

REPORT ON LARK AND RAMBLER 35 CENTS

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU

Bail Out for Fun
—page 65



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SPOON FISHING

How to convert



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EVINRUDE

FIRST IN OUTBOARDS

What kind of a car do you want, exactly? Chevrolet has a choice of nine engines, five transmissions, two suspension systems, regular or Positraction rear axles, special cams, two air-conditioning systems, even Fuel Injection—the list of extra-cost options is tremendous. But what it means is that you can virtually design your own car, tailored precisely to your needs. Here's just one example:

“I ‘built’ my Chevy for top economy . . .
and extra easy running at 300 miles a day.”



“As a traveling salesman with a big Midwest territory I rack off about 300 miles a day—and, boy, how I love gas economy. But I like all the comfort I can get, too.

“I used to wish I could design my own car, until this year. That’s when my on-the-ball dealer friend showed me how I could ‘build’ just the right car out of Chevy’s terrific list of options. Look what I got:

“I picked a Biscayne two-door, ‘cause I pay for my own auto and that’s right at the base of the price list. A Hi-Thrift 6 engine—that’s the world’s best workhorse. And Overdrive; with that high ratio you can just whisper down the road at good fast cruising speeds. No strain, hour after hour . . .

and that gas needle *never* seems to go down!

“Then I pampered myself a little bit. Foam rubber padding in the seats (I’m a big guy and I spend *hours* at the wheel); Chevy’s new throttle-holder where you just set your cruising speed for those long straights and the car holds it while you rest your right foot; the big ‘fresh-air’ heater. Man, you should drive my car. It fits me like a glove!”

There’s something to figure on, friends. Whatever kind of car you want—sports car, salesman’s car, town car—you can “design” it for yourself. But check your Chevrolet dealer and see how you can suit yourself to a T. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



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Next Month...

AT LAST there's a prefab house you can finish yourself. To save money you can take over the work at any point in the construction. In the June issue you'll find a story on this unique method of building. . . . You've seen their films on TV. The "fathom photogs" are the Navy's skin-diving cameramen, who not only do underwater films for TV, but scientific studies as well. A June article shows you how they get their spectacular films. . . . Also next month, a world's swimming champ reveals his secret, and the Owners Report on Pontiac, that surprising sales success of the medium-priced field

ROUNDUP

Hitch up your horse, pick up the boys, and head for the nearest store to git a pack of

PHILLIES. CHERROOTS



WHY HERE'S A CIGAR AS FRESH AS A NEW BORN COLT.

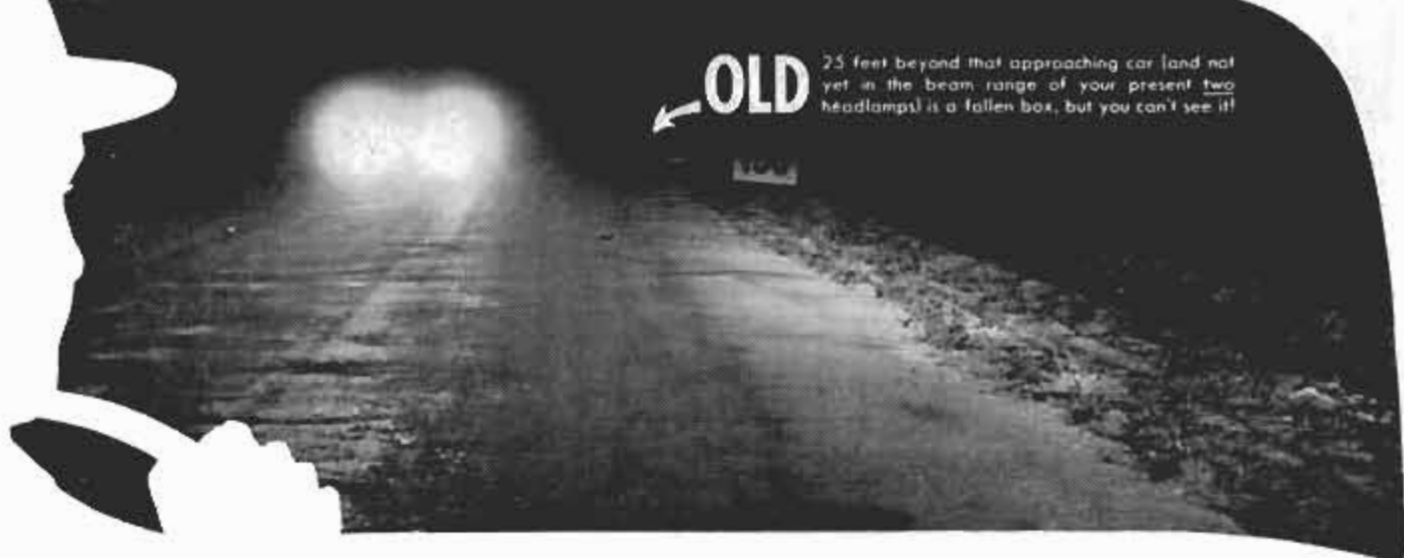
A spankin' new size and shape and it's

MIRACLE MILD

*Slick on the draw
and big as your trigger finger!*



Rustle up 28 cents and buy yourself a pack of 5. If you gotta wait in line and your horse starts chompin' at the bit- tell him "whoa"- you ain't getting back in the saddle 'til you get your CHERROOTS!



OLD

25 feet beyond that approaching car (and not yet in the beam range of your present two headlamps) is a fallen box, but you can't see it!

See better in spite of the other car's lights!



NEW

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The additional light enables you to see better beyond the oncoming car in

spite of *its* lights—when both cars are from 75 to 200 feet apart. And it helps you recover your vision more quickly after the other car goes by.

See the dramatic difference; get G-E SUBURBAN Headlamps. Have a pair installed and aimed now. General Electric Co., Miniature Lamp Dept., Nela Park, Cleveland 12, Ohio.



Special low beam filament shield lets you see better in fog, rain or snow. The upper beam reaches far and wide for safer driving on the open road.

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

"Back in 1944, I was living in a rut. It was almost as if the few miles between our house in Pelham and my desk in New York City were the whole world. I never dreamed that now—in 1959—I'd be financially independent, living in year-round sunshine—with time to enjoy it.

"Today I'm getting an income of \$300 a month, each month, every month. It'll keep coming as long as I live. Yet I grew up in the depression. I had no training at investments.

"What got me started? Actually, it was a booklet I got in the mail. I'd been reading advertisements about people who had retired. *Sounds wonderful, but there's a catch*, I thought. *What does it cost?*

"Then, one Sunday afternoon early in February, I was figuring up my income taxes. Up, up they were going. It was then I realized how little I held on to, out of all that I earned. What I needed, I thought, was an automatic way to put aside money for the future. If I left it to chance, there just wouldn't be any.

"So that day, I looked up one of the ads I'd seen for the Phoenix Mutual Life Insurance Company. I clipped the coupon and mailed it. The next week, I got a booklet in the mail, 'How to Retire.'

"That booklet taught me a lot. It told how a man of forty could retire in fifteen years—

with absolute assurance that he would get an income every month, all his life. It told how a man could take care of his family and his own retirement—both. It told how he could start with a certain plan and change it as his life changed. It was the only way to get an income guaranteed for life.

"I did a lot of thinking, then. In fifteen years, whether I planned to retire or not, I'd be fifteen years older. I ought to be free to do what I wanted to do—retire, if I wished. The right plan for me had to be something regular—something that I paid for as regularly as I paid the grocery bills. Soon after, I applied and qualified for my Phoenix Mutual Retirement Income Plan.

"I've always been glad. And all those fifteen years it was a pleasure to know that I could do what I actually did this January—retire, sell the house and start a new kind of life in Florida. Security? I have more than our company president!"

Send for free booklet

This story is typical. Assuming you begin at a young enough age, you can plan to have an income of \$100 to \$300 a month or more—starting at age 55, 60, 65 or older. Send the coupon and receive, by mail and without charge, a booklet which tells about Phoenix Mutual Plans. Similar plans are available for women. Don't delay. Send for your copy now.



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ACROSS THE DESK



To the Editor:

I am sending along a photograph that shows an interesting and novel way of making (or rather, growing) an ornamental



garage for the family car. This garage is shaped from a beautiful crimson bougainvillea plant, and kept meticulously trimmed.

Margaret S. Close,
Kitwe, Northern Rhodesia

To the Editor:

From a frequent contributor to our editorial pages, Hans F. Kutschbach of Hannover-Westerfeld, West Germany, comes this interesting account of the origin of the name of the famed band leader and composer of marches, John Philip Sousa.—THE EDITOR.

Sousa and my uncle, Holm E. Kutschbach, were born at Leipsic, Germany, the same year—1854, and attended the same high school and the same church. It was the well-known "Thomaskirche" which the renowned Johann Sebastian Bach attended and where in 1519 the famed "Thomaner" choir came into being. Both my uncle and Sousa joined the choir as boys, and here Sousa first was filled with enthusiasm for music. Years later the two friends emigrated to America and went their separate ways.

Again, years later, both decided to visit their native city, and when the pair came in together at the Prussian Railroad station in Leipsic, my father and I awaited my Uncle Holm. There were hearty greetings on the platform and after much visiting we four found ourselves alone—my father, William Kutschbach and his brother

(Continued to page 8)

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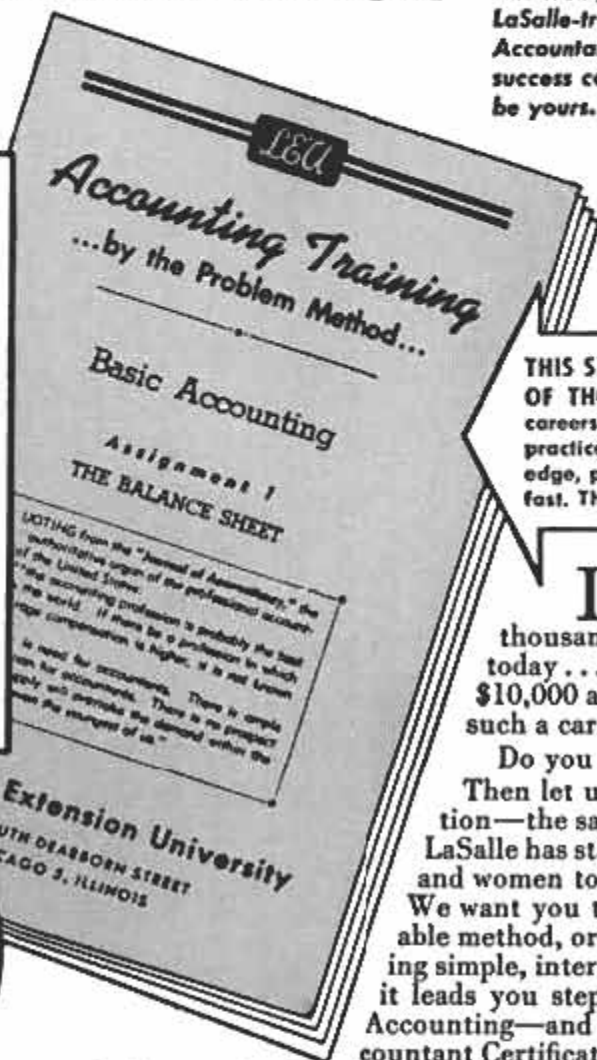


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BOEING

(Continued from page 6)

Holm, Sousa—it was not yet his name—and myself.

In fact it was at that moment that his name was born. The musician's huge trunk stood on the platform, branded with large initials: "S. O. U.S.A."—which stood for "Siegfried Ochs, U.S.A."

A redcap approached us and inquired: "Shall I take the trunk of Mr. Sousa?"

Ochs broke into loud laughter and pounded my father on the shoulder.

"Now I know my pseudonym—Sousa!" he shouted.

The porter took the trunk, and a handsome tip from the man who was to become the world's most renowned composer of marches.

"Sousa," writes Hans Kutschbach, "took me aside as I made such an astonished look and said to me in good Saxon: 'Ochs ist kein guter Name, wenn man berühmt werden will' (Ochs is no good name, if one wants to become celebrated). Indeed, so it is: Ochs meaning in English 'ox,' sounds not good; and then Sousa translated his other names into English 'John Philip' leaving out the first Christian name Siegfried. Thus the celebrated composer came to the name, 'John Philip Sousa.'"



To the Automotive Editor (Arthur R. Railton):

I have often wondered, Art, where you got your thirst for automobiles, and now it has finally come to light.

While rummaging through our historical files the other day I ran into the 1937 Railton which was produced by the Fairmile Engineering Company of Fairmile



Cobham, Surrey, England. The literature said that it was the "best in English and American engineering brains and workmanship." They used the main components of the Hudson chassis as well as the Hudson engine. Its manufacturers claimed it was the "ideal motor car."

John R. Pichurski,
American Motors Corp.

(Continued to page 10)

POPULAR MECHANICS

How to **CRACK** the education barrier



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(Continued from page 8)

To the Editor:

The town of Tullah in western Tasmania is unique in being the only town in Australia and Tasmania that has no road leading to it, not even a mule track or footpath. It hasn't even an airstrip.

A town of 100 persons, Tullah is completely cut off from the outside world except for a narrow-gauge railway that winds and climbs through a rugged mountain



range. It exists solely for a 60-year-old silver-lead mine. The metal is extracted by the flotation process and shipped out via Burnie to the United States. The name Tullah is an aboriginal word meaning "Meeting of the waters"; it is situated at the junction of the Murchison and McIn-tosh rivers, which unite to become the Pilman river.

The railway is a two-foot gauge and its engine is known affectionately far and wide as "Wee Georgie Wood." Built very early in this century by Fowler & Co., Leeds, England, Wee Georgie is a sight to delight any boy from 8 to 80. The old wood-burner weighs six tons and boasts a nominal six horsepower, develops 180 pounds' pressure and its cab is fully air-conditioned—open on all sides! Everything that goes in or out of Tullah rides that train—passengers, freight, stones, and silver and lead ore—six tons at a time. The railroad is six miles long, and its one train makes two round trips a day at about 40 minutes per trip. Tullah itself does have some roadways, but if you want reach the town by car you load it aboard Wee Georgie's flat truck.

The engineer, Mr. Len G. Marshall (shown in the photo) took over about two years ago and found Wee Georgie somewhat run down; being a man who takes pride in machinery he got busy and made the little chap gleam again. When Wee Georgie is laid up for repairs Mr. Marshall drives a ten-ton Krauss engine, a coal-burner built at Munich, Germany, in 1908.

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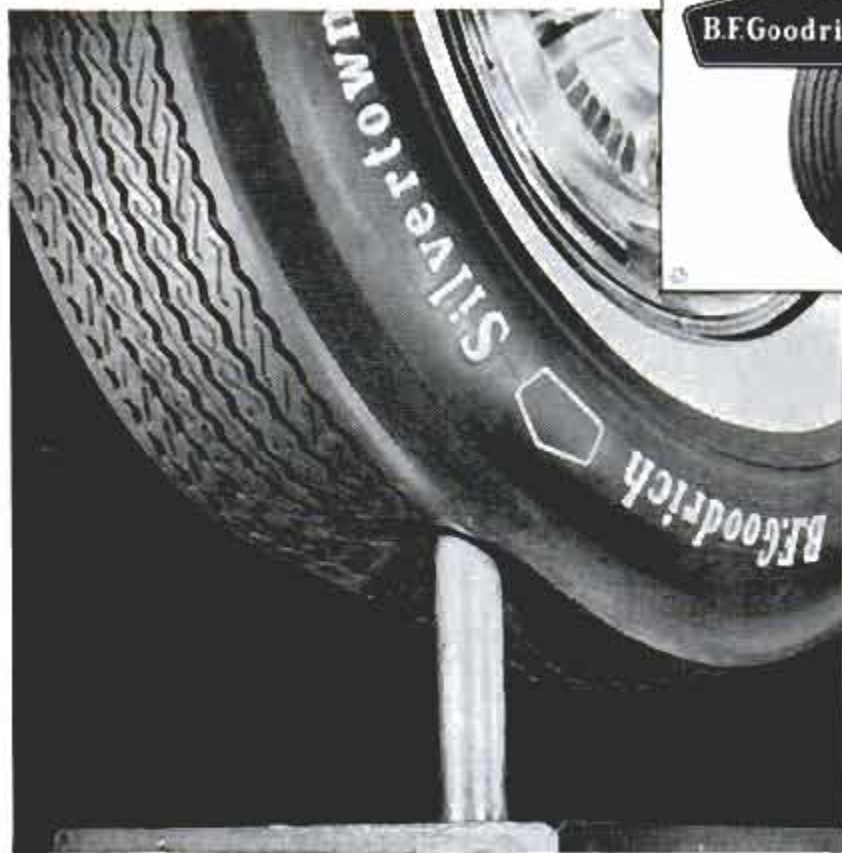


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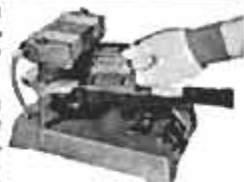
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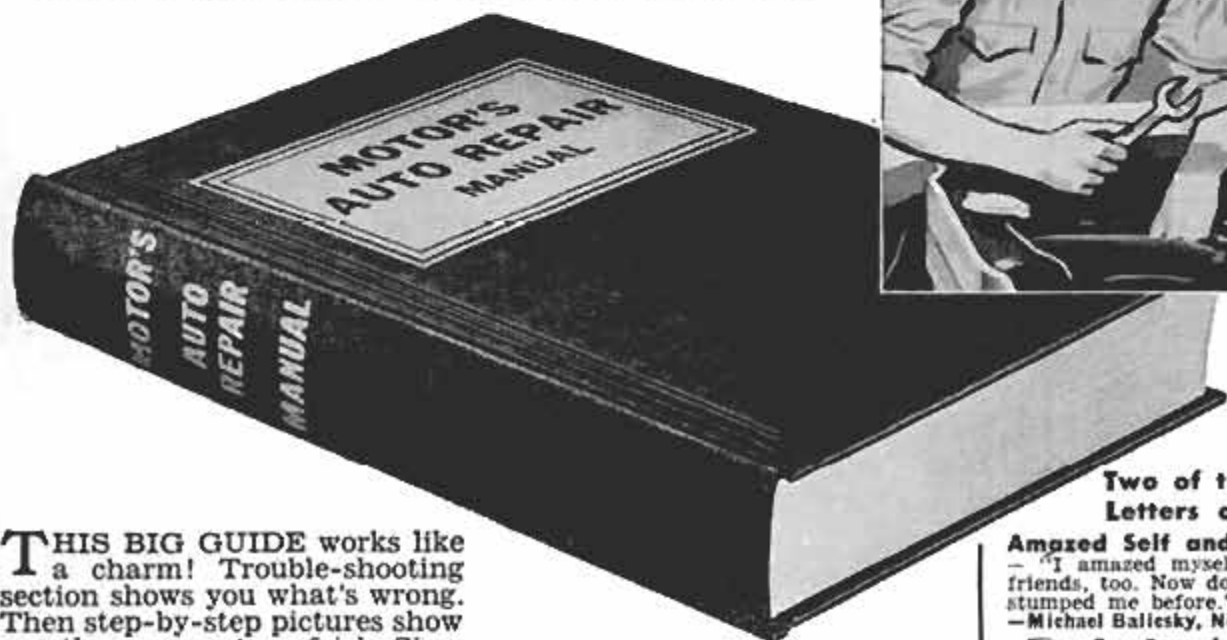
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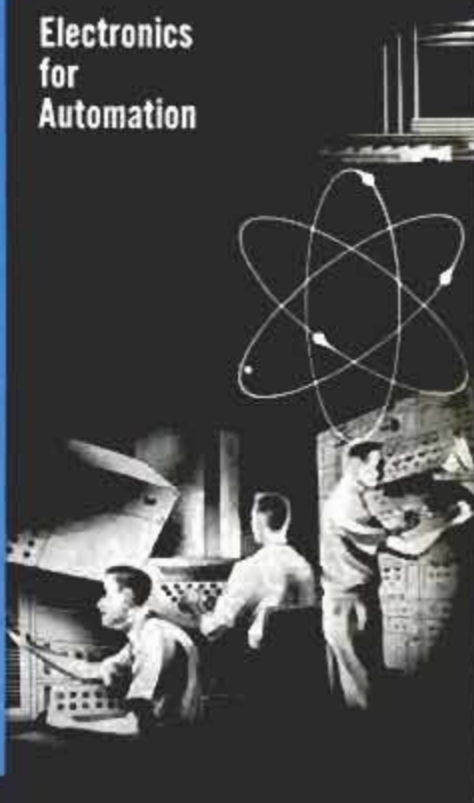
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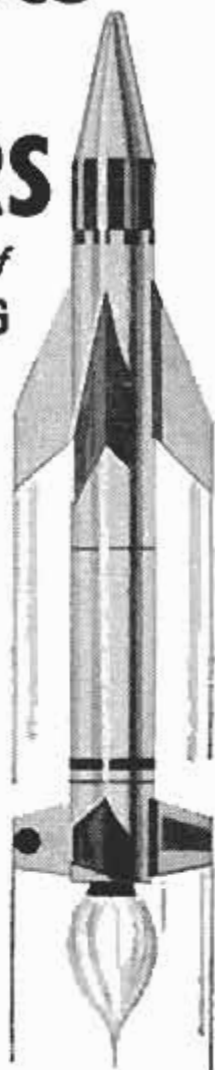
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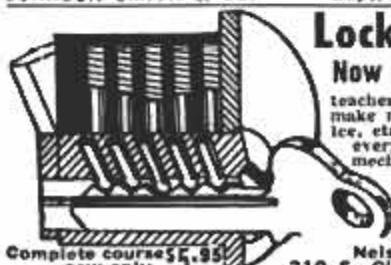
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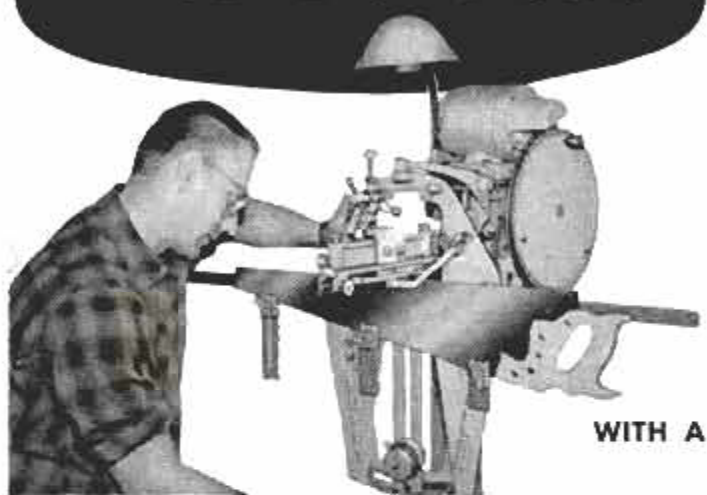


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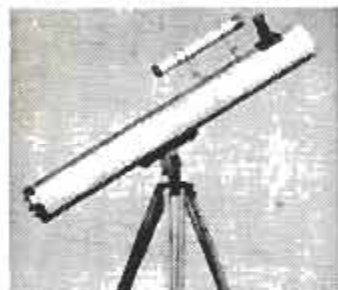
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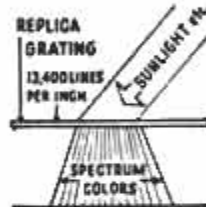


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START Your own profitable doll hospital, repair-supply and accessory business. Excellent full or part-time money-maker. Send \$1.00 for comprehensive catalogue. Grand Wig Co., Inc., 139 Fifth Avenue, Dept. P.M., New York 10, N. Y.

"MAILORDER Laws and Regulations" and "Mailorder Rules for Beginners." Learn about necessary licenses, different taxes, legal requirements, etc. Both books, \$2.00. Tasker, Box 3131, Alexandria, Va.

EARN Good money sharpening chain saws, scissors, cutters, knives. Free manual. Treco, North Tonawanda, N. Y.

GET Into booming mail order the professional way. We supply everything. Big profits. Write: Sigma Enterprises, Box 3509, Cleveland 18, Ohio.

SIX Mailorder magazines, articles, tips, sources, moneymaking opportunities, 25¢. Thompson, Box 94-PM, Salinas, California.

MANUFACTURE Concrete drain tile with simple machine. Profitable! Easy! Circular free. Ceeten Products, Cornelia, Ga.

ROBINSON'S Sewing Machine Service Manual, 579 illustrations, 144 pages. Earn to \$5 per hour. Price \$6.25. Lee Robinson, Book Nook Bldg., Walla Walla, Wash.

BOSS Your own home business. Profits 1200% to 3000%! Make, distribute stunning Shellcraft jewelry. Sells itself wherever displayed. Big repeat demand. Details free! Shellcraft, Dept. A, Box 804, Panama City, Florida.

I Got rich in the dry cleaning business with no investment, so can you. Free details. Write: Imperial School of Dry Cleaning, Dept. PMC, 1700 Touhy Avenue, Chicago 26, Illinois.

LEARN Sewing machine repairing. To \$125 weekly. Sparetime. Supplies. Add to present business. Write today! Taylor Service, Box 2126, San Bernardino, Calif.

MOLDED Terrazzo monuments. Terrific profits. No machinery. Local material. One man operation. Granitex Monuments, Dyersburg, Tenn.

RE-Cast junk batteries into new. Latest achievements. Battery Laboratories, Bayou LaBatre, Alabama.

OPERATE Part-time auto seat cover and upholstery business from your home. Fast sales, big profits. Send \$1.98 for complete, colorful sales kit with sample materials. Velco, 1338 Hillside, Windsor, Connecticut.

FREE! Free! Metal storage bins. Stack on top each other. Portable! Keep nuts, bolts, nails, parts separated. Information \$1.00. Guaranteed. Tommy Lynch, 2330 Springlake, Dallas 34, Texas.

\$10,000 ANNUALLY Possible, operating successful collection agency. Box 1346-PMX, Denver 1.

HAVE A profitable business of your own selling the "World's Most Usable Pictorial Bible." Let us tell you about this opportunity. International Book Company, Dept. M., P.O. Box 118, Wichita 1, Kansas.

FREE! Profitable, spare time home business ideas. Van Teschelt, 7 Broadway, Stoneham 80, Massachusetts.

SELL Books by mail. 400% profit. Royal, Box 368-X, Cleveland 27, Ohio.

\$100 WEEKLY! Men, women! Work home! Sparetime. Free "Confidential Plan." Scott Sales, Box 388, Great Neck, New York.

PURCHASE Your snow cone machine direct from manufacturer. All prices, sizes. Box 7803, Dallas, Texas.

MAIL Trade magazine has moneymaking opportunities galore. Sample 25¢. Donovan, 79PM Greenbelt, Levittown, N. Y.

PRESTIGE Address in New York City available. Also complete showroom services to exhibit and sell your advertised products. Low commission basis. Suite 800, 580 Fifth Ave.

START A profitable business sharpening scissors, pinkie shears, on precision electric machine. No experience necessary. Eastsharpe, 4217-B Rocky River Dr., Cleveland 35, Ohio.

MONEYMAKING OPPORTUNITIES

GIFT Discount catalogue, coupons worth \$10.00 free when ordering our 5 money-making plans, \$1.00. Edith's, Box 984, Globe, Ariz.

HAMMER? Saw? Drill? \$100 weekly. Jett, Box 422, Escondido, California.

WE Pay \$4.50 lb. dried. Grow mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We pay \$4.50 lb. Free book. Mushrooms, Dept. 173, 2954 Admiral Way, Seattle, Wash.

EARN \$5,000-\$15,000 Yearly at home in respectable field. Only 3 hours weekly attention needed. No public contact, no experience necessary. Exceptional but true. Rush \$1.00 for complete detailed plan. Satisfaction or refund. Columbia, 8203 Grubb Road-PM, Silver Spring, Maryland.

TYPISTS! Make money at home! Mailers, 2 Madison, Greencastle, Indiana.

SUCCESSFUL Moneymaking boats (details) airmail (stamped envelope). Capt. Wm. Lewis, Tampa 9, Florida.

NEW! Over 70 full, sparetime, home moneymaking opportunities to choose from! Information free. Mann, Z-427, Woodcliff Lake, N. J.

\$340.00 MONTHLY With jigsaw. Details. Elkman, 346F North Summit, Sioux Falls, So. Dak.

35MM. Camera owners, extra earnings, no experience. Details sample, free. Teleplex, Box 12, Queens Village 27, New York.

MAKE Extra money. Sell handmade leather items. Judy Shukayr, 2406 Creswell St., Shreveport, La.

SELL Your neighbors aluminum awnings! Wholesale prices. Write Groff, Box 10254, Tampa, Florida.

SAMPLE Copy of Puzzle Contest Magazine, 10¢. Spence, Box 11569, St. Petersburg 5, Fla.

NEW Magazine shows you how to make mail order pay. Copy of recent issue, 10¢. Mailorder Income, 2639-25 Howard, Chicago 45, Illinois.

"MAIL Order and the Law" and "Starting a mailorder business." Know about required licenses, federal and state regulations, taxes, etc. Both for only \$1.00. Dorf, 188 Covington Lane, Woodbury, New Jersey.

MAKE Money showing personalized door name-plates. Sells on sight, priced right. Details free! Engravers, 6349-P N. Fairfield, Chicago 45.

YES! You can enjoy handsome profits from magazine clippings. Complete instruction manual. Send \$1.00. National Enterprises, Box 176, Flint 1, Mich.

"IDEA Guide"—Free details. Harwood, 533 South Presa, San Antonio 3, Texas.

OWN Land? Profit opportunities in drive-in movies. Send \$1 for booklet. Profit Research, 2 Thomas Park, Cambridge 38, Mass.

START A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. No experience needed. Send this ad with your name and address to: Popular Mechanics, Room 5-0, 250 West 55th St., New York 19, N. Y.

BE Appointed state notary public now. Details. Stationers, 515 East 33rd, Kansas City 9, Missouri.

FREE Plan and help. Start home mail order business. In 1952 I was almost broke. Today I own \$18,000 home, drive Cadillac, have bank account. Anyone can do this. Norris Cole, 217 West 49th, Bradenton, Florida.

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

AMAZING Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, MP-528, 333 North Michigan, Chicago 1.

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

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

SELL Information by mail. 10-to-1 profit ratio. Valuable suggestions free. Rawson F. Wood, 3974 Milwaukee, Chicago 41.

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

BOOKS; Hundreds of subjects. Big 1958 book catalog—10¢. Popular Mechanics Press, 200-BC East Ontario St., Chicago 11.

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

MAKE Money, operating mail order business, selling business cards. Vosacek Printing, 4444A Ute, San Diego 17, Calif.

CIGARETTES—Improved roller makes 20 for 9¢. Facts free. Moberly, Box 821, Owensboro, Kentucky.

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.

\$3.00 HOURLY. Sparetime. Typewriter required. Confidential home-setup 35¢. Interstate, 37 Besch, Albany 9, N. Y.

"COLLECTIONS Unlimited" offers fascinating agency proposition! Extraordinary. Box 1346-PM, Denver 1.

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-D, Chicago 26, Ill.

MAKE Money writing short paragraphs. Information free. Barrett, Dept. C-27-D, 7464 No. Clark, Chicago 26.

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-D, Chicago 26, Ill.

PROFITS By mail sparetime. Details free. Grimson, 9421 Harper, Detroit 13, Mich.

WIN Contests. Latest contests, helps. Contests, 25 Earl, Red Bank, N. J.

FREE Business franchise protected. Have own office. Self-employed. No merchandise to buy or sell. Nationwide. Details free. Pippin & Company, Box 87, Benham, Ky.

MAKE Money from walnut shells. Sample, instructions \$1.00. Chambers, 681 Court St., Keene, N. H.

HUMOROUS Signs—Easy to make. Complete instructions, \$1.00. Stanmore Sales, Listowel, Ont.

MEN—Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.50. 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-D, 1512 Jarvis, Chicago 26, Ill.

FORMULAS, PLANS, ETC.

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

FORMULAS; All kinds, latest, best. Literature free. Kemixal, Park Ridge, Ill.

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

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 Sussex Avenue, Newark, N. J.

LAMINATING Supplies. Free price list. Solomson. 46 Cornhill, Boston 8, Mass.

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

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.

PLASTIC Materials—Commercial, retail. For boats, glazing, hobbies, aircraft, decoration; for manufacturers, retailers, hobby shops, building suppliers. Informative catalog, 25¢. Gem-O-Lite, 5529A Cahuenga, North Hollywood, Calif.

NEW Do-it-yourself casting and molding plastics! No experience or machinery necessary. Send 25¢ for big 64 page catalog. Castacraft Corp., Dept. E-22, P.O. Box 555, Palo Alto, California.

MACHINELESS Plastic laminating kit. \$2.00 postpaid. Garrity, 5011 Elton, Baldwin Park, Calif.

MAKE—Sell signs. Plastic letters 1"-10". Dixie, 2093, Lakeland, Fla.

SPECIAL Sale—Extra heavy 006 gauge black plastic tarpaulins. 6'x9', \$1.75; 8'x12', \$3.50; 10'x20', \$6.50; 20'x20', \$12.50; 20'x30', \$20.00; 20'x40', \$25.00. Postage paid. Plastic Supply, Lyman 16, Nebraska.

NEW Liquid casting plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25¢ for two handbooks "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. E-101, Woodstock, Illinois.

ELECTRIC Laminating kit. \$14.95 complete. Also laminating done. Burr, 330 East Center, Kalamazoo, Mich.

EVERYTHING In plastics. Specify interest, or send \$1.00 for master catalog. Gel, Box 261, Union, N. J.

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EXPERIMENTERS: Bargains galore catalog. 25¢ (refundable). Hagenow Laboratories, Manitowoc, Wisconsin.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25¢. Dept. M-50, Biological Supply Co., 1178 Mt. Hope Ave., Rochester 20, N. Y.

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FREE — Miniature chemical elements chart listing 102 elements in English, French, German, Russian; physical constants, discovery, occurrence, preparation, uses. 315 South Lancaster, Massachusetts. Send stamped, self-addressed envelope.

400 PAGE Illustrated books! Chemistry, Physics, Science, Biology. \$1.60 each. Information free. Franks, 3121 South Racine, Chicago 8.

CHEMICALS In small quantities; laboratory apparatus, glassware. Catalog 25¢. Winn Chemicals, 124M West 23 St., New York 11, N. Y.

PORTABLE Physics laboratory complete with all apparatus and manual of 107 experiments, \$49.00. Model atom smasher, \$9.95 up, 3-in-1 electromagnet, \$14.95. Raymaster cloud chamber, \$16.00 up, spinthariscopes, \$2.00. Send 25¢ for literature about these and many other fascinating new scientific products. Atomic, 3086 Claremont Ave., Berkeley, Calif.

AMAZING New book of science experiments, formulas, and catalogue of laboratory supplies. Only 25¢. National Scientific Co., Dept. PM-5, 13 S. Park Avenue, Lombard, Illinois.

AGENTS WANTED

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FREE Sample! Beautiful feather pictures. Send 14¢ stamps mailing. Sylviak, Apartado 9036, Mexico 1, D. F.

Cushions, slant boards Coin timers factory. Mary-Mac, 1012 Powhattan St., Dallas 2, Tex.

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

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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. F. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

YOUR Own business — Used suits \$1.50, overcoats 65¢, mackinaws 35¢, shoes 12 1/2¢, ladies coats 30¢, dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 2109-AA Roosevelt Road, Chicago 8.

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MAGNETIC Cobs grab all steel surfaces, fisherman tackle boxes, auto dashboards. Details free. Sample \$1.00. Hanco, Box 97B, Lombard, Ill.

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EARN \$201.60 Weekly selling new polishing cloth for aluminum storm doors. Write today. Kauffman, 76 Hedge, Levittown, Penna.

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FREE Catalog. Bulova, Elgin, Gruen watches, etc. 1959 styles, \$6.95 up. Buy direct from importer: Electrical tools, novelties, costume jewelry, etc. Write today! Jet Premiums, 423-EM South Los Angeles, Los Angeles 13, Calif.

SILVER Tip refills 5¢; sells for 49¢. 500 name address labels 50¢. Pocket rubber stamp 50¢. Norelco speed shaver \$14.99. Price war catalog 10¢. John Hayes, 806 Tallman, Syracuse 4, N. Y.

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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.

AMAZING Opportunity. New low priced fire alarm protects homes, farms, offices, factories, etc. No wiring, hangs like picture. Pays up to \$1,100 a month. Free kit. Merlite (Alarm Div.), 114 E. 32nd St., Dept. F-66Y, New York 16, N. Y.

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IT Ain't sellin'—Just servicing! Stores make money for you every open hour. Tremendously successful! Free book tells all. Write Novo, 1166 Milwaukee, Dept. C-51, Chicago 22.

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WILL You test new items in your home? Surprisingly big pay. Latest conveniences for home, car. Send no money. Just your name. Kristee 32, Akron, Ohio.

DISTRIBUTORS, Jobbers, salesmen: \$500.00-\$5000.00 monthly possible. Sell beautiful spiritual birth certificates. Market goal 125,000,000 certificates. Retail value \$40,000,000. Protected territory. Write Spiritual Birth Certificates, Red Springs, North Carolina.

TREMENDOUS Profits — Selling from America's largest catalogue of stock signs, Real estate companies, truck companies, motels, restaurants, etc. Everybody wants our signs. Send \$1.00 for catalogue and samples, refunded with first order. Mort Associates, 2616-24 N. Jefferson, St. Louis 6, Missouri.

HIGHLY Profitable carded windproof lighter distribution. Quick sales to all retail stores. \$8.50 (refundable, per plan) brings dozen lighter sample kit and plan. Check or money order. Up to 55% off on subsequent orders. Immediate income. Bestco, 3031 North 24th Street, Phoenix, Arizona.

delinquent accounts. No inventory required. National Credit Co., 304E Pickwick Bldg., Kansas City 6, Mo.

MAKE 200% Profit. Easiest selling repeat gift. Hinkles, Dayton M. Va.

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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, 848 N. Dearborn, Dept. 17, Chicago 10, Illinois.

EARN Big commission full or part time. Build profitable business of your own selling America's largest line low priced business printing. 360 page catalog samples hundreds of items used daily by business people. Advertising specialty line features imprinted ball pens low as \$9.95 for 100. Calendars low as \$5.95 for 100. Free sales kit. National Press, Dept. 8, North Chicago, Ill.

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WANT Action! Sell revolutionary new rotating beacon lights. Either three color or high impact commercial one color beacons. These Action-Lites are real stoppers. Low cost—5,000 uses. Over \$500.00 week potential. Eric Sales, 1136 Manor Dr., Wilmette, Ill.

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ALUMINUM Awnings direct from factory. P.O. Box 6271, Jacksonville, Fla.

NEW Multicolor wholesale catalog! Housewares, appliances, clothing, silverware, cookware, luggage, binoculars, shavers, radios, phonographs, cameras, projectors, recorders, typewriters, sewing machines, furniture, power tools, toys, sporting goods, watches, diamonds, jewelry, automobiles, etc. Name brands. Huge discounts. Postcard: Selbyco, Decatur 156, Illinois.

ACCORDIONS Wholesale! Save 1/2. Home trial. Free catalog. Accordion Warehouse, Dept. 59-RW, 2003 Chicago, Chicago 22.

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BARGAINS Galore! Hundreds of items actually less than wholesale. Catalog 10¢ refundable first order. Welk's 925G, West Sycamore Willows, California.

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FREE Wholesale catalogs. My source of over fifty, \$1.00. Ozco, Canaan, Conn.

NYLONS—Bargains! Closeouts! Essential Products Co., 210 Fifth Ave., New York City 10.

VITAMIN Users: Write today for free 12 day supply vitamin-mineral Family Formula. Also wholesale prices six other potent formulas. Wholesale Vitamins, Factory Street, Kalamazoo 4, Michigan.

WHOLESALE! Thousands of items! Tremendous discounts available! United Wholesalers, 1265-M Broadway, New York 1, N. Y.

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JOBS On ships. Write for free information. World Wide Seamen's Service, Box 1445-PM, New York 1, N. Y.

JOBS Overseas! Write Janeczek Development Co., 109 Hub Station, New York 55, N. Y.

INFORMATION—U.S.A. overseas jobs. High pay, transportation. Futures, Dept. M, 215 West 34th Street, New York City 1.

FOREIGN Jobs—Latin America, Alaska, Canada. up to \$1500 monthly. Up-to-date 1959 foreign service directory gives complete information; hot list of firms hiring for military and civilian construction, aircraft, oil, exporters-importers, mining. How-when-where to apply. 11th successful year. \$1.00. Global Reports, Box 8873-S, Los Angeles 8, Calif.

JOBS—High pay; U.S.A., So. America, the Islands. All trades. Many companies pay fare. Write Dept. 71J, National Employment Information, 1020 Broad, Newark, N. J.

JOBS On ships and yachts traveling foreign countries. Davenport's, 1354 G.P.O., New York 1, N. Y.

BOOMING Texas. Plenty job opportunities in the golden triangle including Houston area. \$1.50 for information. East Texas Information Service, P.O. Box 3162, Port Arthur, Texas.

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FOREIGN Employment with American companies overseas. Write World Employment Information, Box 2545-F, Hollywood 28, California.

EARN High pay, aboard ships. Travel foreign countries. Write Dept. 76G, Universal, 1020 Broad, Newark, N. J.

SEATTLE Classifieds airmailed \$1.00. Howland, 208 S.W. 115th, Seattle 66, Wash.

JOIN The Merchant Marine. Big pay. Box 4092, Jacksonville, Fla.

FLORIDA Jobs—Miami, Orlando, Tampa, Jacksonville classifieds \$1.00. King, 5418 Bobby St., Orlando, Florida.

CARPENTERS, Laborers, drivers. All occupations. American, overseas projects. Bonus paid. Free information. Employment Headquarters, 79 Wall Street, Dept. 5-D, New York City 5.

AMERICAN Overseas jobs. High pay, men, women. Transportation paid. Free information. Write Transworld, Dept. 14D, 200 West 34th St., New York City.

BEAUTIFUL, Booming Denver. Job opportunities galore. Sunday classifieds ads \$1. Peak Enterprises, P.O. Box 173P, Denver 1, Colo.

Make big money in Europe, Africa, South America, Canada, Alaska, Far East, Transportation paid. Construction workers, clerks, truck drivers, etc. Travel, adventure. Complete information application blanks, sent by return mail. Send \$2.00 to Foreign Bureau, P.O. Box 512, New Orleans, Louisiana.

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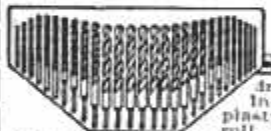
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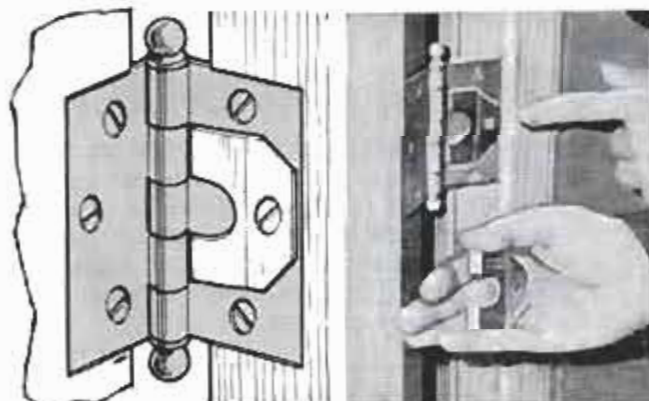
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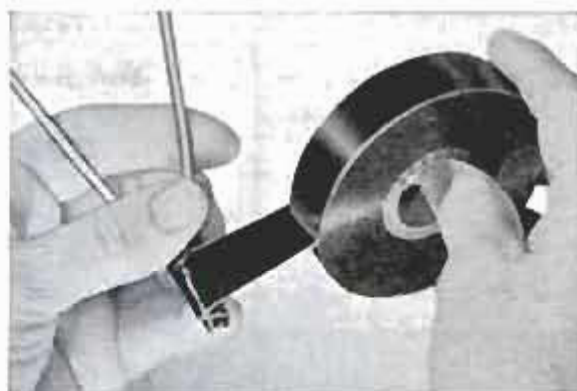


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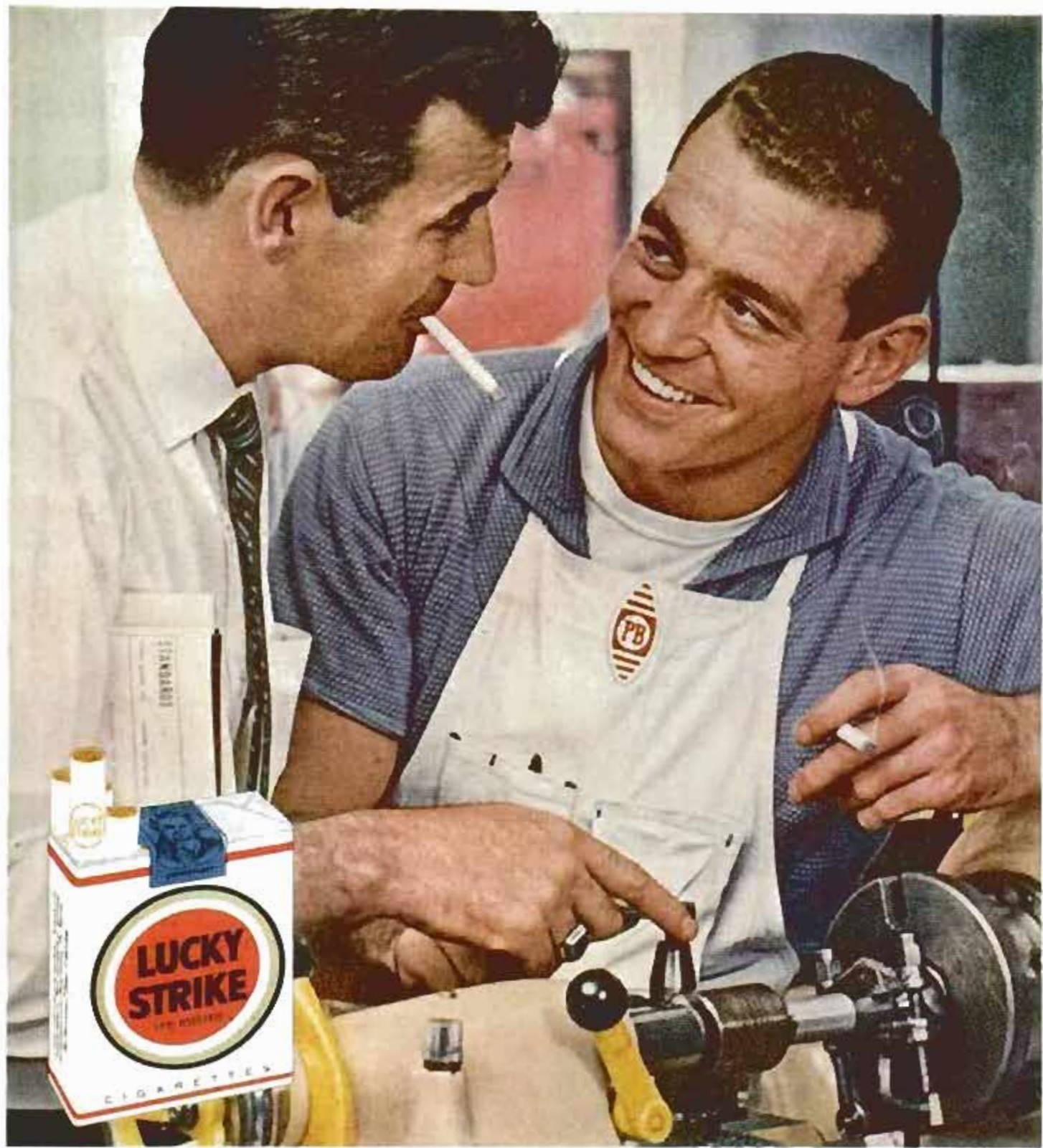
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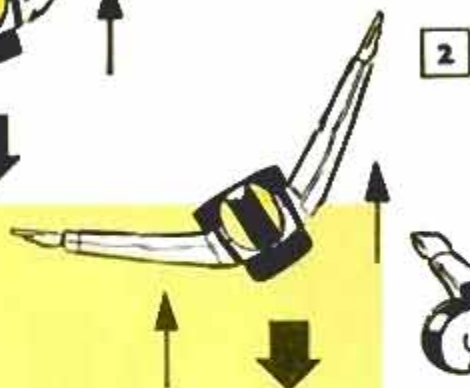
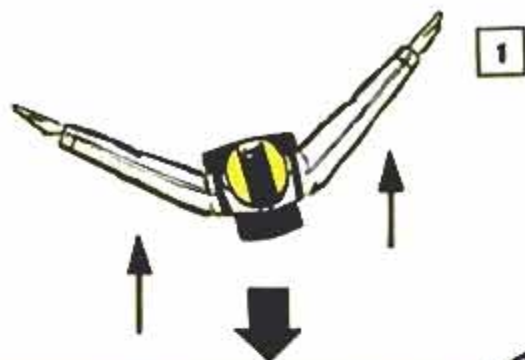
BAILING OUT FOR FUN

By Carson Kerr

IF YOU'VE run out of recreational activity that gives you a real kick, or even if you're merely interested in increasing your self-confidence, it's time you tried sky diving, America's newest, fastest-growing sport. Parachuting for pleasure is guaranteed to give you both kicks and confidence. What's more, it has recently gained such international importance that it is almost certain to get recognition at the next Olympic Games.

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Photo by Eugene Stein

Above is target as seen from jumper's view. Below, members of Los Angeles Sky Divers observe lesson in parachute packing. Ages of Los Angeles jumpers: 20 to 40



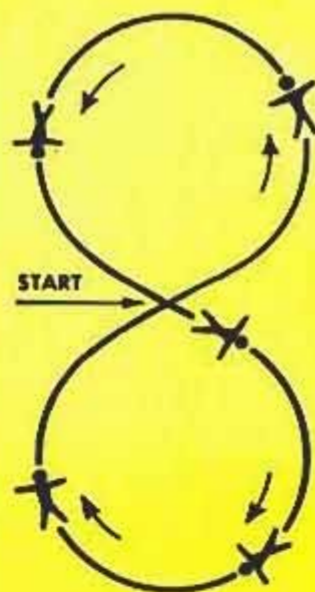
NORMAL POSITION FOR FLAT, STABLE FREE FALL.

You arch your back, brace yourself and, when the jumpmaster gives you the go-ahead, fling your feet free and let go. Immediately, your body tilts forward, the upward rush of air supporting it in a horizontal position. You have a brief sensation of lying motionless, but with a colossal wind whipping at your clothing. It lasts only five seconds, until your chute is automatically opened by a "static line" attached to the plane. The uncertainty of those seconds dims by comparison with the immense feeling of relief that comes when you hit the nylon. It knocks your wind out, but it's wonderful.

Your most vivid impression is one of sudden silence, the noise of the plane having died away and sound on the ground not yet within earshot. Regaining your composure to some degree, you prepare for the toughest part of a sky dive, the return to terra firma. Manipulating the control rings of your chute, you hope to land at least a respectable distance from the designated spot. The last 200 feet seem more like 20. You're rapidly running out of time, but you try to remember the instructor's advice: Feet and knees together, chin on chest, elbows in, and—if you can—relax!

Touching down about 10 miles per hour, you don't achieve the "standup" landing of the veteran sky diver, but you do manage to quickly get to your feet—after you fall on your face. Then comes the struggle to collapse the canopy, and you're grateful when ground runners rush to give you a much-needed assist. Your first sky dive has lasted 95 seconds and, if you're like most of the folks who bail out for fun, you start planning your next jump even before you shed your chute.

Later, when you've made a minimum of five static-line jumps, you're ready for a delayed drop, or free fall. This means soaring in a spread-eagle position for a minute or more before pulling the



AS IT LOOKS FROM GROUND

Here's the "standup" landing for which all sky divers strive. The touchdown is made at a speed of about 10 miles per hour

ripcord. It's the closest man will ever come to flying like a bird. Properly trained, a parachutist can fall in a stable position, without somersaulting or spinning, arms acting as elevators, shoulders as ailerons and legs as rudders. In this position, terminal velocity of 120 m.p.h. is reached in 12 seconds. But, by bringing the arms back in a delta or swept-wing position, the rate of fall will rise as high as 220.

"It's as simple as swan diving," says Jacques Istel, the father of sky diving in the United States, "only you spread your legs and make your belly the center of gravity. To turn, you lift an arm, shifting the center of gravity, and bank around. With proper education and encouragement, the American public should take up this sport as readily as motorcycling.

This trio of Los Angeles Sky Divers has recorded more than 50 jumps. Their sport is called safer than crossing the street

Photo by Eugene Stein



WHAT HAPPENS IN THE AIR





Before bailing out for first time, divers practice rearward-exit technique on ground

It's less expensive and much safer."

Istel, a Marine Reserve captain of Bedford, N. Y., has captained several American sport-parachuting teams in international competitions, and is the founder of Parachutes, Inc., an organization devoted to the development of sky diving. He has pioneered parachuting techniques and introduced equipment that reduces chute-opening shock and lessens the risk of landing to the point where he's positive Americans will follow the lead of Europeans and make parachuting a popular week-end sport. Jacques sees the future establishment of sky-diving centers, similar to skiing resorts, and predicts that sky diving in the 1960s will be what skin-diving is in the 1950s.

"From my own experience and from what I have seen abroad," he says, "I know there are people who have an urge to jump, but don't have the place and the equipment. In France, I watched doctors, lawyers, priests and even women spend entire vacations at parachuting centers, learning how to jump. The French have developed the sport to the same level skiing was in the United States 30 years ago."

France has 10 government-sponsored sport-parachuting centers, with 1000 students enrolled and 10,000 graduates. An average of 40,000 jumps are made by French civilians annually. In Russia, where the sport is also government-sponsored, it's estimated that two million jumps are made each year. This explains why the Russians win many international parachuting contests. They made a clean sweep of awards at the Fourth World Championship meet in Bratislava, Czechoslovakia, last August.

An American team competing in a world meet at Moscow in 1956 topped four better-financed teams to take sixth place. In June of 1958, the U.S. team scored its first big success abroad by winning second-place honors among representatives of 10 countries competing in

Lew Vincent, parachute tester for Navy, teaches Sky Divers how to collapse chute



Photo by Eugene Stein

Winner of 1956 Olympic Sky Diving Championship in women's division gets harness adjusted in preparation for her 144th jump

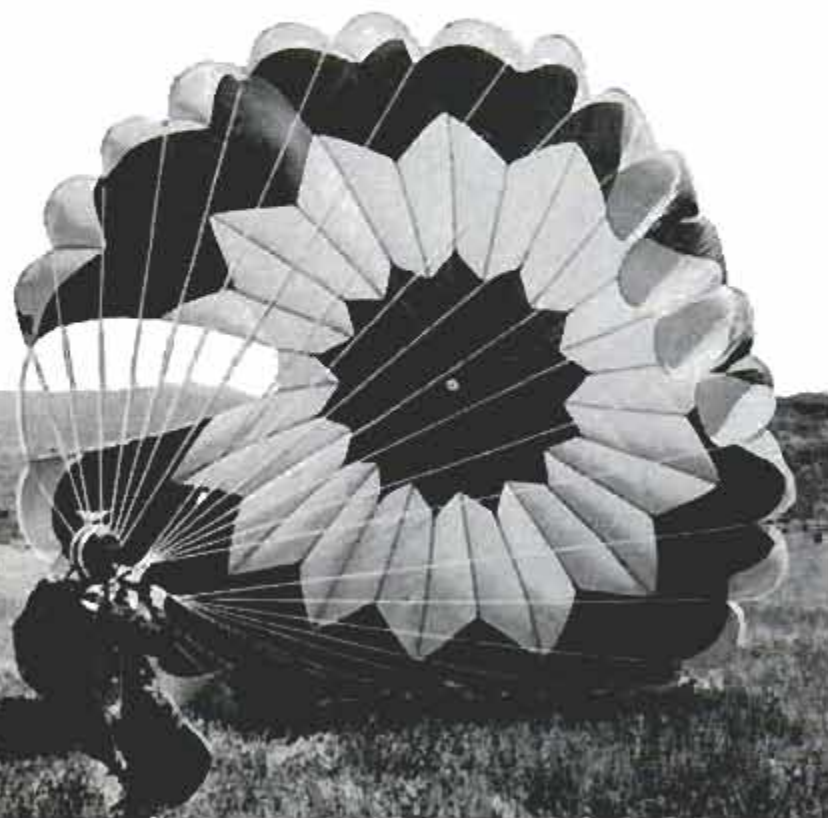




Photo by Gathel Weston

When a Los Angeles Sky Diver makes his first jump, other members of the club run out to congratulate him

France's most important annual sky-diving event.

Competition jumps quickly separate the men from the boys. The events of a meeting at Fort Campbell, Kentucky, last October, are typical. One of the most difficult, judged on both performance and accuracy, called for a jump at 4300 feet, 10 seconds of stable fall, the start of a 360-degree turn between the 10th and 12th seconds, completion by the 20th. Then, the start of a 180-degree turn in the opposite direction between the 20th and 22nd seconds, completed before the 27th, ripcord being pulled between the 27th and 32nd. Other events included free fall for 27 to 33 seconds followed by an attempt to land on a target, plus performance of a figure 8. For such competitions, contestants carry both altimeter and stopwatch on top of their reserve chutes.

Sport parachuting in the United States is under the jurisdiction of the Parachute Club of America, P.O. Box 212, Mt. Kisco, N. Y. Its more than 40 affiliates are "devoted to the development of personal stamina and civic responsibility through the pursuit of safe parachuting activities."

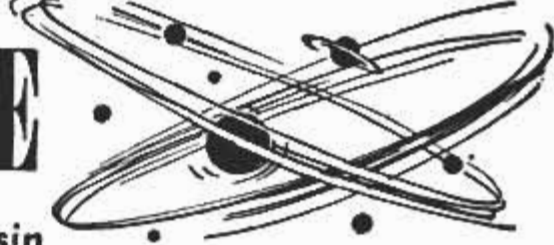
(Continued to page 284)

When Mike and Linda Curtis want to learn about parachuting, they go to their parents. Howard Curtis co-founded Los Angeles Sky Divers. His wife Margie was first woman in U. S. to make 10 jumps needed for Parachuting Club of America license



"17300" (on AUGUST 58 A 10)

AN EYE ON SPACE



By Dr. Dan Q. Posin

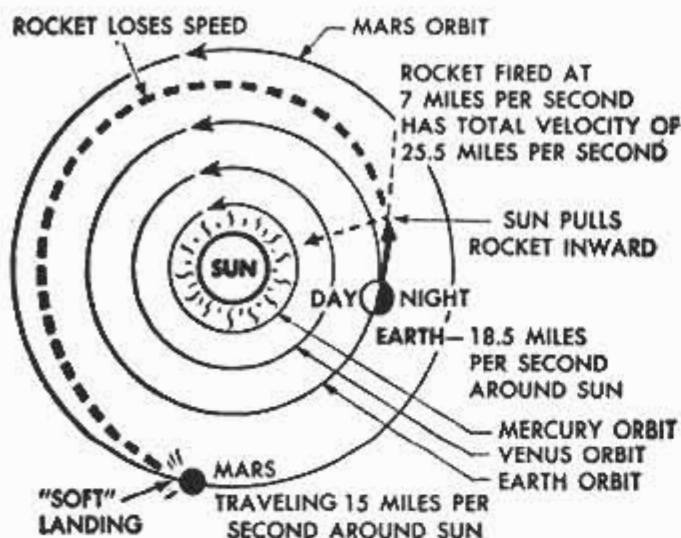
PROFESSOR OF PHYSICS, DE PAUL UNIVERSITY
SCIENTIFIC CONSULTANT AND ADVISOR, COLUMBIA BROADCASTING SYSTEM

A SHOT THROUGH SPACE toward Mars should be made at dawn, but a shot toward Venus should be made at sunset. Sounds a little peculiar, doesn't it?

"If you're going to fire something on a journey of millions of miles," a friend said the other day, "what difference does it make whether you let 'er rip at night, or after lunch, or whenever?"

It matters a lot. The diagram shows that if a rocket takes off at dawn, its velocity will be added to that of Earth;

and this total velocity will make the rocket fly outward toward the Mars orbit. However, as the rocket moves away, the sun keeps pulling back on it, makes it lose speed, and finally the rocket's speed may be reduced to the speed of Mars. Then you can make a casual transfer to that planet. In other words, a "soft" landing is possible. Here are the speed figures for such a venture: Earth travels at 18.5 miles per second around the sun; the rocket is fired at seven miles per second with respect to Earth; that gives 25.5 miles per second for the rocket's initial speed around the sun; the rocket now will be losing speed due to the sun's pullback, and finally will be reduced in speed to about 15 miles per second (orbital velocity around the sun), thus creeping up on Mars which is

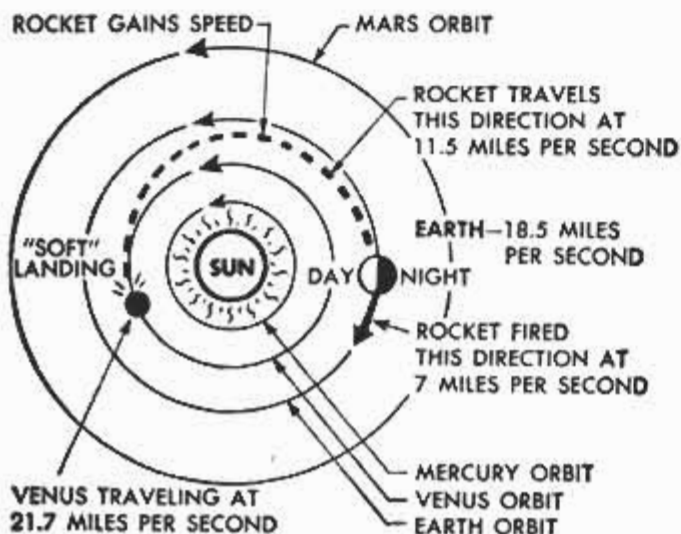


also moving around the sun at 15 miles per second.

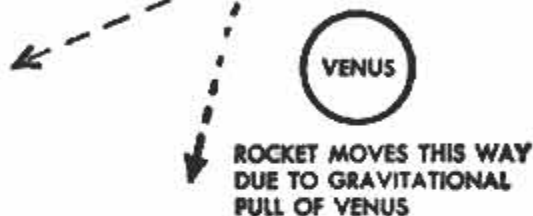
If we want to let 'er rip toward Venus, then we would do well to fire at sunset so the speed of the rocket will subtract from the orbital speed of Earth. The rocket, fired at seven miles per second relative to Earth, has enough speed to escape Earth, but it does not have enough orbital speed around the sun to stay in the same orbit as Earth. In fact, orbitally speaking, the rocket has only 18.5 minus 7, or 11.5 miles per second. Accordingly, it will begin to fall toward the center of the solar system. But as it falls it picks up speed—as a rock picks up speed as it falls toward Earth—and, coasting along faster and faster, it may approach Venus at something like 21.7 miles per second, which is the orbital velocity of

Venus. Hence we can step off again in a "soft" landing to see what Venus has to offer.

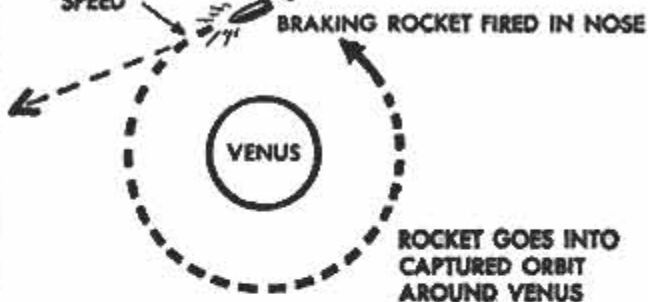
A shot which is intended to place a rocket into orbit around Venus (instead of landing on it or passing near it) requires a larger final stage. Why? Because the final stage must carry some fuel to correct the rocket's flight path so Venus will be able to capture it, orbitally speaking. Thus it will become a satellite of Venus. The best procedure would be to have the rocket traveling fast as it approaches Venus (though not heading directly for it) and fire the fuel in the direction of flight. This would make the rocket lose speed and let the lovely Venus capture her victim.



ROCKET WOULD PASS THIS WAY IF VENUS WERE NOT PRESENT



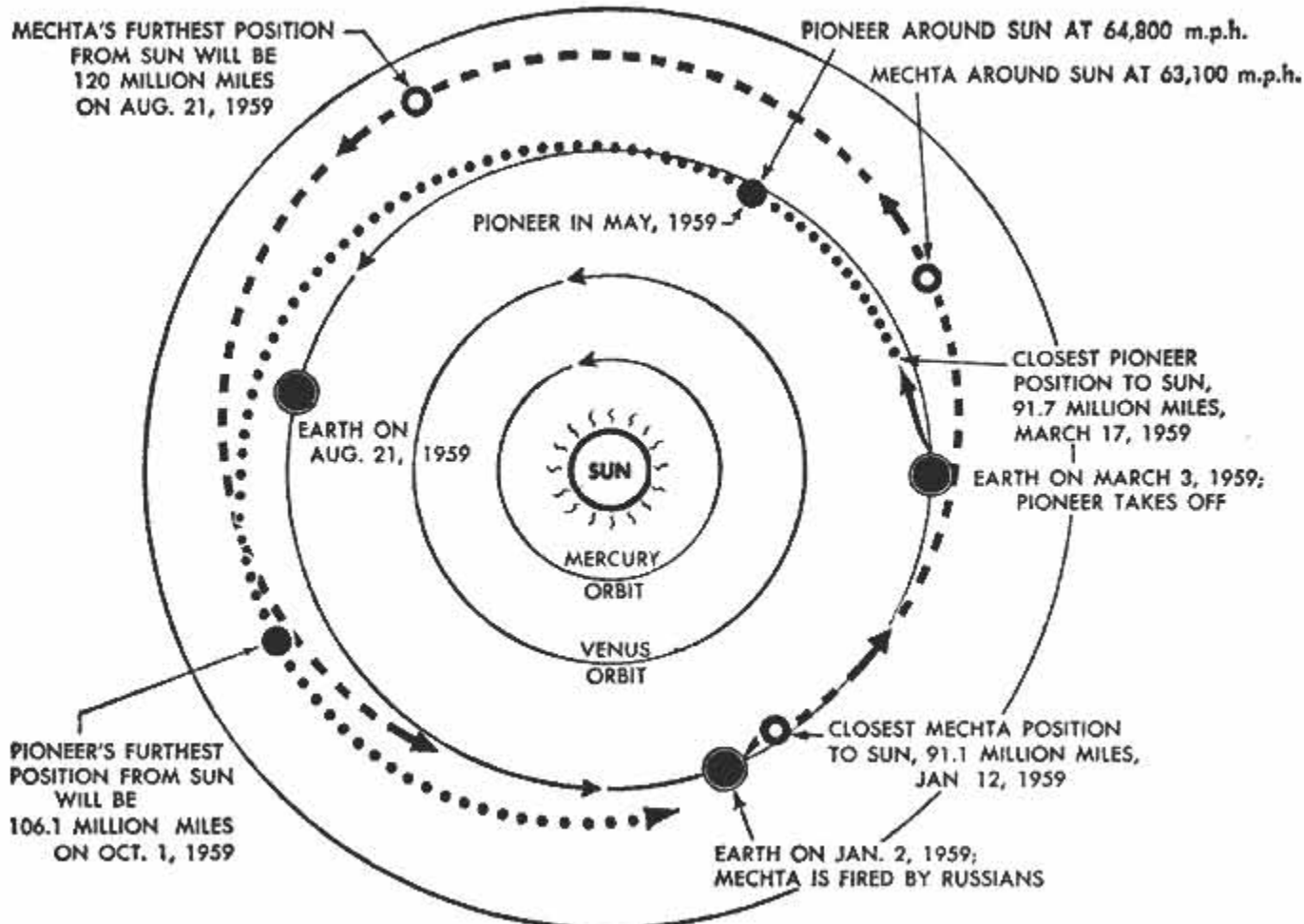
ROCKET LOSES SPEED



It's a pretty tricky job to fire a rocket and make it go into orbit around Venus or Mars, but it isn't really very hard to fire a rocket into orbit around the sun. The sun has such a strong gravitational field that it will eventually capture almost any kind of a projectile which has first been shot away from Earth's control. Of course the man aiming the blamed thing may send it whooshing off so that it heads straight toward the sun and falls into it. But if the projectile goes into orbit around the sun, it becomes, in effect, a new planet. And, as everyone knows, Earthlings have succeeded in creating new baby planets (planetoids) on more than one occasion already. Mechta and Pioneer are diagrammed below.

SPACE QUERY: Isn't space travel going to be impossible because of the deadly radiation zones?—J.R., Evanston, Ill.

ANSWER: Not impossible, but somewhat perturbing. There are two main radiation zones around Earth, but the region over the North and South Magnetic Poles is quite clear. So either we will be taking off at the poles, or we'll take off anywhere but travel fast through the belts of radiation, before they have time to belt us good. If we get through fast enough, we can sail onward to the heavens.





On a court near the family's residence in Highland Park, Ill., the tennis-playing members of the O'Connell family take time out to pose: Front, Nancy and Scott; rear, from left, Jerry, George, Sr., George, Jr.

George O'Connell, Sr., perfects son George's backhand. George, Jr., holds an indoor title



I Coach a Family of Champions

By George O'Connell

ABOUT GEORGE O'CONNELL

GEORGE O'CONNELL won his first tennis title in 1918. Married to a former Western Sectional Indoor Women's Champion, he turned professional in 1933 and for many years has been coaching tennis full time. Four of his five children have come under his expert tutelage: Jean, 22 and married, played a good game but wasn't much interested in championships. Nancy, 18, has won 11 national indoor titles, including the U. S. Women's Indoor Singles crown. George, Jr., 17, has just broken into the championship ring, while Jerry, 15, is working on fundamentals. The youngest, Scott, 6, already knows something about swinging a racket properly.



Nancy O'Connell has won many national titles. Now 18, she is a student at the University of Illinois

TENNIS IS ONE of the most pliable of games requiring both mental and physical dexterity. Both sexes, all ages can play it. Middle-aged couples on the court just for fun can get as much excitement out of the game as teen-age boys and girls playing a championship match.

In 40 years of playing, teaching and coaching tennis, I've seen many a nine-year-old get along just fine with a full-size racket, and many an adult past the late 30s take up the game and enjoy it for the rest of his active life.

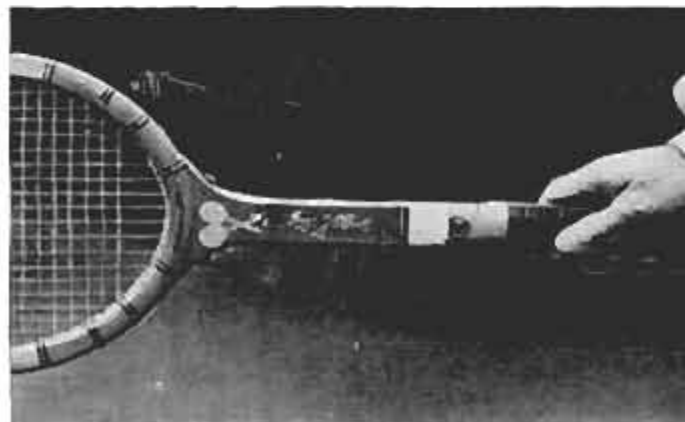
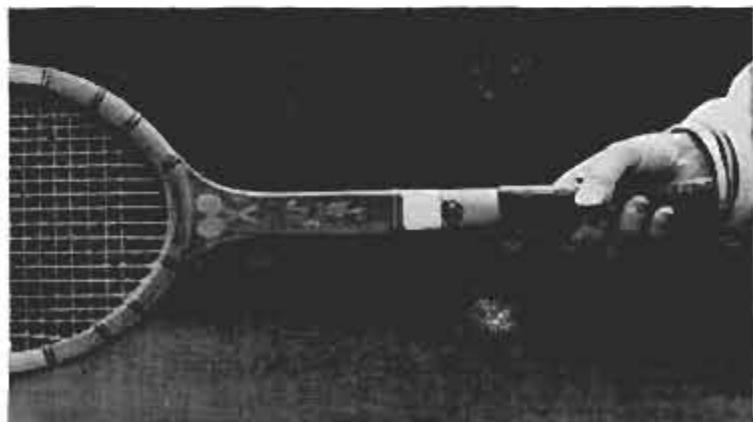
You've all seen white-thatched, elderly men swinging a tennis racket. They're the best proof that tennis is not exclusively for the young. There's Sen. Theodore F.

Green of Rhode Island, for instance, who was still playing six sets of tennis a week in his 80s. U. S. Supreme Court Justice Hugo L. Black, was reported as saying he would rather play tennis than practice law. He's 73.

Whether you're young or old, playing tennis for exercise or to win trophies, I recommend mastery of the game. Play the game better and you'll have more fun and add more cups to your mantel. This sounds like I'm pounding the obvious, but it's always surprising to me how many so-called tennis players are content with a mediocre game and avoid matching themselves against superior competition.

Aside from the competitive angle, it's

GRIPS: Of three grips, Eastern is preferred. At left is Eastern forehand; right, Eastern backhand





BACKHAND: Move racket back with straight or circular backswing. Keep body sidwise, with wrist and racket head on same plane as ball. Weight should shift from back foot to front at impact. Meet ball opposite right knee

important to learn the game thoroughly if you're going to enjoy it fully and realize its true value as a physical and mental challenge. (I've seen many capable players get beaten when the chips were down because they weren't as strong in the game mentally as they were physically.)

This article is designed to help you master your game, and give you some hints that will enable you to help your children's game.

Don't Force Game on Kids

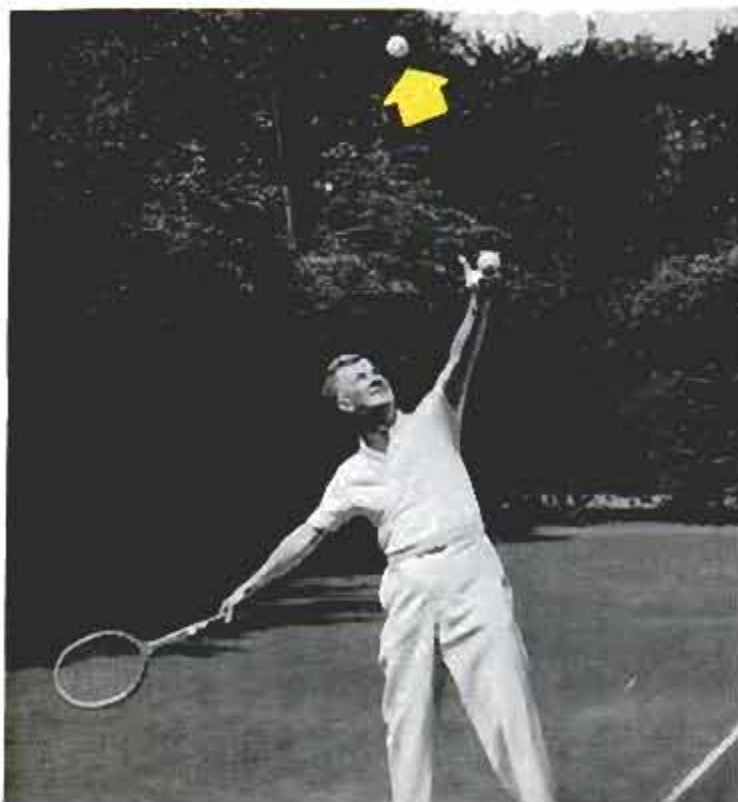
First of all, when should a child begin taking tennis lessons? My answer—10 years of age—can be adjusted to 9 if the youngster is really eager and pesters his

parents for lessons. I don't believe in forcing the game on kids. Tennis is part of me. I love it. But I haven't made any of my own children play. My oldest, Jean, plays well but never really worked on her game. Nancy, who's 18, was U. S. Women's Indoor Singles champion in 1958, but only because she wanted to be. Nor have I forced my two oldest sons to play tennis.

I hope you don't have the idea that you have to be very young—a child—to learn to play tennis. I've had several middle-aged pupils, and they've developed to the point where they can get a lot of enjoyment from the game. One businessman, who played football for the Chicago Bears in the 1930s, started playing just last year

SERVICE: Ball is tossed to comfortable height. Do not twirl it. Perfect toss is vital to successful service

Backhand grip is recommended on service. Weight shifts to right foot as racket pulls back



and already he's playing pretty good tennis. He's on the courts five or six times a week.

Bill Tilden—in my opinion the greatest tennis player of all time—improved so much at 40 that experts were amazed.

Once parents turn over the youngsters to me for tennis instruction, it's up to me to bring out the best that's in them. To do this I keep them working on such things as strokes, service, footwork and control. Sometimes a youngster's attention span is very short. Realizing this, I employ little stratagems to spur him on. For instance, I ply the soft-drink and candy-bar machine with nickels and dimes—both for reward and for diversion. "If you beat her I'll buy you a Coke," I'll say, or, "Two candy bars if you get 5 out of 15 balls into the serving court." I find this a reliable stimulant to their competitive drive.

I remember one boy who was having trouble doing anything right, but I knew he could do better. One day his mother came out to watch a lesson. She was most unimpressed with her son's performance, so I told the lad I would buy him a Coke if he could hit 25 balls into the serving court. He did it—he got his 25 before he served 50 balls. Before I made my

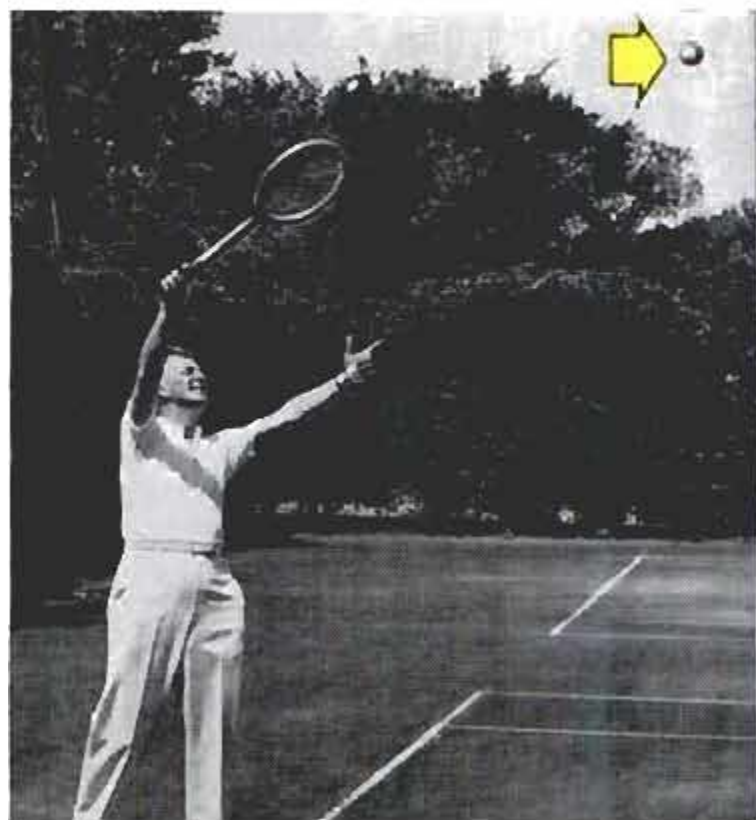


Author's pupils are in all age groups. For teen-ager above he drops ball after ball on bench, teaching her to strike at top of bounce. Below, middle-aged man gets help on his strokes



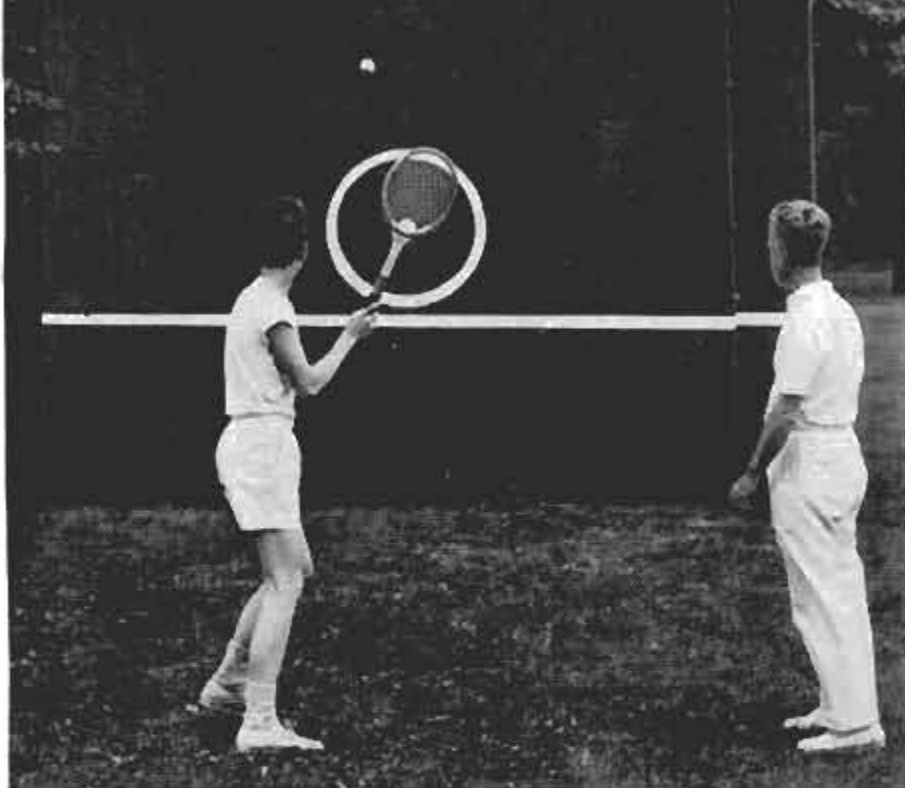
Ball is struck on top of toss. In slice service, racket cuts across right side of ball, providing definite control

Racket finishes to left. Controlled, placed service is greatest asset a player can have





OVERHEAD SMASH: Made from net position. Ball is met high, hard



Jerry O'Connell works on accuracy by aiming for backboard target. There's no substitute for power properly placed, according to his father

little wager, though, I doubt that he hit a single ball into the serving court.

Approach Depends on Pupil

Different children, of course, have to be handled in different ways. I always regard each pupil as an individual and I try hard to find the right approach to getting his best cooperation. Then I try to kindle his interest to the hilt, because I know what a bright addition tennis can be to his life.

I recommend at least two hours of practice daily. Nancy practices that much indoors on school days during the winter. On Saturdays and Sundays she practices two

VOLLEYING: Player is 12 feet from net. Volleys are blocked, not stroked. Racket is stopped moment ball is met. Body is sideways



to six hours; in summer, from two to six hours every day.

I can usually tell within one year whether a pupil has what it takes to make the grade in competitive tennis. Sometimes it takes longer. In Nancy's case it was about three years; when she was 12 I could see that she would click because of her exceptionally good timing and the way she stroked.

What are the most important qualities for a youngster to have if he wants to play good tennis? Body coordination (which can be acquired through effort), good eyesight, quick reaction, confidence and unlimited willingness to work hard. That last quality can cover a lot of deficiencies.

Now let's discuss my routine of instruction and some pointers on how you can improve your game.

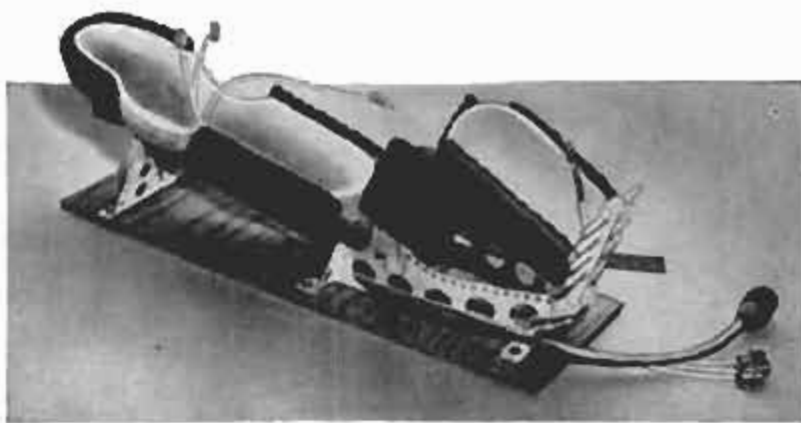
Eastern Grip is Preferred

The first thing I teach is the grip. There are three recognized grips: the Eastern, Western, and Continental. The Eastern is deservedly the best, for it equips the player for all types of surfaces, while the other two are best suited to special types of bounces. In the Eastern grip, hold the racket in the left hand, placing the butt of the handle at the body. The cross strings

(Continued to page 270)

Monkey Space Team Tests Equipment

Tiny monkeys will ride into space on specially developed strap-on seats resembling a fancy toboggan. The seat and its equipment, plus the four to six-pound passenger, will make up a 100-pound payload. One of the monkeys undergoing experiments at the School of Aviation Medicine, Randolph Air Force Base, Tex., is shown at the right, entering a psychomotor training unit. Monkey space travel is expected to provide scientists with valuable basic data contributing toward ultimate space flight by man. All the research experiments on the monkeys and other animals follow the American Medical Association's rules for the humane treatment of animals.



Electric Golf Caddy Carries Two Bags

Golfers who don't want to carry their clubs or pull a cart can let an electrically powered machine do the job. Operated on a single battery, the cart holds two sets of clubs. It has a low speed for the fairways and a high speed for hills. Compact enough so that it can be transported in a car trunk, the cart has three wheels, with power applied to the front wheels.



Automatic Self-Starter For Rotary Mower

With an automatic self-starter, a rotary lawn mower can be started with a few turns of a handle. Located on top of the engine, the handle winds a coil spring that is released automatically when the handle is folded. The uncoiling action starts the engine. Buyers of mowers with the starter get a booklet and phonograph record of instructions on operation and upkeep.





Jet Tubes Hurl Circulars From Moving Car

Circulars now can be shot out of tubes from a moving car to porches and lawns, propelled by jets of carbon-dioxide gas.

The driver-marksman and a rider who loads the tubes can deliver circulars at the same speed as 12 men working on foot.

Hear Yourself Talk

You can hear yourself as others hear you while wearing a lightweight plastic mask being marketed in Japan. The instrument, which works somewhat like a doctor's stethoscope, is used to help correct speech defects and to practice foreign languages.

Pump-Action Swing

One child can easily "pump" a new swing with no push from another small fry. The child sits on a saddle-type seat and pulls on a handle bar while pushing on a foot bar. The swing is suspended on three ropes which are provided.



The Scourge of the Lakes Is Scourged



The sea lamprey, after decimating commercial fish life for a decade, is doomed at last by chemical science

BY THE TIME you read this, the sea lamprey that has devastated Great Lakes fishing and reduced lake trout to the vanishing point may, itself, be right at the end of its slimy rope.

Probably it can never be eliminated completely, but control is at hand. U. S. Fish and Wildlife experts, along with

U.S. Fish and Wildlife Service workers check caged lampreys during test of poison in Michigan stream

By
**Kenneth
Anderson**





Lampreys spend most of their lives as larvae, burrowed in the mud of streams that border the Great Lakes. These larvae were killed by one of the recently developed chemical weapons

chemists of the Dow Chemical Company, have found a weapon that is deadly to the lamprey larvae in their spawning grounds, yet virtually harmless to game fish and other underwater life.

How critical the problem was can be seen in the figures. Less than a generation ago, lake fishermen caught over 100,000,000 pounds of commercial fish each year. Today, commercial fishing is almost nonexistent. In Lake Michigan nearly 7,000,000 pounds of trout were taken in 1943. The latest report shows exactly eight trout caught on 1600 miles of gill nets. After decimating the trout population, the lamprey turned to other victims: Walleyes, suckers, whitefish. Two species of chubs have disappeared.

The chemical that promises to finish off the battle against the lamprey has a simple trade name, Dowlap, and a formidable chemical title: 3,4,6-trichloro-2-nitrophenol. A "selective" poison that acts on lampreys in a way that

Portable fluid-proportioning machine meters the lamprey poison through a perforated pipe on stream bed

Photos courtesy Michigan Department of Conservation





Sea lamprey is well equipped for killing fish. Sucker-type mouth is lined with sharp, horny teeth and the tongue is rasped. Each lamprey during its parasitic stage destroys about 20 pounds of fish

Testing strength of the electric field near an electromechanical barrier. Fish and lampreys approaching barrier are turned back by electric field or diverted into traps from which fish are released



Photos courtesy Michigan Department of Conservation

could be compared to the action of 2,4-D against weeds, it has passed its tests with better-than-anticipated success in several Michigan streams where the lamprey spawned.

Scientists are not certain just how the new larvicide acts upon lampreys. In field tests, it was noted that within a few hours after the chemical entered the water the lamprey larvae literally popped out of their burrows in the mud of the stream bed. According to Dr. James Moffett, chief of Great Lakes Fishery Investigations for the U.S. Fish and Wildlife Service, the chemical appears to affect the respiratory system of the larva. "Something happens to the blood and gill areas to produce rather extensive hemorrhaging and a gradual deterioration."

Besides eliminating up to 100 percent of the lamprey larvae in spawning areas, the chemical is the most economical weapon so far developed in the decade-old battle to eradicate the vampire from the Great Lakes. And it will do the job more quickly by killing the eel-shaped monster in its early, semidormant life, rather than after it has developed into the adult form which destroys fish.

Despite the "breakthrough" in the struggle against the lamprey, whose genealogy predates the dinosaurs, state and federal fisheries experts will not relax their vigilance. Complete elimination is still the goal of the Fish and Wildlife Service. The search for still better chemical controls will continue.

The new problem is that of restocking the game fish, particularly trout, in the

lamprey-ravaged lakes. There aren't enough lake trout left in Lakes Huron and Michigan to establish within a short time a breeding population. Dr. Moffett estimates it would take about 10 years of stocking yearling lake trout before the species could maintain itself. The next year or so will be especially critical because adult lampreys still in Lake Superior may further reduce the remaining trout stocks.

The sea lamprey became established in the western Great Lakes because of a fluke of nature and the progress of man. For countless centuries the lamprey lived its adult life in the Atlantic Ocean and returned to the St. Lawrence River and Lake Ontario to spawn a new generation before it died. The lamprey couldn't migrate beyond Lake Ontario because of the barrier of Niagara Falls. Then man constructed the Welland Canal to bypass the falls. The sea lamprey sneaked through the locks and, as it moved farther away from the ocean, it abandoned its ancient habit of living its adulthood in the sea. Instead, the lamprey adapted itself to living its full life cycle in fresh water.

When Dr. Moffett and his assistants were given the assignment of getting rid of the sea lamprey they began a careful study of its life cycle. They found that of the lamprey's life span of seven years, only 12 to 20 months are spent as a parasite. During the first four years, after hatching from one of its mother's approximately 60,000 eggs, the lamprey is a pin-size, blind and harmless larva. Its home is a burrow in the

(Continued to page 244)



Extra Wing Behind Cockpit Makes Midget Plane Safer

Is the pilot in the picture above hauling a sheet of plywood behind his cockpit? No, that's an extra wing. It serves as an elevator and is said to make the French

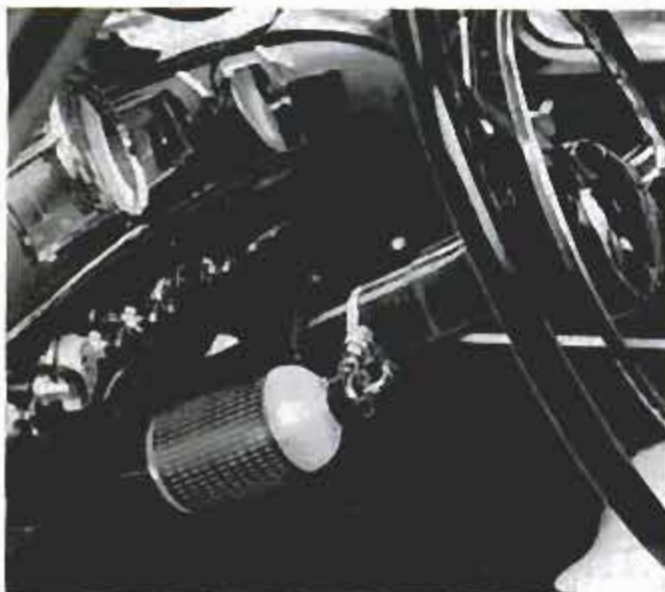
Mignet 320 safer and easier to handle. The plane has a cruising speed of 80 miles per hour, and can take off or land within a distance of 50 yards.

Three-Wheel Japanese Truck Hauls 3000-Pound Load

Built to take the punishment of Japan's rough roads, the Mitsubishi Mustang three-wheel truck hauls a 3000-pound load at 50 miles per hour. And it does it while burning only one gallon of gas every 35 miles, says the manufacturer. The engine is an air-cooled, two-cylinder overhead-valve design that drives through the back wheels. More than a million of the trucks are in use in Japan. Price: About \$1800, port of entry New York.



Plastic Squeeze Bottle on Steering Column Washes Windshield



Some car owners in West Germany have a simple but inexpensive windshield-washer system attached to the steering column. It consists of a plastic bottle filled with water and connected by tubing to a spray nozzle in front of the glass. When the windshield is dirty, the driver just squeezes the bottle and water is sprayed from the nozzle.

Radiationproof Tires

Future nuclear-powered aircraft will have radiationproof tires. The tires, developed by B. F. Goodrich Company, are treated with antirads—chemical materials added to rubber stocks before vulcanization to improve rubber's resistance to radiation damage.



Static Lines for Chutists Extend Outside the Plane

Parachutes of Army paratroopers, as they drop from a C-130, are pulled open by static lines that extend from the plane's doorway past the Air Force insignia. A

static-line retriever system, developed by Lockheed engineers, reels back into the plane any jumper who might become entangled in the lines.



