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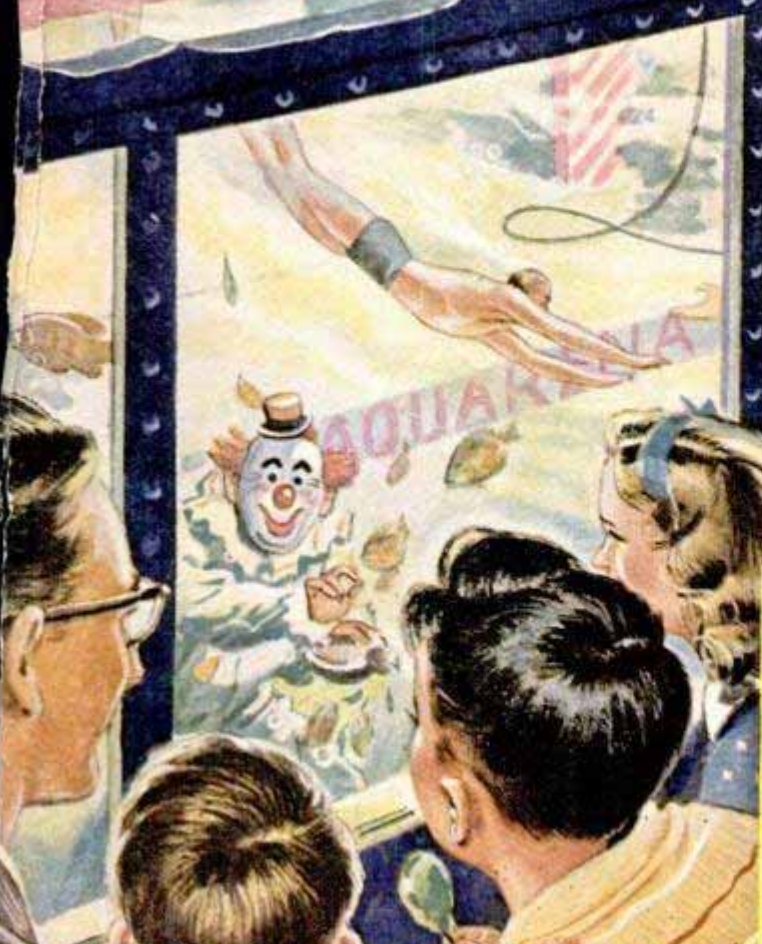
MAGAZINE

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MERMAID THEATER - *page 71*

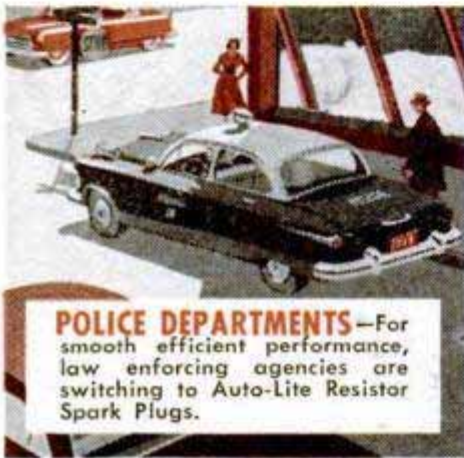


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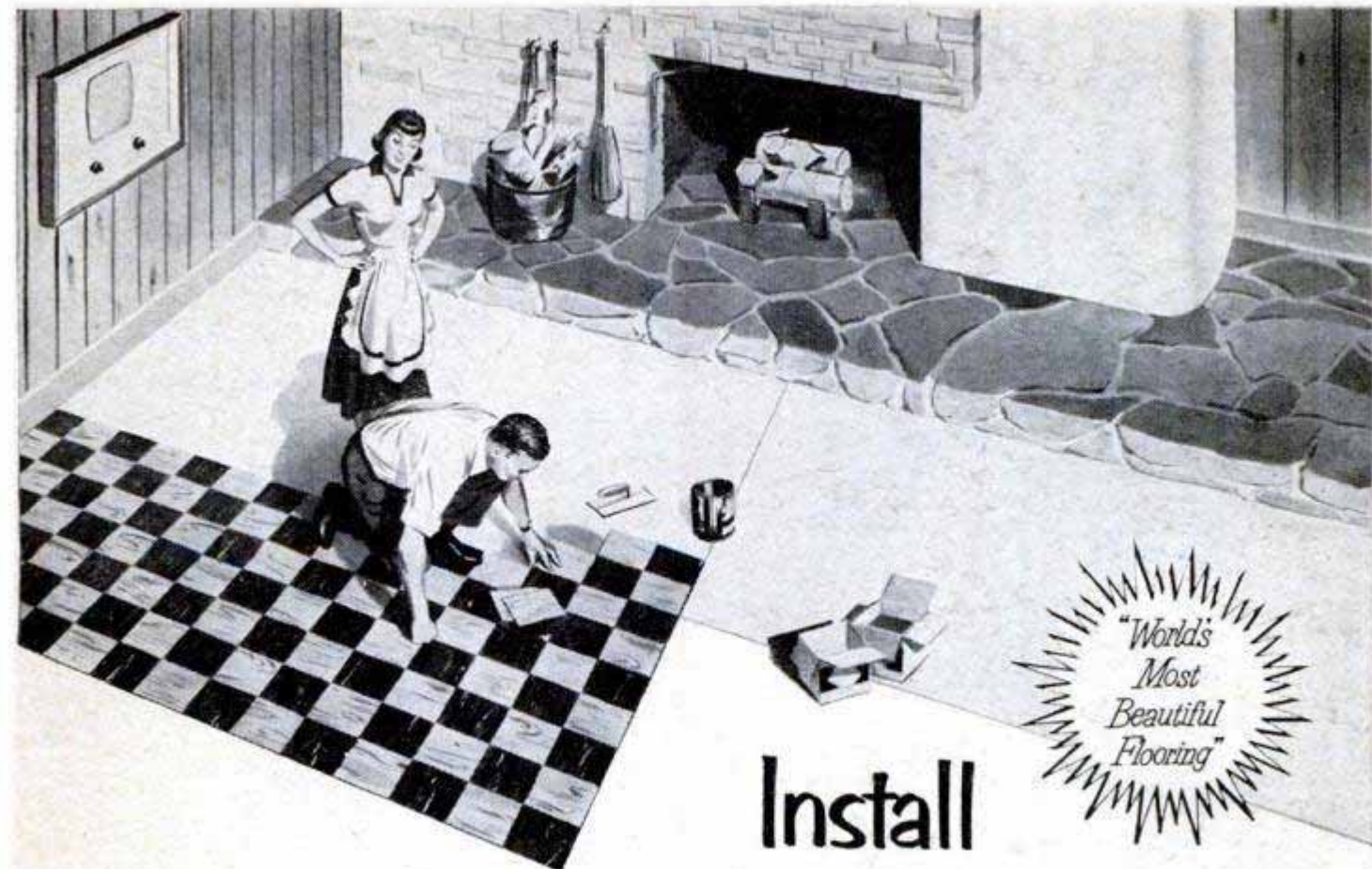
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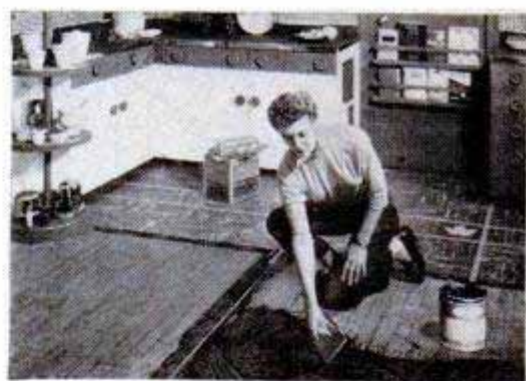


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POPULAR MECHANICS

Popular Mechanics Magazine

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H. H. WINDSOR, Founder

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this month's cover

DOWN TEXAS WAY, where things always seem to be first or biggest, there's a theater that dives like a submarine. When you walk into Aquarena, shown on our cover, you're standing above water level. Then water is spilled into ballast tanks and you go down, down, down until you have a fish's-eye view of the show. Mermaids and mermen cavort with fish and ducks and from the bottom of the pond you watch diving exhibitions, a ballet and even an underwater picnic—free of ants and spiders but attended by hungry schools of fish. One unique feature is an underwater stage—sort of a bubble of air suspended beneath the surface where performers can rest between acts. When the show's over, a pump forces water out of the tanks and the theater rises to the surface. The show goes on even in subfreezing weather for the pond has a year-round temperature of 70 degrees. Take in the show on page 71

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8. That 8% also means 20 *extra miles* on every tankful of gas.

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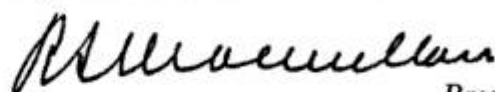
11. Better piston seal.

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THE EDITORS



WHEN ROBERT KORTA painted "The Old Craftsman" for our Anniversary Issue in January, he didn't know he was doing a real portrait. The sleepy old-timer in the painting came straight from Korta's imagination.



About the time the Anniversary Issue appeared on the stands, Alan Deyoe, our circulation manager, was on a business trip through Mexico. In Vera Cruz he found *Mecanica Popular*, PM's Spanish-language edition, displayed with the painting in full view. The reason? The painting is almost a photographer's portrait of Javier Avila Senties of Vera Cruz.

The flesh-and-blood "Old Craftsman" is associate distributor of *Popular Mechanics* and *Mecanica Popular* in Vera Cruz as well as a city official.

Letter to the Editor:

Enjoyed your February article, "In Battle, There's Always One More River to Cross." Thought you might like to know that the 254th Combat Engineers of the First Army, V Corps, erected a 220-foot Bailey bridge over the Thames River in England within 31 minutes from the time parts were laid out at the site. [The article stated that a bridge section 20 feet long could be erected in a half hour.] What's holding up the boys at Fort Belvoir?

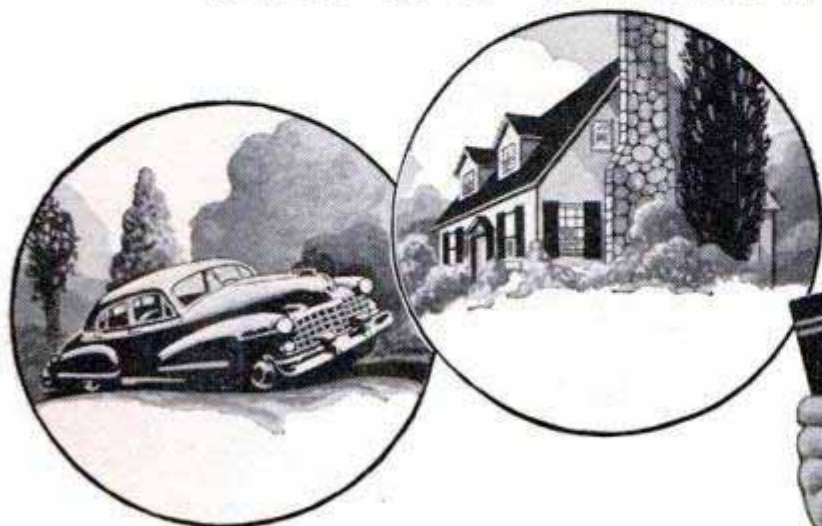
James Wapner,
Highland Park, N. J.

Letter to the Editor:

When one of the local Cub Scout dens celebrated its annual dinner this year, the

(Continued to page 8)

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TRAIN IN MIAMI - AIR CAPITAL OF THE WORLD

(Continued from page 6)

boys were overwhelmed by a huge cake topped with a campfire giving off smoke. It was the creation of Daniel Joy, a local baker and father of one of the Cubs. He fashioned a three-deck cake decorated with chocolate-icing tepees and a campfire made



Providence Journal-Bulletin photo

of pretzels, plus nine inedible Indians. A pencil flashlight was buried in the campfire to provide a glow. Through a hole in the middle of the cake passed a rubber tube, which reached to a near-by table where it was attached to a bottle of water. When Dry Ice was dropped into the water, the campfire sent up smoke signals. The boys submitted the cake to exhaustive tests and declared it a huge success.

Mrs. Ada F. Almy,
Providence, R. I.

Lady Wonder

Editor Dempewolff's article in March on Lady Wonder, the Virginia mare that taps out answers to questions on a keyboard, has aroused many comments from readers. Here are some excerpts from their letters:

"... The horse has no power; that is, of its own. It sounds to me like a duplication of Satan's power, manifested through another animal recorded in the third chapter of Genesis. Incidentally, the horse need not falter or misspell any word. That would be too obvious. It's all for one purpose—deception."—W.P., Concord, Calif.

"... I have written several articles about this amazing creature and have been interviewed by her several times. . . . The third time we went down there my husband said, 'Lady, will you give us our last name?' She did more, she spelled out 'Mary Hyde.' My husband also asked her, 'Do you remember us, Lady?' 'Sure,' she replied. . . . Many

(Continued to page 10)



Up to the top . . . together



If you've ever asked yourself "What can I do to get ahead?" you'll find the story of Ernest and Janet Jarvis interesting and inspiring

They married young. Neither had finished grammar school. Both worked—and studied.

Ernest was enrolled with the International Correspondence Schools. Janet helped him with his lessons. Together they mastered Chemistry, Metallurgy and other I. C. S. subjects.

Slowly, surely, their training bore fruit. Ernest was made plant manager of a marine pump and valve factory. Mrs. Jarvis worked as a chemist in the laboratory.

Then, with \$3500 savings, they started their own business, the Niagara Falls Smelting & Refining Co. Inside twenty years, it became the nation's largest producer of nonferrous alloys.

In 1944 they sold the company and retired as millionaires. But they couldn't stop. Before the year was out, the Jarvises were working again.

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Cream Hair Oil FOR MEN

(Continued from page 8)

people will begin to wonder. . . . Is intelligence all about us? Can animals know . . . more than we do? Is the bar only that of communication?"—M.J.H., Alexandria, Va.

The story of Lady Wonder had one odd consequence in Fort Wayne, Ind., which was reported by Cliff Milnor in the Fort Wayne *Journal-Gazette* of March 17.

Don A. Weber, president of the Deister Concentrator Company, had been irked by delays in the installment of a traffic light at a dangerous highway intersection. After reading the *PM* article, he dispatched a telegram requesting Mrs. Fonda, owner of the horse, to ask Lady Wonder when the State Highway Department would authorize installation of a traffic light at Glasgow Avenue and U. S. Highway 24. Although Mrs. Fonda ordinarily does not answer mail or telegraph inquiries—because, as she wrote afterwards, "I think she responds much better if her visitors come in close contact with her"—she did telegraph Mr. Weber: "About May 20."

On March 19, two days after columnist Milnor reported the prophecy of the horse, Mr. Weber reports there was "feverish activity" at the corner. The Highway Department had authorized the light and city officials rushed to install it. On March 20, instead of May 20, it was in operation. Writes Mr. Weber: "Around here everyone . . . credits Lady Wonder."

Commented highway officials in the *Journal-Gazette*: ". . . The people should know that the light became a reality through the efforts of the State Highway Department and not because of a smart horse."

Maybe Lady Wonder made a typographical error. May 20 and Mar. 20 look alike.

Letter to the Editor:

In your April issue on page 118 you show a lever-action shotgun. You state that this is the first time "lever action has been adapted to a shotgun."

I'm not so old as *Popular Mechanics* but I seem to remember a previous lever-action shotgun. I know that Winchester put out a 10 or 12-gauge lever-action shotgun early in the century. You probably have made Winchester very unhappy!

Arthur W. Krann,
Colonel, U.S.A.F.,
Washington, D. C.

Right, Colonel. Our informer did not inform us correctly. Winchester made lever-action shotguns from 1887 to 1901—mostly 10 gauge, some 12. Spencer also manufactured one. Marlin produced a lever-action shotgun for only two years, discontinuing it in 1931.—The Editor.

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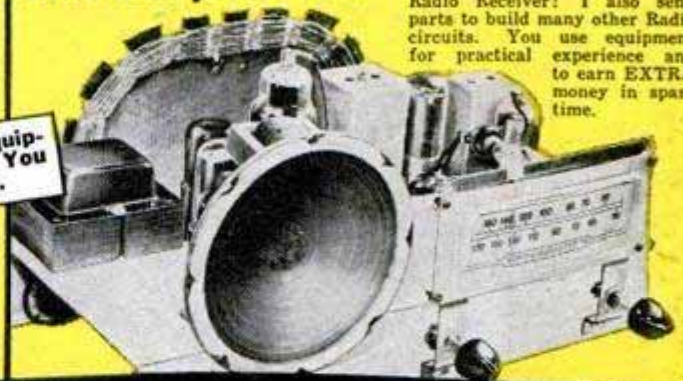
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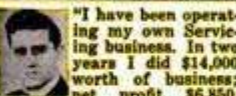
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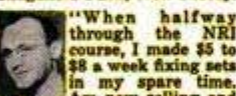
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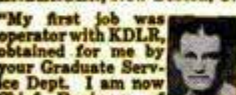
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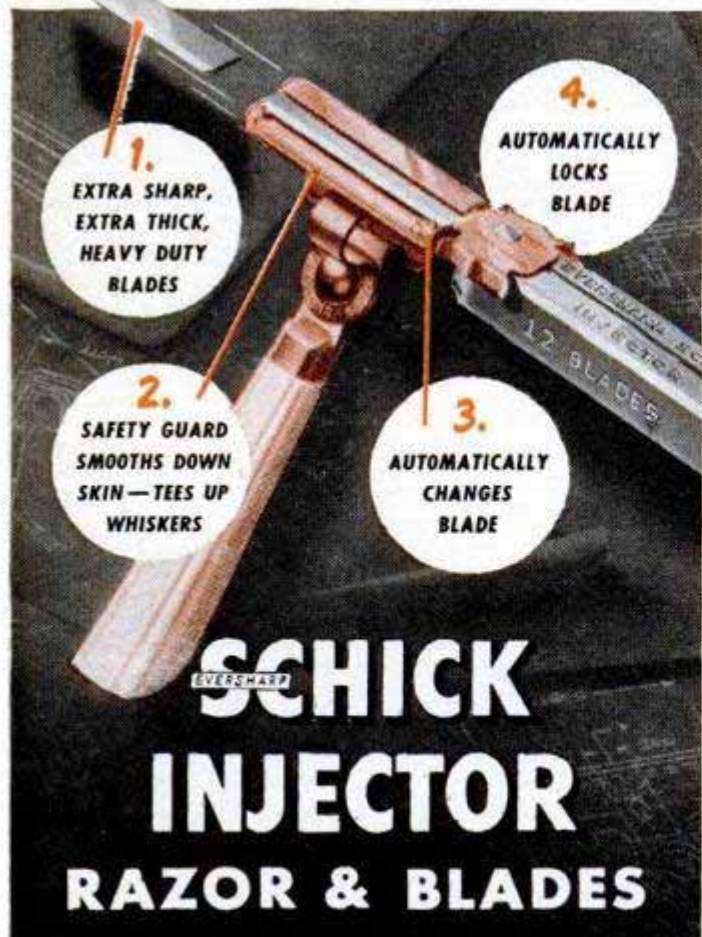
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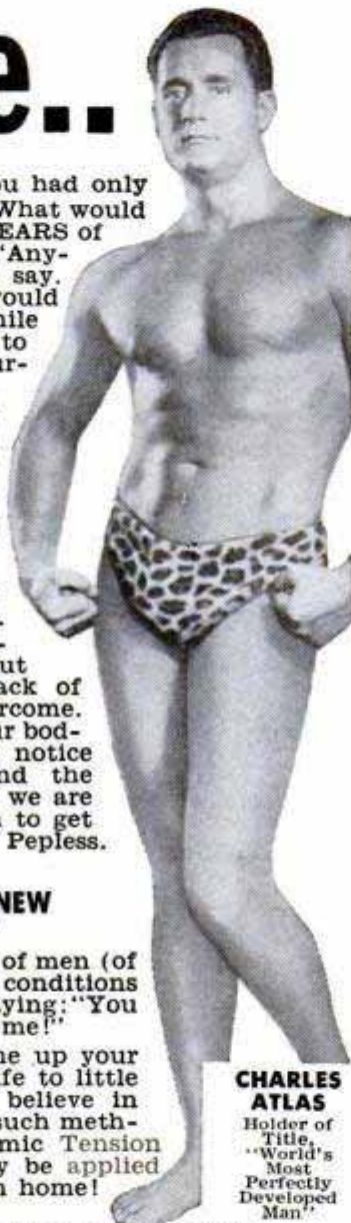
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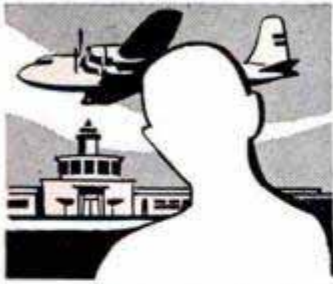
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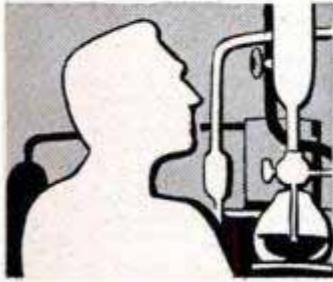
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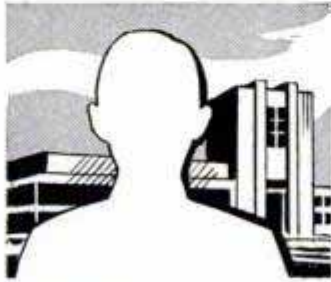
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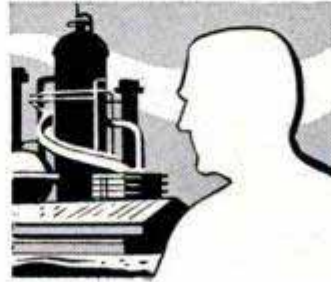
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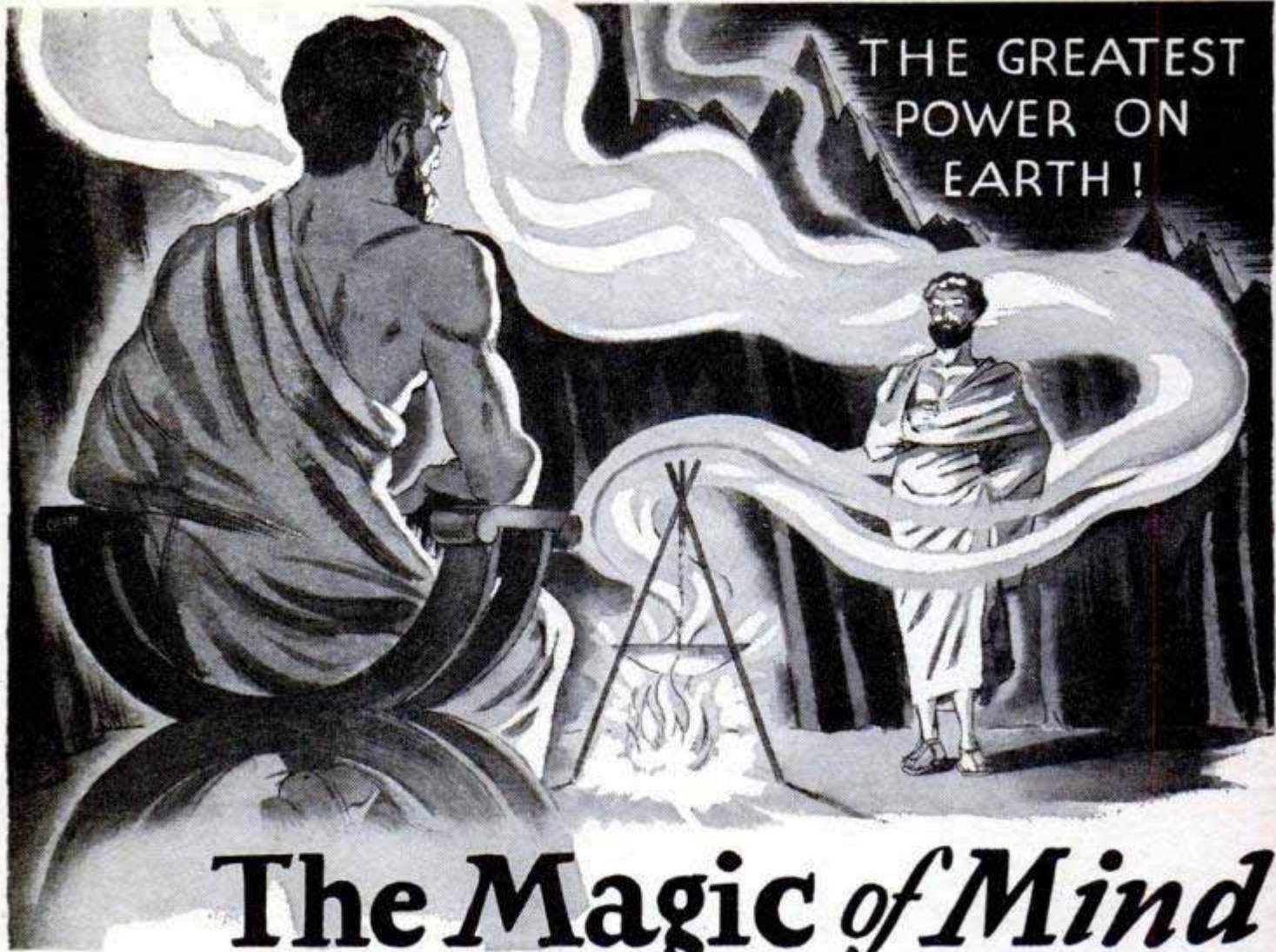
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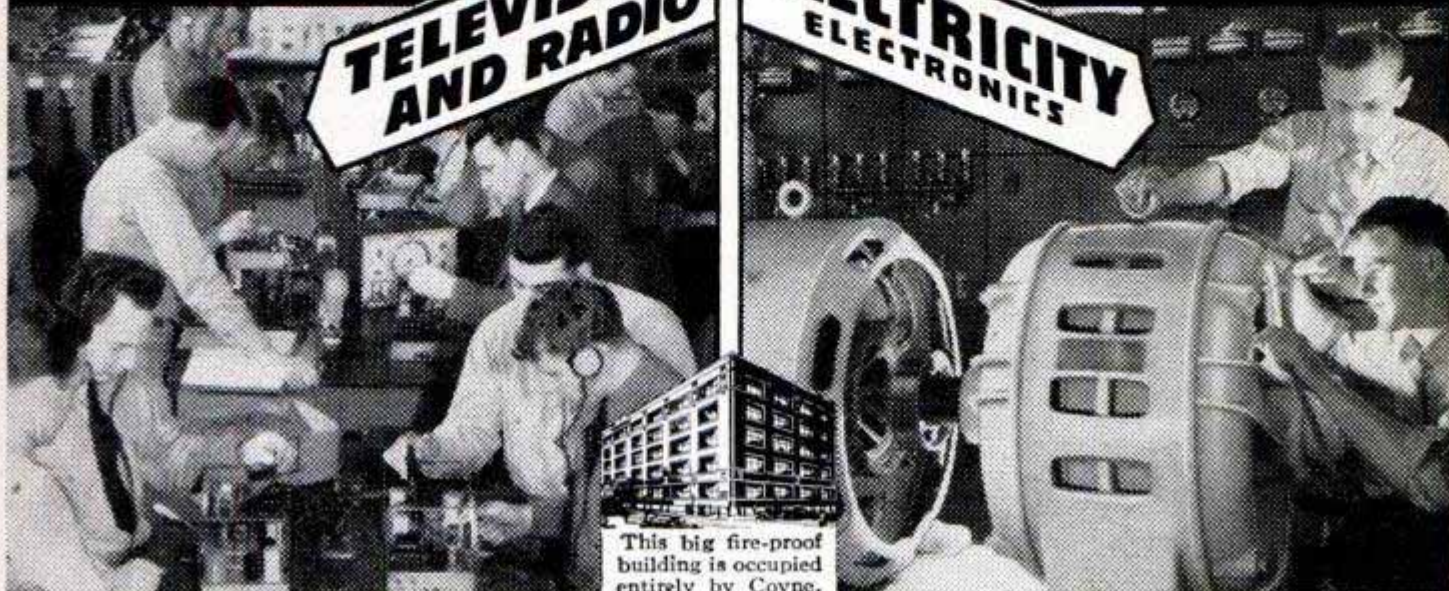
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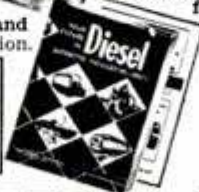
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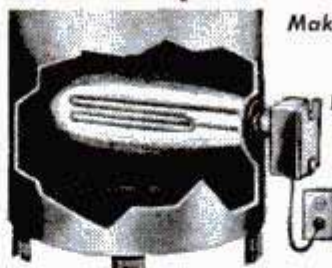
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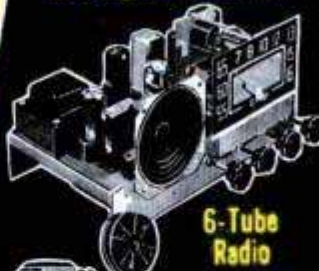
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How many times this month have you been completely blinded by the headlights of another car? How many times have you been blinded when you were driving 30-40-50-miles an hour . . . when you were in the middle of a dangerous intersection . . . when you were turning a sharp curve or corner? Yes, how many times this month have you been forced to trust your life—and the lives of your family—to a driver who doesn't even have the sense to dim his headlights?

These Accidents Can Be Avoided

Do you know that now you can avoid all these risks? Do you know that during the last five years over 70,000 drivers have found a new way to protect themselves against this headlight blindness? That these drivers have tested and proved an optical instrument that actually makes the brightest headlights as easy to take as dims. Here is that amazing story:

Five years ago, three of the country's top optical experts decided to tackle this problem of headlight glare. They immediately discovered that all of the common remedies were either useless or actually dangerous. These experts discovered that there was only one sure way to protect yourself against this blinding night glare—a piece of optically colored glass worn by you, yourself—that filters out the glare from these headlights in exactly the same way that a pair of sunglasses filters out the glare of the sun.

These experts discovered that scientists had developed such a glass—that many of the leading automobile manufacturers, such as Buick, Cadillac, Oldsmobile, Lincoln and Chrysler—were equipping their special deluxe models with special glare-resistant windshields. However, the cost of this glass on these special cars was necessarily \$20-\$50.

To avoid these costs these experts took this special glare-resistant glass and built it into a pair of Night Driving Glasses that could be worn by any driver. Since they eliminated all rays of glare, the experts called them RAYEX Night Driving Glasses. Here are some of the amazing results they discovered when they tested them.

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from the other cars at that hour—or of hitting one of the other little girls in the streets. Now, thank God, I know I can see them. I wouldn't take \$100 for these glasses."—Mrs. L. G., Forest Hills, New York.

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against the first two or three cars you pass. Prove to yourself that you can see their lights . . . but there is no blinding glare. After that you will be able to totally disregard the headlights of any car coming toward you on the highway. You will be able to sit back and relax—enjoy your night driving as much as you do in the day.

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- 1) Eliminate blinding headlight glare.
- 2) Actually help me see better . . . farther . . . clearer after dark.
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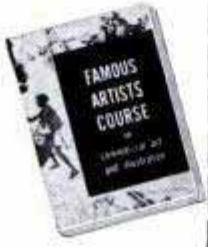
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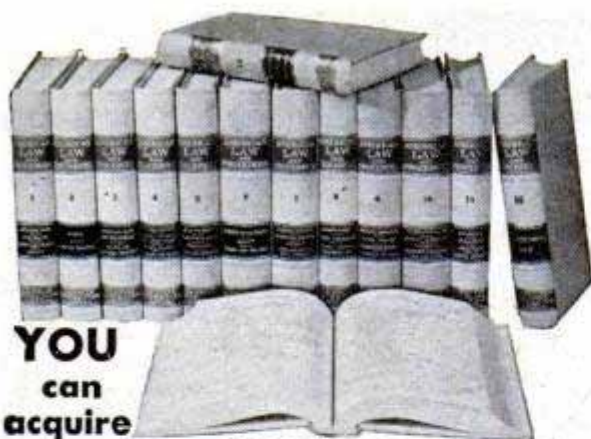
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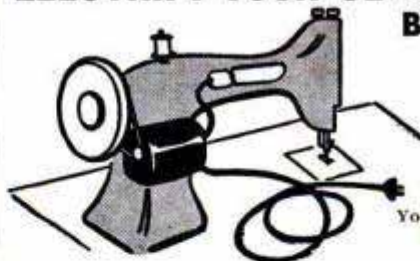
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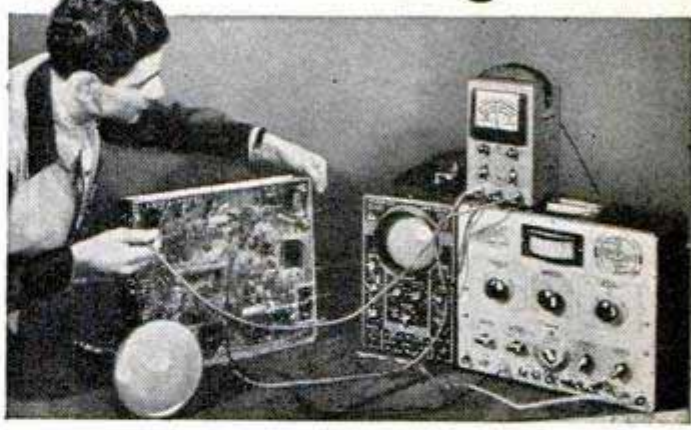
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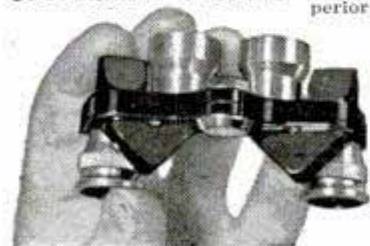
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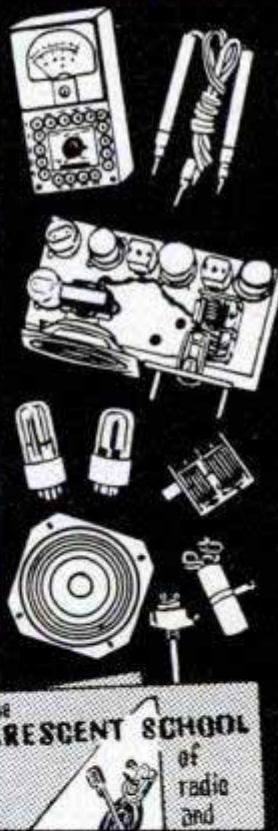
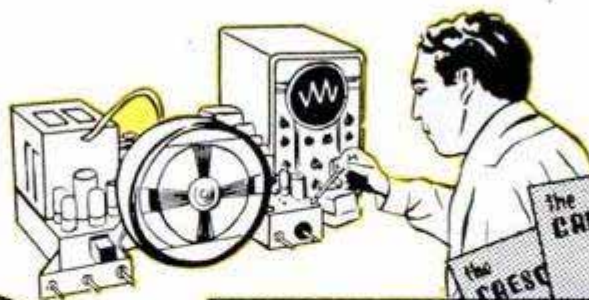
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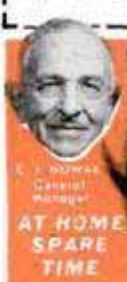
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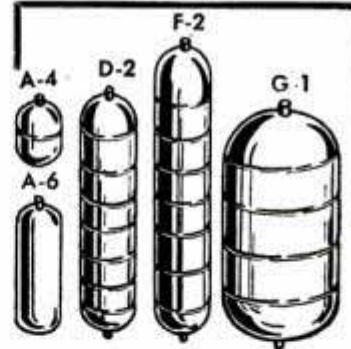
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FREE Photographic bargain book packed with hundreds of sensational values in still and movie cameras, lenses and latest accessories. Super savings for you in new and used equipment. Liberal trade-in allowances, too, on your equipment. Write now for your free copy to Central Camera Company, Dept. 9L, 230 S. Wabash Ave., Chicago 4. (Photographic headquarters since 1899.)

PHOTO FINISHING

8 KEEPSAKE Oversize deckledge snapshots from roll 40c, 12 exposure 55c or 2 each contact size same prices. Free mailers. Keepsake Photographic Laboratory, Box 7968-P, Kansas City 3E, Missouri.

8 CONTACTS 30c. Jumbos 40c, 12-45c, jumbos 55c, reprints 4c, jumbos 5c. Western Photo, Dept. PM62, Box 298, San Francisco 1, Calif.

8 EXPOSURE Oversize in plastic ring album 40c; 12 exp. 55c; 16 exp. 70c. Snapshots, Box 1469, York, Penna.

FILMS—Finest quality. Extra rapid service. 8 exposures enlarged, 50c. "Camera," Dept. 4, Box #280, West Chester, Pennsylvania.

TWO 8 x 10 Enlargements 50c, five for \$1.00 from your negatives. Wilart Enlargers, Box 967, Little Rock, Ark.

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FREE Roll of film with each developing order. 75c develops and prints 8 jumbos. Sent first class mail postage paid. Oxford, 3042 Greenmount Avenue, Baltimore 18, Maryland.

SATISFACTION guaranteed! Eight jumbo size prints mounted in album, 35c—12 to 16 exposure rolls, 50c. Free mailers, quick service, finest developing, finishing. Crown Studios, Box 1223-PM, Dallas, Texas.

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6 OR 8 Picture roll 35c, 12 or 16 picture roll 55c. Each roll printed and developed. Handy album pack. If you fail to get pictures on your film a new roll will be sent you without extra cost. Send coin with roll. No c.o.d.'s. Mailing containers sent free. DeLux Film Service, Box 1268-A, Shreveport, Louisiana.

BEAUTIFUL Enlargement from each picture on 8 exposure roll 35c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

TWO Beautiful prints from each picture on 8 exposure roll 35c. Thirty-one years of satisfied customers. Quick service. Lens Photos, Dept. J-4, Janesville, Wis.

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LEARN Movie projection, management. Free catalog. Theatre Institute, Elmira, New York.

USED Sound films at bargain prices. Free lists. Seller, 1399 Eggert Road, Buffalo 21, New York.

FREE Movies. Thousands of subjects. Interesting. Entertaining. Fascinating. Latest directory—only 50c. National Cine Society, 126 Lexington Avenue, New York 16, N. Y.

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5000 NEW-Used 8-16mm. silent-sound films. International, 2120 Strauss, Brooklyn 12.

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SONGPOEMS And lyrics wanted with new and clever ideas to be set to music. Tin Pan Alley, Inc., 1650 Broadway, New York 19, N. Y.

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POEMS Wanted. Broadcast consideration. Sooner Song Co., 22PM North West 8th, Oklahoma City 2.

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HOME Mail business opportunity—Get dollar orders—Keep 90c. Everything furnished. Gemmerco, Box 142PM, Dorchester 24, Mass.

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SELL Rubber stamps! Proposition 25c. Elwood, Box 163, Sunnyvale, California.

START Business without capital! Reliance, 15-A Park Row, New York 38, N. Y.

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1001 OPPORTUNITIES Club. 1495-P Westchester Ave., New York 72, offers real money making ideas. Free information.

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UNPAINTED Bookends, plaques, statues, figurines. List. Haverty Products, 822-17th St., Altoona, Penna.

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DOLLARS In personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, Calif.

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MONEYMAKING OPPORTUNITIES

SELL Snowballs. \$8.50 buys ice shaver that shaves into paper cup and enough flavor and cups for thousand snowballs. Other outfits \$2.50 up. Shavers, supplies, equipment. Illustrated circulars free. Snowball Co., 9534P Lemturner, Jacksonville 8, Florida.

BE Independent, be secure, have your own profitable business—Earn \$20.00 and more a day making beautiful, fast-selling lamps at home. No equipment needed. Illustrated course teaches you quickly. Course, parts catalog, wholesale price list—only \$2. Gearon Co., Dept. 300-B6, 27 S. Desplaines, Chicago 6, Ill.

FOUNTAIN Pen repairing. Send 50c for Penkit; includes sac, point with instructions for repairing. Penmart 96, Boulder City, Nevada.

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

SELL From your own catalog. Hybarger, 709 E. Baltimore, Fort Worth 4, Texas.

MAIL Order profits! Leading trade magazine (published 20 years) shows you how! Sample copy 10c. Pioneer, 4303C Highview Avenue, Baltimore 29, Maryland.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 627-PM Linden, Buffalo, N. Y.

BRAND New sure fire money maker. Write Post-Rite, Box 802, Sioux Falls, S. Dak.

GROW Dwarfed trees! Pot, sell. Instructions, 25c. Levy, 4019 Dumaine, New Orleans, La.

FREE Circular on moneymaking mail order business at home. Sheldon Mail Order, Sheldon 1, Iowa.

FREE Nationwide advertising, publicity! Advertise your products to 51 million readers thru 77 national magazines, free of charge! Broadcast on 400 radio stations without risking a penny! Send 25c (refundable) for details today! Treasury, 149 Storer, New Rochelle 6-M, New York.

\$100-\$200 WEEKENDS No selling or manufacturing. Brennan, 4025-Z Lanker-shim, North Hollywood, California.

HAVE Thrilling vacation trip to South America through our easy profitable subscription plan furnished free. Sample magazine 25c. Guiding Star, Box 5944M, Los Angeles 55, Calif.

GROW Miniature dwarfed trees. Pot, sell. Instructions, 25c. Metro, Box 103PM, Berwyn, Illinois.

MAKE Money with your telephone. Profitable telephone service can be rendered by housewives, shut-ins or in an office. No solicitation. Copyrighted instructions based on actual experience of author. Instructions \$1.00. F. Shreve, Dept. J, Box 1583, Charlotte, N. C.

MAKE A fortune this summer, importing. Amazing offer, everything you need supplied, airmail \$1 (refundable). Brandt & Ditco, 910 Manning, Toronto, (Ont.).

SEVERAL Mailorder magazines, money making and homework offers. 10c. William Woodrow Jenkins, Lucasville, Ohio.

YOUNG Men earn \$200-\$400 in spare time during month of July. No investment. Box 154, Oakland City, Indiana.

WONDER Liquid—New—Not rubber or plastic. Own a profitable business making several different products. Amazing results. Details \$1.00. Mutual Service, 270 Villa St., Elgin, Ill.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minnesota.

UP To \$25 weekly assembling costume jewelry at home. Send 10c for complete money making plan. Gemcraft, 1812C E. 13 St., Cleveland 14, Ohio.

TIE-Breakers for D.A.V. American puzzle contests exposed. Manual \$5.00. Satisfaction guaranteed. D. Wenograd, Box 1495, Philadelphia 5, Penna.

EXCITING Mail order home-work opportunities. Scneider, 1227 Woodlawn Ave., Louisville 8, Ky.

SELL Diamond gems. 10% more brilliant than expensive diamonds. New scientific discovery. Only \$9.75 carat, wholesale. Guaranteed. Make \$50.00 day. Free information. Diamond Gem Co., 1404-M Mitchell Street, Oakland 1, Calif.

MAKE Money in your back yard. Send \$1.00 for Plans to Profits. P.O. Box 633, Sheboygan, Wis.

FREE! Money-making opportunities galore including magazines. Wilbur Errickson, Englishtown, New Jersey.

50,000 ARTICLES Wholesale. Source directory, dime. Nelko, Box 3462-DR, Chicago 54.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

BE Appointed State Notary Public now! Details: Stationers, Helotes, Texas.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

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.

FORMULAS, PLANS, ETC.

"EASY To make" shampoo formula \$1.00, plus generous sample. Dees, 820 Candelaria, Albuquerque, N. Mex.

10,000 FORMULAS, Processes, trade secrets, etc. 900 pages. \$3.98 postpaid. K. Paulin, Loudonville, Ohio.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

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

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

FREE Formula catalog. Anything analyzed \$25.00. Western Chemical, Salem, Oregon.

PLASTICS

INTERNAL Carving drills, dyes, blanks, kits, supplies, findings, chain, etc. Free lists. Dept. P-2, Caraday, Box 71, Ryder Sta., Brooklyn 34, N. Y.

LEARN Plastics at home. Small cost—Spare time. Dime brings sample plastic, three experiments, full details. Plastic Projects, Box 5151, Detroit 35, Mich.

MANUFACTURERS Of a complete line of internal carvings. Special introductory offer; \$1.00, jewelry set and keychain. Crystal Floral Company, Bound Brook, New Jersey.

NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for wholesale catalog and new sales manual showing how to make money at home. Castolite, Dept. G-101, Woodstock, Illinois.

HOME Repair kit. Mends all plastic articles. Quick, easy, professional results. \$1.00. Free information. Plastic Industries, Box 1138, Santa Fe, New Mexico.

PLASTICS Catalog—10c. Sheets, rods, tubes, molding, casting plastics. Information, bargains galore. Sample low price: 1/16" clear Lucite, full sheets, 98c square foot. (36"x48"). Gem-O-Lite, Box 686G, North Hollywood, Calif.

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16". \$1.20; 1/8". \$1.40; 3/16". \$1.75; 1/4". \$2.08. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

CHEMISTRY

URANIUM Ore, weighing scale, graduate, directions 44 experiments. \$1.00. Rex Laboratories, 2849-A Birchwood, Chicago 45, Illinois.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

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

ILLUSTRATED Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

AGENTS WANTED

AMAZING Miracle auto polish—Plastone! New scientific discovery contains pure carnauba wax, genuine plastic plus silicones! Sensational money maker! Nationally advertised! Sold by leading firms. Used by America's largest organizations. Only \$1 retail. 100% profits. Sales experience unnecessary. Exceptionally easy sales. High repeat sales. Choice protected territories. Once in a life time opportunity for large steady earnings. Only limited number of agents accepted. Write today. Plastone Company, 2950 W. Grand, Dept. PM-6, Chicago 12, Illinois.

DISHWASHER. Portable. Fits kitchen drain board. Washes, rinses, air dries in minutes. No installation. Low priced. Guaranteed. Housewives wild about it. Great money maker. Literature free. Bes-sen Co., 522 Main, Evanston, Ill.

THREE New products, never before on the market. For details write Products, 962 Main St., Leominster, Mass.

GET Into toys! Big money. Show free toy-gift line full or spare time. Take orders, pocket juicy profits. Styleco, Dept. E259, Cincinnati 10, Ohio.

FRANCHISED Distributors, items offering 100% profit. Sample available \$1.00 (refundable). House of Holland, P.O. Box 583, Mount Vernon, New York.

AMAZING But true! We pay you daily wonderful nylon stockings at our risk. These beautiful sheer nylons cost nothing unless satisfactory! Yet, you get advance cash for giving women privilege wearing cash plus huge bonus that increases your earnings by 40%. Postcard brings you free sample stocking and complete money-making outfit. No obligation. Kendex, Babylon 93, N. Y.

MEXICAN Feather pictures. High profit! Fast sellers! Adelphi, Box 57-B, Bellerose 6, N. Y.

PRINTING—Salesbooks, envelopes, tags. Free illustrated catalog. Ersco, Dept. PM, Bronx 72, N. Y.

ASTONISHING! Plastic magnets. No metal. Good proposition. Sample 25c. Box 357, Flint 1, Michigan.

GREETING Card bargains. Personalized napkins, book matches, playing cards. Raun, 4154-g Fifth Street, Philadelphia 40.

AMAZING New seller! Chenille rugs and bath mat sets personalized with woven-in names and monograms. All colors. Low priced; big commissions. Miniature sample rugs and sales kit free. American Mills, Dept. 508, Indianapolis 7, Ind.

MAKE Extra money—For yourself, club or church. Up to 100% profit selling big value Christmas, all-occasion greeting card assortments to friends, others. 7 leading 21 card \$1.00 boxes, religious and novel cards. Gift wrappings, ribbons, stationery, napkins, animated books, sewing kits, unusual gifts. Over 150 items. Bonus plan. Experience unnecessary. Write for samples on approval, special offers. Hedenkamp, 361 Broadway, Dept. PM-21, New York.

OKURA With liquid rubber pays 200%. New miracle transparent coating protects, preserves, glamorizes floors, walls, linoleum, furniture, autos. Resists acids, soap, water, alcohol. Waterproofs wet basements. Big seller. Rubber Products, New Haven 66, Conn.

YOU Will make more money day after day, year after year selling DuPont nylons priced to sell and repeat. Details free. Write today. Arch Hosiery, 104 N. Fifth St., Philadelphia P6, Penna.

AMAZING Big profits selling exclusive Sunshine Christmas cards. Nationally famous 21 for \$1.00 assortment is unequalled, sells on sight. Other tremendous Sunshine values: merry holly-day, nature prints, Park Avenue kromekotes, scripture text, gift wraps, stationery, etc. Send for samples on approval. Earn big money now! Sunshine Art Studios, Dept. PM-6, Springfield 1, Mass.

STATE And local distributors wanted for "Blue Blaze"—Battery proven by years actual road service. Guaranteed for 30 months: non-prorated. Write Blue Blaze, 2817 Jeffries, Los Angeles 65, California.

SELL Big money maker to men and women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

NONFLAMMABLE. Scientific. Spot remover. Send two dimes. Murphy-Yale, Meriden, Conn.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 629-PM Linden, Buffalo, N. Y.

WANTED! Men-women, to sell new, different specialty to homes and business places. Big earnings full—part time! Rush name for complete offer. Brady Specialties, Dept. A, 255 West 34th Street, New York 1, N. Y.

MAKE Wedding profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 3, N. J.

100,000 ITEMS Wholesale prices. Directory 25c. Refundable. Flatwoods, Leesburg, Florida.

BUY Wholesale — 25,000 items. Catalogue 25c. Matthews, 1472-B-11 Broadway, New York City.

NEW Plastic mending tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 148, Akron, Ohio.

BIG Daily profits—Selling embroidered wool and cotton uniforms, initialed buckles, belts, badges, choice 3000 emblems. Free sales kit. Hook-Fast, Box 480PM, Roanoke, Virginia.

FREE Samples, and amazing plan, giving you gorgeous dress without penny cost. Rush name today with dress size. Harford, Dept. G735, Cincinnati 25, Ohio.

MEXICAN Feather pictures. Sell on sight; 200% profit! Free details. Sample 20c stamps. (No coins). Sylviap, Apartado 9036, Mexico City.

WHOLESALE Catalog appliances, toys, watches, etc. 25c (refund first order). Cam Company, 1717 58th, Brooklyn 4, N. Y.

BE A money maker. Use your home as magazine headquarters. Liberal commissions. No experience. No capital needed. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

BIG Profits selling ties (\$2.00 values.), \$6.50 dozen. Free catalog. Empire Cravats, 648 Broadway, New York 12.

GOLD Lacquered and silver sign letters. Windows, doors, trucks. Standard sizes. Penny and up samples. Atlas-P, 544 West 79th, Chicago 20.

YOUR Own business—Used suits \$1.50; topcoats 50c; shoes 12½c; ladies' coats 30c; dresses 10c. Enormous profits. Catalog free. Moro, 558-AA Roosevelt, Chicago 7.

MAKE Tremendous profits with fast-selling costume jewelry! Buy direct! Sell your friends, neighbors and customers at big savings to them! Write for our free catalog! Penn Jewelry, Dept. P, 826 W. Lacka., Scranton, Penna.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 6, Calif.

\$50 WEEKLY Selling finest razor blades, other items. Free details. Edisans, Box 274, Far Rockaway, N. Y.

GUARANTEED 200,000 Mile ring, valve job! Restores compression! Stops oil pumping! Send \$3.00 for \$6.00 package and sales offer! Nerlino, Box 7, Inglewood 5, Calif.

NEED Extra cash? Take orders for personal initialed belts and buckles, cap badges, tie holders, etc. Choice of 3000 emblems. Free sales kit. Hook-Fast, Box 1425PM, Providence, R. I.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

BE The Popular Mechanics representative in your neighborhood and earn big profits in your spare time. Write Popular Mechanics Magazine, Room 408M, 200 E. Ontario St., Chicago, Ill.

AGENTS — 300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog, free. Pickcraft, M19 Bank, Attleboro, Massachusetts.

HIGH-GRADE SALESMEN

WANT To make real money? You can positively make \$50.00 a day and up selling a brand new item going to every type of food and beverage store, factories, laboratories, hospitals, etc. First time advertised. Samples furnished. Utility Dura-wear, 53 West Jackson Blvd., Dept. PM-6, Chicago, Illinois.

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SIDELINE For energetic salesmen—Sell advertising specialties, calendars. Earn \$500 monthly easy. Big commissions advanced, bonuses. Samples furnished. Continental Calendar, 542-L So. Dearborn, Chicago.

IS \$210 A week worth a postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator defroster "like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. J-102, 173 W. Madison, Chicago 2, Ill.

WRITE 3 Words—Collect \$7.65 on 10-second demonstration to merchants. Write on glass with amazing magic crayon—presto! 5 color advertising message takes fire. Glows like brilliant neon. Three sales daily bring \$22.95 profit. Rush postcard for details. Complete sales kit, free! Maxilume Co., 125 W. Hubbard, Dept. CL-8-H, Chicago 10, Illinois.

DISTRICT Mgr. calendars, specialties. Klingstedt's, 425-509 Schroyer, Canton, O.

COMPLETE Line calendars and advertising specialties. Excellent commissions. Bonus. Full time, sideline. Write fully. Midwestern, Dept. 7, Box 129, Normandy Station, St. Louis 21, Missouri.

SELL Sensational bass lure and catfish bait guaranteed stay on hook. Box 927, Coleman, Texas.

COUNTY Agency. Power mowers, \$41.90. Delivered. Appointment dealers-agents. Rotacut-51, Excelsior Springs, Mo.

MAKE \$3000 Next 60 days selling 1953 calendars, advertising specialties and executive gift line. Season on. Big commissions advanced. Outfit free. Meyerson Calendar, 605-PM Washington, Chicago 6.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-652, 7530 Greenwood, Chicago.

I Need 500 men to wear made-to-measure suits and earn up to \$15.00 in a day showing friends and taking orders. Write for free outfit. Progress Tailoring Co., 500 S. Throop St., Dept. G-217, Chicago 7, Ill.

\$12,000 EARNINGS Or more each year. Sell for a company successfully manufacturing a molybdenum disulfide grease and other top quality "specialized lubricants." Call on owners and users of heavy duty equipment in industry and in the field. An advance on earnings with no collection or delivery worries. Write experience and qualifications to E. J. Baker, P.O. Box 676, Dayton, Ohio.

AD Matches! Sell amazing designs—20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-30, Chicago 22, Illinois.

ANYONE Can sell Hoover DuPont nylon uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. F-100, New York 11, N. Y.

MIRACLE Glaze—Amazing car luster. Free sample. Big commissions. Miracle Glaze Company, 9714 Austin, Oaklawn, Illinois.

SALESMEN: \$100.00 More weekly on present job using "amazing secret." Postcard brings startling information. Brennan, 4025-C Lankershim, North Hollywood, Calif.

SALESMEN—Get happy! Hundreds different things to sell; all details free! Write what you sell now; what you'd like to sell. Your mail box will run over! Salesmen's Service, Drawer 8711, Fort Worth 12, Tex.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

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CAN A man my age become a hotel executive even though he has no previous hotel experience? Would you like to step into a well-paid position as hotel or club manager, purchasing agent, social director or assistant manager, etc.? The success of Lewis graduates from 18 to 50 proves you can—though you have no experience in hotel work. Harry E. Roorbach says: "While in the hospital I enrolled for Lewis Training. Shortly after completing the course, the Lewis Placement Service informed me of an opening. At present, I am night manager in the largest hotel in Rochester. I owe my success to the Lewis Course." Our free book explains how you can qualify for a well-paid position in leisure time, how you are registered free of extra cost in Lewis National Placement Service. Write today. Course approved for veterans' training. Lewis Hotel Training School, Desk VH-324, Washington 7, D. C.

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LETTERS Rемаiled Atlantic City 25c each. 2 scenic postcards 25c. Lucas, Box 1115, Atlantic City, N. J.

TEXAS Letters remailed 25c. Houston help wanted columns and business opportunities mailed \$1.00. Huebner, 1112 Danube, Houston, Texas.

REMAIL 25c; Canada; Hamilton, Toronto, Vancouver; also Niagara Falls, Buffalo, Frank Richardson, Mt. Hope, Ontario.

NEW Orleans! Letters remailed 25c each. Levy, 4019 Dumaine, New Orleans, La.

RENO, Nevada; Sacramento, San Francisco, California. Dependable remailing service. Letters, cards 25c each. M. Custer, P.O. Box 1404, Sacramento, California.

REMAILS: Los Angeles! Hollywood! 25c each, 5—\$1.00. Roope, Box 561, Inglewood, California.

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CALIFORNIA Or Mexico remail service 25c per letter. Knight Company, 948 Third, San Diego, California.

ENGLAND, London, remails \$1. Air both ways \$2. Franchel, Palmyra, N. Y.

PALM Beach. Letters remailed. Forwarding service 25c ea.; picture cards \$1 doz. Help wanted, business opportunities column. Miami, Palm Beach, Jacksonville, \$1 ea. air mail. P.O. Box 1645, West Palm Beach, Fla.

HOLLYWOOD Postmark! Letters, cards remailed 25c each. 8 scenic postcards \$1.00. Mailing address \$3.00 monthly. Stadler, Box 2335, Hollywood 28, California.

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CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

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

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BE Smart. Get in art. Let me start you free. 25 years experience. Nick Nichols Arts, 39 W. Adams, Chicago 3, Ill.

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MAILING Lists—New Orleans area. Thousand \$4.00, others \$3.00, \$1.00. Sinclair, Box 762, New Orleans 2, Louisiana.

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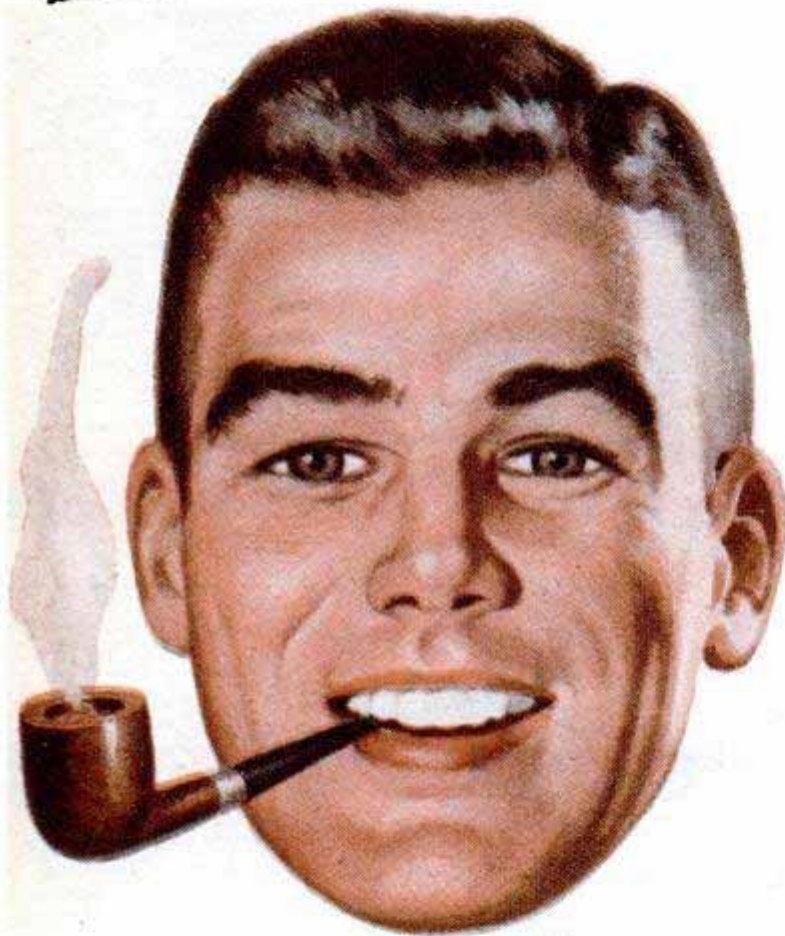
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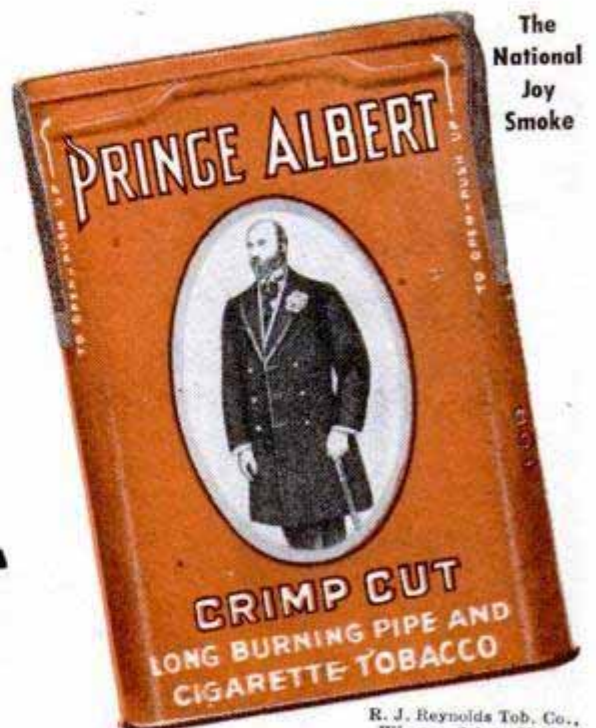
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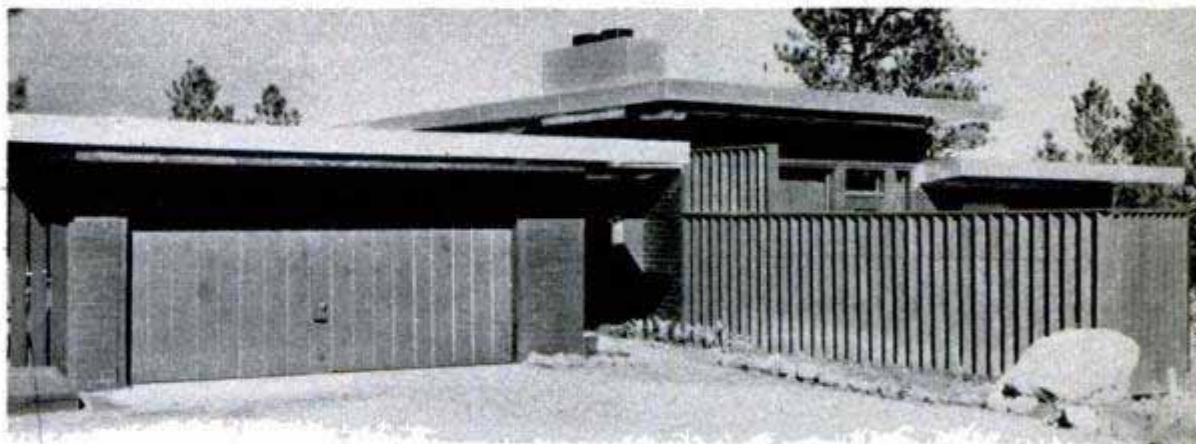


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VOL. 97 NO. 6



House of the future? Home was designed by a writer of stories about a future world

By Thomas E. Stimson, Jr.

IN WHAT KIND of house will the captain of a space ship live during his stopovers on earth?

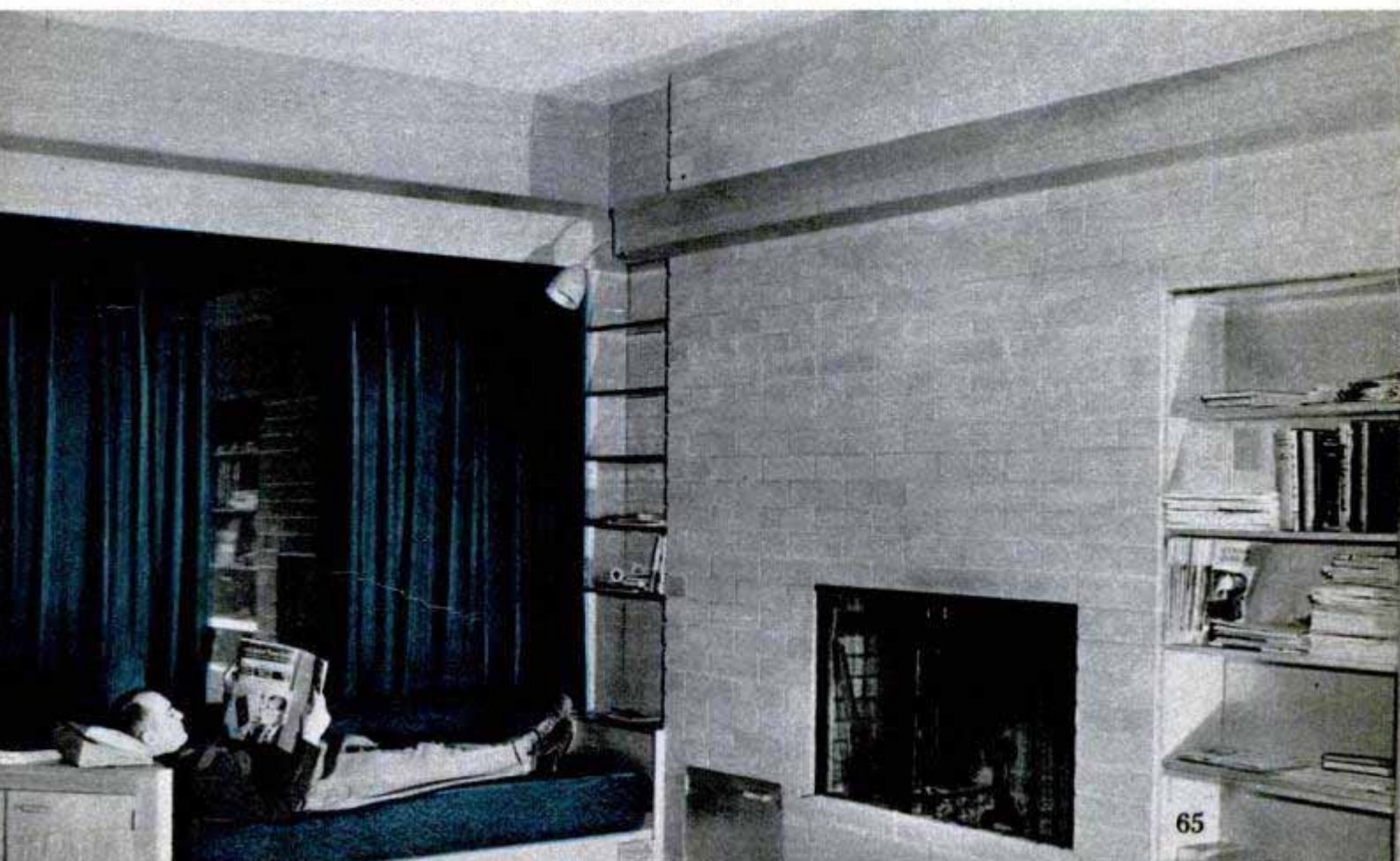
It's too early to say yet, though probably it will contain some of the features of a residence just built by Robert A. Heinlein in Colorado Springs, Colo.

Heinlein is author of the movie *Destination Moon* and creator of the *Tom Cor-*

bett, Space Cadet program on television. As a writer of science fiction his books *The Green Hills of Earth*, *The Puppet Masters* and others are on current book lists.

The engineering training that gives him a solid background for writing about the mechanics of space travel also has helped him in designing a house that's called extreme today but may become conventional

Author Heinlein relaxes on built-in divan beside raised fireplace. Note convenient cupboard at end of divan





There's everything to please a housewife in the kitchen, including an "office" with phone and typewriter

Below, "commuting" table is set with china in kitchen, then rolled through a wall to the dining area





Skylight panels have mirrors which reflect sunlight into house. Behind panels are tubes for night lighting

before the 20th century has run its course.

Heinlein's house runs itself with a minimum of maintenance and housework. It has an indoor climate that's unrelated to varying outdoor temperatures. Within reason it is fireproof, termiteproof and earthquakeproof. The house is expensive compared to minimum standards and yet the owner saved money when he moved in.

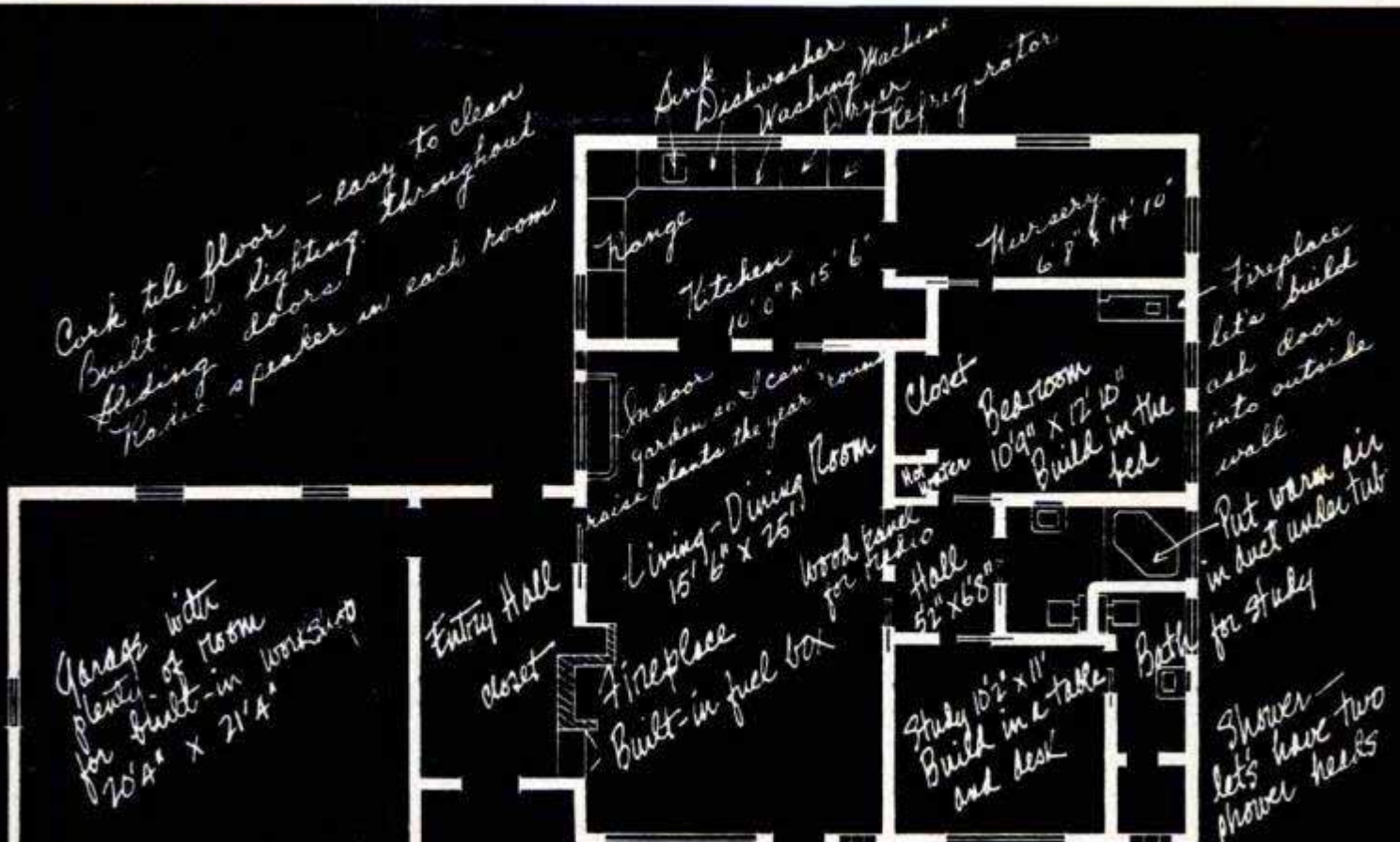
What Mr. and Mrs. Heinlein wanted was a comfortable, pleasing residence that would just about take care of itself. The result is a single-story flat-roofed house containing entry hall, combination living-dining room, kitchen, bedroom and nursery with a sliding wall between, study, two baths and attached garage with space for a home workshop.

It's a small house, 1150 square feet of floor space in the living area, designed for two adults and a child, yet by means of built-in furniture it could sleep seven without crowding. Built-ins are a major feature. Aside from a few chairs, a piano, and a dining-room table that commutes on wheels, there is no movable furniture in the house.

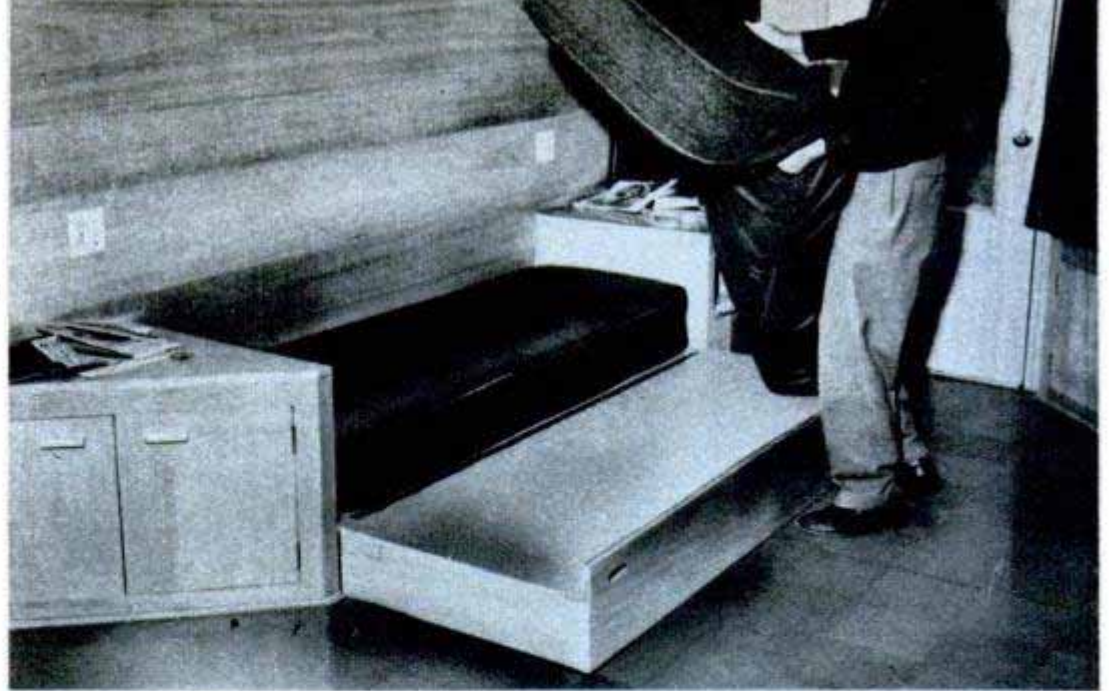
"The built-in bed with storage drawers beneath it, the built-in divans that can be converted to extra beds and all the other furniture are built right down to the floors," Heinlein says. "There is nothing to clean under.

"There are no rugs or any need for them. All floors are surfaced with cork tile that provides a warm, comfortable and clean footing. Nor are there any floor lamps or table lamps. The illumination is built into the house. General lighting for the living room comes from cold-cathode tubes concealed behind a box molding. These illuminate the ceiling. Adjustable wall spotlights are located at all work and relaxation areas in the house. All electric convenience outlets are at comfortable hip height. I'm through stooping over to the baseboard

The Heinleins, after careful study, made personal recommendations for every built-in item in their home



Divans in home can be converted into double beds simply by swinging top half out onto floor and covering with pads



whenever I want to plug in an appliance."

With no rugs or movable lamps or furniture, the whole house can be given a general cleaning in about an hour.

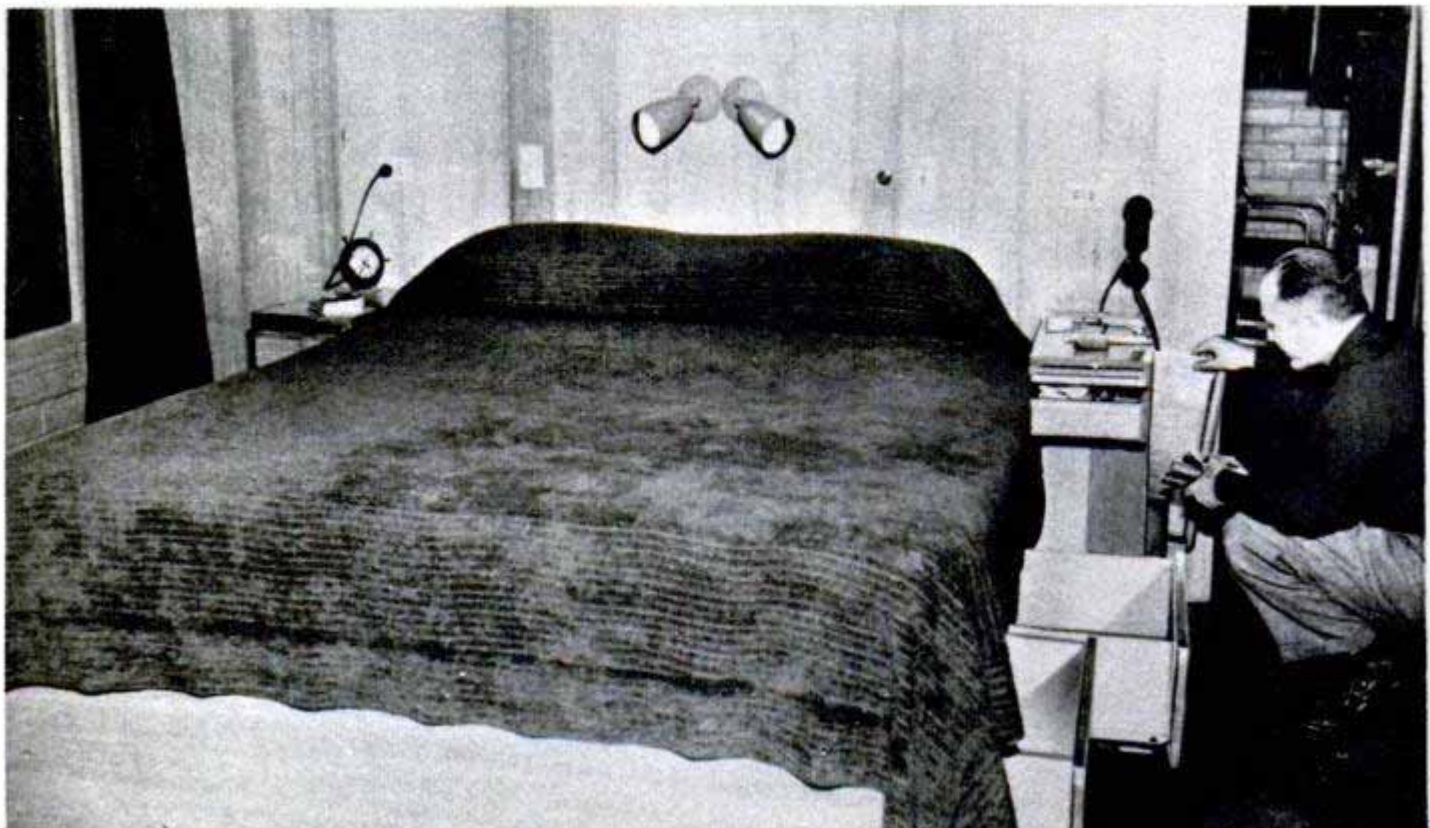
The house is built of steel-reinforced concrete blocks and masonry and is painted dark green on the exterior, offset by broad panels of gleaming aluminum roof trim. Interiors of the concrete-block walls are exposed and painted light green. Interior partitions are of bleached mahogany backed with rock wool. The same wood is used for all cabinetry and built-in furniture. All interior doors are sliding doors. Walls of the study and the water-heater compartment are soundproofed. The roof is insulated.

A flat roof is no disadvantage in snow country, Heinlein finds, if it is properly reinforced against heavy loads. The extra

strength permits it to be decked over and used as a porch for sun bathing. The roof surface consists of several layers of hot-mopped roofing paper topped by a layer of gravel and sprayed with aluminum paint to reflect solar heat. The roof projects far enough beyond the south side of the house to shade the south windows from the summer sun, yet it admits light to the windows in winter when the sun is lower in the sky.

Two small skylights that work night and day help illuminate the study and a small center hall. Each skylight contains a pair of fluorescent tubes that provide indirect lighting in the evening for the area below. Top and bottom of each skylight are translucent glass, with the bottom frame hinged for access to the lighting tubes. The skylight interiors are painted aluminum for

Oversize bed (seven by six feet) has storage drawers on each side, a table on both sides of the headboard





Trash goes through a hinged partition in kitchen wall, falls into a storage bin outside the house



Music center in hall off the study contains radio and record player wired to speakers in each room

greater efficiency and contain mirror panels slanted to reflect sunlight below even when the sun is not at its zenith.

Most houses are too hot or too cold at times, or too drafty or dusty. Heinlein gets just the indoor climate he wants by an ingenious arrangement of air conditioning and ducts. First of all, the house is sealed. None of the windows can be opened. They are double-glazed, in fact, with 1/4-inch air space between the panes.

The air-conditioning unit, off the kitchen, consists of a gas-fired furnace and electric blower equipped with dust filter, humidifier and glycolator air purifier. Tempera-

Heated air enters the bathroom through a duct beneath the tub, warming the bathtub and the floor



ture is controlled by a thermostat in the living room. The blower operates at all times. The furnace draws 20 percent of its air from outside the house, creating a positive pressure indoors that is exhausted through concealed vents in the kitchen and each bath. Heinlein estimates that the blower uses no more power in constant operation than it would in intermittent use. He plans to add an electrostatic precipitator to the system to augment the present dust filter.

Air from the conditioner is ducted at floor height along the exterior walls of the house to the room outlet grilles. This perimeter ducting creates a band of warmth that insures comfortable floors even in freezing weather. In one bath the warm air is ducted under the bathtub, in the other the warm-air supply flows under the floor of the shower. Thus the tub and shower floor are pleasantly warm at all times.

The shower, incidentally, has an extra shower head on the wall opposite the standard fixture. It's operated by an overhead valve and a bather may be sprayed from two sides if he desires. A shampoo dispenser is attached to the shower wall just below the soap dish.

The built-in furniture includes a seven by six-foot bed with drawers beneath, a storage-wall-type wardrobe closet containing a set of drawers, a combination worktable and typewriter desk for Heinlein in his study, and its counterpart, an "office" in a corner of the kitchen for his wife. Here she has a desk with drawers, bookshelves and a flat top that folds back to reveal a typewriter and paper compartments.

In a compact line around the kitchen

(Continued to page 228)

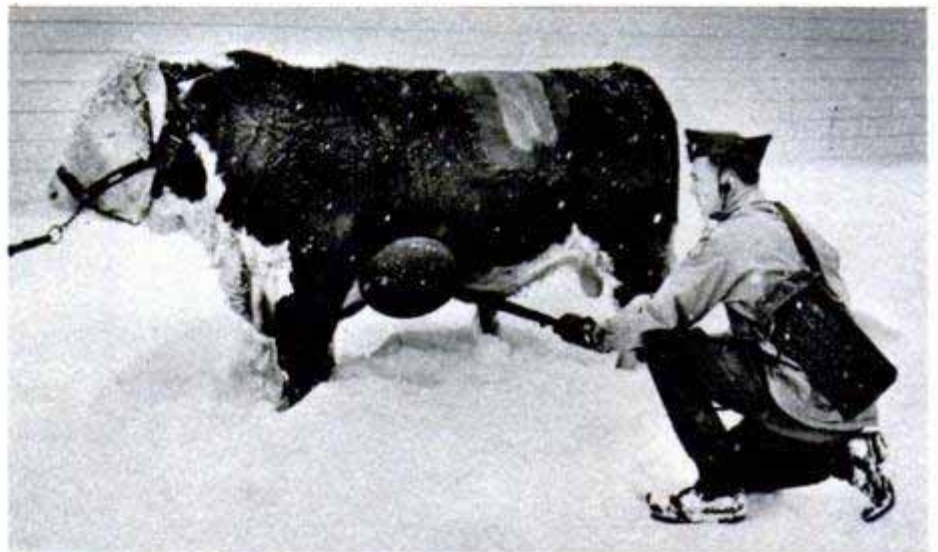


"For Want of a Nail"

Shoeing horses is not exactly an expanding occupation, yet, if Harry Howe, horseshoe expert, is right, it is in for even worse times now that every horseman can shoe his own animals. Nails are no longer necessary, he claims, if the shoes are held in place by plastic glue. Howe has invented an electric-powered hoof trimmer that cleans out the hoof and makes it possible to use the powerful glue to attach the shoes. Most of today's horse-shoeing activity is centered around the nation's race tracks, where Howe has been demonstrating his invention and the plastic glue to horse trainers.

Mine Detector Scans Bull

When a rancher near Central Ferry, Wash., noticed that his prize \$5000 Hereford bull was ailing, he took the animal to the veterinary school at Washington State College. The vets suspected that a chunk of metal was lodged somewhere in the bull's body but couldn't determine the exact location. A call to the college ROTC staff produced Lt. Col. Frank G. Hubbard, armed with a mine detector. After sweeping the instrument over the bull's hide for a few minutes, the Army officer pointed to the



exact spot where the piece of metal was lodged. Now the school is considering a mine detector as standard equipment.



Plastic Bucket

Easy-to-pack equipment for campers and picnickers now includes water buckets, basins, drinking cups and dishpans made of plastic sheeting. The material is resistant to moisture, food, mildew, tearing and scuffing. The drinking cups, which hold six fluid ounces and can be used for hot coffee, fold flat and will fit in a shirt pocket.

☐ Tires are now being made on which airplanes can land at 240 miles per hour without danger of blowouts.



MERMAID THEATER

By Norris Jackson

AT SAN MARCOS, Texas now boasts a venture unique to both the entertainment and educational worlds—a theater which allows an amazed audience to witness an hourlong program beneath the surface of a crystal-clear lake. It is a submarine theater which, when a special ballast tank is flooded, takes its cargo of people below the surface.

Aquarena is situated at the head of the San Marcos River, a spring-fed stream that maintains a 70-degree temperature every day of the year.

The arena holds three million gallons of water and is 30 feet deep. Between shows, a pump spills 10,000 gallons of fresh water into the arena per minute for a constant supply of clear water. The water is taken directly from an encased spring.

Submerging 42 inches in 11 minutes, the theater will accommodate 100 spectators,

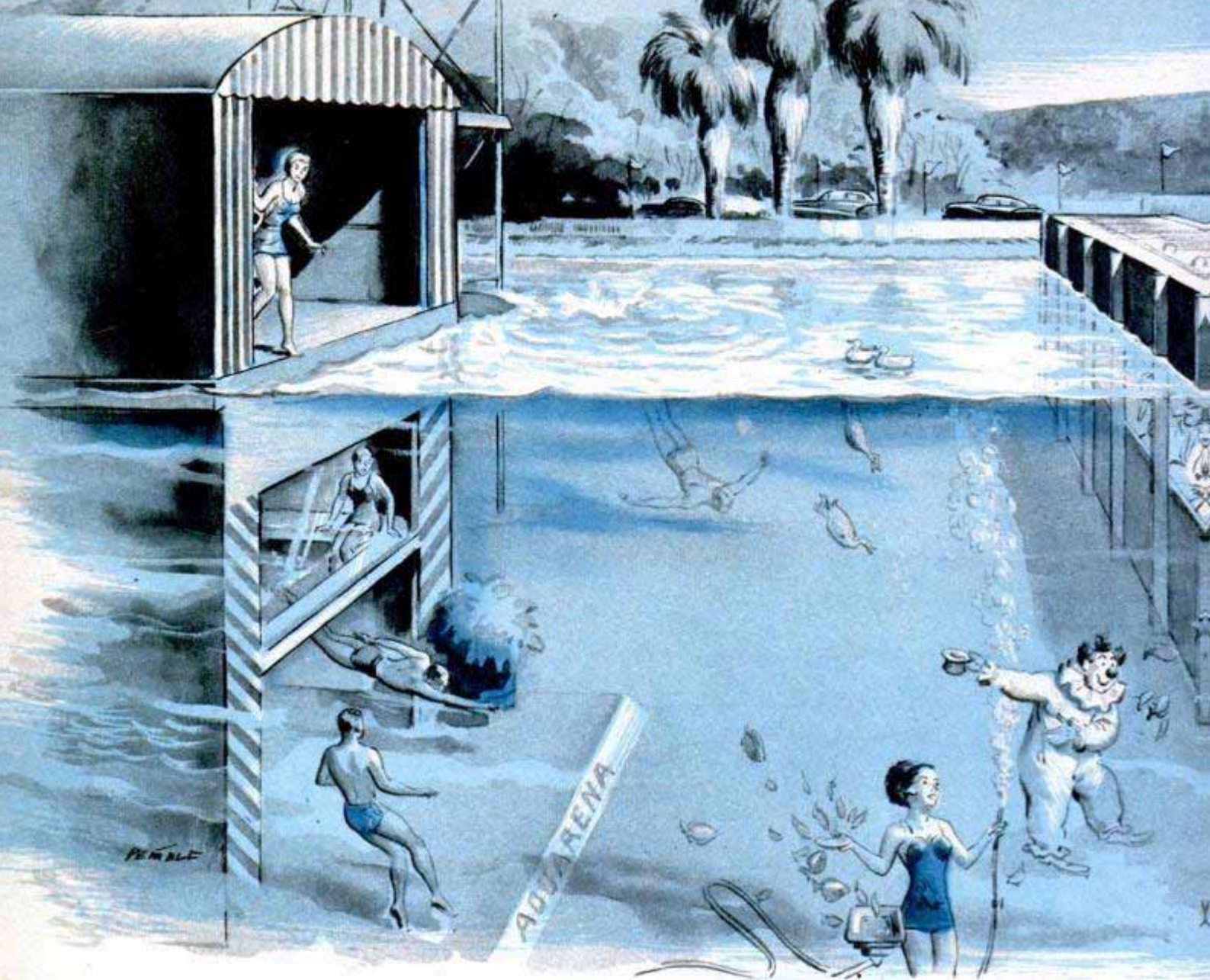
Left, "aquamaid" holding an air hose for breathing comfortably feeds fish during the hourlong show. Above, spectators are seated comfortably beneath the surface and watch the show through plate glass

who witness the underwater routines through plate-glass windows. The submarine's entrance, which is above water even when the theater is submerged, remains open at all times.

Some 50 tons of steel and 20 tons of concrete went into the submarine theater's structure. It requires 15,500 gallons of water for submersion.

Opposite the theater at a distance of 30 feet are the surface and underwater stages. These two stages are built of steel, glass and wood, supported by concealed pontoons.

Serving as an underwater breathing station for the performers, the underwater stage is suspended from and hangs below the surface stage. Air pressure supplied by two compressors forces the water level downward within a special compartment



Artist's drawing shows how the theater submerges to give spectators underwater view of the show. Water ballast flows into tanks under the seats to move the gallery 42 inches downward. At left are the two stages, one above the surface and the other underwater. Compressed air forces water out of the lower stage, which is used as a breathing platform by the entertainers. Pumps force out the ballast to return theater to the surface



where performers may wait between acts.

The sequence of events during the show begins as the captain of the theater-going submarine opens a valve to take in water for submersion. Seated comfortably behind the large windows, the visitors see a strange and unusual sight as ducks dive beneath the surface to fetch food thrown to them from above. This act has become one of the high lights of the show.

Routines that follow feature an underwater ballet and a demonstration of diving while breathing through a hose, a new and revolutionary method. A genuine picnic—free of ants and bugs but full of small perch—is conducted underwater. A fish-feeding routine, in which fish take food from the girls' hands, also entertains the

In new diving method exhibited at show, air intake is regulated to permit deep diving without weights

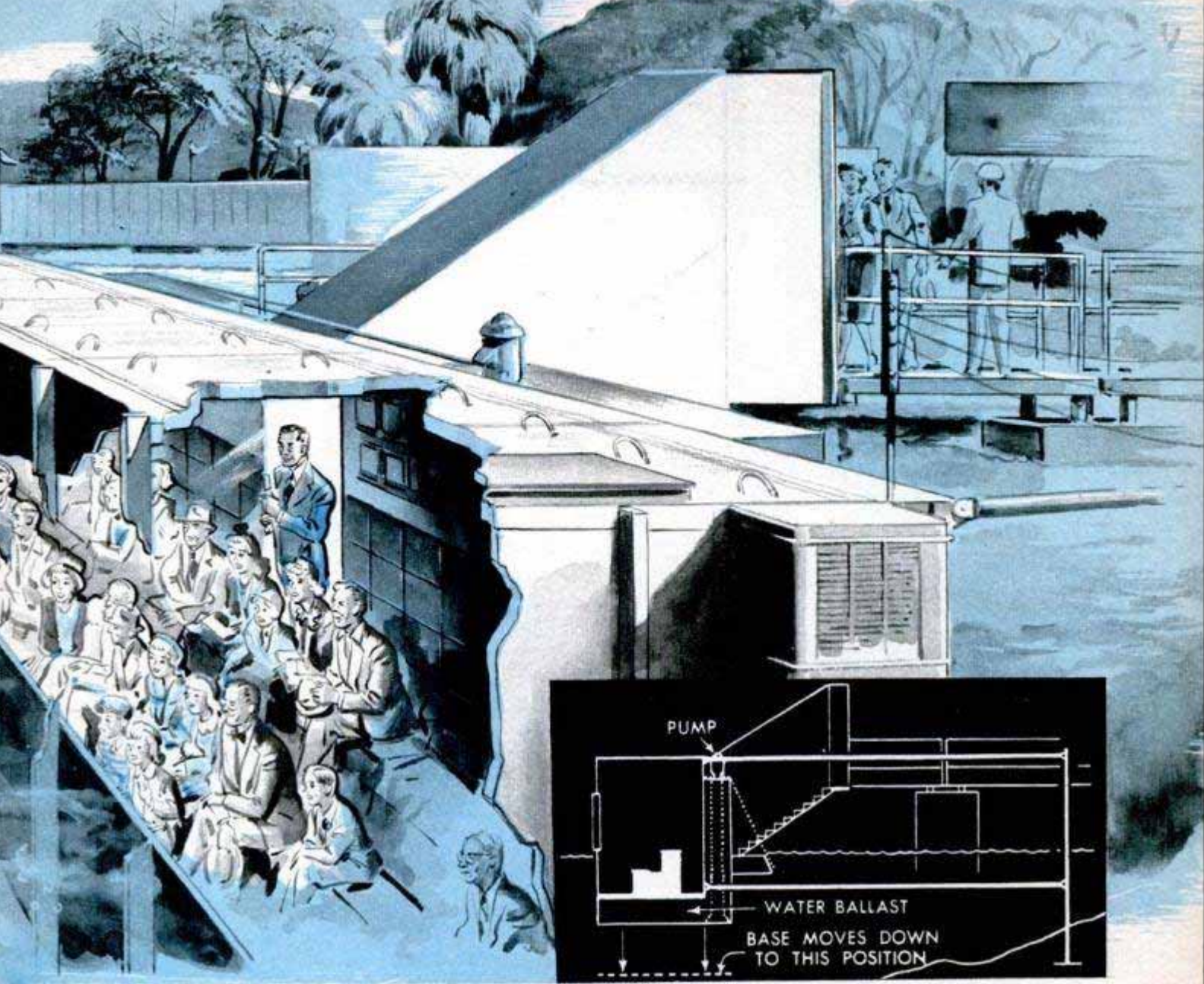


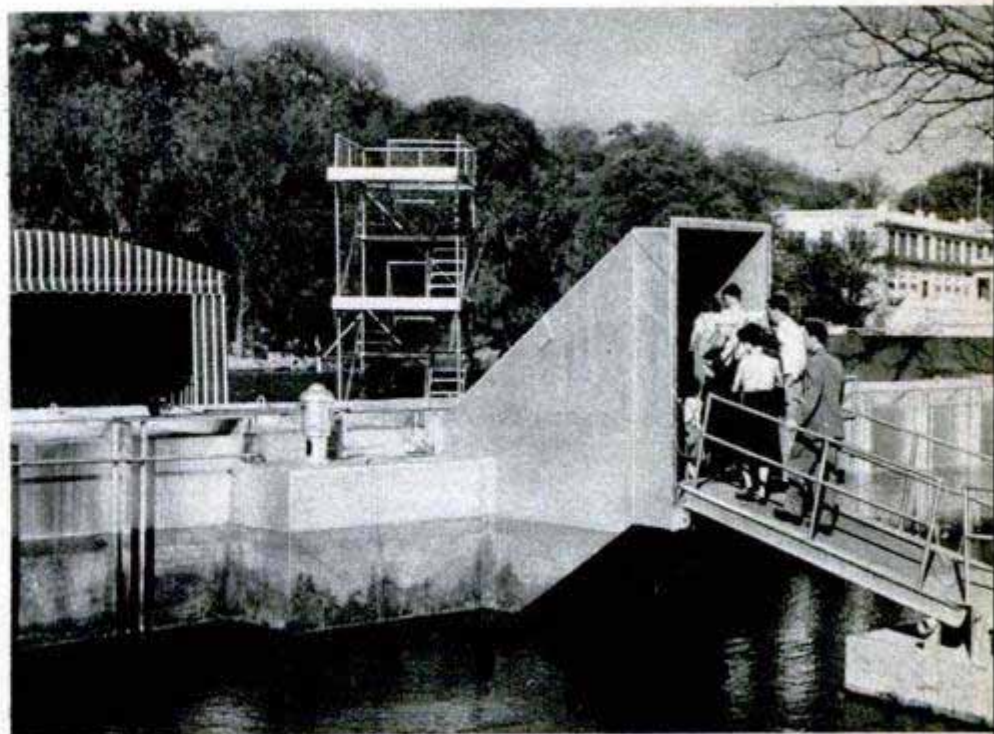
Diagram above shows how the theater gradually settles as water flows into the ballast tanks. Pump forces out water as the show enters the finale. Below, gangplank entrance remains above surface

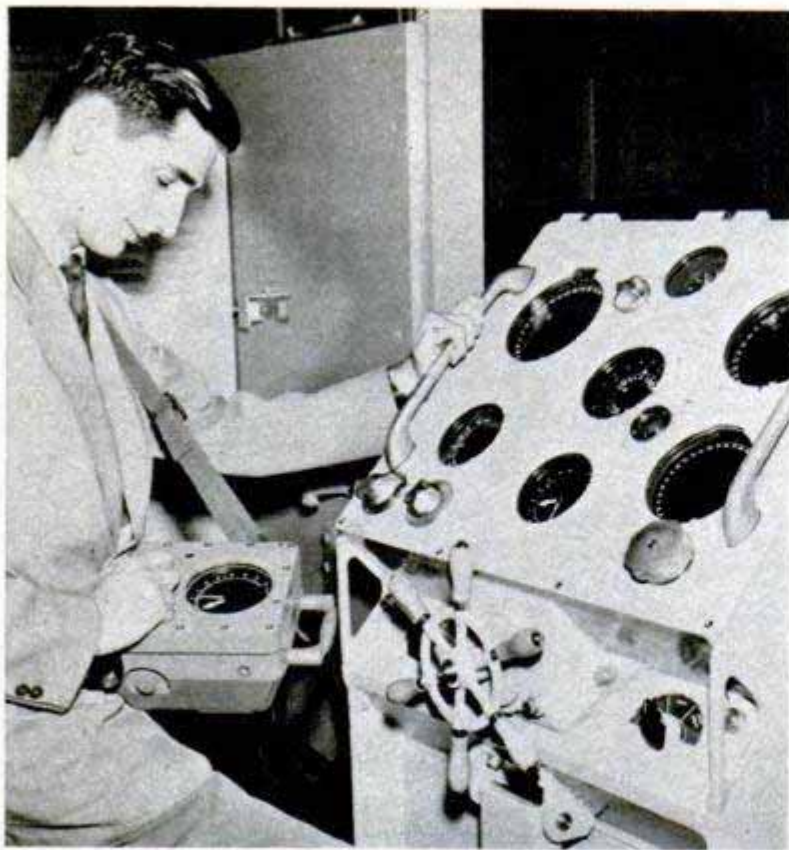
visitors. "Glurpette," the underwater clown, provides the comedy.

Throughout the hourlong program, the performers talk to the audience via an intercommunication system from the breathing station.

The show enters its final scene when the captain throws an electric switch, starting the pumps which empty the ballast tank. During the eight minutes required for surfacing, the "aquamaids" enact a grand finale of underwater and surface ballet routines.

Even in subfreezing weather, four shows are produced every day at the submarine theater. The secret — of course — is the pleasant, year-round 70-degree temperature of the water pumped into the Aquarena pool from near-by springs. ★ ★ ★



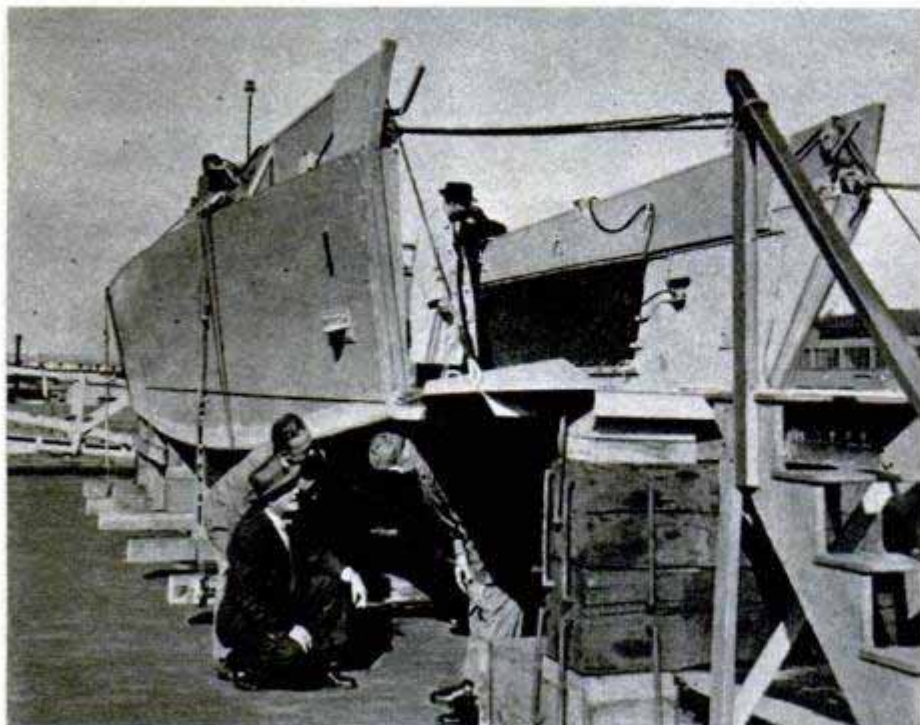


Autopilot for Flattops

Without human aid a new automatic pilot for aircraft carriers will steer prescribed zigzags and follow computed course schedules despite the disturbing forces of wind and sea. The robot helmsman, developed by the Sperry Gyroscope Company, is being installed aboard the USS *Oriskany*. A magnetic "brain" which anticipates steering motions replaces conventional electron tubes used to control earlier pilots. One use of the robot will be to steer the carrier into the wind—within close tolerances—during the launching and landing of aircraft. This requires keeping the wind a precise number of degrees off the port bow to neutralize the turbulent stream of air which flows around the ship's island. The ship's course may also be guided from remote stations by means of a portable controller.

Small Portable Gas Stove Fueled From Pressure Can

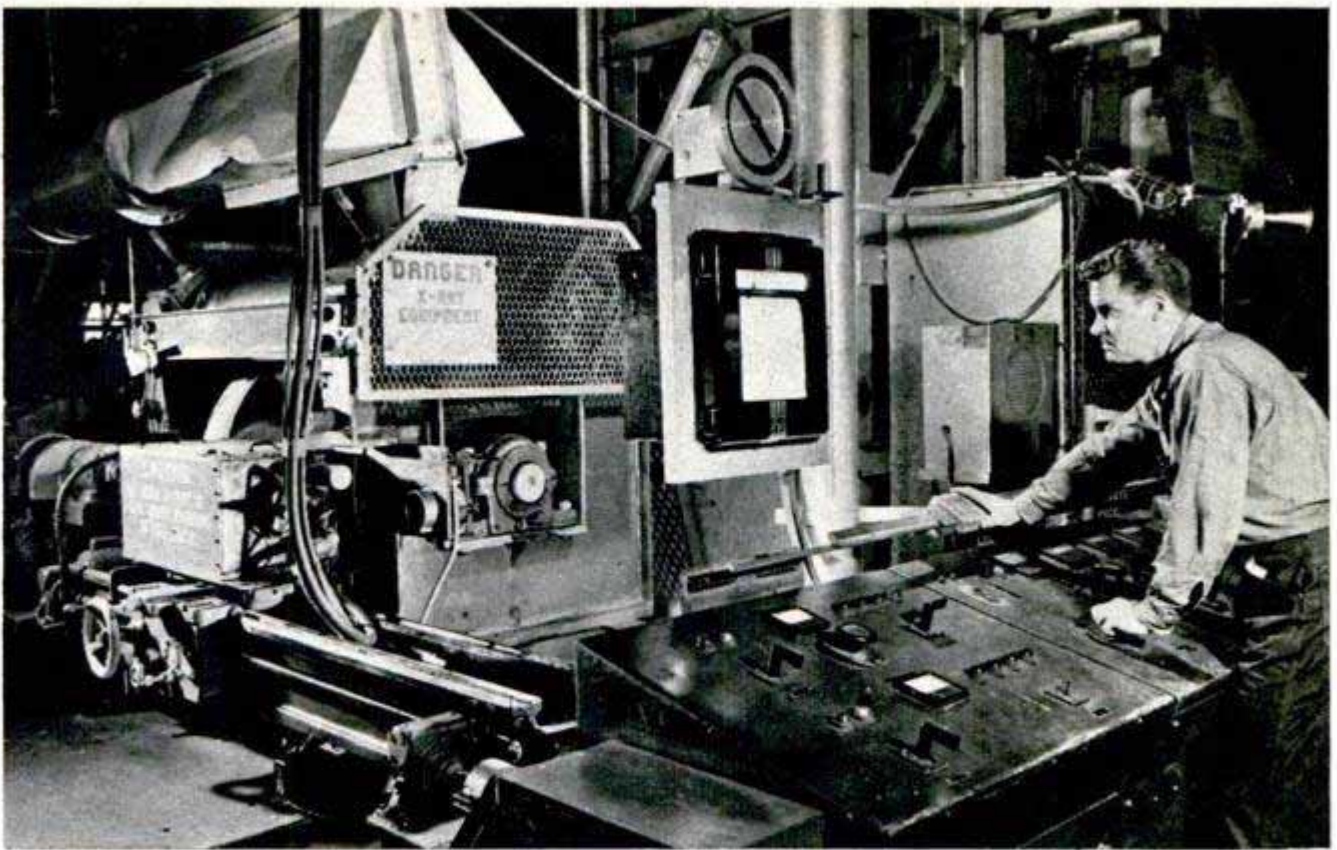
You could cook in the living room with a portable gas stove that gets its fuel from a pressure can of the same size as those used to package bug spray. You merely push the can into an opening on one side of the two-burner stove and it is automatically punctured and it is automatically punctured. The burners, just like those on a standard kitchen range, are recessed to permit use of the stove outdoors in the wind. One burner operates for 2½ hours on a can of fuel which, when exhausted, is thrown away and replaced by a full one.



Landing Craft Made of Plastic

Virtually the entire hull of an experimental landing craft built for the Navy is made of plastic. The craft is identical in design and size to the conventional landing craft used during World War II but very little metal was used in its construction. Its hull was built up of glass fiber reinforced with cloth and impregnated with a resin.

Ⓢ Natural-gas pipe lines in the United States today total more than 314,500 miles.



X Rays Measure Tin Coating With No Delay in Production

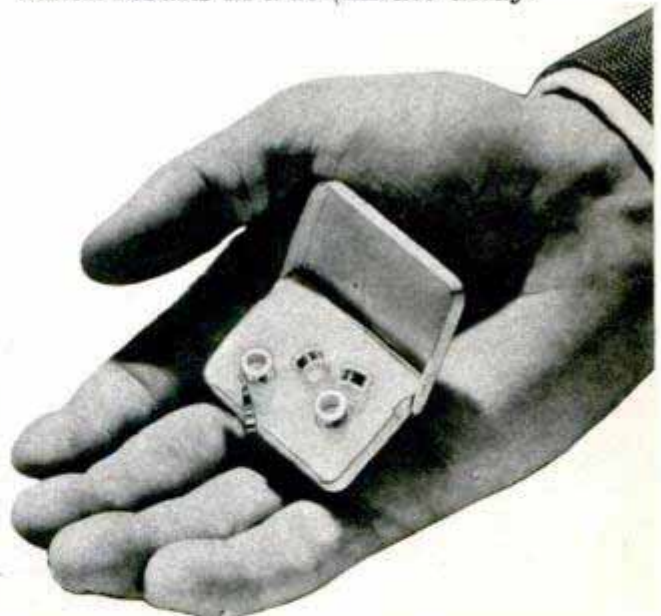
Using X rays, a new instrument provides a continuous visual record of the tin coating on tinplate as it moves along the production line. Measuring in millionths of an inch, it operates on the principle that rays of a certain length will cause fluorescence in sheet steel, but not in the coating.

With an X-ray tube and a scintillation counter mounted in front of the puller roll, rays are shot at the tinplate and the resulting fluorescence measured as the plate speeds past. The present method is to halt the line and cut out a sample for tests, which results in a 15-minute delay.



Electric "Snake" Scares Birds

Marauding birds which are damaging the garden of Halsey W. Kline, a General Electric engineer, now are frightened away by an electric "snake" fashioned from a bamboo fish pole and a piece of aluminum. A clock motor makes the snake revolve.



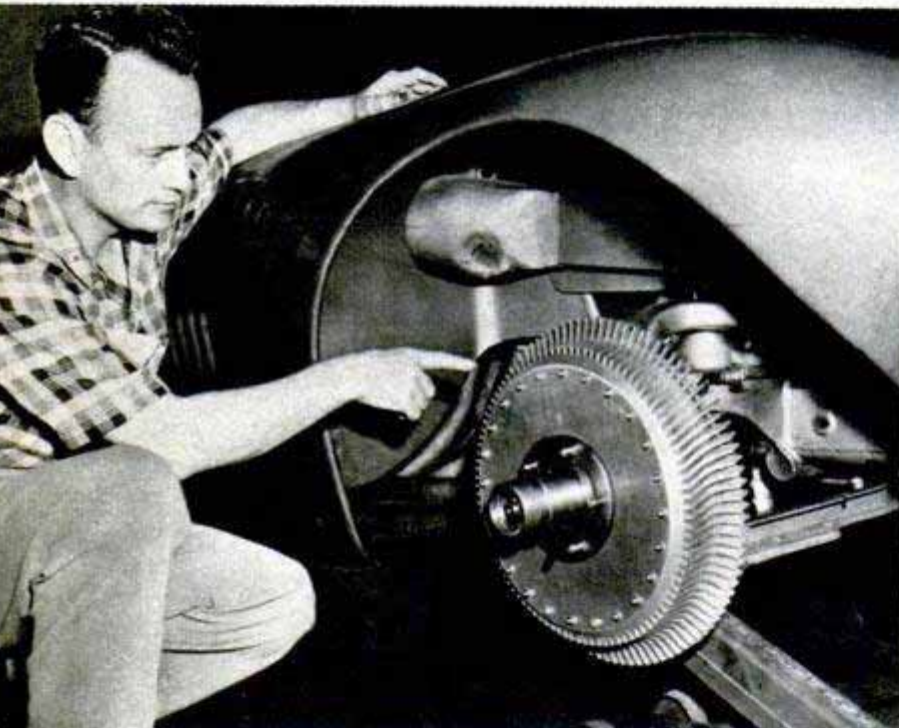
Thin Steel

Shipping an order of steel in an aspirin-tablet box may sound ridiculous, but that is the way a special superthin steel ribbon is packed. So thin that it would require 10 pieces to equal a human hair in thickness, the Armco electrical steel ribbon is wrapped on tiny coils. It was developed for use in a secret electronic device for the Navy.

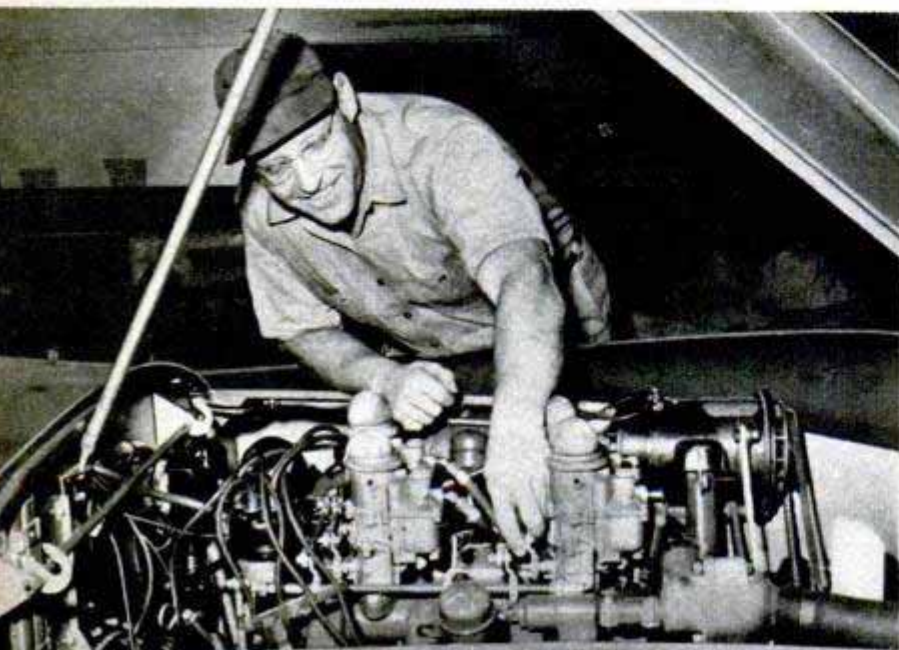
THE C-4R—



Briggs Cunningham sits in the cockpit of his new masterpiece, the C-4R. The safety steering wheel collapses in the event of a collision. Below, racing driver Phil Walters points to the cooling fins which force a stream of air over the brake drum



Powerhouse of the C-4R is a modified Chrysler V-8 engine that develops 300 horsepower. It has a compression ratio of $7\frac{1}{2}$ to 1



POUNDING HAMMERS and hissing torches in the hands of expert mechanics in Briggs Cunningham's autoshop at West Palm Beach, Fla., are producing a car that promises to put an American trademark among the world's best-known sports cars.

A streamlined, low-slung powerhouse on wheels with a grille that gives it the look of a squatting beetle, the new Cunningham C-4R embodies a host of innovations worked out on three earlier models. It is 800 pounds lighter than the 3200-pound Cunningham in which racing driver Phil Walters roared through the Austin-Martin trap at 152 miles per hour at Le Mans, France, last year. How fast will the new one go? "Better than 150," Walters says, smiling. Most sports-car fans figure it will hit close to 175 miles per hour as its big 7.50 x 15 racing tires wail like sirens on the straightaways.

Under the sloping hood of the Cunningham, a Chrysler V-8 Fire-Power engine modified with special carburetors and Cunningham tricks will send the little car rocketing under the mighty push of 300 horsepower.

This will give the new American sports car twice the horsepower of the average automobile engine harnessed in a lightweight, one-piece frame of welded tubular steel for maximum rigidity and strength. With all those horses and so little weight, acceleration of the Cunningham gives a driver the feeling that he's about to shoot out the back end and wind up sliding along the road on the seat of his pants. To hop up acceleration even more, the three-speed Cadillac transmission used in former models has been abandoned in favor of a new five-speed gearbox of Cunningham's own design and construction. "It covers the same gear-ratio span," says Phil Walters, "but will permit the use of even more horsepower during acceleration since a driver can keep the engine speed higher."

Biggest eyebrow raiser of the new C-4R is the fact that Cunningham has thrown out the famous de

AMERICA'S NEWEST SPORTS CAR

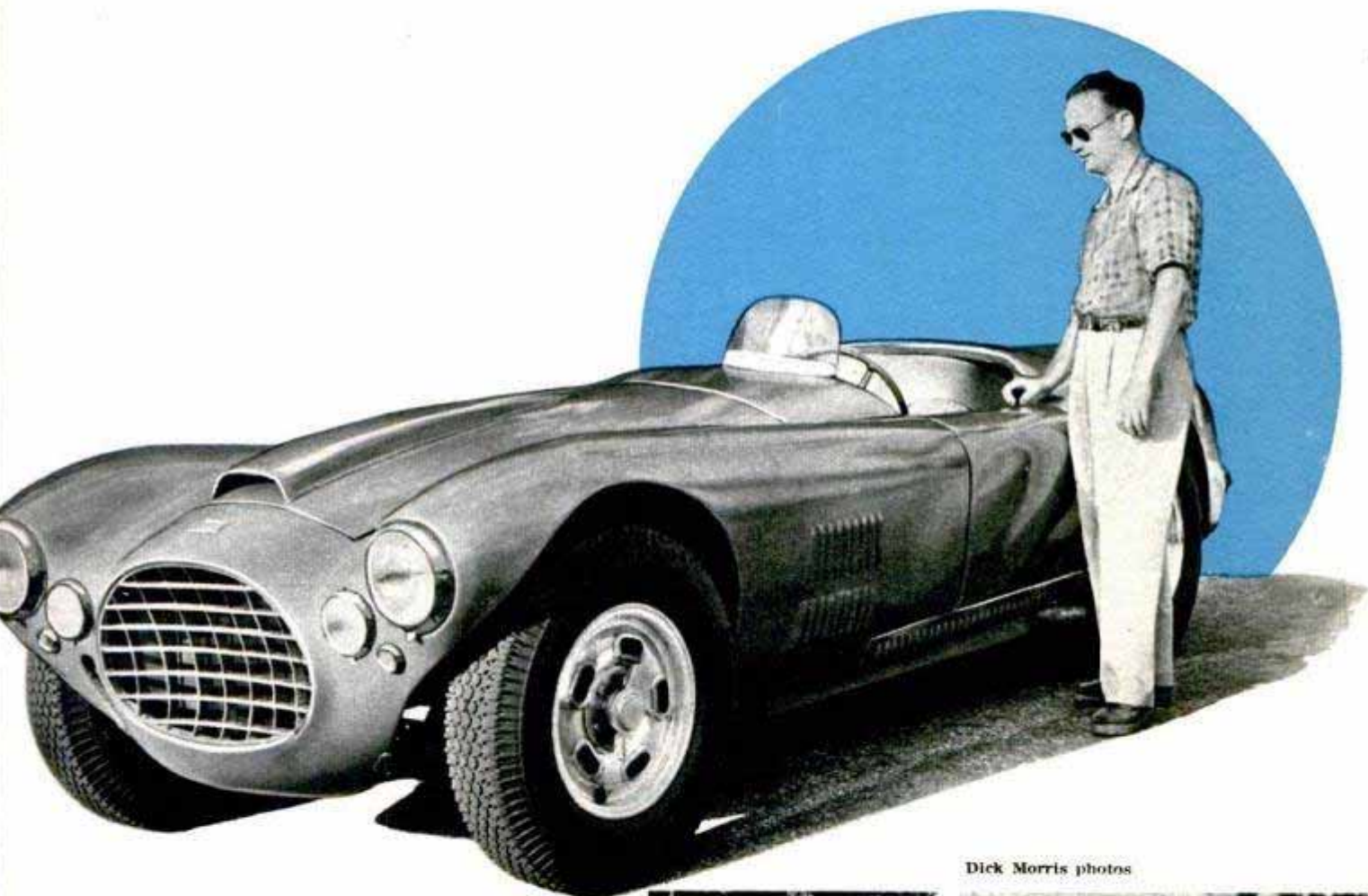
Dion rear end. Invented in 1904 by a Frenchman of the same name, this suspension was almost ignored after World War I until Mercedes picked it up in the late 30s. But the C-4R's rear end is a brand-new Cunningham-designed affair about which the builder and his engineers are extremely secretive. "It's the first revolutionary rear-end improvement since the de Dion," Walters says. "Its principal feature is 25 percent less weight but it is also tougher."

A low center of gravity and careful weight distribution make the new Cunningham hug the road with rugged tenacity and give it the feel of a much heavier car. "Like the Jaguar XK-120, it always seems to be going about 40 miles an hour slower

than it actually is," one test driver reveals.

Driver comfort and safety are heavily emphasized features of the Cunningham. It has the roomiest cockpit of any sports car, allowing the driver to stretch his legs, wave his arms around or sprawl every which way if he wishes. Foam-rubber bucket seats are covered with a special, rough fabric to keep the driver from slipping on fast turns or stops.

