

JULY 1948

25 CENTS

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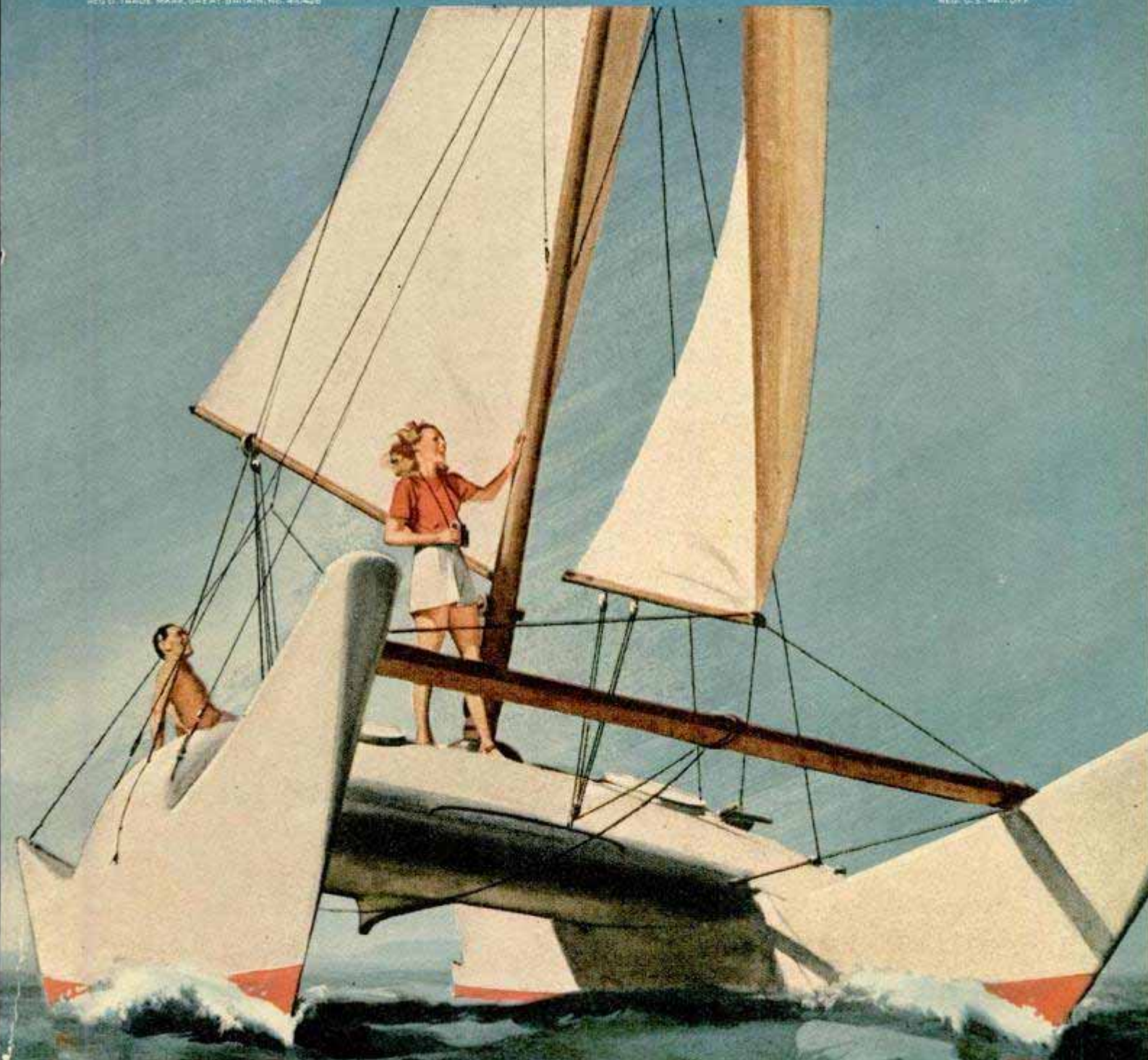
POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. D. TRADE MARK, GREAT BRITAIN, NO. 40426

REG. U.S. PAT. OFF.



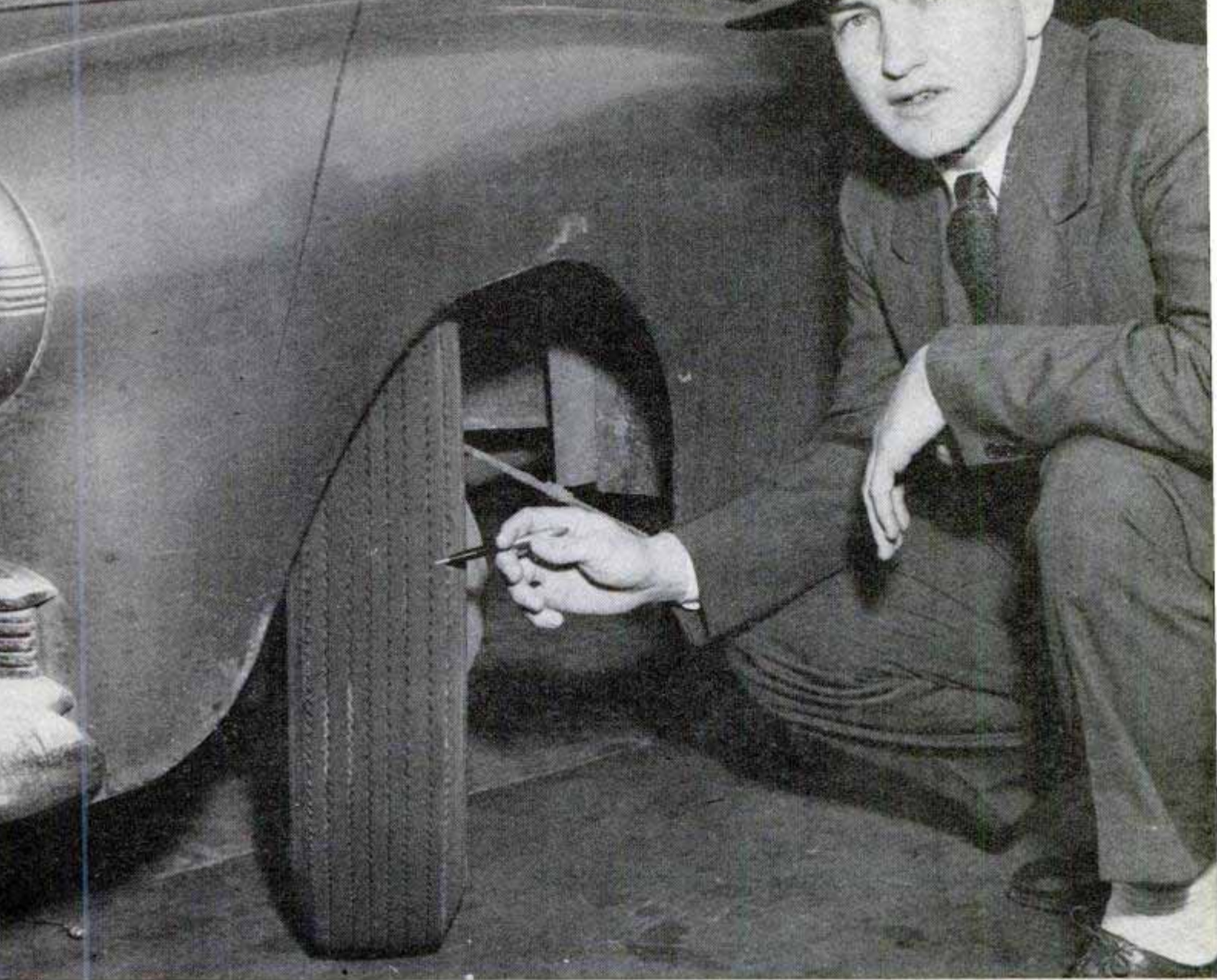
SAILING THE WINGED "SEABIRD"

*Used on
more new cars
-sold by more
dealers!*



replace with a
DELCO
BATTERY

DELCO-REMY WHEREVER WHEELS TURN OR PROPELLERS SPIN



Typical example: user's experience with B. F. Goodrich tires

MR. FELIX R. HELMS of the Military Service Company lives in Birmingham, Alabama. But like the man from Missouri, when it comes to tire advertising he likes to be shown.

Recently he wrote us: "It is a pleasure to inform you that B. F. Goodrich tires are just as good as they are advertised to be . . . My sales job involves driving in all types of weather and on any type of road mentionable.

"The original equipment tires on my 1947 . . . 2-door Sedan have given me twenty-six thousand (26,000) miles of uninterrupted service. I can reasonably

expect another 20,000 miles.

"I am extremely pleased with B. F. Goodrich tires and hope to always be able to use such a fine product."

The picture above, taken at the time Mr. Helms wrote this letter, clearly shows why he expects 20,000 *more* miles of trouble-free driving on his B. F. Goodrich tires. The tires still look like new because B. F. Goodrich tires are built to last, inside and out.

The tire body is made tougher, longer lasting with more—and stronger—cords. The tread wears slower and more evenly because it's broader, and hugs the surface

of the road, putting every inch of rubber to work. Under the tread, a special breaker strip cushions shocks.

You can easily prove to yourself, like Mr. Helms did, that B. F. Goodrich Silvertowns outwear other tires, including prewar tires. With the big trade-in allowances given by B. F. Goodrich dealers, the cost of a new set of B. F. Goodrich tires is surprisingly low. *The B. F. Goodrich Company, Akron, Ohio.*

B.F. Goodrich



These "sound jurors" record their preferences as they listen over test circuits.

Trial by "Sound Jury"



The engineer in the foreground talks over the test circuits which the other engineer sets up on a "circuit simulator."

AFTER Bell Laboratories engineers have designed a new talking circuit, they measure its characteristics by oscilloscopes and meters.

But a talker and a listener are part of every telephone call, and to satisfy them is the primary Bell System aim.

So, before the circuit is put into operation, a "sound jury" listens in. An actual performance test is set up with the trained ears of the jurors to supplement the meters.

As syllables, words, and sentences come in over the telephones, pencils are busy over score sheets, recording the judgment of the listeners on behalf of you and millions of other telephone users.

Targets of the transmission engineer are: your easy understanding of the talker, the naturalness of his voice, and your all-around satisfaction. To score high is one of the feats of Bell System engineering.

BELL TELEPHONE LABORATORIES

• EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE



Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

GOING FISHING? You'll find an expert's opinion on "Baits for Bass" on page 94, with some tips on casting from a champion.

NEXT MONTH might be a good time to set out for a vacation camping trip. The money you save by living outdoors on one trip will almost pay for a camping outfit. But don't carry just a thin blanket roll and try to use a rock for a pillow. An August feature tells how to "Camp in Comfort."

GUSTAV EGLOFF, noted oil researcher, faces the annual bugaboo of oil shortage with a frank and enlightening article, "Do We Need Synthetic Oil Now?" in the August issue. Other outstanding features tell why the submarine is increasing in importance, why the Hoover Dam needs a "doctor," and why there's "Confusion in the Cockpit" of airplanes.

IN THE Craftsman section next month you will find complete how-to-build details on Keith Storey's model plane, Gold Rush of '47, which set an official speed record of 134.91 m.p.h.

TEN THOUSAND flashes—10,000 photos without changing a bulb. You can do just that with a battery-operated, high-speed flash unit described in the August issue.

EVERYONE can't be the "life of the party," of course, but a bag of impromptu magic tricks described next month will help. The tricks are simple, but mystifying, and need no special props.

IN THE August Shop Notes section you will learn some of the secrets of skilled craftsmanship when an old-time machinist tells how to hone cutting tools.

RADIO experimenters will find a 3-tube pocket set with built-in loudspeaker in the Radio and Electronics section next month.

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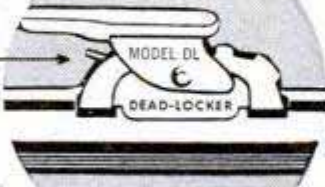
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FINGER-
TIP
RELEASE



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(A war-born invention—by ANCO—first)
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DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car . . . in stormy weather . . . with your dull old windshield wipers that SMEAR and SMEAR. He'll gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them—Newest Models! But he forgets to remind you? Too busy? You can't shoot him for that!



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Here's Why New AUTO-LITE STA-FUL Battery

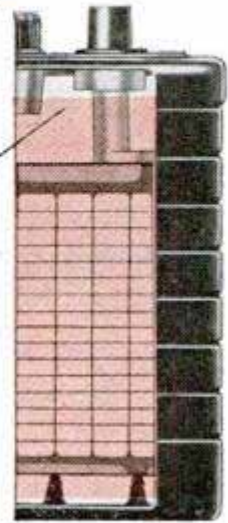
*...needs water
only 3 times a year**



ORDINARY BATTERY

HERE'S WHAT HAPPENS INSIDE AN ORDINARY BATTERY

This battery is now full. Small liquid reserve gives battery plates little protection against damage and loss of power if evaporation lowers liquid level.



STA-FUL BATTERY

HERE'S WHAT HAPPENS INSIDE AUTO-LITE "STA-FUL"

The new "Sta-ful" feature has $3\frac{1}{2}$ times the liquid reserve of ordinary batteries. Gives its plates added protection. Helps it last longer too!

BOTH BATTERIES FULL



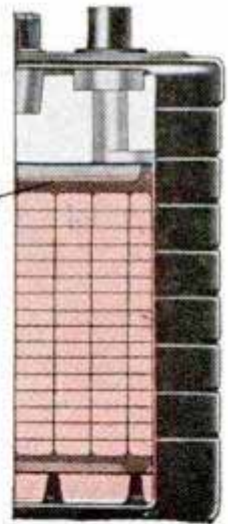
ORDINARY BATTERY

ADVANCED STATE OF EVAPORATION

Equal Liquid Loss From Both Batteries

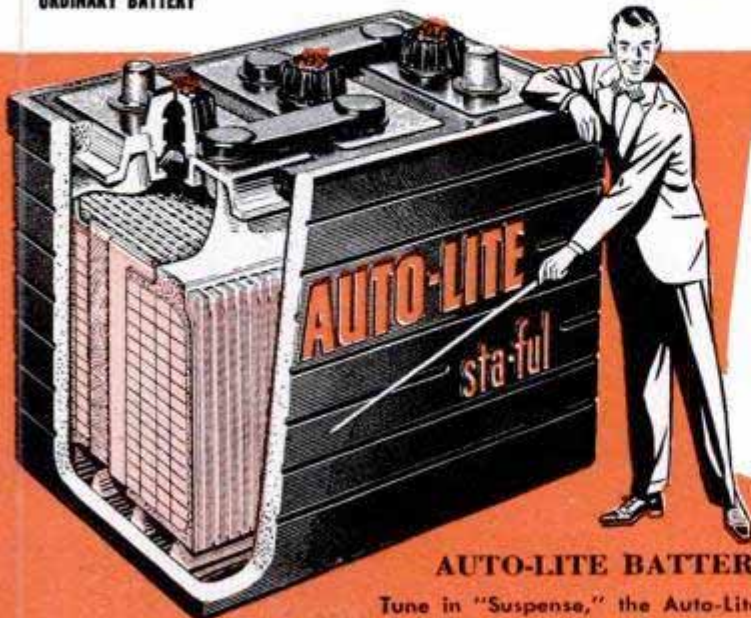
Plates at the left are now exposed and inactive because of the small liquid reserve provided in ORDINARY battery.

The "Sta-ful" Battery plates are still kept fully covered and protected because of the $3\frac{1}{2}$ times greater liquid reserve.



STA-FUL BATTERY

*In normal car use



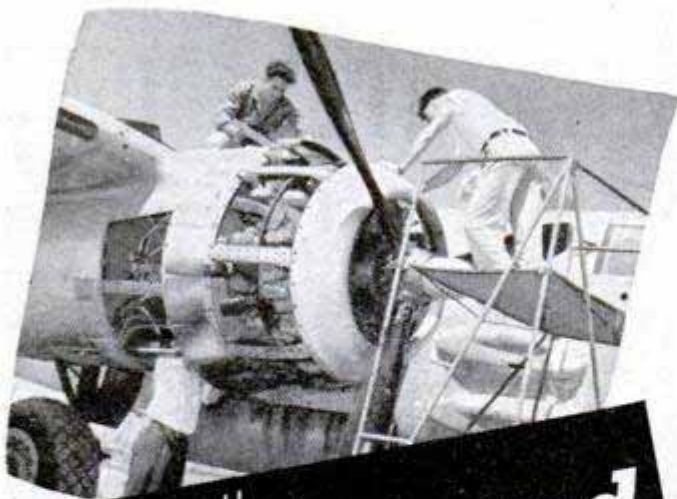
Why the "Sta-ful" Design Is Possible
Fibre-glass mats help to keep the power-producing material from shedding—add to battery life. This makes possible the "Sta-ful" construction with its smaller sediment well which permits room for a liquid reservoir with over 3 times the usual capacity at the top of the battery. Make your next battery an Auto-Lite "Sta-ful."

AUTO-LITE BATTERY CORPORATION, Toledo 1, Ohio

Tune in "Suspense," the Auto-Lite Radio Show—Thursdays, 9:00 P.M.—E.T. on CBS



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 Aeronautical Engineering

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PRESSURE QUEEN

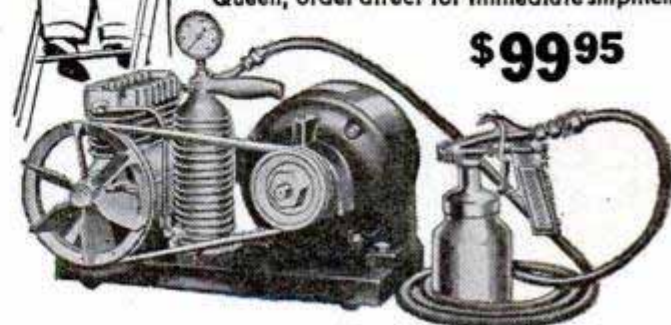
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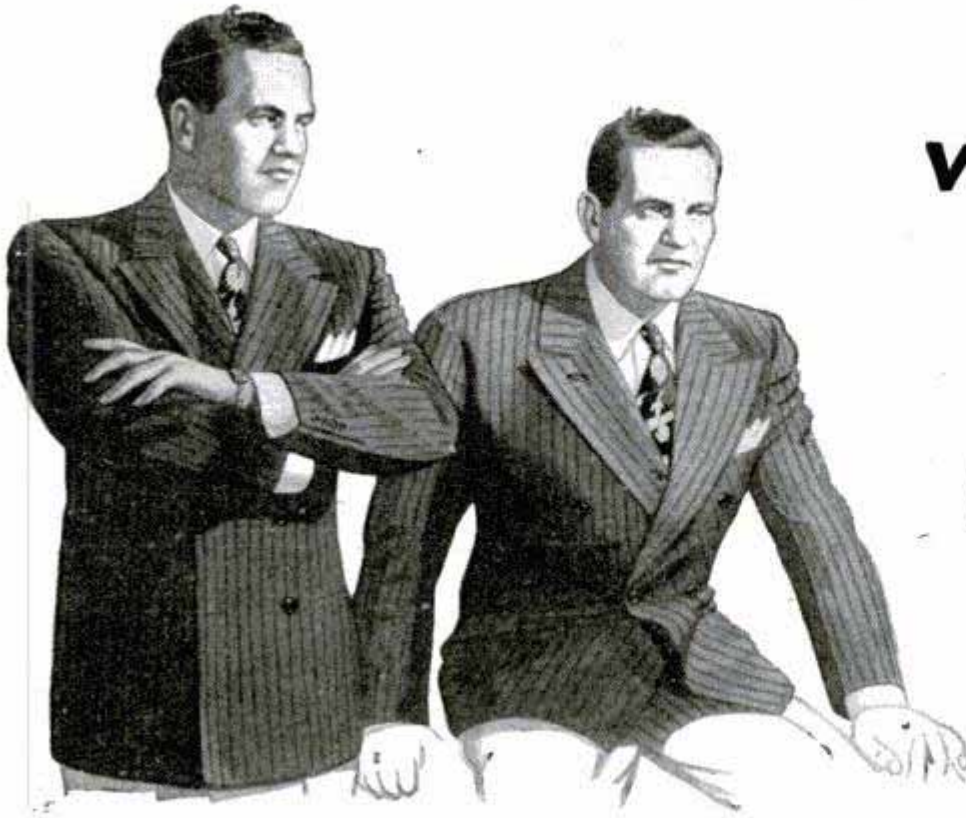
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"Tappets Are Our Business"



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Be honest now—

suppose that a better job had opened up in your company—carrying with it promotion and more money—could you qualify?

If you were boss, would you select "YOU" for that better job?

Consider before you answer.

First of all, could you *fill* the job? Has your experience fitted you for the step forward—have you been preparing for promotion apart from experience gained on the job?

Or have you just been filling a niche, doing daily tasks well but making no real and intelligent effort to learn and qualify for the job ahead so that if an opening should occur you would be ready to fill it?

The man who gets real promotion makes his own breaks—the man who slaves in the ordinary job at low pay just wishes and dreams of promotion and more money. Which are you?

Business is always willing to pay the man who knows—and pay him well. The man who is ready and willing to take responsibilities—and capable of directing the efforts of other men is a

valuable asset to any business organization. He never wants for a good job and above average earnings. He gets ahead.

We have helped thousands of men achieve promotion and more money—success sometimes beyond their dreams—a success that was started by a coupon similar to the one below.

Get out of that rut—don't be satisfied with a mediocre job at small pay—be a success in business—this coupon may be your first step.

So send it today—right now—tomorrow never comes for the man who consistently puts things off.

La Salle Extension University *A Correspondence Institution*

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417 S. Dearborn, Chicago 5

If you can help me get the ability and knowledge for real promotion, I want to know it. Please send me your free 48 page booklet telling how I can succeed in the field I have checked below. I understand you will send this without obligation to me.

- | | |
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Name.....Age.....

Position

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City and State

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The secret to long motor life is lubrication—and the secret of lubrication is the constant maintenance of an oil film between moving metal surfaces. The difficult lubrication spot in your car is the surface between piston and cylinders. Park your car and the surface drains dry—start it and metal rubs metal to produce wear. PYROIL gives oil the property of clinging to metal surfaces. Ask your gas station attendant to add PYROIL—and add miles to your car.

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PYROIL COMPANY
81 Pyroil Bldg., La Crosse, Wisconsin

I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

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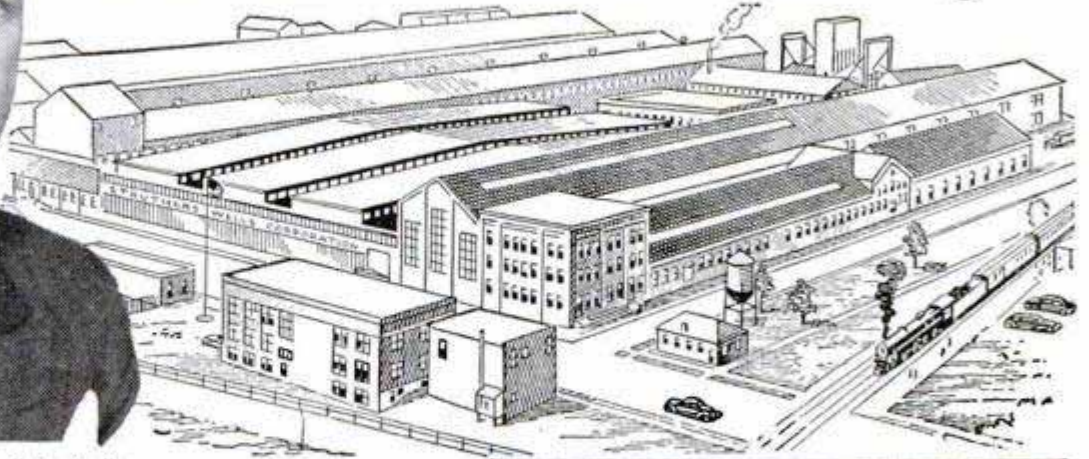
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<input type="checkbox"/> Commercial
<input type="checkbox"/> Commercial Art
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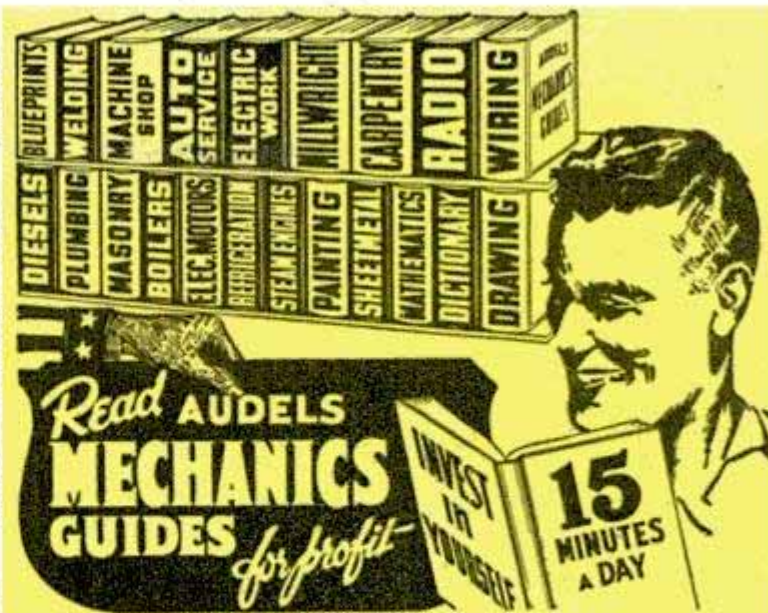
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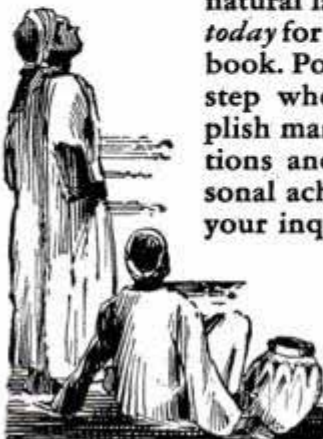
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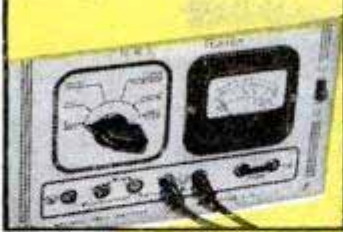
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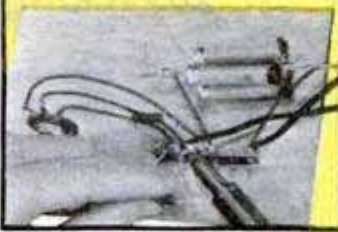
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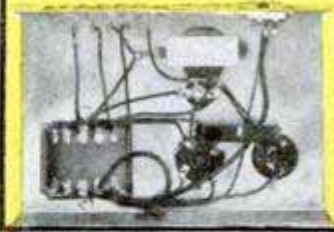
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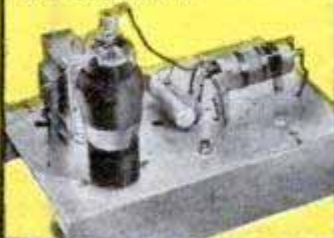
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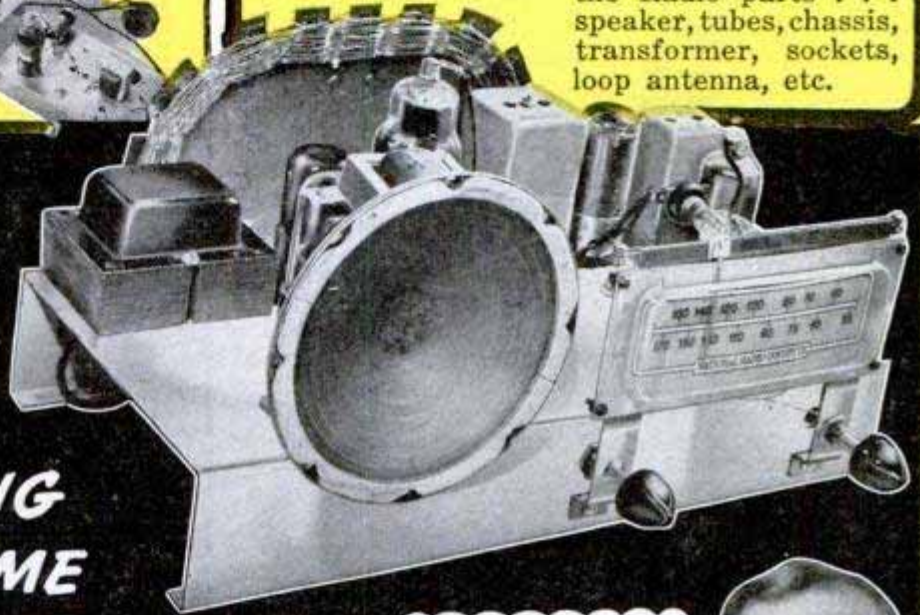


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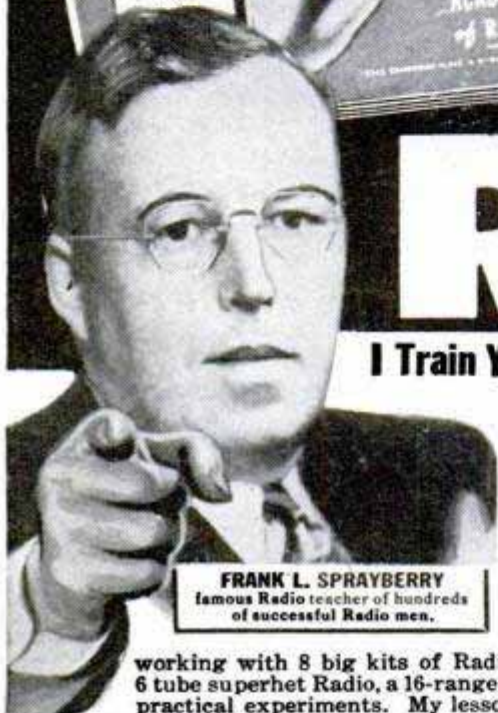
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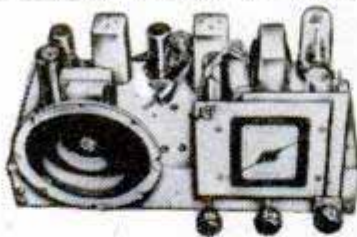
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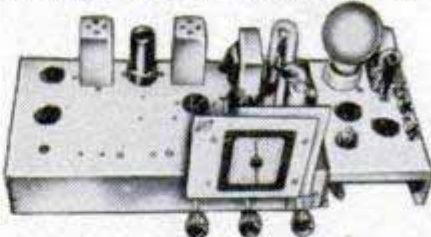
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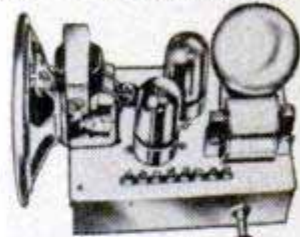
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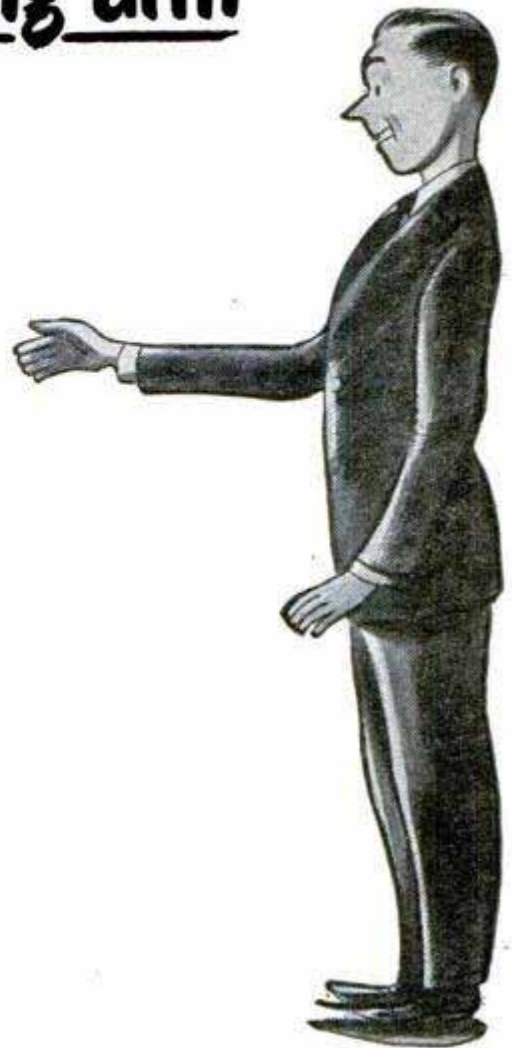
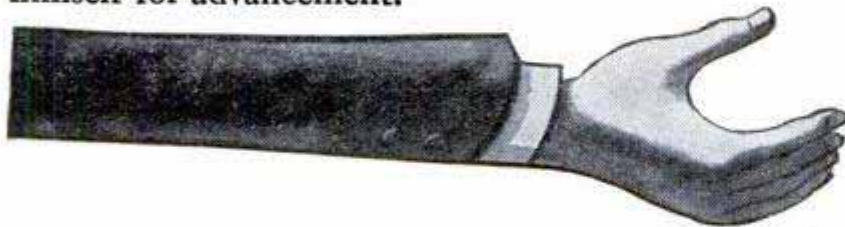
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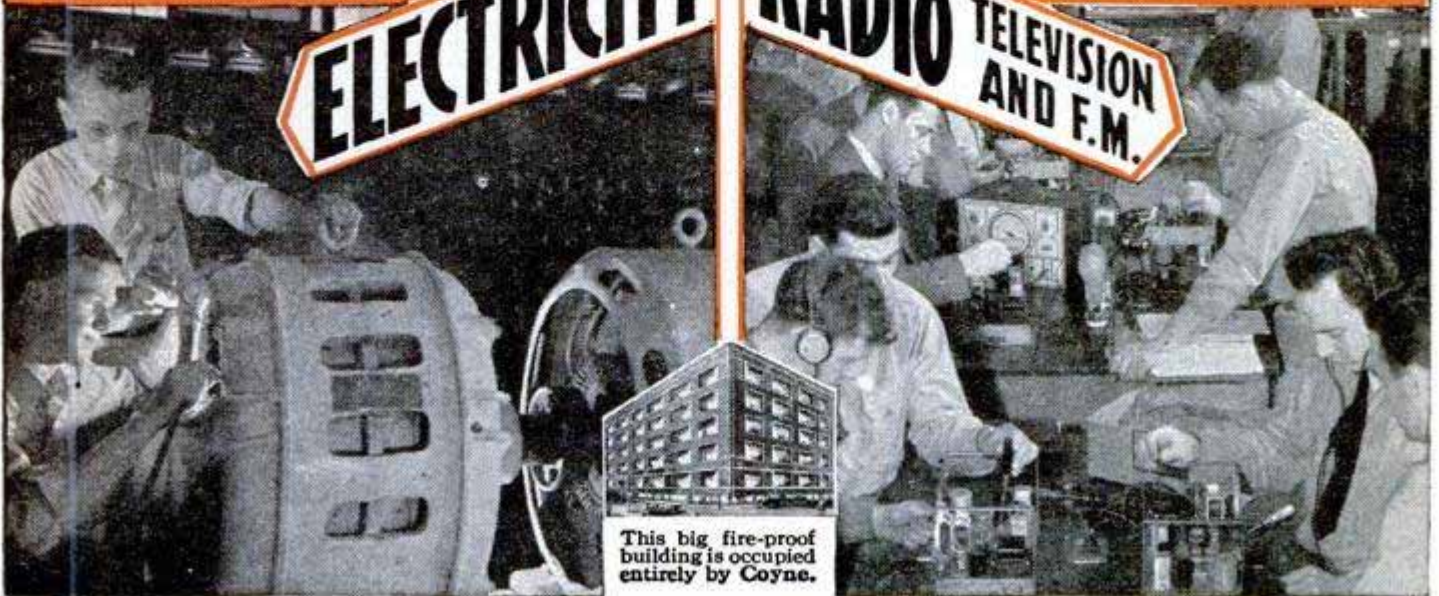
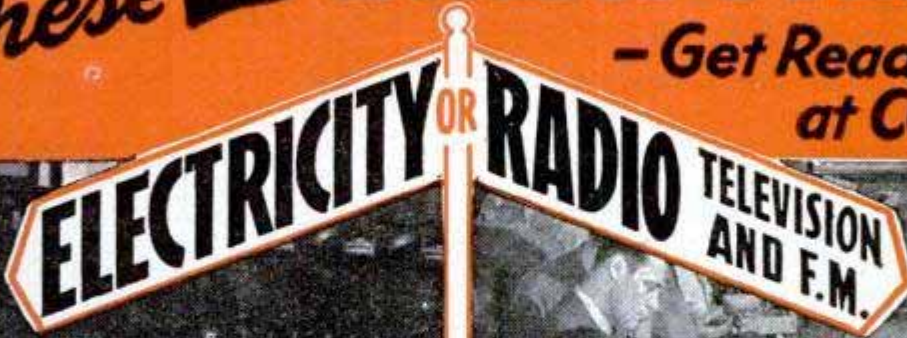
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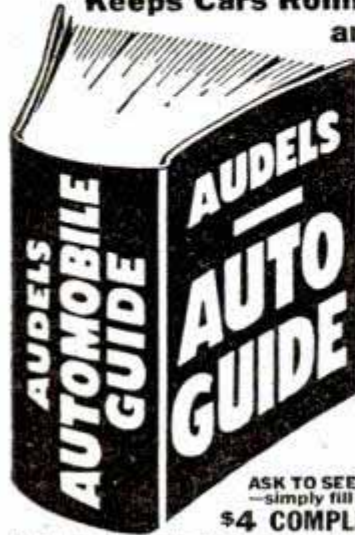
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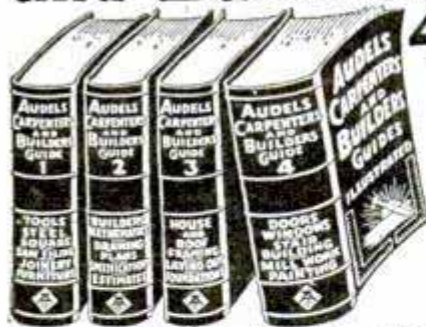
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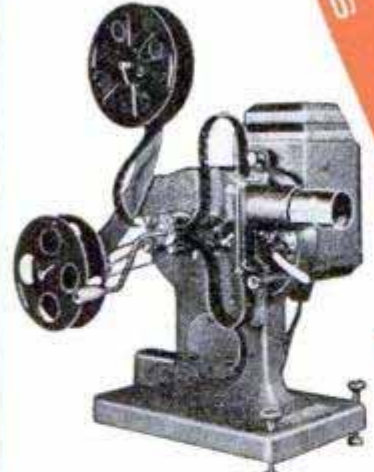
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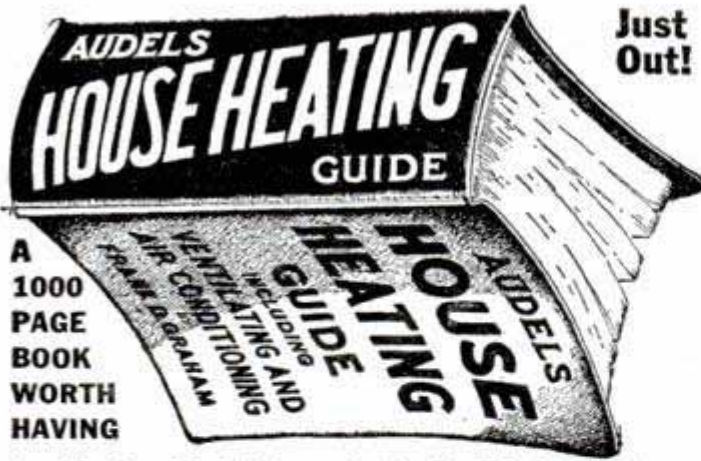
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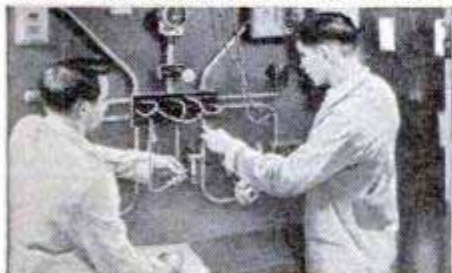
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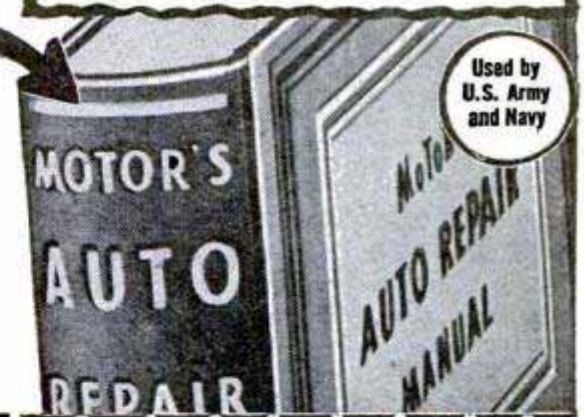


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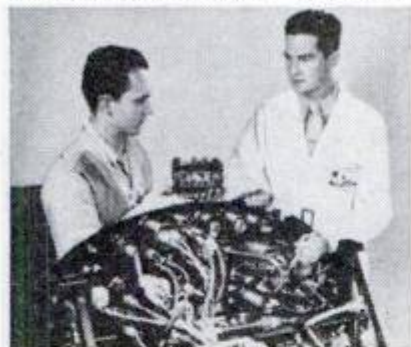
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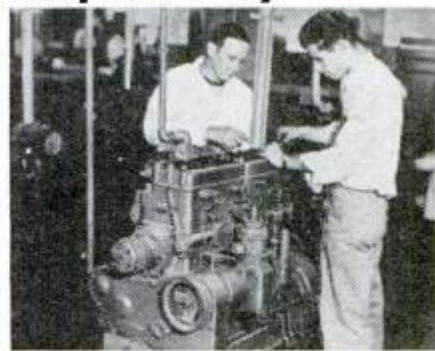
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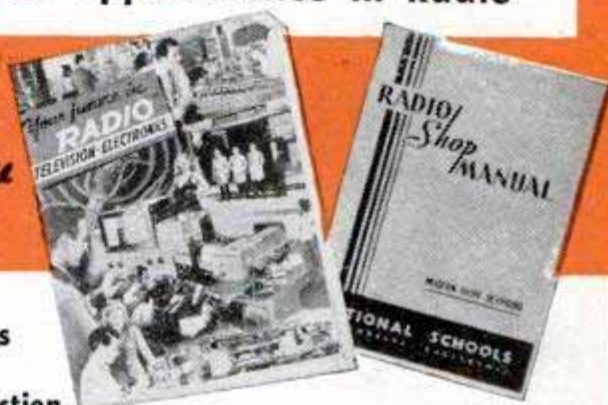
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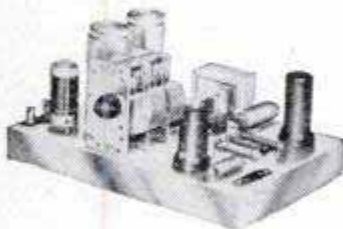


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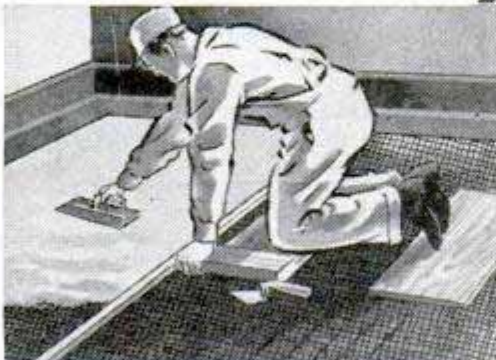
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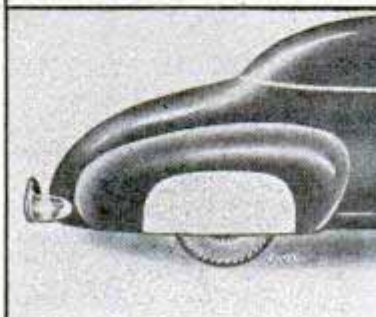
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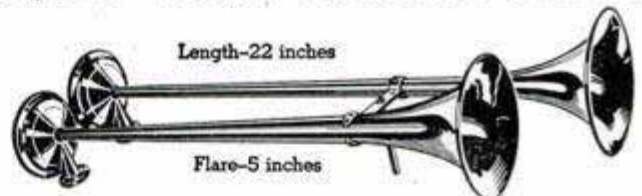
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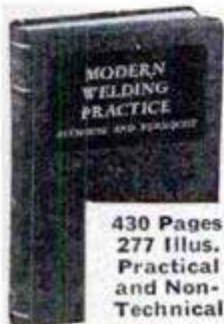


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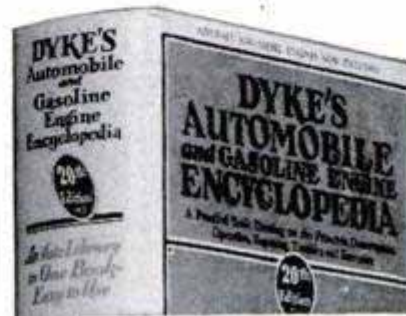
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RACING Camshafts for all cars; semi, 3/4, full race, and super full race. Harman & Collins or Weber for V8 Ford and Mercury \$30.00; all 6 cylinder cars \$30.00; all other 8 cylinder cars \$40.00. Winfield cams: semi, 3/4, and full race for V8 Ford and Mercury \$36.00, super full race \$40.00. All prices exchange. If no exchange, price of new cam will be added. Specify make, model, type of grind desired. Racing Equipment Co., Dept. M-3, 1916 W. Valley Blvd., Alhambra, Calif.

CLYMERTONE, Twin muffler sets, beautiful sound, complete with necessary welded pipes, E-Z installation. Ford V-8, \$20.00. Chevrolet set with split manifolds, \$37.50. Specify car model. Clymer, Dept. A-74, 1268 So. Alvarado, Los Angeles 6, Calif.

MAKE Your Model "A" do 100 m.p.h. Lightning acceleration, breath-taking top speed. Complete details, photographs. \$1 postpaid. Four Barrel, Box L-1, Eaglerock, Los Angeles 41, Calif.

1948 SUPERIGNITIONER. Atomic starting, pep, mileage \$5.50. EG Mfg., Elmsford, N. Y.

INSTALL V-8 engine in your Model A for extreme acceleration, more top speed, smoother performance. Complete details, photographs. \$1 postpaid. A-V-8, Box L-1, Eaglerock, Los Angeles 41, Calif.

WE Sell direct to customers over 200 speed equipment parts manufactured by us. Ford A-B-V8-6-4-(Ferguson), Studebaker Champion, Chevrolets and Willys. Cylinder heads, dual intake manifolds, lynch flywheels, oversize valves, compound springs, camshafts and other supplies. Complete engines ready for race for cars, boats and midgets. \$1.00 to cover illustrated literature and price sheet. R & R Mfg. Co., Robert M. Roof, Box 546, Anderson, Indiana.

SEE Our ad under motorscooters for midget car bargains. Midget Motors Directory, Athens, Ohio.

AUTOMOBILE Racing, Sixth Edition. 100 illustrations. Working drawings with building instructions for Ford-60 midget, California roadster, Offenhauser racer. Details on racer parts. Sample entrance blank. World's record 158.5 m.p.h. rear engine four-wheel drive car. Interesting information for fans, drivers, mechanics. \$2.00 postpaid; \$2.25 c.o.d. Ray Kuns, Department 63, Cincinnati 27, Ohio.

BUILD Speedy midget track racer from castoff parts! Plans, specifications, construction information, \$1.00. Motor Supply. Box CS-1682, Toledo, Ohio.

AUTOMOBILE Racing book, fifth edition, well illustrated. Instructions on building bodies, frames, engines. Ford A and B conversions. Plans. AAA rules, specifications. Roadster racing. Indianapolis cars. \$1.00 postpaid, \$1.30 C.O.D. Ray Kuns, Dept. 47, Madisonville, Cincinnati 27, Ohio.

GREASE Car yourself. Fast, easy, clean centralized system reduces repairs. Useful information, free. H. B. Rodd, Box 305, Trona, California.

HOT-ROD Manual, fast Fords, photos, instructions, \$1.50. Airmailed \$1.75. Racing parts list 25c. Hollywood Hot-Rod, Los Feliz, Box 9626P, Hollywood 27, California.

MAKE Your Ford fast! Complete details, photographs. How to construct 120 m.p.h. Hotrod. \$1 postpaid. California Bill, Box L-1 Eaglerock, Los Angeles 41, Calif.

AUTO SUPPLIES AND EQUIPMENT

BURN Water in your car. Costs less than gas. More power, cleaner motor. Mail card for data on \$17.50 Octa-Gane Water Injecting Carburetor. Advanced Automotive Products, 563-2 Lake Road, Webster, N. Y.

LOOSE Insert main bearings to fit into Ford A or B blocks. \$13.00 for upper set. Send bottom caps for complete set of three mains, \$16.75 complete set. Standard or undersize ready to install. No outright sales on bottom caps until we can buy more old caps. Wellens Auto Supply Co., 417 N. P. Ave., Fargo, North Dakota.

FOR Safety's sake, get Vis-A-Brake. 207 Findlay, Cincinnati 10, Ohio.

AUTO Parts. Buy direct. Get dealers' prices. Represent us in your territory. Write requirements. Specify car make. Mechanics Auto Parts, Factory Warehouse, 3807-PM N. Ashland, Chicago 13.

REPAIR Dents and holes in auto bodies with Duro Plastic Metallic Auto Body Solder. Applied with putty knife. Half-pint \$1.00 prepaid. Leonard Sales Company, Box 6412, Cleveland, Ohio.

BERMUDA Auto bells—Nickel plated brass, two loud, musical chimes. No wiring, installed under floorboard. Details. 16 Concord St., West Hartford 7, Conn.

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SAFETY Light control. Automatic hand switches auxiliary lights on should head lights go out. Literature free. Willard Via, 209 North Bell, Dothan, Alabama.

WELDING For low-cost repairs on bodies, blocks, fenders. Adds to your profits. Easy with Hobart Welders. Free catalog. Write Hobart Welders, Box M-782, Troy, Ohio.

AMAZING New invention! Quick-charges; protects; controls; conditions battery and generator while driving! Sensational low price; write quick for Free Demonstrator Offer! Gen-O-Batt, 1136A Dodge, Evanston, Ill.

AUTO Mechanics—Having trouble replacing king pin bushings? We have tool to drive them in exactly correct position. \$2.75 postpaid. Argie Developments, 2008 El Rey Drive, Whittier, Calif.

HYDRAULIC Jack repair kits. Repair your own. Send for prices. Beerman Precision Machine Works, 2000 So. Claiborne, New Orleans 13, La.

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SAVE Gas! Instant starting. Power! "Lektron" spark intensifier. Guaranteed. Easily installed. \$1.25 plus c.o.d. State make car. Electronic Industries, Cleveland 11, Ohio.

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MOTORISTS Save gasoline by Vacuumating overrich mixtures. Fits all cars. For free particulars write Vacuumatic, Dept. 1368, Wauwatosa, Wis.

NIGHT Drivers—Eliminate approaching headlight glare with "Saf-T-Aid" glare filter. Easily attached. \$2.00 postpaid. Brookmyre Distributors, 4924 State Road, Drexel Hill, Penna.

BEAUTIFUL Rich-looking seat covers. Mono. 6545 Santa Monica Blvd., Hollywood 38, California.

MECHANICS: Modern manufacturing methods allows reduction. \$12.50 gasoline saving vacuum supercharger now only \$9.75. McDowell, 2000 NE. Union, Portland, Oregon.

OIL Filter elements—Purolator N-50, N-51, Fram C-31, C-31D, AC C-117, interchange chart and prices mailed upon request. Discounted as much as 85%. Hill Equipment Co., 1301 East 5th St., P.O. Box 643, Reno, Nevada.

BEAUTIFUL Two-tone plastic leatherette seat covers. Pax Products, 55 E. Washington, Chicago, Illinois.

NEW And used automobile and truck parts. Lowest prices. Complete stock. Prompt reply. Babbitt Auto Parts, 2833 W. Chicago Ave., Chicago 22.

AUTO Parts for all cars, transmissions, motors, differentials, fenders, carburetors. Security Auto Parts, 1923-PM Grace, Chicago 13.

GRILLES For all cars. Meyers Auto Parts, 820 Dryades, New Orleans, La.

PLATING Outfits for auto parts. Connect to a battery. No tanks used. Free

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TRAILER Plans, parts, accessories—complete line. Prompt delivery. Catalog 25c (coin); catalog plus booklet, "Trailer Building," 50c (coin). Marine Mart, Buffalo 7-B, New York.

MODERN Trailer book tells all. Designing, building, traveling. New circular illustrating 8 designs 20c. Craftsman Books, Box 1153, Milwaukee 1, Wisconsin.

ACTUAL Photographs and detailed plans for 12' camp and travel trailer \$1.00. Many new features. Ed. Christensen, Box 687, Thief River Falls, Minn.

BUILD Your own trailer! Save money! Have every feature you want! Plans for house, sport, camp and utility trailers. Catalog describing 9 models 10c. 15c in Canada and overseas. Jim Dandy, Box 125-A, Wausau, Wisconsin.

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WHIZZER And Cushman ground cams and high compression heads. More speed and power. Also telescoping spring forks for motorbikes. Thomas, Dept. T-13, 1916 W. Valley Blvd., Alhambra, Calif.

TELESCOPING Bicycle spring fork. The new Thomas Spring Fork is the only telescoping fork made for motorbike and bicycle. Absorbs all road shocks, makes riding velvety smooth. \$9.95. Write for free illustrated folder. Jobber and dealer openings. Mercury Specialties Co., 1916 W. Valley Blvd., Alhambra, Calif.

PISTON Rings for all engines, any size or age. Trade discounts. Thomas, Dept. T-23, 1916 W. Valley Blvd., Alhambra, Calif.

MOTO-SCOOT \$35. Midget racer \$15. Indian motorcycle \$30, Cushman motorscooter with extra tire \$20, motors \$3 and up, homemade motorscooter \$10. Send 25c for new catalog listing these and many other sensational bargains in used motors, wheels, tires, motorscooters, midget cars, motorbikes, etc. Associated, Box 1764-CS, Toledo, Ohio.

MOTORSCOOTER \$7.50. Midget racer \$10, motorbike \$5 less motors; Harley single \$40, midget car \$55 complete. Motors \$4 up. Plenty brand new engines and surplus motorscooters. Over 5000 small tires \$1 up. Mailorder only. Send 25c for Big War-Bargain catalogue listing the above and hundreds of other bargains in motorscooters, motorcycles, midget racers, outboards, engines, etc. (35c by First Class Mail). Midget Motors Directory, Athens, Ohio.

HARLEY-DAVIDSON "45" Engines. Govt. surplus, rebuilt with generator and carburetor. Few left, close out \$89.00. Clymer, Dept. A-7Z, 1268 So. Alvarado, Los Angeles 6, Calif.

MIDGET Car with three-speed transmission \$35. Cushman motorscooter \$15. Shaw bicycle motor \$15. Harley-Davidson motorcycle \$15, motorbike outfit \$15. Rush 25 cents for special new catalog listing amazing bargains in motorscooters, used motors, tires, parts, midget cars, etc. Gail, 538 Erie, Toledo, Ohio.

NEW 1948 Indian and Harley parts and accessory handbook. 25c. Motor parts, chains, batteries, tires, chrome accessories. Motor rebuilding. Bootz, 622 East Grand, Des Moines, Iowa.

MOTORCYCLE Pistons and parts, new, used. Harley Indian, Henderson, Super-X. List 10c. Ballak, 811 N. 9th, St. Louis 1, Missouri.

BICYCLE Supplies, wholesale, retail, list 10c. Universal, 4713 Virginia, St. Louis, Missouri.

MOTORBIKE \$50.00; 3 1/4 H.P. outboard motor \$40.00; Briggs motor \$15.00; midget car \$40.00; model airplane motors \$3.50 and up. Motorcycles, bicycles, scooters, race cars, midgets and big race cars. Mail order only. Send 25c in coin for latest bulletin. Behnke's, Dept. B, 5721 Leland, Chicago 30, Ill.

FLAT Rate repair manual for Harley-Davidsons. Gives flat rate charge for every operation. Every dealer, owner, mechanic needs this new book. \$2.00 postpaid. Clymer, Dept. A-FR, 1268 So. Alvarado, Los Angeles 6, Calif.

WHEELS—Aluminum disc: 10"x1 1/4" semi-pneumatic tires, bronze bearings, for 7/16" shaft. \$1.25 each. Metalcraft Toy Company, Paul Brown Bldg., St. Louis.

AIRCOOLED Engines aplenty List 15c. Motorscooter plans 50c. Donz, Mount Ephraim, N. J.

NEW Bicycles specially priced. \$32.50.

MOTOR Scooters, bicycle engines. 120 miles gallon. Dime for catalog. Clymer, Desk A-75, 1268 So. Alvarado, Los Angeles 6, Calif.

MOTORCYCLE News, monthly. Yearly subscription \$1.00. Latest worldwide information. Motorcycle News, 5424-A Sawyer, Chicago 25.

TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

BICYCLES, Tricycles, parts, accessories. Send 10c for bulletin. Propp's, 2202 Fondulac, Milwaukee, Wis.

MOTORCYCLISTS Chromium accessories. New and reconditioned motors. Complete stock Indian parts. Expert motor rebuilding. Indian Motorcycle Sales, Kansas City 1, Missouri.

MOTORCYCLE Cams ground for speed and power. Write Harold Schaller, Box 31, Turlock, Calif.

HARLEY-DAVIDSON Supplies, parts, accessories, oil service, tires all sizes, repaired 45" motors. Send \$2.25 for Army Motorcycle Manual, 10c for bulletin. Knuth's (Harley-Davidson Dealers), 2491 Fondulac, Milwaukee, Wis.

HARLEY-DAVIDSON Parts, accessories, batteries, and tires, 24 hour service. Authorized factory dealer. Philadelphia Harley-Davidson Company, 857 North Broad Street, Philadelphia 23, Penna.

WHEELS! Build wagons, scooters, mowers, trailers, wheelbarrows, grocery carts, baby carts, play pens, baby carriages. 4" to 16" Free list. Truism Mfg. Co., 811 E. 31, Kansas City, Mo.

AVIATION

PROPELLERS—2-3 Blade, snow-ice sleds, boats. Catalog. Standard Aircraft, Box 387, Ft. Worth, Texas.

FAMOUS "Zweng" books include Mechanic's Rating With Examinations, \$3.00; Flight Engineer \$4.00. Surplus Sextants \$12.50. (Free folder). Pan American Navigation Service, 12021-C, North Hollywood, Calif.

LIGHTPLANE. Blueprints. Circular 20c. Craftsman Books, Box 1153, Milwaukee, Wisconsin.

VETERANS: Flight training under the G. I. Bill. Tuition paid. Private, commercial, flight instruction, instrument and multi-engine ratings. Opportunities to work for living expenses or tuition, if not a veteran. Write Gottschalk School of Aeronautics, Adrian, Mich.

PROPELLERS, Plans for ice sleds, snow sleds, air boats. Catalog 10c. Banks-Maxwell, Ft. Worth.

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LAMPS—All parts to build or repair. Illustrated catalog 10c. Gyro Lamps, 5402P Clark, Chicago 40.

FLUORESCENT Noise filters 25c; three 50c, prepaid. Box 214, Lawrence, Mass.

LAMPS—Build own originals, parts wholesale any amounts. Catalogue 10c. Brown Lamp Co., Box 501, Wellston, St. Louis 12, Mo.

WATTHOUR Meters. Reconditioned G.E., West., 115 v. \$2.95. T. Price, 310 14th, Raymond, Wash.

LAMP Parts wholesale. Large variety available for building, repairing, or remodeling. Order in any quantity. New 1948 catalog, 10c. Gearon Company, 27 South Desplaines, Chicago.

ELECTRICAL Repair men, send for literature on motor winding tester and A. C. motor winder. Motor Industries, Quincy, Illinois.

ELECTRIC Fans? Assemble your own. 16" correctly balanced aluminum fan blade, 1/2" bore, \$2.25. 18" all welded guard, \$2.50. Use any ordinary motor. No c.o.d. Ted Riseman, 207 North Fifth, Springfield, Illinois.

ELECTRIC Pencil: Engraves all metals. \$1.00 postpaid. Beyer Mfg., 229-H Dixon, Uniontown, Penna.

BATTERIES

GENUINE Edison storage batteries. Non-acid, odorless. Fifteen year life. Unconditionally guaranteed. 450 ampere hour type. \$242.50. Literature. See-Jay Company, 321 Yonkers Avenue, Yonkers, New York.

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WELDING—A profitable trade. Learn quickly at best equipped school in W. S. Demand for trained men. Write Hobart Welding School for free catalog. G.I. approved. Box M-786, Troy, Ohio.

ELECTROPLATING Simplified, all metals, latest formulas and instructions, \$1.00. Alan Hawkins Co., 770 Sycamore, Buffalo, N. Y.

OXY-ACETYLENE Welding outfit—New. Complete including: full oxygen and acetylene cylinders, torches, goggles, lighter, regulators, hose, carrying case, and supply of rod. Only \$89.75; supply limited. Check or deposit with order, balance c.o.d. Cylinders can be refilled anywhere. Ideal for hobbyists, garages, repair shops, etc. Burdett Oxy-Weld Equip. Co., Dept. B, 3399 Lakeside Ave., Cleveland 14, Ohio. Leading suppliers since 1923.

WELDERS For all requirements. Free catalog. Write Hobart Weld, Box M-785, Troy, Ohio.

TRANSFORMER Welders 110v. Welds 1/2" steel, \$29. Morris Welding Service, 1850A State, Schenectady 4, N. Y.

OWN Mirror shop. Resilver mirrors. Glass sign making. Electroplating. Supply prices. John Sprinkle, V55, Marion, Indiana.

"POWER-WELDER"—New combination a.c. welder; a.c. power plant. Portable, makes you independent of power lines. Gives you welding, plus power for tools, lights, motors; anywhere. Free catalog. Write Hobart Welders, Box M-784, Troy, Ohio.

RECTIFIERS: Ramyr Selenium platers, 10, 30, 50, 100 amp. sizes. Immediate shipment. Complete line of bronze baby shoe mounts. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

WELDERS!—New portable Champion special transformer welder; 110/120 volts, a.c. 8 heat stages. Welds, brazes, solders, cuts all metals. Complete with electrode holder, helmet, rods, carbons, fluxes, cables. Also special flame weld torch. Easy to use. Full directions. Splendid for shop, farm and home repairs. Guaranteed. Only \$27.50. Money back guarantee. Also resistor model, now \$14.95. Magic Welder Co., 239 MP Canal St., New York, N. Y.

"BUILD-UR-OWN" Portable arc welder. Save \$350. Easy with Hobart generator plus auto engine. Free instruction book. Write Hobart Welders, Box M-783, Troy, Ohio.

NEW Airplane tires, tubes, wheels, bearings, spindles. For harvesters, implements, lawnmowers. Free pictures. World's largest stock. Airplane Tire Company, Dept. 3, Box 89, Merced 3, California.

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LAWN Mower sharpener, \$3.65. Guaranteed. Goodwin Mfg. Co., Crab Orchard, Ky.

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INDEX Heads for sale. Very inexpensive. Sixty two different divisions. Used on lathes, drill press, milling machines, etc. Very accurate and durable. Not a toy. Every shop owner should have one. Write for free folder. Long's Index Head's, Box 537, Torrington, Wyoming.

HYDRAULIC Leather cups for jacks, lifts, presses, pumps. Write for prices. Beerman Precision Machine Works, 2000 So. Claiborne, New Orleans 13, La.

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CHUCKS, (Genuine Westcott) Independent, Universal, threaded 1 1/2"-8 for South Bend, Atlas, Logan, Clausing, Craftsman lathes. Also other chucks to 16". Top value. Free literature. Westcott Chuck Co., 3600 Walnut, Oneida, N. Y.

DRILL Grinder for twist drills, \$2.95. See ad on page 239.

HOME Lathe owners—Build your own attachments. Send for picture, sample of work and list of blueprints. Cut gears, ratchets, etc. Make neat screws easy. The Home Shop, 415 Raymond Ave., Glen-

BAND Saw—Special \$14.95. Ideal for hobbyists and home workshop. Circular free. Woodcraft Tools Inc., 147 E. Lake, Minneapolis, Minn.

POWER Tools. Build your own with Lewis Castings. Save up to 80%! Complete castings, materials and blueprints supplied for 23 woodworking and metalworking tools. Free catalog. Write today. Lewis Machine Tool Co., 3217 Union Pacific Avenue, Dept. M, Los Angeles 23, Calif.

SHEBEL Saw filer. Files all saws. Circular. A. P. Shebel, 730 B. So. 2nd St., Milwaukee 4, Wis.

CONCRETE Block machines \$39.50 up. Catalog free. Concrete Machine Company, 5466 Gravois, St. Louis 16, Missouri.

DRILL Grinder—Grinds drills to factory accuracy. Calipers with direct reading scales. Circle cutters. New Tool grinder. Lowest prices. Free literature. Factory, 811-B East 31st, Kansas City 3, Mo.

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HORIZONTAL 1 1/4 h.p. gasoline engines. Many uses. Used, "as is," complete, \$22.50. Circular. Warwick, Denbigh, Va.

GAS Drive arc welders. "Build-Your-Own." Portable. Get profitable jobs anywhere. Save \$350 with Hobart generator plus auto engine. Free instruction book. Write Hobart Welders, Box M-787, Troy, Ohio.

BRAND New 1/4 h.p. 1725 r.p.m., 60 cy., 110 v., cushion base General Electric motors with thermal overload protector. Special introductory price \$16.50. Also in stock at lowest prices, all size motors, fans, blowers. Send for catalog. Motors & Equipment Corp., 178 Lafayette St., New York 13, N. Y.

BARGAINS In war surplus motors, switches, geared speed reducers, instruments, etc. Delta Sales, P.O. Box 968, Shreveport, Louisiana.

MOTORS! 1/4 h.p., 1750 RPM, A.C., \$10.75. 1/6 h.p., \$9.75; 3 K.W., 32 Volt Lighting Plant, \$155.00. Robert Electric, 7232 Madison, Forest Park, Illinois.

IMPLEMENT Dealers, magneto repairmen, send for magneto tester circular. Abbott Electric Co., Quincy, Ill.

MOTORS! 1/2 H.P. D.C. converted to A.C. All new. High speed 110 volt, 25 or 60 cycle, ball bearing motors. Actual value about \$75.00. Now \$15.00 each or 3 for \$40.00. With forward and reverse switch \$19.50, 3 for \$50.00. Countless uses for home mechanics. Can be used in any position. Order today! Immediate delivery! No c.o.d. orders. "Amazing Bachman's," 27 Herman Street, Rochester 5, New York.

WINDING Data, listing 225 motors, single and three phase. \$1.00. Motor Data Co., Box 7631, Kansas City 3, Mo.

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SAILS, Canvas, all widths. Wingdope, marine paints, equipment for canoes to cruisers. Alan-Clarke, 96 1/2 Chambers, New York City 7.

BOAT Plans by professional naval architects. All sizes and types. Free circular. Westlawn Associates, Montville 5, N. J.

P-38 BELLY Tank speed boat. Complete plans, instructions \$1.00. Twintank Boat Co., 1032 62nd Street, Oakland, Calif.

MARINE Fittings, accessories. Thousands of items (pictured, priced). Prompt delivery. Catalog \$1.00. Marine Mart, Buffalo 7-B, New York.

SUPER-BOAT \$20. Easy to make your own with readymade streamlined laminated one-piece super-hull developed by Navy. Light, sturdy, leakproof. Anyone can convert into dinghy, outboard, scooter, cartopper, other craft. 9'x4', Warwood, 480 Lexington Avenue, New York 17.

BOAT Plans, kits—See display advertisement page 239. Marine Mart, Buffalo 7-B, New York.

BOAT Steer wheels, windshield brackets \$8.95. Modern hardware kits, bargains galore, folder. Marine, Box 681, Mendota, Minnesota.

OUTBOARD Motors—Good values, used motors. Also used parts for most makes and models. Crandall-Hicks Co., 911 Commonwealth, Boston, Mass.

P-38 BELLY Tanks, new, steel, 10 ft. 2 in. 165 gallon \$9.95. Anzio Boat Co., Box 89H, Merced, Calif.

BUILD Your own boat by the Welch System, ready cut parts. No experience necessary. Save 2/3 cost. Rowboats to cruisers. Illustrated catalog 25c. Midwest Boat Company, Menomonee Falls, Wis.

ASK About Osco Electric Tachometer for all popular makes of outboard motors. Oscometers, 2020B E. Orleans St., Philadelphia 34.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

MARINE Conversions for Ford and Jeep engines. Catalog 10c. Lehman Manufacturing Company, Department D, Newark 2, New Jersey.

NEW, Used, rebuilt marine motors. Marine conversions, fittings. Free catalog. Stokes Marine Supply, Dept. 24, Coldwater, Michigan.

ATHLETIC EQUIPMENT, BODY BUILDING COURSES

BARBELLS, Dumbbells \$8.65 up. Stamp for folders. Jackson Barbells, Springfield, New Jersey.

BARBELLS, Exercise equipment. Courses. Free booklet. Good Barbell Co., Reading, Penna.

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SPEAR Fish and bait, Indian method. Get the big ones. Spear head \$3.50, plans to make 65c. Campet, 1826 N. Springfield Ave., Chicago, Ill.

FISHERMEN'S Special. Braided nylon line, 23 test. \$2.00 hundred yard spool prepaid. Donaldson's, 7416 S. Vermont, Los Angeles 44, Calif. Established 1936.

BASEBALL, Softball. Uniforms, equipment. Catalog ready. Craigco, 670 East 42, Brooklyn 3, N. Y.

GET Three good lures, all different, and a brand new official 1/2 oz. practice casting plug by postage-paid return mail in exchange for three old lures you no longer want, plus \$1.00. Lures you specify sent whenever possible. Satisfaction guaranteed; tell your friends. Trade today as hundreds have. Westbrook Company, 227 N. Water Street, Milwaukee 2, Wisconsin.

GUNS! Catalog listing 2,000 modern and antique guns. Also war relics, edged weapons, ammunition. 600 illustrations. 50c coin. Martin Retting, W. Hurley 12, N. Y.

AMMUNITION—45/70 Blank cartridges, loaded with black powder, center fire, standard length, mfg. 1943 Western cartridge, 1 1/2c each, minimum order 500. Hill Equipment Co., 1301 East 5th St., P.O. Box 643, Reno, Nevada.

REPROCESSED Golf balls—Guaranteed satisfactory. \$3.95 dozen c.o.d. Indianapolis Golf Co., 4903 Brookville, Indianapolis.

AMMUNITION, 75 Sizes in stock. Dime for list. Central Sports, Delphos 5, Ohio.

PISTOLS: Walthers, 32/7.65mm. calibre, double-action hammer, automatic, perfect, \$50.00. J. P. Shuer 32/7.65mm. calibre, double-action hammerless, automatic, perfect, \$50.00. Mausers, 32/7.65mm. calibre, excellent, \$40.00. Smith-Wesson .38 specials, military-police, 5 inch barrels, excellent, \$55.00. Complete firearms-ammunition lists postpaid 25c. Frank Parish, Vicksburg, Mississippi.

SHOTGUNS, Rifles, handarms, ammunition, rods, reels. List 10c. Rudolph's, Atchison, Kansas.

FIREARMS—Ammunition; complete list 25c. Satisfaction. Frank Parish, Vicksburg, Miss.

5000 BARGAINS, Firearms, binoculars, war relics. Catalog 40c. Smith Firearms, Pennemede, New Jersey.

FISHERMEN! Make real savings on your tackle needs. Get our catalog. Snap swivels 3 for 10c. Jointed cane poles \$1.95; floating minnow buckets \$2.49. Hundreds of other bargains just like these. Send for free catalog today. Write Dept. PM, Andy Anderson's Sporting Goods Co., 124 W. Grand, Oklahoma City 2, Okla.

BOWS—Arrows, write headquarters for archery equipment. Quality products. Popular prices, catalog 10c. Large illustrated handbook instructions, aiming and shooting, 50c. Archery, 617-B So. State, Chicago 5.

SHOTGUNS, Rifles, revolvers, over 500 modern, obsolete. Also cartridges, list 10c coin. Ed Howe, 52 Main, Coopers Mills, Maine.

FIELD GLASSES, TELESCOPES, MICROSCOPES, MAGNIFIERS

BINOCULARS, Telescopes, watches, guns. Buy, sell, trade. Schweer's, Donnellson, Iowa.

TELESCOPES, Rangefinders, aiming circles, optics. Lowest prices. List free. Donn Surplus, Dept. M, Box 27, Norwalk, Ohio.

MICROSCOPE, 75 Power, achromatic objective, standard optical threads, \$19.95. Free folder, Rowe Co., Dept. 2, Box 1, Brighton Station, Rochester 10, N. Y.

TERRESTRIAL Eyepiece for astronomical telescopes, \$3.00 postpaid. Suffolk Science Service, Manorville, New York.

7x50 **COATED** Optics sets \$13.00, telescopes, supplies, surplus. 10c for list. R. Beach, 703 S. Claudina, Anaheim, Calif.

ASTRONOMICAL—Terrestrial telescope lens kit. 50X, 100X, 200X, 400X powers \$3.00. Microscope lens kit. 50X, 100X, 200X, 400X, 800X \$2.00. Postcard brings plans. Optical list outstanding values. Pfeegor Optical Co., PM-7, Sunbury, Penna.

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MAKE \$3 To \$10 per hour in spare time with Emrick Workshop, doing home repair jobs for others. Five power tools in one unit (lathe, drill press, circular saw, grinder and sander). Uses 1/4 h.p. motor. No toy or gadget—does heavy work—83 operations. Buy at factory price—save 50%—complete, only \$34.95. Write for free literature. Emrick, Inc., 1732 Clinton, Kalamazoo, Mich.

FREE Details on 100 easily made soaps and chemical cleaners. Brown, 9111-C Hoyne, Chicago 20.

MAKE Your own gold, silver, metallic, sign letters for store windows, etc. Samples, literature free. Art Enterprises, Box 852, New Westminster, British Columbia, Canada.

SELL By mail! Learn how! Join Mail Selling Opportunities Club! Details free! Chas. Wehner, Box 142-A, Roxbury 19, Mass.

AMAZING Hold screw drivers! Insert, remove screws inaccessible places! Exclusive distributor; factories, garages, mechanics, stores buy quantities. Millenco, 271 Miller Bldg., Boston, Mass.

VENDING Machines earn big money! An investment as low as \$10.50 will start you in this fascinating, profitable business that can lead you to the road of success and independence. Routes can be established and operated in either full or spare time with no experience needed. Write for full details and our free catalog illustrating our nut, candy, gum and stamp vendors; also slot machines, amusement games, etc. Parkway Machine Corporation, 623 W. North Avenue, Dept. 7, Baltimore 17, Maryland.

START Home manufacturing business making Cleaning Compounds, Soaps, Insecticides, Cosmetics, Polishes. Food Fla-

PIANO Tuners are in demand making big money. Learn piano tuning at home. Write Evansville School of Piano Tuning, Dept. B, 714 S.E. Second Street, Evansville, Ind.

NO Selling, operate vendors, amazing profits, details free. Silver-King, 622 Diversey, Chicago 14, Ill.

SPECIAL Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

"PLIASTONE"—New building material. Resurface old homes, build new ones. Composition floors; colored tile. Particulars free. Marbleized Service, Edwardsville, Illinois.

LIQUID Marble—Colorful, glossy! Molded, brushed, sprayed. Cast novelties, statuary, colored tiles. Flexible molds. Composition floors. Particulars free. Marbleizing Service, Edwardsville, Illinois.

BIG Money in vending machines. Smallest capital start brings immediate profits that build permanent profitable business. Starting instructions free. Becker Vendors, 105-A Dewey, Brillion, Wis.

START Your own business. Formulas, duplicated products. Marchild Service, P.O. Box 166, Plymouth, Mass.

POPCORN Machines, peanut roasters, caramelize equipment, griddles, gasoline; bottled gas appliances. Northside Sales, Indianola, Iowa.

DON'T Chance an income, guarantee it. Free. Roard, 629 Drexel Building, Philadelphia 6, Penna.

HOW And where to obtain capital. Small and large loans. Free particulars. Star Service, Wapakoneta, Ohio.

OWN Mirror shop. Resilver mirrors. Glass sign making. Electroplating. Supply prices. John Sprinkle, V60, Marion, Indiana.

DOLLARS In your own business at home. Literature free. Frank Webster, Box 1972A, Hollywood, Calif.

"OPPORTUNITIES for You in Modern Electroplating." Full or part time. Free illustrated booklet. Write Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 8A, Pennsylvania.

RUBACREAM! Natural rubber latex! Makes molds quicker! Thicker! Free sample convinces! Castcraft Studios, 509-P Fifth Avenue, New York 17.

MAILORDER Offers increased income! Free details. Cox, 14 Church, Saugus 10, Massachusetts.

LOOKING For a profitable sideline? Metallize baby shoes! Good profits. Small investment. Easy work. Free details. Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 8, Pennsylvania.

MAKE Beautiful vari-colored, highly glazed concrete pottery. Amazing profits. Small capital starts. Write for samples and photographs. Ozark Enterprises, Lock Box 273, St. Charles, Mo.

MONEY For you in your own business. Many surprising opportunities. Free information. Empire, Box 1340-C, St. Louis, Mo.

MOLD Makers. Genuine natural latex for rubber molds, only two coats needed for thick mold. Reproduce statuary, plaques. Inexpensive. Write Major Chemical Co., 131A Inman Street, Cambridge 39, Mass.

INVENTIONS Protected in 30 days. Patents for sale. Patent News, 12M, Washington, D. C.

\$100 BUYS Ten year license to sell copyrighted mailorder article. Make full profit ten years. Free particulars. Robert J. Drummond, 33 North St., Stoneham 80, Mass.

BRONZED Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution, 30-amp. plating rectifiers with powerstat control, \$85.00. Geared motors for agitation \$20.00. Lead lined tanks. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

SELL Greeting cards, pictures, signs, novelties, books! Large profits! Catalog free! Elfcoc, 434 North Wells Street, Chicago 10.

MAKE Money making new greasless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

YOUR Own business in plastics. Details free. Harco, Edgewood, Maryland.

ADVERTISE Your business—5,000 6x9 circulars \$14.00 postpaid. Journal Printing Co., Newark, Ark.

START Business! "with \$1.00." Money-maker! Free sample! Stephens, Grand Junction, Colorado.

A FACTORY in your home garage! Mfg. and sales rights, mechanics' waterless hand cleaner. \$500-\$800 monthly. No special equipment necessary. Western Aircraft Mfg., Dept. D, Los Angeles 6, Calif.

DO It with sea shells. Profitable easy home work. Free lesson. A. Werts, Sharp Park, California.

MAKE Liquid marble, artificial marble flooring, flexible molds, statuary, art goods, novelties. Literature free. Kemico, Park Ridge 50, Ill.

NEW Low prices. Complete line cosmetics, flavorings, specialties. Distributors, jobbers, agents wanted. Victor's Products Company, 917-201 College Avenue, Morgantown, W. Va.

TEN Moneymaking home business opportunities. Details, 25c. Crawford, Box 1161-PM, Bridgeport, Conn.

EARN \$200 Weekly installing new amazing "Styron" plastic wall tile in homes, offices. Easily applied. Tile your own kitchen, bathroom, too. Instructions, everything furnished. Literature free. U. S. Tile Co., 30 W. Washington St., Chicago 2, Ill.

GET Hundreds money making deals, business ideas, plans and manufacturing. Amazing holo free. Austin Mail Service, 5538 Lexington, Chicago, Illinois.

PRIVATE Label service. Complete line cosmetics, flavorings, specialties. You furnish labels, we label, or will ship unlabeled and you label. Can supply complete line labeled our Victor's label. Also big line flavor concentrates and flavor ingredients. Hindman Products, Inc., 917-200 College Avenue, Morgantown, W. Va.

MAKE Money by mail, every month. Spare time business. Small capital required. Tuff, 429 Robison Ct., Pittsburgh 19, Penna.

BABY Shoes preserved. Formulas, instructions \$1.00. Reilly, 5432 Malcolm St., Philadelphia, Penna.

EASY \$500 Month profits. Men or women. Your own distributing business. Not house to house. Nationally distributed, fast selling line cosmetics, flavorings, specialties. Sales or business experience desirable. High school or equal education. Car and extensive traveling required. New, profitable, proven sales plan by telephone. Investment secured by merchandise required, or credit arranged. Victor's Products Company, 917-202 College Avenue, Morgantown, W. Va.

QUICK Money. "Repairing car batteries." At home! Easy too! Batteryman, Grand Junction, Colorado.

WANTED Unused U. S. postage stamps, small discount. Advance Stamp Company, 24 East 23rd Street, New York.

MAKE And sell candy professionally, inexpensive to start, information free. Box 670, Kissimmee, Florida.

AGENT Or exclusive distributor for cigarette lighter mfg. MacGregor, Tahoe Valley 16, Calif.

OWN—Operate ball gum, nut, cigarette vending machines. Amazing profits, no selling. Write for free details. Cameo Vending, Dept. P, 432 West 42nd, New York.

METALLIZE Baby shoes. Excellent profits. New system assures success. Free details. Treasures Forever, 89 Henry Ave., Lynn, Mass.

POPCORN Machines. Potato chip outfits. Long Eakins Company, 4860 Hi Street, Springfield 99, Ohio.

OPERATE Profitable mail order business. Splendid opportunity. For details write V. M. McKinley, 76 Ave. "A," Battle Creek, Mich.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. American Mail Trade Association, 313 East 21st Street, Suite 450, New York 10, N. Y.

\$46 FROM Square foot plywood. Jigsaw necessary. Write, Woodarts, X-38, Bridgewater, Mass.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

RE-NEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723A Troost, Kansas City, Missouri.

EXTRA Money? Free details. Trable, 1018 1/2 A Elm Street, Dallas, Texas.

RECAST Old batteries into new. Latest achievements, Battery Laboratories, Minneapolis.

MAKE Money casting new 1948 metal toys and novelties. Latest scale model autos, original ashtrays, savings banks, water pistols, etc. Enormous wholesale and chain store demand keeps manufacturers busy. Spare or full time. No experience or special place necessary. Write for details and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

LEARN Piano tuning, repairing, at home. Tremendous field! Piano parts, tools furnished. Established 1935. Empire School of Piano Tuning, 606-B East University Ave., Champaign, Ill.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

START Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

LIQUID Rubber for making flexible molds. Cast novelties. Sample bottle 25c. Free literature. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

OPERATE Profitable home business selling merchandise by mail. Past sellers. Large profits. Powell Service, 5713 Euclid, Cleveland 3, Ohio.

SPECIALTY Manufacturing, the big money business that can be operated anywhere. start on a very small capital; we supply dependable formulas and complete instructions; get interesting free booklet, "Moneymaking Opportunities in Specialty Manufacturing." Howard Robinson, Ph.G., 1300-A South Ohio Street, Sedalia, Mo.

COPUBLISH Leading m.o. paper. Latest copy Mail Sale Advertiser and proposition, commemorative stamp. Vanroy Shirk, Lebanon, Penna.

\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

137 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd, Successful Enterprises" free! Some offer occasional "day off." Work home. Expect something odd! Pacific, Oceanside, Calif.

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordon Publishers, Box 23, Pawtucket, R. I.

CO-PUBLISH And advertise in The Central Mail Advertiser. Sample copy for stamp. Low rates. Large circulation. Bagby Printing Co., Georgetown, Ohio.

MAIL Order opportunities. Full or spare time. Hundreds of chances. No charge. Postal brings copy. Blackstone Press, Somerville, New Jersey.

MONEYMAKING OPPORTUNITIES

EARN Extra money. Easy pleasant work. Write: Reminder, Thurmont, Maryland.

LOOK Here! Wanted—men to start in business on our capital. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. G-192-PPM, Freeport, Ill.

MAKE Money having fun—Novel idea and sample 25c. Aircastle, 7050 Van Buren, Hammond, Indiana.

CASH For you—Yes, you keep dollars. We fill orders free. You risk nothing. Write, Edwin Velker, 1836 Champlain Street, Toledo 11, Ohio.

PUT Your wife in business; Sell home decorations. 200% profit, everyone buys, no investment. Camnet Company, 1826 N.

TESTED Money making plans. Free details. James Carter, Rocky Mount, Virginia.

100 MONEYMAKING Ideas! 64 pages—\$1.00. Zampino, 2337 Bath Avenue, Brooklyn 14, N. Y.

BIG Profits raising earthworms. Wetzel's, 4051 West 226, Cleveland 16, Ohio.

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

EARN Up to \$520 month part or full time keeping books for small firms. Simplified system. Write Tax-Saver System, Dept. V, Ft. Worth, Texas.

MORE Money needed? Postal brings profitable proposition. Ace, Brentwood, Maryland.

MAKING Money mailing circulars. Booklet 25c. Artistic, 217P Longwood, Merchantville, N. J.

SEA Shells. Interested in making shell jewelry, lamps, novelties. We have all supplies at wholesale. Write for price list. Sea Shells, 269 W. Flagler Street, Miami, Fla.

CO-OPERATIVE Publishing pays! Copublish "Progressive" for profits, prestige, independence! Complete instructions, 25c. Kimball, 31-P Norway, Berlin, N. H.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 40, Illinois.

CONCRETE Block molds, 8x16x4 \$6.70, others, literature free. Lehnert, Norwood 2, N. J.

PRIZE Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2685P, Miami, Florida.

WIN Contest money. Send 25c complete instructions for writing winning answers. Winacontest, 22P Westlake Ave., Auburn, N.Y.

ANALYZE Handwriting for profit! Complete outfit \$1.00. Graphologists, POB-971, Philadelphia.

EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

WIN Contest money. General Contest Magazine gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609 1/2 East 5th, Duluth, Minn.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd Successful Enterprises" free! Proven! Work at home, office. Expect something odd! Pacific, Oceanside, Calif.

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.

FORMULAS, PLANS, ETC.

OPPORTUNITIES! Catalog describing 200 helpful formula, money-making books. Airmailed throughout world for stamps. Adams Brown Company, Boston 67, Mass.

MONEY Making formulas. Circular free. Arthur Beers, R2, Freehold, N. J.

"EVERYBODY Likes Candy." Learn to make professionally. (Our 38th year.) Ragsdale Candies, D5, East Orange, New Jersey.

FREE Formula catalog. Anything analyzed \$20.00. Western Chemical, Salem, Oregon.

FORMULAS For twenty-five useful products. One dollar. Chemist, Box 274, West De Pere, Wisconsin.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. Literature free. Kemico, Park Ridge 16, Illinois.

21 POPCORN, Candy apple, etc. formulas. All money-makers. \$1.00. We can supply equipment. Concession Supply Co., Dept. "A," Box 133 Sta. "B," Toledo, O.

10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

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

PLASTICS

PLEXIGLASS, clear, masked, 3/8" \$2.00 square foot, postpaid. Guaranteed perfect. Crafton Industries, Waseca, Minn.

"PANTOGRAVER." Motor tool attachment, engraves plastic signs. Details. Sample engraving 25c. Desco, 6334 Senul-

LUCITE, Plexiglas. Masked sheets. All sizes, cost square foot (12"x12") 1/16" 90c; 1/8" \$1.16; 3/16" \$1.43; 1/4" \$1.68; 5/16" \$2.09. Include 10% postage. Almac Plastics Inc., 230 Fifth Avenue, New York 1, N. Y.

PLEXIGLAS—Red, black, white, green, yellow, blue, with supplies for two tone jewelry set. \$1.00. Bradlee, P.O. Box 142, Buffalo 5, N. Y.

BOOK—Illustrated, fabricating, forming lucite. Simplified methods, projects. \$1.00 p.p. Ideas-B, 11379 Ventura, North Hollywood, Calif.

INTERNAL Carved wild-life pins \$1.50. Rose costume jewelry sets \$1.75. Crystal Floral Novelty Co., Somerville, New Jersey.

SUMMER Special. Prime quality masked Lucite. 3/16", 16" square \$2.45 postpaid. Free catalogue. Craft-Plastics, Somerville 1, New Jersey.

PLASTIC Materials. Cements, dyes, findings, internal carving drills. Send 10c for catalog and floral carving instructions. Locket with internally carved rose and bud 50c less findings. Art Plastics of Calif., 8125 East 14th Street, Oakland 3, Calif.

BARGAINS in plastics. Lucite, Plexiglas, Catalin. Many colors and sizes. Details free. George Plastics, 6938A George St., Chicago 34, Ill.

RENEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723B Troost, Kansas City, Missouri.

PLASTIC—Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2618 St. Louis Ave., St. Louis 6, Mo.

CHEMISTRY

RADIUM (Uranium) Specimens, apparatus. Catalog 10c. Luminous paints: five colors, phosphorescent or fluorescent, \$1.00 each set. Hammer Laboratories, Denver 7, Colorado.

EDISON'S Home laboratory made him famous. Start yours today. Catalogue chemicals and apparatus 15c. Microscopic stain catalogue 20c. Both for 25c. National Scientific Company, 2204 North Ave., Chicago 47, Ill.

CHEMICALS, Ounce quantities, apparatus, catalog 10c. Fleischer's Laboratories, Everett 49, Mass.

NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Illinois.

CHEMICALS And apparatus for industrial, analytical and private laboratories. Complete supply service for correspondence school students. Send 10c for catalog. Dept. M-43, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, New York.

FREE Catalog: Chemistry, mineralogy, physics, biology. Tracey Laboratories, Evanston, Illinois.

HANDBOOK For chemical experimenters, illustrated, hundreds of experiments, 50c. Experiment booklet 15c. Supply catalog 5c. Reading Scientific Company, Reading, Penna.

HELP WANTED

BOYS Wanted. Over \$50 week! Sell name plates for front doors. Write National, 214-CC Summer, Boston, Mass.

AGENTS WANTED

DENTAL-STERO—The new toothbrush holder and sterilizer for money-making salesmen. Used in every home! Big profits. Write Dental-Stero Company, 3906 Secor Road, Toledo 6, Ohio.

EARN Big money year 'round. Be a one-person-department-store. Take orders for shirts, ties, hosiery, lingerie, household linens, etc. For information, Corporate Merchandisers, Dept. PM 4, 110 West 34 Street, New York City 1.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7x11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 391, New York City 70.

MAKE More money in spare time handling magazine orders. Fall best selling season. Our helps build big repeat business. Wholesale catalog free. Write McGregor Magazine Agency, Dept. 12,

VIS-A-BRAKE Sells on sight, fits all cars. 207 Findlay, Cincinnati 10, Ohio.

INFLATABLE 12" Plastic play balls, excellent summer sellers. Send \$1.00 for sample. Wholesale prices. Nythor Company, 259 West 34 St., New York, N. Y.

LECTRIK Silver Kleaner Atomic Metal Electrode Plate (magnetic principle). De-tarnishes silverplated ware (and other metals) quickly. Simply dip, rinse, dry. Agents wanted, Part or full time. NuProcess Products, Aurora, Ill.

MAKE Money easily. Fast-selling line 50 new boxes Christmas, everyday cards, stationery. Unusual Christmas carol, Americana, etching, "flocked" initial stationery, others. Profits to 100%. Bonus. Special money-saving offers. Experience unnecessary. Write today for Christmas Leader assortment on approval and free samples 5 different name imprinted Christmas card lines, personal, floral stationery. Elmira Greeting Card Co., M-9 Elmira, N. Y.

\$1 STARTS You in business. Sell lined ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-25, New York 10.

BIG, Easy profits to 100% selling new, novel Christmas card, gift wrapping, panorama, Christmas carol assortments. Bonus. Special offers. Request free samples 50 for \$1.00 personals, silver imprint line, name imprinted and floral stationery and feature Christmas samples on approval. New England Art Publishers, North Abington 171, Mass.

AMAZING Offer—\$40 is yours for selling only 50 boxes, each containing 25 new, entirely different deluxe Christmas cards with or without name imprinted. Also 50 for \$1.00. Free samples. Other boxes on approval. Write today. It costs nothing to try. Cheerful Card Co., 354 White Plains, N. Y.

MAKE Money fast! Sell Christmas cards to friends, neighbors, others. Big variety etchings, religious, 50 for \$1.00. Wrappings, stationery. New \$1.25 line "Little Ones," flower box, plastic frosted, Saints 'n' Sinners. Special offers, bonus. Fund raising opportunity for individuals, clubs, churches, schools. Mail postal today for feature 21 card \$1.00 Christmas assortment on approval. Hedenkamp, 343 Broadway, Dept. Y-42, New York 13.

SELL Luxury perfumes for profits and repeats. Generous samples \$1.00 deductible first order. Edward Lawson, 10-21 Joiner Street, St. Augustine, Florida.

CHRISTMAS Cards. Earn \$3.00 an hour. Take orders galore from friends. America's fastest selling 21 Christmas folder assortment. Smart, distinctive! Costs 50c. Sells \$1. A complete line. Samples on approval. No investment. Sunshine Art, Dept. PM-7, 115 Fulton St., New York 8, N. Y.

START Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. G-U1-PPM, Freeport, Ill.

AT Last! Something new and sensational in Christmas cards. Gorgeous satin, velvet designs never before offered. Amazing value! Gets orders fast. Name-imprinted Christmas cards, 50 for \$1.00 up. Big profits. 30 other assortments 60c to \$1.00. Imprinted stationery. Samples on approval. Puro Co., 2801 Locust, Dept. 840-J, St. Louis, Mo.

ACT. Sell new Xmas photo greeting folders. Big profits, we deliver, free kit. Spooner, 115 Chauncy, Boston, Mass.

DE-ODORIZER—Refrigerator and ice-box unit. Sell finest, retails \$2.00 and profit 100 to 300%. Exclusive territory. Write L. A. Muffler, Continental Bldg., Los Angeles.

REMNANTS—Amazing values. Housewives buy on sight. Good profit. Write B & M Textiles, 78 N. Main St., Paterson 2, New Jersey.

SHINE Shoes without "polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 124, Akron, Ohio.

FREE Sample! Big profit opportunity with amazing Glow-in-the-Dark house numbers, switch plates, pictures, decals, religious articles. Represent large manufacturer Madison Mills, 303 Fourth Ave.,

A DRESS Yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. P-9128, Cincinnati, Ohio.

CALL On friends with sensational Christmas cards in handy assortments. Sell for \$1.00. Profit up to 50c. Also popular-priced personal Christmas cards, everyday assortments, stationery, imported napkins. Samples on approval. Wallace Brown, Dept. G-4, New York 10, N. Y.

AGENTS Wanted to sell nationally advertised pocket atomizers. Just four sales daily net \$50.00 weekly. Write Dept. M, Louell Products Co., 423 Fulton Street, Brooklyn 1, N. Y.

AGENTS, Fast sales. Cuts food cost. Nets \$9 a case. Sell 6 daily. Jeld, Ltd., Burbank, Calif.

MAKE More money direct from factory. Fibre brooms, floor dusters, patented wet mops. Aluminum mop wringers. Big profits. Write Burtz Fibre Broom Co., Columbia, Penna., Dept. A.

PLASTIC Christmas cards. Exclusive new plastic, sachet, panoramic and carols Christmas assortments. Five leading 21 card \$1.00 feature assortments. Six portfolios of personal cards. All this plus America's fastest imprint service. Free samples. Elmercraft Card Co., 5930 South Western, Chicago 36, Illinois.

LATEST Discovery. Savol Waterless Hand Cleaner Creme. Removes stains. Pounds 50c postpaid. Valtex Company, Rochester 7, New York.

SENSATIONAL New rubber toilet bowl applicator free with each Skasol sale to filling stations, homes, etc. Good profits, sure repeats. Box 80, Webster Groves 19, Missouri.

100% PROFIT! Selling gasoline-savers. Literature 10c. Thorn, P2842, Paterson, New Jersey.

MAKE Sensational profits! New, sell-on-sight plastic line: Tablecloths, aprons, many other splendid fast-selling items, novelties. Postal brings free details, special deals. Hurry! Royalty, Box K-748, Passaic, N. J.

BE A jobber, sell brushless auto enamels to retailers. Car or bicycle helpful. High earnings on our capital. Sterling Chemicals, Middletown 99, Conn.

AGENT-Distributors. Flo-Glo plastic linoleum finishes. Acme, Box 404, Mount Vernon, N. Y.

CHRISTMAS Cards 50 for \$1.00! Other series of 25 from \$1-\$2.50. Also box assortments. Free sample albums. Commission. Bonus. Richar Greetings, 16 E. 18th, New York 3.

AGENTS. Make big profits selling guaranteed Reflex spark plugs, sideline, exclusive territory. Reflex Spark Plug Co., 10902 Madison Ave., Cleveland 2, Ohio.

SPOOK Hand cleaner sells itself—Pays you 130% profit. Amazes prospects by instantly removing paint, grease, etc. without water. Sold coast to coast and export. Everyone a prospect. No offensive odor. Contains antiseptic. Repeats. Free particulars. Sample 50c. Arrow, 1012 Charlevoix Building, Detroit 26, Michigan.

BIG Money. Sell friends, others, exclusive Christmas card assortments unobtainable elsewhere. Profits to 100%. Bonus. Request free samples exclusive 50 and 25 for \$1.00 name imprinted Christmas cards with Christmas and everyday assortments on approval. Regal Greetings, Dept. PM-2, Hazel Park, Mich.

CANVASSERS Make to \$36 cash daily. New electric device, everyone needs. We deliver, sample kit \$2.00. Sibert Company, Newark 3, N. J.

BUY Thousands of nationally advertised products direct from manufacturers. Write for "Buy Direct and Save." Consumers Assn., 287-A Lebanon Ave., Mt. Lebanon, Penna.

BIG Money selling cooking utensils direct. Cast iron and aluminum, exclusive designs, nationally known. Free photo illustrations. Jones Machine & Foundry Co., Chattanooga 2, Tenn.

CHRISTMAS Cards. Earn \$5.00 with every ten \$1.00 21 card boxes you sell. Also new Plastic cards, personalized cards and stationery. Note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-8, Pitman, N. J.

START Flocking—Spray professional plush finish on everything. Easy, profitable, inexpensive. Free samples, illustrated folder. Coast, 1507 W. Manchester, Los Angeles 44.

HOUSEHOLD Specialty. Profitable fast seller. Flinson, Box 4333-B, Kansas City, Mo.

A NEW Fast-selling kitchen item. Big profits. P.O. Box 3631, Highland Park 3, Mich.

ALIVE—Permanizing salesmen. Dodge Studio, Meriden, Conn., 37 Gravel St.

BALLPOINT Pens. Unexcelled. 200% profit. Circular. Hebron, 6422 Fitchett, Regopark, New York.

\$25 YOURS For selling only fifty \$1.00 boxes, new exclusive different Christmas and all-occasion cards; also extra cash bonuses. Send for Champion Cheerio 21-card box on approval. Free samples 6 new personal groups and stationery. Write today. Dept. 27, Pen-Brush, 154 Nassau St., New York 7.

AMAZING Profits. \$25.00 for selling 50 \$1.00 deluxe Xmas boxes. Embossed 50 and 25 for \$1.00, name imprinted. Free samples. Ed-Brite, Dept. 12, 435 North Terrace Avenue, Mt. Vernon, New York.

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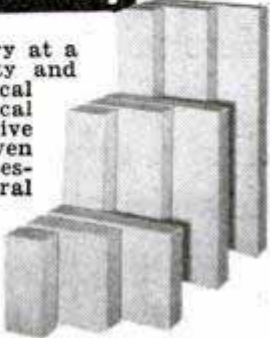


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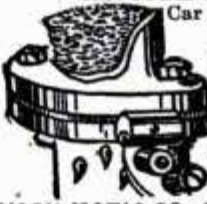
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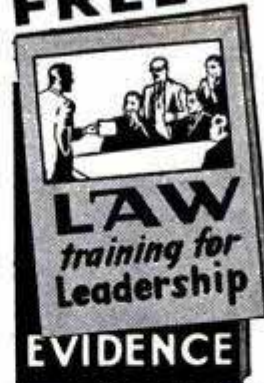
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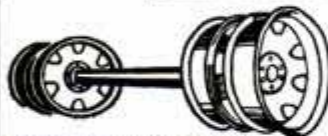
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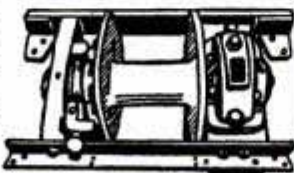
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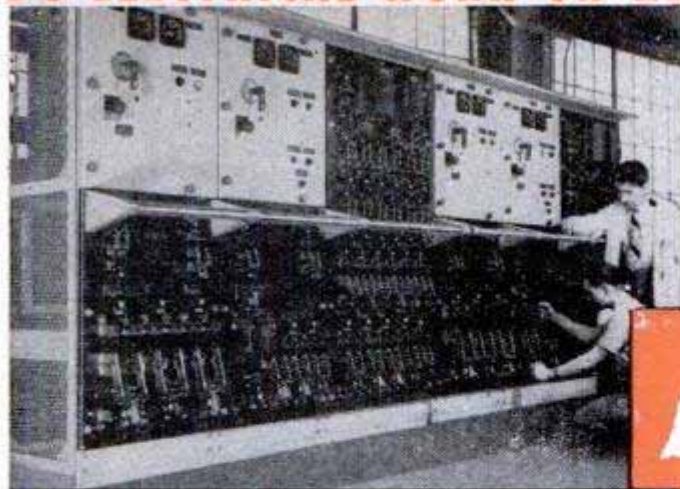
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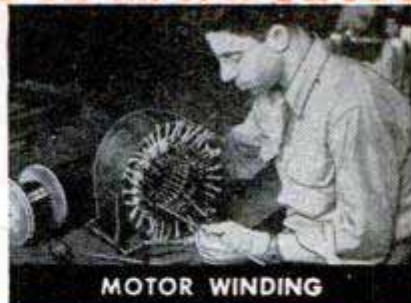
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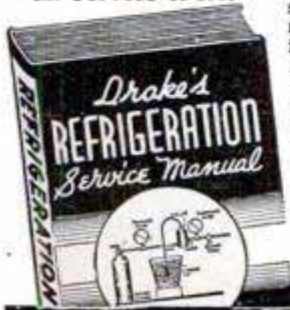
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A rechargeable, wet plate battery good for years of service. Brand new. Battery is shipped dry but fully charged—any battery station will add acid. Use singly or in multiples for radio sets, bell circuits, alarm systems, etc. Measures 5 1/4 x 4 x 3 inches. Ball floats indicate condition of charge. Shp. wgt. 4 lbs. Stock No. 297—**\$2.95** Each Only

WHAT EVERY PERSON OVER 21

SHOULD KNOW about advertising



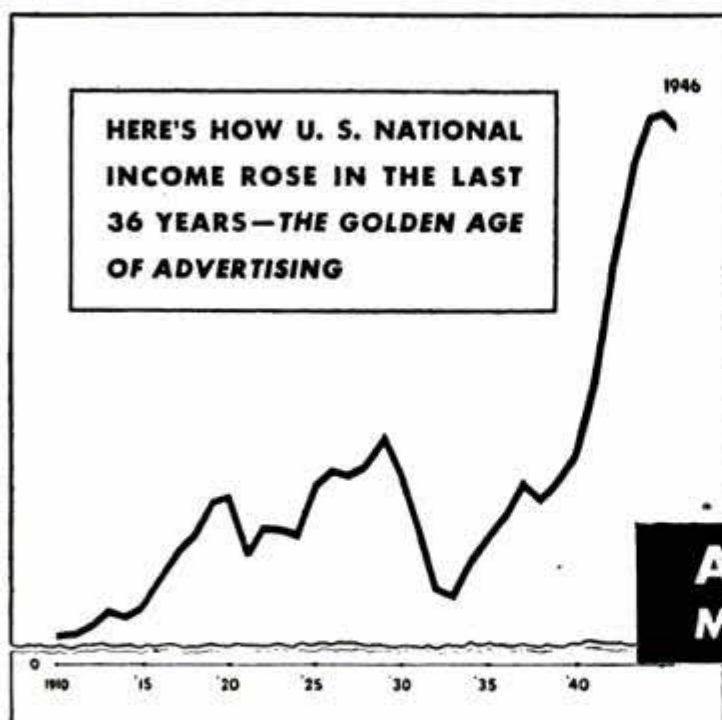
I AM an ad. And everyone who has a job or wants one should know what I do.

For it's advertising—by selling more goods to more people—that makes jobs, and makes jobs *more secure*.

Whether you want a job or want a better one, remember—jobs all along the line depend on somebody selling something to somebody else. And advertising is the lowest cost way yet devised to sell goods.

That's why advertising is called the spark plug of American business. Advertising makes the wheels go around. For advertising's job is to sell. When more goods are sold, there are more jobs and better jobs for everyone. Selling less goods means failures, pay cuts, layoffs.

So whenever you see or hear advertising don't forget that it's helping you. If it weren't for advertising's low-cost way of selling goods you couldn't have such a secure job or opportunity in the future.



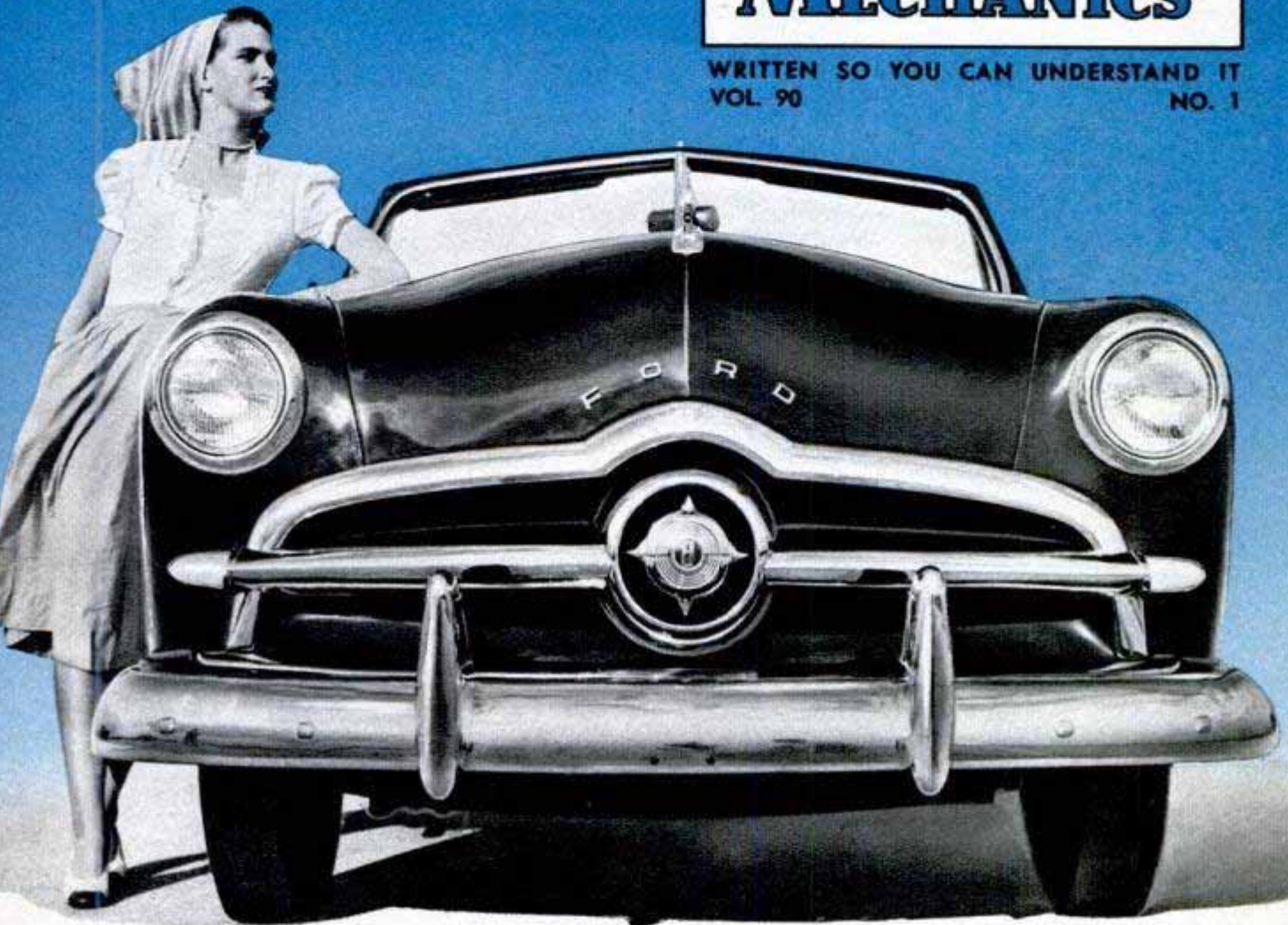
OTHER WAYS ADVERTISING HELPS YOU AND YOUR FAMILY

- 1 Brings you better goods for less money
- 2 Makes shopping more pleasant and easier.
- 3 Gears consumer demand to production, to create prosperity.

Advertising... BY SELLING MORE GOODS TO MORE PEOPLE
Makes your job more secure

This rise in the standard of living for you and yours is unequalled in all history. Advertising helped raise this standard—is needed even more today to sell industry's new developments.

**ADVERTISING FEDERATION
OF AMERICA**



Debut for the '49 FORD

ONE ICY FEBRUARY night a 1949 Ford test car was delayed by road conditions on its return to the Ford Motor Company's proving grounds at Dearborn, Mich. The driver was upset because there was an ironclad rule that all the super-secret test cars had to be back behind the high board fence of the proving grounds by dawn.

Like all test cars, this particular tardy model was devoid of chrome and dress-up trimmings. Despite its beaten-up look the car had the line and design of the new Ford.

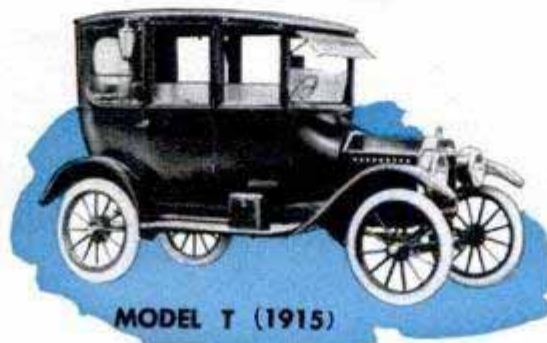
"I was really sweating it out that morn-

ing," the driver said, "and making no unnecessary stops along the way. Once I was stopped for 20 minutes by a bottleneck caused by the slippery highway. People kept giving the car a second look. Then several men gathered around it. One of

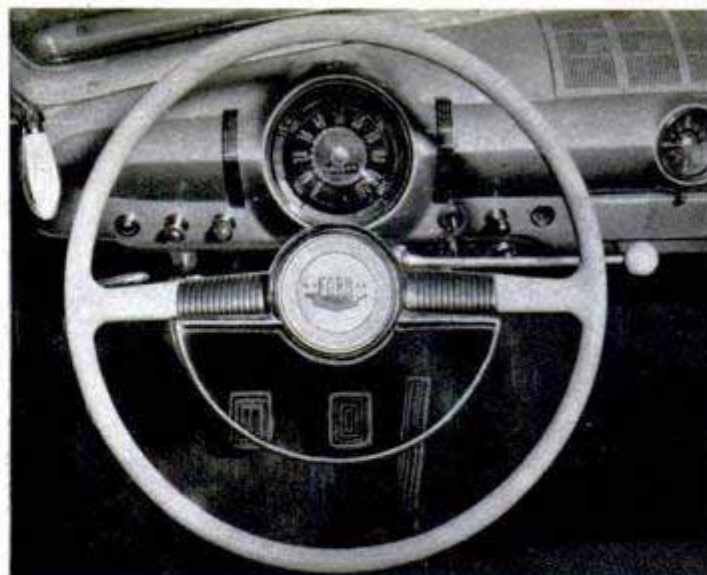
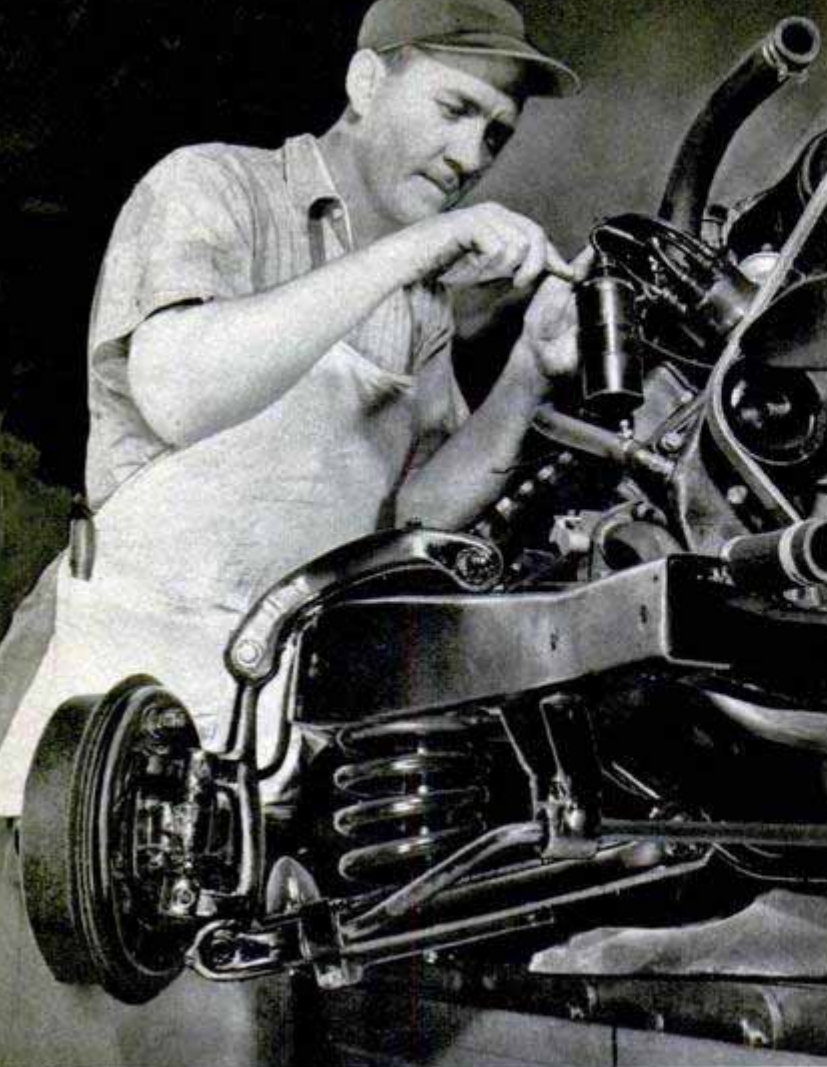
them said, 'We've been trying to figure out what you got there. Is it a 1949 Studebaker?' I nodded and they were completely satisfied."

The Ford test driver still chuckles over that incident. As a matter of fact, the new Ford no more resembles a 1948 or prewar Ford than do the new Studebakers or Hudsons. It's

By Wayne Whittaker



MODEL T (1915)

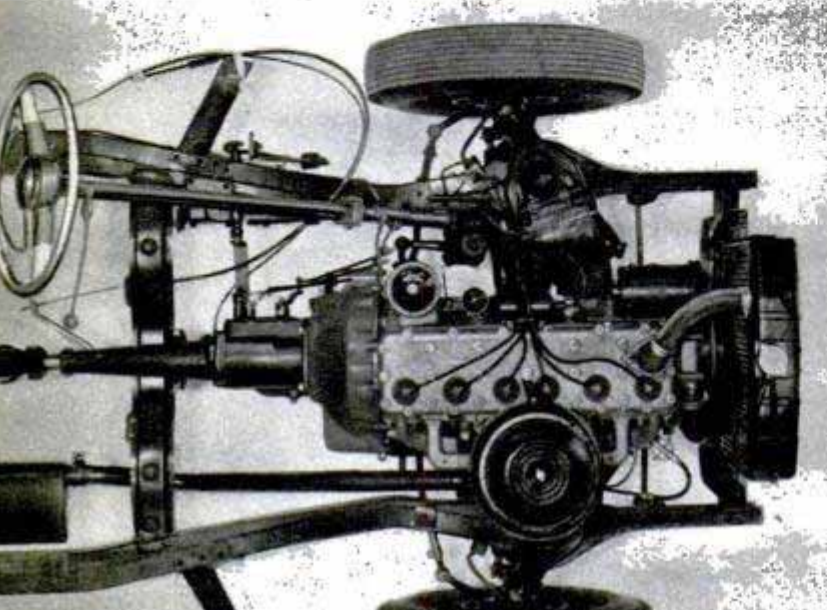


Left, "hydra-coil" springs in front replace the old transverse leaf springs. Above, indicators are all clustered on speedometer rim directly before driver

a strictly new postwar car following closely in the trend pioneered by Studebaker in 1946. If there had been no new Studebaker, Hudson, or — right in the Ford family — Mercury, the '49 Ford would have been a sensationally new postwar car. As it is, it is a sensationally new Ford which is totally unlike in appearance its grandparents of the Ford line.

Gone are the rough-riding old-fashioned transverse-leaf springs; gone are the narrow seats and windows of poor visibility, and — far from least — gone are the con-

Over-all view of the new '49 six-cylinder engine. Oil filter is one feature. Rubber mounts hold engine



servative black and gray paint jobs associated for years with Ford. The new cars rival the rainbow in attractive color variations. They have straight, modern lines, a massive but short hood, and the body is so wide the rear fenders have been entirely eliminated.

About the only points of similarity between the old and new Fords are the wheelbase (both 114 inches), tire size (600 x 16) and the basic V-8 engine. This engine has been improved in the '49 to such an extent that Ford engineers claim a 10 percent increase in gasoline mileage. The six-cylinder engine is entirely new and either the six or V-8 is available in all models. The horsepower of the improved

COMPARATIVE SPECIFICATIONS

(Ford Four-Door Sedan)

	1948	1949
Wheelbase	114"	114"
Curb Weight	3414	3175
Over-all Length	196.08	196.75
Maximum Width	73.25	71.7
Height—Loaded	66.15	62.75
Horsepower	V-8—100 Six—90	V-8—100 Six—95
Brake	Hydraulic	Hydraulic
Front Spring	Transverse Leaf	Independent Coil
Rear Spring	Transverse Leaf	Longitudinal Leaf
Drive	Torque Tube	Hotchkiss
Differential	$\frac{3}{4}$ Floating Spiral Bevel, 4-Pinion Differential	Semi-Floating Hypoid, 2-Pinion Differential
Tire Size	600 x 16	600 x 16
Front Seat Width (Hip Room)	55.3	61.5
Front Seat Shoulder Width	54.25	57.2
Width of Body at Center Pillar	55.6	61.0
Rear Seat Hip Room	51.5	60.0



Taking its place among the forefront of smart convertibles, the '49 Ford is low and graceful and seats six persons with ease. Luggage space under rear deck is twice as big as in the '48 and totals 28 cubic feet

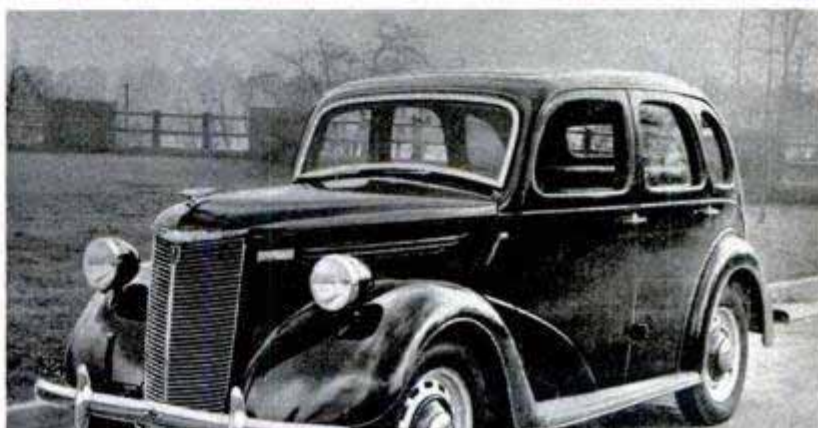
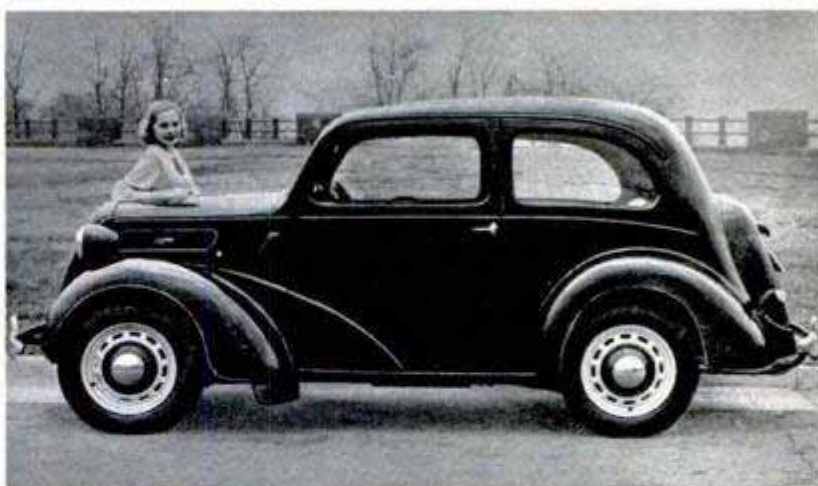
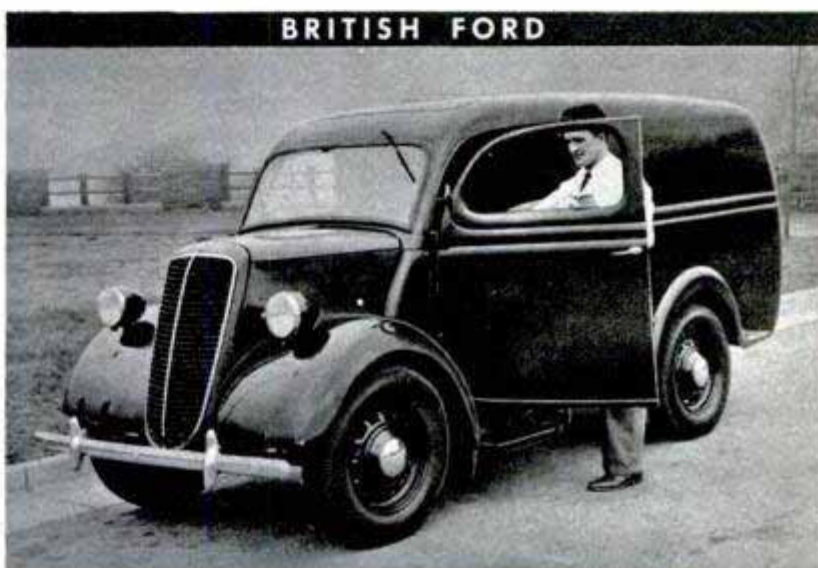
V-8 is the same as previously (100) and the six has been stepped up from 90 to 95. A 10 percent boost in gasoline mileage is also claimed for the new six. The engineers say gas consumption can be reduced as much as 25 percent by taking advantage of the overdrive which is available as optional equipment.

