

THE NEXT WAR AT SEA

POPULAR MECHANICS

★

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF.

MARCH
25 CENTS

SEE PAGE 350

MAGIC in "MAN-MADE STONE"



Ingram's shaves are better shaves for these *3 reasons*

TO GIVE YOU COOL COMFORT ALONG WITH QUICKER, CLEANER SHAVES, WE PUT THREE SPECIAL INGREDIENTS INTO EACH TUBE AND JAR OF INGRAM'S SHAVING CREAM.

Every time you shave they do these three things to make your face look better and feel better —

1st, wilt whiskers thoroughly at the skin-line, so they come off clean at the first stroke of a good blade.

2nd, smooth the skin — draw tiny wrinkles tighter; your razor glides along without scuffing or scraping.

3rd, cool your face while you shave; keep it cool after you've finished. No sting, no rawness, no lotion needed.

Ingram's feels grand on any skin. And it treats all whiskers alike. Softens them, takes out pull, sees that they meet your razor meekly!

"Bluebeards" — men who can't get by without two shaves a day — like Ingram's for the protection it gives the skin. And all users like it for its economy. Ingram's Shaving Cream is concentrated. It goes further. Three months of cool, happy shaves in every tube or jar.

Begin with Ingram's tomorrow. Join up with the "world's best shavers"! You can get Ingram's Shaving Cream at drugstores anywhere. Or, mail the coupon below to try 10 cool shaves free.



TRY THE WORLD'S COOLEST SHAVE *free*

BRISTOL-MYERS CO., Dept. E-36
636 Fifth Ave., New York, N. Y.

I'll gladly try Ingram's for 10 days. Send me sample tube, free.

Name..... Street.....

City..... State.....



1 Ingram's rich lather strips the oily coating from whiskers — softens them to the skin-line for easy shaving.



2 Ingram's conditions your skin before you shave. Smooths the way for your razor. No skipping or scuffing.



3 And Ingram's cools your skin! No sting while shaving. No burn or taut sensation when whiskers are off.

INGRAM'S SHAVING CREAM

Car Operating Costs *Keep on Tumbling!*

ENGINEERING GENIUS has attained sensational gas economy in the Plymouth car by super-high compression (6.7 to 1). No premium fuel is required, and owners report 18 to 24 miles a gallon. To get this very high compression without spark-knock, they developed calibrated ignition... the spark is controlled by vacuum.

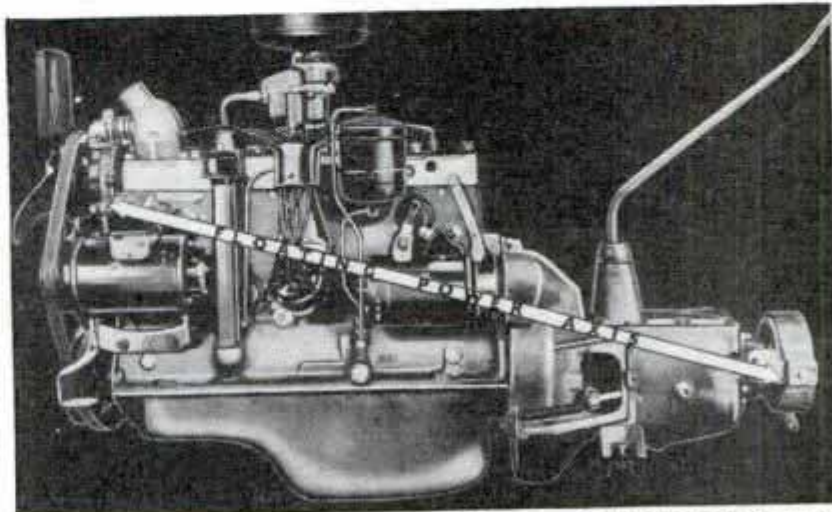
The cooling problem they solved by *full-length* water jackets and directional circulation at high velocity to all parts of the cylinder block.

Plymouth's safe 100% hydraulic brakes save brake adjustments. The Safety-Steel body cuts out the usual repair costs.

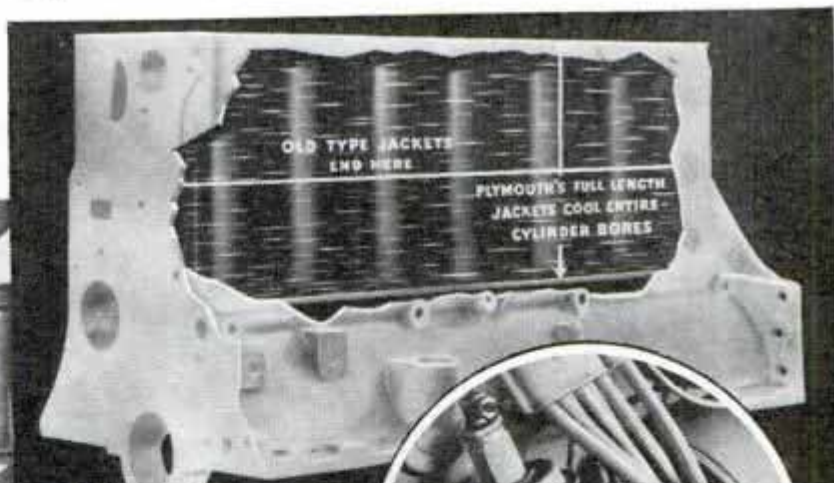
Your Chrysler, Dodge or De Soto dealer will gladly arrange a Plymouth demonstration. The price is only \$510 (and up, list at factory, Detroit—special equipment extra).

PLYMOUTH DIVISION OF CHRYSLER CORP.

Insist on 100% hydraulic brakes.



Plymouth's 6-cylinder engine... with patented "Floating Power" engine mountings that eliminate vibration (unpleasant, expensive).



(Above) Full-length water jackets and directional cooling make for economy.

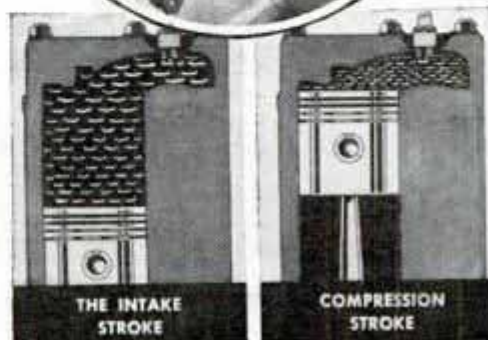
(Right) Calibrated ignition that helps to get power from every drop of gas.



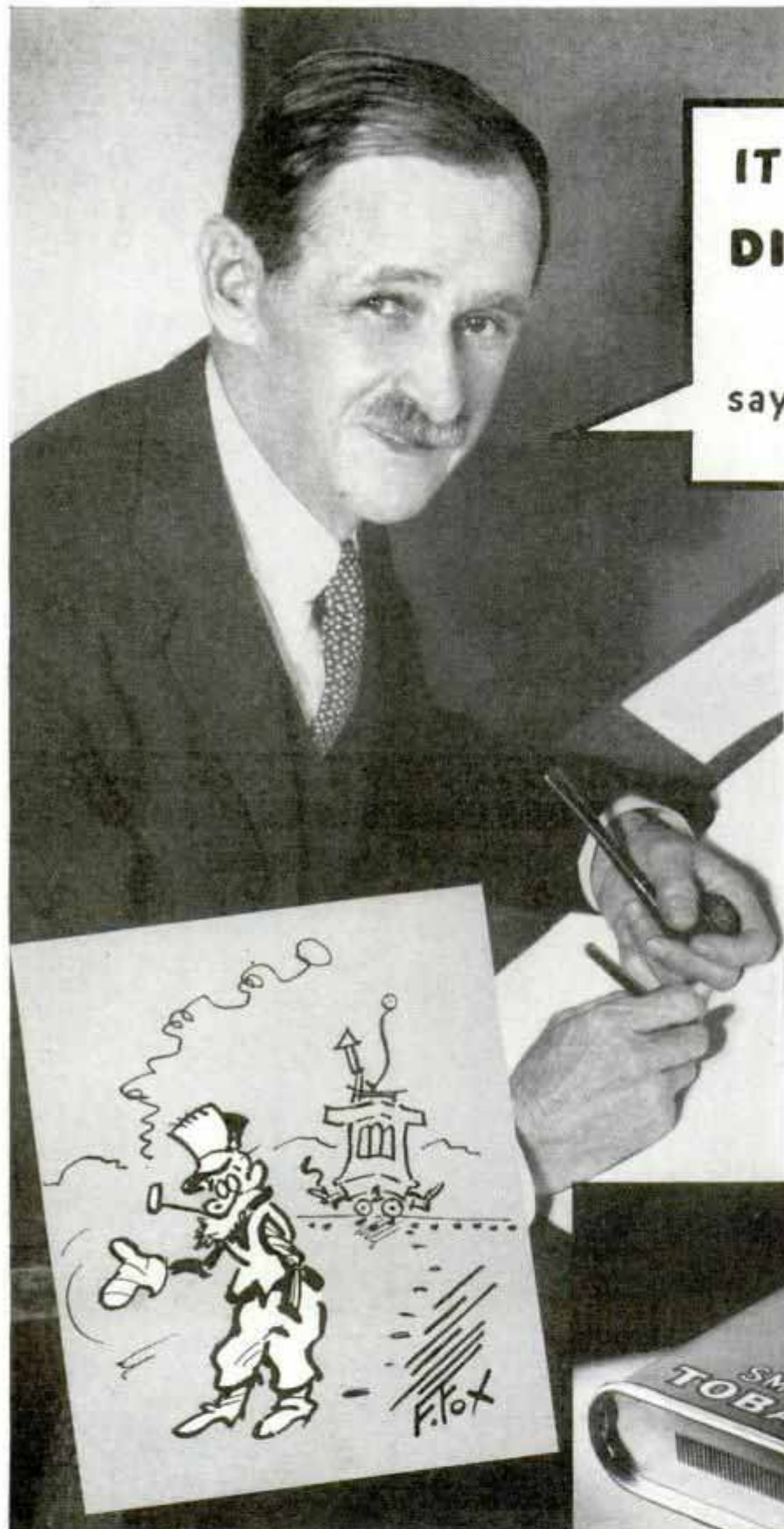
**HARDENED
EXHAUST VALVE
SEAT INSERTS**

(Left) They save money on valve-grinding costs—special heat-resisting exhaust valve seat inserts.

(Right) 6.7 to 1 Compression Ratio—vaporized gasoline entering cylinder with INTAKE STROKE of piston is compressed by COMPRESSION STROKE.



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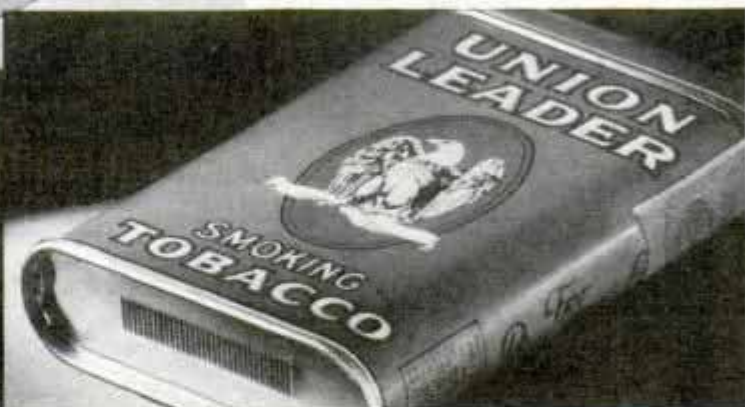


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DIME LOOK LIKE
A DOLLAR!**

says **FONTAINE FOX**

AFTER ALL, Mr. Fox, there's just so much satisfaction in any fine, luxurious pipe tobacco... whether it costs a dollar an ounce or a dime a tin. In aroma, flavor and distinctive character, Union Leader is a direct challenge to every fancy blend and expensive mixture. That's why shrewd smokers say this grand old Kentucky Burley is the "sweetest buy" that ever packed a pipe. (... And it can't be beat for cigarettes!)

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

March, 1936

Vol. 65, No. 3

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The Five Greatest Inventors

FIVE men and five machines have remade the world. Who and what are they? One thinks immediately of Edison, of Ford, of Morse and of Bell, but these great men never could have produced their own wonders except for five machines. The five men who invented those five machines probably have done more to shape the productive destiny of civilization than any other five in history—yet it is quite likely you may not recognize the name of more than one of them. The lives and works of these five men of genius make a fascinating and dramatic tale. You will find it in the April issue.

Next Month

PICTURE Wall street paved in gold, Fifth avenue a crimson hue and Washington with traffic lanes of red, white and blue. All are possibilities with the aid of modern concrete which is being produced in all the colors of the rainbow. The second installment of the story of concrete appears next month. It's illustrated with eight pages of Coloroto pictures.

War in the Ether

WHAT are the wild waves saying? That, declares Hiram Percy Maxim, will be a big question in the next great war when, he predicts, man will battle in a new medium—the ether. Next month, in the last of four articles, Mr. Maxim visions vast land, sea and air forces directed by thousands of radio receivers and transmitters with victory possibly perching on the standard of the combatant with the best communication system.

Meet the Octopus

IF YOU should meet an octopus while strolling on the ocean floor, just stand still, tuck your hands under your arms, hold your breath—and hope for the best. That's the advice of John D. Craig who has encountered dozens of the creatures during years spent exploring the bottom of the sea. Read his thrilling story of life among the sea killers next month.

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This One

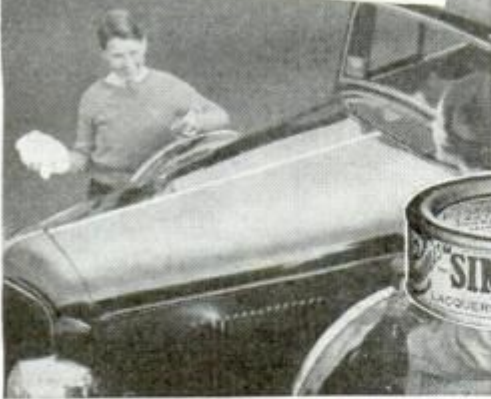


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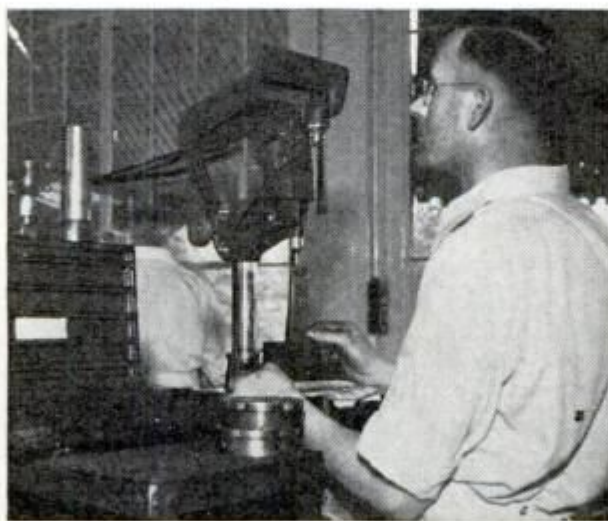
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 when they say Edison MAZDA
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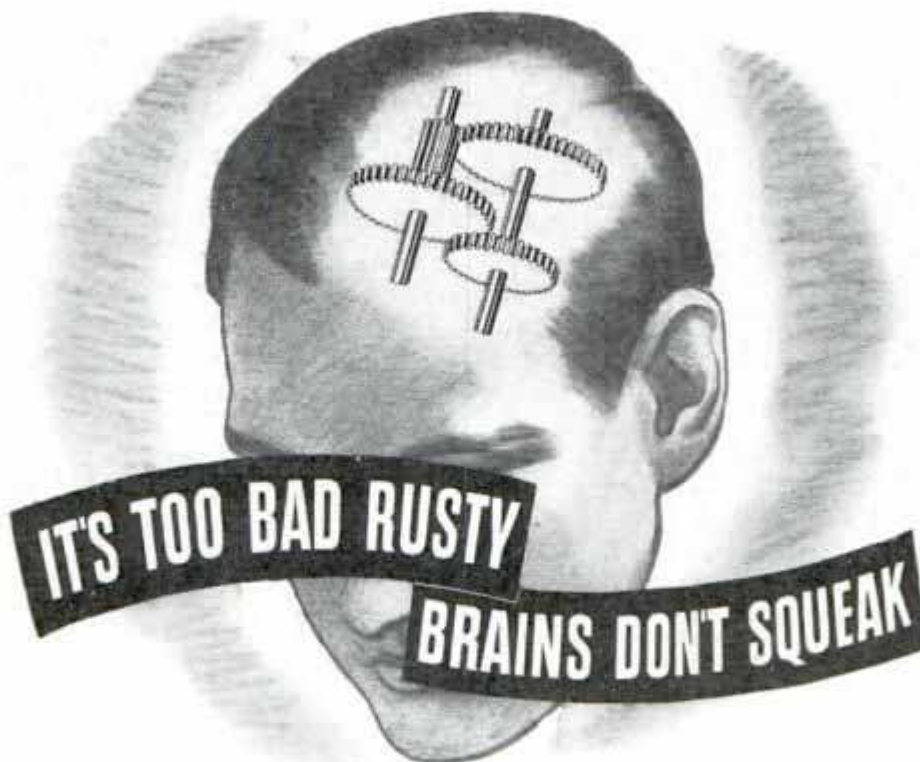


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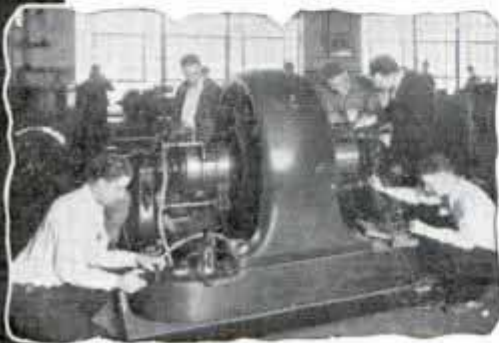
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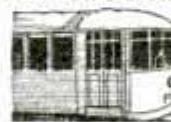
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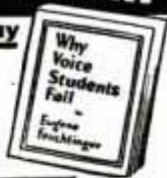
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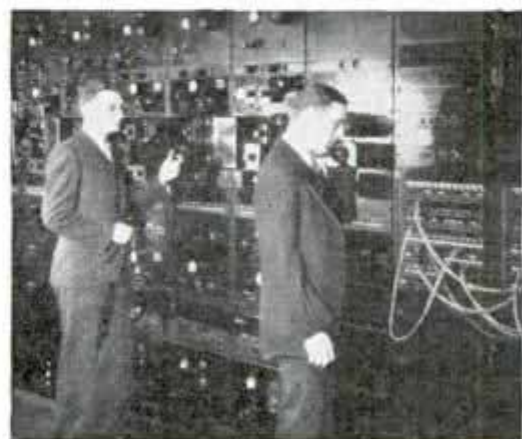
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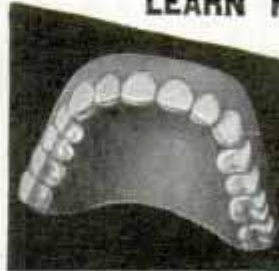
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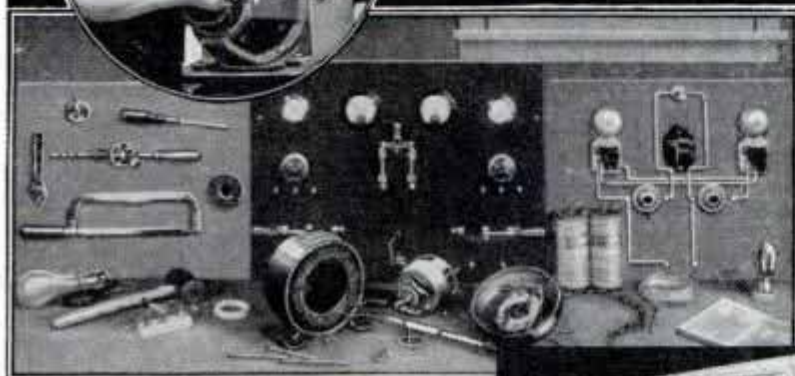
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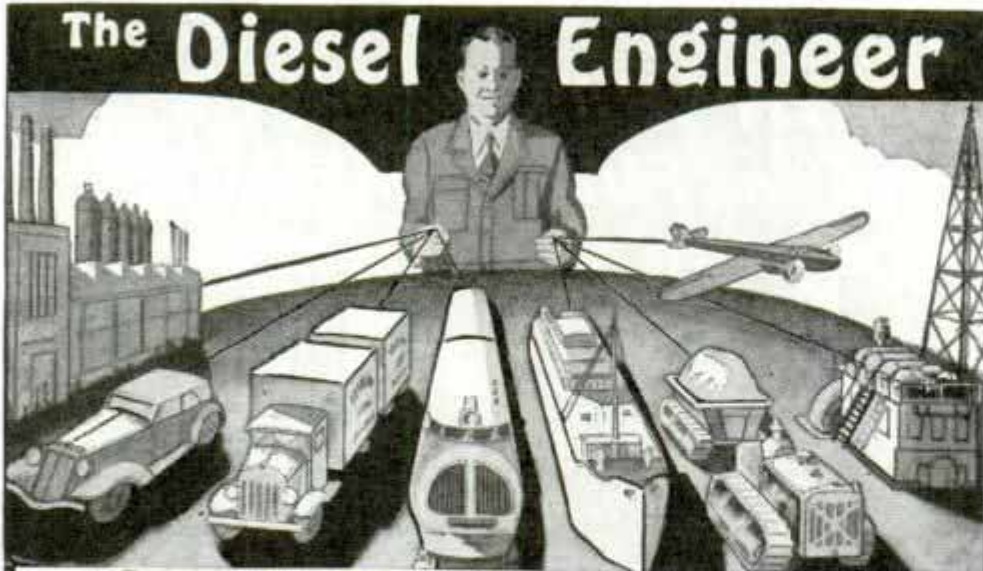
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A frank man to PATENTS-INVENTIONS

THE world of invention moves on. The Patent Office clerk who resigned his job back in 1833, because he said there was nothing left to invent, now stands out as one of the funniest men in American History. Think of everything that's happened in the last 100 years! Did you see a notice in the papers that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats? *Already, the report states, the steam ship lines have saved more than \$15,000,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announced that it will soon test out a new, non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

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A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man; busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? **Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.**



Can You Answer These Questions?

Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the first man to think of my invention? Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent, how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! **YOU CAN HAVE THEM, without cost, trouble, or delay.**

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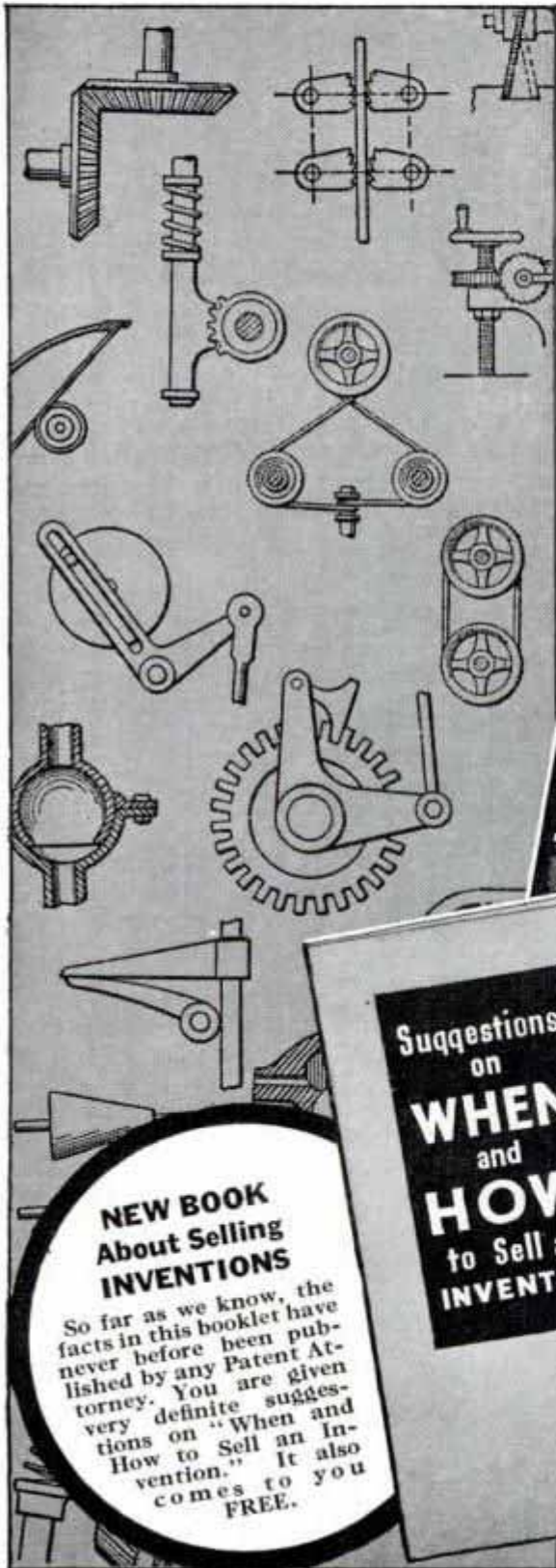
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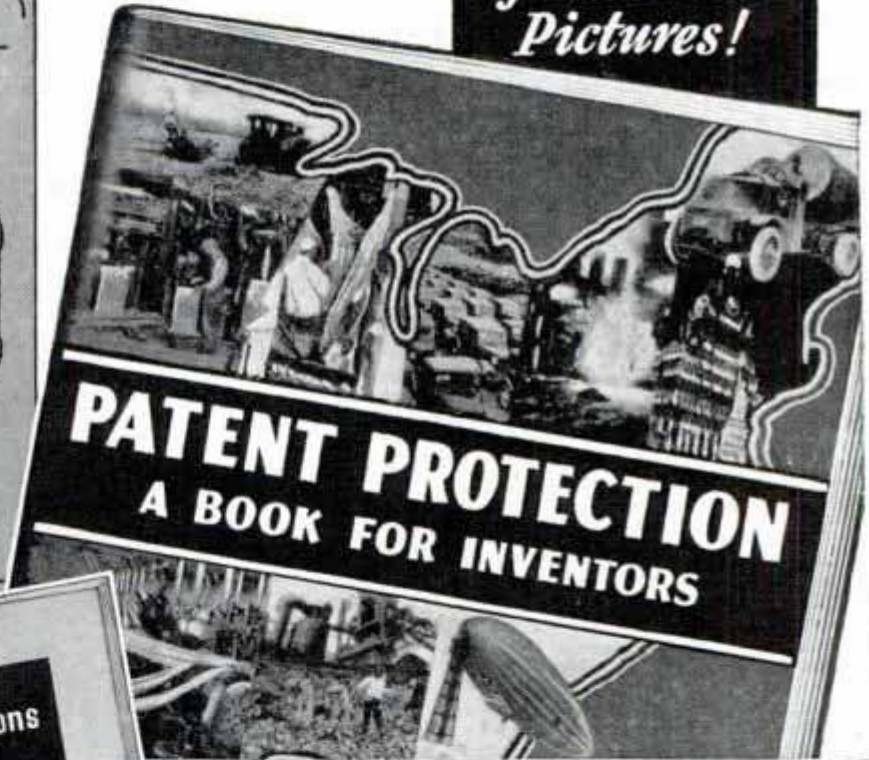
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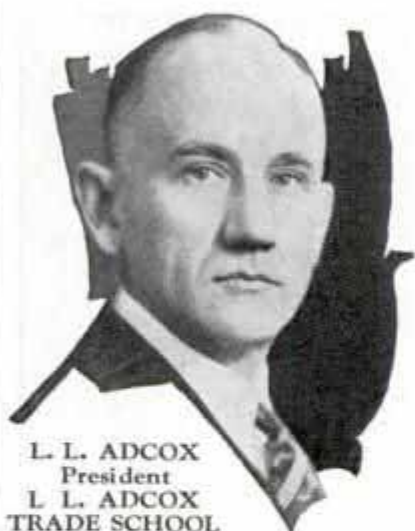
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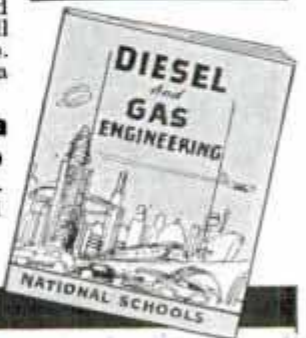
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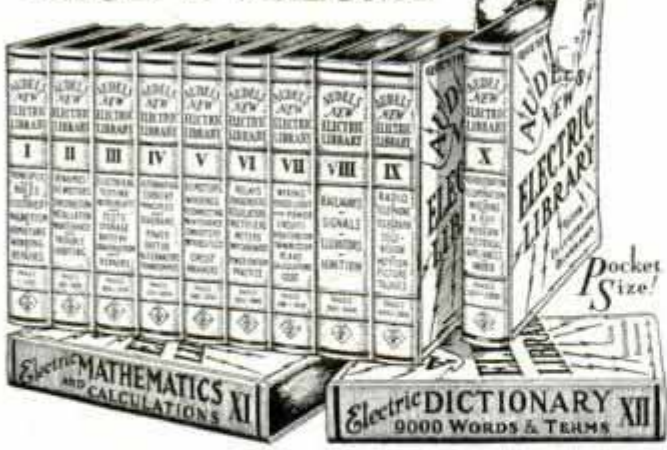
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The Editor's
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"What makes a flag wave? When the wind blows hard, it seems that the flag should straighten out, but always there is a flutter. Not to my knowledge has the answer ever been published, but it may have escaped me. Can any reader explain this apparently simple thing?"—*Joseph Prim, Chicago, Ill.*

Another "Zip" Fan



"I am inclosing a snapshot of the 'Zip' model racing yacht which I built from your plans. Now I am considering construction of a 'Flying Cloud' model."—*Kenneth R. Willis, Sherbrooke, Quebec, Can.*

More About Metals

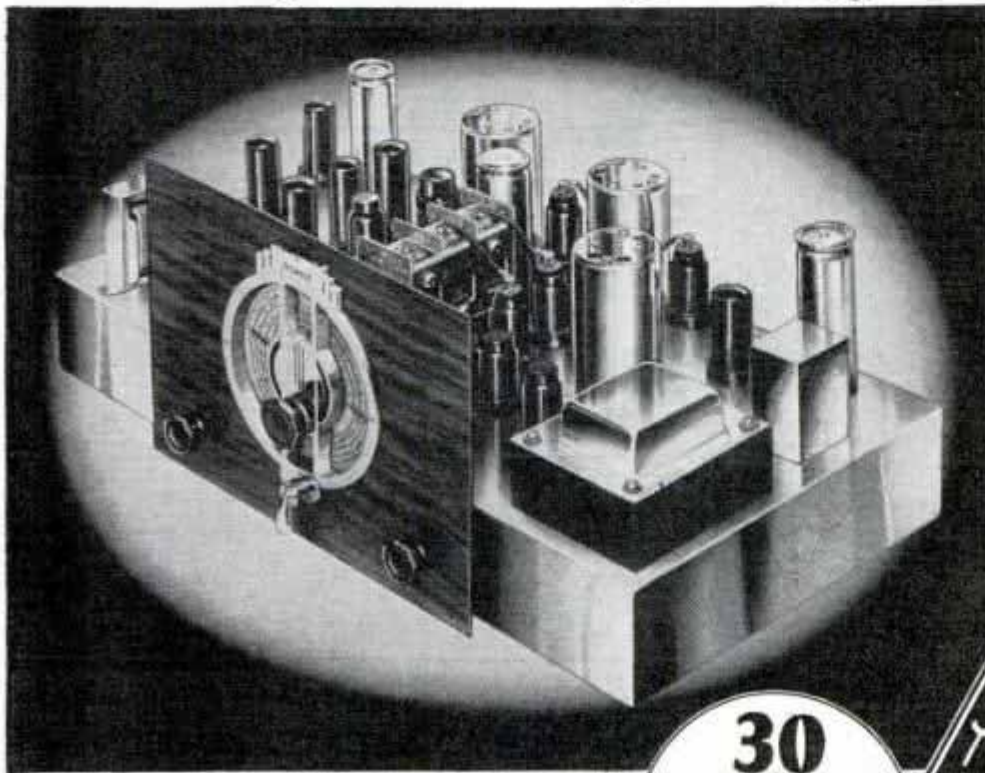
"Would like to see more articles on the use of metals, such as zinc, tin and lead, and on electroplating and hot dipping."—*C. T. Jewell, Martins Ferry, Ohio.*

One for the Scientists!

"In the January issue there is a short article, 'Tales of Eagles Stealing Baby among Nature Fakes.' As to the glass snake, you do not seem to know what you're talking about. In Kansas, Oklahoma, northern Texas, Colorado and Nebraska, there was a

(Continued to page 37A)

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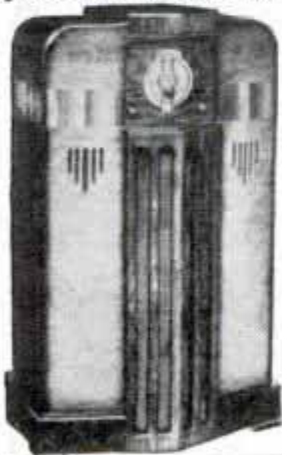
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The Editor's
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(Continued from page 30A)

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(Continued to page 62A)

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MILLIONS Jobless! Supply them amazing job-getting information (got man 76 openings). Keep dollars paid you; we fill your orders free. Stamp brings details. Co-Operative Service, Dept. A, 77 Swan, Buffalo.

START Paying circular mailing business. Idle hours or full time. Stamp brings particulars. Dixie Publishing Company, Station A, Greensboro, N. C.

PROSPERITY For home workers. 52 page magazine. Sample, dime. Sizemore, 4917 N. Keatner, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

"1,000 WAYS To Make \$1,000.00." You can do it—others have. This new amazing book will startle you, 475 pages only \$2.50. Popular Mechanics Press, 209 E. Ontario St., Chicago.

TO Win success you must do something different; particulars free. Publishers Sales Company, Box A-67, Nelson, Georgia.

HOMEWORKER Magazine—filled with profitable ideas! 3 months, 25c. Mailmarts, Cincinnati.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gunmetal Co., Ave. N. Decatur, Ill.

FORMULAS, PLANS, ETC.

FORMULAS. All kinds. Guaranteed. Catalog, "Special Offer Free." Kemico, 32, Park Ridge, Ill.

PILLING Station specialties formulas, 15 for 50c. Guaranteed. R. C. Smoot, Henderson, Texas.

500 **MONEYMAKING** Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Indiana.

PROVEN, Tested, successful formulas. Ritter, 1713 Powers Street, Cincinnati, Ohio.

ANY Formula \$.50, three \$1.00. Cole Laboratories, Bryant Pond, Maine.

ATHLETE'S Foot remedy. Guaranteed, formula 25c. Arnold, 1492 Pacific, San Francisco.

GUARANTEED Formulas! Literature free. Terrone, 22 Station S, Brooklyn, N. Y.

FORMULAS—Guaranteed paint and varnish remover, \$1.00. Baic, 1150 Leonard Ave., St. Louis, Mo.

TESTED Formulas—Largest, most complete line. Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

FREE! "Ten Famous Formulas." Write Derhammer, 531-R Wesleyan, Barberton, O.

"KILZKOFF" Cough syrup, breaks any cough. Complete information, \$1.00. P. O. Drawer 309, Canon City, Colorado.

NEW Formula! Created by depression. Exclusive rights. Smith Products, Ambridge, Penna.

"NEW Scientific discovery." Everlasting match. Lights by striking. Formula 25c. Research Laboratories, 966 Fourth Ave., Brooklyn, N. Y.

NEWEST Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, BD-4702 No. Racine, Chicago.

PSORIASIS—Tried, tested formula \$3.00. Money-maker. Martex, Princeton, Minn.

BIG Profits making, selling your own goods. Large 26 page formula catalog free. Browns Formulary, 212 East Waters, Tampa, Florida.

FORMULAS—Latest money makers. Literature free. Belfort, 4012 N. Keeler, Chicago.

FORMULAS—Tried, tested, proven. Real money makers! Average cost only 4c per formula! Write for interesting information. Best-Formulas-of-the-Month Club, Mayo, Florida.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

10,000 **MONEY-MAKING** Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, anti-freeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

CHEMISTRY

NEW Big catalog! Chemical sets, microscope outfits, laboratory apparatus, biological supplies, chemicals. Approved by experimental laboratories. Send 10c now (refundable) and get special 30 day offer. Winn, 124T West 23rd St., New York.

CHEMICALS! 20% Off! Bargain price list and one ounce sample, 10c. Century Chemical Co., Portland, Mich.

FREE Chemistry catalogs. Supplies at 5c! Equip complete laboratory. Send 3c postage. Kemkit Corporation, 135P Johnson Street, Brooklyn, New York.

25 **CHEMICALS** With experiments, 50c. Kayare Chemicals, 5522 Ft. Hamilton Parkway, Brooklyn, N. Y.

CHEMICAL Analysis and industrial problems. Estimates free. Essco Laboratories, 2206 Lyncaste, Detroit, Michigan.

HANDBOOK For chemical experimenters, revised and illustrated, 50c. Experiment booklet 15c. Chemical catalogue 5c. Scientific booklet free. Reading Scientific Co., Reading, Pa.

CHEMICALS, Laboratory glassware and apparatus. Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

AGENTS WANTED

MEN! Women! No dull times selling guaranteed food products. Regular customers. Steady income. Experience unnecessary. Free sample. Write today. Federal Pure Food Company, G-2944 Lake Street, Chicago.

450% **PROFIT** In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMG-39, Bradford, Pa.

100% **PROFIT** Selling housewives and auto owners necessity. Particulars. Raymond Schwarting, South Amana, Iowa.

BUY—Sell—Resharpen drills accurately. Attachments, instructions, complete \$6.65 postpaid. We pay cash for old drills. Mail today. Kelly, 5958 Washington, Chicago.

RAZOR Blades 50 cents per hundred, 8 oz. bottle flavoring extract 10 cents. Bargain catalog listing over 2000 items. Mail 15 cents covering printing, postage, handling. Refunded on first order. Consolidated, 140 North Dearborn, Chicago.

WHOLESALE Catalog free, 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

\$6.00 **HOURLY.** Amazing Karnu refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. Y-8, Cincinnati, Ohio.

NEWEST Office specialties, supplies. Competition-shattering prices. Mailmarts, PME-2, Cincinnati.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot Co., 4503A Ravenswood, Chicago.

MAKE More money in a real business of your own. Make and sell your own products. Employ agents to sell for you. We supply formulas and full instructions for making toilet preparations, perfume, flavoring extracts, soap, household specialties. Experience unnecessary. We furnish everything. Valuable booklet free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

MAKE Good money taking orders; shirts, ties, underwear, dresses, hosiery, raincoats, pants, uniforms. Sales kit free! Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

\$2.00 **HOURLY** With new, scientific cream that mends all cloth easily, quickly, invisibly, without needle and thread. Stands laundering. Free sample. Sewnomore, Y-744, Cincinnati, O.

WANTED—Direct purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

AMAZING New specialty. Whirlwind seller. Fast repeater. Write quick for sample offer. Natsales, Plymouth, Indiana.

FREE! Descriptions, 450 newest money making opportunities. Metromails, P-3, Cincinnati.

100% **PROFIT** In the "Self Starting Cigar Lighter." No flint or friction. What makes it light? No wind can blow it out. Retail 25c. Costs \$1.75 per dozen. Sample and sales plan 25c. New Method Company, Desk PM-39, New Method Bldg., Bradford, Pa.

AGENTS, A whirlwind seller and coin getter. "Middy's Scissors Sharpener." Sample and particulars 10c. Edward Woehr, 808 S. 49th St., Philadelphia, Pa.

SELL Men's ties, razor blades, etc., big money for you. Heil Premium Co., M4, Gaylord, Minn.

MANUFACTURER Offers big daily commissions, steady employment, liberal cash bonuses. Complete new spring and summer line tailored shirts, neckwear, dress and work pants, uniforms. Experience unnecessary. Part or full time. Outfit free. Write today. Packard Shirt Corp., Dept. S-311, Terre Haute, Ind.

UP To \$65.00 weekly easy! Sensational new tire repair fixes holes, cuts, worn spots, for 8½c a tire! Spreads on with knife. Dries overnight. Can't come off. Free sample. Plastic Rubber, Dept. Y-410, Cincinnati, Ohio.

"WINDOW-RITER"—Magic pencil writes on glass. All colors. Storekeepers buy quickly. Ideal for baseball scores. Large profits. Big repeaters. Free sample. Lake Chemical, 6 E. Lake, Dept. 3-PM, Chicago.

SELL Automatic "Hot Spot" fire grenades. Develop full-time business with these dependable, low-cost extinguishers. Morrison Laboratories, Rockford, Illinois.

DOUBLE-EYED Self-threading needle packages, size 3/9. Blind people thread them, invaluable for failing sight, necessary for good sight. Five samples 25c. Twenty packages, dollar bill, 100 packages \$5.00. Particulars. Wm. Oglesby, Vandalia, Ill.

AGENTS—Sell amazing automobile ornament. Produces revolving colored light. Propell-O-Lite Company, Mt. Washington, Ohio.

"BLEACH-IT" Laundry bluing concentrate. Positive success and economical. Wholesale or direct to consumer. 25c sample will make one gallon of unadulterated bluing. Information free to agents and distributors sending stamped envelope. "Bleach-it", 2317 Ursuline Ave., New Orleans, La.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 16A.

ZIPPER Clothesline—Sensational new invention. Instant demonstration. Free big money plan. Dunn Bros., Hempstead, N. Y.

FAST Selling products easily made at home! Literature free. Terrone, 22 Station S, Brooklyn, N. Y.

TRANSPARENT Day and night signs. 8"x14"; 4c, retail 25c; over 800 designs; sample free! Lowy, Department 620, 8 West Broadway, New York.

SEND Hose size for samples and chance to earn \$20 weekly. Show sensational guaranteed hosiery. Guaranteed against holes or replaced free. Dignified, pleasant work. Wilkmit Hosiery, Desk C-37, Greenfield, O.

MEXICAN Feather pictures. Unusual novelty. No competition. 25c (stamps) brings \$1.00 worth sample and details. Refunded if unsatisfied. Mexican Art, Apartado 1593, Mexico City.

EARN Up to \$100 weekly underselling drug, jewelry specialty stores. Fast selling necessities. We furnish you with stock. Reserve territory. Write today for catalog and agency offer. National Products Co., Berwyn, Illinois.

\$6.85 **HOURLY!** Amazing No-Flatz fixes punctures without patching; makes tires puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatz, Dept. Y-172, Cincinnati, Ohio.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

NEW Sensation, fast selling perfume candles. Merchants Studio, Glenview, Ill.

EVERY Woman buys the Sunshelf, new, fast-selling, adjustable window plant shelf. Sample, details, 20c. Sunshelf, Continental Building, Des Moines, Iowa.

MAKE \$50.00 Weekly selling Texas mineral water crystals. \$1.50 package, dozen lots \$3.75. Sample prepaid 50c. Imperial Company, Waco, Tex.

BIGGEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 220 Southern Boulevard, New York.

AGENTS—Engraved name plates, number plates, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

AUTO Radio—World's cheapest. Entirely new. Write J-20th Century Co., Kansas City, Mo.

CASH Income daily silvering mirrors at home. Plating autoparts, tableware, etc. Combination outfit. Write Sprinkle, Plater, 128, Marion, Indiana.

AGENTS: Smash go prices! Santos coffee 12c lb. 4 oz. vanilla 8½c, razor blades 10 for 8½c, 100 sticks chewing gum 12c. 150 other bargains. Experience unnecessary. Write Carnation Co., P.O. St. Louis, Mo.

AGENTS Moseo corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfits. The Moss Company, 64 Searle Bldg., Rochester, N. Y.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

GOLD Letters for store windows. Large sizes penny each. Free samples. Modernistic Sign, 3094 Lincoln Ave., Chicago.

100 **PROFITABLE** Mail order and local business plans. A. Pruitt, Elburn, Ill.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 DeGrauw St., Brooklyn, N. Y.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

SELL Townsend postcards, big demand. Large dollar assortment starts you. Chariton Associates, Chicago, Ill.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, muciflages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$5.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

MAN Wanted by shoe manufacturer established 32 years for sales work. Ready cash daily and extra bonuses to producers. No experience needed. Your own shoes at factory prices. Sales outfit free. Write Mason Shoe Manufacturing Co., Dept. B21, Chipewa Falls, Wisconsin.

MANUFACTURER Wants local man—Represent line fine shirts with new Tru-benized starchless collars. Ties, underwear, hose also. Exceptional values. Maker to wearer. Large earnings daily; cash bonuses regularly. No investment. Expensive outfit free. Write Dept. PM3, Quaker, Broadway at 31st, New York.

EARN Big pay every day in advance. Sell complete line printed business necessities, advertising book matches, gummed labels, advertising novelties, sensational business stimulants and complete line process engraved-like combinations for professional trade. New low prices. New plan. Experience unnecessary. Large 1936 outfit free! Northwestern, ST-625 Jackson, Chicago.

MAKE More money taking orders; shirts, ties, underwear, dresses, hosiery, raincoats, pants, uniforms. Sales kit free! Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

MEN Wanted by world wide industry. Write today for particulars about few good old Raleigh routes that have paid well for years. Established, profitable business. Over 200 farm and home necessities. Industry and reliability main qualifications. Man with auto preferred. Give age, experience, references. Raleigh, Dept. C-N-PPM, Freeport., Ill.

NEW Suction mop cleans like magic. Revolutionary invention. Banishes cleaning drudgery. Housewives amazed. Biggest seller in years. Outfit free. Kristee, Dept. 253, Akron, Ohio.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 3-A, 4503 Ravenswood, Chicago.

MAN—Sideline, full time, handle regular store route 10c counter card merchandise. 100% profit! Fast repeats! No competition! Nationally, locally advertised. Details free or sent 25c for \$2.80 value. NoDoz Awakeners, PM-3, Sacramento, California.

EVERY Store, office, institution needs new \$2 letter printer. Mailmarts, PMC-2, Cincinnati.

UNUSUAL Earnings, live wire specialty salesmen. Approved, simplified tax record. New federal, state tax laws compel all merchants keep records. Penalties severe. Rush reply. Protected territory. Record Control System, 20 Vesey Street, New York.

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mdse. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 3810, Spencer, Ind.

SALESMEN: Everybody now buying calendars, memo books, restaurant checks, gummed labels, carbonized salesbooks, business stationery, etc. Wonderful sideline. Free deals. Big commission daily. Free sales portfolio. Willens, Dept. HF, 2132 Gladys, Chicago.

EVERY Salesman may now share the profits of "Salesman's Secret of How to Get Favorable Interviews." Copyrighted. Formerly \$12.00 and worth it! Veteran salesmen say: "Salesman's Secret is biggest discovery within twenty years! Its psychology makes interviews easy." Guaranteed to double your sales. For limited time just \$1.00 buys it. Send your dollar now! Wendell West, Box 145, Oakland, Calif.

BIG Money makers: Large line work uniforms, raincoats, pants, shirts, etc. Advertising embroidered. Low prices. Every business, individual prospect. Free outfit. Dove Garment Co., 1733 Milwaukee Ave., Dept. 102, Chicago.

MAKE Big money steady. High grade coveralls, shopcoats, pants, shirts, raincoats. Advertising on back. Fast sellers. Free outfit. Strong Mfg. Co., 2330 W. 22nd St., Dept. N-10, Chicago.

SOMETHING New in fire extinguishers—Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write, Red Comet, 404 Comet Building, Littleton, Colorado.

DO You want a good selling item, needed in almost all homes? Either as a principal or a side line. Write Tiff, Tiff Road, Route 1, Dover, N. H.

SALESMAN Make big money. Joseph K. Kidder wants a man to sell Koatsal, new, improved lubricant for motorists and industry. Exclusive territory available. Great profits. Get particulars and free trial offer. Joseph K. Kidder, LaCrosse, Wisconsin.

SELL Ideal all weather chicken feeders that work automatic. Exclusive territory. The May Mfg. Co., Colwich, Kansas.

DISTRIBUTORS, Brushless shaving cream. Trial jar 10c. Wemco Products Company, 600 Arcade, Cleveland, Ohio.

SALESMEN: Sell new line quantity-Co-op printing. Million dollar company. Letterheads low as \$1.38 per M. Billheads low as 77c per M. Prescription blanks low as 54c per M. Many other printing bargains. Write for free sample and price brochure today. Fort Wayne Printing Company, Dept. PO, Fort Wayne, Ind.

WONDER Weeder better than hoe. Twice as fast. Salesmen wanted. Link Company, Fargo, N. D.

AUTOMOTIVE Specialties, accessories. Wholesale. Internationally distributed. Supreme Lubricants, Dayton, Ohio.

BIG Money in tire patches. Sell New auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 790 Burkhardt, Dayton, Ohio.

SELL Our marvelous new shelf moldings, signs, pricing systems. Sanicard, Waynesfield, Ohio.

OUTDOOR Sports for everyone—Enjoy them all year round with aid of book published by Popular Mechanics. Hundreds of ideas for new and popular sports for every season; complete instruction for making necessary equipment at small cost. 350 pages and 650 illustrations. \$2 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

GOOD-PAY Position. Call on factories, wholesalers, truck owners with complete line low-priced decalomania transfers for lettering trucks, store windows; metal signs, calendars. Also advertising tire covers, auto seat covers, mechanics' garments for garages and auto dealers. Exclusive features get quick sales and steady repeats. Permanent position. Large commissions paid weekly. Write fully. Palmen Company, Dept. PM-3, Muncie, Indiana.

PRINTING Prices wrecked. Show local users big savings. Take easy, quick orders. Experience unnecessary. Complete line. Union label. Free cut service. Big commission. Outfit free. Publix Printing, 633-H Plymouth, Chicago.

MAKE Big money—Commissions advanced, sell Popular Mechanics work shoes—complete line of dress shoes—outfit free. Dura-Tex Shoe Co., 80, Brockton, Mass.

SALESMEN: Sell advertising novelties, calendars, fans, thermometers, etc. for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

SALESMEN—New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2801-123 Sheffield, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SELL Process raised letter printing \$3.95 thousand. Free cut service. Worth \$6.00. Commission \$1.00 advanced. Experience unnecessary. Outfit free. United, P-6155 South State, Chicago.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

SELL Aspirin, laxatives, laces, blades. Write National, Box 500M, Cincinnati.

SELL Business establishments. Two minimum sales daily make \$42.00 weekly. No investment. Paracraft, 1600 Locust, Des Moines, Iowa.

START A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

HELP WANTED

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36-WD, 1956 S. Troy, Chicago.

USE \$500? Raise canaries for us. Guaranteed market. Free particulars. Crimmins, 3741F Sixtieth, Woodside, New York.

USER-AGENTS, Introduce new \$1 postcard printed. Mailmarts, PMB-2, Cincinnati.

VITALIZING Health exerciser \$1.00. Agents information 25c. Mullikin, Texarkana, Texas.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. C-817, Chicago.

STEADY Work for responsible man. Wonderful opportunity for good steady cash income and extra money to save. Old established manufacturer will furnish you with complete stock of finest guaranteed food products, farm and household necessities on credit—you pay when sold. Premiums, dealer helps and fast-selling specials for quick sales and profits. Anderson of Utah sold \$402.70. Karel of Michigan \$347.48. McMillen of Pennsylvania \$314.15 in one week. Work very pleasant. Permanent. Write McConnon & Company, Room 66CG, Winona, Minn.

MONEY In mushrooms! Grow them now, in cellar or shed. Exclusive new process. Bigger, better, quicker crops. We buy. Book free—write today! American Mushroom Industries, Dept. 588, Toronto, Ont.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 16A.

MRS. M. M. earned \$267 in 3 weeks (sworn statement) raising mushrooms for us in her cellar! Exceptional? Yes, but your cellar, shed, barn may be suitable to bring moderate income all winter. Book, sample free. (Estab. 1908.) United, 3848-A172 Lincoln Ave., Chicago.

FREE Information will reveal "How to Get a Job." Sulmar, 17 N. Ithaca, Philadelphia.

MUSHROOMS—Start growing now, cellars, sheds. Quick returns. We buy crop. Free booklet. Adanac Mushroom Company, Toronto, Canada.

EDUCATIONAL AND INSTRUCTION

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Company, 601 Lake Street, Chicago.

LEARN Auto mechanics, metal finishing, electricity, refrigeration, Diesel. Stevinson's, 2088A Main, Kansas City, Mo.

LEARN Spanish in one day. Everyday phrases easy with pronunciation English Spanish. Copyrighted authoritative wonder-book, mail 25 cts. Prischmann, Box 1792, El Paso, Texas.

BE Meat cutter, taught quickly; actual practice; special offer; free particulars. National Meat Cutting School, Toledo, Ohio.

WORK For "Uncle Sam." Start \$105 to \$175 month. Pleasant work. Men-women. Try next held examinations. Common education usually sufficient. Experience unnecessary. Full particulars, list jobs and sample tests—free. Write today sure. Franklin Institute, Dept. G3, Rochester, N. Y.

WOULD You be strong? Try the Jackson Barbell way. Train for real strength. Low cost international bar bells. Jackson Barbell Co., Springfield, New Jersey.

WANTED: Men with average intelligence to learn scientific crime detection and secret service. My fifteen years in United States secret service should be your guarantee that I'll train you successfully. Information free. Write Joseph Kavanagh, International Secret Service Institute, PM-36, Hoboken, N. J.

WORK For "Uncle Sam." Start \$105-\$190 month. Men-women, age 18-53. Common education. Are you eligible? Get our free questionnaire—find out. No obligations whatever. Write, Instruction Bureau, 133, St. Louis, Mo., quickly.

CORRESPONDENCE Courses, book bargains, formulas. Free lists. Send stamp. R. E. Kelley, Sturgis, Michigan.

PRIZES For writers! \$135,000 cash prizes for amateur writers and authors. Send 3c for literature. U. S. School of Writing, Dept. F, 20 W. 60 St., New York City.

SHORTEST Methods solving arithmetical problems. Frederick A. Smith, 2410 Smalley Court, Chicago.

BECOME A chartered master bookkeeper, business executive, or accountancy expert, by examination, credit evaluation, or home study. Tuition \$3.00 monthly. Write Institute of Business Structural Engineers, Box 1055, Sacramento, Calif.

PATENT Examiner, U. S. patent office, will accept limited number of applications for correspondence training course for inventors. Inquire Examiner, 909 Emerson St., Northwest, Washington, D. C.

INVENTING Now taught successfully. Home study. Write for free booklet. Trofimov School of Inventive Practice, 3859 Northampton Rd., Cleveland, Ohio.

STAMMERING. Stuttering corrected. Write Lewis Institute, 12052 Woodward, Detroit, Michigan.

BIG Bargain catalogue educational matter 10c. Hanfling, Y-799 Broadway, New York.

SECRET Service. Particulars free. Write immediately. George Wagner, M-2640 Broadway, New York.

MEN Wanted willing to learn landscape designing and fill big paying positions as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 400 Plymouth Bldg., Des Moines, Iowa.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

CHIROPODY Taught by correspondence. Evans School of Chiropody, Montgomery, Alabama.

U. S. GOVERNMENT Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

MODERN Refrigeration. New industry needs trained men for installing, servicing, repairing. If you seek a new field with larger opportunities get latest book by Alt-house and Turnquist. \$4.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

CARTOONING—COMMERCIAL ART

DO You like to draw? Artists—cartoonists—illustrators earn big incomes. We teach you how. Write for free art book. Federal Schools, Inc., Dept. P36, Minneapolis, Minn.

WE'LL Help you! Students' drawings carefully, professionally criticized, corrected! Practical assignments! Send work weekly, enclosing stamp. Membership, 50c monthly. Growing Young Artists Association, 10505 Dove Ave., Cleveland, Ohio.

CARTOONS. Newest methods. 320 illustrations. \$1.00 postpaid. New Market Studio, Kniekerbocker Building, New York City.

CARTOONING Pays. Learn quickly with our new complete cartooning course, contains 700 illustrations. Only 50c postpaid. Lawrence Publications, 178 West 97th St., New York.

CARTOONING Course:—30 lessons, 500 illustrations with drawing pens and pencils. \$1.00 complete. Scovell Studios, Box 716-P, Hollywood, Calif.

MONEY—Popularity—Through illustrating. 56 lesson, professional course—\$1.00. Graphic Service, 417 Southway, Baltimore, Maryland.

CHALK Talks. Laugh producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

CARTOONING, Sketching, etc.—46 lessons, 600 illustrations, including practice sheets, pens, pencils. \$1.00 complete. Fraba Service, Cashton, Wisconsin.

PENCILGRAPHING Makes sketching easy as writing. New, simplified method. Entirely self-instructing. Over 100 illustrations in beautiful cloth-bound book show just how it's done. Start classes, make your hobby profitable. Complete with all working materials \$3.48 postpaid. Pencilgraphing, Inc., Wenatchee, Wash.

SURVEYING INSTRUMENTS

GUARANTEED Factory rebuilt transits and levels for rent (with purchase option) or sale (cash or terms). Order now before prices advance. We will repair, trade in, or buy your old instruments. Ship prepaid for estimate and valuation. Write for List M-13 and complete information to Warren-Knight Co., 136 N. 12th St., Philadelphia, Pa.

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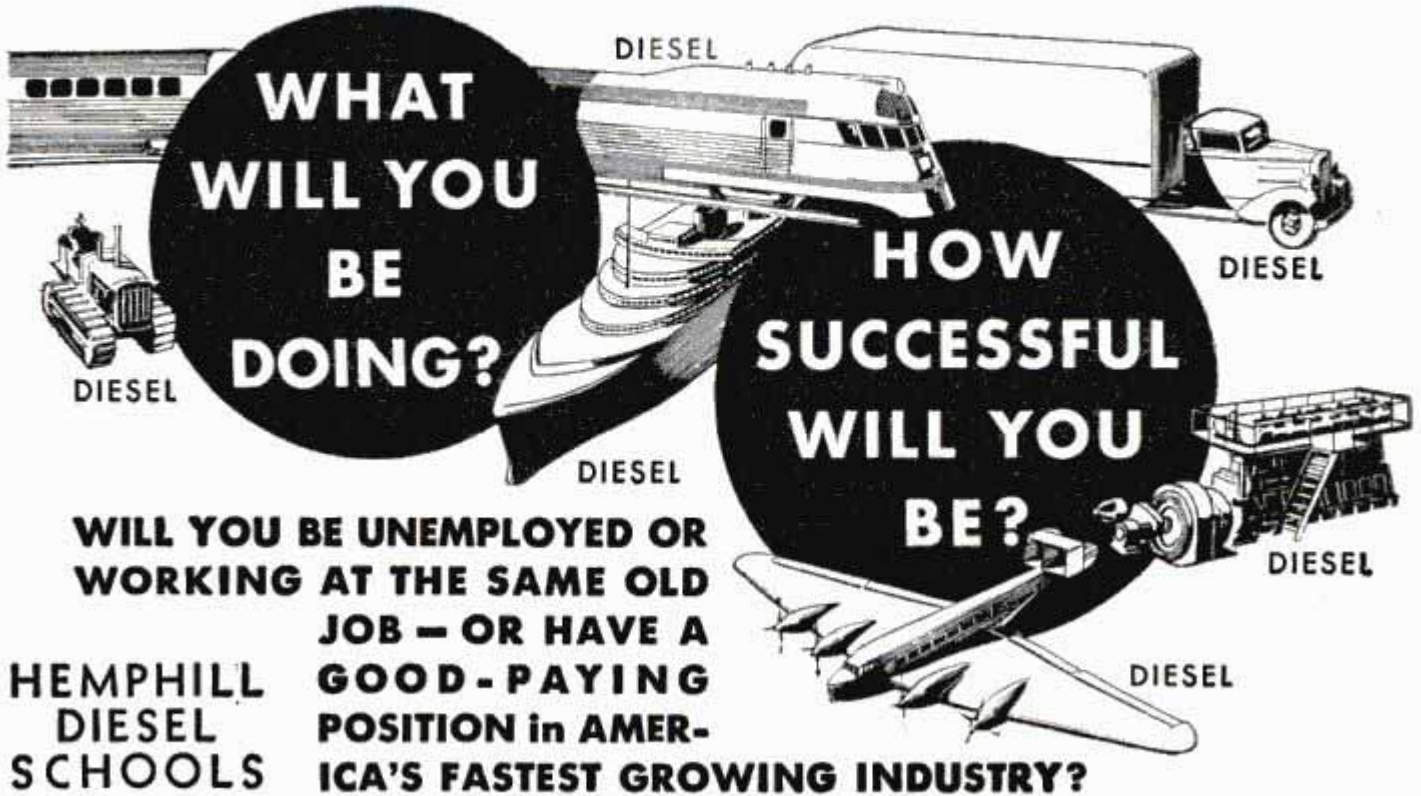
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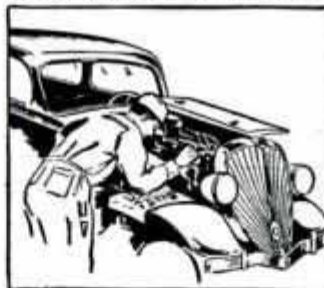
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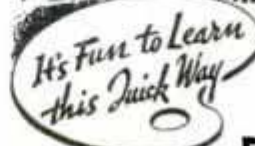
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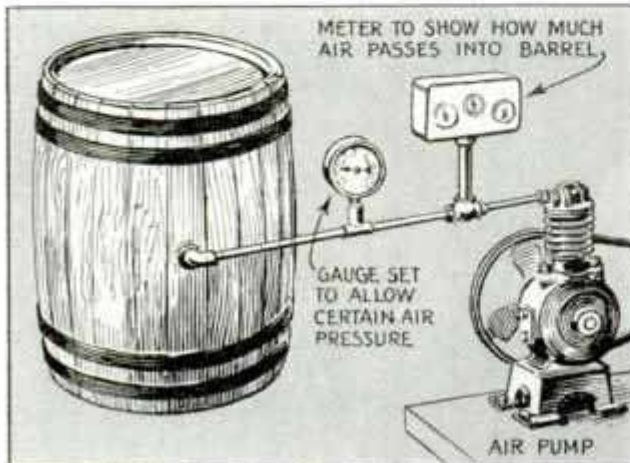
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(Continued from page 37A)

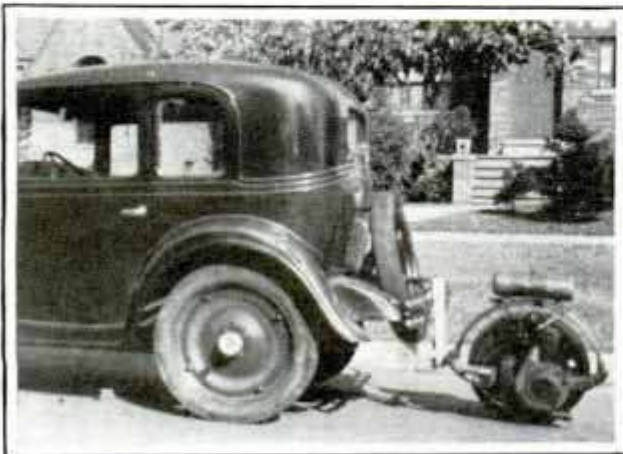
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(P. M. 3-36)

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JOHN TENNANT smokes a nice French briar. What goes in it? Prince Albert! He says: "Prince Albert has a mild, mellow, soothing flavor. You get a slower, cooler smoke that's easy on the tongue."