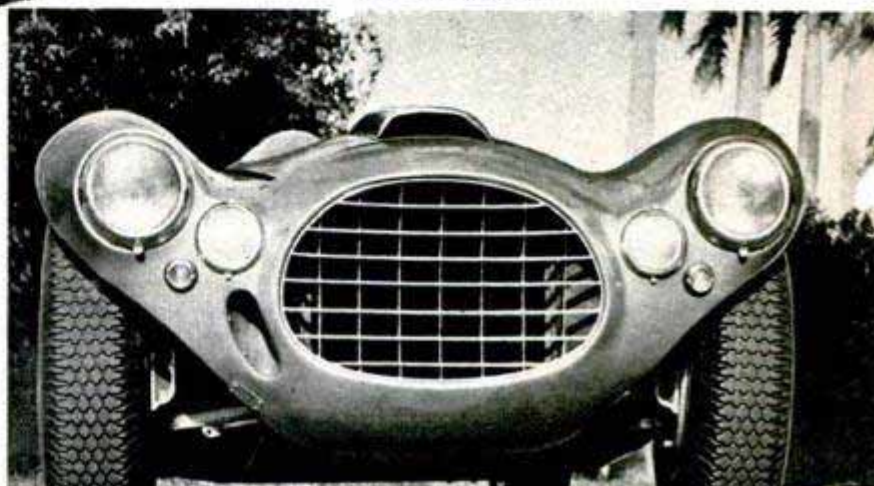
Brakes on the new Cunningham are unbelievably powerful. Even on the earlier models tested over a pebbly, rough asphalt surface, the cars screeched to a dead stop from 60 miles per hour in 134 feet. What's more, Cunninghams have finished races with as much "pedal" as they had when



Dick Morris photos

Over-all view of the Cunningham sports car shows off its low lines and complete streamlining. This model, designed for racing, is priced at \$16,000

Right, air scoops on top of hood and at the left of the grille carry cooling air directly to engine. Just visible on inside of wheels are brake-cooling scoops





Here's a full side view of the sleek American sportster that is expected to hit close to 175 miles an hour

they started and with no sign of brake fading—a common complaint with high-performance sports cars after repeated stops.

On the C-4R the brakes are even more powerful than on former models. "You can increase braking performance in three ways," Walters explains. "You can reduce the car's weight, increase the brake size or improve brake cooling. We did all three. Brakes on the C-4R are 20 percent larger than last year's Cunningham Model C-2."

Secret of the nonfading feature is a unique cooling system for the brakes. Metal fins on the rims of the brake drums act as centrifugal blowers and whip cool air from scoops under the car, across the brake drums and out through exhaust holes in the hubs.

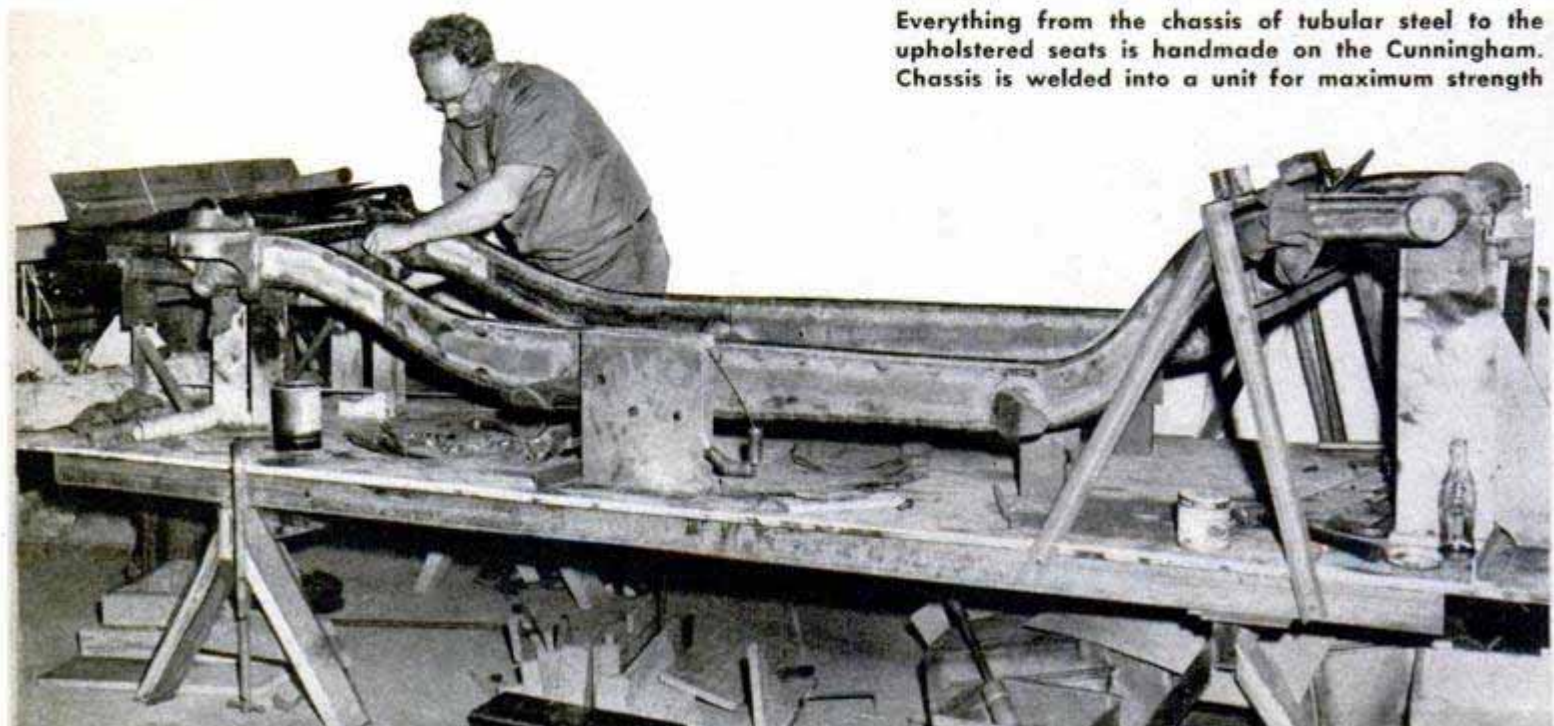
Cunningham is experimenting with a hardtop model which has low, swooping lines that slim into a V-shape in the rear.

It will be run through wind-tunnel tests in Germany, probably in the same lab used to test Mercedes bodies. Right now the long, chest-high automobile is a three-foot clay model in the Cunningham shops at West Palm Beach. There it is undergoing continual changes in conformation as engineers experiment with air-flow curves over its surfaces.

Since the Cunningham is unique in many ways, it doesn't lend itself to assembly lines. Most of it must be put together by hand. In spite of this, production slowly is creeping upward. Fifty C-3 Continental coupes will be delivered this year as their handmade bodies arrive from Italy. Cunningham expects to produce about 25 of his sports cars this year and 50 in 1953.

You can have one of the C-4Rs for about \$16,000. The Continental coupe is all yours for \$9000. ★ ★ ★

Everything from the chassis of tubular steel to the upholstered seats is handmade on the Cunningham. Chassis is welded into a unit for maximum strength





Douglas Aircraft Co. photo

Airliner Groomed for 1954 Service Cruises at 360 Miles per Hour

One hour will be lopped from coast-to-coast air-travel time when the new Douglas DC-7 goes into service for American Air Lines late next year or in early 1954. The 60-passenger airliner is a little more than three feet longer than its widely used pred-

ecessor, the DC-6, and 50 miles per hour faster. It has a cruising speed of more than 360 miles per hour. Both have a wingspan of 117½ feet. Four Wright compound engines turn out 13,000 horsepower at take-off, compared with 8400 for the DC-6.



Portable Piano

Small and light enough to be carried in a suitcase, a portable piano developed by a Berlin radio engineer plays up to five octaves. Karl Baessler calls his 25-pound instrument a "pianophon." In place of strings it has metal bars similar to reeds in a mouth organ. The vibrations from them are picked up and transformed into tunes in a magnetic system and amplified.



Dial Phone Uses Numbered Drum

Faster dialing and fewer wrong numbers are the advantages of a new German telephone. Instead of a clockface dial, the new instrument has a cylinder with odd numbers listed on one side and even numbers on the other for rapid location. There is also a sound-modulator control mounted on the telephone so you can adjust the sound to suit your ear.

British Test Devices To Speed Home Building

BRITAIN, even more than the United States, has faced a widespread housing shortage since the end of World War II. Bombing raids plus the dearth of building during war years made the shortage a national problem. Today building materials are second only to armaments on the priority lists of the British government.

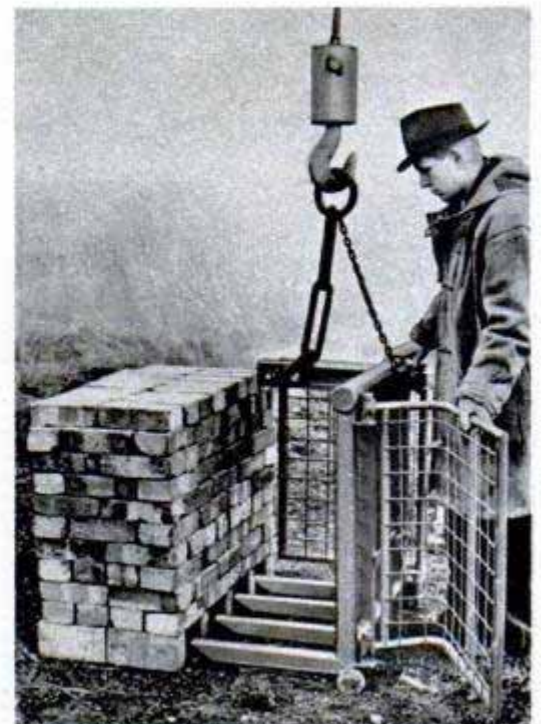
To get more houses per man-hour of labor, the government set up a laboratory near London that develops and tests mechanical methods of speeding output. The lab even designs and builds complete housing units. In fact, one of its buildings is a test structure known as the "Ctesiphon." Mound-like, it is made of reinforced concrete in corrugated form. Fire-proof, verminproof and resistant to earthquakes and shocks such as bombings, the building is being tested for possible use as a home.

Other research projects are eliminating bottlenecks in brick-home construction. New material-handling methods, both British and foreign, are tested. Those found practical are then made available to the nation's contractors and builders.

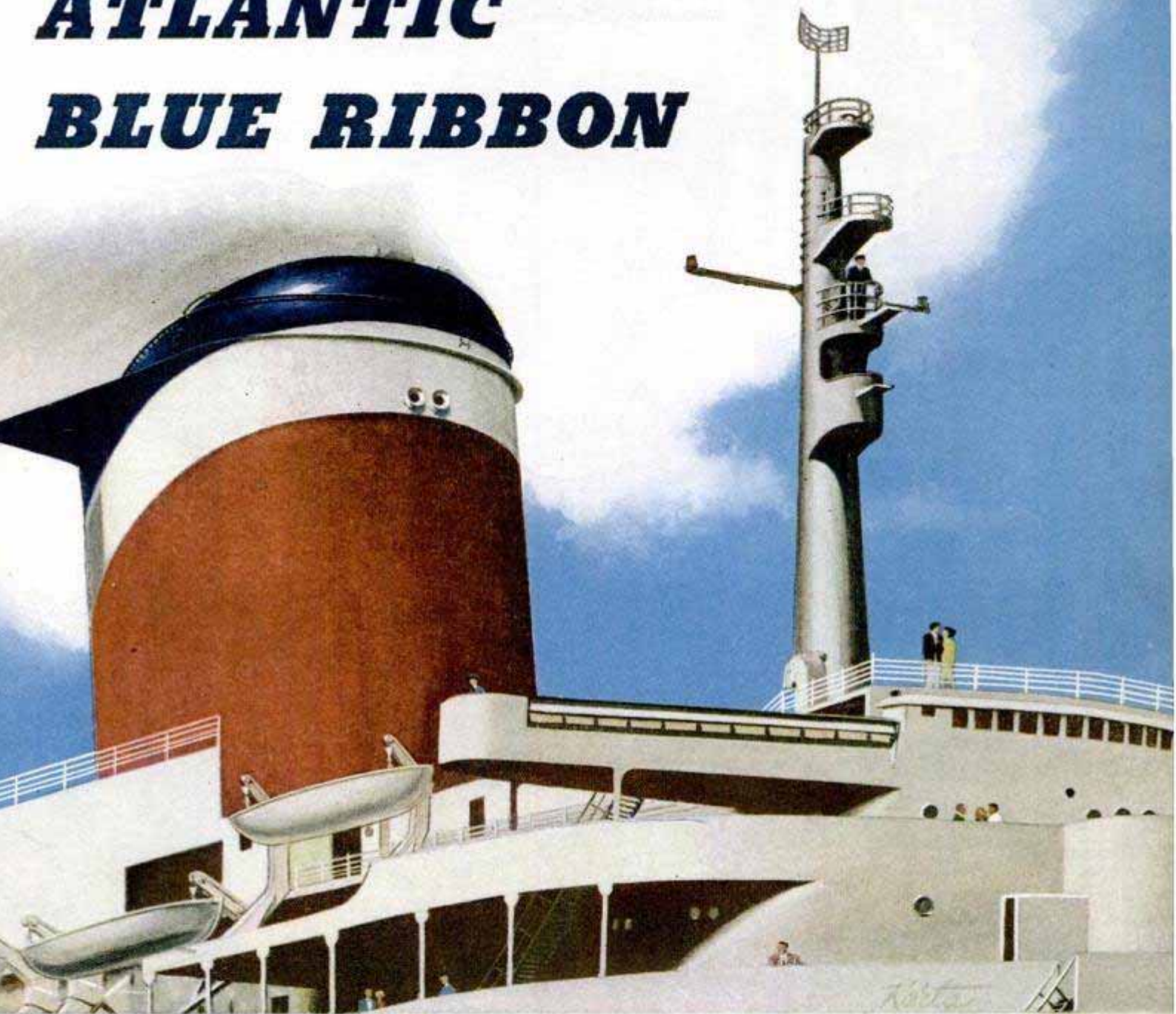
Above, a mechanical "hod carrier" is able to haul 10 buckets of mortar on each trip

Below, a large number of British houses are of brick. A brick grab, also crane-powered, picks up 98 bricks in one bite

Another brick-handling device is a fork with a capacity of 160 bricks. The crane is designed for small construction jobs



AMERICA BIDS for the ATLANTIC BLUE RIBBON



Towering above the *United States* is its forward stack—biggest ever built—and the communications mast

By Richard F. Dempewolff

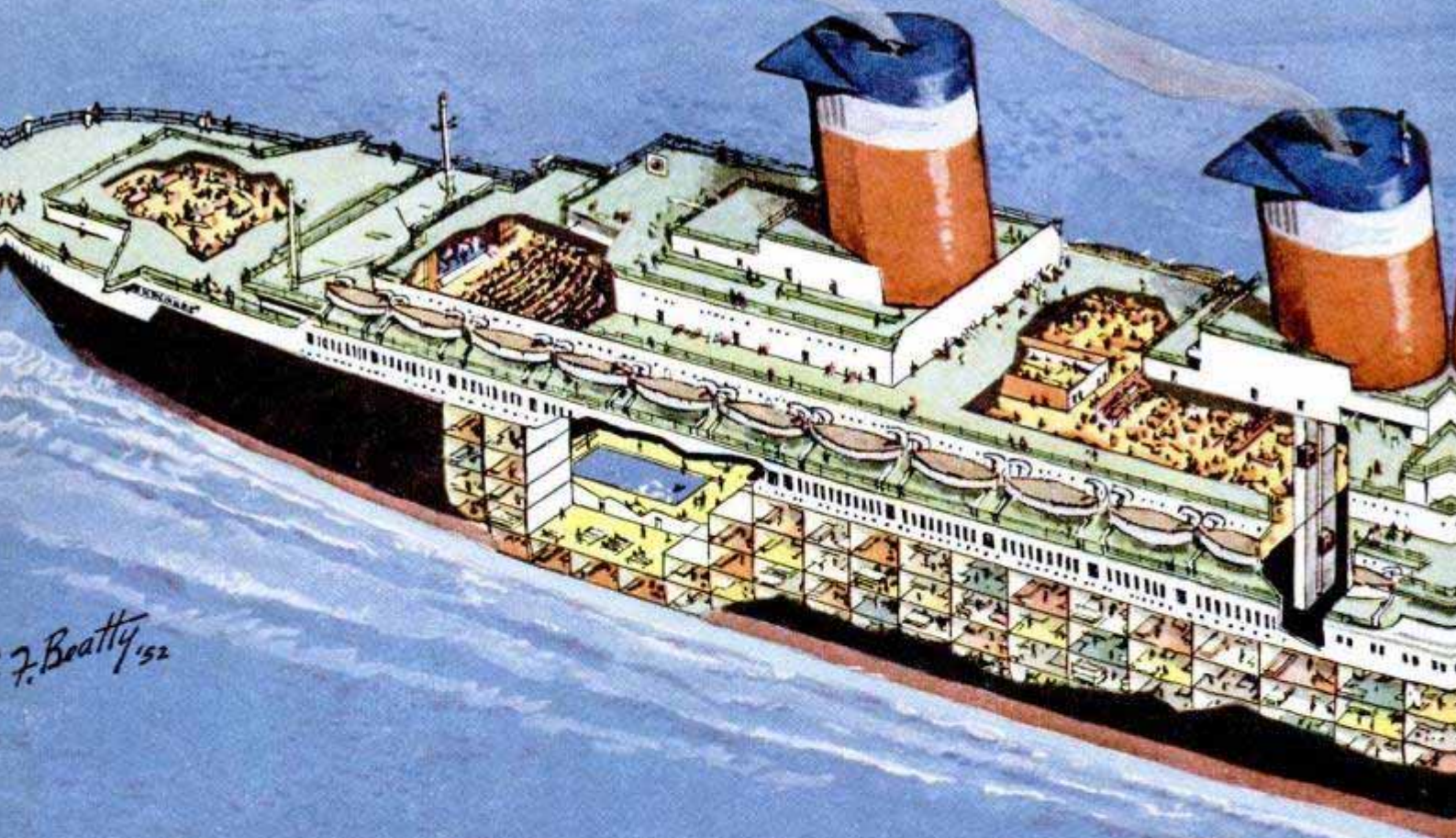
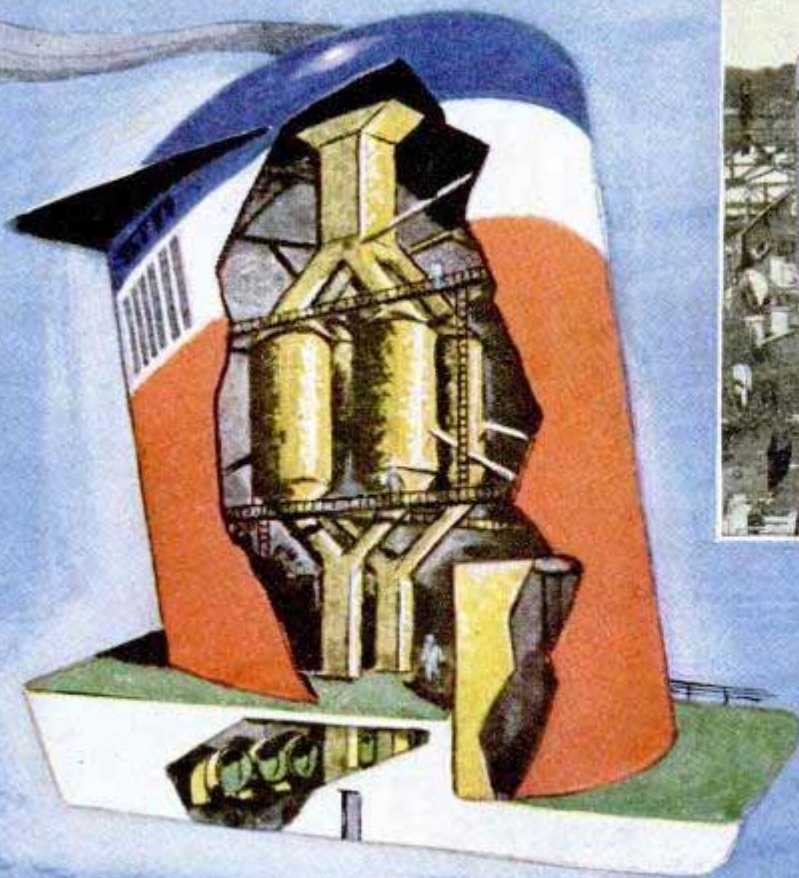
ON THE COAST of southern Virginia, there's a world of supergiants. Rumbling monster cranes towering 14 stories into the sky stud the horizon, swinging 40-ton chunks of fabricated steel into place like so many matchsticks. Single rooms in some of the vast buildings cover about the same floor space as six football fields. Inside these caverns, men crawl like flies among three-story steel behemoths that, for the past 2½ years, have been thundering and whining as they fashioned or finished off even more monstrous goliaths: King-sized

turbines; incredible shafts of gleaming steel, as big around as a barrel, that stretched away in the gloom as far as you could see; unbelievable bronze propellers that, from blade tip to blade tip, stood higher than the roof of a two-story house; great steel plates, twice the size of your garage floor, thumped and twisted into curved shapes like bits of foil. All bore the simple mark, "Hull 488."

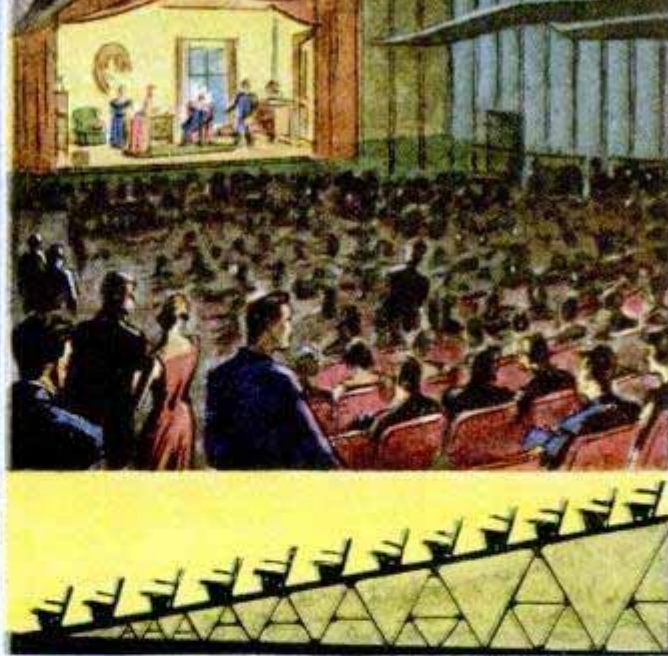
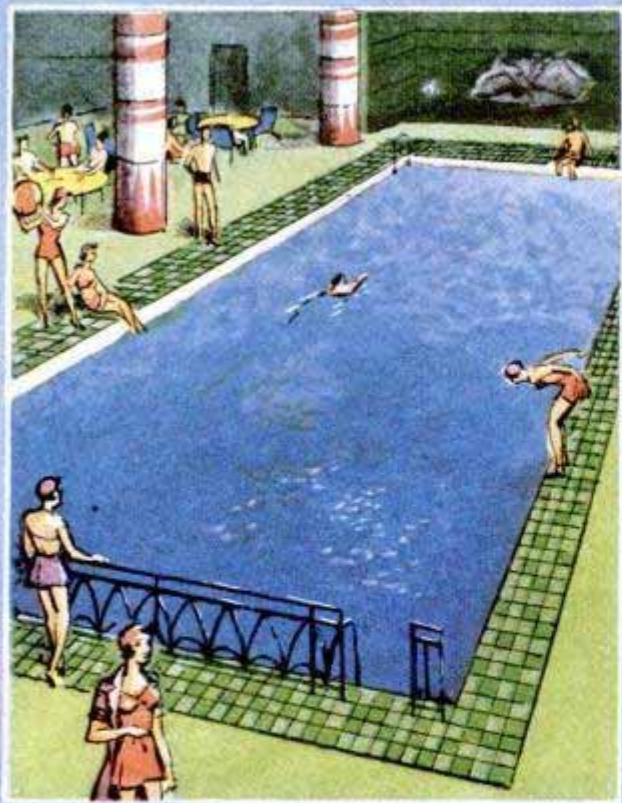
On the waterfront of the sprawling Newport News Shipbuilding and Drydock Company where all this transpired, Hull 488 was a mountain of steel gradually rising



Forward stack measures a mighty 60 feet fore and aft, 55 feet high. Finlike projections prevent the smoke from swirling down to the deck. Cutaway at left shows how smoke ducts branch off into four huge dust-collecting drums



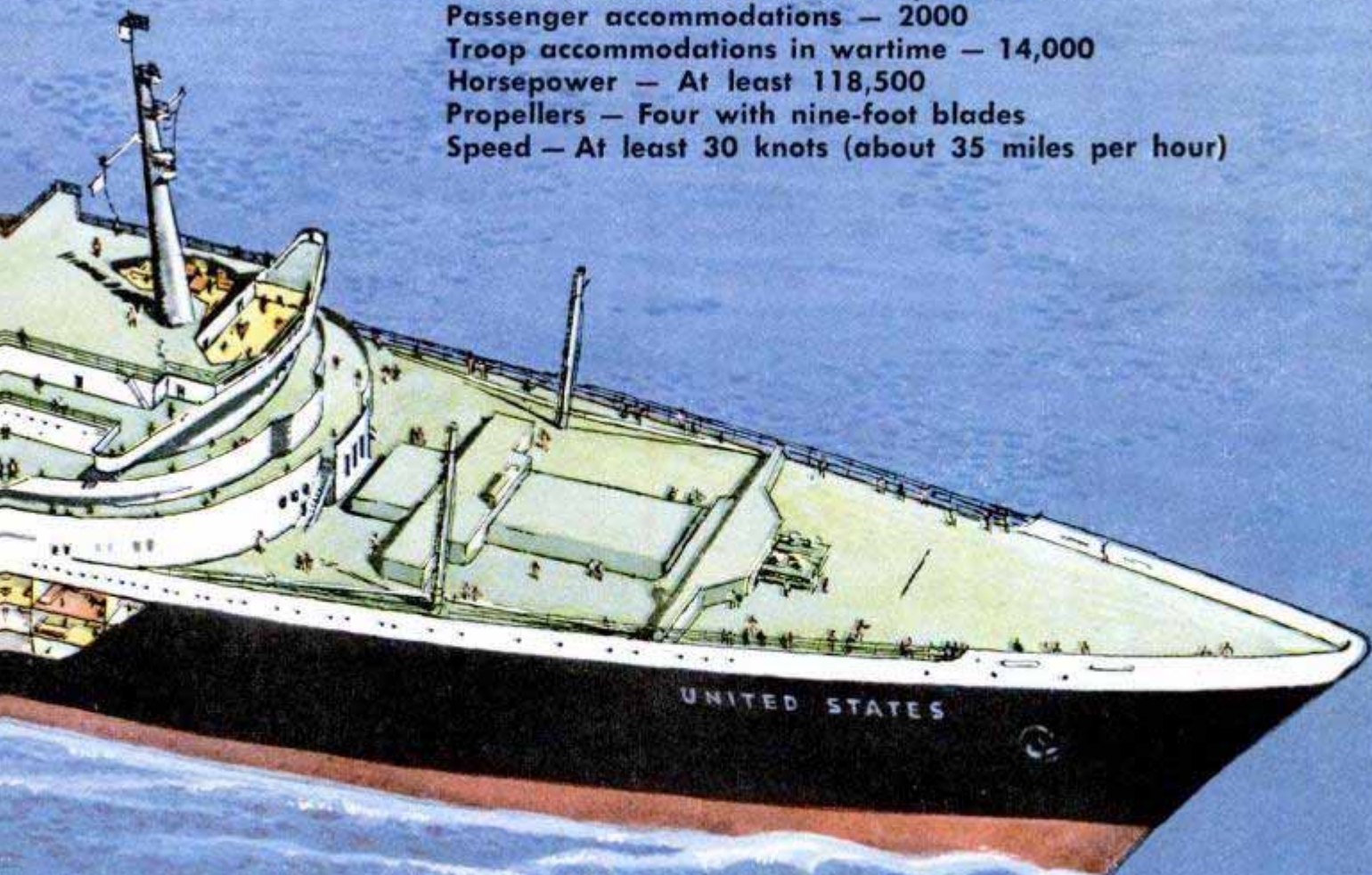
F. Beatty '52

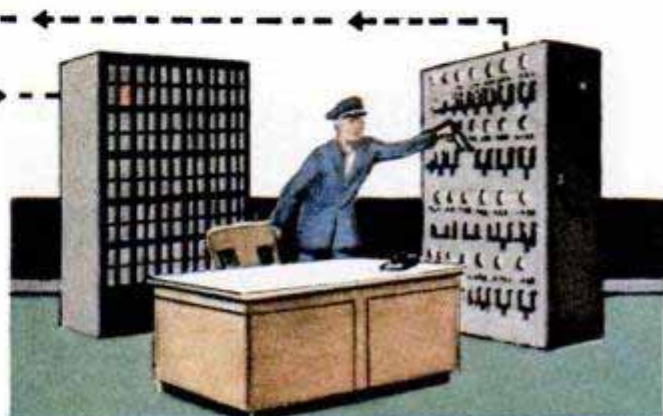
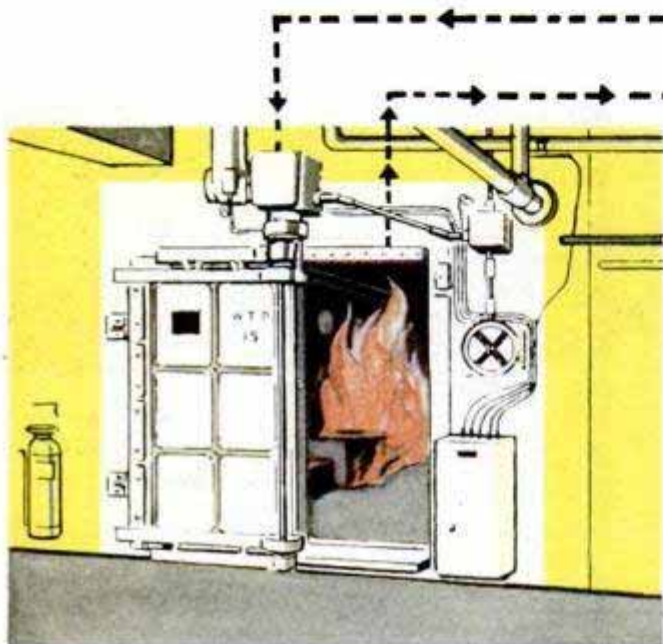


There are two theaters aboard, each seating more than 500 persons. They are the first theaters aboard ship to have sloping floors for visibility. During the day passengers can swim in the big interior pool surrounded by a luxurious terrace for lounging and games

AMERICA'S BIGGEST LINER

Cost — \$75,000,000	Weight — 51,500 tons
Crew — 1000 men	Decks — 12
Length — 990 feet	Beam — 101 feet
Height from keelson to stack top — 175 feet	
Passenger accommodations — 2000	
Troop accommodations in wartime — 14,000	
Horsepower — At least 118,500	
Propellers — Four with nine-foot blades	
Speed — At least 30 knots (about 35 miles per hour)	





Top, hull is compartmented like a battlewagon with waterproof, fireproof bulkheads. In case of fire or collision, damaged compartment can be sealed off

Above and left, if a fire should break out in a stateroom, smoke detector triggers signal on bridge. Officer can sound alarm, then close door to stateroom

in a step-sided concrete graving dock. No ordinary incline shipway on the whole coast was big enough to take the great keel. Here, in the birthplace of such sea mammoths as the giant aircraft carriers *Midway* and *Coral Sea*, she slowly grew.

One scorching day last summer, under a splatter of champagne and the roar of a crowd, Hull 488 took on a new name. She became the SS *United States*—the most revolutionary modern superliner in the world and the mightiest ever built in this country. Bigger than her aircraft-carrier predecessors, her 990-foot length overhung the rim of the huge graving dock by 30 feet at bow and stern. If upended, she would top the 70-story R.C.A. Building at Radio City by 140 feet. Her 101-foot beam can skim through the Panama Canal locks with only four feet to spare on each side. From keelson to the top of the forward stack, she towers 175 feet in the sky, or about as high as a 14-story building.

No greased skids or dramatic splash marked the launching of this supership. Instead, her builders opened the floodgates of the big graving dock. Water from the James River swirled around her vast hull and

lifted her from a forest of chocks. A small fleet of tugs nosed her a mile downstream alongside the pier where 3000 men working in three shifts are putting the finishing touches on her thickly carpeted staterooms and lavish public lounges. Next month—half a year ahead of schedule—under the banner of United States Lines, the \$75,000,000 behemoth will make her maiden voyage on the run between New York, Southampton and LeHavre.

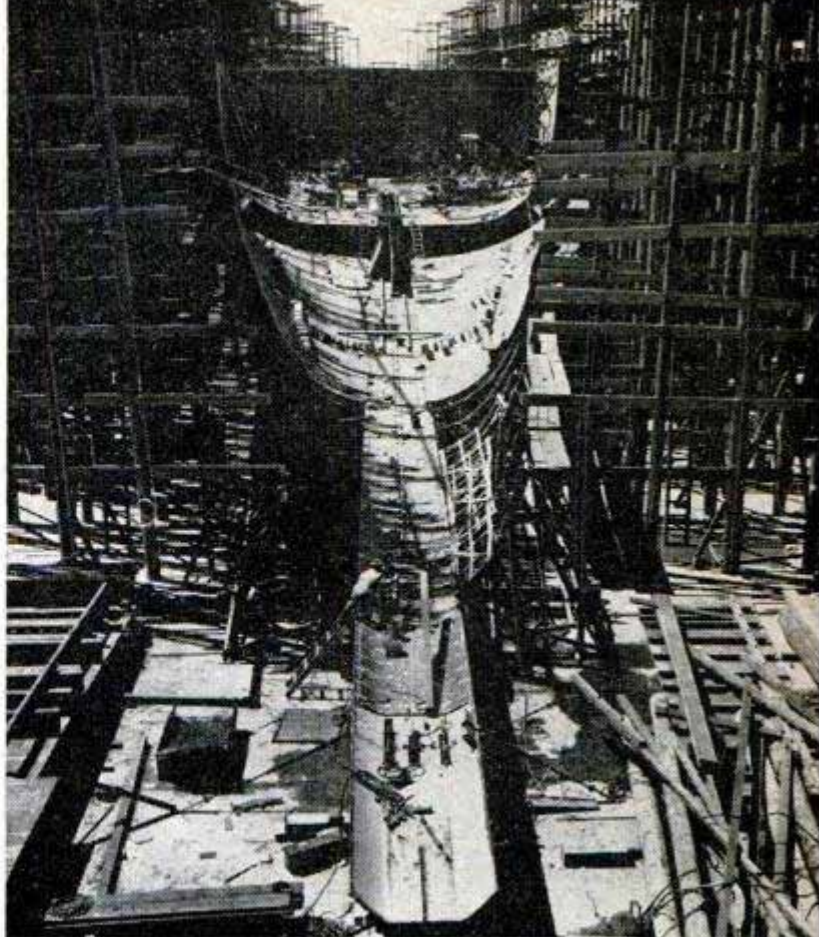
Tip-off to the drastic innovations in the SS *United States* is her mysterious gross weight. Though she's nearly as big as the *Queen Mary* and *Queen Elizabeth* (1021 and 1031 feet respectively), she is listed at only 51,500 gross tons—about the same as the old *Bremen*. Gross tonnage of the *Mary* is 81,235; the *Elizabeth*, 83,673. But the capacity and accommodations on the *United States* are almost identical with the big *Queens*.

It will take 1000 crew members to send her plowing through the North Atlantic. Some 2000 passengers will be luxuriously accommodated in the 12 completely air-conditioned decks that honeycomb her cavernous hull. They will be lifted and dropped to

various levels in a dozen different elevators. Their evenings at sea will be brightened by entertainment in two theaters with sloping floors and seating capacities upward of 500. They will have the run of three spacious lounges and exercise on a broad sports deck. Two and a half turns around the "prom" deck will provide a one-mile stroll. They'll eat in one of three dining rooms and swim, if they wish, in an interior pool framed with a colonnaded beach terrace. Every passenger space is equipped with ship-to-shore telephone that will connect with any part of the world. No other ship is as well-equipped.

But there's a lot more. The SS *United States* is no ordinary ship. Dark secrecy has cloaked her ever since 1946 when she was a gleam in the eye of her designer—a retiring, bespectacled naval architect named William Francis Gibbs. She is considered strictly a naval vessel. That's why the Navy is paying the bill for features that will adapt her for war. The Maritime Commission will pay the balance and turn her over to the United States Lines for only \$28,000,000. In return, she is subject to call at any time as a transport. And what a transport! Enveloped within her sleek lines are all the tricks of ship design learned during World War II. She's a "convertible." In a matter of days (instead of months and years as was the case with ships like the *America*), her luxurious fittings can be stripped out. Roomy accommodations for 14,000 troops—a full division—can be fitted into the same space. And she will be able to carry them 10,000 miles, if necessary, without stopping to refuel or reprovision.

Four propellers with nine-foot blades will slam the floating hotel through the seas, driven by a series of four roaring high-temperature steam turbines. According to the

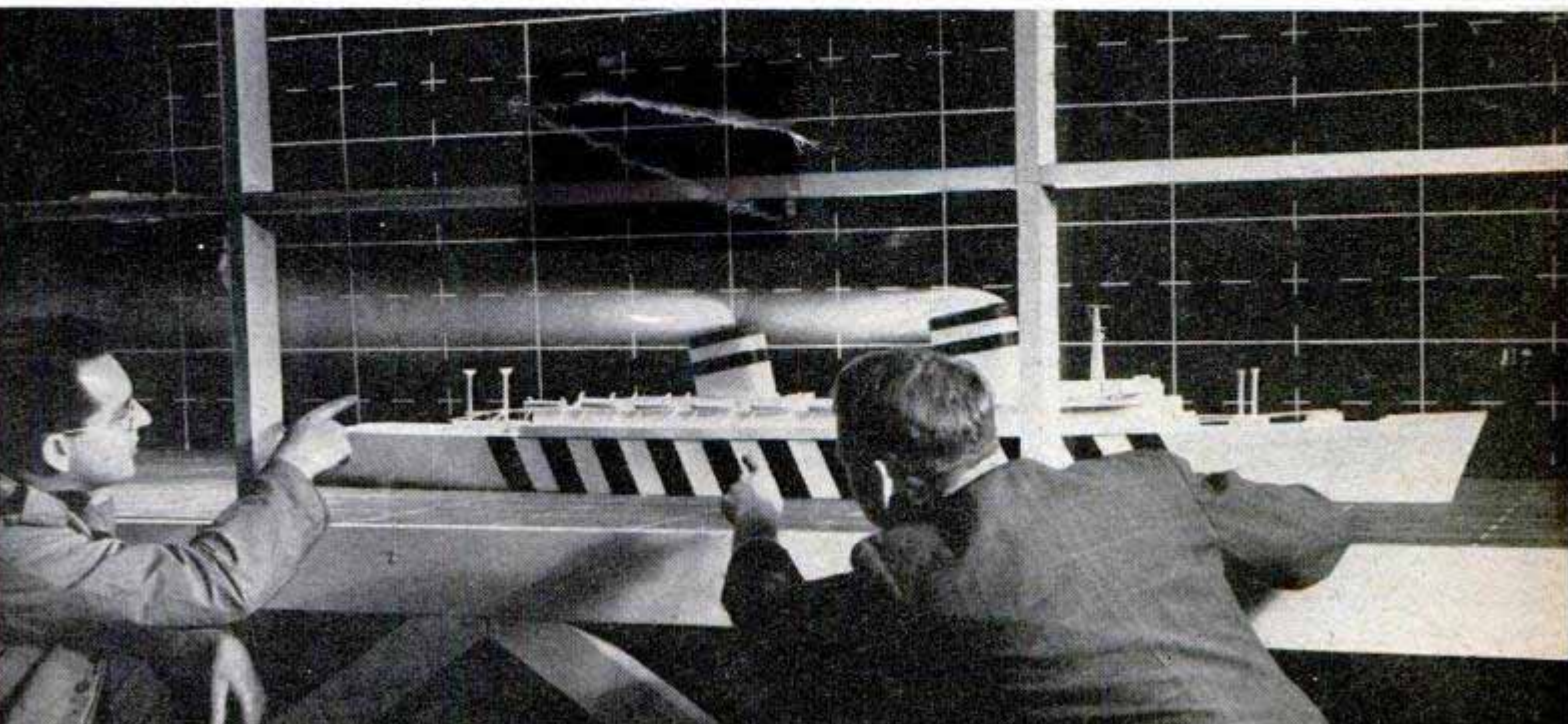


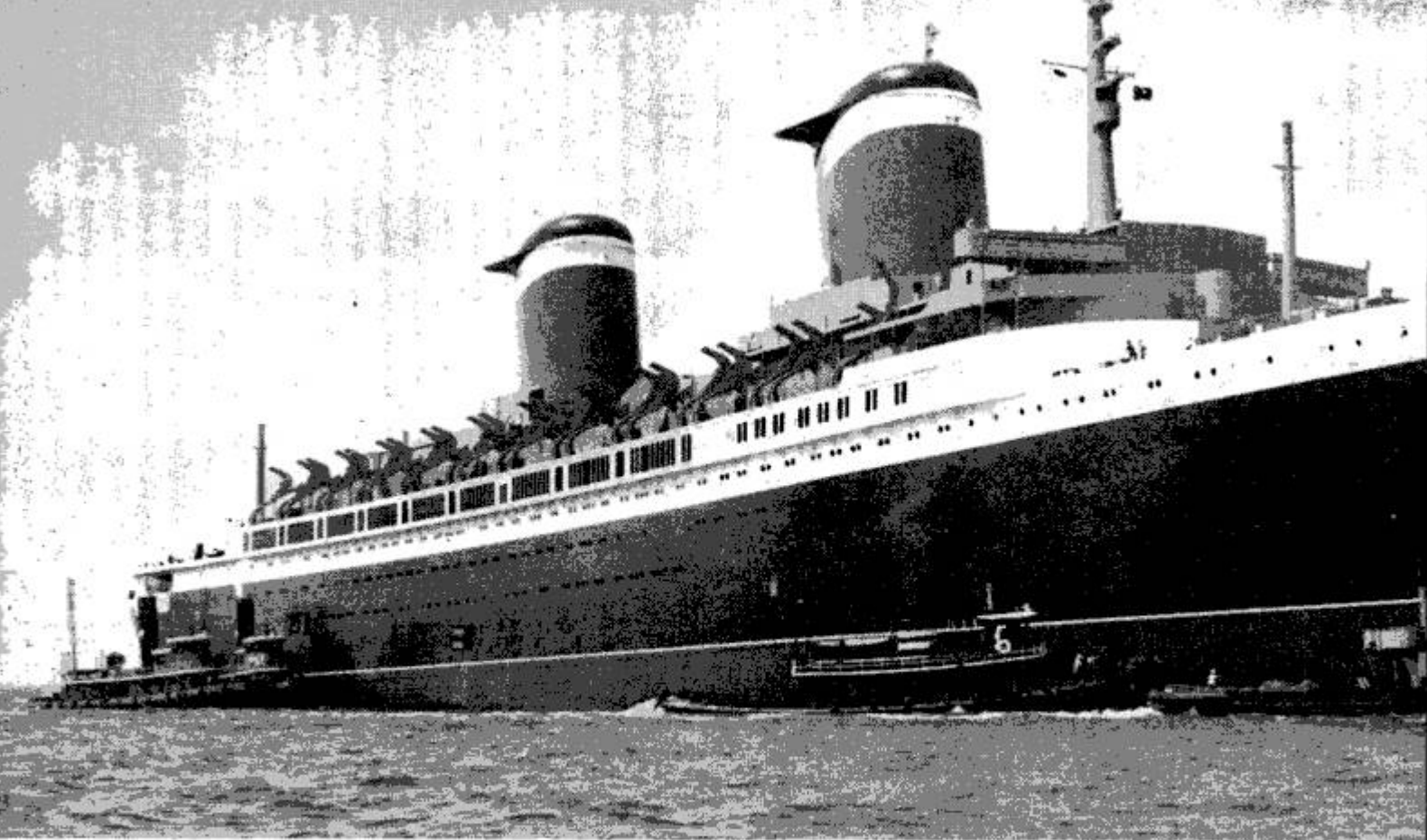
Tiny dots inside the hull are workmen, dwarfed by just one section of big ship during construction. Far "wall" is one of the many watertight bulkheads

Merchants Vessel Register, they'll kick up 118,500 horses. (According to other authorities, lots more.)

Just how fast she'll go no one is telling. The officially announced speed is 30 knots—about 35 miles per hour. That's the same as the *Queen Elizabeth*. Mention this to anyone who knows and he'll just smile. It's a widely circulated "secret" that she may attain nearly 40 miles per hour—fast enough to make the run to Southampton in

Designers check stack shape inside a wind tunnel. These stacks were abandoned when they failed the tests





Whopping 990-foot superliner, ready for finishing touches, is shoved toward fitting berth by a fleet of tugs

a record-breaking time of only 70 hours!

How is it possible to pack all that punch into a supership which, big as she is, seems slightly outclassed by the British *Queens*?

Stand on her rakish forepeak, look around at the towering superstructure and you soon see one reason. Virtually everything from the promenade deck up is made of aluminum. Even lifeboats, davits, ladders, rails and stacks are made of the light metal. Below decks, you find it in many partition bulkheads, shower stalls, crews' berths and elevator doors. Some 2000 to 3000 tons of the featherweight metal account for the mighty ship's unbelievably small dead weight of a mere 12,810 tons—half that of the *Queens*. It also accounts for years of headaches and engineering miracles turned by the Newport News builders.

Aluminum must be worked "cold" (under 400 degrees F.) or it loses strength and corrosion resistance. Big die presses are fine for punching out odd-shaped forms for mass production. But when you're making only one each of a few hundred different forms, die presses become uneconomical. Hence, aluminum plates for the *United States* had to be formed individually by hand. To shape plates, men had to pound them in steel forms with machine hammers—somewhat the way you'd hammer out a copper bowl in a wooden form.

The fantastic job of forming and riveting the metal fell largely to Gordon Donnan and Charles Boykin, young engineers in

the planning section of the shipyard's steel-hull division.

"All our folks are principally steel men," Boykin explains. "The properties of steel are vastly different from those of aluminum. So we had to experiment for months to acquire the 'know how' of aluminum."

Aluminum has more "spring back" than steel, for instance. If the huge ½-inch plates for the stacks had been hammered to the exact swooping curves called for by ship designers, they would have "unbent" themselves enough to throw everything out of kilter. "So our fabricating men," says Boykin, "had to 'overform' all rolls and bends in making the design shapes."

If bent at too abrupt an angle, aluminum will fracture, so the fabricators soon learned to turn sharp corners in the metal with a more generous radius. Expansion and contraction of aluminum are twice that of steel. During early experiments, the men riveted some aluminum plates together. Overnight, the temperature dropped, the plates contracted and morning found the riveted seams ripped apart. Aluminum partitions on the big ship now fit in slotted columns. They can expand and contract every which way without popping loose.

Aluminum rivets lose some strength if driven hot, but not if you freeze them. So while aluminum riveting was in progress on the *United States*, her passageways were dotted with Dry Ice cabinets loaded with deep-frozen rivets that could be lifted out,



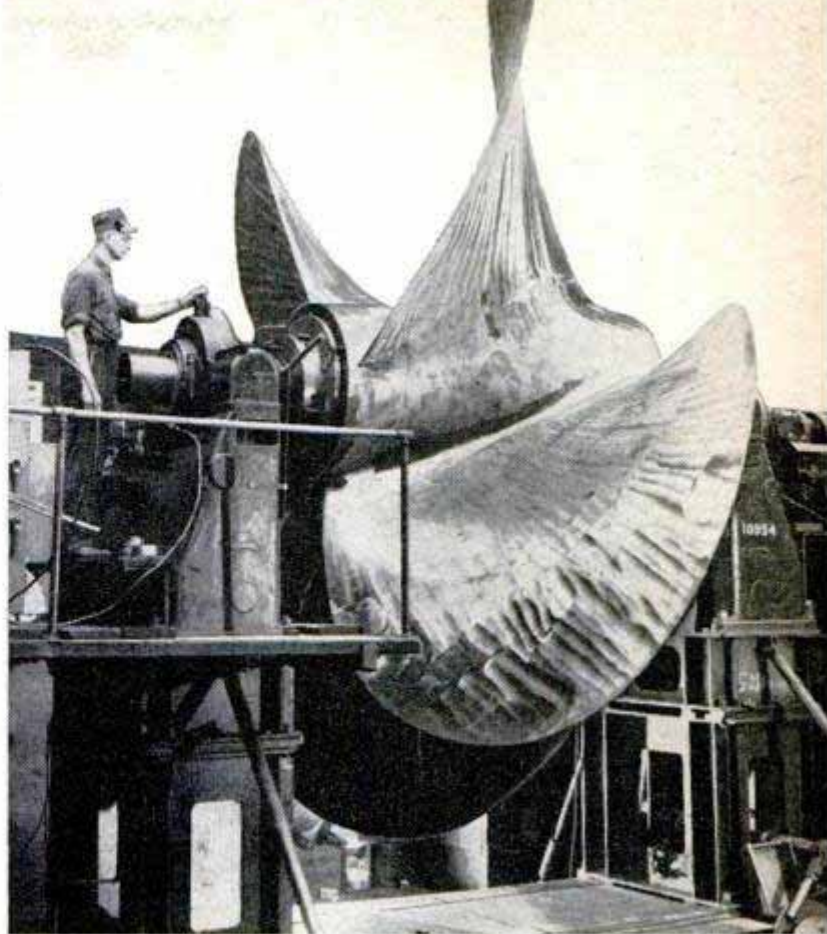
steaming, in wire-mesh baskets all ready to hammer in place.

Most of the monster ship was built in chunks in the shops on steel platens or skids. The hull alone consists of 183,000 separately fabricated pieces. Some, like the bow section, weighed up to 200,000 pounds!

The real "skull busters" were the ship's mighty funnels with their streamlined, finned "umbrellas." They are the biggest smokestacks of any ship in the world. Largest of the two is the forward one, stretching away for 60 feet fore and aft and 55 feet skyward. More than 80 tons of aluminum and steel and 65,000 rivets make up its shell, which is big enough to accommodate four six-room houses and a few front lawns.

(Continued to page 252)

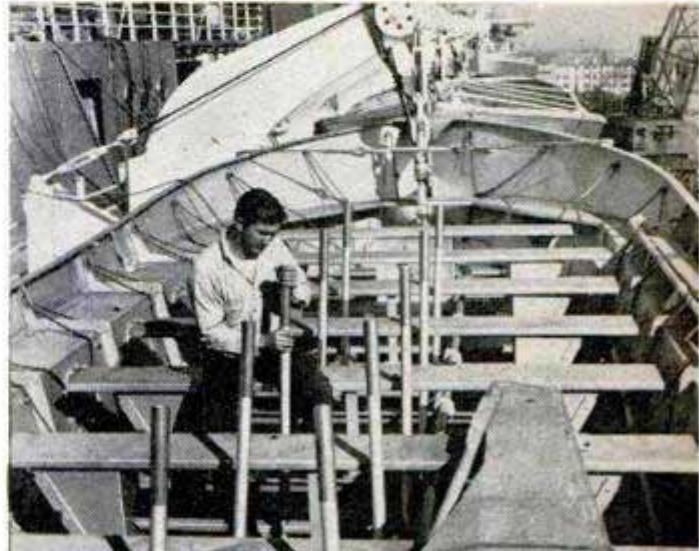
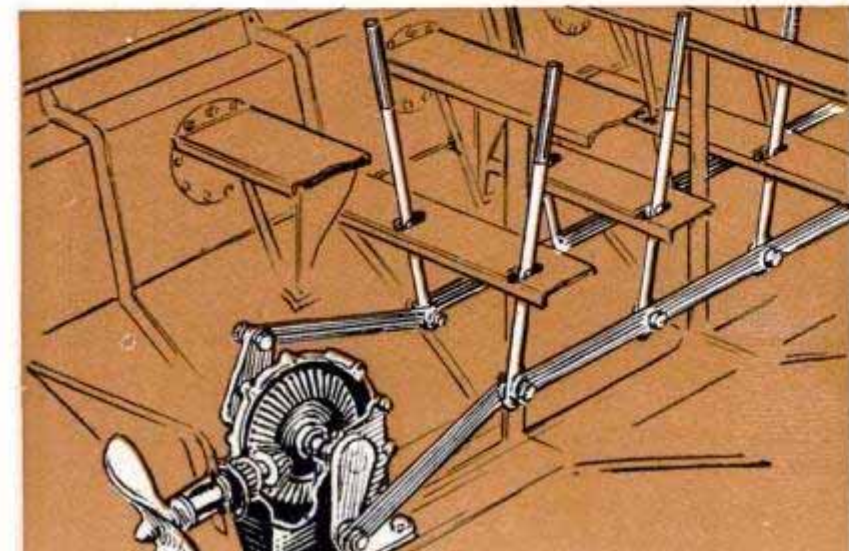
Instead of oars, lifeboats have pump handles which are worked back and forth in unison. Shafts operate gears, which turn a propeller to move the craft

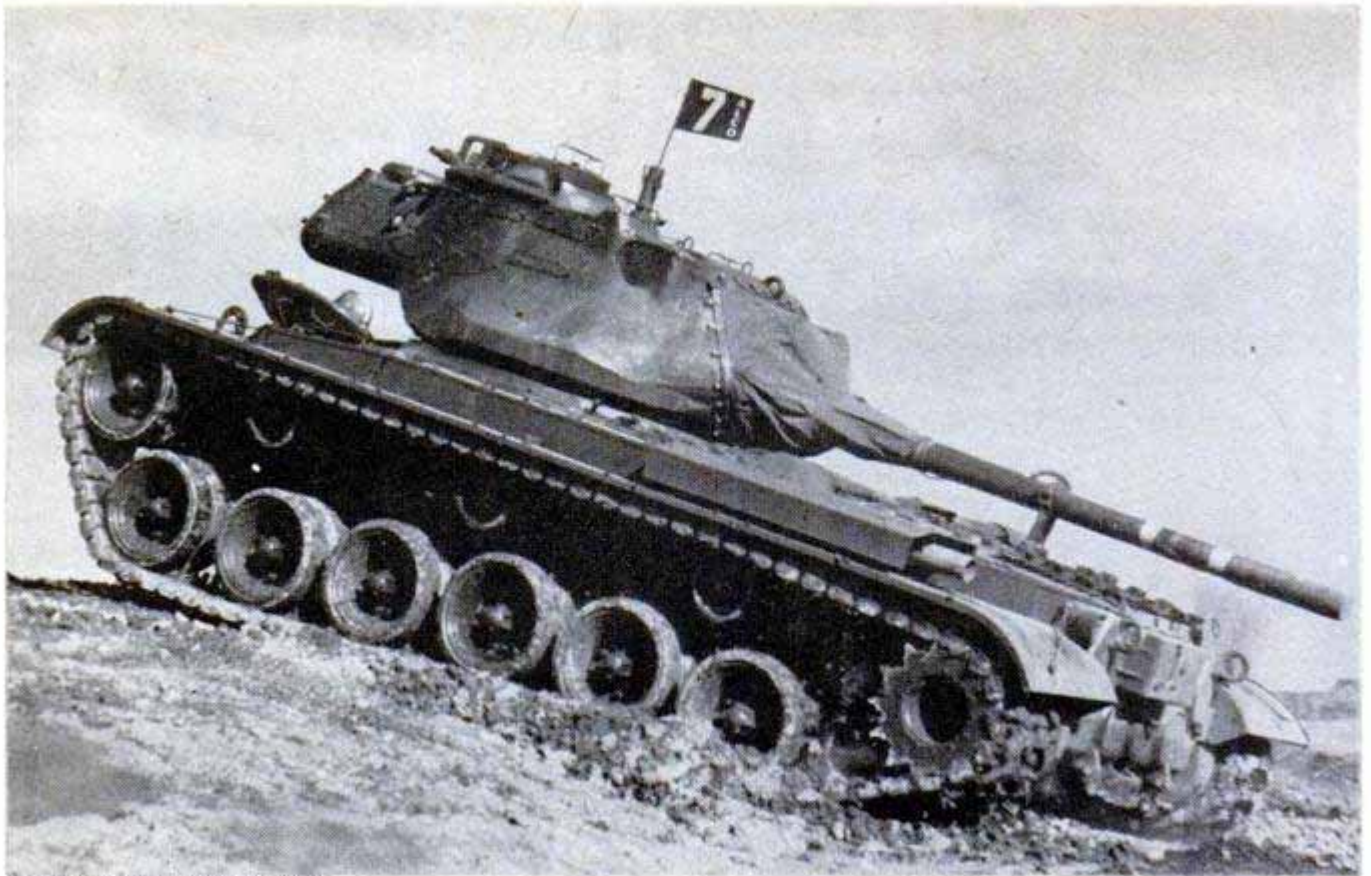


Four massive propellers with nine-foot blades will drive ship at speed of at least 35 miles per hour



Aluminum rivets, made malleable by keeping them cold, are delivered to workmen from freeze chests. Below, 40-foot aluminum lifeboat carries 140 persons





American Locomotive Co. photo

Army's Latest Medium Tank Features More Lethal Fire Power

Hundreds of fighting models of what an Army arsenal commander describes as the "finest medium tank in existence" are off the production lines already. The 48-ton metal monster—the M-47—has an 810-horsepower air-cooled engine that drives it over rough terrain at faster than 35 miles

per hour. The 28-foot-long, 11½-foot-wide tank has a five-man crew. Its most superior feature is increased fire power. An improved high-velocity gun steps up probability of first-round hits and has a compensator that automatically restores the aim of the gun after each shot.

Quick-Release Battery Terminal Prevents Fires Due to Short Circuits

Short circuits in a car's electrical system can cause fires unless the current is shut off quickly by disconnecting a battery cable. A fast-acting terminal clamp enables the motorist to disconnect the ground terminal in seconds without any tools, thus eliminating the cause of the fire before serious damage can be done. The safety device, a handle-like rod threaded on one end, replaces the clamp bolt in the conventional terminal. When the handle is pushed flat against the top of the battery, the clamping nut can be drawn up tight to make a good connection. In an emergency, you merely swing up the handle to a vertical position and, by means of a washer arrange-



ment, the tension on the battery post is released, allowing you to pull off the terminal easily.

The OWNERS' REPORT on the MG

7651

I am the owner of MG. I have owned it approximately 23 years. Having tried both kinds, I find that my MG operates on regular gasoline premium (high test) gasoline. My average gasoline mileage is 23 m.p.g. for city driving, and 28 m.p.g. for country driving.

I CHANGE OIL every 2000 miles, but also ADD OIL every 1000 miles.

Roadability and handling qualities are: Excellent Good Unsatisfactory Better than excellent

Maneuverability in traffic seems to be: Excellent Good Unsatisfactory

Acceleration is: Exceptional Very Good Average Poor (Very good for 1250 cc.)

Curb and road clearance is: Satisfactory Too High Too Low

My MG is the only car I own ; I own another car (or cars), beside the MG . Here are my main reasons for purchasing an MG: Wanted sports car at a low price with reasonable cost of operation, also a high degree of reliability for everyday use.

Particular features I like are: Low center of gravity, low body lines ; Compact interior, seating arrangement ; Size and weight of car ; Length of wheelbase ; Four-speed transmission ; Four-cylinder, overhead-valve engine ; Others I like.

I use my MG: for general pleasure driving ; in competition exclusively ; for both foregoing purposes .

Specifically, what do you dislike about the car? Poor instrument lighting - poor quality material in top & side curtains. Numerous oil leaks when raked-up & near maximum for long periods.

Have you ever owned an MG before? Yes No How many? Two

Would you buy another MG? Yes Possibly No

M.G. is the finest all-around sports & passenger car available. No, definitely.

Do you find MG parts and repair service readily available? Yes, definitely.

How do you find your dealer service? Excellent Good Average Poor

The dealer I bought my car from is a moon about mechanical work and a small time swindler to boot!

How do you rate your MG, generally? Excellent Good Average Poor

GENERAL INFORMATION

What type of car would you prefer in your next sports car? In-line V-type

Valves: Side Overhead

More?

2 cc. D.O. H.C. V-6 (to make at cost I can afford)

Do you think the MG have a real future in America? Yes - we have experienced a tremendous future in this area.

My question listed. Thank you.

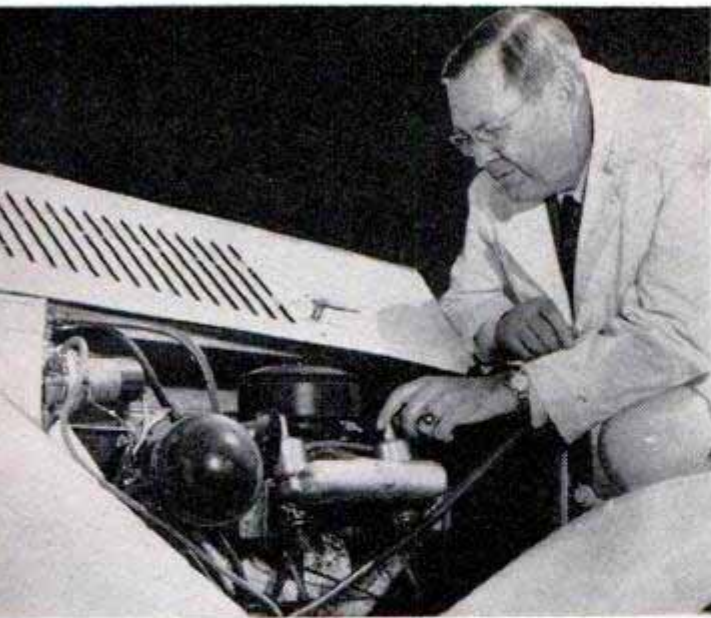


Aside from questionnaire survey (sample above), Clymer interviewed many enthusiastic MG owners in person

By Floyd Clymer

OUR SURVEY of MG owners hit a new high in the percentage of questionnaires that came back. They not only answered all questions with alacrity but nearly all added personal comments, mostly

in praise of the popular British sports car. Although production capacity and other factors make it improbable that sports cars ever will give Detroit manufacturers serious competition, it is obvious that there is



The MG's tiny four-cylinder OHV engine has only a 76.6-cubic-inch displacement; has dual carburetors

"I think they're here to stay but they'll never offer any competition to passenger cars."—Albany, Ore., physicist.

"It puts the pleasure back in pleasure driving."—Milwaukee, Wis., bus driver.

"It seems to be an amazing piece of machinery—fast, safe and fairly comfortable."—Chicago dentist.

"If the general public in some way could be shown (through demonstrations) what it is missing, the light-car manufacturers of the U. S. either would have to go out of business or get on the ball."—Hollywood, Calif., movie sound technician.

"My MG is an attraction wherever I park

Acceleration Test

MG Midget, Series TD

¼ mile from zero	(Through 1-2-3 gears) — 20.1 seconds
½ mile from zero	(1-2-3 gears) — 33.8 seconds
0 to 30 m.p.h.	(Low and second) — 6.1 seconds
0 to 60 m.p.h.	(1-2-3 gears) — 22.7 seconds
0 to 70 m.p.h.	(1-2-3-4 gears) — 44.8 seconds

SPEED IN GEARS	M.P.H. (Normal & maximum)
1st	18-23 m.p.h.
2nd	32-39 m.p.h.
3rd	50-60 m.p.h.
4th	81-83 m.p.h.

Actual speed 79-80 m.p.h.; Speedometer variation 2 or 3% (quite accurate)

Best cruising speeds — 60 to 65 m.p.h.

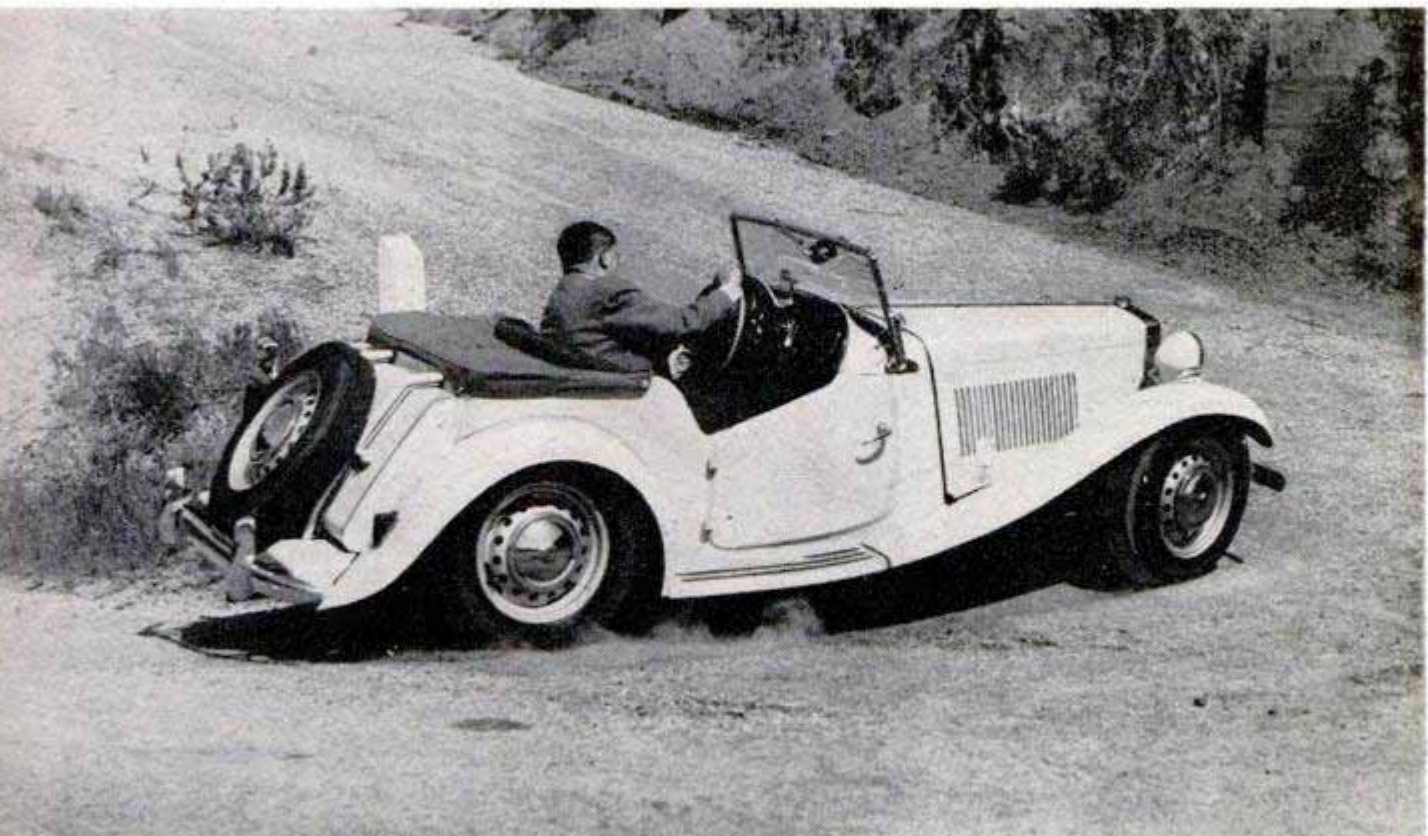
it. I find myself wanting to do all the polishing and simple maintenance work myself in my spare time. The little car has zip, dash, character and a good personality."—Wrentham, Mass., lawyer.

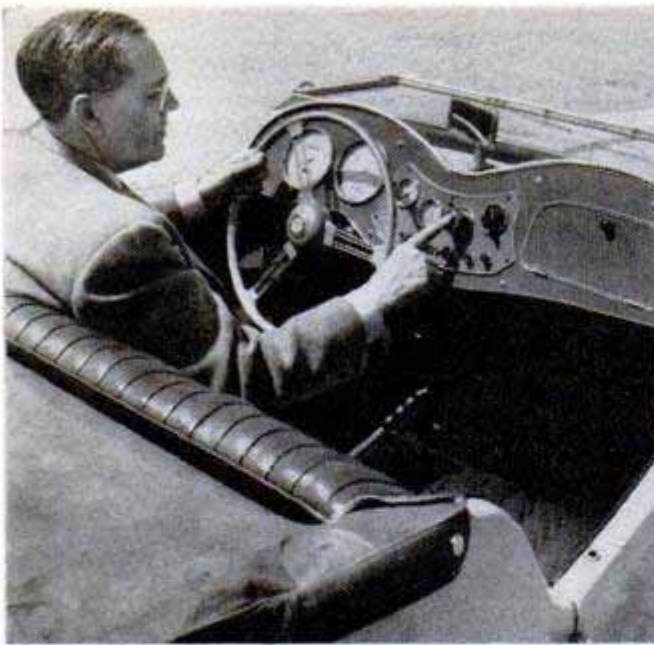
"I hope Detroit wakes up some day and gets something just half as good on an assembly line."—Crestline, Calif., Air Force officer.

"I enjoy driving it as I have a sense of being part of the car rather than having just a means of transportation. This is partly because of the need for constant shifting, the sound of the high-r.p.m. motor and the responsive steering."—Thiensville, Wis., industrial engineer.

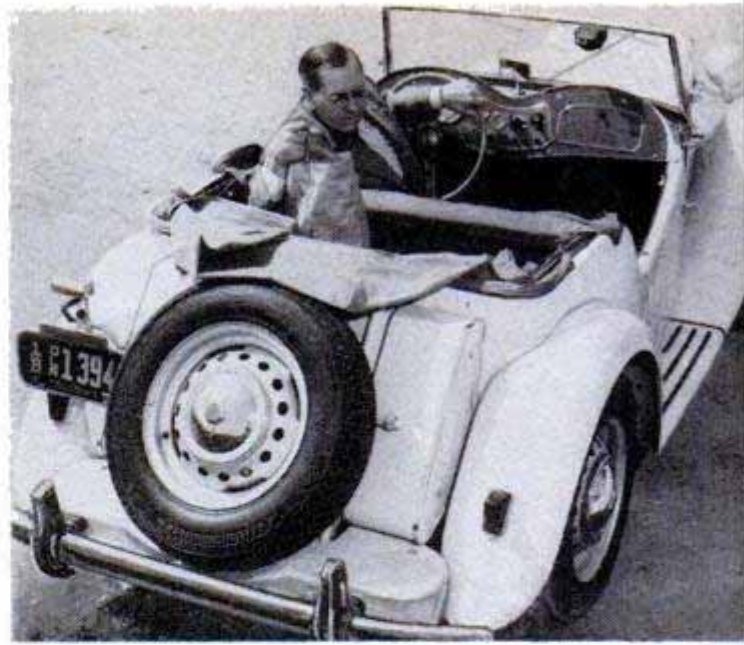
"The car should have a 6-volt electrical

Short turning radius of the MG (complete circle in less than 16 feet) makes it a pleasure on quick turns





Clymer touches horn button on the MG, oddly placed in center of dash in a unit with the dimmer switch



Luggage space back of seat may be large for a midget car, says Clymer, but small by U. S. standards

system as the 12-volt system is harder to service in the U. S. Otherwise it's a fine car."—Los Angeles, Calif., broker.

A La Grange, Ill., manufacturer's agent and a Dumont, N. J., engineer agreed on one thing. The first said, "Definitely they are cars for men. Married women are a detriment to their sale. They want a utility car." The second said that MG has a real future in America "only if women allow the men in the family to choose the car to be purchased."

At least two woman owners contradicted this masculine opinion. A Milwaukee, Wis., fashion designer wrote, "Every girl should have one." A Portland, Ore., secretary said, "For me it's the ideal car. . . . Practical, easy to keep up and service myself. Also, there's the woman's angle. The MG has a certain style of its own."

"My MG costs little to run, has very good roadability, it's an awful lot in a small package and, above all, it's the cutest car."—Brooklyn, N. Y., nurse.

"From the woman's point of view, the MG has a lot to offer. . . . Why would anyone want an American car?"—New Orleans, La., secretary.

As always, some objections arose. These included:

"Too small, hard to get in and out of, poor resale value."—Montclair, N. J., physician. (Conversely, a Beaver Falls, Pa., insurance agent remarked: "I weigh 230 pounds and am 6 feet tall but can slide in and out of my MG without difficulty.")

"I have been backed into three times to date by people who seemingly did not see the car. There appears to be no solution unless the American public is educated to watch more closely."—Piedmont, Calif., draftsman.

"Repair work on my MG runs higher than I figured it would when I bought it. Too many repair men figure any man with a foreign car has plenty of cash in the bank."—Milwaukee custodial worker.

"Sports cars are slow to sell as used cars."—Flint, Mich., jeweler.

"The worst part about owning an MG is the price of a heater, radio, luggage rack, etc. They are way too high and since the MG has a 12-volt system you can't buy electrical accessories from other local dealers."—Union, N. J., factory foreman.

Some more miscellaneous reactions of the survey included:

"Rings and bearings on the MG show much more wear than those on American cars, because of the constant high engine speed."—Winnetka, Ill., research engineer.

"Not enough 'guts,' poor workmanship, poor engineering, won't stand rough treatment."—Longview, Wash., machinist. (This complaint was the only one of its kind in the entire survey.)

"Can't read the instruments at night. . . . The MG could use an additional 15 to 20 horsepower."—Burbank, Calif., advertising artist.

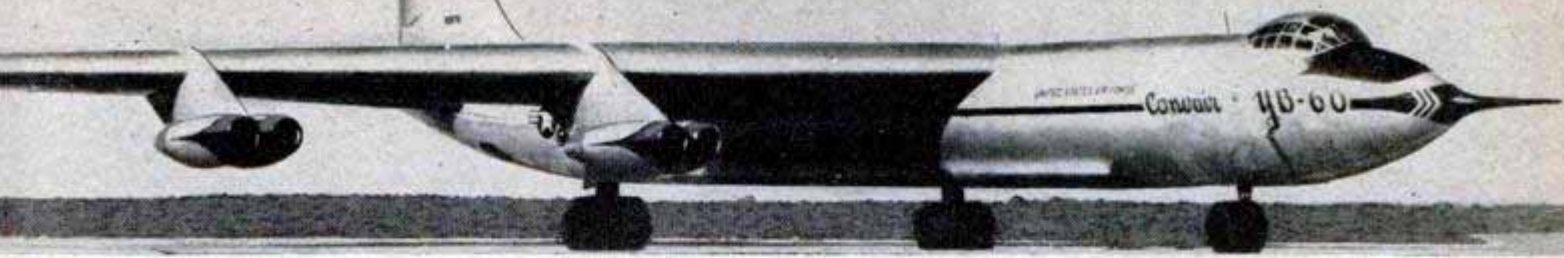
"Should be more powerful with the great highways we have."—Los Angeles investment broker.

"In extremely cold weather, visibility is poor. Windshield continually fogs and freezes."—Chicago salesman.

"People always are touching and playing with the car when I park it."—Oakland, Calif., airline inspector. (This complaint was noted several times.)

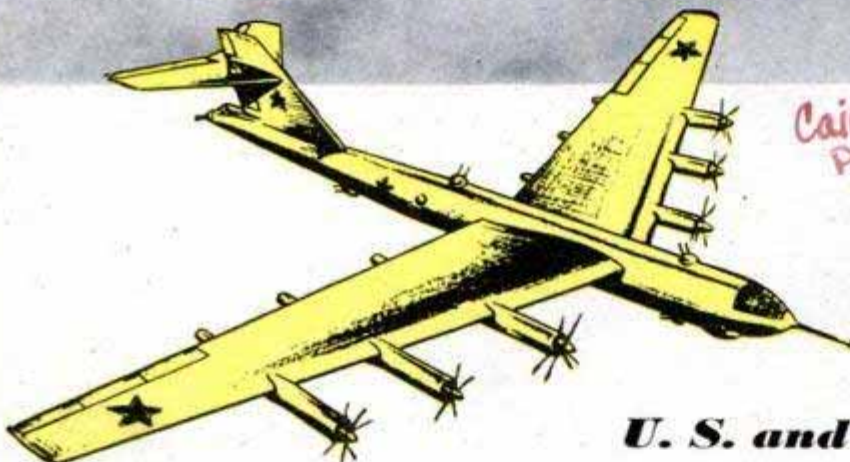
The most common complaint about MG's Midget TD model was a minor one—many don't like the canvas top and side windows.

(Continued to page 240)



First flown in April, the YB-60, above, was built for the Air Force by the Consolidated-Vultee Aircraft Corporation. Slung beneath its wings are four pairs of J-57 turbojet engines whose total thrust equals nearly 80,000 horsepower, about four times as much as the giant B-36's six piston engines now produce

Weighing approximately 175 tons, the YB-52, below, is capable of speeds as high as 550 miles an hour. Its eight jet engines are the same as those powering the YB-60. In the nose of the Boeing-built bomber is a new sight designed for precision bombing at altitudes above 10 miles with visibility at zero



Cain + VORDEN - "MILITARY AIRCRAFT"
 PUBLISHER: HERBERT JENKINS
 3 DUKE OF YORK ST.
 LONDON S.W.1

HEAVIES

U.S. REP: LAWRENCE V. FAIRMALL
 231 So. LA SALLE ST.

U. S. and Russian Air Forces

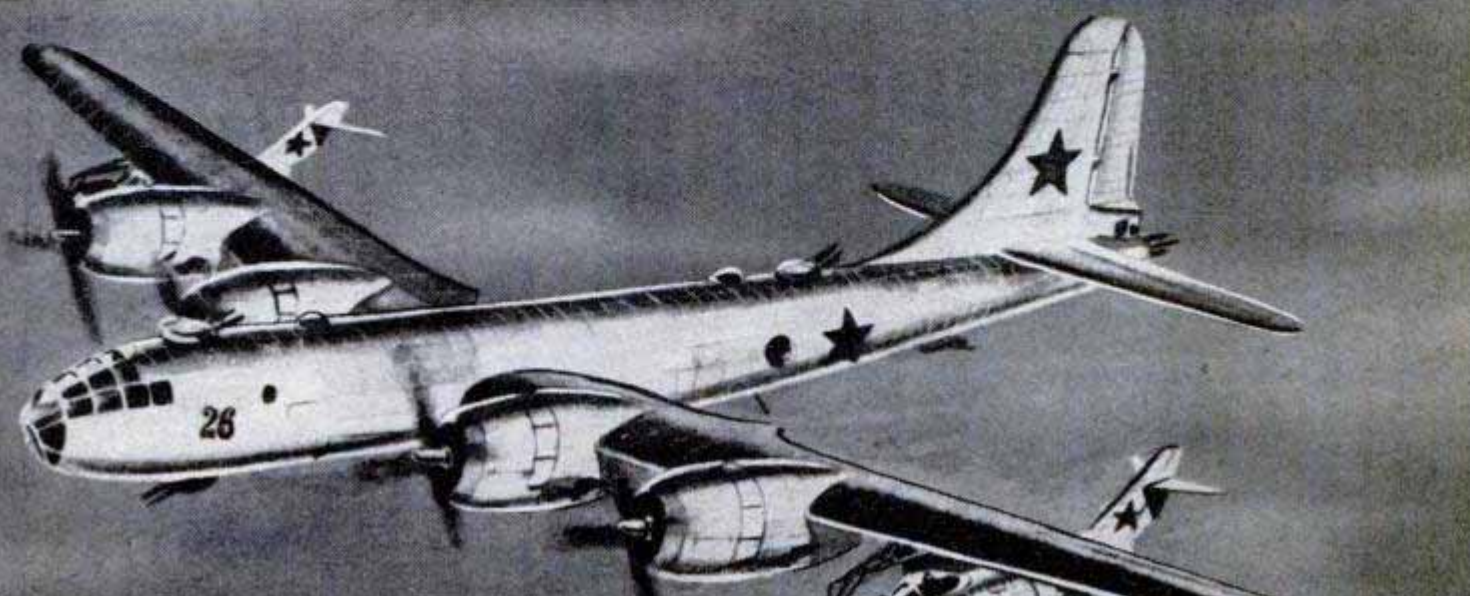
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Boeing Magazine

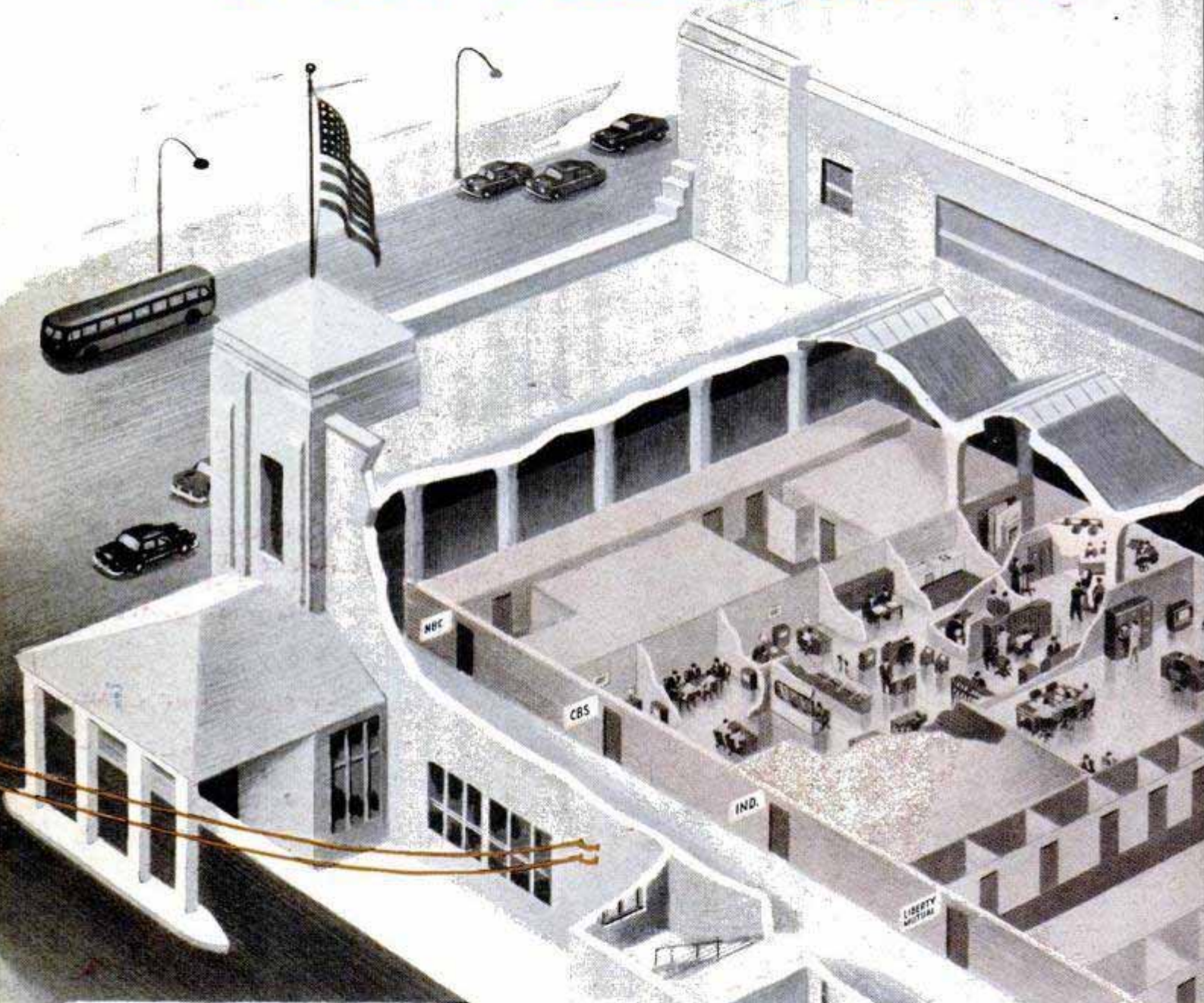
Drawn by British artist James Hay Stevens, using data brought from behind the Iron Curtain, the Russian intercontinental bomber, above, is about the same size as the B-36. Reportedly it is powered by six turbojet engines and is believed to have a range near 10,000 miles. Its 22-man crew functions in shifts

Two MIG-15 fighters can be carried on hooks under the wings of a Soviet TU-4, below, economizing on fuel consumption for the small craft. Based on the American B-29, the Red bomber has turbojet engines copied from the Rolls-Royce "Nene" design. There is also a Russian transport version of the same plane

From *Military Aircraft* by Cain and Vorden

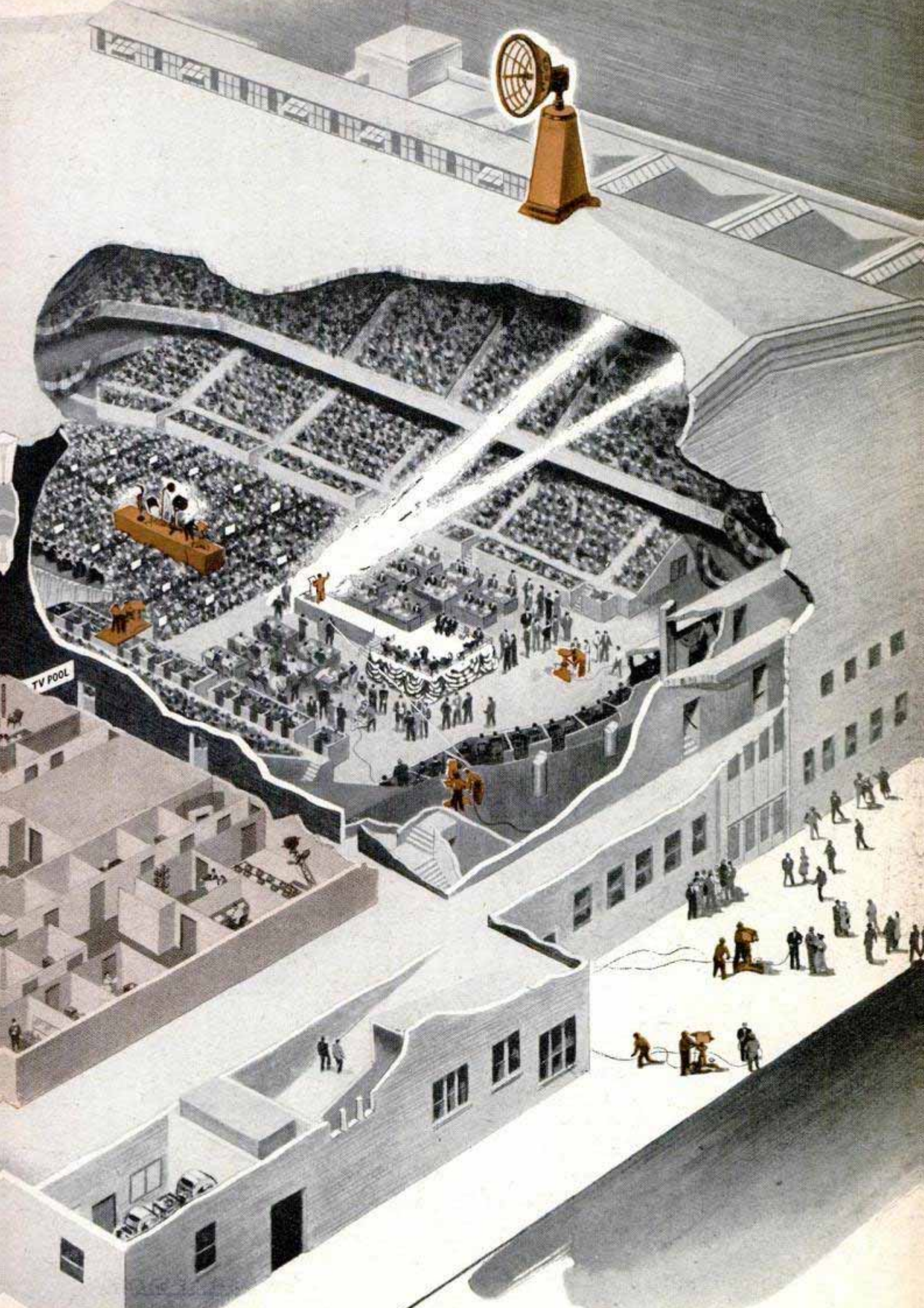


TV Goes to the CONVENTIONS

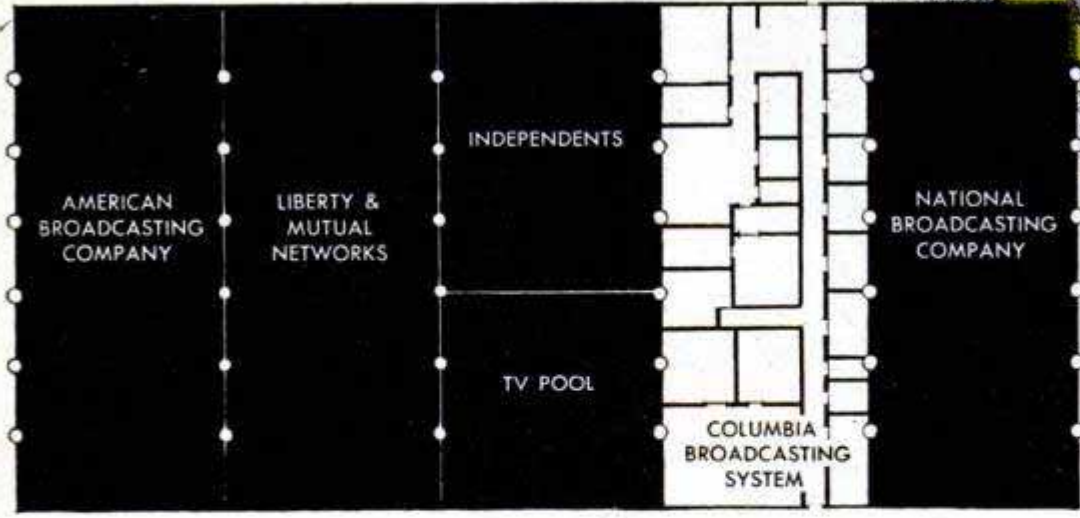
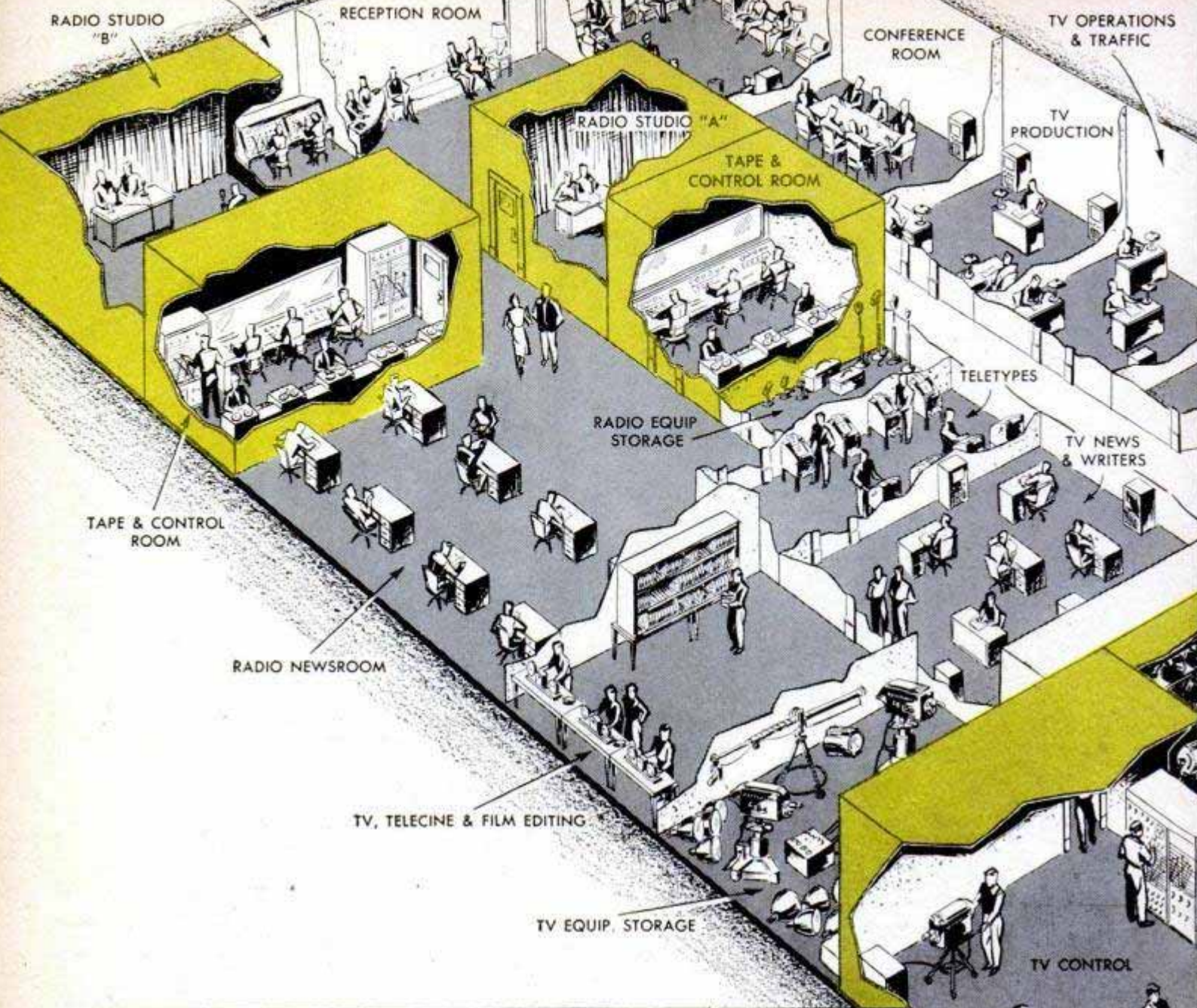


ACCORDING to estimates, about 60 million people, or 40 percent of the nation's population, will watch the political conventions this summer on more than 16 million TV sets. The largest concentration of television equipment ever assembled will beam the convention to the nation. These four pages of drawings show how it will be done. One entire wing of Chicago's Amphitheatre will be given over to television and radio studios and equipment. Cable is being laid to every vantage point in the building and live pickups will be made at the entrances. An antenna on the roof will pick up remote broadcasts from hotels and rail terminals. Cameras on special pedestals will televise the convention proceedings from several points inside the vast main hall of the Amphitheatre





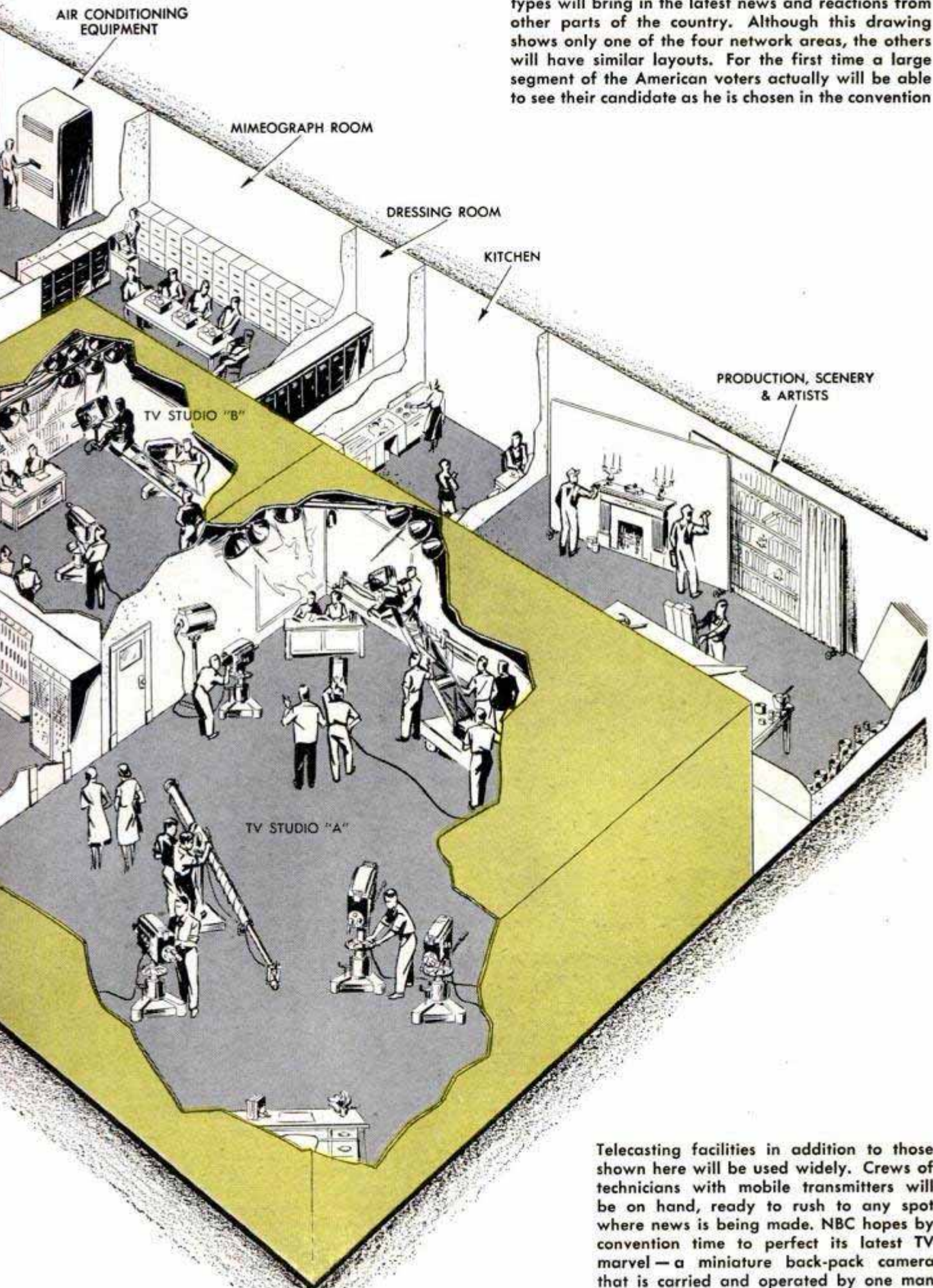
TV POOL



Big wing of the building is split into five similar sections—four for the major television networks and one to be used jointly as a TV pool which also will serve the independents. The area in white shows the floor plan for one network. The cutaway drawing shows how this section will be split into studios and control rooms. Each of the rooms with colored walls and ceilings will be soundproofed. The remaining

rooms will be built with temporary partitions. Studios permit interviews and comments whenever there is a lull in the convention proceedings. Telecasts from various parts of the building and from several strategic spots in Chicago's Loop will be funneled into the control room. There technicians will be able to choose the most interesting picture to transmit to viewers watching video screens across the nation

In addition to the studios, other rooms in the layout will be used for film editing and storage, headquarters for TV and radio newsmen, lounges, conference rooms, a scenery room and a complete kitchen. Teletypes will bring in the latest news and reactions from other parts of the country. Although this drawing shows only one of the four network areas, the others will have similar layouts. For the first time a large segment of the American voters actually will be able to see their candidate as he is chosen in the convention



Telecasting facilities in addition to those shown here will be used widely. Crews of technicians with mobile transmitters will be on hand, ready to rush to any spot where news is being made. NBC hopes by convention time to perfect its latest TV marvel — a miniature back-pack camera that is carried and operated by one man



Plastic Car-Body Kit

You can build your own high-performance sports car for less than \$1000 by reshaping the frame of a secondhand Crosley and installing a new lightweight, low-slung plastic body. The original engine of 26 horsepower can be rebuilt to produce 46 horsepower and give a road speed of 95 miles per hour and more. Other small engines up to the V-8 60 may be used, or a motorcycle engine of the 500-c.c. class may be mounted over the rear wheels for a rear-engine installation. The plastic body weighs 100 pounds exclusive of glass and hardware and sells in kit form for \$445. The kit consists of the body itself, deck lid, hood and rear bumper plus instruction sheets and draw-



ings. Windshield assembly, hydraulic brakes and an all-weather top are available also. The average mechanically inclined owner can make the complete conversion in 100 to 125 hours.

Chrysler Experimental Sports Car Produced in Italian Shop

Trying to combine features of sports-car styling with some elements of practical automobile design, Chrysler has come up with its C-200 convertible. All plans for the experimental model were completed in Detroit but actual body construction and as-

sembly were done in Turin, Italy, by Ghia, custom-body builder. The car stands less than five feet high at the top of its windshield. A long hood line and large, fully exposed wire wheels show the European sports-car influence as do the straightfor-



ward grille and closely set headlights. Front and rear fenders blend smoothly into the body structure although the front fenders are outlined sharply forward. The engine is a standard Chrysler Fire-Power V-8 and the frame also a standard 125½-inch production job. Instrument panel is typical of the sports car with individual instruments, including a tachometer, rather than the cluster of the modern American car.



Detroit Listening Post

By Siler Freeman

IT IS PROBABLY a good thing for the old-line automobile manufacturers that many of their customers do not get to see sports-car displays. One such as was held this spring in New York's Grand Central Palace might cause some dissatisfaction with the efforts of the car designers to please the mass market.

Many of the cars at the sports show were ordinary makes like Chevrolet, Buick and Cadillac. But by paring off some of the chrome, hammering out a different-styled hood and making a few other deft changes, a stockcar took on a custom air.

The epidemic of "dream cars" brought out this year by the industry indicates some thought is being given to different-looking cars. The latest dream car may be one of the few to find its way into the market. This is Packard's sports roadster, a three-seater called the Pan American. It has the same Packard chassis and 175-horsepower power plant under a specially built body. The drawback? Its price can't even be held within four figures. In mass production, however, it could be brought down considerably.

Both Packard and Chrysler have revealed a trend in their dream cars that may be a welcome revival. Both have shown wire wheels on their custom jobs. The wire wheels serve a dual purpose as well as look attractive—they help keep the brakes cooler and they give a "softer" ride.

Wire wheels were once the rage but went out before the heavy-looking disks of steel. They may make a comeback, as has the spare wheel hooked onto the rear deck. It remains only for running boards to reappear and the spare wheel will again be set into them.

Despite the apparent stodginess of the industry in regard to new body designs, its mechanical improvements continue to advance. Power brakes, power steering, more powerful yet more efficient engines and the automatic headlight dimmers—to say nothing of further advances in transmissions—are some examples of what is keeping engineers on their toes.

The hottest item since the automatic

transmission is power steering. And it seems to be receiving parallel acceptance. Like Hydra-Matic, it will grow faster when increased volume reduces cost.

Don't think automatic transmissions have reached their end of improvements. All types are undergoing constant study to make them more efficient.

Chrysler is expected to be the next to come out with a new type of automatic transmission. It has one now that is semi-automatic but the next one will be fully automatic.

And that brings up the question of what it will do for Plymouth. The first step recently was taken when the company announced an automatic overdrive at extra cost. But that does not meet the competition of Powerglide or Fordomatic. Tool ordering is being watched for a clue as to what Plymouth will have for 1953. It's almost certain the car will have an automatic transmission.

Tooling orders already placed by the car manufacturers indicate 1953 will be a better-than-average new-model year. Power-plant changes are certain and so are new body designs for companies which did not introduce them for 1952.

This could include most of the Chrysler divisions, Buick, Pontiac, Chevrolet, Hudson and Kaiser-Frazer. Ford and Nash will stand by their present models.

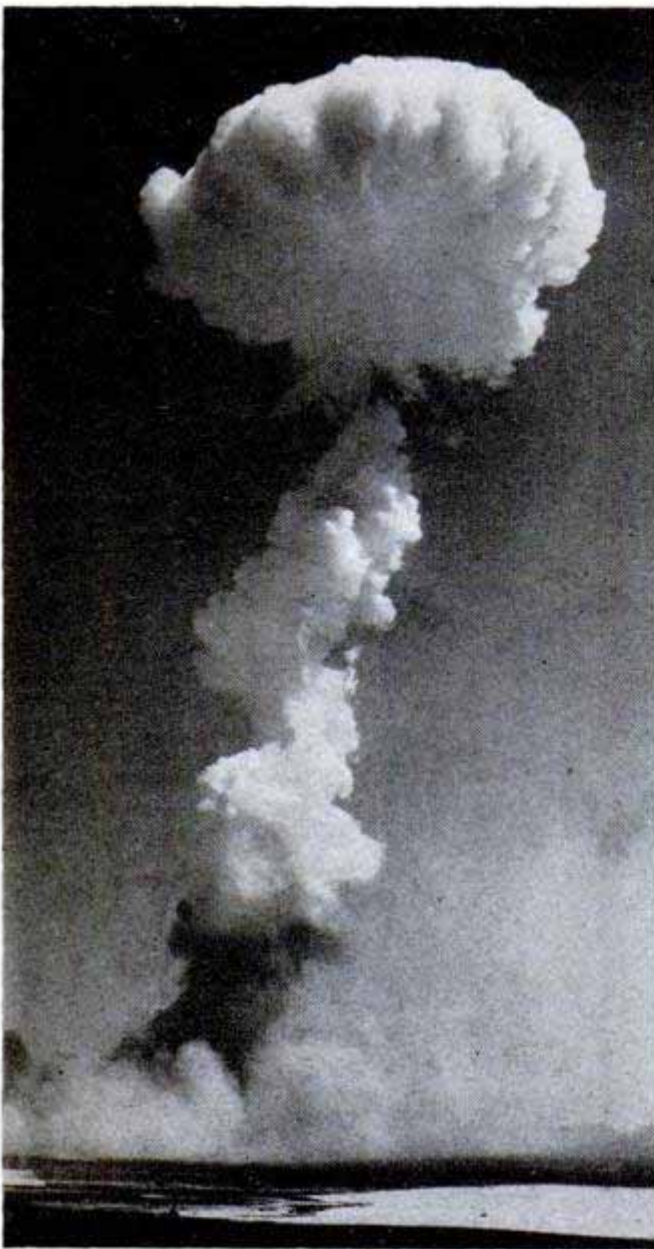
The change this year may be the earliest in some time. It has been whispered that Chevrolet will be ready early in the fall with its challenge to the restyled Ford.

The horsepower race may make 1953 the year when the first 200-horsepower engine is seen in a stockcar. But it is not through any desire of the competing companies. In fact, the leaders are a little sorry they ever started the whole thing.

The engineers themselves disclaim any part in this race or even that it is a race. They intimate it was the sales departments that emphasized the tremendous power. All the engineers sought was more efficiency.

But there seems to be no way for the competition to stop now. That is, short of a 200-horsepower engine.

Scientists Study A-BOMB BURST



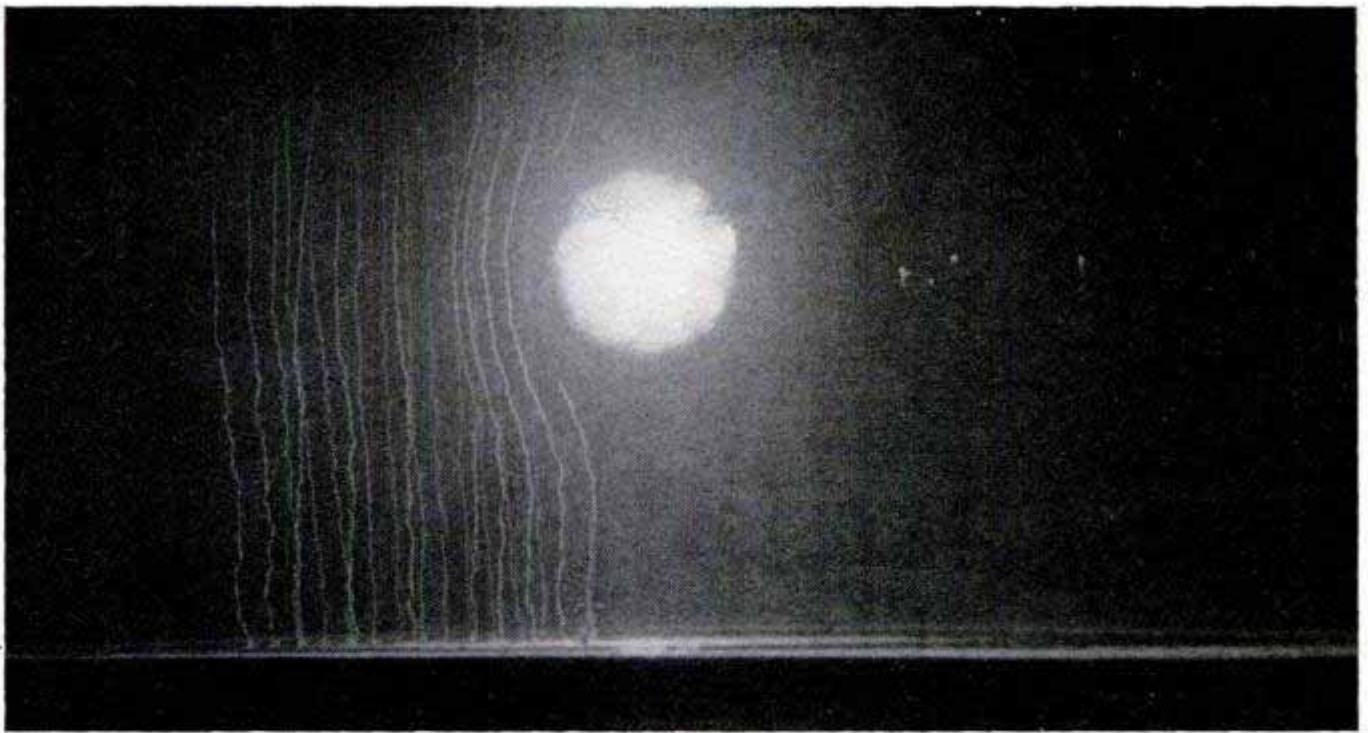
WHAT the awed spectators saw 11 miles across the Nevada desert last April was the biggest ball of atomic fire ever unleashed. What the eyes and ears of the Army and the nuclear scientists recorded was a gigantic secret on strips of film from cameras and sensitive instruments focused on Operation Big Shot from circling reconnaissance planes and distant mountaintops and bunkers ranged from the fringe of the blast area to ground zero.

The test proved that ground troops can move safely into the explosion area one hour after the bomb goes off. Monitors, checking for dangerous radioactivity, moved in almost immediately. The bomb was detonated at a height of 3000 to 3500 feet to prevent radioactive contamination of the ground. Military experts are weighing the advantages of this against an explosion closer to the earth that would have been more destructive to defenses. In the April test, some 2100 soldiers, including paratroops, were dug in four miles from ground zero. After the explosion, the paratroops were flown over the area and parachuted to earth.

A study of the radioactive clouds that formed after the explosion was made from numerous aircraft, including jets. These planes took samples of the air at various

Within a minute after the initial atom-bomb explosion, a doughnut-shaped cloud replaces ball of fire. The cloud is 30,000 feet high. Below, 10 cameras project from side of plane to record the explosion





Bomb explodes in dazzling ball of fire. At left, the smoke trails from rockets measure motion of air

levels to measure radioactivity. All the planes that went up after the explosion were carefully checked when they landed for deposits of radioactivity.

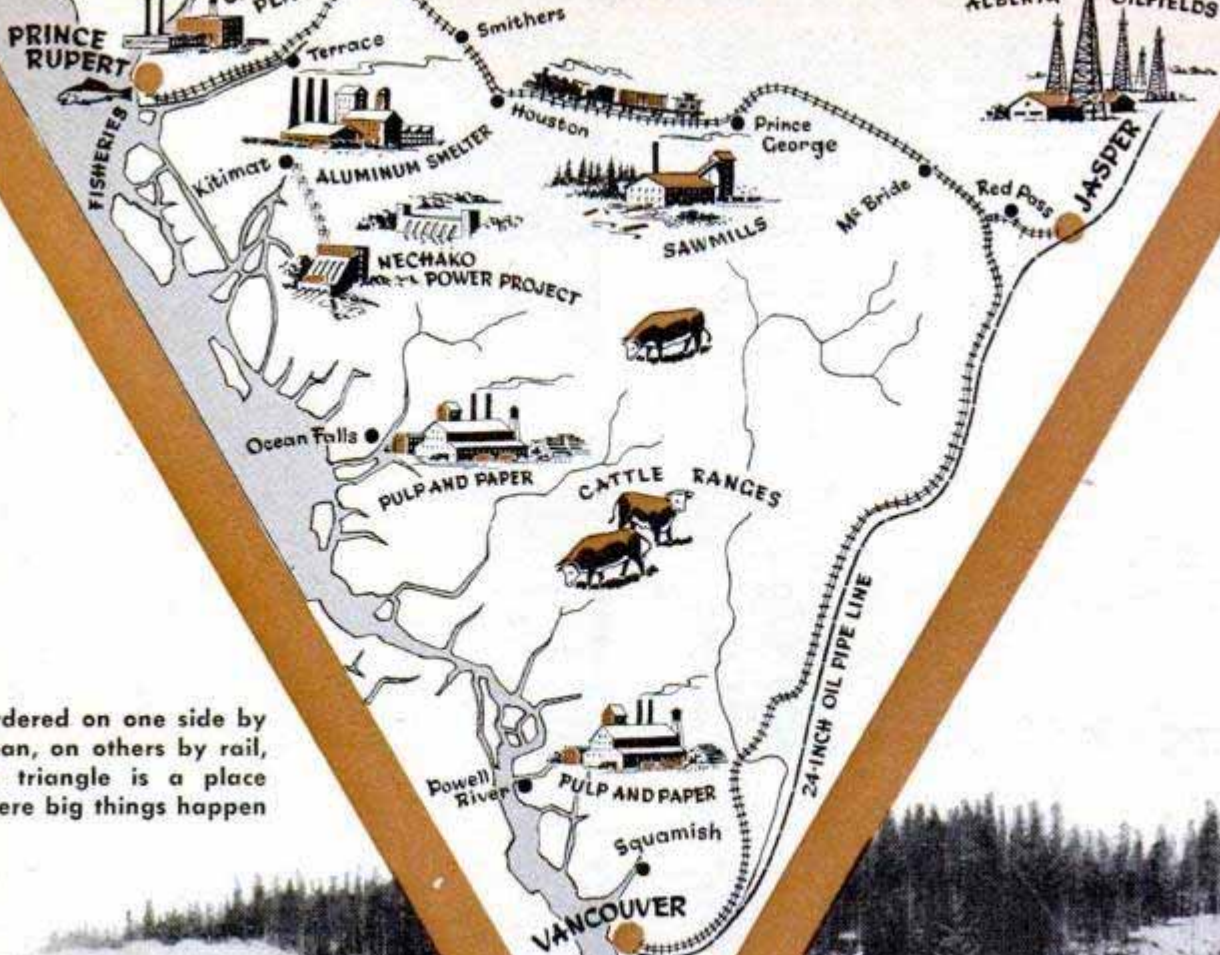
Of vital interest, also, was the problem of delivering the bomb to its detonation point. As the bomb was exploded in a troop maneuver, the direction and velocity of the wind were of extreme importance. Last-minute measurements were made with captive balloons. The bomb, dropped from a Boeing B-50 at 30,000 feet, exploded only 200 feet in a lateral distance from the planned position.

The April maneuvers were a continuation of the studies described in the March issue of *Popular Mechanics* under the title "The Army Meets the Big 'A.'" ★ ★ ★



Helicopter, above, carries TV antenna to mountaintop relay point, below. Wing tank of jet plane, lower left, was adapted to sample air for radioactivity

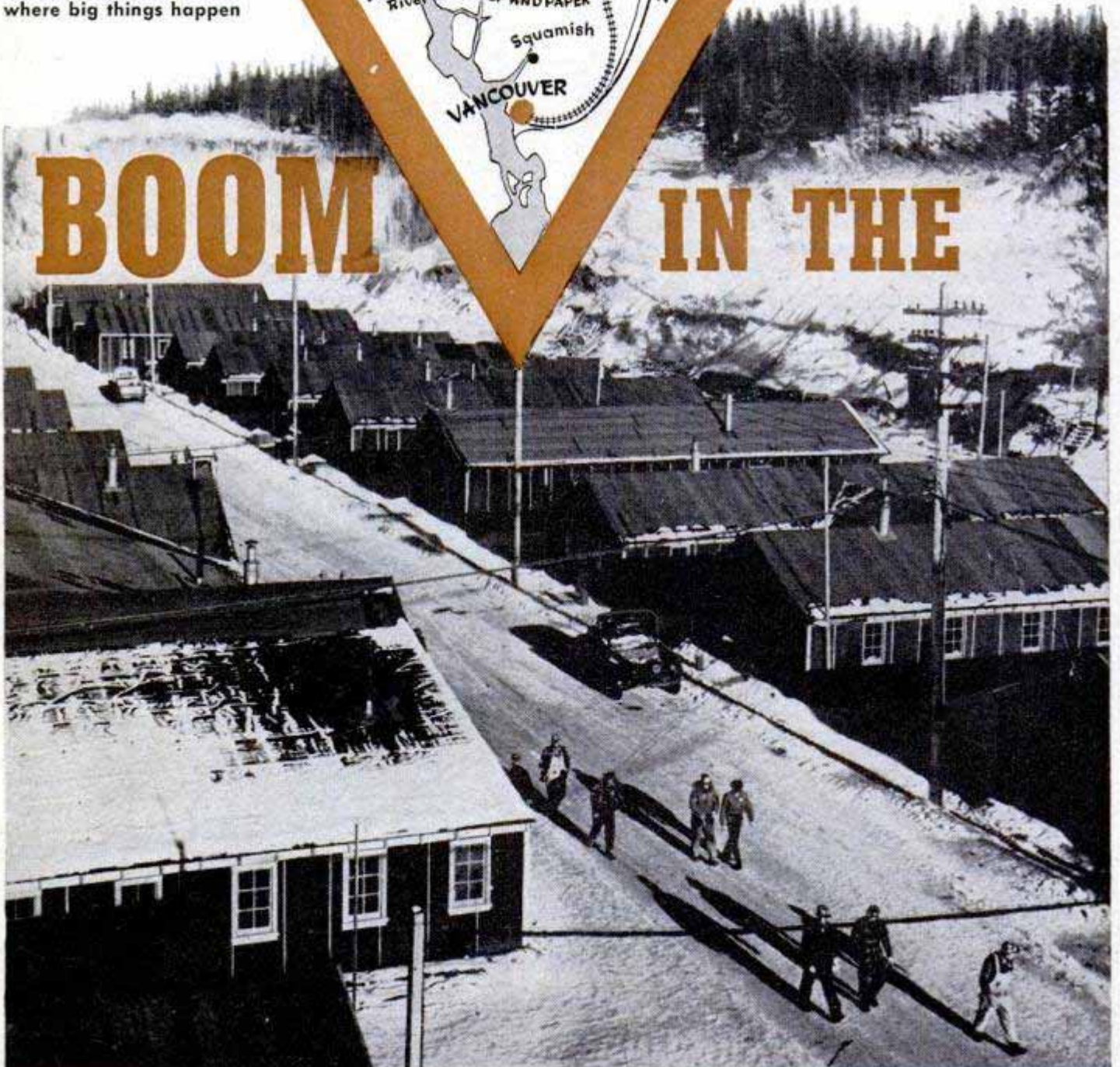




Bordered on one side by ocean, on others by rail, the triangle is a place where big things happen

BOOM

IN THE



Part I

WHEN PREMIER Byron Johnson, bossman of Canada's most westerly province, described the building of a 700-mile oil pipe line as "the biggest thing that ever happened to British Columbia," he was taking in a lot of territory.

So many "biggest things" have been unloading on B.C.'s industrial doorstep that the terrific impact on its economy is difficult to grasp. Gigantic projects, sprung in overnight announcements, have involved investments of millions of dollars toward developing tremendous natural resources of the Pacific province.

The oil pipe line, while not utilizing a British Columbia resource but of distinct benefit to coastal enterprise, is the latest of developments marking two years of astronomical industrial growth.

Trans-Mountain Oil Pipe Line, backed by six major oil companies, ran its survey last

summer and estimates the cost at \$82,000,000. Late 1953 is the target for completion—when the 24-inch line will be primed to carry 75,000 barrels of Alberta crude oil a day; ultimately, 200,000 barrels.

For 500 of its 700 miles the oil line will snake through mountain valleys, climbing from Jasper, Alta., over Yellowhead Pass and skirting the base of Mount Robson, highest summit in the Canadian Rockies. Pumping stations will lift the oil over the coast range and down to Vancouver.