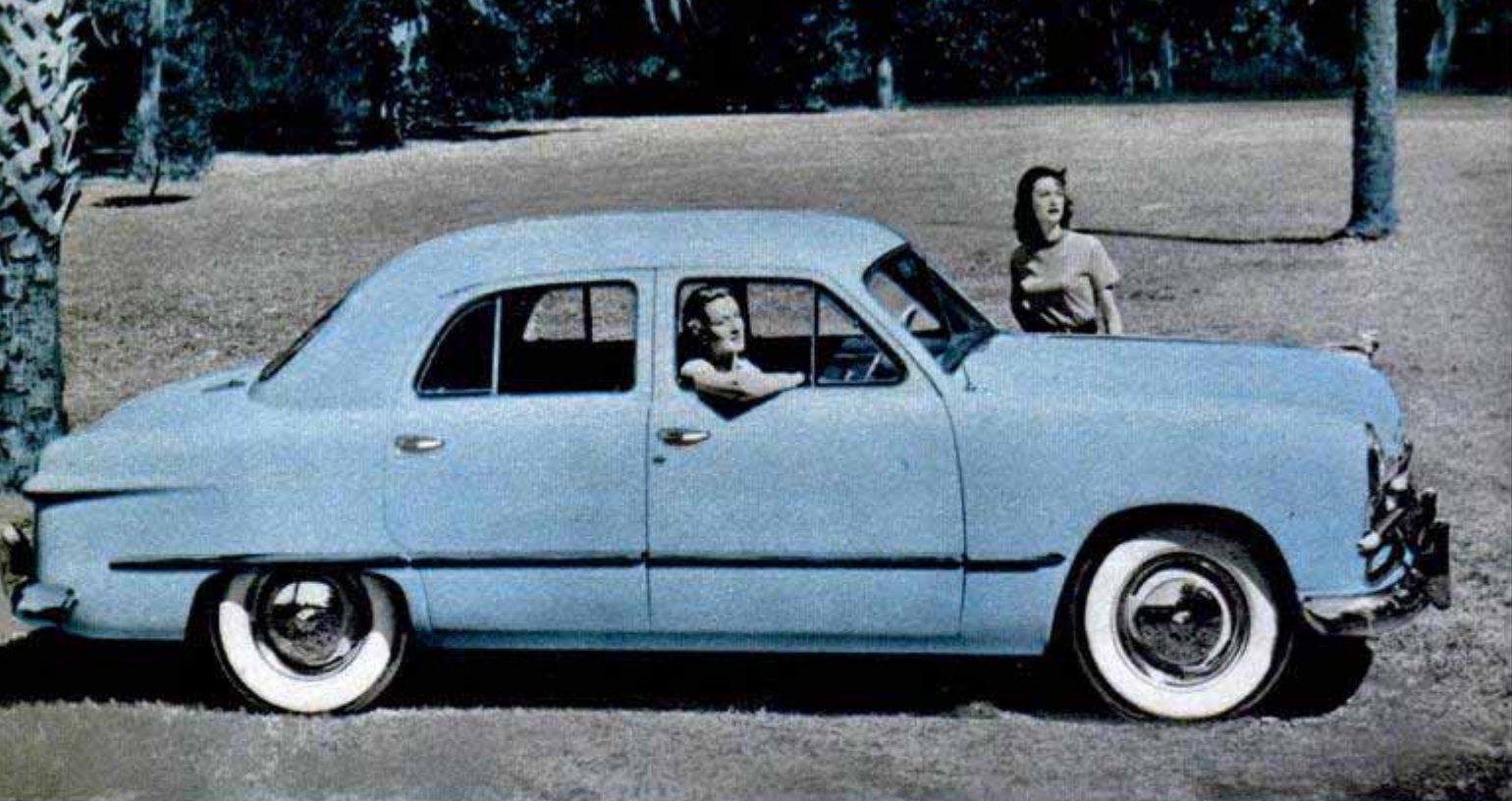
If you have been a Ford driver in the past, prepare to be completely at a loss when you first get behind the wheel of the new '49. Few of the familiar gadgets are in their old familiar places. On the instrument panel, fuel level, oil pressure, water temperature and charge indicators are grouped around the outside rim of the speedometer. This handy five-in-one cluster is in line with the driver's view of the road. The clock dial has been centered on the panel and placed higher. Night glare has been eliminated on all instruments by "black lighting."

The car's interior is all new and inviting. The front seat is six inches wider than the '48 and the rear eight inches wider. The visibility, both front and rear, is excellent—there are 20 square feet of windows in the '49. You feel closer to the ground, and actually are four inches lower. This lower center of gravity is particularly noticeable as you take the car around a sharp curve on the proving ground at high speed.

British-made Fords from top to bottom are the half-ton light panel truck, a two-door four-passenger Anglia sedan with a 90-inch wheelbase, and the four-door Prefect sedan with 94-inch wheelbase. All are powered by 30-hp. four-cylinder engine. Ford has imported 12,000 of these cars into the U. S. as a test of public taste for light cars

BRITISH FORD





This four-door '49 Ford sedan shows radical change from traditional Ford styling and follows postwar trend

There is also the feeling of sitting further forward as one does in the Studebaker and Hudson. This is because Ford, too, has moved the body forward (five inches) which makes possible cradling of the seats between the axles for a smoother ride.

There is no questioning the smoothness of the new ride. The car rolls over rough Belgian block paving, over sharp bumps and dips, with an easy ride completely alien to any previous Ford. Even over a section of staggered bumps, which are taken by one wheel at a time, the car performs amazingly well. The reason is that Ford engineers, after years of holding onto an antique springing system, have adopted coil springs in the front, longitudinal springs in the rear and airplane-type shock absorbers. Also, the drive-shaft tunnel has

been decreased by adoption of the Hotchkiss drive and the hypoid rear axle. These changes have helped to minimize road noises, and engine vibration has been greatly reduced by rubber mounts.

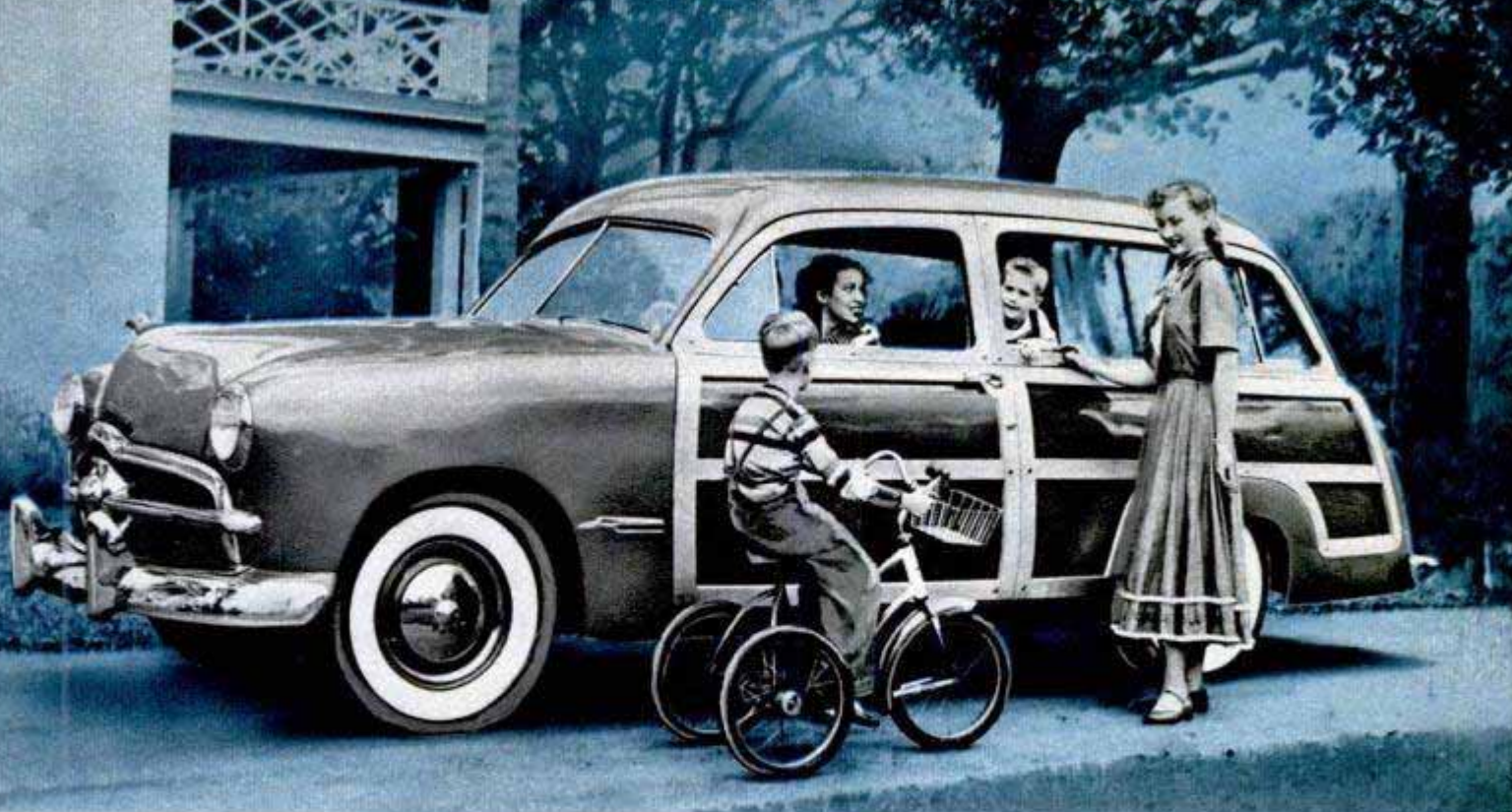
The new heating system, which has an automatic temperature control, can be used as a fresh-air ventilator, a fresh-air heater or as a recirculating heater. The fresh air is scooped into the car through large intakes just behind the grille.

Better fuel distribution is achieved with a new intake manifold which is attached to the engine horizontal to the ground. This reduces the tendency of raw gasoline to flow toward the rear cylinders and makes engine operation smoother. In the car's new "equa-flow" cooling system water flows in volume to the full length of the block. Temperatures in "hot spots" in the six and eight-cylinder engines have been decreased by as much as 12 degrees. The water pumps in the improved V-8 are larger. Combustion chambers have been redesigned and there is a new crankcase ventilation system.

Although the new four-door sedan is 239 pounds lighter than last year's model, Ford engineers point out that new standards of safety have been set in the rugged construction of the '49 chassis and body. The box-type frame is of all-welded construction in contrast to spot welds used on most frames. Despite



Two-door '49 Ford sedan affords glimpse of wide windshield and enlarged windows

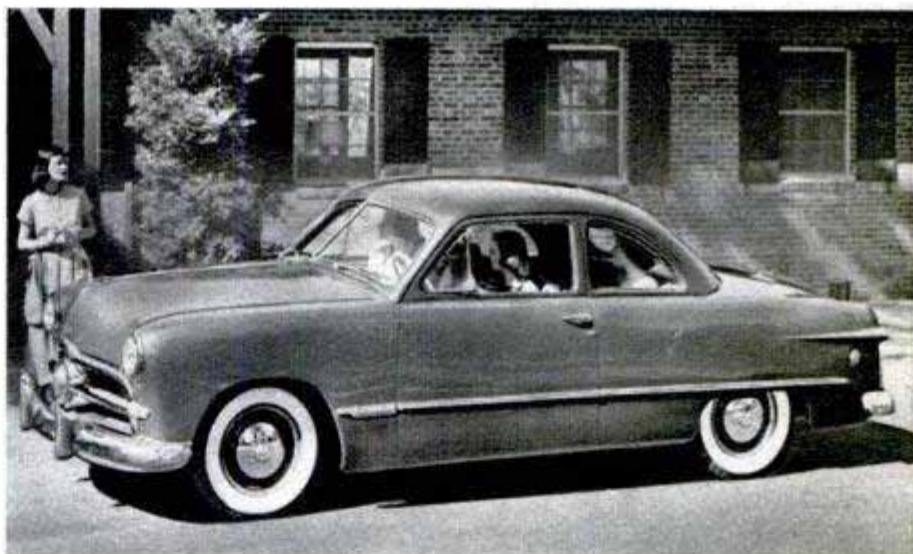


the fact that the frame is lighter, tests have shown that there is 59 percent more rigidity when combined with the body. A minor safety factor is that all doors hinge at the front and the inside handles push up instead of down to open the doors. Both features help prevent accidental opening. The doors have a new lock which eliminates persons being locked out with the keys inside.

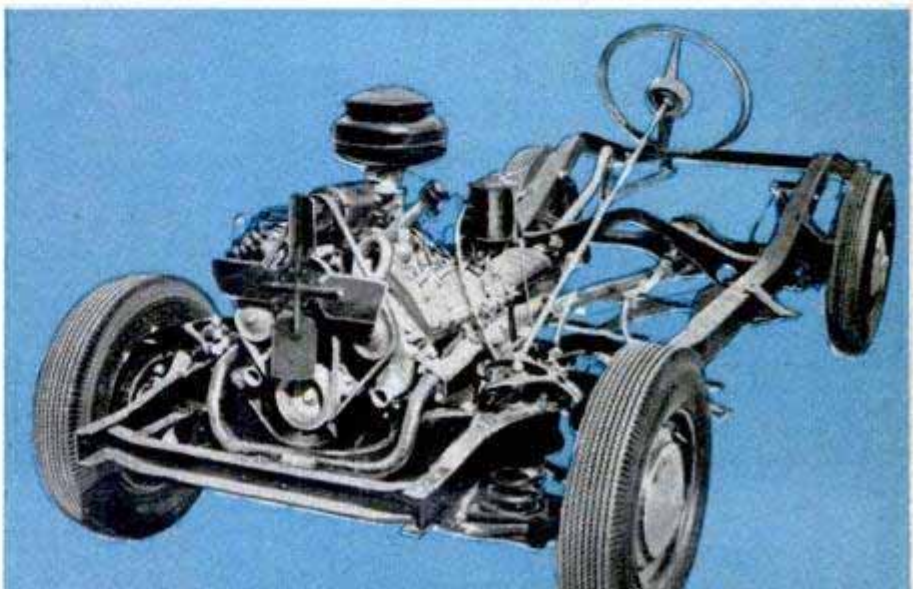
The Ford steering is greatly changed and improved. It has a big car "feel" and hugs the road under a high wind. Road shocks have been cut to a minimum. This is partly the result of a newly designed linkage in which the pivot point of the tie rods is on the same center as the wheels.

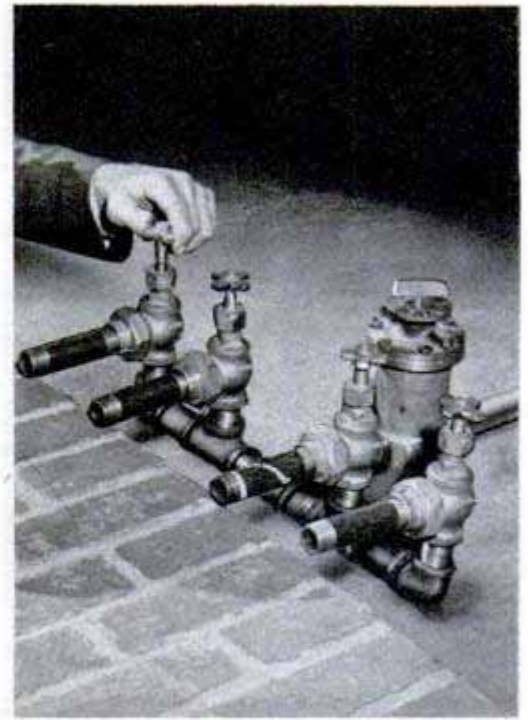
There are two lines of the '49 cars — Ford and Ford Custom. The body styles in both lines include the club coupe, four-door sedan and two-door sedan. Convertible and station wagon (two-door all-steel body) are obtained only in the custom line and the three-passenger coupe only in the Ford line. The new colors are Bayview Blue Metallic, Birch Gray, Sea Mist Green, Arabian Green, Colony Blue, Gun Metal, Midland Maroon Metallic, and Black. Two others—which would make the '49 Ford's great-great grandpappy Model-T spin in his junkyard grave—are Fez Red and Miami Cream which are available only in the convertible.

The new two-door Ford station wagon has an all-steel body; plywood veneer panels are bolted directly to the stout steel body. It carries eight passengers. The two rear seats are removable



Sedan coupe above is available in either the Ford or Ford Custom lines. Chassis below shows many new features such as improved frame and coil springs in front which replace leaf springs



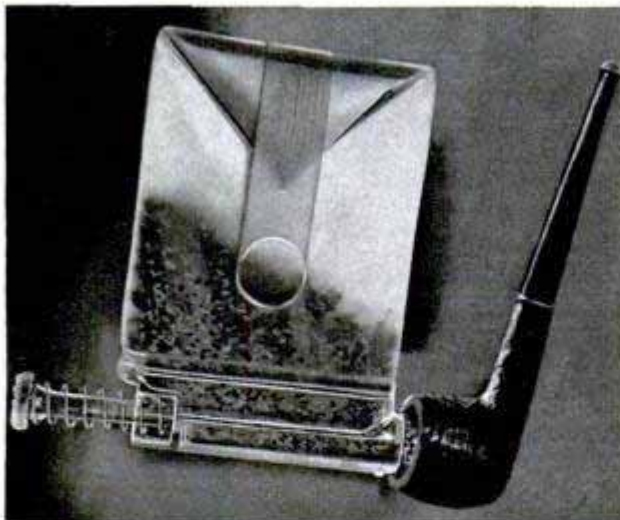


Left, setting the pointer to desired time of flow. Center, cutaway shows piston that is forced down to shut off water. Right, one or more of several faucets can be controlled by timer with this T-shaped arrangement

Sprinkler Turns Itself Off With Time Valve

Lawn and garden sprinkler systems are turned off automatically after a preset period of flow by a time valve that operates by water pressure. A tiny portion of the water passing through the valve flows

through a by-pass into a cylinder and moves a piston that closes the valve. A dial on top of the valve is set for the number of minutes the valve will remain open. Available in 1, 2 and 4-inch sizes, the valves can be set for any period from five minutes to two hours. Pressure variations do not affect its operation.



Piston on Tobacco Pouch Fills Pipe Without Waste

Pipes are filled with tobacco without spilling by a pouch that has a piston-operated filler attachment. The pouch doesn't have to be opened except for refilling. When the pouch is inverted, tobacco falls into a plastic cylinder and is forced into the pipe bowl and tamped by the piston. The tobacco stays moist longer because it is not exposed to the air.



Trap Catches Rats With Water

Liquid instead of food is used as the bait in a new rat trap. Tests prove that rats are as eager for water as for food. The rust-proof metal trap is designed for use where food is plentiful but water is difficult to find. In appearance, the trap is similar to conventional traps except that one end is depressed to form a saucer. A perforated trigger covers this section and releases the powerful spring upon contact. Food also can be used as bait.

Retractable Wheels Form Boat Trailer

Like the landing gear of an airplane, the wheels on a boat trailer retract out of the way when the boat is in the water. For traveling over the road, the wheels are locked in the down position. The tow bar swings downward to act as a bow support for storing. In the water, it folds against the keel. For launching, the boat is unhooked from the car and wheeled into the water. When the boat floats, the wheels are raised out of the water to the retracted position.



Wipe-on Paint for Cars Applied With Mitten

Refinishing a car is easy with a smooth-flowing paint and a mitten that acts as a brush. The enamel dries to a hard gloss. It is applied by dipping the mitten in the paint and then wiping it across the car, the fingertip pad serving as a five-inch brush. The thumb pad is used as a smaller brush for painting window frames and other narrow surfaces. One coat of the paint dries in about two hours. The mitten and enough paint for two coats are provided in a kit which also includes a solvent cleaner for removing dirt before painting, sandpaper for smoothing the surface, plastic for filling cracks, and a spatula.

Speedy Racing Car Assembled From Kit

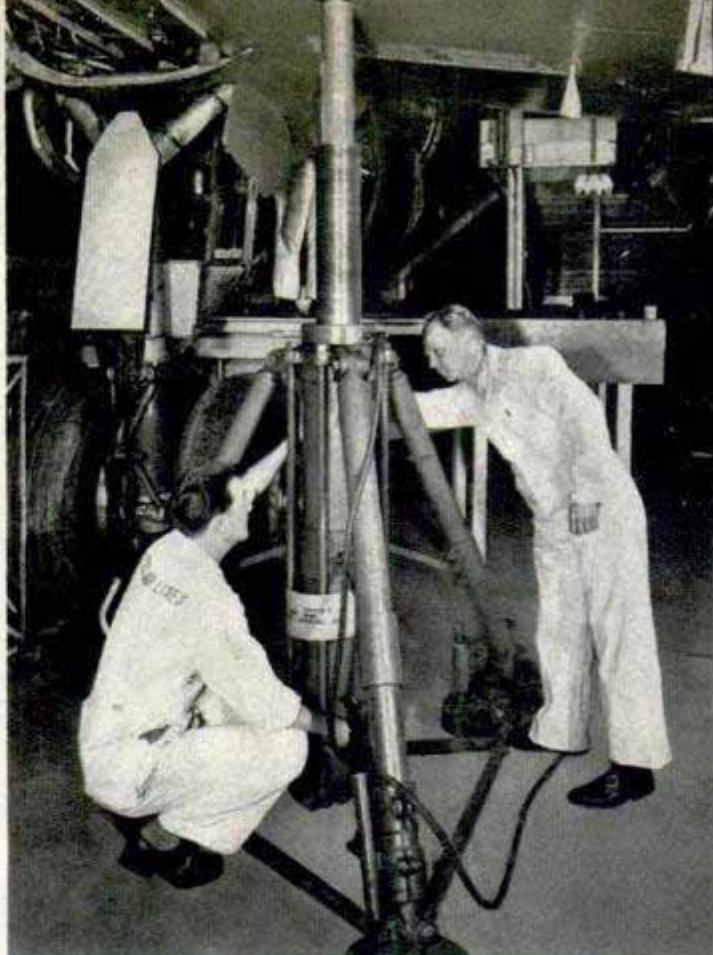
You can build your own racing car that will go up to 100 miles an hour with a kit now being sold in England. The car, called the "Marwyn," has a one-cylinder motor and is sold without the body. The buyer can design and build his own body style to fit the chassis, which is sold in parts ready for home assembly.





United Air Lines photos

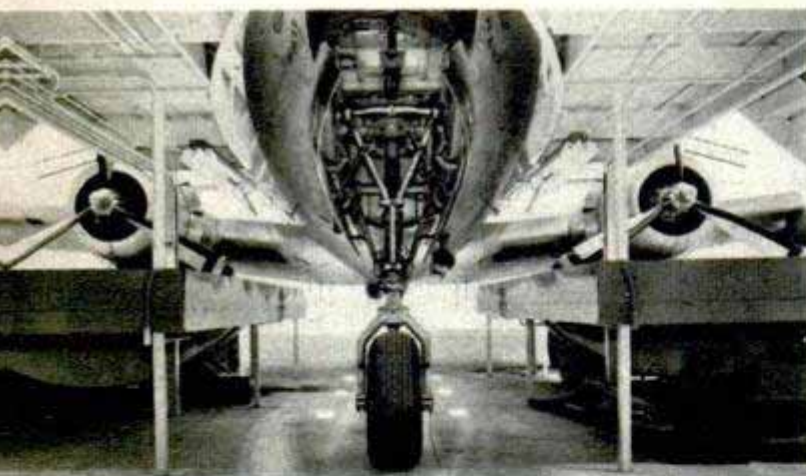
With only one side of tail assembly dock lowered into place, workers at three levels "operate" on a 30-foot-high DC-6. Above right, four hydraulic jacks lift the landing gear a few inches off the ground



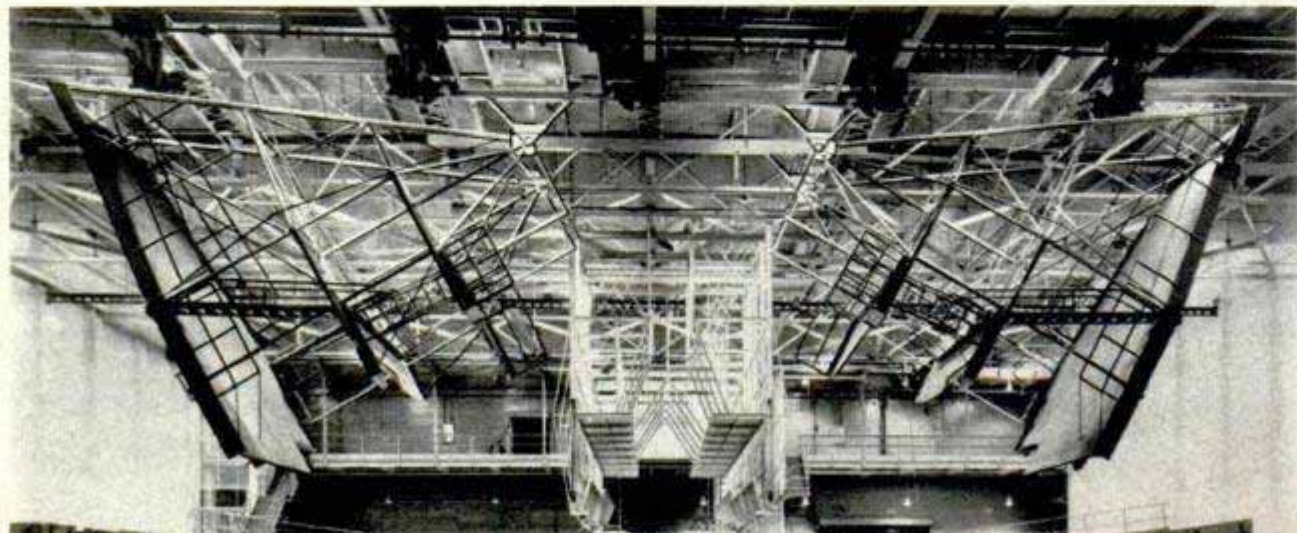
Push-Button Dock

FOUR-ENGINE airliners are practically rebuilt in four days at United Air Lines' new San Francisco maintenance base, featuring a push-button dock that fits around giant DC-6s and 4s like a tight glove. It replaces temporary workstands and ladders that, a company official explained, "made mechanics wait 50 minutes to do every 10 minutes of actual work."

Now, a few moments after a pressed button has flipped open the 25-ton steel hangar door, an army of 50 workers is swarming over the plane at the start of a 700-hour overhaul that every big plane gets about four times yearly. Two sections of a massive tail dock meanwhile swing down from the ceiling, enveloping the rear of the plane from either side, and metal



Seen from below, nose of the DC-6 above fits snugly in dock. Below, empty dock, showing steel framework



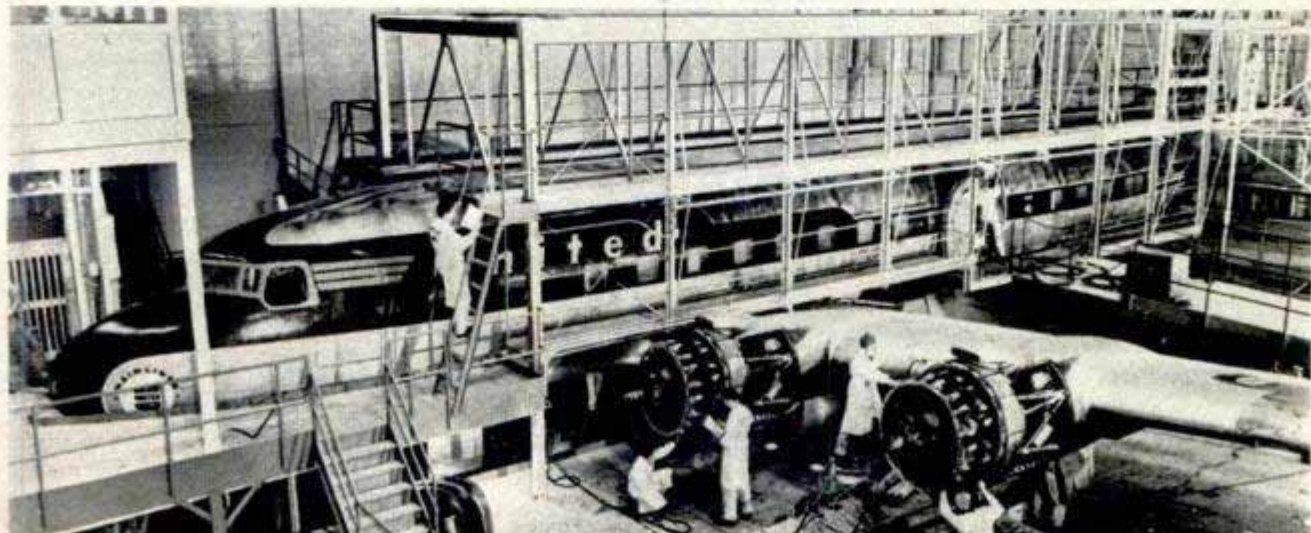
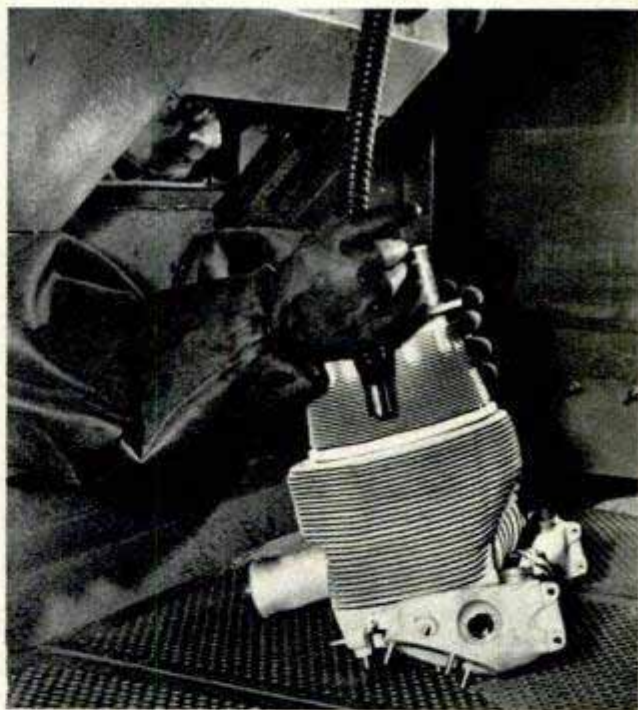


Halves of tail dock, upper right and in left background, drop into position when plane moves forward

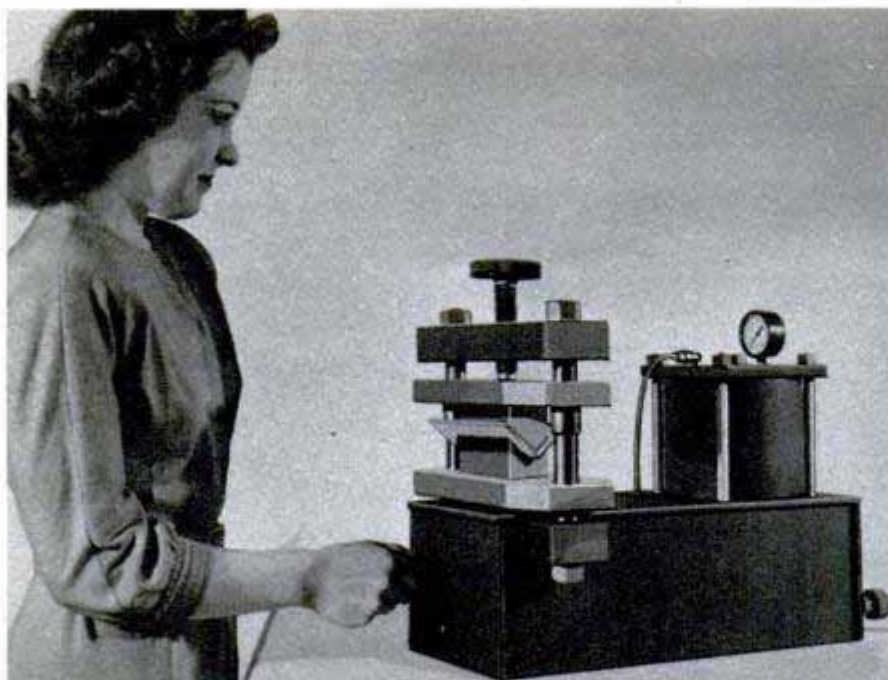
catwalks that parallel the cabin on both sides drop into place. Four jacks boost the plane enough to get the landing gear a few inches off the ground.

The four engines nose forward over an inclined ramp, so accessible that their complete removal is accomplished in less than 16 minutes. Permanent floor lights play on working areas beneath the wings and cabin. Removed parts are sped to the base's cleaning and overhaul shops by electric hoists, overhead chain conveyors and elevators. Since about 95 percent of the parts needed can be anticipated from the ship's service record, they are set out in advance near their installation point.

Compressed air spray of finely ground walnut shells, right, cleans and polishes cylinders. Below, there is solid working space for all around the big airliner



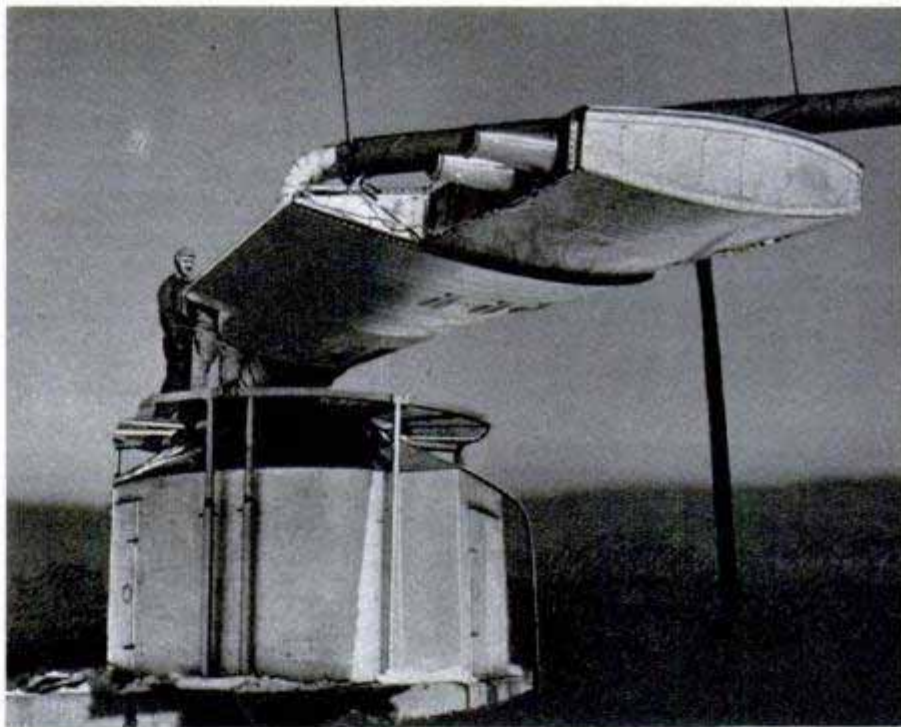
Small Utility Press Operated by City Water, Compressed Air or Oil



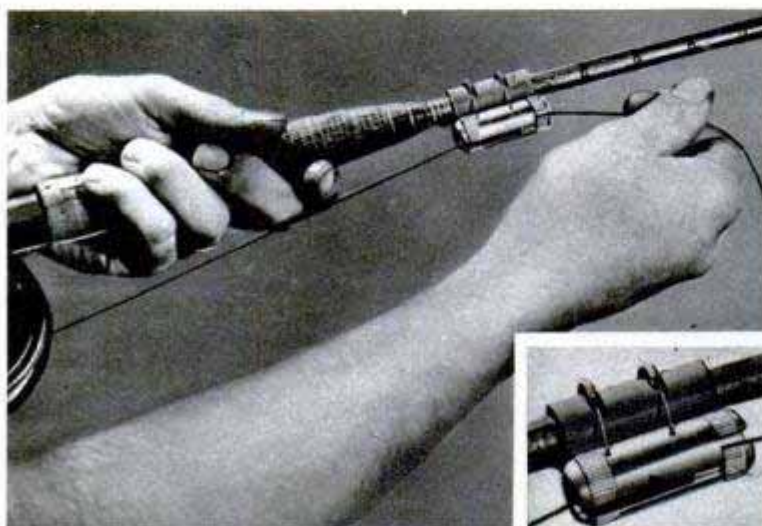
Designed for use with air, oil or water pressure, a small utility press develops a force of 10,000 pounds from a line pressure of 100 pounds per square inch. If no air compressor is available, the press can be connected to a water tap and pressures of from 3500 to 7500 pounds are possible. Its unusual valve permits smooth speed control and enables work to be held at any selected pressure. It can be used for bending cold-rolled steel up to $\frac{1}{8}$ inch in thickness, notching, shearing, punching and embossing metals.

Helicopter Jets Get "Whirl Test"

To duplicate operating conditions, jet engines for helicopters are whirling through tests at the tip of a giant blade at General Electric's experimental flight center. The runs are made in an outdoor bowl-shaped pit, 150 feet in diameter and 13 feet deep. A 1000-horsepower electric motor drives the blade when the drag caused by the engines is being measured. When the burners are operating, the motor functions as a generator in gauging the thrust the jets produce.



General Electric photo



Dresser for Fish Line Clamps on Fly Rod

Fly line can be dressed on the rod without leaving the stream with an aluminum cylinder that clamps to the pole. The cylinder, mounted midway between the handle and first guide, is filled with felt padding and two coil springs. The line is pulled into a slot in the side of the cylinder where it is squeezed between the pads. When the line is pulled off the reel the dressing is applied. The pads come without dressing so fishermen can choose their own.

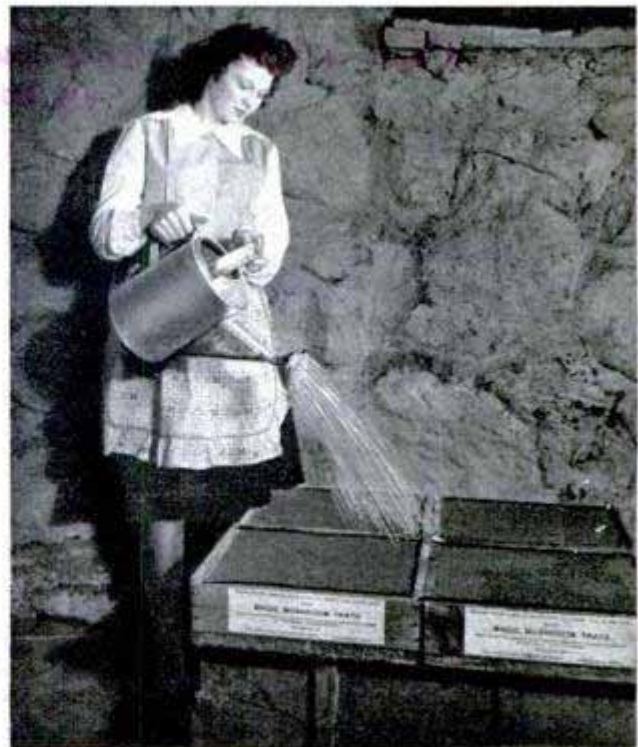
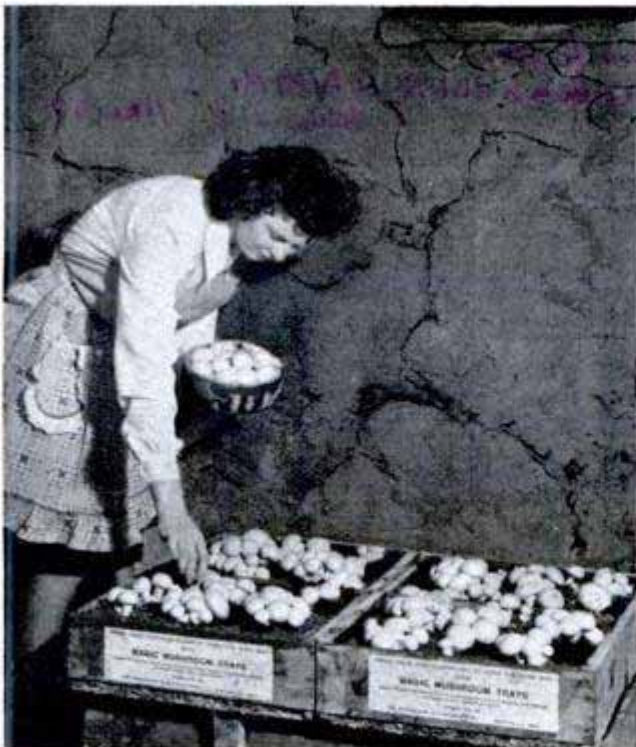


U. S. Navy photo

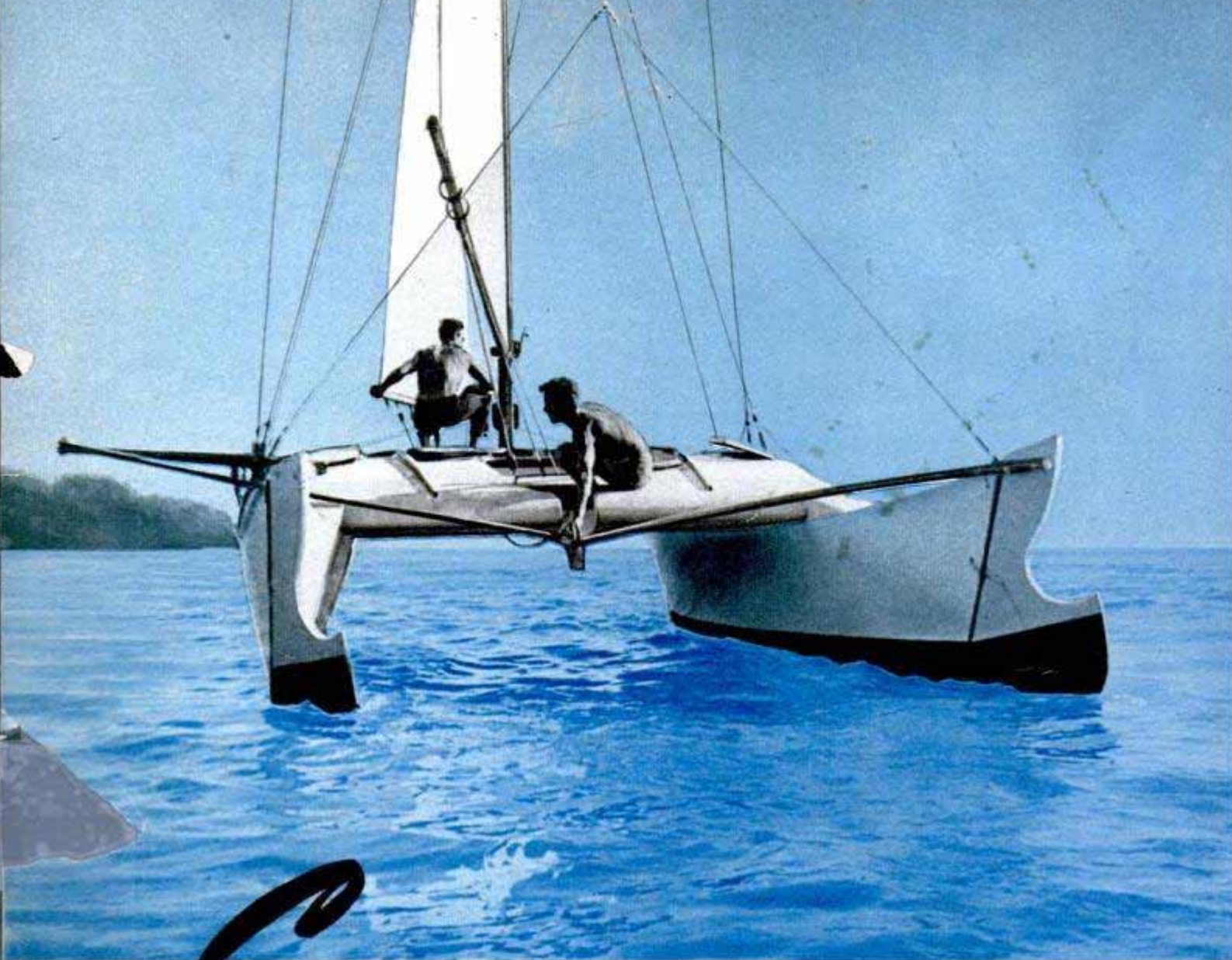
Metal Rotors Help Helicopter Fight Ice

All-metal rotor blades and a cabin floor hatch are novel features of a Sikorsky helicopter being tested by the Navy for use on carriers, battleships and cruisers. The blades are more easily adapted to de-icing equipment than the wooden ones now used and are less likely to be damaged. Air-sea rescues and cargo loading are simplified

by the hatch. To protect deck personnel and prevent the blades from striking a rolling deck during landings on heavy seas, the tail rotor is mounted on an arm that extends upward high enough to give full head clearance. Designated the XHJS-1, the craft carries five, has a 110-mile-an-hour top speed and range of 330 miles.



MUSHROOM TRAYS contain a bed of mushrooms in prepared dirt, permitting the housewife to raise a private crop in the basement. Each bed produces its first crop in about three weeks and continues to yield for four or five months before tray is exhausted. Trays must be watered and kept at about 55-degree temperature



Sailing the Winged "Seabird"

*Photo & Ketch for Calamians from
 W.A. DICKSON & COMPANY, WAIKIKI,
 HONOLULU, HAWAII*

COMBINING the sailing secrets of the ancient Polynesian with modern principles of aeronautics, "Woody" Brown and Alfred Kumalae of Honolulu have built a 40-foot catamaran, believed to be the largest and fastest in the world today.

They provide thrills for the tourists, and dollars for themselves, by skimming passengers over the waters of Waikiki at better than 22 knots.

Woody first made a name for himself as a glider champion in Kansas, where he set a world's distance record. He came to Honolulu shortly before the Japanese attacked Pearl Harbor.

On Christmas Island, as a war worker, he watched natives build a catamaran after an ancient design. Completed, he saw it sail with extraordinary speed.

Here was something that made his glider seem tame. He decided to do research on

By Richard M. Botts Polynesian catamarans, and work into the design of one some of his knowledge of aeronautics. He wanted to build the fastest catamaran the world had ever seen.

He found in Alfred Kumalae, a Hawaiian lad, the partner he needed, and together they worked out the design for their new craft at Waikiki. They followed the ancient Polynesian design exactly, except for the wing innovation. They built it entirely of plywood. It took almost a year to complete and dug into their savings to the not inconsiderable sum of \$4000. They christened it "Manu Kai," which means seabird in Hawaiian.

The craft's remarkable speed is due to several factors.

One is the light weight of the catamaran (just over 2000 pounds) compared with other craft of equal size, giving it a draft of only 15 inches. The small draft and light



One man easily handles the 40-foot catamaran. Lines from both jib and mainsail run into the small cockpit

weight leave little drag or weight for the sails to pull over the water.

The catamaran is able to outdistance other sailing craft because it keeps its stability and sails in an upright position. Conventional sailboats heel over in even a moderate breeze and spill air off the top of the sail. Because the catamaran keeps upright, the wind flows off the back of the sail instead of spilling off, giving it added speed and thrust.

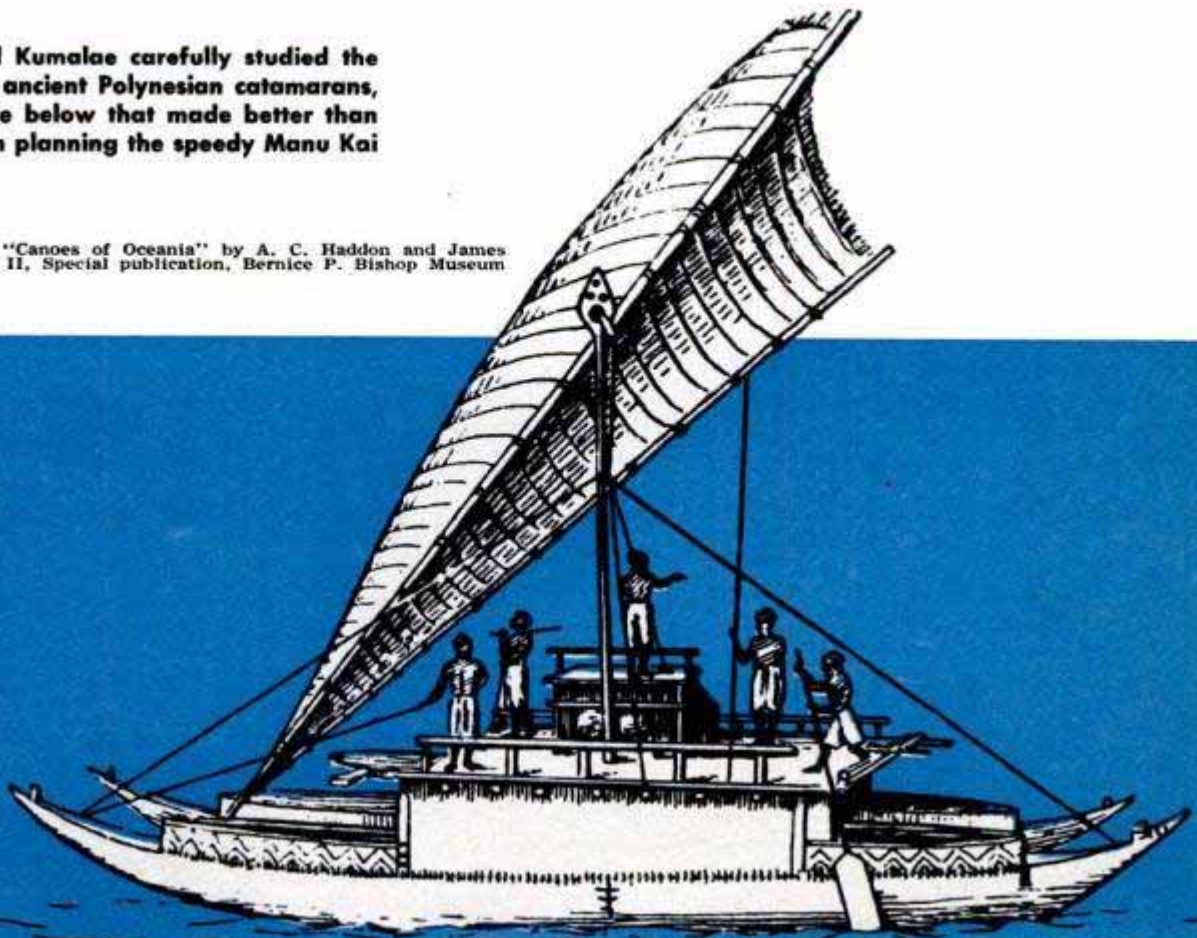
Trials proved the most speed could be obtained in a beam wind or a close reach.

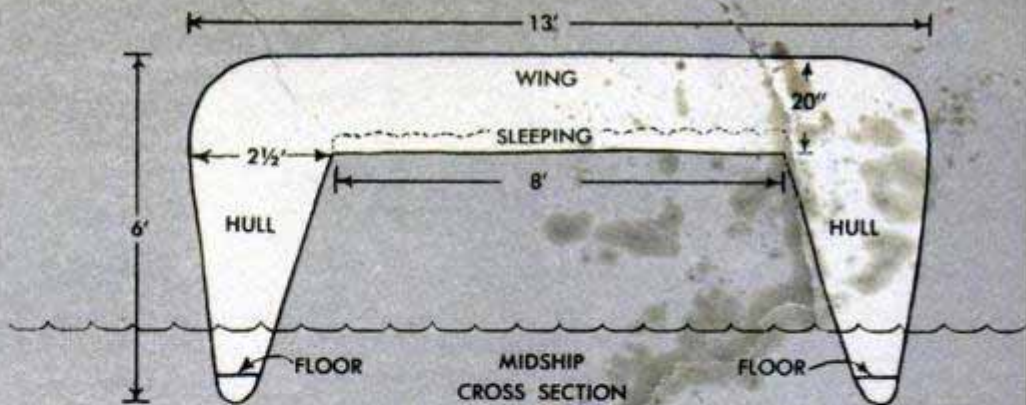
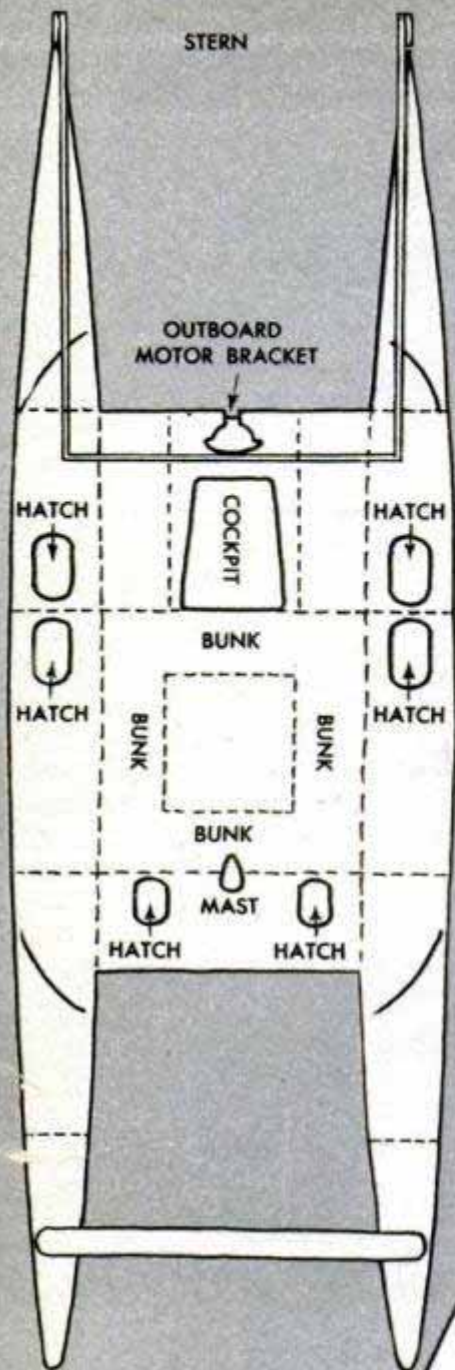
Taper ratios run from about 3 to 1 in ordinary sailboats to as high as 9 to 1 in racing yachts. In contrast, the *Manu Kai's* hulls have a 20 to 1 taper ratio. This makes the craft long, slender, and very fast.

Woody's innovation, the wing, besides holding the two hulls together, is designed to add speed. It is skin stressed and internally braced like an airplane. When the

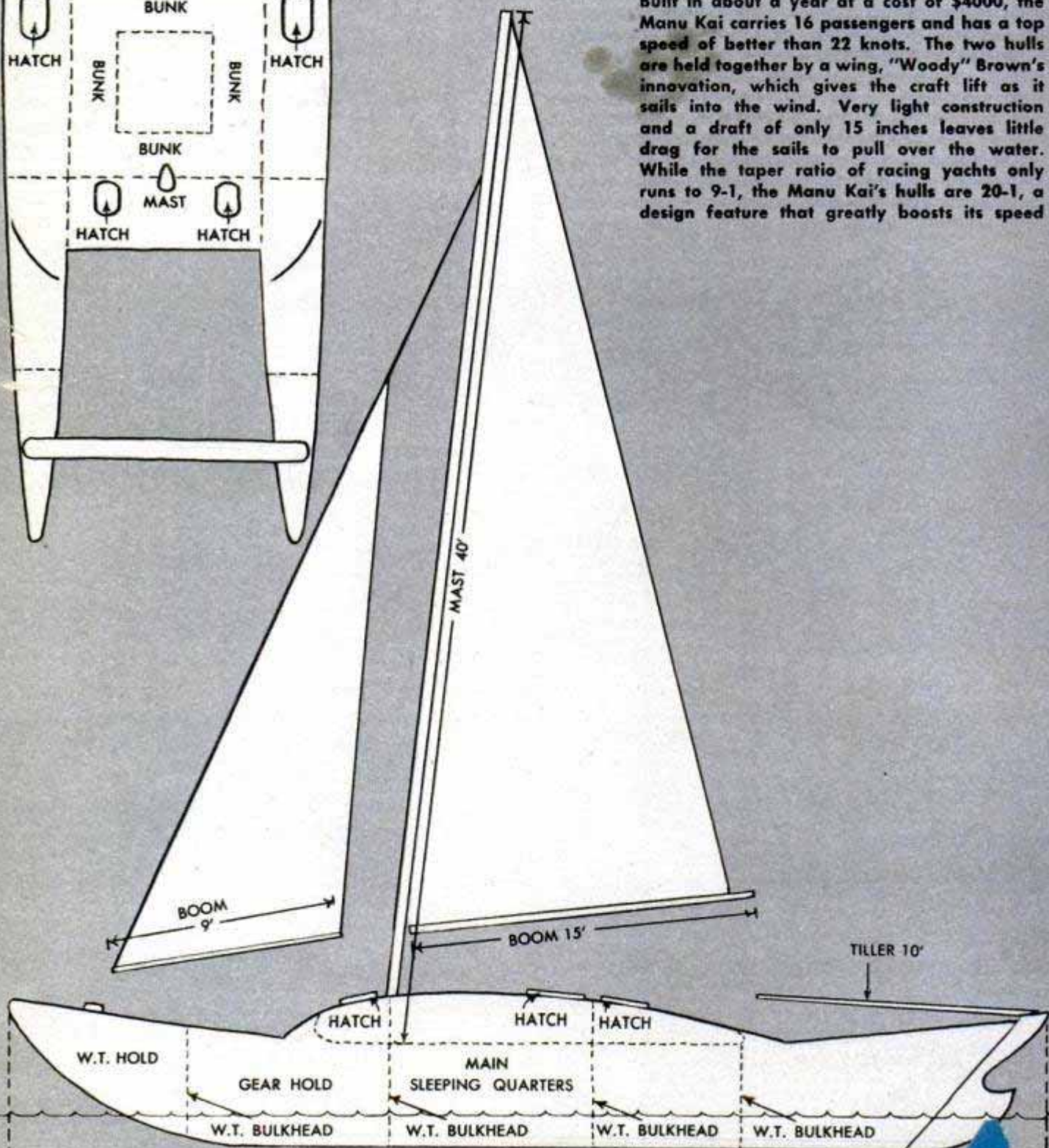
Brown and Kumalae carefully studied the designs of ancient Polynesian catamarans, like the one below that made better than 20 knots, in planning the speedy *Manu Kai*

Sketch from "Canoes of Oceania" by A. C. Haddon and James Hornell. Vol. II, Special publication, Bernice P. Bishop Museum





Built in about a year at a cost of \$4000, the *Manu Kai* carries 16 passengers and has a top speed of better than 22 knots. The two hulls are held together by a wing, "Woody" Brown's innovation, which gives the craft lift as it sails into the wind. Very light construction and a draft of only 15 inches leaves little drag for the sails to pull over the water. While the taper ratio of racing yachts only runs to 9-1, the *Manu Kai*'s hulls are 20-1, a design feature that greatly boosts its speed



craft sails to windward, the wing, an airfoil, lifts the catamaran, thus reducing the weight in the water and increasing the speed.

What makes the *Manu Kai* so unusual and astounding to the yachting fraternity is the lack of either keel or centerboard that mark other modern catamarans.

Until the "seabird" was built no modern catamaran had been able to prevent leeway without the use of a keel or centerboard. One was built without keel or centerboard, but it made too much leeway and had to be refashioned.

The secret lies in the unsymmetrical hulls, designed in the old Polynesian fashion. The inboard sides are curved, the outboard sides are straight up and down, making a hydrofoil of the hulls. When a hydrofoil is pushed through the water, it lifts, like an airplane wing, and prevents leeway.

Another convenience for singlehanded sailing of the *Manu Kai* is her small amount of sail area and short 15-foot boom for the mainsail and six-foot boom for the jib. It uses only 370 square feet of sail, against some 430 square feet in the latest Herreshoff catamaran developed in 1945. Despite this it is considerably faster than Herreshoff's 15-knot craft, but no official speed runs have been made.

As in all catamarans, a double rudder is needed for greater control. If one hull and rudder were out of the water, the opposite rudder would still provide control.

From each rudder a long tiller runs to the after end of the wing. These tillers are connected by a 10-foot crossbar, making it possible for the helmsman to steer from any position on the after-section of the wing, as the beam of the craft is only 13 feet.

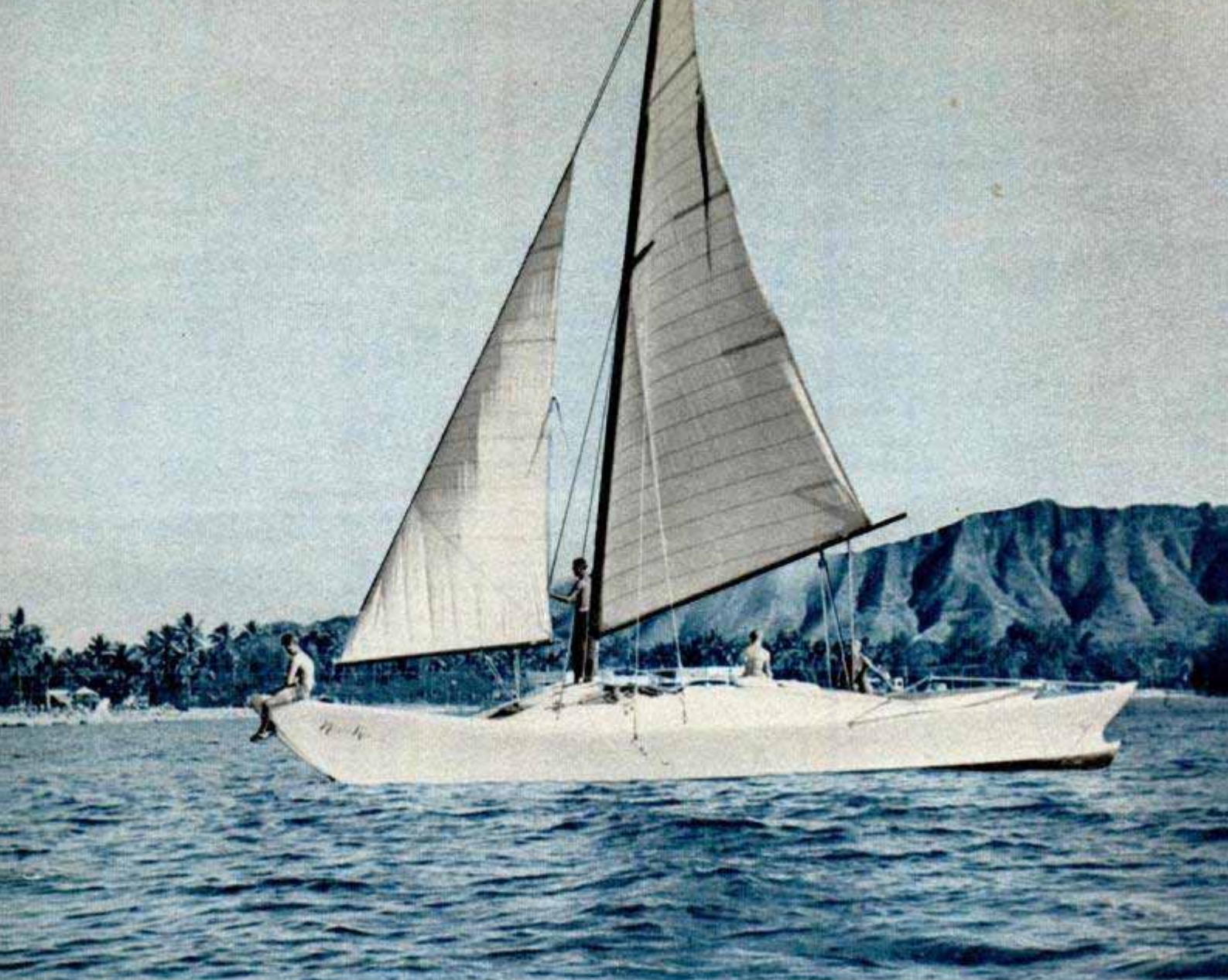
Both the hulls and wing serve as stowage space and living quarters.

The catamaran has five water-tight compartments, each accessible from a hatchway.



Six can be slept comfortably in the craft. Four are put in the wing section, which is entered by the hatches on deck, and there is space for one in each of the after hulls. Below, the *Manu Kai* carries only 370 square feet of sail, which is considerably less than half of that carried by one of the fastest catamarans developed in the early '30s





Its comparatively light weight and complete streamlining allow the catamaran to ride high at all times

The two forward sections of each hull are used for storage space for the lines, anchor and fishing gear.

The center part, comprising most of the wing and the two center sections of both hulls, provides the living and sleeping

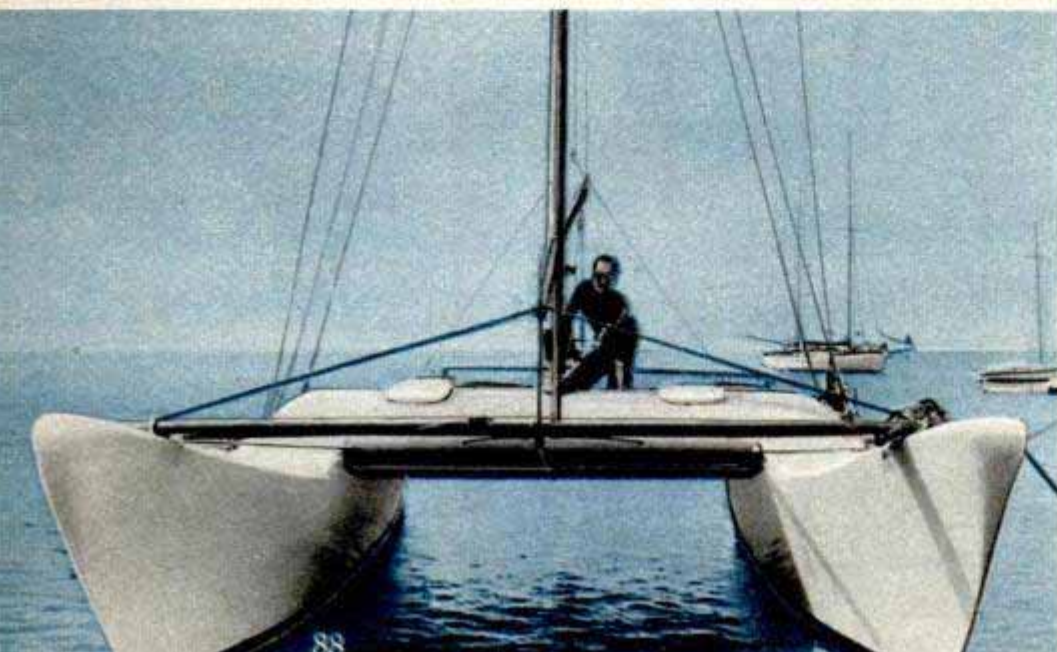
quarters. This main section will sleep four. Two small built-in chairs, a desk and clothes pegs make up the furnishings.

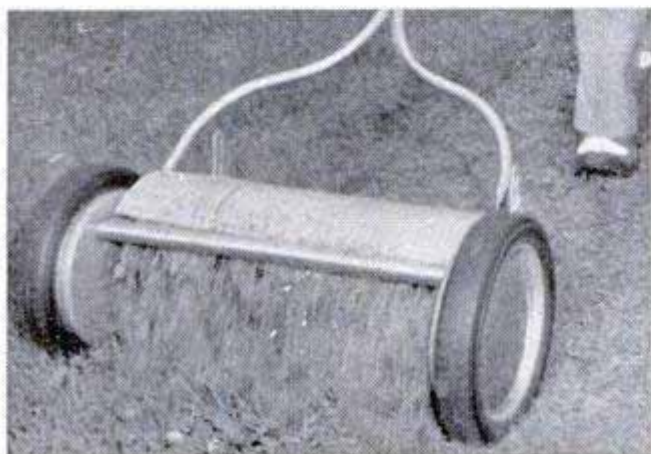
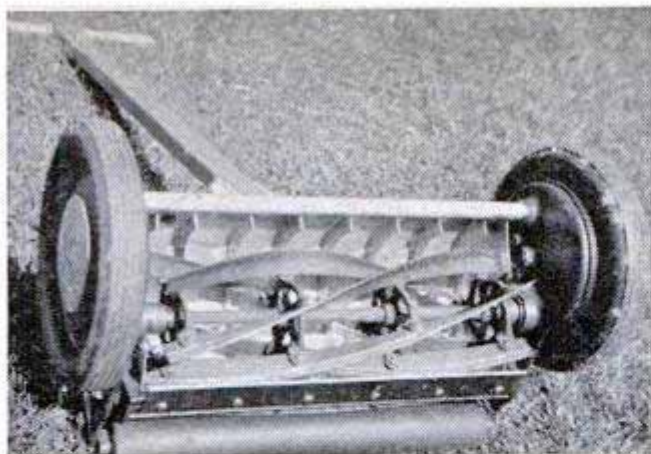
The after sections of the hulls sleep one each. They, too, have plenty of room for clothing and additional gear.

The catamaran rides the sea very easily, partly cutting through, but mostly riding over the waves. This is due to the light weight and draft and because the twin hulls are very sharp.

A round trip open-sea sail of almost 200 miles in rough weather between the Islands of Oahu and Maui has convinced Woody of the catamaran's seaworthiness under adverse conditions.

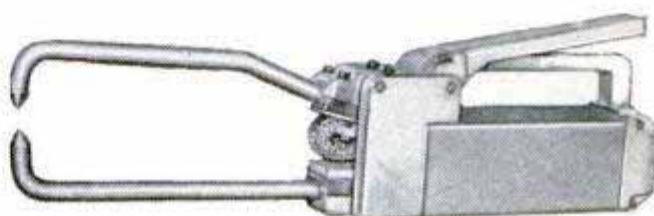
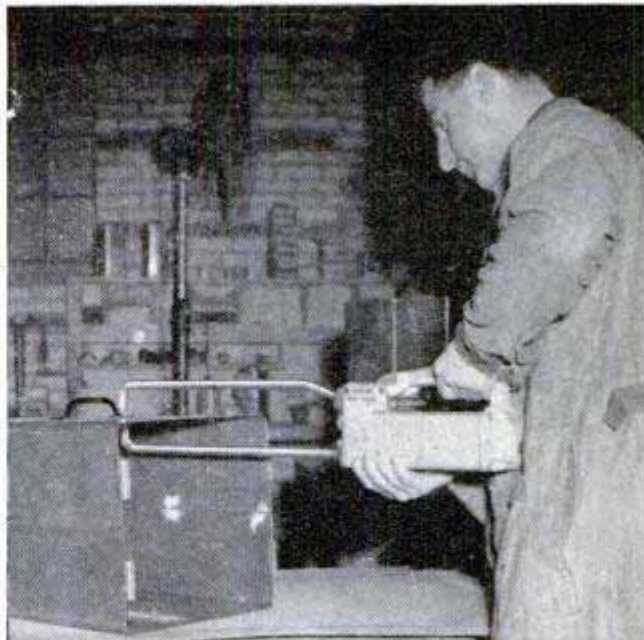
Built entirely of plywood, the winglike center section is 8 feet wide and 20 inches thick





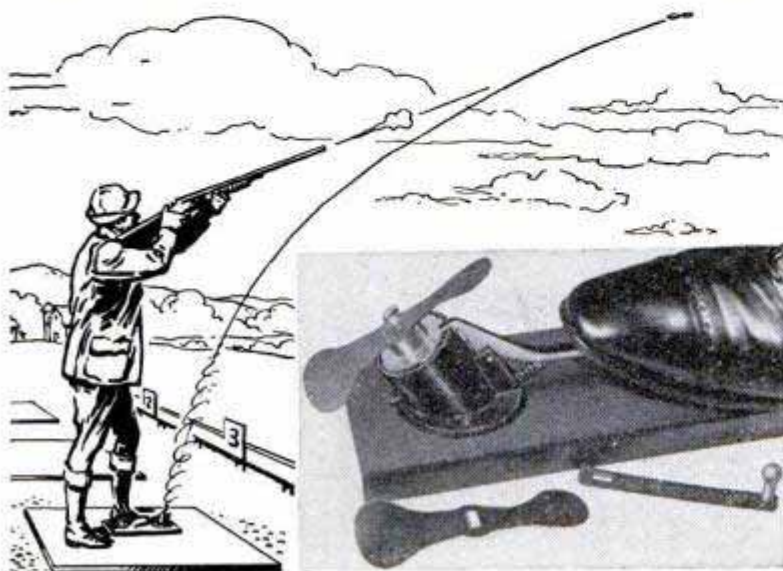
Hood for Lawn Mower Returns Grass to Blades

Freshly cut grass is changed from a nuisance to a valuable fertilizer by the invention of Harold Elliott and Thellar Johnston of St. Paul, Minn. It is a hood with vertical fins that fits over the blades of a lawn mower. When cut grass flies back against the hood, it is carried forward and caught by the mower blades a second time. This is repeated until the grass is chopped into minute bits, then it is deposited on the ground as mulch. Built of aluminum and weighing less than two pounds, the attachment has an extension plate and can be fitted to any size mower.



Portable Spot Welder Weighs Only 23 Pounds

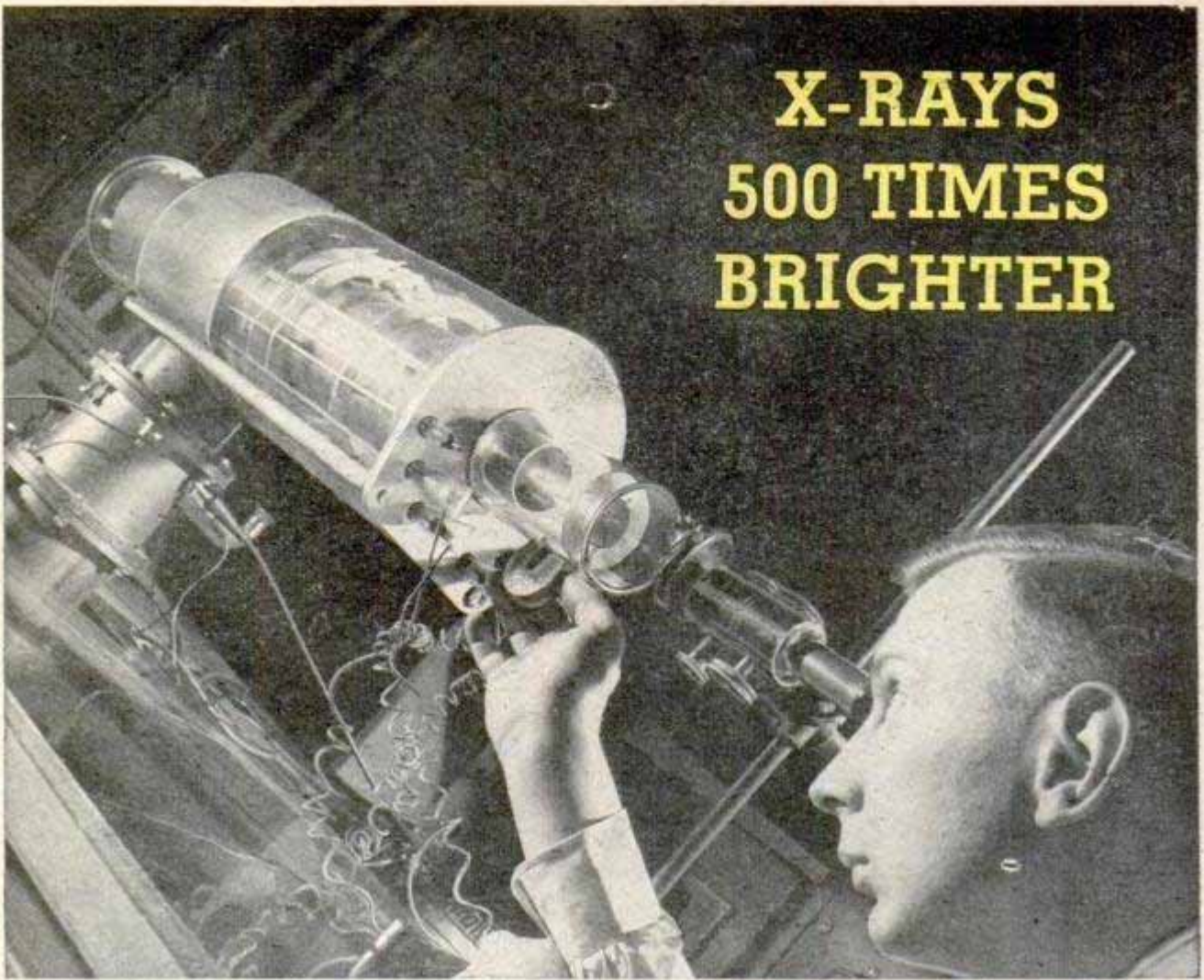
Spot-welding jobs that can't be carried into the shop can be reached with a portable welder weighing only 23 pounds. The self-operating unit has a cast aluminum case and is available in models for both 220 and 110-volt current. It welds up to $\frac{1}{8}$ -inch combined thickness of metal. The copper arms come in 6, 12 and 18-inch lengths and the alloy tips are available in an assortment of shapes. The unit is designed for welding window frames, skylights, display signs, wire fences and other installations that are difficult to reach with a conventional spot welder.



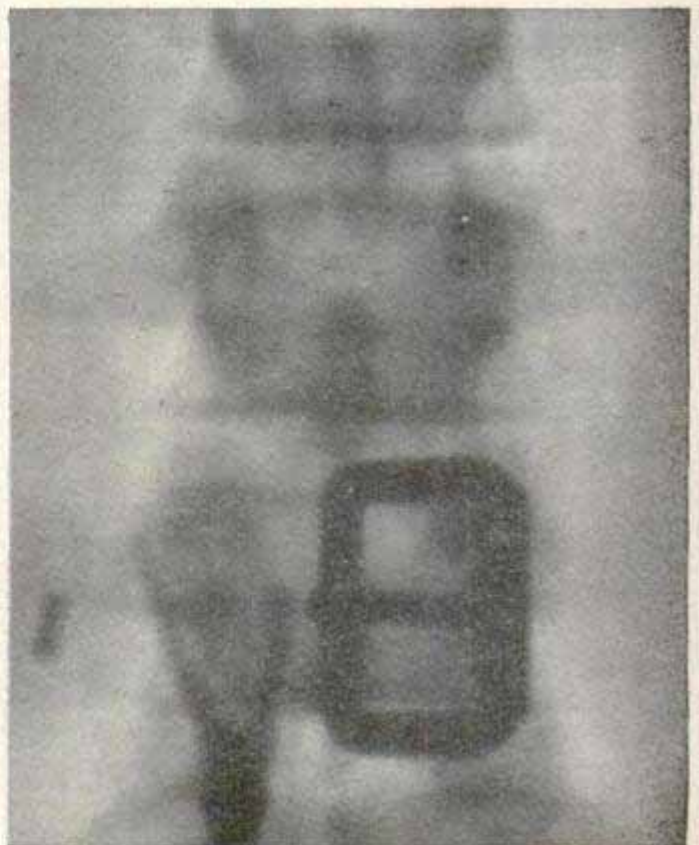
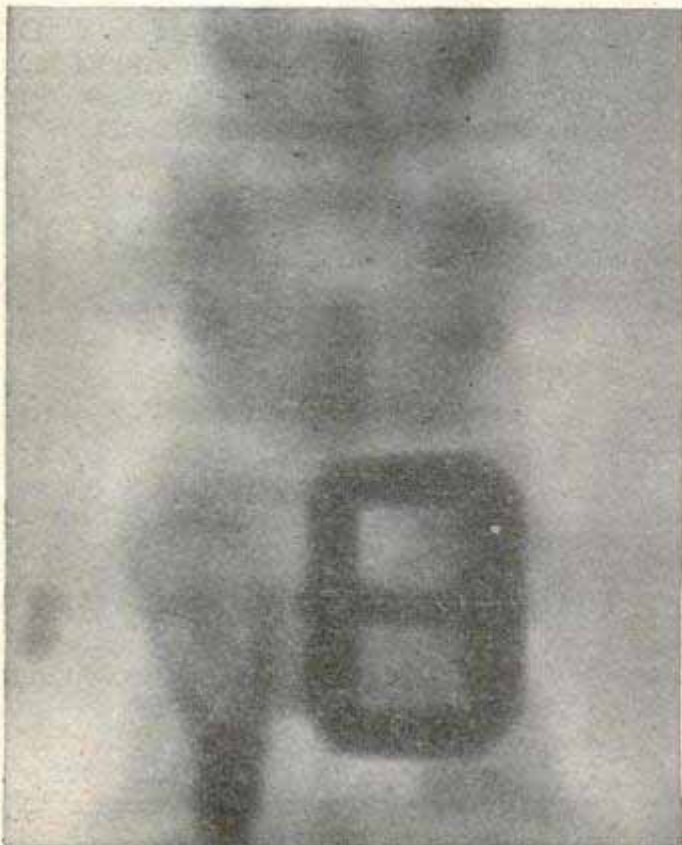
Foot-Triggered Skeet Trap Shoots "Propeller" Targets

Propeller-shaped targets spin up from a small skeet trap which is triggered by foot. The spring-operated trap sends aloft metal targets which can be adjusted to skim over the ground for more than 60 yards or rise almost straight into the air. When a target is hit it takes a sudden change in course. Targets which are not badly hit can be straightened and used many times. The trap's spring is wound by approximately three turns of a crank.

X-RAYS 500 TIMES BRIGHTER



Opening a new field to medical science is the X-ray "telescope" which has helped Dr. John W. Coltman (above) of Westinghouse Research Laboratories discover how the X-ray image seen on screen of fluoroscope can be brightened 500 times. The panel of three pictures below and on opposite page shows from left to right (1) what physician sees on fluorescent screen today, (2) brightness increased five times, (3) 500 times



By Bill Reiche

FLUOROSCOPY, the "motion picture" member of the X-ray family and valuable diagnostic tool, is emerging from its own Dark Age.

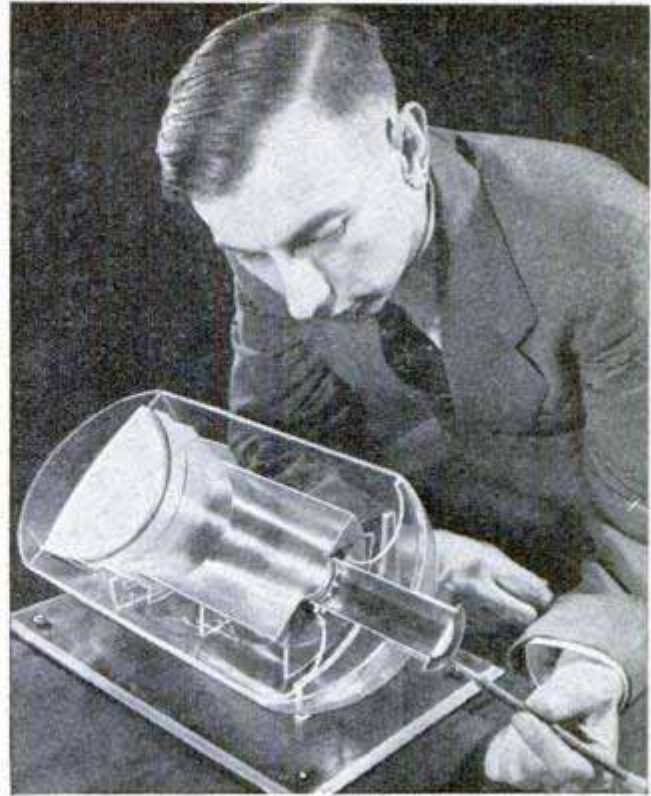
For almost 50 years, since Roentgen discovered the X-ray, the fluoroscope has been potentially the ideal medium for examining the human body, presenting for the doctor's observation the movements of the organs in a light and shadow picture on a fluorescent screen.

However, only a certain intensity of radiation could be tolerated by the patient without injury and the screen could produce a definitely limited amount of light from a given number of X-ray quanta. The resulting image was so dim that the physician could not distinguish objects less than one eighth inch apart, even after increasing the light-sensitiveness of his eyes for 30 minutes in a pitch-dark room.

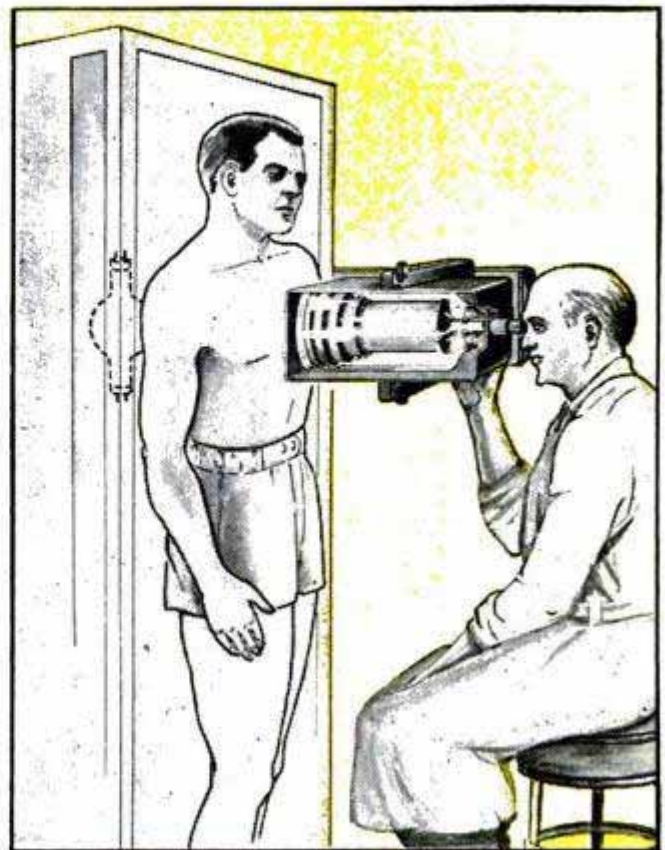
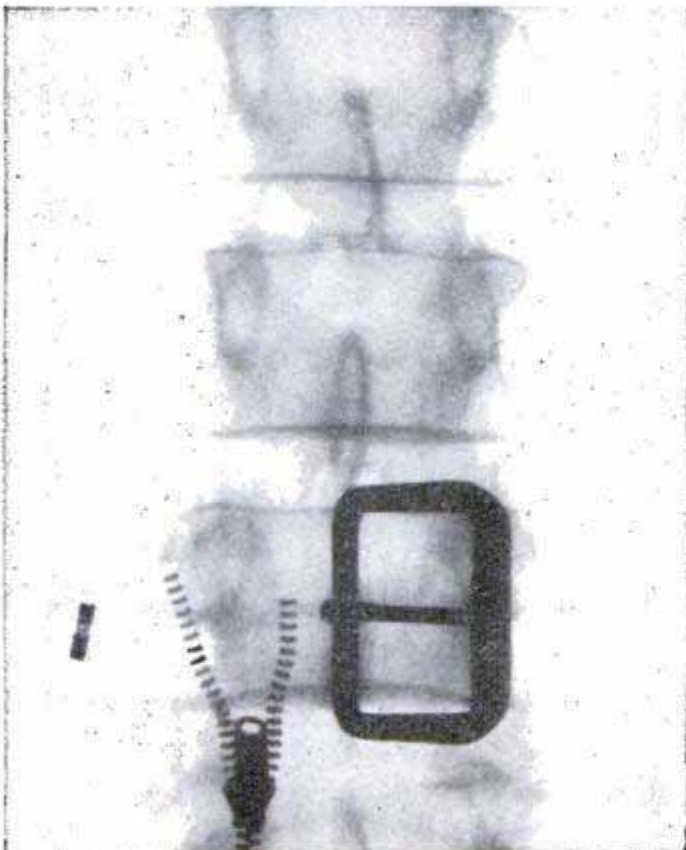
It is estimated that the image of the average human abdomen, using the best equipment available today, is 30,000 times dimmer than a sheet of white paper held under a reading lamp.

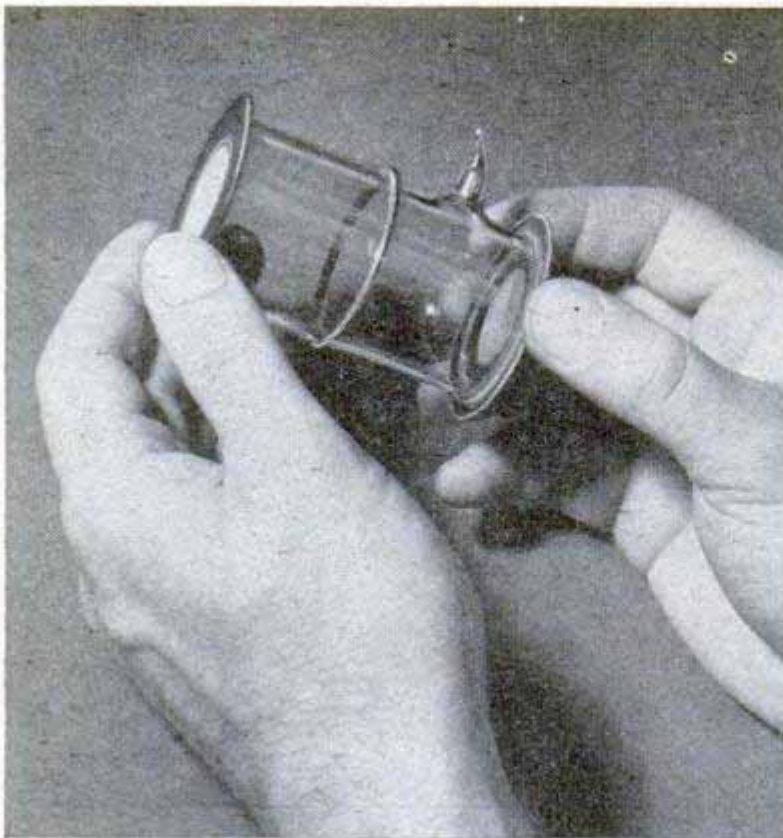
It seemed obvious that, since the rays couldn't be increased in power, or focused, or speeded up, or otherwise be made to produce greater brilliance on the screen, something had to be done with the rays after they left the patient's body and before they reached the doctor's eyes.

Dr. John W. Coltman, research physicist of Westinghouse Research Laboratories,



Scientist with model points to fluorescent screen on which image will be 500 times brighter than in the past. At other end of tube is replica of larger fluorescent screen coated inside with metal that ejects electrons when light falls on it. Metal section in center of tube represents lens system that focuses electron beam on small screen. In practice, X-rays leaving patient strike large screen at left and release light rays; these strike photosensitive surface on other side of screen and eject electrons which speed across the tube at 5000 miles a second. Light rays released when they strike the screen at right give image which is magnified optically. Below, drawing of a commercially practical ray outfit





In this tiny tube, X-ray image brightening was first achieved. It's a four-way play: X-rays to light rays to electrons to the light rays again which give intensified image on small screen

after four years study and experimentation, recently announced the perfection of a device which will, in its fully developed form, increase the brightness of the screen 500 times over what we have today.

The ingenious process worked out by Coltman and his associates introduces the use of electrons, which, unlike X-rays, can be accelerated and focused. In a vacuum-tube "straightaway" the electrons are accelerated from 500 to 5000 miles per second as the diameter of the straightaway narrows from six inches to one inch. It was this conversion of X-rays to light to electrons to light that, for the first time, brought fluoroscopy out of the shadows.

The tube, 18 inches long and tapering in successive steps from a diameter of six inches to one inch, is contained in a glass

envelope and is itself evacuated. The larger end is sealed with a fluorescent surface on the outside and backing this up is a photoelectric or photosensitive surface coated with cesium and antimony.

The larger end of the tube is placed against the patient and the X-rays proceed through his body and strike its fluorescent surface, which lights up. The cesium-antimony combination has the useful quality of emitting a stream of electrons when exposed to light and a flow of these particles results from the action of the light on the photoelectric surface.

In this first and widest section of the tube there is an electrical field with a 200-volt potential and in it the electrons are still in low gear and moving at 500 miles per second. A series of electrostatic lenses, which focuses the electron beam much as glass lenses focus light, guides the beam into the next field. This has a 500-volt potential which accelerates the electrons to 800 miles per second;

the third field gets them up to 1300 miles per second with 1300 volts; the fourth field, with 3300 volts, speeds their rate to 2000 miles per second and in the final field, only one inch across and boasting a 20,000-volt potential, the tiny particles hit the finish line at 5000 miles per second.

The finish line is another fluorescent screen, where all the electrons launched by the light from a five-inch screen land on a one-inch screen and at a considerably higher velocity than the original X-rays. This screen has an aluminum backing to prevent light from going through the wrong way. Image brightness is proportional to the speed at which the electrons strike the screen; definition or contrast—to use a photographic term—depends on the number of electrons striking a given area.

The use of accelerated electrons brightens the image 20-fold and since the area of the second fluorescent screen is only $\frac{1}{25}$ that of the first, then 25 times 20 equals 500, the increase in brightness.

A simple lens or two, with either a single or double eyepiece, inverts the image to its normal position—it was reversed by the path of the electrons in the tube—and enlarges it so that it appears about

(Continued to page 240)

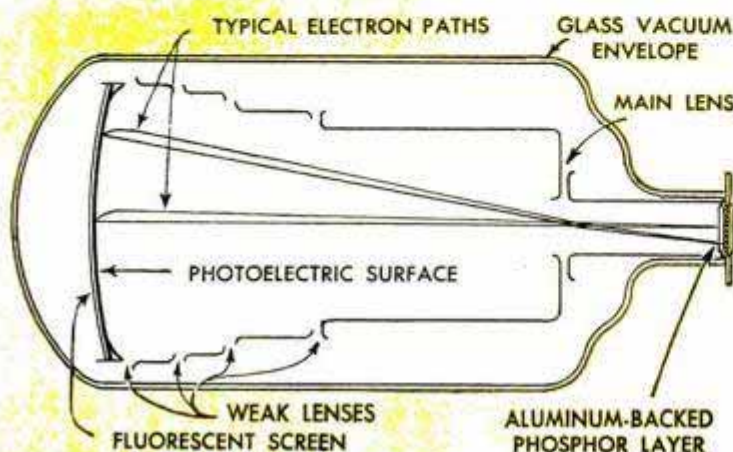
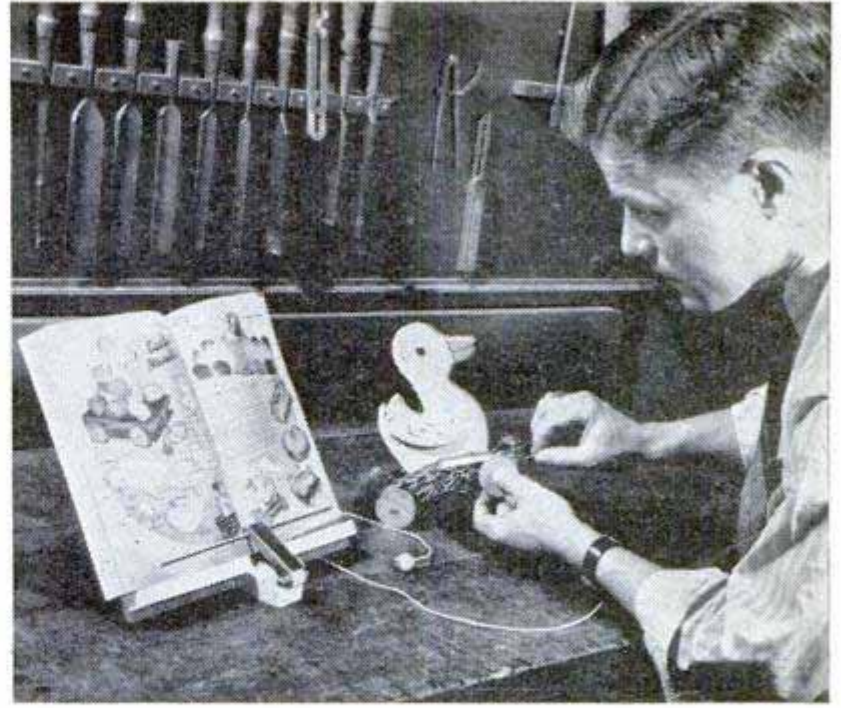
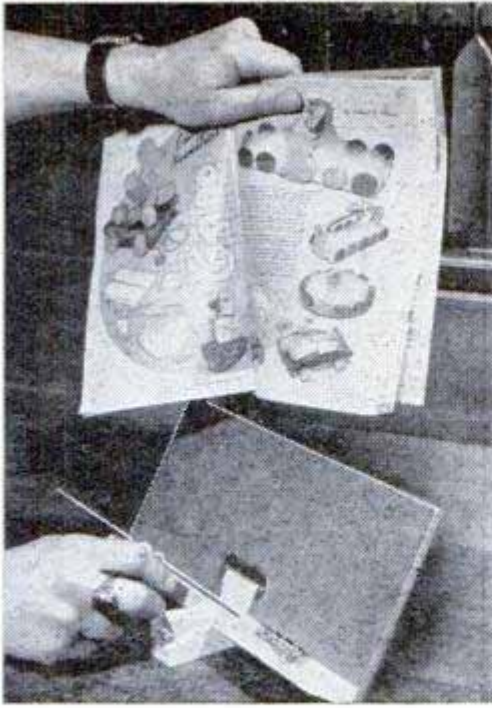


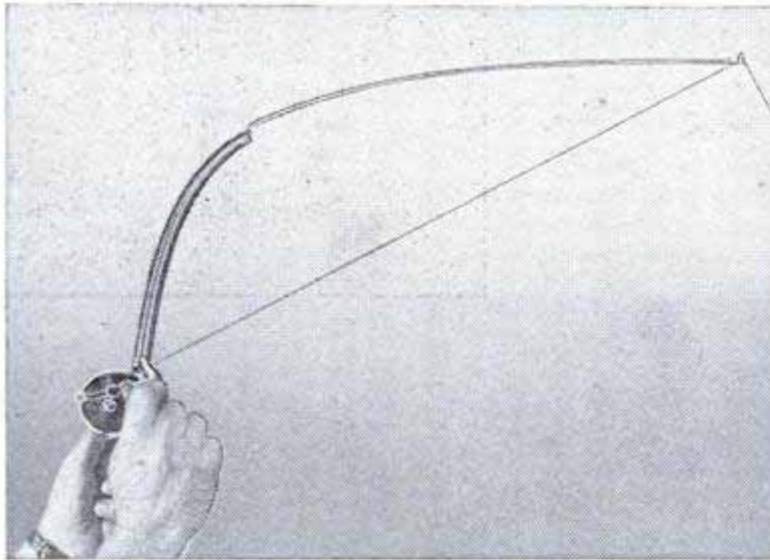
Diagram shows electron paths. Final image is only one inch across before magnifying



Rack Holds Book at Desired Page

Books and magazines are held open at any desired page by a rack which leaves both of the reader's hands free. The holder is designed for use with cookbooks and

workshop instruction books so that the user always has the information directly in front of him. After the book is opened to the proper page and placed on the rack, a metal bar is swung into place which prevents the pages from flipping over.



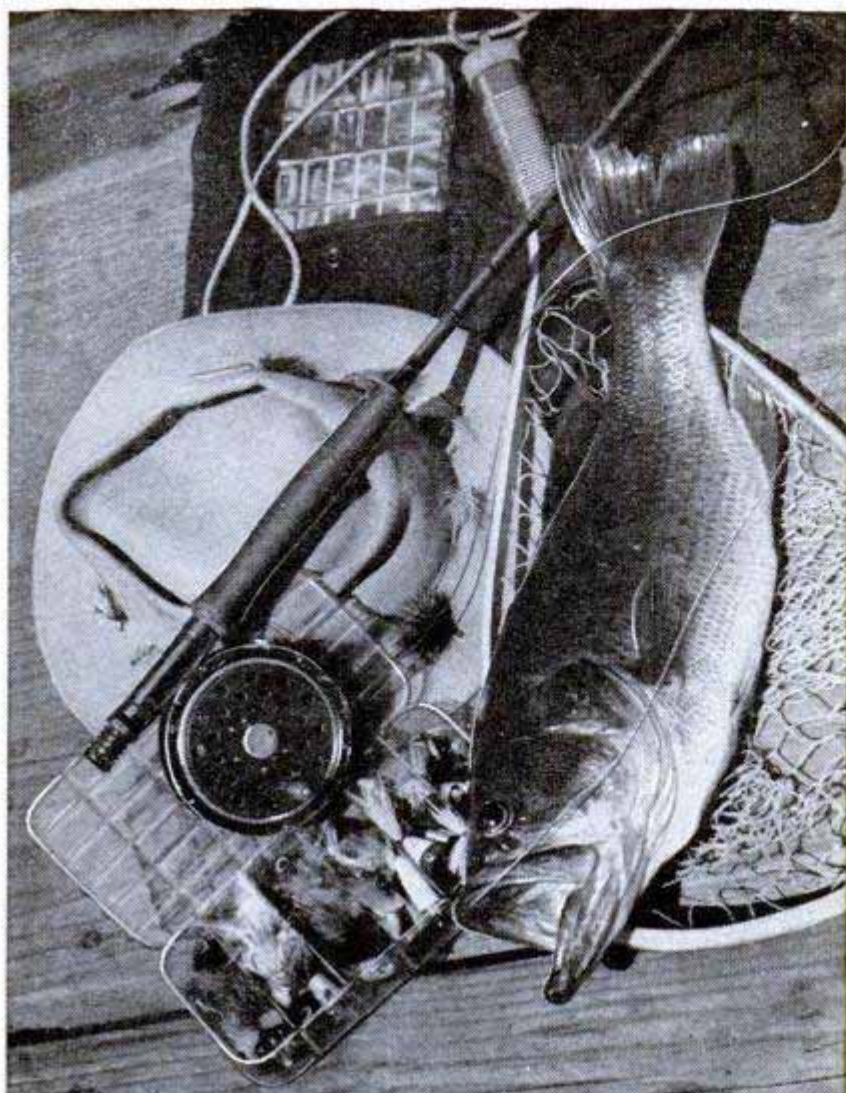
Spring Rod Lengthens Casts

Coiled at the base to form a spring, a steel bait-casting rod has great flexibility which gives a longer cast with less effort. Inside the coil spring are several flat steel springs to prevent lateral action during flexing and thus to increase casting accuracy. Less than a yard long, the rod has only one guide, a feature that assures free line action. Its shortness permits underhand casting along bushy streams and makes for greater safety when two or more fishermen are casting from the same boat.

Small Camp Stove Fits in Pocket

Small enough to fit in your coat pocket, a gasoline camp stove has a windshield, metal grid and generates enough heat for a four-quart pot or a large skillet. No pump is used as the stove is self-pressurizing. Made of rustproof metal, it burns any kind of gasoline and holds enough fuel for 90 minutes' operation.



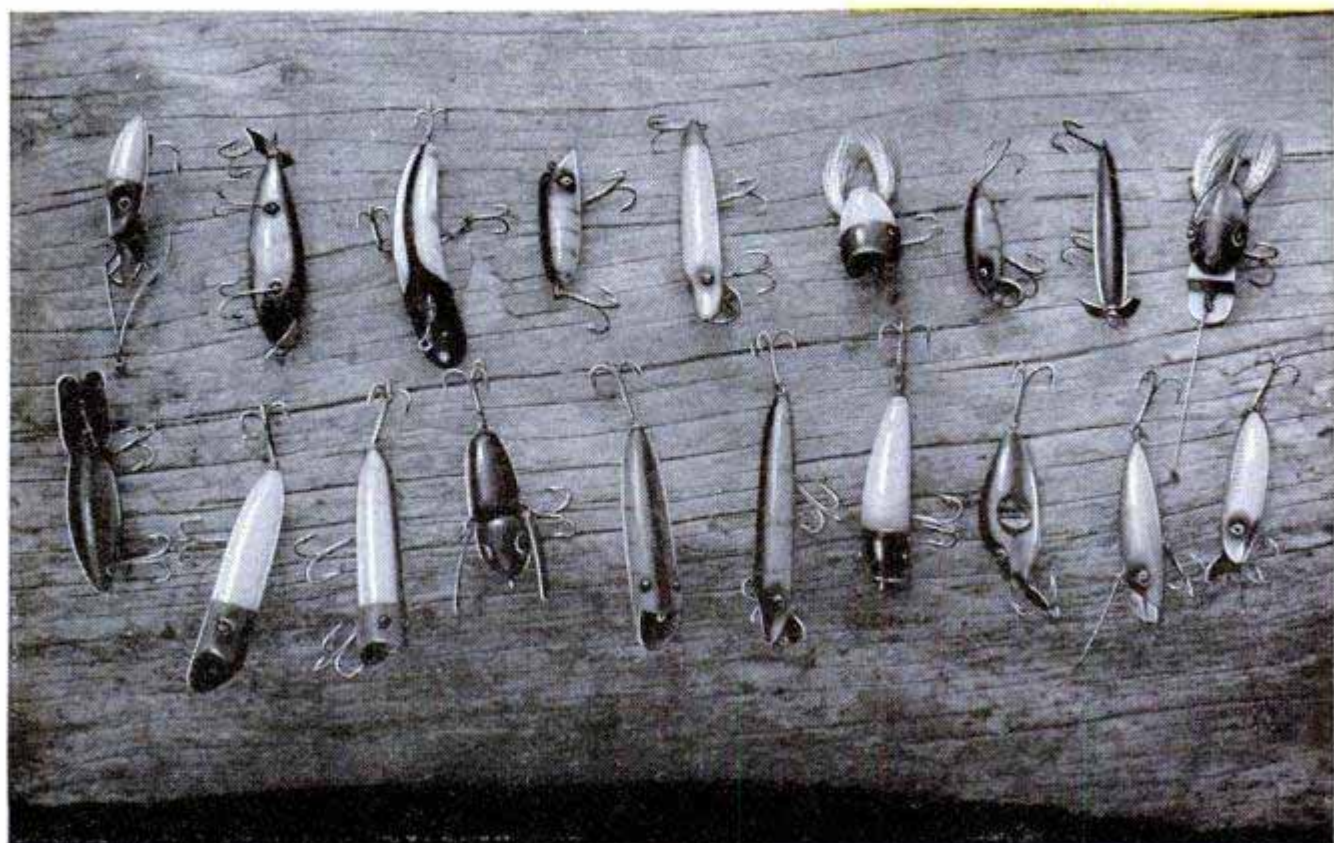


BAITS for BASS

By Claude M. Kreider

Here's the answer to any bass fisherman's dream. Surface poppers for use with the fly rod provide the ultimate sport in bass fishing. Below, among the assortment of casting-rod plugs, both deep-running and subsurface, is one popper, top row fourth from right

Photos by Ray Chapin





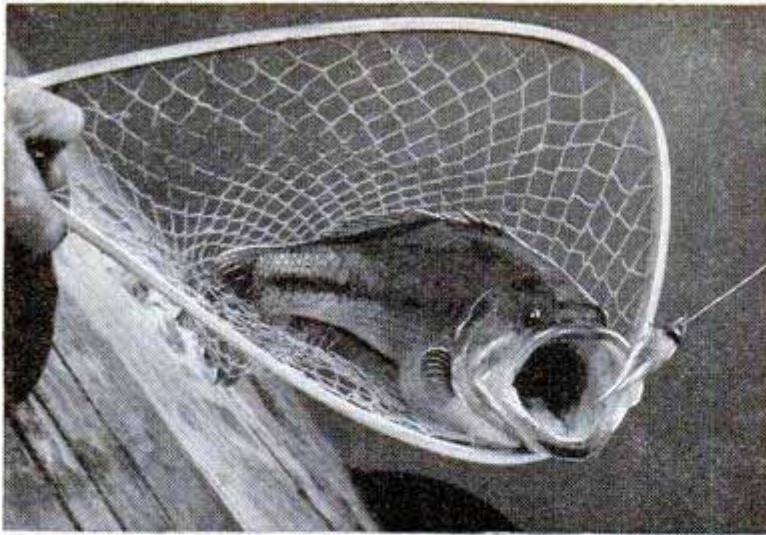
The wisest bass cannot resist a popping plug when expertly cast into pockets and tiny bays along a shore

A SAVAGE and spectacular warrior is the large-mouth bass, most popular game fish we have, and sought by more anglers, young and old, expert and beginner alike, than any other fresh-water game fish. The bass is at home in countless lakes, streams and sloughs in almost every state, and provides nerve-tingling sport almost the year around for he may be fished all through the winter in many states of the South and Southwest.

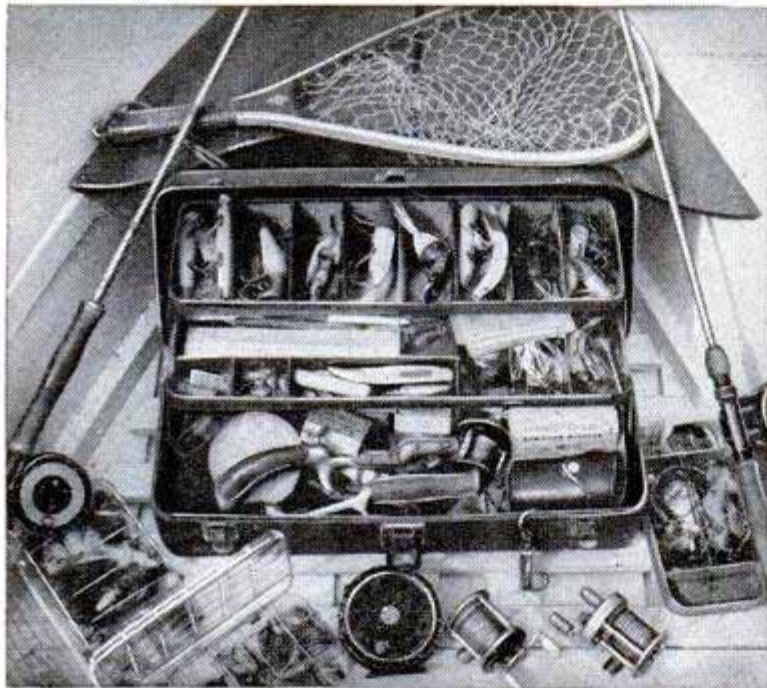
The seasoned angler will seek this bronze-back battler with a wide variety of tackle and methods, with both live baits and a large assortment of artificial lures, for never can he know what will please these notional and unpredictable game fish. Plugs, spoons, wobbling lures and surface poppers and flies all provide fine sport, and their use is more interesting and exciting than that of bait, so we will deal with this type of fishing, which is becoming increasingly popular.

There is a tremendous thrill for the angler when a great bronze-back seizes his deep-running plug or wobbler, makes a wild run to the surface and comes out in a mighty leap, his great head shaking, in an effort to dislodge the hooks; and still more exciting is when a great fish smashes a surface offering with fury, his wide mouth agape. Each type of lure and the method of fishing it has its place, and each is studied by the successful seeker after old *Microp-terus salmoides*.

There are hundreds of effective bass lures on the market of every size, color, action and weight. These may be divided into two general classes: the deep-running, underwater baits, which include plugs, wobblers and spinners; and the surface lures embracing the various poppers, "paddlers," "splashers," and scores of varieties of large flies. So beautifully colored and finished are many of these baits, and so varied the effective methods of casting and



Big mouth? You bet. The mouth of the bass is tough and muscular, and large single hook of this fly-rod lure digs deep



Well-stocked tackle box carries favorite plugs in tray and a box of fly-rod baits in box at right. Also present are a good fly reel and two level-wind casting reels which carry 100 yards of nylon line each. Below, "gang" hooks on lures penetrate well but can be shaken out by the leverage of the plug



"working" them, that just their possession and use contributes much to the angler's pleasure.

Surface lures: In warm weather, and particularly in shallow water, in the evening, bass will often be cruising for surface food, ready to smash anything that splashes or moves. It is then that the poppers provide the most thrilling sport. The larger sizes of these are cast with a light 5½ or 6-foot rod—for the best sport—and a level-wind reel holding about 100 yards of 10 or 12-pound test line of braided silk or nylon. The plug is placed near a lily pad, log or projecting boulder, and is retrieved in slow, short jerks, which produce a disturbance on the surface.

Such baits probably simulate the movement of a frog or drowning mouse, and so provoke a strike. Again, that savage surge of a big bass may be due to pure pugnacity. But always it is satisfying and exciting. Some poppers are designed simply to create a disturbance; others, with spinners attached, hair or feather wings simulate some type of small mammal or large insect. The wise angler will try them all when necessary.

Casting-rod popping lures will weigh from ½ to ⅝ ounce, since it is the weight of the plug which flexes the rod and permits easy, accurate casting. These can be handled nicely up to a distance of about 100 feet. And sometimes a "surface and subsurface" plug is best. It is a floater which can be permitted to lie motionless for a moment—perhaps a big bass is craftily watching it—and retrieved in short jerks or by steady reeling, which will cause the plug to dart and dive, depending on its shape and construction.

Fly-rod surface lures: The finest sport of all is in the use of a pliant fly rod for bass, and a big one will test its strength to the limit. The fly rod, of course, depends on the weight of the line to flex it properly and so permit easy, long casts. It is usually fitted with an oil-dressed line of silk or nylon of size "D" or "C" to fit the fairly powerful rod which this fishing requires. A good rod is one nine feet long, weighing from 6 to 6½ ounces. The reel may be any fairly large-size single-action fly reel.

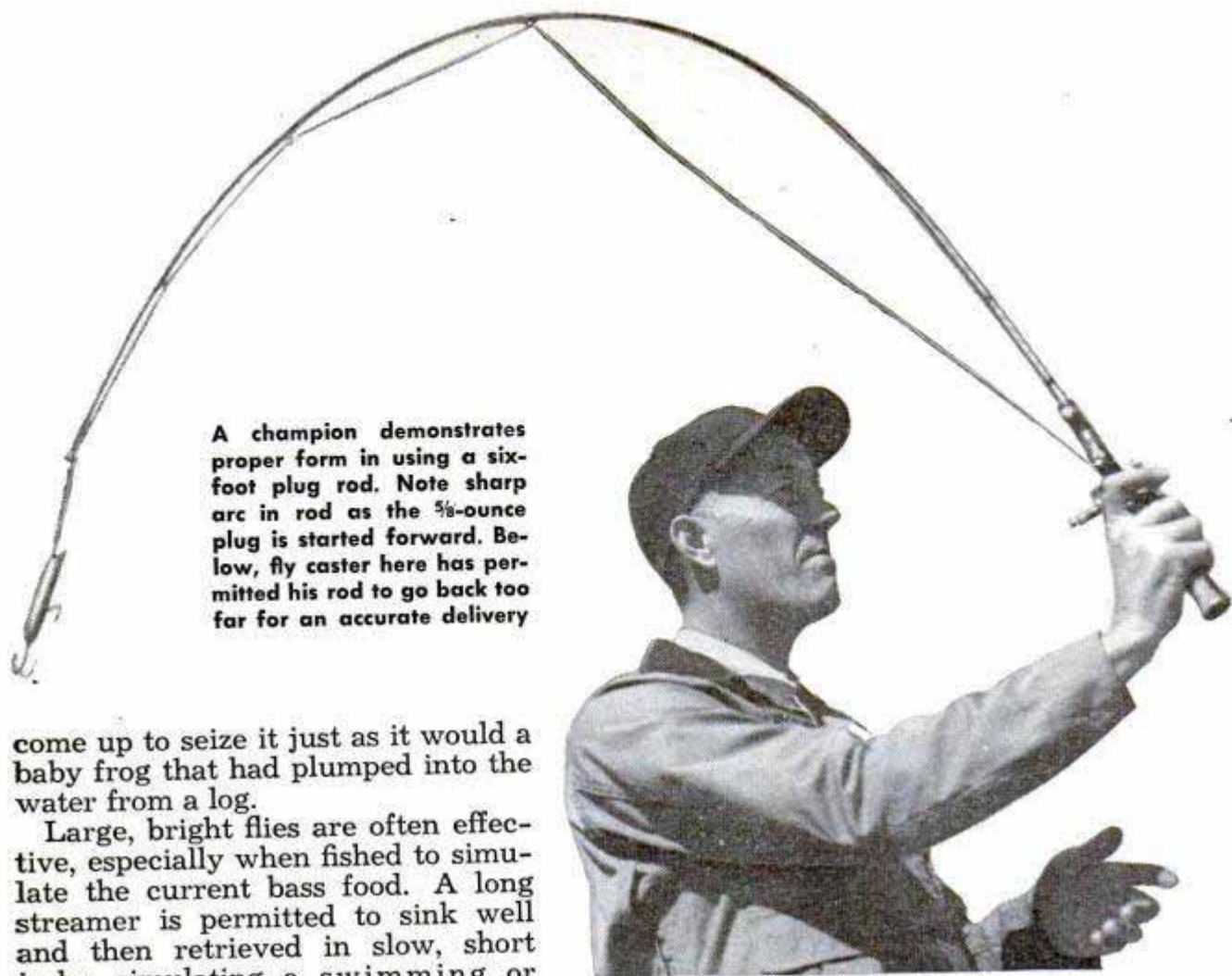


James Corbell, national fly-casting champion, tests casting rod with offset handle and an effective surface plug with perch-scale finish. Below, he examines a favorite bass bug. Every kind of lure—and there are hundreds—answers special need

These lighter lures for the fly rod will weigh only from $\frac{1}{16}$ to $\frac{1}{8}$ ounce, and in the popper type will be made of cork, balsa wood or of one of these materials with feathers or hair wings attached. Retrieving is done by snapping up the tip of the rod while, at the same time, a bit of line is pulled in through the rod guides.

While all these popping lures attract bass by their surface disturbance, there are many types of bass bugs for use with fly rods which resemble very closely small frogs, minnows and large flying insects. Some are designed to float, while others will sink slowly, but come to the surface with gentle rod manipulation. All such bugs and the poppers have large single hooks, often protected by a slender wire to render them weedless, and may be cast directly on floating weeds, brush or lily pads. This is usually the best method of fishing them, the bug being skipped to the water from its resting place on the theory that a bass, often lying under the vegetation, will at once





A champion demonstrates proper form in using a six-foot plug rod. Note sharp arc in rod as the $\frac{5}{8}$ -ounce plug is started forward. Below, fly caster here has permitted his rod to go back too far for an accurate delivery

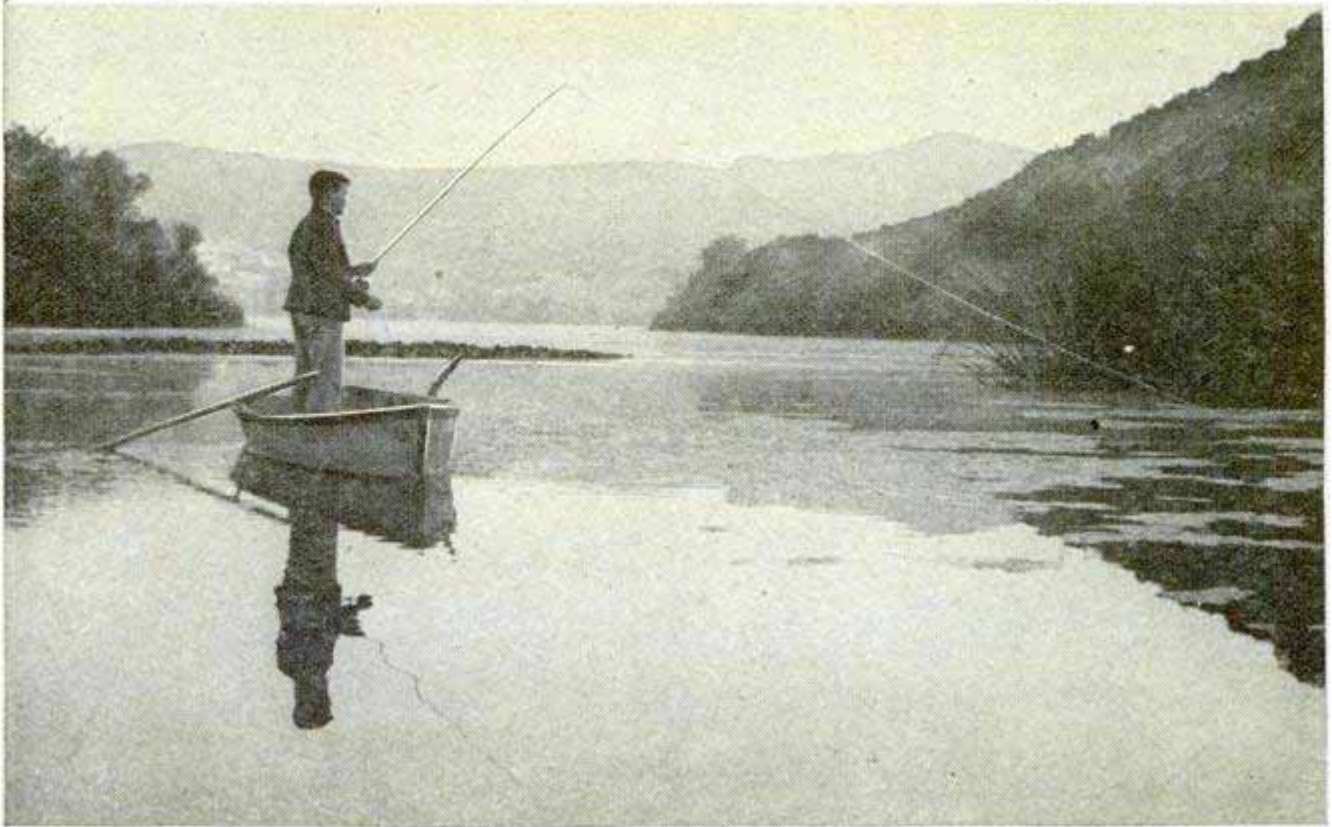
come up to seize it just as it would a baby frog that had plumped into the water from a log.