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Vol. 65

MARCH, 1936

No. 3

87506

New MARVELS in METALS

RECENT developments in the art of alloying, treating and molding metals are revolutionizing industry.

Metals are making new conquests, and almost daily comes an announcement of new and unforeseen applications. As a result, new industries are springing up and old ones are expanding.

One of the most significant announcements in the field of metal-



See *Jan. 1936, 18. - Aug 1936 - 189.*
Dept. of Electro-Chemistry
 lurgy came recently from Dr. Colin Fink of Columbia University, who developed the modern art of chromium-plating. After fifteen years of experimenting, Dr. Fink has found a cheap commercial process for coating steel with a stick-tight and protective film of rustless aluminum. The immediate possibilities of this development are almost endless.

Steel has strength, body, resistance, and hardness, but it rusts when exposed to air and moisture. Dr. Fink has found a way to cover the steel with a thin film of aluminum and thus prevent it from rusting. This means we can use steel for exterior construction and for a variety of articles for which it was never used before. Store fronts, window frames, fly screens, auto



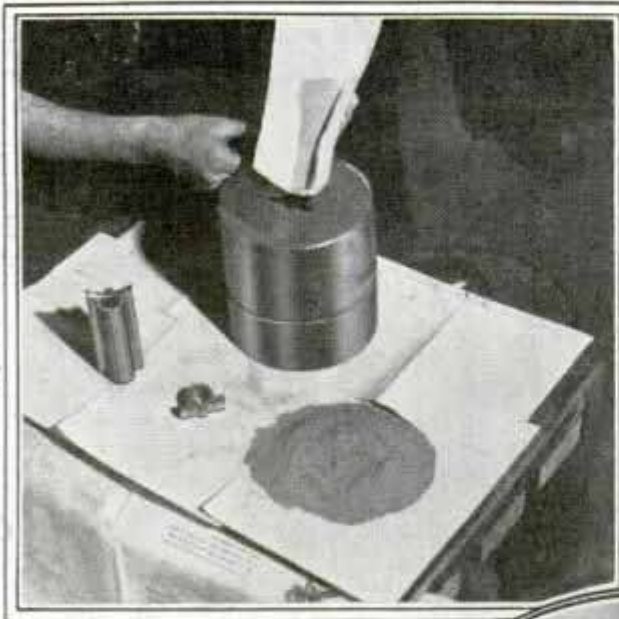
"Alnico" magnet supporting sixty times its weight and, above, samples of aluminum-coated steel displayed by Dr. Colin Fink of Columbia University who developed the coating process

Cont. Elvi Idaromay
4 W 10 B. rd
Newark

Newport

see Jan. 1936, 18. - Aug 1936 - 189.
Mr. Symonds Steel Co. Lockport, N.Y.

General Electric Co. Schenectady, N.Y. 321



thick plate. I don't see why we make buildings today of masonry or brick. I would prefer all metal and glass construction.

"The serious objection to iron has been corrosion. Every year 20,000,000 tons of iron are lost in corrosion. And twenty per cent of new iron production must be used for replacements. From an engineering point of view iron is our basic metal; there are not enough of the others to go around.

"I don't see why in the next hundred years we should not discover a cheaper process for converting iron into steel. We also must develop a cheap all-around alloy; it should be

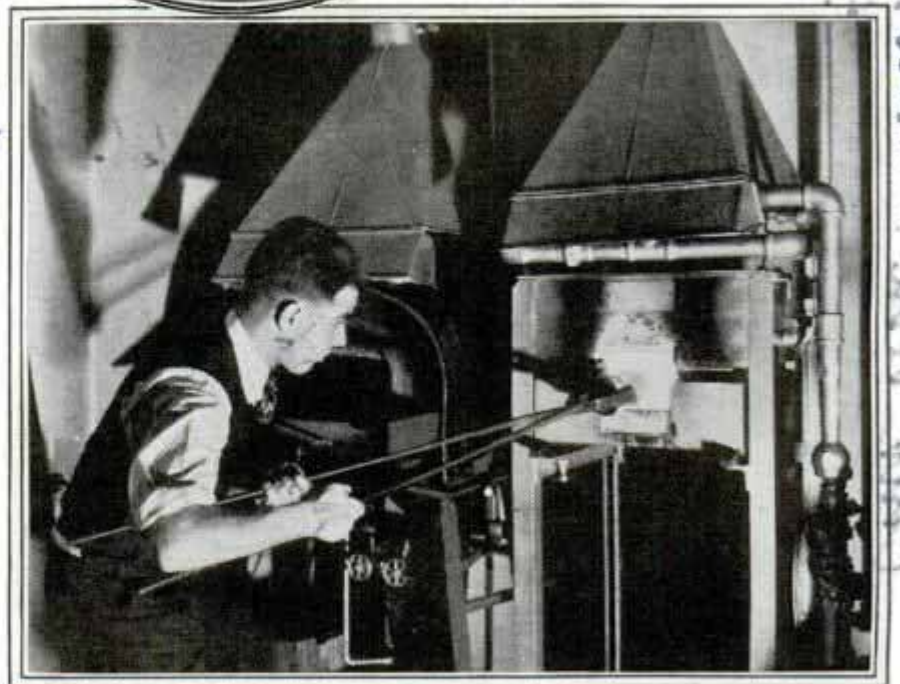
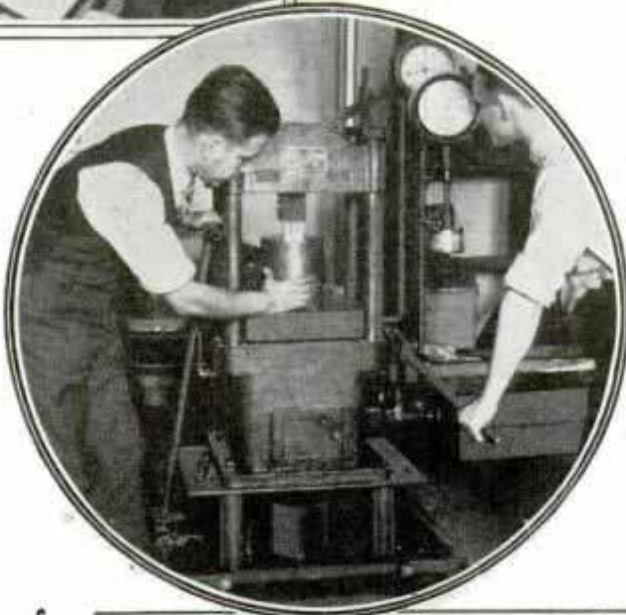
light in weight, non-corrosive, hard, and possess super-tensile strength. Steel is good now, but I believe that it should, and I think it can, be made ten times as strong."

As consultant to the engineers and architects building Radio City, Dr. Fink advised them to use aluminum-silicon spandrels, in place of stone, underneath

bodies and any number of similar things may now be made of thin steel sheets protected against rust by an aluminum film. The airplane industry is also a possible user.

"Since iron is our most abundant metal, we must find new ways of using it," says Dr. Fink. "Steel has many excellent qualities, one of which is its great fatigue value. Steel costs one to two cents a pound; aluminum costs about twenty-one cents a pound. Steel is, however, three times as heavy as aluminum. Now, if we cover a thin sheet of steel with an aluminum film, we can save as much as eighteen cents on every pound used.

"I estimate the aluminum film on steel can last about forty years under ordinary conditions. It is ordinarily very thin. I consider .0003 of an inch a thin plate; .00125 of an inch may be considered a



The three steps in powder metallurgy shown in Columbia University laboratory. The metal powder is poured into a mold, the powder is subjected to pressure and the molded object is heated and hardened in a furnace

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Restoring Church Windows Is a Giant Jig-Saw Puzzle

Charles Hardy, due 4/15
Lester Self
hgh.

window sills. These spandrels are one-quarter of an inch thick and their use saves a great deal of weight. If, says Dr. Fink, the present process of coating steel with aluminum had been known at the time Radio City was built, I would have specified steel spandrels only one-fiftieth of an inch in thickness. Since there are thousands of windows in Radio City, the saving, in weight and dollars, would have been tremendous—perhaps as much as eighteen cents on every pound used.

Another important development, "powder metallurgy," has been brought to its present state largely through the efforts of Charles Hardy. Powder

metallurgy is a process for mass-producing metal articles without resorting to molten metals. To a large extent, it is "cold" metallurgy.

Specially prepared powders of the desired metals, or metal, are poured into a mold and subjected to a pressure of about thirty-five tons per square inch. The tiny particles are thus made to stick to each other; they are united in a permanent bond by heating. The finished product requires no machining; after polishing, it is

(Continued to page 130A)

Detachable Spikes for Golfers Can Be Worn on Any Shoe



Spikes mounted on a plate which can be attached to any pair of shoes or boots are now available for the golfer. Made of rust-proofed steel they are fastened to the sole with clamps adjusted at the instep.



© Fox Photos
Dr. Stanley Baker at work on a giant jig-saw puzzle—the restoration of the thirteenth century windows of Salisbury cathedral

Jig-saw puzzlers, even the most expert, would probably throw up their hands in despair if faced with the task which Dr. Stanley Baker of Salisbury cathedral has imposed upon himself. Dr. Baker is attempting to restore the thirteenth century windows of the cathedral, a task made necessary because the architect threw the famous glass away when the building was restored in the eighteenth century. Dr. Baker has been working on the task for seven years and the complicated jig-saw puzzle was brought a stage nearer completion recently when he received three small parcels of glass from New York where they had found their way years ago.

Boiled Potatoes Turn Black if Soil Lacked Potash

Housewives who have found that boiled potatoes have turned an unappetizing blue or black, instead of remaining firm and white, may learn for the first time exactly why this happens. Prof. W. E. Tottingham of the University of Wisconsin has discovered that the discoloration is the result of formation of pigment products which appear when the potatoes are grown in soil lacking potash.

Charles & Smith
Text 5/4/20
Lester Self
The same thing

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England
15/10/1906

made in W. Wis.

Giant Rushmore Statues Dwarf the Sphinx

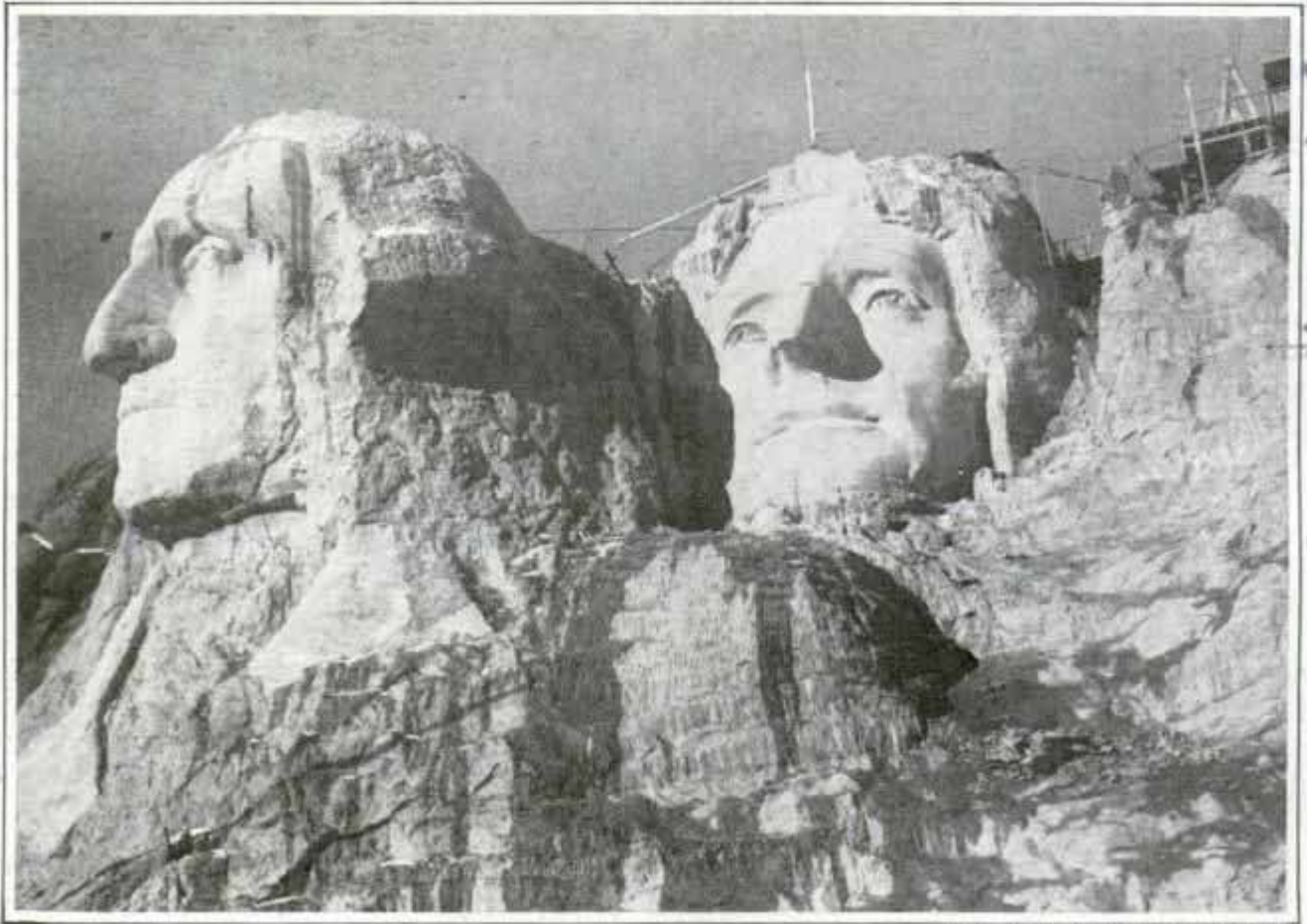


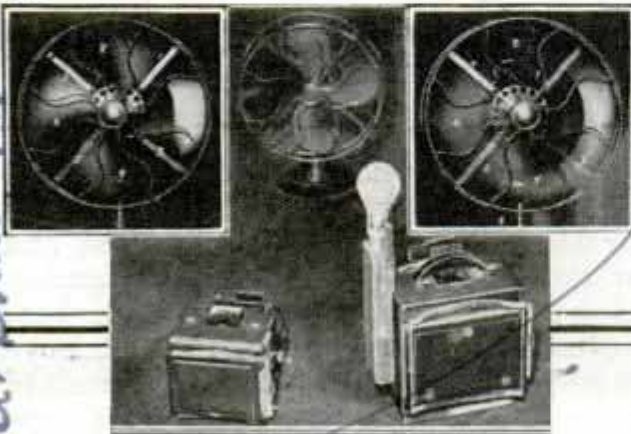
Photo by Publishers Photo Service

Two of the giant heads in the Mt. Rushmore group, Washington and Jefferson, as they appeared at beginning of winter. Washington's nose was modeled by removing 10,000 tons of granite

Colossal statues carved by man are dwarfed by the figures being blasted on the sheer side of Mt. Rushmore for the new national shrine. For instance, the nose of the Washington statue is two feet longer than the entire head of the famous Sphinx. Ten thousand tons of granite were

blasted away in modeling the nose and nearly half a million tons have been removed from the mountain in carving the figures of Washington, Jefferson and Lincoln. The heads of Jefferson and Lincoln are well underway, after five months work by Gutzon Borglum and his staff.

Electric Fan Helps Synchronize Camera with Flashlight



Time exposure and speed shot of revolving fan help synchronize shutter with peak of light

One method of timing a camera flashlight synchronizer to catch the peak light of the flash was worked out with an electric fan by a St. Louis man. He painted a white mark on one of the fan blades and set it revolving at its slowest speed, about twenty revolutions per second. Four feet away he aimed two cameras, setting the shutter of the camera being tested at its highest speed, up to a five-hundredth of a second. The other camera, for checking purposes, is set at "time" and opened; the test camera and its bulb are "fired" and the check camera closed. Thus the time-

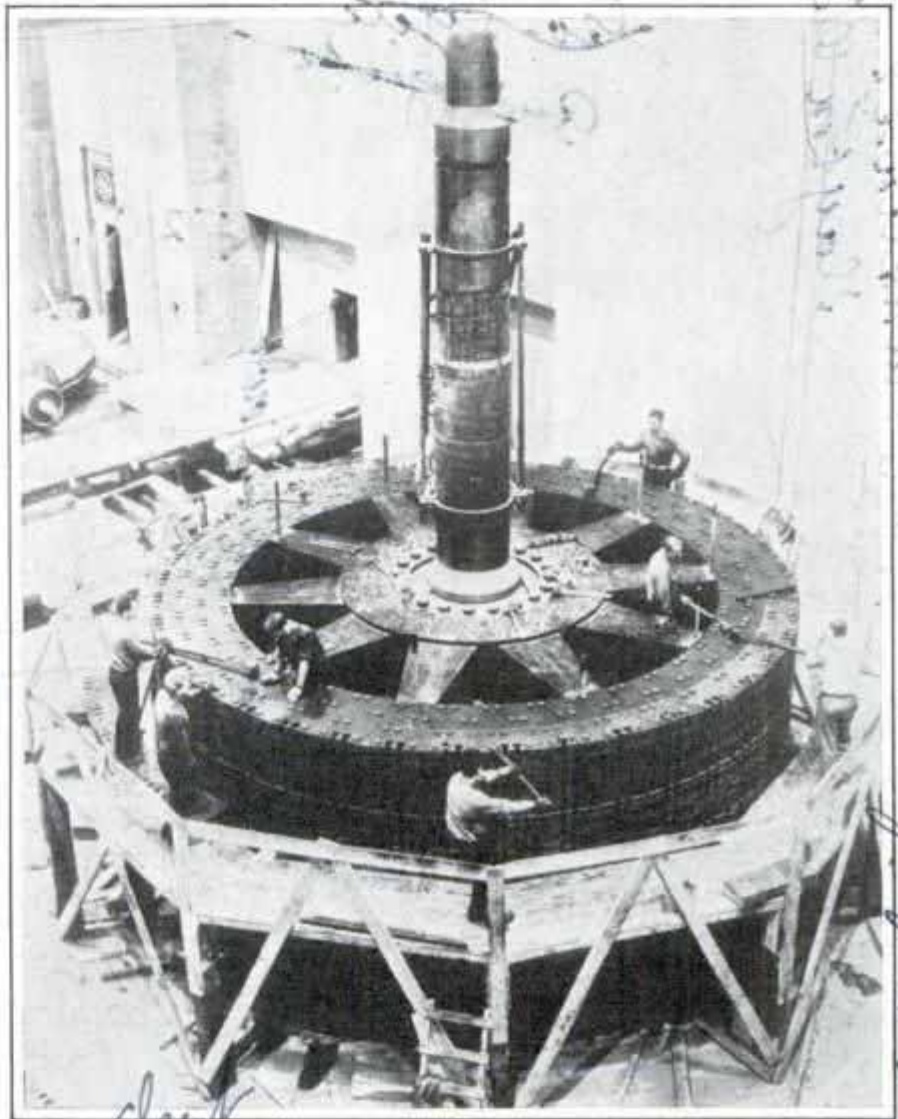
near Raped City. South Dakota

Carl W. S. Rice
St. Louis, Mo.

Russell E. Zeschke

set camera takes an image of the entire burning of the flashlight, consuming perhaps one-half revolution of the fan. The test camera snaps only an image of the white mark moving during the brief exposure, and if the synchronizer has been adjusted properly the peak light and shutter exposure coincide at the same segment of the circle. In the test illustrated, the duration of light was from segment one to five, with the light peak in segment two, where the shutter tripped. The peak filled one-eighth of the circle, indicating the shutter snapped in $\frac{1}{100}$ of a second, or one-eighth of the fan revolution which occupied a twentieth of a second. If the shutter had exposed in segment one, it would have been too early for the peak light, and if in three, too late. The synchronizer could have been corrected by adjusting the tension springs, tightening them if the shutter snapped too late and lengthening them if too early.

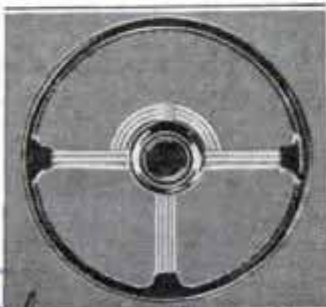
Giant Generator to Help Light Cities in Six States



Together with several others, this huge rotor will generate power to light many cities when Boulder Dam is completed

View Cleared by Taking Spoke Out of Steering Wheel

Improved vision for the automobile driver is attained by using a steering wheel which has no spoke in its upper half. The spokes are of carbon steel which will bend in case of accident, resulting in new safety for persons on the front seat. The wheel was developed by the Chrysler engineering department.



Chrysler Motors
311 Massachusetts Ave

One of the world's largest generators has just been installed in the power house on the Nevada side at Boulder Dam. This giant machine is a rotor which will develop 82,500 kilovolt amperes to help furnish power and light to six states. Fifteen of these generators will be installed in the same unit, which will be coupled with other units when completed. The men shown working on the generator give some idea of its great size.

Announced by Sweetest thing in the world is alpha-anti-pirilla-Aldozime, newly developed chemical substance which is eight times as sweet as saccharine and 2,000 times sweeter than cane sugar.

Chicago Trib

Albert F. Blafelce
 U.C. Carnegie Institution
 Washington

1600

dr

12/31/35

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Power Cycle Like Scooter Is Cheap to Operate

The Curtis Specialty Co. Inc.
119 Franklin St.
Dayton Ohio
Wiltron Products Co.
Reading, Pa.

Power Cycle
Auto Globe



Power cycle like child's scooter driven by a one-half-horsepower, four-cycle engine

Resembling a child's scooter in appearance, a power cycle boasts a fuel consumption of 100 miles or more to the gallon and is simple in construction. Spring suspension and sixteen by four-inch pneumatic tires give a floating ride. The rider sits upright in a comfortable position, ready to step off at a moment's notice. Two pedals control operation, the right one being the brake while the left automatically engages the clutch and opens the throttle. It is powered with a one-half horsepower, four-cycle engine, develops a speed of twenty-five miles an hour, weighs 170 pounds and is eighty inches long.

Danger of Lead Dust Reduced by Latest Respirator



Approval of a respirator for lead dust, one of the most dangerous dusts known, has been granted by the U. S. Bureau of Mines. It is the mechanical filter type, designed to protect against inhalation of me-

chanically generated dusts whose main constituent is lead, such as those produced in the manufacture of storage batteries, enameling, pottery making, rubber compounding, sandpapering and chipping painted surfaces, paint making and mining, milling and processing lead ores. The respirator also protects against quartz, asbestos, iron ores, cement, limestone, coal, wood, cellulose, flour and similar dusts.

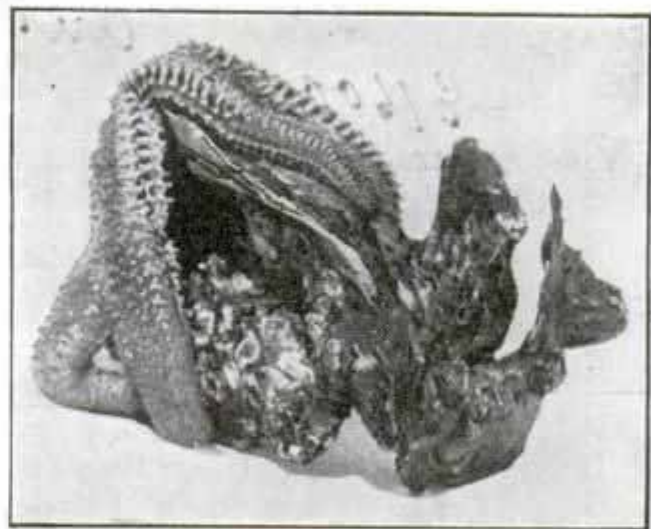
F20 Myriads of Shooting Stars Bump into Earth Daily

Iowa City Iowa

Don't worry about being struck by a meteor, even if 24,000,000 meteors bright enough to be seen with the naked eye bump into the earth every day. Three hundred thousand shooting stars as bright as Vega burst into our atmosphere daily, but most meteors burn themselves out before landing. Prof. C. C. Wylie, of the University of Iowa estimates that 130 meteors as brilliant as the full moon can be seen every year from a single spot on the earth, and six explode violently. About once in 300 years a meteor as heavy as thirty-five tons collides with the earth. At the present rate less than an inch of meteoric material would have fallen on the earth in two billion years.

Science Democrat 12/36

Chemical Rope May Protect Oysters from Starfish



Actual photo of starfish forcing open shell to get oyster. Starfish will wipe out oyster beds

How to protect the oysters from starfish is a problem on which the Bureau of Fisheries is working. A photograph taken re-

Washington D.C.

1837-16th St. N.W.

Washington D.C.

\$1.595

Photograph in Dark Theater Taken with Infrared Light

cently shows a starfish in the act of opening an oyster. After wrapping its five "points" around the oyster, the starfish applies pressure and exudes a fluid that has an effect similar to that of ether on humans. This makes the oyster powerless to resist and the starfish opens the shell and eats the victim. Hordes of starfish attacking productive oyster beds will soon wipe them out. Bureau of Fisheries men use "mops" which sweep the ocean floor, entangling the starfish and hauling it to the surface to be destroyed. Experiments are being made with a chemical rope to be laid around oyster beds. It is hoped that this rope, which is weighted and lies on the bottom, will keep starfish away. It is impregnated with a mixture of paraffin and a strong chemical. Paraffin keeps the chemical from dissipating and the chemical drives away the starfish.

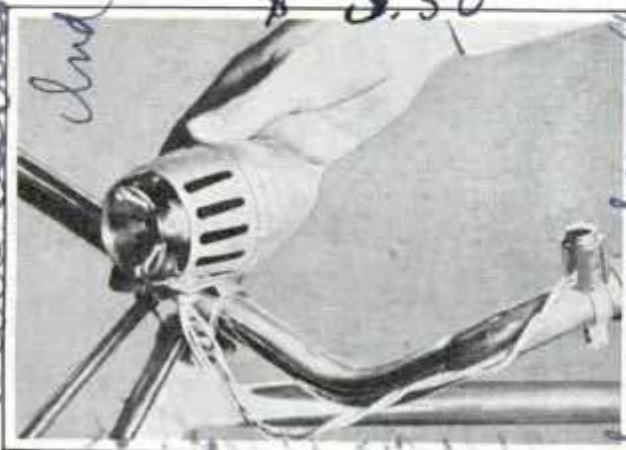


Wide World
Photograph of Queen Mary of England and her party at the theater made with infrared light while the theater was dark

Clear, sharp photographs can be taken in a darkened room with "invisible light." Without disturbing the audience by using flashlights or floodlights, a cameraman snapped this picture of Queen Mary of England in the royal box at a London theater "first night." The photograph was made with infrared light while the theater was dark.

\$1.555
**Horn and Light for the Bicycle
Combined in One Unit**

One of the latest accessories for the bicycle is a streamline electric lamp which also contains an electric horn in the rear. The two elements operate from the same battery of three flashlight cells.



Combined electric lamp and horn for bicycle

6721
**Chromium-Plating Speeded Up
by Chemical Process**

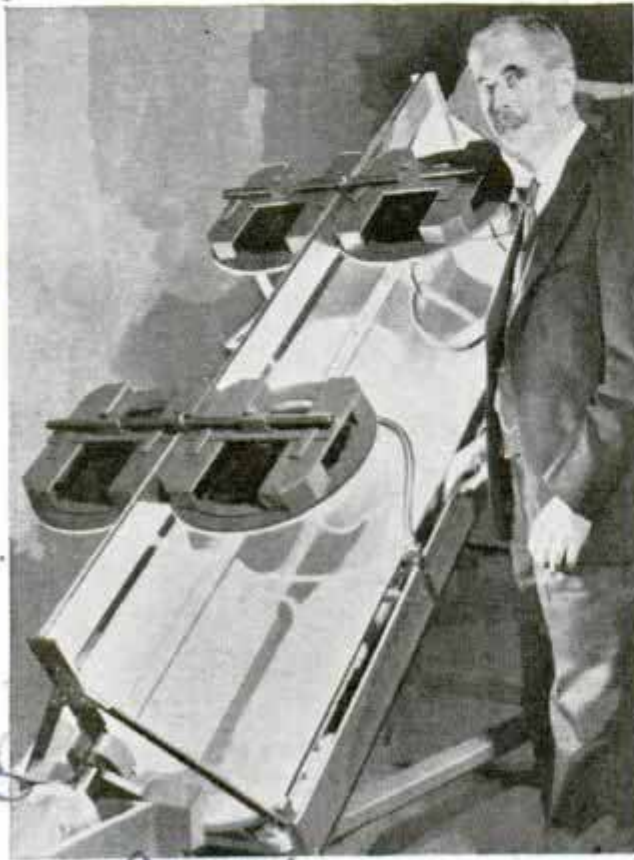
By using complicated organic chemicals, Dr. Richard Schneidewind of the University of Michigan speeds up even plating of non-corrosive chromium on other metals. The process gives a spreading effect which results in complete plating of hollows and high spots in the metal. So much faster is this method that one manufacturer can plate 100 frying pans per hour instead of sixty-five. This time-saving results from elimination of the necessity for fitting a special wire loop into each unplated pan to keep the electricity from going directly to the high spots, as lightning acts, and causing heavier plating on the "bumps" than in the low spots.

Dept. of Electrical

Successor to square

Delta Electric

Sun-Ray Steam Engine Hope of Cheap Power



Steam generator which is operated by heat of sun

Possible home and industrial uses are predicted for a steam engine designed by Dr. C. G. Abbot of the Smithsonian Institution to operate on solar energy. The engine is driven by steam produced by the sun's heat. Its designer believes that it may solve the problem of cheap power.

Movie Film Held in Magazine Is Easy to Load in Camera

Home-movie cameras with magazine-loading film are now being produced by the Eastman Kodak company. Amateur movie-making is simplified by elimination of the threading process, the film being loaded by merely opening the hinged door of the camera and

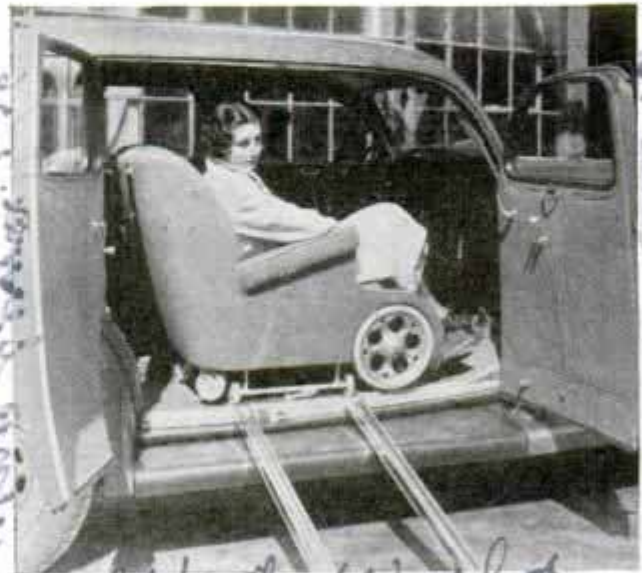


slipping the loaded magazine of film inside. It engages with the camera's operating

mechanism automatically. If it is desired to change the type of film, perhaps to insert color film before the entire footage is taken, the magazine can be removed and the other slipped in place. This camera is available in the sixteen-millimeter size, and is equipped with interchangeable lenses, three-speed operation, a lock to prevent accidental exposure, and a "pulse" which clicks every half foot, or twenty frames, to help time the length of a scene. A footage meter on each magazine shows how much film has been exposed.

Invalid's Chair Rolls into Car to Give Shut-Ins an Outing

Invalids may enjoy the pleasures of motoring if their families take a tip from a Seattle man whose car has been altered to permit rolling a wheel chair into and out of the vehicle. The chair, built with extra heavy padding and double duty springs, is clamped beside the driver's seat after being rolled into the car on grooved chromium nickel rails attached to the door sill. When not in use, the rails are bolted to the front bumper. When the invalid's chair is rolled from the car on a set of auxiliary wheels which fit snugly into the grooved rails, the chair is moved on a set of large-size pneumatic-tired wheels. The auxiliary wheels may be raised or lowered by a lever. Extra width necessary for rolling the chair in and out of the car was attained by removing the right center door post.



Invalid's chair installed in car. Note rails up which it is rolled from the ground

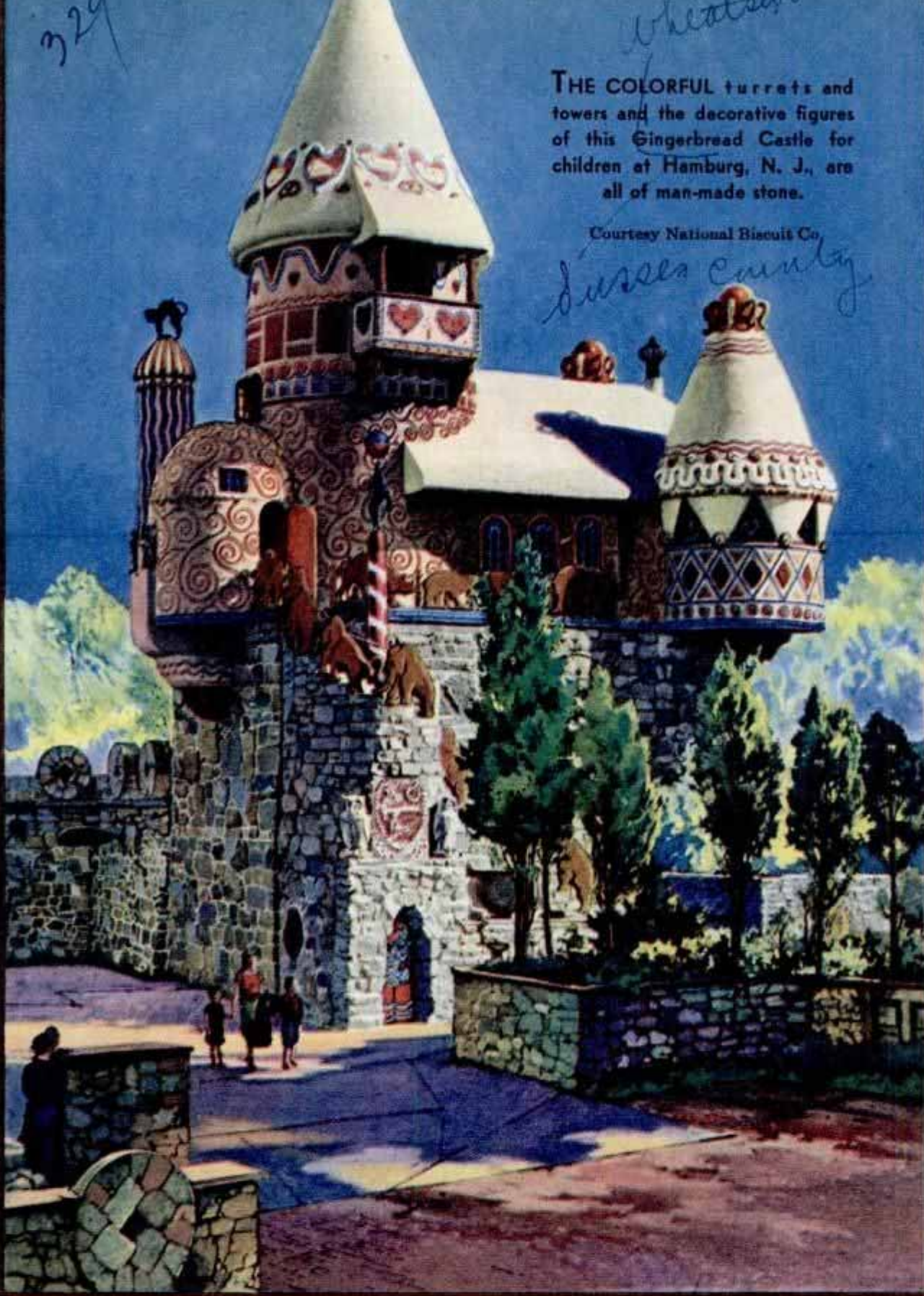
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329

Wheaton
THE COLORFUL turrets and towers and the decorative figures of this Gingerbread Castle for children at Hamburg, N. J., are all of man-made stone.

Courtesy National Biscuit Co.

Durham County



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124-9th St.
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All The
RAINBOW'S COLORS
in Man-Made **STONE**



Bahai
 THE BEAUTIFUL Temple of Light near
 Chicago whose tough, rugged sinews of
 concrete, jeweled with crystal-like frag-
 ments of quartz, are so delicately
 molded as to give the appearance of
 a piece of fine lace, as can be noted
 on the dome. The entire structure, out-
 side and inside, eventually will have the
 same appearance as the dome. Right,
 note how the lines of nature have been
 reproduced in concrete in this statue
 of St. Christopher.

81340
no
at Wilmette
designer - Louis Bourgeois
Franciscan monastery Brooklands Washington DC

ST CHRISTOPHER
 WHERE THE LOVE
 OF GOD ASSISTED
 WALKERS ACROSS A
 STREAM HAS BECOME
 OF HIS CHARITY BEEN
 INVOKED BY MANY AS
 THE PATRON SAINT OF
 THOSE WHO TRAVEL
 BY WATER

Cement Assn. 33 W. (6,1340) Chicago
also Concrete Dept



CONCRETE has brought bowling out-of-doors, as evidenced by this night scene on alley of man-made stone at Miami, Fla.

See Sept. 1934. 415- { Owner, Roy Marsh, Little River, Florida

BUILDINGS in the gay colors of the rainbow with sidewalks to match, or to harmonize. New brilliance, new color, new beauty, never before available in structural building materials.

These are among the remarkable possibilities of recent developments in concrete. For concrete, like Cinderella, has doffed the costume of a trusty but humble servant to be acclaimed both beautiful and remarkable. Truly, a magic stone.

Trusty, because it has served faithfully for centuries; no longer humble, for it has been brought from concealment behind a mask of veneers. Beautiful, because sincerity and honesty have been substituted for imitation by utilizing natural advantages of the material. In competent hands, concrete can be made to express any mood, from the somber to

the exotic. It can be molded freely, later to freeze into an enduring monolith.

Concrete today offers possibilities undreamed of in the classic days of early Rome. Heat-insulating concrete, sound-absorbing concrete, high-strength concrete, lightweight concrete, architectural concrete, quick-hardening concrete, colored concrete, low-heat concrete—these are major developments that give the material adaptability that exceeds the vision of even a decade ago.

In the classic days of ancient Rome, concrete and its use were highly developed. One early structure, the Castle Sant' Angelo, is still in use. It was built in 138 A. D. but was by no means the first concrete structure. With the decline of the Roman Empire, the art was lost. It was England's interest in shipping that finally revealed Portland cement and

(Specifications for tennis courts, etc filed in Misc. file, under Concrete.)

81340

Mr. Taylor, 1610 Buchanan St. Washington, D.C.

332
Earley



COLOR is being used everywhere, and above is an example of the permanent adaptation of color to a home. The entrance, like the rest of the building, is constructed of concrete, made by using aggregates of selected colors which are exposed by treating the surface with acid.



61340



putas white Portland Cement Co Grant Park

COLORFUL terrazzo esplanade which forms the approach to the Adler planetarium in Chicago. Blended in nearly fifty color tones, accentuated by a shallow sheet of water flowing over them, the "cascade of the months," as the central panels are called, seems a magic carpet of color harmony. Below, designs in colored concrete by John J. Earley which add distinction to a low-cost home with pre-cast walls.

Earley Process Corp. National Press Bldg. installed by National Terrazzo Association



81340

Checkerboard - on ground - specifications from Portland Cement Assn. Chicago

gave us the marvels and mysteries of present-day building. English shippers needed a lighthouse on storm-ridden, wobbly, dangerous Eddystone Reef, in the Channel a few miles off Plymouth. The first lighthouse on Eddystone, completed in 1699, was carried away by the sea. The second, also of wood, was destroyed by fire in 1755. Then John Smeaton, an eminent engineer, was engaged to design and erect a permanent structure.

Smeaton knew that if he could find a cement that would remain hard, exposed as it would be to the weather and the elements, he could build his lighthouse of stone. That would give it the advantages of weight, freedom from repairs, and security against destruction by fire. So the construction of the third Eddystone lighthouse revolved upon a painstaking study of cementitious materials, conducted in a remarkably scientific manner considering the facilities and practices of the time.

Smeaton was able to make a cement fundamentally like the present Portland cement. The lighthouse was completed and remained for a century or more in the stormy and sea-swept location. Thus the "lost Roman art" was revived and vastly improved for this new "magic stone" became as hard as stone itself. It hardened under water or in the air and it interlaced a myriad of microscopic fingers into the face of the hardest stone, uniting the two as one. To James Aspdin, English bricklayer seeking a better mortar, goes the credit for naming this artificial stone "Portland cement" for its re-



CONCRETE has beauty as well as permanence when shaped by an artistic hand. The concrete bench and checkerboard in colors stands at the Manhattan end of the Queensborough bridge. The charm of the colorful garden of a Washington home is enhanced by the delicate hues of the concrete fountain.

Taylor

see Concrete Book further material



33-

Earley

FEW are the limitations of forms in which concrete can be cast, as evidenced by this fountain of most unusual design

at Walter Reed Hospital Washington D.C.

semblance to the building stone of the Isle of Portland.

It was Aspdin, who established the first cement plant, at Wakefield, England, in 1825. Three years later his cement was used in the Thames river tunnel. By 1850 the manufacture of Portland cement was well established in England. A concrete pipe sewer was built in 1842 and in 1850, a British patent was issued for casting solid walls of concrete in wooden forms. A small, reinforced concrete boat was built in 1850. Garden pots, tubs and tanks were made of concrete soon after. Principles for designing reinforced beams, arches and pipes were announced in 1855.

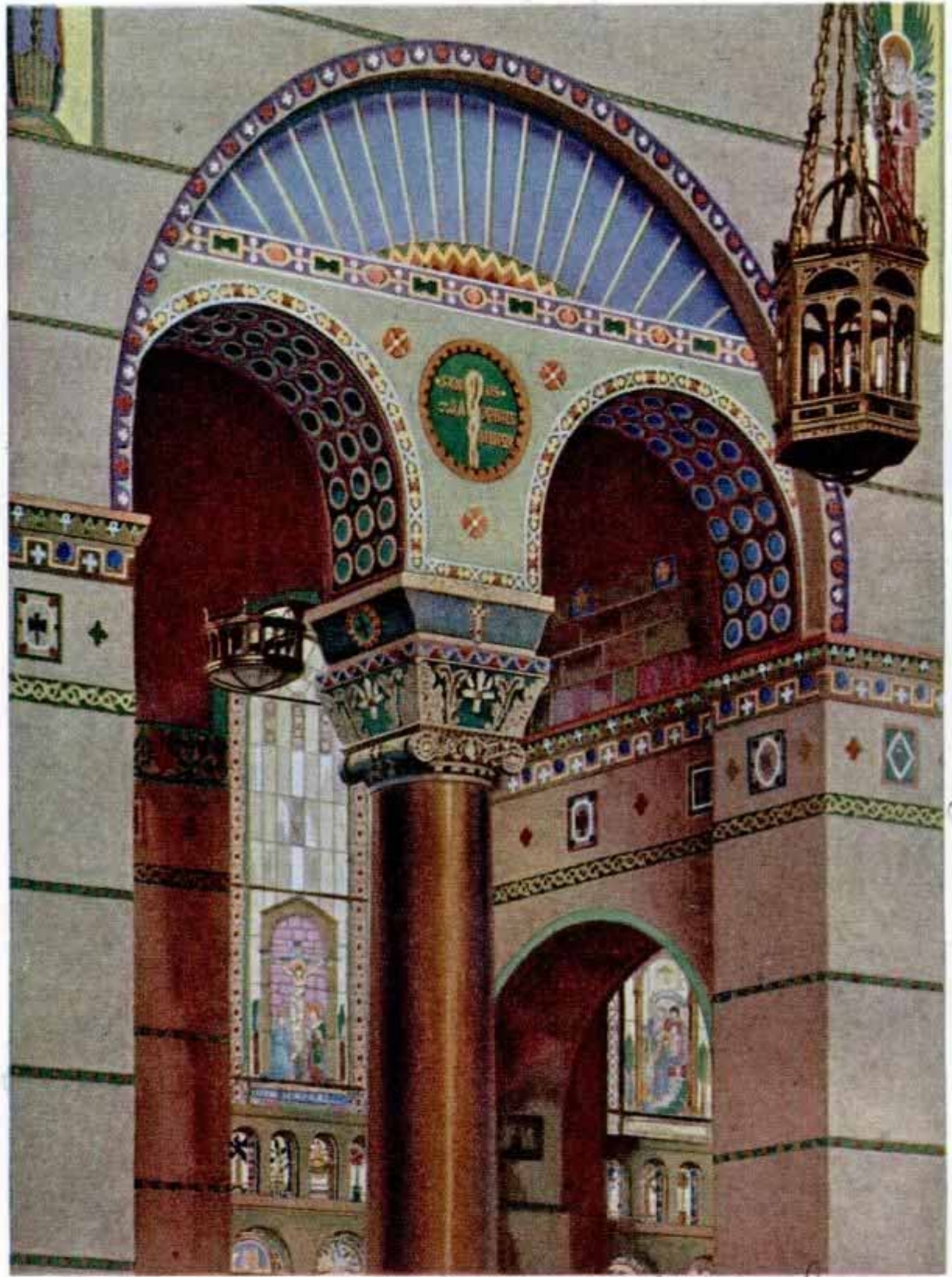
The first modern concrete road was built in 1862, at Edinburgh, Scotland,

and is still in use today. Ways to make concrete pavement and floors and walks around wells were described by Vitruvius in the first century after Christ. A patent for reinforced concrete floors was issued in 1867 and one for hollow concrete blocks for building walls was issued in the United States in 1866. In 1874 came a patent for shingles and hollow blocks followed by patents for manufacturing artificial stone by the sand mold process, and for artificial stone, in 1902. The first concrete bridge in this country was built in 1871; the first tunnel lined with concrete in 1874. But it remained for the third decade of the twentieth century to perfect beauty and wide utility; to match the pace of modern industry.

Portland cement first was made in

E1340

336

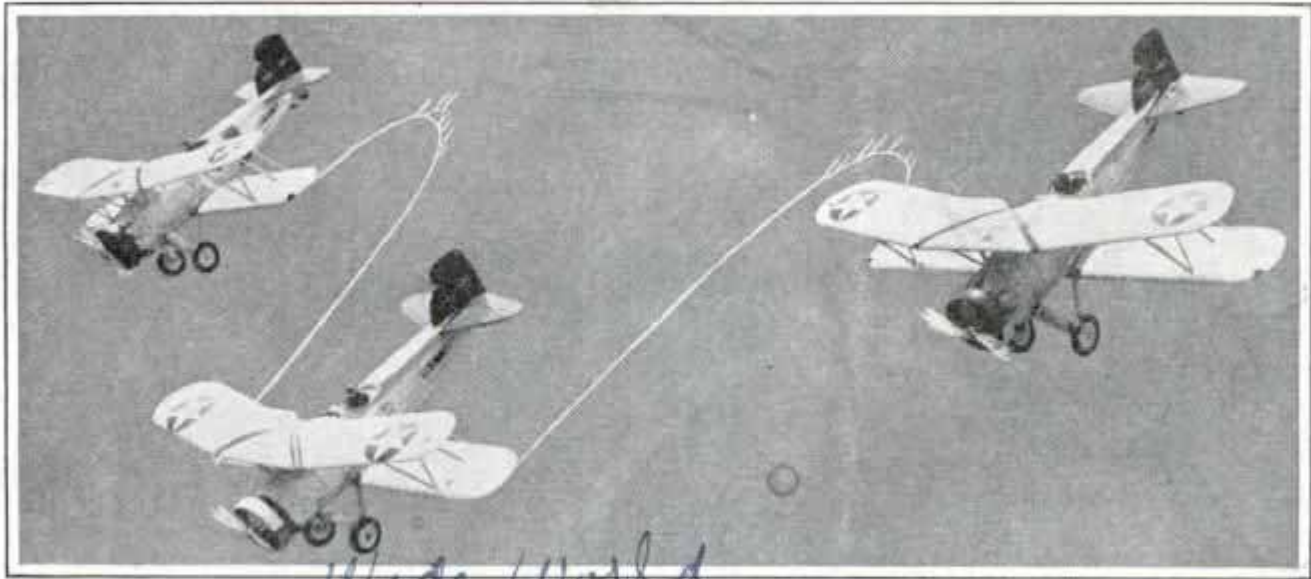


Sacred Heart, Washington

THIS church shows how concrete adapts itself to interior, as well as exterior, decoration.

America by David O. Saylor at Coplay, Penn., in 1872. Other plants followed rapidly for American builders found urgent need for this material in the expansion immediately after the Civil War. A network of canals, bridges, and then railroads, in addition to buildings, challenged manufacturers to supply the demand. It was not until 1897 that use of American cement ex- (Continued to Page 128A)

Navy Planes Tied Together Fly in Formation



Three navy planes, roped together, and flying in formation. The planes take off, fly and land while tied together and the pilots boast the rope has never been broken

Wide World

Just to demonstrate their skill, pilots of the naval reserve rope their planes together and fly in formation without so much as tightening the cord which binds the ships to each other. The planes take off, fly in V-formation and land while tied to each other with a rope which has never yet been broken.

Meter on Fishing Reel Shows Length of Your Cast

Containing a built-in meter which shows at a glance the amount of line payed out in a cast, a reel for fishermen uses any high-grade fifty-yard silk fishing line. Before reeling on a new line of a certain weight, either a cork arbor or "filler" line is used to build up the spool diameter of the empty reel to the required size for that weight, as marked on the side of the spool. This enables the meter to register accurately when the line is cast or rewound as it works both ways.



When the line breaks or a new line is put on, the meter is set to zero by turning a knurled dial. When an angler makes a thirty-yard cast and gets a strike, he knows he has twenty yards left to fight his fish. In trolling and still fishing, it is easy to determine how much line to use and the level at which the fish are biting with the aid of the measure.

Sweden is producing "safety" matches which can be struck on any dry, rough surface as well as on the box.

Report from American Engraver London

"Speaking Paper" Makes Possible a Newspaper That Talks

Newspapers and books that talk now become possibilities as the result of the invention of "speaking paper" by an Argentine engineer. It is claimed this paper will permit a newspaper to print an actual record of a public speech, concert or play which readers could reproduce in their own homes with the proper equipment. The system, called the Fotoliptofono, operates somewhat like a talking picture. A sound track is registered on a celluloid negative by means of a microphone and oscillograph. From this photographic impression a block is made from which is printed the speaking paper, a series of close parallels of jagged black lines. This paper, about the size of a single newspaper sheet, is fitted to the cylinder of a machine resembling an early phonograph in appearance and a photoelectric cell retranslates the lines into impulses which issue from a loud-speaker as speech or music.

£1508

Fernando Cueto

Patent memo. Dept. of Comm. 12/3/35

Katanaga
mill
Shakespeare

Fotoliptofone
11 April 1934
Spensha Jundelich
in Gittel dasel

g 1416

WHAT are the ODDS

Emil C. Schürer Teacher
727 Park Ave. New York City



The construction crew, left, and the dynamite workers, below, probably run less risk than you



than of being killed in a steamship, rail or airplane accident. And the chances of meeting accidental death in a mine or factory are far less than on a farm.

ONE hundred and one thousand killed, 370,000 permanently injured and 9,821,000 temporarily disabled. Such was the accident toll in 1934 on the highway, in the home and at work. What are your chances of going through this year unscathed? Just how safe are you, and what can you do to increase your safety?

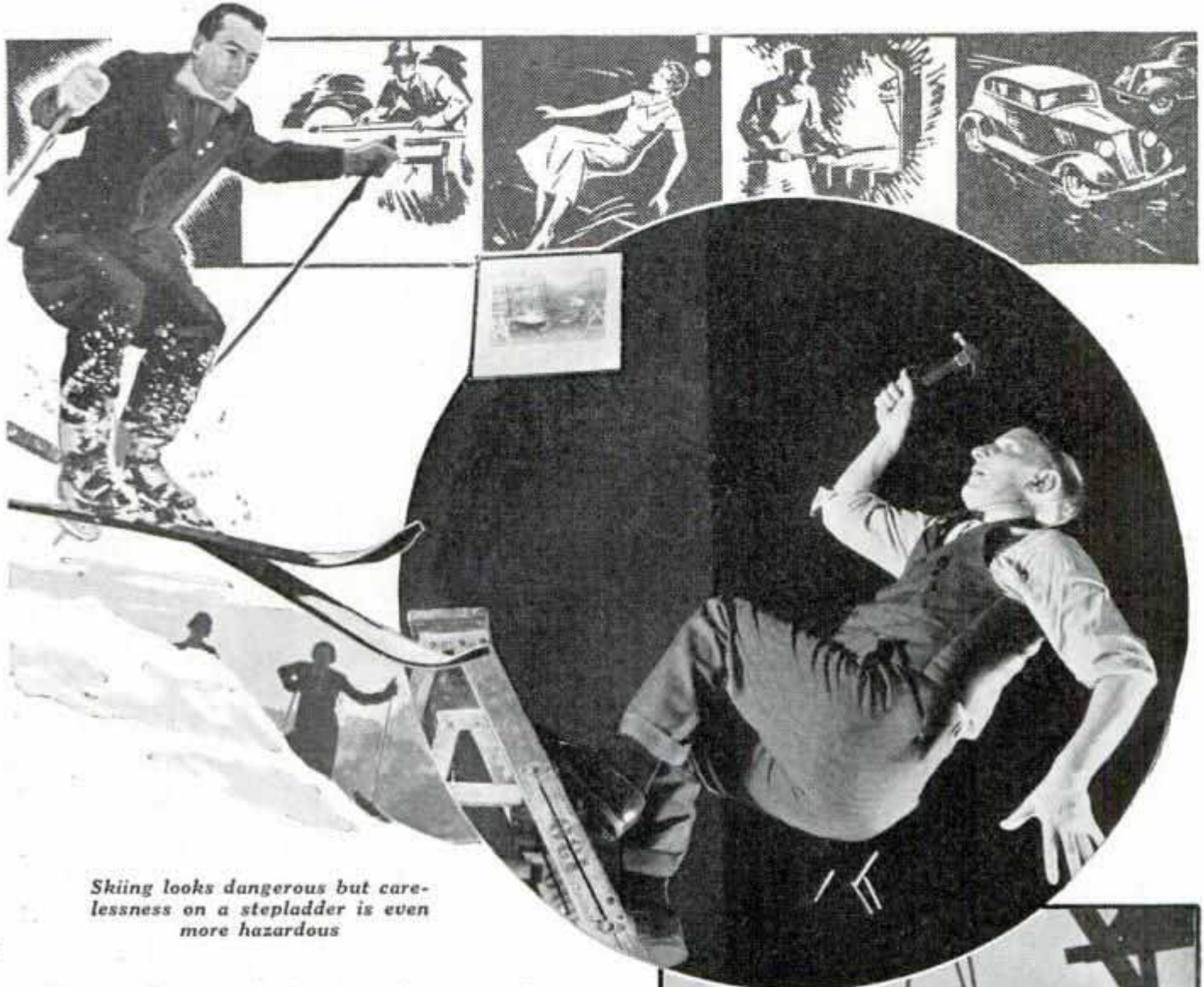
Research workers have discovered many existing popular beliefs regarding the risks you run are wrong. For example, you are safer driving a car at midnight than at seven in the evening. You run less risk driving in crowded traffic than on the open highway. There are less chances of getting killed in a bath tub by slipping on a cake of soap than by falling out of bed or slipping on a chair. There is much more chance of your drowning on a public beach

than of being killed in a steamship, rail or airplane accident. And the chances of meeting accidental death in a mine or factory are far less than on a farm.

Science has increased its efforts to safeguard you and has devised many new mechanical safety devices to help protect you in your daily life. Whether it be in the home, on the farm, at work or while traveling, an army of research workers is ever vigilant in your interest. But psychologists point out that the weak link in reducing

8 14 16

AGAINST YOU?



Skiing looks dangerous but carelessness on a stepladder is even more hazardous

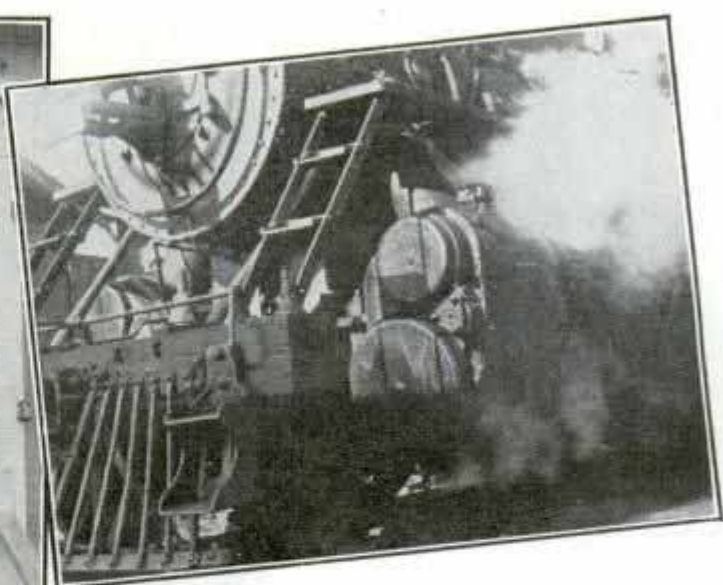
accidents is the human element—the carelessness of the human machine—you. The majority of fatal and non-fatal accidents are not caused by mechanical failures or structural defects of modern inventions and conveniences but by carelessness.

How safe are you? That depends upon what you do and where you live, but most of all on how careful you are. The geographical location of your home has something to do with it. Residents of Oklahoma, North Dakota and Rhode Island live in the three safest states from an accident standpoint, statistics show. Of course, some occupations are more hazardous than others, but such factors are small compared to the risk you run through carelessness in your everyday life. Here the odds against you are fixed. You have one chance in 1,205 of being killed outright in an acci-



These two men, trained to play safe, are taking fewer chances than you probably take daily

8/14/6



Left, a ladder is no place for a careless man. Above, driving this locomotive is safer than driving in front of it



 <p>AUTOMOBILES CLAIMED 36,000 LIVES IN 1934</p>	 <p>THE HOME CLAIMED 34,000 LIVES IN 1934</p>	 <p>RHODE ISLAND'S DEATH RATE 53 PERSONS PER 100,000</p>
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From the standpoint of accidental falls, your bedroom is the most dangerous place in your home

dent, one chance in 331 of being permanently disabled and one chance in twelve of receiving less serious injury.

Motor accidents were responsible for the greatest number of accidental deaths in 1934, taking a toll of 36,000 lives. A close second were accidental deaths in the home, claiming 34,500 victims. Accidental deaths in sports were third with 17,500 deaths while accidents at work were fourth with 16,000 deaths.