The route from Jasper to Vancouver follows one leg of a booming industrial triangle. This triangle—with its corners at Red Pass, Vancouver and Prince Rupert—fences a vast area of almost 150,000 square miles, a region of great waterways like the Fraser and Skeena rivers, forest and mineral riches, enormous power potential and resources in fisheries and agriculture.

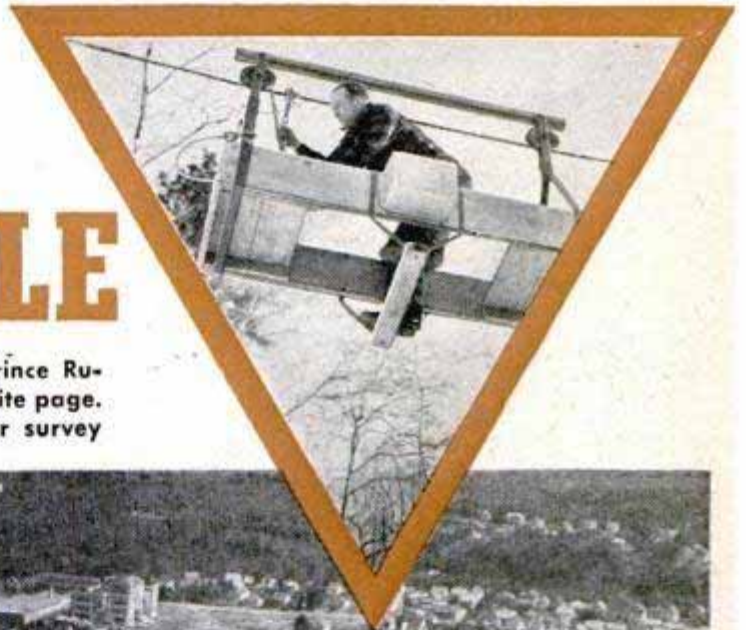
Flanked on two sides by rail lines forking out from Red Pass Junction and on a

By Harry Rowed

BIG TRIANGLE

Cities in triangle range from sprawling, modern Prince Rupert, below, to a work camp at Nechako Dam, opposite page. Insert, engineer rides cable over river on a power survey

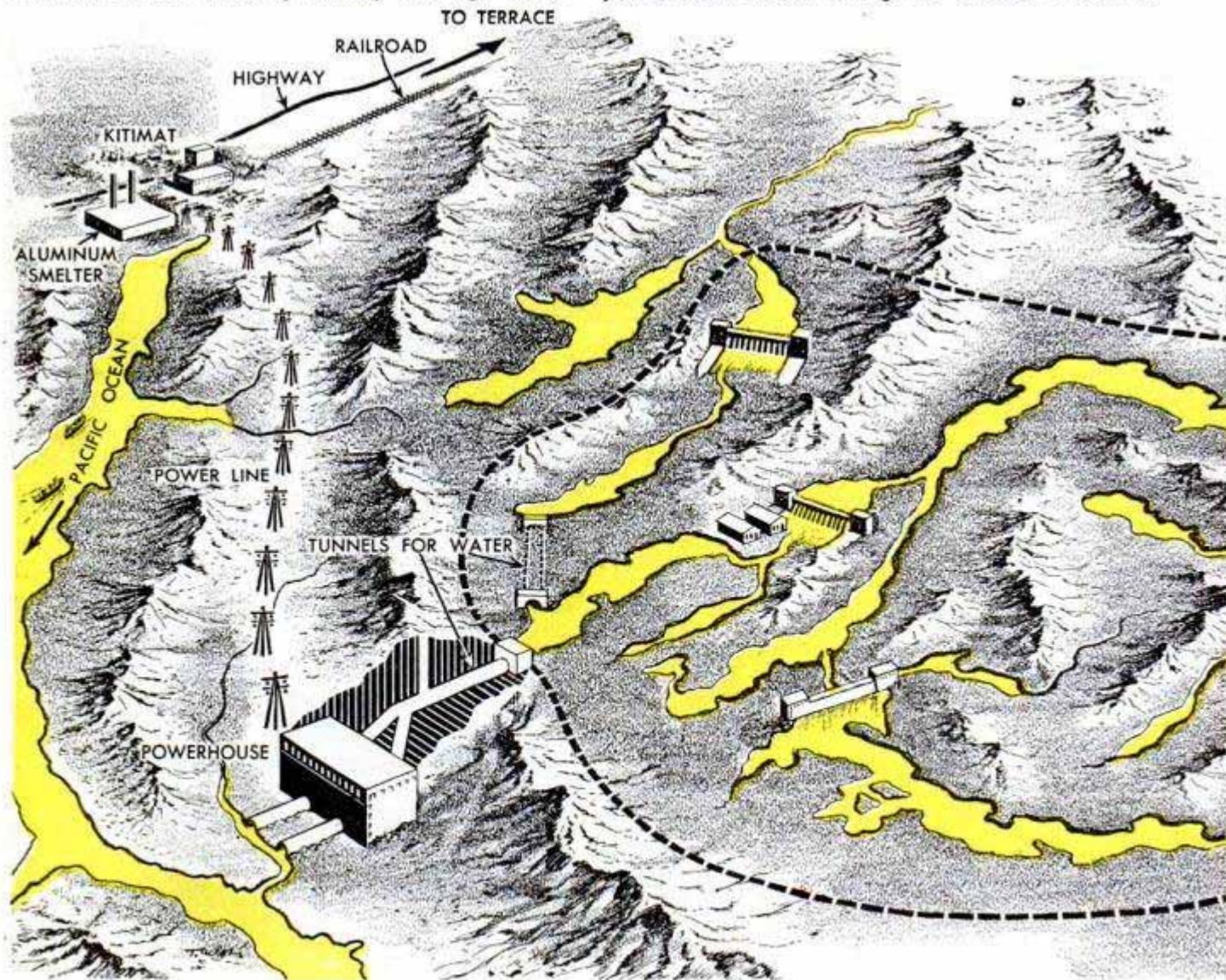
Wrathall photo

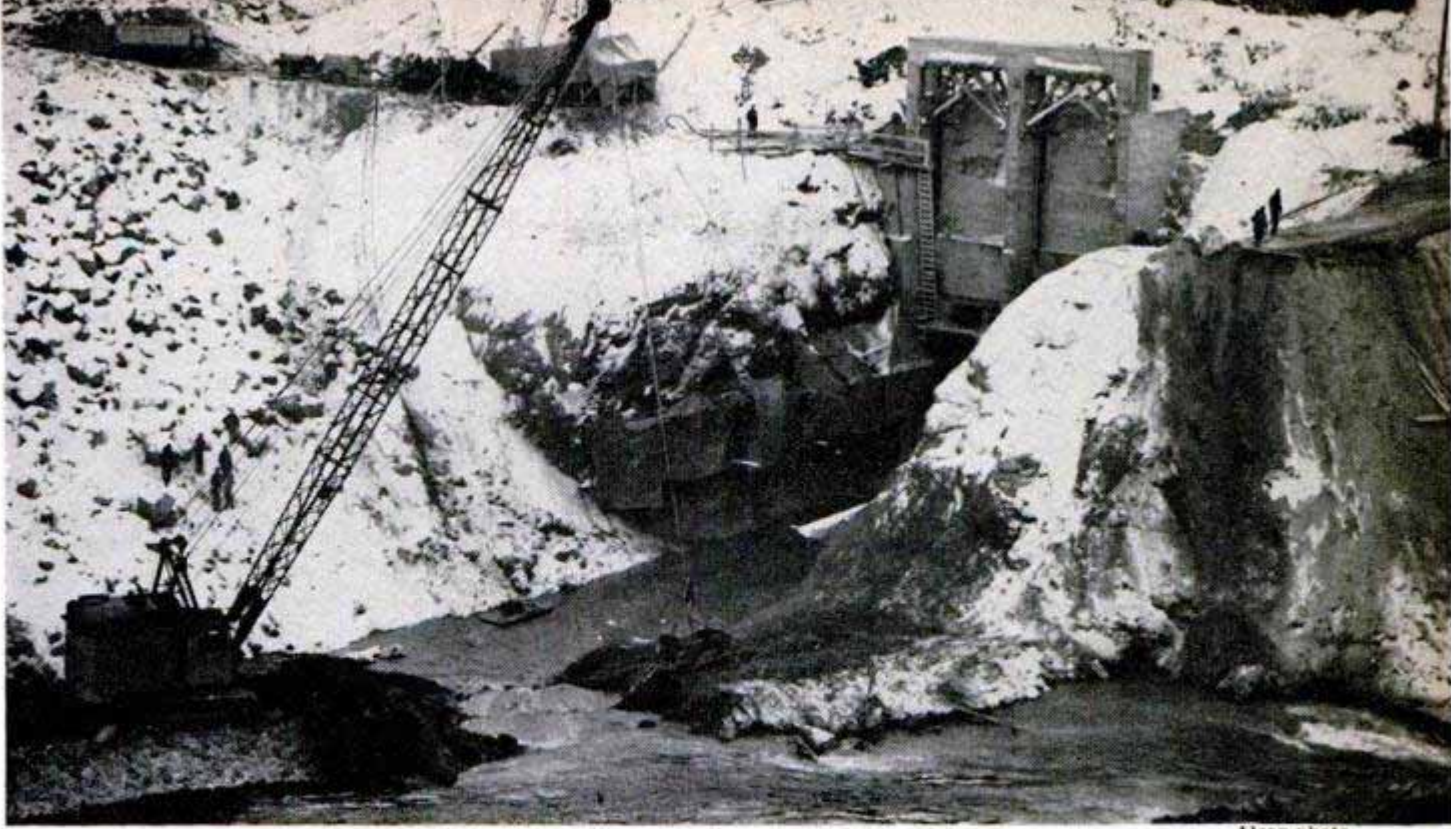




Above, salt-water lumberjacks take up slack on the thick cables around a giant raft of logs at Queen Charlotte Islands. Raft will be towed over coastal route to Powell River pulp mills. Secure lashings are essential because of the possibility of rough water

Below, the vast size of the Nechako-Kitimat project is shown here. The Nechako Dam is at extreme right. It will raise water level as much as 170 feet and reverse flow from east to west toward underground powerhouse. Power will go to smelter at Kitimat





Alcan photo

Diversion of water through tunnel at site of Canyon Dam on Nechako River was accomplished October 1951

third by the ocean span from Vancouver to Prince Rupert, the triangle is nurturing a healthy flock of young enterprises.

Here's the lineup:

The \$600,000,000 aluminum smelter and power project of the Aluminum Company of Canada is surging into its second year of development. Possible offshoots include a huge pulp mill and a fertilizer plant.

At Prince Rupert, Columbia Cellulose has announced a step up in production and plant expansion.

At Prince George, hub of the sawmill in-

dustry, a large tract of land has been purchased, probably for a pulp-mill site.

At Terrace, Canadian National Railways likely will step into first stages of construction of a rail line joining Alcan's Kitimat with the northern transcontinental route. A highway may parallel the railroad.

Oil and gas exploration, spurred by new discoveries in the Peace River region, blankets millions of acres. Seismic and geological crews have pushed by aircraft, tractors and pack trains from Alberta's northern muskeg far into the mountains of B.C.

Alberta's legislature authorized export of natural gas from Peace River to British Columbia and the United States. This means another big triangle pipe-line project.

A Dominion-Provincial Board study of economic and settlement possibilities of the Fraser River could result in a seaway project at an estimated cost of \$100,000,000.

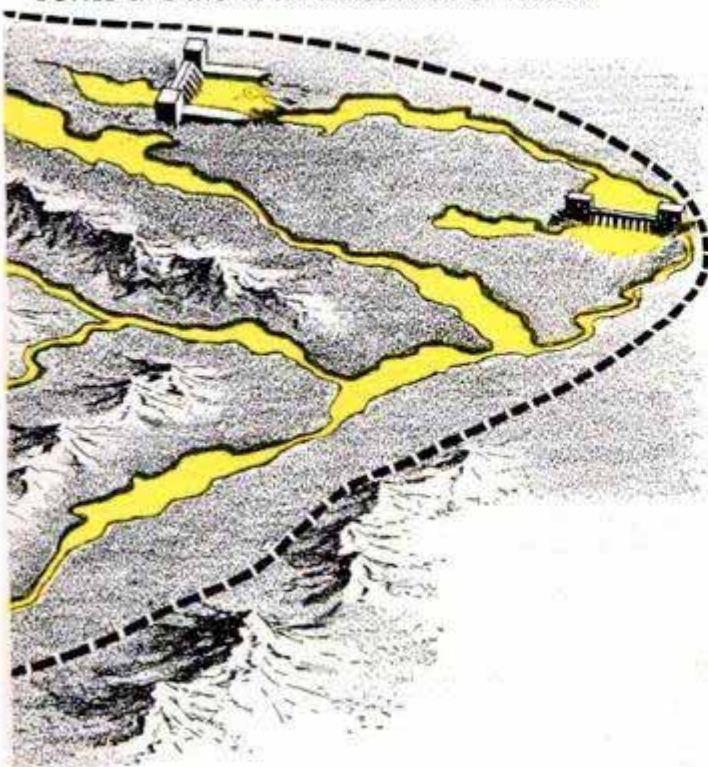
Demand for base metals has created intensive search and renewal of activity in the triangle's mining industry, particularly at Smithers, Hazelton and other north-line points. Important asbestos finds have been staked near Alaska Highway to the north.

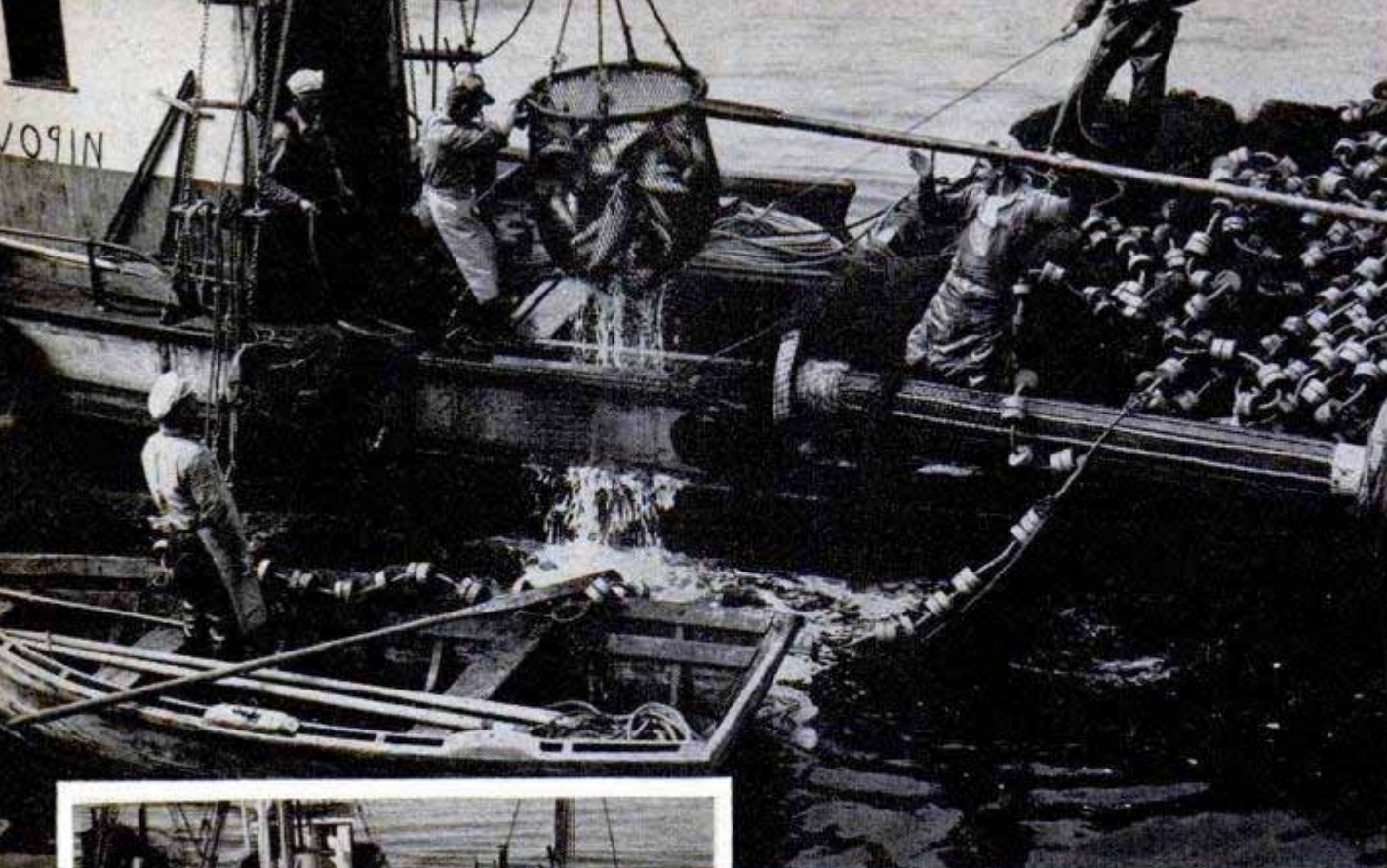
British Columbia Power Commission surveys indicated new power development along Quesnel River inside the triangle.

The new oil line from Edmonton to Vancouver could mean immediate start on construction of a good highway following explorers' trails west beyond Yellowhead Pass along southern border of the triangle.

For sheer prodigy and as a colossal feat in engineering, few construction projects match Alcan's power development 400

DOTTED LINE SHOWS DRAINAGE AREA OF PROJECT





National Film Board photo

Above, basic industry in Prince Rupert is fishing. Talk of the province's big expansion doesn't excite fishermen, who have average annual income of \$6600

miles north of Vancouver. This gargantuan plan spreads over 5400 square miles of rugged mountains, forests and streams.

When finished, it will provide British Columbia with two more superlatives—the biggest power-generating plant ever built and the world's biggest aluminum smelter.

The Alcan Story, first of all, entails construction of a great rock-fill dam in the Grand Canyon of the Nechako River. Four million cubic yards of fill will be dumped into this precipitous gorge to create a dam 1500 feet across and 325 feet deep.

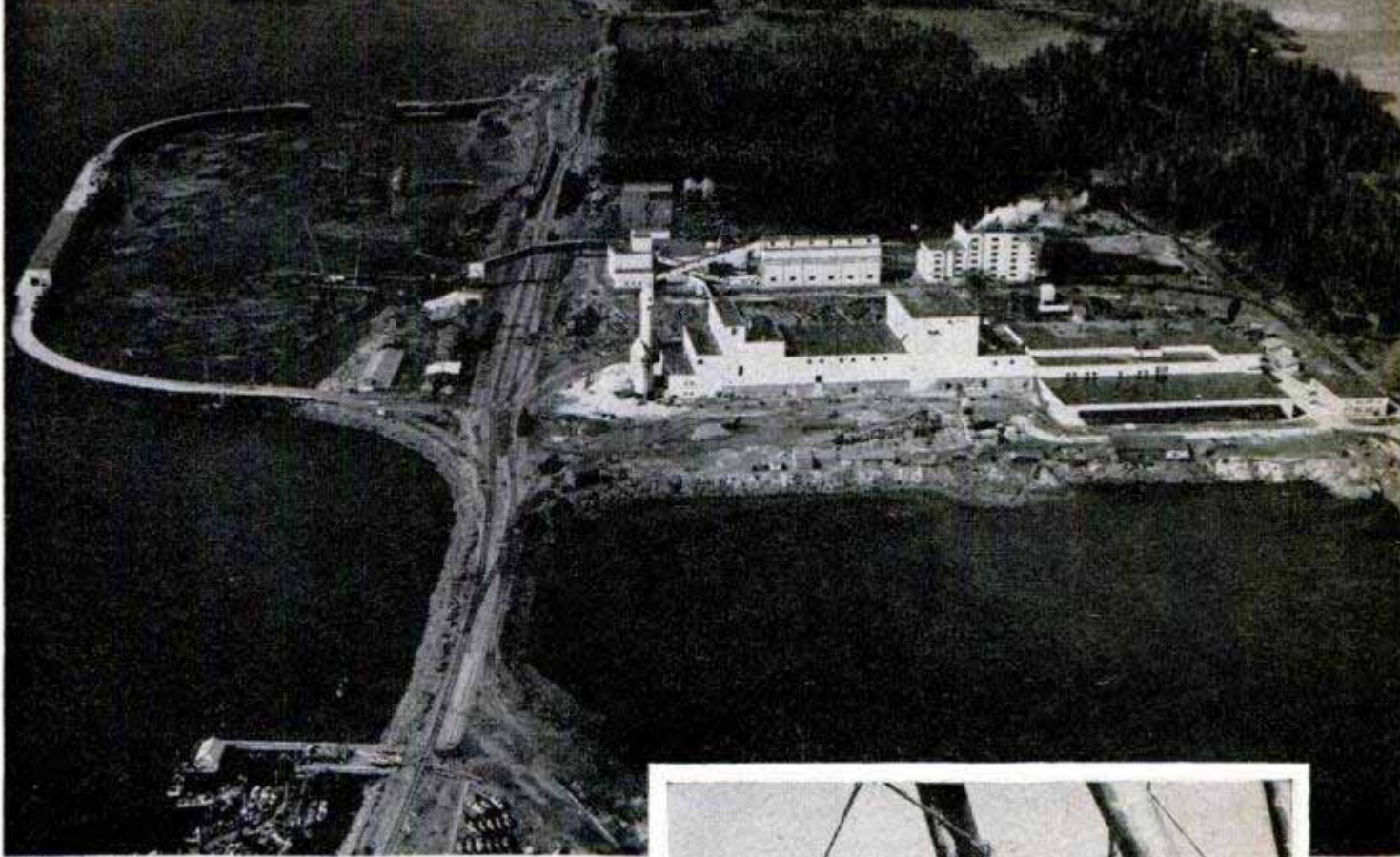
Slowly, over a period of four years, this manmade plug in the Nechako will back up waters which normally flow in the opposite direction. The balked river will retreat into a dozen lakes to form a reservoir with a surface area of 335 square miles.

Meanwhile, to the west, veteran hard-rock miners are sinking drills into the face of a granite mountain. From Kemano's compact camp of 2000 men on the opposite side of the peak, more drillers are biting into the rock. When the crews meet, a tunnel—a second tunnel is tentative—25 feet in diameter and 10 miles long will have been driven through the mountain. Then mountain-locked waters will thunder into the tunnel and tumble downward 2600 feet to Alcan's immense powerhouse. The powerhouse, to be completed by 1954, will be inside the mountain. A huge excavation to house three massive generators is being



Above, fishing boats at Prince Rupert. Below, these are frozen salmon in quick-freezing plant at Rupert. Temperature is 26 degrees below zero. Salmon is the most valuable catch of the fleet, with halibut next





Wrathall photo

Air view of the Columbia Cellulose plant at Prince Rupert. It produces more than 200 tons of pulp each day for shipment to producers of yarns and plastics

blasted and drilled $\frac{1}{4}$ mile into the granite.

Alcan engineers list three good reasons for building their powerhouse in a subterranean cavern. While cost of further tunneling from penstock to powerhouse will be high, steel pipe also is expensive—and scarce. An underground plant also will afford greater security in time of war. But principally they figure that the 6000-foot mountain holding down the powerhouse will serve as a useful overburden when Nechako's waters hit the turbines with a smashing pressure of almost 150,000 pounds per square inch.

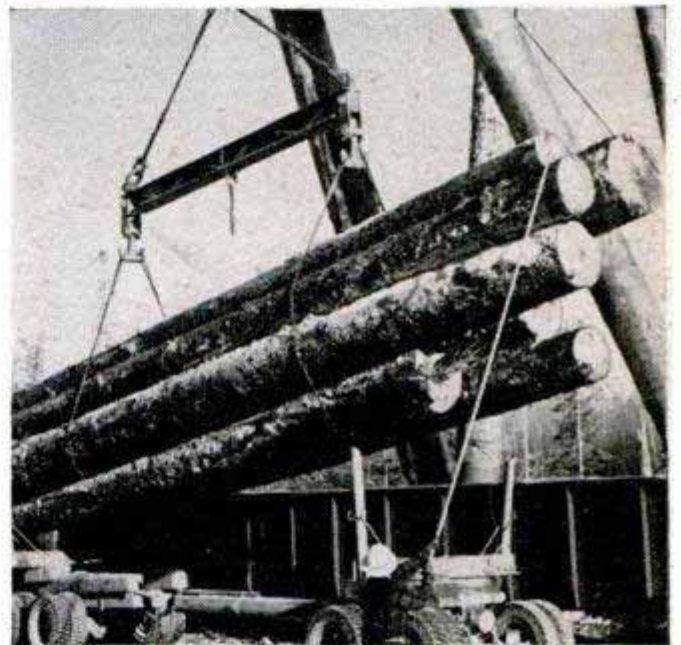
Power output in the initial stage will be 420,000 horsepower with the ultimate goal a staggering 1,657,000-horsepower output.

Why all the power? Simply that smelting of aluminum, an electrolytic process, consumes a colossal amount of electricity. If your home is average, you could provide yourself with 16 years of power with the amount required to melt enough ore to produce one ton of aluminum.

What will happen to the power from Kemano? Crews are building transmission lines to Kitimat, 50 miles over a serrated mountain summit from Kemano. They are following a survey made by helicopter-hopping engineers.

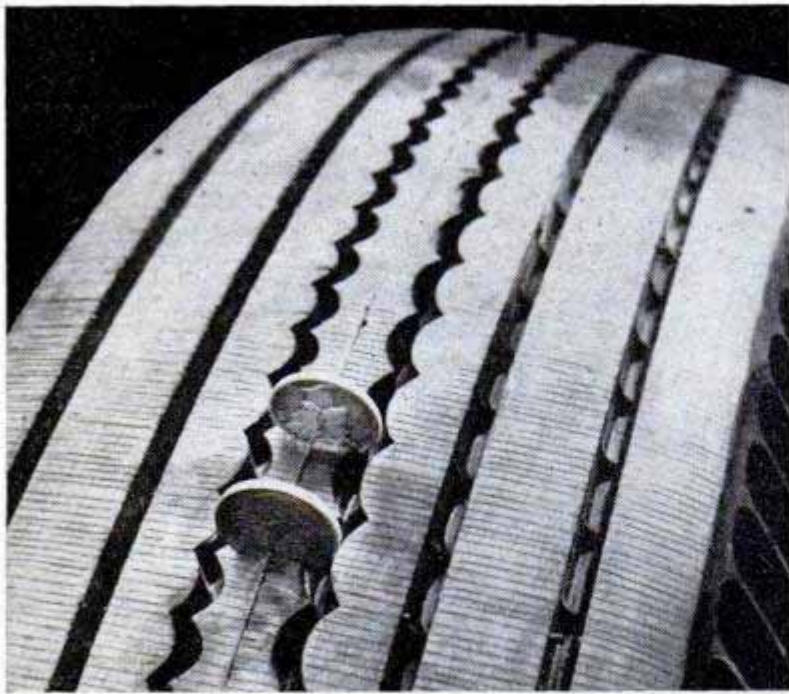
Kitimat (in Indian, "Place of the Melting Snows") is destined to be the king post in Alcan's B.C. structure. It is the site for the

(Continued to page 246)



Above, at Terrace logs fresh from woods are loaded on a train by crane for shipment to plant at Rupert. Below, long lengths of the timber are hauled up the jack ladder at Cellulose. Most of wood is hemlock





Antiskid Tire Tread Made of Tiny Blocks

More than 10,000 tiny blocks of rubber make up the tread of a new antiskid tire, acting as fingers to grip a wet or icy surface. The tire is the puncture-sealing tubeless type. The little rubber blocks are $\frac{1}{4}$ inch deep. As the brakes are applied the blocks separate into individual gripping surfaces. Tests indicate that the tire shortens stopping distance on ice up to 30 percent and on wet pavement up to 20 percent. When the tire is rolling, each block exerts a "walking" motion instead of the scuffing action of a regular tire. This tends to increase mileage.

"Tricycle" Sports Car

Capable of speeds up to 120 miles an hour, a three-wheeled sports car looks like a wingless jet plane. Built by Richard Harp of Boonsboro, Md., the 1800-pound car is powered by a 75-horsepower aircraft engine. It took Harp two years to construct the car, which he values at \$5000.



Airline Speeds Changing From M.P.H. to Knots

Beginning July 1, airline pilots in the United States will express air speed in terms of knots and distances as nautical miles. Air Force and Navy pilots already are using them as units of measurement and the standardization is expected to simplify things for both flyers and ground personnel. A plastic ring designed to fit around present air-speed indicators is being developed to facilitate the switchover to knots. It is calibrated so that the pilot can read his speed directly in knots without having to use conversion tables. New maps will have nautical as well as statute-mile scales. A nautical mile is 6080 feet (compared to 5280 feet in a land mile) and a knot is used to measure nautical miles per hour.

¶If you're discouraged because you feel there's nothing left to discover, take comfort from the fact that each year scientists find 5000 new kinds of insects, 2000 new kinds of plants, 500 new mollusks and 20 or 30 new mammals—but only two or three new birds.

Thousand-Mile Target Range

Stretching away from a knob of Florida coastland to the western tip of Puerto Rico is a 1000-mile swath of Caribbean water, a beautiful strip where the Air Force is playing hide-and-seek with some of the deadliest weapons ever developed. This is the target range for guided missiles, a proving ground for push-button warfare. On seven scattered islands men hunch over instruments, tracking the missiles that roar overhead. For the exciting story of these trail-blazing flights, read "Thousand-Mile Target Range" in the July issue.

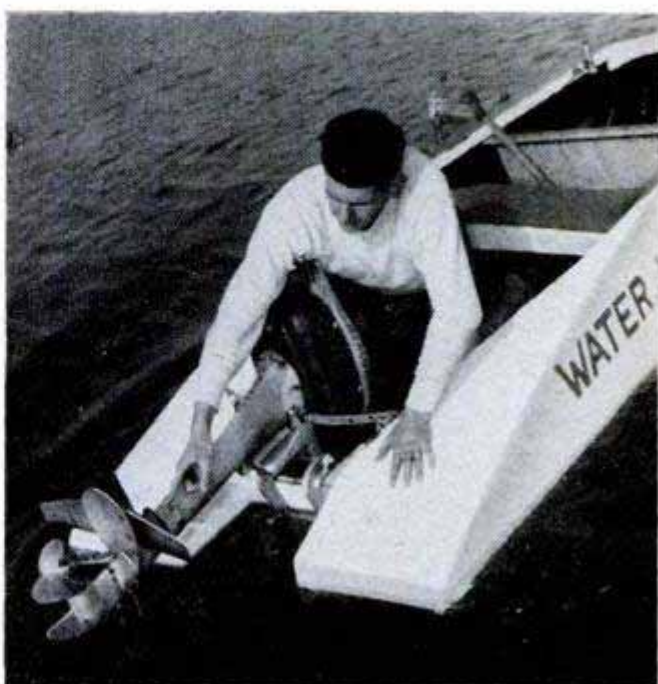
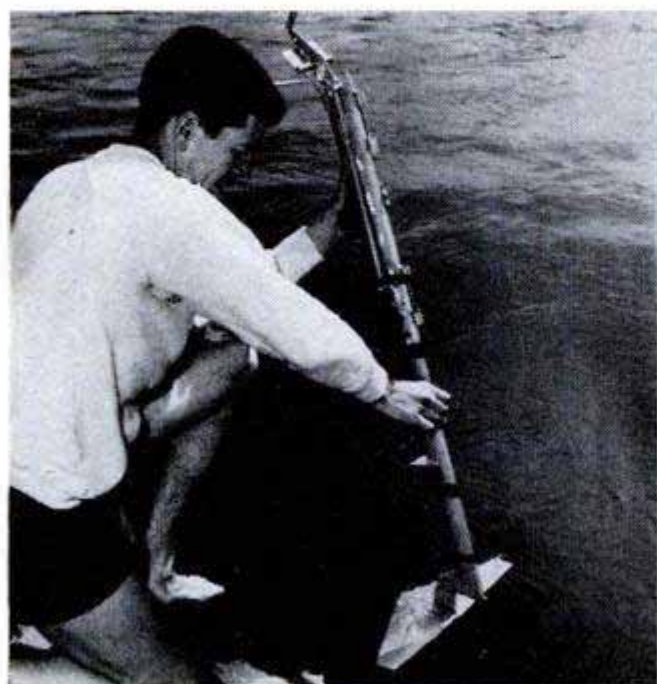
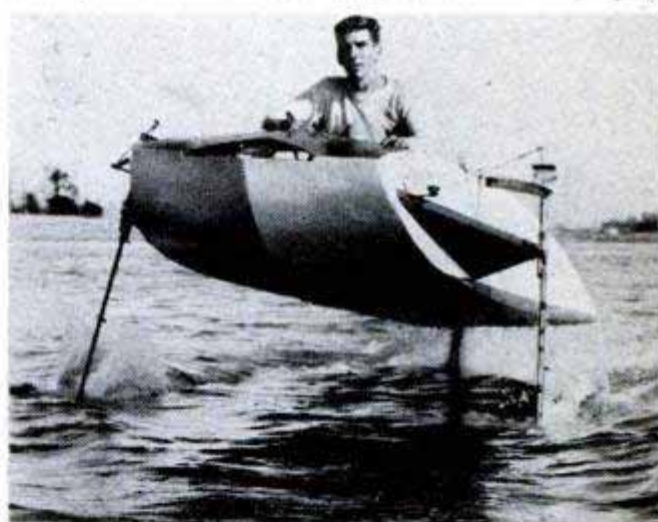


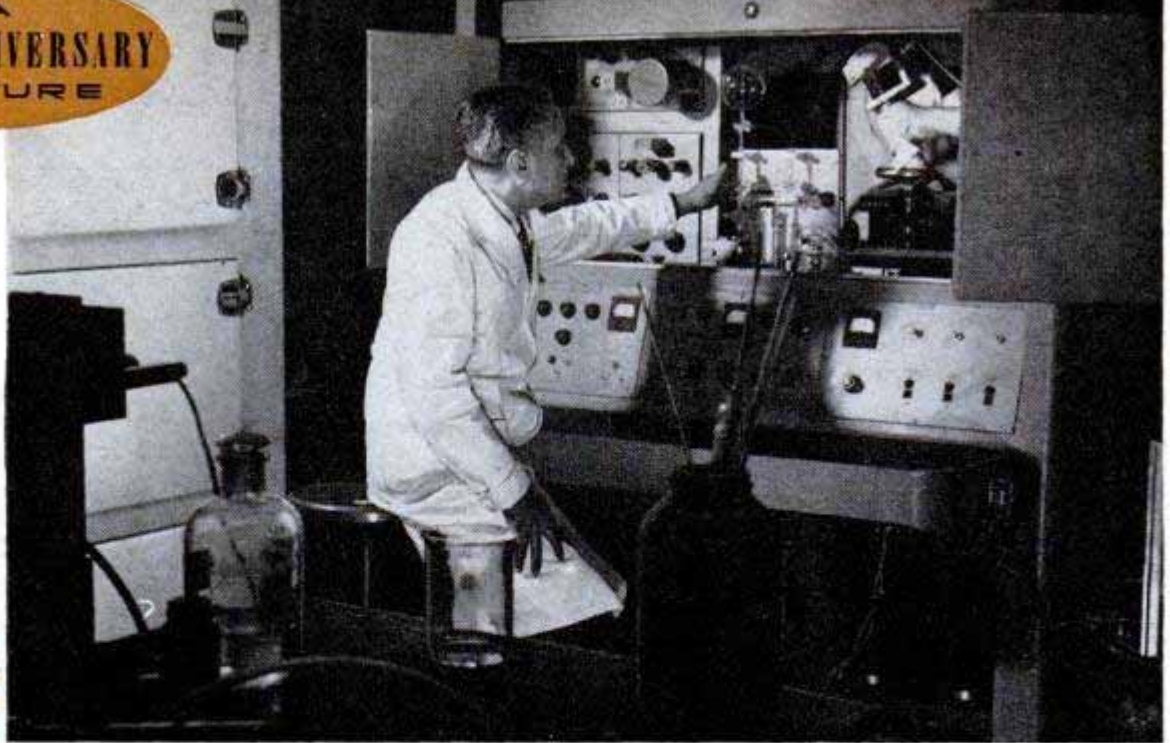
BOAT ON STILTS

EVER SEE a speedboat buzz along on stilts? Allyn B. "Hap" Hazard of Los Angeles, Calif., flies above the water instead of plowing through it. Hazard attached a pair of stilts to the sides of his craft. Each stilt ends in a hinged hydrofoil surface and another hydrofoil is mounted on the long shaft of the 16-horsepower motor. At 15 miles per hour, Hazard pulls back on a control stick which changes the pitch of the front hydrofoils and the boat rises out of the water.

Small finlike surface at the bottom of each stilt can be tilted up or down with control stick. Below right, another fin fits on the extra-long motor shaft

In stunt for camera, fins ride on top of water. Below, normally hydrofoils slip along just beneath surface. It's a smooth fast ride even in rough water





Research in pure science has spurred medicine's greatest gains



1902

FROM PILLS

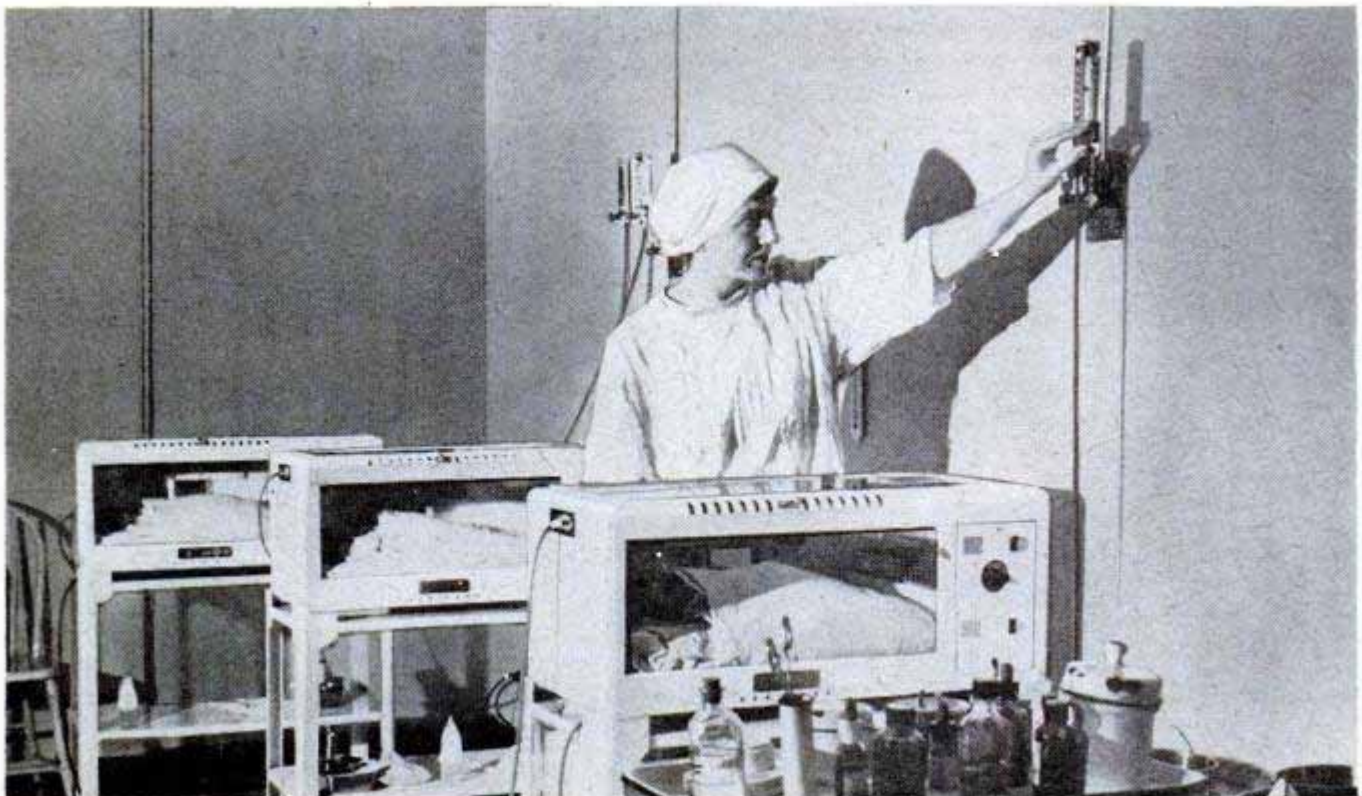
By Herb Bailey

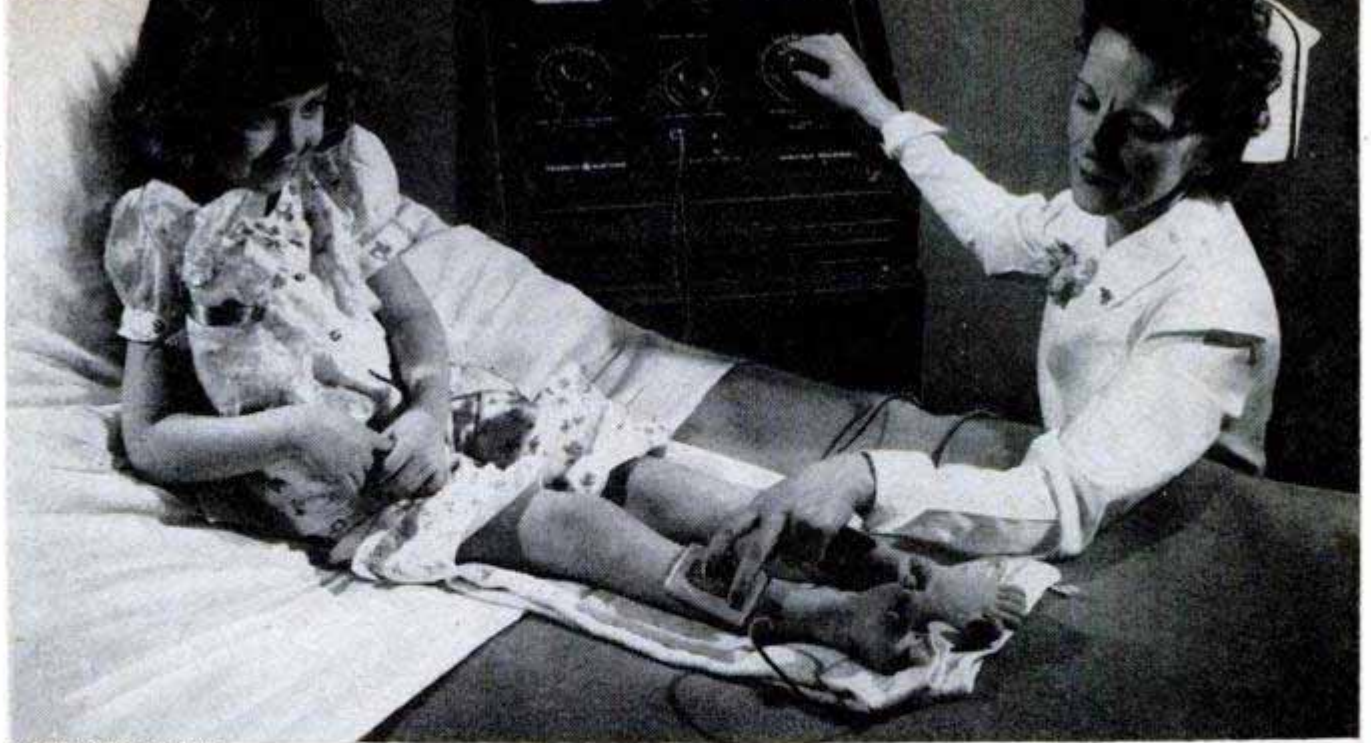
DON'T EVER MAKE the mistake of longing for the good old days—at least not in medicine. If you were born 50 years ago, the chances are you're alive today because you were born naturally strong and lucky. It isn't likely that the medicine of

that period did much to save you for medicine was just learning to be scientific, which is another way of saying effective.

If medical progress hadn't advanced your life expectancy, last year you'd have been slated to die at the age of 49! In 1902 there

Instead of being trundled about in tanks, life-sustaining oxygen is now piped into some hospital rooms





General Electric photo

Electric current stimulates paralyzed muscles, preventing them from wasting away

to PENICILLIN

were few diseases that could be cured; today there are few diseases that cannot be cured if treated in time.

Fifty years ago childhood diseases—diphtheria, scarlet fever, measles and whooping cough—were exacting terrible tolls. The doctors were nearly powerless. They had to let the diseases run their courses, keeping the patients as comfortable as possible. If children escaped these dread diseases, there was practically everything else in the book ready to ambush them before they grew up. The average age of adults dying in 1902 was only 30. Today this has been advanced to nearly 70!

Tuberculosis, malaria, pneumonia, syphilis, typhoid fever, typhus fever, diabetes, pernicious anemia, meningitis and cancer yearly claimed millions of victims even in "civilized" countries. Methods of antisepsis were not practiced as they are today; many patients died from infections contracted at the operating table; many died from shock.

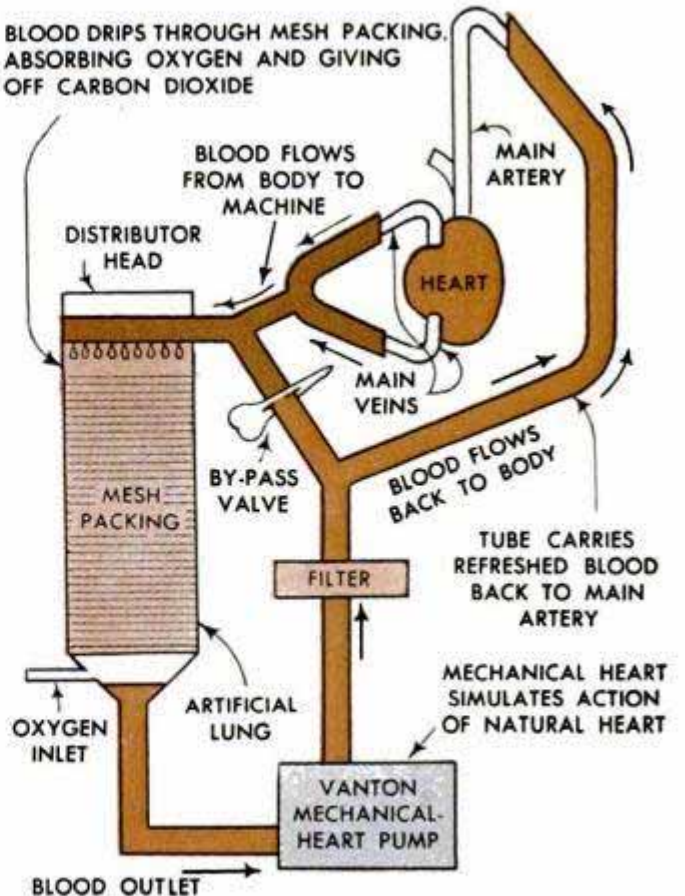
Blood transfusion was almost unknown until 1912 and it was much later before it was generally practiced. Of course, such refinements as the matching of blood were little known; likewise, making counts of red and white corpuscles to diagnose disease, a practice now routine.

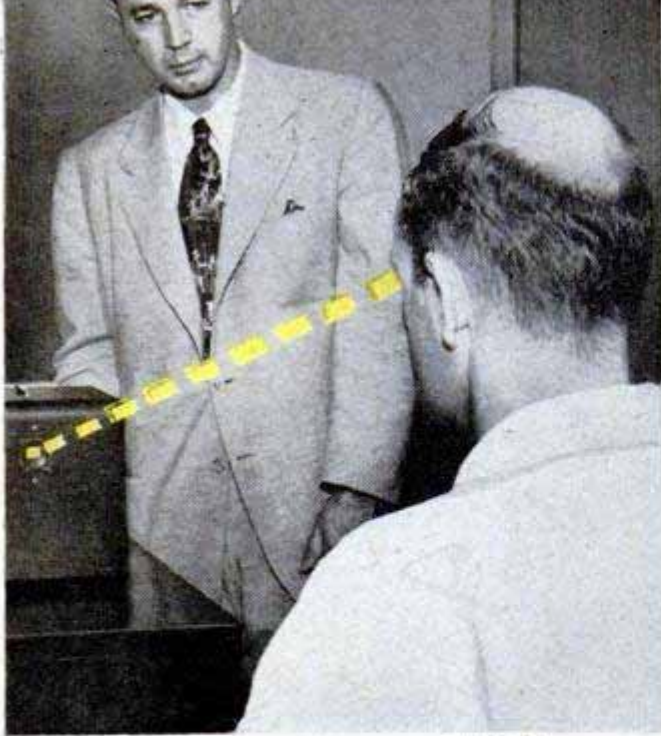
Vitamins were unheard of, the first being isolated around 1918. The first hormones—vital secretions of the ductless glands—had been used in treating thyroid deficiencies in 1891 but little else was done for years.



ARTIFICIAL HEART AND LUNG MACHINE

BLOOD DRIPS THROUGH MESH PACKING, ABSORBING OXYGEN AND GIVING OFF CARBON DIOXIDE

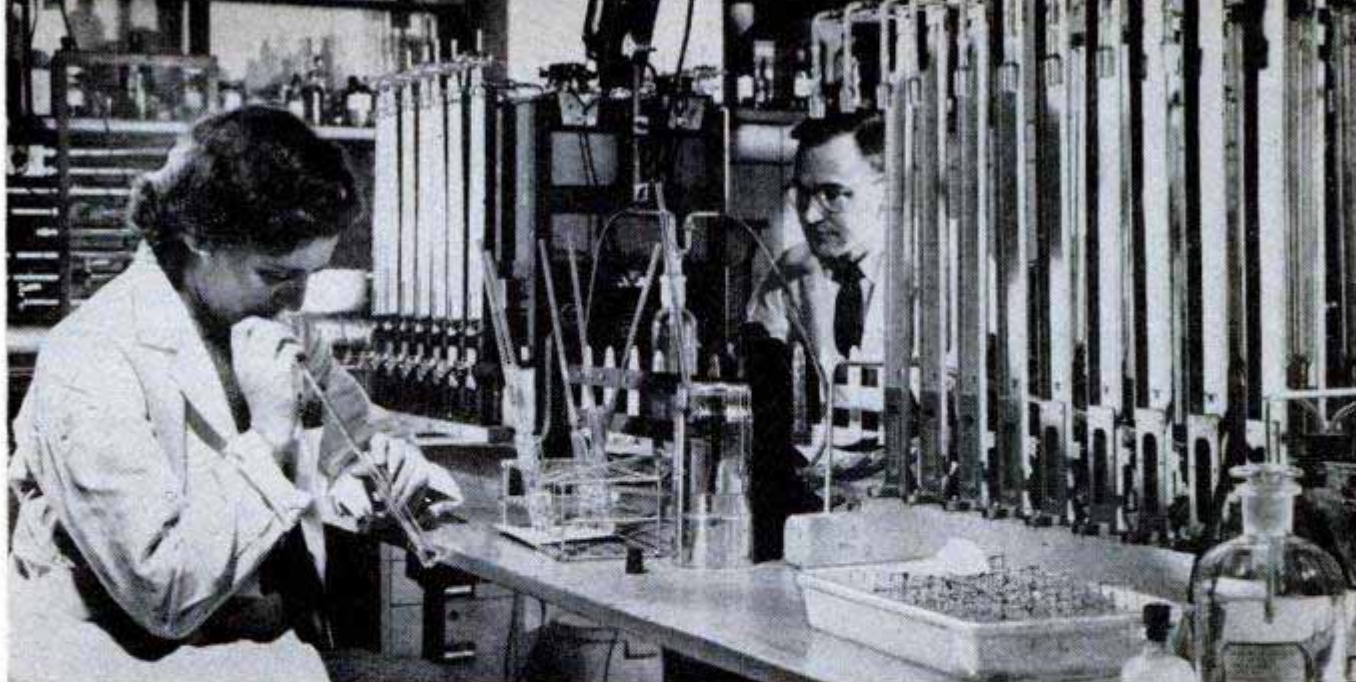




From patient's reactions to flickering light of a photometer, above left, a doctor can detect even the likelihood of cardiovascular troubles. The tiny capillaries in the eyes reflect impending diseases. Above, an electroencephalograph, a device that can distinguish normal from abnormal brain patterns, is helpful in diagnosing epilepsy and schizophrenia

Guided by a counter which picks up gamma radiation from radioactive iodine that collects in thyroid glands, device below traces glands' size and shape. A normal gland is "pictured" on the opposite page





University of Illinois photo

Building up more knowledge of the human brain, this equipment studies physiological aspects of its cells

The control of disease by a specific medicine (chemotherapy) was in its infancy. In fact, a person couldn't even cure a headache safely and effectively for acetylsalicylic acid, commonly known as aspirin, wasn't yet in wide use. You say there were fewer headaches in 1902? Well, maybe.

Though medicine was beginning to learn how to immunize humans against diseases by preparing serums made of weak or dead germs cultured in the bodies of animals, it was many years before such diseases as diphtheria were brought to bay. Yet today there are doctors who have never seen a case of diphtheria or typhoid fever!

While the mysterious X rays had been named in 1895 by Roentgen and first used in the treatment of cancer by Emil Grubbe shortly afterwards, they were still looked upon with much suspicion by conservative

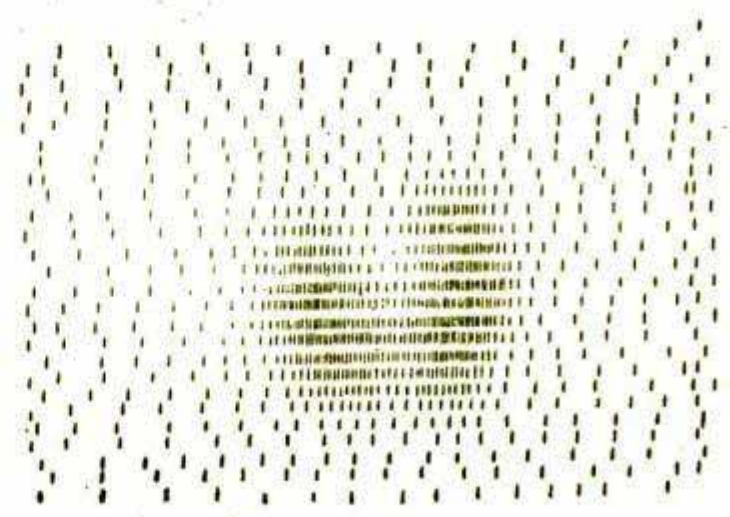
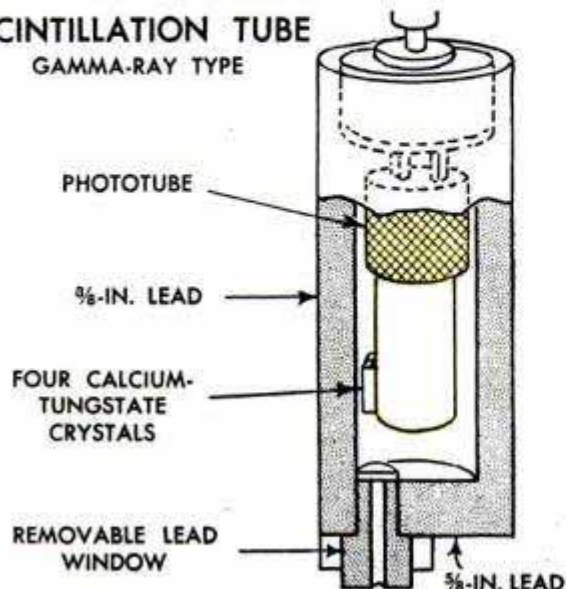
doctors in 1902. Later the infinitesimal rays were to save millions suffering from countless diseases and eventually they were used to treat diseases such as cancer, brain tumor, hyperthyroidism and leukemia.

A person suffering from a mental illness, or even a physical disease of mental origin (now called psychosomatic), was totally out of luck. He didn't even have the meager comfort of understanding. Psychiatry still was engaged in classifying the types of mental illnesses. The first work of Sigmund Freud, pathfinder of the intricate mental processes which govern us in both sickness and health barely had been published. None of the controversial storms concerning the relationship of sickness to the mind yet had shaken the medical profession. And, of course, none of the physical treatments for mental illnesses, such as electric

Sketch of the "brain" of device, left, that outlines size and shape of thyroid glands

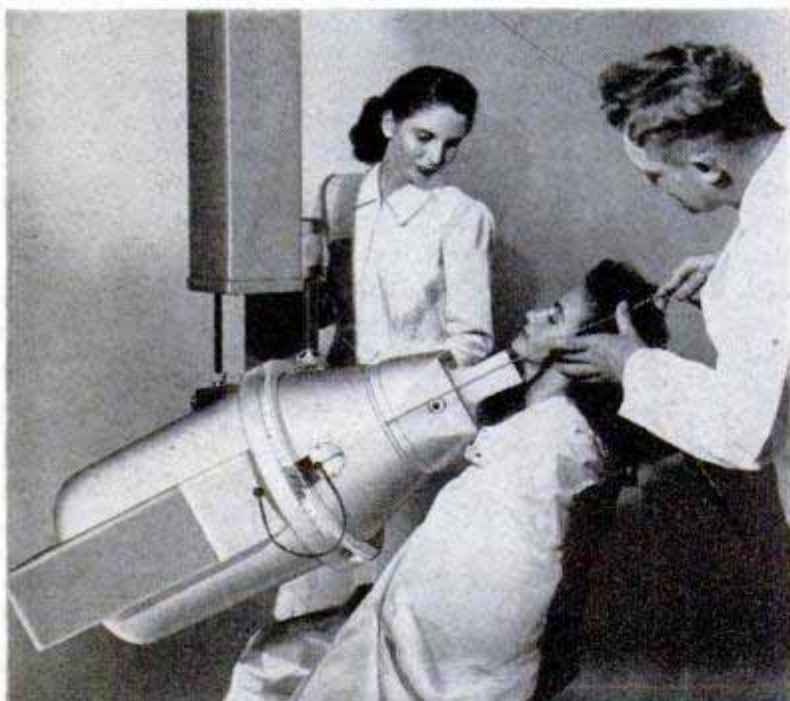
Heavy concentration of pen strokes, caused by greater gamma radiation from iodine, forms picture of the thyroid glands

SCINTILLATION TUBE
GAMMA-RAY TYPE





Deep-therapy X ray, 25 million volts of it, is delivered by the University of Illinois betatron for treating cancer victims. Below, another cancer fighter is this General Electric device using radioactive cobalt to combat deep cases of the dreaded disease



General Electric photo
Widespread detection of diabetes, eighth-greatest killer, is made possible by the "clinatron," which speeds up blood analysis



shock, even had been dreamed of.

If you were crazy, you were crazy. That's all, brother, and you were put away in an institution which did nothing for you except provide guards to watch you closely. Or, if you kept complaining about symptoms for which doctors couldn't find any physical basis, most likely you'd be shrugged off as a malingerer or a neurotic. Today it's acknowledged that many organic diseases can be traced to emotional causes.

Before 1900 and for some time after, medicine was practiced as an art, not a science. Doctors based their treatments on what they learned from older doctors, whose greatest education was obtained in the school of experience.

In contrast to the 19th century, modern medicine doesn't guess. Medical laboratories test drugs sometimes for years before releasing them for use. But a good scientific reason has to be advanced before any testing occurs. This doesn't mean that today's findings are not the result of insight. Many great discoveries have occurred because of successful "hunches."

The laboratory methods of the "pure" scientists began to come into their own early in the 20th century. The result was that the first 51 years of this century—particularly the last 25—zoomed into a revolution which affected you, me and our children more than any series of revolutions, wars or discoveries ever has affected the human race.

Probably the most dramatic of the new methods of science to fight disease with chemicals came in

1909 when Paul Ehrlich in Germany announced his magic bullet 606, or Salvarsan, would destroy the deadly spirochetes that caused syphilis. This was indeed a monumental discovery. As revolutionary as the new magic bullet was, the treatment generally was long and costly, and it wasn't until the widespread use of penicillin in the 1940s that the treatment of syphilis was simplified.

By that time, however, syphilis—like many other diseases such as tuberculosis—had ceased to be a great public menace because of widespread public-health education in prevention and prompt treatment.

Equally famous in medical history was the discovery by Doctors Banting and Best in 1921 that insulin, a hormone secreted by the pancreas, could control diabetes. Until then there had been no treatment for the disease. Millions had died because of their bodies' mysterious inability to absorb, or "burn," sugar. According to estimates, nearly 500,000 persons in the U. S. alone are diabetic—without knowing it. About the same number do know it. Today diabetics can live normal lives, thanks to the miracle of insulin.

In 1926 Doctors Minot and Murphy discovered a half pound of liver daily would control most cases of pernicious anemia, a dread blood and nerve disease which had been fatal until then. Today we know the substance in the liver which set the red blood and nerve cells right was vitamin B₁₂. Only a few micrograms of this vitamin will supplant the raw liver needed for control of pernicious anemia.

Use of the first "wonder" drugs in the early 1930s touched off a cycle of amazing cures. Beginning with sulfanilamide and continuing with the antibiotics, penicillin and the newer aureomycin and terramycin, these drugs did more to provide medicine with effective tools of treatment than any other methods in the preceding 500 years.

Sir Alexander Fleming discovered penicillin in 1929. Not until 10 years later were its curative qualities demonstrated on human beings. Since most readers of *Popular Mechanics* want to know how and why anything works, here is the best explanation the physiologists give as to how the antibiotics work: Germs have to combine with red blood cells or other cells of the body in order to produce their deadly reaction. The molecules of the sulfa or the earth drugs such as penicillin imitate our body cells to such an extent they trap the germ cells into combining with them instead of our cells.

The discovery of chlorophyll as a wound healer (it's 2½ times faster in this respect than penicillin) and deodorant deserves

(Continued to page 234)



Fountain Brush

Using the same solution over and over again, a fountain brush cleans oily, greasy or dirty parts. With the solution flowing through its nylon bristles, the brush dislodges particles while the solution floats them away. The solvent, clean at all times, is filtered twice before it is pumped through the brush. Only three gallons of solution are needed for a steady flow. Another tank holding 2½ gallons of solution can be used for soaking parts. The unit generally is placed on the workbench and plugged into any 115-volt electric outlet.

Submarine "Speedometer"

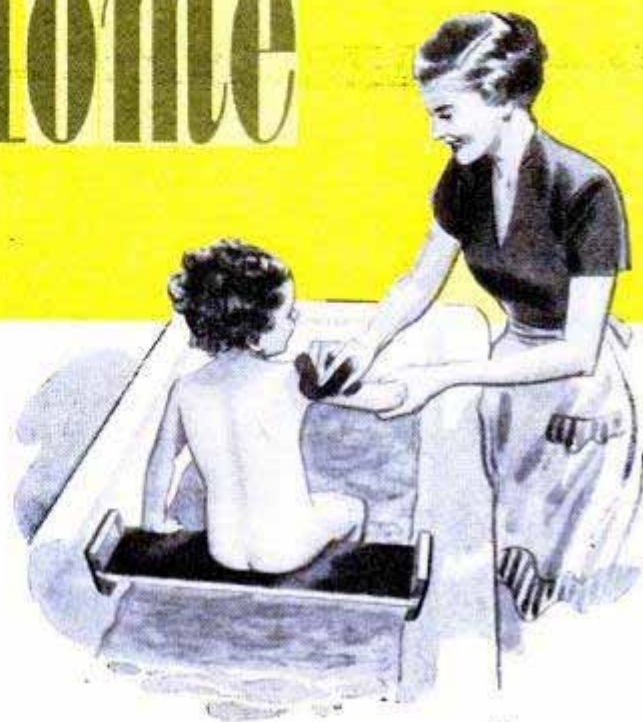
Although the details are still secret, the Navy has revealed a new instrument that accurately measures a submarine's speed and distance traveled. These factors are now recorded by dead-reckoning analyzers that indicate latitude and longitude, from which position and speed are figured. The device was developed at the University of Cincinnati's Science Research Laboratory.

Do You Remember . . .

. . . When photographers made flash shots with a tray of powder held high above their heads? When flash photography was so dangerous every camera case included a first-aid kit for burns? When exposures were judged by eye and a photographer might mention he used a lens opening "about the size of a dime?" Two of America's foremost authorities on photography take a long and fascinating look at its development in an Anniversary Feature in July. The illustrations include some of the finest photographs ever made.

WHAT'S NEW FOR Your Home

1. BATH SEAT fits any tub by wedging against the sides. It will support the heaviest person safely. Rubber padding on ends prevents damage to the bathtub



1

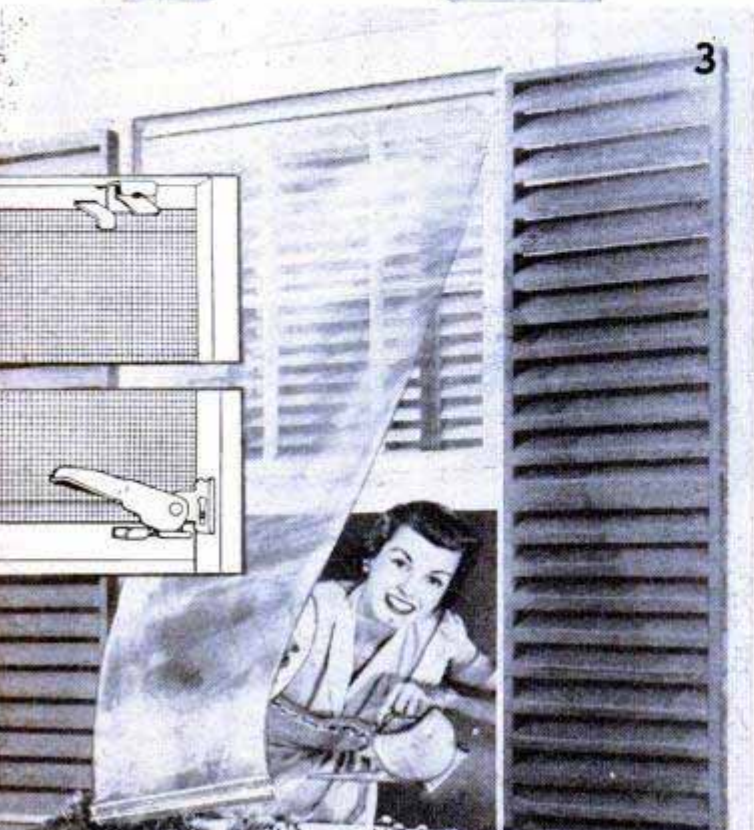


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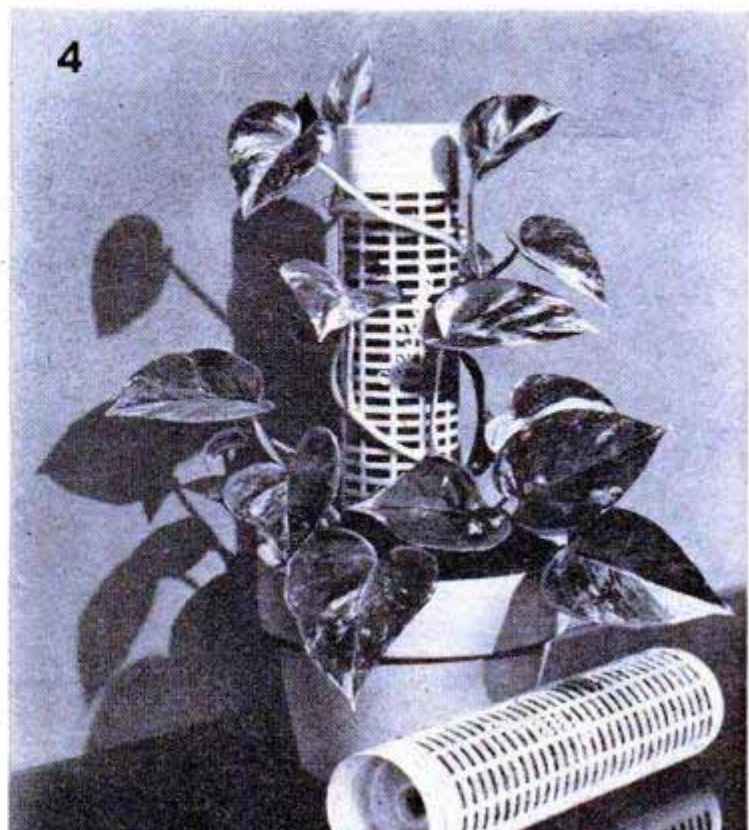
2. COFFEE SPIGOT not only opens the can but makes a tight seal that keeps flavor in. Cuplike cap is a tablespoon measure

3. TENSION SCREEN with improved brackets can be put up from the inside in seven seconds. There's no hardware on the sill

4. IVY SUPPORT is a plastic tube filled with sphagnum moss to which plant clings. It stores up moisture for the ivy, too



3



4

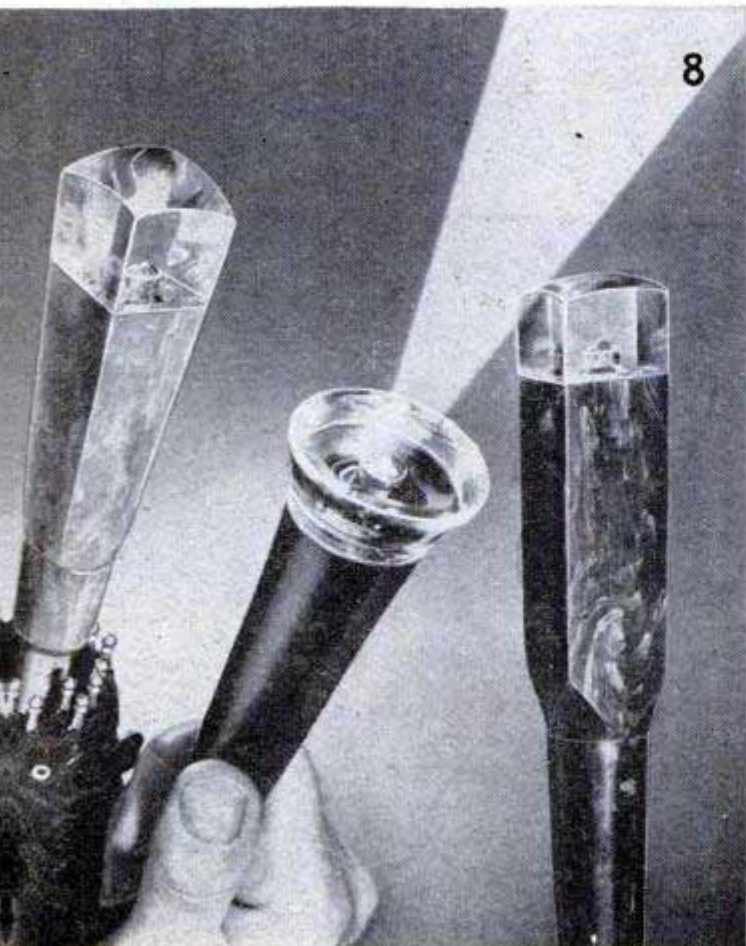
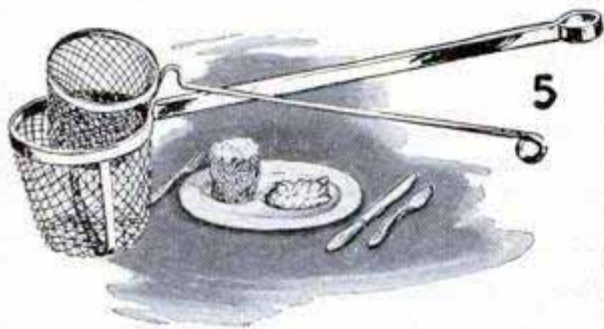
a fryer consisting of two wire baskets that hold the noodles or shredded potatoes in a nest shape while you fry them. Simply stuff them and luncheon is ready

6. **BABY WALKER** lets the child learn to walk but keeps him out of dangerous spots. A 20-pound sandbag serves as a pivot around which the caster-mounted walker revolves. The canvas seat can be removed for laundering and is adjustable

7. **FIRST-AID KIT** for furniture has materials and equipment to eliminate the scratches in furniture of all kinds from the dining table to the kitchen sink or range. Included in the kit are a spirit lamp, spatula, brush and filler material

8. **UMBRELLA LIGHT** is concealed in the handle on which its plastic lens is a decorative tip. Battery-operated, it can be removed and used separately, also

9. **COVER HOLDER** ends the problem of keeping the lid on the garbage can. Held to the handles by a coil spring, the lid is easily removed yet stays on securely

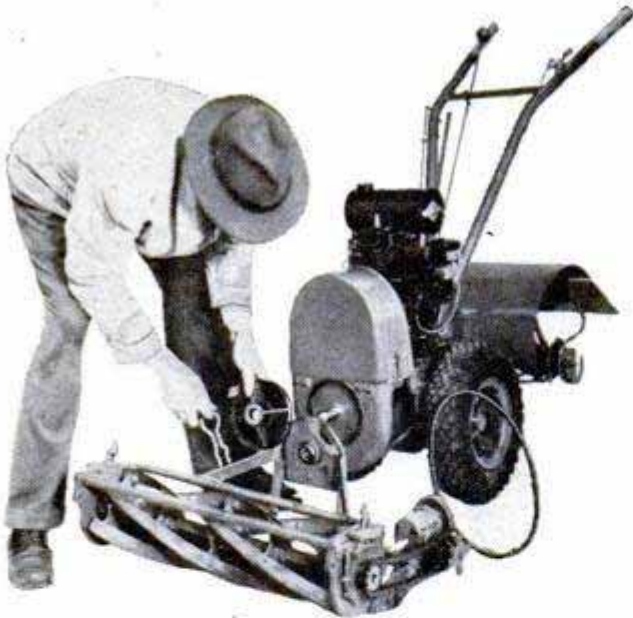




Highway Vacuum Cleaner

California is keeping its highways clean with a giant vacuum cleaner strong enough to suck up gallon-size glass jugs. Developed by the Division of Highways, the highway cleaner started out as a leaf picker. Mechanics converted it into a powerful vac-

uum cleaner that is mounted on a trailer chassis and towed behind a truck. Workmen move ahead of the cleaner, raking the trash into a row. The operator, riding on the side of the trailer, guides the flexible nozzle over the row of trash to suck it through the machine and into the body of the towing truck.



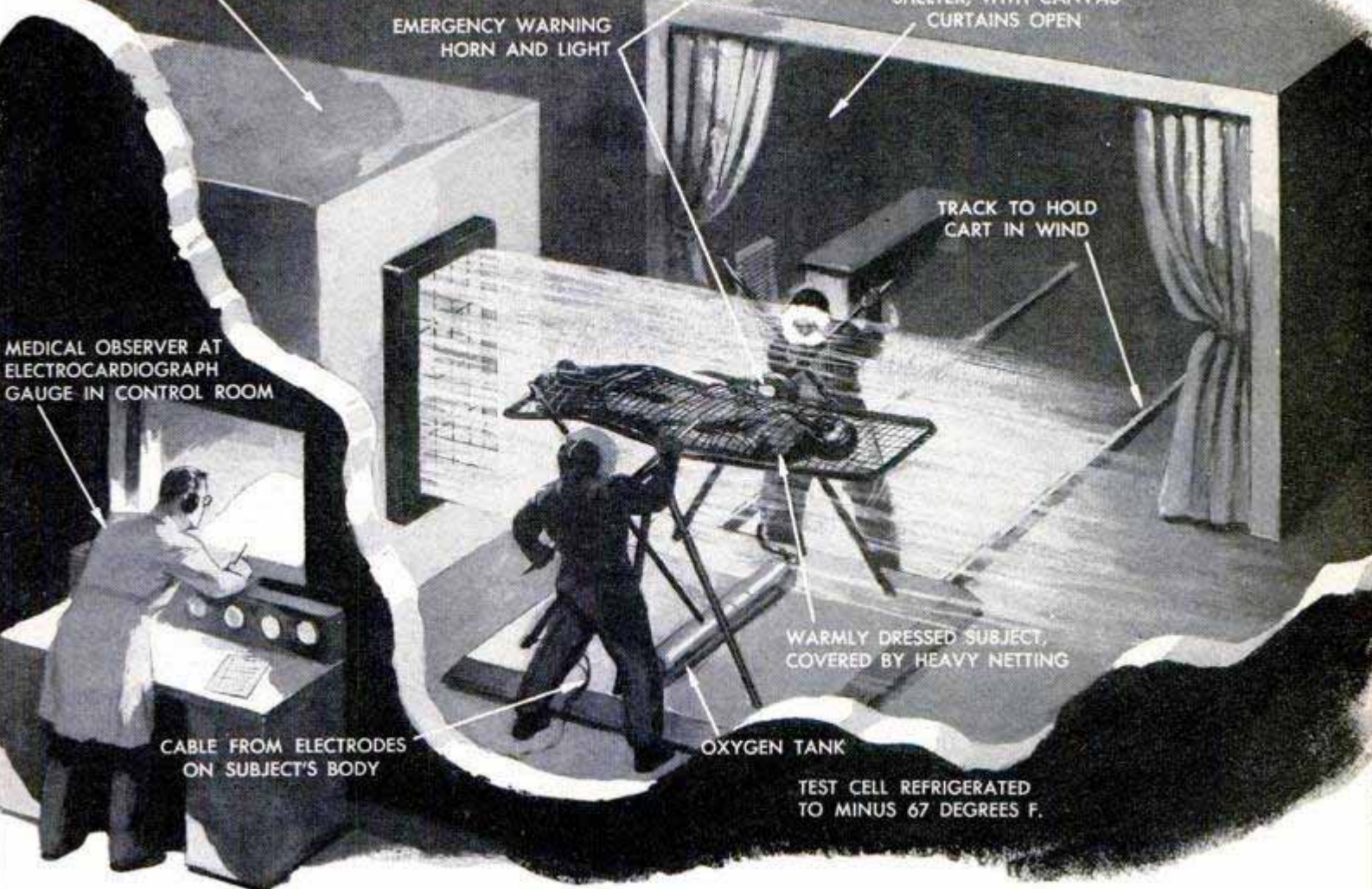
Quick-Change Garden Tractor

Attachments can be installed on a small garden tractor within seconds through a disk converter appearing on new models of the machine. The owner can change the tractor from a tilling machine to a pump or mower in less than a minute. A pin is pulled out of the flanged disk, which then is removed. This exposes a stud to which the attachment is connected.



Eye-Catching Sign

Electricians at the Hawaiian Pineapple Co. have rigged a novel sign to prevent eye injury. When a workman picks up his goggles, the grinder starts automatically. But the real safety device is a sign which flashes the message, "Wear Your Goggles."

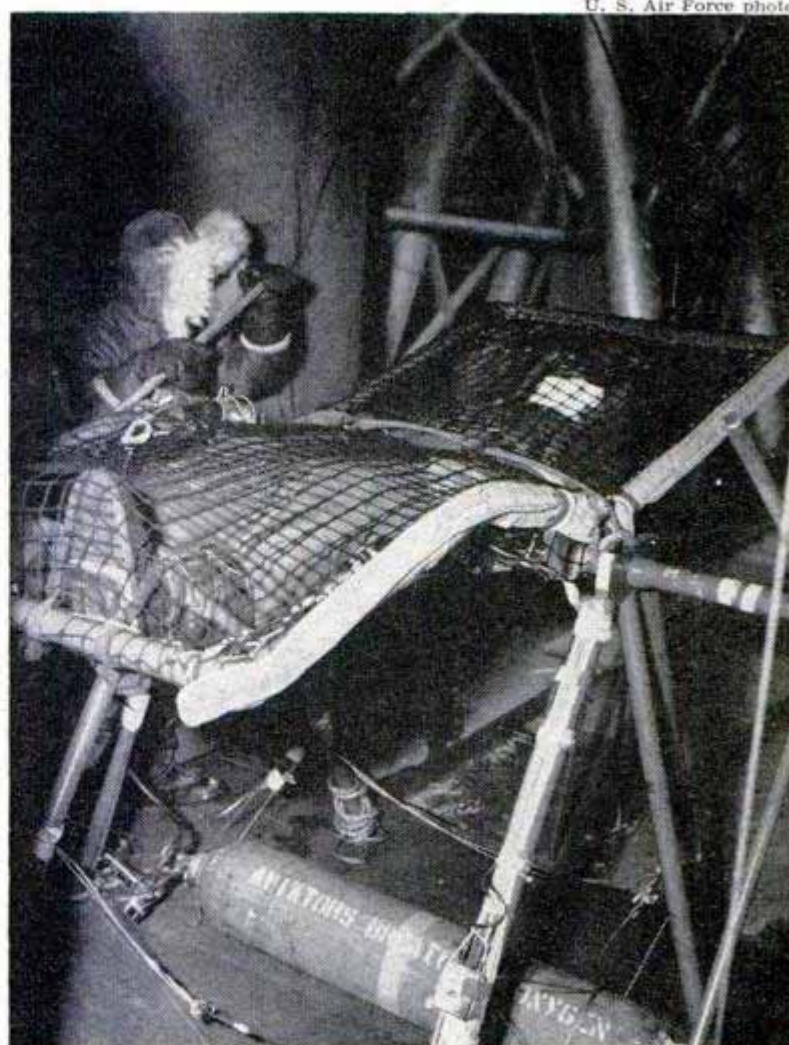


Observers, standing out of the direct path of wind blast, turn rack to simulate various falling positions

Falls From 50,000 Feet Simulated on a Rack

USING a machine to stir up 125-mile-an-hour winds in a hangar refrigerated to 65 degrees below zero, Air Force researchers found that flyers can make free falls safely from 50,000 feet. Complete body covering, even though light, is necessary, particularly for the head, hands and feet. Seventy-nine volunteers were tested three minutes at a time. Dressed in flight clothes of various weights, they were fastened to a rack directly in the path of the wind blast and held in positions a falling body might assume. Some were turned over and over on the rack to simulate tumbling through the air. Instruments attached to the subjects measured their skin temperatures, blood pressure, heartbeat and respiration. Only three very mild cases of frostbite were reported during the mock falls.

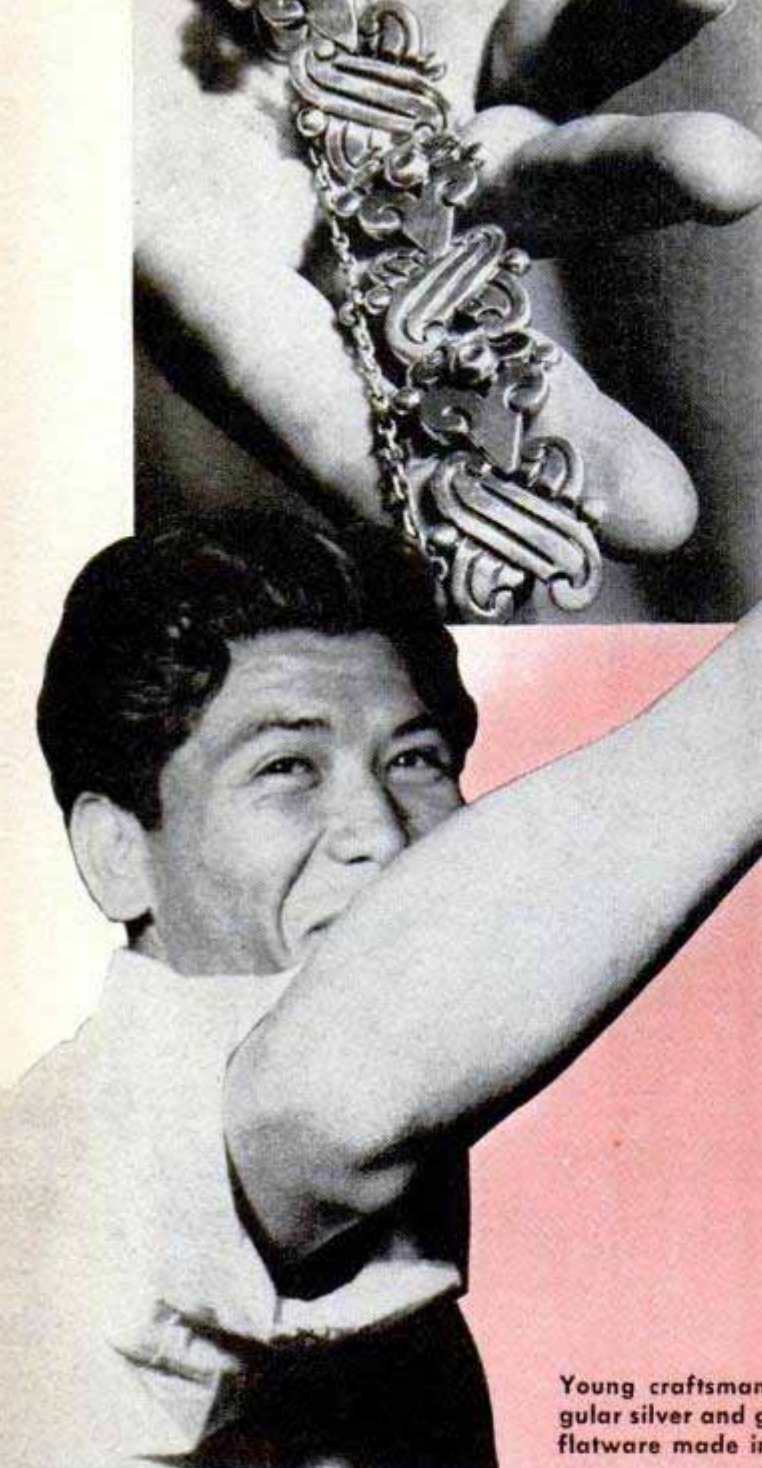
Coarse hammock netting strung over a steel frame completely envelops subjects, who draw oxygen from cylinder below the rack



U. S. Air Force photo

MEXICO'S

◆ Intricate necklace has a true Mayan design that dates back for centuries. Right, area also abounds in tin, which is made into gleaming lamps for patios



Young craftsman shows off an angular silver and glass lamp. Below is flatware made in old Aztec pattern



CITY OF SILVER

By Michael Day

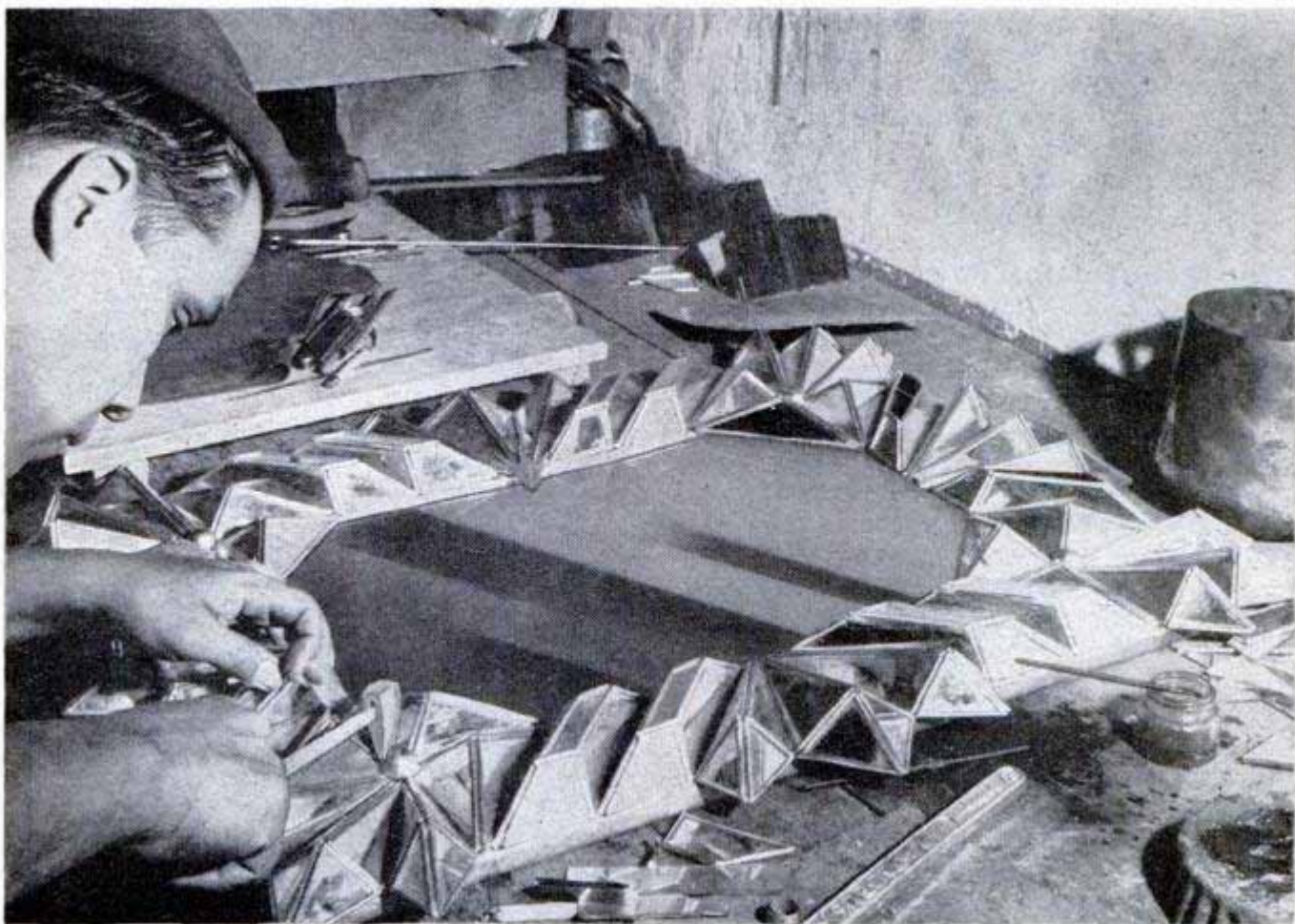
WE CALL IT *metales casados*, which in English means 'married metals,' said the young craftsman, whose dark complexion, high cheekbones and square body betrayed his Aztec forebears. Standing in his little adobe shop in Taxco, a picture-post-card village clinging to a mountainside high above Mexico's central plateau, he twirled a beautifully wrought tray of pure silver, so cleverly inlaid with patterns and figures of copper, bronze and black silver that a magnifying glass would not show a line of separation between the metals.

On the felt-covered tables around him lay a fortune in precious silver artistry—heavy necklaces and bracelets inlaid with turquoise and mother-of-pearl, delicately wrought chains with glittering black-onyx pendants hand-carved like the grotesque faces on idols around the Mayan pyramids. Silver forks and spoons, sweated tightly to red-mahogany handles, gleamed in the dim light of the ancient Spanish colonial building. Every item on display revealed evidences of an art which, until a few years

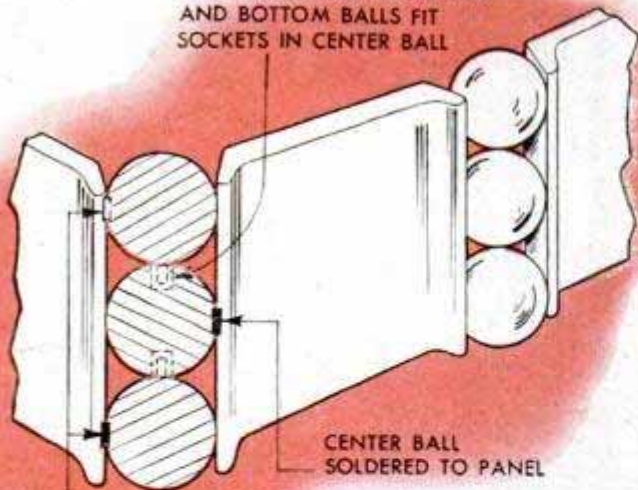
ago, was lost in the moldering ruins of Montezuma's Aztec empire. And if it hadn't been for a Tulane University professor named Bill Spratling, it might still be lost and moldering.

Some 20 years ago, Spratling visited Taxco and fell in love with the ancient colonial village, its steep, narrow, cobblestone streets, burro traffic and its shaded square. He learned that abandoned silver mines tunneled the mountains beneath those streets; that Cortes, thinking the metal was tin, had mined it to make guns; that long before the conquistadors, Aztecs had mined it for ornaments and pottery, and that Jose de la Borda, a French mining engineer who gave the town its great twin-spired church with golden altars, was riding a mule when he stumbled on a new vein of ore that kept the town rich for nearly 50 years, some two centuries ago. Since Borda, however, Taxco's time seemed to have run out. Its rich ore veins were bled dry and the listless villagers were glad to subsist on the few tourists who might

Copper or silver strips are shaped to hold tiny mirrors, which in turn are formed into an elaborate frame



PINS PROJECTING FROM TOP
AND BOTTOM BALLS FIT
SOCKETS IN CENTER BALL



CENTER BALL
SOLDERED TO PANEL

TOP AND BOTTOM BALLS
SOLDERED TO SILVER PANEL



Hidden hinge developed by a Taxco craftsman has a swivel joint concealed in three gleaming balls

Completed bracelet, made of alternate panels and balls, is flexible, yet hinges can't be seen anywhere

journey the 75 roller-coaster miles southwest from Mexico City to see their quaint town.

Spratling investigated the mines and found there still was silver to be had for the digging and refining. "But I searched Taxco in vain for a silversmith," he says.

After months of scouting the rugged mountains for hundreds of miles around, he finally located an aged silverworker in an Indian village. Spratling designed jewelry from old Aztec archeological pieces which he scoured Mexico to find—pre-Cortes vases, ornaments and hand-carved stone utensils. The Indian transformed these patterns into native silver masterpieces as his forebears had done. That was the beginning, 15 years ago. The old man taught some younger men his tricks and techniques. They, in turn, taught others.

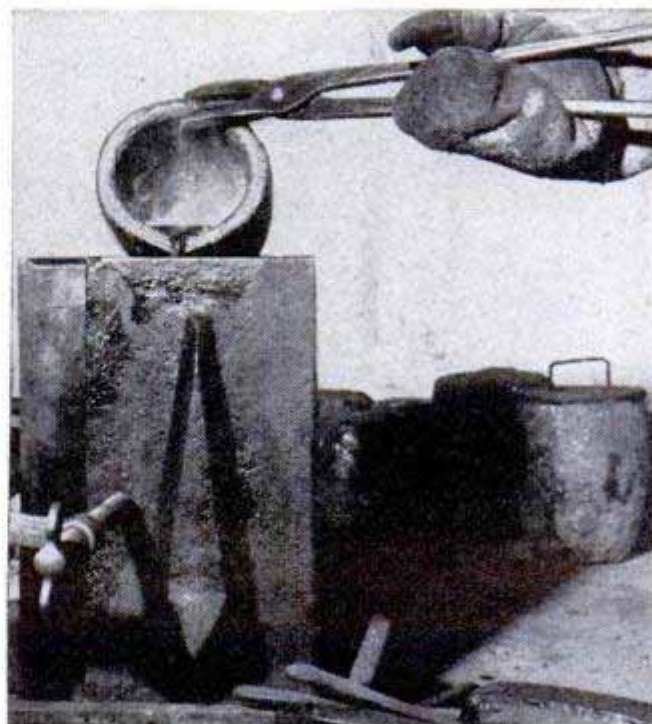
Today, Taxco is once again Mexico's city of silver—abuzz with activity. Fires roar in a hundred smelting furnaces under the red-tiled roofs and in the picturesque patios of its jumbled, white-adobe houses that literally stand on top of each other as they climb the steep slopes above the stone spires of the church in the plaza and spill into the deep *barrancas*, or eroded ravines. Little burros once more tote basket cargoes of silver treasure up and down the precipitous streets, zigzagging so they won't plunge headlong if they stumble. Craftsmen in a hundred shops are plying the ancient trade of the Aztecs—soldering, sweating, molding and carving the precious metal.

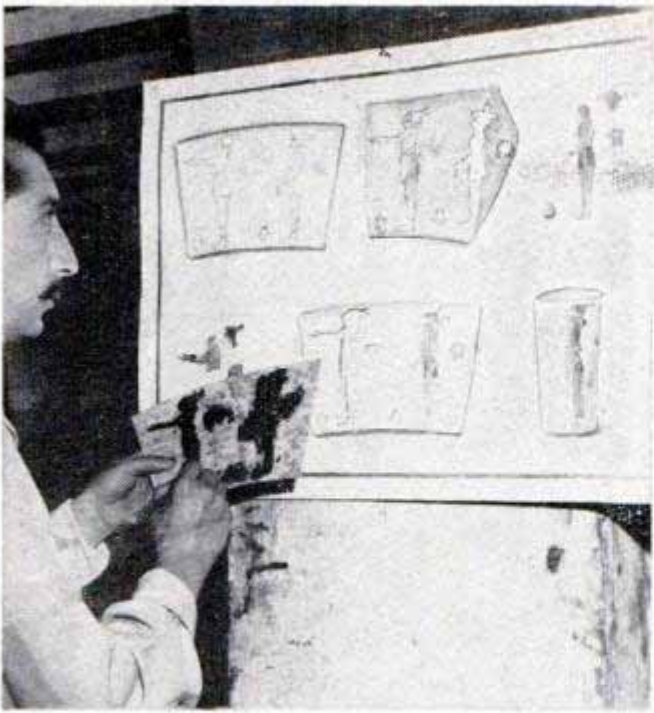
Just outside Taxco, in what was once a huge old ruin, about 500 of Spratling's own artisans melt, pour, hammer and polish at

a huge collection of forges and shops that scramble up the side of a mountain in three vast levels. Spratling still designs his fabulous pieces from old Aztec patterns, and his craftsmen use the ancient techniques to make them. Up and down the steps they go, their arms laden with jade, turquoise and silver treasure. Out of this fabulous studio, or *taller*, pours more than \$2,000,000 worth of hand-wrought jewelry, tea services, bowls and water pitchers each year.

One of the most intricate of all the jewel-making techniques you can see in Mexico's newly revived silver industry today is the Aztec mosaic and married-metal work orig-

Silver taken from the honeycomb of ancient mines beneath village is melted and poured into a mold





Silversmith makes a pattern by tracing the design of ancient artwork taken from ruins of the Aztecs

inated by Los Castillo a year ago. The first step is identical with what you may see in any of the silver shops of Taxco. The craftsman melts down the raw silver over a charcoal blaze. His big iron ladle dips into the white metal, which he pours into an ingot or bar mold. Into a cool bath goes the cherry-red bar, sizzling and steaming as it falls from the mold. While it's still hot, the artisan squeezes it, like dough under a rolling pin, between the steel cylinders of a roller press until it becomes a sheet of metal just the right thickness for what he wants.

From this sheet are cut blanks for neck-

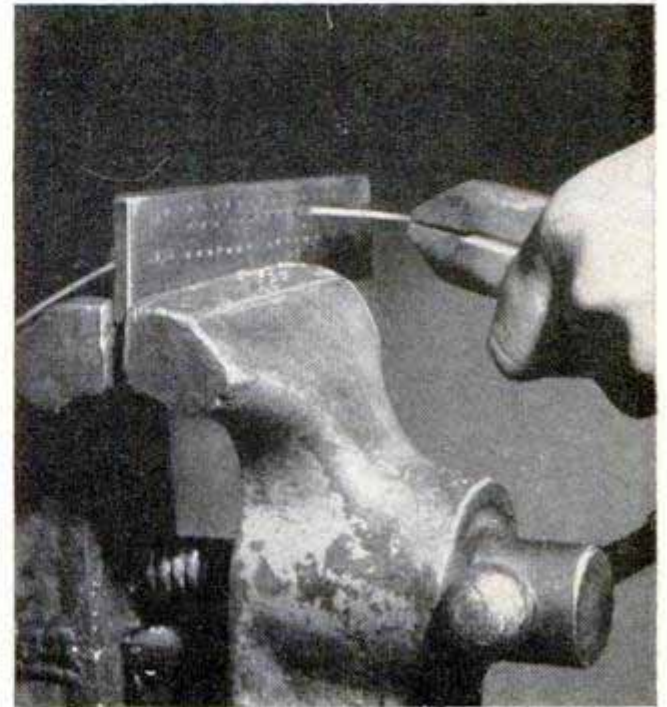
Silver ingot is forced between rollers which squeeze it out into a sheet of exactly the right thickness

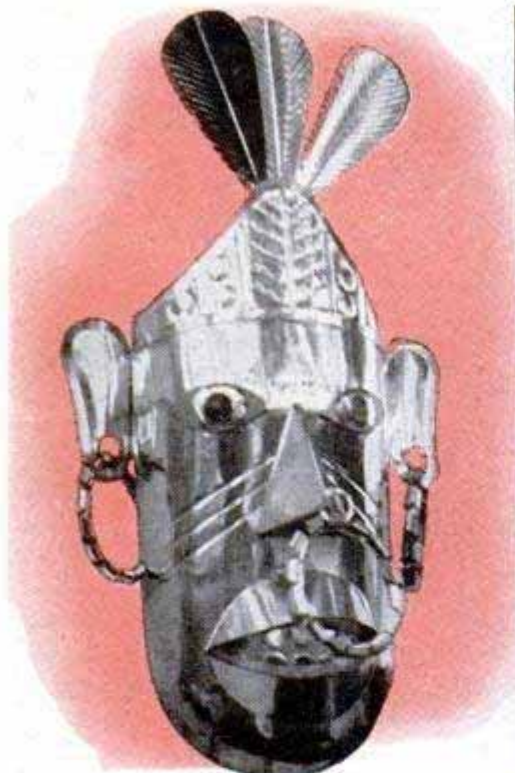


"Married metals" are made by routing a silver base, filling it with copper or bronze and hammering it

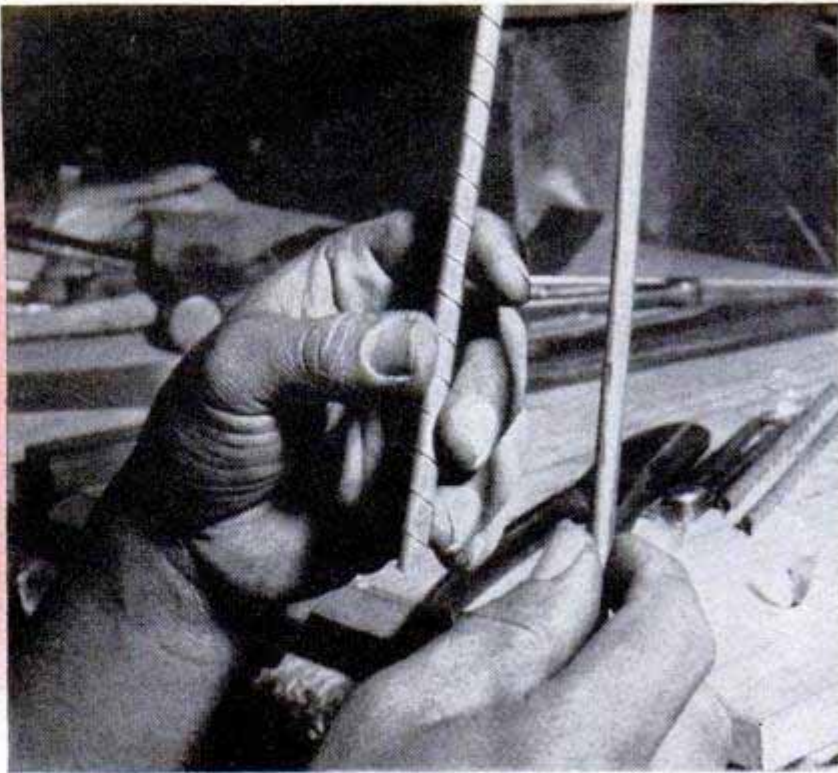
lace pieces, bracelets and ash trays. Now he hammers, etches, saws and files each tiny piece with a vast assortment of tools. A long, slender, soldering iron that looks like a pencil ties the links to his necklace pieces. Tiny files smooth rough edges. With a miniature saw he cuts a slice of jade onyx, lapis lazuli or mother-of-pearl to the exact dimensions of the well into which it must fit. Then, with a dozen different-sized hammers and punches, he beats and taps until his entire mosaic of gems and silver has become one piece. Turquoise is easier, since it is crushed, melted into the piece and burnished flush on a wheel.

Wire is made by cutting a narrow strip from the sheet, then pulling it through successive holes in steel plate





Aztec ceremonial masks, made of tin, adorn Taxco and the surrounding towns



To make rings for ears and nose of a mask, a craftsman wraps a metal strip around a rod, then strips it off and bends it to shape

Toughest are the inlaid, or married, metals which must fit without a hairline of space between them and then be cold-hammered into the silver piece so they are in a single plane.

"This sounds easy," one of Los Castillo's best artisans says, "but when you are inlaying many types of metal in a tray with large surface, it is the devil. It takes me three days to turn out even a small ash tray of *metales casados*."

This craftsman spent months creating a huge silver tray with 14 Aztec figures in bronze, copper, silver and black silver—all inlaid at the surface of the tray so perfectly that no wave appears anywhere on it. You can run a needle tip across it without feel-

ing a click as the point rides across the different inlays. The piece today is on exhibit at the Museum of Fine Arts in Mexico City.

In the same way, working so closely that he must rest his eyes every few minutes, this man inlays his fantastic mosaics of metal and gems in black onyx. No cement anchors the pieces. Using tweezers and tiny punches, he hammers and sweats the inlays until they fit as snugly as though they were a part of the original stone.

Most craftsmen in Taxco started out at Spratling's *taller*, where they learned to hew closely to the Aztec line and to maintain a sharp integrity in the quality of their workmanship. When they branched out to start their own little shops, they developed new techniques and individuality, but the results are as fine—and often unique.

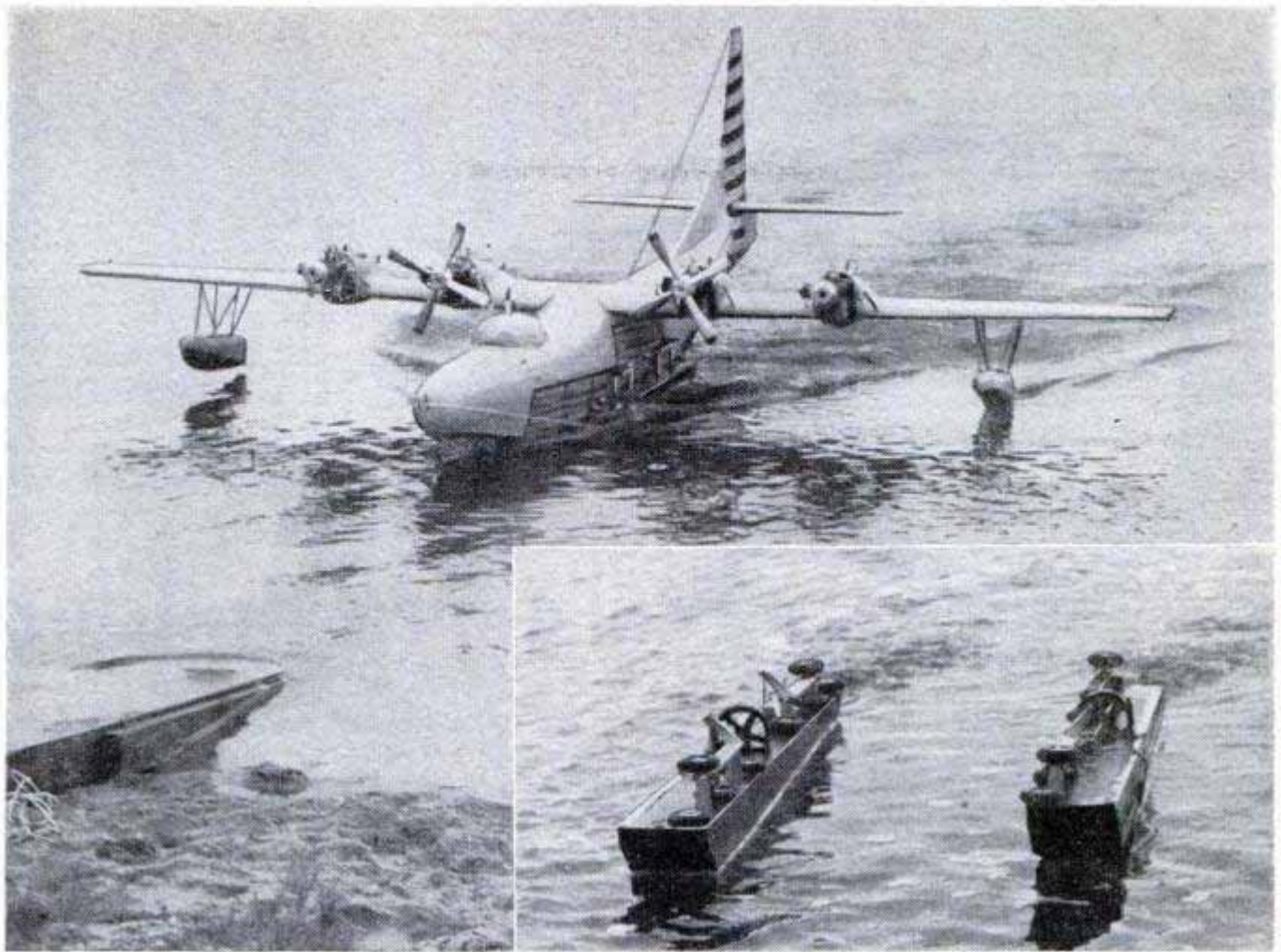
At the forges of Antonio Pineda's place on the village plaza, Indian artisans build their curious primitive designs into three-dimensional hollow jewelry with a distinctly modern flavor. Silver sheets are cut and soldered into swirling pyramids for incredibly beautiful necklace pendants. Heavy-looking concave bracelets, ringed with beads of turquoise, look like museum pieces. Fantastic angular mirror frames are held together by beading, made by coiling a thin strip of metal around a rod, slipping it off and soldering it to the joint between the flat sections of the frame.

(Continued to page 220)

Jack Atkin photo



Intricate inlay design is filed smooth so it will fit exactly into recess routed from the silver base



Self-Powered Beaching Cradle Gives Seaplane "Land Legs"

Today's largest U. S. seaplane can be picked up and brought ashore by a new self-powered beaching cradle. Designed by the Consolidated-Vultee Aircraft Corp., the 20,000-pound cradle has four outboard motors totaling 100 horsepower and travels at about six knots. An operator, seated at controls under a Plexiglas canopy in one of two aluminum-alloy pontoons, guides the amphibious craft alongside the aircraft's hull. Cradle-to-pilot communication is established and steel cables are attached from

cradle to plane. Pneumatic pistons elevate the cradle's substructure so the cushioning pads make firm contact with the seaplane hull. A glass-bottom window at the operator's station permits direct view of the pads, the step-positioning block and the hull bottom. A diver's lamp improves visibility in murky water. His "land legs" attached, the pilot is able to taxi up the ramp and park the plane. On land the steering is done by the cradle operator under guidance of a signalman.

Helpful Bomb

Assistance instead of destruction is the purpose of a "mercy bomb" planned and built by two Air Force men in Korea. An obsolete napalm tank is loaded with heavy clothing, carbine, water-purifying tablets, first-aid kit, three days' food supply, portable stove, sleeping bag, radio and other survival aids. Fastened beneath a rescue plane, the tank is dropped from low altitudes.





Marsh grass, twisted into a loose rope, is wrapped around a core to make the target by a machine that works in the field

Bull's-Eye Builder

MAKING A LIVING by stopping arrows may sound like a dangerous occupation, but for Charles Saunders it isn't. He produces archery targets—those overgrown bull's-eyes that look like bundles of straw to the uninformed.

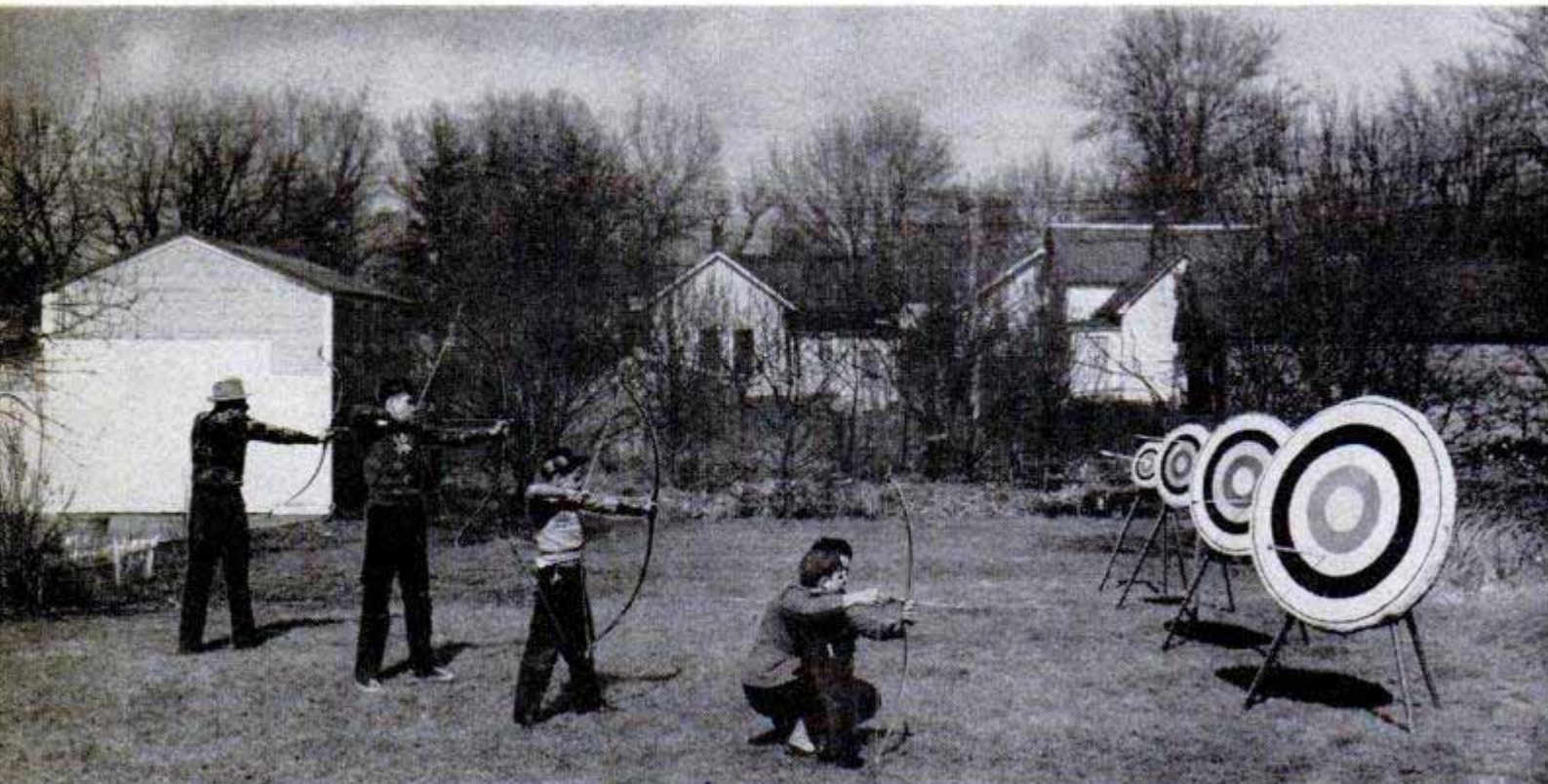
Target making is not as simple as you might think. It takes a well-made, resilient target to stop fast-flying arrows repeatedly without breaking down. The material best suited for the job is a tough marsh grass known as *Spartina*.

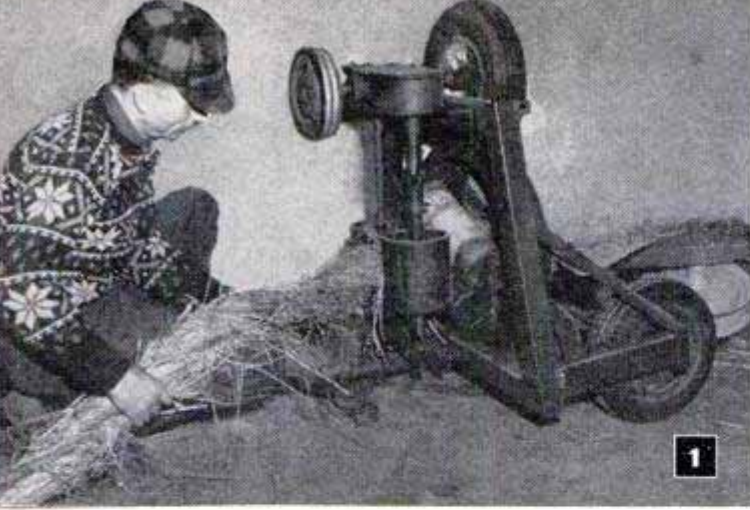
Up to 1939, targets for the modern Robin Hood were made completely by hand. After

many unsuccessful attempts, Saunders, who now operates his target business in Manilla, Iowa, developed machinery to speed the job.