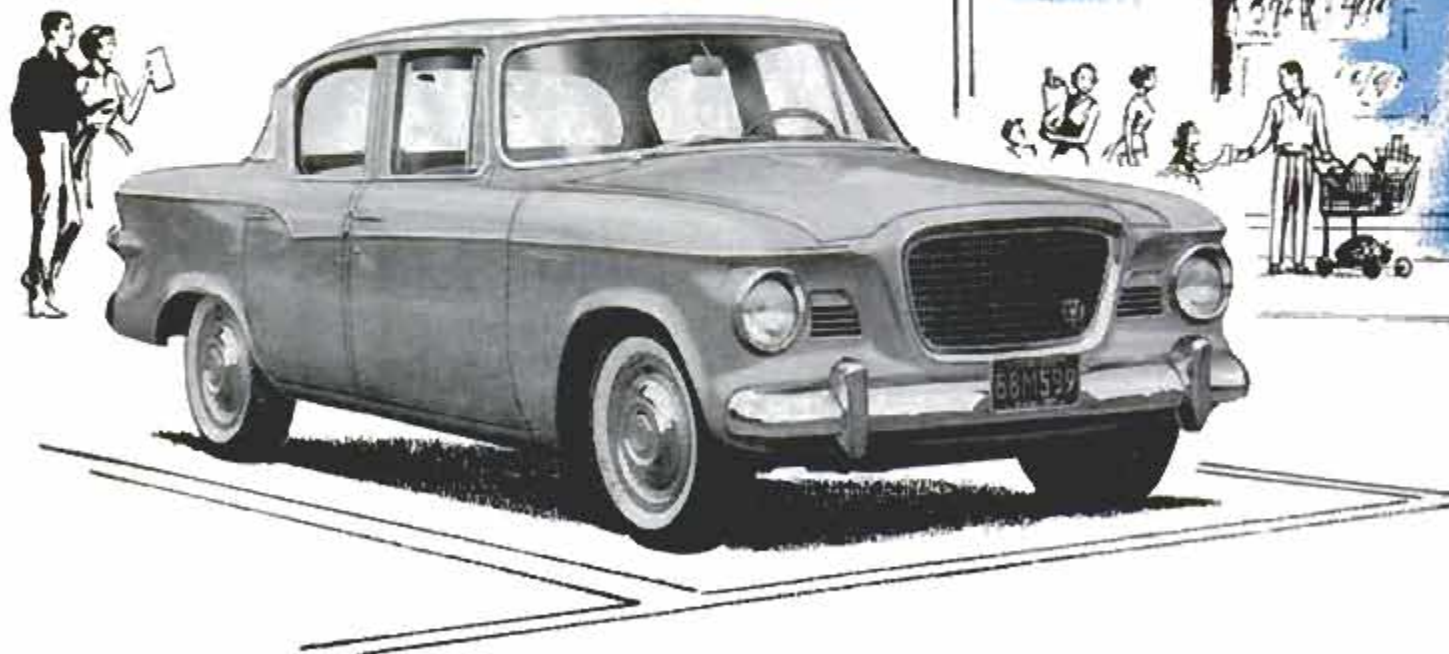
Powered Chair Lifts Steeplejack

With a 30-pound hoist developed recently, steeplejacks can work on virtually any manmade structure, regardless of its height. And, because of its light weight, one man can carry his own machine. Conventional rigging equipment weighs hundreds of pounds and is limited in its range. The lightweight machine, which can be operated either manually or on compressed air or electricity, uses the cable as a track. One of the machines will lift 1000 pounds in a "cage" or bosun's chair. A pair of the machines attached to a scaffold can lift a one-ton load at a rate of 20 feet per minute.

☐ Strontium 90, the radioactive villain of nuclear energy, may soon be used to power remote weather stations. The Atomic Energy Commission has authorized research on a generator, fueled by Strontium 90, which would operate for almost a decade without servicing or refueling.

OWNERS
REPORT

A NATIONWIDE SURVEY



THESE CARS MAKE SENSE, SAY

MARGINAL COMMENTS
BY ART RAILTON
PM's AUTO EDITOR

*If this keeps up,
the public will renew
its faith in mass
production.* →

*Once accustomed to
shorter, more
maneuverable cars,
owners seem hesitant
to go back to big
ones.* →

LARK OWNERS are a happy bunch, although over-all they are not quite so well pleased as Rambler owners. With Studebaker, the V8 owners are happiest. Not one of them rates his car poor. Those few who do rate the Lark poor (2.7 percent of all owners) are six-cylinder owners.

Another encouraging fact disclosed in the PM nationwide survey of 1000 Lark owners is the extremely small percentage (1.6 percent) mentioning poor workmanship. Usually, this complaint is high on the list of gripes by owners of any new model, but not so with the new Lark.

What do these Lark owners like most?

First on the list is handling ease, followed (among V8 owners exclusively) by acceleration and power. These two features are well ahead of the rest, which includes ease of parking, small over-all dimensions and ample interior roominess, in that order.

(Continued to page 86)

WHAT DO LARK OWNERS SUGGEST THE AUTO INDUSTRY SHOULD DO?

"Get down to earth. Make cars as good as possible for the money instead of as big as possible."—Arizona foreman.

"Get some sense. The people are beginning to wake up. They can't afford the monsters."—Missouri accountant.

"I consider a car a necessary evil and not a luxury and with that concept I begrudge every penny I pay on one. I'll sacrifice many comforts for a car that will go more than a week or two without servicing."—Maine public-health nurse.



LARK AND RAMBLER OWNERS

RAMBLER OWNERS are a happy bunch also. And owners of the Rambler Six are happiest of all. Not one owner of a Rambler Six rates his car "poor." The few who do rate the 1959 Rambler poor all are V8 owners.

Actually, less than one percent (0.9 percent to be precise) of all Rambler owners in the *PM* survey give their cars a poor rating. This is the best record achieved by any American car since our Owners Report series began in 1950.

Each month, *Popular Mechanics* asks 1000 new-car owners from coast to coast to tell you about their cars. This article describes the likes and dislikes of the owners of the 1959 Rambler.

What do these owners like most?

Not economy of operation, as you might expect, but handling ease by a wide margin. Second comes economy of operation, followed by riding comfort and ease of parking.

(Continued to page 87)

MARGINAL COMMENTS
BY ART RAILTON
PM'S AUTO EDITOR

← A spectacular achievement and one that assures lots of repeat sales. Usually four or five percent rate their cars "poor." Occasionally, as many as 10 percent. To cut the number to under one percent is an achievement.

WHAT DO RAMBLER OWNERS SUGGEST THE AUTO INDUSTRY SHOULD DO ?

"Make reasonable cars with less emphasis on fenders and tail-lights, more on practical and durable engines."—Montana florist.

"Strike a happy medium between the foreign and the American car."—New Hampshire circulation manager.

"Wake up the engineers and give the stylists a rest."—Louisiana university student.

"Leave off the frills and flash. Concentrate on safety, handling ease, comfort and utility."—California engineer.



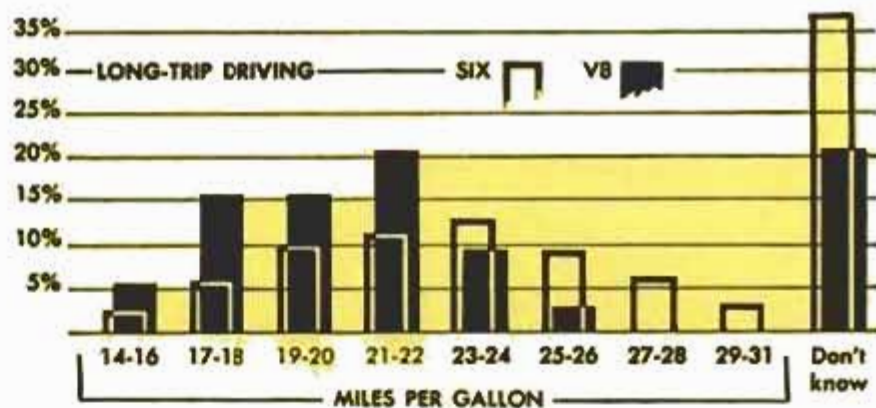
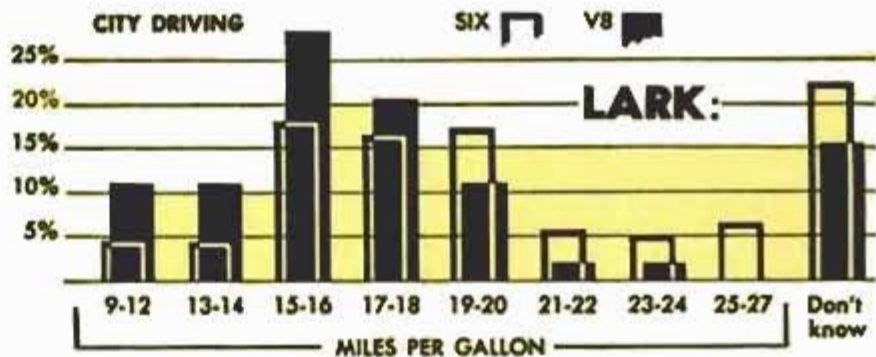
Dash is unadorned and functional. Speedometer may be too small for bifocal wearers. Right, charts show gas economy. Most owners of the Six will probably get better mileage now thanks to a carburetor modification kit

Owners insist, with logic, that smaller cars should be more economical. →

Anomalous is the fact that some sixes (old designs) are less economical than some V8s (new designs). →

Of the two Larks I drove: a Six economy model and a V8 luxury model, neither rattled. → However, the more expensive car was certainly tighter and more solid. Why?

Trunk is small, but is adequate. It means you must pack sensibly



LARK

Relatively far down the list is economy of operation, which ranks seventh, just behind riding comfort.

There are complaints and, just as with the Rambler owners, the top-ranking complaint is poor gas economy. Strangely enough, considerably higher percentage of six-cylinder owners make this complaint than V8 owners. Apparently, the six-cylinder buyer expects much greater economy than the V8 buyer and is more inclined to complain when he doesn't get it.

Second among the complaints is trouble with the carburetor and automatic choke. This, too, is mentioned by many more six-cylinder owners than V8 owners. A large number of those complaining state that their dealers are going to modify the carburetor with a kit now factory-supplied.

Third on the complaint list is body noises and rattles, fourth involves the heating and defrosting system, fifth is engine noise and vibration (also mostly among six-cylinder owners) and sixth is body leaks.

Slightly more than 30 percent of the Lark owners say the car is without fault and make no complaints at all.

Here are quotations from Lark owners, arranged in order of frequency of mention, describing the car's best-liked features:

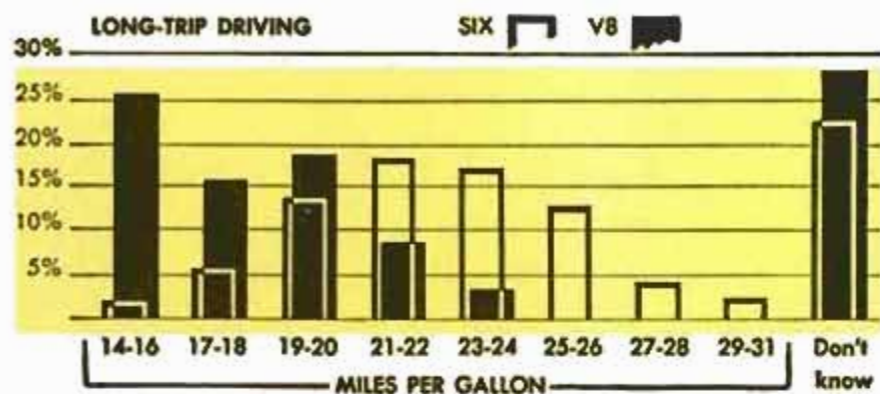
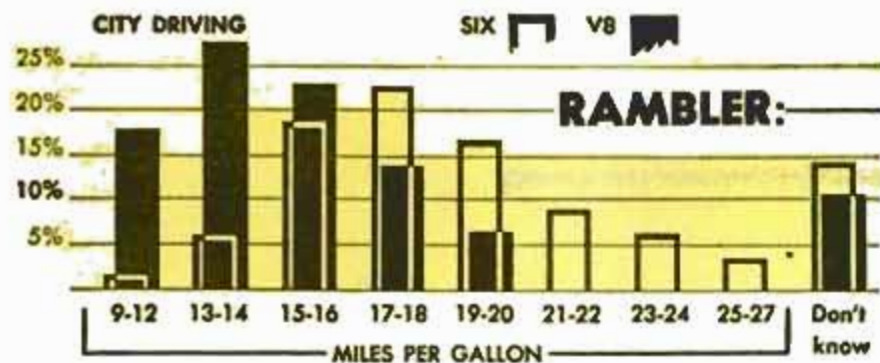
"It's a pleasure to drive through city traffic."—Arkansas printer.

"It handles well. Steers as though it had power steering."—Alabama oiler.

"Extreme ease of driving. Almost sports car handling. Stays in the groove at cruising speed."—Louisiana naval architect.

"Outstanding acceleration. My V8 has been clocked at 15.1 seconds over a quarter mile. It is equipped with power pack, overdrive. It was in top tune at the time."—Pennsylvania bank teller.

(Continued to page 89)



Dash instruments are very small and simple. Speedometer scale has numerals jammed together in central 30-to-70 section where speed information is most valuable. Charts at left show gasoline mileage claimed by owners

RAMBLER

Fifth, they mention the small size of the car and sixth, the tight, solid body structure.

There are also some complaints, although fewer than usual in these surveys. The most-often mentioned complaint is that the car does not give expected (nor in some cases the promised) gasoline economy. More V8 owners make this complaint than Six-cylinder owners (21.0 percent V8, 12.5 percent Six), but the complaint is the top one on the complaint list of each group.

Second and third on the list both involve transmissions: One is a difficulty in shifting the manual transmission; the other is the awkwardness of the push buttons on the automatic transmission. Fourth on the complaint list (among six-cylinder owners only) is sluggish performance and fifth is the jerky shifting of the automatic transmission.

Almost one third of the owners make no complaints at all, feeling that the Rambler is perfect as is.

Here then is how the owners describe the best-liked features, the quotations being arranged in order of frequency of mention:

"Handles in traffic like a small car and on the highway like a large car."—California truck driver.

"It handles very easily in traffic and in my kind of driving. I am a rural mail carrier and it is the most satisfactory car I have ever driven on a mail route."—South Carolina mail carrier.

"My wife uses it most to carry children to school and she likes it for its ease of handling in traffic."—Arkansas railroad conductor.

"We are averaging 19 miles per gallon over-all and feel that this Six will get from 23 to 25 miles on long trips."—New Mexico office manager.

"I have the V8 with overdrive and average about 18 miles per gallon on normal town driving using regular gasoline only."—California Navy technician.

(Continued to page 91)

Gas economy is relative. The Rambler is not an economy car compared with foreign cars, but it is slightly more economical than most American cars.

The industry should be able to build a smooth-as-butter shift linkage. As for push-button troubles, that's simple: Get rid of the buttons!

For some reason, it is not so nimble in traffic as it should be. It's a little ponderous for a small or even a "compact" car.

Rambler's trunk is ample for normal use. Parkinson's law of trunk space: Luggage expands to fill all the available space



MODEL TESTED: Four-door deluxe sedan with six-cylinder in-line engine, single-barrel carburetor, automatic transmission, rear-wheel drive, power windows, power door locks, power steering, power brakes, and power antenna. Rear-axle ratio, 3.09 to 1; wheelbase, 108.5 in. Tires: 5.50 by 15. Weight: 2738 pounds with gas tank half full (55 percent on the front wheels, 45 percent on the rear). Mileage on car at time of test: 1500 miles. Barometer: 29.1 in. Temperature: 63 deg. F. Payload: 200 lb.

By **DALE KELLY, SAE**
Registered Professional Engineer

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 70	1/4 mile
Regular gasoline.....	4.0	10.4	26.5	41.0	24.9
Premium gasoline.....			No improvement		
Super-premium gasoline.....			No improvement		

(Gasoline used had following octane ratings by Research method: Regular 90; Premium 99; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	27.5	23.4	15.1	13.0
Premium, super-premium.....			Not tested	

(Steady-speed tests made in overdrive. Traffic tests made in 1st, 2nd and 3rd gears. In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$153 for 10,000 miles

(Based on the exclusive use of regular gasoline at 30.5 cents per gallon.)

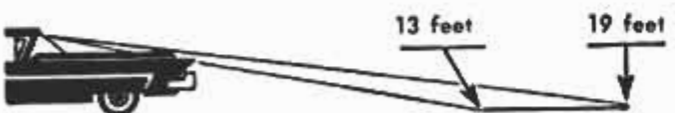
SPEEDOMETER ERROR (miles per hour)



Speedometer reading	20	30	40	50	60	70	80
True speed	20	28	37	46	55	65	75

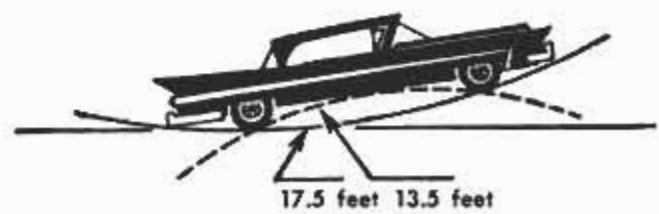
ODOMETER READING (miles traveled)

Odometer registered 103 miles for an actual distance of 100 miles



DRIVER'S VISION

Driver could see part of road 13 feet in front of car, full width of road 19 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....17.5-ft. radius
Worst hump that could be crossed.....13.5-ft. radius
Deepest rut that could be negotiated..... 8.0 inches
Curb clearance for door opening.....13.0 inches

STEERING

Steering-wheel turns for 50-ft. circle.....1.55 turns
Curb-to-curb turn-circle diameter.....38 feet
Wall-to-wall turn-circle diameter.....40 feet
Steering-wheel turns, lock-to-lock.....4.0 turns

CENTER OF GRAVITY: 23.2 inches (unloaded car)

TRUNK CAPACITY

10 cartons (one cubic foot each)

WATER RESISTANCE: Very good

Splash-pan test: No leaks
High-pressure test: No leaks

OBSERVATIONS

This car is from 4 to 10 inches narrower and almost 3 feet shorter than the Ford-Chevy-Plymouth trio tested last month. Yet it comes close to matching them in passenger room. The rear floor is flat except for a very modest shaft tunnel and the center passenger has the luxury of a soft cushion beneath him.

Driver's forward vision is good due to the lack of overhang. Lack of rear overhang makes its ground clearance excellent. There will be few, if any, rumps on which this car will drag. Steering is fast for a manual, nonpowered system.

Speedometer is very legible, but there is no

provision for reducing or for turning off its illumination. Wipers on test car were vacuum-operated and stopped whenever, as often happens with overdrive, the throttle was opened wide.

Engine access is good except that the hood does not open very wide and also has to be held open by a prop.

There is no provision for lubricating rear-wheel bearings except by removing them. Studebaker recommends that this be done every 25,000 miles.

Dale Kelly, SAE

LARK

"It's a little bomb. The V8 is superb."—California owner.

"Few cars have been able to stay with me on acceleration. We have taken a 1600-mile trip in this V8 sedan and it was a joy to drive under all conditions."—Texas sales director.

"I'm a salesman calling on drug stores and have to park an awful lot. This is the easiest car to park I have ever owned."—Tennessee salesman.

"Fits into my garage beautifully. No parking problem."—Pennsylvania telephone operator.

"Able to get into a very small place to park."—Wisconsin retired owner.

"Common-sense size."—Pennsylvania foreman.

"Although the car is small, you seem to enjoy all the roominess of the larger and more cumbersome wagons. All in all, it just seems like good, sensible transportation."—Kansas banker.

"Small size outside, yet no sacrifice inside."—Pennsylvania salesman.

"It is 3 feet shorter, 14 inches narrower yet has big interior."—New Hampshire letter carrier.

"The part I like most is its roomy interior. It is one of the few 1959 cars that I can sit in without removing my hat."—Pennsylvania banker.

"It's a mystery to me how Studebaker was able to make a car that seems so small on the outside and has so much room on the inside. Except for one measurement, it is bigger than one of the so-called low-price three."—Arizona executive.

"Has no foot wells. Has average-size transmission hump."—North Dakota owner.

"When I traded my big sedan in on the Lark, I was apprehensive about the riding qualities. We have taken several long trips since and find the Lark rides just as well as the 126-inch-wheelbase big car did. It is even more comfortable on long trips because of its better headroom and higher seats."—Ohio chemist.

"Ride is unique. It takes the short chop better. When you

(Continued to page 248)

← He's right. The V8 is a bomb. And not disgraceful on gas either. In a 20-mile city test involving 48 stops, it averaged 18 miles per gallon. Of course, there was no "peeling" in the test, only sane, sensible driving.

← "Sensible." That's the new word in the public's automobile lexicon. And if shouted loud enough, it will bring miracles.

← Interior width is less than in the bigger cars, but three sit more comfortably in the narrower Lark. Doesn't make sense, but could make sales.

SUMMARY OF LARK OWNERS' OPINIONS:

LARK: Excellent 75.3%

Average 22.0%

Poor 2.7%

Best-liked features

Handling	57.5%
Acceleration (V8)	41.0%
Ease of parking	32.4%
Small size	30.6%
Interior room	25.8%
Riding comfort	25.1%
Economy of operation	24.6%

Most frequent complaints

None at all	30.3%
Not enough economy	18.7%
Carburetor trouble	10.9%
Rattles, squeaks	9.5%
Inadequate heater	6.9%
Engine noise, vibration	5.2%
Water leaks	5.0%

Satisfied with gas economy?

Six-cylinder owners:	
Yes, satisfied	63.1%
No, not satisfied	36.9%
V8 owners:	
Yes, satisfied	73.3%
No, not satisfied	26.7%

Had trouble with engine?

Six-cylinder owners:	
No trouble	78.5%
Some trouble	17.1%
Considerable trouble	4.4%
V8 owners:	
No trouble	86.4%
Some trouble	12.8%
Considerable trouble	0.8%

What was engine trouble?

Six-cylinder owners:	
Carburetor	10.2%
Hard to start	2.9%
Ignition	2.0%
V8 owners:	
Carburetor	6.4%
Ignition	2.1%
Generator trouble	1.4%

How is dealer service?

Excellent	63.6%
Average	28.8%
Poor	7.6%
Would buy from him again?	
Yes, would	66.9%
No, would not	9.9%
Don't know, no answer	23.2%

What make was traded?

Studebaker	24.4%
Packard	3.1%
GM make	22.5%
Ford Motor make	16.6%
Chrysler Corp. make	12.3%
American Motors make	3.6%
Other U.S. make	2.3%
Foreign make	3.8%
No trade, no answer	11.4%

What make will buy next time?

Studebaker	54.0%
GM make	3.3%
Ford Motor make	3.1%
Chrysler Corp. make	0.7%
American Motors make	2.6%
Foreign make	3.5%
U. S. "small car"	1.4%
Don't know, no answer	31.4%

One suggestion for industry?

Make sensible, practical cars	28.4%
Make smaller cars	25.3%
Greater gas economy	18.1%
Less horsepower	8.3%



AN ENGINEER'S ANALYSIS

By **DALE KELLY, SAE**
Registered Professional Engineer

1959 Rambler Super Six

MODEL TESTED: Four-door sedan, six-cylinder engine, single-barrel carburetor, single exhaust and hand-shift transmission with overdrive.

Rear-axle ratio: 4.11 to 1. Wheelbase; 108 inches. Tires: 6.40 by 15. Weight: 3053 pounds with gas tank half full (56 percent on the front wheels, 44 percent on the rear).

Mileage on car at time of test: 300 miles. Barometer: 28.8 inches. Temperature: 94 deg. F. Payload: 200 lb.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 70	1/4 mile
Regular gasoline.....	4.0	9.5	20.0	27.0	22.5
Premium gasoline.....			No improvement		
Super-premium gasoline.....			No improvement		

(Gasoline used had following octane ratings by Research method: Regular 90; Premium 99; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	30.3	22.3	18.3	15.6
Premium, super-premium.....		Not tested		

(Steady-speed tests made in overdrive. Traffic tests made in 1st, 2nd and 3rd gears. In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$143 for 10,000 miles

(Based on the exclusive use of regular gasoline at 30.5 cents per gallon.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading	20	30	40	50	60	70	80
True speed	17	26	35	43	52	60	69

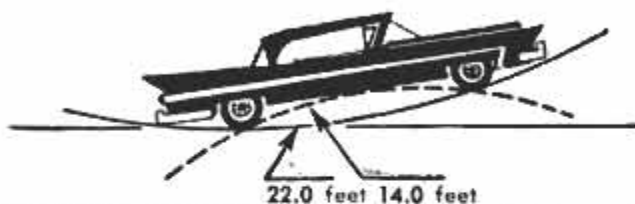
ODOMETER READING (miles traveled)

Odometer registered 107 miles for an actual distance of 100 miles.



DRIVER'S VISION

Driver could see part of road 17 feet in front of car, full width of road 21 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....22.0-ft. radius
Worst hump that could be crossed.....14.0-ft. radius
Deepest rut that could be negotiated.....8.0 inches
Curb clearance for door opening.....14.0 inches

STEERING

Steering-wheel turns for 50-ft. circle...1.7 turns
Curb-to-curb turn-circle diameter.....38 feet
Wall-to-wall turn-circle diameter.....40 feet
Steering-wheel turns, lock-to-lock.....4.5 turns

CENTER OF GRAVITY: 23.7 inches (unloaded car)

TRUNK CAPACITY

12 cartons (one cubic foot each)

WATER RESISTANCE: Very good

Splash-pan test: No leaks

High-pressure test: Slight leak

OBSERVATIONS

This car is from 4 to 7 inches narrower and about 1 1/2 feet shorter than the Ford-Chevy-Plymouth trio. Yet it substantially matches them in passenger space.

Speedometer and odometer were less accurate (being considerably on the optimistic side) than any tested so far this year. The speedometer was hard to read. The 50 and 70-mile-per-hour

marks were only a half inch apart.

Top speed in overdrive was 79 miles per hour. In third gear, it was slightly more than 80 miles per hour.

A vacuum-booster fuel pump is standard equipment on all Ramblers (even the American) and the wipers on the test car worked regardless of engine load.

RAMBLER

"My gasoline and oil bills are almost half what they were in my previous car."—New Mexico secretary.

"We like its riding quality. We had made up our minds to endure the jolts of a short-wheelbase car if we got economy. But the ride we are getting is a pleasant astonishment to us all."—Ohio school supervisor.

"It rides much easier than most big cars."—South Dakota sign painter.

"It's a woman's car. Very easy to park on crowded and busy streets."—South Dakota nurse.

"I like the ability to park in places I once had to pass up."—California Navy officer.

"Fits my garage with plenty of room to spare."—Michigan clerk.

"Can park the car in the garage without having to add onto it."—North Dakota supervisor.

"I bought it because it is smaller than other cars."—Minnesota foreman.

"Body is very tight. Usually by checkup time there are rattles to be taken care of. Rambler has none."—Maine housewife.

"I like the solid feeling you get when you ride in it."—South Dakota teacher.

"I haul new cars out of Kenosha (where Ramblers are built). The Rambler climbs the truck ramps very good. When you tie them down the doors don't pop open, something I have had other cars' doors do. All the nuts and bolts are tightened up well at the factory. On other makes, after hauling them I find a lot of nuts, bolts and metal screws in the trailer. Not with Rambler."—Ohio trucker.

But There Are Complaints

The following quotations describe the things that owners don't like about their new Ramblers and are listed in order of frequency of mention:

"Rambler seems to misrepresent its product when it

(Continued to page 254)

Years ago, short cars had to be uncomfortable. But today, engineers can make short cars as comfortable as long ones.



Before you buy any car, drive it home and park it in your garage. You might be surprised.



Rambler is tight, solid. Two reasons: 1. Unit body; 2. The basic shell has been used for several years without major change.



SUMMARY OF RAMBLER OWNERS' OPINIONS:

RAMBLER: Excellent 74.2%

Average 24.9%

Poor 0.9%

Best-liked features

Handling	54.9%
Economy of operation	30.0%
Riding comfort	27.8%
Ease of parking	23.7%
Small size	21.6%
Tight, solid body	20.9%

Most frequent complaints

None at all	32.1%
Not enough economy	15.8%
Hard to shift gears	9.8%
Push-buttons awkward	7.9%
Six is sluggish	7.0%
Auto. trans. trouble	6.4%
Inadequate wipers	3.4%

Satisfied with gas economy?

Six-cylinder owners:	
Yes, satisfied	73.9%
No, not satisfied	26.1%

V8 owners:

Yes, satisfied	59.1%
No, not satisfied	40.9%

Had trouble with engine?

Six-cylinder owners:	
No trouble	85.1%

Some trouble	13.5%
Considerable trouble	1.4%

V8 owners:

No trouble	77.9%
Some trouble	19.2%
Considerable trouble	2.9%

What was engine trouble?

Six-cylinder owners:	
Carburetor	5.0%
Automatic choke	2.1%
Stalling	1.9%
V8 owners:	
Carburetor	7.6%
Valves	3.5%
Stalling	2.3%

How is dealer service?

Excellent	52.3%
Average	39.7%
Poor	8.0%

Would buy from him again?

Yes, would	59.2%
No, would not	9.0%
Don't know, no answer	31.8%

What make was traded?

Rambler	18.0%
Other AM make	8.9%
GM make	25.3%
Ford Motor make	16.1%
Chrysler Corp. make	17.7%
Studebaker-Packard	2.9%
Other U.S. make	1.1%
Foreign make	1.6%
No trade, no answer	8.4%

What make will buy next time?

Rambler	65.6%
Another AM make	2.0%
GM make	2.3%
Ford Motor make	1.1%
Chrysler Corp. make	1.0%
Foreign make	1.3%
U. S. "small car"	1.6%
Don't know, no answer	25.1%

One suggestion for industry?

Greater gas economy	24.3%
Smaller cars	24.0%
Simpler styling	14.6%
Less horsepower	11.6%



DETROIT LISTENING POST

By Art Railton

AT LAST they admit it. They admit what we have all known for a year or more. The Big Three will bring out smaller cars this fall. Of course, there are still "ifs," "ands" and "buts" in official statements.

But don't let the ifs and buts fool you. The cars are coming out just as certainly as the leaves will fall off the trees this autumn. The General Motors smaller car will be here by the end of September, the Ford smaller car by the end of October and Chrysler's by the end of November.

The reason for the "we're not certain" tone of the industry is that it is scared profitless that the fast-peaking excitement about the small car will cut sharply into spring sales of the 1959 models. And the spring sales are volume sales—sales the industry counts on to pay the bills.

Incidentally, there is some concern lest these small cars, when they do come out, will be anticlimactic—so intense has been the speculation. They will have to be miraculous to raise even an eyebrow.

Ford's small car (and there persists a story that there will be two of them—one an Edsel, the other a Ford—perhaps not two this year, but by next year) will be in the Ford character with the crisp lines that stylist George Walker loves so much. It will have the straight, flat roof, the horizontal creases of the Thunderbird.

Chrysler is taking a different tack. Its small car will be a fresh concept in styling. It will not be finny like the Exner-created Chrysler image. For it, Exner has come up with a fresh personality. No scaled-down-Plymouth look. You'll have trouble recognizing its ancestry.

It will use a new overhead-valve six-cylinder engine (long overdue in the Chrysler family). The same engine, in a larger version, will probably be available for Plymouth and Dodge. For the first year at least, it will be cast iron. Look for it to switch to aluminum subsequently.

The swing to a widespread use of aluminum by the industry will be gradual for the next year or two. Then, bang, the

whole thing will break wide open. Within five years more than half the industry's engines will be aluminum; in 10 years, almost all of them.

Plants in the industry are already casting aluminum parts for these small cars. The pipelines are filling.

There's bound to be a lot of pulling and tugging in the next few years. The medium-price field will be opened up—it's too crowded for comfort or profit right now.

Watch Dodge. It will get a new batch of names for its 1960-car series. There must be good reason for this. Companies change names only when there's going to be a series dropped, or a price-class change or some similar maneuver. Look for Dodge to offer a smaller model in 1960. Dodge also may take over the small-car sales.

The lower-and-lower trend will continue for 1960. All cars will be lower, except American Motors. This is for better or for worse—take your pick. Some may rebel, but it's inevitable, so relax and enjoy it. The Rambler will have all-new exterior sheet metal, but the floor pan and shell are said to be almost unchanged.

The most changed, the most exciting and, perhaps, the most improved line for 1960 will be the full-size unit-bodied Chrysler Corporation cars. They will be in the Chrysler tradition fin-wise, and will be quiet, solid, roomy (although low) and as thoroughly engineered as any cars ever introduced, say insiders.

Chrysler will retain push-button shifting. There is evidence that American Motors may drop the buttons.

Foreigners still make news. Simca will offer four more models this summer, bringing to 11 the number it sells. Volvo is importing its Amazon, a handsome, up-to-date four-door sedan introduced in Europe two years ago.

But the biggest news will come from another direction—from Japan. The Japanese have done wonders in transistor radios, cameras and binoculars. Now they are going after the automobile business.

Late this year, Toyopet will bring a stylish, sporty, four-seated two-door sedan into this country at a price that will shake heads in Detroit, Paris and Wolfsburg. Its suspension system is claimed to be revolutionary. So simple that you'll wonder why you didn't think of it. The lightweight unit body (current Toyopets have massive frames, heavy bodies) will be tight, roomy and stylish. The aim is to cut sharply into the Karmann-Ghia and Renault Caravelle market. The price tag for its most luxurious model is said to be under \$2000.

Watch out, Europeans. The East is awakening. ★ ★ ★



Using materials which change heat directly into electricity, this thermoelectric teakettle powers radio

IN THE WESTINGHOUSE Research Laboratories at Pittsburgh I saw an old-fashioned copper teakettle bubbling away over a gas burner while waltz music came from a radio beside it. A homey scene, but deceptive, for unless hundreds of scientists and engineers throughout the world turn out to be wrong, it was a symbol of future power as exciting in its implications as another kettle which stirred the imagination of a boy named James Watt two centuries ago. A cable running from the kettle to the radio furnished its electric power—power produced by the same flame that boiled the water. In the base of the kettle was a small pioneer “thermoelectric generator” which converts heat directly into electric current, with no intermediate machinery.

Watt’s teakettle grew up to be a steam boiler, and most of today’s electric power is produced by burning fuel under boilers and using the force of the expanding steam

*Today’s Alchemist is
Opening a New World*

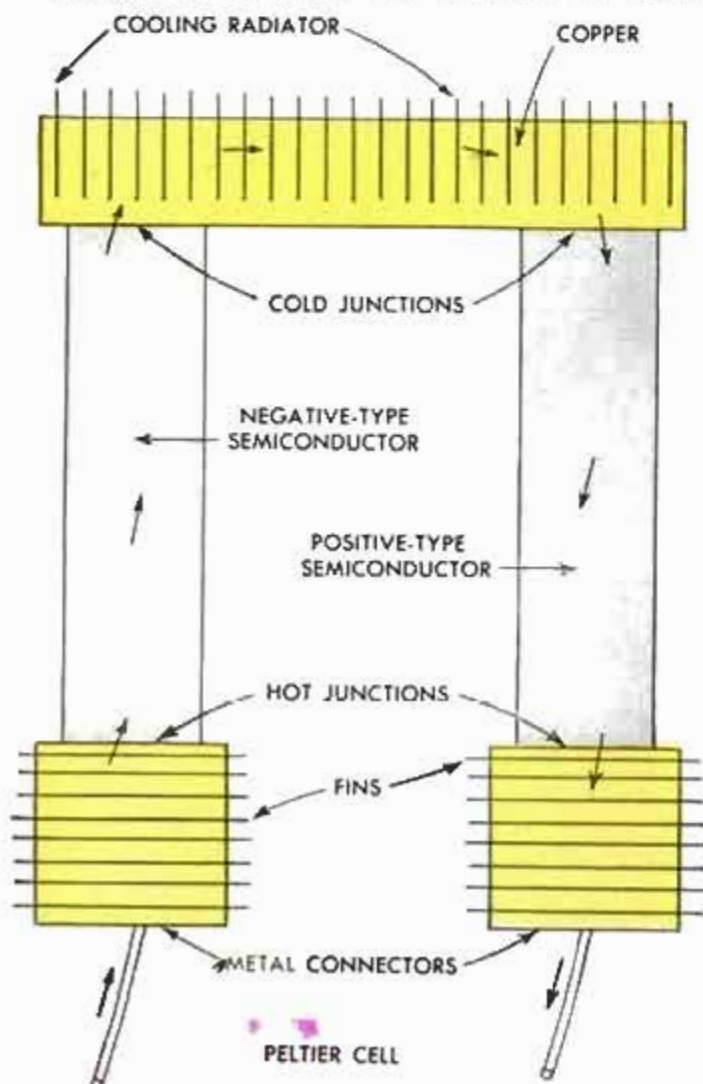
**ELECTRICITY
DIRECT FROM
HEAT**

By Harland Manchester ^{50 COMMERCE ST,} NEW YORK 14



Photo courtesy of RCA

Getting electricity from the sun is demonstrated by RCA engineer. Sun's rays are concentrated on thermoelectric cell. Drawing of junctions shows principle of the Peltier cell used in heat engines



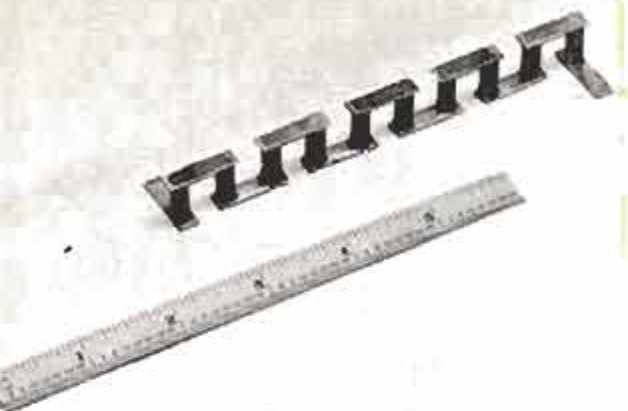
to drive turbines, which in turn drive electric generators. This system works pretty well, but for decades engineers have been calling it cumbersome, wasteful and noisy, and have been dreaming about methods of eliminating the mechanical middlemen and converting heat into electricity in one simple, silent step.

Now, in a great surge of development throughout the world, they are doing it. SNAP-III (Subsystem Nuclear Auxiliary Power), the five-pound device recently shown by the AEC, in which the heat from an isotope pellet is converted into sufficient power to run the instruments of a space satellite, is only one of many. In the laboratories of seven U. S. corporations and in a number of government research centers, dozens of thermoelectric power-makers of various types are experimentally running radios, lighting bulbs, turning fans, heating baby bottles and performing other token chores. These fascinating new machines are still a long way from putting the steam plants out of business, but engineers are confidently pointing to a wide range of practical uses, not only in space vehicles and in small home machines, but in big nuclear power plants and many intermediate jobs.

In Soviet Russia, thermoelectric devices have been actually put on the market in quantity. Hanging from the ceiling in the Pittsburgh laboratory is a big kerosene lamp like those common in American farmhouses 40 years ago. A plug-in cable hangs from a finned metal collar around the glass chimney. These lamps, which convert heat directly into current, are now said to be running radios by tens of thousands in Russian villages, while others have been exported to India. Their efficiency is low, but Westinghouse engineers say they should run 24 hours on a pint of kerosene.

Now Westinghouse, after consultation with the International Cooperation Administration of the State Department, has built a lighter and more efficient heat-powered radio which uses transistors instead of tubes, will operate 10 days on the same amount of kerosene, and can also be powered by the heat of a wood-charcoal fire or the embers of a campfire. They are now working to bring down its cost, with a view to distribution throughout remote areas where there are no powerlines or batteries.

The thermoelectric radio is one of a dozen devices in the Westinghouse laboratories, where a group of engineers has been working since 1955 to develop these new "engines" for practical use. In a larger device, the heat of a gas flame beneath a metal cabinet is converted into current that will light a bulb, run a fan or operate a public-address system. It does these things



Chain of junctions produces heat or cold, depending on the direction of current flow

Working model of "refrigerator of tomorrow" draws electricity from a group of thermoelectric junctions

by a principle discovered more than a century ago. It has long been known that if you join two wires made of different metals and heat one of their junctions, a tiny but measurable flow of current will pass through the loop. From this discovery came the thermocouple, which has long been an indispensable tool of scientists for measuring temperatures. But these loops of metal are very inefficient producers of electricity. Now Westinghouse, the Russians and others have developed loops made of specially "doped" alloys (akin to the semiconducting materials used in transistors) which are already hundreds of times more efficient than their flea-power sire. In the base of the teakettle, as well as in the Russian lamp, a battery of these loops converts heat directly into electric power. This giant stride is only the beginning, engineers state.

By way of background, the efficiency of engines now in use (in terms of their conversion of heat into power) ranges all the way from five percent or so for many small ones up to about 40 percent for the newest big steam-electric plants. Several firms working on thermoelectric generators have reported laboratory efficiencies running from 10 to 15 percent, and have set their sights on 30 percent as their goal. Many problems remain to be solved, and there will be no overnight power revolution, but it is clear that a new prime mover has entered the field, and that it will find increasing use in the years to come.

Curiously enough, some thermoelectric devices also have a future in refrigeration. I placed my hand on a metal panel in the Westinghouse laboratory, and Dr. John C. R. Kelly threw a switch. It soon became uncomfortably warm. "This is a thermoelectric panel," he explained. "You see, if



you put in heat and get a current, you can also put in a current and get heat. Then if you reverse the current, you cool the junctions of the units behind this panel." He flipped the switch over, and soon the panel felt as cold as ice. It had still another trick. Dr. Kelly threw a second switch and the panel glowed with a soft blue light. This, he explained, had nothing to do with thermoelectricity—it was a thin, electro-luminescent panel which Westinghouse is developing so that entire walls will illuminate rooms.

"So there we have a panel about the

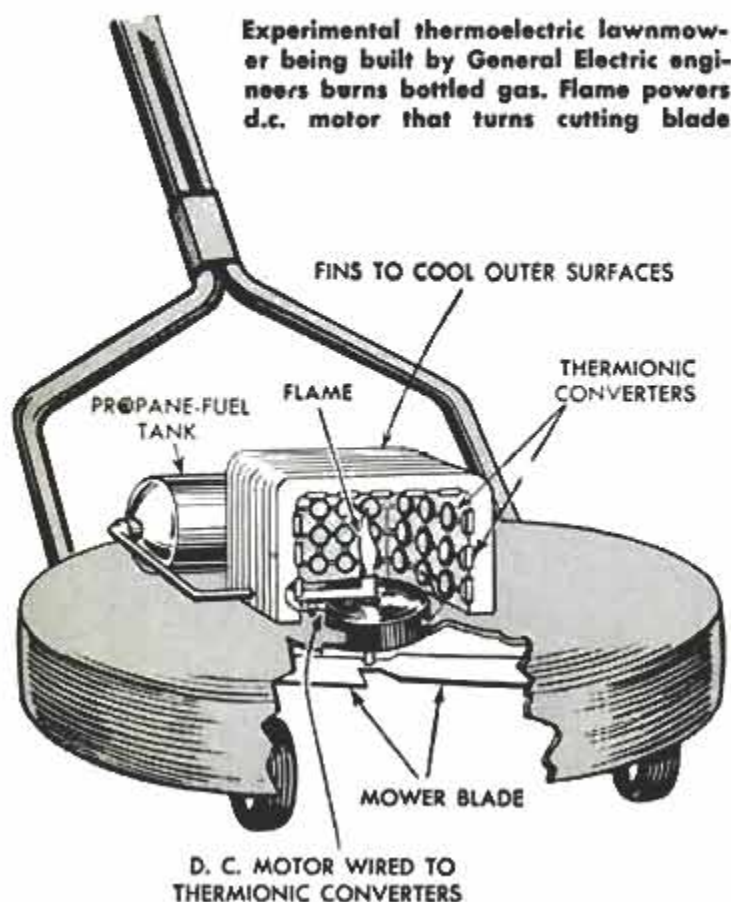
Radioisotope heat from cartridge in SNAP-III generates two watts continuous power for six months





Full-scale panel developed by Westinghouse offers light as well as heating and cooling of future homes

thickness of a wall which will heat, cool and light a room. We hope some day they'll be used in houses, but we can't predict when. Now here's something which may reach the market earlier." It was a portable, thermoelectric baby-bottle cooler and warmer.



"You put the bottle in here," he explained, "and a small thermostat-controlled refrigerator keeps it cold. You set the time clock, and at the baby's feeding time the current is reversed and the milk is warmed to the correct temperature. My wife and I took it along on a trip with our small daughter and it was a great help. How many people want a thermoelectric bottle cooler-warmer I don't know, but it's easy to think of possible uses for the device. It would be easy to fit it under an automobile dash to dispense either hot or cold beverages on demand."

Another device is a hostess cart. A compartment for cold beverages is surrounded by thermoelectric units which pump out the heat and transfer it to an adjoining compartment where food is kept warm.

Four manufacturers have exhibited basically similar household thermoelectric refrigerators. The Radio Corporation of America unveiled one in 1956, at the same time showing a wall panel which would become warm or cool at the turn of a switch. The Whirlpool Corporation of St. Joseph, Mich., acquired RCA patent rights, did additional research and recently displayed several prototype thermoelectric devices of its own design including a refrigerator, an air-conditioning panel, and a laboratory instrument which will heat or cool a sample of material and hold it at the desired temperature.

Last January, Westinghouse displayed a full-size home refrigerator, a handsomely styled cabinet in which the thermoelectric panel, contained in the rear wall, pulls the heat from the box and dissipates it into the room through a battery of concealed metal fins. Considerable space is saved because it has no motor, compressor or other moving parts. It is completely silent, and engineers state that "nothing can wear out but the hinges." More engineering must be done, but Dr. Clarence Zener, Westinghouse director of research, believes that within five years it can compete in every way with today's refrigerators. Photographs of a similar refrigerator developed in Russian laboratories have been published, and there are reports that it will be mass-produced for city apartments.

"Such devices may change the whole concept of household refrigeration," said Dr. Robert A. Ramey, Westinghouse manager of new products engineering. "It may break up today's refrigerator into small units to be located where they are most needed. Once, the kitchen had a single stove which was a baker, roaster, toaster, iron-heater, water-heater and space-heater. Now we have several "stoves," each designed for its special job. With these thermoelectric panels there would be no costly

(Continued to page 260)



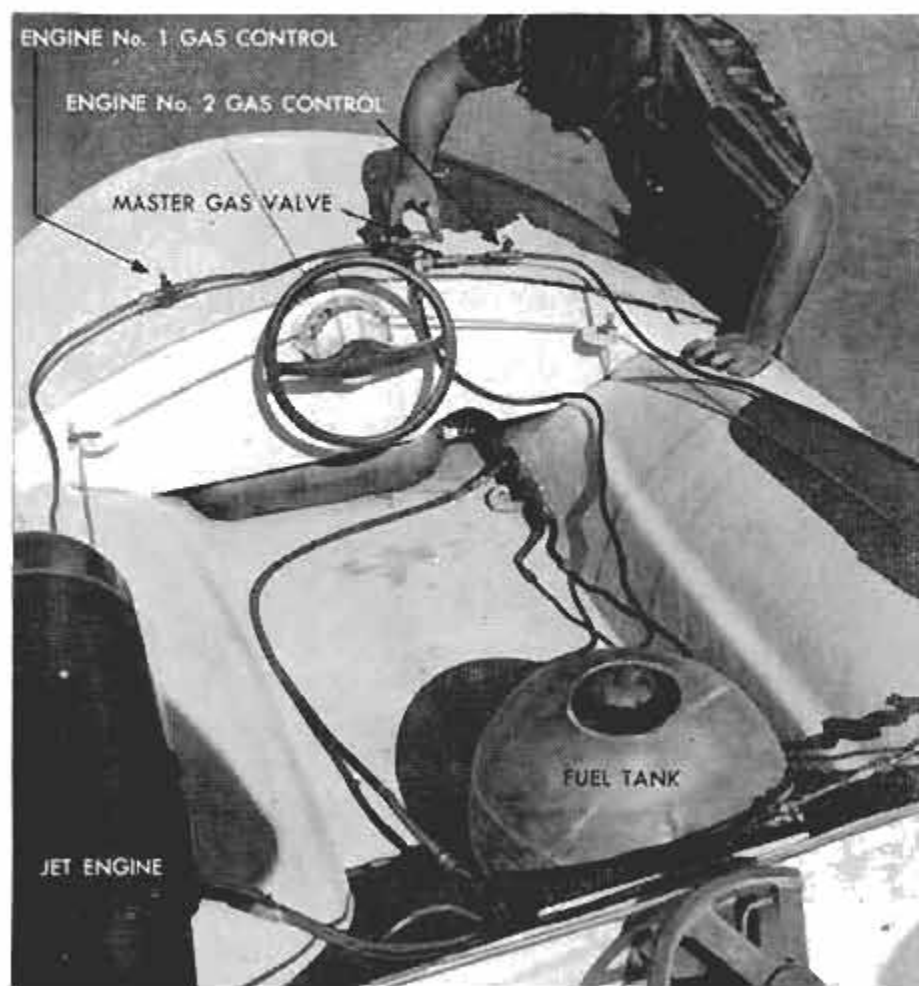
Thundering boom rises from Canyon Lake's mountain walls as jets send little boat streaking across surface

Twin Jets Power Tiny Boat

VISITORS TO ARIZONA'S Canyon Lake occasionally are amazed to see a tiny boat skim across the water, propelled by two thundering jet engines. The little boat is the brainchild of 22-year-old Bill Pearson and his father. The two jets thrust the tiny glass-fiber hull across the water at a 45-mile-per-hour clip, but the rig, according to Pearson, has a potential for much greater speed. Actually the boat is designed for a fast one-mile run rather than high-speed, long-distance cruising. Measuring seven feet eight inches long, it weighs only 147 pounds with the twin jets and other equipment. Each jet develops 105 pounds of thrust. In addition to the conventional operating controls, Pearson has a master gas valve and a gas and air valve for each engine. At first he used an outboard motor to develop enough speed for the jets to open up, but soon found that the motor contributed too much drag. Now an inboard runabout tows the little craft until it reaches about 30 miles per hour. Then the jets are opened up and the boat streaks ahead for about one mile, checked by timers on shore. During the one-mile jaunt the engines burn six gallons of high-octane gasoline.



Jet, shown here with cover off, generates temperatures up to 2300 degrees. Below, Pearson adjusts the master gas valve



WHAT'S NEW FOR
Your Home



CERAMIC COOKWARE can be used for baking, boiling, frying or freezing as well as for serving food. The cookware, resembling fine white china, is guaranteed against breaking from thermal shock. Its non-porous material will not absorb food particles

Corning Glass Works, Corning, N. Y.

GROUND SOCKETS, made of heavy steel, serve as bases for yard-light posts, clothesline poles or flower trellises. The pole slips into a 1½-inch hole. The metal socket is fashioned in an elongated V-shape, with fins at the top for lateral support

The Morrison Co., 125 W. Melvina St., Milwaukee 12, Wis.



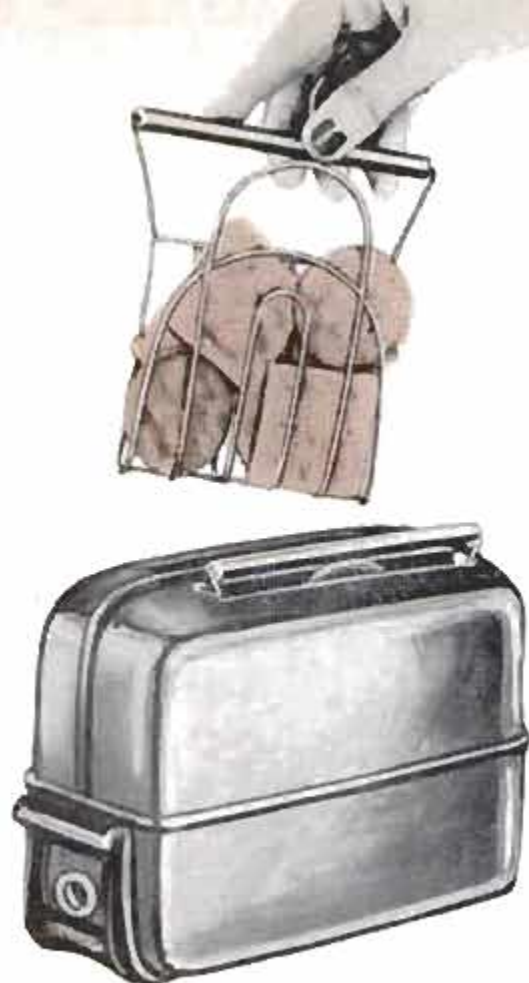
FLOWERPOT CLIPS solve problem of how to hang clay or plastic plant containers on a wall. The durable plastic clips can be mounted with screws or bolts. The flowerpot is attached simply by tipping it forward so its rim slips inside the C-shaped holder

Southern Interiors, 433 N.W. First Ave., Fort Lauderdale, Fla.

PORTABLE DISHWASHER features a hot-air drying system. Dishwasher glides on casters and can be connected to the kitchen faucet by a double-hose unit. A release button on the faucet connector permits drawing hot water without removing hoses

The Hobart Mfg. Co., Troy, Ohio

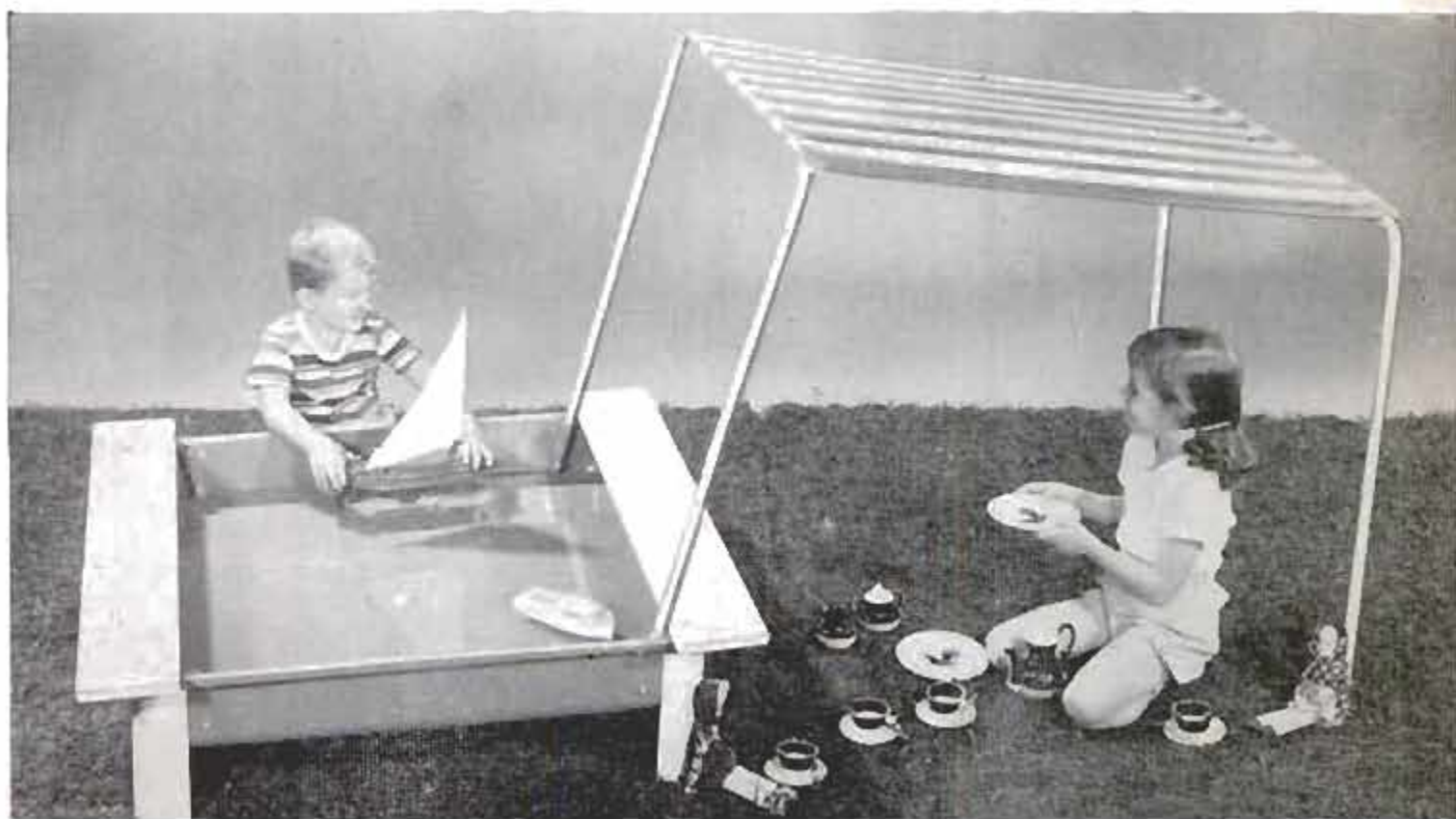


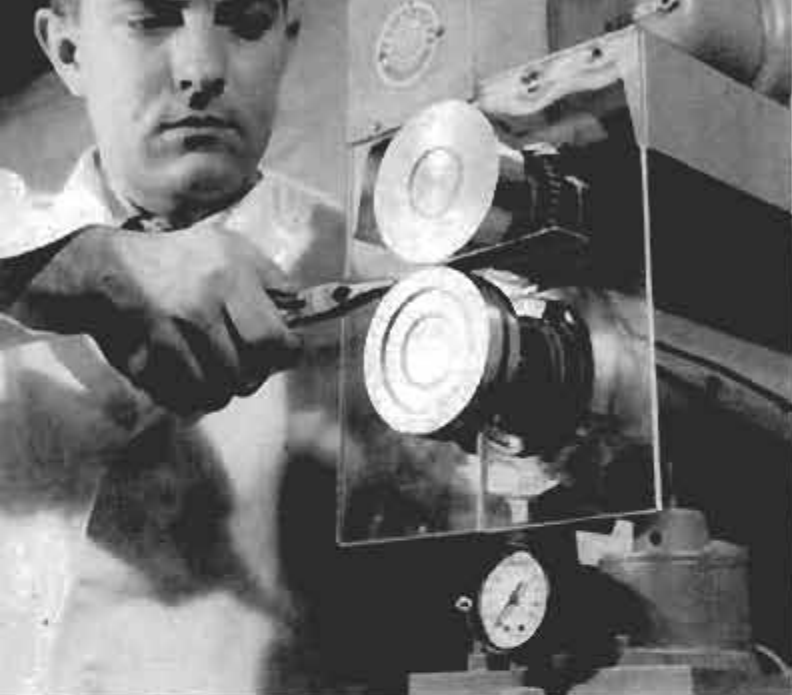


SNACK RACK for toasting crackers, muffins or small cake and bread slices fits in nearly all models of electric toasters. The rack prevents the small food items from falling against the heating elements. If the toaster doesn't have an automatic pop-up mechanism, the rack can be lifted out by hand
 Bouley Products Co., 331 S. Peoria St., Chicago 7.

BUILT-IN STRAW is part of a plastic cup unit now on the market. The cup is made of a rigid polyethylene that can be sterilized. It also can be dropped on the floor without breaking or cracking. The cups hold eight ounces and are shaped so they can be nested. They are available in red, blue or yellow
 Colanese Corp. of America, 180 Madison Ave., New York City 10.

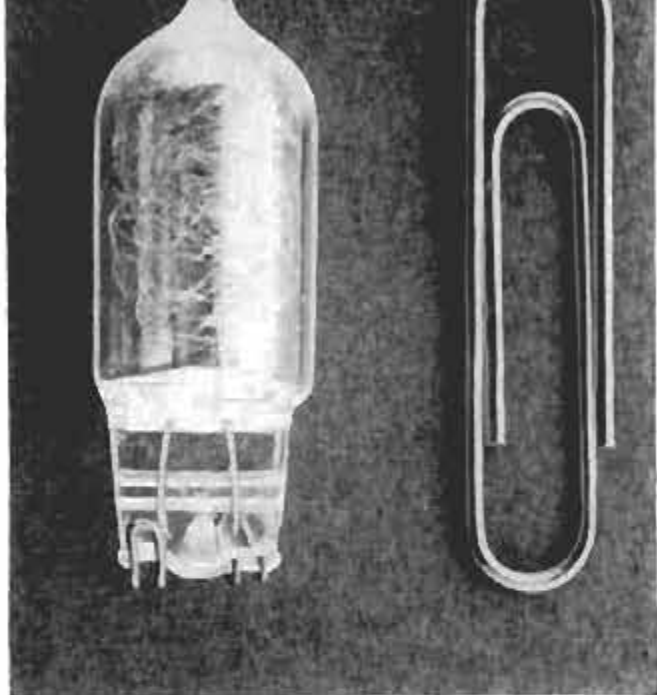
SAND BOX that doubles as a wading pool also has a canopy that can be mounted over the box or adjacent to it. The metal box has a center drain which makes it easy to remove the sand or water when changing it from a sand box to a wading pool, or vice versa. The canopy is made of striped vinyl mounted on two inverted U-frames. When mounted alongside the box, the canopy can serve as a sun shelter or a play house
 American Metal Specialties Corp., 200 Fifth Ave., New York City 10.





Sound Waves Weld Metal

High-frequency sound waves are used to weld metals in an experimental technique developed by Westinghouse scientists. The metals are passed between two vibrating wheels that carry the ultrasonic waves. The sound stirs up the surface molecules of the metals and binds them together. The seam produced by ultrasonic welding resembles a typical electric weld.



Miniature Flashbulb Has Big Light Output

Tiny zirconium-filled flashbulbs that deliver as much light as M2-size lamps, four times as large, are now available. The jelly-bean bulb has a grooved glass base for use in multilamp clips. A two-inch reflector has been designed for use with the new bulb. General Electric engineers predict eventual development of a complete miniature flash camera.



"Jump Ball" Trains Rebounders

Basketball coaches can make better rebounders of their players with a device called a "Jump Ball." Set at a challenging height, the ball requires a player to leap high and use sharp timing and a firm grip in order to pull down the ball's supporting arm. The resistance of the arm can be adjusted through a hydraulic-spring mechanism. Some coaches have reported that players, after training with the device, can jump two to three inches higher than before. The ball is identical in size and appearance to a basketball, but is made of rubber-covered aluminum.

Plastic Coating Protects Wire Fencing

Chain-link fencing manufactured by a British firm has a coating of plastic to protect the galvanized wire against corrosion.



Massachusetts Institute of Technology photo

Charts and diagrams help M.I.T. students understand Russian grammar though emphasis is on technical terms

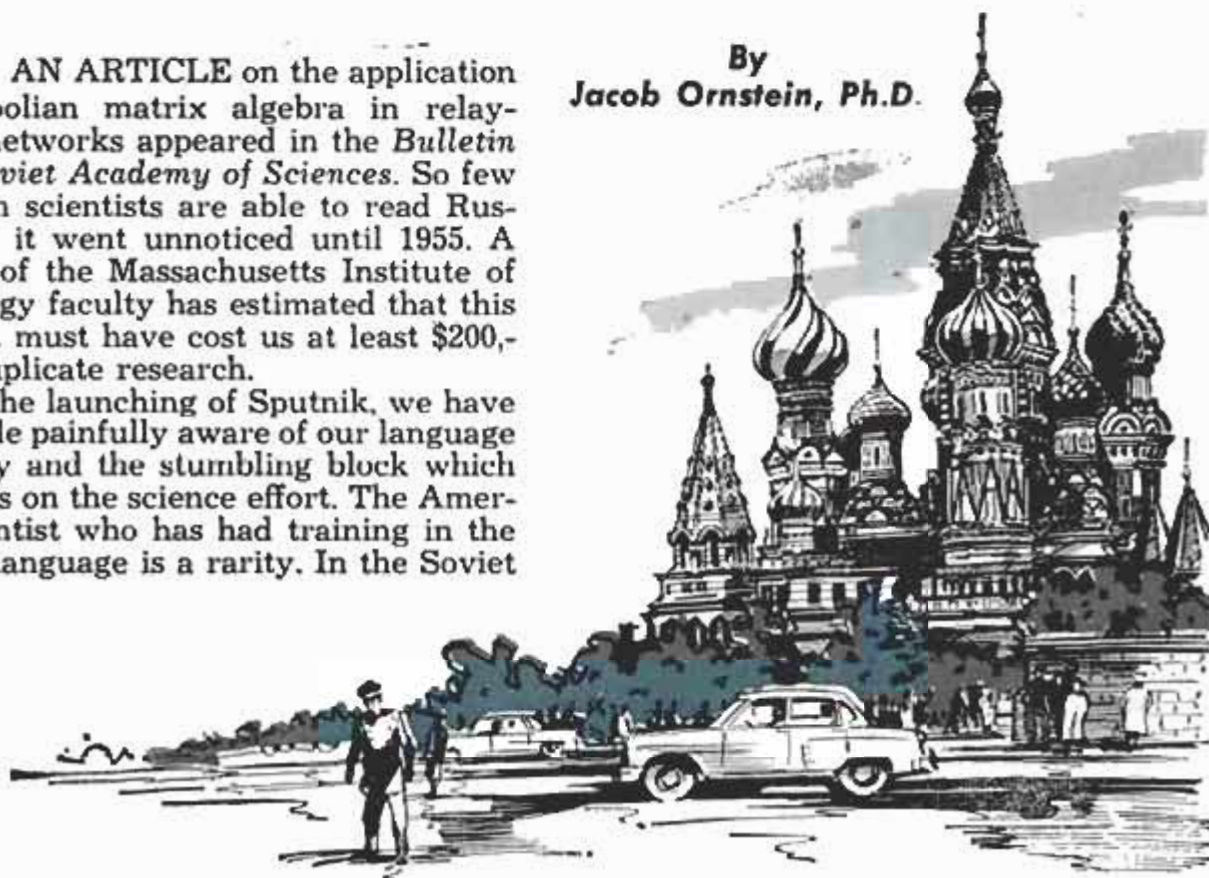
You Ought to Learn Russian

The author calls the Russian language a "pipeline to Soviet research," yet reports that only 165 American colleges teach Russian to 8000 students, while 10 million Russians are mastering English. Mr. Ornstein is an Associate Professor in the U. S. Department of Agriculture Graduate School.

IN 1950, AN ARTICLE on the application of Boolean matrix algebra in relay-contact networks appeared in the *Bulletin of the Soviet Academy of Sciences*. So few American scientists are able to read Russian that it went unnoticed until 1955. A member of the Massachusetts Institute of Technology faculty has estimated that this oversight must have cost us at least \$200,000 in duplicate research.

Since the launching of Sputnik, we have been made painfully aware of our language deficiency and the stumbling block which it imposes on the science effort. The American scientist who has had training in the Russian language is a rarity. In the Soviet

By
Jacob Ornstein, Ph.D.



RUSSIAN WORDS SIMILAR TO THEIR ENGLISH EQUIVALENTS

(In Transliteration)

RUSSIAN	ENGLISH	RUSSIAN	ENGLISH
park	park	motor	motor
tsement	cement	elektrichestvo	electricity
doktor	doctor	televizor	television
avtomobil'	automobile	radio	radio
produkt	product	kabinet	cabinet
mashina	machine	komandir	commander
energiya	energy	mexanik	mechanic
plan	plan	pilot	pilot
inzhener	engineer	atakovat'	to attack
industriya	industry	politika	policy
fizika	physics	shkola	school
apparat	apparatus	million	million
garazh	garage	alkogol'	alcohol
traktor	tractor	aviayatsiya	aviation
protsess	process	instrument	instrument
soldat	soldier	portativnyy	portable
armiya	army	foto-apparat	camera
bomba	bomb	kontsert	concert

Union, however, the linguistic training of the scientists, particularly in English, receives great stress. Dr. Ralph E. O'Dette, Program Director of the Foreign Science Information Program of the National Science Foundation, not long ago observed, "Consistently, United States scientists who have visited the Soviet Union have been amazed at the Soviets' knowledge of our literature. One recent visitor went so far as to state that they know our literature better than we do."

In addition to the translations and abstracts of scientific literature of some 80 countries which are turned out by the All-Union Institute of Scientific and Technical Information in Moscow, at least 300 foreign technical publications are reproduced intact and mailed to long lists of scientists who read them in the original English, French, German, Dutch or Japanese.

Thinking Americans, disturbed by our linguistic shortcomings, may take comfort in the knowledge that a tiny but determined corps of future scientists is busy mastering the language of Soviet science. Unfortunately, their number is small and the institutions where such training is available are few. In 1957, Dr. Leon Twarog of Boston University identified only eight universities offering scientific Russian. The writer, in a survey published by the Department of State, found that only 165 of our 1800 colleges teach Russian—to about 8000 students. By vivid contrast, there are an estimated 10 million Russians of all ages mastering English.

Warnings that more Russian study was

needed have been repeated since World War II. As early as 1941, Dr. E. J. Crane, Editor of *Chemical Abstracts*, emphasized that every seventh chemical paper in the world was published in Russian. Ten years ago, in a survey of literature in the field of organic chemistry, Dr. Paul Howerton indicated that Russian was rapidly surging up to second place. But most schools continued to teach the traditional courses in French, German, Spanish and Latin.

A few institutions, recognizing the strategic importance of scientific Russian, began to launch courses in this subject immediately after the end of the last war. Their pioneer efforts and achievements, little known even to informed Americans, need to be brought to light in order to show what can be done to bolster our linguistic pipeline to the field of Soviet research.

The Massachusetts Institute of Technology has gone farthest in the development of a scientific Russian program. A recent visitor to that school was surprised to find a number of young men in the library poring over Maxwell's equations in Russian. Convinced of the importance of this strategic language in their careers, these future chemists, physicists, mathematicians and electronics engineers have been willing to add a time-consuming subject to their already crowded schedules.

M.I.T.'s program aims to give the learner a reading knowledge of scientific Russian in only one semester. The main architect of the course has been Prof. George Znamensky, a native of Kiev, who first introduced it in 1942.



Indiana University, Department of Slavic Languages

Tape recorders in soundproof listening booths help Indiana University students master sounds of Russian

M.I.T. has discovered no magic formula for language teaching. What is accomplished is the end product of skillful instruction, plenty of hard work and high motivation. The approach is based on the sound principle that, of all linguistic skills, the ability to read scientific materials is easiest to come by. This is because writers in the field of science must be careful to use their words in a very precise, unambiguous manner. And each branch of scientific research has its own peculiar vocab-

ulary, which is repeated over and over again in its literature.

Technology students have nicknamed Russian the "language of endings." This is not accidental. Russian, like Latin, Greek or German, uses a great variety of terminations to point out grammatical relationships. Despite this, its grammar can be presented, with the aid of charts, in the 14 hours devoted to it at M.I.T. Dr. James Perry, in the preface to his text on

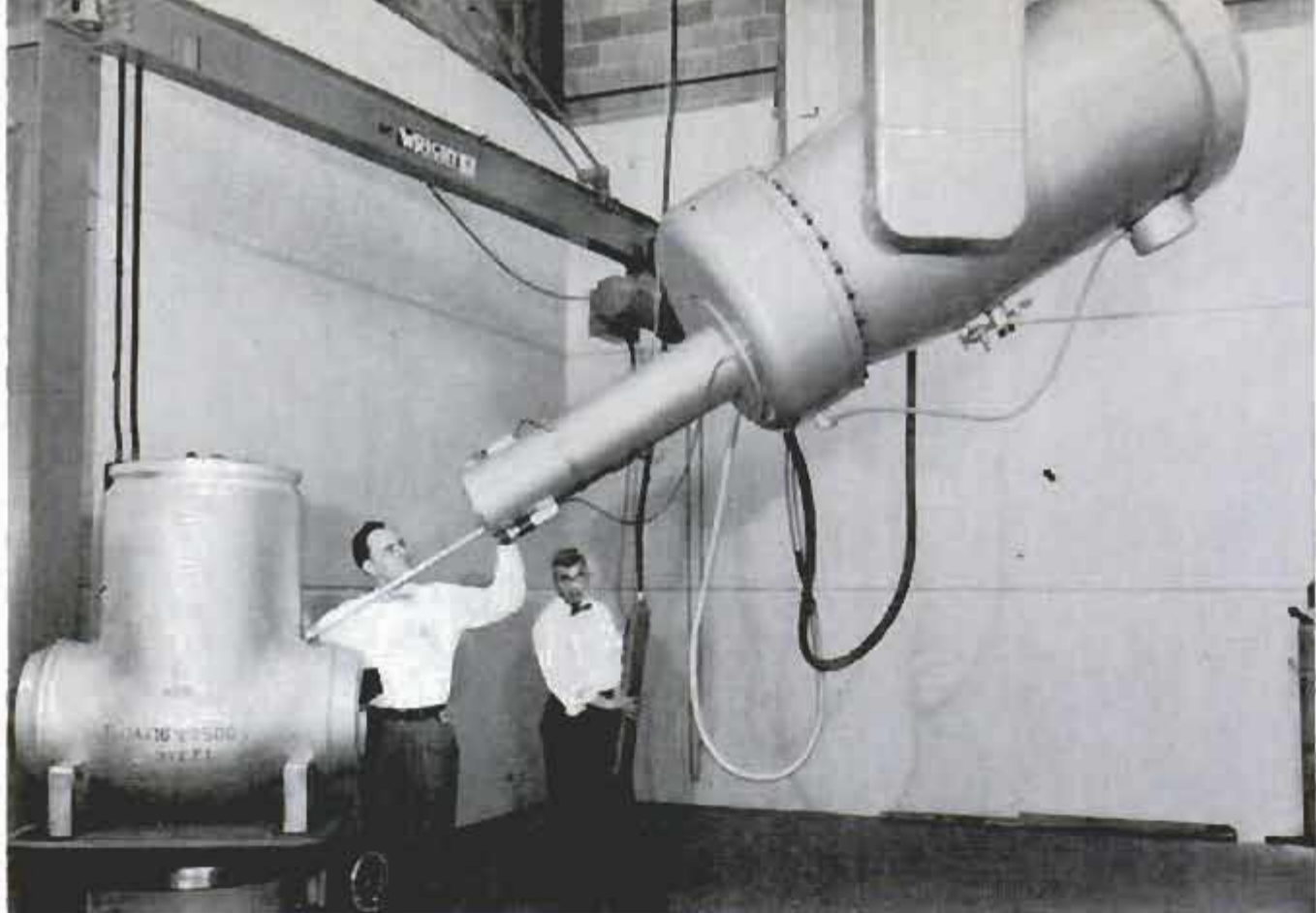
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THE RUSSIAN ALPHABET

The Russian alphabet is given below with the names of the letters written phonetically. It will be necessary to memorize the alphabet if you wish to use a Russian dictionary, and it will help the pronunciation of letters.

А	а	ah	Р	р	er
Б	б	beh	С	с	es
В	в	veh	Т	т	tch
Г	г	geh	У	у	oo
Д	д	dch	Ф	ф	ef
Е	е	eh	Х	х	khah
Ё	ё	yaw	Ц	ц	tseh
Ж	ж	zheh	Ч	ч	chch
З	з	zeh	Ш	ш	shah
И	и	ee	Щ	щ	shchah
Й	й	ee KRAHT-kuh-yeh (short ee)	Ъ	ъ	TVYAWR-dih-ъ znahk (hard sign)
К	к	kah	Ы	ы	yeh-REE
Л	л	el	Ь	ь	MYAHKH-kee-ь znahk (soft sign)
М	м	em	Э	э	eh uh-bah-RAWT-nuh-yeh ("eh" backwards)
Н	н	en	Ю	ю	yoo
О	о	aw	Я	я	yah
П	п	peh			

From *Say It In Russian*, reprinted through permission by Dover Publications, Inc., New York 10, N.Y.



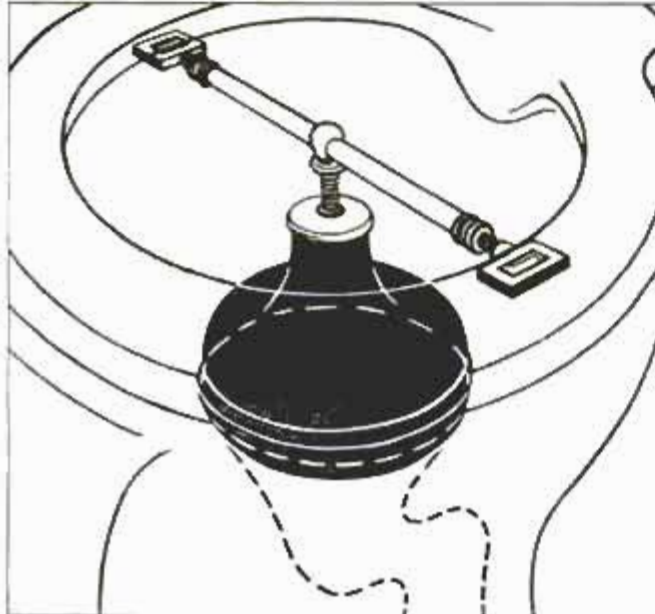
Massive X-Ray Machine Finds Flaws in Castings

Two-million electron volts are generated by a new industrial X-ray machine used to detect internal flaws in big valves and castings. The X-ray generator is suspended by a modified bridge crane above a turntable. A three-ton jib crane positions the castings on the turntable. As the turntable is revolved, the X-ray pictures are made. The films are studied on a viewer which can be turned on and off with a foot control, leaving both hands free to mark any defects which appear. Equipment is housed in a building with thick concrete walls.

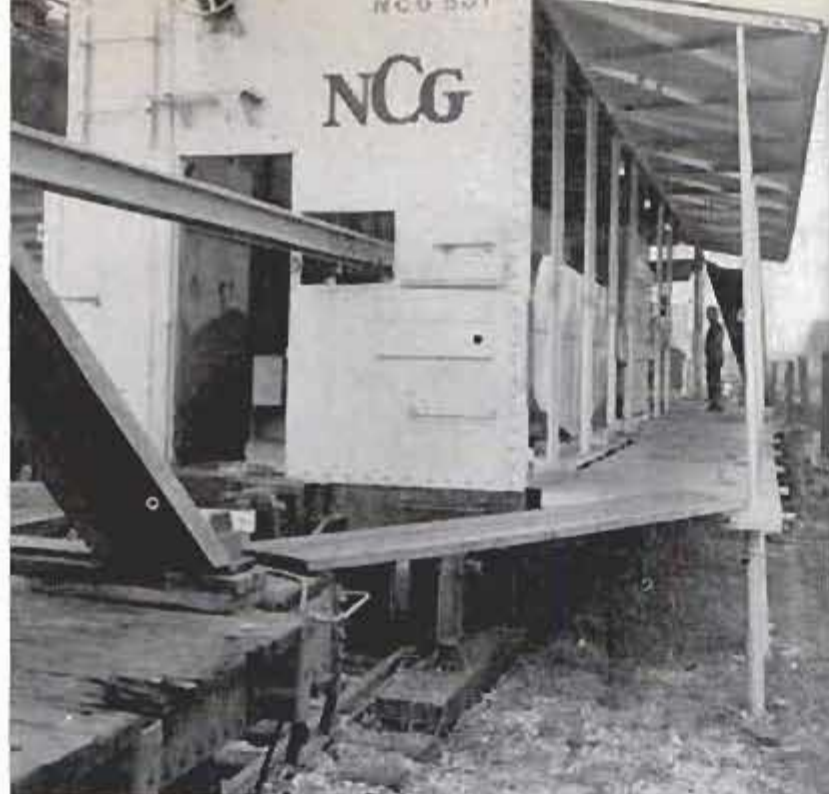


Force Cup in Toilet Prevents Flooded Basement

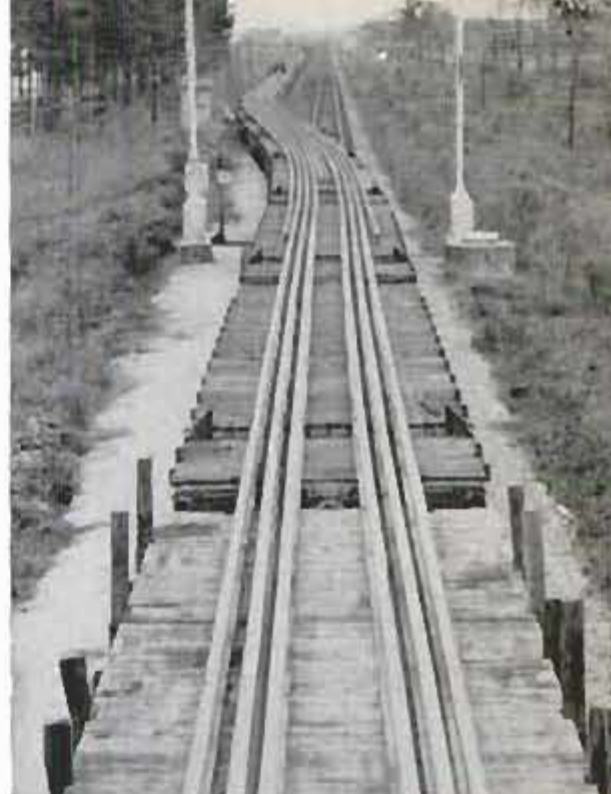
When heavy rainfall causes sewers to back up through basement toilets, a force cup can be inserted in the bowl to prevent flooding. The unit consists of the rubber force cup and a crossrod. The ends of the crossrod fit beneath the underside of the bowl rim. The unit is adjustable for various bowl widths and heights. A handle on the force cup converts it to a plunger.



☐ Agriculture Department scientists, in experiments with grassland-destroying European chafer beetles, have found that chemically baited traps catch mostly male beetles while more female beetles are attracted to traps using black-light lamps.



Quarter-mile lengths of welded rail emerge from one end of the welding car; standard 39-foot lengths are fed into other end



Lengths of continuous-welded rail are flexible enough for gentle curves

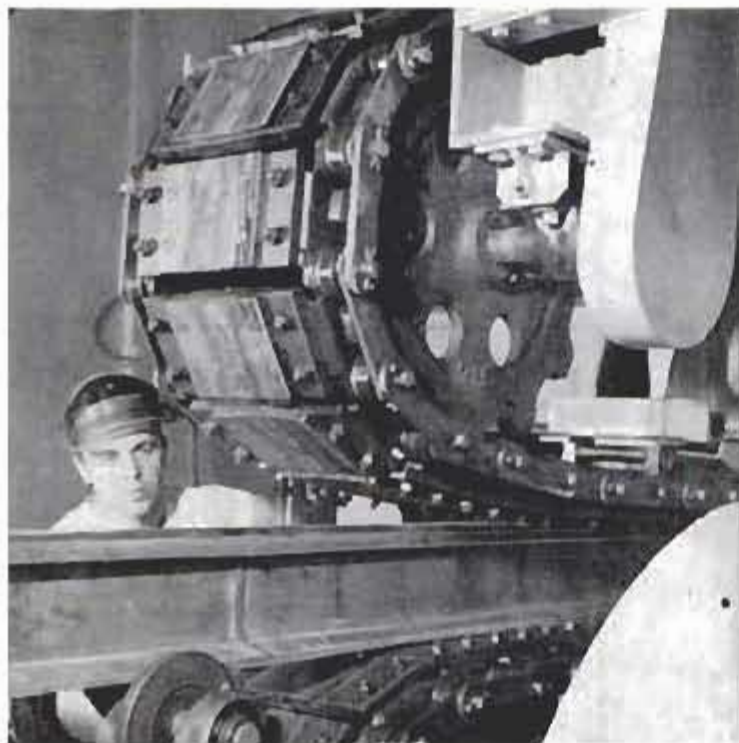
Automatic Rail Welder Doooms "Clickety Clack"

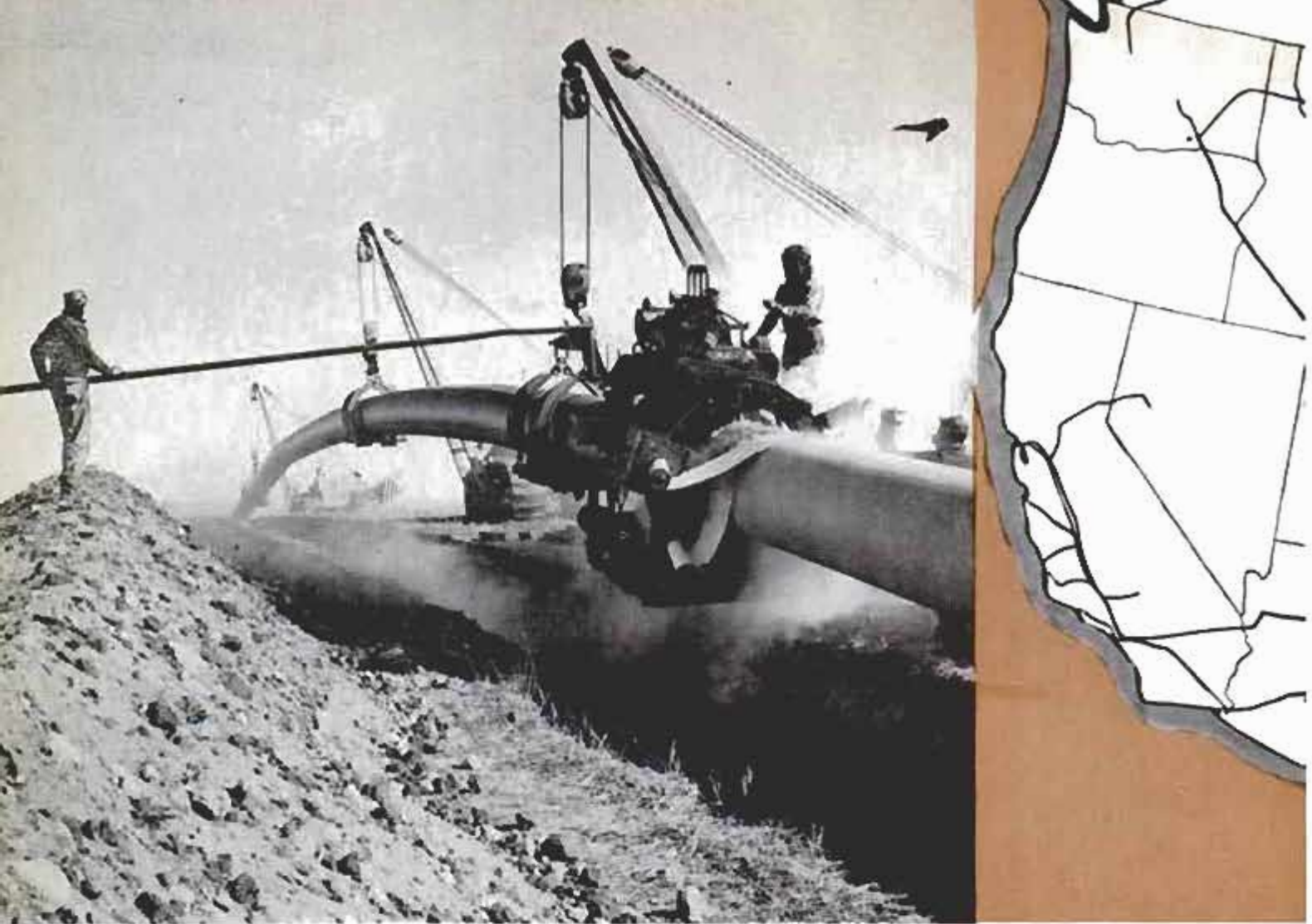
RAILROADS CAN now use an automatic electric rail-welding system that produces a continuous-welded rail for less than the cost of conventional bolted-joint rails. This may doom the familiar "clickety clack" of train wheels. The system, first of its kind to be manufactured in the United States, completes a welding operation in about four minutes. Rails are fed into a welding unit mounted in a car. Rail ends are pre-

heated to a plastic, molten stage, then welded with a hammerlike forging blow. Excess molten metal is sheared off the joint and the weld moves automatically to the next operation, where the joint is smoothed by grinding. Quarter-mile lengths of welded rail are moved on 34 flat cars to the required location. By anchoring the rail ends, two rails at a time can be removed.

After individual rails are welded together, two treadmill-like conveyors, one on top of the other, move rail along

Thirty tons of pressure push rails toward each other while ends are electrically heated





To protect pipe during its many years underground, a coating-and-wrapping machine coats the pipe with a corrosive-resistant compound and wraps it with nylon tape

Pipelines Grow Like

By Rafe Gibbs

AS THE MAN in faded coveralls pulled away from a service station in the Ord Mountains of California, in a boulder-battered, brush-scratched car, a bystander commented: "Don't be fooled by him. He's a pipeline-bead welder—makes over \$10,000 a year."

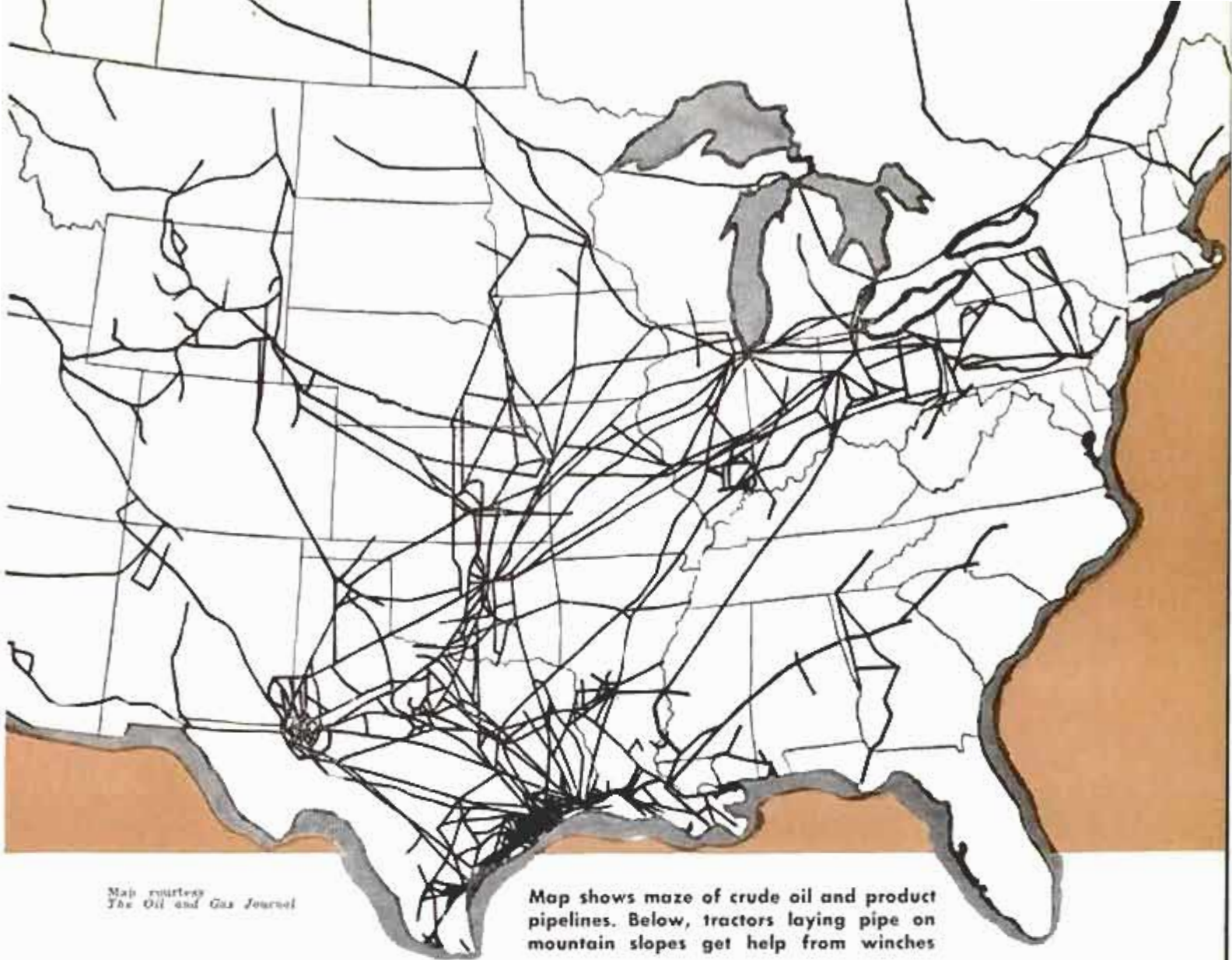
"You mean he makes that kind of money for welding beads?" asked the station operator.

"Yes, and he earns it. His beads are 20 to 40-foot pieces of pipe weighing several tons apiece. Sometimes he welds them standing in a river, sometimes on the side of a mountain."

These welders are rated at the top of their profession. And so are the various other mechanics and craftsmen who are

pushing across the nation thousands of miles of pipeline to give the United States the world's greatest and most intricate web of underground carriers. These are the men who have more than doubled the nation's 335,000 miles of pipeline that existed at the end of World War II; who have added \$2,000,000,000 worth of new lines in the last three years alone. They have made it possible to ship a gallon of crude from a Texas oil field to a Great Lakes refinery for less than the cost of mailing a post card the same distance.

