—is a piece of insulating wallboard framed with lengths

of tongue-and-groove flooring from which one lip of the groove has been cut. Eyestrain is eliminated by using wall-mounted lights of the size indicated and 150-watt lamps that have built-in diffusion





Queen Anne Mirror and Wall Shelf

By C. W. Woodson

EARLY QUEEN ANNE is the period represented by the graceful design of this mirror and companion wall shelf. Mahogany-faced $\frac{1}{4}$ -in. plywood is used throughout for the shelf, and also for the jigsawed panels above and below the mirror. The frame around the mirror glass is made from ornamental picture-frame molding that you buy.

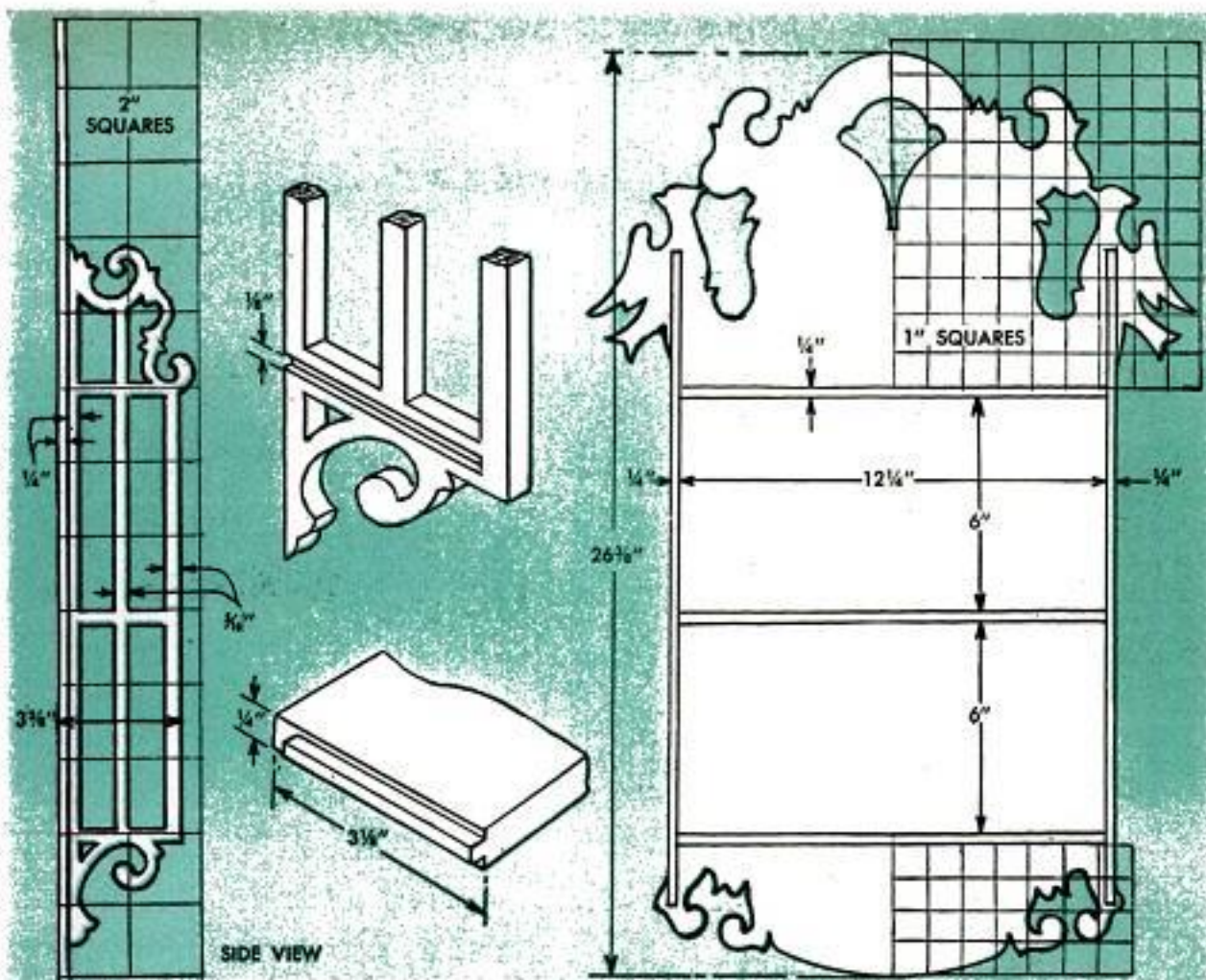
Mirror

Start construction of the mirror by making the frame, which has mitered corners. Before assembling, saw a groove in the upper and lower members to accommodate the plywood panels, as indicated in the lower left-hand detail. Next, make a pattern of the upper and lower panels by enlarging the squared drawings in the detail. Trace the patterns on the plywood and cut

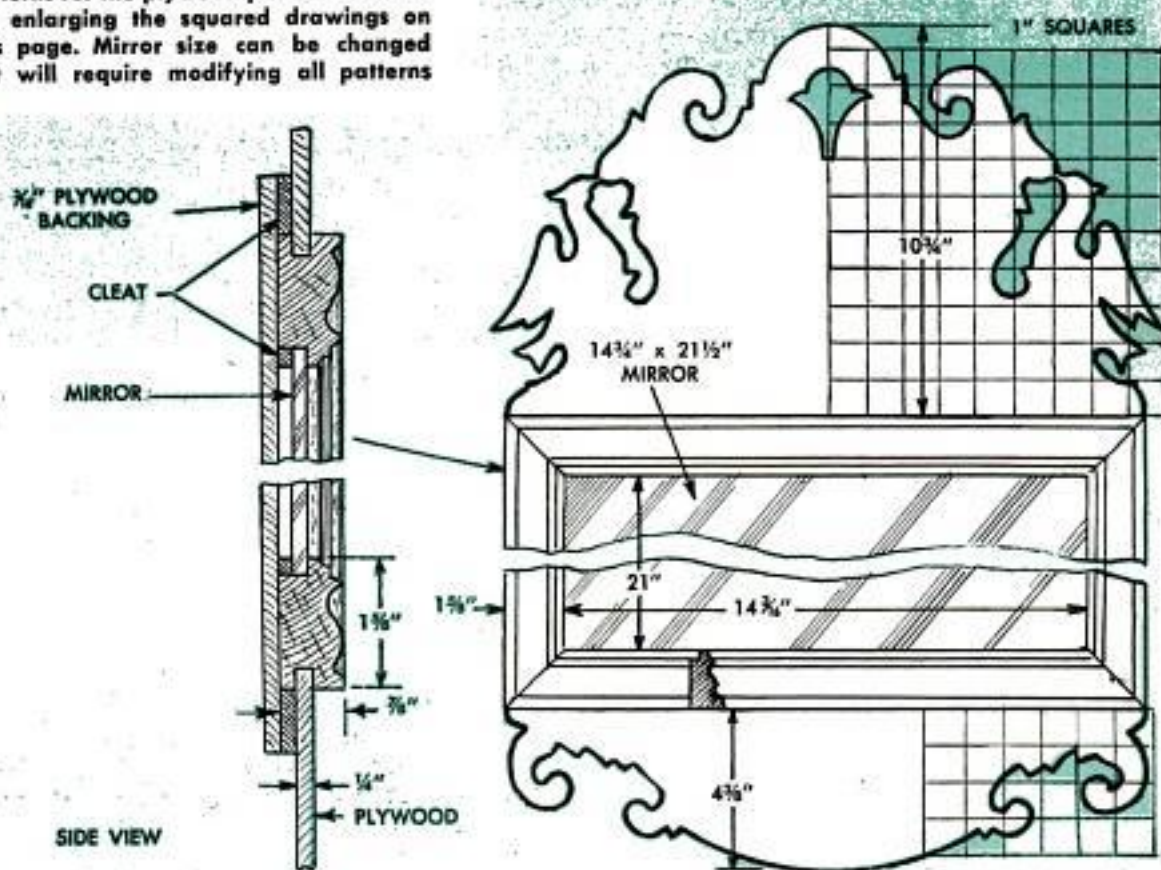
them out with a jigsaw. Sand the edges smooth and glue the panels to the mirror frame. Now, set the glass mirror in the frame and glue and nail narrow cleats to the inside edges of the frame to keep the mirror in place. Cleats also are glued to the plywood panels as indicated in the lower left-hand detail and a piece of $\frac{3}{16}$ -in. plywood is glued and nailed over the mirror back as indicated, both to protect and to stiffen the plywood panels.

Wall Shelf

Both sides of the wall shelf are jigsawed at the same time to assure that they are identical. The sides then are mortised to receive tenons cut on the shelf ends and the assembly is glued together. A pattern is made for the back, cut out, then nailed to the back edges of the sides. ★ ★ ★



Patterns for the plywood panels are made by enlarging the squared drawings on this page. Mirror size can be changed but will require modifying all patterns





Soaped Straightedge Won't Slip When Cutting Glass

It is easier to hold a straightedge in place when using it as a guide for cutting glass if soap is rubbed on the underside. When making a long score on a pane of glass, the hand holding the straightedge should be moved several times to be in a better position to control the lateral force exerted by the cutter.

Tape Keeps Glue off Wood

Before gluing wood that is to be stained, one craftsman applies strips of masking tape flush with the joining edges. The tape prevents absorption of excess glue forced out of the joint by clamping. After the tape is stripped off the stain will "take" uniformly clear to the edges.

Jar Lid Seals Spray Gun

Mason-jar lids provide a means of sealing most spray-gun cups when the contents of several are being used intermittently in touch-up work. Also, the capped cup can be cleaned by agitating thinner in it.



Bounce Flash Made Easy With Swivel Attachment

Bounce-flash pictures can be taken without removing the flash unit from the camera by screwing a tripod tilt-top head to the flash-unit bracket. When the bracket is slipped into the accessory clip on the camera, the unit is ready for use. The tilting head permits the reflector to be swiveled in any direction.

Masking Tape Strengthens Chalk

Masking tape wrapped around a stick of chalk prevents it from breaking in small pieces when writing, even under heavy pressure. Also, the tape prevents chalk particles from adhering to the fingers and is easily peeled from the writing end as the length of the stick is reduced.

Holder Anchors Dog's Food Dish

Your dog will not overturn his food dish if it is supported on the ground by a wire holder. The holder is made by twisting together the ends of two lengths of wire and forming a hoop as in the detail.





INEXPENSIVE

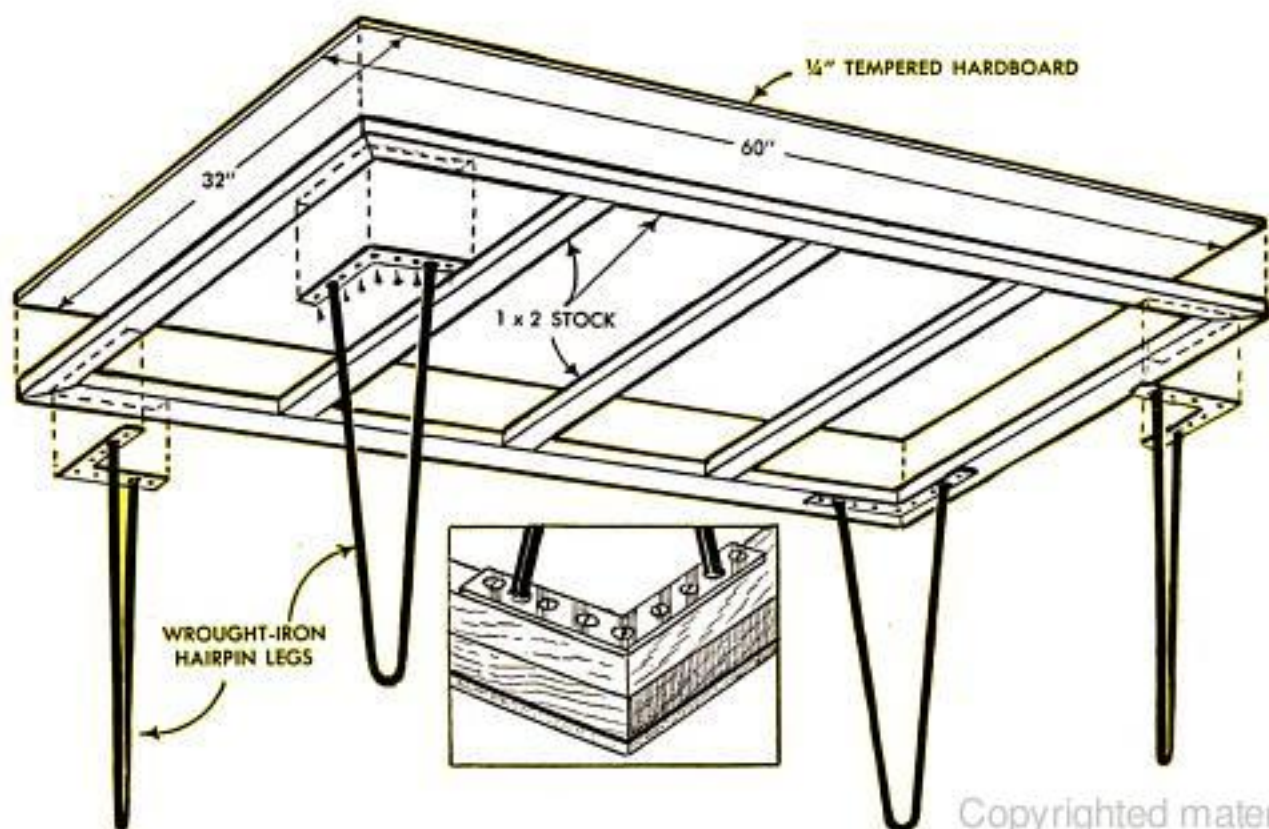
Porch Table

Information
courtesy
Masonite Corp.

EVEN ITS CLEAN DESIGN suggests that this attractive porch table be used for cool, summertime living. Combining simple construction and low materials cost, it is an ideal project for an amateur craftsman who wants to try his hand at building furniture, or the experienced woodworker who wishes to build something that will require a minimum of time and labor.

The one-piece top of the table is cut from a sheet of $\frac{1}{4}$ -in. tempered hardboard; the

framework under the top is assembled from 1 x 2 stock and is mitered at the corners. Cross pieces are 15 in. apart. The hardboard top is glued to the frame, clamps being used to hold the assembly until the glue dries. Wrought-iron hairpin legs can be purchased in various lengths and are easily attached with wood screws. Finish the top by applying one coat of shellac or sealer, then brushing on two coats of gloss varnish and one of dull varnish.



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Spring bulbs should be taken from the ground in fall and potted for forcing. Pot them about the second or third week in October and store in cold frames so they remain dormant until removed in January



In January the potted spring bulbs are removed from the cold frames and taken indoors or into a hothouse to artificially induce them to start their spring growth. Bulbs treated this way will bloom in March

Winter Insurance for Your Garden



Dead leaves and grass clippings can be made into valuable mulch by treating them with commercial compost-producing preparations

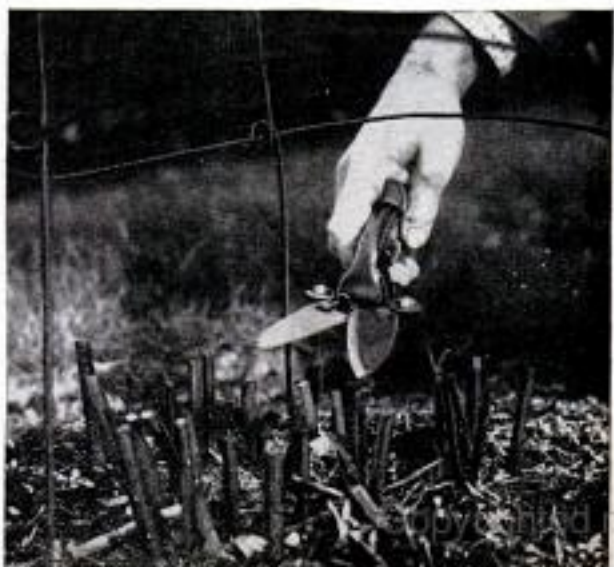


Given a little assistance, your flowers will winter well, bloom early.

ABOUT THE MIDDLE OF OCTOBER is the time to dig up and pot spring bulbs if you want to force them for early blooming. Store the potted plants in cold frames until January, then move them indoors or into a hothouse. They will bloom in March. Annual plants should be dug up before the first frost, potted and taken indoors. Replant them outside in spring. To assure vigorous peony bushes, prune the stalks down to within a few inches of the ground in fall. Cover the root area with several inches of mulch, such as peat moss, composted material or a blanket of straw 2 or 3 in. thick.

Annuals that would be destroyed by winter weather should be taken out of the ground before the first frost and placed in pots. The plants will grow all winter indoors and then can be replanted outdoors

Peony bushes have fresh growth every spring and the old stalks must be cut down to provide room for the new growth. Prune the old stalks down to within a few inches of the ground as shown in the photograph





Requiring especially good care if they are to last through the winter are rosebushes. To protect these plants, pile soil around the roots and about halfway up the main stem of the plant. Rosebushes are not pruned in the fall, but in the early spring



To make sure that the dirt piled around the rosebush does not thaw, once it has frozen, straw or hay is piled over the dirt to insulate it. This is done after the ground has frozen thoroughly. Straw also is piled around the rosebush to protect it



Trees and shrubs, although hardier than flowers, also require protection.

Freezing does not hurt most plants, rather it protects them. Alternate thawing and freezing is what does the damage, breaking the roots and sometimes heaving the plants above ground level. Insulation by mulching, therefore, is required. Pile soil about 8 in. high around a rosebush, then completely surround the bush with straw. Some trees, such as figs, are unusually sensitive and should be wrapped completely with waterproof paper, as well as having their roots protected with a heavy layer of mulch. Soft trees, such as rose trees, should be wrapped in straw or hay of the type that has long strands, which provides a "blanket" around the tree. Older trees are hardy enough to go through a winter with no assistance, but young trees, because their roots are close to the surface, can be killed by freezing. For this reason, the roots should be insulated with mulch.

Soft trees, such as rose trees, should be wrapped completely in straw or hay that has long strands, permitting it to be tied around the tree like a blanket. The straw protects the tree against winter weather and early buds against the spring frosts



Fig trees and some dwarf fruit trees are extremely sensitive to weather extremes and must be wrapped completely in waterproof paper and the roots well mulched

Roots of young trees should be protected against the damage that can be caused by alternate thawing and freezing, which may break them or heave them out of the ground. Insulate around the root area with a layer of mulch after the ground has frozen





Winterizing treatment for a lawn begins late in the fall with the application of fertilizer and lime, distributed evenly over the lawn with a spreader

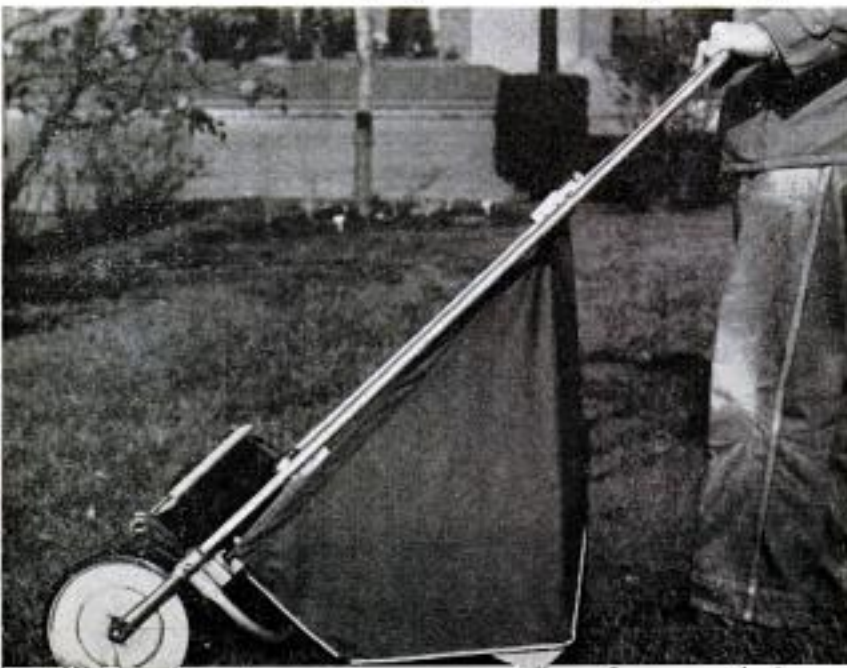


Next operation after fertilizer and lime are spread on lawn is to aerate it with one of a number of devices to assure that air and food reach grass roots



After the entire lawn has been aerated thoroughly, spread a top-dressing, such as peat humus, over it

About a month after applying the top-dressing, sweep the lawn to remove debris. Mechanical sweeper pictured makes this job a simple one

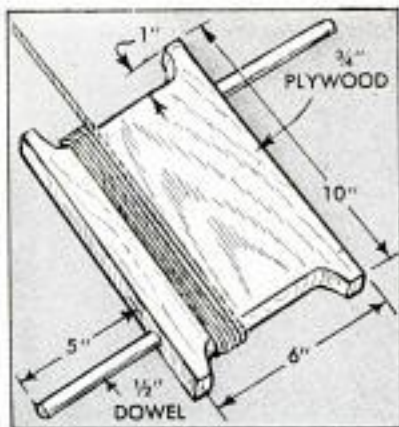


“Scalp treatment” for lawn readies it for winter.

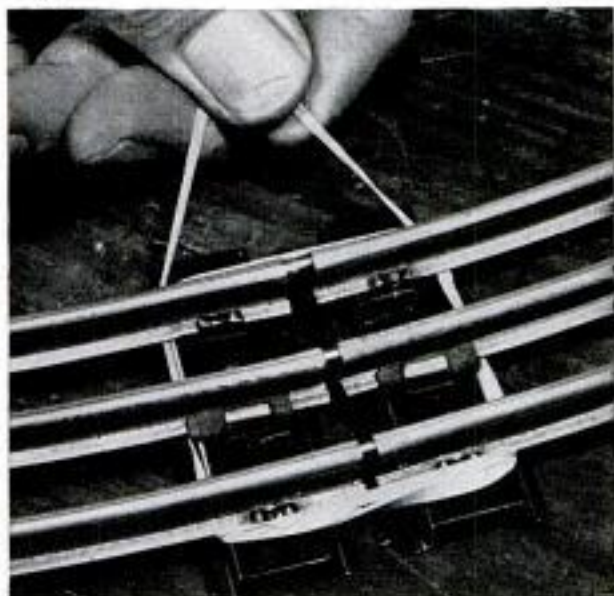
Preparation of your lawn in the fall will have much to do with its health the following spring. The first step in winterizing a lawn is to spread fertilizer and lime, making sure the materials are evenly distributed. A spreader designed for this purpose will give the best results. After the fertilizer has been spread, aerate the lawn with a spiked disk, plate or roller to assure that both air and food reach the grass roots. After aerating the lawn, apply a top-dressing; peat humus is excellent. A month after the top-dressing has been applied, sweep the lawn thoroughly to remove any debris. Mechanical sweepers, mounted on wheels and fitted with rotating brushes make this job a simple one, but an ordinary straw broom will do just as well, although requiring more time. The lawn now is ready for winter. To further guarantee a healthy lawn, there is a precaution to take during the winter. If possible, avoid piling snow very high on a lawn when cleaning walks and drives. The weight of banked snow seems to encourage “snow mold,” which often causes large areas of grass to turn brown and die. ★ ★ ★

Reel Assures Kite Control

Paying out and taking in kite string can be done quickly with this simple reel. It gives positive control and reduces the possibility of the string being jerked from the hands and the kite getting away. The reel consists of a piece of $\frac{3}{4}$ -in. plywood cut to the shape and dimensions shown in the detail. Two $\frac{1}{2}$ -in. dowels are glued in drilled holes to provide handles. All edges are rounded and the entire reel sanded smooth, varnished, then sanded again and coated with paste wax. Repeated waxing will produce a slick finish.



Toy Train-Track Sections Held by Rubber Bands



When sections of track for a toy electric train are not screwed or tacked to a special board they often pull apart from the motion of the trains, or the joints become loosened enough to cause a poor electrical connection. To prevent this, stretch a rubber band around the "ties" at each joint as shown in the photograph. This method of securing the sections can be used on any style or gauge of track and permits quick dismantling when the tracks are to be stored away. Also, the rubber bands will hold the joints firmly enough so that a fairly large-sized layout can be moved or picked up without any sections becoming disconnected. The idea also works well on tracks for wind-up-type trains where younger children are apt to pull the track sections apart while they are playing.—Fritz Snyder, Dover, N. J.

Paint Identifies Photo Filters For Easy Selection

To solve the problem of quickly finding a particular filter in your camera equipment, paint the lid of the container the same color as the filter. Auto touch-up paints are ideal for this purpose as they come in a large variety of colors. For filters that have no color, such as the color-compensating type, write the number of the filter on the case with India ink. If the cases are of plastic, clean them with carbon tetrachloride before writing or painting.

Robert C. Florian, Chicago.



Solving HOME PROBLEMS

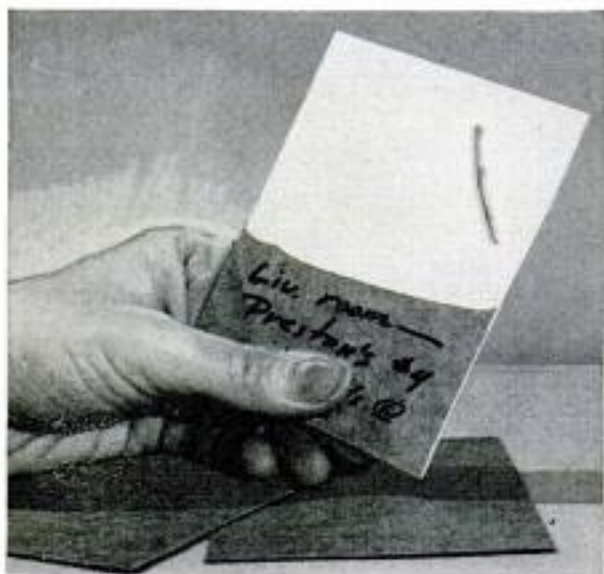


REFILLING A STEAM IRON is easy, when an empty plastic shampoo bottle of the type shown, is used for pouring the water. Any other plastic bottle with removable spout is suitable for this purpose



WOOD SCREWS turn more easily in tight-fitting holes when threads are rubbed with a slightly wet bar of laundry soap as shown above. The soap lubricates the threads as they turn in the wood

PAINT DATA is recorded on hardboard scrap dipped in paint used on a job. Board is then cut to size for easy filing. When necessary to repaint, or touch-up repaired surface, simply consult paint-data file



174

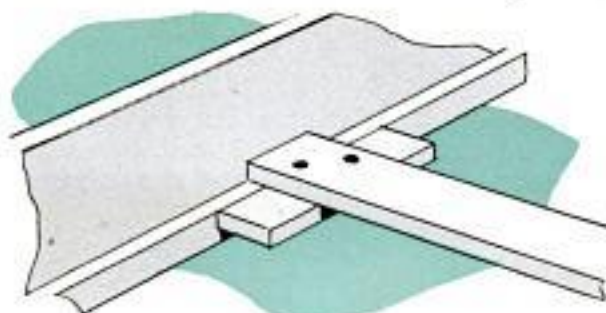


VENETIAN-BLIND SLATS won't scratch woodwork on window frame if short lengths of rubber hose are slotted and slipped over the ends of one or two of lower slats. Also, blind operates more quietly

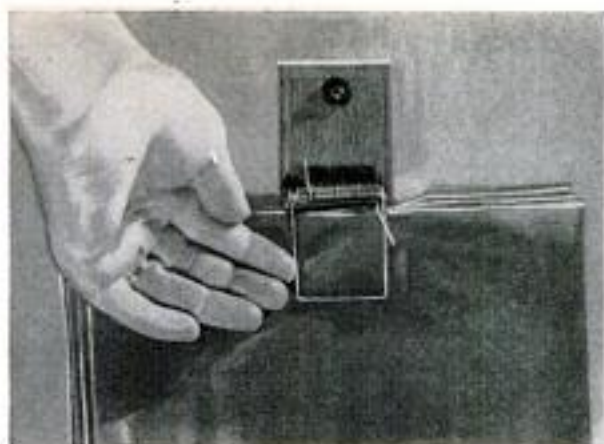


SOILED BAND on felt hat need not be removed when cleaning it with cleaning fluid. Simply insert strip of aluminum foil between the band and crown as shown to prevent absorption of the fluid by the felt

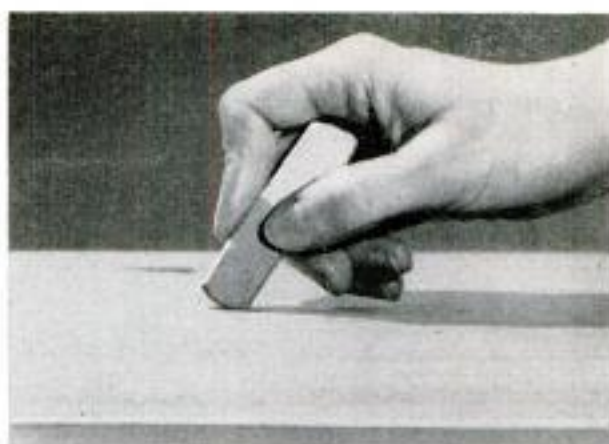
BED SLATS that tend to work out of position and drop the spring and mattress to the floor, can be made to remain in place by screwing cleats near the ends of each slat as shown in the drawing below



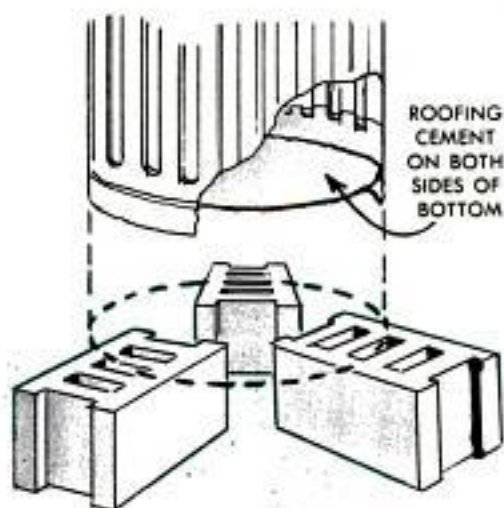
POPULAR MECHANICS



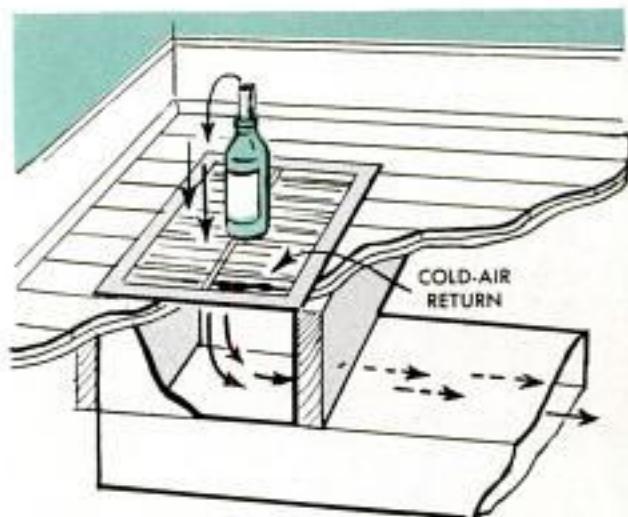
SPRING-TYPE MOUSETRAP is handy holder for paper bags, receipts or note paper, when it is screwed to inside of kitchen-cabinet door as shown above. Simply remove bait pan and the trigger



SURFACE MARKS on fine furniture that cannot be removed with a mild cleaning solution, usually can be rubbed off with an ink eraser. Application of polish on cleaned spot will restore original luster

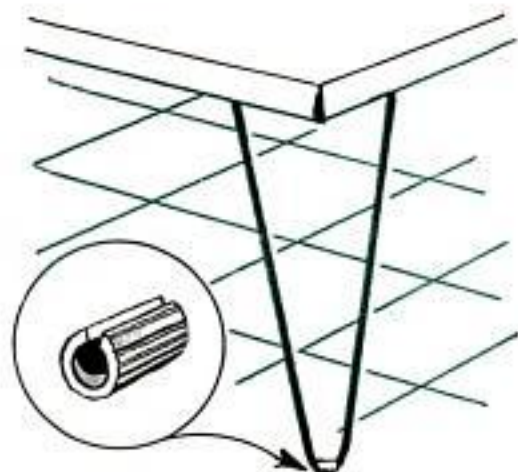


YOUR GARBAGE CAN will last longer if a coating of roofing cement is applied on both sides of the bottom. Also, a base should be provided that will permit air to circulate under cans as shown above



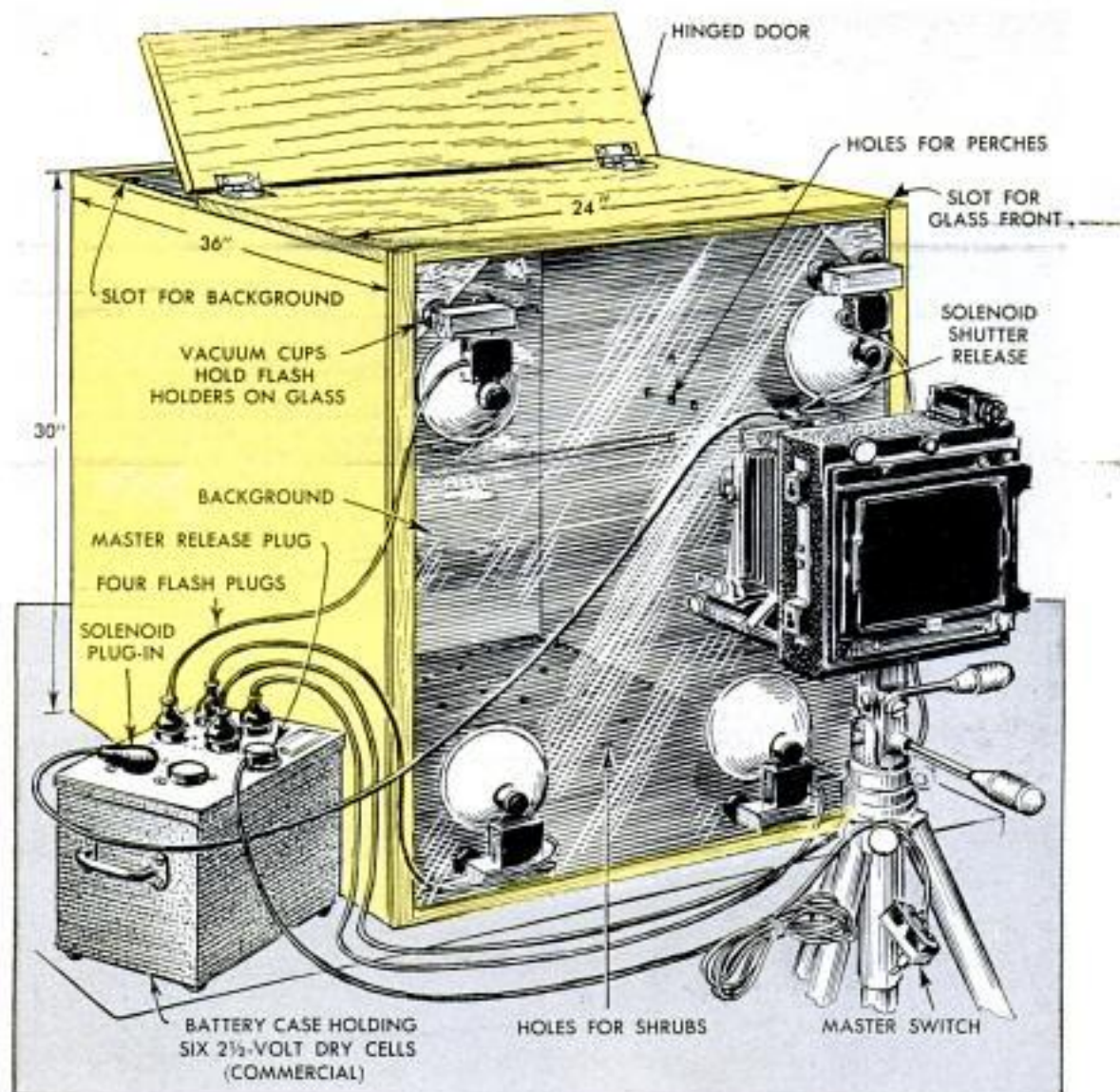
PAINT AND COOKING ODORS can be removed from house provided with forced-air heating by placing open deodorant bottle on cold-air return as shown above. Also, deodorant may be placed inside return

WROUGHT-IRON LEGS of the type shown below will not mark linoleum or wooden floors when a short length of rubber hose is slipped over the lower end of each leg



TINTING PLASTIC SWITCH and wall plates to harmonize with room furnishings is easy. Just wipe liquid food colors on plastic with soft cloth or cleansing tissue. To change or renew colors, simply remove plate and wash with cold water





Give Caged-Animal Shots a Natural Look

By Henry H. Sheldon

GETTING WILD ANIMALS to "sit" for portraits is easy when you have a box with a glass front for a cage in which to confine their movements while waiting for an unusual shot. A background of a colored enlargement of scenery appropriate to the habitat of the animal being photographed, actual ground cover and simulated trees provide a realistic setting for some terrific photos.

Four flash units secured to the glass front by suction cups as shown provide adequate lighting. These are synchronized with the camera. This is done by plugging an extension cord into the solenoid shutter release on the camera and the solenoid plug-in on the lid of the battery case. The solenoid plug-in is connected to the

flash receptacles on the lid, with a master switch wired into the circuit for operating the shutter and flash units when desired.