Saunders' machinery cuts the grass and feeds it into a spiral winding drum that wraps it tightly around the core, the actual bull's-eye. This operation takes place right in the marsh where the grass grows. A special lightweight tractor had to be built to power this machinery. After curing in the field, the targets are stitched tightly by hand so they will stand up under the repeated bombardment of arrows. ★ ★ ★

Archery appeals to all ages, and the targets are made in different sizes to challenge the aim of the bowmen





1

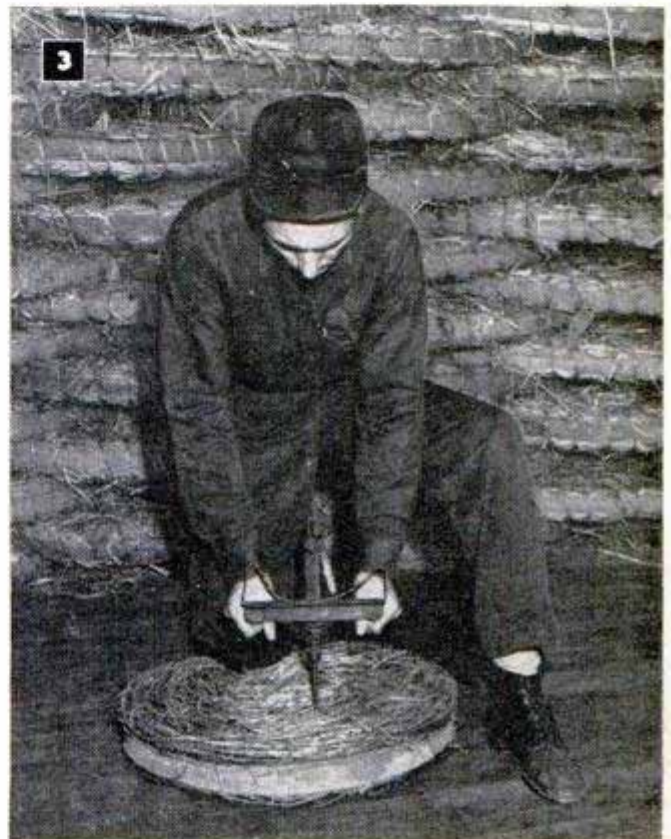
1. After the marsh grass has been mowed, a machine twists the long strand into a loose rope which is then left in the field for a week or more to cure. Saunders developed the rope-twisting machine. Before he entered the business, targets were all handmade



2

2. The bulky target-winding machine, opposite page, wraps the grass rope around the target core, forming mats such as these which are stacked in the field to permit air circulation during a second curing period. The core, or bull's-eye, is plainly seen in this photo

3. Testing the targets is an important part of the process because they must be firm enough to stop a speeding arrow. This device exerts the same force as an arrow from an 80-pound bow. Any soft spots that are found are corrected by tightening the stitching



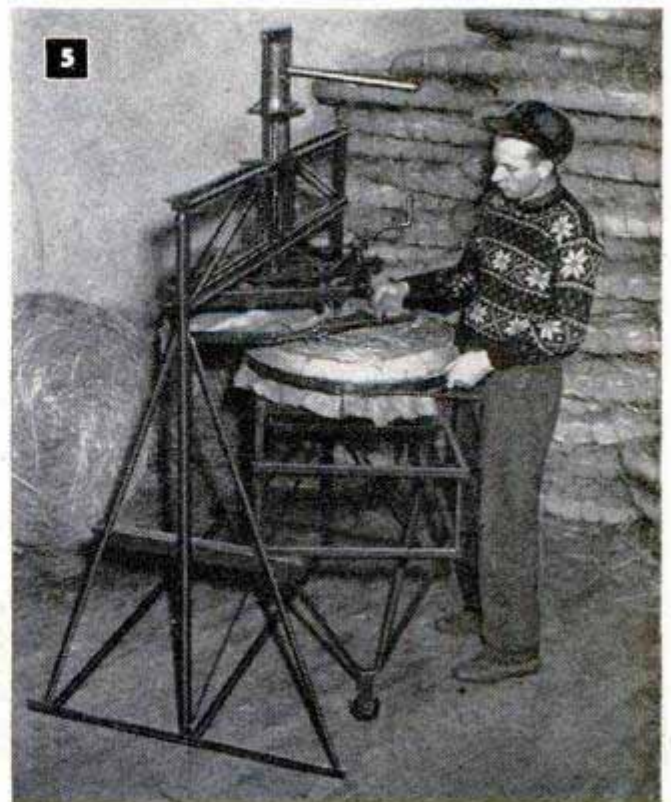
3

4. Despite the Saunders inventions, there are still hand operations in target manufacturing. Sewing the grass mat to make it strong is one of these. Walter Crouch, veteran target maker, stitches a mat, using 48 hooked needles to pull the cord through the grass

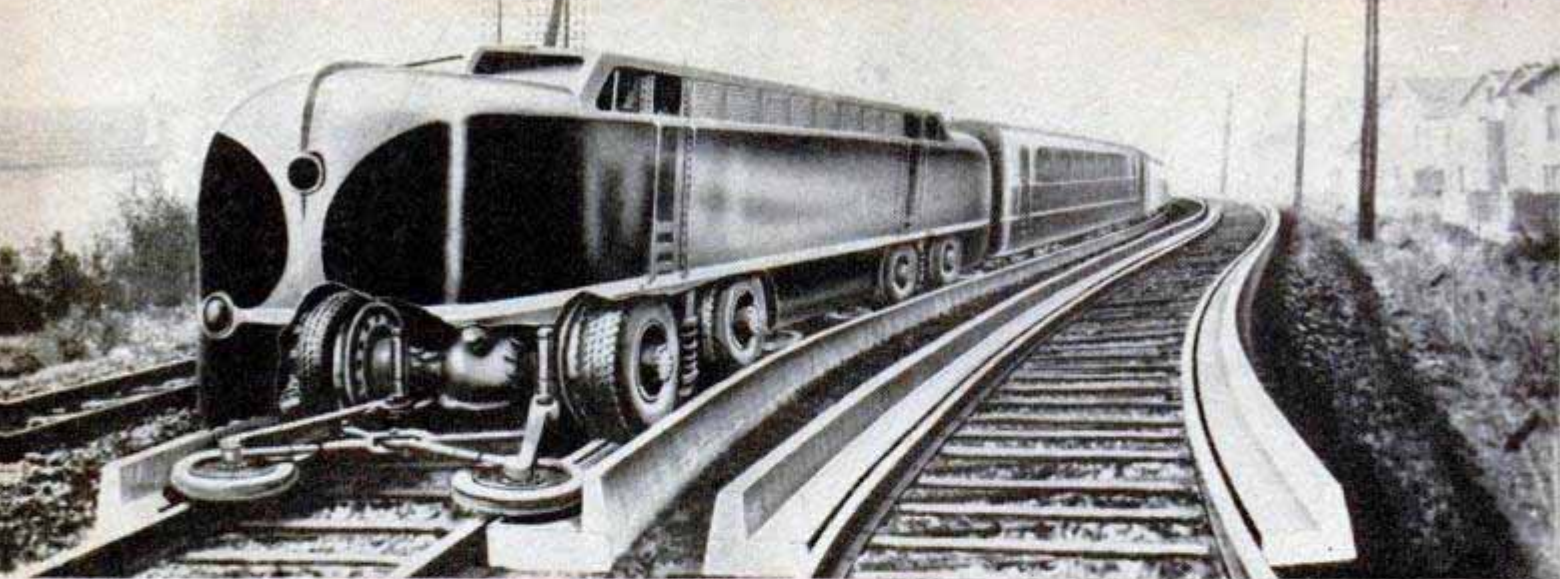
5. Targets, tightly sewed and ready to stop arrows, are covered with burlap on the stretching machine. The burlap protects the target mat and it provides a surface on which the scoring rings can be painted



4

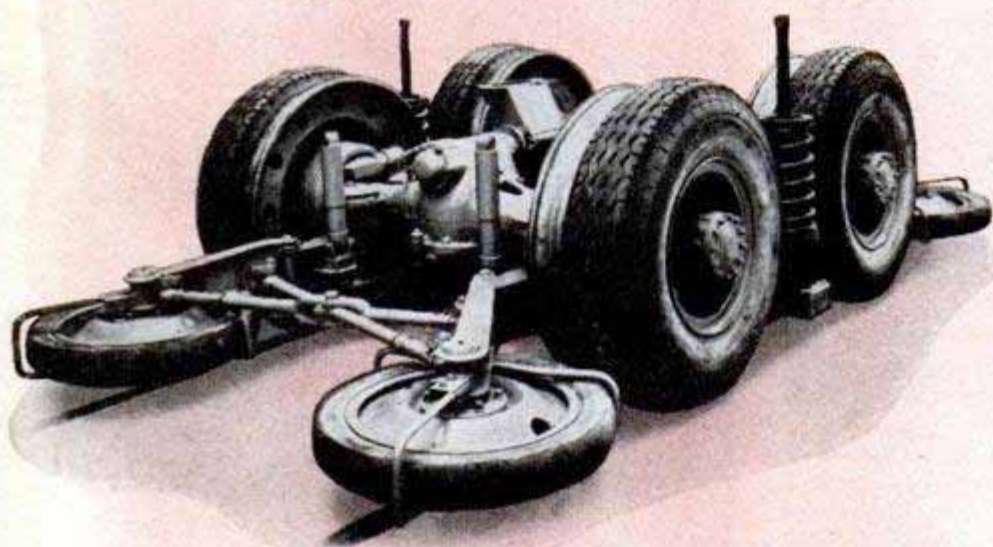


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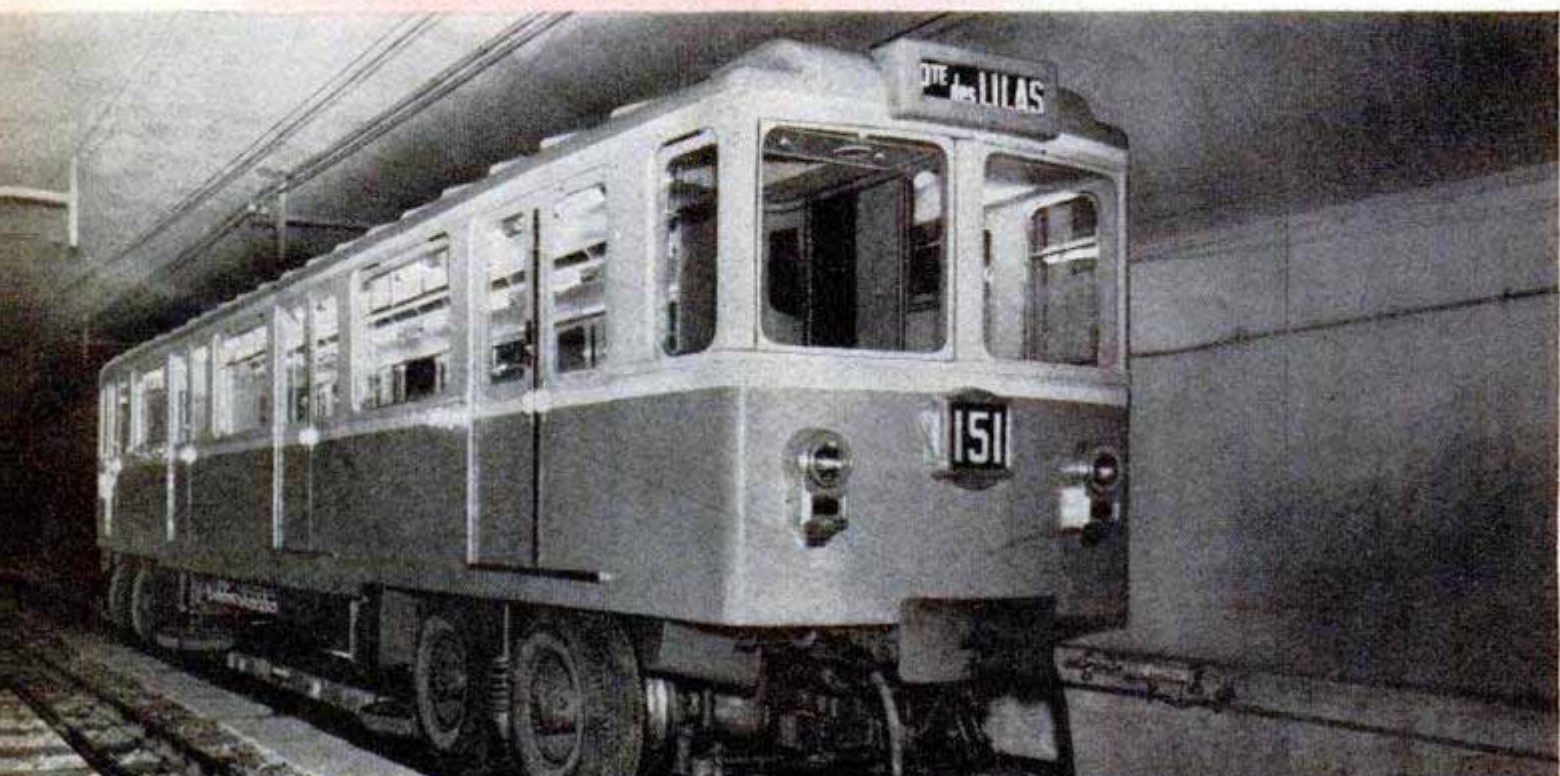
Artist's drawing shows how Parisian train of the near future will look if tests with tires are successful

QUIETER SUBWAYS FOR PARIS?



Horizontal wheels in front of train guide truck along rails. Below, test train runs along wooden tracks, to be replaced later with concrete

IN PARIS, a train equipped with rubber tires is traveling the subway system. Conventional truck tires have been fastened outside the regular flanged wheels in an attempt to reduce noise and increase comfort. The train travels along a wooden runway, to be replaced later with concrete tracks. Two smaller tires mounted horizontally in front of the train press against the sides of the track to guide the main wheels. In case of puncture, the train can proceed without delay on its old flanged wheels.



NOW THEY'RE MAKING CARS OF GLASS



In demonstrating the ruggedness of laminated glass fiber, worker repeatedly clubs a removable top with all his force but it fails to show the slightest sign of a dent

By Paul W. Travis

WITH STEEL so short, why not make car bodies of glass fiber?

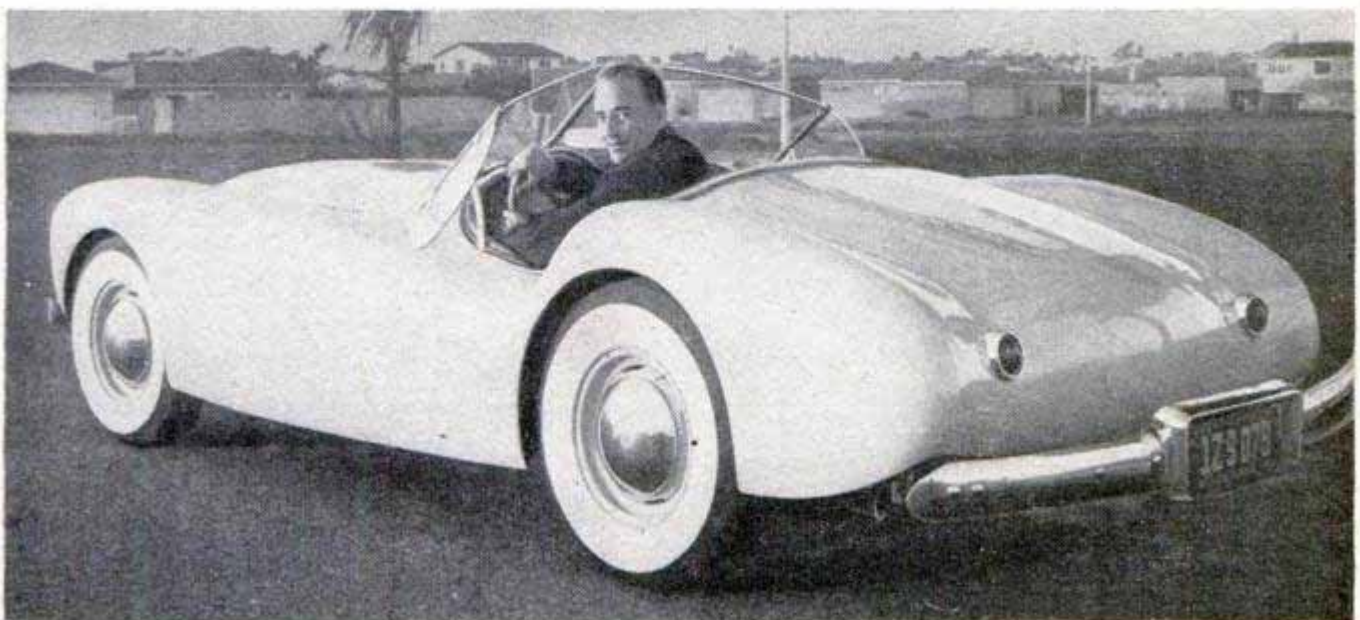
A California company answered that question by turning out one weighing only 140 pounds, one third the weight of a conventional steel model but equally strong. In addition, it is dent and corrosion-resistant.

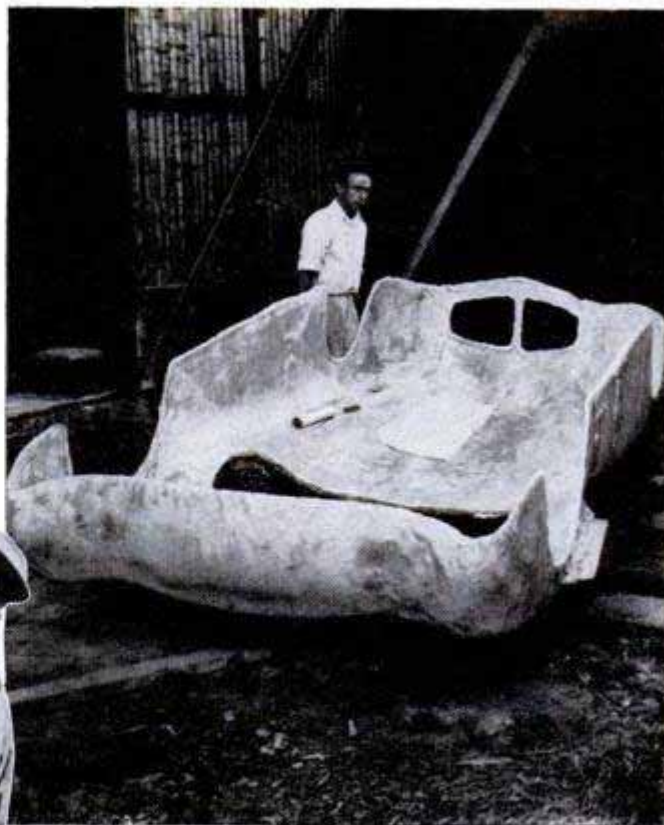
Before the hood was attached, the laminated-glass-fiber body was laid on a concrete floor. Husky men with boots jumped on it, drove automobiles over it and beat it with a sledge hammer — without damage.

The car was built by the Glasspar Company of Costa Mesa, Calif., for Maj. and Mrs. Kenneth Brooks of near-by Lido Island. It was designed by William Tritt of Glasspar. A 1940 Willys chassis was used and the forms for the glass fiber were made from a wooden body model built over it. Then the $\frac{1}{8}$ -inch-thick body was made from layers of fiber held together by plastic polyester glue.

Makers of laminated boats for years, the company is also building removable tops of

Layers of glass held together by plastic polyester glue form the $\frac{1}{8}$ -inch-thick body built for Major Brooks



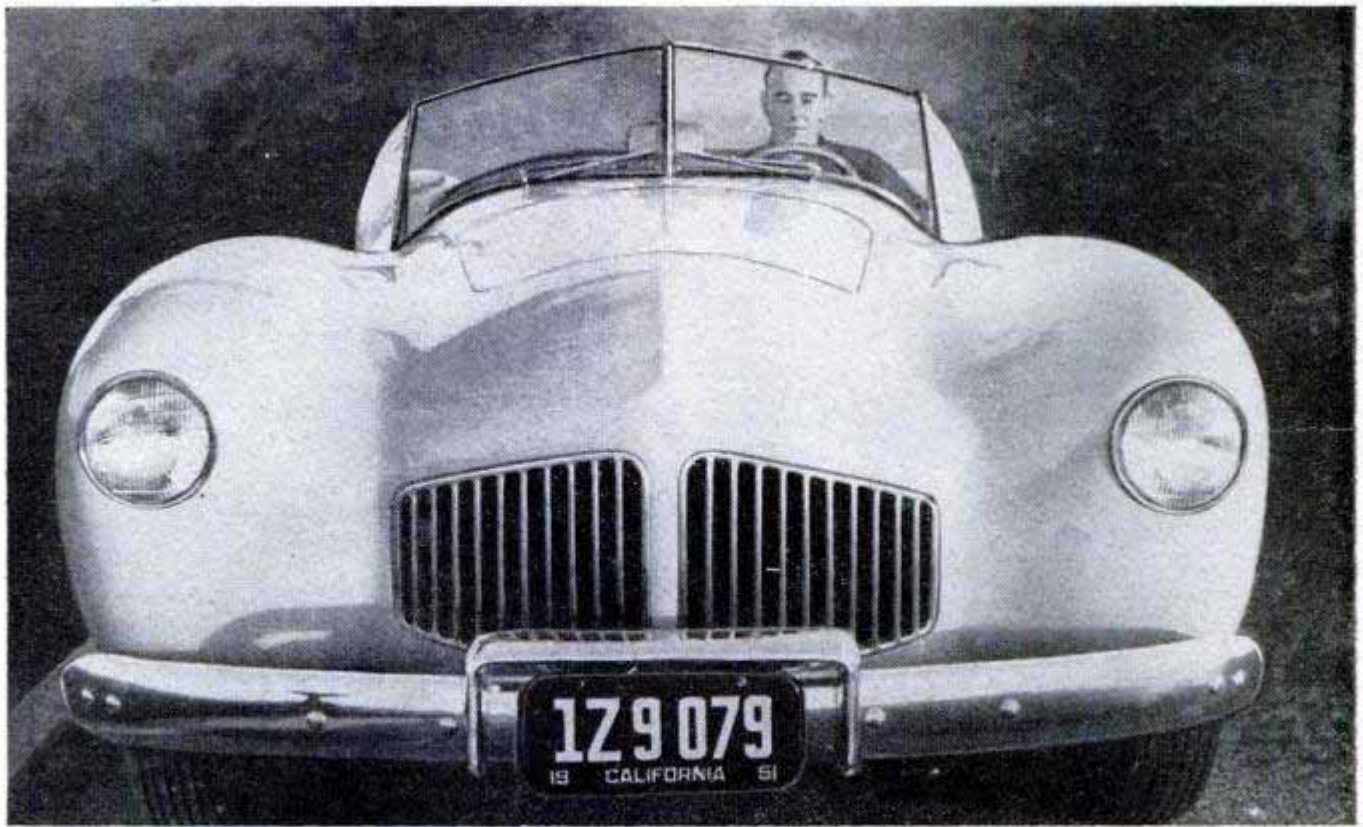


Mold, above, in which the glass-fiber car was formed. A special releasing agent is painted over the inside. The first body stuck and had to be chiseled out in pieces

Strong and tough-skinned, fiber top for Jaguar easily bears the weight of two men as they jump up and down. A special repair kit simplifies the smooth patching of large holes

William Tritt, the top's designer, holds it over his head to demonstrate the material's lightness. Two average-size men could lift an entire car body built of glass fiber





Sanding, a prime coat and 12 heavy coats of lacquer gave the Brooks' car body its exceedingly glossy finish

glass fiber for the British Jaguar Sportster. These weigh 22 pounds and can be attached in 15 minutes by three screws in the windshield frame and a bolt on each side. With a repair kit soon to be made available, a layman could patch a two-inch hole in the top so expertly, the manufacturer claims, that the repaired spot couldn't be detected under close observation.

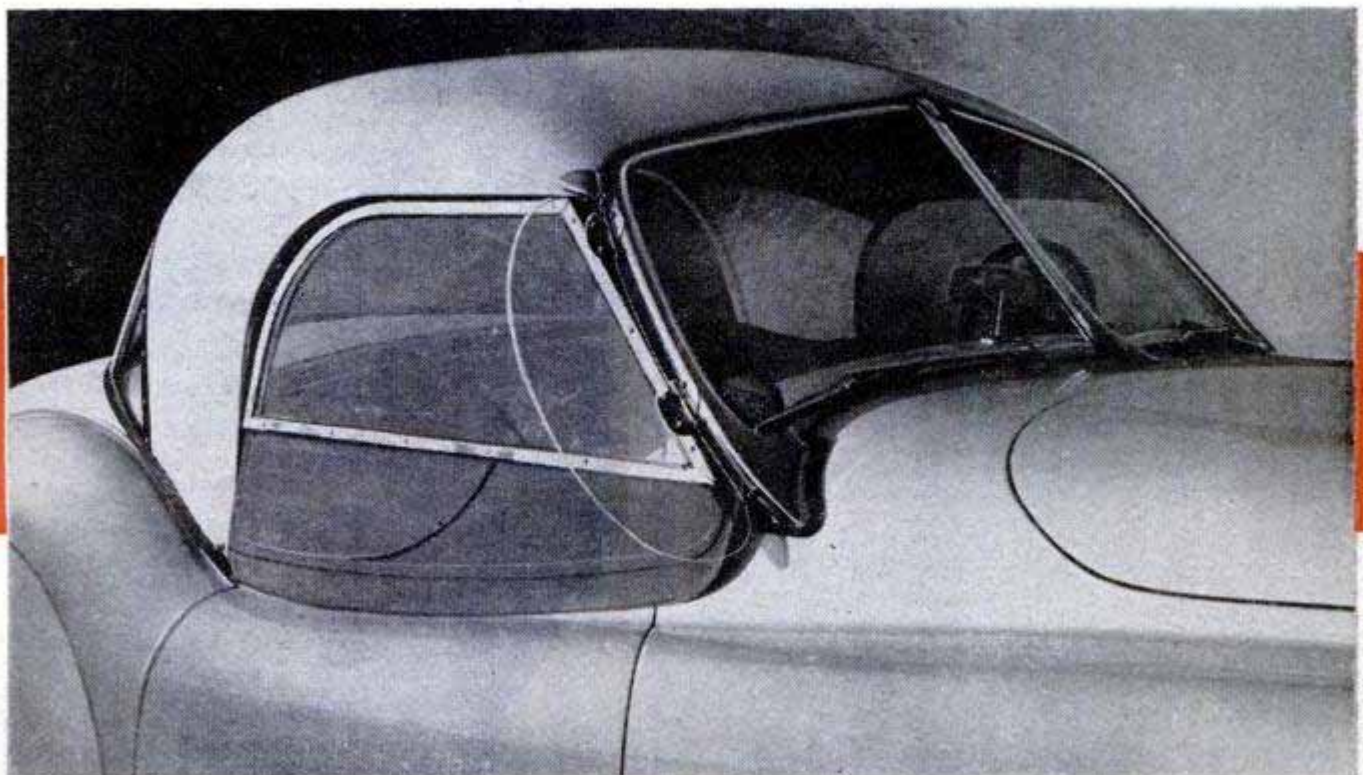
In appearance, the car most closely resembles a Jaguar. The wheelbase is 102

inches and the tread is a standard 56 inches. Its exceedingly glossy, fine-grained paint job was done in the conventional manner with sanding, a prime coat and 12 heavy coats of lacquer topped off with a polishing.

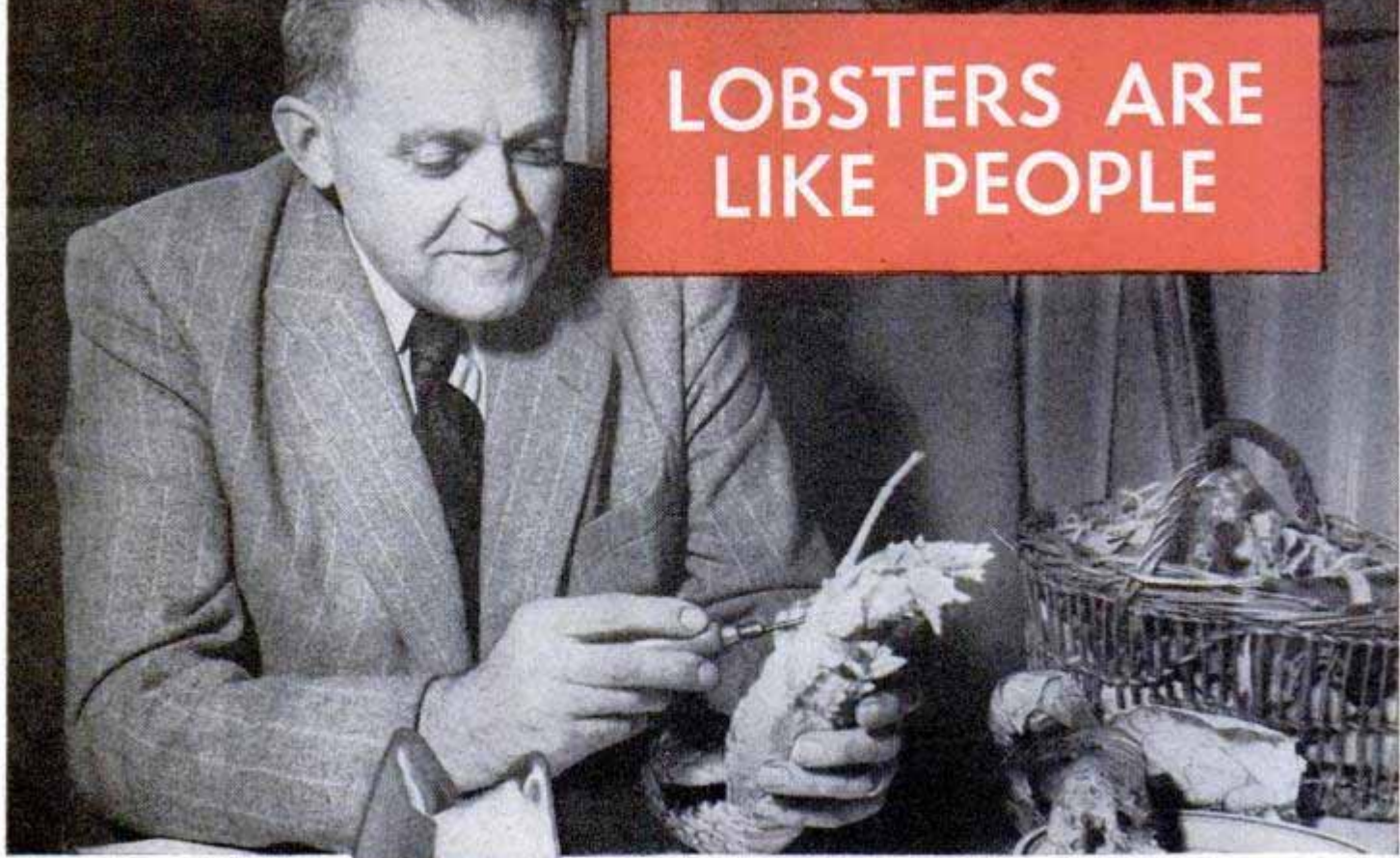
The Brooks' car is so low-slung and lightweight that sharp corners can be turned at 50 miles an hour. The passengers' heels are only nine inches from the ground. The pedals are adjustable to the driver's size.

★ ★ ★

It takes only 15 minutes to adjust three screws and two bolts that attach 22-pound top to a Jaguar Sportster



LOBSTERS ARE LIKE PEOPLE



Jean Sulpice, Parisian restaurateur, believes that lobsters and people have similar features. These "portraits" seem to prove the artist's contention

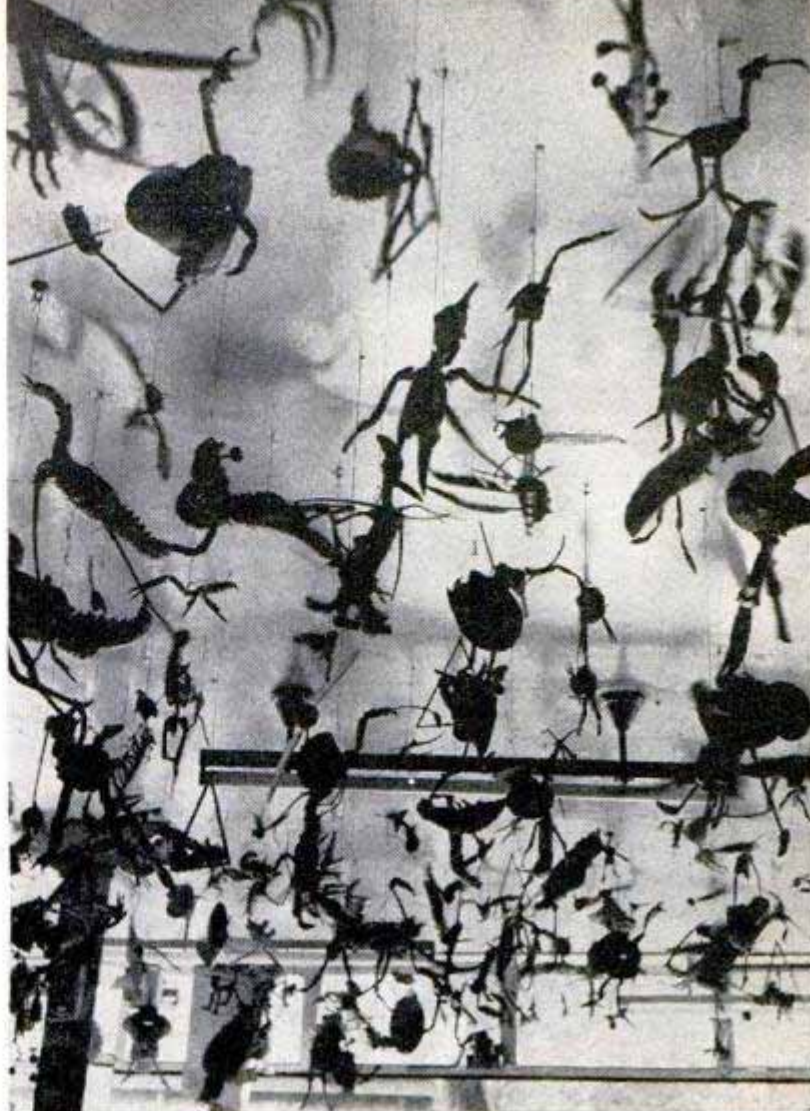
With a few props (a cigar, glasses and hats) and his lobster shells, the Frenchman created these caricatures of two famous international figures





Fine wire holds the various parts of the figures together in their lifelike poses

ANYONE WHO HAS seen Paris knows about Place Pigalle—and knows that almost anything can be found there. That is why it is no surprise to learn that in the city of artists, one Pigalle restaurateur is an artist who hangs his work from the ceiling. More surprising is his medium—lobster shells! ★ ★ ★



Hanging from the ceiling in a somewhat frightening array are scores of examples of the artist's work in a variety of subjects



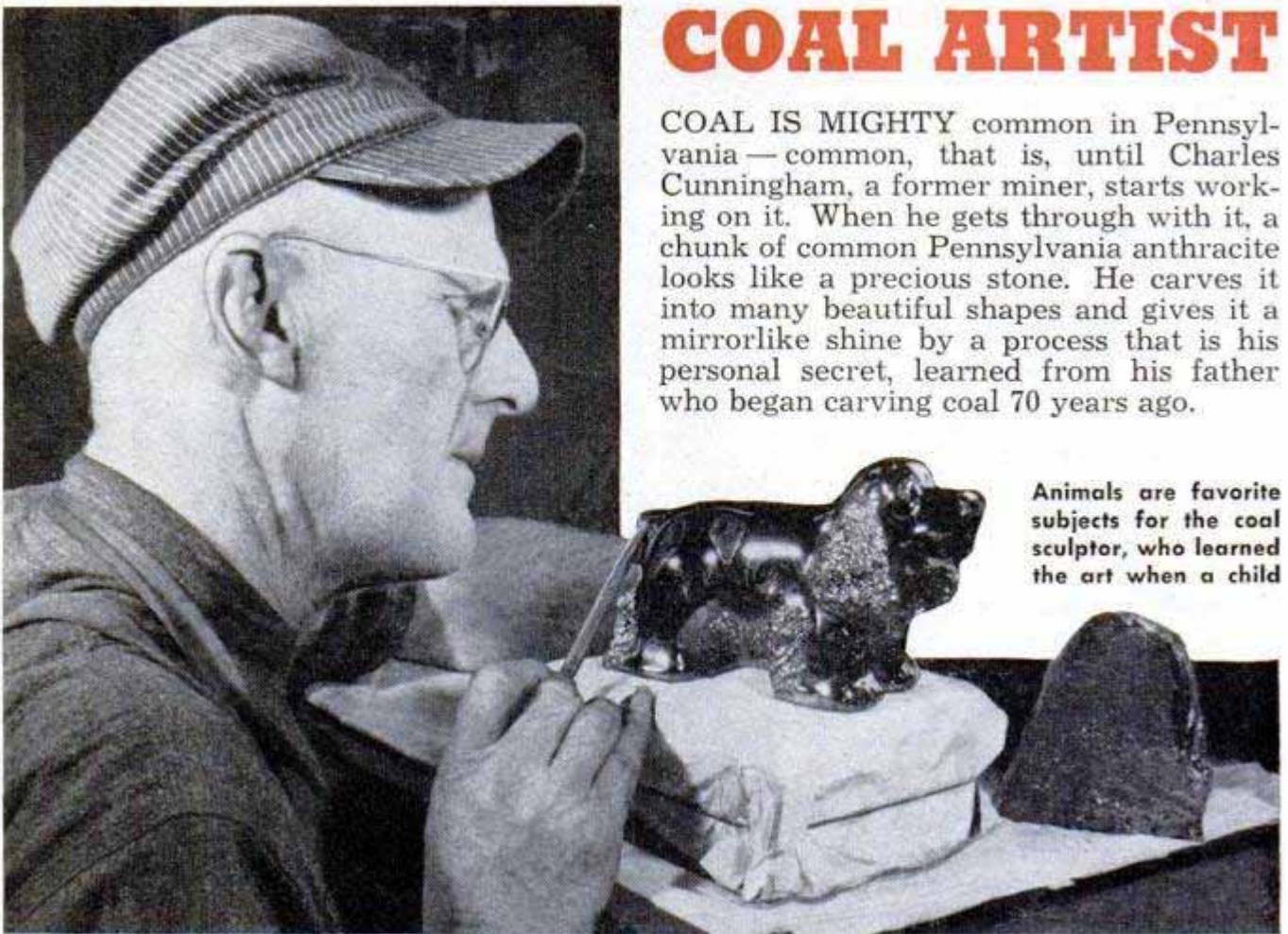
Left, no label is needed to identify De Gaulle. Right, not so easy to recognize is the figure of the French president, Vincent Auriol



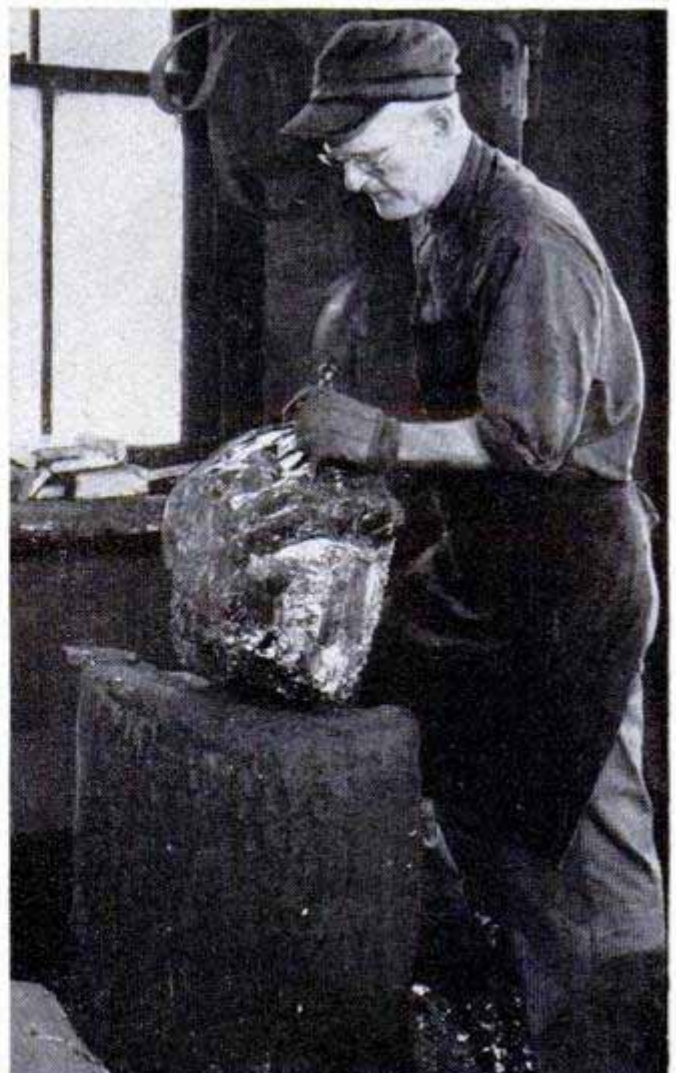
COAL ARTIST

COAL IS MIGHTY common in Pennsylvania—common, that is, until Charles Cunningham, a former miner, starts working on it. When he gets through with it, a chunk of common Pennsylvania anthracite looks like a precious stone. He carves it into many beautiful shapes and gives it a mirrorlike shine by a process that is his personal secret, learned from his father who began carving coal 70 years ago.

Animals are favorite subjects for the coal sculptor, who learned the art when a child

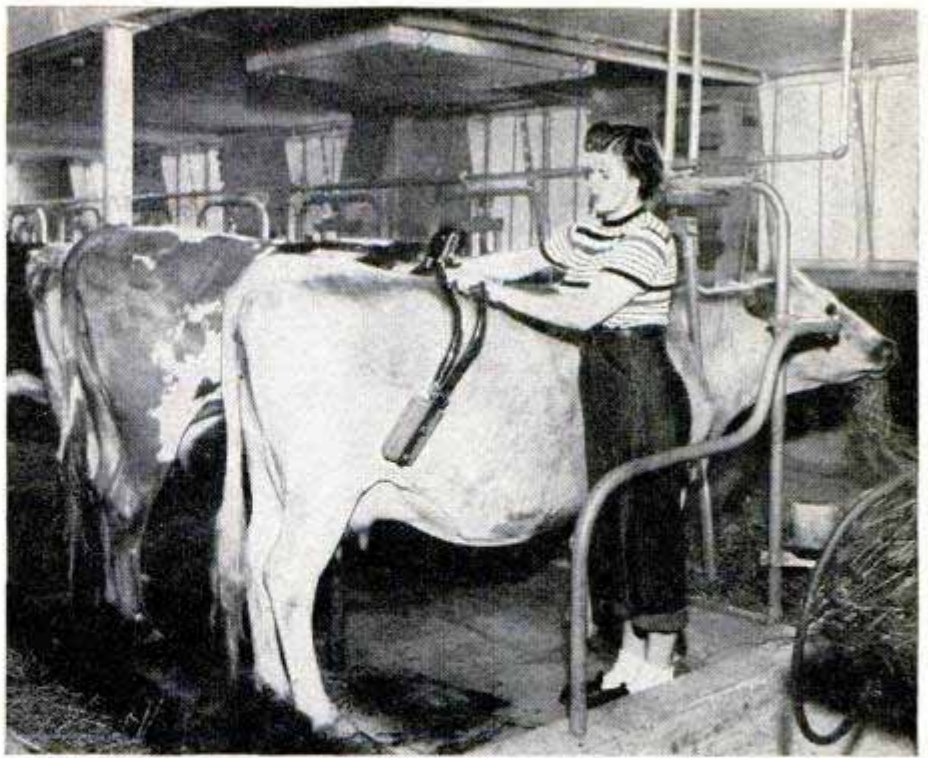


Below left, some of his work. Right, he selects coal in the mine himself, splits it carefully in his shop



Clamp Deters Cow From Kicking

Cows in stanchions are discouraged from kicking by a U-shaped clamp that exerts light pressure on certain muscles. The clamp grips the animal at a point below and slightly behind the hipbone projection. Pressure in this area inhibits the use of muscles involved in kicking. The instrument also affects certain nerves, according to the manufacturer. The gentling device is made in a standard size to fit most cattle and a smaller size for cattle of smaller breeds.



Desk-Size Facsimile Machine

Smaller than a typewriter, a miniature self-contained telegraph "office" provides the executive with 24-hour telegram service. Telegrams are sent and received simply by pushing a button. They don't even have to be typewritten. You simply write out the message on a blank, wrap the blank around the drum of the machine and turn it on. A scanner views the message and sends it to the addressee where an exact copy is reproduced by an identical machine. Transmission time of about 2½ minutes is required to handle a full message. The call is routed through the main office of Western Union, which directs the message to its destination and bills the sender.

Shoe House

"There was an old woman who lived in a shoe"—at Hickam Air Force Base in Hawaii. A few years ago S/Sgt. George E. Sylvain built a playhouse—a replica of a modern bungalow—for his three daughters. Eventually they lost interest in the house and he sold it to a civilian. But later they wanted another miniature home, so Sylvain went to work again. This time he built them a home in the form of a huge shoe. The playhouse is complete with a miniature door, windows, painted-on laces and a crooked chimney.



THE CARS



By Ewart Thomas

ABOUT EVERY five miles in traffic someone pulls alongside Bob Gottlieb with the question, "What's that you're driving, one of the new foreign cars?"

Gottlieb leans over the side of his long, low, sporty automobile and grins. "Nope," he replies, "It's a 20-year-old Chrysler."

In this lineup, the old-time Packard, Pierce-Arrow and Rolls-Royce are classics, restored in every detail and now used daily by their owners



And it is, though the gleaming maroon custom body doesn't look a month old and the engine is so quiet you hardly can hear it.

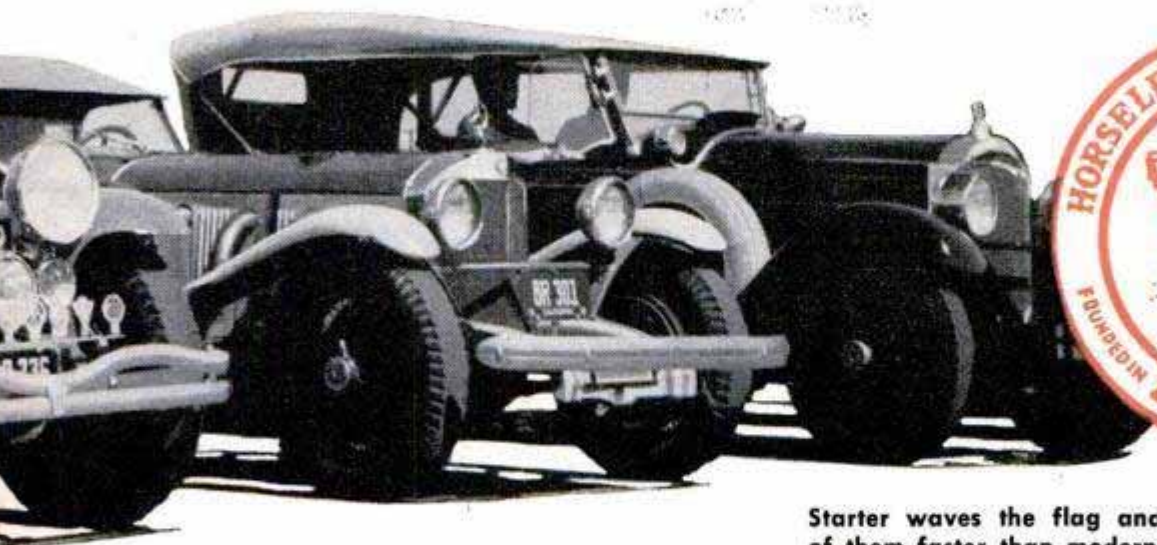
The car was a rusty wreck when Gottlieb paid a couple of hundred dollars for it several years ago. The water jacket had rusted out, cam followers were broken, three springs had snapped, the brakes were shot, universal joints ruined and many parts missing. The new owner spent six months of spare time restoring the car to original condition and today he drives it to work.

Last year he put 22,000 miles on it. The whole car is strictly original except for a 1950 carburetor that was installed for better mileage.

Gottlieb can afford a new car but there probably isn't a 1952 model on the market he'd accept as an even trade. He's one of the "classic car" fans, one of the growing number of enthusiasts who delight in restoring and driving some of the great cars that were built in the past.

The classics include most of the expensive, limited-production automobiles that were built for looks, performance and durability. Many of them cost fabulous amounts when new. A

THEY DRIVE ARE CLASSICS



Starter waves the flag and the classic cars—many of them faster than modern cars—are off on a race

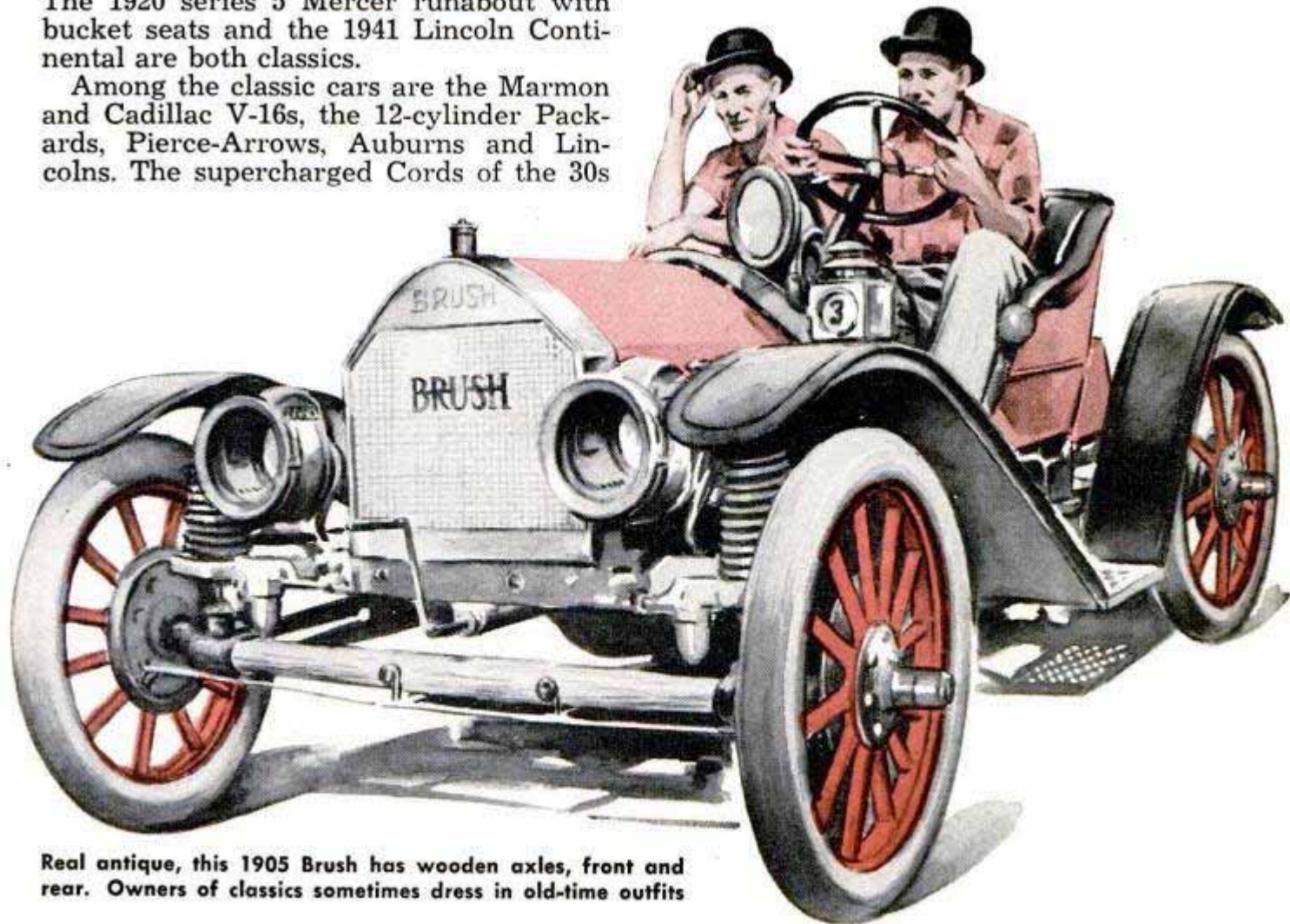
1928 Rolls-Royce town car with special body that sold originally for \$25,000 is a classic even though you can pick one up today, unrestored, for around \$500.

Beauty of lines, performance, rarity and present usefulness all contribute to the definition of a classic car. Such cars have also been called romantic cars, or cars of special interest. Age makes no difference. The 1920 series 5 Mercer runabout with bucket seats and the 1941 Lincoln Continental are both classics.

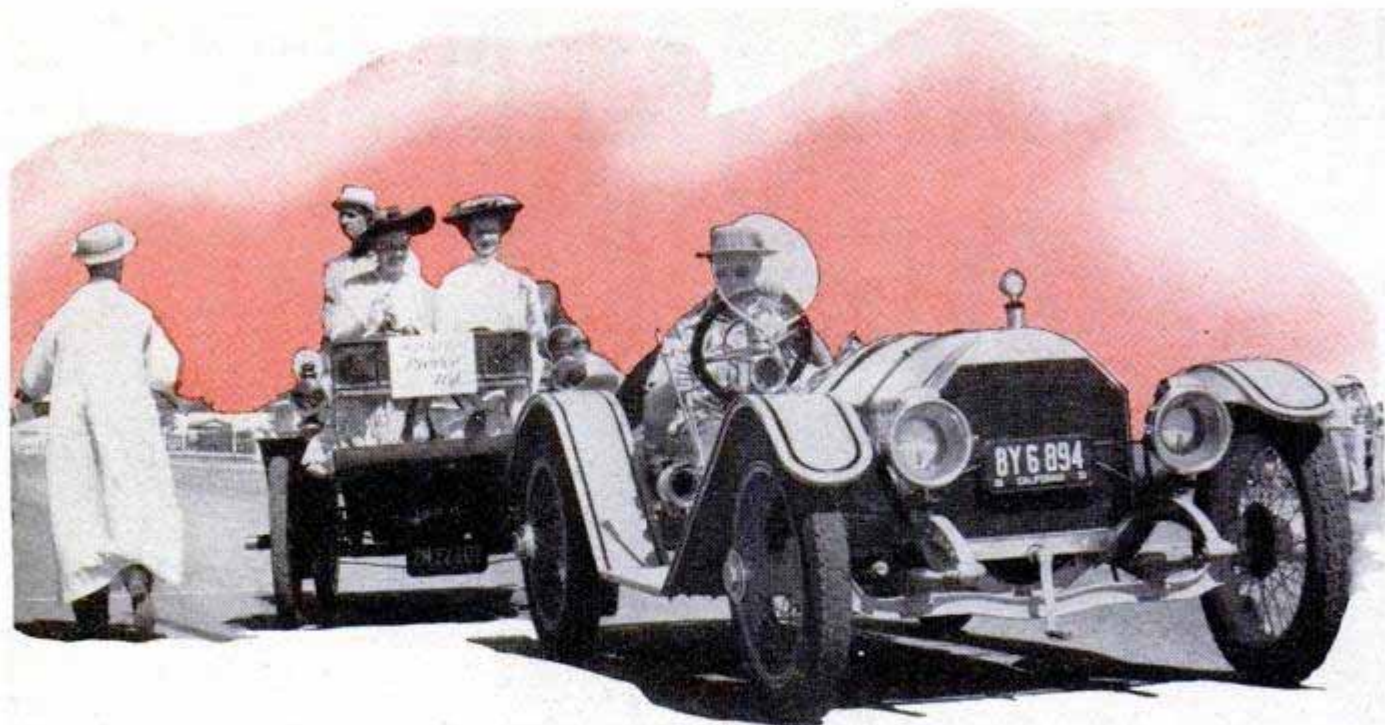
Among the classic cars are the Marmon and Cadillac V-16s, the 12-cylinder Packards, Pierce-Arrows, Auburns and Lincolns. The supercharged Cords of the 30s

are classics, as are the 100-mile-per-hour Stutz Bearcats and Super Bearcats. Many of the best foreign cars are in the classic category in spite of age. The greater beauty of a custom-built body always contributes to the value of a classic.

The early Stars, Overlands, Chevrolets and Durants are not classic cars although some may be prized for other reasons.



Real antique, this 1905 Brush has wooden axles, front and rear. Owners of classics sometimes dress in old-time outfits



Early Mercer with a "monocle" windshield and acetylene lamps leads a one-cylinder 1902 Pierce in field meet

Unlike a collector of antique cars who hesitates to take his early creation out on the highway except on special occasions, the enthusiast who has restored an old Stutz or a custom Chrysler is apt to drive it almost daily. The springs aren't as soft as on a newer model, to be sure, and the acceleration of the long-stroke engine is slower, but the chances are good that his restored vehicle can go faster than any modern stockcar he'll meet. There's no doubt at all about its superiority on a twisting mountain road. Virtually all the old cars corner like jack rabbits. They breeze around turns that a modern car with

its soft springs and heavy front end can't take without slowing down.

The rage to restore the old cars started several years ago and has been growing rapidly. Luxurious but time-worn automobiles that had no takers at \$50 a couple of years ago now command prices of several hundred dollars. Not all of them are bargains and it never pays to try to restore a car that is ready for the junk heap. If the car is completely worn out or wrecked it's best not to buy it.

The Horseless Carriage Club and other organizations of antique-car enthusiasts have opened their memberships to the own-

Right-hand-drive Mercer had cumbersome gearshift. It was really open-air driving with circular windshield

Steering wheel of Kissel pushed up out of the way when driver entered, then snapped in place again





At a Western field meet, passengers in antique cars compete in trying to "lance the ring" with wooden poles

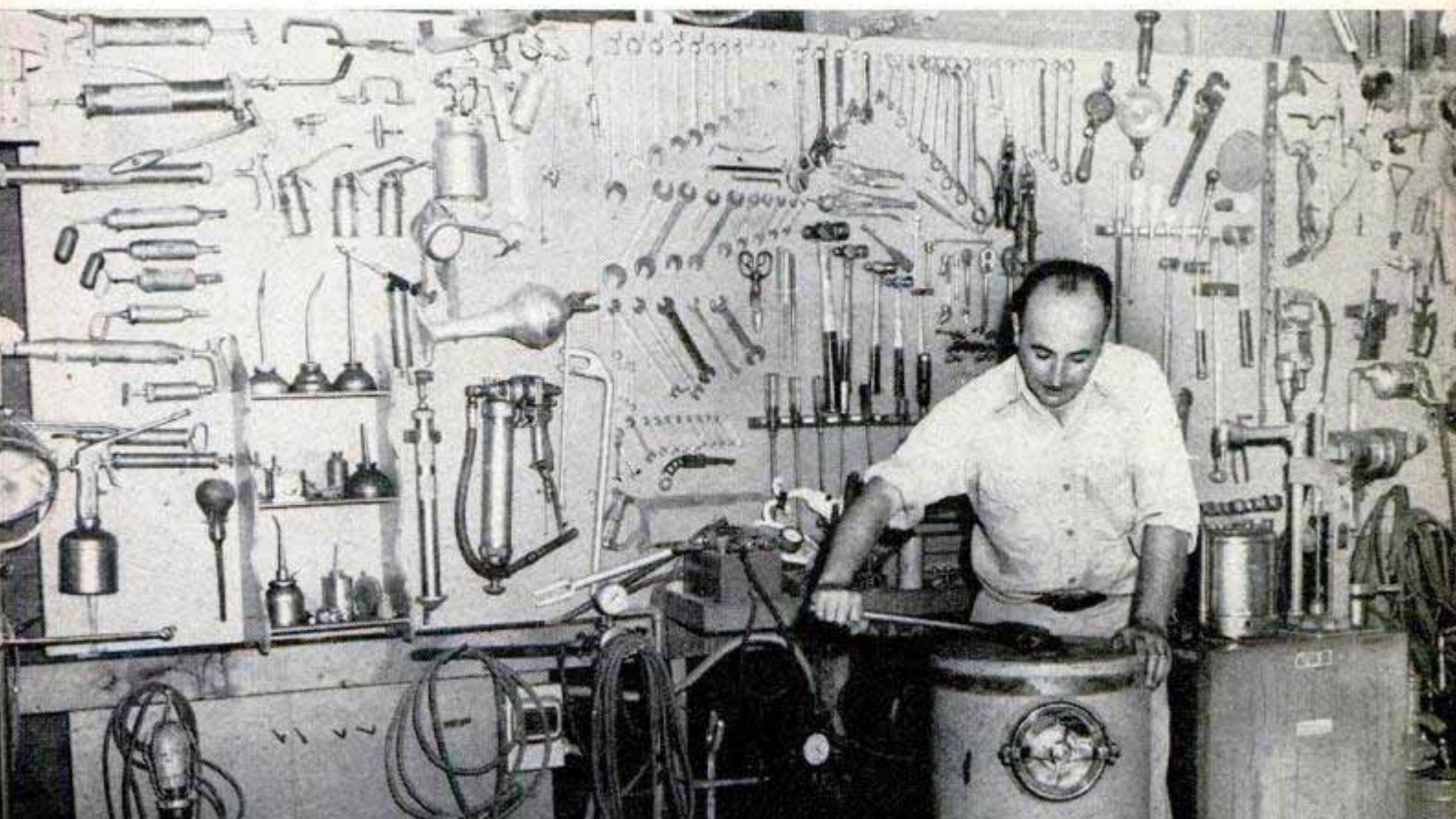
ers of classic automobiles, and in the Horseless Carriage Club alone classic owners are joining at up to 200 new members per month. The field meets that are held annually by these organizations are now beginning to take on a semimodern look. Sprinkled in among the early horseless vehicles, steamers and electrics, there are now plenty of classic automobiles that add a touch of the 30s to the earlier equipment.

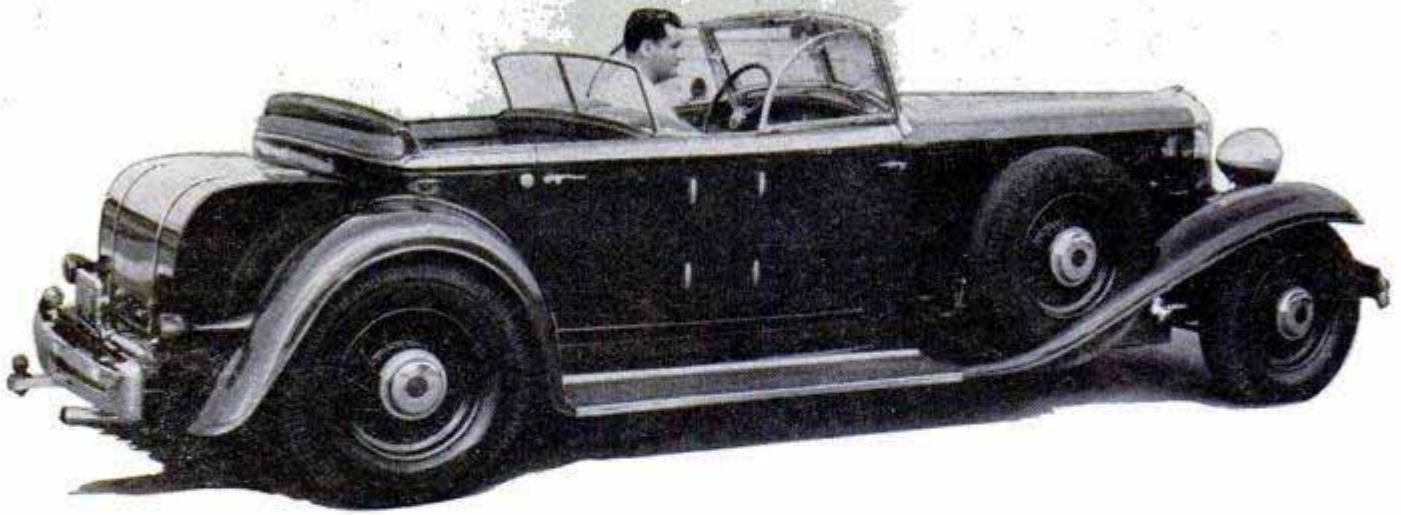
Both the classics and the antique cars compete in field events at these meets. Races are for short distances only, to hold down speeds, and a powerful classic car

doesn't always beat an earlier automobile of little horsepower. In a typical race the cars may sprint for several hundred yards, come to a dead stop, stand there while the drivers leave their seats and run all the way around their cars, then start up again to sprint to a finish line.

Most classic-car owners are content with one old automobile but some owners enjoy their cars so much that they may wind up with half a dozen. One such enthusiast is Elliott Wiener of Pacific Palisades, Calif., who acquired a 1909 Buick in 1945 and spent the next year restoring it. The Buick

Elliott Wiener, bitten by the bug to restore the classics, soon discovered he needed a modern machine shop to rebuild parts. Here's the result. There's even a pit built into floor for servicing the antiques





Owner drove 20-year-old Chrysler 22,000 miles last year. It has custom body resembling modern foreign cars

is a true antique, and Wiener next bought a classic, paying \$350 for a 1927 Stutz four-passenger speedster in excellent condition. A year's spare time was devoted to restoring the car completely. Today the Stutz undoubtedly could be clocked in excess of 100 miles per hour, the speed it was guaranteed to do when new. Its present value is more than \$3000.

His next restoration was a 1915 Pierce-Arrow, a ponderous antique that he occasionally drives to field meets. The car is powered with a six-cylinder T-head engine.

Today Wiener is restoring two classic cars, a Phantom I Rolls-Royce town car that was a mechanical ruin when he started work on it, and a 1920 Mercer runabout that had been used for a time as a race car.

Wiener enlarged his private garage several years ago to house his collection, then added a new garage complete with shop and pit when his collection continued to grow. Stored away against the time when

he can get to work on them are a 1920 HCS with a sport touring body and a four-cylinder overhead-valve engine and a 1909 Overland coupe that has the appearance of an early electric.

King of all the classics is the Duesenberg J, a juggernaut of an automobile that has become a legend in automotive circles. The Duesenberg was the mightiest stock-car ever produced in America and its eight-cylinder engine, equipped with 32 valves and dual overhead cams, developed 265 horsepower. The Duesenbergs were reputed to have a top speed of 120 miles per hour, to do 105 miles per hour in second gear and to go from 0 to 100 miles per hour in 20 seconds. Some 470 of these cars were built between 1929 and 1937.

The Duesenberg had a wheelbase of 153 inches, weighed 6800 pounds and cost \$16,500 with a custom body. By modern standards it handles like a fire engine and is too big and long for comfortable driving

Wiener usually drives sports car in center, but often rolls along streets in 1909 Buick, left, or early Kissel



in traffic. But some of the Duesenbergs that still exist have gone 600,000 miles and seem good for many hundreds of thousands of miles more.

Among the Duesenbergs that have been restored to tiptop condition is a 1930 convertible Berline owned by James Talmadge, also of Pacific Palisades. The car was being used as a chicken roost when Talmadge paid \$400 for it in 1949. Recently he refused \$2500 for it.

The Duesenbergs all had four-wheel brakes and a lubricating system that automatically lubricated all spring and steering points every 85 miles. In addition to the standard instruments there were also an intake-vacuum gauge, tachometer, chronograph, brake-pressure indicator and altimeter.

The goal in restoring a classic car is to return it to its pristine factory condition and appearance. You wouldn't use modern sealed-beam headlights on a 1932 Pierce-Arrow, nor would it be right to install an automatic transmission in an early Hupmobile. But in the case of his Duesenberg, Talmadge made several changes for the sake of efficiency and safety. The original car was equipped with 6:50 x 19 tires, not now available, and so Talmadge uses eight-ply truck tires on 20-inch wheels. The original carburetor and ignition system were poor by modern standards, so he replaced those parts with better equipment. To cut down the thundering exhaust he uses part of a diesel-truck exhaust system plus a special tip. Aside from those changes the car is completely stock.

If you hanker to drive a Rolls-Royce, say, or a Cadillac 16, here's some composite advice put together by scores of owners who have restored some of the old classics.

There's no telling where you'll find one of the old cars. Occasionally one is seen

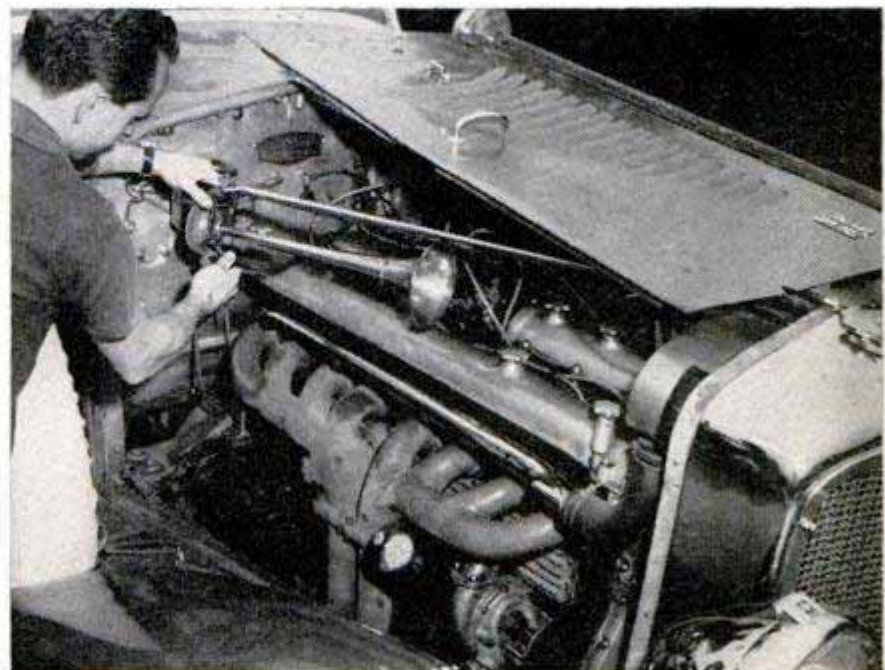
(Continued to page 230)



Antique-auto collector works on 1911 Stearns, which has sleeve-valve engine, spring-operated starter and body springs heavy enough for truck



Wiener checks the wheel hubs of a 1929 Rolls-Royce which he has almost completely restored. "Royalty" of the classic cars is a Duesenberg. Photo below shows an eight-cylinder Duesenberg engine of 265 horsepower





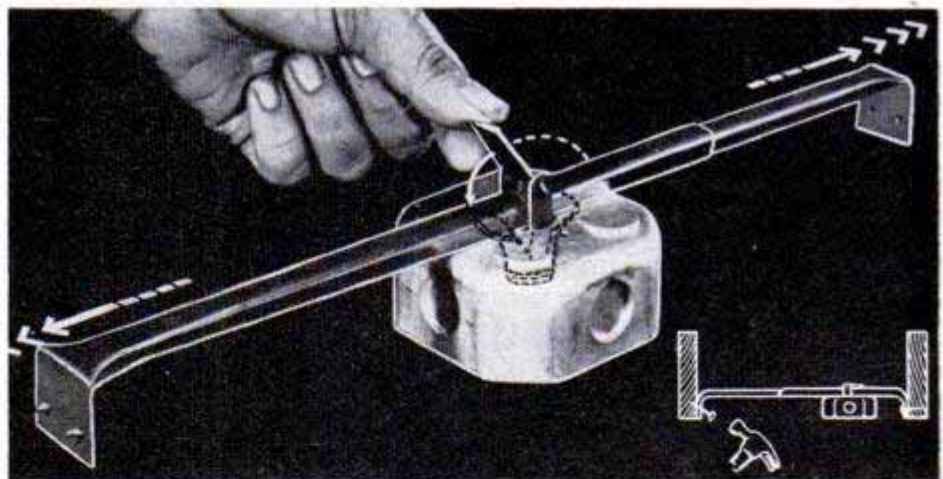
Surplus Army Telephones Are Grocers' Intercom

Several war-surplus field telephones make the job of replenishing shelf stock in a self-service grocery store much faster. Two Moscow, Idaho, grocers use these battery-operated phones to cut shelf-filling time from 2 hours to 20 minutes a day. The store is wired with outlets, all con-

nected to the stock room. The checker in the store simply moves along the rows and, by plugging his phone into various outlets, can relay shortage data to the stock room. Because the items are loaded on carts in order of their display positions, unloading is fast and efficient.

Bar Hanger

Fixture installation on both new and old work is speeded by an adjustable hanger that telescopes to fit any joist or stud spacing from 10 to 24 inches. The outlet box is held in place with a sliding stud that locks by means of a pivoting lever. Sharp prongs at each end hold the bar in position until nailed.



Circular Pencil Sharpener For Draftsmen

Pencils used by artists and draftsmen can be sharpened to extremely fine points with the aid of a cuplike tool. The pencil point simply is revolved around the inside wall of the cup. This wall is covered with silicon carbide, an abrasive almost as hard as diamond. A felt strip guides the draftsman in sharpening the pencil and also removes excess graphite.

Fruit Juicer-Squeezer Attaches to Grinder

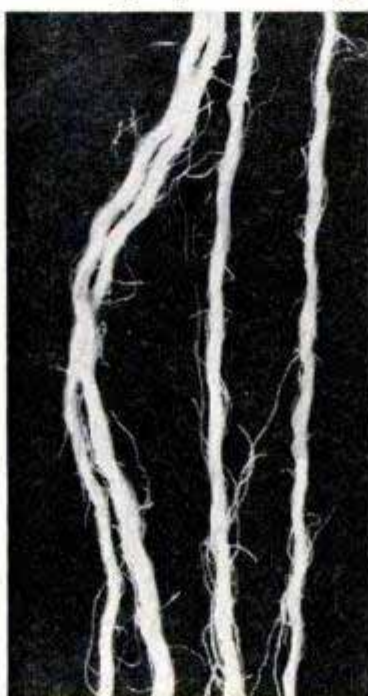
Berries and other fruit are squeezed and juiced by a conical-shaped attachment that fastens to the mouth of a German meat grinder. The usual knife blade is removed and the attachment substituted for it. As the handle is turned, the fruit is fed into the tapering squeezer which forces the juice and fine pulp out through a sieve on the underside. Seeds and pulpy material like the cores are ejected through the nozzle. A knob on the nozzle controls the amount of juice extracted.



Chemists Make Rayon Nonwrinkling by Altering Molecular Structure



Iron stains on rayon at left resulted from chlorine retention. Treated rayon did not yellow. Right, the four strands of rayon were moistened with water. Two straight strands were X-2 treated; other two were not

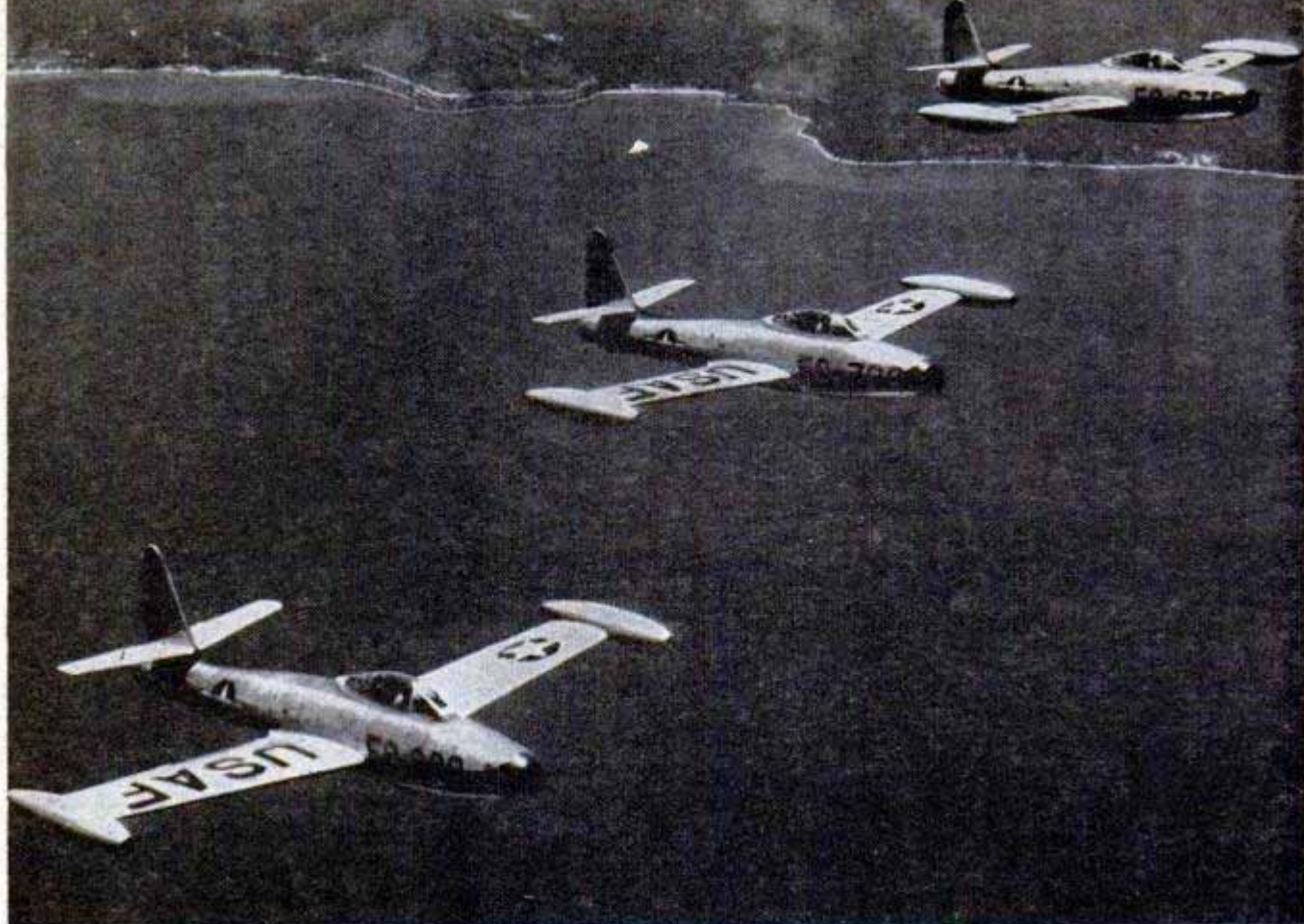


Chemists have found a way to change the molecular structure of rayon fiber to stop wrinkling, yellowing and other undesirable characteristics of the man-made textile. The process by which the structure is changed is known by the laboratory name of X-2. It promises to double the wear life of rayon clothing and makes all-white rayon clothing practical for the first time. It assures shrinkage control and makes the textile completely washable. The rayon will not retain chlorine used in laundry bleaches. Regular resin-treated rayon did absorb this chemical and breakdown often resulted.

Canasta Lazy Susan Is Also an Ash Tray

Canasta players have a new device for simplifying the game — a merry-go-round tray. The base of the device is a large metal ash tray. The card tray is supported by a metal rod that pivots so it can be swung around in each player's turn. A compartment below the card shelf holds the score card and pencil to provide more space for melding.





When radar outposts pick up a suspicious "blip," fighter planes are "scrambled" to intercept unknown craft

MANNING AMERICA'S RADAR WALL

By Dick Frederic



SQUATTING ATOP desolate bluffs or standing amid the snows of North America's frigid arctic perimeter, the eyes of the world's greatest radar system constantly are on watch these days. Few people have seen the steel towers with their great antennas slowly revolving day and night. The antennas are the secret outposts of our early warning radar net. Their lonely locations were picked for two reasons: Secrecy and clear line of sight.

Spaced several hundred miles apart from southern California's shores clear up along the Alaskan peninsulas, around the arctic rim and down the East Coast to Florida, these lonely stations—each manned by 200 to 400 Air Force technicians—form an overlapping network of radar. They maintain a constant vigil of the skies. Their job is to spot any suspicious aircraft headed our way with unknown cargo and flash a warning.

Actually, these outposts are only the forward scouts of a big team that makes up

Big "acquisition" antenna scans skies, picks up target for smaller radar which automatically points AA guns

At an arctic outpost, snow can drift roof-high overnight and men must burrow tunnels between buildings

our air-defense setup. Some 400,000 volunteer aircraft spotters, or ground observers, also are watching the skies (see *Popular Mechanics*, July 1950). Reports from their lookout posts are flashed to filter centers where the information is pieced together.

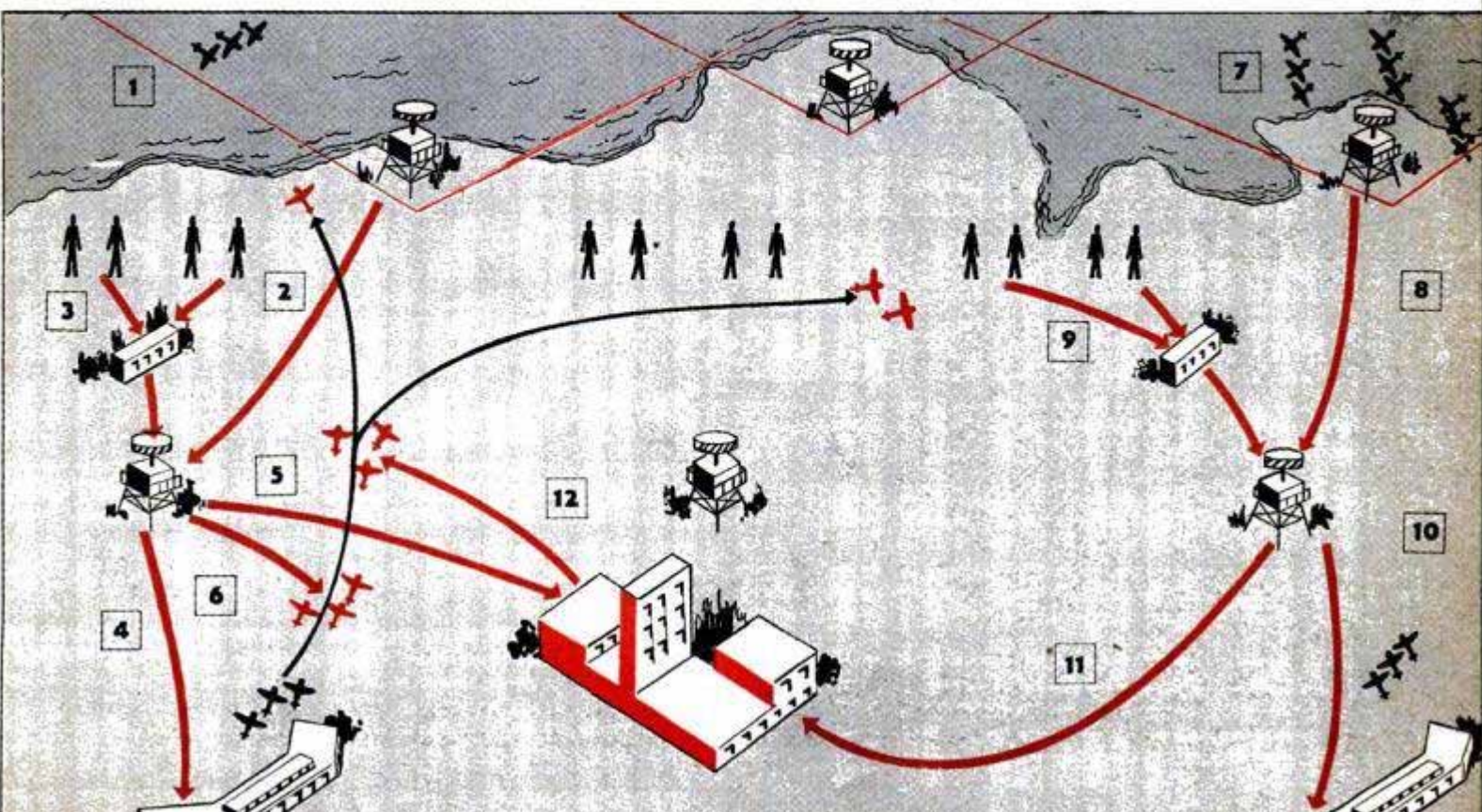
Data on hostile planes flows from both early warning radar outposts and from the filter centers to a third outfit—a ground-control intercept (GCI) station. Here reports from both sources are studied and orders to “scramble” interceptor planes are flashed to near-by air bases. Simultaneously, GCI shoots all the hostile-plane information along to another post still farther back. This is the air-defense control center, or ADCC. ADCC gets reports from many GCI stations. From the picture these reports make on the big plotting board, officers can soon tell if an enemy is sending in one or several waves of planes along a wide stretch of coastline. It can see which wave is the feint and which the real strike. ADCC may order the fighter interceptors rerouted in flight so they’ll converge where they’ll do the most good. This chain reaction, as warnings flash back to station after station, is known as “depth defense.” GCI and ADCC also scan the skies with radar.

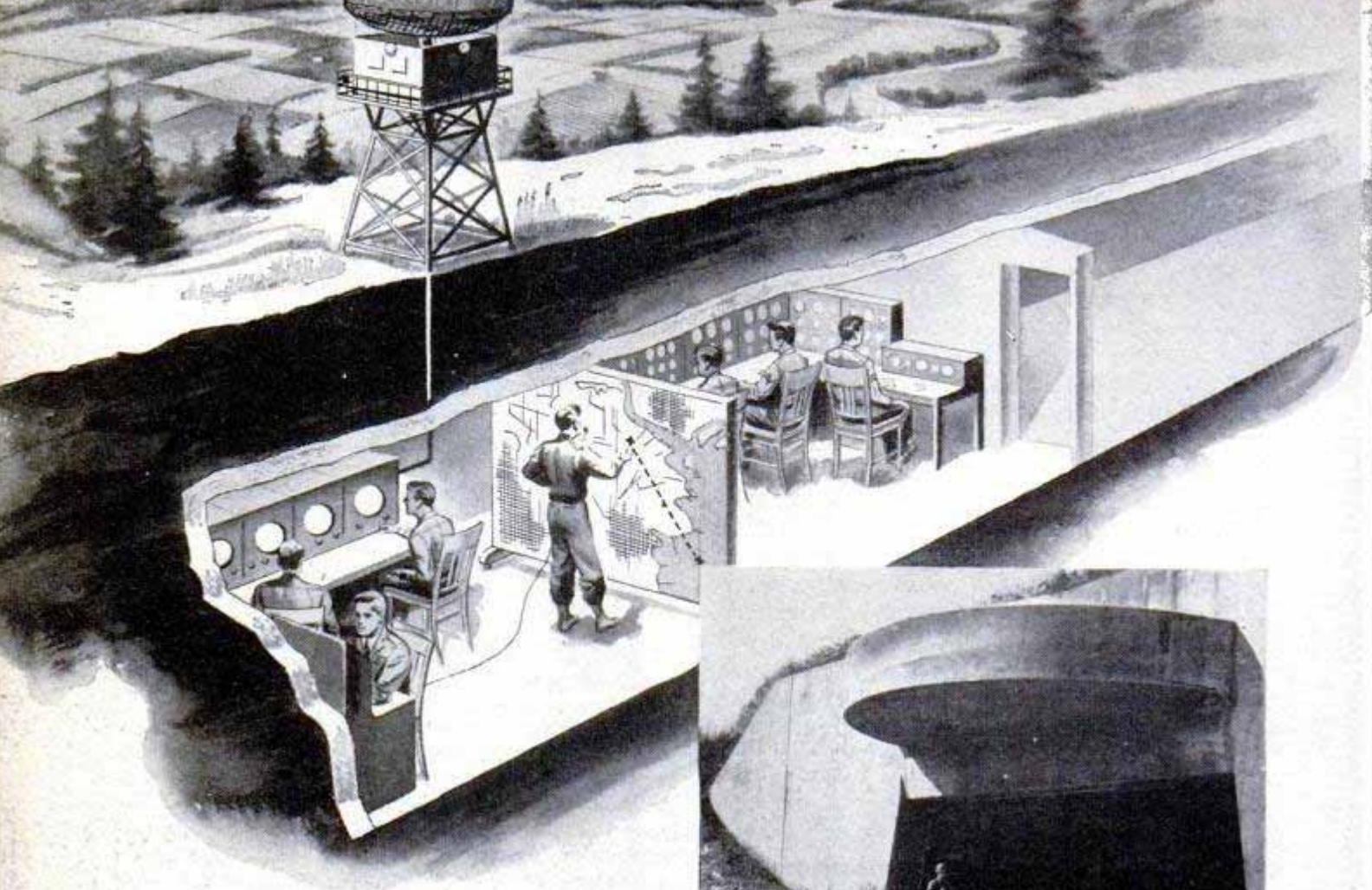
The real eyes of this intricate system, however, are the early warning radar outposts. Their invisible pulses can scan more than 200 miles, pinpoint planes flying 1000 miles per hour at 80,000 feet.

One of the outposts recently opened its gates to *Popular Mechanics*. It was a bleak winter day when the Air Force lieutenant



Diagram below shows how the radar network picks up and sifts information: An early warning radar spots small flight of planes (1); (2) information is flashed to ground-control intercept; (3) ground observers also spot the planes and send information to filter center, which transmits it to GCI; (4) GCI scrambles interceptors from near-by base and sends data back (5) to air-defense control center; (6) GCI vectors aircraft toward the target by radio; (7) meanwhile, another radar down-coast spots a larger flight of aircraft and (8) flashes data to its GCI; (9) ground observers fill in further information and this GCI scrambles interceptors (10) from another base; (11) all information goes to air-defense control center where controllers soon realize second alert is the big one; (12) ADCC reroutes most of the interceptors from the first base toward the major enemy flight. One plane proceeds toward the diversionsary attack





In one typical early warning outpost, big radar squats atop an underground bunker. "Scope dopers" interpret the radar signals, feed information to officer who plots flight on map. Men in other room are ready to send up interceptors. Right, armed guard patrols entrance to underground installations. Below, big snow compacter builds air strip in Arctic so another early warning outpost can be flown in and supplied



accompanying me wheeled his car across miles of desolate land. We turned off on a road hemmed in by high scrub, underwent 15 minutes of identification and were led into the base by an armed guard.

A lonelier spot would be tough to find. A barren vertical bluff dropped away so far and abruptly that no sound from the pounding Atlantic combers below reached our ears. Above us, on a high mound, towered the black skeleton of the "set," its massive "fan" turning ponderously. Huge bunkers overgrown with scrubby bushes hide a maze of rooms. The crew houses a lot of its gear in underground hideaways. Even the motor-pool vehicles have a gloomy, subterranean garage.

The cable from the big set feeds its radar impulses into one of these underground chambers. Here a controller is always on duty. Under him, a crew chief and 8 to 16 technicians run the set. Four separate crews maintain watches around the clock.

In one section of the underground chamber, heads are bent over an array of scopes on which the white and green light from the cathode rays paints ever-changing patterns of what the big fan "sees" as it revolves overhead. The men call these fellows "scope dopers." Their trained eyes are

One of the loneliest spots in the world is this radar outpost, circled in red, perched on Aleutian mountain

constantly alert for the tiny "blip" of light that will indicate something in the sky.

Near by, at a huge luminous board, plotters are sketching the tracks of all aircraft in the area. They get their information via telephone from the row of scope dopers, each of whom is following the progress of the tiny blips on his scope. If several flights of aircraft are moving across the sky at once, the scope dopers divide them, each keeping tabs on a single flight or group of flights. On the plotting board the controller can see from which direction a possible attack may come. If the aircraft are not identified, he'll instantly contact fighter operations at an air base, calling them by a code name. His patter will go something like this:

"Hello, Red Dog. Scramble 20 to 15,000 feet. Rendezvous at Top King 8521. Contact Gingerbread."

In plain English this means the air base is to send 20 jet interceptors to 15,000 feet to rendezvous at a given location (Top King 8521) and contact via their VHF radios a certain GCI station called "Gingerbread." Down in the operations room of Gingerbread, radio operators guided by the scope dopers' information will continue to vector the jets toward moving targets.

Meanwhile, a GCI teller flashes all information concerning target locations and scrambled fighters to an air-defense control center, where the track of enemy aircraft is plotted on another big board along with the tracks called in by all other GCI stations in the area. If they all agree, the early warning job is done and the rest is up to the fighter pilots. Plotters and radiomen are crisp and precise as they call their coded data back and forth. But among themselves, the men have a special language.

"I'm painting something," a scope doper may mutter.

"What you got?" asks the plotter.

"Boxcar at four angels going buster." Translated, this gibberish means the scope doper has a blip on his scope. He pegs it as a C-47 or C-54 cargo plane (boxcar), flying at 4000 feet (one angel per thousand) and going full speed (buster).

Of all the jobs at the set, scope doping is most grueling. Sgt. Henry Vallee, crew chief who's been reading scopes at this post for three years, explains it this way: "When a man stares at a busy scope more than two hours he gets 'blip eyed.' One man asleep or woolly-eyed at his scope and the whole chain is broken—because it might be his scope that would pick up the crucial plane."

Radar sends out short, rapid energy bursts called pulses—about one millionth

(Continued to page 258)





Car-Washing Machine For Service Stations

It takes only 15 minutes for one man to wash a car with a machine that sprays powerful jets of detergent solution as it passes over the car. Tanks or special pipes are not needed as the washer attaches to existing water lines. It can be installed in the same bay as a lift without interfering with the use of the lift. It is especially economical on water and detergent, using only two or three cents' worth of detergent per car and 30 gallons of water, a large saving over the 300 or 400 gallons ordinarily used.

Truck Wheels Balanced While on Axle With Portable Machine

Truck and bus wheels are balanced without removal from the axle by a compact outfit that can be rolled around the garage. Containing a three-horsepower motor, the portable balancer drives the vehicle wheel at any desired speed by means of a spinning disk which is held against the sidewall of the tire. A pickup arm, placed directly beneath the vehicle axle, transmits data on static and dynamic balance to a neon light on the balancer housing. The stroboscopic light "stops" the movement of an indicator marker fastened on the wheel. From the position of this indicator, the operator determines the location of the weights for correction of both static and dynamic balances.



Inflated Rubber Bumper Guards Absorb Shocks of Minor Collisions



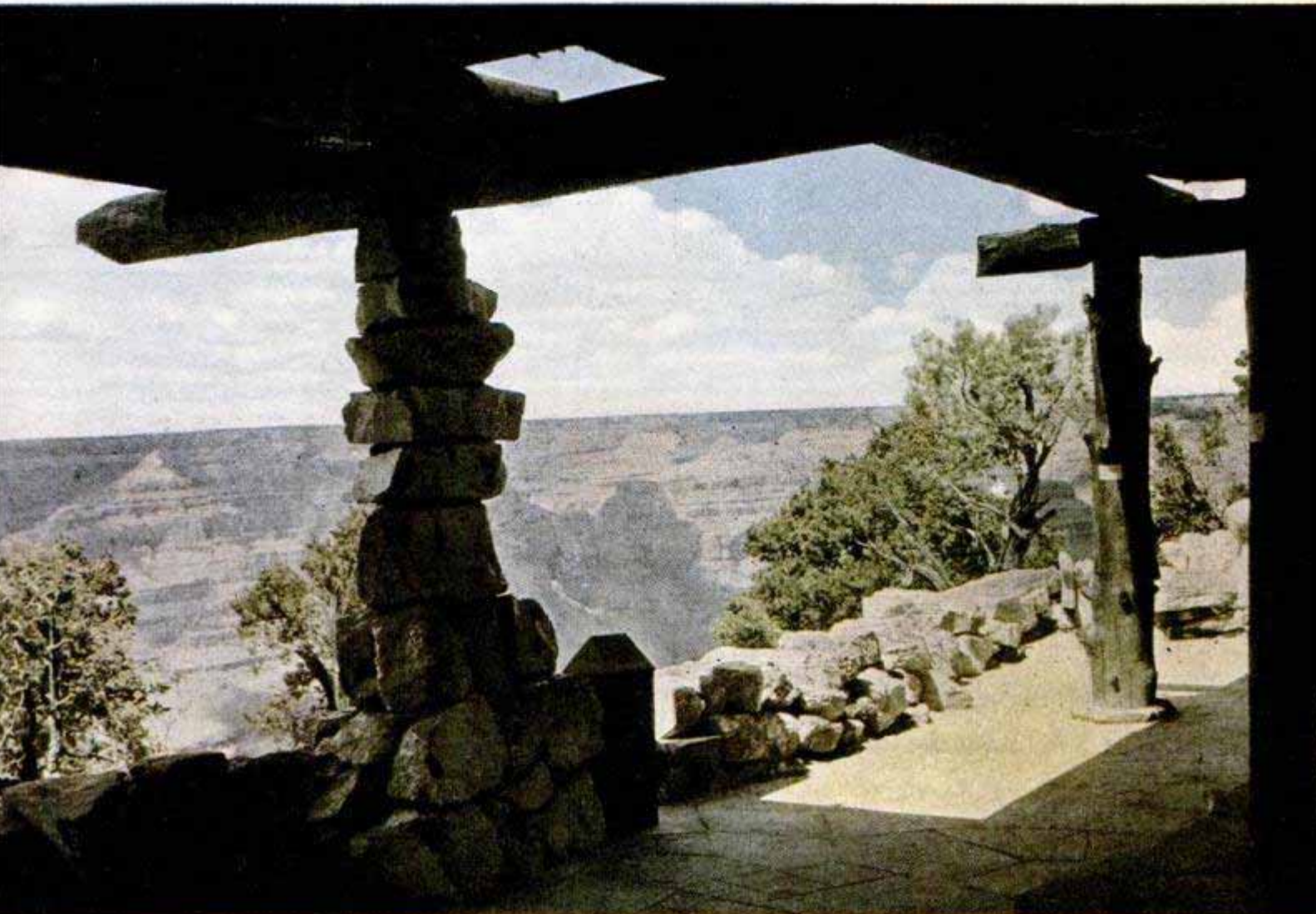
Extending beyond the thickness of conventional auto bumper guards, a set of inflated rubber guards takes the sharp jolt out of two cars colliding. The molded guards also eliminate dented and scratched chrome bumpers. They are attached by drilling a new set of holes to accommodate regular-size bolts.

Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, available from the Bureau of Information, 200 East Ontario St., Chicago 11

the

POPULAR
MECHANICS

CRAFTSMAN



TRY COLOR THIS VACATION

By Paul T. Hutchinson

ARE YOU PLANNING a vacation trip this summer? By all means, take your camera loaded with color film. The pictures you take will provide a record whereby you may relive a glorious vacation at any time. Vacation trips offer countless opportunities for interesting and unusual shots of scenery, buildings, historic sites, boats, beach scenes and people. Actually, the making of color photos outdoors isn't much different from taking black-and-white snapshots if you remember a few rules.

Any 35-mm. camera on the market today is suitable for color film and capable of reproducing faithfully any subject you

This excellent shot of the Grand Canyon is a good example of how your pictures will take on a third-dimensional quality when framed by the foreground. Animals, horses especially, are good color subjects

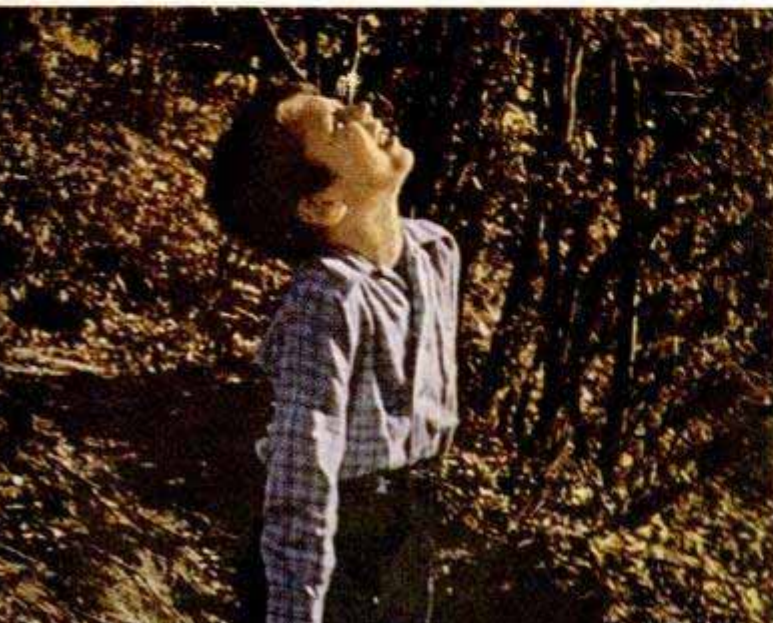




Group shots are more interesting when subjects are engaged in some activity, such as kids climbing fence



In most cases front lighting is recommended for color film although these two examples show interesting effects obtained by side and back lighting



might choose. A lens of $f:4.5$ is desirable because even outdoor color film, depending on the kind you use, is from 3 to 10 times slower in inherent speed than black-and-white film, and the widest diaphragm opening might be needed under weak lighting conditions. High shutter speeds are not a requirement because most shots will be taken at $\frac{1}{25}$ or $\frac{1}{50}$ second. Possibly you might use $\frac{1}{100}$ second but only on rare occasions when necessary to shoot action.

Color films are different from black-and-white in that they have a narrow exposure latitude. The ability of a film to record a range of brightness values is called latitude. Emulsions that are able to reproduce a long range of brightness values are said to have a wide latitude, while emulsions that reproduce a short range of brightness values are said to have a narrow latitude. The average black-and-white film has a latitude of about 1 to 130. This means that a high-light area in a subject can be 130 times as bright as the shadow area and the film will produce a negative that has a normal range of tones. The brightness range of the average scene under average lighting conditions is 1 to 32. Therefore, there can be considerable variation of exposure above and below normal which will still produce a normal negative. This does not hold true with color film because it has a brightness range, or latitude, of only 1 to 4, as compared with 1 to 130 in black-and-white, which indicates that correct exposure is the first important factor in producing good color photos.

There are two methods of computing correct exposure: One is by using a photoelectric exposure meter and the other is an exposure guide. The reflected-light-type exposure meter is the more accurate way to calculate exposure outdoors and also eliminates the guesswork usually involved in taking pictures. The meter is not infallible but if used correctly will become a valuable asset to you. Be selective in taking your exposure reading. When people are the important part of your picture and are within 20 feet of the camera, take the reading on them. If they are beyond that, take a general-scene reading from the camera position. By taking readings close up, you avoid getting incorrect information from the more intense light surrounding your subject. If you were photographing people and took a reading from the camera position the result would be underexposure because of the high reading from the background light. Thus, the important part of the picture, the people, would be sacrificed in using a general reading. When people in the scene are beyond 20 ft. they become only a small part of the entire picture. The exposure of the background and the exposure of

Correct exposure is found with either a photoelectric meter, shown at right, or an inexpensive exposure guide pictured below meter. Meter is the more accurate

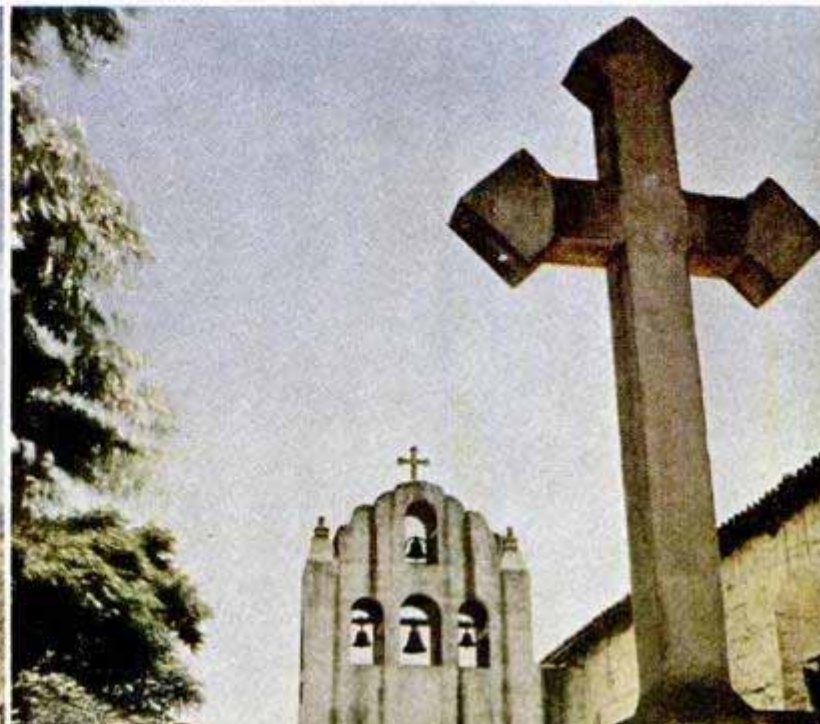
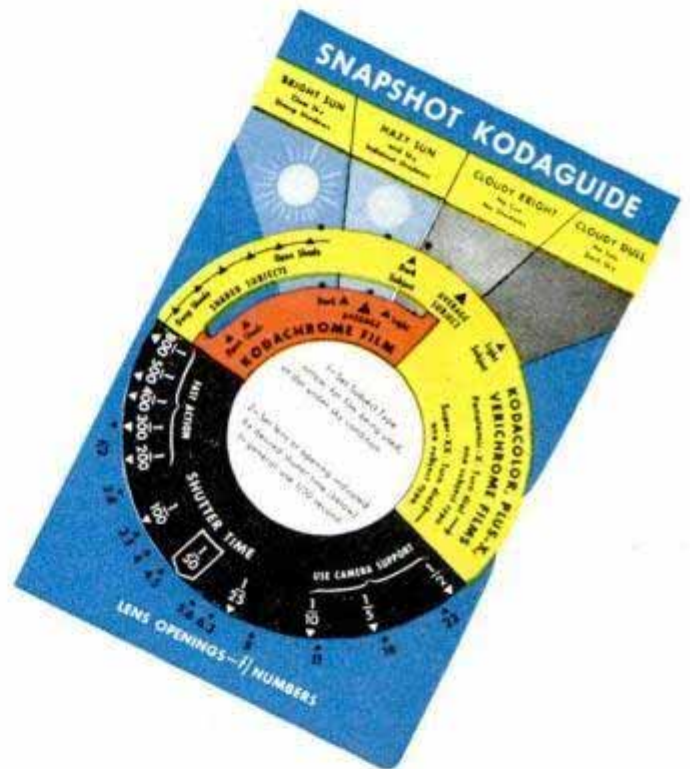
the people is of equal importance and an average reading is used.

In taking landscapes the meter should be tilted downward to avoid the intense light from the sky. When taking pictures of people on the beach a close-up reading is best. When making general shots of a beach or seascape, cutting the meter reading in half is advisable to avoid underexposure caused by the intensity of reflected light from haze, water and sand. If you are in doubt whether to expose for the bright or dark colors in your subject, and if the dark colors are not too important, the most pleasing results to the eye will be had by exposing for the bright colors.

An exposure guide is a good inexpensive substitute for a meter and with practice will enable you to get good results under average light conditions. Manufacturers of color film always enclose a data sheet in the film package which gives information concerning the film speed and exposure tables. The exposure tables include the lens openings and while these tables are of some value, you can have more complete information in a compact and convenient form by buying an exposure guide. By rotating a disk which is attached to the face of the guide you can match lighting conditions with subject contrast and obtain the correct aperture and shutter speed for the type of film you are using. While the success and accuracy of your exposure depend, to a certain extent, on your judgment in using a guide of this type, it nevertheless is far better than just guessing at exposure.

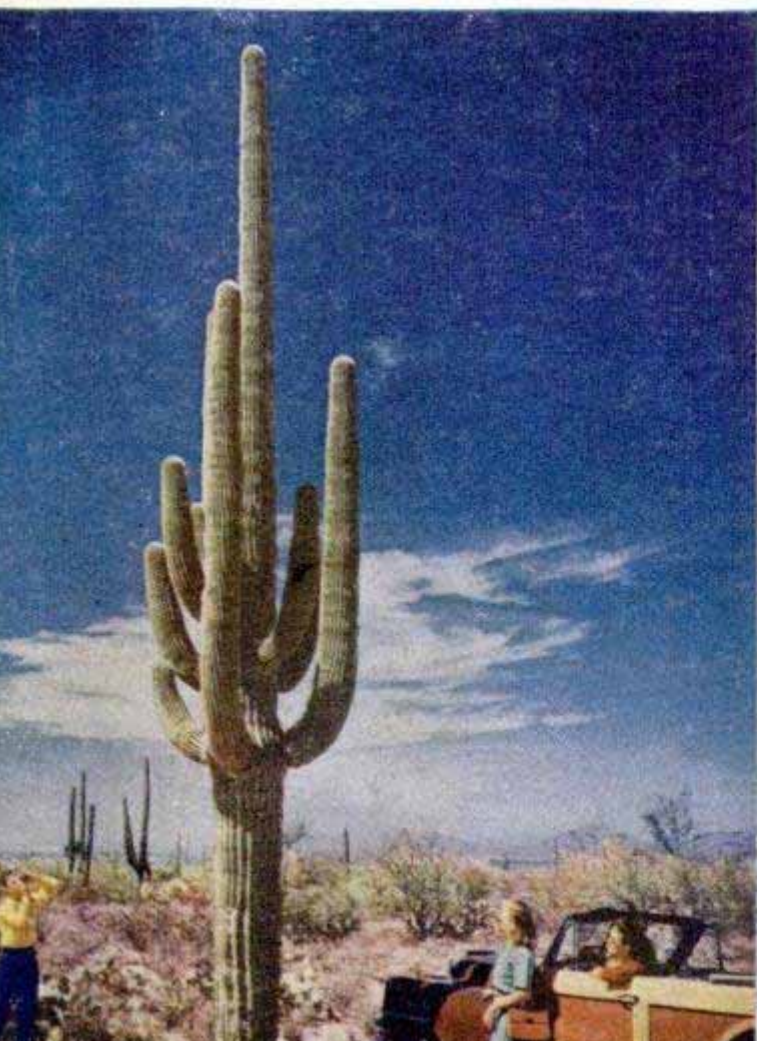
Choice of subject, lighting, composition,

Photos below and at right show how foreground objects lend depth in both cases to improve composition





Above, rocks in foreground provide a base for this typical seashore vacation shot and add strong focal point to an otherwise average photo. Below, left, posing family and car with cactus makes picture personal



and time of day are as important as exposure and make the difference between an interesting transparency or just another picture. When photographing landscapes, try to include some near foreground objects in the picture, such as rocks, trees, walks, railings or shadows. Shots through arches, doorways or pillars give a picture a third-dimensional quality that is not there if you shoot in the open. The photos of the mission churchyard, the Grand Canyon, and the seashore illustrate the effect of proper framing and camera angle. Repetition of a particular subject also creates a pleasing effect. Pictures of people are most interesting if they are engaged in some activity rather than just standing and staring at the camera. Children with their endless activities are perfect subjects for the candid color camera. If people are your subject, fill the view finder with them unless the background is necessary to create the effect you desire. Pictures of people 15 or 20 feet from your camera in uninteresting surroundings are of no value.

During the summer it is best to make color photos in midmorning and midafternoon and to avoid taking pictures at noon-time because the lighting is too flat. However, in the winter when the sun is always at a low angle, the most successful pictures are taken during the midday hours. Front lighting usually is recommended with color film, but side and back lighting may be used to give special effects as shown in the photos of the girl on the beach and the boy in the woods. You also can make shots in open shade, but your picture will have a bluish cast. Photos made of snow scenes also have a slight blue cast because of the reflected blue color of the sky.

Sunrises and sunsets can be taken with very striking results. Because of the extreme brightness range, a sunrise or sunset exposure is made for the sky area. So make your exposure when the sun is concealed by the horizon or clouds, or use the shadow of some foreground object to shield the lens and avoid flare caused by light reflections.

A certain amount of haze is present in all landscape and seascape photos and can be partly eliminated with the Skylight Filter, number 1A. This filter absorbs the ultraviolet, blue and some green light from the haze. It requires no increase in exposure and can be used for all outdoor pictures with no effect other than giving a slightly warmer tone to your pictures. ★ ★ ★

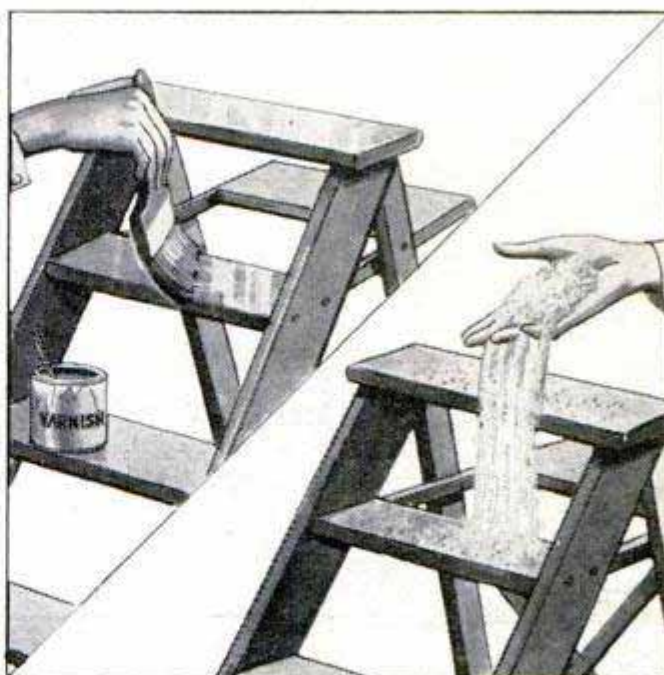
Rasp Improved From Metal Lath Ideal for Filing Plasterboard

Desiring a fast method of smoothing overlapping edges of plasterboard on an outside corner before applying corner beading, one workman made a coarse rasp by wrapping a piece of metal lath around a block of wood and locking it in place with a second block nailed to the back. By overlapping the edges of the lath a little, a ridge is formed to embed in the wood and hold the lath more securely. Should the lath gradually become clogged with plaster, a sharp rap will clean it.

O. W. Johnson, Spokane, Wash.



Abrasive Applied to Ladder Steps Provides Sure Footing

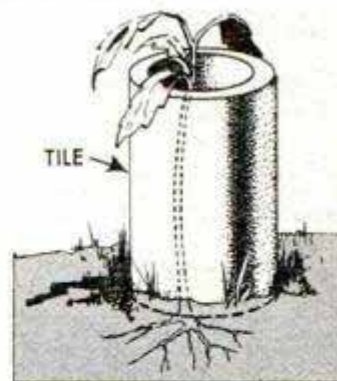


Here is one way to safeguard against the possibility of slipping and falling from a stepladder the next time you redecorate or wash windows. First, apply a coat of varnish to the treads and then, while it is still tacky, sprinkle it with either sawdust or sand. The particles will adhere to the varnish and create a surface sufficiently rough to provide a safe, nonslip footing.

Bess Ritter, New York City.

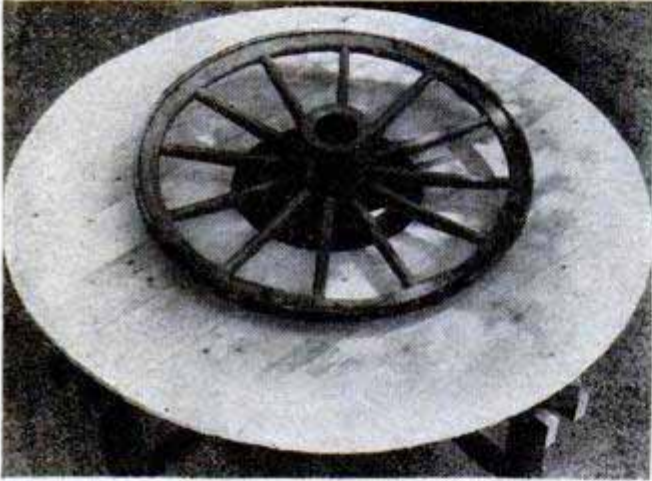
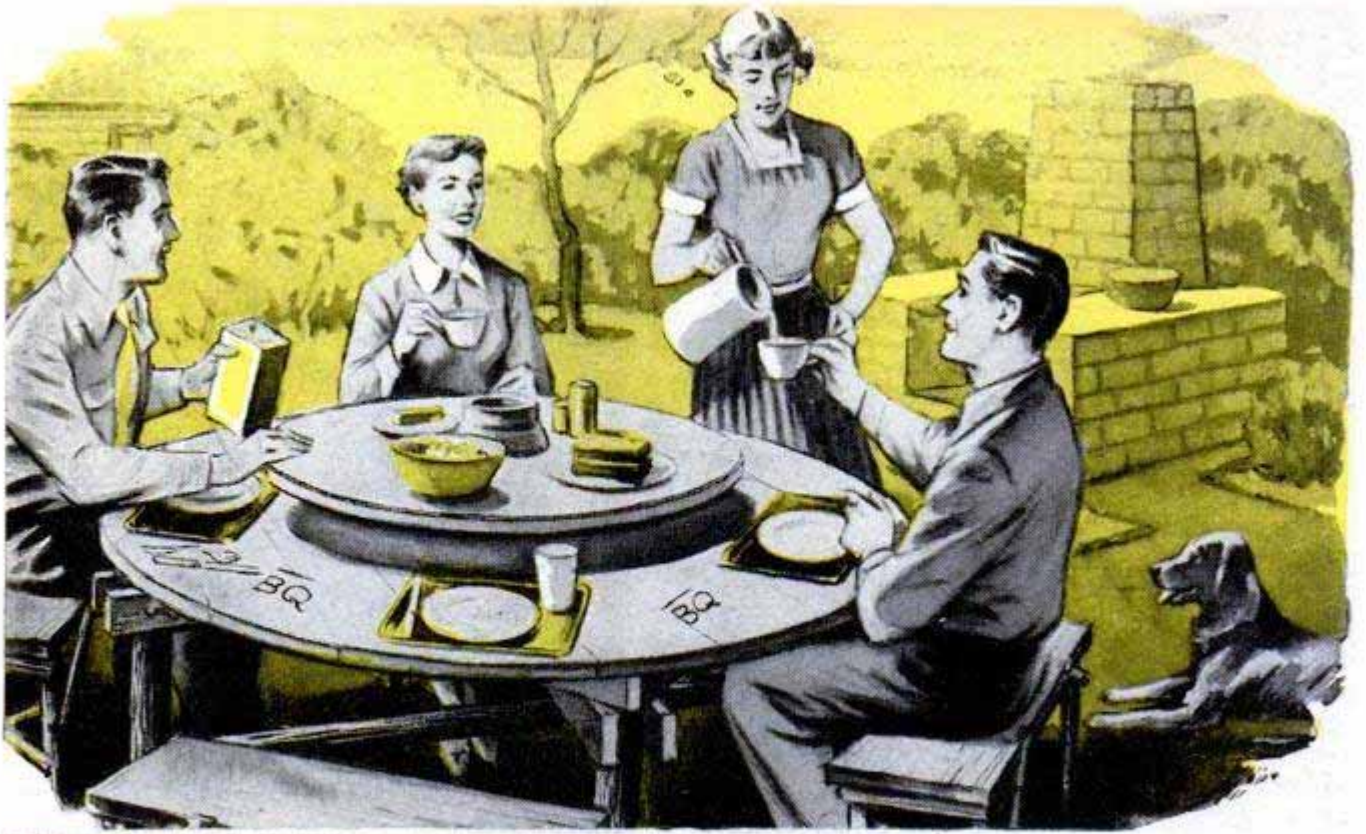
Tile Placed Over Tomato Plant Helps Speed Growth of Stalk

To speed plant growth and increase the abundance of tomatoes, one gardener places a tile, or a tin can with the bottom removed, over each tomato plant as it is set in the ground. This not only forces the



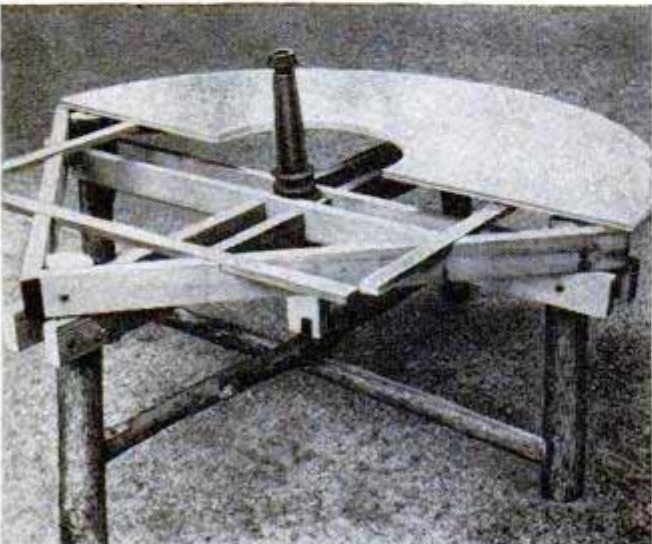
plant to grow more rapidly in order to reach the sunlight but also produces a stalk that is pale and tender. The tile is removed as soon as the leaves of the plant appear above the top of it. The plant is then laid upon the ground and all but the leaves is covered with soil. Additional roots soon sprout from the buried stalk, resulting in a larger, hardier shrub and more abundant crop.—G. E. Hendrickson, Argyle, Wis.

☛ A cone-shaped paper cup having the pointed end torn off provides a handy funnel when pouring liquids.