Although automotive engineers have de-

vised many new safety factors, such as no-draft ventilation for clearer, safer vision by keeping the inside of the windshield and windows free from fogging in cold weather and rain, and improved hydraulic brakes for safer, smoother, straight line stops, due to the human factor of carelessness, you still have about one chance in 3,388 of being killed outright in an automobile accident some time this year. The highest risk is on the open highway where over thirty-eight per cent of automobile deaths occur. Your second greatest risk is between street intersections where twenty-three per cent of accidental automobile deaths take place, and the most dangerous time for you to drive is between 7:00 and 9:00 p.m.

If you walk, you may be one of the 16,200 pedestrian victims of others driving. Here is one of the most outstanding examples of human carelessness for, in a study of one month's pedestrian accidents in Chicago, ninety-two per cent of all the cars which struck the pedestrians at intersections were going straight ahead at the time and only eight per cent were

five miles an hour will be required for the sixteen-hour run. Regular time for present Chicago-Denver trains is nearly twenty-six hours. The two 1,200-horsepower Diesel engines are housed in separate cars, and can be operated jointly, or either motor separately, from the front cab, which is mounted high and slightly behind the rounded nose. Power cars are of Cor-ten, a chrome alloy steel, and the other ten cars—three sleepers, a sleeper-observation car, dining car, two coaches and three cars for baggage, mail and express—are of aluminum alloy. Similar conventional trains weigh about 1,200 tons with the locomotive; the streamliner will weigh only 600 tons. Of standard outside dimensions, the cars will be five inches wider inside. Twin trains will leave Denver and Chicago in the late afternoon and arrive at the other terminals the next morning.

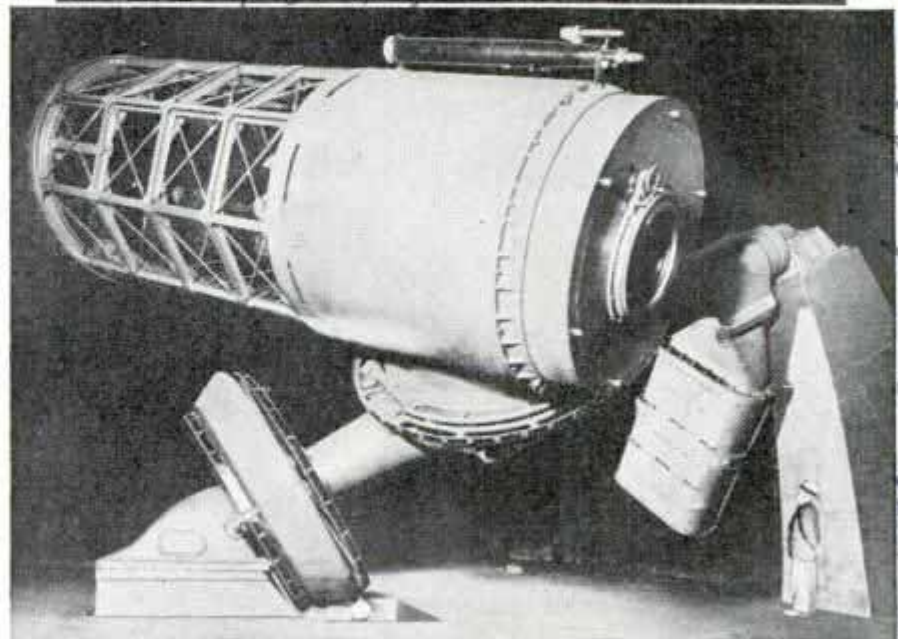
Special Snow-Bucking Auto Carries the Mail

Designed with tractorlike wheels, a special automobile carries the mail between Idaho Falls and Bone, Idaho, regardless of weather conditions. The car bucks snowdrifts or climbs on top of them, averaging fifteen miles an hour.



Extra rear wheels and flexible track enable this car to conquer deep snowdrifts

Forty-Ton 'Eye' to Penetrate Many of the Secrets of Space



Eighty-two-inch reflector telescope for McDonald observatory. Compare its size with figure of man at the right

Weighing more than forty tons, the eighty-two-inch reflector telescope for the McDonald observatory at Mt. Locke, Tex., was completed recently after months of tedious work. Despite its great size and enormous weight, this giant eye, which is expected to penetrate many of the secrets of outer space, has a tolerance of only one forty-thousandth of an inch. By using film sensitive to infrared rays, photographs of the heavens taken with the aid of such telescopes reveal pictures of stars that the human eye may never have seen.

"Brown Spot" Fungus in Grass Is Cured by Huge Fans

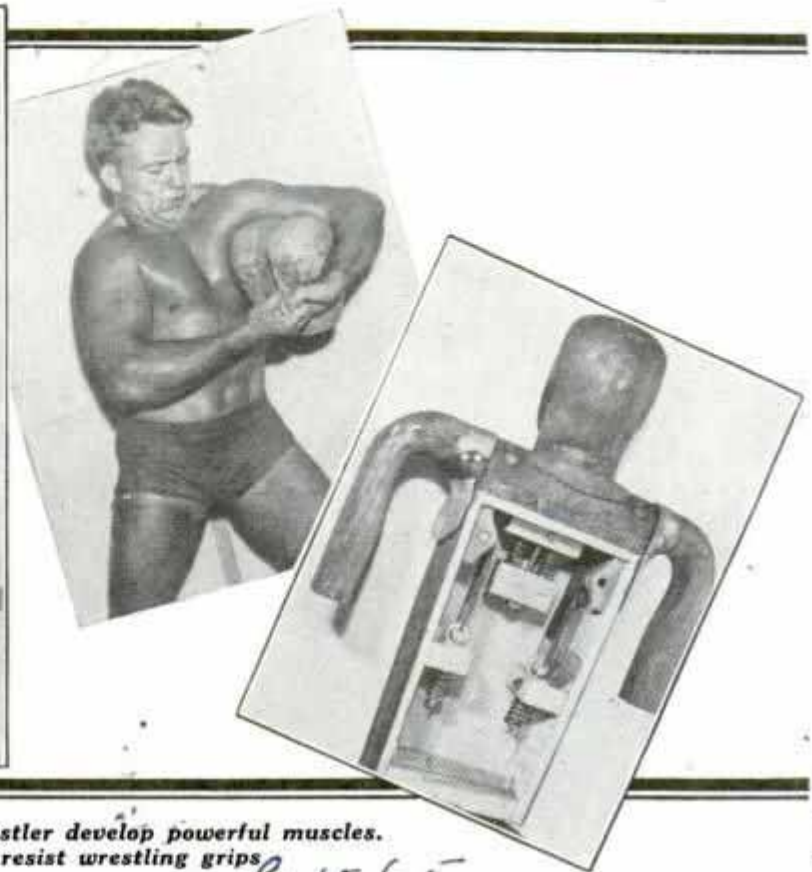
One way to check "brown spot," the fungus disease that kills grass, is to fan it. The fungus thrives in hot, damp weather, but wind checks its growth. In experiments by the department of agriculture giant fans resembling airplane propellers kept air circulating over the turf and eliminated the brown patch, apparently by raising the evaporating power of the air so that fungus could not grow. Brown patch might be treated by cutting ventilating lanes for air through dense vegetation and encouraging air circulation.

Alma... suggest... Chicago... Pullman... Chicago

Washington... Carnegie... D.C.

Carrier... D.T. Rumberg... Mrs. John Monteith, Jr.

Robot Helps Wrestler Strengthen His Muscles



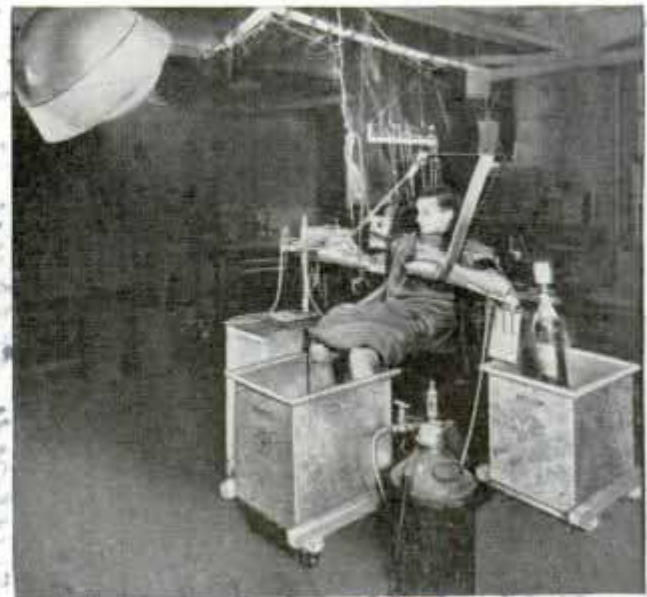
Two views showing how robot helps wrestler develop powerful muscles. Right, dummy with springs to resist wrestling grips

Designed to develop powerful muscles so necessary to the wrestler, a robot training partner is used by Everett Marshall. The contraption is made of wood with large concealed springs to resist the wrestling holds clamped on it in training. The dummy has a head and almost a complete body of wood, with strong springs attached to stirrups in which the feet are placed. The stirrup arrangement is intended to give power to the leg muscles. When the wrestler grips the dummy under the arms and back of the neck to set the full nelson hold, the springs resist. At first, Marshall could hardly bend the dummy's head, but constant training has so strengthened his muscles that now he can force the head far over, exerting a pressure that few wrestlers can withstand. Other wrestlers frequently use mechanical devices to build up their muscles for the application of some favorite hold.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Nerve-Tester Seeks to Learn Why You Are High Strung

How do you react when frightened by a sudden noise or danger? Do you feel shivers running down your spine? Why are you more high strung than your brother? These questions are being studied in a



Testing responses of a man's sympathetic nervous system to physical and mental stimuli

Developed by 247 S. High St. Columbus, Ohio. Bittly Sandow

Developed by 247 S. High St. Columbus, Ohio. Bittly Sandow

Everett Marshall
Columbus, Ohio

Swene Service 12/12/33

London hospital. There scientists record man's reaction to pinpricks, to fear produced by unexpected noises or threats, to mental calculations and to deep breathing. Activities of the involuntary nervous system differ in individuals, and so their emotional and physical reactions to stimuli vary—the fast-beating heart, "goose flesh," digestive upsets, and similar bodily processes which occur without conscious effort. The tests center on measurement of the reactions of sympathetic nerves as seen in changes of the size of blood vessels. A pneumatic system connects the finger ends of the subject with a mirror arrangement and the minute changes in his finger blood vessels are recorded photographically.

Shower Bath for Army Camp Provides Sun Bath Too

Water may be scarce in Ethiopia, but Italian soldiers in one army camp managed to pipe enough for an open air show-bath. They mounted the shower on a stand and pumped water into four containers on top—apparently using discarded oil cans for the "tank."

W. L. C. Scharnhorst Milwaukee Chiropractor

£ 15 48.
Snarls in Tackle Removed by Leader Straightener



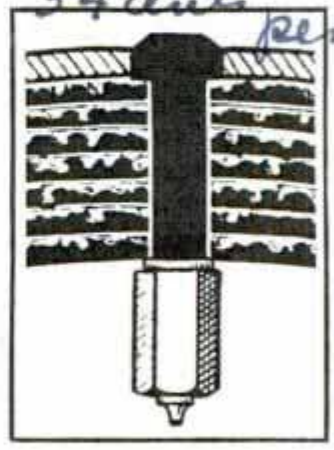
© Milwaukee Journal
Straightening a tangled gut leader with latest aid to keeping fisherman's temper unruffled

King Manufacturing Co. Manitowish

Snarls in the gut leaders of fishing tackle can be removed by a special straightener designed to keep the temper of the trout fisherman unruffled. It is made of aluminum, with a rubberized material inside, and replaces the familiar soaking pad.

£ 15 58
Spring Nut Permits Greasing Without Being Loosened

Lubricant can be forced between spring leaves without loosening a new type nut designed for Ford and Lincoln-Zephyr automobiles. The nut replaces the old type nut on the spring center bolt, installation being simple.



Lubricant forced into the center of the spring through the nut will expand equally into each leaf.

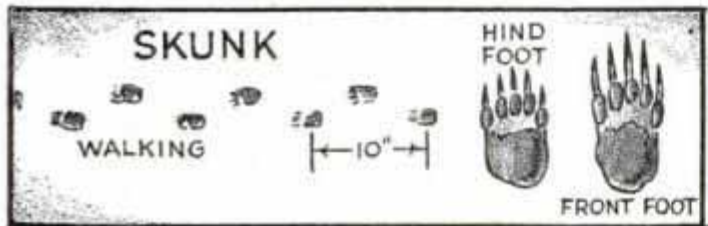


W. L. C.
If you want a hot shower in this army camp, just let the Ethiopian sun shine on the water tank

Ford and Lincoln Zephyr

Walker-Steninger

TRAPPER



humane. Also available are leg-hold traps designed to hold fur bearers without any pain. When the trap is sprung, the base becomes detached from the bow which, through pressure, holds the animal in a chain noose positive in action.

The skunk usually is found in a hole on a hillside, in a rocky ledge or next to a hedgerow. On the farm it may make a den under a building. The holes are free of cobwebs, have a light skunk odor and often have a few hairs around the entrance. A blind set at the entrance to a den will get them. Simply dig out a place in the entrance in which to place the trap and cover lightly with dead grass or sift sand over the trap, being careful not to get it under the trigger. Draw the chain of the trap back and fasten to a stake or tree. Visit the trap early in the



Top, raccoon and hollow tree trap likely to catch it. Center, skunk and raccoon tracks. Below, muskrat pelts on stretchers and two sets for muskrats

6/4/97



you may see a hole in the ice with a muskrat feed bed below. Set a trap on this bed, then cover the hole again. If you use bait, most any vegetable is good. Some of the best pelts are not prime until midwinter or even around March first.

The raccoon is not hard to catch, and "wears" a valuable fur coat which remains in good condition until late

morning because skunks are night prowlers. If you can't find a den, make baited sets by placing traps around old stone walls, old buildings in the fields, or at the ends of hollow logs. For bait use pieces of rabbit, the entrails of fowl or pieces of fish with plenty of odor.

Many a marsh or stream can be made to yield muskrats. Muskrats along streams and even in lakes often live in dens in the bank. To trap them you make sets different from those in marshes and ponds where the animals build beehive-shaped houses of mud and vegetation.

You will have to wear boots to make den sets. If the den entrance is under water or about at water level, place the trap back from the entrance where the animal will step when it enters the den. Fasten the chain to a stake set well out in deeper water or tie a heavy rock to the chain. When the muskrat is caught it will drown itself quickly. If you find a trail leading from the water to a den in the bank, place a trap in three or four inches of water. Use a stake to anchor the trap. Just a blind set will usually catch them on a trail. If you see a log or old snag in the pond or lake, and find muskrat signs, cut a notch in the log to hold your trap just under water. Fasten the chain to the log.

When the ice is breaking up watch for small piles of aquatic plants and roots on the ice. Pull this vegetation away and



Top, muskrat trapper with cased pelts. Below, a good mink set, an opossum and diagram showing how water set for fox is made in open water

spring. It dens up in hollow trees as a rule. Several sets can be made for it and water sets are very good. Look for coon tracks along a stream. If the animal has crossed in a certain place, it may cross there again. Fasten a piece of bright tin to the pan of the trap and set it in about three inches of water near the bank. No bait is needed but a touch of scent on the

81419

81542

Nonskid Bottom in Tub Reduces Hazard

bank is good. A good scent can be made by taking a pint of vile-smelling fish oil and adding a half teaspoonful of anise oil. Mr. Raccoon is inquisitive. He will reach for that bright thing in the water and usually get caught. Or watch for a tree, log or rock at the edge of a brook and in such a position that a raccoon must step into the shallow water to get around. Place the trap under water where it walks.

Another water set that has produced not only raccoons but also minks is placed at each end of a log lying across a small stream. You can figure a coon will walk that log, so place both traps under water.

For den sets in the woods, put your traps in holes in logs, or hollow stumps, and in holes at the bases of trees. Examine the bases of big trees for claw marks. If you see a lot there probably is a raccoon den in the tree. Set your trap on the side that has the most claw marks and place it about fifteen or eighteen inches from the base of the tree because the coon will take a short jump from the trunk when he goes to the ground. Some place two traps in this location. The raccoon likes the water, and will "snoop" in many natural holes in logs, snags and stumps, so a hole under a stump makes a good place for a trap.

The mink likes the water and follows creeks and rivers to find food. While traveling it explores everything. You can use different kinds of sets. Find a steep bank on a creek where the water is running shallow, then place a piece of meat on a stick so it hangs over the water. The trap is placed beneath the bait. The mink will go into the shallow water to reach the bait and thus get into the trap. Fasten your trap to a stake so the animal will drown.

Sets for minks also can be placed in piles of driftwood or in hollow snags along a stream. When setting a trap in a hollow log put the bait beyond the trap and cover the latter with decayed wood. In some places it will be advisable to fasten your trap to a drag made of a chunk of a small green tree. Don't overlook the possibility of sets around bridges. Tiny islands in a stream also offer good sets. Place traps in the water at the edge of these little spits of land with bait above them. Your raccoon sets at the ends of logs in water also are good for mink.

(Continued to page 120A)



Corrugations on bottom of tub reduce danger of slipping while stepping in or out

Slipping on the bottom of the bath tub causes thousands of accidents every year. To reduce this hazard a safety tub with a nonskid bottom is ready for the market. Made of formed metal instead of cast iron, the tub has a bottom with a wave-like tread. The tub weighs only one-third as much as cast-iron tubs.

81549

Oilstone with Tool Holder Makes Sharpening Easy

Useful alike to skilled workman and amateur, an automatic oilstone with a tool holder makes sharpening and honing easy. The tool is held at the proper angle to maintain a bevel edge, such as is necessary on many wood working tools. Any kind of straight-edged tool of the chisel type can be inserted in the holder. The machine has an aluminum

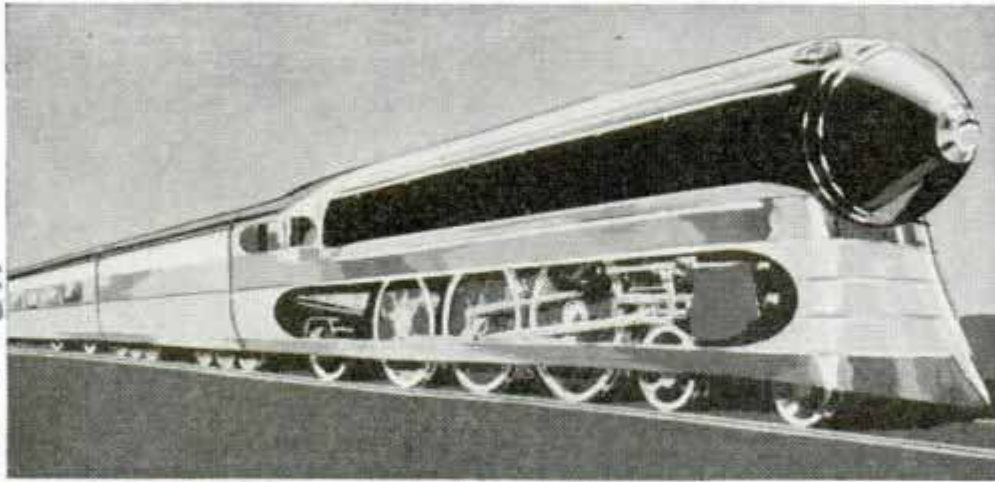


base in which is placed a round combination oilstone, coarse on one side for fast grinding and very fine on the other for finishing or honing. The tool holder rides on a steel table which is adjustable.

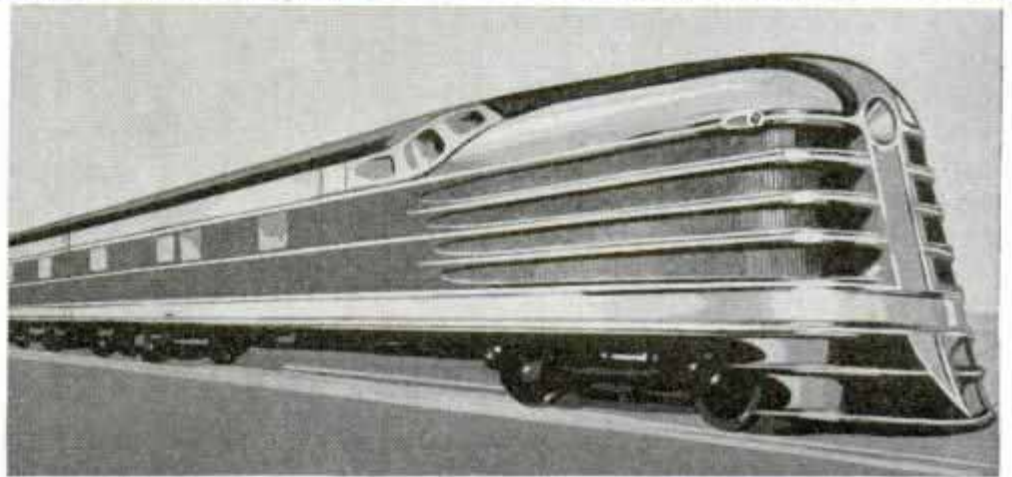
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Locomotive Like Bullet Styled for Tomorrow



Left, practical design for streamline steam locomotive allowing ready access to wheels for inspection and maintenance and preserving "personality" of iron horse



Right, sketch of a streamline Diesel locomotive demonstrating how engines can be mounted in front of engineer's cab without obstructing his view ahead

What is the next step in the evolution of the streamline train? A suggestion of tomorrow's styles is presented by Otto Kuhler, industrial engineer, in sketches of a steam locomotive with bullet-shaped boiler and open-side shrouding, and a Diesel-electric car with its power plant mounted ahead of the engineer's cab. Mr. Kuhler believes many streamline engines today are freaks, badly conceived in outline, and he prefers to retain the "personality" of the old iron horse in its new dress. Trains must be re-styled rather for public appeal than for aerodynamic reasons, he says, but the ultimate in streamlining is impractical for locomotives because of the need for easy access for inspection and maintenance during short stops. Thus he leaves the "skirt" open at the side. Germany's "Flying Hamburger" locomotive is, Mr. Kuhler thinks, the "most perfect shape" but its underslung bullet nose would not meet conditions in this country, where the traditional "cowcatcher" is retained on the latest streamstyled types to shove stalled

obstacles off the track. Technical evolution of steam locomotives has all but streamlined them, for the high balloon stack of the 1860 engine would have thwarted any effort to streamline by shrouding, while the modern steam engine with its low overhead projections is readily adapted to thorough streamstyling. Five requirements for good streamline designing are 1, easy identification for public appeal and for vision at crossings; 2, visibility radius of almost 270 degrees for the engineer; 3, sturdy construction; 4, good aerodynamics, and 5, pleasing appearance. In 1935, fifteen new steam engines were built, more or less streamstyled, three new Diesel, and twelve lightweight Diesel-electric articulated trains.

81502

Loud Noise to Replace Machine in Shaking Up Paper

Noise may soon do the work of mechanical agitators in shaking up the tiny fibers of cellulose used in making paper. This

1495 from Railway Age 11/20/30
 Liberty National Club
 136

development, as yet in the experimental stage, was revealed at a recent meeting of the Acoustical Society of America. At present paper goes through a process known as "beating" in which a mechanical flail is used on the pulp to prepare it for sheeting, mangling the fibers so they will mat better and forming a cellulose and water gel in the pulp to act as a strengthening glue. The desired gel effect can be produced by irradiating a water and cellulose solution with a high intensity sound, thus shaking up the molecules. The pulp is treated in a tub the bottom of which is, in effect, a large unpolarized telephone receiver. In tests, paper made in this way did not have the strength of that made by mechanical agitation, but it is believed that an improved method of applying the sound may give the process a definite commercial value.

Scene Service. 12/17/35

S. H. Warren Company Cumberland Hills, Maine
Plants on Hillside Are Watered Underground by High Pressure

81472



Conf. Paris Jimmy Boy 2' Portland, Me.
Conf. Calkins, Portland, Me.
 Forcing water under high pressure into the ground above spot where plants are growing on hillside

81491
Bookmark Holds the Line with Slide Index

Made of metal and attractively decorated, a new bookmark has a sliding index which holds the paragraph or the exact line where the reader stopped. A clip on the upper end holds the mark on the proper page.

1946 Washington D.C.



Handy mother holds page and line for reader

Watering plants on a hillside is a problem that has been solved by the Oregon highway department. The water is introduced into the ground above the plants under a pressure of sixty pounds. This system forces the water downward to the plant roots and prevents evaporation.

81553
Chemical Stick Kindles Fires

Made from the waste products of lumber mills and oil wells, a wood fiber stick impregnated with chemicals burns for ten minutes when ignited and is handy for the home owner or camper in kindling fires. It is waterproofed so it will burn when damp and will even continue to blaze when held under a stream of water.

Arnold Model Works

Handel's typewriter Bldg. 601 Main St. Portland, Me.

84 Boulevard Lavoisier, Paris You Can Fold This Bicycle and Carry It in a Bag



© Deltus

Folding bicycle is carried compactly in a bag and can be assembled speedily for a ride

Now you can pack up your bicycle in the old kit bag and go for a walk. A French inventor has designed a bicycle that can be taken apart readily and folded compactly. Of regulation size, it is carried in a small handbag and is ready for quick assembly when the bicyclist decides to ride.

Electric Humidifier for Home Has No Moving Parts

Containing no moving parts, wicks or valves, an electric humidifier for the home or office operates on alternating or direct current and is adjustable from seventy-



five to 275 watts, according to the rate of evaporation desired. The water container holds more than a gallon and is filled through a hole in the bottom which is closed with the finger when placing the container in the base. The water is air locked in the container and released automatically and an automatic switch shuts off the humidifier when the water is exhausted. The water climbs in the base

ing the container in the base. The water is air locked in the container and released automatically and an automatic switch shuts off the humidifier when the water is exhausted. The water climbs in the base

so it is converted instantly into vapor, a knob on an agitator raising or lowering the agitator in a constant water level to control the rate of evaporation. The water in the container itself is not heated, so operation is economical.

Oil Spray Protects Idle Motors from Corrosion in Tropics

"Cold corrosion" of automotive engines, long a trouble-maker in the tropics where humidity is high, has been conquered by the development of a "slushing compound" which protects metal against rusting in a humidity of ninety per cent and a temperature of 100 degrees Fahrenheit. Under high humidity and temperature conditions rust has attacked the cylinder bores of idle engines, and aircraft motors in the tropic regions have been especially susceptible to damage because of precision of motor parts and special materials used. The slushing compound is a sprayable brown oil which forms a jellylike film.

Baby Locomotive Dispenses Peanuts and Chestnuts

Vendors of chestnuts and peanuts are among the identifying sights of the streets of Paris, and one ambitious street hawker



This baby locomotive attracts customers to a Paris vendor of hot chestnuts and peanuts

attracts trade with a cart constructed like a baby locomotive. From his steaming vehicle he dispenses his wares piping hot.

Handwritten notes in blue ink:
- Top left: "84 Boulevard Lavoisier, Paris, France"
- Top right: "Director, Detroit Chemical Laboratory"
- Middle left: "Mr. Lavoisier, Paris, France"
- Middle right: "Edelmann Company"
- Bottom left: "Edelmann Company"
- Bottom right: "Edelmann Company"

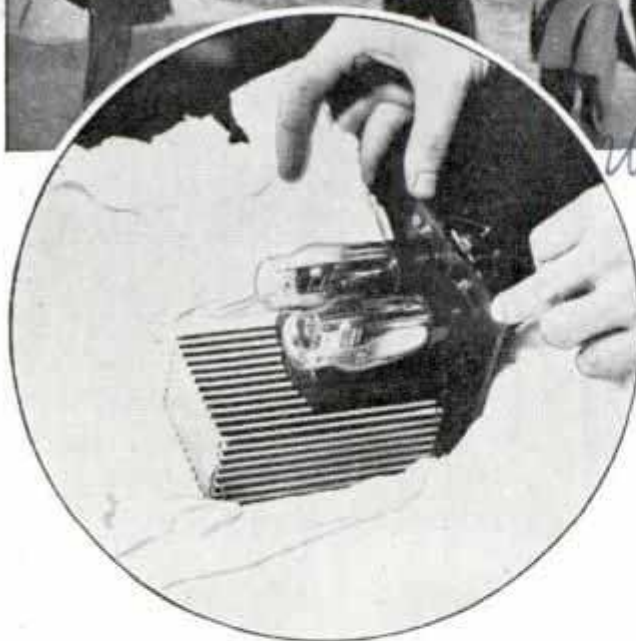
Midget Balloons Radio Stratosphere Secrets Automatic Transmitter Reports Pressure and Temperature

Four small free balloons, carrying an automatic radio, recently conquered the stratosphere in a test flight arranged at Harvard University. The balloons, which were filled with hydrogen gas, reached the stratosphere in one hour, then continued to rise for thirty minutes more. The radio transmitter flashed reports at intervals on air pressure and temperature until the signals stopped when the balloons reached an

Cambridge, Mass



at Blue Hill Weather Observatory, Milton, Mass



Top, start of flight. Circle, wrapping radio transmitter to protect it from cold

estimated height of ten miles. At that point, the temperature was eighty degrees below zero, Fahrenheit. The radio is a newly developed ten-meter automatic transmitter. On the test flight, the set was wrapped in insulating material to protect the batteries from the extreme cold.

Pipe Vise Has Slot to Guide Saw and Insure a Square Cut

£1580

Containing a slot to guide the saw and insure a square cut, a pipe vise consisting of a base and interchangeable units to accommodate standard sizes of copper, brass or plated tubing is a valuable aid in doing plumbing work. The saw blade is held in close guides so there is no chance for a wavy cut and the vise holds the pipe so it cannot break off or form a lip at completion of the cut. It is claimed the tubing cannot be forced out of round in the vise. The vise also makes it possible to saw off very short lengths of pipe.



Tremont Huggins & Co. 55 - Beacon St. Boston

pend - \$15.00 per - 100 - 150 - 200 - 250 - 300 - 350 - 400 - 450 - 500 - 550 - 600 - 650 - 700 - 750 - 800 - 850 - 900 - 950 - 1000

61266

Mr. Charles C. ...
1151 S. Broadway
Los Angeles, Calif.

WONDERS of the



Above, making model of field for jousting, first step in reproducing old English scene in movies. Left, scenic engineer sketching set from blueprints

form of sets, from small indoor rooms to gigantic out-of-doors extravaganzas, but upon their shoulders falls the great mass of detail required to produce tens of thousands of black-and-white drawings, finished sketches in

THE scenic engineer has the world's biggest art job. He decides what settings shall appear in a motion picture, with what colors they will express the desired mood and how each set must be decorated to lend good taste to the particular scene.

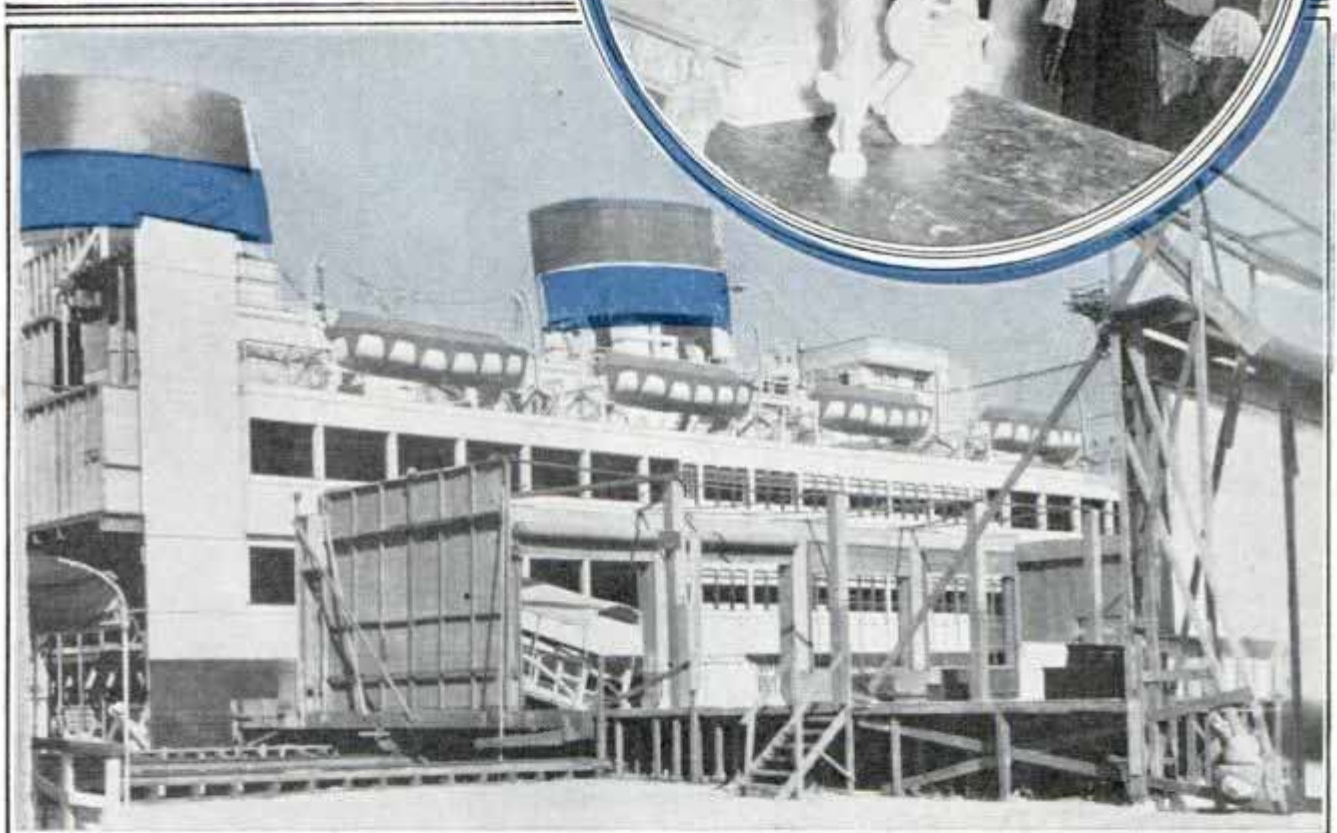
Seven Hollywood scenic engineers, known in the studios as art directors, create more than 10,000 sets for pictures produced each year by the seven major studios. These wizards of pencil and brush not only create the ideas expressed in the

color, blueprints and assembly drawings, designs for decorations to be executed in wood, plaster and metal. Besides there are hundreds of models, complete to furniture and miniature actors, which are made for important scenes.

The materials of the scenic engineer are wood, cloth and paint. He can make ordinary cloth tacked over flats and arranged like the walls of a room look like a hovel or a palace. He is a true magician of the movies who surrounds actors and actresses

SCENIC *Engineers*

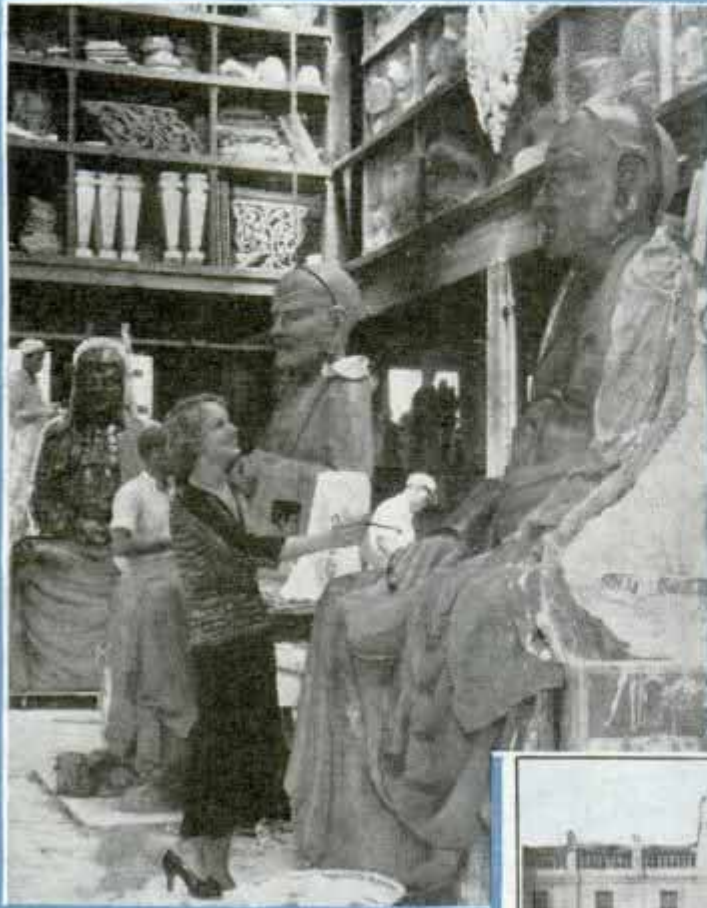
with "mood" in form and color. His work fixes a picture as dramatic, sophisticated or comedy before a word is spoken. From a story outline which gives the essential features of the forthcoming production—time, locale, action, types of players and setting—the scenic engineer gets a rough idea of how many sets will be required and approximately what they must look like. Then he



Set decorations cast in plaster, and 250-foot section of ocean liner used in many pictures. The "ship" never sails; instead, the dock moves away from it

Model room of Hollywood studio which houses the models from which movie sets have been constructed. Models prevent many mistakes in building the full-size sets

swings into action. When the outline of "Ivanhoe," whose action is laid in medieval England, reached Van Nest Polglase, scenic engineer for RKO-Radio pictures, he assigned an artist to prepare rough pencil drawings of all settings. Other artists began to design small decorations, such as shields, armor and tents for a large outdoor set. Four sketch men and



six draftsmen, following blueprints, built a model of an English jousting field. The location manager found near Hollywood a setting virtually duplicating the English valley where the story unfolds.

In a few days the model, representing a great scene 500 feet long by 300 feet wide, was complete, including miniature figures of armored knights on horses in the act of jousting and twenty-eight tents and pavilions, cut from cardboard and whittled from single blocks of wood in faithful detail. The director viewed the scene as the cameras would see it, even to a reproduction of distant hills, painted on cardboard and erected around the edge of the model. This background of low mountains gave the "feeling" of English countryside so important to the mood of the picture.

The scenic engineer takes advantage of every resource to provide the desired tone and mood. Whether indoors or out, he first must consider lighting, then camera angles, finally authenticity of materials

to be used, and color. For gay, sophisticated pictures he provides settings light in color; dark sets help deepen the drama of a murder mystery. Where possible, he designs outdoor sets to permit cameras to shoot east or west across a back light. Indoors, under batteries of brilliant lights, cameras may be pointed in any direction so long as adequate illumination is provided. Most indoor sets are colored in "off whites," light tans, blue, green and salmon which approach but do not quite reach a pure white. On these, sharply defined shadows may be created easily. Dark walls, such as red and brown, are avoided, because shadows on those colors turn muddy.



Historical statues and decorative pieces used in movies, and a setting produced in miniature

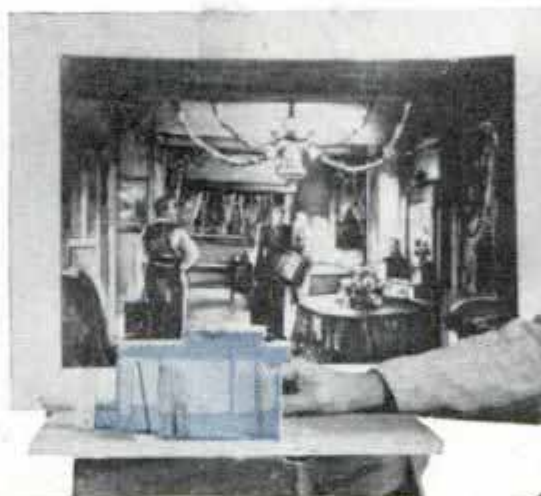
Many of the most beautiful indoor sets are made of nothing more than stock flats, as the oblong wood-and-canvas frames are known, with dyed cloth tacked over them. Such walls are assembled in a few minutes, windows and doors being placed according to the need for lighting and entrances. Cloth photographs like either painted surface or paper, according to the lighting, hence a room or an entire house can be built at little cost.

When the set is complete, the scenic engineer examines the walls for wrinkles and color, studies plaster, wood and metal

E/266

decorations to make sure they are artistically correct and compares the placement of furniture with the tiny pieces on the model. Then he looks through a tiny collapsible camera from positions where cameras are likely to be set. Framed within the squares of the miniature he sees the set exactly as it will be revealed to the movie camera.

Not long ago an art



Top, Ed Willis, M-G-M property department head, studying model and scale drawing of set. Below, collection of models

director carrying with him a model walked onto a set representing a military headquarters. Everything was found in place except one essential painting showing a general in full military dress. Had it not been for his intimate study of both the large set and the tiny model after which it had been patterned, several scenes would have been filmed with the picture missing and a number of costly retakes would have been required.

"Models," explained Polglase, "give both directors and the scenic engineer opportunity to visualize sets before cameras begin to roll, show us exactly how a finished scene will look even before the set is constructed."

The scenic engineer and his staff not only draw black-and-white sketches of all

sets, but on more important pictures produce colored paintings of both sets and costumes, sending detailed information on set construction, design, period, treatment and color to the mill, paint shop, property department, drapery department and the costumer. Meanwhile, the director studies the models, altering the tiny walls at will. Getting several points of view

is important, for the director thus visualizes height, width and depth and learns without costly waste of time from which angles he can obtain the most effective photography.

Hollywood's scenic engineers are artists, engineers and technical encyclopedias rolled into one. One engineer, reading the preliminary story outline, found the writer called for a full-size windjammer to be sailing on a pool inside the studio walls. Three weeks later, with the aid of carpenters who took apart an ancient sailing vessel then rotting in the harbor at near-by Wilmington, he had transported the full-rigged schooner twenty-five miles to Hollywood. There in a huge tank, which had been deepened meantime, he reassembled

(Continued to page 130A)

6/15/35

Mayan 'Snail Tower' Ruins Are Still a Riddle



Reconstruction of unique circular tower of this Mayan ruin baffles archaeologists; because of its inner winding staircase it is called the "Caracol" or "Snail-Shell"

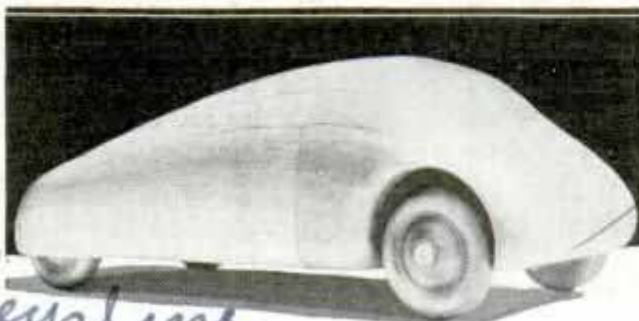
Sunnie Service 12/11/35

For six years, American archaeologists have been reconstructing the famed "Caracol" or snail-shell tower of the ancient Mayans at Chichen Itza in Yucatan, yet now ~~that the restoration work is ended~~ they admit the purpose of the building, its date and the architecture of its tower are as much a mystery as ever. Mayan architects rarely designed circular structures, and the central stone tower with its inner stairway winding like the shell of a snail—hence its Spanish name, "Caracol"—is unique among ruins thus far discovered. The upper story of the tower has been left unfinished by the archaeologists of Carnegie Institution at Washington, who are

uncertain of its original plan. Students of Mayan culture have suggested the building was used as an astronomical observatory, a watch tower or a temple to Kul-kulcan, the great feathered serpent deity, but there is no agreement among the experts. The tower contained a passageway oriented directly west, perhaps for astronomical observation mingled with religious worship—Mayan priests were also astronomers. Supporting the watch tower theory is the fact that the building stands on a high table with unobstructed view of the country for miles. A dignified stone terrace surrounds the tower, with wide stone steps leading to it.

6/15/45

Whale Shape Called Best Streamline Design for Auto



Model of the whale-shaped car which is recommended as best form of streamlining

Designing automobiles with a shape like a whale, instead of like a drop of liquid, is proposed by Professor Elliott G. Reid, Stanford University, as the best form of streamlining. A model of such a car has been constructed by the professor, who says the passengers would ride in the nose and the engine would be housed in the "tail." All four wheels might be enclosed and a sheet of metal would cover the un-

Keystone

Aerodynamics author
Polo Alto, Ca

Four-Wheel Steer and Drive Helps Truck in Tough Spots

dergear, reducing wind resistance. Professor Reid suggested the whale-shaped car after extensive tests in the university's wind tunnel. He says that the power required to run an ordinary automobile of today at eighty-five miles per hour would move a thoroughly streamline job of the same weight at a 125-mile pace.



Even with one wheel in the air, power is delivered to three other wheels and with front and rear steering the truck can maneuver out of trouble

Ship's Hull Is Built of Aluminum for Test

To determine whether aluminum can withstand the buffeting and corrosive attack of ocean waves, the "Alumette," built of aluminum alloy, has been launched for a two-year test at sea. It was designed as a cross-section of a 100-foot boat. Its metal hull weighs only a third



Two-year ocean test of this aluminum section of ship will determine durability of light metal

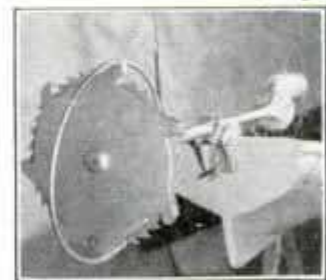
as much as a steel hull of comparable size. The demonstration is sponsored by aluminum manufacturers with the purpose of designing a lightweight hull that will permit greater speed with equal strength.

Cellulose sponges which both hold and absorb water are now being produced

Four-wheel steering and four-wheel drive can take the latest product of a Wisconsin truck manufacturer out of the toughest places. The six-ton truck-tractor is sixteen feet long, and can turn around in twenty-four feet by means of its air-powered steering of both front and rear wheels. Power is delivered to each wheel, and with full floating axles and a flexible frame the truck can maneuver forward or backward in the most difficult positions. It has a six-cylinder, 128-horsepower motor with ten forward and two reverse speeds, capable of forty miles an hour.

Grass Cutter to Mount on Boat Is Power-Driven

Operated by an electric motor taking current from a storage battery, a marine grass cutter is available for mounting on any boat. The cutter is adjustable for the depth at which it is desired to cut away water plants. The equipment makes easy the job of clearing the water of plant life which interferes with operation of boats.



6/15 41 Ashkosh Motor Truck Co. Ashkosh Wis

Emb. City Edwards 5 2

at Bath, Maine

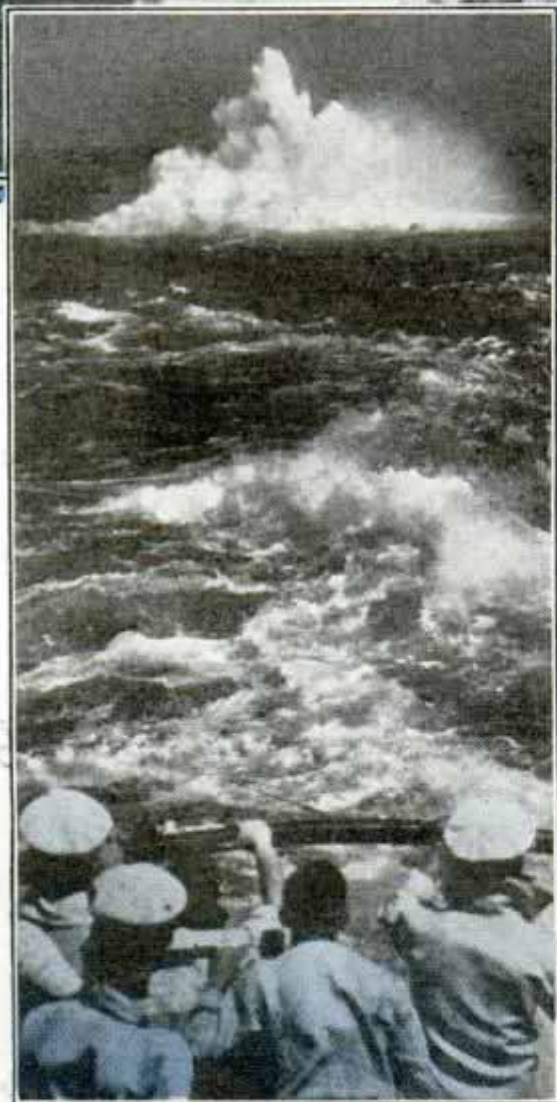
America's Great Bldg. Machinery

Electriccraft Corp. 702 City Bldg. 4-11-33

Schroder + Tremayne 291 Chas. St. Wash. D.C.

6/23/07

The NEXT WAR -



Top, army planes laying a smoke screen to hide New York skyscrapers from a theoretical "enemy." Below, crew of German mine sweeper watching blowing up of mine

Hartford Conn.
By Hiram Percy Maxim
Noted Inventor, Author and Engineer
died Feb. 17, 1936
PART III

IN THE next great war the most elaborate and complicated mechanisms for destruction ever assembled by man will face each other on the high seas. If the quick re-shuffling of large numbers of naval vessels which occurred when it became evident that Italy intended to move against Ethiopia is an indication, we shall see in the next war whole navies fighting each other instead of fleets of fifteen or twenty vessels each.

To envision a modern navy is beyond the mental powers of most persons. The simplest battleship, cruiser, destroyer or submarine is a labyrinth of mechanical and electrical complexity. That any group of men could, by any possibility, successfully operate the appalling array of valves, levers, wheels, handles, buttons and switches, that must be manipulated to navigate and fight even one of these complicated creations, seems unbelievable.

When it comes to a single man, the commander in chief, operating a hundred of them in a rough sea and howling wind, with an

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on the SEA

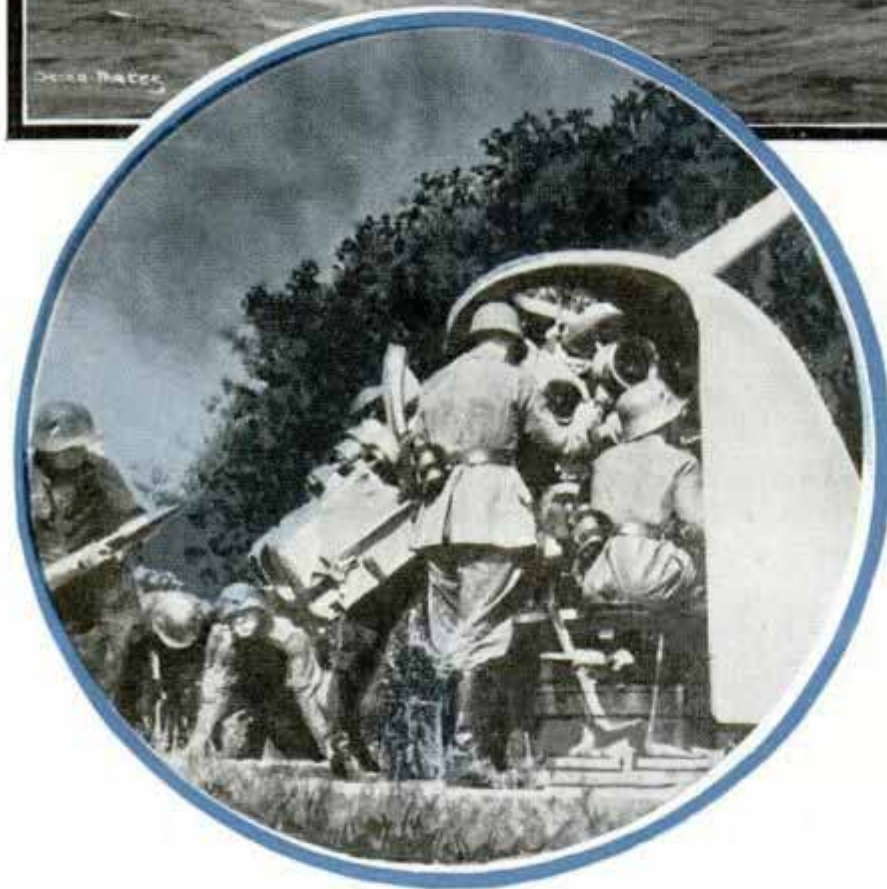
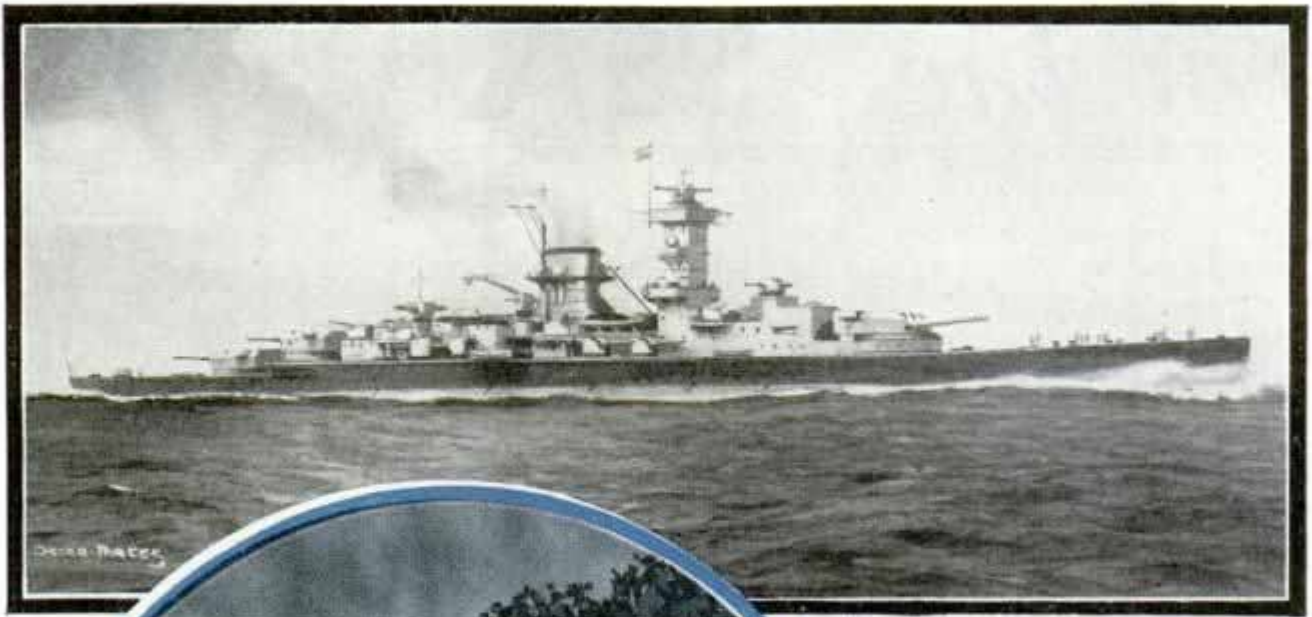


enemy fleet doing everything possible to throw him into confusion, it seems the powers of even a super-man had been exceeded. And yet, one man, standing on the bridge of his flagship maneuvers and fights the whole hundred vessels as effectively, and with no more fuss, than a man manipulating his "men" in a game of checkers. Such an accomplishment is possible only by the most thorough training of the thousands of men involved, perfect team-play between all of them, elaborate organization, and familiarity with the latest developments of science.

Radio is what makes most of this possible. In a fleet of from fifty to 100 vessels, many are out of sight of the flagship. To give each vessel's commander his orders, and to receive from each reports of what has been done and what has been ob-



Top, French battleship, "Dunkerque," whose 10,000 tons of armor make her one of best protected ships. She carries eight 13.2-inch guns in two quadruple turrets forward, sixteen 5.2-inch guns in twin and quadruple mounts and forty smaller ones. Below, German mine searching flotilla



German battle cruiser which bristles with armament. The tower-like mast is the range finder. Below, German coast defense unit

served, requires radio communication. The radio developed for naval warfare is entirely beyond anything with which the layman is acquainted. Not only must each vessel be able to communicate instantly with the flagship, but the vessels must not interfere with each other, they must use a secret system which the eavesdropping enemy cannot penetrate, and communication must be carried on through possible interference or "jamming" radio waves sent out by the enemy. In addition, steady contact must be maintained with scouting, fighting and bombing airplanes.

Continuous-wave telegraphic signals on

waves from five to several hundred meters is the basis of this communication. There is a small amount of radio telephoning, but it is so easily deciphered by the enemy, and it is so easy for errors to creep in, that telegraphic signals have been found more reliable. Naval warfare emphasizes the fact that languages were invented before it was known they would have to be telegraphed. The Japanese and Chinese languages have nothing that corresponds to an alphabet, so neither can be telegraphed. It is either voice by telephone or tele-

graphing in some foreign language. Telegraphing in English is the usual program.

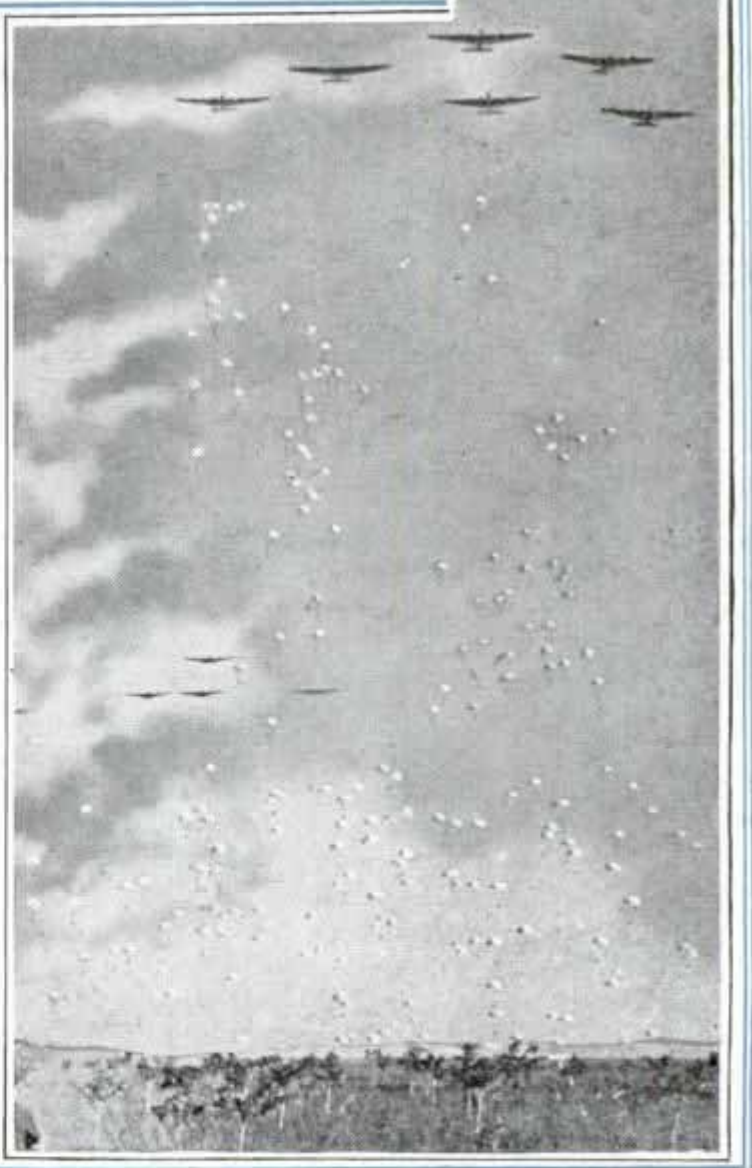
Exactly what radio apparatus is used is one of the many well-guarded secrets of every navy. In all probability, receivers of very sharp selectivity have been devised, along with transmitters which emit pure waves and with crystal frequency control. It is a property of several crystals to oscillate at a fixed frequency, depending upon the thickness of the crystal. Placed between two metal plates, which have been connected to the oscillating vacuum tubes, they force the latter to oscillate at one frequency only. Thus, all wandering into



Left, warships at sea proceeding in column formation. Important changes in fighting vessels which will be reflected in the next great war include protection against torpedoes, the addition of anti-aircraft defense, and deck construction able to localize the damage from direct hits by aerial bombs

neighboring frequencies is avoided. With this fixed frequency for each transmitter, and with ultra-selective receivers, it is possible for a large number of stations to be operated in close proximity without interfering with each other.