The box is made of ½-in. plywood as in the drawing. Two slots at the back accommodate a background board with an enlargement of a nature scene attached, and two slots at the front accept the sheet of glass. Holes drilled in the sides and bottom of the box permit inserting small branches and twigs, also tufts of grass, to provide a setting not unlike the animal's habitat as shown in the color photos on the next page. A colored enlargement depicting the animal's native haunts is attached to the background board to complete the setting. ★ ★ ★

Sitting on branch of tree overhanging lovely lake in South America, peach-faced lovebirds look into camera's lens—could be, but actually they were photographed in the photo box



Left, portrait of bobcat in photo box with background of cedar branches and flash highlight on left only. Below, mink is glamorized on bac'ground of blue silk



Right, use of elaborate ground cover and heavy foliage affords suitable habitat for mountain beaver from St. Helens, Wash., and induces him to feel at ease



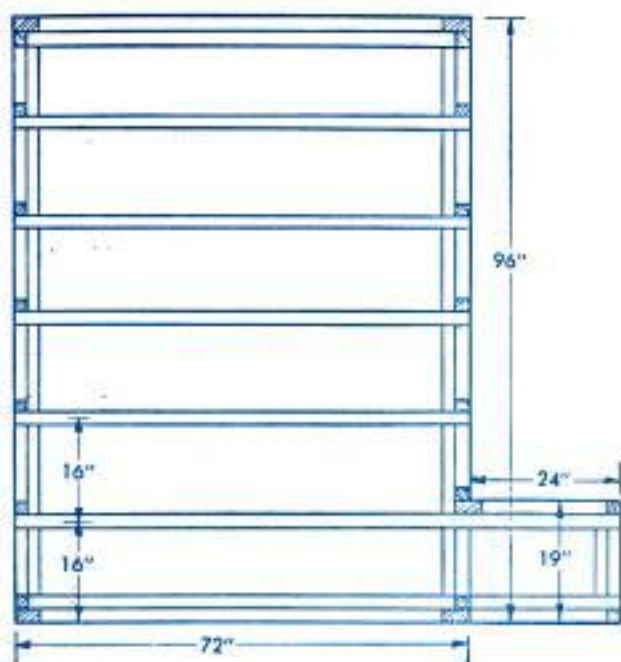


Deluxe Playhouse **has water and lights**

By C. W. Woodson

ANY YOUNG LADY will feel like a fairy-tale princess when she is the proud owner of this enchanting playhouse that includes the modern magic of electric lights, running water and a heating plant. With the little house located in a corner of the back yard, Mother knows her daughter and friends are safely off the street, and she can check on the children's well-being in a moment.

Construction of the playhouse starts with staking-out the foundation, as shown in the detail at the bottom of page 180. Assure that the main 6 x 8-ft. foundation is square by measuring the diagonals, both of which should be exactly 10 ft. Cedar posts 5 in. in diameter are cut in 2-ft. lengths (longer in areas of severe frost) and sunk in holes dug just inside the stakes as indicated in the upper detail on page 180. Use a long



straightedge and level all the posts. A handful of gravel under a low post will bring it up to the right height. The foundation posts should project about 4 in. above the ground, which is high enough to permit ample air circulation under the building to prevent rot, while still being low enough for pleasing appearance. Sills, which can be either 4 x 4s or two 2 x 4s on edge, now are spiked to the foundation posts. Recheck the level of the foundation and shim up the sill where necessary. The floor joists next are toenailed to the sills. The joists are 2 x 4s on edge, and are spaced 16 in. on centers. After the first joist is nailed in place, a spacer block, lower right-hand detail, page 181, can be used to speed the work and assure accurate spacing. The joist plan at the left shows the joists in place and the location of wall studs that are spiked directly to the sills alongside the floor joists. Wall studs and roof beams are 2 x 2s, with the exception of the corner-post studs, which may be 2 x 4s, lower right-hand detail, page 181, to provide a nailing surface for the interior wall covering. An alternate corner-post arrangement,



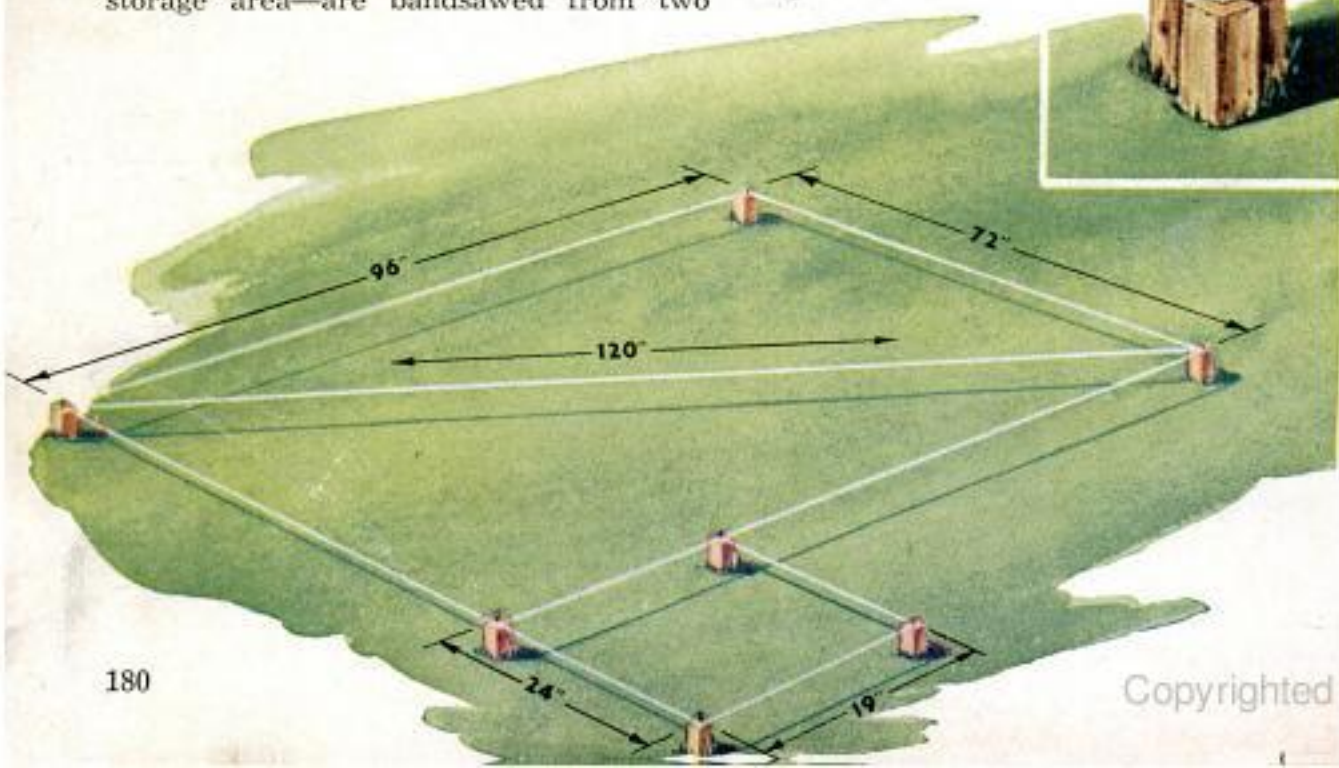
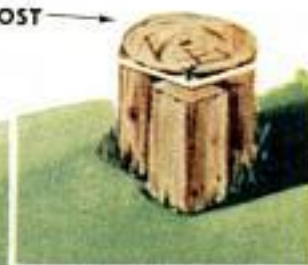


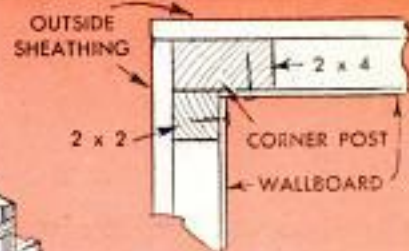
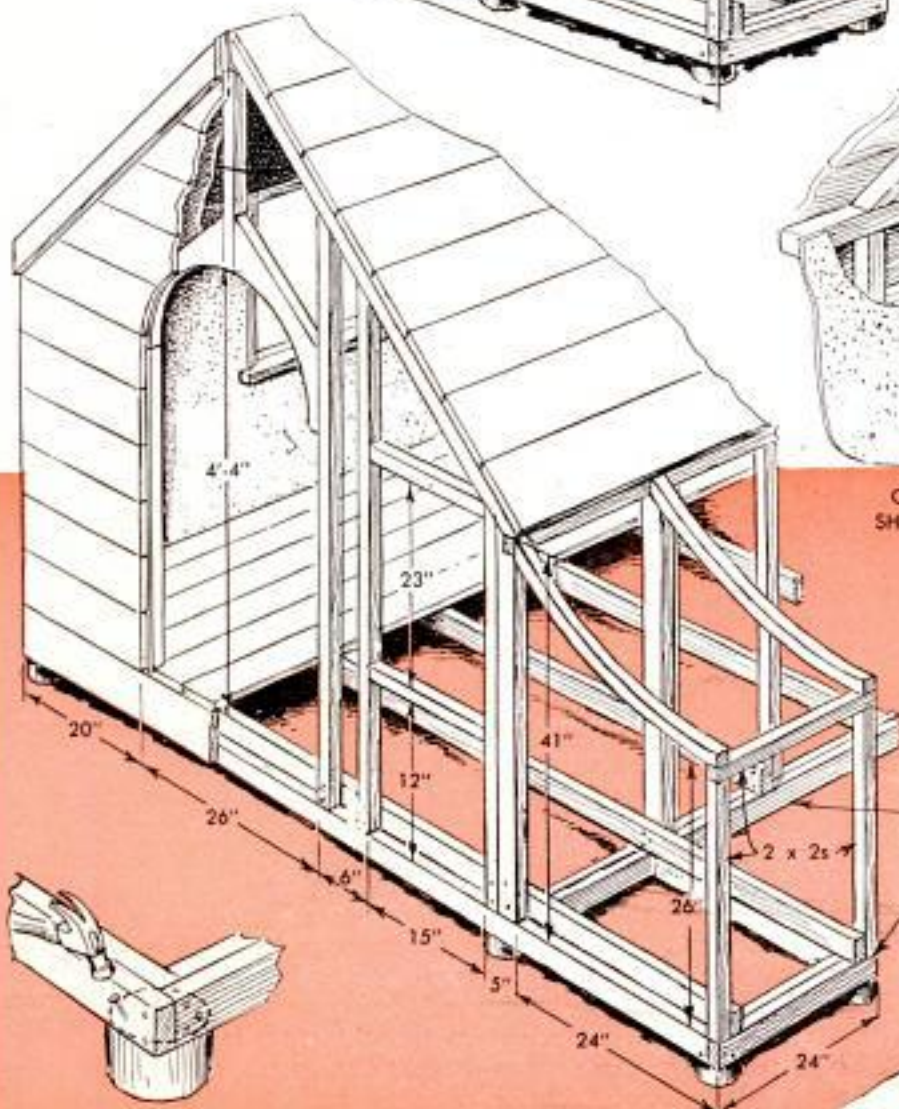
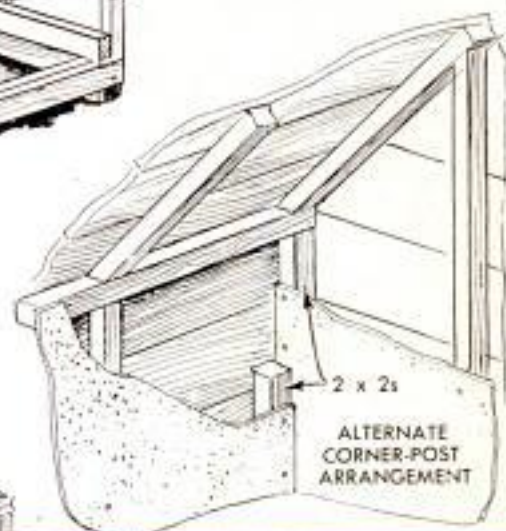
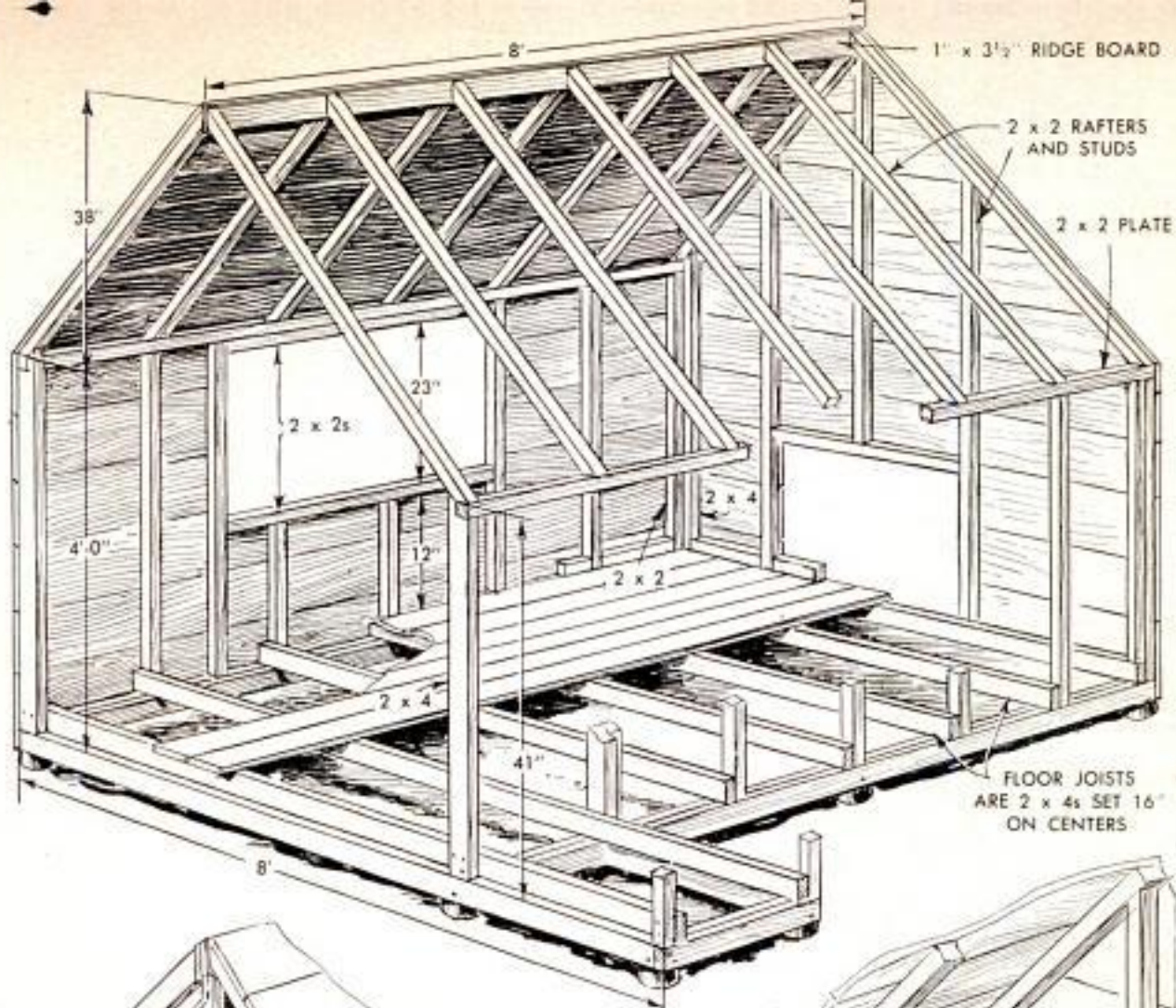
in which 2 x 2s are used, is shown in the right-hand center detail on page 181.

Carefully check all details on page 181 to familiarize yourself with the methods of framing the building, as well as noting the locations of openings for the door, windows and fireplace. The curved roof members of the projecting portion of the building—which can be used as a closet or storage area—are bandsawed from two

pieces of solid stock. The fireplace opening in the back wall is as wide as the space between two wall studs and should be high enough to provide ample space for the electric heater that is to be installed in this area. The framing members over the

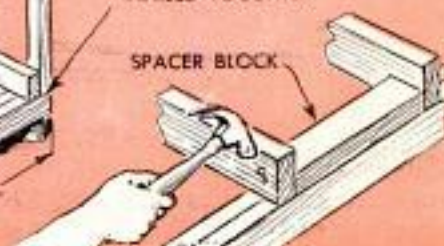
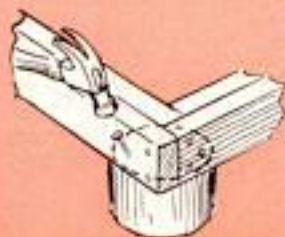
5" x 24" POST →

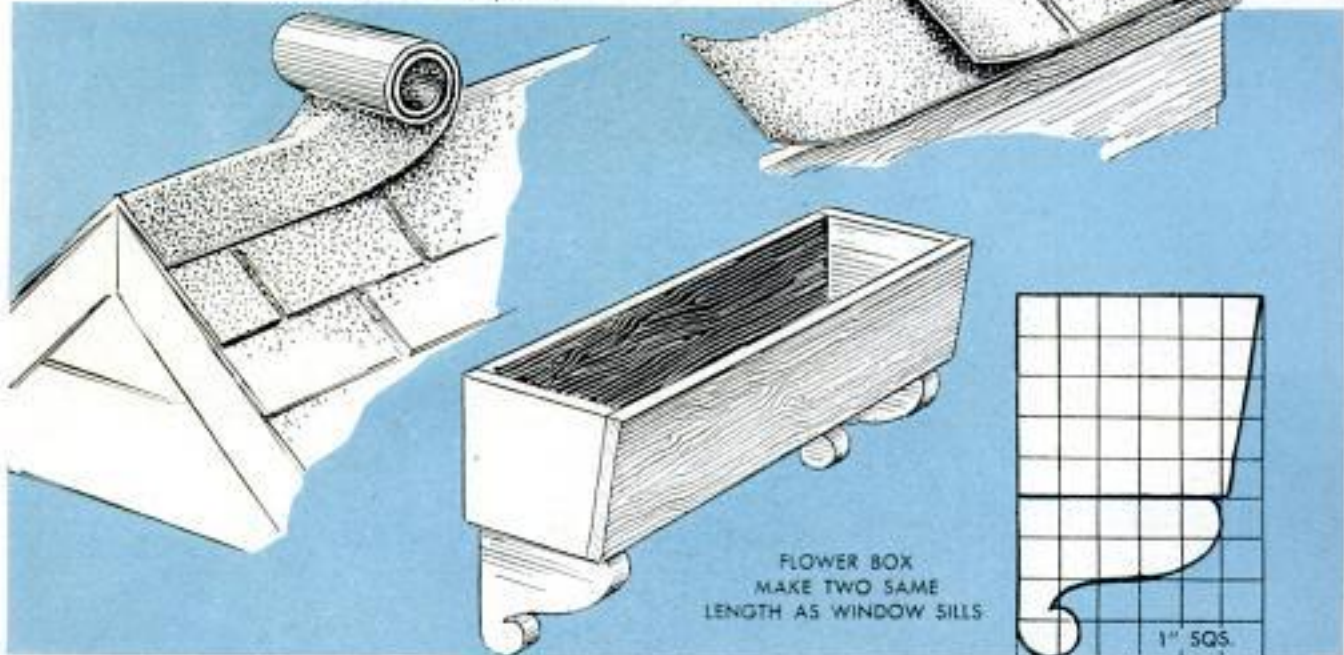
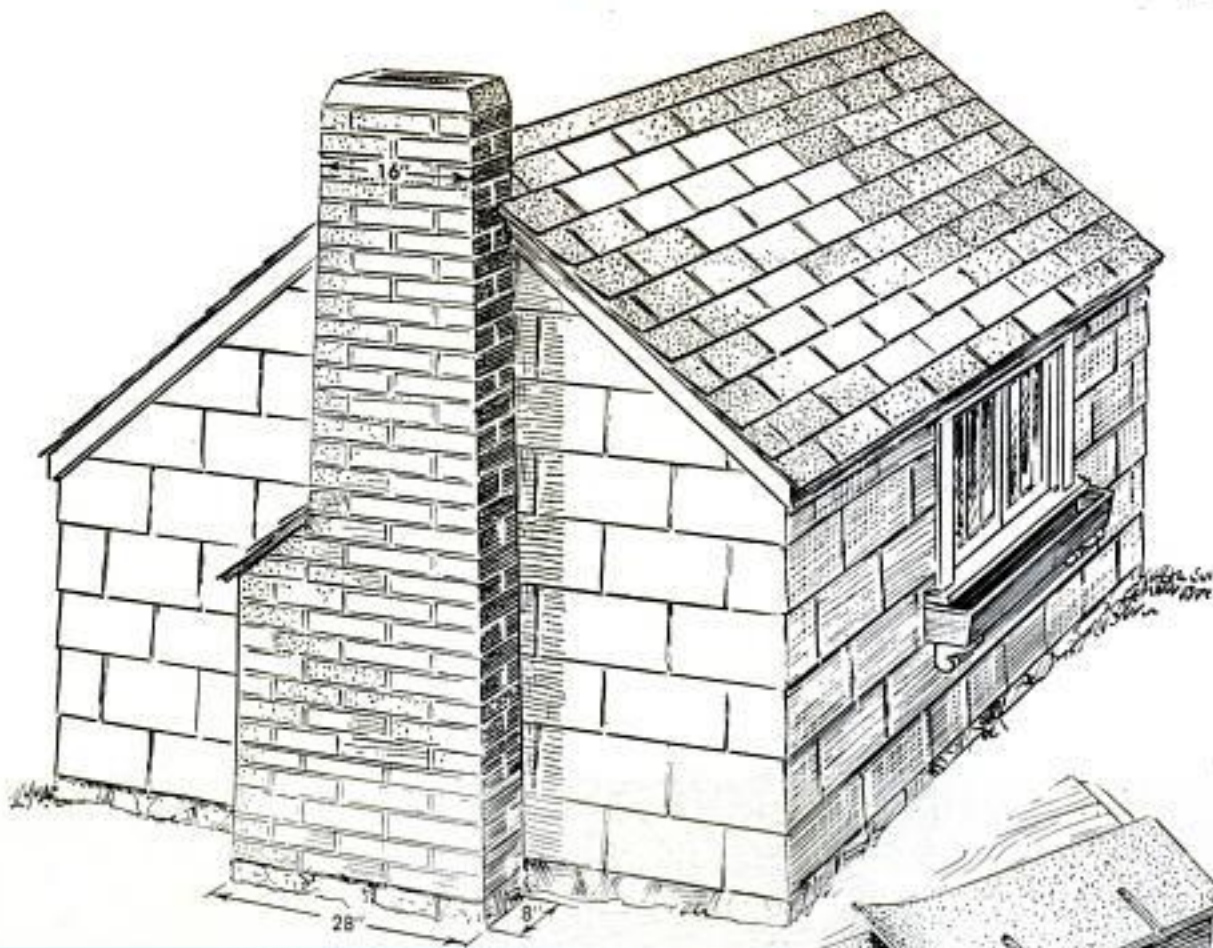




ALL SILLS ARE DOUBLE 2 x 4s SET ON EDGE AND NAILED TOGETHER

SPACER BLOCK





FLOWER BOX
MAKE TWO SAME
LENGTH AS WINDOW SILLS

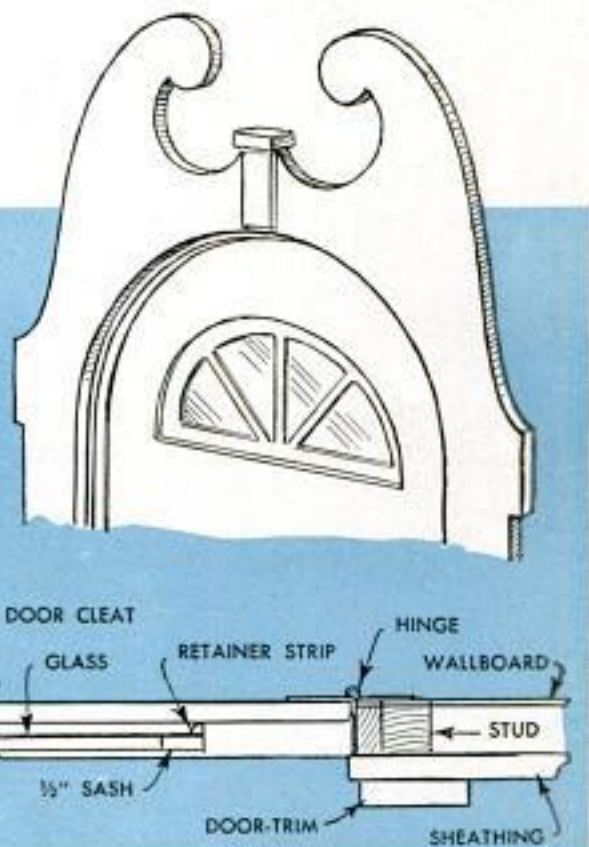
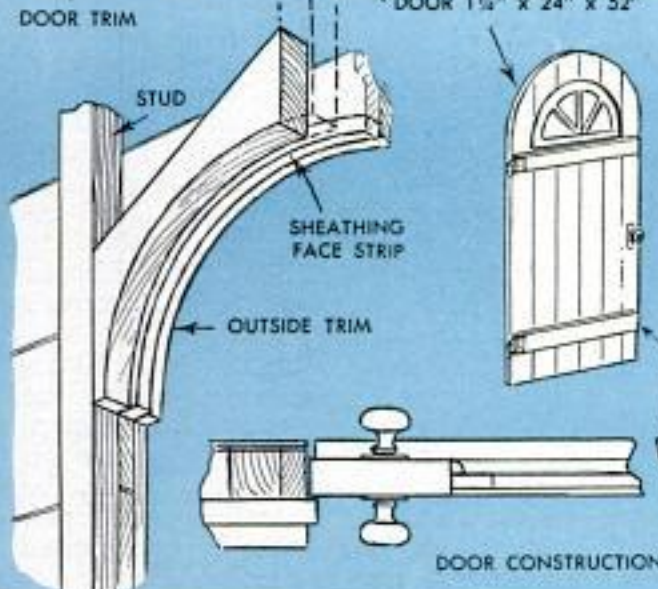
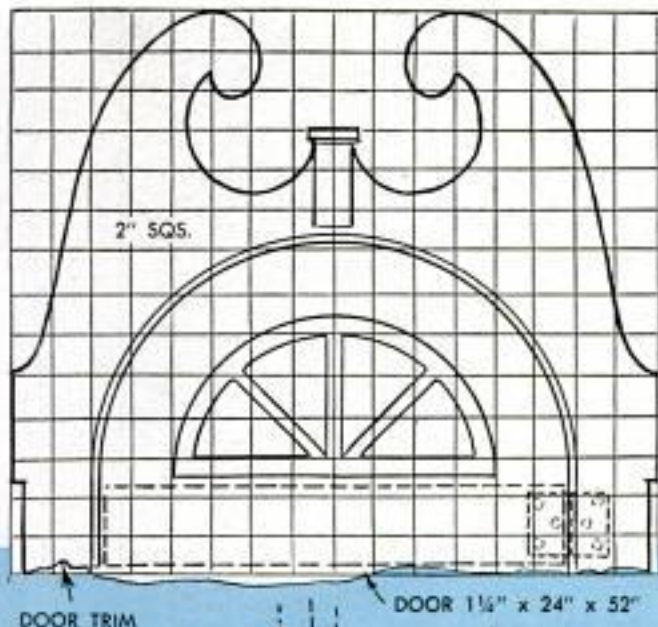
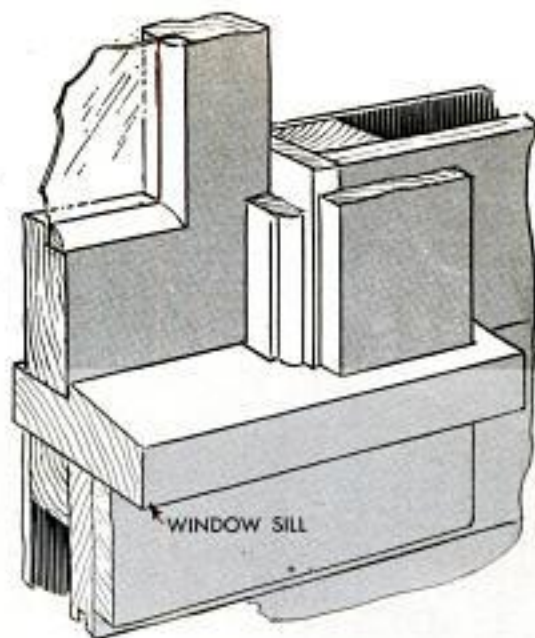
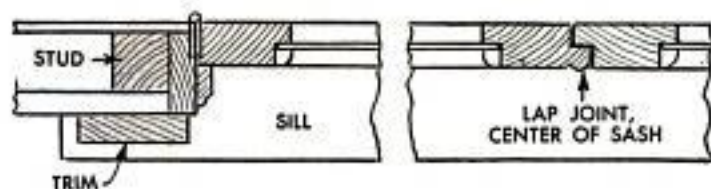
1" SQS.

door opening are bandsawed from solid stock, using a 13-in. rad., or the pattern for the outside door trim on page 183 may be used to determine the curve of the inner edges of the framing members. Note that the lower ends of these members are the width of a 2 x 2 on which each will rest. This provides a double 2 x 2 member on each side of the door opening for additional strength.

Tongue-and-groove sheathing is used for the floor of the playhouse, for roof planking and for wall sheathing. The sheathing goes on quickly and will assure a rigid

structure. Around door, window and fireplace openings, the sheathing is applied so it is flush with the inside edges, as per details on page 181. After the sheathing is applied, the chimney can be constructed. It consists of 1 x 8s fastened to cleats that are nailed to the sheathing. The rear face of the chimney then is nailed to the side pieces. The rear elevation of the playhouse detailed above shows the shape of the chimney, and indicates how the top of the offset in the chimney is shingled with the same material used on the roof. Imitation brick siding is used to cover the chim-

WINDOW DETAILS

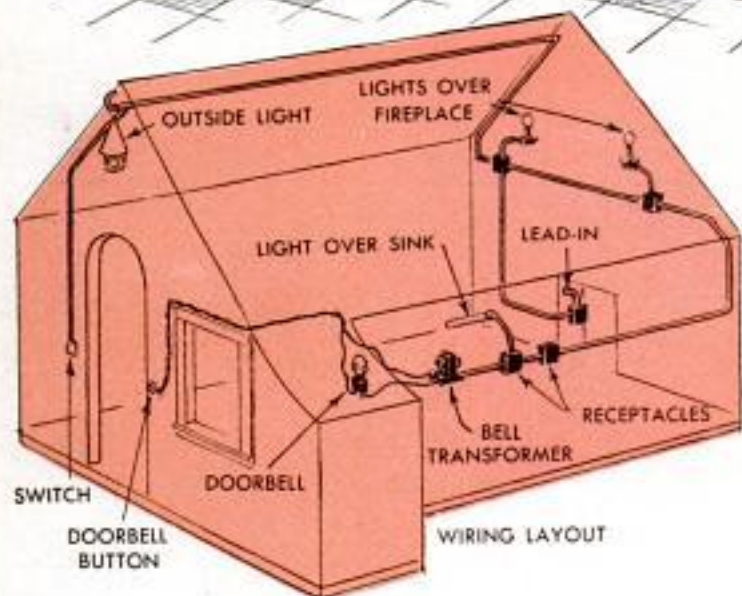
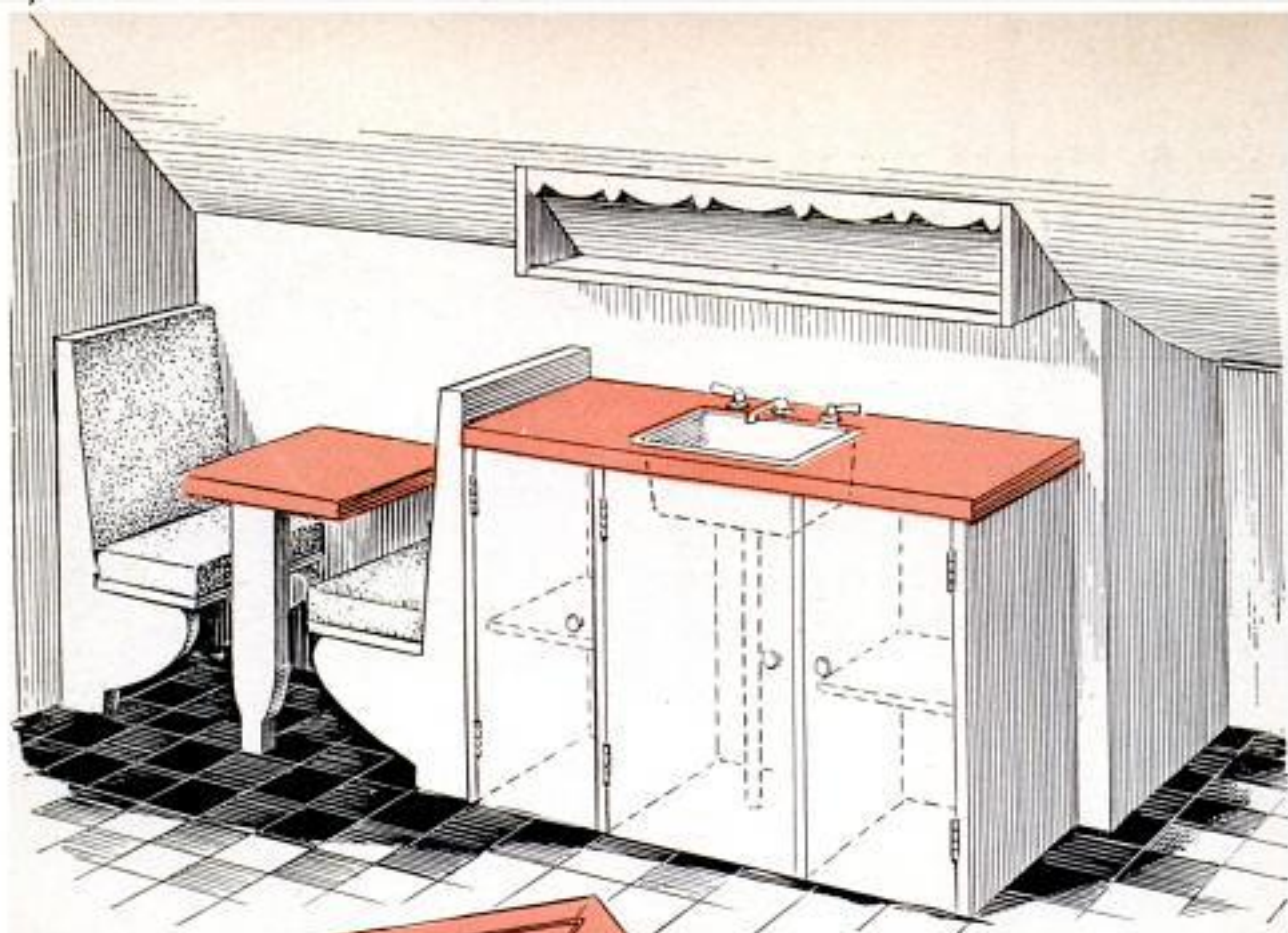


ney, and the top of the chimney is sealed against the weather by a sheet-metal or plywood cap. The latter is painted white to contrast with the red of the brick siding. Metal flashing is installed between the chimney and the roof, and also between the chimney offset and the sheathing.

Inside the chimney a horizontal plywood panel is installed just above the fireplace opening. It should be covered with metal so that it reflects the heat of an electric heater into the playhouse. The heater located in the fireplace is used to warm the little house on chilly days in early spring

and late fall, permitting the house to be used a couple of months longer each year. To protect the lower edges of the chimney from ground moisture, it should rest on a stone or brick foundation.

Window-frame construction for the playhouse is detailed at the top of this page. If your workshop does not have facilities for building the window sash, it may be possible to use a stock window by altering the opening to suit, or a window can be ordered custom-built through most lumber yards. The double window on the side of the playhouse should be hinged to swing in,



while the single window beside the door is fixed permanently in its frame, the door providing necessary ventilation.

The arched front door, lower details, page 183, is built up from 1 $\frac{1}{4}$ -in. clear pine strips glued edge-to-edge. Two cleats are glued and screwed to the inside surface of the door. The top of the door is rounded on a bandsaw and the fan-shaped window opening is cut out with a keyhole saw. A single piece of glass is fitted into this opening, divider strips and edge molding being cemented to the face of the glass and to the inside edge of the opening.

The scroll over the door is part of the outside trim and is cut from a single piece of plywood, using the squared pattern on page 183. Straight trim is run from the lower edge of the arch to the door sill.

After the house trim is in place it should be primed, and all joints calked, since these cannot be done after the shingles are attached. The roof now is shingled, using fire-resistant, slate-surfaced shingles of the square-end type, laid 4 $\frac{1}{2}$ in. to the weather. The side walls of the house are covered with 24-in. prestained shingles with 9-in. exposure to the weather. Flower boxes can be attached beneath the windows.

If local codes require it, wiring in the playhouse should be done by a licensed electrician, according to the diagram on this page. Running water and a drain for the playhouse sink are plastic garden hose. The sink set in the counter top is a plastic or metal basin such as used in house trailers and boats. Other built-in furniture can consist of a breakfast nook as shown in the illustrations, or toy furniture can be used. For ease of cleaning, the playhouse floor is covered with linoleum. Either hardboard or insulating wallboard can be used for interior covering of the walls. Both can be painted to provide a cheerful appearance and ease of cleaning.