This view shows the table proper completed and the wagon wheel in place ready to be covered with a disk of 1/2-in. outdoor plywood which later is varnished

The strips to which the table boards are screwed should be a loose fit in the notches so that the entire top can be lifted off easily for winter storage

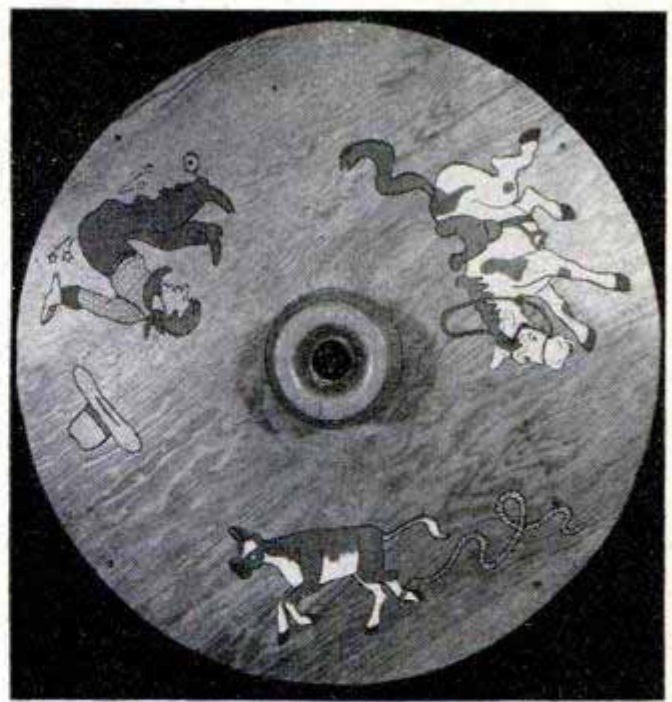
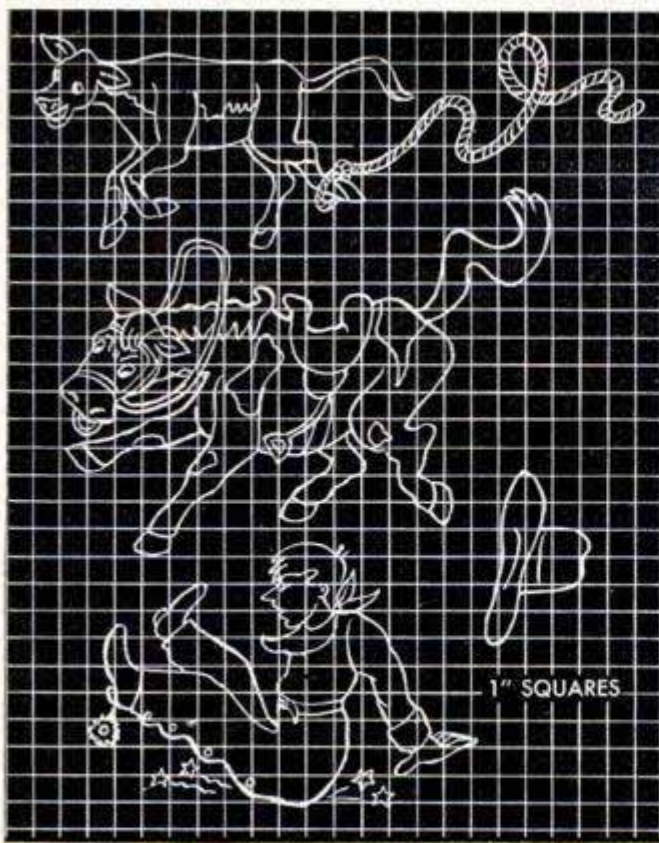


LAZY SUSAN PICNIC TABLE

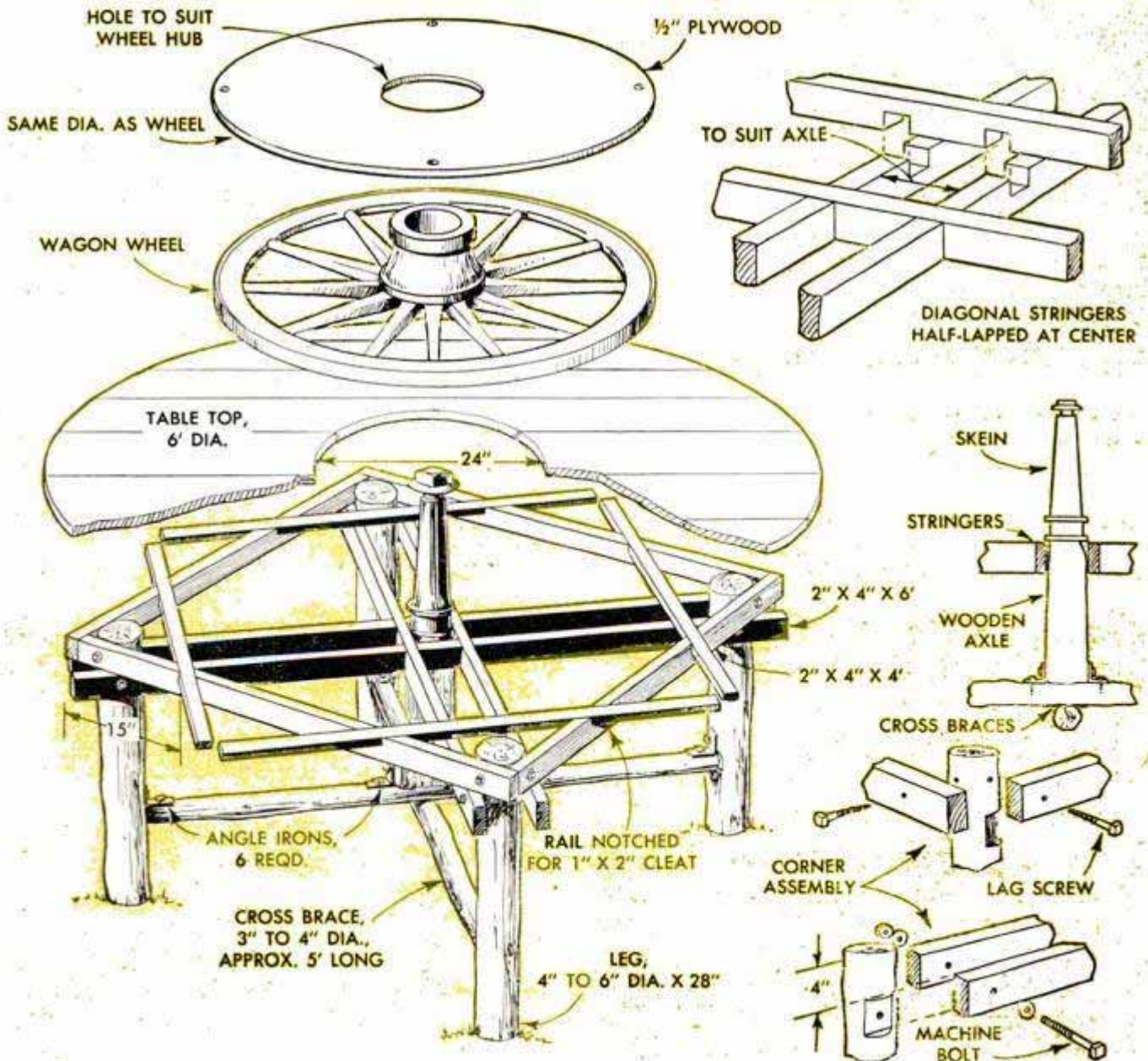
By Elma Waltner

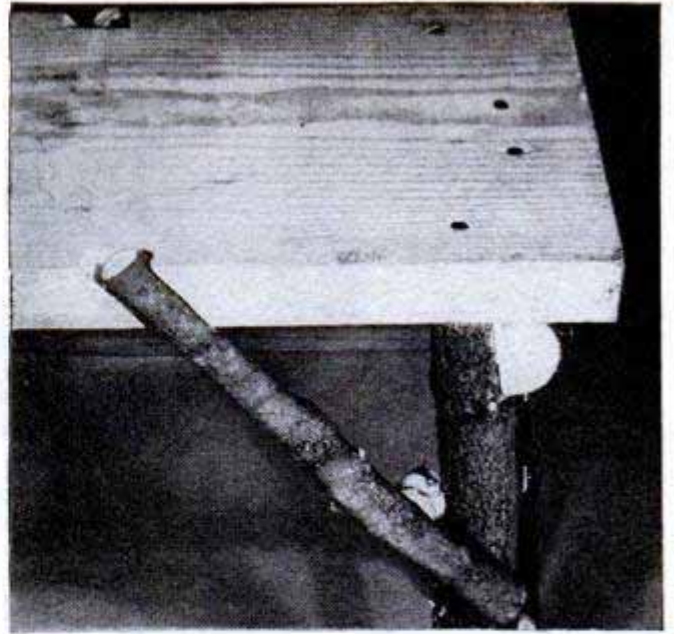
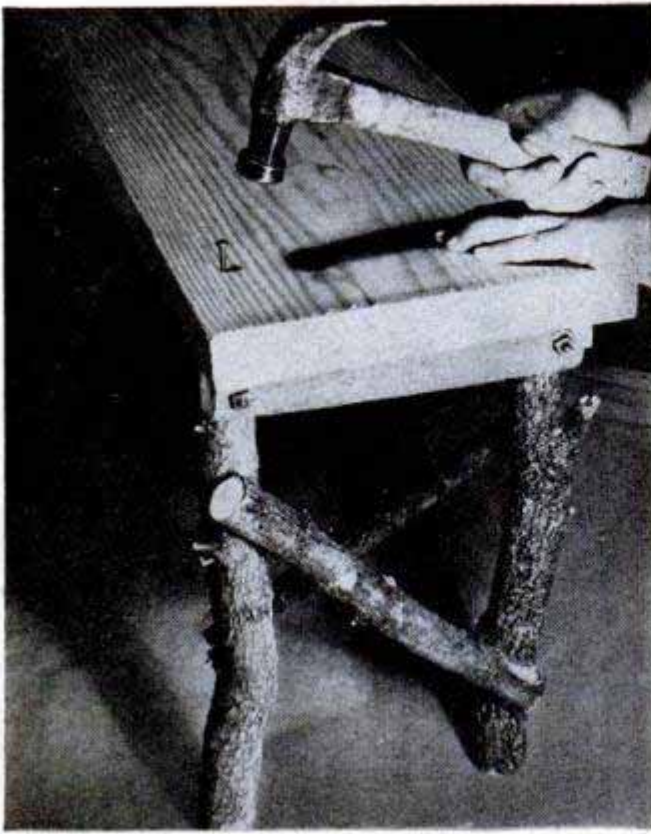
ADD TO THE enjoyment and convenience of your back-yard picnics by building this rustic Lazy Susan lawn table. The feature of the table is a large rotating tray made from an old wagon wheel which is covered with a plywood disk. Legs and cross braces of both the table and matching benches are sections cut from tree limbs. The framework for the upper portion of the table is made from common 2 x 4 and 1 x 2 stock.

Note in the detail at the right how the tree-limb sections and the framework are assembled with bolts and metal angles. Sides of the four legs are notched to provide flat surfaces for the two pairs of diagonal stringers as well as for the apron. The stringers are half-lapped at the center of the table to form a holder for the axle on which the wagon wheel is mounted. The lower end of the axle is cut off so the skein projects the desired height above the top of the table and then is fastened to one of the cross braces with two metal angles. The aprons are notched, as shown, to take four 1 x 2 cleats to which the table top is fastened with wood screws. The notches hold the top in place and allow it to be lifted from the framework for winter storage.



In keeping with the "chuck wagon" theme of the table, the Lazy Susan is decorated with colorful Western figures and the table top with branding-iron motifs



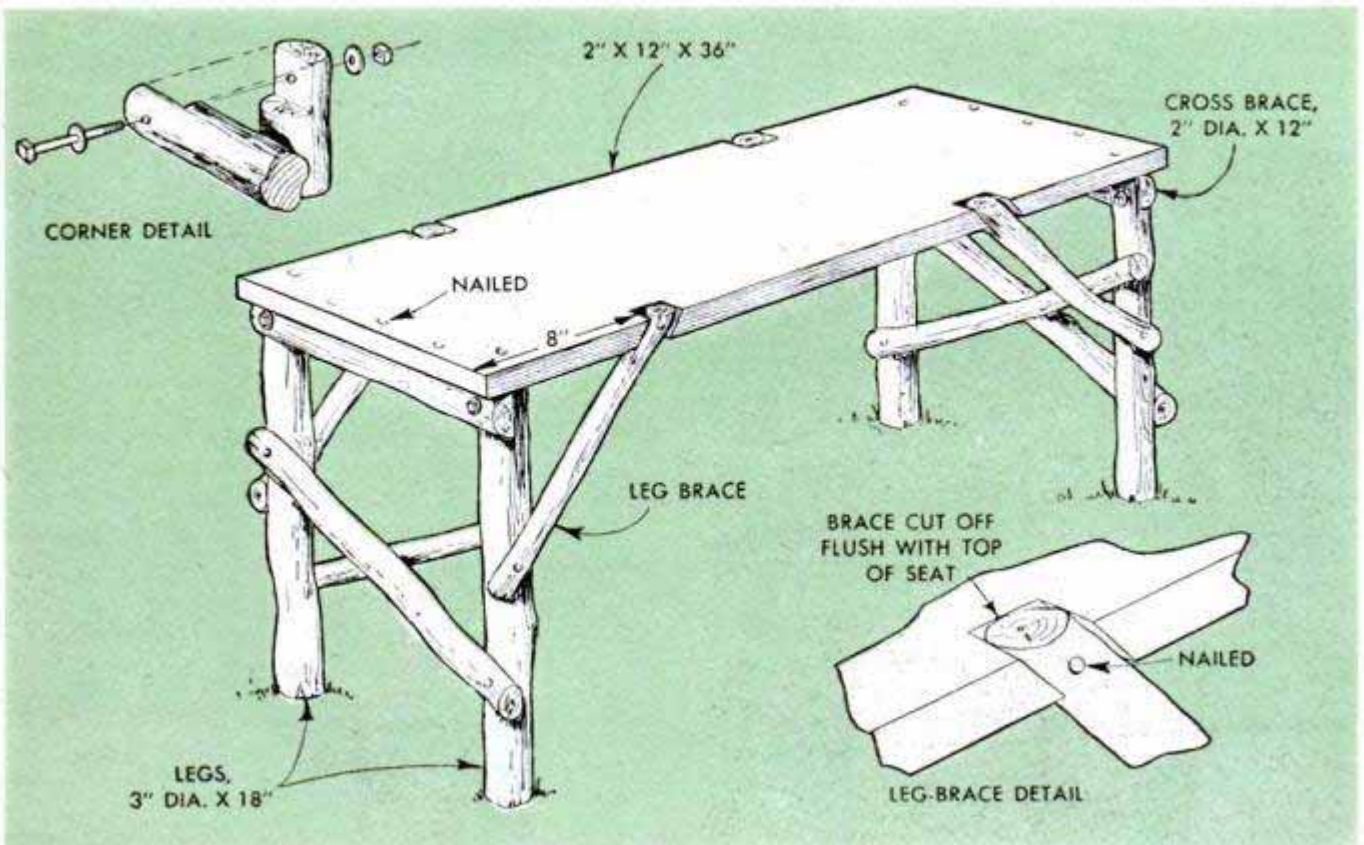


Above, note how the side braces for the bench legs are nailed in slanting notches cut in the edges of the plank seats and sawed off flush with the top. Left, the 2 x 12 bench tops are nailed to the leg assemblies. The cross members of the leg assemblies are half-lapped and bolted as shown in the detail

The top is built up of wide tongue-and-groove flooring, the boards being temporarily assembled to form a 6-ft. square. Two concentric circles are laid out on the assembly, one 2 ft. in dia. and the other 6 ft. in dia., and then the boards are numbered in sequence, disassembled and cut along the layout lines. The boards are reassembled by screwing them to the cleats, the latter being set in the apron notches during assembly.

The benches are made of tree-limb sections and 2-in. stock as detailed below. Both seat and legs of the benches are given two coats of marine varnish.

The table is finished by giving the entire unit a coat of marine varnish. Then, if desired, the cartoons and brand designs are added with enamel or oil colors. After drying, the table top and Lazy Susan are given two more coats of varnish, rubbed lightly with steel wool and waxed. ★ ★ ★



Johnny will turn his hobbyhorse out to pasture when he lays eyes on this real hard-riding pony. The horse, which is about 36 in. long, is cut from a 2 x 12 and fitted with an old tricycle seat to form a comfortable saddle. The "ride" is obtained by mounting the horse on an auto spring as shown in the drawing. Note that the short leaves are removed from the spring. One end of the spring is inserted in a mortise or notch cut in a post and held in place with a bolt passed through the eye. The spring is then clamped to the top of a second post, U-shaped clamps bent from flat steel being used to fasten the spring to the post and the horse. — Ben Hoffman, Troy Center, Wis.

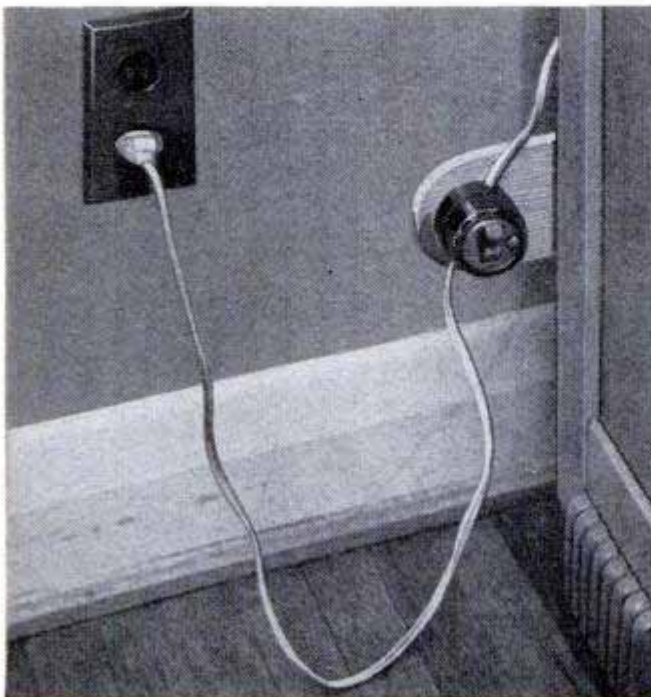
Back-Yard Bronco Gallops on Auto Spring To Give Young Cowboy Thrilling Ride



Table Lamps in Child's Room Controlled by Toggle Switch

Parents will save many steps if out-of-reach table lamps or floor lamps in a child's room are equipped with a switch that the youngster can operate. This can be done easily by wiring a toggle switch in the lamp cord, as pictured, and mounting the switch on a wooden bracket. The latter is screwed to the back of a chest to hold the switch within easy reach of the child.

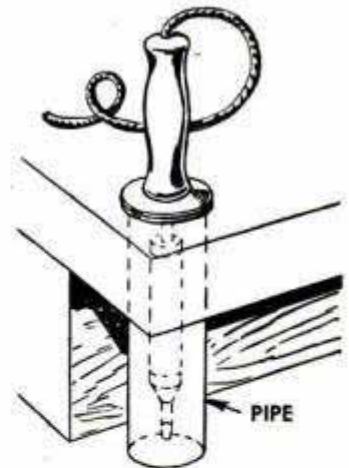
Earl H. Hills, Byron, Ont., Can.



Safe Holder for Soldering Iron

To avoid accidental burns from a soldering iron resting in an exposed holder, place the hot iron in a sheath of pipe or tubing set vertically in the bench top. The tubing is flared at the top for easy insertion of the iron.

If the handle of the iron is small enough to slip through the pipe, fit the iron with a large washer or sheet-metal collar just below the handle to support it as shown.—William B. Egan, Louisville, Ky.



Checkers Replaced With Disks Sliced From Broomstick

Checkers which are frequently lost by children are replaced inexpensively by cutting disks, 1/4 in. thick, from a section of broomstick. Enough makeshift checkers to fill out the set usually can be cut in a few minutes, using a handsaw and holding the work in a miter box. After the disks have been sanded smooth, they are painted to match missing checkers.

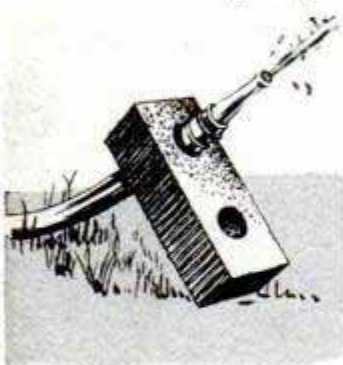
Blanche Campbell, Las Vegas, Nev.

Waste Water From Drinking Fountain Absorbed in Soil-Filled Sewer Tile



To prevent puddles from forming around a hydrant being used for a drinking fountain, one gardener slipped a large sewer tile over it as shown. The tile was filled with soil in which mint was planted to catch and absorb waste water from the fountain. Not only did this keep the ground dry but the plant was assured adequate watering.
Hi Sibley, Nuevo, Calif.

Brick Supports Garden Hose At Correct Spraying Angle



Using a brick of the type shown, a garden hose can be held in a stationary position so that it will spray a certain area. Simply insert the nozzle through one of the holes, adjusting the angle of the spray by tilting the

brick, or by moving the hose forward or backward a few inches in the hole.
Thomas P. Ramirez, Fond du Lac, Wis.

Repairing Toilet Flush Tank

Small annoying leaks in toilet flush tanks, caused by fine hairline cracks which radiate from mounting-bolt holes, can be repaired

by applying several coats of model-airplane dope to the inside of the tank where the cracks appear. To do this, first shut off the water and drain the tank, using a cloth or siphon to remove any water that does not drain out when the tank is flushed. Wipe dry the surface to be covered, and then apply several coats of dope to the damaged areas around the mounting holes of the tank.

Hugh L. Bryan, Chino, Calif.

Pad on Jack Protects Car Bumper

Fastened to the faces of the lifting hook on a bumper jack, a heavy rubber, canvas or leather pad will prevent damage to the chromium on the bumper. A piece of tire or shoe-sole leather is ideal for this purpose and can be cut to size and attached to the hook of the jack with household cement or thick shellac.

Henry Hanscom, Elmhurst, Ill.



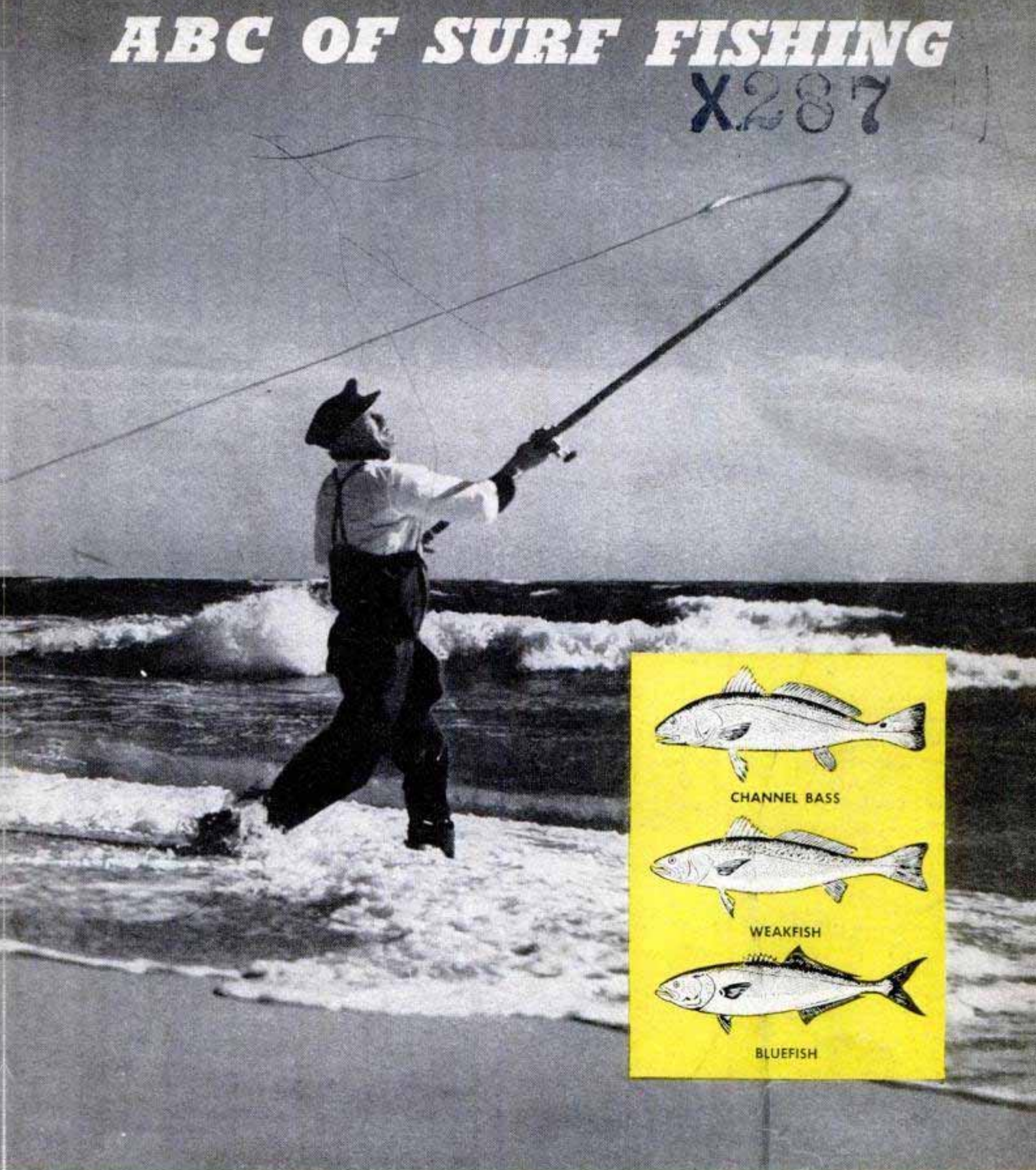
Storing Leftover Paint

A small amount of varnish, enamel or lacquer remaining in a can may be salvaged by pouring it into an empty nail-polish bottle which has been thoroughly cleaned with lacquer thinner. This will enable you to keep it handy for future touch-up work as well as for decorating small pieces of craftwork. A wire held across the can as shown forms a "spout" to guide the liquid into the small neck of the bottle.

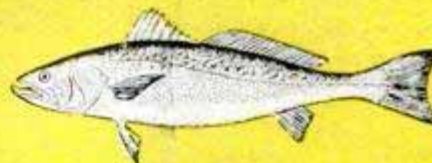


ABC OF SURE FISHING

X287



CHANNEL BASS



WEAKFISH



BLUEFISH

By Vlad Evanoff

WHEN THE SURF fisherman sends his bait far out over salt water in a long-distance cast he must be ready for almost anything within an angler's experience, for his catch can range from a 2-lb. weakfish to a 100-lb. shark. Compared with the average rod-and-reel game fish familiar to inland fishermen, ocean game fish taken in the surf come big and tough. Two of the

favorites among many are the striped sea bass and the bluefish. The striped bass, or striper, averages 5 to 8 lb. and is fairly common up to 20 lb. Individuals are caught each year running as high as 50 lb. in weight. Although smaller than the striper, many experienced fishermen rate the bluefish as the greatest rough-and-tumble fighter taken by surf anglers.

Surf fishing calls for the use of heavy tackle and the development of special skills.

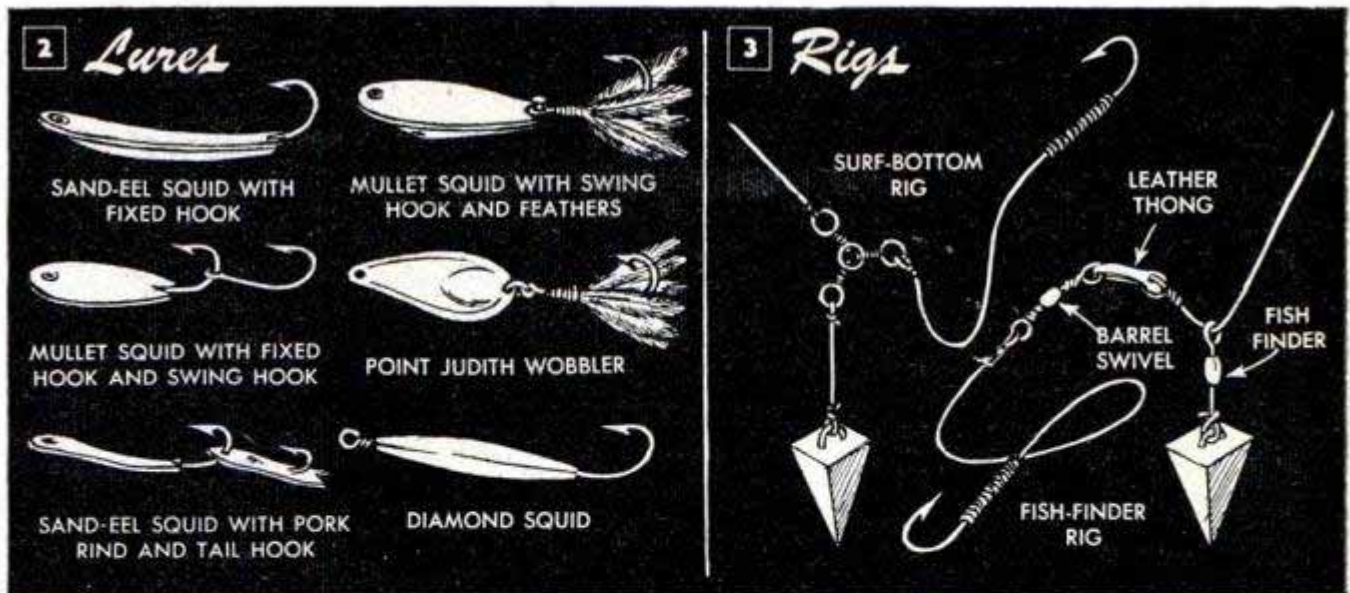
1 Surf-Fishing Equipment



Old hands with the bait rod in fresh water will have little difficulty mastering the technique of the surf caster, but newcomers to the sport will require a period of practice in order to become proficient in handling a surf rod. The standard rod used by surf fishermen comes in two sections, known as the tip and the butt. The tips run from 5½ to 8 ft. in length and the butts from 22 to 30 in., depending on the choice of the angler. Surf rods are made from split bamboo, tubular steel, glass fiber and whole cane. Although many expert surf fishermen still prefer the split-bamboo rod, the glass-fiber rods are widely used. A surf angler picks his rod according to the kind of fishing he expects to do. For casting artificial baits, "squidding" as it is called, the fisherman selects a lighter rod than he would use for fishing live baits deep in the water or on the bottom. For average all-around work he picks a medium-weight rod having a tip from 6 to 7 ft. long, a butt section 24 to 28 in. in length and a weight, in split bamboo, of 9 to 12 oz. A man of average or below-average stature will find the 6-ft. tip more to his liking.

Surf casters pick the reel with care, as proficiency in making long casts over the surf depends to a great extent on smooth and reliable operation of the reel. It must have a lightweight spool, star drag and free-spool, and a gear ratio of at least 3:1. For casting artificial baits, the spool should hold at least 200 yd. of 9-thread linen line or the equivalent in a line laid with synthetic fibers (nylon). For bait fishing, the spool should hold about 200 yd. of 12-thread linen line or its equivalent in nylon. Many surf reels are available with various types of automatic brakes, operated either mechanically or magnetically, which are designed to prevent overrunning of the line on a long cast. These are useful to the novice, as they help to prevent backlash due to inexperienced thumbing of the running line. However, automatic braking tends to cut down distance. Expert surf casters sometimes overcome this tendency by using a heavier rig, but generally they prefer to use a standard reel with regular fittings, especially when conditions require maximum long-distance casting.

Preferences also vary among experienced surf fishermen as to the type of line used. Nylon lines are gaining favor because they are waterproof and exceptionally free-running. Other anglers, equally experienced in casting under varying conditions, object to the excessive elasticity of the synthetic line, its tendency to burn the thumb while maintaining control on a long cast, and also its inability to resist snagging on rocks and other underwater obstructions. Although the linen line lacks both the waterproof



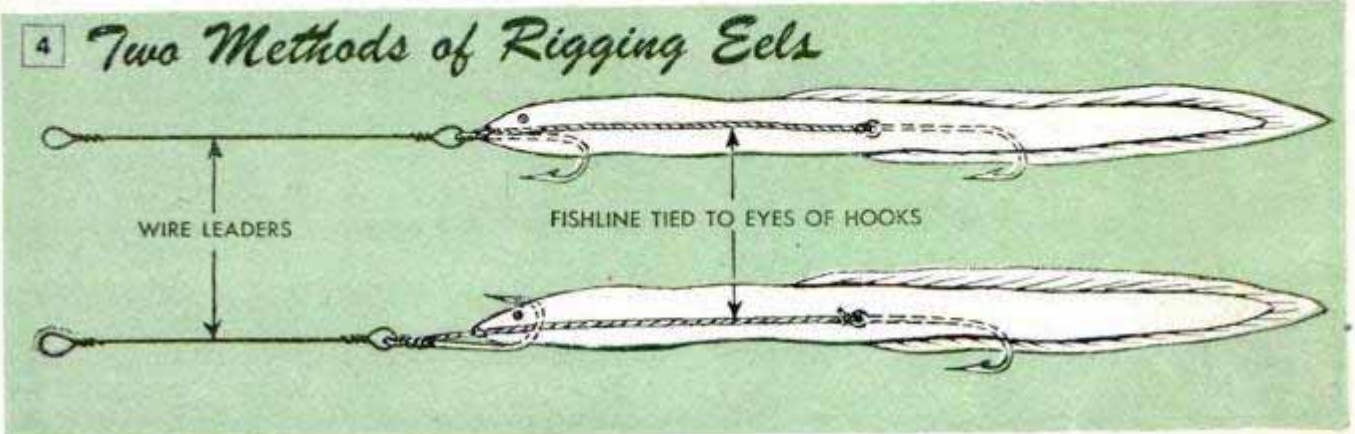
One of the oldest and most popular artificial lures for surf fishing is the metal squid available in many forms. Several types of rigs are made up by surf fishermen but only the two most commonly used are detailed

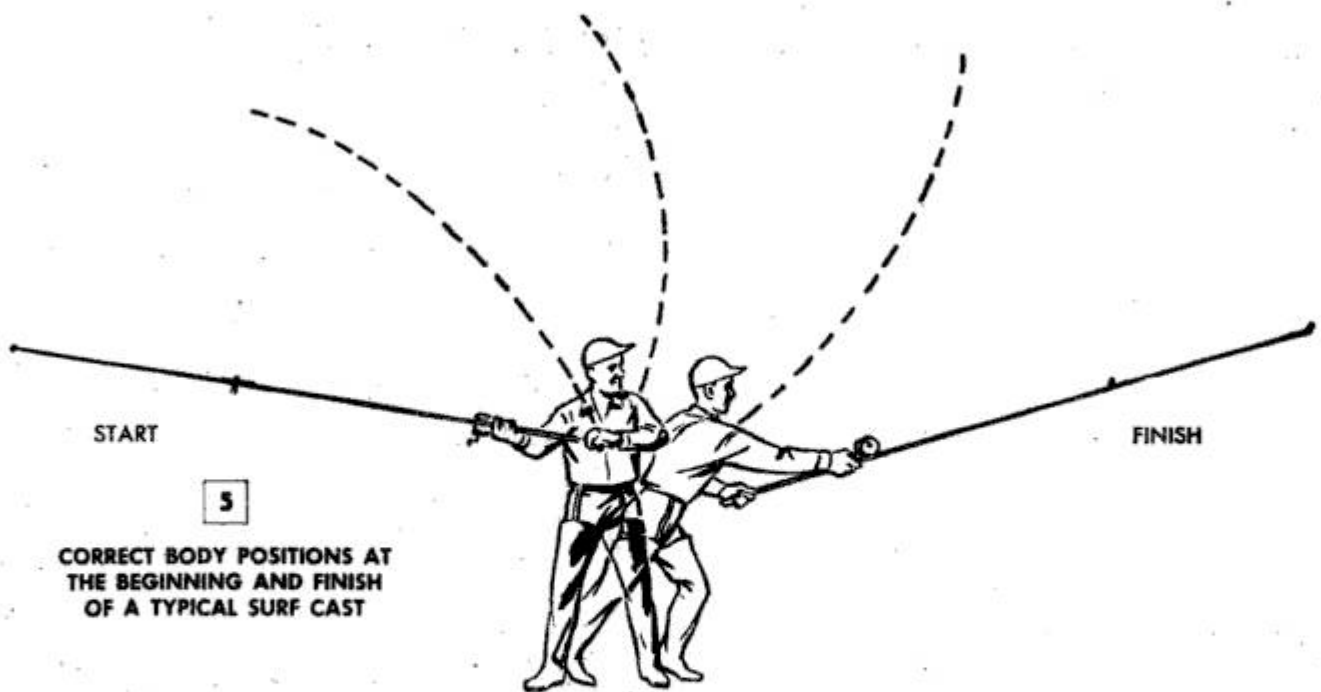
and exceptional free-running qualities of the synthetic line, it is extremely durable and also has what fishermen call "spring," a characteristic peculiar to lines laid with natural fibers. This quality of the linen line enables it to resist kinking and coiling in the air, thus holding air resistance and wind deflection to the minimum. Under average conditions such a line requires less thumbing to maintain control throughout the full length of the cast, and it flies true even in a quartering wind or a stiff inshore breeze. For long casts under difficult conditions surf fishermen generally prefer a linen line. The popular sizes in linen lines are 6, 9, and 12-thread lines, while in nylon 25, 36 and 45-lb. test lines are a common choice. In addition to the basic rod, reel and line, the essential accessories carried by surf fishermen are shown in Fig. 1. The common artificial lures and the surf-bottom and fish-finder rigs are shown in Figs. 2 and 3. These rigs are worked with pyramid sinkers weighing from 2 to 6 oz., depending on weather conditions and the surf and current.

One of the oldest and most popular of the

artificial baits is the metal squid, several types of which are shown in Fig. 2. These lures are remarkably realistic imitations of the common sand eel and mullet, both of which are favorite foods of surf fish. They come in weights ranging from 1 to 4 oz., the heavier sizes being recommended for long-distance casting. Wooden and plastic plugs similar to fresh-water lures also are used. These range from 1 to 4 oz. in weight and are furnished for both surface and underwater fishing. Most plugs are supplied with heavy double or treble gang hooks and are from 3 to 9 in. long. Common color combinations include red and white, shiner, mullet and herring. When fish are feeding on live squid, red and amber-colored plugs are most effective. For striped sea bass, eels rigged as in Fig. 4 are considered best among the various live baits, but in common with most live baits are difficult to cast with the accuracy and distance usually required in surf fishing. To overcome this drawback, anglers sometimes remove the head of the eel and insert a lead weight in the body, making what is known as an eel-bob, which is much easier to cast. Besides

When the fish won't take artificial lures surf anglers resort to live baits, eels being among those most productive of good results. Details below show two approved methods of rigging eels for surf casting





5
CORRECT BODY POSITIONS AT
THE BEGINNING AND FINISH
OF A TYPICAL SURF CAST

eels, which are favorite live lures, fishermen use other live baits such as crabs, clams, sea worms of certain kinds and whatever bait fish are commonly available in the locality. Live baits are used on hooks ranging in size from No. 1 to 9/0, depending on the size of the fish sought and the structure of its mouth.

At the beach surf fishermen keep a constant watch for certain signs that indicate the presence of fish. The gamiest surf fish are wanderers, usually traveling in schools that come and go with the tides. Old hands keep an eye on the gulls, terns and other sea birds that feed on the bait fish which are driven to the surface by feeding game fish. When gulls wheel and dive at the edge of the breakers it usually indicates to the fisherman that the bait fish are breaking water. Occasionally game fish break water when feeding actively. It is then that the surf caster unlimbers his tackle and lets go with plugs or metal squids, selecting his lures to imitate as closely as possible the bait fish present at the time.

When there are no signs which indicate the presence of fish, the angler studies beach formations and the water to determine the most likely spots to fish his bait. Jutting rock bars and sand spits where the waves curl and break into swirling white water are always worth a try for striped sea bass. Other sea fish that live close inshore often prefer the deeper water off rocky coves and also the holes and inlets near a river mouth. Entrances to ocean inlets and salt flats usually are good spots to hook the fighting bluefish, especially when the tide is going out. Of course, there is no hard-and-fast rule for locating productive fishing spots. Surf fishermen say that the fish are where you find them.

The technique of surf casting is well pictured in the photo on page 159 and also in the detail, Fig. 5. Stand with the legs braced well apart and face down the beach at right angles to the ocean. Set the reel in free-spool, place the right thumb on the spool and grip the rod butt firmly with both hands as shown. Start the cast with the rod tip pointing back, as in Fig. 5, and bring the rod forward, somewhat above the horizontal, in a hard, fast swing as pictured. This movement is important as it is the only way you can utilize the full driving power of a good surf rod. Just before the rod straightens near the end of the swing, lift the thumb from the reel spool. As the line starts to run out bring your thumb back on the spool lightly to take the slack out of the running line and prevent a backlash. As the cast loses its initial drive and the bait lowers in the air, thumb the reel spool hard to stop the cast and drop the bait lightly into the water. Of course, a description of the procedure can give only a general idea of the various steps in surf casting. Beginners should confine their efforts to making short casts until they get the feel of the rod and lure under the tension of the initial swing. Timing the thumbing of the reel is the trick in making long casts over the surf. If the spool is thumbed either too early or too late, the cast will fail. If thumbed too early, the initial drive will be lost; if too late, the spool may overrun the line. Good surf casters regularly put out 200 to 250 ft. of line when it is necessary to reach fish feeding a considerable distance off shore. Of course, this is regarded as maximum long-distance casting, reserved for the experts, but generally there is good fishing closer inshore for those who learn the signs indicating presence of fish. ★ ★ ★

Staples Enamelled Before Insertion To Match Surrounding Surface



When stapling material where it is desirable to have the staples as inconspicuous as possible, apply enamel to the top of the strip of staples before putting them in the machine. Use a color

that will match or at least harmonize with the color of the surface on which the staples are to be used. Lacquer for this purpose can be purchased in small bottles at department stores or automobile-accessory shops.

Ken Murray, Colon, Mich.

Wrench for Drill-Press Chuck

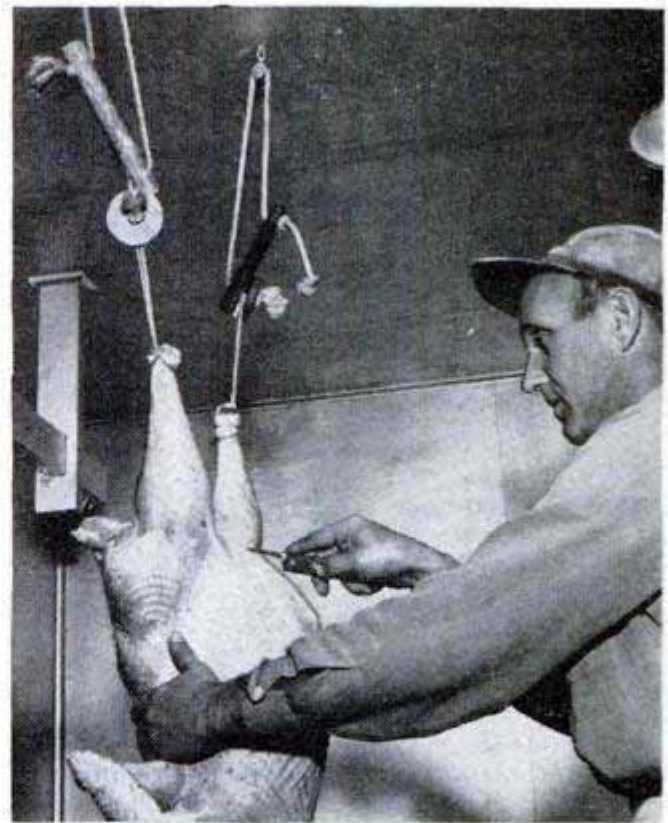
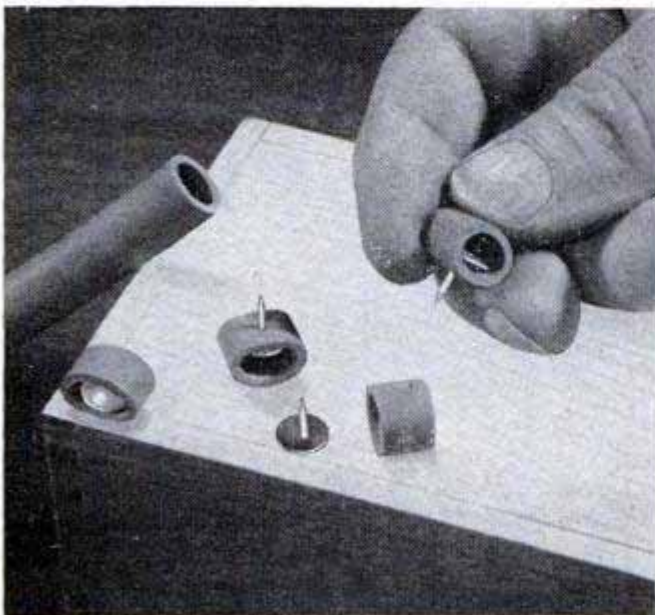


If your drill press is fitted with a keyless chuck which is difficult to open, make a wrench for it from a piece of $\frac{3}{4}$ -in. plywood. Cut the wrench to resemble a paddle with a handle

about 8 in. long and a diamond-shaped hole in the center of the wide portion that will just slip over the chuck. In use, the wrench is slipped over the chuck and the latter gripped by pressing down on the handle.

Tubing Used as Rubber Feet

Rubber feet for use on the underside of small boxes or novelties may be made easily by fitting thumbtacks inside short lengths of rubber hose and attaching them.



Rig Made From Scrap Materials Simplifies Cleaning of Fowl

Requiring only scrap materials that can be found in almost any household, this device will enable you to clean and dress poultry singlehandedly, working at a comfortable height with only a minimum handling of the fowl necessary. A loop of heavy twine is slip-knotted around each leg of the fowl, after which opposite ends of the loops are slipped over small wooden disks that are suspended from the ceiling by short lengths of clothesline. This clothesline, through the utilization of pulleys and pieces of broomstick arranged as shown, permits hanging the fowl at a convenient height.

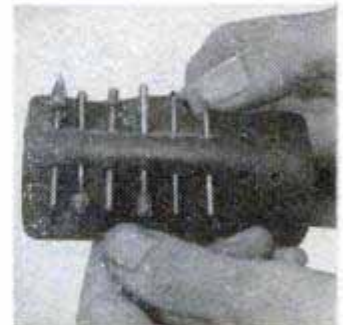
A. Neimann, West Chicago, Ill.

Holder Grips Small Drills

A rectangular piece of rubber cut from an old inner tube can be made into an excellent holder for small drills and grinding attachments. Just punch two parallel rows of holes in the piece with

each hole in one row being directly across from one in the other. Now simply insert the drills by forcing them through the holes as illustrated. The resiliency of the rubber will hold the drills in place even in instances where the holder is rolled or folded.

Richard Hanscom, Elmhurst, Ill.



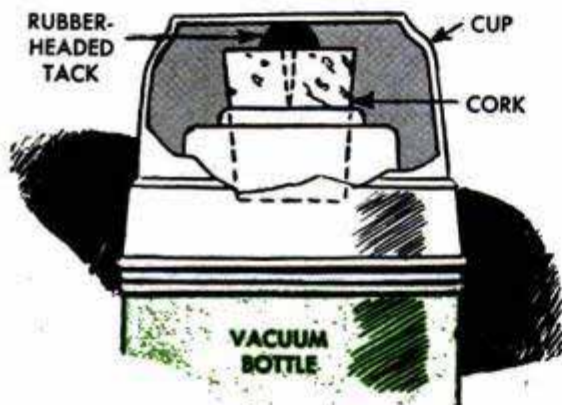


COOKBOOK EASEL hinged to underside of wall cabinet holds recipes at eye level where they are easy to follow. Chain supports the plywood easel in the open position and a cupboard catch holds it closed

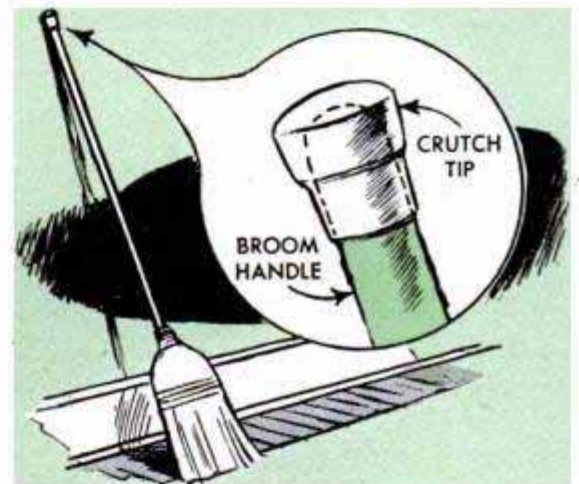


BOTTLE LABELS CAN BE REMOVED quickly even though soaking does not soften adhesive by rubbing them briskly with medium or coarse steel wool

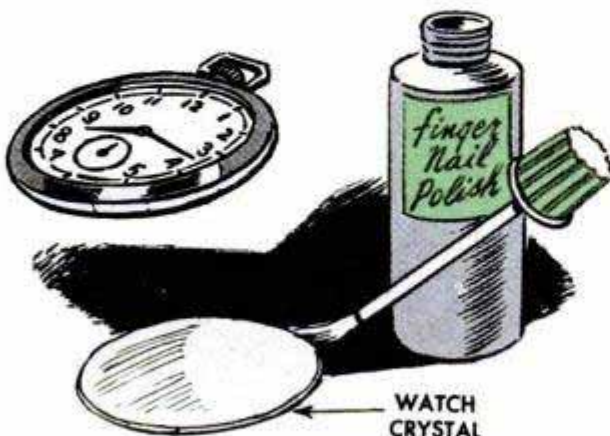
Solving HOME



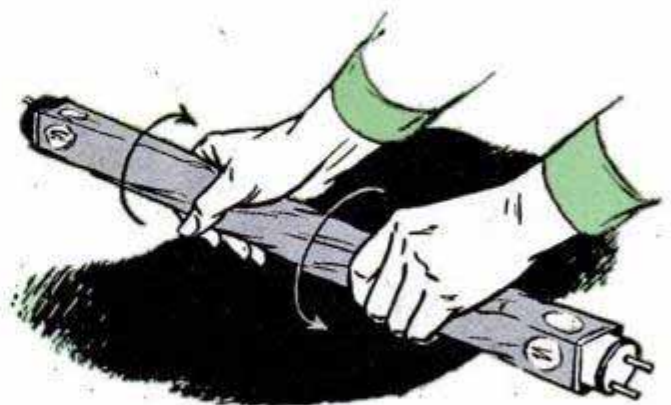
VACUUM-BOTTLE CORK won't loosen and permit leakage if held tightly in place by screw cap of bottle. To extend the top of the cork so the cap will bear against it, press a rubber-headed tack in the cork



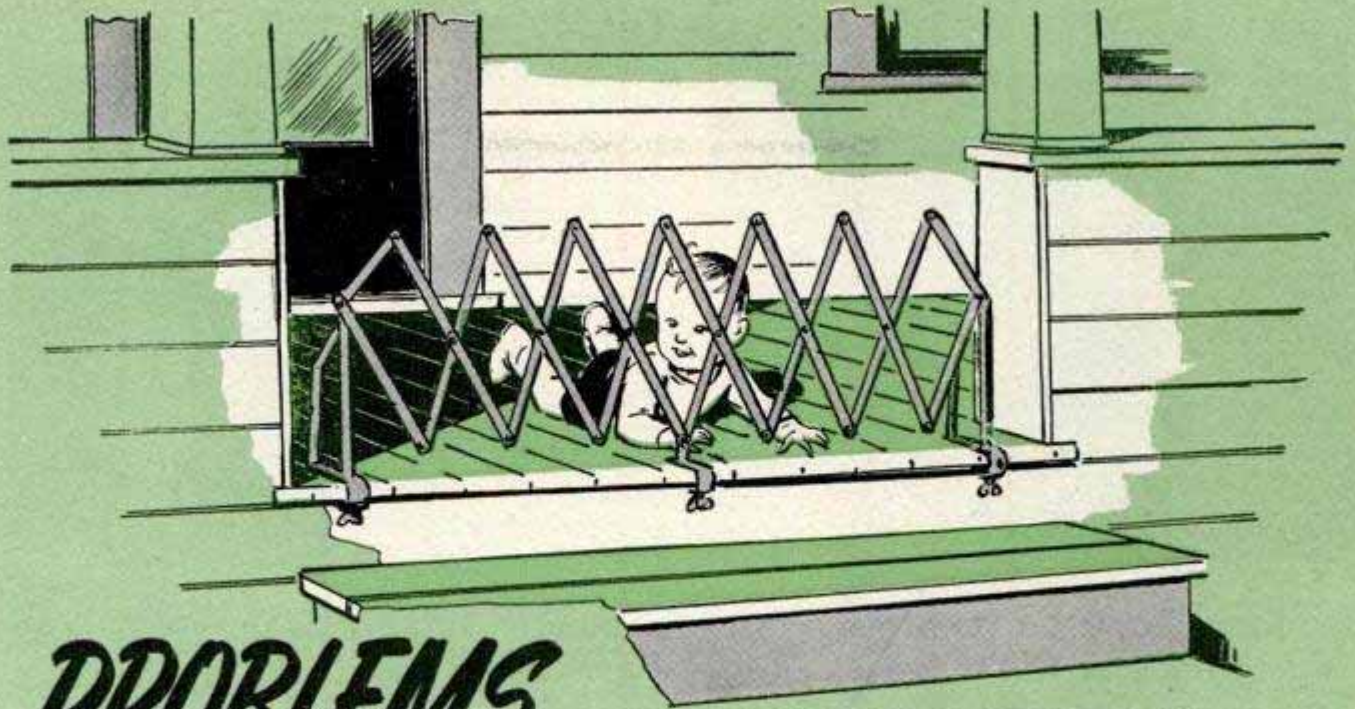
RUBBER CRUTCH TIP pressed over end of handle will keep mop or broom from slipping when it is leaned against a wall. Also improves grip on mop handle when dusting under beds and low furniture



IF THE CRYSTAL on your wrist watch or pocket watch allows dust to seep through, remove it and coat the edges with a thin layer of clear finger-nail polish before replacing crystal in the bezel



DON'T CHANCE BREAKING a newly purchased fluorescent lamp by having the tube slide from the carton on the way home. To hold it in place, gently twist the carton around the bulb, as shown above

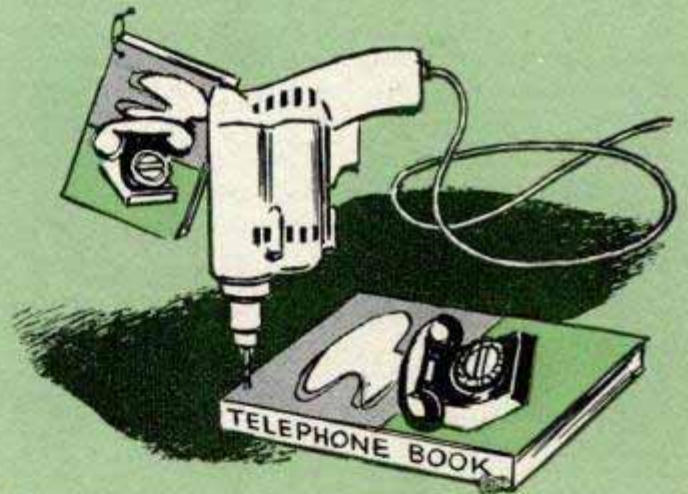


PROBLEMS

RUNNING-BOARD LUGGAGE RACK of the type used on old cars makes a good substitute for a folding gate to keep an infant safely penned on an open porch



TO PREVENT STAINING HANDS with hard-to-remove shoe polish, protect your fingers with an old rubber glove when polishing shoes. Polish can be applied directly with the glove or with a cloth, as usual



HEAVY TELEPHONE DIRECTORIES can be perforated for hanging from a wall hook by drilling at upper left-hand corner. Portable electric drill with a 3/16-in. bit quickly bores neat hole through the thick book



DRAINING MILK FROM COCONUT is done easily by punching two holes in "eyes" of fruit. Holding coconut so one opening will drain into a cup or tumbler, blow into the second opening through drinking straw



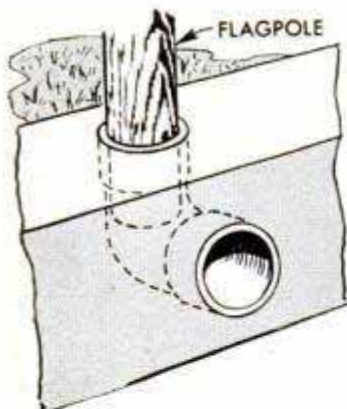
FLOOR-WAX APPLICATOR speeds job of applying paint to large floor areas such as kitchen linoleum or concrete basement floor. Pour paint into shallow container large enough to permit dipping the applicator



Luminous Paint on Umbrella Adds Safety at Night

If you are in the habit of using an umbrella on stormy nights, apply luminous paint to the rib tips. This will enable motorists to see you more readily when crossing a street and will be of aid in heavy pedestrian traffic. It's a good idea to prepare one umbrella in this fashion and keep it for night use only as this paint rubs off easily. If available, reflective tape may be used instead of paint. This comes with an adhesive backing for easy application.

Flag Socket From Pipe Elbow Drains off Water



Flag sockets installed in curbs often become packed with mud and litter and sometimes are broken when water freezes inside them. The socket will stay clean and will not hold water if it is made from a pipe elbow. The

elbow is embedded in the concrete at the time the curbing is poured so that both ends are open—the upper opening holding the flagstaff and the lower one providing a drain. Rain will wash away any accumulation in the elbow and if ice should collect during the winter it can be removed quickly with a little hot water.

☞ When you find that insects are difficult to remove from a car windshield, use a small amount of baking soda on a damp cloth. Follow this by wiping with a clean dry cloth.

Stand Supports Outboard Motor For Storage or Repair

To support an outboard motor in a convenient position while repairing it, or for storing it safely, use a stand like the one shown. It is made of 2 x 8-in. material assembled as indicated. The vertical member is bolted at right angles to a 4 x 4-in. piece which, in turn, is bolted at right angles to a piece of 2 x 8, thus producing a base

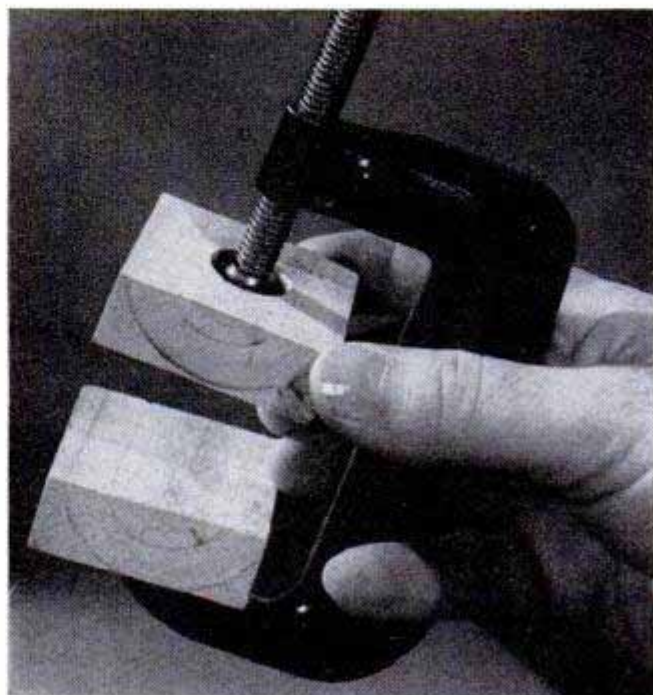


that will not tip. It will be necessary to add blocks to the underside of the 4 x 4 at the ends in order to make the stand set level. Dimensions of the stand will be determined by your particular motor and also by the height at which you want it supported.

Ivan Grosvenor, Richmond, Ind.

Wooden Pads Attached to C-Clamp Protect Finished Work

To save time and also to simplify the use of C-clamps on finished work, one craftsman attached wooden blocks to the pads of the clamps. These were blind-bored to fit the clamp pads so they would not drop off with normal handling yet would be easy to remove when necessary. If desired, faces of the blocks may be cushioned by adding felt or rubber pads. These can be cemented in place to protect a varnished surface.

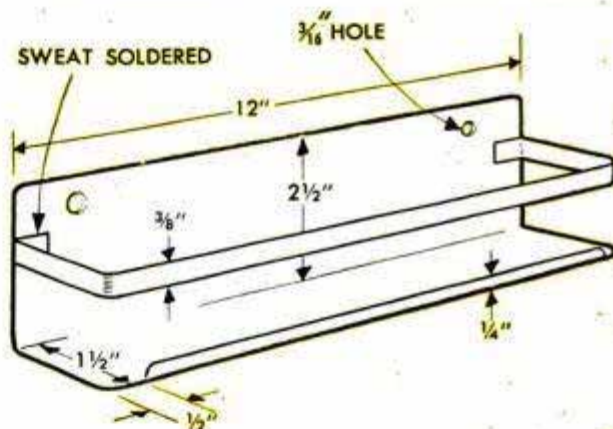




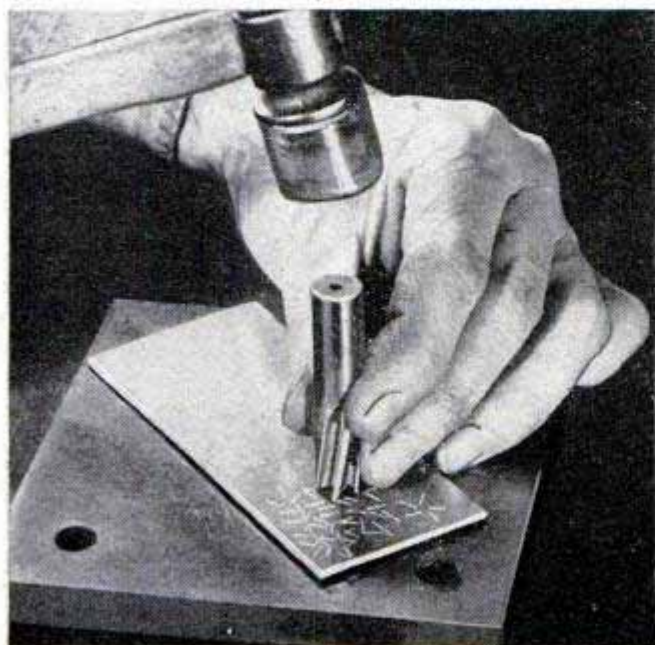
Handy SPICE RACK

Ideal as a one-evening project in metal-work, this little spice rack is dimensioned to hold four standard spice cans. It may be made larger, however, to accommodate more or different-sized cans. Usually, enough sheet metal to make the rack can be salvaged from a large can or other object. If the metal happens to be slightly rusted, it can be cleaned up satisfactorily with sandpaper or steel wool as you will be painting it to match the kitchen color scheme. The $\frac{3}{8}$ -in.-wide retaining band is attached to the rack by sweat-soldering.

I. M. Fenn, Chicago.

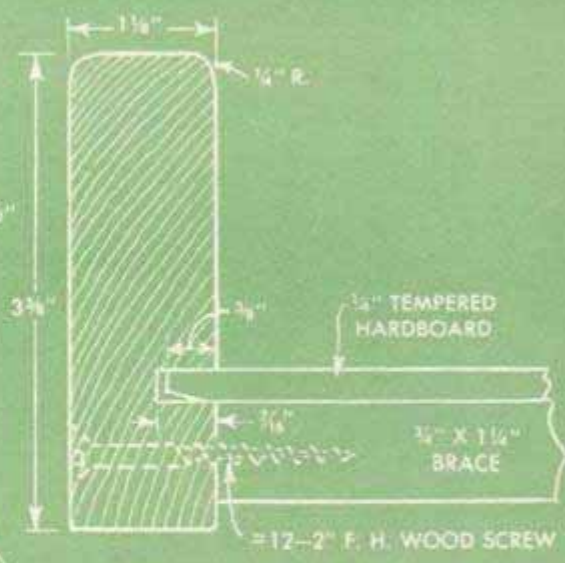
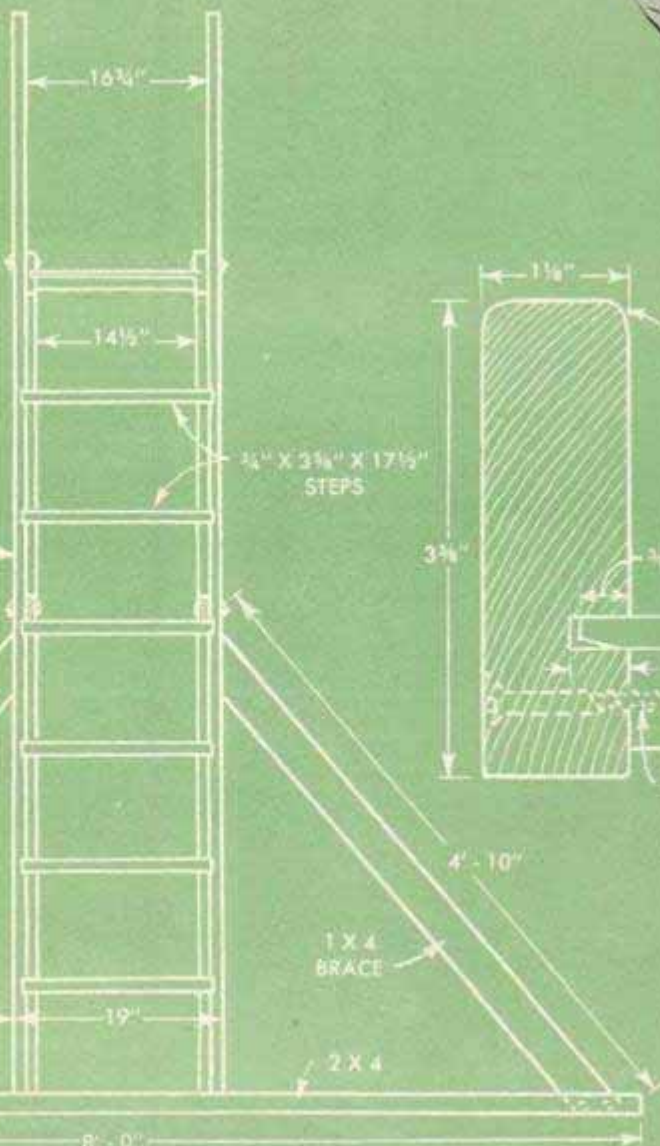
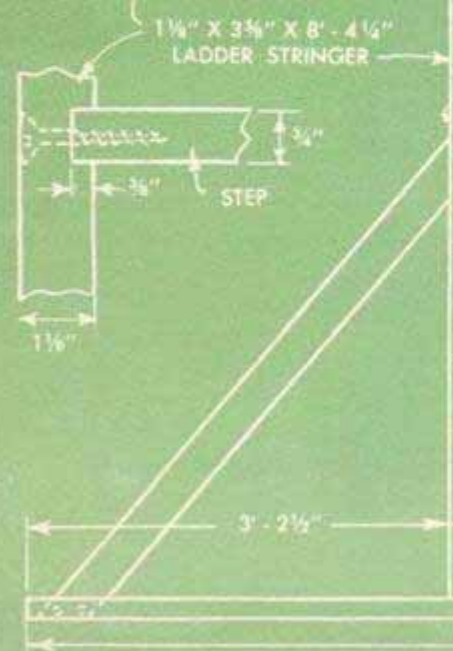
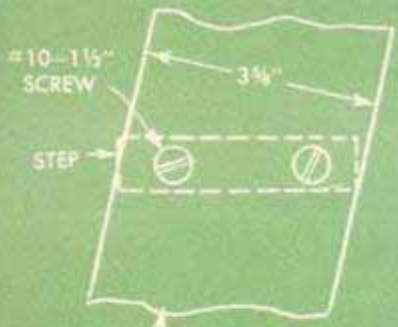
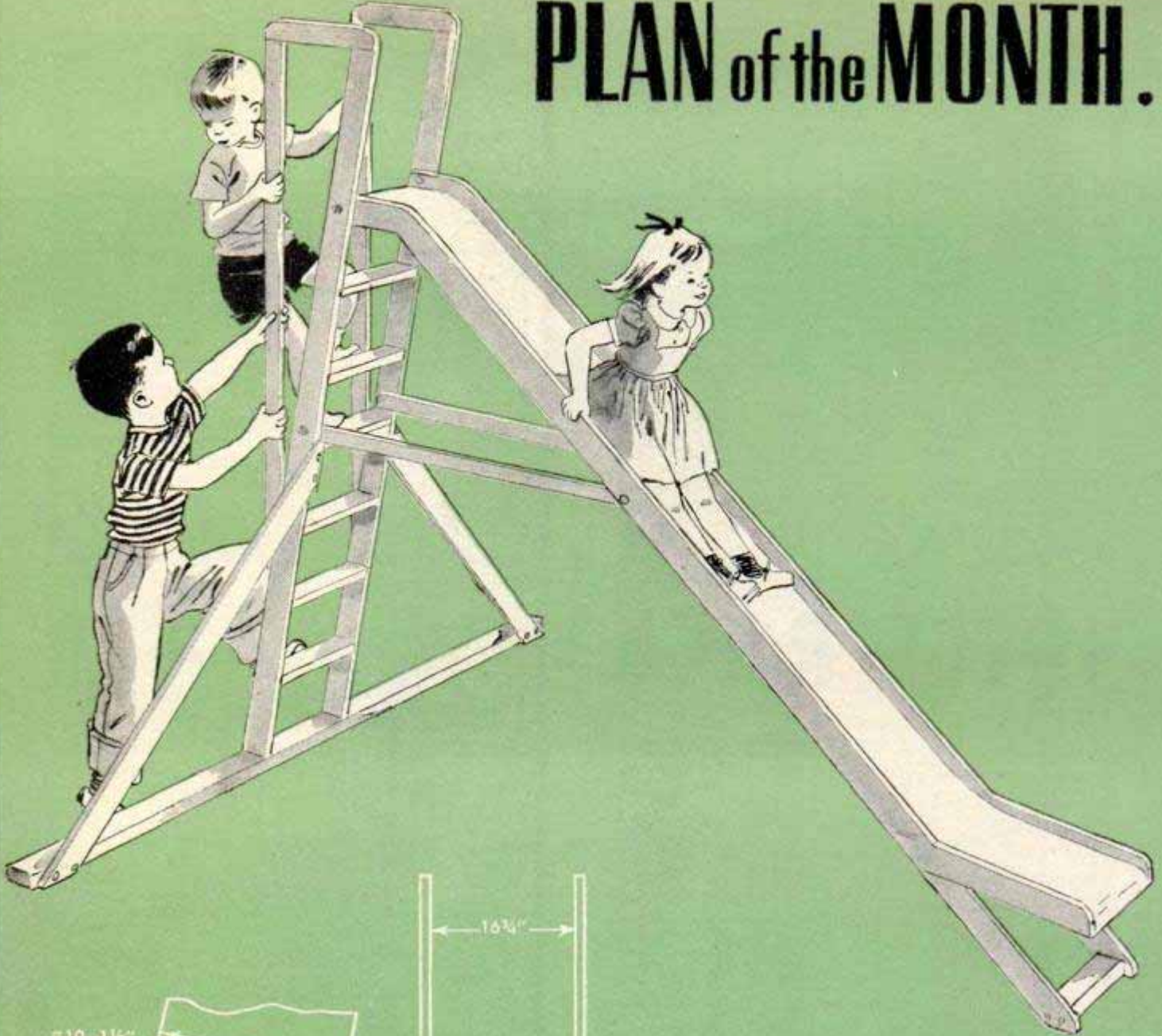


Worn End Mills and Router Bits Make Good Punches for "Tooling"



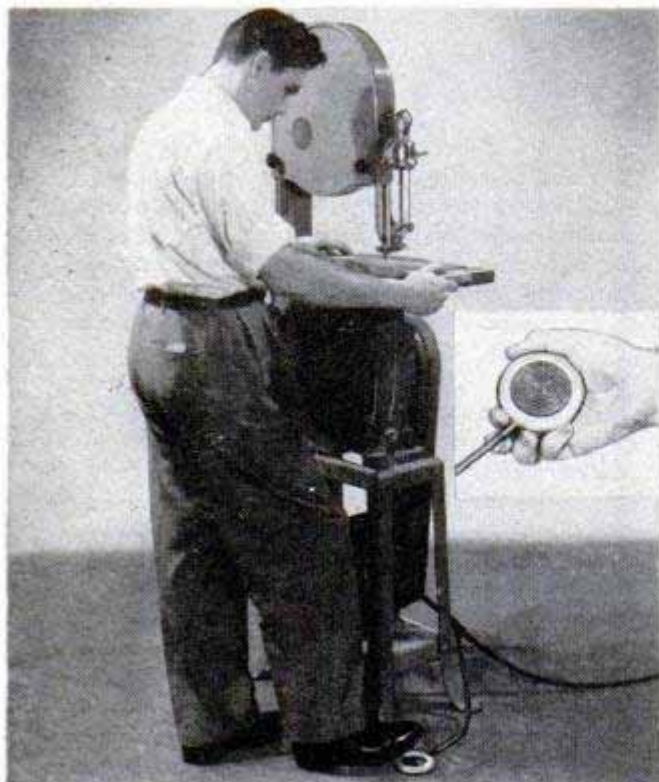
End mills and router bits, usually discarded when worn, may be put to good use by the home crafter as punches or background tools for stamping decorative designs on various craft materials such as metal, wood and leather. Soft aluminum and copper are ideal metals for stamping and they are soft enough not to damage even a new tool if one is used. By using four, six or eight-lip end mills, interesting star-shaped designs may be worked out with a tap of a hammer. Wooden moldings may be embossed in bas-relief by stamping a series of repeat designs in a continuous pattern. In tooling metal with an end mill or router bit, it is advisable to do the work with the metal placed on a flat steel surface to obtain good clear impressions. If a new tool is used for this purpose, use a plastic-headed hammer or wooden mallet to avoid damaging the end of the shank.

PLAN of the MONTH...



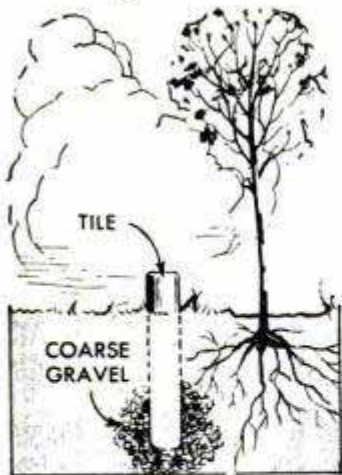
SECTION THROUGH SLIDE RAIL

Foot Switch Added to Power Tool Affords Convenient Control



A foot switch of the type used with photo enlargers can be adapted easily for use with a jigsaw, bandsaw or other power tool. The switch, which is wired in series with the power tool, conveniently permits instant starting and stopping without need for taking the hands from the work.

Tree Roots Watered and Fed Through Tile Sunk in Ground



To save a young tree during extremely dry summer months, one nurseryman set an open-end tile in the ground near the tree to serve as a reservoir for supplying it with water and soluble plant foods. Placed in a hole dug near the outer spread of the roots, the lower end of the tile was embedded in coarse gravel and the upper end capped.

Ervin L. Strayhorn, Beebe, Ark.

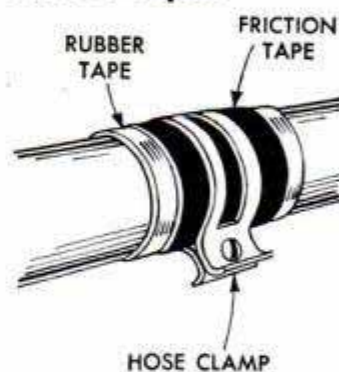
Ignition System Provides "Light" For Motorist Without Matches

On occasion when finding himself without matches, one motorist uses this unique method of obtaining a light for a cigarette

or for starting a fire. With the car engine running, an ignition wire is removed from a spark plug and held just far enough above it to cause sparks to jump the gap. A gasoline-soaked stick or weed is then held in line with the spark to quickly ignite it.

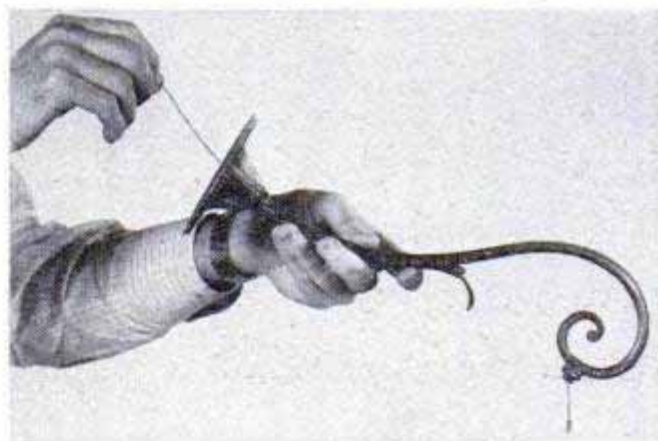
Repairing Leaky Water Pipes

When an otherwise good section of water pipe in his basement sprang a leak, one homeowner not only saved himself the expense of replacing the pipe but also that of removing one end of it from a wall in



which it was embedded. The defective portion of the pipe was wrapped with several turns of electrician's rubber tape, followed by several turns of friction tape. Following this, a hose clamp was applied as shown.

Socket Chain Simplifies Wiring Of Curved Electrical Fixtures



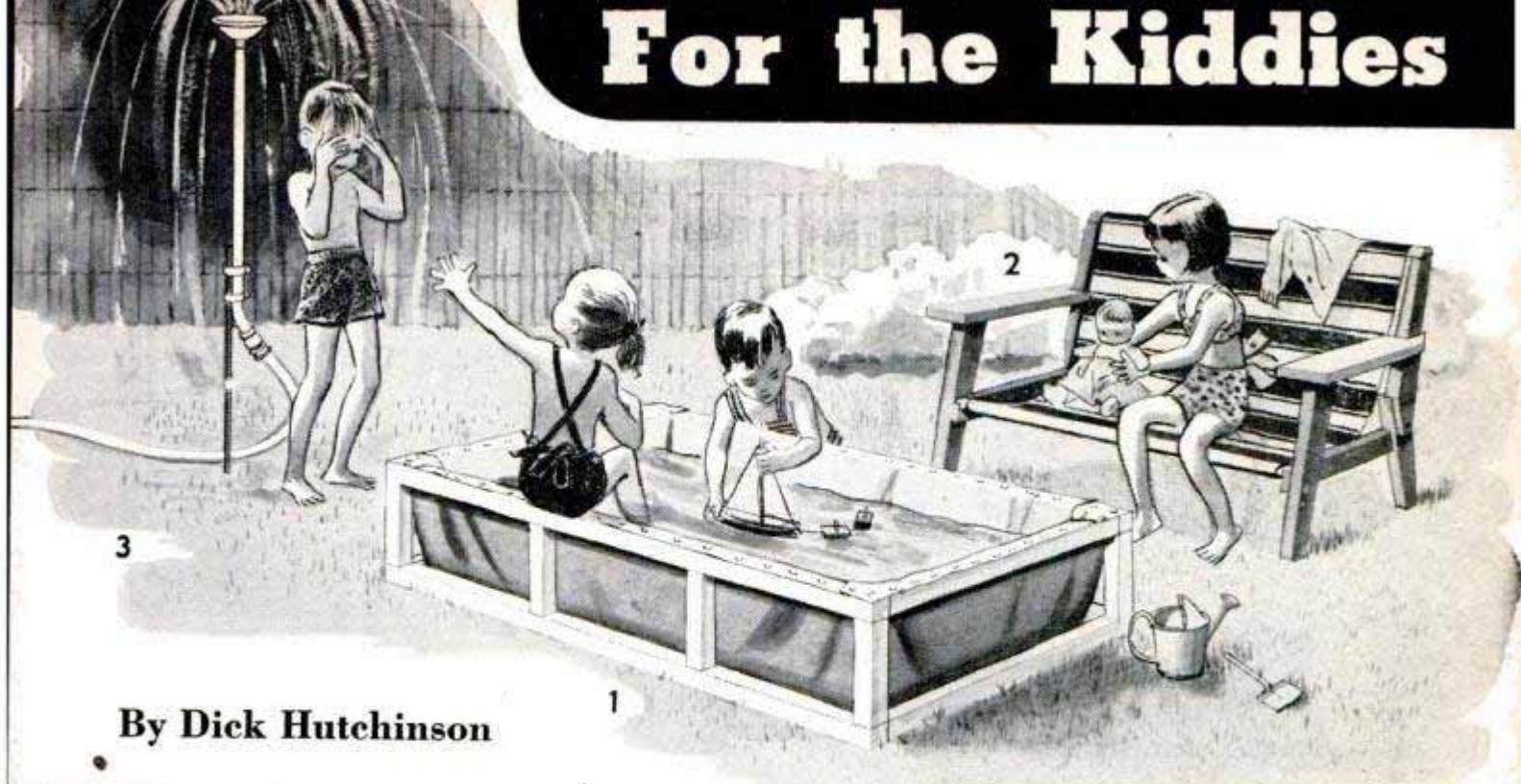
A length of socket pull chain may be used effectively in place of an electrician's fish wire, which generally is used for pulling wires through curved electrical fixtures. Fed into one end of a lamp, the chain—because of its weight and flexibility—can be shaken easily past curved portions of the fixture and out the opposite end. The electric wire is then attached to one end of the chain, after which it may be drawn through with little, if any, difficulty.

Otto Merker, Chicago.

Curtain Stretcher Dries Fishline

One fishing enthusiast hit upon the idea of drying fishing lines by stringing them between the top and bottom rows of nails on a curtain stretcher. Several lines can be accommodated at one time.

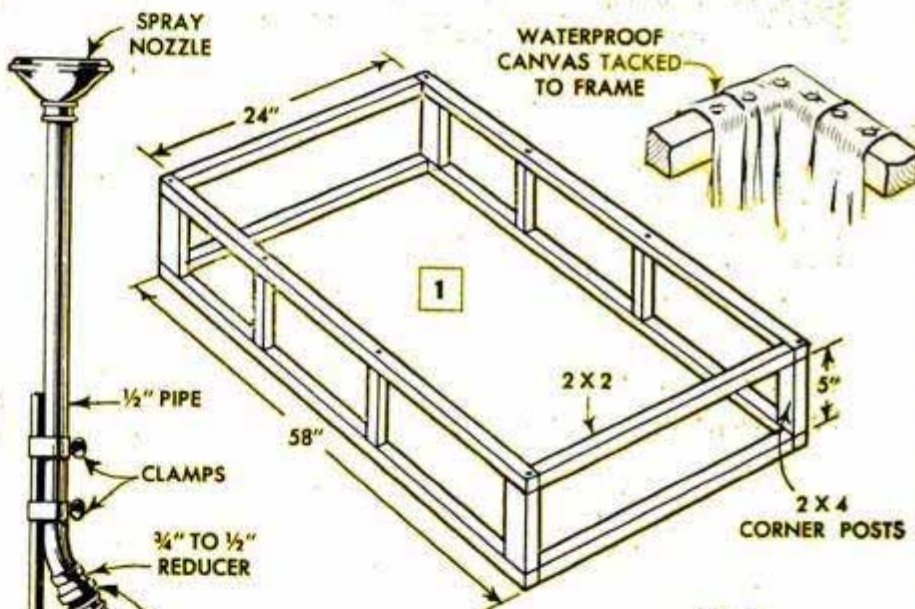
George Kapitan, New York City.



By Dick Hutchinson

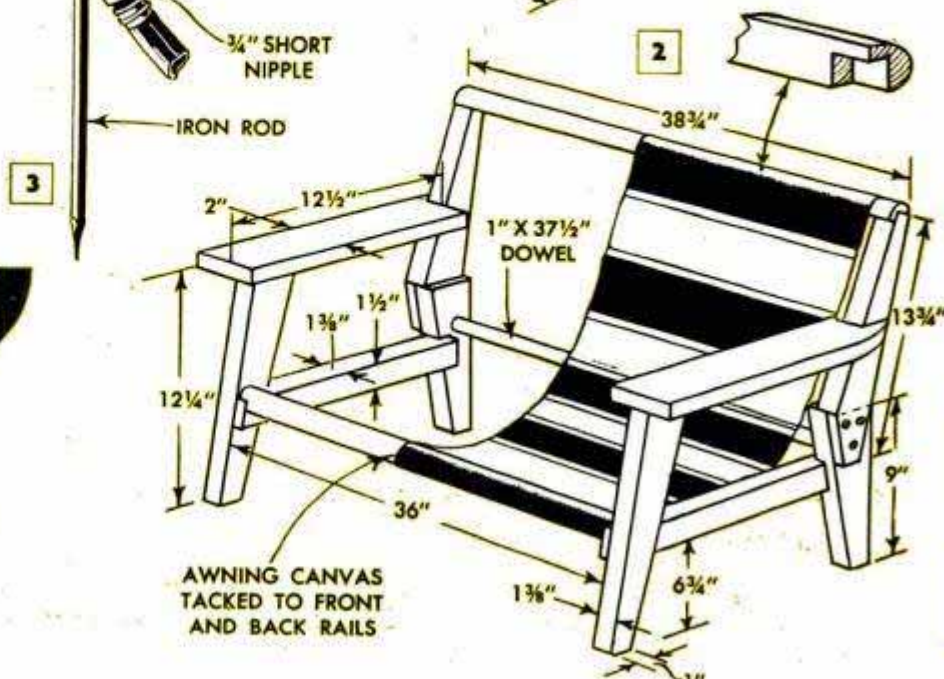
1-Canvas Wading Pool

Made as detailed, the wading pool is large enough for sailing toy boats and splashing, but not too cumbersome to permit storage in the basement or garage. Waterproof canvas simply is brought around edges of a wooden frame and tacked securely. Water can be siphoned out with aid of a garden hose



2-Small-Fry Bench

This little bench provides an ideal spot for the tots to dry out after a romp under the shower or a dip in the pool. A yard of awning canvas, 36 in. wide, is tacked to the front and back rails of the bench to form a comfortable seat. Stock sizes given in the detail may be varied to utilize lumber already on hand



3-Portable Shower

Connected to the garden hose, the portable shower can be set up anywhere in the yard. Radiator-hose clamps hold the pipe extension to a pointed length of rod which is pressed into the ground. If spray nozzle won't fit 1/2-in. pipe, use reducer and nipple at the top of the pipe in same way as for hose connection

Box Mounted on Cupboard Door Stores Household Articles



Should you need a container in the kitchen for storing string, paper bags and other useful items, make one from a discarded cheese box and attach it to the inside of a cupboard door. Fit a partition cut from the cover in one end of the box to form a compartment large enough to hold a ball of string and drill a small hole in the end of the box through which the twine can be withdrawn as needed. Paper bags and other articles can be stored in the larger compartment.

Hair Clip Holds Memos



Taped to the wall near the telephone, an ordinary spring-type hair clip provides a convenient memo holder. Using cellulose or adhesive tape, fasten one arm of the clip to a wall or the side of a cabinet so that the jaws of the clip point downward. To use, simply press against the top of the clip and insert note paper between the outer jaw and the tape.

Joseph Jay Gold, Brooklyn, N. Y.

Carrying Dampened Washcloth

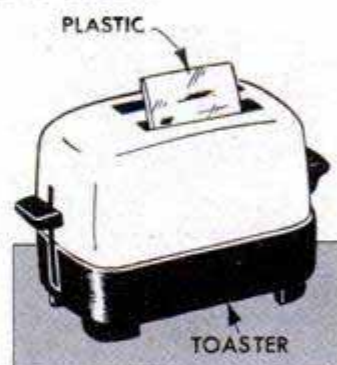
When traveling with children or taking them on a picnic, a damp washcloth is a must for cleaning soiled hands and faces. In case water may not be available, dampen

the cloth before leaving the house and carry it in a plastic container of the kind ordinarily used for sandwiches.

A. R. Tanner, Cold Spring, N. Y.

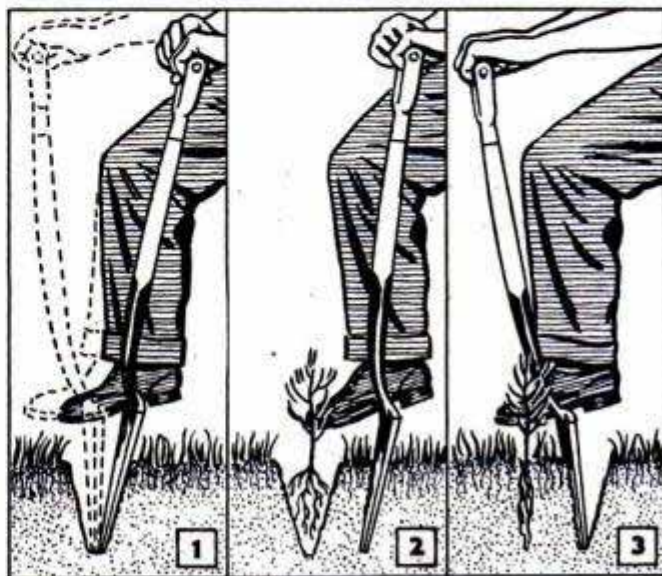
Electric Toaster Serves as Oven For Heating Sheet Plastic

Small pieces of plastic not more than $\frac{3}{8}$ in. thick can be heated for bending in the bread slots of an electric toaster. A toaster with manual controls is most suitable for the job. However, a completely automatic toaster may be used, provided the plastic is pressed down again each time it pops up until heated sufficiently. It is advisable to use a scrap piece of plastic first to determine how much time will be required to soften the material.



Quick Way to Transplant Small Seedlings

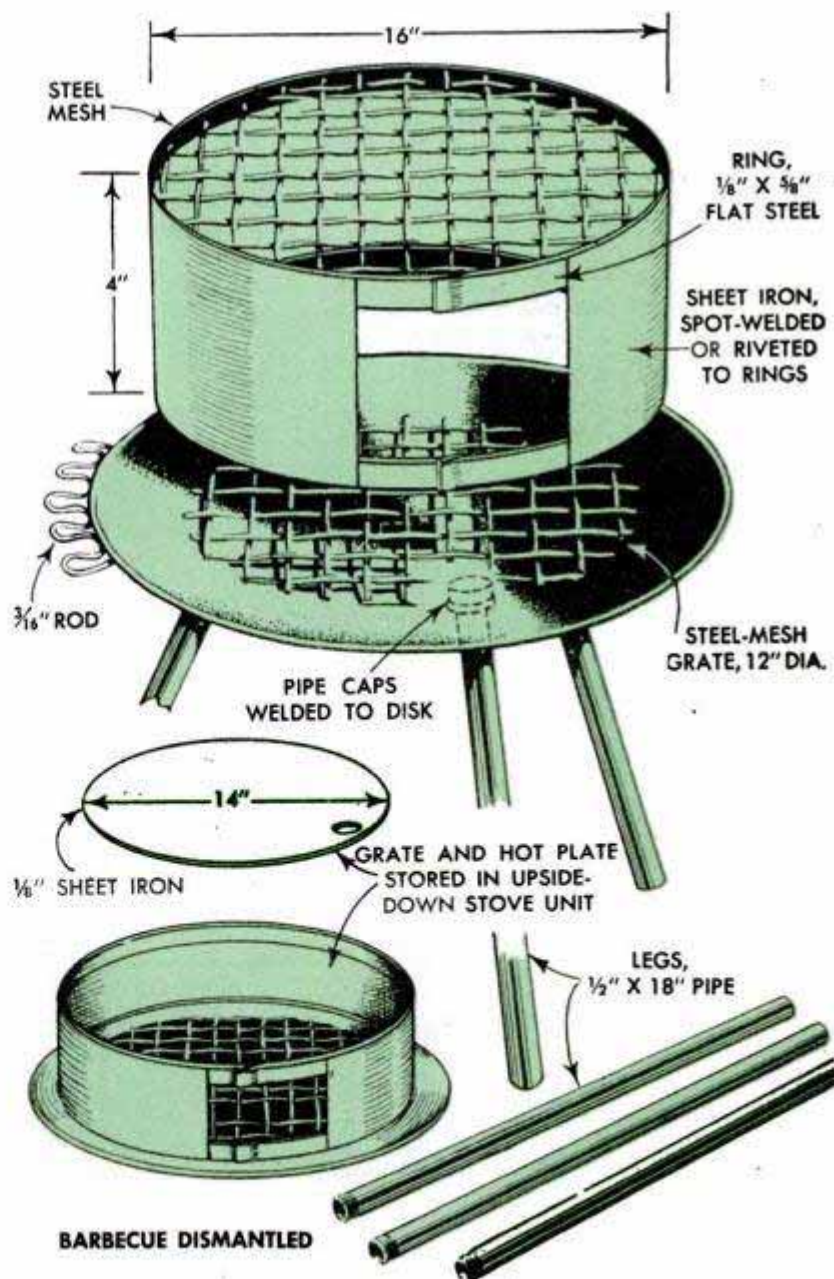
If you have a number of seedlings to transplant, the job can be done quickly by using a spade as indicated. First, sink it into the soil to the desired depth and then move it back and forth to form a trench equal to the width of the spade. Now, insert the plant and spread the roots in the trench. This done, sink the spade into the soil a few inches back of the trench and push the soil forward to close the trench around the roots. The small opening made in doing this allows the roots to get plenty of ventilation and also serves as a water reservoir for providing moisture which the seedlings will need to get a new start.

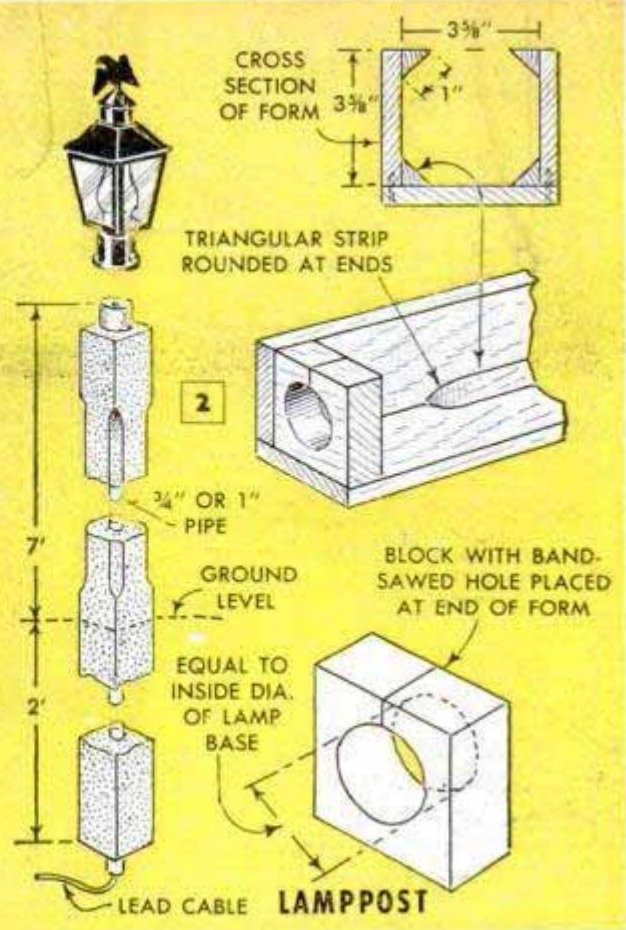
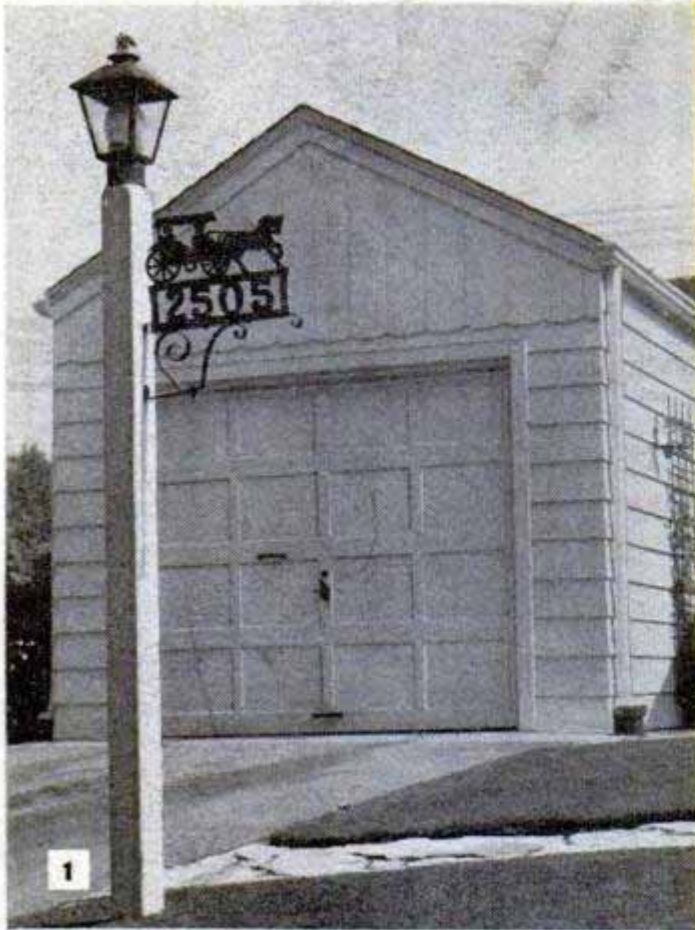


KNOCKDOWN BARBECUE



IF YOU LIKE to cook an occasional dinner in the back yard but have no particular desire for a permanent outdoor fireplace, this knockdown barbecue will handle the cooking and can be tucked away in the basement or garage when not needed. It is set up in a minute or two and, being compact, is ideal for carrying on picnics. Steel scrap, pipe and an 18-in. harrow disk are used to make the unit, as detailed at the right. The 4-in.-deep firebox was designed for charcoal, but it can be adapted for burning wood by adding another 4 in. or so to its depth. The firebox is assembled by welding or riveting sheet iron to two flat-steel rings, and covering the top with a grid of heavy steel mesh. Three pipe caps are welded to the underside of the harrow-disk fire pan to take legs of $\frac{1}{2}$ -in. pipe. A steel-mesh grate, about 12 in. in dia., is placed in the bottom of the fire pan. A simple holder for roasting forks can be bent from rod and welded to the edge of the disk, and a hot plate may be cut from sheet iron. The barbecue is stored compactly by removing the legs, turning the firebox upside down in the fire pan and placing the grate and hot plate inside the firebox. The hole, which is located at the center of the harrow disk, is left open to provide additional draft for the fire.





CONCRETE IMPROVEMENTS

By E. R. Haan

WHEN PERMANENCE is the main requirement in exterior home improvements such as lampposts, steps and fireplaces, it's generally more practical to use concrete. This common building material can be mixed in attractive permanent colors, is rot, fire and termite-proof and, when properly mixed and poured according to approved specifications, will withstand weathering and extremes of temperature over long periods of time without damage. It also has a decided advantage in economy and ease of handling. Homeowners without any previous experience in working with concrete can tackle many jobs single-handed with assurance of good results right from the start.

Lamppost: A concrete lamppost of the kind shown in Figs. 1 and 2 is cast in a three-sided form. If you use lumber with a pronounced grain for the form, the wood grain will be imprinted attractively in the concrete post. Chamfered corners are formed on the post by triangular strips rounded at the ends and nailed to the inside corners of the form as in Fig. 2. The post should extend into the ground below the normal frost level. If the lamp has a round, hollow base, the upper end of the post is cast round to fit it by nailing a wood-

en block in the end of the form. A hole is bandsawed in the block, its diameter being slightly less than the inside diameter of the lamp base. The hole forms a boss on the top end of the post. A length of pipe supported at each end of the form serves the double purpose of reinforcing the concrete and providing an opening for the wiring. White cement often is used for this job so it will not be necessary to paint the post. Use a mix of 1 part cement, $2\frac{1}{4}$ parts sharp sand and $2\frac{1}{2}$ parts of gravel screened to $\frac{1}{2}$ in. in dia. Add sufficient clear water to make a smooth mixture. Work the concrete into contact with every part of the form, especially at corners, to avoid air pockets.

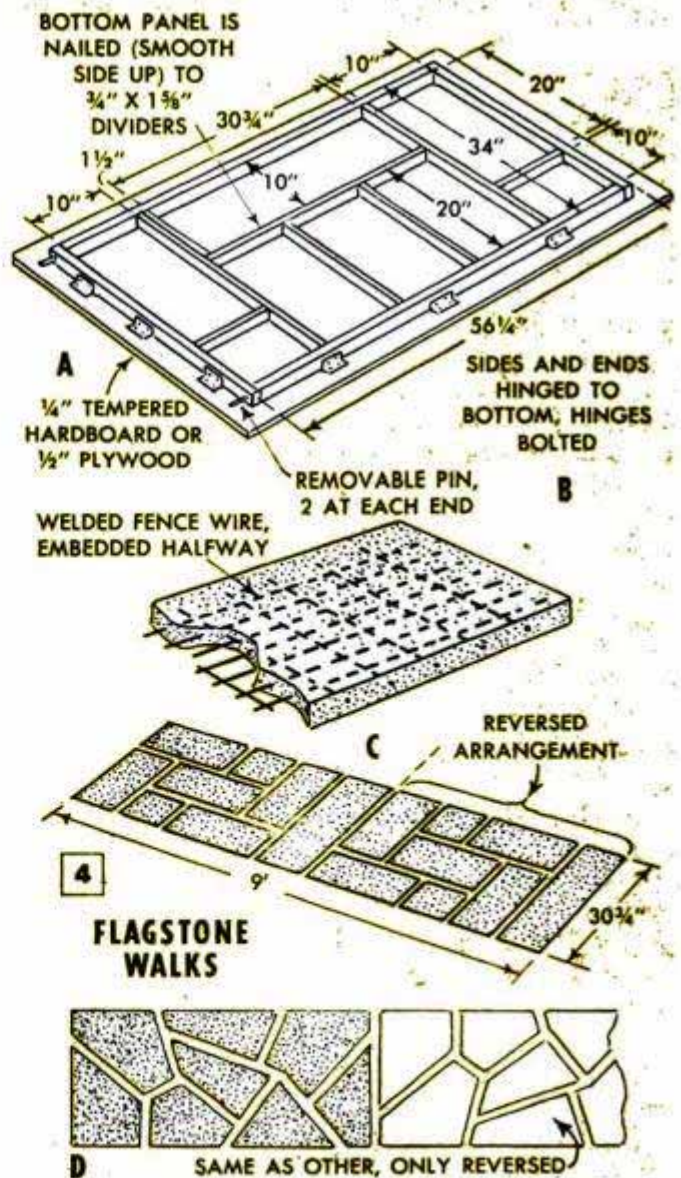
Concrete flagstones: Precast concrete flagstones, Figs. 3 and 4, need be made only $1\frac{5}{8}$ in. thick if they are reinforced with welded fence wire as in Fig. 4, B. Build the form as in detail A. Note that the sides and ends are hinged so they can be swung outward to remove the slabs easily after they have hardened for two or three days. The form shown produces enough flagstones to lay a $4\frac{1}{2}$ -ft. section of walk about 30 in. wide, arranged as in detail C, each alternate section being reversed. Such irregular patterns as the one in detail D also are possible. The form shown in Fig. 4, A, requires nearly $1\frac{1}{2}$ cu. ft. of concrete to fill it. A

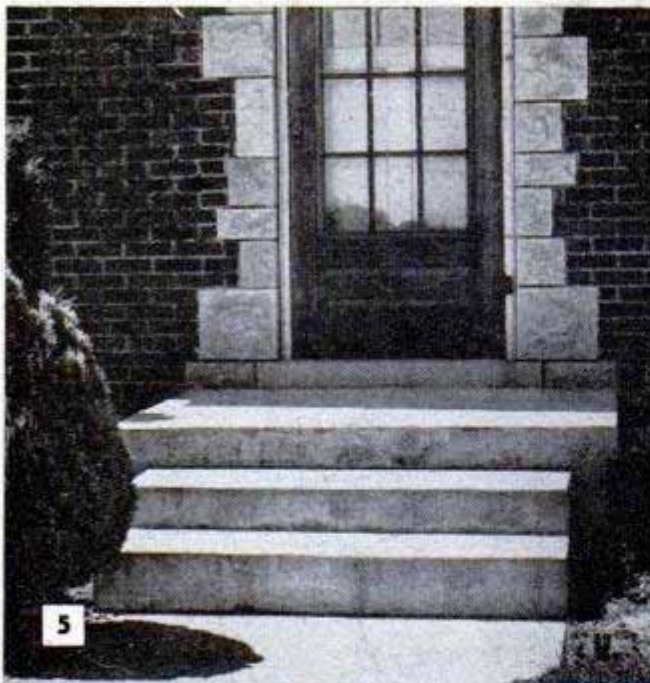


Around the HOME

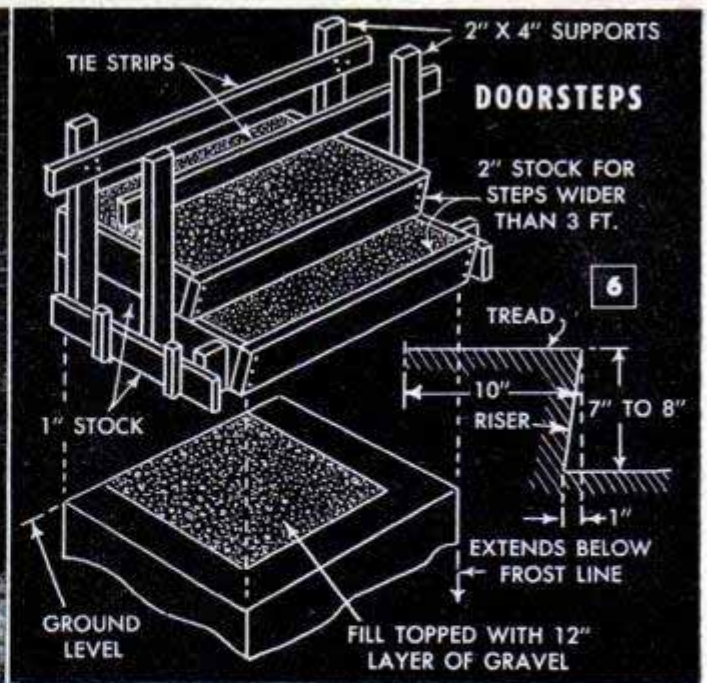
1: $2\frac{1}{4}$: $2\frac{1}{2}$ mix is recommended, with the gravel screened to $\frac{1}{2}$ in. in dia. Flagstones can be cast with colored concrete if desired. Brush the forms liberally with oil, clean them after each casting is removed, and re-oil before using again. Cut the reinforcing wire with a heavy-duty cutter so that each piece is slightly smaller than the slab. After filling the form half full, press the wire in place, then fill to the top and strike off level.

Concrete steps: For permanence, build steps on a 6-in. foundation wall extending below the local frost level, Figs. 5 and 6. In sandy soil a double form is needed, but where soil is stiff enough to resist caving, an inner form usually is sufficient. After the foundation has hardened, fill the hole, tamp the gravel fill and build the form for the steps. Note that tie strips are located well above the edges of the form boards to allow room for finishing the concrete with trowel and edger. Treads should be 10 to 11 in. wide and the step height 7 to 8 in. Slanting the risers inward 1 in. at the bottom provides added toe space. In this case the edges of the riser forms should be planed at an angle to fit flush with the tread surfaces. If one riser must be of slightly less height than the others, it should always be located at the bottom for maximum safety. If you notice that the first tread bulges up when concrete is poured to the second

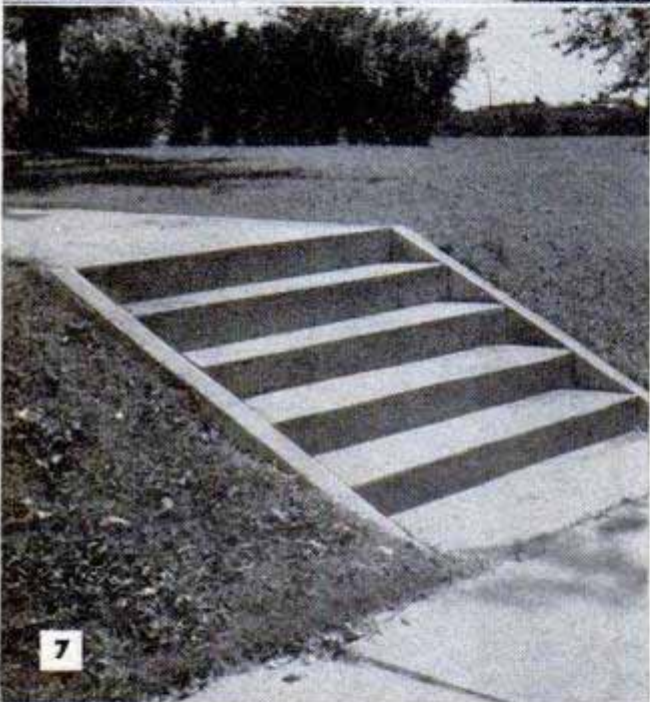




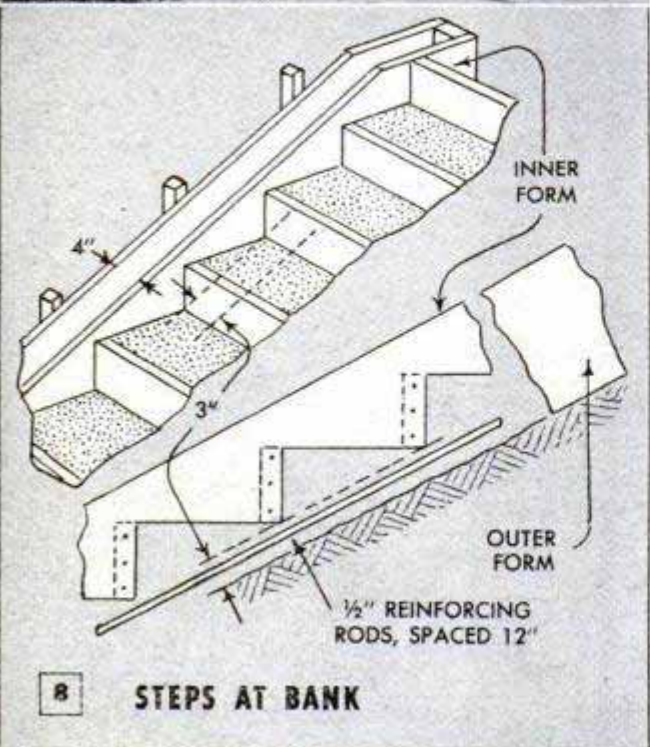
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6



7



8

STEPS AT BANK

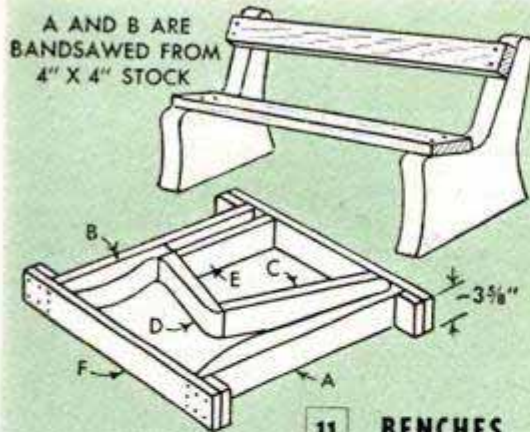
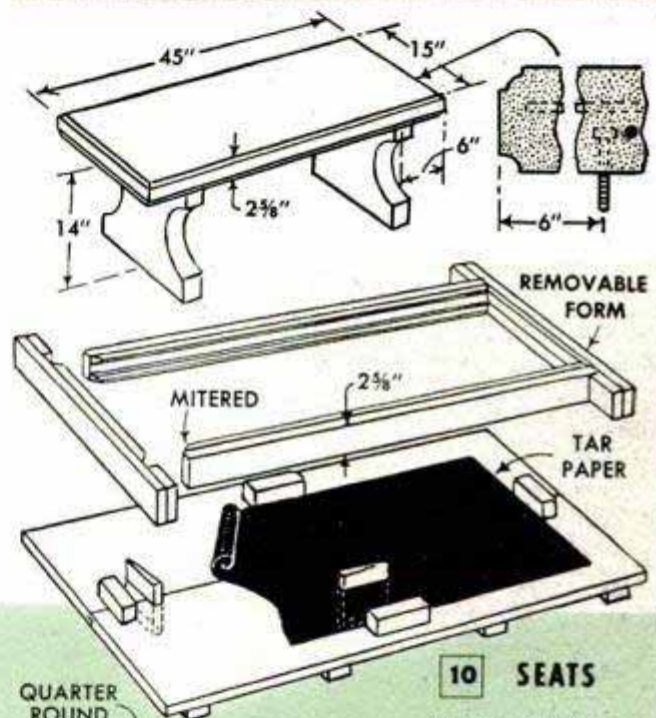
tread level, the mix is not stiff enough. To avoid trouble let the concrete of each tread level set several hours; mix a new batch for each step. Round the edges of the treads with an edger after finishing with a trowel or float. Steps on a bank, Figs. 7 and 8, should have side walls made by using a double form. The earth should be excavated below the treads to produce a continuous slab 3 or 4 in. thick, which is reinforced with $\frac{1}{2}$ -in. rods. A mix of 1: $2\frac{1}{4}$: 3 is recommended for steps, the gravel being screened to $\frac{1}{2}$ in. in size.

Garden seats: Garden seats of the type shown in Figs. 9 and 10 consist of a reinforced concrete seat slab laid on two supports. Reinforce the seat with iron rods or welded fence wire. Cast the seat in the inverted position so that you can embed bolts by holding them in place with crosspieces nailed to the sides of the form about 6 in. from the ends. To form neat edges on the seat, nail $\frac{3}{4}$ -in. quarter-round and cove molding to the inside of the form as in Fig. 10. A piece of tar paper laid on the bottom of the form made up of boards will provide a smooth surface and prevent imprinting of the wood grain. Brush oil on the forms before pouring concrete. Note how the sides of the form are held from spreading at the ends by cleats on the end forms, and how blocks and wedges are used to hold the form in position. The embedded bolts in the seat fit correspondingly spaced holes cast in the supports by means of greased dowels driven through holes in the form. The bolts are screwed into expansion sleeves. The form for the supports is made in the same way as the seat form except that sheet metal is used to form the curved edges. Use a 1: $2\frac{1}{4}$: $2\frac{1}{2}$ mix with gravel screened to $\frac{1}{2}$ in. in dia. Trowel the concrete against the edges and into the cor-

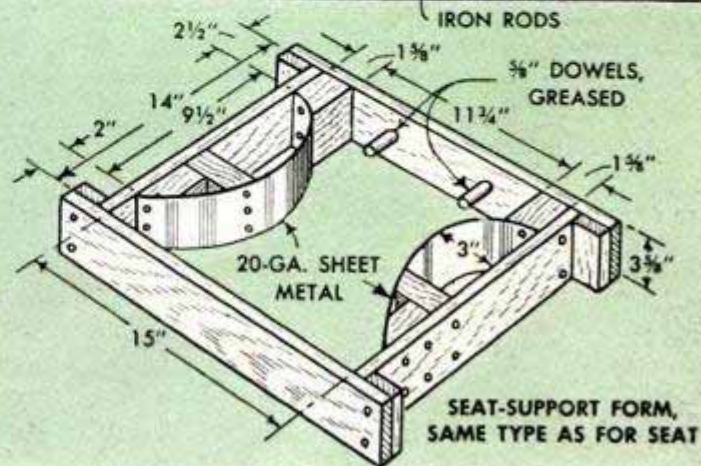
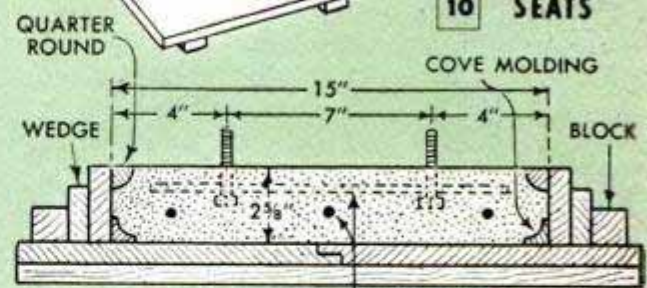
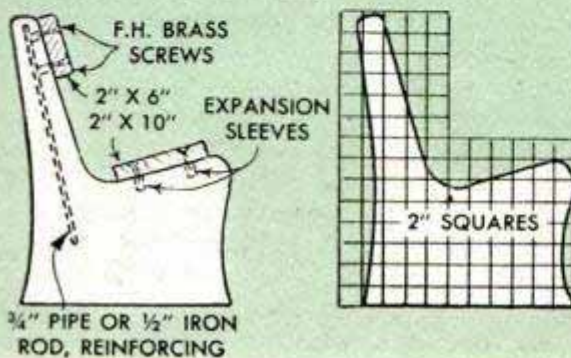
ners of the form before it has been completely filled. Although the castings can be removed from the forms in two or three days, keep them covered with wet grass clippings or straw for a week to ten days before assembling. In the meantime pour the footings for the seat supports in the desired location in the garden. If you prefer a bench having a wooden seat and backrest on concrete supports, or endpieces, follow the design shown in Fig. 11.

Porch floors: Perhaps you have been planning a screened porch with a concrete floor, such as the one in Fig. 12. Concrete porch floors laid on newly graded soil or raised slightly above grade should be supported on concrete piers extending to well-compacted soil below the frost level as in Fig. 13. If the soil is heavy, the holes for the piers can be dug with a posthole auger, but if sandy, use sheet-metal furnace pipe for forms. Build the edge forms so the floor will slope $\frac{1}{4}$ in. per foot for drainage. Then fill the space below the floor with tamped gravel and pour the concrete, using a 1: 2 $\frac{1}{4}$: 3 mix. Reinforce in two directions with iron rods. Reinforcing is necessary since most of the floor weight will be carried on the piers. A mastic joint between the porch floor and the house wall allows for slight expansion and contraction without breaking the seal. You can use mastic strips or you can insert a wedge-shaped form board between the wall and the slab to leave a space to be filled later with oakum and roofing cement or hot asphalt.