It is also likely that use is made of the reflective properties of a parabolic array of wires located behind the main antenna. The antenna for the very short waves is a vertical wire some six feet in length. If behind it at a distance of one quarter wave length there are arranged a series of other vertical wires of proper length, and spaced in a parabolic curve, a reflector is obtained. It projects a narrow beam of radiation as a searchlight projects a narrow beam of visible radiation. If the reflecting array is mounted so it can be rotated around the main antenna, it can be made to shoot out its radio waves in any direction desired and messages can be exchanged which are not easily intercepted. How far television has been used in navies is another secret but has its place in the transmission of sketches, diagrams and photographs inasmuch



Some of thousand infantrymen dropping behind the lines of the "enemy" by parachutes from planes during recent Russian maneuvers to test this kind of aerial warfare



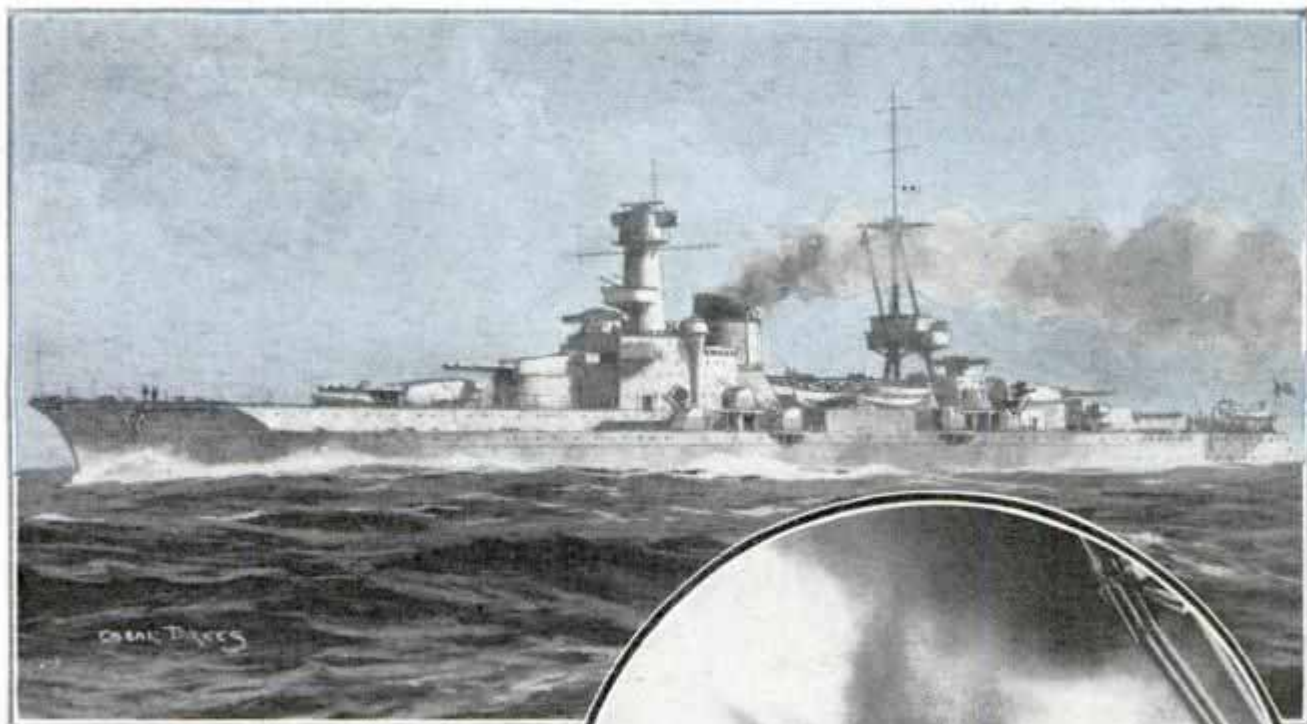
Some of the vessels of the United States navy in review formation proceeding through the waters of the Pacific off the coast of California

as these are often of vital importance but are non-communicable in words.

To make it difficult for the enemy to eavesdrop, it is likely that something similar to the "scrambling" done in transatlantic radio telephony is used. In the transatlantic telephone, in order to secure privacy, the speech is "scrambled" before it is sent out on the air. At the receiving station it is "unscrambled" and made intelligible. This scrambling and unscrambling is applicable to telegraphy also. It is effected by modifying the emitted wave according to a prearranged secret combination. By duplicating exactly, but oppositely, this modifying, the unscrambling is accomplished. Just what the military services of the various nations do in the way of scrambling and unscrambling their radio communications is unknown. But no doubt the intelligence departments of all the great nations are busily engaged at this

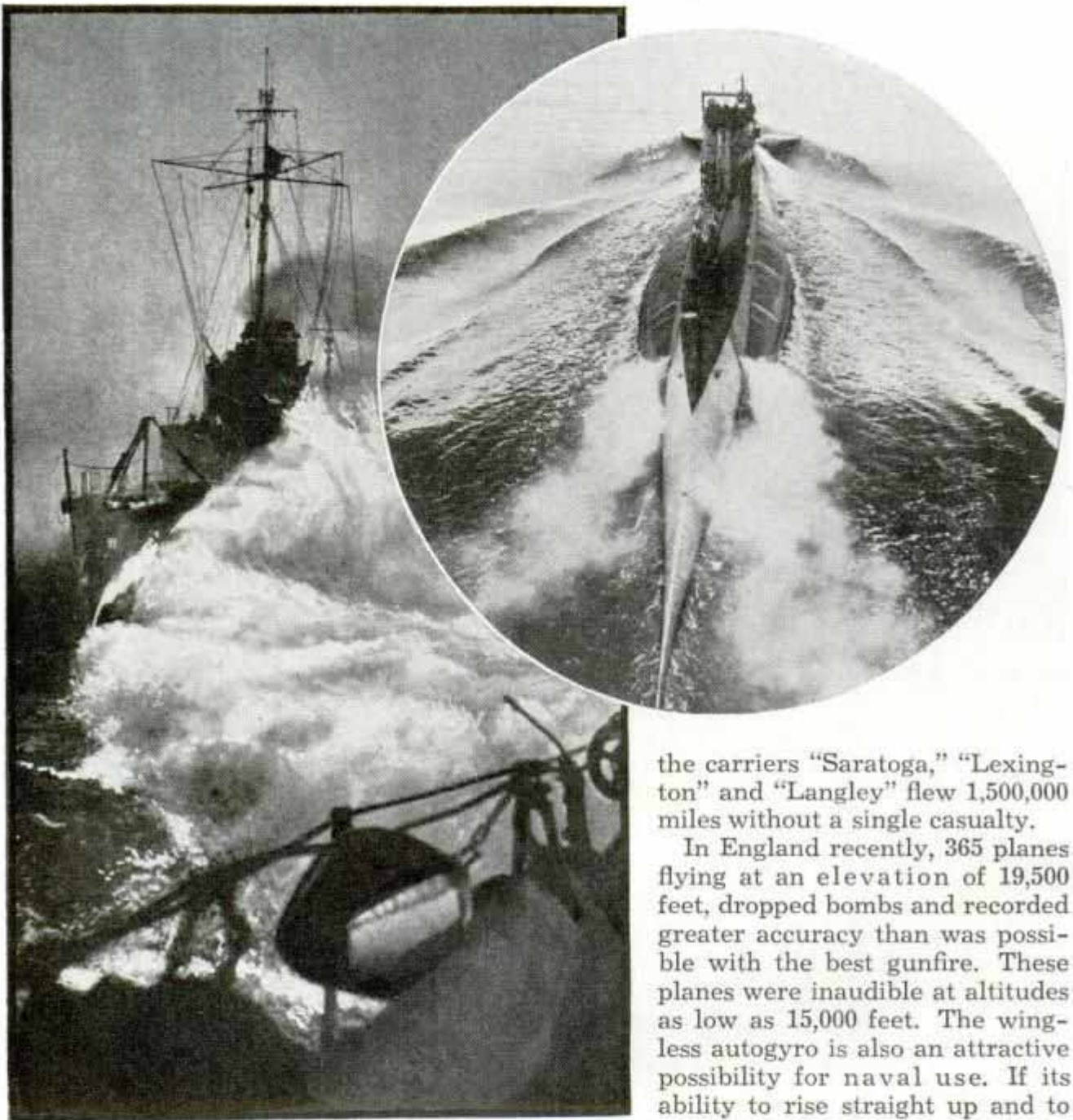
moment trying to find out what the other nations are doing in this matter.

Next to radio, the airplane probably has done more to revolutionize naval warfare than any other recent development. The last great naval battle was the battle of Jutland between the British and German fleets in the latter part of the World War. At the time, naval aircraft had not been developed to a point where they could take an active part. There were no airplane catapults or airplane carriers. Today, every battleship and cruiser carries from one to five airplanes. The latter are literally shot into the air by catapults. The airplane is "loaded" onto a short runway, and brought back against the piston of a pneumatic cylinder. When all is ready the compressed air is admitted, first slowly, but at an ever increasing rate. The flying boat thus gets a comparatively gentle start, but a terrific acceleration. At the



Above, one of Italy's finest fighting machines after remodeling by adding a catapult and enlarging the power plant to raise her speed to twenty-six knots. Right, German naval guns firing at night. Below, firing practice scene on a German cruiser





German torpedo boat at full speed and, in circle, an American submarine about to submerge

end of a sixty-foot run it has been given a speed of sixty miles per hour.

A robust structure is needed to withstand the strain of being catapulted, of alighting on a rough sea, or against the arresting gear of a carrier. These planes must be able to remain in the air for long periods of time, and cover long distances. The planes from a carrier located 150 miles off shore, flew 500,000 miles in a recent maneuver in all sorts of weather. In another maneuver coupled with a fleet transit test through the Panama canal, 110 vessels made the transit of the canal in forty-seven hours and the airplanes from

the carriers "Saratoga," "Lexington" and "Langley" flew 1,500,000 miles without a single casualty.

In England recently, 365 planes flying at an elevation of 19,500 feet, dropped bombs and recorded greater accuracy than was possible with the best gunfire. These planes were inaudible at altitudes as low as 15,000 feet. The wingless autogyro is also an attractive possibility for naval use. If its ability to rise straight up and to settle straight down can be gained without sacrificing reliability, speed, and weight carrying, it will

make possible many desirable improvements on battleships, cruisers and carriers.

The great spectacles in navies today are the huge airplane carriers. These are ships of from 13,000 to 33,000 tons displacement, from 550 to 900 feet in length and with 180,000 horsepower. They carry from seventy-five to 100 planes and have speeds higher than any battleship, which makes it possible for them to escape from the latter even in broad daylight. We have four carriers, the "Langley," the "Ranger," the "Saratoga" and the "Lexington." These ships carry and base no less than 271

(Continued to page 144A)

Festooned Lights Etch Pattern of New Bridge



Like ropes of sparkling tinsel, the lights along the festooned cables over San Francisco bay etch the pattern of the giant new bridge against the night sky

Festooned from the tall towers of the new San Francisco-Oakland bay bridge, hundreds of lights etch the pattern of its steel cables against the night sky. The bases of the towers are studded with lights that flood the steel skeleton of the unfinished giant, which is seven miles long.

Wood Veneer with Steel Back Used for Wall Paneling

Decorative and conforming to city codes prohibiting wood paneling in office buildings, a veneer-steel paneling is being used by architects and decorators. It is a panel which has a back of light-gauge steel to which is cemented natural wood veneer and it is available in stock sizes, thirty-six and forty-eight



inches wide and eight and ten feet long. Application is simple. A mastic is spread on the back of each panel to overcome defects on the wall surface and to deaden sound. The panel is nailed at its edges if stiles and rails are used, or applied by means of concealed clips where a butt joint surface is required. The material has many other uses, such as stamped trays, metal novelties, radios and furniture.

Bombardment of Cosmic Rays Explodes Atoms about You

Atoms of air in the room around you are exploding into showers of fragments under a bombardment of cosmic rays. These atom-destroyers have hurtled many millions of miles through interstellar space. More than ten thousand photographs of the tracks made by exploding atoms have been made with apparatus on Pikes Peak by Dr. Carl Anderson and Dr. Seth Neddermeyer of California Institute of Technology. The terrific speed of some atomic fragments, exploding with more energy than could come from the nucleus of the atom alone, was taken as evidence that some energy was received from the attacking cosmic ray.

Science Service 12/26/35

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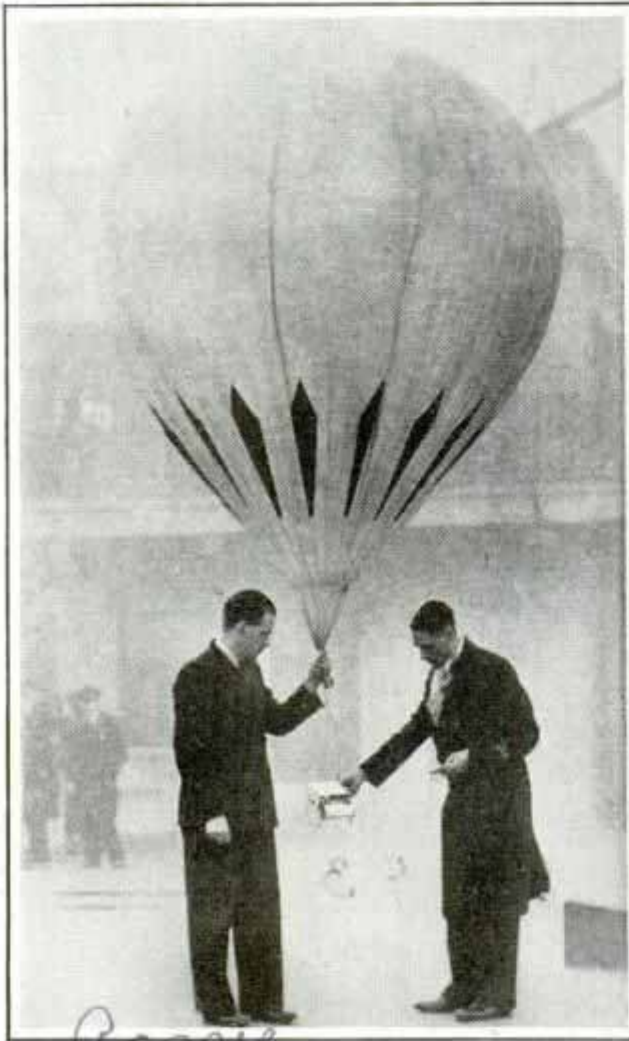
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Pasadena, Calif

Hopkinton, Mass

Washington, Chicago

Fog Balloon Tests Weather over Airport for Flyers



Attaching weather recording instruments to fog balloon at English airdrome

London fogs no longer bar weather observers from testing the "flying air" over the Croydon airport. A fog balloon, with instruments attached, is sent up two or three thousand feet above the field to make observations.

Twenty-Six Pound Gas Engine Is Four-Cycle Type

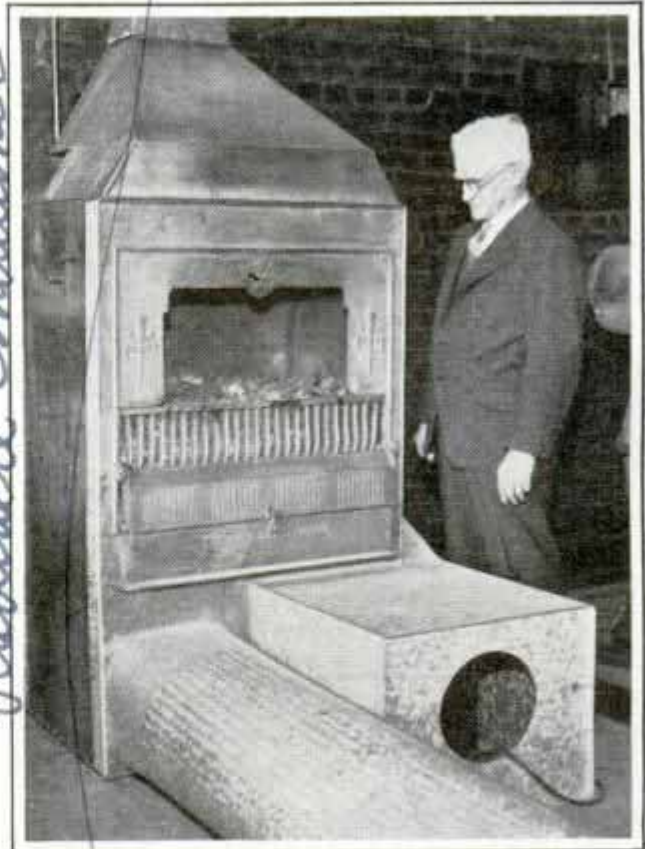


Unusually lightweight for a four-cycle motor, a new one-half horsepower gasoline engine is available for a wide range of uses. It is complete with built-in flywheel magneto,

balanced crankshaft, hardened and ground cams, aluminum alloy connecting rod and piston, and flyball governor which maintains a close speed regulation. The total height is eleven inches and the weight is twenty-six pounds. It operates from thirteen to sixteen hours on one gallon of gas, at 1,800 to 3,600 revolutions per minute.

Waste Heat of Fireplace Used to Air-Condition Home

Escaping heat from an ordinary grate fire is employed to heat and air-condition the entire house by means of a system devised by a Birmingham, Ala., inventor. No basement is required for its installation. Behind the fireplace, air chambers are arranged through which a centrifugal electric blower forces air, raising its temperature to 260 or 300 degrees. The air is sent through a humidifying spray of boiling water and then circulates through the house by way of pipes and registers. A coil is placed in the chimney to heat water for household use. For summer cooling, a refrigerating coil is placed in the intake. The system circulates 1,000 cubic feet of air per minute at 200 degrees Fahrenheit.



System of air chambers which warm and air-condition entire house, utilizing escaping heat of fireplace

The Lonsom Co. New Holston, Wis

ball bearing-air-cooled

£1556

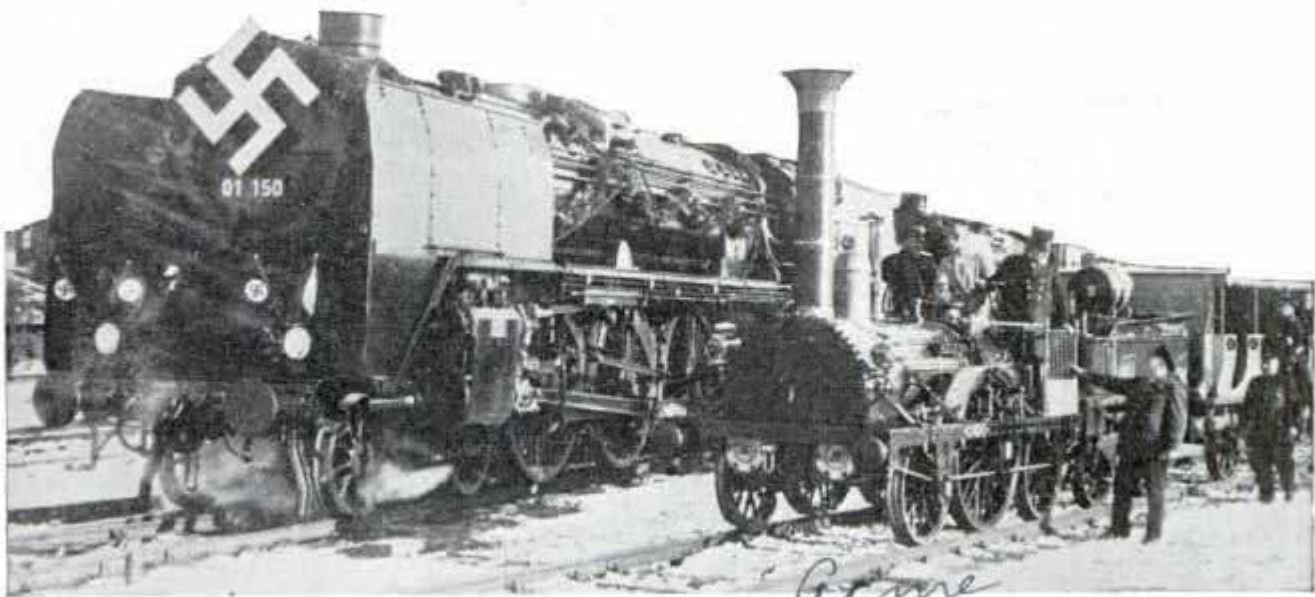
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J. W. Cornelius
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Iron Horses Tell Story of Railroad Progress

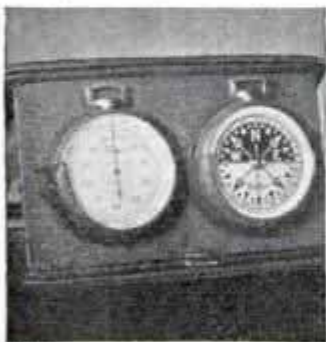


A century of German railroad history is shown in this picture, depicting reproduction of the "Adler," the first German locomotive, beside one of the latest types

Germany recently celebrated one hundred years of railroad history and one of the exhibits was a reproduction of the "Adler," the first German locomotive, beside one of the country's latest types of high-speed express engines. The "Adler," in appearance and design somewhat similar to early American locomotives, pulled the first train in Germany between Nuremberg and Furth.

Pocket Guide for Air Tourist Helps Him Follow Flight

Travel by air is more entertaining if you can watch the pilot's instruments and know how high the plane is flying. Pocket instruments for the air tourist are now being offered.



An altimeter tells accurately the level of flight and a compass enables the passenger to follow the maneuvers of the pilot as he changes direction. With these instruments in a leather case, the traveler becomes a "back seat driver" in the transport plane. This set would also be useful to the touring motorist, the altimeter adding interest to mountain driving.

Radiophone Installed in Auto Is Used for Calls on Road

Adaptation of the radiotelephone to the automobile has been accomplished in Rome, Italy, making it possible for the motorist to make calls on the road. The instrument uses micro-waves and the signals are picked up at a central point where the caller is connected with the number he wants. The system calls for a working arrangement between the central radio station and the telephone company. The motorist's phone is dial-operated.



© Planet News, Ltd.

Telephoning from auto by means of radio transmitter and receiver in compact unit

Taylor Instrument Corp. Rochester

E 1373

Refering to the P. Cahen Stamp Editor, Chicago Tribune

Have YOU a PENNY



THE face value of money means little to the coin collector, but its rarity, state of preservation and other technical considerations can mean enough to make him spend \$2,500 for an uncirculated specimen of the 1799 copper-cent, and for similar cents of the 1793 and 1804 issues more than \$100.

Generally speaking, the most valuable coins are the private gold pieces issued by assaying companies which set up shop in the various mining districts during America's gold rush era. Because the law did not expressly prohibit private minting, they produced gold coins ranging in value from twenty-five cents to \$50, which were freely used as a welcome substitute to the inconvenience of gold dust. The ultimate judgment, however, of what is the most valuable coin in existence rests in the auction hall. On that basis the record price is \$7,900, paid in 1929 for a \$5 private gold piece issued in 1849 by the Massachusetts and California company. Private transactions are another matter, for the prices

Top, left, one of largest gold coins, the ancient Japanese "oban," over six inches long. Center, Chinese "tree money," cast in tin. Below, old Swedish copper "coin" weighing two pounds

paid are not always made public. Nevertheless, it is known that the late William H. Woodin, former secretary of the treasury, paid \$10,000 for each of two United States \$50 gold pieces dated 1877. These were "pattern" coins, samples designed for minting but never actually issued for general use, and were later placed in the government's collection, now housed in the Smithsonian Institution, Washington, D.C.

A \$20 private gold piece issued in 1855 by Wass, Molitor & Company, exchanged hands at auction for \$7,000. The third highest known price was \$6,200, paid for the Brasher doubloon. A New York jew-

Emb Jacob Meschert R. 2240, 100 Fifth Ave New York

National Coin Co (77) Springfield, Mass

Washington D.C.

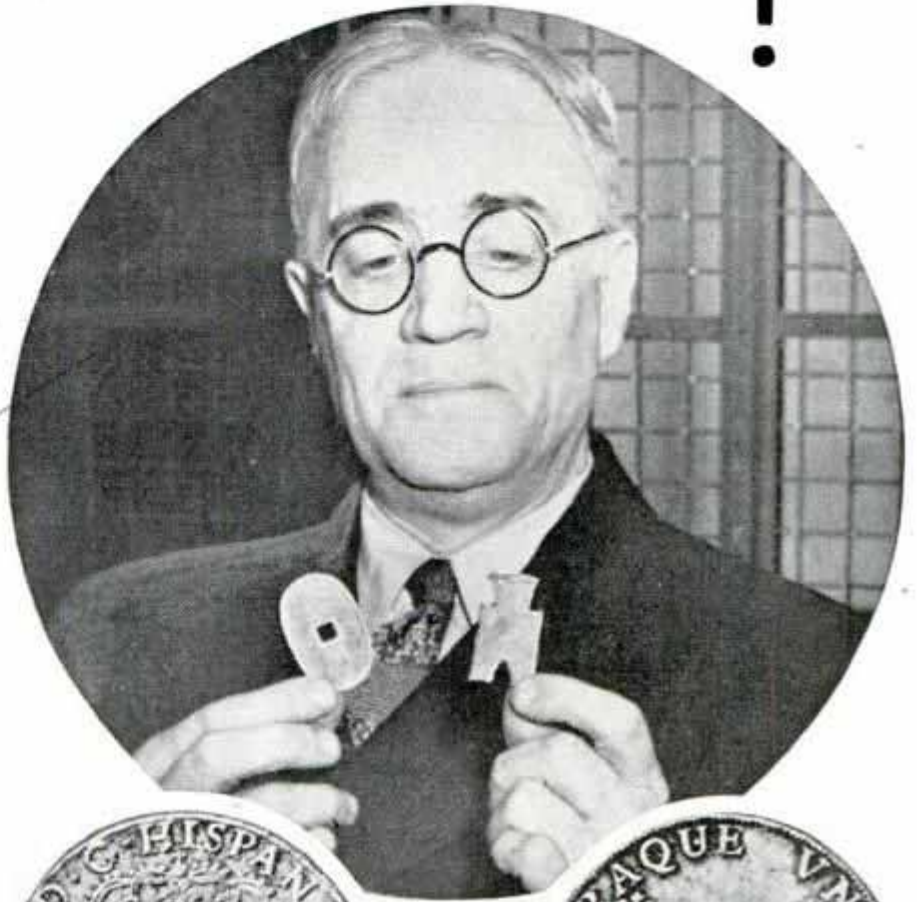
28 Pence needed. 8/13/35

worth \$2500⁰⁰ ?

eler, Ephraim Brasher, designed six specimens in pure gold to show to legislators in the hope of obtaining a coining permit. A laborer working in an excavation in Philadelphia dug one up, but not realizing its value, sold it for a few cents.

The question of how to start a coin collection is best answered by citing Farran Zerbe, curator of the collection of 50,000 specimens of the world's moneys now owned by and on exhibition at the Chase National Bank in New York, but which he himself collected over more than forty years. While selling newspapers as a boy in Tyrone, Penna., he acquired what he thought was a "cute little half dollar." It looked like an American dime, but was marked "50 cent." A bank teller explained it was a French fifty-centime piece and not legal tender in the United States. But the coin fascinated the boy and he began collecting others.

He enlisted the aid of the postmaster, the storekeepers and his friends and before long assembled, by "swapping" and doing errands, a few coins which formed the nucleus for what is now considered one of the most important public money collections in the world. The large American cent pieces, then becoming less and less familiar, were his



Center Photo Courtesy Chase National Bank
Top, old Chinese and Japanese money. Center, Spanish "pieces of eight."
Bottom, they used these for money in ancient China

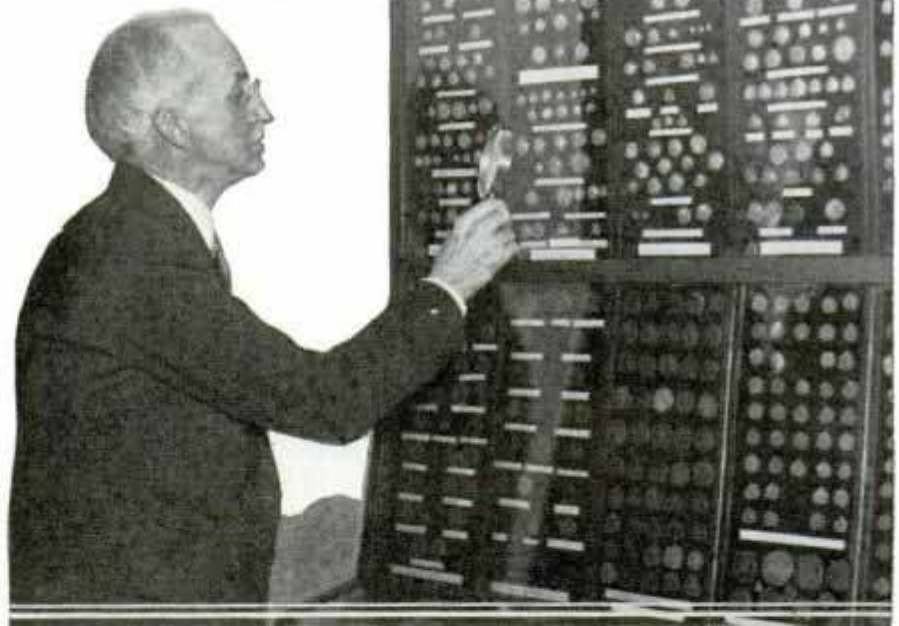


Greek or Roman coins, to cents or half-cents, to American commemorative coins or to coins collected for their artistic value, all are possible fields. A knowledge of what determines the value of a coin is the first essential of the collector. Rarity and condition of the specimen are the main points to look for. The condition of the coin is of such paramount importance in collecting that even

first coins because they were the cheapest and the easiest to acquire. Mr. Zerbe still believes that the various dates of American "coppers" are the best start for a modest collector.

People who travel much are good contacts for a beginner. Not everyone is a collector and quite often a person who accidentally has been given a foreign coin or who has come back with foreign money from a trip abroad will gladly exchange it for American money. Trunks, closets and vaults sometimes yield rare finds and many beautiful specimens are obtainable at very low prices. Exchanging duplicate coins with other collectors is another way to acquire desirable items. Joining a coin-collecting club and sending for coin dealers' catalogues, many of which may be had for the asking, is still another.

Owing to the great variety of coins, specialization is advised by leading collectors. Confining your activities to a single period in history, to a single country, to ancient



Coin collectors looking over specimens and Farran Zerbe, curator of Chase National Bank's collection, looking over ancient coins

with very rare coins, an imperfect specimen will bring much less than the same coin in good condition. The 1823 American cent in fair condition can be had for ten cents and one in good condition costs thirty-five cents, but an immaculate specimen that has never been circulated is worth from \$10 to \$20. At a recent auction a good specimen of the 1799 cent brought \$60, while a poorer one of the same issue brought only \$10.50. Paradoxical as it may seem, cleaning a coin to improve its con-

81373

2624-16th Ave S.

Paving Blocks of Cast Iron Tested on Moving 'Highway'

E. 1480

Minneapolis

dition is of no help but may even cut fifty per cent from the value of an otherwise desirable specimen.

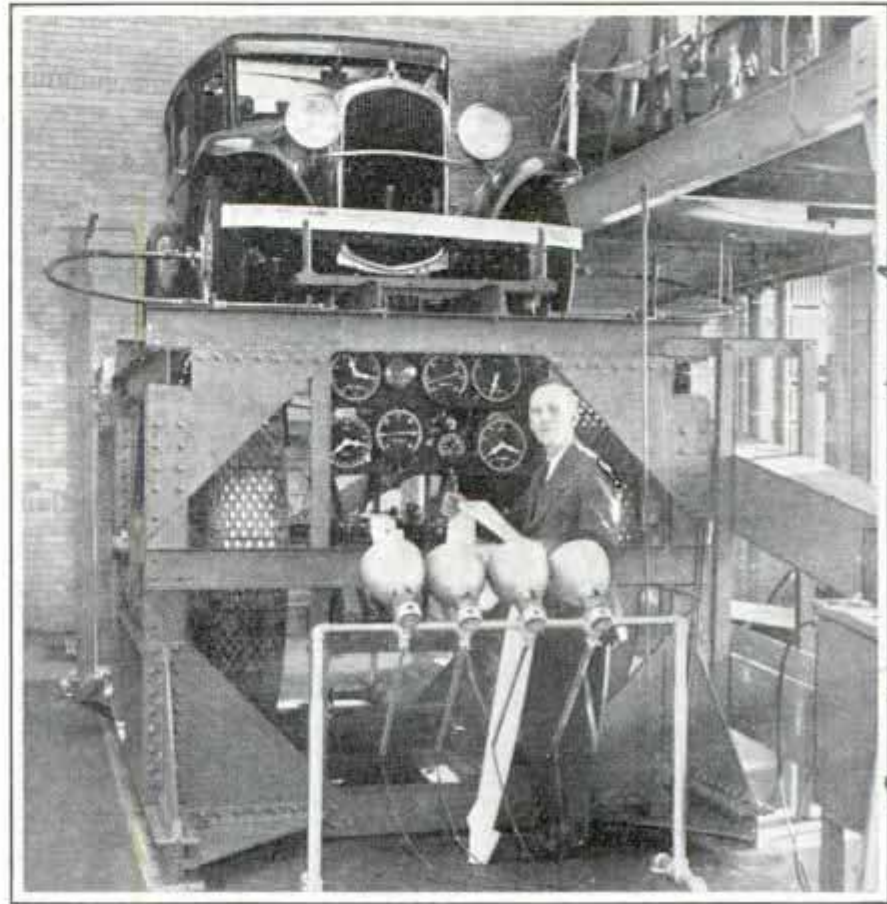
Except in instances where it is known that a very limited number of pieces were minted, the rarity of any group of specimens is always a matter of speculation, for the discovery of a large number of perfect coins of the same issue has, and will, bring the price down. The 1820 United States cent once was scarce and selling for a good price but the discovery in an old cellar of a keg full of bright and shiny specimens toppled the price.

Age is no index to the value of a coin. One in fine condition dating back 2,000 years may be worth less than one minted only two or three decades ago.

A quarter will buy a genuine ancient Greek or Roman coin and fine coins picturing the Caesars may be had for a few dollars but an 1894 United States dime from the "S" mint in San Francisco may bring as high as \$1,000. This is because there are many copies of the former and only twenty-four of the latter.

The great prevalence of ancient coins is due to the fact that there were no banks in those days, so persons were obliged to find hiding places for their wealth. Underground burial in bags and jars seemed to afford the safety desired. A university expedition found 26,000 bronze coins in huge clay jars and rotting cloth bags while exploring Egyptian ruins; a French peasant digging in his barnyard unearthed 4,000 copper coins of the time of Louis XII and sold the lot for \$400; a chicken picking in the soil uncovered 5,000 coins dating back several centuries. Two poor boys stumbled on a cache of United States gold coins in an old cellar of a sea captain's

(Continued to page 132A)

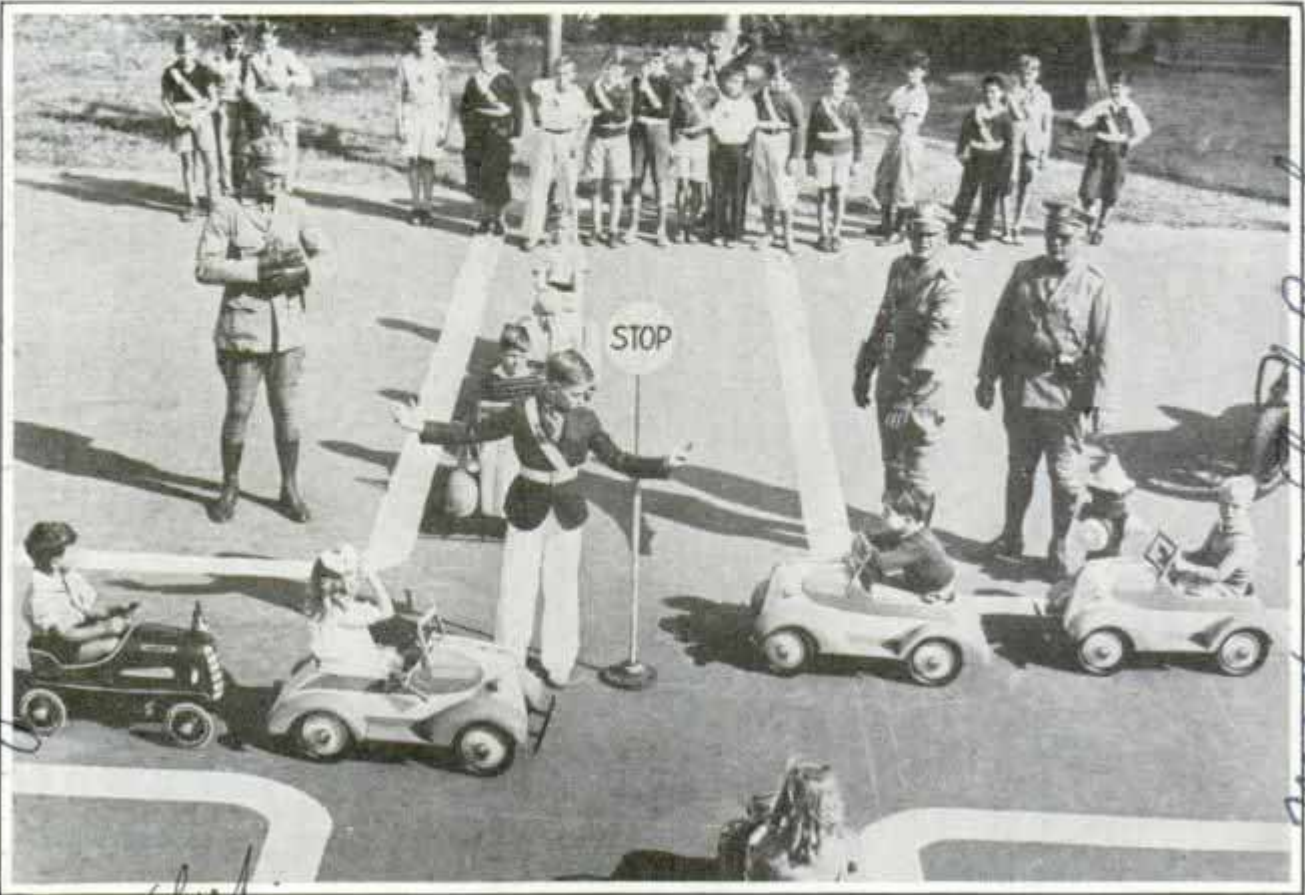


Iron paving blocks are being tested on this moving road; blocks are mounted on two wheels revolving at high speed

Cast-iron paving blocks are tested on a moving "highway" at the University of Minnesota. The blocks are mounted on two large wheels, each weighing one-half ton, and which revolve at a rate equal to a road speed of sixty miles per hour. An automobile is set on the moving road and speed, slippage and stopping efficiency when hydraulic brakes are applied all are calculated automatically by the apparatus which was designed by Prof. E. W. Davis. Braking action in the tests is recorded by a high-speed camera when the motors are stopped and the 1,000-pound wheels slow down from 280 revolutions per minute to a stop in two or three turns. Iron paving blocks similar to those on the wheels are set in a section of road on the university campus where they have been in service for more than a year. The paving has raised, diamond-shaped treads, like those on automobile tires, to provide greater holding power when brakes are applied.

University of Minnesota Engineering Station

Children in Toy Autos Taught Traffic Rules

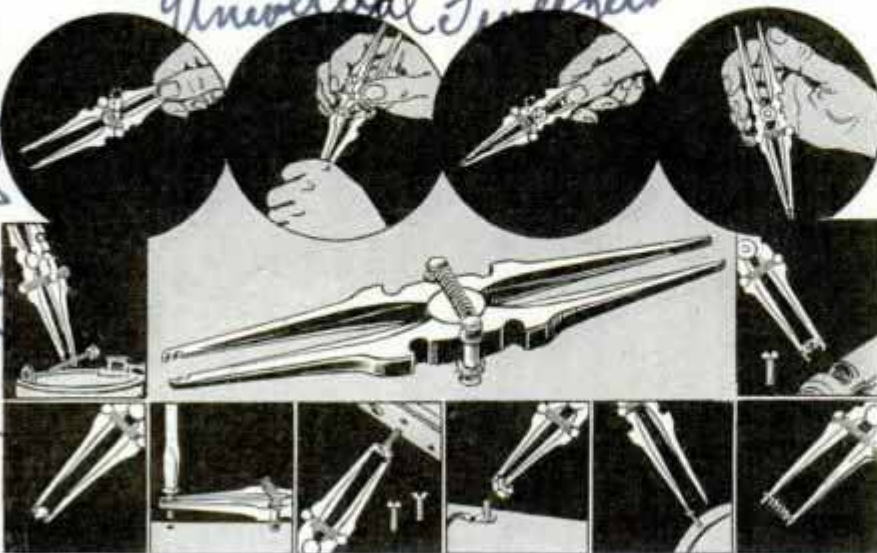


Learning by doing, these youngsters quickly discover the importance of obeying traffic rules. The traffic lessons are taught with the aid of miniature cars, making the course interesting to the children

Mysteries of the stop-and-go lights and other traffic signals are taught Miami, Fla., children by actual experience. Miniature automobiles are used in the course of instruction given by the city's police department, the youthful drivers going through

all the motions of the actual motorist. Thus they learn the privileges of the pedestrian, as well as those of the car driver. Aside from its value in the campaign to reduce traffic accidents, the course is a lot of fun for the youngsters.

All-Purpose Spring Grip Tool Has Two Heads for Work



Tweezers with spring grip in "neutral" position and some of their uses

Among the most versatile hand tools recently designed are two-headed tweezers, either end of which can be put to work by sliding a movable coil spring that supplies a strong grip at the desired head. One head is shaped like a screwdriver and either blade can be used for that purpose. The other end is knurled or grooved, and this is handy for picking up ball bearings or gripping tiny screws, wires, filaments,

Chicago...
Ravenwood...
Chicago...
46...

Madison, Cal Park
Alex de Schebeko, 506
I.M.

Feb. 1932

and springs. It is an all-purpose tool for repairmen, electricians, machinists and locksmiths and for typewriter repair kits. The spring obviates hand pressure.

Railway Track Made of Poles Aids in Hauling Logs to Mill



Wood railway with poles serving as rails used in logging operations. The wheels of the log car are grooved to fit the poles

Waterproof Asphalt Coating Can Be Applied Cold

Cold asphalt that can be poured, brushed or sprayed is being used to form a permanent waterproof coating applicable to home and industrial needs. Driveways and garden paths can be paved at low cost without special equipment or experience. Basement walls may be waterproofed by brushing them with the asphalt "paint," and this can be covered with white paint without danger of "bleeding" through. Elastic and compressible, this product—pure asphalt treated with a secret process—resists wear because of its resilience and a life of twenty years without change is claimed for it. It is used to seal expansion joints and coat roofs, and adheres to glass, polished surfaces and building materials.



It takes no special equipment or skill to pave your garden path by pouring cold asphalt

Logging operations in exceptionally rough country in the state of Washington are carried on with the aid of a wood railway. The rails for this logging road are made of poles of second growth fir of uniform size resting on other poles which serve as ties. This track extends from the mill to the woods operation, a distance of about two miles. The car on which the logs are hauled by a tractor resembles a small flat car with wheels twenty inches in diameter and twelve inches thick, grooved to fit the pole rails on which they roll. From 4,000 to 6,000 feet of timber are hauled on each trip. The same tractor which hauls the car is used to load it. The loading equipment consists of one long cable, one upper and one lower block and two short cables with hooks at the loading end. The hooks are pressed into the end of a log, the tractor at the other end moves forward and the log is slid into place on the car.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

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Handwritten notes on the right margin: "Co. Taylor & Wash. Ravensdale Wash." written vertically.

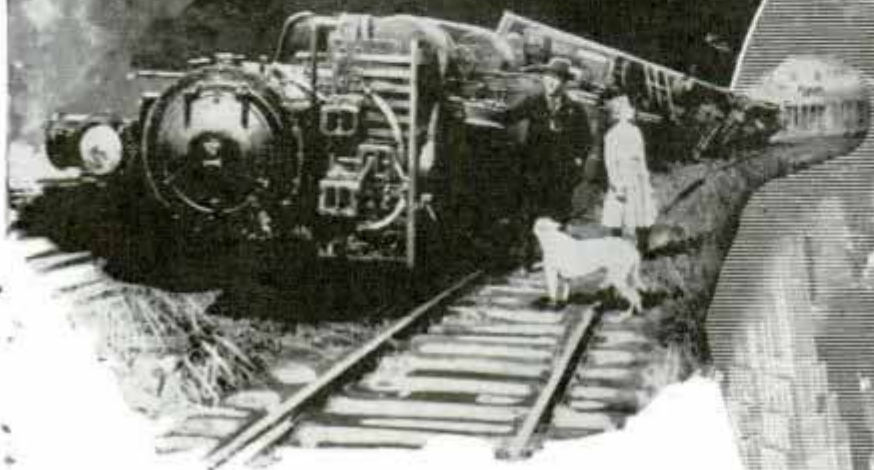
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Com. Leon Klasmann,
4 W. 103rd. New York

How SAFE

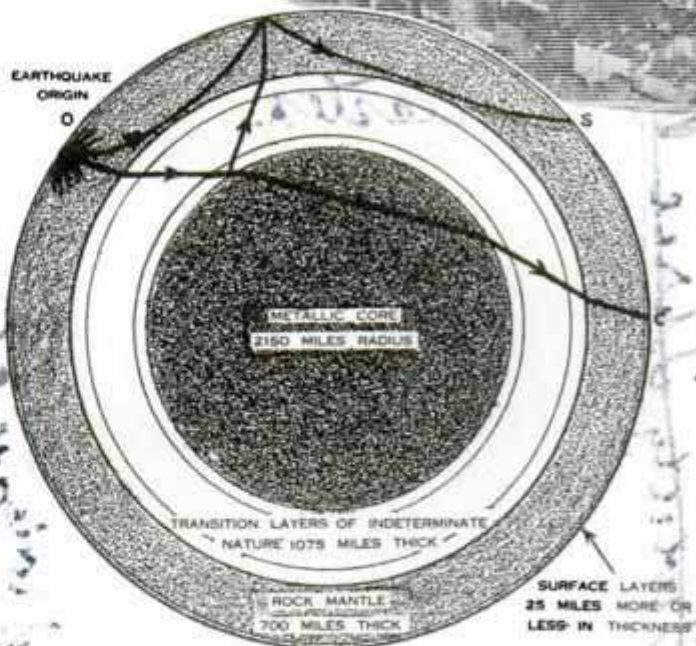


SHIVERS and shocks in the earth's crust thirty years ago sent San Francisco tumbling into ruins. The behavior of tall buildings during that quake did not augur well for the future of the skyscraper. But today San Francisco boasts a good many skyscrapers and people pay substantial sums to live in them.

Recently the northeastern section of the country experienced a quake which came dangerously near the little island of Manhattan, which is sown thicker with skyscrapers than any similar area in the world. Again the skyscraper is suspected of harboring danger. Can San Francisco, New York, Chicago, and other skyscraper cities survive a "severe" temblor?

Plainly, if cities in the United States were exposed to such shocks as periodically shake Japan, the answer would undoubtedly be that our skyscraper cities, as built today, are not safe. But engineers and architects have studied the severity of past earthquakes in the eastern half of the country.

In Japan buildings are limited to 100 feet in height, or eight stories above street level, and the Japanese have devised a special type of construction to withstand the destructiveness of earthquakes. In the United States, the area most commonly

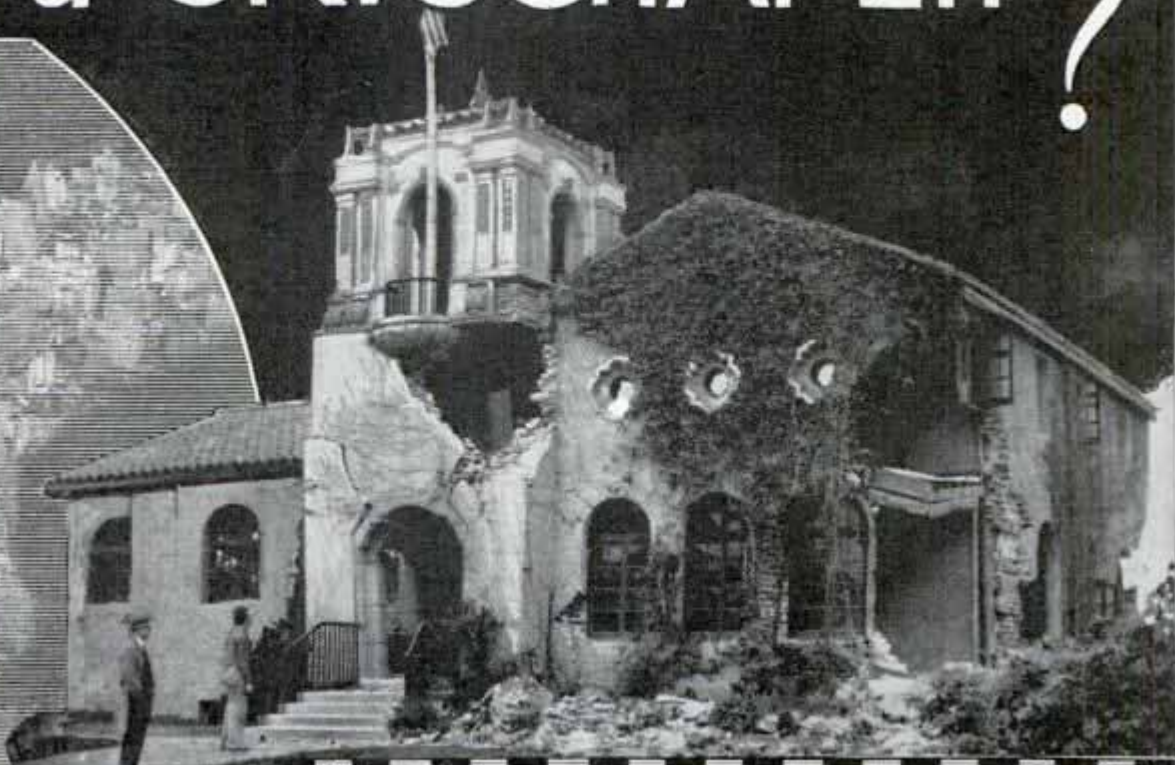
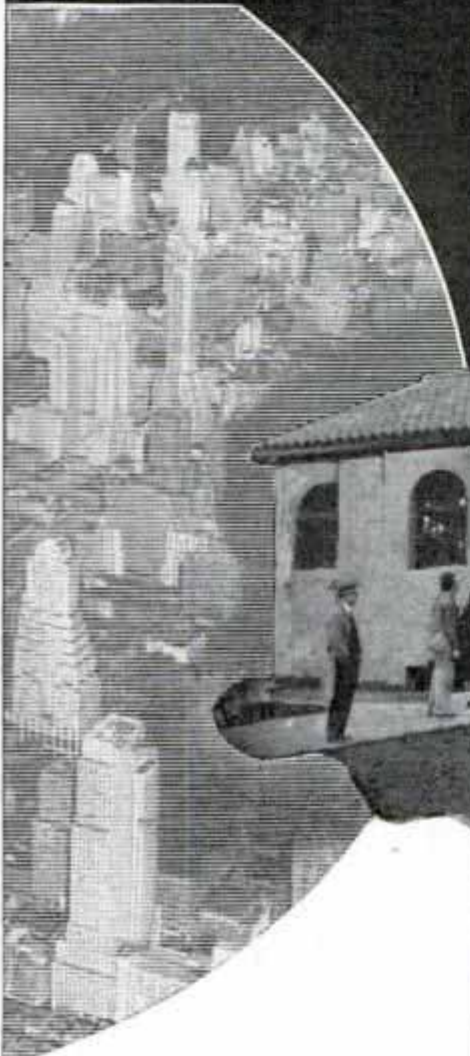


MEDIAN SECTION THROUGH THE EARTH SHOWING COMPOSITION OF THE INTERIOR AND TRANSMISSION OF EARTHQUAKE WAVES

Train wrecked by earthquake, and New York skyscrapers which withstood the recent earthquake which was felt in the east

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is a SKYSCRAPER?



Southern California building in ruins after earthquake there in 1933, and map showing where earthquakes have occurred

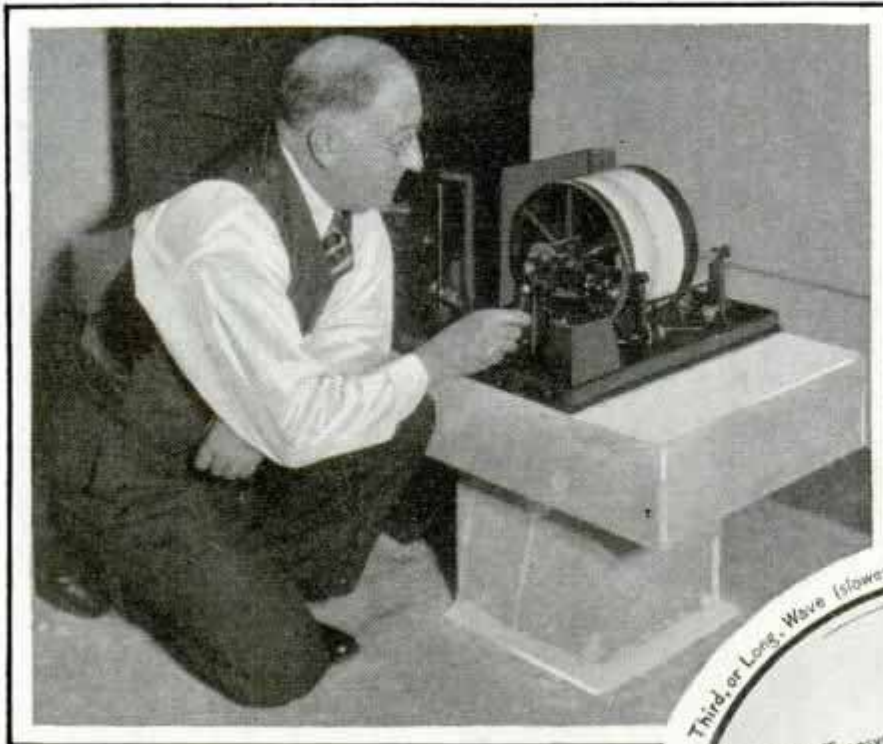
affected by quakes is the Pacific coast, where engineers and architects have also evolved a special type of skyscraper construction. All the recent skyscrapers of San Francisco embody certain features which enable them to stand a test even as severe as that of 1906. They are, in fact, considered so safe that insurance companies do not hesitate to offer them a low rate on earthquake damage policies.

Pacific coast engineers and the owners of large buildings now believe earthquake dangers can be overcome even in the largest modern buildings by taking certain precautions in the design. These engineers are now generally agreed that skyscrapers should rest on a massive foundation block

of concrete; that the building's structural steel work should be embedded in monolithic concrete; that the floors should be built of reinforced rock concrete. Both wind resistance and quake resistance are increased by the use of special cross braces in the steel frame.

In the world's highest man-made structure, the Empire State building, a long pendulum installed to measure the sway of the structure did not register any unusual movement in the recent quake. But

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foundation bears some relation to the mass of a great steamship among ocean waves. The insurance risk on a building on soft ground with extra-deep foundations of concrete tied by reinforcing steel is probably much less than on a smaller building with shallow non-rigid foundations.

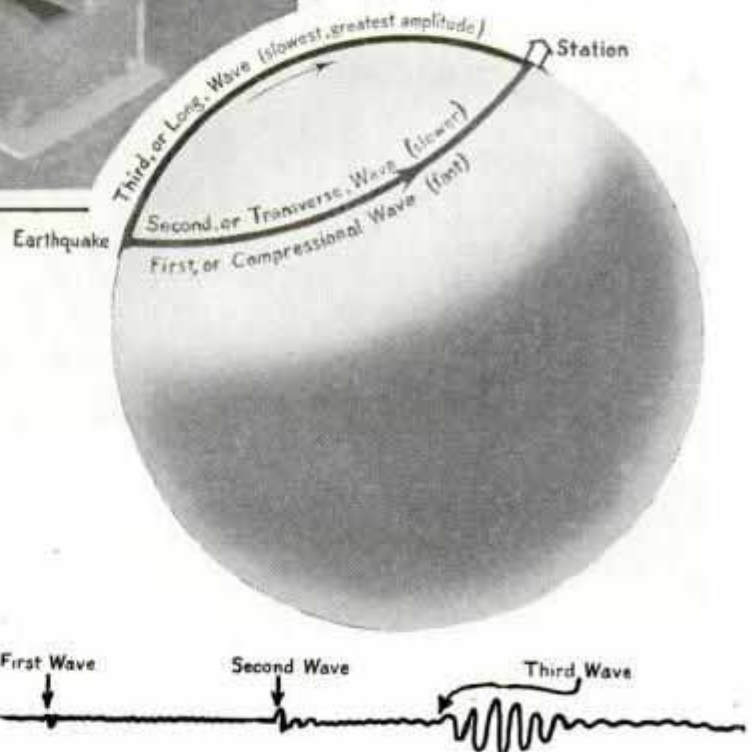
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strangely, the radio beam near Newark airport deviated from its course for a few seconds and then returned to normal. Reports from cities in Canada and the eastern half of the United States showed some skyscrapers were shaken but not one suffered damage.

What ought one to do in an earthquake? The first thought, of course, is to run. The best thing you can do, Dr. Bailey Willis, the earthquake expert, advises is, "Stand still and count fifty—by that time all danger will be over." All the damage of the Japanese quake of 1923 happened in less than sixty seconds and the greatest wreckage of the San Francisco quake of 1906 occurred during the first minute.

John Ripley Freeman, former president of the American Society of Civil Engineers, who has made an exhaustive study of skyscraper behavior, said, recently:

"The public is afraid of earthquake forces because they have been measured by weak structures; but these forces nearly always can be resisted by intelligent and not over-expensive construction. The motion of a great building on a massive concrete

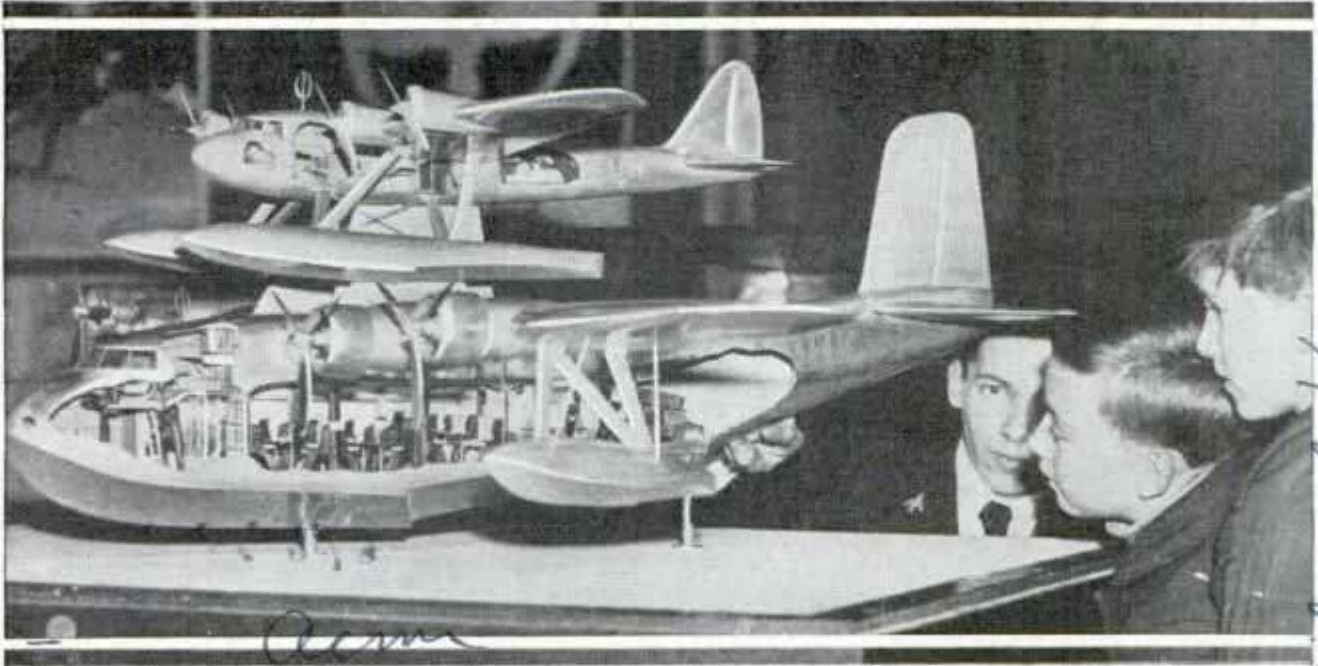


Difference in times of arrival of first and second waves, gives distance from earthquake to station



Adjusting recording drum of strong-motion seismograph. Below, mountain "wrecked" by an earthquake

Seaplane Gives Ocean Flier Pickaback Start



Model of composite seaplane is cut away to show seating and cargo compartments; giant flying boat takes speedier, loaded plane on its back for a flying start and launches it when safe altitude is attained

When Pan American Airways and Imperial Airways launch their joint transatlantic flying service, the British company may send over the ocean route a speedy monoplane that is given a flying start on the top of a giant flying boat. A model of this composite aircraft has been placed on exhibition in London. The smaller ship carries a heavy load of fuel and mail, and is given a "lift" off the sea by the powerful flying boat. When it reaches a safe alti-

tude, the monoplane casts off and races across the ocean with its cargo. The two air lines agreed recently on tentative plans for joint operation of passenger and mail planes between New York and London, Pan American using flying clipper ships of the type pioneering over the California-Hawaii-Philippines route. The Atlantic route will be from New York to Montreal, Harbor Grace, Ireland and London, or via Bermuda, the Azores and Spain.