Large, bright flies are often effective, especially when fished to simulate the current bass food. A long streamer is permitted to sink well and then retrieved in slow, short jerks, simulating a swimming or wounded minnow. Other bushier flies are fished on the surface with a slow movement, then allowed to sink a foot or two and retrieved with varying speed and action, when they probably imitate bottom-hatched nymphs of many insects coming slowly to the surface. And the brighter flies, colored like miniature rainbows, just seem to arouse the ferocious pugnacity of the large-mouth, and he smashes at them with utter abandon.

All these fly-rod lures may be fished either from a boat, from shore or by wading, and offer the utmost in thrilling sport, but knowledge of where the bass lie and the action of the lure is essential. Good casting is important, too, and the proper rhythm and timing with the various lures on the fly rod may be done on one's lawn at home.

Underwater lures: First there are the plugs, of a hundred sizes, shapes and colors. Some of these are designed to go deep, perhaps 20 feet down when reeled in fast, and many have a metal "shovel" on the head, which may be bent to increase the diving action. Others will sink of their own weight and literally crawl along the bottom, the action varying with the angler's style of retrieve. And very often such a plug is most effective when permitted to stop, then is started suddenly.





This angler is fishing a fly-rod lure with proper technique—rod tip well up and line slowly stripped in

These deep-searching plugs are best in deep lakes, having boulders, crevices and sunken logs, near which the big bass lie, and experience will help the angler decide when they are best. Next is the plug which goes to medium depth. It usually floats until the retrieve is started, then dives at once with irregular, darting motion, and so simulates a wounded minnow again. It is one of the best of all bass plugs when expertly maneuvered by the fisherman, for the predatory large-mouth cannot resist taking a minnow, especially one that apparently cannot escape.

Most of the plugs are equipped with two or more sets of "gang" hooks, usually fastened both fore and aft. These promise sure hooking of fish, and add considerable attractive action to the lure, but hang up easily on rocks, brush and logs. Also, they are attached to the body with a loose ring, and when a big bass leaps from the water shaking his head savagely, the leverage of the plug outside his mouth will often let him throw the plug—sometimes "right back at the boat."

Wobbling and darting lures: In this class we have the various "wounded minnows," of many types. Some of these are made of wood, curved for erratic action and fitted with many small gangs of hooks. They are

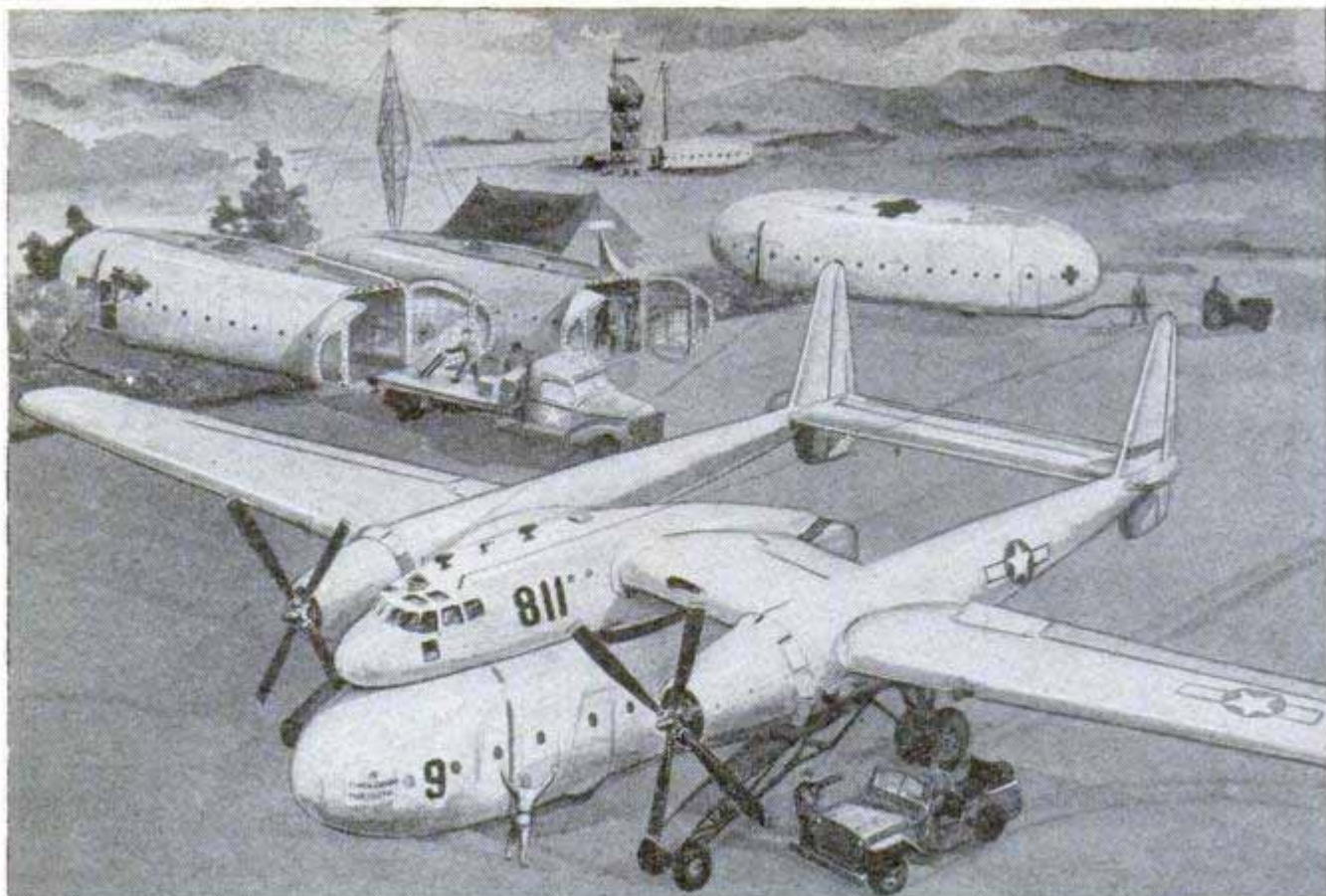
most effective bass-getters when used in color combinations such as red and white; mottled green; and finished with "scale" and "perch" markings.

The many wobbling spoons, with large, single hook are also popular, particularly in the bright chrome finish. These are usually fine weedless attractors, for combing grass and weeds along the stream or lake bottom. Then many of the large spinners, nickel, copper, brass, red, red and white, and all these colors in various combinations, will often provoke a big old "he" bass to surge from his lair.

There are many fine single-hook, weedless lures, which have a slender metal body for quick sinking, over which is slipped a skirt of fiber, plastic or shredded rubber. These skirts come in a variety of solid and variegated colors so the angler who favors this type of bait, a splendid one for easy bulletlike casting, has only to change skirts to please the whim of the waiting large-mouth. This bait sinks readily and can be fished far down directly beneath the boat by retrieving with varying speeds when the fish are unusually deep.

In considering the basic advantages of all these casting lures, for use with the casting rod, the action comes first: the

(Continued to page 244)



Fairchild Aircraft Drawing

USAF Pack Plane to Have Detachable Fuselage

Borrowing the trailer-truck principle, a pack plane being developed for the U. S. Air Force will have a detachable fuselage that can quickly be "traded" for another for return trips. It will carry nine tons of cargo or, as a medical unit, 36 litter patients. The plane itself will serve as an air tractor, flying with or without its pack or fuselage. Under the latter condition it is

expected to perform like a fighter, with high speed and maximum maneuverability for evasive action. In shuttle service it would permit air delivery of supplies and ammunition and the evacuation of wounded on return flights. According to present plans, it will have two Pratt and Whitney Wasp Major engines, with a take-off rating of 3250 horsepower.

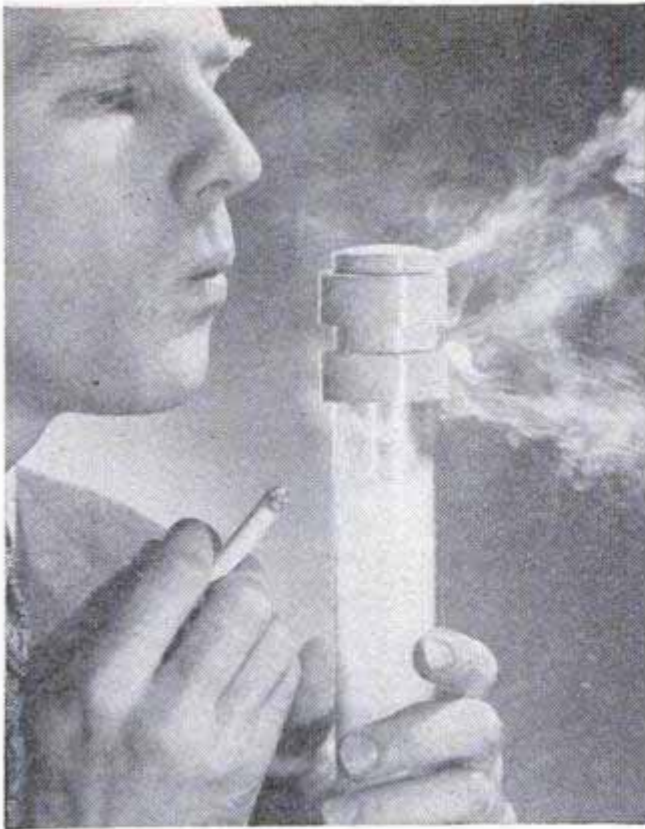
Chicagoan Wins P.M. Camp Trailer

Winner of the camp-type trailer presented by *Popular Mechanics Magazine* at the World Hobby Exposition was Edward C. Helwig of Chicago. Ideal for vacation and camping trips, the compact trailer has a bed for two, closet space and cooking facilities that are reached through a rear door. It was completed at the exposition from plans printed in this magazine.



Our WHERE-TO-FIND-IT INDEX, listing names and addresses of manufacturers and sources of further information for products and articles in this issue, is available free upon request. This index is one of the many services offered to *Popular Mechanics* readers by the Bureau of Information. For your index, just write to the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11

BLUEPRINTS SV1102 - SV1105 \$1.50



Chimney Model Shows Draft

Efficient chimney draft is illustrated by a unique plastic model that shows just what happens when wind strikes a new chimney crown from any angle. First, the model's transparent tube of Tenite plastic is filled with cigarette smoke. Then the chimney crown is blown on from any direction—up, down or across—and the force of the air creates a siphon effect which draws the smoke out through vents. Since the crown is round, air from any direction produces the same effect. Downdrafts are guided across rather than into the vents to produce suction.



Table Supports Portable Saw

Portable saws of one type can be mounted on a sheet-steel stand to convert them for sanding, wire brushing, tongue-and-groove work, and other shop jobs. The saw is mounted beneath the stand with the blade projecting through the surface. In this position the saw can be used for face sanding, cross cutting and sawing tile. With the saw mounted on its side so that the shaft projects through the table top, the assembly can be used as a drum sander, wire brusher and shaper for tongue-and-groove work. A switch extension simplifies control of the saw.

Runners on Mower Guide Blades

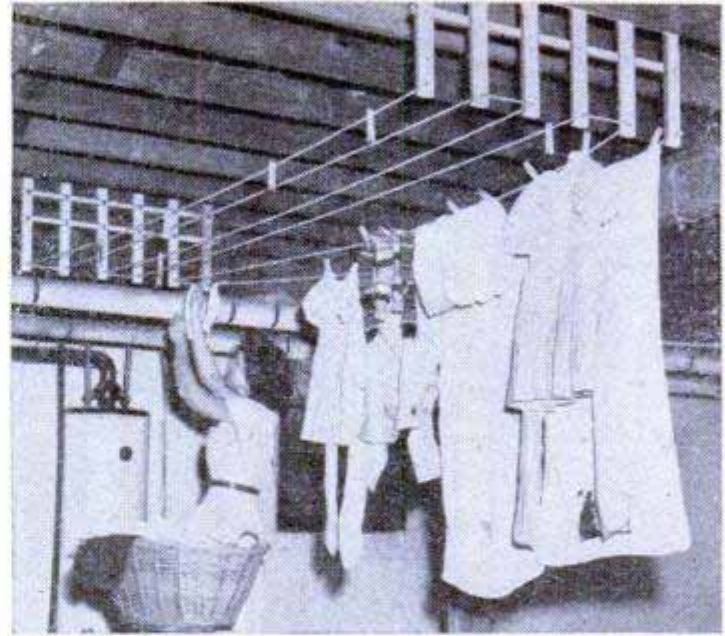
Sled-type runners on a power mower slide along the contours of the ground to guide the blades for an even cut. The mower's wheels always travel on cut grass, eliminating unsightly ridges. Powered by a 1½-horsepower motor, the machine is easily controlled by a lever near the handle which starts or stops both the cutting unit and the tractor. The mower is available in two models. One makes a 21-inch cut with a capacity of three acres per day and the other a 25-inch



cut with a four-acre capacity. With a steel-blade attachment the mower can be used as a snowplow in winter.



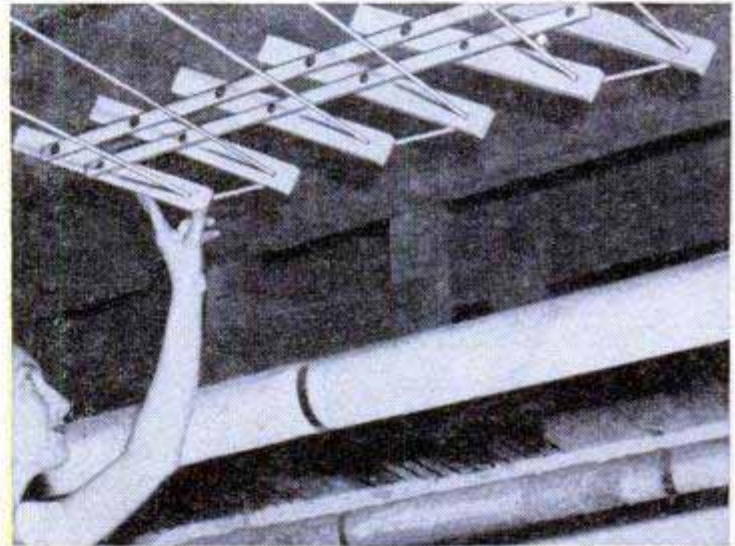
DAY-NIGHT THERMOSTAT is installed in five minutes. Mounted on any manual-thermostat bracket, it uses same wiring. Clock cord plugs into a wall outlet



CLOTHESLINE HANGER swings up against ceiling (below) out of the way when not in use. When being used, it's pulled down to convenient height

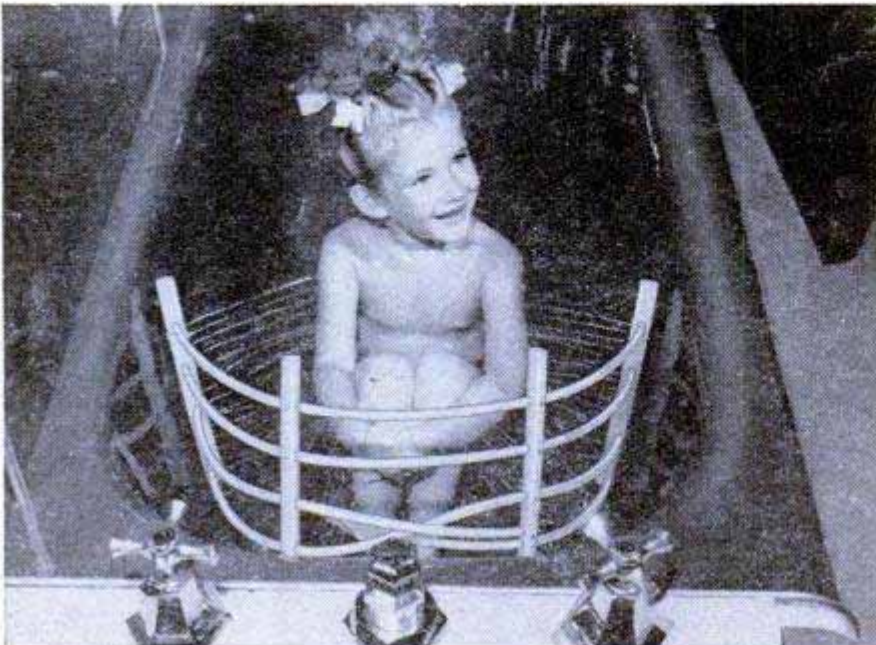
WHAT'S NEW *For Your Home*

Sources of supply for these products may be obtained from Bureau of Information, Popular Mechanics Magazine



PORTABLE SPRAY will make any child anxious for bathtime. It's made of plastic tubing and has suction cups on the back for attaching it to tub. Used outdoors, it provides a cooling spray in summer

BABY-FOOD WARMER consists of a large cover and three small ones that hold jars suspended in water





FRUIT JUICER catches juice in its double-duty base that serves as shaker when the cover is used



TILTING CHAIR provides a comfortable leg rest for sitting up and reading or, when tilted back, lets you relax with your feet in the air. The fabric covering is attached to the aluminum frame with springs

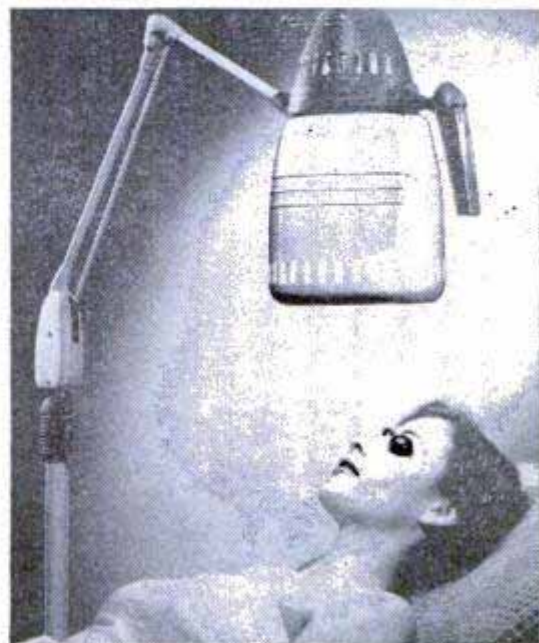
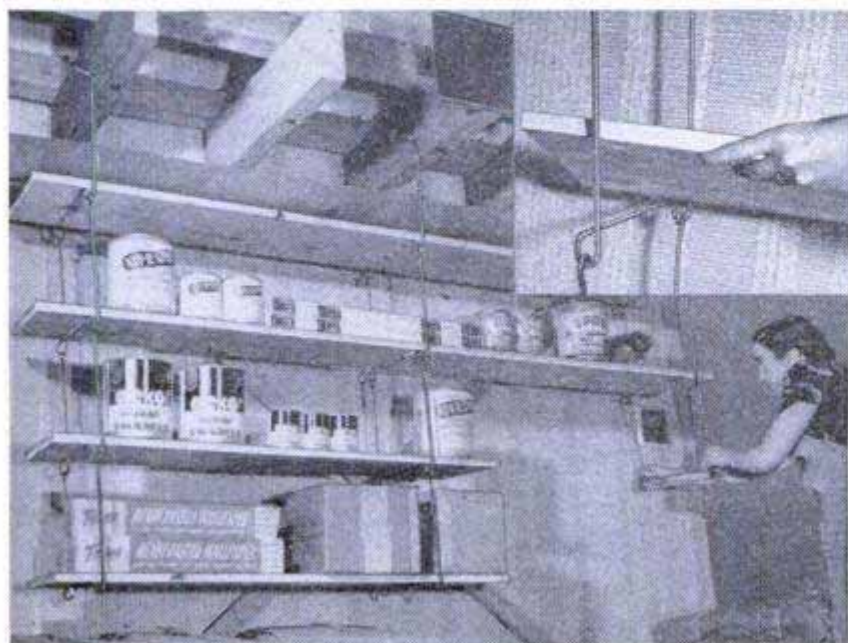
CONVERTIBLE HANDLE holds mop, brush or wax applicator. Spring action holds them all securely

NO-NAIL ROD is held up by pressure of rubber ends against walls. Plastic-covered rod telescopes to fit



SHELF HANGERS need only four large nails to hold them up. Boards up to 12 inches wide are laid across them. Lower shelves are then suspended from the hangers already in place

ADJUSTABLE LAMP locks in any position. The handle of Tenite plastic controls lamp movement. When released, it locks in place





Above, workmen form rough stones from the mixture. Left, air gun sprays stone particles on the surface

Mortar Sculptured Into Stone

Artificial stonework that looks like the real thing can be applied to building exteriors or interiors and can be installed over any type of surface. The plastic stone is a mortar made by mixing natural stone with cement and insulating materials. This mortar is applied to the surface and hand-

sculptured into individual stones. Particles of natural stone in various colors then are sprayed over the surface. In the final step, each "stone block" is tooled around the edges to create a mortar-joint effect. The stone can be installed over shingles, siding, brick, stucco and concrete block.



Suction From Lawn Trimmer Pulls Grass Into Blade

Suction pulls grass into the blade of an electric lawn cutter designed for trimming around trees, flower beds and stones. The blade is constructed like a fan so that it draws the grass away from stones or flowers and into cutting range. The motor has a dustproof cover shaped like a bowl to aid in creating suction. The switch is located on the tubular handle which can be adjusted to the operator's reach. Powered by 110-volt alternating or direct current, the trimmer is available with 50, 100 or 150 feet of cord.

Furnace Burns Oil or Gas

Either oil or gas can be used as fuel for a new furnace burner. The gas component for the burner uses either artificial or natural gas. The regular No. 2 grade of oil serves as fuel whenever the oil burner is used.



Seismograph Forecasts Hurricanes By Spotting Tiny Earth Tremors

Certain weather predictions can be made 25 percent more accurately by measuring earth tremors, it is claimed by Dr. L. Don Leet of Harvard, inventor of a new seismograph. The new device, on which readings are made continuously and above ground, can discover and follow the progress of storms by measuring the microseisms, small earth waves that are standard messengers of hurricanes. They consist of very slight tremors that only the most sensitive seismographs detect. These waves travel more than a mile per second through the ground and may be recorded as far as 1000 miles from the "eye" of a hurricane. The new seismograph is buried in the ground, but earth tremors are recorded on a roll of paper by a machine in the operator's office. With the old type of recorder, seismologists had to go underground to observe the recordings or wait until photographic plates were brought up and developed.

Our WHERE-TO-FIND-IT INDEX, which lists names and addresses of the manufacturers or distributors of products described in this issue, is available to readers without charge. For your copy, just write to Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11

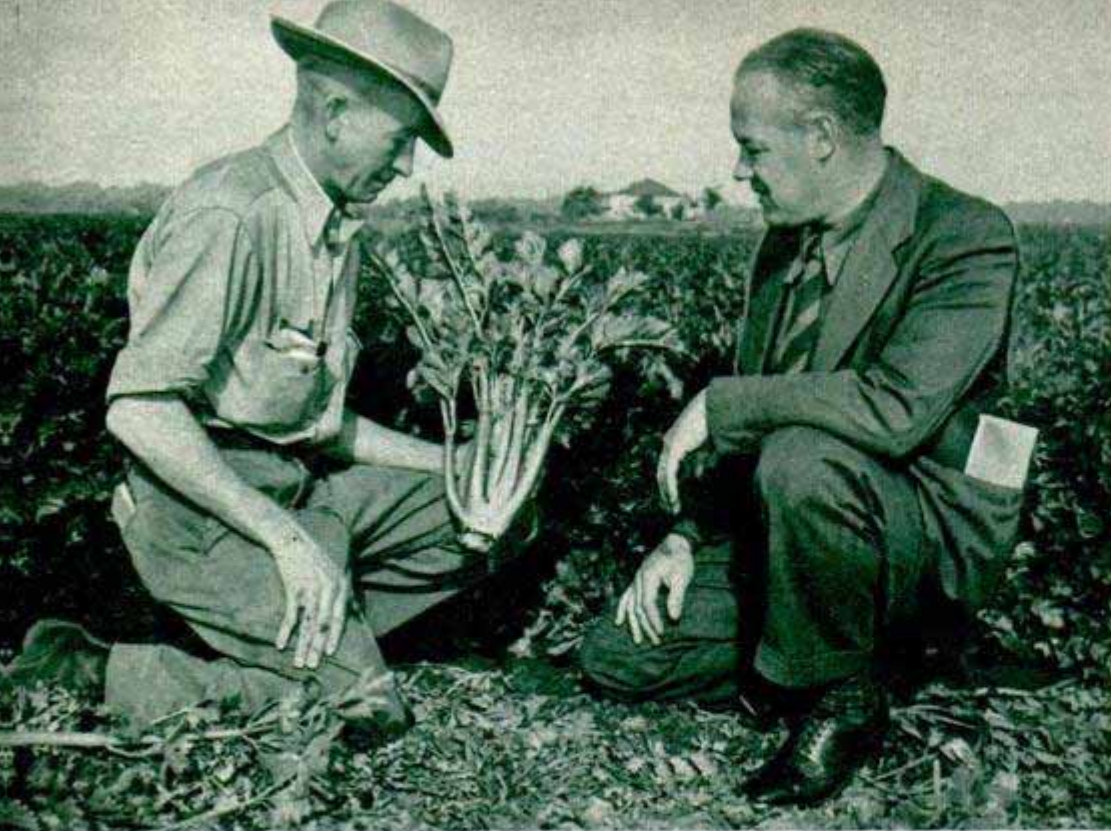


Pocket-Size Plastic Binoculars

Consisting of only 12 separate parts, six of which are of Bakelite plastic, a pair of binoculars is lightweight and small enough to carry in the shirt pocket. The plastic parts are formed simultaneously in the same mold, making it possible for the manufacturer to produce the item economically.

Synthetic Rubber Is Improved When Produced at Zero

Tropical temperatures may be best for natural rubber trees, but tests have proved that a better synthetic rubber is produced when the temperature is held down to zero. Synthetic rubber made under frigid conditions has a tensile strength and stretching ability equal to natural rubber. In resistance to cracking and abrasion, it is expected to be superior to the natural product. Previously, synthetic rubber was made at a temperature of 125 degrees. Heat speeds the processing and as the temperature was lowered the time required increased until chemicals were found that cut processing time to the original 12 hours.



As soon as this celery is harvested, the farmer will plant another crop

By Thomas E. Stimson, Jr.

THE POT OF GOLD at the end of the rainbow is small change to the farmers of the Chula Vista district near San Diego. They reap a pot of gold off every acre, two or three times a year.

"Did all right last year," one of them muses as he figures his income tax. "Grossed \$2300 an acre from celery, another \$2000 from tomatoes. Total, \$4300. Costs were \$1900 an acre and that leaves a profit of \$2400. Now I multiply that by 20 acres . . ."

Fantastic? It sounds

Pay Dirt in Chula Vista

Scientific farming in this Garden of Eden with fertile soil and 12-month season yields profits of \$2000 to \$5000 an acre in cut flowers and vegetables

Crop-dusting with a helicopter means a bigger yield. Here the hoppers are filled for a jump



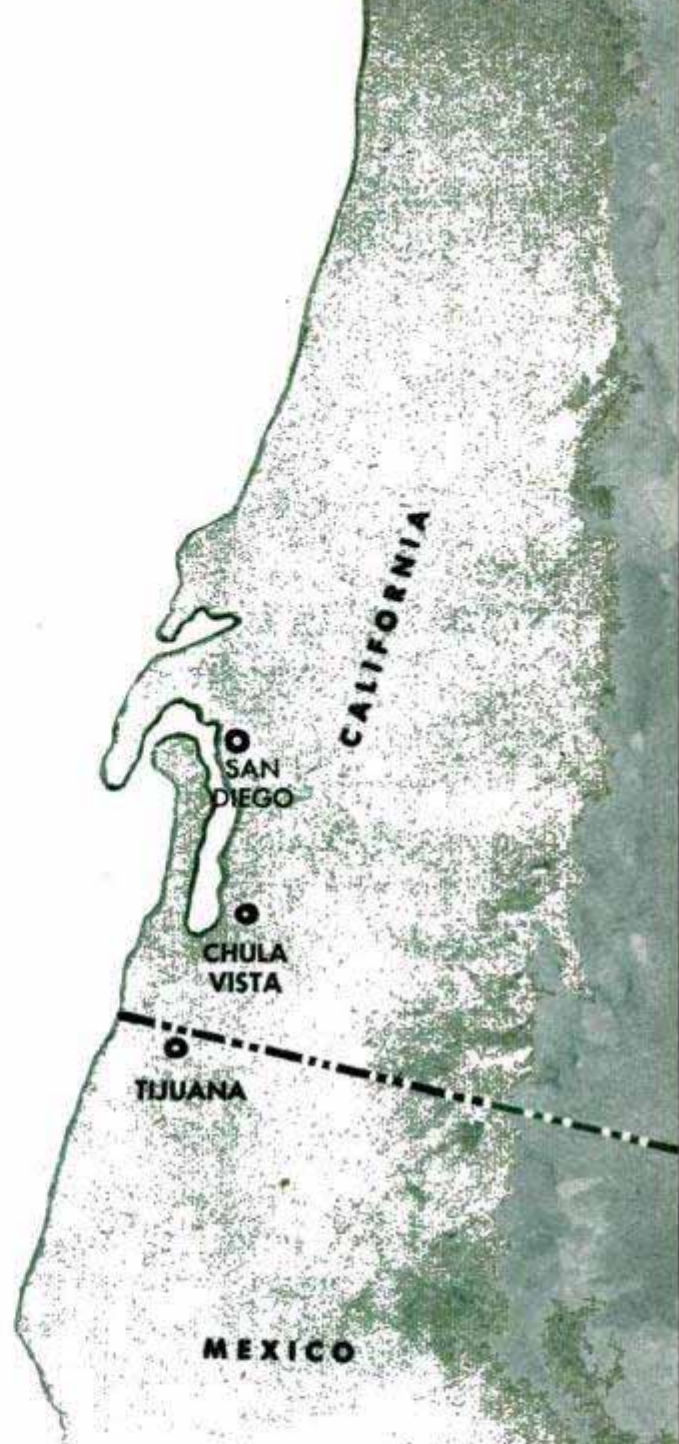
so to farmers who consider a couple of hundred dollars an acre a good return. But some of the Chula Vista farmers do even better. Last year one man banked \$5000 an acre from cut flowers.

Chula Vista adjoins San Diego Bay, a few miles north of the Mexican border. The town and its environs boast the "world's shortest thermometer" with a winter average of 55 degrees and a summer average of 67 degrees. Some days are much hotter, of course, and the oldest inhabitants can recall a few winter frosts. But growers who keep smudge pots handy in case of a freeze rarely light them except for a routine test.

The year-round growing climate allows cultivation of two or three crops on the same ground in a year. A man who plants early cucumbers, for instance, may replant with string beans as soon as he harvests the cucumbers, and then raise a crop of asters after the beans are picked.

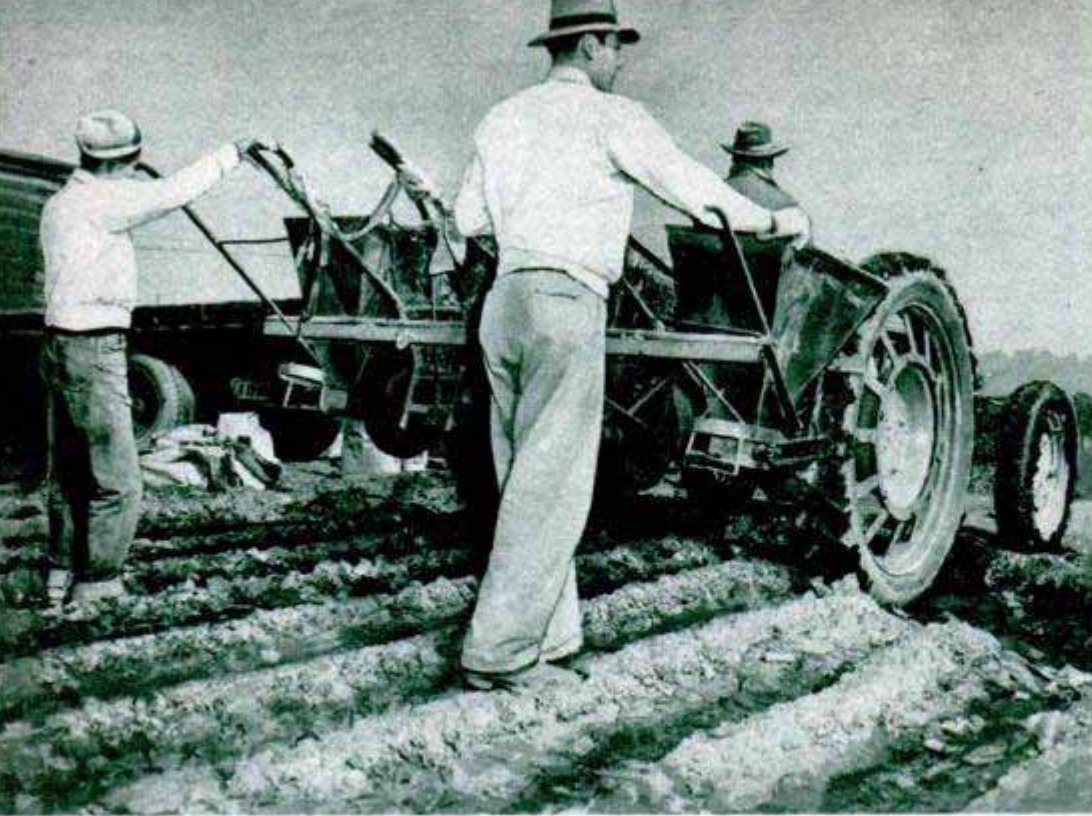
This doesn't mean that Chula Vista has a magic soil or that anyone can stick a few seeds in the ground and automatically become rich. There are plenty of farmers in the district who earn only average incomes. The secret of success is the application of scientific knowledge and good business principles to agriculture. These pay off in Chula Vista just as they can boost farm profits anywhere. High income per acre is based on raising large tonnages of top-quality vegetables that are harvested at times when the same crops are out of season elsewhere.

Chula Vista is only one of numerous examples of high-income regions. Farms in the Encinitas district north of San Diego, in much of Los Angeles County, and in other areas as far north as Lompoc



Map at right shows the location of Chula Vista, one of the richest farm areas in the country. Below, a helicopter hovers over a cauliflower field to dust the plants





Four small fertilizer machines, normally operated by hand, are attached to a tractor, permitting workers to fertilize four celery rows at once

in California are made to yield big returns. Carroll Lorbear, for instance, who grows winter celery and summer lima beans in West Los Angeles almost under the shadow of the Douglas aircraft factories, has grossed as much as \$40,000 from a seven-acre portion of his farms in an exceptional year.

Market fluctuations can make a farmer rich or poor almost overnight and most Chula Vista growers try to stabilize their income by doing their plantings over a period of weeks or longer. They prefer a long harvest season to the possibility that

they would have to market an entire crop when the market is glutted.

Price fluctuations can have odd results. One farmer who was virtually down to his last dollar two years ago unexpectedly cleared a big income simply because he fell ill with influenza. He had staked all his money on tomatoes and then, when the crop was ripe, the price fell so low that he couldn't afford to pick them. He'd lost his shirt and all his friends advised him to plow the tomatoes under and get another crop into the ground as fast as he could. But he no sooner started to plow when the flu put him in bed.

Meanwhile, a sudden frost killed off the tomatoes in another section of the country. The price shot from two cents to 10 cents a pound. The farmer's tomatoes were still prime and as soon as he got out of bed he started to harvest them. He ended up with a lot of money in the bank.

One businesslike farmer in Chula Vista finds it profitable to fly east for checking up on the markets and arranging his shipping schedules, even though his entire farm is less than 10 acres in size. Others who operate 30 or 40 acres are apt to spend \$800 a year in long-distance telephone calls, an

Two men sweep down eight rows at once with a spray boom, while other workers support the 400-foot hose. During some years water is scarce at Chula Vista



expense that pays off in obtaining the best prices.

Super-intensive cultivation produces fabulous crops. A typical example is the production from the 40-acre Chula Vista farm of Jaekel & Rogers. This farm is organized like any good business concern, with W. F. Rogers in charge of sales, Bob Conforth in charge of production, and Elmer Conforth in charge of equipment.

The farm has its own packing shed and spur track. Refrigerated cars carry much of the production to the Northwest, Midwest and East. Some 15 people are on the regular base payroll and employment sometimes runs as high as 100 during harvest seasons.

From their 40 acres Jaekel & Rogers harvest as much as 80 carloads of celery every winter and some 500 tons of tomatoes, plus 24,000 dozen ears of corn every summer.

To obtain this astonishing production,

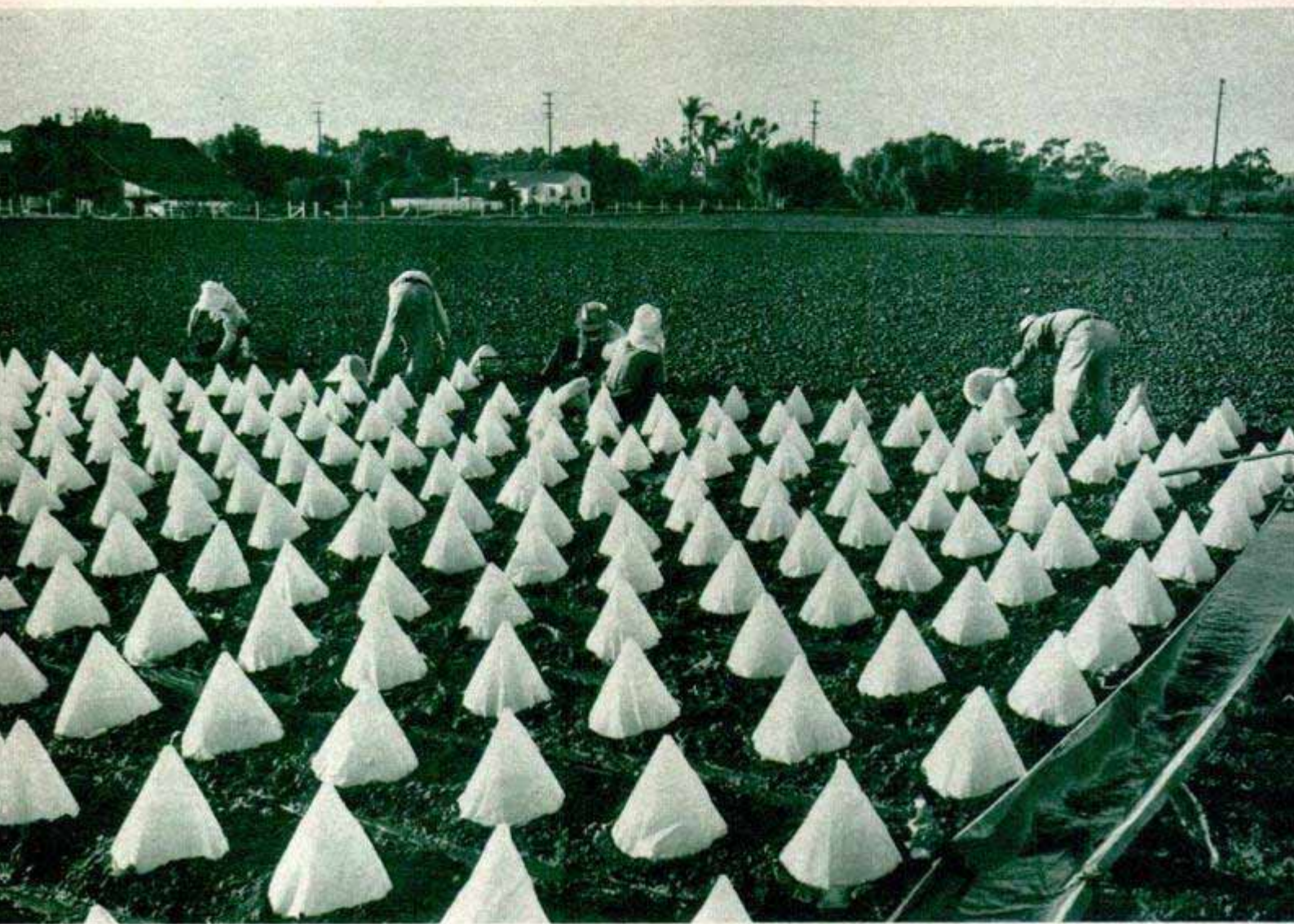


Combination planter built of several machines speeds work by laying four rows of fertilizer, shaping seed beds and planting them in one operation

Bob Conforth keeps men and equipment busy in the fields every day of the year. There is practically no slack time. Celery, for instance, requires that the field be plowed, disked from six to 10 times to pulverize the soil, leveled, furrowed, planted,

Power spray rig has nozzles aimed at different angles to shoot insect spray on celery rows from the top and from both sides





Pepper plants are kept humid and warm during the late winter with paraffin-paper bags shaped like wigwams

fertilized several times, cultivated numerous times, sprayed frequently and irrigated periodically before harvesting.

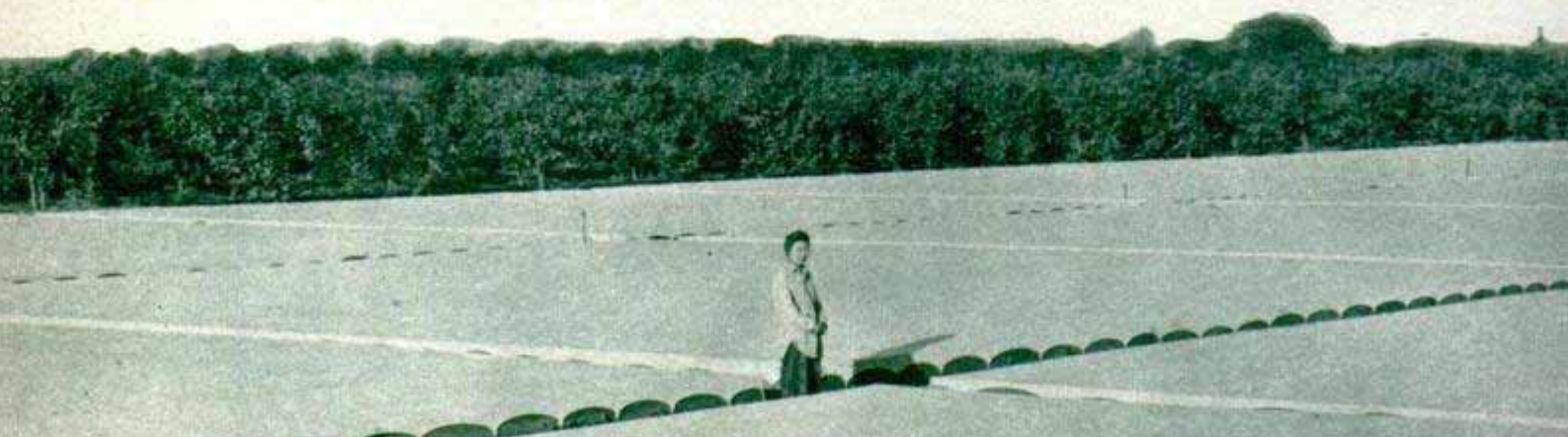
For one purpose or another men ride equipment through the field or walk the rows a total of 45 times during the season. Each single acre involves 100 miles of equipment movement and 45 miles of walking on foot. Even this is not enough in itself. A quality crop hinges a great deal on the timing of the different operations. The entire farm including all personnel must

operate with the smoothness of clockwork.

Each acre of celery ground is fertilized with 2½ to four tons of commercial fertilizer heavy in phosphoric acid and potash and in addition some 20 tons of barnyard manure are spread over each acre. Dusts and sprays are employed against blight and aphids. Weeds are kept down with chemicals and with hand weeding. The total pre-harvest costs are in the neighborhood of \$800 per acre.

Jaekel & Rogers begins transplanting cel-

Celery on this five-acre field absorbs heat during the day. Late in the afternoon huge canvas covers are spread over the field to help the plants retain the heat. Young celery plants grow faster under this protection



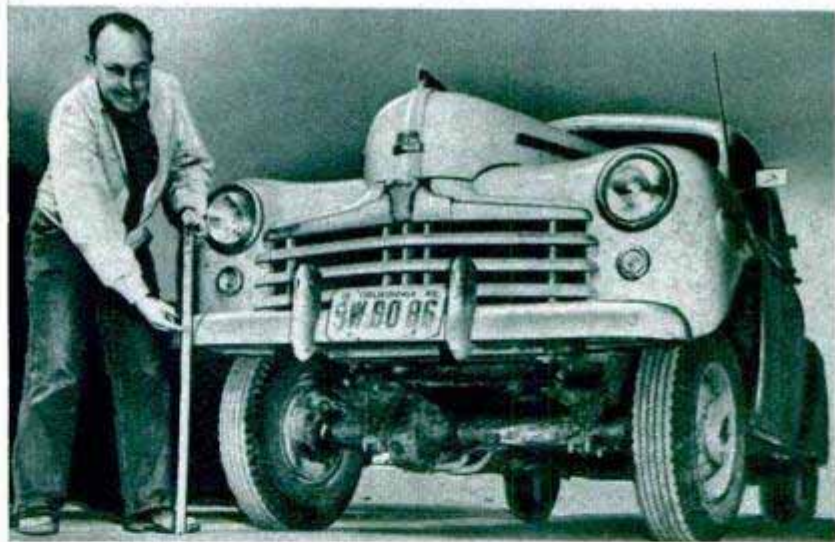
ery into the fields about August 15 and continues to plant until the middle of October. This provides a long harvest season that runs from December 15 to March 15.

To make most efficient use of the sun, rows are laid out in an east-west direction and the seedlings are planted along the southern exposure of ridges. If the slope of the land requires north-south rows for proper irrigation, the seedlings are planted on the east side of the rows to take advantage of the early sun. Consistent with the dimensions of the field and with good irrigation practice the rows are as long as possible. Long rows reduce the number of turn-arounds for equipment at the ends of the field, cutting down the time required to cultivate each acre.

Preparation of the soil for summer crops begins almost on the day the celery is harvested. Sweet corn is planted beginning in late February, pole tomatoes are set out in late March. The corn will be marketed in July, August and September, and the tomatoes will bear from the 10th of July until early winter. A small acreage is planted to miscellaneous crops for use by the farm employees.

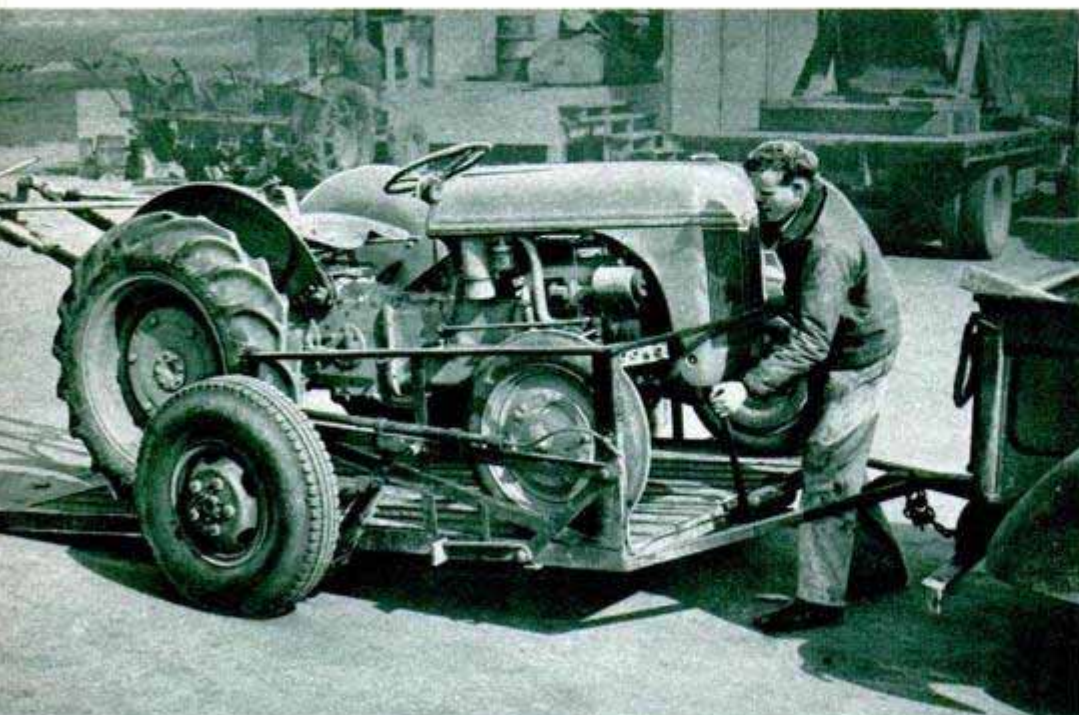
The farm's equipment includes two track-type tractors, a spray rig on a wheel tractor, plows and a subsoiler, two disks, six cultivators, power dusters and hand dusters, and fertilizer equipment. Mules are used to pull the cultivators. Jaekel & Rogers tries out new mechanical equipment as

Top, Chula Vista flower grower tunes in ball game on the radio he installed on his tractor. Center, two-foot clearance of bumper permits car to be driven across fields. Right, sheet-metal gates dam irrigation water





Endless belt conveyors move the celery past workers who trim the stalks, grade them and pack them in crates to be loaded into refrigerator cars. ↓ Flatbed trailer has a hand-operated hydraulic lift so the bed can be raised or lowered when equipment is transferred from one field to another



soon as it becomes available and the firm devotes part of one field to test plots in which new seed varieties, new fertilizers and new farming methods are evaluated. The farm makes use of the advisory services offered by state and federal agricultural agencies.

How small an acreage in Chula Vista can support a family? That's hard to say, though an ex-construction foreman by the name of C. D. Cash does very well on 8½ acres. With water, planning and hard work he has turned his small acreage into a gold mine.

Cash raises giant column stock on 3½ acres, summer asters and vegetables on the rest. At the peak of the winter stock season he ships hundreds of dozens of cut flowers by air to eastern florists. He gets top prices. He makes some deliveries in nearby San Diego and he derives part of his income from the flowers that he sells from a wayside stand on the highway alongside his farm.

The logical question is, why doesn't everyone rush to Chula Vista and start right in to make a fortune? There are lots of reasons against it. In the first place, while commodity prices may be high at any given time, no one can tell when they will drop, cutting deep into the farmer's profits.

In the second place, the Chula Vista district includes less than 100 square miles of agricultural land and all of it is in use. There is salt water on one side, the international border on another, the city of San Diego at the north and some barren hills on the East. There's simply no room for expansion in the area. In all, the district produces \$1,500,000 worth of celery

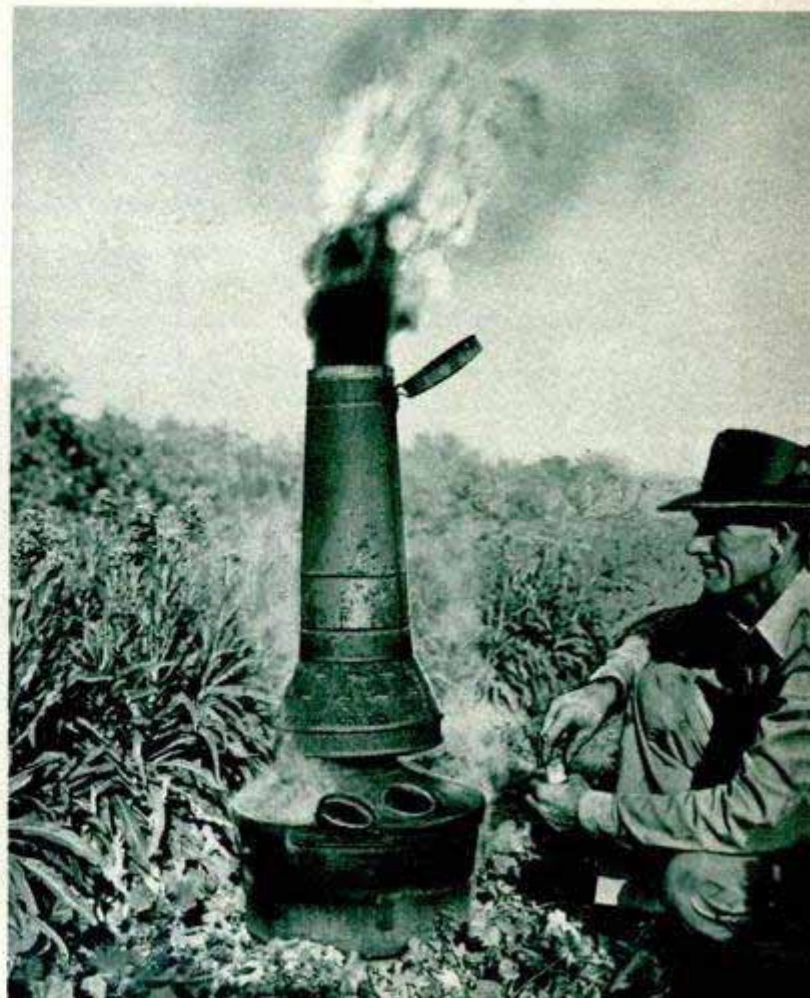
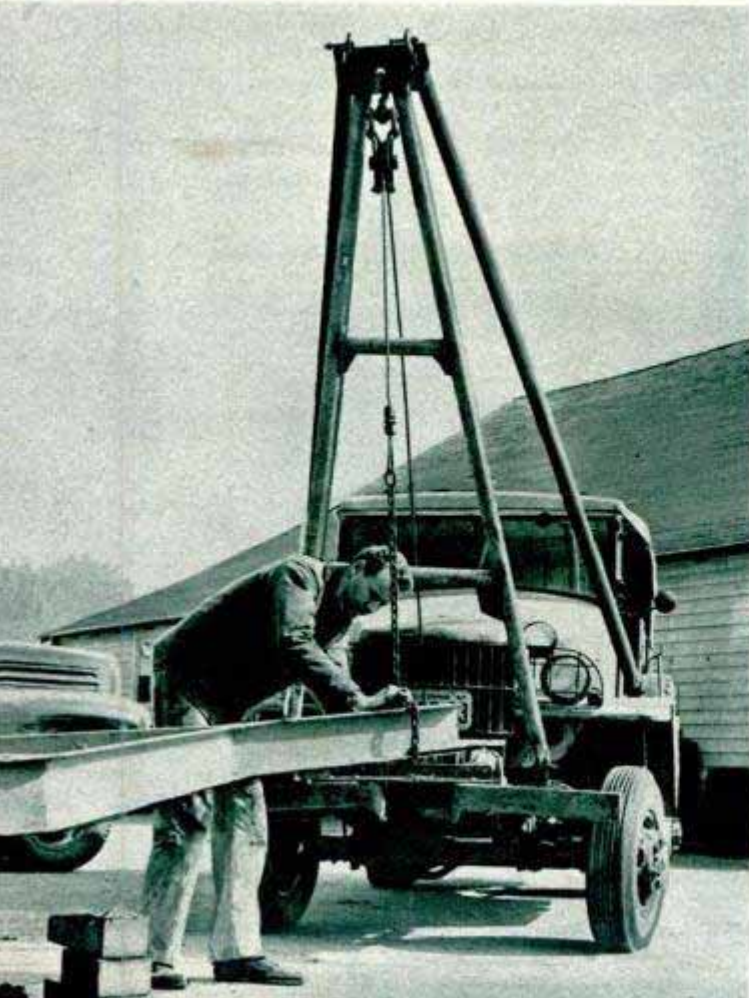
per year, the same amount in lemons and other citrus crops, \$500,000 worth of cucumbers, plus \$1,000,-000 worth of other crops.

The cost of farm land is up in the thousands of dollars per acre and water is always a problem. Some farms get irrigation water from their own wells but underground water can't be found everywhere. Reservoir water may cost as much as \$200 per acre per year and in a dry season like the spring of 1948 it could be severely rationed for irrigation.

Finally, not everyone makes a success of farming. There is a special know-how to scientific agriculture. The big-income farmers of Chula Vista have it, acquired from education, experience and experiment. They know that only by cashing in on the year-round growing season can they keep profits up. And year-round cultivation means year-round work for the farmers of this Garden of Eden.



C. D. Cash has made as much as \$5000 per acre from cut flowers like those he is tying in bundles here. Below left, an A-frame attached to a surplus Army command car comes in handy for lifting heavy equipment. Below, although smudge pots are seldom needed, they must be tested every year





STONE CARVERS' ART REPAIRS BOMB SCARS

Craftsmen using century-old techniques are patiently wiping bomb scars from the masonry of St. Paul's Cathedral in London, damaged by air raids during the war. The cathedral was built during a 35-year period starting in 1675. Today the workmen are using bow drills and other tools that have remained unchanged in the centuries since that time. Damaged arch stones are carefully replaced by stones carved in the same patterns. Only through handwork can some of the old mosaics and carvings be duplicated. A giant screen will be built across the cathedral to permit later work on the interior. A few scars will be left to mark the peril which the cathedral survived.

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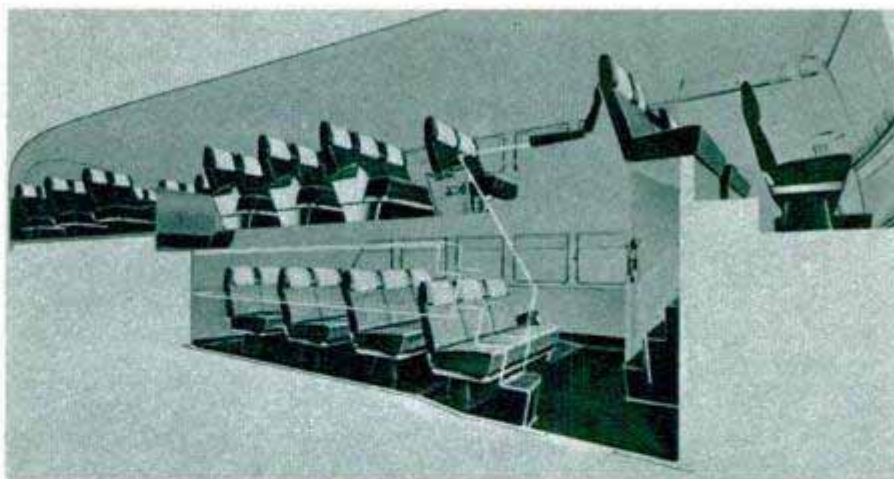
Staging for the repair of the choir arch and vaulting has been thrown across the cathedral. Upper right, these damaged arch stones will be duplicated by carving new stones by hand

↓ Carver operates a bow drill similar to those used by workmen in 1675 when the cathedral was started. Below right, a new carving is patiently matched to old work by a stone carver



Luxury Bus Has Washroom

Travel luxuries that include a cabinet for cold drinks, a drinking fountain, individual radios and a washroom are found on a new 50-passenger highway bus. The bus is divided into three compartments on two different levels. A 12-seat compartment on the lower level has the refrigerated cabinet, fountain and washroom. On the upper level, reached by two stairways, are the forward compartment seating the driver and six passengers, and the main compartment with 31 seats. Each seat has a pillow-type radio which can be heard only by the individual passenger, who has a choice of two programs. A public-address system permits announcements by the driver. The Greyhound bus is powered by two air-cooled, six-cylinder engines, rated at 150 horsepower each, installed at the rear. Under normal conditions one engine powers the bus while the second operates the acces-



sories. On steep grades the second engine cuts in automatically to maintain power without a shift in gears. Other features include a crashproof gasoline tank made of rubber, and tires with steel wire cords.

Air From Spare Tire "Blows Up" Canvas Bunkroom Atop Car

Tourists can make their bed on top of a car with a canvas sleeping compartment. When collapsed for travel the compartment extends only 11 inches above the top of the car. The dressing compartment is 6½ feet high and is built into the trunk. Flexible hoses inside the canvas are inflated with

air from the spare tire to "blow up" the canvas to three feet high. Inside the compartment are a full-size mattress and springs, a dresser drawer, two folding chairs and a wash basin with water under pressure. The water tank is equipped with an automatic gasoline heater.



Left, 6½-ft. dressing compartment extends into the car trunk. Right, the three-foot-high sleeper is collapsible



Tomorrow's cars may spurt up hills on superfuels, but the high-octane gas will cut deep into the driver's budget. Engineers seek a solution in a dual-fuel system — standard gas for cruising and a jet of high test for quick starts

ONE CAR— TWO GAS TANKS

DUAL-FUEL SYSTEMS which will permit the motorist to cruise on standard-grade gasoline and switch to a high-octane tank for quick acceleration or hill climbing may be the best answer to the demand of the motoring public for better performance and economical travel.

Those who read of the 100-octane gasoline developed for warplanes have wondered when this superfuel would be ready for their automobiles. Today's automobiles do not need it. Already engineers have road-tested an auto equipped with a dual-fuel system and demonstrated that it operated without engine knocks on 40-octane gas during most of its time on the road.

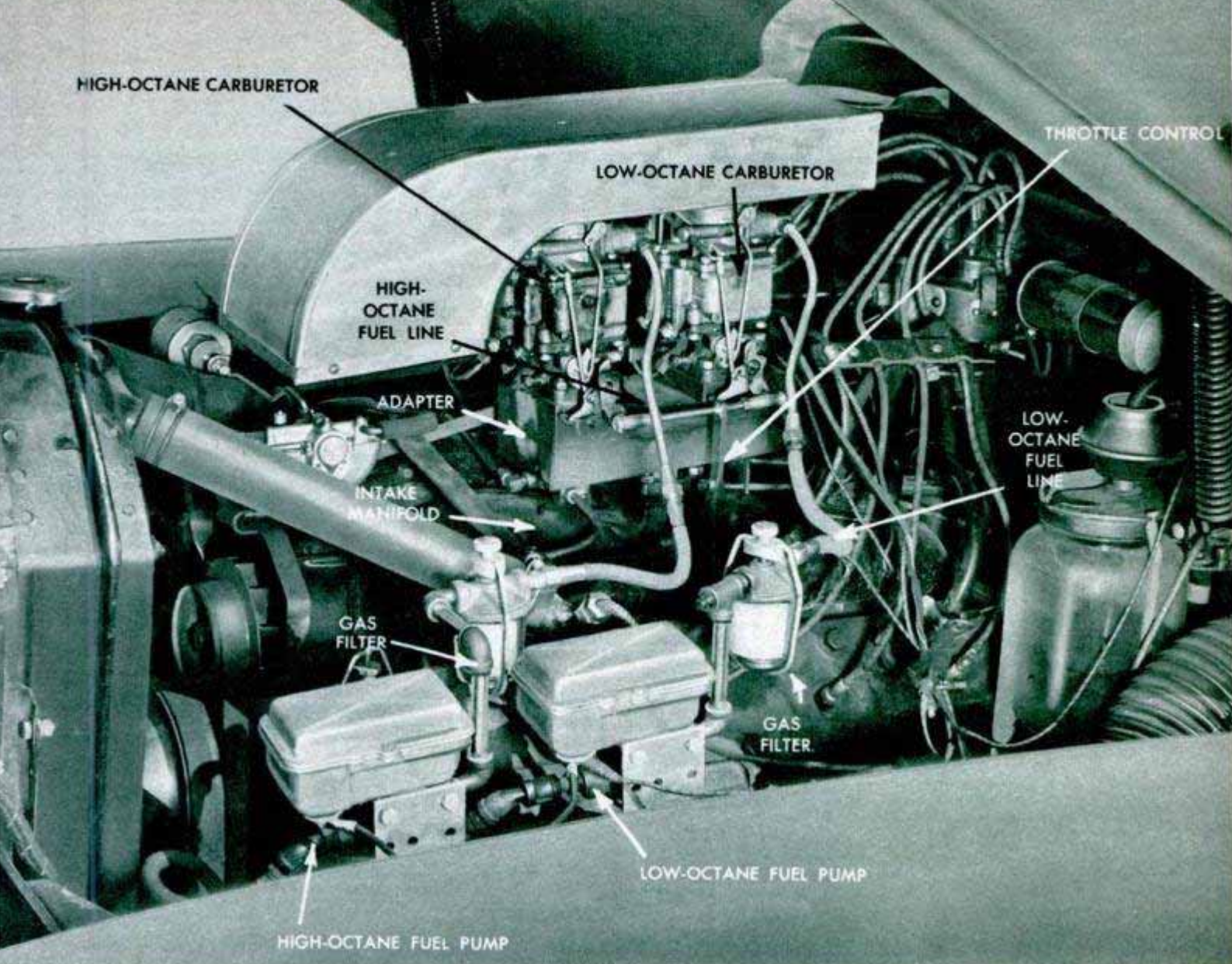
This experiment is part of a cooperative effort by the automotive industry and Soco-Vacuum Oil Co., Inc., to provide more miles of travel per dollar spent on

Signal panel shows driver which fuel is used. With both carburetors in operation, center light glows. The left light represents low octane, right high octane. If the driver switches to only one fuel, one of the other lights glows



gasoline, and optimum performance from fuel in automobiles already in the drawing-board stage.

In the automobile industry, there is a definite trend toward engines with still higher compression ratios which will give benefits in better performance and greater economy. Whether, for this development, fuels with higher octane-number ratings are necessary to provide knock-free performance over the entire operating range is open to question. Dual-fuel systems may provide a common meeting ground.



Twin carburetors under the test car's hood automatically switch on and off depending on fuel requirements

Heretofore, in supplying automotive fuels, the octane-number requirements at the most severe operating condition have been used of necessity by the petroleum industry as the criterion of the quality of the fuels. Requirements at other operating conditions consequently have received little attention.

More than \$4,000,000,000 must be spent by the petroleum industry in the next several years to increase production and refining capacity to meet demands; therefore, it is unlikely that octane-number levels of motor gasoline can be increased economically at as fast a rate as in the past.

Already, investments required for producing fuels with today's octane-number ratings are high. Still higher octane-number ratings will result in just as sharply increased investment totals.

During the war years, \$927,000,000 were expended on major projects in the nation's refineries. Of this total amount, \$864,000,000 were required alone for facilities to produce 100-octane-number aviation gasoline, represented principally by construction of catalytic cracking units.

This was a huge expenditure for equipment to manufacture a quality product. And what was its effect on the octane number of motor gasoline? Between 1941 and 1946, premium and regular grades increased barely three octane numbers, in spite of the fact that aviation-fuel production had been diverted largely to automobile gasoline by 1946!

In other words, an increase in anti-knock quality of one octane number cost in the neighborhood of \$300,000,000. And it should be remembered too, that the refinery investment cost per octane number at present is about 50 percent above the average, for various reasons, of the period from 1941 to 1945.

It is with this economic background that the Socony-Vacuum Oil Company, Inc., undertook a test program on the practicability of dual-fuel systems in automobiles, guided by the facts that current fuels are not utilized to their highest degree, and that cost and other factors stand in the way of sharply increased octane-number ratings. The company's goal was to obtain serious consideration of the principle of

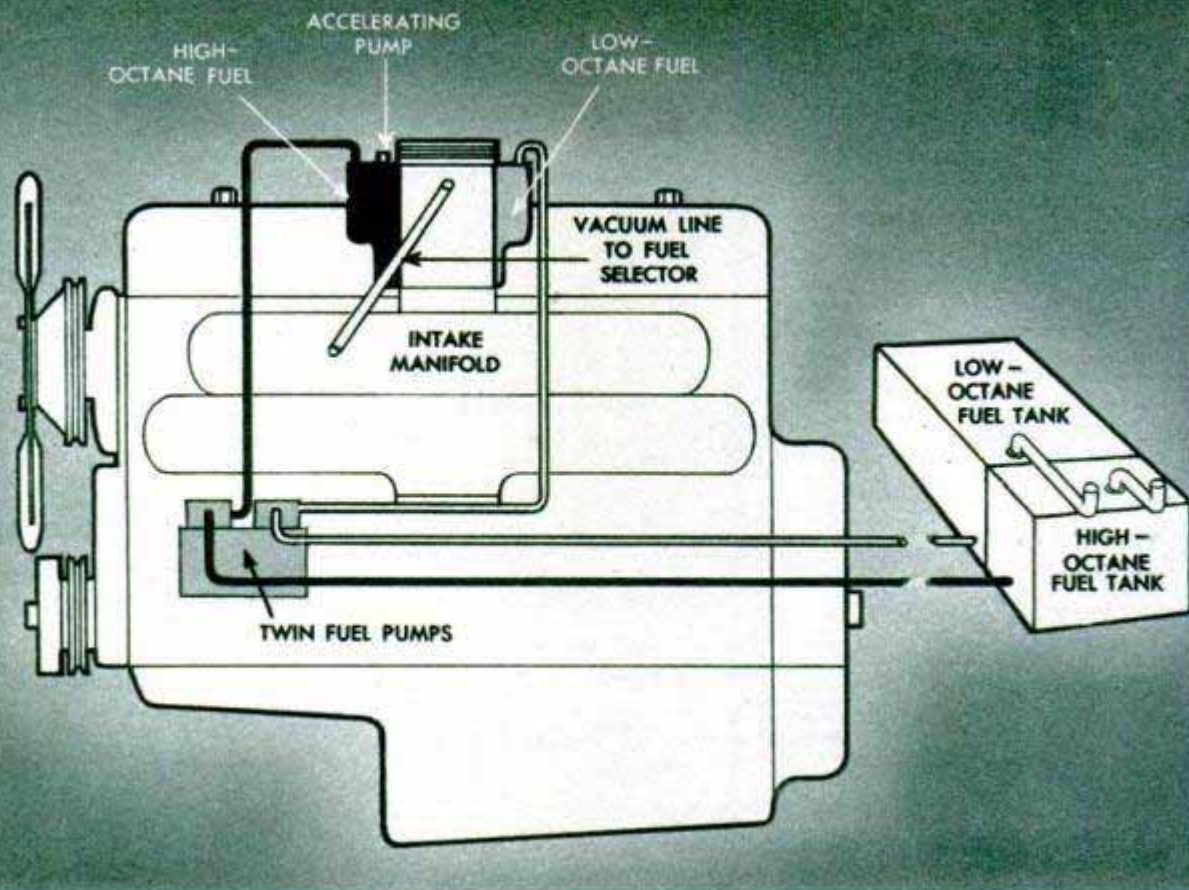


Diagram shows fuel system of the car. Note small size of high-octane tank compared with low-octane tank

dual-fuel carburetion by the automobile and petroleum industries.

To launch the test program, a 1947 eight-cylinder car at the laboratories in Paulsboro, N. J., was equipped with a combination carburetor and control system.

This installation quickly demonstrated that knock-free operation was possible with fuel of a 40-octane-number rating for a majority of the time the car was in operation, although it normally has a full-throttle road requirement of fuel with a 77-octane-number rating.

The test car was operated under driving conditions of all kinds. It proved that the virtues of premium grade, high-octane-number gasoline are utilized to their fullest only for quick starts in traffic, for the bursts of additional speed necessary for passing other cars and for climbing steep hills with heavy loads.

The dual-fuel system also demonstrated that consumption of the high-octane-number fuel should not exceed 20 percent of the car's total consumption. Thus complete freedom from knock without change in car performance, and under all driving conditions, is possible.

What does this mean? It proves that less investment is required for developing high-quality gasolines. The refining industry must be expanded to handle another 1,000,000 barrels per day of crude—production is already at the rate of better than 5,000,000 barrels daily—to meet the anticipated demands for petroleum products in the next few years. This expansion in re-

fining equipment and an increase in distribution facilities will cost the industry about \$1,500,000,000 at today's prices and, in light of current price trends, probably more at the time of installation. Another \$2,750,000,000 will be needed to find, produce and distribute the additional crude oil to fill these demands.

In this expansion program, current high qualities will be maintained. But the very need for expansion, with its total investment of \$4,250,000,000 precludes any additional investments aimed solely at improving the quality of products.

It might be noted, though, that the expansion program for the nation's refineries is certain to result in moderate increases in anti-knock quality, since the modern equipment to be installed incorporates many recent technological developments.

With present refining facilities, crude oil can be made without difficulty to yield 20 percent gasoline with a 97-octane (Research) number and 80 percent gasoline with an 83-octane (Research) rating, supplemented in each case by two milliliters of tetraethyl lead, which could constitute the new premium and regular grades.

It appears possible, therefore, for modern, existing refineries to take complete care of the anti-knock requirements of automobiles of the near future with high compression—provided the dual-fuel systems are utilized.

It is apparent that any improved engine design which leads to fuller utilization of

(Continued to page 234)



"Workshop" Bus Trains Hobbyists

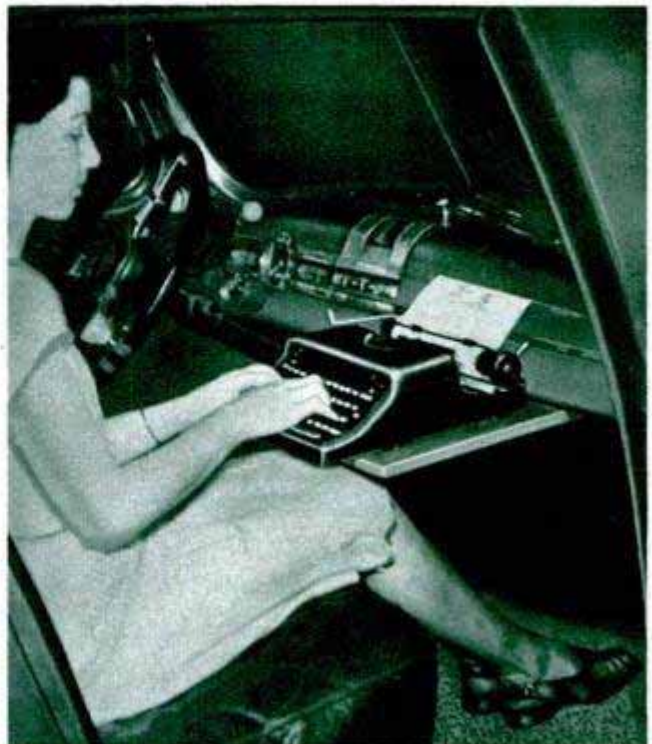
Ten instructors and a complete assortment of craft tools are aboard a bus touring communities in the southeastern United States to promote youth interest in hobbies and in organizing hobby clubs. At every stop, modeling techniques are shown with movies and demonstrations. The tour was arranged by Aero King Modelers, a national hobby organization with headquarters in Chicago.

Dashboard Table Slides Out of Way

Attached under the glove compartment, a sliding table for automobile dashboards provides a convenient work space while traveling. Strong enough to support a typewriter, the table can be used for serving refreshments, holding a make-up kit, or even as a seat for the baby. The table slides in a metal channel that is held in place by three bolts.

Rod Prevents Tank Rust

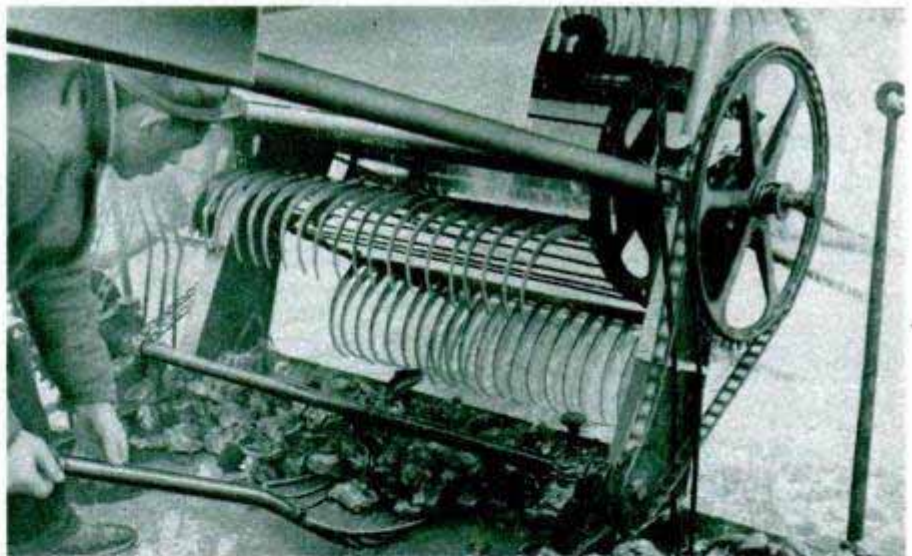
Hot-water tanks of the household type are prevented from rusting by installation of a small magnesium rod. The rod, technically known as an anode, reverses the batterylike action set up between the water and the metal. It becomes self-sacrificing and disintegrates in place of the tank walls. The rods can be installed in old or new water heaters and last about six years, depending upon the type of water used.





Oyster Hoister

Oysters are raked off the bottom of the sea, carried to the surface on an elevator and dumped in a barge by an oyster harvester. The harvester is attached permanently to the bow of the barge and powered by a small gasoline engine. Its conveyor belt has 19 rows of steel prongs which rake the bottom of the oyster bed, picking up all oysters but riding over objects too heavy to lift. Crawl wheels on the front of the conveyor revolve as the belt moves, digging into the water bottom to pull the craft along. A centrifugal pump shoots a high-pressure spray on the oysters to clean them as they are being carried up by the conveyor. The oyster elevator is suitable for harvesting oysters only a foot from the surface or on reefs eight feet deep. Three men can operate the machine. In a demonstration in Louisiana, A. M. Brown of Mobile, Ala., who invented the machine, painted several oysters and tossed them overboard in all direc-



Top, square boxes on the hoister are ballast tanks. Center, a high-pressure spray cleans the oysters. Above, the rakes dump oysters on the deck

tions. The machine picked up every oyster that had been marked. Custom-built models will be built for very deep beds.

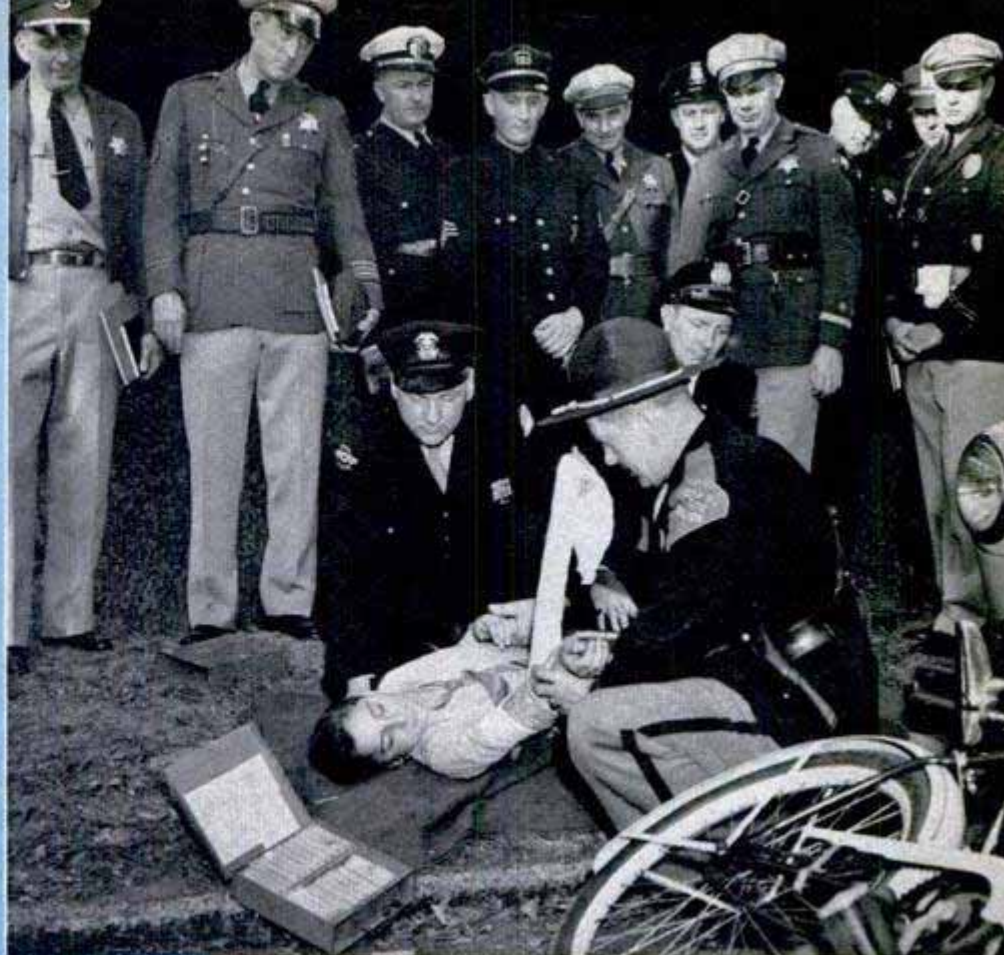
Synthetic May Inoculate Picnickers Against Poison Ivy

Science may soon provide picnickers and outdoor workers with a synthetic for inoculation against poison ivy. A synthetic compound has been produced at Columbia University which successfully imitates urushiol, the irritating substance in poison

ivy. First use of the compound may be for inoculation against poison ivy, poison sumac and poison oak. Principal value, however, will be in the study of all natural blister-raising substances including those in Oriental lacquers and related materials.

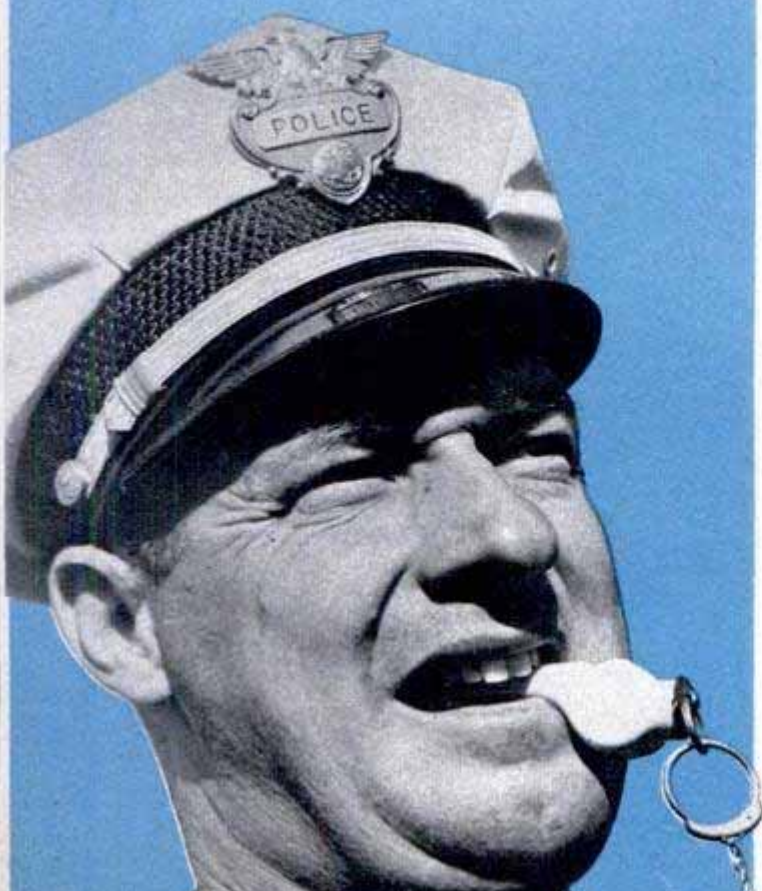
Officer students at the institute take a basic course in first aid. Note the variety of state uniforms

At the Traffic Institute, veteran officers—finest in the country—are pumped full of facts on how accidents happen and how to help motorists behave



COPS

ON THE CAMPUS



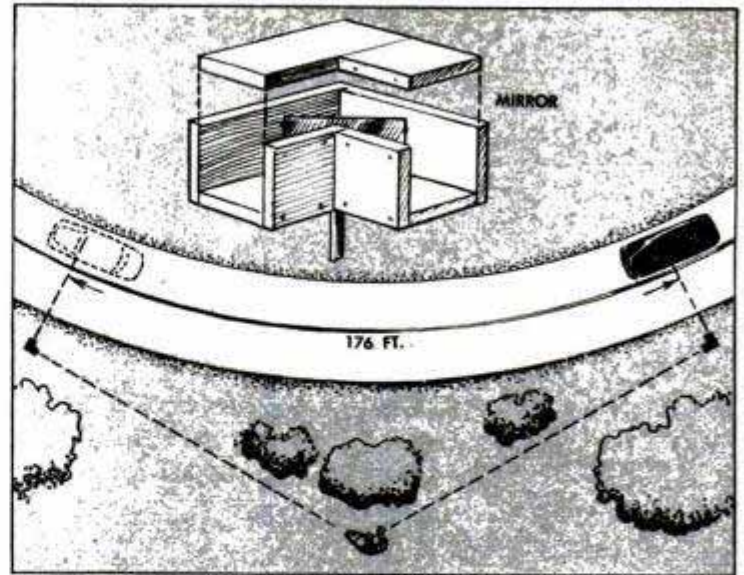
By Clifford B. Hicks

SEVENTEEEN HUNDRED police officers from every section of the country have been learning the finer points of traffic enforcement at Northwestern University's Traffic Institute since 1936. It's not entirely coincidence that the national death rate per 100,000,000 vehicle miles has been cut more than half—since 1936.

Even faculty members don't suggest that the institute is solely responsible for this startling reduction in fatalities. Yet during the past 12 years those 1700 officers, crammed with knowledge of how accidents happen and what to do to prevent them, have taken over key positions on traffic police forces throughout the country. And the institute's sister organization, the Traffic Division of the International Association of Chiefs of Police, has probed traffic enforcement in 60 cities, counties and states and made recommendations that invariably have brought surprising slashes in the accident rate.

Franklin M. Kreml, director of both organizations, believes that if a cop can put his fingertip on the causes of a smash-up and remove them, similar accidents never will occur. The institute is dedicated to producing a superior police officer who can undercut accidents by operating on those causes.

Obviously, one organization can't teach every traffic cop in the country how to apply science to his job. So Kreml and his associates are forming a network of well-



Mirror instrument aimed by officer reflects flash of car, giving accurate check of speed as in diagram



Posed photos show patrolmen how to throw road blocks around an area to block the escape of a criminal, and below, full equipment for patrol car



trained men to blanket the country. Only those officers who are in key positions, or soon will work their way into those positions, are accepted as students, on the theory that the techniques these men are taught will sift down to every officer who waves a white glove or lives in the saddle of a motorcycle. Key men from every section of the country and from Panama, Canada, the Canal Zone, the Philippines, Puerto Rico, Mexico and China have graduated and now are directing model programs of traffic control.

Because the officer students are key men, they also are experienced patrolmen. Many have spent five to 15 years on motorcycles or in patrol cars. They already know how to handle traffic, so the instructors focus training on long-range programs for reducing accidents.

Part of the institute's program is basic research in traffic control. The U. S. Public Roads Administration and other interested organizations provide grants for research projects.

James Stannard Baker, Director of Research, has on the drawing board a mechanical cop that should be able to snare any driver who speeds through a restricted zone. The heart of the instrument will be a radar device for determining the speed of the car. Baker plans to combine this radar with a camera and a stroboscopic light.

The instrument will be pointed down the highway. Each car that passes the mechanical cop will come within the field of its radar beams. These beams bounce back to the instrument at a rate depending on the speed of the car. When a car exceeds the speed limit, the radar will trip the camera shutter and the light. The camera snaps a photo of the rear end of the car, plainly showing the license plate. One edge of the film catches a photo of a speedometer and

a 24-hour watch. After the photo is snapped the camera rolls the film for the next exposure.

At the end of every 24 hours the film is removed from the camera and developed. It contains a photo of every car that speeded, the license plate, and shows the actual speed and time of day of the violation. The speeder then is mailed a ticket and the photo becomes positive evidence in court.

Baker realizes that thoughtless persons who invariably push the edge of the law will raise an objection to the instrument when it is placed in use on the grounds that it spies on drivers. He points out that traffic lights and parking meters raised violent protest when first installed, but today they are accepted by every driver. The mechanical cop can't be bribed by a speeder who tries to buy his way out of trouble. And one patrolman with eight machines can replace about eight officers and the same number of patrol vehicles.

The research department also is working on a project to determine the "halo" effect of a cop. It's known that when a driver sees an officer he invariably slows down or pays scrupulous attention to highway signs. Just how far does this "halo" effect, this radiation of the cop's presence, extend? Half a mile? Three miles? The research department is determining the patrolman's average range of influence by observing what drivers do over a long distance before and after they see an officer.

About 30 officers attend each 4½-month course at the institute. Sixteen are awarded fellowships that pay all their expenses. Most of the others receive scholarships of some kind, and every officer, by previous agreement, draws his regular pay from his home town.

These picked officers attend classes 39 hours each week and crack the books for well over 30 hours outside class—a tough weekly grind.

The instructors pump knowledge into them on such specialized subjects as accident investigation and photography, questioning of suspects and how



Student cops learn to use the "drunk-o-meter," an instrument that puts suspect's breath from balloon through chemical tests



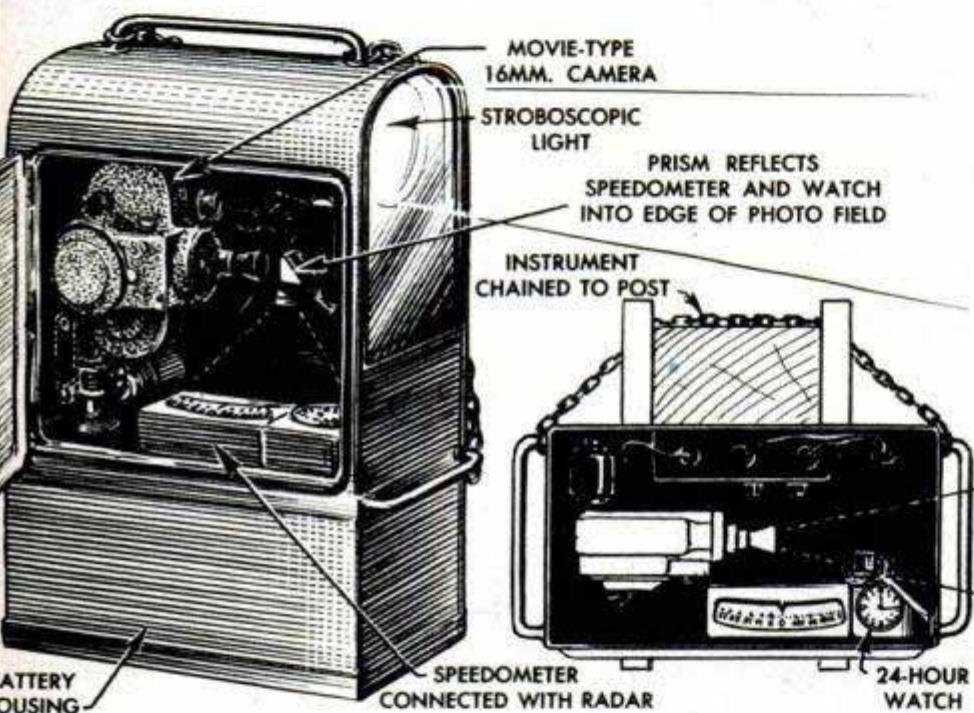
Instructor points out a possible solution to a classroom problem on intersections to officers from four different states. ↓ Officer students study efficient intersections such as this one with its well-marked left turns and its broad pedestrian lanes





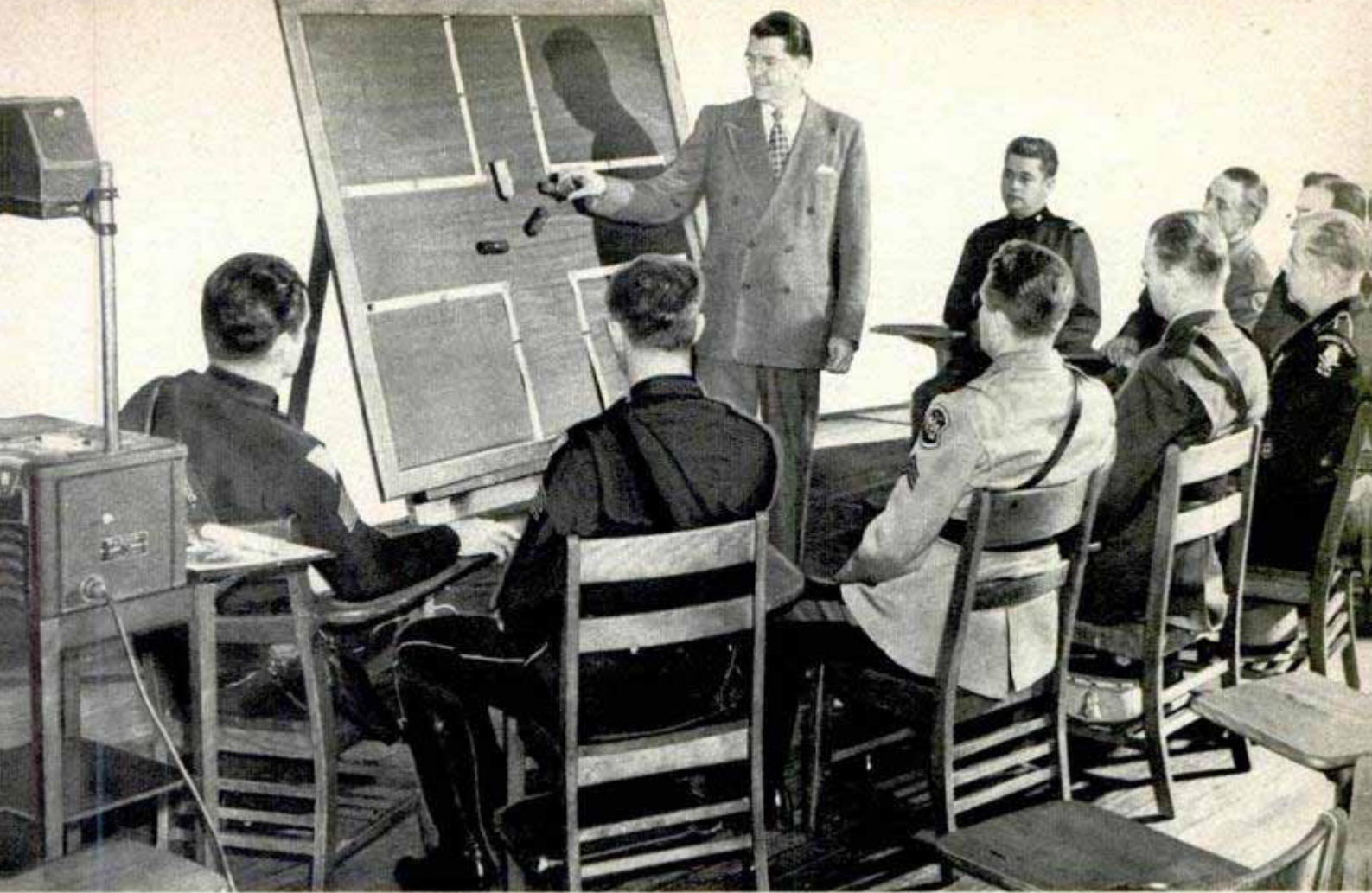
to present a court case. They learn to use scientific instruments in traffic enforcement. Students pick up the fundamentals of the "drunk-o-meter," an instrument for determining the alcoholic content of the blood. The suspect is required to blow up a balloon, and the instrument puts his breath through a series of tests to give a positive answer as to the amount of alcohol his system has absorbed.

Officers also learn to use the "Enoscope," an instrument that is as simple as it is effective. The Enoscope actually is a horizontal periscope—a frame containing two openings at right angles and a mirror at a 45-degree angle to pick up the view of one opening and reflect it through the other. An officer places two Enoscopes a known distance apart along a highway and stands between them with a stop watch in his hand. When a car passes one of the instruments he sees it flash in the mirror. By timing the car until he sees an answering



Top, officers learn photography. Left, artist's drawing of proposed "automatic cop." Radar checks each car's speed, trips camera and light when driver exceeds limit. Photo shows the license number





Magnetic blackboard holds car models in position. Right, magnets hold cars to board

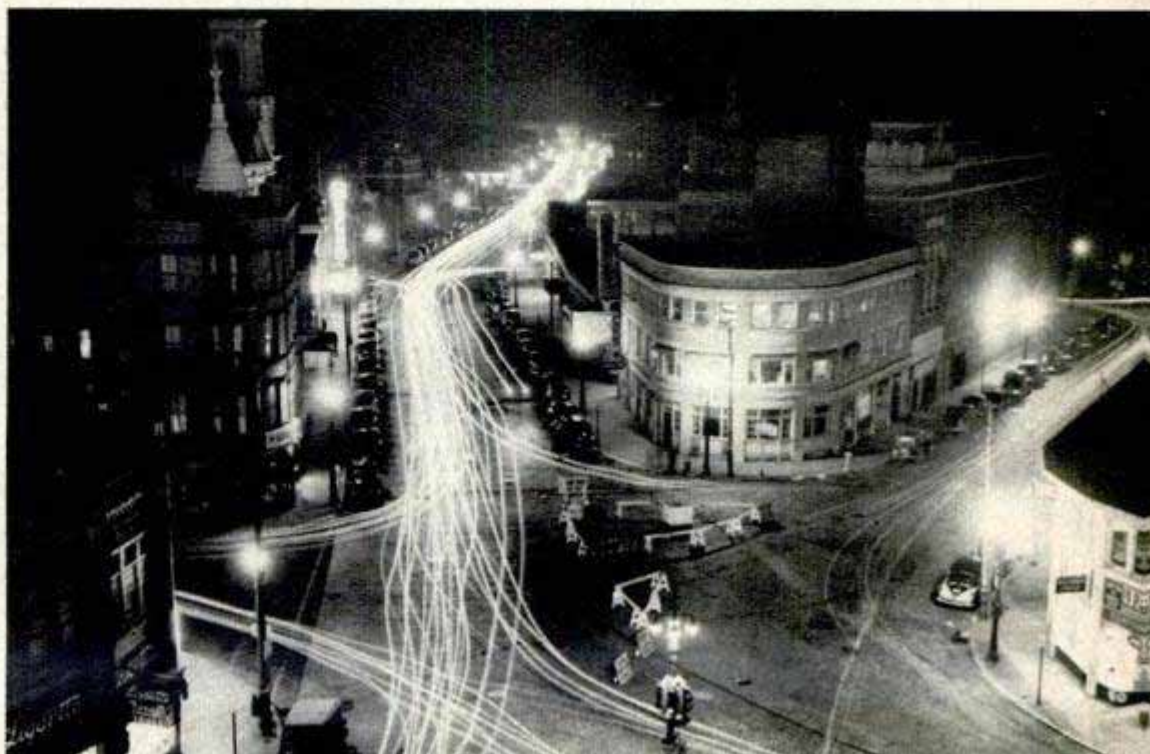
flash in the other mirror he can figure its exact speed.

After the student cop digests books, lectures and discussions for three quarters of his term he is assigned to investigate traffic control in a town similar in size to his home town. For one week he probes the ins and outs of traffic police administration in that town, working with everyone from the mayor to the cop at the intersection. When he returns to the campus he is required to write a detailed report on the traffic police program. The report is not just a record of what he saw, but an interpretation of what can be done to increase safety in the

(Continued to page 236)



Officer's time exposure of traffic flow at night shows use of the main thoroughfare





Fire-Stop Coating Applied Like Paint

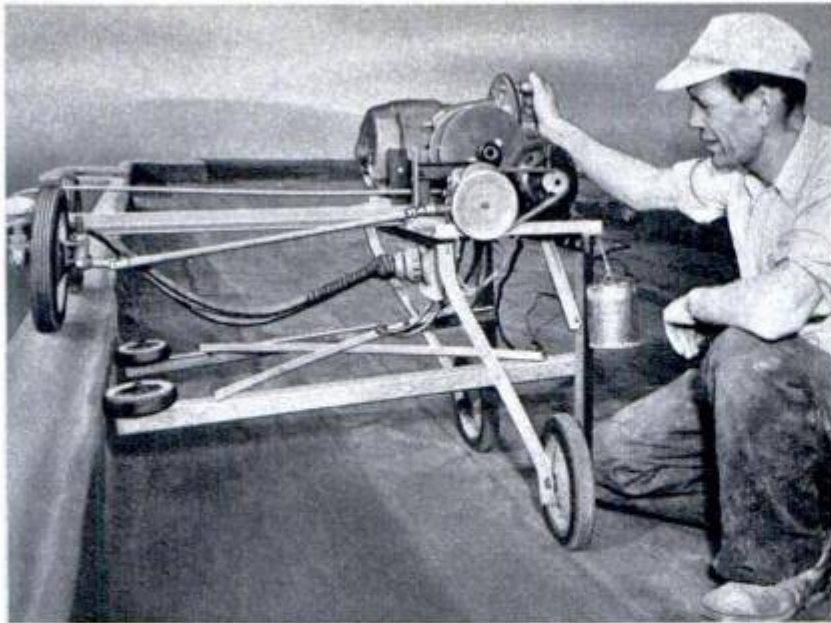
By fighting fire with fire, a liquid coating that is spread over wood and fabric like paint reduces the danger of fire damage. Heat from the fire changes the thin coating into a heavy insulating blanket, preventing the spread of the flame. The hotter the fire becomes the thicker it makes the protective blanket so that, in effect, the fire helps put itself out. In a recent test, the curtains in two identical rooms, separated by a conventional plywood partition, were exposed to the flame of blowtorches. In the room that had not been treated with the protective coating, the flames spread rapidly and completely gutted it. In the second room, in which the curtain and woodwork had been sprayed with the coating, fire did no damage. The plywood panels of the treated wall were painted on both sides with the retardant and, even though the flame burned through the wall panels behind them, they effectively stopped the flames. Even a blowtorch flame failed to ignite the treated plywood.



Farmer's Ski-Car Built From Wrecks

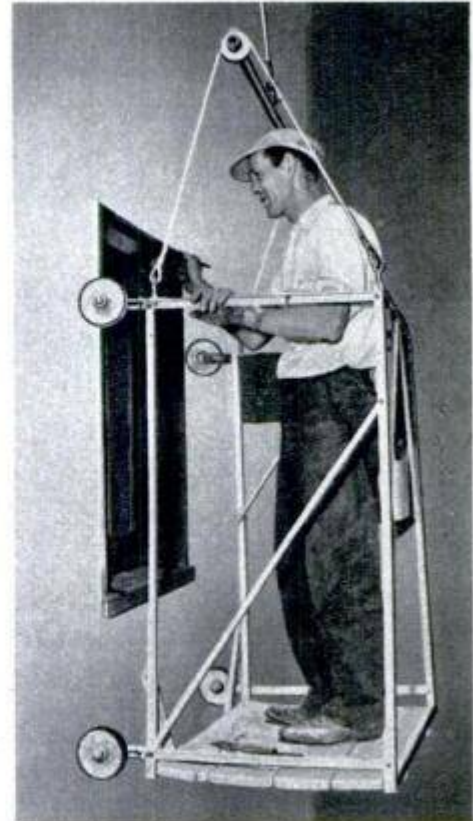
By combining parts of three wrecked automobiles, a farmer-trapper in northern Saskatchewan made a ski-equipped car for driving over snow-covered roads. The motor and chassis are from a Chevrolet, the rear end is from a Hupmobile and the wheels were taken from a Ford. The skis were made from the steel frame of the Ford and are welded to the front wheels.





Painter's Power Hoist Eliminates Ladders

Because he doesn't like to climb ladders, Harold C. Raftery of Long Beach, Calif., built himself an electric hoist that enables him to paint buildings comfortably and safely. He can move sideways or up and down by pressing control buttons mounted on the cage. The power unit runs along the edge of the roof and contains two electric motors, one for up and down movement and one for sideways movement. The cage and power-unit chassis are made of aluminum angle strips.

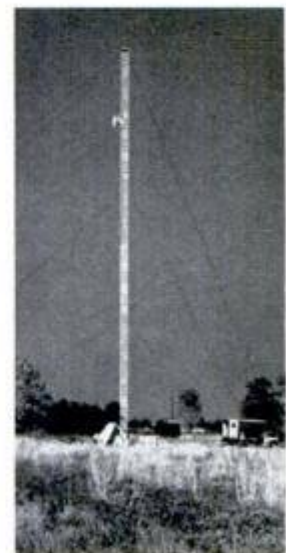
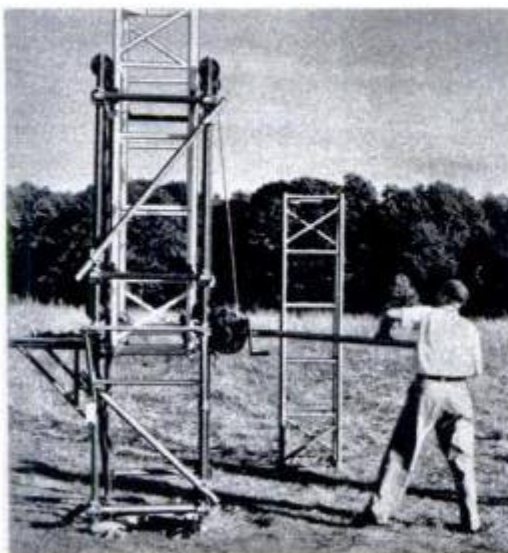


↑ Push buttons mounted on right side of the cage control two electric motors of roof power unit (left) enabling the painter to move vertically or horizontally. Power unit, with its winch and motors, rolls along the roof parapet

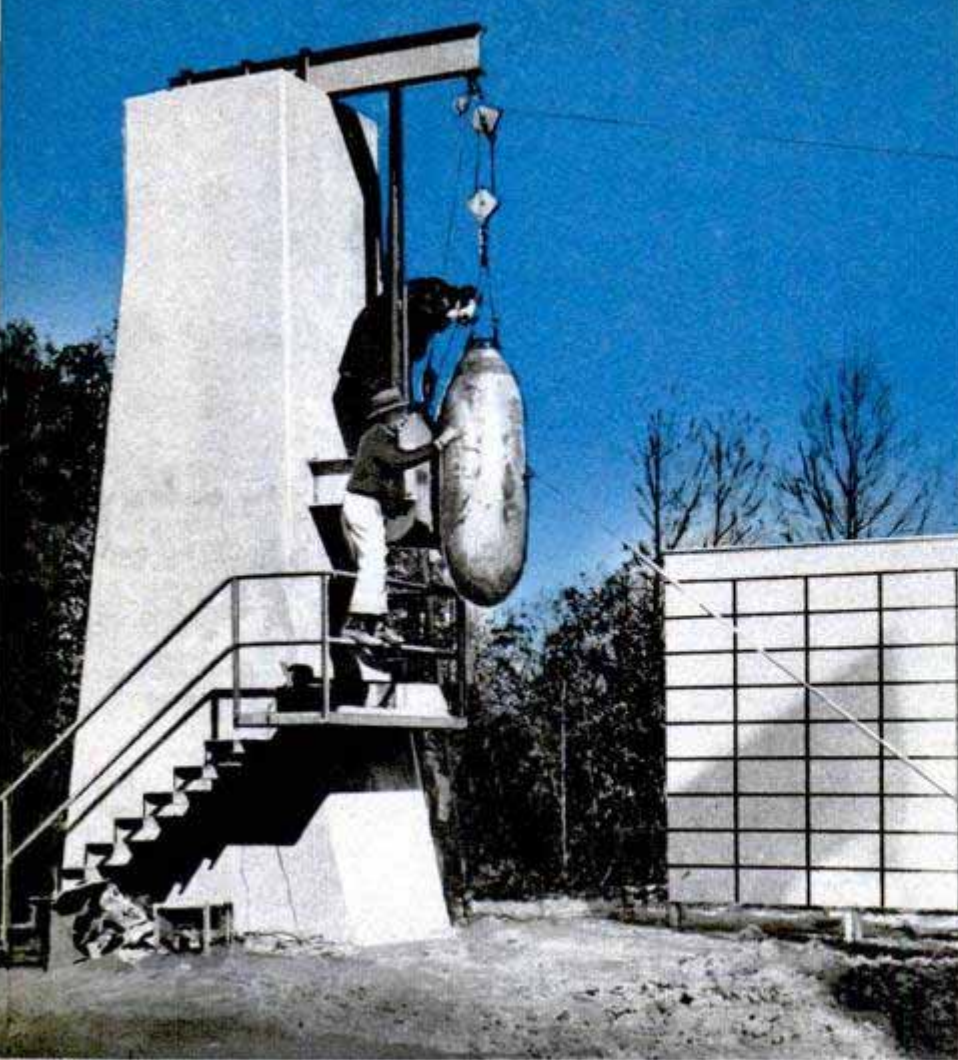
Portable Mast Is "Pushed" Into Air to Test Antenna Sites

Like stacking a pile of blocks in reverse, a new method of speedy erection of portable microwave radio towers raises the mast by adding new sections to the bottom. A hoisting yoke at the ground level has a long-handled winch that raises the tower high enough so that another section can be added to the bottom. The hoisting is repeated until the tower is 200 feet high. Guy

cables are added to every sixth section. A microwave receiver with its antenna and dishlike reflector rolls up and down the tower to test reception qualities of the location. When testing is completed, the portable tower is taken down and a permanent mast erected. Developed by Bell Laboratories, the tower will be used in laying out the Chicago-New York relay system.



Left, tower being raised by hand winch. Section behind winch bar will be added when lifting is completed. Center, antenna carriage begins its trip to the tower top. Right, the 200-foot tower with antenna in place



Official U. S. Navy photos

Bomb ejector tester and fast cameras make certain that bomb released from plane in vertical dive won't strike propeller

Specialists in underwater warfare, scientists at the Ordnance Laboratory developed this new submarine mine-laying device



ON HIS birthday, Rear Admiral Frank E. Beatty was given a crosscut saw by officers, bluejackets and civilian scientists of the Naval Ordnance Laboratory in Washington, D. C.

"What's this for?" he asked.

"A professional joke," said a spokesman. "We figured that you'd need something to help cut up those knotty problems we're going to run into at White Oak."

White Oak—938 acres of rolling Maryland countryside 12 miles north of Washington, D. C.—is one of the Navy Bureau of Ordnance's newest research centers. Congress appropriated \$15,000,000 to get it started, with more likely to be voted later. It is almost completed and in a few more months, 1000 Navy and civilian researchers and technicians will be at work on the project.

They'll be using more than \$10,000,000 worth of new scientific equipment on a hundred or more research programs in torpedoes, mines, fuses, rockets, supersonic projectiles, depth charges, ammunition and pyrotechnica. "We investigate anything that makes noise or wiggles—above or below water," one of the laboratory's scientists pointed out.

Admiral Beatty explained the reason for the new laboratory:

"Since most ordnance has little or no industrial use, the Navy finds it necessary to conduct its own research, development and testing. In peacetime, you can't farm out a magnetic mine or a torpedo to an automobile manufacturer or a university."

White Oak is an outstanding example of a military-civilian team at work. The administrative side of the laboratory consists of a small group of naval officers with seagoing experience, under the command of Admiral Beatty. A graduate of Annapolis, with a mechanical engineering degree from M.I.T., he won his blue-and-white Navy Cross as the skipper of the cruiser *Columbia* during the chips-down fighting in the South Pacific. The civilian research and development work is directed by Dr. Ralph Bennett, an expert on mine warfare.

White Oak itself is the result of an acorn that was planted in 1918. The Navy's mine barrage in the

"SHAKEDOWN" LABORATORY

for navy ordnance

North Sea helped to defeat the Kaiser's U-boat threat. Subsequently, it was decided to continue research on mines and a laboratory was set up in the Naval Gun Factory in Washington, D. C. There it remained until the end of World War II. Now it is taking root at White Oak.

As planned, White Oak is a "dream" laboratory — designed after consultation with scores of U. S. scientists. It consists of approximately 50 permanent buildings all fitted with prefabricated, movable partitions so that laboratories and offices of any size may be created. They are fireproof, air-conditioned, provided with fluorescent lighting and connected by pedestrian tunnels. Laboratory areas are supplied with voltages of different values, compressed air, gas, steam, hot and cold water. A model shop is equipped to do all but the heaviest kind of machine work.

First group of buildings to be completed at White Oak (in which scientists are already at work) is the Magnetics Group.

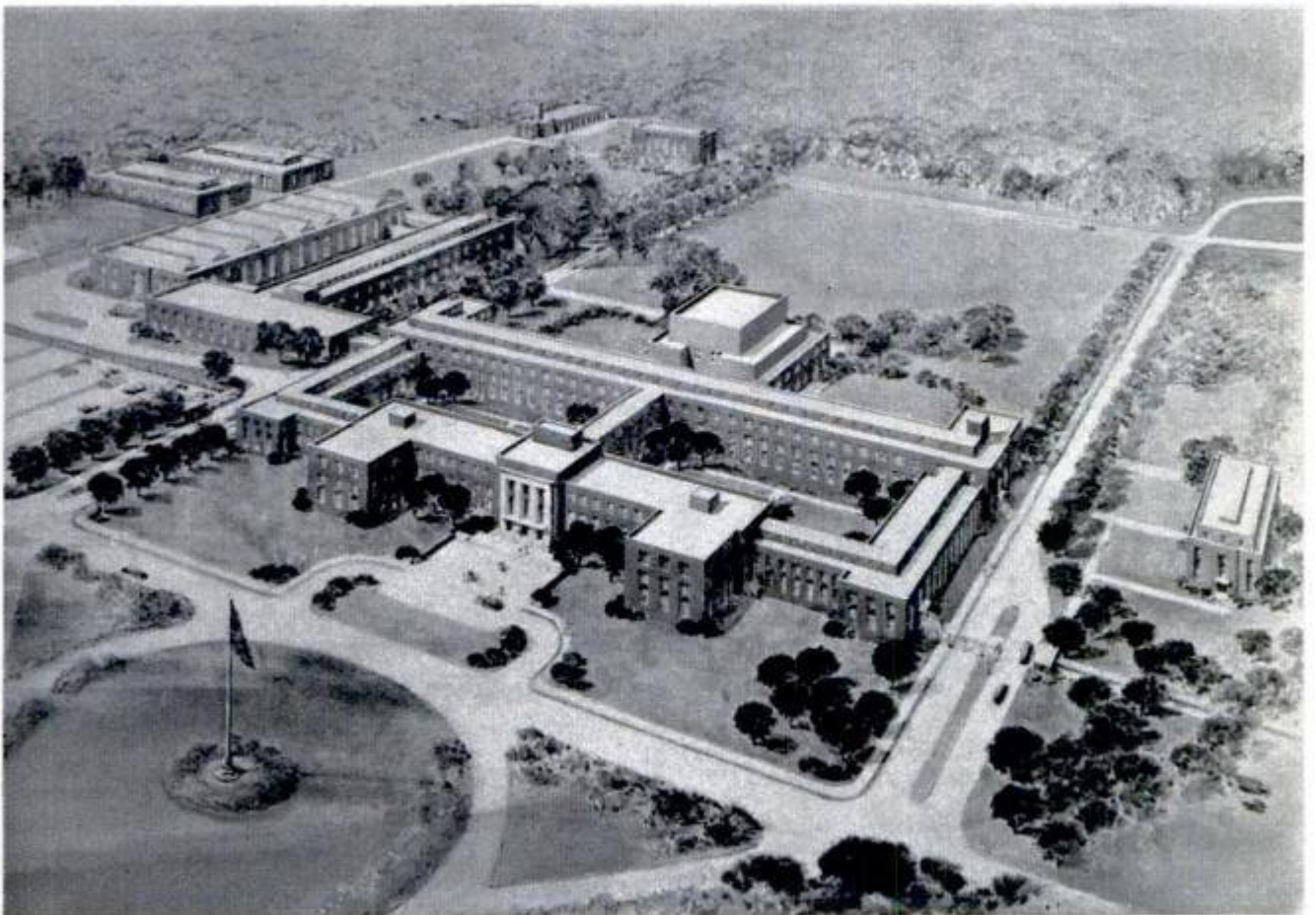
The seven buildings in this group are as free from magnetism as science can make them. They were built in an area isolated from minor disturbing influences such as other buildings and vehicles. Iron and steel have been entirely eliminated. Nails are copper, light switches are porcelain, drains are transite, building beams are wood. Even the sand that went into the bricks was screened to make certain it did not contain minute particles of iron oxide.

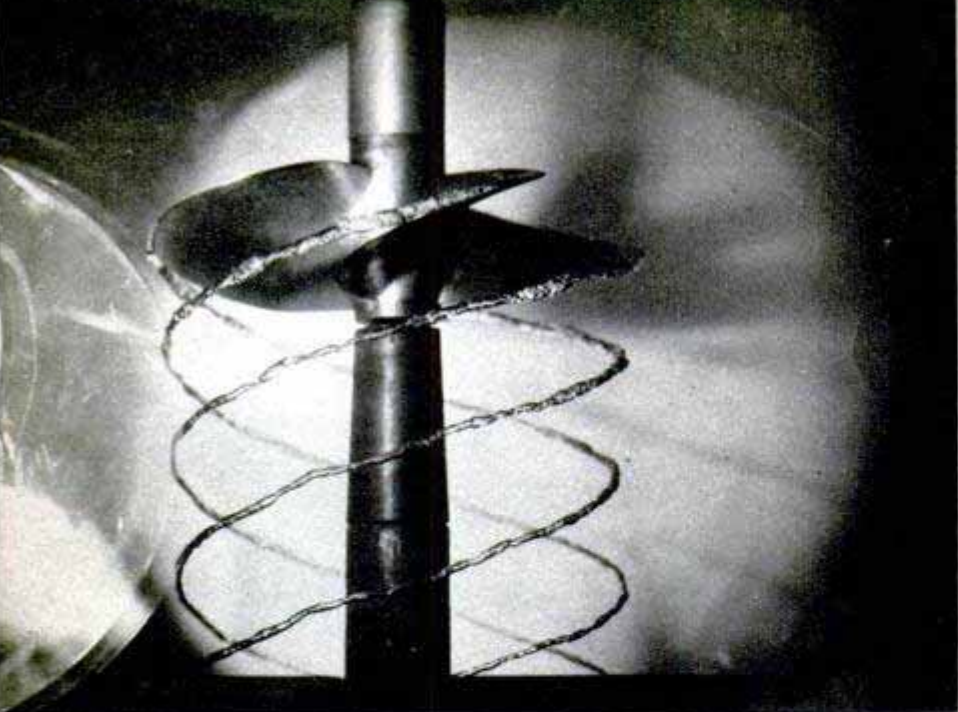
"This kind of planning," according to Bennett, "has resulted in what is probably the earth's largest 'nonmagnetic' pole."

The buildings are equipped with coils of



When completed, the Navy's \$15,000,000 research center at White Oak, Md., will stretch out over 938 acres

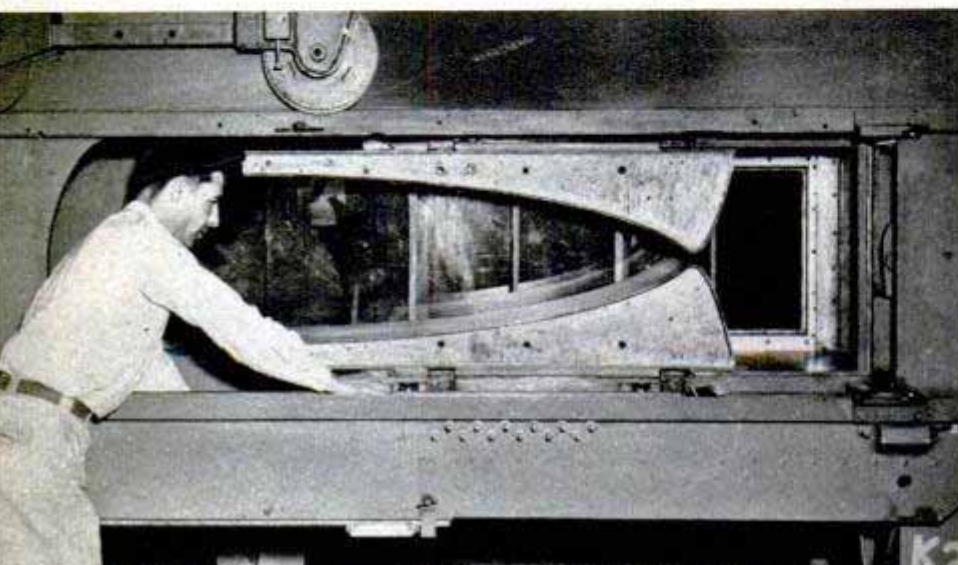




Spiral pattern set up by a propeller in 12-inch, variable water-pressure tunnel. White Oak also has seven varied-size wind tunnels



This 340-gram lithium-sulphate crystal, used in underwater weapons, was grown in 23 days. Below, a wind-tunnel nozzle with mirrors used to photograph air flow around supersonic projectiles



varying size, through which electric current can be sent from a master control panel. The purpose is to duplicate terrestrial magnetic fields under any sort of a ship, at any speed, in any part of the world.