Added luxuries, such as a radio, record player or television set can be added to the furnishings of the playhouse, depending on the age and interests of the residing princess. But no matter what the furnishings, childhood magic will be there. ★ ★ ★

Quick Method for Spacing Hand-Drawn Lettering

A quick method for drawing lettering in a specific space is first to rough out the word on a sheet of paper—or printed copy may be used as shown—and extend vertical lines down from each letter. Next, draw a line on another sheet of paper to indicate the length of the finished lettering and place it at an angle across the vertical lines so the lines from the first and last letter align with the ends of the line. Finally, mark off the space for each letter. The above method will produce a line longer than the original copy. To pro-



duce a line shorter than the original copy, place the copy on the diagonal.

Tips on Soldering Tubing

When sweat soldering copper tubing to a valve, be sure to remove the valve spindle with the attached washer, which can be damaged by heat. Also, for sweat joints, wait about five seconds after heating before applying solder to allow the heat to be distributed throughout the metal.

Cleaning a Hot-Water Tank

Even a rustproof hot-water tank should be cleaned periodically by draining to prevent the accumulation of dirt, scale and rust particles. Best time to drain a tank is early in the morning before water has been drawn from it. Loose particles will have settled to the bottom where they drain off.



Enrich Your Life With the Marvels of Hi-Fi! Thrill to a Pocket-Size Transistor Radio . . .

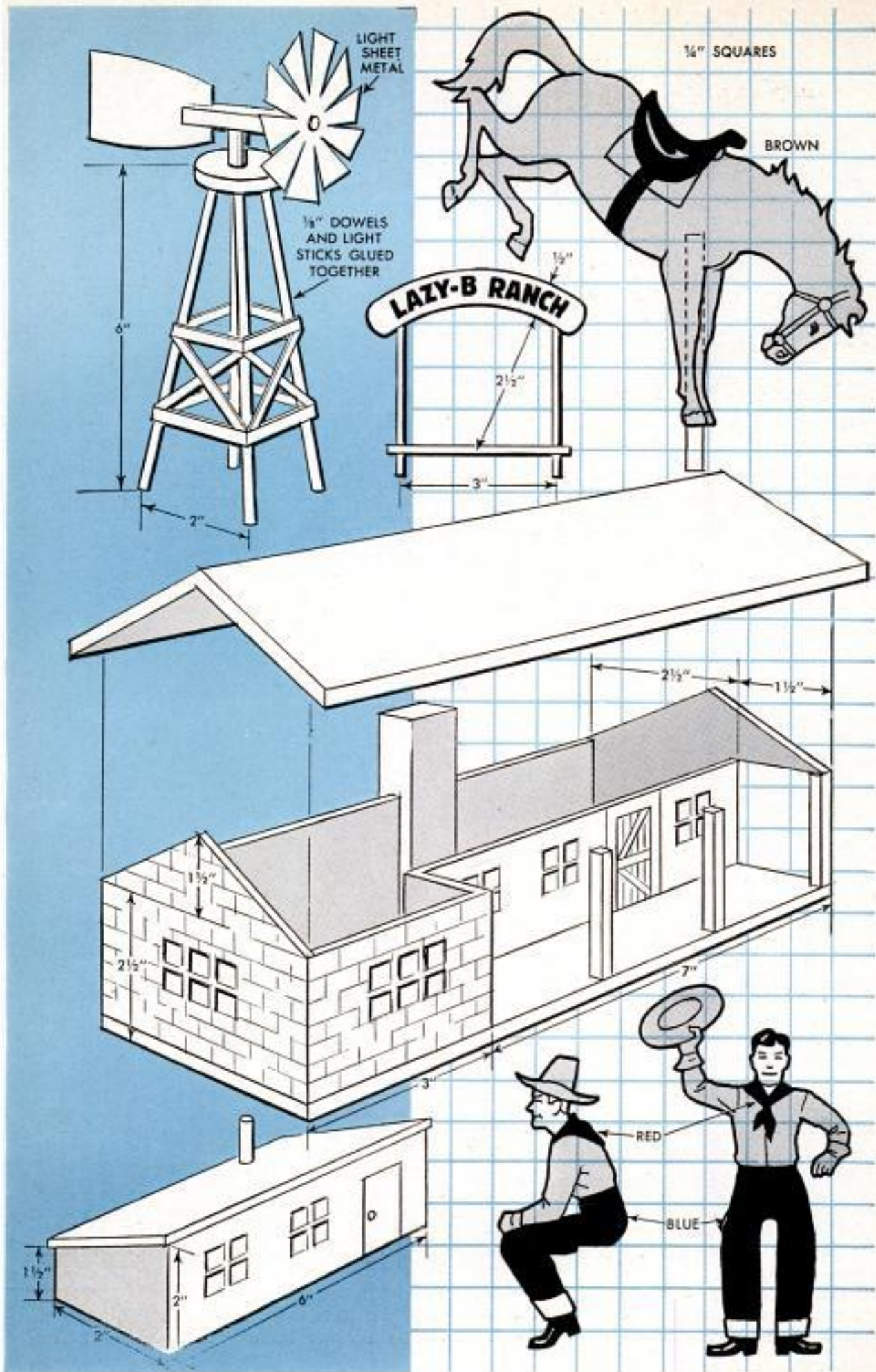
Have you been wanting a Hi-Fi set for your home . . . a portable transistor radio no bigger than your hand . . . and any of the other pieces of electronic equipment that are adding so much enjoyment to modern living? Then here's how you can have them, at merely a fraction of the usual purchase price. Using Popular Mechanics new book—*Electronics Made Easy*—

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servicing, how to use test instruments and make your own, and how to convert old radios into inter-com systems and other devices. It's fun and easy to build your own electronic equipment with the help of this book which contains numerous do-it-yourself projects. Send for your copy of *Electronics Made Easy*. It's your key to the most fascinating hobby of these times **\$2.95** for just.....

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Fun on the Lazy-B

By Hi Sibley

THERE IS NO PROBLEM of toys being tumbled over easily with this Lazy-B Ranch outfit, as all trees, animals and other figures are fitted in holes in a sheet of perforated hardboard. The Lazy-B "range" is just 2 ft. square, which makes it small enough to fit on an average card table, yet large enough to allow plenty of room for broncobusting, herding cattle and fighting off rustlers. Fences can be rearranged, buildings moved and trees "replanted" to suit a child's fancy. With the infinite number of arrangements possible, the ranch will keep children fascinated for hours on end—an ideal rainy-day toy.

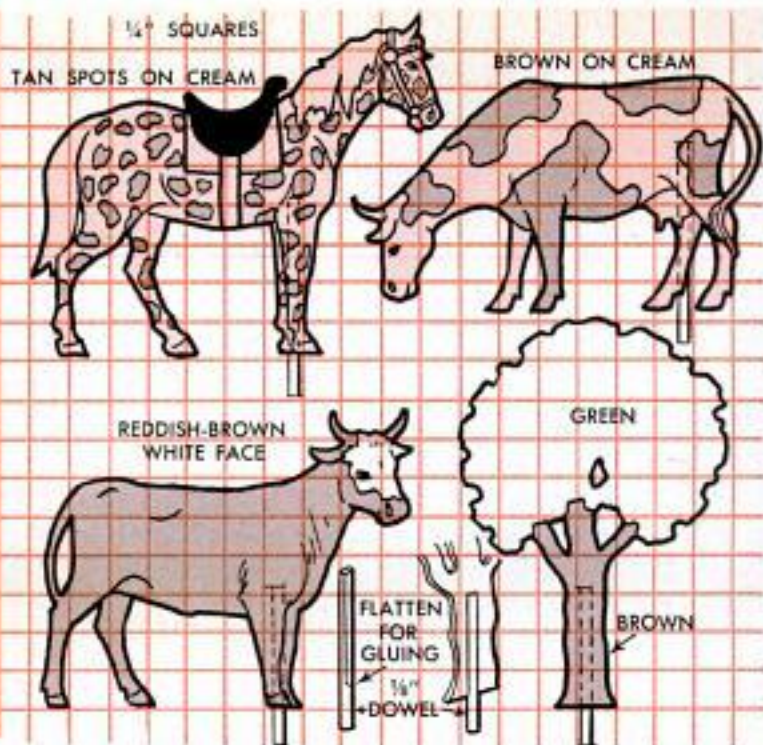
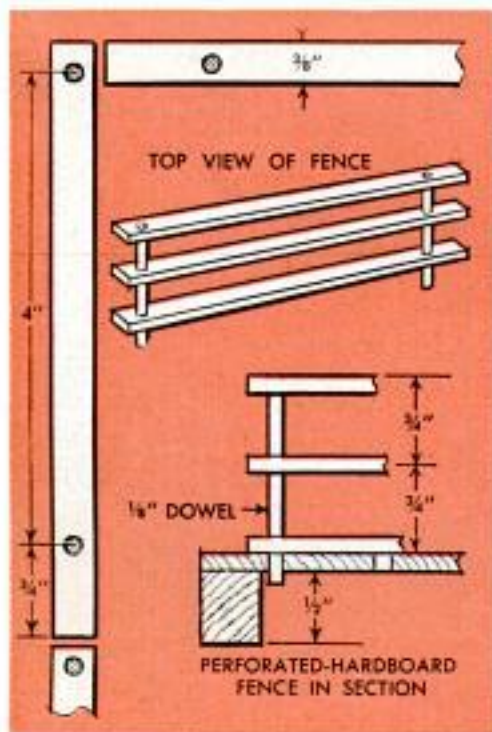
The perforated-hardboard base for the ranch is mounted on a frame made of lengths of $\frac{1}{2}$ x $\frac{1}{2}$ stock, mitered at the corners. It is glued and nailed to the hardboard. The ranch house and the small outbuilding are cut from $\frac{3}{8}$ -in. plywood and then are neatly scored to represent adobe-brick walls and shingled roofs. Windows are painted on, but can be cut out if more realism is desired. The ranch-house door also can be hinged. If there are cow girls in the family, it might be advisable to hinge the roof of the ranch house also, or

make it completely removable, so they can do a little housekeeping while the men are tending to the business of ranching.

Fences for the Lazy-B spread are $\frac{3}{8}$ -in. strips cut from perforated hardboard. Fence posts, which are $\frac{1}{8}$ -in. dowels, are fitted in every fourth hole in the rails. Holes in the fence rails and the perforated-hardboard base of the ranch align exactly, so the fences can be set up anywhere on the range. Dowels used on the fence, as well as on the other figures, should project $\frac{1}{4}$ in. below the bottoms of the objects to which they are attached.

Dowels used to support the figures and trees should be flattened on one side to present a larger surface for gluing. Only one dowel is used on each figure, thus permitting it to be turned to face in any direction. If two dowels were spaced 1 in. apart on a figure to match the holes in the base, the figures could not be placed diagonally as the distance is more than 1 in.

All figures, trees, etc., are cut from $\frac{1}{8}$ -in. hardboard, using the squared details included in this article. An alternate method is to cut figures of the correct size from a child's picture book. Cement the pictures



When perforated-hardboard fence rails are cut as dimensioned, adjoining sections will be 1/16 in. apart

directly to the hardboard and jigsaw around them. Whichever method is used, stack several pieces of hardboard together, so that a number of copies of each figure are cut out at the same time. This also speeds up the job.

Paint the walls of the adobe buildings brown and the roof red. For a weathered effect on the roof, stain it a light brown instead of painting it. Fence rails and posts can be painted with a thinned mixture of white paint. Most of the paint will be absorbed by the hardboard and dowels, and the resulting finish will provide a weath-

ered appearance. The hardboard base of the ranch can be varnished, but should be left a natural color. Painting it green to represent grass, or brown to simulate earth might be confusing, as the corral and ranch house will be moved from place to place on the board. Green grass in the corral, or sand for a lawn might look odd. One suggestion would be to pour fine, dry sand over the wet varnish on the base. When the varnish is dry, excess sand is brushed away and the over-all appearance will have the typical sandy appearance of the soil in many parts of the Southwest. ★★

Lacquer Thinner Renews Grip of Slippery Typewriter Platen



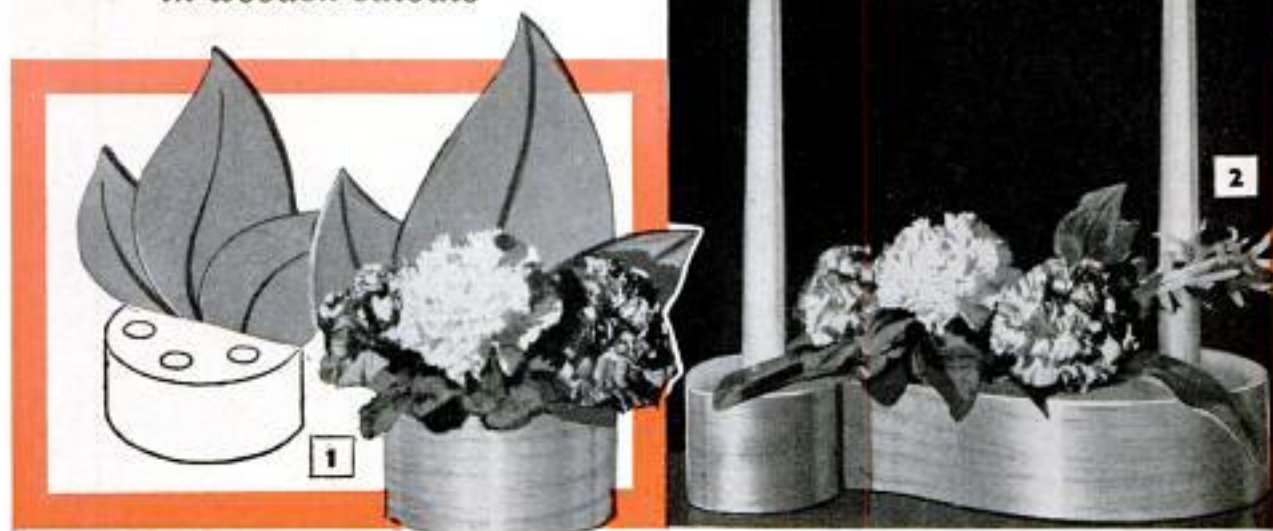
It takes only a few minutes to renew the grip of a slippery typewriter platen when it is rubbed with a cloth moistened with lacquer thinner. If the platen can be removed, it is advisable to clean it away from the machine to avoid damaging the finished surfaces of the typewriter. Periodic cleaning of the platen in this manner will keep its surface in good condition.

Secured Piano Lids Prevent Injury to Tots' Fingers

Small children can be prevented from closing a piano-keyboard lid on their fingers if a wooden wedge is forced between one edge of the open lid and the piano. Also, a friction-type cabinet catch installed on a piano-bench lid will prevent tots from lifting the latter.

CANDLEHOLDERS—

and centerpieces from lipstick caps
in wooden cutouts



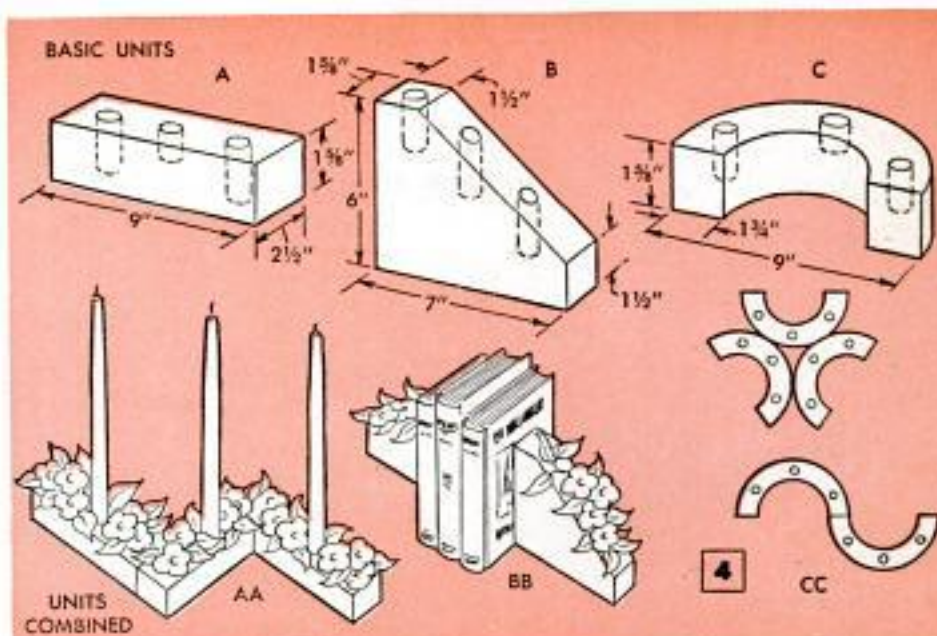
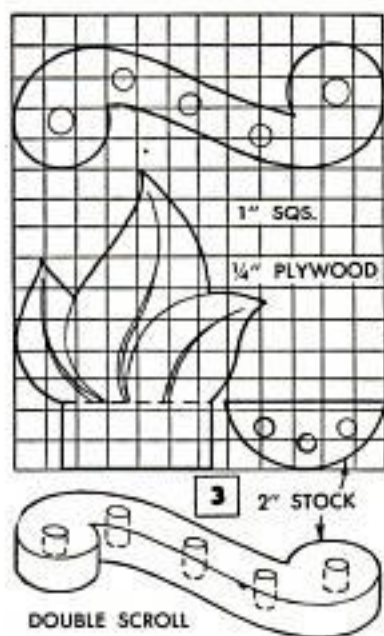
Metal caps from lipstick tubes are fitted in holes bored in these holders to provide water containers

SIMPLE GEOMETRIC SHAPES cut from hardwood blocks are the basic units for these attractive candle and flower holders that can be used as centerpieces, book ends and wall shelves. Metal caps from lipstick tubes are set in holes drilled in the holders to provide water containers. Short-stemmed flowers, difficult to arrange in other types of containers, fit neatly in the caps. Fig. 1 illustrates a simple wall shelf, consisting of a semicircular block fitted with a plywood back scrollsawed in a leaf shape. The leaf is painted green with darker green "veins." The squared drawing in Fig. 3 gives the dimensions of

this planter. In Fig. 2 is illustrated a centerpiece that is a double scroll. It also is dimensioned in Fig. 3. Detail A in Fig. 4 shows a simple rectangular block unit, several of which can be combined to provide an extended centerpiece for a long table, or otherwise arranged as in detail AA. Detail B in Fig. 4 shows clever flower holders that double as book ends, as in detail BB. Detail C in Fig. 4 shows a C-shaped unit, multiples of which can be arranged in an almost infinite number of ways. Diameters of the holes in the unit will depend on the sizes of candles and lipstick tubes used.

Bess A. Lee, Littleton, Colo.

Details below give dimensions of various types of candleholders cut from hardwood block and plywood



X781



ANIMATED

Blue-Jay

WEATHER VANE

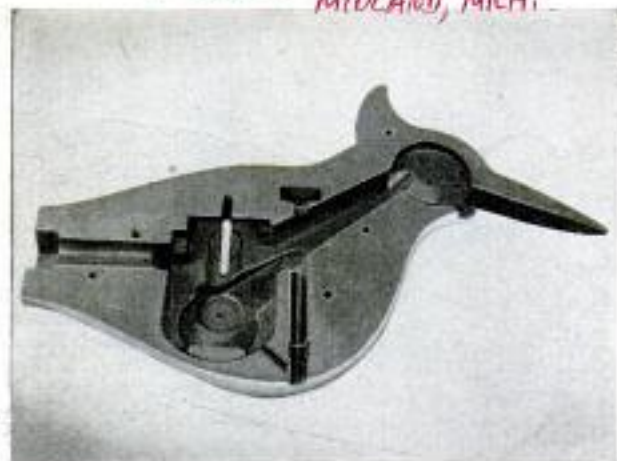
HOVERING on a pole in your flower garden, this "flying" blue jay, which makes an unusual and interesting lawn decoration, takes on considerable realism in the slightest wind. The wings rise and fall in a lifelike manner as the beak slowly opens and closes. The ornate fan tail rotates with sufficient speed to create unusual color patterns as the bird swings to face each slight variation in wind direction. Its lifelike coloring helps to make it a rare conversation piece among bird watchers everywhere.

By H. W. Bull

9 NORWICH COURT
MIDLAND, MICH.

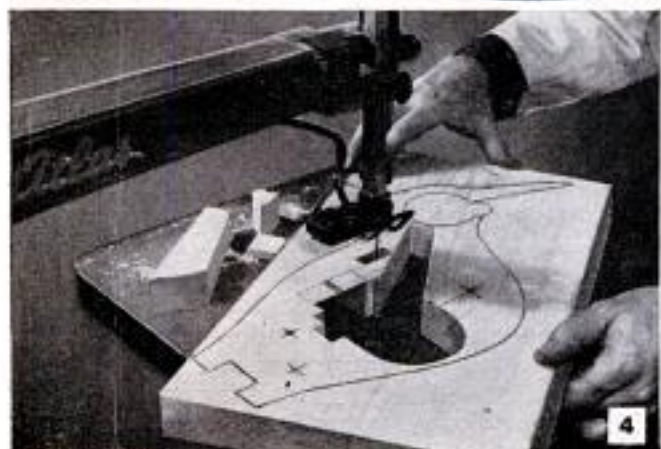
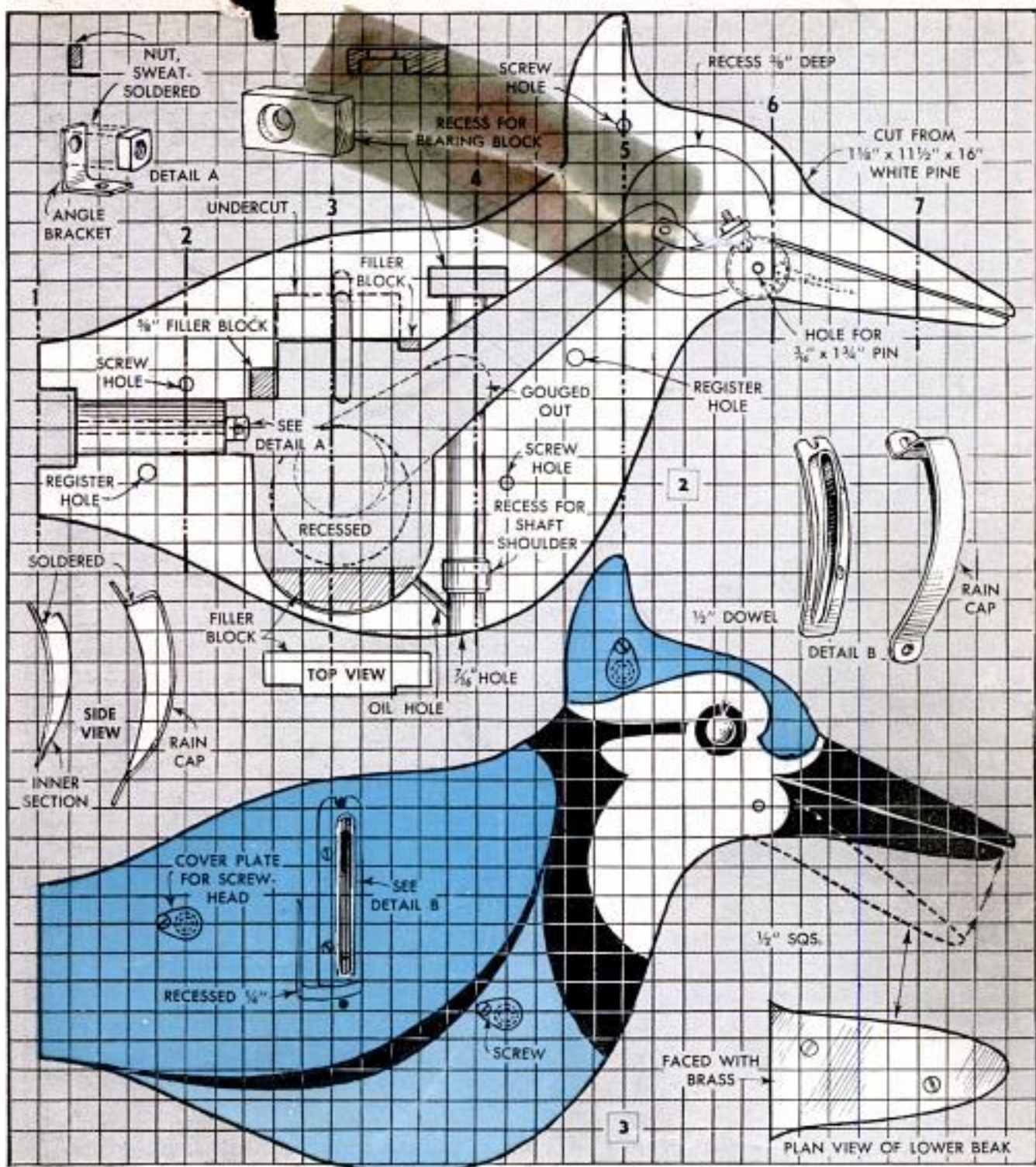
Making the Body

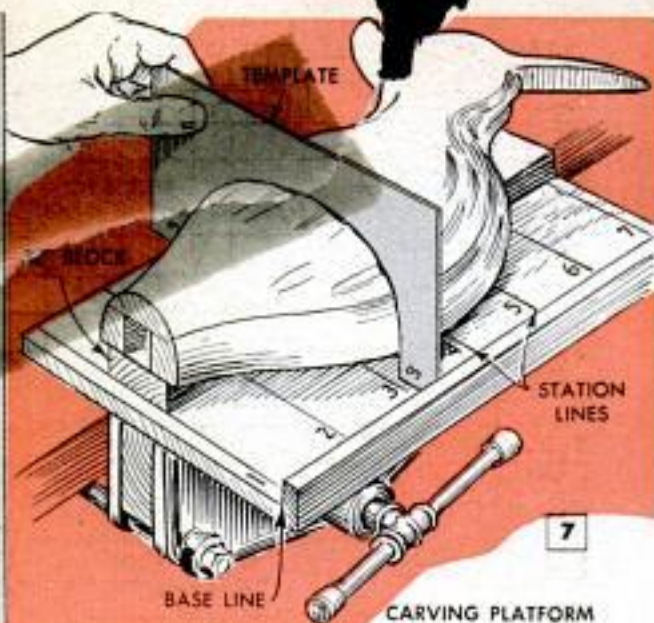
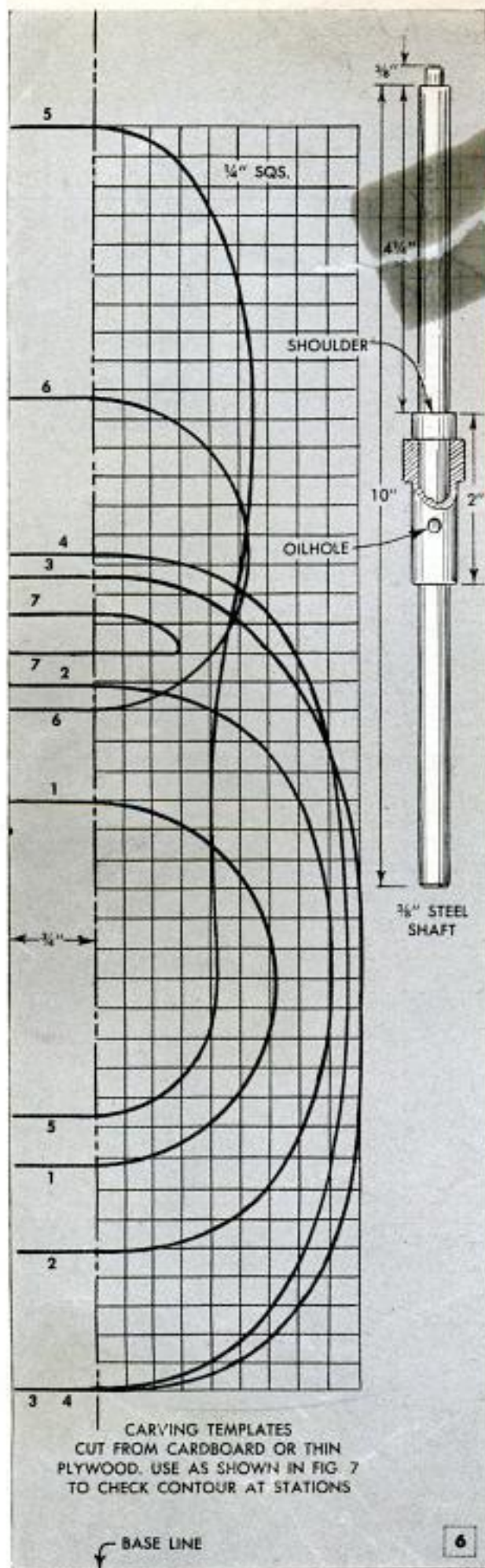
Make the body first. In this way you will



1

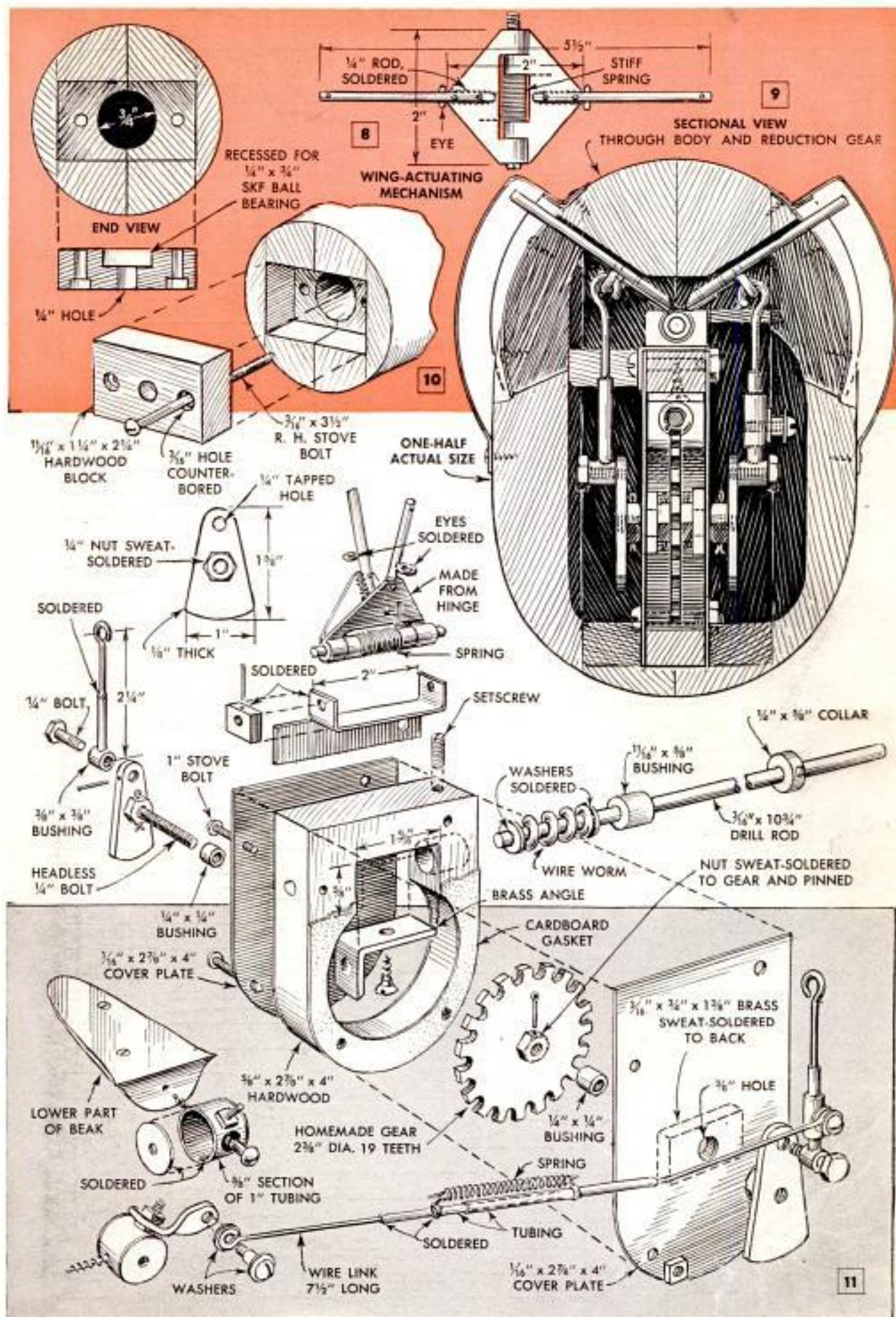


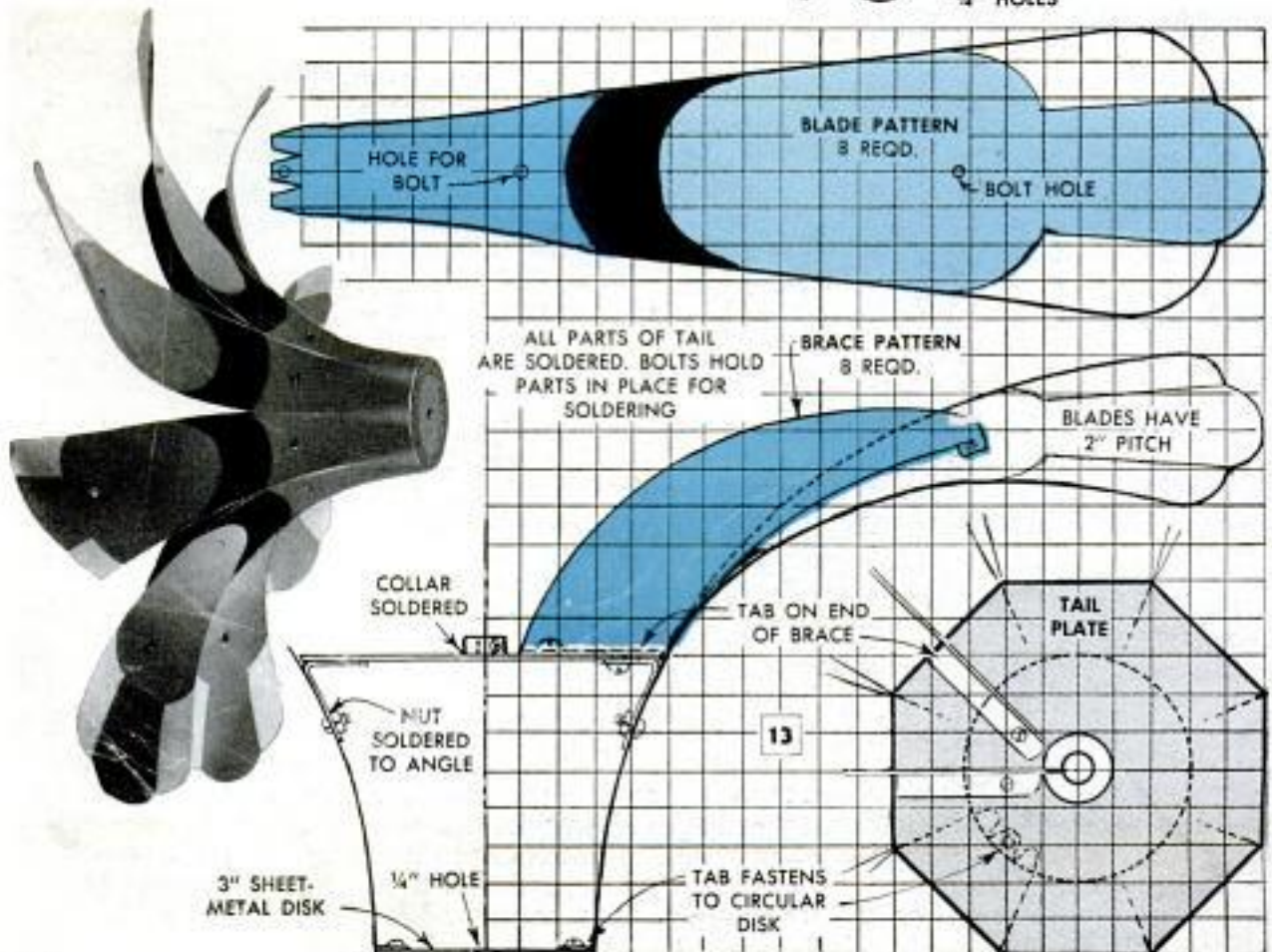
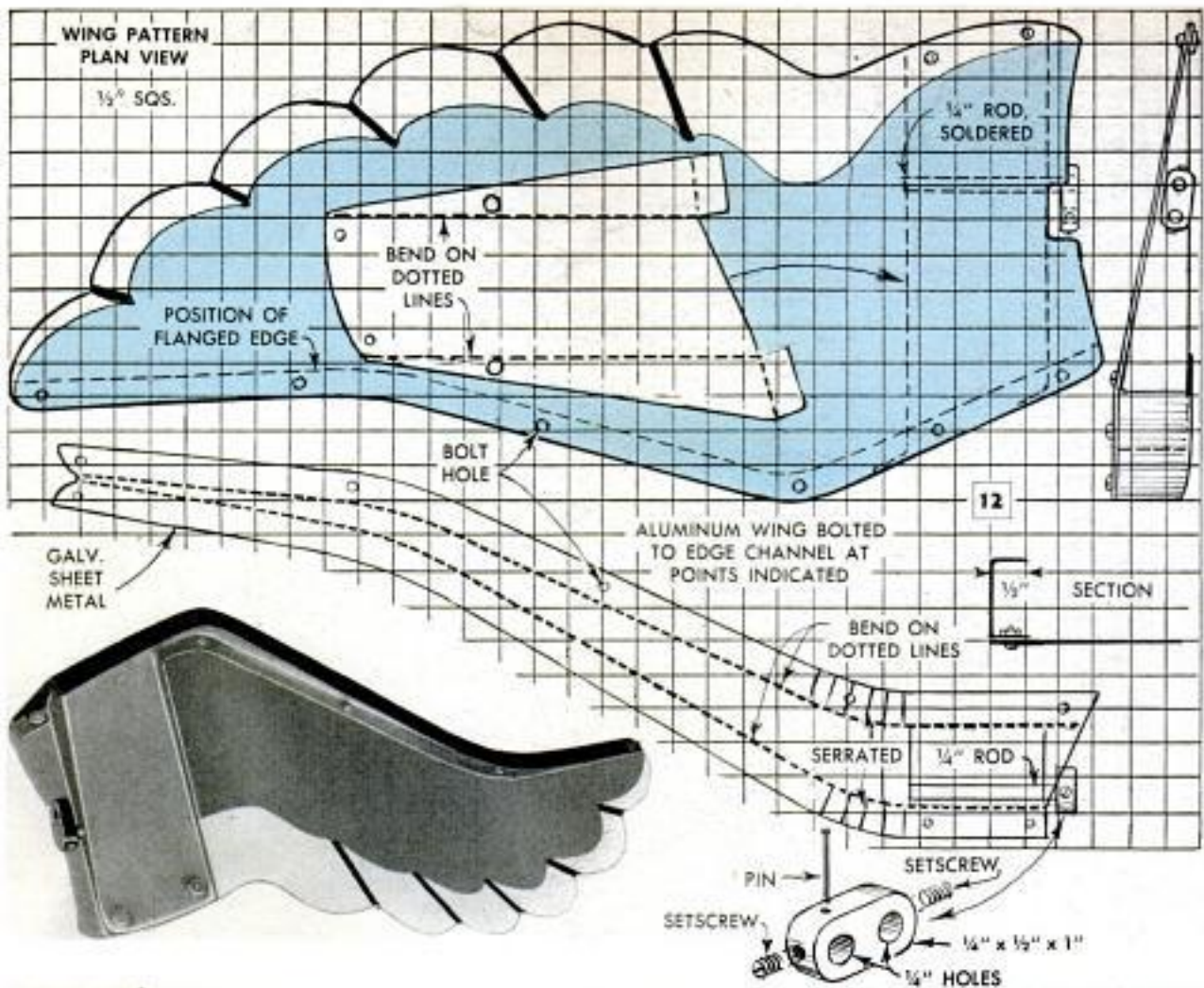




find it easier to follow through with the construction steps. The body of the bird consists of two sections which are made right and left-hand. As shown in Fig. 1, both have cavities for the wing and bill-actuating mechanism. Although the photos show that the cavity of one differs somewhat from the other, for all practical purposes both could be hollowed out the same. Each section of the body is made of two pieces of $1\frac{1}{8}$ -in. soft pine, 11 in. wide and 16 in. long, which, after being hollowed out, are glued together to form one half. By making each half from two pieces, you actually can jigsaw a lot of the cavity. The first step is to make a paper pattern following Fig. 2. Where filler blocks are indicated in the pattern, disregard these and plan on sawing out the areas. It is easier to glue these in later. Jigsaw all the shaded area as in Fig. 4, working one piece as a left-hand unit and the other right-hand. The second, or outside, layer of each section requires a certain amount of recessing to assure clearance for the working parts. It's not too important how neatly this is done, most of it can be cut away with an expansive bit and a gauge and chisel. Just don't go too deep. Study the photos in Fig. 1. Before gluing both layers of each half together, undercut the area indicated at a 40 to 45-deg. angle. Each half now consists of a block $2\frac{1}{4}$ in. thick which can be bandsawed as in Fig. 5 to give the rough profile.