Super-Alarm to Balk Burglar Uses Midget Radio Waves

Ultra-high frequency radio waves, below one meter in length, are employed in a super-alarm system developed by Thomas S. McCaleb of Harvard University. It consists of a transmitter and receiver between which wave patterns pass. The body of a person reflects these wave patterns, causing a change in reception that actuates a relay and operates the alarm. The system is said to be the most sensitive ever devised. In a demonstration, it was impossible for a person to enter a room or to even move in the room without causing the alarm to sound. It works as well outdoors as indoors. Operating cost is about equal to that of an ordinary electric-light bulb.



of Cambridge of telegraphical Cambridge. Mass

Wide water

Switch Pennington
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Latest of U. S. Destroyers to Lead Fighting Squadron



Launching of the destroyer "Moffett" at Quincy, Mass. This new ship will lead one division of squadron of fighting craft

Named in honor of the late Rear Admiral William A. Moffett, who died in the crash of the dirigible "Akron," the latest of the navy's destroyers has been launched at Quincy, Mass. The craft, which is 372 feet long with a displacement of 1,850 tons, is a destroyer leader, built to head a division of fighting ships. On the same day the second of four 1,500-ton destroyers was launched at New York. It bears the name of Lieut. Com. Andrew Boyd Cummings of civil war fame.

drier, demonstrated before cement experts recently at Yale University, is intended to speed up concrete work by many hours.

install. After removing the front wheel, a bracket is bolted to the lower end of the fork, the rear end of the bracket suspended by a strong coil spring from the upper end of the fork. The axle is then fastened to holes at the front end of the bracket, and road shocks are taken up by the spring as the bracket pivots on the fork. A similar knee-action attachment for rear bicycle wheels is being developed.

Concrete Hardened by Quick Drier in Twenty Minutes

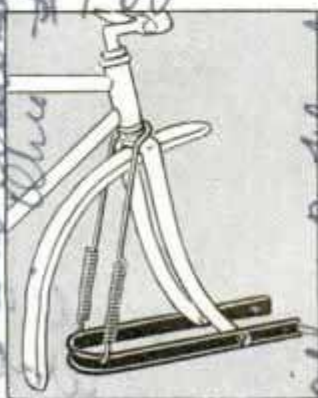
Concrete can be hardened and dried in twenty minutes by a vacuum process which extracts excess water immediately after casting. The quick



Standing on concrete dried by new process

Knee-Action Unit for Bicycle Is Invented by Boy

For a smooth bicycle ride, try knee action. A fourteen-year-old Cincinnati boy has invented a shock-absorbing unit for the front wheel of a bicycle, and it is now on the market. It is easy to



1518
Oliver Shipyard
More
1858 Jaff - read
522
1488
Road Concrete
\$1.00
Alfred B. Harshen

30 Rockefeller Plaza

Vacuum Concrete

Knee Action Co
Karl Paul

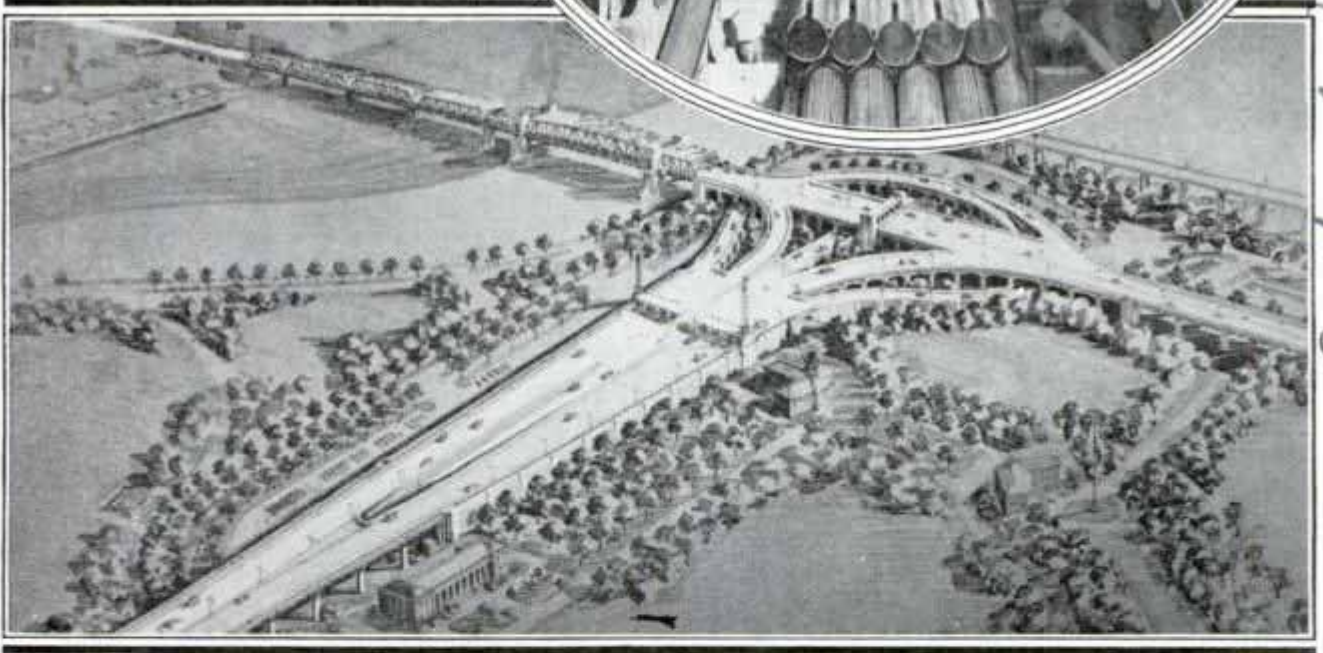
81392.

Mr. Don Glassman
4 W. 103rd, New York

FOUR BRIDGES *in* ONE

WHAT is probably the most elaborate and costly traffic-carrying machine ever built to order for the automobile is near completion in the Hell Gate section of the East river, near New York City.

This \$55,000,000 undertaking consists of a giant suspension bridge, a vertical lift span, and depressed highways, underpasses and viaducts—known collectively as the Triboro bridge. In terms of human effort, it represents 18,000 man-years of labor.



"Flying junction" of Triboro bridge which sorts out traffic automatically, and adjusting strands of cable which will support one of the bridge units

There are four separate bridges over four tidal waterways. The bridges themselves have a combined length of more than three miles, while the over-all length of the approaches, viaducts, underpasses and bridges is about nineteen miles. Set in one of the most congested areas in the world, the Triboro bridge has its feet planted in three boroughs, really three

cities, and carries traffic between three large centers of population. A system of feeder streets, extending for miles from the bridge site, will make the Triboro easily accessible to a metropolitan population of about 10,000,000. It will handle local as well as through traffic.

Long Island, Manhattan Island, Ward's Island, Randall's Island and the mainland

*Engineer's Office
Bridges
H. S. President
A. J. Triboro
Authority*

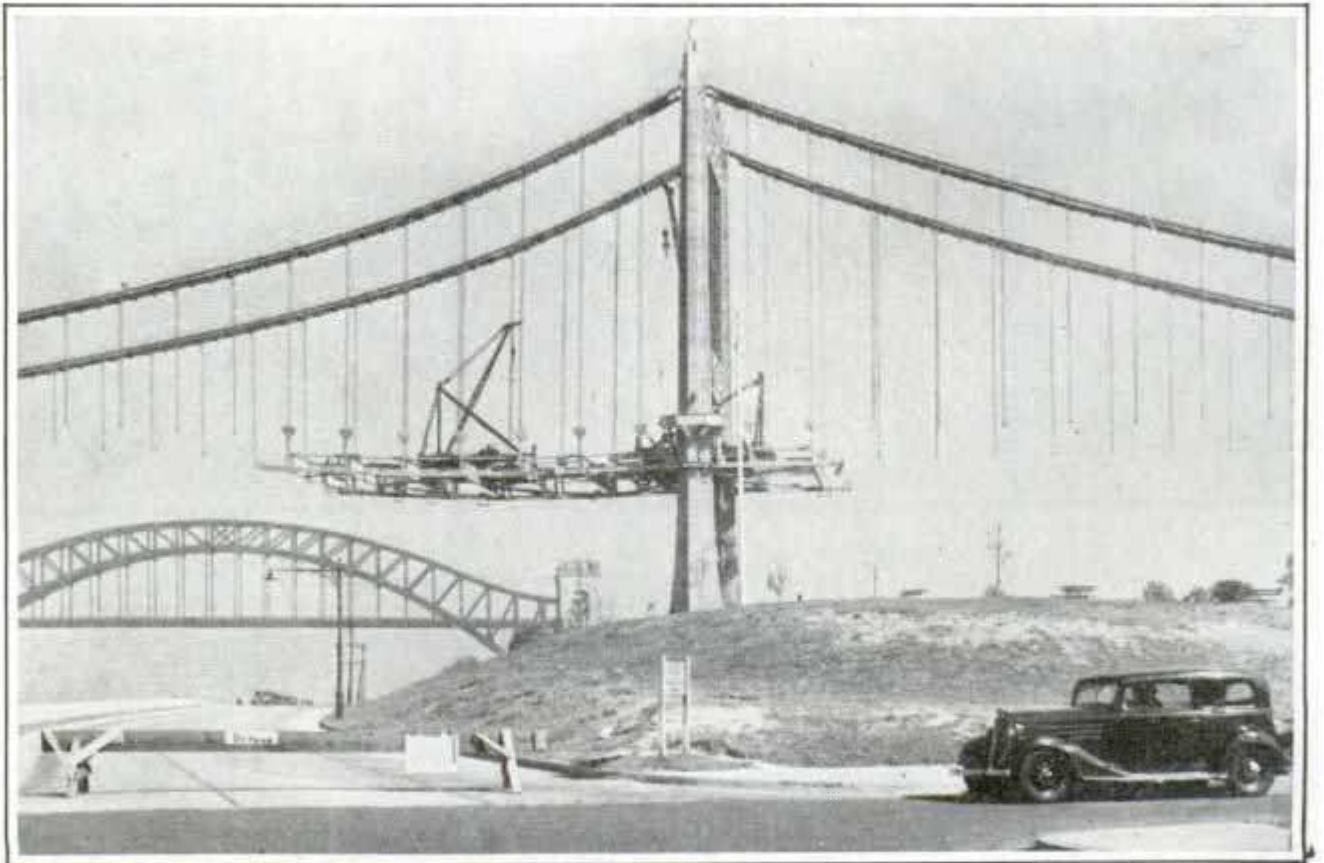


are touched by the various approaches. On the Long Island end the bridge will feed traffic into a state parkway. The Triboro was under consideration for twenty-five years before all financial and legal obstacles were cleared away. The whole cost is expected to be liquidated in a com-

paratively short time by tolls and after this the bridge will be free. Eventually title will pass to the city of New York.

A few years ago, it was maintained by many that the Triboro bridge was impractical. Long approaches and four bridges

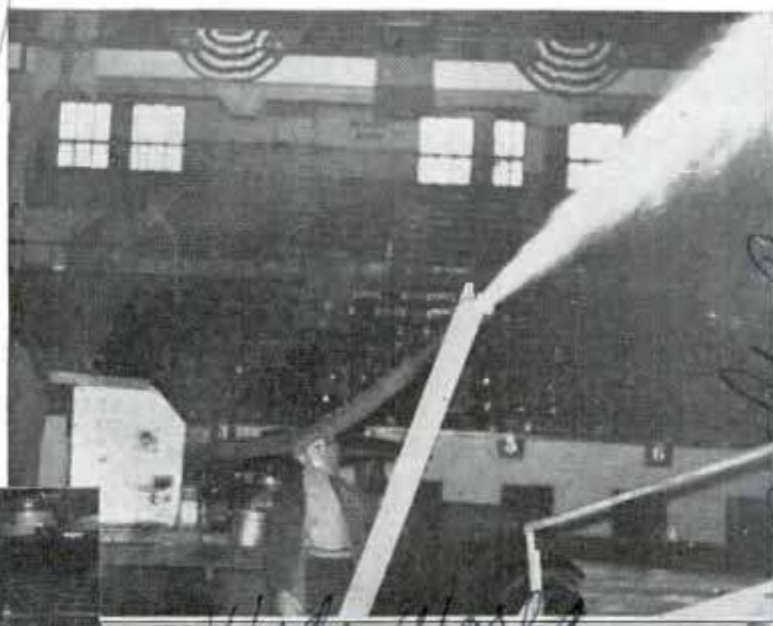
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One of the sections of the Triboro bridge under construction and, at top, a drawing of the East river drive which will lead to the Triboro bridge

Ski-Jumpers Perform Indoors on Arena Slide

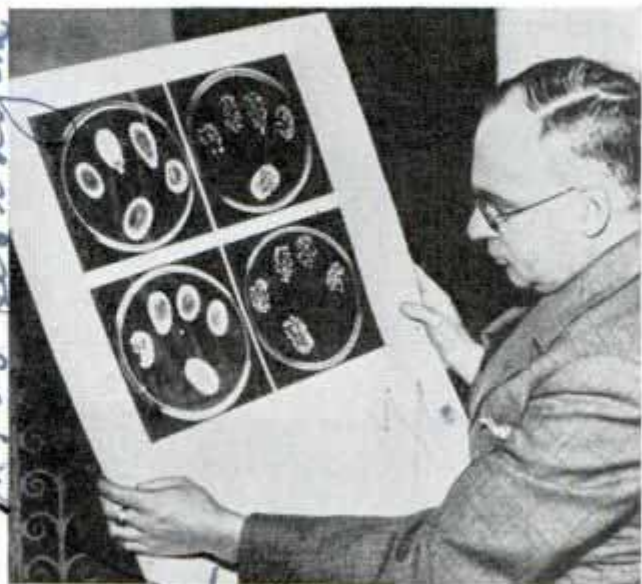
Watching daring ski-jumpers perform indoors is the latest sport novelty made possible by building a long slide inside a Boston arena. The jumpers took off from just under the roof and made the jump at a speed of seventy miles per hour. More than 200 tons of snow were required for the slide, which was used at a recent winter sport show. A machine which grinds ice and blows it onto the course helped supply the snow.



Top, ice machine blowing "snow." Bottom, ski-jumping course built inside arena

Prints of Germ-Laden Fingers Show How Diseases Spread

That the germs of many diseases are spread by unclean fingers was demonstrated recently by Dr. Emil Klarman with enlarged fingerprints. The impressions of clean fingers were clear cut, showing the whorls and ridges plainly. But the prints of germ-laden fingers revealed with startling clarity the presence of the germs. Numerous spots appeared on the unsanitary fingerprints, in contrast to the spotless impressions made by clean fingers.



Enlarged photos show germ-laden fingerprints at right, clean prints at left

"Dry Ice" and Carbide Engine Drives Model Planes

Regarded as the solution to the problem of equipping model planes with inexpensive motors, a Dry Ice and carbide engine has been developed and tested with gratifying results. It resembles a toy steam engine, having two cylinders mounted vertically, one behind the other, on the crankshaft. Pressure which turns the engine is generated in a two-section tank which has carbide and Dry Ice in the lower section and a small amount of water in the upper section. Carbide gas, aided by carbon dioxide from the Dry Ice, operates the motor and the Dry Ice serves the double purpose of cooling the power plant. The engine will run for several minutes on a small lump of carbide and another of Dry Ice. It is the result of months of experiment by Hubert Owens of Memphis, Tenn., and will fly a model plane with a six-foot wing spread for several minutes.

International Models Co. 1789 Broadway N.Y.C.

Memphis Model Plane

4405 Lexington Ave. New York

microphone Boston Mass
Boston Isardens

2045 W. Whiting Park Ave. Phila.
Luther Bell Co. 2045 W. Whiting Park Ave. Phila.

Single-Seat Home Elevator Installed on Stairway

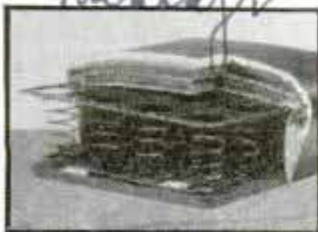
Woolworth



Operating switch on elevator which is installed on stairs without marring woodwork

Designed for installation on the existing stairway, a one-passenger electric elevator is available for the home. It consists of a self-contained unit resting on the stairs, so woodwork is not cut nor the house altered in any way. The installation does not interfere with normal use of the stairs. Push-button switches on the car and at both ends of the track control the elevator, which can be started, stopped or reversed at any point. The elevator has a chair of ample size for a large man. The track occupies only six and one-half inches from the wall on one side of the staircase. A small motor drives the elevator by means of gears under the chair.

1460 Seat Covering That "Breathes" Holds Springs in Place



Assuring proper ventilation, so necessary to seating comfort, and holding the springs in place in seats used in automo-

biles, trucks, railway cars and the home, a new upholstering material has been introduced by the B. F. Goodrich company. It consists of haircloth, insulated with latex, a soft rubber, which has been fabricated into a structure of figure-eight springs. The material is soft, buoyant and elastic, yet has sufficient structural strength to bridge the open spaces between the springs. Thus is presented a smooth, comfortable surface through which it is impossible for the springs to protrude. The material can be used in combination with a conventional type spring unit. Ventilation is provided by the fabrication into loops which permit continuous air circulation regardless of the pressure applied.

E 1486

Twin Slits Cut in Album Page by Double-Bladed Knife

Gripped like a pen, a twin-bladed knife is convenient for cutting slits to mount pictures in albums. This method of slitting the album page gives more freedom in style and position of mounting. The



There is more freedom in mounting pictures when you slit the pages yourself with a twin-edged knife

cutter is also a handy tool for window decorators, for mounting samples in salesmen's books, and for making enclosures in letters such as stamps and coins.

W. E. Cheney
B. F. Goodrich
E. A. Cheney

The Ironway Co. 14-40 Broadway New York

14-40 Broadway
The Ironway Co.

Alton

World's Largest "Eye" Is Ready for Grinding

When the world's largest telescope "eye" is trained on the heavens three years hence it will bring to astronomers at Mt. Palomar, Calif., the light that started earthward from distant suns and planets one billion years ago. The 200-inch lens was taken recently from the annealing oven where it had been gradually cooling for



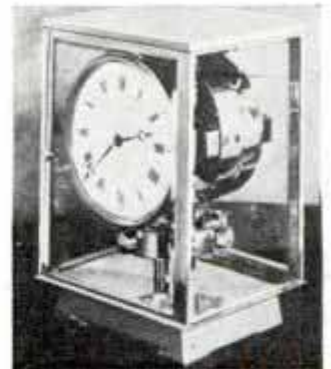
Top, the 200-inch lens just after removal from annealing oven; below, five-foot auxiliary disk

more than a year, and was packed for shipment to Pasadena, Calif., where another three years will be required for the grinding. This process is necessarily slow because any heat generated in grinding and polishing the lens would cause a flaw in it. The telescope is expected to penetrate four times as far into space as any instrument existing at present. A companion piece, also molded at the Corning, N. Y., Glass Works is a 1,500-pound mass of glass designed for an auxiliary disk.

More than 51,000 locomotives with an average capacity of more than 2,000 horsepower are owned by the nation's railroads.

"Perpetual Motion" Clock Run by Changes of Temperature

Here is the "perpetual motion" clock—no spring, no winding, no batteries nor current, no magnets nor selenium cells. Yet it runs! It is activated by changes of temperature. A variation of only one degree centigrade in the air temperature is enough to keep the clock going for 120 hours, and it varies less than a minute a year in accuracy. The motive element is contained in a U-shaped tube of Pyrex glass fixed in a drum. One end of the tube is exposed to room temperature, the other end is shielded by insulating material and a cap. Inside the tube, at the base of the "U," is mercury; above it, on each side, a liquid gas; and at the top of the tube, the saturated vapor of the gas. As the temperature rises, the vapor in the exposed side expands, pushing the mercury toward the insulated end, compressing the gas in the latter. The shift of mercury changes the center of gravity and the drum revolves slightly, storing energy. As the temperature drops, the drum rocks back and builds more energy.



8/15/25
W. Hamlet Luffe
San Francisco, Calif.

Quene Derace
12/4/35

Built by Luffe

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Appliances Speed Up Mastery of the Violin

Mechanical aids to the violin teacher have been devised by Leo Portnoff of the University of Miami conservatory of music. Among them are appliances which help to produce hammer-stroke technique and flexibility of wrist, to stretch and



Left, wrist strengthening device. Right, top, apparatus for correcting position of arms and fingers. Bottom, tone meter



strengthen the fingers and to teach position of instrument and coordination of the hands. One device consists of a tone meter with a pointer showing the student whether he is producing an even tone. The inventor-musician says the mechanical helpers speed up the teaching of violin, reducing the time for mastering fundamentals from years to a few months. Some of the great musicians, Schumann, Ernst, Paganini and Joachim, worked along the same line. Their inventions ranged from changing the form of the violin to placing weights upon bow tips, binding stones to the left arm, putting books under the bow arm, gyrating the wrist while relaxed and pulling the bow parallel to a piece of elastic fastened to the wall. Paganini is said to have produced an appliance which helped him reach the heights, but he never revealed the secret.

□ A hair would have to be split into four pieces to fit it between the piston and cylinder bore of a modern automobile engine.

Imitation Foods Used Widely to Display and Instruct

Many new uses are being found for imitation foods, which are so realistic that they frequently are mistaken for the original. At present, there is a demand for imitation foods for use in showing patients the exact quantity of food required for diets. This method is regarded as an improvement over the old system of telling the patient how much of each food could

Maine, Fla

Mechanics

E. J. Hunt, Master

*Chrysler Corp
Plymouth Div*

*Imitation Food
Display Co*

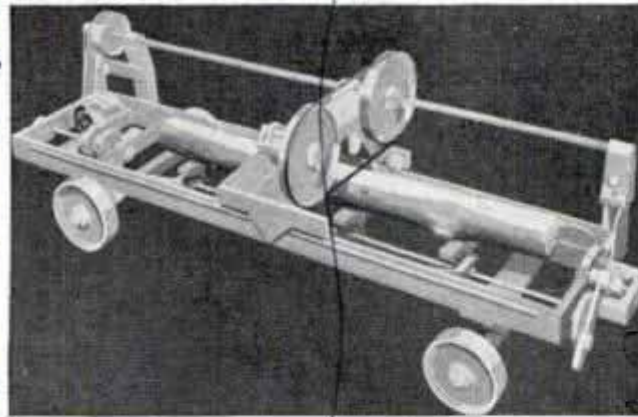
Lawrence H. Lawrence

*1428 Southwest
13th St, Miami Fla*

be consumed safely. For home dieting, the imitations can be kept handy to prevent mistakes in serving the real food. Principally, however, imitation foods are used by manufacturers to show the housewife the quantity of food that pans, pots, boilers and other containers will hold, to demonstrate the capacity of refrigerators and to form displays in show windows. The imitations are used by dairies, bakeries, grocers, motion-picture studios and others.

Band-Saw Mill on Wheels Is More Efficient

Holding the promise of more economical and efficient lumber production from small timber holdings, a design for a portable sawmill has been drafted by the Forest Products Laboratory. The mill is not on the market, but an experimental unit is planned for test purposes. It would be mounted on wheels so that moving would require simply that the blocks steadying the front bolster be removed, the tractor hooked on and the entire unit pulled to the next set for operation without digging a pit or leveling a carriage trackway. In operation, the log would remain stationary and the saw would travel its length. The



Design for economical band-saw mill which can be moved easily to new cutting location

design calls for the saw frame to be cable driven with a disk friction double-clutch drive up to a speed of 120 feet per minute in the cut and 200 feet per minute return. A revolving horizontal bar would supply the power to produce a saw speed of approximately 8,000 feet per minute, with the eighteen-gauge saw running over forty-two inch wheels. The unit is estimated to weigh about 9,000 pounds and is designed for five-man operation.

Disk for Deciphering Codes Reveals Secret Messages



Cipher disk which was used by the famous Black Chamber in decoding secret messages

One of the aids of the famous Black Chamber in decoding secret messages during the world war was a cipher disk with the help of which very complicated code systems often were solved. The letters of the alphabet were arranged in sequence in two concentric circles which could be rotated back of a V-shaped slot in making tests while attempting to decipher codes.

Miniature Electric Hammer Engraves on Metal

Fine engraving on metal can be done with a tiny steel-pointed hammer operated by electricity. It works with a rapid, interrupted beat, striking forty or fifty times per second. Suitable for rugged work by engineers and mechanics, this hammer is capable of very fast precision engraving by skilled artists for work on jewelry and fine instruments, working equally well on metals, Bakelite, ivory and similar hard materials.



Engle Bros. Co. Akron Ohio
8/579
8/564
Major Herbert O. Gardner
Wolfram
cond.
no 4-S. agent
Madison Wis
Turnbaker Products
280 Dearborn

E 1211.

1055-5 Halman Ave
Los Angeles Calif

United Artists Studios, 1048 S. Normandie, Los Angeles



Cameraman measuring distance from lens to actress in making screen test. Below, applying "make-up"

WITH an amateur movie camera and a few tips from Hollywood you can film thrilling deep-sea dramas on your dining-room table, transform your cat into a weird monster on the screen, or grind out exciting plays with the family and friends as actors and the back yard as "location."

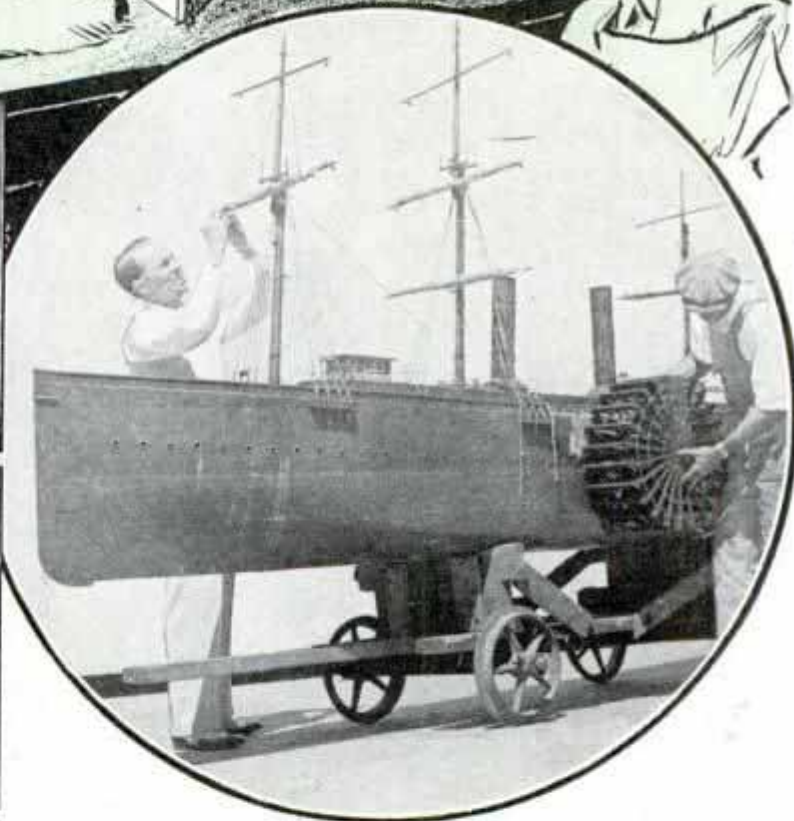
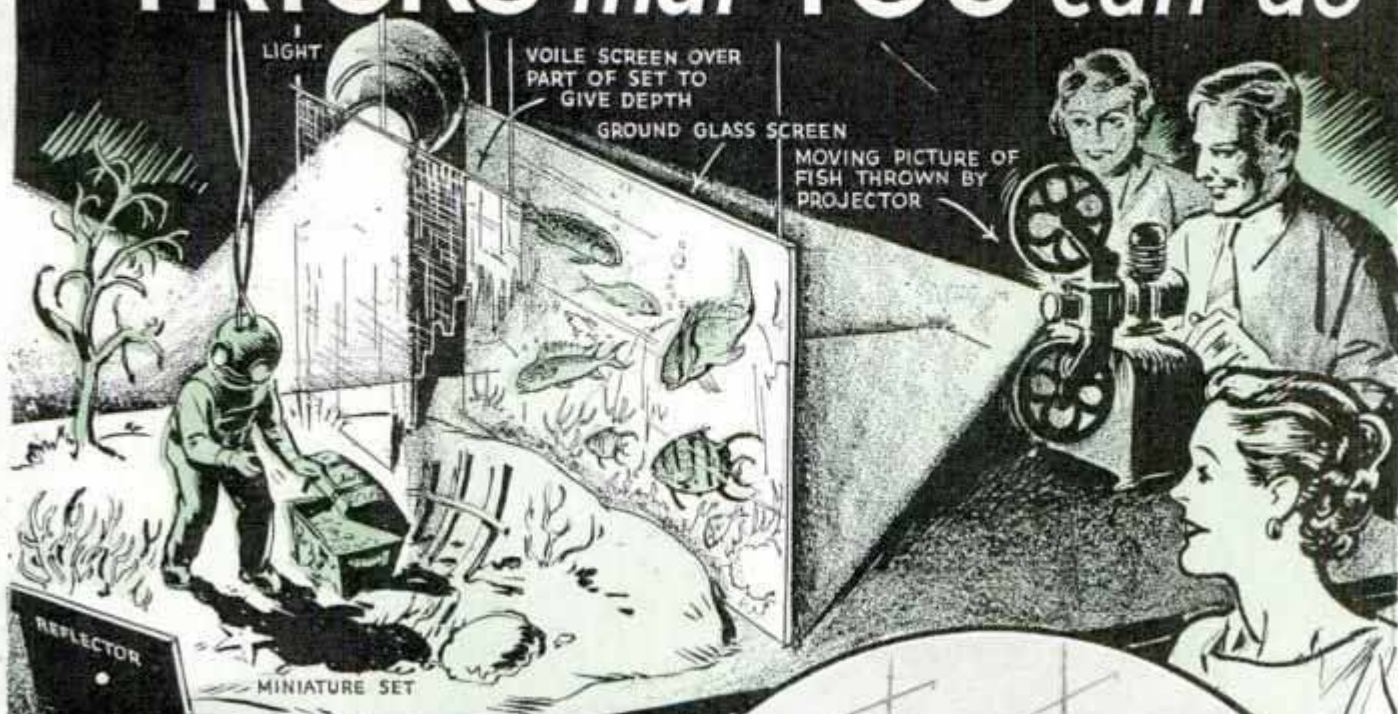
Many of the spectacular tricks developed by professional cameramen to intrigue movie fans can be achieved by the miniature motion-picture camera. Let Gregg Toland, head cameraman for Samuel Goldwyn, Inc., tell you how to adapt some Hollywood secrets to your own equipment—make dolls walk, film realistic shipwrecks, create magic effects that will keep your audiences asking how you did it.

Perhaps you want to make a screen test of some friend to be sent to the Hollywood casting offices. Toland advises you to do it this way:

"For close-ups, seat the model on a revolving stool close enough to the camera so that the picture cuts slightly below the

shoulders. You need at least two sources of light, the main light of about 500 watts above the camera and a weaker light, say 250 watts, about three feet below. A back light adds detail to the hair. A dark screen of thin gauze or net voile right in front of the lens helps soften the features. The subject should be clad in dark, but not black clothes, and moderately made up. Avoid heavy rouge. Take a full front view and then slowly revolve the stool for profile and back views. Make several shots showing her looking down at different angles. It is best for the subject not to smile

TRICKS that YOU can do



Top, filming undersea drama indoors. Right, model used in shipwreck scene. Bottom, fading one scene into another

until the end, when a flash of the teeth makes a pleasing finish. Casting offices also like to see a girl walking, preferably in evening dress. For screen tests in sunlight, use a white sheet or other reflector to lighten the shadows."

Trick shots showing "impossible" action—a boy leaping to a high fence, or pinning a person to a wall by flinging knives—are simple to the movie cameraman. Merely film the action backward. If your camera won't crank film backward, hold the camera upside down. For example, to show Johnny



Gregg Toland making screen test with amateur camera. Digging for treasure in home movie thriller

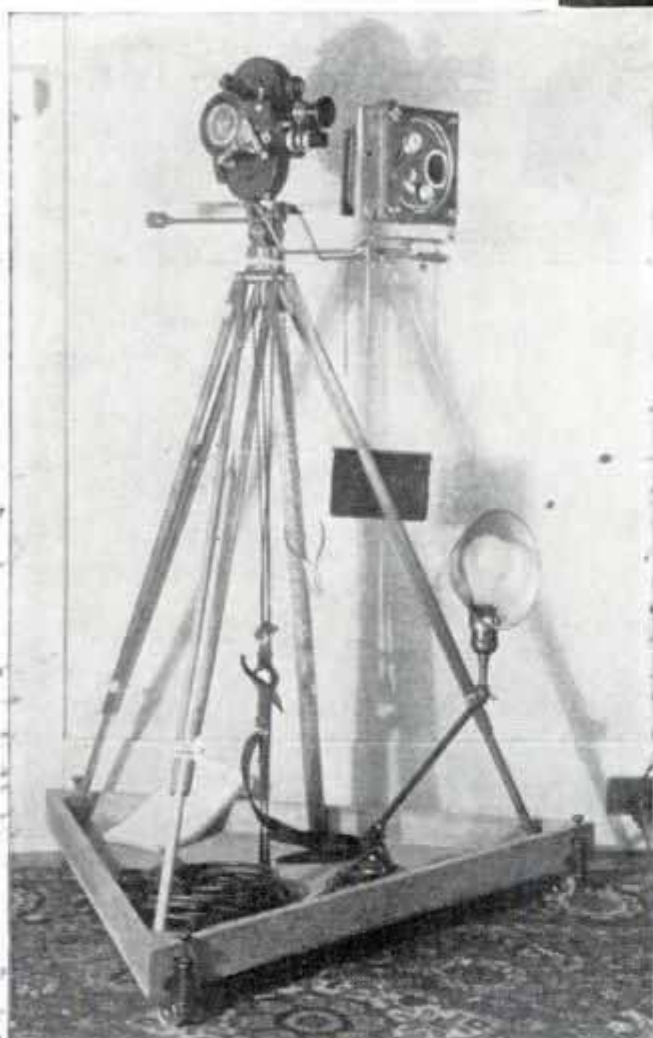
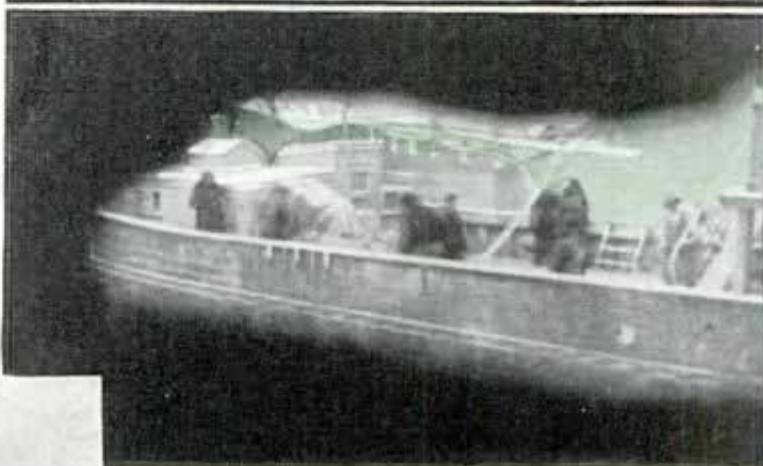
eating some "Tarzan pills" and then jumping to the top of a five-foot wall, put Johnny atop the wall and have him jump backward to the ground, then take a few steps backward. Hold the camera upside down while filming, then cut and reverse the strip in the finished film, and Johnny appears to run forward and make a tremendous jump to the top of the wall. The knife-throwing stunt that looks so dangerous is just as easy. Stand a person against the wall and drive a knife lightly into the wood beside his head. Attach a piece of piano wire or strong thread, the

same color as the background, to the knife handle. Start shooting the scene with the camera upside down. Have someone jerk the knife to make it quiver, then give a strong yank that brings the knife flying away. If you reverse this strip of film and project it after a normal shot of the knife-thrower preparing for the throw, your audience will gasp as it sees the blade plunge into the wood a fraction of an inch from the target's head.

Magic effects can be obtained, too, by double exposure, or even multiple exposure. One small motion-picture company got twelve jurors for the price of one in a court-room scene by photographing the same actor twelve different times on the same strip of film. Each time, the actor posed in a different chair of the jury box, always in a different costume, make-up and action. That was a difficult piece of photography, and ordinary double exposures are much simpler. Your camera should be equipped to rewind film for the second exposure. Try giving one actor a dual role on the same film, talking to himself or holding a match for his double to light a cigarette. To make one scene fade

into another, wind back a few feet of film after finishing one scene, then start the new scene. The end of the first scene should be faded out by slowly closing the lens aperture. After winding back and starting the new sequence, slowly open the aperture to its proper setting. Smoothly done, this type of double exposure shows the old scene gradually merging into the new.

"One of the easiest tricks," says Toland, "is to make people appear out of thin air, or disappear in the middle of a scene. To make someone vanish you merely stop the camera, let him walk off the set, then start the film again. The camera should be held on a tripod for steadiness. To be convincing, there should be some reason for the disappearance. One actor might be dressed as a magician.



Photos Courtesy American Cinematographer
 Camera is masked to block out surroundings, and film of ship's hull and ice is superimposed later

When he snaps his fingers and someone appears out of the air at his command the effect is startling. Or have the magician drape a shawl over a person and suspend part of the shawl from a hook. When he waves his magic wand and pulls the shawl away there's no one behind it. You simply stop the camera while the wand is being waved, have the hidden person walk away, then start filming again."

Animated cartoons are made by the "stop-motion" method. You can employ the same system to make dolls or toy animals act. Many of the prehistoric monsters in "King Kong" were toys actuated in this manner. The camera should have a crank or some means of exposing one frame of film at a time, but you can develop a light touch on the release button to expose only a frame or two at each touch. To show a toy elephant raising its trunk, shoot two frames with the trunk down, raise it a fraction of an inch and expose two more frames, then raise it slightly again, and so on. By a complicated animation process you could show an "impossible" scene of dolls drinking tea,

(Continued to page 114A)

the pan is scraped clean and the cleaner empties into containers at the end of each row of cages. Removing and emptying these containers is the only manual labor involved. The cages ~~for the 5,000 hens~~ are constructed in units, ~~all~~ ^{one} of which can be erected in a one-car fourteen-foot garage. Attached to each cage is a box large enough to contain food for several days. The bottom of the cage has an incline down which the egg rolls into a receiving cup. So sanitary is the battery that the hens are much healthier and the task of caring for them is much easier.

⁶¹⁵⁰³
**Small Hydraulic Hoist
 Handles Big Loads**

Compact and operated by hand, a new sixteen-pound hydraulic hoist handles loads of one and one-half tons, moving such weights as little as one-sixteenth of an inch at a time, if desired. The flexibility in operation makes the hoist useful in machine shop, garage, mill and on the farm.



Handy hydraulic hoist shown in place, ready to lift loads up to one and one-half tons

**Rubbish Used to Make Model
 of Pioneers' Covered Wagon**



Odds-and-ends model represents one artist's interpretation of pioneer family traveling west by covered wagon

Old newspapers, rags, cigar boxes, sand, stones and string were used in constructing a model of the covered wagon of pioneer days. Anton Rogalski, Chicago artist, made the model, which is complete to figures of a pioneer family and the animals drawing the wagon. The only expense of construction was for paste and wire, which could not be found in rubbish.

⁶¹⁵²³
**"Breaking In" New Paintbrush
 Eliminated to Speed Work**

To eliminate the tedious "breaking in" necessary for getting the best service out of a paintbrush, one manufacturer is producing pre-treated brushes which can be used immediately upon purchase. The treatment consists of filling the cells of each bristle in the brush with oil, then cleaning off the excess, leaving the bristles clean and elastic. At the same time, the brush is worked down to efficient shape which normally requires several days of use. The brush is said to withstand abuse from the inexperienced painter.

*Mrs. Paul and Jack
 Knapp 321 4th Ave*

*1014 N. Dermulage
 David Lenzel S. no. chm.
 10-20 Cedar Place, N.Y.C.*

Altar Slab Centuries Old Bears Writings of Mayans

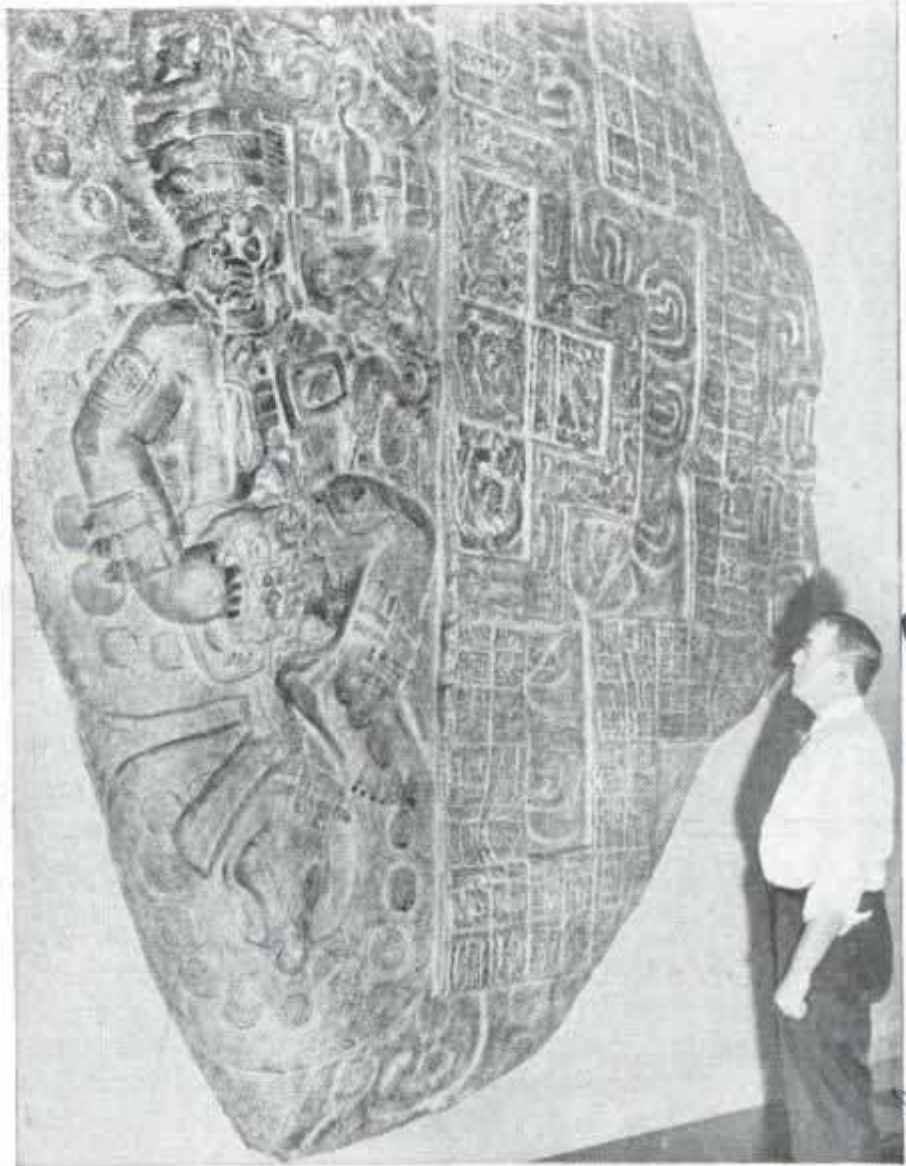
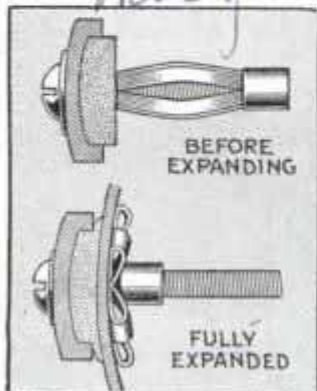
Contrib. R.W. Cayer & J. W. Plumb

planned. For several years, the temperature has been regulated in the gauge rooms, so the accuracy of the gauges, some of which register in millionths of an inch, shall be insured. Inspection rooms and cylinder lapping rooms have air conditioning, and equipment is being installed in the mold rooms of the foundry. Temperature regulation was undertaken in cylinder lapping rooms because it was discovered that there was a variation in the size of cylinder blocks on very hot days, as compared with cooler days. This variation was enough to cause an engineering problem, since a very close fit between piston and cylinder is necessary.

8/14/58

"Spider" Plug Stops Boiler Leaks Securely

Boiler leaks can be repaired effectively with a special expanding plug now available. Really a bolt and nut assembly, it is driven into the hole and then, by turning the screw head, a five-pointed "spider" expands on the inside and compresses securely over an area of one and one-eighth inches, safe against a pressure of 225 pounds of steam. Similar expansion bolts can be driven into lath, plaster or hollow tile walls and used as a base for securing plumbing and lighting fixtures, or attaching furniture to the floor.



Reproduction of huge altar stone taken from the ruins of Mayan city. Note the figure of the dancer

Unearthed in the city of Quirigua, Guatemala, a Mayan altar slab dating from 531 A.D. bears carvings of a dancer and a long inscription in hieroglyphics. A reproduction of the stone, which is twelve feet wide and two feet thick, has been made to permit close examination at the National Museum. The original was dug up by Carnegie Institution scientists.

European invention Cellophane flashlight "bulbs" which enclose their own foil-on-cardboard reflector, easily packed and disposed of without the danger of broken glass, are the latest aid to the cameraman.

Washington, D.C.

Coressant Machine Works 1125

Raygram Corp. 425-4th Ave.

The Camera Dec 1933

8.1301

SPEECH ^{newspaper} without

Mr. Jacob Blechman
R. 2240, 500 5th Ave
New York

Chicago
Conf. 1870



Scene in Chicago wheat pit where hand signals carry on big grain deals. Shouting bids would create too much confusion and slow up trading

HANDS do all the talking in Chicago's trading pits. Fingers speak a language which translates into dizzy figures and decides world opinion on the demand and the supply of grain, provisions and cotton.

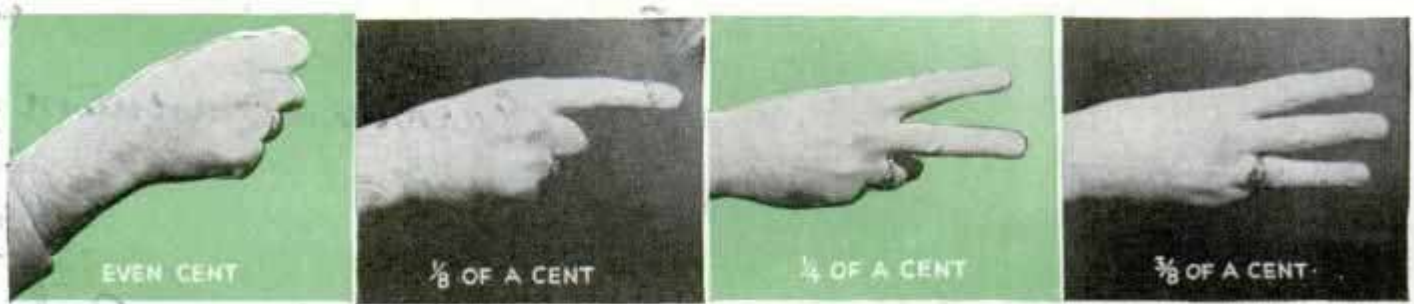
Every hand that moves is watched and its message somewhere registered. The vocabulary is limited but enough for the purpose. One or more raised fingers held vertically say, "5,000 bushels" or "10,000 bushels," each finger indicating a unit of trade, 5,000 bushels. An open palm exhibited away from the trader says, "Sell," the palm turned toward the trader says,

"Buy." Prices are "spoken" by a system of finger signals extended horizontally.

The use of fingers, hands, arms and facial expressions to substitute or supplement verbal speech goes back to the world's beginnings and persists today in one form or another, in almost every walk of life, orchestra conducting, book and fruit auction sales, railroading, baseball, crane hoisting and lowering, in the directing of street traffic, in our everyday man-to-man encounters.

When "words fail us" and we are at a

Below, strip on this page and the one opposite show how grain broker makes his bids

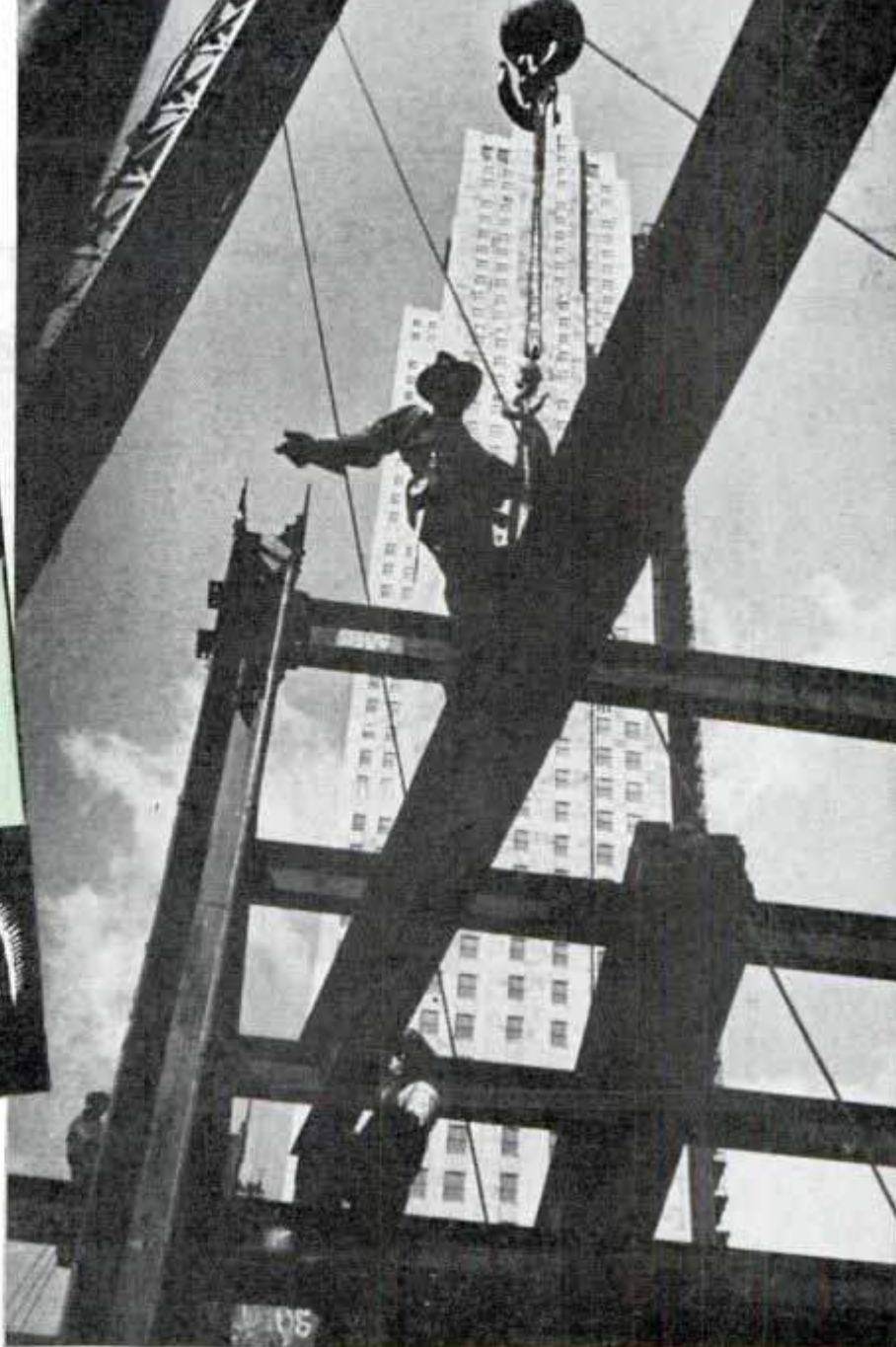
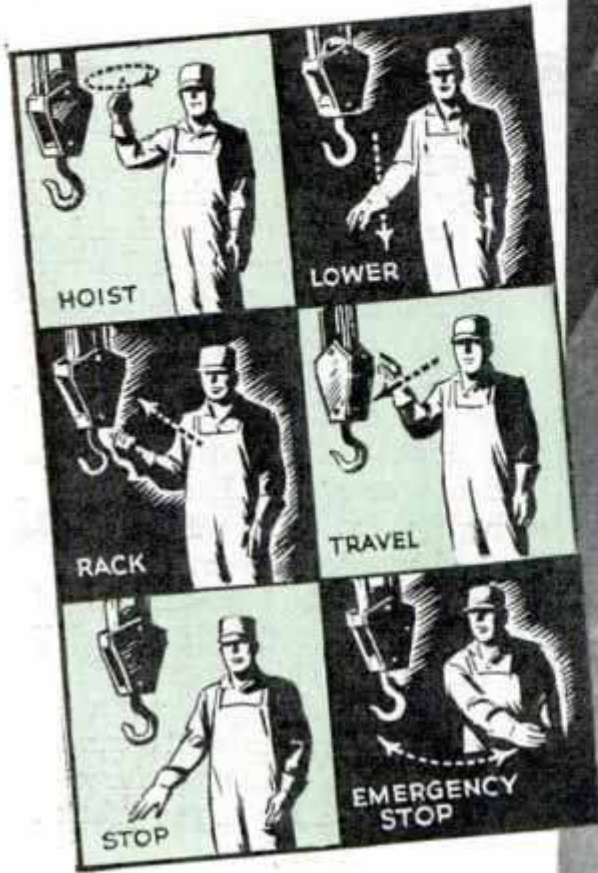


Chicago

Chicago
Conf. 1870

21301

WORDS



Right, hoist in operation on skyscraper. Left, various signals used to operate the crane efficiently and safely. These signals help prevent accidents

loss how to express exactly the meaning we wish to convey, we often resort to hands and arms to add emphasis or to clarify a point.

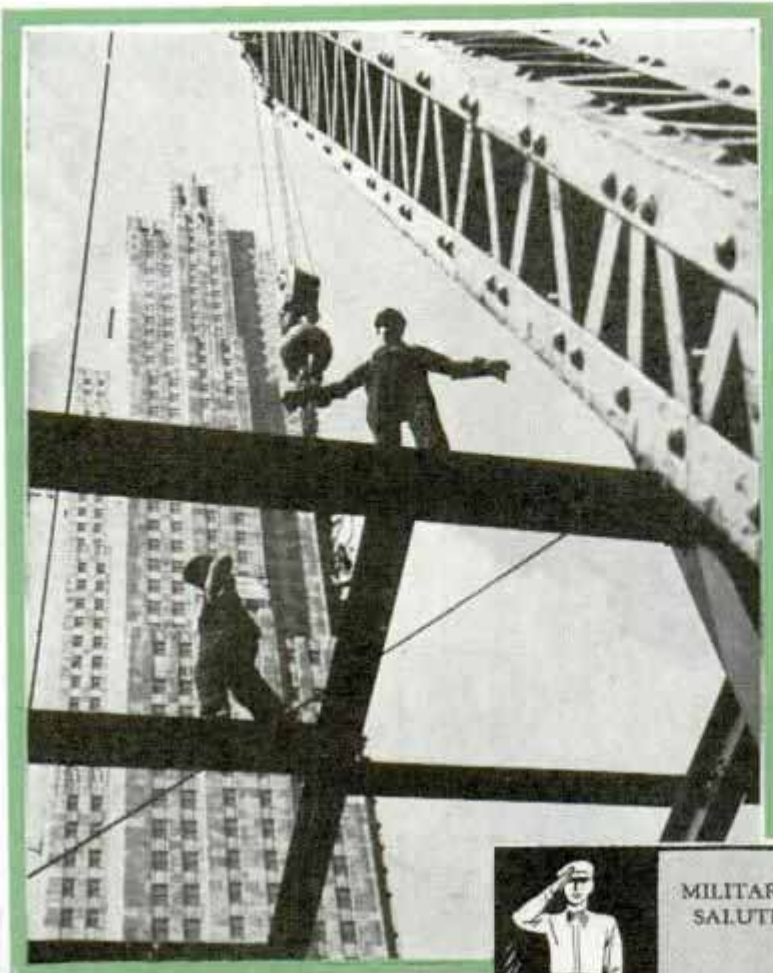
The universal wish for graphic expression of ideas or impressions finds an outlet in such a wealth of revealing gestures as to point to the existence of something of the thespian in us all. We point with the finger to direct attention somewhere; we shake the head in denial and nod it in as-

sent; we shake hands in token of friendship; we shake the fist in threat. We scratch the head in perplexity, pull our hair in despair and wink an eye to indicate mischief.

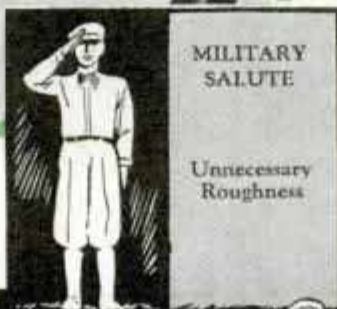
Auction sales of rare books and manuscripts involve the use of some rather subtle signaling methods. His jawbone relaxed and lips slightly parted, an important buyer sits well up in front of the company of bidders, his face seen by none



398



Above, signaling "lower away." Right, below, and on opposite page, signals used by official of football game to indicate cause of penalty



MILITARY SALUTE

Unnecessary Roughness



GRASPING ONE WRIST

Holding



HORIZONTAL ARC

Player Illegally in Motion



FOLDED ARMS

Flying Block or Tackle



WAVING HAND BEHIND BACK

Illegal Forward Pass

save the auctioneer on the rostrum and his assistants. The next moment he has closed up this jaw, causing the lips to meet. He may seem to have been gaping, but in reality he was conveying a definite message, which to the auctioneer signified all he wanted to know—that the man had made a bid.

Cryptic though the expression may appear to the layman, it is plain as day to the auctioneer, who, on the authority of just such simple gestures, has sold items worth thousands of dollars. It is said that some buyers who attend these auctions dare not make the slightest move for fear

it will be interpreted as a bid, and well it might be, when it is considered that bids are effected by raising a catalogue, lifting a pencil or blinking an eyelid. Others carry on their bidding by merely looking assent as the auctioneer who is crying the bids names the rising figures. When they wish to drop out, these bidders do so by a complete change of facial expression, showing indifference and a sort of no-longer-interested look, or by actually turning away the head and lowering their eyes to their catalogues.

B. A. Rolfe, conductor of a dance orchestra, has thought so highly of what he calls "the thousand-worded movements of the hands" that he has abandoned the baton in directing his musicians and uses his fingers and hands instead. His system comprises a series of musical commands, of which the most forceful is the one he terms, "sock it." This is expressed by the gesture of his right fist aiming at the open palm of his left

hand, and constitutes an order to the musicians to "give it all they have." The others range from the gentle touch to a tempo of soldier-like precision.

Bidding at the fruit auctions on the New York piers is done by means of a finger system. A peculiarity is that whereas the routine of bidding ordinarily proceeds on an upward scale, at the fruit auctions the bidding is practically in the opposite direction. Thus, when the auctioneer announces a bid of \$1.05 for some specified lot, a bidder raises one finger to indicate that he will take the lot for "even money" or \$1. If the bidding starts on a lot at fifty-

8/301

five cents, and a bidder raises five fingers outstretched, it means he will take the offering at five cents less, or fifty cents. Other signs are for one-eighth less, five cents more, a half dollar off, three fingers for three-fourths off the bid price, and a fist for seven-eighths less.

Among the arts, the dance very often employs the movements of arms and body to express emotion or to tell a story without the use of a single word, the dancers of the Island of Bali being particularly adept in this respect, their feet remaining stationary during the entire perform-

Right, B. A. Rolfe and signals used to direct orchestra. The signals mean: 1, "sock it"; 2, absolute precision; 3, pull in volume; 4, pull in accompaniment; 5, accentuate; 6, "let 'er go"; 7, a definite cutoff; 8, lightly, delicately staccato



ance while their bodies, arms and hands are constantly in motion. On the legitimate stage, it frequently happens that a mere glance, a gesture or an illuminating movement of the body, tells more than many words. In painting, in sculpture, and even in the humble newspaper cartoon, we often encounter the expression by means of hands and face and body attitude, of a story or description of an emotion or idea which no words could tell so well.

Despite the elaborate devices introduced into railroad signaling systems, the older methods of hand signaling still persist on some roads, especially in the routine of making up and breaking up of trains. The trainman in the Harlem river switching yard of the New York, New Haven and Hartford railroad employs a series of one and two-arm movements, while hand signals in general use among railroads, which have grown

(Continued to page 136A)

E 10/0

Cmd. Thomas G. Stinson, Jr.

10555 Holman Ave
Los Angeles Calif

FLYING the

manager 6th Air Navigative District. Bureau Oakland, Calif
of Air Commerce, 201 New Post Office Bldg



ways pilots are making their way safely through fog and above clouds that would have meant disrupted schedules a few years ago. Every minute of the night and day pilots are "flying the beam." If a pilot strays from the airway the steady tone of the beacon changes to broken signals. In one direction the pilot will hear the dash and dot of the letter "N"; in the other direction the dot and dash of the telegraphic letter "A." At thirty-second intervals the beacon signals are interrupted by letters that identify the beacon station.

About 20,000 miles of airways are lighted for night flying but these



Top, tuning overhead dial to receive beacon signals. Below, plane aerial that receives signals

TWO miles above the earth a transport plane flies above a solid ocean of clouds. For two hours the pilot has not seen ground, yet he hardly glances at the compass. Instead of guiding himself by eye he flies by ear, holding the plane on an invisible radio course. Occasionally the steady hum in his earphones ceases and a voice speaks.