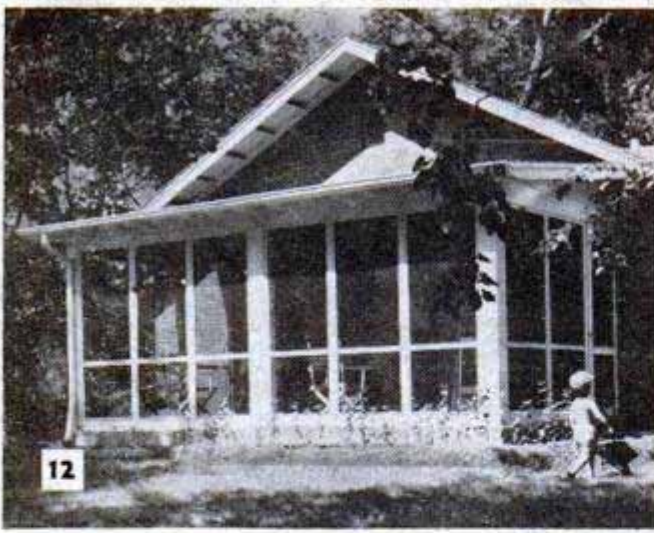
Birdbath: Figs. 14 and 15 show a concrete birdbath having an attractive fluted



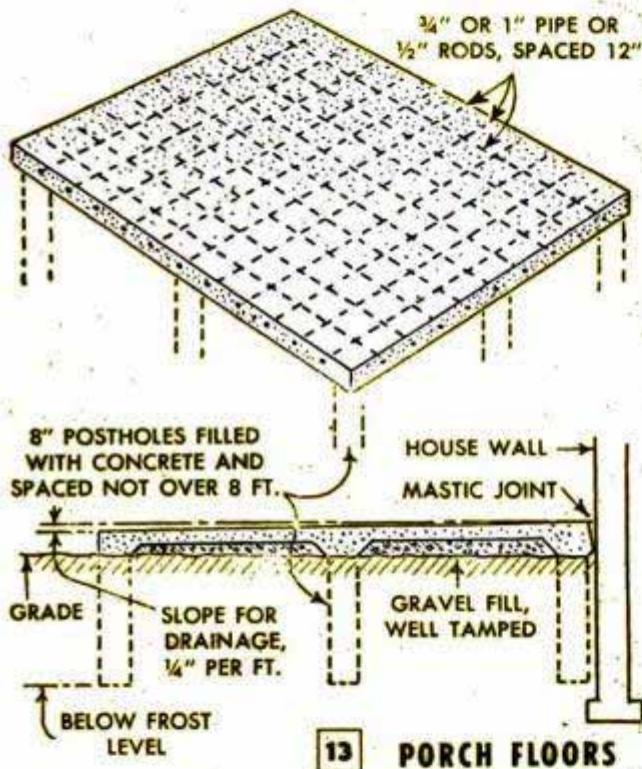
11 BENCHES



SEAT-SUPPORT FORM, SAME TYPE AS FOR SEAT



Concrete porch floors laid over new earth fill are supported on concrete piers extending below frost level. Holes for piers are dug with posthole auger

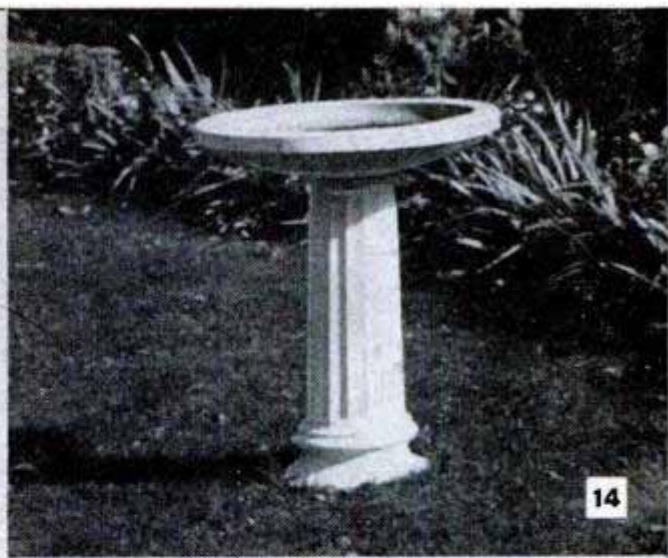
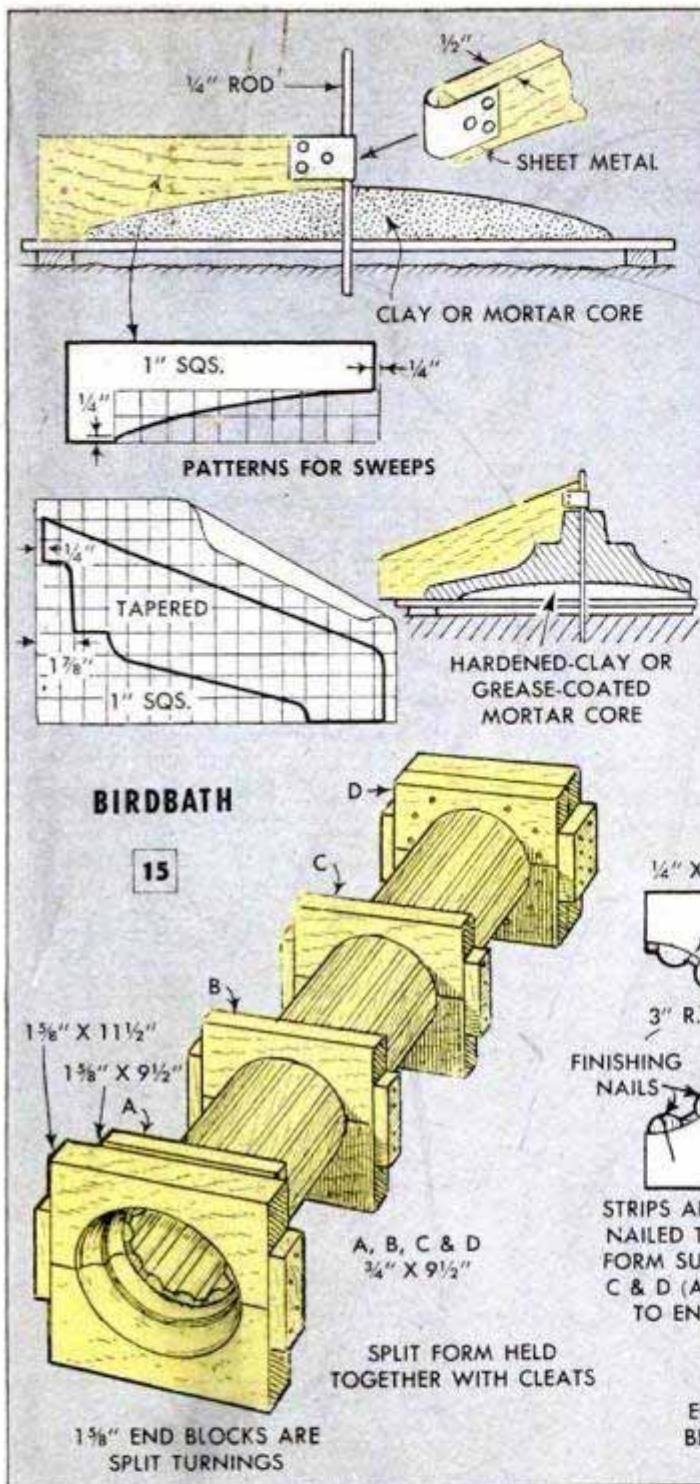


13 PORCH FLOORS

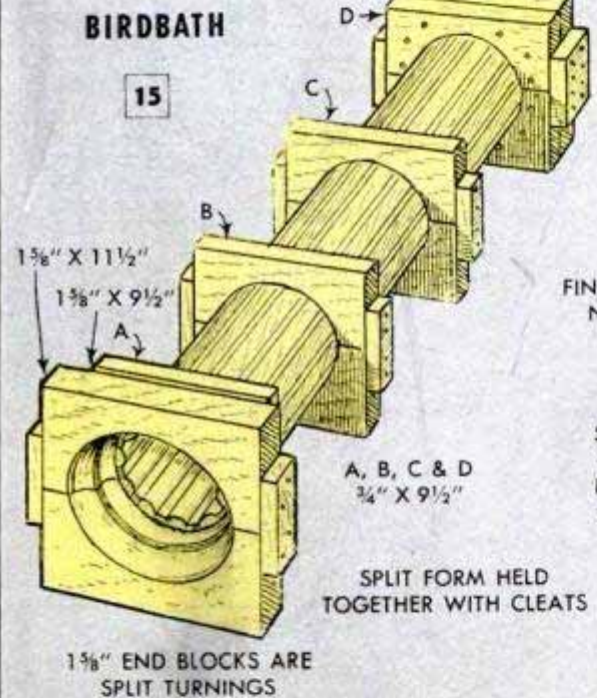
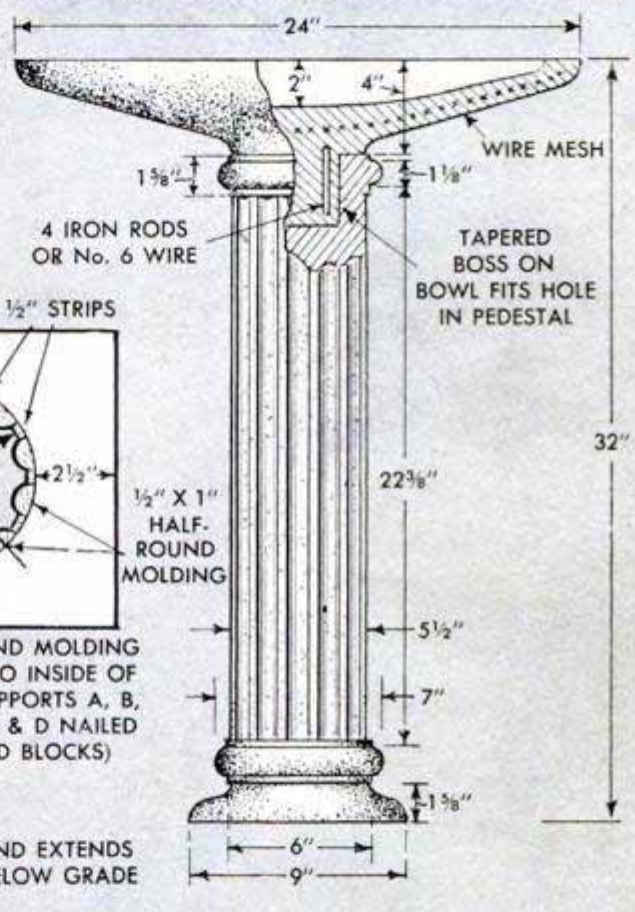
pedestal and a molded base. This design is intended for permanent location as the pedestal extends below the frost level. The bowl is cast with a tapered boss, or lug, which fits into a tapered hole in the top of the pedestal. The inside contour of the bowl is formed with a clay or mortar core, made as in the upper detail in Fig. 15, using a pivoted sweep bandsawed to the proper curvature. A sheet-metal strap nailed to the end of the sweep slips over a rod projecting through the platform and into the ground. The bottom of the bowl is formed with a sweep in the same manner. The clay core should be thoroughly dry and must be coated with heavy oil before forming the bowl over it. The end blocks of the pedestal form are split turnings and the flutes are formed

by alternate straight and half-round strips nailed to square blocks, which are first cut in half and a semicircular cut handsawed in one edge of each piece on a 6-in. radius to form a round opening when the two halves are assembled. Level the form over a posthole dug in the desired location. For sandy soil use a length of 8-in. furnace pipe for the form below grade. This section of the pedestal should extend below local frost levels. For reinforcing the pedestal, center a length of 1-in. pipe in the hole. Four $\frac{1}{4}$ -in. iron rods placed near the edges of the form also can be used. Use a 1: $2\frac{1}{4}$: $2\frac{1}{2}$ mix, with gravel not over $\frac{1}{2}$ in. in dia. for that part of the pedestal below grade. Use only cement mortar (1 part cement to 3 parts sand) to form the molded section, tamping it to assure contact with the form. Then continue with the concrete mix, but resort to cement mortar again at the top turning. The hole at the top of the pedestal is formed by a greased wooden turning which is slightly tapered. Embed a 6-in.-wide band of welded fence wire in the mortar around the hole.

Vases and urns: You can make attractive vases and urns, Figs. 16 and 17, from cement mortar without using molds by applying the mortar in successive layers to expanded metal lath held on a removable form. After determining the size and design of the vase, Fig. 17, make a full-size pattern of it on heavy paper. Allow $1\frac{1}{8}$ in. for wall thickness and mark this off on the pattern so that you can determine the width of the stock for the ribs. Bandsaw the ribs to identical curvature and also bandsaw three disks, two for the top and one for the bottom. After assembling the form, drill center holes for $\frac{1}{2}$ -in. pipe. Then cover the form, including the bottom, with metal lath. Don't attach the lath to the form with nails or staples as it must be removed. Next, make the platform on which the inverted form is rotated while applying the mortar. A sturdy template, or sweep, is firmly mounted on the platform to serve as a guide for applying mortar and also as a support for the $\frac{1}{2}$ -in. pipe. A suitable mortar is made by dry-mixing (by volume) 1 part portland cement, 3 parts sharp sand and $\frac{1}{10}$ part hydrated lime. Add water to make a rather stiff mixture and let it stand for an hour or so before using. Apply the mortar in three successive $\frac{3}{8}$ -in. coats, one full day apart. The first coat should anchor securely to the lath and just cover it. Don't trowel the surface smooth as the next coat will key better to a rough surface. To check on the thickness of the first coat, hold a small $\frac{3}{4}$ -in. block between the template and the mortar while rotating the form. Application of the second and third coats is similar. Before applying these, wet the



14

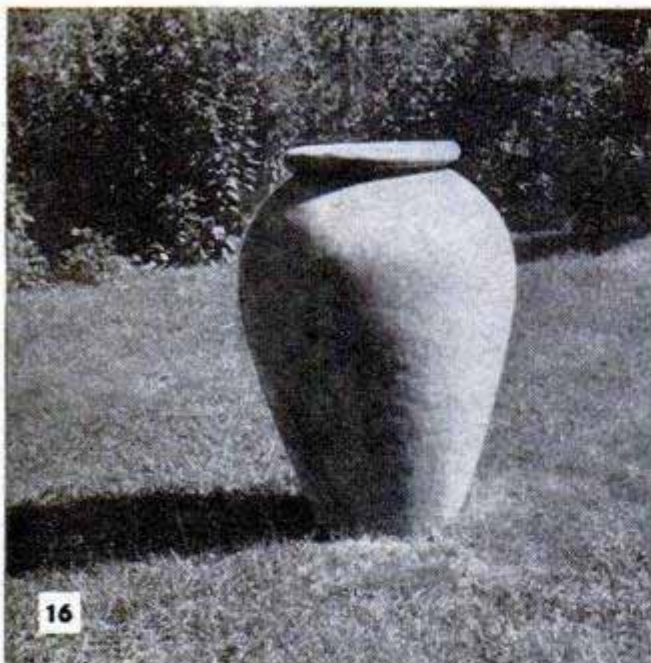


15

previous coats thoroughly. The last coat is trued by rotating the form against the stationary sweep which has a beveled edge to produce a smooth finish. After the mortar has hardened so it resists marking, wrap the vase in several layers of burlap and keep this wet for a week. Slow curing of the mortar gives it maximum strength. Then remove the base from the platform and unscrew the two disks at the top, after which the ribs can be pulled out easily. If the bottom disk is swollen from moisture, wait until it dries and shrinks before attempting to dislodge each half with a punch inserted through the hole in the bottom of the vase. This hole is filled with mortar when finishing the inside of the neck.

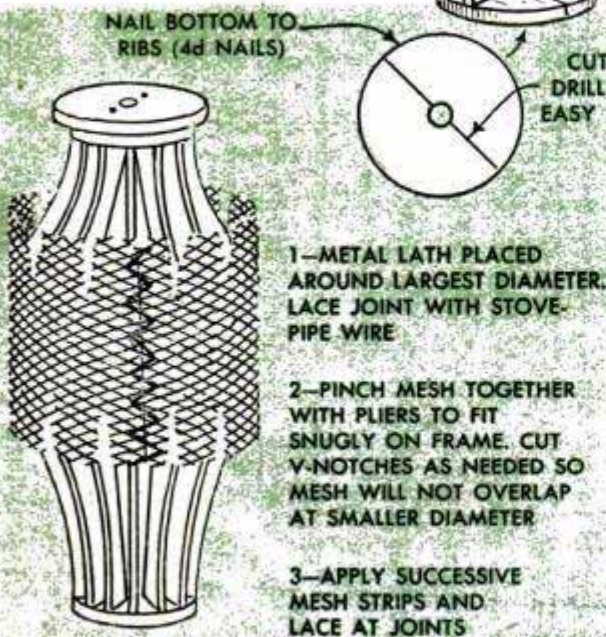
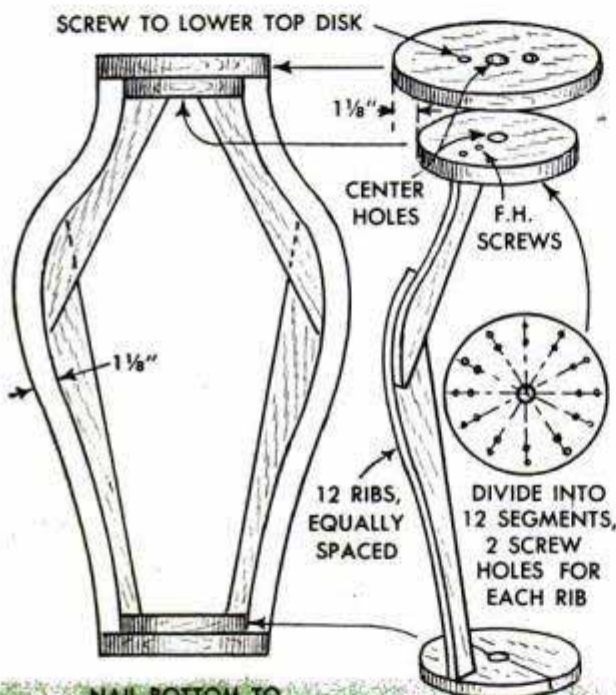
Trash burner and fireplace: To eliminate

an unsightly wire trash burner, substitute one of concrete, Fig. 19, A. First pour a 6-in. concrete slab, reinforcing it with 1/4-in. iron rods or pipe. The form for the slab is shown in detail B. It should be about 4 in. larger each way than the burner and should be flush with the grade so that the grass edging can be cut with a lawn mower. The burner forms, detail C, are built with sheathing board or plywood and are cleated with 1 x 2 and 2 x 4-in. stock. A rectangular box-type form is fitted between the inner and outer forms to produce the draft opening. It also serves to hold the inner form in position while the concrete is being poured. The inside form is cleated on the inside corners, and similar cleats are nailed on the outside of the outer forms, with adjacent sides

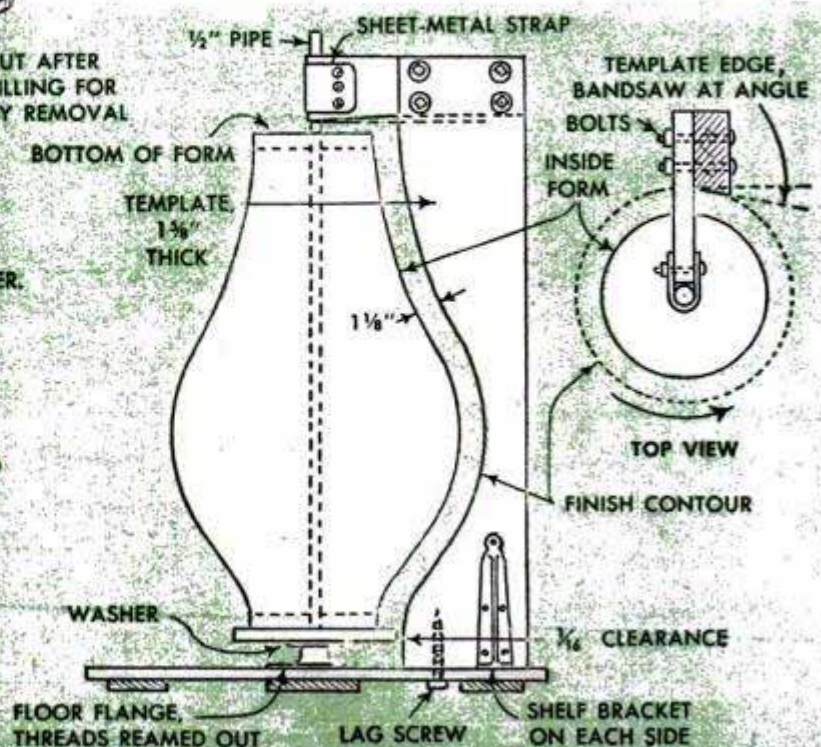


nailed to them, one from the inside and the other from the outside. Only a single support placed edgewise is needed on each side of the outer form. These supports are held by tie strips at the top, and braces and stakes at the bottom. A similar procedure is followed in making a charcoal-burning fireplace, Figs. 18 and 19, D. If desired, this can be used as a trash burner. Four bolts or 6-in. lengths of $\frac{1}{2}$ -in. iron rod are embedded in the walls to support the top grate. Only two are needed for the lower grate as it rests on concrete at the front. The bolts or rods are inserted through holes bored in the form. Be sure to get them level, particularly those for the top grate. Don't use iron rods extending across the opening as expansion of the rods when heated may crack the walls. For grates you can use discarded refrigerator or stove shelves of welded construction. Or, you can make grates as in detail E. Trash burners and fireplaces should be reinforced by using welded fence wire. Use a 1: $2\frac{1}{4}$: 3 mix, with gravel not over $\frac{3}{4}$ in. in dia. Where heaving frosts are likely to tilt the slab, the foundation walls should extend below the local frost level. Don't light a fire until after the concrete has cured for two weeks, during which time it should be kept moist by covering with burlap sacks and soaking them thoroughly every day.

Making good concrete: One sack of portland cement contains 1 cu. ft. by volume. Proportions for dry mixes are measured by volume also, and this should be done accurately. Use only clean sharp sand. Both sand and gravel should be free from vegetable matter, clay, loam and dirt. Cement and sand are mixed first, then the gravel is



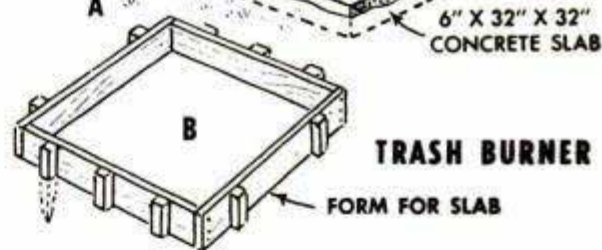
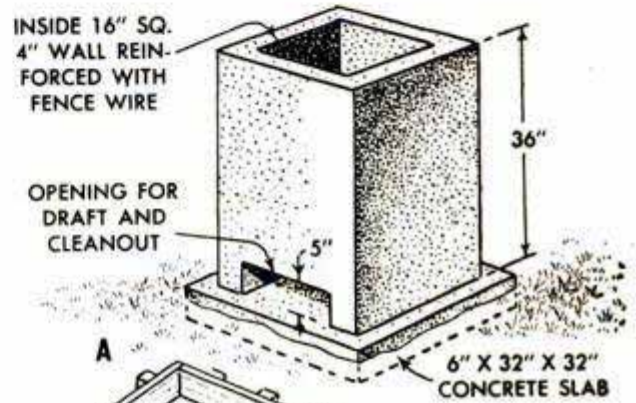
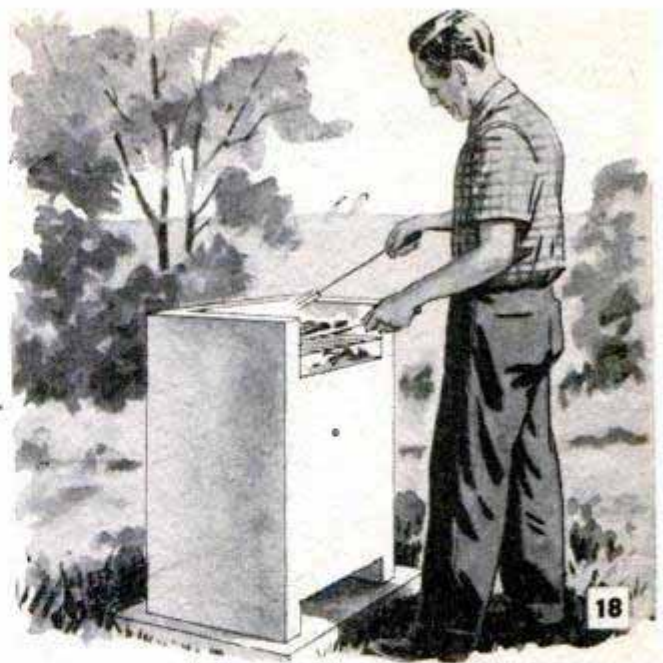
17 CONCRETE POTTERY



added and mixed. Proportions of mixes are given in the same order. For example, a 1: 2: 3 mix is composed of 1 part cement, 2 parts sand and 3 parts gravel. The water used for mixing concrete should be clean and the amount added after the dry aggregate has been thoroughly mixed should be just enough to produce a workable mixture. From $3\frac{3}{4}$ to $6\frac{1}{4}$ gal. of water are used for each sack of cement, or proportionally smaller quantities for less cement. The minimum amount of water will produce a mix varying from a pouring plasticity to a stiff consistency depending on the degree of moisture present in the sand and gravel. When a mix is too stiff, it will not make uniform contact in the form, resulting in air pockets and stony spots that detract from good appearance. Working the mix into contact with the forms is possible only if it is plastic enough to work easily. Concrete and mortar should be placed in forms not later than 45 minutes after mixing. Never let newly poured concrete dry out; keep it moist for a week to ten days. Large surfaces, such as porch or patio floors, can be covered with straw and loose earth. This must be kept moist by frequent sprinkling. Remember to cover not only the surface but, if the forms are removed, the edges of the slab as well. Shovel earth against the edges as soon as forms are removed.

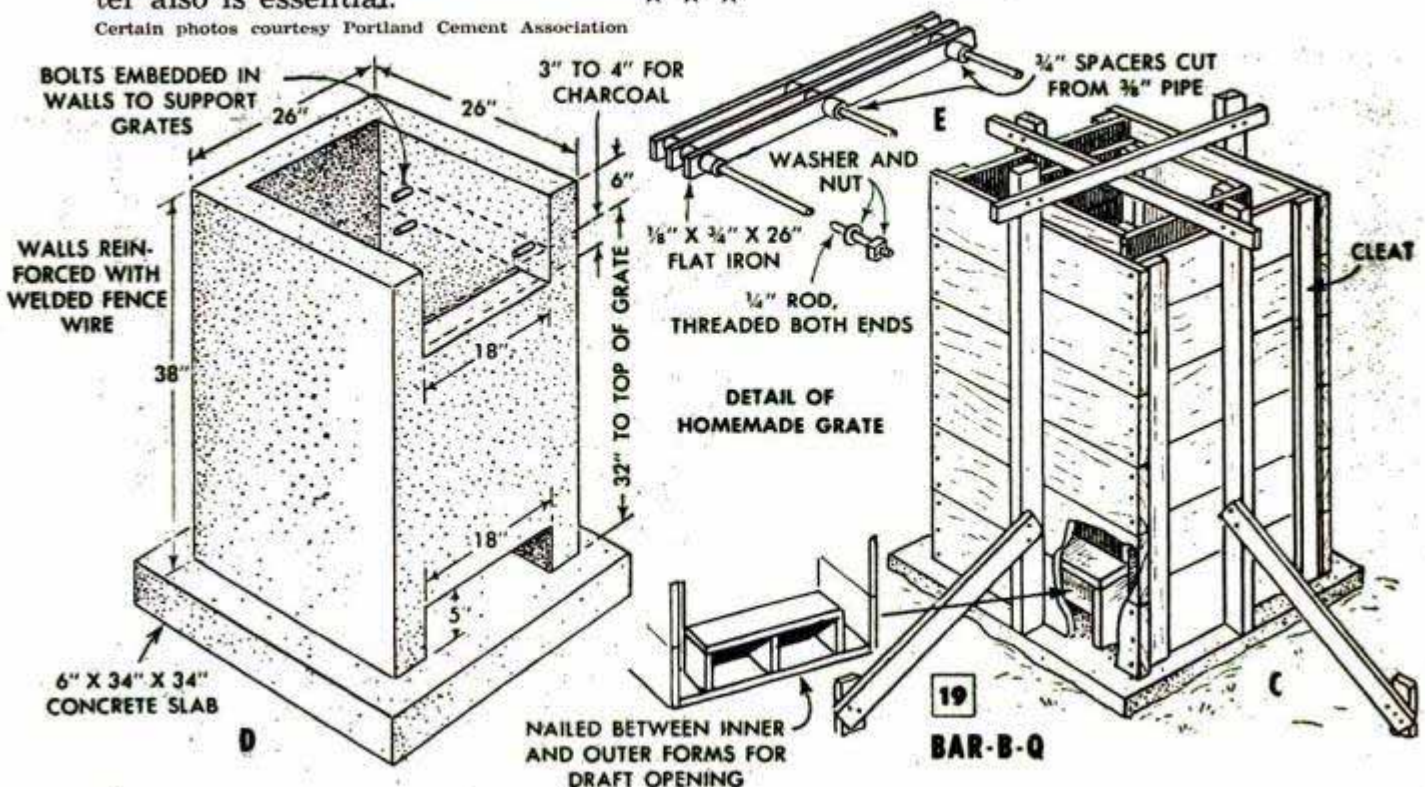
Coloring concrete: Mineral-oxide pigment, available in several colors, is best for coloring concrete or cement mortar. It is mixed with the sand and can be used in quantities up to 10 percent of the amount of cement used in a batch to give deep shades of color. Thorough mixing after adding water also is essential. ★ ★ ★

Certain photos courtesy Portland Cement Association



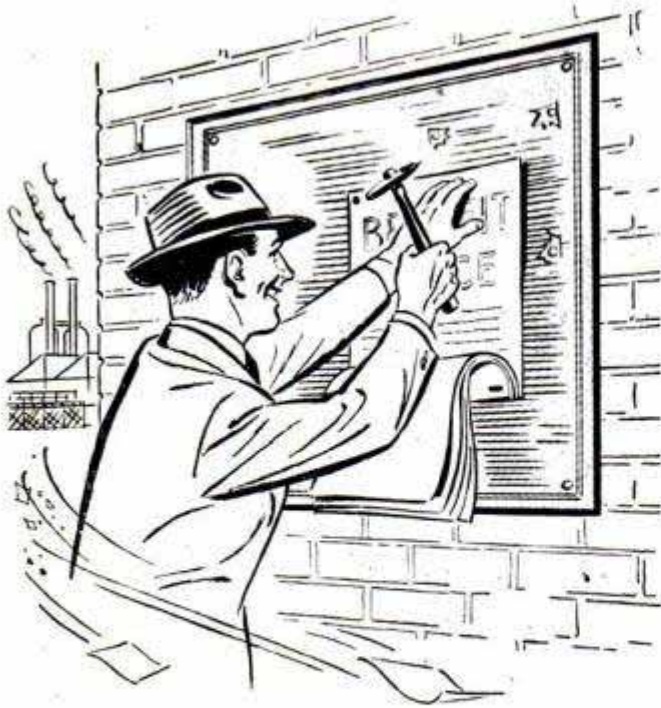
TRASH BURNER

FORM FOR SLAB



DETAIL OF HOMEMADE GRATE

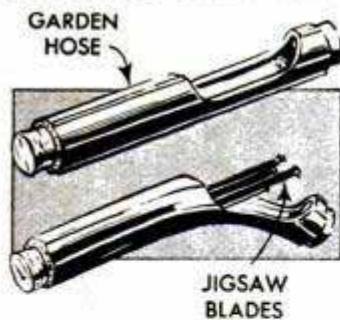
19
BAR-B-Q



Posters Handled Easily in Wind If Stapled Together

The difficulty of tacking posters to outdoor bulletin boards on a windy day can be overcome easily by stapling them together along the bottom edges to form a pad. In this way, the hands are left free to tack the bottom poster at the upper corners while the remaining ones hang from the staples. After the bottom poster has been tacked near the lower corners, the remainder of the pad is pulled free.

Length of Hose Plugged at Ends Provides Saw-Blade Container



Plugged at the ends with corks, a short length of garden hose cut as shown will provide a useful holder for jigsaw blades. The cut-away portion of the hose simplifies selection of the

blade desired and also provides the opening from which the blade is removed when the hose is bent.

Come and Get It!

Next month we present a feature dear to the heart of the amateur chef—an array of fireplaces and back-yard kitchens that carries visions of tasty frankfurters and broiling 'burgers. The article includes complete plans for building two outdoor ranges and a barbecue cart you can wheel about the back yard. In addition, there'll be a good many photos of complete outdoor kitchens. Don't miss this feature in the July Craftsman Section.

Improved Small-Tool Rack

A simple rack for screwdrivers, files and other small tools is improvised quickly by using a "girder" from a toy construction set. The metal strip, which is ready-punched to take the tools, is fastened to the wall with an angle bracket. Several girders can be joined together to form a long rack.



Thumbtack Stop for Box Cover

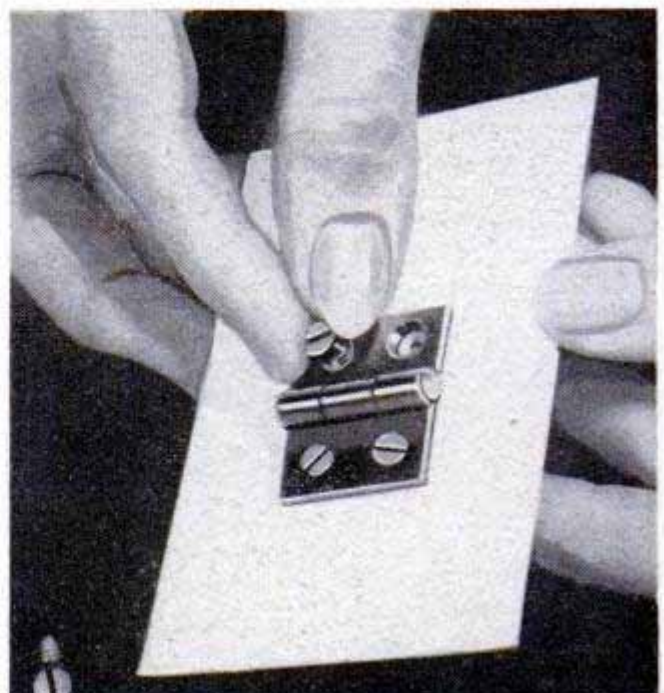
On small boxes with sliding covers, a thumbtack pressed through the top of the cover will act as a stop to keep the box from sliding out all the way. The tack is placed near the end of the cover so that its point will catch one end of the box when opened.



Hinges and Screws Kept Together When Mounted on Cardboard

If you have removed a hinge that will not be used again for some time, "screw" it to a piece of cardboard as shown for handy filing in a cabinet or drawer. This will eliminate the possibility of the screws being misplaced, as frequently happens when screws are stored separately for a prolonged period of time.

Benjamin Nielsen, Aurora, Neb.

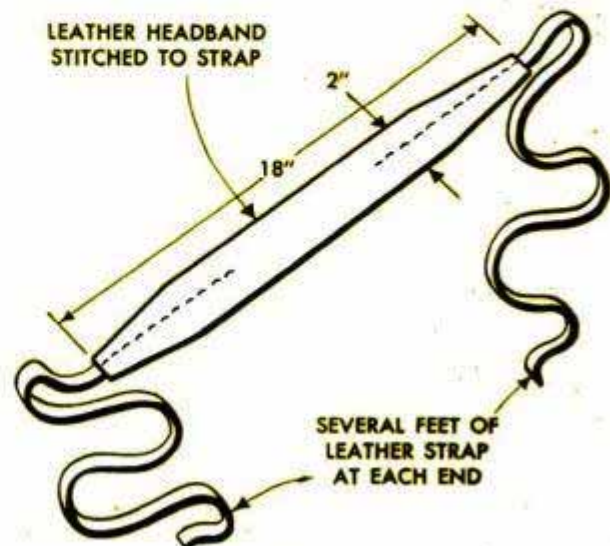
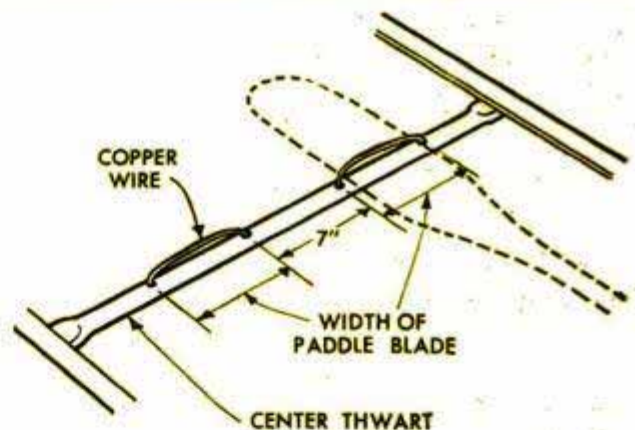
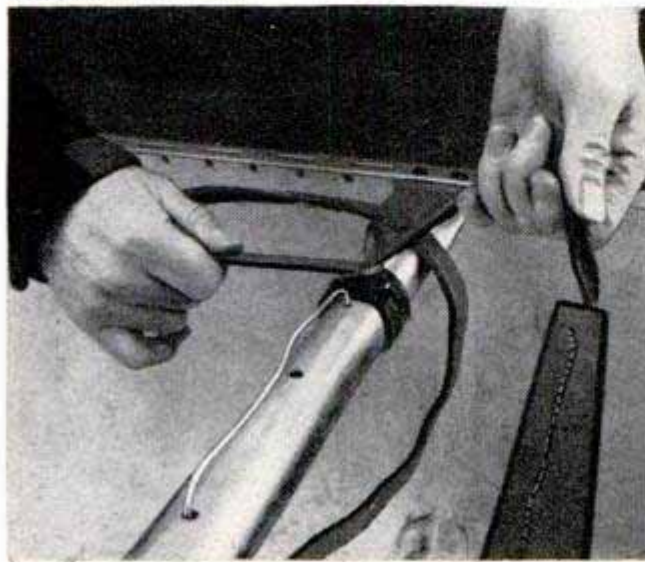


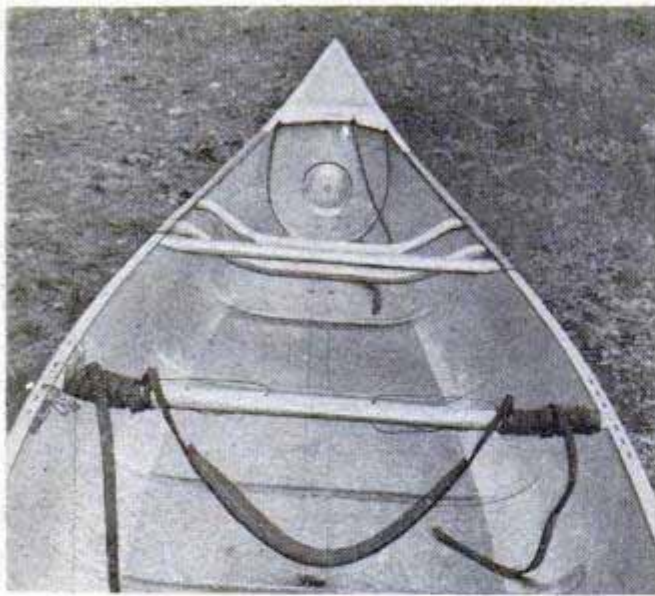
Tumpline CANOE CARRY

By Cal Craig

GOOD FISHING water is never beyond the reach of the experienced canoeman who uses a tumpline to carry his canoe comfortably under difficult conditions. A tumpline, correctly rigged, permits shifting the load alternately from the head to the shoulders without stopping. The tump rig also makes it easier to control the craft when portaging in open country on a windy day. The headband is cut from heavy oil-tanned leather. Although the dimensions in the detail give the width as 2 in., some outdoorsmen may prefer to cut the band 2½ in. wide at the center portion. Soft-leather thongs, or straps, about ½ in. wide are double-stitched to each end of the headband. The thongs should be about 30 in. long, and preferably of rawhide. Drill four small holes through the center thwart, spacing the holes as indicated in the upper detail at the right. Then insert the ends of two short lengths of copper wire through the holes. Place the paddle blades in the position shown by the dotted lines, then twist the ends of the wires together loosely so that the paddle blades are easily inserted and withdrawn from the wire loops. Now wrap and tie the thongs to the thwart, adjusting the tie on each thong so that the headband hangs just above the bottom of the canoe

Photos by Chuck Kinter

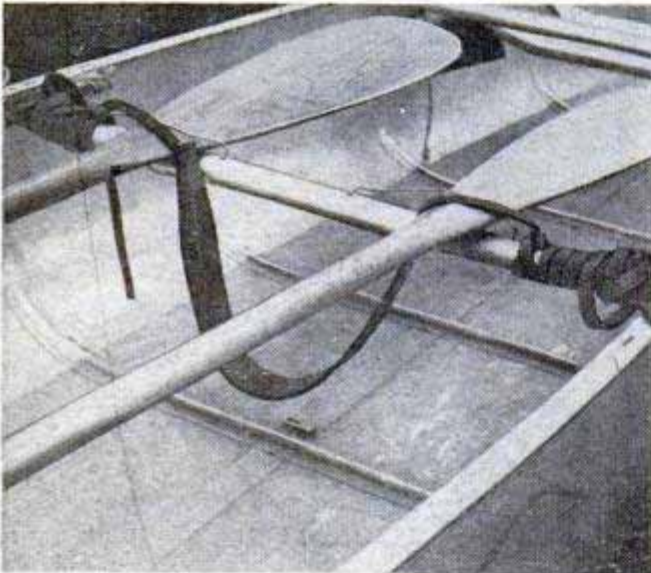




Leather thongs attached to the ends of the tump-line are wrapped around the center thwart and tied so that the line just clears the bottom of the canoe when hanging free. Some experimenting may be necessary to determine the correct position



The oar blades are inserted under the tump-line and through copper-wire loops attached to the thwart. Shanks of the oars are lashed to the forward center thwart. In this position oars can be made to support all or part of the weight on the shoulders



Above, once it has been tied in the correct position the tump-line need not be removed, as it does not interfere with placement of duffel or fishing gear in the mid-ship section of the canoe. Below, the first step in lifting an all-metal canoe into the carrying position

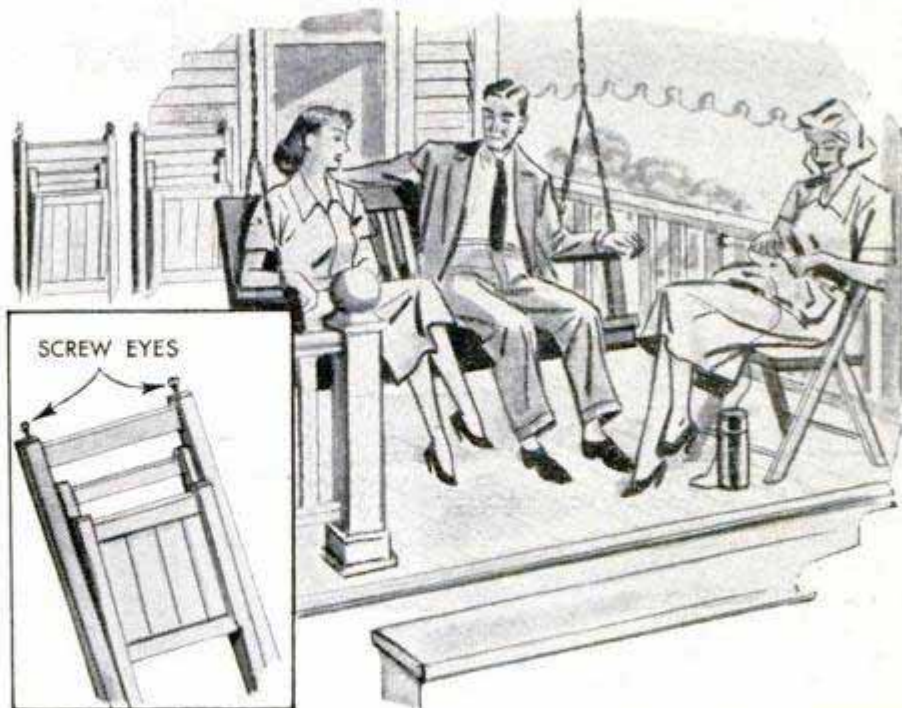
as in the upper left-hand photo. Then raise the thongs and insert the paddle blades as shown in the upper right-hand photo and also in the center photo at the left. Lash the paddle handles to the forward thwart. To raise the canoe into carrying position grasp the center thwart and lift the canoe onto the knees. Then place the right hand below the gunwale so that the latter will slide into the crook of the elbow. Raise the canoe, turning it simultaneously and lowering the head as in the lower right-hand photo. If the second half of the procedure is carried out as one continuous movement, the headband will fall into position, the paddles resting lightly on the shoulders. By shifting the paddles slightly the weight can be transferred to the shoulders. ★ ★ ★

Next step in the pickup, or lift, is to place the right hand on the side of the canoe below the gunwale so that the latter will slide into the crook of the elbow as the canoe is raised. Then swing the canoe up and over until paddles rest on the shoulders



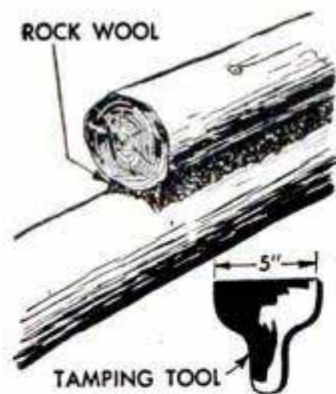
Folding Porch Chairs Stored by Hanging on Wall

There's a seat for everyone at those friendly summertime gatherings on the front porch if you have a number of folding chairs handy—and with the chairs hung from the porch wall you won't have to get them from the house. In addition, the unused chairs require no porch space and cannot be blown over by the wind. To hang the chairs, drive two screw eyes into the back of each chair and merely slip them over pairs of cup hooks turned into the siding. The hooks are spaced the same as the screw eyes.—R. M. Woodbury, Natick, Mass.



Rock Wool and Spar Varnish Provide Chinking Compound

The three major requirements of chinking compound used on a log cabin are that it adhere firmly to the logs, be resilient enough to compensate for shrinkage and



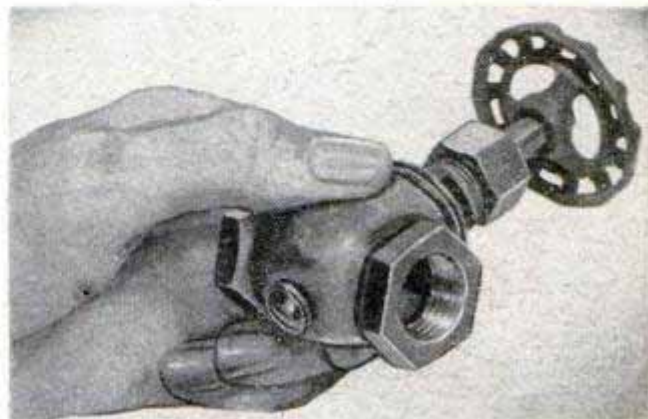
provide effective insulation. These requirements can be met at minimum expense by using rock wool, either the pellet or bat type, and applying it with spar varnish. To chink the logs, first apply varnish in between them, covering only a short section at a time, and pack the wool in place with a tamping tool while the varnish is wet. A tamping tool can be made from $\frac{3}{8}$ -in. wood as detailed. After packing the wool in place, give it a light coat of varnish, using quick strokes to limit penetration.—H. G. Thuesen, Stillwater, Okla.

use. Repeated wetting and drying of the board often will hasten the straightening. Wetting swells the wood fibers on the curved side and tends to force it back into its original shape. Let the board dry in open air since any hastening of the drying with artificial heat may split the wood.

Peter G. Gordon, Lansing, Ont., Can.

Shutoff Valve Fitted With Plug For Draining Pipe in Emergency

It is frequently desirable to convert an ordinary shutoff valve into a drain-type valve to permit draining of a pipe line for repairs and to prevent freezing during cold weather. The operation is comparatively easy, even with the valve connected in the line. First, a small hole is drilled and tapped in the valve chamber on the outlet side of the valve. A short bolt fitted with a rubber or leather washer is then inserted in the opening. With the valve turned off, removal of the bolt will allow the line beyond the valve to drain.



Repairing Warped Ironing Board

A warped ironing board top often can be flattened by turning it over so that the underside is on top. On most boards this can be done by unscrewing two cleats that hold the leg assembly to the board and then screwing them to the opposite side. Ordinarily, the board will flatten after some

By **W. K. Mitchell**
and **Howard B. Birt**

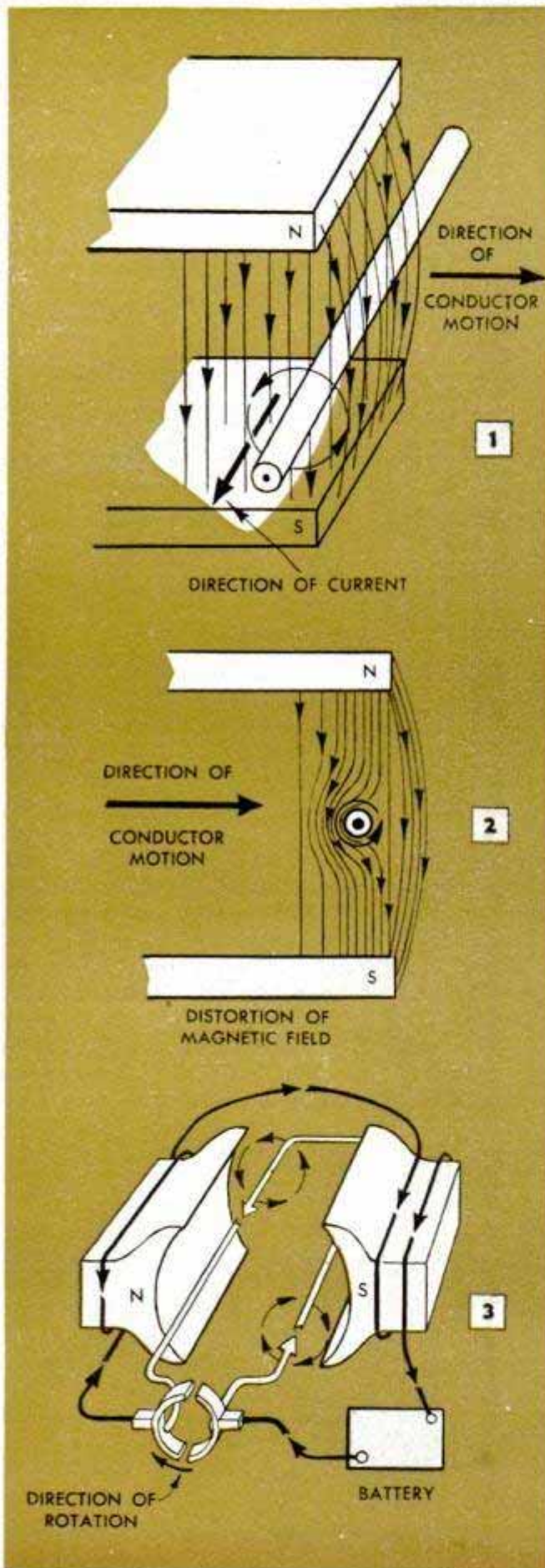
The Electric Starter— Operation, Care and Repair

PROBABLY ONE of the units of the automotive electrical system most taken for granted is the cranking motor, or starter. Although it operates only for short periods of time compared with other parts of the car, its successful performance definitely depends on regular checking and maintenance procedures. The armature in this highly specialized unit rotates at about 1500 r.p.m. in order to crank the car engine at 100 r.p.m.

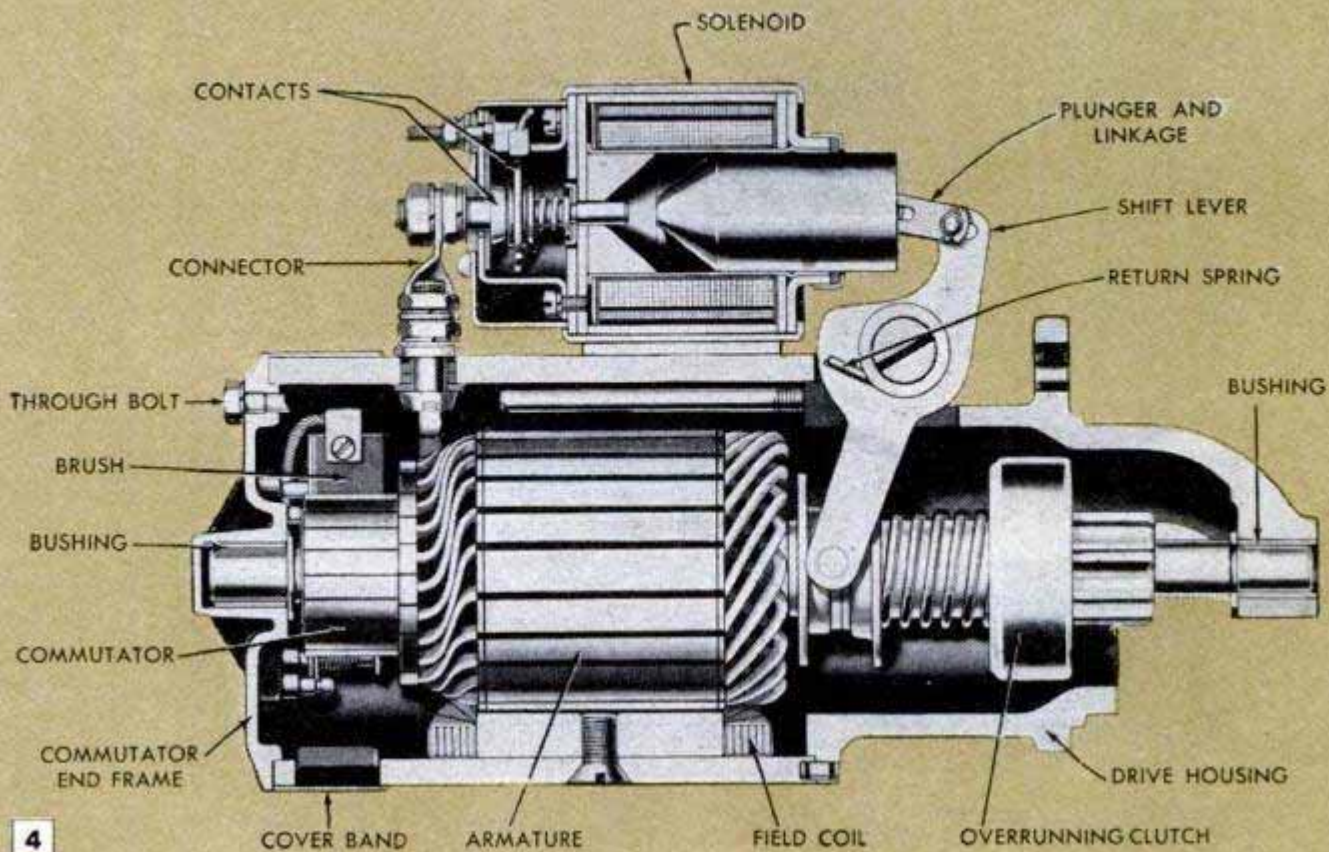
It operates on the principle that opposing magnetic fields tend to attract each other while similar magnetic fields repel each other. Fig. 1 is a simple sketch of a magnetic field from a permanent magnet in which a single conductor has been placed. Current flowing through the conductor in the direction indicated by the heavy arrow causes a magnetic field to circle the conductor as shown by the circular arrows. As a result a force is exerted on the conductor which tends to move it to the right.

Fig. 2 explains this force. The circular magnetic field around the conductor (indicated by the circular arrow) opposes the permanent magnetic field on the right side of the conductor while it aids the magnetic field to the left of the conductor. Opposition to the magnetic field on the right tends to cancel it, so there is less magnetism to the right of the conductor than there is to the left. The magnetic lines of force are thus distorted around the conductor and exert a thrust on it.

Fig. 3 is a drawing of a simple electric motor with a one-turn armature which indicates how the sidewise thrust on the conductor causes it to rotate and crank an engine. The armature is a single loop of wire suspended between two magnetic poles. The magnetic field of each pole is reinforced by the field coil wound around it. When the circuit between the battery and the motor is closed, current flows from battery through the armature loop, then through the field-coil windings and back to the battery as shown by arrows. On the left-hand side of the armature loop current is flowing in the direction of the loop arrows, which causes an upward thrust on that half of the armature. Since the current is flowing in the opposite direction through the other half of the armature, the thrust on it is downward. These opposing thrusts



The Starter



4

cause the armature to rotate in a clockwise direction.

A powerful cranking torque is produced by using many windings in the armature, instead of the single loop of wire, thus multiplying the thrusts on the armature. Fig. 4 is a sectional view of a typical modern passenger-car starter.

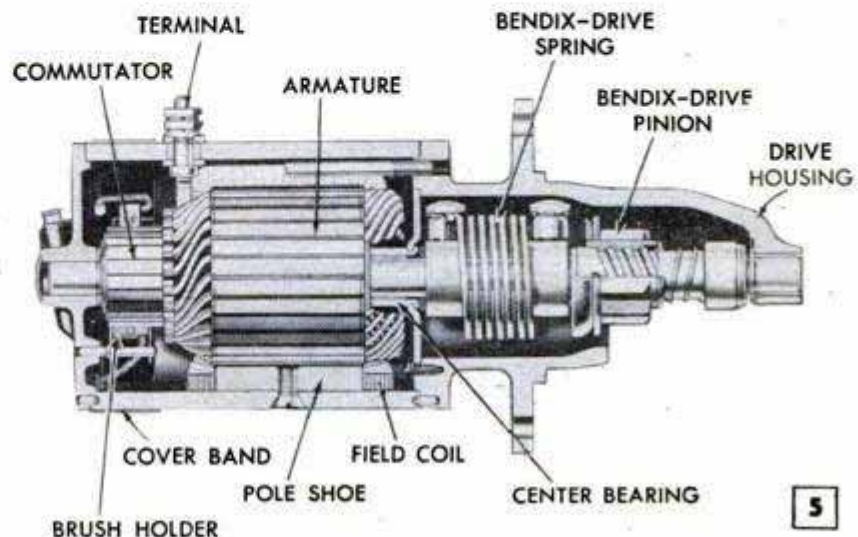
All passenger-car starters are much the same in general design and operation, differing mainly in the type of drive used. The drive mechanism has two functions—to transmit the cranking torque to the engine flywheel and to disconnect the starter from the flywheel after the engine has started. Most passenger cars use either the Bendix or the overrunning-clutch type of drive.

A typical Bendix-drive starter is shown in Fig. 5. This drive depends upon inertia to mesh and unmesh the starter drive pinion from the engine-flywheel ring gear. When this type of starter is not operating, the pinion is out of mesh with the flywheel ring gear. As soon as the starter switch is closed, the starter armature begins to rotate and moves the pinion into mesh with the flywheel.

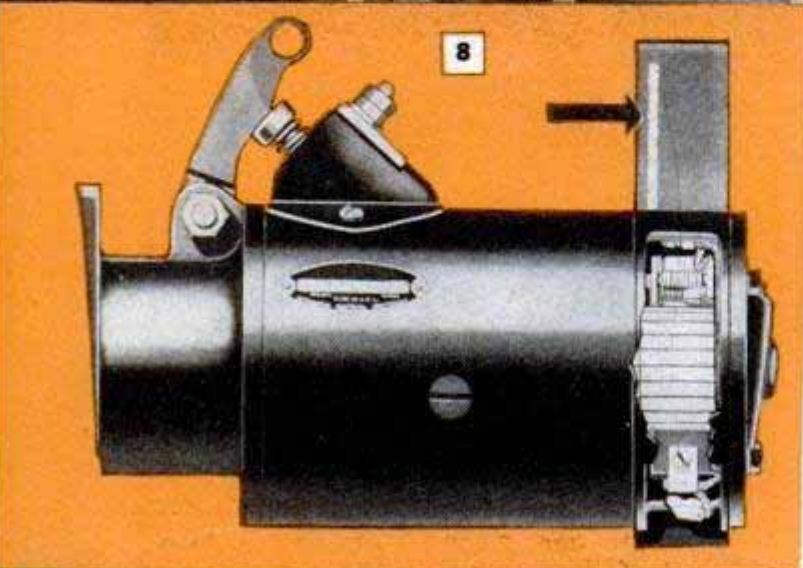
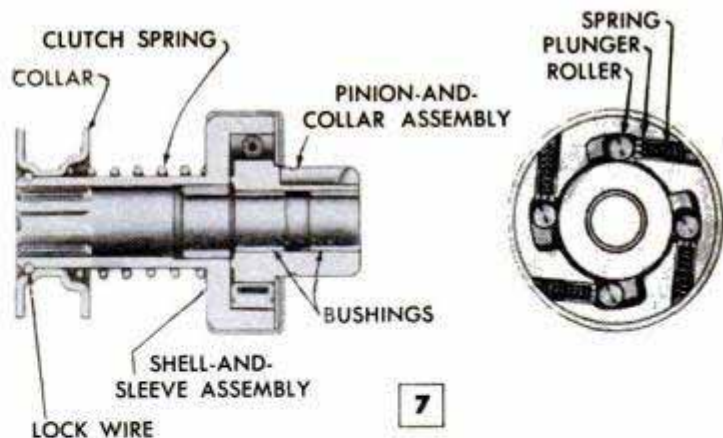
The overrunning-clutch type of drive, Fig. 4, is shifted

mechanically into mesh with the flywheel. This may be done directly by foot pressure on a pedal or by a solenoid switch controlled from the dashboard. Completion of the shift in either case closes the circuit between the starter and the battery. The pinion maintains contact with the flywheel ring gear until the pedal or switch is released.

Briefly, the overrunning clutch consists of a shell-and-sleeve assembly—in which is fitted a pinion-and-collar assembly, Fig. 7—that rotates with the armature. Four tapered slots in the face of the shell take spring-loaded steel rollers. When the shell is rotated by the starter motor, the rollers move into contact with the collar, jamming tightly against it and forcing it to rotate



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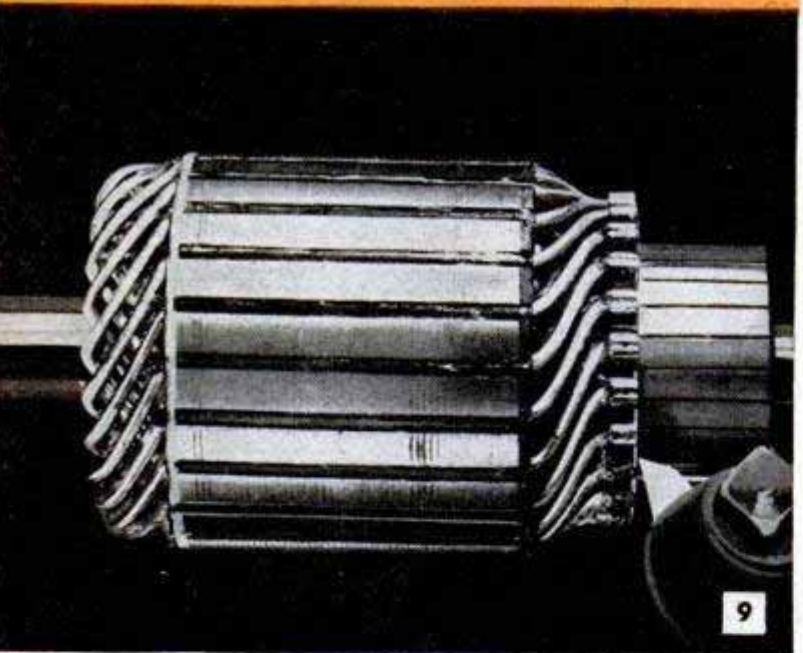


with the shell, thus cranking the engine. When the engine flywheel rotates faster than the shell, the rollers move back in the slots, disengaging the collar and shell so the shell overrides the collar and disengages the starter from the engine.

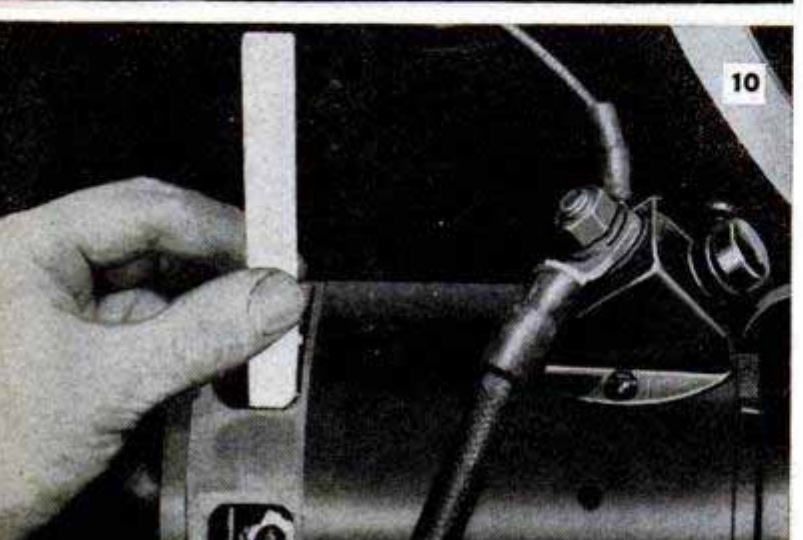
Obviously, as soon as the engine begins to operate, the starter switch or pedal should be released. Otherwise the drive pinion remains in mesh and continues to overrun the armature, which will cause overheating.

Quick checks and maintenance procedures: Armed with a working knowledge of the operation of his car's starter, a motorist can do much to assure a long and dependable life for the starter. The following trouble shooting, inspection and maintenance procedures can be followed easily without specialized equipment or tools.

To make a quick check of the starter system, turn on the headlights. If they do not burn with normal brilliance, the battery should be checked. If the battery is in a charged condition and the lights burn brightly, operate the starter. One of these things will happen to the lights: They will go out, dim considerably or stay bright with no cranking action taking place.



1. If the lights go out, there is a poor connection, which usually will be found at the battery terminals, between the battery and the starter. Correction is made by removing the cable clamps and cleaning both the clamps and terminals. After reconnecting and tightening the clamps, a corrosion inhibitor such as petroleum jelly should be applied.



2. If the lights dim considerably, the battery may be discharged or there may be some mechanical fault in the engine or starter which is throwing a heavy burden on the starter. Check the battery first. If it is in good condition, the trouble is in either the engine or the starter. In the engine, tight bearings or pistons or extra-heavy oil may be causing the added strain on the starter. Low temperatures cause engine oil to thicken and make the engine more difficult to start. Low temperatures

also lessen the effectiveness of the battery. In the starter, look for a bent armature shaft, loose pole-shoe screws or worn bearings. Any of these will cause the armature to drag and reduce starting performance.

Occasionally, more serious internal damage may be found. Thrown armature windings or commutator bars, which sometimes occur on overrunning-clutch-type starters, usually are caused by excessive overrunning after starting.

On Bendix-drive starters, broken Bendix housings and "wrapped up" Bendix springs may result if the driver closes the starter switch during engine "rock back," which occurs when the engine starts automatically, then stops again. Another cause may be engine backfire resulting from ignition timing being too far advanced. To avoid such failures, the driver should pause a few seconds after a false start to make sure the engine has come to rest completely.

Frequently, a worn pinion gear in a Bendix drive will jam into mesh with the flywheel ring gear and refuse to unmesh. If this happens, put the car in gear and manually rock it forward and backward.

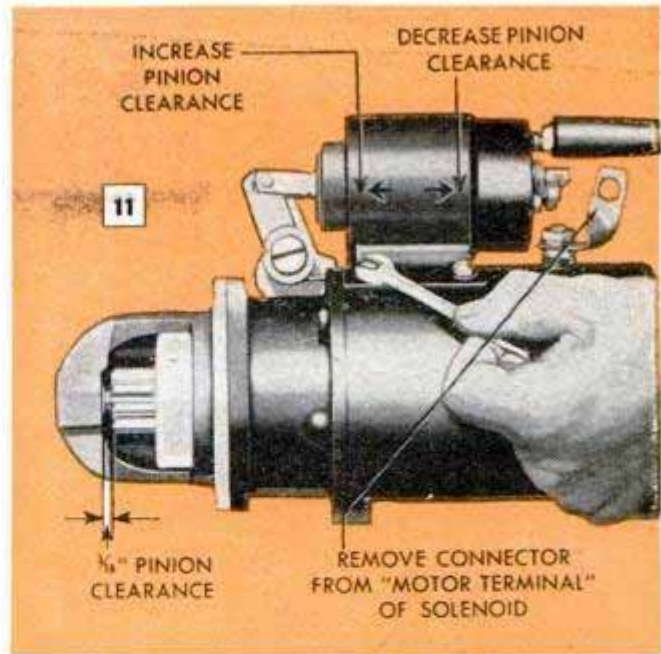
3. If the lights stay bright and no starting action takes place, an open circuit at some point is indicated. This may be in the starter, in the starter switch or in the control circuit. Where the starter is operated by a solenoid switch, temporarily eliminate the solenoid circuit by placing a heavy jumper lead across the solenoid's main terminals to see if the starter will operate. This connects the starter directly to the battery. If the starter operates, the control circuit is not functioning normally. If the starter does not operate, the trouble most likely will be found in it.

Every 5000 miles, under normal operating conditions, inspect the mounting, wiring and connections to make sure they are in good condition. The magnetic switch or solenoid should be mounted firmly and should operate freely, without binding.

Next, remove the cover band so the commutator, brushes and internal connections can be checked, Fig. 6. Examine the cover band for thrown solder, Fig. 8 (arrow), which results if the starter is subjected to such excessively long cranking periods.

Check the brushes to see that they are not binding and that they are resting on the commutator with sufficient tension to give good, firm contact. Make sure brush leads and screws are tight. If the brushes are worn down to half their original length, they should be replaced.

Note the condition of the commutator. If it is glazed or dirty, it can be cleaned quickly by holding a strip of No. 00 sandpaper against it with a piece of wood, Fig. 10, while the starter is operated. A brush-



seating stone may be used for the same purpose. Move the sandpaper or stone across the face of the commutator as it spins. Blow out all dust after the commutator is cleaned. Always remember never to operate any starter for more than 30 seconds to maintain an accurate adjustment of the pinion clearance. Fig. 11 shows the proper method of making this adjustment. Remove the connector from the "motor" terminal of the solenoid. Place a piece of $\frac{3}{16}$ -in. bar stock or a $\frac{3}{16}$ -in. gauge between the pinion and the housing. Connect a six-volt battery across the "switch" terminal of the solenoid and the solenoid base (ground) and push the solenoid plunger in by hand. Battery current will hold the plunger in the "bottomed" position while the pinion clearance is adjusted. Loosen the solenoid-switch mounting and pull the switch away from the shift lever until play is taken out of the lever and the clutch mechanism. *Be careful not to compress the overrunning-clutch spring.* Moving switch toward the lever increases clearance; moving switch away from the lever decreases pinion clearance. Then tighten the switch-mounting screws and replace connector at "motor" terminal of the solenoid.

This adjustment must be made each time after the armature is removed from the starter for any reason. Unless it is correctly adjusted, the solenoid cannot operate properly. Starters equipped with hinge-cap oilers should have 8 to 10 drops of light oil each 5000 miles.

Some models are equipped either with oil wicks to lubricate the center and drive-end bushings or with oilless bushings. Oilless bushings should be supplied with a few drops of light engine oil whenever the starter is disassembled for repair or service.

★ ★ ★

Photos and information courtesy Delco-Remy Division, General Motors Corp.

PHOTOFLOOD

By Hugh Smiley, Jr.



Parade Routes Marked Temporarily With Long-Handled Pounce Bag

Frequently asked to mark parade routes through city streets, one person does the job quickly with a marking device which is nothing more than a pounce bag having a long handle of pipe. A piece of $\frac{1}{2}$ -in. pipe about 4 ft. long is fitted at one end with a tee which, in turn, is fitted with two short lengths to form handles as shown. After tying a small burlap bag over the lower end of the pipe, the device is made ready for use by pouring whiting in the upper end. In use, the whiting contained in the bag sifts through making a white mark each time the bag is tamped against the pavement. The marker may be carried and manipulated while walking or while riding in the back of a truck along the parade route.

Cutworms Trapped by Fruit Rinds Placed Among Plants in Garden

Placed upside down, discarded halves of oranges and grapefruit will trap cutworms and snails preying upon plants in a garden. An inspection of the rinds each morning will reveal a number of worms and snails feeding upon the spoiling fruit which they generally will prefer to growing plants.

John Krill, North Lima, Ohio.

☐ When cleaning a small quantity of tiny screws, nuts or bearings, put them in a metal teaball. You can douse them up and down in kerosene or other cleaning fluid or let them soak without danger of losing them.

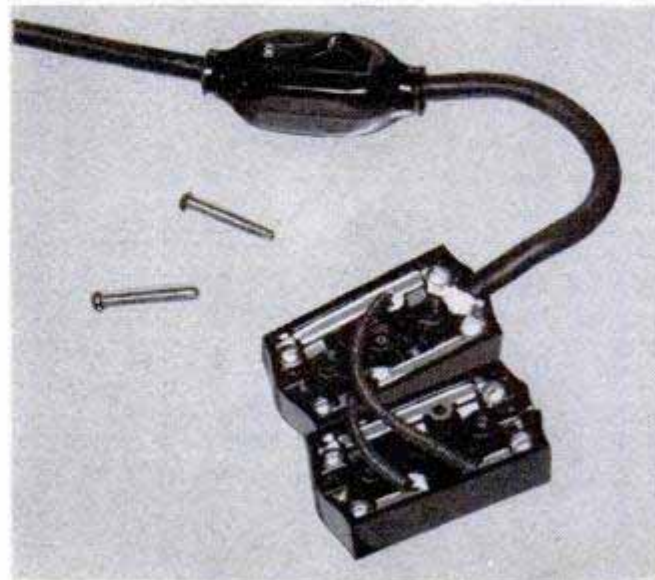
YOUR TRIPOD doubles as a fine lamp-stand when fitted with this handy photoflood bracket. Designed to hold two reflector-type bulbs, the unit frames the camera and has a high-low lighting feature which permits the lamps to be dimmed for focusing, thereby increasing the life of the lamps for a greater number of shots.

Made of aluminum or any other sheet metal at hand, the hexagon band of the unit is bent from a strip measuring $\frac{1}{8} \times 2 \times 30\frac{1}{2}$ in. Note in the drawing that the ends of the band are lapped and joined with 6-32 machine screws turned into tapped holes. Note also that the band is drilled at five points for locating the lamps at various positions around the band. Two $\frac{1}{4}$ -in. holes, one to be tapped, are made at the lap, the tapped one being used to mount the band directly to the tripod and the other to attach a camera mounting plate.

Split, screw-type porcelain sockets are installed in the rounded ends of the two lamp brackets, the latter being fastened to the band with small stove bolts and wing nuts. The camera is centered in the band on a separate mounting plate which is drilled at each end and fastened to the band with a $\frac{1}{4}$ -in. flat-headed stove bolt, the head being set flush on the underside. A $\frac{1}{4}$ -in. thumbscrew, made by soldering a short section of bolt to a wing nut, is used to mount the camera.

Two three-tap baseboard receptacles are fastened back-to-back with two 6-32 machine screws. Only the two end outlets of each receptacle are used. If you study

Two three-tap baseboard outlets fastened back-to-back and wired according to the diagram at the right serve to form the dimmer unit used when focusing

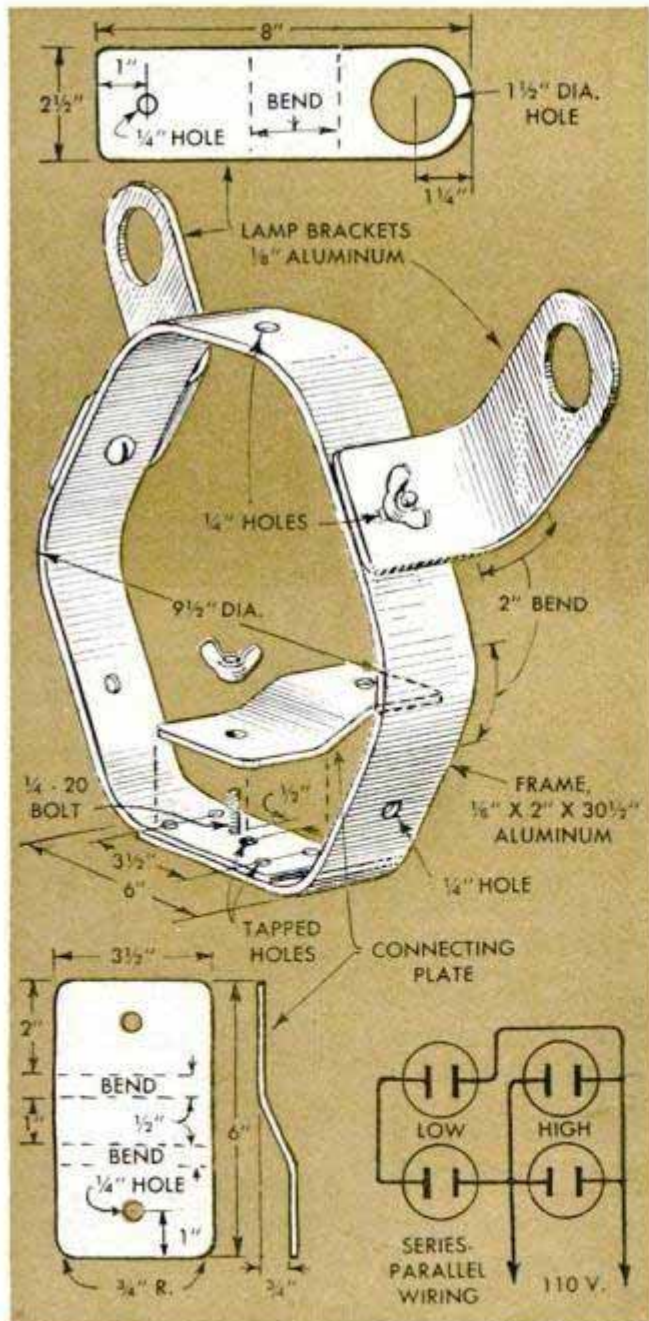


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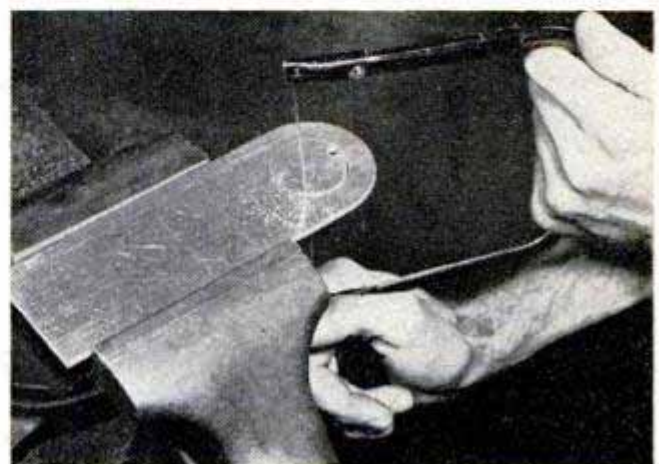
closely the photo on the opposite page, you'll note the outlets are joined together with metal strips held at each end with a screw or rivet. One of the strips is cut to form an open circuit, which is done by removing a 1/4-in. piece from the center. Wire the outlets as shown in the diagram, soldering short insulated wires between the outlets of each unit. Note, particularly, that the unbroken connector on one side of the low tap is not wired to the 110-volt line. Instead, it serves as a jumper when both plugs on the lamp cords are inserted and connects the filaments in series. Mark the outlet to identify the low tap at a glance. The heavy extension cord to which the high-low tap is attached should be at least 15 ft. long and rubber-covered. Individual lamp cords are about 3 ft. long. ★ ★ ★



As the camera actually is behind the photofloods, it is best to shade the lens with a regular hood



Above, the band is bent hexagonally by gripping with C-clamps and wooden pads. Below, holes for bulb sockets are cut in brackets with a coping saw



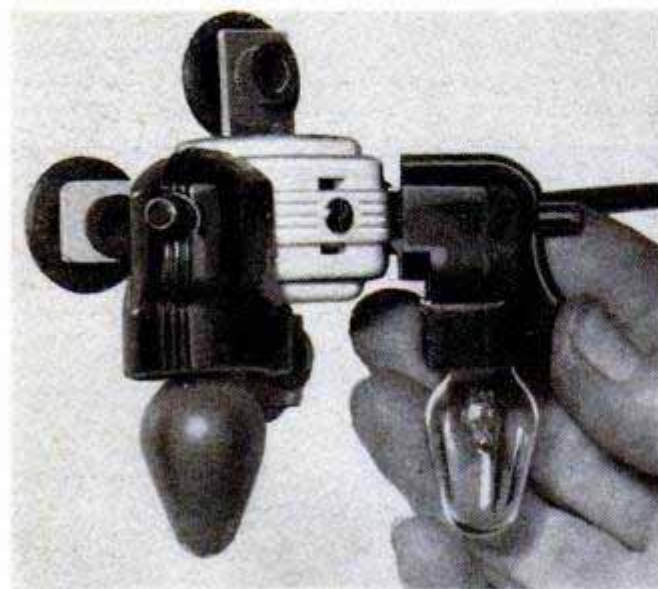
Improved Spotlight Boom Clamps to Chair Back



Handy for overhead lighting in either portrait or still photography, this adjustable spotlight boom is made from a metal fishing-rod holder and a broomstick or length of 1/2-in. pipe. The holder is clamped to the back of a chair and the pole, with a spotlight attached, is mounted in the holder as shown. A thumbscrew permits adjustment of the boom to the desired angle.

"Pin Up" Safelight for Darkroom Made From Standard Parts

Amateur photographers who utilize the kitchen or bathroom as a temporary darkroom, will appreciate a compact safelight such as this. Assembled from common electrical fittings it takes up little space and can be quickly mounted on a wall in any desired position. Two small socket units of



the type that are equipped with individual switches and made to plug into standard receptacles provide a red and a white light. These units are plugged into a dual-plug surface receptacle that is attached to an extension cord. An L-bracket is fitted with rubber suction cups and attached to the receptacle to permit mounting the entire assembly to any smooth surface. Moistening the inside of the cups will help make them adhere more readily.

Ivan Grosvenor, Richmond, Ind.

Rubber Band Holding Film on Reel Removed Easily When Knotted

If you use a rubber band to hold movie film on a reel, tie a short loop in the band before stretching it over the film. This will provide a convenient handle with which to remove the band, thus eliminating the difficulty of getting hold of it with your fingers. Be sure the band is large enough so that it will not damage the film.



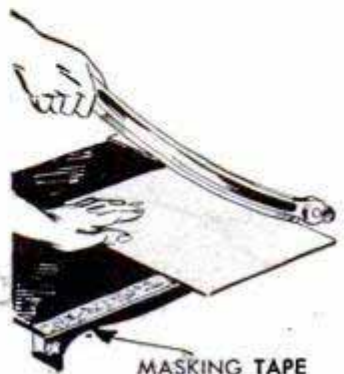
Round Corners Protect Emulsion

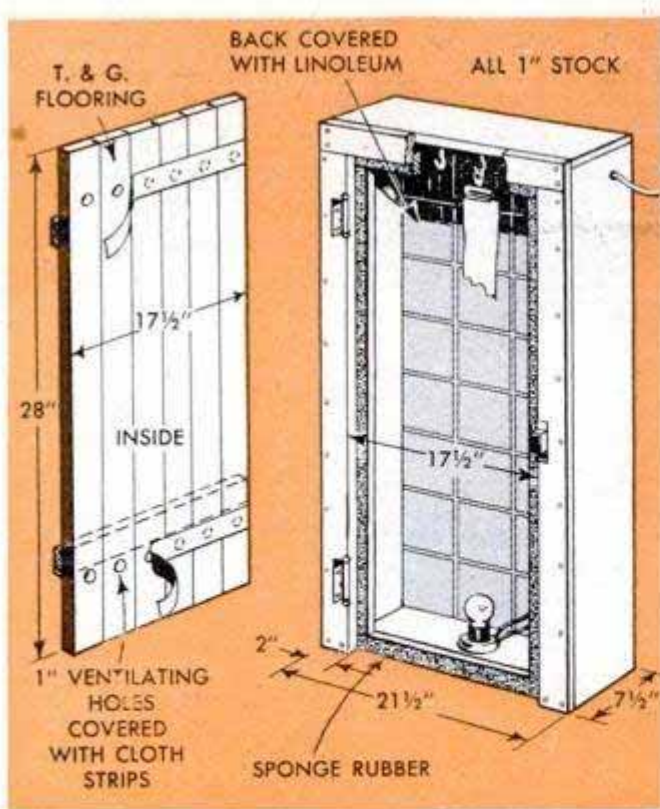
In order to prevent the emulsion on sheet film from being damaged while being washed in a tray, simply round the corners of each sheet to eliminate the possibility of their gouging one another. One of the simplest ways to do this is by using fingernail clippers.—Virginia Hanson, Los Angeles, Calif.



Tape Along Edge of Paper Trimmer Speeds Cutting Operation

A strip of masking tape will furnish the amount of friction needed to help prevent photographs from shifting while they are being cropped on a print trimmer. The increased friction also will prove helpful when a print is being manipulated into position for cutting. The tape is applied in the normal manner near the cutting edge.





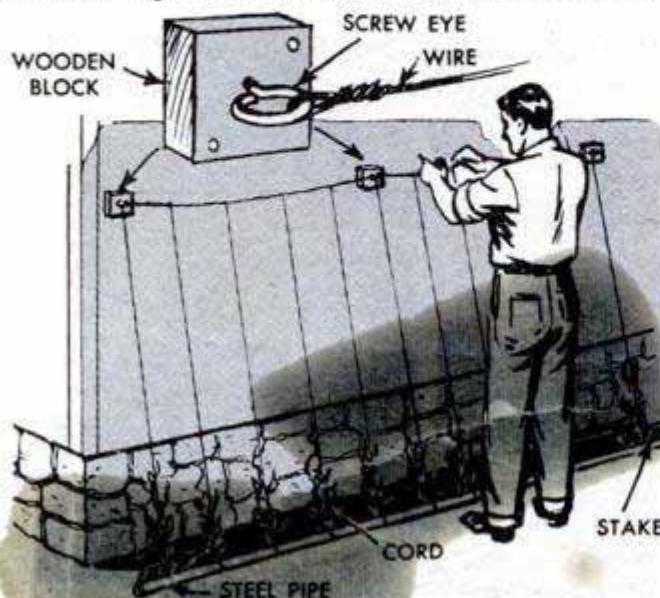
Negative Drier Heated by Bulb

By A. L. Armstrong

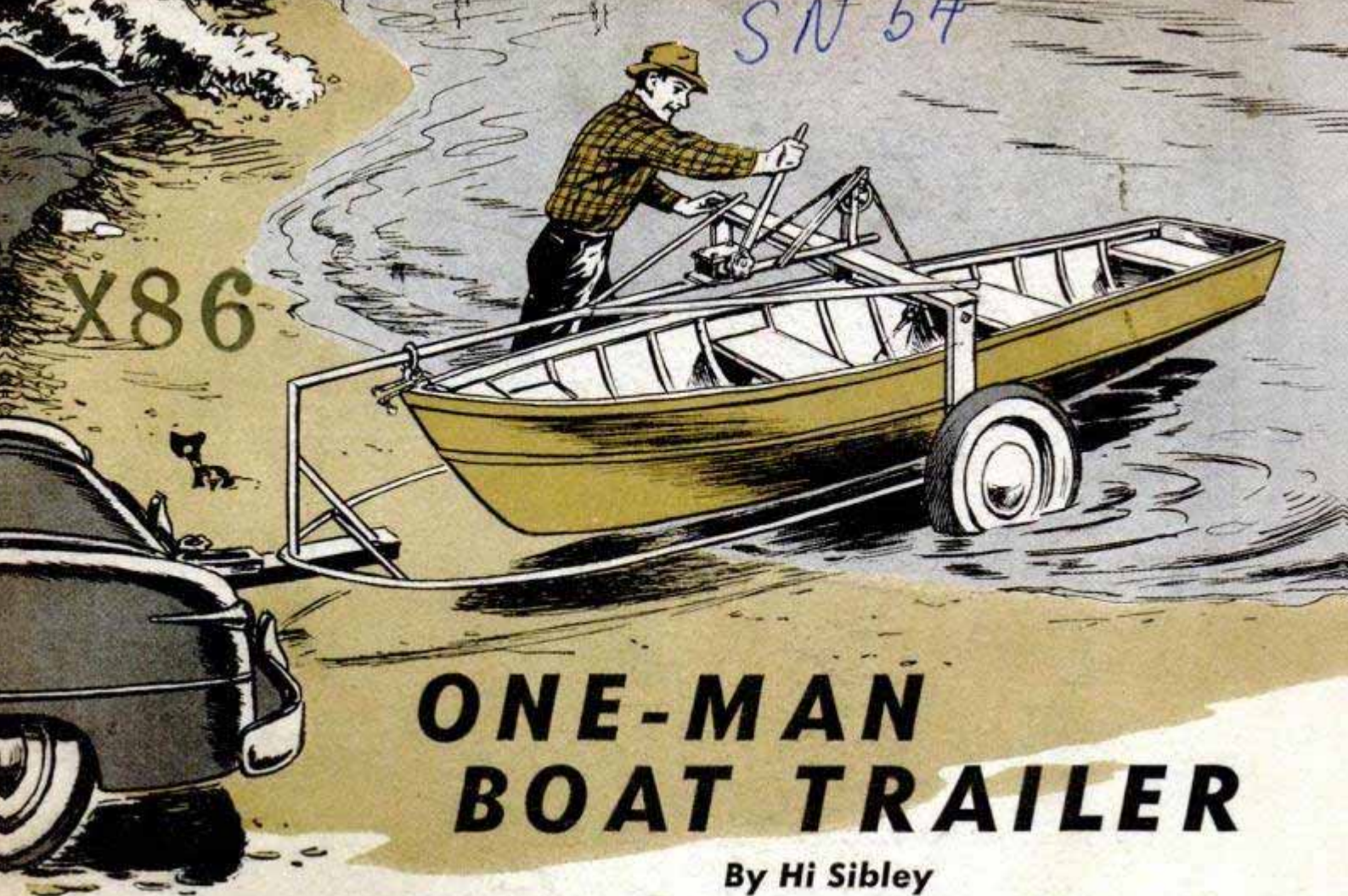
DUST IS ever present in the average basement darkroom yet it is common practice for the man who processes his negatives at home to hang the film in the open to dry. Wet film is susceptible to dust floating in the air and, while it may not be noticeable through casual observation of the film, dust may make a difference in the quality of the finished print. This dust-tight drier solves the problem perfectly. Consisting of little more than a box fitted with a hinged door which is sealed with sponge-rubber weather stripping, the drier is heated by a 75-watt

bulb installed in the bottom of the cabinet. The drawing gives the size of the original drier, which primarily was designed to hold cut film. Note how the drier is ventilated through a series of holes at the top and bottom of the door which are covered on the inside with muslin to exclude dust. The back of the original drier was covered with a scrap of tileboard, although a sheet of plywood may be used. Likewise, the door can be of plywood. If the drier is fastened permanently to a wall, a backing will not be required. Several screw hooks are provided for film clips. Before painting the cabinet seal any cracks with wood putty.

Screw Eyes, String and Pipe Provide Excellent Trellis for Climbing Vines



Sweet peas, moonflowers grown as annuals and other one-season climbers do best on a simple string trellis which does not absorb heat from the hot midsummer sun and is disposed of easily along with the dead vines in the fall. This trellis also keeps strings taut throughout the growing season. Cut the strings to equal lengths of 4 to 8 ft. as required and tie them to a length of pipe of approximately the same length as the seedbed. Then attach a length of wire to the side of the house by means of small wooden blocks and screw eyes. Tie the individual strings to the wire as shown, spacing them 6 to 12 in. apart. Plant the seeds in a trench between the pipe and the wall. As the strings gradually stretch, the pipe is moved out to keep them taut.



ONE-MAN BOAT TRAILER

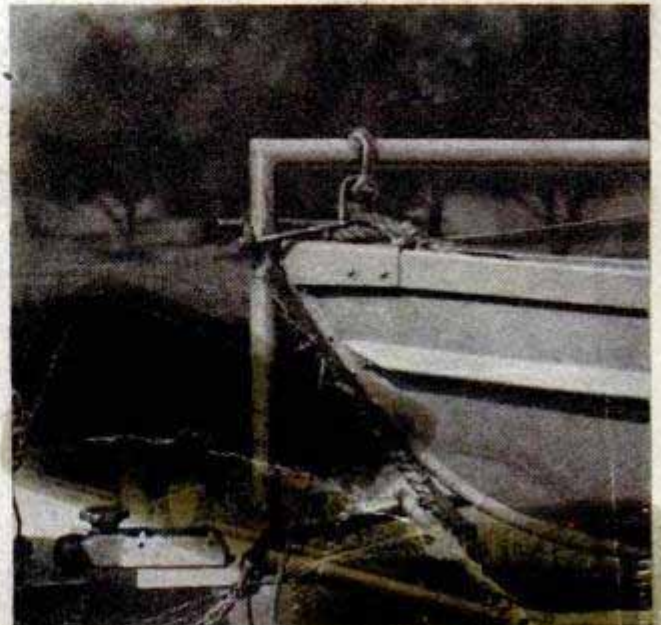
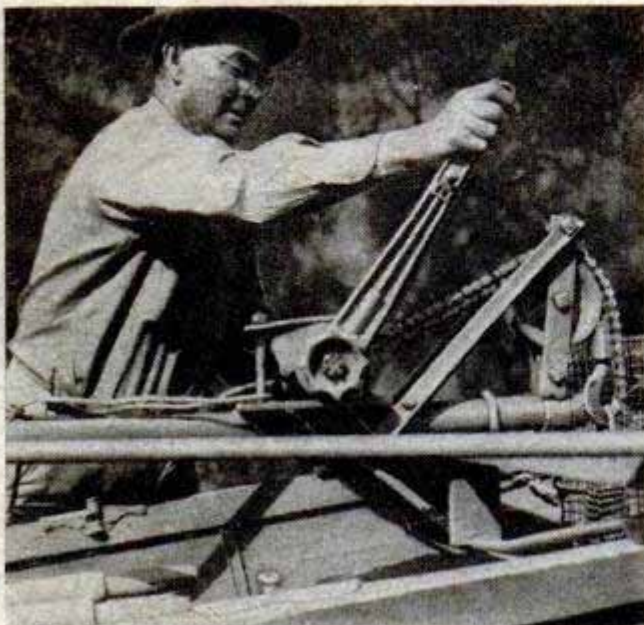
By Hi Sibley

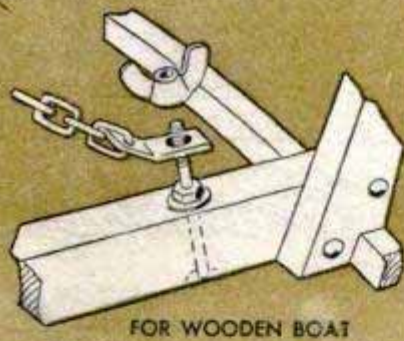
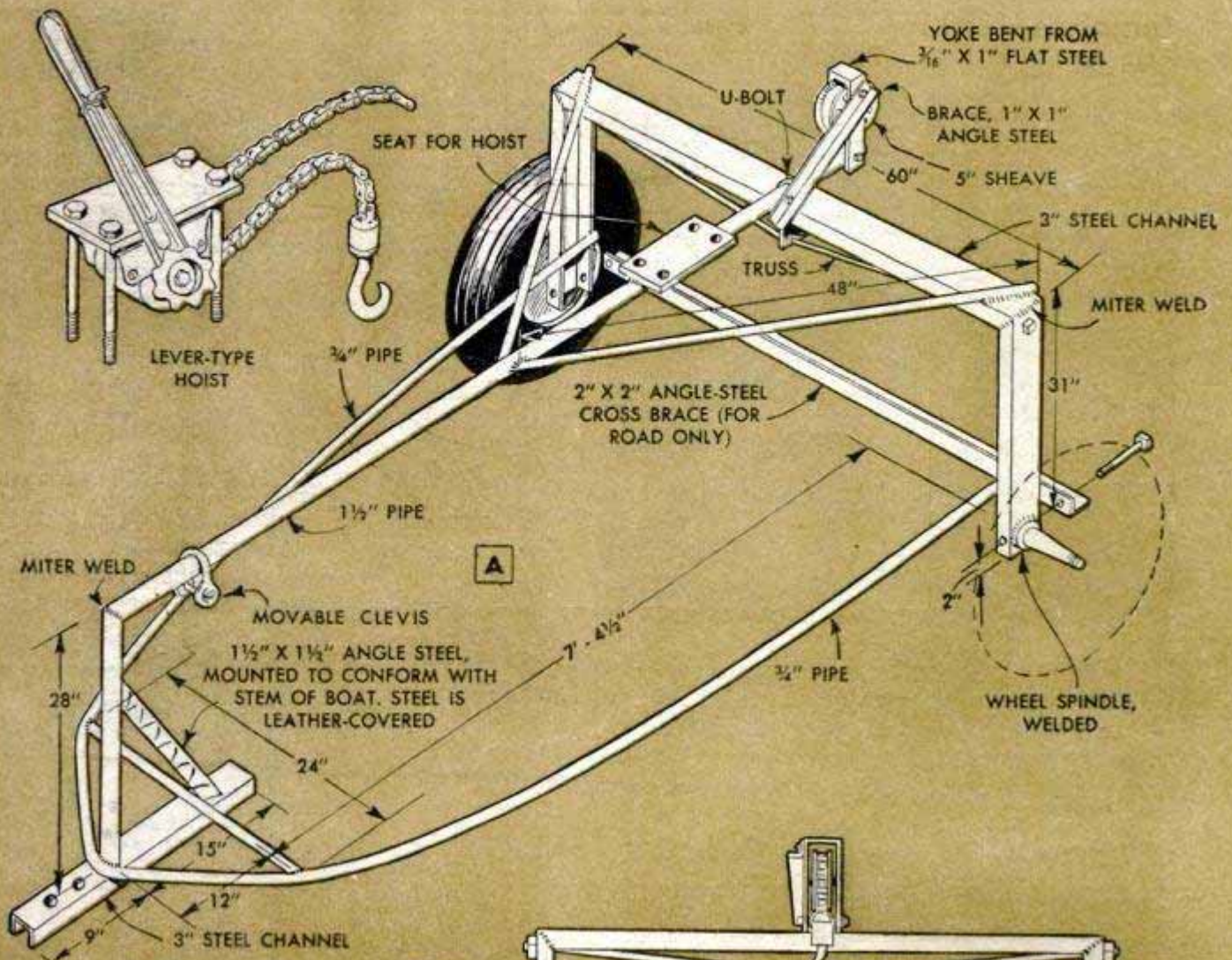
LAUNCHING a rowboat or lifting it from the water is no longer a back-breaking job if you use this underslung boat trailer equipped with a powerful hoist. The trailer will be especially appreciated if you go fishing alone, as the trailer permits handling the boat singlehandedly. The trailer frame is welded from pipe and steel channel and fitted with a lever-type hoist, as in detail A. Note in detail B how a length of

chain is bolted to one of the center frames of the boat. A coil spring attached to the chain is slipped over the hoist-chain hook, the heavy spring providing a shock absorber when the boat is in riding position. A hook and eyebolt are fitted to the bow of the boat, detail C, the eyebolt being fastened to the movable clevis before the boat is raised. An angle-steel cross brace is bolted to frame after boat is in position.

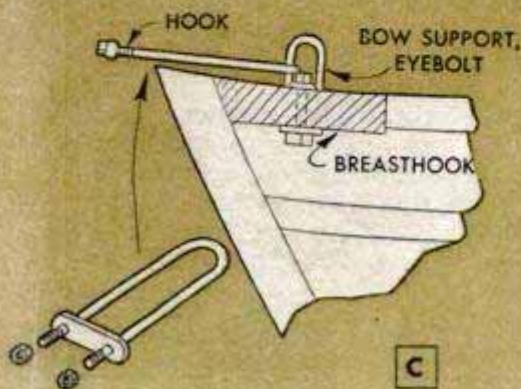
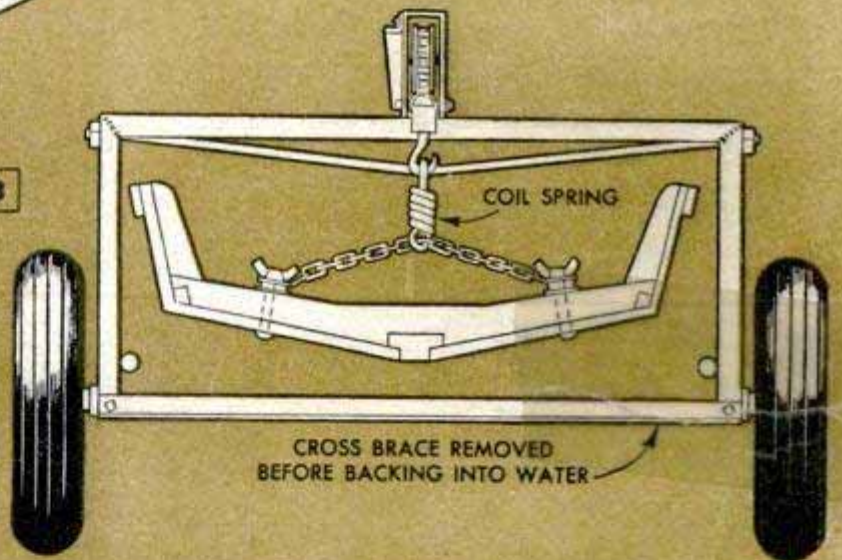
Pumping lever-type hoist easily raises boat into position on trailer. Note how sheave is mounted

Movable clevis guides bow of boat to angle-steel rest at front of trailer. Hook secures bow to frame





B



Template Used for Cutting Prints Simplifies Centering of Subject



By using a transparent template for cutting photos to an irregular shape, it is easy to see when the desired portion of the picture is centered. Such templates can be made from clear plastic or celluloid.

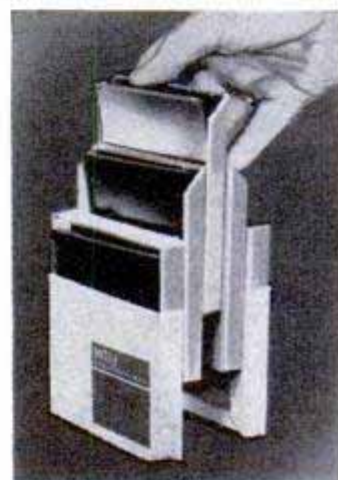
"Skyhooks" in Basement Ceiling Support Clamp-On Photofloods

Having occasion to take photos of shop projects in my basement, but not frequently enough to warrant buying lamp stands, I provided "skyhooks" in the ceiling so that I could clamp the reflectors overhead and

out of the way. Two screw eyes, spaced about 1½ in. apart, were placed at key positions in the paneled ceiling for each lamp, screw eyes being driven in line edgewise. The screw eyes provided an excellent clamping surface and when not in use were practically unnoticeable. To keep the lamp cords well out of the way I installed several screw hooks to support the wire across the ceiling. I found that supporting the lights in this manner was even better than with regular stands as the photofloods were always out of the picture and could still be adjusted to direct the light just where needed.—Walter E. Burton, Akron, Ohio.

Film Boxes Made Into Negative File

To simplify the problem of keeping used and unused negatives separated while making enlargements or contact prints, one amateur photographer glued together several discarded cut-film cartons in order to make a handy, portable file for this purpose. Two outer covers are joined together to form each "leg" of the container, while inner-box sections are cut and assembled as shown to form additional compartments.



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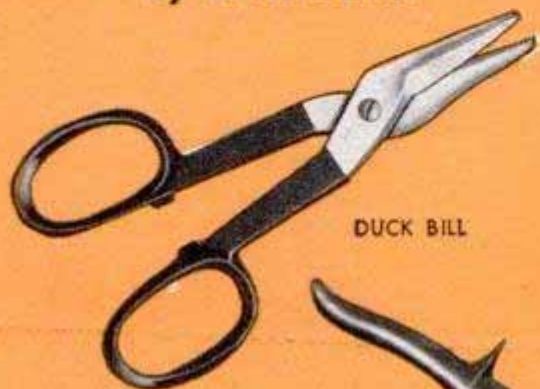


SHOP NOTES

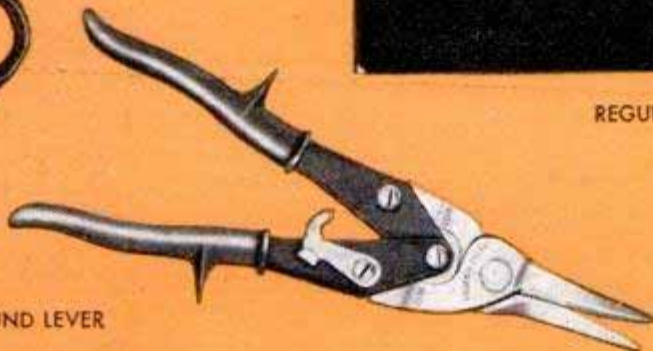
SNIPS

and how to use them

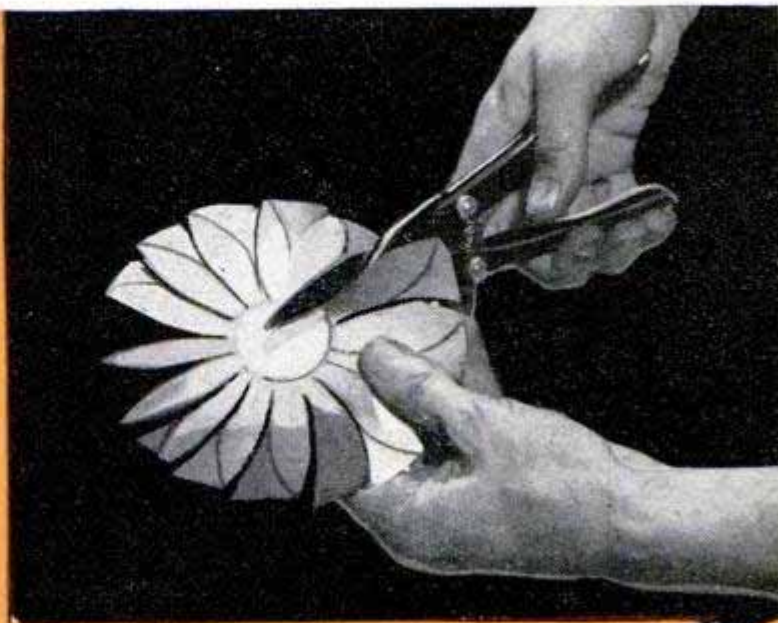
By E. R. Haan



DUCK BILL



COMPOUND LEVER



REGULAR PATTERN



COMBINATION TYPE

1

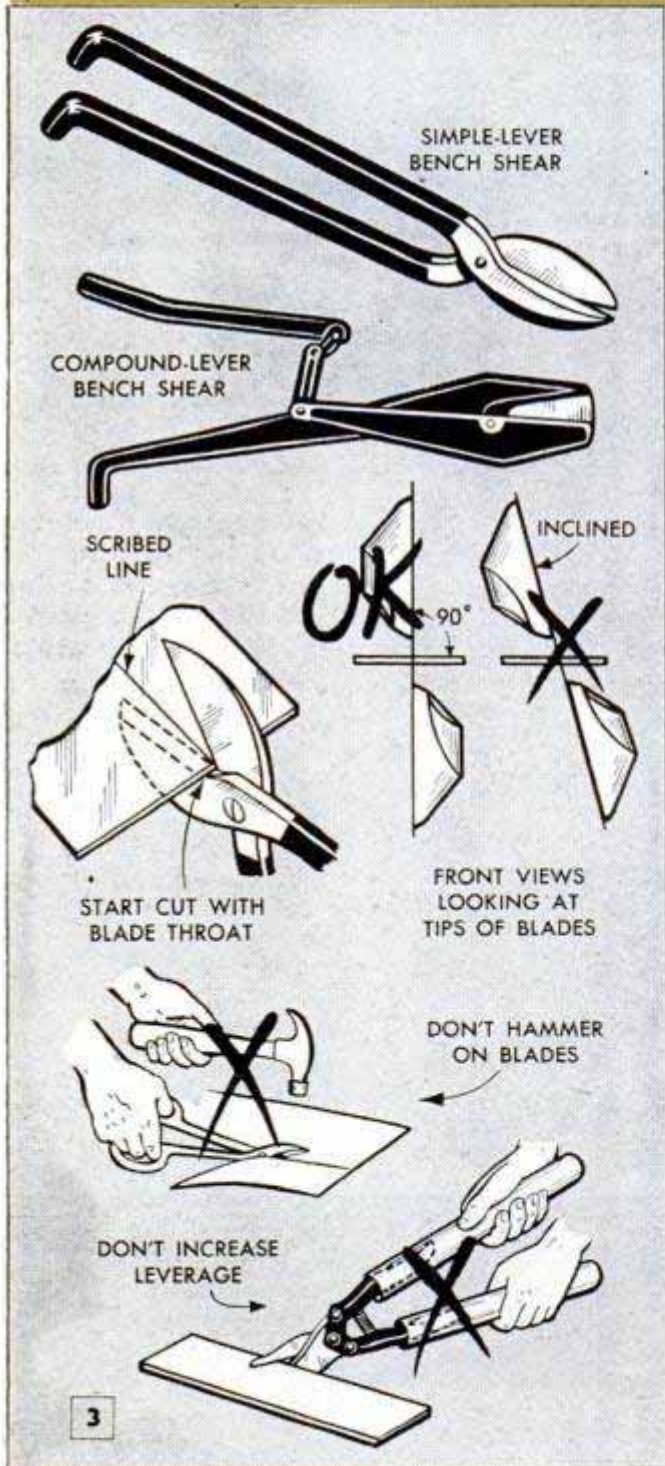
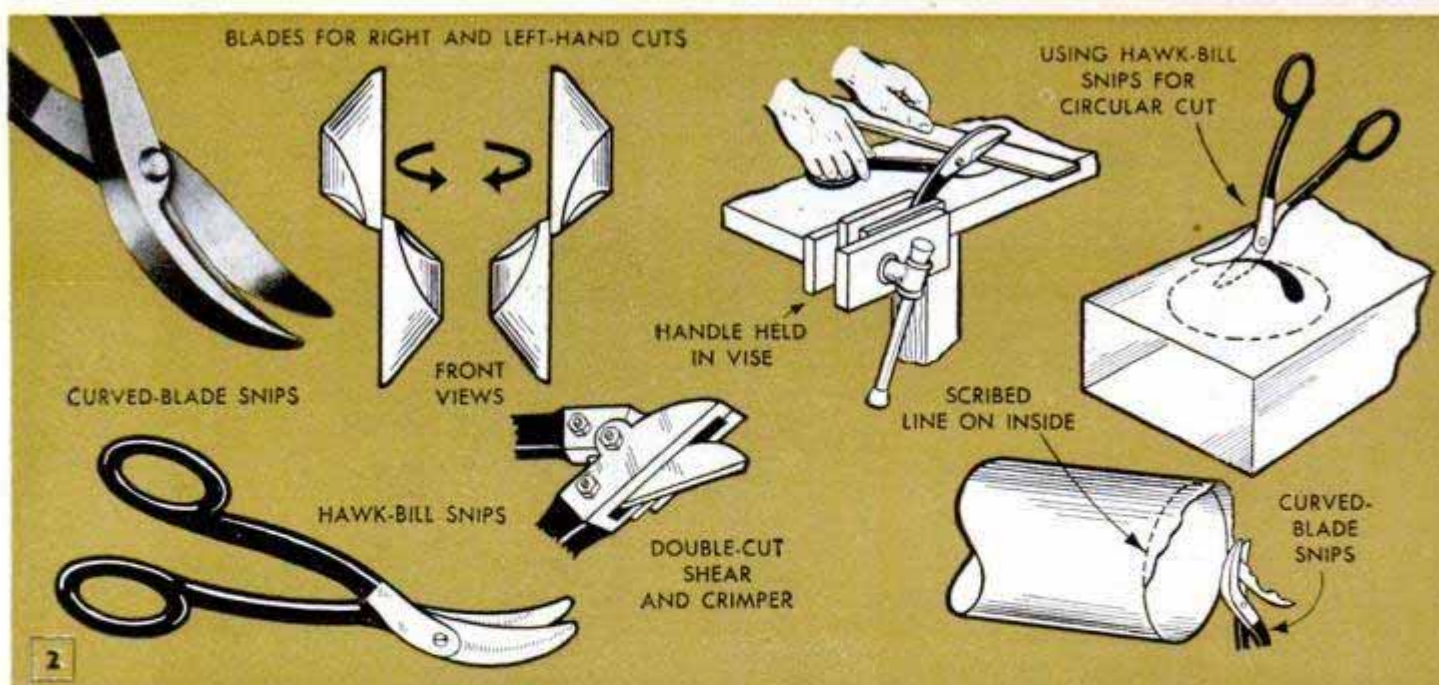
Photos courtesy J. Wren & Sons Co.

WITH HAND SNIPS of the proper size, you can cut sheet metal having a thickness up to 18 gauge. Snips vary in size from 6 to 17 in. in over-all length, with cutting edges ranging from $1\frac{3}{4}$ to $3\frac{1}{2}$ in. Both right and left-hand models are available in many types. Some snips are designed for specific purposes, such as the double-cut type and those having curved blades.

Common types: Duck-bill snips, Fig. 1, have narrow, beveled blades with somewhat slender tips that have an outward curve and are designed for making both straight and curved cuts. Compound-lever, or aviation-type, snips also are used for straight and curved cuts. Their special feature is a powerful cutting action that requires minimum effort to operate. By test, one make required about half the cutting effort needed to operate standard 13-in. snips. Most of these have a spring that opens the blades. The blade bevel permits easy handling on curves and the finely ser-

rated cutting edges keep metal from slipping while being cut. The snips come in different patterns, one primarily for straight and limited-curve cuts, one for left-hand and one for right-hand cuts. The 10-in. size is most common. Regular-pattern, straight-blade snips are intended mostly for straight cuts but can be used for large-radius external curves also. The flat inner surfaces of the blades slide along the edges of the stock on straight cuts and should be kept at right angles to the stock surface. Heavy-duty, or "bulldog," straight snips, not shown, have shorter blades and longer handles. Straight, beveled-blade snips, also called combination snips, permit greater side movement than the regular-pattern straight snips when cutting curves.

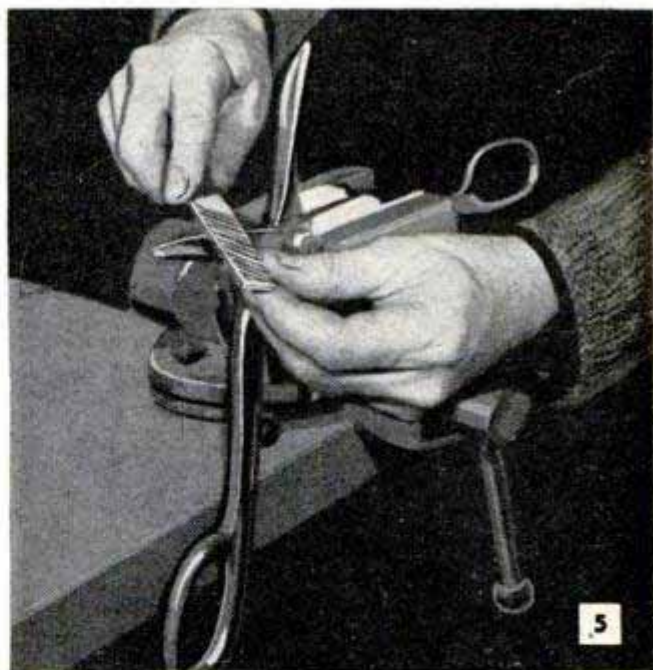
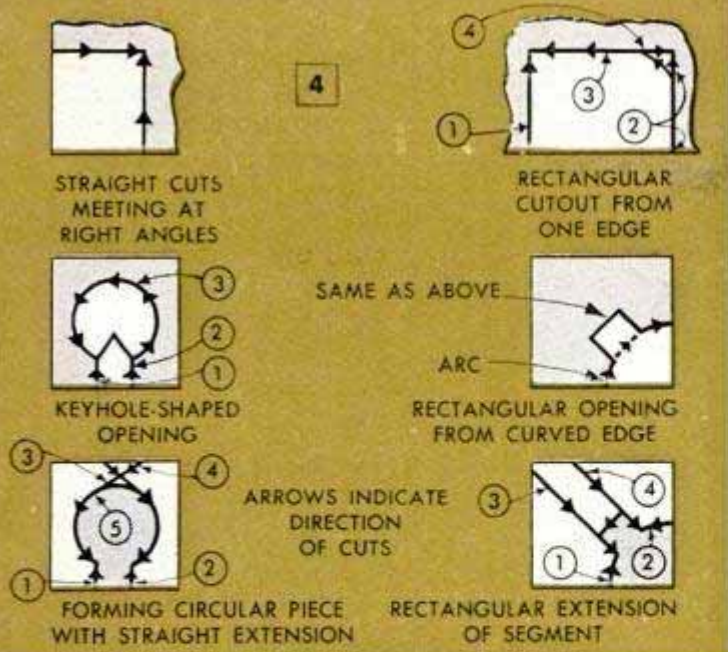
Special types: Curved-blade snips are especially designed for cutting circles and arcs, Fig. 2. Note the blade arrangement of snips for cutting either toward the left or right. The hawk-bill snips have offset



handles and narrow, curved blades for straight or curved cuts in cramped quarters and for cutting openings in ducts. Some compound-lever snips are of similar design. Double-cut shears, which are used to cut off sections of sheet-metal pipe without distorting the metal, are sometimes combined with a crimper. The blade shears on both sides, thus removing a narrow strip of metal. Hand-operated bench shears may be of the simple-lever or the compound-lever type, Fig. 3. The latter cuts sheet iron up to 12-ga. thickness. Both types have bent handles, the lower one to fit a hole in the bench and the upper one to serve as a stop.

How to use snips: When handling sheet metal, it's always best practice to wear gloves for protection against sharp edges. Insert the work about as far as it will go between the blades. Cutting near the throat of the blades is easier and gives better control than cutting near the tips because leverage is increased. Sometimes there's appreciable side spread near the tips, resulting in less-accurate cutting. Hold the snips squarely and start right on the scribed line, as in Fig. 3. Inclining the snips toward one side is apt to pinch the metal between the blades and cause burring. Don't close the blades so tightly that the tips come together in the work, as this bends the metal and is apt to tear it sideways where the tips meet. This also causes sharp edges and slivers. Stop each stroke a safe distance from the tips and start a new one. When you approach the end of a cut that stops in the stock, use the throat end of the blades and cut slowly for best control to stop accurately. Passing the stopping point in metal is a common error.

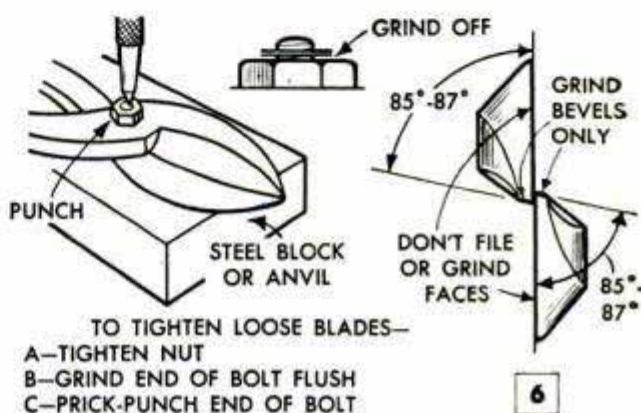
If the cutting edges of the snips drift from the scribed line on the work, hold the snips slightly inclined in the same direction as the drift in order to return to the



line. When cuts in heavy stock become burred, use the throat end of the blades. If this does not stop the burring, cut the stock on the side of the scribed line toward the waste to allow for filing off the burr. When cutting requires excessive effort, the snips may be dull, the blades may be loose or the work may be heavy enough to require the use of larger snips. Don't increase the leverage of snips by slipping pipes over the handles. When cutting large sheets, you can rest the lower handle of the snips on the bench and grip the upper one; this lessens finger strain and allows you to use your weight to advantage. For short cuts in heavy stock you can use snips as in Fig. 2, one handle being held in a vise between pads.

For internal cuts, punch or drill a starting hole in the waste portion near the cutting line. Support the metal on the smooth end grain of a hardwood block when punching. Then use a hawk-bill snips or a similar-shaped compound-lever snips. You also may be able to use a double-cut shears. Handle a hawk-bill snips carefully to prevent springing the slender blades. To trim a straight edge on cylindrical or conical work, scribe a line on the inside surface and cut the edge farthest away from you; for greatest accuracy, use a curved-blade snips as in Fig. 2. You'll avoid considerable trouble if you keep in mind direction and sequence of cuts. Note the examples in Fig. 4. Don't try to make sharp turns in the metal but form inside corners with two meeting cuts. Greater accuracy results from following a thin mark scratched with a sharp scribe rather than a heavy pencil line.

Care of snips: The blades must be kept in firm, sliding contact with each other. If there's space between them they will not cut thin stock, especially near edges, and will burr thicker stock. Also, if blades are



loose, it's hard to follow a line accurately. To tighten blades, turn up the nut on the pivot bolt, file off the projecting end of the bolt and then lock the nut and bolt by prick-punching carefully, Fig. 6. Keep the pivot and blades oiled. When snips are not in daily use, particularly in humid places, protect them from rust by wiping frequently with an oily rag. Keep the blades closed when not in use and hang snips out of the way of other tools. Never nick blades by using snips to cut wire, nails, pins or rivets—use cutting pliers or a bolt cutter suitable for the particular job at hand.

Sharpening: Resharpen dull blades at an angle of 85 to 87 deg., Fig. 6. Use a fine file such as a No. 2 half-round diemaker's file, holding snips in a vise, as pictured in Fig. 5. If you prefer grinding the blades, take them apart. Hold them to the wheel lightly for short durations, and each time the blades are removed from the wheel, dip them in water to prevent drawing the temper. Don't remove metal from the flat face of the blades—only the burr at the edges, using a slipstone or very fine emery stone. ★ ★ ★

☛ Cork fishing-rod handles will look like new if cleaned with fine emery paper and coated with liquid floor or car wax.

Hook Mounted on Top of Scale Keeps Forms Close at Hand



In order to hold weigh slips, invoices and other papers on a produce scale where they would be handy and would not be blown away, a merchant installed a hook of heavy steel wire in a hole drilled in the top board of the scale as shown. With its point resting on the papers, the weight of the hook is sufficient to hold them securely and yet light enough to be raised with a single finger for releasing the slips.

Holding Sack Strings For Instant Use



the others by selecting an end and pulling it out with a quick jerk.

Roofing Cement Rustproofs Car

In the absence of a professional job of undercoating, a car can be protected from rust by the use of roofing cement for coat-

ing various joints and surfaces where rust is most likely to develop. Naturally, this cement cannot be expected to give thorough protection for as long a period of time as the regular undercoating material. Remove one wheel at a time and use an old brush to apply the cement, working it well into the joints between fenders and body. It is a good idea to coat all exposed metal parts that are accessible on the underside of the car. Application of the cement will be easier if it first is thinned by heating.
Ed Packer, Chicago.

How to Store Fertilizer Bags

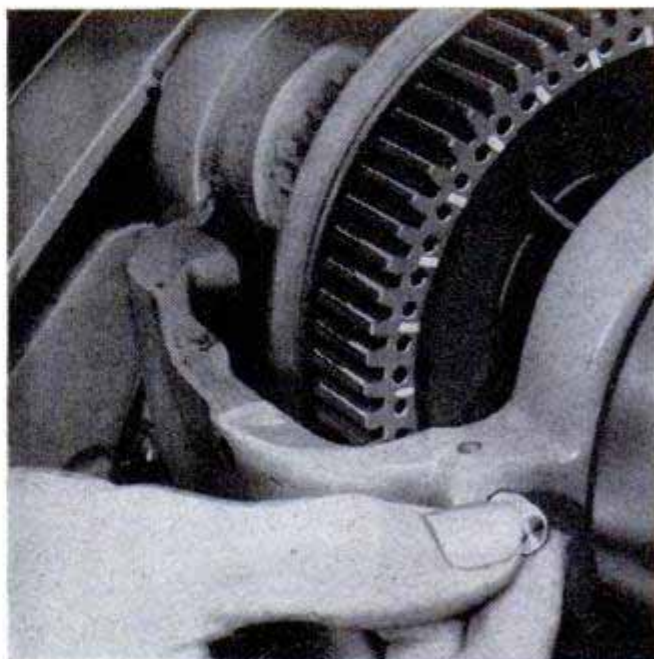
To prevent empty fertilizer sacks being blown about the fields, one farmer made several holders, each consisting of a 36-in. length of $\frac{3}{8}$ -in. steel rod pointed at both ends and



having a small lug welded at the midpoint to form a footrest. Each holder is forced into the ground near the point where the sacked fertilizer is stacked. As the paper sacks are emptied they are pressed down over the sharp point of the rod where they are held in place in the same manner as are papers on an office spindle file.