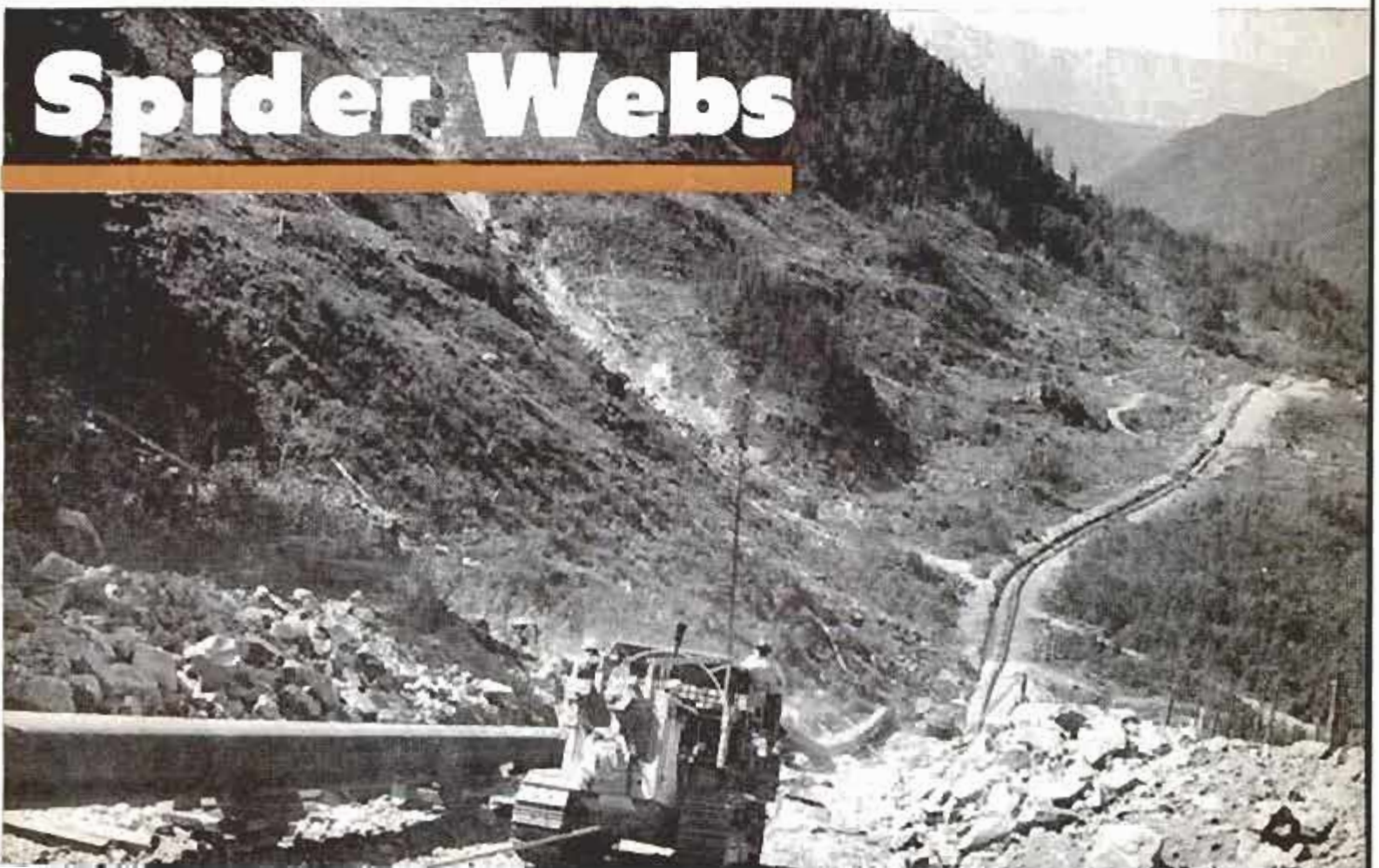
Laying of pipelines today—for oil, natural gas, water and many other products varying from antibiotics to pebbled or powdered coal—is an exacting business that must proceed with a minimum of



Map courtesy
The Oil and Gas Journal

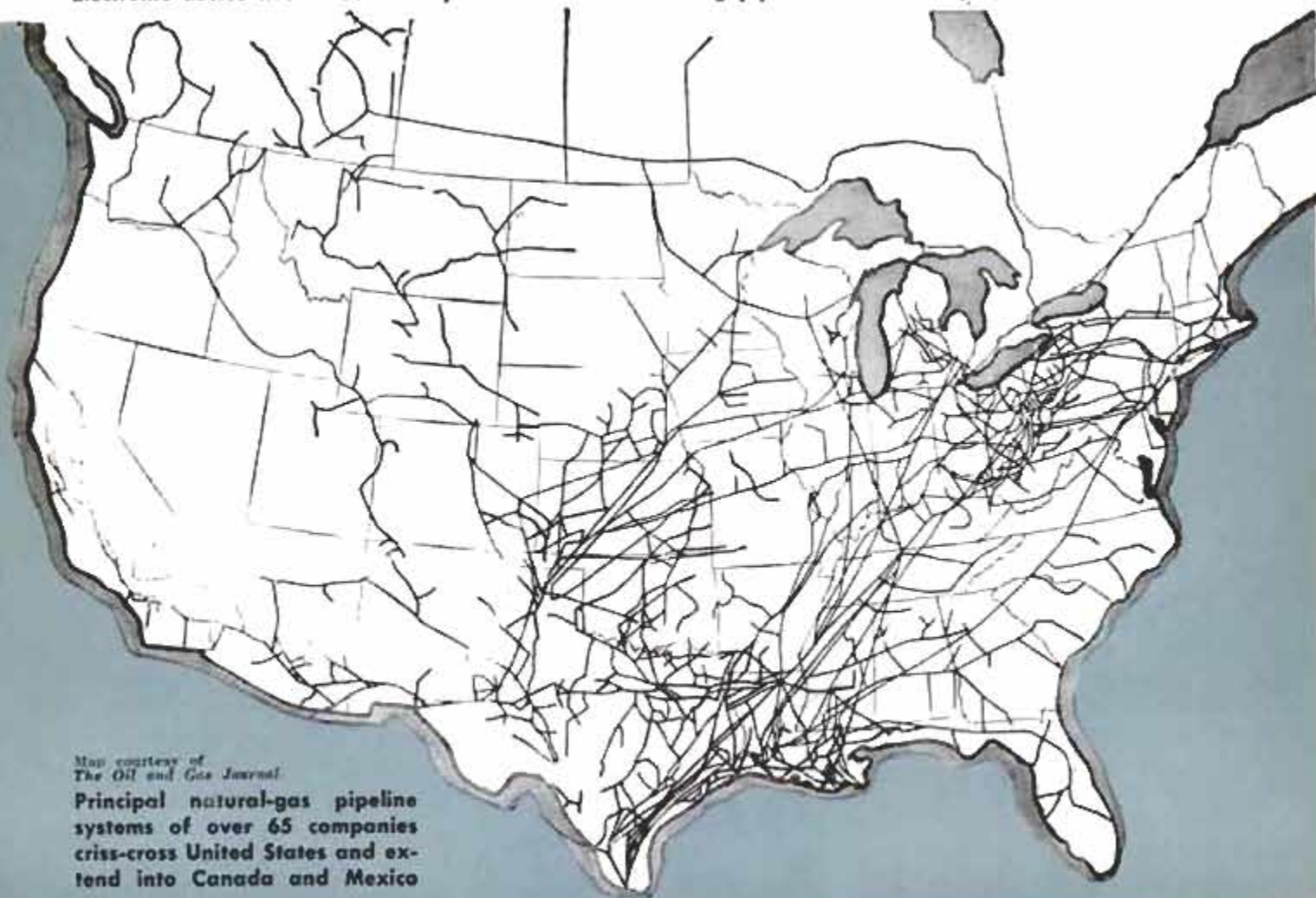
Map shows maze of crude oil and product pipelines. Below, tractors laying pipe on mountain slopes get help from winches

Spider Webs





Electronic device known as holiday detector is moved along pipe to find weak spots in coating, wrapping



Map courtesy of
The Oil and Gas Journal

Principal natural-gas pipeline
systems of over 65 companies
criss-cross United States and ex-
tend into Canada and Mexico



Diesel-powered tractors equipped with side booms position pipe where line crosses river in Pennsylvania

hitches. Bad weather can idle several hundred men and hundreds of thousands of dollars worth of equipment, so when the weather is good the pipe must go down fast. That is why assembly-line operations have been brought to the mountain, prairie and desert.

One of the most spectacular jobs in recent years was laying 53 miles of pipe over the nation's rugged roof—the Continental Divide in Colorado. It all started when the Air Force decided to build its academy at Colorado Springs.

For years, the city had had an adequate water supply, piped down the mountain-side from the Pikes Peak area. But the academy made a big jump in water needs, and that meant going over the mountains for a new source.

Construction of the academy was only a few months away when a pipe-laying crew went into action. There was still snow in the mountains and the winds sweeping down the canyons were biting cold. There was solid rock to go through and the ditch had to be seven feet deep. There were treacherous inclines and fast-water streams to be traversed. But 60 days later the pipe was in—almost a mile of pipe per day laid over the divide.

How does a crew accomplish a job like this in such a hurry? Well, both men and equipment have to be good.

Laying a pipeline starts with the obtain-

ing of rights of way, and the legal problems sometimes seem as difficult as the mechanical ones.

Then come the ditch diggers with their powered trenchers that claw at the earth like a hound after a rabbit. The only difference is that the earth is kicked out sideways.

The digging machines may move at the speed of a funeral procession, but that is fast compared with the old hand-shovel method. In rocky terrain, percussion drills, some 15 feet high, are required. And the dynamiters blast with startling accuracy—well, usually.

Classic is the story of a dynamiting job in the laying of the 700-mile Trans Mountain Oil Pipeline through the Canadian Rockies between Edmonton and Vancouver. A rock cliff overhanging the Canadian Pacific Railroad tracks had to be blasted off without delaying the transcontinental trains.

The foreman of the dynamite crew studied the situation, and told his boss: "I'll use a supercharge that will blast the rock clear over the tracks, and I'll gamble my job that it works."

"You're gambling your job all right," said the boss, "because I don't think it will work."

But, supremely confident, the foreman set off the colossal blast. The rock wall shot

(Continued to page 208)



Metal Canopy Converts Pickup Into Mobile Shelter

Lightweight metal canopies for pickup and flatbed trucks make suitable foul-weather enclosures for hunters, fishermen and winter-sports enthusiasts. They're valuable also for farmers, tradesmen and servicemen who need to protect products and tools from snow, rain, dust and pilferers. The canopies are manufactured in aluminum and steel. They can be purchased

with or without a rear door. Various models include fixed or ventilating side windows. The canopies add little weight to the truck and do not affect the payload. Weights range from 52 pounds for a standard aluminum model up to 145 pounds for a deluxe steel unit. A canopy is easily installed by drilling three bolt holes in each side of the truck box and attaching the unit.



Color-TV Studio on Wheels Covers Army Operations

Army signalmen use a huge aluminum studio-on-wheels in their color-TV coverage of training and operations. The mobile studio, 35 feet long, is fitted with eight tons of television equipment. Besides studio-control equipment, the trailer has special compartments for three color cameras and complete audio gear for recording, taping and transcribing Army training programs. The mobile studio can be used to cover military assignments anywhere in the U. S. It is equipped with a nine-ton air-conditioning and heating unit. To operate the studio's equipment, the crew taps into existing power lines. Cameramen can work from a top deck, raising and lowering their equipment with a small hoist. The trailer and color equipment were designed for the Signal Corps by General Electric.



"Bump Netting" Fishermen Use Motor to Attract Shad

Attracting game fish into a net with an outboard motor may sound ridiculous, but that's the method California sportsmen use to catch shad. The technique is called "bump netting." It's done at night when schools of spring-run shad are moving upstream to spawn. The fisherman holds the chicken-wire net off the stern in about two feet of water while his partner steers a course close to the bank. The motor sometimes is tilted so the propeller agitates the surface. According to veteran fishermen, the shad swim up to investigate the bubbles, bump into the net and are heaved aboard.



Electric Eye Controls Still Camera

Automatic exposure setting, introduced recently as a feature on some electric-eye movie cameras, is now available in a small still camera. The camera requires only one adjustment—turning a film-setting knob for black-and-white or color film. An automatic system in the viewfinder signals with a green light if there is enough illumination for the photograph you want to take. It also warns—with a red flag—if there is not enough light. The automatic system opens and closes the aperture according to the amount of light falling on the lens. The light is converted by a photoelectric cell into a small electric current which activates the system. The device ends film waste caused by poor exposure. The camera also has a flash attachment.



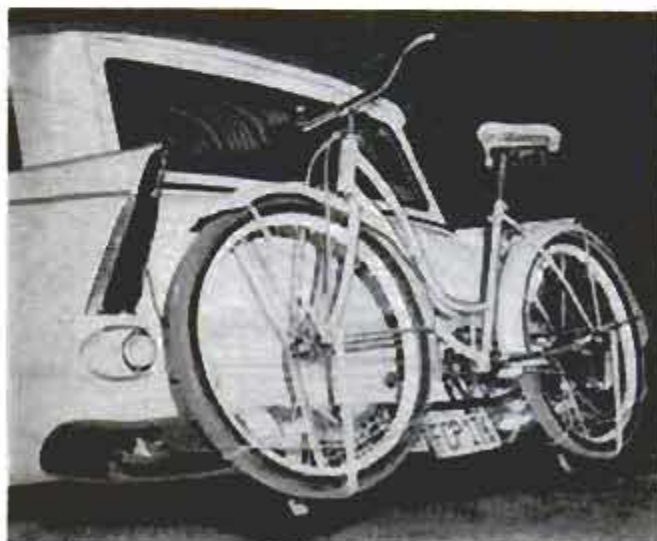


Measuring Grid on Photograph Locates Pipes and Conduits

Ever wonder exactly where the conduits, drains, pipes and junction boxes are located under the floor of a building? Equipment now is available for making a photographic record of the building before it is finished, with a measuring grid superimposed on the vital features. The equipment and an accurate spirit level are attached to the camera. For each camera and specific lens, a measurement sheet is prepared for use as a grid on the finished photograph. The photo record can save much time and expense in locating vital points after the concrete has been poured.

Rear-Bumper Rack Totes Bicycle

Transporting a bicycle on the rear bumper of your automobile eliminates the struggle of trying to fit it into the back seat or luggage compartment, and saves wear and tear on the car. A new bike carrier for the rear bumper can be attached or removed quickly. The bicycle is set in two V-shaped racks, with wheels held firmly by movable "wings." A chain at the top of each rack locks the bicycle. The bike rides high enough so that it can be seen by the driver.





Triple-Barreled Spray Gun Laminates Glass-Fiber Boats

Thanks to a recently developed three-way spray gun, the cost of laminating a glass-fiber boat can be reduced by 40 percent. The tool, called a Rand Fiber-Resin Depositor, sprays activated resin and chopped glass-fiber strands simultaneously. The sprayer will deposit 15 pounds of high-strength laminate per minute. Three streams, two of resin and one of glass fiber, meet in midair, permitting laminant to be deposited with a minimum of trapped air.

Steel Mailbox Post Screws Into Ground

Designed for rural or suburban homeowners, a new type of mailbox post can be installed simply by screwing it into the ground. A square steel plate at ground level can be raised or lowered to set the post at the height desired. A braced right-angle strip of iron carries the weight of the mailbox. There are two loops on the box support. One loop serves as a holder for newspapers. The lower loop provides a hook for hanging large packages.





Soldier-students at Fort Leonard Wood, Mo., learn tractor driver's signals. Their course lasts six weeks

COMMENCEMENT EVERY FRIDAY at the Army's EARTHMOVER SCHOOL

EVERY FRIDAY afternoon at Fort Leonard Wood, Mo., the world's largest construction-equipment operators' school graduates 30 to 80 students who have successfully completed a rugged six weeks' course. The graduates can operate powerful earthmoving equipment anywhere in the world as soldiers of the U.S. Army Engineers.

These graduates had entered military service just a few weeks before. After basic training—and aptitude tests showing good mechanical ability—they were as-

signed to the Army's 4th Training Regiment at Fort Leonard Wood. The 4th Training Regiment is a "trade school" that supplies specialists in more than 70 crafts for Army installations throughout the world.

Start Course With Dozer

The GI tractor school teaches one of the most important of these trades. The course begins with a two-week bulldozer phase. A quick briefing takes place, followed by a tour of the training area where the student watches instructors dem-

By third day, men are lowering dozer blades, making simple cuts, loading and spreading dirt smoothly





Shovel-and-dragline students get feel of their machines—probably hardest construction tool to handle

onstrate proper operating procedures.

The second day begins with crawler tractors arranged in two circles separated by the instructor's platform. Using a public-address system powerful enough to be heard above the roar of the big diesels, the sergeant-instructor teaches students the use of hand signals—the only means of direction because voice commands are useless once the diesel engines start.

The instructor explains the preventive-maintenance check each student must make before he starts a machine: See that nothing is loose; make sure the machine will not damage anything when it starts to move; check oil, fuel tanks, hydraulic fluids and radiator-coolant levels.

Students Get "Feel" of Units

Starting the engines for the first time, the students move into the practice area and get acquainted with the feel of the big crawlers. The next day they begin using the dozer blade. In two weeks they are pushing out trees, cutting ditches, grading and side-casting on the steep slopes.

Next they master the motor grader, which is used for precision road-grading and maintenance. The final two weeks are spent on the tractor-drawn scraper. This unit combines the tractor and the motor grader. They also learn to move dirt—self-loading or push-loading it, and spreading it smoothly on the fill.

Eighty percent of the trainees' time is spent in operation or maintenance checks. There are also films and slides, lectures and written examinations.

Instructors Are Career Men

Instructors are mostly career men who have had experience with the Army Engi-

First, trainees operate machine until they're familiar with it. Then they learn how to put it to work





Graduate of school, assigned to 5th Engineer Battalion, pushes stranded pontoon-bridge section off pilings. He will then maneuver his International Harvester TD-18 aboard and float across to other side of river.

neers and in civilian construction. Sgt. Dennis McGhee is typical. He helped build the Oak Ridge Atomic Energy Plant and has been in the Army ever since. According to Sgt. McGhee, the first day of the training program is the most difficult. Few of the men have been on earthmoving machines before and they are nervous and frightened. Some adjust quickly, but others don't. McGhee reassures the latter by climbing into the seat alongside them and directing them up over a four-foot levee. This harmless but thrilling experience makes the smooth working area so safe by comparison that fear for personal safety disappears. ★ ★ ★



Six weeks earlier, this operator was a raw recruit. Now he easily clears trees from a new target range.

Sitting in bleachers, students learn earthmoving-equipment techniques as demonstrated by instructors.



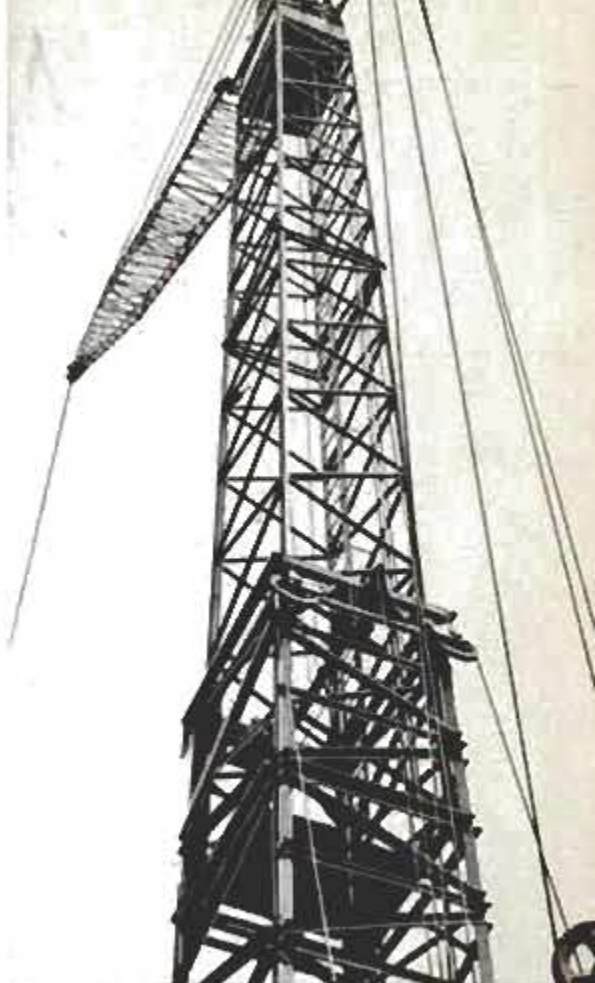


Operator can see all corners of building from movable platform

Climbing Crane Does "Inside Job"

CONSTRUCTION of a 12-story garage in Boston recently featured the American debut of a climbing crane made in West Germany. Unlike a conventional crane, which works outside a building area and has a boom extending diagonally from the bottom, the new crane works inside, and its boom angles horizontally from the telescoping tower. It climbs as the walls rise.

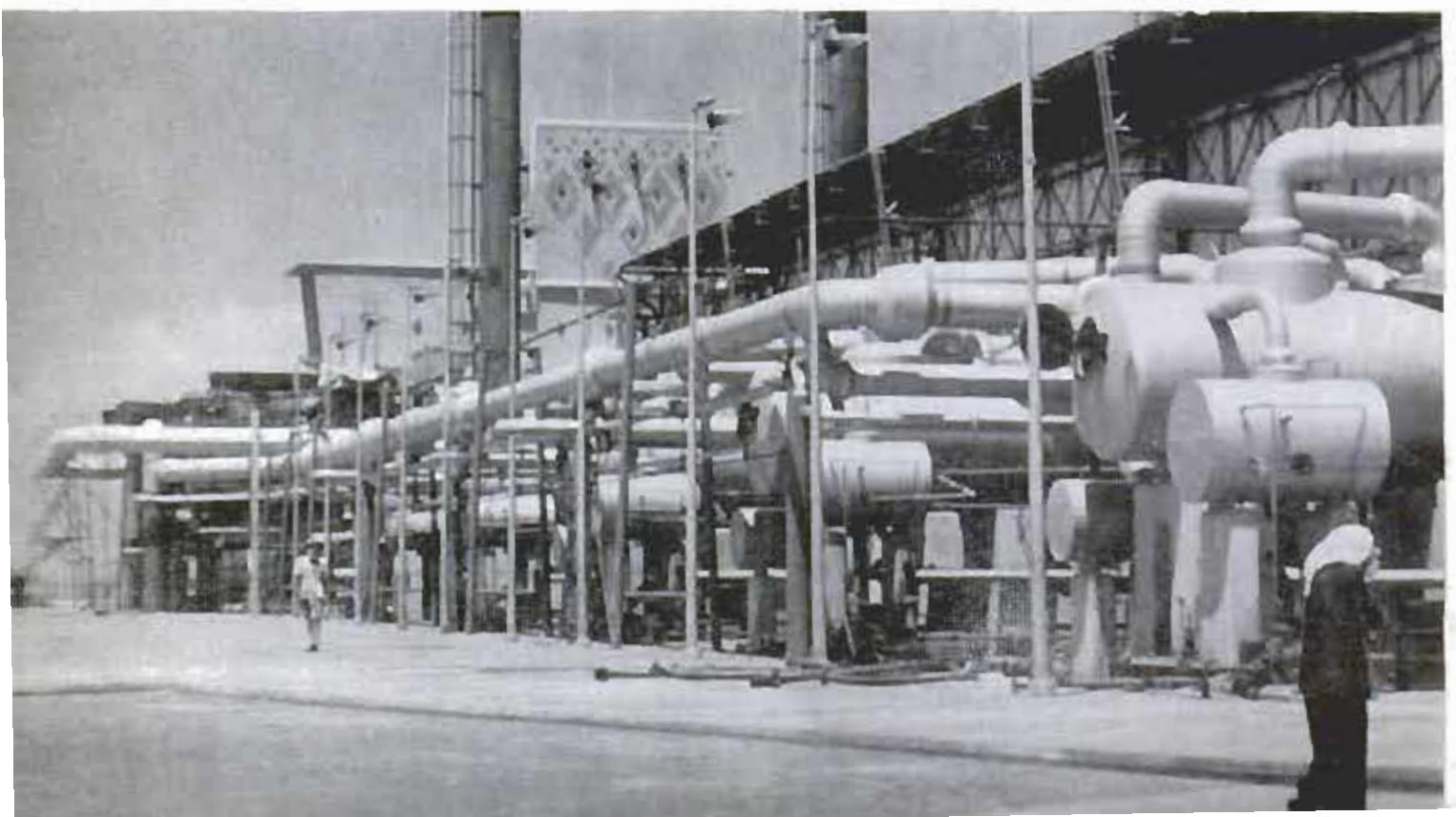
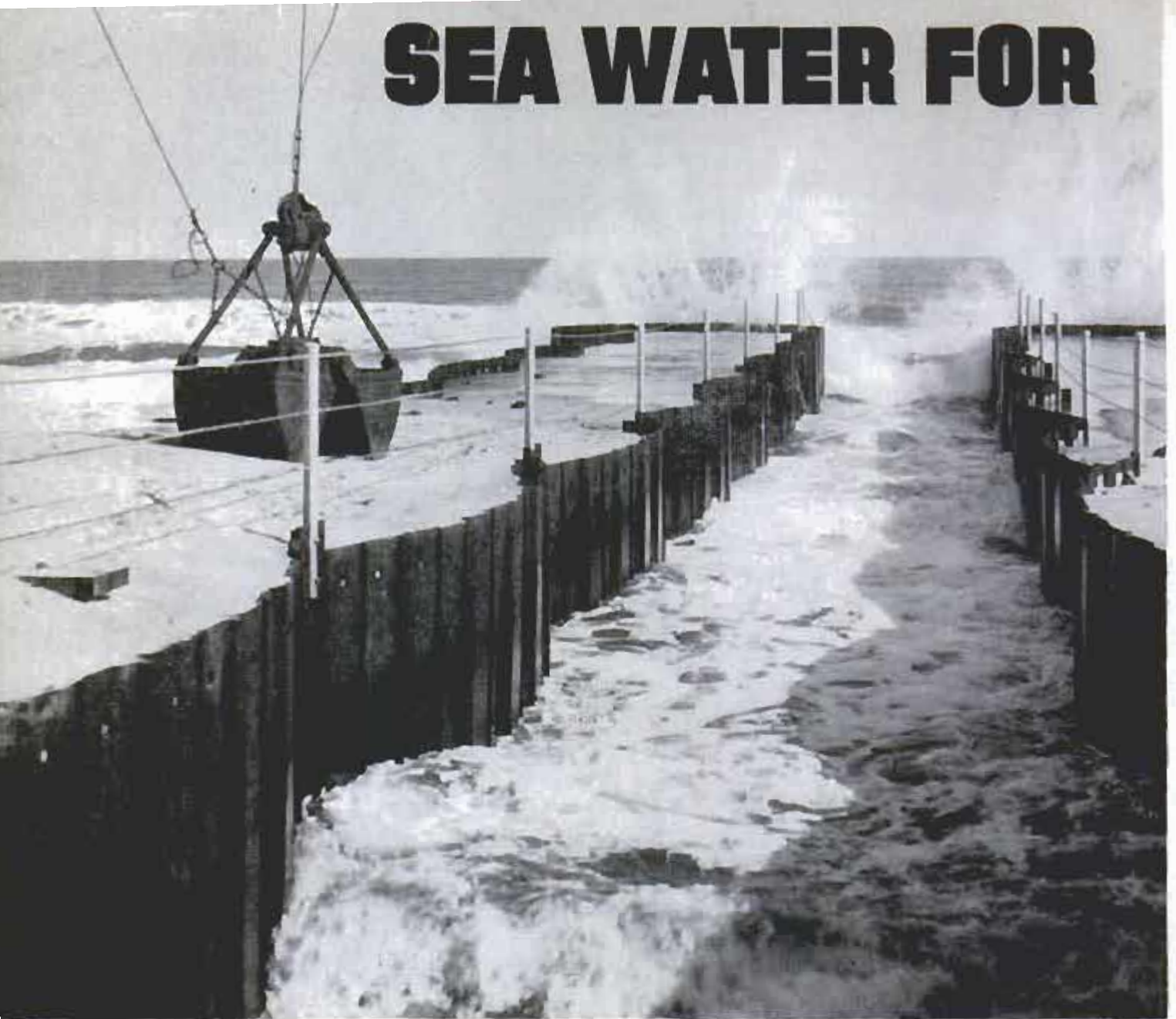
Crane reaches every corner, later is dismantled inside building



Crane rides rails in well of walls. Its "inside job" eliminates need of encircling big building with elevators



SEA WATER FOR



A THIRSTY WORLD

By Richard F. Dempewolff

ON A SUN-WARMED BEACH at Wrightsville, N. C., a stack of whirling "pie plates" is sucking salt water from the Atlantic Ocean and spewing out 25,000 gallons of fresh water each day. The thirsty island of Aruba in the Dutch West Indies has a mammoth still boiling the sea in a row of giant "teakettles," hitched together spout-to-handle like elephants on parade. Between them they steam out the 2,700,000-gallon gulp of potable water required each day by Standard Oil of New Jersey's Lago refinery.

In a dozen United States shore and inland laboratories, the salty water from our seas and brackish wells is being evaporated by the sun's free energy under endless rows of plastic tents designed to pluck molecules of pure water from a sluggish stream of brine. In still more labs, ocean water is being frozen in refrigerators that wash the salty brash from ice.

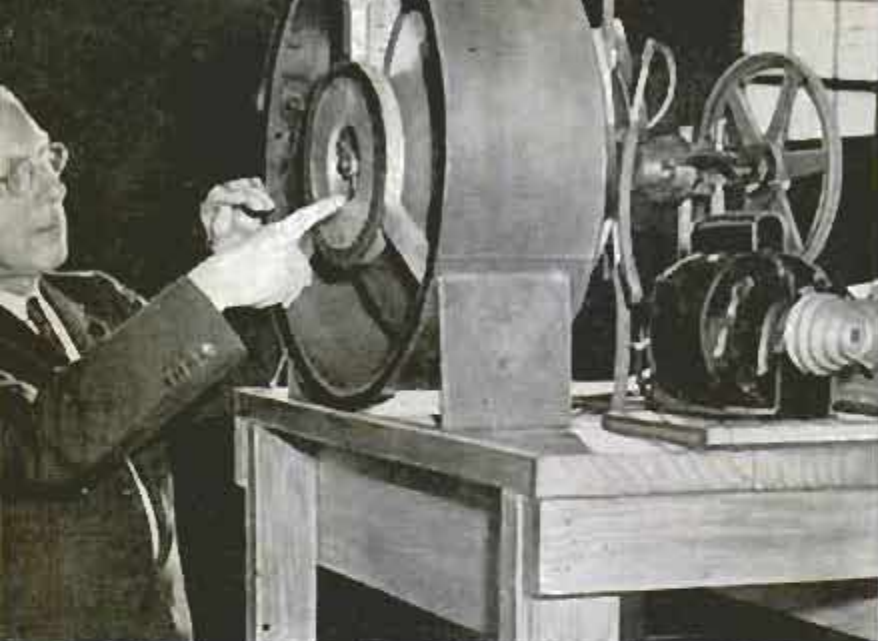
To squeeze fresh water from the ocean, its tangy brine is being compressed to heat it, expanded in vacuums, jammed through membranes, shocked by electric currents and shoved through mazes of coils.

Some of this unique work is being privately financed. Some is part of a \$10,000,000 Interior Department plunge in the ocean to develop a cheap, efficient method of desalting sea water. Reason: To help banish the looming specter of a national water-shortage crisis. How critical is the shortage? It's not disastrous yet, but it's growing with precipitous speed. In one recent summer, experts reveal, 1072 water systems serving 24 million people in all but three states were forced to ration customers. In parts of Texas, during recent droughts, water was sold to citizens at 50 cents per gallon jug. Last year, United States industry alone gulped an unbelievable 77 billion gallons of precious water every day. Within 15 years the slide-rule wizards believe that that astronomical figure must double! But the frightening fact is that in many areas water consumption already has reached the total capacity of local wells and reservoirs. Parched California towns, sinking wells deeper and deeper to solve their problem, are bringing in salt instead of fresh water. New wells driven for sun-scorched towns on the Panhandle come in with bitter alkali and hot sulphur—but no water for thirsty people. "Nobody knows how important water can be until he turns the faucet and get a spurt of air," is the way one man puts it.

David S. Jenkins, the man who heads up the Department of Interior's Office of Saline Water, points out that there really is no shortage of water. "There's a shortage of cheap water," he says. "We have all the water anyone will ever need in our oceans. The trick is to desalt it and put it where we want it at reasonable cost." Today, half a dozen systems show great promise and others may prove valuable in areas with unique water conditions.

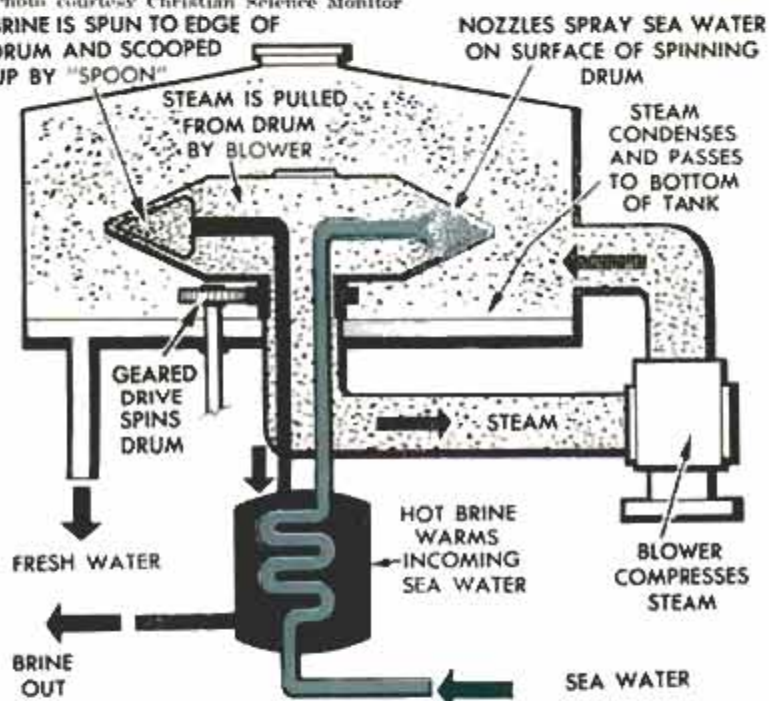
Top, intake on North Carolina coast, similar to structures proposed for evaporation plants, is dredged below ocean surface to permit gravity flow of water to pumping station. Left, evaporator plant for capital of Kuwait yields 2,500,000 gallons of fresh water every day





Dr. Kenneth Hickman points to whirling drum in model of his "pie plate" still that produces fresh water from the sea

Photo courtesy Christian Science Monitor
BRINE IS SPUN TO EDGE OF DRUM AND SCOOPED UP BY "SPOON"

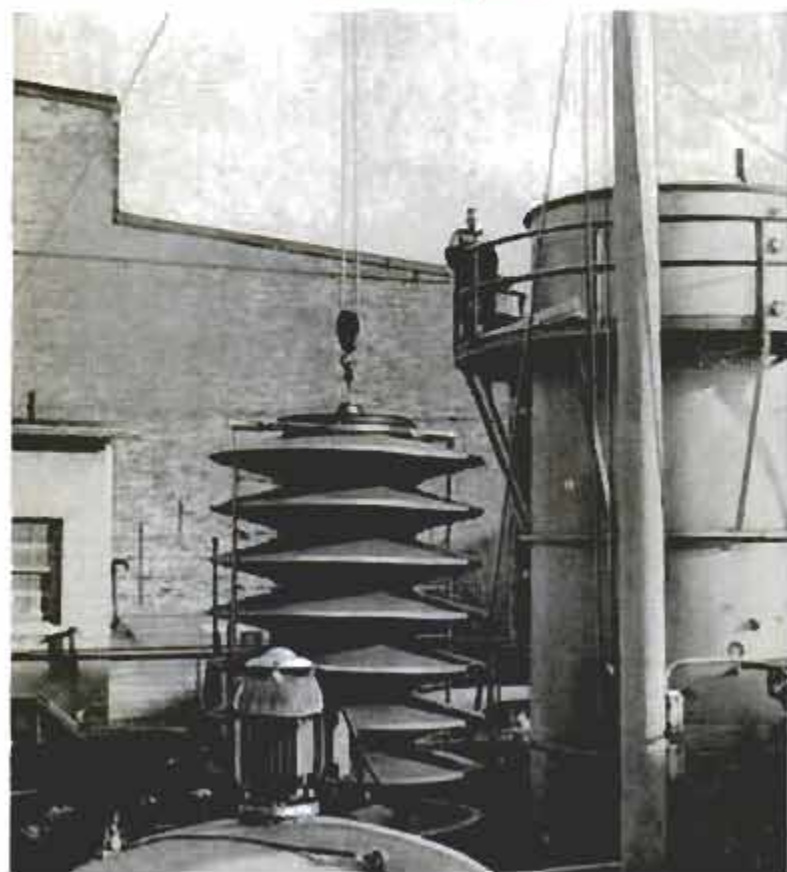


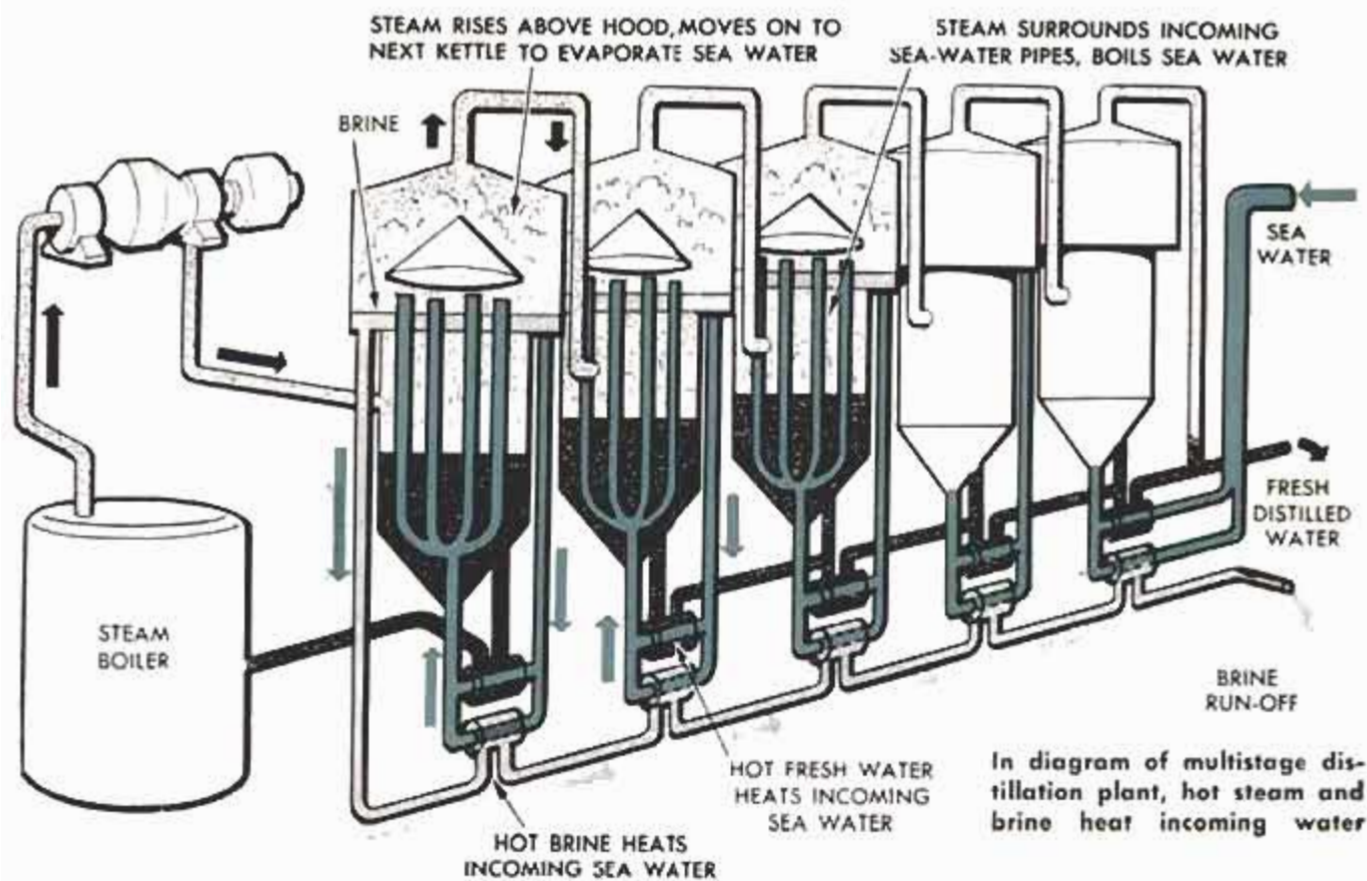
For centuries, scientists have known that by boiling ocean water and collecting the condensed vapors, they could distill fresh water from the sea. But until recently the cost of heat to perform that operation has been fantastic. Most communities pay from about two cents to 40 cents for 1000 gallons of domestic or industrial water from their rivers and reservoirs. Formerly, the best that distillation plants could do was about 10 times the maximum. When there's no other way to get fresh water, men wince, pay the price and run such stills. On Bermuda, where no fresh-water wells exist, inhabitants trap rainwater as it runs off their white-roofed homes. This primitive system couldn't begin to supply the thousands of men at Kindley Air Force Base, so a big distillation plant boils 200,000 gallons of fresh water from the sea daily—at about 10 times the cost of industrial water in your home town. It's worth it. Stills become sensible on Navy ships, too, though the 60,000 gallons a day of fresh water produced by a big carrier cost about \$400 for each thousand gallons. A king-size 280,000-gallon-per-day evaporator is being built for the new U.S. nuclear carrier. Here, too, the cost of production will be high.

At such prices, few communities could afford desalted sea water even though it would abundantly supply all their needs forever. To find new ways of doing the job cheaply enough to use in hard-hit domestic areas, the Office of Saline Water was given a target date of 1963. Meantime, private industry all over the world has picked up the ball. Already, ingenious systems have been developed and more are on the way.

Distillation still is solidly in the running, but you'd hardly recognize it. Huge, complex plants play all kinds of tricks with pressure, heat and plumbing to cut costs. In that long row of kettles in Aruba, the hot vapor from each

Diagram above shows principle of Hickman rotary still. In the photo at left, a Hickman-Badger unit is being assembled



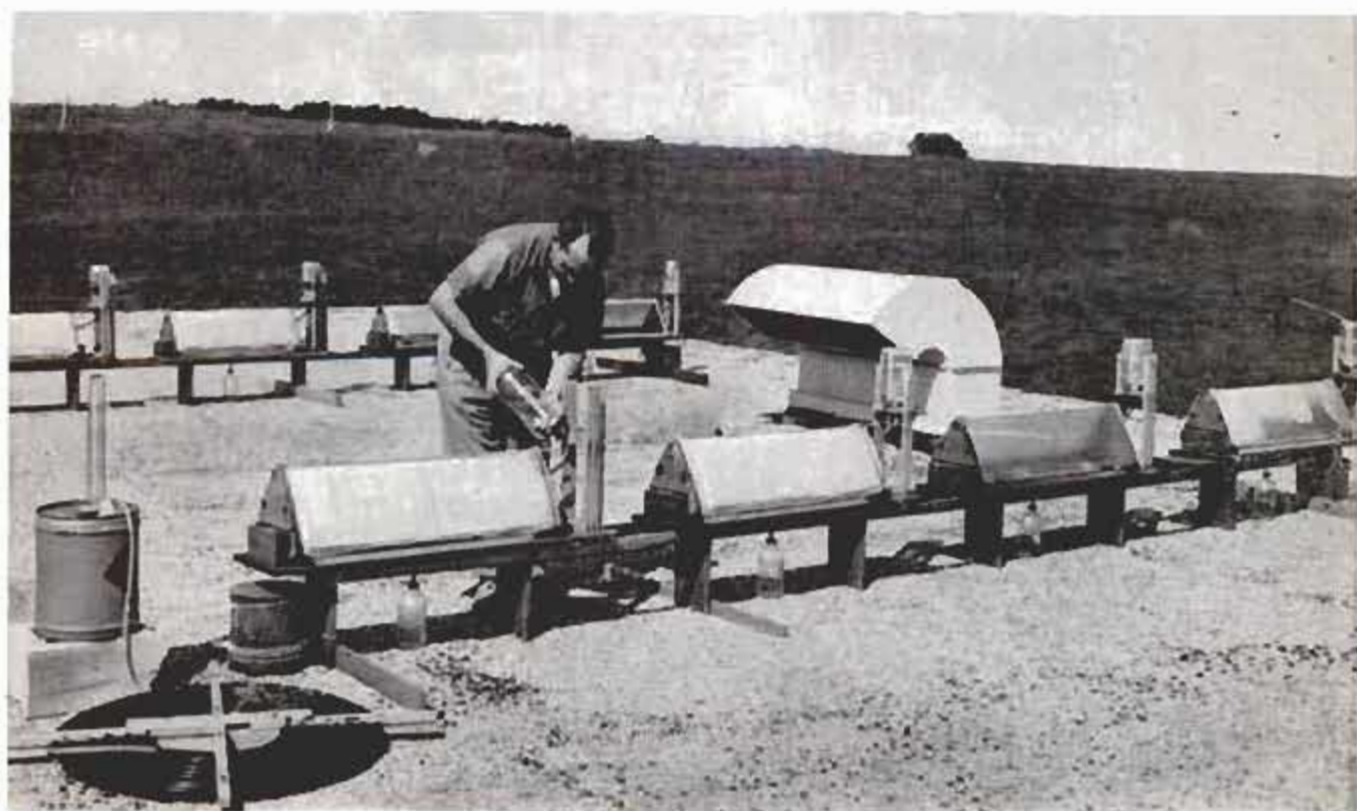


tank is used to help heat sea water in the next in a sort of chain reaction. It's known as multistage distillation. Slightly lower pressure is maintained in each succeeding kettle so the sea water can boil at lower and lower temperatures along the chain. Fuel heat is needed only under the first kettle. Another cost-saving trick in Aruba is the use of exhaust steam from an electric-generating plant to help heat sea water for

distillation. Aruba estimates that it is producing potable water at less than \$1.75 per 1000 gallons.

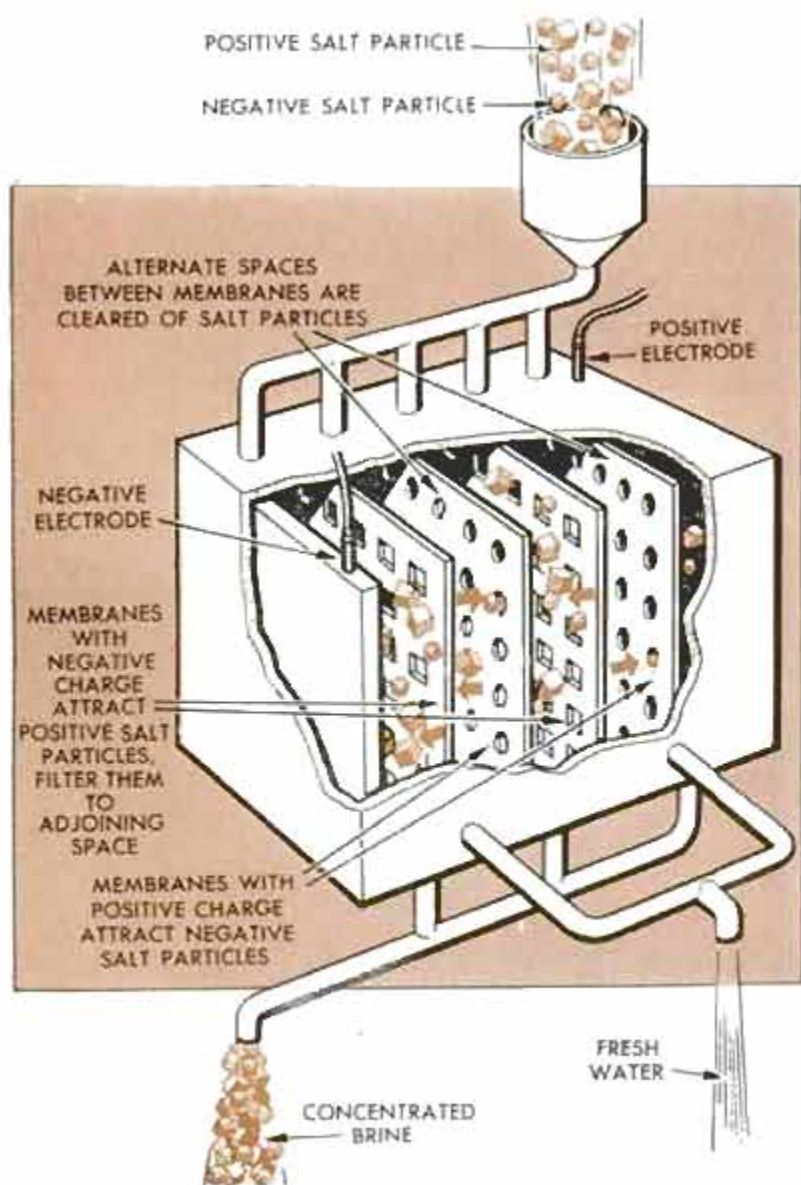
Designers of the big Kuwait plant on the Persian Gulf use a different stunt for similar economy. The sea water is fed into a series of vacuum chambers. Due to the sudden reduction in pressure, some of the water "flashes" into vapor, which is drawn off and condensed as fresh water—giving

Near Madison, Wis., Bjorksten Laboratories experiments with four types of plastic film for solar stills





Another kind of solar still, under tilted glass, consists of sandwich of wicks and condensation layers



up its heat to help warm incoming sea water in the process. Flash evaporators need little heat — a big advantage in the fight against costs. The huge units add 2,500,000 gallons of water a day to Kuwait's reservoirs.

French engineers in Abidjan, Africa, are designing a revolutionary flash evaporator that will pump into its system warm surface sea water and cold water from the ocean depths. The plant will use that slight difference in temperature to operate, flashing the warmer water to vaporize it, while the cold water chills the vapor and condenses it. At the University of California in Berkeley, Everette D. Howe is busily at work on a similar idea which, he says, should make good sense economically, since there is no fuel cost. Working at such low temperatures, the process converts only about five percent of the sea water that pours through its plumbing. As a result, it must accommodate a Niagara of sea water. "Plans for one such plant that would produce 10 million gallons of fresh water a day," says

(Continued to page 236)

Electrodialysis filtering process uses electric current to trap positive and negative salt molecules between membranes



Concrete "Dominoes" Make Floating Docks

Floating units made of concrete can be assembled like dominoes into small-boat docks of any shape. The precast units are made from a concrete mix that is 50 per-

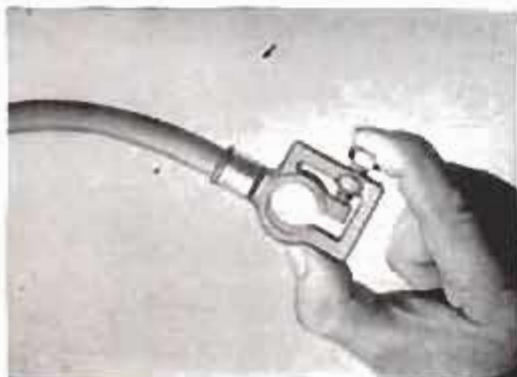
cent lighter than ordinary concrete. Because of their deadweight characteristics, they are stable even in choppy waters. The units are available in four widths.

Farm Compressor Turns Hay Into Wafers

Up to six tons of hay per hour can be processed by a machine that compresses it to three times the density of baled hay. The hay is squeezed into wafers about four inches in diameter and an inch thick.

Noncorroding Battery Clamp

On a new cable for auto batteries, the clamp's bolt is outside the battery post. This keeps it free from the corrosion that usually develops around the post. A simple twist removes the clamp.





Parents built the 13 subassemblies in top secrecy. Right, punctured tin can projects "blips" on radar screen

Space Ship,

ON A SPECIAL launching pad near Syracuse, N. Y., the X-3 stands ready for blastoff. As the countdown crackles over the intercom, the crew makes ready for a new adventure in outer space.

The X-3 is perhaps the only space ship in the world made of plywood, nails, paint, gadgets left over from hobby kits and imagination. The ship was built by M/Sgt. and Mrs. F. S. Kalinowski (he's in the Air Force) for their

Crew makes preflight check before each blastoff. There are two working levels inside



Closed television circuit really works. Crew member in control compartment is visible on power-deck receiving screen. Picture is "transmitted" by three mirrors

Center right, brave crew of the X-3 arrives on the craters of the moon, sends back to earth the message "Mission accomplished!"



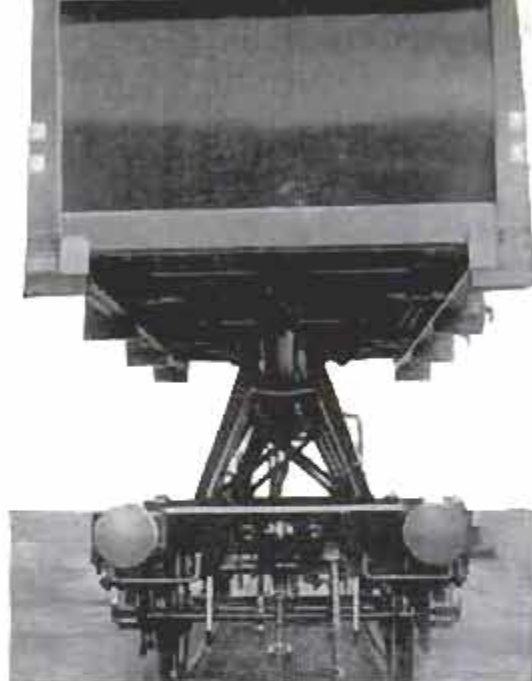
Junior

three youngsters. Until it was completed, ready for its first flight to Mars, the ship was a top-secret project. The two parents spent 60 evenings of hush-hush work producing the ship's 13 subassemblies.

At last, in the dead of night, all the parts were smuggled out of the basement and the X-3 was quietly assembled. Soon after day-break, the wide-eyed kids discovered that a spaceship had landed in their own backyard. ★ ★ ★

Below right, lights of the "atomic pulsator" blink on and off, and space member informs rest of crew that reactor is operating





Unique Rolling Stock For German Railway

Two new types of railroad cars have been introduced by the German Federal Railway. At the top, left and right, are photos of a gondola that can be lifted and tilted by push-button controls. At left is a freight car with sliding roof and sides. It was designed for loading by crane or fork-lift truck.

Powder Plugs Punctures

Tubeless tires become puncture-sealing with a few shakes of a new rubber powder developed by United States Rubber Co. Tires containing 2½ ounces of the hole-plugging powder can be driven for 48 hours, or hundreds of miles, after being punctured.



Prone Pedaling Bicycle

Inventor David Hallin has been trying for some years to interest a manufacturer in his bicycle which can be pedaled from the prone position. Hallin, shown demonstrating the bike in Malmo, Sweden, claims bicycle riding while lying down is very comfortable.



Irrigation-Ditch Screen Rescues Wandering Fish

Rotating screened cylinders de-tour fish from irrigation ditches to their regular migratory streams. California Department of Fish and Game conservationists say the device can save thousands of fish and may replace conventional-type barriers in irrigation systems. The circular screen uses a jet stream of water to deflect fish from dead-end ditches back into their breeding channels. The screen does not harm the fish. The cylinder is turned at a speed of 21 feet per minute by a small motor. The unit is nine feet in diameter and four feet deep.



High-Level Mower Tops Citrus Trees

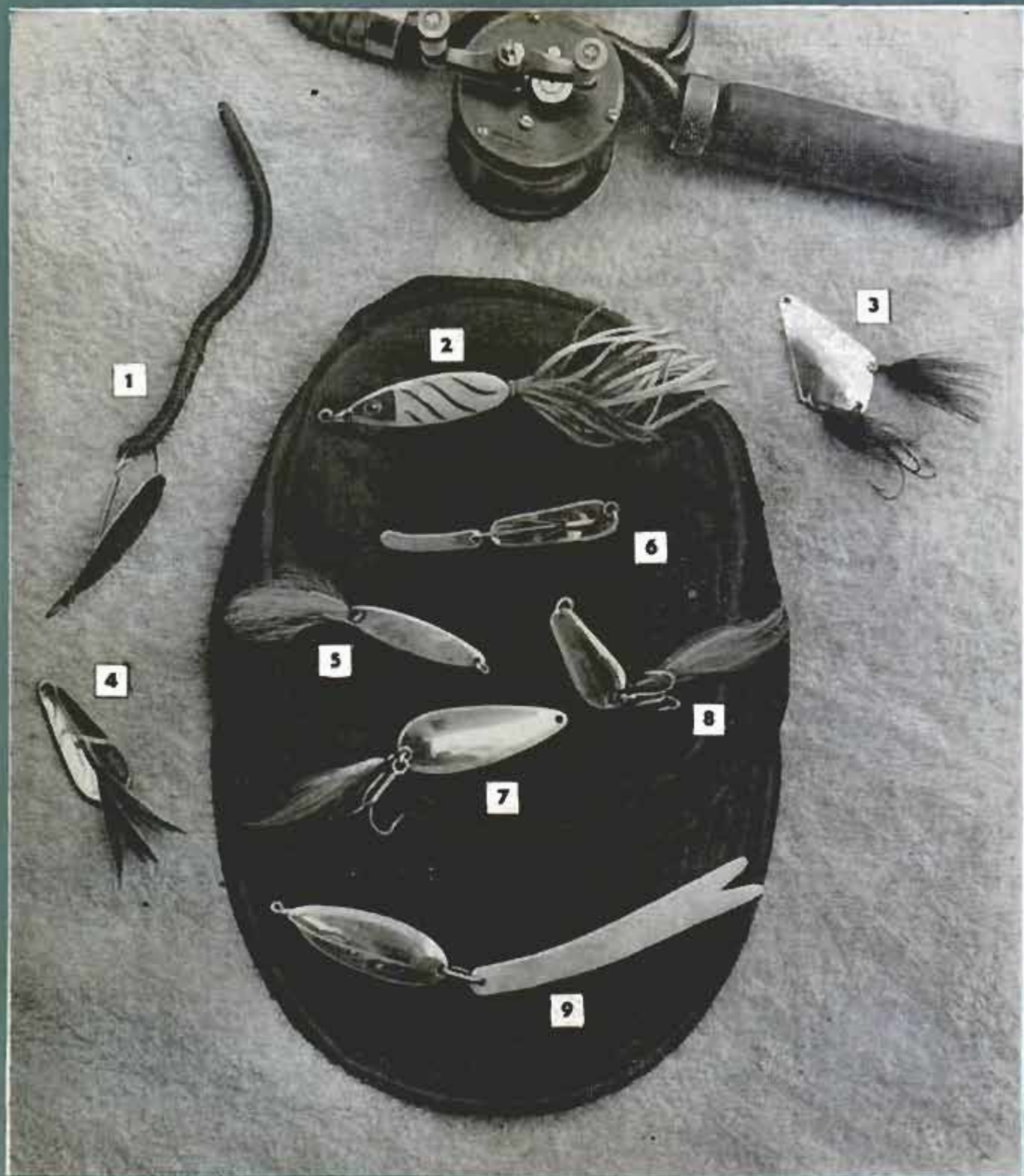
Used on lemon trees, a new mower-type topping machine lops off shoots, covering an acre of trees per hour. The adjustable machine reduces total costs to almost half what they had been with hand-pruning. It is one of several machines used in a University of California study of mechanical pruning of citrus. Hand-pruning of lemons normally costs \$60 to \$80 per acre. In three years of testing, the University found that use of the machines reduced costs 40 percent. Two factors have driven growers to mechanized pruning: Aging trees with crowded limbs and too much height, making picking and pest-control difficult; and the expense of hand-labor to remedy these conditions.



Welder Forms Foil Into Aircraft Honeycomb

Foil-thin metal ribbon is formed and welded into lightweight honeycomb core by a new machine developed by the Solar Aircraft Company. Forming rollers first corrugate the metal strips. The strips are then welded, layer by layer, into the circling loop of completed core. Core material, which looks much like honeycomb from a beehive, is brazed between two sheets of metal to form structural panels for aircraft and missiles. It also is used to seal the sections of gas-turbine engines.



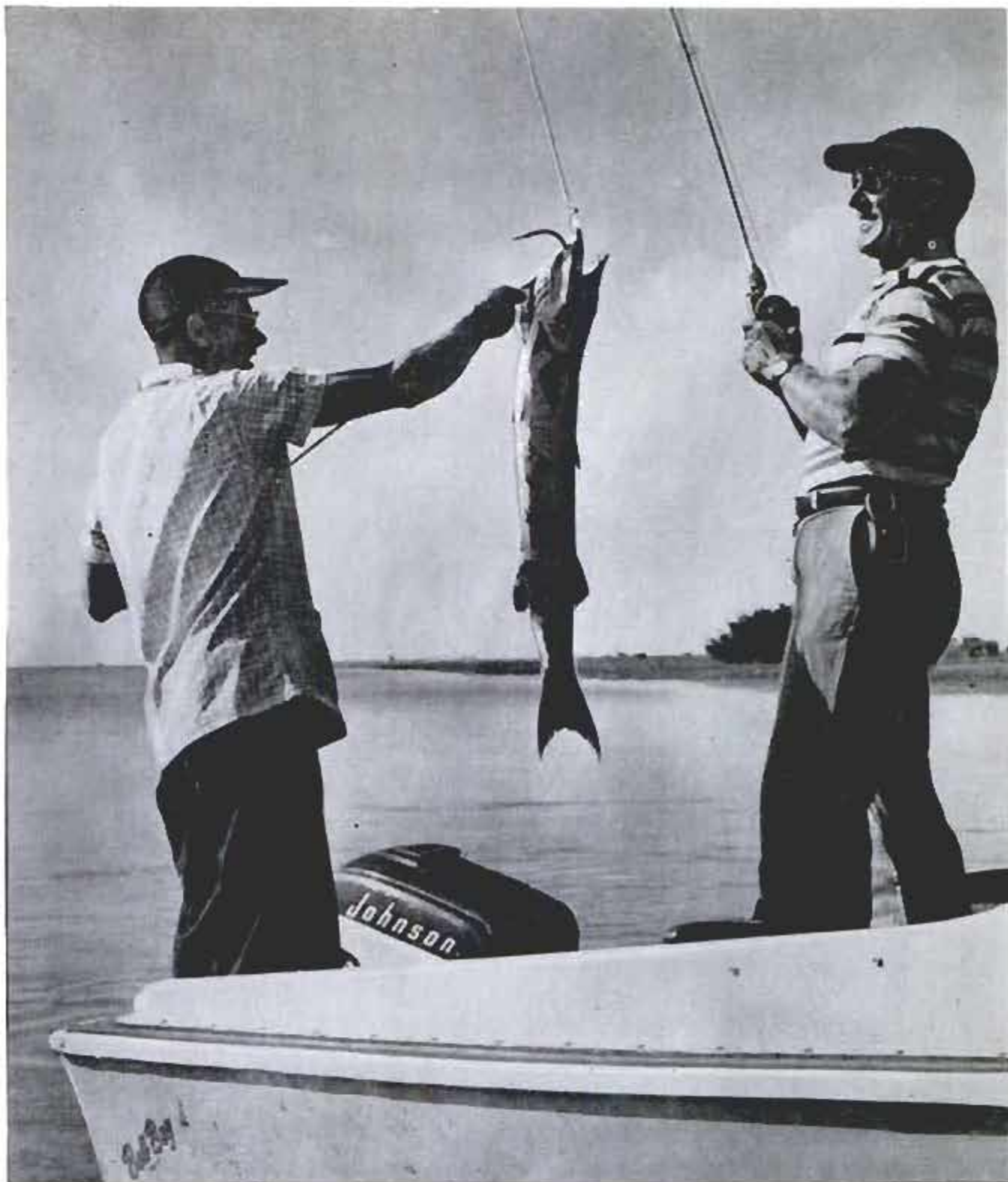


Favorite spoons include: 1. Black Silver Minnow with plastic worm tail; 2. Hawaiian Wiggler with rubber skirt; 3. Dixie Rocket with bucktails; 4. Rex Spoon with bucktail; 5. Mr. Champ with bucktail; 6. Chum with pork rind; 7. Dixie Jet with bucktail; 8. Wob-L-Rite with bucktail; 9. Silver Minnow with pork rind

MAKE MINE A SPOON

Read on, and see whether you agree that
this is the best all-around fish lure

By Russell Tinsley



Here's what happens when a slim and mean barracuda tries to mangle a salt-water angler's favorite spoon

IF YOU EVER had to choose a single bait for all your fishing for the remainder of your life, which one would you select?

As outdoor editor of a newspaper I've got to do lots of fishing. A brimming tackle box is a constant companion. I've found that a variety of lures often is the secret for catching more fish. But if I were forced to cull my baits to a lone lure, I'd unquestionably pick a spoon.

Why? Versatility, naturally. A spoon will readily take most kinds of game fish in both fresh and salt water, and it can be fished in different ways to meet almost every situation.

A rapid retrieve with the rod tip held high causes the spoon to run shallow. A slow retrieve with rod tip low keeps the lure deep, while a medium retrieve works the spoon at moderate depths. And by deft manipulation of the fishing rod, a spoon actually can be made to flutter across the surface.

A spoon basically is nothing more than a metal disk designed to either wobble or spin to attract fish. The spinning type usually has a trailing treble hook while the wobbler has either a treble or single hook. Spoons come in various shapes, designs and sizes. You can buy them in practically



Spoons can be handmade from scraps of metal and a few simple accessories such as split rings and hooks

any color. A black spoon is a pet bass bait in parts of the South, and red-and-white spoons are deadly on muskellunge and pike in the Northlands. The spoon originally was designed to imitate a minnow, and the best way to fish it is in erratic jerks to simulate a crippled minnow. Predatory fish always are on the lookout for an easy meal.

The first artificial lures known to man were crude spoons. Probable date of origin was about 3000 B.C. Ancient Romans used polished clam shells with hooks to take fish, and spoons were popular in Sweden and Lapland before 1800.

The spoon has been a dependable producer of game fish in America for more than a century. It was first manufactured in numbers in 1848, a clever creation of an imaginative angler named Julio T. Buel. He made his first ones of pure silver, reasoning that this was the best imitation of a white fish belly.

Young Buel first got the idea for a spoon design when he tossed some white pebbles in a Vermont brook and noticed that trout rose to them. Later, while eating his lunch on a lake, he accidentally dropped a teaspoon into the water and marveled at the way it wobbled and twisted as it plummeted toward bottom. He had been experimenting with various pieces of tin made to revolve upon retrieve, but the convex face was a new find.

Immediately he found an old brass spoon,



Author poses proudly with a whopper of a bass and a stringer full of crappie, all taken on spoons

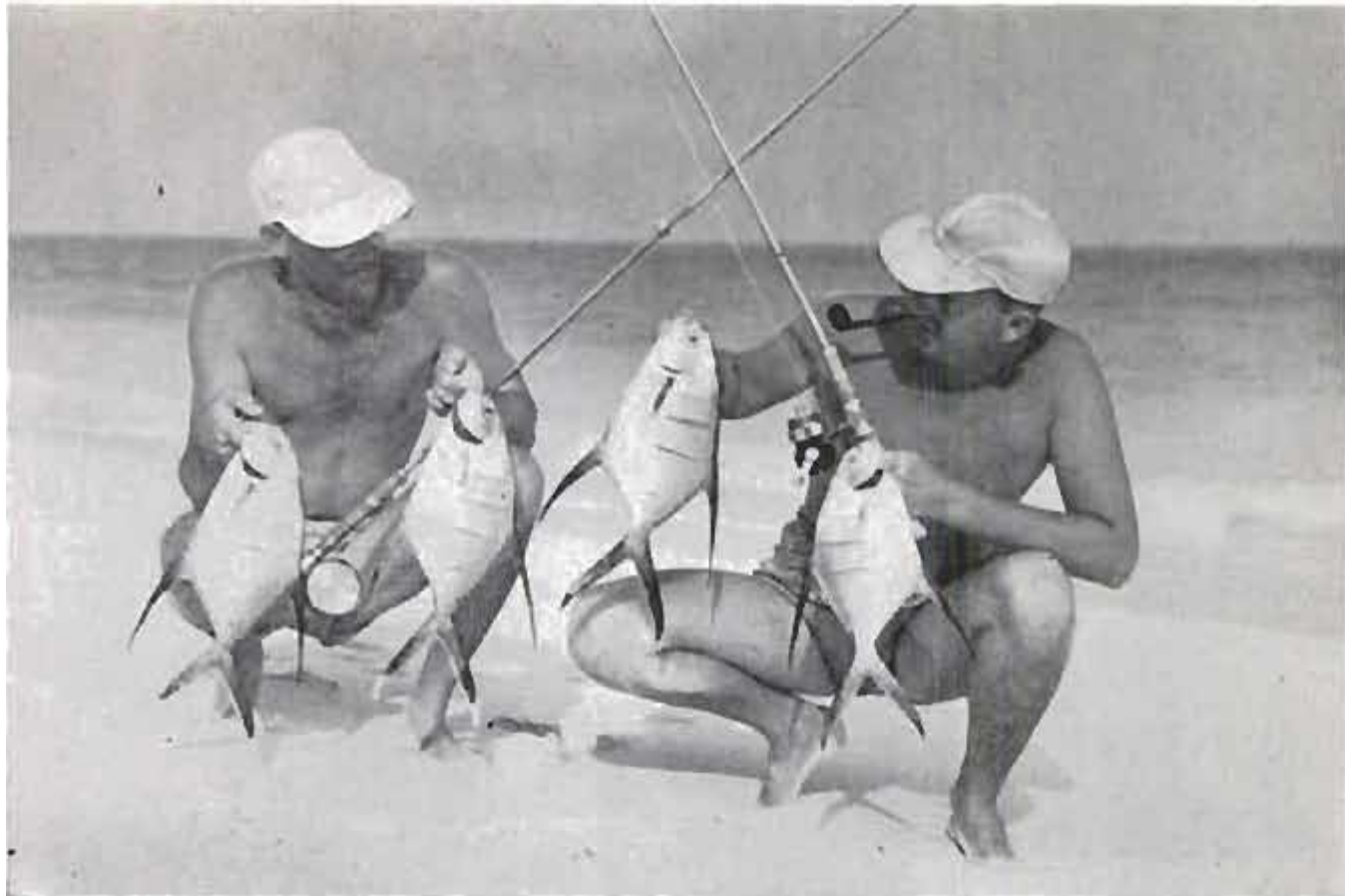
soldered a hook in the face and punched a hole in the handle, in which he fastened his line. The results were astounding. Game fish struck savagely at the revolutionary lure.

Buel worked with varied designs of the spoon idea, and the end result was the first patent for trolling baits in 1834. He began manufacturing spoons for deep trolling in 1848 at Whitehall, N. Y. All of the modern-day wobbling spoons are patterned after this basic design.

The spoon is one of the best bass baits ever to hit the market. Most of my bass fishing as a kid was on the Llano River of central Texas, and I didn't own an artificial lure except spoons until I became an adult. Spoons would catch bass consistently on the Llano, and consequently my angling companions and I never bothered to try anything else.

Magic Formula for Bass

One hot summer morning I was fishing a familiar stretch of shoreline on Granite Shoals Lake, a manmade reservoir on the Colorado River of Texas. I fished most of the morning with practically everything in my tackle box before chancing upon the magic formula for tempting the bass to strike. I'd cast a spoon, tipped with a generous tail of limp pork rind, past some submerged trees, letting it sink deep and working it up gently through the branches.



Pretty, aren't they? Pompano are just one of the varieties that can be caught by surf-casting with spoons

As the spoon wove ominously through the trees, bass streaked off the bottom and tried to kill it.

A spoon is especially effective on bass when worked over submerged weed beds. Bass lurk in the weeds to keep cool in summer and to hunt food. A spoon protected by a weed guard will slither across the reeds without fouling, and bass will mistake it for a crippled minnow.

When bass are deep, near bottom, I like to impale a plastic worm on the hook of a wobbling spoon and jig it in tantalizing stop-and-go jerks along the lake floor. As the spoon snails silently along the bottom, eager bass will gobble it up.

Many anglers don't realize that a spoon is also an effective top-water bait for bass, but difficult to fish properly on the surface. The secret for keeping the spoon from sinking is to dance it from side to side on the retrieve. On the cast, start working the bait the instant it kisses the water, weaving the rod tip back and forth continuously. The tip should be swung about three feet in either direction, and the reel stopped for a split second each time the rod tip reaches a vertical position.

Black bass, both largemouth and smallmouth, are not the only freshwater game fish that can be taken successfully on spoons. Add to the list such favorites as muskie, northern pike, crappie, bluegill, pickerel, white bass and walleye, among others.

White bass abound in the artificial impoundments of the South and Southwest. The favorite lure for catching them is a silver spoon of the spinning variety. Two barbs of the treble hook are snipped off so the lure won't foul as readily on bottom obstructions. This spoon is jigged under schools of white bass chasing gizzard shad on the surface.

(Continued to page 246)

Seven-pound bass in Texas (everything's big down there) went for a spoon, found a fisherman instead

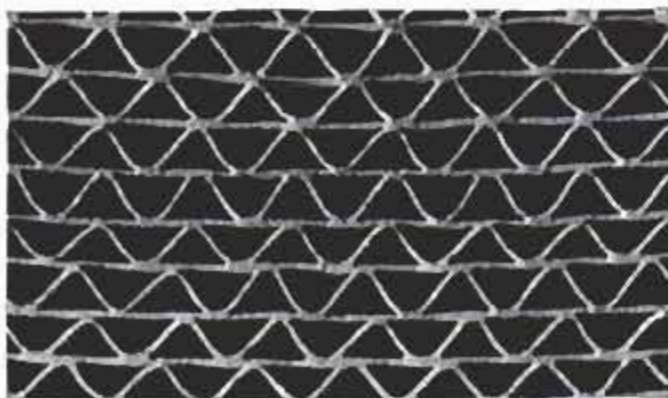




Engineer Carries Controls as He Moves Through Locomotive Cab

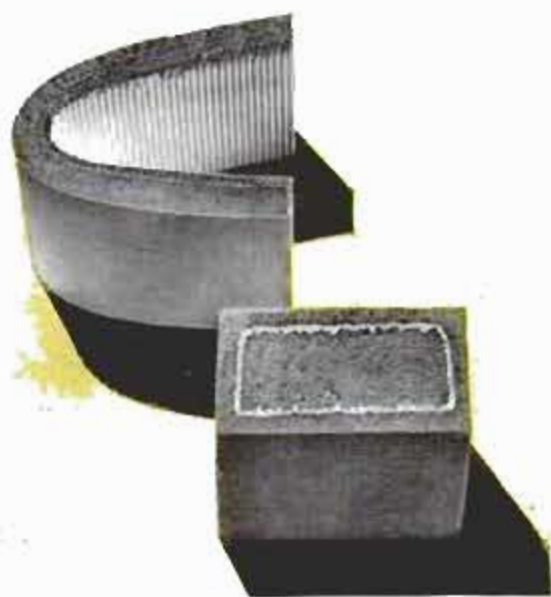
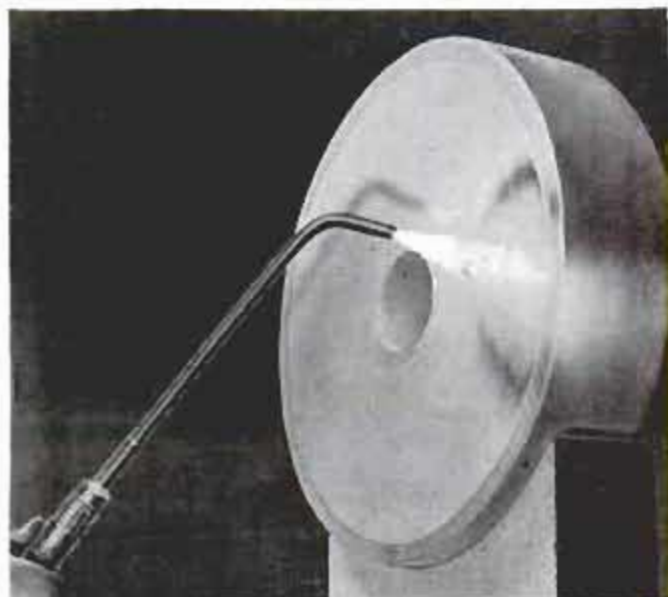
With a new portable control box, one man can operate a diesel-electric locomotive from anywhere in the cab. A flexible cable connects the control box with the

engineer's regular control stand. Carrying the box, the engineer can move throughout the cab and still control the locomotive. The handle has a "dead man" feature.



Honeycombed Ceramics Resist High Temperatures

Thin-walled ceramics have been developed that can be formed into lightweight honeycomb structures capable of resisting high temperatures. The new products are expected to be used in gaseous heat exchangers, as catalyst supports and as structural materials. As seen at the left, the material has many corrugations per inch. A blowtorch applied to it has no effect.



Unique Profession: **HE WASHES JUGS**

By Hal R. Moore



JUGS MEAN different things to different men. Some men build them. Others fill them. Still others make a career of emptying them. Lawrence Gruenke, of Phoenix, Ariz., has built a profitable business by laundering jugs.

Gruenke is owner, operator and builder of the Jug Laundry, which is perhaps unique in the Southwest. "One thing for sure," Gruenke says with absolute finality, "there is no other business just like this one, because I built it myself—every gadget in the place."

The "place," now located in a newly constructed concrete-block building measuring 50 by 100 feet, has plenty of gadgets in it, and thousands of jugs. In one year more than a quarter of a million jugs, bottles and



When ordinary laundering doesn't do the job, jug is placed on machine that immerses it in muriatic acid

jars pass through his laundry. He feels this is only the beginning. As soon as he can design and build more machinery for mass movement of different types of bottles, he expects to double his volume. If business keeps up the way it has been going, he hopes he might even double that.

The jug laundry started by chance. Sev-

Each of these brushes is suited for a different type bottle. Gallon jugs provide most of the business



en years ago Gruenke had a small home laundry that wasn't doing too well. Among his problems was an accumulation of jugs left over from the bleach used in washing. One day he asked a paint-store owner if he could use some clean jugs. The jugs were sold on the spot, at a price that made Gruenke wonder if washing jugs would not be more profitable than washing clothes.

Designs Own Machinery

So Gruenke began designing machinery. He now has a machine that soaks jugs in a bath containing caustics, wetting agents and solvents. This removes labels and most foreign material from inside and out. An operator then scrubs each jug in a detergent bath, with the aid of high-speed revolving brushes. A steam rinse completes the laundering process for most jugs. For stubborn cases, another Gruenke-designed machine dips them in a bath of muriatic acid. The jugs are then dried, inspected and sorted according to quality, then packed for shipping.

Gallon jugs provide most of Gruenke's business, though he deals in all sizes and shapes. The jugs, jars and bottles come to him from junk dealers, stores and charitable organizations earning money by col-



Powered by electric motors, this machine bathes jugs in solution of wetting agents, caustics and solvents

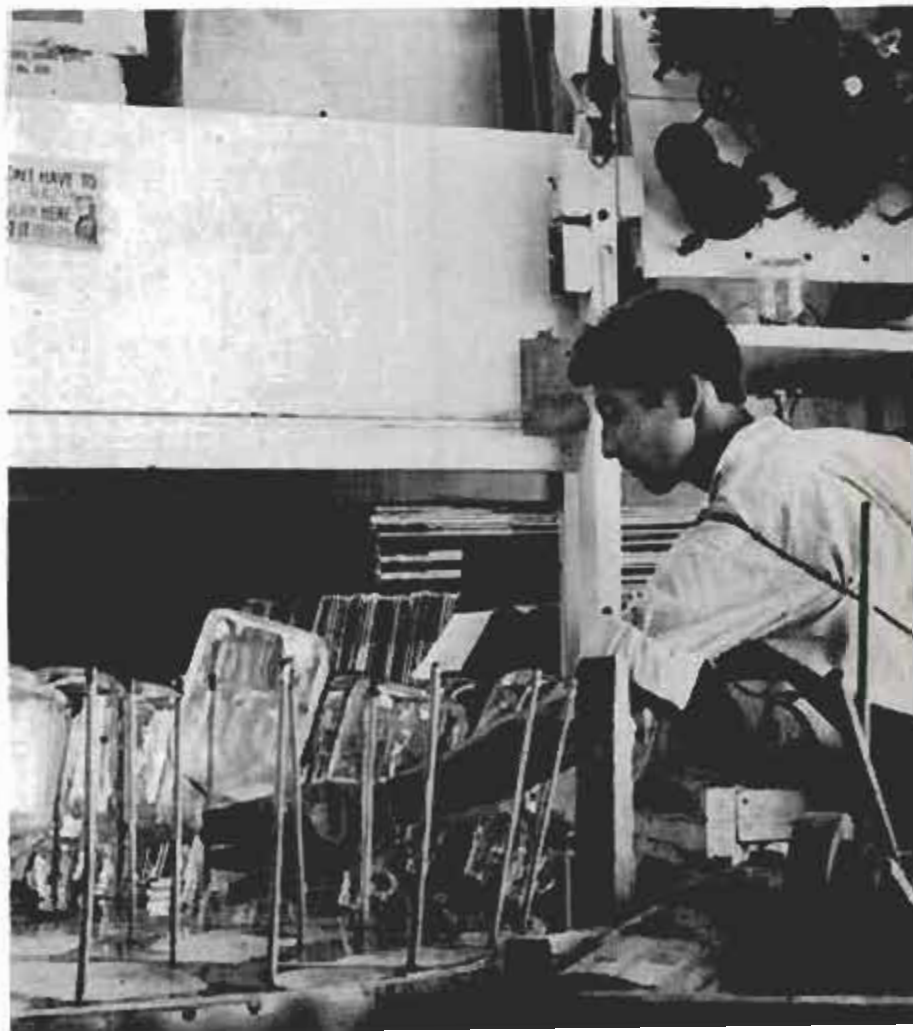
lecting salvage. Once laundered, the jugs and jars are sold to chemical or paint companies, or food dispensers. Some companies pay him to launder their own reusable jugs.

Plenty of Bottles

Wine bottles offer a challenge at present. The bottles are available by the ton, and a market is ready and waiting. All that's needed is for Gruenke to design and build machinery that will handle the smaller bottles in volume.

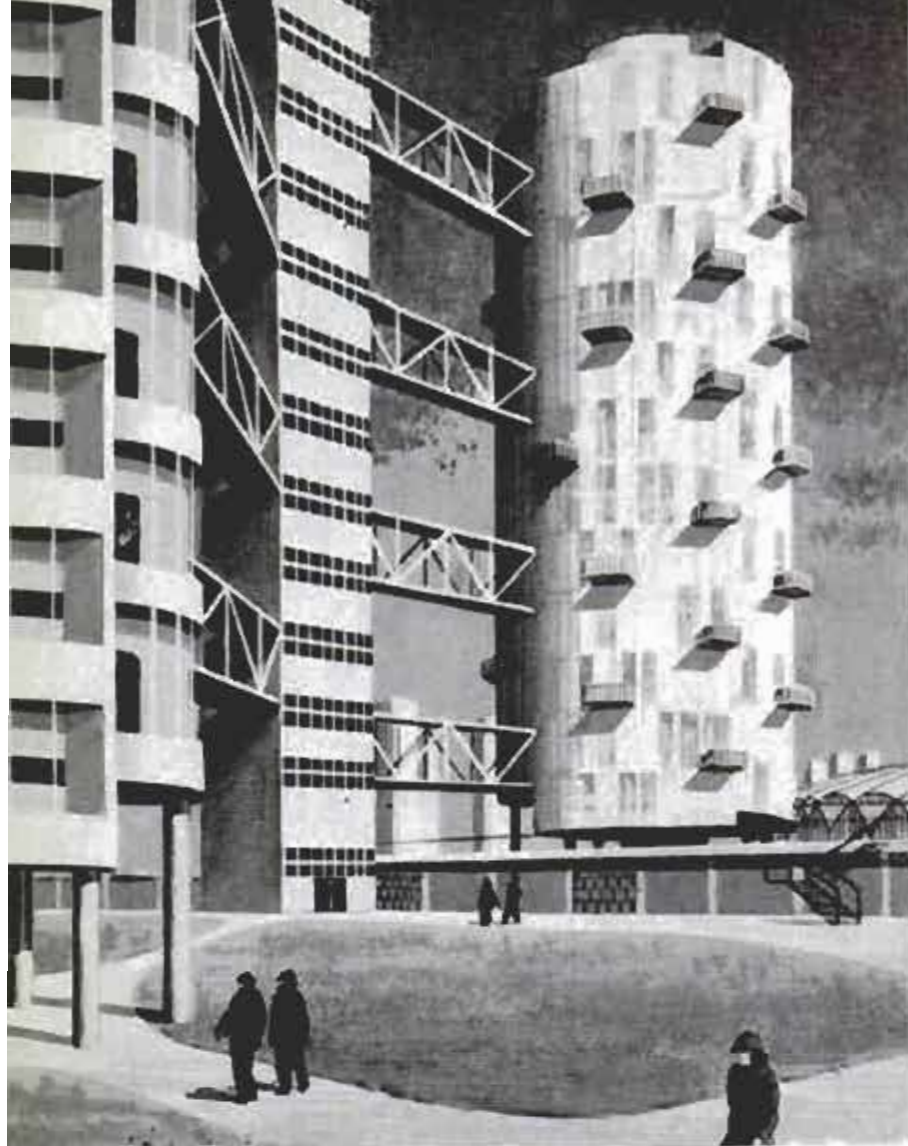
Gruenke believes his jug laundry is proof that there still is opportunity for new, small businesses in this country. "All you have to do," he says, "is to be able to see the opportunity. My business sat in the corner for five years before I knew it was there." ★ ★ ★

After the jugs are washed and rinsed, they drain and dry on a revolving rack filled with upright spokes. Then they pass under the eye of an inspector. If okayed, they are packed and shipped to customer

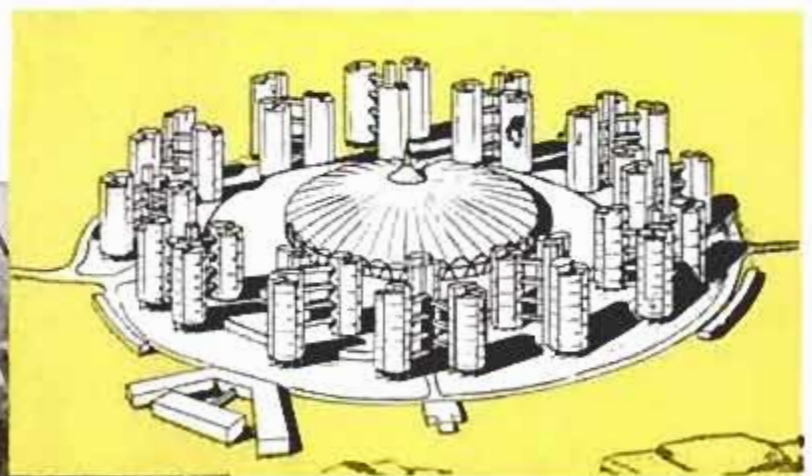


City Around a Dome Planned for Arctic Area

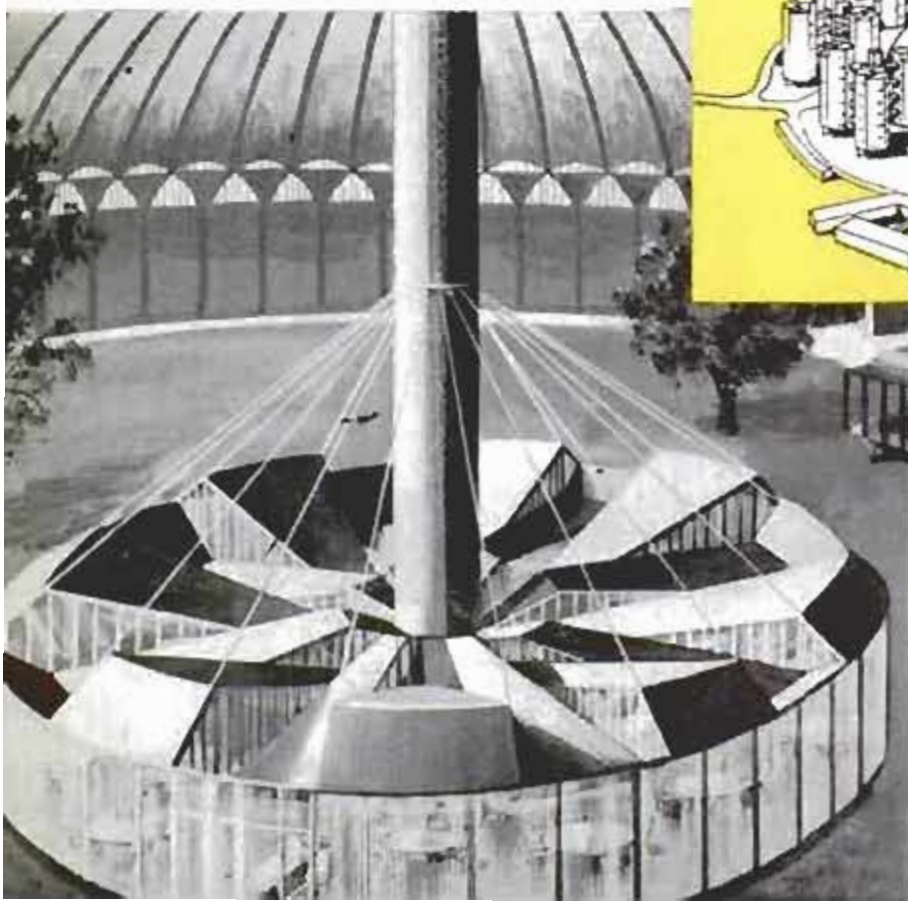
PRELIMINARY PLANS for a new city on Frobisher Bay, near the Arctic Circle, are being studied by Canadian government officials. The planned community, still in the "idea" stage, would provide housing in 36 apartment buildings arranged in a circle about a large thin-shell concrete dome. Each apartment tower would be 12 stories high, with balconies. Outside elevator shafts would service groups of three apartment buildings and the bottom of each shaft would be connected with the dome area. Under the dome would be government offices, schools, churches, community center, hotel, restaurant and shops. The area under the dome would be heated to around 20 degrees above zero in the winter, but the temperature inside the buildings and apartments would be 70 degrees. Atomic energy has been suggested as a source of heat and electricity for the community.



External elevators would carry residents to apartments in 12-story towers. Central dome would be connected to elevators



Plan of Frobisher Bay townsite features 36 apartment towers in clusters of three around central dome. "Covered" community is planned so residents could live near Arctic Circle without need of overshoes



Interior of huge dome might include a restaurant around a central pier, overlooking park. Plan also proposes use of basement in dome for year-around swimming pool, chemical garden for vegetables



Infrared Cooker Prepares Food at Table

With a portable, infrared cooker, housewives are now able to do their cooking right at the dinner table. They merely place the meat in a glass container, lower the container into the cooker, then remove the meat within minutes—ready to eat. Resembling a king-size beer mug, the infrared cooker is made of aluminum and was developed in Europe.



Lid of Bait Bucket Floats Closed Automatically

When the angler removes a minnow from a new bait bucket, the lid floats closed automatically. The eight-quart bucket is made of polyethylene. Because the density of the plastic is approximately that of water, the inner bucket floats exactly at the water surface without any built-in air chambers. There are no metal parts to rust or corrode.

Russian Competition Car Is About as Low as You Can Go

If you think cars can't get any lower, the Russians have proved you wrong. A cigar-shaped racing car, the Zvezda, is a mere 27½ inches high. Its driver lies on his back as he pilots the tiny four-wheeler. Its en-

gine has a 250-cubic-centimeter displacement (about 15 cubic inches). This tiny engine (it would take 13 of these engines to equal the displacement of a Rambler six) will drive the racer 110 miles per hour.



Seagoing Derrick Drills a Mile Deep

A SEAGOING DERRICK has been drilling mile-deep oil wells off the coast of California, testing a method by which vast amounts of submarine petroleum can be recovered.

Holes have been drilled in 1500 feet of water. Its developers see no reason why the technique can't be used in water several thousand feet deep. Other offshore-drilling methods are limited to water depths of about 150 feet.

Cuss I, named for its four sponsoring oil companies (Continental, Union, Shell, Superior), is a converted 260-foot freight barge with a 98-foot derrick mounted amidships over an open cofferdam. Draw works, mud pumps and tanks, and all the machinery of a typical drilling rig are carried on board. Drill pipe, 8500 feet in 60-foot lengths, is carried in an automatic racking device on deck.

In action, *Cuss I* is moored over the drilling site by six anchored buoys, then well casing is lowered through the cofferdam to within a few feet of the bottom. The casing

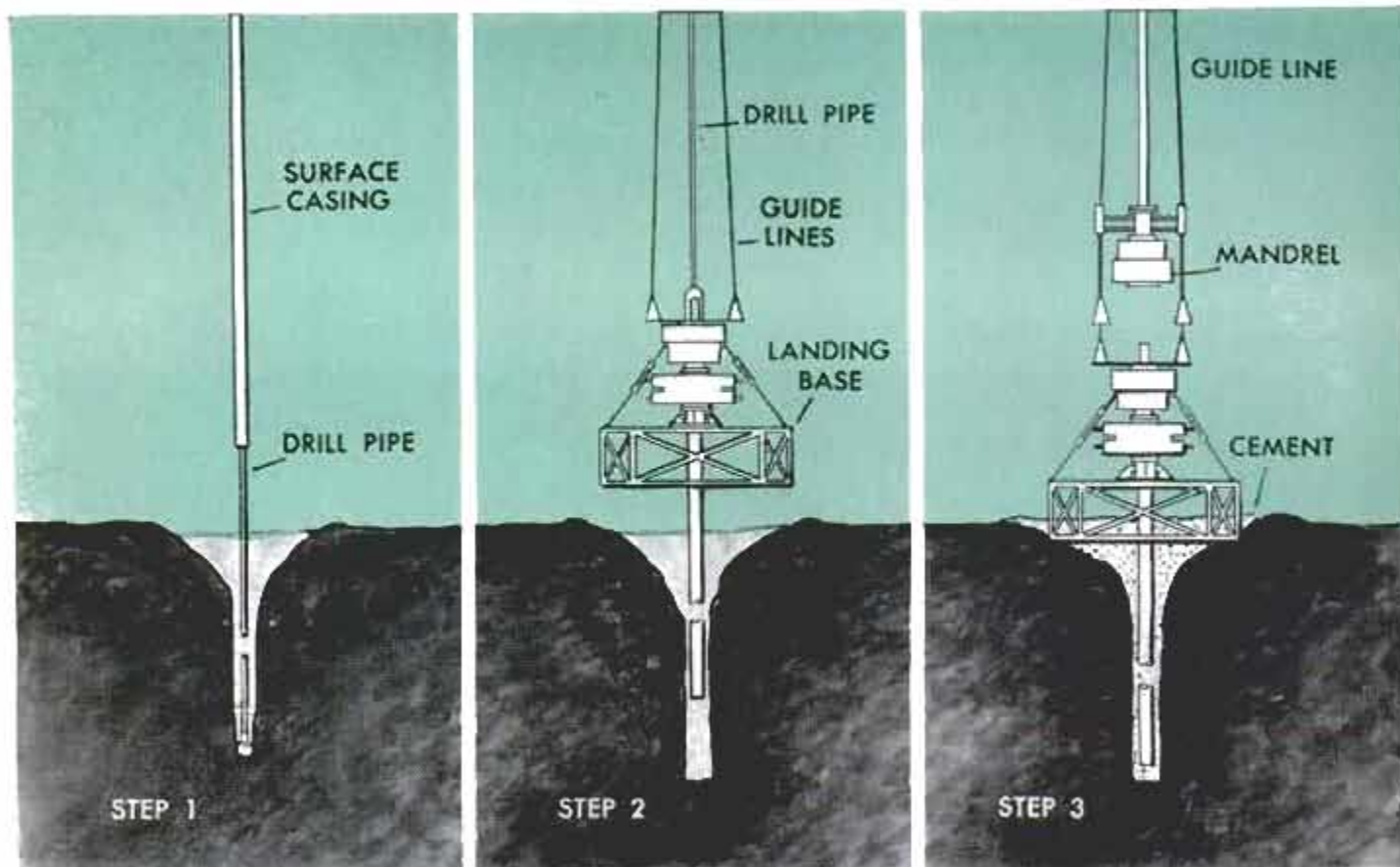
serves as a guide while a surface hole is being drilled. The drill is withdrawn, casing is run into the hole, and a landing base complete with blowout preventers is guided down the casing and into place, the positioning of the equipment being checked by an underwater television camera.

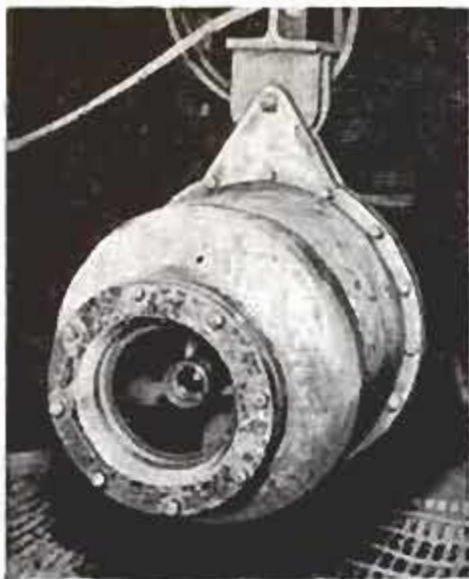
All ordinary drilling operations can be conducted, including setting casing as the hole progresses, coring, logging, and sampling. Costs of drilling are about \$18 per foot, which compares favorably with standard costs of onshore drilling.