"Burbank. Burbank. Overcast. Overcast. Ceiling 1,000. Visibility seven miles. North pass open. Daggett. Daggett. Clear and unlimited. Clear and unlimited." The voice trails on through a list of stations along the airway, giving the weather report of each.

Thanks to the radio lighthouses scattered at 200-mile intervals along the air-

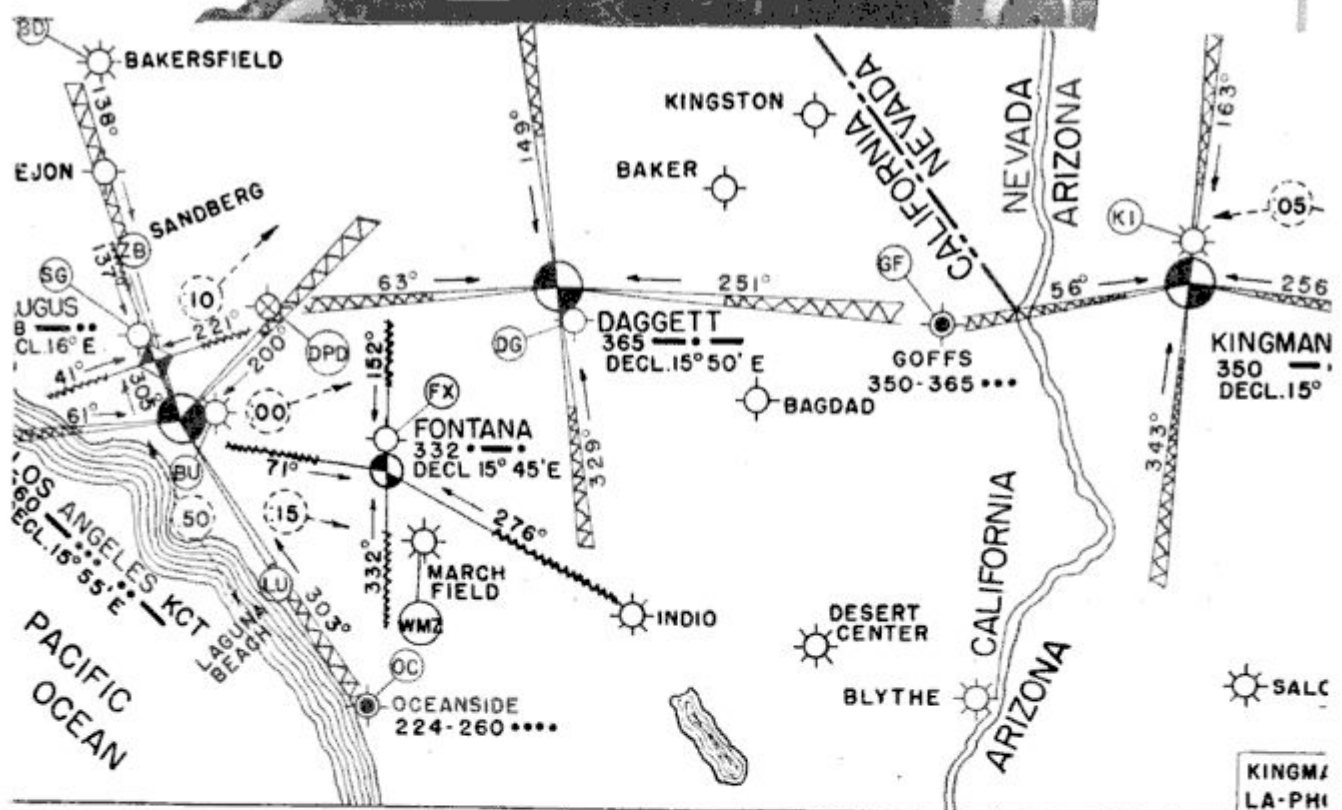
visual beacons have limited range in cloudy weather. Transport planes nowadays fly mostly above the clouds and the pilots depend almost entirely on the radio signals to stay on their courses. The bureau of air commerce of the department of commerce employs a corps of operators to listen continuously to the beacons. Their job is to report any interruption at once

1919
1919
1919

BEAMS

so the beacon can be repaired.

These radio lighthouses practically run themselves and aside from a daily trip for cleaning and inspection no one visits them. Motors hum continuously and the automatic telegraph keys turn and click steadily day and night. At Burbank, Los Angeles terminal of several transcontinental airways,



- TYPE "RL" OR "RA" RADIO RANGE BEACON. SHADED SEGMENTS INDICATE "A" SIGNAL ZONES.
- INDICATES MULTIPLE COURSES.
- TIME AND DIRECTION OF WEATHER BROADCAST. MINUTES AFTER THE HOUR.
- TYPE "MRL" OR "MRA" RADIO DIRECTIVE MARKER BEACON, - 125 WATTS.
- INDICATES MULTIPLE COURSES.
- TYPE "ML" RADIO DIRECTIVE MARKER BEACON, - 15 WATTS.
- TYPE "M" RADIO MARKER BEACON.
- TYPE "M" AT INTERMEDIATE FIELD.
- TYPE "PV" RADIO TELEGRAPH AND VOICE.
- TYPE "PV" AT INTERMEDIATE FIELD.

Chart showing radio range stations in southern California. Note how "legs" of beams are bent from right angles. Above, teletype equipment that receives weather reports for broadcast



Pilot using radio telephone to talk to ground station

the radio lighthouse as well as the weather broadcasting station is controlled from one central office.

In a room of the Union Airport passenger terminal, Operator Herbert Hela has charge of the radio range station four miles away and the voice transmitter six miles in another direction. An automatic telephone-type dial enables him to do sixteen different things at the distant stations without leaving his chair. By dialing one number he turns off the beacon transmitter. Another number throws the switches that turn on the power at the voice transmitter so he can deliver a weather report. Then he dials other numbers to shut down the voice transmitter and put the beacon back in operation. At dusk he dials a number that turns on lights on the radio towers.

The radio transmitter of the range beacon generates a continuous signal broken into dots and dashes by an automatic key. A slowly turning cam diverts a dot and then a dash to one part of the circuit and another cam picks up the intervening sig-

nals and switches them to another part of the circuit. At intervals a third cam breaks in to broadcast the call letters of the station over both circuits. The radio range stations operate at from 200 to 400 kilocycles and the largest uses 1,500-watt transmitters.

Some transmitters are equipped with loop aerials for sending directional signals but the latest antennas are tall steel towers that act as radiators. At Burbank four 125-foot towers in the form of a square broadcast the signals. Two opposite towers radiate "A" signals while the other two broadcast the "N" signals. At a distance from the station the radiating signals from two adjoining towers overlap to provide the continuous note tell-

(Continued to page 138A)



Center, high-frequency tubes used in radio lighthouse. Bottom, adjusting power of amplifying tube of one of ground stations

6/15/28
 "Flivver" Plane Has Engine Mounted at Rear



Acme

Designed for the private flyer, this two-passenger monoplane has its engine mounted high at the rear of the cabin, thus subduing noise and giving the pilot the maximum visibility

Entered in the contest for development of a safe, inexpensive airplane for popular use is a mid-wing monoplane with an automobile engine mounted above and behind the egg-shaped cabin. The rear-engine type affords good visibility to the pilot and reduces noise in the cabin. Built

at St. Joseph, Mo., this ship averaged twenty-two miles to the gallon of gasoline and reached a top speed of 125 miles an hour on a test flight to Kansas City. The cabin carries two passengers. Hayden Campbell, wartime pilot who built it, says a novice could fly it after three lessons.

6/15/30
 Cooling Unit for Farm Dairy Chills Milk in Can Quickly

Designed for use in farm dairies, a quick cooling unit to reduce the temperature of milk in cans has been invented by an Oshkosh, Wis., man. Made of stainless steel, it can be dropped into any standard size milk can and requires only the water pressure from a gravity drop of two feet to operate it, cooling the can inside and out. The water source, which may be a small tank on a shelf overhead, is linked to the top intake pipe containing a regulating valve. There its flow divides into the cooling tubes inside the milk can and a water motor which turns an agitator to keep the milk circulating. Overflow water splashes into a high-collared cup at the top of the can, and drains through perforations in the collar, running down the outside of the can for additional cooling.



Cooler is inserted in can and water flows through tubes while agitator keeps milk circulating

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Hayden Campbell
St. Joseph, Mo.
Chilly Milk Chiller
Oshkosh, Wis.

12/7/35

Duck Decoy Modeler Turns His Hobby into a Business



Using one bird at center as "master," Frank Mackay fashions several duck decoys from same model in his workshop

Twenty years ago a duck hunter and home craftsman, Frank Mackay, combined his two hobbies and began building duck decoys for his own use. Friends soon started ordering the decoys and today he has converted his hobby into a profitable business and ships the birds all over the country. In the accompanying photograph, he is modeling several birds after one "master" bird in the center. California redwood, he has found, is the best material for construction of the decoys.

the justice at the other end clearly and persons near the middle of each side of the huge room cannot hear what lawyers are saying if the attorneys stand in certain spots. The cause of this unusual acoustical effect and the possible cure were described at a recent meeting of the Acoustical Society of America by V. L. Chrisler of the National Bureau of Standards. Specially treated walls and ceiling were built into the courtroom, but for beauty in keeping with the rest of the edifice, four great eight-foot slabs of marble adorn the corners of the room. Tests by Mr. Chrisler showed sounds are reflected back and forth on the two diagonals of the room, and the ends of the justices' bench are near these diagonal "lanes of sound." Experiments showed that sounds starting in the diagonal lanes can rarely be heard clearly due to "flutter," a type of reverberation where sounds

persist for some seconds so any given word spoken in a sentence extends and overlaps following words, thus tending to blend into an unintelligible mixture. One way to cure the fault is to place sound-absorbing materials about the room to reduce the time a given sound persists.

Ground-Gripping Tractor Tires Solve Farm Problem



Giving greater traction and thus solving a problem in the operation of tractors and other farm implements, a new ground-

Sound "Flutter" in Courtroom Reveals Acoustical Defect

In the main courtroom of the new Supreme Court building in Washington the justice at one end of the bench cannot hear

Frank Mackay, 1123 Howard St. San Francisco Calif.

Washington D.C.

8150

2xruptone Tire +

gripping tire has been patented and is being marketed by Firestone. The tread is made of extra tough rubber, designed with deep grooves between scientifically placed crossbars. These ribs are oppositely inclined on two sides of the tread, the ribs on one side passing beyond the center of the tread to join up with oppositely inclined ribs on the other side. A continuous grip on the ground is thereby provided. Open grooves extending from the sides of the tire beyond the center of the tread provide self-cleaning. The tread is so effective that chains are said to be unnecessary under any conditions.

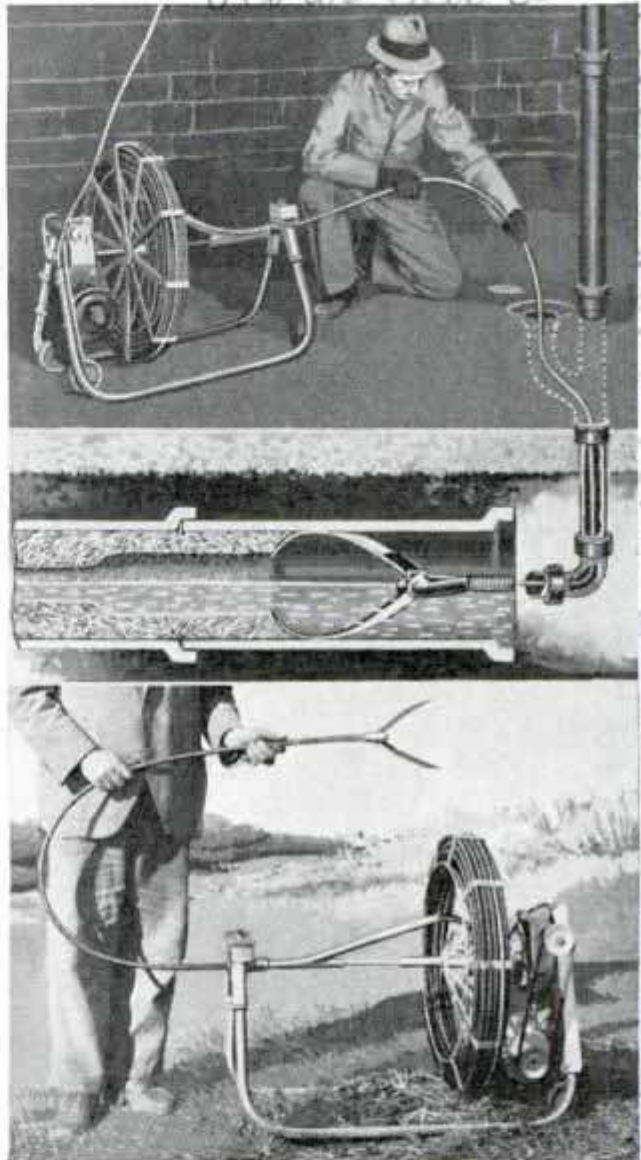
1481
Your Weight in Los Angeles Recorded in New York

Chemists attending a recent exposition of the chemical industries in New York predicted that the day is not far distant when one man will be able to operate and control an entire industrial plant from a central point. In part proof of the assertion they pointed to a remote-control board, recently developed, which governs weighing operations and the recording of weight from a distance. With the aid of this apparatus it now is possible to transmit weight recordings over wires; thus your weight could be registered in New York although you might be standing on the scales in Los Angeles.



acme
 Demonstrating remote-control board. Weight recorded on scales is transmitted over wires

Rotary Blade
Rotary Blades Cut Passage through Clogged Sewer



Above, cutter boring through pipe from basement trap, and, below, blades in open position

Trees boring down for moisture during recent years of drought have seriously menaced drainage systems by clogging sewer pipes with their roots. An Iowa man has developed a rotary pipe cleaner which makes it unnecessary to dig into lawn or pavement to reach the sewer. The cutting blades, electrically driven by a flexible steel cable, are fed into the obstructed pipe at the nearest sewer opening or basement trap. The steel blades are adjustable, and for the first drilling are set close together to clear a small passage through the obstruction. Then they are spread and run through the pipe again until it is thoroughly cleared. Sewers as long as 200 feet can be cleaned.

down by 100 ft. in 10 min. 100 ft. in 10 min. 100 ft. in 10 min.

Talbot Scale Co. 2216 Broadway

S. C. Blaine & Son 193 E. 1st St.

81396

Making SOLIDS Dustless - and

BULK materials such as grain, flour, coffee, peanuts, beans, salt, cement, fertilizer, talcum powder and scores of others are being moved in factories today by a conveyor system which causes these solids to "flow" like liquids.

One of the principal advantages of the system is that dust is eliminated in handling finely ground and pulverized materials, this in turn eliminating the danger of dust explosions. Materials are moved in an inclosed trough or casing and can be conveyed virtually anywhere the casing leads, vertically, around corners or horizontally.

The principle of the conveyor was dis-

80 N. Wacker Street Chicago - 360 N. Michigan Ave. State of Ill. Aurora, Ill. 1919. M. E. Lester

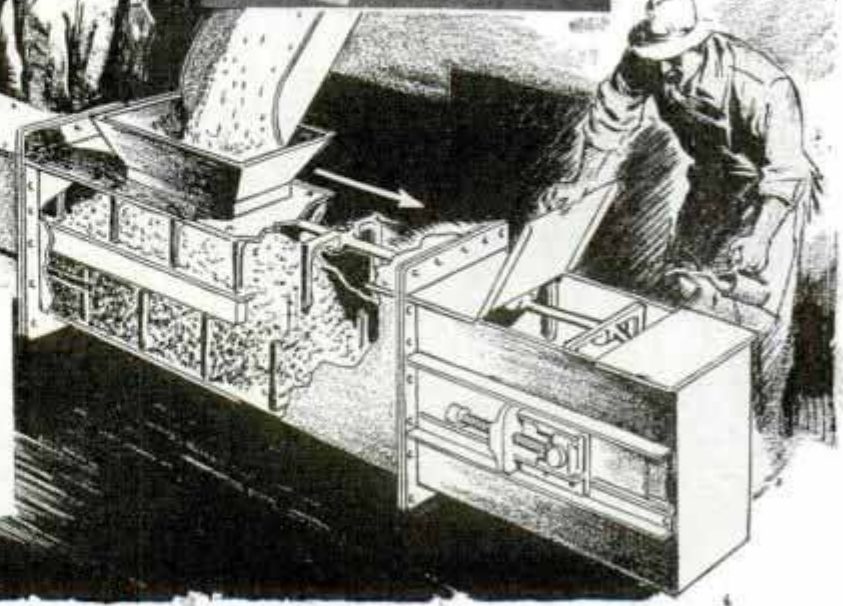
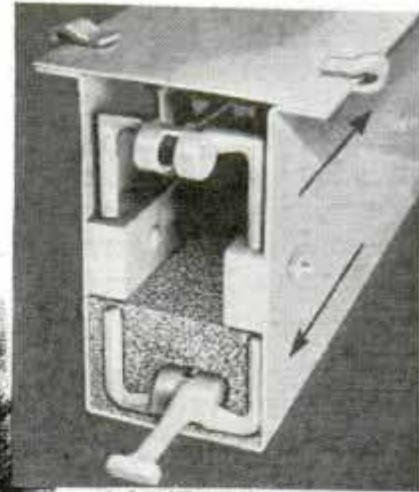
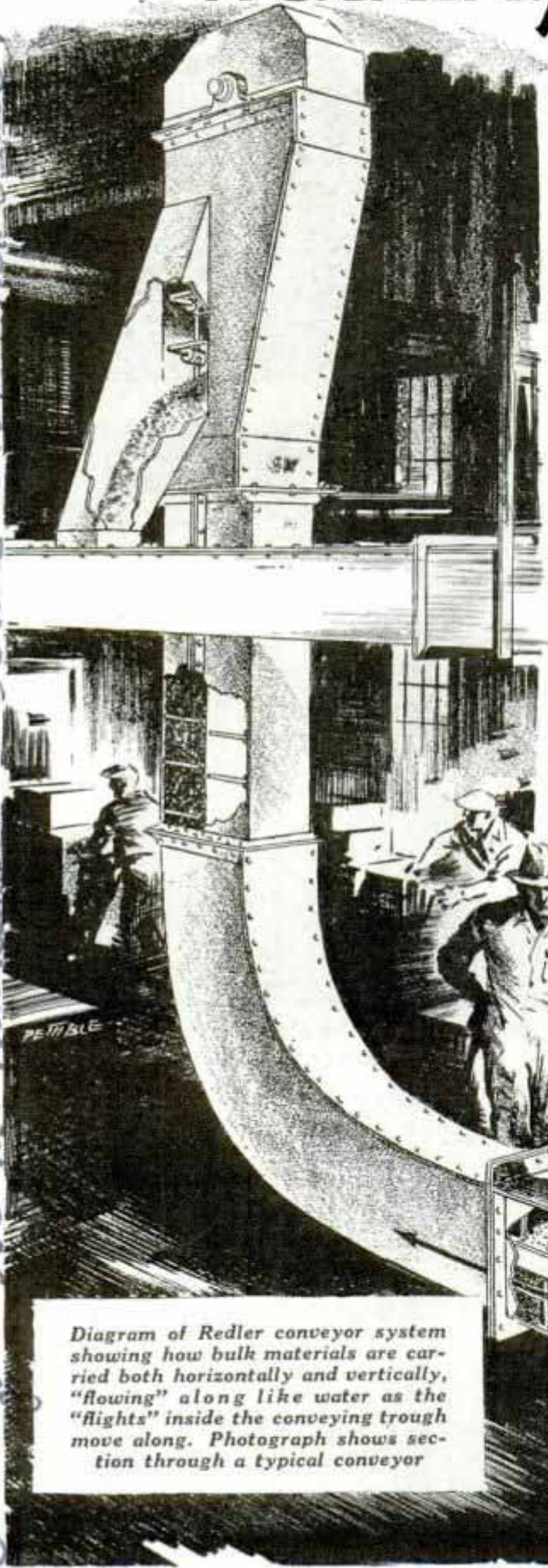


Diagram of Redler conveyor system showing how bulk materials are carried both horizontally and vertically, "flowing" along like water as the "flights" inside the conveying trough move along. Photograph shows section through a typical conveyor

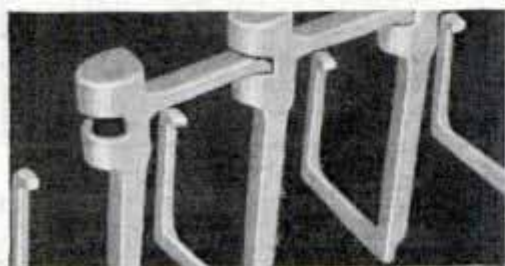
E 1396

Flow Like WATER ..

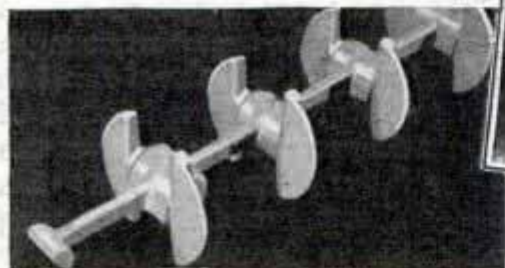
Explosion Proof



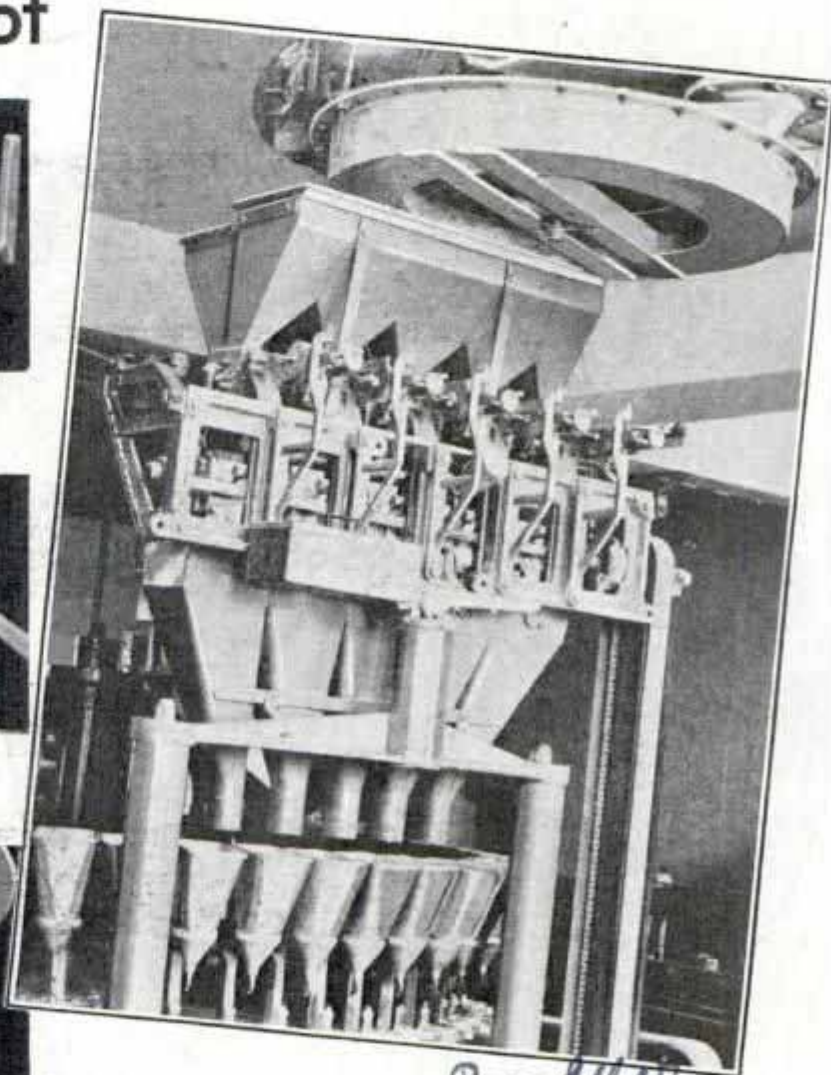
Light, skeleton U-flights used to move material in horizontal, inclined and vertical elevators



Side-pull U-flights for conveying material around horizontal curves and bends



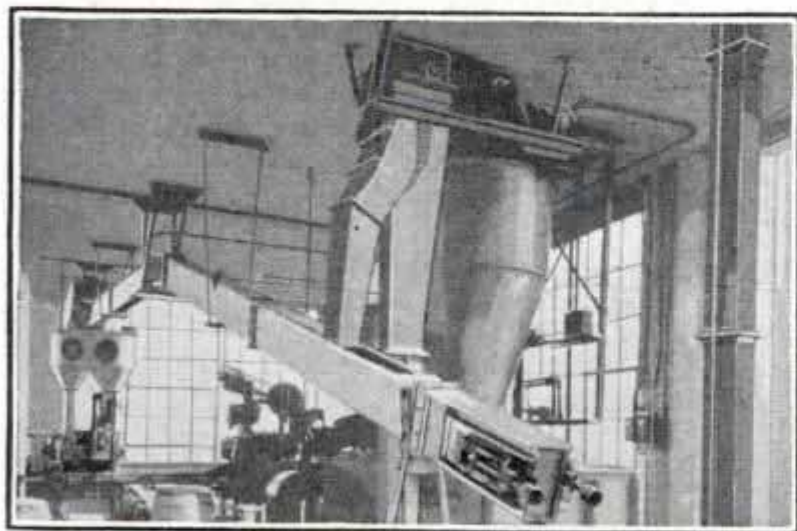
Flights for conveying solids through tubular casings instead of rectangular troughs



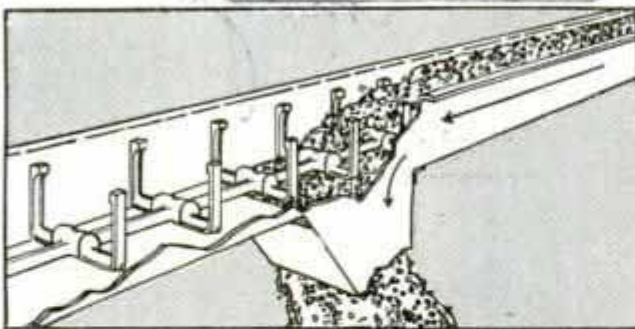
Conveyor

covered quite by chance by Arnold Redler, an English flour miller, and the system bears his name. Mr. Redler had devised a seasoning method for flour in bulk, and reclaimed the flour by having the floor of the seasoning bin alive with chains. A careless employe loaded a bin from the back, leaving a space at the front with the chains bare. Mr. Redler halted the filling, got into the bin, stood on the chains and ordered the unloading to start so he could observe the interaction of flour and chains at close range.

Something seemed amiss, however. The chains moved under him, as usual, but unloading did not start. Keeping pace with the live floor, he stooped to see what was happening.



Top, conveyor feeding salt to packaging machine.
Bottom, conveyor units in flour mill



Top, lime and stone plant which uses many conveyors to handle material. Center, conveyor in lime plant. Bottom, conveyor discharge

Suddenly something bumped him from behind and he looked up to find himself between the wall of the bin and an advancing wall of flour. He made a quick leap to safety, but the action he had seen intrigued him and when he had figured the cause, he had the idea for a new conveyor system.

The law he found can be stated briefly as follows. In handling bulk materials, if the boundaries or outer surfaces are urged forward, the entire mass moves as a unit because the shearing strength of the material on itself is greater than the friction of the same material against the relatively smooth walls of a conveyor conduit. Applying

this principle, Mr. Redler made a conveyor out of square conduit, and inside he placed a longitudinally moving element containing light metal members sweeping all four sides as they moved along. With this arrangement he was able to convey material en masse and quiescent at any angle desired. Later he found he could do the same thing without complete four-side sweeping.

The common shapes assumed by the moving elements, or "flights," in Redler conveyors today are the "H," the "U" and the "L," depending on the type of material to be moved. These elements are pulled through the shaft on an endless chain of which they form a part and this supplies the motive force to the part of the material in contact with the sides of the shaft. The rest of the bulk is carried along by the shearing strength of the material on itself.

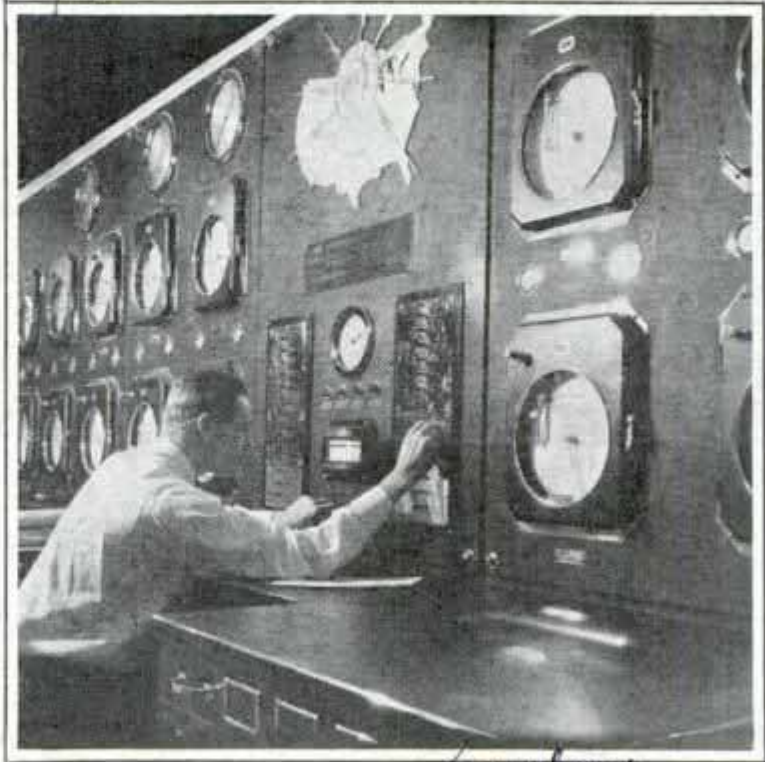
The conveyor is self-feeding and can

operate from a choked source, such as the bottom of a full bin of grain, without becoming choked itself. There is virtually no relative movement of one particle on another, the materials tending to "flow" like water, so that the most fragile product, such as peanuts, can be conveyed without crushing. Relatively small horsepower is required to move large quantities of material because the material being moved is not rolled about or disturbed in transit.

The "flights" which are cast integral with the chain links composing the conveying element are designed to "float" through the conveying trough, completely imbedded in the material being moved and with no metal-to-metal contact with the sides or bottom of the casing as long as the conveyor is one-third or more full. In addition to the "H," "L" and "U" flights, circular ones have been designed to operate in elevators.

The conveyors have been installed on boats to carry coal from bunkers to crushers and then into pulverizers, and the prospective usefulness of such equipment ranges all the way from a two-inch pipe conveying coal to, and ashes from, a small domestic heater, to big conveyors handling up to 600 tons of material per hour.

Vast System Conditions Air in Radio Broadcast Studio



Huge control panel with indicators showing the temperature in various parts of radio broadcast studio

One of the largest air-conditioning systems in the world has been installed in the National Broadcasting company's section of Radio City to maintain the proper temperature and humidity in each studio. A large control panel permits regulation of temperatures in all parts of the building and its large dials keep a constant record of the condition of the air in each studio.

"Perfume" for Boilers

FIRST cousin to a synthetic perfume, a chemical known as "Dowtherm A" is being substituted for water in steam boilers to increase the output of power per ton of coal. The chemical is a mixture of diphenyl and diphenyl oxide, freezes at 54.7 degrees Fahrenheit—virtually room temperature—and vaporizes at high temperatures in the boiler but develops much less pressure than steam. Chemically, it is closely related to synthetic geranium perfume and to certain synthetic resins from which plastics are made.

Shear for Cutting Stovepipe Has Curved Blades

Stovepipe can be cut quickly and evenly with a special shear having a pair of curved blades to fit the contour of the pipe. One stationary blade has a slot in its edge and the movable blade operates within this slot which assures a smooth edge and makes it easy to follow a guide line marked on the pipe. Because of the double cutting edge, a narrow strip of metal is cut out in the operation.



Service device 11/19/35

New Chemical

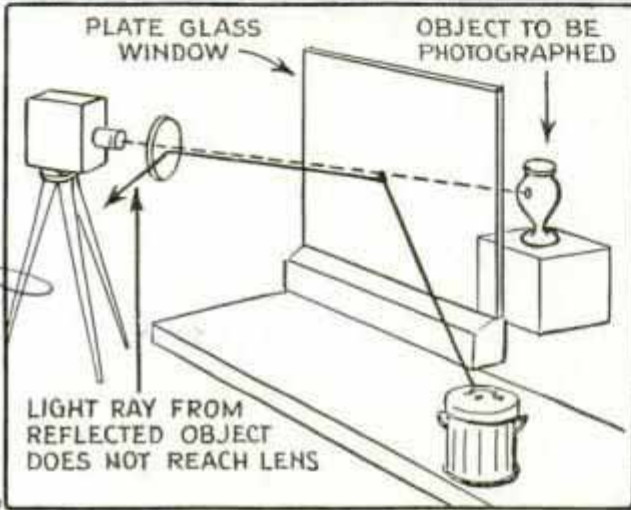
Expansion Engineering

Tested at U of Michigan
Ann Arbor Mich
C. J. George

8 14 39. Eastman Kodak Co

343 State St Rochester
Plascreen NY

Polarized Light Works Magic for Cameraman

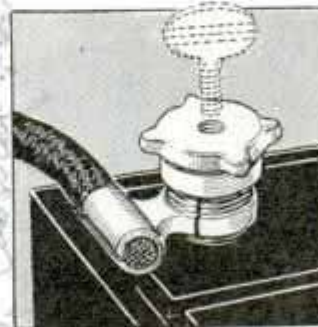


Window photographed (left) without and (right) with polarized light, and diagram of set-up

With polarized light for his wand, the cameraman becomes a magician. Take a picture of a plate-glass store front in ordinary light. Most of the picture is a reflection of the street scene behind the camera. Take the same picture with polarized light. Reflections have vanished! Instead, the developed plate shows the objects inside the store window. By means of a filter-like arrangement recently developed, the marvels of polarized light are now available to any photographer. High lights are not destroyed by this process, but shiny objects can be photographed without the annoyance of reflected glare. Ordinary light travels in waves that vibrate in all directions in all planes; polarized light travels in only one plane, without scatter or side reflections. Certain crystalline materials are so formed that light vibrating in only one plane is allowed to pass through them; light in other planes is reflected away. Among these crystals which

polarize light are the herapathite or periodides of quinine sulphate and related alkaloids, needle-shaped and about twenty-millionths of an inch thick. To make a photographic screen, Edward H. Land devised a method of laying these crystals magnetically so that they remain side by side, suspending this sheet of crystals in a cellulose acetate solution and binding it between glass. Used in front of the camera lens, this crystal screen polarizes the light, lets the lens "see through" reflections, subdues glare in marine pictures and pierces high lights in glass. A similar result can be obtained by holding a number of thin sheets of glass, optical glass or cleaned-off photographic plates, in front of the lens at a fifty-seven-degree angle and revolving this "filter" until the glare in the ground-glass finder disappears. This method increases the exposure.

Battery Terminal Easily Lifted by Turning Thumbscrew



Any danger of damaging the automobile battery when removing the terminal is eliminated by using a terminal equipped with a thumbscrew puller. The terminal

fits all posts and attaches to all sizes of cables. When a thumbscrew in the top of the terminal is turned down, it comes in

487
See April
Polaroid Corp. Cambridge, Mass.
73 main

34 W. La Salle
Chicago, Ill. 60411
Batteries

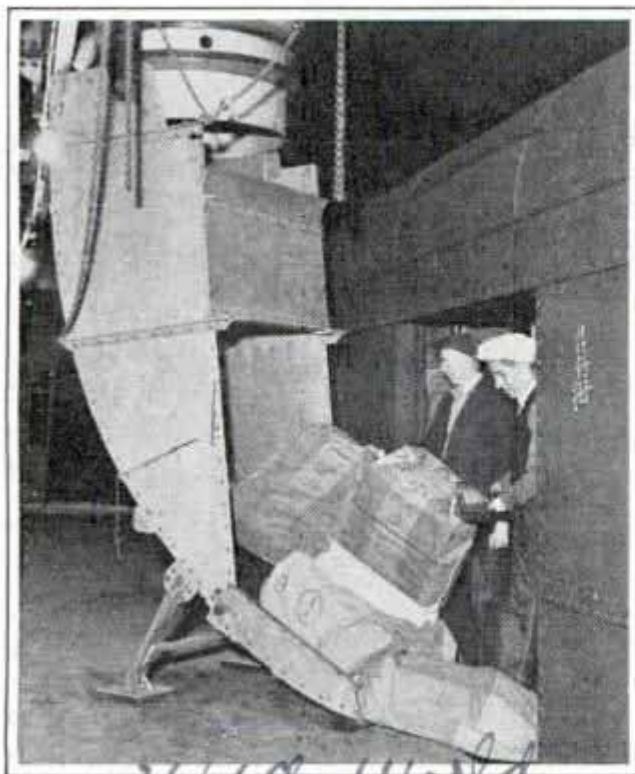
8 9 off Battery

contact with the post, thus lifting the terminal. By greasing the post and filling the cup of the terminal with grease before attaching, corrosion is prevented. The thumb-screw can be left in position on the terminal or, if it interferes with the floor boards, removed and used only when pulling the terminal.

E 463

Five-Mile Mail Belt Handles 150,000 Sacks a Day

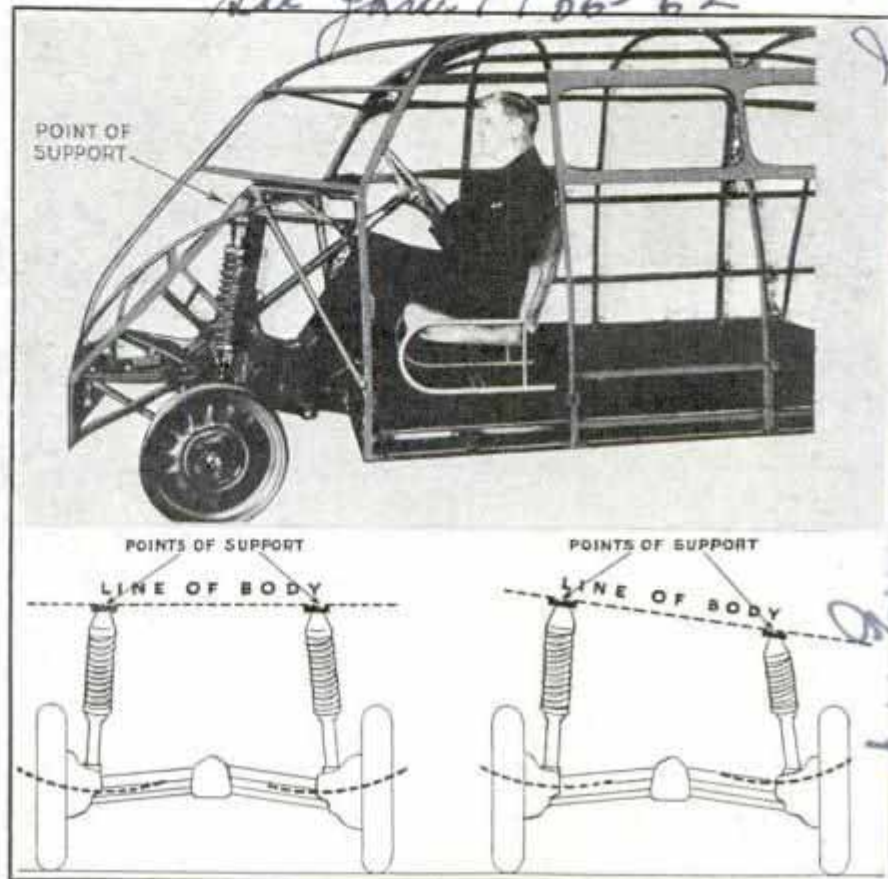
New York's new post office annex is equipped with a five-mile mail belt conveyor system capable of handling 150,000 sacks of mail daily to and from 250 incoming and outgoing Pennsylvania railroad trains. Mail sacks are carried over the conveyor system to chutes down which the sacks pass to loading platforms.



At the end of long conveyor belt in New York post office, mail sacks drop down chutes to mail car

Auto Built Like Hammock Rides Better with Safety

see Jan. 1936-62



Front end of hammock-like car. Sketches show how suspension operates to give "banking" effect when the car turns corner

Unusual riding qualities and more safety are claimed for the Stout Scarab automobile, the body of which has a pendulum support. The center of gravity of the body is below its supporting points, like a hammock. William B. Stout, the builder, explains the principles involved: "This method of suspending the body gives us something that engineers have sought for years, exact control of the location of the center of gravity. With this pendulum type of suspension, there is an actual banking movement of the body as the car rounds a corner. The car is supported between the two suspension members at the front and rear of the body, or fuselage. These supporting units are cushioned against road shock by a suspension system novel in the automotive field." The suspension system is akin to that employed in the landing gear of airplanes, consisting of long oil shock absorbers. In tests an ash tray held its place on a table while the car rounded curves at sixty miles per hour.

*Engineering Laboratory
Stout Scarab*

Wide World

67512.

Leggett

Stout Engineering Laboratories Dearborn, Mich

How to WIN

EACH WHEEL SHOULD TEND TO RUN ON A STRAIGHT LINE PARALLEL WITH THE OTHER THREE WHEEL TREADS



IF FRONT WHEELS ARE NOT IN ALIGNMENT THEY DRAG



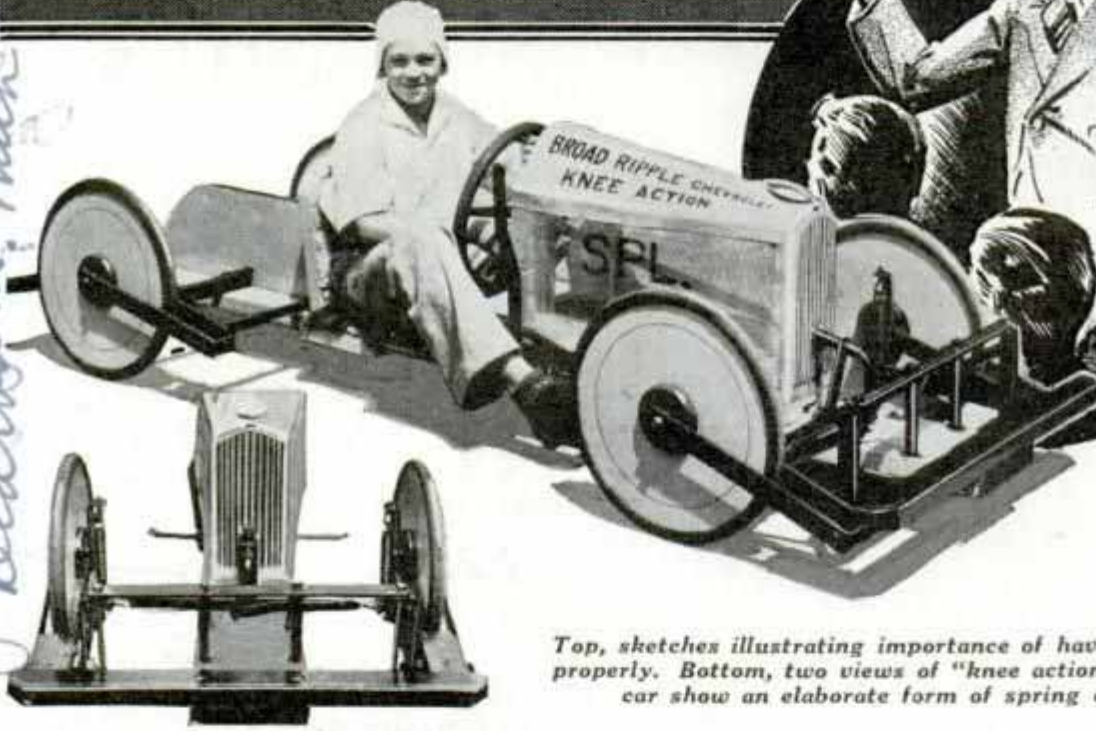
THESE CARS WOULD RUN POORLY



LOAD ON TOP OF BEARING CAUSES BINDING AND PREVENTS FREE ROLLING

LOAD ON BOTTOM OF BEARING

SAGGING AXLE THROWS WEIGHT ON OUTSIDE OF BEARING



Top, sketches illustrating importance of having wheels aligned properly. Bottom, two views of "knee action" Soapbox Derby car show an elaborate form of spring construction

BUILDING a fast car for the All-American Soapbox Derby, annual racing event for boy drivers, involves many problems. How would the engineer solve them? Three authorities on automobiles and racing tires discuss what they consider important in constructing a speedy motorless vehicle for the race.

By **WILLIAM B. STOUT**

1935 President of the Society of Automotive Engineers

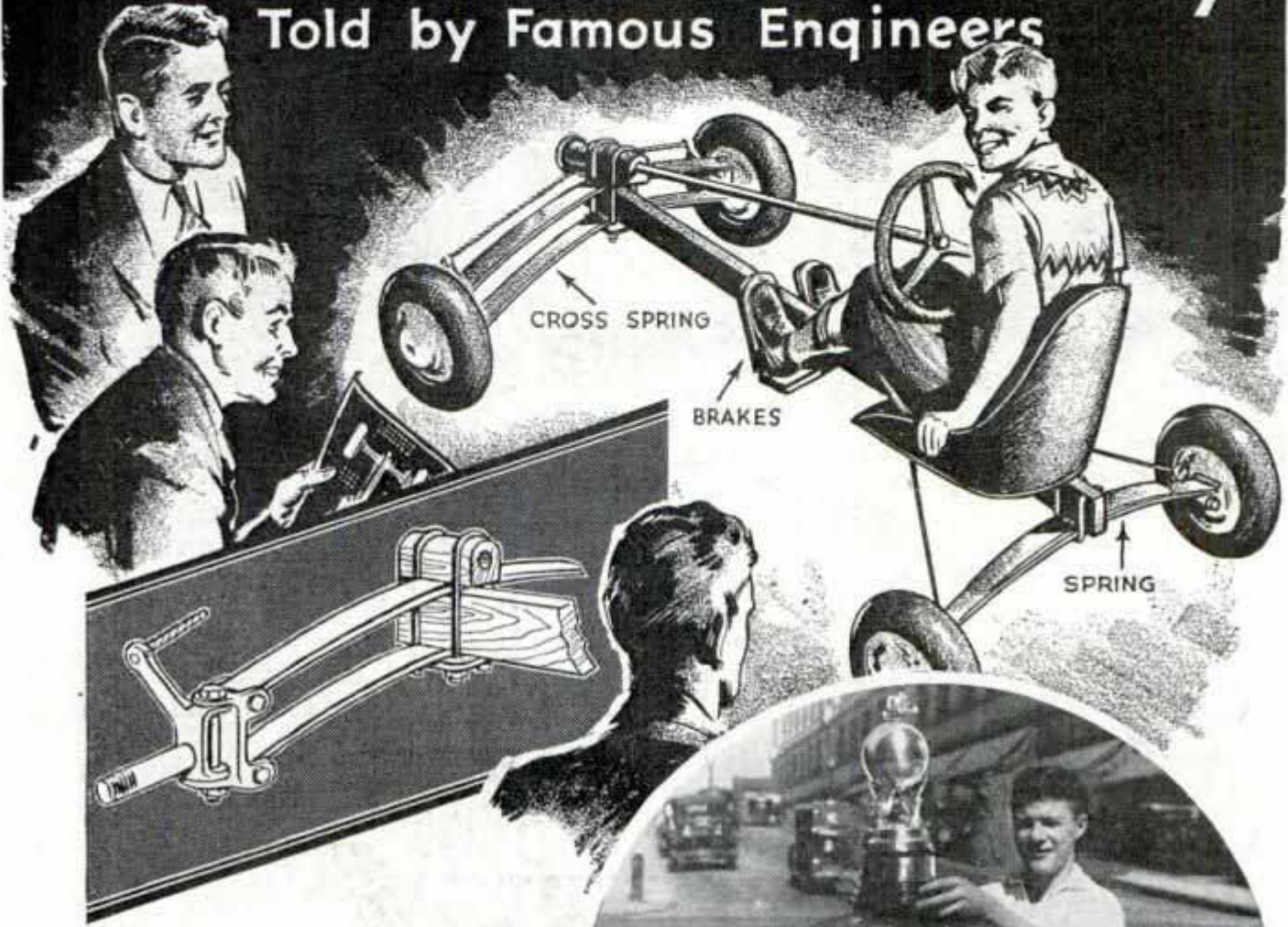
WITH the speeds that are obtained in the Soapbox Derby, streamlining is of absolutely no value, particularly if there happens to be a side wind, when it might be an actual disadvantage.

The chief requirement is the lowest possible rolling friction for the load carried.

The least rolling friction, all things considered, will come from the lightest-weight car. Light weight is of extreme value, unless on the particular course you are to run momentum is of any value for carrying you a certain distance after the bottom of the hill is reached.

the SOAPBOX Derby

Told by Famous Engineers



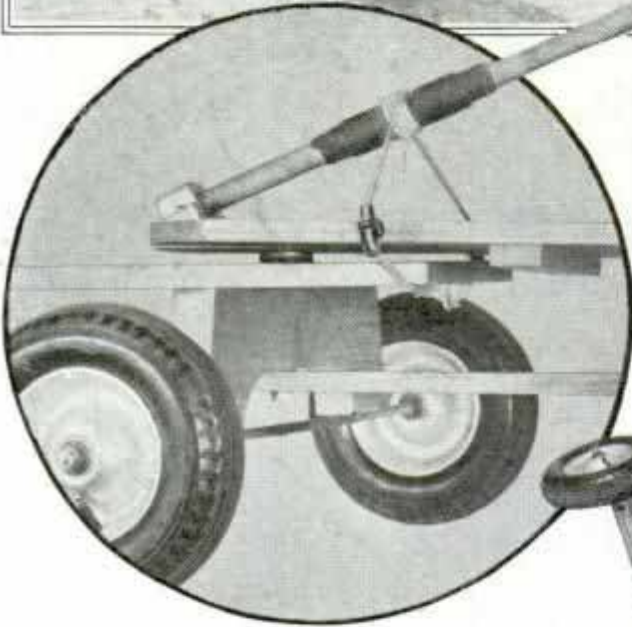
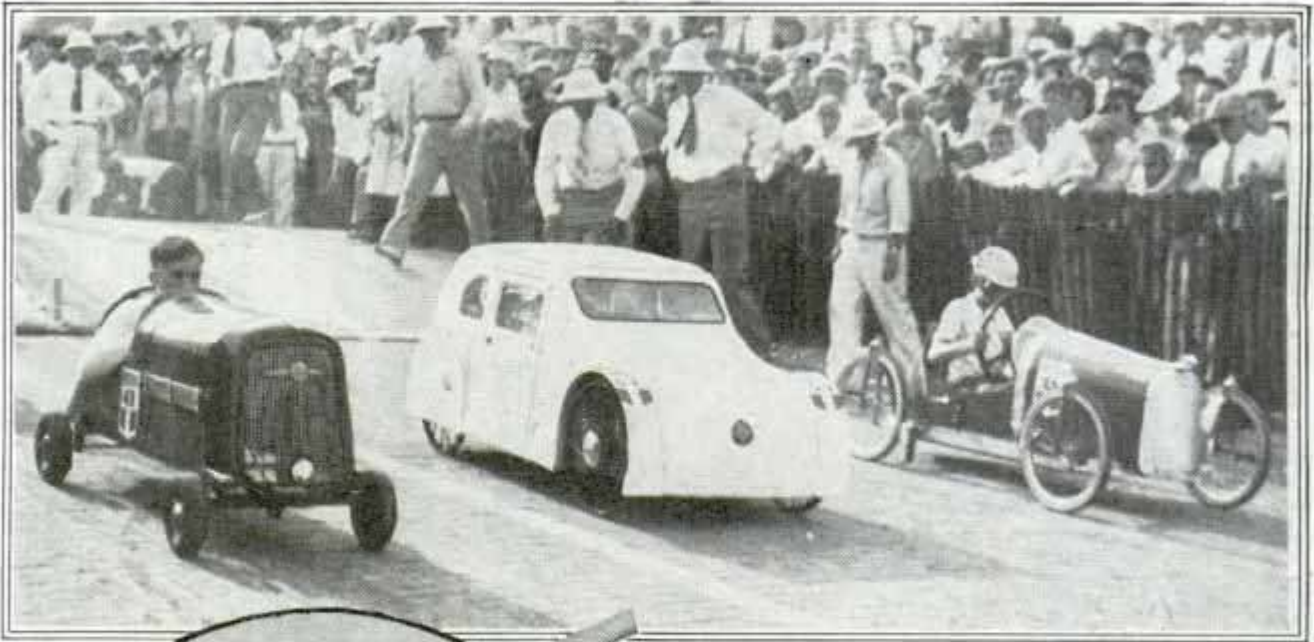
If the entire course is downhill then light weight is an advantage; if not, the weight should be designed for the particular hill and length of run that you have after you get to the bottom of the hill so that your momentum may carry you to the end of the run with the least possible slowing up. This will mean a little arithmetic on your part when you know the actual grades on the hill where you are going to race.

For the maximum reduction of rolling friction, individual springing with all wheels separate would be of considerable advantage, and with tires fairly well pumped up, so as little motion as possible comes from the work required to develop heat in the rubber. The tire pressure, again, will depend on the surfacing of the particular hill on which you are racing.



Top, sketch of Soapbox Derby car as suggested by William B. Stout. Left, front-end construction for same car. Bottom, 1935 winner, Maurice E. Bale

As to weights, a fifty-fifty load on all four wheels on the steepest gradient that you are to run the race on will give you the least rolling friction, and then you can perhaps shift your rear weight forward to keep this still fifty-fifty when you get on



petition, have been purposely made to encourage the utmost simplicity in construction.

Incidentally, the simplest possible Soapbox racer has as good a chance to win the race as those that display complicated mechanisms for steering or unusual forms of spring suspension.

The greatest factor making for success



the level. This should not be of very great importance on a smooth concrete, but might be of considerable importance on a rough course.

Certainly the least possible unsprung weight is of advantage in reducing the rolling friction.

Streamlining for any speeds below fifty miles per hour will be of absolutely no value in a Soapbox Derby except where the beauty of the entry has something to do with the opinions of the crowd.

By JAMES M. CRAWFORD

Chief Engineer, Chevrolet Motor Company

It is an axiom, in engineering and manufacturing, that the simplest construction is the best. Therefore, the rules of the All-American Soapbox Derby, in an endeavor to make it possible for any boy to construct a worth-while car for the com-

Top, three cars leaving starting line. Note sedan model in center. Left and bottom, two views of simple construction suggested by A. J. Musselman

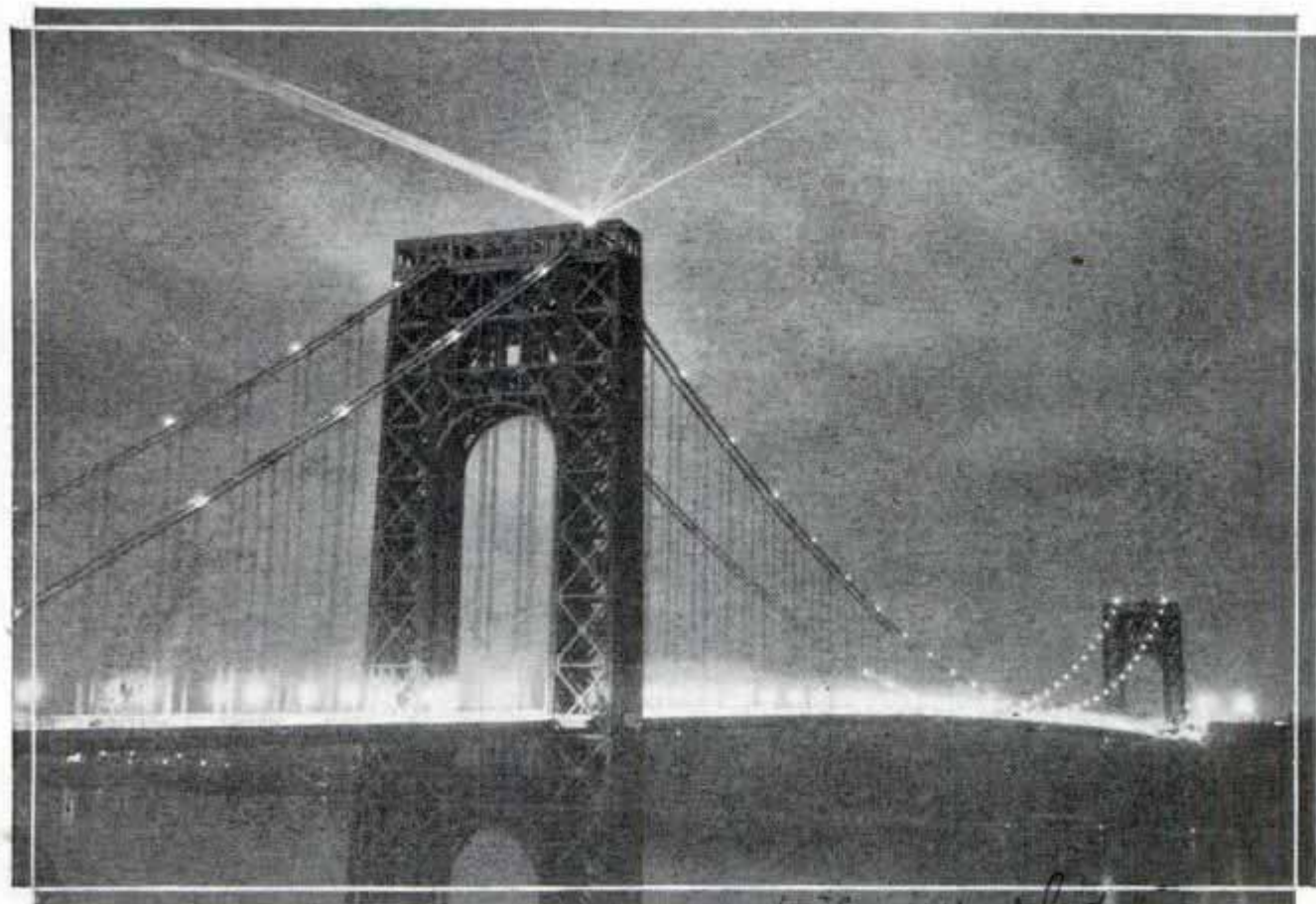
in this race is the ability of the car to roll freely. That is, friction in moving parts must be reduced to a minimum and excess rolling resistance must be eliminated.

There is, of course, a great difference of opinion among builders of derby racers on the subject of tires, bearings and wheel sizes—each of which is an important element to be considered in striving for a free rolling car. However, it is my opinion,

(Continued to page 122A)

E 1462.

Air Beacon on Bridge Is Visible Sixty Miles

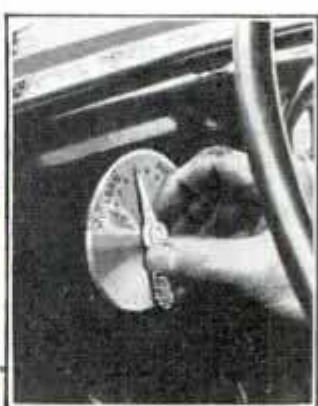


Air beacon of 1,800,000 candle power atop George Washington bridge tower in New York. Erected as a memorial to Will Rogers and Wiley Post, it is visible for sixty miles

Erected in honor of the late Will Rogers and Wiley Post, a huge air beacon of 1,800,000-candle power blazes from the top of the George Washington bridge in New York City. The beacon is of the revolving beam type and the beam it casts is visible for more than sixty miles.

Trailer Brake Control in Truck Is Adjustable for Load

Adjusting the trailer brakes to the load is possible by operating a simple control mounted on the dash of the truck.



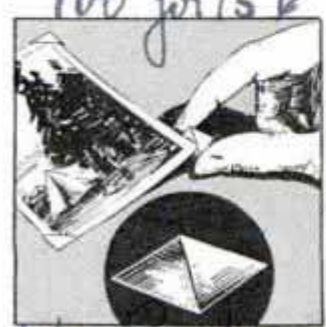
Easily accessible to the driver, the control is used without stopping the vehicle train. It prevents over-braking when the trailer is only partly loaded or empty, thus improving control,

saving tire wear, eliminating jack-knifing of the trailer and reducing fifth wheel and coupling failures. On the other hand, it provides adequate braking at peak load. The control admits pressure to the trailer brakes at the driver's option, thus balancing the braking effort of truck and trailer.

*Wider world
E 1489
motors Bldg. - Lubbock Tex
see ad*

Invisible Mounting Corners Have Adhesive Backs

Thin, crystal-clear corners for mounting cards, photographs, posters, and similar articles are now available. Made of gelatin, the corners are invisible and are backed with adhesive.



Slip one on each corner of the picture, moisten the back and press it down; the mounting is permanently in place, yet the picture can be slipped out and in.