Registering holes are drilled in the sections for pins which align the halves when placing them together. The pins can be short pieces of dowel or tubing. You'll notice in studying the pattern that a $\frac{1}{4}$ -in. slot is made completely through each outside layer to let the wing shafts protrude. You'll also notice that the head is recessed $\frac{3}{8}$ in. deep on the inside to provide





clearance for the mechanism which actuates the beak, the lower half of which pivots on a steel pin made from a headless screw and turned into a hole at the point indicated.

Holes for the tail and mounting shafts should be made while the body is still in block form and can be clamped in a vise. Place the halves together and bore the tail hole with a $\frac{3}{4}$ -in. bit and the other at right angles to it with a $\frac{7}{16}$ -in. bit. In each case, spot the bit on the parting line so that you bore half of the hole in each half. The recess in the end, Fig. 10, was automatically formed at the time you jigsawed the interior. This recess is for a wooden block which seats a ball bearing. The block is held in the recess with two long stove bolts. Nuts soldered to small metal angles are located in the cavity so the bolts may be turned up tightly. See detail A, Fig. 2.

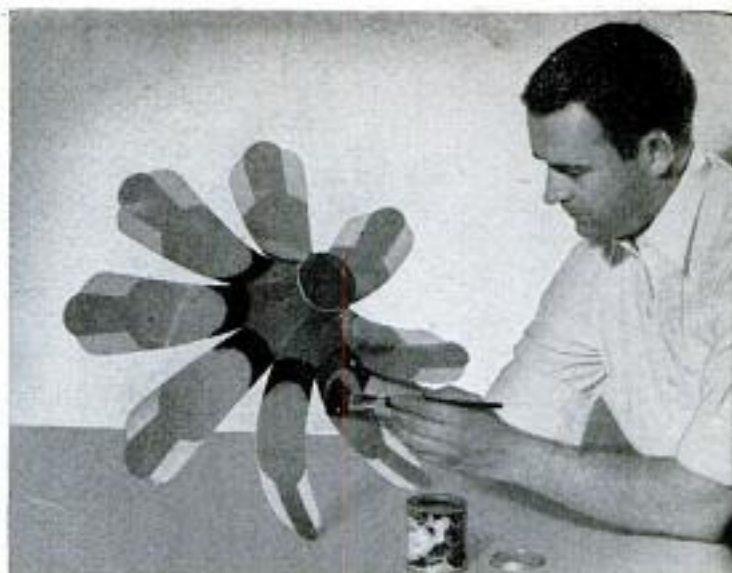
Carving the Body

You are ready to carve the body. Each half is carved separately. For this you will need to make a carving jig like the one shown in Fig. 7. As you can see, it consists of a base board about 12 in. wide which is screwed to a vertical member for clamping in a vise. Seven station lines, $2\frac{1}{2}$ in. apart, are ruled across the board and numbered. The bird is supported $\frac{3}{4}$ in. above the base board by a scrap about $2\frac{1}{2}$ in. wide and placed at the center. This is first screwed to the bird from the underside and then to the base board from the top.

In addition to the carving jig you will need a set of contour templates. These are drawn on lightweight cardboard following Fig. 6, each one measuring 4 x 12 in. They, too, should be numbered to correspond with the station lines on the carving jig.

Making the Reduction Gear

The "heart" of the bird consists of a small worm-type reduction gear that is driven by a shaft propelled by the tail. It provides the up-and-down movement to the wings as well as to the beak. Crank arms on the reduction gear actuate the wings, while a spring-loaded connecting rod of wire attached to one of the crank arms, actuates the beak. The spring cushions the closing of the beak and prevents damage. The pull-apart drawing in Fig. 11 shows how the reduction gear is assembled around a centerpiece of hardwood that houses the worm and gear. This is packed with grease and sealed with cardboard gaskets between the metal cov-



Follow the color scheme in Fig. 13 for painting the outside of the tail vanes. Reverse the color scheme on the inside, painting what's white, dark blue, and the light-blue areas white

ers. The worm is made by winding a $\frac{1}{8}$ -in.-dia. rod around the $\frac{1}{4}$ -in. shaft and soldering in place. You'll notice that part of the wing-shaft assembly is an altered hinge which is fitted with a stiff spring to offset the weight of the wings and to give a smooth positive action, free of play. This part is detailed in Fig. 8. The sectional view in Fig. 9 shows how the completed mechanism fits inside the bird and how the wing shafts extend through the slots in the body. These slots, incidentally, are covered with rain caps consisting of an inner and outer section. They are fashioned to the shapes shown in detail B, Fig. 2, from sheet metal and soldered together so they will conform to the contour of the body. Each part is attached separately with small screws, the inner part being placed in a partial recess cut in the body. Three wood screws hold the halves of the bird tightly together, after which the screw heads are concealed with cover plates. See Fig. 3.

Wings and Tail

The wings and tail are detailed in Figs. 12 and 13. The wings are made right and left-hand and are formed from sheet aluminum to make them as light as possible. The wings attach to their shafts with steel blocks fitted with setscrews. The tail is comprised of eight vanes fashioned from galvanized sheet metal which are bolted and soldered together to a hollow hub. The curve of the vanes lets the bird swing from side to side during a high wind and in doing so, spill the wind. The tail is attached to the shaft with a setscrew-fitted collar soldered to the hub. The vertical mounting shaft for the bird is detailed in Fig. 6. The upper end rests on a bearing ball seated in a hardwood block. ★ ★ ★



Cutting Rafters Without a Framing Square

By Louis Martin Reitz

ALTHOUGH a professional carpenter who specializes in building roofs may need a thorough knowledge of the many uses of a framing square, such skill is not necessary for the average home craftsman who wants only to put a roof on a garage or other simple structure. Instead, the one-roof builder can use scale drawings to determine the correct angles to cut on the ends of the rafters, and also to determine the lengths of the rafters.

Because related buildings, such as a garage and home, should have roofs with the same pitch, the first thing to do is to determine the pitch of the house roof. Technically, pitch is the span of a house divided by the rise. Span is the distance from the outside of one wall, excluding sheathing and siding, to the outside of the opposite wall. Rise is the vertical distance from a horizontal line drawn across the tops of the opposite walls and at a point midway of the rafters at the peak of the roof. The approximate point is given, because it actually is determined by a line drawn parallel to the edges of the rafters from the point of the bird's-mouth, or plate, cut near the lower end of the rafters, as indicated in the upper detail. Although it is handy to know this terminology, it is not necessary for building a roof. Three methods can be used by the home craftsman to copy the pitch of a house roof. One way, if the attic is unfinished, is to copy directly from the roof. Three strips of wood are used, two being held against the rafters at

the peak, then clamped or nailed together, with the third strip used as a brace for the pattern. The second method is to measure the outside of the house to find the span and rise, and thus the pitch. A third method is to make a number of scale drawings of the garage, with roofs of various pitches drawn on it. The one that looks closest to matching the house pitch is the one to use.

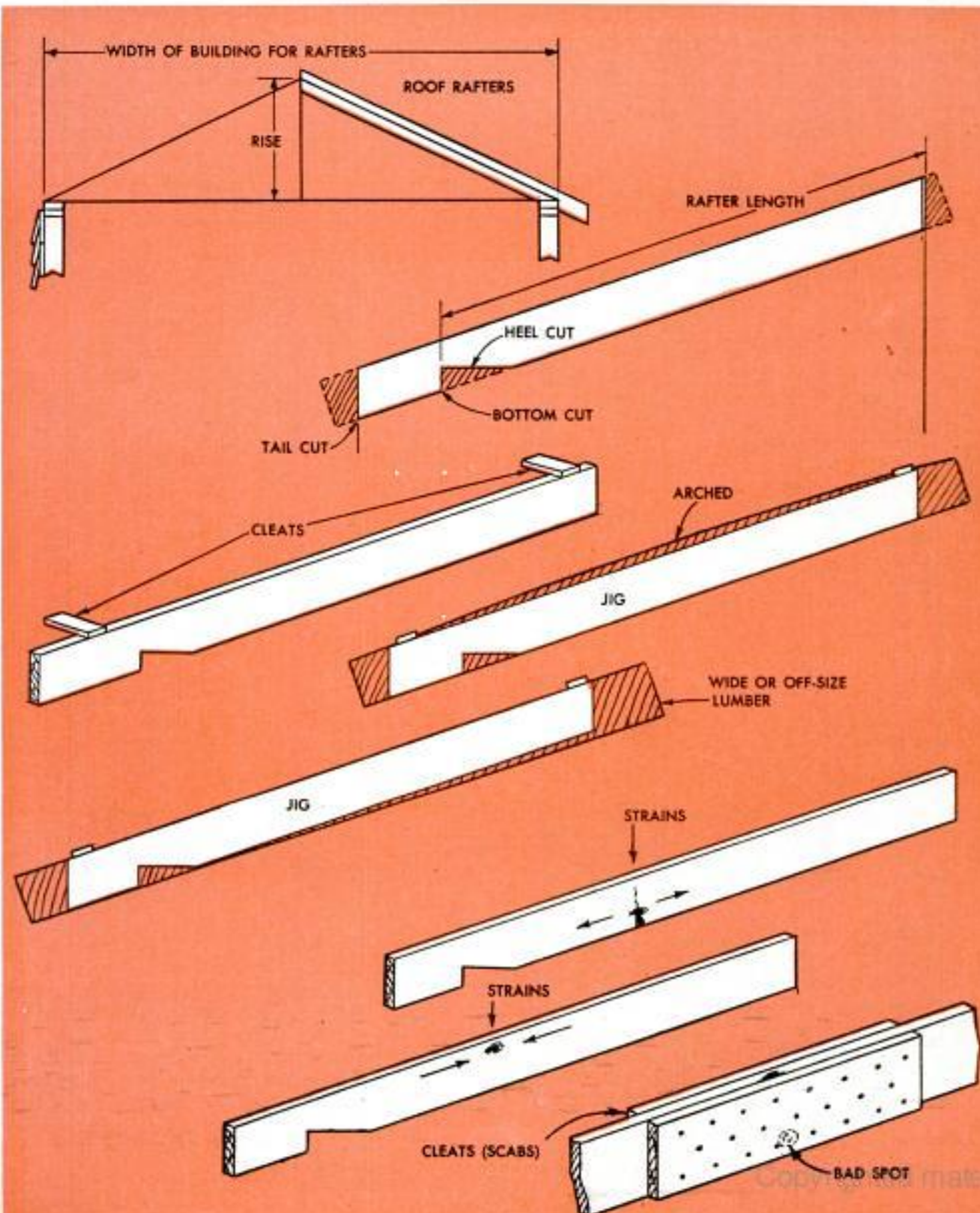
When the pitch has been determined, a scale drawing is made; $\frac{1}{4}$ in. to the ft. generally being the easiest scale to handle. The drawing should be like the upper detail on the opposite page. Using a square, vertical lines are extended from the ends of the span and at the rise. The lines should extend about 6 in. past the rafter line, so the angles at the rafter ends can be transferred to a length of 1-in. stock that is cut to make a jig. If the roof is to extend beyond the walls, which is the best construction, the scale drawing should include the bird's-mouth cut, the bottom cut of which is parallel to the cuts on the rafter ends. The heel cut is parallel to the span. The bird's-mouth cut primarily is to keep the garage walls from being forced outward. The lengths of the rafters also are determined on the scale drawing. Remember that the upper end of each rafter must be shorter by half the thickness of the ridge board, which is 1-in. stock. On the lower end, allowance must be made for the 1-in. facing strip if the eaves are to be boxed. When the lengths of the rafters have been determined, shorten or lengthen the tail

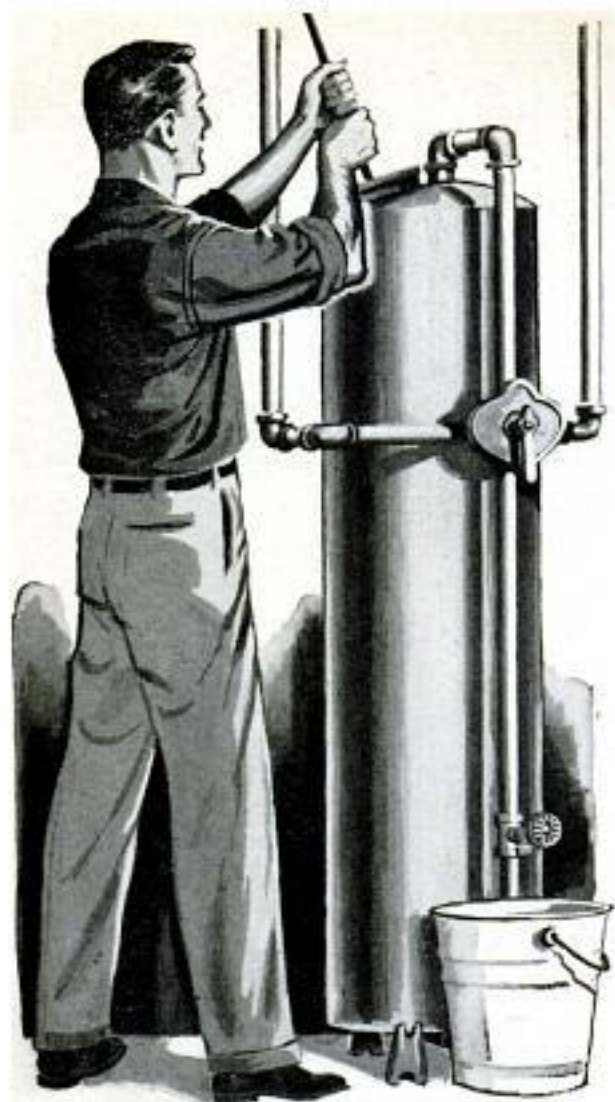
measurement so that standard lengths of 2-in. lumber can be used to minimize waste. Standard lengths are in multiples of 2 ft.

The rafter jig has a cleat nailed to its upper edge near each end as indicated in the details. Fitting the jig over the 2-in. stock will permit drawing the angles for both ends and the bird's-mouth. As a rule of thumb, spans of 6 ft. or less require a 2 x 4, spans of 6 to 10 ft. take a 2 x 6 or 2 x 8, and a 14-ft. span needs a 2 x 10. For spans longer than 14 ft., a 2 x 12 is used.

If unplanned lumber is used, it may not be accurately dimensioned, and may be bowed or have knots or cracks in it. Allow-

ance must be made for these irregularities. If the lumber is arched, keep the crown of the arch upward, so a snow load on the roof will keep the lumber under compression and will not allow the roof to sag, as would be the case if the crown were down. When lumber is wide or off size, the jig will keep the top of that particular rafter aligned with the tops of the other rafters. If lumber has large knots or checks in it, keep the knots and the open ends of the checks upward, so the load on the roof will compress the damaged spot, rather than force it open. On badly damaged stock, it is necessary to install cleats. ★ ★ ★





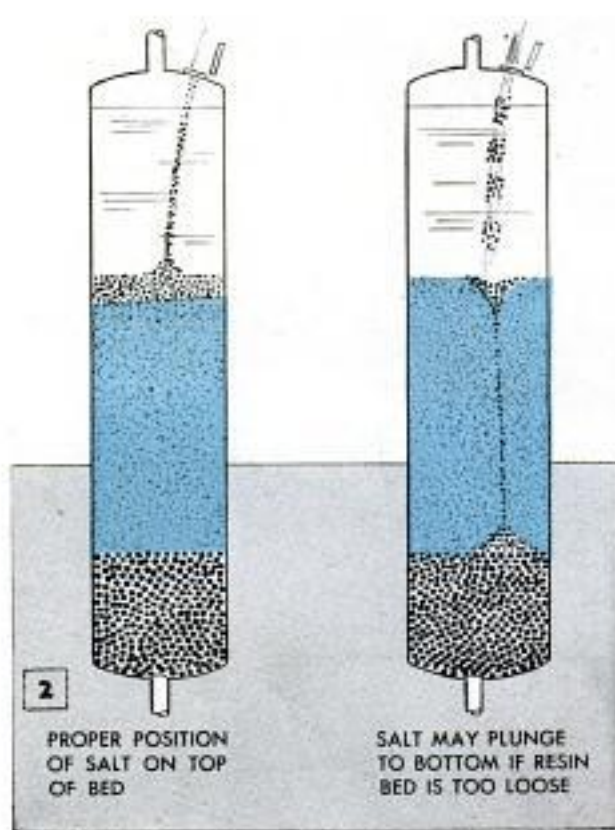
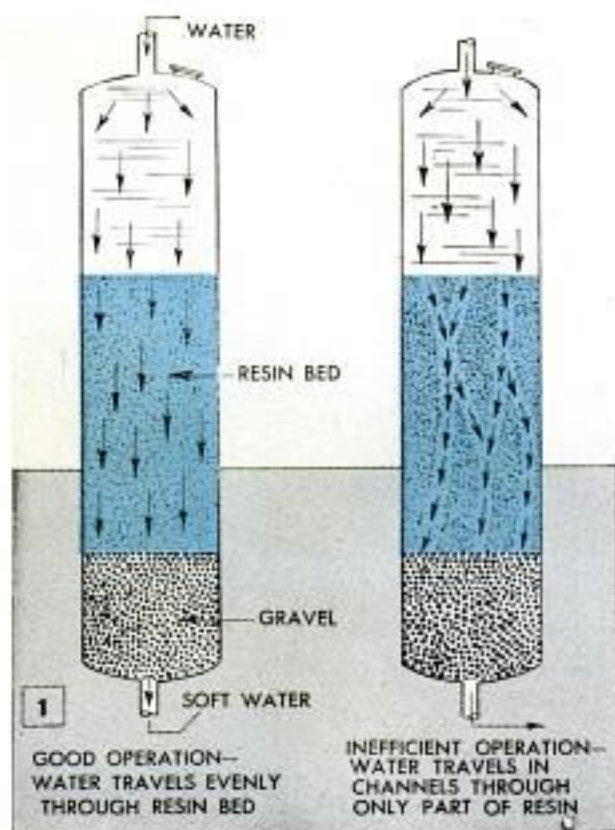
YOUR WATER SOFTENER

is always on the job when you follow a regular maintenance schedule

By B. W. Nies

ALTHOUGH a home water softener is a simple and reliable appliance, it requires proper maintenance to assure its efficient operation. A thorough understanding of the principle on which a water softener works will aid the homeowner in doing a better job of keeping it at top efficiency.

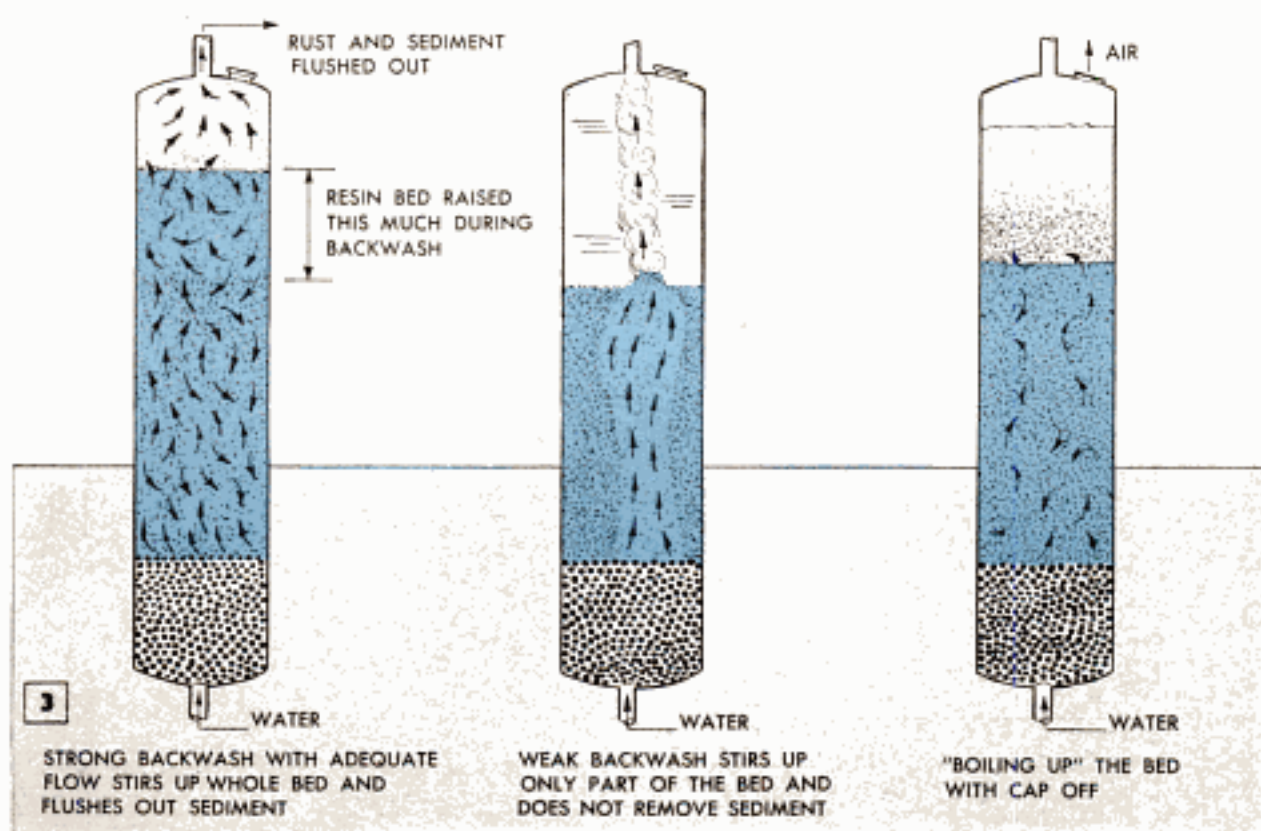
The simplest and most common type of home water softener consists of a tank containing a thick bed of tiny synthetic-resin or mineral beads, supported on a layer of gravel. When the incoming "raw" water flows downward through this bed, the "hard" calcium and magnesium ions are taken up by the resin, and "soft" sodium ions are released in exchange. When the resin has given up all of its sodium ions, it must be recharged or regenerated with a strong solution of common salt (sodium chloride). During recharging, the softening process is reversed so that the accumulated calcium and magnesium salts are released from the resin beads and washed down the drain.



The softener will operate most efficiently when the resin bed is in a condition that permits all the resin beads to contact the raw water during the softening cycle, left-hand detail, Fig. 1. Any factor which removes some of the particles from operation will not only reduce efficiency, but will produce need for frequent regeneration. Such a condition will exist when the raw water travels only through channels in the resin, right-hand detail, Fig. 1, rather than evenly through the bed. To "fluff" the resin bed to uniform density, it generally is standard practice to "backwash" the bed by reversing the water flow when regenerating the softener, left-hand detail, Fig. 3. This operation also flushes away sediment that is filtered out of the water and settles on top of the resin bed. However, if water pressure is low, only part of the resin bed may be stirred, center detail, Fig. 3, and the sediment will not be flushed away. On the other hand, excessive pressure may stir the resin so violently that it will "boil up" too far and some may be washed down the drain. Water pressure can be checked by noting the action of the water and resin bed when the cap of the softener tank is removed.

Backwashing is done in the following manner: First, turn the control valve to "backwash." Then, open the drain valve on the softener and drain it until the water runs clear. Next, turn the control valve to "off." Remove the cap on the softener and drain water until it is about even with the top of the resin bed. Use a stick or rod to gently break up the sediment crust, turn

the control valve to "backwash" and let the water rush in at full pressure until it reaches the top of the tank. This effectively boils up the bed, right-hand detail, Fig. 3. Now, replace the cap and continue backwashing in the normal manner until the discharge water is clear. Check the drain to make sure no resin is being washed out of the tank. Finally, turn the control valve to "soften" or "rinse" and run water through the tank to settle the resin bed, which will assure that the salt will not drop down through the bed, right-hand detail, Fig. 2. Salt, either granulated or in pellets, now is added if the softener is of the direct-salting type. Rock salt may be used if the softener has a separate brine tank. Drain out just enough water to make room for the salt, and add it slowly, spreading it over the surface of the water, left-hand detail, Fig. 2. While the salt solution is being passed through the bed, keep the water flow moderate to allow an appreciable time for the salt to dissolve and react with the resin. Taste the discharge water with the tip of your tongue. A very bitter taste means the operation is right, while a faint bitter taste means raw water is channeling through part of the bed and not all of the resin is being regenerated. If a strong salt taste persists after the bitter taste stops, it means an excess of salt is being used. Reduce the amount of salt until the salt taste persists just enough to show it is present. Salt consumption often may be decreased as much as 50 percent without reducing softening efficiency. ★ ★ ★



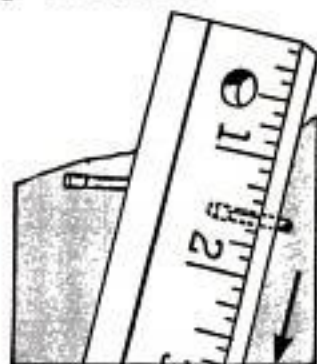
Auxiliary Bars Double Towel-Rack Capacity



It takes only a few moments to double the capacity of bathroom towel racks when it becomes necessary to take care of extra guests. Auxiliary bars of nonrusting metal, stored away conveniently, simply are slipped onto the racks as indicated. The hook-shaped ends of the extra bars are made to grip the arms of the racks, bearing upwards, while the portions of the bars crossing the racks bear downwards.

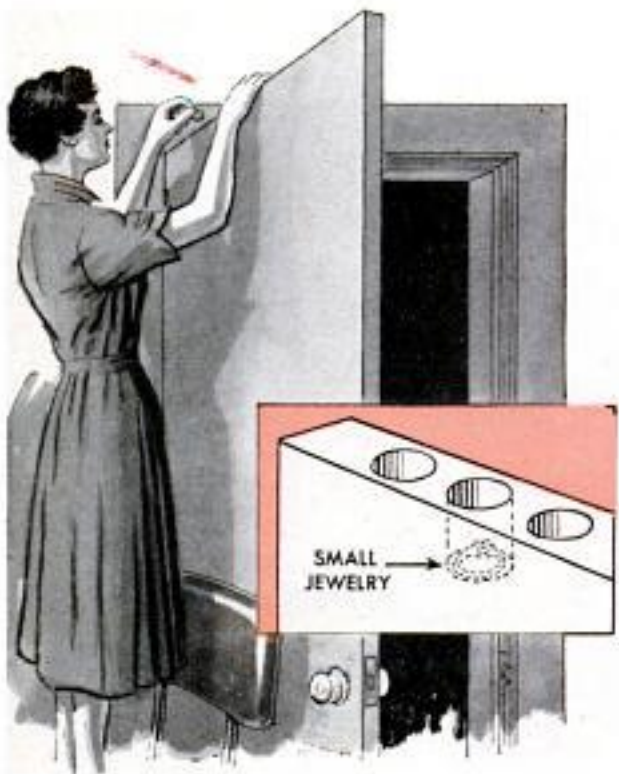
Simplify Hanging Yardstick

Hanging a yardstick on a nail beyond your reach is no problem when a "guide nail" is used. The latter is located so that when the edge of the yardstick contacts it, the hole aligns with the hanger nail.



Valuable Small Items Hidden Inside Top Rail of Door

Although within easy reach, a relatively safe location for small items of value is in the top edges of doors. Several holes 1 in. in dia. and about 1½ to 2 in. deep bored in the top of a door will provide a hiding spot for rings and even small watches. Stuff cotton or cloth in the holes to prevent the jewelry from rattling.



Sawhorse Is Adjusted for Height By Extension Rail

This extension rail can be added to almost any sawhorse to provide the extra height that sometimes is needed for certain jobs. The rail consists of a cross piece and two vertical legs that slide in U-shaped metal sleeves screwed to the end plates of the sawhorse. Each leg of the extension rail has holes drilled in it 2 in. apart to permit vertical adjustment.

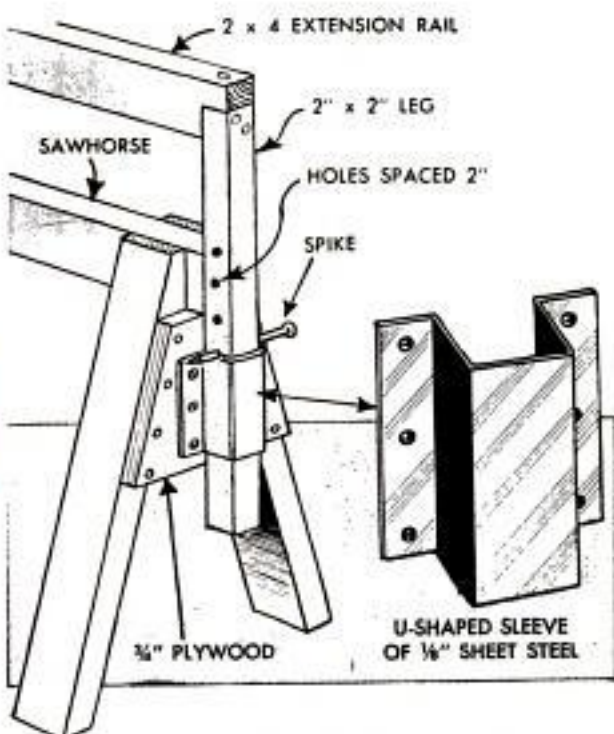


Photo Copying Is Easy—

when the camera is mounted on a sliding door

By William G. Waggoner

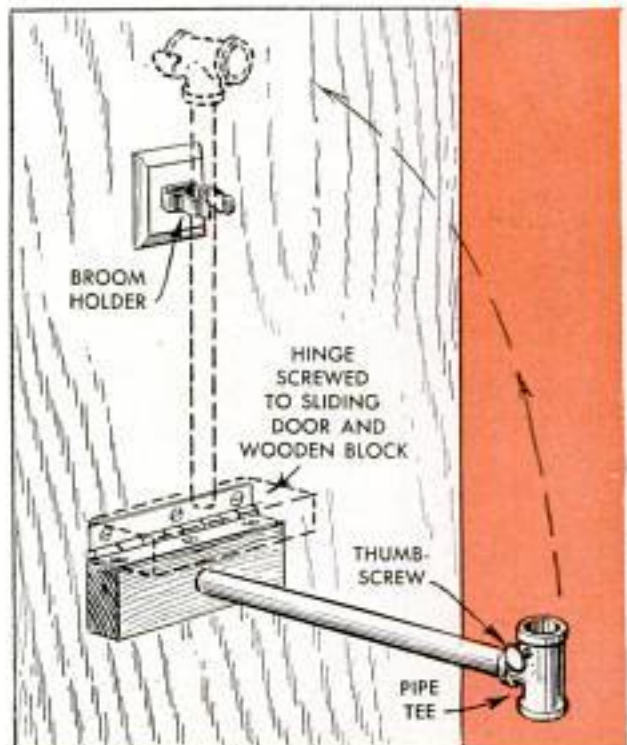
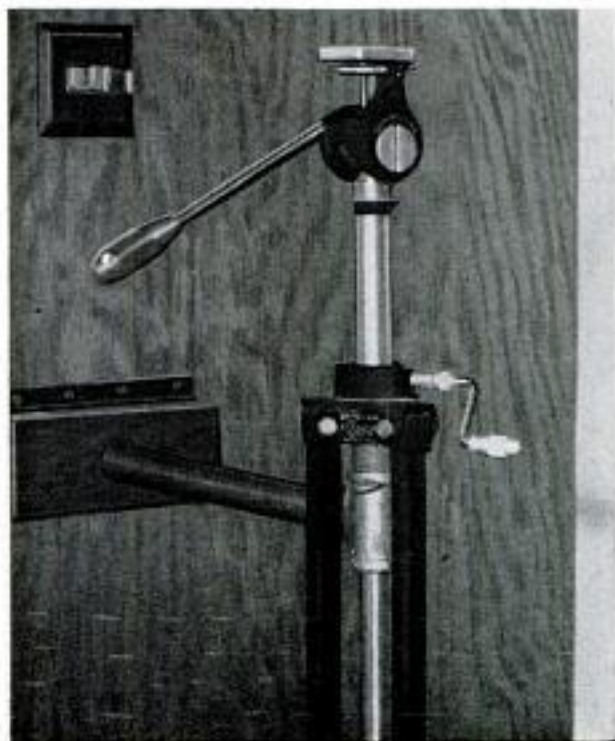
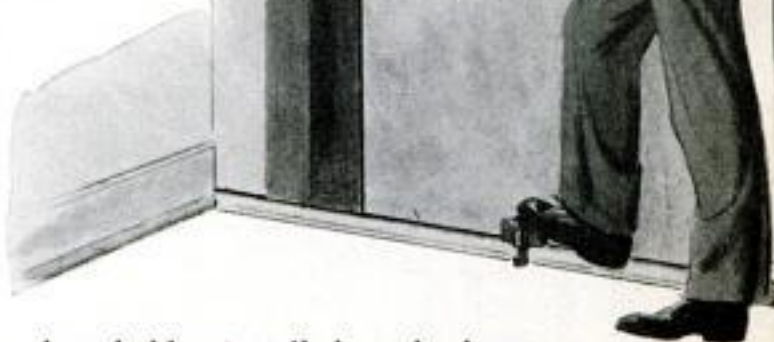
IN ADDITION to picture taking, your camera and elevator tripod can be used for photo copying simply by mounting them on a bracket screwed to the sliding door of your darkroom. The holder for the material to be photographed is mounted on the wall opposite the camera as in the illustration.

The mounting bracket is made of a pipe tee screwed on a 15-in. length of pipe threaded at both ends. The latter is screwed into an undersize hole drilled in a hardwood block as shown in the drawing. A length of piano hinge screwed to the block and the door, and a broom holder screwed to the door, permits the entire bracket to be folded against the door when not in use.

Vertical adjustment of the copy camera is made by elevating the tripod to the desired position and then locking it in place by tightening the thumbscrew fitted in a hole tapped in the pipe tee. Lateral movement of the copying unit is checked by means of a foot-action

door holder installed at the bottom edge of the sliding door.