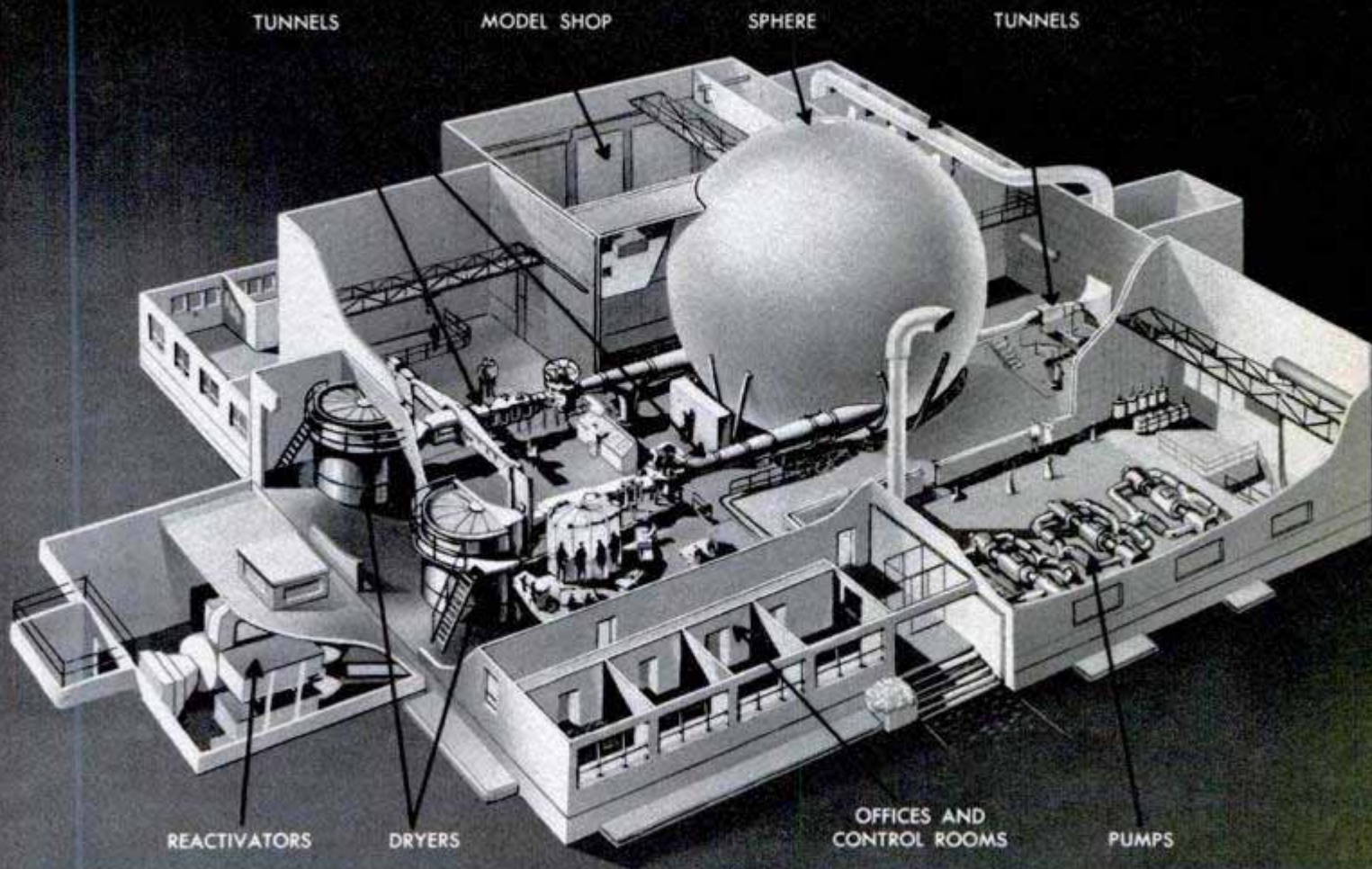
The magnetism research program at White Oak will not only be aimed at developing new and more powerful kinds of mines—but also toward such new equipment as the compensated airborne magnetometer. This is an uncannily sensitive device which has been described as “starting where radar leaves off.” It was originally designed to point a finger at submerged submarines. It can also be used to locate oil and mineral deposits, and the contour of the earth underneath the polar ice cap.

One of the most interesting—and perhaps significant—group of buildings at White Oak is the Wind Tunnel and Ballistics Group.

Three of the seven planned wind tunnels are from the famous Nazi supersonic research center at Peenemunde on the Baltic, where the famous V-2 was developed. After the bombing of Peenemunde, this tunnel was moved to Kochel, Bavaria, where it was captured by the U. S. Army. The equipment was loaded aboard 38 railroad cars and shipped to White Oak. Redesigned and modernized, it will provide the Navy with a wind tunnel whose range of Mach numbers and number of nozzles are greater than any in existence.

The wind tunnel is operated from a huge steel sphere—52 feet in diameter—and two huge pipes that run out from it to two separate wind tunnels which can be worked in alternation. This is how it works: a vacuum is created in the sphere; quick-acting valves are opened and the air rushes in through the pipes. This takes but 40 seconds, after which the air is pumped out of the sphere—the whole cycle taking about 10 minutes.

What gives the air its tremendous speed are two nozzles. The first nozzle constricts



Shipped in pieces from Germany, a wind tunnel at White Oak, already capable of simulating speeds up to 4000 miles an hour, is being further improved so that it will increase to almost 10 times the speed of sound

the air and speeds it up to the speed of sound, roughly 700 miles per hour. The second nozzle expands the air, but instead of slowing down, it speeds up still more—to almost 4000 miles per hour. Further improvements are planned to increase it to almost 10 times the speed of sound.

In these streams of air that flow at dizzying speeds are placed small models of rockets and other missiles (average size—2 inches in diameter). As the air rushes past, they are observed or photographed with elaborate optical apparatus. Two pressurized ranges will check, in free flight, models previously tested in wind tunnels.

In the future, the Acoustics Division plans to build apparatus whereby sound waves can be projected into the air to obtain upper-atmosphere temperatures and pressures. At present, such information is recorded by balloons and V-rockets fired into the stratosphere.

The laboratory will have one of the most complete X-ray experimental stations in the world, featuring a 10,000,000-volt betatron. This huge machine will produce powerful X-rays that will penetrate up to 20 inches of steel, exposing radiographic film in less than a minute.

The betatron is useful not only for detecting flaws in steel and other materials,

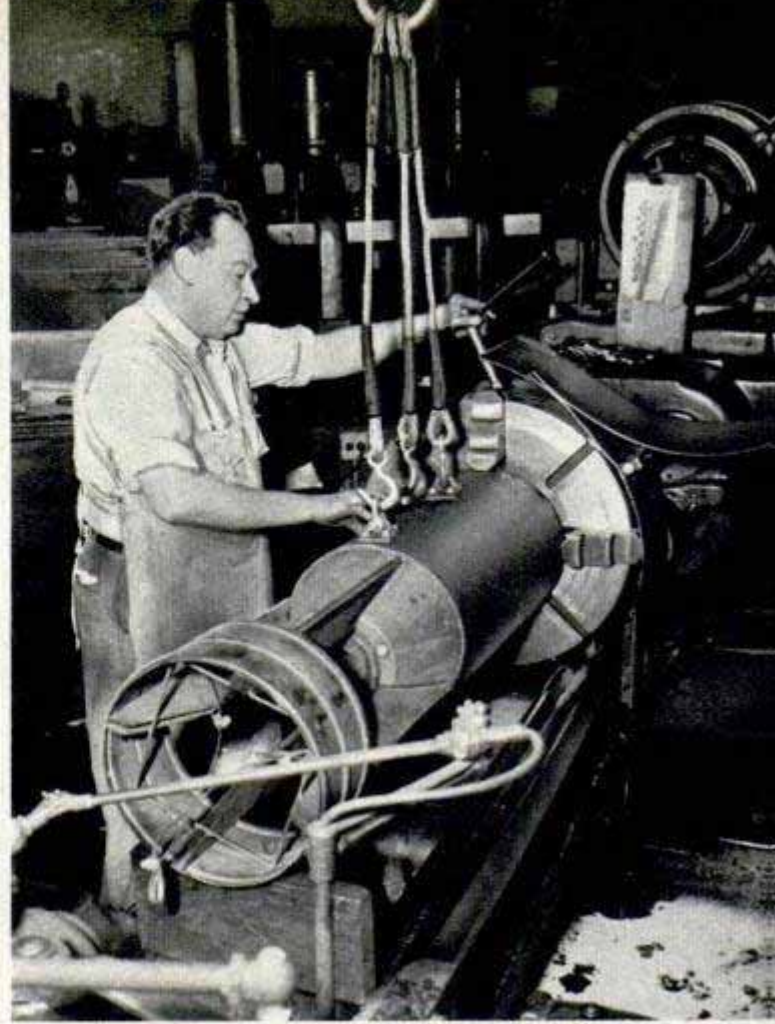
but also for looking inside weapons without disassembling them.

One of the more spectacular testing devices at the laboratory is a 75-foot steel drop-tower that can handle bombs and projectiles up to 1000 pounds. Its main purpose is to test live fuses. The fuses are mounted in dud bombs, hoisted by an electric motor to a height of 40 feet, and dropped on sand or armor plate.

The idea of the drop-tower grew out of experiences in World War II. Occasionally bombs were accidentally dropped in the course of handling—endangering ships and crew. Experiments at White Oak are designed to provide the knowledge of how to handle such “runaway” bombs and to test the workability of fuses after a fall.

Another bomb-testing device that has been tried is the bomb ejector tester, which simulates a plane diving at a 90-degree angle. The problem is to make certain that the bomb will clear the plane’s propellers in a vertical dive. Inert bombs are hoisted up a 15-foot tower, fired from an ejector and their path measured by fast cameras.

Equally important as drop tests are the shock and vibration trials. Four pieces of equipment, based on the “air gun” principle, are used in shock testing. A projectile fired from a 16-inch gun or a heavy



Fuses under test are put in dud bombs and projectiles weighing up to 1000 pounds and dropped on sand or armor plate from 75-foot tower at left. Right, machine shop where pilot models of new weapons are developed

bomb striking the water must be built rugged enough to withstand such a shock without being damaged or exploding upon contact. The equipment at White Oak tests acceleration and deceleration ranging from 4 to 35,000 times that of gravity.

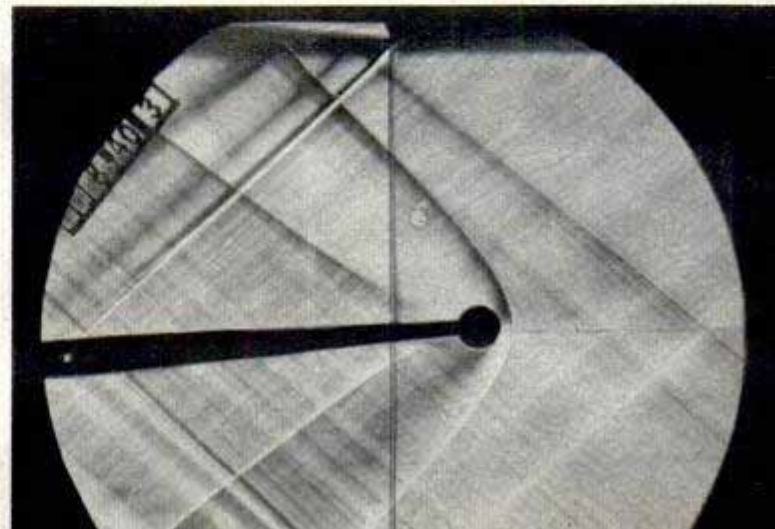
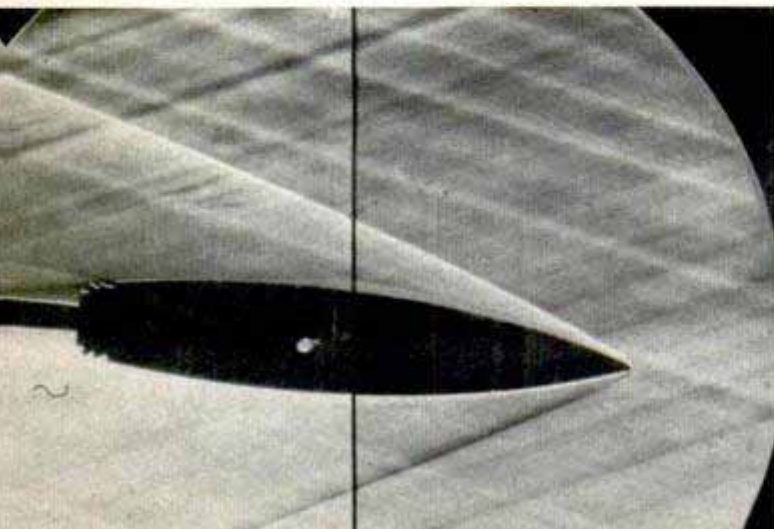
And what about those billions of smaller shocks called vibrations? What happens to ammunition, mines and bombs that are transported by jiggling railroads, trucks, planes or ships? The White Oak facilities include a vibration machine that, as one scientist puts it, "shakes the very devil out of everything that goes into it."

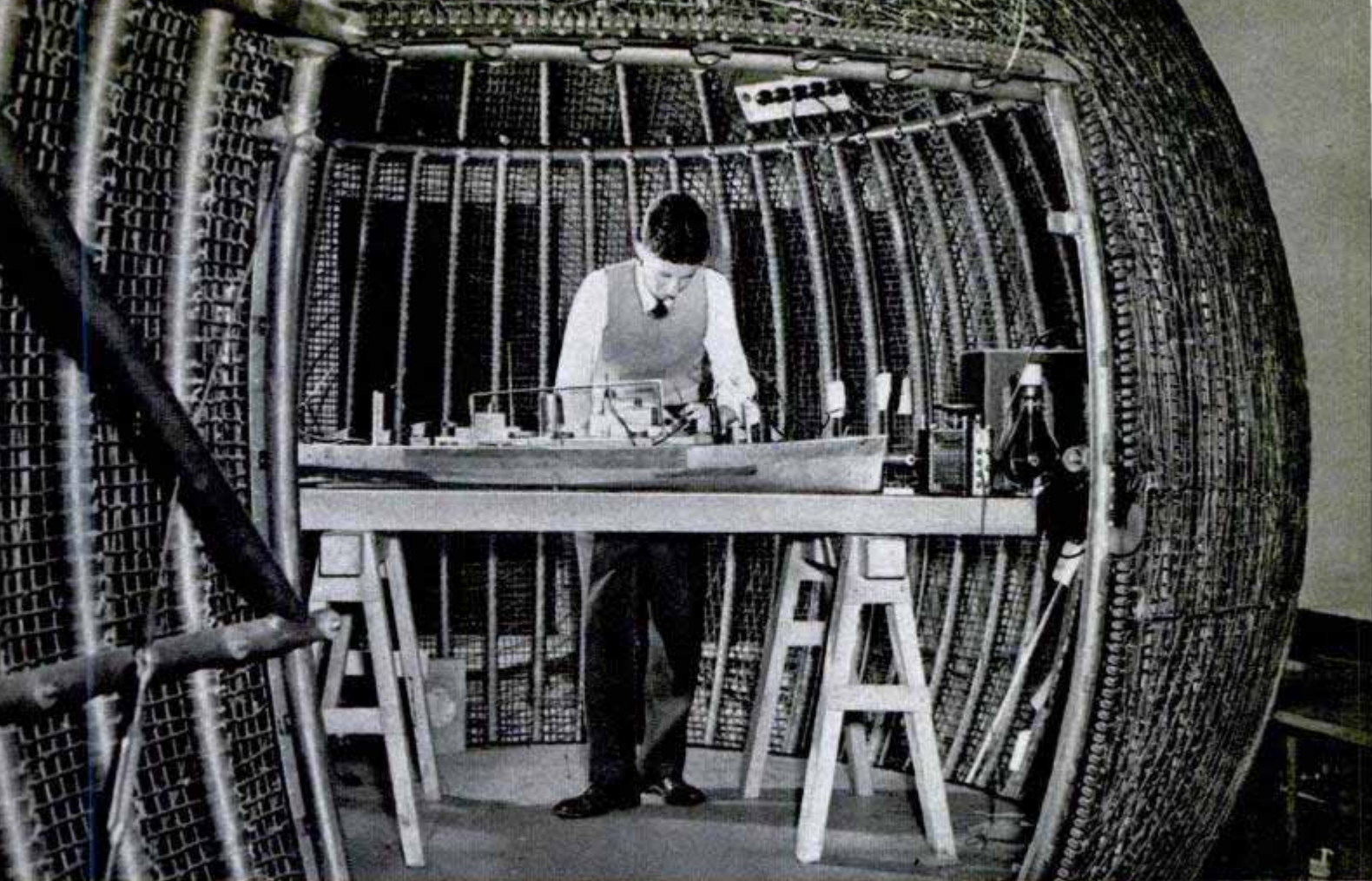
Another question that the Navy is cur-

rently asking is: what happens to live-loaded rounds of ammunition when continuously drenched with salt water? Projectiles to be tested are placed in a spray cabinet and receive a three or four-week drench treatment. Other boxes and cubicles—which look like huge butchers' ice-boxes—are temperature rooms that can be regulated between the span of 200 degrees above to 60 degrees below, Fahrenheit.

To study the peculiarities of sound waves, White Oak scientists are preparing one of the world's largest anechoic or "dead" rooms. This is a room which reflects almost no echo from its walls. Sound

As a contrast in shock-wave patterns formed in wind-tunnel trials, note how closely boundary layer follows surface of pointed projectile at left. Sphere at right, held by stinger, pushes air instead of cutting through





Magnetic field created inside the "bird cage" is used in Navy research to render enemy mines harmless. White Oak scientists boast that they "investigate anything that makes noise or wiggles—above or below water"

waves are trapped by five-foot wedges of fiber glass which line the walls, floor and ceiling—making the room 99.9 echoproof.

The anechoic room will be three stories high, with a control room located on the second floor. Loudspeakers, microphones, sirens and acoustic air fuses will be tested here. The latter is a new type of weapon which holds great possibilities. The Nazis began experiments with it during the war. German fighter planes would fly above an American air formation and drop "air mines" equipped with acoustically sensitive fuses. The mines exploded when they fell within sound range of the American-made motors.

Also to be investigated in the anechoic room are human hearing problems. How loud can the reproduced spoken word become before it is unintelligible? An authoritative answer to this will be useful in designing loudspeakers and earphones.

The laboratory will also manufacture plastic devices in experimental lots and grow its own experimental lithium-sulphate crystals, used in weapons and such intricate devices as sonar, underwater sound detection and transmission systems. Because few crystals are known which possess the necessary piezo-electric qualities, the Navy hopes to discover new ways of producing and using them.

Although White Oak is one of the

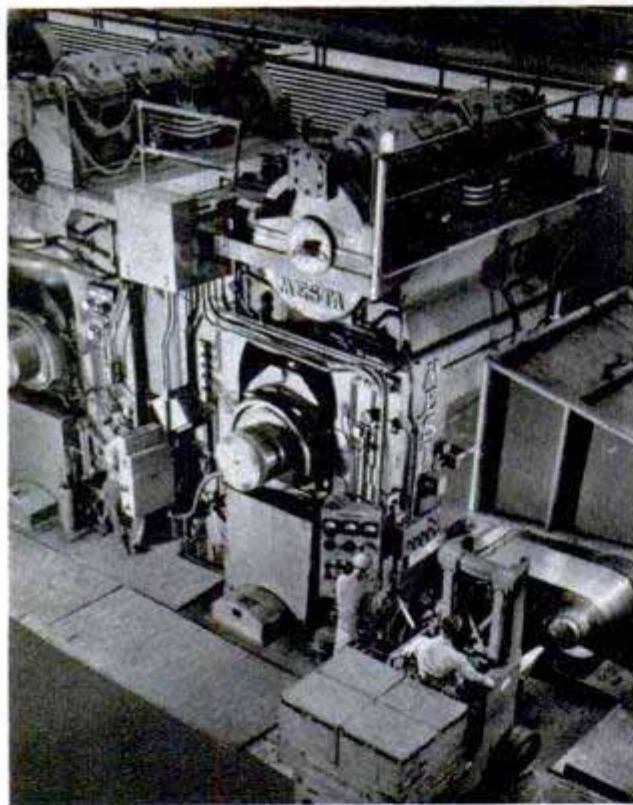
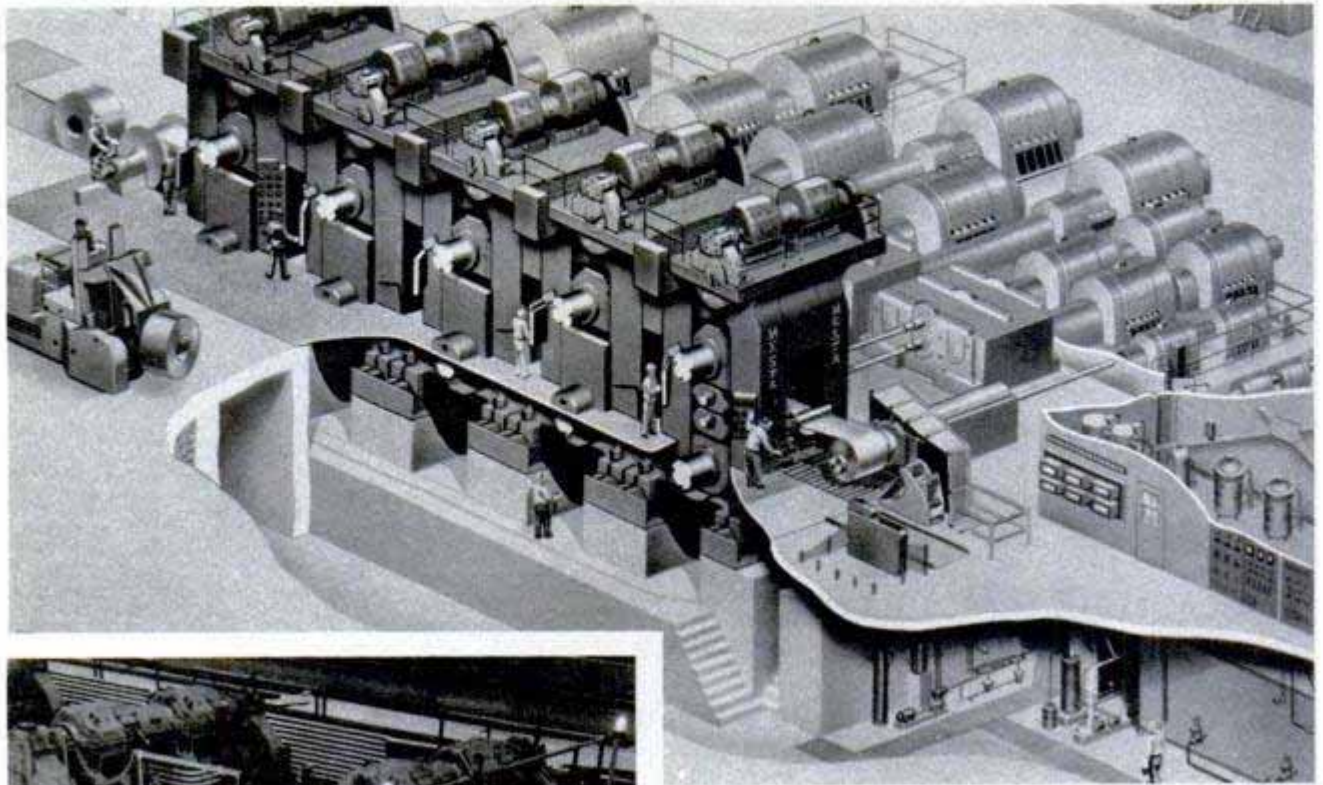
"brains" of the Bureau of Ordnance, its eyes, ears and hands operate all over the U. S. Torpedoes are tested at Hiwassee Dam, N. C., and at Morris Dam, Calif. Mines and depth charges are tested at Fort Monroe, Va., and exploded near Solomons, Md. Fuses, pyrotechnica and parachute gear are tried out at the Naval Proving Ground, Dahlgren, Va. Rockets and jet motors are flown at Inyokern, Calif. New types of guns are developed at the Naval Gun Factory, Washington, D. C.

In addition, little groups travel literally to the ends of the earth to test Navy weapons under all conditions. One group may be at the atom-bomb testing grounds in the South Pacific. Another group may be testing the magnetometer in the Antarctic. The third may be investigating seismic waves in an Alaskan volcano.

"In the next war—which we hope will never come—there can be no delaying action," pointed out Admiral Beatty. "We hope to have completed a large backlog of pure and applied research which can be translated immediately into weapons. There won't be any time for research in a world of atomic weapons, proximity fuses and supersonic guided missiles."

Navy and civilian scientists at the Naval Ordnance Laboratory, White Oak, Md., are fighting the "cold war" right now with blueprints instead of bullets.

Strip of Steel Six Miles Long Rolls Out of Mill Every Five Minutes



Top, drawing of the five-stand mill shows strip entering at left and rolling out at tin-can thickness at right. Note power equipment in background. Above, each of the stands requires many electrical controls

Every five minutes a massive rolling mill can produce a strip of steel 30 inches wide and more than six miles long. The cold mill, recently completed for Jones & Laughlin Steel Corporation, operates at more than 70 miles an hour to reduce hot-rolled strip to tin-plate gauges. The strip is processed into tin cans and tops for glass containers. Hot-rolled strip about .095 to .109 inch in thickness is threaded into the mill. After passing through five stands in the machine it rolls out the other end, reduced in thickness to about .009 inch and elongated approximately nine times. Six large motors that power the mill have a total capacity of 16,850 horsepower. Because the strip moves at such high speeds it is difficult to measure accurately, so a special gauge X-rays the strip to check thickness. Great quantities of water that flow across the rollers to dissipate the heat produced by the mill are turned to steam, which is cleared from the room by a fog-elimination system.

Research Scientists Bottle Sub-Zero Cold—458 Degrees Below!

Temperatures only one degree above absolute zero—about 458 degrees below zero Fahrenheit—are being “manufactured” by Westinghouse scientists. The purpose of the research is to discover how metals act in this super-cold and to find uses for such frigid temperatures. Absolute zero is approached by changing gaseous helium into a liquid, causing a drop of about 520 degrees Fahrenheit. The gas under high pres-

sure is put to work driving two piston engines, causing it to give up a large amount of energy in the form of heat, thus cooling the gas. The cold gas is used to cool still more gas in a continuous process. Finally a small portion is expanded through a tiny opening, changing it into a liquid. The liquid then is bottled up in a five-foot-deep cylinder. Metals to be studied are lowered into the cylinder.



Flip-Flop Marker for Football

Football downs are recorded for spectators by a marker with numerals which flop into place when a cord is pulled. Made of aluminum alloy, the marker has large numbered plates which are hinged at the top and turn over to expose the next number when the cord is pulled. A model for stadiums has numbers which can be viewed from four sides.



Pocket-Size Exposure Suit

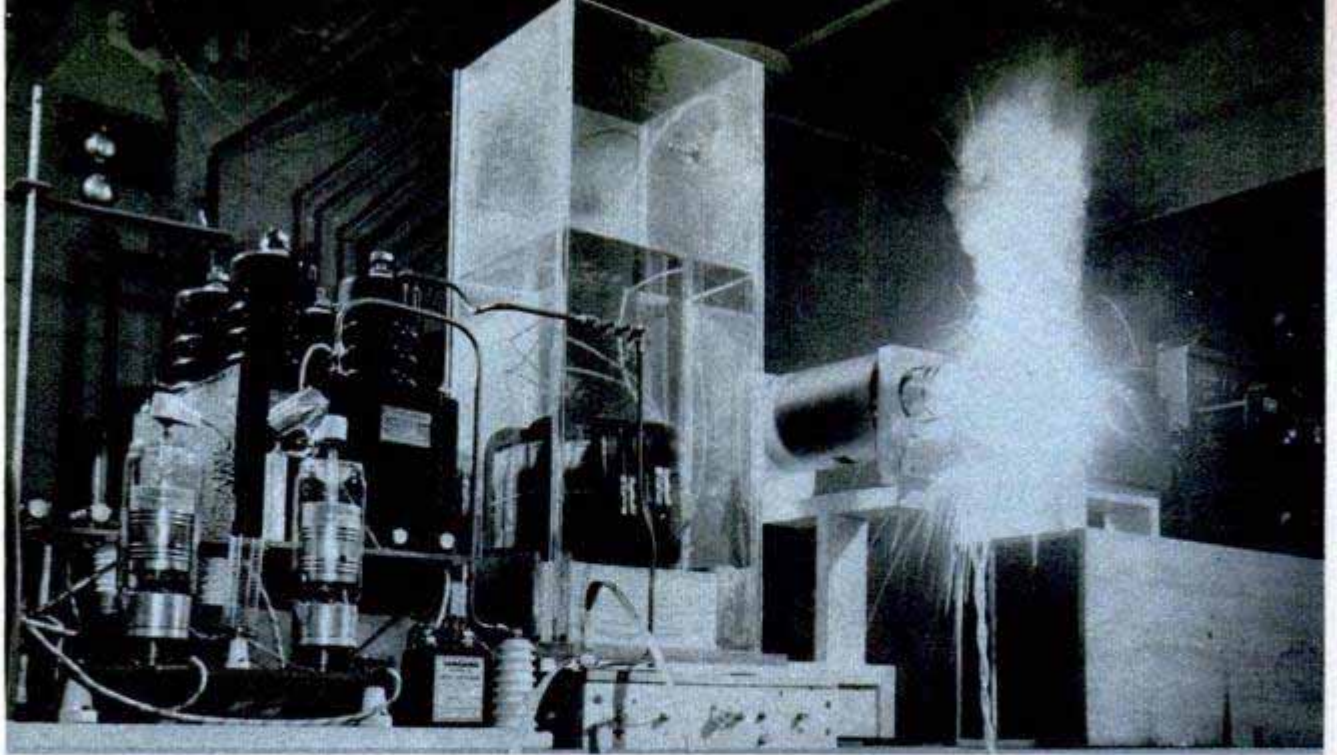
Exposure, one of the biggest trials of airmen downed at sea, is curbed by an inflatable rubber suit small enough to be rolled into a pocket in the collar of a Mae West jacket. It weighs less than three ounces and provides air insulation against cold and damp. The suit is being tested in England and may soon be adopted as standard equipment for Royal Air Force crews.

Four-Jet Bomber "Hits the Deck" in 500 M.P.H. Tests

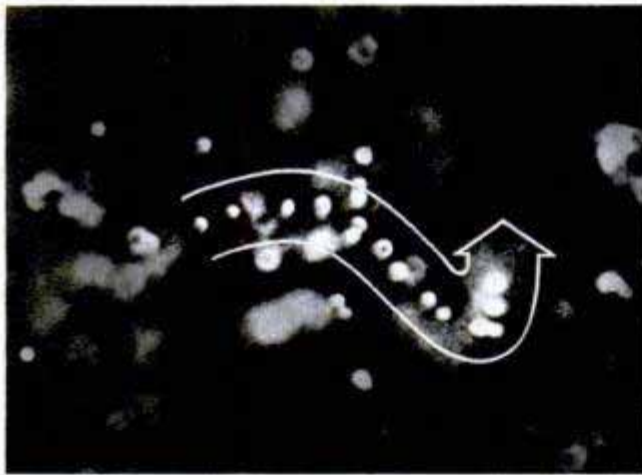
Low-level speed runs at more than 500 miles an hour have been made by one of the U. S. Air Force's new four-jet bombers, the North American XB-45. The craft

hurtled along just a few feet above the runway at the Muroc, Calif., desert test center. Two jet engines are paired in a single nacelle in each wing.

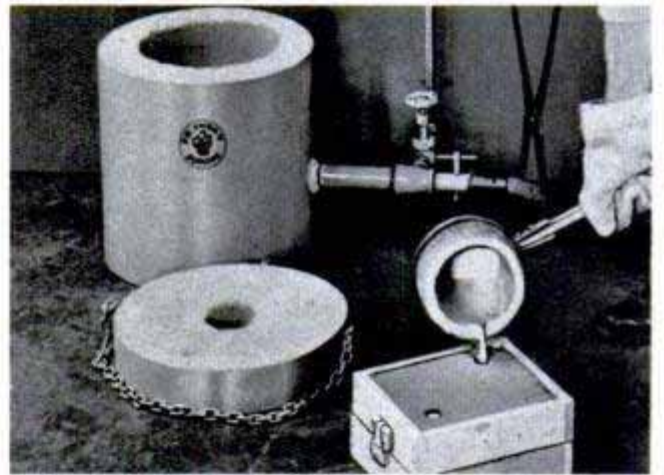




X-RAY MOVIES of burning iron oxide and aluminum are made by photographing a fluorescent screen which picks up X-rays projected through fire. No shutter is used as the rays last only 10 millionths of a second



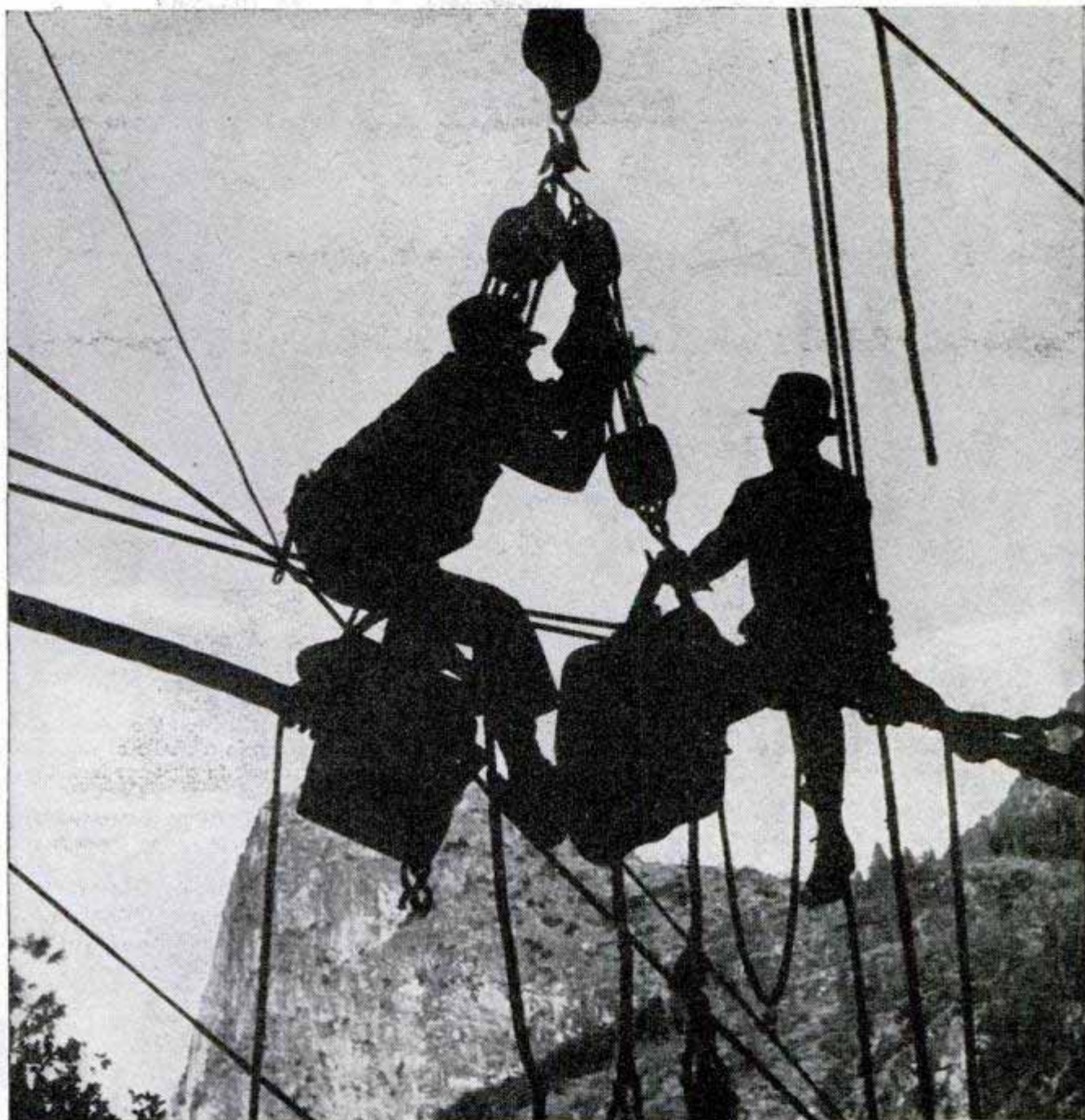
SPEEDING ELECTRON has its picture taken for first time on new Eastman film. The actual length of travel is less than the thickness of sheet of paper



HOBBYIST'S FOUNDRY is small enough for your workshop, yet has everything you need to make sand and plaster-mold nonferrous castings. It burns gas

PENTHOUSE DELUXE has everything a country estate has except a garage. A luxuriant lawn separates the two buildings. Overlooking San Francisco's waterfront, it has a patio, sun deck, swimming pool and gardens





The Story of Rope

THE OLD INDIAN rope By Andrew Hamilton **ing is difficult. Monkeys are trained to climb ropes and strip off the leaves.**

trick has amazed and mystified people for generations. A fakir throws a rope above the stage where it stands without apparent support, as stiff as a rod. The trick is simply this: an unnoticed four-pronged hook at the end catches a taut piano wire in the dim light above the stage.

This vaudeville stunt is not half as amazing as the miracle of rope itself—one of mankind's most useful tools.

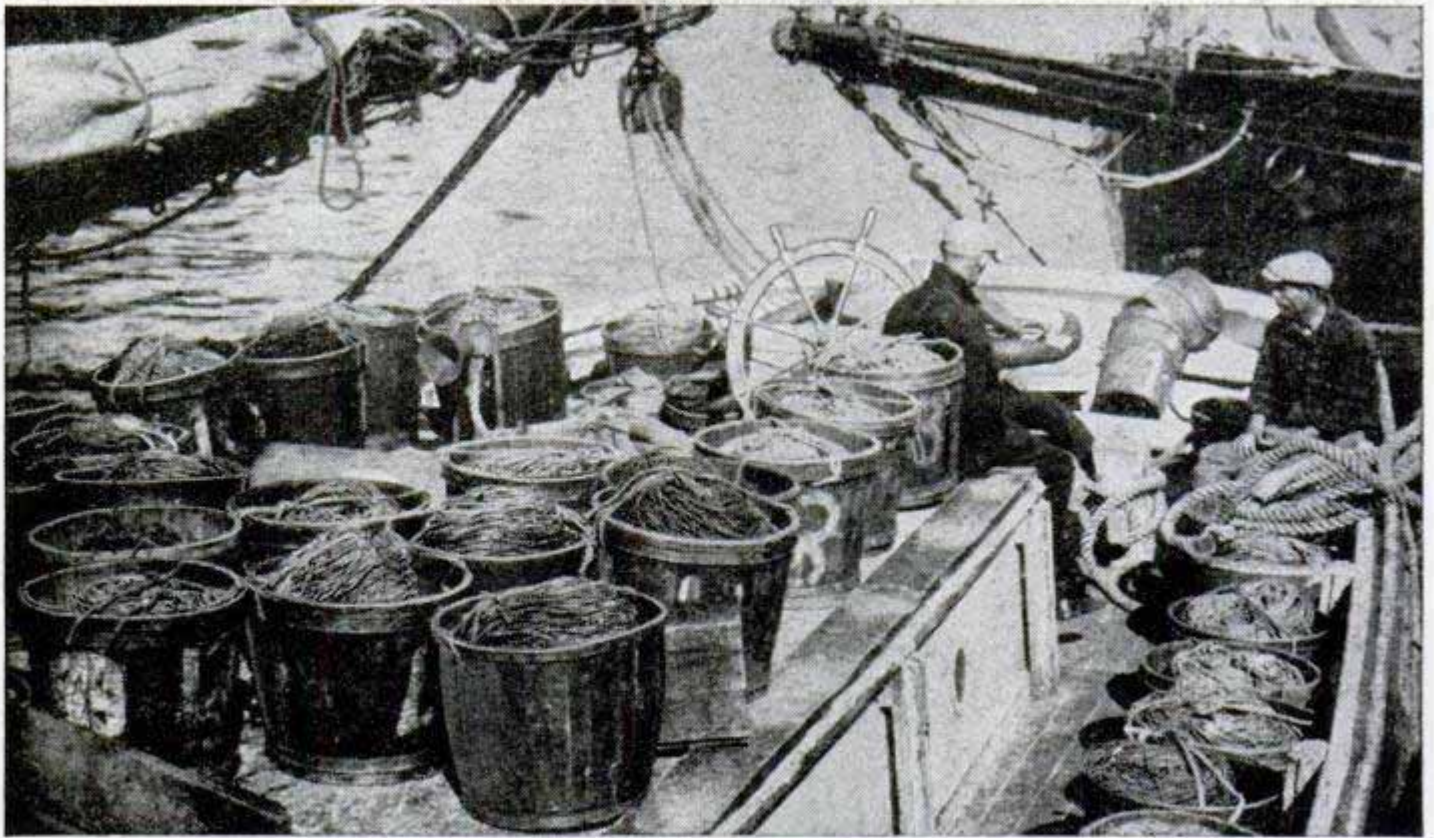
In China, tea bushes are sometimes planted on steep hillsides where harvest-

A tremendous hawser, 18 inches in diameter, was once woven for a special harbor job in South America.

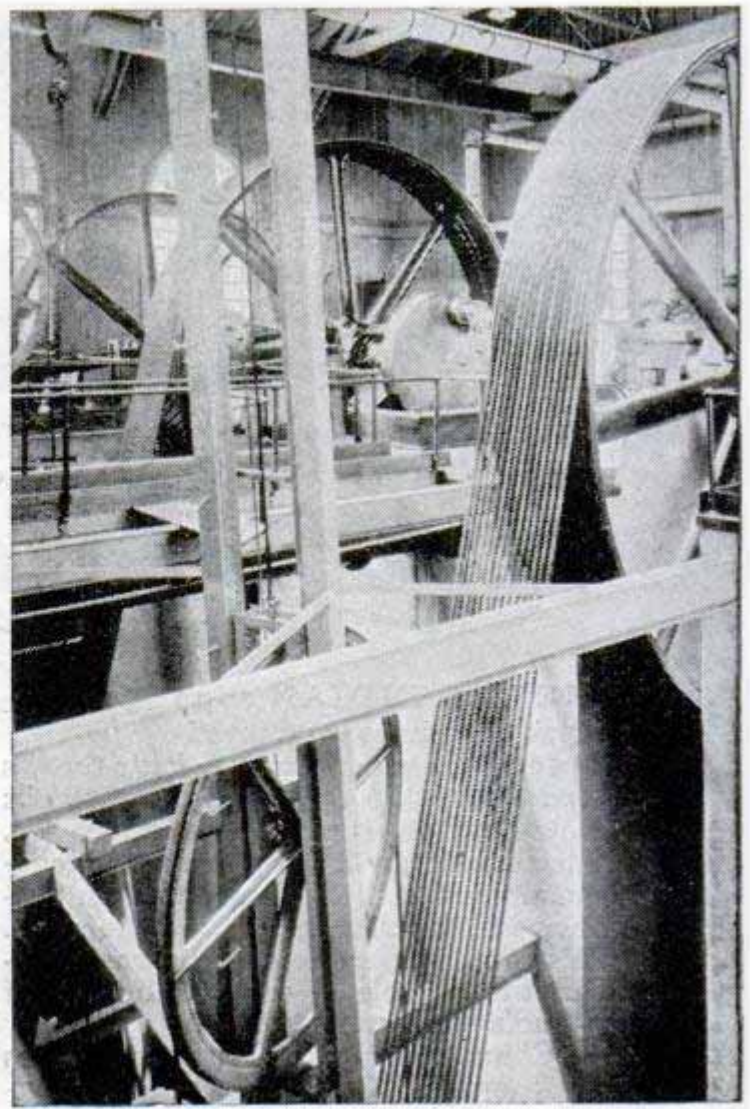
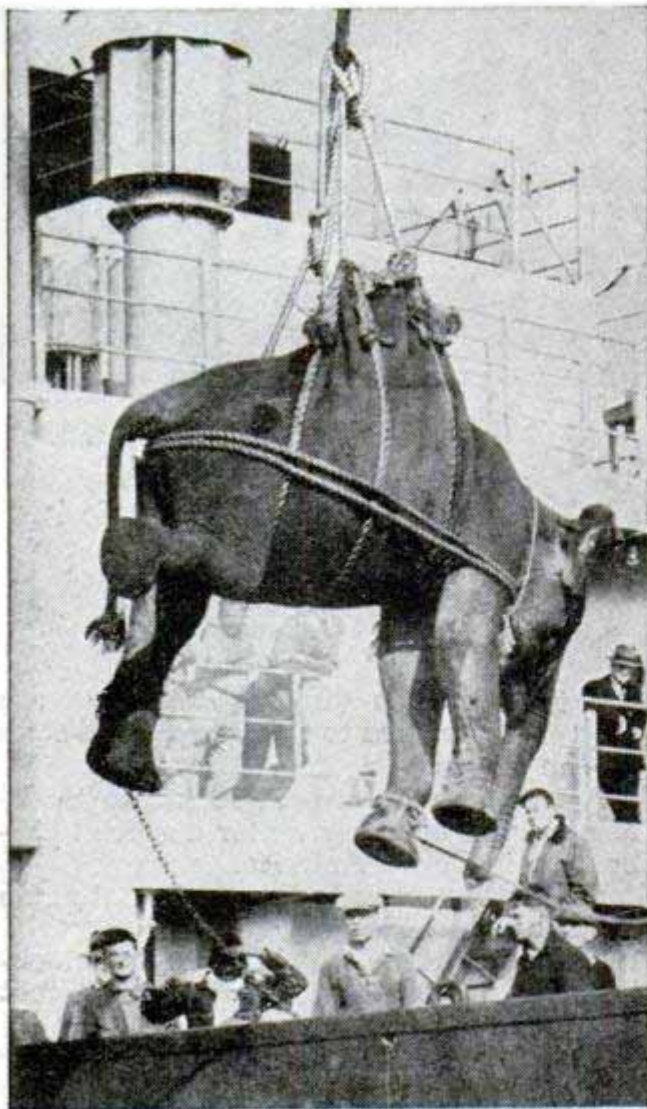
Earliest automobile tires were not made of rubber, but of rope.

Thread equal to that in 932 nylon stockings is required to make a single 350-foot tow rope for a military glider.

There are many kinds of cordage other than rope. A cable is simply a super-rope



Coils of rope cover the deck of a commercial fishing vessel. There would be few fish on the dinner table if there were no rope or netting. Below left, a circus elephant comes ashore, slung in a cradle of rope. Below right, transmission belts made of many strands of rope turn the huge generators in a power installation





Finest Manila rope is made from abaca fiber, stripped from the inside of a fruitless banana plant grown in the Philippines. The supply of rope became critical during the war when no fiber was shipped from the islands

in which ordinary rope is used as the component strands. Twine is two or more yarns, twisted together.

Rope is one of the oldest devices for lightening back-breaking work. Anthropologists say that our caveman ancestors probably used it even before they invented fire, the ax or the wheel.

Today, cordage-making in the United States is a giant and far-flung industry. Before World War II a score or more hard-fiber cordage and twine manufacturers were producing approximately 350,000,000 pounds a year. Wartime demands stepped this up to 600,000,000 pounds by 1945. Now production has leveled off at about the prewar figures.

World War II proved that rope was indispensable to modern warfare. The Army used rope for tents and trucks, to lash guns in position, to help mountain troops scale peaks; the Navy used rope for cargo nets, boat fenders and refueling lines. A 35,000-ton battleship carries about 50 tons of rope. The Air Force

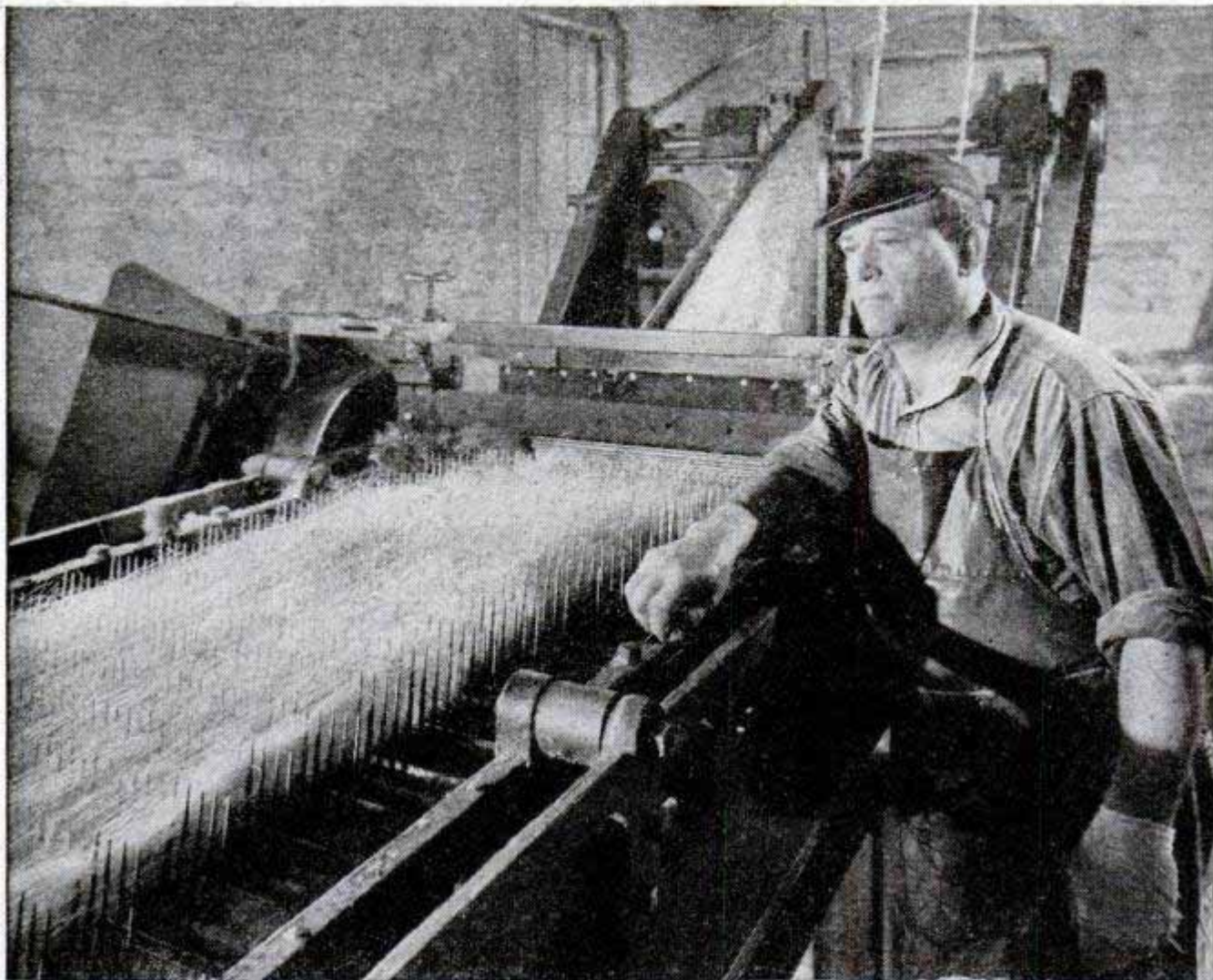
used rope for parachutes, for glider tows and for securing gear inside planes. The War Production Board found 400 uses for rope that were considered "critical."

Best material for making strong, long-lasting rope is abaca, commonly known as Manila fiber. This is a fiber from a tree, botanically the same as the banana.

Other fibers, not quite as good as Manila, are sisal from the Dutch East Indies, Africa and Haiti, and henequen from Cuba and Mexico. Materials used to make ropes for special purposes are: cotton, jute, flax, strips of leather and, newest of all, nylon.

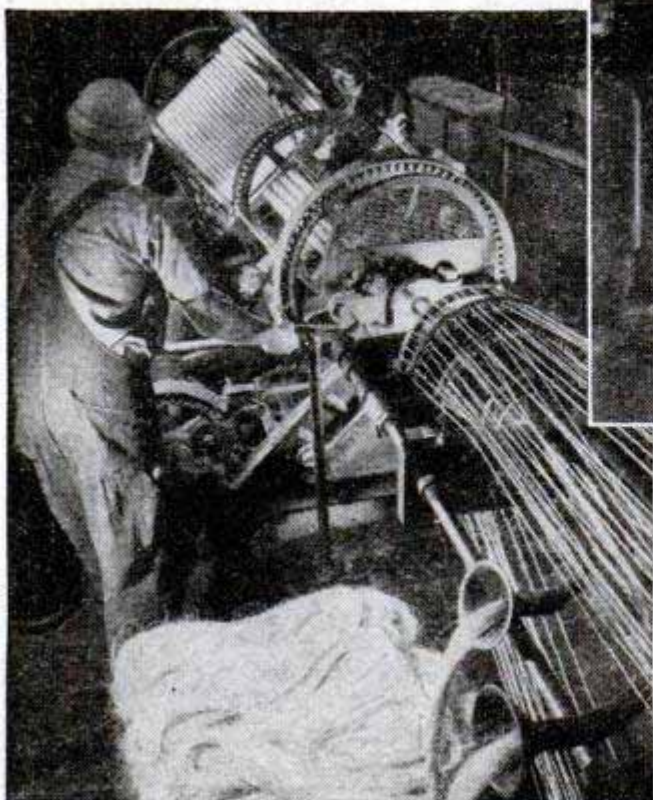
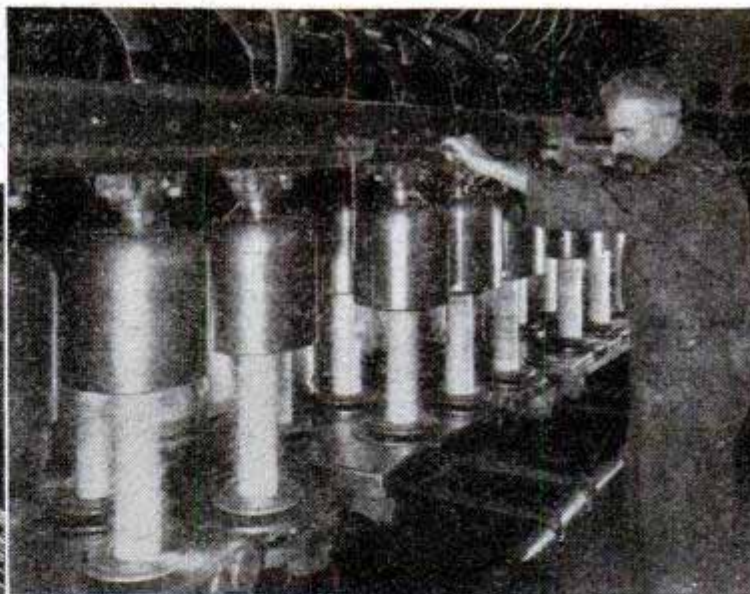


Loose bales of the silky blond fiber await shipment to United States factories where they will be combed and twisted into rope



Plymouth Cordage Company photos

In the preparation machine the fiber is combed by hundreds of mechanical teeth before it is blended and mixed. Right, the Gill spinner removes bunches and thin spots in the yarn, then spins it into the uniform strand suitable for use as binder twine



FIBERS

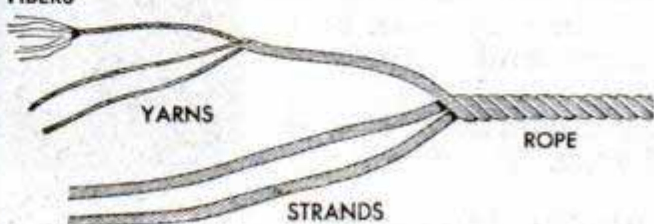


Diagram shows how rope is constructed from fibers. ← Machines twist the yarn into strands, which must have correct degree of twist to make a strong rope

In rope-making there are four steps: preparing the fiber; spinning the yarn; forming the strand; and laying the rope.

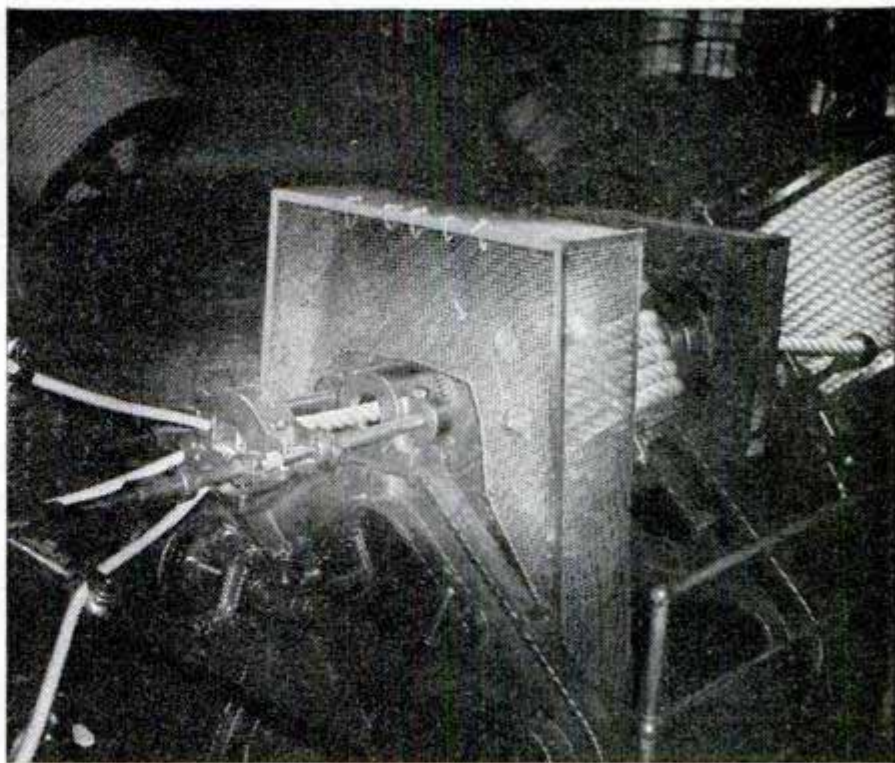
When bales of fiber arrive at the mill, they look like huge batches of blond hair. These fibers are scientifically blended and fed into the preparation machine. Thousands of small moving teeth comb, mix, overlap and parallel them into a continuous length of soft, silky "sliver." Oils—animal and vegetable fats and waterproofing compounds—are added at this stage to make the rope water repellent, flexible, easy to handle and less likely to wear out by internal friction.

In the second stage, the sliver is converted into yarn. Machines again comb the fiber, pass it through a funnel-shaped tube, twist it into yarn and wind it around a small capstan. From there it is wound on a large spool. Size and correct turn of the yarn are carefully regulated.

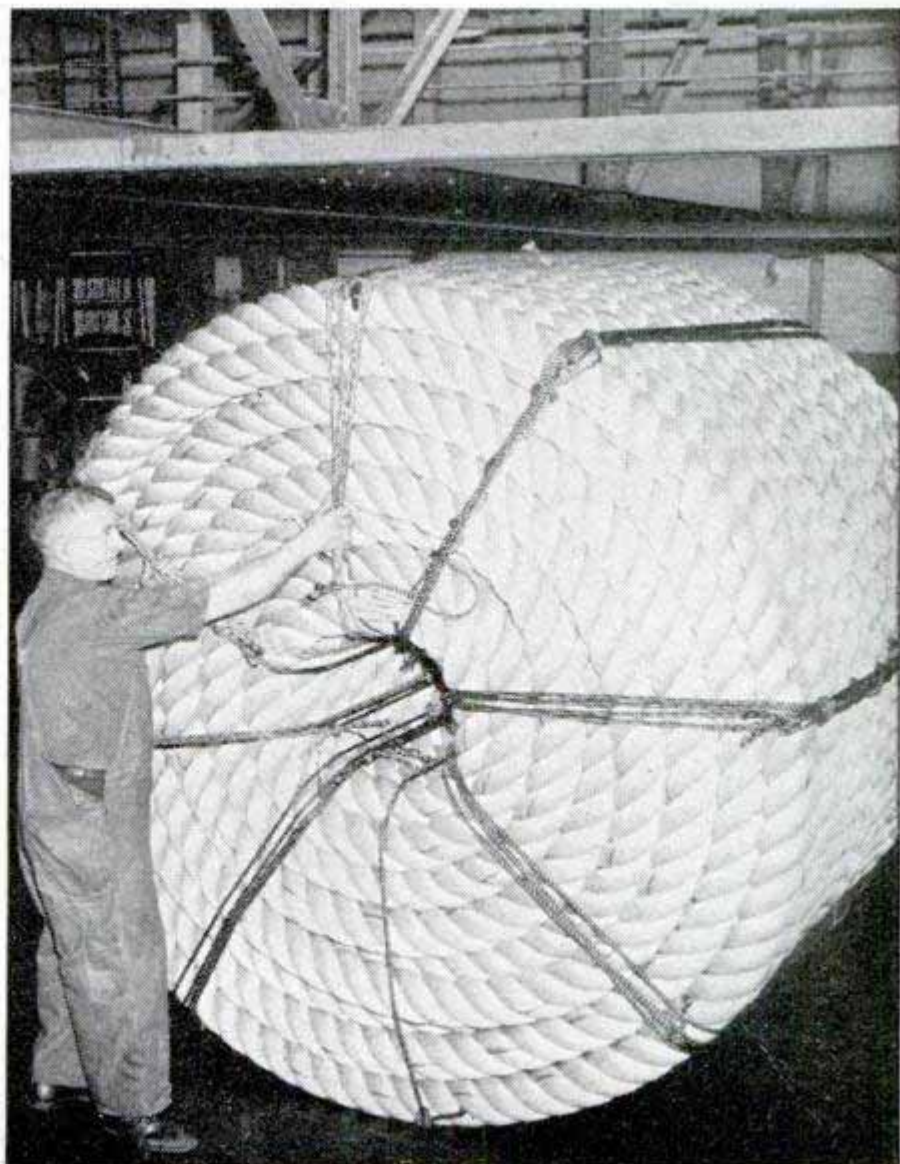
Third step is forming the strand. A scientific formula determines the number of individual yarns that will make up the finished strand.

Fourth and final step is laying the rope. A rope is usually formed of three or four strands. One of the chief problems of rope-making is to overcome the tendency for yarns to untwist. This is done by making the first twist when the fiber is spun into yarn from left to right. The second twist—from right to left—is applied when the yarns form the strand. The third twist, when strands are laid to form rope, is again from left to right. The three twists counteract each other.

About one third of all
(Continued to page 230)



Three strands are turned into a rope with a twist directly opposite to that of the individual strands. This keeps the fibers from straightening. ↓ Largest rope for general use is this heavy Manila measuring 16 inches in circumference. A special hawser 18 inches in diameter once was made

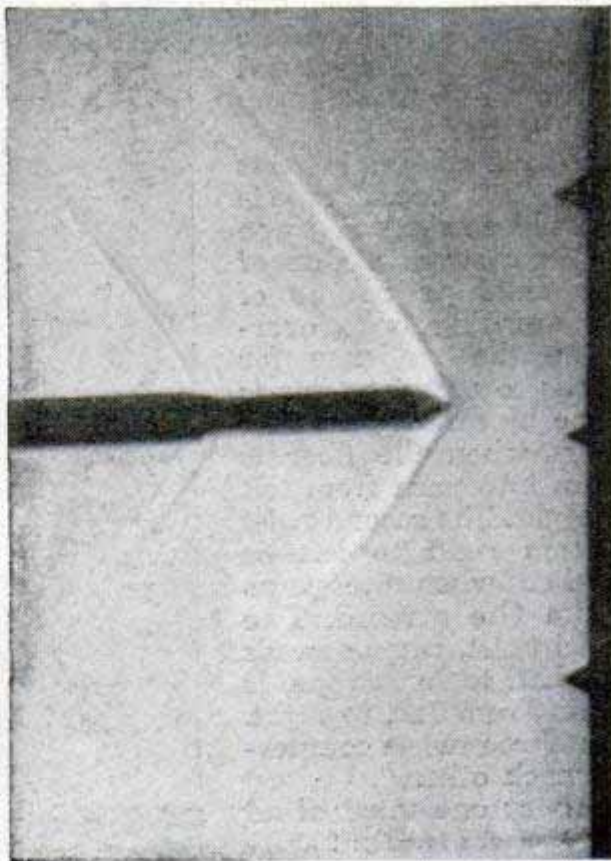
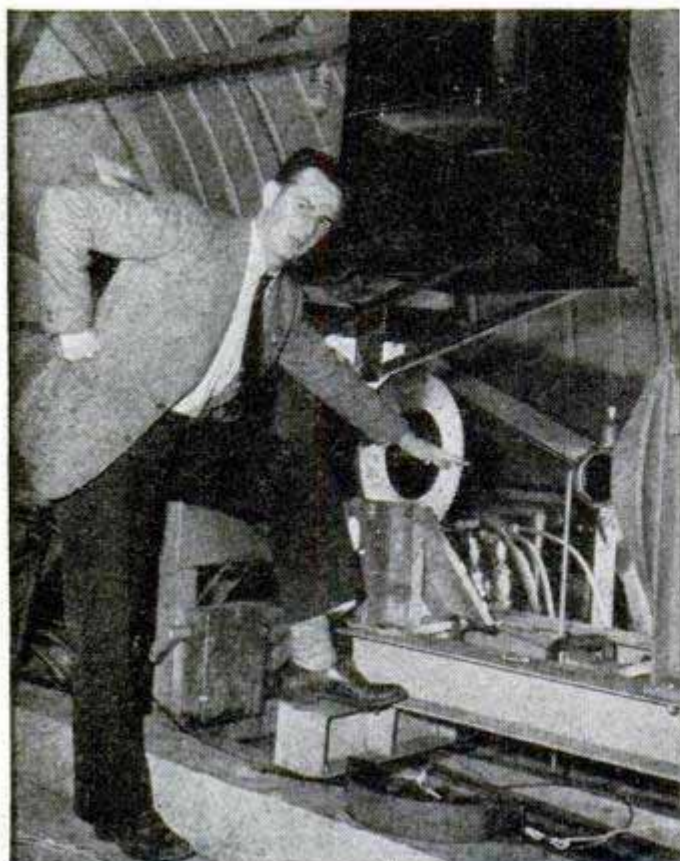


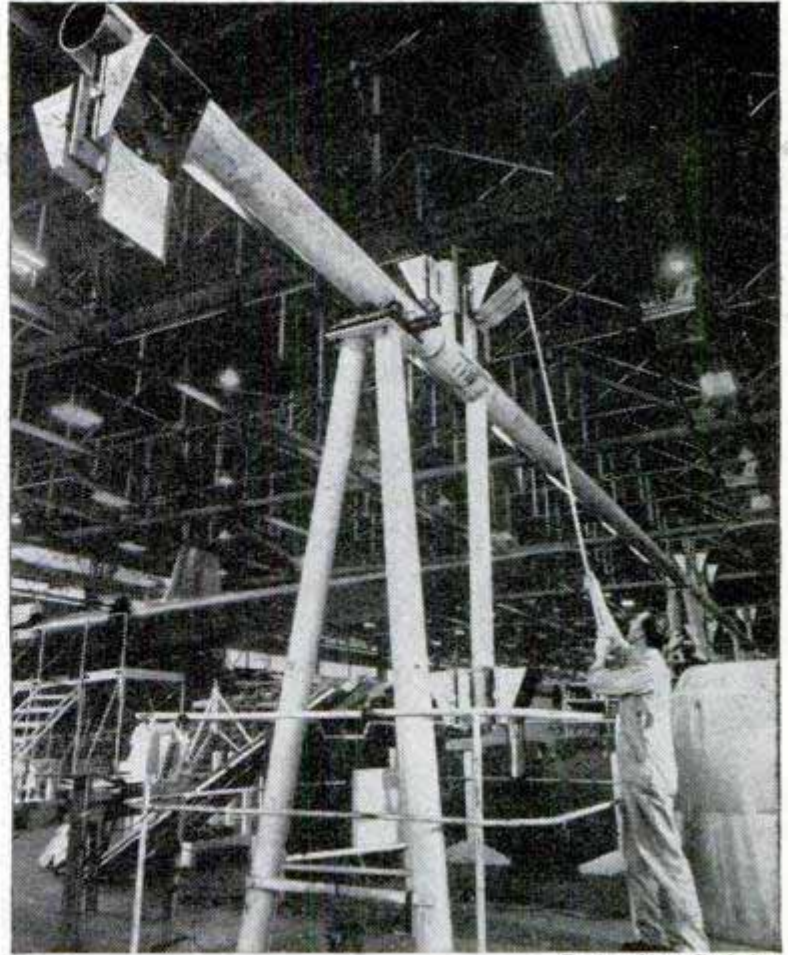


PLANE BUILDERS DO IT WITH MIRRORS

THERE'S more truth than fiction to the old bromide—"It's done with mirrors"—when applied to testing and building airplanes at Boeing's Seattle plant. In some unusual forms, the common household mirror is used to inspect hard-to-reach parts, in aligning electric machine-gun turrets and to check such minute parts as bolt threads for perfection.

Above, with 15-foot lighted "telescope," worker inspects rivets inside a wing. **Below left,** five mirrors "transport" a moving shadow of shock wave, caused by air stream striking obstacle (man's hand). **Right,** two shock waves as they appear on shadowgraph. Device gives visual proof of disruption in air flow

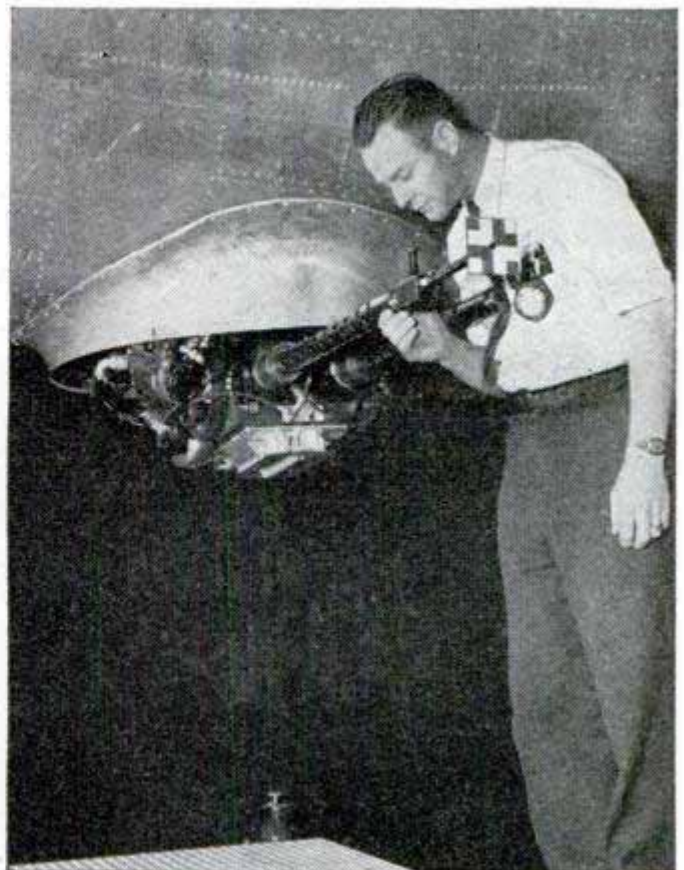




Boeing Aircraft photos

Resembling flapjack turner, mirror in right hand of worker (left) enables him to inspect inaccessible rivets and structures. Towering "mirror range," right, extends almost 98 feet. Each turret and sighting station is lined up perpendicular to one of seven mirrors, so they can be electrically "tied together" to work in harmony

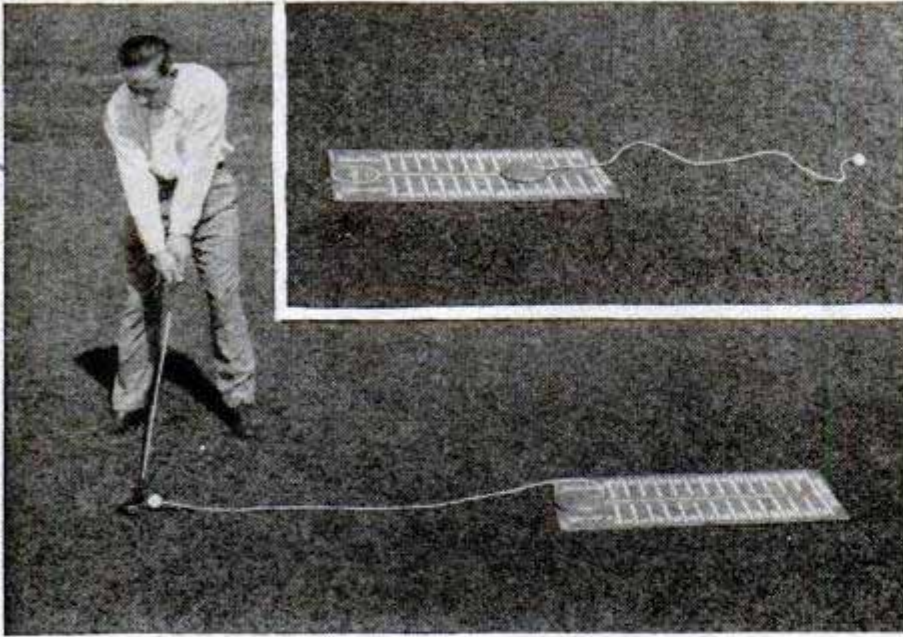
On mirror range, worker inside sighting blister at left adjusts equipment so that it will work in perfect unison with turret. Right, first step in harmonizing is to set all guns perpendicular to mirrors. Inspector raises gun so center of the target on front of scope he is using reflects back exactly on the cross hairs



Golf-Trainer Co.
407 S Dearborn Chicago 5 Ill.

Disk Anchored to Golf Ball Indicates Length of Practice Shots

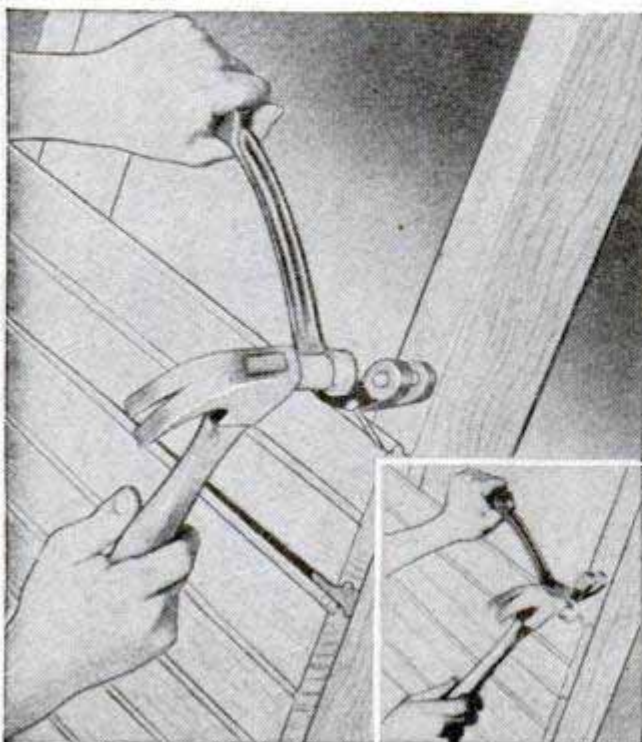
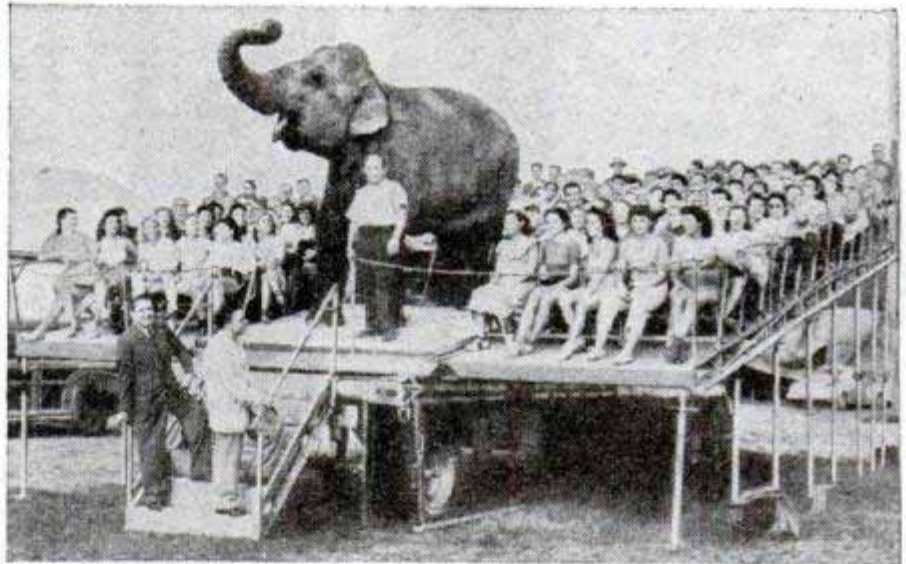
Pierpad. 20-51 *



There's an answer now for golf practice swingers who boast "a shot like that would have traveled a mile!" It consists of a regulation golf ball, a cord anchored to the ball and to a steel disk, and a three-foot-long board with markings scaled up to 300 yards. When the ball is driven the disk-anchor checks its flight, but momentum drags the disk forward along the board. The disk's position indicates both the shot's distance and direction. The trainer can be used indoors or outdoors.

Portable Grandstand

When the circus comes to town its grandstand will roll into position under the Big Top and in a few minutes it will be ready to seat the crowd. Mounted on a trailer, the portable grandstand, which folds into a compact package for traveling, will seat 300 persons. During a recent demonstration, the grandstand was tested by adding the weight of an elephant to that of the spectators.

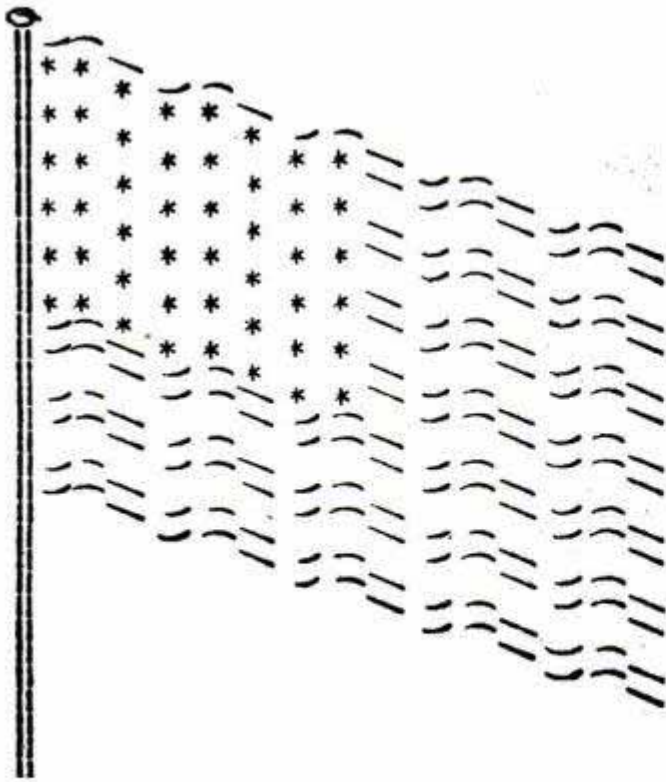


Bender for Warped Lumber

Warped, rough or twisted lumber is forced into place for nailing by an ingenious board bender. The tool's anchor pin is hammered in above the board and its handle then drawn down until the wood is forced into the position desired for nailing. Made of aluminum, the tool adds little weight to a tool chest.

Fire Door Closes Automatically

Fire-resisting doors, often kept open for ventilation purposes, are closed automatically when fire breaks out by a heat-actuated device that attaches to the standard door closer. Resembling an automatic sprinkler head, the device holds the door open until the temperature reaches 135 degrees. Expanding thermal liquid in the device releases the plunger on the door closer and the door shuts automatically.



Typewritten Flag

Anyone can draw an accurate picture of the American flag on a typewriter, according to Menno Fast, a relief worker in Poland. Fast read a recent *Popular Mechanics* article on drawing pictures with a typewriter. He submits a drawing of the flag as proof that it can be made on an ordinary typewriter using standard spacing. The flag, with a full 13 stripes and 48 stars, appears to be rippling in the wind.



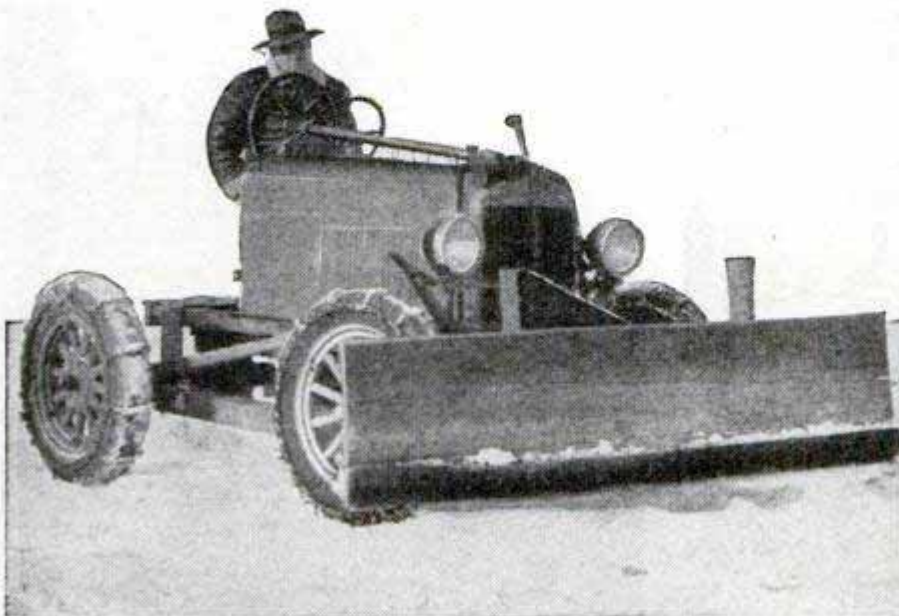
Collapsible Baby Stroller Folds for Carrying

Small enough when folded so that it can be carried like a suitcase, a stroller that is made in England weighs only 15 pounds. It is opened or closed in a few seconds. In bad weather, the child is protected from rain and wind by a light cover that is attached to the handle.

Project Begun on Sick Bed Pays Big Dividends

What started out as a convalescence hobby after a serious illness turned out to be a valuable investment for Jack Lawton of Moscow, Idaho. While confined to bed he poured over his file of *Popular Mechanics*

and decided to build a garden tractor that was described in one issue. As soon as he became strong enough to do light work for a few hours a day he began building the tractor and by the time he was fully recovered he had completed it. That was 14 years ago and the tractor, made of junk Model-T Ford parts, is still doing plenty of work. He uses it for everything from plowing and harrowing gardens to shoveling snow.



Instead of lead, extra high-voltage cables that will give up to 50 years service are sheathed with Bakelite polyethylene, a material which is waterproof, flexible and chemically inert when in contact with high-voltage insulation.

PROSPECTING for Better Metals

THE SEARCH for new and better metals goes on endlessly at the Westinghouse Research Laboratories where a score of scientists are attacking the problem from every conceivable angle. Like a giant jigsaw puzzle in which the main pattern is apparent but not wholly clear, the concept of the right metal for the right job is gradually taking shape.

Here are just a few of the questions that scientists are seeking to answer. What ingredients mixed together will produce the best metal for high-temperature applications such as the jet engine? What ingredients give a metal strength, hardness, toughness, elasticity? What hidden changes occur in a metal under heat treatment? How does the microscopically thin "skin" that forms on metal surfaces at high temperatures protect it from further corrosion? How is the presence of carbon in steel linked to brittleness?

To dig for the facts, researchers have at their command an ingenious array of equipment especially created for the job. There was the problem of testing the whirling disks used to hold the blades in jet engines. Such disks must be able to stand up under the simultaneous assaults of terrific heat and blurring speed. The

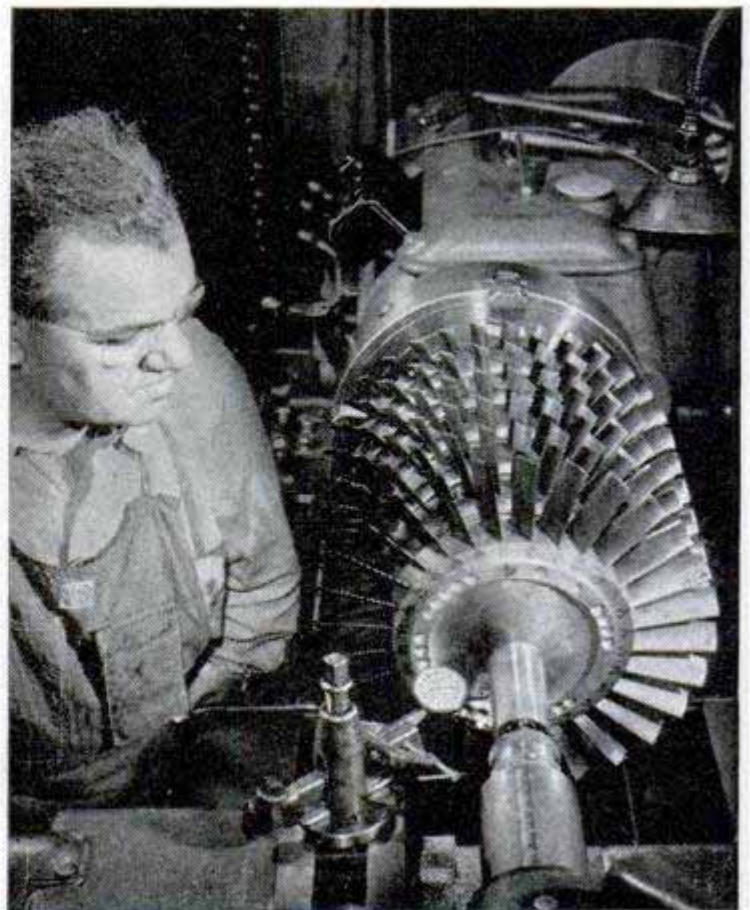
scientists wanted to learn what happens inside a metal subjected to such punishment.

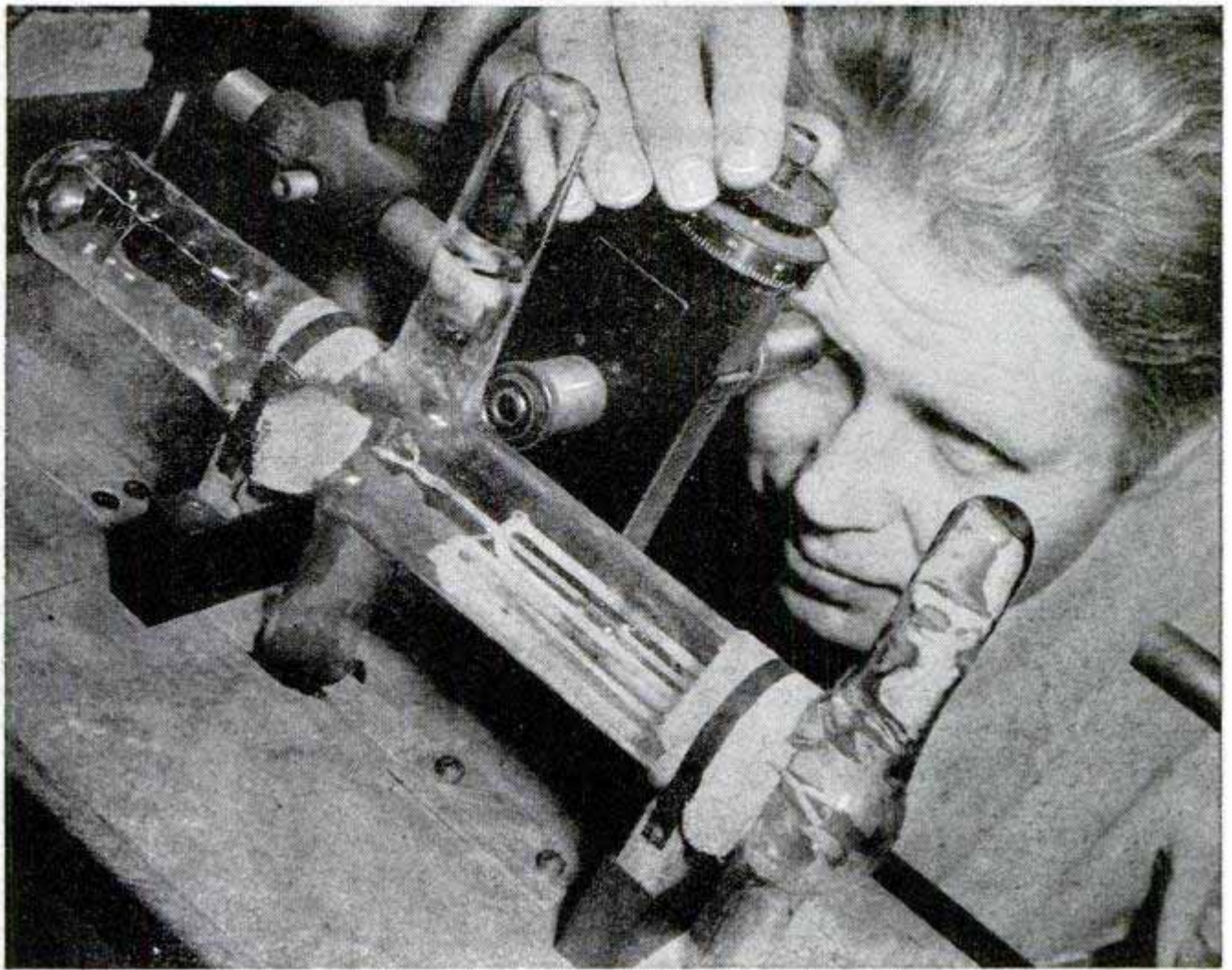
They built a "bombproof" dugout in which they can study jet disks under every temperature and speed up to the point where they literally explode. In this dugout, ringed with heavy sandbags and sunk deep below floor levels, disks made of specially developed alloys are heated up to temperatures above 1400 degrees Fahrenheit, and spun around at dizzying speeds of 1200 miles an hour—35,000 revolutions a minute. That's much more than presently used metals in jet engines can safely stand.

During tests, the disk is covered by a thin steel hood from which air has been evacuated to reduce friction. The hood was constructed purposely of very light steel, so that flying fragments of metals will easily penetrate its thin skin. Use of heavier steel would cause serious damage to the fragments and prevent close scrutiny of the type of fracture or break involved—vital information to the scientist.

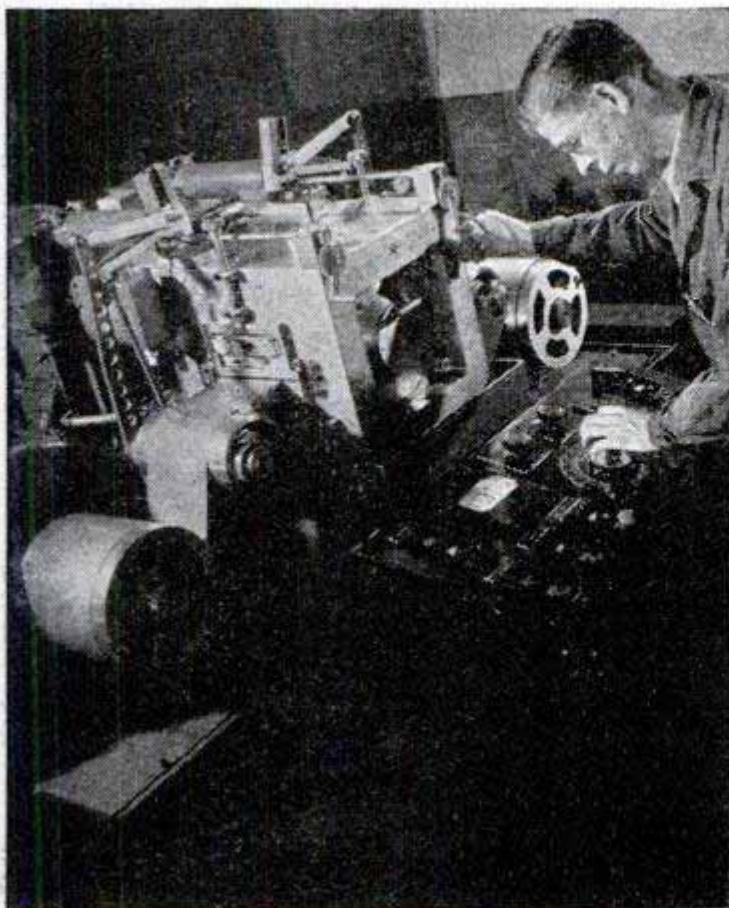
As the heated disk spins, research engineers A. C. Hagg, B. Cammetti and Gale Sankey make continuous measurement of its temperature and of the expanding diameter. Even the toughest of metals tend to flow or "creep" under high stress or

Left, taking hot metal from furnace in laboratory steel mill. Right, metal in jet-engine blades must be tough
Westinghouse photos





Micro-balance scales weigh single layer of oxygen atoms forming skin on metal. Below, "vest pocket" rolling mill turns out strips thin as tissue paper

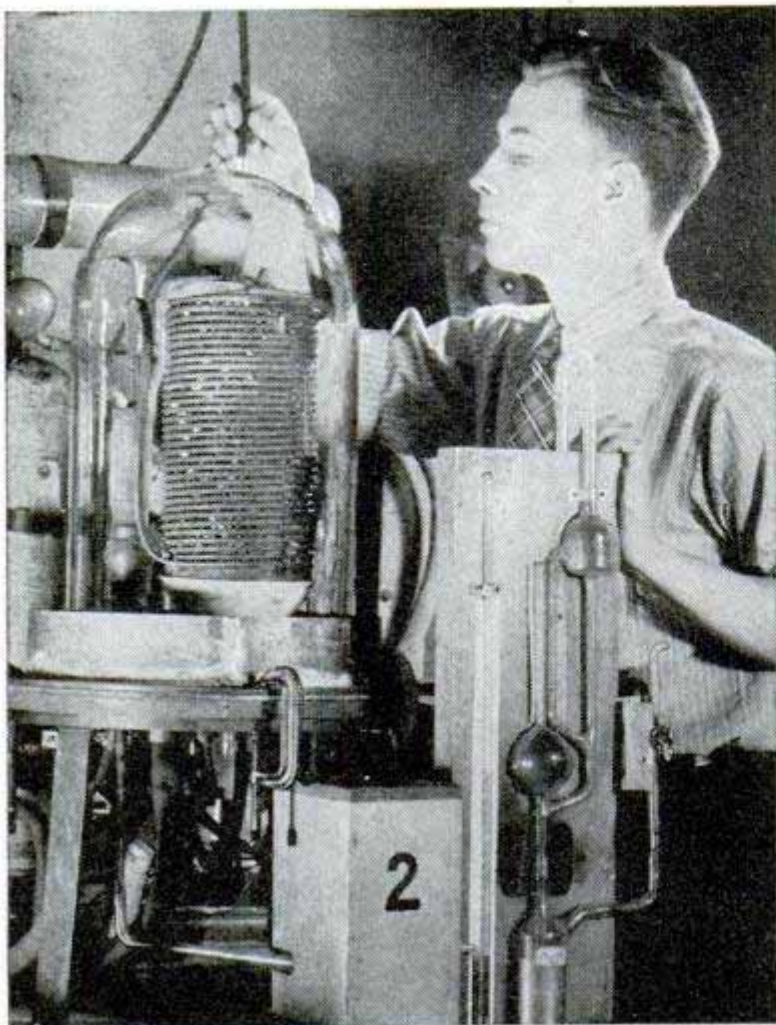


temperature, and with the narrow clearances in the jet engine, knowledge of this rate of flow is vital to the design engineer to prevent future rubbing of surfaces.

Many other things happen to a metal when it gets red-hot. One of the most significant and interesting of these is oxidation—essentially the same process that causes exposed metals to rust. But scientists wonder whether oxidation at high temperature really is a "metal termite."

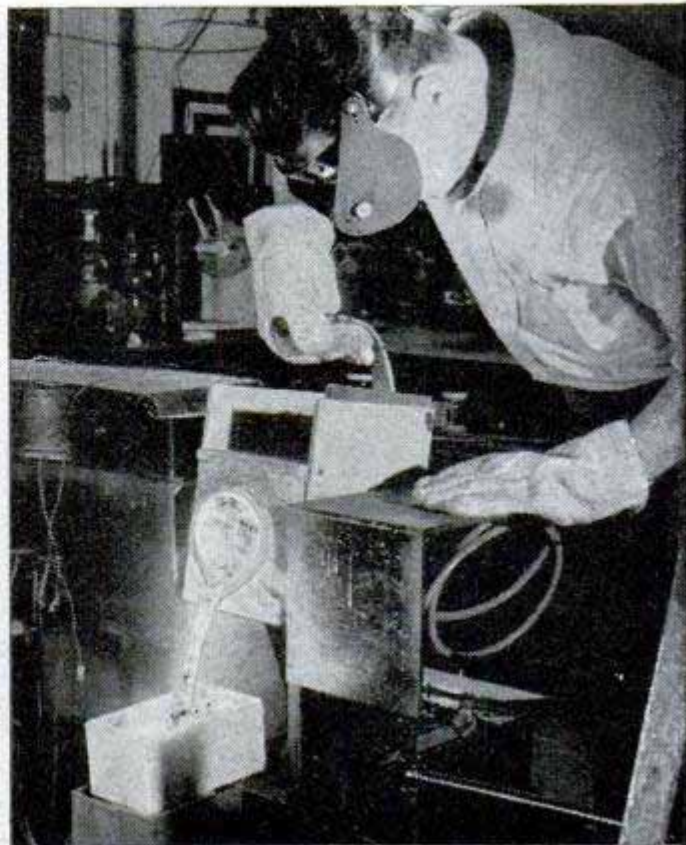
For as a metal grows hotter, a curious process takes place. A sub-microscopically thin skin—only a few atoms thick—is formed on the metal surface and protects the metal underneath from further deterioration. Is it possible, scientists are asking themselves, to develop an alloy in which this oxide skin would provide permanent protection over a wide range of temperatures? At present, all known oxide protection is vaporized as the temperature continues to go up.

Westinghouse men are attacking this problem from within and without. To study how fast and how thick the skin is formed, they use a balance scale so sensitive it can weigh a single layer of oxygen atoms! That's about one ten-millionth of an ounce. A perfectly clean metal sample is attached to the balance, which consists



Stream of water cools bell jar of induction furnace which has a heat of 3000 degrees Fahrenheit inside the furnace coils

"Bombproof" dugout is used to test jet-engine disks at high speeds and a heat of 1400 degrees Fahrenheit. Below right, an ingot of new magnetic alloy (Hiperco) is poured by scientist



of a hair-thin tungsten wire in a sealed quartz tube. Then oxygen is admitted into the tube and heat applied. As the skin is formed, the balance is tipped in favor of the metal sample and the gradual change in weight of the film is recorded step by step. In this way, the scientist gets a clear picture of when and how oxidation forms.

But this is only a partial view of metal oxide skins. To complete the picture, E. A. Gulbransen and J. W. Hickman, Westinghouse scientists, employ two sets of electronic "eyes"—the electron microscope and the electron diffraction camera.

With the electron microscope—which can magnify his vision 200,000 times—the scientist sees the physical make-up of the film. He sees how atoms and molecules combine to form crystals and how these crystals grow as the temperature increases and the skin thickens. It tells him the size of the particles, how they are linked together and how they shift position under various temperatures.

What of the chemical nature of this skin? How do the oxygen atoms and molecules link up with the metal and what oxides do they form? These answers come from the electron diffraction camera which takes up where the electron microscope leaves off.



Left, electronic portrait of skin formed on nickel at 900 F. was made by the electron microscope at right

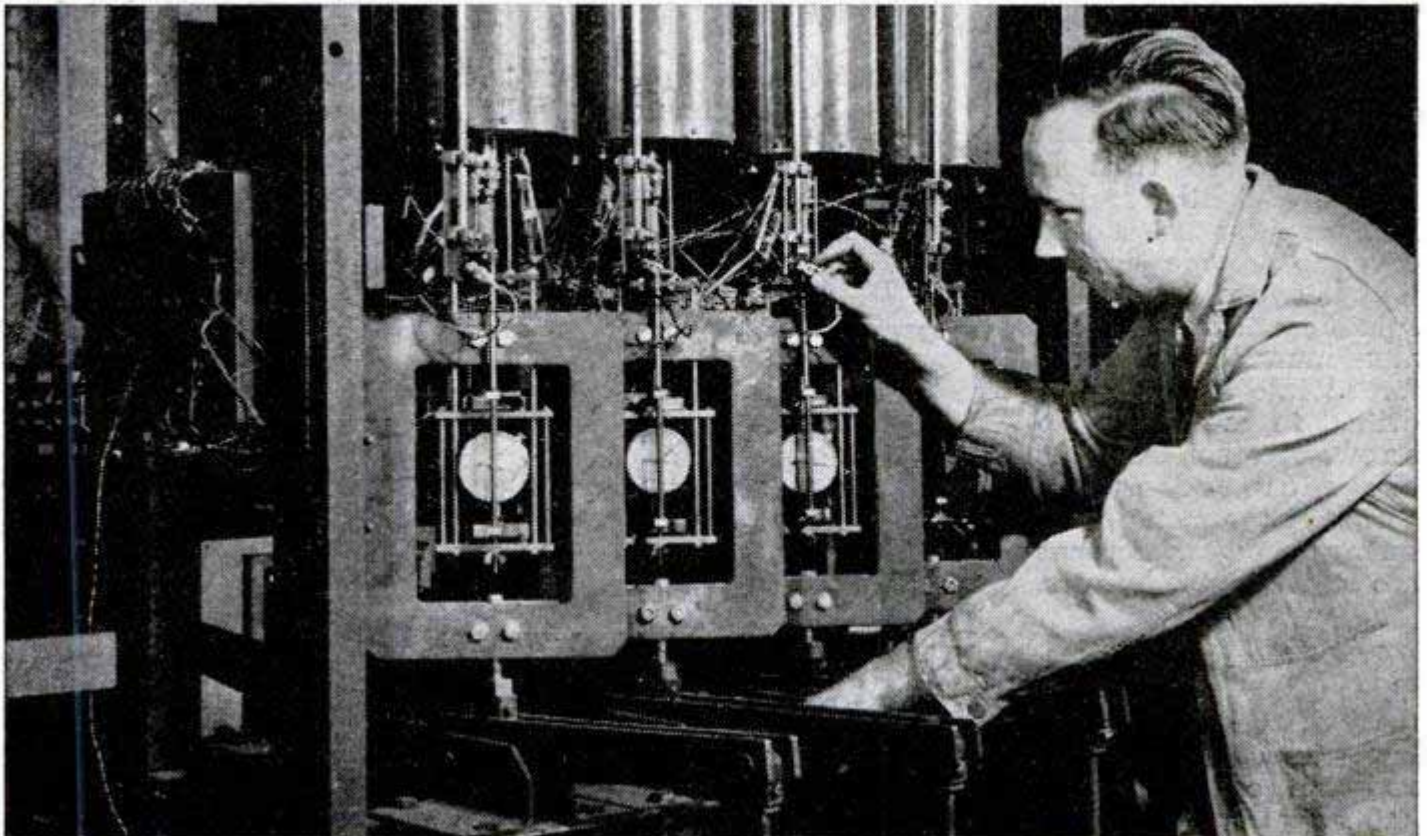
In this unique camera, the metal sample to be studied is bombarded with a powerful electron beam. The beam ricochets off various "faces" and "ridges" on the metal oxide skin and strikes a strip of photographic film. The result is a portrait consisting of a series of concentric half-circles. By measuring the distance between these half-circles, the scientist is able to determine the distance between the atoms in

the oxide skin being studied. This tells him the chemical nature of the film and how the oxidation takes place. It enables him to "fingerprint" chemically the great variety of oxide films that form on metals.

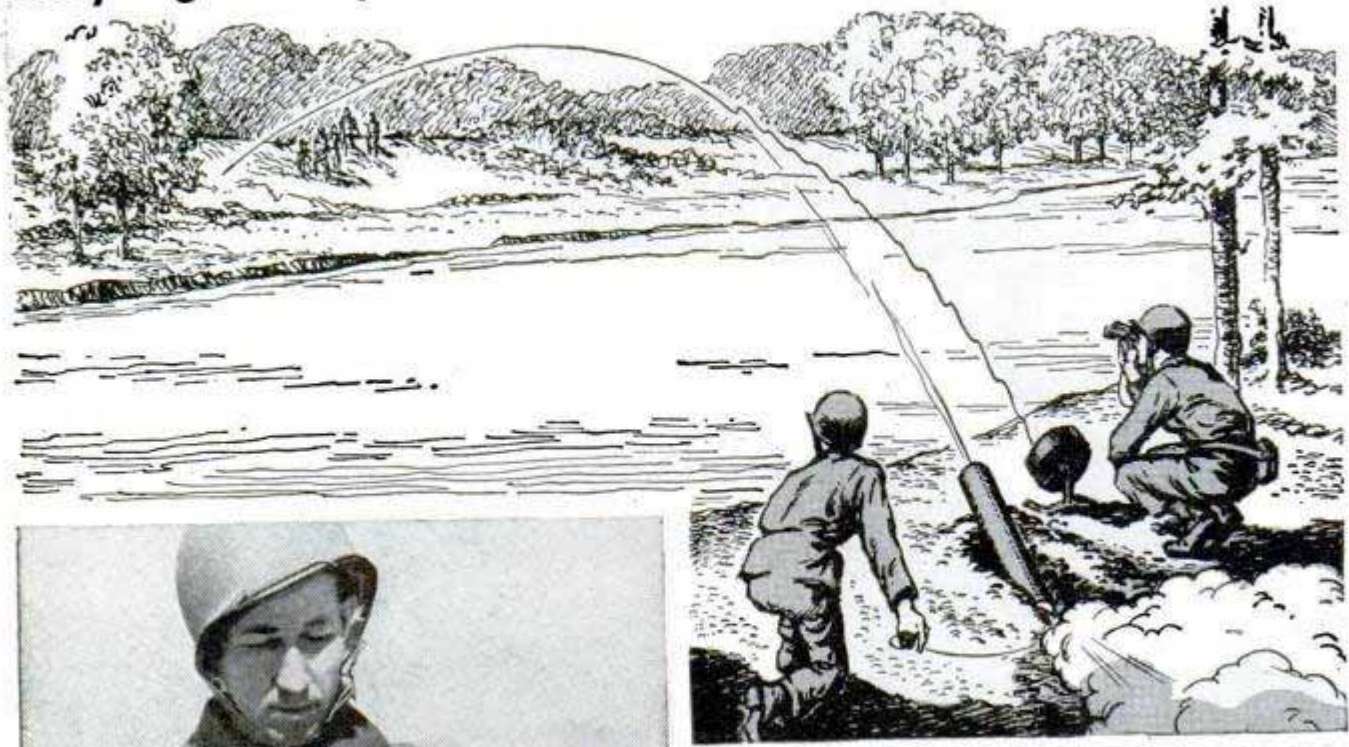
Research men recently made the camera an even more effective tool by adding a tiny furnace, so that the portraits can be made continuously at temperatures up to

(Continued to page 218)

"Torture" machine in Westinghouse lab shows how fast copper creeps when the metal is heated and pulled



Army Signal Corps Uses Rockets to Lay Field Telephone Wires



Army Signal Corps photo

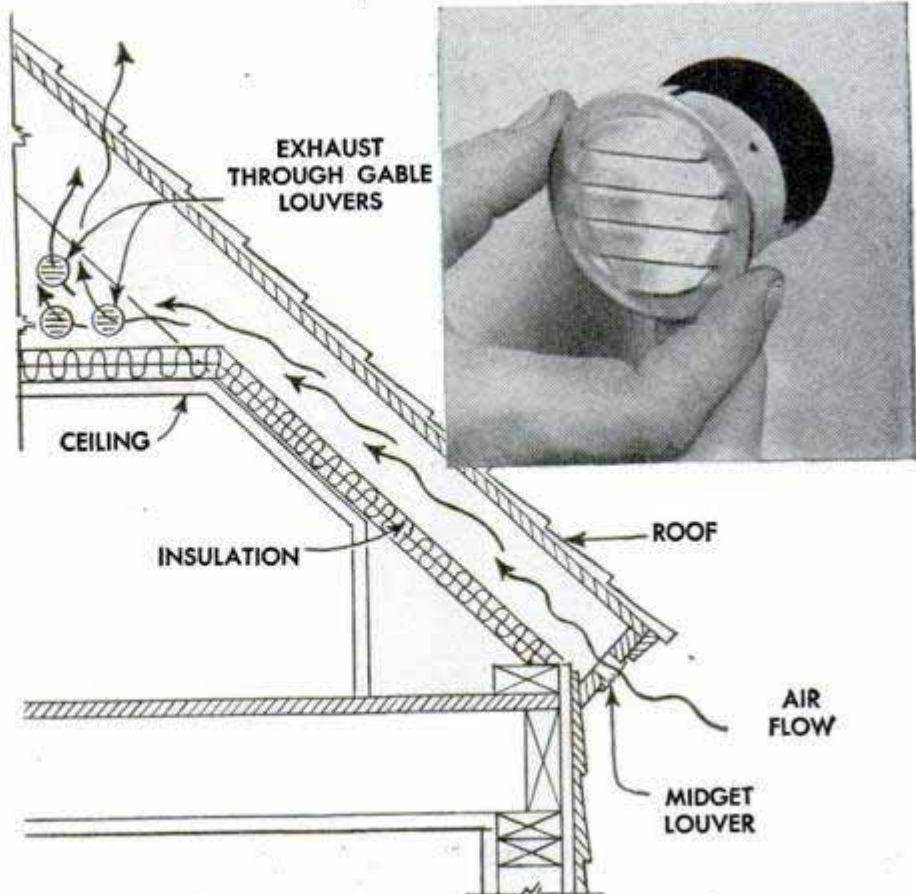
Fired from original container, rocket pays out wire from dispenser. One mile of wire weighs 48 pounds

Employing a rocket that can be fired from its original container, the Army Signal Corps has developed a lightweight portable unit for laying telephone wire over rough country. The rocket is fired from a wedge-shaped hole dug in the ground. One man, equipped with a wire dispenser, small field telephone and a rocket, can establish wire communications for relatively short distances over rivers, cliffs and ravines.

Miniature Louvers Ventilate Eaves

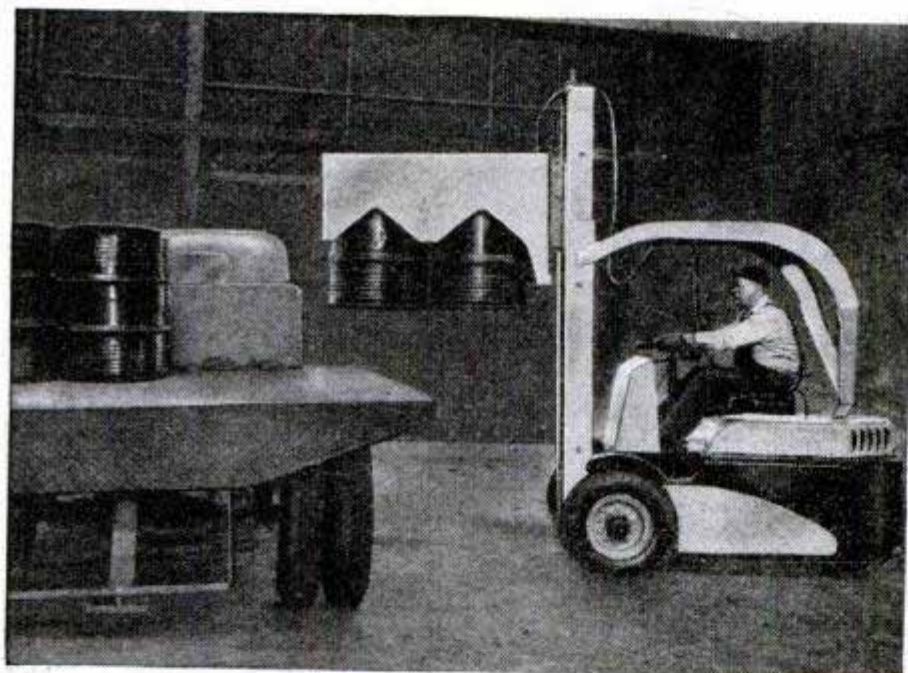
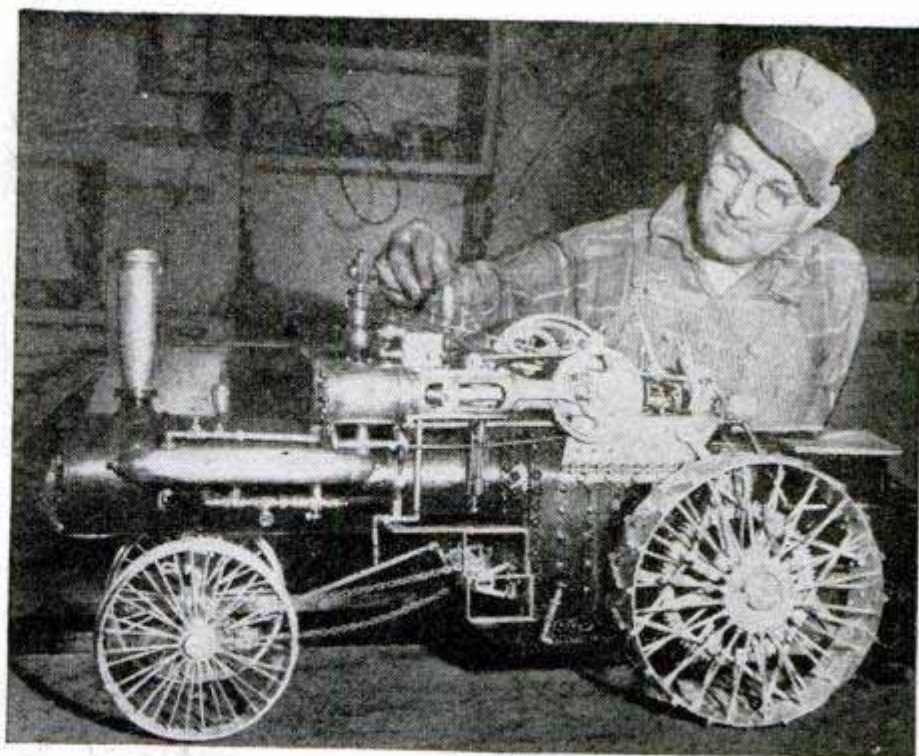
Midget louvers, 2½ inches in diameter, provide air circulation in building space that is normally tightly sealed. Designed for use under eaves to provide circulation between ceiling insulation and rafters, the aluminum louvers are forced into a small hole drilled in the wood. No screws or other fasteners are required as the spring of the metal holds them in place. Screens are built into the louvers.

☐ Weighing 120 tons, a blue whale can speed through the water at 20 knots for short distances and can cruise at 14.5 knots for long periods.



"Coal" Tractor Run by Steam

Live steam powers a scale model of an early type farm tractor, a coal or wood-burning vehicle used many years ago. The model, built by Warren A. Taylor of Kansas City, Mo., is 41 inches long and weighs 200 pounds. It required three years of sparetime work and an outlay of \$204.39 for materials. Built to a scale of two inches to the foot, the model is driven by steam generated from charcoal or by a supply of compressed air.

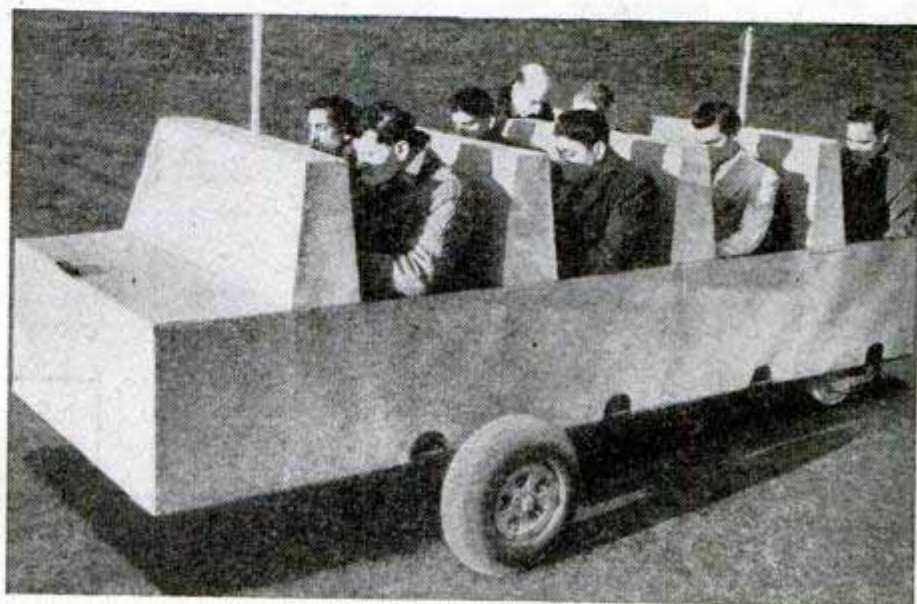


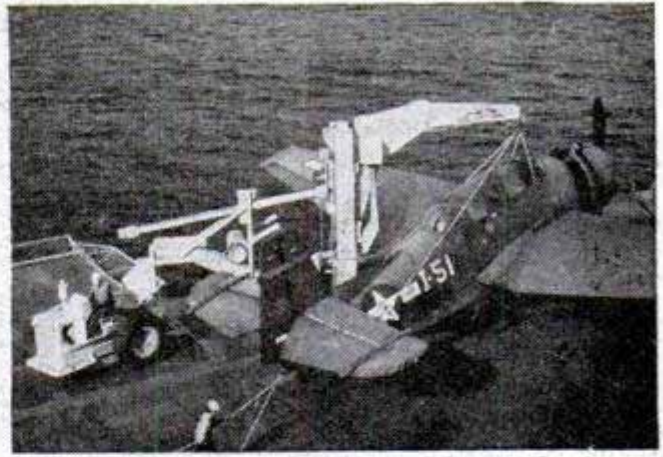
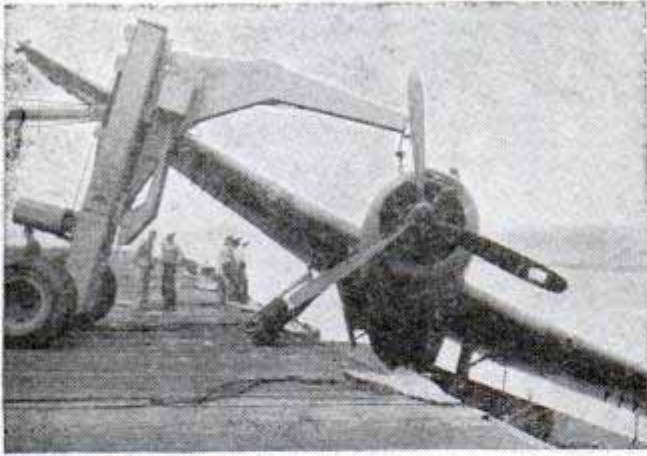
Drum Power Hoist Lifts Four at Once

By installing a multiple drum carrier on a fork-type power truck, one man can move up to four drums at a time. The carrier does not interfere with the driver's vision. It grips the drums firmly by hydraulic pressure and releases them quickly when desired. Not all drums need be the same size; it can handle drums that vary two inches in diameter. The carrier can be removed from the truck in 10 minutes.

"Land Ship" Trains Pilots

Far different from the streamlined planes they are learning to fly, a "land ship" is used to instruct British trainees in compass navigation. The boxlike vehicle is swung around in varying directions by the instructor and fliers learn to adjust their compass bearings accordingly. It is part of the training at the Air Service Training School in England.

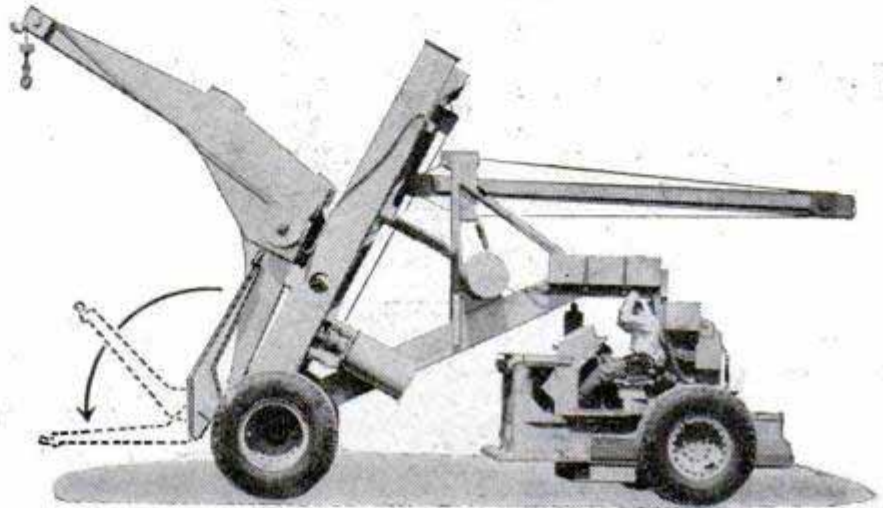




U. S. Navy photos

Carrier Crash Crane Lifts 24,000 Pounds

Flyers can be rescued faster and larger planes salvaged with the Navy's new mobile carrier crash crane, now aboard the USS Franklin D. Roosevelt. It lifts 24,000 pounds, almost double the amount of previous models, and is the first to be operated entirely by electricity. Two lift forks can speedily right an overturned plane if immediate rescue of trapped occupants is necessary. Instead of operating only on the flight deck of the carrier, it can reach out 65 feet over the side of the ship or from the hangar deck to lift up to 13,000 pounds. Though larger than previous types, the



Mobile crash crane has a pair of forks which are extended from the base to speedily right planes that have overturned and trapped the occupants

crane requires less space when folded. It has a speed of 10 miles an hour. The improved capacity permits lifting of the Navy's largest carrier plane, the F7F Tigercat.