All holes drilled until now were to learn the offshore depths of petroleum formations that extend from oil fields that exist along the coast. Future wells will be drilled all the way into the submarine-production zones.

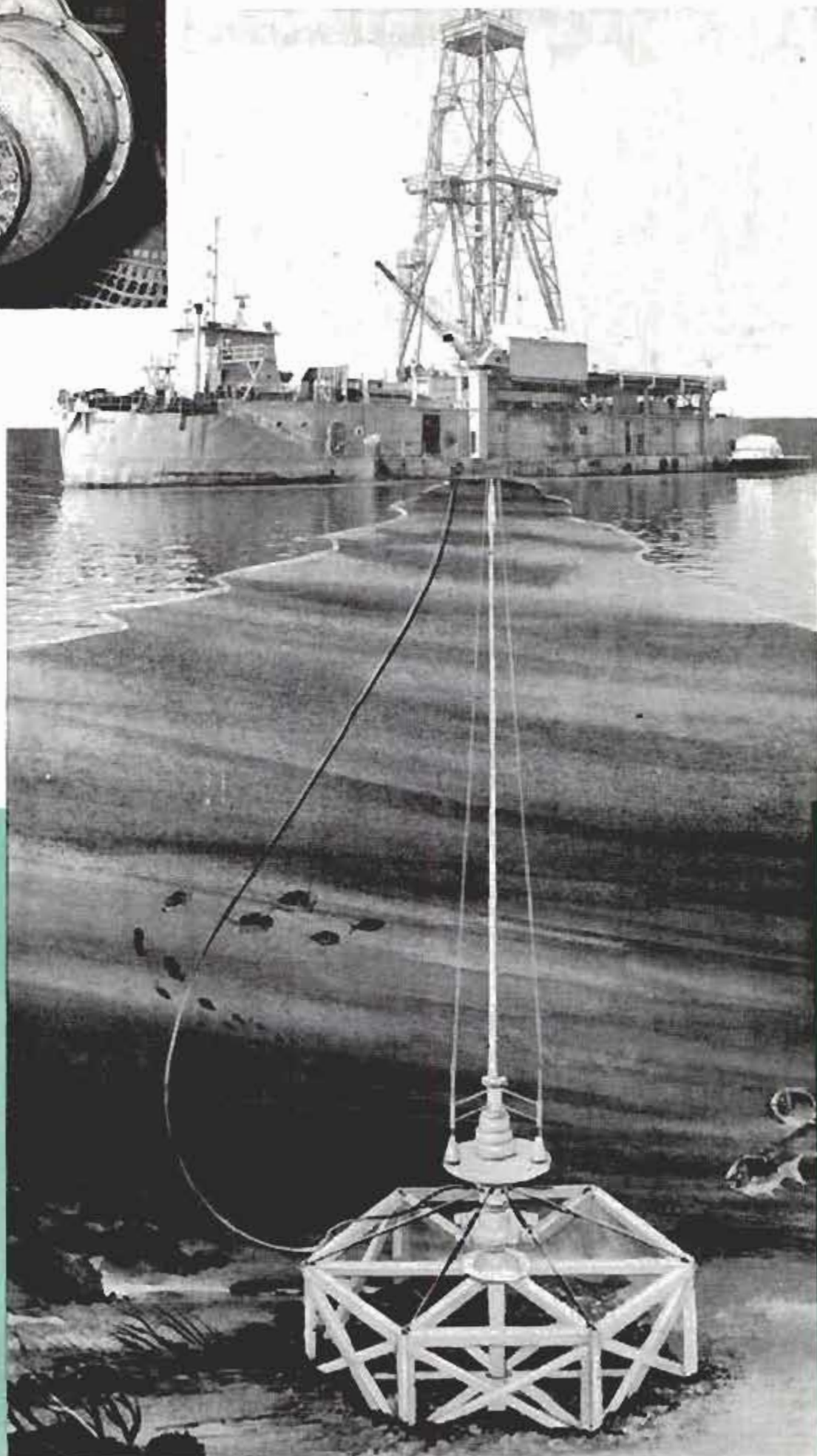
When the submarine wells begin producing, remote-control devices will be used to cap them and to connect them to storage tankers on the surface. If the wells are not too far offshore, pipelines may be laid along the ocean bottom to the wells. ★ ★ ★

Diagram shows underwater drilling started, landing base lowered, added equipment being guided to base





Underwater television camera, left, is used to inspect preparation of drilling site and check positioning of equipment. *Cuss I* is illustrated below as it might appear with landing base and drilling equipment at ocean bottom. Craft has 98-foot derrick amidships



Tubing Under Slab Controls Termites

PERMANENT CONTROL of termites in houses built on concrete slabs is claimed for a system developed by a Louisiana businessman. The system actually is installed before the concrete slab is poured. It consists of a series of pipes and lengths of plastic tubing which extend to every part of the foundation.

The half-inch polyethylene tubing is passed through a special machine before it is installed. The machine makes one-fourth-inch slits through the tubing at staggered intervals. Each end of the tubing is connected to a plastic adapter which, in turn, is connected to a length of galvanized pipe or high-impact plastic pipe.

The tube sections are placed about five feet apart, in or under the gravel fill which will be covered by concrete. The pipe sections extend beyond the outside of the foundation footing. Extra sections of tubing are placed around plumbing, at expansion joints and other places where termites might penetrate the foundation.

A termite poison is injected into the pipe openings. The chemical solution flows through the system of plastic tubing, filling it to the brim. Then pressure is applied and the chemical is forced through the slits in the tubing. The solution flows throughout the gravel fill beneath the foundation. This treatment can be repeated at the intervals recommended for permanent control of the wood-eating insect.

The conventional method of preventing termite infestation consists of spraying the gravel with an insecticide before the concrete is poured. This method is effective. In fact, the conventional spray treatment is applied to the gravel fill when the pipe-and-tubing system is installed.

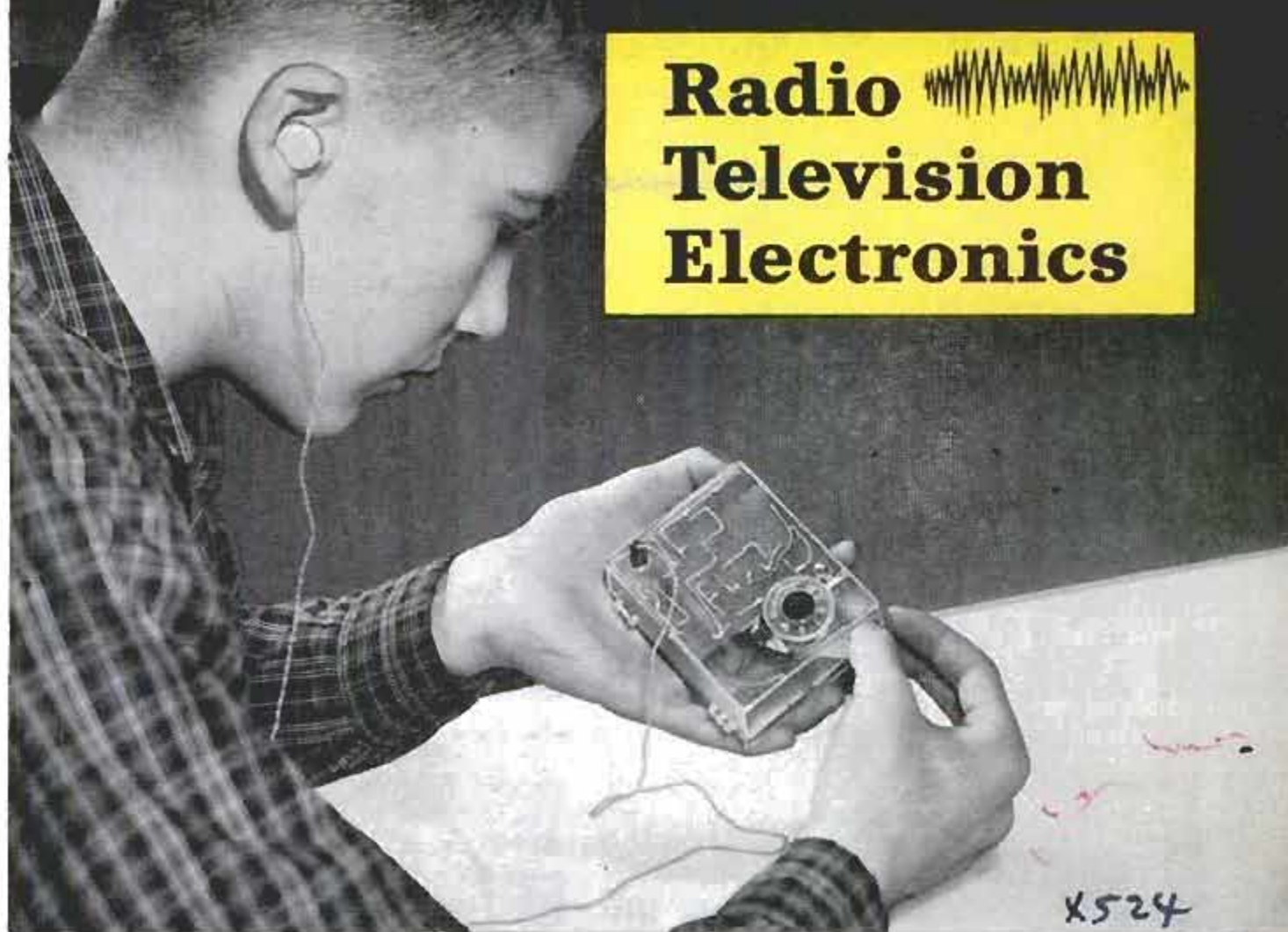
But the initial treatment is effective for not more than six years, according to the inventor of the new method, Paul S. Foster. And if termites invade the gravel fill some years later, the infested areas are hard to reach.



View above shows installation of pipe in gravel fill



Radio Television Electronics



BUILD "THE CHEAPSKATE"

A two-transistor radio for beginners
and more advanced experimenters

By Forrest H. Frantz, Sr.

WHAT KIND OF RECEPTION can you expect from just two transistors? Not very much—when you're talking about the usual type of receiver consisting of a detector and a couple of amplifier stages. Normally, that type of radio requires an external antenna and ground to deliver earphone volume even on local stations.

But when a circuit is designed to take optimum advantage of all possibilities, you can expect something better. "The Cheapskate," for example, is an attempt to get the most for the least—most reception at the lowest cost. The result is a two-transistor set, small enough to fit into your pocket, yet sensitive enough to pull in stations 10 or 15 miles away with only the built-in antenna. What's more, the stations can be adequately separated and do not interfere with one another—a major disadvantage of the detector-amplifier type of receiver.

The Cheapskate owes its sensitivity and selectivity to a first stage which is, at once, regenerative and reflexed. Regeneration provides repeated amplification of the

radio-frequency signal, up to the point of oscillations, and greatly increases the efficiency of the first stage as an r.f. amplifier. At the same time, reflexing causes this stage to perform double duty. Not only does it amplify the r.f. signal picked up by the antenna, but it also serves as an audio amplifier. This is accomplished by applying the detected signal, or audio, back to the input of the first transistor. As a result, the two transistors of the Cheapskate actually do the work of three.

But even the Cheapskate won't give you something for nothing. Though highly efficient, it suffers from the same malady that has forced the discontinuance of regenerative circuits in ordinary broadcast receivers. It is critical in its tuning.

Since the sensitivity of the receiver is largely a function of the amount of regeneration, proper adjustment of the regeneration control, C2, is important. Too much regeneration will cause the receiver to oscillate and howl like a banshee. Too little reduces the amplification to the point

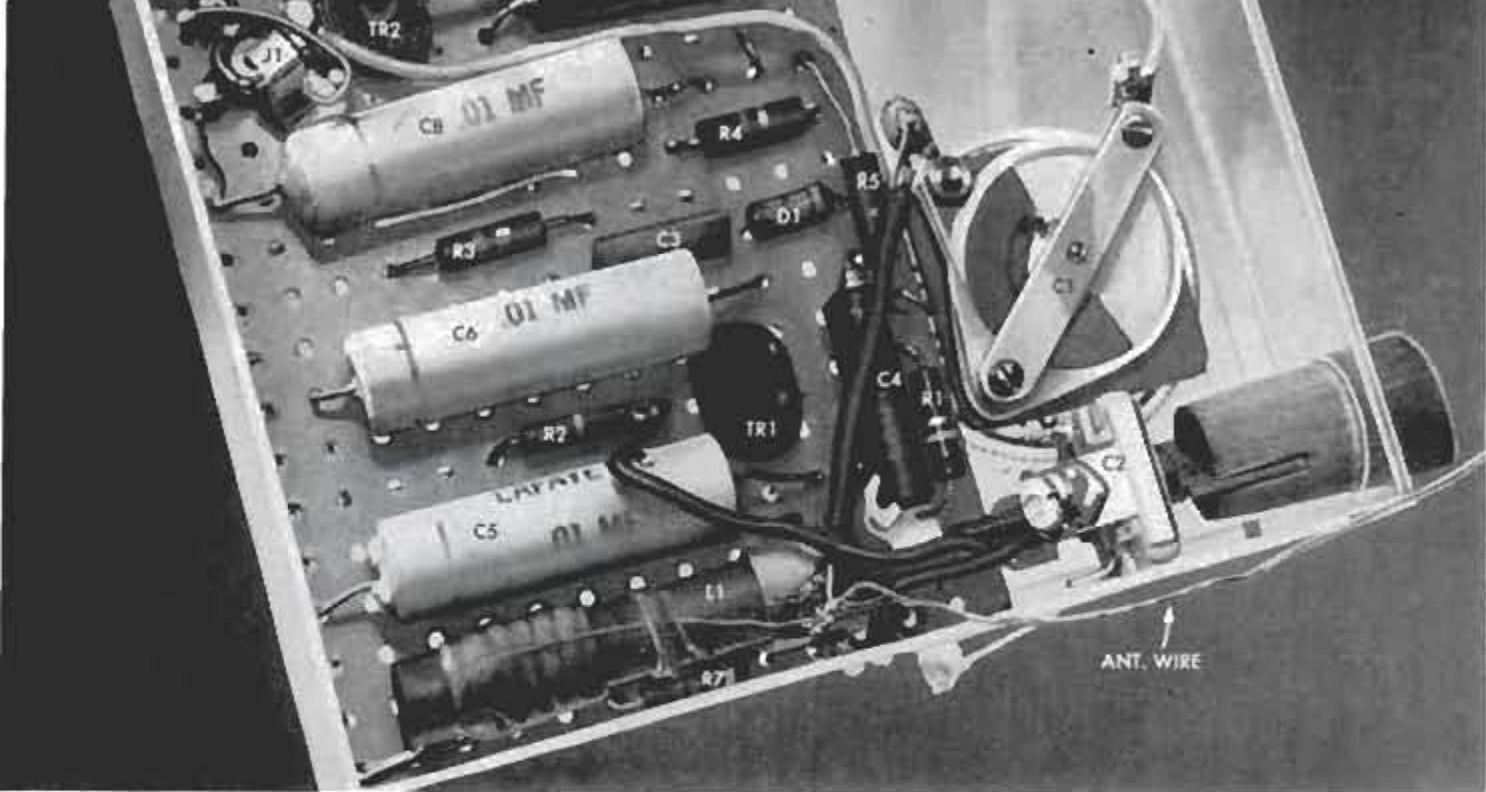


Fig. 1. Top of perforated Bakelite chassis shows parts placement. Ant. wire is glued to inside of case

where you may not hear anything at all. But with a little practice and care in tuning, the Cheapskate performs very well indeed, and provides a rewarding construction project for both beginners and more experienced hobbyists.

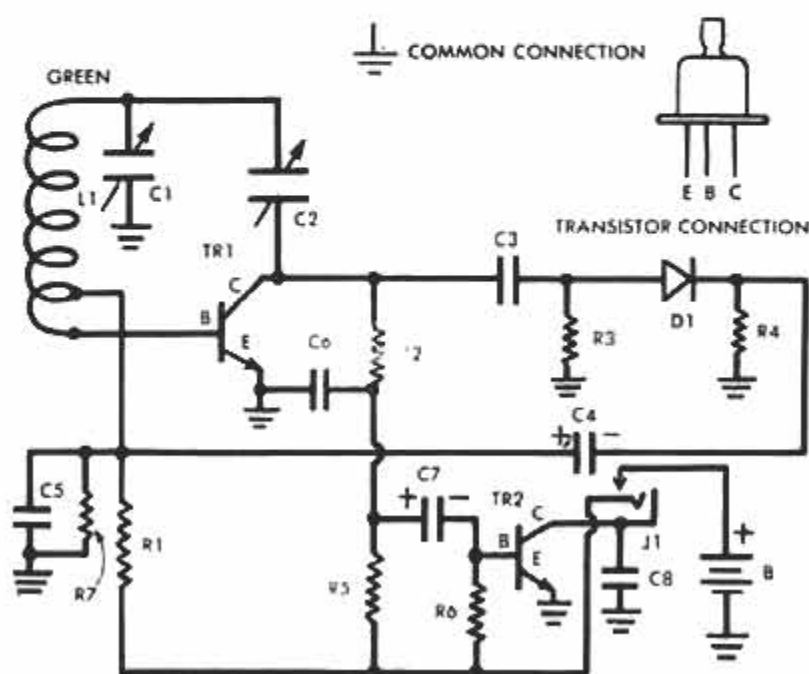
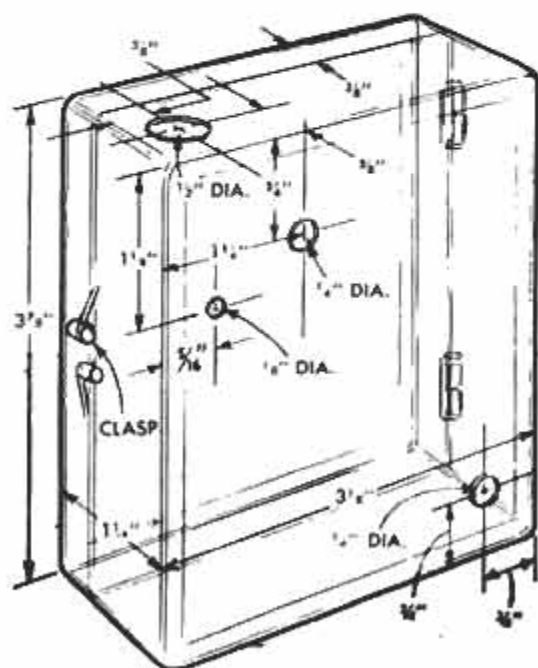
Building the Cheapskate is a job that anyone handy with a soldering iron can complete in one or two evenings. The parts (including batteries and earphone) are easily obtainable and cost less than \$10. The use of a plastic-case housing and perforated Bakelite mounting board eliminates the need for metal-cutting tools and simplifies construction.

Fastening the various parts inside the

plastic case requires 4 mounting holes (see Fig. 2.) The holes in the thin plastic material can be made easily by starting small pilot holes with a heated ice pick and reaming these to the correct size. For a professional appearance, the inside of the case may be painted with either brush or spray.

The photo in Fig. 1 shows the positioning of all parts on the mounting board. The board suggested in the list of materials is of the correct width but must be cut to a length of $3\frac{1}{8}$ in. to fit snugly into the case. The small parts are fastened to the board by routing their pigtail leads through the small holes and bending them underneath. Before fastening them in place, however,

Fig. 2. Plastic case layout, left, and schematic wiring diagram, right, for simple Cheapskate receiver



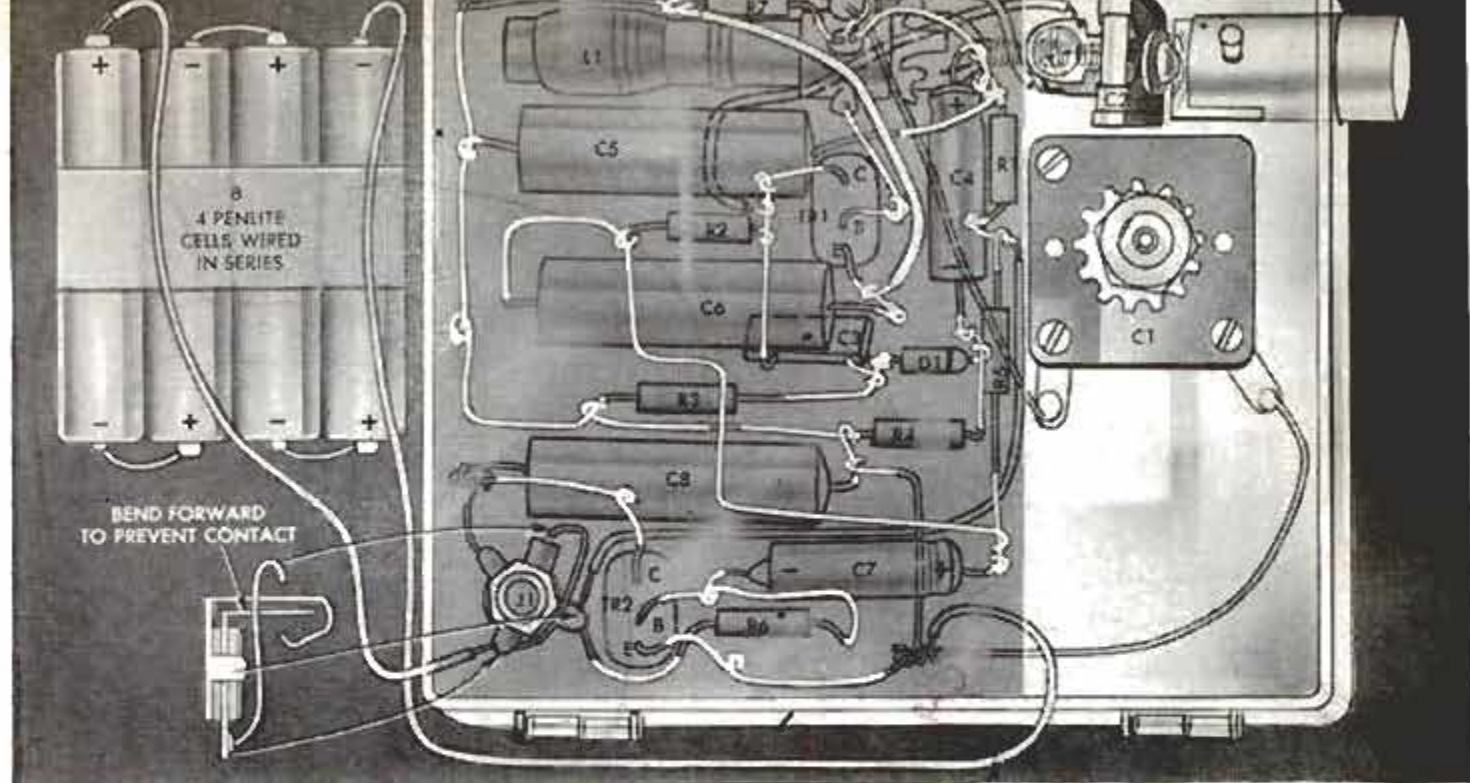


Fig. 3. Pictorial wiring diagram shows wiring and parts placement through "transparent" mounting board

lay the board inside the case to locate the center for the phone-jack hole. The location of this hole must correspond with that in the case, but it is made somewhat larger— $\frac{1}{16}$ in.—so that it will pass the jack collar. Otherwise the jack bushing will not protrude through the front of the case.

The pictorial wiring diagram in Fig. 3 shows the mounting board as if it were transparent, permitting you to see the parts on one side and the wiring on the other. Close adherence to this diagram, followed by a careful check of your wiring against the schematic shown in Fig. 2, should result in a unit very similar to that of the original model.

All connections must be securely soldered with a good grade of rosin-core solder. Double check your placement of the two transistors and the diode, D1, before soldering their leads. Note the unequal spacing of the three transistor leads. Compare the transistor identification diagram in Fig. 2 with the pictorial in Fig. 3 to make sure that the transistors are correctly positioned on the board. Reversing them

would result in their destruction when battery voltage is applied.

When soldering the transistor and diode wires, grip the leads with long-nosed pliers between the solder junction and the body of the unit. The pliers act as a heat sink and prevent the heat from the iron from damaging these heat-sensitive parts.

Before mounting the phone jack, modify it as shown in the small inset of Fig. 3 so that it acts as an on-off switch. This is done by bending the normally closed leaf of the jack away from the plug-contact element so that the two do not make contact at any time. Then, solder a short piece of wire to the center lug of the jack and bend this wire around the back as shown. There should be a slight amount of clearance between the end of this wire and the back of the jack—enough so that there is no contact until the headphone plug is inserted. With insertion of the plug, the jack element will be pushed back to make contact with the wire and complete the battery circuit. When the plug is removed, contact

(Continued to page 219)

LIST OF MATERIALS

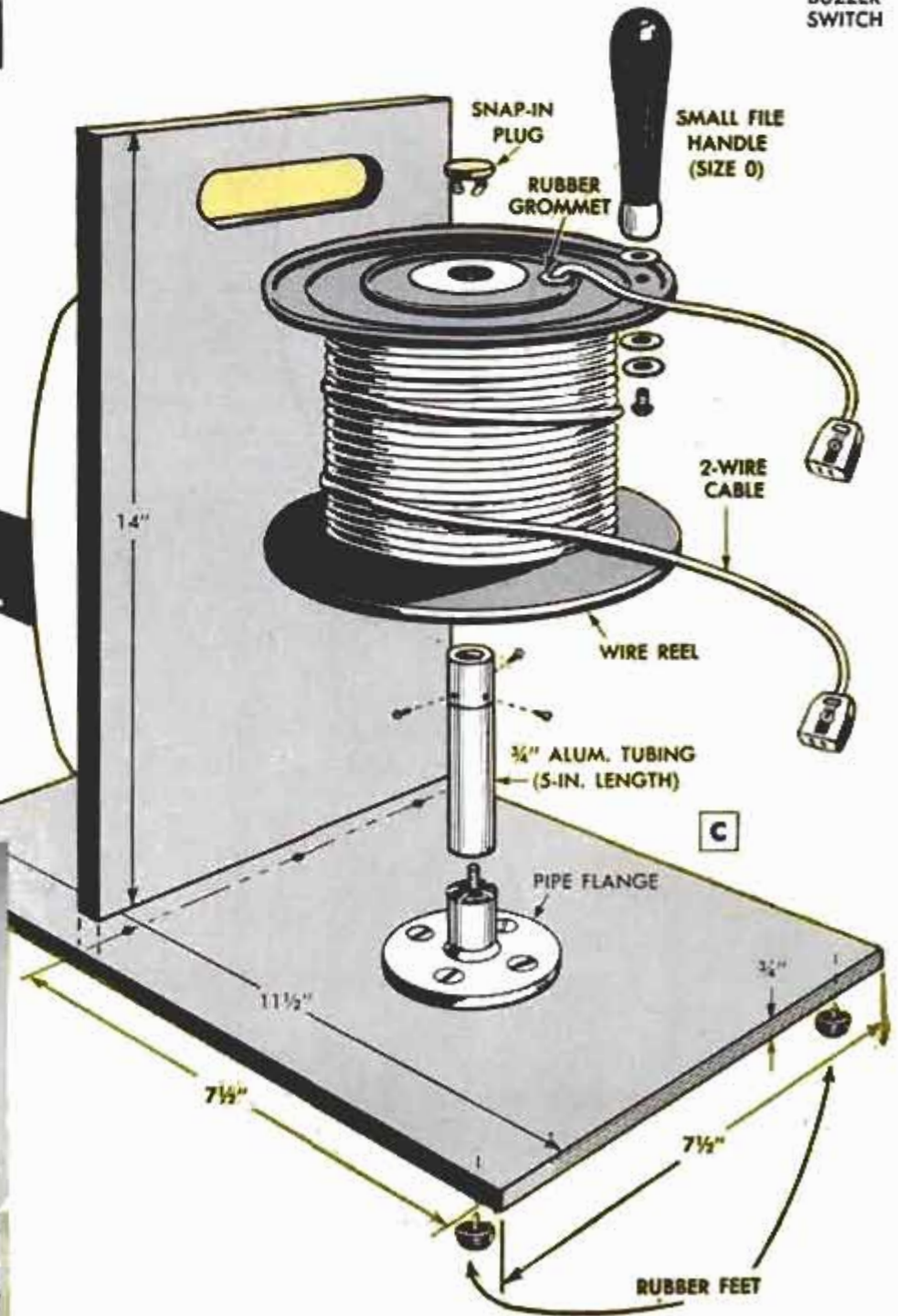
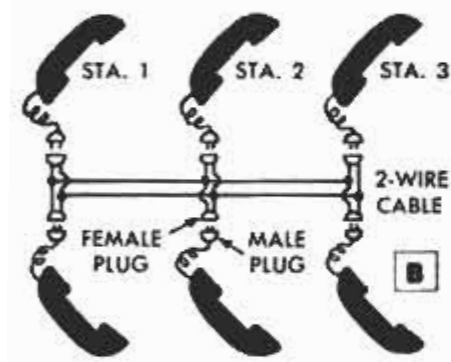
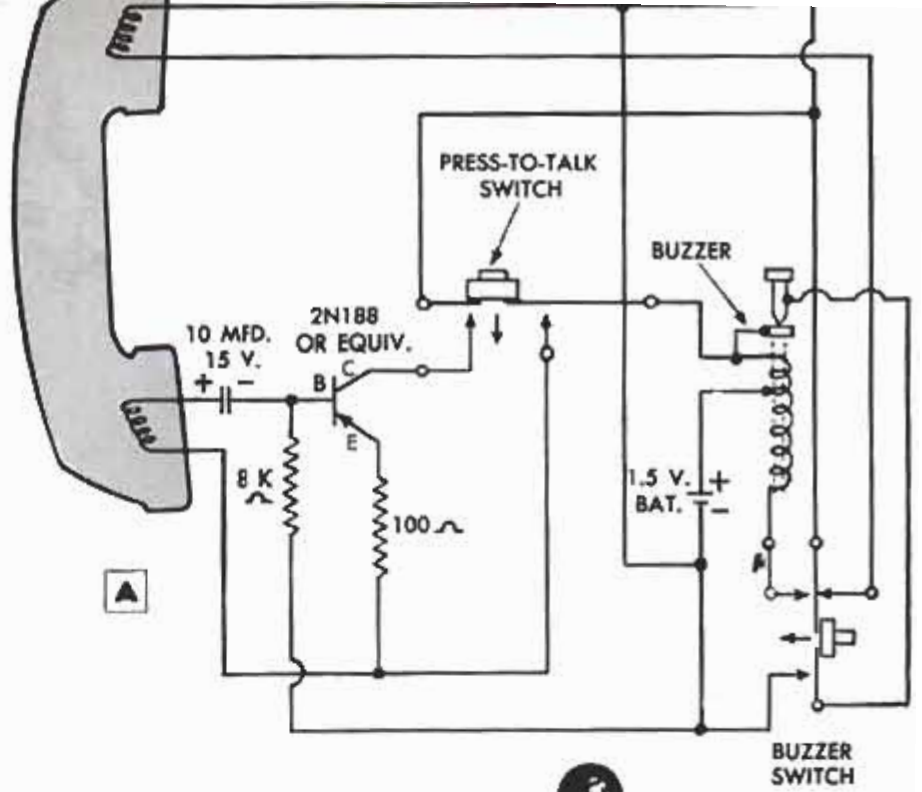
RESISTORS: (All resistors are $\frac{1}{2}$ -watt, $\pm 10\%$ carbon units. K=1000 ohms). R1=270K; R2=1K; R3, R4=15K; R5=4.7K; R6=220K; R7=47K.

CAPACITORS: C1=tuning capacitor (365 mmfd.) with dial knob, Lafayette MS-445; C2=35-mmfd. mica trimmer capacitor; C3=100 mmfd. ceramic or mica; C4, C7=30 mfd., 6 v. miniature electrolytic; C5, C6, C8=.01 mfd. tubular.

SEMICONDUCTORS: TR1=GE 2N168A (NPN)

transistor; TR2=GE 2N170 (NPN) transistor; D1=Raytheon 1N66 diode.

MISCELLANEOUS: L1=Transistor Vari-Loop antenna coil, Lafayette MS-299 or equiv.; dynamic earphone (2000-ohm impedance) with matching plug and jack, Lafayette MS-368 or equiv.; plastic case, $3\frac{3}{8} \times 3\frac{1}{8} \times 1\frac{1}{8}$ in., Lafayette MS-298; perforated Bakelite board; Lafayette MS-304; B=4 RCA VSO-74 Penlite cells (connect in series).





PORTABLE TELEPHONE SYSTEM FOR OUTDOOR USE

By E. G. Louis

IN THE PAST, portable telephone systems, although highly desirable for many outdoor hobbies and invaluable for numerous outside occupations, have enjoyed only limited popularity. In general, many such systems were relatively expensive, bulky or inconvenient to transport, or had limited sensitivity or range.

With the recent introduction of moderately priced *transistor* telephone handsets, however, anyone can assemble a completely portable, self-contained telephone system at a relatively low cost.

The system illustrated on the opposite page requires no external batteries. Yet, by virtue of its built-in transistorized amplifier, it has excellent sensitivity and can be used over distances up to 125 miles. Practically, its range is limited only by the amount of cable you wish to use.

Basically, the system consists of a pair of telephone handsets, a compact, home-made carrying rack, and a reel of 2-conductor wire prefitted with plug-in connectors to fit the handsets. The rack is provided with a carrying handle, a storage box for the handset cords and an axle for the reel of wire. The reel holds several hundred feet of cable—an ample amount for most applications—and is fitted with a handle to facilitate rewinding of the cable. The hand-

sets are Japanese imports, distributed by Lafayette Radio; all other parts are readily available through local outlets. Assembly of the whole system shouldn't take longer than a couple of hours.

The advantages of transistors over vacuum tubes are aptly demonstrated by the amplifier built into each handset, see Fig. A. The small size of these units permits the entire amplifier, including a buzzer, a press-to-talk switch and the battery power source, to be ingeniously fitted into each handset handle. Their relative efficiency permits many hours of operation with only a single 1.5-volt Penlight cell. And, while the maximum range of such a system probably will never be utilized, its sensitivity permits virtually any number of handsets to be interconnected in a single network, see Fig. B.

Assembly details for the two-phone carrying rack are illustrated in Fig. C. Two pieces of $\frac{3}{4}$ -in. plywood, or 1-in. lumber, serve as the main frame. A cutout near the top of the upright piece serves as a carrying handle. The two pieces are fastened together with wood glue and moderately long, flatheaded wood screws, driven through countersunk holes of the base. Four tack rubber bumpers, one in

(Continued to page 226)



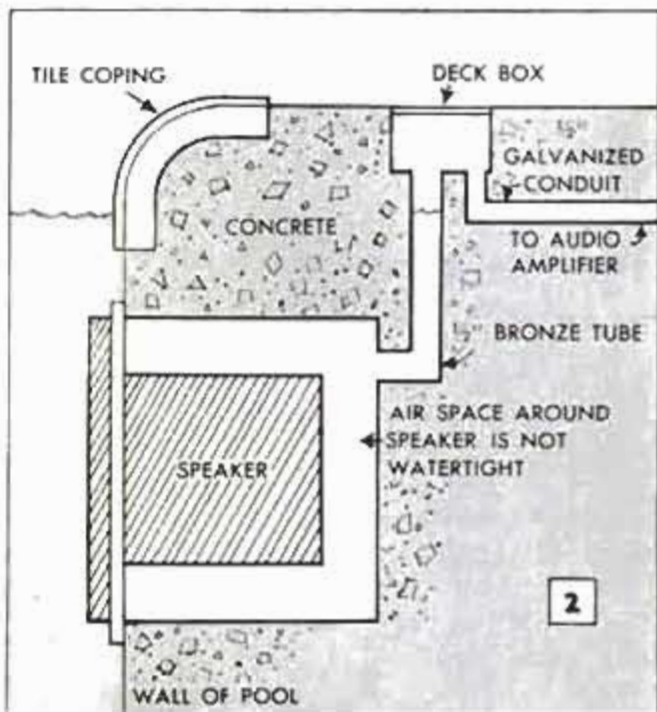
New Thrills With Underwater Sound

By James Joseph

YOU HEAR NO SOUND when standing beside this swimming pool, but dive into the water and immediately you are immersed in music. Frank O'Brien, audio engineer of Van Nuys, Calif., created this unusual condition by installing a loud-speaker under water. It is wired to an amplifier outside the pool. Because sound travels five times as fast in water as in air, and because other sounds are outside the water, music from the submerged speaker is more true-toned than one mounted in the air. The latter factors permit a single, fairly small speaker to fill even a very large pool with music. As an example of this, O'Brien used a single 30-watt speaker in an installation in a large hotel pool in Las Vegas, Nev.

The speaker used in each case is the type designed especially for use under water. In this type of speaker the diaphragm works directly against water pressure, as opposed to a regular speaker with a diaphragm that works against atmospheric pressure. A recess cut or cast into the wall of the pool, Fig. 2, is made 1 in. larger in diameter than the speaker and 1 in.

deeper. The recess should be no more than 18 in. below the surface of the water. Below that level water pressure reduces the speaker efficiency. About 6 in. is a good depth. The flange of the speaker is screwed to a chrome-plated brass ring that is bolted to the surface of the pool wall. Although a Neoprene gasket is used to insulate the



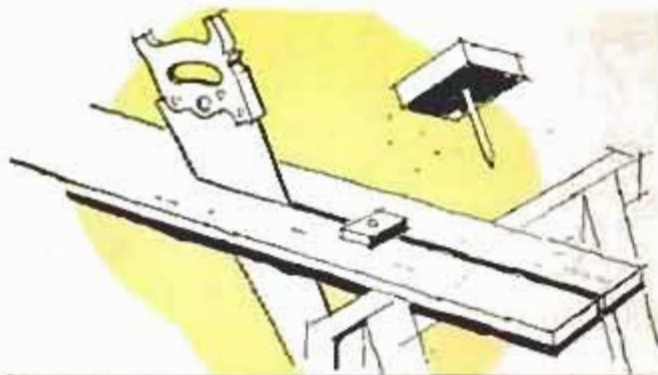


"Music to swim by," could be theme song of owner of this music-filled swimming pool

speaker from the ring, no provision is made for keeping the speaker recess watertight. Used for the home-pool installation was a University MM-2F (UW) "submergence-proof" speaker. The warranty for the speaker applies only to intermittent submerging, but the original installation is still performing satisfactorily after several years. Cost of the speaker is about \$40. From the speaker recess a 1/2-in. bronze tube leads up to a flush-mounted connector box in the pool deck above water level. Waterproof leads from the speaker are passed up through the tube and spliced to leads from the amplifier, the latter routed through a galvanized conduit buried in the concrete deck. Water from the pool fills the speaker niche and rises to its own level in the bronze tube, Fig. 2. To assure watertightness, before installing the speaker it is disassembled and the terminal connections waterproofed with a compound such as General Electric's Glyptol. The spliced wires in the connector box, Fig. 3, although above water level, also are waterproofed in this manner, in case that water runs into the box from the pool deck.

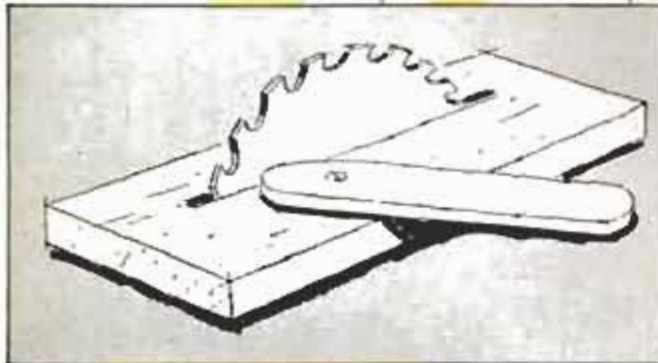


Another factor that must be considered with the speaker installation is the pH factor of the water in the swimming pool. Frequent testing, Fig. 1, is required to make sure that the factor is maintained in a range between 7.2 and 7.6. Excess acidity or alkalinity may damage the diaphragm of the speaker as well as cause corrosion in any exposed metal parts. So popular has underwater sound proved to be that several swimming-pool builders now offer it as an optional accessory. ★ ★ ★



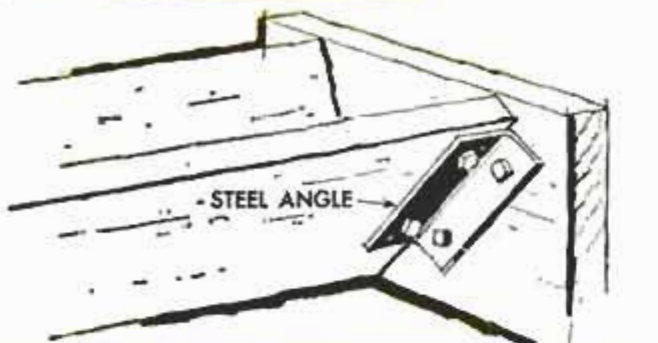
Improved Ripping Wedge

Ripping a long board with a handsaw usually requires a wedge of some sort to hold the saw cut open as it tends gradually to close and bind the saw blade. A wedge for this job can be improvised by driving a large nail through a block of wood. In use, the wedge is moved along the board as the saw cut progresses.



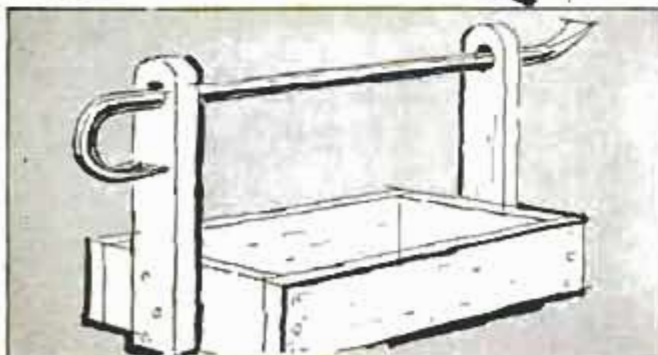
Filing Jig for Circular Saw

Holding a circular-saw blade while touching up the teeth with a file is no problem if this jig is used. It consists of a piece of plywood slotted in the center to slip over the blade and rest on the saw table. A cam-shaped lever pivoted to the jig bears against the blade to hold it steady.



Angles Reinforce Hog Troughs

Short lengths of steel angle, drilled and bolted between the ends and sides of hog troughs will assure that these feeders will stand up under hard usage. The angles will do the job much better than when spikes alone are used, although the spikes may be used to assemble the troughs before the angles are installed.



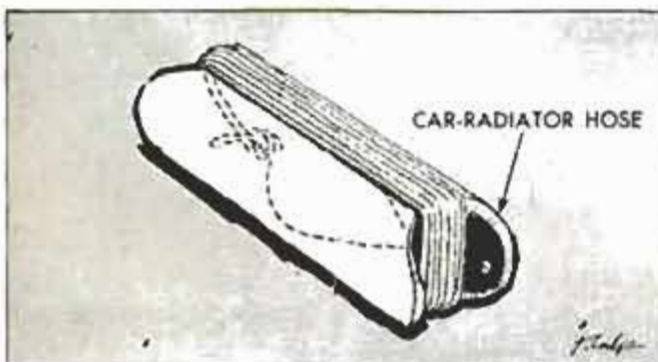
Wrecking Bar "Carries" Toolkit

You can carry a fairly long wrecking bar with your toolkit by drilling the kit uprights to accommodate the bar so it then becomes the handle. Using the bar as the handle assures you of always taking it to a job, and there is no chance of forgetting and leaving it behind, because the kit cannot be carried easily without it.



Eyeglass Case Is Key Holder

Ladies who carry a single key in a hand-bag will be able to locate it quickly if it is dropped into an eyeglass case. This idea applies to a small bunch of keys as well, and is something to keep in mind for almost any small item carried in a large bag or purse. The case also is a good container for bus tokens and meter coins.



"Case and Reel" for Plumb Bob

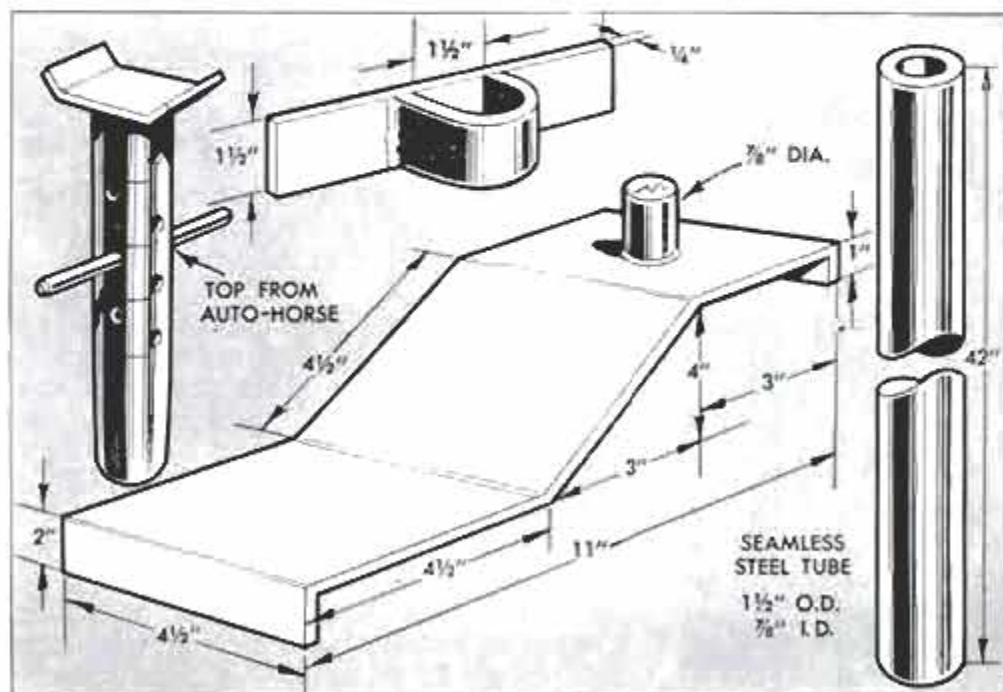
Protect a plumb bob from damage by other tools, yet have it ready for quick use, by making a case-and-reel for it from a length of auto-radiator hose, the ends of which are notched as indicated. The bob is slipped inside the hose, then the line is wound lengthwise around the hose to keep the bob in place.



“High Level” Jack Aids Brake Relining

ON MANY late-model cars it is necessary to raise the body from the axle so there is clearance to remove the rear wheels, and the average motorist does this with a bumper jack. Faced with this same problem with cars on an axle-type hoist, one service-station operator modified a hydraulic floor jack to act as a “high level” bumper jack, for doing brake relining. On a Z-shaped piece of $\frac{1}{4}$ -in. steel, which fits

over the lower part of the jack, is welded a short length of $\frac{7}{8}$ -in. steel round. This round positions the lower end of a length of seamless-steel tubing that slides up and down in a fabricated yoke welded to the jack uprights. The top from an auto horse fits over the upper end of the tube. In use, the jack is fitted to a frame member, rather than the bumper. The modification is easily removed.—Paul Bauer, Blue Island, Ill.





Plastic Credit Cards Make Ideal Identification Tags

When your plastic credit cards are renewed, do not throw away the old ones. Save them for use as identification tags in suits, hats, raincoats and other garments. Cut off the name and address portion of each card, punch holes along the edges and sew them to a garment. The cards are

especially ideal for use on rubbers and overshoes of small school children. The plastic cards are resistant to washing and dry cleaning and will not cause stains, as indelible ink sometimes does when it is applied too heavily.

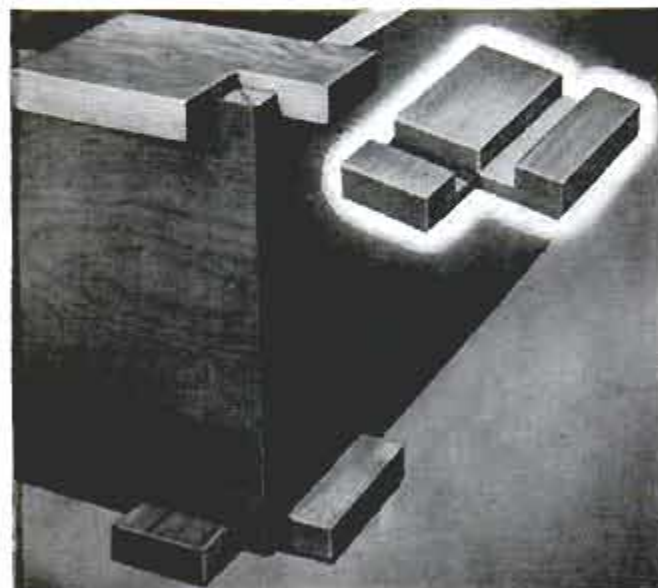
Hugh Lineback, Stillwater, Okla.



Rubber Band Holds Rule on Book

Students who carry a rule with their books will find it helpful to use a rubber band stretched around the rule lengthwise as a means of holding it outside one of the books. While slipping a rule between the pages of a book will tear the pages and damage the binding, carrying it outside the cover harms the book in no way. To prevent the rubber band from slipping off the ends of the rule, cut a notch in each end to accommodate it.

R. Hanscom, Elmhurst, Ill.



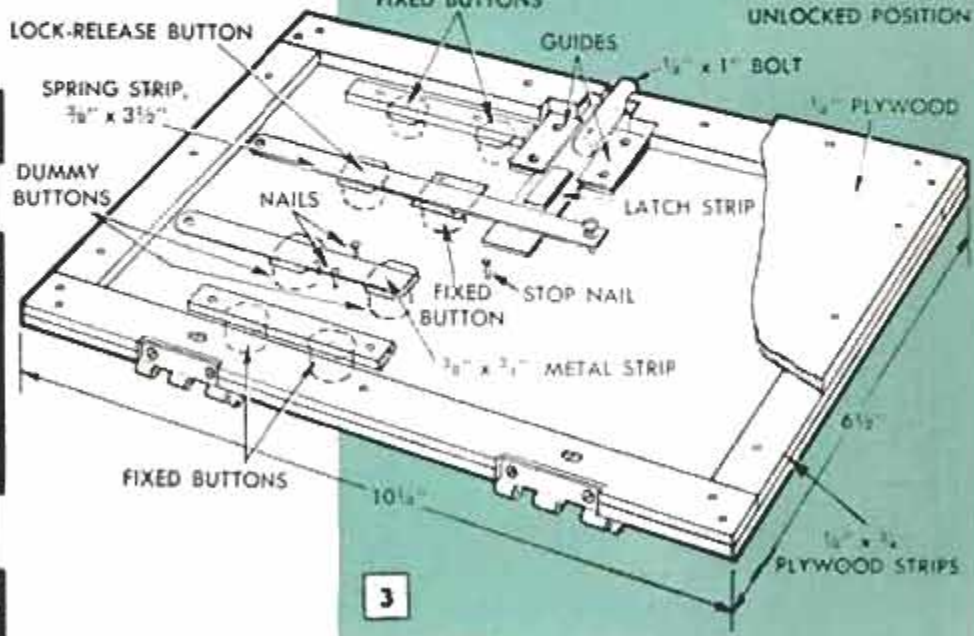
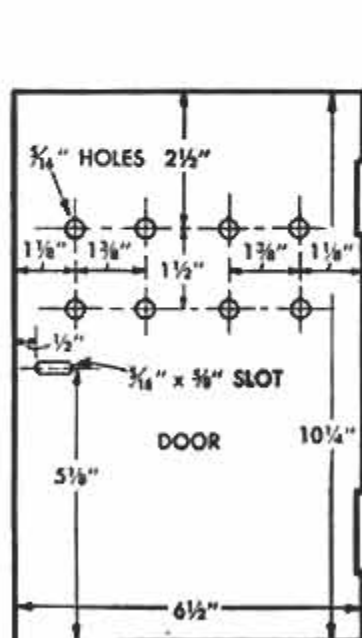
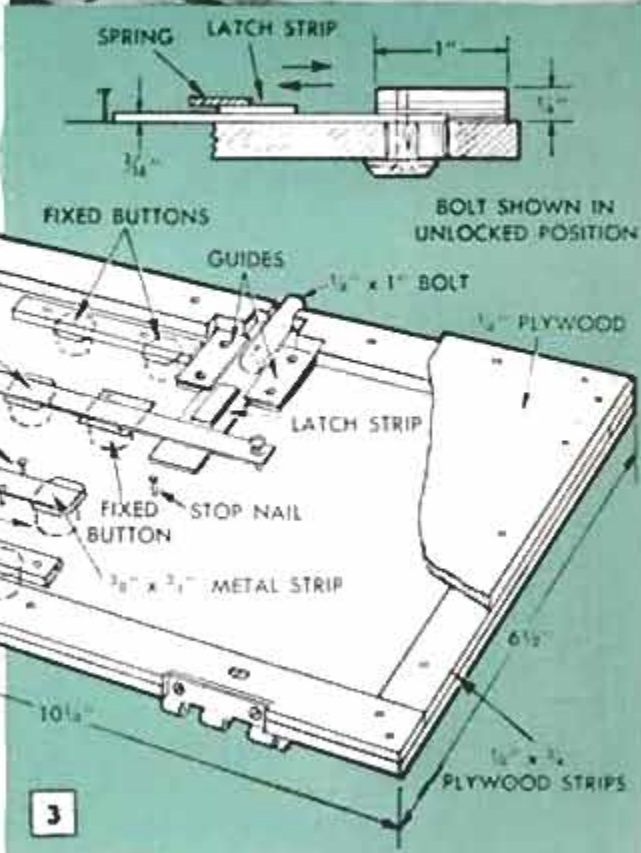
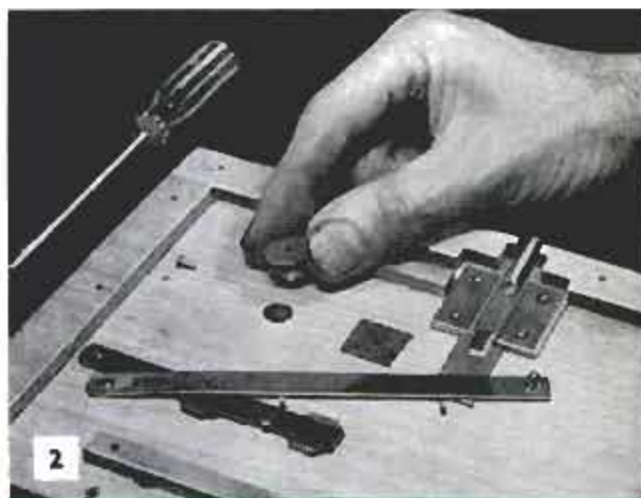
Improvised Miter Clamps of Wood

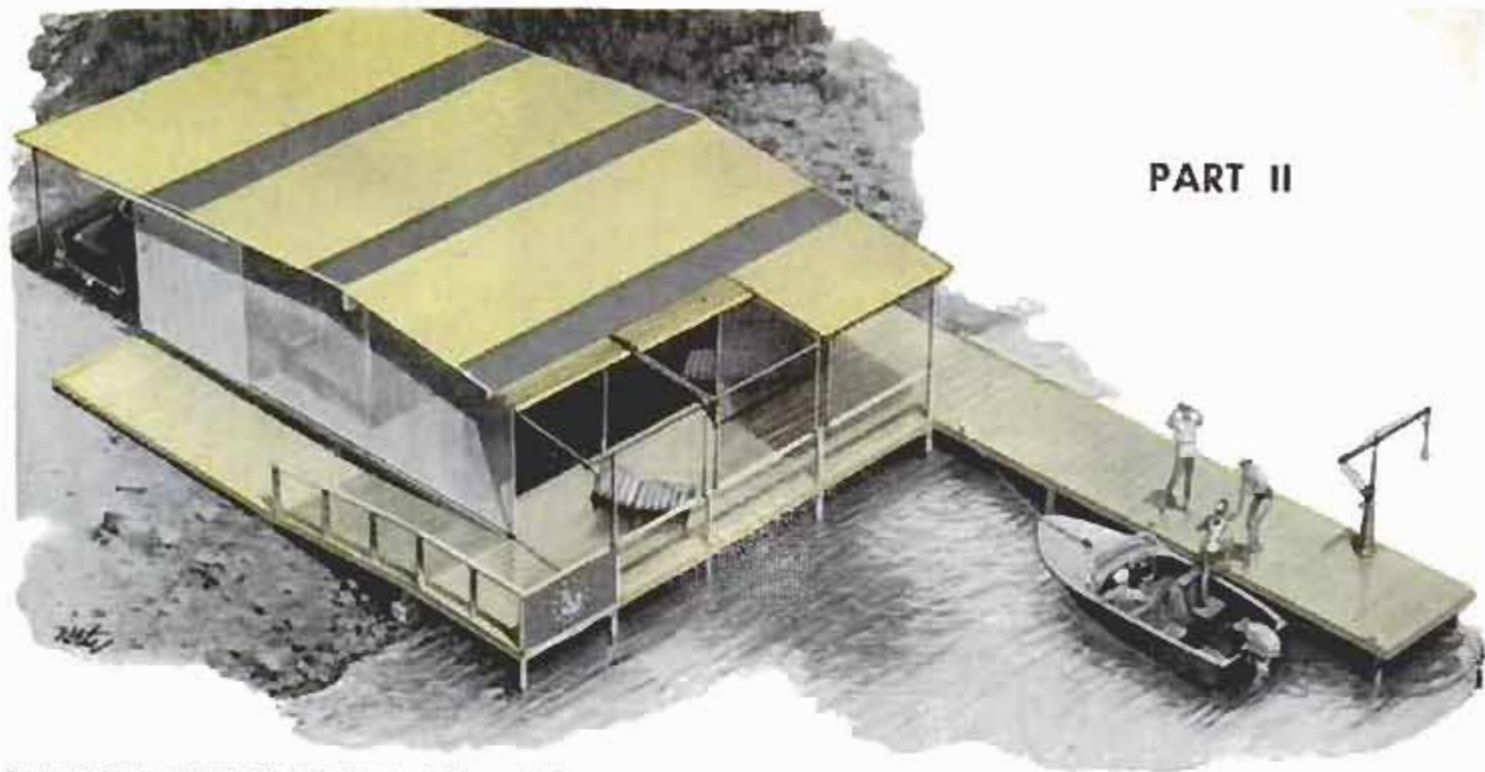
Although most home workshops have one or two miter clamps, a job requiring several of them, such as when joining the mitered corners of a chest, calls for a method of improvising additional ones. A quick way of making clamps for this job is to cut right-angle slots in scrap blocks of plywood or hardwood. Using a dado blade, cut the slots in the $\frac{3}{4}$ -in. plywood or 1-in. stock to a depth of $\frac{1}{2}$ in., and just wide enough to assure a snug fit over the pieces being joined. The mitered corners are coated with glue, then forced together and held in position with one of the improvised clamps at the bottom, the other at the top as indicated.

"PUSH BUTTON" MYSTERY LOCK

By Walter E. Burton

UNLESS YOU KNOW the secret of the decorations on the face of this cabinet door, Fig. 1, you will not be able to release the hidden bolt to open it. Even when the door is open, the mystery is not revealed, as the simple, but clever, lock mechanism is concealed. Two pieces of plywood, separated by plywood strips, form a "hollow core" door, inside which the locking mechanism is located, Fig. 2. Pressing one of the decorative buttons on the door flexes a flat steel spring that allows the latch strip to slide back, pulling the bolt with it. The bolt itself is a length of $\frac{1}{4}$ -in. brass rod soldered to the latch strip, which is a $\frac{1}{2}$ x 3-in. piece of sheet brass. The latch strip slides between two guides. These guides are strips of wood to which metal strips are tacked to form flanges. A strip of brass is soldered to the latch strip to act as a "catch," bearing against the flat spring in the locked position. When the spring is flexed, the strip slides underneath it, upper right-hand detail, Fig. 3. Several of the buttons can be made to push against springs, but only one releases the lock. The "dummy" buttons serve to further confuse anyone attempting to work the lock. These movable buttons are kept in place by sheet-metal disks nailed and cemented to their inner ends. The fixed buttons also have disks attached, but are kept in place by wooden strips nailed over them as indicated. The buttons are $\frac{1}{2}$ -in. lengths of $\frac{5}{16}$ -in. hardwood dowel. The "push button" lock may be assembled so that several buttons must be pushed to release it. ★ ★ ★





Designed for the Family Boating Bureau of Johnson Motors
by Dave Chapman, Inc., Industrial Design

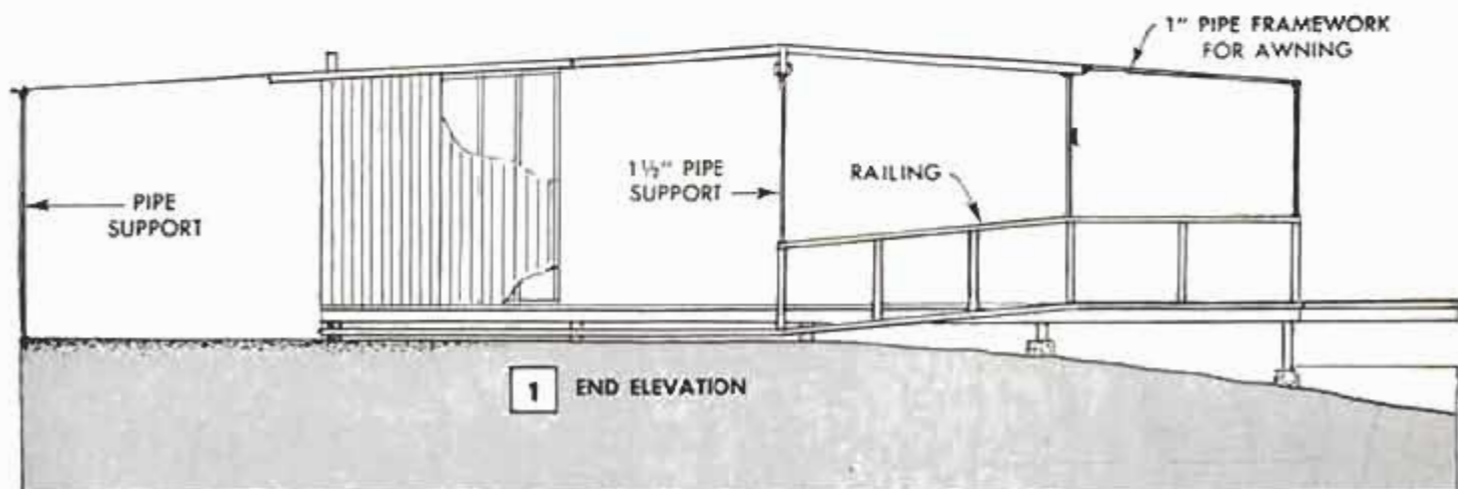
LAKESIDE RETREAT

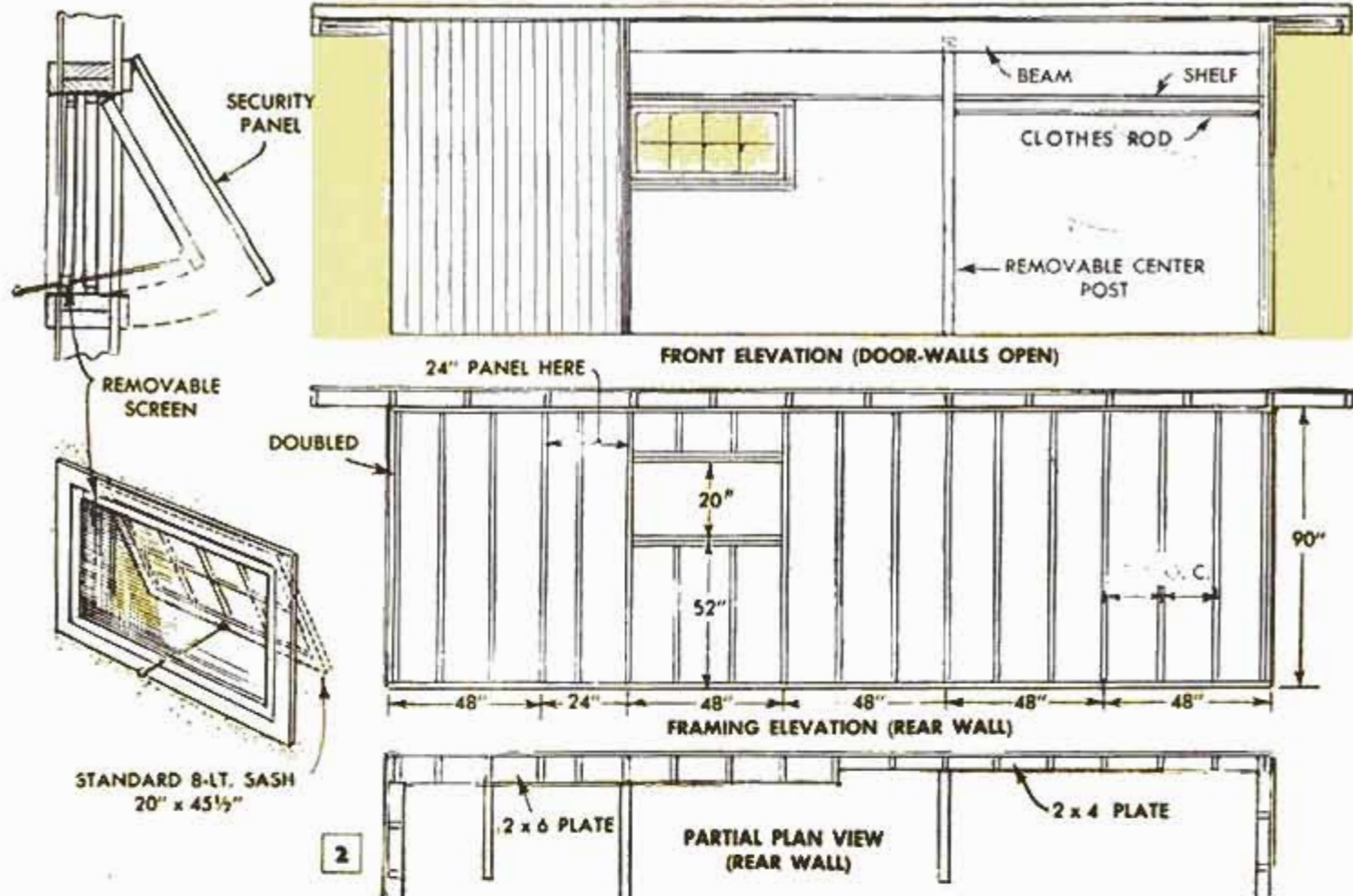
for the boating and water-sport family provides basic living accommodations for the summer and stows away for the winter

LAST MONTH in our outdoor-living section we told you all about this unusual and most appealing waterside home. Perched at the water's very edge, this boater's dream home brings the lake or stream right to the door, where the boater can virtually park his craft in the living room. The canvas roof and the roll-up side-walls, plus furniture and even your boat, store away for the winter in a free-standing structure which is the core of this summer home. Referring to the floor plan in Part I, the core houses kitchen and bathroom, as well as space for sleeping and storage, and is designed to accommodate

standard apartment-size appliances and bathroom fixtures. While planned so it can be expanded to eventually permit year-round living if desired, the basic structure provides the minimum in living requirements so it can be built on a limited budget and in easy stages.

Unless the water site you pick is in a remote area, you should not have to worry about power since electric service is generally available near most lake areas. You will have to give some thought to a water supply and to a septic system. You should first check with local or state authorities in regard to required distances from a lake

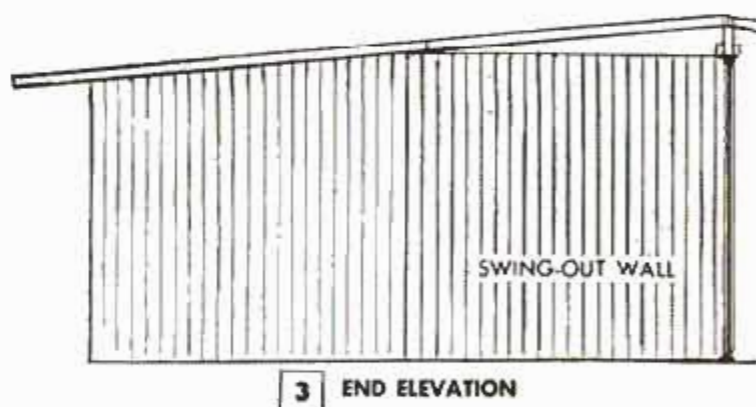




for drilling a well and you should also check your local code as to any restrictions regarding dwellings along lakes or rivers.

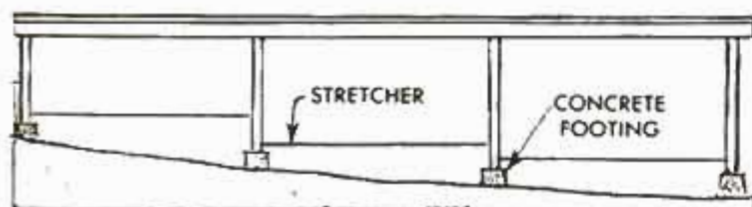
Setting the posts, or pilings, that support the platform and pier is an individual problem. The particular site and the depth of water along the shore will rule whether you can successfully do this part of the work yourself. Where the water is fairly shallow offshore, it may be possible to sink precast concrete units, with posts embedded, by floating them in position on a makeshift raft. Caissons, improvised from open-end plywood forms or oil drums and bailed free of water, may let you pour a suitable piling. Then again, you may be able to merely drive pointed 4 x 4s into the lake bottom and saw off the tops evenly. If there are no objections, the pier part could be made a floating affair and hinged to the platform. When it comes to the pilings you may find it wise and more practical to have this part of the work done.

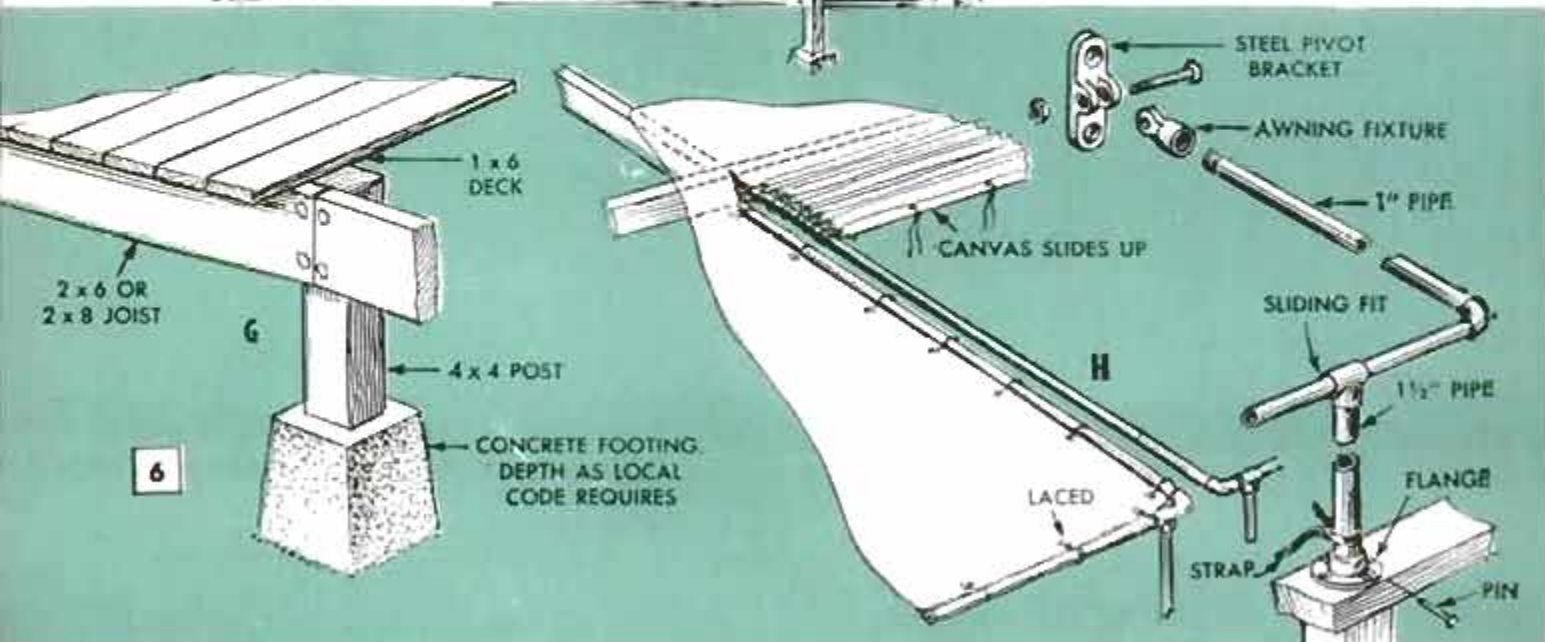
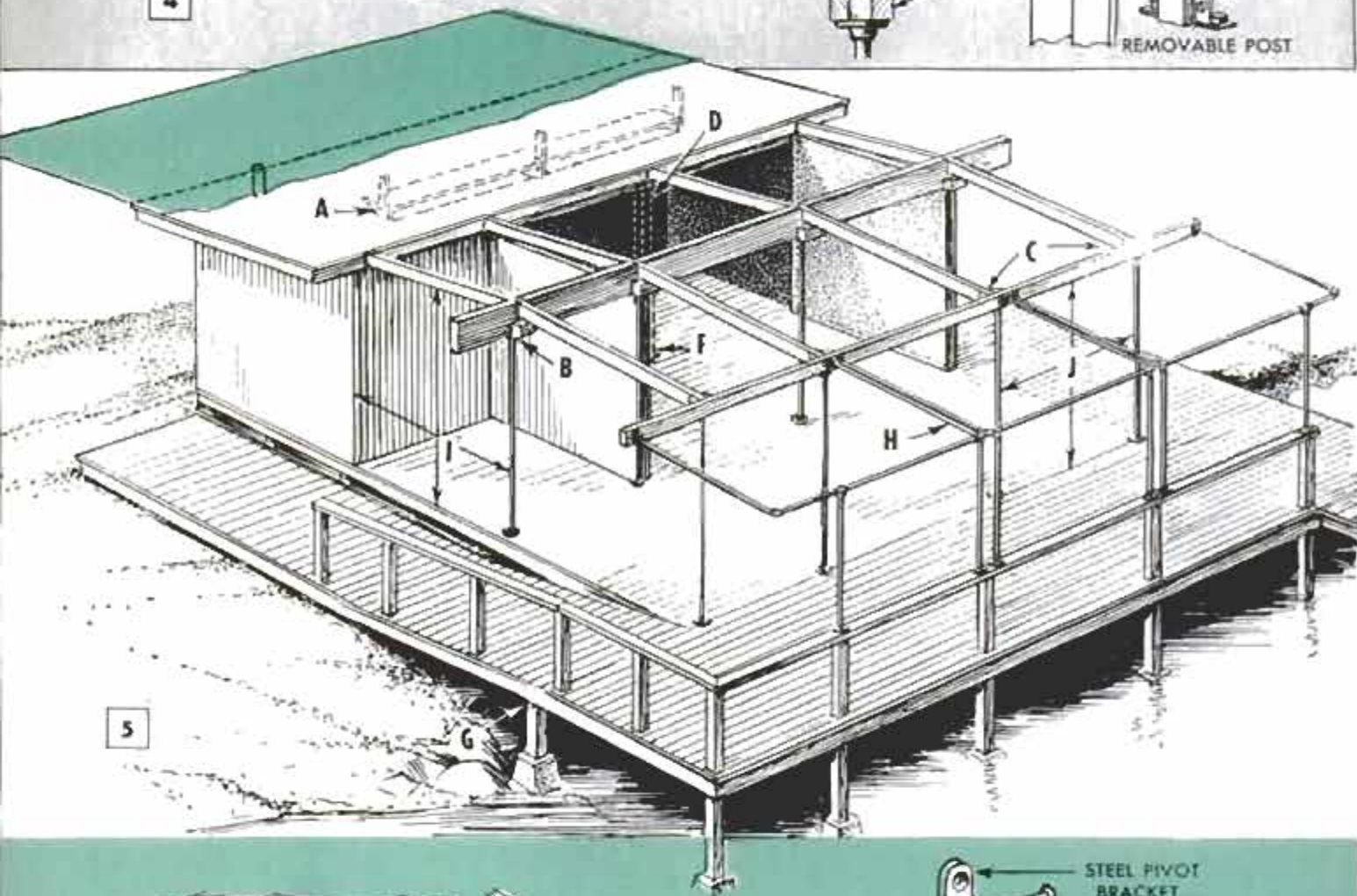
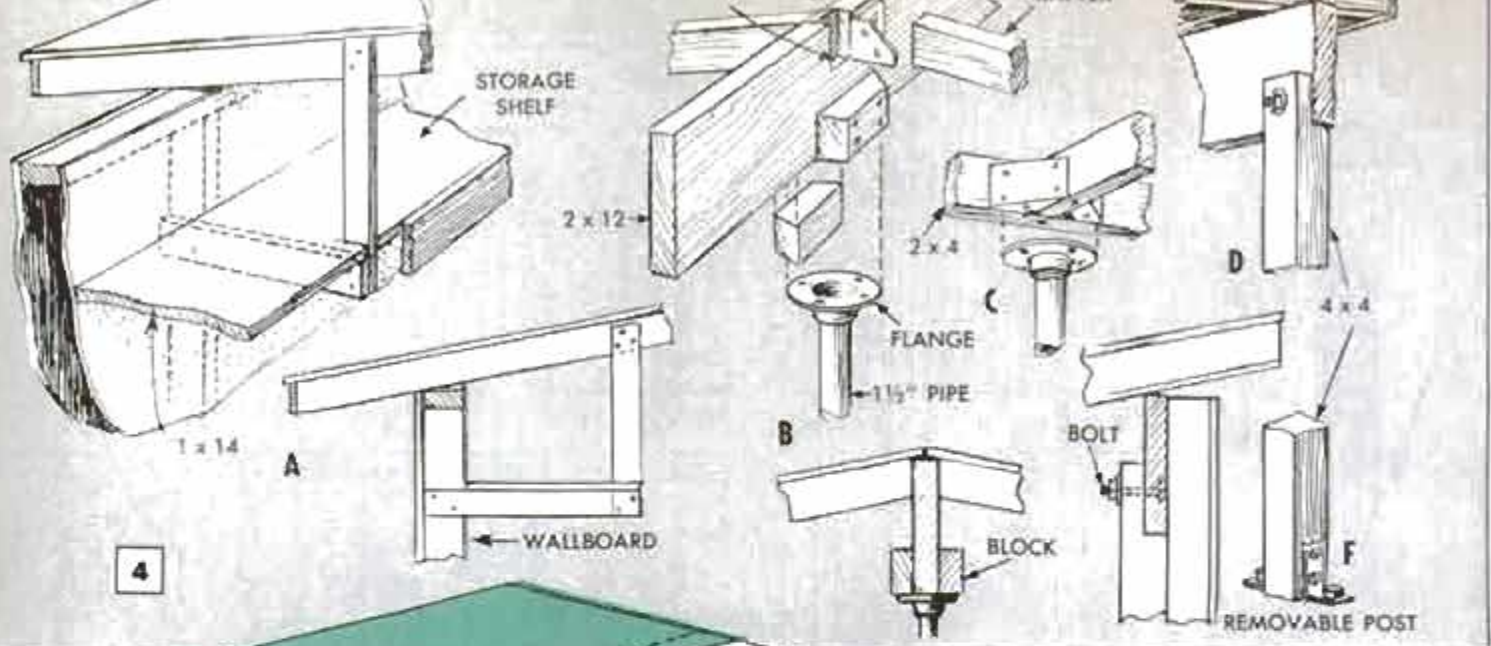
The platform should be of a size to permit a walk area on three sides, and from the floor plan you will note that a ramp is



constructed along one side to aid in wheeling a motor dolly or barbecue onto the platform. The latter is constructed similarly to the floor of a house, using either 2 x 6s or 2 x 8s for floor joists and bolting them to the faces of the 4 x 4 posts, as in Fig. 6. The joists are floored with 1 x 6 boards and spaced everywhere except the floor of the core.

Figs. 2 and 3 detail the core, which measures 8 x 22 ft. and which is placed at the rear of the platform. As pointed out in Part I, most of the front wall of the structure swings open like the front of a garage to form partitions to give sleeping privacy. A central post, which is removed when the swing-out walls are open, gives support to these door-type walls when closed. Construction of the core follows typical wall

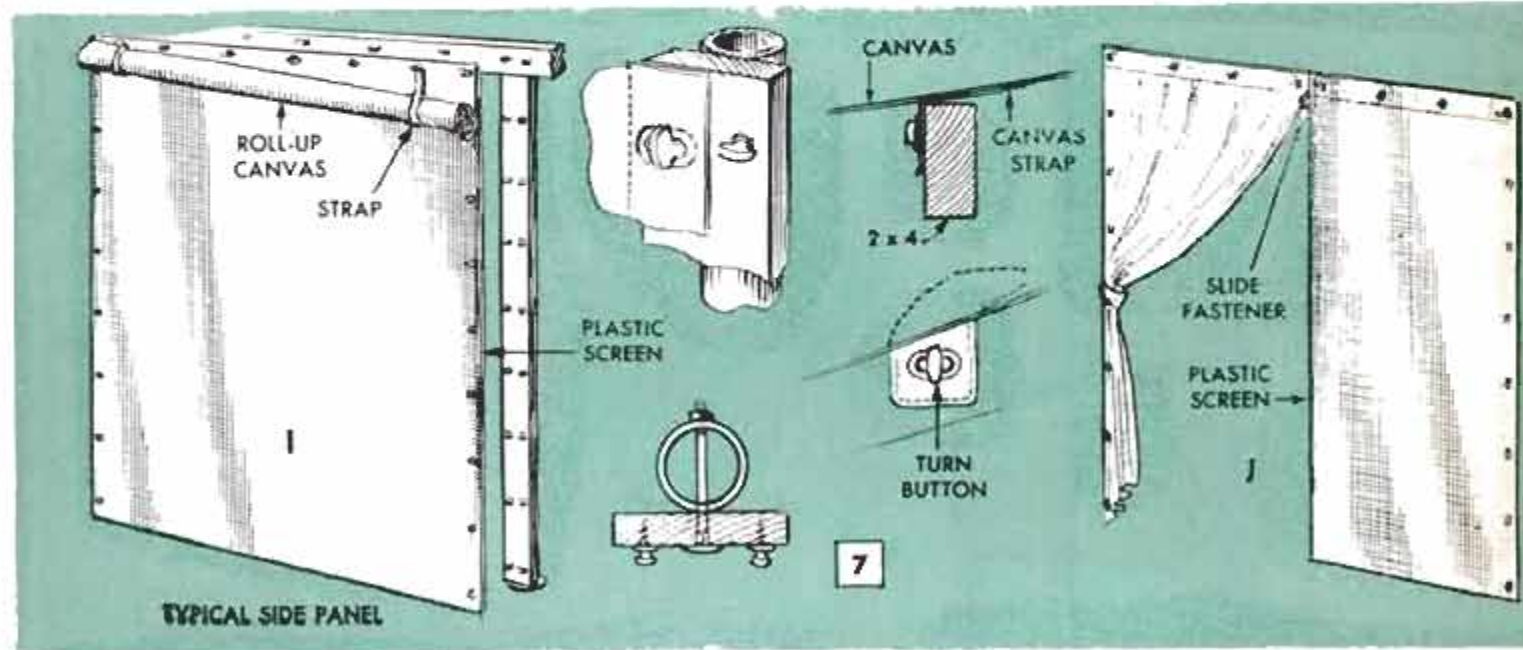
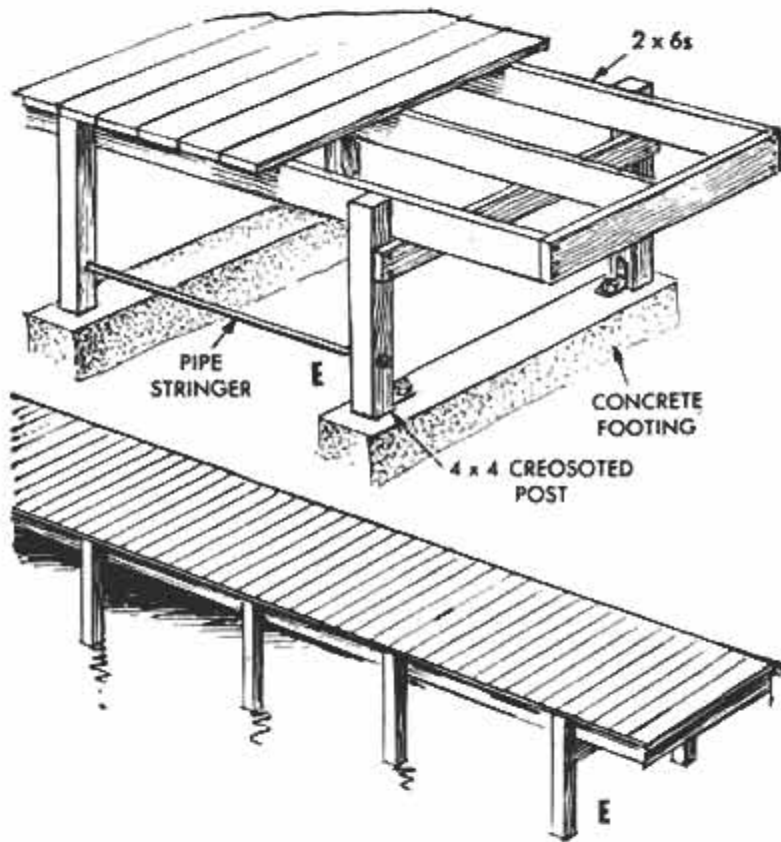




construction, the 2 x 4 studs being placed 16 in. o. c. and toe-nailed to a plate at the bottom. You will notice in the partial plan-view drawing of the rear wall that a portion of the wall is framed with 2 x 6 studs to provide the extra thickness required for the installation of the plumbing. A 2 x 10 header, or beam, spliced if necessary, is placed across the front wall of the core to give adequate support to the roof rafters across the open front. This is located in back of the fixed-wall section so that the swing-out walls close against it at the top. The rafters are 2 x 4s set 24 in. o. c. and decked over with 1 x 6 roof boards or exterior plywood. The opening for the window is made to receive a stock 8-light sash. An overhead shelf, extending the length of

the core from the bathroom wall, provides a place for storing the roll-up side curtains, as well as general storage. Detail A in Fig. 4 shows how this shelf can be hung by pieces nailed to the rafters and wall studs. Detail D shows how the removable post, previously mentioned, is temporarily bolted in position at top and bottom. The upper end of the post is notched to come flush with the outside face of the header.

Fig. 5 shows the arrangement of the various pipe posts that support the tent roof. The 2 x 12 beam supported on edge and notched for the rafter ends, actually forms the ridge of the canvas roof and is placed at a height which will continue the pitch of the core roof. Detail B, Fig. 4 shows how the beam is supported by four pipe posts fitted with flanges at both ends. As you will note in Fig. 3, this beam is located to allow the swing-out wall to open at right angles and meet the supporting post. The second roof-supporting beam, which is a 2 x 4, is supported by pipe posts in a similar manner, detail C showing how blocks are added to accommodate the flanges. The rest of the supporting framework is assembled of pipe and awning fittings and is hinged to the rest of the structure so it will fold down when the house is stripped for winter. The flanges which hold the pipe posts along the railing are reamed of their threads and drilled cross-wise for removable pins. See detail H, Fig. 6. Note here also how the canvas at this point is laced to the pipe so it can be pushed back for more sun. The combination screen-and-windbreak side panels are shown in Fig. 7, details I and J. Wood strips bolted to the pipe posts and fitted with turn buttons allow the plastic-screen panels to be buttoned in place. A roll-up canvas covers the screen. The entrance panel can be placed anywhere across the front. ★ ★ ★



TYPICAL SIDE PANEL



"Floating" Gauge for Planter Provides Seed Reserve

There still is seed in the seedbox when this gauge drops to the bottom, letting the tractor operator know that more is needed. The reserve seed assures the operator that he has left none of the rows unseeded. A length of steel rod forms the upright of the gauge, and is painted a bright color so it is clearly visible. The "float" portion of the gauge is a square of sheet metal fastened to the lower end of the rod. The corners of the square are turned down, so the float slides freely inside the seed container.

A. M. Wettach, Mt. Pleasant, Iowa.

Cleaning a soldering iron while working with it is no trick if the shell of an electric-lamp socket is fastened to the workshop wall or bench and filled with steel wool. The hot iron then is forced into the wool and rotated to clean it. Attach the socket by driving a wood screw through the hole in the bottom.

Name Tags on Plug-in Cords Identify Respective Power Tools

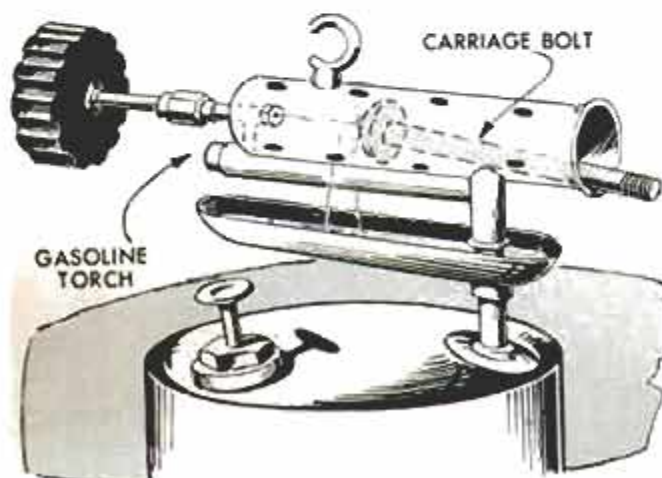


When a number of power tools are used in a shop, there is always the possibility of connecting the wrong machine. In the case of circular saws, jointers and the like, this can be dangerous, especially if several people are working in the shop. Such accidents can be prevented by fitting small cardboard disks on the wires near the plugs, to identify the machine to which the wire belongs.—H. Hanscom, Elmhurst, Ill.

For out-of-the-way storage of hats or caps on a long automobile trip, fasten a heavy cord across the back of the front seat. Attach a number of spring-type clothespins to the cord and the "storage rack" is complete. Hat brims or cap bills are clamped to the cord by the clothespins.—Charles V. Mathis, Wildwood-by-the-Sea, N. J.

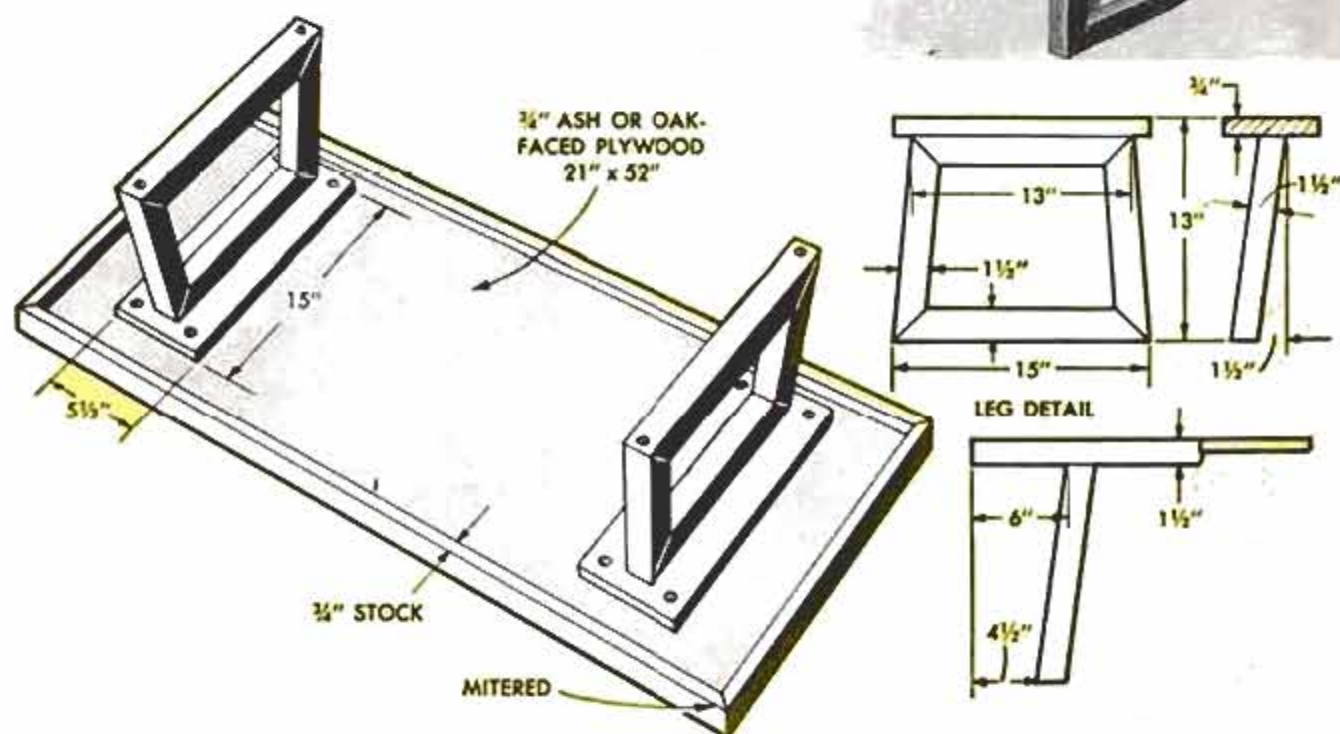
Bolt Is Blowtorch "Accessory"

To fill the heating pan of a gasoline blowtorch quickly, without having the fuel squirt out onto the workshop floor or bench, insert a carriage bolt as indicated. The round head of the bolt will deflect the stream of gasoline from the nozzle, causing it to run down into the heating pan where it can be ignited to warm the torch nozzle. The carriage-bolt method is much safer than the practice of holding a hand over the end of the torch, with its attendant danger of burning the hand.