Photo below, tripod is locked in position when thumbscrew is tightened against shoulder on elevator column. For tripods without a similar shoulder, tripod is locked by tightening thumbscrew lightly against column

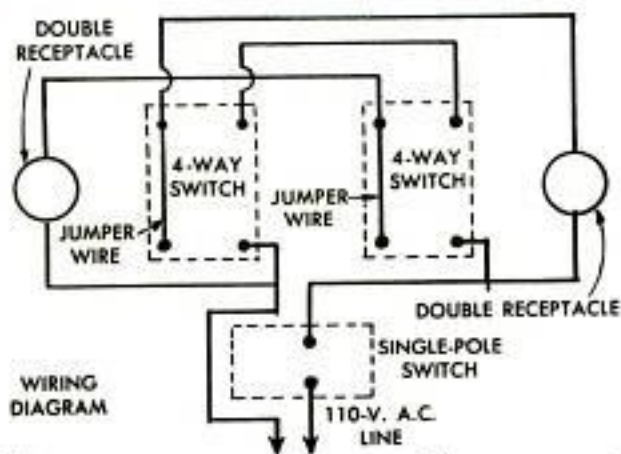


Photoflood Control Box Simplifies Lighting

By Howard R. Clark

HERE IS an electrical control box that will enable you to turn on by remote control the floodlights desired and regulate their intensity without moving from the camera. When pictures are taken away from the home, you have an extension cord and necessary light switches in one unit. Constructing the control box and installing the electrical parts are relatively simple as shown in the drawings and wiring diagram. Note that a jumper wire must be added between terminals on the left side of each four-way switch.

When in use, the unit is hung on the camera tripod as shown at the left. With a floodlamp plugged into each duplex receptacle and both four-way switches in the "up" position, two lamps will burn in series at reduced intensity. When both switches are down, the lamps burn at full brightness. When the left-hand switch is down and the right-hand one is up, the lamp plugged in the right-hand receptacle will burn at full brightness while the lamp connected to the other receptacle will be off. The lower switch merely turns on power supply. ★ ★ ★



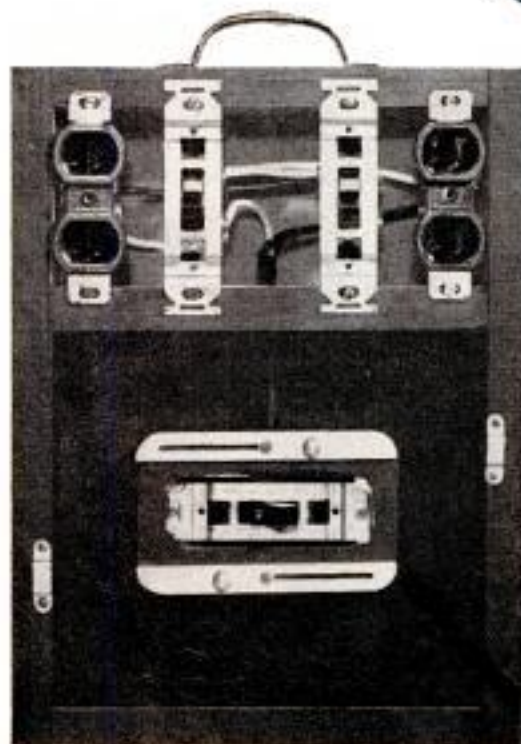
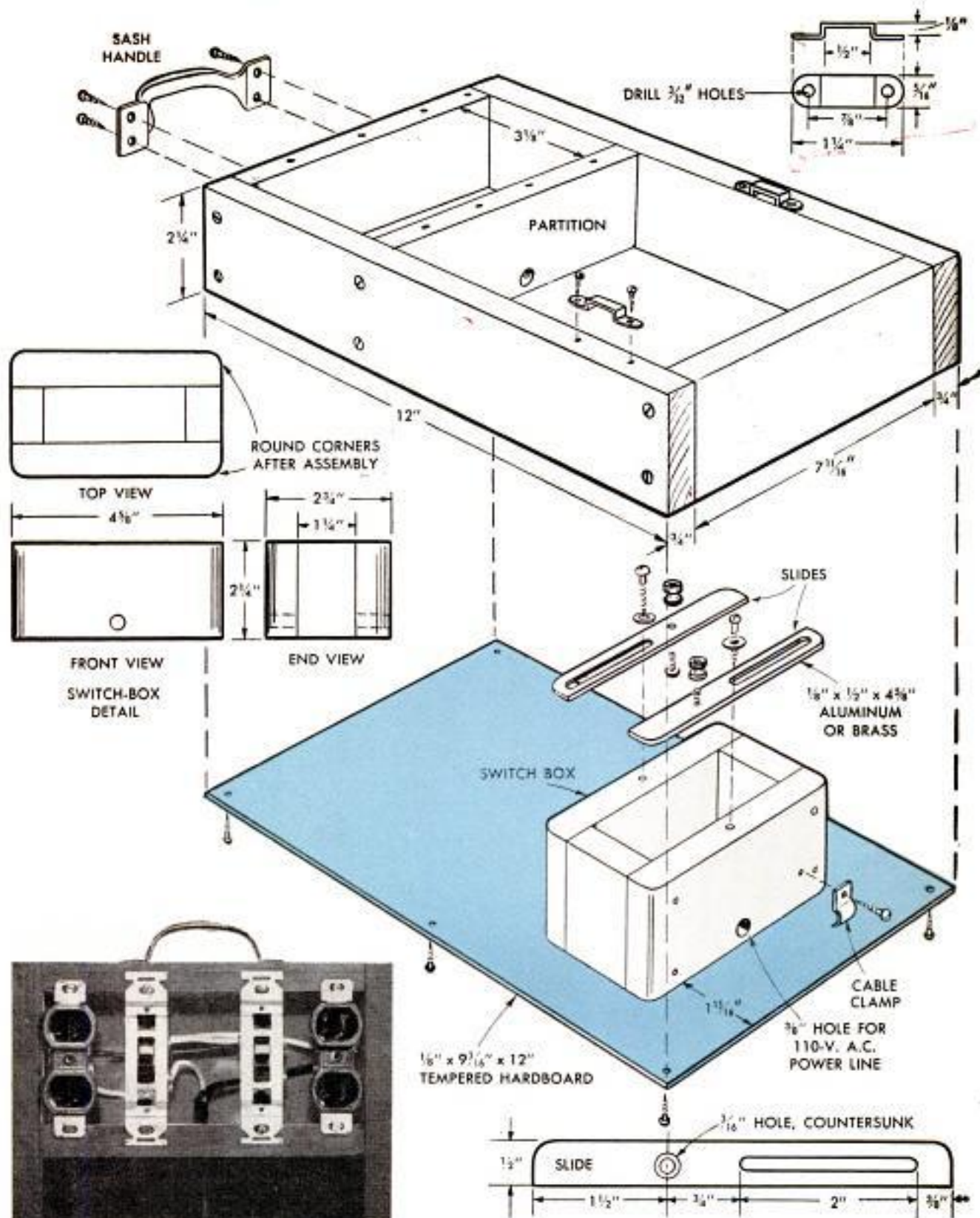
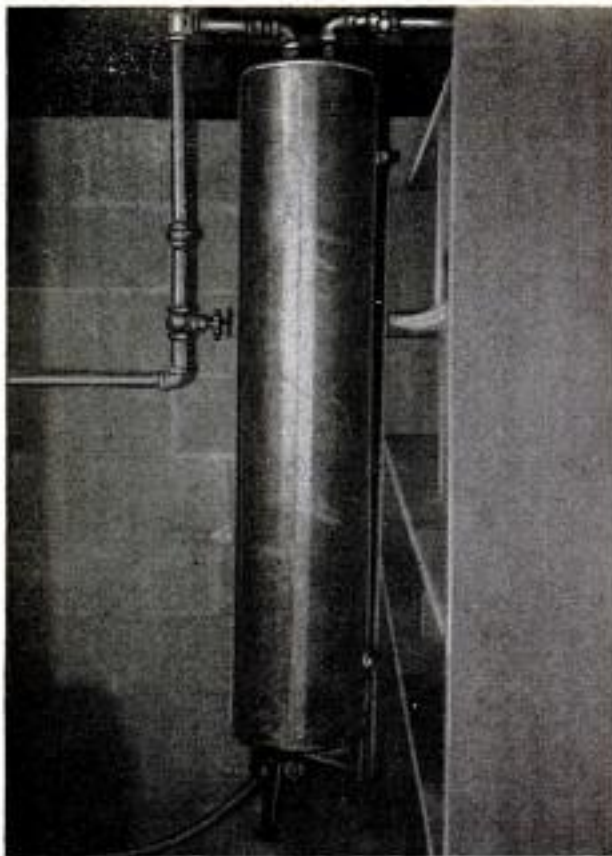


Photo opposite page, when necessary to take photos away from home studio, extension cord, switches and receptacles are conveniently carried in one unit. Cord wrapped around switch box is held in place by extending two metal slides on box

Drawings above, after gluing and nailing switch box and screwing bottom to the latter and control-box frame, all surfaces are enameled and electrical parts installed. Knurled nuts shown on metal slides are light-fixture canopy nuts



Sand Removed from Well Water By Water Tank in Supply Line

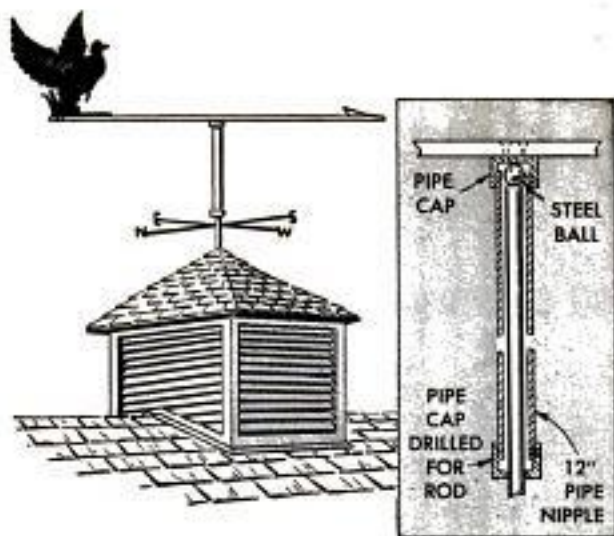
A sand trap, made from an old water tank as shown, removes sand from a well-water system to prevent it from damaging valves and fittings. Sand-laden water enters the tank at the top and flows through a vertical pipe within the tank before being discharged at the bottom where the sand is deposited. The outlet at the top of the tank is connected to the supply line. A valve installed in the bottom permits easy flushing of the tank.

D. E. Marshall, Manhattan, Kans.

Cord Loops Taped to Closet Door Provide Temporary Hat Hangers



Temporary hangers for men's hats are provided by one housewife by taping several cord loops about 28 in. long to the inside of the door on the guest closet as shown in the drawing. From 8 to 10 hats can be accommodated in this way. When not in use, the hangers are stored on a hook.



Ball-Bearing Weather Vane Has Waterproof Mounting

Any weather vane can be provided with a rainproof, ball-bearing mounting simply by installing it on a swivel made from two pipe caps, pipe nipple and rod as shown in the drawing. A steel ball, packed in grease inside the capped pipe nipple, provides a lubricated bearing surface between the rod and vane. Sizes of the parts are determined by the size of the vane.

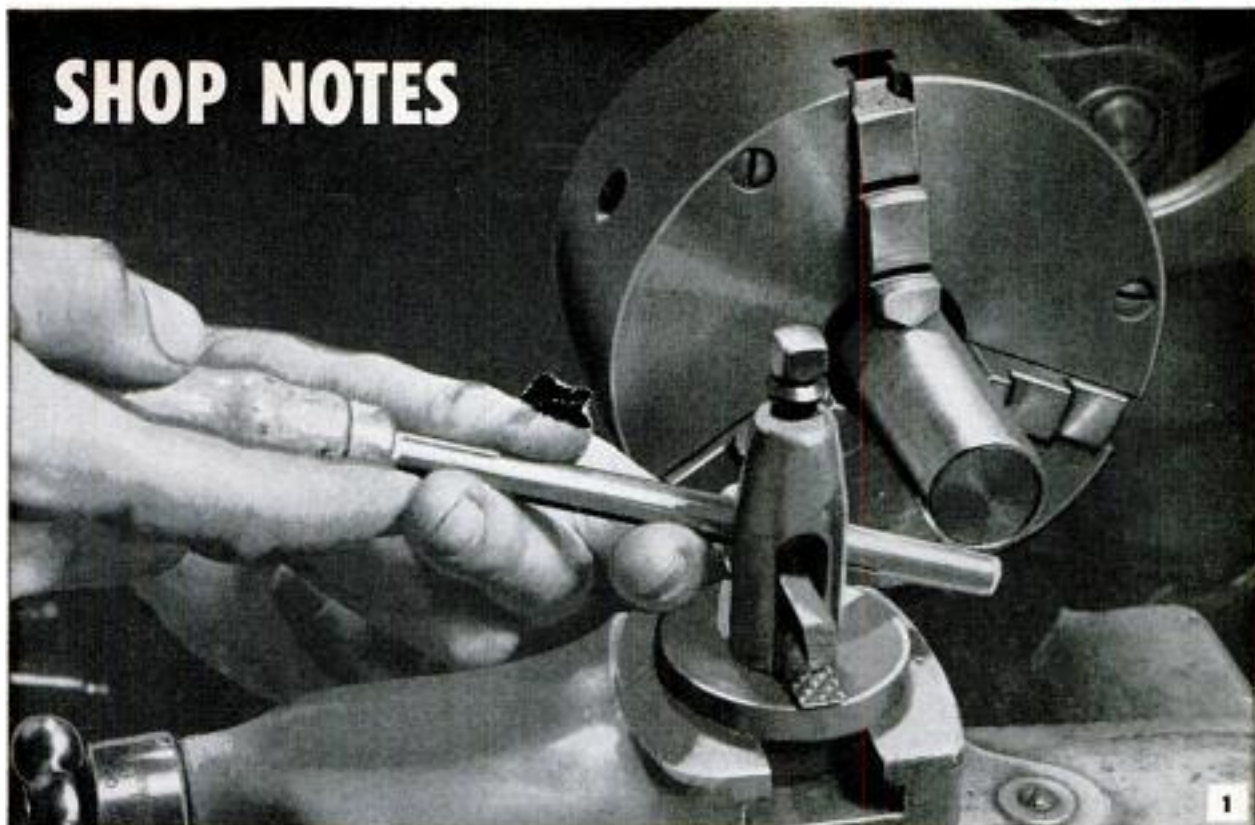
Fan Base Holds Flashlight

When using a flashlight for lighting emergency repair work, one mechanic clamps it on the base of a discarded electric fan with a hose clamp as shown in the photo. The flashlight is quickly removed for normal use when desired.

Frank A. Javor, Newark, N. J.



SHOP NOTES



BURNISHING puts a fine finish on wood or metal

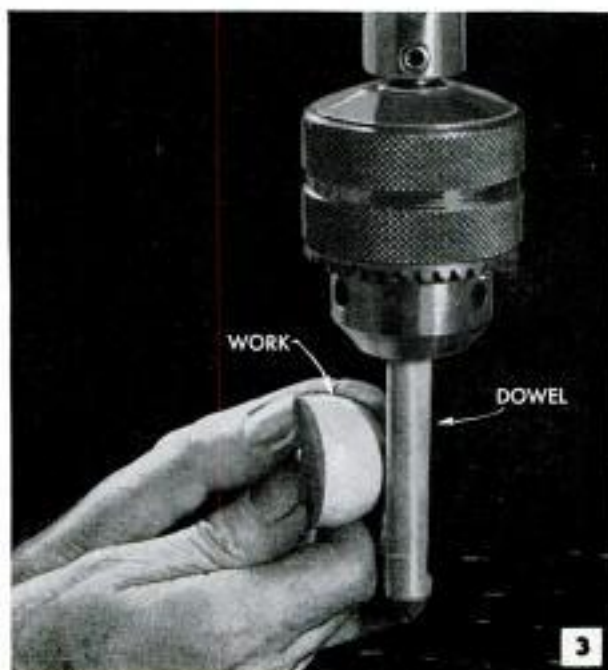
By Walter E. Burton

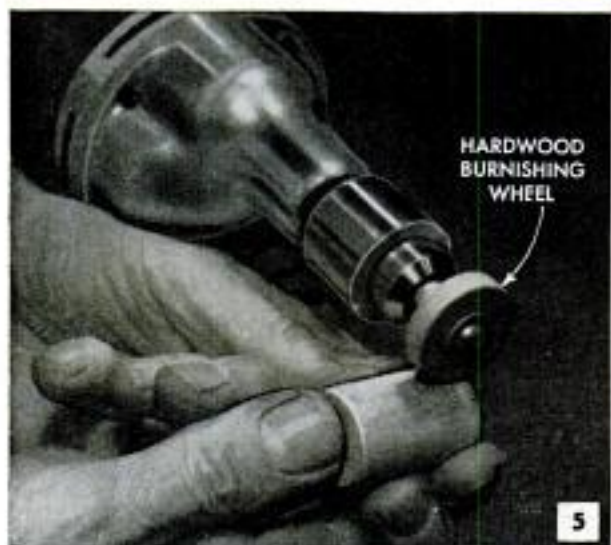
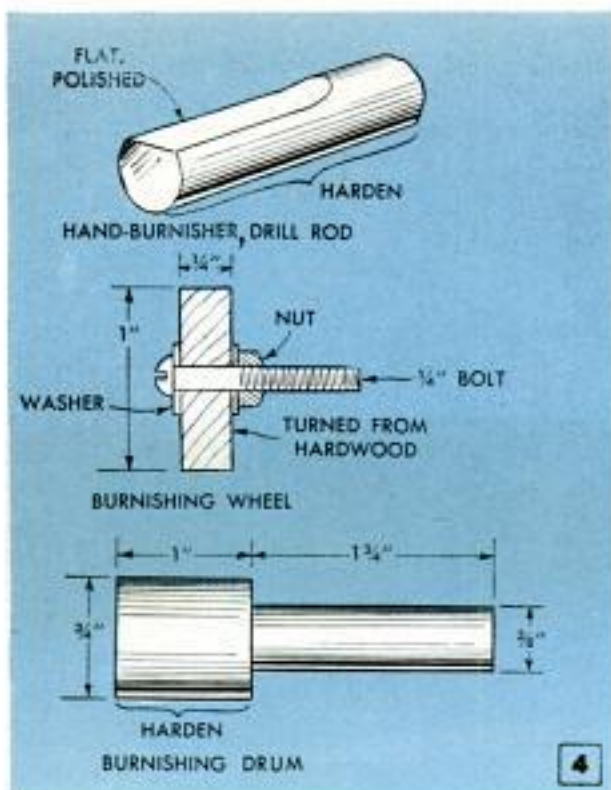
BURNISHING is a method of eliminating surface irregularities without removing material from the surface of the stock. The procedure differs from grinding, sanding and machining. It has a fairly wide range of applications from finishing costly dies to simple polishing of small wood and metal parts in the home workshop.

Simple burnishing on metal, Figs. 1 and 6, forms an infinite number of tiny facets which have the effect of changing the reflective properties of the surface, making it appear highly polished. On wood the process "lays the fibers," making the wood appear to be glass-smooth and lacquered in its natural color. Both metal and wood are velvety smooth to the touch after burnishing. Of course, not all metals and kinds of wood can be burnished. Cast iron and soft aluminum generally do not respond satisfactorily to the action of the burnisher. Neither do the coarse-grained woods such as ash. But most of the other common metals and hardwoods, especially the finer tropical hardwoods, can be given



HAND AND POWER-DRIVEN BURNISHERS





a superfine finish by burnishing alone. In the home shop applications are practical only for such work as refinishing and repairing jewelry, highlighting bronze statuary, renewing carvings, finishing model parts and small wooden novelties.

Burnishing can be done by hand, with a hand-operated tool, or with a power-operated tool. In the first instance the work is held stationary and the tool is moved over the surface in a series of strokes covering the area to be burnished. Figs. 3 and 5 are typical examples of the use of a power-operated burnisher. Representative types of hand and power-operated burnishers are shown in Fig. 2, details A to F inclusive. Those in details A, E and F are designed to be driven either in a drill press or portable drill, Figs. 3 and 5. The power burnishers A and F are detailed further in Fig. 4. The burnisher D, Fig. 2, for use in a lathe freehand, also is detailed in Fig. 4 and shown in use in Fig. 1. Burnisher D, Fig. 2, is made from drill rod, while burnisher C is made by grinding the teeth from the four sides of a square file and fitting a handle. The burnisher B is simply a small twist drill having the shank cut at an angle and the cut surface ground and polished. It is held in a pin-drill chuck and is intended for fine work on small parts.

One of the tricks in getting a fine finish on either wood or metal is to keep the tool moving and at the same time apply a uniform pressure. This is more especially true where the burnisher is power-driven and considerable heat is generated in the process. As a rule, wood is burnished dry, but most metals will take a finer finish when a light oil is used to dissipate heat and prevent any possibility of scoring the surface. When burnishing freehand as in Fig. 1, the tool is held in one hand and the lathe carriage moved slowly left and right with the handwheel. When burnishing with a crowned tool (a diamond wheel dresser also can be used) in a holder as in Fig. 6, the automatic longitudinal feed of the lathe carriage can be used, or the tool fed manually with the handwheel. It should be noted that in such setups, the tool (burnisher) should contact the work slightly below the center line. This position of the tool will offset any tendency to score the surface. As a rule when burnishing metal, the speed of the lathe spindle should not exceed 300 to 500 r.p.m. ★ ★ ★

Compressed Air Tempers Steel

After grinding very hard cutting tools that cannot be cooled in water without making them brittle, one machinist cools them by directing a stream of compressed air on the heated parts.

Electric-Fence Insulators Removed Without Damage

Electric-fence insulators can be removed undamaged from wooden posts or stakes by means of a claw hammer and a 1¼-in. pipe coupling. Slip the coupling over the insulator and use it as a fulcrum for pulling the nail holding the insulator. This prevents cracking the porcelain or bending the nail.

Stanley Clark, East Bradenton, Fla.



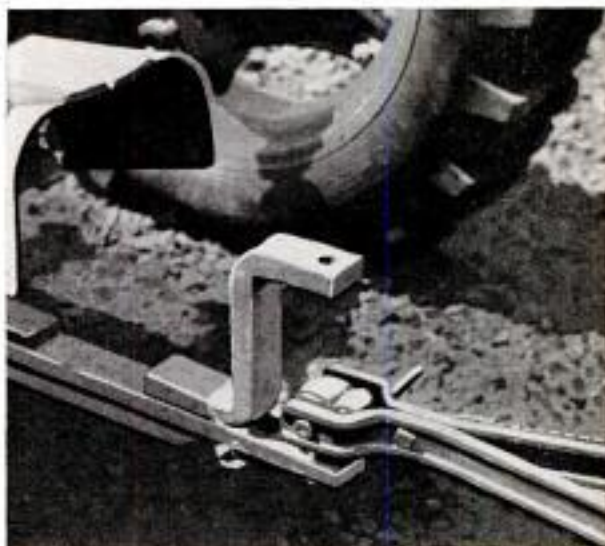
Screen Funnel on Barn Wall Keeps out Unwanted Bees

When one farmer discovered that bees were entering a barn through a knothole in a wall, he got rid of them by shaping a funnel from screen wire and tacking it over the hole. The bees could leave easily through the funnel because the large end was against the knothole. They did not return, since it was difficult for them to find the small opening in the outer end of the funnel.

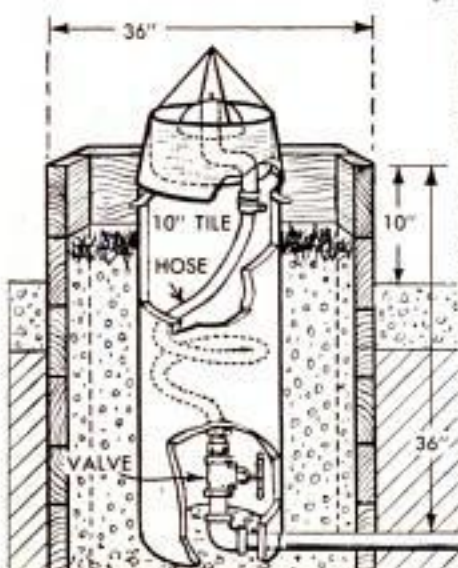
Extra Tow Bracket on Tractor Fits High Equipment Drawbars

The problem of towing farm machinery and equipment equipped with drawbars higher than the tow bar on the tractor was solved by one farmer who welded an offset bracket to the top of the tractor tow bar. Formed from heavy steel salvaged from an old gang plow, the bracket was bent in opposite directions at each end. The section between the two bends was equal to the difference in height. Welded to the tow bar a short distance in from the end, the bracket serves as an alternate point for hitching to the tractor. Thickness of the metal is governed by the slot in the drawbars.

A. M. Wettach, Mt. Pleasant, Iowa.



Water Fountain in Poultry House Protected Against Freezing

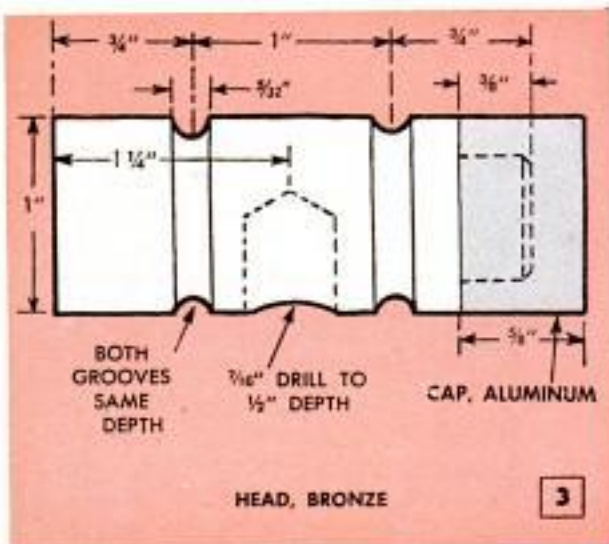
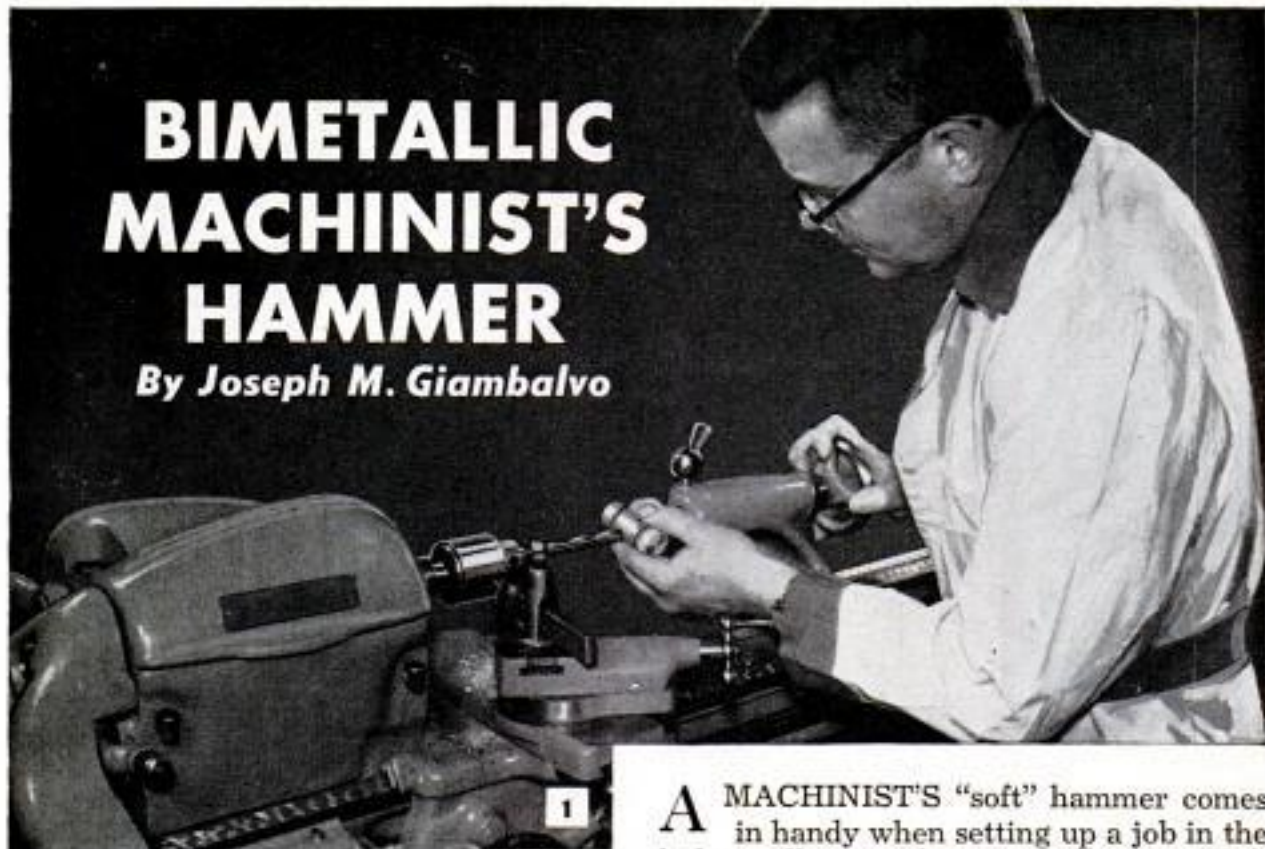


One Iowa farmer placed the automatic fountain in his poultry house on the end of a 10-in. tile buried vertically in the center of a 3-ft.-sq. wooden box filled with loose gravel which projects above the concrete floor. Water is delivered below the frost line to a shutoff valve at the bottom of the tile. A rubber hose, long enough to permit raising the fountain for cleaning or reaching the shutoff valve, supplies water as needed.

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BIMETALLIC MACHINIST'S HAMMER

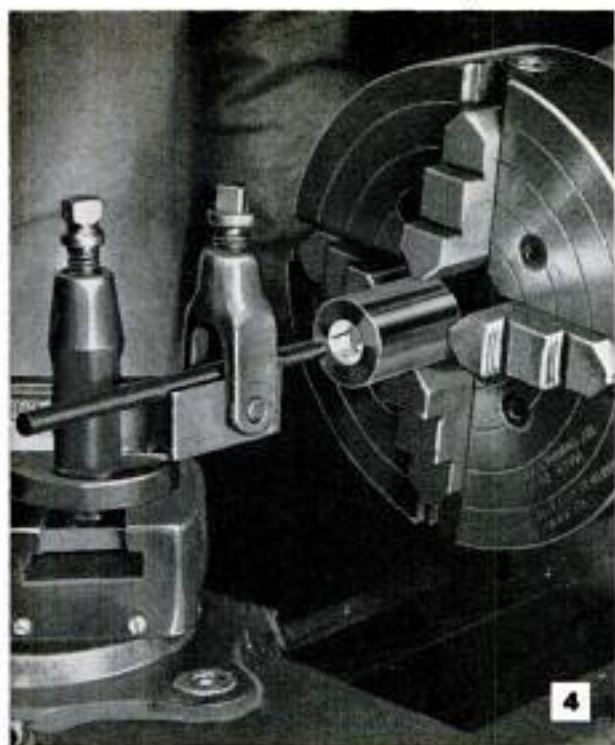
By Joseph M. Giambalvo



A MACHINIST'S "soft" hammer comes in handy when setting up a job in the lathe, milling machine or drill press. With the chuck, vise or strap clamps eased onto the work it usually takes only a light tap or two with the hammer to bring an indicator to the correct reading, Fig. 2, or position semifinished work for the final cut. The soft hammer also is used in assembly of finished parts where it is necessary to strike positive blows without the rebound of the rubber or rawhide mallet, and without denting or marring finished metal surfaces or sharp edges.

A bimetallic hammer, such as that shown in Fig. 6, is especially useful both in set-up and assembly work. The polls (ends of the head) are of different metals, one of bronze and one of aluminum. This combination greatly extends the hammer's range of usefulness where it is necessary to strike nonmarring blows. The hammer serves a twofold purpose in the school shop. It's an excellent project for advanced machine-shop courses and when finished it becomes a useful tool.

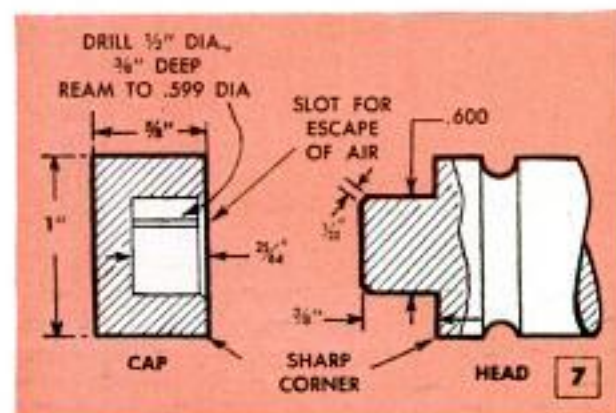
As dimensioned in Fig. 3, the head will weigh about 10 oz. when finished. This is a good average weight for precise and easy handling. Although the details in Figs. 7 and 10 show a press fit of the aluminum cap, or poll, and an easy fit of the handle in the head, you have a choice of procedures in carrying out these two steps. Some machinists prefer to have the handle threaded into the head rather than slip-fitted and soldered as in Figs. 7 and 10. In this procedure the head is drilled through, counter-bored and tapped, and the end of the



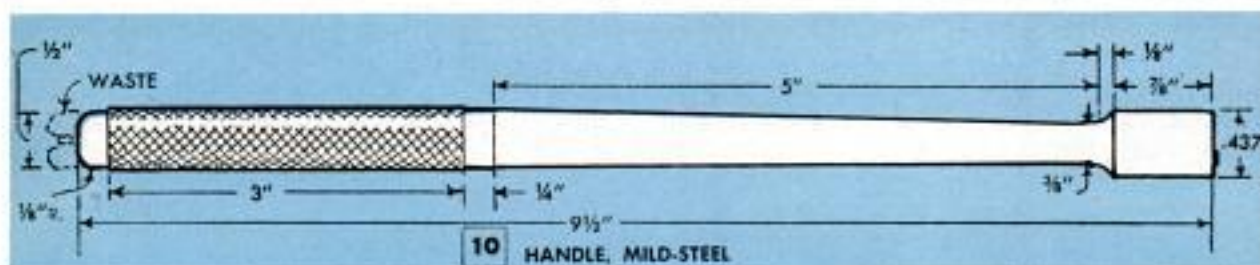
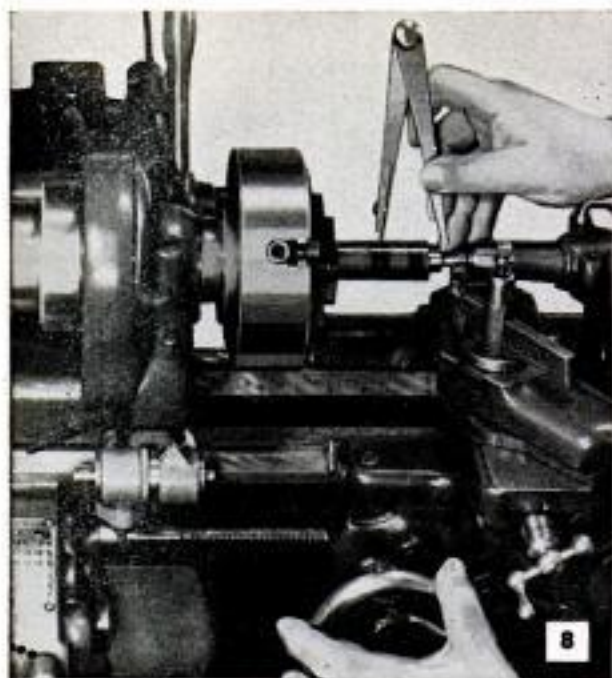
handle is shouldered, clearance-grooved and threaded. This type of assembly is quite satisfactory if you form more nearly a full-depth thread, say about 80 to 90 percent. This will assure that the handle seats solidly when turned into the head. The shoulder on the handle should be undercut slightly and must fit the counterbore snugly, otherwise the head may tend to loosen with use.

Much the same procedure can be followed when fitting the aluminum cap to the head. Although these procedures are not detailed, they can be carried out with only slight changes in the dimensions given in Figs. 3, 7 and 10.

Fig. 3 details the hammer head assembled, that is, with the cap fitted in place. The head is turned from bronze to 1 in. in diameter and is grooved and drilled for the handle, Fig. 1. The hole for the handle, also the center lines of the grooves, are located as in Fig. 8. Note that when the head is assembled with the cap in place the hole



It will be noted that the polls (ends of the head) of this hammer are not crowned. Rather they are faced square across with sharp corners, as in Figs. 3 and 7. Although many users will prefer flat polls, crowned polls with chamfered edges are, of course, optional. Height of crown should not exceed .015. Less is better, about .005 to .008 being a good average. Break (chamfer) the corners about 1/64 in. at 45 deg.



taking the handle is off-center. This is done purposely in order to more nearly balance the head. Important steps in machining the head and cap for a press fit are shown in Figs. 4, 5 and 7. After the bore in the cap has been checked for correct diameter (ream if you have a correct-size stub reamer) cut a shallow slot to permit air to escape as the parts are pressed together. This is done with the work at rest, Fig. 4. The boring tool is simply run in and out by hand-operating the lathe carriage, moving the tool about .002 at each stroke. The corner of the bore is chamfered $\frac{1}{32}$ in. at 45 deg. and a corresponding chamfer is run on the end of the tenon shouldered on the head. For a press fit some machinists prefer to run the chamfers at a somewhat greater angle, say about 60 deg. If available use an arbor press to assemble the cap and head. Otherwise do the job in an accurate vise, shimming the parts if neces-

sary to assure correct alignment. After this step is completed, chuck the head and take a final light finishing cut all over, or polish with an abrasive.

The handle, Figs. 9 and 10, is a simple lathe job. Start with a 10-in. length of cold-rolled stock and rough the taper and the fillet at the small end of the taper. Run 3 in. of fine knurl on the big end of the handle. Finish by filing and polishing with abrasive. Before turning the small end of the handle to the final dimension, .437, be sure to check the diameter of the hole in the head. In making this check remember that the handle is sweat-soldered into the head and this calls for an allowance of .002 or so.