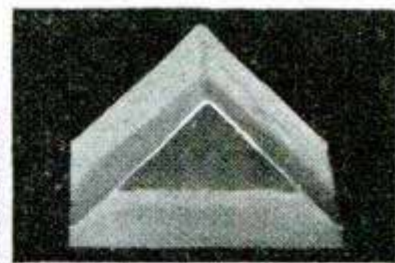
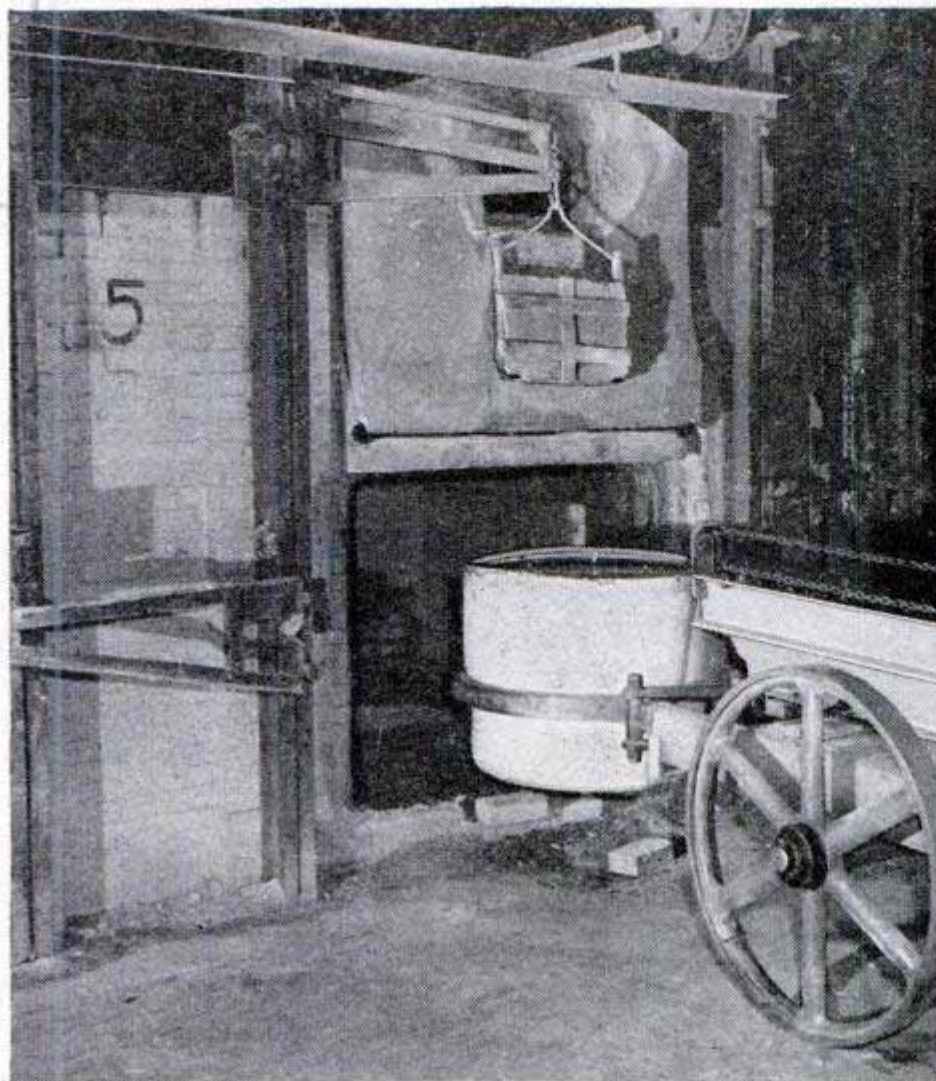
Traffic Cop Dummy Aids School Children Crossing Street



Some policemen in Hawthorne, Calif., can be called dummies safely because that's what they are. With too few policemen to regulate traffic at grade-school crossings, Chief Jack Baumgardner decided to increase his force with life-size wooden dummies. The cutouts, mounted on two-wheeled platforms, hold large stop signs to stop traffic when school children are crossing. A 15-foot pole is attached to the figure and the children push it into the street without leaving the curb. They then cross in safety.

Information, including the names and addresses of manufacturers or distributors, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

After 24 hours in the furnace, the pot, with its load of cooked glass cooled to about 1100 degrees Centigrade, is removed with this wheeled lifter. Panel on right shows glass blanks after removal from the molds



Optical Glass Cookers



These "chefs" in glass are cooking up lenses that will make your binoculars better

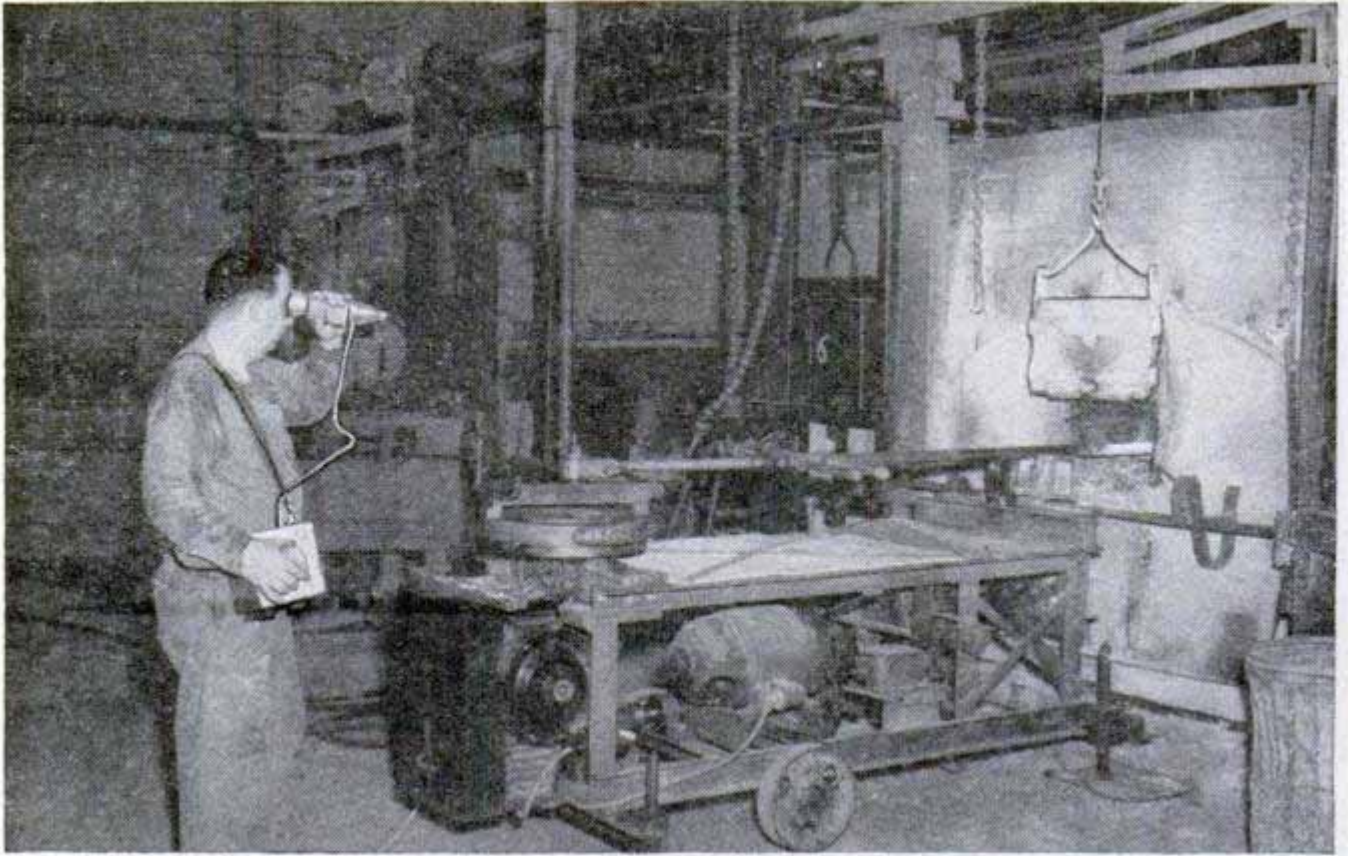
By John L. Kent

"HOW COME?" many an American asked himself early in World War II when asked to lend his binoculars to the Navy. The appeal was reminiscent of the British collection of shot-guns and other firearms in the dark days of 1940 when a Hitler invasion was feared.

The Navy explained why we didn't have enough of these supposedly common optical devices. Civilian requirements for precision optical instruments such as binoculars, telescopes and microscopes in peacetime are negligible compared with the demands made on the industry during war.

Before the war we imported European optical glass. Bausch & Lomb, chief domestic supplier, increased production ten times in 1940 as war drew near. During the war, this company produced over five million pounds, but more was needed. The military asked for help from the Bureau of Standards where research had been conducted since 1912. Three miles





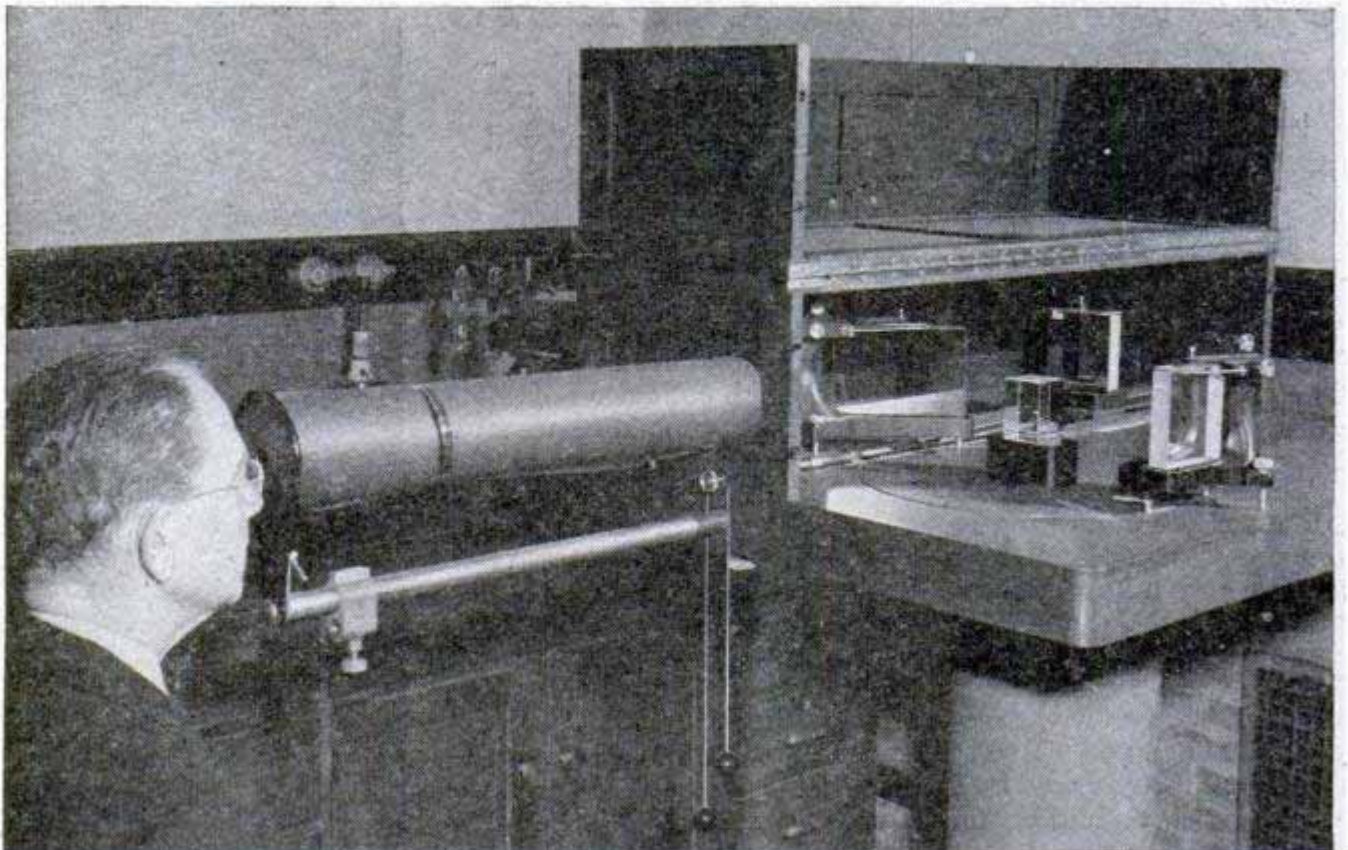
Technician inspects molten glass within the furnace with his optical pyrometer as he gets ready to remove the stirring rod

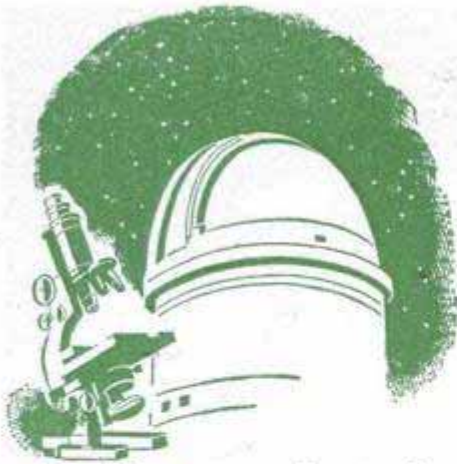
Ground and polished close to perfection, each element is tested by interferometer to assure uniform refraction throughout

from the White House, the bureau's laboratory was converted into a large-scale factory, producing more than a million pounds of high-quality optical glass for the armed services.

Optical glass should not be confused with the glass used in spectacles and reading glasses. Optical instruments must see things that are far beyond the human eye's capacity and must convert them into images which the eye can see. Tiny imperfections which do not affect vision with ordinary eyeglasses cannot be tolerated in instruments.

Perfect optical glass is practically impossible to make, but glass makers strive to get perfection by careful manufacture and the use of only pure materials.





Work begins early in the morning as the charging of the melting pot may take as long as 10 hours. An empty preheated pot is wheeled into the furnace and fired to the right melting temperature.

As the technicians take turns watching the temperature indicator, the raw materials are assembled close to the furnace. A typical batch weighs 1400 pounds and includes sand, boric acid, borax, soda ash, saltpeter, zinc oxide, arsenic oxide and potash. It will produce about 1200 pounds of glass, enough to yield about 250 pounds of optical blanks.

When the temperature indicator reaches the critical point, the hanging door covering the furnace opening is swung up and charging begins. First part of the charge is cullet or waste glass from previous melts. This protects the bottom of the pot and hastens melting of the batch. Then the other materials are added slowly. The pot holds about 7 cubic feet and it normally takes from 5 to 10 hours to fill it.

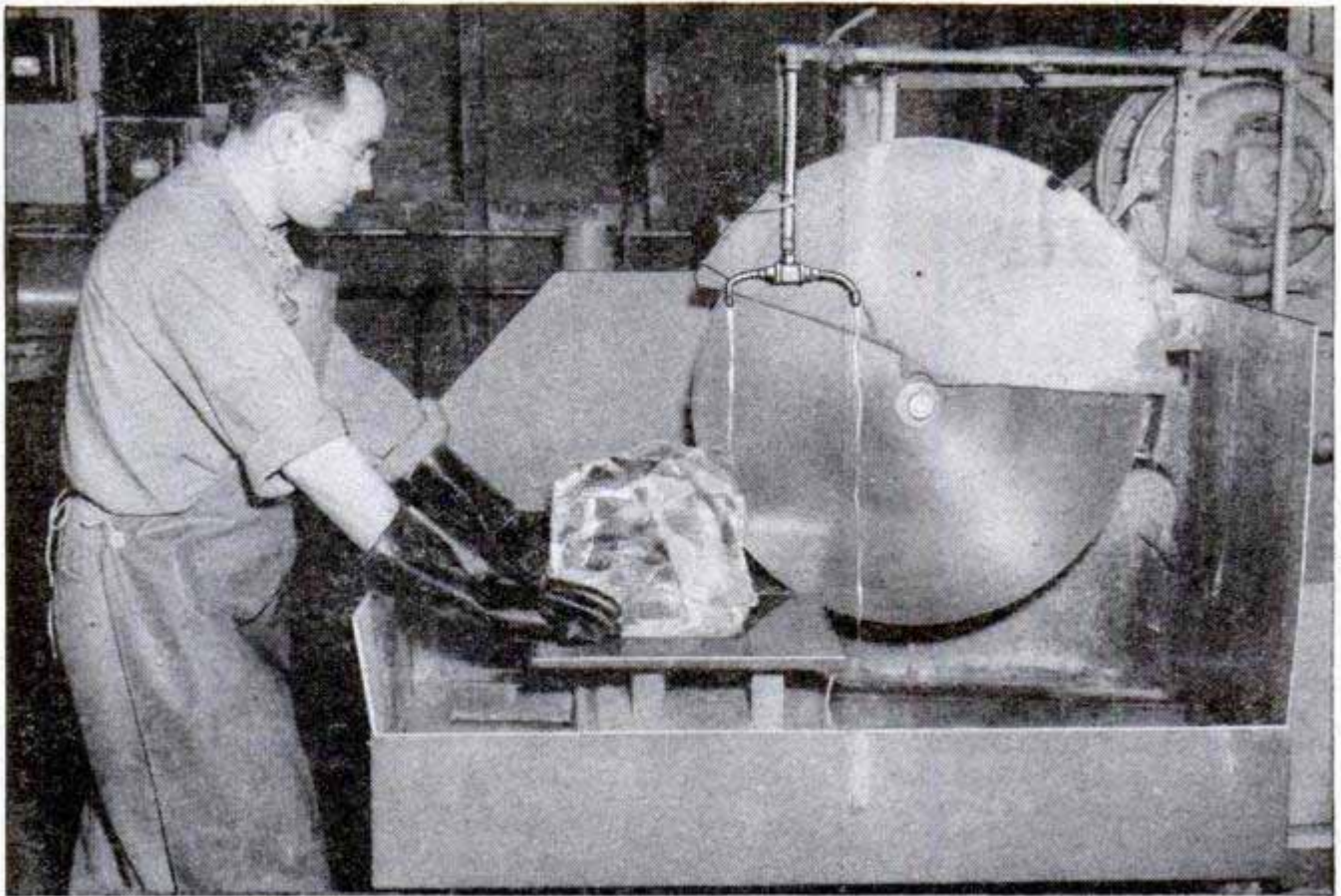
The batch foams while melting. After the foaming subsides, a mechanically-driven, water-cooled metal rod, mounted on a carriage, is inserted through the opening in the furnace gate. At the end of the rod is a special ceramic stirrer or "thimble" made of the same material as the pot. Stirring eliminates bubbles. If not eliminated, these bubbles of gas trapped in the molten glass form "seeds" when the glass cools.



Removed from the molds, the optical-glass blanks are packed in big metal boxes and placed in furnaces for a critical annealing process

In its first cooling period, the glass cracks into irregular pieces that look like chunks of ice. Later it is remelted and cast into molds





Before remelting, the large chunks of glass are cut with a diamond saw into sizes small enough for molding

Seeds and striae are the most common defects of optical glass. Striae are fine streaks within the glass which have a slightly different composition and therefore a different refractive index.

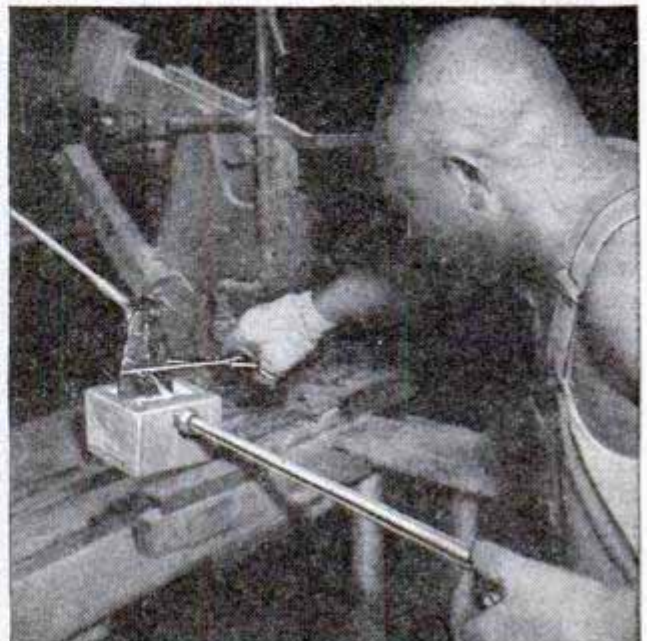
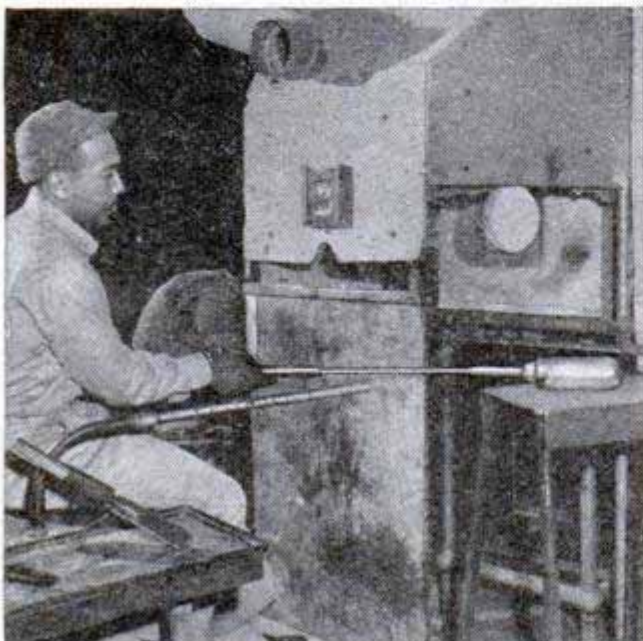
When the molten glass is reasonably free of bubbles, the heat is decreased and the pot gradually cooled in the furnace. Another shift of technicians takes over and stirring continues through the night and into the next day. The stirring is done more and more slowly until the cooling glass thickens to the point where it would be

ruined by further agitation. The temperature at which stirring is stopped is between 950 and 1100 degrees Centigrade, depending on the type of glass being made.

The pot is then removed from the furnace, covered with an insulated jacket and cooled slowly for about 3 days. In cooling, the glass breaks into large chunks which can be handled easily after the pot is broken. The large pieces are then broken or sawed to more convenient sizes for the molding operation.

(Continued to page 224)

Left, on the end of the punty, the soft glass is rolled until it is cut with scissors (right) to fit mold



Radar "Eyes" of Airliner See Storms 150 Miles Away

"Eyes" that see 150 miles through darkness, fog and other obscuring weather are being installed in the front of airliners. The airborne visual radar presents on a screen in front of the pilot a picture of mountains, tall buildings and nearby aircraft to help prevent collisions.

Oil Solution Washes Cars

By the addition of a newly developed organic detergent, Diesel oil and kerosene are given soap-like properties and can be used effectively to remove mud and grease from trucks, buses and automobiles. One part detergent is mixed with 100 parts of the oil. The solution is sprayed over the painted surfaces and allowed to penetrate the grime, which is then rinsed away by water from a hose.



← Golf Practice on Swivel Tee

After properly hit golf shots a ball swivels freely on a portable driving range that can be used either indoors or outdoors. If topped, the regulation-size rubber ball swivels erratically around the cast-iron base to which it is anchored. The unit has three steel spikes that can be pushed into the ground for outdoor use.

Self-Winding Reel on Droplight Ends Slack-Cord Nuisance

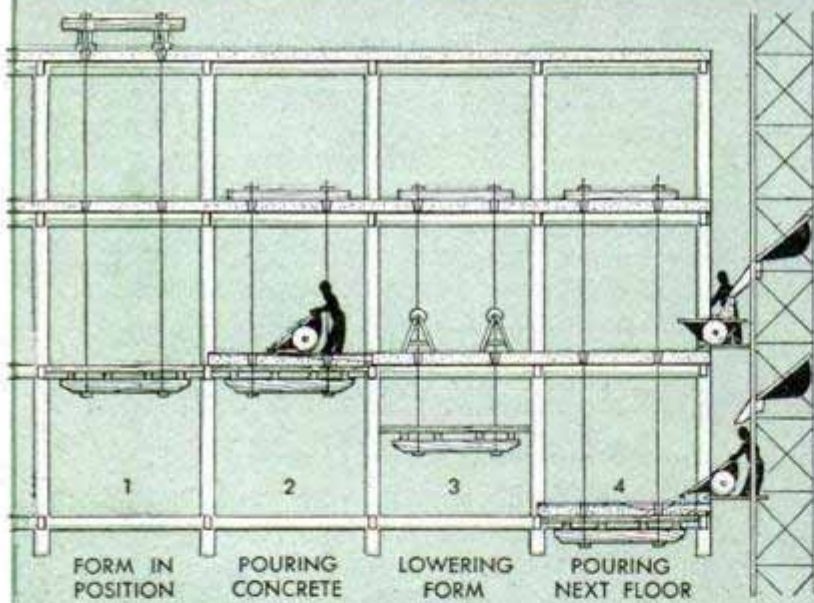
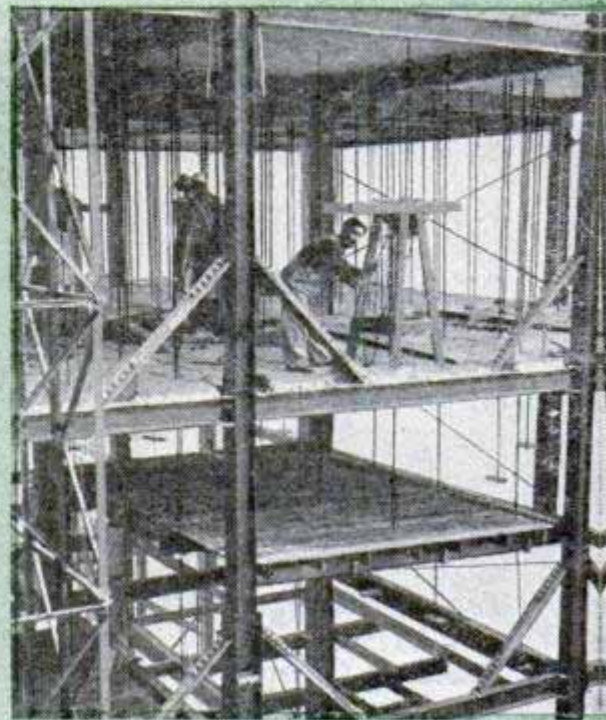
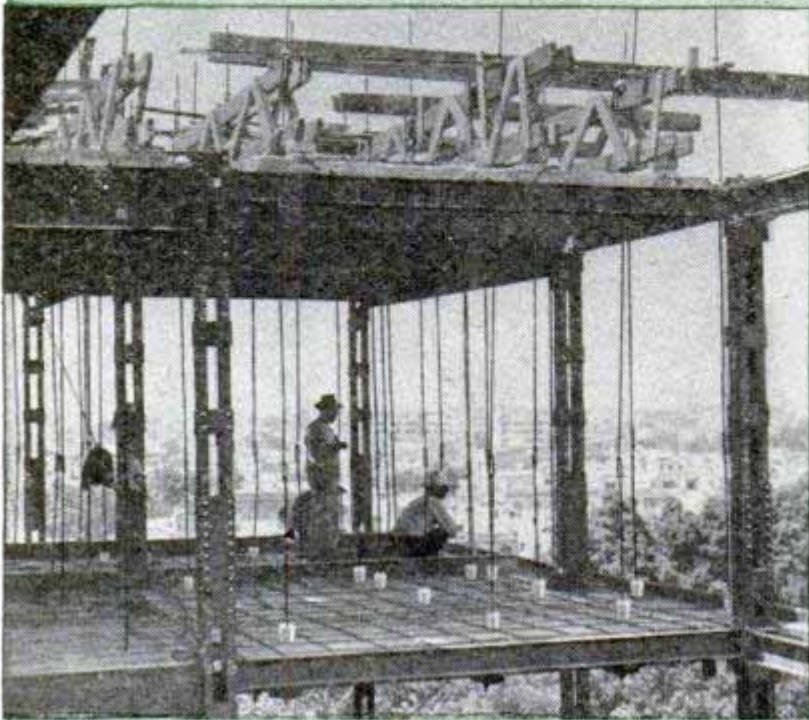
With 20 feet of cord on a self-winding reel, a combination drop-light and trouble light can be used at various heights without dangerous slack cord. The rubber handle contains the off-on switch. For reeling and unreeling, the bracket swivels almost 180 degrees and rocks 90 degrees.



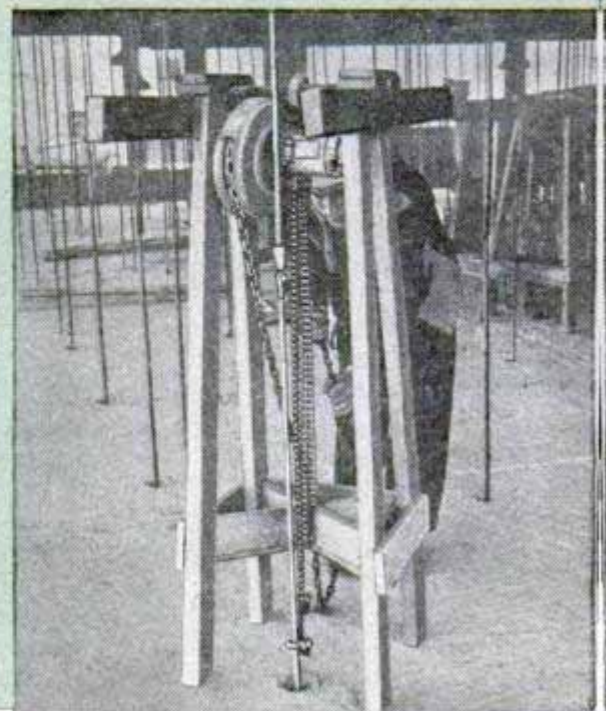
Scientists have measured the speed of lightning traveling 133,220,000 miles an hour and the pace of a snail crawling .000-363005 miles an hour.



POURING a BUILDING from the



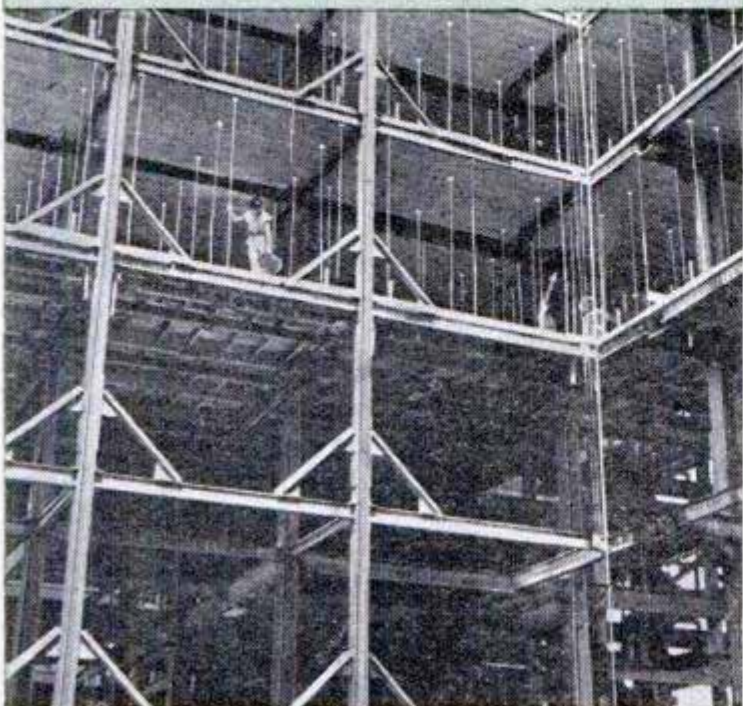
Top left, with roof poured and set, "elevator" form is suspended from the roof support on steel rods. After the concrete hardens, form will be moved one floor lower. Above, chain hoists are used to lower the form. Left, diagram shows the successive steps as the floors are poured from the top down. Roof supports the form only while top floor is poured. Bottom left, steel rods set between two planks and reinforced by a crosspiece support the form, which is removed as soon as the concrete partially hardens. Below, chain hoists move the form from floor to floor. Rods move through holes in the new concrete



TOP DOWN

POURING concrete floors in reverse order is the method used successfully in Mexico and now under trial in the United States. Instead of pouring the bottom floor and working up, workers pour the roof first and then work downward. The method was invented by Manuel Gonzales Flores, a civil engineer of Mexico City. Principal feature of the system is a concrete form which descends like an elevator as each floor is poured. The steel framework of the building is erected in the usual manner. Then the concrete form is suspended from the roof framework on steel rods, adjusted until it fills the top floor, and filled with concrete. When the concrete has partially hardened, all the suspension rods are loosened except two, which are used to lower the form to the next floor, where it again is anchored in place and the process repeated. As the interior rods must pass through the concrete when the form is lowered, wooden cones are inserted to provide openings. The system enables the builder to use the same forms many times with subsequent savings in material, time and labor. After the top floor has been poured, it provides a "roof" over the building, protecting workmen during bad weather. By using the system, a building can be completed in one third the time required by conventional methods, according to the inventor.

View from below shows bottom of the form. System permits using same form as many as 30 times



Radio Controls Camera Lights

Photographic lights some distance from the camera can be set off by radio through a system invented by Kenneth Goodman, an electronics engineer of Columbus, Ohio. Attached to the camera is a miniature transmitter which sends out a signal at the proper instant. The signal is picked up by a receiver at the base of the light and flashes the bulb. The light then transmits the signal to similar lights.



Auto Towing Bar

Only 60 seconds are needed to install a tubular-steel rod as a rigid towing hook-up for passenger cars and light trucks. It is held in place on the bumpers by two steel clamps, each tightened by a single wing nut. Weighing 8 pounds, the 39-inch-long tow bar can pull 4000-pound vehicles up a grade of 25 percent.

¶ If all cropland in the United States were divided among the inhabitants, each person would have about three acres, a decrease from the average of four acres at the end of World War I.



Model-T of the Airways

Fifty miles on a gallon of gasoline is one accomplishment of a new plane described by its designer as the "Model-T of the air." The builder, Al Mooney of Wichita, Kans., used four steel belts to gear a 26-horsepower midget auto-type engine down from 3900 to 1950 revolutions a minute. Fuselage construction from nose to the rear of the cockpit is metal and from there back it is wood. The entire tail can be moved forward or back seven degrees, making elevator trim tabs unnecessary. Mooney's plane has a 27-foot wingspan, is 18 feet long and weighs only 450 pounds empty. It cruises 90 miles an hour and has a normal gasoline capacity of eight gallons.

Right, demonstrating slightly more than seven-degree arc of movement, eliminating the need for trim tabs, ruler shows normal position of tail on Mooney plane



Swiss Golf Watch Keeps Hole-By-Hole and Total Score

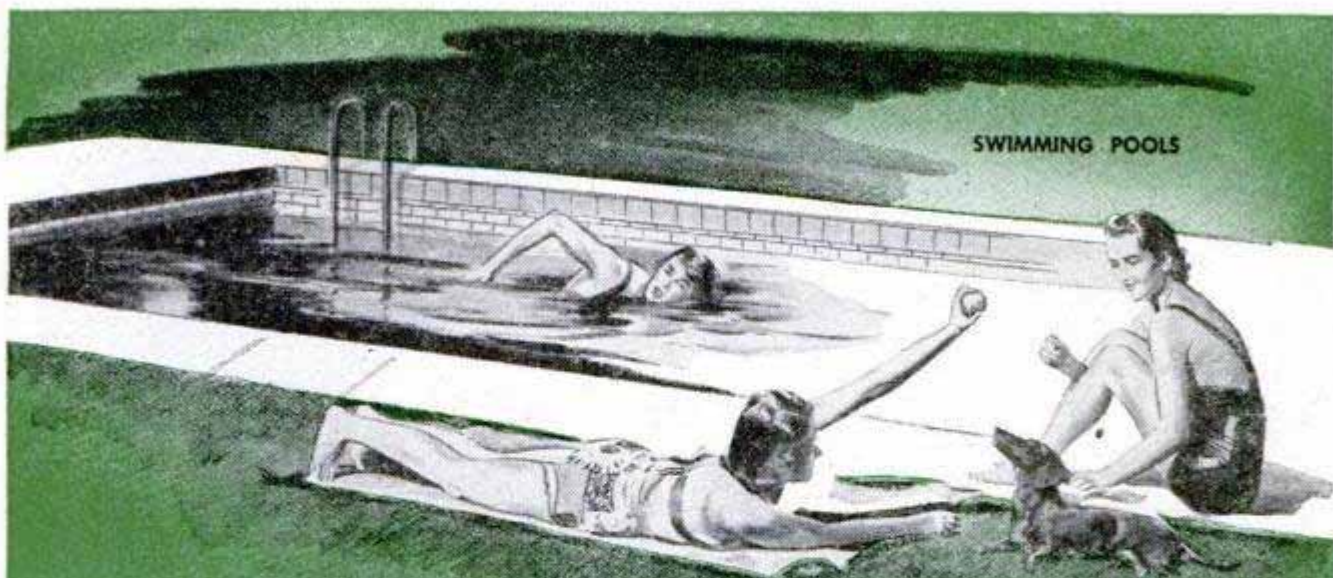


"Minute" hand on scoring watch indicates hole being played. Pressure on crown registers each stroke and "hour" hand reveals total in units of 10. A "second" hand shows single strokes

Golfers can keep a hole-by-hole and total score on a unique Swiss watch. In place of the usual 12 hour numbers, there are 18 openings to indicate holes in a round of golf. A blue "minute" hand is turned forward to each hole being played and the crown pressed down every time a stroke is taken. The

strokes (up to 10) are registered on a small disk opposite the number of each hole and this number stays there after the minute hand is moved ahead. A red "hour" hand keeps the running total in units of 10 and a red "second" hand records single strokes. For example, if the minute hand is at 14, the hour hand at six, and the second hand at eight, a player knows he has completed 14 holes in 68 strokes. The watch can be cleared for a new round by revolving the blue minute hand once or twice around the dial, which brings the 18 small disks and the two red hands back to zeros.

☐ For people who are hard-of-hearing a new alarm clock flashes a light off and on instead of ringing a bell.



SWIMMING POOLS

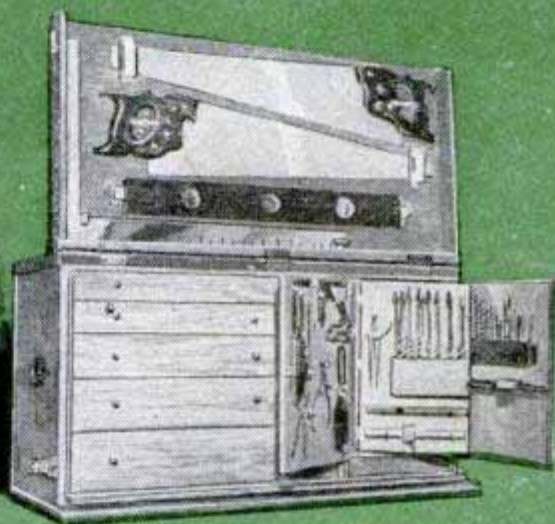
The CRAFTSMAN

★ A practical angle in swimming-pool construction is the money you can save by building the pool yourself. That's added to the fun the whole family will get from it year after year. Beginning on page 170 we outline the construction of pools from the simplest wading type to the most elaborate, with its sloping bottom and walls that require double forming.

★ Craftsmen with the habit of keeping hand tools in order will welcome the bench tool cabinet described on page 199.

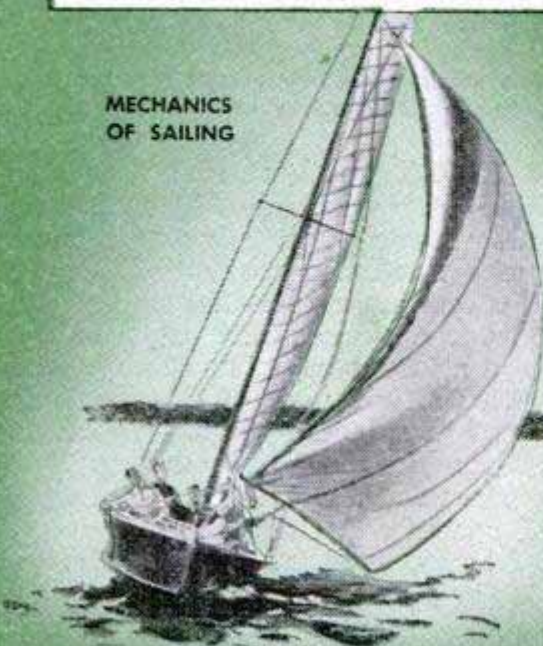
★ Organizing a yacht club from scratch is easy if you get a few old hands together who are experienced on small boats. They'll teach the beginners the mechanics of sailing in short order and at very little cost to members. See page 194.

★ Our regular shop feature for the month, page 202, covers taper turning, how to set up the work, how to figure tapers, etc



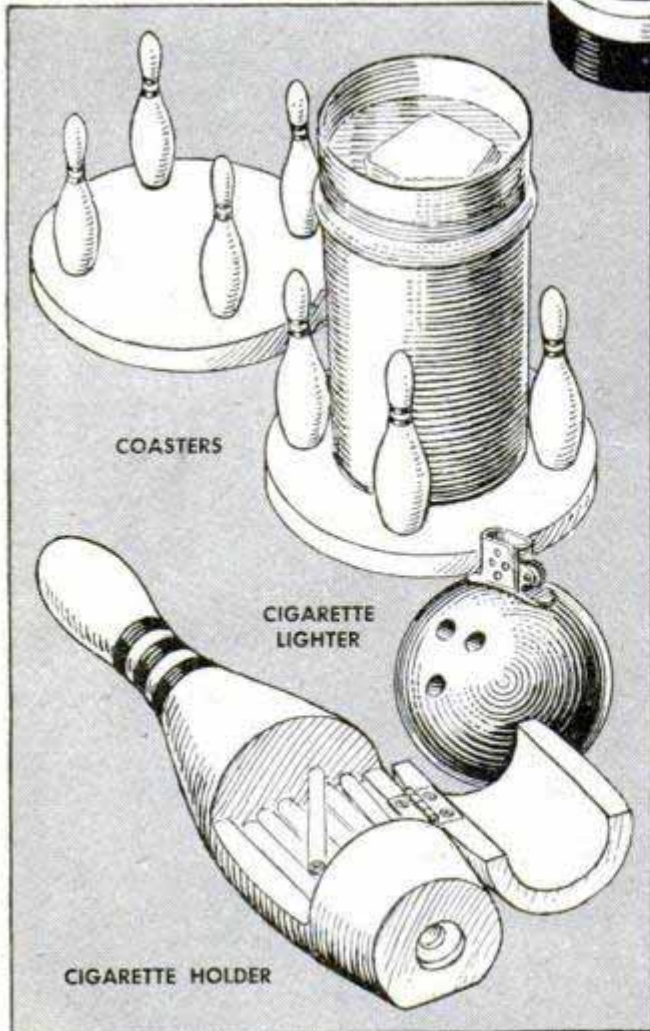
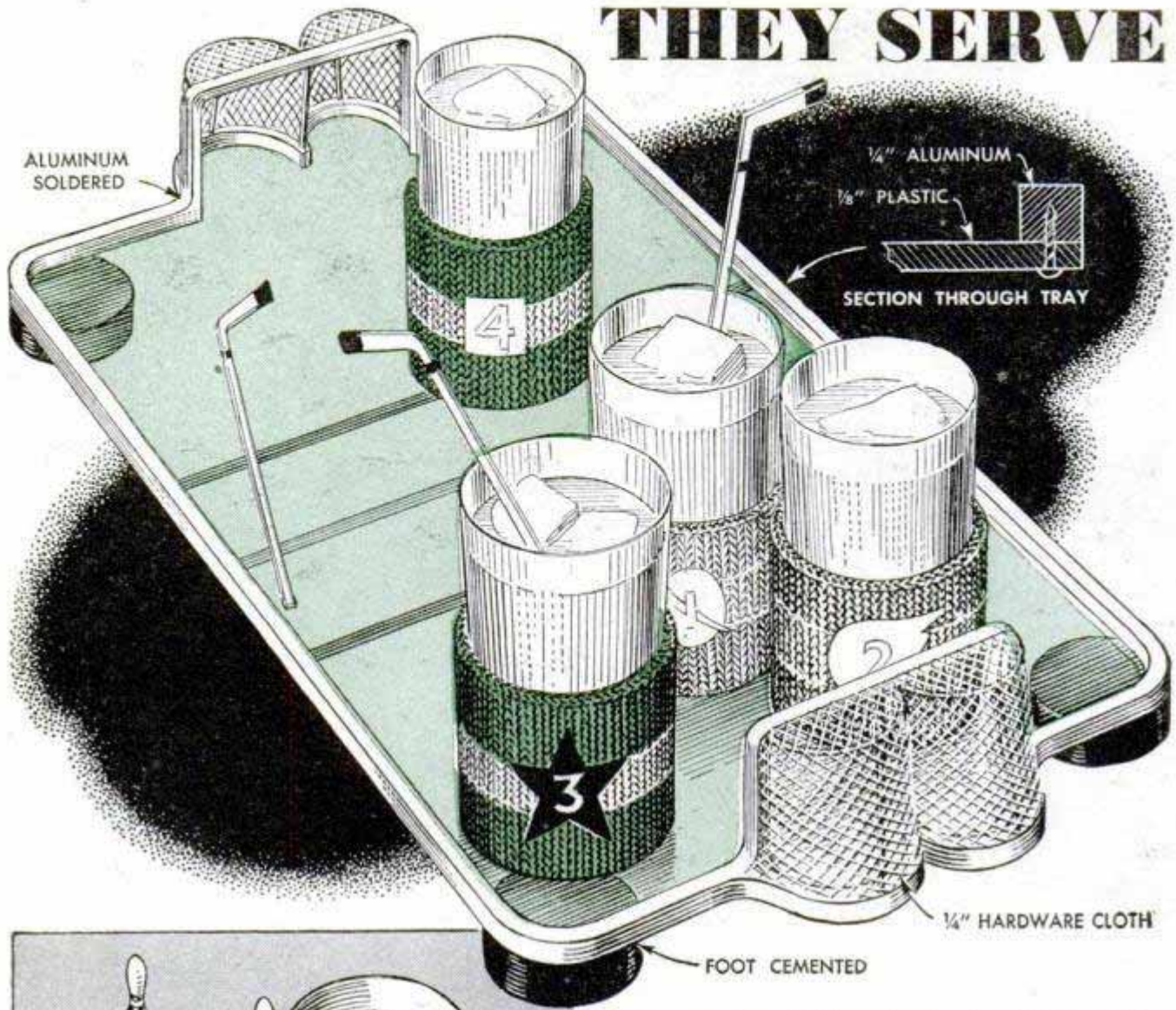
TOOL CABINET

MECHANICS OF SAILING



TAPER TURNING

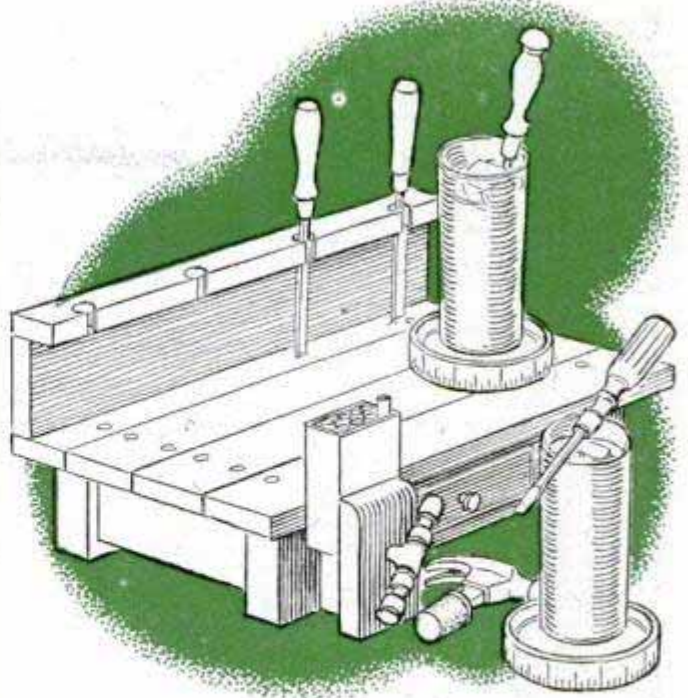
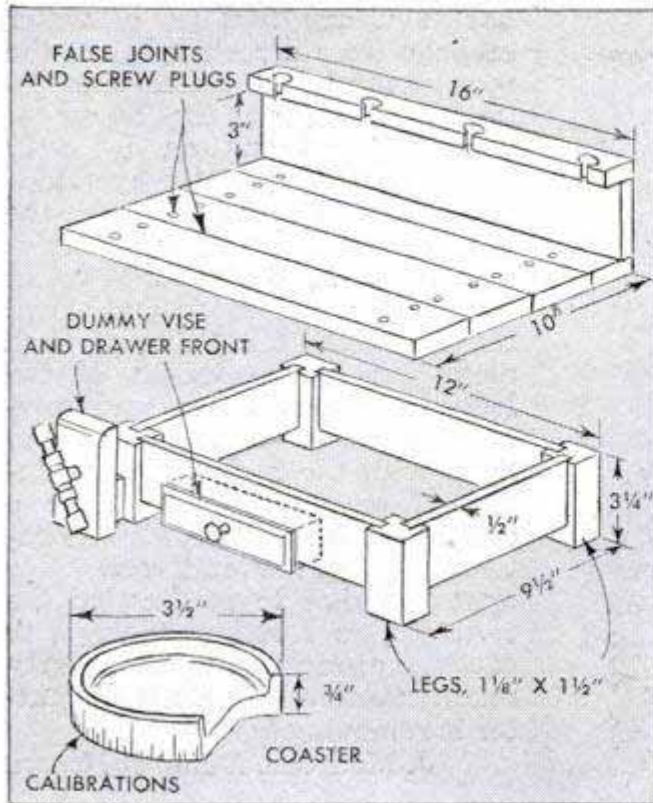
THEY SERVE



Above, a piece of clear plastic, about 12 by 18 in., represents ice for the hockey tray. An edging of $\frac{1}{4}$ -in. square aluminum is bent to conform with the shape of the plastic and attached from below with drive nails. The framework supporting the goal nets is soldered separately, then covered with hardware cloth, using aluminum solder to fasten it. Puck feet are cemented to each corner, and hockey clubs and knitted jackets add to the realism. Left, the bowling set consists of a cigarette lighter fitted in the top of a miniature bowling ball, coasters and a turned tenpin hollowed to hold several cigarettes

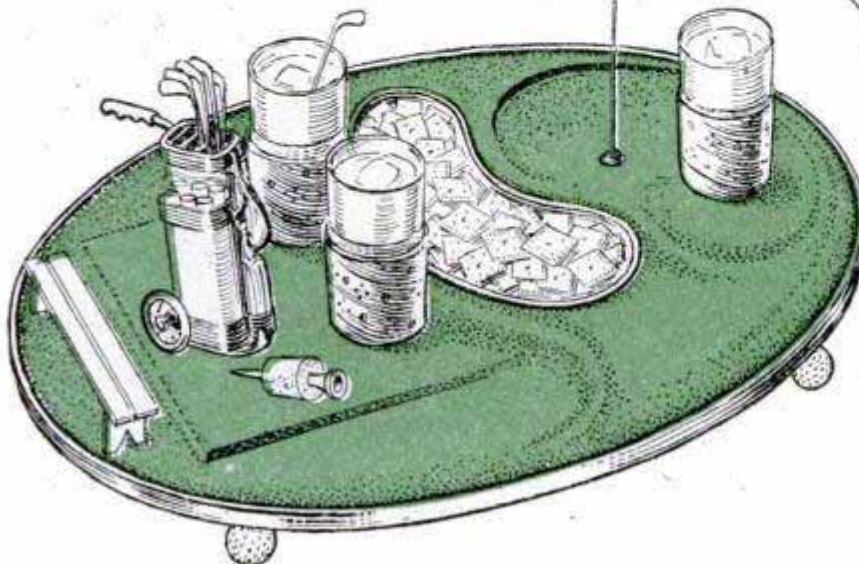
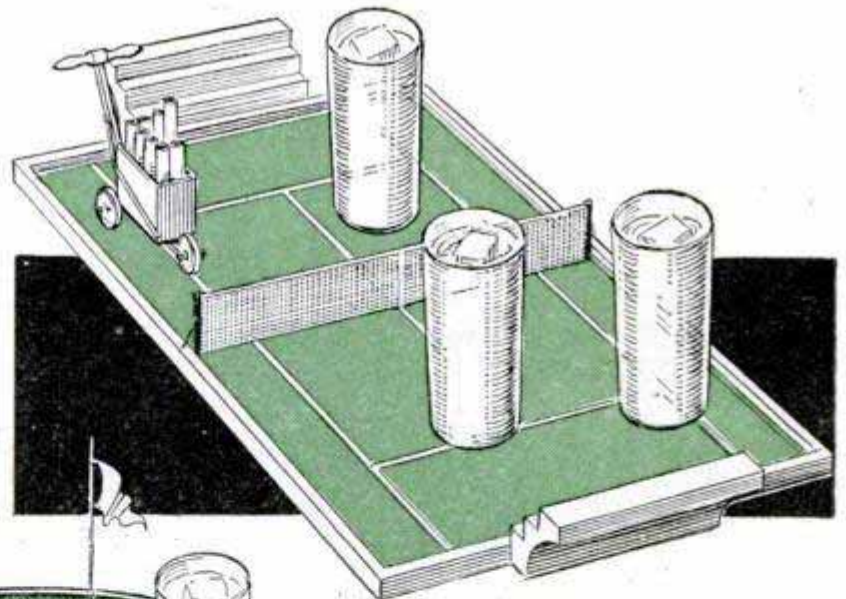
NO DOUBT, you have seen these clever serving trays before. They have appeared nationally in advertisements of Kentucky Tavern, a product of Glenmore Distilleries, in many leading magazines. In response to hundreds of requests for plans on these unusual trays, *Popular Mechanics*, with the approval of Glenmore Distilleries, has selected several which lend themselves most readily for duplicating. Some serve as table accessories, others for actual serving. All are sure to intrigue your friends, especially those who have hobbies or participate in a sport exemplified by the tray. The little workbench tray will make a hit with woodworking hobbyists, the bowling set with keglers.

YOU RIGHT



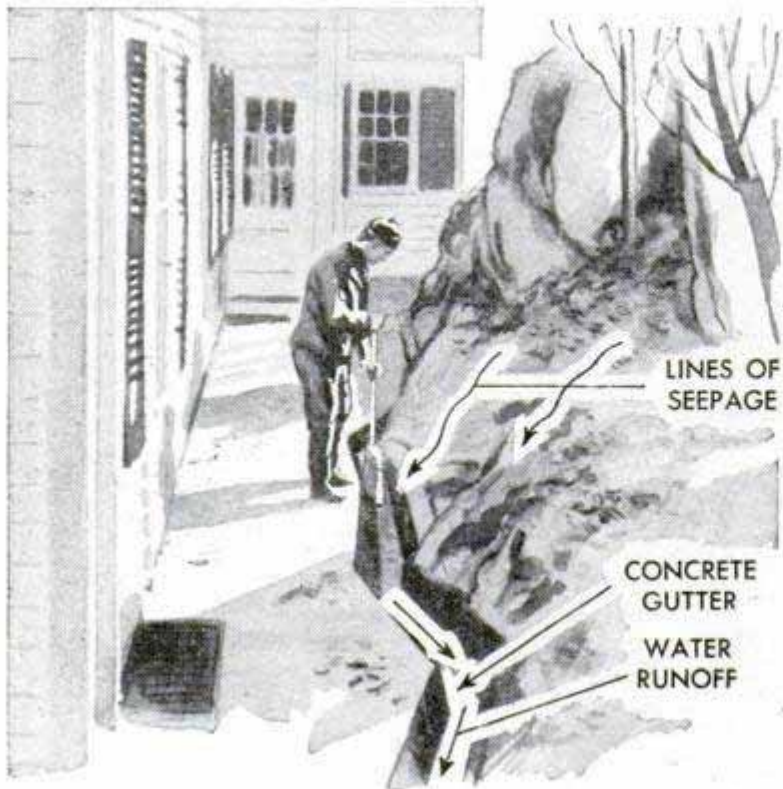
Whatever your hobby, the latest fad is to exemplify it in the form of a serving tray, as shown in these four examples. The workbench tray is designed for the woodworking hobbyist and employs related tools to serve as stirring rods, coasters and bottle stopper. A plastic cigarette case is cemented in the vise

If tennis or ping pong is your favorite sport, the hobby tray at the right is the one for you. The court is a piece of 1/4-in. plywood, painted green, and framed with picture molding. Stepped handles represent bleachers and are attached to each end of the tray with flat-headed screws. A miniature replica of a court marker, which serves to hold cigarettes, is fastened in place with a screw driven up from the bottom. The net is a piece of screen wire or 1/4-in. hardware cloth painted white and stretched between two posts made of straightened L-hooks turned into the base. The court marking is done in white with a striping tool, or with a small brush by first masking off the surface with tape. The handles and edging also are painted white, after which felt is glued to the bottom



Golf fans will go for the tray at the left. The "course" is built up of three pieces of 1/4-in. plywood. Two are cut oval shaped and openings are cut in one of these to accommodate a shallow tidbit tray and to form a slight depression representing the green. The third piece of plywood, which is square and has the edges beveled, is added to provide a raised tee. Then green felt is glued over the entire surface and formed into the depressions. Metal banding covers the edge, a miniature bag holds golf-club stirring rods and cigarettes. Wooden golf balls serve as feet, and leather wristband jackets add to the effect

Concrete Gutter at Rock-Ledge Base Keeps Cellar of Hillside Home Dry



My home is in a beautiful hillside location, but I had the perplexing problem of keeping my basement dry because of water seepage from a rock ledge at the rear of the house. After attempting to waterproof the basement walls without success, I finally corrected the difficulty by building a concrete gutter along the base of the ledge. The gutter is sloped so it drains the water away from the house and down the side of the hill. I dug a trench along the entire length of the ledge back of the house, and troweled concrete on the sides and flush with the rock, using a section of eaves trough to form a channel at the bottom. Cracks between the gutter and rock ledge appeared due to settling of the concrete, so I sealed these with calking compound. The only maintenance required for the gutter is removing leaves.

J. Modroch, Danbury, Conn.

Improved Method for Striping Accurate Border Line on Circular Work

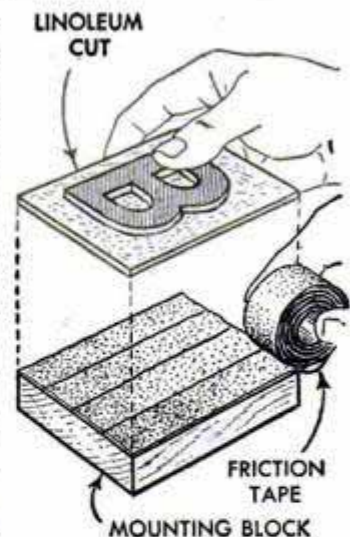
Instead of using the edge of the work itself as a guide when striping a border line around a disk, a better job results if the work is rotated and the striping tool is held stationary against a fixed point. This method produces a perfect circle by preventing any irregularity in the edge of the work from being duplicated in the striped line. The work rotates on a nail point located at one end of a scrap board. Another nail is driven in the board a distance from the pivot point slightly greater than the radius

of the disk. The guide arm on the tool is set for depth and is held against the nail while the work is rotated.

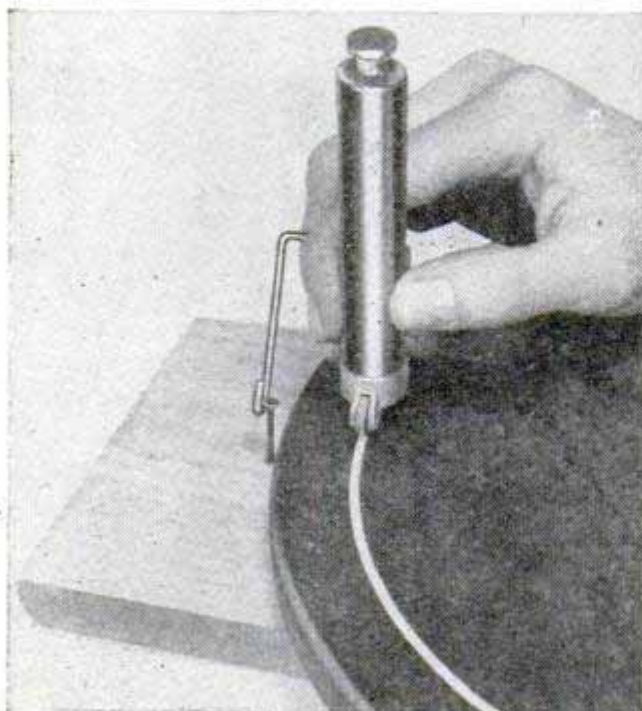
Richard Hanscom, Elmhurst, Ill.

Linoleum-Block Cuts Mounted With Friction Tape

When electricians' friction tape is used to mount a linoleum-block cut, the cut can be detached simply by peeling it from the wooden base. This method enables just one mounting block to be used for several different cuts, if they are of approximately the same size. As the friction tape is sticky on both



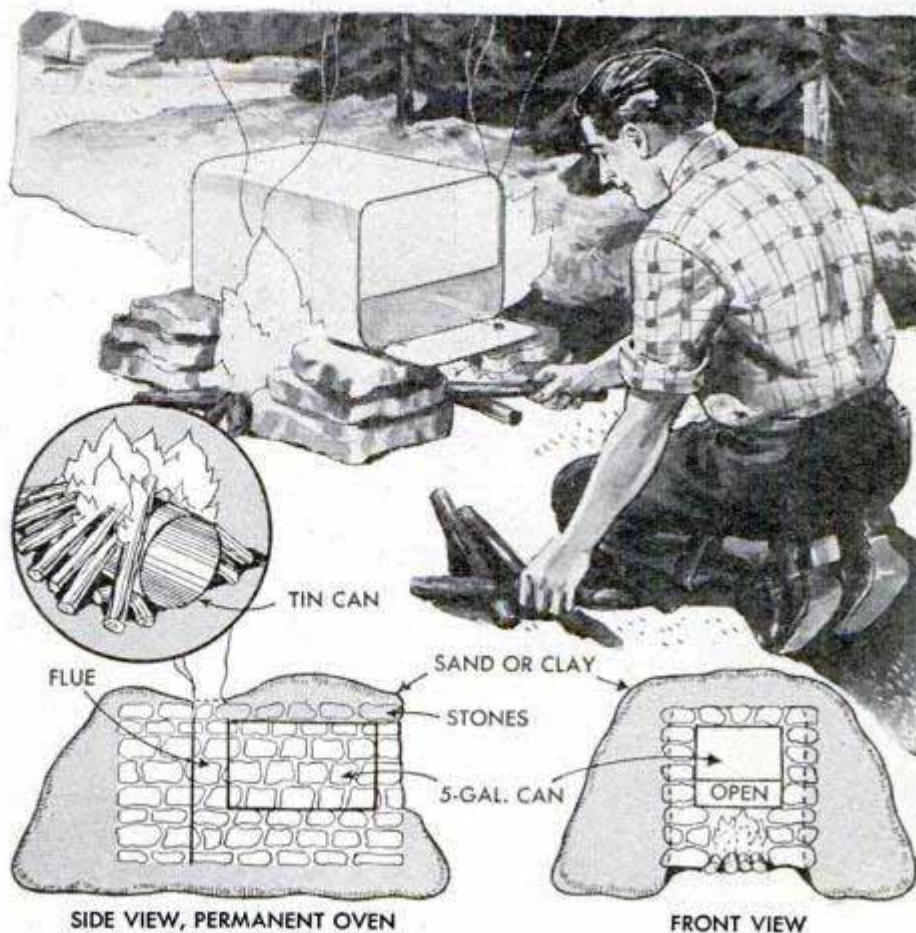
sides, the strips are attached to the mounting block by pressing them in place, as shown in the drawing. Then the linoleum cut is pressed down on the tape. Cover the entire surface of the block by placing the strips of tape edge to edge. If the tape is not sticky enough, fasten it with airplane cement or small carpet tacks.



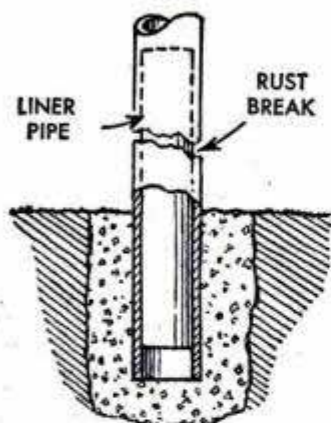
Improvised Outdoor Ovens Give Uniform Heat

By cutting a section from the top of a 5-gal. can and hinging the piece with wire to serve as a door, an excellent camping or picnic oven can be improvised inexpensively. In use, the can is placed over a fire and supported by stones, which confine the heat to the oven, maintaining ample heat for roasting or baking. In addition, smoke and dust will not contaminate the food. A permanent oven is made by building up rock around the can to form a flue, as shown, and covering the unit with sand or clay to provide insulation. Light baking may be done by spreading a ½-in. layer of sand over the bottom of the can. A small oven for baking fish or toasting marshmallows on a fork is made quickly by building a fire over a round tin can, which has been laid on its side. The open top of the can is left exposed to permit inserting the food.

C. L. Meehan, Lakeview, Ont., Can.



Repairing Pipe Fence Posts Rusted off at Base



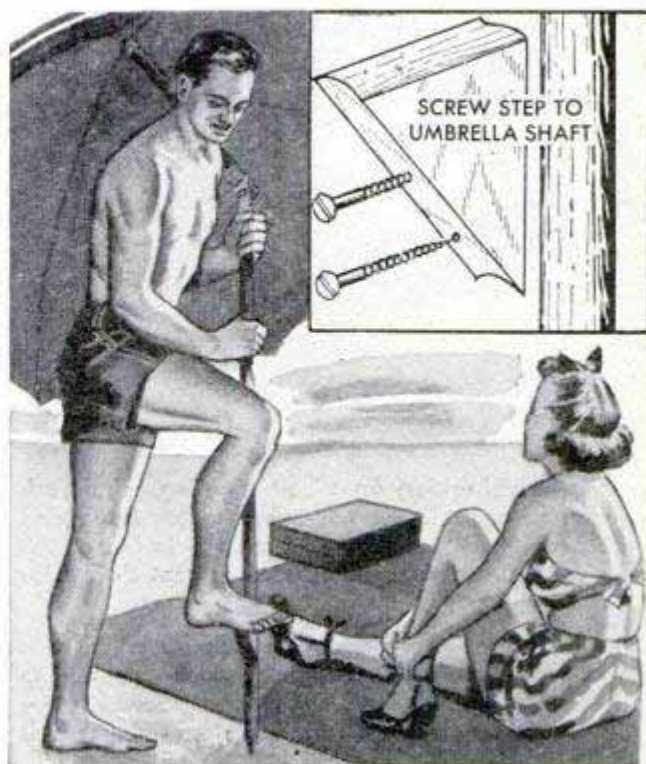
If a pipe fence post has rusted off at its base, it can be repaired to last for years. To make the repair, select a length of galvanized pipe which will fit inside the post snugly. For example, a 1½-in. pipe will fit nicely inside a 2-in. pipe.

The length of pipe required should be twice the length of the embedded post. The pipe is inserted inside the lower half of the rusted post, and then the upper portion of the post is placed over the projecting length of pipe. Coat the break with thick white-lead paint to make the joint watertight. When dry, paint the post with a rubber-base paint.

Evans E. Plummer, Hollywood, Calif.

Step on Beach-Umbrella Shaft Aids Embedding It in Sand

The point of a beach-umbrella shaft may be embedded in the sand easily, if a small step is screwed to the shaft near the point. Just hold the shaft erect and push down on the step with the foot. Groove the step to fit around the side of the shaft.



SOLVING

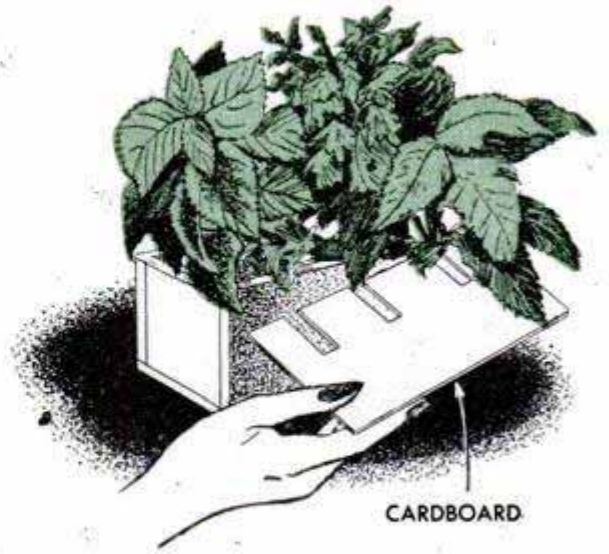


A tablespoonful of uncooked rice and a cupful of warm water poured in a vacuum bottle will get it sparkling clean. Shake the bottle vigorously. The rice-and-water mixture is especially effective in cleaning a vacuum bottle which is used for coffee



To prevent embroidery floss from tangling, wind each remnant of a skein on an empty match book and write brand and color number on the inside of the cover for future reference. Thread is kept clean also

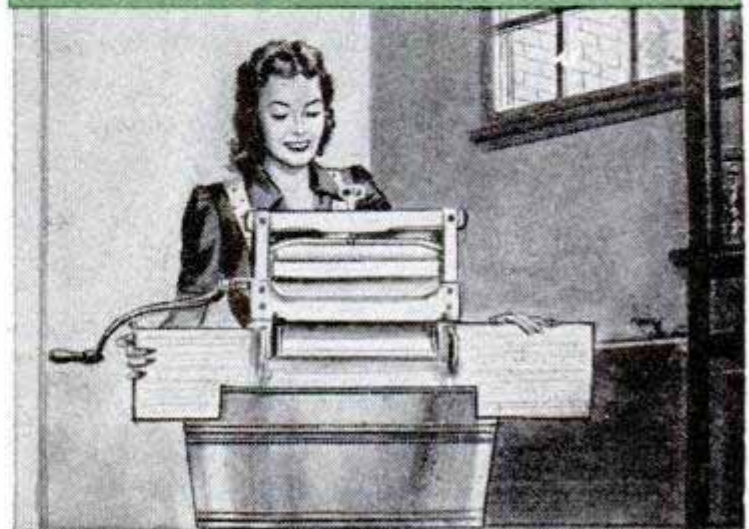
When you want to use a clothes wringer on a small tub and the thumbscrews will not permit clamping to tub, cut two notches in the edge of a board, wedge it over the rim of the tub and clamp the wringer to it



If you are to be away from home a few days, slip a cardboard collar over potted plants to help retain the moisture

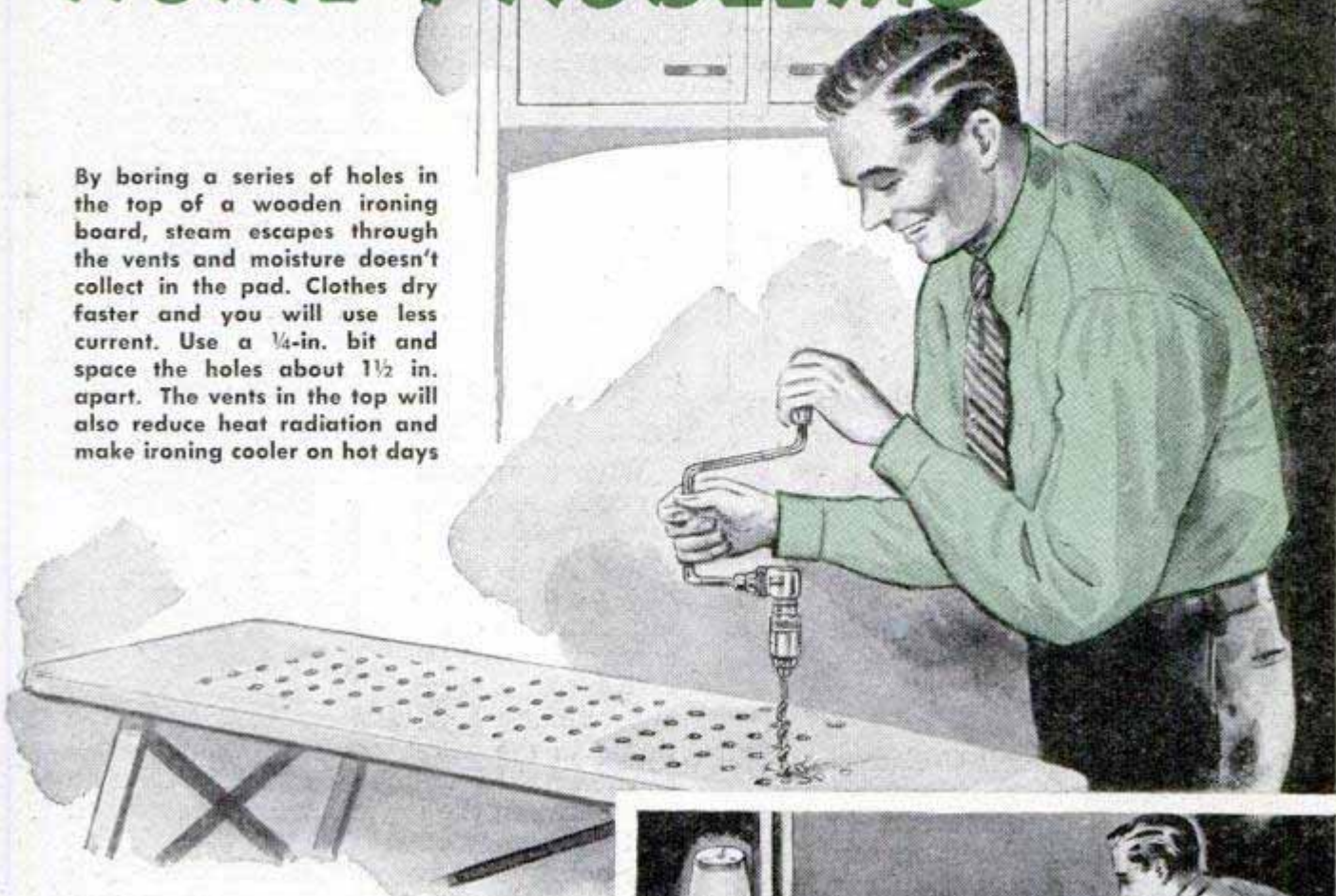


It takes less time to cut out a dress pattern if you use glass tumblers instead of pins to hold the pattern in place on the material, particularly if it is a large pattern requiring many pins

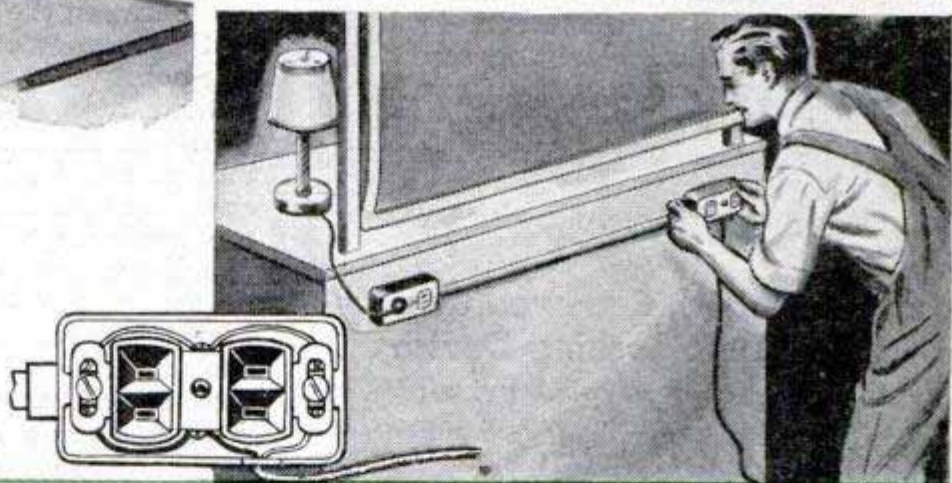


HOME PROBLEMS

By boring a series of holes in the top of a wooden ironing board, steam escapes through the vents and moisture doesn't collect in the pad. Clothes dry faster and you will use less current. Use a $\frac{1}{4}$ -in. bit and space the holes about $1\frac{1}{2}$ in. apart. The vents in the top will also reduce heat radiation and make ironing cooler on hot days

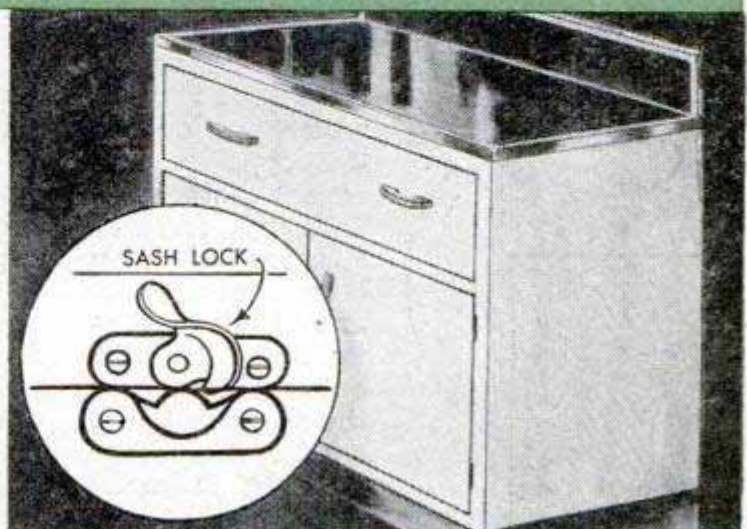


Unsightly wires trailing from boudoir lamps, clock, radio, etc., are avoided if two electrical utility boxes in which the fixtures can be plugged, are attached to the back of a vanity. Boxes are wired and plugged in wall outlet. Protect the wall behind the vanity by padding the boxes

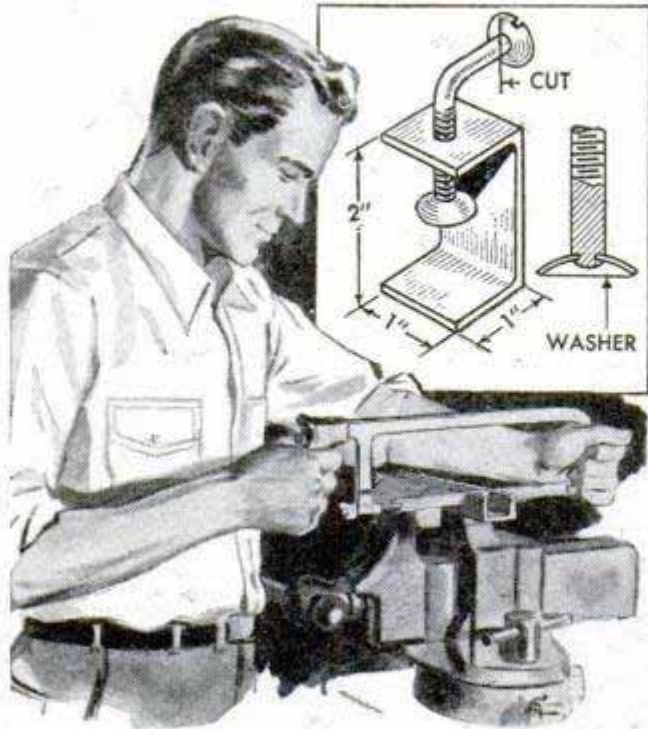


You won't need to worry about getting metal polish on the woodwork when polishing brass door plates if a cardboard mask is cut to fit snugly over the plate and held in position

An excellent inside catch for matching cupboard doors is improvised from an old sash lock. One half of the lock is screwed to the door, the other half to the rail on the inside. Surface of door and rail must be flush



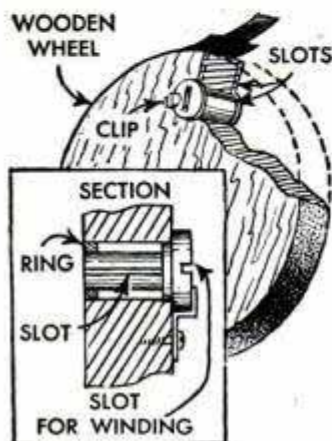
Channel Iron Provides C-Clamps For Modelmakers



Any number of small C-clamps can be mass-produced quickly simply by sawing off sections of a length of channel iron and fitting them with a clamping screw. The clamping screw can be a 1/4-in. carriage or stove bolt, the head being cut off and the bolt bent L-shape. The threaded end is filed to form a tenon to take a cup washer, which is peened loosely to the bolt.

Abrasive Bands Renewed Quickly By Spool-Type Locking Device

Using the camera-spool principle, one man found an effective way to tighten abrasive bands on a wooden sanding wheel. The bands are easy to attach and remove. First, he drilled a hole through the wheel near the rim and cut a slot between the hole and rim. Then he turned a wooden spool which is inserted in the hole as shown. The spool is centered in the hole by a shoulder turned in the flange and by



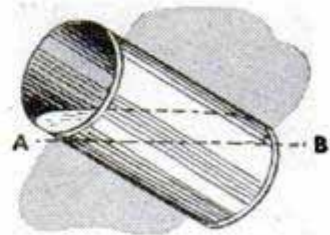
a separate wooden insert ring which is glued in the opposite end of the hole flush with the face of the wheel. The barrel of the spool is slotted lengthwise to take tabs cut on the ends of the abrasive band, and a slot for winding is made across the end of

the spool. To apply the abrasive band, tabs on the ends of the strip are inserted through the slot in the spool. Then the spool is placed in the hole, and at the same time the ends of the band are passed through the slot in the wheel. The spool is turned to tighten the band. When tightened, a metal clip, screwed to the side of the wheel, keeps the spool from unwinding. If necessary, the wheel may be counterbalanced by driving screws near the rim opposite the spool.

Herbert E. Pott, Victoria, B.C., Can.

Easy Way to Pour Half of Contents From Open-Top Container

When you wish to pour half the contents of a full can of paint, gasoline or other liquid into another container, here's a way to get a close

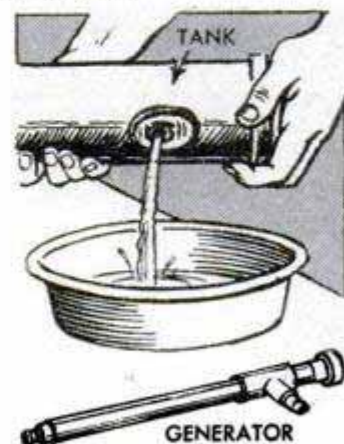


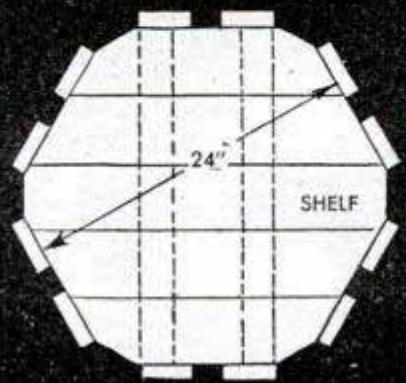
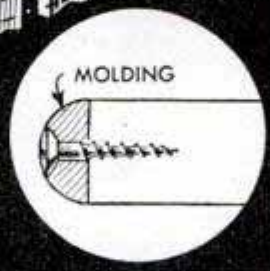
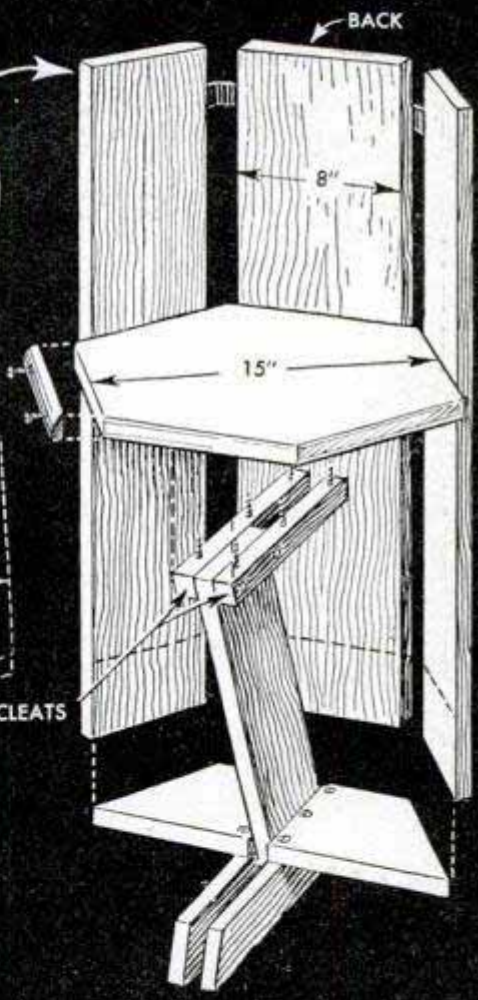
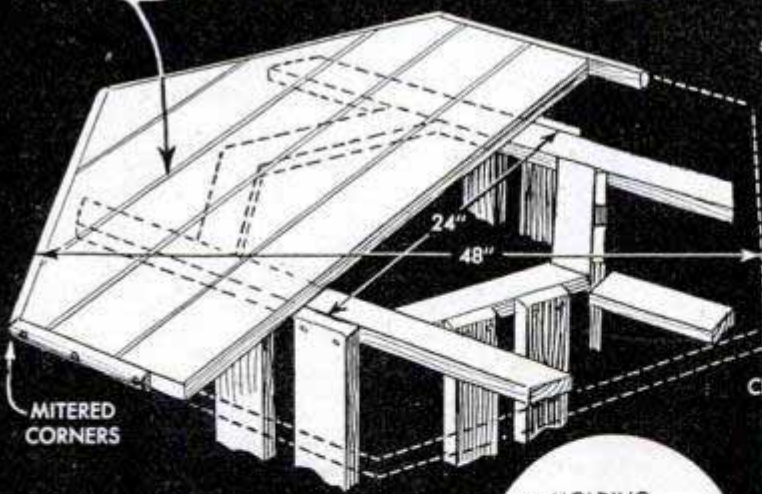
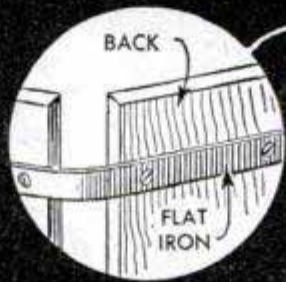
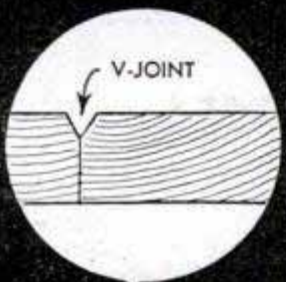
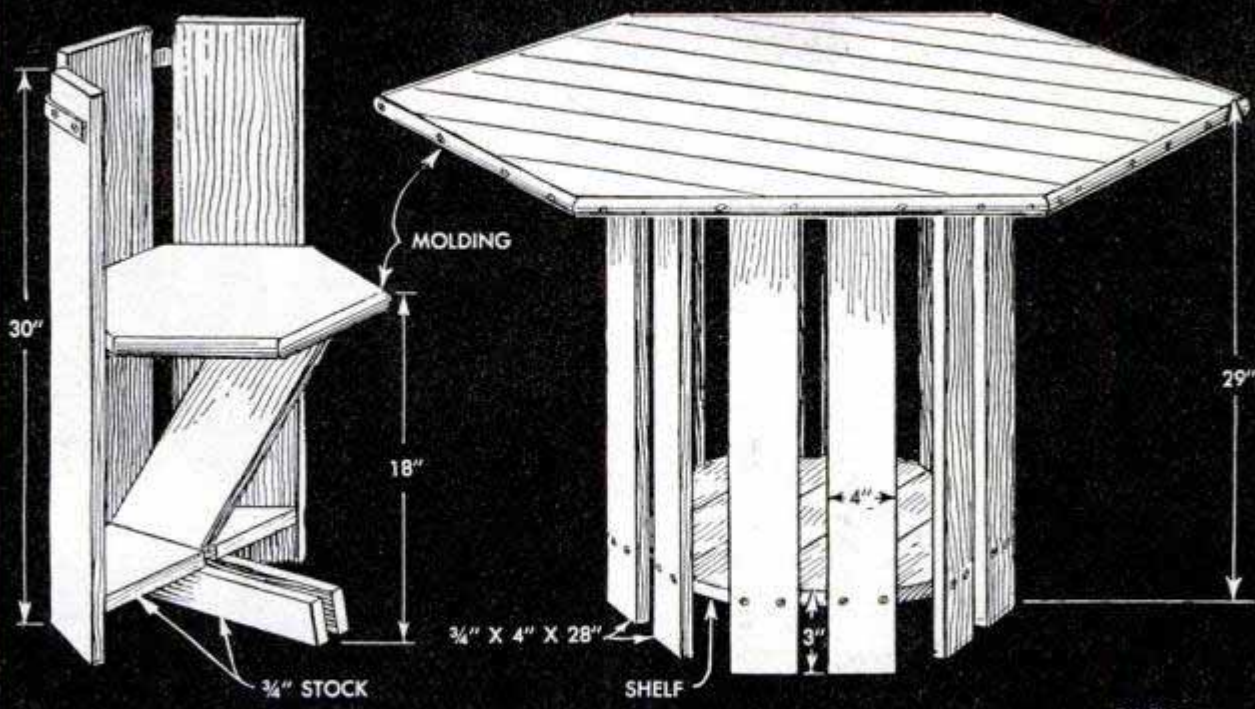
approximation of this amount. Pour the liquid in the usual manner until the level of the liquid remaining in the can forms a line between the lower edge of the rim, A, and the upper edge of the bottom, B. At this point you have poured about one half of the contents from the can. This rule will hold true for both round and square cans, but, of course, it can be done only with open-top containers. If you want to divide the contents of a partially empty can equally, make a mark or place your finger on the outside of the can at the level of the liquid when the can is vertical. Then, use this mark in the same way as you would the lower edge of the rim when pouring from a full can.

Opie Read, Jr., Chicago.

Cleaning Oilstove Tank

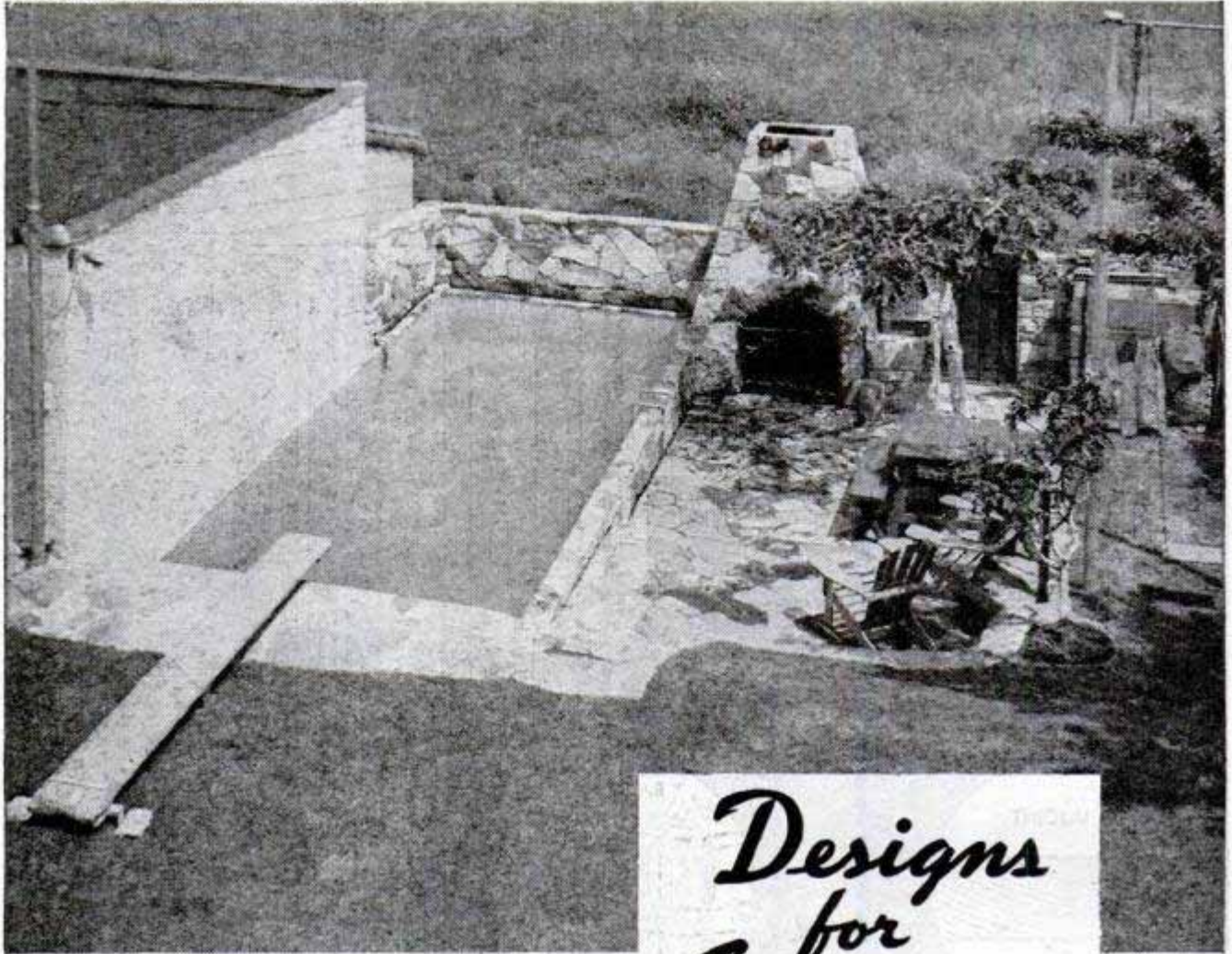
Mere removal of the filler cap when cleaning sediment from the tank of an oilstove usually is not sufficient to empty the tank completely. A better way of doing this, which assures that all foreign matter will be drained out, is to remove the generator-stem assembly from the side of the tank and drain the contents through this hole instead of through the filler-cap opening.—Lester M. Diehl, Pittsfield, Mass.





GARDEN FURNITURE

Pool of Harry J. Keeling, Los Angeles, Calif.



*Designs
for
Swimming*



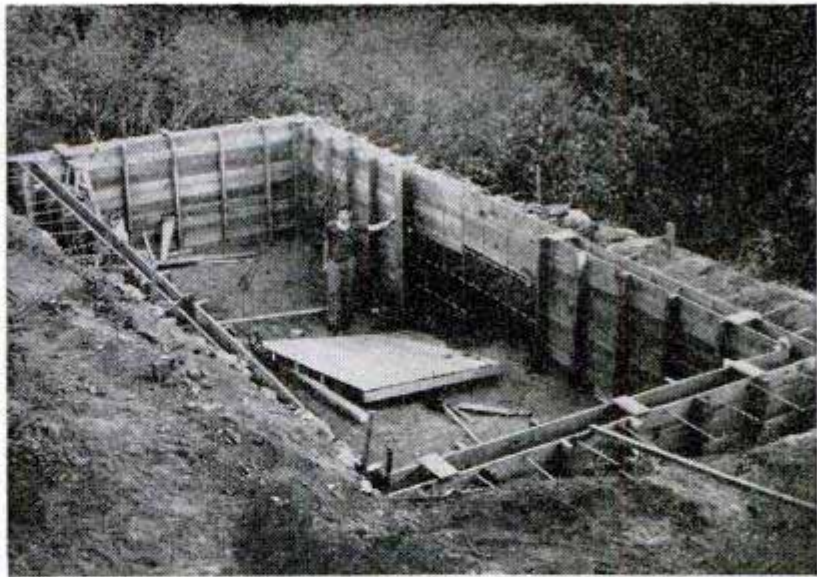
Pool of Irving Snyder, Palm Springs, Calif.

By Hi Sibley

WHETHER it's large and elaborate or small and unpretentious, there's nothing like the privacy and convenience of a swimming pool right in your own back yard. And when you can do most of the work yourself or with the help of friends and neighbors, the cost can be kept well within the limitations of the average pocketbook. The suggestions and pointers presented here cover construction ranging from simple wading pools to a large family-size swimming pool.

When building a wading pool for youngsters, locate it on high ground if possible to simplify draining and also to save excavating, Fig. 1. A simple circular-shaped wading pool is shown in Fig. 2. A novel feature of this pool is a sprinkler head which is attached to a length of coupipe and screwed into a coupling on the drainpipe. The children will enjoy frolicking in the spray from the sprinkler while the pool is being filled. When the sprinkler head is not used, it is removed and the drain stopped with a pipe plug, Fig. 2. The sprinkler feature is practical only if the drainpipe outlet is easily accessible for attaching a hose. Galvanized sheet metal or heavy linoleum makes ideal forms for a circular pool. Fig. 7 shows how stakes and cross braces are used to support metal forms. As a safety precaution, do not make the depth of the pool at the center more than 12 in.

Fig. 6 details a pool of unusual construction which is suitable for youngsters learning to swim. However, it is not desirable in regions where winter temperatures drop below freezing as the 2-in. walls will not withstand movement of the ground due to frost. The excavation for this pool is furred with strips nailed to stakes driven into the earth walls. Then metal lath is stapled to the furring strips and poultry wire is used in the bottom for reinforcement. Walls are plastered with cement and the



Here is an example of how a pool built on sloping ground reduces the job of excavating. Double-formed, pool is ready to be poured

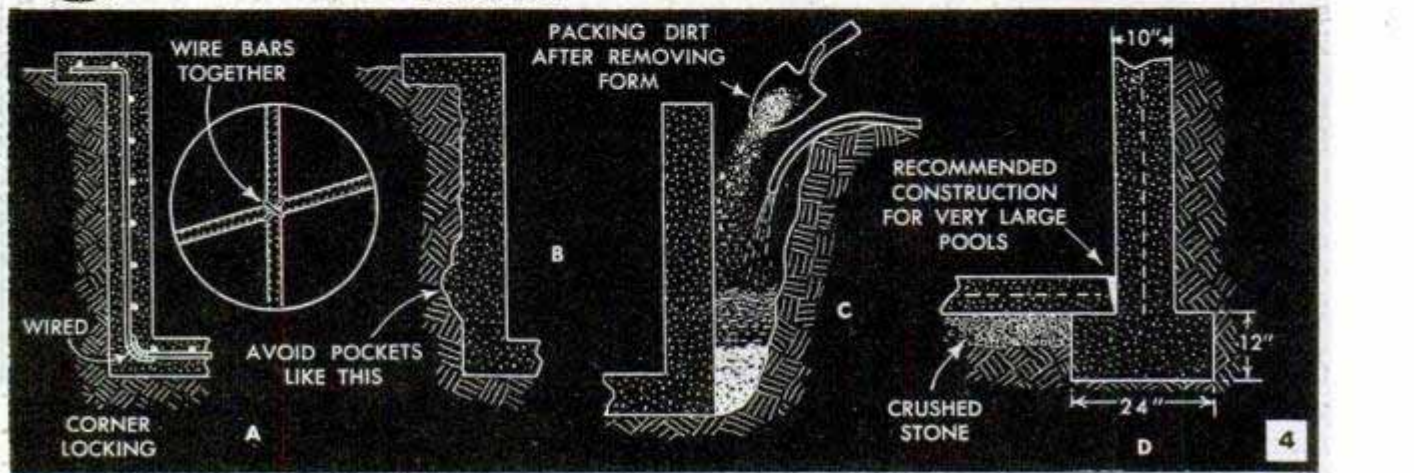
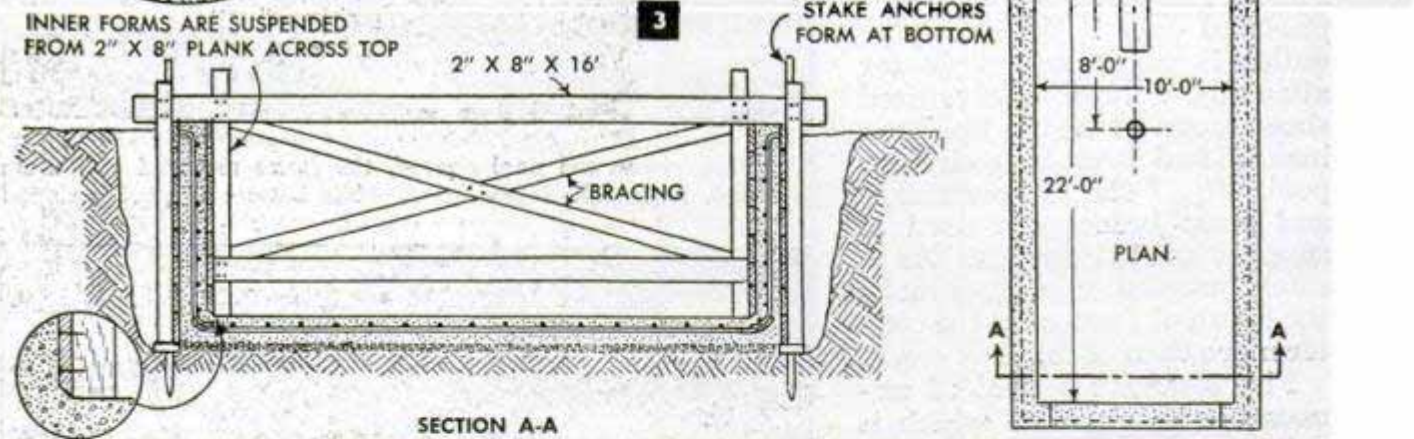
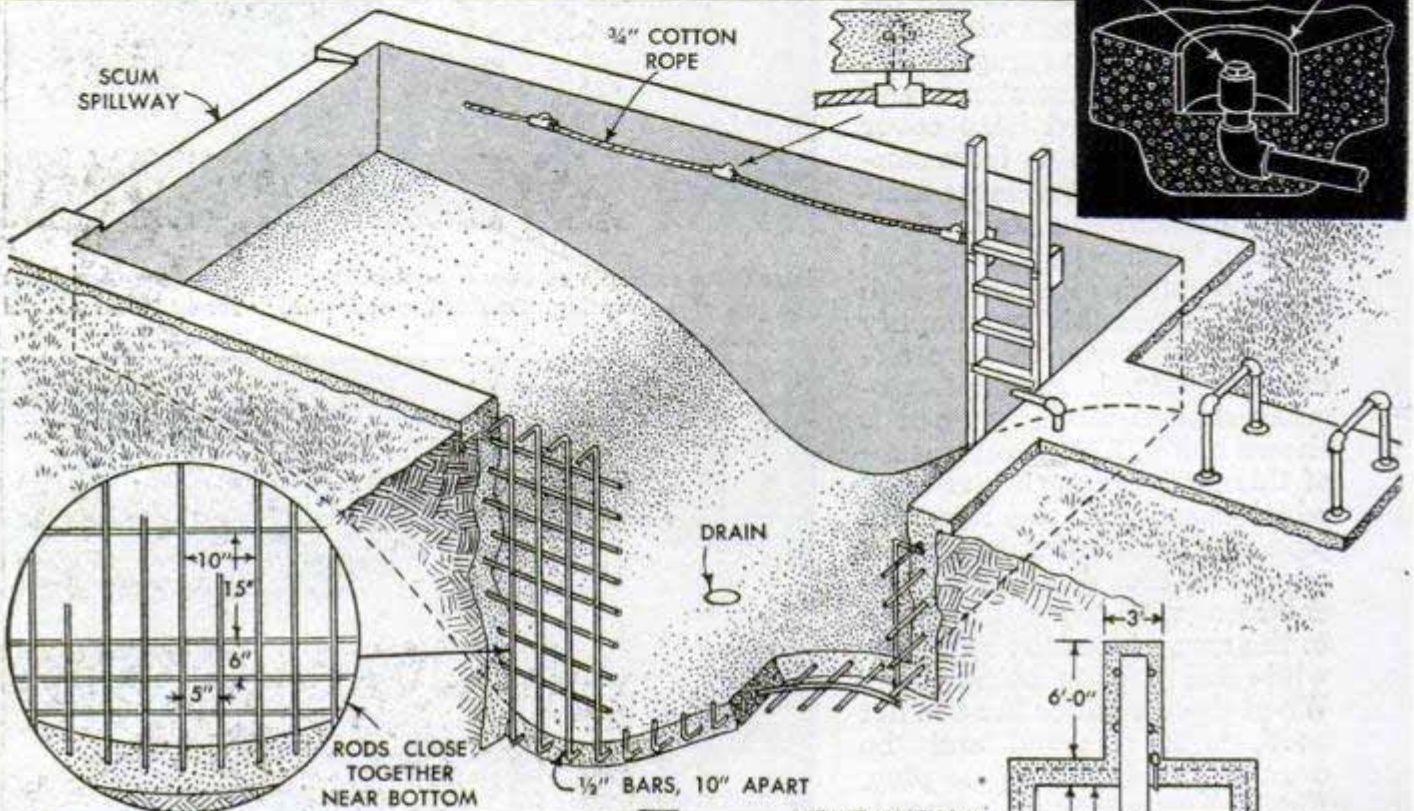
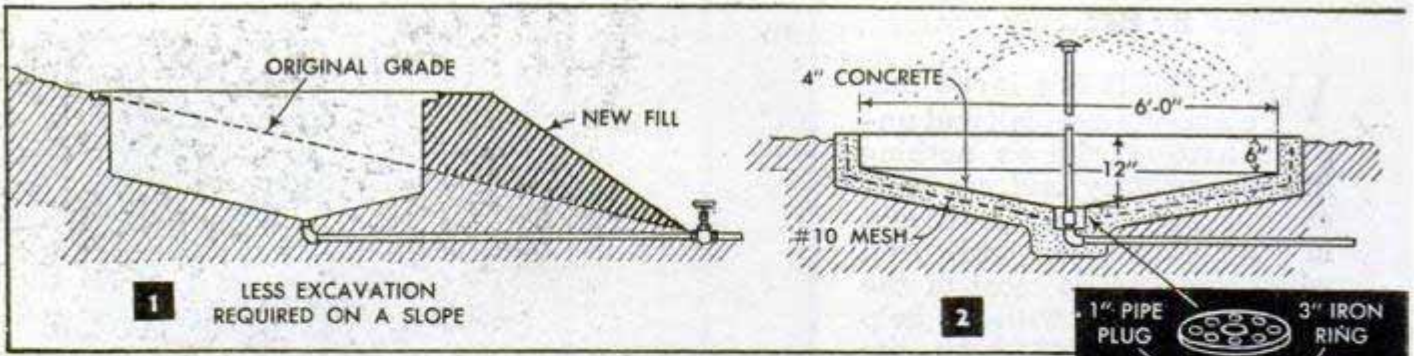


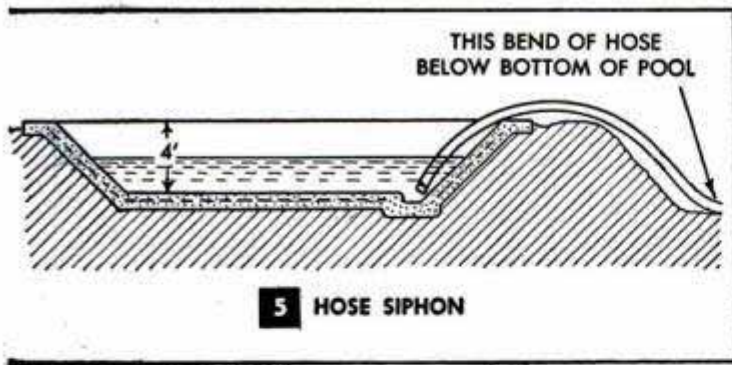
This view shows the pool poured, the forms removed and drain installed. Walls take less concrete when bottom of pool is sloped



Pool of William D. Soper, La Mesa, Calif.

Finished pool in use. Drainage is no problem of pool similarly situated. Here, drain in side carries water off for irrigation purposes. Note metal ladder which is embedded in concrete at time of pouring

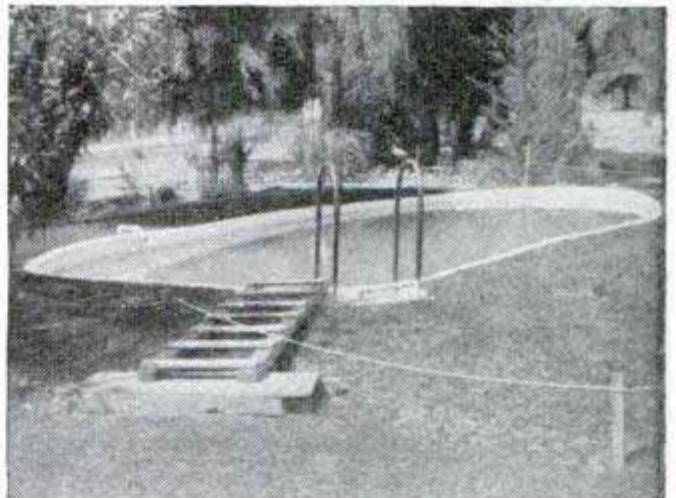




bottom is covered with a 3-in. layer of concrete poured over a 4-in. bed of gravel and strengthened with the wire. Finally, a reinforced curbing or parapet is laid around the edge.

An inexpensive pool without plumbing is shown in Fig. 5. Measuring 12 by 20 ft., it is designed for high ground to eliminate drainage piping and has sloping walls to do away with the need for forms. Bottom and sides of the excavation are tamped well and then 2 in. of concrete is poured over the bottom. This is reinforced with 6-in. spot-welded wire mesh, on top of which an additional 2-in. layer of concrete is poured. When the bottom is firm but still soft, the walls are plastered with cement to form an integral mass which is troweled into a parapet all around the top. The bottom is troweled to slope toward a sump from which the water is siphoned with a hose to drain the pool.

Figs. 3 and 11 detail an adult-size pool, 10 by 22 ft. Note that it is complete with water filter, centrifugal pump, suction-cleaning facilities, diving board and ladder. The deep portion just off the diving board slopes upward at each end to cut material cost. However, don't skimp on the wall thickness and the reinforcement. A minimum wall thickness of 6 in. is recommended for mild climates. Pools built in regions of severe cold should be 10 in. thick to avoid cracking. Section A-A of



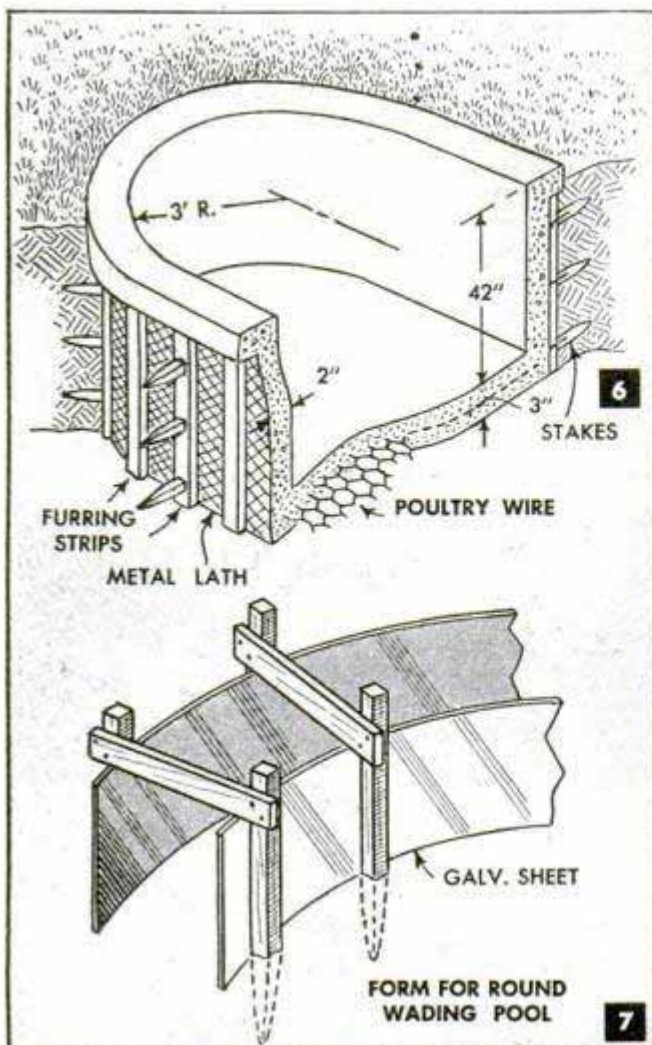
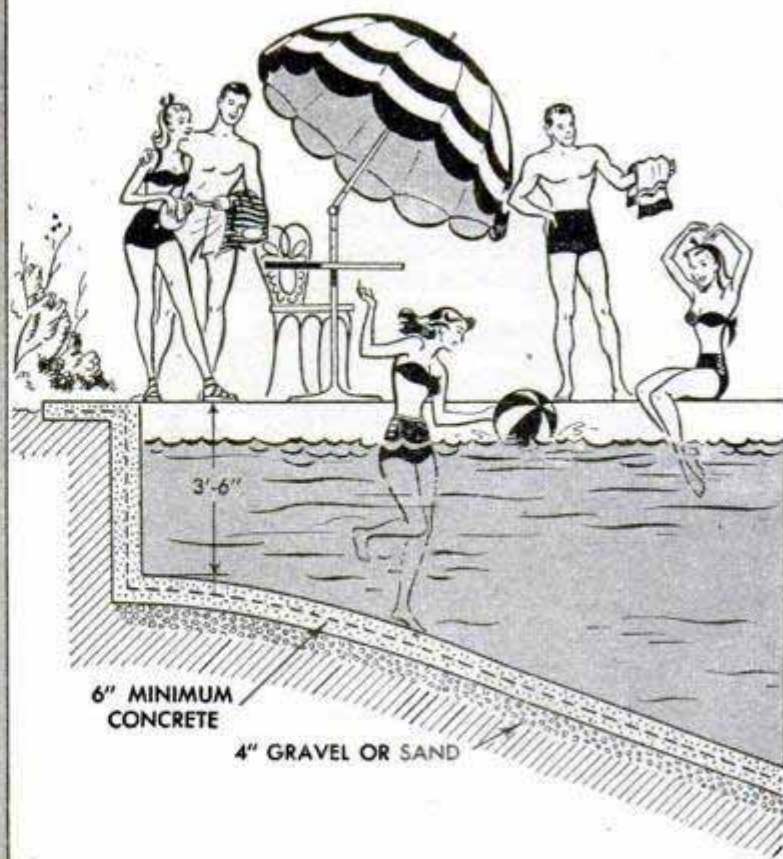
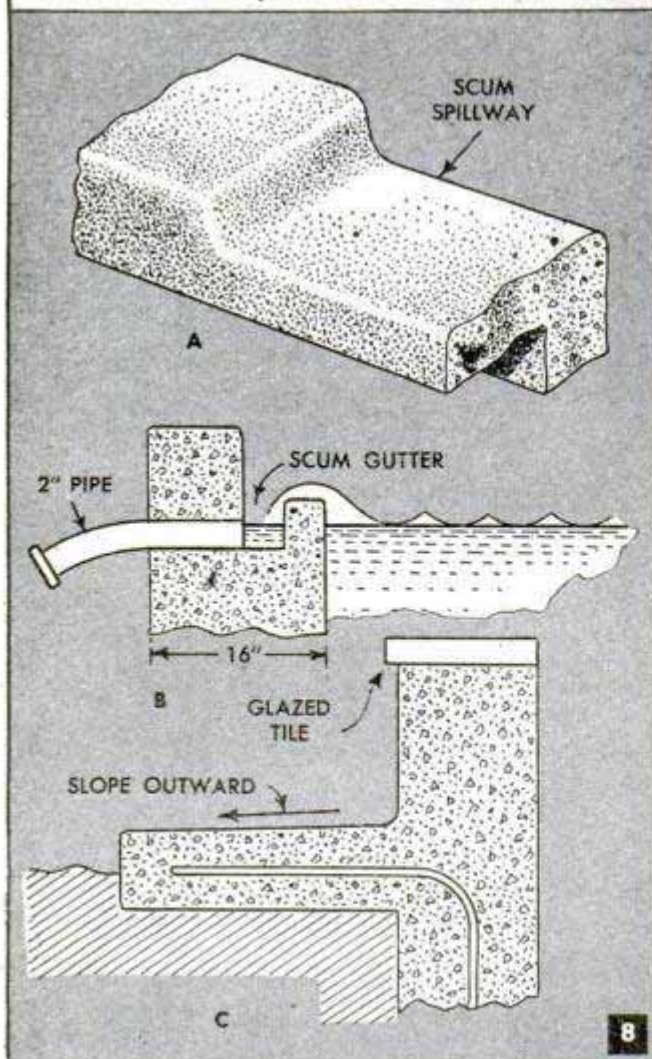


Fig. 3 shows how the pool is double-formed—with inside and outside forms, and how it is reinforced. Note that the inner forms are suspended from crossbeams and that stakes are used to prevent the outer forms from giving way at the bottom. Rods reinforcing the walls and bottom are wired together at the lower corner as shown in Fig. 4, detail A. The walls of large pools generally are poured on footings and a separate slab poured for the bottom, much like the foundation of a house. Then a mastic is run in the joint to make it watertight as shown in Fig. 4, detail D.

Figs. 9 and 10 give suggestions for making ladders of pipe or wood, and also plans for a springboard. The metal ladder should be of galvanized or stainless steel and embedded in the concrete at the time it is poured. Spruce is the best material for the springboard. Bevel the edges and cover the end with a nonslip padding of rope matting.

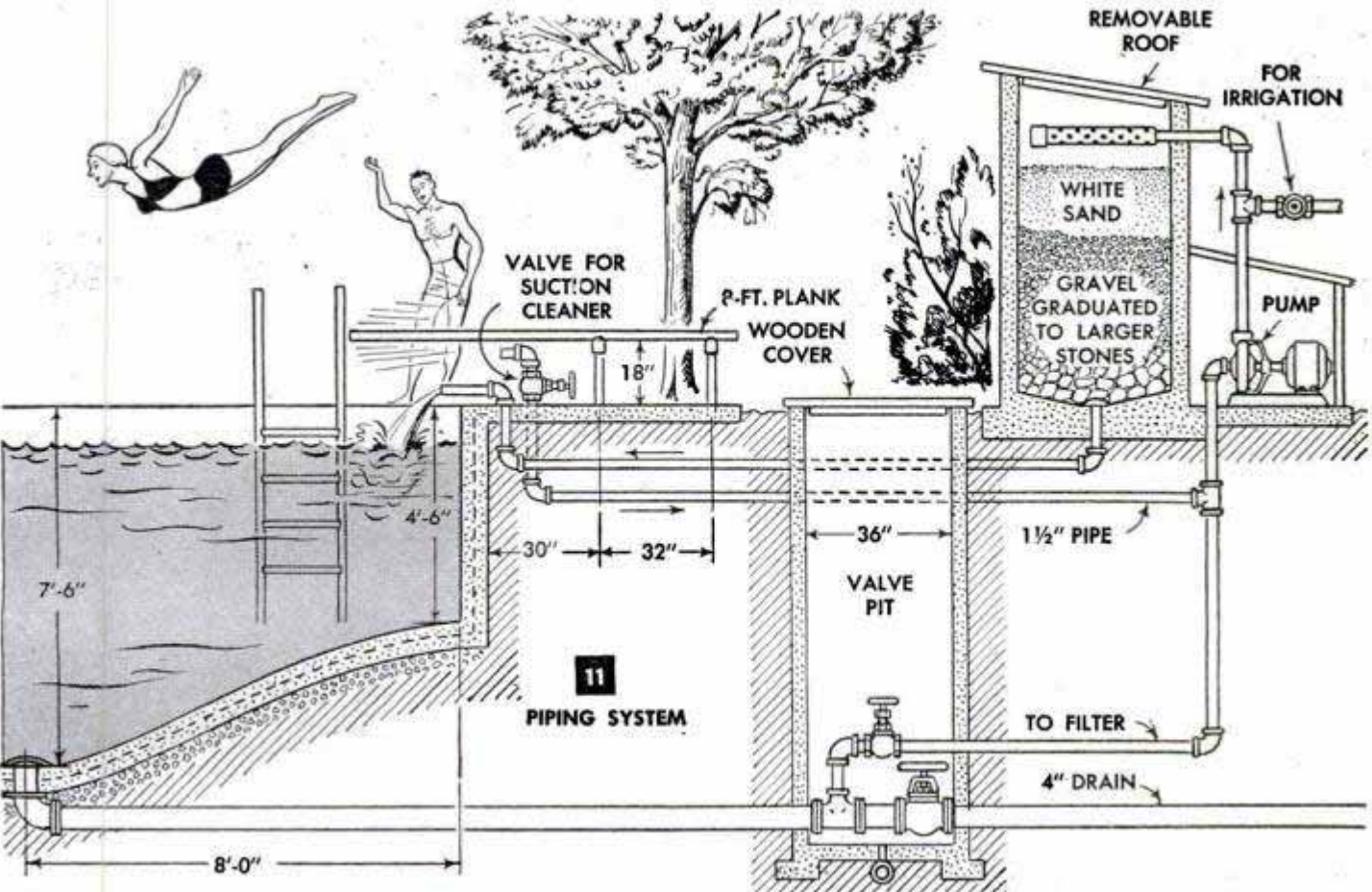
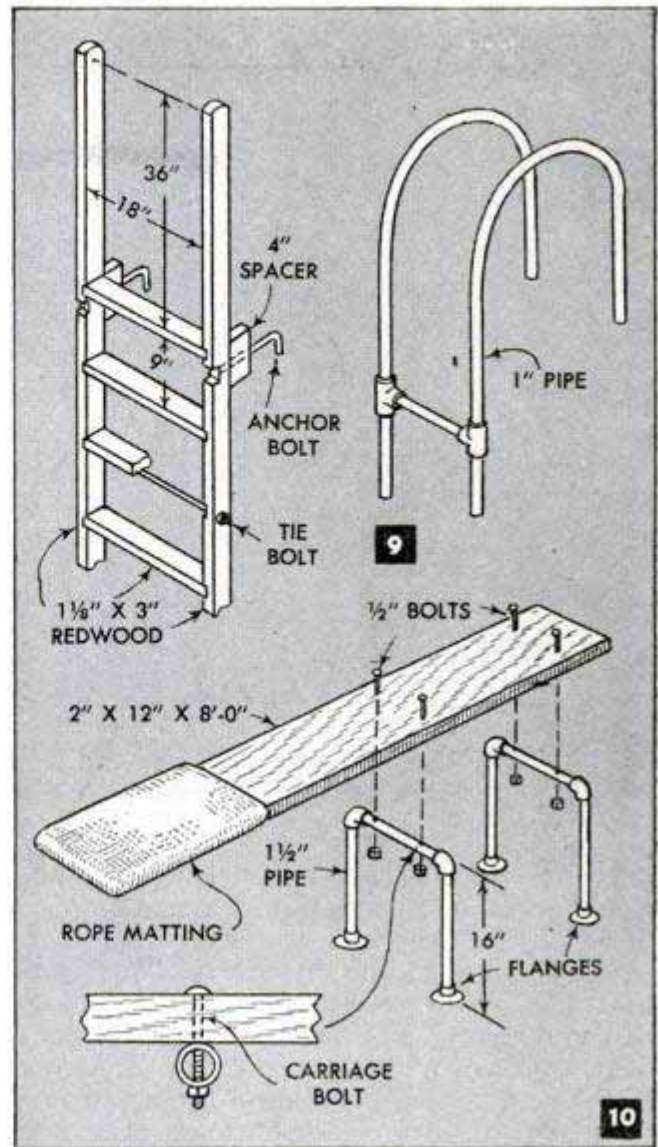
Three types of parapets are shown in Fig. 8. Parapets A and B incorporate a spillway in the top of the wall for floating off leaves and litter by raising the water level. In the case of B, drainpipes are spaced about 8 ft. apart all around the pool. Detail C shows construction of a parapet which extends above ground to provide a low seat around the pool and keeps debris from blowing into the water.