*100 for 15¢
H. E. Harris & Co.
1200*

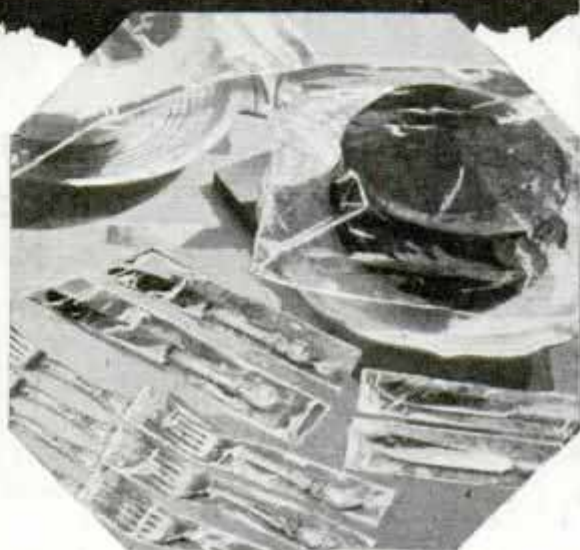
Linderman Service

Making

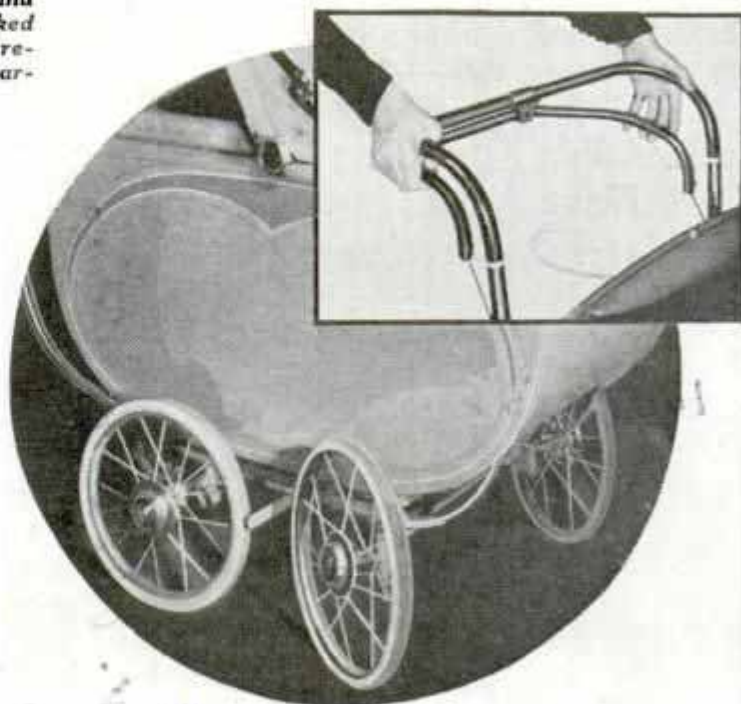
HOME TASKS



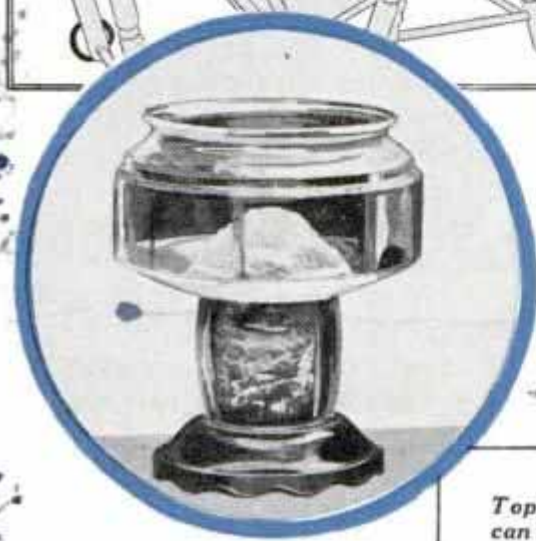
Top, stove and refrigerator combined. Both are operated by gas. Note location of oven at top. The outfit is intended for small apartments and homes. Bottom, garbage pail has cover locked to the bail. Pushing the bail to one side removes the cover and permits placing the garbage into the pail with only one hand



Top, Cellophane wrappers, which are moisture-proof, are available for wrapping vegetables, cakes and silverware. The bags for silver prevent tarnishing. Bottom, baby carriage can be steered by extra handlebar (shown in inset), eliminating the necessity for raising the front wheels to make a turn



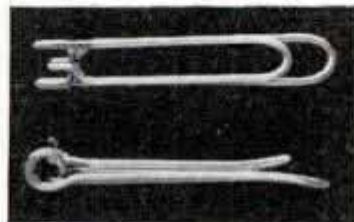
a pleasure



Top, baby's high chair can be unfolded to form a play table, on which the youngster may enjoy his toys while held safely in the chair



Circle, above, aquarium lamp has revolving cylinder which gives effect of fish swimming. Heat from the lamp keeps water temperature at proper point for the fish. Bottom, automatic card dealer operates by whirling the device. It distributes the cards in eight seconds



Sketch and photograph show and illustrate use of stainless metal clothespins. A hanger, shown on the woman's arm, enables her to have the pins handy when needed. The hanger contains five dozen clothespins, yet it weighs only seventeen ounces

E 1487

Concrete Work Is Speeded Up by Cheaper Method



Concrete tower being constructed by method that cuts costs and speeds up the work

Reducing costs and speeding up construction are claimed for a new method of concrete work, a way which reverses age-old practices. Used in a tower 210 feet high, it provides all the advantages of a monolithic concrete building and is practical for structures of all sizes. The usual way is to erect temporary forms, pour in the concrete and after it has hardened remove the forms. Frequently a veneer of cast stone is laid in front of the concrete, completely concealing it. The new method calls for building and bracing the inside wall forms with small openings left between form boards to allow excess water from the concrete to escape. Cast stone is then set, one course at a time, leaving a space between it and the wood form the desired thickness of the concrete wall. Metal loops molded into the cast stone provide a means of fastening it to the inside wall form. The cast-stone slabs are drawn tightly against an accurately

dressed shoulder on the pieces below and against temporary wood spreaders set along the inside top edge by bolts molded to the hooks in the cast stone. When one course of cast stone is erected, the concrete is poured, so the wall is completed as it rises, one course at a time. After the concrete hardens, burlap is removed from vertical joints and a stiff mortar is tamped into any joints that have not filled with grout from the concrete.

E 1435

Fuel Gas Bill Cut by Reducing Room Temperature at Night

By letting the room temperature of your home drop from seventy degrees Fahrenheit to sixty degrees during the night, you can save from four to eight per cent in fuel consumption, based on a gas furnace. With a coal furnace the saving probably would be less. In reaching these conclusions at the engineering experiment station of the University of Illinois, however, it was determined that fuel economy achieved by lower overnight temperatures was somewhat offset by a sacrifice in comfort during the morning hours. Although air at the breathing level was brought back to seventy degrees by 8:00 a.m., the effect of cold walls and floors could still be felt at 11:00 a.m.

E 1471

Blower-Cooled Lamp Housing Speeds Photo Enlarging



By cooling the housing so that larger lamps may be used without overheating, a new blower system speeds up photo enlarging. The work of enlarging Leica prints on contact paper can be done five to seven times faster because a 1,000-

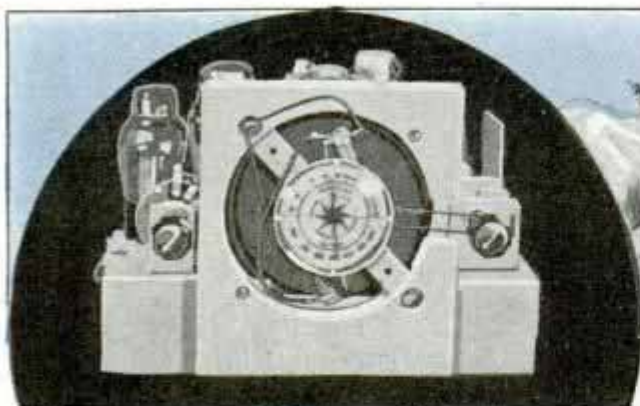
watt lamp can be used in this equipment. The blower in the base exhausts the hot air from the lamp housing, drawing it downward through a tube which supports the housing.

Unpatented - Developed by Engineers of Portland Cement Co. 33 W. Grand Chicago

Available to anyone with agency

Engineering & Patent Co. Toronto, Ontario

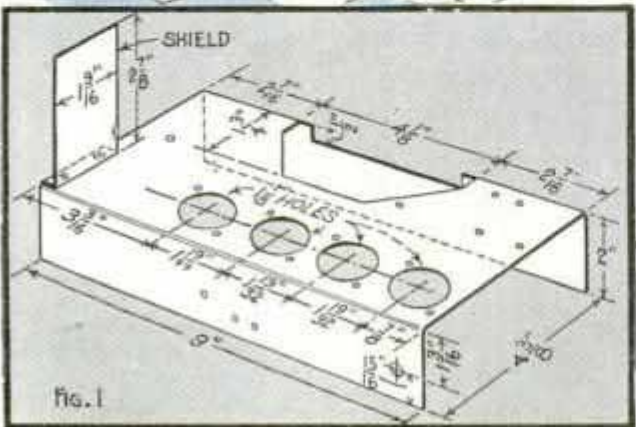
Paquin Enlarger 1 Tee Back Tools



Improved

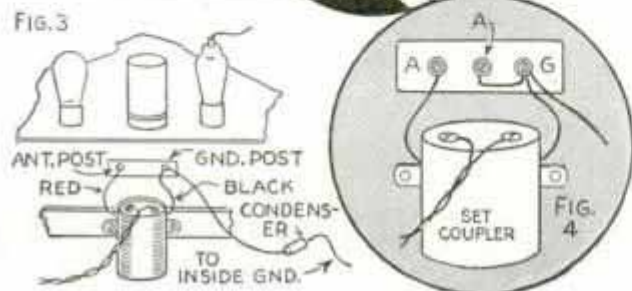
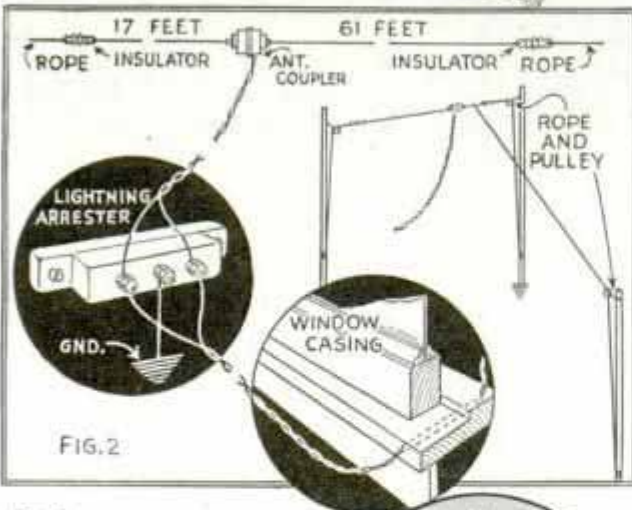
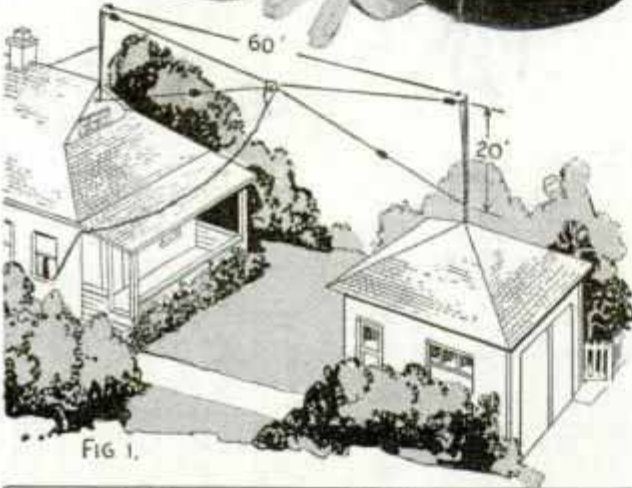
THIS improved model of the most popular 4-tube set ever described for our readers, now has an airplane dial calibrated in kilocycles, two pilot lights, simplified chassis arrangement and smaller variable condenser. Outstanding features of this general-purpose midget receiver include distance-getting ability, excellent tone, a.c. or d.c. operation, low cost and simple construction.

Easily portable and no larger than the original model, which won first prize in a set-building contest held by the Hawthorne radio club, an employees organization of the Western Electric company, this improved layout has been simplified so that anyone able to use a soldering iron can build it. Traveling men and tourists usually have access to a 110-volt supply, either alternating or direct current, and this little portable set will perform equally well on both types of power. A receiver of this type is especially interesting to beginners and those who re-



8 3691 178 16th Street New York

Noise-Reducing All-Wave Antenna Systems



COMPLETELY assembled and ready for erection with no additional soldered connections to make, the double-doublet antenna shown in the photo enables owners of all-wave receivers to enjoy high-quality reception on all bands.

The ordinary balanced doublet system consists of two separate flat-top sections of equal length, and, although it will reduce the noise level as described in previous articles, it favors a particular band and is usually inefficient on others. To eliminate this, several double-doublet systems of the type shown in Fig. 1 are now available. They consist of two separate antennas of different lengths assembled in one unit and are so designed that they will cover the entire short-wave bands without dead spots and at the same time give maximum results in the standard broadcast band.

Signals picked up by the double-doublet antenna system are conveyed to the receiver through a balanced, twisted-pair transmission line. Coupling transformers located at each end of this line make it immune from pick-up of noises in the area through which it passes and at the same time prevent loss of signal strength. Anyone can install this type of all-wave antenna as no extra parts are required except the usual poles, rope, pulleys and lightning arrester.

All installation details are clearly shown in Fig. 1; however, the mast arrangement may be varied to suit the requirements of your location. If there is not sufficient room on your roof for a 60-foot stretch, poles may be erected in the yard or the antenna can be supported between two trees. In either case the transmission line should be run at right angles to the antenna for at least 20 feet and then brought down to the receiver as directly as possible. It should be kept free from the roof and supported with the nail-on-knob porcelain insulators supplied with the assembly. Do not cut the transmission line; drill a small hole through the window frame or bring it into the building any

(Continued to page 134A)

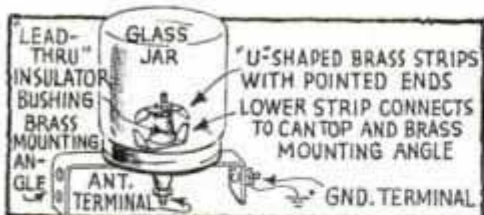
HINTS FOR RADIO EXPERIMENTERS



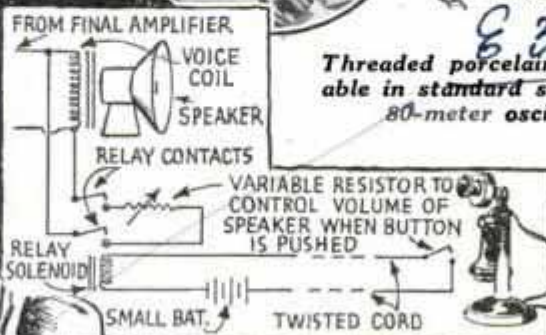
Ordinary headphones can be improved by removing the old iron diaphragms and substituting thin mica disks of the same size. Flatten iron pieces in a vise and smooth edges with file before cementing at center to contact magnets



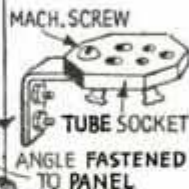
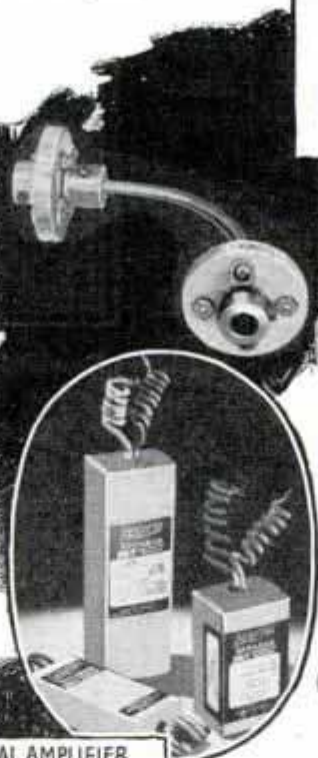
Hole in top of soldering-flux can helps keep hands and clothing clean. Sliding cover is fastened to can lid with short machine screw. Below, an inexpensive lightning arrester made from a glass jar provided with metal cover, three brass strips and a porcelain "lead-thru" insulator



Below, relay and push-button remote-control arrangement for reducing set speaker volume when using telephone

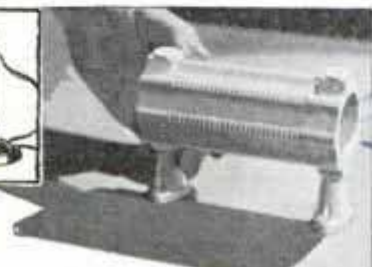


Left, flexible shaft coupling provides insulation and a driving means between offset shafts, or shafts at any angle up to 90 degrees, thus solving alignment problems for radio experimenters. It is supplied with or without insulated hubs. Below, midget dry electrolytic condenser units offered in 200 and 450-volt ratings, and capacities from 2 to 16 mfd.



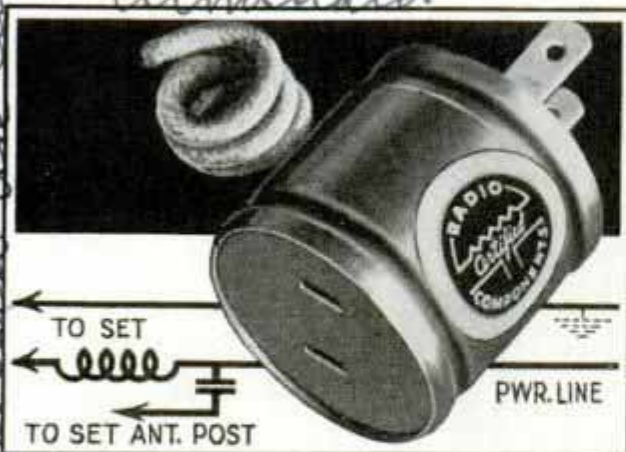
Angle bracket used for mounting wafer-type tube socket on back of panel

Threaded porcelain-type coil form now available in standard sizes for winding 20, 40 and 80-meter oscillator or amplifier coils



*Worshiper Aircraft Corp. of America
25 Park Place
Malden, Mass.*

Antenna Unit Plugs in Line to Demonstrate Sets

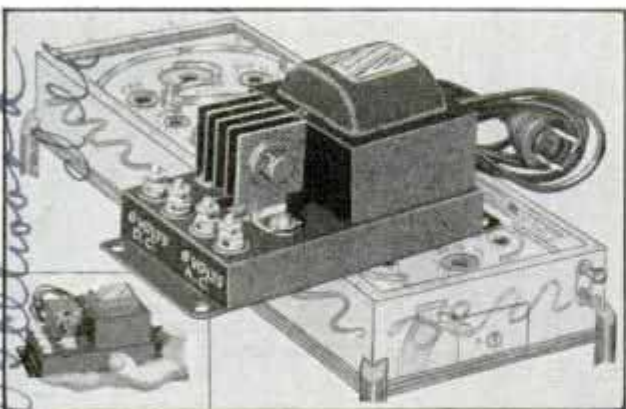


Compact line plug antenna eliminator. Circuit diagram shows built-in choke and condenser

This device is designed for use in locations where it is not practical to install a conventional antenna for demonstrations, and as a test unit for service men. It is claimed to work equally well on broadcast and short-wave sets down to 80 meters. The radio signals which are picked up by the power supply line are diverted to the receiver.

Compact Battery Eliminator

Two low-voltage currents are supplied by this battery eliminator for replacing batteries in electrically operated games and experimental devices. Connected in the regular 110-volt a.c. line, one 6-volt



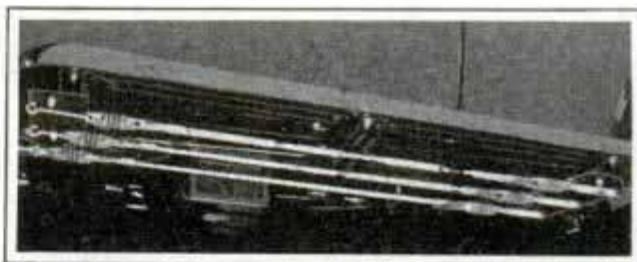
a.c. output is for miniature light circuits and the other supplies 6 volts d.c. for solenoids, relays and kickers. The capacity of this unit is 25 watts; a larger model has an 8-volt d.c. output at 35 watts capacity.

Radio Noises Located Easily

Filling a long felt need of radio service men, public utility trouble shooters and experimenters, this interference analyzer is claimed to make possible the prompt location and elimination of all types of radio interference. It tells you what condensers and chokes are needed to eliminate the noise.



Antenna Under Running Boards



Running-board antenna for cars with all-steel tops

Assembled under each running board of the car and joined by a connecting lead, the auto-radio antenna installation shown in the photo is recommended for the new cars with all-steel tops. Each section consists of three copper strips terminating in insulators, the strips being connected at one end by a jumper wire.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

NEXT MONTH—How to Build an Inter-Office Communication System. This efficient low-cost installation is also suitable for use in homes, hospitals and other inter-room applications. Other features include—**Adapters for Using All-Metal Tubes in Old Sets**, also a **Crystal-Controlled 160-Meter Radiophone for Beginners.**

Continental Carbon Co. 3661 13900 Lorain Ave. Cleveland, Ohio. 3661 13900 Lorain Ave. Cleveland, Ohio. 3661 13900 Lorain Ave. Cleveland, Ohio. 3661 13900 Lorain Ave. Cleveland, Ohio.

Spagnoli Products Corp. 10000 Lorain Ave. Cleveland, Ohio.



Modern Lines

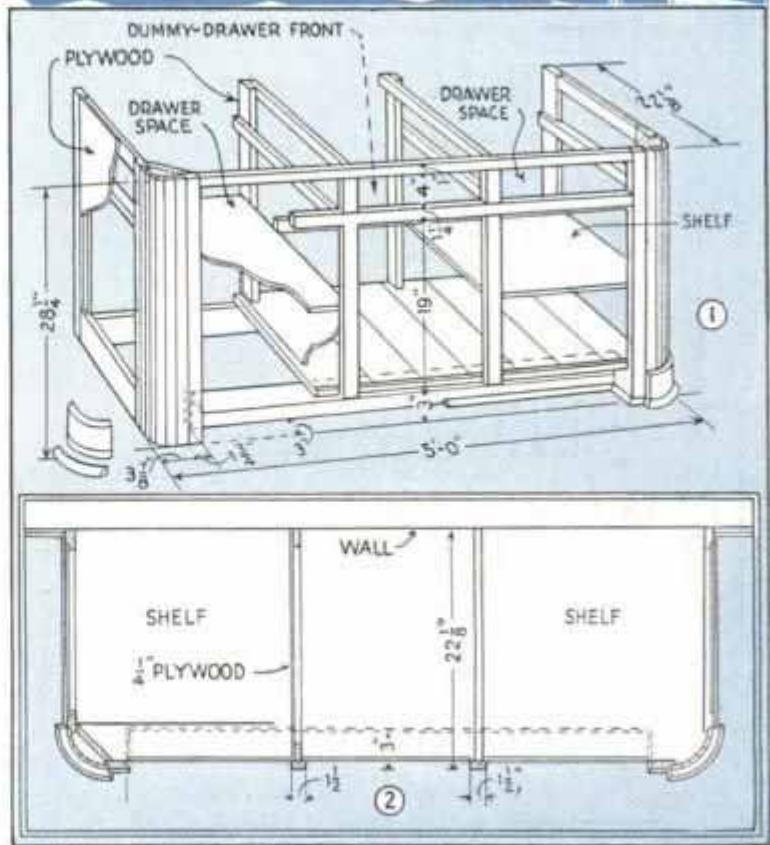
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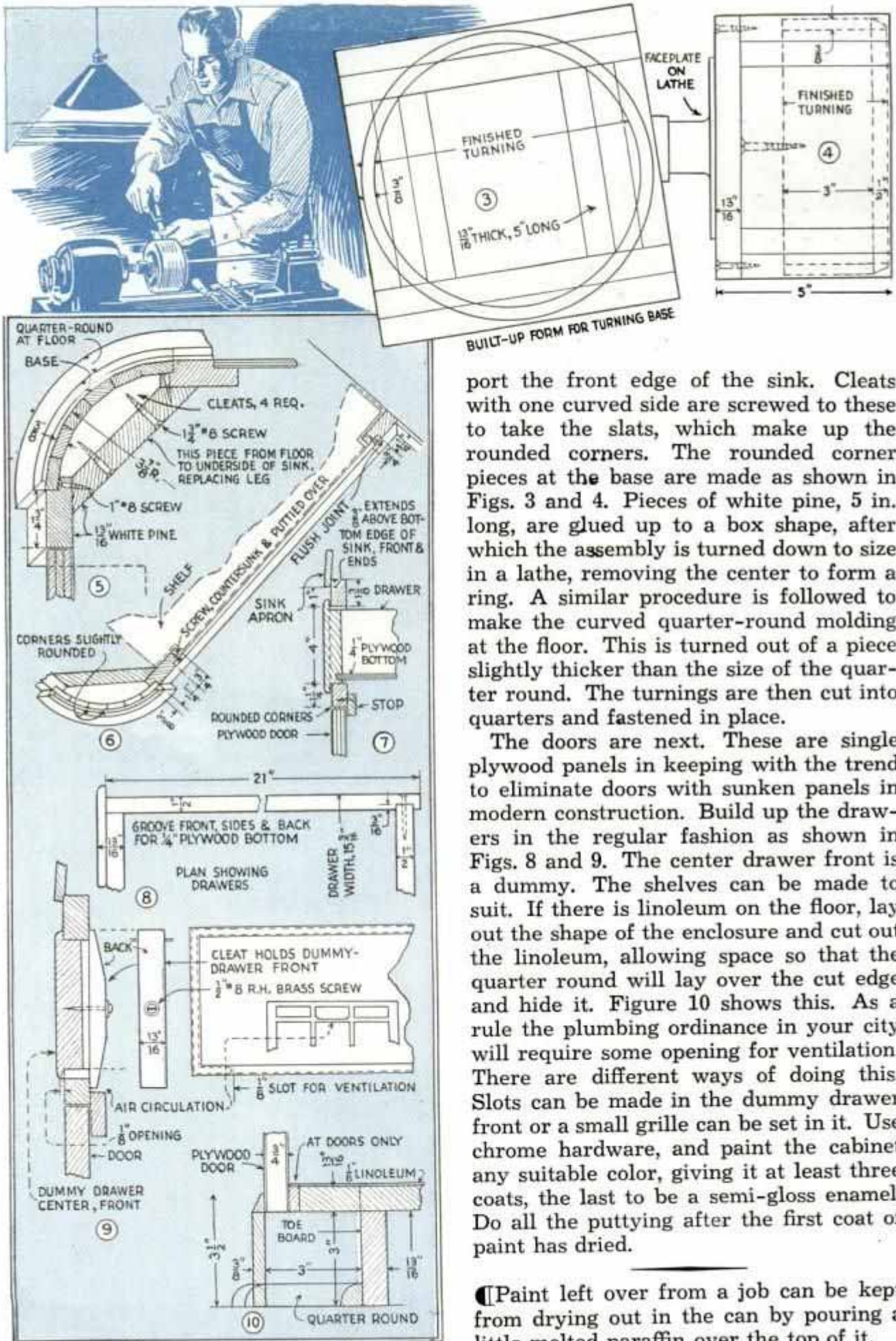
Kitchen Sinks



THERE'S no need of discarding your old sink just because it is out of date. Why not modernize it by building this trim cabinet? Although the one shown is for a 60-in. sink having an apron edge, the design can be altered easily to fit sinks of other styles and sizes. If legs support the front part of your sink, remove them and provide temporary supports. Then put in the framework as shown in Fig. 1. Note that the front of the cabinet is set in to allow for toe space when working at the sink. When the front frame has been set in place, the ends are built to suit. Use plywood for the end panels, rabbeting the frame corner pieces, Fig. 6, to take the panels flush.

The boards setting diagonally across the curved corners, Figs. 2 and 5, reach to the floor and sup-





port the front edge of the sink. Cleats with one curved side are screwed to these to take the slats, which make up the rounded corners. The rounded corner pieces at the base are made as shown in Figs. 3 and 4. Pieces of white pine, 5 in. long, are glued up to a box shape, after which the assembly is turned down to size in a lathe, removing the center to form a ring. A similar procedure is followed to make the curved quarter-round molding at the floor. This is turned out of a piece slightly thicker than the size of the quarter round. The turnings are then cut into quarters and fastened in place.

The doors are next. These are single plywood panels in keeping with the trend to eliminate doors with sunken panels in modern construction. Build up the drawers in the regular fashion as shown in Figs. 8 and 9. The center drawer front is a dummy. The shelves can be made to suit. If there is linoleum on the floor, lay out the shape of the enclosure and cut out the linoleum, allowing space so that the quarter round will lay over the cut edge and hide it. Figure 10 shows this. As a rule the plumbing ordinance in your city will require some opening for ventilation. There are different ways of doing this. Slots can be made in the dummy drawer front or a small grille can be set in it. Use chrome hardware, and paint the cabinet any suitable color, giving it at least three coats, the last to be a semi-gloss enamel. Do all the puttying after the first coat of paint has dried.

☞ Paint left over from a job can be kept from drying out in the can by pouring a little melted paraffin over the top of it.

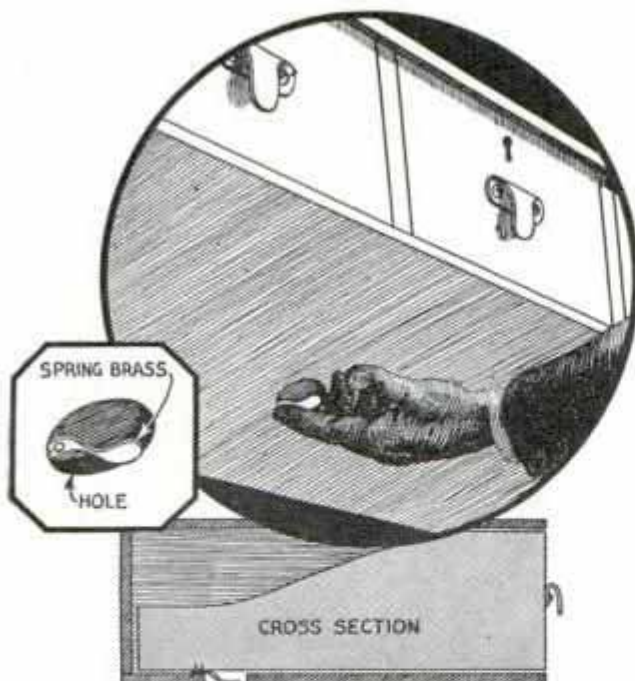
Scrubbing Brush Has Handles for Heavy Work



For heavy work, take a large scrubbing brush and fit it with two handles. Then you can get a good grip and apply plenty of pressure without cramping the hands. Two short pieces of broomstick or hardwood dowel rod, set into shallow holes bored in the brush top, make good handles.

Keyless Drawer Lock Operated with Finger Tip

If you keep private papers in a pigeon-hole drawer in your desk and wish to have a concealed lock, drill a large hole in the bottom of the pigeonhole near the back. Then, with the drawer closed, screw a clip to the bottom directly over the hole so that it extends down through the hole.



Spring-brass clip on bottom of pigeonhole drawer serves as concealed lock

The clip will prevent the drawer from being pulled out unless it is depressed with the finger. A dummy keyhole in the front of the drawer will help to increase the deception.



Glass cutter with edge of wheel flattened on grinder, tools borders on leather

Decorative Borders on Leather Made with Glass Cutter

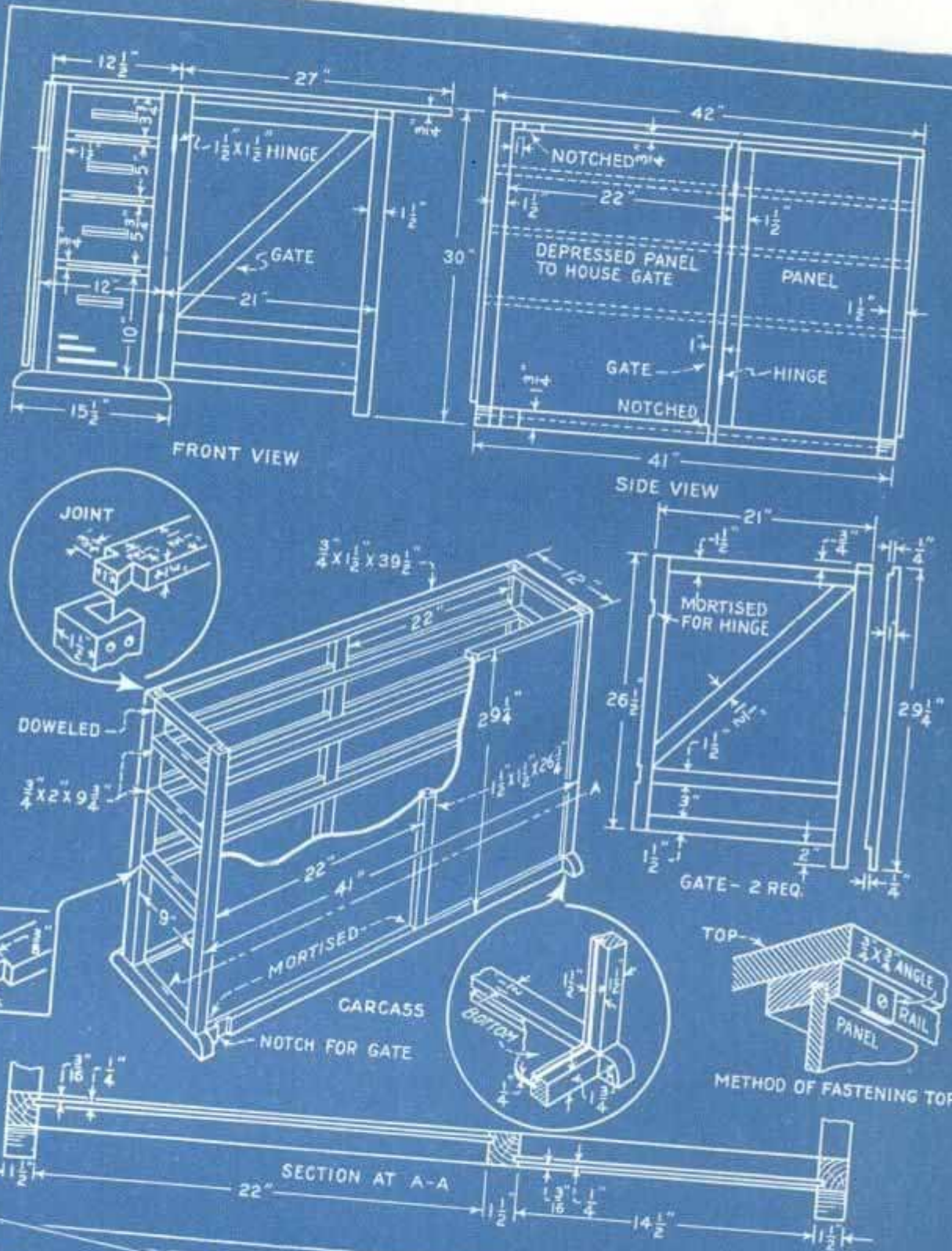
By flattening the cutting edge of an ordinary glass cutter on a grinding wheel, you have a handy tool for lining and creasing leather. All kinds of decorative border work can be done on leather without any possibility of burning, scoring or cutting the work. The cutter is moved over the leather while applying a steady pressure.

Photo Safelight for Travelers Contained in Flashlight

A convenient photographic darkroom lamp that is entirely contained in a flashlight is made easily by inserting a small disk of ruby gelatin paper under the flashlight lens. To carry the paper when the flashlight is being used in its normal way, the disk is placed either in the spring cap at the bottom of the flashlight, or it is fastened around the battery with a rubber band.



Six Served on

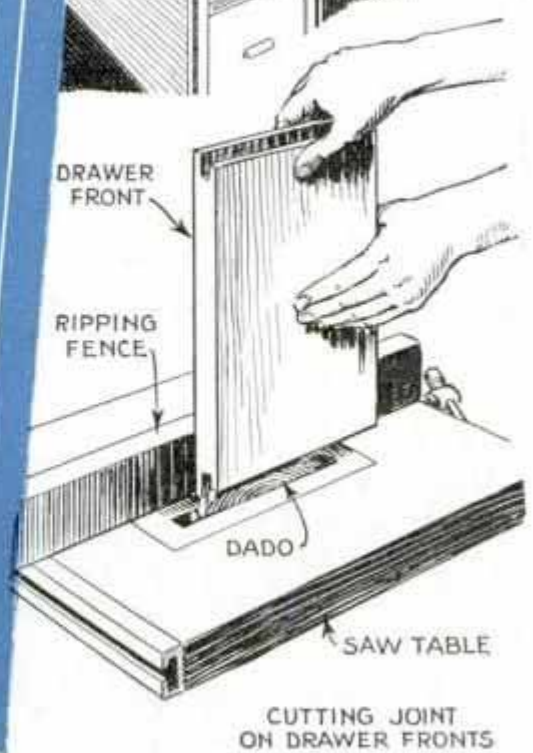
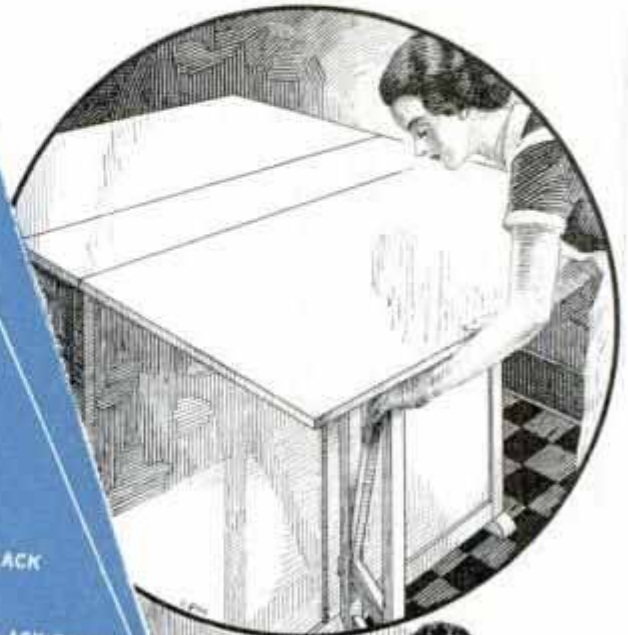
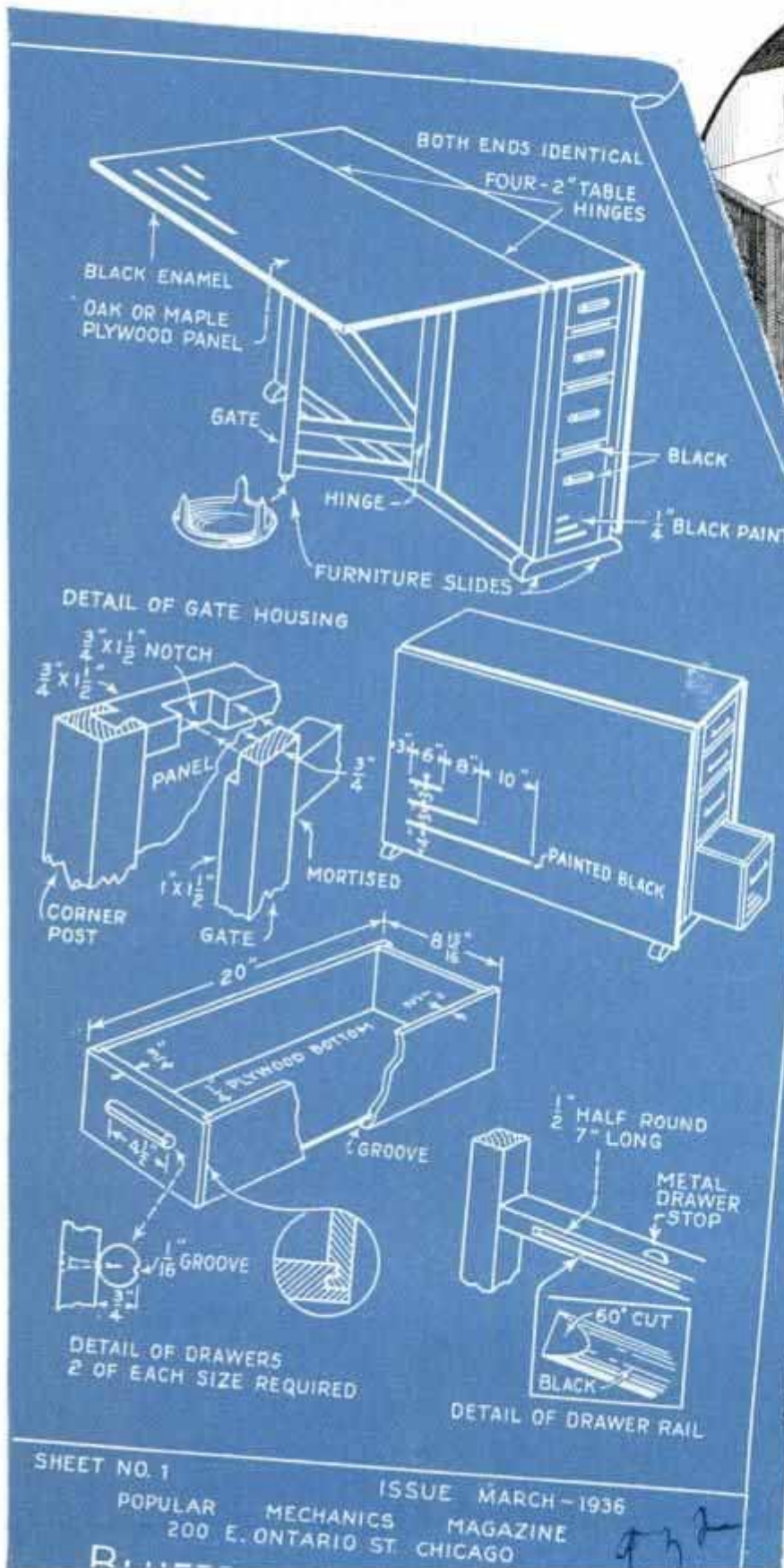


... DINETTE

POPULAR MECHANICS

Ideal for small apartments or as an extra table in the home. It is 12 $\frac{1}{2}$ in. wide when folded and 66 $\frac{1}{2}$ by 42 in. when opened. Eight drawers give you plenty of space for linens and silverware

COMPACT DINETTE



SHEET NO. 1

ISSUE MARCH-1936
 POPULAR MECHANICS MAGAZINE
 200 E. ONTARIO ST. CHICAGO

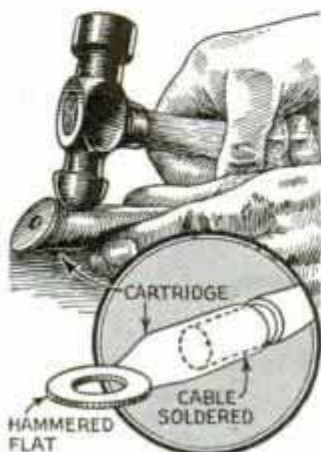
Large Glass Panes Are Repaired to Be Draftproof



Putty between the glass edges and the metal strip makes the joint rain and wind proof

If you have a broken glass pane in a large door or window and do not care to go to the expense of replacing the entire pane, here is a method of joining a new section of glass to the unbroken portion to provide a neat, draftproof joint. Remove the glass, cut away the broken part and fit the new piece, leaving plenty of space at the joint to take a strip of sheet metal, which is bent to the shape shown in the lower detail. Although galvanized sheet iron may be used, sheet brass or copper makes a more lasting repair. The metal does not fit into the rabbets in the door or window; it just butts snugly against the glass frame.

Electrical Terminals from Shells



If you have a number of rifle cartridges available, they are easily converted into electrical terminals or connectors for use around an experimental bench. Just flatten the bottom end with a hammer and drill the

flattened portion to slip over a binding post, or to take small brass machine screws. The wires or cables are soldered into the open ends of the cartridges.

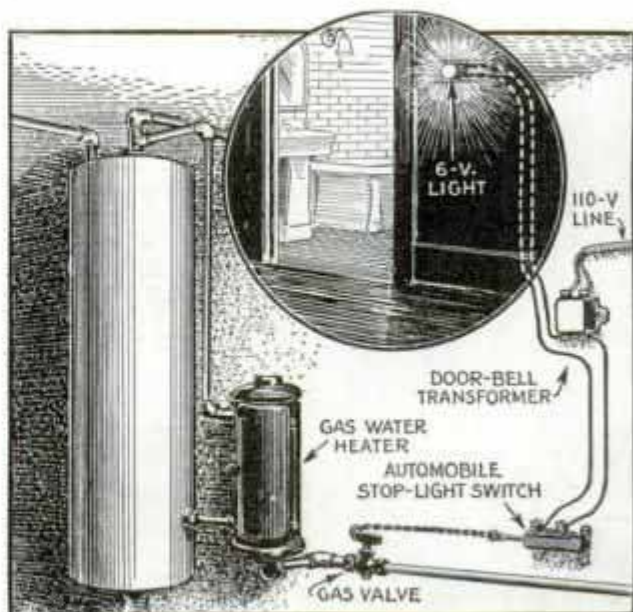
Casters Held in Tubular Legs with Plastic Wood

Casters often loosen in tables or chairs having tubular metal legs and then drop out when the article is lifted from the floor. A quick cure for this trouble is to fill the lower ends of the legs with plastic wood and push the caster sleeves into this when it is about set.



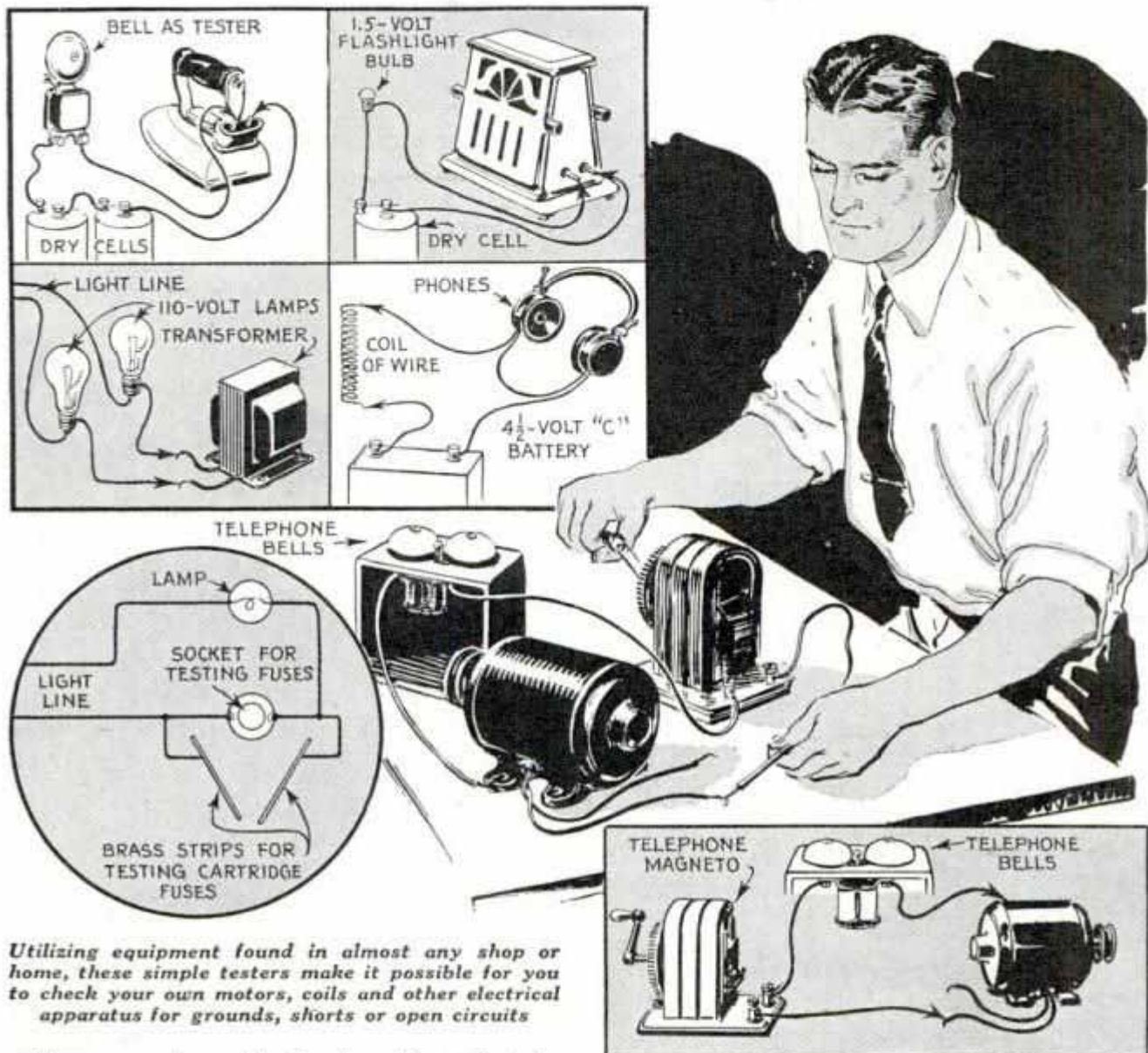
Signal Light for Water Heater

To avoid any possibility of forgetting to shut off your hot-water heater, it is a good idea to install a small signal light in a prominent location upstairs so that it is automatically turned on when the heater is in operation. Such an installation is shown, using a 6-volt bulb, transformer and an auto stop-light switch. The latter is connected to the handle of the gas valve, which operates the switch when the gas is turned on to start the heater.



Auto stop-light switch operates signal light when gas water heater is turned on

Simple Electrical Testers Anyone Can Use

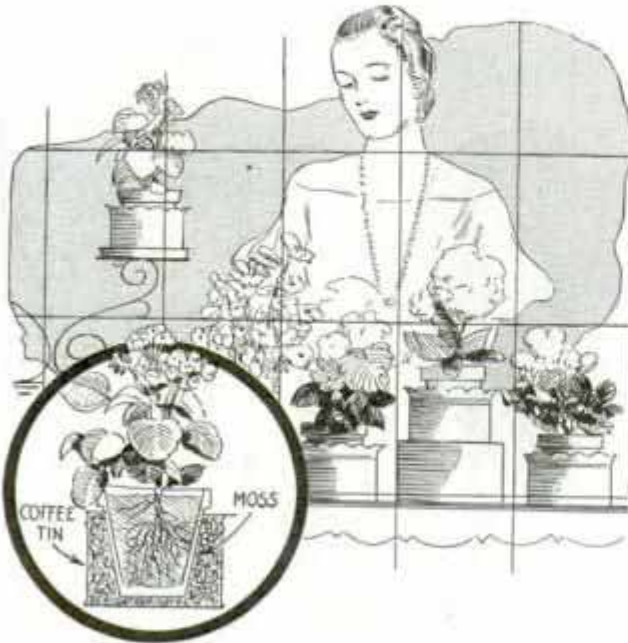


Utilizing equipment found in almost any shop or home, these simple testers make it possible for you to check your own motors, coils and other electrical apparatus for grounds, shorts or open circuits

Here are six methods of making electrical testers from inexpensive equipment to locate grounds, short and open circuits. In the two upper details the methods are identical with the exception that the test results are audible on one and visible on the other. The bell will ring or the bulb will light when the test leads are connected together or to an unbroken circuit. The next left-hand detail shows a tester using two 110-volt lamps and operated from the lighting circuit. In this case also the lamps light when the leads are connected to a closed circuit or in case of grounds. Brilliancy of the lights is a rough measure of the resistance in the circuit being tested. The adjoining detail shows a sensitive method which makes use of a pair of radio headphones. At the instant the leads are connected to a circuit in good condition

there will be a click in the phones. In the circular detail is a tester for all kinds of fuses. The porcelain socket for testing plug fuses has its core removed and a piece of brass tubing substituted so that fuses may be pushed in for testing. The brass strips mounted below the socket are for testing cartridge fuses. The most sensitive tester is shown in the lower right detail. A telephone magneto is used as the source of power, while a telephone bell serves as the indicator. This instrument is most useful for locating grounds which would not show up with other testers. It is also handy when testing circuits having very high resistance but is not very satisfactory for coils of fine wire as it sometimes rings when a circuit is open if the wires in the coil are close together.

Potted Plants Flourish Indoors in Moss-Lined Containers



Water the plants sparingly, not oftener than every three or four days

Have you ever brought home a potted plant, set it in a shallow saucer and watered it carefully only to have it wither and die? The next time you are in a greenhouse, notice the potted plants and you will probably find them setting in deeply in clean, moist sand. This is done to keep the soil in the pots moist and cool. At the same time, it prevents excess water from accumulating around the bottoms of the pots, which will strangle even the healthiest plants by denying them air to their root systems. You can get the same results by setting the potted plants in containers lined with sphagnum moss as shown in the circular detail. The moss keeps the moisture distributed around the outer surface of the pot so that no water accumulates in the container.

Sandpaper Helps Keep Pictures Straight on Wall

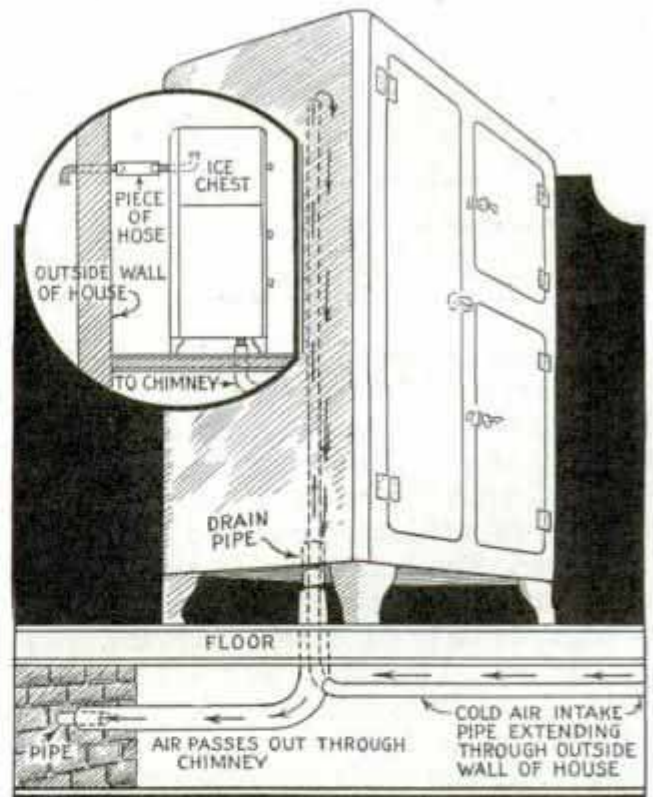


If you have a large picture that has a tendency to slip to one side on the wall, small pieces of sandpaper or emery cloth glued to the rear

side at the lower corners will stop the trouble. Sandpaper is much better for this purpose than rubber, the surface of which soon hardens.

Icebox Cooled in Winter by Air Piped from Outside

Here are two methods of utilizing the chimney draft to circulate cold, winter air through your icebox. Besides being more sanitary than the usual methods, as the air can be filtered before entering the box, these methods offer a means of controlling the temperature in the box if a damper is used in the intake pipes. The circular detail shows how the air is brought into the ice chest through a pipe at the rear of the box and passes out through the drain into a pipe leading to the chimney. The lower detail shows a similar idea. The air is brought in through the drain by means of a small pipe, which extends almost to the top of the box. As a filter for incoming air, you can use a perforated can filled with fine steel wool, which is kept moistened



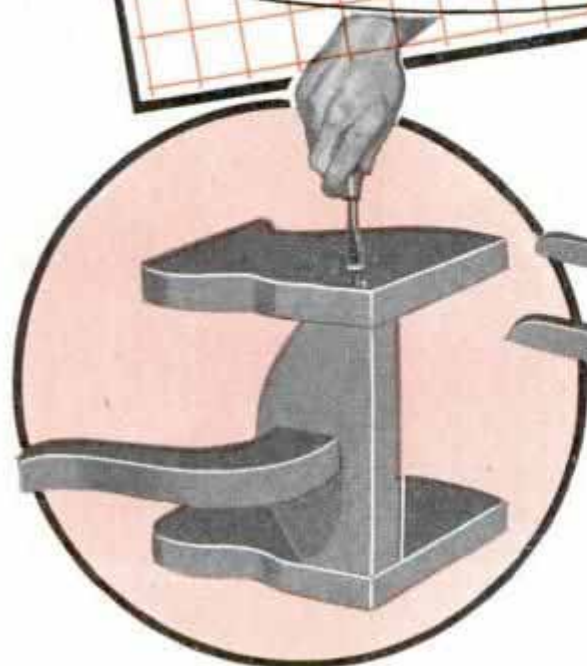
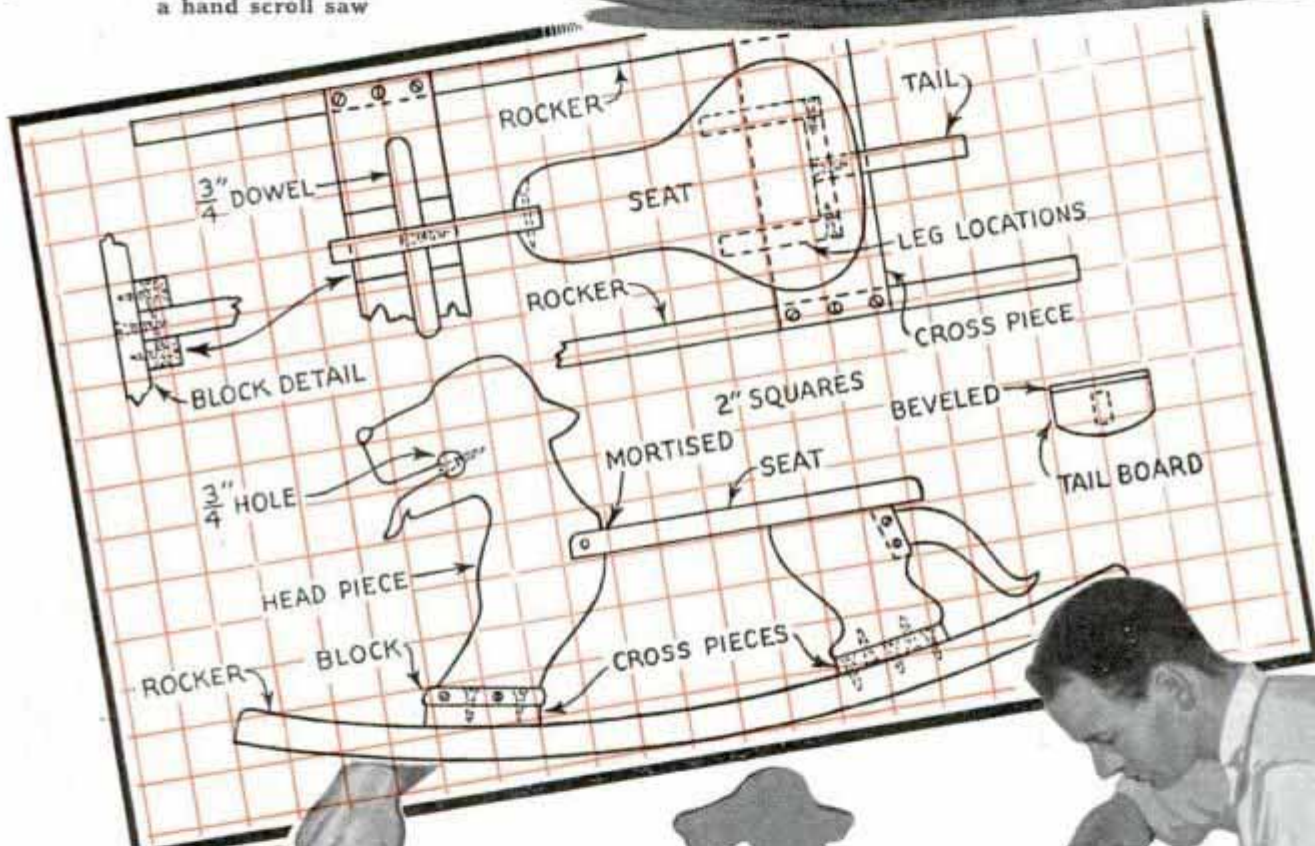
Cold, winter air circulated through icebox by chimney draft to preserve food in winter

with thin oil, or it may be a can with the ends removed and two or three layers of burlap stretched over the opening, the burlap also being saturated with oil.