Then clean the parts thoroughly, tin the joining surfaces and press together. Heat with a flame until the solder flows. Remove any excess solder from the joint while it is still soft. ★ ★ ★

Checking Dual Vacuum Pumps for Diaphragm Perforations

On most late-model cars fouled plugs and carbon deposits often are taken as symptoms of frozen piston rings. Another cause of similar symptoms should be checked before accepting this diagnosis as final. A tiny perforation in the diaphragm of either of the vacuum pumps can cause

oil to be drawn into the cylinders with the fuel mixture. To check for this defect, disconnect the lines and, with the engine running, hold a paper towel over the openings. If there is a leak, oil discoloration will appear on the paper.

George N. Frecker, San Francisco, Calif.

Adjustable Rack on Elevator Speeds Loading of Bales

Loading bales on this portable elevator is simplified by the addition of a bale rack taken from a discarded stationary baler. Two pipe legs, cross-braced with steel rods, pivot to allow the rack to tilt to any angle or fold flat onto the elevator for transport. The lower end of the rack pivots on brackets bolted to the elevator.

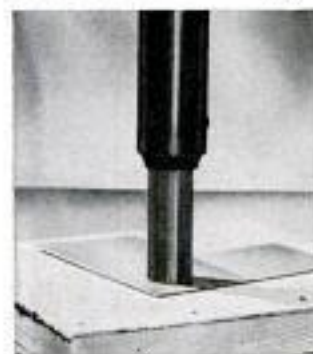
Angle-Iron Bracket Supports Hog Trough



For sturdy hog-trough supports, angle-iron brackets constructed as shown can be bolted one on each end of the trough. Each bracket is 2 ft. wide at the base, 8½ in. high and extends 6½ in. on either side of the trough. A length of

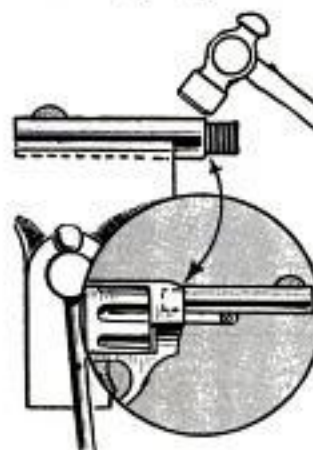
angle iron may be bent into the shape illustrated by cutting the inner flange, or pieces of angle iron cut to the specified sizes may be welded together to form the bracket.—Clifford Cruzen, Wright, Iowa.

Sweat Soldering Improved



If your soldering iron has a removable tip, a better job of sweat soldering can be done with the tip reversed as shown. The flat end has greater contact with the work for more uniform heating.

Peening Tightens Gun Barrels



When a revolver or rifle barrel will not tighten at the correct position when it is replaced in the frame, one gun enthusiast who does his own gunsmithing peens the barrel shoulder lightly as indicated, which corrects the condition.—R. V. Thompson, Clinton, Iowa.



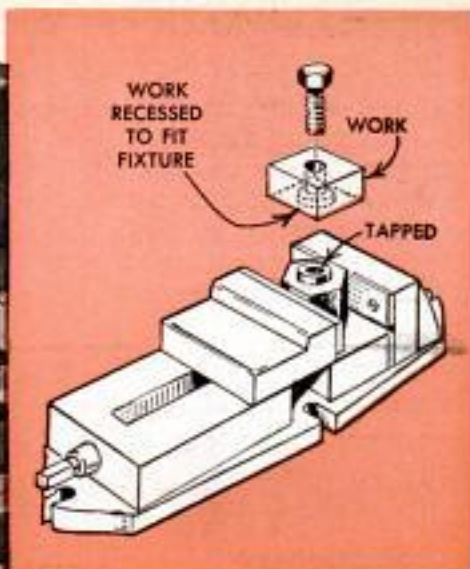
Dump-Body Farm Trailer Powered By Hydraulic Piston

This dump-body trailer was made by hinging an old truck body to a two-wheeled trailer and fitting a hydraulic piston between the front of the trailer and the front of the truck bed. The hydraulic piston is from a tractor scoop. Coupled to the hydraulic system of the tractor, the dump body can be raised or lowered smoothly and quickly with any kind of load.

Charles L. Stratton, Hollis, N. H.



ⓘ Be sure oil stains are well mixed before using. When in storage the pigment settles and unless remixing is complete the stain will not give a uniform color.



Only part to make in this setup is the master pattern, or fixture, which is held in milling-machine vise. Standard hex stock also can be used

Milling-Machine Fixture Indexes Hexagon Shape

Confronted with the problem of filling an order for a number of hexagon shapes in a hurry, one job-shop machinist improvised the setup pictured. First, a master hexagon shape was milled from a blank of round stock, then shouldered to form a projection about $\frac{1}{8}$ in. in height, which was center-drilled and tapped. This part becomes the indexing fixture which is placed in the machine vise. The workpieces are then recessed to fit the projection on the master indexing fixture and center-drilled so that

they can be fastened to the fixture with a capscrew. The vise is then adjusted to the correct angle on the machine table and a first cut taken on the workpiece. When the first cut has been run, the vise jaw is loosened and the fixture and workpiece rotated to bring adjacent faces of the fixture into position for the second cut. This procedure is repeated after each successive cut until the desired shape has been formed. Either hexagon or octagon shapes can be milled with reasonable accuracy.



Pencil Clip on Small Tool Holds It in Pocket

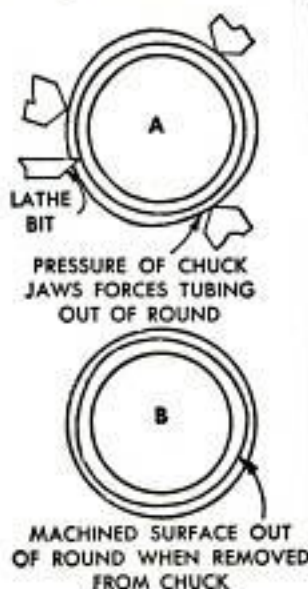
Your nail set, punch or other small tool will not drop out of your shirt or overall pocket if a pencil clip is slipped over the tool as shown. Available in stationery and ten-cent stores, the clips can be shaped to fit the shank of a square or hexagonal tool. In some cases it may be necessary to solder or weld the clip to the tool.

Socket Screw Used as Wrench

A socket-head screw can be used as a wrench when a regular socket-wrench set is not at hand. Also, you can sometimes reach a small hex nut with a socket screw when regular socket-wrenches won't turn the trick. By drilling a small hole near the end of the threaded section of the screw and inserting a nail you have a practical T-wrench.

Out-of-Round Machining Produces Self-Locking Box Lid

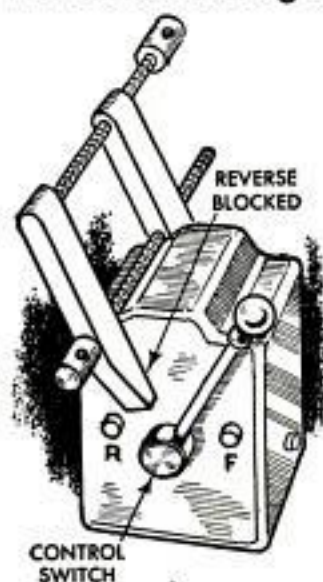
One novel application of out-of-round machining is a self-locking lid on a cylindrical container, such as a jewelry box or stamp dispenser made from thin-walled brass or aluminum tubing. Mount the work in a 3-jaw chuck as pictured. Tighten the chuck jaws to hold the work, then give the chuck wrench an extra half turn or so. This will distort the tubing slightly, detail A. Score the surface lightly at the point where the lid portion is to be cut from the body. Turn a groove (with one edge at the scored line) $\frac{1}{16}$ in. wide and to a depth equal to half the thickness of the tube wall. Measure the diameter at the bottom of the groove. Cut off at the scored line (edge of groove nearest the chuck). This leaves a shoulder on the body of the turning approximately $\frac{1}{8}$ in. long and out-of-round as in detail B. Slacken the chuck jaws about $\frac{1}{8}$ turn of the wrench. Then, using a boring tool, run a shoulder cut internally



on the lid "ring" to a depth of about $\frac{3}{32}$ in. and to a diameter equal to that of the groove before cutting off the body. If careful measurements have been made, the shouldered parts will fit together snugly at one point. It may be necessary to file the shouldered portion lightly to obtain an easier fit. Turning the lid slightly will cause the two parts to lock.

Walter E. Burton, Akron, Ohio.

Clamp on Milling-Machine Switch Prevents Starting Error



One man placed a parallel clamp over the switch housing of his milling machine, as shown, to prevent starting the machine in the wrong direction. End mills and cutters running backward for any length of time will become dull and possibly break. The clamp is placed so it limits switch-lever movement to the right direction.

Oil Dipstick Easily Read

Because oil dipsticks in both the crankcase and the transmission were of bright metal, making them difficult to read, one motorist darkened the sticks with gunbluing solution. The resulting dull finish permits the oil level to be seen clearly.

Lewis C. Rudd, Kansas City, Mo.

Keeping File Teeth Clean

Powdered graphite is more effective in keeping file teeth clean when working soft metal than the usually recommended chalk. The chalk itself may become embedded in the file teeth and present a removal problem. Simply apply a thin film of graphite on the file from one of the handy applicators now available at most hardware stores.

Ken Murray, Colon, Mich.



SN ~~107M~~ 59

To do the job

LATHE TOOLS

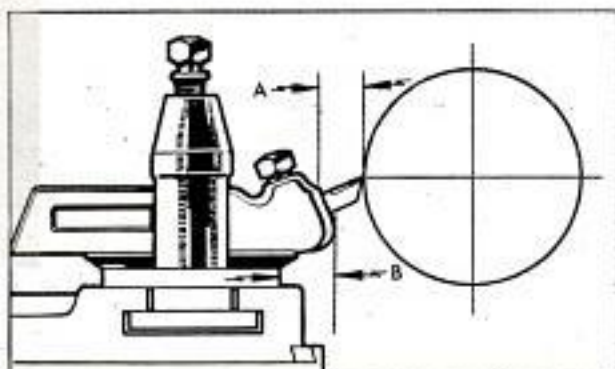
must be sharp

By C. W. Woodson

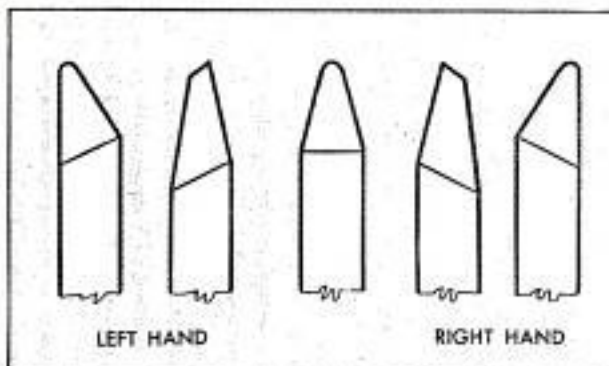


IN COMMON metal-lathe operations the cutting tool moves in two directions in a horizontal plane—parallel with the lathe bed when machining work between centers and at right angles to the bed when facing work. These movements largely determine the form, or profile, of the tool bit at the cutting edge. Eight of the standard shapes are shown on the opposite page. There are, of course, others, the profiles being ground for special jobs. In the detail on tool terminology, below right, the terms are intended to be descriptive rather than conclusive. The tool forms pictured are those of common lathe tools and do not apply to the carbide and ceramic tools designed for high-production schedules. The hand of the tool is determined by the position of the cutting edge when viewing the tool endwise, looking at the cutting end. Note the center detail at the right. The left-hand tools are designed to cut toward the tailstock when machining stock between centers. The right-hand tools cut in the opposite direction. It's the usual practice to set the point of the tool on center as in the upper detail at the right, the distances A and B, which determine the overhang, being held to the minimum.

Although any tool with end and side clearance will cut, machinists generally hold the forms quite closely to those detailed when grinding. Variations are permissible for special purposes. As an example, the end clearance can vary from 5 to 8 deg. and the back rake, or top rake, from 0 on the brass tool to 5 deg. on tools used for other metals. Machinists doing fine work such as that on instruments and similar jobs requiring clean work, hone the cutting edges after grinding. ★★★

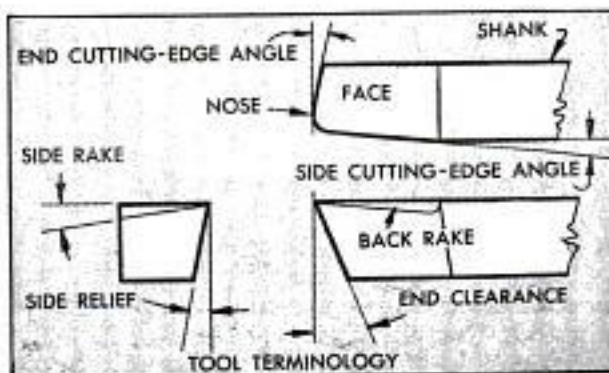


In regular work, tool is set with point on center. Distances A and B determine the overhang of tool and holder and normally should be held to minimum

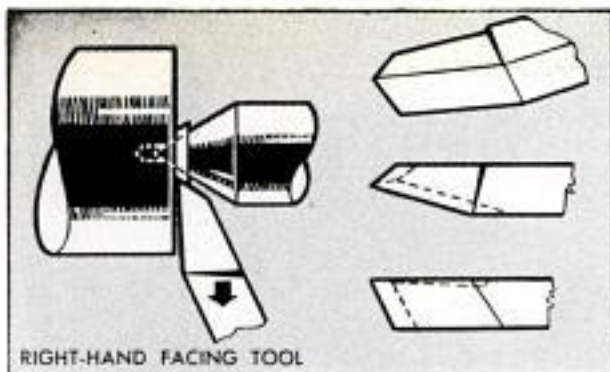


Right or left hand is determined by position of cutting edge when viewing tool endwise, looking at cutting end. Roundnose tool cuts in either direction

In usual practice, clearance angles are held to minimum to provide maximum support for cutting edge. Tools will function over fairly wide range of angles

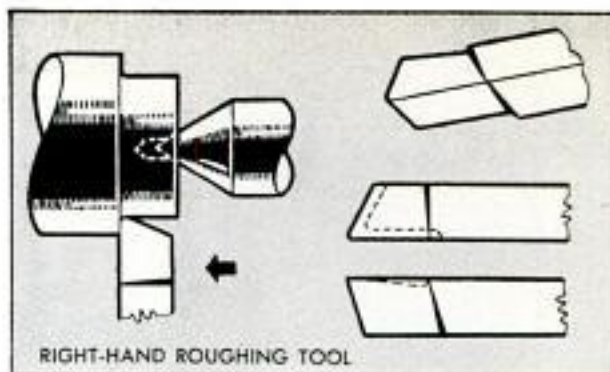


POPULAR MECHANICS



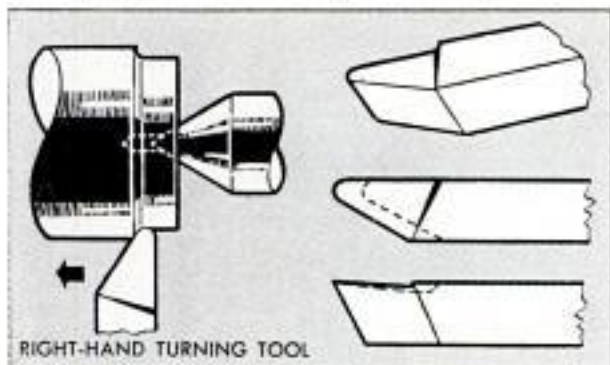
RIGHT-HAND FACING TOOL

Facing tool is worked outward from center when finishing ends of shafts or sides of shoulders. Point usually is ground to 58 deg. for working to center



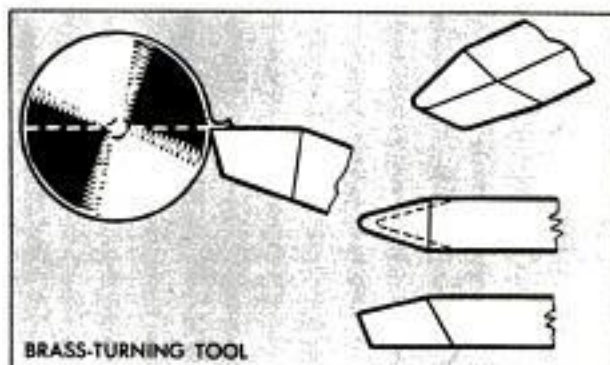
RIGHT-HAND ROUGHING TOOL

Purpose of roughing tool is to remove stock quickly. Cuts freely, but leaves rough surface. When working this tool always leave stock for finishing



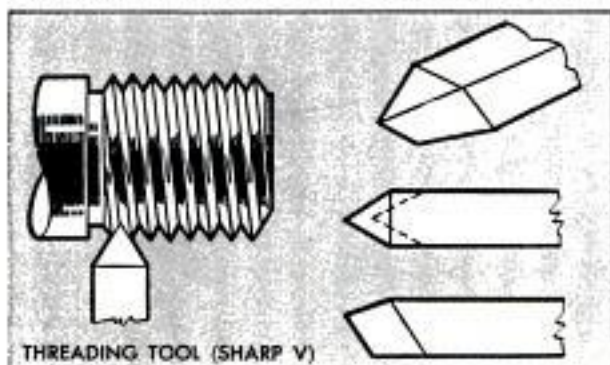
RIGHT-HAND TURNING TOOL

Right-hand tool works to the left, cut beginning at tailstock end of work between centers. Not suitable for heavy cuts. Leaves clean surface at slow feeds



BRASS-TURNING TOOL

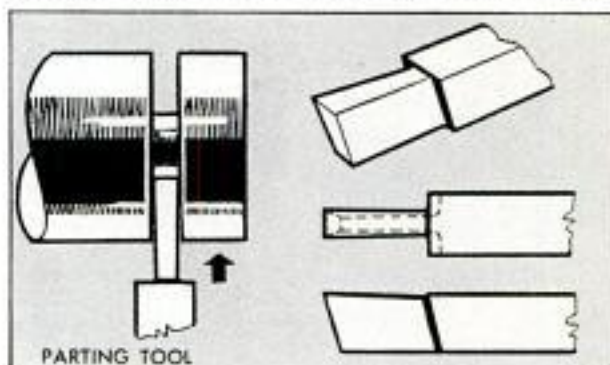
Brass tool is ground with negative rake. Tool is mounted with cutting point precisely on center line, as otherwise it may score work or leave chatter marks



THREADING TOOL (SHARP V)

Sharp-V threading tool usually is ground to 60-deg. included angle at point and with negative rake. It must be set on center line (at lathe-center height)

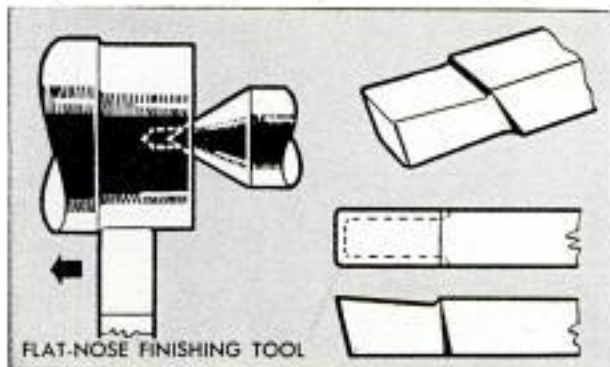
Finishing tool is ground with a straight cutting edge and is frequently honed to produce a finish comparable with grinding. Take a very light cut



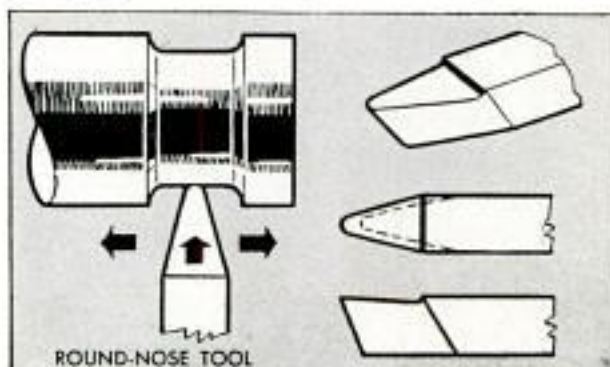
PARTING TOOL

Parting tool also must be set on center line. It is resharpened by grinding end only. Note that the sides are ground to slight angle to provide clearance

Roundnose tool is ground with right and left-hand cutting edges. Cuts in two directions. Tool is frequently ground with a negative rake for special work

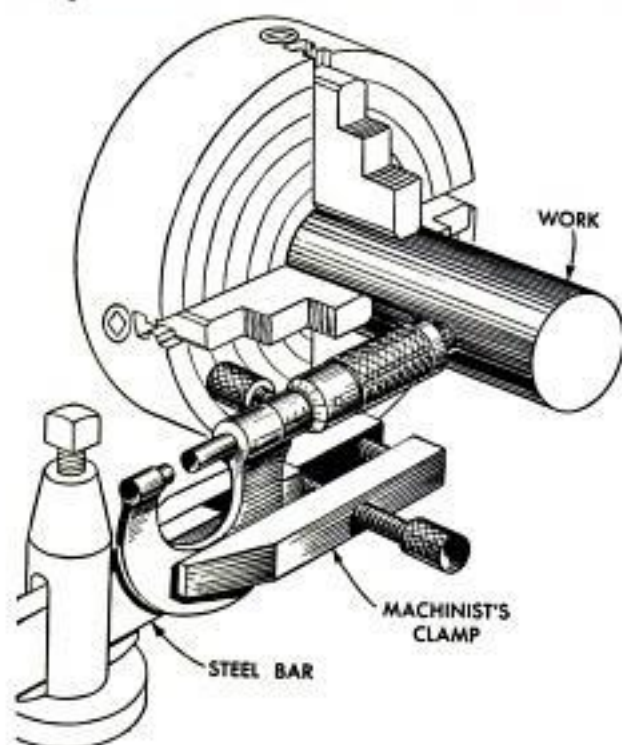


FLAT-NOSE FINISHING TOOL



ROUND-NOSE TOOL

Improved Indicator Centers Work in Four-Jaw Chuck



You can improvise an accurate indicator for centering work in a four-jaw chuck by using an ordinary work mike, a machinist's clamp and a bar of tool steel that will fit in the toolholder. Insert the bar in the holder and clamp the mike to it with the machinist's clamp as pictured. Adjust so that the center of the mike thimble (sleeve) is on the center line of the lathe. Adjust the work in the chuck freehand to run as nearly true as possible by eye. Then run the thimble of the mike out until it contacts the work lightly. Take the reading on the mike and rotate the work a quarter turn. Readjust the mike thimble and take another reading. Adjust the work in the chuck to compensate as nearly as possible for the variation in readings and repeat the process until the reading is the same at four positions of the work. Tighten the chuck jaws and recheck. If there is no change in readings, the work is centered accurately enough for all practical purposes.

C. W. Woodson, Chicago.



Width of Grinding-Wheel Face Measured With Micrometer

There are times when it is necessary to know the precise width of a grinding wheel at several points on the periphery. It won't do to touch the wheel with the measuring surfaces of the anvil and spindle of the mike as the polished faces are almost certain to be scored. Instead, you first mike two pieces of tool steel and jot down the reading. Then, using these pieces as pads, the thickness of the wheel can be measured as shown. Simply deduct the thickness of the pads from the reading.

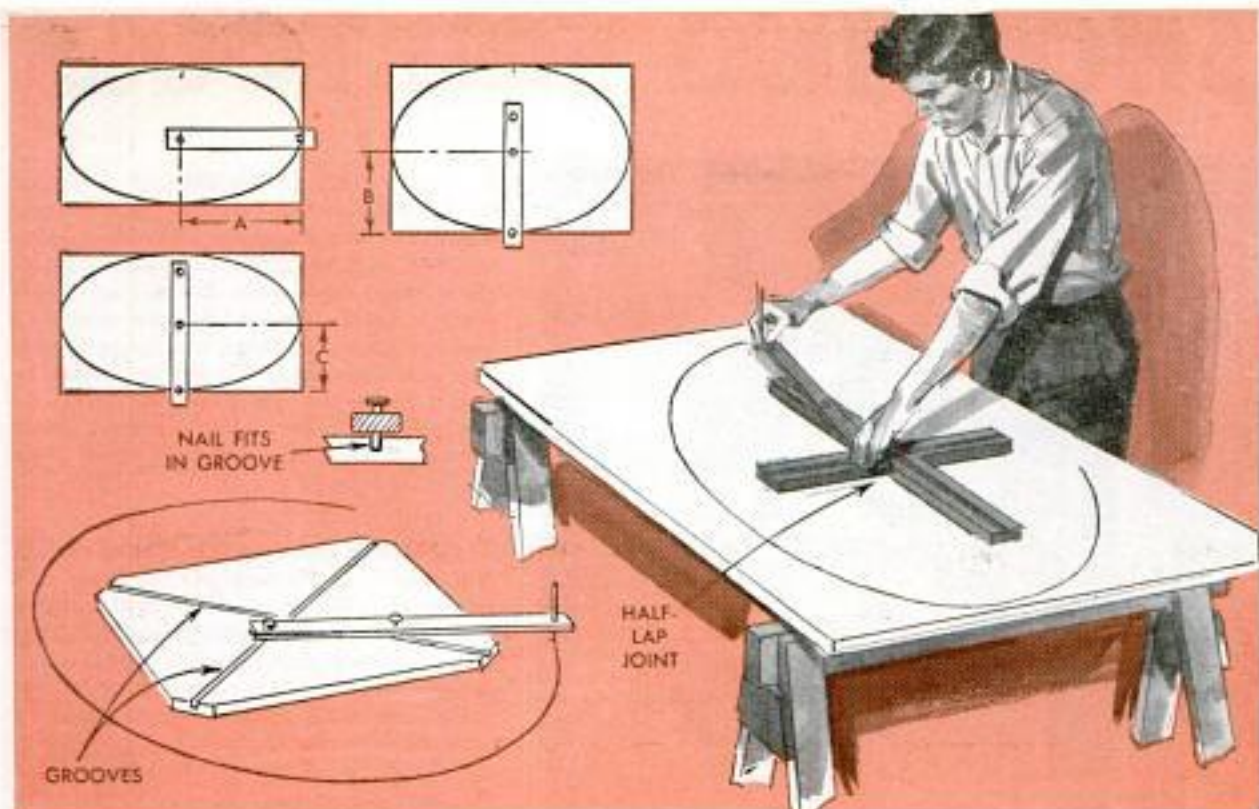
Frank La Saracina, New York City.

POPULAR
MECHANICS
MAGAZINE

OCTOBER
HOME
SECTION

See Our Annual Home Section - - - Next Month

Somewhere in our 50-page October Home Section you may find just the answer to your housing problem, whether it be adding a room to your house, finding something new in wall covering, building a fireplace or an entire new home. We are celebrating the fifth anniversary of this section by presenting two new specially designed houses in full color—one Modern and one Traditional. Both are exciting and planned for 20th-century living.



Jig for Accurate Layout of Elliptical Form

Old-time joiners used this method when laying out an oval table top or mirror frame. As the first step, you determine the size of the oval you require by laying out width and length as a rectangle. Note the three upper details on which the ovals are shown for clarity. Strike horizontal and vertical center lines on the rectangle. Then make a scribing arm from a $\frac{1}{4}$ x 1-in. strip of hardwood, the length slightly greater than half the length of the ellipse required. Place the strip on the layout as in the upper left-hand detail and make a pencil mark on the strip at the point where the center lines intersect and another at the line indicating the end of the rectangle. Drill a hole at the latter point to take a pencil in a tight fit. Drill a hole at the mark on the opposite end of the strip to take a 10d nail in a snug fit. Press the nail into the hole and cut off square, leaving about $\frac{1}{4}$ in. projecting. Now, note how variations

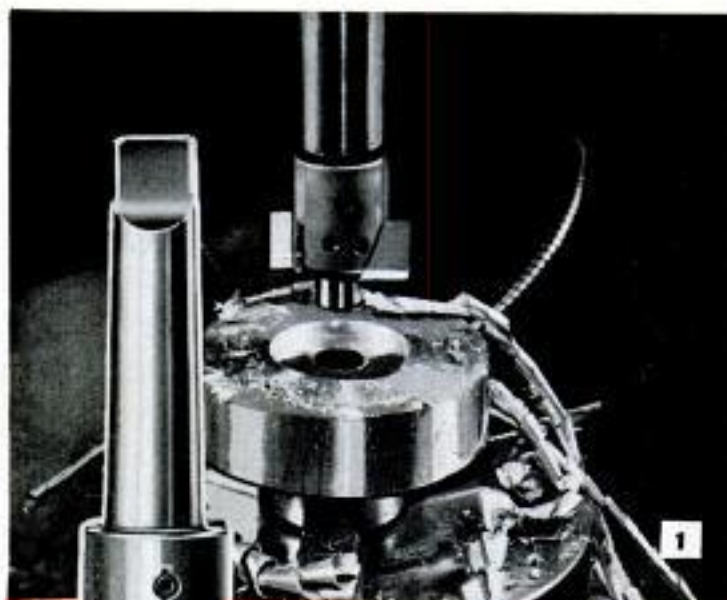
in distances B and C affect the shape of the oval. Place the strip on the vertical center line with the pencil point on the line indicating the side of the rectangle. Mark the strip for the hole taking the second nail at the intersection of the center lines. Drill, insert the nail and cut off square, the projection being about $\frac{1}{4}$ in. Next, make the guide for the strip, using a square of $\frac{1}{4}$ -in. plywood as in the lower left-hand detail, or two half-lapped strips as in the illustration at the right. The former is preferable. Cut $\frac{1}{8}$ -in. grooves in the plywood square at right angles. Turn the panel on which the oval is to be scribed upside down and make the layout on the bottom. Place the plywood square at the center, tack it lightly and then place the scribe in position. Strike the oval in one sweep of the pencil, holding the scribe with the left hand so that the flattened nail points engage the guiding grooves.

Dividers Set With Micrometer

A micrometer can save a lot of time when setting dividers for laying off distances of less than 1 in. which are expressed decimally. First calculate the distance involved, set the mike accordingly and lock the spindle. Then hold the mike and dividers as pictured and adjust the divider points so that they touch the surfaces of the anvil and spindle lightly.



SHOPPING FOR TOOLS



1. ADJUSTABLE COUNTERBORE and spot facer works in steel forgings, heat-treated steels, cast iron, aluminum alloys and stainless steel. Adjustable to hold specific diameters after regrinding. Blades are positively locked in position by two setscrews bearing against the front tool faces. Blades also are V-tongued, the tongues riding in slots milled in body, or shank, for maximum strength. All sizes take standard pilots

Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.

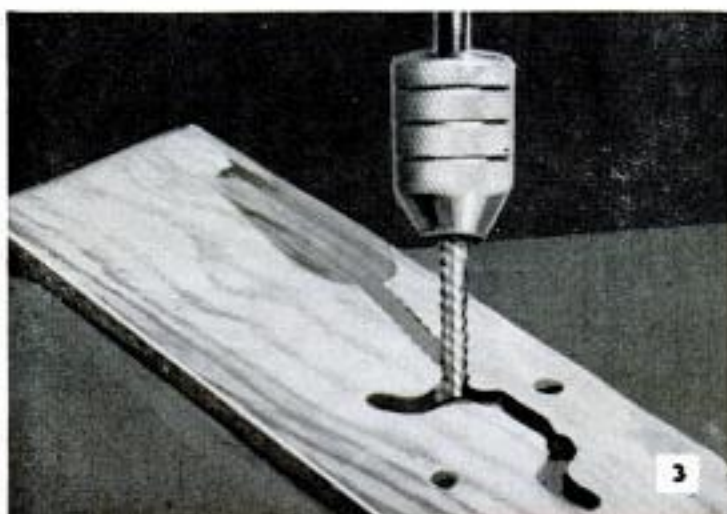


2. PORTABLE TABLE SAW is controlled with foot switch, cuts wood, plastic, brass and aluminum trim, glass fiber and rubber, also ceramic tile with abrasive disk. Comes with 5-7/16-in. combination blade, miter gauge, guard and a.c.-d.c. motor. Table forms one side of sheet-metal carrying case, the latter serving as a base when machine is in use. Accessories fit into base for transport or storage. Weighs only 24 lb. Buzzmaster, Inc., 336 N. Central Ave., Chicago 44



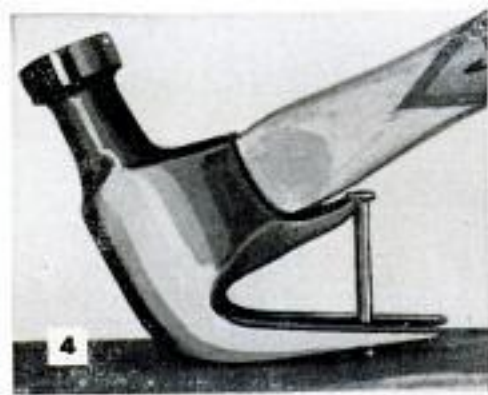
3. TWIST DRILL has cutting edges ground on flutes. Drills a 1/4-in. hole in the conventional manner, then cuts laterally in any direction. Makes accurate through mortises, slots to any desired width by running adjacent cuts, pierced designs, such as a cloverleaf, in thin stock. Works in wood, soft metal and plastic and can be used in a drill press or a 1/4 or 1/2-in. portable electric drill, also in larger hand drills

Drill-Aid Co., P.O. Box 543, Carthage, Mo.



4. DUAL-CLAW HAMMER does away with need for an extra leverage block when pulling large nails. Simply lift nail with regular claws as far as it will go without increasing pressure on hammer handle. Then shift to second pair of claws and withdraw nail entirely. Photo shows nail partially withdrawn and second pair of claws in use. Reduces handle breakage to minimum. Comes with standard 16-oz. head

A. Cripe Tool Mfg. Corp., Box 155, Holly, Mich.





5

5. ROUGHNESS SCALES serve as comparators in the drafting room, machine shop and inspection room where it is necessary to compare or designate surface-finish requirements on machined, ground or lapped work. Especially useful in the small shop where the scope and nature of the work do not warrant investment in electronic equipment of a type designed for this work

Rupert & Co., Ltd., Chapel St., Levenshulme, Manchester 19, England

7. RAISING BLOCKS, or mules, are designed for supporting and positioning work on drill presses and surface plates for finishing operations requiring accuracy and stability. Vees milled at each end of individual blocks are accurately machined in line, making blocks usable as a drill jig for round stock. Available in two sizes

Illinois Metal Products, 429 W. Superior St., Chicago 10

8. PIPE SEAL originally developed for use in the aircraft industry finds applications in other fields. Now used on oil, water, gas, steam, beverage, vacuum and chemical pipelines in sizes varying from 1/8 to 2 1/2 in., the seal consists of a hexagon nut fitted with an insert of tough plastic which seals the pipeline against leakage

Flick-Reedy Corp., 2040 N. Hawthorne Ave., Melrose Park, Ill.

9. SLIP-ON JAWS for adjustable pliers, inset A, come in sets and provide a means of seating and removing various types of rivets. A typical operation on brake-drum linings is shown in photo B. Lining rivets can be removed or seated in one simple operation. Can be used wherever jaws of pliers will reach beyond the edge of the material

Timesaver Tool Corp., 8444 Calumet Ave., Hammond, Ind.



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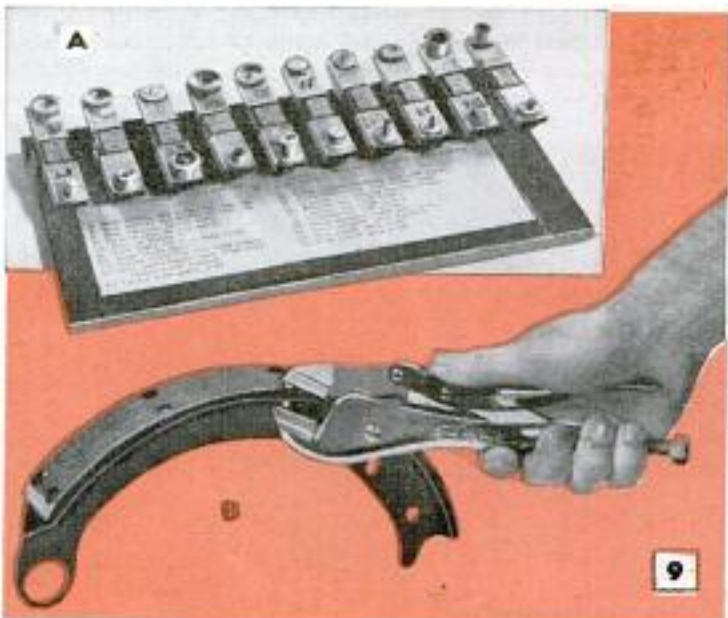
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6. SCRAPER REMOVES PAINT from bricks, stonework, stucco and concrete blocks before repainting. Also removes minor discolorations and all loose material from masonry and mortar joints. Plastic shield protects operator from flying particles

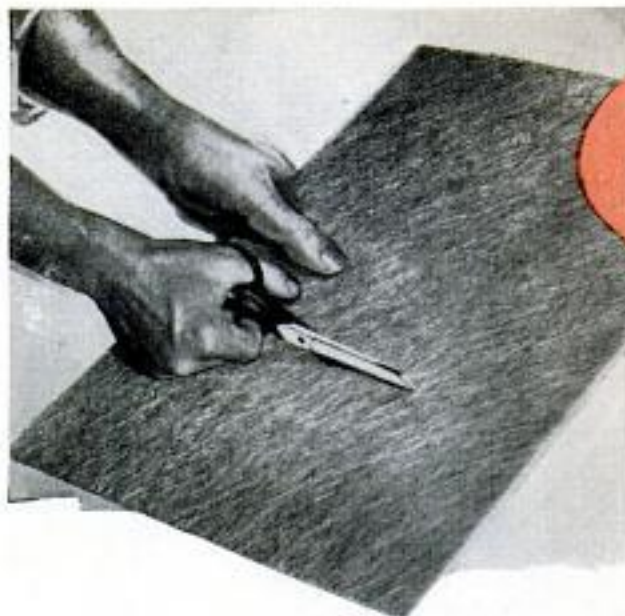
AutoScraper, 2860 W. Valley Blvd., Alhambra, Calif.