STRAIGHT-LINE MODERN COFFEE TABLE EASY to BUILD

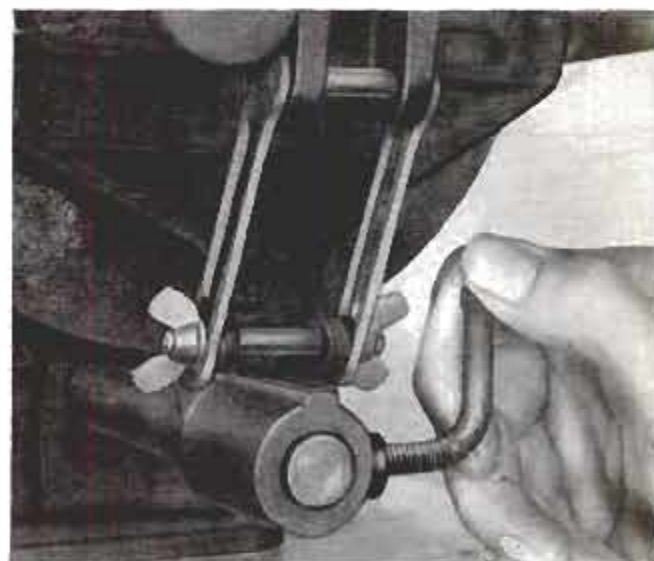
Because of its straight-line simplicity this coffee table is as easy to build as it is handsome. The top is cut from a piece of hardwood-faced plywood around which is mitered and fitted an apron of $\frac{3}{4}$ -in. hardwood stock of matching grain. The legs are cut and assembled with glue and screws, the latter being driven from the bottom and top where they will not show. These leg assemblies then are screwed and glued to wooden pads that are screwed to the underside of the top. The pads are not glued, to permit disassembly.—M. C. Anderson, San Lorenzo, Calif.



Lever-Shaped Bolts Replace Locking Units on Power Tools

On many machines conventional bolts are used to "lock" adjustable parts in position, a process which requires that a wrench be used. Too often the wrench is mislaid and time is wasted hunting for it. If you have this problem in your shop, much time and trouble can be saved by replacing the locking bolts with longer bolts that have been modified. The modification consists of grinding and filing the bolt heads to a knob-shape, then bending the bolts to form levers, as shown in the photo. The wrenches are no longer necessary, as the leverage of the modified bolts provides sufficient torque to lock a machine part in position when moderate pressure is applied.

H. Hanscom, Elmhurst, Ill.





REMOVING A SHEET OF GLASS from a table top for cleaning is difficult when the table has a raised edge. A coat hook or other device with a suction cup attached can be used to raise the glass to insert the fingers beneath it for easy removal



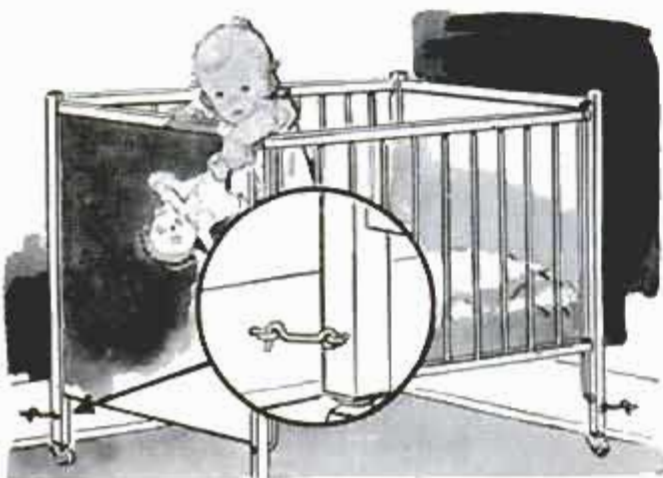
IN A BASEMENT LAUNDRY ROOM, hang freshly ironed clothes on hangers slipped over a long towel rack or curtain rod fastened to one of the exposed joists. An ideal spot, too, for wet raincoats and other outer garments to be hung while they are drying

RIGHT, PROTECT A WALL FROM BABY HANDS and toys by hanging a shower curtain from picture molding. The curtain can be a permanent protection in a nursery, in a color that harmonizes with room decor, or a temporary arrangement for a visiting youngster

Solving HOME PROBLEMS

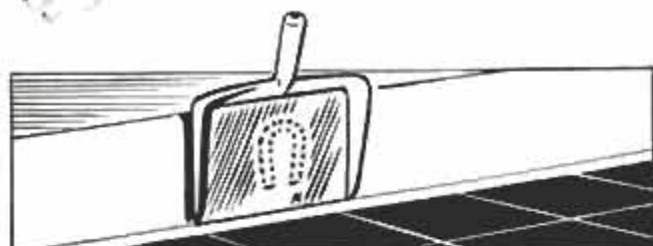


BOUNCING TODDLERS IN CRIBS can move their beds by their energetic action, and possibly roll to a location where they can reach trouble. To prevent this happening, use a couple of screen-door hooks and eyes. Drive the hooks into the crib legs, the eyes into a baseboard as indicated. When the crib is to be moved, the hooks are released quickly





NO SPACE ON THE KITCHEN TABLE or counter tops for lunch when mother is doing a lot of baking or canning? Make the meal an adventure for the youngsters and less work for mother by improvising a table from two counter drawers pulled out about $\frac{2}{3}$ their length. A table leaf or a couple of stiff place mats are laid across them and the table is complete. Kitchen equipment is handy, and mother does not have to walk to and from dining room, nor does she have an extra room to clean afterward



DUSTPAN ALWAYS IS HANDY when stored on magnet cemented to an out-of-way spot on the baseboard

FLOAT A BOUQUET OF SMALL FLOWERS in a bowl of water by using a disk cut from the heavily waxed cardboard of a milk carton. Flowers are supported by inserting the individual stems in holes punched in the disk. Because it is so thoroughly saturated with wax, the disk will float almost indefinitely



PREVENT THE LOSS OF BEADS next time the string is broken accidentally by applying a liberal coating of hard soap to the string when the beads are restrung. Although one or two of the beads may drop off when the string is severed, the rest will remain in place, held by the adhesive quality of the soap



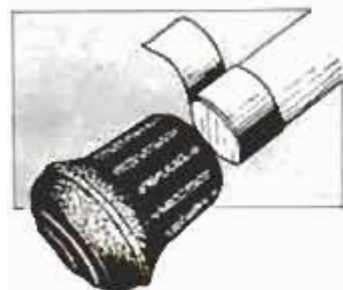
Dressers Replaced With Built-Ins to Provide More Floor Space



Where children have bedrooms in a remodeled attic, more floor space for playing can be provided by eliminating dressers and substituting built-ins. One of the walls is removed, the roof is insulated and framing is built for drawers. They can be built to fit, or purchased in stock sizes. The three lower rows of drawers in the photo measure 20 in. front to back, while the top two rows measure 6 and 9 in. This measurement will vary also with the vertical height of a drawer, but allows the drawers to "step in" so they fit under the slant of the roof. For large toys, cabinets with doors can be substituted for the drawers. Frances Baldwin, Ontario, Can.

☐ If the ends of your bamboo garden rake are worn, soak them in very hot water about 5 min., then bend the ends under again with a pair of pliers.

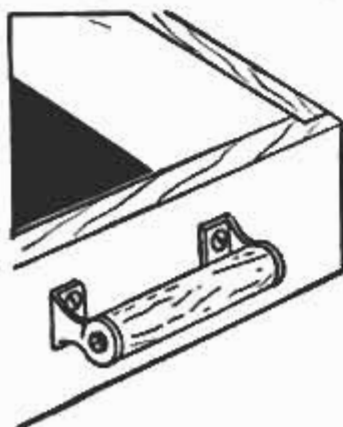
Tape Secures Crutch Tip



Several turns of friction tape on the end of a cane or crutch will reduce the chance of losing a rubber tip, the loss of which could present a serious problem. The tape

enlarges the crutch or cane end slightly for a tight fit, and is tacky so it provides friction against slippage.

Easily Made Shop-Drawer Handle



Two shade-roller brackets and a length of $\frac{3}{4}$ -in. dowel can be assembled to provide a neat and practical handle for a workshop drawer. Do not attempt to use the shade roller itself, as they are hollow and made of soft wood that would break

easily if much pressure were required to pull open a heavy drawer.

Badly clogged files can be cleaned by brushing with full-strength muriatic acid. Allow to stand a few minutes, then rinse with clear water. Brush the files with a solution of baking soda and water, then rinse again, dry thoroughly and oil.

Kit for Socket-Head Wrenches

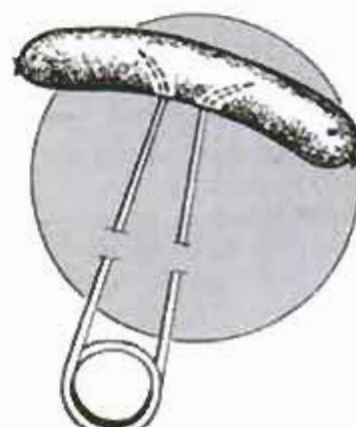
Quickly made and easy to carry in a toolbox is this kit for socket-head wrenches. It is a rectangle cut from an inner tube, with slits in it to accommodate the sizes and number



of wrenches to be carried. The holder can be rolled up and fastened with a rubber band.—D. Spichuk, Brooklyn, N. Y.

Slipproof Roasting Fork

Bent from heavy wire to the shape shown, this self-spreading fork will hold a hot dog securely over a fire. The fork tines are pressed together before inserting so they spread to grip the hot dog. Length of the fork can vary,



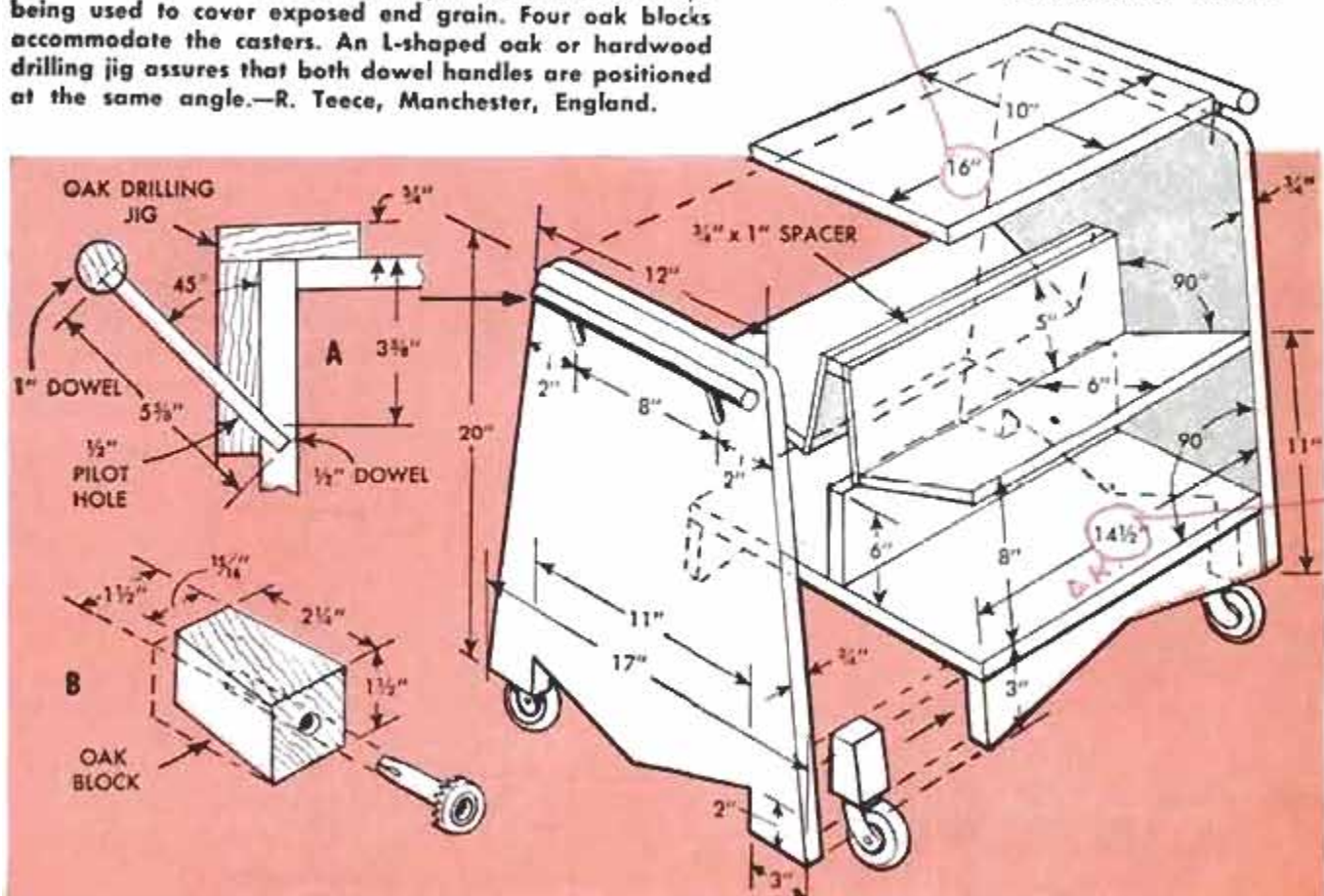
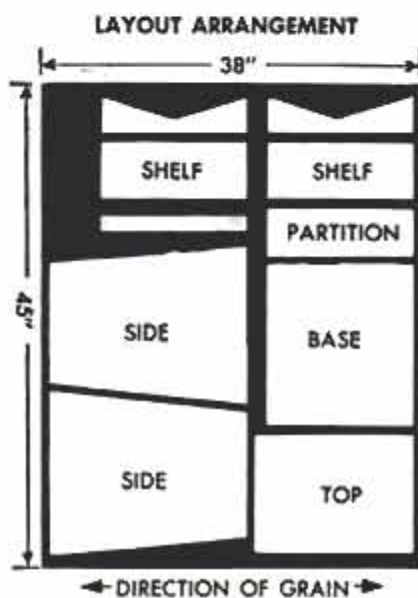
but about 18 in. is right for keeping hands clear of a fire, and for easy storing.

Valuable rings can be hidden by slipping them onto a cup hook screwed to the underside of a cabinet top, or some other out-of-the-way location that is known only to you and other members of your immediate family.



"Mobile" Bookcase

Easily moved about a room so it can be positioned next to a favorite easy chair, this "mobile" bookcase carries a generous supply of books and magazines on its shelves and the top holds smoking supplies. The unit also is handy for late-evening snacks, as it can be wheeled into the kitchen, loaded with food, then returned to the living room. The pieces for the cabinet can be cut from solid stock or $\frac{3}{4}$ -in. hardwood-faced plywood, veneer strips being used to cover exposed end grain. Four oak blocks accommodate the casters. An L-shaped oak or hardwood drilling jig assures that both dowel handles are positioned at the same angle.—R. Teece, Manchester, England.



Shield Over Flowers Permits Spray-Killing Shrub



When shrubs or wild growths must be dug out of a flower bed, it usually is difficult to avoid damaging the plants in the bed. Avoid the need for a shovel by using a weed-killing spray, first covering the flower bed with a protective shield of paper, cloth or sheet plastic supported on light stakes. All seams are sealed with tape. After spraying, remove cover, cut plant out of the way, then remove its roots at end of growing season. — Arthur N. Nelson, Kansas City, Mo.

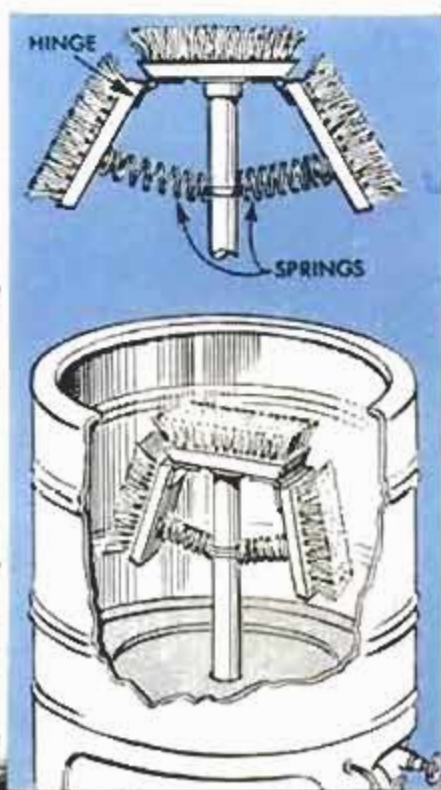
How to Reinstall Loose Casters in Furniture Legs

When the caster assemblies fall out of the legs of furniture the following method can be used to eliminate the problem. Select a dowel of a size that is a tight fit in the hole in the leg, coat the dowel with glue and drive it in place. When the glue has set, saw off the dowel flush with the

bottom of the leg. Drill a new hole, slightly smaller in diameter than the sleeve of the caster, coat the sleeve with soap and drive it into place. The shank of the caster, of course, then snaps into the sleeve. Apply light grease to the shank and light oil to the caster-wheel axle.

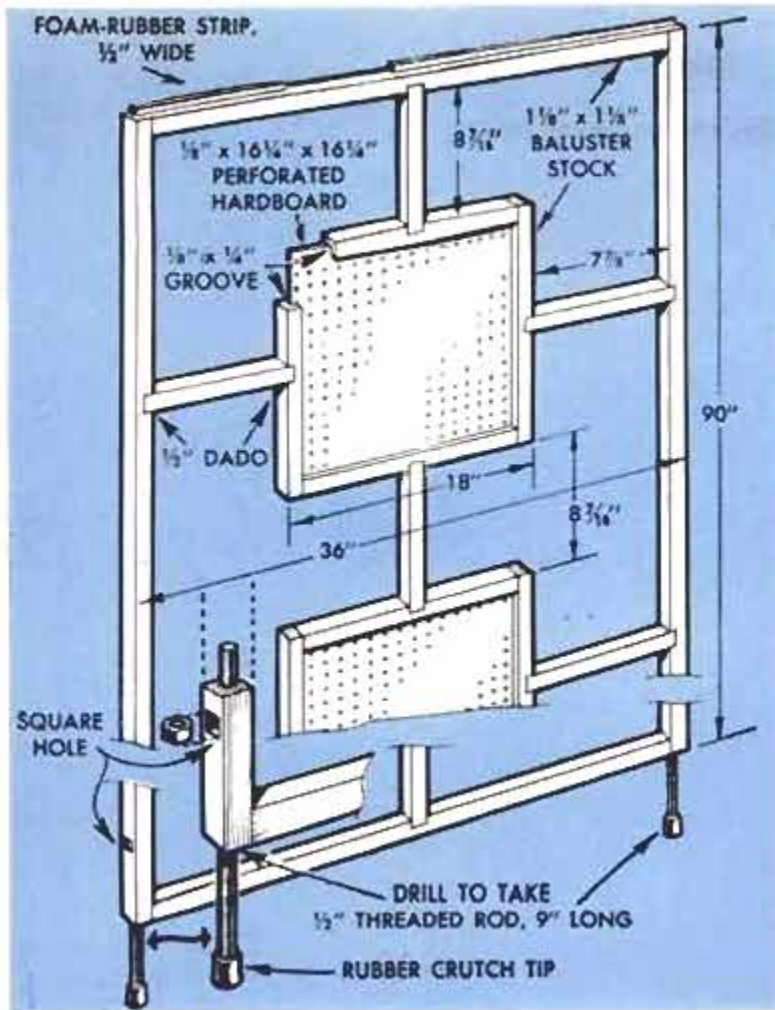


Scrubber Built From Old Washing Machine Saves Time When Cleaning Milk Pails



Pail-washing time is reduced to a minimum on one farm with the aid of an automatic pail washer built from a wringer-type washing machine. The regular agitator is removed and replaced by a length of pipe with a floor flange on the upper end. Three scrub brushes, joined with heavy strap hinges, are attached to the flange as indicated. Two fairly heavy compression-type springs keep the side brushes under tension so they bear against the side of a pail. The machine is filled with hot, soapy water and the pails are pushed down over the agitating brushes that scrub them clean in moments. — Charles L. Stratton, Windham, N. H.

Portable Room Divider "Jacks" Against Ceiling



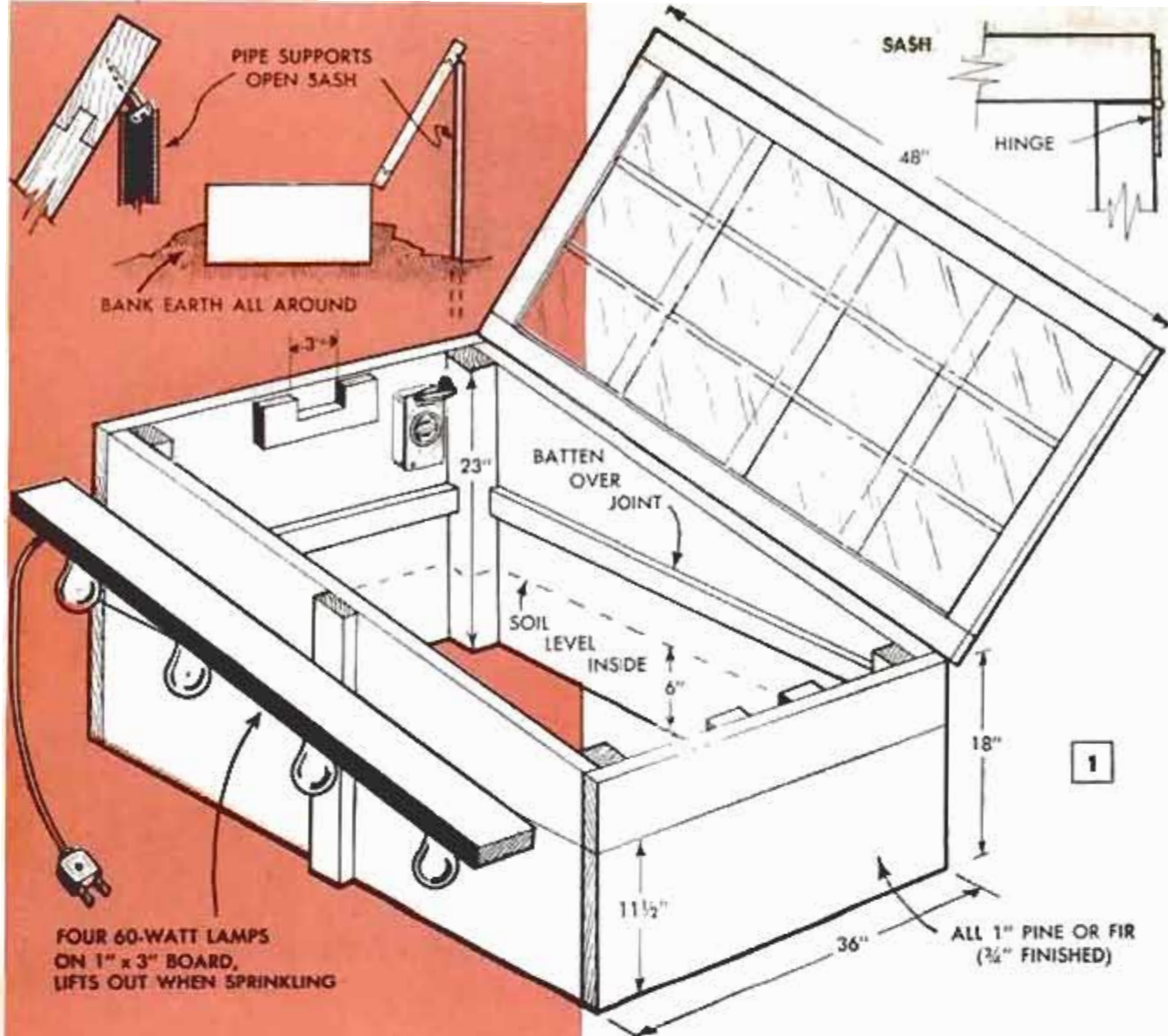
QUITE OFTEN a room divider, especially one placed at an entrance to create a foyer, would be of greater value in a home if it could be removed or its position changed occasionally. By using adjustable legs as jacks, the Masonite Corporation has designed just such a divider. For a room divider of this type, with a 6-in. height adjustment, 1 1/8 x 1 1/8-in. stock is used for all frame members. Three pieces of perforated hardboard, 16 1/4 in. square, also are required. Ends of the inner crosspieces are set in 1/2-in. dados in each side and end member at the center and also 19 1/16 in. from each end of the side members. The perforated-hardboard panels, which are centered down the length of the divider, are framed in pieces of grooved square

stock. Adjustable legs for the divider consist of 9-in. lengths of 1/2-in. threaded steel rod. They fit into holes drilled 9 in. deep in the lower end of each vertical frame member. Nuts, into which the legs fit, are located in 3/4-in. holes drilled at right angles to the legs. Square holes for the nuts can be made with a mortising chisel in a drill press, or a wood chisel can be used to square up the bored holes so that a flat bearing surface is provided. Rubber crutch tips are slipped over the ends of the legs to protect the floor. To prevent damage to the ceiling, a strip of foam rubber is cemented to the upper crosspiece of the divider. Wire hangers inserted in the perforations of the hardboard will support small shelves, as indicated. ★ ★ ★

Straightening Bent Candles

Candles that droop because of excessive heat can be straightened by placing them in a flat-bottomed pan filled with water at about 80 deg. F. Add small amounts of hotter water until the candles can be straightened easily. Once they have been reshaped, drop the candles into a container of cold water so they reharden.





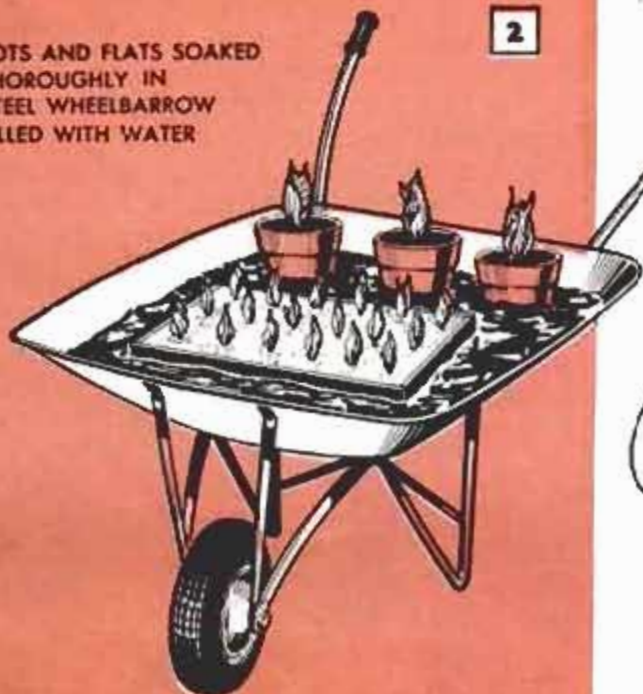
FOUR 60-WATT LAMPS
ON 1" x 3" BOARD,
LIFTS OUT WHEN SPRINKLING

Produce from your garden will be on the table weeks ahead of time if you build the cold frame shown above. Seeds planted early will be young plants by the time the weather is warm enough to permit planting outside. Lamps provide heat on cool nights and sunless spring days

Below, to assure that seedlings in pots and flats receive enough moisture, soak them thoroughly in a water-filled steel wheelbarrow

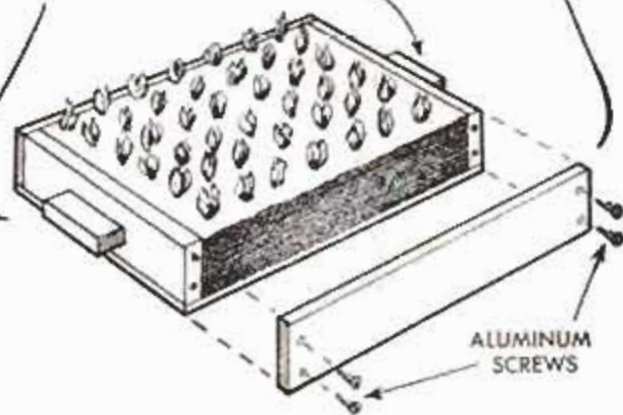
If you build your own flats, assemble them as shown below, with handles for easier lifting, removable sides for simpler transplanting

POTS AND FLATS SOAKED
THOROUGHLY IN
STEEL WHEELBARROW
FILLED WITH WATER



HANDLES FACILITATE MOVING FLATS

SEEDLINGS EASIER TO
REMOVE WITH SOIL
BY TAKING OFF ONE SIDE



ALUMINUM
SCREWS

Garden Hints

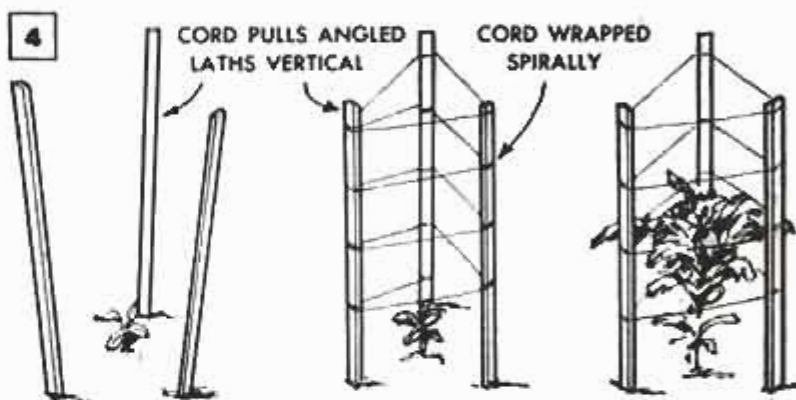
By Hi Sibley

SPRING IS THE TIME not only for planning a garden, but for getting a head start with seedlings so your "crops" are ready for the table weeks ahead of time. It also is time to consider how to keep birds away from the newly planted seedlings, and how to support plants, such as tomatoes, when they are full of heavy, ripe fruit.

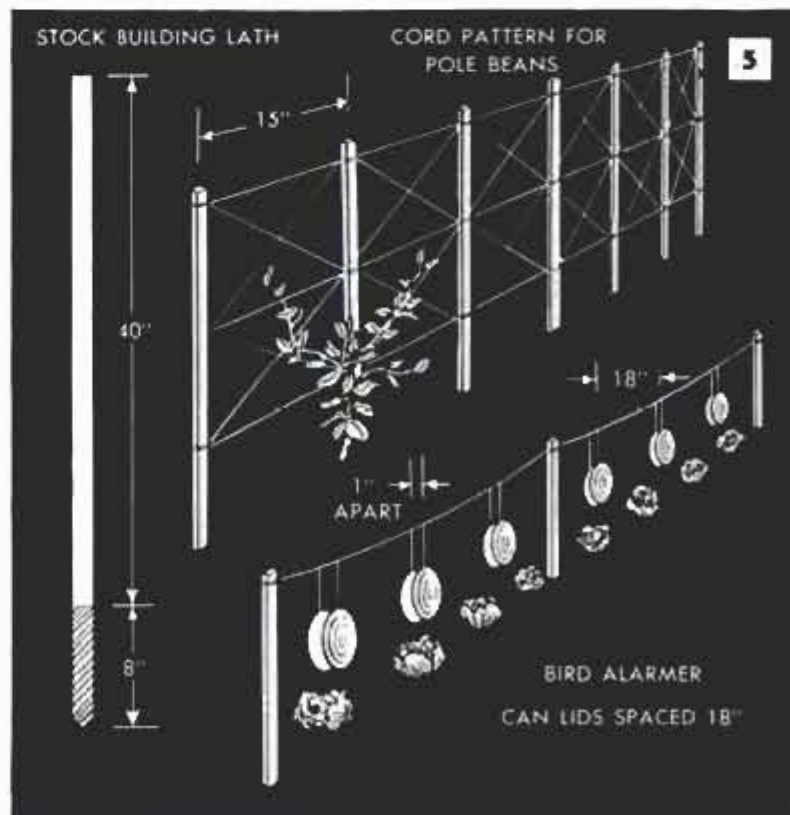
For growing young plants from seed, a cold frame, Fig. 1, is the answer if you have enough room. A stock window sash, available at most lumber dealers, is hinged to a box built of creosoted lumber. An underground cable brings house current to a weathertight receptacle which furnishes electricity to a "lift out" board that holds four 60-watt lamps to provide heat on chilly nights and sunless days. The weather-tight receptacle is closed when plants in the frame are sprinkled.

If you have no room for a cold frame, wooden flats, Fig. 3, and clay pots can be located in a basement or utility room for starting seedlings. It is best to give the seedlings a good soaking once a week, rather than a daily sprinkling. This is true especially in homes with forced-air heat where low humidity will cause fast evaporation. A metal wheelbarrow filled with water will permit giving flats and pots a thorough soaking, Fig. 2. Whether you make your own flats or buy them, fix one side of each unit so that it can be removed as indicated in Fig. 3. Each seedling, with its necessary ball of soil, then can be removed readily. After setting out each tomato plant, drive three laths, strung with heavy cord, Fig. 4, around each one for support when the plant is mature. Pole beans require a fence of cord and laths, Fig. 5. For all plants, tin-can lids strung as indicated in the lower detail in Fig. 5 will help keep away hungry birds. Every whisper of wind will blow the lids together noisily and spin them so the sun will glitter on their shiny surfaces.

★ ★ ★



Supports shown above for tomato plants require only a few laths and some heavy cord. The same materials are used for a "fence" on which pole beans can grow. Lids saved from food tins are strung in pairs to frighten away hungry birds



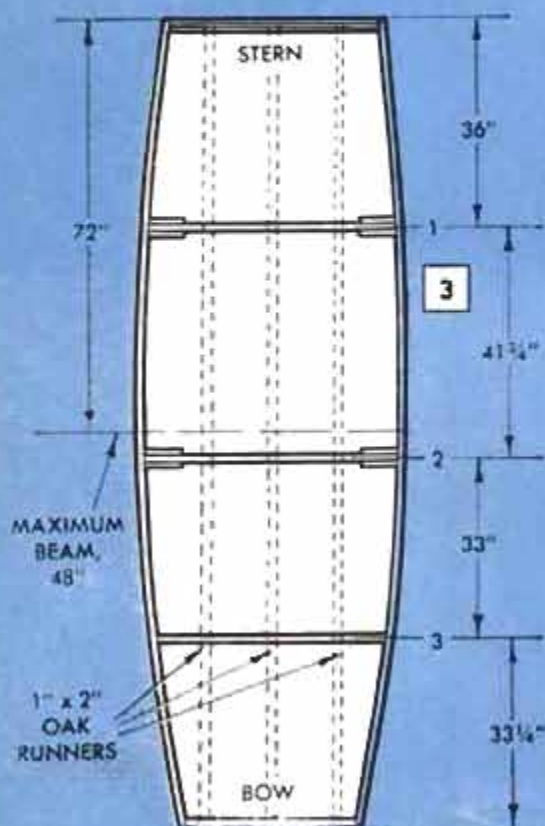
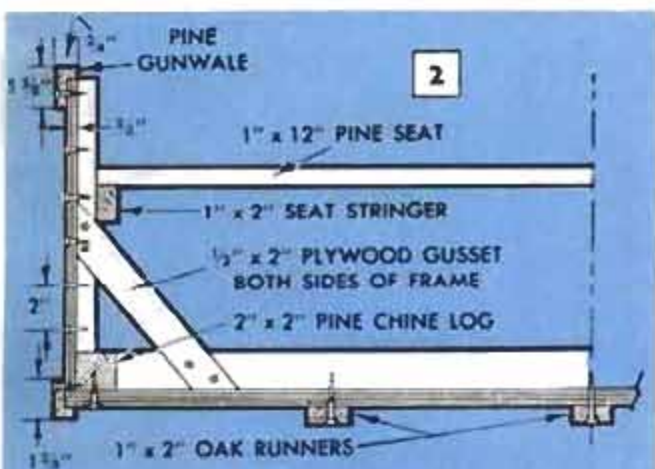
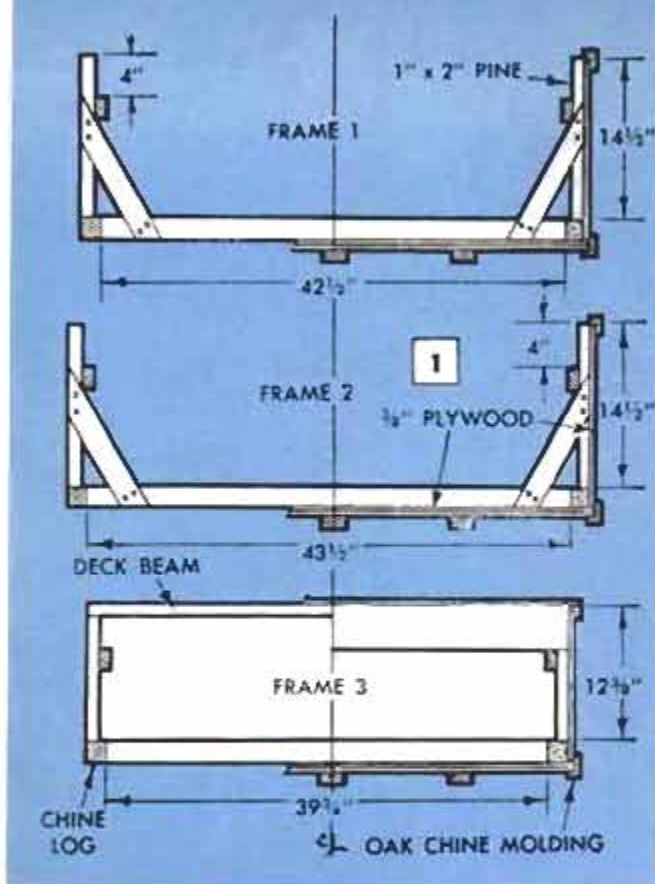
"SWAMPY" Gets You To The Lunkers

By Don Shiner

FISHERMEN WHO LIKE to work the shallow backwaters and weed patches on lakes and rivers will find this flat-bottom scow-type boat an ideal craft. Although the boat is only 12 ft. long, its wide, flat bottom provides more usable space than most round or V-bottom boats of similar size. Low-cost, readily available materials are used throughout. Frames, gunwales, deck beams, chine logs, seat stringers and seat back are made of pine lumber. The runners and chine moldings are solid oak. AB-grade exterior plywood is used for the deck, bottom and side planking and transom— $\frac{3}{8}$ -in. stock for the former and $\frac{3}{4}$ -in. stock for the latter.

Start construction by cutting out the planking. To assure correctly fitted parts and reduce assembly time, make a full-size half pattern of the bottom lengthwise. After tracing one half the bottom from the pattern, the latter is flipped over and the other half is traced on the plywood panel used for this purpose. Next cut the chine logs, seat stringers and frame members according to the dimensions given. Position the frame side members on each of the plywood sides as required. Then glue and temporarily nail them in place, using small finishing nails of a length that will not penetrate the outer ply. Before the glue sets, turn the sides over and fasten the

Solid-oak runners strengthen bottom and protect it from damage when boat is pulled across rocky beach



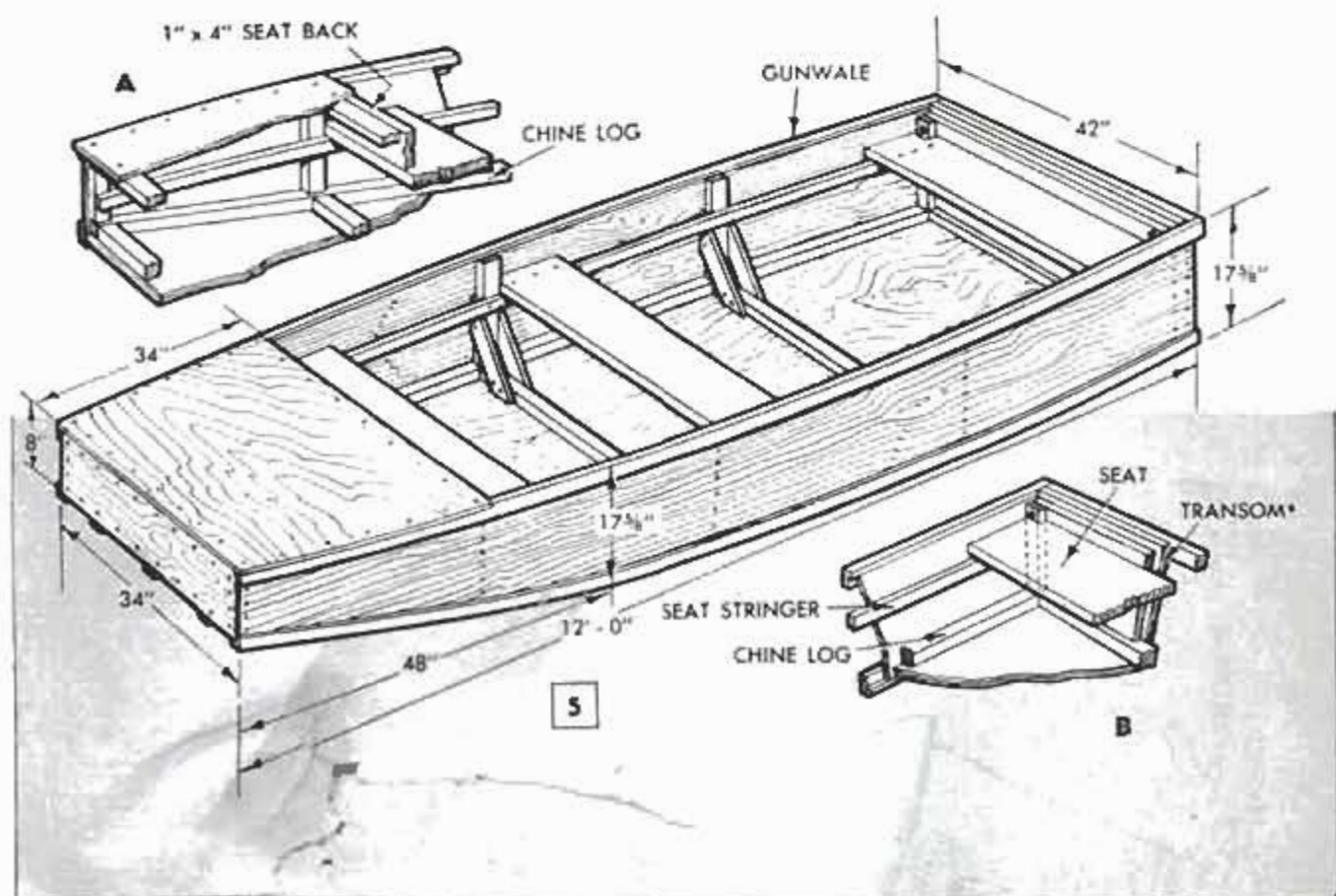


frame sides and chine logs with screws, or annular-ring type nails. Such nails may be used in place of screws for fastening most members.

Next, nail the seat stringers to the frame sides, fasten the bottom frame members in place, and glue and nail the bottom planking to the chine log as shown. Plywood gussets are nailed and glued on both sides of frames 1 and 2 as indicated in Figs. 1 and 5. The transom consists of two layers

of $\frac{3}{4}$ -in. exterior plywood glued together, and screwed to the sides and bottom as in detail B, Fig. 5. To avoid leaks, cut and fit the laminated transom accurately, and apply a liberal coating of waterproof glue on all joints.

The three seats are installed as in Figs. 5 and 6, after which the deck beams and seat back for the bow seat are nailed in place, Fig. 1, and detail A, Fig. 5. If an outboard motor is to be used on the boat, omit





6 Window lifts that are through-bolted to upper corners of transom and bow, serve as carrying handles

7 Chine-molding strip cut from 1 x 2-in. oak, protects chine from damage, can be easily replaced if broken

the molding on the transom and cut the gunwale moldings to fit flush with the back of the transom. Then cut the plywood foredeck to size and nail it to the gunwales and deck beams as shown. Next the boat is turned over and 1 x 2-in. oak runners are attached to the bottom, as in Figs. 3 and 4, to protect it from damage when pulling the boat ashore.

Oak chine moldings fastened to the bottom corners at the sides, Fig. 7, serve as sacrificial members to protect the exposed

plywood edges of the bottom. These members should be bedded in an elastic seam compound and screwed to the boat so that they can be replaced easily when worn or broken. Apply a wood-preservative solution, such as Cuprinol, to all surfaces and cover the completed boat with at least three coats of marine paint. Rowlocks and carrying handles are the only hardware used on the boat. Window lifts serve as handles that are through-bolted to the bow and stern as indicated in Figs. 6 and 7. ★★★



Pointer on Pressurized Paint Can Indicates Direction of Spray

To guard against spraying paint in an undesired direction, when using a pressurized paint-spray can, form a wire pointer as shown in the photo and slip it on the can to point in the direction of the spray. Although most spray cans have a small arrow on top of the spray valve to indicate the direction of spray, it is covered by a finger when spraying, requiring the user to recall the spray direction each time a pass is made over the area to be painted.



Bicycle Lock Secures Clamp Screws To Prevent Theft of Outboard

Here is an easy way of safeguarding an outboard motor against theft when it is mounted on a boat. Simply slip the shackle of a bicycle lock through the holes at the ends of the clamp screws and close the lock as shown. Rubber tape wrapped around the shackle at points of contact prevents rattles. Clamp screws not having such holes can, in some cases, be drilled to take a lock shackle.—A. Jordan, Fresno, Calif.

Suction Cup Deflects Hammer Blows

To avoid striking your hand when using a star drill, slip the suction cup from a plumber's force cup on the drill and hold it in the position shown. Misdirected hammer blows will be cushioned or deflected by the bell-shaped rubber cup, permitting you to work safely and more efficiently.—M. Robert Beasley, Jackson, Mich.



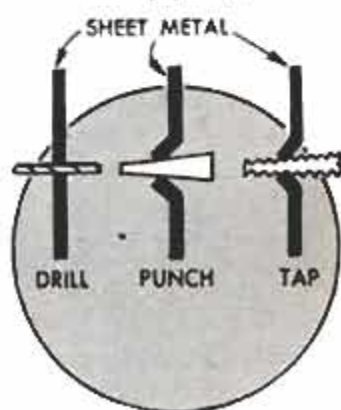
Dirty Carburetor Air Filter Causes Spark-Plug Fouling

Replacing the spark plugs in an engine with a set that will produce a hotter spark will not necessarily result in improved performance, according to the service department of Champion Spark Plug Co. Frequently, the cause of plug fouling is traceable to a dirty air filter on the carburetor that prevents it from getting sufficient air to provide the correct fuel-air ratio. To correct this, simply clean the filter element and clean and refill the oil reservoir to the correct level. If the filter is of the dry type, replace only the element.

The easiest way of determining whether a plug might be contributing to poor engine performance is to note the appearance of its electrodes. When performing properly, they should be dry and gray or light tan in color. Electrodes that are black and sooty but dry usually indicate an over-rich fuel mixture, or insufficient spark to the plug. An oil-fouled plug may mean worn piston parts, or that a hotter plug should be used.

Punched Hole in Sheet Metal "Thickens" Metal for Tapping

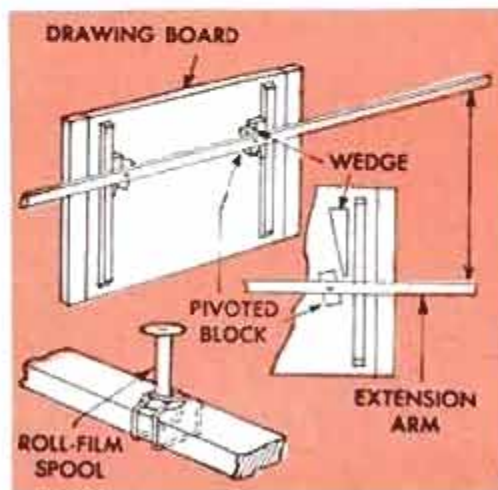
When sheet metal or drive-screws are too short to be used for fastening a part to sheet metal, here is a way of tapping it for machine screws. Drill a small hole in the metal and then enlarge the hole with a prick



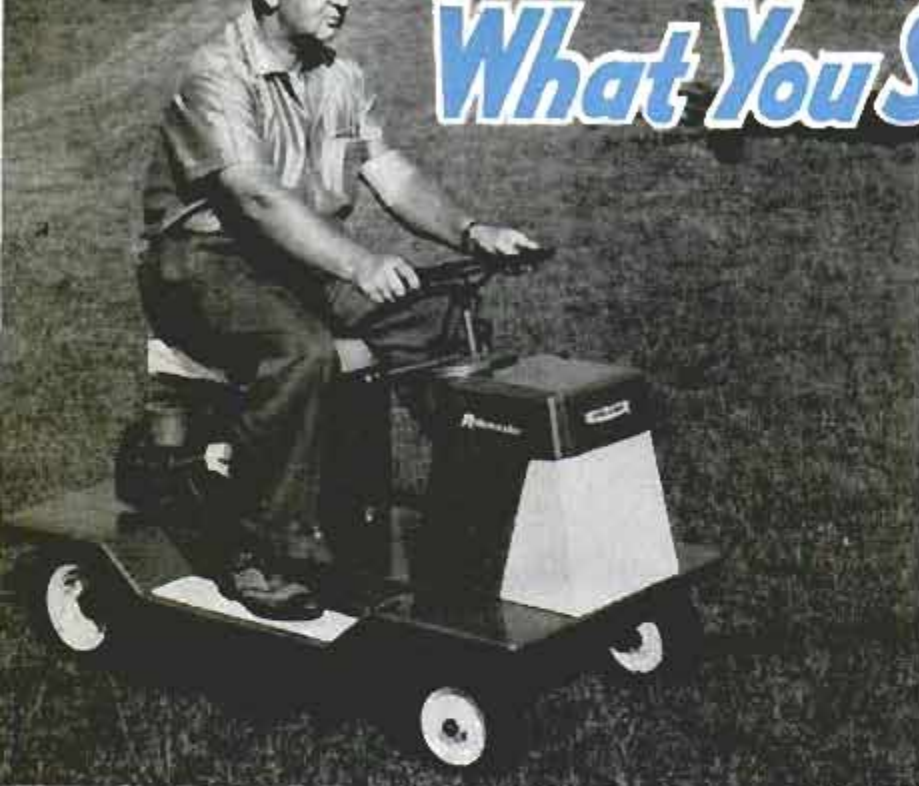
punch to form a small depression in the metal as in the detail. The diameter of the hole should be slightly larger than the hole size recommended for the tap to be used. To accommodate pipe threads, the hole should be punched to force the metal into the same angle of taper as the threads of the tap to be used. When holding power greater than that provided by this method is needed, drill the metal to take a machine screw and braze a nut on it.

Extension Locates Vanishing Points

Vanishing points located beyond the limits of a drafting board usually require the use of some kind of extension arm. The one shown is wedged in position on the back of the board. A film spool serves as the vanishing point. In use, the straight-edge is held against the spool to rule the perspective lines.



What You Should Know



Ridemaster



Moto-Mower

5 BASIC TYPES

RIDING ROTARY

SELF-PROPELLED ROTARY

By Ken Seitz

WITH MORE power mowers on the market than you can shake a stick at, little wonder the average buyer is confused when shopping for power equipment. Currently some 250 manufacturers are producing power mowers in a wide range of sizes and types. Here a little knowledge can go a long way, first, in selecting the right mower for your particular lawn and, second, getting your money's worth quality-wise.

Five Basic Types

There are basically five types of power mowers from which to choose: 1. Push-type rotary mower; 2. Self-propelled rotary mower; 3. Riding-type rotary; 4. Reel-type mower; 5. Trimmer-type reel mower. Which type to choose depends primarily on three things—the size of the yard, the type of grass and the layout of the lawn.

By far the most popular mower today, in terms of the number sold, is the push-type rotary. This type mower generally has a vertical-shaft engine that connects either directly or by pulley arrangement to a cutting blade. The blade rotates at a speed of about 3200 to 3600 r.p.m. and acts like a scythe.

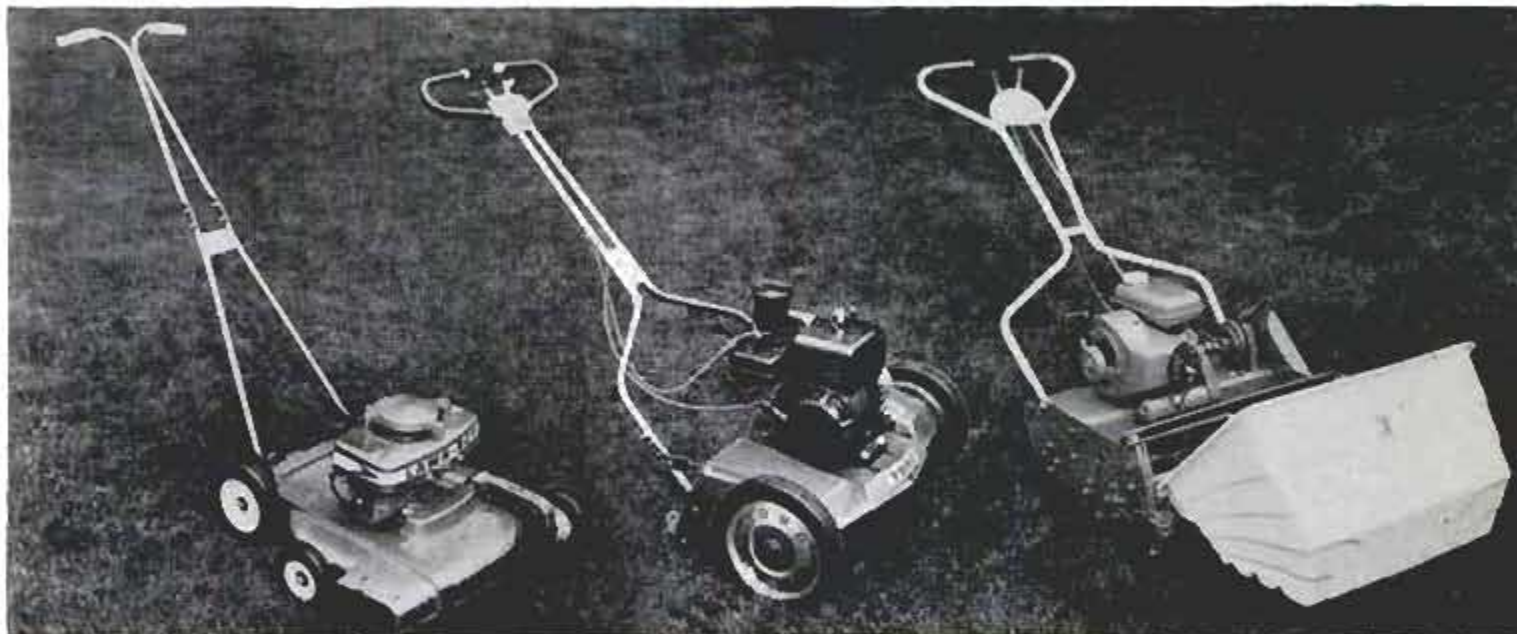
A large part of the popularity of the push-type rotary is due to the fact that they are generally lower in price than the other types. Also, they offer greater versatility in that they can cut fine, coarse and deep grass, including weeds, and can be

used for close trimming along fences and around trees. Other points in their favor are that clippings are chopped so fine they can be left on the lawn, and that most of these mowers have leaf-mulching attachments for pulverizing leaves. They also come in a range of sizes from 18 to 24 in. to fit almost every size yard. Unfortunately, the rotary mower is not practical for cutting the fine bent or low-growing grasses since the blade cannot be set to cut as low, or close, as can the reel-type mower.

Self-Propelled Rotary Mower

As the name implies, this type mower is equipped with a self-propelling mechanism to eliminate pushing. This is the principal advantage and one that is particularly worthwhile where there are inclines to cut and large open areas to mow. On the other hand, where a lawn has a number of trees, hedges and fences that require close trimming, ease of shifting should be kept in mind when considering a self-propelled mower. For unless the design is such that shifting from a propelled position to a neutral position can be accomplished almost instantly, the self-propelled feature may prove more bother and work than the extra cost is worth. Obviously, it is desirable to move the mower back and forth with ease when cutting and trimming in close areas. Therefore, it is important to be able to shift over easily without effort. It is equally important to check to see how

About POWER MOWERS



Lawn-Boy

PUSH ROTARY

Toro

REEL

Jacobson

TRIMMER REEL

easily the mower rolls in a neutral position. You'll find that the power drive is generally provided in one of three ways—friction, belt or chain, or worm gear.

Riding Rotary Mower

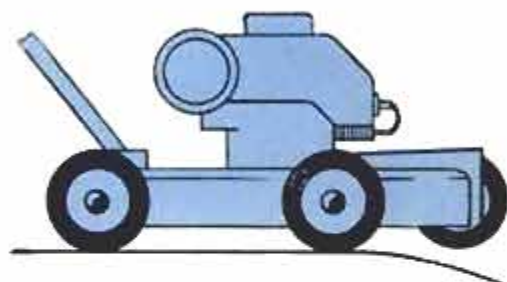
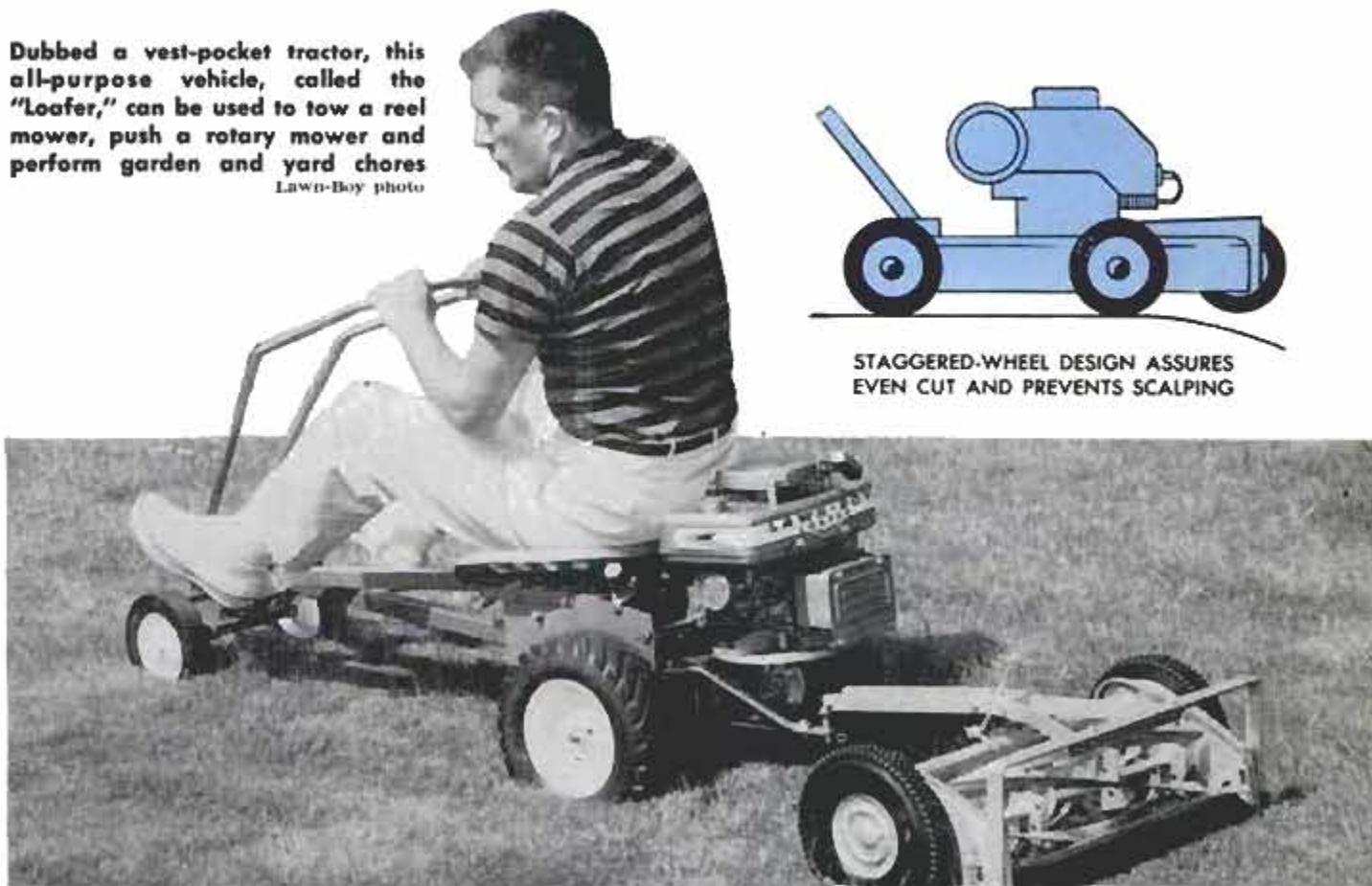
In principle, the riding rotary mower is a mower mounted with a chassis that permits the operator to sit on the unit and drive it about like a small car. It makes mowing a relaxing fun-type task. Such mowers are commonly used on large lots

and estates. One of the extra advantages of the riding mower is that it also can be used as a small tractor for pulling garden carts, lawn rollers and other yard equipment.

Points to be taken into consideration in selecting a riding rotary are that they are considerably more expensive than either the push or self-propelled mower of equal cutting width. Also, the riding rotary is not designed for close trimming around trees and fences, even though it has a side-trimming feature. Therefore, in many instances

Dubbed a vest-pocket tractor, this all-purpose vehicle, called the "Loafer," can be used to tow a reel mower, push a rotary mower and perform garden and yard chores

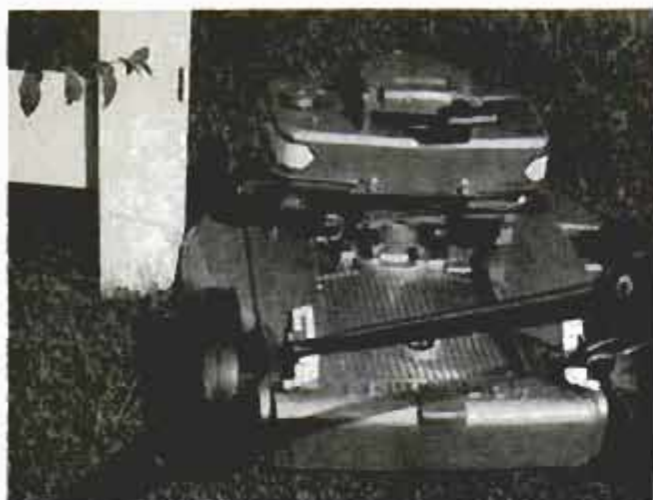
Lawn-Boy photo



STAGGERED-WHEEL DESIGN ASSURES EVEN CUT AND PREVENTS SCALPING



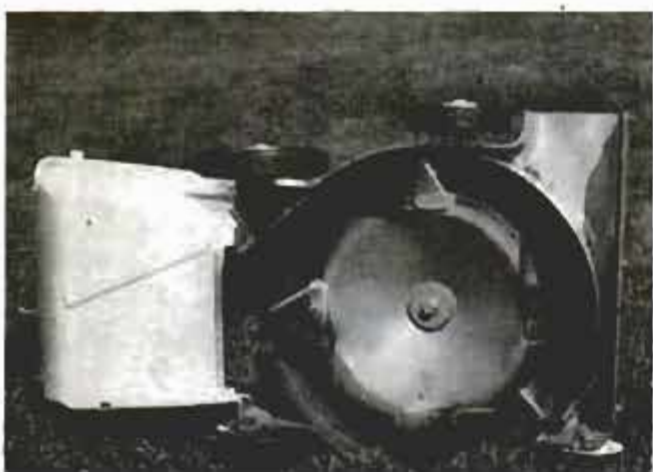
Front-trim feature on most rotary mowers permits trimming to within fraction of inch of post, tree



Deck of rotary mower extends beyond left wheels to permit trimming right along sidewalks and fences



Above, underside view of deck shows typical bar-type blade. Note smooth channeling of underdeck. Below, disk-type rotary-mower blade has four reversible blades, giving greater number of cutting edges



it may be necessary to own a second power or hand mower for use in these restricted areas. This, of course, means an extra cost over and above the price of the riding rotary.

Reel-Type Power Mower

While rotary mowers currently outsell reel-type mowers by a margin of almost 9 to 1, there are still a good many of the reel type sold. The reel-type mower cuts on a scissors principle and, therefore, produces a very clean and even cut. Also, the cutting height can be set less than 1 in. which is a definite advantage when cutting low-growing grasses like bent and Bermuda. Some of the possible disadvantages of a reel-type mower are the fact that it can get out of adjustment quite easily and thus give a sort of striped look to a lawn. It is not practical for cutting tall grass or weeds. And, because the blade is located between the wheels, it cannot be used for close trimming around trees and fences.

Trimmer-Reel Mower

The trimmer reel, a variation of the reel mower, is designed particularly for finer lawns. It has a standard mower reel, but instead of having the reel mounted between the wheels, it is located ahead of the drive wheels. As a result, the reel extends practically the full width of the mower. By comparison, a trimmer reel with a 22-in. cut may have an over-all width of only about 24 in., whereas a 20-in. standard reel mower may have an actual over-all width of as much as 25 to 26 in. This forward-reel position makes possible a side trim, permitting trimming to within $\frac{1}{2}$ to $\frac{3}{4}$ in. of trees and fences. Hence the name, "trimmer reel."

Most mowers of this type are designed with the two rear wheels rather closely set and the two front wheels at full width. The resulting three-point suspension permits the mower to ride level even when one front wheel is suspended over the edge of a walk, curb or flower bed. Adjustable reel-speed control, a recent development, has made the trimmer-reel mower adaptable for both the finer northern grasses and the broad-leaf southern grasses.

Picking the Right One

The best rule to follow in buying a power mower is to select the type that fits your yard. After all, the main reason for buying a power mower is to save work, not to make it. If your yard has a number of trees, hedges and fences, the mower you pick should have good trimming qualities. Otherwise, you'll be finishing up with a hand mower or clippers. Either a rotary or a trimmer-reel mower is recommended

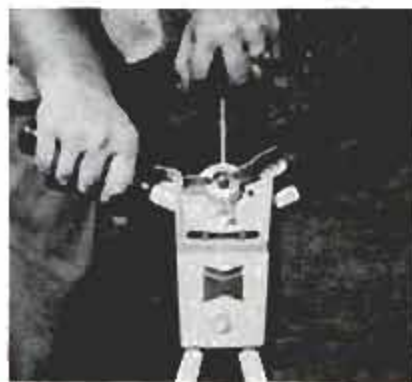


Decks having square corners cause grass to collect and fall out in clumps. Compare underdeck type (above) with clean smooth design of deck at right. Produces better airflow and discharge of clippings and makes cleaning easy with hose

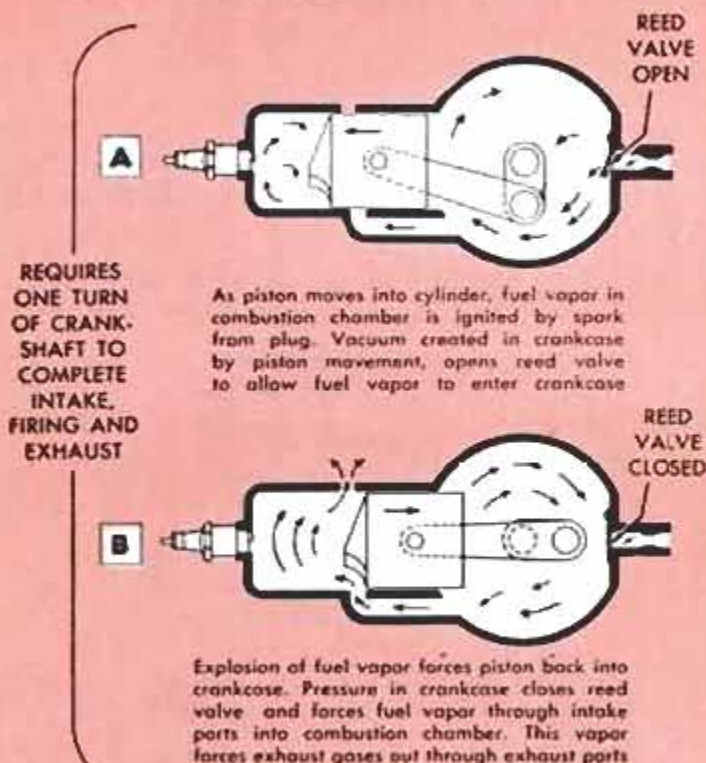


Left, flip of selector lever at each front wheel lets operator dial any one of four cutting heights. Series of holes for shifting wheels with wrench is typical, less convenient

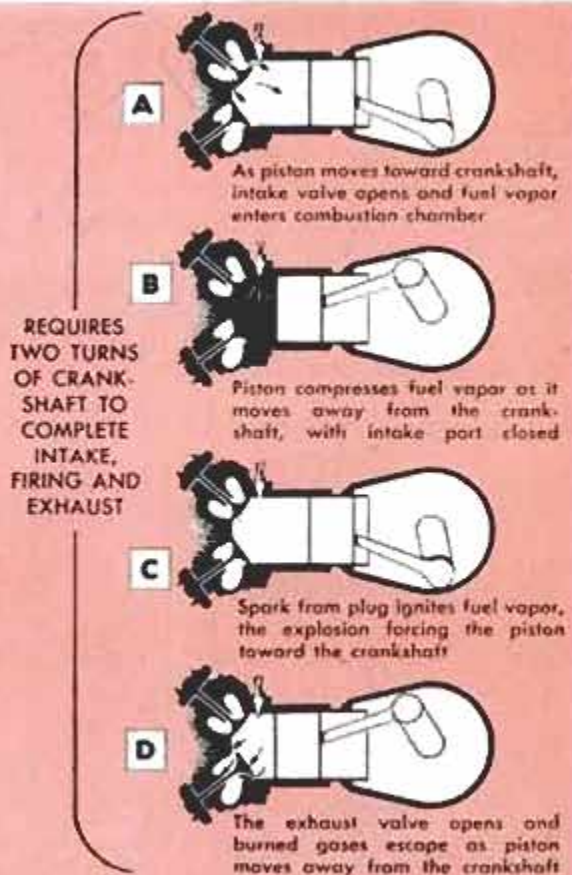
Right, recoil starter rope located on mower handle keeps hands and feet safely away from blade and engine. Other fingertip controls on handle give true push-button convenience



DIFFERENCE BETWEEN 2 AND 4-CYCLE ENGINE



2 CYCLE FIRES EACH STROKE



4 CYCLE FIRES EVERY OTHER STROKE



Safe position for starting mower with rewind starter is to brace self with hand on starter housing

where there is a lot of trimming to be done. If you have terraces, you will want a mower that will cut without scalping. A rotary-type mower with a staggered wheel design is recommended.

If you have a sloping lawn that would require pushing a mower up inclines, you should settle for a self-propelled model that will climb the grade under its own power. If you have a bent or Bermuda lawn, you will need a mower that can be set to a low level of cut—a reel-type mower. If you let the grass grow high, cutting it less frequently than the next fellow, you should choose a rotary mower since its horizontal knifelike blade will chop it down and the mulching action will chew it up. Here you would pass up a reel-type mower as it is not designed to cut tall grass and weeds.

Picking the right size of mower for a particular yard is as important as the right type. A large-size mower (capacity-wise) does not necessarily mean less work. For a yard that is small, or one that requires extensive trimming, a mower that is too

Using a power mower on a steep incline is an invitation to danger—you could fall and get hurt



Play it safe and always remove lead wire from spark plug before ever touching blade of rotary mower

large can be unwieldy and make mowing a chore. Actually, the time saved by the extra size is amazingly little. For example, in mowing a 50 x 100 ft. lot, you save only approximately 4 min. walking time by using a 22-in. mower over an 18-in. mower. In the case of a 100 x 175-ft. lot, the time saved between an 18 and a 22-in. mower is only about 11 min.

Quality and Design

Having decided on the type and size of mower, you should now give some thought to the mower itself from the standpoint of construction and special features. The decks of many rotary mowers are either of die-cast or pressure-molded aluminum. Some are of pressed steel. The test of a good deck is its rigidity. If it is not properly reinforced, it can be subject to vibration and cracking. Equally, if not more important is the deck design on the underside. A smooth underdeck design, free of obstructions, is to be desired. If there are corners and crevices where the grass clippings can collect in bunches, they will drop out on

Don't let child or other person be in direct path of discharge chute—they could be hit by flying object





Toro photo

Vacuuming the lawn is possible with rotary mower equipped with bag to catch both grass and leaves

the lawn in clumps. Such obstructions will make cleaning more difficult, too. Note whether the blade area is baffled. This is a desirable feature in that it confines the air flow and creates a better and smoother discharge of grass clippings. A baffle also adds to the safety of operation. On less expensive models, the discharge chute may be only a hole, or aperture, in the side of the deck. Such chutes often limit the flow and cause clumping. For safety, be sure that the skirt of the deck extends as low as the blade.

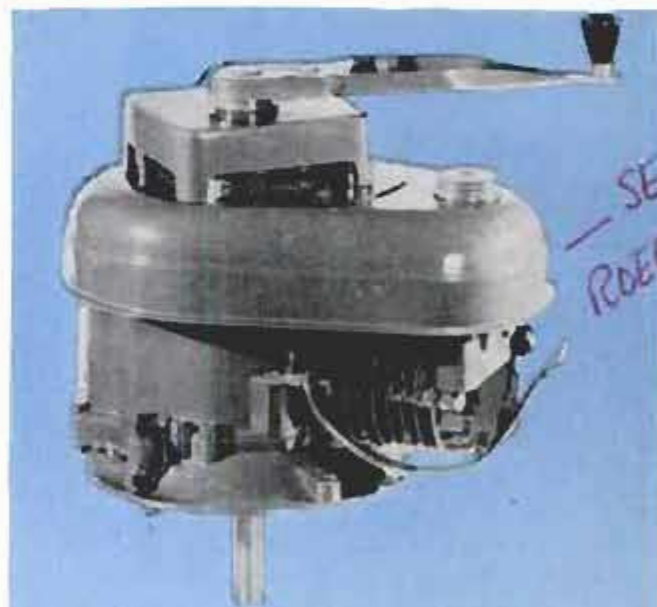
Good grass care requires a variance in the height of the grass, dependent on the time of year, moisture and heat, and all mowers have a provision for changing the cutting height. This ranges from merely a series of wheel holes to lazy fingertip control. The former requires loosening nuts and shifting wheels to respective holes, while the latter makes it possible to change the cutting height without so much as removing a wheel.

A good blade, or cutter bar, will be made of heat-treated steel so it will hold an edge and will have a slight twist to give it a suction action. This lifting action pulls the grass erect for a cleaner cut and also pulls it in along the edges of the mower. It may save you an expensive engine-repair bill to check on how the blade is attached to the shaft. When the blade strikes an object that it cannot cut, something must give, and generally does, unless provision is made to relieve the strain through the use of shear



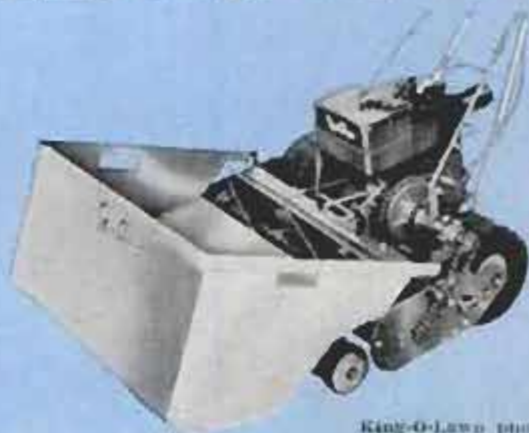
Fully enclosed and of plastic, this bucket-type grass catcher is one of several available for rotary mowers

WASCOBEN



SEARS, ROEBUCK

Above, turning crank of impulse starter loads spring. When released, spring turns engine over. Requires less physical exertion than pulling rope. Below, grass catcher for reel mower



Kang-O-Lawn photo



Sears, Roebuck Co. photo

Craftsman 24-in. rotary rider features 4-hp., 4-cycle engine, recoil starter and chain-drive transmission



Yuba Power Products, Inc. photo

Yardsmith 24-in. rider features padlocked rotary blade, rear-mounted engine and foot-operated brakes

pins and ears, clutch arrangements and devices that transmit the shock to the mower base rather than to the shaft. The better mowers are so equipped.

Controls

The principal controls used in the operation of a rotary power mower are the choke, starter, throttle and stop, and in the case of self-propelled models, a transmission or driving control. Up until a few years ago, many mowers required the use of a rope which had to be wound around a pulley to start the engine. Today, practically all engines, except those on a few low-price models, have recoil starters whereby the starter rope automatically rewinds itself on the starter pulley. The handle of the starter rope generally is located on top of the engine, although a number of models now offer an adaptation that extends the

(Continued to page 222)

Turfmaster rotary rider is both tractor and mower. A blade clutch controls blade, stops it instantly

Dille and McGuire Mfg. Co. photo



POPULAR MECHANICS



Moto-Mower, Inc. photo

Above, Moto-Mower's 24-in. rider features 14-in. roller drive to give greater traction on hills and better weight distribution to eliminate tire ruts. Below, Eclipse 20-in. reel mower is available with sulky

The Eclipse Lawn Mower Co. photo

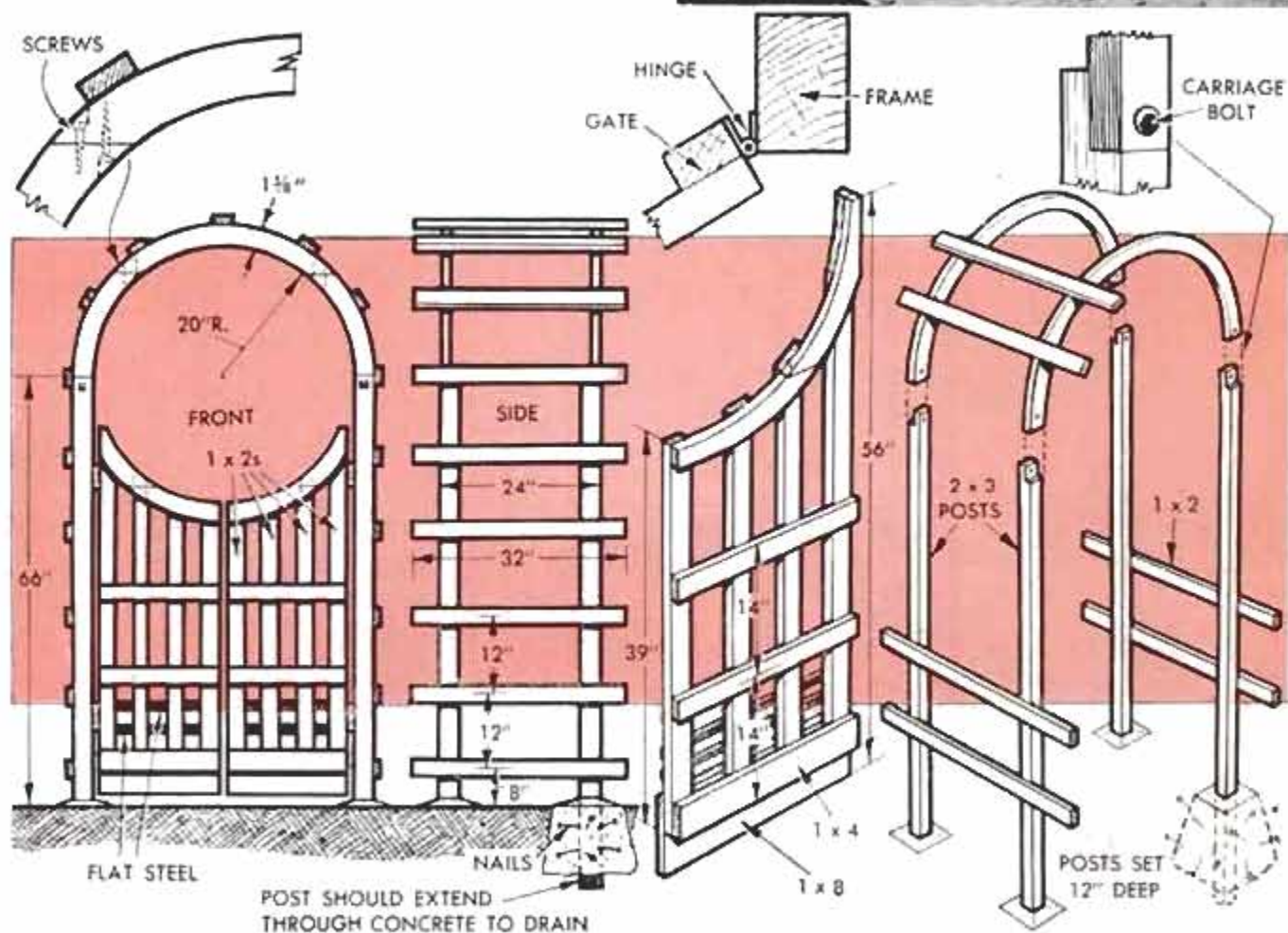


"Picture Frame" Gate

By Hi Sibley

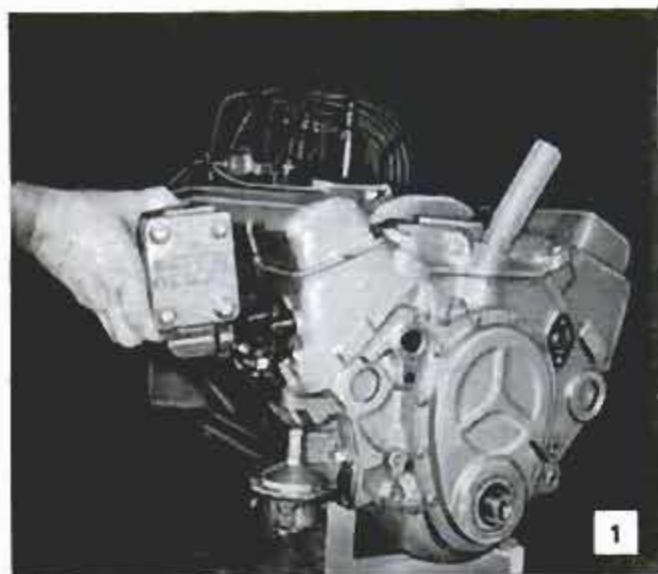
THIS DECORATIVE "picture frame" gate will make any yard more attractive. It is practical as well as beautiful. Children and pets are kept inside the yard, wandering stray dogs are kept out. Crimson roses climbing the trellis around the gate give it added beauty.

Four 78-in. lengths of 2 x 3 stock are used as corner posts for the gate, the lower ends being set in concrete. These lower ends are creosoted or treated with wood preservative before being centered in holes dug to the shape indicated. When concrete is poured into these holes, it is "keyed" into the ground when it hardens, assuring that the posts will not loosen easily. To further assure solid anchoring of the posts, drive a number of nails into the lower ends as indicated, so the posts are "locked" into the concrete. The top arches of the trellis frame, and of the gate halves, are sawed in three segments, then screwed together as indicated. The lower ends of the trellis arches, and the corner posts, are half-lapped. To keep out smaller animals, the lower section of each gate half is latticed horizontally with lengths of flat steel, that also offer protection against damage by toddlers' wheeled vehicles.

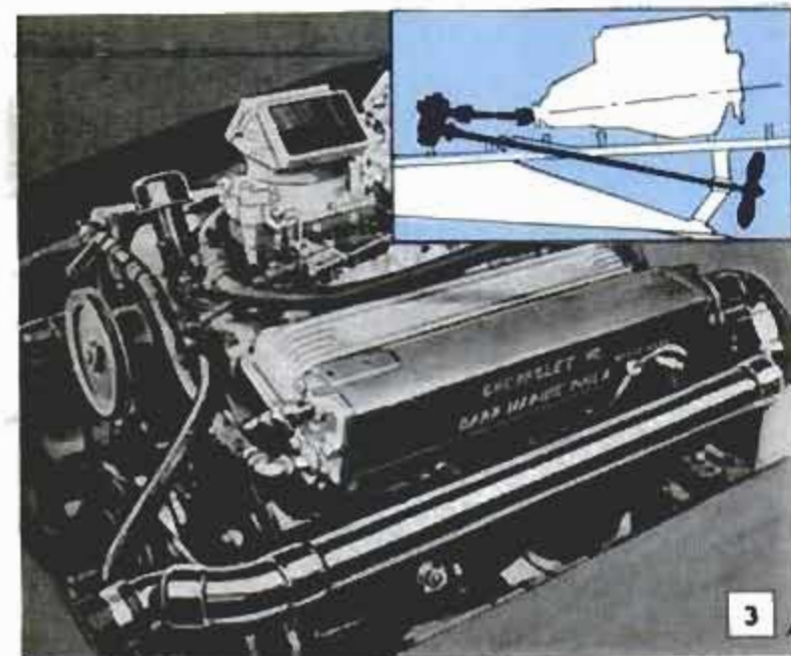
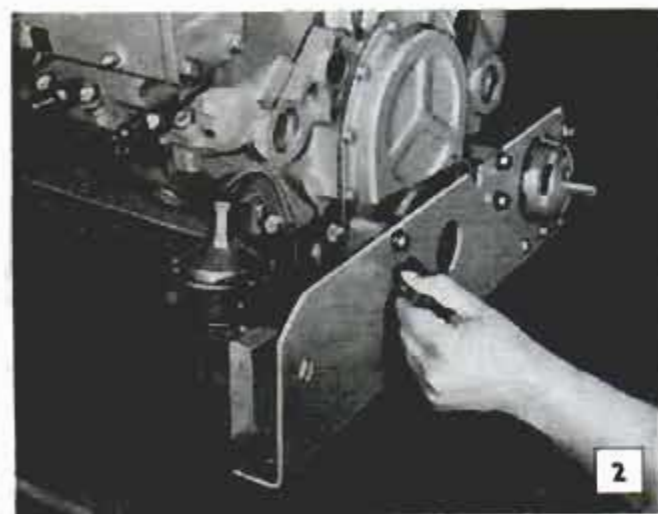


CAR ENGINES GO MARINE

Economy-minded boat owners can save about half the cost of a new in-board engine by installing a marine-conversion kit on a used car engine.



Above, after replacing manifold studs with longer ones, water-cooled manifold is installed on engine



By Earl Wobeck

ONE OF THE REASONS for increasing popularity of inboard marine engines is the availability of properly engineered parts for converting car engines to marine use, which can be done at savings of about half the cost of a new marine engine. In all important respects, a car engine is the same as a conventional marine engine, and will perform just as satisfactorily when converted and installed properly. In addition, there are advantages of convenience and economy in having an engine for which service and replacement parts can be obtained almost anywhere you cruise.

Conversion kits are not new on the market, but until recently kits for only a few makes and models of automotive engines have been available. Now conversion parts are available for most recent car engines, and many older ones that are still popular. Kits also can be obtained for converting

some farm tractor and industrial engines. Choice of engine sizes ranges from a 4-cyl., 40 hp., 1928-1932 Ford to an 8-cyl., 1958 Mercury Super Marauder of 400 hp. developed from 430 cu. in. piston displacement. Kits for engines of current-model cars are placed on the market by several conversion-parts manufacturers each year.

While most older car engines can be converted or "marined" to give good service, it is advisable to select one of the more recent

Fig. 2, support bracket is attached to engine front by four bolts that are aligned with tapped holes used by old brackets. Left, transfer drive installation permits locating engine in stern compartment to leave more usable space in small boat



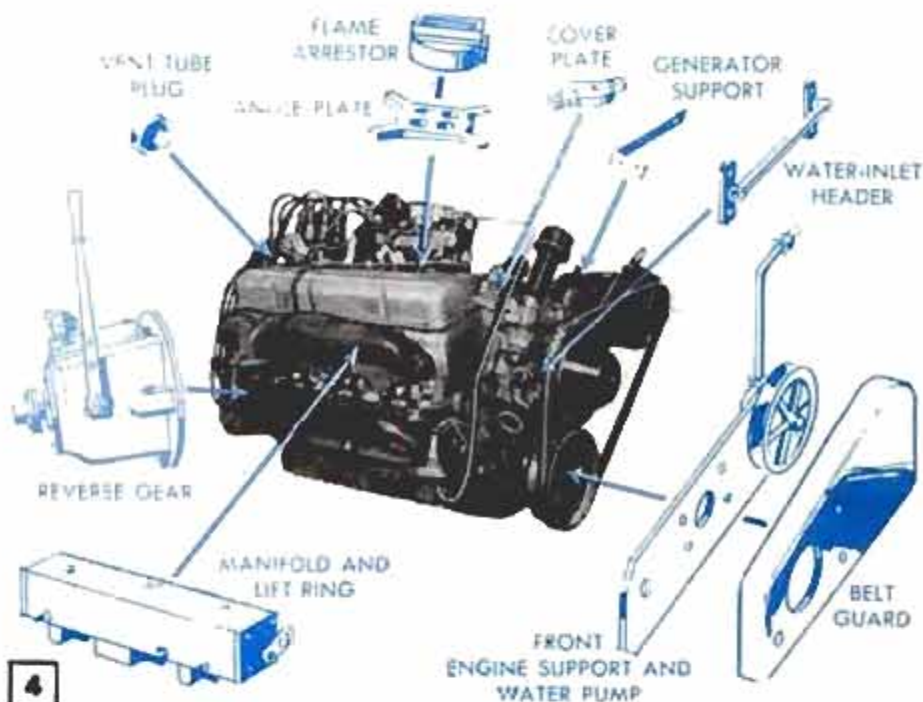
models, for which standard replacement parts are readily available. The engine should be in good condition. If not, it should be reconditioned before installing the kit parts. If it is equipped with hydraulic-valve lifters, they should be replaced with the solid type to avoid valve sticking, which may result from operating the engine at temperatures lower than those normal in car use.

A second important consideration for a successful conversion is the installation of the engine in the boat. First, you should determine

whether an engine to be used will fit in the boat when fully marined. Over-all dimensions and other important installation data on marine conversions usually are given in catalogues published by manufacturers of kits. When installing the engine, provide a good mounting bed in the boat. The propeller shaft and drive shaft must be in proper alignment, and the engine must be located and housed for easy accessibility. It is very important to install the exhaust pipe so that it does not present a fire hazard or reduce efficiency of the engine.

V-Drive Saves Space

To conserve space in a small boat, a V-drive, or transfer drive, may be used. This is coupled to the reverse-gear drive flange and permits locating the engine at the ex-



treme afterend of the boat as indicated in photo and detail, Fig. 3. Transfer drives with reduction-gear ratios combine the functions of a reduction-gear and transfer drive at no additional cost. The engine compartment for such an installation becomes a very compact unit, and may be bulk-headed from the rest of the boat. This isolates noise and reduces the risk of an explosion or fire.

Installation is easy. No special tools are required that are not supplied with the kit. While this article explains the procedure for marining a 1957 Chevrolet V-8 engine, the same procedure applies to converting most other makes and models. The 1957 Chevrolet V-8 currently is one of the most popular engine conversions because of low initial cost, economical maintenance and light weight for the considerable power

produced—185 hp. at 4600 r.p.m. This makes the engine ideal for many types and sizes of boats, especially those designed for high speeds. For example, the boat shown at the top of page 179 is a 24-ft. cruiser powered with a 185-hp. Chevrolet V-8 engine. It is equipped with a 1.5:1 hydraulic reverse gear, which turns a 15 x 15-in. 3-blade propeller. Maximum boat speed is 35 m.p.h.