Marks Help Set Index Pin Accurately

As an aid in setting an indexing pin on a wood or metal-turning lathe, paint white marks on the head as indicated to divide the holes into pairs. In this way, the marks act as a guide when turning the index head, thus making it possible to keep an accurate count of the holes.





TRACTOR WEED SPRAYER

By Richard C. Bell

SINCE C. E. van Winkle of Sunnyside, Wash., equipped his tractor with this handy sprayer, killing weeds in row and field crops is as easy as falling off a log. With the sprayer, which cost less than \$100, he can apply 9½ gal. of weed killer per acre at the fast clip of 3 m.p.h. He used a 50-gal. oil drum for a tank and mounted it on the rear of the tractor. The oil drum is connected to a small compressor driven by the accessory belt-drive unit attached to the tractor's power-take-off shaft. Air is pumped into the bottom of the tank to force the spray material through a hose running to the spray boom at the front of the tractor. A shutoff valve located within reach of the operator makes it convenient to control and regulate the supply, and a safety valve and pressure gauge provide a means of checking the 40-lb. air pressure required to assure efficient operation.

The boom of the sprayer is made from three lengths of ¾-in. galvanized pipe, two 5-ft. lengths being connected to a short center section with regular spray-boom fittings which permit raising the outboard ends of the boom to a vertical position for traveling from one field to another. The boom is fitted with nine fan-type nozzles and each end of the boom, of course, is capped. By studying the photo at the top of the page you can get an idea of how the original sprayer assembly was rigged and mounted to the tractor.

Above, the hose from the tank is connected to the sprayer by a pipe tee fitted in the short pipe section to which the outboard ends of the boom are attached. Below, this view shows how the compressor is connected to the tank and the convenient location of the shutoff valve and the air-pressure gauge





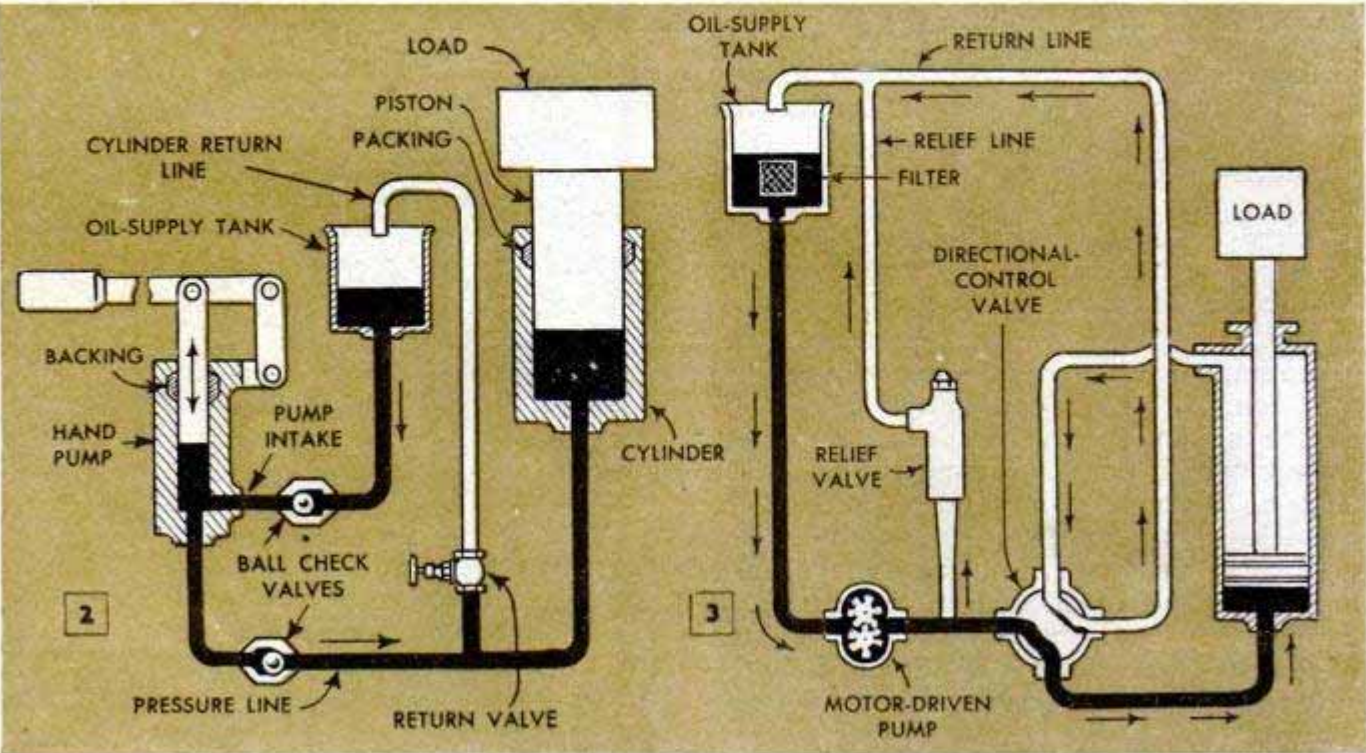
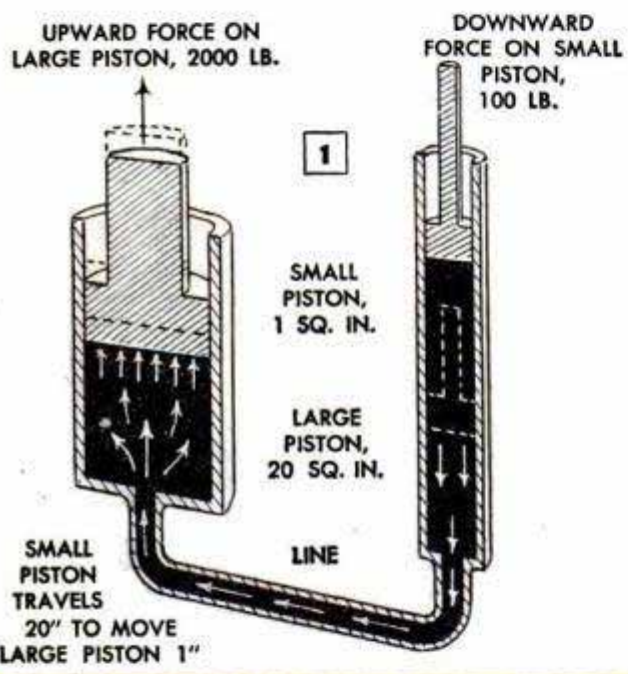
HYDRAULIC LIFTS

do the hard work

By S. H. A. Young

BOTH IN INDUSTRY and on the farm hydraulically operated lift and control mechanisms are doing more and more of the hard work in handling heavy loads and in raising, lowering and depth control of heavy farm implements. Hydraulic controls also are used on various types of units designed to move earth and snow, scrape and level fields and roads, and scoop loose materials.

Using such component parts as hand and power-driven pumps, lift cylinders, control valves and flexible pressure lines, it is easy to build a hydraulic unit to do almost any kind of work desired. Although an assembled, hydraulically operated unit may appear quite complicated, the principle on which it operates is simple. The pressure applied to the fluid, usually oil, is transmitted through the various parts to every point the fluid reaches in the system. The simple system employs an assembly of hydraulic elements for accomplishing the required routing of the oil under pressure to the lift cylinders or other devices for obtaining the desired movement. There must be a pump, either hand or power-operated, for generating pressure, and flexible pressure lines for carrying the oil under pressure to the desired points. Cylinders and other units, such as fluid motors, are used to convert the energy into useful work. Valves are in-





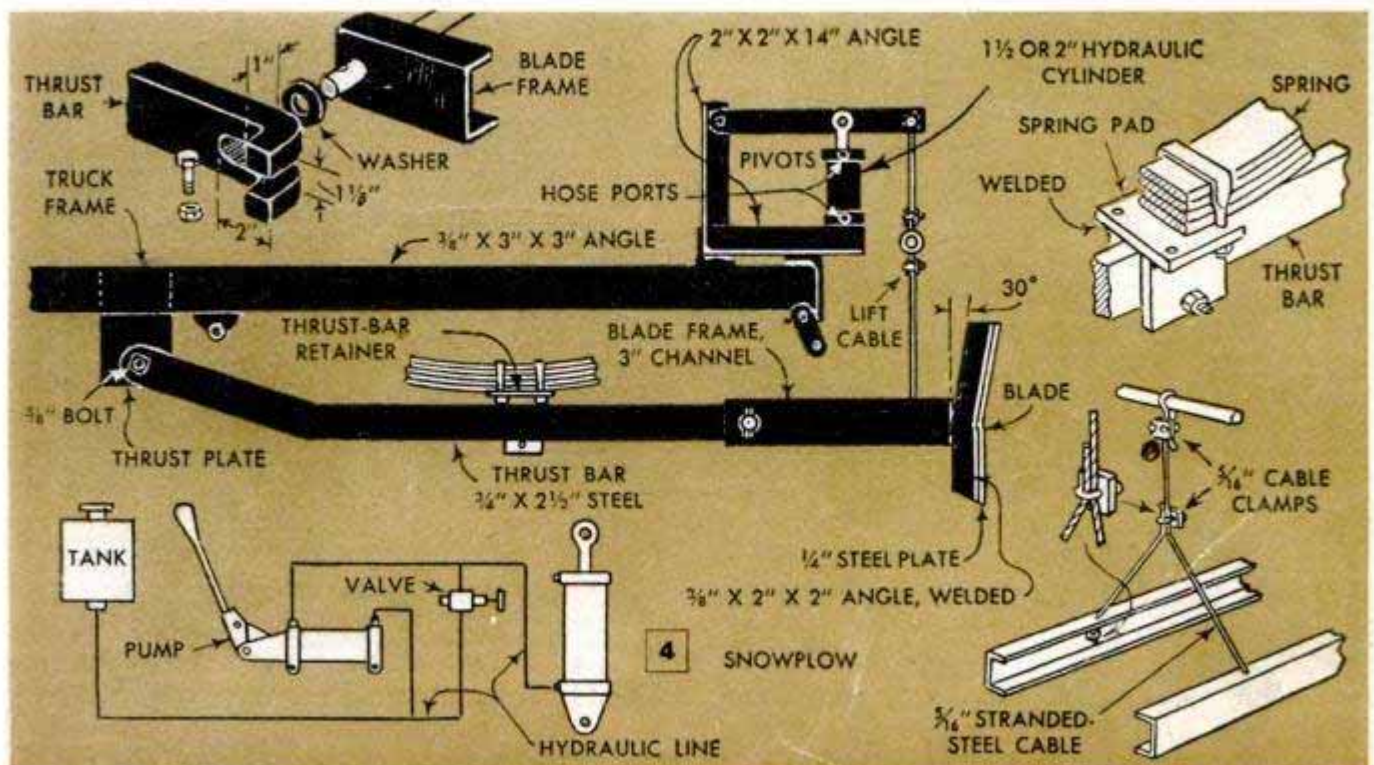
A Jeep or light truck fitted with this combination bulldozer-snowplow speeds up the job of clearing snow from driveways, feeding floors and farmyards. It also makes a fast, handy 'dozer for moving earth

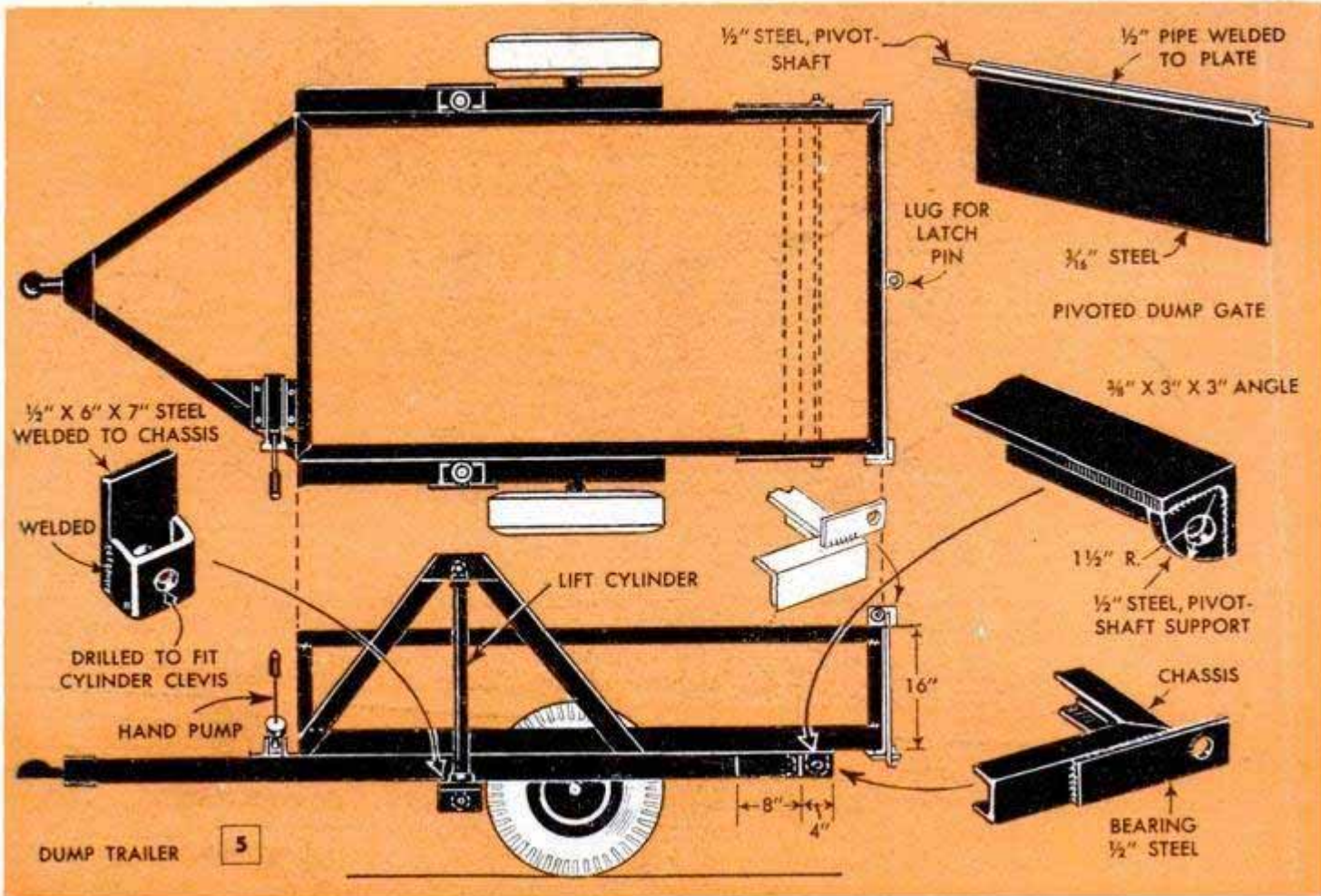
stalled in the lines to control the direction of fluid flow and to limit the pressure where required.

Figs. 2 and 3 show basic types of hydraulic systems, that in Fig. 2 being hand-operated with a manually operated return valve while the more elaborate system shown in Fig. 3 employs an automatic relief valve, a directional control valve and a motor-driven pump. The basic principle on which these systems operate is shown in Fig. 1. Using this detail as an example, the application of a force of 20 lb. to the small piston, having an area of 1 sq. in., will exert a pressure on the oil below the piston of 20 lb. per sq. in. As the small cylinder is connected to the large cylinder by a pressure line, the force exerted against the bottom

of the piston in the larger cylinder by the column of oil will be 20 times 10, or 200 lb., assuming that the larger piston has an area of 10 sq. in. By raising the pressures the values will be raised proportionally. If, for example, the force applied to the small piston is raised to 100 lb., then the lifting power (upward force) of the large piston will be 2000 lb. However, the important thing to keep in mind is that if the application of force to the larger piston causes it to travel 1 in., the smaller piston must travel 10 times that distance, or 10 in.

In the practical working unit in Fig. 2 the small piston is a pump fitted with a handle permitting repeated strokes. This reduces the size of the pump (smaller piston) to a point within usable limits. Check valves





Hydraulic dumping mechanism is easily installed on trailer while it is being built. Only two lift cylinders and a hand pump are required. Body and chassis of the trailer are built by welding steel angles and channels

have been installed in the system to prevent the oil in the larger cylinder from returning to the smaller cylinder when the pump handle is released. The second check valve prevents the oil under pressure in the smaller cylinder from returning to the supply tank. Also, in order to make the unit workable, it is necessary to install a return valve so that oil in the larger cylinder can be returned to the supply tank when the work stroke of the larger piston has been completed.

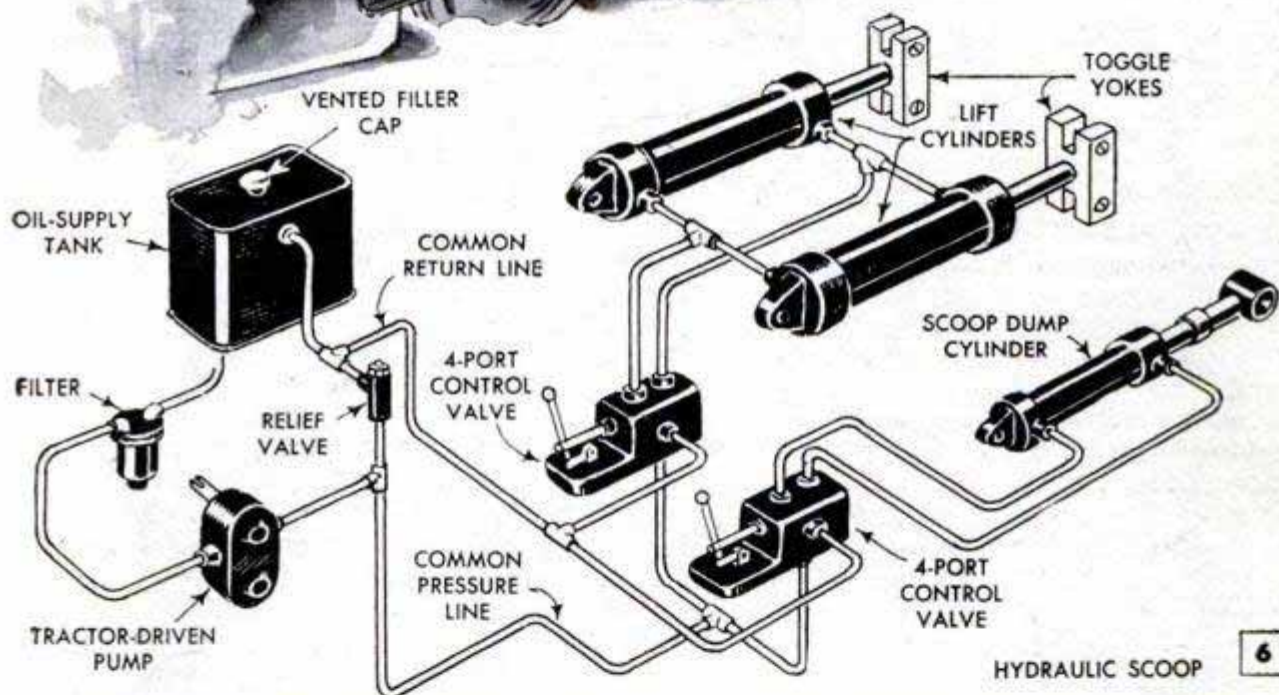
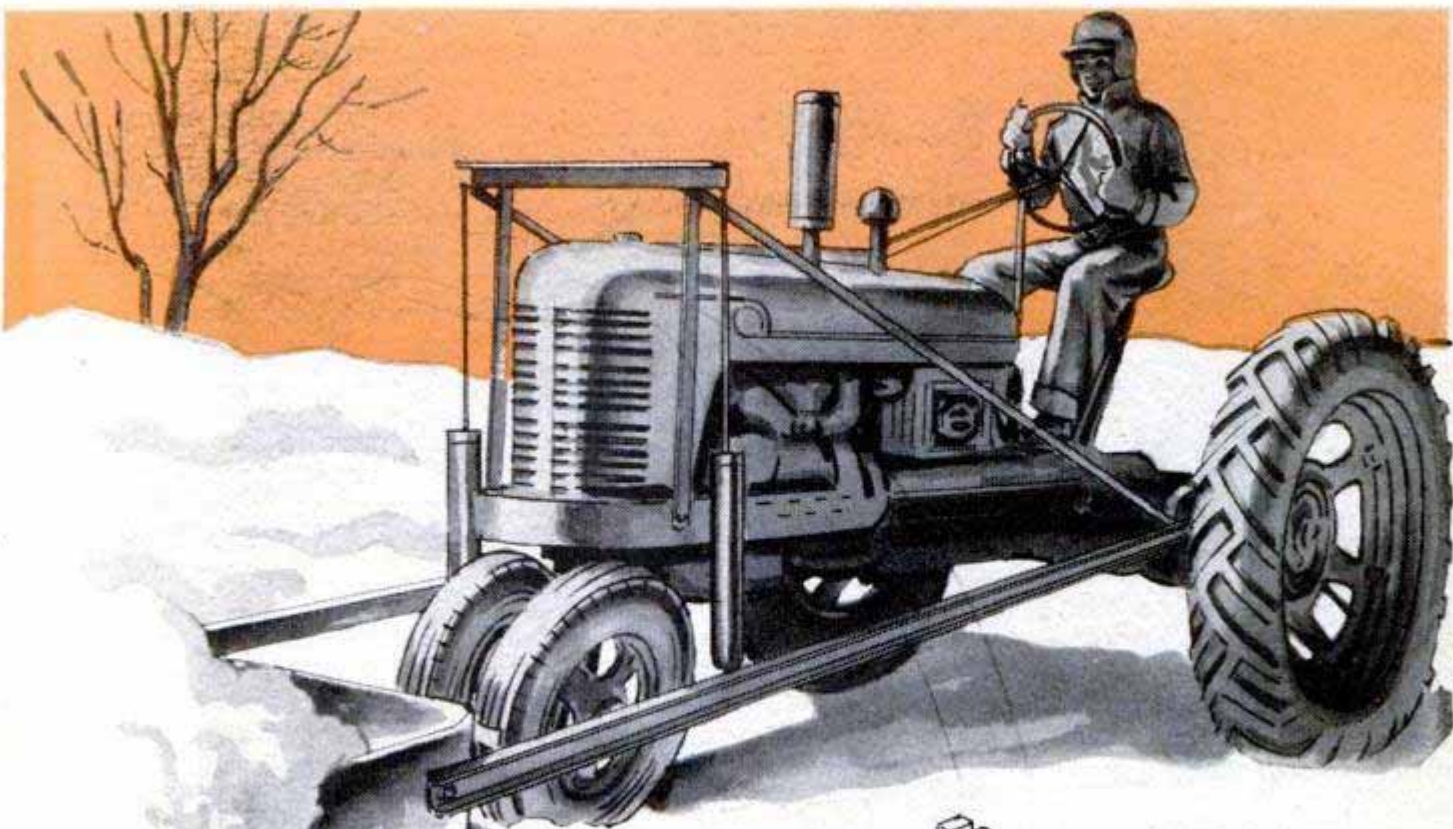
Now note the variations in the system detailed in Fig. 3. By using a continuously rotating pump the ball check valves can be eliminated. The directional control valve is used to route oil under pressure to both ends of the lift cylinder, providing a means of exerting force in opposite directions. To protect the pump from damage by excessive pressures a relief valve releases oil from the pump outlet when pressure in the lines exceeds a given level. To protect the pump and cylinders from excessive wear a filter is installed in the supply tank to remove any abrasive material which may be present in the oil.

Note that by rotating the directional valve through 90 deg., Fig. 3, the oil under pressure will be directed to the upper end of the cylinder, forcing the piston down-

ward. Oil below the piston remaining from a previous upward power stroke will be bypassed by the directional valve back to the supply tank. There are, of course, many variations of the valves, lines, pumps, cylinders and fluid motors used in hydraulic systems and for this reason none of these components has been shown in complete detail in the illustrations. Operating conditions generally serve as a basis for determining the types and sizes of the parts used in building and installing the system.

Typical examples of the application of the simple hydraulic system are the combination snowplow and bulldozer shown in Fig. 4 and the dump trailer, Fig. 5. Both of these units utilize the hand-operated hydraulic system detailed in Fig. 2, as the only function of the hydraulic unit is to raise the trailer body and the snowplow blade. There is sufficient weight in both the body and blade to lower the parts by gravity alone. Both hydraulic systems will be used only intermittently and, as there is no requirement for oil under continuous pressure, a hand pump will serve the purpose in both installations.

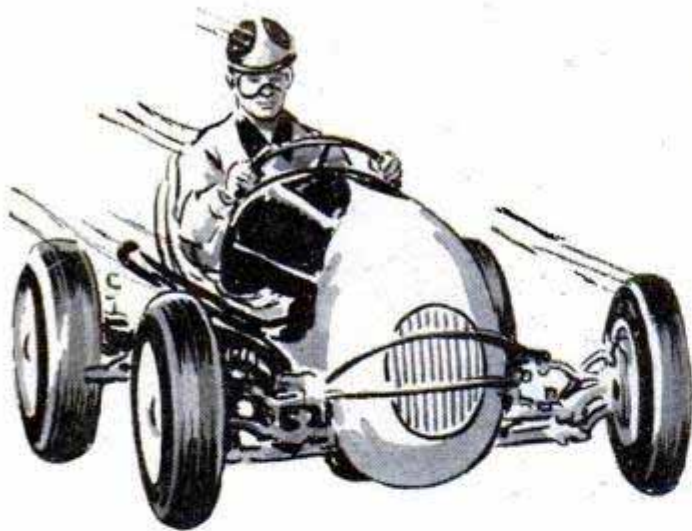
Installation of the bulldozer requires no major structural changes in a truck or Jeep. Flat-steel thrust plates are bolted or welded to the chassis frame just back of the rear-



spring shackles and the thrust bars are attached to the plates with $\frac{5}{8}$ -in. bolts fitted with castle nuts. The forward ends of the thrust bars are slotted and the projections bent at right angles so that the members of the blade frame can be fastened with bolts to permit easy removal. The method of attaching these parts is shown in the upper left-hand detail in Fig. 4. The upper right-hand detail shows how the thrust bars may be attached to the spring pads. The hand pump should be bolted to the floor of the driver's compartment, or cab, in such a position that the handle is reached easily with the right hand. Also, the return valve should be located so it is within easy reach when it is desired to lower the blade. The supply tank should be mounted on a bracket at a level higher than the pump for best results.

When the unit is used as a snowplow the hydraulic system should be filled with No. 10W motor oil for easy operation in low temperatures.

Although there are various types of hydraulic dump trailers, the type shown in Fig. 5 has a hydraulic system which is especially adapted to a small two-wheel trailer chassis. The drawings are intended merely as suggestions for constructing a trailer adapted to the needs of the individual, hence complete construction details are not given. As shown the trailer body is fitted with side-mounted lift cylinders and a pivoted dumping endgate. The body frame, chassis frame and drawbar are welded steel angles and channels, and the bed, sides and ends can be made of steel plates or hardwood boards bolted to the steel frame



is advantageous to build a hydraulic unit for special jobs, or for use on an older tractor not equipped with a hydraulic pump. A typical hydraulic-lift unit for operation of a tractor scoop is shown in Fig. 6. This unit features hydraulic-lift and scoop-control cylinders and dual control valves. The usefulness of this assembly is not confined to the operation of a farm-tractor scoop. It is suitable for other purposes as well, as all cylinders permit force to be applied in two directions.

In any hydraulic-lift installation where movement of the parts requires provision for flexibility in the pressure lines, always use a synthetic-rubber braided line especially designed for hydraulic systems. Avoid the use of rigid pipe wherever possible. In some cases it is necessary to install T-fittings with one opening plugged to provide a means of bleeding air from the system. Usually these fittings should be installed at the top ends of the cylinders.

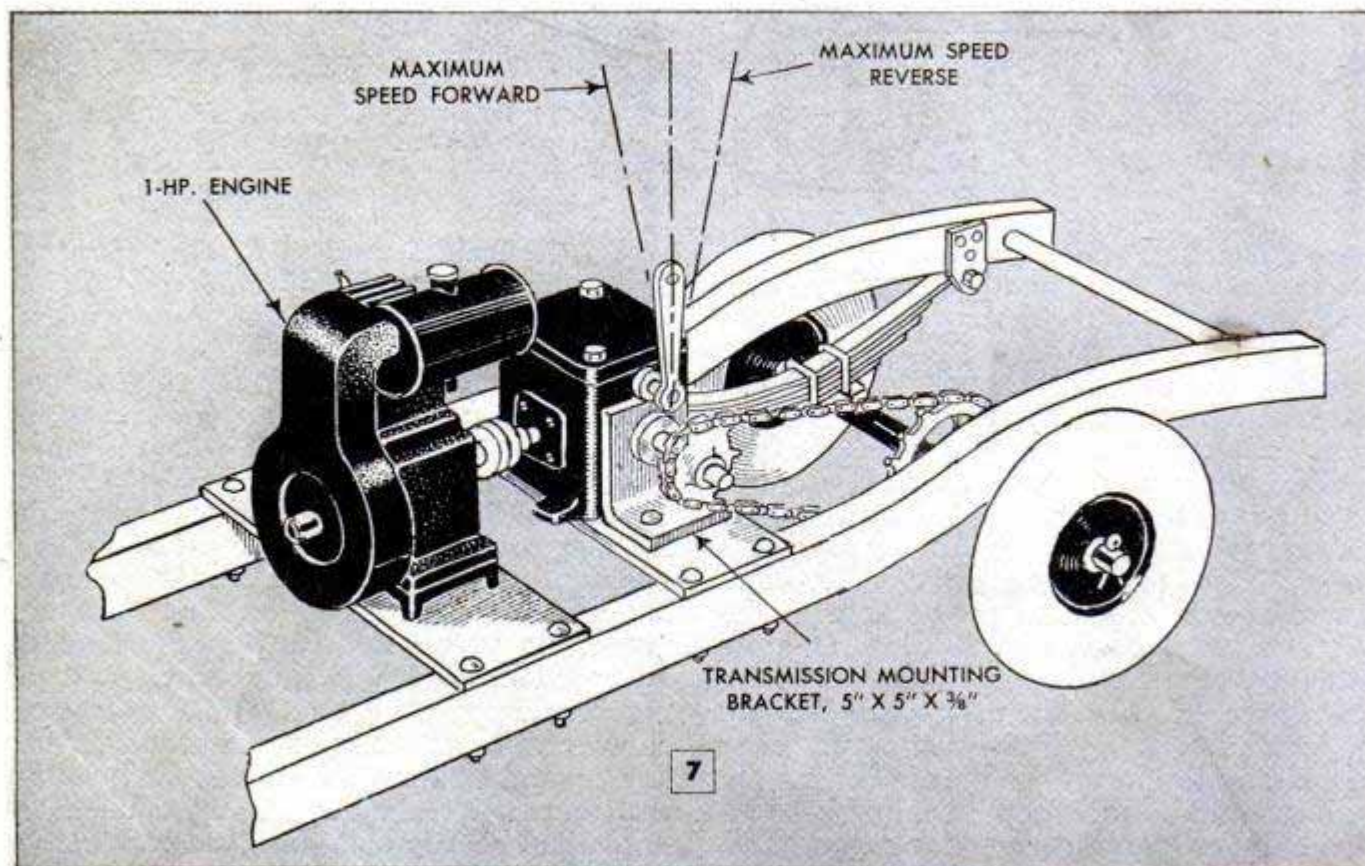
Many builders of midget cars utilize hydraulic transmissions. These are available in several types and sizes. Most of the units are self-contained and will handle readily the power output of 1 to 5-hp. engines. The units also are available with input and output speeds in varying ratios. For example, one unit is available in which the maximum speed of the output shaft is only about $\frac{1}{2}$ the speed of the input shaft. Another delivers the same speed at the output shaft as that of the input shaft when the control

of the body to give the depth required.

The hand pump is shown mounted on a steel plate on the left side of the chassis frame. This plate is welded to the frame members and serves both as a base for the pump and as a frame-reinforcing gusset. The hydraulic cylinders are bolted to A-frames at the top, and the piston eyes, or clevises, pivot in special brackets welded to the chassis frame. Two cylinders are required, one on each side of the bed, and they should be of sufficient length to lift the pivoted bed to the required height for dumping loose material.

Nearly all late-model farm tractors come equipped with hydraulic pumps and accessory hydraulic fittings are supplied for various purposes. However, it occasionally

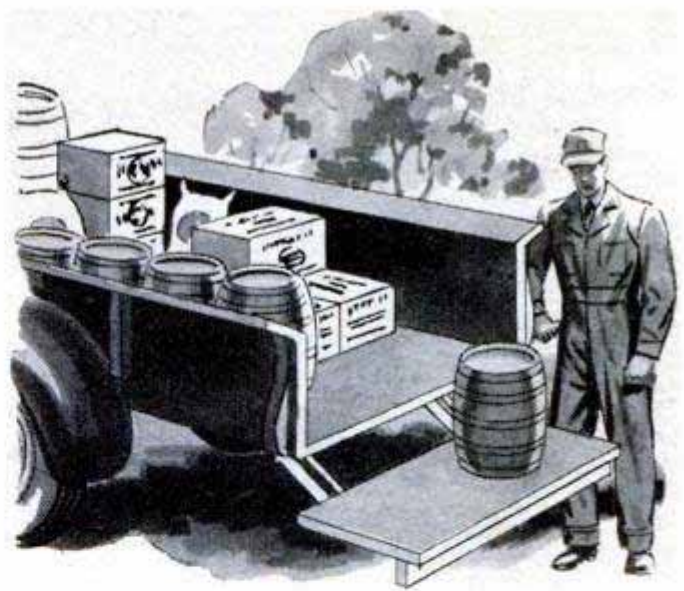
Builders of midget cars of nonprofessional types often utilize flexibility of self-contained hydraulic transmission which is available in several types and sizes with input and output-shaft speeds in varying ratios



lever is set to the maximum forward speed. In nearly all units the speed can be varied from zero to maximum simply by moving the control lever forward or back. On several of these units no clutch is necessary. Fig. 7 shows a typical installation. Although this unit is shown in direct drive with the engine connected to the transmission through a flexible coupling, some types of hydraulic transmission will require a belt reduction from the engine to the input shaft in order to take full advantage of the speed range. Speed reductions to the rear axle of the car are accomplished by means of roller-chain or V-belt drives.

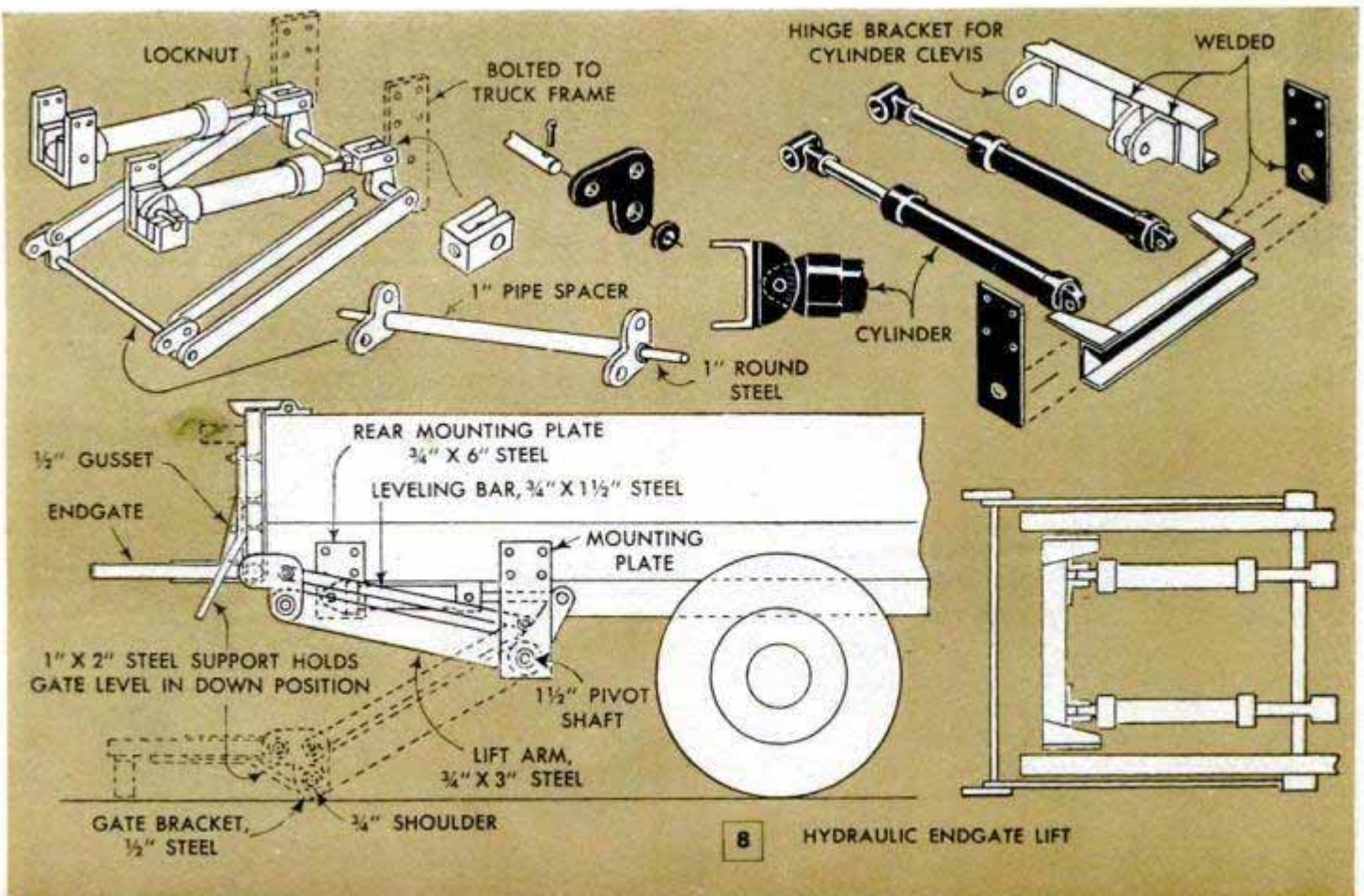
Another hydraulically operated labor saver for farmers and truckers is the automatic truck-gate lift shown in Fig. 8. It can be installed with only minor variations on trucks of nearly all makes having pickup bodies. The hydraulic system required is similar to that used on the tractor-scoop lift, Fig. 6, except that only one control valve is required. Of course, a hand-pump lift could be used, but the slow lifting speed would reduce its efficiency and usefulness in this application.

On trucks fitted with power take-offs, installation of the hydraulic pump is quite simple as the pump usually can be bolted to a bracket attached to the transmission or the truck frame. For intermittent use, the



pump can be powered with a starter motor. The battery drain is nominal as the pump is operated only during the lifting stroke of the hydraulic cylinders which normally requires but a few seconds. Only the general assembly of a typical lift is shown in Fig. 8 and the dimensions of the parts are not given as these must be worked out to suit the truck on which the unit is mounted. In most cases the original endgate can be adapted as a combination lift platform and gate. It may be necessary to reinforce it by welding in vertical stiffeners. Light steel channels will serve this purpose. ★ ★ ★

Another hydraulically operated labor saver for farmers and truckers is the automatic truck-gate lift which will lift heavy crates, boxes and barrels from the ground to the truck-bed level in a few seconds' time



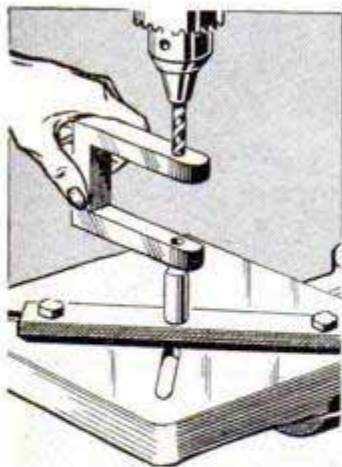
Yardsticks Fastened Together Handled Easily on Blackboard



The difficulty of holding a yardstick flat against a blackboard when it is used as a straightedge may be overcome to a great extent by tacking or gluing two sticks together as shown. The additional stick prevents the original one from bending or bowing out of position and also provides a convenient grip for moving it about.

Special Fixture Aligns Holes When Drilling Yoke

Drilling aligning holes through both arms of a yoke or any U-shaped part often poses a problem in the job machine shop. One



machinist does this ticklish job with a simple aligning fixture which is bolted to the drill-press table and positioned with an indicator on the center line of the drill-press spindle. The fixture consists of a flat steel bar supporting a vertical 60-deg. center which is machined to a

press fit in a hole drilled through at the center of the bar. To use the fixture locate and center-punch the holes to be drilled through the yoke. Then run in on the punch marks with a 60-deg. centering reamer. Hold the work as shown with the vertical point of the jig entering one of the center holes. Drill the first hole, using the center

hole in the upper arm of the yoke as a pilot for the drill. Then turn the piece over, center as before and drill the second hole.

Henry Sevcik, Los Angeles, Calif.

Protecting Fruit Buds From Frost

Spraying fruit trees with water in late evenings of spring nights that threaten to bring frost will often protect the buds from frostbite. Ice coats form over the buds and act as insulators to protect them from the damaging weather.

William Allen Ward, Dallas, Tex.

Auxiliary Feed Supply Stored in Garbage Can

To save time and labor hauling feed to range feeders, one poultryman keeps an auxiliary supply of ground feed stored in a garbage can placed near each feeder. The

can holds an extra filling or two and the tight-fitting cover prevents damage and minimizes waste of the stored feed by keeping out rain and rodents. — A M. Wettach, Mt. Pleasant, Iowa.



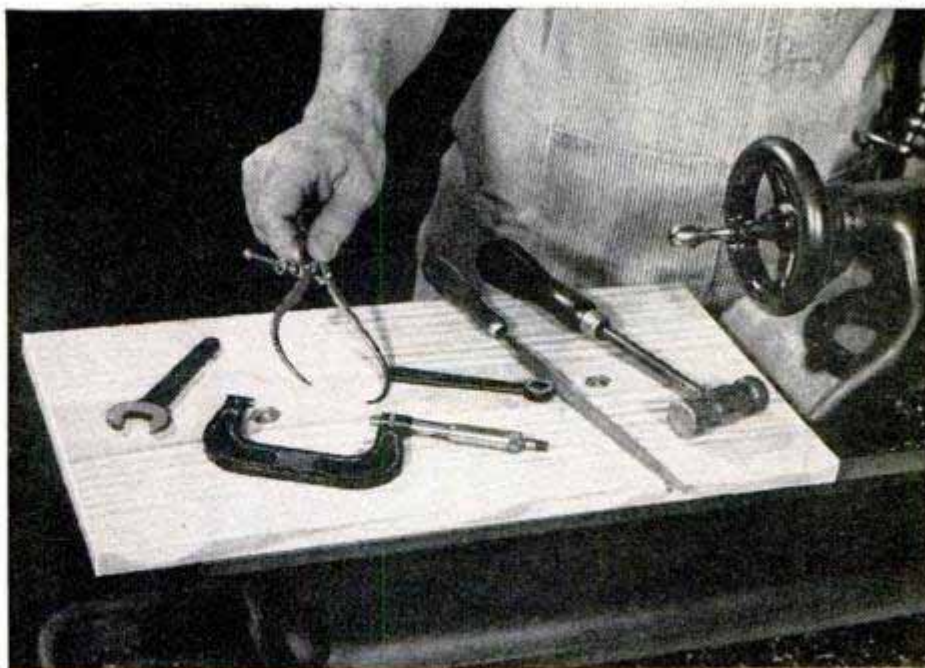
Bottom Margin of Typewritten Page Indicated by Colored Tab

A margin indicator for the bottom of a typewritten page can be made by cementing a colored tab in the lower right-hand corner of a blank sheet and inserting it in a typewriter under the copy sheet. As the writing nears the bottom of the page, the tab will appear to warn the typist.

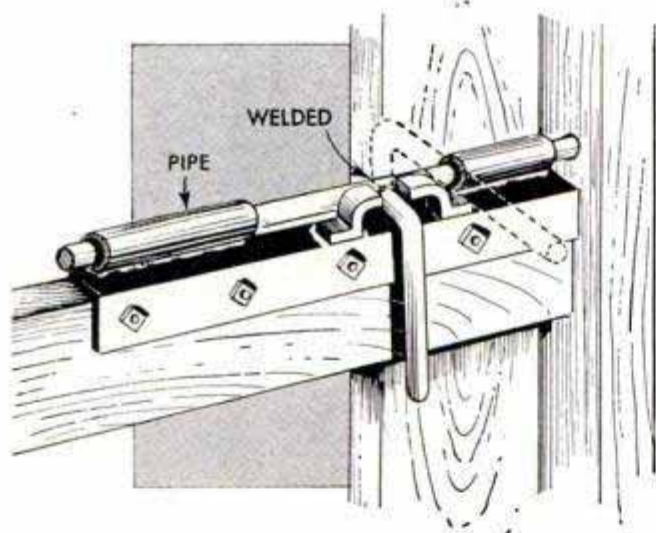


When a lathe is used primarily for short work, it often is practical to clamp a simple wooden tray to the bed beyond the tailstock. The tray, made of scrap lumber, plywood or hardboard, not only holds tools and small parts within easy reach but forms a protective covering over the unused portion of the ways. To clamp the tray in place, a wooden cleat or length of flat steel is drawn against the underside of the bed with a bolt which is passed through the table, the latter being counter-bored for the bolt head. —Erwin S. Koval, Homestead Park, Pa.

Auxiliary Tool Tray Bolted to Lathe Bed Serves as Protective Covering for Ways



Easily Operated Corral-Gate Latch Cannot Be Nudged Open by Horses



Horses that frequently are able to nudge open various locks and latches used to secure corral gates, will be unable to operate this simple but effective sliding bolt. In operation, a steel rod is slid back and forth inside two lengths of pipe welded to one side of a piece of angle steel. Another length of rod, bent at right angles, is welded to the bolt to form a handle which must be raised before the bar can be moved into the unlocked position. Small pieces of flat steel are bent and welded to the angle in the positions shown to provide stops for the bolt. The angle is then bolted to a cross member of the gate and a hole is drilled in the gatepost to receive the bolt.

Hi Sibley, Nuevo, Calif.

Poultry House With Center Driveway Has Double Doors at Both Ends

With a year-round capacity of 400 to 500 laying hens, this extra-large poultry house features a center driveway which allows the manure spreader to be brought inside the building when the latter is being cleaned. The driveway is 10 ft. wide and fitted with two pairs of doors at each end. The inner doors are simple frames covered with poultry wire and are hinged to swing inward. The solid outer doors may be kept closed during the winter months, the house being entered through a small access door in one of the larger doors. The combination of screened and solid doors permits ventilation in all kinds of weather. Extra-strong headers should be used over the doorways and studs on the sides of each door reinforced with diagonal braces.

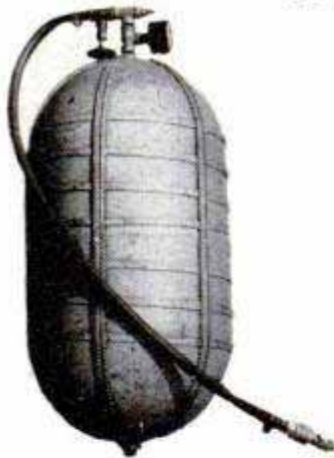


Asbestos Sleeve on Soldering Iron Protects Near-By Parts



Wrapped around a soldering iron as shown, an asbestos sleeve will be found useful when soldering radio and electrical parts where there is the possibility of near-by wires and parts coming in contact with the iron and being damaged. Wired in place, the asbestos can be slipped back while the iron is being heated. The sleeve will also help to conserve the iron's heat.

Portable Compressed-Air Unit Made From Oxygen Container



A war-surplus oxygen tank fitted with a pressure gauge, shutoff valve, and a hose and air chuck has been utilized by one farmer as a portable compressed-air unit for filling tires, paint spraying and cleaning dust from motors and other shop equipment.

The tank is kept filled with air from the compressor in the farm workshop so that it is always ready for use.

Kenneth R. Imig, Watseka, Ill.

Damaged Crankcase Repaired With Lampwicking and Board

If the crankcase of your car is damaged miles from the nearest garage facilities, you may find it practicable to improvise whatever repairs are needed to continue under your own power to the nearest city for help. One motorist, from whose car the crankcase drain plug had been torn by an unseen obstruction, used lampwicking and a small board to seal the jagged opening until permanent repairs could be made.

The wicking was coated with rubber cement and formed into the shape of a ring large enough to encompass the hole. Placed over the hole like a large gasket, the wicking was held in place by a board which was secured with wire to convenient projections on the engine block. The board, had it been fastened to the car frame, would have worked loose eventually, due to the play between the frame and the engine, which is rubber-mounted. A jack was used to support the board until it was securely fastened. The arrangement enabled the motorist, after replacing the oil, to travel 200 miles before stopping for repairs.

Joseph Singerman, New York City.

Portable Holder for Welding Rods

Welders, especially those who work on farm machinery, like this portable holder for welding rods as it is easily carried about and will stand upright almost anywhere. The holder is made by welding a square of $\frac{1}{8}$ -in. flat steel to one end of an 8-in. length of 2-in. pipe. A handle bent from $\frac{3}{8}$ -in. steel rod to form a hook is welded to the open end of the holder. If desired, a suitable divider to separate two sizes of welding rod can be made by simply drilling through the pipe near the open end and inserting a small bolt.



Old Hot-Water Tank Converted Into Automatic Hog Waterer

An efficient long-lasting hog waterer can be made from an old hot-water tank, the larger the better. One side of the tank is partially cut away with a torch, leaving

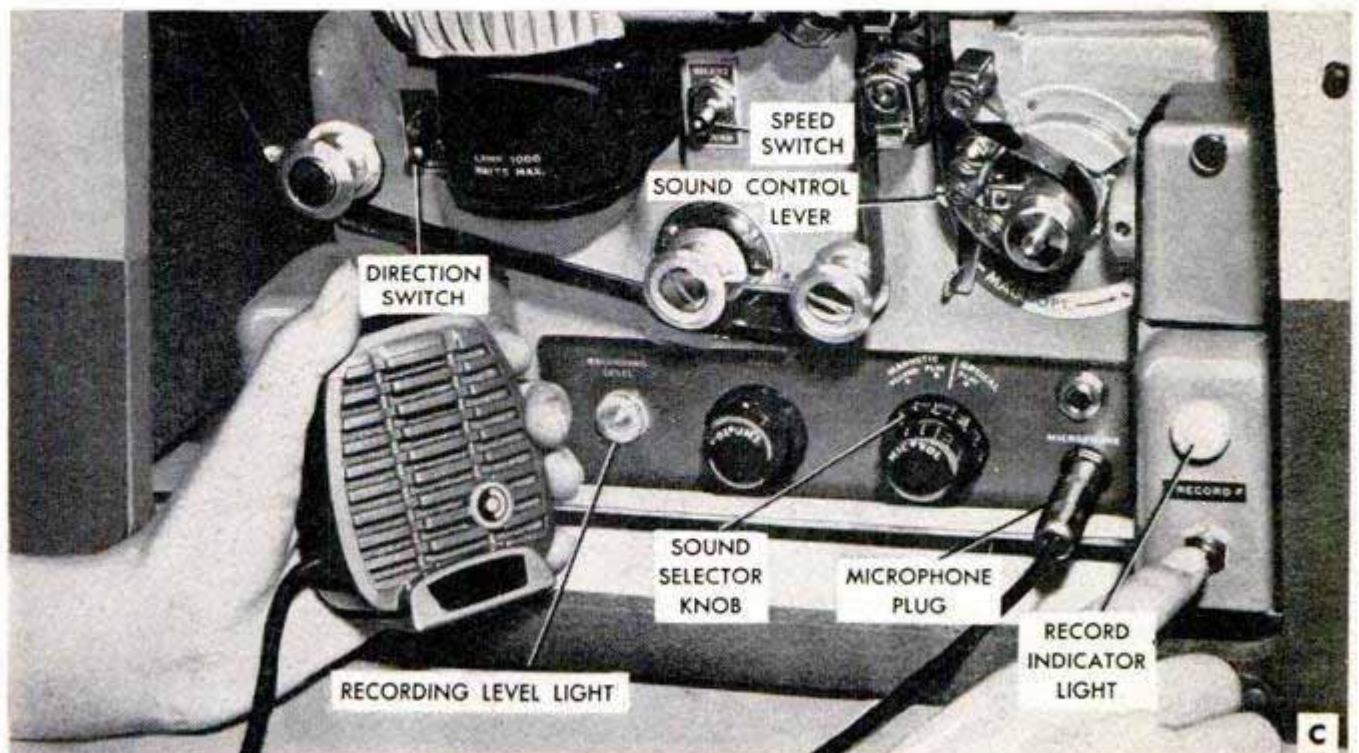
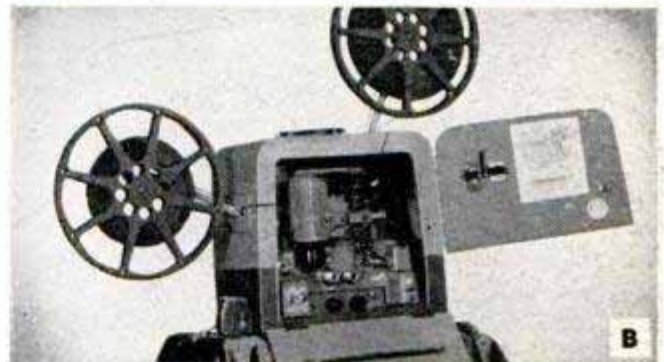


one end uncut to shield the float valve. Pieces of flat steel welded across the cut portion of the tank divide it into compartments which prevent the hogs from getting into the water and also aid in preventing them from crowding each other.

Magnetic Sound on Film

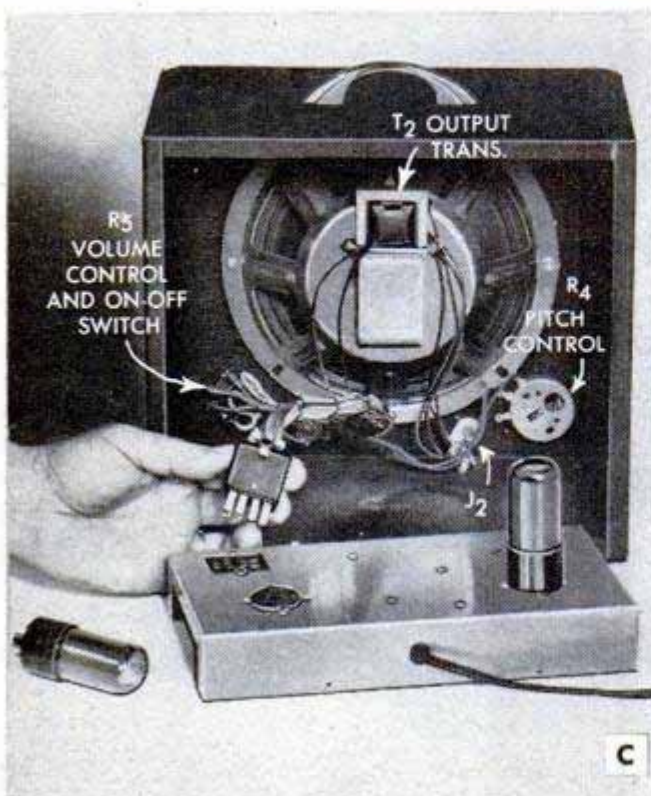
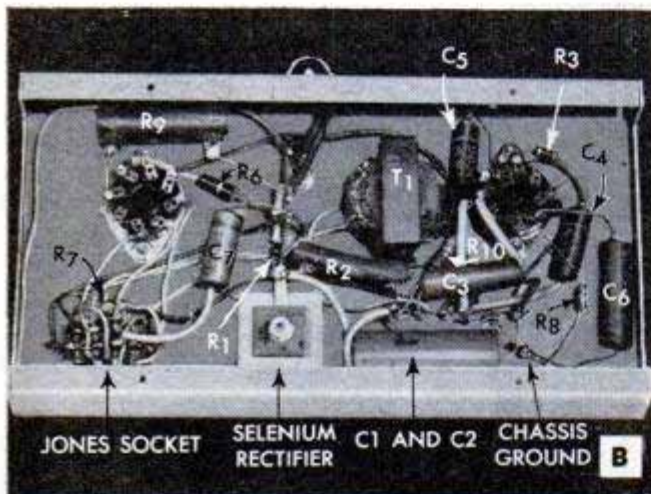
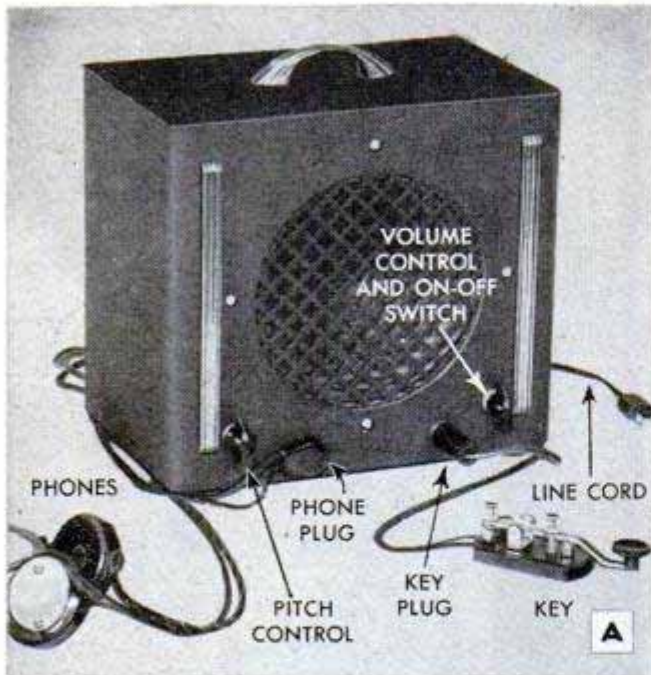
AMATEUR movie makers now can make their own sound films with a new 16-mm. combination optical magnetic-recording projector, recently demonstrated by the Bell and Howell Company. It was announced that the company has developed a process called Soundstripe to coat movie film permanently for magnetic sound. The new projector is an all-purpose unit. It records and plays back magnetic sound at either 16 or 24 frames per second by means of a stripe of magnetic material on the film edge. As the film is projected, sound is recorded and stored on the magnetic stripe, ready for instant playback. Commentary can be erased and re-recorded an unlimited number of times.

The unit projects conventional optical sound films as well as silent films. It can also be used as a public-address system and a regular magnetic recorder. The unit, including the speaker, is entirely self-contained in a single case. A separately cased 12-in. speaker also is available. To record a magnetic sound track you merely plug in the microphone, start the projector and describe what you see on the screen. Photo A shows dad threading the new projector, a close-up of which appears in photo B, preparatory to recording a sound track. Photo C shows the principal operating controls.



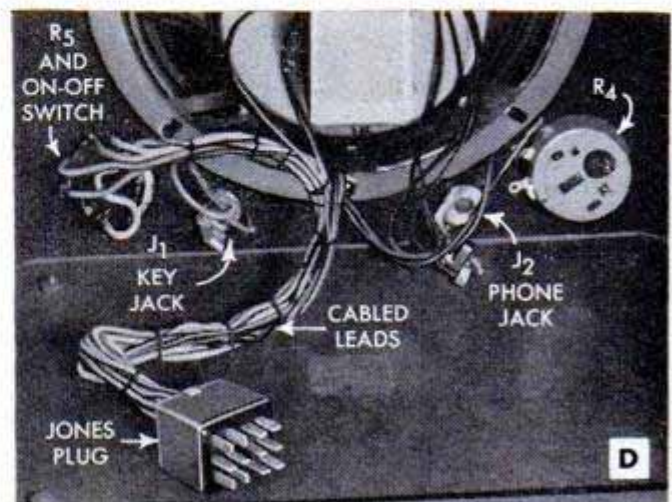
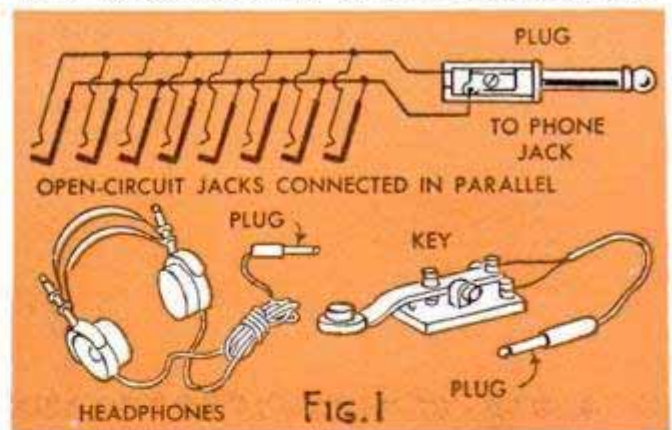
ELECTRON-COUPLED CODE-PRACTICE

By Lothar Stern



MANY PERSONS interested in amateur radio are forming code-practice groups to qualify for the new novice-band license. Previous to the opening of this band in July 1951, the Federal Communications Commission required a proficiency in sending and receiving continental Morse code at a rate of 13 or more words per minute to qualify for a ham license. When the new band opened, anyone could obtain a beginner's novice license by being able to copy only five words per minute and pass a comparatively simple examination. This training-on-the-air program has become very popular as some beginners had been reluctant to undertake the more difficult tests. The new license enables them to get on the air with simple equipment for one year, after which they are required to qualify for a higher-class license. The experience and confidence gained in actual operation on the air make this comparatively easy. Complete information is available to the beginner from any FCC office.

Groups interested in forming classes all over the country have created a demand for a code-practice oscillator with sufficient power output to drive a large speaker as well as a number of headphone sets. The unit illustrated has several features usu-



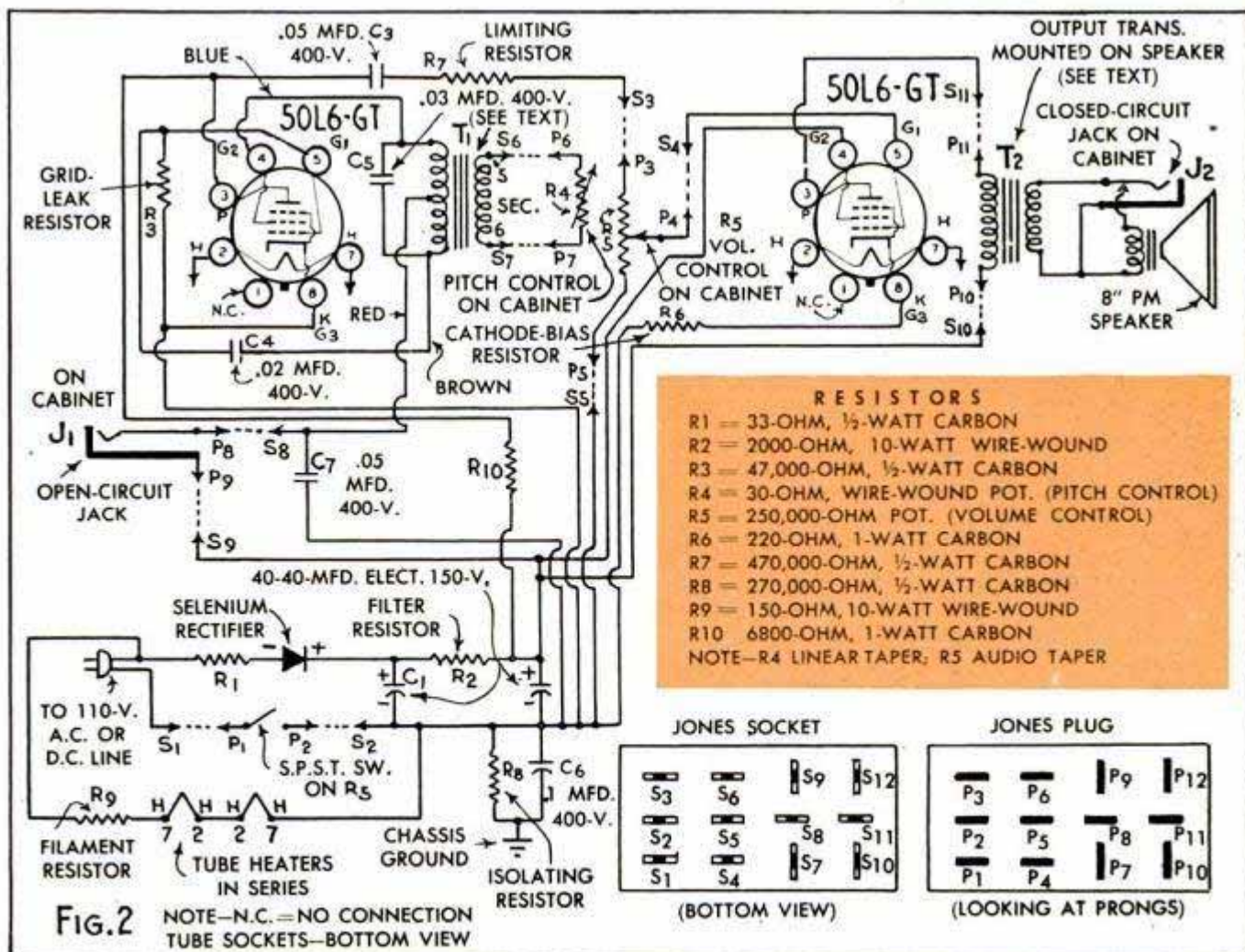
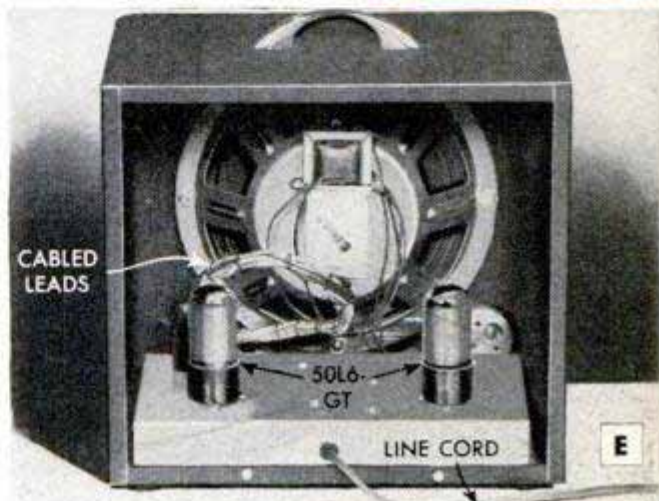
OSCILLATOR FOR GROUP INSTRUCTION

ally not found in code-practice oscillators.

Photo A shows the completed instrument housed in a metal speaker cabinet; a wooden cabinet may be substituted if desired. The speaker cabinet is 7 x 11 x 9 $\frac{3}{4}$ in. The operating controls are all mounted on the front of the cabinet as indicated in photos A, C and D. All other parts are mounted on a standard aluminum chassis base 1 $\frac{1}{2}$ in. high, 9 $\frac{1}{2}$ in. long and 5 $\frac{1}{2}$ in. wide. The controls and jacks on the front of the cabinet are connected in the circuit by means of cabled leads. A Jones No. S-312-AB socket is mounted on the chassis base and the cabled connections are made with a Jones No. P-312-CCT plug. These plug and socket connections are clearly indicated in the circuit diagram Fig. 2 by means of arrows and dotted lines. These correspond to the numbered plug and socket terminals shown at lower right. A bottom view of the chassis base appears in photo B. The chassis base is isolated to eliminate any possible chance of shock.

The output transformer T2 is mounted directly on the speaker and all connections to the transformer are included in the cable. This transformer is a 2000-ohm primary,

(Continued to page 244)

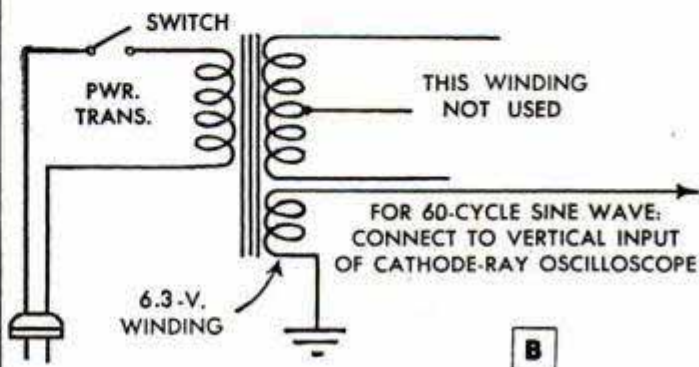
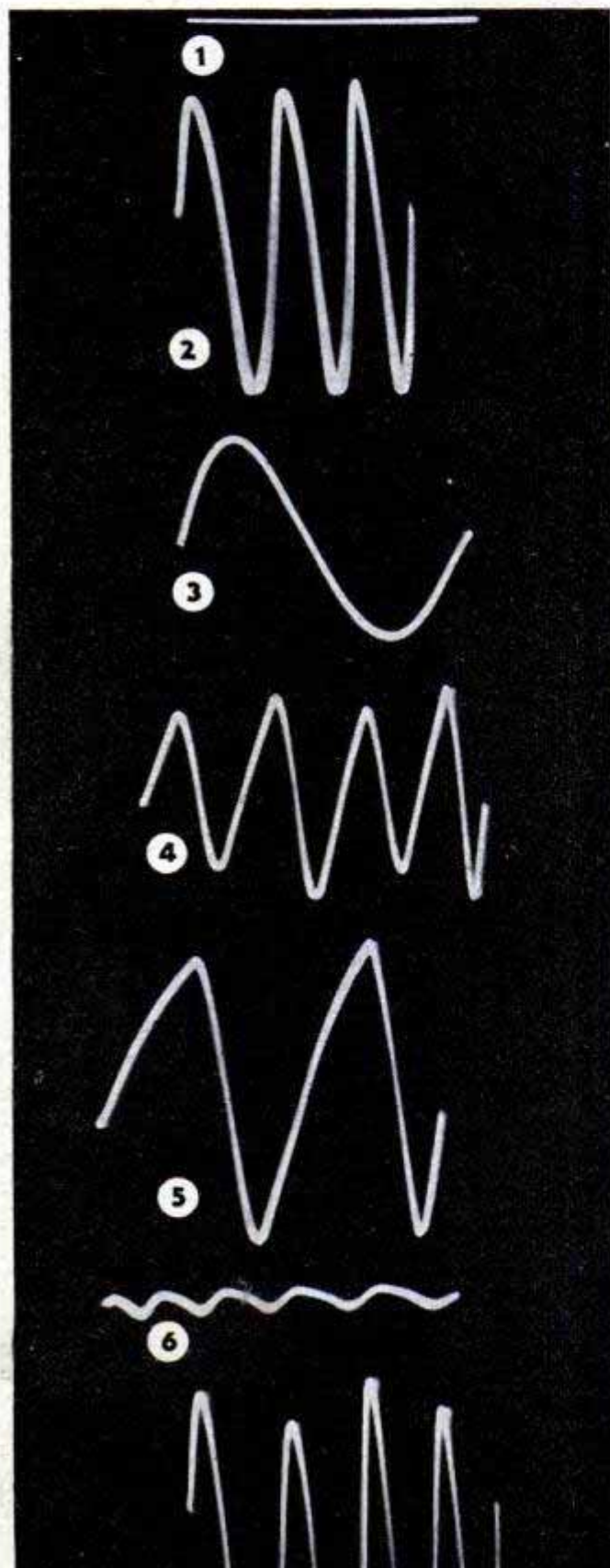


Oscilloscope Patterns Of Radio Power Supplies



AN OSCILLOSCOPE no longer is a mysterious gadget to the student and experimenter. It is a useful electronic tool used by most radio servicemen in repairing radio and television receivers. Proper use of this instrument makes it easy to trace defective circuits and breakdowns in component parts. One useful application is in checking power supplies. The student learns a great deal by viewing the power-system voltages with a cathode-ray oscilloscope, as illustrated in photo A. The oscilloscope shown was assembled at home from a Heathkit. Diagram B illustrates the proper connection to a power-supply transformer for viewing an ordinary 60-cycle sine wave. The ground terminal from the oscilloscope is connected to the grounded side of the 6.3-volt winding and the "hot" side of the winding is connected to the vertical-input terminal of the oscilloscope.

Trace pattern No. 1 shows the internal horizontal sweep adjusted, ready for the voltages which are to be observed. Trace No. 2 shows the 60-cycle sine-wave pattern. The controls of the scope may be adjusted and centered to show one cycle of the 60-cycle pattern as illustrated in trace No. 3. By connecting the vertical plates of the scope from the filament of the type-80 rectifier tube to the chassis, the ripple voltage across the input of the filter system may be seen, as in trace No. 4. Using the same connections, one plate lead to the type-80 tube was disconnected to form a half-wave rectifier instead of full-wave. In trace No. 5 note that there are fewer cycles for the same scope adjustment. To check output, or filtered voltage, the vertical scope terminals are connected from the plate of the radio output tube (B plus) to chassis for observation, and the volume control is turned down so that no signal is heard. The resulting ripple, trace No. 6, is low, and the vertical gain was increased to produce an exaggerated pattern. Trace No. 7 shows the result of a very loud hum, resulting when a filter condenser is disconnected.



Tiny Transistors and Printed Circuits Are Important Developments in Electronics

TRANSISTORS, subminiature tubes and printed circuits are now being brought to the attention of the general reader, who may be amazed at their tiny size and remarkable possibilities. Most radio students and experimenters are familiar with subminiature tubes and the unbelievably small components used in printed circuits, especially in the manner in which they are used in hearing aids.

One of the recent subminiature-tube units is the three-tube audio amplifier illustrated in photo A. It is a complete three-stage speech amplifier built on a lightweight plate of thin ceramic. Designed for commercial and military applications where dependable amplification is required in extremely small or portable equipment, all resistors, condensers and tube sockets are included in the tiny amplifier unit, which is not much larger than a postage stamp. The actual dimensions are $1\frac{1}{2} \times 1\frac{5}{16} \times 1\frac{1}{32}$ in. One of the small components used with miniature portable equipment of this description is the volume control with built-in switch shown in photo B. This is actually smaller than a dime.

The transistor is a comparatively new germanium-crystal device, more properly called a germanium triode. The germanium-diode crystal was developed during World War II and used in radar equipment. The transistor is closely related to it. The main difference between the two is that the transistor has two "whiskers" instead of one making point contact with a tiny germanium wafer. Thus it becomes a useful tube substitute in certain radio and TV-circuit applications.

This new triode unit, photo C, is an amplifier developed by the Bell Telephone laboratories and is about the size of a pea. The basic circuit is shown in Fig. 1. One of the whiskers is biased with a small positive voltage. It acts very much like the control grid of a triode tube and is called the emitter. A much higher negative voltage is applied to the second whisker which is called the collector. It is similar to the plate of an ordinary tube. The germanium crystal is the common electrode and it is comparable to the cathode of a tube. In one type, the points of the two whiskers rest upon the germanium "base" surface only .002 in. apart. A signal is applied to the input circuit in series with the low emitter bias voltage and the amplified signal is taken from the output circuit.

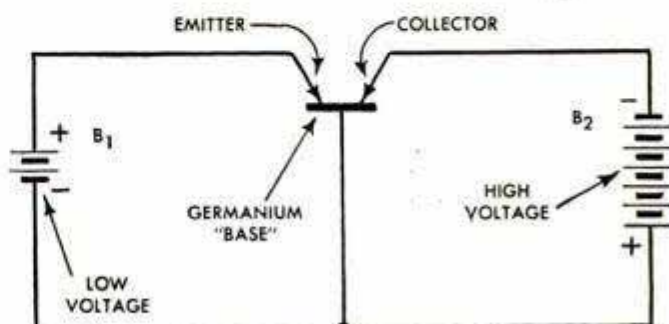
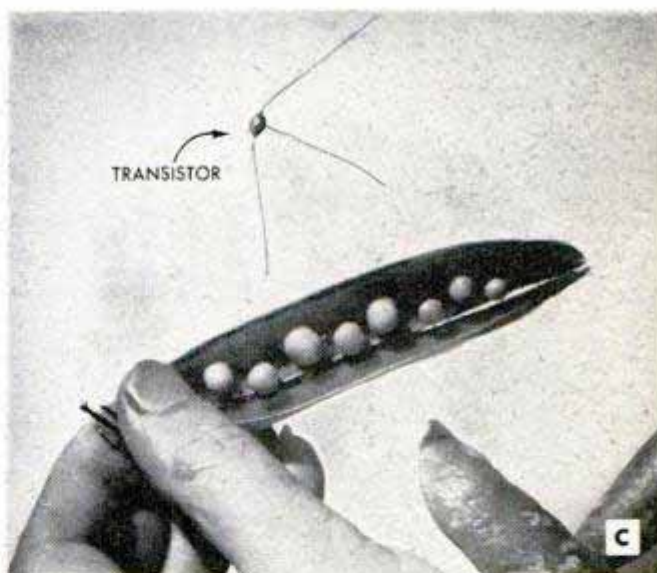
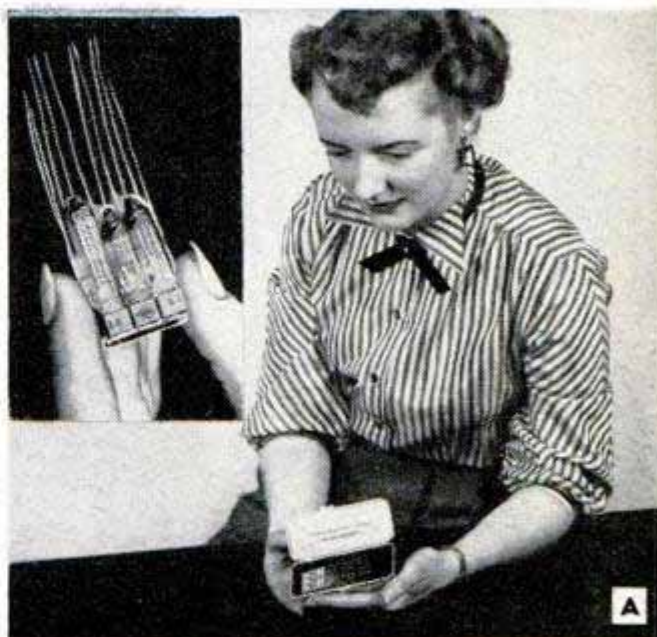


FIG. 1 BASIC TRANSISTOR CIRCUIT

Radio and Electronics Today



A

A—Designed to send and receive radio messages in trucks, taxis, fire trucks, police cars and civil-defense passenger cars, this lightweight unit can be installed quickly by plugging it into a cigarette-lighter outlet to obtain the necessary six volts for operation. It is available in either a variable or fixed-frequency model and may be operated on various wavelengths. It has a power output of about four watts and a range of approximately 20 miles. It also may be used on a standard 115-volt 60-cycle a.c. line



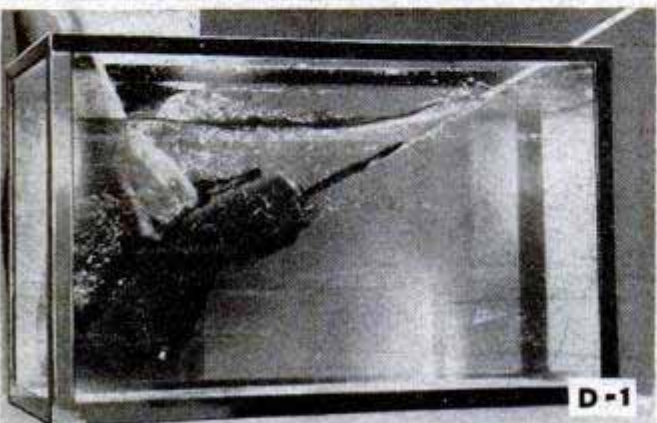
B

B—A truly automatic tape recorder is now available in a compact portable carrying case. The one shown is 12 x 14 x 7 in. and weighs less than 20 pounds. It uses five or seven-inch reels and is available in two speeds. Push-button operated, there are no clutches to cause trouble. Records from microphone, external radio or other external source. The tape may be erased and re-used indefinitely. There is a neon recording-volume indicator and a jack for an external speaker. High-fidelity reproduction is claimed



C

C—The three folding chairs used by these television viewers are designed primarily for this purpose. They are highly versatile, however, and very useful in small apartments where space is at a premium. They fold together into a 12-in. hassock or they may be used to form a cocktail table. The folding units have iron-braced legs and stand 17½ in. high when opened. The top of each unit measures 14 x 19 in. They are upholstered in attractive vinyl-coated plastic that is water and sun-resistant



D-1

D—One of the lightest and most compact hand radio transmitter-receivers ever made recently has been developed by the Raytheon laboratories. It employs tiny subminiature tubes and has a complete transmitter, receiver, battery-power source and antenna in one package. Photo D-1 shows it immersed in a tank of water in a submersion test. D-2 illustrates its method of operation. Designed to link front-line troops with other units, it weighs only 6½ pounds



D-2

Isn't it time to paint your house ?

WITH THIS



Take a good look at your house! Doesn't it really need paint? Doesn't it deserve the best paint? Don't gamble with ordinary paint when the best costs so little. Enough SWP House Paint for the average six-room home costs less than \$45.

SWP has been the standard of quality in house paint for 70 years. This is the paint that is *Weatherated* to stand up against everything the weather can think of . . . to make your house look better *longer*. Insist on SWP for the most paint value.

Ask your Sherwin-Williams dealer to show you how SWP House Paint is *Weatherated* to clean itself and wear longer.

IT'S WEATHERATED

That means SWP is tested rigorously for its ability to resist chalking, checking, cracking, fading and dirt collection.

*Go outside and look at your house...
isn't it time for SWP?*

FREE . . . For Decorating Ideas let your Sherwin-Williams dealer show you or lend you the big Paint and Color Style Guide. Scores of large color photographs of beautiful rooms and homes. Hundreds of authentic color styling suggestions.

If you wish, we will recommend a reliable painting contractor.



IT PAYS TO SEE THE
DEALER WHO SELLS

SHERWIN-WILLIAMS PAINTS

©1952, The Sherwin-Williams Co.

SHERWIN-WILLIAMS AND ITS ALLIED COMPANIES LEAD THE WORLD IN PAINT RESEARCH



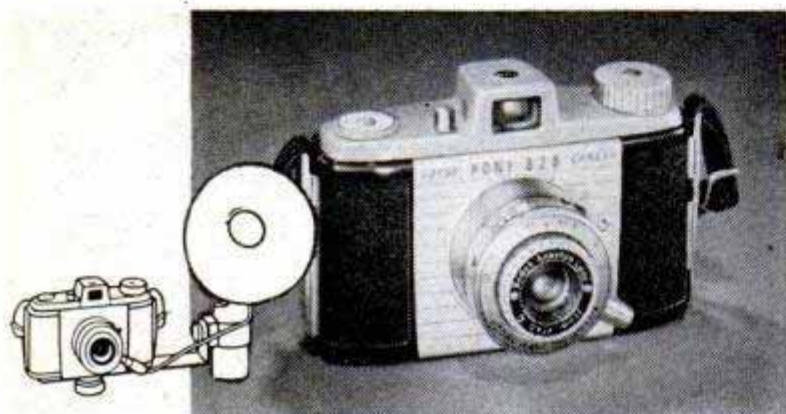
For more fun at Camp-

Take pictures on sunny days... develop and print 'em on rainy days

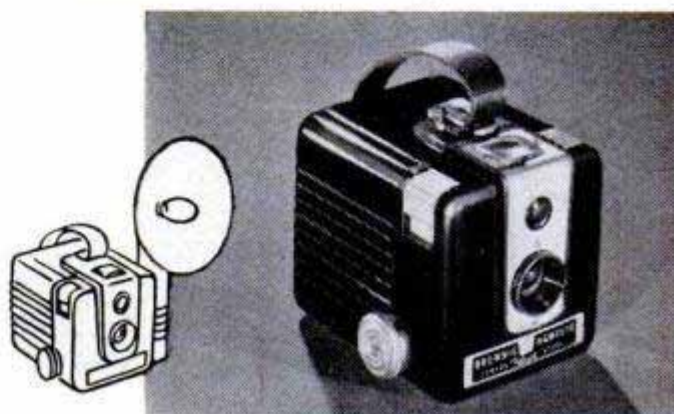
The Boy Scouts' motto is: "Be Prepared." That's a good motto for you, too, on your next camping trip—and for your children when they pack off for summer camp.

Be prepared to add to all the fun with some of the picture-taking "gear" you see

on these two pages. The cost is really little when you consider how rewarding snapshots can be. There's no better way to bring back memories of happy days. Your Kodak dealer will be glad to help you choose the right equipment.

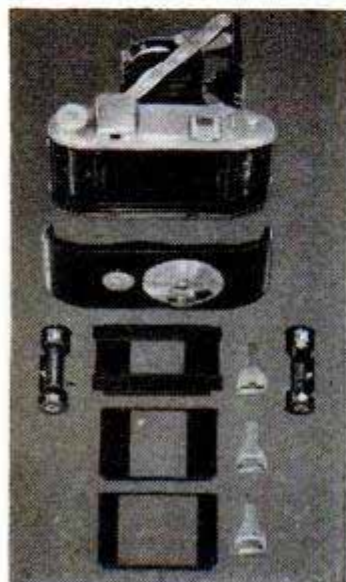


Modestly priced small cameras—superb for color—The famous Kodak Pony 828 Camera is a lightweight, thrifty "miniature." Makes superb color slides on Kodachrome Film, sharp black-and-white negatives that enlarge beautifully . . . Kodacolor snapshots, too. Kodak Anaston *f/4.5 Lumenized Lens*; Kodak Flash 200 Shutter with built-in "synch"; simplified settings marked in red. Takes 8-exposure rolls. Only \$31.15. "Pony 135" for 20- or 36-exposure 35mm. films has automatic film-stop and exposure counter—\$35.75. For flash shots any time, anywhere—Kodak Flashholder fits both cameras. \$10.55.



Rough-and-ready camera for youngsters—The inexpensive Brownie Hawkeye Camera, Flash Model, has up-to-the-minute styling. Simple to operate; no adjustments, just aim and shoot. Oversize view finder shows picture subject big and clear. Takes 12 snapshots on a roll of black-and-white or Kodacolor Film. \$7.20. The Kodalite Flashholder attaches easily for flash pictures night or day, indoors or out. \$3.39.

For protecting your camera—a Kodak carrying case is a smart idea. The handsome, top-grain leather Kodak Field Case for Kodak Pony 828 Camera (right) opens in an instant. \$7. Your Kodak dealer has a protective case for practically any camera.



Adapter kits permit Kodak Tourist and Reflex Cameras to use Kodachrome Film—The Kodak Tourist Adapter Kit (left) for deluxe model Kodak Tourist Cameras permits color shots on Kodachrome 828 Film (for 2x2-inch slides), also economical half and square pictures on all Kodak 620 films. \$13.25. The 828 Adapter for Kodak Reflex Cameras (right) permits use of Bantam-size films—both color and black-and-white. \$4.59. Both kits include back-frame and view-finder masks, and special spool baskets.





Perfect for the beginner—The Kodacraft Printing Kit contains easy-to-use materials for printing your own pictures. Includes trays, printing frame, graduate, thermometer, stirring rod, Kodak Velite Paper for printing in daylight. \$4.30.



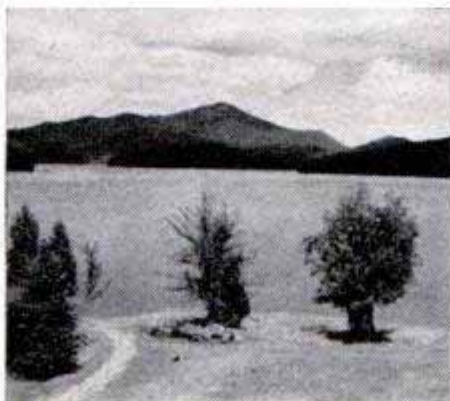
Everything you need to develop and print pictures—The Kodacraft Photo-Lab Outfit includes new Kodacraft Roll-Film Tank; Kodacraft Printing Frame; trays; Kodak Velite Paper; chemicals; graduate; thermometer; and film clips. \$7.45.



This advanced outfit includes a metal printer—The Kodacraft Advanced Photo-Lab packs neatly into the Kodacraft Metal Printer. Contains all materials for developing, printing pictures, including a Brownie Darkroom Lamp, Model B. \$12.10.



To put snap in your snapshots—Medium yellow Kodak Wratten Filter K2 darkens blue skies and emphasizes clouds. From \$1.65. And with inexpensive cameras, a Kodak Cloud Filter brings out clouds in true contrast. \$1.72.



To warm up your distant color shots, Kodak Skylight Filter—Reduces bluish cast in distant scenes. Use it to get warmer-tone pictures of mountains, seascapes . . . pictures in open shade under clear sky and on overcast days. From \$1.65.



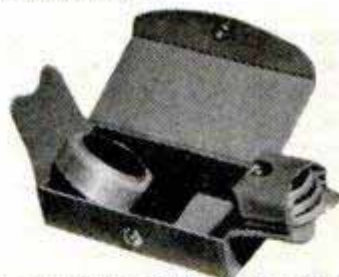
For nature study shots—A Kodak Close-up Attachment enables you to "shoot" at closer range than is normally possible with a simple camera. Gets big, sharp images of flowers and small still-life subjects. Any size, \$1.63.



Get in the picture yourself—Attach the Kodak Auto-Release to any camera which has a cable release . . . set it . . . you have 10 seconds before the shutter clicks. \$3.86 (cable release not included).



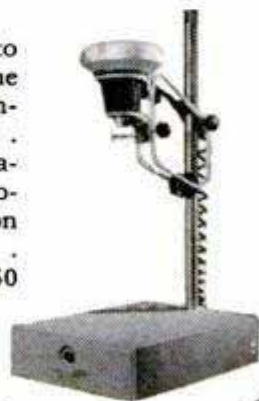
Shade the eye of your camera—A Kodak Lens Hood helps to guard against direct sunlight striking your lens. Also reduces sky "flare" when pictures are side-lighted by sun or photo lamps. From \$1.65.



Keep your filters protected and ready for action—Kodak Combination Filter Cases are made of durable leather. Hold a Kodak Adapter Ring, Lens Hood, and four filters. Series V, \$4.25; Series VI, \$4.95.



And when you get home—you'll surely want to make enlargements from your choice negatives. The Kodak Hobbyist Enlarger (left) is only \$44 complete with lens. "Cold" light protects negatives . . . new negative carrier simplifies loading, takes negative sizes through 2 1/4" x 3 1/4". The Kodak Fluorolite Enlarger (right) has "cold" light illumination . . . rotary negative carrier for easy loading . . . lighttight cabinet in base for paper storage. \$99.50 (without lens).



Prices subject to change without notice and include Federal Tax where applicable

Your Kodak dealer will be glad to demonstrate this equipment for you—see him for all your photo needs.

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Kodak
TRADE-MARK

(Continued from page 124)

The men, whose craft has lain dormant for so many centuries, continually show their cleverness by devising new and intricate ideas. Recently one of the men at Antonio's came up with a beautiful, heavy-linked bracelet in which the hinges were completely hidden. Concave panels of the jewel were alternated with decorative rows of three silver balls, about 1/4 inch in diameter. Top and bottom balls were soldered to one panel, the center ball to the adjoining panel. Tiny silver pins in the top and bottom balls fitted into sockets in the center ball. Hence, each row of balls was actually a hinge, so closely fitted that it would take an X-ray eye to spot the trick.

To keep up the high standard of workmanship in his rejuvenated Taxco, Spratling runs a school for apprentice silversmiths where young Mexicans of the town and from near-by villages and farms may learn the trade of their ancestors from the older, skilled artisans.

And so that Taxco's new-found wealth—from Spratling silver and tourist gold—would not result in neon signs, chrome bars and Cape Cod cottages, Bill Spratling organized a citizens' committee which persuaded the government to proclaim the town a national monument. A rigid zoning code outlaws anything but true colonial architecture. No billboards will ever deface Mexico's city of silver. There will never be concrete sidewalks or tin roofs. Everything will conform with the quaint flavor of this ancient town whose river of precious metal still pours out its bounty more than five centuries after conquistador Cortes first saw the original shaft (still in existence) and described its opening as "large enough for a mounted knight to ride through." ★ ★ ★

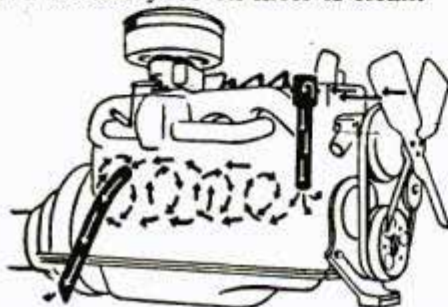


Care and Feeding of Engines

BY S. P. CORP

VACATION FUN INSURANCE

To insure *maximum* fun on your vacation motor trip, take time out to insure *minimum* car trouble. Have your engine tuned up. Get a thorough chassis lubrication job. Don't forget front and rear wheel bearings—they are not part of a regular chassis lube job, and can easily be overlooked too long. Change engine oil and be sure your oil filter is clean.



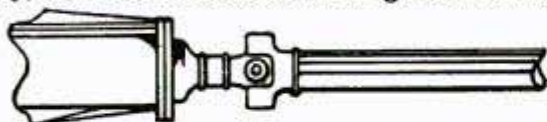
Clean the gauze filter element in the top of your oil filler cap by washing it in kerosene, so the crankcase can breathe. Choked-up breathing

here can cause crankcase dilution and poor oil mileage.

At the right rear of your engine, sometimes connected to the valve cover plate, you will find a one-inch air-outlet pipe. Check tapered lower end, which should open to the rear, to make sure it is not bent or damaged. If bent, straighten it, as the vacuum created by this taper is an important factor in proper crankcase breathing. If this pipe has a gauze filter at the top, clean it with kerosene.

UNIVERSAL JOINT

Every 20,000 to 30,000 miles, universal joints require lubrication. This calls for disassembling of the unit and thorough cleaning, after which high-melting-point wheel-bearing lubricant is added. It is a puttery, detailed job, but means saving a lot of money on costly repairs later. If you don't *know* it has been done recently, be sure to do it before starting that vacation trip!



LATE-MODEL CARS AND TRUCKS ...

...operate at higher engine speeds, higher compressions, higher combustion temperatures. That's plenty of punishment for piston rings, and new Sealed Power KromeX Ring Sets can take it! Top compression ring and steel rails of MD-50 Steel Oil Ring have chrome faces to fight heat, friction, abrasion and corrosion. Write Dept. G-6, Sealed Power Corp., Muskegon, Mich. for your free copy of new illustrated booklet, "More Power, Less Oil, Less Gas."



Contact Lens for Eye Pupil

Weighing less than a drop of water, a new plastic contact lens fits only over the eye pupil and is held securely in place by a natural layer of tears. Earlier types of contact lenses fitted over the whites of the eyes as well as the pupils and were put on and taken off with suction cups. The lens is 1/2 inch in diameter and can be flicked on and off with a finger. Doctors estimate that about 60 percent of the persons now wearing eyeglasses could wear contact lenses successfully.

*univ. of Technology
Stockholm, Sweden*

Through a new Swedish process, rubber can be made from wood by utilizing the alcohol obtained in paper mills.

*Feinbloom Contact Lenses, Inc.
130 E. 74th St., N.Y.C.*

TOMORROW'S
AUTOMOBILE



Made for Each Other

**Modern Cars, Modern Heavy-Duty Motor Oil
and Modern WIX Oil Filter Cartridges**

Today's closer fitting parts and hydraulic valve lifters in your modern, high compression car engine demand exceptional filtration that also can handle the new heavy-duty, detergent type oils. Today's WIX Oil Filter Cartridges give it to you, because they contain the modern, heavy-duty filtrant —

WIXITE

Heavy-duty WIXITE gives you this essential depth filtration in its resilient density and electronically controlled construction. This sludge-thirsty depth removes more harmful dirt, grit and dust *but does not remove* detergent additives from the new oils. For trouble-free driving and modern engine protection, look for the famous WIX trademark on the Oil Filter Cartridges you buy. Care will save your car and here's the place to start saving.

wix

TRADEMARK REG.

OIL FILTERS CARTRIDGES

**WIX ACCESSORIES CORPORATION • GASTONIA, N. C.
IN CANADA: WIX ACCESSORIES CORP., LTD., TORONTO, ONTARIO**



**SEE
FOR YOURSELF!**

Only dealers who sell WIX Filters and Cartridges have the patented WIX Dirtector to show you the TRUE condition of your motor oil. A few drops from your crankcase will expose the presence of damaging grit and sludge. SEE and KNOW what goes on in your engine . . . patronize dealers who sell WIX ENGINEERED FILTRATION and be SURE!



FOR DIESEL & GASOLINE ENGINES

WIX Engineered Filtration includes sizes and types of Filters and Filter Cartridges for Railroad Diesels, Farm Equipment, Marine, Stationary Engines and Compressors as well as for cars, trucks, tractors and buses. Whatever your lubricating oil or fuel filtration problem, write for particulars. CLEAN IT UP WITH WIX.

Here's how for home painters



Get rid of fresh paint smells—overnight! Pour a teaspoonful of ammonia into a bowl of water in center of fresh-painted room. Relax and go to bed. Next morning the smell is gone. Of course, you can save yourself *all* this trouble by using Devoe Wonder Tones—*leave no*

painty smell, dry in 20 minutes.

Clean-up trick for roller coater containers! Before you start, line bottom of paint tray with two layers of newspaper. Then bend over edges and tape them down. When painting's done, just throw papers away. Containers are as clean as when you started.



Preventing paint skin—a two-edged trick! To prevent skin from forming in partly used can, float a little turpentine on top of the paint. Pour just enough to cover surface. Because paint thickens when it stands for long, surface turpentine can be stirred in as thinner when you're ready to paint again.

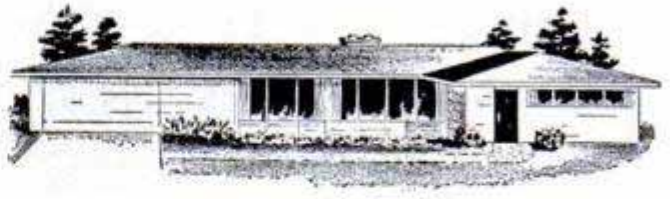
A tip for painting drawer knobs! Here's a handy tip: before you start painting, screw the knobs part way into a piece of cardboard—like the top of a shoe box. You can hold the knob steady while painting—and it will sit still while drying. The perfect enamel for that knob, by the way, is Devoe Mirrolac—comes in many bright colors.



You can get all the painting accessories that you need—and many more helpful tips at the sign of the Devoe Diamond. Why not stop in and see your Devoe Dealer very soon? You'll find his name listed in the *Classified Phone Book*.



Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Finishing Cherry

Q—I want to finish cherry wood in the natural color, but the pieces I have are very light colored, almost as light as poplar or basswood, except that the grain is more pronounced. I was doubtful if this is genuine cherry, but my dealer insists that it is. How should I finish it without using a dark stain?—U.T., Ark.

A—First of all, you should keep in mind that cherry wood, in both the northern and southern types, tends to darken with age. We are not sure that we understand your question, as your mention of "natural color" would imply that you wish to finish the wood in such a way as to preserve its present color. Any transparent finishing material you apply to the wood will darken it somewhat. Paste wax applied directly to the wood probably will color it least of all. However, cherry stock not selected for grain and uniformity of color is not especially attractive in a natural finish. We would suggest that you cut a small sample piece, sand the surface thoroughly with several grades of sandpaper, beginning with No. 2/0 and finishing with No. 8/0. Then apply a coat of raw linseed oil, wiping it on with a cloth and wiping off the excess oil after a few minutes. Allow to dry for 36 to 48 hours, sand lightly with No. 8/0 sandpaper, or rub with fine steel wool, and finish with two or three coats of paste wax, polishing the last coat to a soft sheen. Many finishers use light-colored wiping stains instead of linseed oil. If stain is used, it will be necessary to apply a sealer before applying finishing coats of wax, varnish or lacquer. We suggest that you experiment with both the oil and wiping-stain treatment to find color desired.

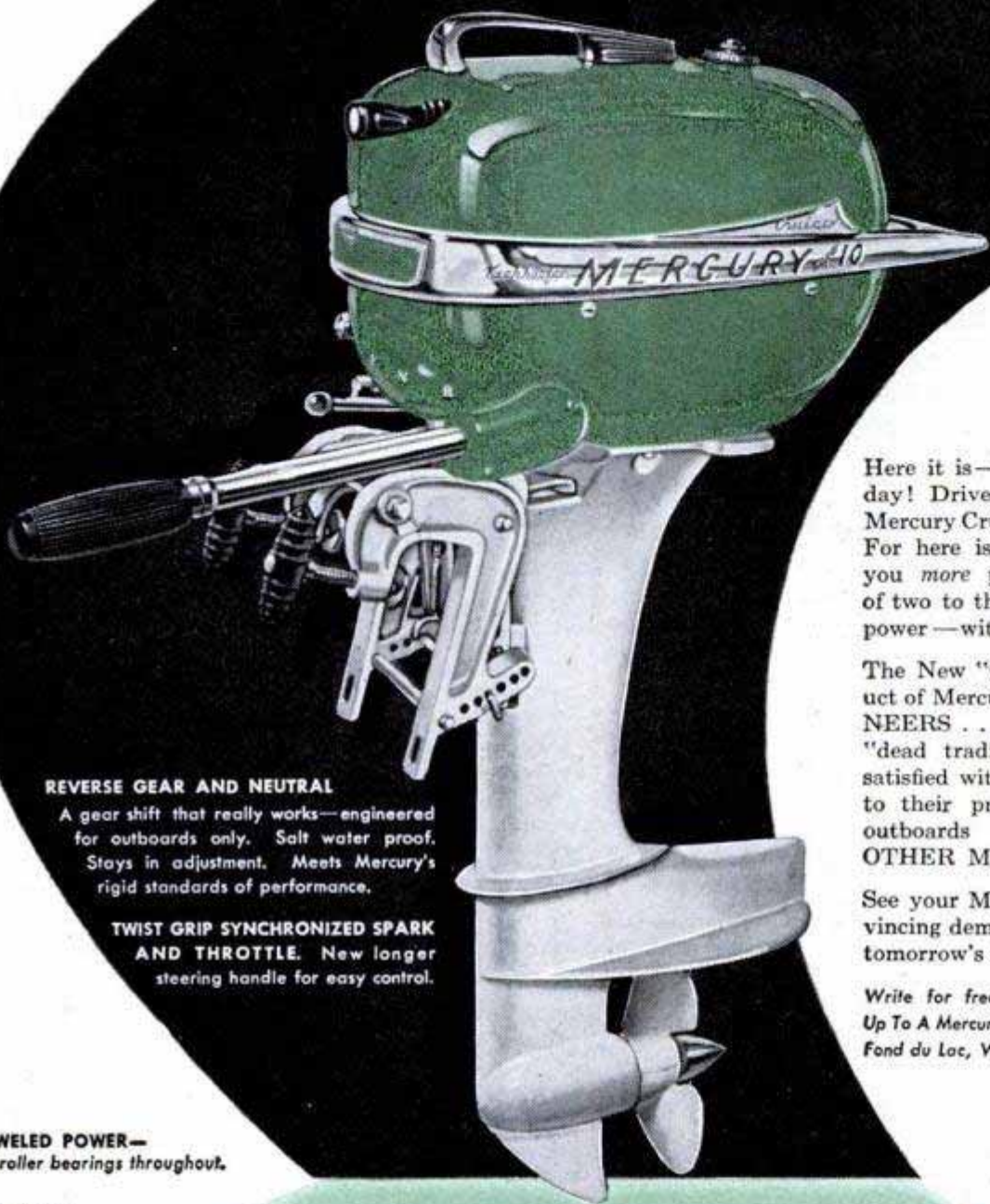
Pruning Brambles

Q—I have a small patch of red raspberries on my newly acquired property which has been neglected. I would like to re-establish it by pruning and doing whatever else is necessary to bring the plants back into full productivity. I understand this can be done, but how? How does one prune red raspberries?

D.A., Iowa.



(Continued to page 224)



REVERSE GEAR AND NEUTRAL

A gear shift that really works—engineered for outboards only. Salt water proof. Stays in adjustment. Meets Mercury's rigid standards of performance.

TWIST GRIP SYNCHRONIZED SPARK AND THROTTLE. New longer steering handle for easy control.

FULL JEWELLED POWER—
ball and roller bearings throughout.

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The New "Cruiser" is another product of Mercury's CREATIVE ENGINEERS . . . men who steer clear of "dead tradition" . . . who are never satisfied with "good enough". Thanks to their progressive spirit Mercury outboards **OUTPERFORM ALL OTHER MAKES!**

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KIEKHAEFER
MERCURY CRUISER

The outboard that will still be copied years from now!



 she'll love 
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 of sunny
 WESTERN PINES*

HERE'S a remodeling job you can do yourself with the help of the Western Pines*. Lovely-to-look-at, easy-to-handle with machine or hand tools, these soft-textured, fine-grained woods are popular with home craftsmen everywhere. There's a mellow, friendly charm about them that adds lasting beauty to any room or workshop project. It's no trick at all to build cabinets, storage walls, garden furniture, bookshelves . . . to reclaim idle space in attic or basement for bunk bedrooms, playrooms, or TV "theaters" . . . when you use versatile Western Pines*. They take paint, stain and enamel beautifully, are particularly handsome left natural, then waxed and rubbed to a gleaming finish.

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includes how-to-do-it folders and booklets, also a copy of the new 1952 edition of 68-picture booklet, "ENCHANTING HOMES OF WESTERN PINES," that will help you get started. Send for yours today to WESTERN PINE ASSOCIATION, DEPT. 535-N, YEON BLDG., PORTLAND 4, OREGON.

These are the Western Pines

- * IDAHO WHITE PINE
- * PONDEROSA PINE
- * SUGAR PINE

(Continued from page 222)

A—The first thing to do is cut out all dead canes, weed stalks and other debris that may have accumulated. Remove all short, underdeveloped shoots from each plant crown. Ordinarily this is done in the late winter or early spring before growth starts. At this stage it will do no harm to cut off dead tips of last year's canes. Some of these will die during the season without fruiting, but a large percentage will bear. This is about all you can do the first year, except to keep down weeds. Many gardeners mulch small patches of brambles with straw to a depth of 4 to 6 in. The straw mulch prevents weed growth and conserves moisture. In the late winter or early spring of the second bearing year, again remove all dead canes and thin the live canes, leaving 4 to 6 to each crown. Later in the season, after growth is well developed, pinch off the tip of each new cane. This tends to force development of new branches, or laterals, lower down on the cane. Early in the third season, preferably before growth starts, the tips of these laterals are shortened to force a more compact blossom set and production of finer fruit. Thereafter the procedure is carried out as in the second year.

Flue Size

Q—I am remodeling my home and the plans call for the construction of a new chimney. I'm told that a round flue is much more efficient than a square or rectangular flue. Why? Also, I'm told that it is necessary to install a tile lining. Is this correct? How does one calculate the required flue area?—T.A., Ind.



A—Answering your questions in order, a round flue is, of course, the most efficient, the principal reason being that smoke and gases always ascend in a spiral motion and therefore there is no circulation in the corners of a square or rectangular flue. Although tile linings generally are recommended, they are not essential if the inside of the flue is plastered and troweled smooth as the chimney is built. Of course, the plaster (mortar) cannot be expected to last as long as vitreous tile. When solid fuels are burned, this is a factor to be considered. It is not possible for us to give you a definite answer to your last question, as you did not say what type of heating equipment you are using or plan to install. In general, when solid fuels are used, the flue area should be at least 1/2 the area of the grate in the boiler or furnace. Manufacturer's specifications of flue sizes for oil and gas-burning heating units vary with the size and rating of the equipment.

Masonry Measurement

Q—What is meant by the term "perch" in connection with masonry measurement? Does it refer to the number of bricks or stones in a wall of a given size or thickness?—P.T., Nev.

A—This is an older builder's term, but still is quite commonly used. It will be found in tables of cubic measure (measures of volume). As generally stated in these tables one perch of masonry equals 24 3/4 cu. ft., or that part of a wall or structure measuring 16 1/2 x 1 1/2 x 1 ft.

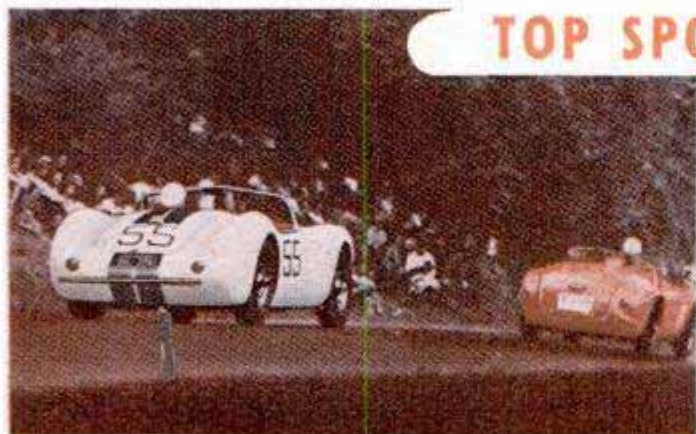
Eradicating Ants

Q—How does one get rid of ants in lawn and garden? I've tried several eradicators with no success. The pests remain in the same location from year to year and damage both my lawn and growing flowers and vegetables.—R.B., Neb.

A—There are a number of preparations which should give good results if the manufacturer's instructions are followed in all details. Old-time gardeners simply fed the ants boiling water. A gallon in each anthill should do it. Of course, boiling water will damage the grass to some extent but it will eliminate the ants quite effectively. It is comparatively easy to reseed the damaged area.

Builder of the sensational **CUNNINGHAM** selects **CHAMPION** spark plugs for America's

TOP SPORTS CAR!



Phil Walters driving one of the Cunningham cars in the Watkins Glen, N. Y. Grand Prix. Walters went on to win, setting new lap and average speed records for this event.



Briggs Cunningham at the Bridge in the Watkins Glen race. These cars driven by Walters, Fitch and Cunningham, placed first, second and fourth, in this Sports Car classic.

BRIGGS S. CUNNINGHAM

(shown here with a 300 HP, 150 MPH Cunningham open tourer) has made a great contribution to the re-birth of American road racing for sports cars—competition cars suitable for everyday driving. In his Florida plant, Mr. Cunningham is manufacturing American sports cars to compete successfully with the best that Europe has to offer.



"Sports car racing in the United States and Europe imposes extreme demands on engine performance. While this form of racing has its share of sustained top speed driving, it places a much greater premium on flexibility. Phenomenal cornering at unbanked turns, terrific bursts of speed coming into the straightaways, shifting down through gears for maximum power, control and braking at steep grades and corners, then up through gears again for top overtaking speeds—all call

for fantastic engine acceleration and equally severe deceleration. Only the most rugged spark plugs can take this grueling punishment and still deliver competition quality performance.

We've found that Champion Spark Plugs more than live up to their great reputation for long life and dependability under these conditions. We use Champions exclusively in the Cunningham cars."

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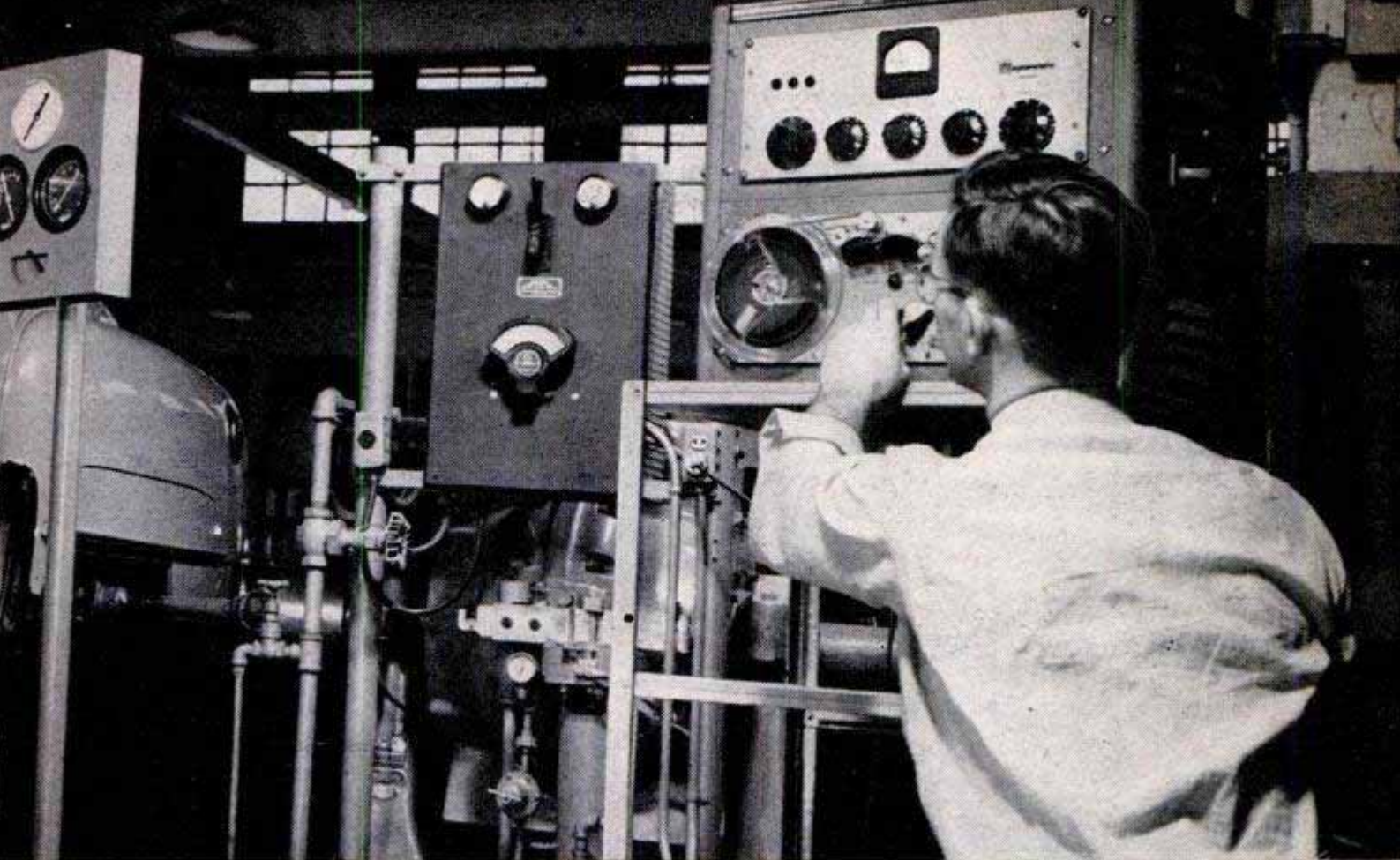
WHAT MAKES A CAR WORTH MORE TO YOU?

You measure the value of a car very simply: a car that performs better when you drive it, then brings a higher return when you trade it in, is *worth more* to you.

The value you get in a Chrysler-built car is the result of a lot of little things, as well as big ones. Engineering, testing, developing new processes—all add up to cars and trucks

PROOF OF VALUE. Newark, N. J., cab driver Albert Cornell operates his Plymouth taxi day and night in rain, shine, snow, sleet and heavy city traffic. The same engineering skill that built faithful performance into Albert Cornell's cab puts hard-working value into *every* Plymouth, Dodge, De Soto and Chrysler car.





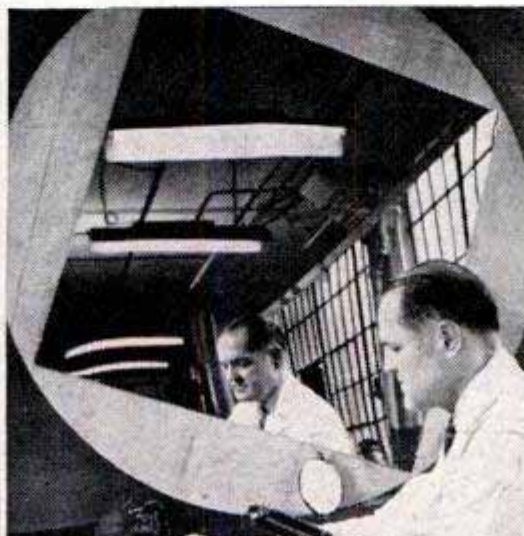
test-driven at varying speeds in the laboratory, as you see here, and other tests are made on the road. These tests help engineers eliminate potential trouble spots *in advance*, giving you more value in Plymouth, Dodge, De Soto and Chrysler cars, and Dodge trucks.

that operate better and longer. This kind of value is important now, when so much of American life depends on motor vehicles.

The same skills that give you Chrysler Corporation cars and trucks are filling defense assignments to help protect the way we live.

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That metal bearing (*left*) actually contains tiny pores, each holding a supply of oil. This metal, *Oilite*, is used for bearings in hard-to-reach spots and other places in your car. *At right* is a "mirror" of tough metal, *Superfinished* by a special process which keeps wear of moving parts to a minimum. *Oilite* and *Superfinish* add greatly to the long life of Chrysler-built cars.

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and Save!*

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Nu-Style Wood Cabinets



Your local Lumber Dealer will assist you in the purchase of Bilt-Well Cabinets.



Anyone can assemble Bilt-Well Cabinets as all parts are prefitted. Cabinets fit directly to wall surface.



You can decorate Nu-Style Cabinets any color. Re-decorate them anytime.

Why wait to buy what you can have now by doing the assembling, the installing and the decorating yourself? Bilt-Well Nu-Style Cabinets are completely machined, pre-fitted, and ready to put together. Don't wait until you "save up" for a new kitchen, do it yourself and save. Sold by leading Lumber Dealers.

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Please send me BILT-WELL cabinet booklet. Enclosed 25c to cover cost of mailing.

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My Lumber Dealer is..... State.....
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Build Well
with **BILT-WELL**
WOOD WORK

A House to Make Life Easy

(Continued from page 69)

walls are the stove, sink and electric-dishwasher combination, automatic clothes washer, drier and refrigerator. Storage walls are used in place of closets for canned goods and other supplies. Such a storage wall contains sets of shallow shelves recessed into the wall. The cans stand in single rows, take up no space and every item is in sight for instant selection.

A time-consuming domestic chore is that of carrying dishes to the dining table before a meal and then carrying them back to the kitchen after a meal is finished. In the Heinlein house the dining table rolls right into the kitchen where all silver, china and food dishes are laid out. Then the table is pushed through the wall into the dining area. It goes back into the kitchen again after a meal and Mrs. Heinlein transfers the dishes directly to the dishwasher.

The table travels through an opening in the wall and normally stands with one end in the dining area and the other end in the kitchen. A sliding partition above the table top may be raised to provide clearance for articles on the table, and a door below may be swung out of the way when the entire table is to be moved into the dining area.

Other features of the house include a radio and phonograph-control center in the hall wired to speakers in each room. The speakers may be controlled at convenient locations.

There is an indoor-garden area in the living room with soil going right down to natural earth. The perimeter heating system keeps the soil warm all through the winter, so delicate plants can be transferred to the indoor garden for the cold season.

Translucent blocks are used to outline the front-entrance door. One block at eye level is of clear glass and has a mirror attached diagonally to its exterior so that Mrs. Heinlein can inspect a caller before she opens the door.

A writer is apt to work late into the night and then sleep late the next morning, so the blinds of the Heinlein bedroom are of lightproof material. Their sides are fitted into sheet-metal slots as a double precaution for keeping out sunlight.

There are wastebaskets in every room but not one of them is visible. They are built in with other furniture and all you see is a spring-hinged trap door.

Heinlein's house has lots of windows, yet a stranger approaching the house can see only the outer garden and the entrance.

(Continued to page 230)

This automobile lighter could save your life!



TAKE your eyes off the road for a split second and *anything* can happen!

Yes, tragedy can take the wheel in *the four seconds it requires to light a cigarette*. Play it safe with the new Wico Safety Cigarette Lighter!

No need to take your eyes off the road ever! It lights your cigarette and takes the first few puffs.

The Wico fits into the present lighter receptacle of your car. No installation or new wiring needed.

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Remove old lighter from receptacle.



Slip Wico Safety Cigarette Lighter in its place. It's now ready for use.



Place cigarette firmly in the lighter.



Push plunger in for a moment... pump once or twice.



Remove lighted cigarette and enjoy your smoke in safety!