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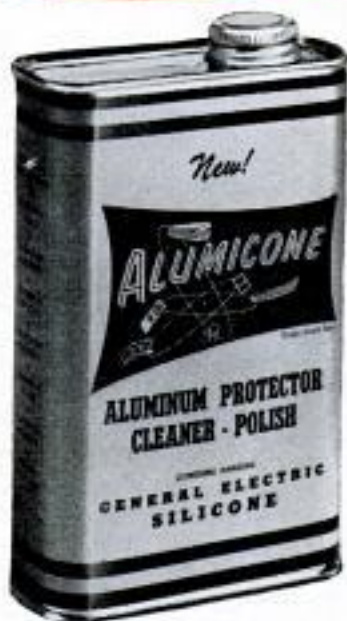
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Lehigh Chemical Co., Chestertown, Md.

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Magic Iron Cement Co., 5403 Bower Ave., Cleveland, Ohio

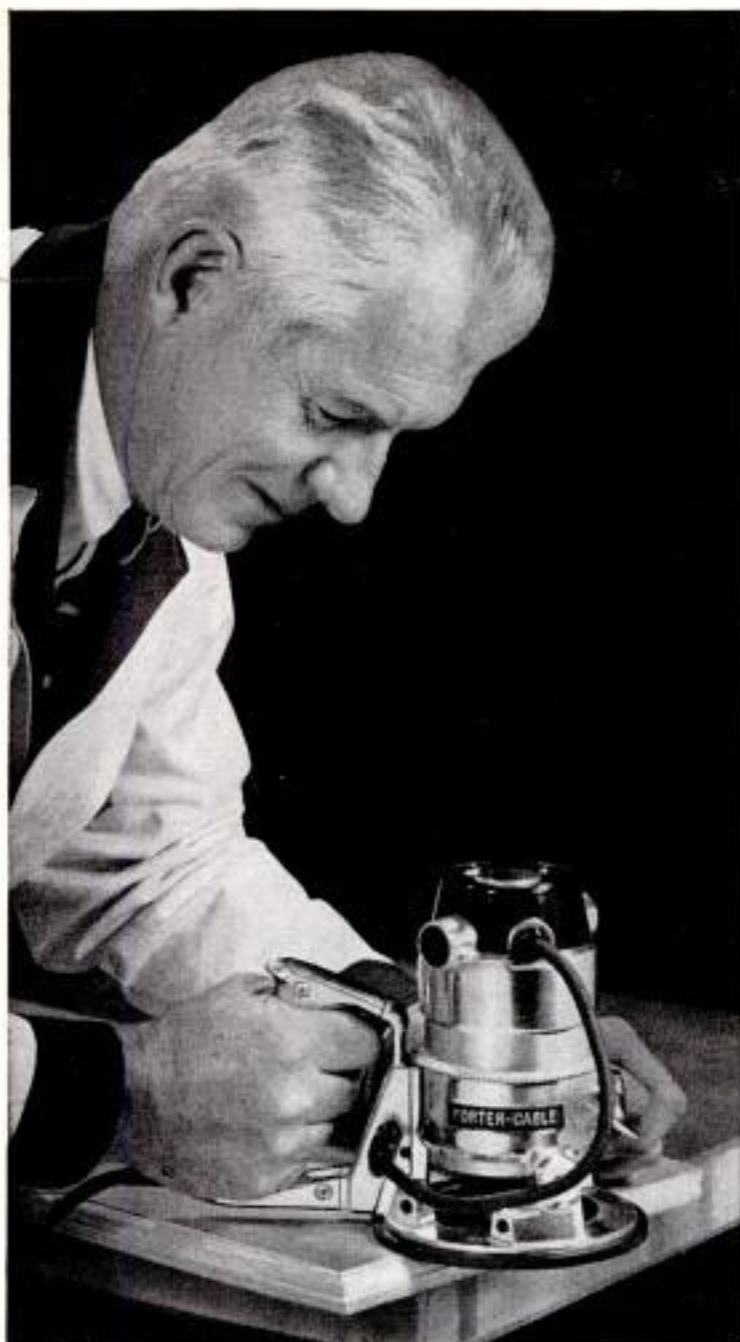


ALUMINUM POLISH has been developed for use on aluminum doors and window frames. Cleans metal, restores original brightness, leaves an invisible coating
Mark "A" Products, P.O. Box 24, New York City 66

SNAP-TYPE COUPLING consists of a nipple, which is screwed onto faucet or sill cock, and a coupling attached to hose. Assembled, parts form a leakproof joint
Snap-Tite, Inc., 201 Titusville Rd., Union City, Pa.



POPULAR MECHANICS



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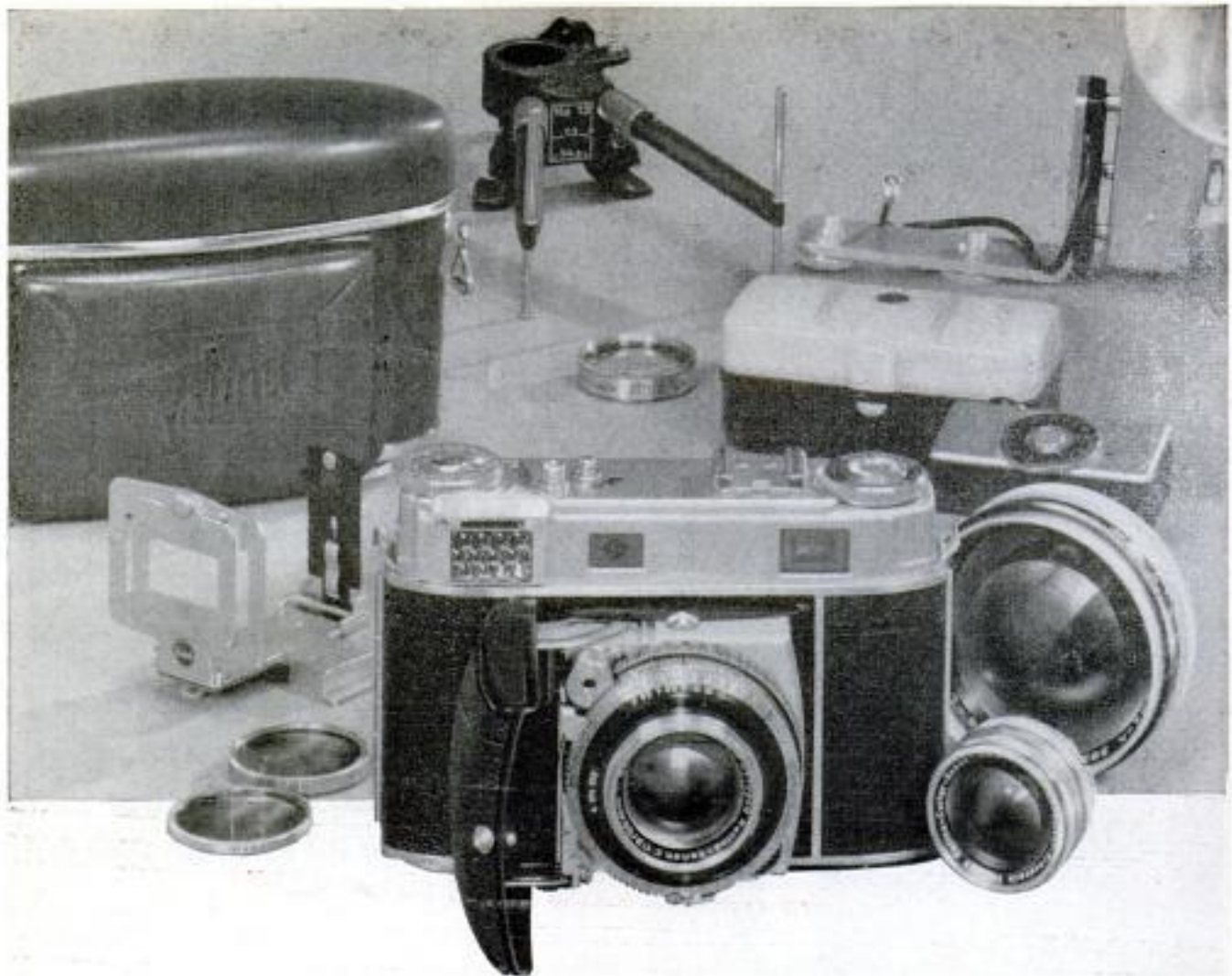
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camera thoroughly capable of helping you explore it.

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Kodak Retina IIc Camera *f/2.8*, \$132—*or as little as \$13.20 down*. Retina IIIc Camera, *f/2* with built-in exposure meter (shown above), \$175—*or as little as \$17.50 down*. See these famous Kodak Retina Cameras *soon*.

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Kodak Retina Curtar Lens Component, 35mm f/5.6—Takes only a jiffy to switch to this lens component for wide-angle views indoors, panoramic shots outdoors. Focuses $2\frac{1}{2}$ feet to infinity, **\$59**

Kodak Retina Longar Lens Component, 80mm, f/4—R-e-a-c-h-e-s across space for telephoto close-ups of distant scenes, candid shots of children and pets. Focuses from $6\frac{1}{2}$ feet to infinity, **\$80**

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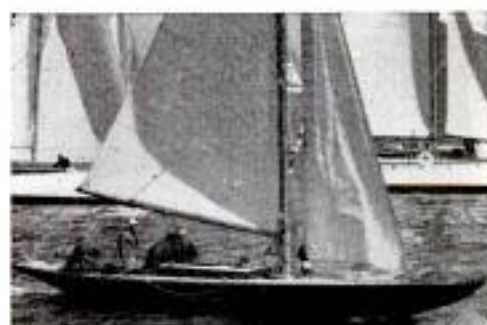
Close-up made with one of the field guides and auxiliary lenses in the Kodak Retina Close-up Kit



Regular view with the Kodak Retina 50mm lens that comes with the camera



Wide-angle view with the auxiliary Kodak Retina Curtar Lens Component, 35mm, f/5.6

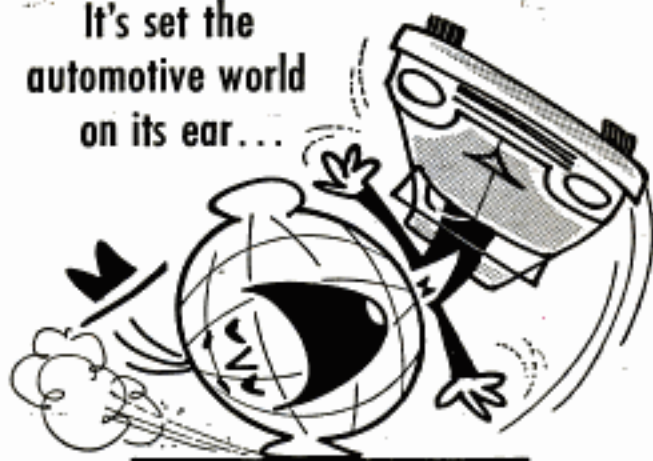


Telephoto view with the auxiliary Kodak Retina Longar Lens Component, 80mm, f/4

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Seeding Time

Q—My lawn was started this spring, regular grass seeding with a rye-grass cover. Of course, the cover crop made a rapid and lush growth but now I notice that the regular grass seeding did not catch in spots. I don't want to dig up my lawn and start over again. Can I apply new seeding over the old with any reasonable chance of success?—O. N., Mass.

A—Much depends on the fertility level of the soil, the weather and other factors. We are assuming from your description of the present condition of the lawn that you have a satisfactory stand of the regular grass on at least a portion of the area involved. In such cases a top-dressing method of reseeding has been fairly successful. There is always the chance that you will lose a percentage of the new seed but even so we think the method worth a trial. As the first step, mow the lawn fairly close, about an inch or so. Apply fertilizer to the entire lawn, taking special care to obtain a uniform application on those areas where the seeding is thin or where there is little or none at all. Then seed these latter areas, the rate of seeding being a little heavier than that ordinarily used in starting a new lawn. Follow this immediately with a very light top-dressing of black soil. Rake this to a uniform depth of not more than $\frac{1}{2}$ in., using a lawn broom, not a garden rake. Then water immediately with a light, fine spray. Keep the top-dressed areas damp for at least 10 days.

Painting Stone Masonry

Q—The foundation walls of my home are of stone. Some of these are very large, 3 to 5 ft. long and up to 1 ft. thick. I have excavated under a part of the house with the idea of providing more room in the basement. The inner surfaces of the walls are rough and irregular due to the manner in which they were laid up. How can I finish the walls?
I. H., Pa.



A—What you do depends on what you consider attractive. If the appearance of the walls as they are, that is, the aged texture of the stonework, is

(Continued to page 226)

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The Borden Company, Chemical Division

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objectionable, then you may have to consider plastering the surface with a cement plaster or installing a false wall of knotty pine, red cedar or some other type of planking suited to the purpose. Either step will be rather expensive comparatively and also will involve considerable labor and time, especially if you should attempt the job yourself. If, on the other hand, the texture of the natural stone is acceptable in appearance, then we would simply clean the surfaces of the walls with a wire brush to remove all loose particles and apply a coat of masonry waterproofer. This material is available in soft, pastel colors and produces a flat finish.



Furnace Noise

Q—When the furnace fan is operating we hear a peculiar drumming sound in one of the ducts carrying heat to the second floor. I adjusted the damper, or vane, in the duct but this made little, if any, difference. Is there any way to stop the noise?
T. R., Minn.

A—The source of noise in an extensive duct system is often difficult to locate with certainty. You describe it as a "drumming" sound and this would lead us to suspect right away that it cannot be due to the normal expansion and contraction of the metal, but must be due to a rapid vibration of metal under tension at some point in the duct system. This could be due to air pressure, a partial vacuum, to a condition of strain not present at the time of installation but imposed by settling of the structure, or some change in the duct system itself. Usually the surest remedy is to install a vibration dampener. Just where to locate this in your heating system would have to be determined by a careful on-the-spot inspection while the furnace is in operation. In general, the most effective dampener suitable for installation on a home heating system is made by cutting out a section of duct about 6 in. long and installing a covering sleeve made from heavy canvas. Normally this would be installed on a horizontal run of the duct from which the noise appears to be coming. Place a sheet of asbestos under the canvas sleeve. Close the ends of the sleeve with drawstrings.

Defective Pressure Water System

Q—Water for my home is supplied by a pressure water system. During the past few months the water pressure seems to be lowering constantly, although at a very slow rate. There appears to be plenty of water in the well and the pump apparently is operating properly. I have examined the entire system for leaks. There are none. What could be wrong?—J. N., Del.

A—Have you checked the operation of the air-inlet valve? Air-inlet valves on pressure systems seldom give trouble, but in your case it is likely that the valve has been damaged or is stuck in the closed position. The purpose of the valve is to admit a small amount of air at each stroke of the pump and thus maintain the correct air-water ratio in the pressure tank. We suggest that you examine the valve and if it is defective it should, of course, be replaced.

Floor Tile Loosen

Q—Less than a year ago I laid linoleum floor tile in my bathroom. Lately I noticed that several of the tiles had loosened along the edge of the bathtub and under the lavatory. After taking these out I found that the joining tiles could be lifted easily. Can you tell me what was wrong?—C. O., Colo.

A—It would appear from your description that something unusual is the cause of the trouble. It is possible, of course, that moisture condensing on a cold-water pipe is somehow reaching the sub-floor or the underlayment, if the latter was used. This could cause failure of the cement. Another possibility is the presence of wax or oil on the tile or the underlayment or subfloor. We suggest that you recement several of the tiles and note results after a period of time. If they still loosen, then it may be necessary to relay the entire floor.

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- Removes all finishes
- Harmless to hands or wood
- Cuts every layer



Get right down to bare wood fast with the *guaranteed* paint remover—Strypeeze—the fastest selling paint remover in America.

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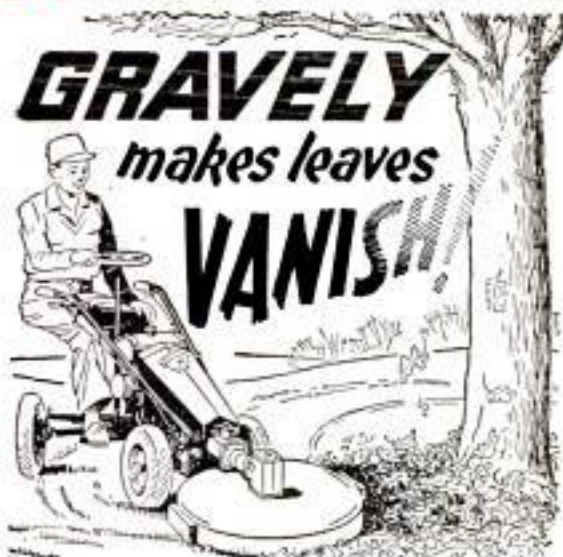
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SEPTEMBER 1957



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CHAMPION DEARMENT TOOL Co. MEADVILLE, PA.

Owners Praise Dodge's Styling, Handling Ease

(Continued from page 137)

dip in front end when making hard stops."—Louisiana salesman.

"Like push-button shift in place where a child cannot reach it."—New York truck driver.

"Spacious trunk. Spare tire does not interfere with luggage space."—New Jersey salesman.

"Plenty of room inside yet not too large."—Indiana tool and die maker.

"I looked at a lot of cars before buying and found that Chrysler products are easier to get into and out of than any others because the windshield post does not protrude into the doorway nearly as much."—Maryland salesman.

"I have three small children and I buy a four-door sedan with center posts because it is safer. There is less chance of them falling out when climbing from front to rear seats than in pillarless job."—New York police sergeant.

Here is an interesting combination of opinions about the same car, one from the husband and one from the wife:

The husband says, "Roadholding is excellent, driver's seat comfortable, trunk is vast and car has a good ride." The wife says, "Styling is good, push buttons convenient and interior is luxurious." The husband is a New York teacher.

And Other Complaints

"Position of rear-view mirror is poor. Rear vision is too easily obscured by rear-seat occupants. Fin obscures much of vision through outside mirror."—Washington chemical engineer.

"Speedometer seems to be a weak point. Clicking and winding noises which you generally find only in old cars."—New Mexico lumber dealer.

"Had trouble with door latches. So hard to open that strangers think door is locked. Back doors open only about half as wide as they should and fat people have an awful time getting into back seat."—Massachusetts sales manager.

"Left torsion bar has terrible squawk up to five miles per hour. Dealer says he has seven other owners with same complaint. His mechanic worked all one day on one car and it still makes the same noise."—Michigan truck dispatcher.

"Rear bumper is not out far enough to protect lights. Have broken the lights twice already."—Indiana housewife.

"Right door handle on this cab has had to be replaced three times in three months.

(Continued to page 230)

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install a

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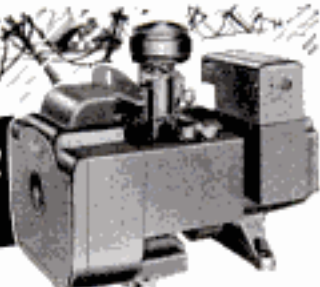
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SEPTEMBER 1957

229

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"I chose the six-cylinder engine because I thought it would give me all the horsepower I want plus economy. It looks like I made a mistake. It's noisy and uses too much gas."—Kansas aircraft inspector.

"Glove compartment is of practically no use. Door hinge crushes contents when it is closed."—Tennessee salesman.

"I bought too cheap a model. Should have bought a Custom Royal. Too much difference in quality."—Kansas secretary.

"Rear windows hard to roll up and down."—Texas natural-gas engineer.

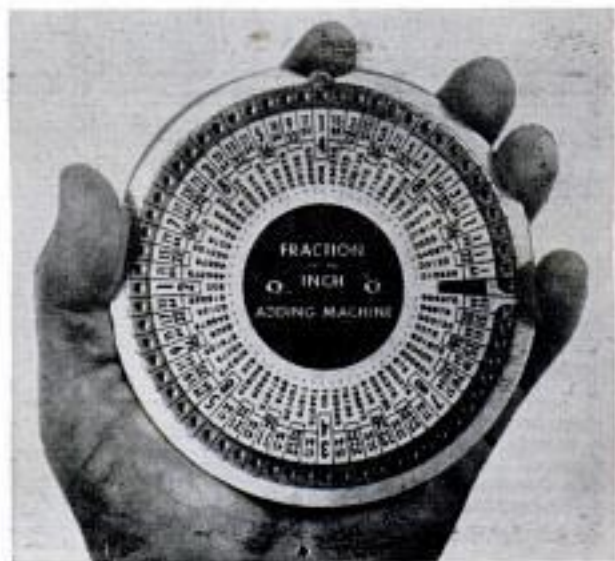
"This part of Arizona is very hot. Lots of sunshine all year. The car has too much glass area for so much sunshine."—Arizona carpenter.

"I do not like the part of the warranty that says the customer must go to the dealer where the car was bought if it is less than 50 miles from his home. I am sure that we pay for this service and the customer should be able to choose which dealer he wants to service his own car."—Ohio electrician.

Those are the opinions of the owners of the 1957 Dodge Coronets, both Sixes and V8s. Next month the British Ford. ★ ★ ★

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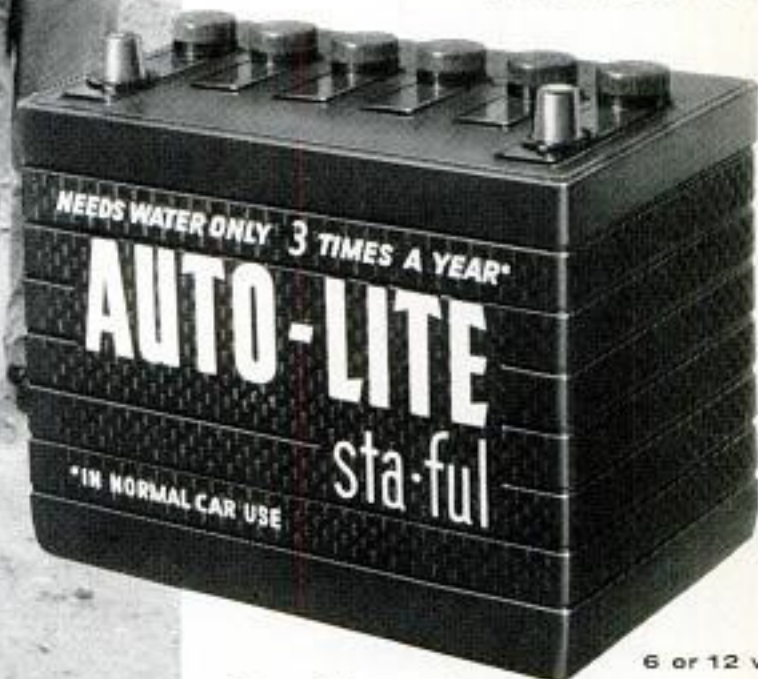
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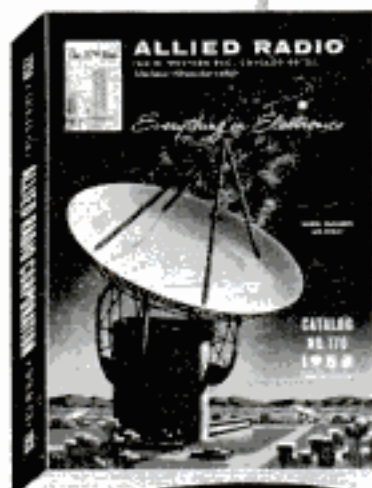


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City _____ Zone _____ State _____

You Can Make a Plant Do Tricks

(Continued from page 85)

you can still have fun and some success if the temperature of your workroom varies somewhat beyond this range.

To prepare your "lab," simply suspend a fixture or fixtures above a bench or table. A two-lamp fluorescent fixture should be suspended approximately 18 inches above the foliage. It will cover an area about 18 inches wide and as long as the tubes. The spacing of incandescent fixtures is somewhat more critical, as they tend to produce hot spots and shadows. Note the drawing on page 85.

If you want to invest money instead of labor, you can buy a commercial or home-type growth chamber with built-in lighting. Some of these chambers also monitor the heat and have a built-in time clock to operate the lights.

To see results, you must divide your plants into two or more groups and use one batch as a control group. Then you can observe the differences between the groups. In your first experiments expose both groups to natural, identical sunlight throughout the day. Then during the night expose one group to your artificial-light source for a few minutes, but keep the other group in total darkness. You'll soon observe big differences between the two groups of plants.

By now you may be so intrigued that you'll want to experiment further. There are several byways you can explore. Try reducing the duration of the artificial light, or its intensity, to find out how short a period or how little light will still produce a reaction. You can also use the cellophane filters to observe the very restricted wavelengths that are actually causing the reactions in the plants.

Don't be discouraged if you observe no results in your first experiments. You may have chosen the wrong plants. A minority of plants have an indeterminate photoperiodism—that is, they are not particularly affected by the length of the night.

Plants for Your Experiments

You can be sure of results, though, if you use plants which already are known to be affected. Doctor Downs suggests you try common weeds first, such as cocklebur (a very sensitive long-night plant), lambs quarter or pigweed. If you want something more satisfactory than weeds to show for your experiments, try such long-night plants as chrysanthemum and poinsettia.

(Continued to page 234)

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A survey shows 3 out of 4 doctors recommend the famous ingredients of Anacin Tablets to relieve pain of headache, neuritis and neuralgia. Here's why Anacin® gives you better *total* effect in relieving pain than aspirin or any buffered aspirin:

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Works in seconds!



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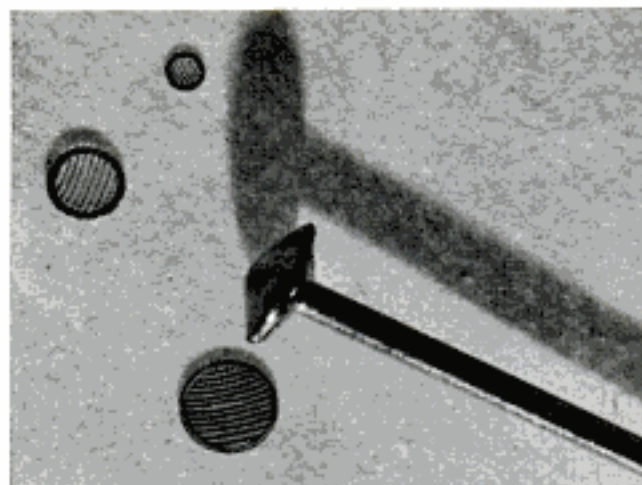


Photo Courtesy Sperry Gyroscope Company

That Spike You See is a Pin!



TAKEN WITH A
**PACEMAKER
GRAPHIC!**

The Speed Graphic* photo above was taken to show the tiny size of electronic tube grids in comparison with the head of a pin. It demonstrates another facet of the Speed Graphic's amazing versatility. By using its long bellows draw plus a short focus lens, direct magnification of objects may be obtained on the negative.

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You can experiment with chrysanthemums without any artificial lights whatever. Chrysanthemums don't ordinarily flower until fall, but you can surprise your friends with spectacular blossoms in mid-summer. As you come home from work at five or six o'clock in the afternoon, put a light-tight box over the plant. In the morning when you leave for work, remove the box. This gives the plant a longer night. Continue the treatment until the buds begin to open. The plants will take it from there.

If you want to experiment with the germination of seeds, Doctor Downs suggests seeds of Grand Rapids lettuce, or *Lepidium* (a common weed sometimes called peppergrass). Place the seeds on wet paper towels inside a couple of transparent plastic sandwich boxes. Then wrap the boxes with black cloth or aluminum foil. After 24 hours unwrap one box and expose it to light for five minutes. Rewrap it, and keep both boxes wrapped for three or four days. When you unwrap them, you'll find that the light-exposed seeds will have germinated almost 100 percent while practically none of the others will have germinated. Some kinds of seeds will not germinate at all at high temperatures, so keep the seeds where the temperature is at most 70 degrees, or even lower.

Polka-dot Tomatoes

And watch the reaction of your friends to your polka-dot tomatoes! Start your experiments with a couple of green tomatoes. Place two of them on a windowsill, one wrapped in aluminum foil, the other exposed to ordinary sunlight. In nine or ten days they will ripen and you can compare the color. One will be bright orange-red, the other an off pink. Follow up this experiment with another in which you reduce the time on the windowsill to a few hours, then a few minutes a day. You'll find that even two minutes of light per day will produce the vine-ripened color. Now add another tomato, this one to be your special polka-dot variety. Wrap it in aluminum foil except for a few holes about the size of a dime. You'll come up with a pink tomato with red spots on it, a sight to shake your neighbors.

Perhaps you can observe some striking examples of photoperiodism in your own yard. Trees growing near a street light often retain their leaves much longer in the fall. Some trees and ornamental shrubs may even be injured during the first cold days of winter because the short nights (caused by the street light) have prevented them from entering the dormant condition

(Continued to page 236)

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necessary for them to survive the cold weather.

Not long ago a greenhouse operator noticed that his poinsettia plants were failing to flower, with Christmas not far away. Just in time he discovered that an electric sign was upsetting the sleep of his plants, turning a long night into a short one. By shielding the plants he forced them to flower in the nick of time for Christmas trade.

Another field wide open to research is the effect of photoperiodism on animals and man. A few experiments indicate that animals may be as sensitive to light-dark cycles as plants. The metabolism of men and animals speeds up under the influence of light. Therefore it is best to give dairy cows and other producing animals as much light as they want. On the other hand, animals which are to be slaughtered should be kept in the dark as much as possible. This depresses their metabolism.

Winter mink pelts are much finer than those produced during the summer, but one researcher has shown that he can make mink produce prime pelts in the heat of summer simply by placing the animals in the dark for a part of each day, thereby lengthening the night. Other experiments indicate that variations in the light-dark cycle, rather than the temperature, have striking effects on the migration of birds, the seasonal breeding periods of animals and the hibernation habits of some creatures.

It's an odd fact of science that the effects of the first occurrence on earth—the night-and-day cycle—are only now being investigated. ★ ★ ★

Synthetic Textile From Paper-Pulp Waste

Lignin, once a troublesome waste product of paper manufacture, can now be converted into a textile plastic by first changing it into vanillin. The vanillin is converted into protocatechuic acid, from which the textile is produced. The new fiber reportedly has good dyeing properties, low water absorption and a melting point above 400 degrees Fahrenheit. About one third of the wood used in paper making is lignin, a "glue" in which the cellulose is embedded. Although lignin also can be used in linoleum, soil conditioners and tanning agents, the chemical accumulates in quantities far exceeding demand and it cannot be dumped into streams because it would cause serious pollution.

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Field Day in the Saddle

(Continued from page 125)

is marked off on the ground with powdered lime. The horse must enter and exit through the corridor from the starting line and make a complete turn inside the circle. If he steps outside or a foot swings out over the line at any point, he is eliminated from competition.

Ring spearing can be individual or team fun. With a few sticks of lumber, some old pool cues, a roll of wire and a handful of harness rings, fun on a horse can hark back to the Middle Ages when armed horsemen charged across the tilting lists in competition for the favor of a king, or the hand of a fair lady.

A Ring on the Run

To set up a ring-spearing course, three standards are arranged 33 $\frac{1}{3}$ yards apart, with the starting line the same distance from the first standard. Number 8 or 10-gauge wire hangs down from an arm on each standard to hold a clip and ring. Rings should measure two inches inside. The bottom part of the ring must be seven feet from the ground and the arm holding the ring and clip far enough to one side and high enough to give plenty of clearance to horse and rider. Spears should be a minimum of six feet long. A running start is made and the rider is timed from the starting line until he passes the last standard.

Relay events generally require five riders to a team. Relays are set up in different ways but the most accepted is to have a rider start from a line, run the length of the course, travel around a stake and return to the starting line where a second rider is given a baton. The first team to finish is the winner.

Horseplay for Laughs

While the original gymkhana embraced races that were mostly competition between individuals, the modern horseman has added some entirely different types of fun, one being events for two-man teams. Among these are the race-and-mount team, cowhide race and the ribbon race.

In one funny race a ribbon is used to guide the destiny of the competitors. It is quite interesting because it takes considerable skill and horse control. Each team of two persons is given a six-foot length of crepe-paper ribbon, three inches wide. They must hold the ribbon stretched out between them as they race from a starting line at one end of the field to a finish line at the other end without breaking the ribbon. The contortions most teams go through

(Continued to page 240)

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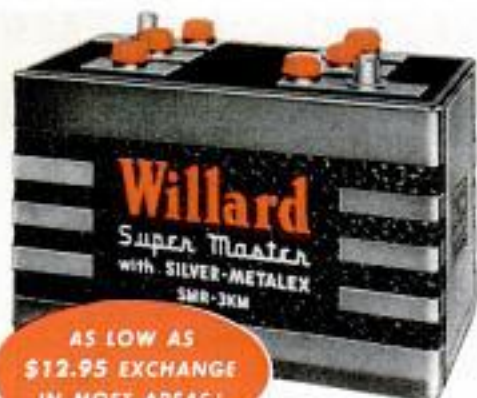
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to keep from breaking the ribbon brings a load of laughs.

The hide race is always a thriller. All that is needed for a team is a cowhide, a strong lariat, two strong men and a horse. One man rides the horse and the other lies flat on the hide. A rope attached to the hide is held in the hand of the mounted partner. At a given signal the horses are started toward a finish line pulling the hide and the man. A dropped rope or a man spilled from the hide spells defeat. The one to cross the finish line first is the winner.

Some Horses Won't Play

In the race-and-mount event a rider starts with his horse at one end of the arena and races to the other end where his partner is waiting. This partner must mount behind the rider while the horse is still in motion. At this point the fun begins. Many horses will not cooperate in this kind of mounting. The first team to cross the finish line is the winner.

There are any number of kinds of barrel races. In most, the horse is ridden over a course on which he must go around barrels, making certain turns in specified directions. Riding designs can be quite varied. Scoring is on quickest time from start to finish. A touched barrel counts a point against the participant.

One of the most exciting barrel races is in the funny race class. Large wooden barrels with both ends knocked out are placed on their sides, halfway between the starting and finish lines. There is a barrel for each rider, who at a signal rides to his barrel, dismounts, ground ties the horse, crawls through the barrel and remounts, and rides to the finish line. That is, he mounts if the horse is still there. In most instances the sight of the rider attempting to crawl through a barrel is something the horse can't stand, so he takes off. That makes for real fun with plenty of action.

The flag race can be handled in several ways. One preferred method is to set up teams of six men. Three members face each other from opposite ends of the arena. Each group is equipped with a flag on a pole. A man from each team rides to the arena center and exchanges flags in a marked circle. Each rides back to the starting line and transfers the flag to a waiting member. The first team to complete all exchanges wins.

So important has fun on horseback become to the modern horsemen that many horse shows include from two to five of the gymkhana or funny races. Everyone likes to watch riders having fun with their horses, for it is as exciting to watch as it is to compete. ★ ★ ★

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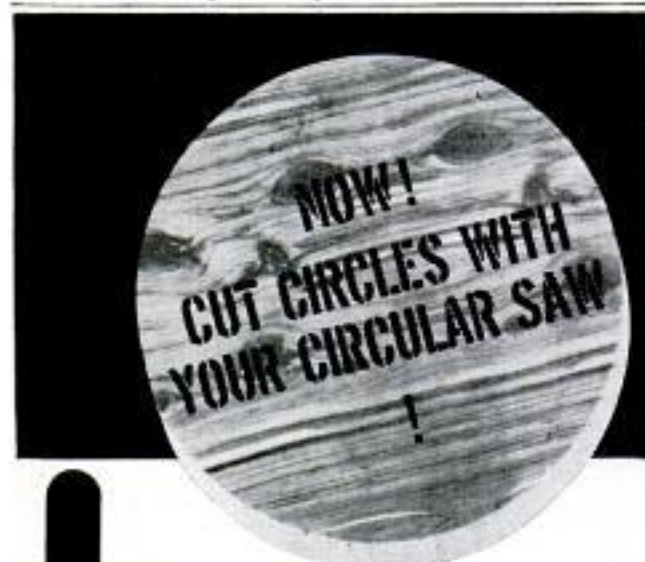
(Continued from page 131)

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(Continued to page 244)

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solenoid plungers. Each octave has its own assembly, which can be replaced as a unit in case of trouble.

No trained organist could be expected to work for hours in a cave each day. Therefore, Sprinkle has built a mechanism for playing the organ automatically, which also is mounted on this platform. It consists of an endless belt of thin, tough plastic, 40 inches wide, rolling over an aluminum cylinder. Melted into the belt are holes corresponding to the notes of the recorded selection. As the belt moves, tiny metal brushes touch the cylinder through the holes, triggering the proper solenoids.

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Variations in volume are also achieved in the control room, so that a selection may swell into triumphant chords or drop almost to a whisper, all automatically. When the plastic belt is prepared, the organist, stationed in the ballroom, telephones recommended volume effects to an operator at the control panel. On the panel are three switches that offer eight variations in volume, which the operator manipulates to carry out the recommendations. He also flicks a fourth switch, its two positions labeled "forget" and "remember," to wipe out undesirable effects or preserve desirable ones.