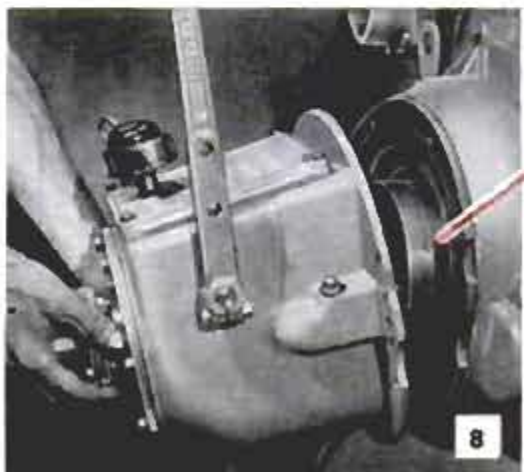
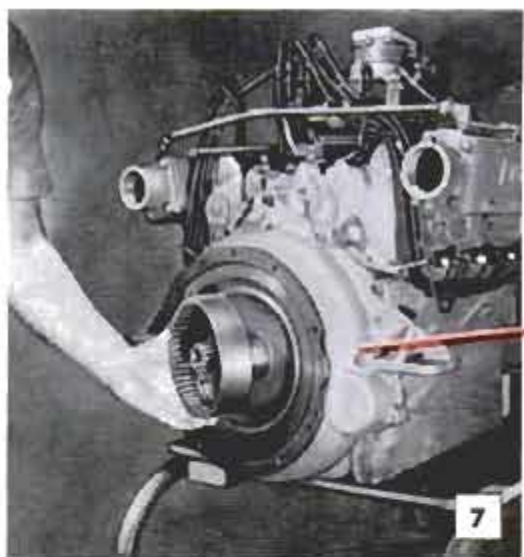
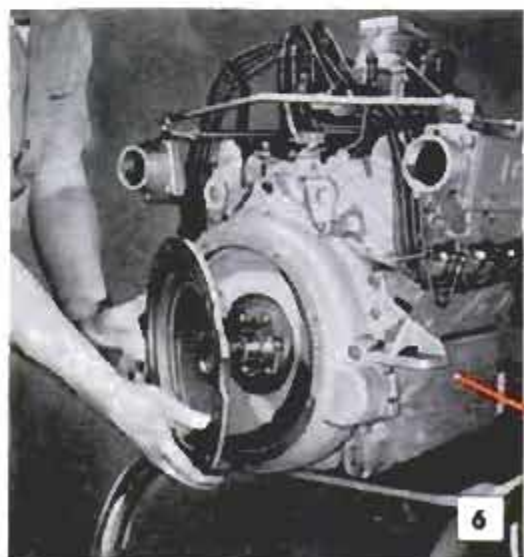
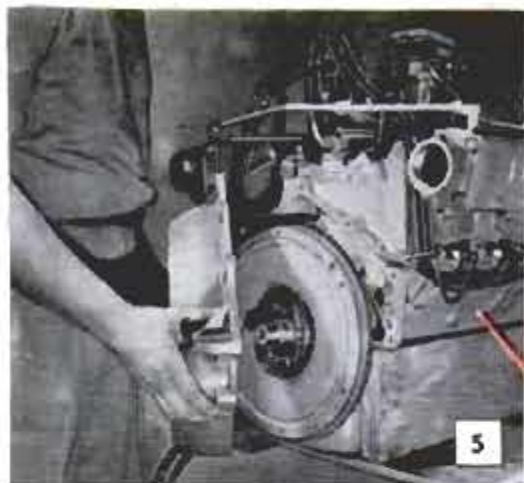
Installing a Conversion Kit

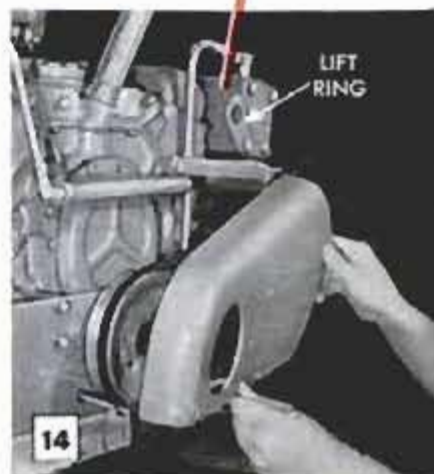
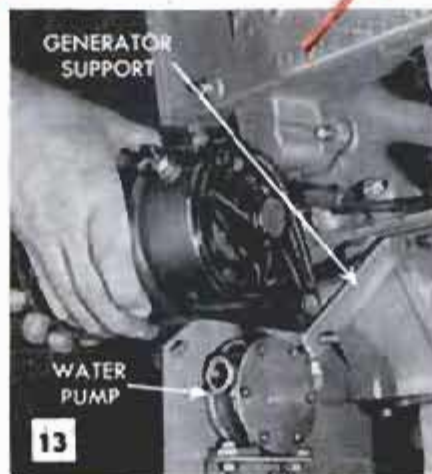
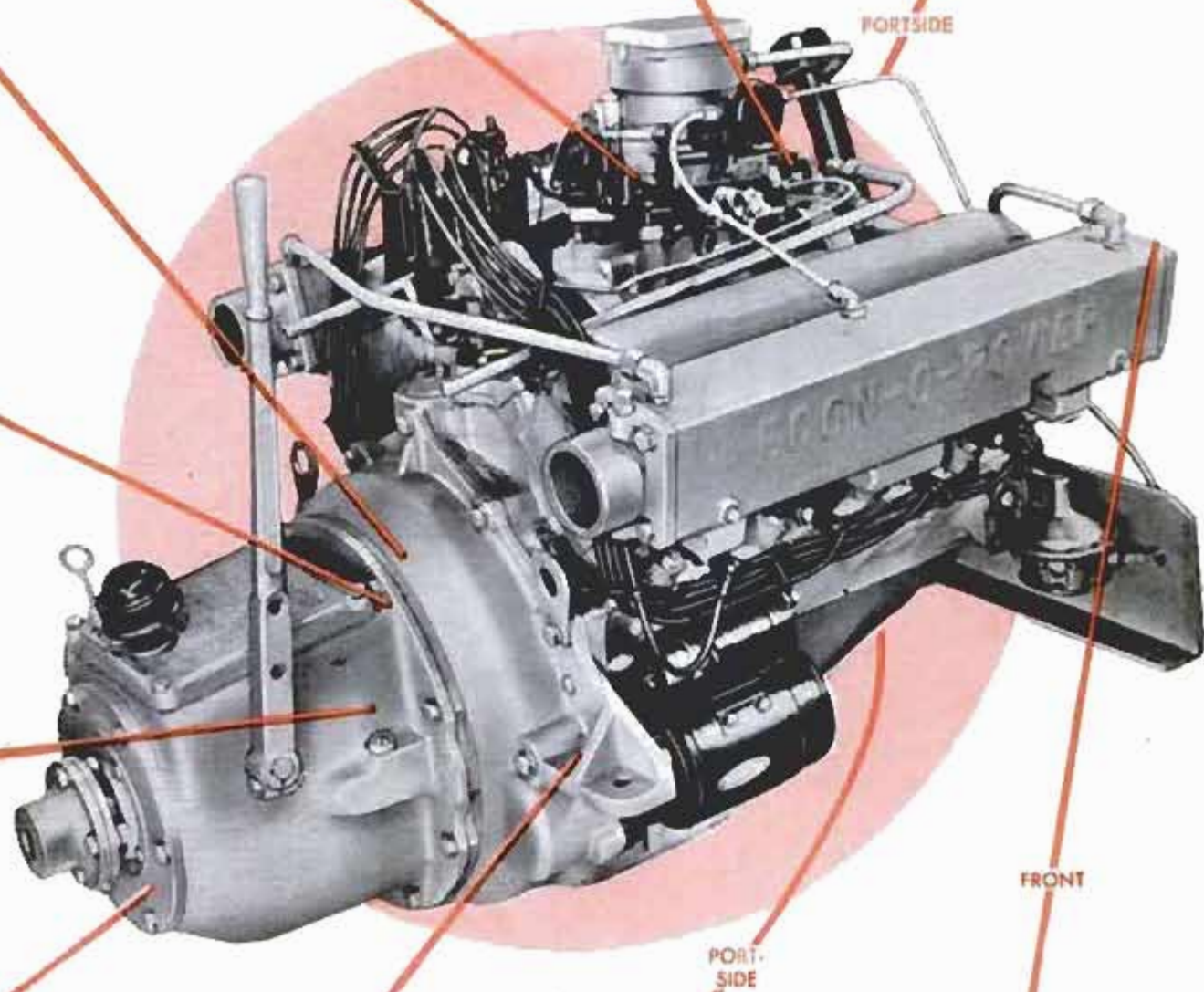
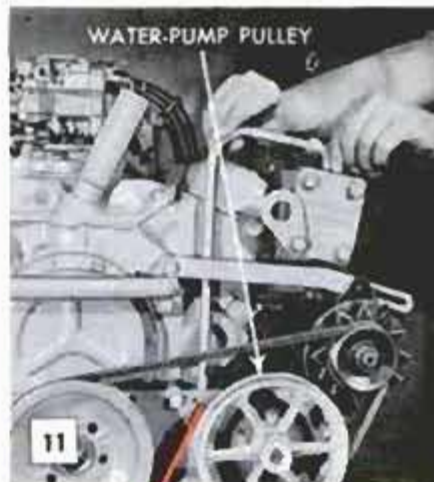
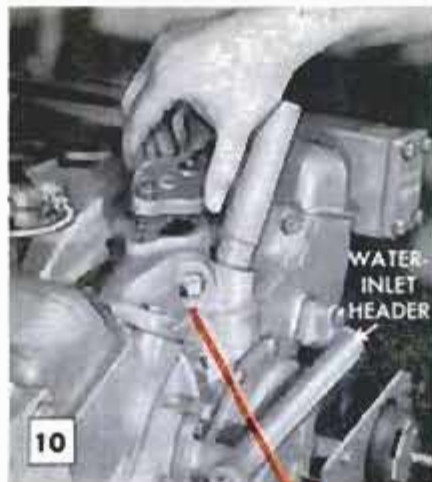
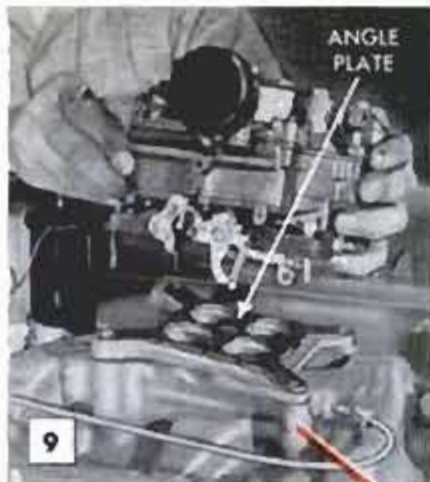
When you are ready to install the kit, block up the engine so that all parts are easily accessible. Then remove the following parts: Generator, generator-adjusting strap, fan belt, fan, water pump and pulley, exhaust manifolds, front motor supports, top hose connection and thermostat, carburetor and fuel line leading to the fuel pump, starter, clutch and flywheel. The crankshaft pulley is removed with a special puller usually supplied with the kit. The crankcase ventilator tube must be removed also. If the engine is to be painted, it is recommended that this be done before installing the conversion parts.

You now are ready to begin installing the marine-conversion parts, the general placement of which is indicated in Fig. 4. First install each of the exhaust manifolds as in Fig. 1. Since the manifolds require longer studs than the original ones, the latter must be replaced with special studs supplied with the kit. To drive them, jam two nuts together on the end of each stud. Be sure to position exhaust outlets to face aft, except for a V-drive installation when the outlets are positioned to face forward. Next the front engine-support bracket is bolted in place, Fig. 2. Two 1 $\frac{3}{8}$ -in.-thick spacer blocks bolted between the bracket and engine block provide the required clearance. The crankshaft pulley is then tapped into place with a hammer. Be sure to strike the hub only, cushioning the blows with a wooden block to avoid bending the pulley. The support bracket shown is supplied with the water pump mounted on the afterside, Fig. 13. This requires the installation of only the pulley on the front, Fig. 11, to make it function. A cover plate installed on the top hose connection opening, as shown in Fig. 10, has tapped holes in it to take two copper tubes and fittings that discharge water from the cooling system into the port and starb'd exhaust pipes. The water-inlet header, Fig. 10, is then bolted to the front of the engine in place of the water pump.

Next the carburetor angle block is installed to compensate for the angle at which the engine is mounted in the boat. Place gaskets on top and bottom of the plate, and replace the fuel line from fuel pump to carburetor after the latter has been bolted in place. The generator-support bracket is an L-shaped angle that holds the pivot end of the generator in position. After bolting it to the engine block and generator, Fig. 13, replace the old adjusting strap to hold the forward end of the generator in position. Then line up all the pulleys on the front of the engine and install the V-belt, adjusting the generator for proper belt tension.

Installing the water piping is easy when you understand the direction of flow of the water as it



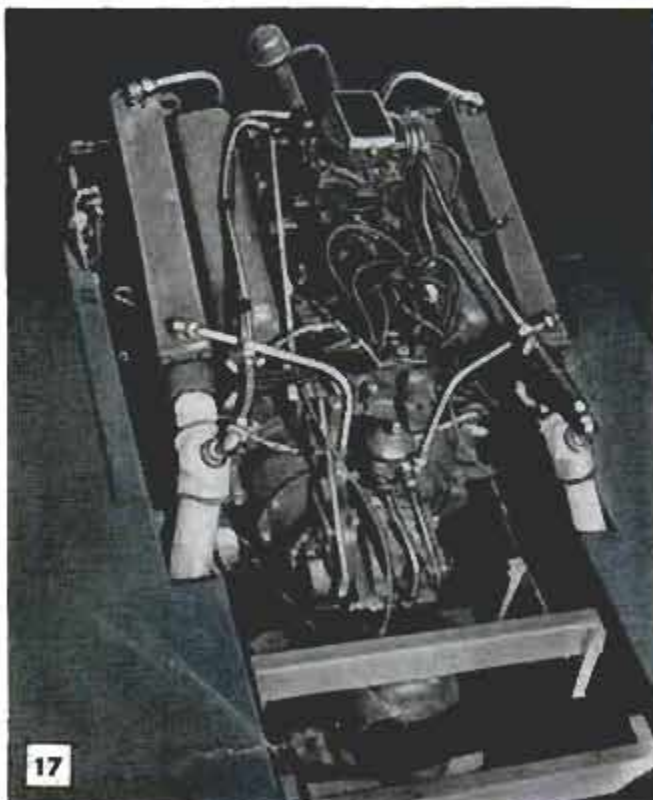




Flame arrestor removes smoke and fumes from engine compartment, provides ventilation for crankcase

circulates through the engine. Fig. 18 shows a layout of the water piping for a Chevrolet V-8. Water-piping layouts for other overhead-valve V-8s are about the same. For 4 and 6-cyl. engines, the piping differs only in that the water is circulated through one manifold and is discharged into one exhaust pipe. For most installations, sea or lake water is brought into the engine by the water pump. Some boats that are used on salt water are equipped with an enclosed fresh-water cooling system to reduce corrosion. In either case, the water is circulated through the engine in the same way. The water pump forces the water into the port manifold, then across the back of the engine through a tube that connects

Converted Chevrolet V-8 installed in 24-ft. cruiser is equipped with hydraulic reverse and reduction gears. Note that oil cooler on it is connected to tubes carrying water from port to starb'd manifold

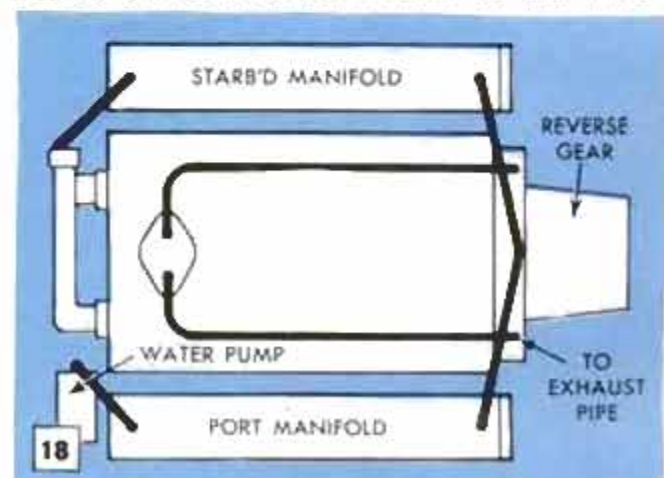


Tubes connected to cover plate discharge water into exhaust pipes to cool them and silence exhaust noise

both manifolds, and into the starb'd manifold. From the latter, it goes into the water-inlet header where the water leaves the engine through two tubes. These are connected at one end to the cover plate, Fig. 16, and to the exhaust-pipe elbows at the other end, Fig. 17, to cool the exhaust pipes and silence exhaust noise. Exhaust pipes can be made up from standard steel pipe and fittings. To avoid back pressure, use pipe of at least the same diameter as the exhaust outlets on the manifolds.

A 1/4-in. tube and fittings are used for connecting the automatic choke to the starb'd-exhaust manifold as shown in Fig. 15. The tubing is shaped by hand to align the ends with the fittings on the manifold and carburetor. The flame arrestor for the carburetor is bolted in position on top of the air intake, positioning it so that the tube fitting for linking it with the oil-filler tube faces the latter as shown. The function of the flame arrestor and the tubing connecting it with the oil filler is to provide ventilation for the crankcase and to remove smoke and fumes that collect in the filler tube and engine compartment. The Coast Guard requires that all gasoline engines be equipped with flame arrestors.

Lifting rings are provided to facilitate handling the engine, two of them being bolted on the forward ends of the man-

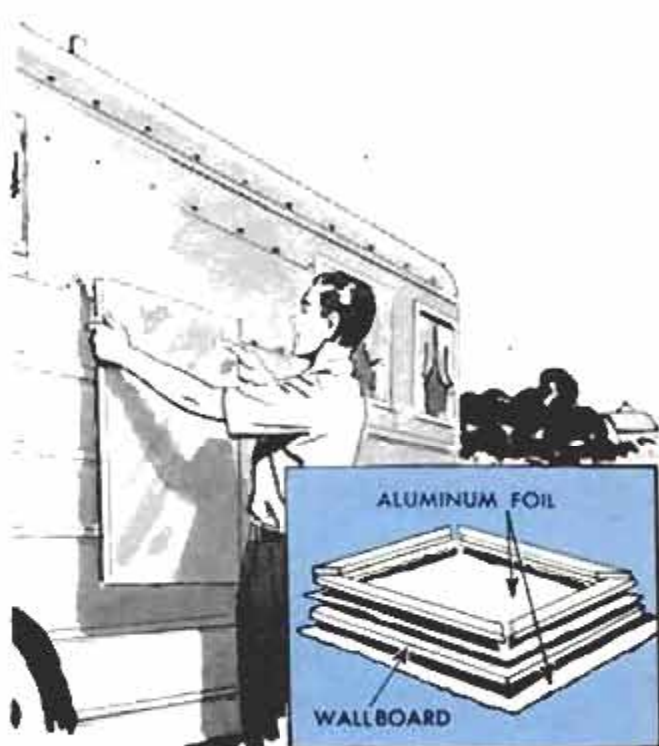


ifolds, Fig. 14, and two on the flywheel housing, Fig. 6. To attach the belt guard, screw three studs from the kit in the tapped holes provided in the front engine support, and mount the guard on the studs as in Fig. 14, using acorn nuts to fasten it in place.

To complete the conversion, a marine-type reverse and reduction-gear assembly is installed to provide a gear ratio that will permit the engine to develop full power when turning a propeller of suitable size for the boat. An auto transmission may provide a desired gear ratio when going forward but it will turn the propeller shaft much too slowly when in reverse, resulting in power loss and poor reverse speeds for most installations. Also, a car transmission is not constructed heavily enough to withstand the continuous strain common to marine service.

Reverse gears may be obtained with reduction gears in any of several ratios from direct drive to a 3:1 ratio (3 revolutions of the engine to 1 of the propeller shaft). Since determining the gear ratio and propeller size best suited to a boat is an individual problem, ask the manufacturer or designer of your boat, or the conversion-kit supplier to recommend a combination that will do the best job. Be sure to give him complete details of the intended installation. Reverse gears also may be obtained with hydraulically actuated shifting. While somewhat more expensive than manual-shift ones, they permit fast and effortless maneuvering. The controls for them are easier to install also. Regardless of the reduction-gear ratio or type of reverse gear used, the installation procedure is much the same.

The reverse and reduction gear illustrated is equipped with a special flywheel housing having rear-engine supports cast integrally for maximum strength. Also included are a built-in thrust bearing, shift lever, flywheel drive flange and propeller-shaft coupling. Begin the installation by bolting the drive flange for the reverse gear to the flywheel. Then the flywheel housing is fastened in place as in Fig. 5, followed by the adaptor plate, Fig. 6, that is slipped on the hub of the drive flange and tapped into place, making certain that the gasket is in its proper position. Next the drive-gear drum, Fig. 7, is tapped on the drive shaft and bolted in place, after which the pre-assembled reverse gear is slipped in place as in Fig. 8 and bolted to the flywheel housing. The opening on the starb'd side of the flywheel housing is then covered by replacing the original extension plate as in Fig. 12, after which the starting motor is installed to complete the job. ★ ★ ★



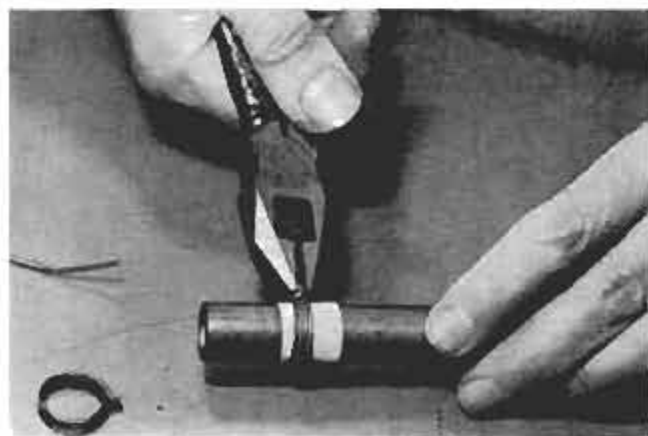
Insulated Panels Reflect Sun From Trailer Icebox

To make ice last longer in the icebox of a small house trailer, one sportsman hangs an insulated panel on the side of the trailer to cover the area next to the box. By shading the wall and reflecting the sun's rays the panel keeps it several degrees cooler. The panel is made of sheets of paper-backed aluminum foil glued to a 4 x 4-ft. panel of wallboard which is nailed to a frame of wooden strips as detailed above.

Clinton R. Hull, Santa Ana, Calif.

Prefabricating Wire Shapes

If wire bands or loops having a definite shape or diameter are needed, here is an easy way of making them. Wrap two thicknesses of paper around a length of steel having the required cross-sectional dimension. Wind the desired number of turns of wire on the paper and twist the ends together or solder them to an adjacent turn. Then heat it until the paper becomes charred and slide the wire loops off.



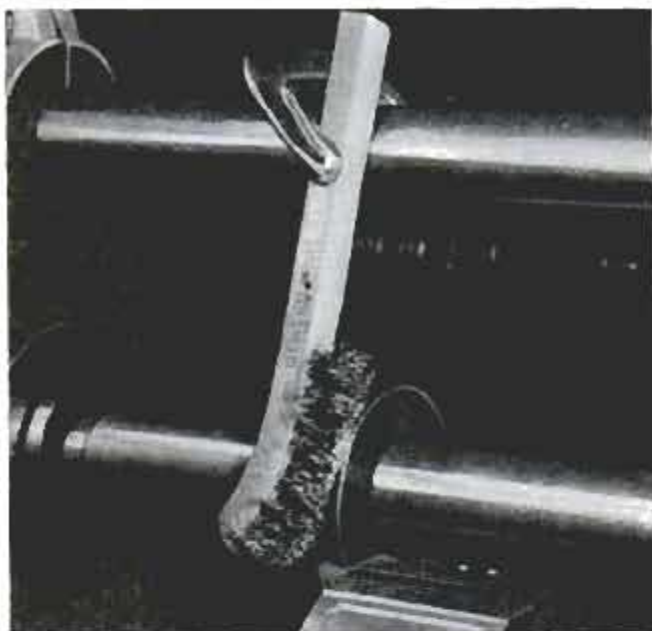
Safety Fishhooks for Youngsters Have Neither Barbs Nor Points



To eliminate the hazard presented by barbed fishing hooks when his young son wanted to join him in fishing, one fisherman substituted the wire hangers used for Christmas-tree ornaments. These hangers have the same general shape as a fishhook, but have neither points nor barbs. Worms are used as bait on these hooks, and they are tied to a line on which is fitted a brightly colored bobber. Youngsters get so excited when they see the bobber move to indicate that a fish is nibbling at the hook that they jerk the pole upward. This action hooks a small fish often enough to make the boy think he is a real fisherman, and he can show the fish to prove it.

Edward Collette, Blue Island, Ill.

When mixing plaster for patching, use vinegar in place of some of the water. It slows setting time so there is more opportunity for making a smooth, professional-looking job. A mixture of half water and half vinegar is practical for most jobs. The vinegar odor dissipates quickly.



Wire Brush on Milling Machine Cleans Blade of Slitting Saw

When using a slitting saw on a milling machine, metal chips sometimes collect in one spot and cause the saw to "grab." To minimize this problem, one operator clamped a brass wire brush to the overarm of the machine and adjusted it so the bristles wiped lightly against the saw teeth. The brush does not remove all the chips, especially when cutting oil is used, but it does reduce the tendency for the chips to collect in one spot.

Walter E. Burton, Akron, Ohio.

☛ Add color and sparkle to a rock garden by dropping brightly colored glass marbles and pieces of quartz or other natural crystals among the crevices in the rocks.

Hair Dryer Permits Faster Reloading of Developing Tank



You can minimize delay in the darkroom by using the hot air from a hair dryer to dry a developing tank and reel so it can be reloaded quickly. Thorough drying avoids the possibility of spotting the undeveloped film with moisture that might remain on the reel or in the tank. The film will slide more readily in the reel grooves when they are dry. Be sure the hair dryer is clean, so it does not blow dust into the tank and reel where it would be picked up by the film.



Traveling-Kit Gadget Bag

By Ken Patterson



EASILY CARRIED in one hand, this gadget bag will hold enough 35-mm. film for a full day of shooting, plus several filters, a photo guide booklet and a package of small-size flash bulbs. The bag is made by modifying a man's travel kit, first cutting off any straps inside. A strip of $\frac{1}{8}$ -in. hardboard then is drilled to accept five metal film containers, which are cemented in the holes. This assembly is cemented to the center of the opened kit. Filter containers also are cemented directly to the inside of

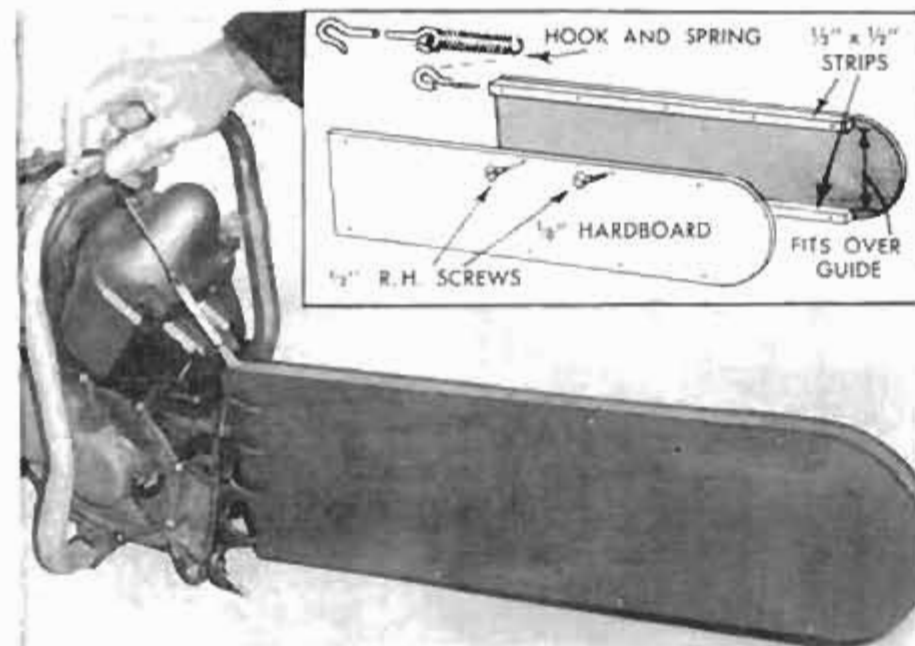
the kit. Holes punched in the inner lining permit rubber bands to be threaded through to hold the guide book and the flash-bulb box. One end of the latter rests on a wooden block cemented to the case, permitting the inner slide of the box to be pulled out more readily and also to clear the filter case that is positioned opposite one end of the box. Note that the filter containers and box of flash bulbs are positioned so they are above the film containers when the kit is closed.

Wooden block is positioned so end of flash-bulb box rests on it, permitting easier removal of inner slide

Film containers first are cemented in holes in strip of hardboard, then this assembly is cemented to kit



"Double Duty" Guard for Chain Saw Made From Hardboard



Instead of using soap or wax to free a sticking drawer or window, a more permanent job can be done by applying a coat or two of Deft Wood Finish to the drawer runners and window slides. It will not wear away from use, as do wax and soap, but becomes smoother from friction.

Two-way protection is provided by this chain-saw guard. It prevents the saw teeth from being damaged when the saw is transported, and also prevents bodily injury to anyone carrying it. Should it be necessary to transport the saw in a car, the guard will protect the upholstery from damage. Size of the guard is determined by adding $1\frac{1}{4}$ in. to the widest part of the guide bar and chain, to allow for the $\frac{1}{2} \times \frac{1}{2}$ -in. edge strips and for chain clearance. Length of the guard is 1 in. more than the length of the guide bar of the saw. After the hardwood strips are cut to length, the guard sides are cut from $\frac{1}{8}$ -in. hardboard and screwed to the strips. A tension spring and heavy wire hook hold the guard in place, yet permit quick removal.

H. Hanscom, Elmhurst, Ill.



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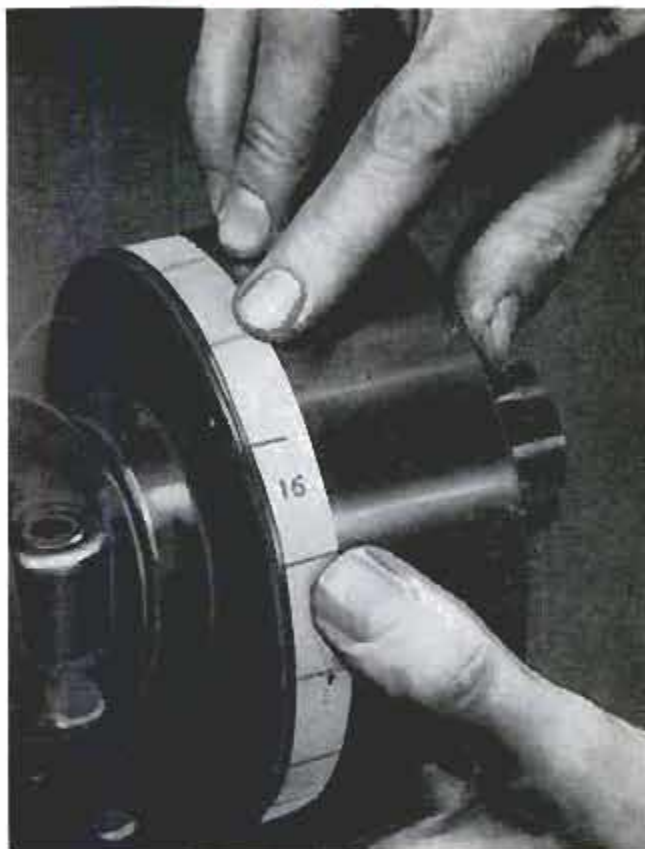
INDEXING SETUP

for small lathe is quickly improvised for those occasional jobs where setup time counts

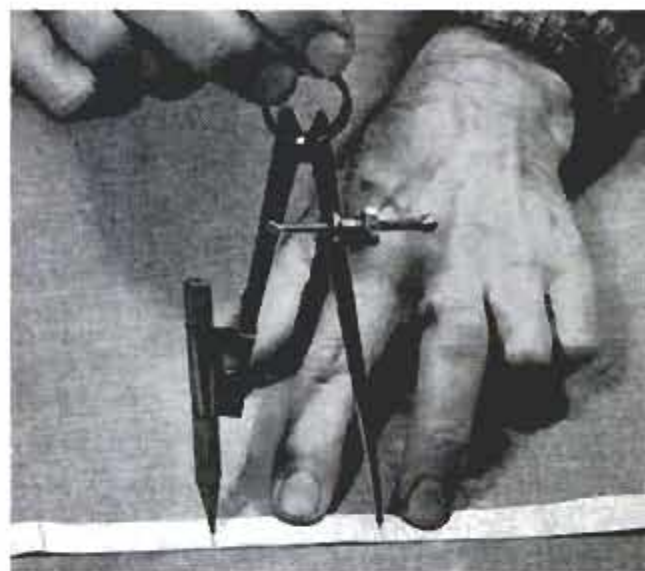
By Walter E. Burton

S SMALL WOOD or metal-turning lathes having chucks or faceplates can be converted quickly to an indexing head with this simple attachment. Made with some care, the attachment is sufficiently accurate for practical purposes such as spacing holes around the circumference of round work, laying out graduations on collars, and spacing holes or slots on faceplate work.

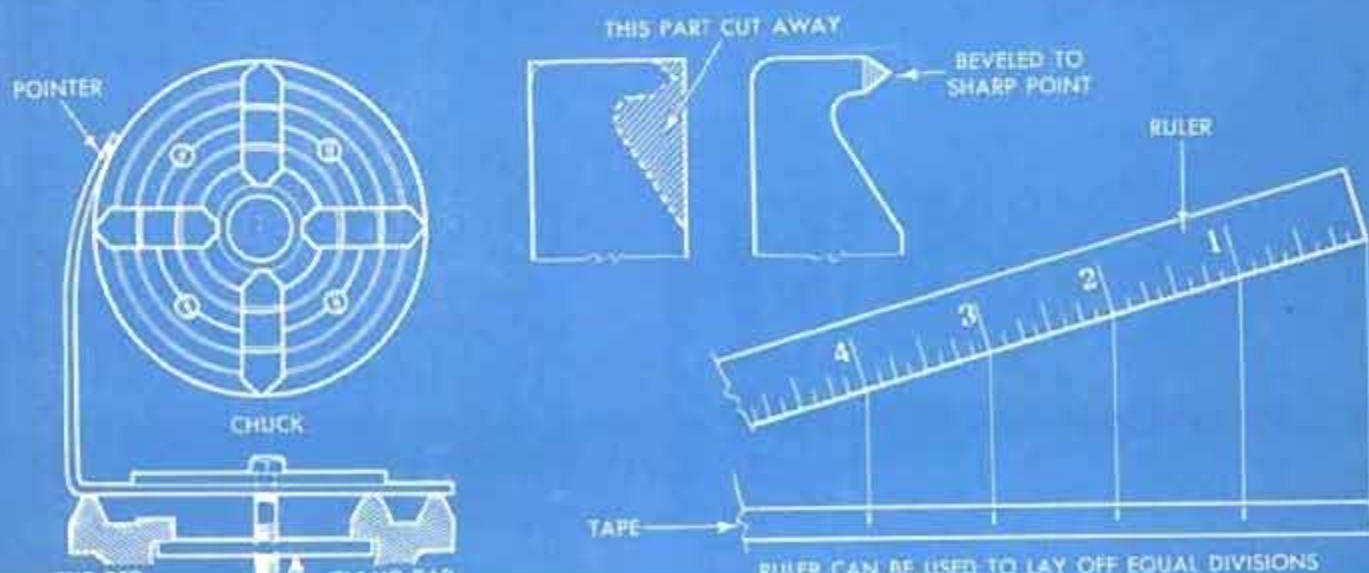
The chuck or faceplate can be made to serve as the index plate by attaching a calibrated strip of heavy paper to the body of the chuck as pictured in the upper right-hand photo. Or, a chuck not being available, the strip can be attached to the rim of a faceplate, preferably one of small diameter. As detailed below and pictured on the following page, the pointer is made by bending a short length of flat steel to form an arm which is bolted to the lathe bed. The arm is bent to the curvature of the chuck body and the upper end is cut away and filed to a point as indicated in the detail. On some small lathes it may be more convenient to attach the pointer to some part of the headstock. Perhaps it would be possible to loosen one of the cap-screws holding the headstock bearing cap, drill and slot one end of the pointer arm

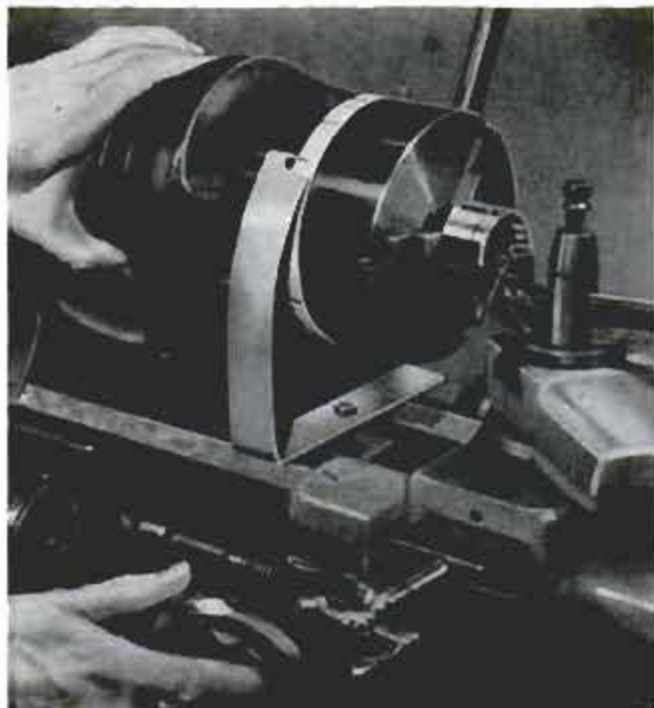


A calibrated strip of heavy paper taped to the lathe chuck or faceplate makes a practical indexing head



It's possible to lay out calibrations with a compass but for greater accuracy it's best to use dividers





Here's the indexing setup. Note position of pointer. On some lathes pointer is mounted on headstock



To make a true butt joint, wrap paper strip once around chuck body and cut through both thicknesses

and place the slotted end under the head of the screw.

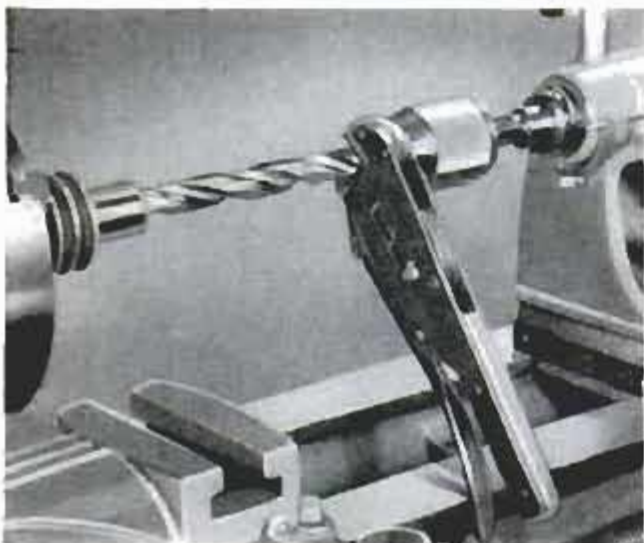
The calibrated index scale is made by cutting a strip of heavy paper to about $\frac{1}{2}$ in. in width and long enough to be wrapped once about the body of the chuck with the ends overlapping. Hold the strip firmly in place on the chuck body and with a sharp knife cut through both thicknesses of paper at the lap. If the work requires only 8 to 12 divisions on the indexing scale then it is possible to lay these off with sufficient accuracy by using a pencil compass as in the lower photo on the preceding page. Or you can use a rule placed at an angle as in one of the details. But if more than 12 divisions are required, then it is best to determine

the spacing with dividers. Once the correct spacing has been determined, ink the divisions so that they can be seen readily.

For the occasional job, the calibrated strip can be attached to the chuck with transparent cellulose tape. In taping the strip to the chuck body, the trick is to get it positioned so that it runs true. When the strip is in the correct position and taped in place, bend the pointer slightly, if necessary, to bring it as close as possible to the tape.

In use, engage the back gears and turn the lathe by hand to position the pointer at each successive index mark. Locate the lathe tool on center and use it to score the work as required. ★ ★ ★

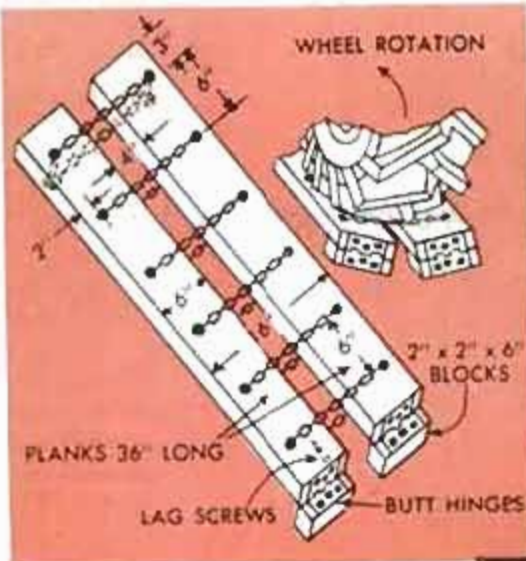
Plier Wrench Prevents Drill-Chuck Adapter From Turning



Did you ever have the drill chuck adapter suddenly let go when you're drilling from the tailstock, permitting drill, chuck and adapter to turn with the work? If you have, you know that this almost invariably results in scoring of the taper in the tailstock sleeve. One turn of the adapter and the damage is done. Eliminate the possibility of damage to the sleeve by setting up the job in the regular way, then before starting the drill, grip the shank with a plier wrench as pictured. The handle of the wrench should contact the lathe bed. When drilling from the tailstock it is essential that the drill bit be correctly ground for the type of work being done, otherwise the hole may turn up out of round.

Nonslip Wheel Ramp Aids Mired Tractor

When a heavily loaded wheeled tractor mires down unexpectedly in a treacherous wet spot it's going to take some doing to get it back on solid ground, unless you keep this nonslip wheel ramp at hand. Just start it under the drive wheel and the tire lugs will get a good grip the instant you ease the clutch in.—Bruce D. Stewart, Winder, Ga.

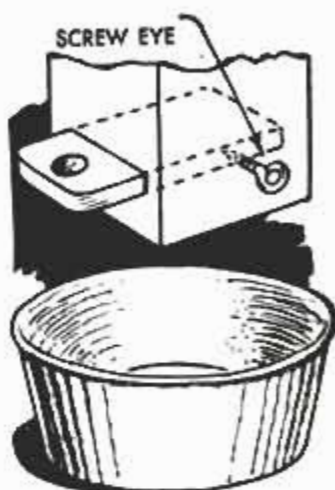


Change Oil and Antifreeze Now

Modern oils and greases designed for use in your car do not wear out. But they act not only as lubricants; they also serve as crankcase and bearing cleaners. Due to this built-in cleaning action, crankcase oils become diluted with water and fuel residues and contaminated with metal particles and dirt. This is why, according to Champion Spark Plug Company, it is so necessary to change lubricants periodically and especially in early spring. And in nearly all localities the time to drain antifreeze and flush the radiator is now. Antifreeze is not intended for year-round use. Like crankcase oils it doesn't wear out but becomes contaminated by cooling-system residues.

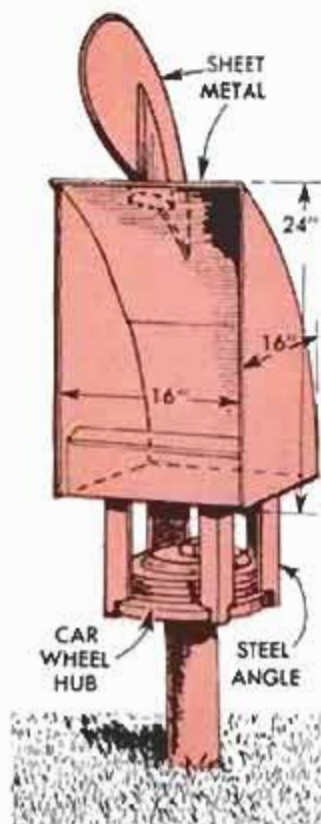
Slide Lock for Grain Chute

If the shutoff slide in a grain chute is left partially open by accident, or is opened by youngsters, there'll be a lot of grain on the floor by the time you discover it. To prevent this drill a small hole in the chute and turn in a screw eye far enough to engage the slide.



Salt Box for Cattle Rotates With Wind

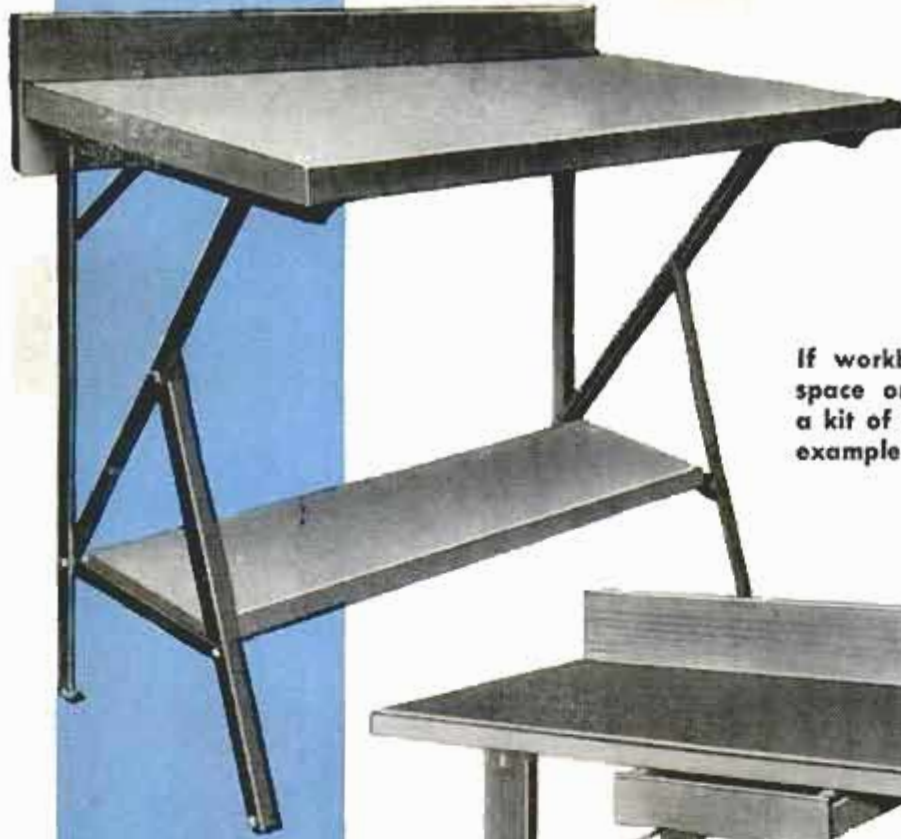
Designed to work on the same principle as a bird feeder, this salt box for cattle has a metal vane on top which keeps the open side of the box headed away from the wind preventing snow and rain from entering. The box and vane are made from heavy sheet metal welded at all joints. Short legs of steel angle support the box on a car-wheel hub (including brake drum). This assembly is then welded to a length of pipe. For a permanent installation, set the pipe in concrete. Dimensions given for the over-all size of the box are average. They can be changed to suit.



YOUR

By Jerry Parker

If workbench must be made to fit a given space or other individual requirement, then a kit of bench legs is needed. Bench at left is example of what can be done with these units



Right, this all-wood bench kit comes complete with drawer and low tool panel. Top is hardboard bonded to wood. Length is 6 ft.



Left, steel benches are preferred by some craftsmen who work in metal and wood. Bench only is furnished in kit. Shelves, drawer unit are accessories



Right, all-wood bench of exceptionally sturdy construction comes complete with shelf and tool rack. Shelf has backboard

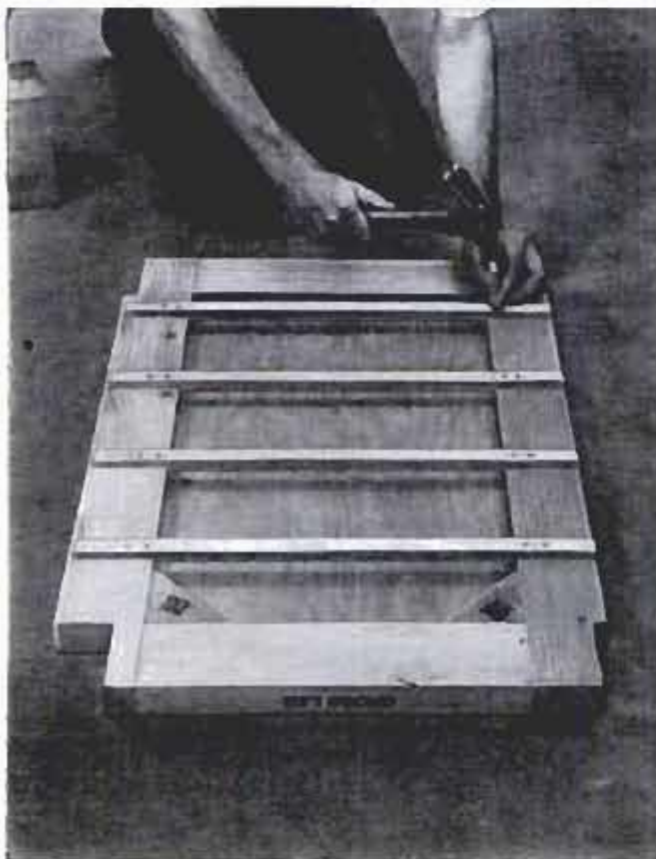


SHOP WORKBENCH

can be set up in minutes, ready for use in basement, garage or apartment. Prefabricated parts make this possible with only a few simple tools

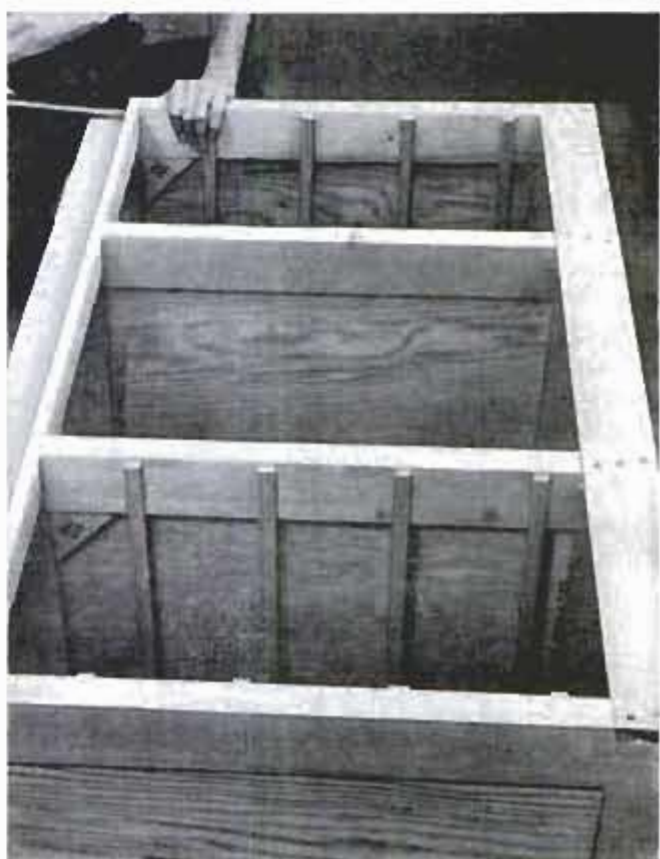
USUALLY, A SHOP grows up around a workbench, and building a good bench from scratch takes lots of time, money and material. But that's been changed. Now you can buy a bench in a package containing all the necessary prefabricated parts, fasteners and instructions for setting up the unit. Such individual parts as legs, top and bottom rails, end and dividing panels (in the cabinet benches) and also the tops, if the latter are of laminated construction, are factory assembled into units of predetermined sizes. Bolt and screw holes are drilled, notches and mortises are ready-made to take bolts, screws, rails, braces and other parts that cannot be preassembled. Bolts included with the kit will be the right diameter and length, screws will be the correct size, and the rails, also braces where used, will be the right length, width and thickness.

Cabinet-type benches are preferred by home craftsmen because of the convenience and storage space they offer. In the kits the difficult parts come ready-made, just like the framed end panel pictured



Junior-size benches also are available as kits. These come in three top sizes and three heights and are complete with hardboard-faced wooden top, drawer and lower shelf. Can be set up in a few minutes

Here's a prefab cabinet bench very nearly assembled. In this one the paneled ends and center dividers are ready-made. In such kits the rails, drawer runners, top and any accessories come as separate parts



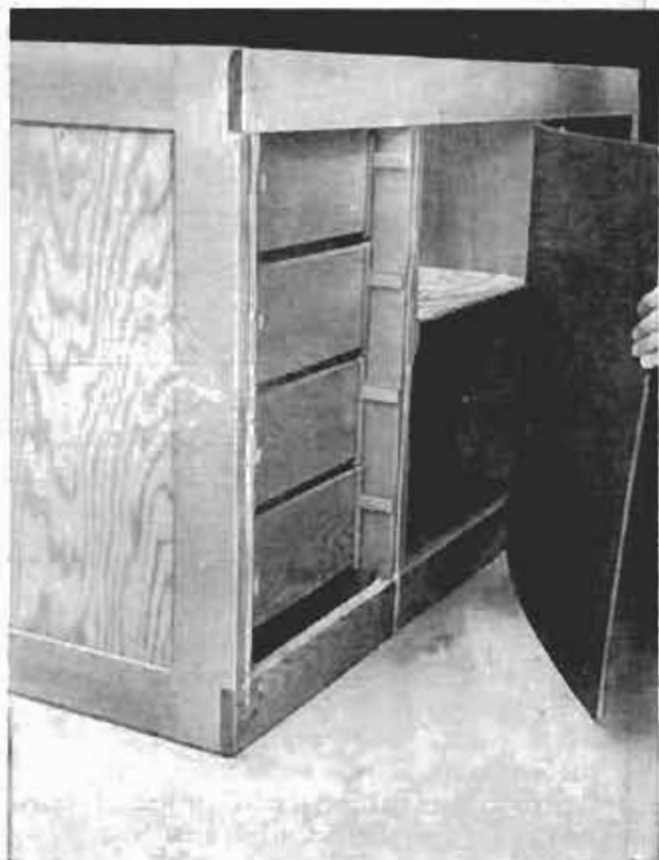


Here's the finished bench shown partially assembled in lower photos on preceding page. Note that there are eight drawers and a center storage compartment

All this makes a one-evening job of workbench building and reduces the tool requirements to a hammer, wrench and screwdriver. If you want to add a tool panel or some other refinement not included in the standard kit, you may need a few clamps and a squeeze bottle of glue.

The bench kits now available are of two general types. One is the open-type bench, which usually consists of assembled legs and stretchers, a lower shelf, a top, and a backboard or a tool shelf, located above the top. A second type is the cabinet bench having both drawers and a compartment with shelves, the cabinet bench pictured above being typical. Cabinet benches are entirely enclosed, having back and end panels and doors fitted over the shelf compartment. Open-type benches also come in junior sizes for young hobbyists, an example of these smaller benches being shown in the upper photo on the preceding page.

Steel bench-leg units also can be purchased in pairs. You build the top and shelf to suit your own requirements. An example of this type of kit, made by the Belson Manufacturing Co., is pictured at the top of page 190. The legs will support a top and shelf up to 8 ft. long. An all-wood bench kit with a bonded-hardboard top, made by the Mohawk Lumber & Supply Co., is pictured second from the top, page 190. This kit includes top, shelf, backboard, or low tool panel, and a drawer. The top,

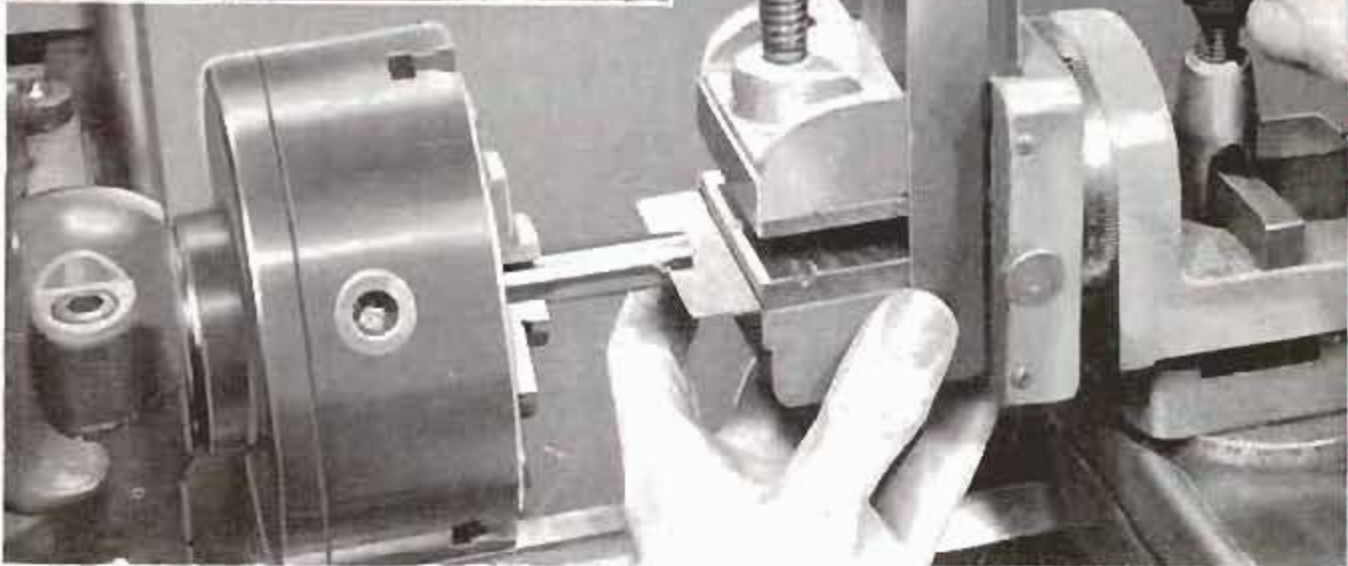
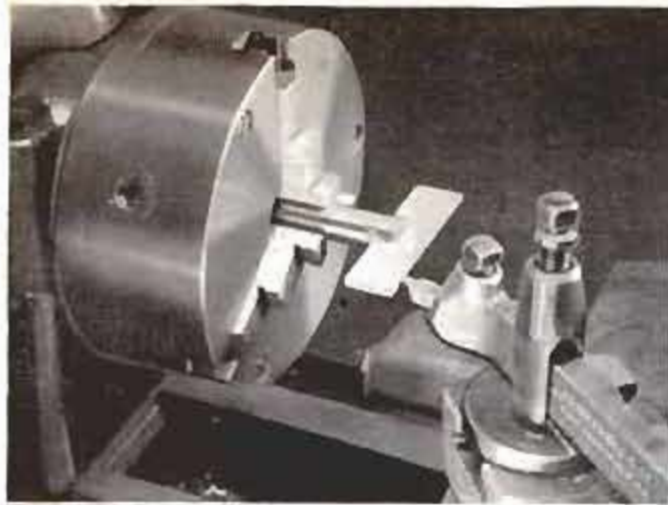


Final step in assembly of the cabinet bench is applying the hardboard back panel which covers drawer compartments and the center storage compartment

made from hardboard bonded to wood, is 6 ft. long. On the same page, pictured third from the top, is an all-metal bench supplied in kit form by Lyon Metal Products, Inc., and designed for craftsmen who prefer this type of open bench. Top and bottom shelves and also the drawer unit are accessories that may be purchased separately and attached to the bench at any time. The lower illustration on page 190 shows a bench kit made by Coast Lumber Corp. This kit includes a tool rack and a backboard on the lower shelf. The bench is made exceptionally rigid by triangular braces to the rails and legs. The junior-size, all-wood bench pictured at the top of the preceding page is made in three different sizes and heights. The work surfaces of the tops are made of hardboard bonded to wood. All three sizes, made by Sturdi-Bilt Steel Products, Inc., are available with a single drawer.

The cabinet bench pictured above at the left, made by Build-O-Bench Co., comes as a kit, with the paneled ends and compartment dividers assembled as units. Steps in the assembly of this kit are pictured in the lower photos on the preceding page and in the right-hand photo above. It is available with tops 6 and 8 ft. long. ★ ★ ★

☞ Fine scratches on furniture finished in a dark color can be hidden by painting each scratch lightly with iodine.



ATTACHMENT SHOWN MADE BY:
 PALMGREN STEEL PRODUCTS CO.
 8383 S. CHICAGO AVE., CHI.

Locator Sets Up Milling Attachment Accurately

In job shops handling custom work it sometimes is necessary to set the fixed jaw of a milling attachment or vise perpendicular to the lathe axis. On some attachments this can be done by swiveling either the attachment or the compound, but you risk a slight error in reading the witness mark. When a close setting is called for you'll do better with the locator pic-

ture. To make it, slot one end of a length of drill rod and braze a short length of flat stock in the slot. Then mount the unit in the chuck and true the forward edge as in the inset photo. Due to the interrupted cut it is necessary to use a sharp cutting tool. When making the setting be sure there are no metal chips on the contacting surfaces.—Walter E. Burton, Akron, Ohio.

Flat Filed on Center Point Prevents Hand Injury

Lathe centers are regularly ground to an included angle of 60 deg. with a sharp point. On certain types of work these points can cause a rather painful hand injury during a moment of inattention on the part of the operator. To offset this minor hazard, machinists file or grind a small flat across the points of both centers. This preventive measure in no way reduces the effectiveness of the centers for regular work.

☞ Make inch marks along the length of a garden trowel to help to judge the proper planting depth for flower bulbs.

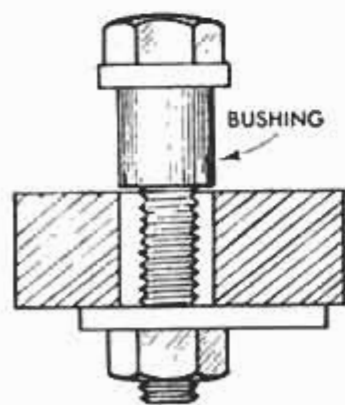


All-Steel Tractor Wheels Get Rubber Retreads

Treads cut from discarded rubber tractor tires make perfect retreads for the all-steel wheels of older-model tractors. Usually the steel wheels have flat rims as pictured and all that is necessary is to cut the tread from a rubber tire, fit it over the steel rim and trim to width. Then to make sure the retread stays in place, drill holes through the rubber to register with the original holes in the rim through which the metal lugs were bolted. Fasten the retread in place with short bolts and large washers.

White shellac enamel makes an eye-catching, modern finish on various woods, according to the Shellac Information Bureau. Just brush on a thin coat and while it is still wet, wipe off with a cloth dampened with alcohol. The trick is to wipe with just enough pressure to remove only the body of the enamel film, leaving the white in the grain.

An Emergency Arbor Press



washer, nut and a drilled steel plate. As an arbor press for seating small bushings this assembly is quite effective.

Seating a bushing with a hammer and a block of wood is a risky business. You are almost sure to damage the bushing, if not the hole in which it is to fit. A better way is to set up the job as in the detail, using a capscrew,

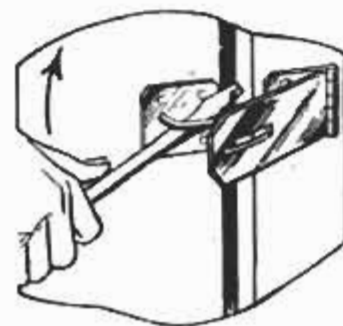
Keep Track of That Chuck Key

Few tools in the shop are more often mislaid than a chuck key. One way to eliminate the nuisance of the lost key is to attach a spring clothespin to the drill-press arm or to the tool panel near the machine.



Hold the pin in place with a small bolt passing through a hole drilled in one handle.—Glenn F. Stillwell, Manhattan Beach, Calif.

Nonlocking Hinge Hasp



Ever have the wind bang a door shut, flip the hinged hasp over the shackle and lock you in? Twist the shackle slightly as shown to make the hasp a friction fit and it won't happen.

Twine Holder Has Cutter

That leaky milk pail is just the right size to hold a ball of harvester twine. Rivet two overlapping mower-sickle sections near the rim of the pail and you have a twine cutter as a bonus.



DUAL-PURPOSE TABLE FOR DRILL PRESS

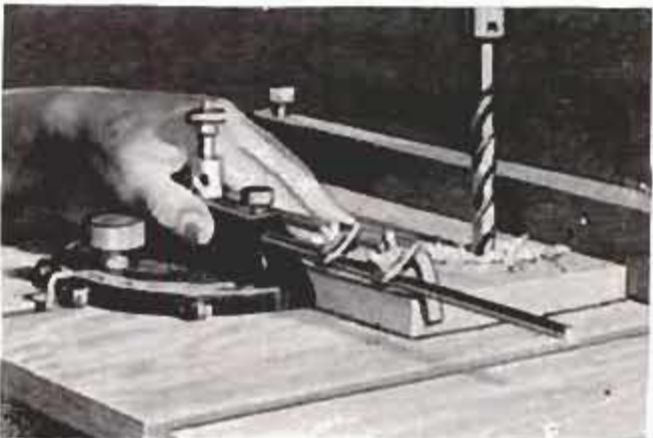
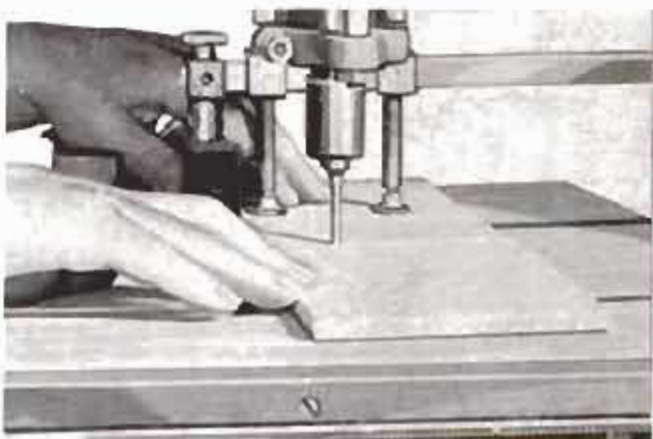
By Howard R. Clark

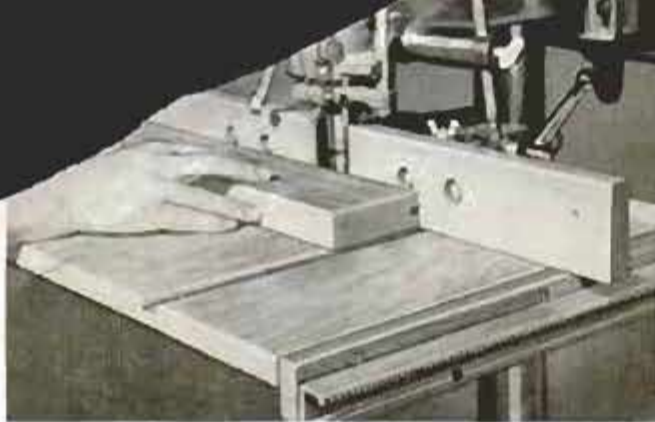
THIS AUXILIARY worktable extends the scope and usefulness of drill-press accessories already available. As you will see from the construction details on the following page the table is 18 x 20½ in., which is circular-saw size. Two grooves in the table take any miter gauge with a ¾ x ¾-in. guide bar. Guides attached to the edges of the table take a standard ripping fence from a circular saw. This fence is shown in use in the upper and lower photos at the right. A miter gauge is pictured in use in the center photo. By using the miter gauge and the ripping fence in combination as in the lower right-hand photo, you can position stock for drilling one hole or a pattern of holes. The ripping-fence guides and the miter gauge come with fractional-inch and degree scales which permit accurate settings for angles and distance from the center of the worktable.

As will be noted from the construction details, the sanding table is designed to fit over the worktable. It is mounted on two guides spaced to drop into the ¾ x ¾-in. grooves. These guides allow the table to be positioned at any desired point in relation to the drill-press spindle and also provide a means of relocating it accurately.

Both the worktable and the sanding table are made from ¾-in. plywood. This thickness gives sufficient rigidity without undue weight. Of course, solid stock such as maple can be used if desired, but if the solid stock is used both tables should be built up to the required widths by gluing together a number of narrow strips. After gluing, both faces should be planed and sanded flat.

The fittings for the ripping fence, detail A, come with the fence guides which are shown in position in the photo at top of next page. These screws turn into hex nuts mortised into the hardwood strips screwed and glued to the edges of the table. Heads

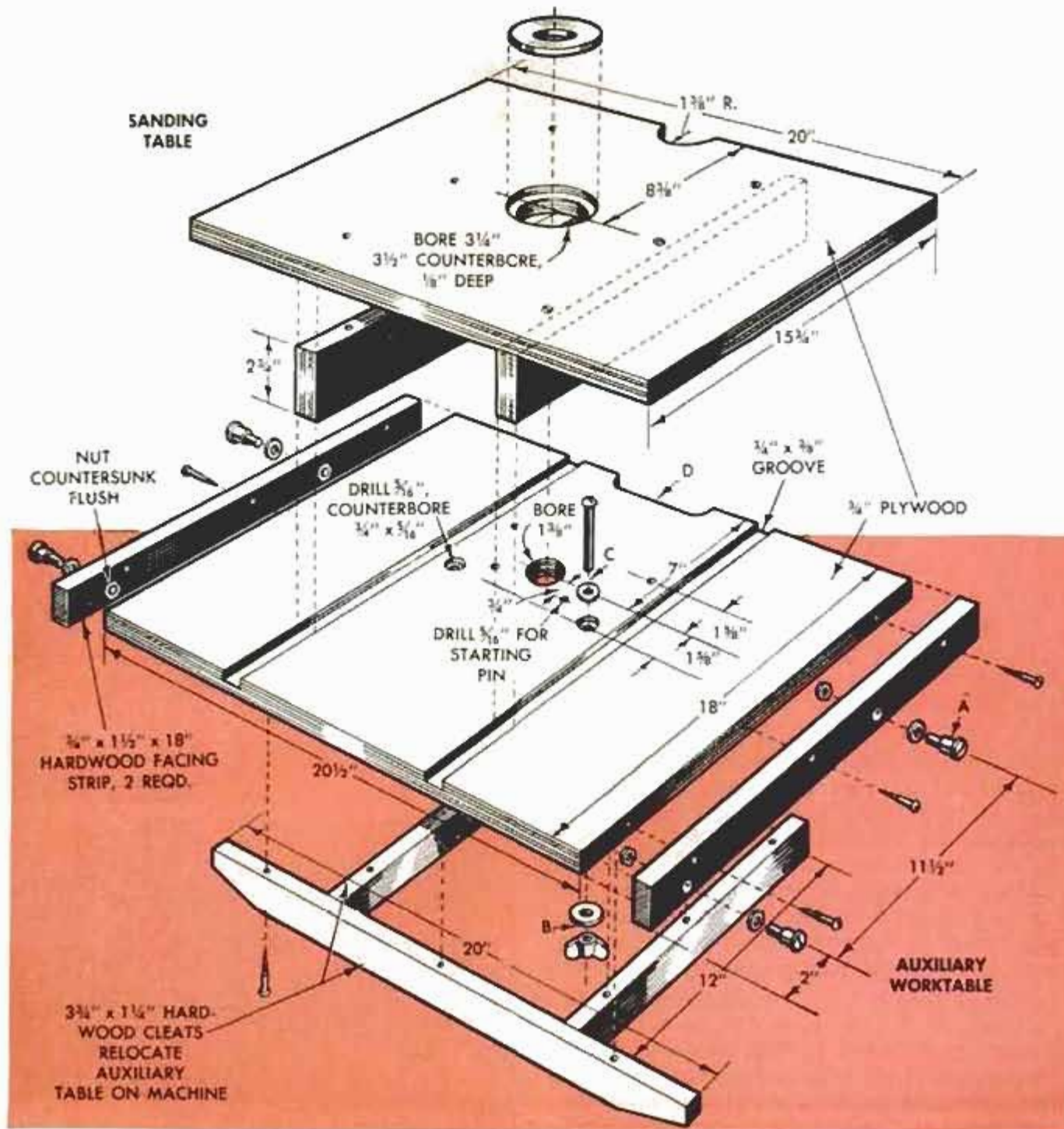




Here the worktable is fitted with a standard shaper fence set up for straight shaping, the drill press being operated at the highest speed. Note position of ripping-fence guides which are special equipment

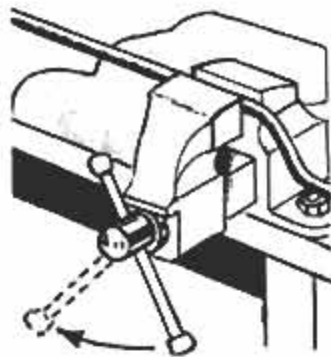
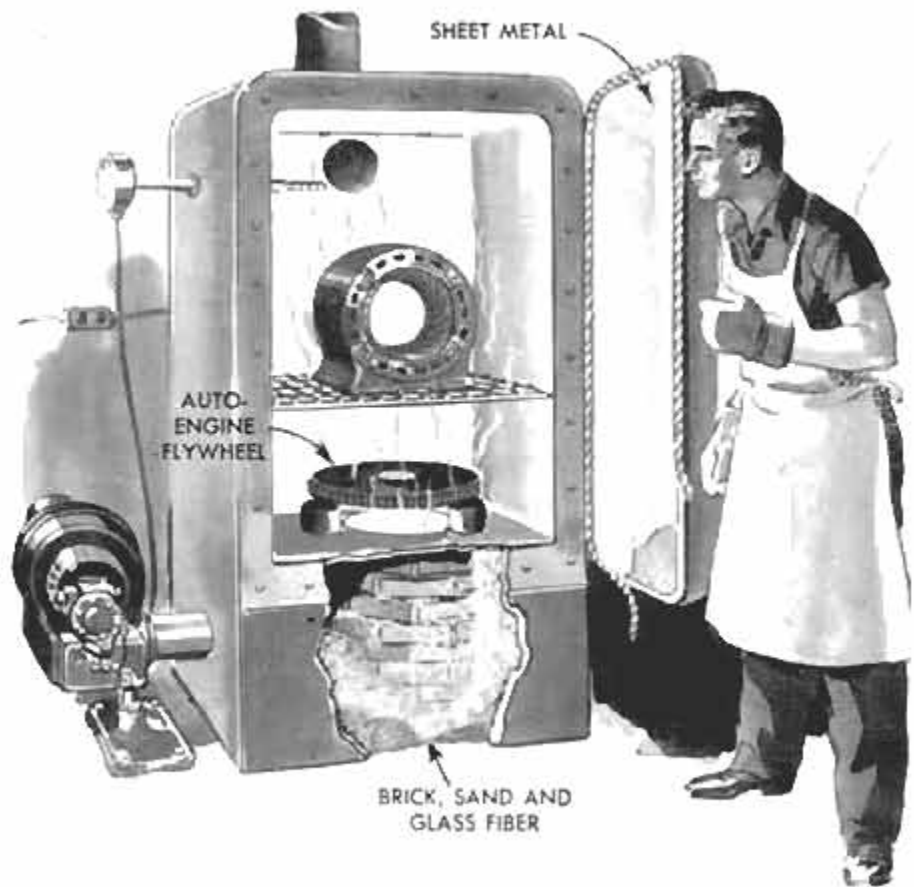
screws must be spaced so that they center through the slots in the machine table. Use washers and wingnuts on the screws, detail B, for easy removal and attachment of the table. It's a good idea to finish the surfaces of the table tops. First, smooth with a fine grade of sandpaper and then finish with shellac and two or more coats of paste wax. The smooth finish protects the wood against moisture and makes it easier to slide stock in any direction.

If your drill press is of the type having a tilting table, then the back edge of the worktable may require the clearance cut-out, detail D, in order to permit the machine table to tilt with the worktable in position. ★★★



Burn-Off Oven Improvised From Discarded Refrigerator Box

"Cooking out" electric-motor windings for replacement calls for a burn-off oven in which temperature can be closely controlled. Locate an old refrigerator with glass-fiber insulation, a used gun-type oil burner with limit control and you have the necessary parts with which to build a practical oven for this purpose. Replace the inside door panel with sheet metal and use $\frac{1}{2}$ -in. rope asbestos as a door gasket. Build a combustion chamber of firebrick in the compressor compartment and install the oil burner. Provide a vent pipe, and a heavy grid-type shelf on which motor parts may be placed.



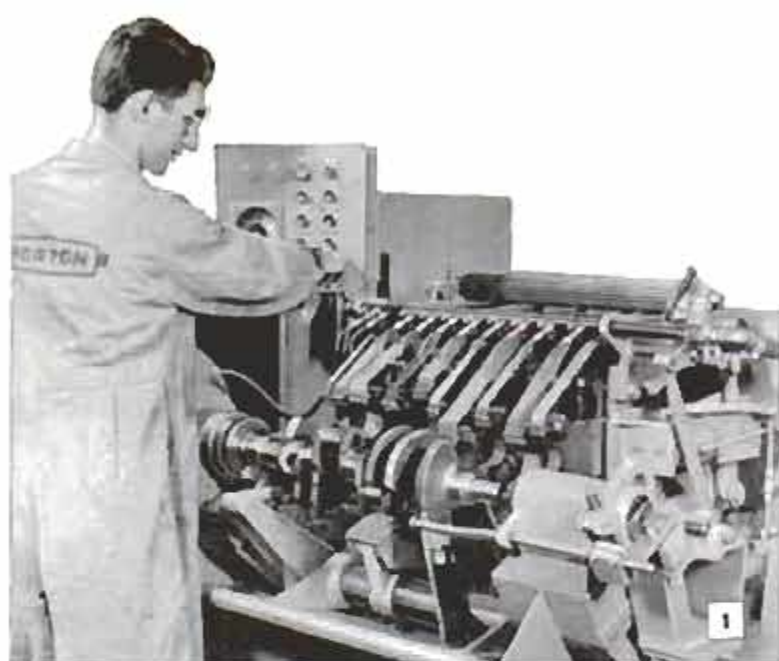
← Pipe and Tubing Straightened in Bench Vise

When you're faced with the problem of straightening bends and kinks in small-diameter pipe or tubing remember this one: Open the vise jaws to take the bend, hold the work in the left hand and bring the jaws against the bend lightly. Release pressure, rotate the work slightly and tighten again. Repeat this same procedure until the bend is removed.

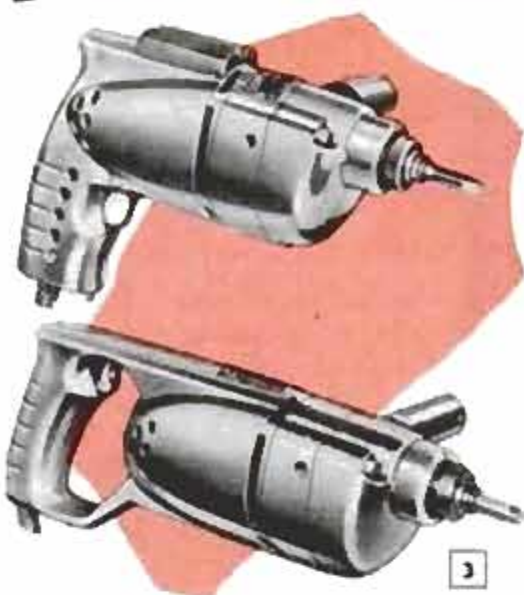
Wheeled Feed Trough

Large feed troughs are easily moved wheelbarrow-fashion in soft ground when fitted with rubber-tired wheels. A front axle, wheels and tires from an old truck mounted 4 to 6 ft. from one end of the trough usually will serve the purpose. Likely it will be necessary to shorten the axle so that when mounted, the wheels just clear the sides of the trough. When the wheels are mounted in the correct position the trough will stand level, without tipping down, yet it can be moved quite easily by one man.





SHOPPING FOR TOOLS



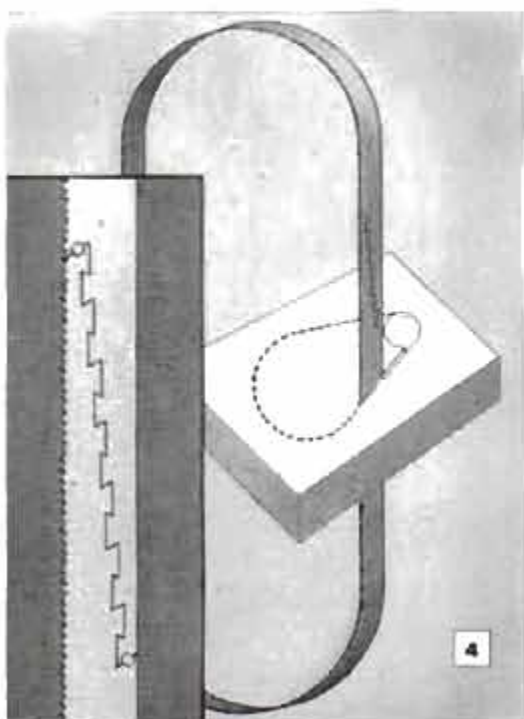
1. CRANKSHAFT LAPPING MACHINE laps the crank and bearing pins simultaneously in an automatic cycle. Fine surface finishing of these parts to low micro-inch readings is done by abrasive-coated strips automatically tensioned throughout work cycle
Norton Company, Worcester 6, Mass.

2. GLASS CUTTER utilizes a natural diamond that cuts in any direction, either along a straightedge or freehand. Only a light pressure is required to score glass to uniform depth, assuring a clean, sharp break the full length of the score
Clipper Diamond Tool Co., Inc., 345 Hudson St., New York City, 14.

3. COMBINATION DRIVER-DRILL is a rugged power screwdriver and a high-torque $\frac{3}{8}$ -in. drill in a single unit. It's available in two models, one having a saw grip, the other a pistol grip as pictured. Both have reversible side handles and special chucks
Millers Falls Company, Greenfield, Mass.

4. BANDSAW BLADE has dovetailed ends permitting it to be joined or taken apart in a few seconds. No need to cut and weld blade when making inside cuts in metals. Dovetailed ends of blade are locked with keys engaging internally cut V-grooves
Davies Product Engineering Co., Box 216, Fraser, Mich.

5. AIR VISE is self-centering, is designed for holding parts varying in size or shape and requiring location of center or other predetermined point. Jaws are 4 in. wide, are adjustable to $4\frac{1}{8}$ -in. opening. Has diaphragm-type air cylinders
Heinrich Tools, Inc., Racine, Wis.





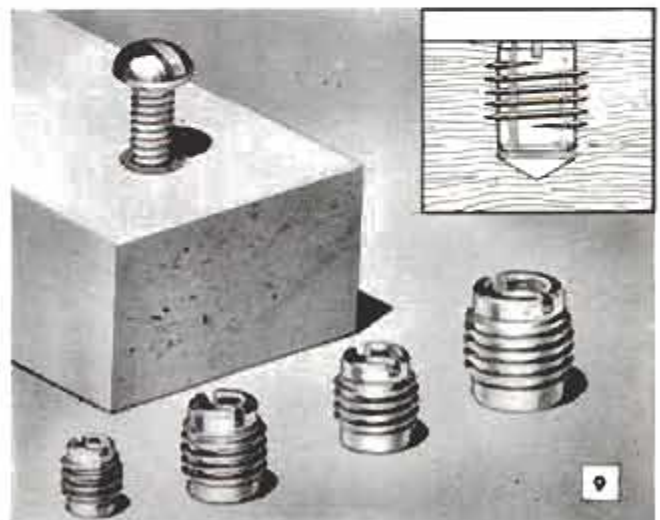
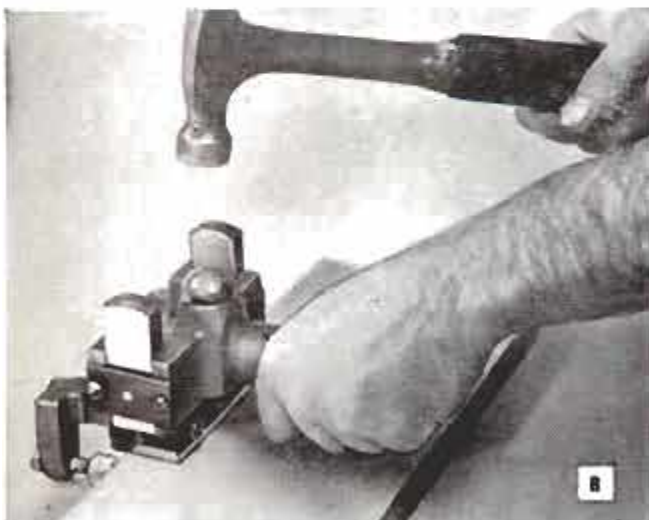
6. RADIAL-SAW ARM converts portable electric saw to radial saw. Portable saw is quickly attached and detached by means of a special adapter. When assembled as a radial saw, unit performs all regular operations and has all the standard adjustments of this type of machine. Radial arm is aluminum alloy
 Portable Electric Tools, Inc., 340 W. 83rd St., Chicago 20

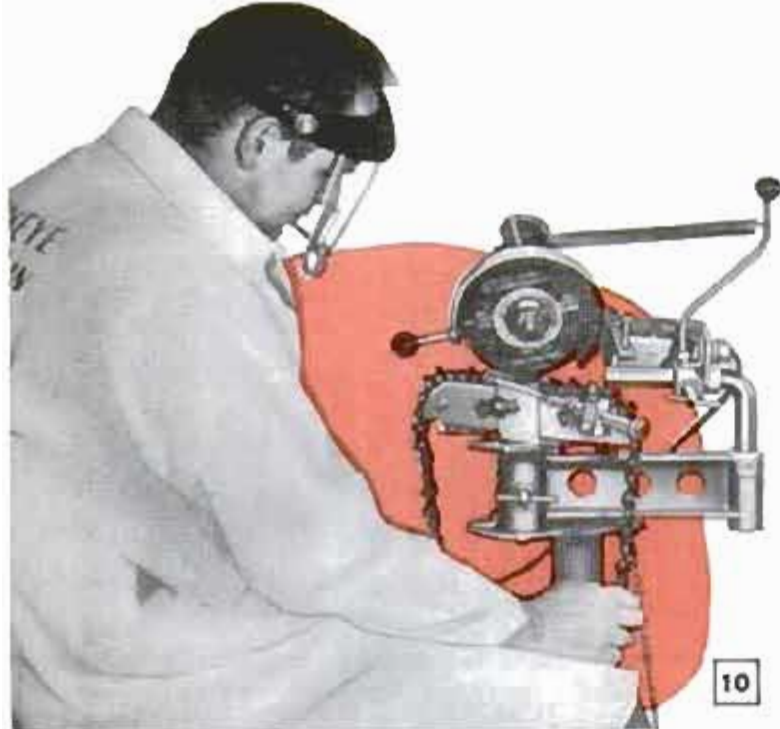
7. ROUTER features a spotlight for illuminating working area and a new type open frame permitting operator to see working area more clearly. Three-position switch starts and stops motor and locks motor shaft. Two models are available; one develops $\frac{7}{8}$ hp. at 23,000 r.p.m., other $1\frac{1}{4}$ hp. at 27,000 r.p.m.
 Stanley Electric Tools, Div. of Stanley Wks.,
 111 Elm St., New Britain, Conn.



8. HINGE-MORTISING MACHINE consists of two units, the outline tool pictured and a cutout tool which removes waste after cutting hinge-butt outline on door and jamb. Produces a finished mortise for $3\frac{1}{2}$ and 4-in. butt hinges in a fraction of time required by hand methods. Works on jambs up to $8\frac{1}{2}$ in. wide
 Dorsch Mfg. Co., Thurnton (Delaware County), Pa.

9. INTERNALLY THREADED INSERT cuts its own threads in wood, provides a threaded sleeve, or fastener, for stove bolts or machine screws used in assembling wooden parts. Inserts permit assembling and disassembling wooden parts without damage or enlargement of screw holes. Available in several sizes
 Rosan, Inc., 2001 W. Coast Highway, Newport Beach, Calif.



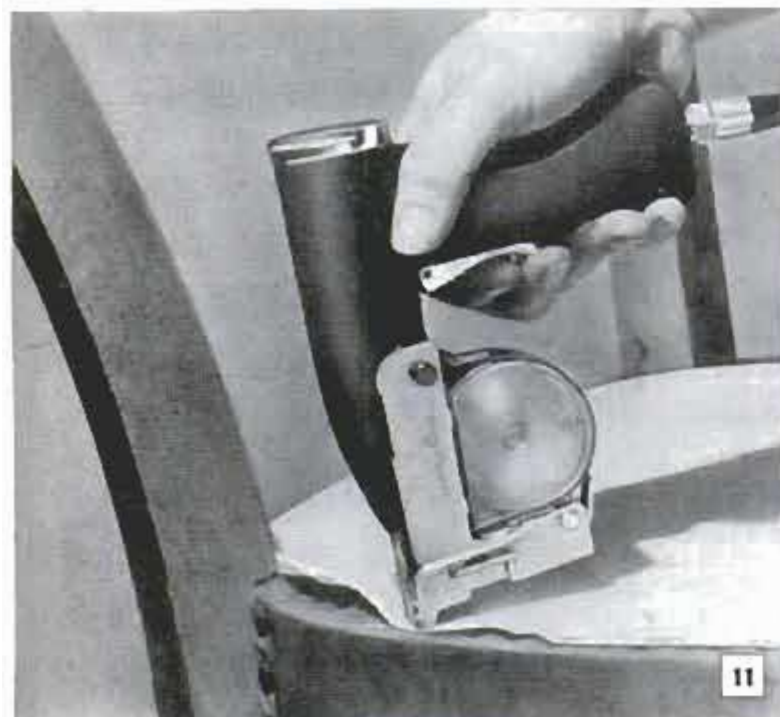


10. SAW-CHAIN GRINDER does a precise job on both right and left-hand cutters. Grinding wheel is arranged to pivot on center line of saw chain and is provided with a semiautomatic foot feed which lowers the wheel to predetermined position on each stroke. Unit is adjustable both vertically and horizontally. Motor is reversible

The Fato-Root-Heath Co., Plymouth, Ohio

11. AIR TACKER forms its own staples from precut wire, fires 5000 staples at one loading. Disposable magazines are of transparent plastic, provide full view of staple-wire supply right down to last pre-cut length. Tacker operates on air pressure up to 120 p.s.i., but will drive staples into nearly all common woods on 70 p.s.i.

Swingline Industrial Corp., 43-34 32nd Place, Long Island City 1, New York



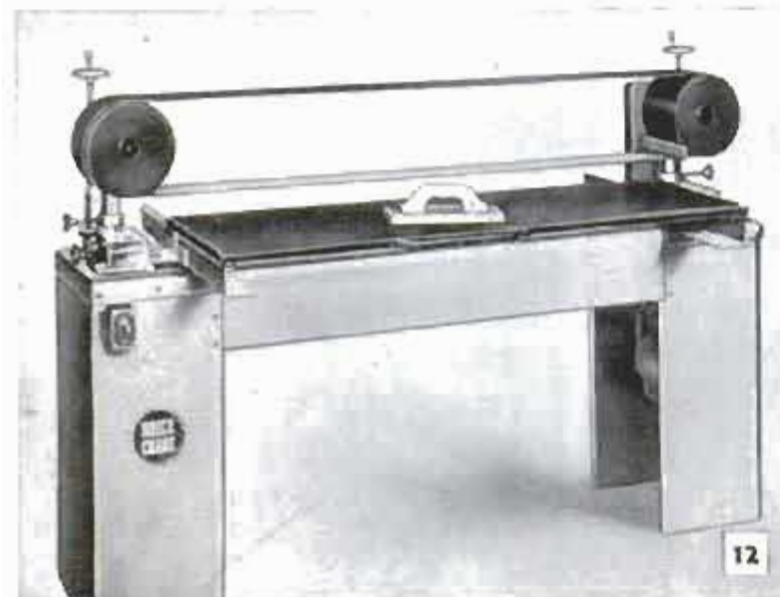
12. STROKE SANDER has a rolling worktable 18 x 60 in. and takes an abrasive belt 6 in. wide and 14 ft. long. Sands panels 29 in. wide and 60 in. long and handles stock up to 4 in. thick. Requires 3/4-hp. motor for light sanding and 1-hp. for heavy duty. Belt speed of 3000 s.f.m. gives exceptionally fine finish on hard or soft woods

Boice-Crane Co., 943 W. Central Ave., Toledo 6, Ohio

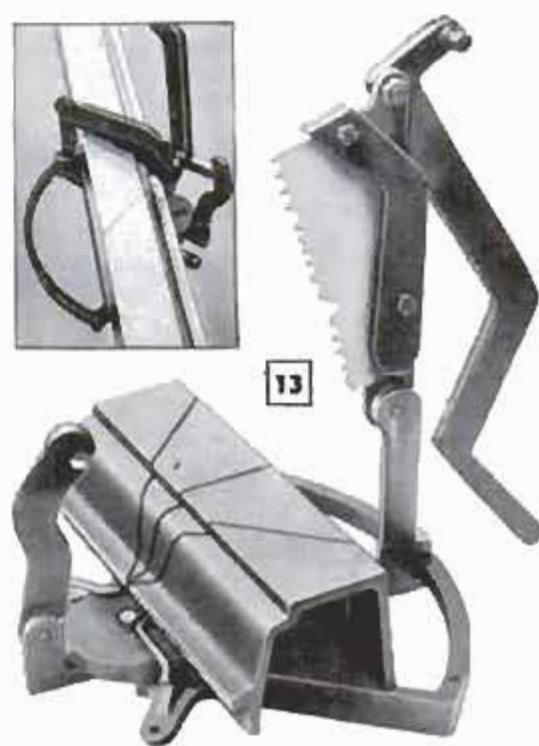
13. METAL SHEAR squares and miters metal gutters to required lengths. Does not crimp or distort the sheared edge or stretch the metal. Both mitered and squared ends fit true for soldering. Works like a bench-type sheet-metal shear, one stroke of the lever does the job. Miters metal gutters for both inside and outside corners

Hughes Mfg. Co., Norfolk, Va.

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13



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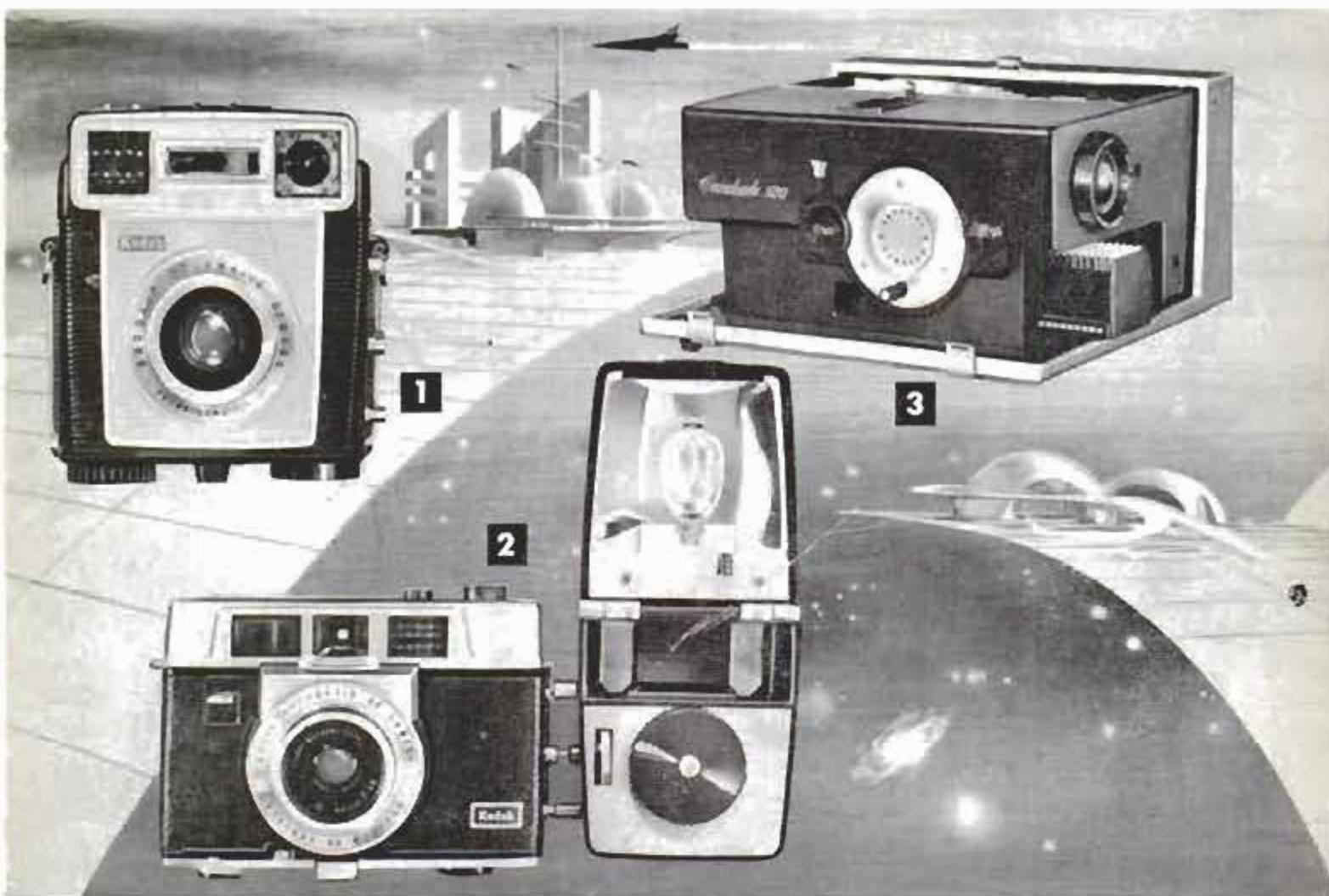
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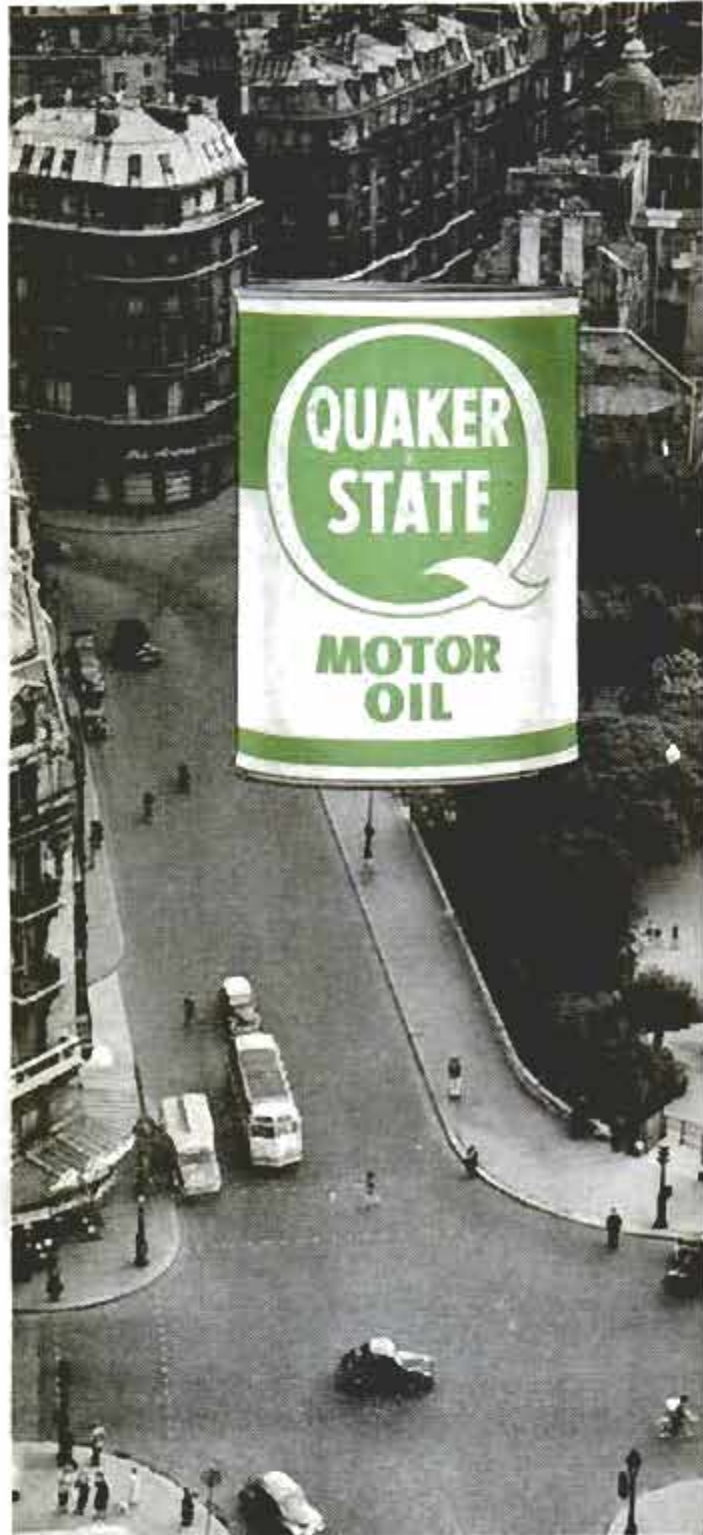
Rochester 4, N.Y.