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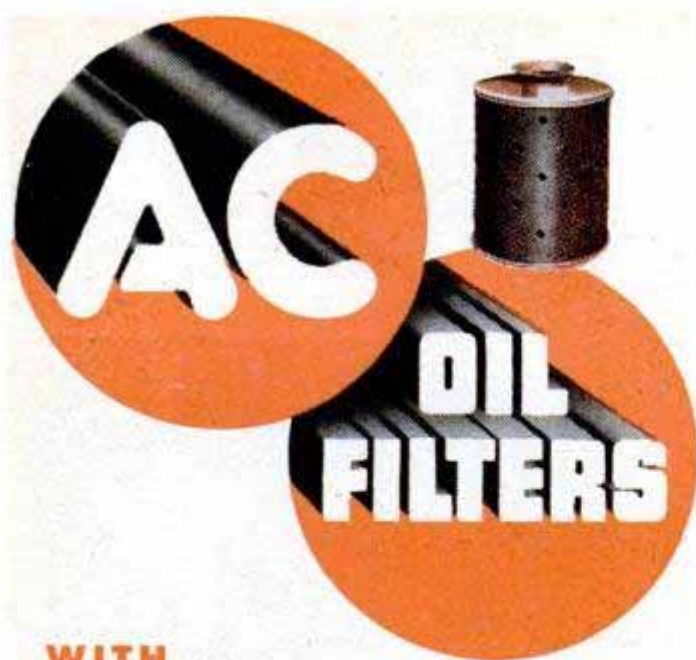
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*are protecting
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the finest engine protection money can buy—
are available for nearly every make of filter.

AC SPARK PLUG DIVISION  GENERAL MOTORS CORPORATION

Shadow trellises at each side screen the view from the street.

The house cost a little more than \$20 per square foot. That sounds expensive but it really isn't. For one thing, cost per square foot would have been less had Heinlein built a larger house; he packed all the expensive kitchen and bathroom fixtures into a small residence. For another thing, much of the house was custom-built on the site because some materials weren't available in the shapes and sizes he required. Most important of all, he had no furnishings to buy when he moved in.

Instead of hiring a moving van, he simply made a couple of trips with his automobile to transfer clothes, food, utensils, linens and personal belongings to his new house. When these items had been put in place, moving day was over. ★★★

The Cars They Drive Are Classics

(Continued from page 141)

sitting at the rear of a secondhand-car lot. Sometimes a classic can be found in a private garage where it has been stored, almost forgotten, for years. Now and then such a car is literally rusting away behind the barn of some farm.

There are two things to do before you buy the car: Make sure that it can be restored and be certain the price is right. If the body has been wrecked or the motor ruined it's a bad buy at any price, though some enthusiasts have bought two junk cars and assembled one good car from the pieces. Spare parts and replacements usually don't exist. In fact you may have to have some engine parts manufactured to the old specifications in a machine shop.

If you are a true classic fan, you won't drive the car a mile until after you've completely restored it. That means a complete mechanical overhaul. Usually all the upholstery must be replaced. All the paint is removed from the body, every bump ironed out and a new paint job applied. For the sake of economy you can replace the original carburetor with one of modern design and for safety you can install four-wheel brakes if the car didn't have these as original equipment. Aside from those items you'll want to rebuild the car exactly to original specifications.

It may take six months or even a year of spare-time labor to put your old car in new condition. But on the happy day you finally wheel it out into traffic you'll have the satisfaction of knowing that your vehicle is right in style again and that, car for car, it need bow to no modern automobile on the road. ★★★

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TO STAY



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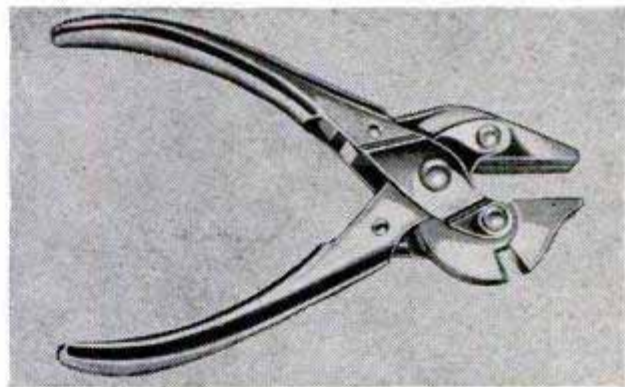
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Extreme Gripping Power is developed by compound leverage... parallel jaws take hold like the jaws of a vise.

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See them in 4½", 5½", 6½" and 8" lengths at your hardware dealer or write for details. Dept. 20F.



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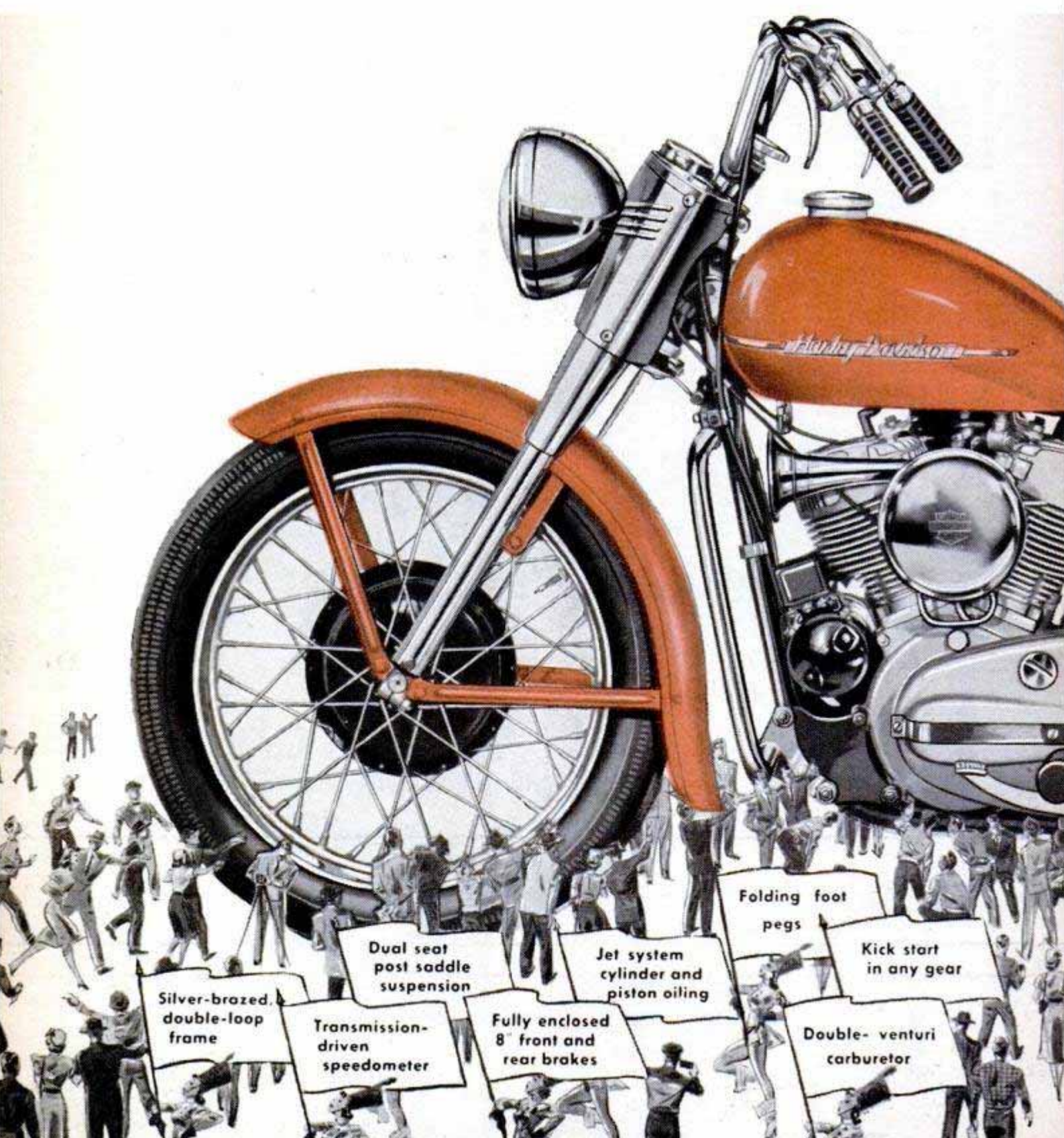
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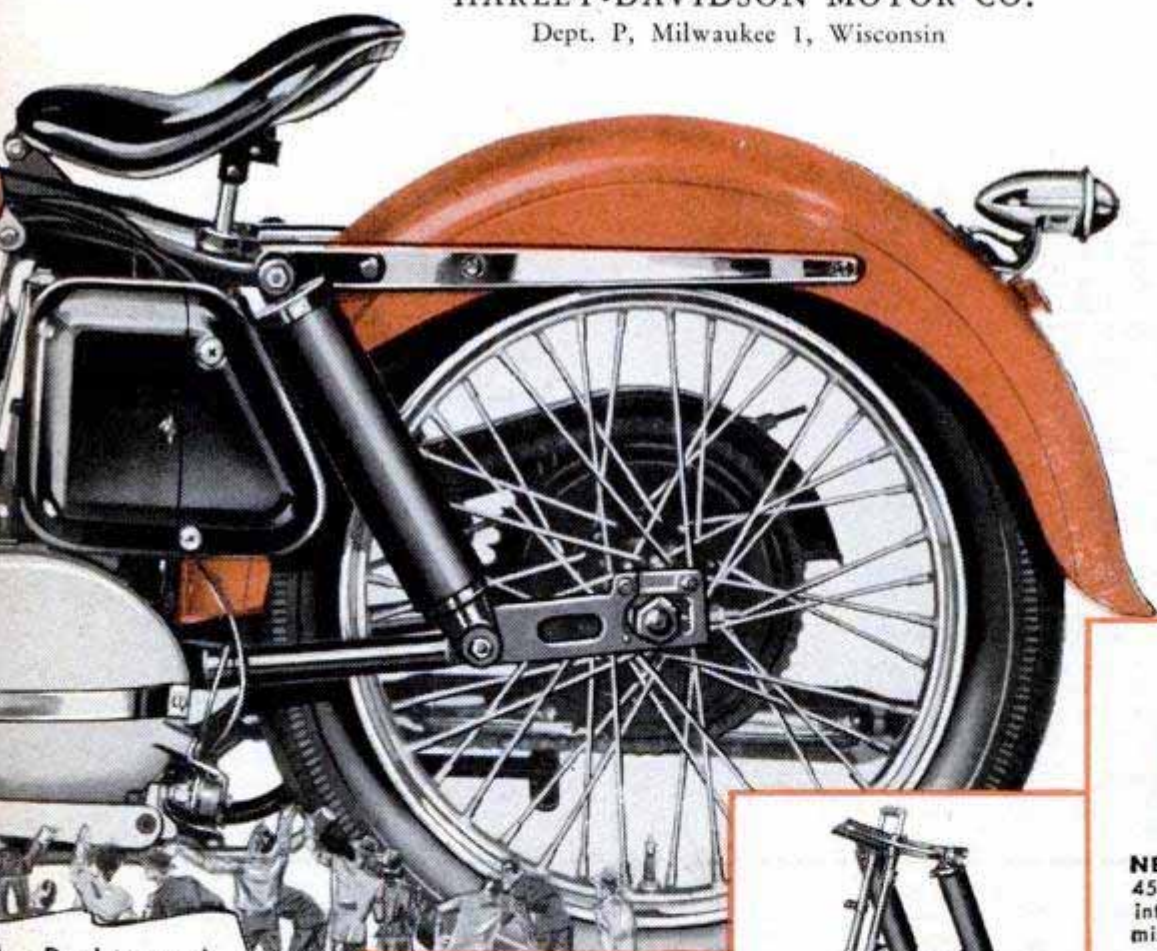
DAVIDSON Model K

outvalue ... any motorcycle in its class !

Here's the latest addition to the world-famous family of Harley-Davidson Motorcycles — the sparkling, *all-new* Model K. It's the motorcycle you've dreamed about — has everything you've always wanted! You'll get the thrill of your life when you swing into the saddle of this thoroughbred. Its surging power will dazzle you. Its comfort will amaze you. Its handling ease will astound you. You'll want to ride, ride, ride — and in competition you'll lead the pack. Come see this mighty new Harley-Davidson Model K at your dealer, and be prepared to enjoy a new sensation in motorcycling. Bring your buddy along.

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Dept. P, Milwaukee 1, Wisconsin



Dual tapered
Timken main
bearings

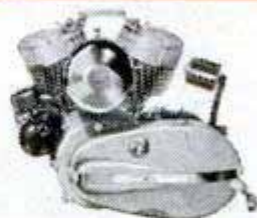
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with voltage
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NEW FOOT SHIFT, HAND CLUTCH Built-in to give maximum ease of operation.



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Swinging arm, coil spring,
hydraulic shock absorbers.



NEW POWERFUL MOTOR
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integral unit, four-speed trans-
mission.



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Motorcycling's newest look;
plus the last word in han-
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362 Stanley St., Roxton Pond, Quebec)

Send me.....copies of Stanley Tool Guide. I enclose.....

Name.....

Street.....

City..... State.....

From Pills to Penicillin

(Continued from page 115)

mention. In late 1951 proof by Dr. Gustav Rapp at Loyola University of Chicago that regular use of chlorophyll in a dentifrice would prevent or curb most simple gum troubles threatens to deal a staggering blow to the diseases which are responsible for many false teeth. Chlorophyll operates on gums as on wounds; it prevents the bacteria and enzymes which cause decay from uniting with the tissues.

Modern dentistry has followed medicine in scientific research. A good example of how science paid off in dentistry is discovery of the value of sodium fluoride. Added to drinking water or applied by a dentist, this hardens the teeth and cuts children's cavities about half.

The modern medical practitioner relies more and more on machines to diagnose and treat diseases. These machines range from the gigantic 450-million-volt synchrocyclotron at the University of Chicago to the common blood-pressure machine used by your family doctor. The synchrocyclotron is being used for basic research and is expected to answer many questions concerning the biochemistry of our cells.

The "isotron" at Northwestern University, a marvel of electronic science with its rows of intricate tubes and circuits, is being used to pin-point brain tumors. It is the first clinical machine to utilize atomic energy in medicine.

The suspected brain-tumor victim is first injected with radioactive material which has a special affinity for tumor tissue. When the hot atoms reach the site they emanate atomic discharges which, checked and recorded by the isotron, reveal the site of the tumor.

I was the only writer to see this first successful use of the atom to fight disease. I felt the occasion was more significant to mankind than the atom-bomb explosion which wiped out 100,000 human lives.

The development of the "clinitron," a machine which vastly speeds up blood analysis, makes possible easy testing for diabetes, our eighth-greatest killer.

A machine using terrific supersonic vibrations has disintegrated gallstones in animals and may prove effective in human beings. This machine, as a therapeutic measure, is also in wide use in Europe.

Artificial hearts and kidneys have been developed which already are responsible for saving many lives.

A more familiar example of machines in medicine is the electrocardiograph. This records the electrical impulses from the

(Continued to page 236)

ONLY SEARS SELLS THIS

DUNLAP Tilting Arbor 8-inch Bench Saw with precision ball bearings



\$46⁹⁵ Cash

Complete with blade, miter gauge, rip fence, machine pulley
ONLY \$5.00 DOWN

Complete Bench Saw

\$110⁰⁰ with motor, motor pulley, V-Cash belt, two side table extensions, power tool bench, tool light and Powr-Panl.
ONLY \$11.00 DOWN ON EASY TERMS



Choose this great DUNLAP saw value NOW!
Available only at your nearest Sears retail store.

Table stays level, work lies flat at any angle of cut. Blade and arbor raise and lower; also tilt up to 45 degrees.

Double-row sealed precision ball bearings form unit with arbor, prevent misalignment; never need lubrication.

Floating motor mount smother's vibration... makes tilting easier... keeps proper belt tension... motor portable.

Improved fence design squares fence directly against front of table. Use on either side of blade. Removable.

17x14-in. cast semi-steel table; top, sides machined. Grooved on both sides of blade for miter gauge.

Comes with 8-in. combination blade (1/2-in. bore); gives up to 2 1/4-in. depth of cut. (Use at least 1/2-H.P. motor; 3450 R.P.M., 2 1/2-in. pulley, 40-in. belt; or 1750 R.P.M., 5-in. pulley, 44-in. belt.)

Complete outfit (as shown) includes CRAFTSMAN 1/2-H.P. 3450 R.P.M. ball-bearing capacitor motor (110-120 volt, 60-cycle AC), 2 1/2-in. motor pulley, 2 side table extensions, 40-in. belt, adjustable steel power tool bench, tool light, and Powr Panl (remote control for light, motor, etc.).

The Sears Retail Store nearest you will furnish you with exact selling prices which will not exceed O.P.S. ceiling prices.

These Accessories make your saw much more useful



A

A CRAFTSMAN 6-in. Dado Set. Dadoes, rabbets, grooves, etc. with 1/2 or 5/8-inch-arbor bench saws. \$9.50 per set.



B CRAFTSMAN Molding Cutter Head. Fits most bench saws with 1/2 or 5/8-inch arbors. 4-inch diameter. With Allen wrench included \$4.50

Cutter bits for above head. 1-inch wide bits cut styles as shown. Made of tool steel. Styles \$2.95 per set, and up.

C CRAFTSMAN 8-tooth Carbide-tipped Saw Blade. Lasts 20 times longer than ordinary blades. Safer—8-tooth design eliminates kickback. Cuts all types of wood, plastic, plywood, formica, Masonite Presdwood, wallboard, abrasive building materials, transite, asbestos, aluminum and asphalt roofing and siding. Teeth project only .020 in. above non-cutting edges. Rips, crosscuts, miters. 5 7/8 to 10-in. diam., all arbor sizes. \$10.85 and up.

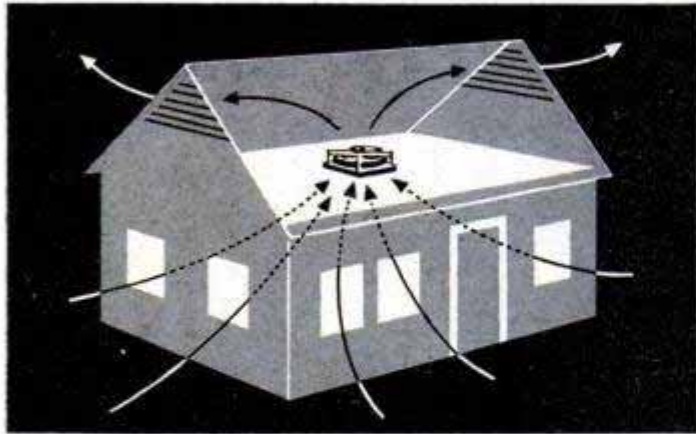


C

CRAFTSMAN and **DUNLAP** Tools by **SEARS, ROEBUCK and CO.**

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Hunter Attic Fan cools the whole house

This modern ventilating fan pulls in cool air through windows, exhausting hot stuffy air through attic louvers. In hottest summer months it circulates cooling breezes through every room in your home. The quiet, powerful Hunter Attic Fan requires little or no maintenance, costs only a few cents a night. It is backed by Hunter's 65 years of fan experience.



You can easily install a Hunter Attic Fan in your home. This compact unit is complete with automatic shutter and modern metal trim to cover the ceiling opening. No suction box to build; no accessories needed. Fan requires only 17 in. attic clearance. Look in your classified directory and phone the Hunter dealer. You can have cool comfort at low cost.

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from Hot to Cool" to:

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Address _____
City & State _____



HUNTER ATTIC FANS

heart, telling the specialist how the heart is behaving. Similarly, the electroencephalograph takes the electrical pulse of the brain. These findings are invaluable in diseases like epilepsy or schizophrenia since the brain-wave machine can distinguish normal brain patterns from abnormal.

What of the future? What can we expect of medicine within our lifetimes?

Today, infectious diseases nearly are conquered. Even tuberculosis, the leading cause of death as late as 1910, is no longer a great menace. Medical men predict the white plague will be a rarity in 20 years. Now our worst foes are the old-age diseases: Heart and blood-vessel disorders, cancer and the neuroses produced by the strain of living in our exciting, exacting era.

Here's the newest in what probably concerns you the most—your heart. First of all, heart surgery has advanced to a point where operations can be performed while an artificial heart pumps blood. The most difficult of heart operations can be done with a minimum of risk.

Furthermore, Dr. Richard Krasno at the University of Illinois has developed an instrument, the "flicker photometer," which will not only call the shots on various types of heart disease but actually will predict whether you are likely to suffer from cardiovascular troubles. The instrument is based on a patient's response to the flickering of light. The tiny capillaries in one's eyes apparently reflect impending heart and blood-vessel diseases.

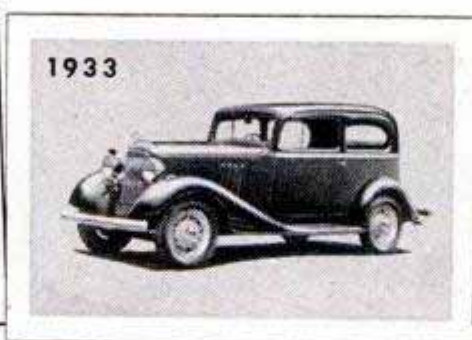
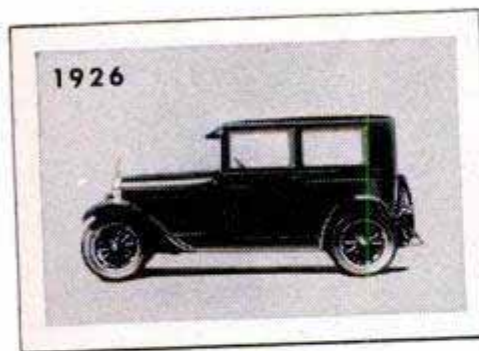
In the same field, Dr. John Gofman and others at the University of California have theorized that the substance cholesterol may be the villain in cases of hardening or aging of the arteries. Cholesterol deposits on the walls of the arteries force the heart to pump harder to keep blood circulating. Gofman found that by reducing the cholesterol intake (fatty foods, primarily) the stuff could be kept from laying its deadly deposit on the arterial walls.

The answer to the country's No. 2 destroyer, cancer, may come more quickly than most doctors thought possible even a year ago. Today, early recognition and prompt treatment with X rays, radium and surgery are saving millions. Yet 200,000 continue to die yearly from cancer in the U. S. Other treatments offering promise of control for certain types of cancer are injections of hormones and immunization.

Discovery that ACTH and cortisone give amazing relief in some types of arthritis, a disease affecting 7.5 million persons in the U. S., opened an exciting field. ACTH, derived from the pituitary gland, is a substance which stimulates the adrenal glands

(Continued to page 238)

on every *Pontiac*

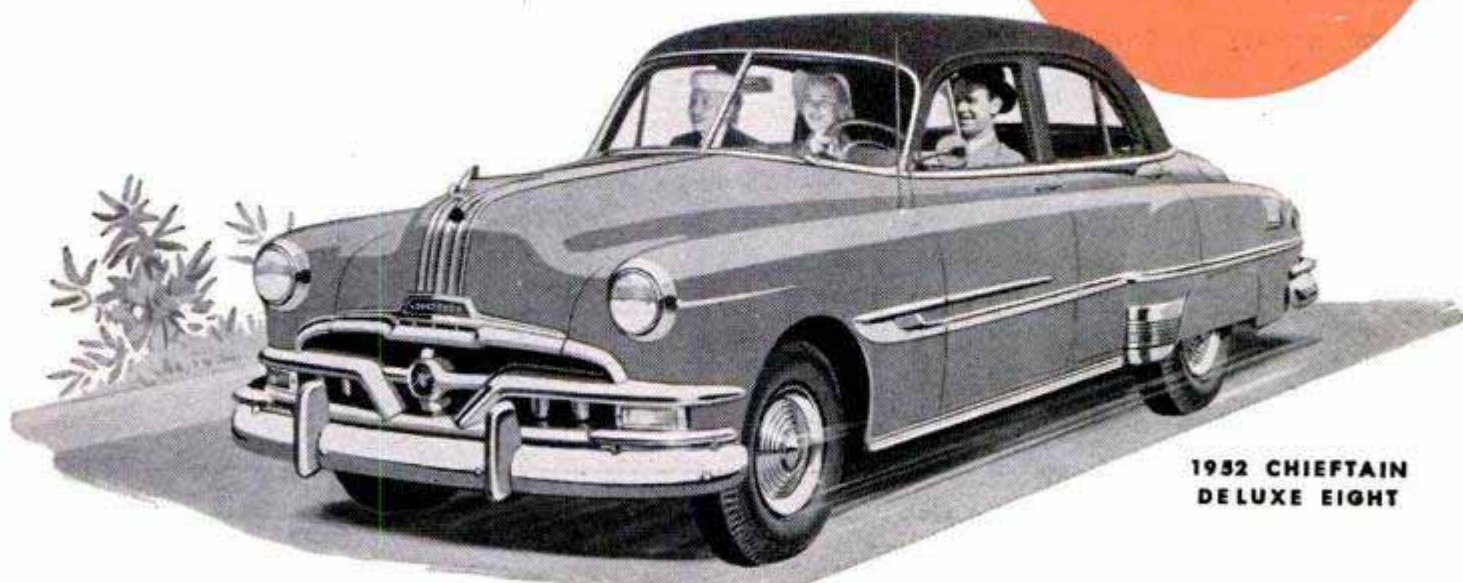
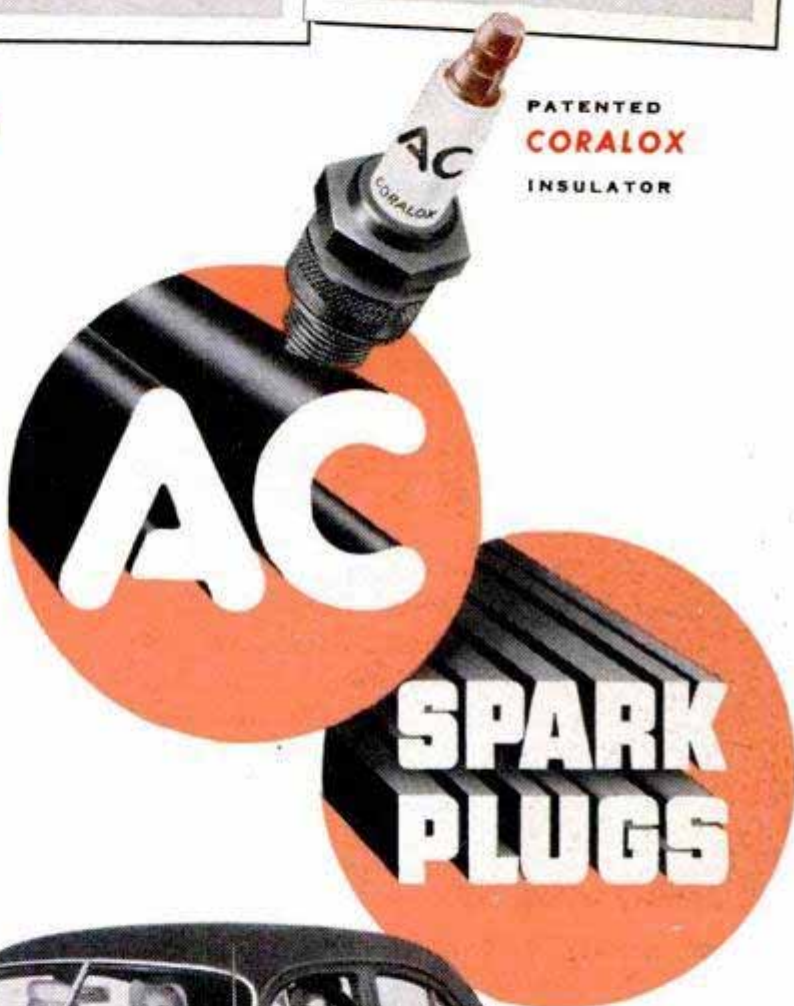


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This Pontiac-AC partnership has been in existence for 26 years -- with Pontiac supplying the power -- and AC providing the spark that helps convert this power into mile after mile of motoring pleasure.

Pontiac relies on AC for split-second starting -- for smooth-sailing performance -- for day-in and day-out reliability. And AC, only Spark Plug with patented CORALOX Insulator, brings about these desired results -- not only for Pontiac, but for all other makes of cars as well.

Are you getting top performance out of your engine? To be sure, specify ACs the next time your car needs spark plugs.



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1/4" Drill
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Speeds Up Drilling—and plenty more!

THIS HANDY Black & Decker 1/4" Electric Drill is so versatile it drives many accessories to handle job after job. So speedy and easy-to-handle it helps you do more work in your spare time. So well-built it gives you trouble-free performance year after year. So down to earth in price you can't afford to be without it. No wonder well over a million have been sold!

Try a B&D 1/4" Drill and accessories today at your hardware, appliance or department store. It's its own best salesman! **THE BLACK & DECKER MFG. Co., Dept. H6M, Towson 4, Maryland.**

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to produce cortisone. Recently, it has been found that hydrocortisone, rather than cortisone, is a true hormone and even more spectacular results have been achieved.

Cortisone dramatically reduces the symptoms of many diseases in addition to arthritis. In pneumonia, for instance, when given cortisone, sufferers are relieved of almost all symptoms including fever, coughing and others produced by the body's reactions to the pneumonia germs. The patient may feel well though the germs are still in there pitching for all they're worth. This teaches an important lesson to scientists. In many diseases, it's the body's allergic reaction to germs that kills the patient, not the germs themselves!

What about our century's particular sickness—neurosis? Almost everybody has that in varying degrees and manifestations. To most, it's evidenced by despondency, anxiety or feeling of insecurity. Happiness or peace of mind is as important to our bodies as penicillin is for specific diseases. Yet it's obvious that we can't all go to expensive psychiatrists.

The outlook for a quick, easy cure is hopeful, at least for 70 percent of us neurotics. The man who introduced shock therapy for the insane, Dr. L. J. Meduna, has come up with another device for curing psychoneuroses. It's carbon-dioxide gas. Breathed twice a week for several weeks, it's been amazingly effective in producing permanent cures, Doctor Meduna reports. I personally can report that his patients are extremely enthusiastic about CO₂ therapy and the doctor's findings have been supported by studies at the Veterans Administration in Chicago.

How can the common soda-water gas, carbon dioxide, achieve the fantastic result of curing your neurosis? It does it by suppressing the harmful, neurotic stimulations which infiltrate our brain cells. CO₂ raises the brain cells' ability to resist these abnormal stimulations.

Almost equally miraculous is the treatment of the truly insane with histamine injections. Based on the theory that insane people suffer from too little oxygen in the brain cells, the new histamine treatment which opens up the arteries is producing cures in schizophrenic and other mental disorders. Sometimes, in stubborn cases, histamine is used along with the electroshock treatment.

So we see that medicine—now the science dedicated to the prolongation of human life as well as treatment of its afflictions—swept like a 50-year typhoon across the records of mankind. Disease, which frequently has struck down man in his prime of life, is being conquered. ★ ★ ★

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A PORTABLE SAW IN ONE MINUTE!

NEW! No. 445 "ARCO-SAW" for
DEPTH & BEVEL CUTS

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Hardware
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Every-
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4" "HYCAR-
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No. 444 "ARCO-SAW", same as
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No. 444G Depth-Bevel-Rip Gage.
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CAN BE USED WITH ONE HAND!

"ARCO-SAW" works like a
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RIGHT ANGLE GEAR
DRIVE eliminates clumsy,
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drill sideways.

CUTS 1-1/4" or 2x4 by
turning over

CHECK THESE EXPENSIVE FEATURES:

Depth gage graduated from 0
to 1 1/4" depth (for grooves,
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from 0 to 45° angle (for dove-
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sideways adjustment. Visual
guide with adjustment to follow
lines on both straight and bevel
cutting. **90-DAY FACTORY
GUARANTEE.**

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DRAINS Cellars, Laundry Tubs; CIRCULATES Oil; IRRIGATES Gardens

Original "Type P" Pump has 2400 GPH capacity.
360 GPH 75' high, or 1500 GPH from 25' well.
Use any 1/8 to 1/2 HP motor. DOES NOT CLOG.
1" intake; 3/4" outlet.

Only \$8.95 postpaid if cash with order.
(West of Mississippi, add 50c.)

Motor coupling included.
MONEY BACK GUARANTEE!

LABAWCO PUMPS, BELLE MEAD 7, N. J.

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Give Wings to Work

ASK YOUR
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POWER MOWERS & KITS

**FREE
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Build your own quality
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America's Finest Power Mowers complete-
ly assembled in 3 and 4 wheel models.
Belt or direct drive. 18" and 20" sizes.
Nationally known make engine. Latest
improved features, sturdy construction
and money back guarantee fully described
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HAZARD
HITCH
A RIDE
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You have a fire-
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drive a car with
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do cause automo-

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trucks and buses go up in smoke every
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Don't play with fire. See that *your* wires
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When wiring is bad, install new genuine
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BE YOUR OWN BOSS! Men who are determined to get ahead in something for themselves will find this opportunity hard to beat! Where else can a man turn his own labor so quickly and easily into **BIG MONEY!** Earn as high as \$50 and more a day sanding floors with an easy-to-run American Machine—and **YOU ARE BOSS.** Prospects everywhere—old and new homes and remodeling. Pleasant indoor work—steady the year round. No schooling—no experience needed. Age makes no difference—men 18 to 80 are active and successful. Send coupon for "money-making" booklet entitled "Opportunities in Floor Surfacing"—enclose 25c in coin or stamps to cover handling.



AMERICAN FLOOR MACHINES

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The American Floor Surfacing Machine Co.
535 So. St. Clair St.
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Enclosed find 25c in stamps or coin for booklet "Opportunities in Floor Surfacing", telling me how I can start my own floor sanding business.

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The Owners Report on the MG

(Continued from page 92)

Quite a few owners regretted that the factory had switched from wire wheels to disk wheels for this model and others didn't like the absence of gasoline and water gauges. But the over-all number of unfavorable complaints on the MG in this survey was remarkably low.

My Own Road Test and Report: I drove the test car over good highways, back roads and some miles in the desert and mountains.

It really is a thrill to drive an MG because the driver seems to become a part of

CLYMER'S ECONOMY TEST

MG MIDGET TWO-SEATER

(Using premium gasoline of popular brand)

Miles per Gallon	
At constant 30 m.p.h.....	34.8 m.p.g.
At constant 50 m.p.h.....	30.1 m.p.g.
At constant 60 m.p.h.....	26.3 m.p.g.
At constant 70 m.p.h.....	23.2 m.p.g.
Average Miles per Gallon	
Los Angeles to Bakersfield and return (241 miles). Open stretches and some mountain grades.....	28.7 m.p.g.
50 miles in city traffic obeying all speed laws and traffic stops.....	24.7 m.p.g.

the car. The ride is not comparable to that in a large American car insofar as comfort or suspension is concerned. But the MG exceeds any American car in ability to corner at high speeds and to maneuver quickly around sharp turns because of its low center of gravity, stiff suspension, steering-gear ratio and general design. Traction is excellent: 51 percent of the weight is on the rear wheels. The hood is quite long and the driver soon forgets that he actually is in a small car.

The four-cylinder overhead-valve engine has a displacement of 76.6 cubic inches with 54.4 horsepower at 5200 revolutions per minute. The engine size is less than half that of the Henry J, Willys or Nash Rambler—and less than one third the size of a Ford, Chevrolet or Plymouth engine—yet the car will do an honest 80 miles an hour and can cruise all day long at 60 to 65 miles per hour. Most sports-car drivers are "r.p.m. conscious" and drive by tachometer, a gauge which shows engine revolutions per minute. While the MG will turn over at 6000 revolutions per minute, about 5000 is considered safe engine speed for the average driver. For the size of the engine (it has approximately the same cubic displacement as the engine in a large American motorcycle), performance of the MG

(Continued to page 256)

GROBAN'S WAR SURPLUS BARGAINS

ALL BRAND NEW-UNCONDITIONALLY GUARANTEED

General Motors — Allison CENTRIFUGAL PUMP

BRAND NEW

200 GALLONS PER MINUTE



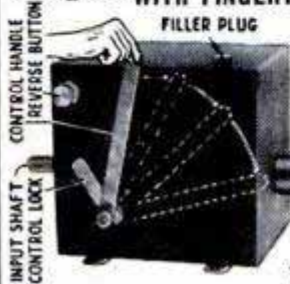
- For Draining Basements • Fire-Fighting
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This General Motors—Allison Centrifugal Pump — designed for use on U.S. Air Force Mustang Fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/2" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counterclockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost \$145.00. F.O.B. Chicago.

39.50

HYDRAULIC SPEED REDUCER

ITEM #115 WITH FINGERTIP CONTROL



- USE FOR:
- Reamer
 - Drives • Midget Cars • Feed Mills • Output Can - Shafting • Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7 1/2"x8 7/8"x11 1/2". Gov't acquisition cost, \$428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago

54.50

1/4" ELECTRIC DRILL KIT STANDARD DUTY MODEL 77-5



Item #348—contains 1/4" Electric Drill with 3-jaw knurled chuck, double pole automatic electric switch, 10' rubber covered—oil and gasoline resistant cord and pistol grip handle. Drill has universal 115 volt AC-DC motor, precision heat-treated alloy steel gears enclosed in grease tight housing. Accessories include drill bits in graduated sizes, sanding discs, lamp's wool buffer, wire buffer wheel, mounted grinders, etc. All enclosed in sturdy metal box. Shipping weight 8 lbs. A terrific buy! F.O.B. Chgo. Only

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NEW MODEL 353 — DUAL RANGE D. C. ARC WELDER

For Stationary or Portable Use. HEAVY DUTY RANGE TO 250 AMPS. NEW 'MAGIC TERMINAL' FOR LOW CURRENT 30 TO 100 AMPS. IDEAL FOR FARM • FACTORY • GARAGE • WORKSHOP

These precision engineered D.C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have over-sized lifetime grease-sealed ball bearings, air cooled commutator, dial type rheostat for easy pin-point control, a high-low rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL', low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep, 7 1/2 HP electric motor or 10 HP gas engine at 2500 R.P.M. Uses two V-belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps, 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Shipping weight 107 lbs. \$350.00 Value. Item #65. F.O.B. Chicago Now only

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MANY SIZES

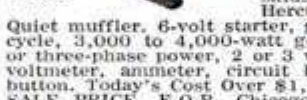
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Plenty of emergency stand-by or general utility power from 350 watts to 25 KVA.

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— FEATURES — Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. SPECIFICATIONS—Size 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter.

ITEM #183



Quiet muffler, 6-volt starter, generator. • Hobart 115 volt, 60 cycle, 3,000 to 4,000-watt generator. • Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's Cost Over \$1,200.00.

SALE PRICE, F.O.B. Chicago

Item #178—350 watt—110 volt—60 cycle A.C. direct coupled to 1 cylinder Midco engine. Shpg. Wt. 116 lbs. F.O.B. Chicago

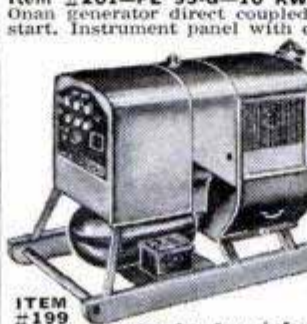
Item #182—Onan Generator—5KW—120 volt—60 cycle A.C. single phase, direct coupled to Ford 4 cylinder, water cooled engine with push button start, battery ignition. (Battery not included.) Shpg. wt. 1200 lbs. F.O.B. Chicago

Item #199—Power Unit PE-99—7.5 KW—120 Volt—Single and 3-phase—60 Cycle A.C. Master generator driven by a 4 cylinder, V-type, air cooled, Wisconsin engine with magneto ignition, push button start. The self-excited, drip-proof generator is driven from 5 parallel V-belts. Control panel contains engine and generator instruments, including circuit breaker, emergency start-stop buttons, volt meter, ammeters. Complete semi-enclosed unit mounted on steel skid. Weight 1885 lbs. F.O.B. Chicago

Item #201—PE 95-G—10 KW—110/220 Volt 60 Cycle A.C.—Single Phase. Totally enclosed. Onan generator direct coupled to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. (Battery not incl.) Skid mounted. Ship. wt. 1500 lbs. F.O.B. Chicago

Item #347—PE-201—1000 Watts—120 Volts—20 Cycle AC—Single Phase, and .3 KVA, 14.6 Volts—20 Amps. DC for battery charging. Model A. Leland Generator, belt driven by a Briggs & Stratton 1 cylinder, air cooled, 2.7 HP gas engine at 1800 RPM. Control panel contains DC voltmeter, ammeter, rheostat, receptacle and terminals. Also AC frequency meter, rheostat, 120 volt double receptacle and terminals. Overall dimensions, 34"x19"x24". Ship. wt. 250 lbs. F.O.B. Chicago

Item #199



Write for free information on other generators — 350 Watts to 25 KVA

ITEM #178



ITEM #182



ITEM #126



BRAND NEW HEAVY DUTY HYDRAULIC EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arborers, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.



ITEM #160

ITEM #160—PESCO GEAR TYPE HYDRAULIC PUMP—Compact—Powerful—Reliable. Especially designed for belt drive from fan belt, power take-off, drive pulley, electric or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for 3/4" hold-down bolts. Standard 1/2" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 3 HP. Will actuate one Item #6, 3" bore, 24" stroke cylinder in 10 seconds. Hardened steel gears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago

22.50

ITEM #126—Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8 1/4 lbs. An outstanding Buy! F.O.B. Chicago

21.50

ITEM #127—Double acting hydraulic cylinder, 1" bore, 1" stroke, 1/2" diam. shaft, 1/4" tubing thread ports. Over-all length closed — 6 1/2". Clevis mounting at both ends. Perfect for clamping and feeding. Postpaid

5.95

ITEM #16C—Double acting hydraulic cylinder, 1 1/2" bore, 26" stroke. Will lift 1700 lbs. with 1000 PSI line pressure. Weight 8 lbs. A \$55.00 value. Now only. Postpaid

16.95

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for

32.50

ITEM #103—Double acting hydraulic cylinder, 2 1/2" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft, 3/8" tubing thread ports. Overall length closed 28". Ship. wt. 11 lbs. F.O.B. Chicago

21.50

ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1 1/8" stainless steel shaft. Gov't acq. cost \$176. Ship. wt. 26 lbs. F.O.B. Chicago

28.00

ITEM #29KJ—Gear Type Hydraulic Pump. Ideal in industrial applications and for operating all hydraulically powered farm implements including loaders, stackers, swathers, plows, etc. Delivers 1000 PSI (may be set at lower PSI if desired), 12 GPM at 400 RPM. Maximum operating speed 800 RPM—rotation counter clockwise. Has built-in relief valve, permanent or torque bar mounting, 1" diameter shaft, 3/4" pipe tap inlet, 1/2" pipe tap outlet. Ship. wt. 22 lbs. F.O.B. Chicago

45.50



ITEM #29KJ

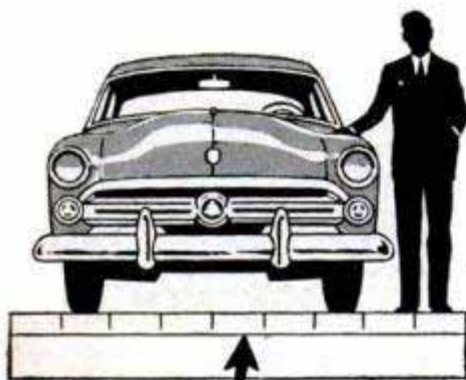
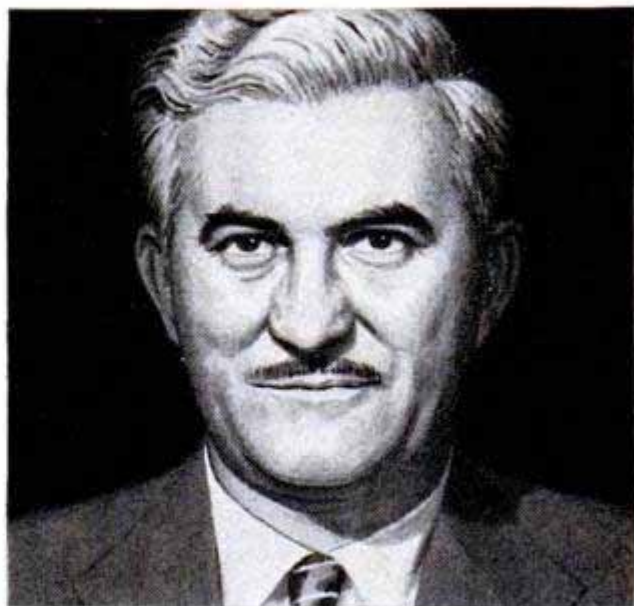
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Here's how Ford controls

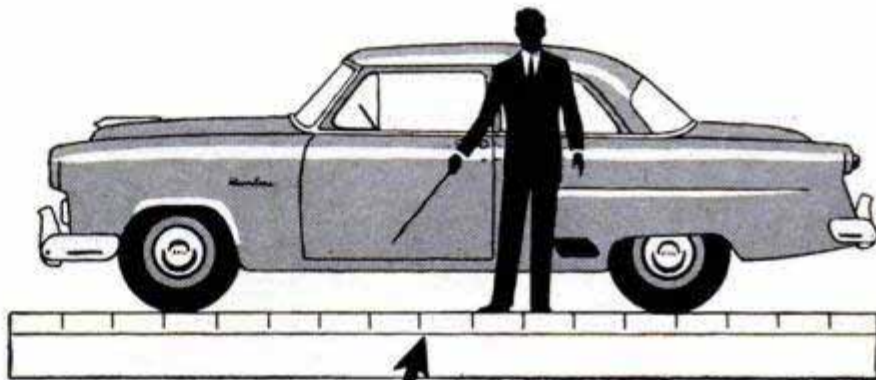
A picture story by Dr. Roy K. Marshall

Dr. Marshall is a former consultant to the Atomic Energy Commission and a well-known lecturer. He is nationally famous for his simplified explanations of complicated things.



1 New wider front tread.

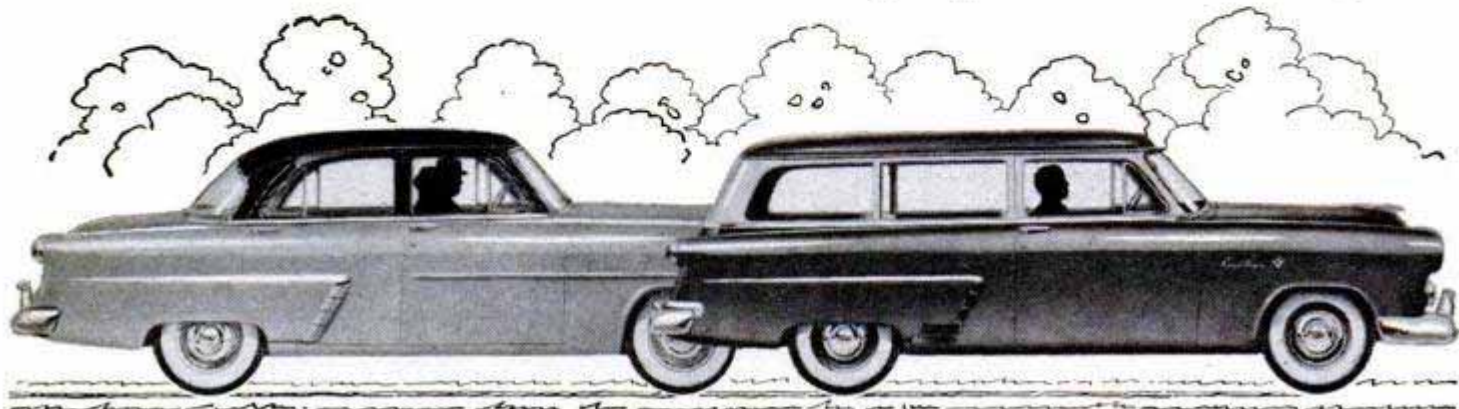
"Ford's wider front tread plus a longer, heavier anti-sway stabilizer bar combat the normal tendency of a car to lean over on curves."



2 New longer wheelbase.

"Ford's longer wheelbase plus lower center of gravity help give you a road-hugging ride with practically no road vibration . . . even in rough going."

You can pay more but you

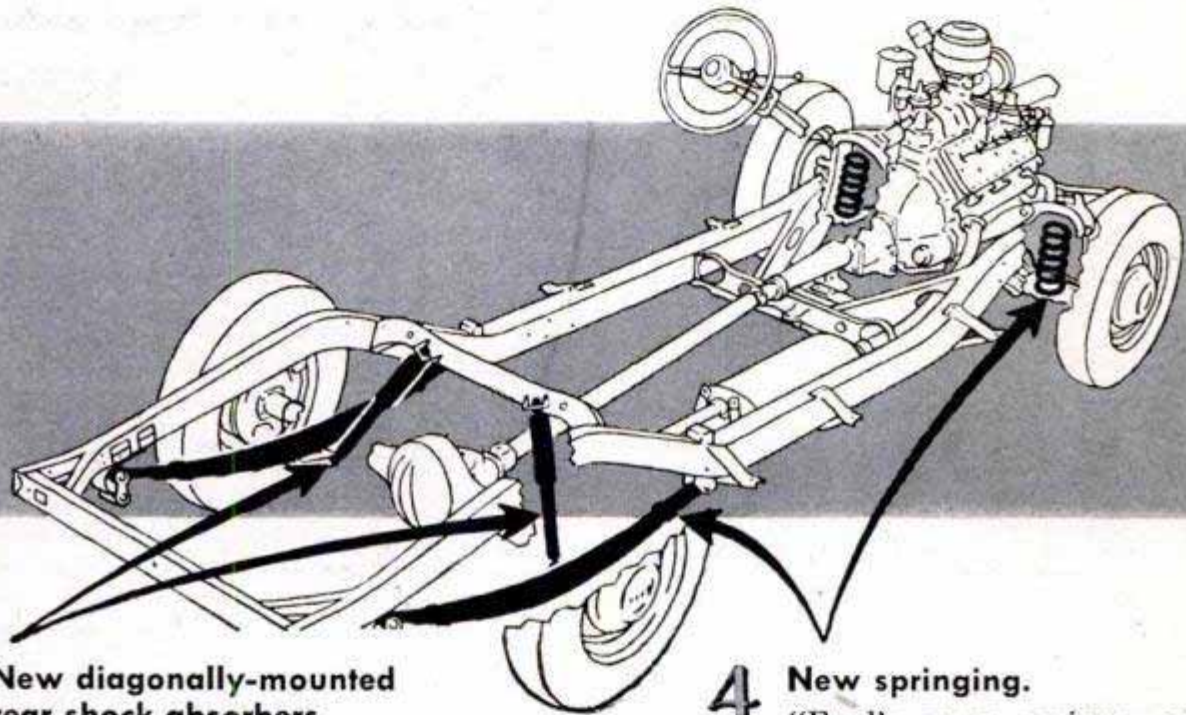


your ride automatically

"Ford's New Automatic Ride Control effectively eliminates objectionable sidesway and absorbs bumps."

"Folks who have driven the 1952 Ford ask me to explain what's behind its obviously smoother ride, behind the way it seems to level out the curves. The answer is many things . . . and they all add up to Ford's

Automatic Ride Control, a unique system of balance and suspension. Below, I explain the major elements of this system which automatically adjusts the car's ride to meet every change in the road."



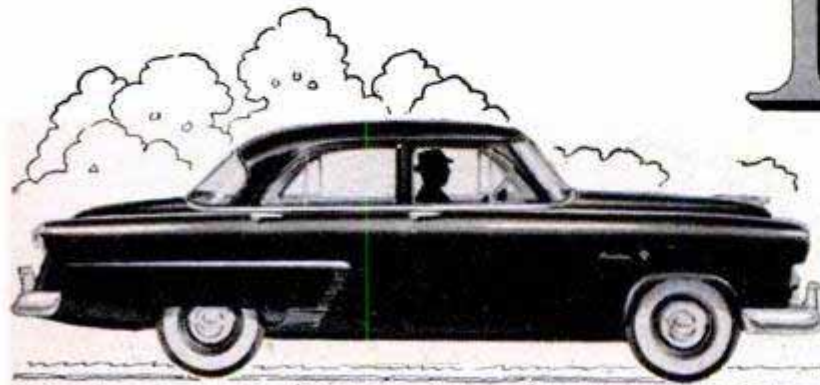
3 New diagonally-mounted rear shock absorbers.

"They 'lean in' to help hold the car level on curves, adjust their 'give' as road conditions change."

4 New springing.

"Ford's rear springs are three inches longer for easier action. Front springs are tailored to each model's weight for more precise ride control."

can't buy better!



Ford

White sidewall tires and two-tone combinations illustrated, optional at extra cost. Equipment, accessories and trim subject to change without notice.

Clean hands

FAST!

but save your skin!



Boraxo "melt-away" action cleans hands faster, gentler than any other hand soap!

No harsh abrasives! Boraxo powdered hand soap contains tiny soluble crystals that clean paint, grease, stains, ground-in dirt, leaving hands and knuckles soft! A *must* for every man who has a workshop, or works on his car, in his garden, or around the house. Get hands *safely* clean in 30 seconds flat, with BORAXO! . . . for all the family!

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Boraxo Home Dispenser plus giant 16-oz. can Boraxo, both only

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The Home Dispenser is white, refrigerator-type baked enamel on rugged 12-ga. steel! Holds many weeks' supply of Boraxo! One-piece plunger mechanism will not clog! Built to last . . . easy to install . . . this is a real bargain you'll be glad to own and use for years to come!

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Please send me *postpaid* the Boraxo Home Dispenser and giant 16-oz. can Boraxo. I enclose \$2.95 (in check or money order). If not entirely satisfied I may return them for prompt refund. Offer good in U. S. only.

Name

Address

City.....Zone.....State.....

Electron-Coupled Code-Practice Oscillator for Group Instruction

(Continued from page 213)

50-ma., five-watt type. The cabled leads should all be long enough so that the chassis can be removed from the speaker case without removing the plug from the socket. When mounting the jacks on the metal cabinet, be sure to use fiber washers so the jacks are insulated from the speaker case. The volume control enables the operator or instructor to adjust the volume to any suitable level. The variable pitch control can be adjusted to sound like actual "on the air" transmissions. The unit is easily portable, and jacks provide for the insertion of either telegraph keys or headphones at the student operating positions indicated in the student-group sketch. These jacks, connected in parallel as shown in Fig. 1, may be mounted on small Bakelite panels at each operating position. The terminating plug can be inserted by the instructor in either the phone or key jack on the cabinet for copying or keying practice. Any number of keys or phones can be plugged in for student participation.

The heart of the instrument is a stable electron-coupled oscillator circuit employing a 50L6-GT tube as an oscillator, and a 50L6-GT amplifier stage. There will be no appreciable change in the pitch with line-voltage variations. The oscillator coil T1 is the center-tapped primary winding of an ordinary universal-type output transformer. The one used was a four-watt type, with a primary impedance of 4000-14,000 ohms. The builder should experiment with the various taps on the secondary winding in order to locate those which will provide the greatest tone variations without stopping the oscillations as the secondary winding is short-circuited. The oscillator signal is resistance-capacitance coupled to the power-amplifier stage. This stage furnishes the necessary power to drive the speaker or several sets of headphones. The secondary of the speaker output transformer is connected to a closed-circuit, make-break jack which determines whether the output is to go to the speaker or to the headphones. As headphones are plugged in, the speaker is automatically disconnected.

An a.c.-d.c. power supply is employed; a 150-ma. selenium rectifier is used to rectify a.c. line voltage. If the unit is used on a 110-volt d.c. line, it may be necessary to reverse the line plug in the wall socket if the unit does not operate when first plugged in. Detailed student material list R-410 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

BUILD YOUR OWN ARC WELDER OR LIGHT PLANT

DELCO D-C GENERATOR

Save \$250 to \$500

\$17.50



Instructions included. Rated 200 Amps, 28 Volts, 2500 R.P.M. Ship. wt. approx. 50 lbs. Stock No. 707

PRICE F.O.B. K.C. MO.

CONVERTS TO ARC WELDER 200-250 AMP. OR LIGHT PLANT CAP. LOAD 5000 WATTS

Stock No. 711 D. C. Generator R-1 Jack & McIntz, rated 300 Amp. 30 Volts. Gov't cost \$300.00. Instruction for converting to welder or light plant incl. Also instructions and diagram for converting the R-1 or Delco generator to Combination Welder and Light Plant Included. Only... **\$27.50**

CARBON FILE GENERATOR VOLTAGE REGULATOR
For use with 24 or 32 Volt D. C. Generators. Also recommended for the P-1 and R-1 type generators in "build your own" Light plant. Only... **\$6.95**



R-21 HEAVY DUTY RHEOSTAT
Brand New for regulating voltage on ELECTRIC WELDERS, model trains, electric blankets, lights, control photoflood lamps, etc. Rated 16-32-ohms. Size 3 1/2" x 2 1/2" postpaid... **\$6.95**

WEAVERS HYDRAULIC HAND PUMP
BRAND NEW INCL. BUILT IN CHECK & RELIEF VALVE. For hydraulic jacks, presses, hoist, etc. For operating hydraulic cylinders to pump oil or hydraulic fluid under pressure, and is capable of delivering 1000 lbs. pressure. Wt. 10 1/2 lbs. A \$50.00 post-value. Instr. incl. Price... **\$12.95**

Valuable Gears — Bargains — Speed Reducers
10-1 or 5-1 ratio, 90 degree angle. Shaft driven 1/2" spline shaft with 3 mounting holes 5/16". Gears held in forged and machined aluminum housing with two needle bearings, one bronze bearing, and three high speed shielded bearings. Rated **\$5.95** postpaid

New Ampidyne MOTOR GENERATOR
Use as 24/32 D.C. motor, pulls 1/2 HP. Applicable for 110 V. A.C. by simple change in connection. Applicable to independent and rural lighting. Instructions incl. Cost over \$140.00... **\$7.50**

SENSATIONAL SELSYNS
Two or more connected together, work perfectly on 110 V. A.C. For weather vanes, rotating directional antennas or controlling distance operations. Complete with diagram and instructions. Wt. 3 1/2 lbs. PER PAIR... **\$7.95** Postage paid

Hydraulic Solenoid Control Valve
BENDIX. No. 81560 24V. D.C. For remote control operation and to operate one single action or double action hydraulic cylinders with 24 V. D.C. Recommended pressure 800 to 1500 P.S.I. connections are 3/50"-18thd. Also applicable for 115 V.A.C. Instructions, Diagrams & Data incl. \$35.00 ea. **\$3.50** pair

RIGHT ANGLE DRIVE with 1 to 1 ratio through 90 degree bevel gears. Drive and take off shaft are 3/8" dia. Self lubricating. Size 3 1/2" x 2 1/2" x 1 1/4". Rated 1/2 HP. at 1750 R.P.M. Ideal for use with power tools, etc. Has three 3/16" mounting holes on 1-5/16" post-center. Price... **\$3.50** post-paid

CUNO OIL FILTER — Brand New
Aircraft type. Filters oil without cartridge replacements. Just turn handle and cartridge is clean. Standard 3/4" inlet and outlet ports to accommodate 12 gallons per minute. STOP CHANGING OIL. Instructions **\$4.95** post-incl.

Send check or money order — all prices FOB Kansas City, Mo. except

ELECTRIC MOTOR 1/2 H.P. 24 Volt D.C. R.P.M. 2500. Amp. 22 #HCA24. Gov't cost \$75.00. Brand New... \$5.50

ELECTRIC MOTOR 1/4 H.P. 28 Volt D.C. R.P.M. 4000 #2832 with simple instructions to convert to 28-32 Volt A.C. Gov't cost \$82.84. Brand New... \$4.50

ELECTRIC MOTOR 1/4 H.P. 24V. D.C. 2000 R.P.M. Applicable for 115V. A.C. Instructions incl. Stock #4949... \$3.50

ELECTRIC MOTOR 6 Volt D.C. Delco. Handles 6" blade, ideal as windshield wiper, car heater motor, toy application, etc. 1/4" dia., 1 1/2" long shaft, size 5"x3", 1200-2000 RPM, incl. 2 mounting studs... \$2.95 post-studs.

AIR FILTERS

Framed air filter for air conditioner, heater, or windows, made of metallic with metal frame to give years of service. Can be easily cleaned to be as good as new again. 4 1/2" x 5 1/2" x 2". Wt. 8#. \$25.00 Value. **\$2.50** each. FOB K.C., Mo.

HY-PRESSURE CYLINDER

Valve and safety locking pin. Applicable as tire inflator, fire extinguisher, spray painter, life raft, etc. Shatterproof. **\$2.95** plus 35c Size 12"x2 3/4". Price...

ECLIPSE MOTOR GEAR UNIT

Brand New including 24V. D.C. Motor Gear ratio 4:1, can be adapted for 2:1, 40:1 & 20:1. Gear unit with separate A.C. motor makes ideal GARAGE DOOR OPENER, HOIST, PUMP JACK, HAYLIFT, LAWN MOWER DRIVE, DRIVE FOR POST DRILL, etc. diagrams & instructions incl. Gov't cost \$221.00. **\$12.95**

D. C. GENERATOR. Brand New. Delivers 430 Volts at 3450 RPM. Ball bearing supported, air cooled, armature base mounted. Wt. 23 lbs. #211220-A... \$7.50

UTILITY PUMP ROTARY VANE TYPE
FOR WATER, OIL, INSECTICIDES. Also applicable as Automobile Crankcase Drain Pump. Pressures 70 lbs. 12 gal. per minute at 200 R.P.M. Vacuum pump for milking machines, compressors, lab., etc. 1/2" pipe thread ports. Data & instructions incl. Stock #27... **\$12.95** post-paid
Utility pump stock #75 is the same as #27. Has about once and half time the volume. Wt. 12 lbs. **\$15.50**

ROTARY PUMP For pumping WATER FROM LILY POOLS, OR BASEMENT'S SUMP, pumping lubricants. Applicable for Garden & lawn sprayers. For use with hydraulic cylinders, vacuum, in dental lab, etc. Capacity 180 G.P.H., 200 lb. pressure. 29 in. vacuum. 500 to 3000 R.P.M. Steel shaft Std. 1/2 in. Stock #101. Instructions incl... **\$6.95**

Thompson Motor Driven PUMP
Including Built in Motor. Applicable for 24 V. D.C./A.C. or 110 V. A.C. The motor is explosion proof constructed. Pumping GASOLINE, FUEL TRANSFER, HOT WATER HEATING CIRCULATOR, USE IT AS COOLANT PUMP, FUEL BOOSTER, OIL PUMP, etc. Discharge connection is for 1" hose. Rated Capacity 300 G.P.H. Direction & data incl. A tremendous bargain! Stock No. 1200—Only... **\$9.95**

PESCO FOUR VANE ROTARY LARGE VOLUME UTILITY PUMP
For Water, Oil, Insecticides, etc. including built in relief and bypass valve. Capacity 400 G.P.H. 1/2" drive spline shaft. 3/4" pipe inlet and outlets. Rotates either direction or in any position. Engineering data incl. (Stock #600) **\$7.95** post-only

Adel Self-Priming ELECTRIC PUMP
For pumping light oils, oil burners, fluid metering, fuel pump, cool post grinder, coolant, pressure lubricating pump, etc. 1/30 H.P. rated 12000 R.P.M. Applicable for 24 V. D.C./A.C. or use on 110 Volt A.C. Size 6 3/4" x 3 1/4" x 3 1/4". rated 3 G.P.H. Diagram and instr. incl. \$50.00 val... **\$9.95** post-instr. incl.

FIRE EXTINGUISHER or INSECTICIDE PUMP SPRAYER. Four Gallon size includes approx. 3 ft. of high pressure hose with fine mist nozzle. Ship. wt. 15 lbs. via Express or Freight. Used, good condition. f.o.b. **\$2.50** each. K.C., Mo.

HYDRAULIC FLUID Mfg. by R. M. Hollinghead or Sacony Vacuum to exact Gov't spec. \$1.75 Gal. Wt. 10 lbs. Plus postage.

Stratopower Constant Displacement HEAVY DUTY PUMP



For operating Hydraulic cylinders, bulldozers, construction machinery, lift trucks. For fuel or oil transfer, Industrial applications, etc. Delivers up to 400 G.P.H. at 3750 R.P.M. Rated 1250 to 1400 P.S.I. 3750 to 4500 R.P.M. HAS BUILT IN RELIEF AT HEAD. Rotation either direction without adjustment. \$100.00 value. Engineering data and instr. incl. Stock #37. Wt. 8 lbs. **\$17.50**

AIR OR OIL HYDRAULIC CYLINDERS
Stock No. 512
Double action hydraulic cylinder 2 1/4" Bore, 4" Stroke, Dia. 3/4" shaft including built in hydraulic control valve which may be operated with rod or lever. Clevis mounting. Overall length shaft retracted 14" \$75.00 value. f.o.b. KC, Mo. value. Wt. 9 lbs. **\$12.95**

Double Action 1 1/2" Bore, 6" Stroke, 5/8" Dia. Shaft. Clevis mounting base and shaft end. Capacity 1160 lbs. with 1000 P.S.I. input. Has a capacity of 1625 lbs. with our STRATOPOWER 1400 P.S.I. A \$50.00 value. **\$8.95** Postpaid Only

Stock #303—Double Action 2" Bore, Stroke 1 1/4", Dia. 1 1/2" Overall length shaft retracted 23". 2000 lbs. capacity with 1000 PSI gives 2800 lbs. with our f.o.b. stratopower. Wt. 14 lbs. **\$14.95** KC, Mo.

Stock No. 12 Hydraulic Cylinder Double Action output 12560 lbs. with 1000 P.S.I. input. Gives 17584 lbs. with our STRATOPOWER PUMP 1400 P.S.I. or will produce 34168 lbs. with 3000 line pressure. Can also be operated on low pressure system. 4" Bore, 10 3/4" Stroke 1-5/16" Shaft, clevis mounting. O. Gov't cost **\$27.50** f.o.b. \$300.00 KC, Mo.

Pesco Hydraulic Flow Equalizer & Pressure Balancer Valve.
Brand New. Guarantees equal flow, and equal pressure for two cylinders or two systems. Capacity 360 G.P.H. 1500 P.S.I. Data & instructions incl. A \$75.00 value. **\$14.50** postpaid Stock 1-D-397 only

HYDRAULIC CONTROL VALVES
Adel Precision #B-10329. For controlling 2 single action or 1 double action cylinder. Including toggle lever. When lever is in one direction it puts pressure on one cylinder connection and opens exhaust, from opposite cylinder. When lever is released it returns to the neutral position and locks **\$8.95** post-cylinder. Brand new

VICKERS Four Way Hyd. Control Valve #137
For two double action cylinders allowing operator to raise or lower the both cylinders simultaneously or raise one and lower the other at predetermined rate **\$14.50** post-and speed

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Brand new, with 3 ports and external pressure adjustment. Has two ports for normal flow, one for relief line to fluid supply or to pump inlet. Eng. data incl. A terrific bargain! Stock #575. Only... **\$4.95** post-bargain! Stock #575. Only... **\$4.95** paid

Large Volume hydraulic pressure relief valve. 3/4" ports, spring loaded. Range 1250 P.S.I. adjustable up to 3000 P. S. I. **\$4.95** postpaid Brand New

FOUR WAY VALVE
Solenoid operated on 24 Volt D.C. Applicable for 115 V. AC. Off in neutral position. For operating double action hyd. cylinders, remote control, etc. Has 1/4" tube ports. Instructions incl. Brand New **\$8.95** post-#324

HYDRAULIC PRESSURE GAUGE. New for High pressure hyd. systems. Range 0 to 2000 P.S.I. 2 1/4" dia. 1 1/4" deep. Black instrument face with white pointer and numerals. Uses 1/4" MPT fittings. **\$3.50** post-paid

Hydraulic Accumulators — Bendix Ball Type. Dia. 5 1/2". Built to stand 2000 P.S.I. Stock #A-65. Wt. 4 lbs. only **\$8.95**
BENDIX ACCUMULATOR. Ball Type. Dia. 10". Built to stand 2000 P.S.I. Wt. 15 lbs. Stock #A-85. Only... **\$17.50**

VICKERS CONSTANT DISPLACEMENT HYDRAULIC PUMPS. Brand New Stock No. PF-713-20. For any type liquid pumping job. 375 gal. per hr. at 3750 R.P.M. 1000 P.S.I. 410 cu. in. per rev. Gov. **\$17.50** post-cost \$100.00

ALTERNATING SHUT-OFF VALVE
Brand New. High pressure. Operates by worm-gear cam operating poppets to alternately close & open either pair of four ports. Standard 3/4" pipe **\$5.50** post-ports. \$50.00 value only... **\$5.50** paid when marked postpaid U.S.A.



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Alcan photo

There are snow and ice in the triangle, too! This is a survey crew plotting route of proposed power line

Boom in the Big Triangle

(Continued from page 107)

giant aluminum-reduction plant which will utilize Kemano's power, eventually will be a major seaport with 50,000 residents.

Less than a year ago, six carpenters pulled into the lonely, uninviting shore line up-fiord from an ancient Indian settlement and clambered ashore to build a work cabin. Now trees have been cleared, docks line the waterfront and permanent camps have sprung up. Before long, first shipments of aluminum's basic raw materials, bauxite and cryolite, are to be unloaded at Kitimat; by 1954, first ingots will be produced. Plans call for an annual output of 1.1 million pounds of aluminum by 1956.

While Alcan's initial surveys were piercing into the watersheds of the Nechako and Fraser three years ago, Columbia Cellulose Company was drafting final blueprints for a purified pulp mill at Prince Rupert. The \$27,000,000 plant went into production in the summer of 1951. Reaching far beyond the 35-acre site of the mill, Columbia's venture embraces 600,000 acres of forest ranged along the Skeena and the Naas, all within a 150-mile radius of Prince Rupert.

To guarantee a perpetual supply of first-quality pulpwood, Columbia's foresters have adopted a cutting schedule based on 100 years' rotation. This entails patch logging, a common-sense approach to the problem of reseeding logged-over limits. Boiled

(Continued to page 248)

You'll find hundreds of time and money-saving uses for this

NEW 2 SPEED 100° ANGLE

BUFFING AND SANDING ATTACHMENT

A complete kit with 2-speed, 100° angle drive unit, 5" rubber pad, 2 5" sanding discs and 5" lamb's wool bonnet. **\$845***

*Price slightly higher in West and Canada



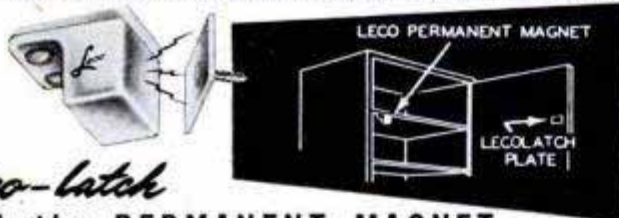
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FITS ANY 1/4-INCH ELECTRIC DRILL and makes it an efficient rotary polisher and sander. Operates at 1/2 or twice drill speed. Exclusive 100° angle feature keeps drill and cord clear of work. A sturdy, smooth-running tool that makes countless jobs quick and easy. Grease sealed lubrication. Machine-cut steel gears. Ask for it at your hardware dealer's.

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with the **PERMANENT MAGNET**

No Moving Parts • No Springs • Absolutely Trouble Free

Utilize the continuous energy of the Permanent Magnet. It will work for you silently and efficiently for the rest of your life! Lasts forever — nothing to get out of order... Works perfectly — even if doors sag or warp... Doors open easily — without snap, noise or jerk... Holds doors in place firmly, yet gently... Easily installed... Improves appearance.

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16" ELECTRIC, made by a leading rotary mower builder to sell at \$64.50, only **\$39.50**

FOB K.C., MO.

(Use #16 or heavier cord)

- 1/3 H.P. Delco motor with over-load switch.
 - Trimmer type aluminum alloy base.
 - Adjustable floating handle.
 - 1-2-3" cutting heights.
 - 3 replaceable knives.
- Shpg. wt. 46 lbs. Send check or M.O. for 39.50. Shipping charges collect.

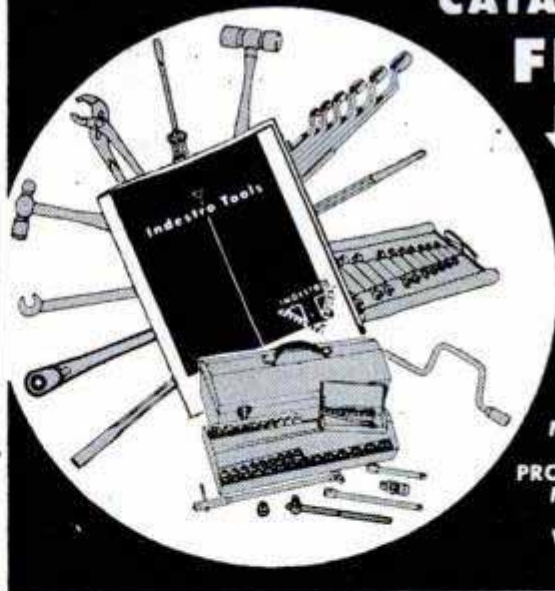


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car may become hard to control...tires wear excessively and unevenly.

Align wheels at least twice a year. Rough roads, shocking jolts and stops throw your car's wheels out of alignment. The result:

Keep up your car's looks. Frequent washing... regular application of finish preservatives not only improve your car's appearance; they lengthen the life of the finish, increase your car's turn-in value. A few do's and don'ts: Keep car under cover whenever possible; never dust with dry cloth; park in the shade.



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FINEST OIL FILTER

Keep a fresh Purolator* Oil Filter Refill on the job. Unique accordion-pleated, plastic-impregnated element (see cut-away at left) provides up to 10 times more filtering area... traps abrasive particles of dirt and hard carbon as tiny as .000039" in

diameter out of engine's oil stream. To keep filter functioning efficiently, replace element before it becomes clogged (a good filter may collect over 2 pounds of sludge and abrasives in 5,000 miles of normal driving). A fresh Purolator Micronic* Refill costs as little as \$1.60. Takes just a few minutes to install.

*Reg. U.S. Pat. Off.

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down, it simply means cutting timber in checkerboard plots, leaving a block of mature trees to reseed the section which has been logged. Where nature's seeding fails, actual reforestation is practiced. R. L. Johnson, woods division chief, claims that patches logged out this summer will bear a top-grade crop 100 years from now.

Based at Terrace, 100 miles east of Rupert, Cellulose woodsmen with portable power saws are downing great hemlock, balsam and spruce. These giants of the coastal forests are trucked to the rail spurs where trains take over. To control the heavy truck traffic cruising its woodland roads, Cellulose is planning an over-all radio-dispatch system.

At Rupert, Cellulose already is producing finished pulp over its rated capacity of 200 tons a day. A new and carefully guarded process introduced in part by researchers of the parent Celanese Corporation has proved so successful that increased output of 100 tons a day is imminent. This pulp is shipped to plants of Celanese for manufacture of chemical yarns and plastics.

Prince Rupert, the northwestern tip of the triangle, now stands on the threshold of a long-overdue development. Rupert is not a boisterous boom city. Her people are cautious; they've seen previous economic surges come and go, leaving little in their wake but disillusionment. Again, Rupert for years has enjoyed an earned reputation as "the fishing capital of the world" and fishermen still make up the basic population. While concerned about factors controlling their own welfare, they're mostly apathetic when gunwale confabs get round to Kitimat and Cellulose. The Aluminum Company's water juggling in the Tweedsmuir Park lakes has worried the industry but fluctuation of the Skeena's salmon run is not a likely aftermath of Alcan floodings.

Rupert's natural caution dates back to early in the century. In 1906 Charles Melville Hays, a vigorous railroad planner from the United States, pounded a desk in Ottawa and told a doubting government that Rupert would become the principal port on the North Pacific, the shortest route to Asia. He backed his beliefs by organizing the Grand Trunk Pacific Railway and immediately shoved survey crews along the Fraser, Bulkley and Skeena rivers.

A hog-wild real-estate splurge hit Rupert in 1909 and lasted until 1912, the year of the Titanic disaster in mid-Atlantic. Charles Melville Hays went down with the pride of the White Star Line. Without its guiding spirit, the railway limped to completion at Rupert, "a ghost train without Hays at the throttle." Steeped in politics, the line

(Continued to page 250)

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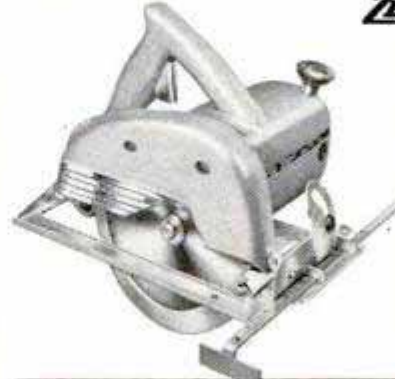


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barely survived the next two years. Rupert's bubble was punctured. The railway struggled through World War I, collapsed in 1922 and became the mate of the also-shaky Canadian Northern under the married name of Canadian National Railways.

World War II brought another glimmer of light to Rupert's commercial horizon. Hoisted into importance as a shipbuilding center, a strategic port and an active military location combining both U. S. and Canadian personnel, Rupert's population zoomed from 6500 in 1940 to 27,000 in 1945. But in one year, at war's end, she lost most of her gains and settled down at 7500. Fishing again became the No. 1 industry.

As No. 1 industry it hasn't been so bad. Millions of dollars are netted each year by Rupert fishermen. In 1950, 2500 of them averaged \$6600 each.

Last summer, a philanthropic member of the Royal Canadian Mounted Police was about to loan a few dollars to a seedy-looking character roaming the streets of Rupert until he learned that the object of his sympathy had earned \$16,000 as a fisherman. A young druggist moved up the coast to open a pharmacy, became a summer fisherman instead, saved \$4000 in his first season.

Salmon is the most valuable catch, with halibut second. Ten canneries operating in the Rupert area last year canned close to one million cases of salmon, a catch which boosted fishermen's incomes by \$10,000,000. Herring, sole and skate are now profitable, while cod fishing has developed into a source of revenue during winter months. But canning of the sockeye salmon still provides the most jobs and incomes.

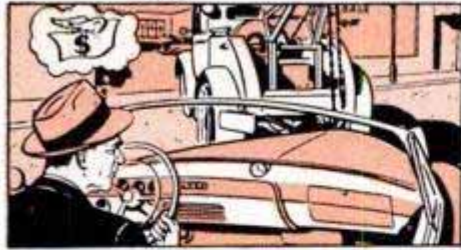
A successful fish cooperative is established at Rupert along with several quick-freeze filleting plants and two independent cold-storage establishments. B. C. Packers' giant plant has a daily freezing capacity of 130,000 pounds of fish and storage vaults for 12 million pounds. Co-op and Atlin combine to add another 10 million pounds of storage.

As science has perfected methods of filleting, canning and curing fish and aided materially in the techniques of storage and marketing, it also has brought improved methods of great value to the fisherman out on the waters. While more capital now is needed to break into the industry, the fisherman stands a far better chance of chugging home with a pay load than did his predecessors of Rupert's early days.

Today, all of the fishing fleet is power-driven. But more interesting are the devices with which the vessels are equipped. The up-to-the-minute fishing craft has a ship-to-shore telephone, a radio direction

(Continued to page 252)

The Biggest Money Saving Idea in Car Maintenance in 20 Years



STOP those endless repairs that keep pulling \$10 bills out of your pocket.

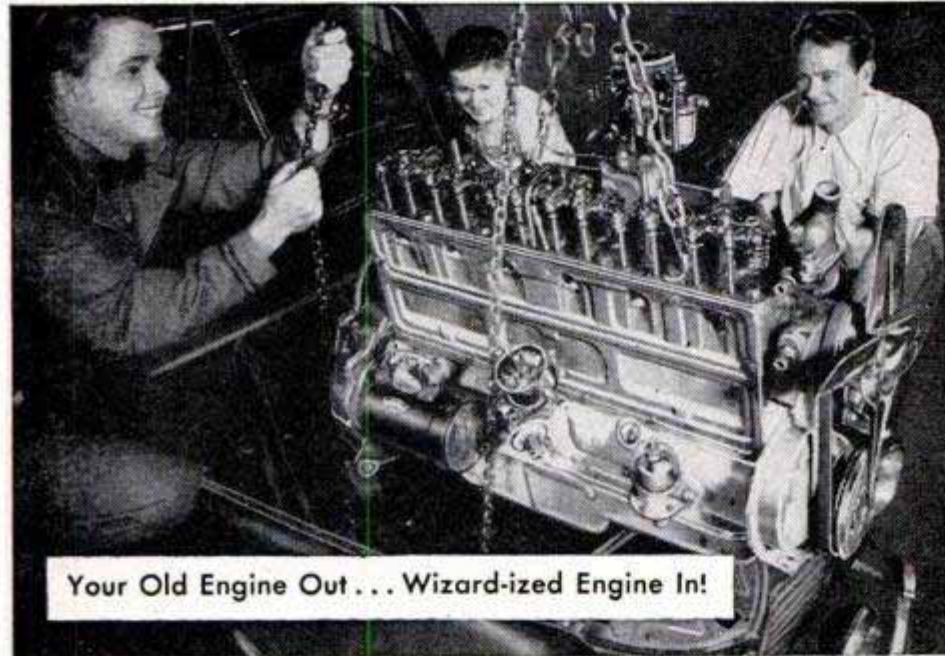


STOP expensive overhauls that still leave things undone to break down later.



STOP paying high gas, oil and maintenance bills on an unsafe, worn-out engine.

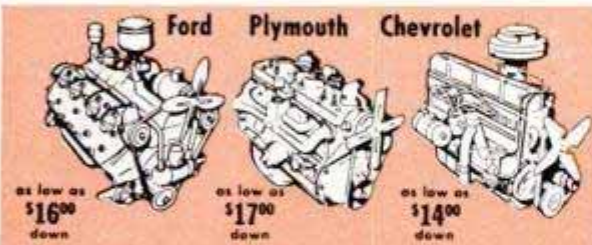
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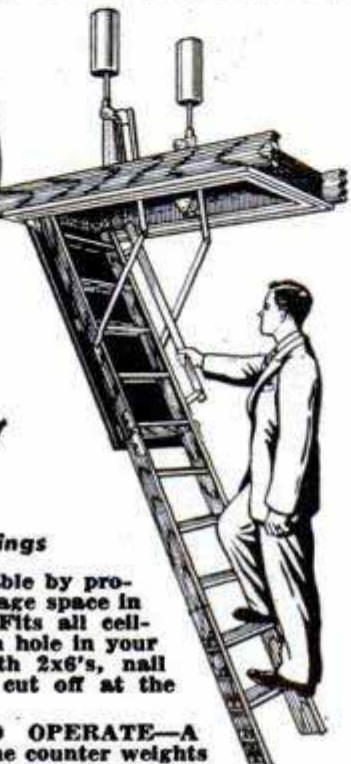
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(To be continued next month)

America Bids for the Atlantic Blue Ribbon

(Continued from page 87)

The problem was how to get these pre-fabricated monsters into place. Donnan's lips still tighten when he remembers the job. "As designed," he says, "those stacks reached 175 feet above the keel. The cranes could reach about 180 feet and carry 75 tons on the lower hooks. But the top auxiliary hooks we'd have to use couldn't begin to handle 80 tons. So we split the funnels in two, hoisted the bottom half to the foredeck first, got two traveling cranes on each side and lifted the thing in place. Then we picked up the top half the same way and set it in place—like putting a 40-ton lid on a 40-ton pot."

The big rakish stacks with their winglike vanes are not just for looks. Their vast interior is a maze of catwalk-entwined smoke ducts that branch off into four huge dust-collector drums—each about the size of a railroad tank car—and narrow down again to the single small vent in each hood. Each stack handles ducts from two engine rooms as well as a battery of huge air-conditioning fans.

The stack hood vanes help cut the down-draft behind the funnel when the ship is under way and so aid in keeping people on the sports deck from having to play shuffleboard under a smoke screen.

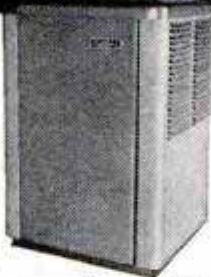
Since naval features account for some \$30,000,000 of the ship's total cost, many of the secrets beneath her hull plates will never be revealed. But without doubt, she's the safest ship in the world. The *United States* has innovations that will enable her to withstand collision damage more than twice that required by international standards. Her entire hull is compartmented like a battlewagon, with watertight, fireproof bulkheads that span her girth.

Imagine that a fire breaks out on B deck

(Continued to page 254)

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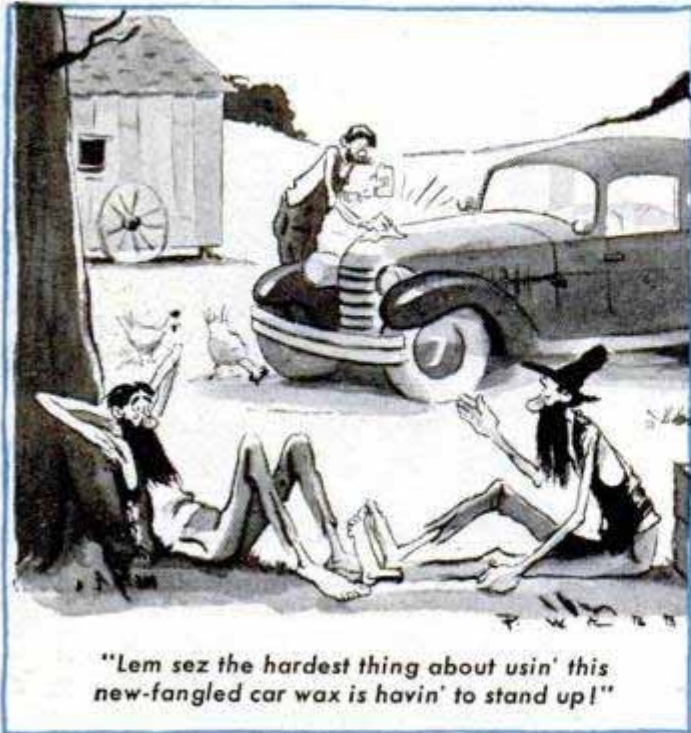
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in a stateroom. Immediately, a smoke detector will trigger a signal to the damage-control room on the bridge, where almost any kind of malfunction registers on a big electronic panel by means of colored lights. Instantly the damage-control officer knows there's a fire and its location. On a switchboard beside his desk, he flips a series of finger switches. One rings an alarm in that "piece" of the ship. Passengers are immediately evacuated. Other switches control all the automatic watertight fire doors in the special gunwale-to-gunwale bulkheads on each side of the fire area. The blaze is trapped and fire fighters can move in on it.

It's extremely unlikely that fire could ever start in the superliner anyway. There is no wood to be found anywhere aboard, except in such items as the grand piano and the butchers' chopping blocks. All of the decorative fabrics, bedding and upholsteries are treated with a resin compound to make them highly fire-resistant.

If passengers should ever be forced to abandon ship, they will climb into some of the biggest lifeboats ever installed on any ship. Twenty-four of the gleaming, deep-draft boats skirt the long promenade deck. Each is about 40 feet long and will accommodate 140 persons with ease. Actually, 400 persons could pile into one of them without sinking it. Instead of oars, the boats are equipped with five pairs of push-pull handles that jut from the centerline. A propulsion crew will pump these handles back and forth in unison, thus spinning a propeller that will send the boat forward.

When she steams into New York Harbor to become flagship of the United States Lines fleet, America's first superliner will already have hung up a host of records. Her hull plates, if laid end to end, would stretch for nearly five miles. The welds that tie her together would reach 1500 miles. Her 1,200,000 blueprints required 145,000 pounds of paper—two freight-car loads!

The SS *United States* today stands as a tribute to American production speed. For, from keel-laying to the last daub of paint on her superstructure, it took only 1031 days—just about half the time required to build each *Queen*, with whom she will compete on the high seas. And if Mr. Gibbs, the Newport News Shipbuilding and Drydock Company and the United States Lines are right about their "baby," she'll be hanging up a few more unprecedented records in the next few months. ★ ★ ★

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is unbelievable and the servicing is easy. The transmission is four-speed synchromesh—four speeds forward and reverse—and is quite noisy. Sports-car enthusiasts enjoy the thrill of shifting.

The clutch and brake pedals are small and I'd like more space between them. The Lockheed hydraulic brakes are very effective and show no tendency to fade even when abused. The emergency brake, located between the seats, operates when

MG Midget Specifications (Series TD)

ENGINE

Type.....Four cylinders, in-line, OHV
Bore and stroke.....2.56 in. x 3.54 in.
Piston displacement.....76.6 cu. in.
Brake horsepower.....54.4 at 5200 r.p.m.
Compression ratio.....7.25 : 1
Carburetors.....Two inclined downdraft
Piston speed at 5200 r.p.m.....3070 ft. per min.
Ignition.....12 volt, coil
Transmission.....Four-speed synchromesh
Rear-axle ratio.....5.125 : 1

GENERAL

Steering wheel, lock to lock.....2 3/4 turns
Turning radius.....15 3/4 ft.
Road clearance.....6 in.
Tire size.....5.50 x 15
Recommended tire pressure.....18 lb.
Weight (unladen).....2016 lb.
Wheelbase.....94 in.
Tread, front.....47 3/8 in.
Tread, rear.....50 in.
Brakes.....Lockheed hydraulic
Height over-all.....53 in.
Width over-all.....58 5/8 in.
Length over-all.....145 in.

INTERIOR DIMENSIONS

Seat width (two bucket-type seats).....45 in.
Headroom.....35 in.
Legroom (measured from front of seat to
foot pedals, seat fully back).....23 1/2 in.

CAPACITIES

Oil.....5.3 qt.
Water.....7.2 qt.
Gasoline.....14.9 gal.

pulled upward and is of a design commonly used in racing cars. To lock the brake the lever must be pulled up and a thumb button pressed.

Driving position is comfortable in the MG as the doors are cut low and afford excellent armrests. Legroom is more than adequate.

MG believes in furnishing the purchaser with proper tools. (Too bad that American manufacturers completely have forgotten that good tools are necessary and should be furnished with a car.) The MG actually is equipped with 22 separate tools.

I gave the car a thorough working over and was impressed with its many fine features. It simply is a different type of motor-car from that to which the American driver is accustomed. It does not fit the requirements of millions of Americans but it does offer the unusual in a unique sports car.

★ ★ ★

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BRAND NEW PUMP AND MOTOR

Pump has 1" connections, built-in relief valve, adjustable up to 1500 lbs. Max. capacity 6 GPM. 1 1/2 H.P., 24-volt motor... 4000 RPM. Can be used on 12 or 36 volts. Govt. cost approx. \$350—our price—NEW—**\$9.75.**



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Made for U. S. Ordnance Dept. to rigid specification. Portable steel hand-carrying unit is a self-contained trouble shooting device for making a complete & rapid check of the generator battery circuit, incl. any circuit & voltage regulators. Battery voltage, regulators, cut-out settings and generator performance easily determined. Terrific testing unit for garages, mechanics, truck fleet owners, boat and marine mechanics. Can be used on any 6 or 12 volt system. Approx. Govt. cost \$175. NEW, complete with instruction book, only **\$32.50.** Shpg. wt. 20 lbs.



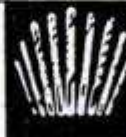
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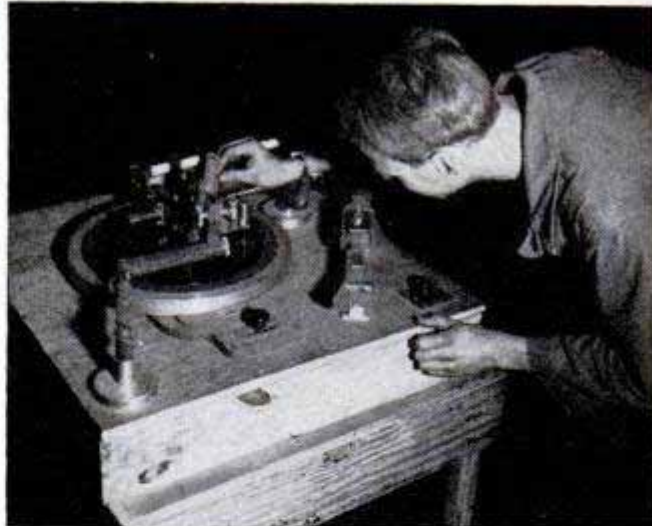
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Hobbies are important at lonely radar outposts. This man built his own high-fidelity recorder from scrap

Manning America's Radar Wall

(Continued from page 147)

of a second long and one thousandth of a second apart. Each time the big fan revolves the echo pulses make a blip of light on the scope doper's radar screen at the moment the antenna is pointed toward a plane or other object in the sky. So the bearing of the antenna is also the bearing of the target and can be used to vector the fighter planes or point AA guns.

No matter how many targets surround the big set, each is translated into a blip on the radar scopes. While these blips do not resemble actual images of airplanes, a good scope doper can interpret them. But occasionally even the veterans are fooled.

"Once," says Sergeant Vallee, "the boys painted something moving in. Suddenly it split into five blips, with all the earmarks of a flight of unidentified aircraft. GCI scrambled everything in the area. We were still painting them when pilots reported that the sky in the target area was empty. Finally, after 10 minutes' hunt, one pilot spotted them. It was a flight of five ducks."

Radar echoes bounce back from many odd things at sea. Several times planes have been scrambled only to find that the scope dopers were getting a return from ocean spray whipping off of breakers.

When long-range radar picks up a potential enemy and planes are scrambled, anti-aircraft artillery at strategic spots also is alerted. The day we were at the outpost, a battery was busy rehearsing with the radar unit. Its 90-mm. guns sat on the bluff with a clear view of sea and sky. Here's how these new, fully automatic guns work:

The battery is alerted by GCI. Out on location, it has its "acquisition" antenna. Like the big outpost's radar fan, it searches

(Continued to page 260)

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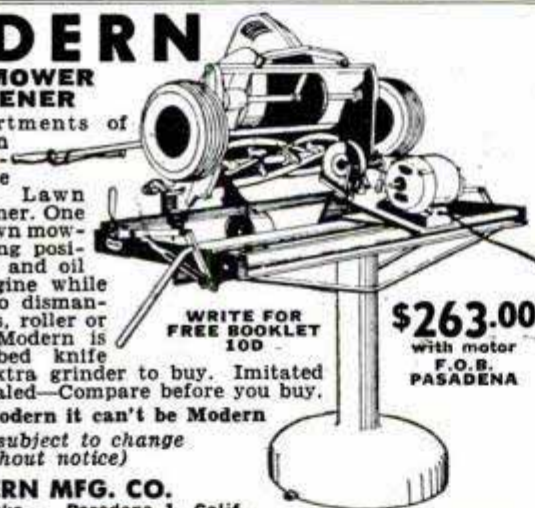
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the sky in the area indicated by early warning. What it sees appears on radar screens inside a mobile radar van, an electronic brain on wheels. Inside, silence is broken only by the hum of tubes and code talk as operators check GCI on locations of aircraft, check with their own scope dopers and plot correct tracks.

Atop each truck is the tracking antenna—a small, circular grid. This is focused on the target and follows it automatically. Down on the bluff the guns electronically are tied in with the movement of this tracking antenna and their long muzzles follow its every waver. In the truck, men feed data on wind, range and azimuth deviations into an electronic brain. As the guiding impulses from the tracking antenna go to the guns, these deviations also are fed into the cables and the guns automatically assume proper lead.

Life at an isolated early warning post is not so dull as you might suppose. The men are kept busy monitoring the skies and guarding their set from prying eyes. Guards all wear loaded weapons and no one gets on the post without a thorough going-over.

Life is a little tougher on some of the remoter arctic outposts. Corp. Bill Carothers spent 15 months at an early warning set on an Alaskan peninsula. "We were 300 miles from civilization of any kind," he says. "All our buildings were connected by corridors so when the snow drifted over them we could get from one to another. Temperatures dropped to 30 degrees below zero for weeks on end and no one went out but the security patrol and the path-shoveling details." To build these arctic outposts, engineers faced grueling problems. Huge cargo planes flew in and dropped heavy machinery, prefab huts and supplies by parachute. Helicopters brought in work crews. Meals served in mobile kitchens would freeze by the time the men reached their bunks with the food. Metal parts snapped in the icy air. Snow-compacting tractors used to tamp temporary air strips cracked their frames. But little by little these rugged crews carved tiny outposts across the frozen north.

Despite the vast improvement in our radar net, General Vandenberg and other Air Force leaders still think that a clever enemy might send in waves of planes with a good chance of 70 percent of them getting through. But improvements are being devised constantly to stop the gaps.

Right now though, we can count on thousands of ground observers and an army of scope dopers under the revolving fans at hundreds of early warning sites to keep us posted on suspicious-looking skyborne craft headed our way. ★ ★ ★

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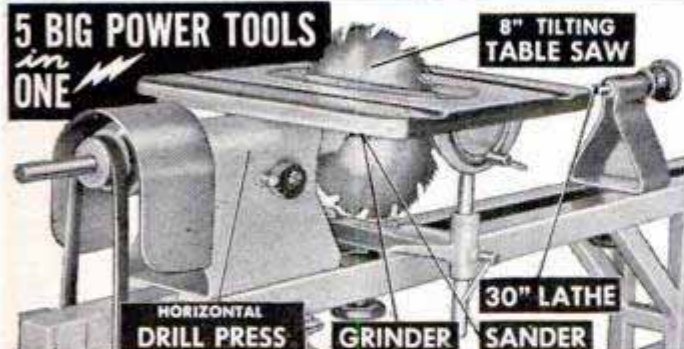
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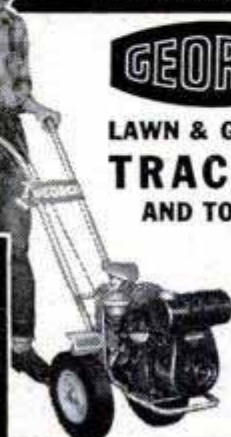
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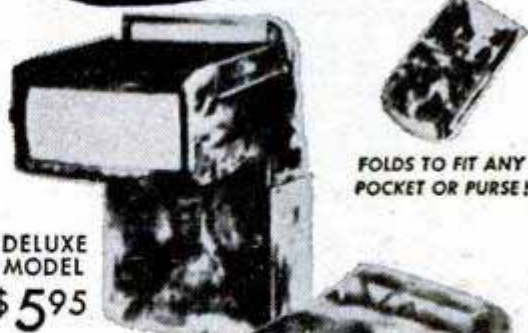
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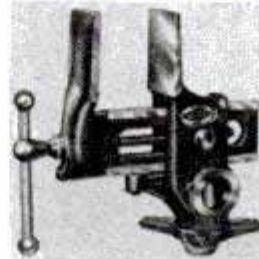


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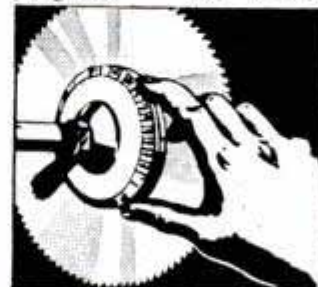
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IT TAKES **2** HOLES TO MAKE A PUNCTURE



● Anything that punctures your tube must go *through* your casing. You have the tube repaired, but what do you do about the **FIRST** hole . . . the one in the casing? Never neglect it!

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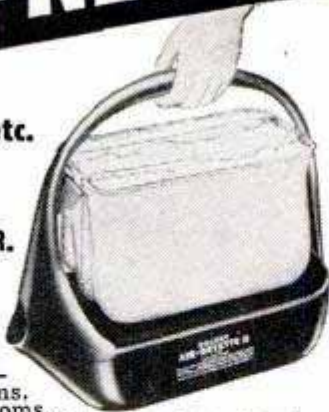


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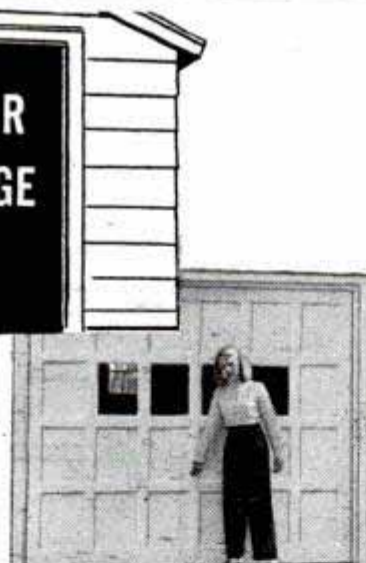
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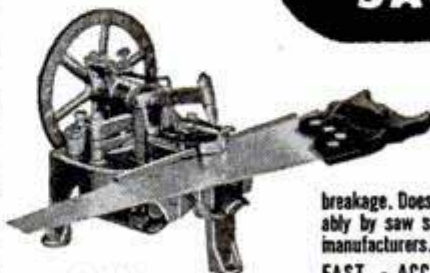
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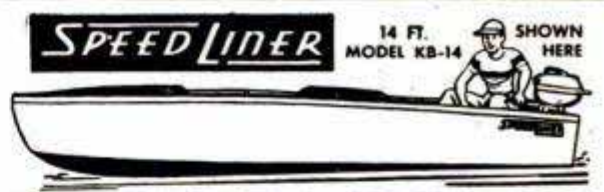
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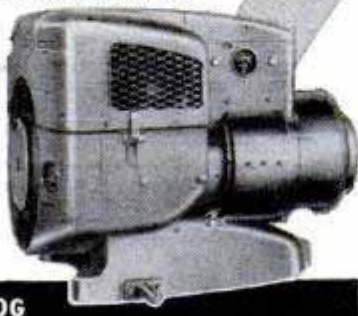
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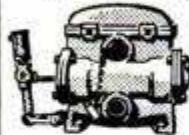
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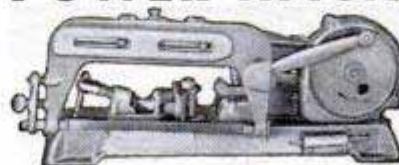


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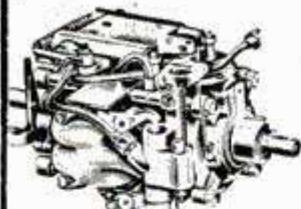
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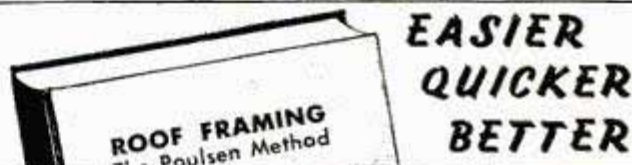
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(Item 198) 110-220 v.—60 cyc. A.C. with Wis. Engine, push button start. Wt. 370 lbs. Heavy duty. **\$399.50**
Generator only for belt drive, Wt. 115 lbs. (Item 198A). **\$239.50**

HI-LINE 6000 WATT PLANT

(Item 162) Push Button Start, 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for fans, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth \$995.00. With self starter. **\$645.00**
Factory Spec. **\$345.00**
Generator and control box only, belt driven. Use your engine or tractor. Wt. 240 lbs. **\$345.00**

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(Item 207) For hospitals, radio stations, fire depts., etc. Automatically starts light plant when power fails. Available for all our plants. From \$59.50 to \$99.50.

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(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2"x2" compressor with built-in air filter, master built with hi-strength alloys and precision bearings. Stainless steel tank, 12" x 24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Note low factory prices. With 1 1/2 hp 110 v. A.C. motor. Reg. \$175.00 (Item 209). **\$98.50**
With 1/2 hp motor (Reg. \$199.50) (Item 209A). **\$119.50**
With 2 hp Briggs Gas Engine (Reg. \$199.50) (Item 209B). **\$109.50**
Compressor only (2"x1 3/4") (top quality) (Item 209C). **\$20.50**
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Giant Compressor (twin 2 1/2"x2 1/2") (Item 209E). **\$54.50**
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HEAVY DUTY D-C ARC WELDER



Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to 1/4" plate using 1/4" rods. Built-in air-cooling system and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, gear, and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. \$400 value at. **\$99.75**
DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec. **\$119.50**
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at. **\$10.50**

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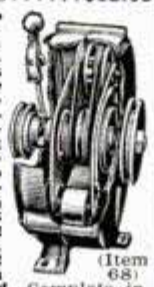
(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2 1/2 lbs. Usually \$4.50—Special 40 ft. **\$1.99**
Combs: 2-40 ft. and 1-20 ft. (total 100 ft.) **\$4.95**
100 foot length (one piece) **\$4.85**
WIRE ONLY (Item 50) No fittings, 100 ft. **\$4.00**

HEAVY DUTY POWER CABLE

#12-2 Cond.—stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made, U.S. Surplus. 50 ft. (Wt. 8 lbs.) Item 199. **\$6.95**
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Heavy duty, made by B. F. GOODRICH for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midgeet autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation. 3 sizes: 1/2-1 hp. wt. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list \$228, \$252 and \$352. Brand new, in Goodrich boxes and guaranteed. Complete installation data included. Unprecedented surplus sacrifice **\$79.50, \$89.50 and \$114.50.**



POTTERS WHEEL

(Item 47) Complete prof. equip. for making finest ceramics and pottery. New design, large, non-breakable, Alemite bearings. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and welding wire. 18"x18" enclosed throwing table—ample area for largest pieces. Reg. 1/4 hp. motor (not incl.). Complete with pulleys, belts and instructions. Wt. 26 lbs. \$145 value at. **\$59.95**
Westinghouse 1/2 h.p. motor for above. Wt. 27 lbs.—Item 47A. **\$19.50**



able turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and welding wire. 18"x18" enclosed throwing table—ample area for largest pieces. Reg. 1/4 hp. motor (not incl.). Complete with pulleys, belts and instructions. Wt. 26 lbs. \$145 value at. **\$59.95**
Westinghouse 1/2 h.p. motor for above. Wt. 27 lbs.—Item 47A. **\$19.50**

DUAL TUBE LIFE SAVERS

(Item 54) NEW APPROVED TYPE made by Genl. Tire for Navy. Each has 2 rubber tubes for double protection. Easily inflated by mouth \$145 value at. **\$5**
to 55 in. Wear one around waist as comfortable life saver. Adjustable safety buckles fit adults or children. Tie several together for raft or big luxurious mattress. Invaluable on boats or beach. Wt. 2 lbs. each. Our spec. (a fraction of cost) 99¢ each, 6 for. **\$5**

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Amazing labor saver. Fells and cuts up 36" trees in minutes. Wonderful for pruning and trimming. Use portable light plant for power. Item 202, 12" Saw Wt. 12 lbs. **\$15.00**
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It's a lawn mower It's a plow
It's a power sickle It's a Snow Blow
It's a cultivator It's a rotary tiller
It's a bulldozer



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Rotary tiller. **\$42.50**
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Weeder (2-shovel). **\$15.00**
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32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Best of U.S. matched chrome alloy, absolutely the best. Complete range of 21 sockets from 1/4" thru 7/16" in 1/4" drive and 7/16" thru 1-1/16" in 1/2" drive; 2 extensions, reversible 1 1/2" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, 1/2" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 11 lbs. Easily worth \$41.50. While they last. **\$16.95**



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(Item 205) Contains a complete set of sockets in 1/2" drive, 3/8" drive and 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chrome thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List Price \$62.90. Factory Special. **\$26.95**

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(Item 201) Same top qual. as above—includes 7 sockets 3/8" thru 3/4", reversible ratchet, extension, flex. handle, cross bar, 3 punches, metal tool box. Wt. 5 lbs. List Price \$18.95. Our Spec. **\$9.95**

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3 ton (Item 208A) **\$11.45**
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Hyd. Cylinders



Brand new! Double acting, 3" bore, 8 1/2" stroke. Overall length 21 1/2" closed. Has adjustable dampener check valves built in at both ends, eye bolt mounting at base of cylinder. Will lift approx. 7000 lb. using 1000 PSI. Threaded for std. pipe. \$88 value. Wt. 10 lb. ONLY... **\$17.95**



Pesco Positive Displ. Hydraulic Pump

Gear type, No. 1P-349. Aircraft quality. Rated 1500 PSI, .227 cu. in. per revolution, 1 GPM at 1500 RPM. Operating speed, 3750 RPM, intermittent max. 4500 RPM. .65" dia. spline shaft. Rotation either direction with slight adjustment. 3/4" pipe ports. Has mtg. flange with 4 bolt holes. Size, 5-9/16" x 3 1/2". Used, guaranteed serviceable. **WT. 4 lb. ONLY... \$7.95**

Stratopower Constant Displ. Heavy Duty Pump

For operating hyd. cylinders, hyd. motors on tractors, bulldozers, construction machinery, lift trucks.



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For fuel or oil transfer, industrial applications, etc. Delivers up to 120 GPM at 1500 RPM. Rated 1400 PSI at max. 4500 RPM. Has built in relief at head. Rotation either direction without adjustment. \$100 value. Used, but tested, guaranteed serviceable. Wt. 7 lb. ONLY...

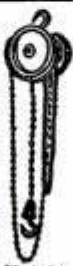
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In stock, Differential Hoists, 1/2 to 2 tons. Spur Gear Hoists, 1/2 to 20 tons. We Repair, Rent, Exchange hoists, also buy spare parts. Send us your hoist problems. No obligation.

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Brand New! Made by Willard. Extra long life. Rechargeable. Ideal for radios, boats, autos, etc. 3 cells of 2 volts each. 1 1/2" high ball float hydrometers built-in each Lucite case. Shipped dry.. Size, 7 1/2" x 2 1/2" x 6". Shpg. wt., 6 1/2 lb. **ONLY... \$6.75**



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2 compression and one oil ring. aluminum alloy connecting rod. Stainless steel valves with brass seats and retainers. Cool-flo cylinder head, spray mist lubrication to every moving part. V groove fly wheel. One year guarantee.

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2 1/2"x2", 2.55 to 4.80 c.f.m. up to 150 lb. pressure. Operates with 1/8 - 1/2 - 3/4 HP motor. Special Price... **\$27.95**

Wt. 24 lbs.

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MODEL W800, 2" bore, 1 3/4" stroke, 2 to 2.8 c.f.m. up to 150 lbs. pressure. Operates with 1/4 or 1/2 HP motor... **\$20.50**
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W103
External atomizing. Flat and round spray. Qt. cup. Maintains 35 to 40 lbs. at 2 to 4 c.f.m. working pressure. Filter built in handle. Wt. 6 lbs.... **\$9.95**



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2-way, internal & external mix. 4 nozzles, 2 fluid tips. Requires 2 to 4 C.F.M. at 30 to 50 lbs. pressure. Qt. Cup. Wt. 6 lbs. List \$18.50. **\$12.95** —Only..



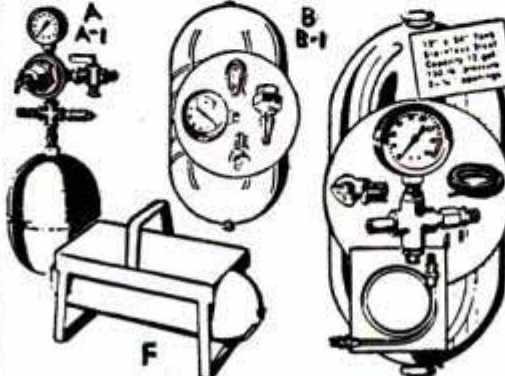
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- B-1-24"x6", with comb. air gauge, and inflation valve for retaining pressure in tank, tire chuck, 3 ft. high test air hose, wt. 12 lbs. 7.95
- C-24 1/2"x12, stainless, wt. 20 lbs. 14.50

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Takes starting load off engines or motors. When speed is reached, a flip of handle shifts clutch from idling to driving position. Handles "A" belts, 2.35" pitch diameter, 5/8" bore. Ideal for use with lawn mowers, garden tractors, home workshop motors, etc. 3 1/4" long. Safe, easy to mount, sealed bronze bearings, positive action. Shpg. wt. 3 lbs.



\$7.50

BUSHING FOR 1/2" SHAFT 15c
SAME CLUTCH FURNISHED **\$8.50** WITH 3/4" BORE

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- \$375 Leland 2 1/2 to 3 KW generator, 135 lbs. **\$225.00**
- 2 to 2 1/2 KW light plant, wt. 180 lbs. **\$299.50**
- \$365 list. Special... **\$169.50**
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- 500 WATT GENERATOR, wt. 55 lbs. **\$99.50**
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BENDIX HYDRAULIC PUMP AND MOTOR **1950**
Has 3 1/2 GPM capacity at 600 PSI. Motor is 1 1/2 HP, 24V, DC. Operates on either 12 or 32V, DC current. Has built-in relief valve adj. to 1500 PSI. This unit ideal for bait tanks, hyd. lifts, portable loaders etc. Cost gov't. approximately \$350.00.



VICKERS HYDRAULIC VARIABLE DISPLACEMENT PUMP GENERATOR
May be used as an elec. motor driven type pressure generator in an hyd. system where a varying volume is desired with a non-pulsating flow. Will give max. volume at pressure settings between 600 & 900 PSI by simple adjustment screw. Pump housing serves as reservoir for system. Has built in compressed air supercharger to make system independent of outside atmospheric pressure. Rotation, left hand only. Max. speed for continuous duty 3750 RPM. Displacement .484 cu. in. per revolution or approx. **3250**
4 GPM at 1750 RPM.

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Turns up to 50,000 RPM. Electric drive motor is integral part of balance wheel. Has double end shaft to drive precision tools or machinery at precise, controlled speeds. Ball bearing mounted. Runs on high or low voltage. Ideal for experimental work, labs, hobbyists, technicians, etc. **495**

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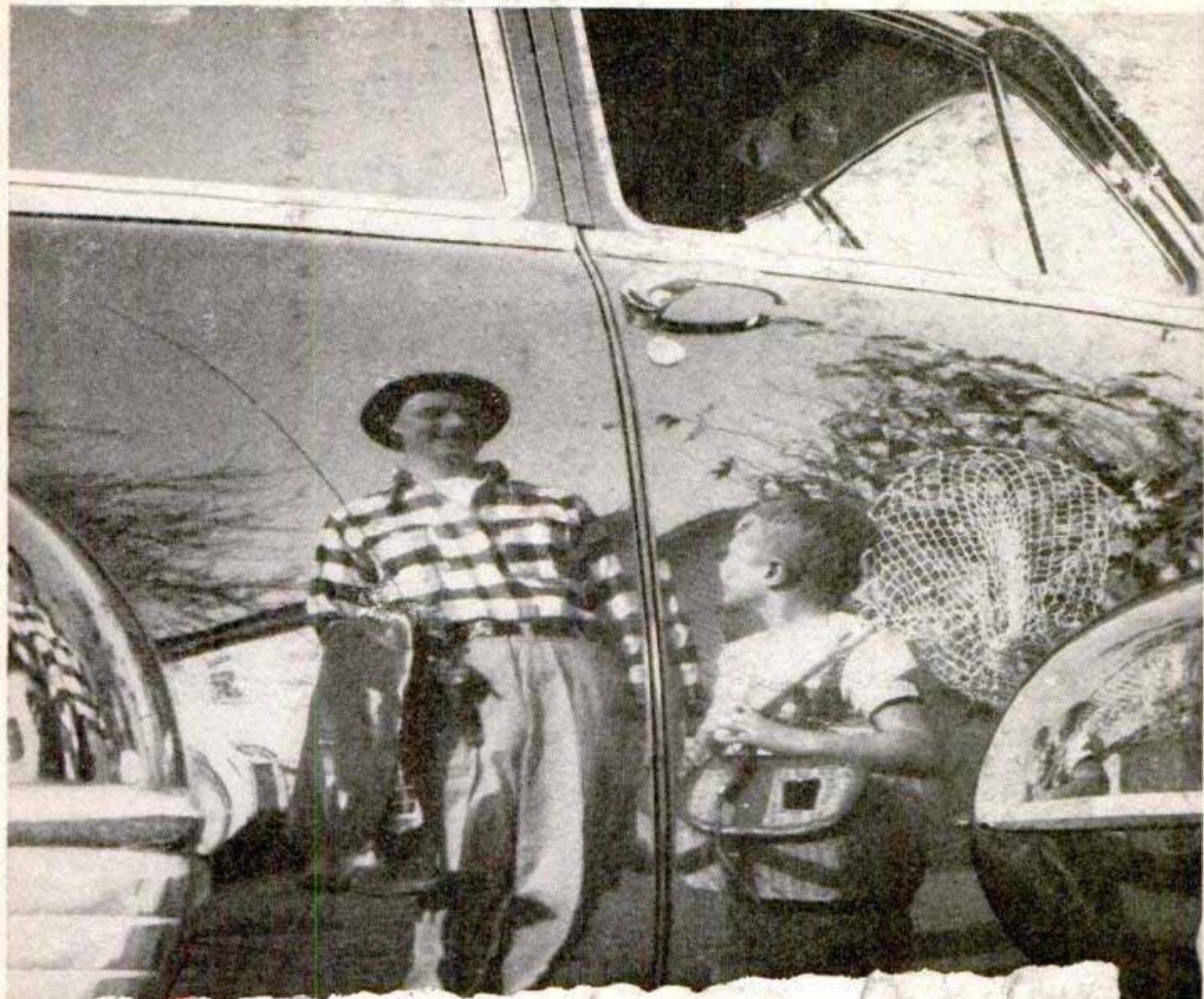
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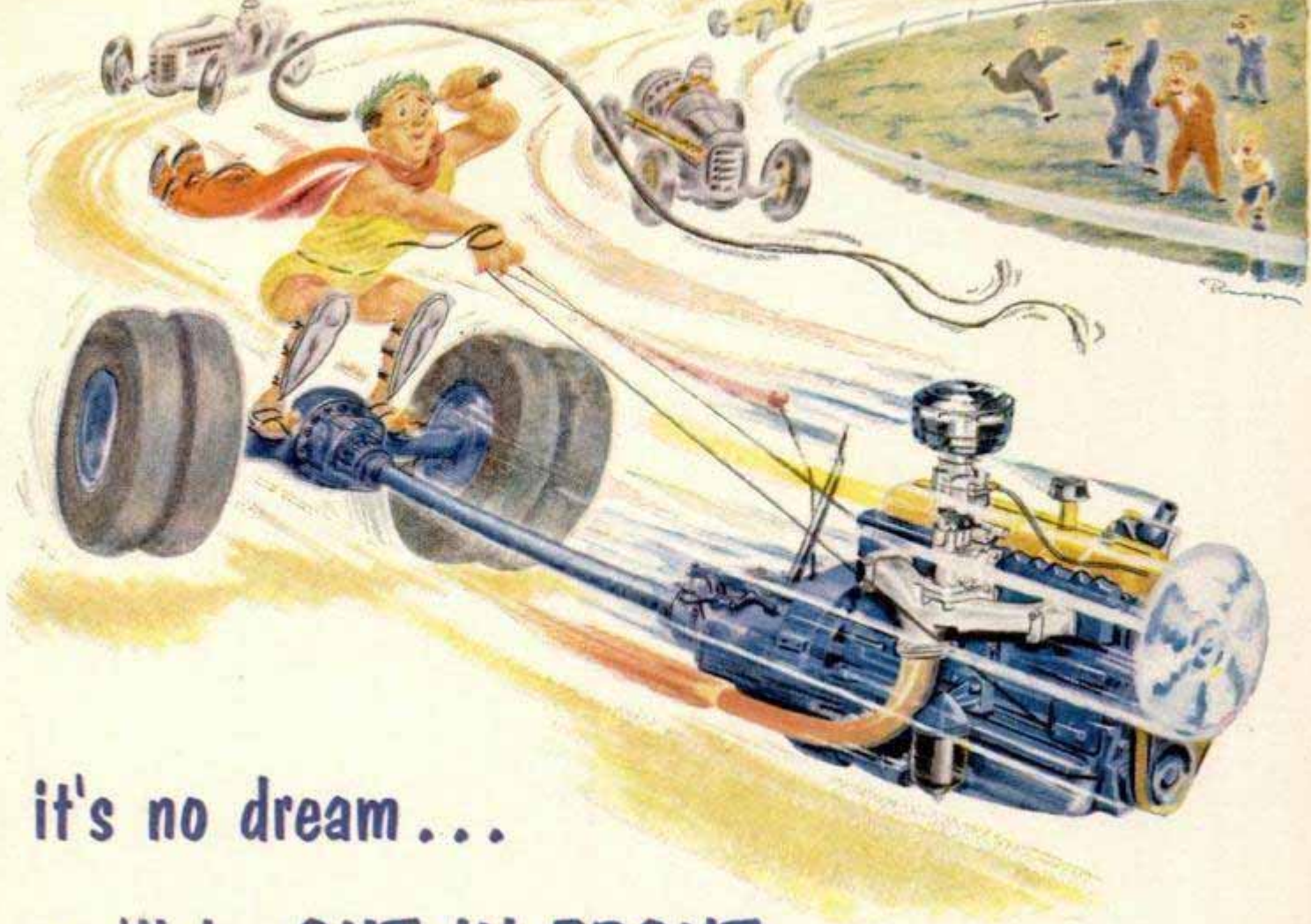
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