Sprinkle faced problems that sometimes seemed insurmountable. Against the unrelenting dampness of the cave, the console platform and the platform in the control room had to be heated with built-in electrical units, which keep the tops of the two platforms dry enough to gather dust.

But the problem of the condensers was knottier. The resistance of the solenoid was so low that a condenser gave up its charge too fast, and quickly developed hot spots. Would any condenser stand up to this kind of punishment? Would the Stalacpipe Organ die before it could ever be heard in recital?

Sprinkle, approaching the problem from the other end, began working over the solenoid. He multiplied the resistance of the solenoid coil 30 times. This not only slowed down the discharge rate of the condenser to a satisfactory level but actually developed a more substantial thrust of the plunger. Result: A stronger tone which required one less condenser.

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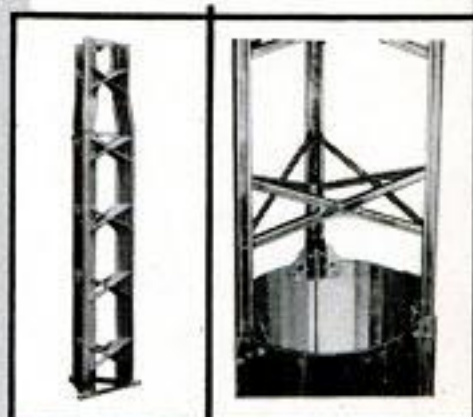
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What's Happening to the Weather

(Continued from page 110)

LANDSBERG: I remember the first A-bomb experiments in Nevada. There was a flurry of publicity as to whether or not the explosions influenced tornadoes. It so happened that the opposite took place—at that time there were fewer tornadoes than in the preceding or succeeding year.

Q: How far ahead can the weather be accurately forecast?

PETTERSEN: The usual period is 24 to 36 hours, sometimes longer, sometimes less depending on conditions.

LANDSBERG: Some attempts have been made to provide extended forecasts, but the longer you make them the less accurate they are.

Q: Is there any scientific fact in some of the weather superstitions, such as the ground hog seeing his shadow?

LANDSBERG: I wouldn't call them superstitions. Some have a basis in fact, others do not. In most cases the animal is "hindcasting," reflecting something that is already happening. For example, the bird migration is often thought of as indicating an impending winter storm. But actually they are taking advantage of high winds to do their flying. There is no question they

used pressure-pattern flying long before man thought of it in an airplane.

LANDSBERG: Concerning ground-hog day, I wouldn't shrug it off completely. There are certain things we call singularities in weather. Around the beginning of February, if there is a cold spell with clear weather, then there is a certain amount of persistence of that type of weather.

Q: What is the status of using computing machines in processing weather information and weather forecasting?

PETTERSEN: At the present time, experienced weather forecasters can forecast wind and weather better than the machines. However, because of the complicated data involved, if you are dealing with winds at the higher altitudes then there is very little difference between a man and a machine-made forecast.

LANDSBERG: If anything, there is a shifting in advantages to the machine in upper-level forecasting. One thing to remember is that the machine cannot be any more accurate than the information fed into it. We lack so much accurate weather data, from over the oceans which are $\frac{2}{3}$ of the world, and from areas with inadequate weather observations.

PETTERSEN: Real progress is being made with these machines, and there is
(Continued to page 248)

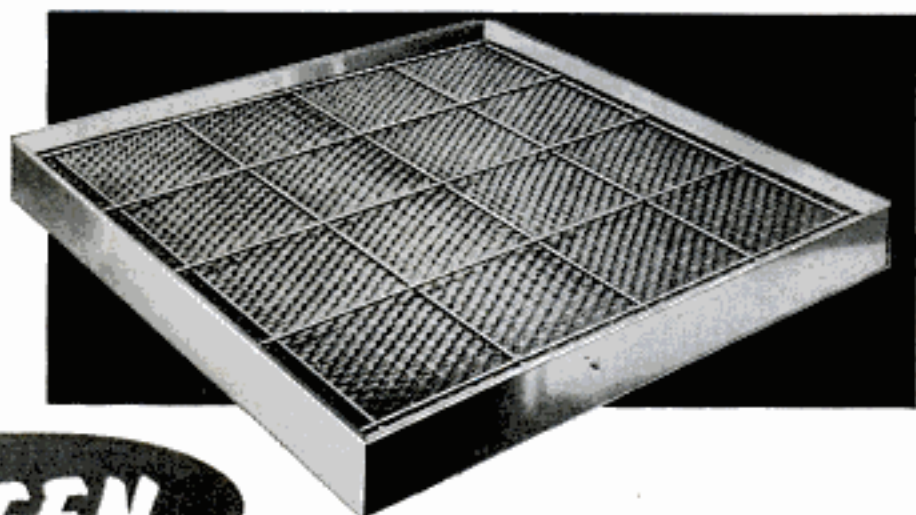
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How to make strong plywood joints with Weldwood glues



BUTT JOINTS are simplest. For thinner plywood, reinforce with block of wood. Be sure wood surfaces make snug contact. Apply glue to all surfaces (two coats on end grain) and clamp. When possible, reinforce joints with nails or screws.

RABBIT JOINTS look neat, give added strength to drawers, chests, cupboards. Make slot with dado cutters, or several overlapping passes with regular saw blade. Apply glue to both surfaces, clamp, and nail or screw if possible.



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a tremendous growth potential. After all, there is a limit to the amount of information a man can carry in his head, whereas the machine is equipped to handle millions of figures.

Q: With the advent of better computing machines and more information, will the period of accurate weather forecasting be extended?

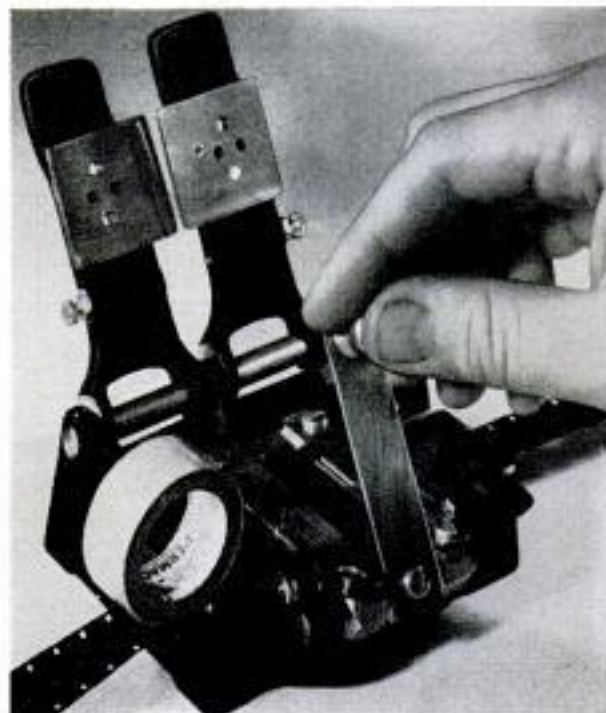
PETTERSEN: Not radically.

WILLETT: I don't believe the prospect of getting specific forecasts of more than four or five days ahead is something we can ever hope for. Certainly, we will be able to improve the present level of forecasting, and perhaps extend it somewhat longer.

PETTERSEN: If we are ever able to go beyond three or four days in forecasting, the only hope is that we can combine physical and statistical techniques and solve the problems by using more weather data and improved computers. ★ ★ ★

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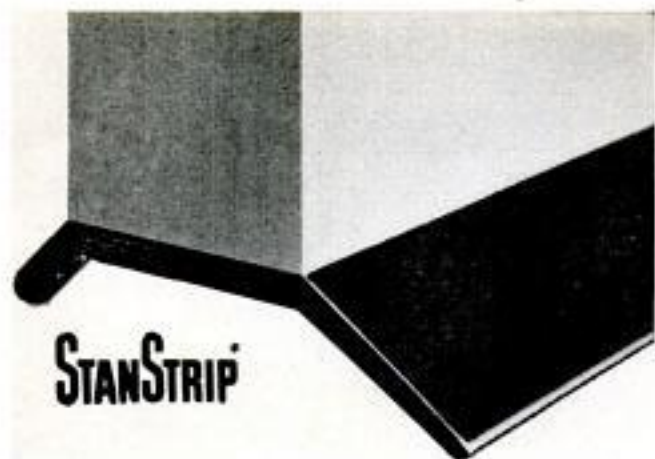
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Brains for Planes

(Continued from page 101)

and see the strip someplace in his circle of vision on a clear day.

As an extra bonus, 66 also senses the plane's drift caused by cross winds. Until now, this was a problem that had to be worked out tediously by a navigator using triangulation, or data from drift meters which are good only in fair weather when the ground is visible.

This feature of the brainy Doppler navigator is the one that enabled Major Smith to follow the river of jet wind all the way from West Coast to East. Leaving March Base, he headed out to intersect the jet stream, whose general location had been supplied by the weathermen. He knew he was in the stream when the 66 informed him that he was being carried swiftly sideways toward the east. Finally, when his sideways movement reached maximum on the drift dial, Smith knew he was in the middle of the jet stream. He swung his plane downwind, until the drift-angle reading was zero, indicating that he was riding with the wind. Then he tied in the automatic pilot. Locked to "zero drift," the autopilot proceeded to steer the plane in any direction necessary to keep the drift angle at zero. Hence the B-47 automatically stayed pointed directly downstream, following the jet wind along its wandering course, and collecting a 165-mile-per-hour kick all the way to Massachusetts.

Today, more than \$50,000,000 worth of AN/APN-66 navigators are contracted for. Though most of this is military, indications are that it won't be long before a 66 will be flying you when you travel by air. Overseas carriers are expected to use them first.

Brain for Plane or Missile

If the 66 seems uncanny, another navigational brain—on the secret list until a few weeks ago—recently showed off its ability to do much the same job without reference to compass, radio or radar signals, or other usual aids. Developed at Massachusetts Institute of Technology under the direction of a stocky engineer, Dr. Charles S. Draper, the eerie system, known as "inertial guidance," can tell a plane or missile exactly where it is in relation to earth or stars in space at any given moment of flight. Sunspots, magnetic interference and enemy jamming attempts have no effect on the system, since it requires no electronic eyes or ears.

The inertial-guidance system's sense of direction is born in a complex array of instruments that sense and transmit every

The Standard Products Co.
LEXINGTON, KENTUCKY

tiny waver of the craft to an electronic brain that tells the automatic pilot how to steer. One of these sensory gadgets is a tiny gimbal-hung gyroscope whirling at 12,000 revolutions per minute in a shiny cylinder no bigger than a frozen-juice can. The axis of this high-speed midget always stays pointed in the same direction no matter how the craft wavers around it.

Besides the gyro, the system employs an electronically controlled pendulum that always points to the center of the earth no matter what the vehicle's speed or attitude. The angle between the gyro's fixed axis, and the rod of the pendulum pointing to earth's core, changes slightly as the plane moves along. It changes violently if the craft wavers, dips or climbs. Tiny accelerometers constantly measure the changing angle, translate it into terms of changing speed of the craft in any direction. This data is flashed to an electronic brain that signals the automatic pilot to make proper corrections to keep the vehicle on a preset course.

Besides all this, a precision clock, making corrections for the earth's rotation as the craft speeds over the globe, enables the brain to calculate its exact latitude and longitude at any instant of flight.

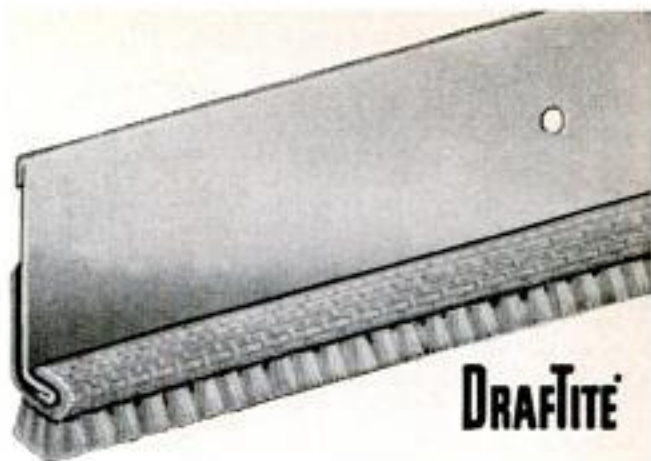
Navigator for Satellite?

The first 2700-pound inertial-guidance navigator flew a B-29 from Massachusetts's Bedford Airport to Los Angeles in February 1953 while pilot C. L. "Chip" Collins sat with folded hands bemoaning the fact that "I've just lost my job." The bulky test navigator brought the plane within 10 miles of its target before Collins took the controls. Since then, much of the system's nightmare of wiring and humming parts has been whittled down to miniature size. Its actual bulk is classified. But it's small enough so that the Navy's intermediate-range Polaris missile is getting an inertial-guidance navigator. And chances are that when the big three-stage rocket pitches the first manmade satellite into outer space next year, one of these brainy navigators will be manning the controls.

Just as brainy as the 66 and the gyro navigator is another electronic wizard—Bell Aircraft's new Automatic Carrier Landing System (ACLS), which electronically plucks planes from the air and sets them down gently on fogbound airstrips or heaving carrier decks.

Here's how it works: Ensign Jones returns from a mission to find his carrier lost somewhere beneath him in a thick blanket of fog hugging the waves. Ordinarily in such weather he'd head for an alternate

(Continued to page 252)



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landing spot—or even ditch, rather than risk smashing himself and a deckful of parked planes. But there's no problem now. Having homed in on the ship's radio equipment, he knows she is right under that layer of milk, so he starts circling.

Down below, in the electronic glow of the CIC room, a sailor monitor has seen a blip from Jones's plane on the search radar. At that instant Jones flicks a switch in his fighter cockpit; a light flashes in the CIC room, telling the monitor: "I'm ready to be controlled." The monitor pushes a button on the console in front of him. That's all. From there on, the transistors and humming tubes are in charge. A white light flashes on Jones's instrument panel, announcing: "We've got you." The landing-system's radar locks in on the craft, tracking and feeding data on its position and altitude to a computer. Radio commands from the computer flash to a receiver on the plane where they are converted into signals that direct the automatic pilot.

"The human pilot doesn't really need to be told he's locked in," explains Campbell Hill, Bell engineer. "You can actually feel the system take over. The plane doesn't drift. Controls move magically under your hands and feet."

Computer Lands Plane

Banking and turning by itself, the craft finally heads through the fog directly for the deck. Ensign Jones sees his throttle move back under the guiding force of electronic gremlins. Radar impulses from the ship, bounced from a tiny "corner reflector" on the plane's extended landing gear, keep constant track of the craft as it moves in. With split-second timing, the computer tells the autopilot to "cut engine" as wheels skim the lip of the deck. If a gust of wind lifts a wing, or the ship rolls the wrong way, the brain commands the autopilot to "take it away." Instantly, throttles pour on fuel, the plane banks to the left to avoid the ship's island, and away goes Ensign Jones for a free ride while the gremlins try again.

So far, in land-based tests, a mobile prototype of the Bell system has completed more than 1200 landings with high precision. At landing speeds of nine feet per second, planes sat down within an area 10 by 22 feet around a designated landing point. At speeds of two feet per second, touchdowns stayed inside an area 10 by 100 feet. What if a rack of tubes burns out and the system fails? "At any instant," says Hill, "the pilot can throw a 'disengage' switch and take over."

Sea trials for the equipment should be

(Continued to page 254)

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- stops piston slap
- increases miles per gallon
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PUMPS ALMOST ANYTHING

ITEM #414

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Higgins Type PNB, Model R, marine bldge pump. Open Impeller design for handling muddy water. Delivers 75 gallons per minute, 30 foot head with 3/4 H.P. motor.

Pump body and impeller are made of solid bronze, with alloy steel 3/2" diameter shaft, 1 3/4" long. Rotation of the pump is clockwise. Inlet has 1 1/2" pipe thread. Plain 1 1/2" outlet for hose connection. Dimensions 12"x7"x8". Shipping weight 23 lbs. F.O.B. Chicago. **23.50**



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(Note—tubing not supplied)



2 H.P. 24 VOLT

ELECTRIC MOTOR

ITEM #315—Rated 24 volts D.C. 90 amps, 4000 R.P.M. Has 1/2" spline shaft on both ends of motor, ball bearing construction, as specified for use with electric wheelchair design Popular Mechanics March Issue, 1953. Shipping Wt. 21 lbs. Dimensions: 11" x 5" x 6 1/2". F.O.B. Chicago. **13.00**



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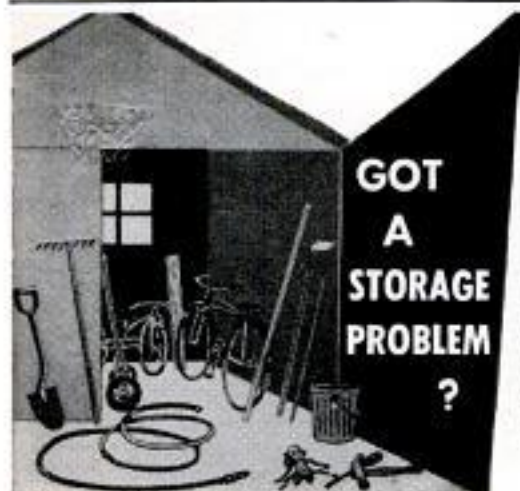
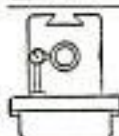
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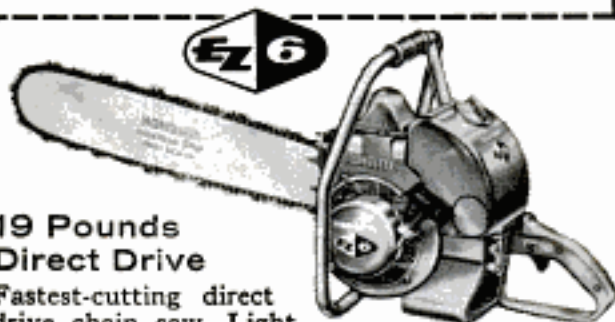
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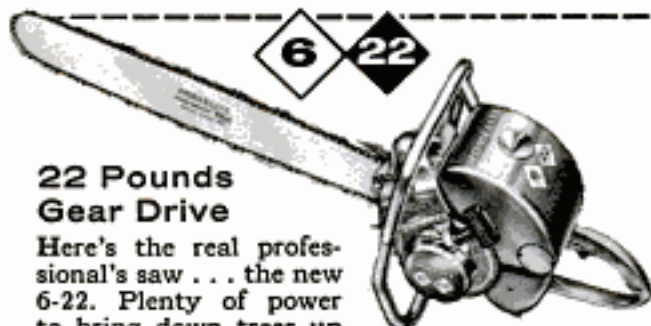
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... both 6 Horsepower!



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under way as you read this. Bell engineers, studying ship motion at sea, have built into their computer certain limits of speed and attitude of plane over the deck, beyond which the system quits trying to land the craft. In such instances, the brain automatically orders a wave-off.

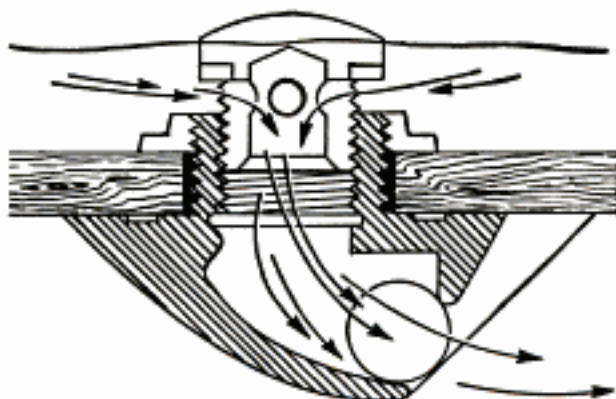
According to Bell's engineers, the Navy is interested in ACLS not only because of its all-weather potential, but because it would enable the planes of wounded and fatigued pilots to be safely landed aboard carriers following rugged missions. The enthusiastic electronic experts are also quick to predict the system's use in commercial aircraft. They point out that it would enable airliners to fly in any weather and land under "ceiling zero" conditions. When combined with a cross-country navigational system (like the 66), they point out, "it could make possible completely automatic flight under all weather conditions. ★ ★ ★"

Computer-Microscope for Trees Tells Rate of Growth and Age

Age and annual growth rate of trees now are calculated automatically by an electronic computer-microscope invented by Swedish scientists. Used to forecast forest resources, the machine counts the number of concentric rings and the widths between them of wood taken from a tree trunk. The number of rings tells the age, and the widths between indicate the growth rate.

Automatic Bailer Keeps Boat Dry

Any boat that planes or moves fast enough to create a vacuum behind it can accommodate an automatic-bailing mechanism. As the craft goes forward, a vacuum at its base draws excess water out of the vessel by way of the bailer's drainage channel. The only moving part in this aluminum apparatus is a plastic "check ball" that floats up and closes the opening in the top of the bailer when the boat slows down or comes to a stop.



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Here It Is—The Edsel

(Continued from page 95)

at the front offsets much of the gain. Edsel explains this by saying that the new engine design was under way before the comparatively new front-hinged hood was decided upon.)

Other novel features of the Edsel include a triple-thermostat cooling system which successively opens up the heads, the block and finally the radiator during engine warm-up. This system is designed to reduce choke time and increase gasoline economy and heater performance.

Power steering on the Edsel is an integral design that has a torsion-bar control for a valve regulating the amount of assist. The

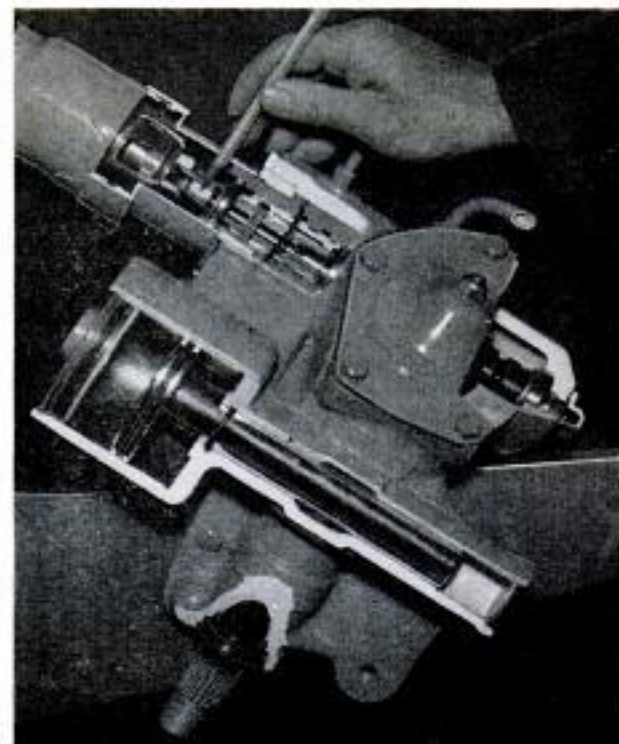
EDSEL SPECIFICATIONS

	Ranger-Pacer	Corsair-Citation
Wheelbase	118.0	124.0
Over-all length	209.0	218.8
Over-all height	56.4	56.8
Over-all width	76.8	79.8
Displacement	361.0	410.0
Horsepower	300	345
Bore and stroke	4.05x3.50	4.20x3.70
Compression ratio	10.5 to 1	10.5 to 1

more you turn, the more the assist. The pump for the unit, incidentally, will be built into the front of the engine, mounted at the end of the crankshaft. There will be no extra fan belt required to drive the pump. The first Edsels off the line will have the conventional belt-driven pumps, but the in-

(Continued to page 257)

Integral power-steering unit has torsion-bar control (pencil points to it) to regulate amount of assist



POPULAR MECHANICS

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tegral pump will be available soon after introduction date, Edsel says.

Color-conscious motorists who shudder at some combinations of hues on today's cars will appreciate Edsel's decision to use only matching or harmonizing colors.

An important part of the Edsel sales effort (as with all makes) is psychological. The luxurious feeling of the front seat is part of this. Also part of the psychological warfare is the hood configuration. As you sit behind the wheel of the Edsel, tapering creases make the hood seem to extend miles out in front. There is a lot of the Mark II Continental in this sensation. It's not a big car, but to the driver it seems to be. And that is expected to help sales.

Will it succeed? It's no easy task, Edsel admits. No all-new car has been successful since the Mercury was introduced in 1938. Ford's reputation and its millions of devoted customers will help, of course, but it must get sales from other makes if it is to succeed. Edsel is jumping into the ring at a rough moment. The medium-price field is sagging and the veterans in it are in no mood to share customers with any upstart.

Edsel's aim is to provide Ford owners who want to move up with another car in the Ford family. With only Mercury between Ford and Lincoln, the Ford Motor Company has been losing customers to competition. Edsel is here to plug that gap.

It will be an interesting battle. ★ ★ ★

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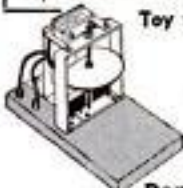


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By Don Hoppe

EXPERTS WARN US that we face a growing shortage of scientists and engineers. Less has been said about the need for technicians to assist these professionally trained men, but it is becoming painfully obvious that for every engineer a squad of from two to 10 draftsmen is needed. A glance at the "help wanted" pages readily reveals this need.

The backlog of engineering work has reached such proportions that some consulting firms have draftsmen working on an unlimited-overtime basis. Some companies offer bonuses of up to \$300 to their employees for each new qualified man they bring in. In addition to high salaries, such inducements as free insurance programs, profit-sharing plans, bonuses, paid vacations and free coffee are offered to lure prospective employees to the larger firms.

In the major metropolitan areas, a senior structural draftsman may command a basic salary of about \$600 a month, but with fringe benefits and unlimited-overtime programs much greater earnings are possible. One highway-engineering company, engaged in a rush program to complete plans for a multi-million-dollar Eastern expressway, willingly paid overtime salaries that ran as high as \$2000 a month in order to meet the promised deadline. Many firms working at a more moderate pace have an overtime program that allows a good man to make \$200 per week. And bonuses can run as high as \$2000 a year in firms that have profit-sharing plans.

How does a draftsman get started and how does he rise to a \$7500 to \$12,000-a-year position? Many engineering offices have excellent on-the-job training programs. Through such programs, young men who have sufficient basic education and an aptitude for drawing may soon establish well-paying careers. Others get their initial training through correspondence school courses, specialized trade schools or technical schools. Some have completed drafting or engineering courses at colleges or universities. It is still a man's world, although the ladies maintain a

(Continued to page 262)

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persistent minority in the drafting rooms.

Regardless of the source of their basic training, those who reach the higher-paying jobs have this in common: They are creative members of an engineering or research team and must be able to contribute actively to the development of their firm's product. They know this product or service thoroughly, so they can translate ideas into detailed drawings without excess supervision. And, finally, their work reflects craftsmanship in its neatness and accuracy.

The drawing board is the beginning of nearly all the constructive and productive activity that man undertakes. Consequently there are numerous types of draftsmen. Architectural, structural, mechanical, civil engineering, statistical, topographic, aircraft, piping, electrical, chemical engineering, tool design and product design are some of the major classifications. Since many of the engineering fields overlap, it is possible for a good draftsman to become experienced in more than one major field, thereby increasing the employment opportunities open to him.

What preparation is necessary in order to study drafting? A high school education or its equivalent is basic. Mathematics and science courses are the most helpful. Mechanical drawing and shop courses are valuable, too. Some kinds of drafting require considerably more mathematics than others but all draftsmen in the engineering fields (which now offer the most opportunity) should have a working knowledge of algebra, geometry and trigonometry. Of the science courses, physics is probably the most useful.

Salaries for drafting trainees range from \$300 to \$400 per month in the major employment areas. To enter one of these programs, the trainee must be able to do the more elementary drawings in pencil or ink and do neat and attractive lettering. A beginner is often judged by his lettering.

After his initial employment, the future depends on the aptitude and industry of the trainee. In two years he may be able to accept employment as a regular draftsman. And after five years he may be regarded as a senior draftsman.

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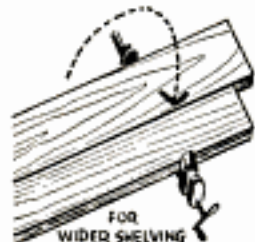
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OCTOBER HOME SECTION

See Our Annual Home Section—Next Month

Two new PM homes specially designed for our readers are featured in full color in our fifth annual October Home Section. One is Traditional, the other Modern. Plans for both are available. Also featured in the 50-page section are the latest in wall coverings, concrete blocks and other building materials, ways to add space to your house, how to build a fireplace, how to line a closet with cedar and scores of other useful ideas. Special articles take you on a visit to a unique solar house, an ambitious do-it-yourself home in Minnesota and on a cross-country tour with our own Parade of Homes.

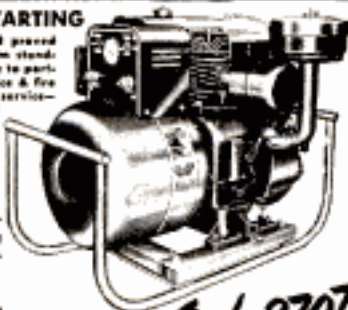
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**32⁷⁵
32⁷⁵**

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**32⁷⁵
32⁷⁵**

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USED
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Thread-adjustable drive shaft travels 3" either direction in 15 seconds. Will stand compression or tension load of 800 lbs. Static load 1750 lbs. Motor is 24VDC., 11.5 amps., series wound. Rated 1/6 HP. Turns 6000 RPM. One minute intermittent duty. Extended length 17", retracted 14". **9⁹⁵**

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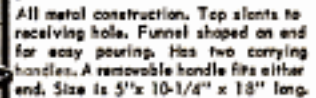
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15 INCH **ONLY 1⁹⁸**

Made of top quality, Vanadium Steel, ideal for clearing brush, etc. Complete with belt sheath.

NEW 16 QUART OIL DRAIN

All metal construction. Top slants to receiving hole. Funnel shaped on end for easy pouring. Has two carrying handles. A removable handle fits either end. Size is 5"x 10-1/4" x 18" long. **ONLY 2⁴⁹**



AIR PRESSURE TANK

G-1 Type, Stainless Steel. Shatterproof and rustless. Built to withstand up to 400 PSI with high safety factor. Has 1/4" pipe ports. Ideal for use in Air Storage for painting, spraying, etc. Can also be used for water storage, as a buoy, etc. Size: 12 1/2" diam. x 24" length. **NEW and UNLTD 16⁹⁵ USED 12⁹⁵**

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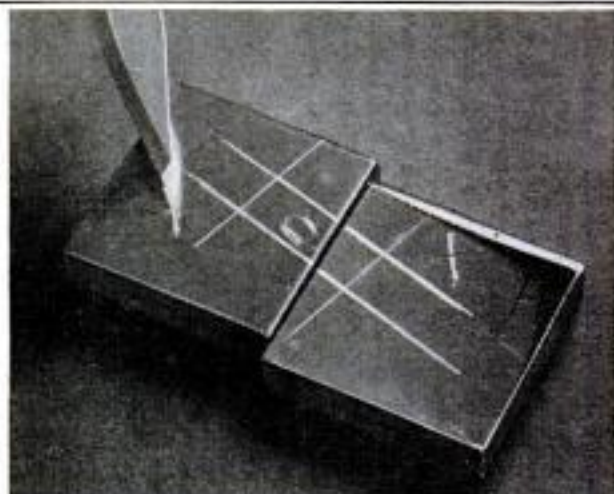
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Material Made From Glass Can Scratch Steel

Hard enough to score blocks of steel (above), although made from glass, a new material called Pyroceram has been developed and is reported to have a variety of potential uses. It is made by mixing additional ingredients with the raw materials of a glass batch, which is cooled and then put through a special heat-treating process. First application of the material is for hypersonic guided-missile radomes. The before-and-after photograph, above right, shows how heat-treatment turns the transparent glass to opaque. However, it can

also remain transparent. The three-foot lighter-than-aluminum cones will protect sensitive directional equipment in missile noses from the sudden extreme temperatures of hypersonic flight. Other possible uses for the material, according to the manufacturer, include aircraft parts, engine components, oil and chemical piping, heat-conducting range tops, cooking and eating ware and curtain walls for industrial buildings. Pyroceram was invented by Dr. S. Donald Stookey of the Corning Glass Works.

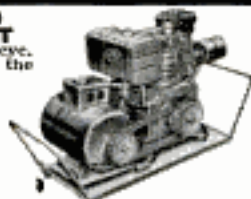
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GIANT 2500 WATT PLANT

110-120 v. 60 cyc. AC. Absolutely the best made - exclusive dynamo-cally balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted - portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories! engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory Warranty. (Item 31) Wt. 210 lbs. Reg. price \$585. Special at..... **\$299.50**

Same plant with electric self starter (Item 31a)..... **\$359.50**

DUAL VOLTAGE 110-220 available on any of above models for \$28.00 additional. Generator only and control box..... **\$169.50**



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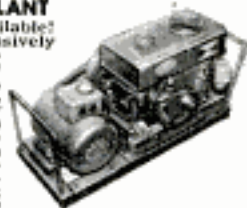
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Never before available! Now offered exclusively by Master Mechanic. A low priced, lightweight, continuous duty, Diesel generator set. Powered by a super rugged, exceptionally smooth running, one cylinder Diesel engine. Operates at conservative 1750 r.p.m. and delivers full 1750-2000 watts of power. Operates on low cost fuel oil. Wt. only 240 lbs. representing a triumph of Diesel Engineering. Complete with fuel filter, oil pressure gauge, control box with duplex receptacle and voltmeter. (Item 830) Special factory price..... **\$399.50**

DIESEL ENGINE only, as above described 3.5 HP (Item 830a) Wt. 116 lbs..... **\$249.50**

700 WATTS PUSH BUTTON START 115 v. 60 cyc. AC. Powered by a rugged 2.2 HP easy starting Briggs engine. No wiring necessary! just plug in and operate. Plenty of current for any oil burner, freezer, toaster, emergency lights, etc. Which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge B.V. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. \$275 value..... **\$143.50**

1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output..... **\$199.50**



LESS THAN WHOLESALE

1500 WATT PLANT

115 v. 60 cyc. AC. Push Button Start. Powered by a 3 1/2 HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, steam pump, freezer, television. Lights, communications systems, etc. which require up to 1500 watts. (Item 22) Wt. 110 lbs. Reg. \$475 value. Factory price... **\$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price... **\$279.50**

2500 WATT PLANT—Push Button Start (Item 21) 110/120 v. 60 cyc. A.C. A rugged powerful plant. Reg. \$645. Spec. **\$329.50**

3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 35% more capacity. Wt. 270 lbs. Reg. \$760. Factory Price..... **\$379.50**

DUAL VOLTAGE 110/220 for Item 21 or 23—\$30 additional. We make every type and size of light plants—Write, giving us your requirements!



EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable. 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **\$8.95**

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50 ft. (Item 592) with fittings..... **\$13.45**
100 ft. (Item 135) with fittings..... **\$25.95**

No. 12-2 Power Cable. Very flexible rubber covered, special outside shield for grounding power loads, etc. 50 ft. (Item 190) Wt. 8 lbs. **\$6.95.** 100 ft. (Item 200)..... **\$12.95**

No. 8-2 Conductor Power Cable. 80 ft. heavy duty. Very flexible rubber covered with male & female plug (Item 817)..... **\$12.95**



SCREW-TYPE PRESS

A tremendously powerful screw capable of exerting nine tons of pressure. Pays for itself straightening bent parts, or pushing out bearings and washings. Ideal for manufacturing and assembly operations. Because of precise control. Massive 1 1/2" screw permits precise control over vertical travel. Extra heavy ribbed yoke has a throat 2 1/2" high; depth capacity for working into the center of an 1 1/2" object. Includes 8" x 15 1/2" vise-type table and two pushing arbors. Wt. 150 lbs. (Item 797). Reg. \$149.50. Special..... **\$49.50**

HYDRAULIC PRESS. Nine ton capacity. See Aug. Pop. Mech's. ad for details—or write. Complete. Wt. 110 lbs. (Item 464)..... **\$69.50**

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A powerful cylinder mfd. by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder is 3 3/4" O.D. with 4 1/2" stroke—standard heavy duty clevis on both ends. Has standard 3/4" pipe thread openings. Can be used for tilting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. \$68 value. Special..... **\$14.95**

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8" stroke - 3" bore..... **\$34.00**
10" stroke - 3" bore..... **34.80**
10" stroke - 3" bore..... **43.00**
24" stroke - 3" bore..... **47.50**

We have all sizes of cylinders available.
HYDRAULIC CONTROL VALVE—4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet. 1/2" on cylinder outlets. Easily mounted, finger tip control. Wt. 34 lbs. (Item 822)..... **\$21.95**

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Heavy duty, made by E. F. Goodrich for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: 1/2-1 hp., 3/4-1 1/2 hp., 1-2 hp., 2-3 hp., 2-3 hp., wt. 105 lbs.; Reg. list \$228, \$252 and \$252. Our prices **\$79.50, \$89.50 and \$114.50**



FAUCET WATER HEATER

Instant hot water from any faucet for just pennies—noads unobtrusive—just install. You just plug MASTER MECHANIC'S new Faucet Water Heater over any water faucet, plug it in a wall outlet and you've got steaming hot running water instantly for dishes, shaving, washing baby's bottle, etc.

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(Item 10) Easily installed in furnace pipes. Forces even heat in all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air, 1400 to 600 CFM.
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9" Pipe, wt. 6 lbs..... **\$7.85**
10" Pipe, wt. 7 lbs..... **\$8.85**
12" Pipe, wt. 8 lbs..... **\$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 108)..... **\$11.95**
12" Fan, Wt. 10 lbs. (Item 109)..... **\$12.95**

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12" Fan (Item 106)..... **\$14.95**
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WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at..... **\$10.50**

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Wt. 480 lbs. (Item 280) Compares with welder costing \$1200. **\$449.50**

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