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Repairing Table Leaf

Q—I have a drop-leaf table which I think is made from solid walnut. One leaf is split from the end in two places, the splits extending back nearly half the length of the leaf. I'd like to repair this part of the table rather than have a new leaf made. How do I go about it?

O. P., Kan.



A—You do not say that the table leaf is warped, so we will assume that it is still reasonably flat, is otherwise in good condition, and that it is genuine walnut and worth repairing. Without examining the defects closely it is difficult to say which of several methods should be used. Also, much depends on how old the defects are. A new split, or check, usually will close perfectly under clamping pressure, but if the defect has existed for some time, the release of stresses sometimes alters the shape of the meeting edges sufficiently to prevent them from closing tightly under pressure. The first step is to check this by removing the leaf from the table and closing the splits with bar clamps. Work carefully with the clamps and be sure to protect the outer edges of the leaf with strips of waste stock. If the splits close tightly under clamping pressure, then all that is necessary is to release the clamps, force glue between the joining edges and draw together again with the clamps. Wipe off any excess glue with a dampened cloth. Allow the glue to set permanently before removing the clamps. Sometimes the meeting edges will tend to offset slightly when the clamps are drawn up. As a rule this can be corrected by placing short hardwood strips across the joint, one on top of the leaf and the other on the bottom, and drawing up with a C-clamp.

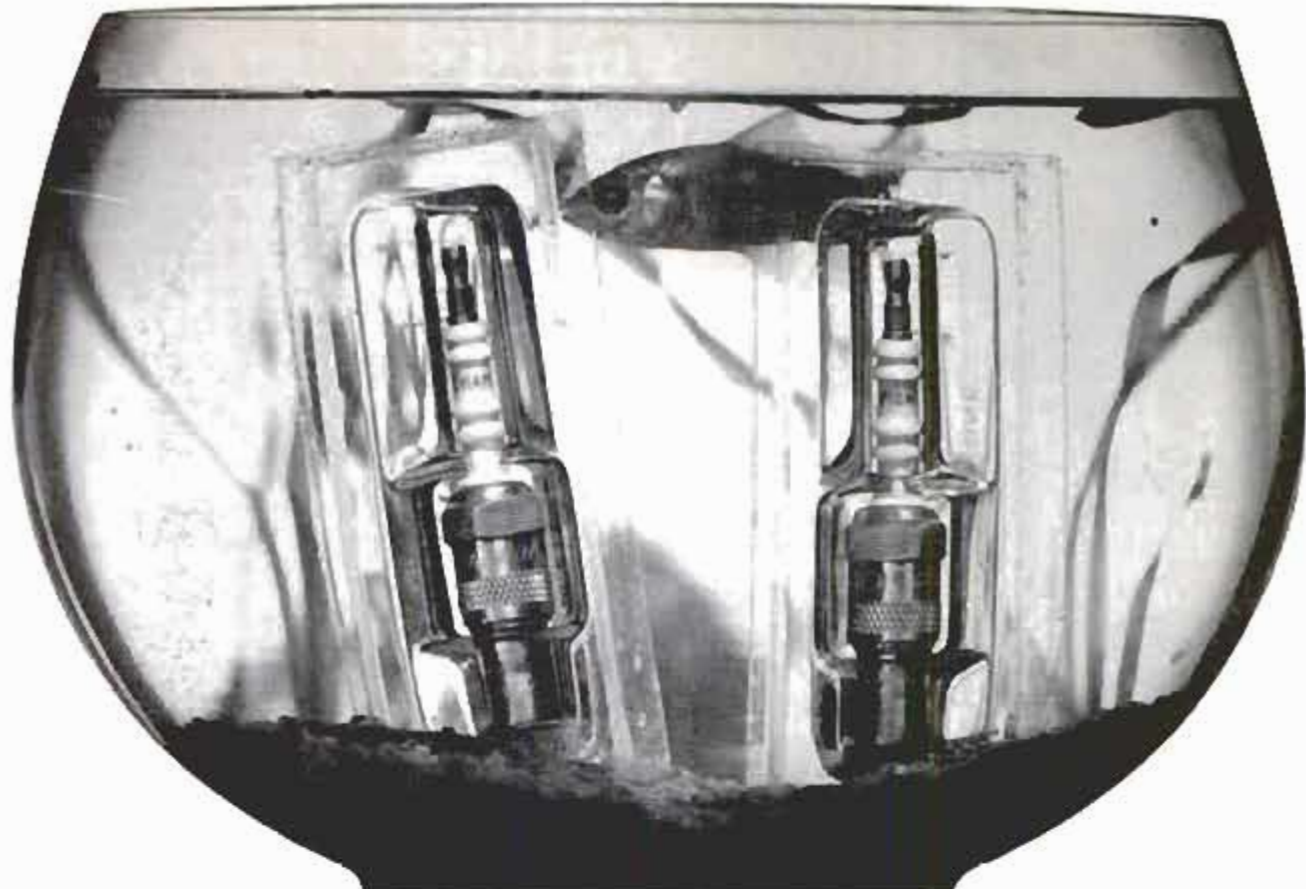


Sanding Moldings

Q—I have some molding which I purchased with the idea of using it for picture frames. During the storage period it has gathered dust and some pieces seem to be discolored, several showing dark, reddish streaks and some, dark spots. How should I go about preparing this molding for use?—O. D., Wis.

A—We're assuming from your description that the molding is a stock item of pine rather than hardwood and that you plan to finish by staining and applying a clear finish rather than paint or

(Continued to page 206)



24 hours before these pictures were taken, we put these Champion plated marine spark plugs in this goldfish bowl. Plenty of time for water to try to seep into these waterproof packs—if it can!

Waterproof pack makes Champion spark plugs the perfect spares...

24 hours under water – and these new Champions spark motor to life on first try!



After 24 hours under water, Champions are opened, gapped and put into engine, without being dried in any way. Even a little moisture could short the plugs . . . keep engine from starting.



It starts on the first try! Here's proof that plated marine Champion spark plugs in the waterproof pack are always ready for instant use when carried as spares.



Only Champion offers you a waterproof pack to help assure your boating fun by keeping your spares always clean, dry and ready for instant use!



START THE SEASON WITH A NEW SET OF CHAMPION MARINE SPARK PLUGS

enamel. The reds and browns in certain pieces of pine tend to intensify with age and, if the pieces have been exposed to dampness sometime during the storage period, stains will appear as dark spots on the surface. An accumulation of dust usually can be removed with fine steel wool. Don't attempt to wipe it off with a cloth as this will only embed the finer particles in the wood. You can't remove the reddish streaks without sanding or scraping off considerable wood. This may alter the shape of the molding. A better way is to select the colored pieces and miter them so that you obtain an attractive figure, or "grain," in the finished picture frame. Dark spots and other minor discolorations usually will yield to a light sanding with fine sandpaper. Use a small synthetic sponge or a thick piece of soft felt as a sanding pad. By turning such a pad on edge you can work in the contours without rounding the sharp edges of the molding shape.

Preventing Sash From Sticking



Q—Isn't there some practical way of preventing paint from working into the space between the sash frame and the stop? Once the paint hardens it is almost impossible to loosen the sash without damage. I'm not referring to use of a putty knife after the paint has hardened, but some way to prevent the paint from getting into the opening.

N. R., R. 1

A—Usually it's the upper sash of a double-hung window that gives the trouble. Of course, it is possible to prevent paint from working into the space between the sash and the stop by various methods, but considering the time involved, the question arises as to whether such steps are practical. Many professional painters thin a small batch of paint especially for the purpose of painting the sash frames. By mixing the paint thinner it is easier to control with a sash brush when cutting in sash and working to an edge, as in painting the stops and the adjacent face of the sash frame. In this way you can prevent the paint from working into the space between the frame and stop. We think it would prove the most practical. Another method is to cut strips from light-gauge sheet metal, such as aluminum, and force these edgewise into the space between sash and stop to serve as shields. As soon as painting is finished the shields are removed and wiped clean with a paint solvent.

Putty Hardens in Storage

Q—When I buy a pound or so of putty and use only a part of it, how do I keep the rest from hardening? I've tried about everything I could think of and still the stuff hardens just enough to be unusable.—T. F., Mass.

A—The trick is to locate a container that can be closed tightly and which is just the right size to hold the putty leftovers without any space to spare. Lacking this, place the putty in a tight container, press down and level it to exclude air, then cover with an inch or so of clean water. This method is fairly reliable.

Paper Over Paper

Q—I recently moved into my present home and would like to repaper several of the rooms. Rather than take the old paper off the walls I plan to apply new paper over the old. I'm told this is wrong. Why?—E. H., Del.

A—This we cannot recommend, although we know it is commonly done. By papering over the old you are adding to the difficulties of removal should you ever wish to take off the old wall-paper and redecorate with paint or some other type of wall covering. It's better in the long run to remove the old paper each time before applying the new. After the old paper has been removed, wash the walls thoroughly to remove any residue of paste that may remain.



PAINTING YOUR HOUSE THIS YEAR?

For greatest economy when painting your house, use world-famous SWP House Paint. The super-durability of SWP will result in a paint job that will give extra years of beauty and protection. SWP's longer life can save you hundreds of dollars in repainting costs over the years.

Insist on SWP . . . the house paint that protects more homes in America than any other brand.



FREE BOOKLET

"How to Save Money When Painting Your House". Ask your Sherwin-Williams Dealer for a copy, or write The Sherwin-Williams Co., Dept. K, Cleveland 1, Ohio.

EUROPE...OR THE FAR EAST?



choose your travel before you enlist

Ever had the itch to travel? To explore Paris at night? To hunt wild boar in the forests of Japan? To try surfboarding at Waikiki? Skiing in the Swiss Alps? Swimming on the Italian Riviera?

Every year, thousands of American soldiers experience the thrill of foreign adventure. Roaming far-away corners of the world that most folks at home can never hope to see. Storing up exciting memories that'll last a lifetime.

Many of these Army men *chose* their own travel. And they made their choice *before* enlistment.

Sound interesting? Your Army recruiter can tell you all about Army travel opportunities. This week, drop in and talk it over.

P.S.

You may enlist in the Army for only three years.

CHOICE, NOT CHANCE **U.S. ARMY**

How WEEDONE helps you have a better lawn



Broad-leaved and other lawn weeds mar the appearance of your lawn, crowd out desirable lawn grasses, rob good grass plants of needed nutrients.



WEEDONE penetrates the weed, kills it roots and all. Dandelion and other lawn weeds die from leaf top to root tip, yet WEEDONE will not injure fine lawn grass.



By killing unsightly weeds, roots and all, you give desirable lawn grasses room to grow, preserve valuable plant nutrients which weeds rob from the soil.



You'll have a healthier, more beautiful lawn if you control lawn weeds the WEEDONE way. It's the original 2,4-D weed killer, now with 2,4,5-T added.

WEEDONE is easy and economical to use—liquid for sprayer, dry for spreader application. Harmless to children and pets. Sold wherever fine garden products are available... still at the same low price: 8-oz. can \$1.00, 5-lb. bag \$2.25. Larger sizes available. (Dry form slightly higher west of the Rockies.)



WEEDONE

kills weeds, roots and all!



Amchem Products, Inc. (Formerly American Chemical Paint Co.)
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Pipelines Grow Like Spider Webs

(Continued from page 109)

off into the distance as if fired from a cannon, and only a single chunk landed on the railroad tracks below. That chunk was as large as a freight car—with perhaps a caboose attached. The foreman was fired on the spot, but he soon got a job on another pipe-laying crew because he was good. Just one mistake to his credit.

Dozers With Safety Belts

In the mountains, the bulldozer operators who clear the paths for the ditch diggers sometimes have to strap themselves to their seats with safety belts which can be quickly released. If an operator sees a bulldozer is about to leap down a canyon wall, he bails out.

On the Trans Mountain job, many thousands of dollars' worth of equipment tumbled down canyons. The job, costing \$1000 a foot in some sections, was also one of the most expensive in recent times in human lives lost—six. But usually a job is carried out with only bruises and jolts.

The pieces of pipe are welded in the field into sections usually consisting of three pieces, and the inside linings and outside coatings of the pipes are patched at the welds. Pipe that has been cleaned, primed, coated and wrapped is expected to lie in the ground for 30 or more years without being dug up for repairs, and this is where electronics plays a significant role today.

The tiniest pinhole can lead to corrosion, so a device known as a holiday detector has been developed to seek out, electronically, places missed with the coating. A hoselike electric wire is placed around the pipe and moved along behind the coating-and-wrapping machine. Whenever a weak spot in the coating is encountered, the battery-energized machine buzzes and blinks. A hand "doper" fixes the spot.

Pipes Groan When Bent

The sections of pipe are lowered into the ditch by tractors with cranes that carry huge "iceman's tongs." These pipelayers can support up to 130,000 pounds.

Sections are bolted together by crews with electric wrenches, followed by other crews with torque wrenches. Then the joints are coated with enamel. The couplings permit bends up to three degrees and greater deflections are accomplished by cold bending the pipe in the field.

Cold bending of the pipe by huge, hydraulically operated machines is something that would have startled even Paul

(Continued to page 210)

A pleasant addition to the art of fishin'



Photographed at Florida's Silver Springs.

dependable **MERCURY OUTBOARDS**

There's been *new* progress in fishing motors by Mercury . . . *new* freshness of design in the forward *Glide-Angle* look . . . more dependability . . . a water pump specially designed for operation in weeds and mud.

Automatic Transmission that puts shift, throttle and steering control in *one hand!* Weedless *Glide-Angle Design* slides safely over submerged objects. There's no "wrassling" to fix broken shear pins because

Mercury got rid of them years ago, introducing modern propeller clutches! So go *where* you please, *when* you please! Your Mercury is rugged, reliable — and quiet as a good fishing companion should be. See your Mercury dealer now for a *free* demonstration ride. Choose from three *Glide-Angle* twins — 22 hp Mark 28A, 15 hp Mark 15A, 10 hp Mark 10A. They're easy to look at, easy to own with the Mercury time payment plan.



MARK 28A
22 hp

Single-Lever Control and Ride-Guide Steering available for remote operation. Safe single-line, vacuum-fed fuel system eliminates dangers of pressurized fuel tanks.



MERCURY—the 50,000-mile outboard, the world record line for '59!
Twins—6 hp, 10 hp, 15 hp, 22 hp. Fours—35 hp, 40 hp, 45 hp.
Sixes—60 hp, 70 hp. "Full Jeweled"® Power throughout!

Write for FREE Catalog and 28-page Booklet, "Fishing with an Outboard". Address Dept. PM-5. © 1959 Kiekhaefer Corporation, Fond du Lac, Wisconsin.

Bunyan, who used to bend sky-tipping trees when he leaned on them. The pipes groan and squeal, but they bend to the force of the machines.

When the pipelines that were to revolutionize oil transportation were introduced in 1865, they were ridiculed. And the laying of them entailed the hardest kind of hand labor, performed by "tong gangs." These crews got their names from the heavy, long-armed tongs they used to lower the pipe into ditches. A tong gang of 28 men would lay as much as 3500 feet of six-inch pipe in a day.

The weakness of the tong gangs was not in their own joints but in the joints of the pipe they laid. Line walkers had to patrol the pipes continuously for breaks. One line walker was expected to cover 25 to 30 miles a day.

Bigger Pipeline Future

Today there is great optimism about further possibilities for oil pipelines. Commented J. W. Meehan, President of Pure Oil's transportation company: "The surface hasn't been scratched yet in the laying of pipes for oil products."

Added Herbert E. Fisher, President of Pipe Line Technologists of Houston, Tex.: "Just about any commodity that can be put into a gaseous or fluid form can be handled through a pipeline, provided it's not too viscous, abrasive or corrosive. The primary question is one of economics."

Major General Paul F. Yount of Army Transportation stressed the value of the pipelines in time of war.

"They are well camouflaged," he said. "They carry their cargo with secrecy and security. In case of withdrawal, a pipeline is the easiest type of transportation to destroy. It takes something to destroy a rail line. With the pipeline, no explosives are necessary."

The general also stressed that the pipelines can go where tracks cannot.

Big Underwater Jobs

This fact was borne out dramatically several years ago when the world's deepest line was laid across the Straits of Mackinac at the north end of Lake Michigan—21,000 feet of pipe 243 feet below the water line.

Another big underwater job was the laying of three miles of pipe in the Persian Gulf off Bahrein because oil tankers could get no closer to the shore. For 3½ months a Standard of California crew of 45 men lived in a ship that was often like an oven. The divers were the key men, also the coolest.

In the Peace River country of northern Canada, Texaco crews hauled their big equipment into place during the biting cold

of winter because they couldn't get across the muskeg in the summer. But "Ma" Anderson, who operates a lodge on the Alaska Highway, cheered up the half-frozen men.

"It's better than in the summer," she told them. "Then the mosquitoes are out, and they don't bite around here. They plug you—like a watermelon."

Tigers and Sand Storms

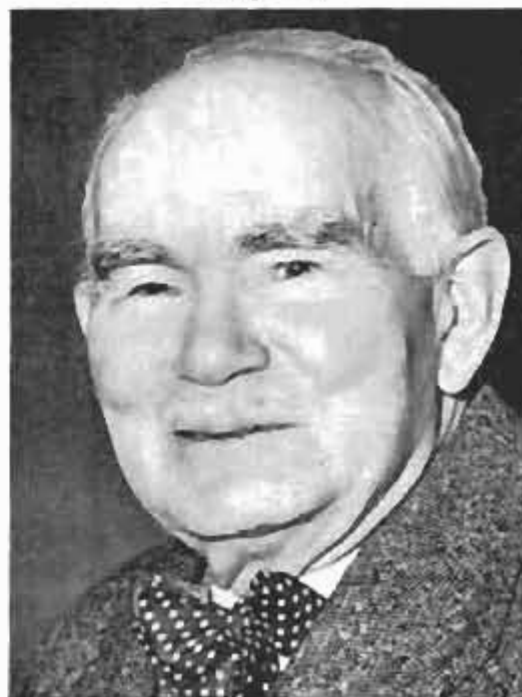
In Sumatra, crews laid lines through tangled, dripping jungles. But the crews didn't mind the rain as much as they did the restless tigers.

In Arabia, the pipeliners fought swirling desert sands to lay a 1000-mile stretch, 30 inches in diameter, to the Mediterranean Sea at Sidon. There were no towns, but five new permanent ones were built to serve the crews and eventually the pumping stations.

The job of pipelaying, what it entails, and what it means to the men who do it, was probably best summed up by Royce Fulton of Lubbock, Tex. In 1940, he quit a \$250-a-month job to start out as a pipeline contractor. Now his organization lays about 1500 miles of pipe a year. His comment: "It's a rough business with a new headache every day. But I don't suppose I'll ever quit being a pipeliner." ★ ★ ★

***This Month's* "Great Pioneer in Science"**

(Page 24)



Lee De Forest (1873—)

MILLERS FALLS
TOOLS

SINCE
1868

IT'S TOOLTIME '59



Lepper



DON'T MISS THESE

FREE CARRYING CASE and RIP GUIDE... \$15 VALUE



No. 747



When you buy an "all-new" Millers Falls Heavy Duty Saw at the regular price



Three models with tremendous cutting capacity. Professional builder features. Full-power motors. Exclusive "Micro-Guide"®.

Saw	Capacity		Power	Price
	90°	45°		
No. 646-6½"	2"	1-11/16"	1.5 H.P.	\$69.50
No. 747-7¼"	2⅜"	2"	2.0 H.P.	\$84.50
No. 800-8¼"	2⅞"	2-9/32"	2.0 H.P.	\$95.00

You pay for saw only. Case and rip guide FREE.

FREE BENCH STAND and TABLE WITH VERSATILE JIG SAW

It's 6 saws in 1 — and the fastest in its field. Cuts own starting hole in wood. Bench stand and table included for regular price of No. 480 saw alone!



~~\$45.95~~
NOW
\$39⁹⁵

TOOLTIME '59

SPECIAL OFFERS GOOD FOR LIMITED TIME ONLY!

Sizzling Spring Specials!



No. 8006 POWER BIT SET

Over 10% Saving

6 high speed steel bits that cut quickly through wood, steel, plastics. Even bore through nails.

REG. ~~\$7.90~~ NOW \$6.95



Your Old
Screwdriver
Worth \$5
toward a

NEW DRIVER-DRILL

2 tools in 1! A power screwdriver, geared to 275 RPM for high torque and easy control. Quickly converts to a 3/8" drill. Pistol grip (No. 2860) and saw grip (No. 2660).

Only
\$34.95 plus your old screwdriver

\$3.00 OFF HEDGE TRIMMER ATTACHMENTS



No. 2150 No. 8821
Now \$11.95 Now \$9.95

Specially reduced prices on 2 models. No. 2150 fits any 1/4" drill. No. 8821 for use with Miller's Falls "888" power unit and 1114, 1115 and 1134 drills.

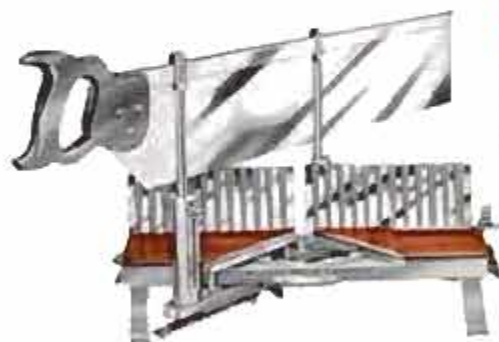
SPECIAL PRICE on No. 725 NEST OF SAWS!

~~\$3.50~~ ONLY \$3.00



Pistol-grip handle with 3 interchangeable blades. 8 positions. Cut steel, plaster, wood and practically anything else!

SAVE \$11 on a Langdon Acme Mitre Box



~~\$86~~
NOW
\$75

No. 74C

The famous Langdon Acme, best mitre box you can buy! Rugged construction. "Oilite" bearings for smooth saw glide.



**TOOLTIME
'59**

**HOW TO BUILD THE POWER WORKSHOP
YOU WANT . . . AND SAVE MONEY
IN THE BARGAIN!**



**THE DRILL
THAT DRIVES
A WORKSHOP**

No. 1114

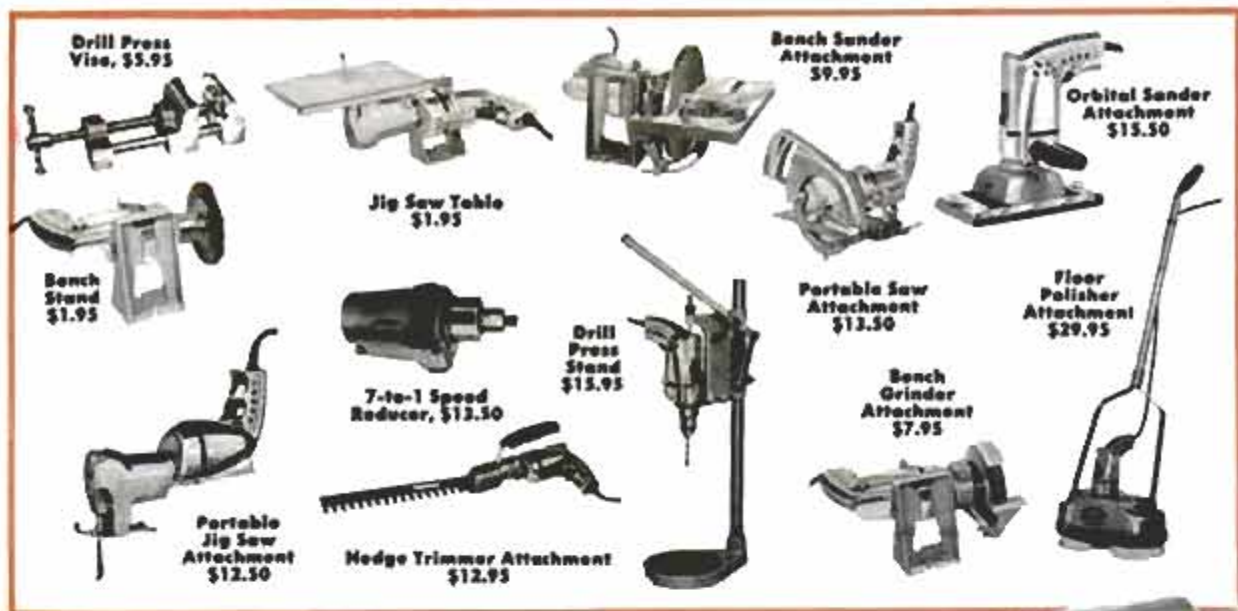
\$22⁹⁵

POWER DRILL

Here's a brand new 1/4" power drill that packs a solid wallop. Designed like Millers Falls famous "888," it direct-drives a *complete workshop* of attachments. Many of them can also be used with the "888."

This drill really has what it takes — a full 2.7 amp. motor for high torque and 2250 RPM gearing. It's the economical way to build a professional 14-tool shop.

Two other models are available. No. 1115 with saw grip, No. 1134 with ball bearing armature.



Here's REAL Authority!

Famous "big brother" of the 1114 drill — the "888" Dyno-Mite power unit. Packs a full 1/3 H.P. Drives attachments shown above and more besides. Costs only \$39.95 completely equipped as 3 tools in 1 — 3/8" drill, 6" disc sander, and 6" polisher.



EXTRA POWER



FOR THE PRO!

No. 912
1/2" Drill

For really tough jobs that smaller drills can't handle, this is the 1/2" drill that "can do"! Most powerful all-purpose 1/2" drill made with 3.0 amp. motor. Drills holes up to 1/2" in steel, 1 1/2" in wood. No stalling or overheating. A real value at only \$47.50.

No. 2912 stand quickly converts the 912 into a powerful drill press. \$27.50.

Rugged 3/8" drills also available. No. 2838 (pistol grip) and No. 2638 (saw grip). Each \$34.50.

SANDS SMOOTH AS A BABY

No. 580
ORBITAL
SANDER



For a truly satin-smooth finish, this orbital sander can't be topped. Sands with or across grain without leaving whorls or marks. Use on wood, metal, plaster, plastics, etc. Gets flush into corners. Wet or dry sanding. Only \$39.95.



Fine Craftsmanship made easy with Millers Falls

ROUTER - PLANE - SHAPER

ROUTER . . . has large 6" diameter base, rugged 3 amp. motor with ball bearings throughout. Runs at 30,000 RPM for fast, clean cutting. Full line of accessories available. No. 6800 router complete with base . . . \$39.95.



PLANE . . . attachment has extra long 14" shoe and outboard arbor support. Micrometer-screw adjustment for shoe and cutter alignment. Direct-reading depth adjustment. Notched quadrant for quick bevel cuts (-15° to +45°). No. 6826 . . . \$31.95.



SHAPER . . . attachment has 24" x 15" table - twice the size of comparable units. Built-in motor mount. Adjustable fence. 1" marine plywood. No. 6818 . . . \$19.95.



These router bits really bite

High speed steel bits for 17 most useful cuts. Basic Bit Kit (No. 6977) contains 3 bits and a grinding wheel. No. 6977 . . . \$9.25.



**MILLERS FALLS
TOOLS**

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These attachments can make any 1/4" drill DO MORE FOR YOU

BUFFING AND SANDING ATTACHMENT SAVES TIME AND WORK!

Makes any 1/4" drill an efficient polisher and sander in seconds! Complete with 5" rubber pad, lamb's wool bonnet and 2 sanding discs. No. 2120 . . . \$9.30.



IT'S EASY WITH A RIGHT-ANGLE DRIVE

Enables you to get into close quarters with your 1/4" drill. Use it in corners, between studs and wherever direct-drive is impractical. No. 2130 . . . \$5.50.



JIG SAW ATTACHMENT CUTS ANY SHAPE

Saws straight lines, curves, or any irregular shapes in wood, metal, plastics. Cuts own starting hole. Air blast keeps cutting line clean. No. 2140 . . . \$11.95.



FOR A SATIN-SMOOTH FINISH

This orbital sander attachment inexpensively turns a 1/4" drill into a fine-finish sander. 12 times faster than hand sanding. Sturdy clamp holds sander rigidly in place. No. 2160 . . . \$15.95.

EASY-TO-USE 5-INCH CIRCULAR SAW ATTACHMENT

This lightweight, 5" circular saw is easily attached to any 1/4" drill. Ideal for the handyman who wants a fast cutting power saw at a bargain. Rips, crosscuts, mitres. No. 2170 . . . \$14.95.



TOOLTIME '59



Millers Falls fine quality hand tools make it easier to do quality work



BIT BRACE WITH MANY USES

Bores holes, countersinks, does heavy screwdriving. Sturdy ratchet mechanism. Precision made.
No. 1950 . . . \$7.35.



HACK SAW FRAME CUTS METAL FAST

Rigid, rolled steel back. Unbreakable "Tenite" handle. Adjustable for 8" to 12" blades. Furnished with top quality 10" blade.
No. 48 . . . \$4.25.



Look to Millers Falls for the finest hacksaw blades, too. Special alloy "Tuf-Flex"® . . . high speed "Blu-Mol"® . . . flexible "Blu-Flex"®.



TOP QUALITY HAMMERS

Well-made and well-balanced. All steel No. 592C . . . \$4.75. Tubular steel No. 692C . . . \$4.75. Hickory handle No. 1417 . . . \$2.60.

HANDY HAND DRILL

A basic tool in every shop. Chuck holds drills up to 1/4" in diameter. Operates smoothly.
No. 1420 . . . \$3.95.



BEST WAY TO DRILL SMALL HOLES

Automatic drill operates by pushing with one hand. 4 drill points from 5/64" to 11/64" included in handle. No. 170 . . . \$4.00.



LIFETIME HAND SANDERS

Last indefinitely. Medium (No. 556) or fine (No. 555) grits. Sand anything. 99¢.



**MILLERS FALLS
TOOLS**

SINCE
1868



**TOOLTIME
'59**

PROFESSIONALS PREFER THE MILLERS FALLS LINE OF HAND TOOLS

SCREWDRIVERS FOR EVERY USE

Highest quality. All sizes and types. No. 229 spiral ratchet . . . \$4.25. No. 199 offset . . . \$1.00. No. 851-6" plain . . . \$1.35.



ACCURATE TORPEDO LEVEL

A useful tool on innumerable jobs. Bakelite body. Nickeloid top. 3 vials. No. 590 . . . \$2.70.

PERFECT PLANE

An ideal bench plane. Beautifully balanced and clean cutting. Easily adjustable. No. 90 . . . \$6.95.



IT'S A PLANE



IT'S A FILE

PLANE-'R-FILE

It's 2 tools in 1. Handle reverses to change from plane to file in seconds. Use on wood or metal. No. 1220 . . . \$3.49.

THE MEASURE OF QUALITY

Accurate tapes, rules, combination squares and other measuring devices. Traditional Millers Falls quality. No. 1506 tape rule . . . \$1.10. No. 1200 combination square . . . \$2.25. No. 1460 folding rule . . . 90¢.



MILLERS FALLS COMPANY
Dept. PM-28, Greenfield, Mass.

**MILLERS FALLS
TOOLS**

SINCE
1868

Finest hand and power tools made for home and industry

Build "The Cheapskate"

(Continued from page 143)

will be broken and the battery circuit opened. This provides a simple, yet effective, switch and causes the receiver to be turned on automatically when the earphone is plugged in.

The Vari-Loop antenna coil, L1, is supplied with a bracket which is not needed for mounting purposes. It does come in handy, however, for fashioning a knob for the regeneration control, C2. Cut off a piece of this bracket, about $\frac{1}{2}$ in. long, and solder it into the screw slot of the capacitor, C2. Do not permit the solder to flow down the capacitor plates. The rest of the knob consists of a 1-in. length of $\frac{3}{8}$ or $\frac{1}{2}$ -in.-dia. dowel fitted through the hole in the top of the plastic case. A saw slot in the bottom end of the dowel fits over the metal piece so that the dowel acts as an extension which permits adjustment of C2 from the outside of the case.

Since the plastic case is easily damaged by a hot soldering iron, all solder connections should be made before any parts are fastened to the case. This includes a piece of hookup wire, about 3 in. long, soldered to the heavier of the two lugs on capacitor C2. It is this lug which will be fastened to the case with a screw and nut.

Before fastening the subassemblies to the case, unravel the short length of copper wire which is soldered to one lug of L1. This wire can be glued to the inside of the case after all parts are installed. Final assembly will be simplified by mounting first C2—with screw and nut—then the fully wired mounting board—held in place with the phone-jack nut—and finally, the tuning capacitor, C1. A tuning dial, together with a polished-metal center which screws into the capacitor shaft, is supplied with this unit.

The battery, a 6-volter, is made by connecting four Penlite cells in series. Wrap the four cells with cellulose tape so that they are in line with one another and solder jumper wires to adjacent cells as shown in Fig. 3. But keep the amount of heat, and the time it is applied, to a minimum in the interest of long battery life. Make sure that the battery is connected exactly as shown because improper battery polarity will not only prevent operation of the set, but may ruin the transistors. After connecting the battery to the circuit, tape it securely to the inside of the plastic case cover.

Now you're ready to try the Cheapskate. Plug in the earphone and increase the capacity setting of C2, by tightening the screw, until the receiver starts to oscillate (squeal) or motorboat (a put-put sound).

(Continued to page 220)

10 years from now you'll be glad you bought **ALUMA**



THE MARK OF QUALITY

Wherever boating enthusiasts see the Aluma Craft name it is instantly accepted as the mark of quality . . . the guarantee of fine design, precision construction and quality materials. Aluma Craft also means excellent performance. It stands for the speed, stability, safety, and strength that assures years and years of boating pleasure.

MORE FUN AND LESS WORK

Owning an Aluma Craft is practically all fun with no work. Your Aluma Craft is always ready to give you a day, a week or a season of pleasure. They are strong and sturdy, yet light and easily handled. They require little or no upkeep and are easily trailered or car-topped. Winter storage problems are mostly eliminated.

WARRANTED

Every Aluma Craft comes to you with a nine year warranty . . . a complete guarantee of quality materials and construction. Send for new catalog showing the new models in our top-flite line for '59. All in full color.

ALUMA CRAFT BOAT CO.

1519 Central Avenue N. E.
Minneapolis 13, Minnesota



● Please send catalog
showing Aluma Craft's top-flite line for '59.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

NEW! CRAFTSMAN PROPANE TORCH KIT

FOR SOLDERING AND BRAZING

A Sears Exclusive!



COMPLETE WITH
5 SOLDERS, 3 FLUXES
AND STURDY METAL CASE

The tool of endless uses—and now it comes with soldering tip and 5 different solders: acid core, silver, stainless, aluminum, and rosin core—plus 3 fluxes for aluminum, stainless steel and silver! You're all set for almost any soldering job. Pencil burner included, too, for laying tile, burning paint... a hundred different jobs. UL listed for safety, easy to light, burns in any position—even upside down!

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SEARS
\$788
LOW PRICE



Buy this special kit at your nearest Sears Retail Store or Catalog Sales Office. Other attachments available.

Satisfaction Guaranteed or Your Money Back

Rotate the tuning dial throughout its range. There should be a whistle in the earphone every time you tune past a station.

Tune in a station, as indicated by the whistle, and slowly loosen the screw of C2 until the whistle just disappears. This is the most sensitive adjustment of the set and the station should now be audible. You will have to readjust the tuning dial slightly to bring in the station with maximum volume.

The antenna loopstick is directional, and rotating the receiver may increase the volume still more. The regeneration control will have to be readjusted for each station.

The coil, L1, and capacitor, C1, combination should provide satisfactory operation over the whole broadcast band. If you are unable to tune in stations near the low end of the band, turn the screw in L1 clockwise so that the slug moves farther into the coil. If you can't get all high-frequency stations, rotate the screw counterclockwise.

Considering its simplicity and low cost, the Cheapskate is a "hot" little set. While it can't be compared with more elaborate and expensive "superhets," it is nevertheless perfectly adequate for private listening to local stations. ★ ★ ★

First Solar Battery Made From Organic Dyes

Scientists at the University of California have developed the first solar battery to be made from organic materials. They achieved a solar-battery effect in a cell containing alternate layers of organic dyes. The new battery is crude and inefficient at this stage of development, but it holds promise because of the almost unlimited range of organic materials that might be used.

Do You Know This Old-Timer?

(answer to quiz, page 14)



1918 Overland Country Club

Perfect mating

of man and machine



CRUISING COMFORT ON A HARLEY-DAVIDSON DUO-GLIDE

Highways . . . expressways . . . country lanes . . . city streets — there's always a *smooth* road ahead when you ride a Duo-Glide. Solo or with a buddy, you travel as smooth as silk—hydraulically smooth from front fork to rear suspension.

And this glide-ride is a go-ride too. 74 cubic inches of OHV power are nestled compactly in this chrome and steel beauty. Also available in an "H" super-powered model with extra speed . . . extra stamina. Make a date to test ride the Duo-Glide at your Harley-Davidson dealer. Or use the coupon for free color folders.



1 **FRONT** — Hydraulically damped, Hydra-Glide front fork goes into action on all surfaces — takes the bumps out of rough roads, makes smooth roads even smoother.

2 **MIDDLE** — Spring-loaded seat post offers an extra measure of riding pleasure. Alone or riding double, springs give you a level ride at all times.

3 **REAR** — Husky, hydraulic shock absorbers control the amazing swinging arm. Bounce and bumps are ironed out . . . wheel actually hugs the road around curves.



Harley-Davidson
MOTOR CO.

Milwaukee 1, Wisconsin

Dealerships Available.

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Dept. P, Milwaukee 1, Wisconsin

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Address.....

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BOLENS



Mowing is easy with any one of Bolens four new Mustangs for '59. Need extra stamina? Select the Heavy-Duty or Super Mustang, both with new rotor reverse for easy handling in tight spaces. For smaller garden needs, choose the Mustang or Junior Mustang, long-time favorites of economy-minded gardeners.

select-o-width extension tines



are available for all four models . . . a quick easy way to match rotor width to row spacing. Extra tines are added or removed without tools.

BOLENS

Use this coupon to get free full-color literature and the name of your nearest Bolens dealer.

Check the catalogs that interest you, and mail to Bolens with your name and address.

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|--------------------------------------|---|
| <input type="checkbox"/> LAWN MOWERS | <input type="checkbox"/> UTILITY TRACTORS |
| <input type="checkbox"/> TILLERS | <input type="checkbox"/> CHAIN SAWS |
| <input type="checkbox"/> POWER-PAK | |

BOLENS PRODUCTS DIVISION



Food Machinery & Chemical Corporation
Port Washington O-1, Wisconsin

What You Should Know About Power Mowers

(Continued from page 176)

starter rope to the top of the handle, where it can be pulled from a standing position without need to get near the engine. Likewise, you'll find the rest of the controls variously located on the engine or the handle. The advantages of any or all controls on the handle are that they are easily accessible for more instant control, and there is no necessity of getting near the blade. The important test of a self-propelled unit is the ease with which it can be shifted from drive to neutral and back to drive since it often is necessary to shift to neutral to mow close quarters and to trim around trees and fences.

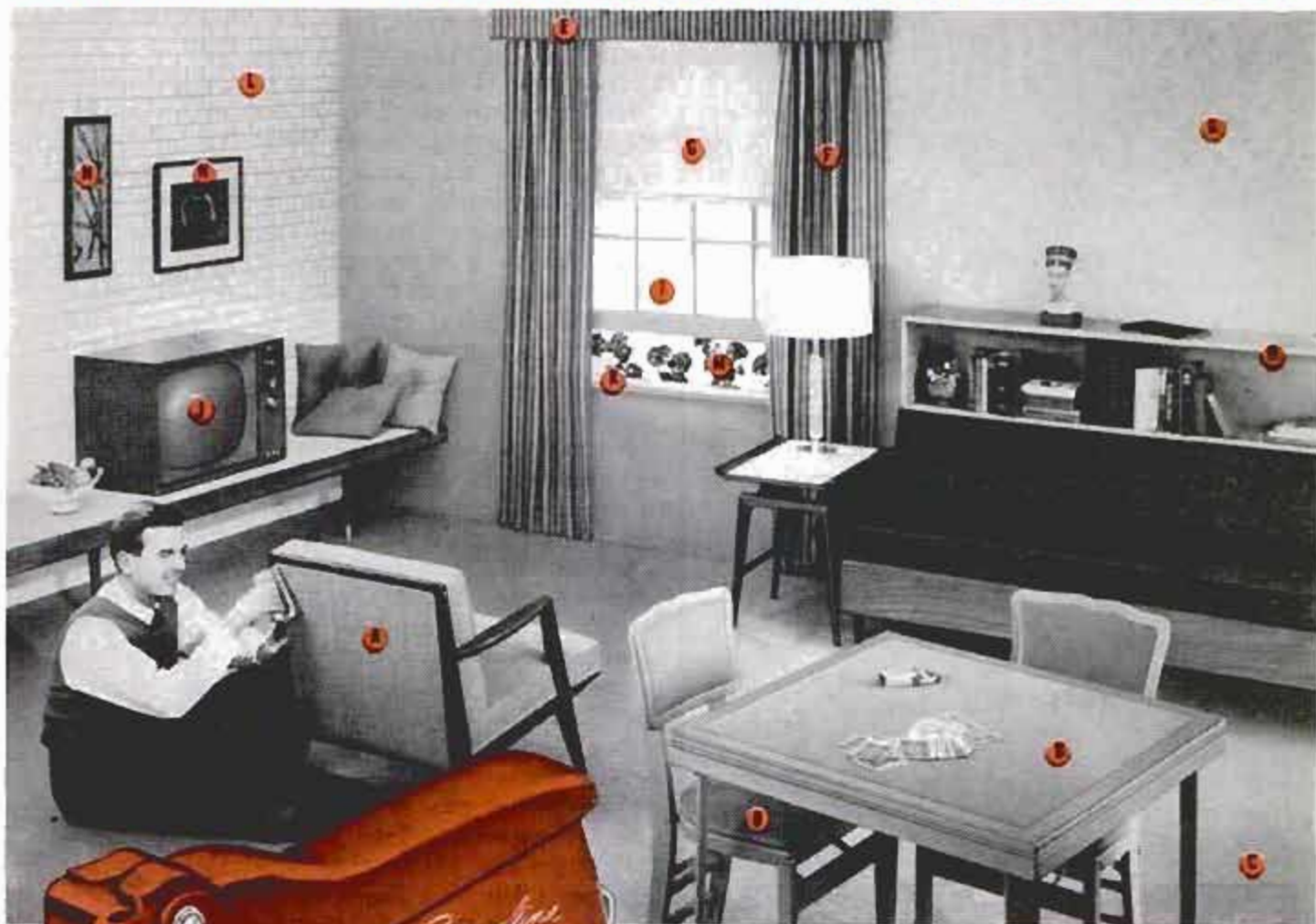
In considering a riding rotary you should be concerned with stability, location of the engine, brakes and blade control, or "lock-out." Is the mower low enough and wide enough to have good stability on hills? Tipping over, on a mower that is running, can be dangerous. If the engine is located up front, or if the operator has to straddle the engine, there is danger of leg burns from the hot engine, as well as the inhalation of unpleasant fumes. Can the blade be disengaged when not being used for cutting? This is an important point as the mower may often be used as a small tractor for pulling and pushing rollers, carts and other yard equipment. In the case of reel mowers, the number of blades, 4, 5 or 6, is a good measure of quality and a tip-off on the kind of grass-cutting job they will do. The more blades, the higher the frequency of cuts and the smoother the grass.

A Word About Engines

There are three types of power units from which to choose—the two-cycle and four-cycle gasoline engine and the electric motor. The most popular type is the gasoline engine, even though the electric motor costs less and is quieter. The cord problem is its drawback. In choosing between two and four-cycle engines, there actually is no appreciable difference between them. Both are internal-combustion engines. Both have a piston, connecting rod and crankshaft and both get power from the explosion of gasoline by a spark plug. A two-horsepower, two-cycle engine has exactly the same power as a two-horsepower, four-cycle engine. The essential difference comes in the method of getting fuel into the combustion chamber, the means of exhausting the gases and the method of lubrication. The four-cycle engine gets its

(Continued to page 224)

See what you can do...easily, quickly ...with a SWINGLINE STAPLE GUN!



ONLY \$ **4.95** with
PUSH-BUTTON
LOADING

- Built-in extractor
- Handle lock
- Push-button loading
- Rugged, heavy-duty steel construction
- Load indicator
- Open channel takes 2 staple sizes: 1/4" and 5/16"

FREE! Send

for Booklet "Tips for Tacking"
How to do many stapling jobs.



A SWINGLINE staple gun makes *immediately possible*—and *easy*—all those time consuming, hard-to-do chores both inside and outside your home. This is a lightweight, maneuverable, *precision* tool that's so easy to operate even a housewife can use it. Drives those staple-nails flush and holds 'em tight! The price? A hard-to-believe \$4.95—that's all! Your choice of Gray, Red or Green. Insist on a SWINGLINE staple gun—with push-button loading—at better hardware, department, stationery stores!

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- A—upholstering furniture
 - B—recovering card table and chairs
 - C—installing carpeting
 - D—shelf trimming
 - E—valances
 - F—hanging drapes
 - G—window shades
 - H—matting pictures
 - I—window screens
 - J—attaching TV antenna
 - K—weather stripping
 - L—installing plastic wall brick
 - M—making window boxes
 - N—wall decorations
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- And hundreds of other uses.

Swingline® INC. Long Island City 1, New York
World's Largest Manufacturer of Staplers For Home and Office!

LOOK, MISTER!

No Hands



It's Self-Gripping

CHANNEL LOCK

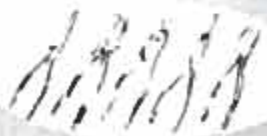
No. 410

HEAVY-DUTY PLIER

How's this for gripping power? You won't know your own strength 'til you grab hold with this heavy-duty self-gripping plier. The Channellock No. 410 HEAVY-DUTY is actually a combination plier-wrench . . . and it will get into tight places you can't reach with a pipe wrench. A mighty handy, multi-purpose tool with four jaw adjustments up to 1-1/8".

ASK YOUR TOOL SUPPLIER FOR A
CHANNELLOCK No. 410 HEAVY-DUTY PLIER

BE SURE IT'S
A GENUINE
CHANNELLOCK



LOOK FOR THE
TRADEMARK
ON THE HANDLE

CHAMPION DEARMENT TOOL COMPANY
MEADVILLE, PENNSYLVANIA

name from the fact it requires four steps to complete a cycle, whereas a two cycle, not having intake and exhaust valves, takes only two steps to complete a cycle. Because the two-cycle engine passes fuel over the moving parts in the crankcase, it is possible to lubricate it by adding oil to the gasoline. The four-cycle engine, on the other hand, requires a separate oil reservoir. Advantages of the two-cycle engine include fewer moving parts, positive lubrication and lighter weight. Since engine repairs account for over 90 percent of mower-service problems, perhaps the most important consideration is the make of engine and the availability of engine service.

Play It Safe

Numerous accidents have resulted in recent years from power mowers. In a limited number of accidents, the fault has been in the design of the product or a faulty part. More often, accidents result from sheer carelessness on the part of the operator, or failure to respect the mower as power equipment. The following simple safety precautions could avoid most accidents: Check the yard before mowing to be sure it is free of objects that could be thrown by the mower blade. Don't ever allow the discharge chute of a rotary mower to point toward another person. Any object the whirling blade might strike can be thrown with the force of a bullet. Take proper precautions in starting a mower. If the starter is on the engine, be sure your feet are not in a position where the mower can accidentally be pulled over them or tipped onto them. A good safety measure is to put one hand on the rewind starter and pull with the other. In this way, you are pulling against the pressure of your hand. Don't try the method (sometimes recommended) of putting one hand on the starter handle and one on the mower handle. The engine may start and one hand may slip and let the mower ride over your foot. The safest practice to follow before touching the blade for any reason is to always disconnect the spark-plug lead wire. Just shutting off the gas is not sufficient, as enough gas to run the engine for several minutes generally still remains in the carburetor. Turning the blade by hand has the same effect as pulling the engine starter rope. Be careful when mowing steep hills and terraces and be sure that the handle on a rotary mower has a positive locking device that prevents it from accidentally swinging too far forward. This will protect you against getting too close to the mower, or having the mower topple back when cutting on a steep incline. ★★★



ONLY THE '59 PLYMOUTH GIVES YOU SPORTS CAR HANDLING, PROVED ECONOMY—AND PERFORMANCE, TOO!

You don't have to take our word for it! The experts — impartial automotive writers and editors — agree that in the low-price field, there's no car that *handles* like the '59 Plymouth! As MOTOR LIFE puts it: "... Great handling car. . . May even surpass some sports cars."

Don't take our word for Plymouth's *economy*, either. It has been thoroughly documented in tough competitions. Today's standard Plymouth V-8s save extra gas with new Fuel-Saver Choke plus new 3-stage Carburetor.

As for Plymouth's *ride*, it's Torsion-Aire, yours at no extra cost. There's nothing to compare with it in the low-price field . . . for smoothness, for minimum of sway or roll, for level-keel cornering, for freedom from dive on stops. And Plymouth's extra roominess inside assures you of the sort of *comfort* you've never before associated with low-price cars! Why don't you ask your Plymouth dealer for the Two-Mile Try-Out that will prove to you what a big difference Plymouth's great engineering makes!



ECONOMICAL FURY V-800 DEVELOPS 230 HP

Biggest standard V-8 in the low-price field. A *repeat winner* in its class in the Mobilgas Economy Run, only recognized competitive test for economy in America today. 318-cubic-inch displacement. Also available at small cost: 305-hp New Golden Commando 395, biggest V-8 in the field.

'59 Plymouth

to be fully appreciated, must be driven

Portable Telephone System For Outdoor Use

(Continued from page 145)

each corner of the base, prevent scratching of any polished surface upon which the finished unit may be placed.

The reel's axle is made from a 5-in. length of 3/4-in. aluminum tubing, a pipe flange and a snap-in plug. All three pieces are standard Reynolds "Do it yourself aluminum" items and are readily available through local hardware stores. The flange and axle are attached to the base with four flatheaded wood screws. After the reel is fitted over the axle, three sheet-metal screws driven into the tubing, just above the reel, prevent it from slipping off.

The reel itself is provided with a small wooden handle to simplify rewinding of the cable after use. A rubber grommet pressed into a hole in the upper side of the reel protects the fixed end of the cable where it fits through the side of the reel. After the cable has been wound on the reel, a female plug (supplied with the handsets) is attached to each end.

The storage box for the handset cords and spare batteries is made from a single piece of sheet metal and is attached to the frame with short sheet-metal or wood screws. The exact height isn't important—

a 3-in.-wide strip was used in assembling the model shown in the photograph.

A pair of support hooks (large finishing nails driven into the upright piece and bent to shape with a pair of pliers) provides a convenient set of hangers for the handsets. The completed rack should be given a coat of outdoor paint or porch or deck enamel.

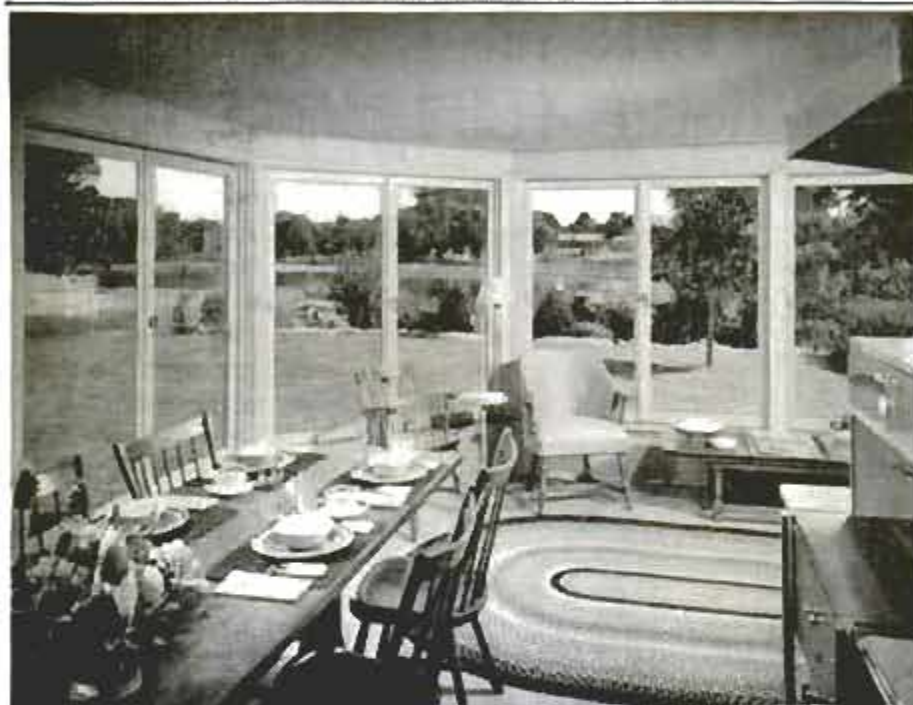
Operation and Use

Operation of the two-phone system is simple. After the handsets are plugged into the connectors on opposite ends of the cable, the party initiating a call firmly depresses the red buzzer button on the rear of the receiver end of the handset. This causes an audible tone to sound in both handsets. The party on the other end of the line then presses the black press-to-talk button—an almost automatic action when the handset is picked up—and verbally acknowledges the call.

While the press-to-talk button must be depressed when talking into the handset, it is not usually necessary to release the button when listening to the other party. In some cases, however, a slight increase in listening volume will be noted if the button is released.

Each handset has a buzzer-adjustment screw which is accessible to a small screw-

(Continued to page 228)



NEED MORE SPACE? CREATE AN EXTRA ROOM WITH ANDERSEN WINDOWS!

Now's the time to turn that unused porch or attic into a usable, livable room. And it's easy! Just remodel with versatile, trouble-free Andersen Windows. They're *weathertight*: Penta-treated for permanence. They give you oceans of fresh air and sunlight. Have your architect, builder or lumber and millwork dealer help you choose the Andersen Window units that are just right for you. Or send coupon.



FM-59

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Andersen Corporation, Bayport, Minnesota
Please send FREE booklet "A Treasury of
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IT'S A DRILL!



TWIST!



It's a Screwdriver!

It's the new B&D Scru-Drill!

Two-in-one, that's the new Black & Decker Scru-Drill! Set the adjusting collar on "DRILL" and you have a B&D $\frac{3}{8}$ " Drill. Twist the collar to "SCREW" and presto! With a screwdriving bit, the powerful B&D-built motor drives either slotted or Phillips-Head screws. Spindle clutch idles until pressure is applied and disengages when screw is

"home." Drives up to #10 by $1\frac{1}{2}$ " wood screws, #12 machine screws and nuts—in seconds! Now you can drill lead holes and drive screws with the same tool! Ask your B&D dealer about the new Black & Decker Scru-Drill. **Special introductory offer!** For limited time, 6-pc. Pilot Drill Assortment (reg. \$3.95) *free* with every B&D Scru-Drill!



OTHER B&D DRILLS AND POWER UNITS: B&D $\frac{1}{4}$ " Utility Drill • B&D $\frac{1}{4}$ " Deluxe Utility Drill • New B&D $\frac{1}{2}$ " Deluxe Utility Drill • B&D Power Driver • Also Drill Stands for accurate bench work (shown with Power Driver).

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- Drill

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Here's what happens with worn shocks. Wheel hits bump, then returns to road . . . but violent spring recoil pulls it off road a second time. Meanwhile car body (indicated by plane lines) rocks severely. This causes serious loss of control, shakes up passengers, takes miles off tires.



With new Gabriel Adjustomatic shock absorbers, wheel hits bump, returns to road . . . and stays there! Spring recoil is absorbed, entire car recovers from impact almost instantly. Besides increasing safety, comfort and tire mileage, this helps prevent spring breakage, actually lengthens car life!

Gabriel Adjustomatic shock absorbers give greater comfort and car control

If you've gone over 20,000 miles on your present shock absorbers, chances are you need new ones. Ask your service station attendant or garage mechanic to give your shocks the Gabriel safety check now . . . especially if you are planning a family trip soon. And if you *do* need new ones, tell the man you want Gabriel Adjustomatics, the modern shock absorbers that can be adjusted to give you the kind of ride you need, for the kind of driving you do!



Leo Petty won the recent 500-mile stock car race at Daytona riding on Gabriels! Leo says: "It sure was a wonderful feeling riding on those Gabriel shocks. They gave me perfect control throughout the race, even on the curves. I wouldn't have any other shocks on my race car . . . or my family car, either!"

Gabriel
ADJUSTABLE SHOCK ABSORBERS

THE GABRIEL COMPANY • Cleveland 15, Ohio

driver through a hole in the front of the unit. The buzzer is factory adjusted, but a slight rotation of the screw may provide greater output or a clearer tone.

Aside from an occasional battery replacement, the handsets should require no service attention. Unlike tubes, transistors are not subject to burnout and many of them outlive the equipment in which they are used. The low voltage and current requirements of the amplifier circuit assure exceptionally long life for other amplifier components. And battery replacement is both simple and inexpensive. Unscrew the plastic covers on both ends of the handset and the "receiver" and "transmitter" elements can be lifted. This frees the center section of the handle which can be turned over to expose the amplifier and battery. The latter is held in place with spring clips.

Expanding the System

The two-phone system illustrated here can easily be expanded to handle any number of additional handsets merely by increasing the size of the carrying rack.

Increasing the axle length permits stacking of two or more wire reels, one above the other. Separated by metal washers or spacers, each one will rotate independently.

Connecting all phones in parallel, as shown in Fig. B, is easily accomplished by means of a Tap-a-Line outlet strip fastened to the upright piece of the rack. Tap-a-Line strips, available from hardware stores or radio-parts distributors, are normally used for connecting a number of appliances to a single electrical outlet. They are supplied with a line cord and plug to fit into standard a.c. receptacles. This cord should be cut off because the accidental application of line voltage would result in immediate damage to any phone connected to the outlet strip.

When used with a Tap-a-Line strip, the fixed end of each phone cable should be outfitted with a male plug in lieu of the female connector supplied with the handsets. The plugs, when inserted in the outlet strip, provide parallel connections for all phones.

A multiphone system used in this manner is "nonprivate." A buzzer signal originating at one station will be heard in all phones, and any or all stations can participate in a conversation. While this is desirable for most applications, a buzzer code should be worked out to prevent all other stations from answering calls intended only for a specific one.

Warning: Do not insert the plugs on the end of the handset cords into an a.c. power receptacle. ★ ★ ★

Rez

DECORATOR WOOD FINISHES DESIGNED TO FULFILL THE NEEDS OF EVERY HOME CRAFTSMAN

From sealing unfinished wood to creating "luxury wood" effects, you'll find REZ perfect for unfinished furniture, built-ins, outdoor furniture, carports, siding, fences and all home wood projects.

1

CLEAR SEALER AND PRIMER

Seals all wood, so that when you use REZ COLOR-TONES or paint you will avoid that "blotchy" appearance of dark and light areas which appear when color tints of any kind are applied on unsealed wood.



2

COLOR-TONES

13 DECORATOR COLORS

REZ Color-Toned sealers are the easiest, most economical, most richly beautiful finishes for siding, built-ins, fences, garden furniture, etc. One coat for interiors or two coats for exteriors seal and color.



3

GLAMOUR FINISHES

Hi-Gloss REZ

The perfect high luster finish coat. For interior use on fine paneling, woodwork, etc.



Satinwood REZ

The low luster finish coat that accents the clear, natural grained beauty of interior wood and the color value of the finish.

4

SPECIAL EFFECTS



White REZ

Use primarily for interior wood. Create "frosty" or "bleached" wood finishes without acids and neutralizers. Apply and wipe while wet.

5

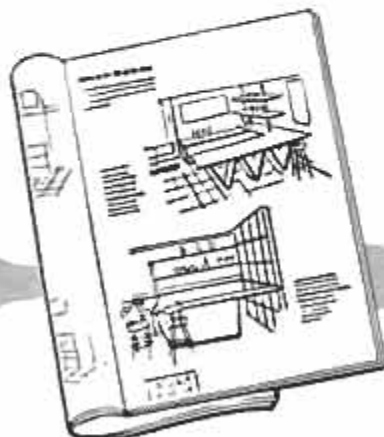
Rezite

For clear gloss finish coating on outside wood siding surfaces. Siding is subject to discoloration due to exposure to sunlight and may darken unless a pigment (such as a REZ COLOR-TONE) is first sealed into the surface.



SEND TODAY for this valuable 56-page book "HOW TO MAKE WOOD A BEAUTIFUL PART OF YOUR HOME." It tells how to get all kinds of interesting wood finishes. Includes 35 plans for outdoor furniture, fences, wall paneling, built-ins and room dividers. Illustrates ways to convert your basement into livable space. Write today! Be sure to include your name and address. We'll send your book immediately.

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... on cars with just
panel warning lights!

If your car is equipped with just battery and oil warning lights, you need an ammeter and oil pressure gauge for complete operating safety. For finest gauge performance and dependability, install the new Stewart-Warner Deluxe Panel and Gauges!

Stewart-Warner Ammeter—tells actual rate of current flow, helps prevent burning out a generator . . . overcharging or discharging of battery.

Stewart-Warner Oil Pressure Gauge—tells exact oil pressure, at any engine speed.

Stewart-Warner Deluxe Panel—Luxurious off-white grain color harmonizes with any interior. Bracket, light wire and socket included. Will accommodate two Stewart-Warner Gauges of your choice in economy, heavy-duty mechanical or electric types.

STEWART-WARNER MOTOR MINDER



Pays for itself in gasoline savings. Helps avoid costly repairs by giving constant check on condition of spark plugs, carburetor, rings, valves, timing, etc.

STEWART-WARNER ELECTRIC FUEL PUMP

Maximum delivery. Quick starts. Prevents vapor lock. Adjustable pressure feature. No starving or "flatten out." Eliminates stalling due to fuel surge. Recommended for today's high-compression motors. 6-volt and 12-volt models.



Ask for them at your car dealer, service station, garage or automotive parts store.



INSTRUMENT DIVISION
STEWART-WARNER
CORPORATION

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You Ought to Learn Russian

(Continued from page 103)

scientific Russian published a half dozen years ago, remarked, "Russian as a scientific language has long been neglected. This has been due in part to an unreasonable fear of the difficulties of the language."

Some Russian Words Like English

Because of this exaggerated fear, M.I.T. instructors first try to rid their students of common misconceptions about Russian so that they can proceed without undue worry and apprehension. First of all, they learn that it is an Indo-European language, related to English, German, French and other familiar tongues. Such words as *mat'* (mother), *tri* (three), *sestra* (sister), *voda* (water) are proof of this. Next, they are gratified to discover that the language is not written in Oriental ideographs but in an alphabet containing some familiar letters (t, m, a, o, e) which can be mastered in a couple of hours. Sentence order is far simpler than in classical Latin or German. The main difficulty, they find, is that they do not encounter as many familiar words as they would in French, German, Italian or Spanish. By way of compensation, however, the vocabulary of science, technology and politics is high in "international" words such as *kabinet*, *politika*, *protsess*, *atom*, *molekula*, *material*, *atmosfera*, *revolutsiya* and thousands of others.

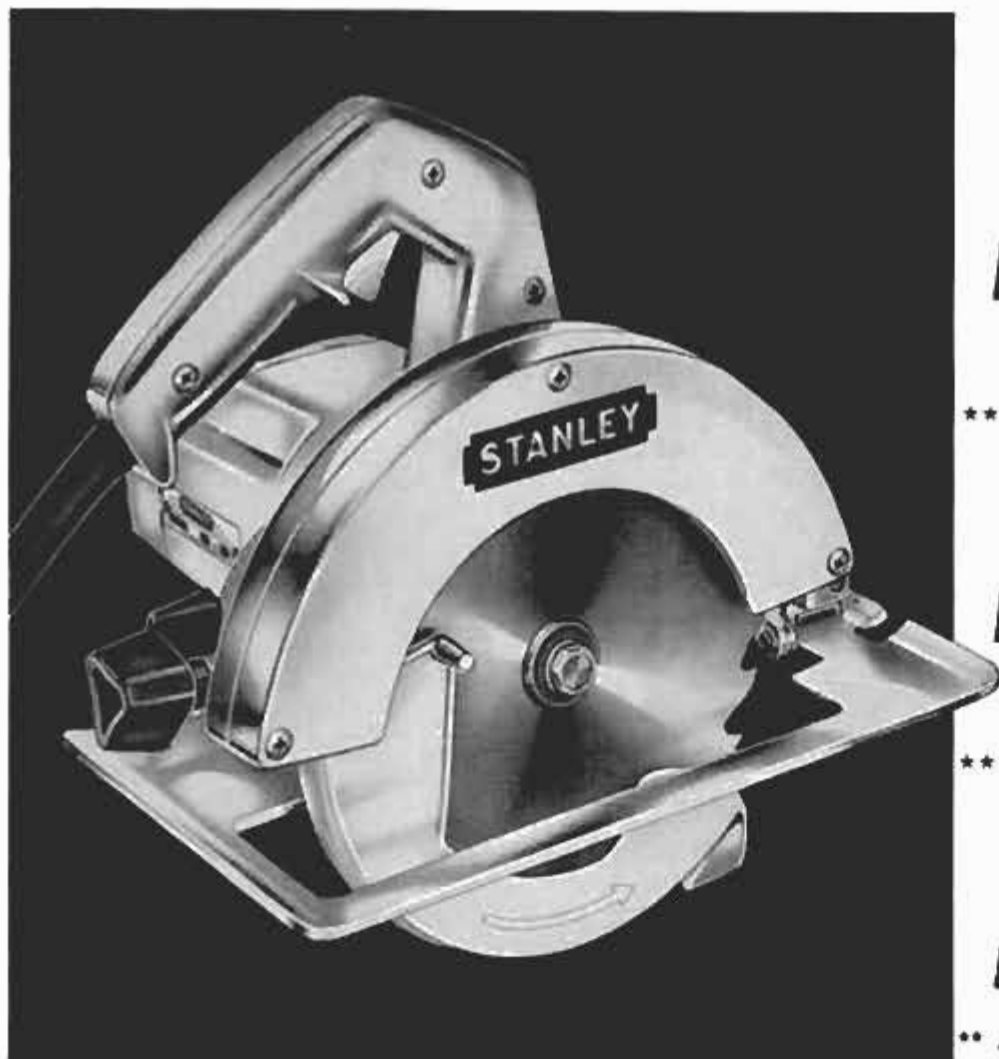
Other Russian Courses

With something like 10 sections and 200 students, including a sprinkling of faculty members, M.I.T. boasts the largest scientific Russian program in the country. However, considering the huge volume of research published in the U.S.S.R., there is need for many times the number of Russian linguists that are being trained at that institution.

Other programs do exist. One of the oldest and most practical is the scientific Russian course offered at Northwestern University's evening division in Chicago. J. B. Tolpin, its developer, combines a native knowledge of Russian with a broad technical background, gained both in Russia and the United States. His position in the Research Department of the Standard Oil Company of Indiana gives him added insight into the workaday needs of his learners.

Another center for teaching scientific Russian is Georgetown University's Institute of Languages and Linguistics, in Washington, D. C. A special course has been developed which makes maximum use

(Continued to page 232)



H268 6½" saw—\$49.95
Case, etc.— 15.00

REG. PRICE \$64.95
NOW \$56⁹⁵

**H269 6½" saw—\$64.95
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REG. PRICE \$79.95
NOW \$67⁹⁵

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** ALL BALL and NEEDLE BEARINGS

3 NEW saws—in kits—\$8⁰⁰ \$12⁰⁰ \$15⁰⁰ OFF!

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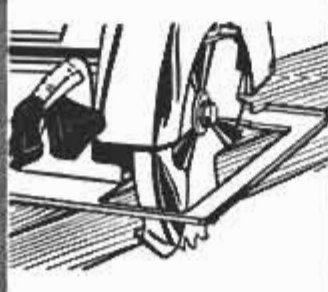
Kits include saw, rip gauge, wrench and this sturdy steel carrying case.

STANLEY

Electric tools built for the professional, priced for everyone!



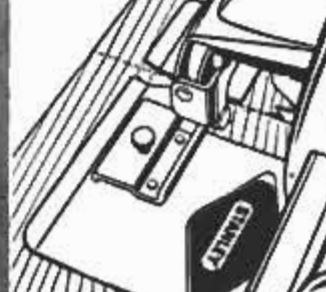
Rear-position controls! Set depth or bevel from cutting position — fast!



Ball-bearing* blade guard won't stick. Lets blade enter cuts smoothly.
*Model H270 only.



Steel beam and wrought aluminum base give saws extra strong structure.



Big window lets you see cut clearly. One notch guides 45°, 90° cuts.

ALIVE in your hand—

True Temper's ROCKET® hammer seems to have a vitality all its own. Grip it: it's as secure in your hand as if it were gripping back. Heft it: the balance is perfect. Swing it: you'll feel its comfortable, shock-absorbing action while it delivers a power-centered blow. See this superb hammer at your hardware store today. True Temper, 1623 Euclid Ave., Cleveland 15, Ohio.



Hatchet, belt axe and ball peen, too, in famous True Temper ROCKET design that has proved its worth in the hands of so many proud users. Ask a carpenter!

TRUE TEMPER®

THE RIGHT TOOL FOR THE RIGHT JOB

of audio-visual equipment. Part of the students' work consists of listening to tape recordings of Soviet scientific materials while following the written translation in English. Several hundred scientists, government employees and linguists have completed the course.

Need Updated Language Teaching

All these efforts are good, but they still represent only a drop in the bucket when one considers the vast shortage of personnel acquainted with scientific Russian. A number of national leaders have made statements about our language problem, especially in the field of science. Dr. Wallace R. Brode, President of the American Association for the Advancement of Science, and Scientific Advisor to the Secretary of State, told the House Government Information Committee that scientists of the future will be required to have a knowledge not of one, but at least three foreign languages—French, German and Russian.

Until the awareness of our language needs is translated into terms of more students enrolled in more courses at more schools, there is no reason to be complacent. It is time for a new look at our badly outmoded system of language teaching. An effort should be made to replace it with a program geared to 20th-century requirements. Few measures would be of more importance than the large-scale introduction of Russian at both secondary and college levels. Armed with a knowledge of this tongue, future American scientists and researchers would gain direct access to the vast storehouse of Soviet publications, so many of which have gone untapped for want of linguistic know-how. ★ ★ ★

Agree on Age of Universe

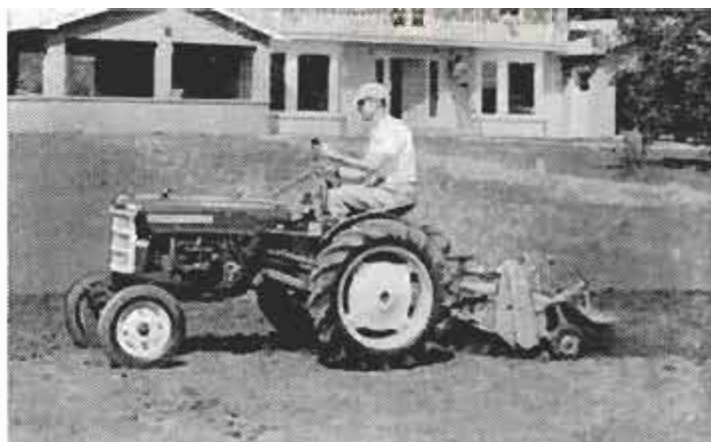
Telescopic studies made atop Mt. Palomar, Calif., indicate that the universe is from 7 to 13 billion years old. This is the first time that the estimated cosmic age has jibed with the figures set by geologists, who base their calculations on the decay of radioactive elements in rocks.

Electricity Directly From Heat

With no moving parts, a new generator converts heat directly into electricity. The generator, called a plasma thermocouple, was developed by five scientists at Los Alamos Scientific Laboratory. Thermocouples are not new, but they normally employ two metals fused together. The new generator uses one metal and plasma, an ionized gas, to convert heat energy into electrical energy.



Mower: International Danco



Rotary Tiller: Howard Rotavator

EXTRA INCOME all year 'round with an International® CUB Lo-Boy®!

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*T. M. Reg. U. S. Pat. Off.



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So quick and easy! Just brush on to remove all types of paint, enamel, varnish, lacquer... even synthetics. Off comes paint in 5 to 15 minutes. Safe, too. Non-flammable. No acid or alkali. At better hardware, paint and marine dealers.



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Aberdeen, Maryland

Columbia Fastener Company

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Win a new SCOTT



Leaves all other outboards years behind!

*Full electrical system
with generator, full gearshift
... the 60 hp. Flying Scott*

Your looking at the most exiting new outboard in America. Rugged as an Amry mule. Compact as a wach. Lean and light enough to fit a wide range of boats—even in pairs!

With only three clyinders, the Flying Scott delivers a strong 60 horsepower* that planes big criusers, tows water skiers effortlessly—sends runabouts flying at up to 50 mph.! The secret. a bold, simple new

*OBC certified at 4800 rpm.

design that cuts vibration, and delivers more smooth power at the propeller

Yet for all its lightning, this sweet sixtey handles as easily as a new car. You start it with the turn of a key (full electrical system with generator is standred, no exrta cost). As you criuse, the new offset lower unit countracts propeller torque for easier steering. New Single Lever Control (otptional, extra cost) snychronizes you're throttle and full marine gearshift, gives you safe, sure comand of your boat. And Scott's bail-a-matic pump bails your boat—automatically! \$950, frieght extra.

MARINE PRODUCTS DIVISION **McCULLOCH CORPORATION**  Minneapolis 13, Minnesota

OUTBOARD in the \$50,000 SCOTT SPELLING BEE!

FIRST PRIZES

10 electric-starting 60 hp Flying Scotts!

SECOND PRIZES

15 electric-starting 40 hp Royal Scotts!

THIRD PRIZES

20 electric-starting 25 hp Scotts!

FOURTH PRIZES

25 10 hp Scotts!

FIFTH PRIZES

30 7½ hp Scotts!

If you buy a Scott outboard during May, 1959, you may choose to have double the purchase price refunded to you in place of your regular prize.

Here's all you do to enter:

Just count the number of misspelled words in this advertisement. Enter that number in the coupon below. Fill out the rest of the coupon, completing the statement, "I would like to own a 1959 Scott outboard because . . ." in 25 words or less. Then bring your entry to any Scott outboard dealer. It's as simple and easy as that—and you may win a wonderful new Scott outboard!

CONTEST RULES

1. To be eligible for consideration for a prize, entry must show the correct number of misspelled words in this ad, and be accompanied by a completion of the statement "I would like to own a 1959 Scott Outboard because " in 25 words or less, together with the name and address of the entrant and be delivered to a Scott Outboard dealer no later than May 31, 1959.
2. Each person will be allowed only one entry. Persons sending in more than one entry will be disqualified. Only one prize will be awarded to a family.
3. The contest is open to anyone in the United States except employees of the McCulloch Corporation, Scott Outboard dealers, distributors or salesmen, their advertising agencies and their families. The contest is subject to all Federal, state and local regulations.
4. The number of misspelled words will be authenticated by independent judges using the latest Webster's unabridged dictionary. Prizes will be awarded from among the eligible entries on the basis of originality, sincerity and appropriateness of the completed statement. In case of ties, duplicate prizes will be awarded.
5. All entries become the property of the McCulloch Corporation to use as it sees fit. None will be returned.
6. For a list of the prize winners, attach to your entry a 4¢ stamped envelope addressed to yourself.

OFFICIAL ENTRY BLANK

TAKE TO YOUR NEAREST SCOTT OUTBOARD DEALER

I count _____ misspelled words in the Scott Spelling Bee advertisement.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

"I would like to own a 1959 Scott Outboard because . . . (25 words or less)



Simplifies Complicated Measuring:

A New Precision Instrument for Leveling and Incline Measurement

HOPPY

SPLIT IMAGE TRANSIT



Only
\$6⁹⁵

**Accurate,
Inexpensive,
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thousands
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Transits
now in use—
sturdy carry-
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*Easy as a camera to operate! One man—ALONE—
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a fraction of an inch. Many uses on the job and
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Carpentry Leveling	Contour Plowing	Guttering
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If not available at your Building Supply or
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HOPKINS MANUFACTURING CORP.
Dept. PM-4 Emporia, Kansas

Another Quality Product by HOPPY

Sea Water for a Thirsty World

(Continued from page 122)

Jenkins, "call for a tank 30 feet in diameter and 360 feet long!"

By squeezing vapor, you can raise its temperature. This is the fuel-saving trick employed in the four-stage compression still at Kindley Field in Bermuda. Here, the Gulf Stream is 70 degrees to start with. Compressed vapor from each stage is used to help heat incoming sea water in the next. The scheme works so well that engineers are able to run the entire plant on heat from the exhaust of the diesels that pump sea water into the plant.

One of the most curious and promising of the distillation systems is Dr. Kenneth C. D. Hickman's "rotating pie plate," developed in a Cambridge Laboratory. His pilot plant in North Carolina is turning out a steady 25,000 gallons of fresh water a day. Core of the device is a stack of drums, each resembling a pair of pie plates placed rim-to-rim. Heated to about 125 degrees, the drums are rotated and sea water is sprayed into them, spreading in a thin film across spinning inner surfaces. Some water evaporates and leaves the drum through a pipe. A blower compresses this vapor, raises its temperature and shoots it out over the exterior surfaces of the drums where it condenses as distilled water and is drawn off. Meantime, it has given up its heat to the drum surfaces, thus helping to evaporate more water inside. The brine that is left inside the whirling drums is scooped up and drained away as fresh sea water pours in for processing in a nonstop operation.

Cottage-Size Systems

Intriguing feature of this system is the fact that production of fresh water can be great or small, depending upon the number of pie plates used. Hickman is working hard on a one or two-drum still, about the size of a washing machine that, he says, will supply fresh water from the sea at reasonable cost for private seashore cottages. Using such low heat, Hickman's still not only produces 1000 gallons of fresh water for about 40 cents, but like all "low temperature" systems, has the added advantage of cutting down formation of scale—the gremlin of all distilling processes. Right beside Hickman's plant in North Carolina is another still consisting of a vertical nest of tubes with heating steam outside and sea-water liquor inside the plumbing. Salt water enters the bottom of the pipes, starts boiling and fresh-water vapor is drawn away at the top. This system, developed by the W. L. Badger Company, is

(Continued to page 238)

ANN ARBOR
MICH.



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OUTSELLS ALL OTHER IMPORTED TOBACCOS COMBINED

Your first pipeful tells you why

Smooth-smoking, even-burning, long-lasting, mild AMPHORA is blended in Holland. Popular priced. In handy pouches and tins, at tobacco counters everywhere.



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AMPHORA



Works in seconds!



Loosens Rusted Bolts
nuts, screws, "frozen" parts!

LIQUID WRENCH

SUPER-PENETRANT

The super-penetrating rust solvent that quickly loosens rust and corrosion.

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RADIATOR SPECIALTY COMPANY
CHARLOTTE, NORTH CAROLINA

FREE THE HISTORY OF THE COMPASS SEND FOR YOUR COPY

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COMPASSES

in Beautiful GOLD or SILVER

A jeweled, precision instrument—designed for modern cars. Full, indirect illumination. Sharp, clear letters. Silver or gold Celebrity models \$6.95, standard models \$5.45, illuminated \$6.45 APPROVED BY AUTO MAKERS Fine Quality Compasses for over 31 Years

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EASY-WORKING SLIP-ON GLOVES FOR ASSEMBLERS LIGHTWEIGHT SUEDE PIGSKIN WITH ALL THE FREE FINGER AND WRIST ACTION YOU NEED.

Once you wear 'em, you won't be without 'em!
At stores everywhere.

WOLVERINE GLOVES

Wolverine Shoe & Tanning Corp.
Rockford, Michigan

known as a long-tube vertical evaporator. Its carbon-steel plumbing is highly resistant to rust and scale formation. The hotter the still, the worse the scale problem. In an effort to lick this bugaboo, ingenious tricks are being tried. Maxim Silencer Company recently developed a fast temperature-change "shock," designed to snap the caked scale from inner walls. They claim that it cuts the build-up of salty crust to a moneysaving degree.

Despite troubles with high heat, one firm — Nuclear Development Associates in White Plains, N. Y.—has proposed a startling plan to use nuclear energy to superheat sea water to 700 degrees under pressures of 3200 pounds per square inch. No one knows what would happen to scale under such searing pressures—but such a still would make a lot of fresh water fast. But it could be brutally expensive. To find out, the Fluor Corporation in Whittier, Calif., is studying the feasibility of a \$60,000,000 reactor hitched to a generating and distilling factory. The complex plant would produce 20 million gallons of fresh water a day from the sea—but as a by-product of steam-generated electricity production.

Sun-Power Converters

Similar to Hickman's still, but so far only committed to paper, is a "multiple effect centrifugal evaporator" under investigation by Dr. L. A. Bromley of the University of California. In this device, salt water would feed into a stack of trays mounted on a vertical axle. Steam, entering beneath the stack, would whirl the trays and evaporate some of the sea water in them. The vapor would condense on the bottom of the next tray above and be whirled off as fresh water into special catch basins. Remaining weak brine in the trays would be carried away. Bromley figures that a battery of 12-foot-high units, each with a dozen stacks of 20 to 50 trays, might produce up to 10 million gallons of fresh water a day at a cost of 25 to 50 cents per 1000 gallons.

Harnessing the sun's cheap heat to purify sea water has intrigued scientists for years, and today a clutter of new ideas is under test. The simplest version of a sun still is a shallow pan of sea water under a tent-shaped glass roof. Water evaporating from the pan condenses on the underside of the glass and dribbles off into a trough for collection. The device will yield only one pint of water per sunny day for every square foot of still, and an acre of such "hot-houses" would produce only 2500 gallons a day under clear skies. To beat this low,

fair-weather production, inventors are trying to squeeze more work from Old Sol. Out in Denver, Dr. George O. G. Lof has built a roof-type still right on the ground, eliminating some framing and insulation. The sun's heat is soaked up by the ground, which acts as a "heat bank" and keeps the still working through nights and brief sunless periods. Right now, Lof, a consultant to the Interior Department's program, is building a similar stripped-down solar still in Daytona. Using half of a 50 by 100-foot plot, the still will produce 300 gallons of fresh water a day from the ocean brine flowing through its black asphalt troughs under glass tents.

Stills From Plastics

Just as ingenious is DuPont's string of plastic tents, with black polyethylene on the bottom for a heat-absorbing evaporation pan, and tough, translucent Teflon film for the roof. The frameless tents are kept erect by fans that "inflate" them like a string of sausage balloons. If you own enough territory, you might prefer the extruded plastic still developed by Bjorksten Research Laboratories in Madison, Wis. Dr. Johan Bjorksten points out that his solar still can be laid out "by the mile" to produce fresh water in a steady trickle.

Most sophisticated solar watermaker is Dr. Maria Telkes' "10 stage" still—a fat, vertical sandwich of black cloth wicks and condensing layers under glass. Sea water soaked up by the first wick evaporates into the adjacent layer where it condenses, giving off heat to evaporate more water in the next wick—and so on. Dr. Telkes claims that her wick sandwich jumps production five times. But it costs more to build.

Because solar stills must cover vast areas of valuable land to produce anything like volume, experts predict that these sprawling affairs may be limited to individual domestic units. "A desert or prairie family with a 20-foot-square still could produce 50 gallons of good fresh water from brackish wells every sunny day—at no operating cost," they point out.

Even solar stills get into trouble with scale deposit that whitens the pan bottoms, slowing heat absorption and evaporation. So, scientists are trying some new approaches that may eliminate the scale problem entirely.

Fresh Water for "Texas Tower"

Out on the Air Force's radar platform on *Texas Tower II*, off Nantucket Shoals, three contraptions, resembling a row of washing machines, are desalting 2500

(Continued to page 240)

NOW the perfect
garden sprinklers



MODEL No.
109A-D50

"Guaranteed for a Lifetime"

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SPRINKLER FOR
EVERY NEED.
14 MODELS
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ROBERT HORTON,
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"I like a smooth running car."
**TRY THESE
TWO SURE WAYS
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Stops Oil Burning!

Pour MOTOR CURE into the engine oil and let its "Cushion Plating Action" work while you drive. MOTOR CURE'S oil film seal fills in, tightens and oil plates cylinder bores, rings and all internal engine parts. It restores power and pickup . . . saves gas . . . increases oil pressure . . . quiets noisy tappets, valves and lifters . . . **STOPS OIL BURNING!**
MONEY BACK GUARANTEE . . . 16 fl. oz. \$1.95



TRANS-CURE

Stops Transmission Leaks!

Save costly repairs—restore smooth shifting with **NO SLIP • NO JERK • NO HOWL • NO GRIND.** Pour TRANS-CURE into the transmission fluid. It acts at once to swell around seals and gaskets—keeps them soft and pliable. Prevents drying, hardening or shrinking—**STOPS LEAKS!** Money back guarantee. 16 fl. oz. \$2.45

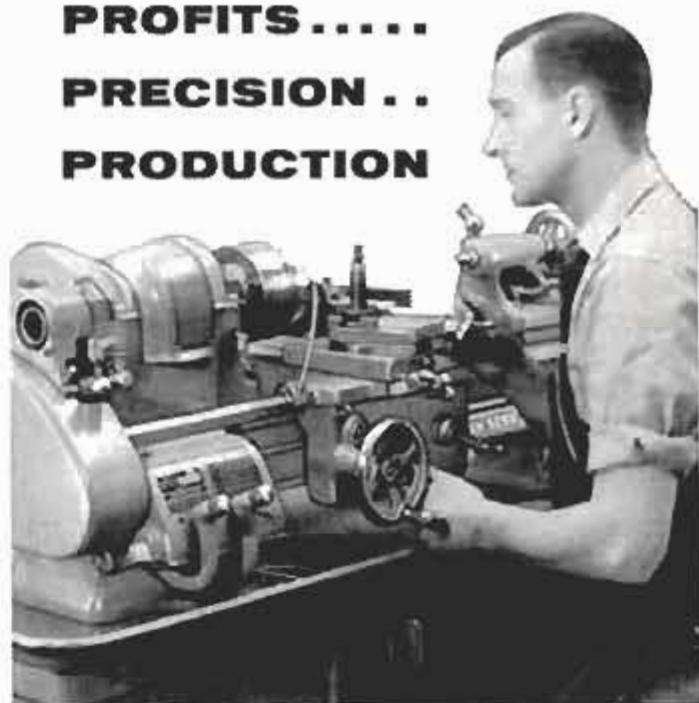


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BENCH LATHES—9", 10-K and 10" sizes in independent change gear, quick change gear and toolroom models.

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SUPREME VERSAMATE

Versamate . . . a wonderful tool that fits any power drill—reduces speed to give seven times more power. Drives screws of all sizes. Inexpensive extras make it a nut and bolt driver, heavy-duty drilling unit. See your tool dealer today!



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For Portable Drill Users...

CHOOSE THE ATTACHMENTS THAT DO THE BIG JOBS!



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Versamatic triples portable drill usefulness. *Reverses!* Drives and removes screws, nuts, bolts. Boosts power 7 times. Set includes regular and Phillips-type bits, and 1/4" square drive adapter. For heaviest drilling jobs in steel and concrete, add a 1/2" Supreme Brand Chuck.

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gallons of water pumped from the ocean daily. This provides the 60 specialists aboard—30 miles at sea—with all the pure water they need for drinking, washing, cooking, laundry and bathing. The little units perform this "miracle" by means of an electrical filtering process called electro dialysis. It's based on the fact that the molecules of some minerals, like salt, are dissolved in the water in "ionic" form. Their particles of matter have a positive or negative electrical charge. As the sea water percolates through a stack of 300 plastic membranes in the machine, electric currents capture the salt molecules between certain charged membranes. They are promptly drained back into the ocean, while pure water is pumped into a 120,000-gallon storage tank.

The system, developed by Ionics, Inc., of Cambridge, Mass., is an outgrowth of work in "ion exchange"—the principle used in water-purifying briquets for marooned fliers. Dropped into a plastic bag with built-in filter, the briquet will swap its neutralizing ions for salt ions as sea water is poured over it. The thirsty survivor pulls a plug at the bottom and out comes drinkable water.

So far, ionic desalting is proving itself most practical for freshening brackish water. From Alaska to the Persian Gulf more than 100 units are operating already or under construction. The first real desalting plant to serve a United States city is an Ionics converter for the town of Coalinga, in California's San Joaquin Valley. Coalinga's brackish well water contains only 1/15 as much salt as the ocean but is so undrinkable that that town has had to haul in fresh water 45 miles by rail since 1900.

Desalting by osmosis last year, Coalinga's freight bill for the 17,000 daily gallons of drinking water consumed by its citizens came to \$43,000. The new Ionics plant will produce 28,000 gallons of drinkable water daily from the town's own wells, and is expected to save \$400,000 in the next 10 years.

Equally curious as Ionics' desalting process is a system using osmotic membranes, working on the same principle our body tissues use to purify and pass nourishing fluids through cell walls. In a laboratory rig of tubes, pumps and membrane filters at the University of Florida, Dr. Charles Reid has discovered cellulose acetate membranes that will pass water molecules but hold back salt ions when pressure is applied in the sea-water tank. His research rig removes about 95 percent of the salt at one pass. Dr. Gerald Hassler at the University of California in Los Angeles, in a similar laboratory rig, is experimenting

(Continued to page 242)

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- Remove old finishes easier, faster
- Non-inflammable and needs no afterwash
- For wash-off or scrape-off use

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THE KLEAN-STRIP CO., INC.

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More aluminum, lighter weight, better performance, beautiful styling. Still Worlds Lowest Priced Car. Drive it for 75c a week. Rider Agents Wanted. If no dealer near you send 25c for 32 page picture book, full details, dealer price. Or send \$1 (refunded first order) for this and Service Manual plus Repair Manual and 15 5 x 7 photos of car and factory.

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80% Steel

When home repair troubles start to pile up . . . don't let it get you down . . . Get PLASTIC STEEL the permanent mender with a million uses around the home, garage or farm. PLASTIC STEEL fixes practically anything in minutes . . . saves you hundreds of dollars on repair bills.

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Repairs broken furniture, light fixtures, tools, toys, and appliances without special tools. No heat or pressure required. Seal leaking pipes, tanks, sinks, radiators and furnaces with PLASTIC STEEL. Holds under pressure. Won't shrink or expand.

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PLASTIC STEEL — in the black and yellow package — is available in three convenient home kits — \$4.98, \$1.89 and \$3.95. At all leading hardware stores.



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150° above zero and 65° below zero

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The True Story of Jess Masters, Santa Barbara, Calif.



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VISE-GRIP Does More Jobs Easier Than Any Other Tool

You'll find *hundreds* of uses for powerful, all-purpose Vise-Grip. It's a pliers, wrench, clamp, hand vise, wire cutter—all in one tool! Ask for the new Vise-Grip with Easy Release. Only \$2.15 to \$2.95 at your hardware store.



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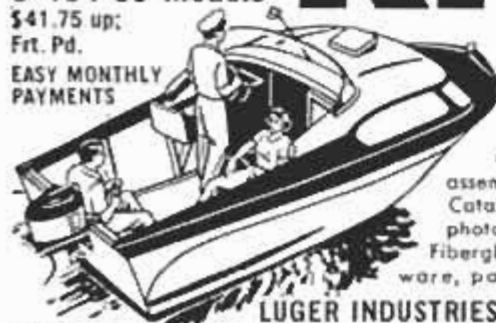
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LUGER INDUSTRIES, INC., Dept. B-5

9200 Access Road, Minneapolis 20, Minnesota

with an eerie membrane of oil, held together by capillary action, which will pass water molecules but block others. Hassler claims he can build a cubic yard of oil membranes capable of passing 2000 gallons of fresh water a day.

In several laboratories, engineers are busy desalting water by freezing it. Scientists have known for a long time that when sea water freezes, minerals automatically separate from the ice crystals. The trick is to freeze it cheaply enough—and also to get rid of the salt particles after freezing has separated them. At the University of Texas, engineers are doing the latter job by whirling the frozen "brash" in a centrifuge, letting the pure ice crystals melt just enough to wash the salt off so it will spin away.