The concrete for small wading pools can be mixed in a wheelbarrow, but for large pools it is best to rent a small power mixer.

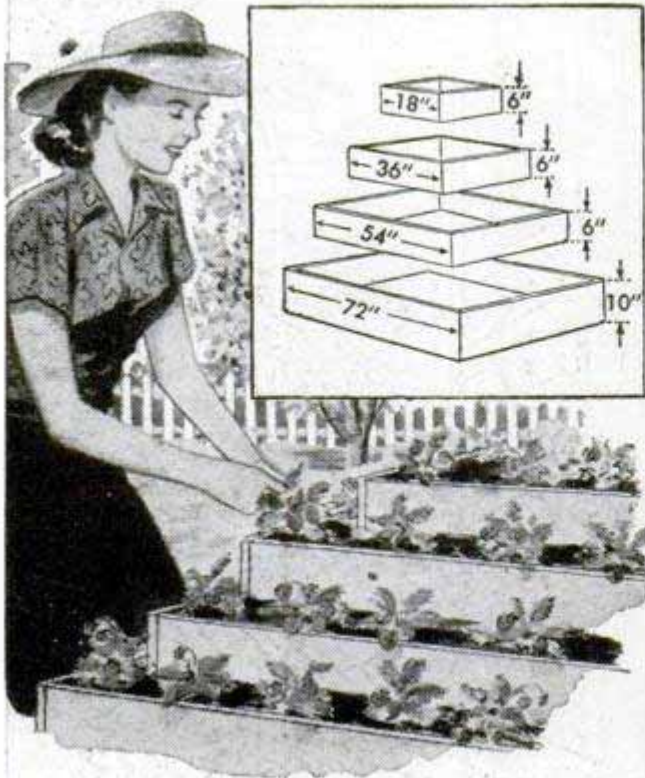


A recommended proportionate mix consists of portland cement, 1 part; sand, $2\frac{1}{2}$ parts; and gravel, $3\frac{1}{4}$ parts. If the pool is to be plastered, the proportions should be as follows: portland cement, 1 part; and sand, 3 parts. Six gallons of water per sack of cement is about right. It is always best to pour a job complete at one time, but if this cannot be done, the joint should be roughened to assure a good bond and brushed with a soupy mixture of cement and water just before the pouring is resumed. Be sure that the concrete is well spaded in the forms with a long pole, to prevent air pockets and porous places in the finished wall. Also, avoid cave-in areas in the dirt walls, Fig. 4, detail B, which take considerably more concrete. Forms should not be removed for two or three days, after which the concrete should be cured gradually by wetting it frequently for several days. Dirt fill around the outside of the walls is packed solidly by wetting with a hose as it is shoveled in place, Fig. 4, detail C.

The nozzle from an old vacuum cleaner attached to a long pole will be found handy for cleaning the walls and bottom of a pool. Fasten it to a length of large hose and connect it to the suction-pump inlet, Fig. 11. Finish the walls and bottom of the pool with a couple coats of rubber-base paint. When cracks develop which cause serious leakage, they can be filled with asbestos roofing cement and then painted.



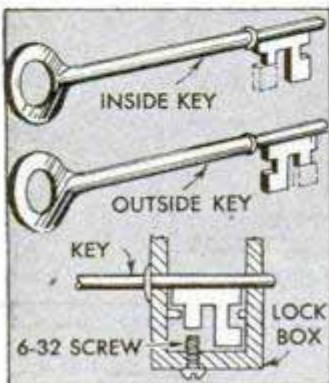
Pyramid-Type Strawberry Bed



This pyramid-type strawberry bed holds a large number of plants in a small space while bringing each plant within easy reach for individual attention. The original bed, built to the dimensions given in the drawing, holds 64 plants in a space 6 ft. square without crowding. Because of the design of the pyramid the strawberry plants are not likely to spread, and weeding, watering and gathering the fruit is simplified. The bed consists of four square frames of diminishing size, filled with soil to about 2 in. above the top to allow for settling, and stacked pyramid fashion. A cheesecloth cover placed over the bed, will prevent birds from eating the fruit.—Carl C. Buebke, Portland, Ore.

Screw Inserted in Rim Lock Prevents Use of Passkey

If you have a mortise or rim-type lock on your door, you can alter it so that a passkey will not open it by simply turning a small machine screw through the bottom of the lock, as shown. Place the screw at one side of the keyhole so that it will not interfere with inserting the key.



Also, determine the location of the screw by noting the direction the key is turned to unlock the lock.

Then make two keys for your own use, one to operate the lock from the inside and the other from the outside, and grind off the portion of each key indicated by the dotted lines.

Nathan Bogoch, Winnipeg, Man., Can.

Getting the Most From Canned Heat

When using canned heat to cook outdoors after a long day of hunting or fishing, it's very annoying if the flame burns low because the fuel is almost exhausted. However, you can produce a high flame and enjoy a warm meal merely by

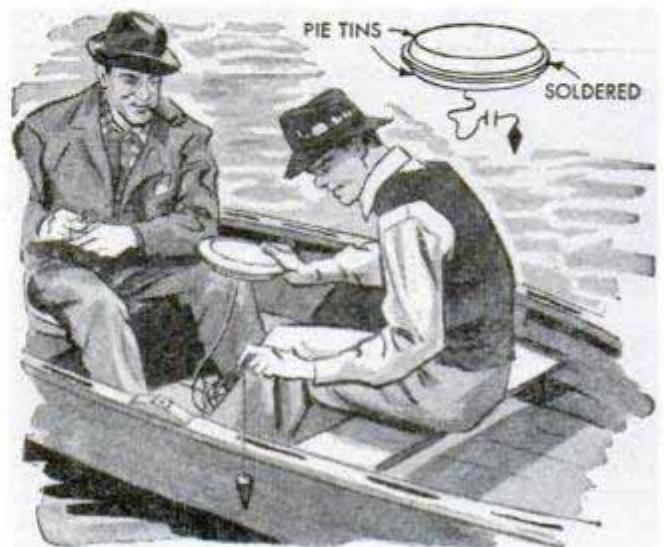


punching several holes around the side of the can with a nail. Punch the holes near the fuel level to obtain effective draft.

Plumb Bob Anchors Pie-Tin Buoy Used as Fishing-Hole Marker

On large lakes or rivers where it's often difficult to return to the exact location of a good fishing hole, a brightly colored marker buoy will permit you to find the spot in a jiffy. A float can be made by soldering two pie tins together and soldering a screw eye to the bottom of one of them. A plumb bob attached by means of a line serves as a weight to anchor the marker in place. When you find a spot you wish to mark, drop the weight and pay out the line until the weight is on the bottom. Then tie the buoy to the line. If it is painted orange, it will be easy to see in daylight and can be picked up at night in the beam of a flashlight.

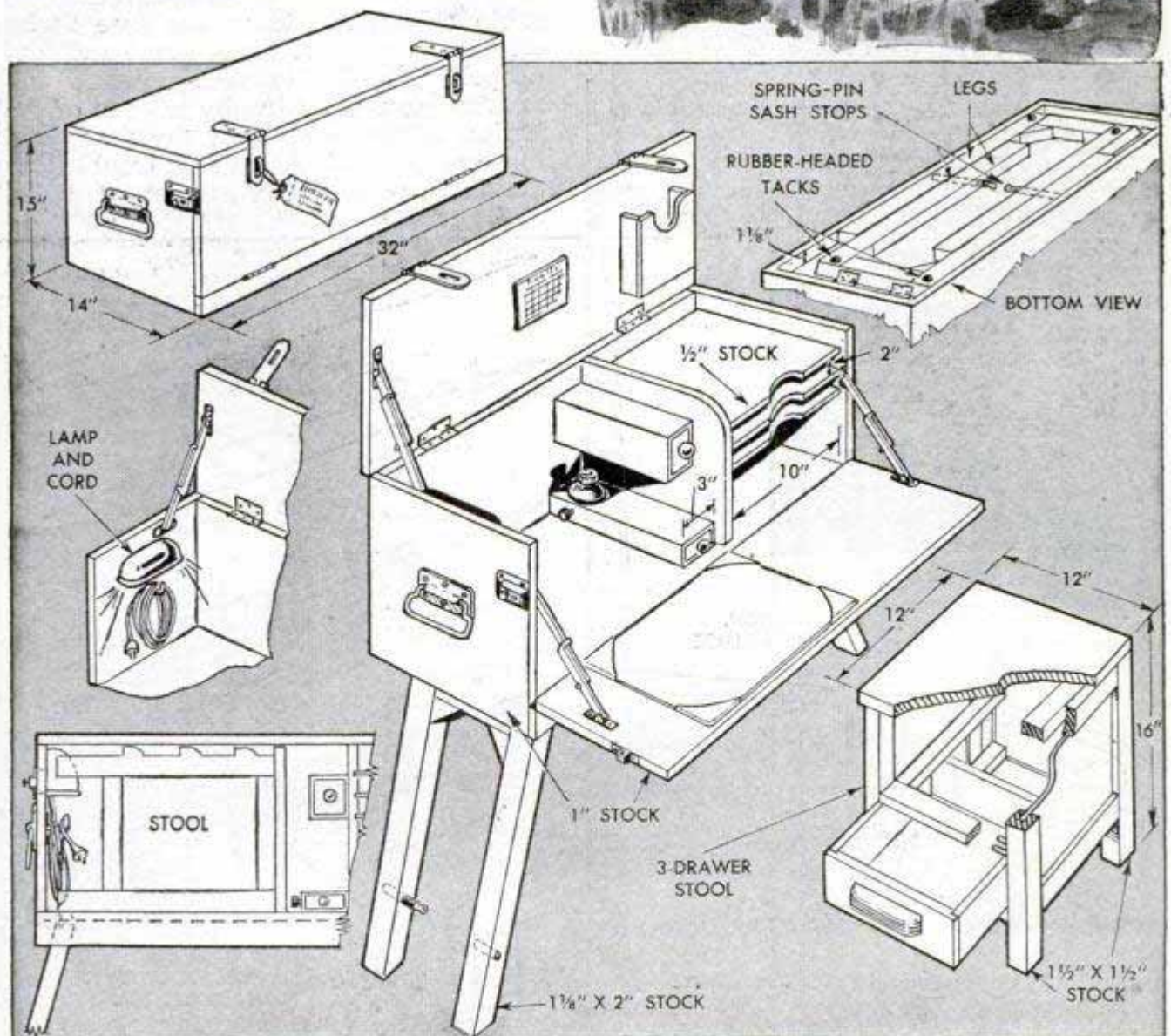
Wm. P. Houser, Organ, N. Mex.



OUTDOOR DESK

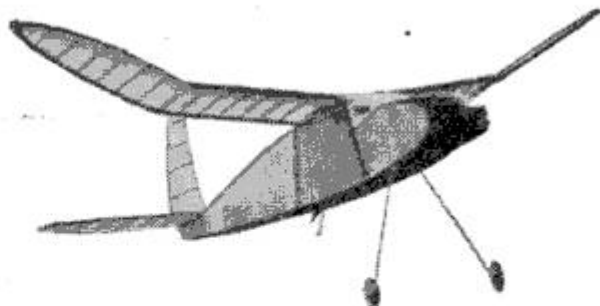
By B. P. Horsley

IDEAL for the naturalist, archaeologist or anyone who must do documentary work in the field, this folding desk-and-stool combination provides substantial writing surface along with comparative comfort. The desk folds into a compact case for traveling. In addition to containing all the essential writing equipment, it also carries the three-drawer stool. Shelves, together with the stool drawers, afford ample space for storing paper, records and reference books. Two small drawers at the center partition hold pencils, pens, etc. A bottle of ink is inserted in a hole cut in the lower drawer and is held by means of a thumbscrew. A lamp, which can be connected to a portable power supply, is attached as shown. In this location, the lamp will furnish sufficient illumination and still not interfere with packing of the stool. The desk legs fold for carrying and are held folded by spring sash stops.



Build your MODEL PLANE

There are 141 trophies and \$7875 awaiting builders of the best entries in Plymouth's 2nd International Model Plane Contest at Detroit, Aug. 18-23. Cut yourself a slice!



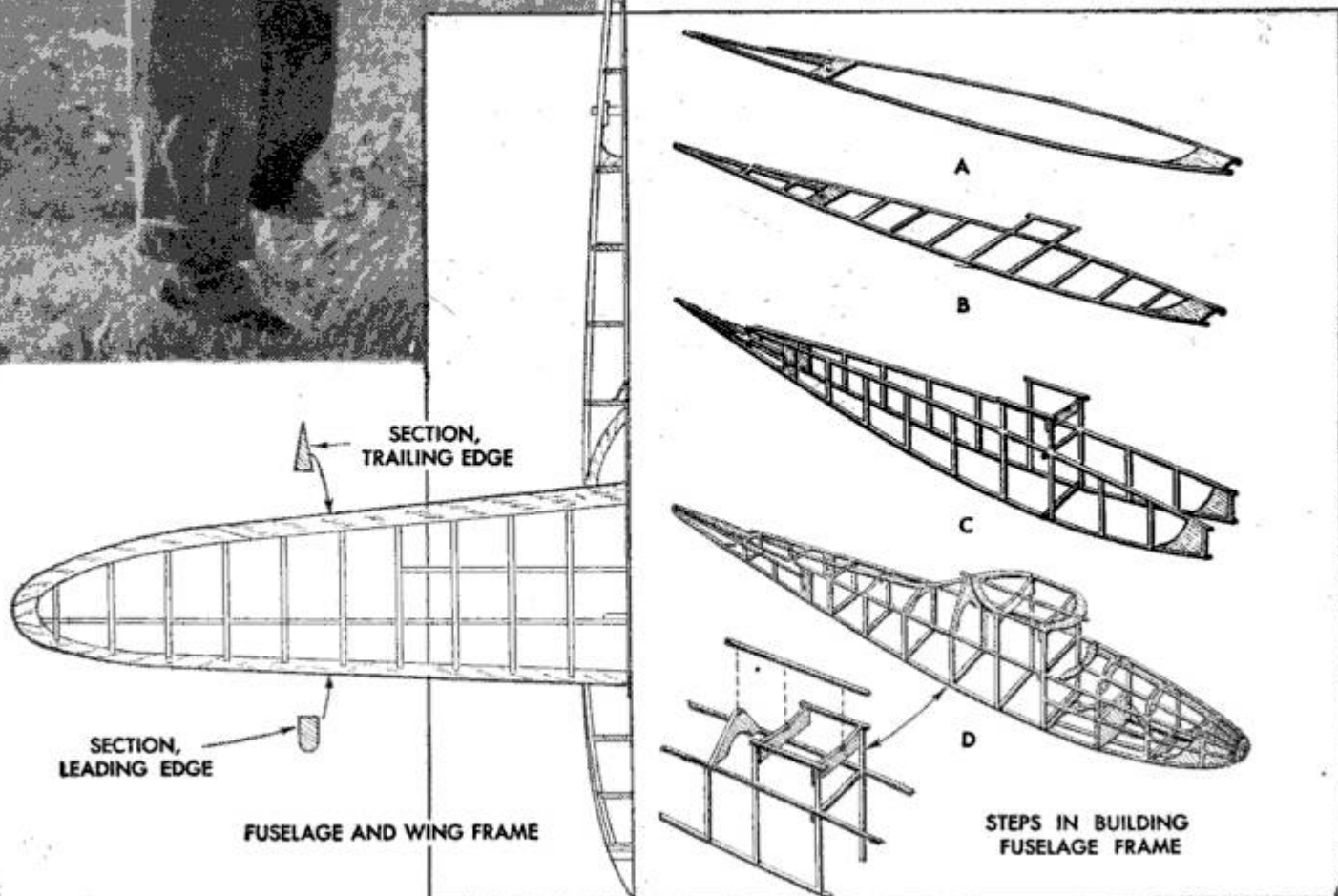
RUBBER-BAND POWERED



THOUSANDS of model-plane "engineers" are busy preparing their contenders for one of the big air shows of the model world—the 2nd International Model Plane Contest scheduled at Detroit, August 18-23.

Elimination meets are being held in cities and states with 500 finalists being picked for the big air meet, sponsored by Plymouth Motor Corporation. Every contestant must build and fly his own plane.

There are 45 events for indoor and outdoor rubber-band models (both stick and cabin classes), outdoor gas free flight, control-line speed, scale, stunt and jet-propelled. In addition, there will be a permanent high-point trophy in each of the junior, senior and open divisions, and three perpetual international trophies for the stunt, scale model and jet-propelled



to WIN



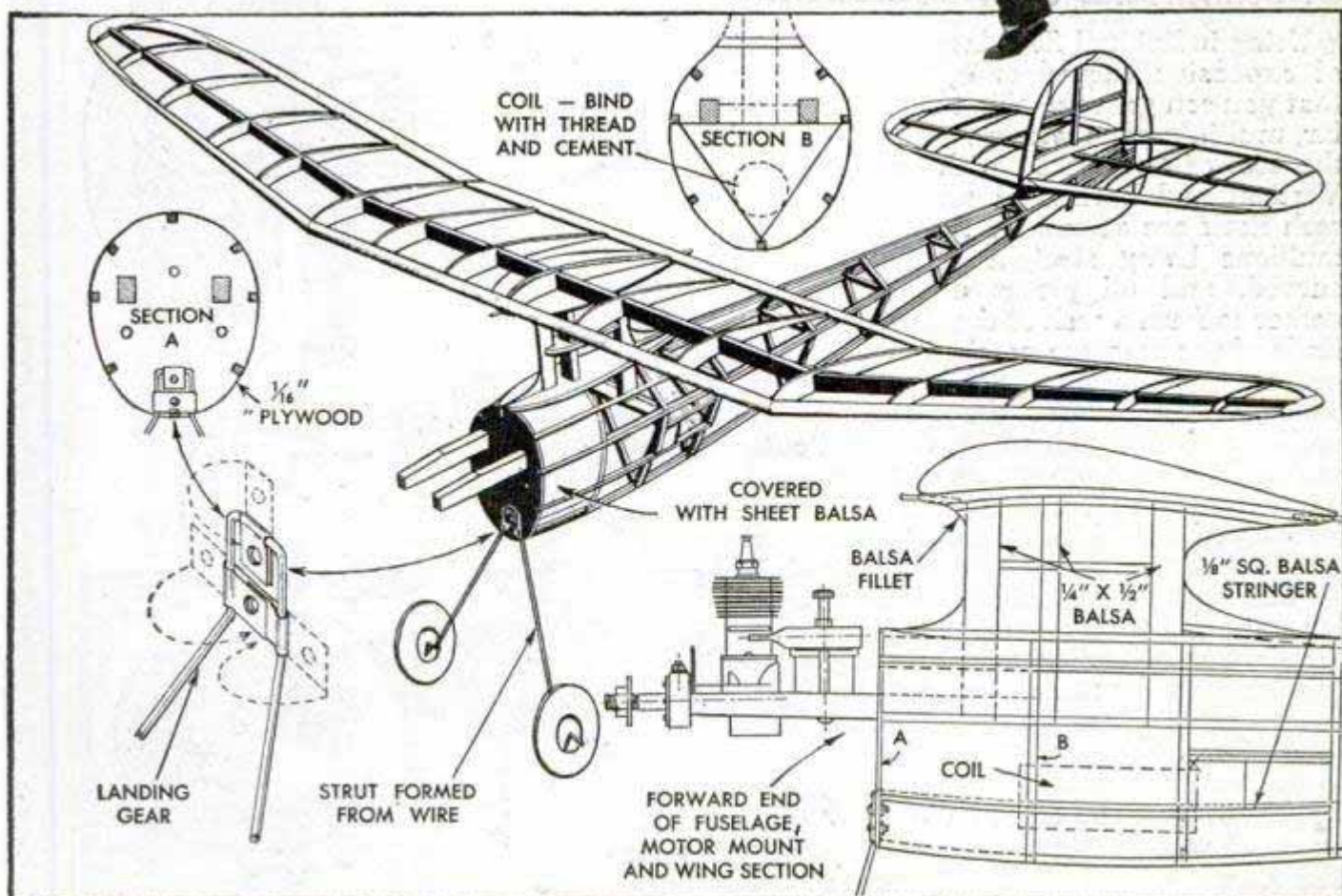
GAS-POWERED

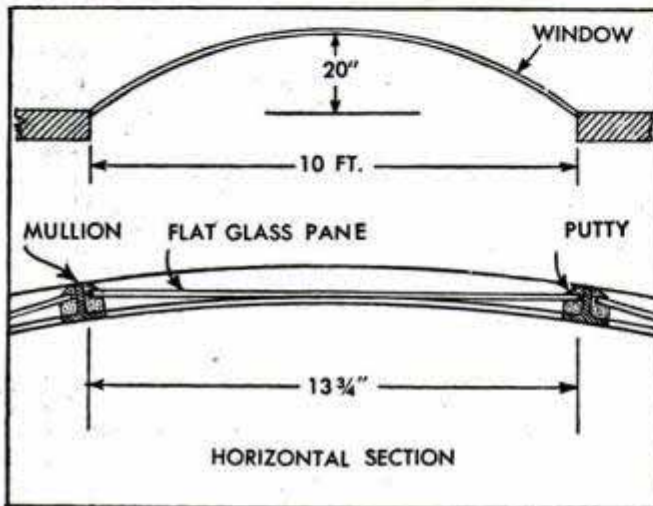
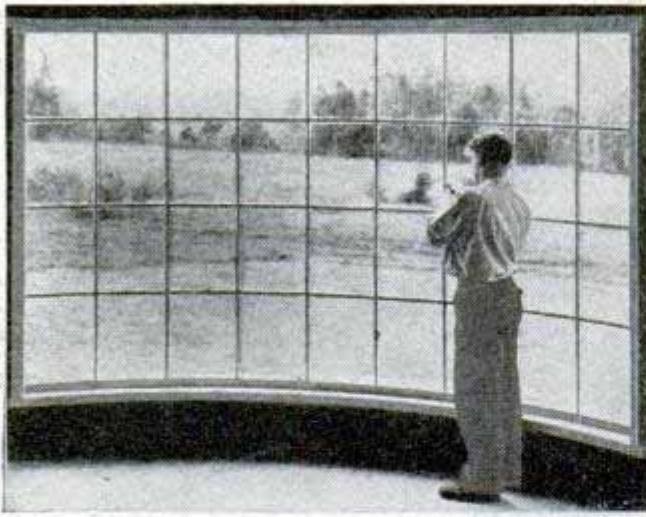
events. The meet is invitational and you must first qualify. Rules and entry blanks are available from Plymouth dealers.

Here are some things to watch: In indoor events, wing area of both stick and cabin models must be limited to a maximum of a 150 sq. in. Maximum cross-sectional area of stick models must conform to the formula $L^2/150$ as a maximum (L —the over-all length, excluding propeller), while the maximum cross-sectional area of cabin models must be $L^2/100$ as a minimum.

Cross-section formulas are the same for outdoor rubber, but wing area may vary from 100 to 300 sq. in. Minimum weight is 4 oz. per 100 sq. in. of wing area. In gas free flight, the minimum weight is 100 oz. per cu. in. of piston displacement, and no model can weigh more than 7 pounds. In control-line events, no model can weigh more than 4 pounds. No metal props are permitted.

The details below are only representative of the acceptable methods of construction of the fuselage, or cabin types, in both rubber and gas models. Special care must be taken with built-up sections such as those in details A, B, C and D below at the left.





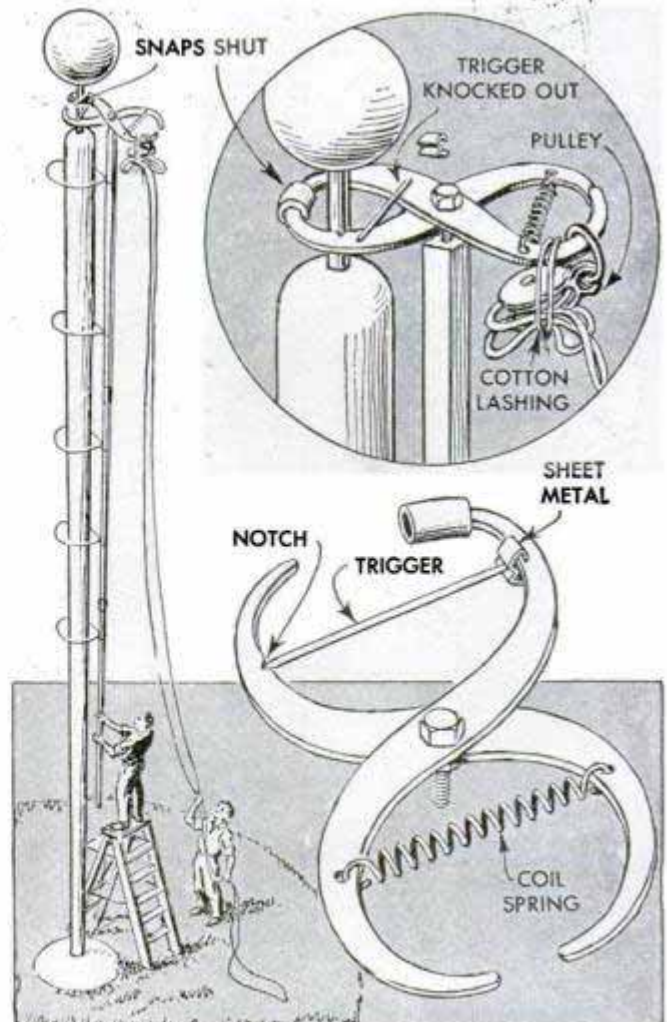
Flat-Glass Panes Reduce Cost Of Semicircular Sash

Using individual flat-glass panes instead of expensive curved ones, here's a way that you can gain the effect of a semicircular, multiple-pane window at a fraction of the cost of one glazed with curved glass. Vertical and horizontal members of the sash itself are assembled from T-iron, the mullions being straight and the bars curved, and all pieces are welded together to form a sash of the desired radius. Ends of the bars are notched to butt flush against the mullions. The width of the panes, which governs the spacing of the mullions, is determined by the particular radius. The example shows that the maximum glass size for a 10-ft. sash which projects 20 in., is 13 $\frac{3}{4}$ in. This is the maximum width that the T-iron will accommodate. To determine the spacing of the mullions, lay out a full-size drawing on paper as in the horizontal-section detail. Swing a line representing the radius and swing another representing the width of the T-iron to be used. Then hold a straightedge at a tangent to the second line and note the maximum length that can be drawn within the two lines, allowance being made for glazing. The panes are set in the T-iron rabbets.

Snap Restores Halyard Pulley To Flagpole Top

To solve the problem of replacing a fallen halyard pulley at the top of a tall flagpole, one man devised this snap clamp which remains a permanent attachment on the pole. It is made in two parts cut from heavy-gauge sheet metal in the shape of a letter S. The two parts are pivoted together with a cap screw to form a figure eight and one end is provided with a coil spring. Then, the other end is fitted with a trigger made from heavy wire and a V-shaped piece of sheet metal. One end of the wire engages a notch filed in one leg as shown. In use, a light touch disengages the trigger, causing the spring to snap the jaws shut. The device is raised with a pole built up of sections, the first one having a hole in the end to receive the pivot screw snugly. Wire loops, formed around the flagpole and attached to each section as it is added, help guide the pole. The pulley and halyard are tied to the device with string or a rubber band so that a slight tug will free them. After the clamp reaches the top of the flagpole, the trigger is bumped against the ball spike to snap the clamp in place. Then the sectional pole is pulled away from the cap screw.

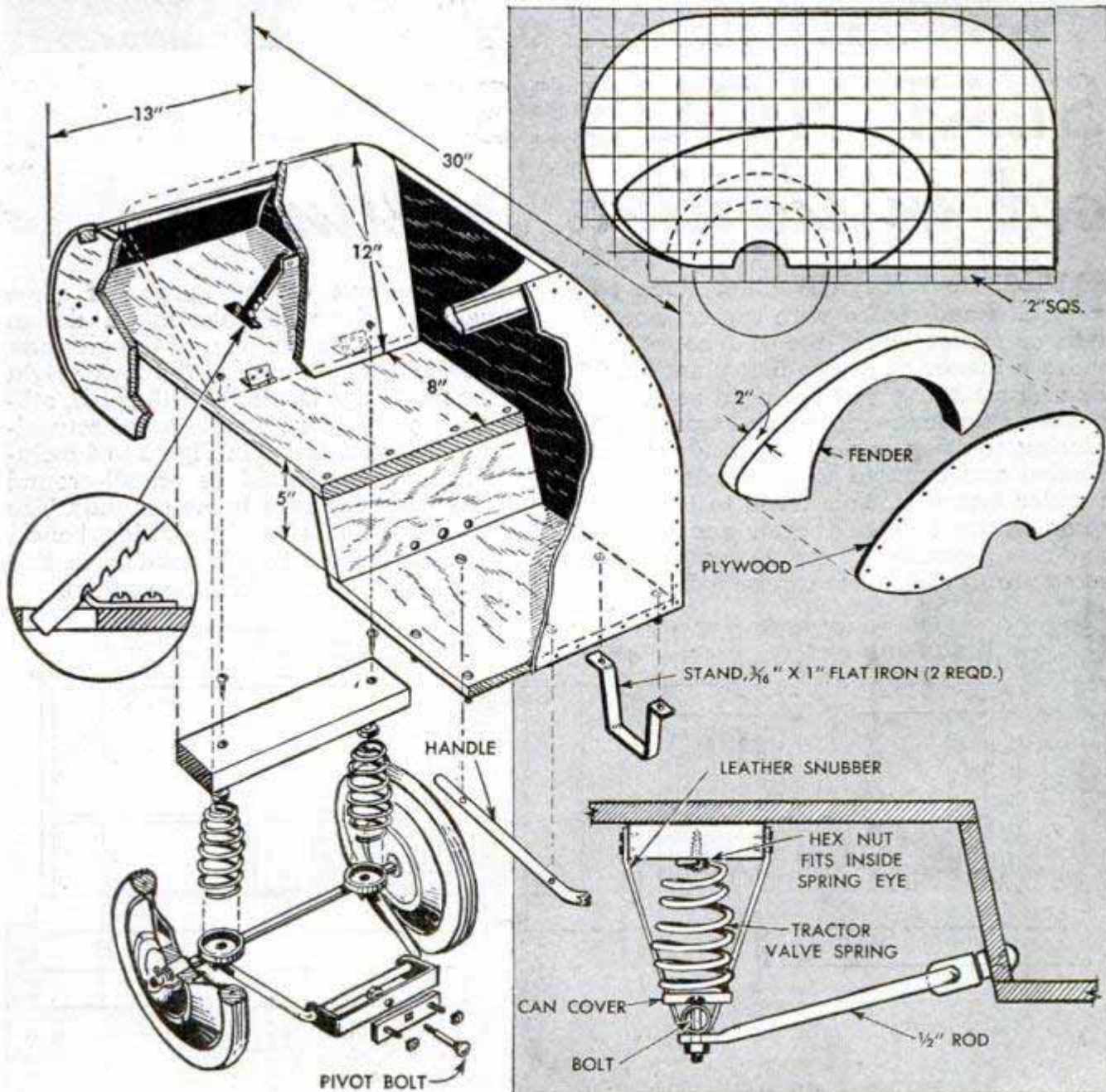
Jack Bronte, Grass Valley, Calif.

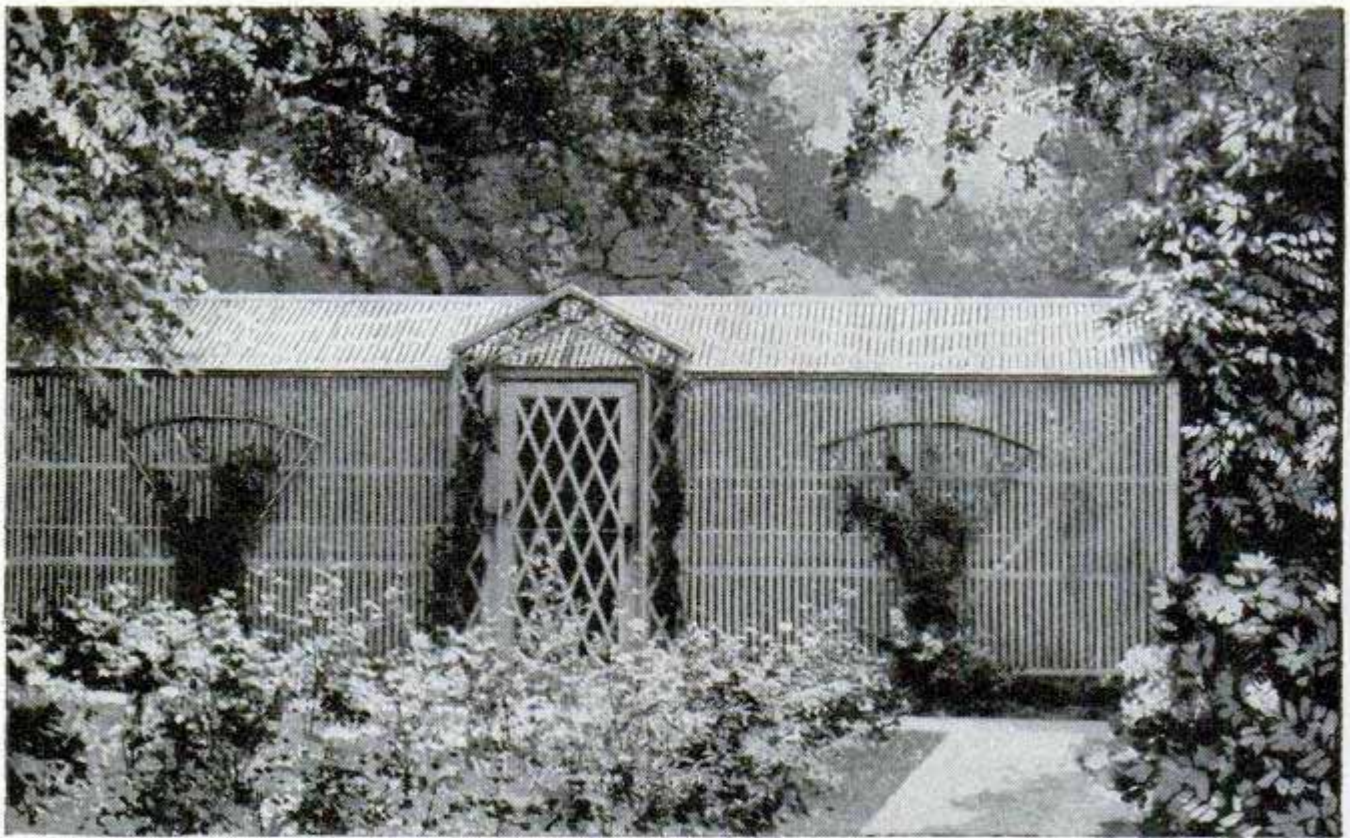


GOCART

has coil springs

Baby is in for a smooth ride in this sporty streamlined gocart for it has "knee action" which takes the bumps like a new automobile. Tractor valve springs provide the knee action and these are set in can covers bolted to the axle with the same bolts which fasten the radius rod. A screw and a hexagon nut anchor each spring at the top and a leather snubber holds the springs in place, slightly compressed. Waterproof plywood and solid stock are used in the body, with sheet metal being used to cover the rounded ends. The teardrop fenders are shaped from 2 by 8-in. plank, covered with plywood.—J. C. Montgomery, Bowness, Alta., Can.



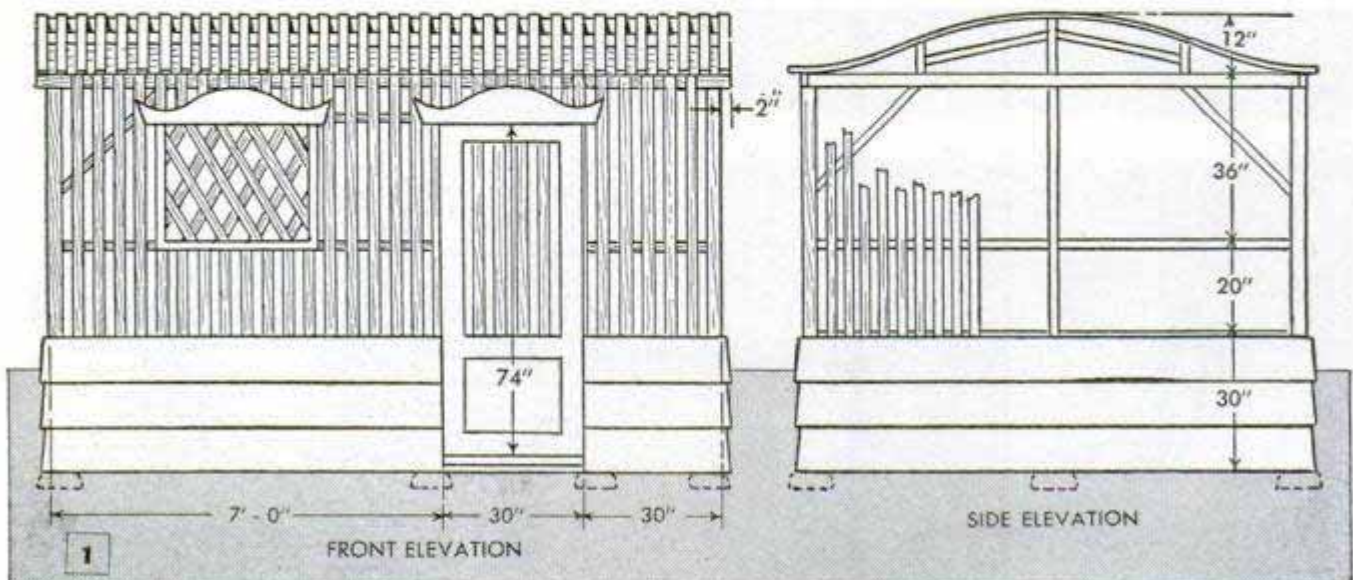


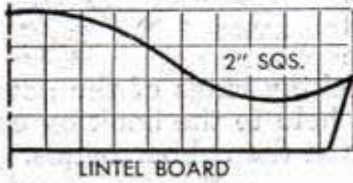
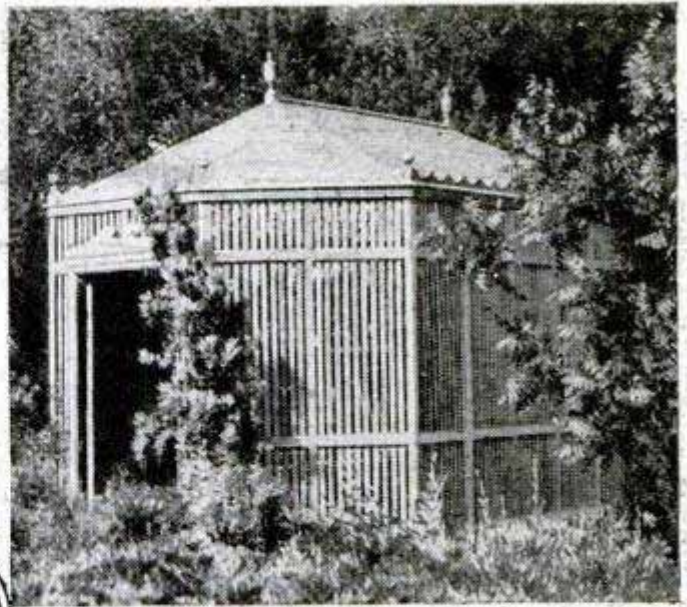
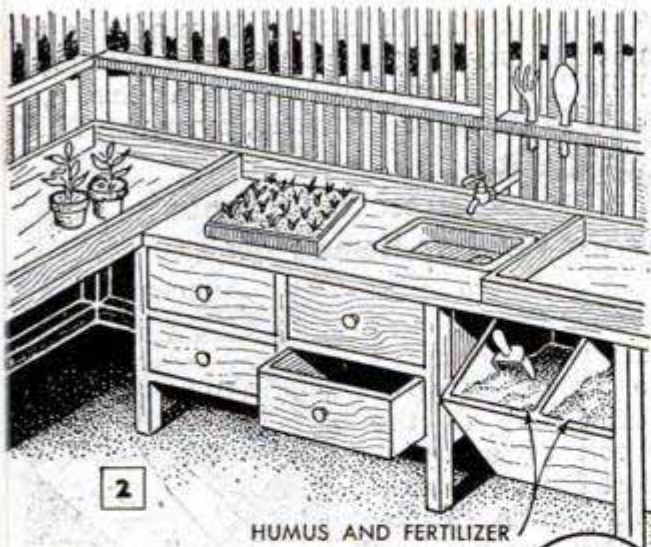
SLAT HOUSES

aid in starting seedlings

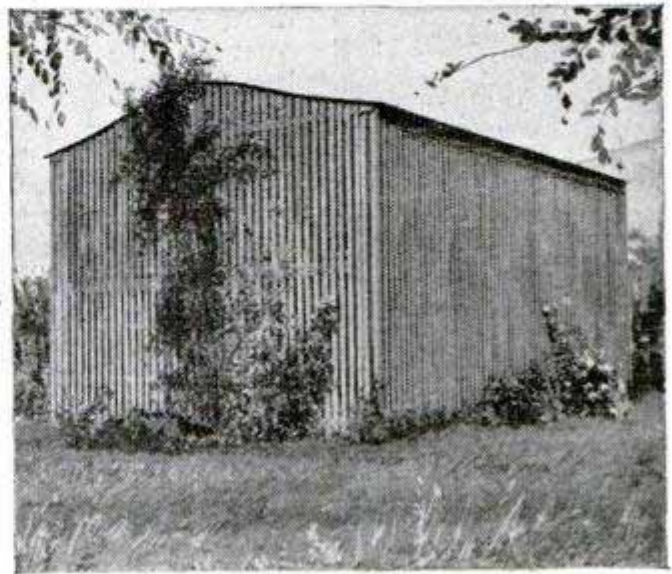
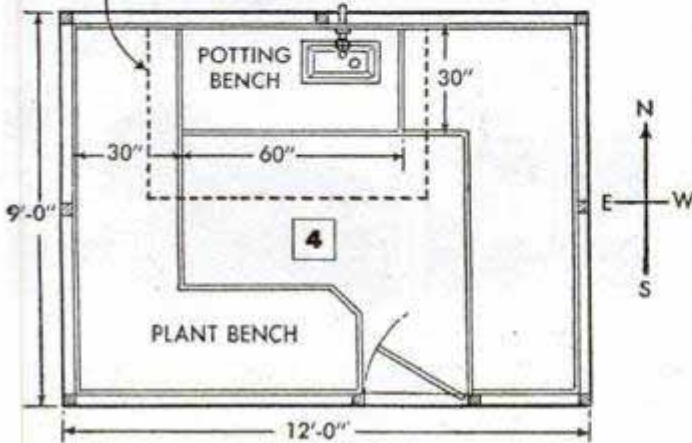
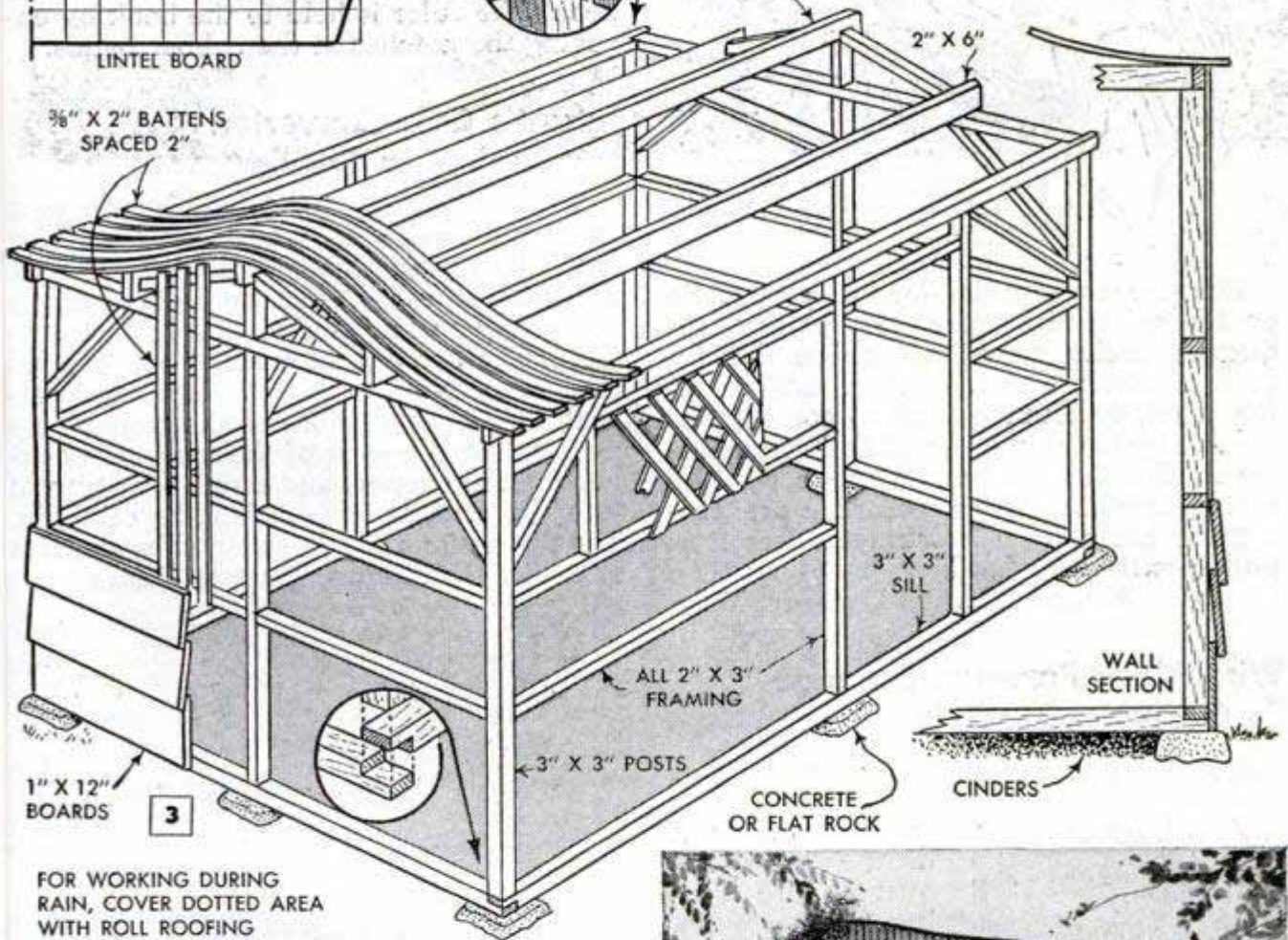
BUILT from rough framing stock and sided and roofed with spaced wooden lath or lattice stock, the slat house provides a means of controlling plant shade. Spaced slats give just the right amount of shade to tender seedlings and transplants. During the day each plant is alternately shaded and exposed to direct sunlight at regular intervals. This tends to lower the temperature both of the air and seedbed and also prevents too rapid evaporation of moisture. A slat house can be made an at-

tractive feature of the garden if some thought is given to selecting a design which fits in with the plan of the grounds. While the type pictured at the lower right on the next page is wholly utilitarian, others shown are more ornate architecturally. The design detailed in Figs. 1 to 4 inclusive has been selected as an all-around type suitable for most home grounds. The plan, Fig. 4, includes the potting bench, Fig. 2, and the framing is detailed in Fig. 3. Frame and slats should be stained.

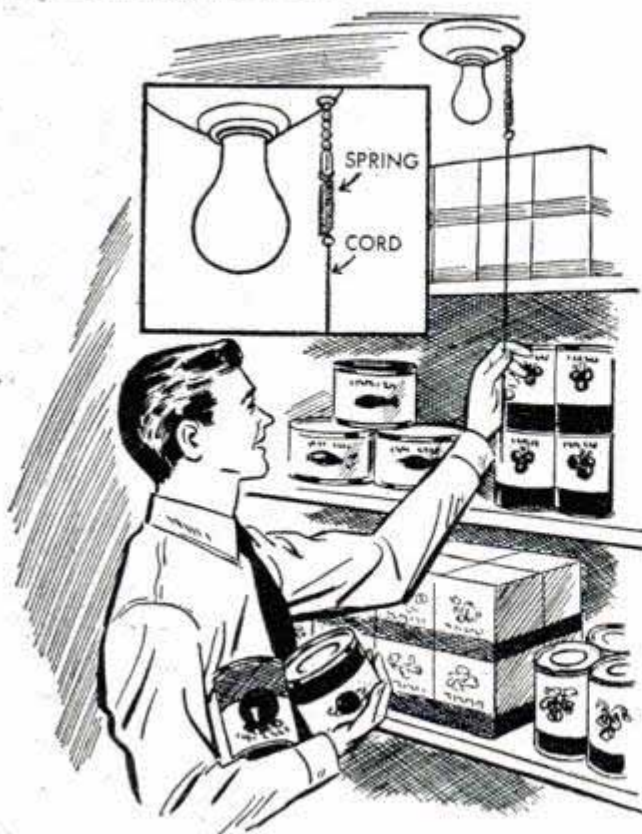




3/8" X 2" BATTENS
SPACED 2"



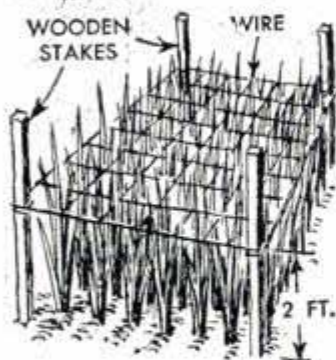
Pull-Chain Shock Absorber For Ceiling Fixture



Because it was pulled too hard; the chain on the ceiling fixture in our pantry frequently broke, sometimes inside the fixture necessitating a bothersome repair job. I finally found a way to correct this trouble by fastening a small coil spring between the pull chain and the cord. The spring acts as a shock absorber preventing the chain from breaking unless it is pulled extremely hard.

Willard Allphin, Danvers, Mass.

Wire Mesh Prevents Damage To Growing Gladioli



Tender stalks of "glads" growing in small beds out in the open frequently are broken by the wind. To prevent this, drive wooden stakes at the four corners of the bed and stretch welded wire fencing

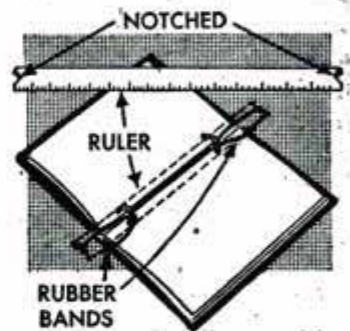
(4-in. mesh) over the bed when the plants are 6 to 8 in. high. Train the stalks through the wire mesh as the plants grow and raise the wire at intervals as growth progresses. With average-sized plants, height of the wire should not exceed 2 ft. at the end of the growing period. As the metal gets very hot on sunny days, some foliage should be

above the wire to keep it from getting too hot and injuring the plant. The fencing is held to the posts with soft-iron wire.

Lorraine Palmeto, Syracuse, N. Y.

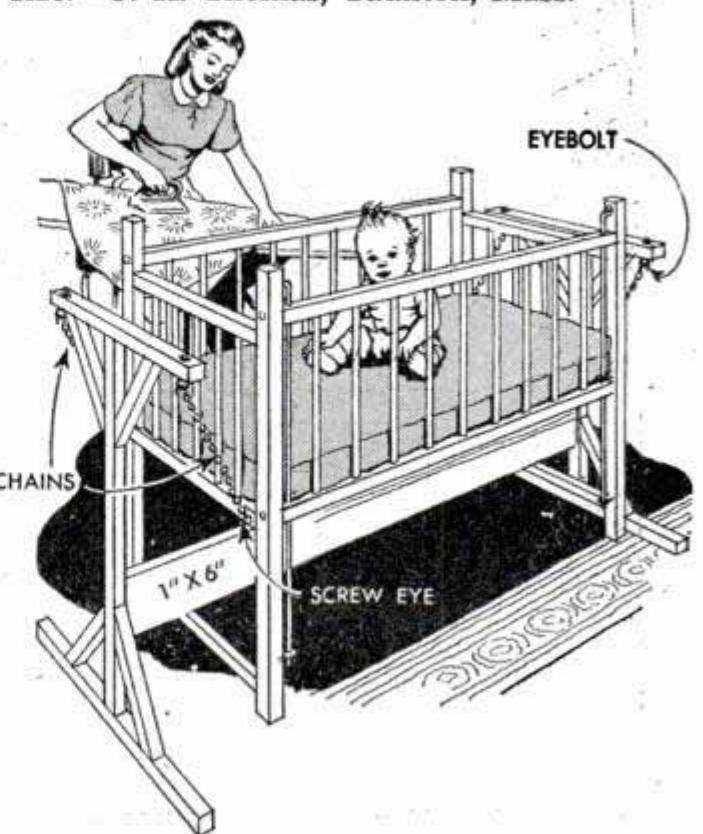
Ruler Fastened in Notebook With Rubber Bands

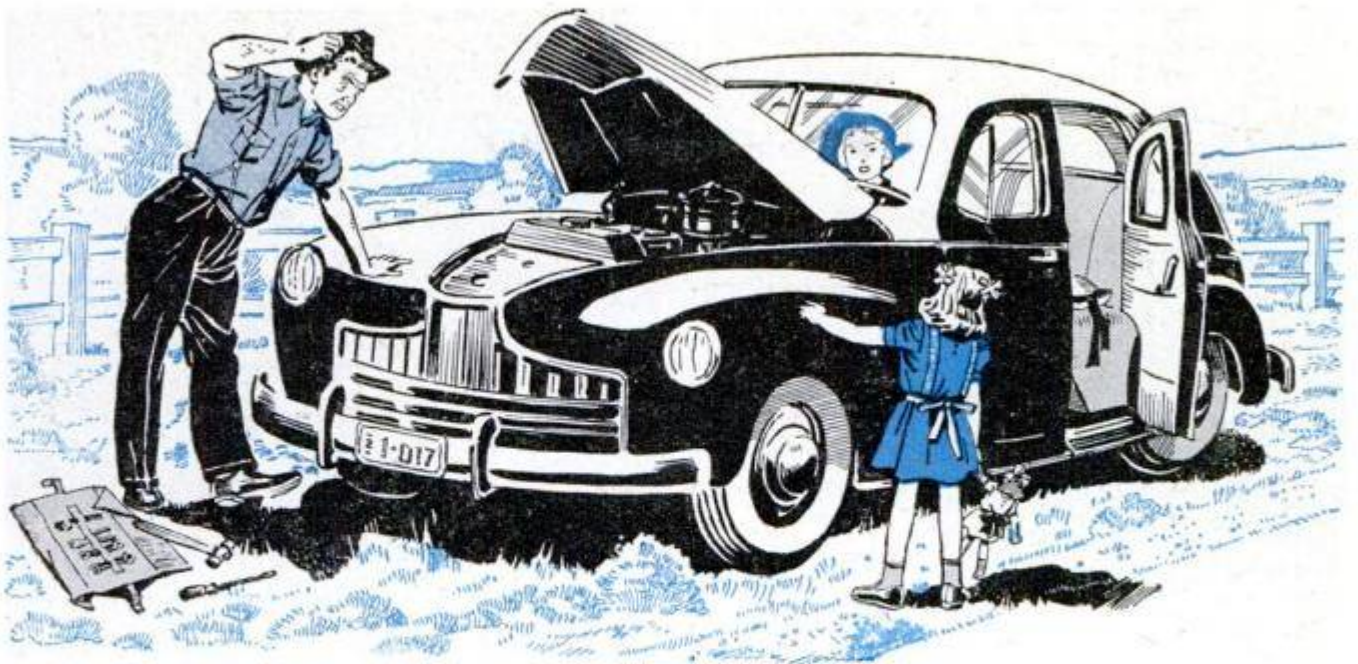
Here is a convenient way for students to carry a ruler. Simply attach it to the back of a loose-leaf notebook. The ends of the ruler are notched and a rubber band is placed on the top and bottom locking rings of the notebook. The ruler is held to the book by engaging the notches in the rubber bands.



Infant's Crib Converted Into Swinging Cradle

Since I converted the baby's crib to a swinging cradle, he amuses himself for hours by kicking his legs to rock the crib. If he is restless during the night, rocking the crib gently usually will lull him to sleep. The two end supports are assembled from 2 by 2-in. stock and made rigid laterally by a 1 by 6-in. board. Eyebolts inserted near the ends of the top crossmember in each support and screw eyes turned into the crib, hold four lengths of chain.





Getting Home on a Sick Engine

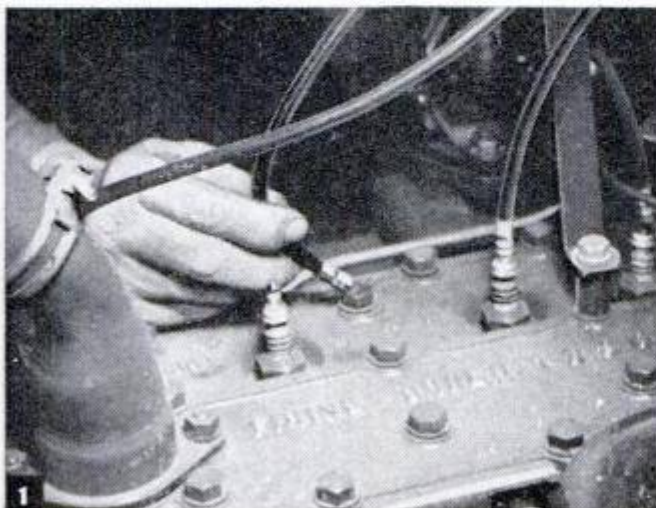
If your car suddenly goes dead on the road, simple checks may enable you to locate and repair the trouble, at least temporarily so that you can get to a garage

IF YOU have ever had your car engine conk out on the road and experienced a helpless feeling as the car coasted to a stop miles from a garage, this article will be helpful. No doubt, your first thoughts were of an expensive service call, or even a stiff tow bill.

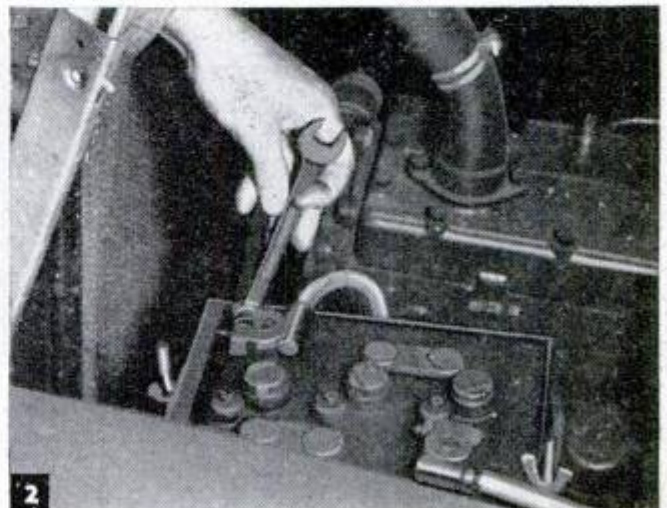
In many cases you can locate the trouble right on the spot and either correct it, or at least make a temporary repair that will permit the car to be driven home or to the nearest garage where permanent repairs can be made, thus saving the delay and expense of a service call or tow charge, especially on holidays when repair shops are closed.

Naturally, insurance against engine trouble on the road is to inspect the engine at regular intervals, make necessary adjustments and keep worn parts replaced. Also, it is a good idea always to carry a small emergency kit consisting of a few simple tools, such as wrenches, spare insulated wire, friction tape, a quart bottle and a 3-ft. length of small hose for siphoning gas from the tank.

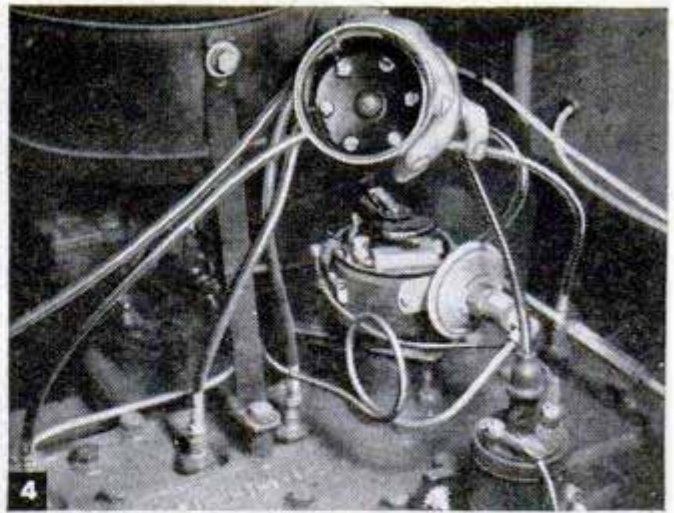
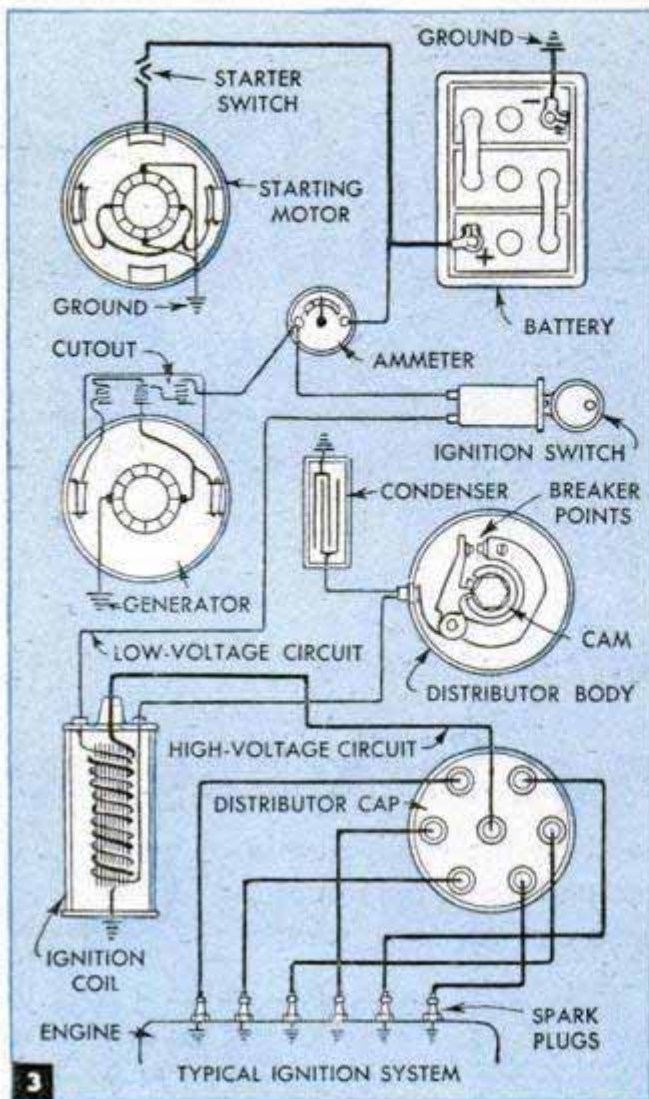
But if you do get stuck on the road, just remember that a car engine needs four things to make it operate; fuel in the carburetor, spark at the spark plugs to ignite the fuel, and oil and water to prevent wear



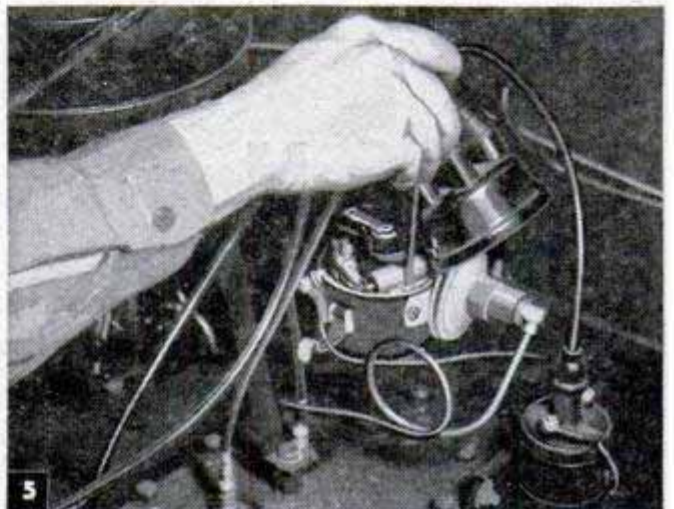
1 Holding spark-plug cable $\frac{1}{8}$ in. from cylinder head should produce a hot spark as engine is turned over



2 Clean and tighten cable connections at battery periodically. See that the ground connection is tight



When you remove distributor cap, inspect for cracks



Check all wiring in the distributor whenever it is opened and make sure the condenser ground is tight

and overheating. A glance at the temperature gauge will take care of the latter two. If the reading is normal, your water is okay, and the chances are the oil is too, because lack of oil would cause the engine to heat. This leaves the fuel and ignition systems, but a process of elimination may enable you to locate the trouble quickly. Just how the engine "died" may give you the key to which system is at fault. If the engine gave no signs of starting as the car coasted, the ignition system may be suspected. Sputtering, grabbing and kicking in and out is likely to indicate that the fuel system is at fault. In any case, check the fuel supply in the tank first.

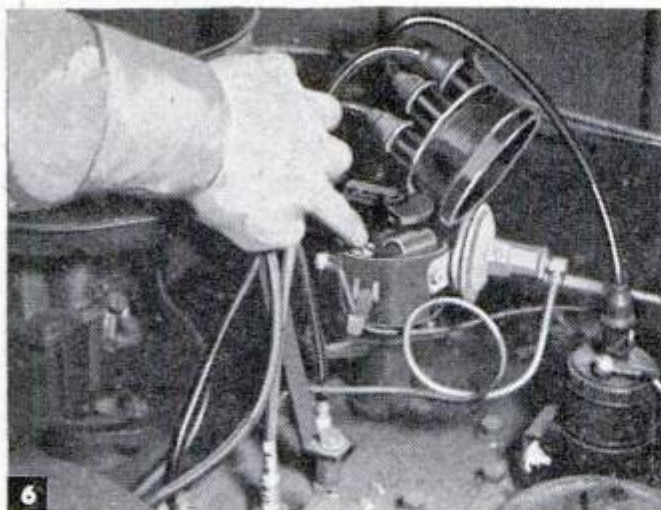
If you suspect the ignition system, start the process of elimination by trying the starter. If it works, the battery and cables are all right, but don't overlook the possibility of loose connections at each end of the battery cables, or a broken cable. Sometimes they loosen and vibration will break the circuit enough to stop the engine, which may operate when the car is standing. Tighten the cables, Fig. 2. If one is broken, twist a few strands of heavy wire together, even fencing wire, for a repair.

If this does not locate the trouble, and

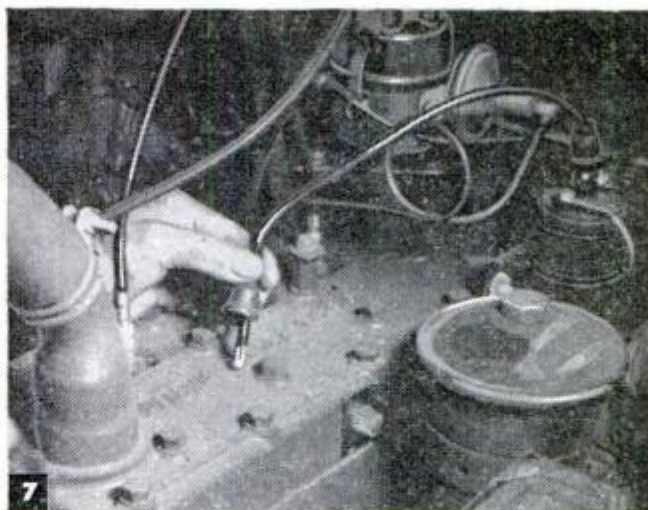
still assuming that the starter works, go back to the ignition. Remove the distributor cap and inspect it for cracks, Fig. 4. Then turn on the ignition switch and crank the motor until the distributor breaker points close. Now, with the switch on, spread the points quickly with your fingers. This should produce a spark. If it does, the ignition is okay to the distributor. Next, remove one of the spark-plug wires and hold it about $\frac{1}{8}$ in. from a cylinder-head bolt, Fig. 1, and crank the motor over a few times. You should see a spark jump from the end of the wire to the bolt. If it does, the entire ignition system is okay.

The next move is to check the fuel system. Disconnect the fuel line at the carburetor or at the discharge side of the fuel pump and crank the motor several times. Gas should flow from the pump. If these few preliminary checks, which are fairly easy to do, have not disclosed the trouble, they should enable you to determine which system is at fault. It is now a matter of tracing the trouble to its source.

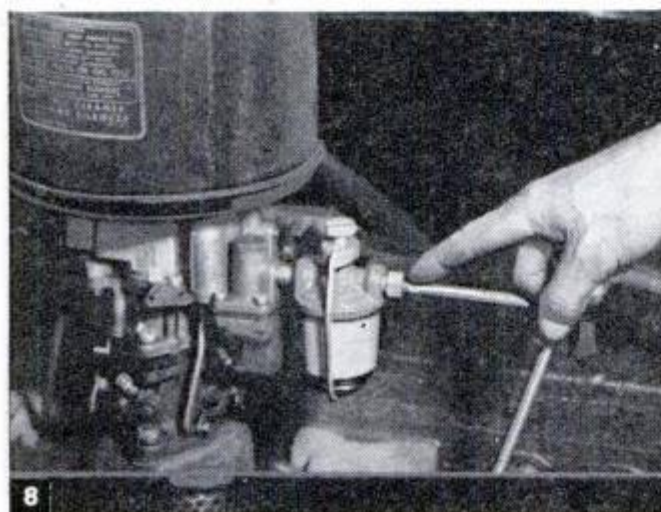
Suppose you found that the fuel system caused the trouble and gas did not flow



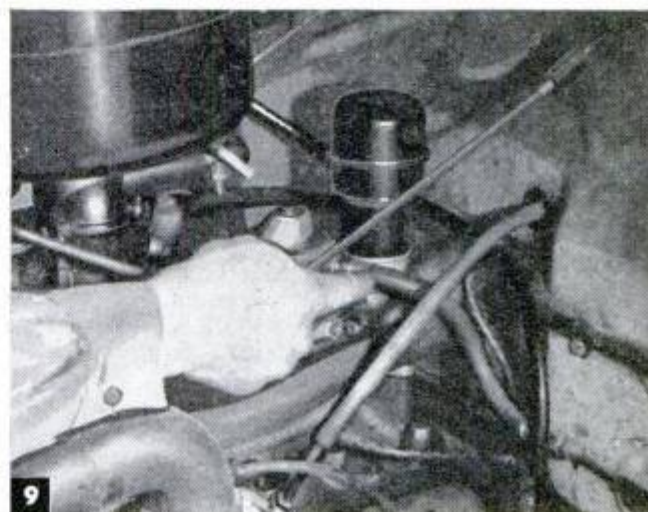
6 Breaks and abrasions in wiring, or loose connections inside distributor, may short-circuit the ignition coil



7 Hold coil-to-distributor lead $\frac{1}{4}$ in. from the cylinder block. If the coil is okay there will be a hot spark



8 The fuel filter should be cleaned periodically. Wash out sediment and be sure screen is clean and open

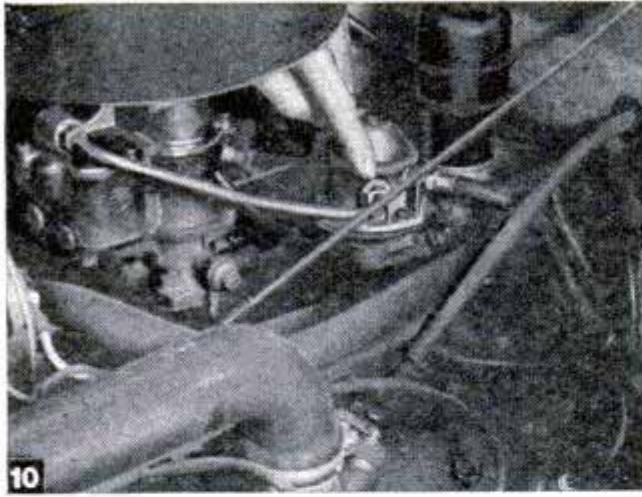


9 Examine flexible line on the suction side of the fuel pump closely. Breaks here often cause air leaks

from the line when it was disconnected. The trouble is most likely to be in the fuel pump or the flexible connection between the main fuel line and the pump. However, check the filter screen in the line. The screen may be located as in Fig. 8, or it may be at the pump or carburetor. Usually a clogged screen does not stop the motor dead without long warning several days ahead. Again connect the fuel line to the carburetor, remove the air cleaner from the carburetor and pour a tiny stream of gas into the air intake while cranking the motor with the switch on. A pop bottle is best for pouring the gas. If there isn't a small hose for siphoning the gas from the car tank, there is a drain plug in the bottom of the tank that can be taken out to get gas. Be careful, though, in doing this or you will be sprayed with gas. Race the motor for several seconds. Sometimes this procedure will start a defective fuel pump to working. If it does, don't stop the motor because the pump may refuse to work again. If the motor refuses to start, check the flexible connection between the pump and main gas line, Fig 9. It may be cracked

either externally or internally, allowing the pump to suck air into the line. Wrap it tightly with tape and again try the above procedure. If this fails, disconnect the fuel line at the pump, remove the fuel-tank cap and blow into the tank, pressing your cheeks tightly over the filler hole to prevent air from escaping. By this means, you can build up enough pressure to force gas from the line at the pump if the line is not clogged. If it is clogged, try to blow it out with a tire pump. If all of these remedies fail to correct fuel-system trouble, a mechanic is about your only hope.

If, however, the difficulty was found to be in the ignition system, it's a matter of eliminating the most likely causes of the trouble progressively. Fig. 3 shows the circuit of a typical ignition system. Suppose, for example, you had a spark at the distributor breaker points, but none at the plugs. The trouble is probably a damaged rotor. The spring contact may be broken or worn so that it does not touch the center contact in the cap. Sometimes a temporary repair can be made by binding a piece of tin or other thin metal to the rotor to carry



To check operation of the fuel pump disconnect the line on discharge side and turn the engine over

current from the center contact through the rotor. Don't overlook the possibility of a loose ground on the condenser, Fig. 5, which should be tightened.

The final check for this part of the ignition system is to remove the high-tension wire from the center contact of the distributor cap and make sure that it is clean and is seating correctly in the cap well, and also that it is not broken. Hold the free end about $\frac{1}{4}$ in. from the cylinder head as in Fig. 1, and crank the motor over several times. You should get a fat spark from the wire to the head. If not, the coil may be at fault.

To make sure about the coil, remove the "hot" primary wire from it and rub the end against an unpainted metal part of the car. There should be some indication of sparking. If there is sparking, and the connections in the distributor are tight and in good condition, Fig. 6, the trouble is likely a dead coil, which will have to be replaced. If you did not get sparking at the end of the primary wire, the trouble is between the coil and the battery. Trace the circuit, tightening all connections as you progress. Likely you will find a loose connection or a broken wire, but don't overlook the possibility of trouble in the ignition switch. Be sure the ignition switch is on when making the tests on the ignition.

In making periodic checks to avoid engine failure, consider the following:

(Approx. intervals: M—monthly, T—twice a year, Y—yearly)

IGNITION SYSTEM

Spark Plugs

1. Clean, inside and outside T
2. Look for cracks in the porcelain T
3. Adjust points to recommended setting..... T

Distributor

1. Clean inside and outside T
2. Clean terminal sockets in cap and metal contacts on wire ends T
3. Inspect for cracks in cap and body T

4. Adjust breaker-point gap. Replace points if necessary T
5. Replace frayed or swollen wiring T
6. Test condenser and tighten connections..... Y
7. Oil drive shaft and wick under rotor. Wipe trace of petrolatum on cam face M
8. Check breaker spring tension and condition of fiber bumper on breaker arm T
9. Inspect rotor contacts for burning or wear. Also, inspect metal inserts which distribute current to spark-plug wires T
10. Have timing and various timing controls checked Y

Coil

1. Clean and tighten connections T
2. Test for condition Y

Battery

1. Clean surface. Grease terminals M
2. Clean and inspect ground strap and starter lead T
3. Check gravity and water level M

Instrument Panel and Wiring

1. See that all gauges work properly M
2. Check wiring under dash for loose connections and frayed or broken insulation T

FUEL SYSTEM

Tank

1. Clean vent M
2. Drain and clean Y

Pump and Filter

1. Drain filter and renew gasket M
2. Check pump delivery T

Carburetor

1. Have cleaned and adjusted Y
2. Check choke action T
3. Check manifold heater T
4. Lubricate controls M

Fuel Lines

1. Check for kinks and air leaks and tighten all connections T
2. Especially check any flexible connections on suction side of pump T

Air Cleaner

1. Clean element M
2. Drain and refill oil type T

COOLING SYSTEM

Radiator

1. Flush complete cooling system and protect with antifreeze and antirust T
2. Repair leaks and clean outer surface of core and grille T
3. Check thermostat T
4. Replace hose connections, including heater leads T

Water Pump and Fan

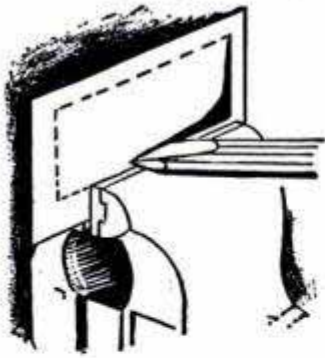
1. Grease both (if required) M
2. Check for leaks T
3. Check fan-belt condition and tension..... T

MISCELLANEOUS

Crankcase

1. Drain, flush and refill T
2. Use seasonal grade of oil T
3. Replace oil-filter element (if any) T

Cutting Openings in Sheet Metal



When you want to cut a square or rectangular opening in sheet metal, mount the work in a vise and cut it with a cold chisel. This method will simplify the job and result in a straight-edged opening with

square corners. First, scribe the section to be removed and then clamp the work in the vise, aligning the jaws flush with one of the scribed lines. Rest the chisel at a slight angle on the vise jaw and give it a sharp blow with a hammer. The shearing action produced in this manner will cut through the metal easily, even if it is of fairly heavy gauge. The chisel should have a long tapering point.—Jo Ro Jung, New Orleans, La.

Wall Plaque Enlivens Child's Room

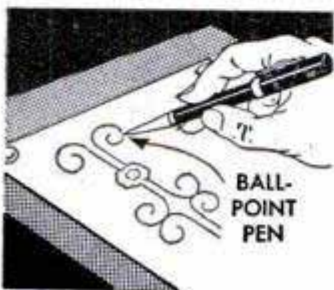
Made from wood scraps and finished in gay colors, this duck wall plaque will add a novel touch to a child's room. Suitable animal cutout designs can be obtained



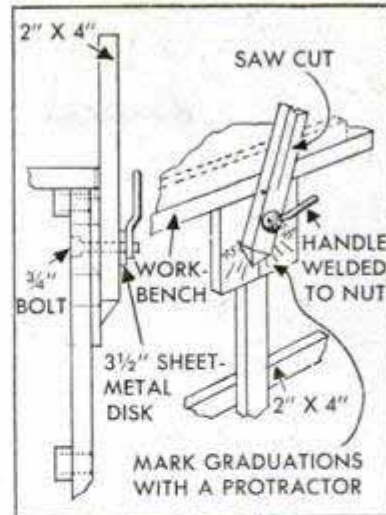
from children's coloring books, or decals may be used. These are applied to the wood, then outline-sawed and finished with clear lacquer or shellac. Finish the parts separately and assemble with glue and brads, the brads being driven from the rear side. A roundheaded brass screw and a washer make an excellent eye for the duck, or regular glass-bead eyes can be used.—I. M. Fenn, Chicago.

Ball-Point Pen Serves as Stylus When Tracing Stencil

An inexpensive ball-point fountain pen makes a good substitute for a stylus when writing, ruling or drawing on a duplicator stencil. The pen makes a clear impression



that gives an excellent reproduction and, unlike the sharp point of the stylus, the ball point practically eliminates the danger of tearing the stencil.



Pivoted "Miter Box" for Bench Use Permits Sawing Intermediate Angles

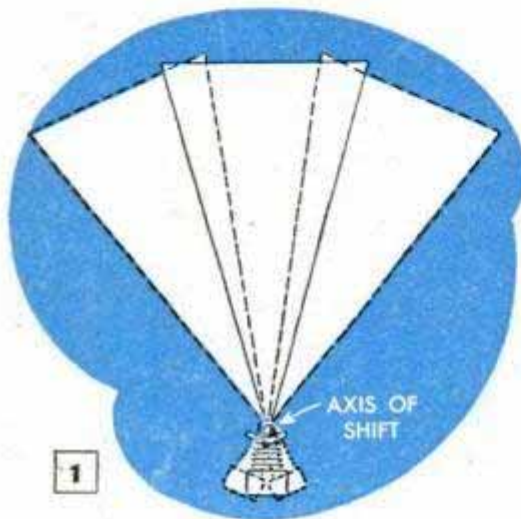
Permitting a greater number of angles to be sawed than a common wooden miter box, this unusual one features a pivoted saw guide for making either right or left-hand cuts. It can be adjusted to any angle between 45 and 90 degs. Mounted permanently to the front edge of a workbench, it is designed so that the saw guide can be swung down out of the way when not in use. A vertical 2 by 4-in. support, having a 12-in. square block nailed to the face at one end, is spiked to the bench at the top to bring the block flush and nailed to the bench crossrail at the bottom. Then, calibrations, 90 to 45 degs., are marked on the block as shown, the 90-deg. mark and the hole for the pivot bolt being aligned exactly at right angles to the bench surface. The saw slot in the guide also must be centered exactly, and the lower end of the guide is pointed to serve as an indicator. The clamping handle is formed by welding a short length of rod to the bolt nut and is backed by a sheet-metal disk. The head of the pivot bolt should be embedded in the block so that it will not rotate. In using the "miter box," a cleat should be nailed temporarily to the bench top to provide a fence, its position determined by the thickness of the work, against which the latter is held when being sawed.

Nontangling Fishhook Holder

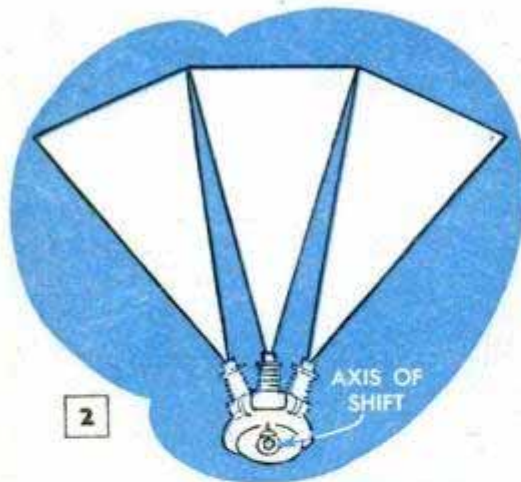
Often fishermen have trouble keeping snelled hooks from tangling and kinking in the tackle kit. Here's one way to keep them straight. Cut a piece of discarded garden hose about 8 in. long and make several slits in one end. Then fit the hooks over the other end and slip the snells into the slits, pulling them tight.



By *Frank P. Fritz* **PANORAM**



PANORAMS are fun to make. All you have to do is take a series of four or five shots of a landscape or sky line covering an arc of 90 to 120 degrees, and crop the prints to line up. Then you'll have a panoramic picture similar to the one at the top of the page. While each print will not align perfectly, a continuous photo can be produced by careful matching and trimming.



The important point in making a panorama is to have the rear nodal point of the camera lens directly over the axis of shift or rotation. As long as the lens is rotated on an axis perpendicular to the optical axis, the images of distant subjects will change their relative position very little with each shot, as illustrated in Fig. 1. But, if the camera is held by hand, the axis of shift or rotation is at your body, Fig. 2, and not the lens, and the series of prints will not match properly. The approximate location of the front and rear nodal points of a lens is shown in Fig. 4, and to bring the rear nodal point on a center line with the tripod axis, it is necessary to use a wooden top on the pan or tripod head as in Fig. 5.

Best results are obtained by using a camera which has a ground glass and a spirit level to correct distortion and keep it to a minimum. If you use a camera without a ground glass, use a spirit level and view each picture so that the outer edge of the

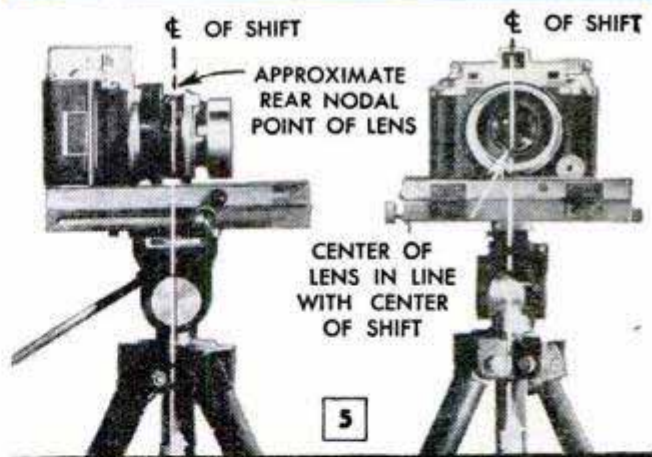
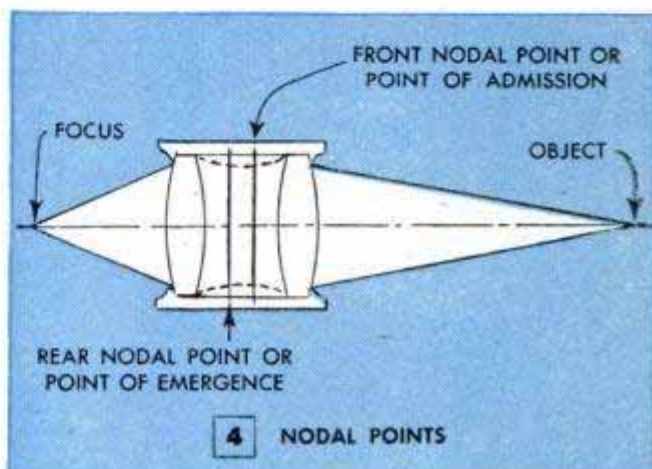




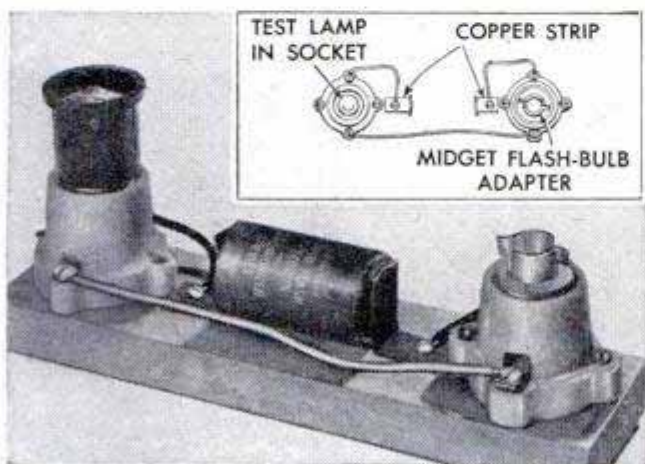
PHOTOGRAPHY

previously exposed area slightly overlaps the succeeding shot. Avoid shooting a panoram on a bright sunny day. Negative densities will vary as you swing away from the sun, making it difficult to match the tone of each photo when printing, so it is better to shoot on an overcast but bright day.

In making the prints, keep the enlarger at the same setting for all enlargements. Develop all the prints at the same time to allow you to watch and control the uniformity of tone values during development. When the prints are dried, trim adjoining edges and skive the rear side of the abutting edges with sandpaper to prevent a ridge at the joint. Match prominent parts of the image first. It will be necessary to shift the prints slightly and retrim to get them to align as closely as possible. Hold the prints in position with tabs of masking tape and when all the prints are matched, Fig. 3, use a straightedge to mark and crop the top and bottom edges of the finished print. Finally, mount them on cardboard with rubber cement.

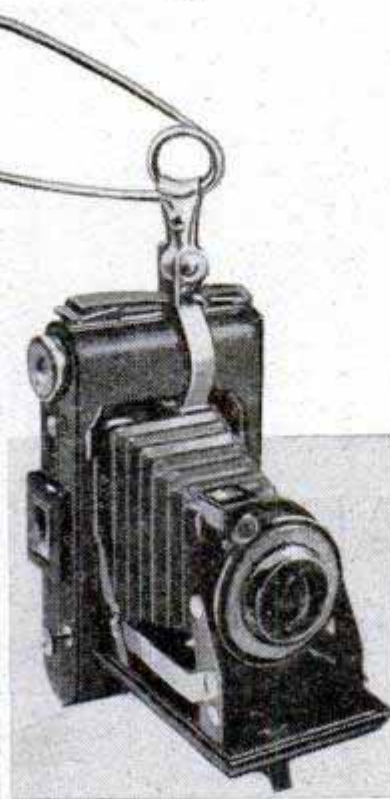
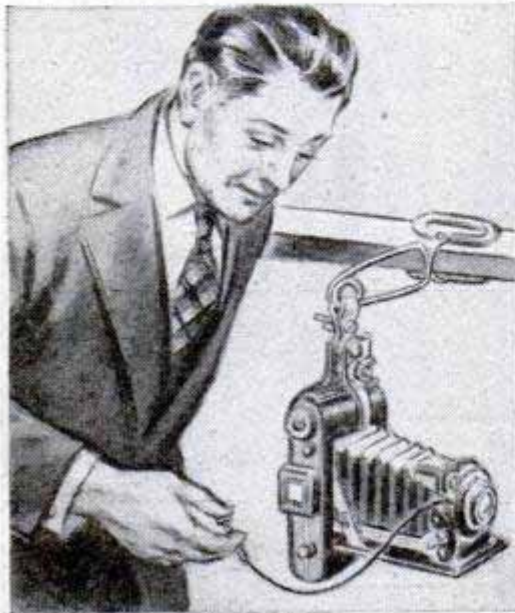


Battery-Operated Tester Picks Out Duds Among Your Flash Bulbs



To prevent missing spectacular shots due to flash-bulb failure, one photographer made sure his flash-bulb bag contained no duds by testing them beforehand in this little tester. The tester is designed to handle all sizes of flash bulbs and glows to indicate a good bulb. It consists of two porcelain sign sockets, a flashlight battery, a test lamp and two strips of copper, assembled and wired as shown. By flattening the threads in one of the sockets, the bulbs can be tested quickly without screwing them in. A midget flash-bulb adapter permits testing bayonet-base bulbs.

Use of Photoflood Reflector Spring-Type "Tripod" for Folding Camera



It's not always necessary to carry a tripod when taking pictures either indoors or outdoors with your folding camera. The spring-type clamp from a photoflood reflector, which may be fastened to almost any convenient object, will serve as a handy "tripod." This clamp will hold a light folding camera easily merely by tightening the socket clamp over the top of the camera. One arm of this clamp first should be flattened to provide a better grip on the back of the camera, and it may be padded with felt or cloth to prevent scratching the camera case. The swivel joint allows the camera to be held in practically any convenient position.

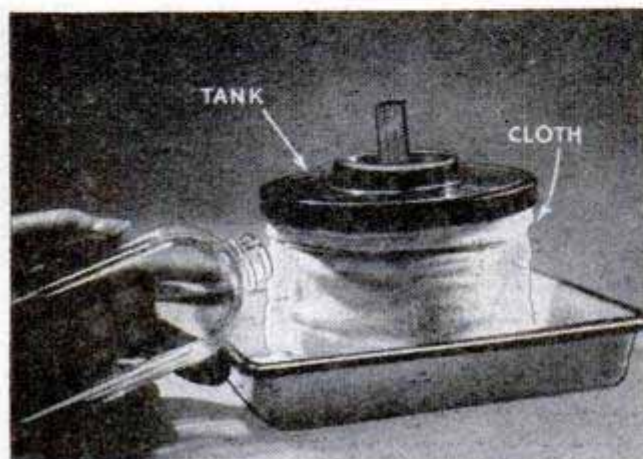
Avoid Using Your Expensive Tubular-Type Tripod in Sand and Dirt

When there is danger of getting grit from sand or mud into the telescoping legs of a tubular-type tripod, mount the pan-type head on a wooden tripod. To mount the pan head, drill a small hole in the top of the tripod to engage the short stop pin in the base of the head, and attach the latter in the regular way.



Cooling Developer by Evaporation

During hot weather, if ice or cold water are not available, a tank of developer can be kept cool if wrapped in a cloth saturated with fast-evaporating fluid. Rubbing alcohol, which is economical and easy to obtain, can be used. Hold the cloth in place around the tank with rubber bands.



Preventing Water From Splashing

Water can be prevented from splashing when washing photo-prints under a sink faucet if a strip of clean cloth is suspended from the faucet so the water runs down it. The cloth, which is held with a rubber band, should reach the tray bottom.

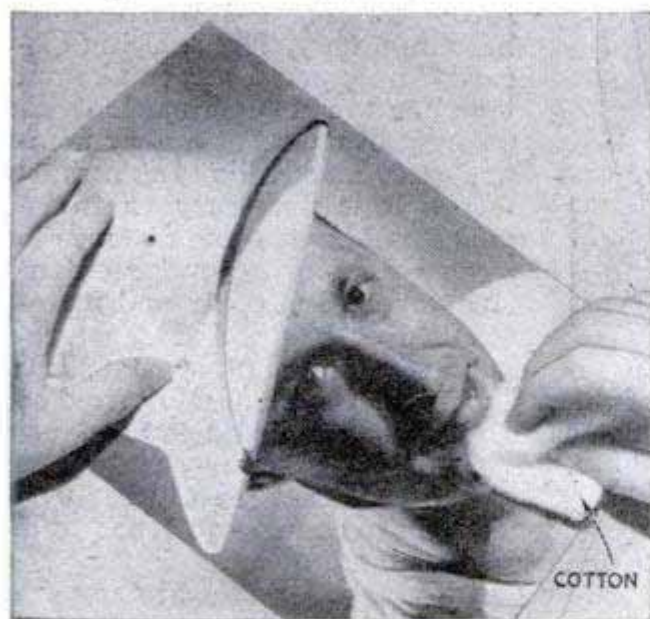


Detached Flash Gun Hung From Camera Handle

When taking pictures with a flash gun, many photographers who use a Speed-Graphic camera prefer to remove the gun from its bracket and hold it high above the bellows, as this method produces improved lighting effects affording better modeling and composition. However, the bothersome job of detaching the flash-gun cable from the camera or taking time to slide the gun on its bracket after each shot can be eliminated in the following manner. Merely unsnap the upper end of the leather handle and hang the flash gun from the square ring. The bulb may be changed and the gun left in this position ready for the next shot. The handle, of course, is snapped back easily in the carrying position when finished.



Sizing Solution Permits Spotting Glossy-Surface Prints



Glossy-type prints may be spotted or retouched as easily as prints having a matte or semi-matte finish if they are first sized with this simple solution. It is prepared by dissolving in water any of the wetting agents sold commercially as water-spot preventatives for negatives. Mix the solution to the proportions of powder, 1 gm.,

and water, 100 c.c. Apply the solution generously to the surface of the glossy print. Then remove the excess with a swab of dry cotton and spot the print in the usual way with pencil or water color and a brush. If you wish, a stock solution of the sizing can be prepared to manufacturer's directions and mixed as follows: stock solution, 1 part, and water, 8 parts.

R. F. Donovan, Jersey City, N. J.

Cable Release Operated By Darkroom Timer

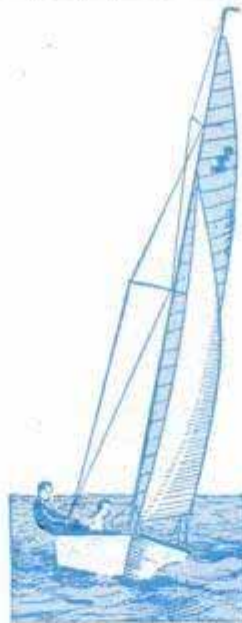
If your camera is not equipped with a built-in timer for taking self-portraits, you can use a darkroom timer of the wind-up type to trip the shutter remotely at a preset time. Just tape the end of the cable release to the face of the timer in a position where the side of the pointer will contact and depress the plunger when it reaches the preset interval. Masking or adhesive tape will do to fasten the cable to the timer.



YACHTING



ONE GOOD WAY to budget individual costs to a minimum and still enjoy all the thrills of sailing is to form a yacht club. Any group of friends with a common interest in sailing can pool talents, equipment and cash, and thereby gain all the advantages of group action on the purchase of additional gear, boats, tools, shore property for a clubhouse site and other incidental items. A clubhouse, grounds and a pier come high on the list of requirements. With careful planning, a clubhouse and a suitable pier can be built by the club members, thus confining the cash outlay to that required for good materials. Every clubhouse should have private rooms for changing from ship to shore clothes, a locker for each member so that he has space for storage of sails, clothing and other small gear, and a fairly complete set of tools for the common use of all members for repair and maintenance. No clubhouse really "belongs" until it is fitted out with a flagpole rigged complete with yardarm so that the national ensign and club pennants can be flown in correct order on all occasions. Landscaping, telephone, an oar rack and other minor details of the layout usually are decided by a vote of the club members. A slanting dock constructed at the water's edge is handy as small sailing boats can be hauled up on it



between runs or for minor repairs. A small pier adds to the completeness of the layout, provides for loading and discharge of passengers and serves as a temporary mooring for the boats when readying sail, Fig. 1. In some cases, the more rough-and-ready sailors will prefer the beaching dolly, Fig. 3. Using discarded auto parts, this can be put together to suit average individual requirements at a very nominal cost. Such a dolly is a must where it is necessary to transport small boats some distance to a yard for storage or for extensive repair. In repair and maintenance of boats, and construction of additional equipment, special skills of the members should be administered so that each individual contributes an equal share. With careful planning, clubs can build their own boats at greatly reduced costs by arranging a change-work schedule which includes all members.

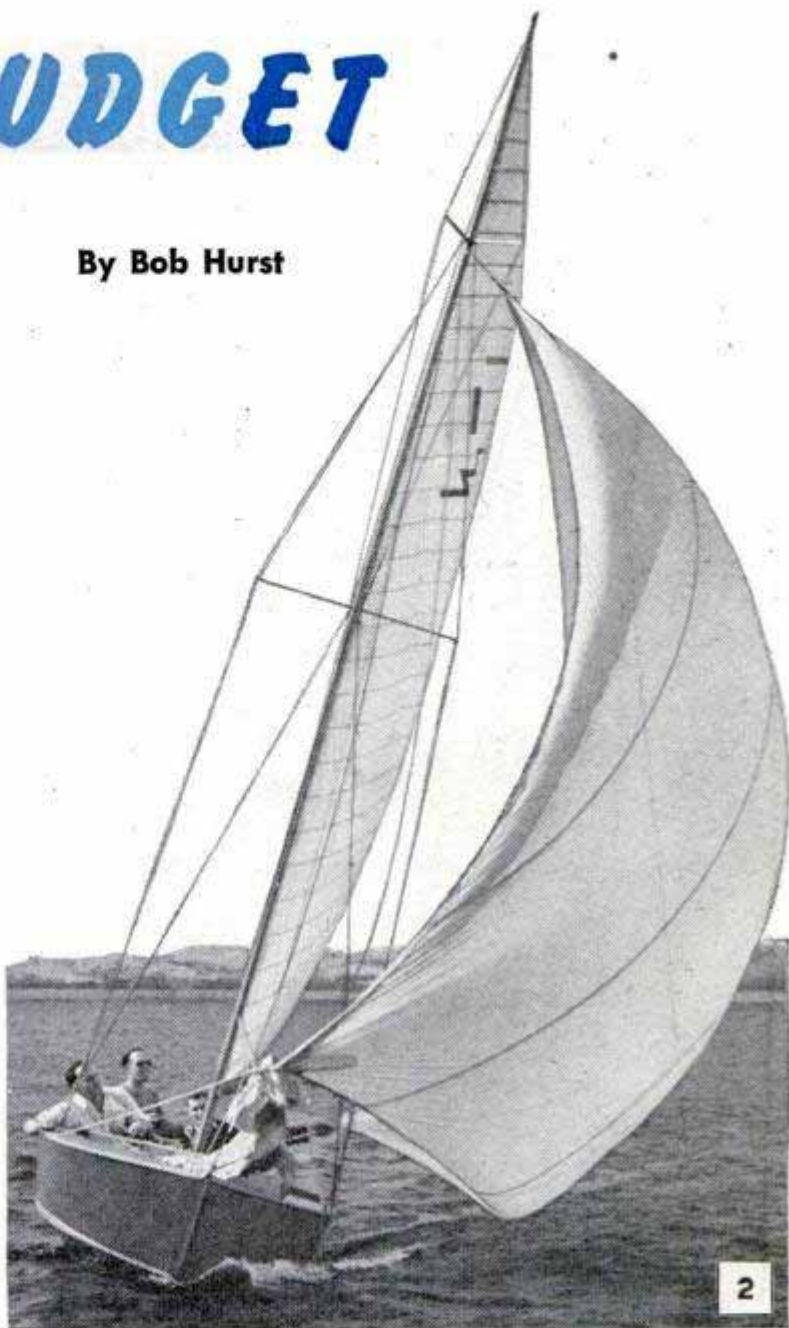
Sailing dinghies, or "dinks" as they are often called, are the smallest and simplest of the common sailboats. Having only one sail, they are easy to handle because there is no complicated rigging, unless of course, you add a spinnaker like the more daring sailors in Fig. 2. And if members are holding costs to a minimum, then the club will own mostly little boats of the Snipe class with perhaps an occasional Lightning or

ON A BUDGET

Comet, which are larger, or in other words, a lot more boat. But the pleasure of sailing your own boat is not determined by the size of the craft or the amount of money you, as an individual member of your club, spend on the sport. With skillful handling, the tiny little boats of the Snipe class are flashy performers and once you get the feel of sails in a fair wind you'll understand why seasoned yachtsmen regard this particular sport so highly.

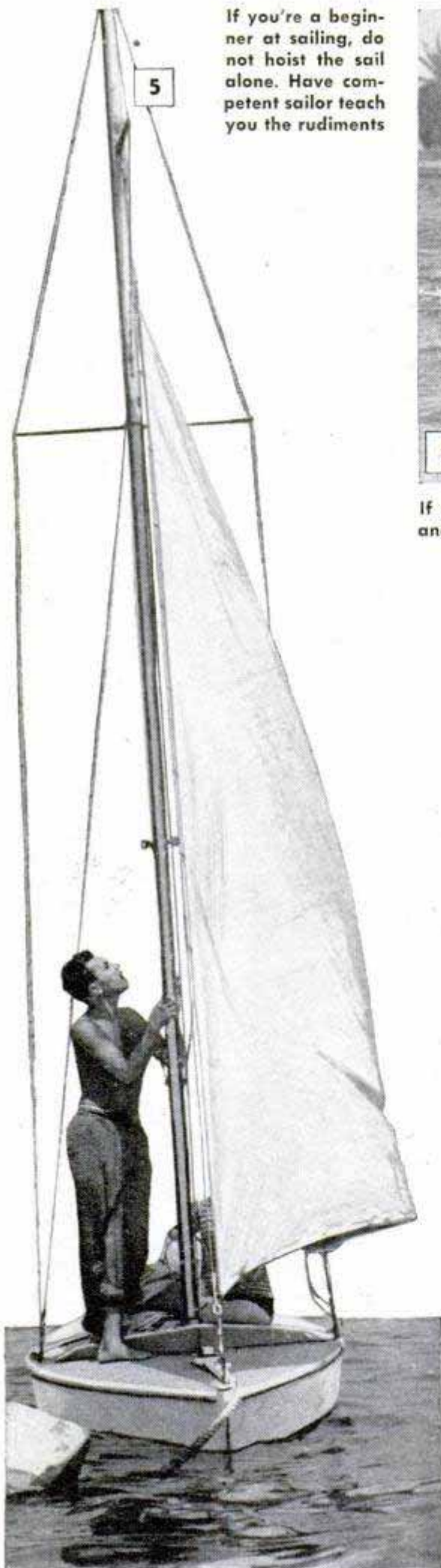
If you are a beginner, you'll need to take lengthy counsel with an experienced member of the club before venturing to hoist sail alone, Fig. 5. Take an instructor with you, not only on the first trip, but on several succeeding trips. You must acquire absolute confidence in the boat and in your own ability to handle it. Many beginners have difficulty overcoming the fear of getting away from shore, especially if there is a fairly strong offshore breeze. But a competent sailor will show you how to run out before the wind, then turn, come into the wind and tack back across it to the harbor, Fig. 9. You will be much impressed with the ease with which he handles the latter

By Bob Hurst



Below left, a beaching dolly is just the thing for launching small boats without the aid of a dock crane or where they are transported some distance for repairs. Right, approved manner of holding tiller and sheet





If you're a beginner at sailing, do not hoist the sail alone. Have competent sailor teach you the rudiments



If you drive your boat hard, always keep on the weather side and hold the sheet ready for instant trimming of the sail

maneuvers; how, after running on the port tack for an interval (reach), he eases off on the sheets to luff sail and simultaneously puts the rudder hard down to tack ship. The boom will swing to the opposite side to allow the sail to catch the wind from the new quarter, and before you know it your little boat is away on the starboard tack. It's a neat trick just to watch, if it's done by an old hand, but the real thrill comes when you do it yourself for the first time. Once you see demonstrated how quickly and smoothly the craft responds to the rudder and the set of the sail, you get the idea that with fair and steady winds you can go anywhere there is water under your keel, and you can come back just as easily to home harbor.

Your sailor friend also will show you how to turn into the wind and coast your little boat smoothly up to the dock. To do this expertly, you have to judge distance and wind strength to a nicety, because a light boat loses way quickly on being turned into the wind. It's a good idea to practice the maneuver often in both light and strong winds. Fig. 4 shows an approved manner of holding the sheet and tiller when sailing a small boat. It's easy and comfortable and you're in a position to slack off instantly on the sheet if the boat heels (tips) too sharply to an unexpected gust. And this brings up one of the first principles in sailing a small boat. Always hold the sheet in your hand. Never snub it, or fasten to a cleat, for even when the weather is fair and the wind light, some unlooked-for emergency may make it necessary to trim sail quickly to release wind pressure. Keep the sheet free. It's a rule in small boats. When sailing, except perhaps when everything is going smoothly as in Fig. 8, it's regular practice to sit on the weather side of the boat, that is, the side from which the wind is coming, Fig. 6, and change from starboard side to port side

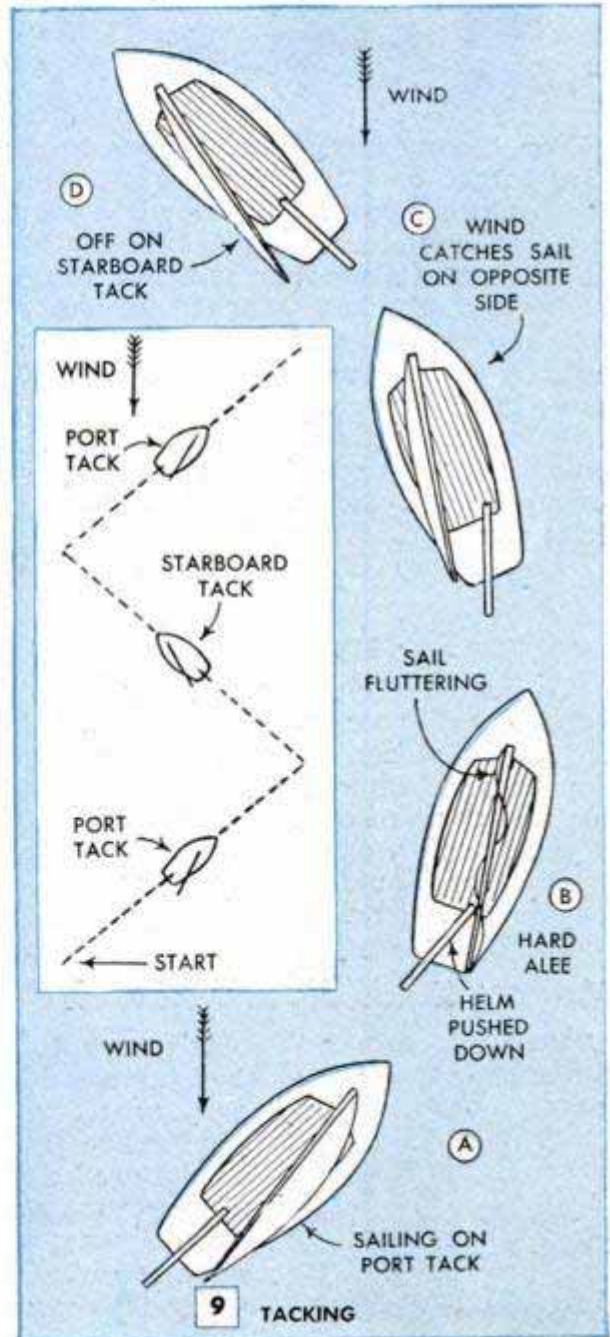


Above left, quick work with tiller and sheet usually will avoid heeling and capsizing, but if you do go over, the boat will not sink unless the hull is badly damaged. Right, all a yachtsman asks for is smooth sailing

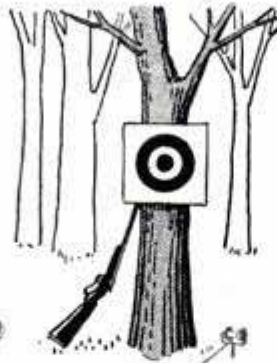
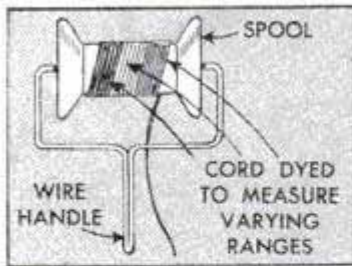
and back again when you're beating to windward on repeated tacks. If the wind turns suddenly gusty or if a squall races down on you and the boat begins to heel alarmingly, ease off on the sheet and the tiller simultaneously. Or, if it looks like an emergency, merely let go of everything. The sail will swing out and the boat will come up into the wind and right herself. If you are quick, you usually can avoid capsizing, even when hit by a severe gust or wind squall. The student sailor need not unduly fear capsizing, for small sailboats do not sink readily when upset, Fig. 7. Unless the hull is damaged by collision or other accident, it will support your weight until a rescue party comes alongside and picks you up.

When working back to windward, that is, tacking, many beginners tend to sail too close to the wind on the port and starboard tacks. This probably is due partly to the amateur's desire to reach home port, but mostly to the natural tendency of small sailing craft to come up into the wind when running the reach between tacks. To get the full drive of the sail and to steady the boat, it's generally considered good practice to hold her off, even where you must shorten the reach between port and starboard tacks. In this, good sailors rely on their judgment and gauge the procedure by the performance of the boat under varying conditions. Many sailing practices apply only loosely to the handling of the very small boats, particularly after one gains experience and comes to know his own boat well.

After you have mastered ordinary sailing techniques under the tutelage of your instructor and have gained confidence in yourself, your boat and your ability to take her out in any reasonably good sailing weather, you're eligible in most unofficial small clubs to wear the snappy blue-and-gold yachting cap and club emblem.



Colored Lengths of String on Spool Used for Measuring Range Lengths



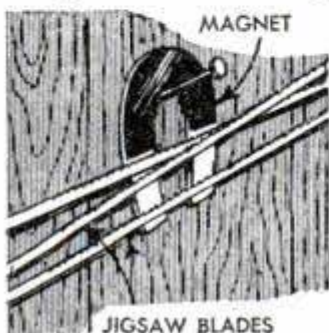
For the marksman who likes to practice target shooting away from marked ranges, this measuring device will come in handy for determining target distances. It consists of a spool on which is wound a string that has been marked for the various ranges, and a wire handle. To mark the string, dye the first fifty yards red, the next twenty-five blue and leave the last twenty-five yards white, etc., varying the color scheme and distances to suit your own purposes. Clothing dyes or waterproof inks are used to color the string.

Harry Wandrus, Milwaukee, Wis.

Lacquer Preserves Chrome Parts

To keep the chrome on your car at its original brilliance without constant polishing, coat it with a mixture of clear lacquer, 1 part, and thinner, 3 parts. The lacquer may be sprayed on the large surfaces and applied with a clean brush to the smaller parts. This should be done on a warm, dry day so the finish will not appear milky.

Magnet Holds Jigsaw Blades

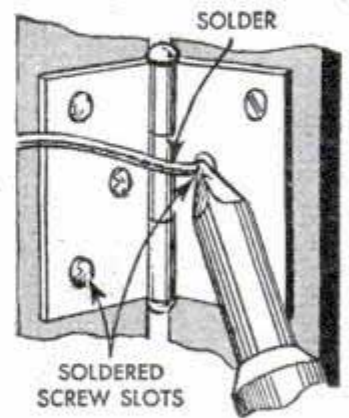


It's easy to select just the blade you want when your extra jigsaw blades are held by a horseshoe magnet. Hang the magnet on a nail near the workbench or jigsaw.

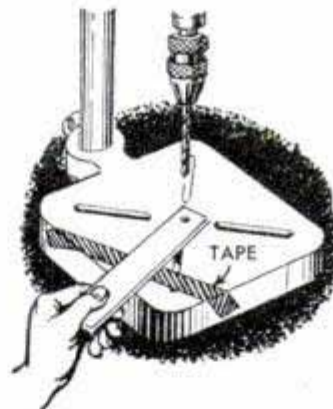
Storing the blades in this manner will be found more convenient than when they are kept in a drawer. A magnet is provided for each size of blades.

Screwheads Filled With Solder Discourage Hinge Removal

Petty theft from a toolbox, which has a cover that is surface hinged, is discouraged if the heads of the exposed hinge screws are soldered over to fill the slots. This has been found effective in foiling attempts to remove the screws, due to the likelihood of the thief being discovered because of the extra time and work involved in removing the solder.



Tape Adds Nonslip Surface To Drill-Press Table

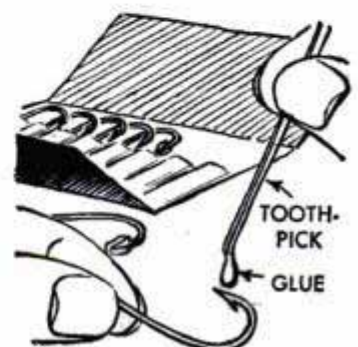


When drilling strips of sheet metal on a drill press, the possibility that the work will rotate and injure the hands is reduced considerably if electrician's friction tape is applied to one corner of the table and the work rested on it.

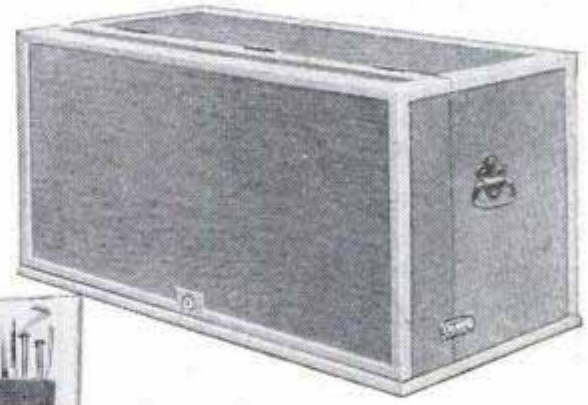
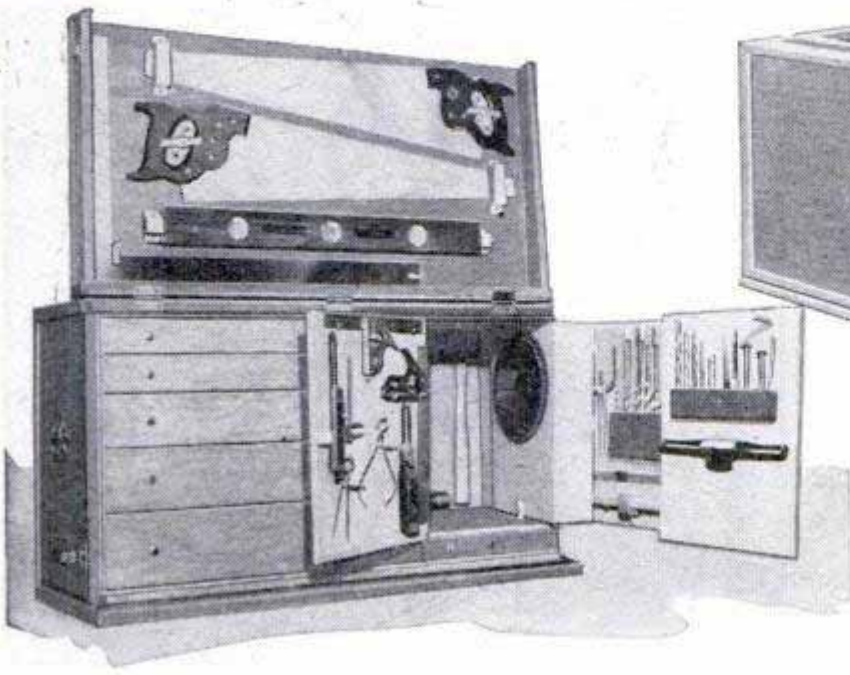
As this tape is sticky on both sides, it will adhere to the table top and provide a nonslip surface for the work.

Handling Fishhooks Safely

Even if fishhooks are kept in books or holders, the barbs on the hooks are apt to injure a finger when they are handled. To avoid this, place a drop of nonwaterproof glue on the point of the hook and around the barb. Then the hook can be handled safely and, when placed in the water, the protective covering will dissolve.



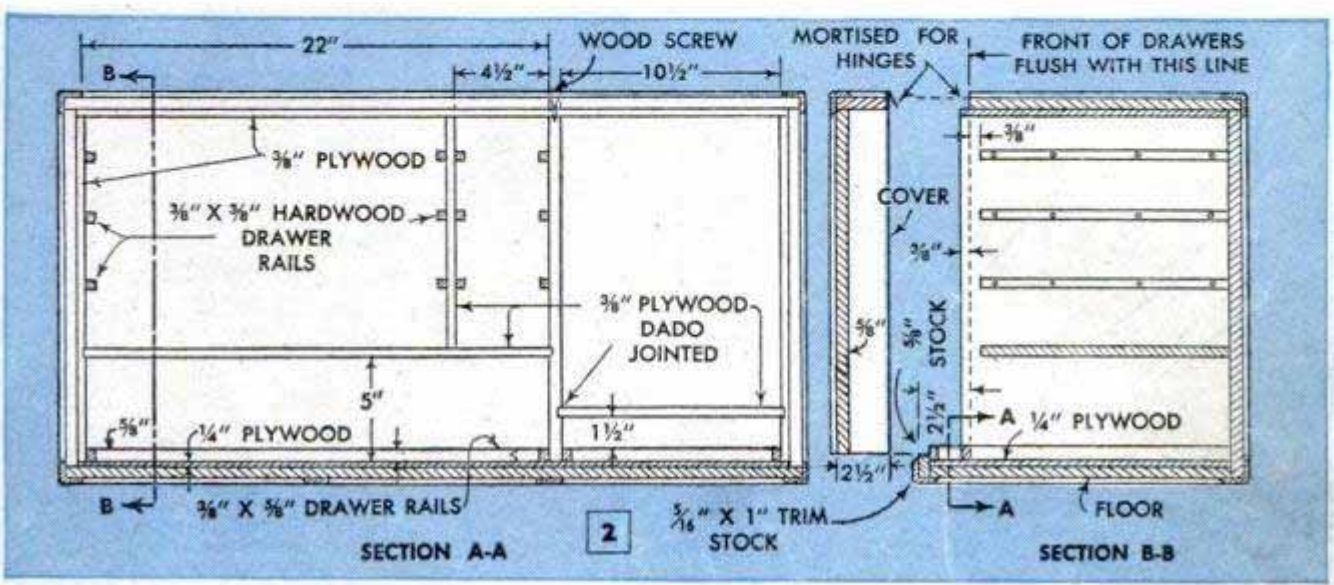
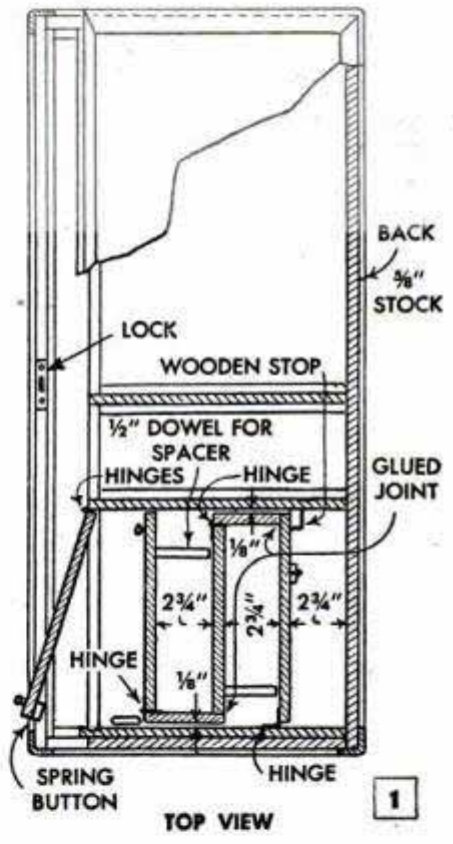
SHOP NOTES

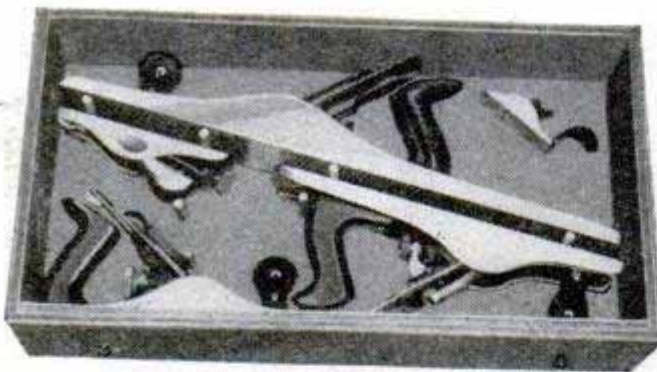
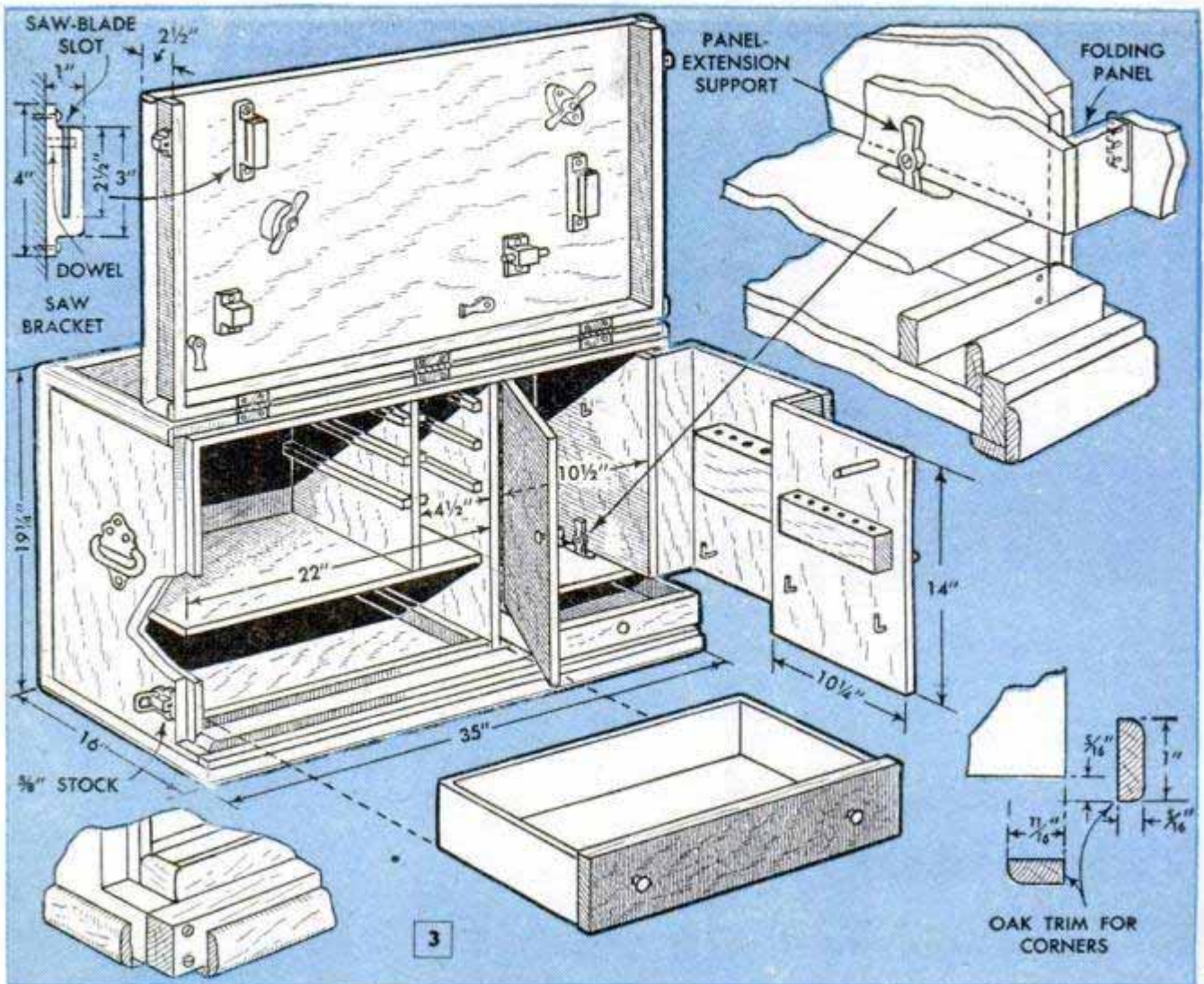


Woodworker's TOOL CHEST

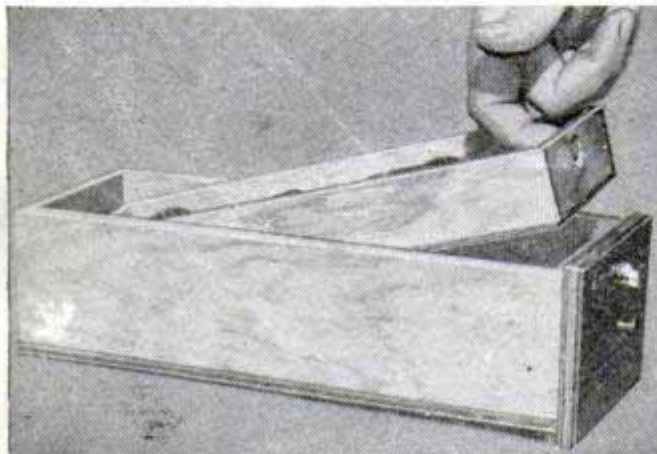
By Edward R. Lucas

THERE'S a place for each tool and you'll know just where to find it if your woodworking tools are kept in a chest like the one built by Vernon Cutler of Bremerton, Wash. In addition to its convenience and efficiency, this chest conserves workshop space and, if constructed with close-fitting joints and lid, it appreciably retards tool rust. The chest has a spacious drawer for storing planes and other large tools, nine smaller drawers, a tool panel that folds compactly into its compartment, and plenty of room on the inside of the lid for hanging saws, a level and a square. Even the space between the large drawer and chest bottom can be utilized





Above, roomy bottom drawer provides ample storage space for planes or other large tools. Below, drawer inserts permit the number of compartments to be increased without the installation of extra drawers

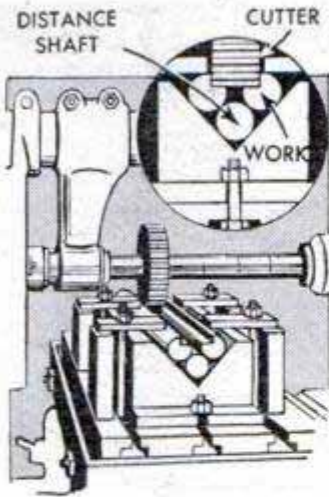


for storing blueprints, magazine plans and pamphlets.

The outer shell of the chest is of cedar with all corners and edges protected by oak trim. The top and sides are lined with 3/8-in. plywood panels and the bottom with 1/4-in. plywood. These liners extend 3/8 in. beyond the front edges of the top and sides to form a rabbet for the lid, Fig. 1 and Fig. 2, section B-B. Two 5/16 by 1-in. oak cleats are fastened across the bottom of the chest to give additional support. The vertical partitions and hardwood drawer runners are inserted as in Fig. 1 and Fig. 2, section A-A. All drawer fronts and the door for the tool-panel compartment should fit flush with the chest sides.

The tool panels are hinged and fitted as in Fig. 1, leaving at least 1/8-in. clearance between each wall of the compartment and the panels when they are folded. Note the wooden stop and the dowel spacers for the panels. The extension support, upper right-hand detail, Fig. 3, holds the tool panels in the open position. The lid is constructed in the same way as the rest of the chest, and is mortise-hinged to the chest top. Fig. 3 shows fixtures for mounting tools on inside of lid.

Milling Setup Doubles Output



Two identical cuts can be milled in the time it takes to make one cut, if the work is clamped as shown and a straight-faced cutter is used instead of an angular one. Here, the idea is used to mill shallow V-grooves in shafting. Two pieces of work are placed in a V-block and

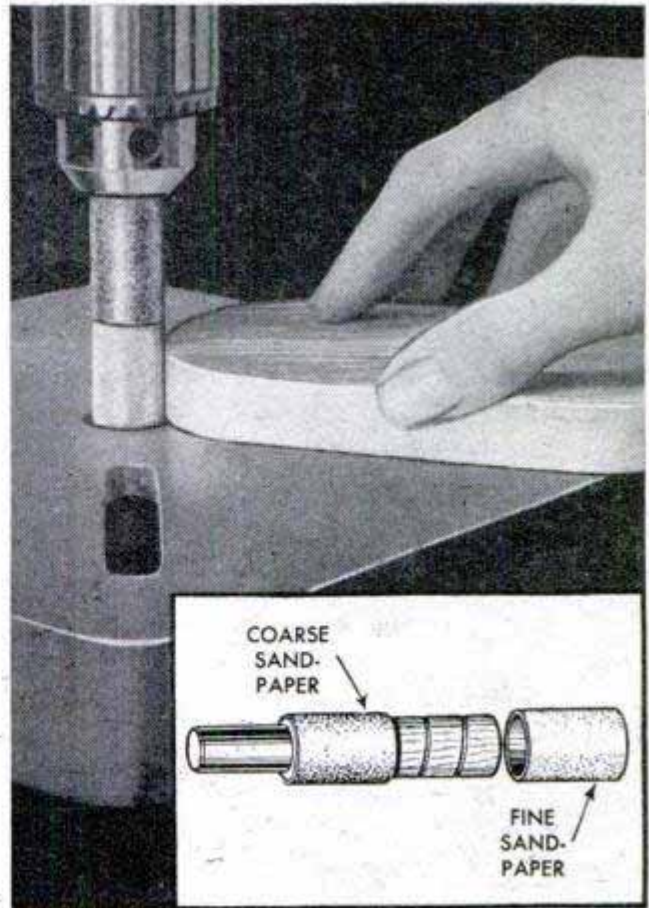
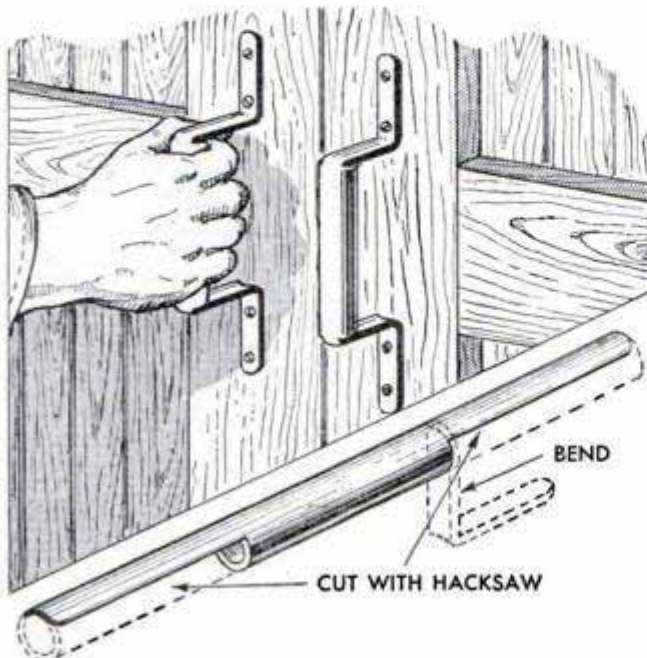
supported by a third piece labeled "distance shaft." As the distance shaft determines the spacing of the work and the depth of cut, the size of the shaft and cutter must be such to permit milling an identical groove in each shaft. Mounting two pieces of work in this manner also permits the work to be clamped along each side and thereby provides free passage for the cutter along the entire length.

H. Moore, Leeds, England.

Scrap Pipe Makes Sturdy Handles For Shed and Barn Doors

Excellent, inexpensive handles for the doors of barns and other out buildings can be made from lengths of pipe by sawing and bending them as shown. The finished handle has a round, comfortable grip and its size, of course, is determined by the pipe used. Holes are drilled in the flattened ends to permit fastening the handles to the door with screws.

John Krill, North Lima, Ohio.

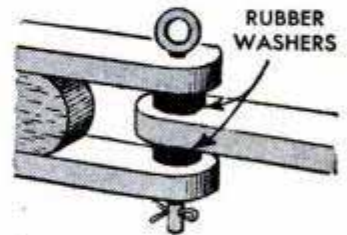


Drill-Press Sanding Sleeve Does Coarse or Fine Work

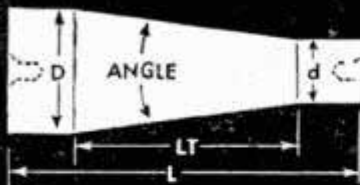
Both coarse and fine sanding may be done on the same drill-press sanding drum without changing sleeves, if sleeves of two different grit sizes are cut in half and a piece of each is slipped on the drum. Raising or lowering the spindle and locking it in place brings either grit into working position. If the sanding drum is too large to pass through the hole in the drill-press table, a piece of wood the same thickness as the height of the lower sleeve section will serve as a platform to elevate the work.

Eliminating Trailer-Hitch Rattle

Rattling of the pin-type hitch between a tractor and wagon is eliminated by placing rubber washers on the clevis pin so that one is on each side of the drawbar. Suitable washers can be fashioned by making a hole through the center of two rubber shoe heels.



Ⓜ Torn coat linings, due to hanging the coat on a nail in the shop or barn, can be prevented by driving the nails lengthwise through a cork. Long, small-diameter corks are most suitable for this purpose.



TAPER TURNING

TO FIND SETOVER

- T.P.F. GIVEN:**
FIND NEAREST T.P.F. IN COL. 1. READ SETOVER FACTOR ON SAME LINE, COL. 4. MULTIPLY FACTOR BY TOTAL LENGTH OF WORK (L).
- TOTAL ANGLE GIVEN:**
FIND NEAREST ANGLE IN COL. 2. READ SETOVER FACTOR ON SAME LINE, COL. 4. MULTIPLY FACTOR BY L.
- DIAMETERS AND LENGTH GIVEN:**
APPLY THIS FORMULA TO FIND TAPER PER INCH:

$$\text{T.P.I.} = \frac{D-d}{L}$$
 THEN, FIND NEAREST T.P.I. IN COL. 3. READ SETOVER FACTOR IN COL. 4. MULTIPLY FACTOR BY L.
- PROPORTIONAL TAPER:**
A TAPER SPECIFIED, FOR EXAMPLE, 1 IN 24, MEANS T.P.I. OF 1/24". LOCATE THIS FIGURE IN LEFT SIDE OF COL. 3, THEN READ SETOVER FACTOR AND MULTIPLY BY LENGTH.

TAPER ATTACHMENT

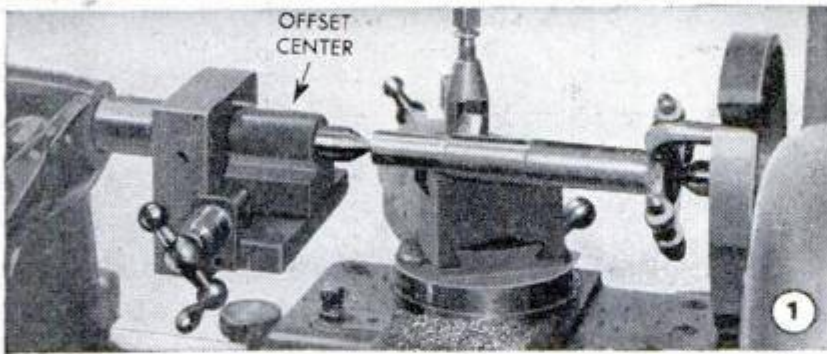
IF T.P.F. OR TOTAL ANGLE IS GIVEN, SET DIRECT ON TAPER-ATTACHMENT SCALE. IF LENGTHS AND DIAMETERS ONLY ARE GIVEN, CALCULATE T.P.I. AS PER UNIT NO. 3 ABOVE. THEN, LOCATE T.P.I. IN TABLE AND ON SAME LINE READ EITHER T.P.F. OR TOTAL ANGLE FOR TAPER-ATTACHMENT SETTING.

COMPOUND SWIVEL

- T.P.F. GIVEN:**
FIND NEAREST T.P.F. IN COL. 1. READ EQUIVALENT COMPOUND SWIVEL IN COL. 5.
- TOTAL ANGLE GIVEN:**
TABLE NOT NEEDED. SET COMPOUND PARALLEL WITH LATHE BED; THEN, SWIVEL THROUGH 1/2 OF THE TOTAL ANGLE SPECIFIED.
- DIAMETERS AND LENGTH GIVEN:**
CALCULATE T.P.I. AS PER UNIT NO. 3 ABOVE. THEN, FIND NEAREST T.P.I. IN COL. 3. ON SAME LINE, READ EQUIVALENT COMPOUND SWIVEL IN COL. 5.

1		2	3		4	5	6
TAPER PER FT.		TOTAL ANGLE	TAPER PER INCH		SETOVER FACTOR	COMPOUND SWIVEL	SPECIFIC USE
Fraction	Decimal		Approx. Fraction	Decimal			
	.006	0° 02'	—	.0005	.0003	0° 01'	Mandrels
1/8	.125	0° 36'	1/100	.010	.0052	0° 18'	
3/16	.187	0° 54'	1/62	.016	.0078	0° 27'	
	.210	1° 00'	1/59	.017	.0087	0° 30'	
1/4	.250	1° 12'	1/48	.021	.0104	0° 36'	Taper Pins
5/16	.312	1° 30'	1/38	.026	.0130	0° 45'	
3/8	.375	1° 47'	1/32	.031	.0156	0° 53'	
	.419	2° 00'	1/29	.035	.0174	1° 00'	
7/16	.437	2° 05'	1/28	.036	.0182	1° 02'	
1/2	.500	2° 23'	1/24	.042	.0208	1° 11'	All Brown and Sharpe Except No. 10
	.516	2° 28'	1/23	.043	.0215	1° 14'	Brown and Sharpe No. 10
9/16	.562	2° 42'	1/21	.047	.0234	1° 21'	
	.597	2° 52'	1/20	.050	.0249	1° 26'	Jacobs No. 0
	.600	2° 52'	1/20	.050	.0250	1° 26'	Morse Nos. 1, 2, 3 Jarno (All)
5/8	.625	3° 00'	1/19	.052	.0260	1° 30'	Morse Nos. 0, 4, 6, 7 Jacobs Nos. 4, 5, 6
	.630	3° 00'	1/19	.053	.0263	1° 30'	Morse No. 5
	.637	3° 02'	1/19	.053	.0265	1° 31'	Jacobs No. 3
11/16	.687	3° 18'	1/17	.057	.0286	1° 39'	
3/4	.750	3° 25'	1/16	.062	.0312	1° 47'	Pipe Threads
	.838	4° 00'	1/14	.070	.0349	2° 00'	
7/8	.875	4° 12'	1/14	.073	.0365	2° 06'	
	.923	4° 24'	1/13	.077	.0384	2° 12'	Jacobs No. 1
	.978	4° 40'	1/12	.082	.0407	2° 20'	Jacobs No. 2
1	1.000	4° 45'	1/12	.083	.0417	2° 23'	
	1.047	5° 00'	1/11	.087	.0436	2° 30'	
1-1/4	1.250	5° 58'	1/9	.105	.0521	2° 59'	
	1.257	6° 00'	1/9	.105	.0523	3° 00'	
	1.465	7° 00'	1/8	.122	.0610	3° 30'	
1-1/2	1.500	7° 08'	1/8	.125	.0625	3° 34'	
	1.676	8° 00'	1/7	.140	.0698	4° 00'	
1-3/4	1.750	8° 20'	1/7	.146	.0729	4° 10'	
	1.885	9° 00'	1/6	.157	.0785	4° 30'	
2	2.000	9° 32'	1/6	.167	.0833	4° 46'	
	2.094	10° 00'	1/6	.174	.0872	5° 00'	
	2.310	11° 00'	1/5	.192	.0958	5° 30'	
2-1/2	2.500	11° 54'	1/5	.208	.1042	5° 57'	
	2.513	12° 00'	1/5	.209	.1045	6° 00'	
	2.717	13° 00'	1/4	.226	.1132	6° 30'	
	2.931	14° 00'	1/4	.244	.1219	7° 00'	
3	3.000	14° 16'	1/4	.250	.1250	7° 08'	
3-1/2	3.500	16° 36'	1/3	.292	.1458	8° 18'	Milling Machine

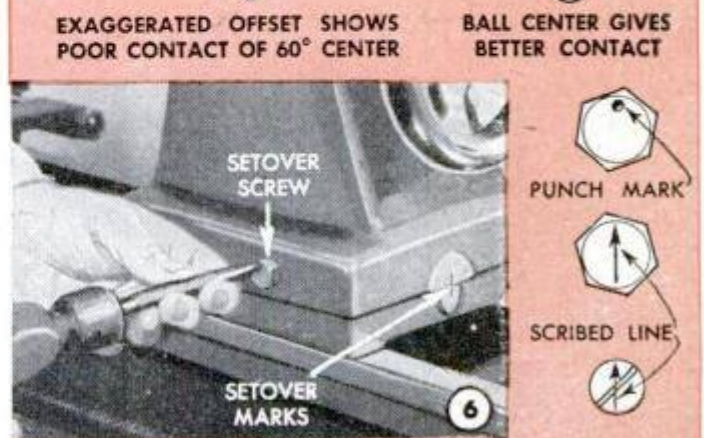
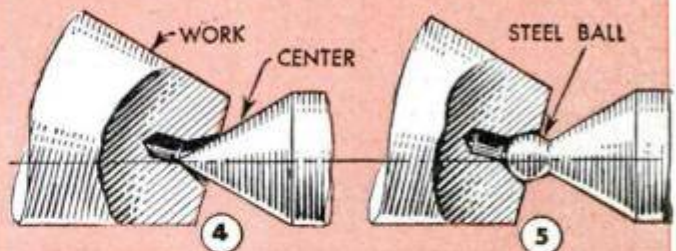
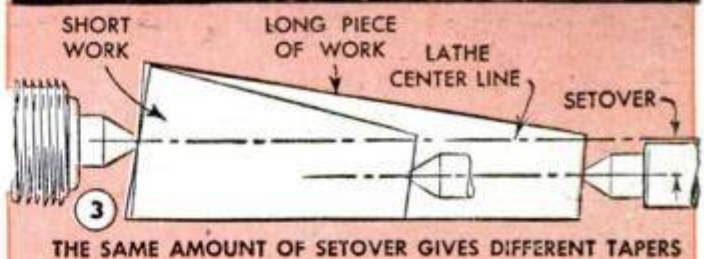
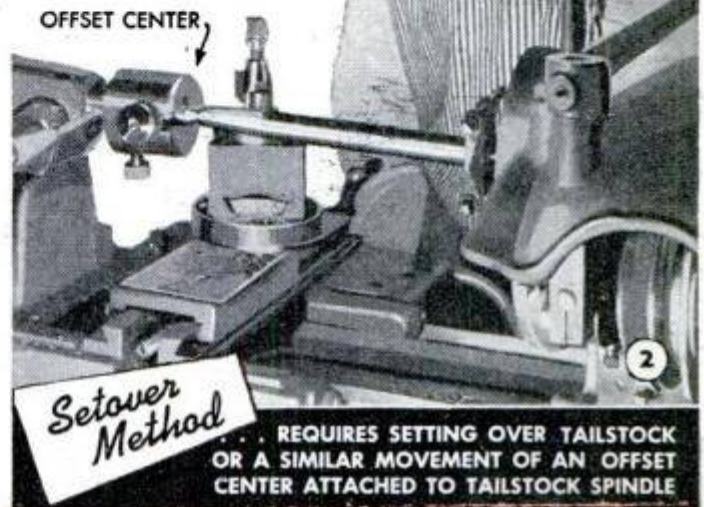
and BORING PRACTICE



By Sam Brown

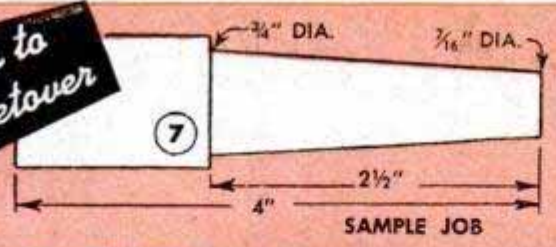
ALTHOUGH taper turning is a common shop operation, it requires a careful setup to produce work accurately to required dimensions. In most shops it commonly is done by one of three methods: (1) Setting-over the tailstock; (2) by use of a taper attachment and (3) by swiveling the compound. Most craftwork and small machine-shop work is done with the set-over method. The mechanics of this operation are fairly well understood by most workers, and the main difficulty is not in the work itself but in calculating the required amount of setover. This is simplified by the table on the opposite page, which lists a considerable range of standard tapers. If the job happens to call for a taper not listed, use the next size under the specified taper.

Setover method: Nearly all lathes are equipped with setover tailstocks, the amount of setover varying with the size and type of machine. Although it serves the purpose where only an occasional taper is turned, in production work this system has two faults: First, it requires movement of the tailstock and the consequent tedious adjustment of getting it back to the proper position for straight turning; second, it tends to score the tail center. One good remedy for the first fault is to use an offset center, which is adjustable for setover. A simple type is shown in Fig. 2. Another style with a micrometer sleeve is pictured in Fig. 1. This model has a ball center, Fig. 5, which eliminates the problem of scored centers. Why the work scores the common 60-deg. center can be seen from Fig. 4. This is exaggerated, of course, as the scoring is not bad when cutting medium tapers. However, there is the possibility of an inaccuracy developing while the work is in progress, due to deep scoring of the center

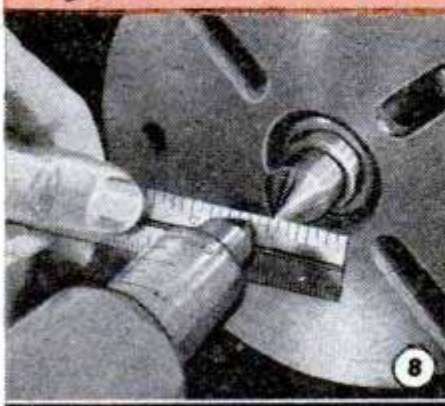


PUNCH MARK OR SCRIBED LINE ON SETOVER SCREWS ASSURES ACCURATE RESETTING OF TAILSTOCK

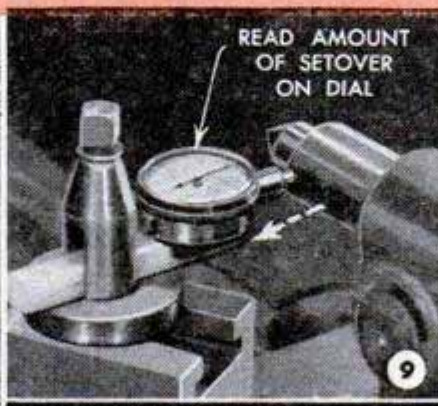
5 - Ways to Measure Setover



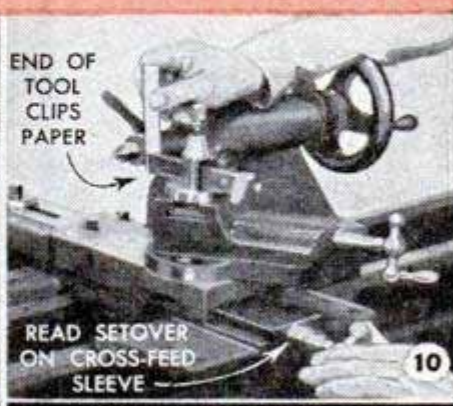
SETOVER CALCULATION
 $T.P.I. = \frac{D-d}{LT} = \frac{.750-.437}{2.5} = .125$
 T. P. I. OF .125 = .0625 SETOVER FACTOR
 (THIS FROM TAPER-TURNING TABLE)
 THEN: .0625 X 4 = .25" SETOVER



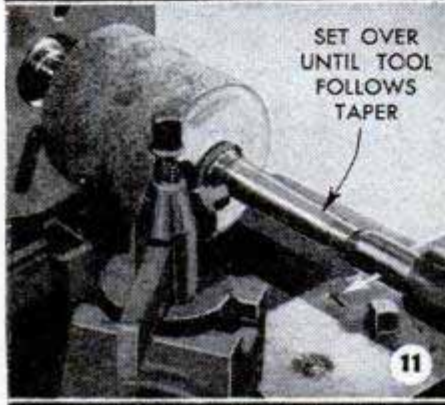
1 BY MEASURING AT CENTERS



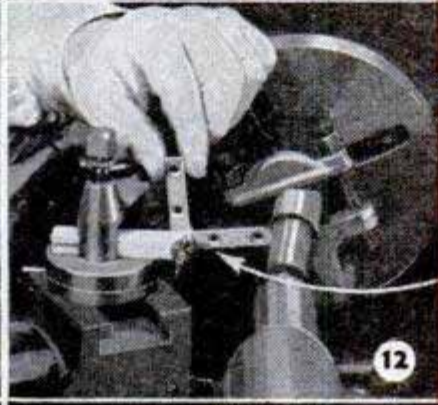
2 DIRECT DIAL READING



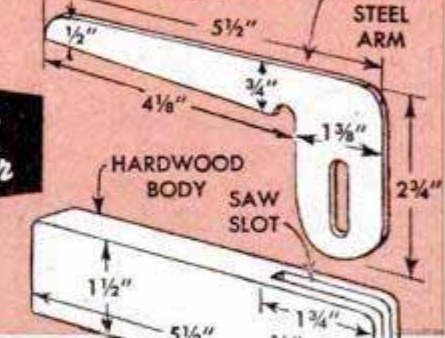
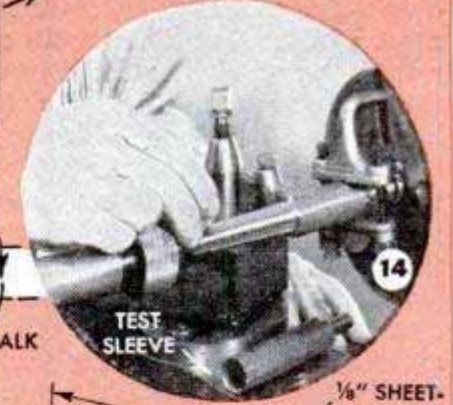
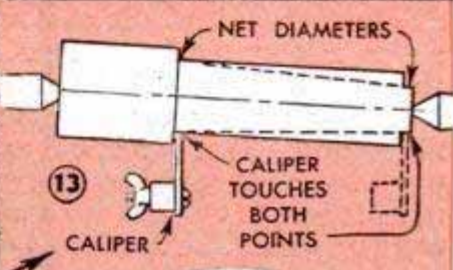
3 READING MICROMETER SLEEVE



4 SET TO DUPLICATE TAPER



5 SET TO GUIDE CUTS



16 TAPER GAUGE



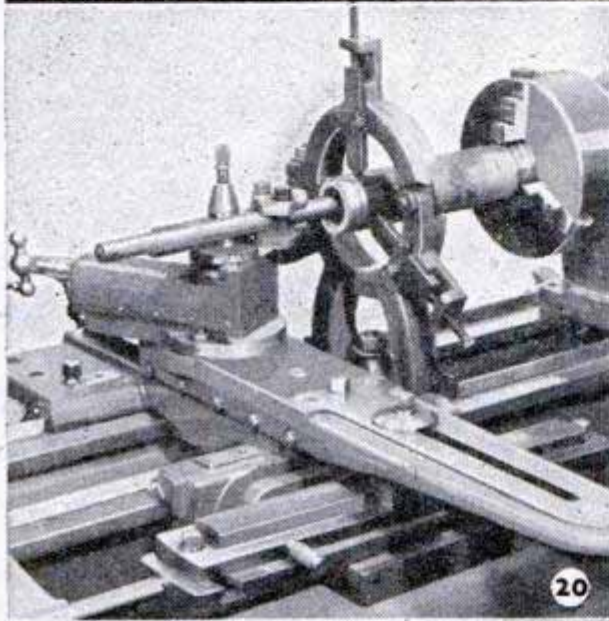
or, in some cases, the work. Another simple way to eliminate this trouble is to use a ball-bearing center instead of the plain type. When the tailstock itself is set over, resetting is made easier if the setover screws are indexed. By punch-marking the adjusting screws as in Fig. 6, you can easily readjust the centers to the parallel position after turning a taper.

The main point in setover taper turning is that the over-all length of the work always determines the setover. The taper can be part or full length, at either end or at the center, but the amount of setover depends on over-all length. Fig. 3 shows how the same amount of setover produces different tapers on different lengths of work. If the work is mounted on a mandrel, the setover is calculated from the length of the mandrel, not the length of the work. For external cutting, the setover usually is made toward the operator; internal cuts are made with the setover away from the operator. The tool bit must be exactly on center, as inaccurate work will result if the cutting point is above or below center.

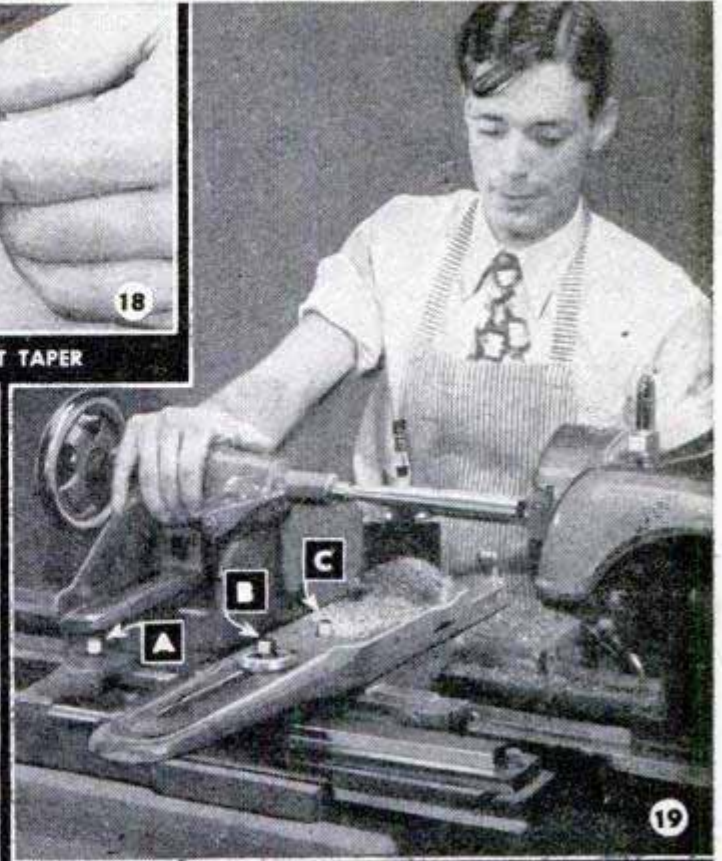
Five ways to measure setover: Figs 8 to 12 inclusive show five ways to measure the



SETTING TAPER ATTACHMENT FOR 1" PER FOOT TAPER



BORING WITH TAPER ATTACHMENT



Taper Attachment

FURNISHES BEST WAY OF DOING TAPER TURNING, EITHER INTERNAL OR EXTERNAL. THE DEVICE IS A PERMANENT PART OF THE LATHE

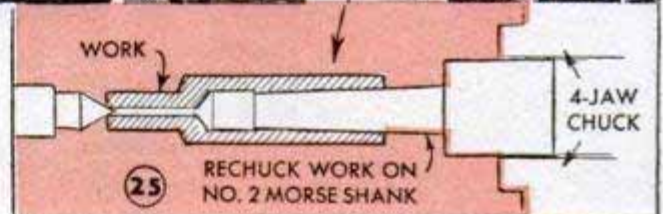
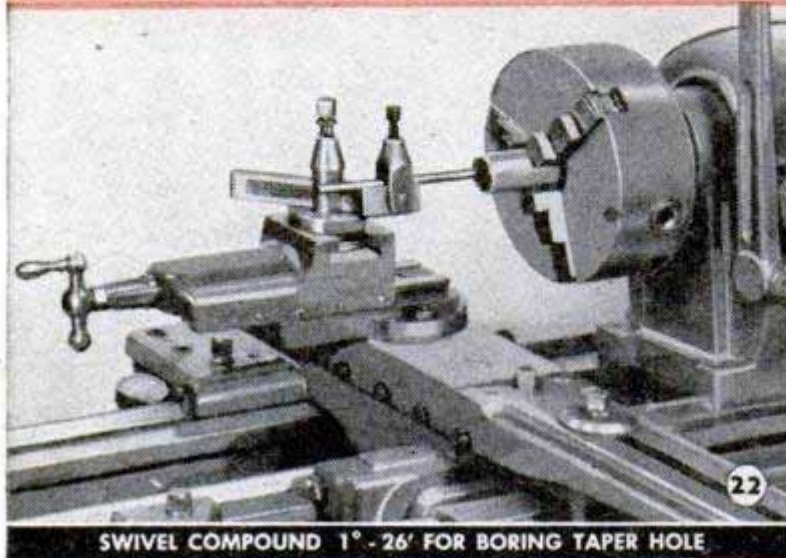
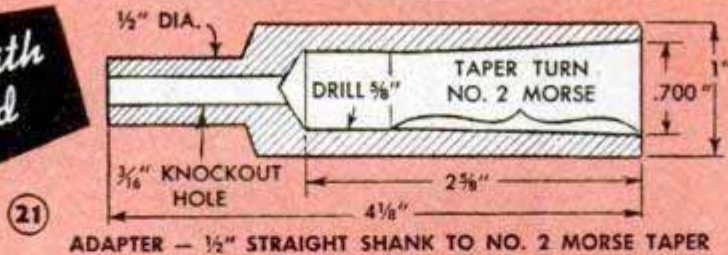
tailstock setover. These are numbered 1 to 5 inclusive. A sample job, Fig. 7, is used to illustrate. However, when work is specified in this way, it is practical to make the setover without calculation, using the method shown in Figs. 12 and 13. In this method, the body of the taper is turned to the net diameter at the big end, and a shoulder cut is run in at the small end to the small-end diameter to give a second measuring point. Now, if the tailstock is offset so that the two measuring points are equidistant from the parallel line of carriage travel, the longitudinal carriage movement consequently will cause the tool to cut the taper as specified. This can be seen in Fig. 13. Method No. 4, Fig. 11, is another system of direct setting without calculating the setover. This requires a duplicate taper which is mounted between centers. Then the tailstock is set over until the tool point follows the taper. Now, if the workpiece is made the same length as the sample, the taper cut will duplicate the sample. Methods 1, 2 and 3 are measuring methods from a calculated setover. No. 2 is the most exact and simplest; No. 1 is fast but rough; No. 3 is the method most commonly used. In this last method, the calculated amount of setover is read on the cross-feed micrometer sleeve. In order

to take out backlash in the screw, the reading should be made as follows: Run the flat end of the tool holder lightly against a strip of paper held over the tailstock spindle, as shown in Fig. 10. Now, back up the feed until the paper can be pulled free. Take the micrometer reading from the sleeve and back off the calculated amount of setover. Then, with the tool remaining in this position, the tailstock is set over until it clips the paper with the same "feel" as before. In any case, do not overrun the setover—set it light and take a sample cut preparatory to checking.

Checking the taper: If a test sleeve is available, the work is tested by chalking the turned portion, Fig. 14, and then rotating the work inside the sleeve. Fig. 15 shows the small end of the work oversize; more setover is needed. This is the correct way to proceed—gradually coming down to size with a series of cuts. Testing should begin as soon as you have about 1 in. of tapered surface. Figs. 16 and 17 picture one of many types of taper gauges. These are often handy, but must be accurately made to be useful.

Taper attachment: The best taper attachments are specially-made fixtures permanently attached to the lathe, just like the gear box or carriage. A typical unit is

Tapering With Compound



shown in Fig. 19. Screw C is the normal cross slide lead-screw nut, and when the lathe is used for straight turning, this screw is tightened while screws A and B are loosened to allow the parts to move freely. For taper turning, bracket screw A is tightened to hold the taper-turning unit in a fixed position. Lead-screw nut C is loosened, releasing the cross-feed. Screw B is tightened, and this ties the free cross slide with the slide bar of the taper attachment. The taper-per-foot is set by swinging the pivoted taper bar until the index mark on the end of the bar reaches the correct reading on the fixed scale, Fig. 18. A taper attachment has many advantages: It is not necessary to set the tailstock over or to measure the amount of setover; the same taper can be cut on work of any length; work can be mounted in the chuck, and internal cuts, Fig. 20, are just as easily made as external cuts.

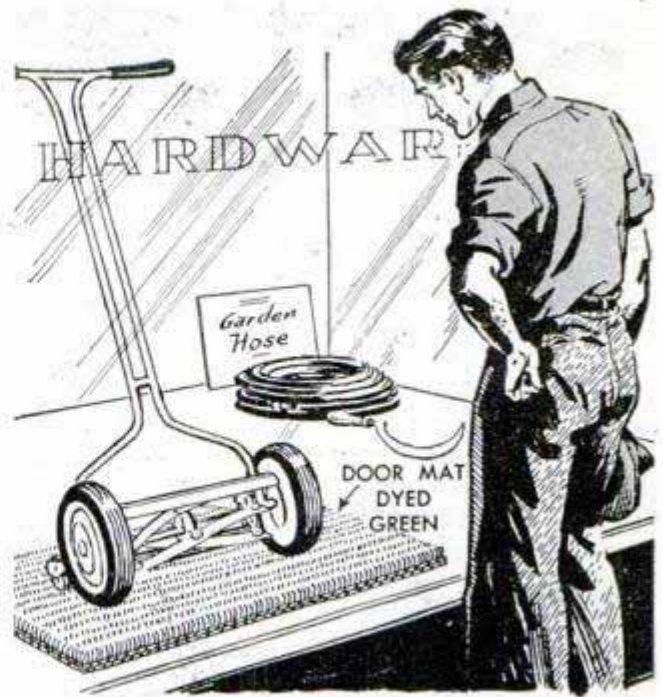
Tapering with compound: Lacking a taper attachment, internal taper cuts are usually made with the compound-slide hand-feed. A sample job is shown in Fig. 21. The feed of the average compound slide is 2 to 2½ in., so instead of boring the full length of the taper, a short distance at the bottom is bored straight with a suitable tool. The remaining distance is then within the travel of the compound, and also is sufficient for accurate fitting and practical use. Since this sample job is a No. 2 Morse taper, the compound swivel is 1 degree and 26 minutes, which is just a little under 1½ degrees. Set the compound parallel with

the lathe bed, and then swivel it the 1½ degrees required. It is a good idea to check the parallel position first, since the compound scale cannot always be relied on for this purpose. Fig. 22 shows the cut being made, using a ¼-in. boring bar.

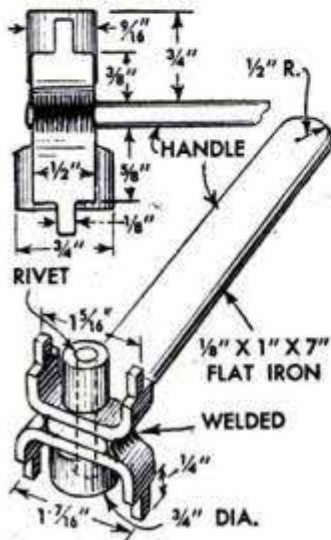
Reaming a taper: Accurate boring with the boring tool alone can be done, but if you do much of this work it is better to finish with a taper reamer. Using the reamer, the hole need only be rough-bored, and then finished with a light reamer cut, Fig. 23. In this operation, the work should be flooded with oil, should run at lowest lathe speed and the feed must be slow and even to prevent jamming or "freezing." When doing this type of reaming, especially where considerable stock is to be removed, it may be necessary to withdraw the reamer at short intervals to clear it of chips. If the flutes fill with chips this may cause the reamer to freeze with possible scoring of the work. The outside of the sample job is finished by mounting on a No. 2 Morse chucking fixture or any kind of shank having a No. 2 Morse taper. The operation is shown in Figs. 24 and 25. If desired, the procedure can be reversed, turning the outside first and then centering in a 4-jaw chuck for the taper cut.

Dyed Door Mat Simulates Grass for Lawn-Mower Window Display

Looking for a novel way to display lawn mowers, one hardware dealer dyed a door mat bright green, to simulate close-cropped grass, and set the mower on it in his show window. This arrangement, which is economical in cost, attracted considerable attention. The same idea could be used for other lawn and garden equipment.



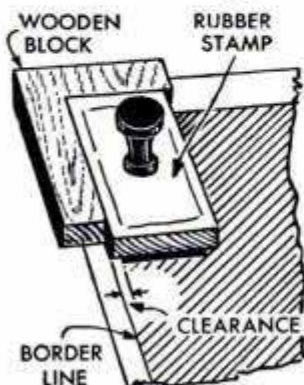
Special Wrench Speeds Tightening Of Conduit Locknuts



Not satisfied with the hammer-and-screwdriver method of tightening the thin locknuts on conduit connectors, Joseph Marino of Chicago devised this special wrench which does the trick in a jiffy. The wrench has two guides which fit both thin-wall and rigid-type conduit connectors. It is

used by inserting the proper guide in the conduit connector after the locknut is started with the fingers. Two prongs on the wrench engage the lugs on the nut and permit drawing it up tightly against the outlet box. Both heads of the wrench are the same design but of different size. They are riveted and then tack welded to a suitable flat-iron handle. If the guides are grooved lengthwise, the wrench can be used to loosen nuts where wires are in place.

Try Square Aligns Rubber Stamp When Printing Data on Tracing



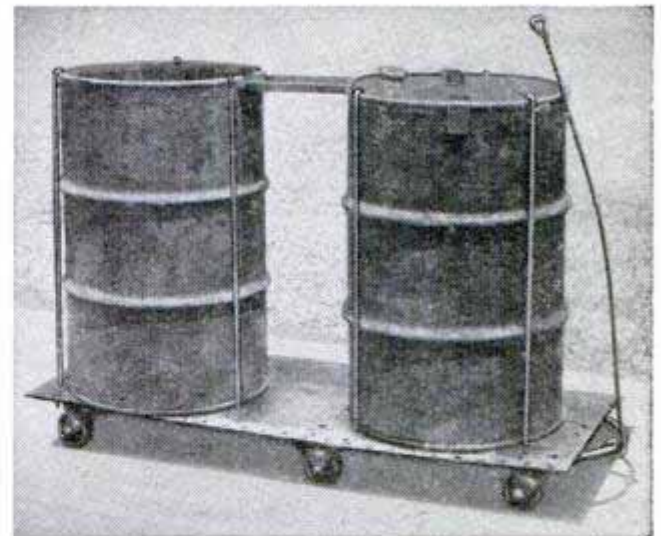
For draftsmen who use a rubber stamp to print the necessary information on a blue-print tracing, a try square cut from a wooden block will simplify aligning the stamp with the border of the tracing. As the lettering usually

does not extend to the lower edge of the stamp, this must be taken into consideration when locating the try square.

W. B. Eagan, Louisville, Ky.

Tank Cart Speeds Mixing Liquid Used in Tractor Tires

To facilitate the job of filling tractor tires with liquid when extra weight is desired or when adding an antifreeze solution to the tires, one service station rigged up this handy mixing cart. It is nothing more than two 55-gal. oil drums anchored to a caster-fitted platform, and is used to mix thoroughly calcium chloride and water by pumping the solution from one tank to the other several times. This speeds



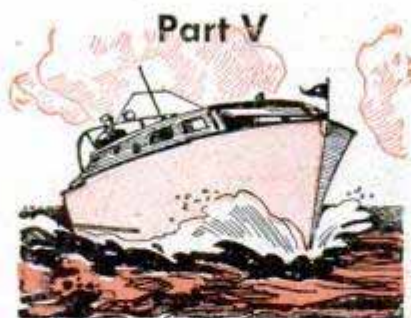
mixing, after which the solution is pumped into the tires. The amount of chemical used is varied according to the manufacturer. Avoid using a solution consisting of common table salt and water for an anti-freeze, as the salt will separate from the water and permit the water to freeze and damage the tire.

W. N. Skourup, Jr., Columbia, Mo.

"SEA CRAFT" - a 25-ft.

IN THIS, the final installment of the "Sea Craft" series, the boat is completed ready for launching and the thrill of her maiden voyage.

Continuing with the cabin interior, install the framing and plywood covering of the port and starboard bunks and forward cabinets. The top of the port-side cabinet is cut out to take a 12 by 12-in. galley sink, which drains through the hull, as in Fig. 43 of Part 4. Fresh water is piped to a faucet fitted through the bulkhead, Fig. 30 of Part 3. The bunk mattresses are supported on a removable frame woven of burlap webbing, as in Fig. 33 of Part 3. They are kept in place by a 1½-in. projection of the plywood bunk sides, which extend down over the inboard sides of the floor stringers. The hull ribs above the bunk frames are covered with ½-in. mahogany, Figs. 41 and 42 of Part 4. Center of the cabin floor is made in two removable sections, each supported by cleats fastened to the plywood bunk sides and floor timbers which are bolted to the frames on top of the tie bars (see station 3, Fig. 43 of Part 4). Note that the floor slopes to obtain maxi-



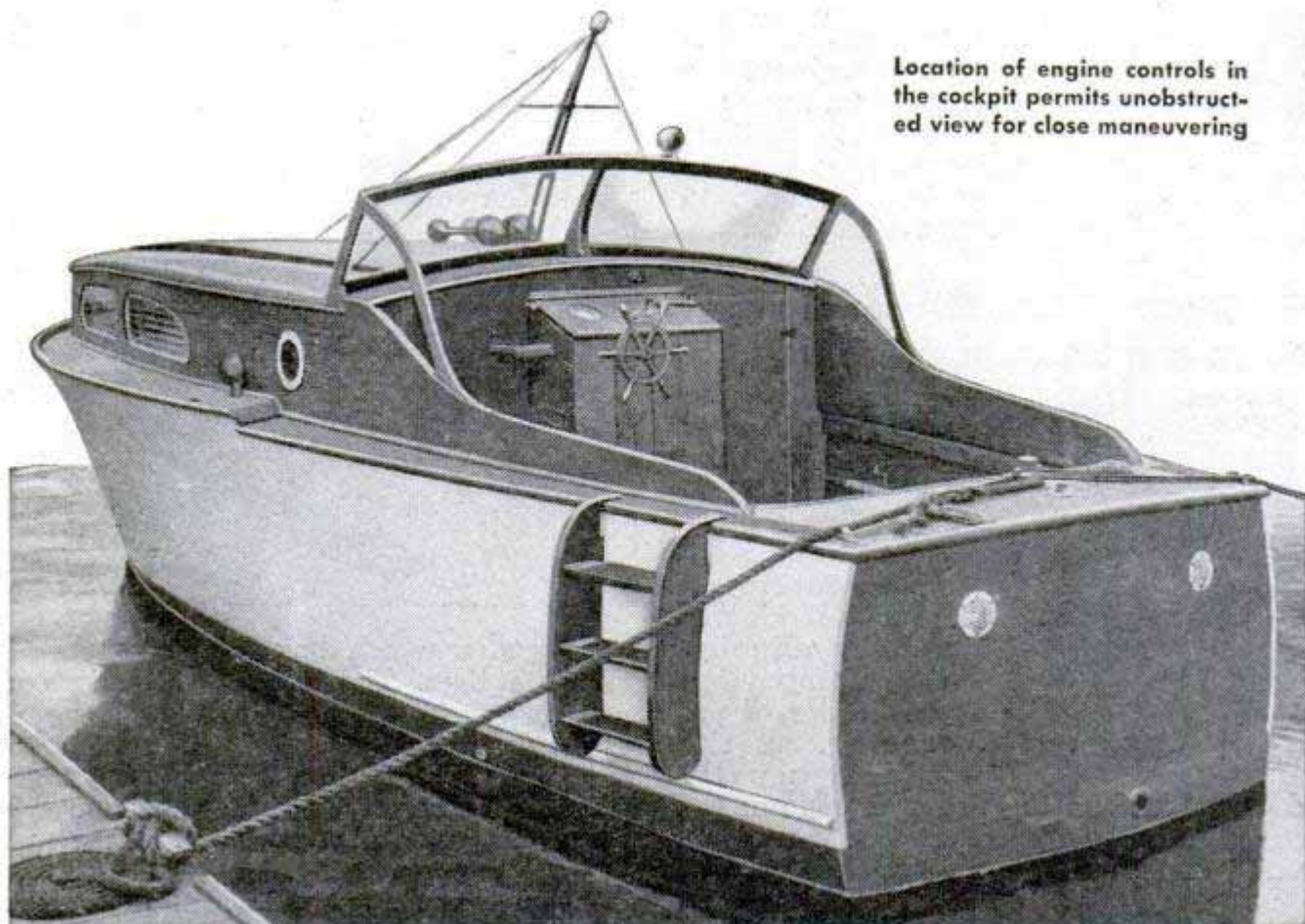
By Edward Colby

mum headroom at station 6. The cabin floor on both sides of the engine compartment is fastened permanently to the top edges of the floor stringers and floor timbers, Figs. 35 and 38 of Part 3.

Before covering the cockpit-bulkhead framing, install the water closet, which must be purchased from a marine supply house. Plywood is

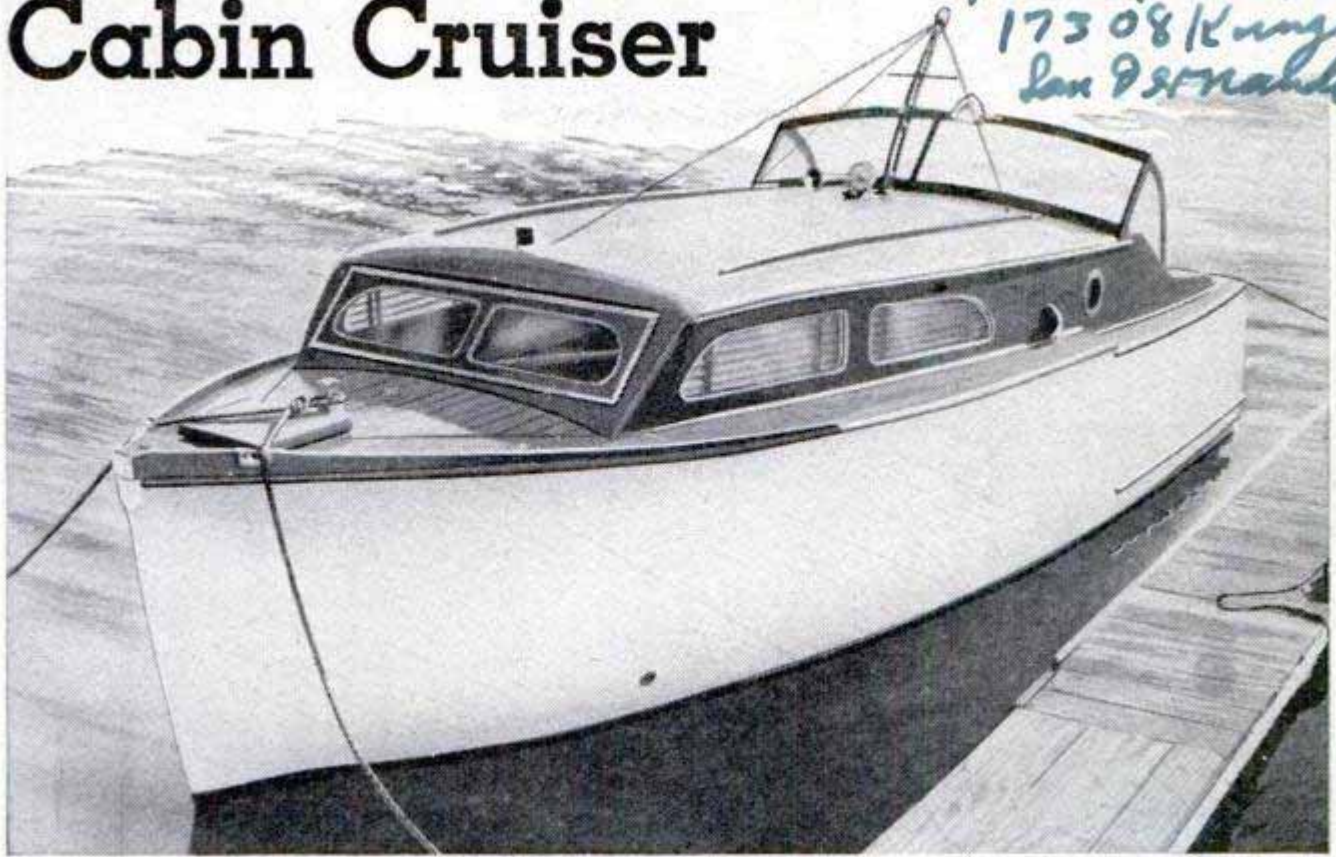
used for the walls and doors of the toilet room, engine compartment and chart cabinet. Note in Fig. 35 of Part 3, that the sides and top of the engine compartment are removable. They also must be lined with asbestos. The sides are held in place at the top by hooks and at the bottom with quarter round nailed to the floor. One side and top are shown removed in the photo, Fig. 36 of Part 3. An alcohol cooking stove is bolted in a sheet-metal cabinet mounted on the bulkhead frame. The cabinet must be removable for access to the rear of the control box as detailed in Figs. 49 and 43 of Part 4. This box houses the compass, electrical switches, engine controls and steering gear. An inspection door in the front of the box, Fig. 37 of Part 3, is held in

Location of engine controls in the cockpit permits unobstructed view for close maneuvering



Cabin Cruiser

*Ed. E. Wildie
4-W Ranch.
17308 Kungsholm
San Francisco, Cal.*



"Sea Craft's" lines show to best advantage when viewed off the bow. Cabin roof can be used for sun bathing

place with brass door buttons and plates.

The steering system, Figs. 30 and 38 of Part 3, consists of an automobile steering knuckle of the worm-gear type bolted in the control box so that a steering wheel can be fastened to the worm shaft. The stub shaft of the worm gear is welded to a vertical shaft extending below the cockpit floor. Lever arms attached to the lower end of the shaft and rudder post are connected with a steering rod of $\frac{1}{2}$ -in. pipe, which has a clevis welded to each end. A hand-operated bilge pump is fastened to the port side of the control box with the outlet connected to a $\frac{1}{2}$ -in. galvanized pipe running under the cockpit floor to a hole in the transom. The pump intake is connected to a hose extending down to the bilge.

The cabin stairway, Figs. 41 and 43 of Part 4, is covered with a trap door which projects under the cabin door when closed, preventing entrance to the cabin when the cabin door is locked.

Two 6-volt storage batteries, placed in a box under the cockpit floor are connected to a S.P.D.T. switch located in the control box. The wiring hookup should be arranged so the batteries may be used individually or disconnected when the boat is not in use.

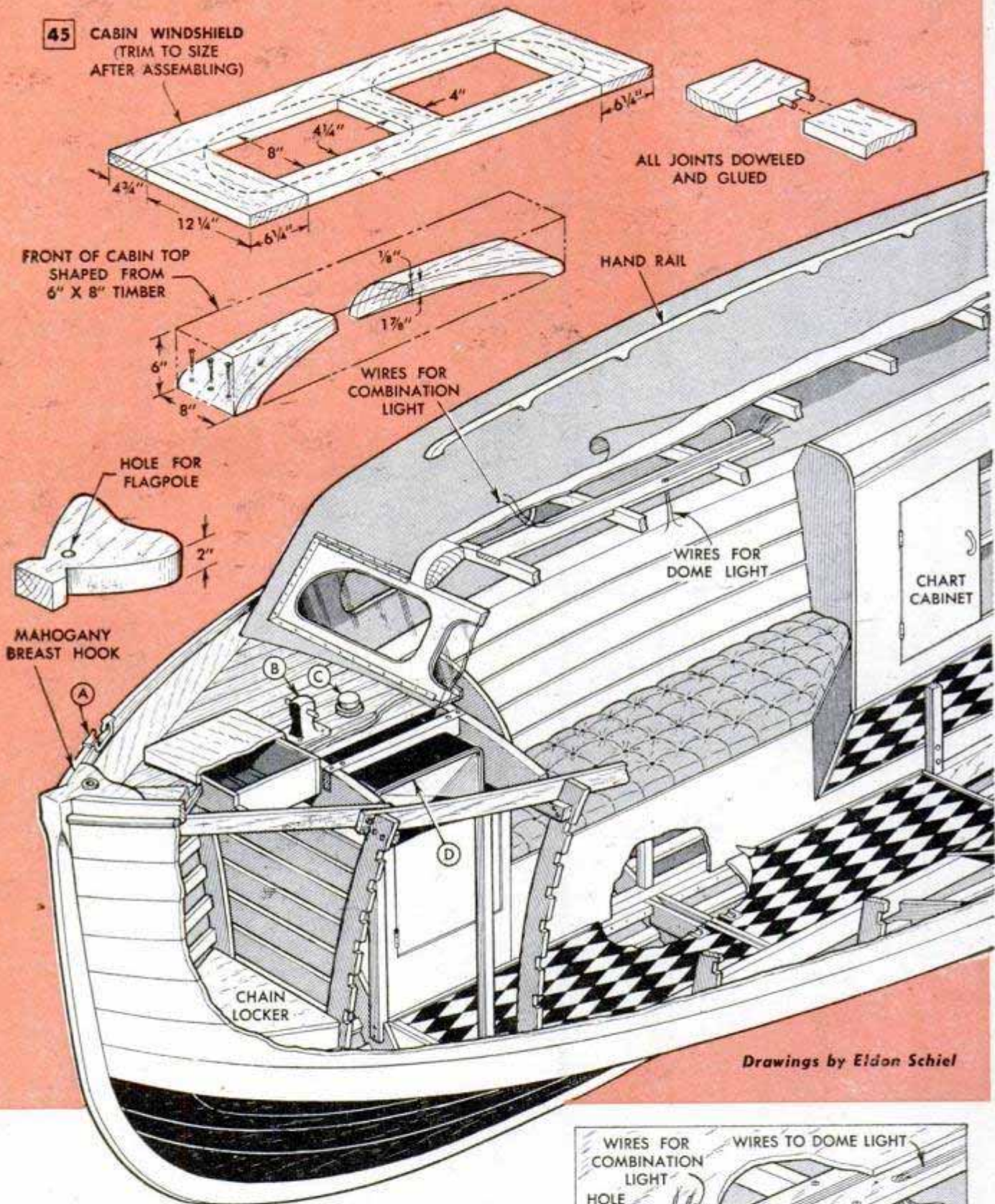
The stern deck is made of the same material as the forward deck. It is crowned 2 in. and the forward edge curved to conform with the radius of the cockpit seat, as in Fig. 47 and also Figs. 40 and 41 of Part 4. The seat top is made from three pieces of

plywood and is removable for access to storage space beneath. This provides an ideal place to store life preservers, which must be carried for each person on board. The side decks or shelves, extending from the sheer drop to the transom, should be installed at the same time as the stern deck. They are of $\frac{3}{4}$ -in. mahogany cut to fit snugly against the cabin sides and trimmed flush with the hull planking. The shelves, forward of the sheer drop, are of $\frac{3}{4}$ -in. plywood covered with canvas to provide a nonslip surface. They must be notched to clear the ventilating ducts. A block of wood is inserted between the fore and aft shelves where the sheer line drops, and $\frac{3}{4}$ -in. quarter round is fastened along the joint of the shelf and cabin side.

Before the cabin top is put on, cut grooves in the center strip for the insulated electrical wires, as in Figs. 46 and 47. These wires, which are connected to switches on the control-box panel, are brought through holes in the cabin top to the combination light, mast light and a horn which is required for a boat of this size. The wires leading to the cabin dome lights and toilet-room wall light, which have individual switches, are connected directly to an ammeter on the panel.

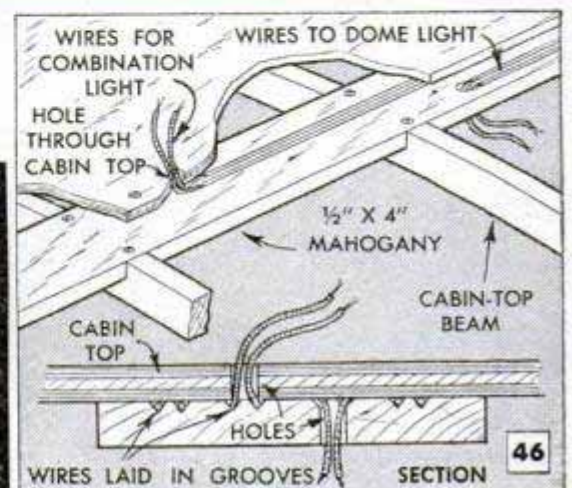
The two outer supports for the cockpit windshield, shown in pattern squares in Fig. 41 of Part 4, are installed next. Each side is made from two pieces doweled and glued together at the top and screwed to

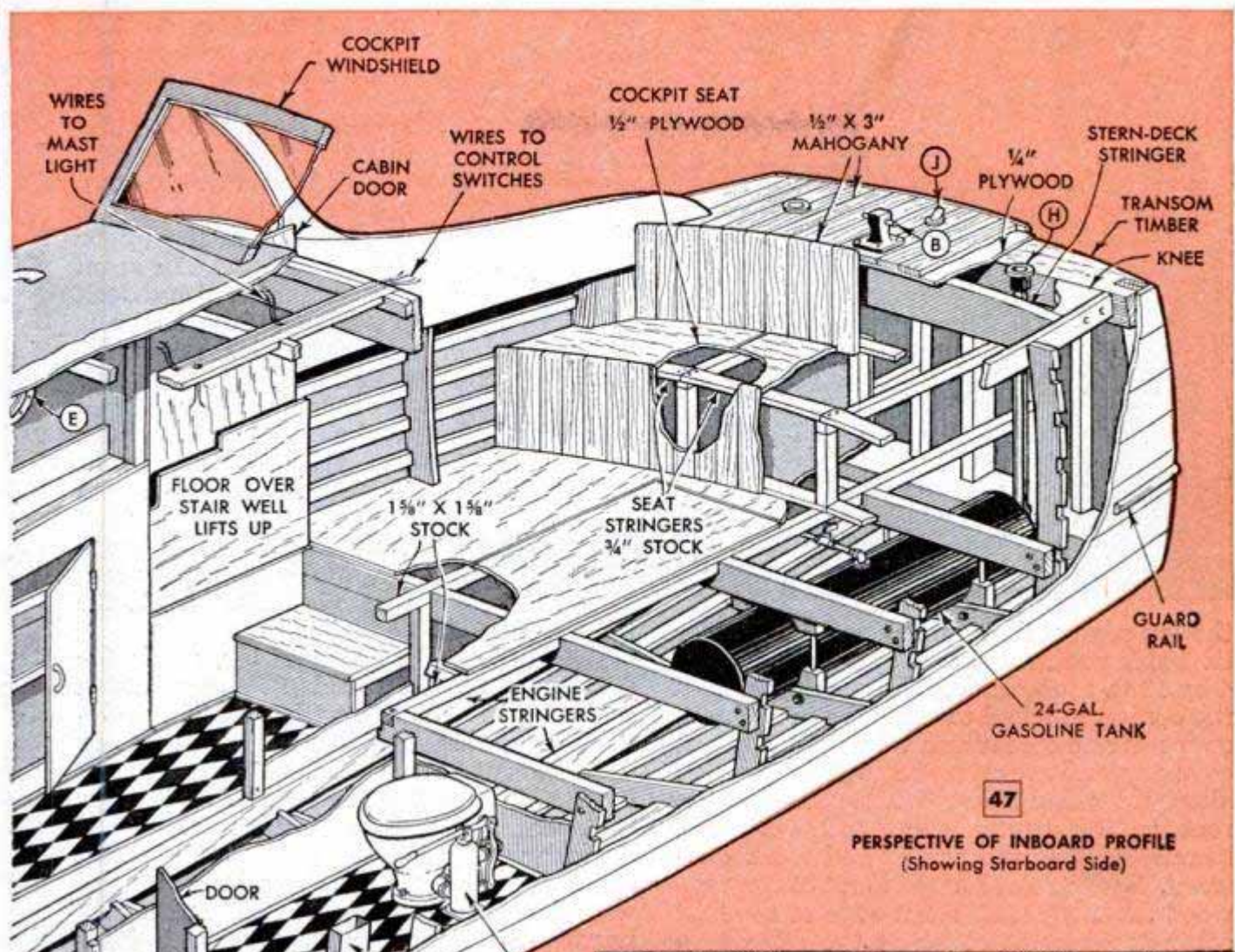
45 CABIN WINDSHIELD
(TRIM TO SIZE
AFTER ASSEMBLING)



Drawings by Eidon Schiel

"SEA CRAFT" BLUEPRINTS AVAILABLE
SINCE IT IS DIFFICULT TO REPRODUCE BLUEPRINTS
TO A WORKING SCALE WITHIN THE LIMITS OF A
PRINTED PAGE, A COMPLETE SET OF SEVEN LARGE-
SIZE BLUEPRINTS SCALED 1 IN. TO THE FT. MAY BE
PURCHASED FROM POPULAR MECHANICS BOOK
DEPARTMENT, 200 E. ONTARIO ST., CHICAGO 11

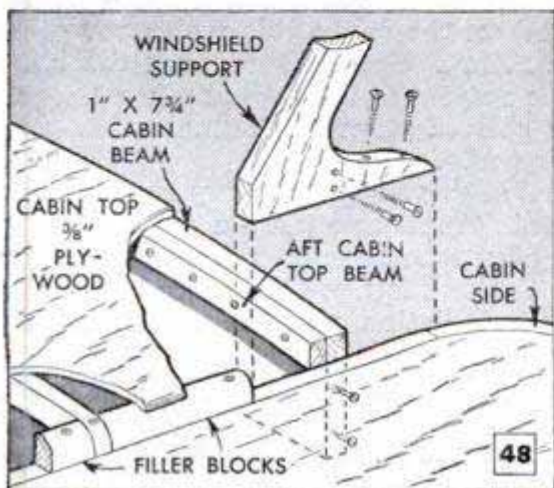




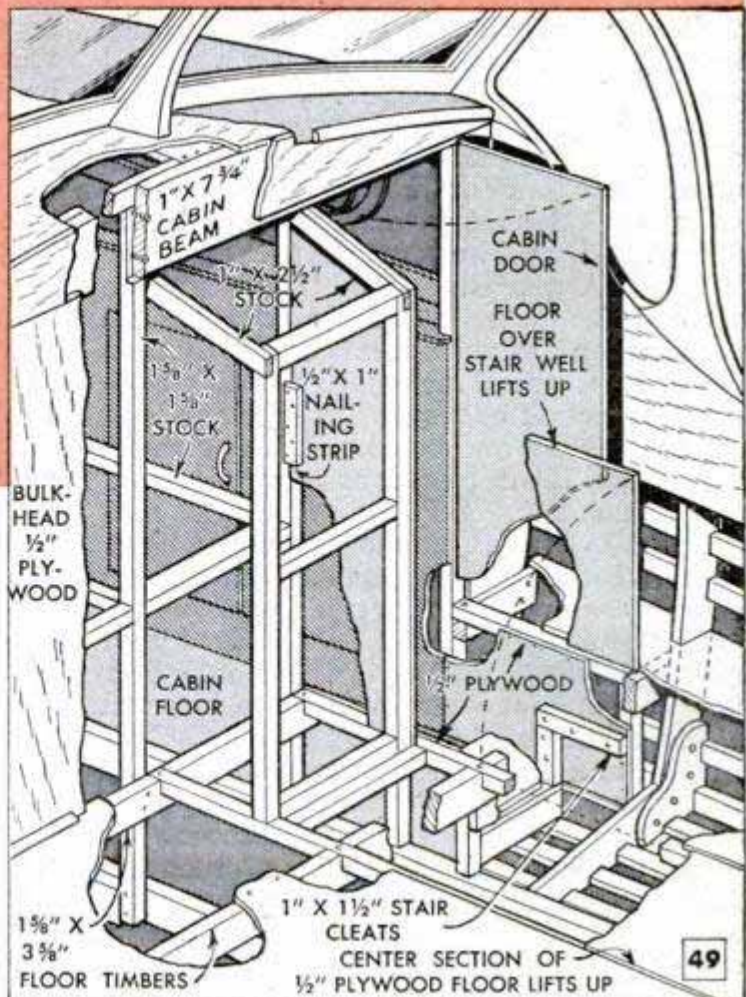
47

PERSPECTIVE OF INBOARD PROFILE
(Showing Starboard Side)

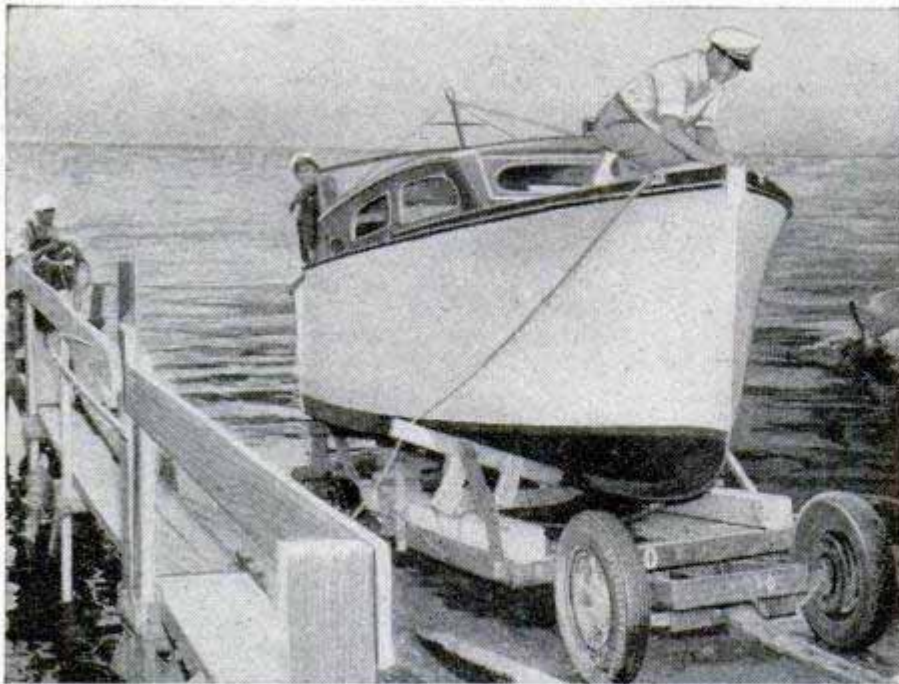
- A—SKENE BULWARK BOW CHOCK
- B—MOORING BITT
- C—PIPE DECK PLATE
(For Filling Fresh-Water Tank)
- D—15-GAL. FRESH-WATER TANK
- E—PORT LIGHT
- F—SHEET-METAL VENTILATING DUCT
- G—MARINE-TYPE PUMP CLOSET
- H—PIPE DECK PLATE
(For Filling Gasoline Tank)
- J—FLAGPOLE SOCKET



48



49



Thrill of launching the boat will help compensate for the many hours spent building it

station 4 on both sides along the sheer, Figs. 40 and 41 of Part 4, are screwed to the deck planking as in the upper detail of Fig. 42. The seam between the hull and deck planking at the sheer is covered with 1½-in. half-round molding. This also is used for the guard rail at the aft end of the hull, Fig. 41. The hatch cover for the chain locker should be a snug fit. It is planked with ½ by 3-in. mahogany over ¼-in. plywood, which is rabbeted into the

the top edge of the cabin sides, Fig. 48. For the cabin roof, two pieces of ¾-in. plywood 4 by 12 ft. are needed. These are joined at the center, notched to clear the windshield supports and come flush with the bulkhead covering, and are trimmed slightly oversize along the cabin sides. When screwing the roof to the center strip and cabin-top beams, start at the center and work outward. Saw off the forward end of the plywood flush with the front edge of the first cabin-top beam and plane the sides to a well-rounded corner to blend into the filler blocks. The front of the cabin top is shaped from a timber, as in Fig. 45. The entire top is coated with canvas cement and one piece of canvas stretched tightly and tacked along the sides just below the seam between the filler blocks and cabin sides. The forward edge of the canvas is tacked under the front edge of the shaped timber and the aft edge is tacked to the bulkhead. The canvas then is given several coats of thinned paint. Half-round mahogany molding covers the tacked edges of the canvas along the cabin sides and bulkhead. The cockpit windshield is completed, as in sections F-F and E-E of Fig. 41, Part 4. The mast, also detailed in Fig. 41, supports a white light. Section D-D of Fig. 41 gives the dimensions of handrails fitted to the cabin top.

The cabin windshield, Fig. 45, fits into a rabbet cut in three pieces of 1½-in. stock, two of which are screwed to the forward edges of the cabin sides, section C-C of Fig. 41, and one placed horizontally across the forward deck. Widths of these pieces are not given as they will vary somewhat with each boat. Note in Fig. 47 that the rabbet on the athwartship piece is cut at an angle to fit a 36-deg. bevel on the lower edge of the windshield. Toe rails extending from the breast hook at the bow to

top edges of the cover frame.

Before painting the exterior, mark the L.W.L. on the hull and fill the planking seams above this line with a fresh or salt-water seam sealer. Give the hull three or four coats of flat-white marine paint above the L.W.L., sanding the hull by hand after each coat. Then apply a mixture of flat and glossy white paint and follow with a coat of glossy white. The decks, cabin sides and windshield frames are sanded, and a mahogany-colored wood filler or a stain is applied, after which three coats of marine varnish are applied, sanding the first two coats. The seams between the deck planks are filled with a white seam sealer before varnishing.

All exterior hardware is installed next. The fore and aft mooring bits must be bolted securely in position to withstand considerable strain. Plate glass for the windshields and cabin windows is held in place with lead beading, as in Figs. 31 and 41. Mahogany on the interior of "Sea Craft's" cabin was stained and varnished and the plywood painted white, as in Fig. 44 of Part 4. The boat must be provided with a fire extinguisher which should be mounted on the cabin side wall above the chart cabinet. Before launching the boat give the bottom of the hull another coat of copper bottom paint and launch while the paint is wet.

A boat of this size must carry registration numbers. Application for a certificate of award of number can be made by the boat owner to the District Coast Guard Officer having jurisdiction over the area in which the owner resides.

In addition to a set of seven working-size blueprints, full-size paper patterns for the hull frames and keel are also available.

The end



Radios in Your Hair

RADIO receivers, tinier than a penny matchbox have been developed by Paramount sound men in Hollywood. These replace the megaphones that directors used in the days of silent pictures to shout instructions to their stars. The resulting confusion on crowded sets was nerve racking to both the director and members of the cast. When sound was added, the megaphone had to go. It was then replaced by intricate signaling systems and many necessary interruptions and expensive retakes. Now this tiny inductive-type receiver, that uses no batteries or tubes, is concealed on the actor's person. It is claimed that it can pick up signals as far as 300 feet away from the transmitter which is placed near the movie studio stage.

In photo A, Director Mitchell Leisen shows the studio hairdresser how to work the antenna into Andrea King's hairdo. The antenna wire is not long and is easily hidden in the hair; a flesh-colored plastic tube carries messages to the ear. The receiver, which is smaller than any hearing aid, has to be set on frequency before it is used. Its tiny size is clearly illustrated in the engineer's hand shown in photo B. Worn suspended from a neck ribbon it is easily concealed. John Beal carries his in his coat pocket, and the antenna is wound around his waist. The earplug lead comes up his neck behind his ear and tape holds it in place. Although flesh-colored plastic is used for the tubing, make-up is applied to hide both the tubing and tape.

Either music or words of direction may be broadcast to the actors, but the sounds are inaudible to those not equipped with the tiny receivers. There are no trailing wires and the members of the cast are free to move about anywhere within the range of the transmitter, which is out of camera range. Engineer Robert Carr, in the studio sound department, operates the 150-watt transmitter located just off stage as shown in photo C. He monitors the signal and works in close cooperation with the stage director.

It is quite possible that this specialized 2-way communication system will find other useful applications; a similar system might be useful for the legitimate stage, especially for magicians.



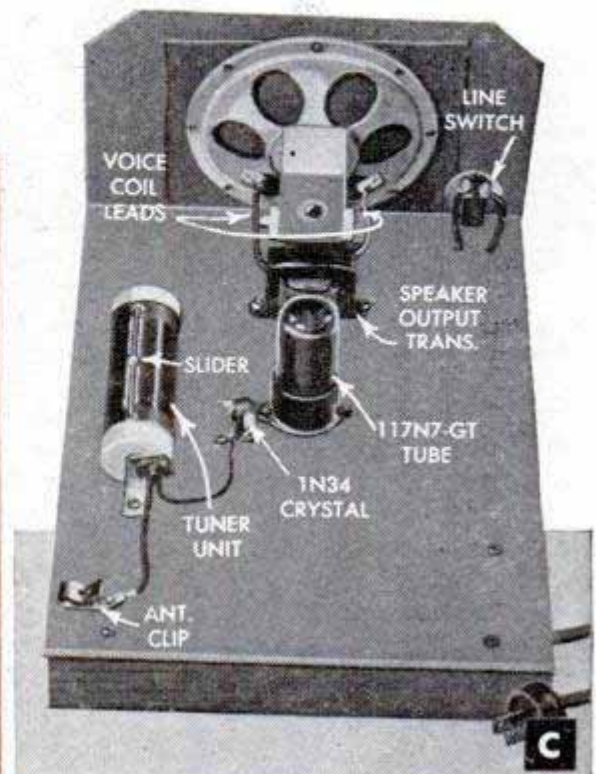
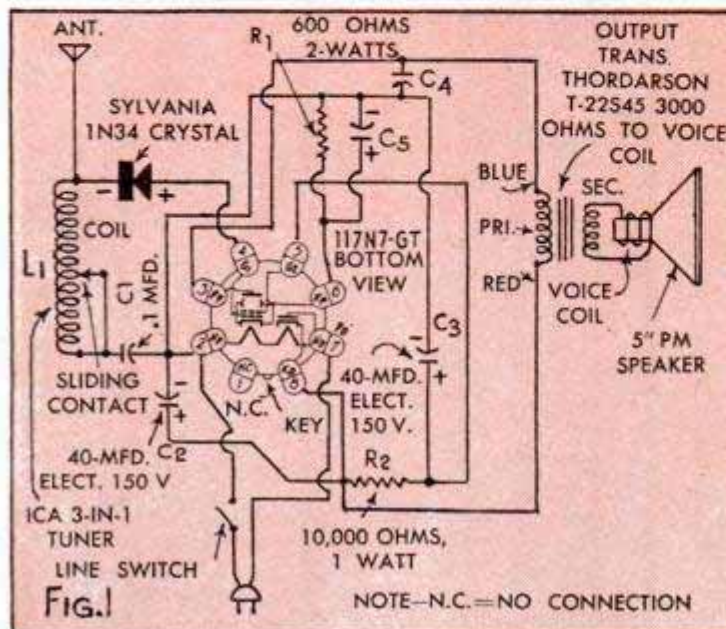
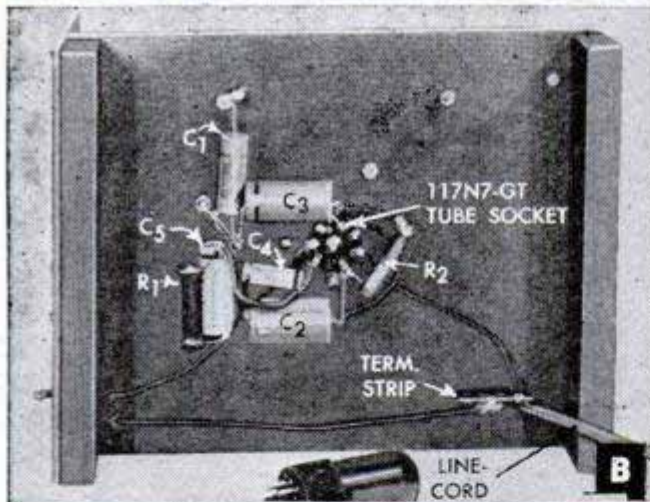
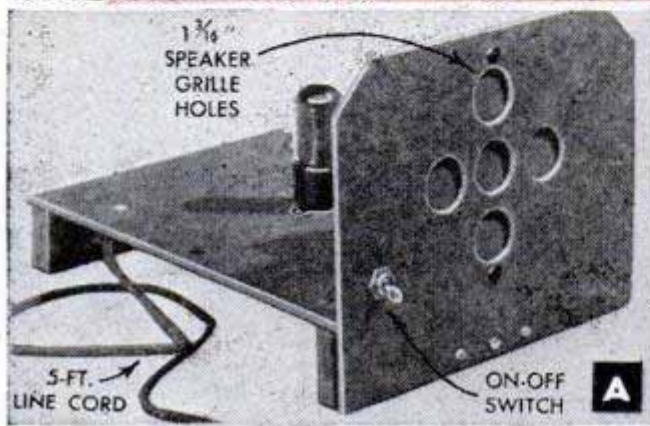
BEGINNER'S ONE-TUBE

By S. A. Johnson



ONLY A HANDFUL of parts are required to build this very simple loudspeaker set. Although reduced to practically absolute fundamentals, it will give satisfactory loudspeaker volume on any strong local broadcasting station which can be received well on a good crystal receiver. As a matter of fact, this set is designed around a Sylvania 1N34 diode crystal detector, one of the types which were developed for radar during the war. This detector is connected directly to the grid of a 117N7-GT power pentode tube. This dual-purpose tube is a combination half-wave rectifier and beam-power amplifier that operates directly from the ordinary 115-volt a.c. or d.c. power line; no ballast tube or line-cord resistor is required. With this tube, the signal from the crystal detector is amplified sufficiently to operate a permanent-magnet speaker.

There is no tuning coil to wind and the usual variable tuning condenser is not required. Tuning is provided for with an inexpensive adjustable commercial tuning unit available from all radio parts houses for about 60 cents. This I.C.A. 3-in-1 radio tuner consists of a simple solenoid single-layer-wound coil with an adjustable slider for tuning. The terminal clips at each end of the tuner are common with the mounting brackets. For ease of construction the receiver is assembled on a $\frac{3}{16}$ by 9 by $11\frac{1}{2}$ -in. hard-pressed-wood base, supported by



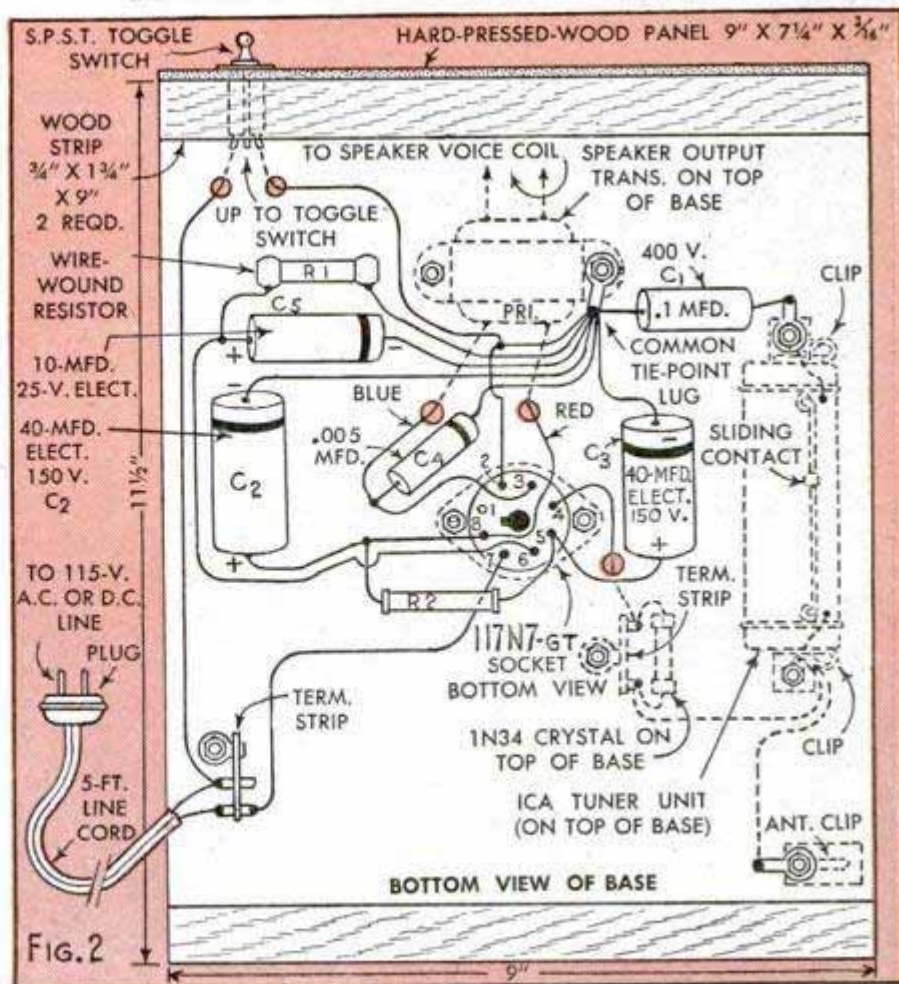
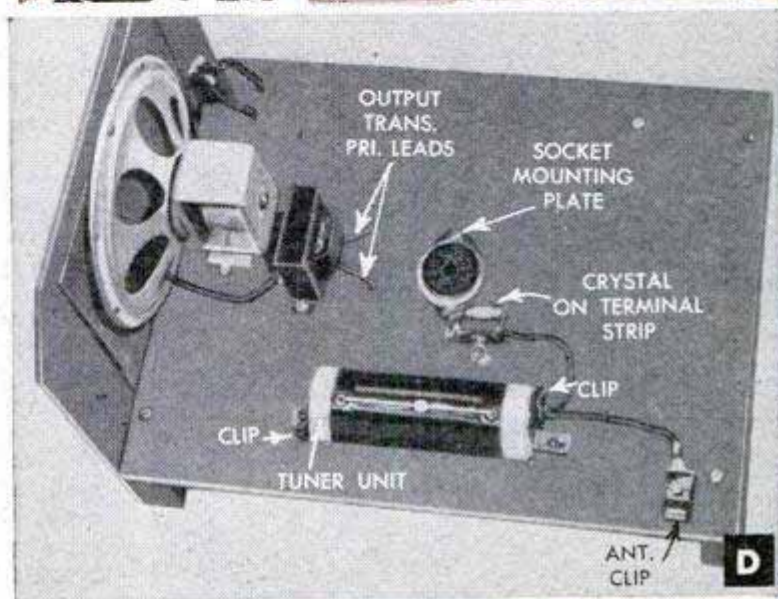
A.C.-D.C. LOUDSPEAKER SET

$\frac{3}{4}$ by $1\frac{3}{4}$ by 9-in. wooden cleats at each end. One cleat serves for mounting the front panel, which consists of a $\frac{3}{16}$ by $7\frac{1}{4}$ by 9-in. piece of hard-pressed wood. Three wood screws are used to fasten the panel to the wood cleat in the final assembly. This panel also acts as an efficient baffle for the 5-in. PM loudspeaker; the on-off line switch is also mounted on this front panel. The speaker grille merely consists of 5 holes, $1\frac{3}{16}$ in. in diameter, arranged as shown in photo A, and backed with a piece of grille cloth.

Except for the speaker-matching transformer, tuning coil and the crystal detector, all of the other parts such as the various resistors and fixed condensers are underneath the base, as shown in photo B and pictorial wiring diagram Fig. 2. The schematic circuit diagram appears in Fig. 1. To mount the tube socket in the center of the base, it is necessary to cut a hole $1\frac{1}{8}$ in. in diameter. Place the socket so that the center key is in the position shown in Fig. 2; short 6-32 machine screws hold the mounting plate at each end. In this position, as viewed from the bottom, the socket terminals are numbered clockwise from 1 to 8.

When soldering the crystal detector on the 2-lug terminal strip mounted on the top of the base, be sure that the positive end goes to terminal 4 on the tube socket as indicated in Fig. 1. Apply the soldering iron only to the wire leads, and take care that the crystal itself is not overheated. Do not attempt to use a metal base for this set; the hard-pressed wood provides good insulation, and is easy to cut and drill. Make all connections just as shown in Fig. 2; use rosin-core wire solder and be sure that all soldered

(Continued to page 220)



RADIO AND ELECTRONICS TODAY



1

1—Safety radio for children is housed completely in a one-piece plastic cabinet. Although the back is enclosed, ample provision is made for required cooling. A concealed handle makes it conveniently portable



2

2—Easily installed on the package deck behind the rear seat in an auto sedan or coach, this remote speaker does not require a recessed hole to be cut in the shelf. It is held in position with two small screws



3

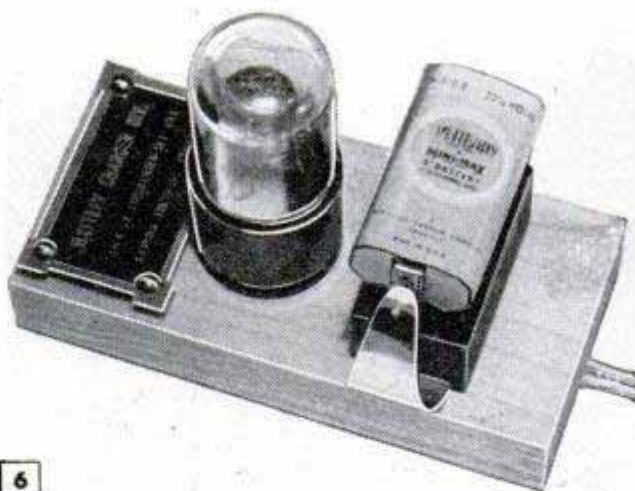
3—Combining a 4-band radio, phonograph and television receiver in one compact unit, this new console employs a swinging mounting for the television picture tube so that the image may be viewed from the most desirable angle without moving room furniture

4—Handy auxiliary weatherproofed car speaker is provided with a heavy rubber-covered hanger which fits over the car door sill when the glass is rolled down

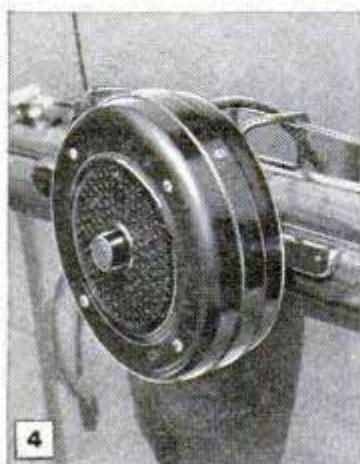
5—As handy to use as a desk fountain-pen set, this improved crystal microphone features a detachable base for hand operation. It is especially recommended for P.A. systems, home recorders and amateur phone use

6—Hearing-aid B-battery charger operates from 110-volt house line. It is claimed to extend the useful life of the battery. The user rotates two batteries, one in use and the other is placed on charge each day

7—Five-tube built-in radio fits into a steel flush wall receptacle 6½ in. high, 9¾ in. long and 3¾ in. deep. It is intended primarily for installation in rooms where space is at a premium, such as modern breakfast nooks, kitchens and children's playrooms



6



4



5



7



KODAK FILTERS
snap up cloud effects



KODAK POLA-SCREEN
cuts reflected light



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for magnified close-ups



KODAK LENS HOOD
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Name

Address

City Zone State

Prospecting for Better Metals

(Continued from page 149)

2000 degrees Fahrenheit — an increase of several hundred degrees over previously attainable temperatures. A series of 20 tungsten-wire "hairpins," through which electric current passes to produce tremendous heat, is the heart of the furnace.

Still another piece of the giant jigsaw puzzle is being fitted in place with the aid of radioactive, "tagged" atoms, like those being used to track down and treat diseases of the human body. Here the problem is to find out how and why carbon, phosphorus and other elements affect the properties and behavior of metals.

James K. Stanley is tackling this problem by administering tiny "doses" of the tagged atoms and then tracing their path through the metal by means of sensitive recorders and counters. Only a pinch of the radioactive material is required to follow it through as much as a ton of molten steel. The electrons and rays thrown off by the "exploding" atoms are ticked off by the famed Geiger counter, while the position of the tagged atom can be determined by periodic exposure to a photographic plate which fogs up when bombarded with atomic particles.

The case of the "wandering" carbon atoms is another major project.

"Under the effect of heat, carbon atoms are always meandering about in the internal structure of metals," says Stanley. "Even at room temperature, the carbon atoms in the steel beams of a building, for example, are constantly taking up new positions, resulting in what metallurgists call 'aging' of steel, and bringing about a slight strengthening of the metal. The position of such atoms also determines the hardness and wearability of the metal, as well as brittleness. If we can follow the path of the atoms as they move through the metal and take up definite positions, we may eventually arrive at methods of spotting the carbon in the most advantageous places."

For this purpose, the scientists use radioactive carbon 14, which has a half life of 5000 years and hence can be stockpiled.

In another laboratory, scientists are "looking inside" metals in quite a different way. A plastic model of some piece of industrial equipment—a crane hook, for example—is loaded with heavy weights, and heated to somewhere around the boiling point of water. Then with the weights still attached, the model is cooled gradually down to room temperature. Next the scientist examines the plastic hook under

(Continued to page 224)



*Radiator rusted-
Vacation busted*

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Before your engine is ruined by overheating, clean out rust and scum in the radiator. Just pour in a can of DU PONT COOLING SYSTEM CLEANSER, run the engine 30 minutes or more, then drain. No reverse flushing is necessary. It dissolves rust—cleans thoroughly, quickly, and safely.



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Avoid radiator leaks with

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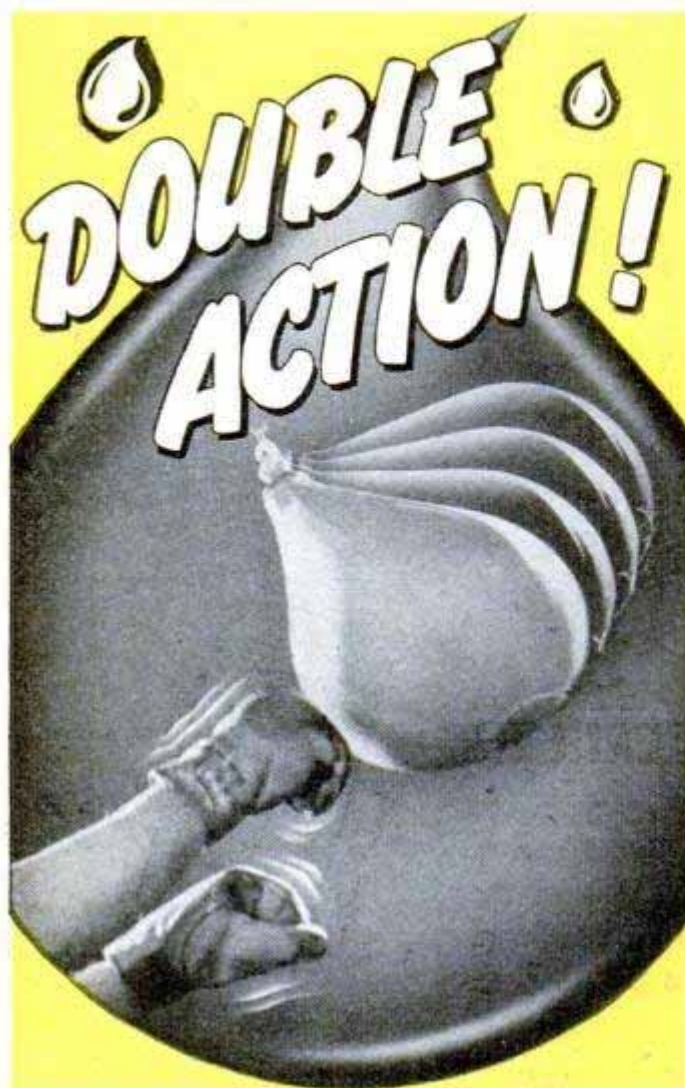
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**Tough-film PENNZOIL* gives all engines
an extra margin of safety**

Beginner's One-Tube A.C.-D.C. Loudspeaker Set

(Continued from page 215)

connections are neat and well made. No. 20 flexible insulated hookup wire is used for the circuit connections. It is necessary that the negative ends of the electrolytic filter condensers C2 and C3 be connected to common floating ground on the tie-point lug, as shown in Fig. 2. Mount the speaker-output transformer so that the primary leads face the tube socket, and drill two small holes for the leads that pass down through the base. The secondary leads connect directly to the voice-coil terminals on the speaker. A universal output transformer may be substituted, if desired.

Like any extremely simple receiver, this one has its limitations. Therefore, for maximum results a good antenna is absolutely necessary. If there is only one station in your locality, make this antenna as long and as high as you possibly can. If there are a number of stations in the area, you will have to compromise, since a long antenna will make the stations overlap on the tuning range. If the stations cannot be separated by adjusting the position of the slider on the tuning coil, shorten your antenna gradually until you can tune out the undesired station. No external ground is required on this set, and none should be used. Do not expect loud volume on distant stations as this receiver will only amplify the signals that can be picked up by the crystal detector, and these are usually limited to strong local broadcasting stations. With a good antenna, the results are highly satisfactory. The chassis base is intentionally large and provides room for experimenting with other circuits in which practically all of the same parts can be used. Detailed student material list R-368 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



**Model Builders
Attention!**

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	5/32
Weight, Grams	8	3 1/2	2 1/2

Actual Size V-Plug

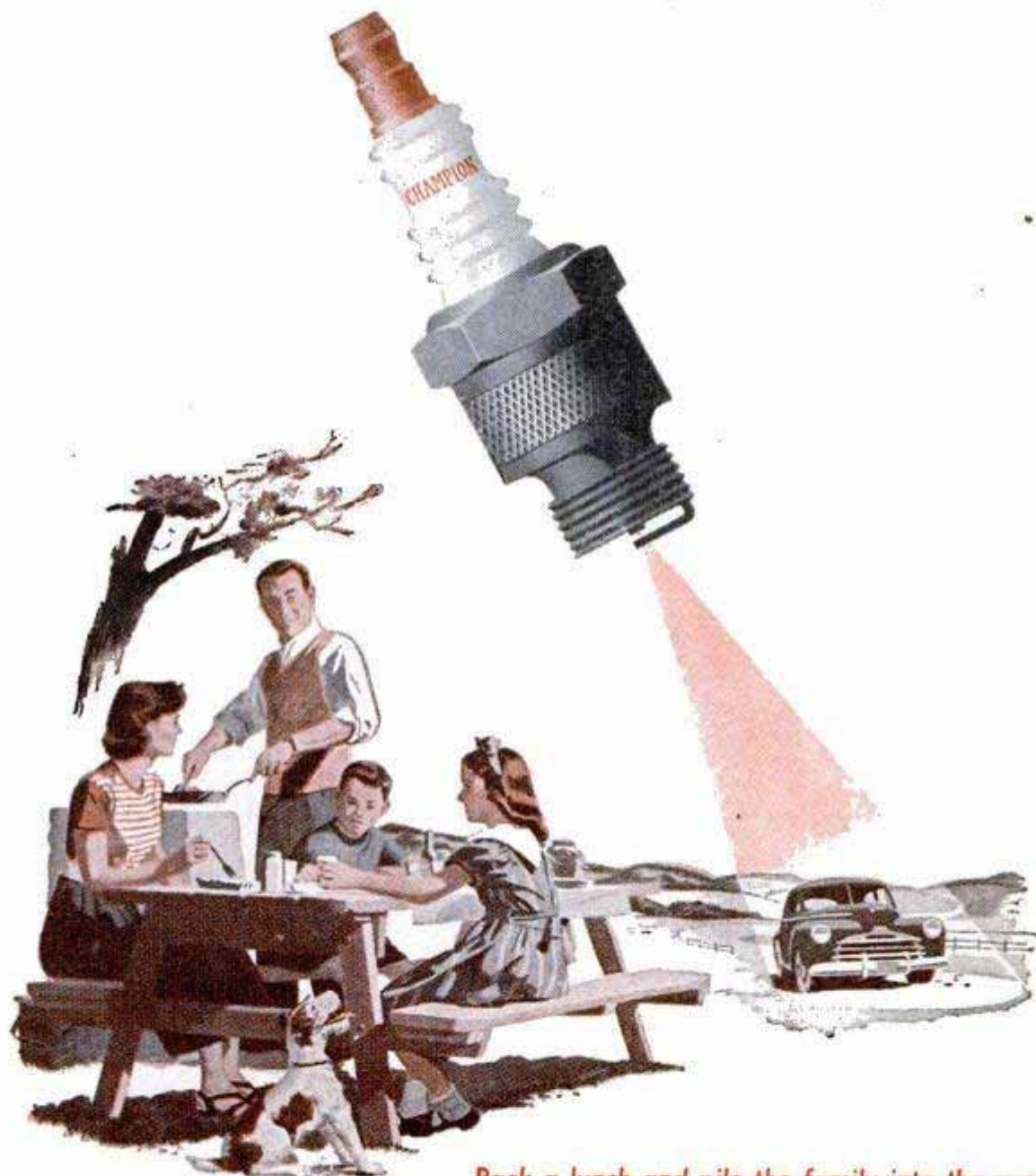
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Orphan? What do you mean, Dad?

This chisel. There's no brand name on it.

What of it? Just feel that edge.

That's not much to go by when you're buying a chisel, son. Even a piece of cheese can have a sharp edge, you know.

You mean this chisel's no good?

I mean you can't be *sure* it's good. No brand name, no reputation to back it up. It's one of those bargain counter orphans—and they generally let you down.

Well, it didn't cost much, anyway.

Better get your money back—if you can. And then go over to the hardware store and buy a *good* chisel—one with an advertised brand name you can trust. The hardware man will always steer you right.



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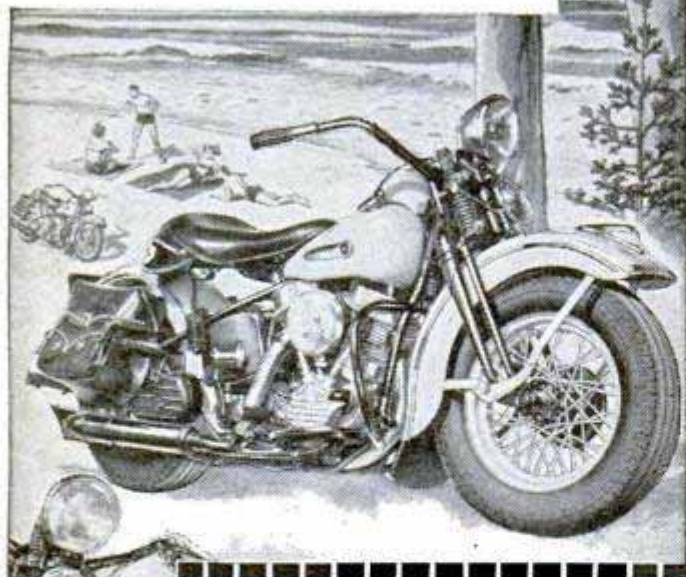
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special polarized light. What he sees is a series of brightly colored lines—red, yellow, green in a definite progression—literally “frozen” into the plastic material.

This is called the photoelastic method for studying how metals react to various loads. To the scientist's skilled eye, every line in the brightly colored pattern tells a story: how great the stresses are, where the greatest concentration of stresses occurs, and in what direction they are.

In the quest for new metals there are many other prospectors: researchers who make elaborate, painstaking analyses of the “creep” or plastic flow in metals, those who are probing the grain size and structure of metals to find out what secrets can be yielded here, and those who try countless combinations in the hope of developing new alloys for particular applications.

Although they work independently—each intent on his own area of conquest—their efforts are solidified on one broad frontal attack with a common objective: the creation of new alloys and metals to further man's progress.

Optical Glass Cookers

(Continued from page 156)

Expert glass molders manipulate the glass at this stage. The rough pieces are first heated gradually in a preheating furnace to a temperature just below the softening point. Each piece is then picked up on the end of a steel pontil rod or punty as it is commonly called. The molder thrusts the hot glass fragment into a molding furnace and spins it until it is just fluid enough to start dropping off. He then quickly withdraws the punty from the furnace and, holding the soft glass over a heated steel mold, cuts off the right size piece with a pair of shears.

The hot syrupy glass drops into the mold and is pressed into shape. The molds are left to cool. When cool enough to be handled, the blanks are taken from the molds and inspected by immersion in a liquid having the same index of refraction as the glass.

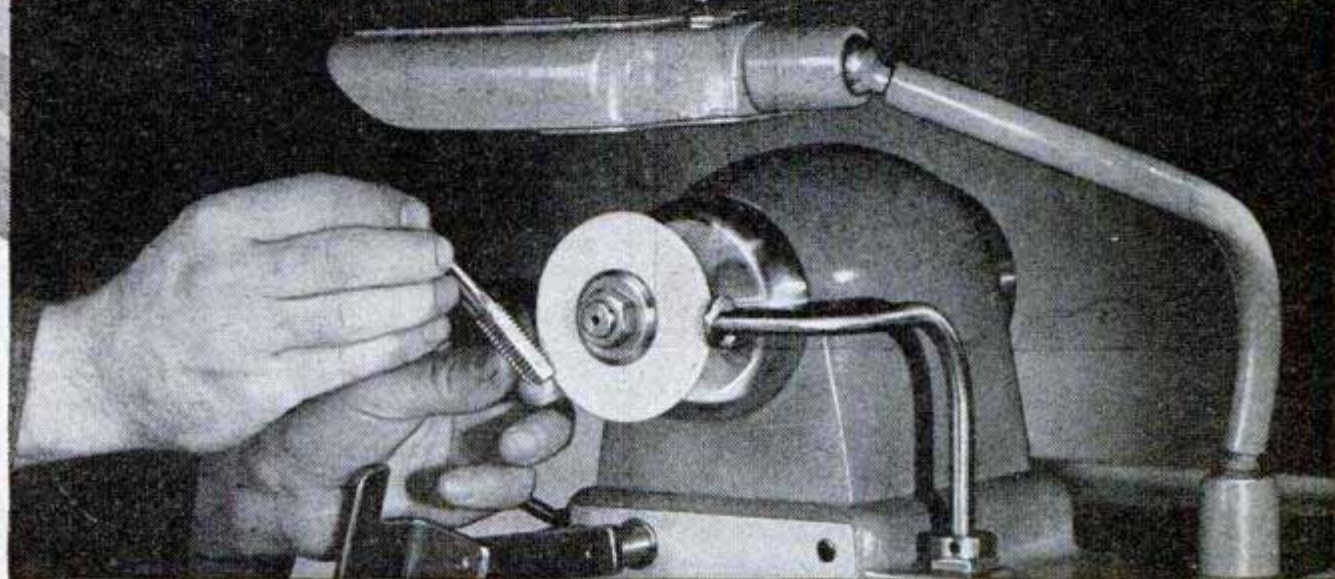
The method gives an X-ray picture of the glass. In the liquid the glass surfaces of the blank disappear and any imperfection beneath the surface of the glass shows up clearly when illuminated.

As the glass had solidified in the molds, internal strains were created which seriously affect its physical and optical properties. One of the most critical processes in the manufacture of optical glass, annealing, is used to remove these strains. The blanks

(Continued to page 230)

Ingenious New Technical Methods

To Help You
Simplify Shop Work



Versatile New Grinder Saves Time —Improves Grinding Efficiency

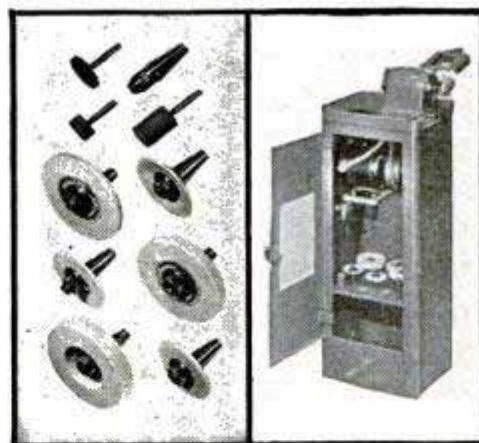
A new grinder, the Corlett-Turner G-3, permits changing of grinding wheels in a matter of seconds and assures a true running wheel at all times. Each wheel is individually mounted on a ground, tapered arbor.

Easy wheel changing is accomplished by a slight wrist motion on the end bells of the grinder head. A twist to the left releases the wheel arbor; the reverse action instantly secures it in place. It's all done in a matter of seconds. No costly time is lost in repeated wheel dressing.

In addition to its primary function, the G-3 grinder has innumerable uses for burring, buffing, polishing, and production applications requiring a high speed spindle. Powered by a 1/3 horsepower motor, a three-step pulley arrangement provides speeds of 5600, 8000 and 12,000 r.p.m.

Efficiency in precision work is also increased when tension is relieved by the act of chewing. And chewing Wrigley's Spearmint is a pleasant, easy way to help relieve workers' nervous tension. For these reasons Wrigley's Spearmint Chewing Gum is being made available more and more by plant owners everywhere.

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Puttying Window Sash

Q—I reputted most of the window sash in my home a year ago. The putty was allowed to dry two weeks before the sash were painted. Now the putty seems to be loose and on some of the windows, sections of it have fallen out. What is the cause of this and what is the remedy, if any?

H.M.—Lincoln, Neb.

A—It is essential that the wood be thoroughly dry before new putty is applied, and it also is necessary to paint the exposed wood in the rabbet with a light priming coat before the putty is applied. The procedure steps are: Remove all cracked and loose putty and clean the fine material out of the rabbet with a wire brush. Then apply a priming coat of paint in the rabbet, using the same color primer as will be used for the finishing coats. Apply putty after the paint is dry. After the putty has hardened, paint the sash in the regular way.

Water Creeps Under Front Door

Q—During driving rainstorms water comes under my front door, which is directly exposed, there being no hood or porch. Due to the location of the door, I cannot install a hood without some alteration of the exterior. Is there any other remedy for this trouble?

G.F.—Birmingham, Ala.

A—There are several remedies, of course, but usually the simplest is to rehang the door, although in some instances it is easier to install a new threshold. In either case the idea is to relocate the door or the threshold so that the outer edge of the door bottom overhangs the top edge of the threshold bevel about $\frac{1}{4}$ to $\frac{3}{8}$ in. In rehang the door, simply move the hinges, stops and striker plate out $\frac{1}{4}$ to $\frac{3}{8}$ in. This usually can be done without damaging the frame in any way. The alternative is fitting a new threshold so that the outer bottom edge of the door overhangs it as described. When the door or threshold are installed in this way, water drips from the lower outside edge of the door directly onto the sloping bevel of the threshold and is carried away.

Repairing Cracks in Stonework

Q—How can I fill narrow cracks in the stonework across the front of my house? The stone is a reddish-brown color.

W. S.—Oklahoma City, Okla.

A—If cracks follow the mortar joints the wall should be pointed up in the usual way, but to fill small cracks in the stone, mix equal parts of red lead and litharge, and add glycerine to make a thick paste. Then apply to the cracks with a stiff-bristled brush or with a putty knife.

(Continued to page 228)



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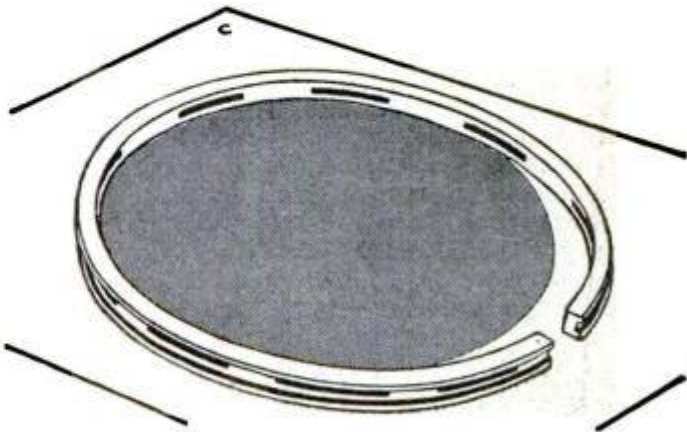
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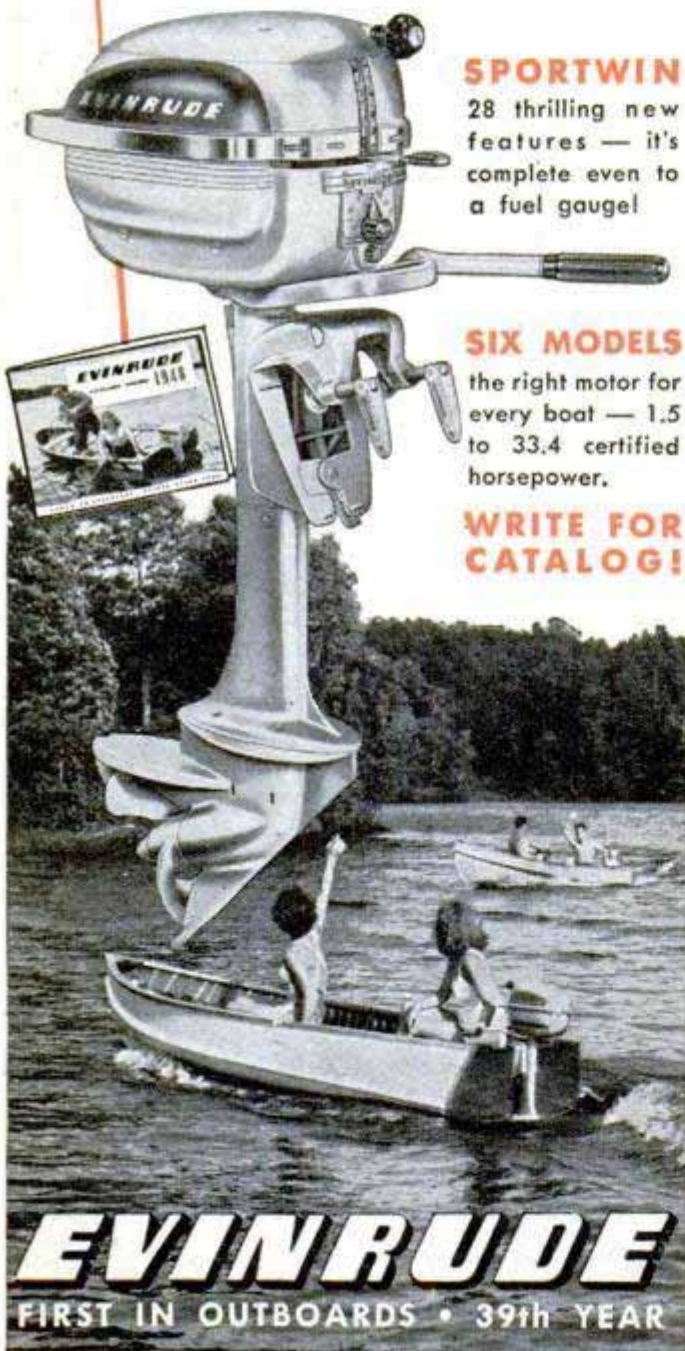
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Installing Cleanout in Chimney

Q—My chimney has no cleanout door at the bottom. Soot has filled the flue up to the furnace-pipe opening, and it seems impossible to get it out by any means I know of. The chimney is lined with tile. How can I break an opening through this tile to install a cleanout door, and is there any substitute for a cleanout door? I have found it impossible to obtain one thus far.

E. R.—Lynn, Mass.

A—In many cases the tile lining does not extend to the bottom of a single-flue chimney, especially where the tile is square or rectangular in section. It is easy, therefore, to break an opening in the brick with a bricklayer's chisel or an ordinary cold chisel. Make the opening large enough so that the cleanout door can be set in mortar. Where the tile lining extends to the bottom, break through the bricks and chip the opening to the proper size. Then score the tile deeply with a cold chisel, and it will be possible to break through it without shattering. A discarded check damper of cast-iron construction makes a good cleanout door.

Removing Ink Stains From Fabric

Q—Recently I spilled writing ink on an article of clothing. Can you tell me what will remove the ink stains without damaging the fabric?

J. G. R.—Monterrey, N. L., Mexico

A—To remove ordinary ink stains from fabric, first soak the material in lukewarm water. Next squeeze or wring very lightly and spread over a clean, dry cloth. Apply a few drops of concentrated liquid ammonia, specific gravity 0.891, to the ink stain. Then saturate a tuft of absorbent cotton with dilute phosphoric acid and apply repeatedly to the ink spot. Press firmly but do not rub. Finally, rinse the fabric in clean, warm water and dry in the sun.