No Idea too Fantastic

Meanwhile, out on the Negev Desert, an Israeli engineer, Alexander Zarchin, is building a \$270,000 pilot plant that will freeze salty Mediterranean Sea water and turn out 1000 gallons of fresh water per hour. Zarchin's plant helps cut the cost of expensive refrigeration of the tepid sea water by adding a vapor-compression still to the system. Entering a vacuum chamber, some of the water vaporizes; the remainder is frozen. Then, by compressing the vapor, it becomes pure water—washes away the salt and gives off enough heat in the condensation process to melt the pure ice crystals. Presto—pure water!

David Jenkins still scans the field for new ideas. Many odd ones have been suggested. One imaginative fellow wanted to tow icebergs into our harbors and melt them. Another wanted to divert the Japan current and cause more rainfall on our prairie lands. A biologist suggested flooding great inland areas and breeding billions of one-celled animals that remove the salt in their life process. "Nothing is too fantastic to consider," says Jenkins.

Meanwhile, Congress has authorized \$10,000,000 for the construction of five full-fledged plants, employing the five most promising systems. Engineers are picking sites right now on the East, West and Gulf coasts. Two others in arid regions will convert brackish water.

Whatever the final outcome, the time is fast approaching when the oceans will supply a large share of our fresh water. Secretary of the Interior Fred A. Seaton sees the day when vast networks of pipelines will carry fresh water from big coastal conversion plants to interior areas for irrigation and industrial use—just as economically as pipelines carry oil across the nation today.

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GENUINE ALNICO MAGNETS

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Conduct interesting experiments. Hundreds of uses. Retrieve valuable
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No. M-250 Kit of Round Rods 5 Pairs (10 Magnets).....	\$2.50
No. M-17 Hot Pad Magnets, 10 for \$1.00.....	\$1.00 for \$4.87
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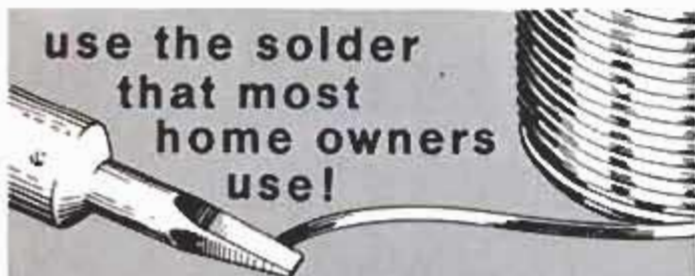
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- Hex shank gives positive, nonslip drive... added strength
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See your hardware or building supply dealer now for ZIP BITS with free bit holder.



GREENLEE TOOL CO.

1843 Columbia Ave., Rockford, Illinois

The Scourge of the Lakes Is Scourged

(Continued from page 81)

mud of a stream bed where it subsists on small organisms that drift near its mouth.

As a young adult it migrates downstream to the lakes and as a mature adult it migrates back to the streams to spawn. The scientists decided that the lamprey would be easiest to attack in the tributaries, while it was a larva or a migrating adult.

Many schemes besides poisoning were considered. One idea was to run bulldozers through the stream beds to force the larvae out on the banks. Another was to stock the streams with a species of American eel that kills lamprey larvae, but it was found that the eel also killed game fish.

Electromechanical barriers were built on some streams to electrocute lampreys on their way upstream to spawn. The barriers proved effective and more of the electromechanical weirs were constructed on the tributaries of Lake Superior to protect the remaining stocks of lake trout.

One type of electromechanical barrier consists of parallel rows of lengths of steel pipe suspended in the stream. The pipes serve as electrodes carrying 110-volt alternating current. Fish and lampreys approaching the electrical field are turned back or diverted into traps. The fish are released from the traps and allowed to continue upstream. Lampreys or fish that try to pass the weirs are electrocuted. More than 10,000 lampreys have been killed or captured at a single barrier.

The electric barriers eventually could control the lamprey population. But time was important and the chemical attack advanced the victory by several critical years. ★ ★ ★

Electronic Meter Reader Checks Gas Bill by Phone

Recently invented by a television serviceman is an electronic instrument that can read your gas meter by impulses transmitted over your telephone line. The utility company could figure your bill each month by inserting a punched card into special equipment. In code, the card would have your telephone number and the previous month's meter reading. Electric impulses would travel to your home via the telephone line, but without ringing the bell, and trigger the meter-reading instrument. The reading would be fed back to the utility-company office where computing equipment would punch a new set of holes in the card and calculate the amount of your bill. The apparatus isn't in use yet, but a number of utility companies are interested.



Made especially for mounting plastic table tops and bonding many dissimilar materials.

Send stamped, self-addressed envelope for Free copy of "Elmer's Guide To Good Gluing". Write The Borden Company, Dept. 5G, 350 Madison Ave., New York 17, N. Y.

BORDEN'S PRODUCTS FOR THE HOME HANDYMAN

Bring your house up to date electrically

with the easy-to-install

Electrostrip

"4-FOOTER" KIT



ONLY \$2.95! And worth ten times its price in electrical convenience. Installs in minutes on walls, woodwork, counter or workbench. Gives you outlets you can move with a twist of the wrist. Ideal for kitchen, bedroom, den, workshop . . . anywhere you need multiple outlets in minimum space. Comes complete with screws, 3 twist-in receptacle plugs and polarized connector. Listed by UL. *Good Housekeeping Seal*. 4-Footer Kit and larger 15-Footer available at your hardware or variety store. Or send \$2.95 plus 50 cents postage to BullDog Electric Products Division, I-T-E Circuit Breaker Company, Dept. E. M., Box 177, Detroit 32, Michigan . . . and your 4-Footer Kit will be mailed to you promptly.

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Cards, stationery, circulars, etc. Save money. Print for Others, Good Profit; easy rules sent. Raised Printing like engraving, too. Junior press \$15; Senior \$29 up. Sold direct from factory only. We furnish everything. Write for free details. **KELSEY PRESSES, Y-37 Meriden, Connecticut**



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100 ft.
per
minute
"Quick as a Walk"**

To really look good, a lawn must have trim edges too. There's no need to stoop, bend, dig, or shove a heavy machine. Edge-o-matic will edge the average home lawn; along walks, driveway and curbs in 10 minutes . . . while you simply walk along and guide it! The tool steel bed knife slides on the top of your walk, picks up and automatically feeds overhanging grass to self-whetting

cutting blades. As you walk, you make a picture-perfect edge: neat, beveled, even.

Patented blade level adjustment lets you quickly set Edge-o-matic for easiest cutting. Built to use! Heavy cast iron housing, tube steel handles, tool steel blades and bed knife.

Thousands of these ruggedly engineered lawn edgers have been in use for over 4 years.

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Free Trial On Your Own Lawn

Use your Edge-o-matic for 30 days . . . let the neighbors use it, too. If you're not satisfied, return it for a full refund.

Edge-co, 3208 Bunker Hill Rd., Box 171
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Please send me one Edge-o-matic.

Enclosed is check or M. O. for \$13.95*. (Postage free if check accompanies order)

Name _____

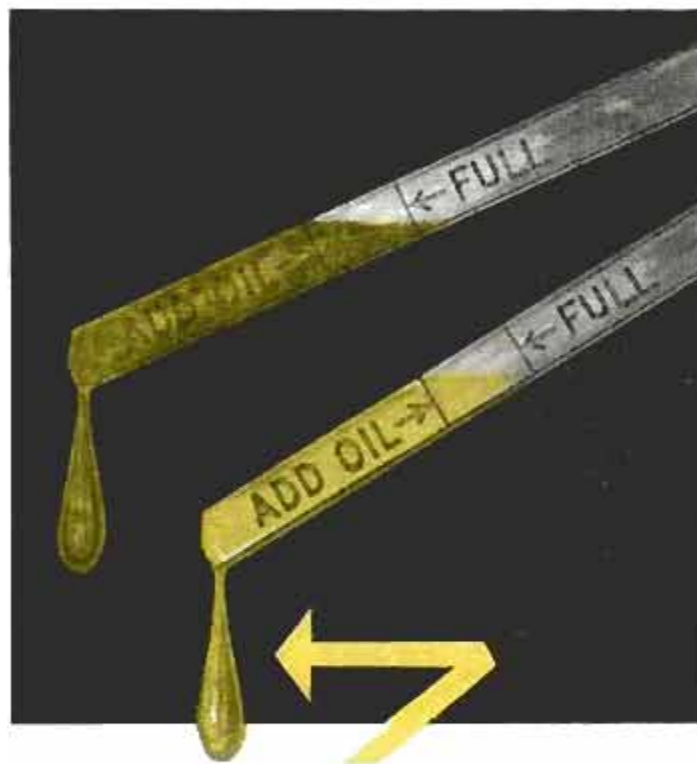
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* \$16.95 Denver and West.

Reprinted from March '58
POPULAR MECHANICS
"What's New For Your Home"

LAWN EDGER is really a sideways lawn mower. Metal finger moves along the edge to lift the overhanging grass. Single wheel is geared to turn the side-revolving blades, which trim the grass wherever lawn meets sidewalk.





Proof on your dipstick— Hastings keeps oil clean all the time

See for yourself! If your oil shows dirt before it should—you'd better change to Hastings. Hastings Oil Filter Cartridges keep oil clean from filter change to filter change, when replaced as normally recommended. Proved by tests conducted in accordance with U. S. Bureau of Standards.

Here's the reason: Only Hastings has Dense-site filtering material. Millions of selected, pressure-packed cotton fibres trap and hold even the most microscopic dirt particles. Your dipstick will prove it!

Next filter change, call for Hastings—for clean oil all the time.

U. S. Patent Nos. 2,797,811, 2,584, 771

HASTINGS
OIL FILTER
CARTRIDGES



**HASTINGS MANUFACTURING COMPANY
HASTINGS, MICHIGAN**

Make Mine a Spoon

(Continued from page 131)

Two friends and I were boating across sprawling Buchanan Lake in central Texas one windy day last spring when we sighted a telltale canopy of noisy gulls swooping over the water. A concentration of birds on a Texas lake normally indicates a school of white bass beneath. The white bass come up under a school of shad, driving them to the surface for a quick and easy kill. Gulls hover above, waiting impatiently to grab any shad the whites miss.

Paradoxically, when the whites are schooling on top, the best way to catch bigger bass is to go to the bottom. The larger fish allow their younger brethren to chase the shad on the surface while they wait for the wounded fish to sink.

We drifted over the melee, jiggging our spoons in short jerks along the lake floor. Several times we all three had whites on at the same time. When action subsided, two dozen or more chunky bass decorated our stringers.

Another favorite spot for whites is in the tailrace waters below the huge concrete spans which back up the manmade reservoirs. Whites congregate below the dams to feast on mangled shad sucked through the electrical generating ducts. A spoon cast up and across the white-water current is surefire medicine for catching foraging white bass.

When spinning tackle was first introduced to this country from Europe, it opened new frontiers for the trout fisherman. Prior to spinning rods, only skilled fly anglers could consistently catch the wily trout on artificial baits. But today a spin-fisherman can catch his share of trout by fishing tiny lures—most likely spoons—with almost invisible monofilament line.

Taking Trout on Spoons

Some of my better trout fishing came in the Rio Ruidoso River, an eastern New Mexico stream that natives described as being "too small" for spinning. I hiked upstream away from the usual week-end crowds and located some beaver-dammed ponds. A delicate, fish-shaped spoon, inched slowly across the pool, produced several spirited rainbows in the 15-inch class.

A spoon isn't limited to fresh water by any means. This time-honored bait is equally potent in salt water.

Last spring while surf-fishing in the Gulf of Mexico at the mouth of the San Rafael River on Mexico's east coast, I actually caught six varieties of fish—jack crevalle, ladyfish, pompano, bluefish, spotted sea

(Continued to page 247)

trout (weakfish) and channel bass (redfish)—on a large chrome-plated spoon. I caught all these fish at the cut between Gulf and river without moving more than a few hundred yards either way along the beach.

The spoon is a popular lure for spotted sea trout and redfish in bays along the Gulf Coast, and is deadly on king mackerel and Spanish mackerel when trolled offshore in the Gulf.

Frequently spoons are dressed with "frills" to add to their appeal. A lengthy, wiggling strip of white pork rind is perhaps the most popular, adding much life-like action to the spoon. Some spoons already are equipped with hair bucktails, others with rubber skirts. At times fishermen will add bucktails in their choice of sizes and colors, while others will put blade spinners ahead of the spoons to add to their flash.

Homemade Spoons

The spoon is the simplest of all fishing lures and is easily handmade with basic home tools. Scraps of metal, such as large brass or copper tubing, can be fashioned into attractive and productive spoons. After sawing a piece of tubing in half, flatten one side and rough out a blank with a hacksaw. File it to the desired size and shape. Experiment with designs until you get suitable action when retrieved through the water. Simple oblong strips will spin; contoured disks will wobble. Smooth the lure with emery cloth or fine sandpaper. Small holes should be drilled at either end, and split rings added. A treble hook goes into the tail ring; the fishing leader is attached to the other.

The finished lure may be left in its natural brass or copper tint, or hand-painted with quick-drying lacquer available in any hobby shop. The color scheme can be patterned after spoons that pay off best in your part of the country. Red and white is probably the most universally popular color combination.

Spoons run the gamut in size from the large heavy models designed for salt water to the tiny slivers of metal for fly fishermen. But the spoon probably never enjoyed the zenith of success it gained when spinning tackle flashed across the angling scene. Medium to light spoons are easily cast with spinning gear, and it is this size that entices the most fish.

Scrutinize carefully the lure display the next time you visit your favorite sporting-goods store. I'm sure you'll be amazed at the number and variety of spoons. No wonder. You name it; a spoon probably can catch it. ★ ★ ★



Piston Rings wear out, too!

You can't see the wear on your piston rings. But you can feel it—in your engine's loss of power—and in your pocketbook.

At the first sign of oil-pumping, smoking exhaust or loss of power, ask your motor specialist for a ring check-up. If your car needs new rings, you'll be money ahead on gas and oil . . . and avoid big repair bills later on by installing new Hastings Piston Rings now.

They stop oil-pumping, seal compression and provide the special lubrication worn engines need.

Don't gamble with the power and economy that are built into your engine. Restore it, keep it, enjoy it. Get new rings. And be sure they're Hastings—the only rings engineered exclusively for replacement service in your car. Truly the best money you can spend on your car.

HASTINGS
PISTON RINGS

TOUGH on oil-pumping
GENTLE on cylinder walls



HASTINGS MANUFACTURING COMPANY
HASTINGS, MICHIGAN
Piston Rings, Casite, Oil Filters, Spark Plugs

The closer the wheels are to the corners of the body, the greater the sense of security. Overhang and resultant oscillation create an insecure feeling. →

Owners shouldn't expect "eye dropper" economy in a heavy station wagon with a V8 engine and automatic transmission in traffic. →

First production Sixes had bad carburetors, Studebaker admits. Modifications by dealers are correcting the trouble (if yours hasn't been corrected yet, see your dealer) and all cars built since mid-January are right, says the company. →

Blower is annoying. Acoustics engineers work months to quiet the body and engine, but who worries about the racket made by the heater? →

This is why expensive models sell best, even among "economy" cars. The industry should be able to make its cheapest cars durable and neat. That doesn't cost money. →

A frequently heard comment about the handsome Lark hardtop is that it looks "British." →

Owners Report on the Lark

(Continued from page 89)

strike a long roll on the road that will throw my big car almost off the ground, the Lark just skims over without that awful sense of insecurity."—Maine service station operator.

And Now the Complaints

The following quotations describe the complaints of Lark owners in order of frequency:

"Not enough gas mileage. I was getting only 19 miles per gallon with this six-cylinder wagon for a while. Now I get 23 or 24."—North Carolina executive.

"I get 13.5 miles per gallon in city with this V8 wagon. How so much gas can get through such a small carburetor I will never understand."—Pennsylvania craneman.

"With the original carburetor, this Lark Six got 10 miles per gallon. On the present carburetor we get 12 miles per gallon in city, 17 on trips. This leaves a stench in the nostrils, not to mention high blood pressure."—Indiana religious school director.

"Jerking motion between 30 and 50 miles per hour. Garage man claims fault in carburetor. Conversion kits due in from factory to correct it. Have waited three weeks so far."—Mississippi salesman.

"Does not recover properly in high gear if you slow up on a grade or when turning a corner. This is caused by a flat spot in carburetor. Factory has corrected this and replacement kits are being shipped to all Lark dealers for each Lark sold."—Missouri machinist.

"Too many rattles."—Georgia engineer.

"Very tinny with rattles."—Texas student.

"Heater is too small for short drives in cold weather. Yet a car heater costs about half as much as a house furnace. Blower motor is noisy."—Iowa carpenter.

"Heater blower noisy when on full. Maybe could be relocated in engine compartment. Plastic knob on heat control poor. Have broken one already."—Montana oilman.

"Engine vibration in the Six is excessive at about 60 miles per hour."—Minnesota geologist.

"Don't like the engine sound. One man said it was the air intake. Sounds like an air-cooled motor. It's not as annoying now as it was at first."—Kentucky missionary.

"Other than a few water leaks around doors and windows I have no complaints."—Louisiana owner.

"Upholstery too thin. Will never stand up. Padding and springs too cheap."—Arizona hospital engineer.

"Front-seat mechanism too flimsy. Had to have mine torn down and adjusted."—Tennessee salesman.

What About Foreign Cars?

PM asked the owners of the Studebaker Lark if they had considered buying a foreign car before getting their new Studebaker. Nearly half of them did consider a foreign car (43.1 percent) but decided against it, most frequently because it was too small.

Here are some comments on the subject:

"I was interested in European design, but wanted no part of a European-made car. Therefore I bought the closest American-made car I could get—the Lark."—Pennsylvania Scout executive.

"I did consider a foreign car but distances in Wyoming are too great. Speeds on the open roads are too high for safety in a small car. Also the elevations are too high (7200 feet) for

(Continued to page 250)

New **LAWN-BOY QUIETFLITE** tames the roar of power mowing!

Exclusive 3-way sound barrier is the secret
of the new soft sound



1 Rubber engine mountings isolate vibration, cause of most mower noise. You mow in relaxing comfort, with no more bone-jarring, nerve-shattering handle shake.

2 Strong new fiberglass "bonnet" covers the entire power unit; traps and baffles random engine noises. You enjoy the new soft sound of smooth, modern power mowing.

3 Largest muffler on any power mower (89 cu. in., twin-chambered muffler) cuts exhaust roar to a whisper, deflects annoying exhaust downward, away from you.



LAWN-BOY QUIETFLITE
it whispers while it works!

Here's the first power mower you can use
anytime, anywhere, without disturbing
anybody! See it now!

- Exclusive LAWN-BOY Balanced Power Engine.
- Guaranteed non-bendable crankshaft.
- Exclusive Activated Pilot Wheel levels hollows, bumps.
- Fast, easy "dial-adjust" height control on each wheel.
- Famous LAWN-BOY level-cut and close-trim design.
- Complete 1-year factory warranty.

Look in the "Yellow Pages" or call Western Union Operator 25 for name of your nearby LAWN-BOY dealer. Call for a FREE demonstration on your own lawn.

For the long run, get a

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... it pays you back in performance

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Johnson, Evinrude, and Gale Outboard Motors.
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LARK

Detroit doesn't worry about this guy (nor does South Bend). But when the working man buys European family cars, the worry begins (as it has). →

A not infrequent complaint among foreign-car owners. →

In some big cars, tire wear costs almost as much as gasoline on small cars. →

Unpretentious, but in good taste. So different from the plain-Jane Scotsman of 1958. It proves that to be sensible you needn't be dull. →

Over the biggest bumps, there's no dangerous pitching. It makes considerable fuss, however, crossing rough railroad tracks. But its bark is worse than its bite. There is no discomfort to riders. No sheet-metal shudder. →

Women are said to be the ones who demand big cars. But once they've driven small cars in traffic, once they've parked them, they become addicts. They're not so dumb after all. →

a low horsepower engine."—Wyoming university instructor.

"I could probably get a little better mileage on a smaller foreign car but the difference would not compensate for the added comfort of the Lark."—Missouri owner.

"If American cars don't become more economical, I for one will take a long look at the foreign cars next year."—Kentucky steelworker.

"I sold my Lark and bought a TR-3 sports car. As a family car, the Lark is great, but I am unmarried and have only a few years left to do as I please. I thoroughly enjoy the TR-3. Learning to drive it is a new experience. It responds so well that it makes American cars seem sluggish and unsafe. I fear that from now on I am going to be addicted to sports cars."—Maryland student.

"I decided against a foreign car because they stick you when you need parts."—Virginia executive.

More Best-Liked Features

Seventh on the best-liked-feature list of Lark owners is economy of operation, much farther down than you would expect it to be. Eighth on the list is styling, followed by roadability and maneuverability. Here are quotations from the owners describing these and other best-liked features, listed in order of frequency of mention:

"I have gotten as much as 30 miles to the gallon with very careful driving and at speeds not over 60 miles per hour."—Louisiana six-cylinder owner.

"Easy on tire wear and I get 19.2 miles per gallon on trips. I have 11,000 miles on it already."—Colorado highway engineer and V8 owner.

"I've got my cake and am eating it too. Lots of economy with power to spare in this V8."—New Hampshire salesman.

"Lower insurance rates. Lower license plate costs. I get 22 miles per gallon on trips with this Six."—North Dakota farmer.

"Stylish without being gaudy. Plain without being dowdy."—New York station-wagon owner.

"I average 550 miles per week with 35 stops per day in and out of city. Over a two-week period I got 20.5 miles per gallon. I added one quart of oil in 4000 miles."—Alabama salesman.

"Uncluttered lines. Not a mass of overhang and a mess of chrome."—Maine postal clerk.

"Simple, unsculptured sheet metal."—Minnesota mechanical engineer.

"Good roadability. Does not get light at 100 miles per hour. Holds road better than most large cars."—Arizona construction equipment owner.

"Drove 400 miles this week end. I'm more pleased than ever. Never once did I feel that I was about to lose it on a curve. Other cars feel unsafe by comparison. I owned an MG and know how a car is supposed to handle."—Iowa dentist.

"Very maneuverable: Parking, turning, cutting in and out."—New Jersey salesman.

"Common complaint among our friends who own the bigger cars is that their wives can't see out to drive properly. Studebaker puts out a car a woman can handle with ease."—Pennsylvania millhand.

"Visibility excellent. Design gives one the feeling of riding out in front since the hood is not ornamented and drops quickly in front."—Montana customs man.

(Continued to page 252)



DO IT YOURSELF REGLAZE WINDOWS PROFESSIONALLY

This FLETCHER No. 600 G Reglazing Kit contains all the necessary tools for reglazing windows quickly and easily.

Spring time is fix-up time and there are always windows that need attention. The Kit contains an electrical putty softener (a very unusual tool), a glass cutter, a point pusher (inserts points easily), a putty knife, a can of glazing compound and a paint trimmer that neatly removes surplus paint from the glass.

If your dealer does not stock this kit, we will ship it prepaid for \$5.98. Send check, money order, or request C.O.D.

THE FLETCHER-TERRY COMPANY

Dept. D • FORESTVILLE • CONNECTICUT

with sockets, *QUALITY* counts

P & C SOCKETS

Last longer, let you work faster, easier



When you need sockets, buy good ones... P&C. Buy from the colorful P&C Merchandisers, 12,000 stores. Send 10c for tool catalog.



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THROW OUT

Model No. 520
20" x 8 1/2" x 13"



Model MC-28
28" x 9" x 8"

Write For Name of
Nearest Dealer.

These famous Kennedy tool chests in brown, ripple baked enamel. See them at your dealer's NOW.

YOUR OLD CHEST

for a new

KENNEDY

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- 7 lined drawers, top storage, heat- and moisture-proof
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Compound
Drawer Slides



Bar
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- Machinist chest designed as a base for the JOURNEYMAN
- Large enough to hold 24" scale and 1/4" drill



Kennedy Manufacturing Company
Van Wert 2, Ohio

LARK

True. You get in and out with remarkable ease. There's no mystery about it. That's the way cars were designed a few years ago. Remember? →

How rarely you think of this when shopping for a car. But you should. →

A fine testimonial from a guy who "road tests" his car daily. →

There's no excuse for any wiper that stops upon acceleration. There are some dangerous features of cars that can't be eliminated. This one can and should be. →

MISCELLANEOUS: Dash is neat, but uninspired. Speedo is very small, almost watchlike. Rear-view mirror gives narrow view to rear. Tunnels are unobtrusive, seats are comfortable for three — almost unique these days. Hardware on luxury models feels rich, on economy models gives evidence of skimping. Brakes excellent except when wet. Car has only two headlights, but who needs four? Both V8 and Six engines aspirate loudly on acceleration. This driver likes its "economical sound." You may not. Front end of six-cylinder models stands several inches too high. The Lark is an agreeable machine to live with. It makes sense.

"Body is solid and well put together."—Nebraska student.

"I like most the comfortable chair-height seats and the easy entrance and exit as I am 6 feet 4 inches tall and weigh 290 pounds."—South Dakota salesman.

"Can get into the Lark with my hat on and have plenty of headroom."—Indiana real-estate salesman.

"Starts on the first try at 20 below zero."—Maine flyer.

"Ease of repairs to fenders in case of accident."—Alabama cattle breeder.

"The brakes are the best I have ever used."—Kentucky toolmaker.

"I can wash this car in 20 minutes thanks to its small size. Grille is easier to keep clean."—New Hampshire teller.

"Twin-traction rear end gives more traction in snow with smooth tires than most cars with chains on."—Montana farmer.

"I have been a rural mail carrier for 30 years and this Lark is the most nearly perfect car I have ever used for this."—New Hampshire mail carrier.

The following quotations describe additional complaints of Lark owners and are arranged in order of frequency of mention. All of these were mentioned by fewer than four percent of the owners.

"Somewhat slow on acceleration. This is a Six. I suppose it wouldn't be with a V8."—South Carolina builder.

"Interior is made of inferior material."—Maryland social worker.

"I did not get the electric windshield wipers and the vacuum model is very unsatisfactory. In passing a car or when speeding up normally, the wiper stops. That's usually when you need it most."—South Carolina civil service worker.

"Hard to shift into second."—Illinois mechanic.

"It started slow in cold weather but by installing a Commander Bendix spring it now starts easily."—Minnesota salesman.

"Quality is not up to that of foreign products."—Virginia naval aviator.

"Seems as if the bumpers are too close to the body for protection. Should have bumper guards at least."—Rhode Island chief petty officer.

"Gravel from front wheels chips paint off the front of the rocker panels."—Ohio refrigeration man.

"Hood hard to raise and does not stay up by itself."—Missouri vice-president.

"Emergency brake and ignition switch too close. When you reach for the brake the keys are in the way."—New Hampshire blacksmith.

"The car lists for about \$1900, but by the time you finish it goes for \$2400 and you have nothing that is really luxurious."—Rhode Island lawyer.

"To check master cylinder and automatic-transmission oil you have to raise the floor mats which are screwed down."—Montana mechanic.

"Not satisfied with trunk compartment. Spare tire takes up too much room. Difficult to pack luggage."—Rhode Island chemist.

"Hard to reach lever for moving seat back and forth."—Wyoming oil pumper.

"Key well is too deep in padded dashboard. Hard to get key in with gloves on."—Michigan factory worker.

There you have it—the story of the bright, new Studebaker Lark as told by the owners themselves. For an engineering analysis turn back to page 88. ★ ★ ★

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cessories... to
handle all metal-
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THE EDINBORO

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"TOUCH CONTROL"
rewind

WHEN YOU PRESS
THIS MEZURMATIC® BUTTON

Even if you've been measuring and sawing for thirty years, this tape rule will stop you right in your tracks.

You'll peel out the blade ... expecting it to buckle the way other tape rules do. You're surprised when it doesn't.

Then you'll cautiously press the button ... expecting the blade to come lashing back the way old-fashioned automatics do. Again you're surprised. This one slides back smoothly, perfectly controlled ... stops the instant you release the button. It can't creep.

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You'll find a world of
LUFKIN measuring tools
at your hardware store.



LUFKIN TAPE RULES
TAPES · PRECISION TOOLS

(Continued from page 91)

You won't do much better on a Six with automatic transmission. →

claims you can get fabulous mileage. This V8 is my second Rambler and I have never gotten more than 18 miles per gallon."—Ohio mathematics teacher.

Take all reports of economy runs with a handful of salt. These runs are like the four-minute mile. Sure, humans can run the mile in under four minutes. But can you? →

"Rambler people should either be frankly honest about the gas consumption of the V8 or else make a drastic change in it. The inference of economy is not at all admirable of an organization that has produced this fine car."—Florida picture framer.

Auto companies must let the janitor engineer their hand-shift linkage. You'd think by now this problem would have been solved. →

"I do not feel it is good to report that 32.9 miles per gallon was gotten on a certain test trip when it is obvious that no normal driver will get that mileage. I have a Six and I get 18 miles in city, 23 miles on long trips."—Wisconsin minister.

"I have a Six with automatic transmission and I get 13.3 miles per gallon in city, 15.5 on long trips. I have kept accurate gas checks since purchase."—Indiana realtor.

Push buttons are sold as a convenience, but it takes six months to get used to them. How inconvenient can a convenience be? →

"Hard to shift into second gear. Shift lever has locked in high gear several times making it necessary to lift the hood to move the shift lever to neutral."—Montana National Guardsman.

"Every once in a while it sticks in second gear and I can't get it out unless I raise the hood and dislodge a certain joint."—District of Columbia secretary.

"I don't think the push-button transmission controls are worthwhile. My wife is always breaking fingernails and I haven't learned to change buttons without looking yet. I prefer lever."—Arizona parts manager.

"The thing that annoys me is the push-button drive and parking gear, but expect to get better accustomed to it."—Pennsylvania molder.

"Acceleration between 50 and 70 is too slow when passing cars on the highway with this Six."—Colorado milk driver.

"This Six is too short on power."—Iowa fieldman.

"My only complaint is the automatic transmission. The company replaced the original transmission. It could not be adjusted to give smooth operation. The new one is some improvement but still too rough."—Texas metallurgist.

"They were better off with Hydramatic. This Borg-Warner transmission costs them gas mileage I think. And it takes too long to upshift."—New Jersey foreman.

"Noticeable jolting surge when the automatic transmission shifts."—New York registered nurse.

Rambler's big threat is not foreign cars, but the up-coming "smaller" U. S. cars. And AM knows it. →

What About Foreign Cars?

Because Rambler owners are obviously interested in smaller cars and in greater economy, *PM* asked them if they had considered buying a foreign car. A surprising 25 percent of them said they did consider such a move, but decided against for various reasons. The most frequently mentioned reason was the extreme smallness of foreign cars, followed by a concern for repairs and parts. Here are some comments by the Rambler owners about the current foreign-car trend in the United States:

"Most of the foreign cars are too small and I believe not safe on American highways mixed in with the large cars."—Michigan shop foreman.

"Bad trade-in policy by foreign-car dealers. Too much independence expressed."—Washington, D. C., salesman.

"Foreign cars not comfortable enough. Driver can 'feel' the road too easily. For me, a car is less and less a symbol

(Continued to page 256)

This argument would make it unsafe to drive a Cadillac on the same highway that trucks use. →

"THE SPORTING NEWS' PLAYER OF THE DECADE"



STAN MUSIAL SAYS:

"Try America's Fastest Growing Shooting Sport"

"Wherever I go, I see more and more people shooting the modern Crosman Pellguns. The reason is, a Crosman is both a man's gun and a family gun. Shoot a Pellgun in and around your home all year long like I do. It's good recreation when I'm on the road, too. And a Crosman Pellgun is safe, quiet and easy to handle ... it fits today's living."

Stan Musial

Take Stan Musial's advice and see the new Pellguns at any Crosman Select Dealer.

Write for new booklet, "Now Shooting Is Three Times More Fun."

Crosman Arms Co., Dept. PM-29, Fairport, N. Y.

Shooting is 3 Times
MORE FUN with

Crosman

Power
Without Powder® **PELLGUNS®**

World's largest producer of pellet rifles and pistols

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AIR PRESSURE FOR 101 JOBS!

**JOHNSON
RED HEAD
PORTABLE
AIR
COMPRESSOR**

for home, shop
and farm



complete kit
less motor
\$44 at Your Dealers

There's simply no end to the jobs you can do with this new all-purpose unit! Red Head lets you do scores of chores better, faster, easier! Saves time, work and money—pays for itself. For example:

- **SPRAY PAINTING**—furniture, fences, siding, screens, porches, boats. Easily handles heaviest multi-color paints!
- **GARDEN SPRAYING**—spray insecticides, fungicides, weed killers. Protect roses, shrubs, flowers, vegetables.
- **INSECTICIDE FOGGING**—enjoy outdoor living. Red Head sprays away pests and bugs around patio, fireplace, lawn.
- **AUTO CARE, HOBBIES**—do your own greasing, waxing, refinishing. Cleans, sprays, blows, inflates.
- **FARMS**—Red Head sprays heavy machinery enamels, cleans machines in a jiffy! Great for push-button barn fogging.

MOST EFFICIENT UNIT MADE

Powerful Red Head delivers full 3.5 cfm free air and 50 psi pressure—easily out-performs many larger 1/2 hp units. Compare Red Head's price, quality and power with other compressor outfits. Fully portable. Only 10" high, weighs under 30 lbs.

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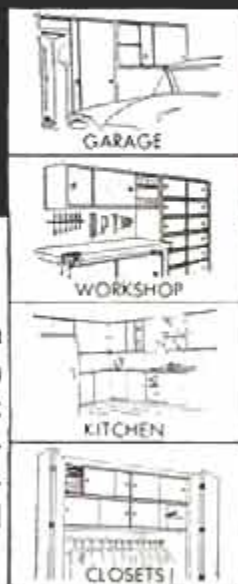
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storage space!
It's easy with



for 1/2 to 3/4-in. panels of glass,
plywood, masonite, etc.

Now, build your own extra storage cabinets. Installation is easy and fast! You'll think of dozens of more uses. Aluminum track sets come packaged ready to use. No special tools needed.



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MACKLANBURG-DUNCAN CO.
OKLAHOMA CITY, OKLA.

RAMBLER

*It takes all kinds
to make a world!
Let's be tolerant.*



of status and more a utility. Factors of style, chrome, prestige, mean very little and I refuse to pay for them. Rambler is on the right track."—Michigan clergyman.

"I don't care for the type of people that drive foreign cars. They all look the same: Big glasses and screwball hats."—Wyoming branch manager.

"I bought an American car because in case of dealer trouble I am completely unable to swear in French, German or Italian."—Vermont registered nurse.

More Best-Liked Features

Seventh on the best-liked list is exterior styling, far down the list from the usual position it holds in an American-car survey. Here, in order of frequency of mention, are quotations describing this and other features the owners like:

"Styling is smart and modern, but not gaudy."—Virginia mathematician.

"General good looks. Individual without being radical."—New Mexico Air Force sergeant.

"Ample space for a small car. Actually almost as large as the so-called large cars which are all fenders."—Alabama engineer.

"Good legroom in front and rear."—Pennsylvania school-bus contractor.

"Sliding, reclining seats are priceless on long trips. I am a semi-invalid and we take extended trips of at least 4500 miles twice a year. My wife drives and I ride Pullman style all the way in ease and comfort."—Arkansas retired owner.

"Individually adjustable front seats mean I am not crowded when my wife (who is shorter than I am) drives."—Maine engineer.

"My mother was able to lie down five hours on an eight-hour trip thanks to the reclining seats. She was able to sleep part of the time and was not exhausted by the trip as she had been before."—Pennsylvania teacher.

"Seat is high and comfortable, unlike other cars."—Illinois insurance salesman.

"For the first time in my driving career I do not have to use a cushion in order to reach the gas pedal and I can see perfectly."—New York office manager.

"Very good roadability. Very stable on corners and drives like a much heavier and larger car. It gives one the feeling of safety and provides a feeling of being in control at all times."—Montana salesman.

"One of the quietest cars on the road today."—California electrician.

"The short hood enables the driver to see right down in front of the car."—Montana wholesaler.

"The V8 has good power and pickup. It will stretch out if need be. I had mine at 110 miles per hour once."—South Carolina payroll supervisor.

"Its maneuverability in traffic has cut 10 minutes off my driving time to and from work (eight miles)."—Washington, D. C., scientist.

"This car was built and finished at the factory. The dealer didn't have to finish the job as is the case in so many other makes."—Nebraska banker.

"You can get in and out of it easily."—Michigan school director.

"My figured cost on a Rebel V8 Custom, power steering and brakes, white walls, tinted glass, windshield washer, padded dash, backup lights, radio, heater, was \$2700. Comparable competitive cars were \$300 to \$400 higher and the

*Not too long ago,
Rambler looked queer.
Then it learned that
it didn't have to
set the style, it only
had to be in style.*



*Real handy things
for both young
and old.*



*It takes chuckholes
as quietly as a
Greyhound bus.
Seems to have no
loose elements to
rattle or clatter.*



*What a fix we're in
when the fact that
you can get in and out
of a car is important
enough to brag about!*



(Continued to page 258)



RALLY ROUND THE LARK, MEN (and girls, too)

THE *LARK* [➤] BY STUDEBAKER

➤ Here's the car that's fun to drive. It's The Lark by Studebaker! What makes The Lark so much fun? It combines the most desirable qualities of handling and maneuverability of Continental machines with the spacious 6-passenger interior typical of much larger U.S.A. automobiles. In brief, The Lark provides you with satisfaction at the wheel. ➤ Down under a short 108 inch wheelbase, variable rate coil springs surround front hydraulic shock absorbers; asymmetrically mounted semi-elliptical springs combine with outward-angled rear shocks. The result, teamed with a 175 inch overall length, provides good cornering and a smooth, but firm, ride. It cuts acceleration "squat," too! ➤ Ideal for gasoline stretchers, the 170 cu. in. "6," with improved induction and manifolding, is great for winning top money economy awards. For higher performance, the 259 cu. in. V-8 with 4 barrel carburetor and dual exhausts is ideal. It *really moves!*

➤ Why don't you "move" to your local Studebaker dealer today and test drive The Lark? It's your new dimension in motoring.

Rambler finish puts them in the shade."—Louisiana attorney.
"Its well-finished interior is socially acceptable."—California salesman.

And the Other Complaints

The following quotations by Rambler owners describe the other complaints in order of frequency of mention, beginning with the sixth on the list, windshield wipers:

"Vacuum windshield wipers too slow on hard pulls."—Wisconsin machinist.

"Heater dumps a full load of heat on my accelerator foot. Very uncomfortable on long trips, although good on short drives."—Nebraska salesman.

"Heater gets front-seat riders too hot but leaves back-seat riders cold. Prefer underseat heater."—Colorado insurance underwriter.

"Starting switch on top of the manifold did not operate properly until recently."—Arkansas minister.

"Only trouble: I have had three new starter switches installed."—Pennsylvania owner.

"Body paint chips very easily. Undercoat has peeled off in some areas."—Arizona farmer.

"Some evidence of slack inspection. Loose connections in wiring to automatic transmission."—Virginia Marine colonel.

"Body noise is considerably more than I expected. This is my first station wagon and I guess you have to expect more noise than in a sedan. Steering column is noisy."—Oklahoma draftsman.

"Step-on parking brake does not hold too well."—South Dakota school principal.

"Seems to bounce around a little when in a heavy wind."—Wyoming farmer.

"Rear end whiplashes in mud and snow."—Kansas insurance salesman.

The following miscellaneous complaints were mentioned by a comparatively few owners, but are of interest to all prospective Rambler buyers:

"I am a rural mail carrier and the window cranks are not handy for me."—Nebraska rural carrier.

"Miserably small glove compartment."—Illinois industrial photographer.

"Sun reflects from the chrome on steering wheel so much I had to put tape over it."—Iowa clerk.

"The letters of the word Rambler in the grille seem to break out easily."—North Dakota farmer.

"Luggage dented the top of the car when we piled it on the station-wagon roof rack. Chipped the paint also."—Alabama engineer.

"Rear-view mirror is too small. Full rear vision is impossible without considerable turning of the head."—Missouri civil engineer.

"Front-door handles inconveniently located."—Maryland secretary.

"Corners of rear doors extend too far back and are dangerous for passengers who might hit themselves in the face when opening door."—Rhode Island mechanic.

"Exhaust of station wagon is on left side. Exhaust smoke obscures driver's vision when backing and also provides unpleasant fumes."—Pennsylvania executive.

"No place for chains, tools or other things one might like to carry in a station wagon."—Kansas motel owner.

That is the story of the 1959 Rambler, the car that is setting new sales records every month. That is what the owners have to say about the car. For an engineer's analysis of the Rambler turn back to page 90. ★ ★ ★

No reason why the industry can't distribute the heat evenly. If America wants lots of room in its cars, it also wants that room heated. →

On the test car, the vacuum switch failed once, but cured itself after a few minutes. This is just another complication of the push buttons. →

A good thing to remember when shopping for a wagon: They're noisier than sedans (colder, too). →

MISCELLANEOUS:

A much improved car, evidence of what can be done by keeping the same body for several years. Seat height is excellent, steering-wheel position and visibility also. Quiet, well behaved at highway speeds. Annoying glare from dash and heavily chromed steering-wheel spokes. Speedometer scale is ridiculous: About six inches long, half of it represents speeds over 70. Result: the 0-to-70 usable portion is jammed. Who wants a 120-mile scale anyhow? Heater controls somewhat crowded. Squeeze-type door handles make no sense. Inside armrest too close to door handle. All these are small, petty complaints. Fact is that this is a good, sensible machine that looks, drives and rides in a manner that will give any owner great satisfaction.



The casting that caused a revolution in outboarding!

It's just 33 pounds of metal—but by figuring out how to die-cast it, Johnson engineers brought outboarding into the new age of "V" power.

AN INTRIGUING DREAM

Outboard motor designers had long been intrigued by the possibilities of adapting the "V" engine to outboard use. It offered many advantages: compactness, a short, strong crankshaft and balanced power impulses for smoother running. But the cast iron, automotive-type V-block was too heavy for outboard use.

ALUMINUM THE ANSWER

Before an outboard V-engine could be practical, a way had to be found to die-cast the V-block in a light but strong metal. This had never been done before, but Johnson engineers went to work on it. By 1957 they had perfected equipment to cast an amazingly compact V-four block of alu-

minum. With cast-in cylinder liners and main bearings it weighed only 33 lbs.!

BIRTH OF THE V-50 SEA-HORSE

Johnson's V-50 launched the V-age in outboarding in 1958. The power and smoothness these new Sea-Horses brought to outboarding is now a matter of record. Never before have there been outboard motors with so much load-lugging muscle, yet so dependable, quiet-running and pleasant to drive.

FOR '59... DYNAMICAL DESIGN!

This year Johnson continues its pioneering by creating Dynamical Design—outboarding's new *Profile of Power!* It's on the mighty V-50 and all other Sea-Horse models down to 3 hp. See the new Sea-Horses with Dynamical Design now at your Johnson dealer's. He's listed under "Outboard Motors" in the Yellow Pages.



Johnson

FIRST IN SALES
FIRST IN DEPENDABILITY

B O L E N S



big tractor design is yours in the new 7 hp Ride-a-matic, with push-button starting, Versa-matic drive, automotive steering and differential. Over 20 time-saving attachments.



... and this is the Power-Ho, most versatile garden tractor of its kind. Three models, 3 to 6.6 hp, rugged, easy to handle wide choice of attachments.

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Check the catalogs that interest you, and mail to Bolens with your name and address.

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 TILLERS CHAIN SAWS
 POWER-PAK (Tiller-Mower-Snow Plow Convertible)



BOLENS PRODUCTS DIVISION
Food Machinery & Chemical Corporation
Port Washington D3, Wisconsin

Electricity Direct From Heat

(Continued from page 96)

multiplication of motors and compressors, and we could distribute small units throughout the kitchen: Icemaker, food freezer, beverage cooler, vegetable drawer—all kept at the required temperatures." Westinghouse has also developed a small, portable, thermoelectric dehumidifier for use in cabinets, cupboards and closets. A chilled metal surface condenses moisture from the air, keeping crackers and potato chips crisp, or it may be used for drying clothes in humid climates.

Small cooling units for special purposes are already in use. I saw a "refrigerator" about as big as a matchbox, using only a fraction of a watt of power, which is used in place of the vaporizing liquid oxygen now used to cool a small airborne electronic device. Another miniature cooler is used in laboratory microtomes, both here and in Russia, to freeze biological samples so that they can be easily sliced.

"The smaller coolers will pay off first," said Dr. Ramey, "but as we increase thermoelectric efficiency and lower manufacturing costs, I see no reason why this method cannot be used in all refrigeration, including air-conditioning."

The basic principle which makes these devices work has been known to science since 1822, when Thomas Johann Seebeck of Berlin, experimenting with two joined wires of different metals, noticed that when a junction was heated, a magnetic needle held near the loop dipped sharply. He had pioneered in converting heat directly into electric power, but did not know it. Twelve years later, Jean Peltier, Paris watchmaker, discovered that if he passed a current through a similar loop in one direction, the junction of the two wires became hot, and that if he reversed the current it became cold. He discovered thermoelectric refrigeration, again without knowing. Electrons had not been heard of then; later it was established that when the stream of electrons passed from one metal to the other it was like water falling downhill, giving up energy (heat), and that when the current was reversed the stream was "forced uphill," absorbed energy and made the junction cold. From these beginnings the useful but feeble thermocouple was devised—feeble because metals are very inefficient conveyor belts for the interchange of heat and electricity. Recent research in solid-state physics, which led to the invention of the transistor, accelerated the search for materials which would carry a more powerful electronic stream.

(Continued to page 262)



Three ways to start a balky car

1 On damp or rainy days, moisture can "short circuit" your ignition system. When you can't get started on such days, try wiping dry the exposed parts of spark plugs, wiring, coil, distributor cap and points.

2 On wet or dry days, when your engine won't re-start, the trouble may be carburetor "flooding." To clear out the excess gasoline that may be present, slowly push the gas pedal to the floor—*don't pump it*—and hold down while you turn over the engine.

3 The exact reverse of carburetor "flooding" — not enough gasoline reaching the engine—may make your engine sputter and die over and over again. When this happens, pump the gas pedal *quickly*, four or five

times. This will squirt a charge of fuel into the carburetor.

If everything fails and you must be towed or pushed, carefully follow your car manufacturer's instructions about how to set automatic transmission *before* you allow the car to be moved. And to *keep* your automatic transmission in tip-top operating condition, have it drained and refilled with Texaco Texamatic Fluid. It's the *heaviest duty* automatic transmission fluid you can buy! Texamatic gives you maximum protection against breakdown under the most severe operating conditions. Costs no more than ordinary automatic transmission fluids!





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makes *tough jobs*
EASY!

**EASY
PAY
PLAN**

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UNMATCHED PERFORMANCE!

Rotary Mower attachment mows-mulches the finest lawns or roughest weeds *faster, easier, better!*

Just one of 30 year-round, job-proved tools. Gravely, with *more power... more performance... more tools*, does the jobs others can't!

All-Gear Drive, Power Reverse, Optional Electric Starter. Riding or Steering Sulky.

Write for **FREE** 24-page "Power vs Drudgery" Booklet **TODAY!**



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Holiday Hideaway

Build this smart vacation cabin for less than \$1,500 with easy-to-use **FIR PLYWOOD**



PLANS ONLY

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... include six 14" x 20" sheets. Fully detailed with material lists, illustrated step-by-step instructions.

If you're looking for a vacation cabin you can build simply, easily and economically on almost any site—this is for you! Designed by award-winning architect George Matsumoto, it has over 400 sq. ft. with roomy living-sleeping area (built around a cheery log-burning fireplace), kitchen, bath, semi-detached bunk room that sleeps four. Rugged fir plywood construction simplifies building. Cuts costs, too. Actual material costs for test-model cabin came to less than \$1,500.

ORDER CABIN PLAN NO. 6. 25c per set postpaid. Or send 10c for idea-packed 12-page color-illustrated Cabin Plans Catalog. (Offer good USA only)

DOUGLAS FIR PLYWOOD ASSOCIATION, Dept. 9, Tacoma, Wash.

About 20 years ago, Dr. Maria Telkes, then at Westinghouse, now noted for her work in solar-energy utilization, developed an alloy which showed some improvement, stimulating the company's interest in developing practical thermoelectric devices. Then four years ago Dr. Zener and Dr. R. R. Heikes tested an idea about the magnetic behavior of certain ceramic materials. Their idea wouldn't work, but the behavior of electrons in the materials suggested that it might be the sought-for stuff which would beef up the flea-power Peltier device into horsepower brackets. These newest compounds, made from ingredients as common as those in a dinner plate, are to be used in the Westinghouse devices.

"Much basic work still remains to be done," says Dr. Zener, "and a great deal of technology is still to be developed, but we are convinced that the day of useful thermoelectric power almost certainly lies in the not too distant future."

Meanwhile, "thermoelectric engines" of a completely different type are being energetically developed by two scientists working separately in the Research Laboratories of the General Electric Company at Schenectady, N. Y., and a research team at the Massachusetts Institute of Technology. While they vary widely in detail, all three convert heat directly into electric power by means of vacuum tubes, and all are based on the "Edison effect" discovered by the great inventor in 1883. While trying to find ways to keep his early carbon-filament light bulbs from blackening, Edison inserted a wire in the bulb, and found that a measurable current leaped the gap from the hot filament to the colder wire. Edison did not understand this behavior; years later it was found that when you heat metal, you boil electrons out of it, and if you give them a goal that appeals to them they will flock to it. Edison's discovery became one of the cornerstones of the electronics industry, but the available current was so small that no one dreamed until recently that the tube might some day be engineered into a practical power producer.

Electron Traffic Cops

Dr. Volney C. Wilson of G.E., who was one of the early atomic scientists in Fermi's Chicago group, has invented a device of this type which converts thousands of times as much heat into power. It is a tall glass tube several inches in diameter. Heat boils off electrons from a wire in the center; they leap a gap and are captured by a surrounding cold-metal cylinder. Heat goes in and out comes electric current which will light a lamp and do other small

(Continued to page 264)

EDGE PLANE

SLOT AND GROOVE GUIDE

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5 in 1
MAGIC
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 makes the
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 even more
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MODEL 162. This ½ h.p. router has all the exclusive Porter-Cable professional features. All precision ball bearings, micrometer type depth adjustment, twin molded plastic knobs, light weight.

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HIGGINS BRONZE CENTRIFUGAL PUMP

FOR IRRIGATION • SUMP PUMPING
• SEWER DRAINAGE

Item 414—PNB Model R, Marine bilge pump. Open Impeller design for handling muddy water. Delivers 75 gal. per min. @ 2400 RPM. 30 foot head with $\frac{3}{4}$ H.P. motor. Pump and impeller of solid bronze, with alloy steel $\frac{1}{2}$ " dia. shaft, $1\frac{3}{4}$ " long. Clockwise rotation. Inlet has $1\frac{1}{2}$ " pipe thread. Plain $1\frac{1}{2}$ " outlet for hose connection. $12" \times 7" \times 8"$. Shp. Wt. 23 lbs.

\$23.50

Hydraulic Transmission

Item 115—For Reamer Drives, Midget Cars, Feed Mills, Canning Machines, Conveyors, Lathes, Milling Machines, Motor Boats, Pumps, etc. Variable output speeds from 0 to input speed available by moving control handle. Use input power of $\frac{1}{4}$ to $1\frac{1}{2}$ H.P. Shafts $\frac{3}{8}$ " diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. $7\frac{1}{2}" \times 7\frac{1}{2}" \times 11\frac{1}{2}"$. Output rotation reversible. Shp. Wt. 31 lbs. Complete with 2 qts oil and instructions. P.O.B. Chicago.

\$72.50

BOLT & WIRE CUTTER

Item 478—New! Extensible handles for extra leverage. Center cut type bolt cutter. Capacities: medium hard bolts in thread $\frac{3}{8}"$; medium hard metals $5/16"$. ONLY **\$3.95**

2 for \$7.00 ppd.

BAIL PUMP

Item 491—For hand-pumping bilges, sewers, basements, ditches, etc. Heavy gauge sheet metal. Full length handle and spring valve for high volume with minimum effort. 60" long, 3" dia. Weight 22 lbs. P.O.B. Chicago. **\$3.95**

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Professional Mechanics' TOOL CHEST FOR YOUR HOME WORKSHOP



This may be the lowest cost full-sized chest in America! 4 sliding drawers in blue or red rugged steel cabinet. 26" x 12 $\frac{1}{2}$ " x 12 $\frac{1}{2}$ ". Keep your valuable tools safe, clean and always at your fingertips.

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HUOT MFG. CO.

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PORTABLE MODELS
500 to 10,000 watts. Supply plug-in power anywhere!

Start automatically when high-line power is cut off, supply current for lights, heating system, freezer, water pump, stove, all appliances and machines. Prevents losses and hardships. Plant stops automatically when power is restored. Compact, easy to install. 500 to 200,000 watts A.C. Priced from \$319.00.

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chores. One of Dr. Wilson's problems in boosting the tube's power output was to expedite the flow of electrons across the gap. They tend to accumulate, he explains, blocking traffic and repelling newcomers like a crowd of homebound commuters in a railway station. He solved the problem by introducing "policemen" in the form of positively charged ions of cesium gas. Added to the vacuum tube in the ratio of one positive "cop" to one million jostling, negative electrons, these particles convert the mob into a fast-marching column. When Dr. Wilson first showed this device to a New York audience in the fall of 1957 it was converting eight percent of the incoming heat energy into electric power. He has since boosted its output to 13.5 percent. There are knotty problems ahead, but he has a confident eye on 30 percent, at which mark it could compete with many of the engines which do the world's heavy work.

In another laboratory in the same building, James E. Beggs, noted vacuum-tube engineer, has a pellet the size of three stacked half-dollars. When he plays a torch on it, two attached wires take off enough power to run a small motor. The pellet is a metal-ceramic vacuum tube, and Beggs solves the electron traffic problem by making the gap between his terminals so small that there is no room for a crowd to accumulate.

Electric Power From a Box

In Cambridge, Mass., stands the shining new plant of the Thermo Electron Engineering Corporation, its workrooms full of sophisticated electronic instruments. There 20 recent M.I.T. graduates are plotting another heat-into-power revolution under the leadership of Dr. George N. Hatsopoulos, a lean, dark young Greek who, as a teen-ager, built radios for the wartime Resistance in the cellar of his Athens home. He is now an assistant professor at M.I.T., where he teamed up with Dr. Joseph Kaye, and the result was still another kind of tube called a "thermo electron engine." Hatsopoulos' ship-owning relatives backed him with \$250,000, and he formed a corporation to develop the device and put it to work.

One experimental model of the Hatsopoulos-Kaye engine of tomorrow is a tube two inches in diameter and three inches long, which they report has converted heat into power with efficiencies of 15 percent and better. Large numbers of these tubes can be combined, says Hatsopoulos, or the size of the tube can be increased to yield large amounts of electric power. He envisions a box a foot square holding enough

(Continued to page 266)

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Radio Network Spots "Spy" Satellites

Already in existence across the southern part of the United States is a network of radio stations that can find and track silent and potentially dangerous reconnaissance satellites.

According to authorities, the radio network will make it impossible for any nation to launch a satellite that passes close to the United States without detection, even though the artificial moon may not send out a telltale beep-beep.

The system, operated by the Army and the Navy, is known as Spasur, which stands for Space Surveillance. Nine stations currently are in operation. They work in clusters of three so that the United States has three complete systems forming an overlapping span across the southern part of the country. The network will detect all satellites except those in a tight orbit around the equator.

In each cluster of three stations, the middle one is a transmitter. It is flanked by receivers 250 miles away. The transmitter sends out a continuous fan-shaped beam of radio energy. Any satellite passing through the beam reflects the radio waves, which are then picked up by the receiving stations. Since two stations "hear" the reflected signal, the height, speed and course of the satellite can be plotted by the triangulation method.

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of these units to supply electricity for the average home, using about the same amount of fuel as the utility companies now burn, or a thermoelectric automobile with the tubes getting their heat from bottled gas.

Unlike the Westinghouse and the Russian devices, the vacuum-tube "engines" developed at M.I.T. and General Electric cannot be reversed to provide refrigeration. All thermoelectric devices turn out direct current, which would have to be converted where alternating current is needed.

Thermoelectric Lawnmowers

There have been all manner of predictions and suggestions for the use of a thermoelectric engine. Speaking of this development before Congress last year, Adm. A. M. Morgan said, "We are on the verge of a breakthrough which will enable us to get efficiencies comparable to conventional power plants. In submarines, it would eliminate almost all noisy machinery. We should have something definite on this in three years." Dr. Abram F. Joffe, who is in charge of the development in Russia, stated in a recent visit to the United States that settlements in many remote regions of his country now have light and power run by thermoelectric generators from the heat of firewood and other fuels. Details are lacking about these installations, but informed U.S. engineers do not discount Russian achievements in the field. Wernher von Braun has suggested the use of these generators, operated by the heat of the sun, to provide power for space satellites; Dr. Wilson has drawn up plans for a similar device. And last year at a meeting of the Institute of Radio Engineers it was remarked that a silent thermoelectric lawnmower would be a boon to suburbia.

The use of isotopes to furnish heat for small thermoelectric generators is especially intriguing for certain communication uses. To call these devices, such as SNAP-III, "atomic generators" is a misnomer. All radioactive isotopes emit heat as well as rays. When they are used in industrial plants and in laboratories for detection and measurement, the penetrating rays do the work and the heat is a useless by-product. The reverse is true in the new generators; the heat is all that matters and the atomic radiation is a potential nuisance.

Power for Moon Radio

SNAP-III, a cylinder smaller than a quart fruit jar, has a pencil-shaped hole in the middle into which the isotope heater is dropped. It is expected to produce current

(Continued to page 268)

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Electronic Amplifier Makes Starlight Brighter

Scientists at the Lowell Observatory can take a photograph of Mars through a 24-inch refractor telescope with an exposure of only $\frac{1}{300}$ of a second. This is 10 times as fast as photographs previously were made through the telescope. The faster shutter speed is possible because the telescope now has an electronic attachment called an image converter. The instrument intensifies the light from stars and planets and eventually could make a 20-inch telescope the equivalent of a 200-inch instrument for some purposes. The image converter is a six-inch tube that is attached to the eyepiece of the telescope. Starlight enters one end of the tube, is intensified internally by electronic means, and produces at the other end an image that can be photographed. However, the device does not produce clearer details than are obtained by direct photography. University of Michigan physicists also are using the image converter to photograph the paths of high-energy nuclear particles.

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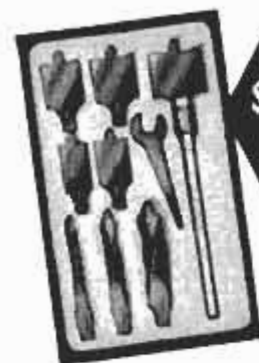
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eral months, until the constantly disinte-
grating isotope cools off. The Minnesota
Mining and Manufacturing Company,
which developed the thermoelectric units,
has several other generators under con-
struction. Westinghouse, General Electric
and the Hatsopoulos firm are working on
similar small generators. There are many
different radioactive isotopes — made by
bombarding bits of stable metals in atomic
reactors—and they vary widely in their
longevity. If anyone wants to place an un-
manned weather-broadcasting device at
the North Pole, or on the moon, there are
isotopes which will furnish heat for a cen-
tury. Because of by-product radiation,
these isotope-heated generators might not
be safe for civilian use, but these power-
makers don't care where their heat comes
from, and the Bell Telephone Laboratories
has built another low-power type which
will run for several years without attention
on a tank of cooking gas.

Radioactive gross fission products—the
"ashes" of atomic reactors — which may
create a grim disposal problem because of
heat as well as radiation, could be used to
fire the new thermoelectric engines. It has
been estimated that a solidified cube of
this stuff 11 feet square, if buried beneath
a house, would provide heat and power for
a lifetime. That is not likely to happen for
safety reasons, but its use in big thermo-
electric power plants is at least conceivable.

Putting Wasted Heat to Use

An alluring goal for the new engine
which many scientists are discussing is to
boost the power of atomic plants, which
are still in the horse-and-buggy era com-
pared with the most efficient coal-burning
plants. The reactors make more heat than
the steam turbines can use, and throwing
it away is like dropping dollars down the
drain. Among others, Dr. Volney Wilson
has drawn up blueprints for a plan to put
his device inside the reactor and convert
the excess heat directly into electric power.
Such a scheme might make atomic power
pay off years before it is now likely to.

All hands agree that there is a great
deal of work to do before a fraction of these
dreams are realized. It is estimated that
about \$10,000,000 a year is being spent in
research and development, and any report
on the engine should be considered a loose-
leaf notebook. Making due allowance for
optimistic enthusiasm—essential to all
progress—it would appear that a versatile
new power-maker is moving in, and that
it will have a profound effect—perhaps in
ways unexpected—on the technology of
the world. ★ ★ ★

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ACCESSORIES FOR BUILDING ARC WELDER for above generators consisting of VOLTAGE Regulator, 300 AMP. ammeter, 300 AMP. shunt, heavy-duty welder's gloves, 50' welding cable, electrode holder, rheostat, welder's helmet (hood type), Giant Toggle Switch. All 9 items—Approx. GOVT. COST \$150. Like NEW—Complete \$21.50.



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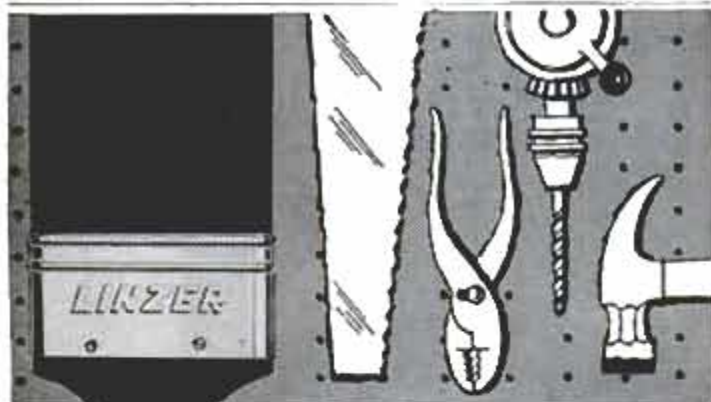


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I Coach a Family of Champions

(Continued from page 76)

should be perpendicular to the ground. Then grasp the racket with the right hand as if you were shaking hands with it. This is the Eastern forehand grip. For the backhand, give the racket a one-quarter turn to the right. Don't squeeze the handle; just hold it, firmly. The power comes from your body weight; your wrist merely smooths it out. In hitting the ball, use as much wrist action as you normally use in shaking a salt shaker. The wrist must lock when the ball hits the racket.

Work on smoothness first. Power will develop later.

As soon as my pupils have learned how to grip their rackets, I start them working on forehand drives. Most players use the forehand for a put-away or "kill" shot. If you can't finish off a point after making an opening, you won't be able to defeat an effective player. There are three forehand drives: The flat drive, slice drive, topspin.

The flat drive hits the ball squarely in the center with the racket head passing straight through on the same plane.

The slice is driven with the racket turned slightly upwards. As you connect, the racket head finishes slightly under the ball.

As for the topspin, racket meets ball as in the flat drive, but there's a slight rise to the racket's swing. Swing the racket from below the ball to slightly above the ball, following through with a slight upward turn. If your body is turned sideways to the net, your feet will naturally fall into the correct position. Shift your weight forward at the moment the racket meets the ball. Your body shouldn't lunge forward; it should pivot. And your knees should be slightly bent.

There are two other shots made from the forehand side after the ball has struck the court: The forehand chop and the forehand slice. To chop, hold the racket head high and swing down and under the ball. In slicing, the racket head should be held directly behind where the ball is to be struck, and afterward should pass under and to the left (for a right-handed player).

We have two types of players in tennis—the hitters and the pushers. The hitter uses controlled power. When he has an opening, he smashes the ball—but always with control. The pusher, on the other hand, never hits hard. If he's playing against a hitter, he bumps the ball, using his opponent's power to put the ball away.

When working with pupils on their forehand, I like to use a flat wooden bench. Next to me is a supermarket basket filled with tennis balls. I drop the balls on the

(Continued to page 272)



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bench and the pupil hits them. I insist that he hit each ball at the top of the bounce and that he aim his shot. I also drill into him the necessity of keeping his eyes on the ball. This is extremely important. If a tennis player watches the ball he can hit it where he wants to. I stress ball placement constantly, for in topflight tennis, control is an absolute must. A good player is consistently able to hit the ball deep into his opponent's court, and place his shots.

In tennis, (1) depth in the court, (2) placement and (3) power are rated in this order—and power is a very bad third. But remember that there is no substitute for power properly placed.

Proper Footwork Is Vital

Another vital thing I begin concentrating on at this stage is footwork—feet side-wards to the net, and weight on the toes. I don't know anyone who always walks on his toes, but every tennis player has to—on the court, that is. This is because tennis is a succession of starts. You simply must be able to start fast.

This means that you have to keep your weight on your toes. I remember one opponent of mine in a professional championship match who stood dead on his heels. I saw right away that he wasn't a "starter," so I kept throwing drop shots at him. I drop-shotted him to death. He sneered at the first ones, but he eventually found he couldn't get at my drop shots by starting from his heels. It took him until the third set to get on his toes, and by then I had won the first two sets 6-1, 6-1. He snapped into action when I was ahead 3-1 in the third, but my lead was too great and I won—just because I was on my toes and he was flat on his feet.

At this point in my instruction, my pupils know their grip and are working on toe-starting and forehand drives. So the ball boys and I begin hitting balls over the net to them. I keep them watching that ball, starting for it, stroking it, placing it, watching it—over and over again.

You can hit a ball against a wall to improve strokes and service. Another thing you can do is practice your swing in front of a mirror. Do it until it becomes part of you. That's an important point: Practice your swing until it becomes part of you. The same goes for your strokes and your toe starts. Learn them well and then keep doing them over and over until you can do them naturally and smoothly.

The backhand is traditionally the most difficult shot for most players, and I think it's chiefly because it's the least practiced. Naturally, a player who hits 25 forehand

(Continued to page 274)

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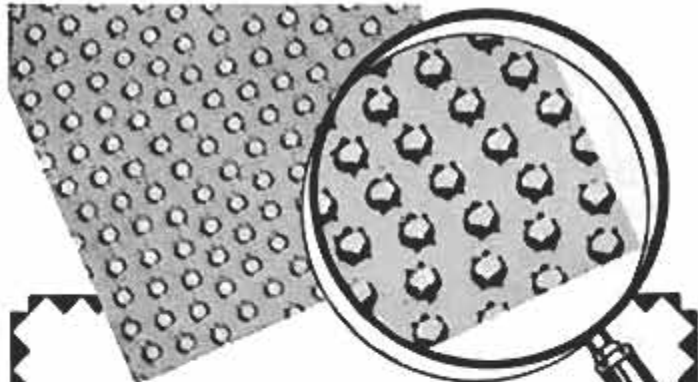
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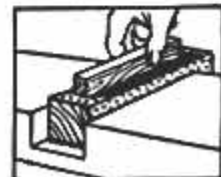
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shots to three or four on the backhand will become more proficient in his forehand.

You can make your backhand drive absolutely flat or with a slight backspin or topspin. I advocate and teach the slight topspin on both forehand and backhand, because this is offensive tennis—and offensive tennis is winning tennis.

Apply the backhand grip and spread the fingers up the handle. Don't point the thumb up the handle. Move the racket back with a straight or circular backswing. Keep your body sidewise to the net and have the head of the racket and the wrist on the same plane as the ball. If the ball comes low, bend down to it and swing. The racket should point straight up and down for a flat drive. For a backspin, let the strings cut slightly under the ball. To get a slight topspin, let the racket swing upwards from below the ball.

When playing a backhand, turn sidewise on the left foot (if you're a right-hander) and bring the racket head back, reaching the "ready to hit" position before the ball bounces. Shift your weight from back foot to front foot at the moment of impact. Meet the ball opposite the right knee. Don't try to kill it. Perfect timing and a fast pivot, not brute strength, give you power.

Your best offensive spot is the net position—about 12 feet back. From here you have the decided advantage when advancing to volley after a forcing shot. A volley should be blocked, not stroked. Stop the racket at the moment the ball is met. A fast stop generates power; a slow stop can kill the ball. Footwork and body position are just as important at the net as in ground strokes. Turn sidewise to the net on every shot—even if you don't have time to move your feet. When you face the net, it's hard to get weight into a stroke.

Overhead Smash From Net

It's also from the net position that you make an overhead smash. Pull the racket back at once. Unleash a full swing, meet the ball high at a comfortable distance—and hit hard. Usually, it's best to smash a deep overhead toward your opponent's backhand. Then, if it's returned, it is usually weak. But remember to practice smashing to all parts of the court so you can put a ball away whenever you have the opening.

Three shots you'll need in your repertoire if you're to be a serious tennis player are the lob, the drop shot and the half-volley. The lob is a ball hit up into the air and aimed toward the back court. It is frequently a defensive shot, employed to give yourself enough time to get back into position,

(Continued to page 276)



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or to force your opponent away from the net. This lob is usually very high and falls in the back of the court. An offensive lob can be used against an opponent as he rushes to the net. This lob has a lower trajectory and should be just out of reach.

The drop shot can be dangerous. When not done perfectly, it is a setup for an alert opponent. The drop shot is best made by blocking a rising ball while holding the racket with a firm, but not tense, grip. A drop shot should seldom be played from deep in the court. The half-volley is merely a pickup—playing the ball just after it bounces. The half-volley should be used only when caught out of position.

One of the last things I teach is the service. I advocate the backhand grip on service. This may be the hardest service grip to learn, but it's also the best, for it enables a player to hit the ball with power and with perfect control.

The service is the most important shot, for a service well-controlled and well-placed is the greatest asset a player can have. The two most popular services are the slice and the flat service. The slice is the easiest and I recommend that you start with it. Its cut on the ball gives definite control and breaks the ball downward with greater safety than a flat service.

Using the backhand grip, turn sidewise to the net, with both feet back of the base line, and point the racket toward the net. Holding two or three balls in the left hand and the racket in position, let the racket head drop, swinging freely. At the same time, shift the weight to the right foot as you pull the racket back. Then toss the ball directly overhead, just high enough to reach comfortably with the racket. Now swing the racket straight forward, striking the ball with a slice motion, the racket going across the right side of the ball. Let the racket finish to the left and you have delivered a slice service.

In the flat service, hit the ball about 12 inches closer to the net. Hit straight through the ball. Bill Tilden once said that if a good tennis player swung a sword instead of a racket, he would cut the ball cleanly in half, but the novice would merely slash pieces off the ball.

Practice tossing the ball until you can do it consistently without twirling it. The ball should be struck at the top of the toss.

As soon as you have mastered your strokes and service and have developed technique, you can enjoy tennis to the fullest and get the satisfaction and recreation that its inventors intended. And who knows—you might even like tennis so much that you'll work hard enough to become a champion!

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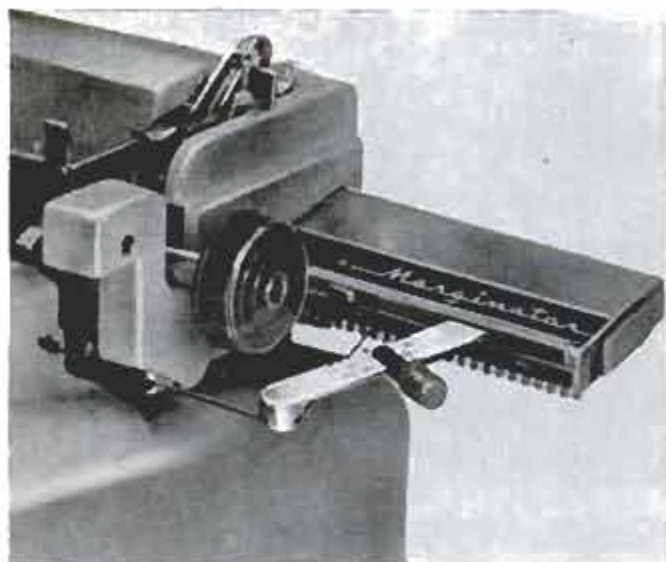
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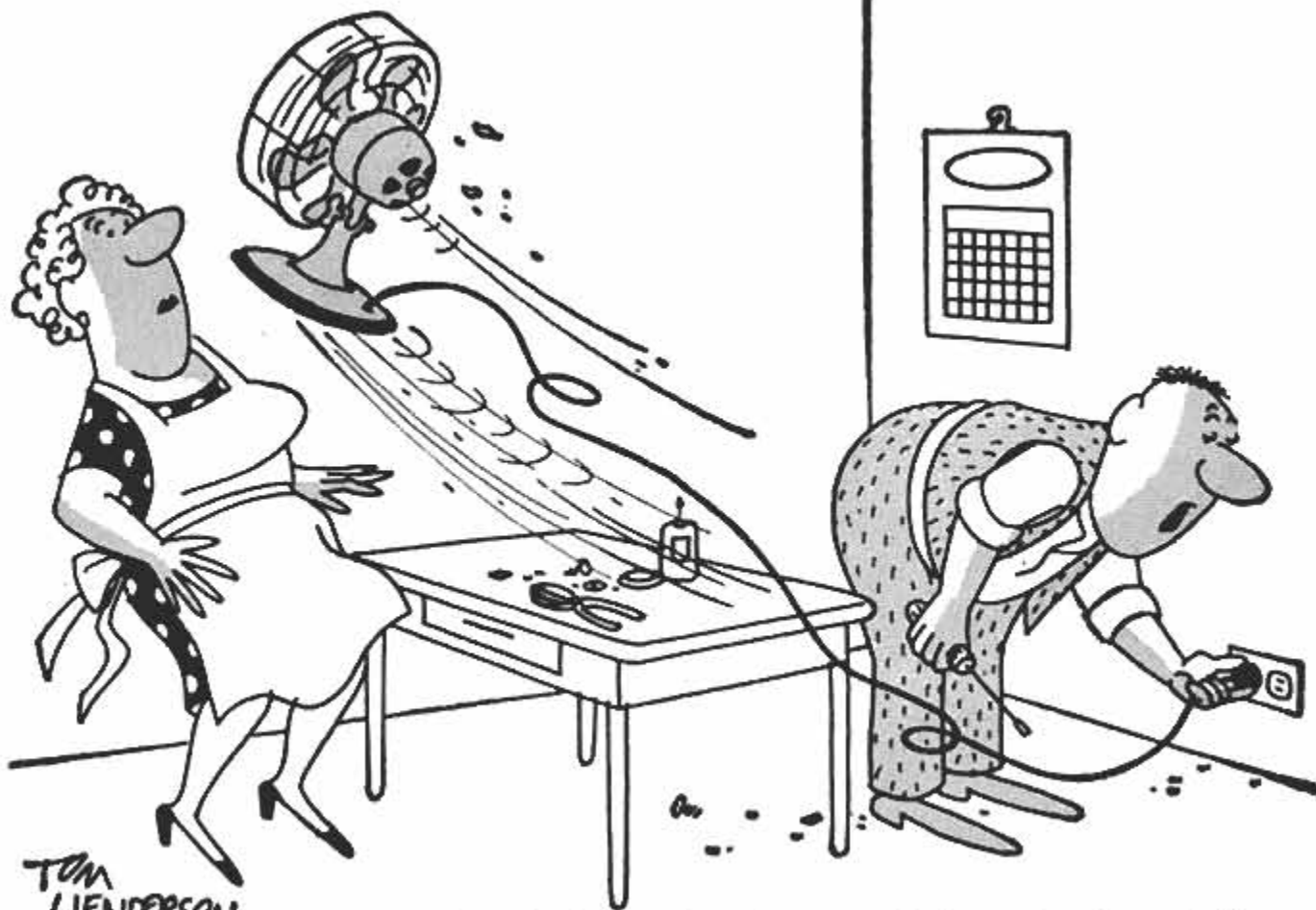
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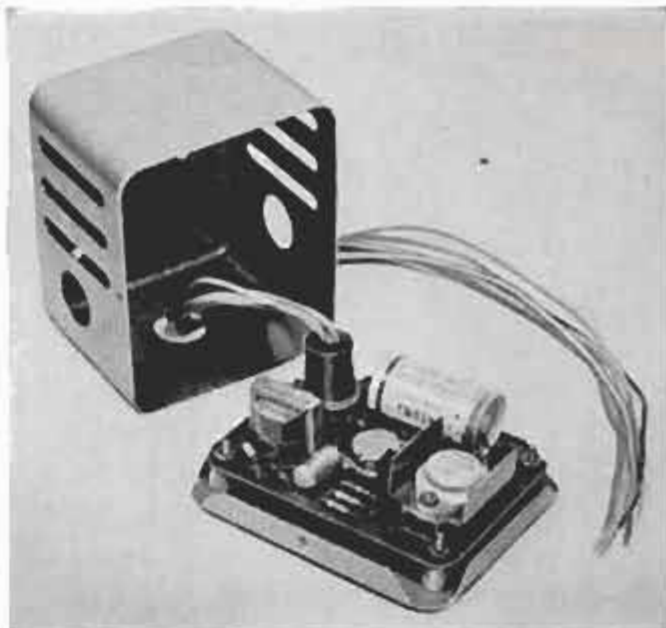
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Four young British scientists have achieved what has been described as "the most important advance in antibiotic medicine since the discovery of penicillin." They have isolated the basic penicillin molecule.

Their discovery, medical scientists assert, may lead to the production of countless "tailormade" varieties of penicillin, varieties capable of knocking out organisms that are resistant to existing antibiotics.

Today, antibiotics are manufactured by fermentation. The process does not lend itself to variations except on a hit-or-miss basis. The isolation in pure form of the basic substance of penicillin very likely will lead to the production of penicillin by chemical synthesis in the laboratory, permitting precise variations. The result would be new varieties of penicillin that could knock out bacteria and other microorganisms resistant to existing penicillins.

New varieties would also be valuable because many patients are sensitive or allergic to the antibiotics now available. The development of "thousands of new types" of penicillin would mean that a type could be found that all patients could tolerate.

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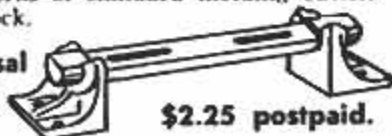
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Bailing Out For Fun

(Continued from page 69)

The sport got its start in the East five years ago, with clubs at Harvard, Yale, Princeton, Williams, Columbia and Middlebury holding informal intercollege meets each year. Membership of the Cambridge Parachuting Club is made up of about 20 Harvard men and one Radcliffe girl, who describes sky diving as "a great, lonely moment in space."

The spread of the sport has been rapid, and there are now clubs across the country, as well as two in Alaska and three in Canada. American sky divers now number nearly a thousand, while two years ago there were fewer than 600 and only half that number in 1956.

The Los Angeles club, called the Sky Divers, is one of the most active of the lot. Established in the spring of 1958 by former UCLA high-diving coach Howard Curtis and police officer Dick Morgan, it has 25 members, 5 of them female. In their first five months, they logged over 170 jumps.

The Sky Divers have two distinct advantages over most clubs in that three of their members are licensed parachute riggers, and America's leading parachutist is an honorary member. He is Lew Vincent, a parachute tester for the Navy, who has made almost 800 jumps.

"People who get into trouble parachuting are those who don't know what they're doing and haven't prepared properly," says Howie Curtis. "If you know how, sky diving is safer than crossing the street, and a lot safer than playing football. Although the French are ahead of us with fancy stuff, American jumpers have begun to do baton jumps, during which two or three parachutists pass batons to each other during free fall. We're also getting into formation-maneuvering, where three jumpers fall in a pattern."

Under usual conditions, a sky diver lands with an impact that can be compared to the shock of jumping from the roof of a car to the ground. But wind blowing at 20 miles per hour will add enough sideways velocity to the momentum to make the landing comparable to a jump from the top of a car traveling at that speed. Still, the Los Angeles Sky Divers haven't had a single accident since they started jumping, and only one member has been hurt—while diving into a swimming pool!

Monthly meetings of the club are informal gatherings of members and friends, together with their children, usually around a back-yard barbecue. Parachute-packing practice is a must and most members also

(Continued to page 286)

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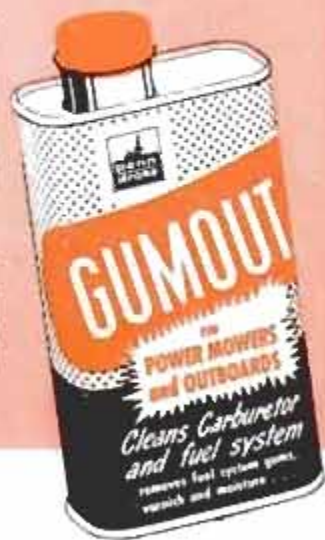


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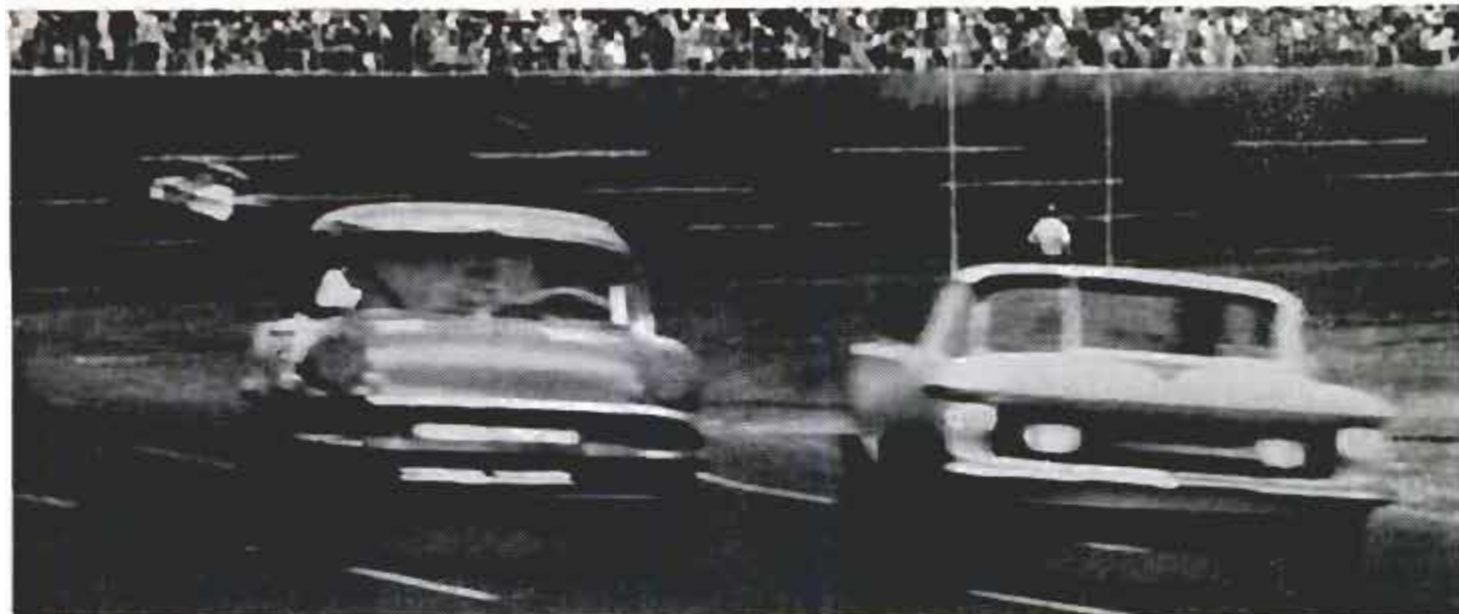
work out in a swimming pool, on a trampoline or with hoops and rocking boards. What makes a sky diver? Bill Morney, who had but one jump logged at the time I talked to him, gives as good an explanation as any. For him, the appeal was the anticipation of a new kind of thrill and he found that the first jump more than lived up to his expectations.

Modern parachutes are so foolproof that manufacturers no longer take out insurance as protection against claims of heirs in case of failure. The addition of a sleeve to the canopy has slowed the opening, easing the strain on the jumper. With the blank-gore chute, it's comparatively simple to make a pinpoint landing minus the possibility of cracking up. In this type of canopy, almost all of one panel is left out and the sideways momentum of air rushing through the opening enables the parachutist to control it much more easily.

Unlike paratroopers, sport parachutists jump under the best conditions, over the best terrain, and they aren't burdened by 60 pounds of extra equipment. In 1956, U.S. paratroopers made more than 200,000 jumps, resulting in 440 injuries and 36 deaths, but adoption of sky-diving techniques has changed the picture completely. Apart from eliminating tumbling, spinning and other uncontrollable, possibly fatal evolutions, the new methods have added secrecy and accuracy to reconnaissance-by-parachute. Old-style jumps were never made from an altitude above 1200 feet, whereas sky diving has been done as high as 12,000. With fast-flying planes and a free fall of at least a minute, paratroopers can escape detection by the enemy much easier than before. And, with the directional, smooth-opening and slow-landing capabilities of new canopies, a parachutist can operate with more precision than if he fell in the outdated manner.

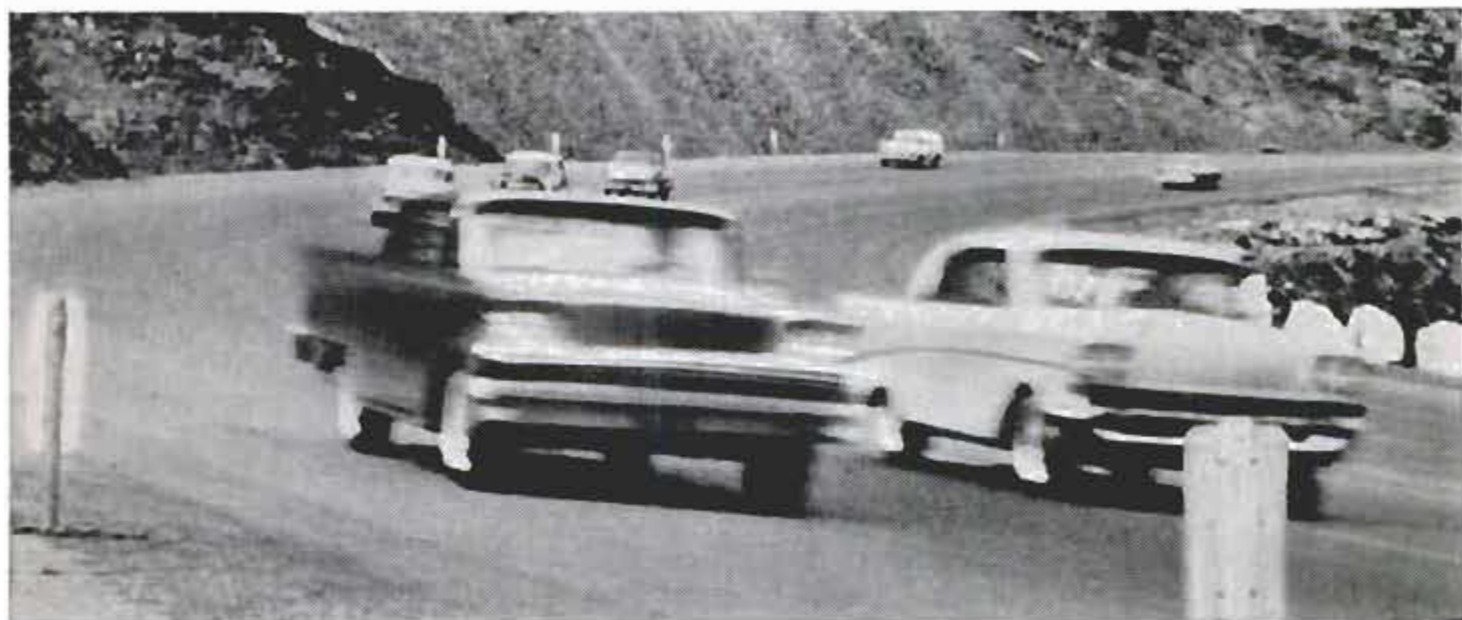
While it's possible to pick up a used chute for as little as \$30, it's advisable to pay about \$125 for a second-hand two-chute set. The price of a new back pack and reserve will run about \$200, and more elaborate equipment (such as blank-gore and "Istel" rigs) costs from \$300 to \$450. The cost of flying is figured at \$3 to \$5 per jump. Initial club fees range from \$10 to \$25, and monthly dues are usually \$2 or \$3. Only other expenses are cost of crash helmets, heavy boots and coveralls. Many clubs save money by sharing equipment.

Sport parachutists are like prospectors, in that they engage in a constant search for suitable landing strips close to home. The ideal strip has no trees, power lines, barbed-wire fences or beehives, all of which have proven hazardous. ★ ★ ★



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Lee Petty, NASCAR 500-Mile Sweepstakes winner at Daytona, Fla., says, "When it comes to the big test, only Firestones are good enough."

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- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- Elements of Nuclear Energy
- General Chemistry
- Natural Gas Prod. and Trans.
- Petroleum Prod. and Engr.
- Professional Engineer (Chem)
- Pulp and Paper Making

CIVIL ENGINEERING

- Civil Engineering
- Construction Engineering
- Highway Engineering
- Professional Engineer (Civil)
- Reading Struc. Blueprints
- Sanitary Engineer
- Structural Engineering
- Surveying and Mapping

DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Drafting & Machine Design
- Electrical Drafting
- Mechanical Drafting
- Sheet Metal Drafting
- Structural Drafting

ELECTRICAL

- Electrical Engineering
- Elec. Engr. Technician
- Elec. Light and Power
- Practical Electrician
- Practical Lineman
- Professional Engineer (Elec)

HIGH SCHOOL

- High School Diploma

- Good English
- High School Mathematics
- High School Science
- Short Story Writing

LEADERSHIP

- Industrial Foremanship
- Industrial Supervision
- Personnel-Labor Relations
- Supervision

MECHANICAL and SHOP

- Diesel Engines
- Gas-Elec. Welding
- Industrial Engineering
- Industrial Instrumentation
- Industrial Metallurgy
- Industrial Safety
- Machine Shop Practice
- Mechanical Engineering
- Professional Engineer (Mech)
- Quality Control
- Reading Shop Blueprints
- Refrigeration and Air Conditioning
- Tool Design
- Tool Making

RADIO, TELEVISION

- General Electronics Tech.

- Industrial Electronics
- Practical Radio-TV Eng'g
- Practical Telephony
- Radio-TV Servicing

RAILROAD

- Car Inspector and Air Brake
- Diesel Electrician
- Diesel Engr. and Fireman
- Diesel Locomotive

STEAM and DIESEL POWER

- Combustion Engineering
- Power Plant Engineer
- Stationary Diesel Engr.
- Stationary Fireman

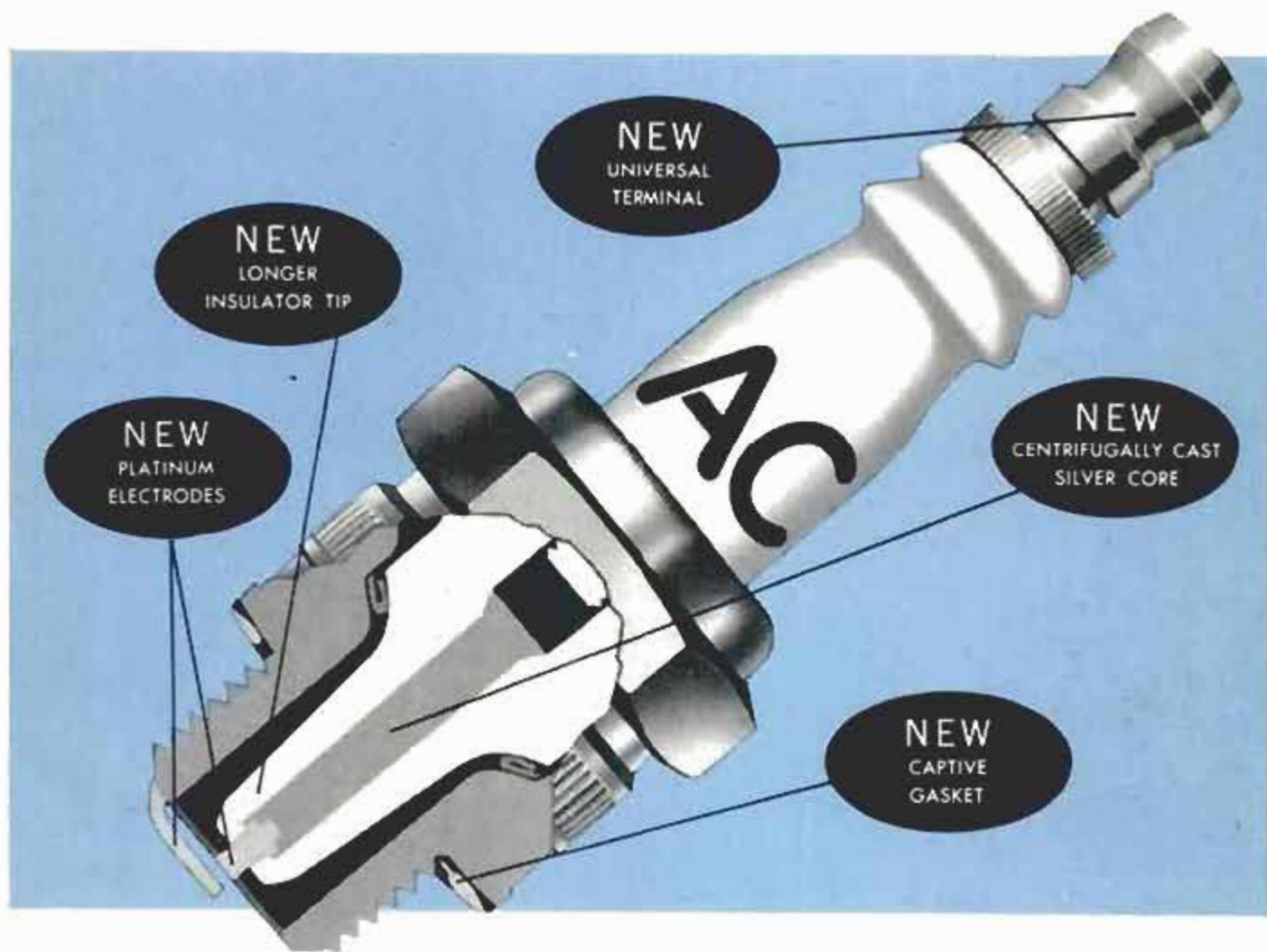
TEXTILE

- Carding and Spinning
- Cotton Manufacture
- Cotton Warping and Weaving
- Loom Fixing Technician
- Textile Designing
- Textile Finishing & Dyeing
- Throwing
- Warping and Weaving
- Worsted Manufacturing

Name _____ Age _____ Home Address _____
 City _____ Zone _____ State _____ Working Hours _____ A.M. to P.M. _____
 Occupation _____

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