Reseeding Old Lawn

Q—My lawn is patchy and infested with weeds, and on several spots moss appears to be crowding out what little grass there is. The soil is very hard — seems to be mostly clay — and grass seed does not germinate and take root except in a few scattered places. I do not want to go to the expense of reworking, tilling and reseeding the entire lawn. Is there any other method by which I can improve it, get rid of the weeds, etc?

J. V.—Terre Haute, Ind.

A—Unless you rebuild the sod completely, you cannot expect to attain a perfect lawn, but there is much you can do to improve what you have. First, allow the grass to grow to a height of 3 or 4 in., and clip any tall-growing weeds with a small scythe or weed hook. Then apply a complete lawn fertilizer which is combined with a weed killer. This should be applied with a wheeled spreader so that you get uniform distribution. Several applications may be necessary during one season to kill the weeds and stimulate growth of the grass. As the weeds are killed out, there will be bare spots. Loosen the soil lightly in these spots with a spading fork and then spread rich black soil over the whole lawn, raking it to a uniform depth of about 1½ to 2 in. so the blades of grass will be exposed to the sunlight. Next, apply grass seed and fertilizer, mixed half and half, with the spreader. Finally, when the top ½ in. of soil is dry, roll the entire lawn. Do not rake it, as this tends to bunch the grass seed. By repeating this process of applying seed and fertilizer over a period of several seasons, your lawn will be greatly improved.

Removing Dark Stains From Red Linoleum

Q—The cabinet tops in my kitchen are red linoleum and lately several dark-colored stains in the form of rings have appeared on the top of one cabinet. How can I remove these stains?

Mrs. J. M.—Boise, Idaho.

A—Go over the stains lightly with fine steel wool, working carefully so that the wool does not bunch and scratch the surface. Then wash with mild soap and water and wipe dry. Saturate a cloth with furniture polish and rub, first with the saturated cloth, then wipe with a dry, clean cloth. Finally, apply several coats of paste wax, polishing each coat to a high gloss.

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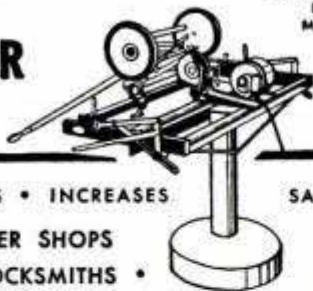
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APPROXIMATE SIZES DRAWER
1 1/4" Deep
2 3/4" Wide
6" Long

32 DRAWER UNIT
6" Deep
12 3/4" Wide
15 1/4" High

64 DRAWER UNIT
6" Deep
25 1/2" Wide
15 1/4" High

for home or shop,
the handy way to
keep small parts,
washers, nuts, bolts,
nails, screws, etc.

AND STILL AVAILABLE

32 DRAWER UNIT \$5.95
POSTAGE PAID

64 DRAWER UNIT \$9.95

Solid one-piece aluminum drawers for greater strength and long life—and still at low cost. So handy to keep office, shop, work bench, household and hobbyist needs at your fingertips. Spot welded steel cabinet, enamel finish, and metal flange drawer guides.

32-Drawer Unit—\$8.95. 64-Drawer Unit—\$15.95. Postage Paid. Send check or money order. No C. O. D.'s, please. Add 3% sales tax for Ohio orders.

THE JIFFY METAL CABINET WITH LAMINATED FIBREBOARD DRAWERS

Same steel cabinet as above with covered fibreboard drawers. Suitable for most home needs. Thousands in use. 32-Drawer unit—\$5.95. 64-Drawer unit—\$9.95. Postage Paid. Check or money order. No C.O.D.'s. Add 3% sales tax for Ohio orders.

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SAY YOU SAW IT IN POPULAR MECHANICS

Riegel WORK GLOVES

tops in...



comfort...
economy...
long wear

Enjoy the genuine comfort and protection of Riegel Work Gloves. They cost no more . . . and you'll find them tops in working ease and rugged resistance to wear. Made from raw cotton to finished glove, in America's largest work glove plant.

STYLES TO FIT EVERY NEED

canvas, jersey, leather . . . knit wrist, band top, gauntlet . . . double-palm, reversible, quilted . . . for factory, farm and home. Ask for the Riegel brand wherever work gloves are sold.

Riegel Textile Corporation
342 Madison Ave., New York 17, N. Y.

**Riegel
WORK
GLOVES**



FREE

Full descriptive literature if requested on business letter-head.

"THIS TRADE MARK IS YOUR GUARANTEE OF VALUE"

are packed in metal cases and heated at carefully controlled temperatures in electric furnaces. They are then slowly cooled so that neither strains nor refractive inequalities develop.

Removed from the furnace, the blanks are again inspected in the immersion tank. After grinding and polishing, the optical element is ready for installation in binoculars, microscopes or other instrument. The grinding and polishing is done on ordinary abrasive wheels and buffing machines.

A peak production of 236,000 pounds was reached in 1943 by the Bureau of Standards. By the summer of 1944, there was a drop in production as requirements of the armed services were beginning to be met by commercial plants. Today, the Bureau is producing special types of glass and advancing optical-glass research.

Thus the little-publicized glass factory only a few miles from the White House was and still is a vital part of our glass industry. Because of its continuing research, your new binoculars and microscope "see" more than the old ones did.

The Story of Rope

(Continued from page 141)

the rope manufactured in the United States is used for general marine purposes. Another third goes to industry and agriculture. The remaining third is used for making wire-rope centers, for commercial fishing, oil-well drilling and miscellaneous purposes.

In addition to rope, agriculture, industry and commerce consume huge amounts of wrapping and baler twine. An official of the U. S. Department of Agriculture says:

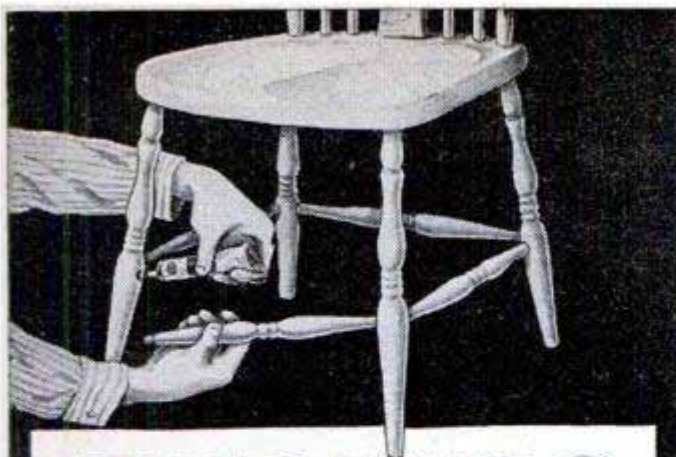
"If no harvesting machines were made for a year, farmers would be inconvenienced . . . but they'd get along. However, if the supply of twine for a single harvest were suddenly cut off, it would mean not only a national but an international calamity. It would be impossible to get enough help to gather the crops."

The Plymouth Cordage Company, one of America's oldest and largest rope-makers, recommends 15 rules for the proper care of rope.

Remove from coils properly. When taking the usual right-laid rope from the coil, make sure it unwinds in a direction opposite to clockwise. Lay coil flat on the floor with the inside end at the bottom. Pull end of rope through the center of coil.

Store properly. A dry, unheated building, or a room with free air circulation is the best place to store rope.

(Continued to page 232)



REPAIRS

FURNITURE, LUGGAGE, ETC.

It's transparent, water-proof, flexible and durable.



DUCO CEMENT

REG. U. S. PAT. OFF.

Everything you want for outdoor pleasure when you ride a . . .



Royal Enfield

FAMOUS ENGLISH LIGHTWEIGHT MOTORCYCLE RUNS 100 MILES ON A GALLON OF GAS

Up and go—with the rugged new Royal Enfield popular Model R.E. Style, safety, flexibility, 125 c.c. 2-stroke, single cylinder engine, 3-speed gears; 45 m.p.h. Write today for folder "P", for complete details. Also 350 c.c. and 500 c.c. models are immediately available.

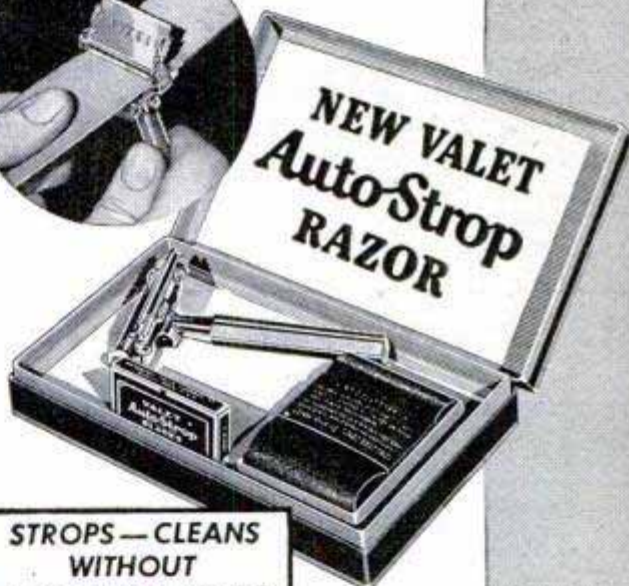
Dealer inquiries given prompt attention.

WHITEHALL DISTRIBUTORS, Inc.
1385 Commerce Avenue, New York 61, N. Y.



STROP YOUR RAZOR AS A BARBER DOES!

For extra shaving comfort plus economy



STROPS—CLEANS WITHOUT REMOVING BLADE

RAZOR, STROP AND 5 VALET BLADES

\$1.25

SELF-SHARPENING . . . ONE PIECE

SOUTH BEND

QUALITY LATHE DOGS

Heavy malleable iron. Tail shaped to fit face plate slot. Standard Dog has square head screw. Safety Dog has headless screw. Prices for either style.



Capacity	Price*	Capacity	Price**
1/2"	\$0.80	3/8"	\$0.70
3/4"	.95	1/2"	.75
1"	1.05	5/8"	.90
1 1/4"	1.20	1"	1.00
1 1/2"	1.40	1 1/4"	1.10
1 3/4"	1.55	1 1/2"	1.35
2"	1.70		
2 1/2"	1.95		
3"	2.20		
3 1/2"	3.00		
4"	4.00		

*13-inch or larger lathes.
**9-inch and 10-inch lathes.

SOUTH BEND LATHE WORKS 455A E. Madison St. South Bend 22, Ind.

Dry after wetting. A wet rope never should be stored—make sure it is thoroughly dry before putting away.

Keep it clean. If your rope gets dirty, wash with clean water and dry thoroughly before storing.

Protect from chemicals. Keep rope away from storage batteries, paint, linseed oil, manure and fertilizer.

Avoid kinks. If usage involves continual twisting in one direction, throw more turns into or out of the rope to avoid damage to rope structure.

Don't overload. With first-quality rope, it is safe to load up to one fifth the guaranteed minimum breaking strength.

Slack off guys. When ropes are used as guy lines, and other supports exposed to weather, they should be slacked off to prevent overstrain due to shortening from wetting.

Avoid sharp angles or bends. A sharp bend reduces tensile strength by putting extra strain on the outer fibers.

Sheave right. You put unnecessary strain and friction load on a rope with sheaves that are too small.

Reverse ends. When using rope as tackle, reverse the ends periodically. If a rope is damaged, cut and splice.

Don't lubricate. A well-made rope is already lubricated by the manufacturer and

no additional lubrication is necessary.

Avoid unnecessary wear and abrasion. Surface wear may come from allowing one rope to chafe another.

Splice correctly. Splices are better and stronger than knots, which reduce the strength of the rope up to 50 percent.

Avoid sudden jerks or strains. A common piece of twine may be difficult to break with a steady pull—yet it can be broken easily with a sharp snap. The same is true of ropes.

Shears With Double Grips Can't Be Picked Up Wrong



Because of the double hand grips, each forming a figure eight, reversible shears can't be picked up the wrong way. They can be used with the pointed blade up or down. The double grips on the handles give greater leverage and prevent cramped fingers.

MAKE LIFE-LIKE PHOTOS OF YOUR FAVORITE HOBBY

WITH THE
Pacemaker

SPEED

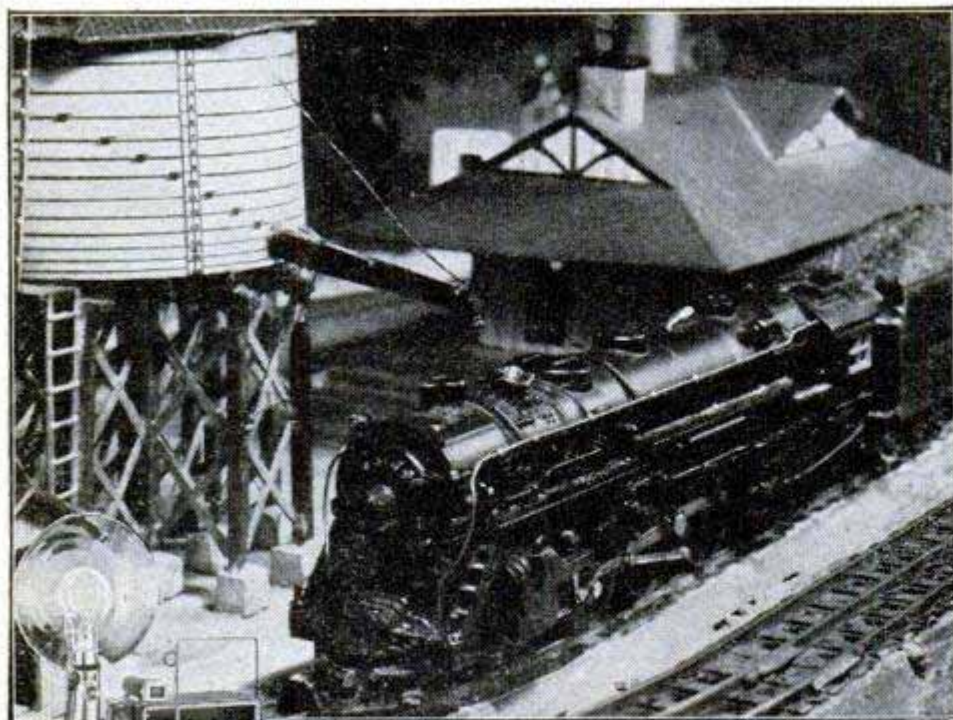
GRAPHIC!

Do you have a detailed model train layout that you've never thought of photographing? Or one that you *have* photographed, but not to your satisfaction?

Start to take "breathing" pictures of your pride and joy with a new Pacemaker SPEED (or Crown) GRAPHIC! Whatever your hobby, you can get more fun out of it by taking sharp, clear shots suitable for hanging . . . or for record purposes.

It will pay you to see your Graflex dealer today! Meanwhile, write for literature, Graflex, Inc., Room 42, Rochester 8, N. Y.

GRAPHIC cameras and accessory photo-products are manufactured only by Graflex, Inc., Rochester 8, N. Y.



GET PRIZE-WINNING PICTURES WITH

GRAFLEX

Western Division Office, 3045 Wilshire Blvd., Los Angeles, Cal.



SAVE YOUR PRECIOUS EYESIGHT!



Soften that GLARE...
wear these genuine

U. S. ARMY AIR FORCE TYPE

SUN GLASSES



SPECIAL OFFER
WHILE
THEY LAST!

Regular \$15.00 Value

SUPER-SENSATIONALLY PRICED

at only **\$2.49**

including convenient leather case
Men's and Women's sizes!

Imagine! These attractive, optically-correct sun glasses at such a bargain price! U.S. Gov't. approved for meeting all specifications for absorption of ultra-violet and infra-red rays.

DON'T BE A SUMMER AND WINTER SQUINTER!

Effectively protect your eyes from harsh glare of summer sun and winter snow. Wear these smartly-made, official Army type sun glasses for carefree, glare-free pleasure . . . the year 'round!

- Ground and polished 4 base lenses.
- Made to highest optical standards.
- Gold plated adjustable frames.
- Absolute satisfaction guaranteed or money cheerfully refunded.
- Pearloid sweatband and pads.

LIFETIME GUARANTEE!

If at any time during the life of these sun glasses you return them to us for repairs, we will be glad to fix them for a nominal service charge of 50c.

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Successors To S & B SURPLUS SALES COMPANY

HURRY! FILL OUT AND MAIL THIS ORDER COUPON NOW!

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Dept. PM7

Please send me _____ men's _____ women's SUN GLASSES.

- Send C.O.D.
- Enclosed find check or money order for \$2.49 pr. postpaid.

Name _____

Address _____

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(Illinois residents add 2% ret. occ. tax)

Get **BOOK** and **PLANS** for only \$14
and **BUILD THIS HOUSE YOURSELF**

Save

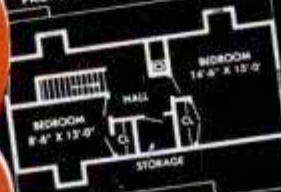
**THOUSANDS
OF DOLLARS
WITH THESE
REMARKABLE
PLANS!**



**POPULAR
MECHANICS**
**Build-It-Yourself
House**

Actual Photograph of House Built
by 23 Year Old Veteran

PROPOSED SECOND-FLOOR PLAN



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Your HOME
and how to build it YOURSELF

If you can use common tools you can build this house yourself, in any of its five exterior designs, following the Popular Mechanics Build-It-Yourself Book and plans and save thousands of dollars. Even if you have the work done by a contractor or an ordinary carpenter, this amazing book and plans will give you a tremendous saving.

**SPACE FOR LIVING AND
FAMILY GROWTH**

This beautiful, modern home, with breezeway and garage, as pictured above, was built from these same plans and instructions by Jacques Brownson, a 23-year-old veteran in Aurora, Illinois. It is 1½ stories with basement, recreation room, living room, kitchen, dining nook, two bedrooms, bath, plenty of closets and space for 2 additional bedrooms on the second floor. An inspection of floor plans, shown in reduced size, indicates an unusually large amount of good, usable living space that can easily be increased to meet the needs of a growing family. The house itself is 35'-9" x 28'-11"; breezeway 20'-10" x 8'; garage 20'-10" x 12'.

**DESIGNED BY POPULAR MECHANICS
AND FAMOUS ARCHITECTS**

The big, basic idea behind the design of the Build-It-Yourself House is ease of construction (so a man could do the job himself with very little assistance) and the most living space and the most useful space, at the least

cost, considering attractiveness and suitability for any neighborhood and most income groups. It is a home anyone can enjoy and be proud to own.

**Read the Book—Study the
Plans—Start Building
When You Can**

"Your Home and How to Build It Yourself," contains 100 pages, size 8½ x 11 inches. Three-fifths of the book consists of photographs and drawings. Several sections are printed in extra colors and a full-color insert shows just how your own house will look in actual colors. Every detail of the house and its construction is discussed in minute details that will guide you in every step. Plans consist of ten working-size blueprints, giving floor plans, elevations, notes on construction, framing, lumber list, millwork list, specifications, plumbing and wiring diagrams. Every measurement is marked, every detail made as clear as A.B.C.

**FOR EXTRA SAVING ORDER BOOK
AND PLANS TOGETHER**

With the Build-It-Yourself Book as a guide and the remarkably complete plans to follow, any handy man who can use simple tools can build this remarkable house and enjoy every minute of the work while saving thousands of dollars.

Plans

Set of ten full-size working blueprints — easy to read and easy to follow. Every construction detail included. See reduced combination price below.

Book

**Your Home — How to
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Plastic bound. 8½ x 11 inches. 100 pages—60 in colors. Complete instructions for building "Build-It-Yourself House." Valuable also to every home builder no matter what house is built. Can easily save you hundreds of dollars—much time, trouble and worry, too.

Order Today

Your Home and How to Build It Yourself \$ 3.00
Complete set of plans 12.50
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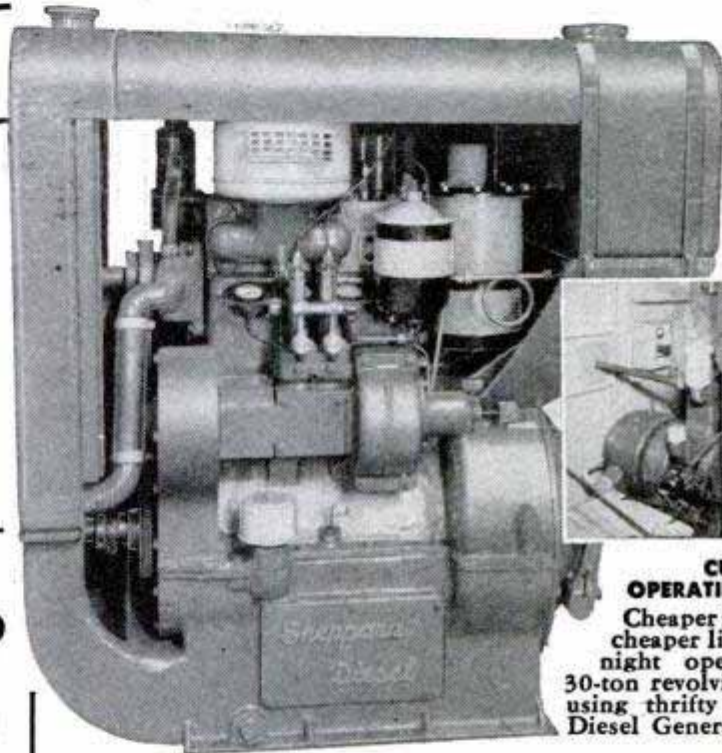
ORDER BUILD-IT-YOURSELF HOUSE BOOK AND PLANS TODAY!

NOW... *Sheppard* DIESEL POWER for Small Engine Users!

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DIESEL POWER UNITS

3.5 to 100 H.P. Pushbutton starting on all models, in any weather, using non-explosive Diesel fuel oil. Easy maintenance, long operating life, low operating costs. All accessories are standard equipment, *no extras to buy*; delivered complete, ready to operate.



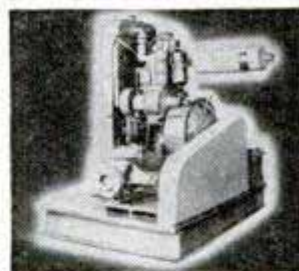
CUTS NIGHT OPERATING COSTS
Cheaper fuel means cheaper lighting for night operation of 30-ton revolving cranes using thrifty Sheppard Diesel Generating Sets.



SMALLEST AIR-COOLED DIESEL AVAILABLE AMAZING 5.4 H. P. SHEPPARD DIESEL

At last—dependable Diesel power for original equipment manufacturers, plant operators, farmers, contractors, lumber mills, other small engine users! Available as 5.4 H.P. power unit or 2,000 watt generator. Does any job your present engine will do . . . with less maintenance . . . at lower operating cost. Standard Sheppard features: pushbutton starting; only one moving part in injector.

SHEPPARD PUTS SAFETY FIRST. Sheppard Diesel power has *no electrical ignition system; no dangerous fumes.* That's one important reason why Yale and Towne Mfg. Co. engineers designed this high octane aviation gas pump assembly with a Model 7 Sheppard Diesel Power Unit.



Mail this **FREE BOOKLET COUPON** *Today*

DEALERS:

Complete your line of engines and equipment with Sheppard—the *small engine* that opens a great new market for Diesels! A few dealer territories are still open. Send coupon for Sheppard Diesel franchise plan.



GET FACTS on how Sheppard Diesels can do your small power jobs at amazing savings in fuel costs, upkeep, and do the jobs better due to long life, dependable operation! Mail coupon now for free illustrated data sheets, facts, specifications, figures. No obligation!

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DIESEL'S THE POWER *Sheppard's* **THE DIESEL**

STOP Battery Failure!



No one likes to buy a new battery. No one likes the starting delays that come with battery failure. Eighty per-cent of battery failure is traced to lack of water.

The Superior Automatic Battery Filler keeps the water in your battery at the proper level, AUTOMATICALLY, while you drive. You can see the water level at a glance. This automobile necessity protects your battery against dangers of fast evaporation in Summer—keeps starting power at peak in Winter.

This new invention pays for itself on the first battery. It makes your battery last 2 to 3 times as long. Can be changed from car to car. Easy to install, requires no drilling or cutting. See your dealer or send \$4.75 for inexpensive battery protection. It's a real automotive necessity. For sale at many Ford, Mercury, Chrysler, Dodge, DeSoto and Plymouth dealers. Dealer and Jobber inquiries invited.

DON'T WAIT — SEND TODAY

Superior Seal & Stamp, 1401 Vermont Avenue, Detroit 16, Michigan

Please send me _____ Superior Battery Filler(s) as advertised. I have enclosed \$4.75 for each filler. Rush prepaid.

Name _____

Address _____

City _____ State _____

Make of car _____ Year _____

Fits all cars with battery under hood except Hudson previous to 1948.

One Car — Two Gas Tanks

(Continued from page 118)

the anti-knock qualities of gasoline than at present, is certain to result also in improved economy. The improvement, therefore, does not depend solely upon increases in the octane numbers of the gasolines.

Too, the policies already existing in automotive design and in the marketing of motor fuel can provide the 20 percent premium gasoline sufficiently high in anti-knock quality to meet the requirements of proposed high-efficiency auto engines.

Development of dual-fuel systems for automobiles underscores the fact that although significant increases in the octane number of motor fuels may be several years off, it should not impede the progress that the automotive industry can make in designing and producing engines and cars with improved performance and economy.

Currently, the Socony-Vacuum Oil Company, Inc., is cooperating with a major manufacturer of carburetors to develop a commercially practical unit for new automobiles which would utilize premium-grade gasoline only under the conditions when this special fuel is needed. Other carburetor manufacturers are interested in the subject also. Hence the day of important announcements in this respect might not be far off.

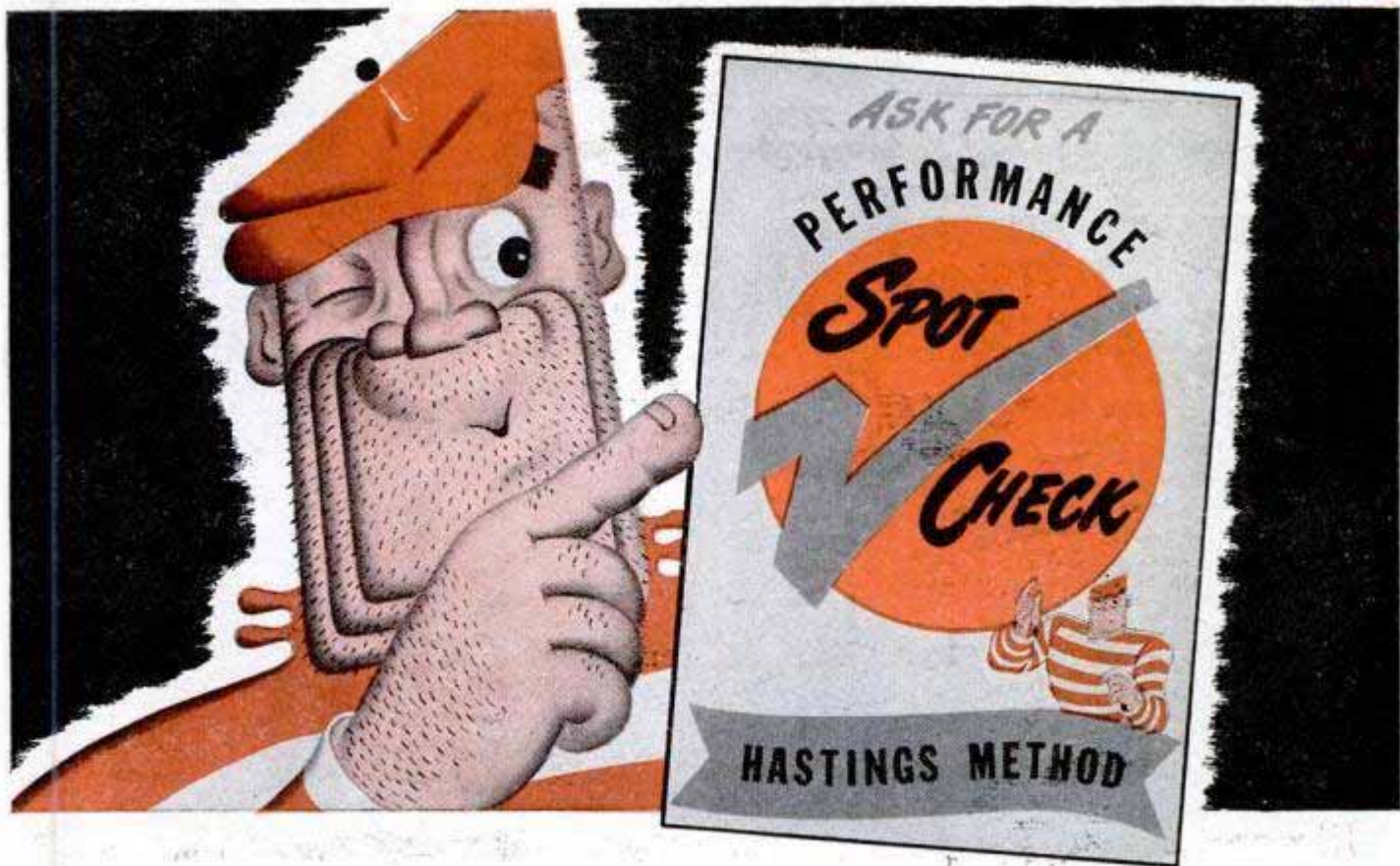
The eventual commercial product, it is hoped, will reconcile the differences in octane-number requirements observed in the Paulsboro tests at various throttle openings (manifold vacuums). In order to study this relationship, several cars were operated on various octane-number fuels in city traffic, level open road and over mountainous terrain to determine the percentage of time during which knock-free operation was obtained.

In the test car alone, fuel of 70-octane number gave knock-free performance for 95 percent of the driving time. This demonstrates the waste of anti-knock quality because normally in similar cars an 80-octane-number fuel is used 100 percent of the time solely to satisfy the peak requirement.

In contrast to passenger vehicles, trucks and busses operate a greater proportion of the time under more nearly full-throttle conditions. Consequently they utilize octane ratings of their fuel more efficiently; but in general, commercial vehicles do not have as high maximum anti-knock quality requirements.

The potential importance of dual-fuel systems in automobiles also shows that distribution and marketing of a third grade

(Continued to page 236)



HERE'S A "CAR-SAVING" SERVICE THAT'S YOURS FOR THE ASKING

Wouldn't you like to have an expert check up on your car? A skilled mechanic's "once-over" now can save you real money later on.

Thousands of Hastings dealers are offering this service right now. They're set up to give your car a Performance Spot Check—a quick and accurate

analysis that will help you get the most out of your car and avoid major repairs.

Ask your Hastings dealer to give your car a Spot Check tomorrow. He'll give you an expert diagnosis and an honest recommendation. And there's no obligation.

HASTINGS MANUFACTURING COMPANY • HASTINGS, MICHIGAN
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TOUGH BUT OH SO GENTLE



HASTINGS

STEEL-VENT PISTON RINGS

TOUGH on Oil Pumping
GENTLE on Cylinder Walls

New Type Hearing Aid

Needs No "Fitting"



New Radionic *Zenith "75"*
This is all you wear. \$75 complete.

SAVES YOU OVER \$100

Coupon below brings it to you—no salesman, no visits to salesrooms. Hear better or pay nothing!

MONEY-BACK TRIAL!

Wear the Zenith "75" at home, at work, anywhere. If it isn't better than you ever dreamed ANY hearing aid could be, return it within 10 days of receipt and Zenith will refund your money in full.

Because it needs no "fitting," it comes to you by mail—no salesman to high pressure you, no embarrassing visits to salesrooms. If its price had to include "fitting," middlemen's profits and high sales commissions, the Zenith "75" would have to sell for \$195 instead of \$75. So do as tens of thousands have already done. Order your Zenith "75"—mail the coupon today.

BY THE MAKERS OF THE WORLD-FAMOUS ZENITH RADIOS



Look only to your doctor for advice on your ears and hearing



MAIL THIS COUPON TODAY

Zenith Radio Corporation
Hearing Aid Division, Dept. PM78
5801 Dickens Avenue, Chicago 39, Illinois

I enclose check or money order for \$75* for one Zenith "75" Hearing Aid. Unless I am completely satisfied and find the Zenith "75" superior to any other hearing aid, I may return it within ten days of receipt and get my money back in full.

*Plus tax of \$1.50 in Illinois or New York City; \$1.88 in California, except Los Angeles, \$2.25.

Please send me free descriptive literature.

Name.....

Address.....

City..... State.....

of gasoline—a "super-premium" gasoline—is not feasible. Not only is the required capital investment excessive, but the materials required for the installation of additional pumps, lines and tankage at the refineries, bulk terminals and service stations would have to be drawn from the same limited stocks now being used for the expansion of crude-oil production and refining facilities.

Whether the industry will be in a position to continue an upward trend in anti-knock quality indefinitely is a serious question and will continue to be so for years. Such improvements cannot be obtained simply by turning valves and readjusting operating conditions on equipment currently in use. All of it is now being operated at maximum capacity to meet quantity demands. Refining facilities must be built to meet these increasing quantity requirements before emphasis can be placed upon construction for quality.

Certainly improvements in performance and economy in automobile engines through increases in compression ratios is highly desirable—up to the point where such engines will require fuels with higher octane ratings. This obstacle diminishes in importance if cars can utilize currently available octane ratings to their fullest. Dual-fuel systems to accomplish this are appropriate and appear justified so far on the basis of Socony-Vacuum's development efforts.

Cops on the Campus

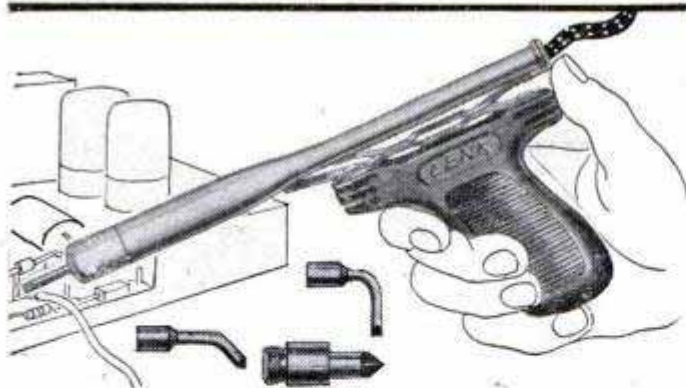
(Continued from page 125)

town through wise traffic enforcement.

Some of the knowledge crammed into the officer's head may save home-town taxpayers some money when he returns to his job. For example, selective enforcement is emphasized throughout the course. Instructors explain this technique by pointing out that accidents occur according to definite patterns. Cars may frequently smash up on a particular corner between 5:00 and 6:00 p.m. Another area may be a hazard between 7:00 and 8:00 a.m. These areas need special attention from the traffic police at particular times, but they are as safe as other areas the rest of the day. By making a master pattern of such accidents for an entire town, city or county, and enforcing the danger areas "selectively," the head of the traffic police may, in some cases, reduce his force without any cut in its efficiency.

Modern training aids help the student cops solve traffic problems. One classroom

(Continued to page 238)



All Soldering is a Cinch with the
LENK Gun-Grip*
SOLDERING IRON

The perfect Soldering Iron for hobbyist, novice and mechanic. Has always cool, unbreakable plastic Gun-Grip. 4 interchangeable tips for varied angle approach—light and heavy duty. Spring construction cushions pressure for delicate work. Built-in stand rests iron safely. Brilliantly chrome plated. Completely U. L. approved. Buy one at your dealer's today.

FREE! Write for booklet
 "TIPS ON SOLDERING"

THE LENK MANUFACTURING CO.
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BUY DIRECT...

SAVE 1/3!



Sold at \$19.95
 in the stores...

TERRIFIC demand for more and MORE and MORE of these super deluxe Sussex wagons at this sensational \$12.95 direct-from-factory price, enables us to continue this smashing offer.

Top quality from its shiny-chrome-plated handle to its patented hubless, steel disc wheels, the Sussex super-wagon has a solid oak frame, steel bottom, semi-pneumatic tires, supports 1/4 ton, and has a brand new auto-type steering gear that makes a 90° turn without tipping!

Prompt delivery. Send \$12.95, money order, or check, or send \$5.00, pay balance on delivery.

ONLY
\$12.95
 F. D. B.
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DIRECT TO YOU

STAR features:

- ★ Big 16"x 36" body
- ★ 10"x 1 3/4" Firestone demountable tires
- ★ Chrysler Oilite bronze bearings
- ★ New auto-type steering gear
- ★ Metal parts cadmium and nickel plated
- ★ Chrome-plated handle of channeled steel

MARKWARDT MANUFACTURING COMPANY
 3354 N. BUFFUM STREET MILWAUKEE, WISCONSIN

New Easy Way
 TO MAKE
BIG MONEY!
 AT HOME

FULL
 OR SPARE
 TIME



Permanently
METALLIZED
BABY SHOES

Costs You Only 5¢-You Get \$6.00

Now is the time to cash in on this big-paying, easy-to-operate year 'round business, and you need no experience! With actual illustrations and step by step instructions, YOU can start earning money in only one week—up to \$1000 per month full time, or

LARGEST NUMBER OF SUCCESSFUL BUSINESSMEN

Our course has the largest number of successful businessmen in this field today! They are all men and women who acted and are making money. This course is guaranteed—your money will be fully refunded if you are not more than satisfied. There is nothing to lose, so act at once.

- Money Back Guarantee
- Most Successful Name in Metallizing
- Big Income
- Huge Demand
- Sales Plans
- Future Security
- Your Own Boss

\$50 to \$75 per week spare time... at \$5.00 per hour. Working only a few hours you can make more money than most people make working an entire week.

IMMEDIATE RESULTS

This tested and proven method shows you complete details, so that you may start at once, metallizing Baby Shoes, with real GOLD, SILVER or BRONZE. They will last forever, retaining every priceless detail of the natural shoes; something for which there are 5 million new customers waiting to buy every year.

BEGIN AT HOME

Don't pass up this real opportunity to start your own business on a shoestring right at home. **ACT NOW!** We will send you all the details absolutely free.



FREE!

Two actual metallized Baby Shoes guaranteed to be the most attractive on the market—or a pair of your own Baby Shoes metallized if you prefer.

SEND NO MONEY
 USE THIS COUPON

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Rush me FREE full particulars at once.

Name _____
 Address _____
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Handy Electric Drill

Saves Time 3 Ways



HOME-UTILITY
1/4" Electric Drill
\$18.95

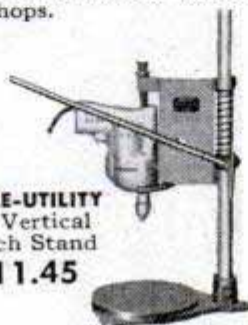
1 FOR PORTABLE DRILLING—

Drills bolt holes, lead holes in metal, wood, plastics. Saves you time, turns out better work in homes, on farms, in workshops.



HOME-UTILITY
1/4" Horizontal Stand
\$3.35

2 FOR GRINDING, SANDING, buffing, polishing—Helps you sharpen cutlery and tools, remove rust, sand hobby shop items, etc. Frees both hands for applying work.



HOME-UTILITY
1/4" Vertical Bench Stand
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3 FOR DRILL PRESS WORK—Quickly converts the Drill into a convenient drill press with a smooth feed for bench work. Drill is slipped into both Stands, or removed, in a few seconds.

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has a magnetic blackboard which attracts and holds small models of cars, so that the instructor quickly can set up a visual problem in enforcement. The officers get an overview of everything that's new in enforcement through demonstrations of wire recorders for taking statements of witnesses, speed tests in relation to stopping distances, walkie-talkies for emergency use, and the latest developments in engineering equipment.

The 4½-month course is not the only service of the institute and the IACP. They also offer a basic course in enforcement lasting only three weeks, sponsor regional courses in other parts of the country, courses for judges and prosecutors of traffic courts and a course for supervisors of large fleets of vehicles. In addition, the institute publishes information on enforcement, maintains a library of films dealing with traffic and backs up its graduates with an extension service. Extension men go into the officer's home town and help him apply what he has learned at the institute.

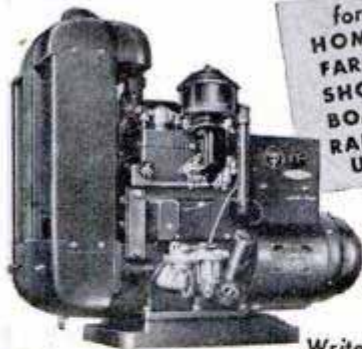
Hundreds of photos are submitted to the institute each year during the contest for police photographs. These pictures are snapped by officers on active duty. In last year's contest one photo showed a lipstick print on a car compared to the lipstick prints of a hit-and-run victim, resulting in a prison term for the driver.

Facilities aren't available for training the number of officers who are eager to attend the course. One young man was so enthusiastic about the institute after a visit that he immediately applied for enrollment. Unfortunately, he was not an officer and had never been on any police force, so his application was rejected. A few days later he telephoned from his home town—population a few hundred—that he had persuaded the village fathers to appoint him Chief of Detectives. Kreml accepted him as a student on the theory that anyone with that much ingenuity could serve well in unsnarling some of the present traffic problems.

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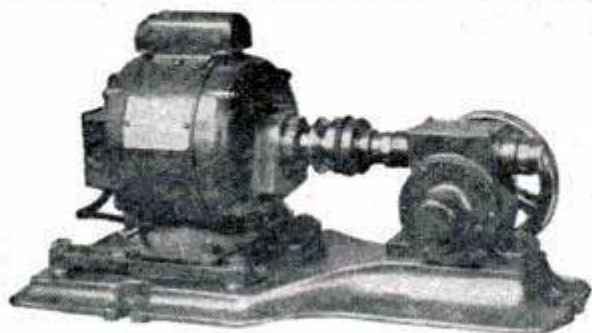
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(Continued from page 92)

five inches in diameter, or the size of the original screen.

Two laboratory tools brought this device over the hump from theory to practice. The first is a small pilot tube, three inches long by two inches in diameter, which proved that the fluorescent image could be intensified by the use of electrons as already described. It achieved a five-fold increase in brightness. A second tube, which more closely resembles the still unbuilt production model, proved that a 500-fold increase could be attained by electron acceleration and compression.

The advantages of this brighter image are manifold. It will largely eliminate the need for the doctor to remain in darkness for long periods or to wear red glasses in normal light in order to increase the light-sensitiveness of his eyes. A minute or two in darkness will enable him to see far greater detail and in a much shorter period than ever before.

Since examination and diagnosis will be possible in a much shorter time than heretofore, it will be possible for more persons to have fluoroscopic examination. Details, which are nothing more than shadows contrasted against the brightness of the background, will be visible to an extent hitherto undreamed of.

Shortening of the examination period is also important to both doctor and patient for another reason: X-rays in too heavy or too lengthy doses can be harmful to the human body. A patient who must have thorough fluoroscopic examinations at frequent intervals may be running a risk and the physician who exposes himself to X-radiations for many hours a week may suffer unpleasant consequences.

This is a situation which is not emphasized by persons engaged in working with X-ray or manufacturing such equipment, but occasional hints in the direction of caution are encountered. The producer of a new fluoroscopic screen claims 40 percent greater brilliance, but he does not suggest that the doctor use this increased brightness to enable him to see more. No, the screen manufacturer suggests that power can be reduced with no deterioration of the image.

It is believed that, where extraordinary circumstances demand it, the fluoroscopic image can be transmitted by television from city to city, permitting eye-witness consultation by two or more specialists in widely separated points.

(Continued to page 242)

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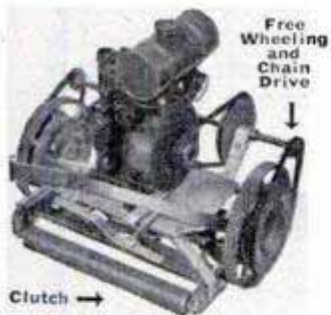
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The device could also be applied directly to the television transmission and reception techniques, but not where you might first suspect. While it would be possible to use the kinescope screen in place of the larger screen in Coltman's tube and obtain a smaller and much more brilliant image, this would be undesirable in some cases and more easily achieved by other methods in other cases.

Brilliant images can now be obtained on kinescope or receiver tubes by reducing the size of the tube head, but it is possible that the image intensifier might prove useful on the transmission end. Where scenes of low brightness were to be telecast, the light rays of the scene itself could be brought directly to the photoelectric surface, which would accelerate the electrons and permit the orthicon or other television camera to pick up a greatly brightened image for transmission.

What Coltman has done is to make up for certain inherent deficiencies in the human eye, which has been the weak member of the team in the use of fluoroscopy up to now. The most carefully "light conditioned" eye sees a dim image on the screen because of its low sensitivity to light. The same amount of light striking a negative in radiography for even a short period of time produces a vastly superior image owing to the cumulative effect of the exposure.

The contrast sensitivity of the eye—its ability to distinguish between closely spaced objects—cannot be increased, but by raising the level of brightness of the background the contrast of the shadows is increased and they can be much more readily distinguished.

Chief problems which were encountered by Coltman were in selecting fluorescent and photoelectric coating materials which would work together as a team. In most cases the latter "attacks" the phosphors in the former, resulting in an unstable and quite useless combination. The finding of a harmonious combination was the major factor in perfecting this development—which has the laboratory name of "image intensifier."

Fortunately, the intensifier will in no way make obsolete current fluoroscopic equipment, which can use it simply by substituting the new tube assembly in place of the screen now used.

No production date has been set by Westinghouse, but a good guess places early 1950 as the date when it may be in the hands of the medical profession.

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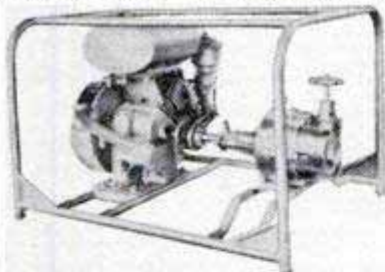
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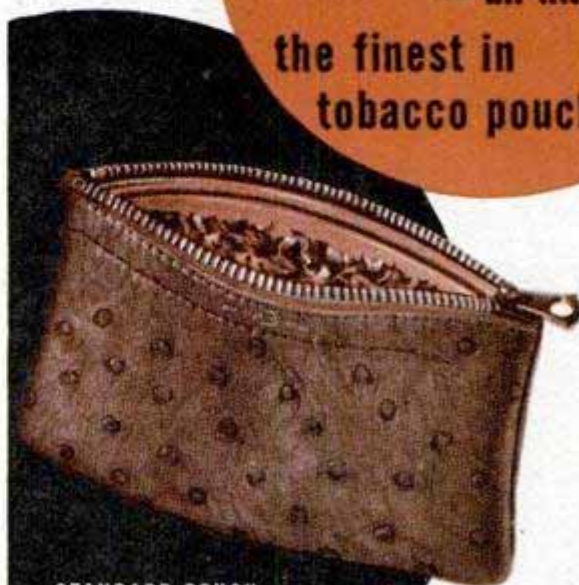
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Baits for Bass

(Continued from page 99)

wobbling, crawling, erratic, diving or darting motion, which at first attracts the pugnacious bass. Each plug has its special characteristics of motion, but the angler's skill in retrieving, in pausing and changing speed is of equal necessity. Next in importance comes the hooks. The gangs will hook a fish easier, but are more easily thrown out during that high, head-shaking leap for which the bass is famous.

Many plugs so fitted will be lost on hidden obstructions. Also, this type does not usually cast as easily as the more slender, single-hook lure. The large single hook, with its long, keen point bites deep and is not easily dislodged. It is usually protected by a weedless device, which saves much tackle and also the angler's temper. This type lure, being heavy and slender, casts very easily and accurately.

Color of plugs: No two anglers will agree here, for one day the bass will take a red-and-white affair, and disregard it the next for something entirely different—perhaps jet black. And it is certain that color is less important than the plug's action. But experience has shown that certain color combinations have been most productive for a great many anglers. Thus, we might place red and white first; next, perhaps a yellow or yellow and brown "perch-scale." It looks like a large minnow. Then, sometimes black and white works well, as does a combination of red and yellow.

And, regardless of how we try to concentrate upon a few "tried and proven" bass lures, there is always a chance that the bass will want something different. Each season scores of new and attractive lures come on the market—and we must try them. That is why the confirmed bass fisherman buys the largest tackle box he can find, and stocks it full of such a variety of beautiful, shiny new gadgets. And that is one reason he is a bass enthusiast.

But finally, with all his lures, the angler must be expert in their use. Casting practice for distance and accuracy, at home on the lawn or in a park pool, is essential. The slender little rod will send out that plug easily, granting a good level-wind reel, and the delicate, all-important thumbing of its spinning spool.

At the current rate of mining, the Lake Superior ore deposits, which have yielded 2,300,000,000 tons of ore since 1850, are expected to last only 20 more years. Last year, the area produced 82 percent of all ore mined in the United States.

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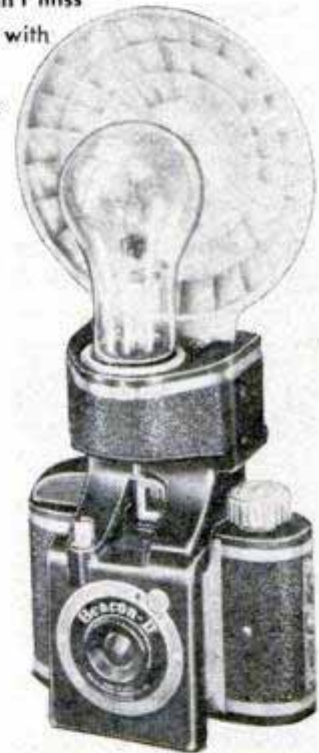
detail needed for sharp enlargements

up to 8x10. Two

optical lenses, coated

four sides. Flash unit takes any size bulb.

Push-button "hot bulb" ejector. Flash tester. Handsome, compact camera.



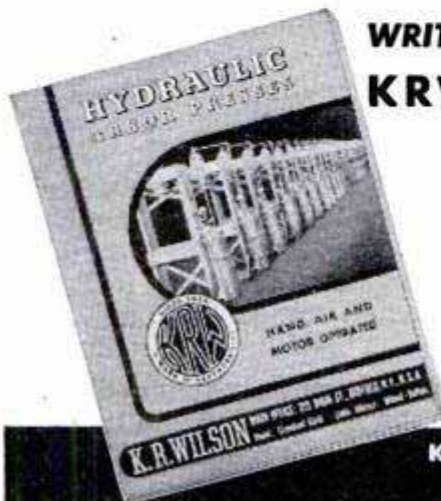
Beacon II
Camera

\$9.95 tax incl.

Beacon II
Flash Unit

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AVAILABLE AT ALL CAMERA STORES
SEE SPECIALLY DESIGNED ACCESSORIES
WHITEHOUSE PRODUCTS, INC.
360 FURMAN STREET
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Describes all manner of Production and Shop Work on KRW Hydraulic and Bench Type Arbor Presses. 32 pages illustrating the new KRW Hand-operated, Electric-operated and Air-operated Hydraulic Presses.
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Builders of Shop Equipment for Ford Dealers Since 1916

GROBAN'S SURPLUS BARGAINS!

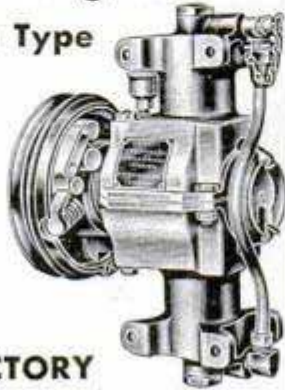
WESTINGHOUSE AIR COMPRESSOR

**BRAND NEW
War Surplus Bargain**

2-Cylinder Piston Type

Ideal for:

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- Industrial Uses
- Tire Inflating
- Spraying Insecticide
- Operating Air Tools



For the:

HOME... FARM... FACTORY

Designed for automotive truck or tractor mounting. Can be run off fan belt or power takeoff. Comes with automatic clutch. Can be installed for use on: farm trucks, jeeps, tractors, tire or garage service trucks, contractor or road building machinery, pneumatic devices, etc. Has 2 inch bore — 1½ inch stroke.

Can be operated with ½ H.P. or more electric motor or equivalent portable gas engine.

Light weight, compact and versatile unit... delivers "oil free air" simple in operation; requires minimum of maintenance; operates under all climatic conditions; suggested operating pressure 75 P.S.I.; equally efficient operation in either direction of rotation; approx. displacement 3.27 CFM at 600 RPM, 6.54 CFM displacement at 1200 RPM; Overall dimensions: width 9", height 11 7/8", depth 6 5/8"; approx. wt. 23 lbs.

**A REAL BUY...
worth many times
this price**

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REGO REGULATORS OXYGEN — MODEL 1601

INLET 967

BRAND NEW

UNDERWRITERS APPROVED

**For the Workshop — Home —
Factory — Farm**



Designed for precision, gas pressures; meet the heavy demands of cutting and welding in shops, ship and scrap yards, mills, etc. REGO REGULATORS deliver an ample supply of gases at constant, even pressures.

Manufactured by Bastian-Blessing Company. This highly dependable accurate instrument is modern in design—diaphragms are 2 5/8" in diameter; two brass gauges are each 2 1/2" in diameter; 0-400 P.S.I. and 0-3000 P.S.I. Ship. wt. 7 lbs.

ORIGINALLY WORTH MANY TIMES MORE

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½ H.P. — A.C.

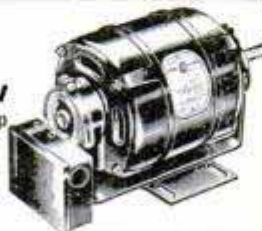
ELECTRIC MOTOR

(Capacitor Type) BRAND NEW

For the Farm, Home, Factory, Workshop

Here Are a Few of Many Uses:

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| Pumps | Air Compressors |
| Stokers | Refrigeration Units |
| Oil Burners | Conveyors |
| Unit Heaters | Blowers—Fans |
| | Machine Tools |



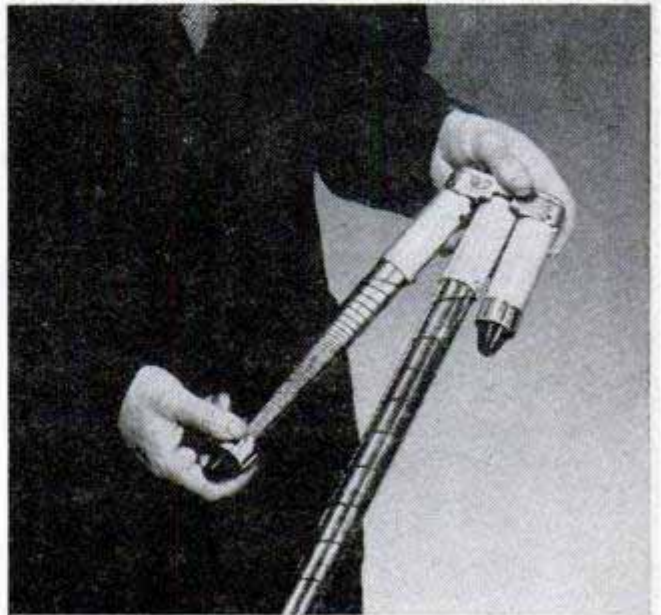
5/8" Keyed Shaft; 115-230 Volt; 60 cycle; 1725 R.P.M. Single phase—alternating current; capacitor start—Induction Run—Resilient Mount and Motor Protector—Reversible Rotation—High Starting Torque—Magnetic Starting Switch. Cooler Operation—**\$34.95**
Dynamic Balance—Compact Design.....
F.O.B. Chicago

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Spiral Tripod Fits in Pocket

Small enough to be carried in the pocket when collapsed, a spiral tripod extends to more than five feet and will support any camera. The legs are formed of spiral coils of stainless-steel strips. When the spiral



is pulled out to extend the legs, the light-weight tripod will not vibrate if accidentally tapped. The legs are locked open by a few turns of the tips. For table-top photography, it can be set up only 5½ inches high. Steel spear points under the rubber tips can be used to prevent slipping.

Tinsel Downpour

There's no connection between holiday spirit and tons of tinsel dropped from planes on Panama's highest peaks. It is a timesaver for United States Air Force teams mapping the entire republic, much of which is covered by dense jungle. Ground observers have had to laboriously select and work their way to the highest points for geodetic information. Now, air observers use altimeters to determine the greatest elevations, then drop batches of aluminum foil to mark them. The metal's bright reflection is detectable for great distances against the green foliage. The foil is war-surplus material that was used to fool enemy radar warning systems. It comes in 300-foot-long strips ½ inch wide and in narrow two-inch strips. Tinsel dropping has also been proposed as a method of marking paths for ground parties to follow to planes downed in jungle country.

More than three billion dollars worth of eggs and chickens were raised in the United States during 1947, a record-breaking year for the poultry industry.

GROBAN'S SURPLUS BARGAINS!

BRAND NEW

AIR OR OIL HYDRAULICS



Use hydraulics on arbor presses, hydraulic presses, hay lifts, manure loaders, lift trucks — push or pull, tilt or turn, press or squeeze, open or close, lift or lower—and other hydraulic and industrial applications. Use with either air or oil . . . of finest precision workmanship.

1. Use these cylinders on farm trucks, bulldozers, hay lifts, manure loaders, etc. Double action, 1½" bore, 27" stroke. (Will lift 1760 lbs. in 2 seconds with Vickers Pump). A \$55.00 hydraulic cylinder value for only . . . **\$12.95** postpaid Wt. 8 lbs.
2. Double action, 2¾" bore, 8" stroke. (Will lift 4400 lbs. in one second with Vickers Pump). Will withstand 1500 P.S.I. against wall. A \$65.00 value, available now at . . . **\$14.50** postpaid Wt. 7 lbs.
3. Double action, 3" bore, 12" stroke. All steel hydraulic cylinder, will lift up to 12,000 lbs. (7000 lbs. in 3 seconds with Vickers Pump). A \$78.00 value. Wt. 12 lbs. . . . **\$19.50** postpaid



Brand New HYDRAULIC CONTROL VALVES

Outlets are standard ½" pipe thread and inlet takes standard ¼" copper tubing fitting.

Four-way control valve for use with

1. double action hydraulic cylinder, may be used with 1500 p.s.i. hydraulic system to open and close hydraulic cylinders. Brand new. Shp. wt. 4 lbs. A \$38.00 value. . . . **\$7.95** postpaid
2. Four-way control valve for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Brand New. Shp. Wt. 6 lbs. A \$60.00 Value. . . . **\$10.95** postpaid
3. Same as valve item 2, except that unit is designed for three double action cylinders. Brand New. Shp. Wt. 8 lbs. A \$72.00 value. . . . **\$12.95** postpaid
4. A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously or to raise one and lower the other at any predetermined rate and speed. Brand New. Shp. Wt. 8 lbs. A \$75.00 value. . . . **\$14.95** postpaid



VICKERS MF6 HYDRAULIC PUMP OR MOTOR

Compact, powerful, rated 1,000 P.S.I. .507 cu. in. per revolution, 8 gal. per min. at 3750 r.p.m. Change rotation by reversing flow. Delivers up to 6 H.P. BRAND NEW, Wt. 4½ lbs., \$60.00 value for . . . **\$14.95** Postpaid

VACUUM-AIR HYDRAULIC GENERAL PURPOSE PUMP

Original Cost

\$45.00

Now Only

\$9.95

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BRAND NEW!



Worth Many Times This Low Sale Price

• Originally cost \$45.00. May be used as air or fluid pump—for pressure or vacuum. Standard ¾ inch pipe thread with interchangeable ports. Will pump 7½ gal. SAE 30 oil per minute at 300 RPM. Builds air pressure of 30 lbs. per sq. in. at 1000 RPM. Vacuum will draw 26 inches of mercury at 1750 RPM. Develops up to 120 lbs. per sq. inch of hydraulic pressure, which in conjunction with a 3 inch hydraulic cylinder will lift 840 lbs. minimum. Runs forward or reverse. Self aligning shaft. Die cast aluminum housing 6x4x4 inches. Has stainless alloy steel vanes and impeller. Made by Bendix Avia, Corp. Spline terminal for direct drive—readily replaced with a pulley. Recommend a ½ H.P., or stronger electric motor. Rated capacity 1500 RPM with high overload factor. Special price for quantity users. Complete illustrated engineering report and instruction booklet FREE with every pump. Send check or money order today! Postpaid in U.S.A. . . . **\$9.95**

Use them for

SPRAYING MACHINES

MILKING MACHINES

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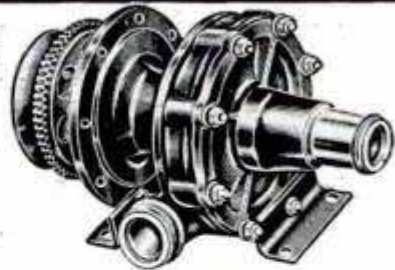
VACUUM PUMPS

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PRESSES, etc.

BRAND NEW ALL-PURPOSE WATER PUMP



Ready for use on any pumping need

Use it for: DRAINING BASEMENTS

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FIRE PROTECTION

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SPRINKLING SYSTEMS

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INDUSTRIAL PUMPING

Complete with pulley and mounting brackets, ready for use.

Belt Driven — Centrifugal Pump

An extraordinary value for all types of intermittent or continuous pumping in the home . . . farm . . . factory. Built to exact specifications of Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft Engines. May be run with electric motor, gas engine or power take-off on tractor. Delivers up to 25 gallons a minute with ¼ H.P. motor; 80 gal. a min. with one H.P. motor. Will deliver up to 44 ft. head or 25 ft. suction. Use 1" outlet hose; 1" or 1½" inlet hose (recommended).

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP

Has cast aluminum housing, accurately machined 5" bronze impeller; 3½" V belt pulley and mounting brackets. Shaft rotates on ball bearing; has grease gun fitting.

Original cost approx. \$88.00. Shipping weight 10 lbs. A REAL BUY. Satisfaction guaranteed. Mail orders filled promptly.

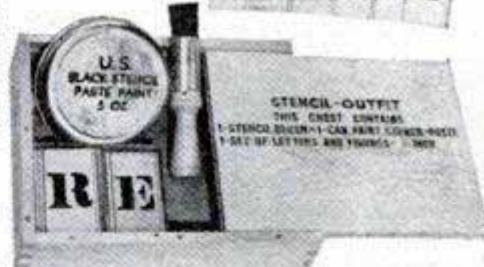
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F.O.B. Chicago

Here is YOUR identification stencil set! Ideal for all industries in marking boxes and packages, identifying inventory, numbering doors, etc. GUARANTEED. Saves time, money and effort, easy to use, pays for itself. Metal letters, INTERLOCKING to make words. Comes in handy wooden box with sliding top.

STENCIL

OUTFIT



CONTAINS
1 stencil brush;
1 can paint,
stencil paste;

1 complete set of metal letters, figures, punctuation and spacers

COMPLETE KIT with 1" letters . . . **\$2.50** Pre-paid

COMPLETE KIT with 2" letters . . . **\$3.95** Pre-paid



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Polaroid Goggle Kit

USE THEM FOR ALL OUTDOOR SPORTS, BEACH, MOTORING, BOATING—ANYTHING.

Brand New! In original packing. Each with four interchangeable lenses. Shock Proof Frame. Shatterproof Lenses.

Heavy windproof sponge rubber ventilated frame with snap button lens retainers! Adj. elastic head band. Clear, red, green, amber, flexible, shatterproof lens, all instantly interchangeable, with carrying case. They won't last long at this price—it's smart to buy an extra. **\$1.00** Prepaid in U.S.A.

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EARN BIG MONEY
AND BE YOUR OWN BOSS
Sharpening Lawn Mowers

THE UNIVERSAL GRINDER
PUTS YOU INTO BUSINESS
WITH SMALL INVESTMENT

Earn as much as \$400.00 a month in your basement or garage. Mr. Felber of Ind., writes, "MY UNIVERSAL GRINDER is faster and more accurate than any other grinder. Its efficiency enabled me to sharpen 450 mowers in 4 1/2 months. More than paid for itself the first month. Every customer satisfied." Mr. Hardy of Mississippi writes, "Received my Universal Grinder the first part of May and by August 18 had sharpened over 1000 mowers." Mr. Bacon of California writes, "The lawn mower business, with my Universal Grinder, has been a gold mine these last two years."



Only on the UNIVERSAL GRINDER can the inside face, the edge of the stationary blade, and the reel blades, be ground to proper clearance ALL IN ONE SET-UP WITHOUT REMOVING ANY BLADE FROM THE MOWER
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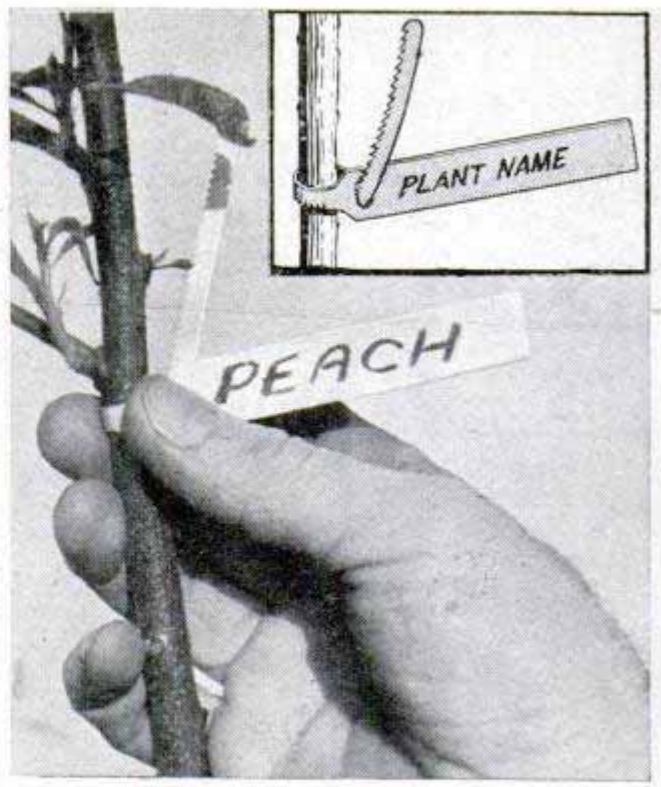
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Garden rows are marked with metal tags that stand out parallel with the ground for easy reading. The tags are made of zinc so they won't rust or corrode. The writing surface is covered with thousands of tiny holes that retain the marks of a grease pencil. The tags are locked to stakes with a saw-tooth strip that is inserted through a hole in the label.

Big-Game Animal Population Up 25 Percent in Three Years

Good news to the sportsman is the fact that big-game animals in the United States increased their numbers by 25 percent from 1943 to 1946, according to the Fish and Wildlife Service. There were an estimated 8,240,400 big-game animals in 1946 compared with 6,598,422 in 1943. Michigan had the largest big-game population with 880,600 animals, nearly all of them being deer. Wisconsin and Pennsylvania ranked second and third. Kansas is the only state with no big game, the report stated. Of the total big-game animals in the country, 7,375,200 or about 90 percent were deer. Others in numbers exceeding 100,000 were elk, prong-horned antelope, peccary and black bear. Rocky Mountain bighorn sheep showed the largest increase with a gain of 75 percent from 9152 in 1943 to 16,000 in 1946. The moose population went up from 14,803 to 23,300 while buffalo dropped from 6047 to 5000. The Fish and Wildlife Service estimates that 923,600 big-game animals were killed in 1946.

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for only

\$3.95

The QUICK CHANGE Motor Mount gives you the service of two or more motors! Change from one machine to another in moments! Positions for 5-step pulley. Simple screw clamp permits tilting for belt-tension and tightening. The QUICK CHANGE Motor Mount allows one motor to work an entire shop! Complete Motor Mount only \$3.95. Extra mounting blocks only \$1.50 per pair. Send check or money order today. Write for FREE illustrated circular.

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BUILD YOUR OWN FLOOR JACK

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Build-a-Jack

and save up to 2/3rds

Buy this husky screw assembly and plates from us and use your own two-inch pipe or timber. You'll save up to \$6.00 per installation. Build-A-Jack is coated to resist rust and is easily adjustable. Special collar available for use with timber or pipe up to 3 3/4 inches for extra heavy use . . . 50c extra, pre-paid. No C.O.D.'s, please.



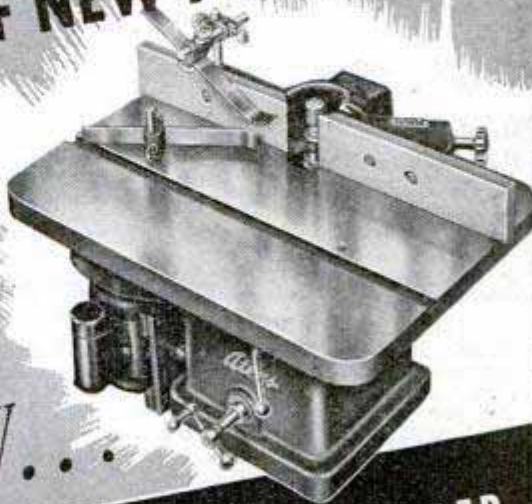
SCREW ASSEMBLY
AND BASE PLATES
\$3.49
PREPAID ANYWHERE
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Patented

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Build-a-Jack MASSILLON, OHIO

**NOW HANDLE HUNDREDS
OF NEW PROJECTS!**



NEW . . .

Atlas WOOD SHAPER

- ★ 21" x 15" PRECISION GROUND TABLE
- ★ STATIONARY SPINDLE (Table raises and lowers)
- ★ PRECISION BALL BEARINGS (Sealed)
- ★ TAKES ALL CUTTERS WITH 1/2" BORE

They say it takes an old, experienced craftsman to appreciate the value of a wood shaper. Perhaps this new Atlas shaper will change that idea — because here is one of the most versatile and helpful tools you can have in your shop. It will handle all your shaping work on chairs, tables, desks, lamps, cabinets, beds, doors, trim, window moulding, storm windows and screens. And every job you tackle will come out as smooth and finished as the work of a master craftsman.

This is one of the new Atlas woodworking tools built to industrial quality standards for the men of America who really know tool values. Use the coupon for complete information.



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GENTLEMEN:

I'D LIKE TO HAVE COMPLETE INFORMATION ABOUT THE NEW ATLAS WOOD SHAPER.

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... Quick Easy Way to BIG PROFITS

Read What Others Are DOING!

"Enclosed you will find 56 orders representing 9 1/2 hours' work on Monday and Tuesday."
 "Enclosed are twelve orders secured after supper this p.m."

Housewives are Enthusiastic

Everyone that sees this outstanding Cell-U-Mop immediately wants one . . . That's the reason why our distributors are so successful . . . You also have the advantage of our other QUICK SELLING PRODUCTS that step up your Volume Sales and Profits.

Hands Never Touch the Water—Can be put in Boiling Water. Housewives Like It.

48" Long Handle

Sales QUICK, EASY Every Locality

SALES ARE EVERYWHERE . . . Sells quick to Taverns, Clubs, Hotels, Hospitals, Stores, Restaurants, Large and Small Buildings and the Homes . . . Scores can be sold on a single street . . . Note the Drain Bracket in the illustration . . . This squeezes out the water so thoroughly that HANDS NEVER TOUCH THE WATER . . . Makes no difference what you ever sold, you will like this proposition . . . Your name on a Post Card will bring you FREE PARTICULARS.

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• We Teach You How •

Gets down under and around for MOPPING, DUSTING or WASHING

DOES THE WORK OF 6 TOOLS IN 1

Get Choice Territory NOW!

Holds 20 times its weight in water.



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GENERAL ELECTRIC MOTORS
 For Kitchen, Office, Darkroom, Furnace or Attic Ventilation

Here is everything you want in an all purpose ventilating fan. GENERAL ELECTRIC 1/25 H.P. totally enclosed motor. Guaranteed Perfect, quiet operation. Bearings lubricated for life. 1550 R.P.M., 115 Volts A.C. 50-60 cycle. Horseshoe mounting bracket. 2 wire rubber lead cord. 6-blade fan—size 7 1/2" Dia. Overall height 9 1/2". This smashing value complete as shown—NOW— at **\$8.95**

Immediate Delivery

6 Volt HEATER MOTORS
 Don't wait for winter—get ready now! Ideal 6 volt heavy duty heater motors for automobiles, buses, or trucks. Adaptable for defrosting fans, heaters, etc. Motor screws extended for mounting purposes. 1/2" shaft. Motor size 1 1/2" L x 2 1/2" Dia. Don't delay—Order today. No. 1110 **\$2.75** POSTAGE PREPAID IN U.S.A.

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ONE-MAN SAWMILL LESS THAN \$200.00
Easy To Turn Trees Into Money

Makes lumber, ties, shingles, crates, lath, studding.

Belsaw Models
 in 10 to 24 foot sawing lengths. **MECHANICAL FEED**, accurate set works and positive dogs. Use tractor or old auto engine for low cost power. Thousands used for commercial sawing. Pays for itself quickly. Send post card today for FREE booklet, "How To Make Lumber" and Catalog of Woodworking Equipment.

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STEEL MEASURING TAPES

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Easy to Build

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 • For Greater Safety, more Comfort and Pleasure!

Protects against eyestrain caused by glare on sloping windshield. Helps keep windshield free of snow, ice and sleet by the **air flow sweep** and by direct protection. Easily installed, clamps on — no holes to drill.

THE PERFECT AUTO VISOR

Frame is of all-steel construction covered with weatherproof and durable leatherette cover with zipper closure. Adds class and distinction to any car.

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New "DRIVE-EZ" ARM REST

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 • Fits seat of any car, truck, boat, trailer... home use.

The "Drive-EZ" Arm Rest gives arm chair comfort to the motorist... relieves driving strain and thus promotes greater safety. Especially helpful and comfortable on the longer trips. Filled with sponge foam with velon cover.

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Latest Theft-Proof Gas Tank Cap on the market. Prevents siphoning of valuable gas and eliminates loss of cap. No keys or combinations... One model for all cars. Installed in a jiffy — no tools required. Beautiful chrome plated.

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Flying Lady. Popular streamlined creation. Harmonizes with all cars. Length 5".

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Smooth action pump type bumper jack... fast, efficient and easy to operate. All working parts fully enclosed—dirt and dust proof. Lifting capacity 2500 lbs. Full 18 inch lift. A top quality jack at a sensational low price. Compare!

Ship. wt. 8 lbs. Each... **\$4.87**

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Dependable and serviceable, liquid type, airplane style for use on auto, plane or boat. Foolproof, easy to install. Shpg. wt. 1 1/2 lbs. Each... **\$1.79**

ALL TRADES Hyd. JACK

Handles all loads up to 10,000 lbs. with ease and speed. Made of treated steel for dependable performance. Ship. wt. 17 lbs. Each... **\$7.95**

Pebble DEFLECTORS

Give Beauty and Flash to any car! — These Chrome plated deflectors are practical and durable... give real protection to rear fenders. Easily installed... will not rust.

No. GG-7 For Ford V-8 & 6 cyl. (also Mercury) 1942-48 Made of Steel, chrome plated.

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Specify for car wanted.

Per Pair... **\$6.95**

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Ball-Bearing SPEED WHEELS

Juvenile wheels, solid tire—No Bearings

7" wheels 60c
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Semi-pneumatic tired wheels

12 x 1.75" \$3.25
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Industrial wheels for heavy loads

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400 x 8, 2 ply tire and tube... \$12.50
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 MANUFACTURERS
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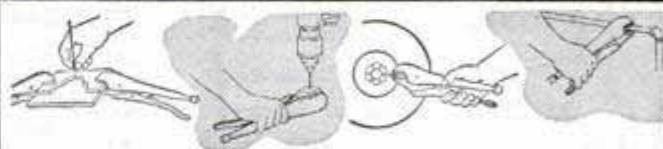
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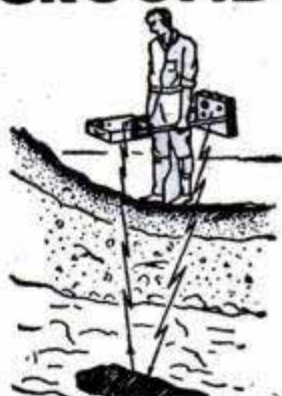
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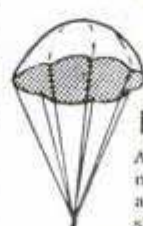
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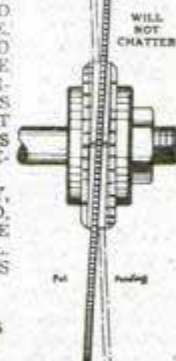
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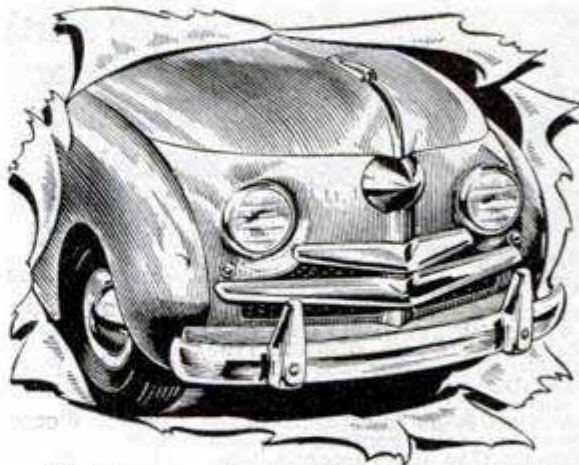


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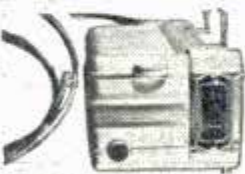
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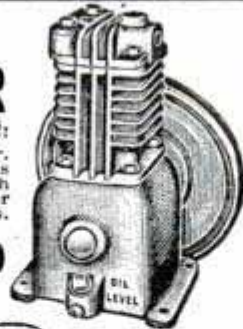
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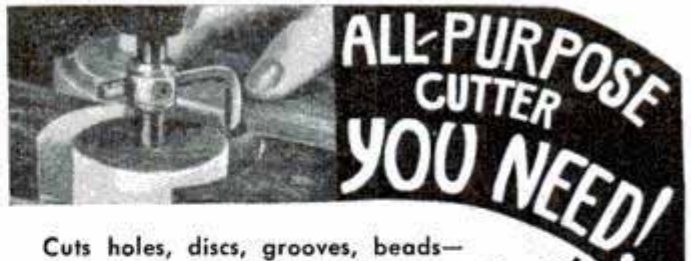
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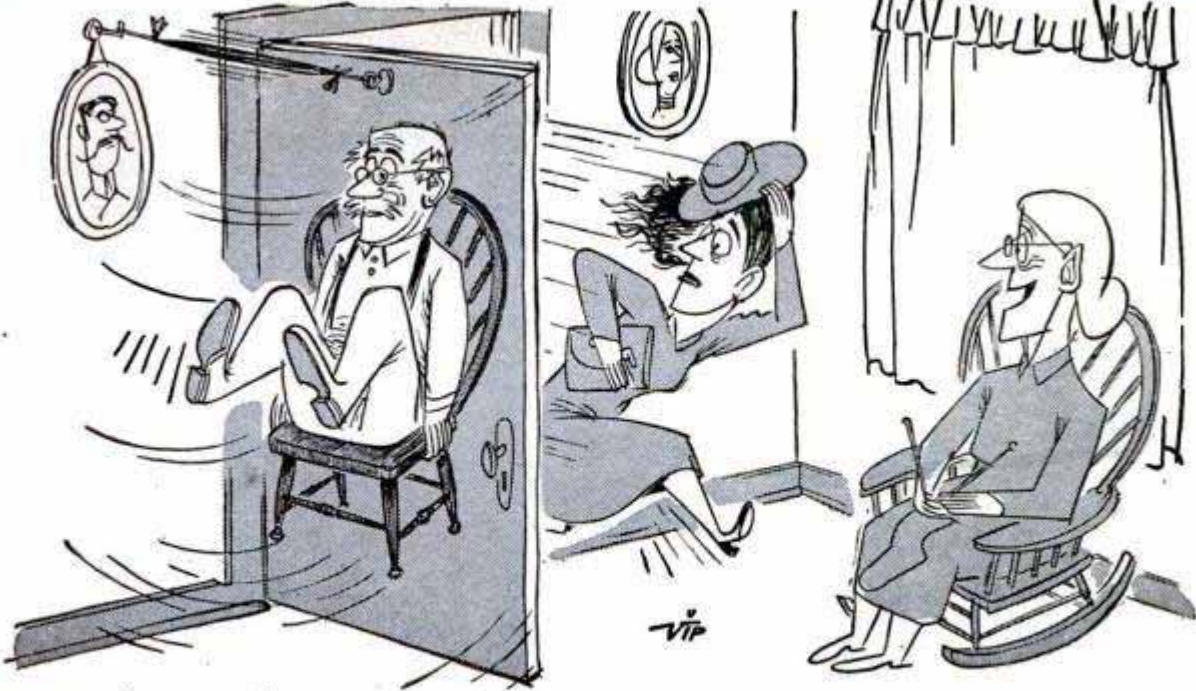
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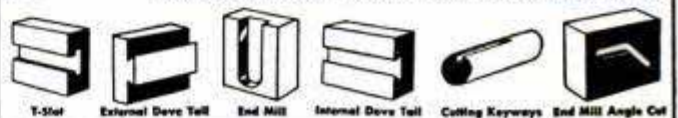
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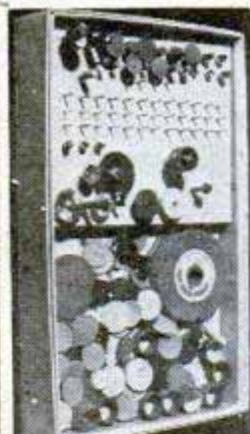
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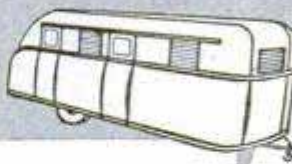
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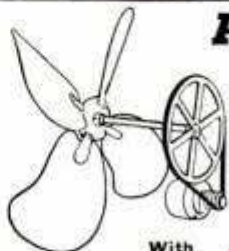
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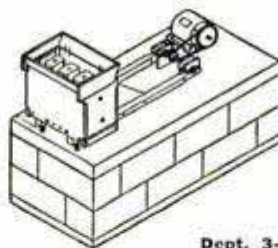
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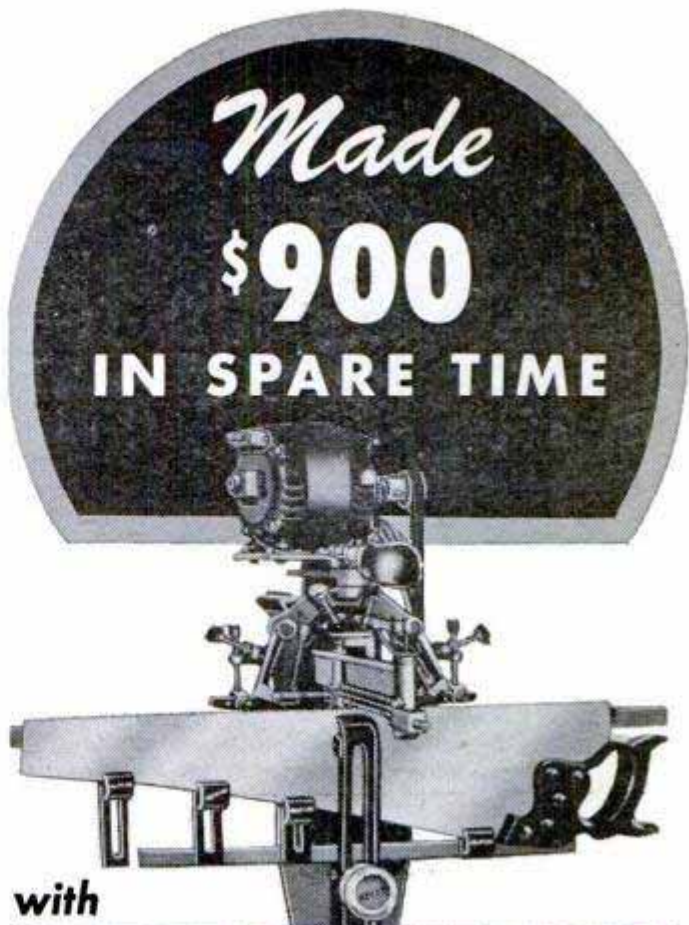
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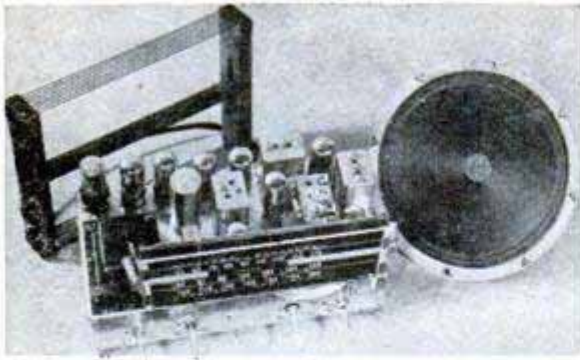
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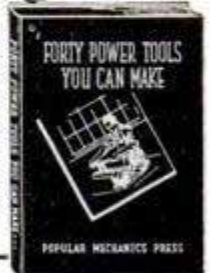
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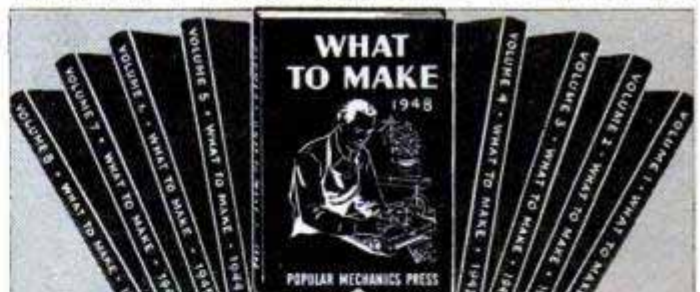
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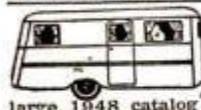
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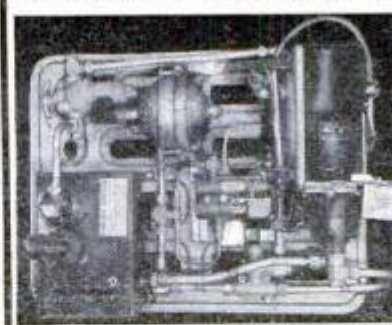
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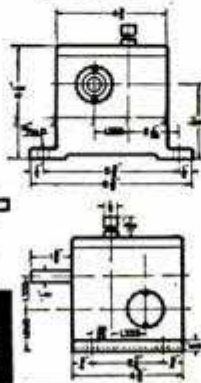
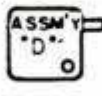
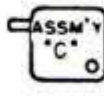
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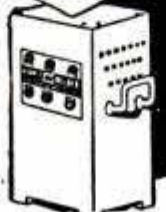
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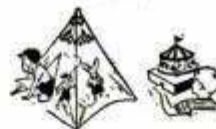
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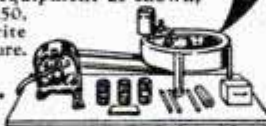
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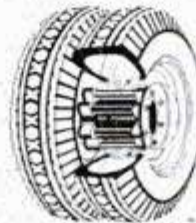
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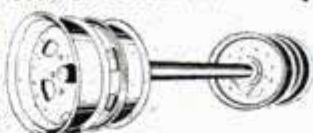
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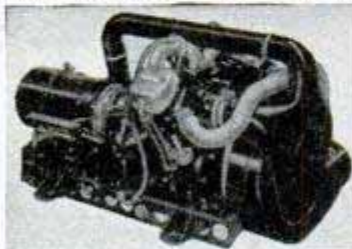
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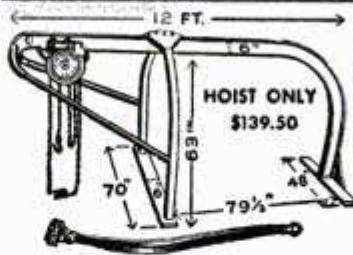
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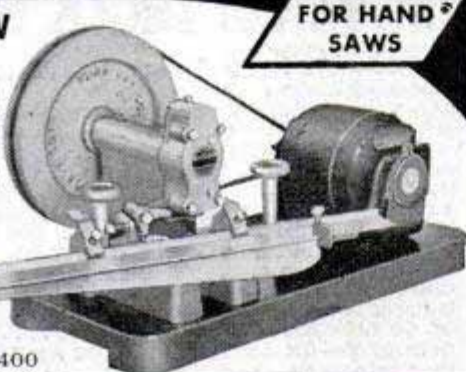
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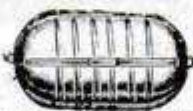


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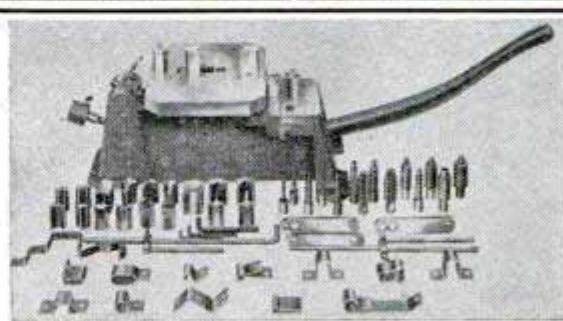
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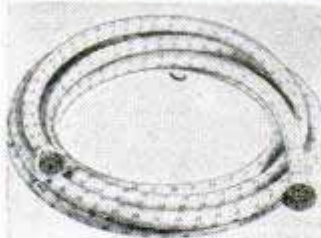
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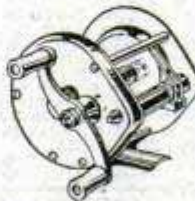
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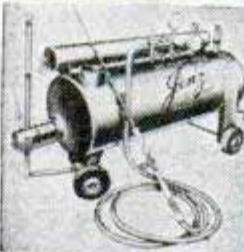
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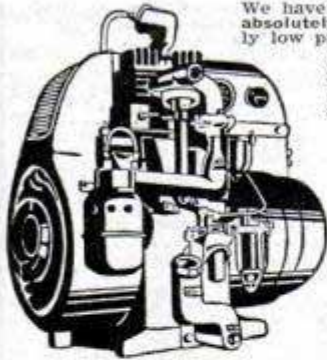
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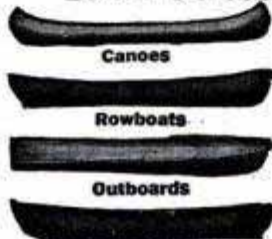
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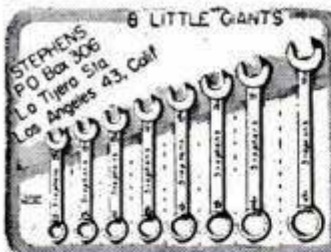
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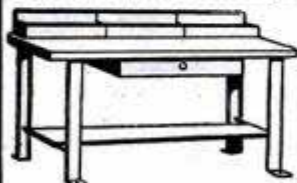
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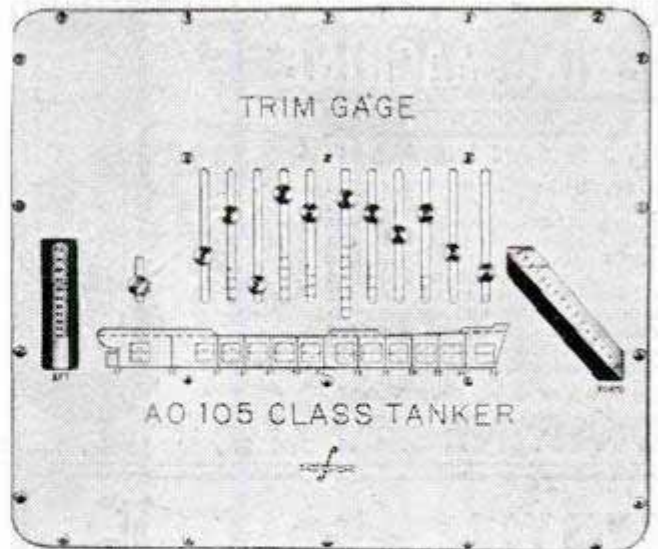
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Apples kept in cases lined with Pliofilm hold their color and ripeness as much as three months longer than those in ordinary storage, tests at Iowa State College indicate. Weight loss is one half to one fourth of normal and soft rot is particularly reduced in Washington and West Virginia Delicious and Iowa Jonathan types. The apples were kept at 36 degrees, with a relative humidity of 86 percent.

Australia Drops Huts by Air To Hunters Slaughtering Deer

Australia is going to drop prefabricated huts by air to aid deer hunters in isolated areas. It is part of a campaign to wipe out thousands of red deer which have become a menace to crops and the national forests. Nearly 18,000 were killed in 12 months by hunters, spurred by large government bounties. The huts are divided into four-foot plywood panels for easy assembly and have a galvanized steel covering.

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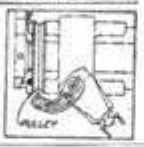
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Easy to install for quick, low-cost, dependable 2-way communication, indoors or out. Compact . . . rugged . . . portable. Originally cost government \$39.90 each. Hundreds of uses around home, shop, farm, industry. *Performance equals present-day commercial telephones.*



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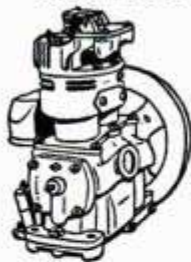
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Only

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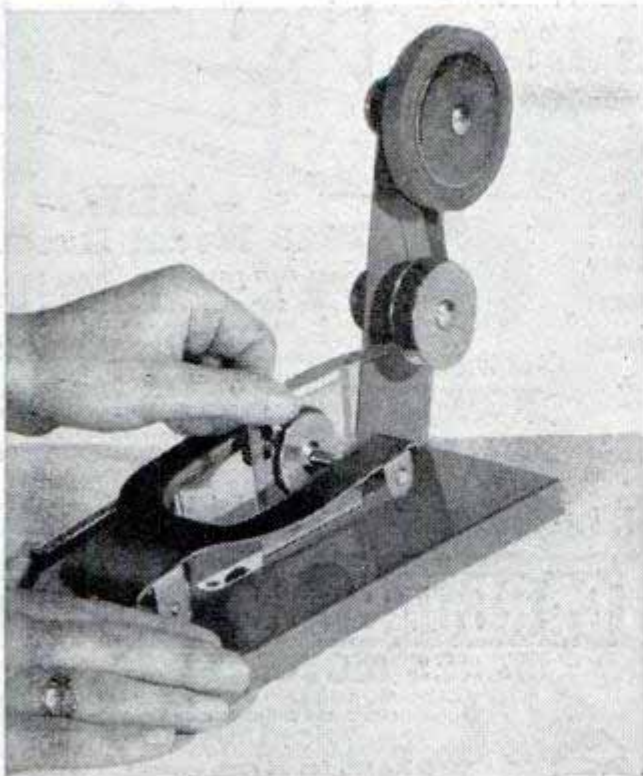
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Dug out of the earth, a new mold similar to streptomycin has given excellent results in laboratory tests in the treatment of typhus fever, Rocky Mountain spotted fever, scrub typhus and parrot fever. The mold, called chloromycetin, was discovered by Dr. Paul R. Burkholder of Yale University in soil from a field near Caracas, Venezuela. The mold has not yet been used in the treatment of patients, although tests with animals show no poisonous effects. The chemical has been administered both by mouth and hypodermic injection. Results in the treatment of parrot fever are significant because the disease is caused by a virus, and virus diseases from the common cold to infantile paralysis have shown little reaction to molds or other chemicals.

Because telephones are scarce in Lima, Peru, and many passengers can't contact the terminal, an airline has its own radio station there to broadcast last minute news of plane arrivals and departures.

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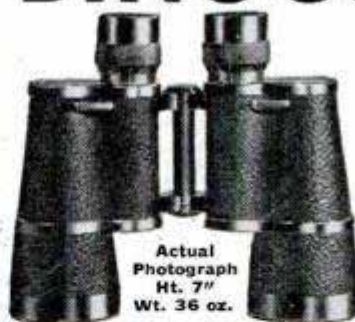
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BALL BEARING STEEL WHEELS

Complete With Wheels, Tires & Bearings Made To Outwear Other Type Wheels

SIZE	TIRE	BEARINGS	LOAD	ONE	TWO	FOUR
12"x2 1/2"	Semi-Pneumatic	Ball 1/2" or 5/8"	150 lbs.	\$ 5.50	\$10.00	\$18.00
12"x2 1/2"	Semi-Pneumatic	Ball 1/2" or 5/8"	225 lbs.	\$ 6.00	\$11.00	\$20.00
12"x3"	Semi-Pneumatic	Ball 1/2" or 5/8"	340 lbs.	\$ 7.00	\$13.50	\$26.00
10"x1 3/4"	Semi-Pneumatic	Ball 1/2" or 5/8"	125 lbs.	\$ 3.00	\$ 5.50	\$10.00
10"x2 1/2"	Semi-Pneumatic	Ball 3/4"	250 lbs.	\$ 5.50	\$10.00	\$18.00
8"x1 7/8"	Solid	Ball 3/4"	640 lbs.	\$ 8.00	\$15.00	\$29.00
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4.00"x8"	Pneumatic					
	16" O.D.	T.R. 1"	700 lbs.	\$13.50	\$26.00	\$50.00
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It's fast . . . cuts on an average of 1 ft. per minute up to 3/4" medium hard wood. Operates on 110-120 V. 50 or 60 cycle alternating current. If your dealer does not yet have Moto-Saw, send \$5.85 . . . we'll pay postage. Or send \$1, pay postman balance plus postage. MONEY BACK if not delighted after 5 days' trial.

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Car owners who are wasting money and not getting proper gas mileage due to over-rich mixtures will be pleased to learn how to save gasoline by VACU-MATING over-rich mixtures. VACU-MATIC fits all cars, trucks and tractors. It is automatic and operates on the supercharge principle. Easily installed in a few minutes.

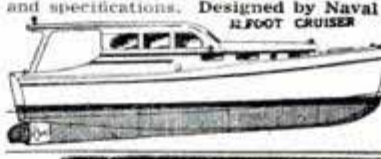
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1948 MODEL OUTBOARD MOTOR AT DEALER WHOLESALE PRICE!!

Powerful deluxe twin cylinder outboard motor with automatic starter (no fumbling for a rope), a positive cooling unbreakable water pump, and an improved magneto for sensationally quick starts as well as smooth, efficient operation at slowest trolling speed or with the throttle wide open. Dozens of additional outstanding features are provided, such as corrosion resistant aluminum alloy castings, to protect the engine and give the unit a sleek, streamlined appearance; hardened alloy steel connecting rods with roller bearings, and a rugged, perfectly balanced crankshaft. Delivers a full 7.5 H.P., as rated by the Outboard Boating Club of America. Net weight—52 lb. Gross shipping weight including free steel storage stand—100 lb. For a limited time we are selling this motor, which is produced by the world's second largest maker of outboards to sell for more than \$30.00 above our price—for only **\$139.00**, brand new, FOB Buffalo.

ALUMINUM GEAR BOX 18x8x7 that contains two powerful electric motors and two matched gear trains, 62 gears in all varying in size from 1/2 to 4 inches in diameter. This unit is readily converted to rotate a beam antenna or for any other similar use. **\$3.00**

Terrific Value — Portable Electric Drill

(Sold at less than established factory price so we cannot mention brand name)

Only \$19.95 equipped with 1/4" Jacobs Geared Chuck and Key. Not an intermittent duty drill, but a full size rugged tool. Most convenient type switch, natural grip handle, and balance like a six shooter.

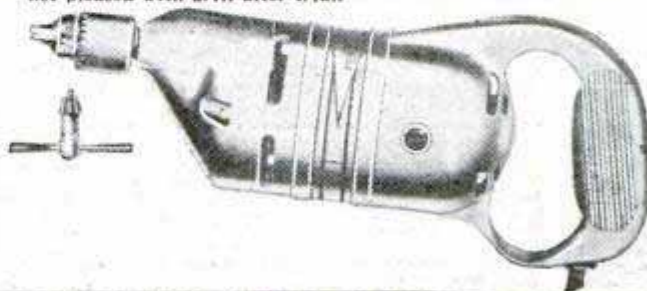
Precision cut gears — turbine type cooling blower — extra long brushes.

No stalling under heaviest pressure because of powerful 110 Volt AC-DC motor and multiple ball thrust bearing.

Other bearings self-aligning lifetime-lubricated Chrysler Oilite type. Made for toughest year-in and year-out service in plant or on construction jobs.

Amazing perpetual factory guarantee assures you of a lifetime of trouble-free use.

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This is the famous Gibson Girl Transmitter that saved so many lives during the war. It is used as a distress call transmitter on boats and airplanes. The Gibson Girl is the easiest transmitter in the world to operate. No instruction or experience necessary. No external power supply required for operation. It is merely necessary to turn the crank on the top of the transmitter and power is generated and the distress signal is automatically sent out on the international distress frequency. Brand New Gibson Girl transmitter complete with tubes **\$9.95**

Antenna Kit for Gibson Girl transmitter. This kit was designed to improve the effectiveness of the Gibson Girl Transmitter by increasing the range several times. The kit includes 300 feet of special antenna wire, two balloons for raising the antenna in calm

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AUTO RADIO DEALERS! ATTENTION!

Nationally advertised brand of 1948 car radio which will fit practically any car and every pocketbook. Six tube superhet with three gang condenser and 6 1/2" speaker. **\$32.20** for sample, or 2 for **\$29.97** each.

GENERAL ELECTRIC RT-1248 15-TUBE TRANSMITTER-RECEIVER

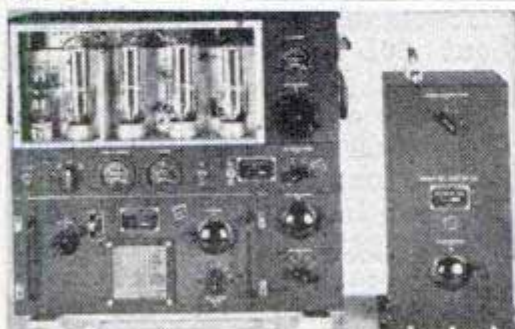
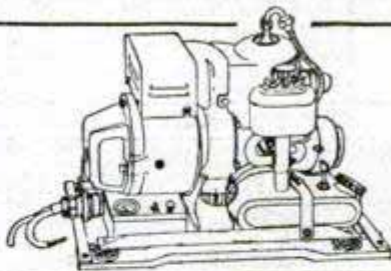
TERRIFIC POWER — (20 watts) on any two instantly selected, easily pre-adjusted frequencies from 435 to 500 Mc. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 955's, as first detector and oscillator, and 3—7H7's as IF's, with 4 slug-tuned 40 Mc. IF transformers, plus a 7H7, 7E6's and 7F7's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for use in mobile

or stationary service in the Citizen's Radio Telephone Band where no license is necessary. Instructions and diagrams supplied for running the RT-1248 transmitter on either code or voice in AM or FM transmission or reception, for use as a mobile public address system, on 80 to 110 Mc. as an FM broadcast receiver, as a Facsimile transmitter or receiver, as an amateur television transmitter or receiver, for remote control relay hookups, for Geiger-Mueller counter applications. It sells for only **\$29.95** or two for **\$53.90**. If desired for marine or mobile use, the dynamotor which will work on either 12 or 24V DC and supply all power for the set is only **\$15.00** additional.

PE-109 32-VOLT DIRECT CURRENT POWER PLANT

This power plant consists of a gasoline engine that is direct coupled to a 2000 watt 32 volt DC generator. This unit is ideal for use in locations that are not serviced by commercial power or to run many of the surplus items that require 32V DC for operation. The price of this power plant is only **\$58.95**. We can also supply a converter that will supply 110V AC from the above unit or from any 16-32V DC source for **\$12.95**.

(Due to the fact that the PE-109 comes to us sealed in heavy steel strapped govt. cases we are unable to determine whether the individual units are new or used or what the condition is if used, and consequently must sell them as is. In general, they represent a terrific bargain.)



"B"—uses two 211 tubes. POWER SUPPLY: Supplied complete with dynamotor which furnishes 1000V at 350 MA from either 12 or 24 volts DC (specify). Complete instructions are furnished to operate

CABLE ADDRESS
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Minimum order \$3.00 — All prices subject to change — 25% deposit with C.O.D. orders.

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150 WATT TRANSMITTER

COST THE GOVERNMENT \$1800.00

COST TO YOU BRAND NEW \$67.50!!!

This is the famous transmitter used in U.S. Army bombers and ground stations, during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world. The entire frequency range is covered by means of plug-in tuning units which are included. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. Here are the specifications: FREQUENCY RANGE: 200 to 500 KC and 1500 to 12,500 KC. (Will operate on 10 and 20 meter band with a slight modification for which diagrams are furnished.) OSCILLATOR: Self-excited, thermo compensated, and hand calibrated. POWER AMPLIFIER: Neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. MODULATOR: Class set from 110V AC. SIZE: 21 1/2 x 23 x 9 1/4 inches. Total shipping weight 200 lbs., complete with all tubes, dynamotor power supply, seven tuning units, antenna tuning unit and the essential plugs.

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 Chance of a lifetime to acquire a magnificent piece of equipment. Ea. **\$7.50**



DYNAMOTORS, NEW. Check list and order now. G.E. 485 KVA, Input 27 V.D.C., Output 115 V.A.C. Ea. **\$4.50**

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Employs exclusive double notched sets of full 1" and 1/2" split blades. Blades automatically held in position by notched design and in absolute alignment. No set screws to loosen; blades cannot fly out. Provides endless varieties of standard and special contours. Specify type of spindle on drill press or shaper. Available in six standard adapter sizes. Ten-day money back guarantee. Complete literature on request.

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Leaving both hands free, a telephone holder designed to fit the contour of the shoulder balances the instrument perfectly in talking position. The three-point suspension holds the handset so securely that typing is possible during a conversation. The holder snaps on in five seconds and does not have to be removed to place the instrument in its cradle.

Steel Ball Spinning 1800 M.P.H. Tests Paint for High-Speed Planes

Adhesive quality of paint is tested by putting dabs of it on a tiny steel ball that spins 2,400,000 times a minute, or about 1800 miles an hour. The method was developed by the Navy and the University of Cincinnati to test paint for high-speed aircraft, where its thickness has to be limited to about .001 inch because of the weight factor. At high speeds the thin coating tends to come off, causing dangerous disruption of the airflow. The ball is suspended in a vacuum in a centrifuge and subjected to a rotating magnetic field. After a small dab of paint is put on the ball, its speed is increased until centrifugal force is great enough to make the paint fly off. Both the ball's speed and the weight and area of the paint dot are then used to compute the adhesive qualities. The spinning is so swift and friction-free that the ball will continue to rotate for a week after the power is cut off.

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Made in U. S. Gov't. specification of Herringbone Twill in evidence toughest, roughest wear. Full concealed front zipper. 4 large pleated patch pockets with double snap fastened flaps. snap collar, full action knee back. Inside suspenders to keep part can be thrown at shoulders for sun exposure.

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Dyed in guaranteed fast Royal blue color. **\$4.95**

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200,000 in 5 different types with adjustable hd. bnds. Bi Valve Type **29c** each

in lots of 50, 25c ea., 100 or more, 19c ea.

FOR PNEUMOCOCCUS—producing dusts, road dusts, mists, & chronic acid mist, produced in crushing, mining, road building, abraded, farming, drought, painting, spraying, etc. Ideal for Farm, Mill, Factory, Garage, Foundry.

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dual-disc, Style BM-2101, with 10 extra filters. a \$3.50 value. **\$1.59** each

WILSON CO., dual disc, type J-750 with 10 extra filters in appearance like BM-2101 **\$1.29** each

AMERICAN OPTICAL CO. RESPIRATOR

Style R-8100 small & compact especially suited to laboratory & hospital **\$5.9c** ea. work.

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Ideal for insulation or bushing stock. 36" x 1/4" wall x 1" O. D. Original use was for trailing antenna - F 10. Use for towel rack, souvenir displays, shafting spacers, bearings, etc. **\$5.9c** ea. In original carton.

Radio ANTENNA Reel

Just the thing for tuning beam antenna. Powered by 1/2 h. p. 24v G. I. Motor. Removable 4" Reel-limit Switch - Cam Worn gear. Rev. el gear. Solenoid clutch.

Motor engaged to gear reduction only when electrical contact made. Operates in either direction. Ideal for auxiliary power take-off, opening and closing doors, etc. **\$4.29**

A TREMENDOUS VALUE

RADIO HEAD SET

AN-BH-1 with Leather Sponge Rubber Pad A Wonderful Buy **\$1.00**

Excell. Condition Low Impedance

NEW U. S. Officers THERMOS FOOD CONTAINER

Keeps Food Hot or Cold. 3 compartments, containing 2 3-Quart Pyrex Cooking Dishes layered with asbestos and 1 8-Quart Fibre-lined covered compartment. All in light but strong plastic case. Will carry liquids. Vegetables, Meats, etc. Ideal for the Sportsman, Hunter, Outdoor Man. At a fraction of Gov't. Cost. Only 100 Available. wt. 21 lbs. **\$12.95** Each

New Navigators Magnetic Compass

Type D-17 size 7" dia x 4 1/2" deep. Rubber lined - rotating vernier range rings calibrated in 1 degree from 0-360° with 1 parallel and wires for alignment with N.S. line. Bobs. **\$17.95**

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6 compartments, rustless, stainless steel. Barbecue, outdoor cooking, save dish-washing. Hospital, Restaurant, Home, or roughing. **83c** New ea.

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SLEEPING BAG

NEW! 100% wool. Mummy type Heavy duty 20' zipper. Gov't. Cost \$22.50 **\$4.95**

\$1.50 extra for used water repellent cover. Sold only with Sleeping Bag

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6" chrome vanadium blade handle, leather grip. In leather sheath. **\$5.98** Value For Only **\$1.69**

Like above but black Parkerized Finish. #307A **\$1.39** ea.

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10" x 2" Parkerized Blade 5" Grippd Handle. Weight 1 1/4 lbs. Ideal for Hunting, Clearing Brush, or Trails **99c** ea.

TEAR SHAPED PLEXI DOME

Overall length 21" width at widest point 11." at base 4" 6" deep. **\$1.39** ea.

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24 Pt. PLASTIC KIT.

Plexiglass, Lucite, Dye Colors, Cement, Project Book of Plans and Instructions. For Pir. and Pfr. #701B **\$2.39** ea.

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#407 Fleeced-lined winter **\$1.59** ea. Ideal for cycle drivers, racers, sportsmen. Used.

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but in excellent condition. #407 A—Summer weight **69c**

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A-14 Demand type **\$3.50** ea.

Slightly used but perfect **\$1.95** ea.

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Used for Drill & Air Speed. Can be dismantled for:

1. Acromatic 25 MM Double Lens.
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2. Engraved Scales.
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Can be adapted to 25 MM Projectors, Fortell and Enlarging Work, Photograph, etc. by DeLuxe. Artist, etc. Information Bulletin with ea. Ditch Meter. Gov't Cost \$200.00. Yours for Only **\$4.98**

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Here's the real McCoy. Army Air Force 6 Base over Polished and ground clear-lens lens with leather case that can be attached to belt. Gold plated adjustable frame. Pearlloid sweet box **\$3.95**

and pads. A real Palley \$17.50 value for **\$2.39** ea.

ARMY AIR FORCE TYPE SUNGLASSES

4 base, polished and ground lens. 95% Ultra Violet Ray free gold plated frame. Pearlloid lens with leather case. Our price **\$2.39** ea.

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Plastic Frame **\$1.29** ea.

Optic Ground, Polaroid Type With Carrying Case. 56-1

GOGGLES

New One Pc. Type Shatterproof Sponge Rubber Frame. Flexible Lens. Colored and Polaroid. GO-1 **59c** ea.

GOGGLES

GENUINE Aviators (AN-6530) Windproof & Damp Proof **\$1.69** ea.

Sponge and leather protected frame with ground lens in clear, amber and green. Clear set in replaceable metal frame with hinged nose bar. Go-5 Ideal for Motorcycles, etc. Same appearance as above, but with plastic lens in clear color only. Go-3 **79c** ea.

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adjustable legs, removable tray. stainless steel formed tray. spreads 33" x 12" high in 17" x 23" on bed. Made of light weight metal. **\$4.49**

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Elgin 15 jewel. Pocket style. Shatterproof crystal. Split seconds (1/10th). Waterproof. Stainless steel, spring suspension Case. NEW **\$12.95** = 300

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You ever saw - 3 metal post. Cylindrical locking heavy duty 3/16" fabric-lined hinged cover. End Identification window. Ideal for photo albums, student publications, Reference books, artist sketch books, etc. Will hold 500 sheets. 8 1/2" x 11". A \$3.50 Value for Only **59c**

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Barbed wire, welding, all purpose work gloves. A Steel... Gov't. cost many, many times more.

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#151 Marching, lensite, with luminous dial **\$1.59**

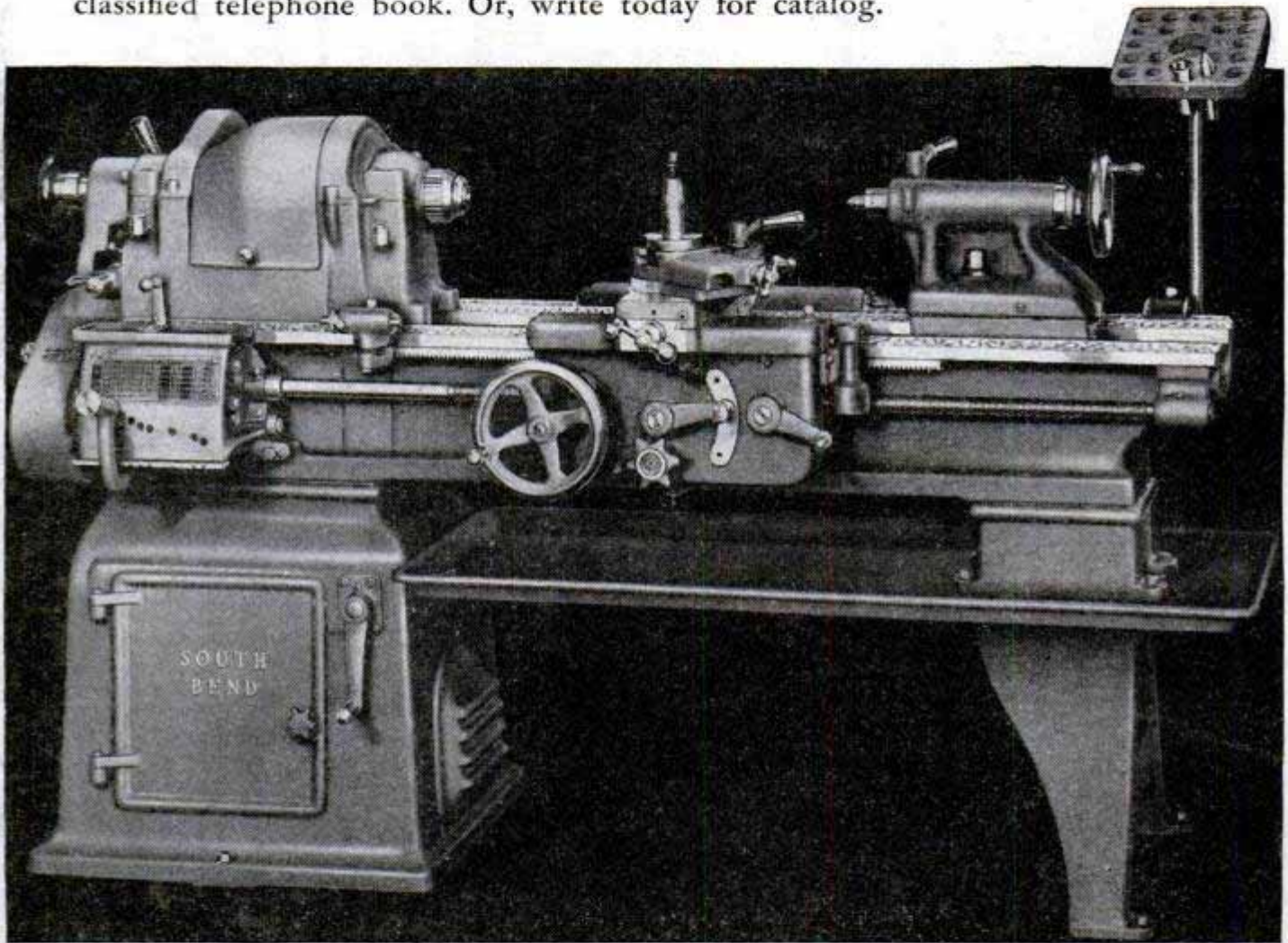
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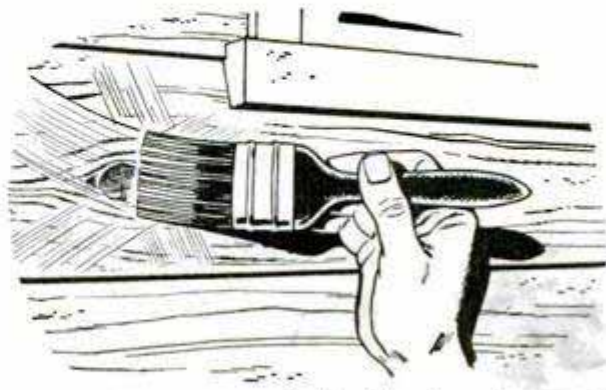


Printed by Popular Mechanics Company, Chicago, Ill., U. S. A.

Pointers on exterior painting



Before painting, prepare surfaces. Scraping with a wire brush or smoothing with 1½ or 2 grade sandpaper will do if paint has worn evenly. A trisodium phosphate solution will clean old paint stained by mildew, rust or water.



In painting new exterior lumber, brush over all knots and sappy places with turpentine or solvent naphtha. Coat with shellac and let dry. Apply priming coat, fill cracks, then apply finish coat.



Brushes should be cleaned with the proper thinner. For oil base finishes (paint, enamel and varnish), use turpentine, then naphtha or mineral spirits. Alcohol for shellac or alcohol stain, lacquer thinner for lacquers, water for water-thinned paint. After cleaning, dry and suspend by the handle.



And now white lead paint comes all ready to use! Eagle RTU is factory-mixed to perfect painting consistency. You just open, stir and apply. It brushes evenly and easily, making a smooth, gleaming white coat that protects and beautifies longer because it's pure white lead.

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Yes, it's true. Now you can get famed, durable, beautiful white lead paint that's all ready to use. Eagle RTU is pure carbonate of white lead, in pure linseed oil. It's carefully formulated and mixed for instant, easy use. Eagle RTU has the opacity, covering power and endurance qualities that only pure white lead paint gives—plus the convenience of being ready-mixed. It's made by the Eagle-Picher Company, makers of quality white lead paint since 1843. Eagle RTU comes in two forms: Primer Sealer, Outside White Finish Coat. Quarts, one, two, and five gallon cans.



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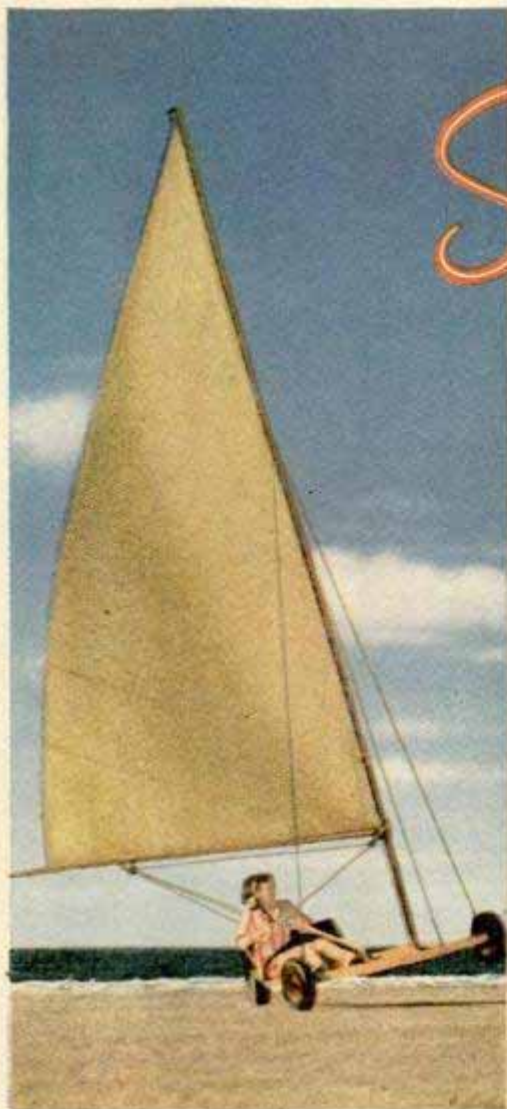
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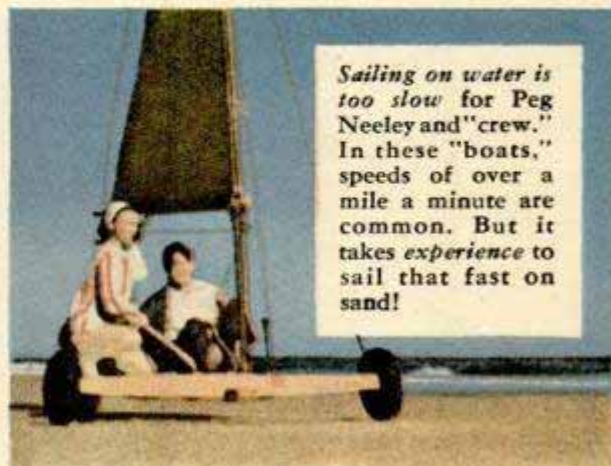
IT TAKES EXPERIENCE TO GO

Sailing on the Sand



On Florida's Daytona Beach, Skipper Peg Neeley "beels over" in a stiff breeze.

Skipper
PEG NEELEY
agrees: "In sand sailing—and in cigarettes too—
EXPERIENCE IS THE BEST TEACHER!"



Sailing on water is too slow for Peg Neeley and "crew." In these "boats," speeds of over a mile a minute are common. But it takes experience to sail that fast on sand!



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