Rocking Pup

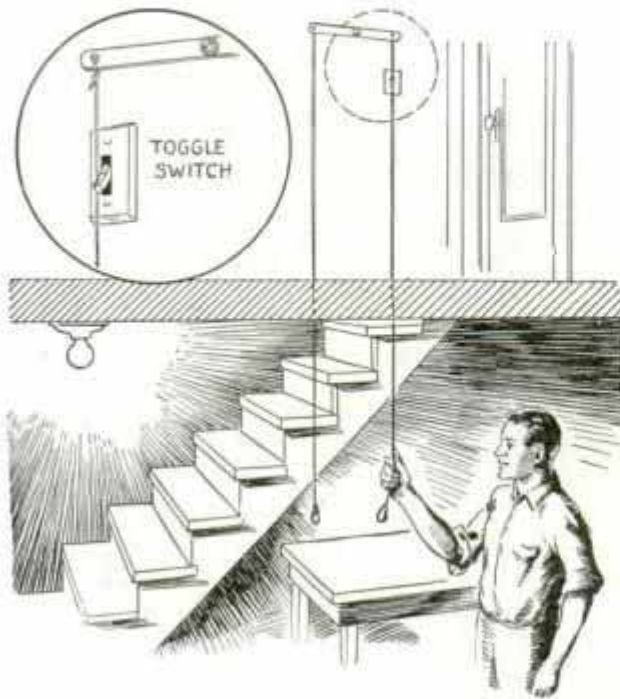
helps solve the play problem

With his red tongue hanging out as if actually enjoying a frolic with his young master, this rocking pup will go a long way toward keeping the small child busy the many hours spent indoors during bad weather. A grey ground coat with a touch of black here and there to suggest body lines adds greatly to the realistic appearance. Construction takes little time if a scroll or band saw is available. And, the job is not too difficult to tackle even with a hand scroll saw



Lay off 2-in. squares on large pieces of paper, draw in the outlines of the various parts and then cut out the patterns. Trace these on 1-in. wood stock and saw the parts. When cutting the head, drill a hole for a $\frac{3}{4}$ -in. dowel handle before sawing the slot for the mouth. Then round all the edges, smooth with sandpaper and assemble with screws. Note that the seat is mortised into the shoulders

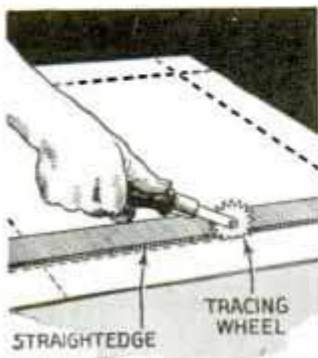
Substitute for Three-Way Switch to Operate Basement Lights



Cords and pivoted arm arranged to operate switch when entering basement through grade door

My basement lights are not operated by a three-way switch, and in coming into the basement through the grade door, I had to grope around in the dark to find the switch at the top of the stairway. To operate the switch from the basement, I attached two cords to an arm pivoted above the switch so that they hung down as shown, running one of them through the toggle switch lever and knotting it at this point. Two luminous pendants attached to the ends of the cords make it easy for me to find them at a glance when I enter the dark basement.—C. A. Veburg, Omaha, Nebr.

Tracing Wheel Scores Cardboard for Making Boxes



When making up small gift or mailing boxes, the cardboard can be shaped without breaking it if the lines on which it is to be folded are scored with a dressmakers' tracing wheel instead

of a razor blade or other sharp instrument. Mark off the cardboard in the regular way and then go over the lines with the tracing wheel, using a straightedge as a guide.

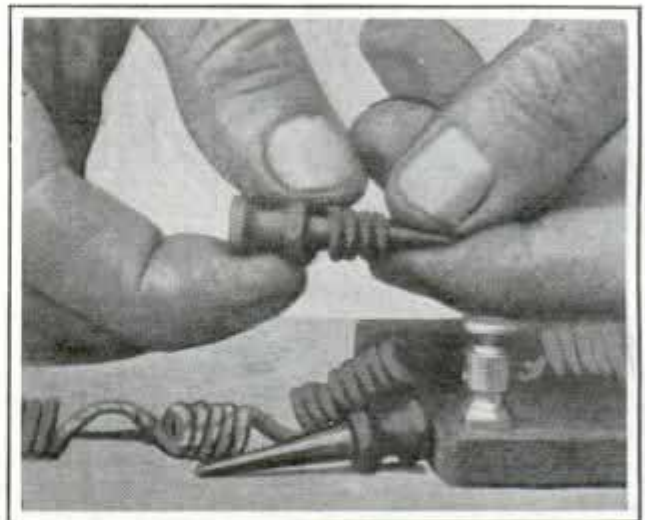
Curved Brush Cleans Pots and Pans Effectively

For washing the sides and grooves of pots and pans, take an ordinary scrubbing brush and saw it to the curvature indicated by the dotted lines in the drawing. When fitted with a handle, you will find it especially handy for cleaning frying pans, which are otherwise difficult to clean.



"Pig-Tail" Coils at Ends of Wires Formed on Golf Tee

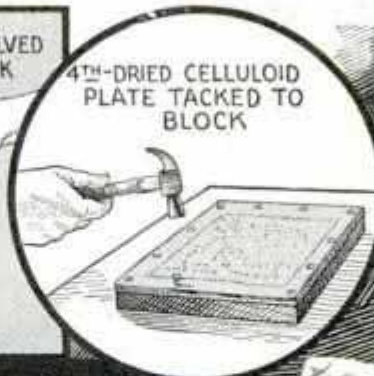
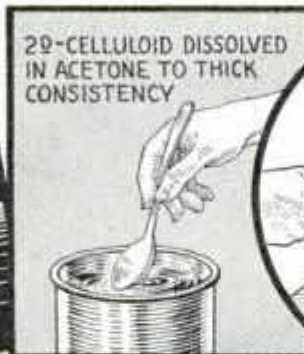
In electrical work where small wires are coiled at the ends, a golf tee will be found handy for making the coils. Wind the wire around the tee as shown in the photo,



Golf tees are handy for coiling ends of small wires used in electrical work

holding the large end of the tee with the fingers. Due to the tapered shank of the tee, the coiled wire is slipped off easily.

Celluloid Cuts Save on Small Printing Jobs



Owners of small printing shops, home publishers of school, club and church papers can make celluloid cuts from newspaper mats that will stand hundreds of impressions. Just follow the steps shown in the details. Trim the finished cut and mount it on a wood block, using cardboard as an underlay to make the cut "type high"

Drawing Board Converted to Store Your Unfinished Work

Drawings and drawing paper are always at hand and are protected against being soiled and creased if kept in a pocket provided on the back of the drawing board. It consists of a piece of thin plywood

screwed onto the back of the drawing board, spacing it from the latter to give the pocket the desired width. To do this, wood spacing strips of suitable thickness are slipped under the edges along three sides, leaving the fourth side open to permit insertion and removal of the drawings and paper. It is a good idea to countersink the screws that are driven through the plywood to avoid the possibility of marring surfaces on which the drawing board is placed.



This simple addition of a storage pocket will not interfere with the regular use of your drawing board

Paper Clip for Emergency Use from Hairpin

When a wire paper clip is needed and none is at hand, a substitute is easily made from a hairpin. Fold the legs of the pin over toward the head as shown and you will have a clip that really holds

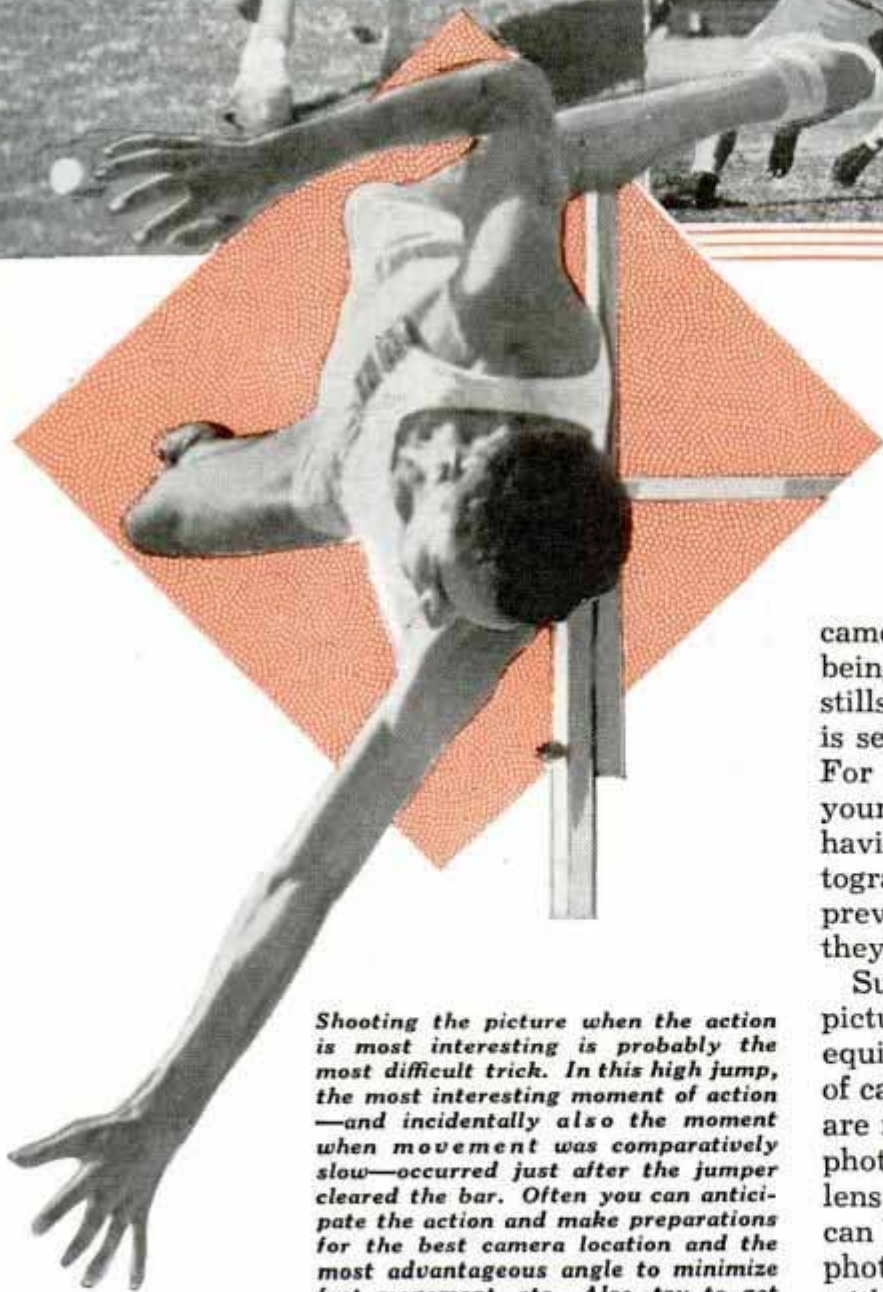


due to the springiness of the wire and the crimped portions of the legs. Use the heaviest hairpin available for this purpose.

Try your hand



"Frozen action"—a few typical pictures in which the camera is faster than the eye, recording things that most spectators miss



Shooting the picture when the action is most interesting is probably the most difficult trick. In this high jump, the most interesting moment of action—and incidentally also the moment when movement was comparatively slow—occurred just after the jumper cleared the bar. Often you can anticipate the action and make preparations for the best camera location and the most advantageous angle to minimize fast movement, etc. Also, try to get the object in strong contrast against the background

SPLIT-SECOND action photos that seem to live and breathe are within the scope of any amateur photographer. Of course, continuous action photos of any event, from start to finish, are taken with motion-picture cameras, the individual shots on the film being enlarged to give the "candid movie stills," which often reveal much more than is seen through the eyes of the spectators. For individual action shots you also have your choice of several miniature cameras having high shutter speeds for action photography. Where the fast shutter speeds previously had a maximum of 1/300 sec., they are now 1/500 and 1/1000 second.

Successful snap-shooting of fast action pictures does not only depend on suitable equipment, but just as much on the tricks of camera manipulation, and, although you are more likely to "bag" a thrilling action photo with a camera having a high-speed lens and shutter, surprising results often can be had from even a dollar camera. The photographer who has his camera loaded with fast panchromatic film, or one of the high-speed "chrome" type films, will find

at HIGH-SPEED ACTION PHOTOS



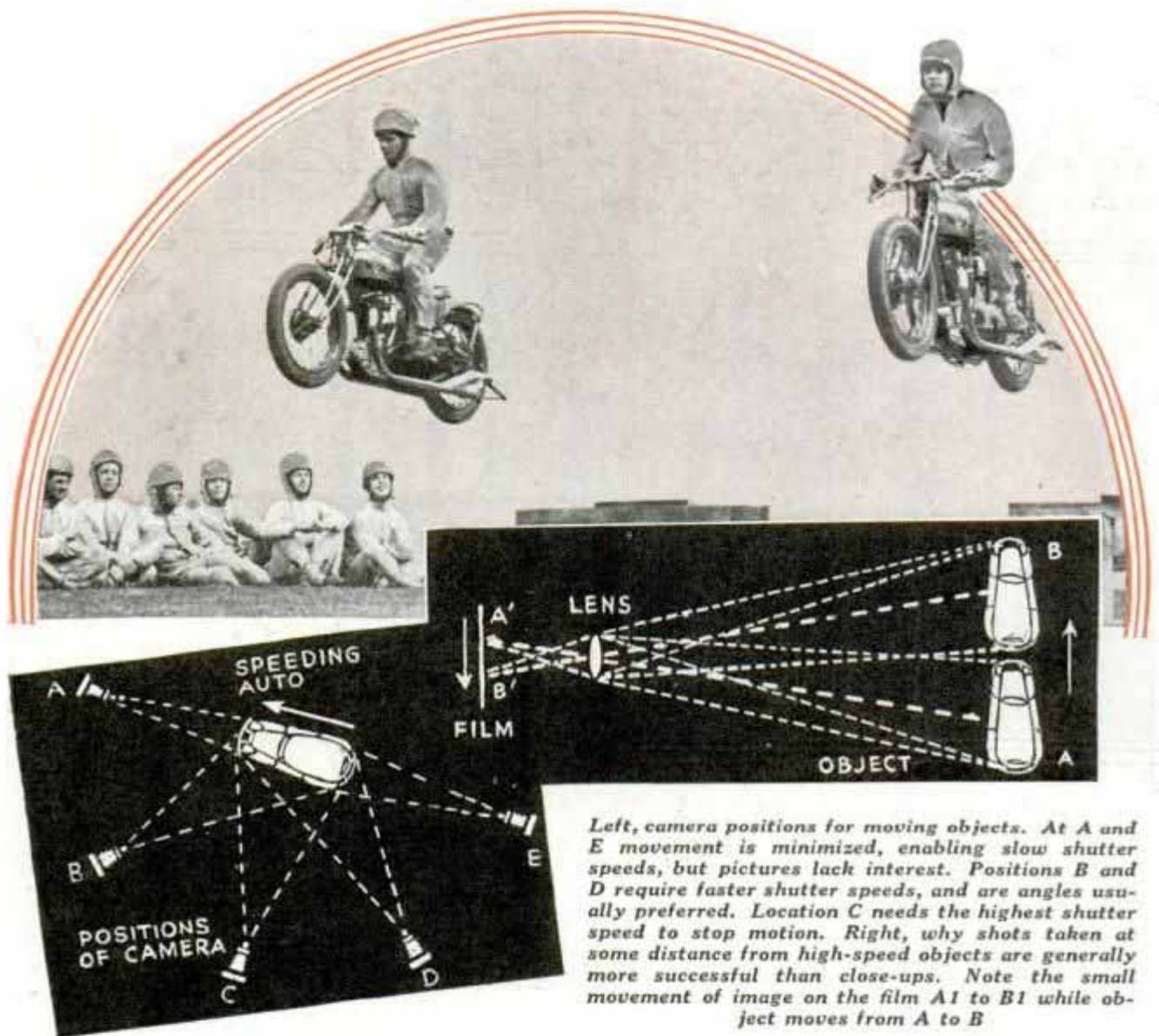
plenty of suitable action in almost any direction.

Before attempting to photograph a type of action with which you have had no experience, it is wise to give some thought to the problem and, if possible, watch the game or whatever it is for a while before unfolding your camera. In this way you can determine the best positions in which to get, the instants during which there are pauses in action that would permit you to get sharp images even with a slow lens, and eventually learn to anticipate thrilling spills and other exciting moments in sufficient time to have your camera ready for them when they do happen. Suppose you are going to photograph an automobile that is traveling at high speed along a highway. By placing yourself at a turn in the road, you could snap the car as it comes toward you. Objects moving toward or away from the camera do not change their positions on



Broadside shots require high shutter speeds. Movement of image across the film is minimized by swinging camera with direction of movement while sighting to keep object in camera range

the film as rapidly as when photographed from other angles. In this way it is possible to get a sharp picture at a shutter speed of $1/50$ or perhaps even $1/25$ sec.



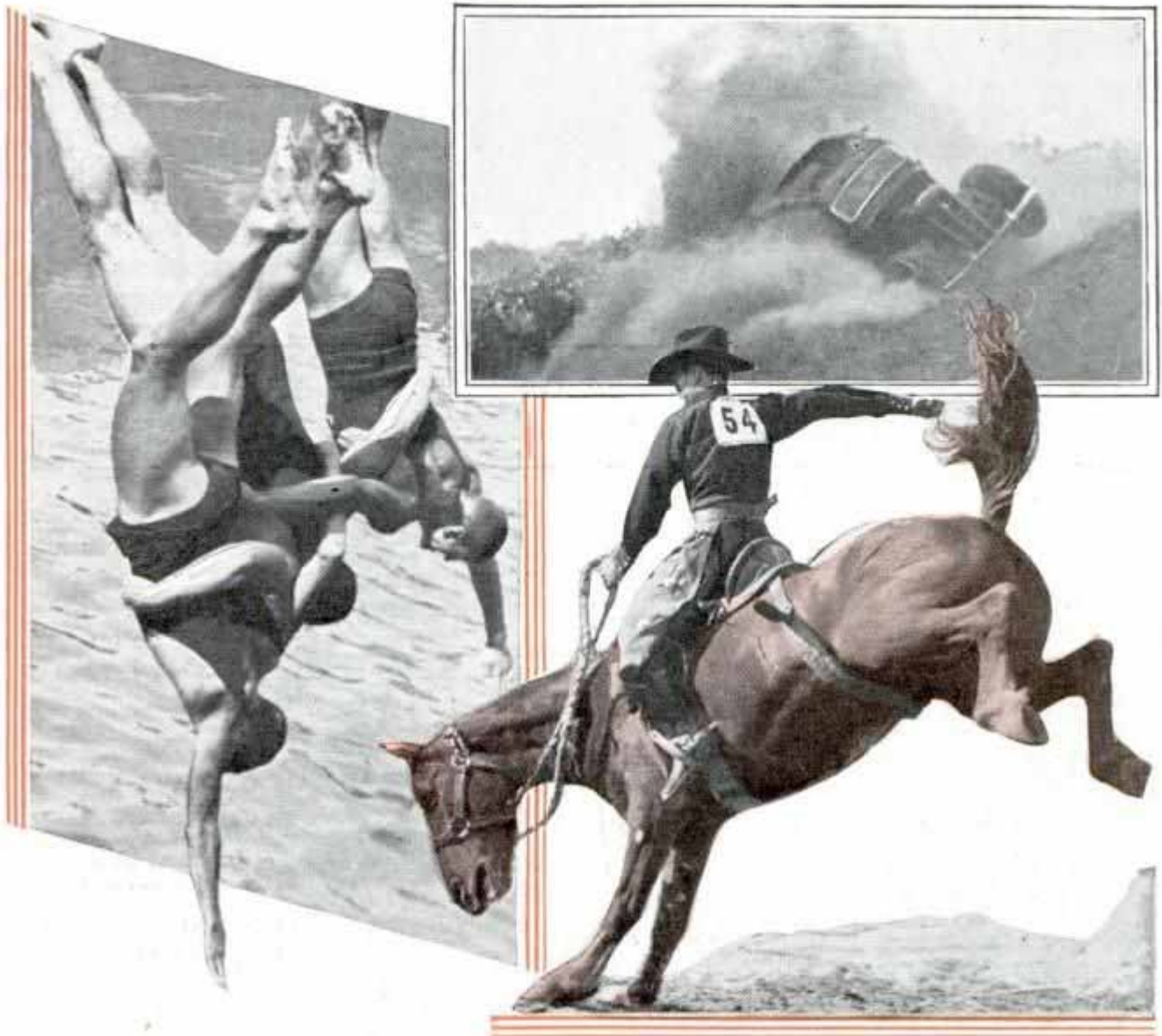
Left, camera positions for moving objects. At A and E movement is minimized, enabling slow shutter speeds, but pictures lack interest. Positions B and D require faster shutter speeds, and are angles usually preferred. Location C needs the highest shutter speed to stop motion. Right, why shots taken at some distance from high-speed objects are generally more successful than close-ups. Note the small movement of image on the film A1 to B1 while object moves from A to B

However, the objection to this camera angle is that it is not likely to produce an interesting picture, as there will be very little indication of speed. It frequently is better to move to one side, so that the car is photographed as it approaches at an angle to the camera. The shutter must be speeded up, for angle shots require shorter exposures than head-on ones. The highest shutter speeds are needed when making broadside shots. Movement difficulties connected with broadside and angle shots may be overcome to a great extent by moving the camera so that the image of the speeding auto will be kept in one spot on the film, and to do so, you will need a direct view finder or sighting device attached to the camera and used somewhat like the sights of a rifle. Some types of direct finders have glass lenses and an eye hole or sighting post. Others consist of

wire frames and sighting posts. Two brass tacks or pins in the top of the camera, arranged so that a line through them will strike objects centered by the lens, will serve well. The resulting picture should show the auto rather sharply defined against a blurred background.

In connection with backgrounds, whether they are to be blurred or not, try to arrange your position so that the main object will stand out in strong contrast to the background. This is often a simple matter by merely squatting down closer to the ground, to throw the object against the sky. This also accentuates the action of high jumps and similar events.

Usually action takes place so rapidly that you do not have time to focus your camera. Therefore, it is necessary to focus before the action starts. Usually it is possible to determine beforehand just where



What to take? Just load your camera and you will find suitable action almost everywhere. The more rapid and exciting the action—the better will be the picture possibilities

the moving object will pass. The camera is focused for that distance, and the shutter snapped when the object gets there. Another way is to set the focus at some definite figure, say 50 ft., and then wait until the thing to be photographed seems to be that distance from the camera. If this distance makes the image of the object photographed rather small, you can often depend on later enlargement to obtain a usable size print. Likewise, slower shutter speeds can be used because the image travels more slowly across the film.

Shooting when the action is most interesting, is one of the most difficult tricks to master and requires some planning. However, if the most interesting action is too fast for your camera, the shot must be taken at a moment when the movement is relatively slow. For example, take a pole

vaulter. In this case the slowest movement, and incidentally the most interesting, happens when he clears the bar and starts on his downward drop. That is the time the shutter should click. Practice is about the only way of learning exactly when to press the button. You should also keep in mind the fact that no photographer can release his shutter the instant he makes up his mind to do so. A definite period of time is required for the thought processes to result in muscular action and there is also a slight lag in the shutter action. Therefore, you must actually press the button before the action you want to record takes place.

Sometimes the tables may be turned, with you and the camera in motion, and the subject stationary, as when snapping pictures from trains, busses, automobiles,



For close-up action photos you will have to get on the spot. The good action photographer boldly ventures where others fear to tread

boats and airplanes. Relatively slow shutter and lens speeds can be used for taking pictures from moving vehicles, if the trick of using the right angles, as previously explained, is remembered. However, the matter of vibration of the camera is of great importance, and it may be a problem to prevent this vibration from jiggling the photographic image. Your body provides an excellent shock absorber when properly employed. If you hold yourself rigidly, with every muscle taut, vibration will travel through you like an electric shock. But if you relax, bend your knees a trifle when standing, and perhaps raise yourself just enough to clear your heels above the floor, vibration will be minimized. The camera can be steadied against

the head, although some photographers prefer to rest the elbows against the hips and hold the camera in the hands so that it does not touch any other part of the body. Do not lean your body, or rest the camera against any solid part of the vehicle. It is easier to hold a heavy camera steady than a small, lightweight one. For this reason, some photographers attach weights to their cameras when taking them up in airplanes, or on other vehicles where vibration is great. Such weights can be blocks of lead, weighing a pound or more, attached by means of a screw engaging the tripod socket in the camera frame.

The photographer of fast action generally under-exposes his film, and then depends on development to save the day and the picture. For speed pictures taken on ordinary negatives, say 2¼ by 3¼ in. and larger, the following developer has been found satisfactory:

Elon	⅛ oz.
sodium sulphite	1 oz.
hydroquinone	¼ oz.
sodium carbonate	1 oz.
potassium bromide	30 to 50 grains
water	1 qt.

Develop 1 min. at 65 degrees F. when the solution is fresh. For miniature cameras, such as those using 35-mm. motion-picture film, the following fine-grain developer may be used:

water (about 125 degrees F.)	14 oz.
sodium sulphite	1 oz., 147½ grains
paraphenylene-diamine	65 grains
glycin	80 grains

Let stand 24 hrs. before using. Develop 20 to 25 mins. at 65 to 70 degrees F. This developer may be used repeatedly until it begins to show signs of weakness. A dark color does not retard its action. Even though the resulting negatives may be thin and harsh as a result of under-exposure and perhaps over-development, excellent prints can be obtained on one of the numerous grades of paper available. Photographers who use exposure meters find that, for action pictures, they have to divide the exposure indicated by the meter by 4, or some similar factor. Meters are calibrated to give ideal exposures; and the photographer of action usually has to cut his exposures deliberately in order to stop movement. The focal length of the

The Contax camera, made by Zeiss Ikon
Leica, made E. Leitz, both German miniatur
have focal plane shutters and are excellent
work. Maximum speed of Leica is 1/500 sec. a
1/1000 sec. The rapid winder described is made
Leica camera.



lens used will depend on the size of the film to be covered, and the distance of the camera from the action. Thus, when the photographer has to stay on the sidelines, he must use a long-focus telephoto lens in order to get images of sufficient size. The small camera with a lens of 2 or 3-in. focal length has much to commend it for action work. Among its advantages are great depth of focus at large lens openings, high lens speed without prohibitive cost, and small image movement across the film as compared to that of a longer focus lens. Lenses generally are rated for speed in the "f" system. Each number engraved on the speed scale represents the focal length divided by the diameter of the opening through which the light passes. Thus an f:4.5 lens has, at widest opening, a focal length 4.5 times as great as the biggest diameter of the lens. When stopped down to f:11, the focal length is 11 times as great as the diameter of the hole through which light is admitted. Although lenses having the extreme speed of f:1.5 and f:2 are used widely, most fast lenses are either f:3.5 or f:4.5. Much slower lenses, with correspondingly slower shutter speeds, can be used if the photographer watches his camera angles and the psychological moments when action is momentarily stopped.

Compass Carried on Wrist



after soldering the wires in place.—Herman R. Wallin, Brooklyn, N. Y.

Giving Wood the Appearance of Hammered Metal

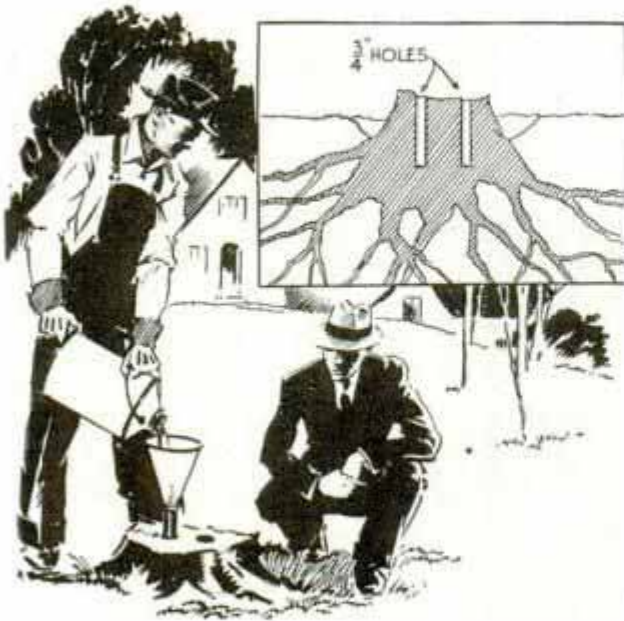


Dented wood given coats of shellac, aluminum bronze powder and black paint has appearance of hammered metal

Articles of wood such as vases, chests, sconces, jewelry boxes, picture frames, etc., can be given a realistic appearance of hammered metal by the following method: First hammer the article with a ball-peen hammer and then apply a coat of shellac or clear lacquer. When this becomes tacky, dust on aluminum bronze powder and rub the surface to a bright finish. Allow the work to dry thoroughly and then apply another coat of shellac or clear lacquer. After this has dried, brush on a thin coat of black enamel or black oil paint. Let the paint dry for three or four minutes and then wipe the surface with a flat pad of closely woven cloth, making all the strokes in one direction. This will remove most of the black paint, but will leave some in the indentations, giving them an appearance similar to those in hammered metal. The amount of black paint to remove with the pad depends on the desired appearance of the finished article.—W. Clark Ziegler, Providence, R. I.

☞ Slender vases used to hold cut flowers are less likely to tip over if they are about one-fourth filled with sand.

Roots of Green Tree Stumps Killed by Kerosene

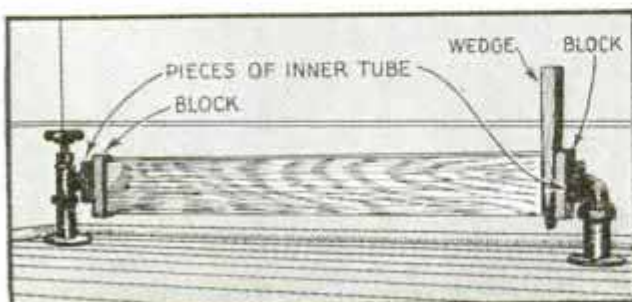


The kerosene gradually penetrates all the roots, killing them so they do not send up sprouts

If you have to cut a tree in your lawn, a few applications of kerosene to the stump will kill the roots and keep them from sending up sprouts. Just drill two or three $\frac{3}{4}$ -in. holes into the stump as shown, remove the shavings and fill the holes with kerosene once or twice a week for a month. One application is usually enough to kill stumps 3 in. in diameter or smaller.

Emergency Repair for Radiator on Hot-Water Plant

Awakened early one morning by noise of running water, I found that the hot-water radiator in a bedroom on the second floor had frozen and burst. As the water was running over the floor with a possibility of ruining the ceilings below, an emergency repair was made quickly as indicated in the drawing, which allowed

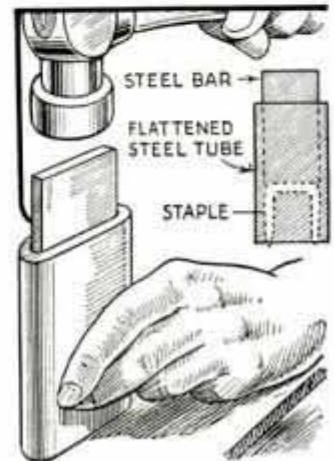


Closing open pipes with a wedge when radiator must be repaired while heating plant is in operation

us to heat the rest of the house until a permanent repair could be made. After draining the water from the boiler to a level below the second floor, the radiator was removed and the open ends of the pipes covered with pieces of old inner tube. These were then held in place by wedging a short plank between the ends of the pipes.—R. M. Anderson, Detroit, Mich.

Tool Drives Small Staples without Bending Them

When small staples are to be driven into hardwood, this little tool will do the job without bending them. It is made by flattening a short piece of seamless tubing to take a flat steel plunger with a sliding fit. The tool is set over the staple, which has been started, and the plunger is tapped with a hammer.



Garbage Cans Are Deodorized with Carbolic Acid



An effective method of deodorizing a garbage can is to fasten a cloth soaked in carbolic acid inside the lid. A holder for the cloth is made from one half of a tin can, which is perforated and tacked to a wood block.

This is forced between the lid flanges as shown. The cloth can be saturated by pouring the acid through the holes.

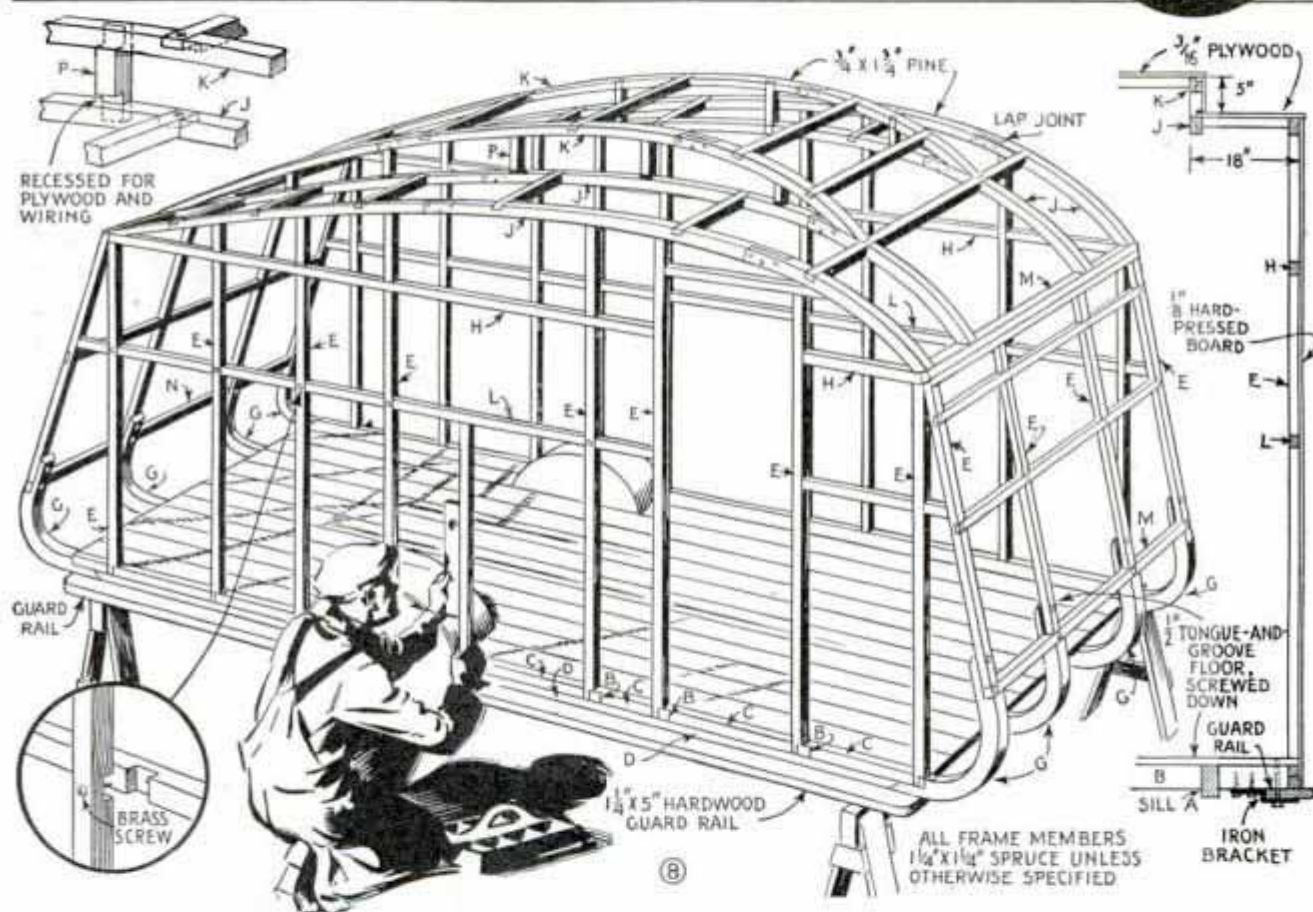
☞ When packing dishes, glassware, etc., with excelsior, dampen it slightly and, as it dries, it will conform to the shape of the packed articles, thus affording better protection than when used dry.



Your

FAMILY TRAILER

Part 2



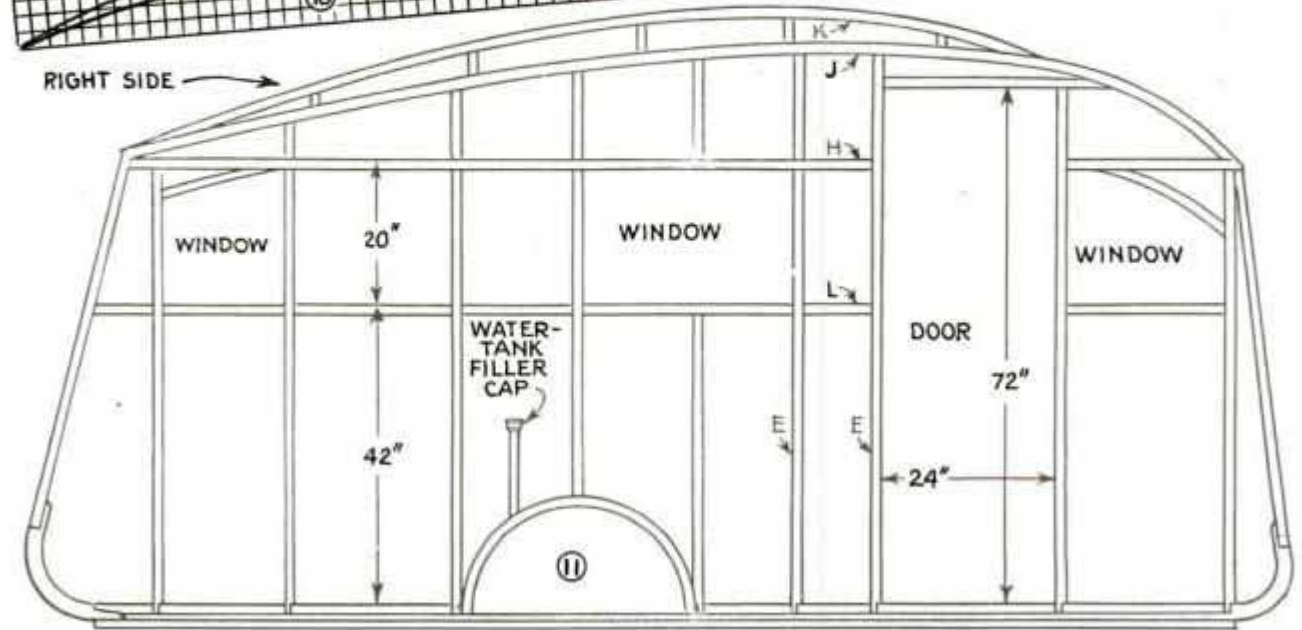
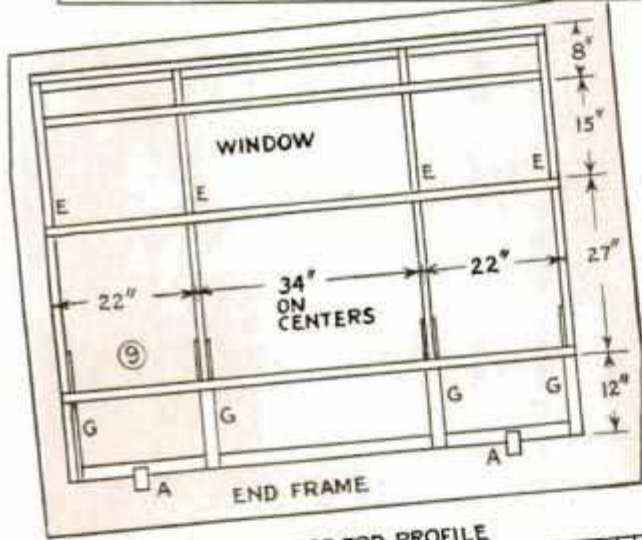
NOW that you have completed the trailer chassis, Fig. 8 shows what's next. Notice first, from Figs. 11 and 14, that the position of the vertical and horizontal members differs on the two sides of the frame. The end frames, Fig. 9, are identical with exception of the top cross member, which is 1 in. lower on the rear frame. To start the framing, set up the corner studs, E in Fig. 8, then follow with the top rails, H, and those across the ends, M, which are double. At the lower ends

the studs are halved and screwed to the cross members, B. Then the filler blocks, C in Fig. 8, are screwed to the lower rail, D, to complete the joint. All joints in the entire frame are set in waterproof casein glue and wherever vertical and horizontal members join, the two parts are halved to make a flush joint which is held with a 1-in. screw. Some care is necessary in mortising, as a tight joint adds greatly to the strength of the structure.

Profiles of the roof and raised center



Provision is made in the framing for building in a sink and a compartment for a gas stove, also storage cabinets for clothing, food and cooking utensils

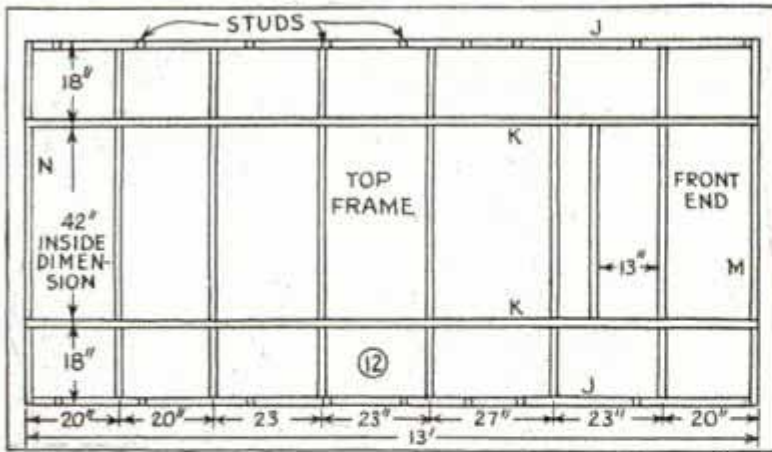


section are given in Fig. 10. Roof beams are of pine, band-sawed to the curve given and made in three sections with lap joints. The beams, Fig. 8, are set temporarily on the studs to mark locations of the mortises. Each individual will probably have his own method of assembly, and whichever method achieves the purpose with the least complication, should, of course, be chosen. Note,

from Fig. 11, that dimensions between the studs are not given as these are determined by the notches in the side rails of the chassis frame. Windows are identical on both sides, but the door, of course, is only on the right side.

The framing for the raised center section of the roof is erected upon the inner beams, J in Fig. 8, and cross members are installed, being mortised at the joints. Locations of the cross members are given in Fig. 12. These pieces are the same size as the studs and rails, and are mortised into the curved members of both roof and raised center section. In order to leave space for the plywood roof, Fig. 13, on top of the curved inner members, J, the short studs or uprights, P, Fig. 8, are notched at the bottom. This construction assures a rain-tight joint.

A cross section of the completed body



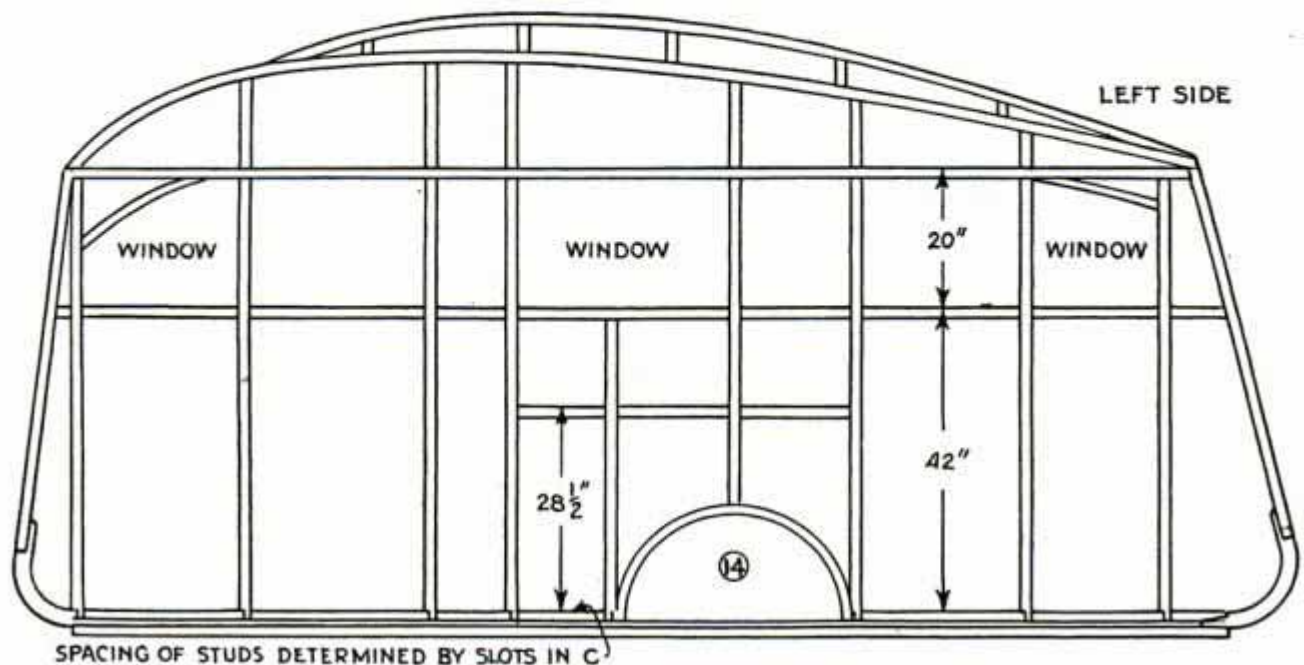
is given in Fig. 8. This also illustrates the installation of a hardwood guardrail along the bottom, secured to cross members with bolts and angle brackets. This guard will prevent possible damage to the side of the trailer in parking lots and on the highway. An automobile bumper, attached to the sills by means of extension bars, will be a wise precaution for protecting the rear of the trailer.

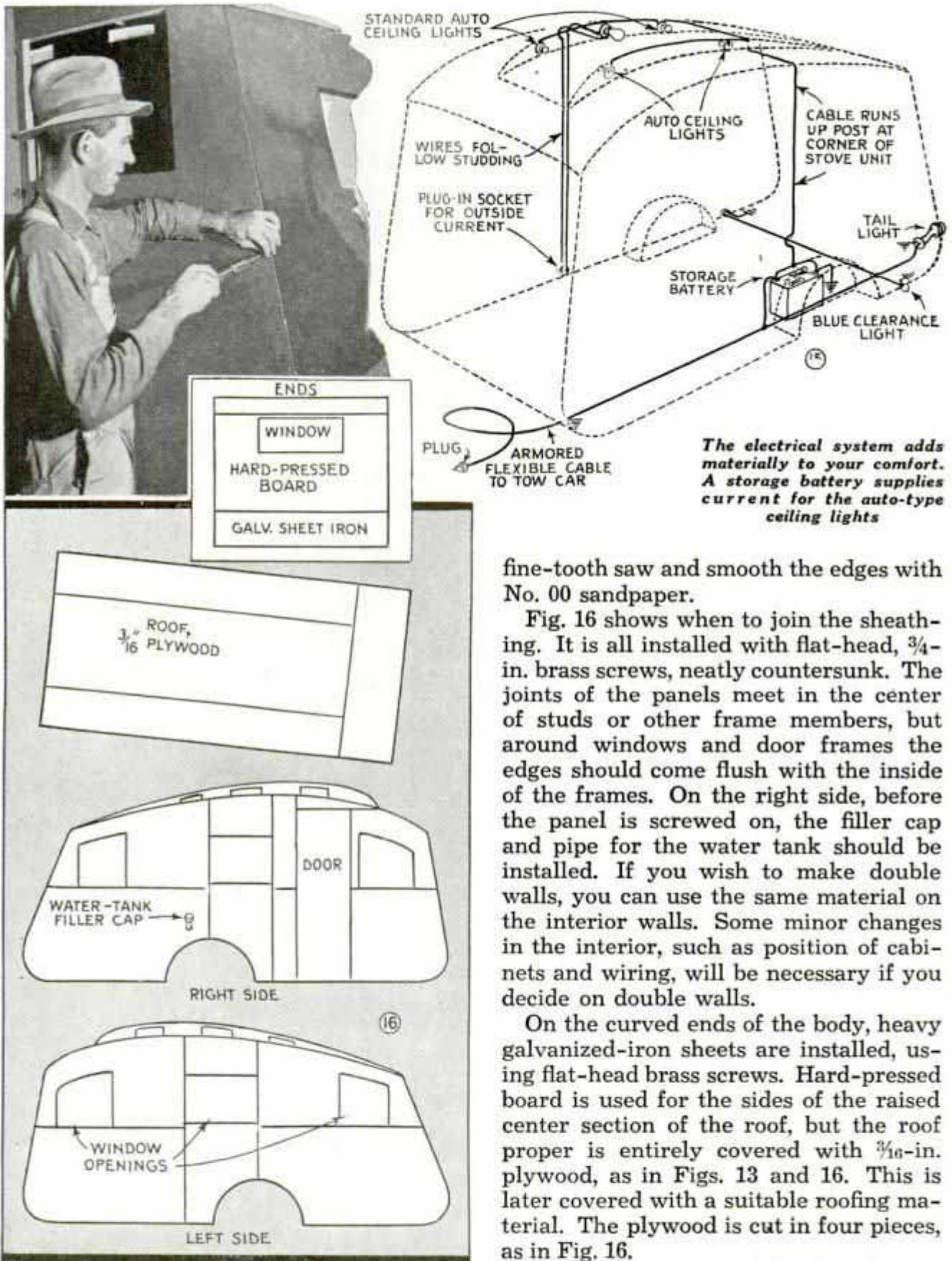
When the upper structure is all complete, the floor can be laid. This is 1/2-in. pine, tongued and grooved. Screws are used to fasten it in place. In this way it will add greatly to the rigidity of the structure. This done, the entire frame is given a priming coat of paint.

A wiring diagram, shown in Fig. 15, provides for a single 110-volt bulb supplied by outside current where this is available. The outside current is led in through a

plug-in socket mounted on the right side of the trailer, on the underside of the guardrail. Tail and clearance lights are connected to the towing car through the usual plug and armored cable, and a storage battery placed on the left side back of the fender takes care of four ceiling lights. These are the standard automobile type with individual switches. The wires from the storage battery are run up a post at a corner of the stove compartment, and along a cross member of the roof to the lights on the other side.

For outside sheathing, 1/8-in. hard-





The electrical system adds materially to your comfort. A storage battery supplies current for the auto-type ceiling lights

fine-tooth saw and smooth the edges with No. 00 sandpaper.

Fig. 16 shows when to join the sheathing. It is all installed with flat-head, $\frac{3}{4}$ -in. brass screws, neatly countersunk. The joints of the panels meet in the center of studs or other frame members, but around windows and door frames the edges should come flush with the inside of the frames. On the right side, before the panel is screwed on, the filler cap and pipe for the water tank should be installed. If you wish to make double walls, you can use the same material on the interior walls. Some minor changes in the interior, such as position of cabinets and wiring, will be necessary if you decide on double walls.

On the curved ends of the body, heavy galvanized-iron sheets are installed, using flat-head brass screws. Hard-pressed board is used for the sides of the raised center section of the roof, but the roof proper is entirely covered with $\frac{3}{16}$ -in. plywood, as in Figs. 13 and 16. This is later covered with a suitable roofing material. The plywood is cut in four pieces, as in Fig. 16.

There are two ways of finishing the exterior. One is to cover with Fabrikoid and the other to fill seams with plastic wood to make an invisible joint, and spray the body with automobile lacquer or enamel. Both finishes are very effective, especially when the lower half is in a dark color to

pressed board is excellent material, having a very smooth finish and rigid structure. It is obtainable in 4-ft. widths, and should be accurately marked by tacking to the frame temporarily and outlining with a sharp pencil. Cut with a sharp,

match the car and the upper portion, above the window sills, in aluminum, with window sash to match the lower part of the body. For that matter, any color that matches your car will give a pleasing contrast with the aluminum-painted top.

Before the sheathing is put on, it is well to decide on the interior finish. If you prefer all one tone, the painting can be done anytime, on the interior. If, however, you like a light framing contrasted with dark panels, paint the wood before the sheathing is set on.

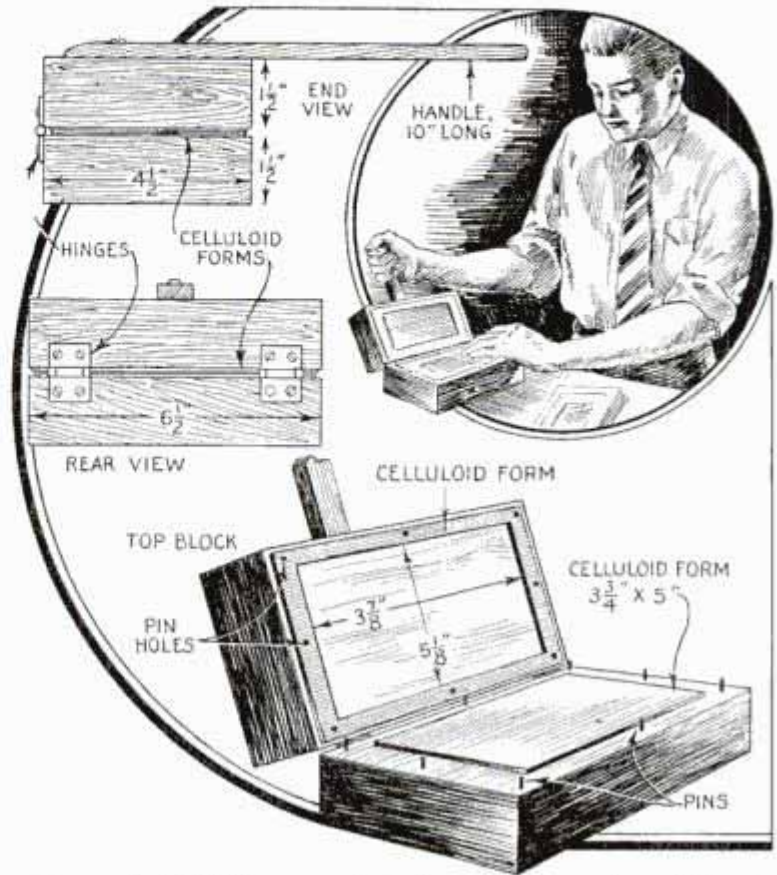
Cementing Nails in Roof Prevents Corrosion

When the home owner goes to the expense of installing a slate roof, it is certainly worth while to put in a little extra work in taking precautions against leaks by sealing over the nail heads. Even when the best quality of copper or coated nails are used, moisture often causes them to corrode and allow the shingles to loosen. A good precaution against such trouble is to coat each nail head with a little non-hardening roofing cement after it is driven.



Cement protects nail heads in slate roof against corrosion which allows wind to loosen shingles

Plate-Sinking Photos and Cards on Small Hand Press

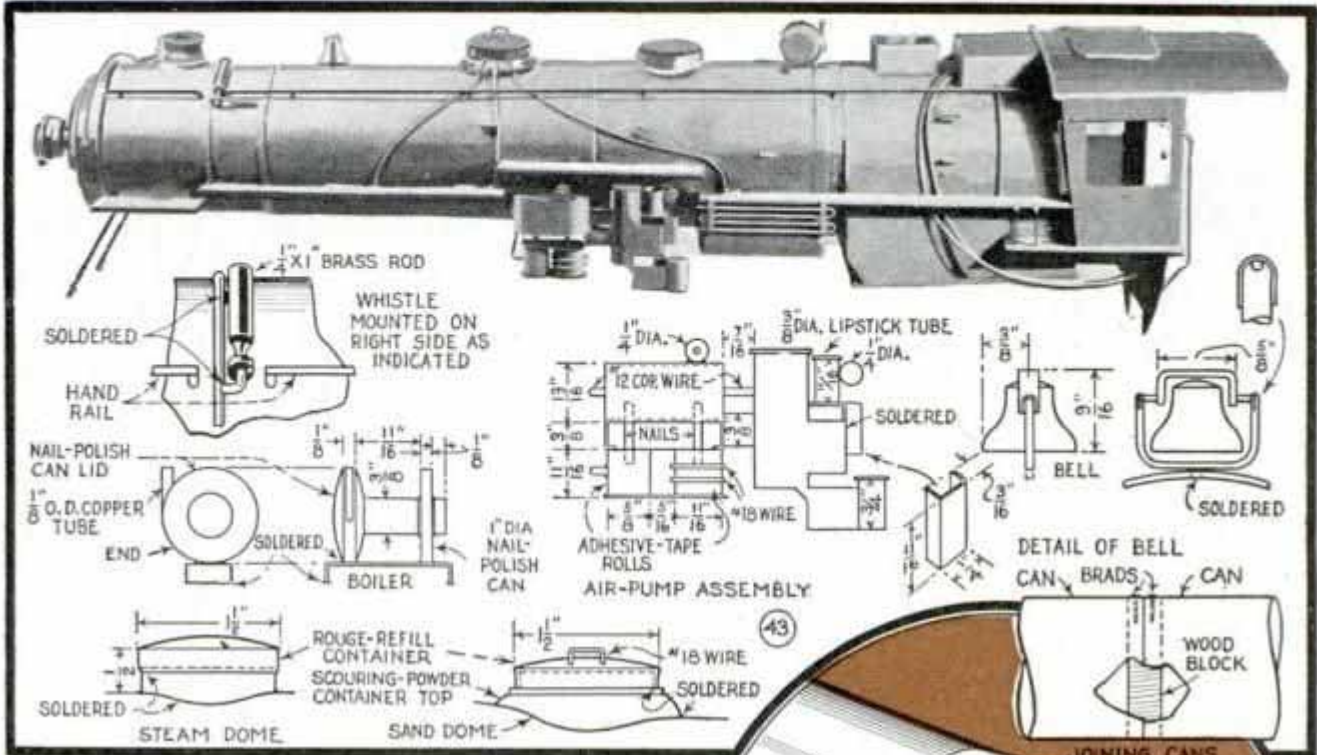


Pieces of celluloid cemented to inner surfaces of two hinged blocks plate-sink edges of photos and greeting cards

Handling two to three hundred photos or greeting cards an hour, this plate-sinking tool can be made by anyone at a cost of less than a dollar. It consists of two hard-maple blocks, one being faced with a rectangular piece of $\frac{1}{32}$ -in. celluloid and the other with a rim of the same material to fit over the rectangular piece with a $\frac{1}{8}$ -in. clearance all around. Guide pins in the lower block aid in centering the cards and in keeping the two pieces of celluloid in register when the blocks are pressed together. In squaring the blocks, be sure that the surfaces carrying the celluloid make good contact. Photo greeting cards will dry flat and have just enough flexibility to plate-sink easily if the final washing is done in a solution containing glycerin, 1 oz., for each 12 oz. of water used. Slightly dampening the backs of cards and photos already printed will help.

When a glue job must be invisible and non-staining, use a package of plain cooking gelatin dissolved in a little hot water.

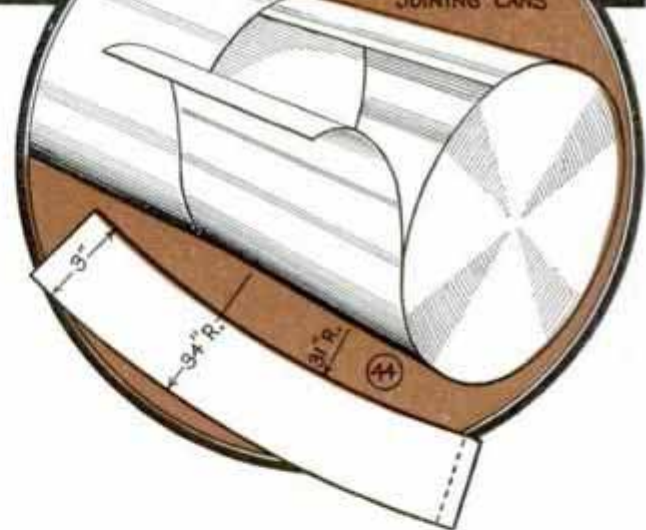
Model Railway Builder



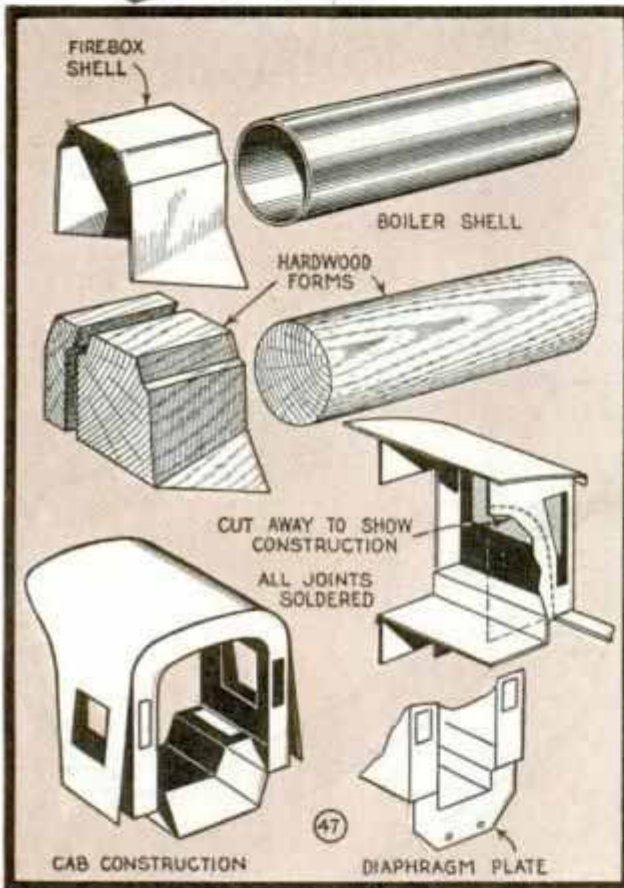
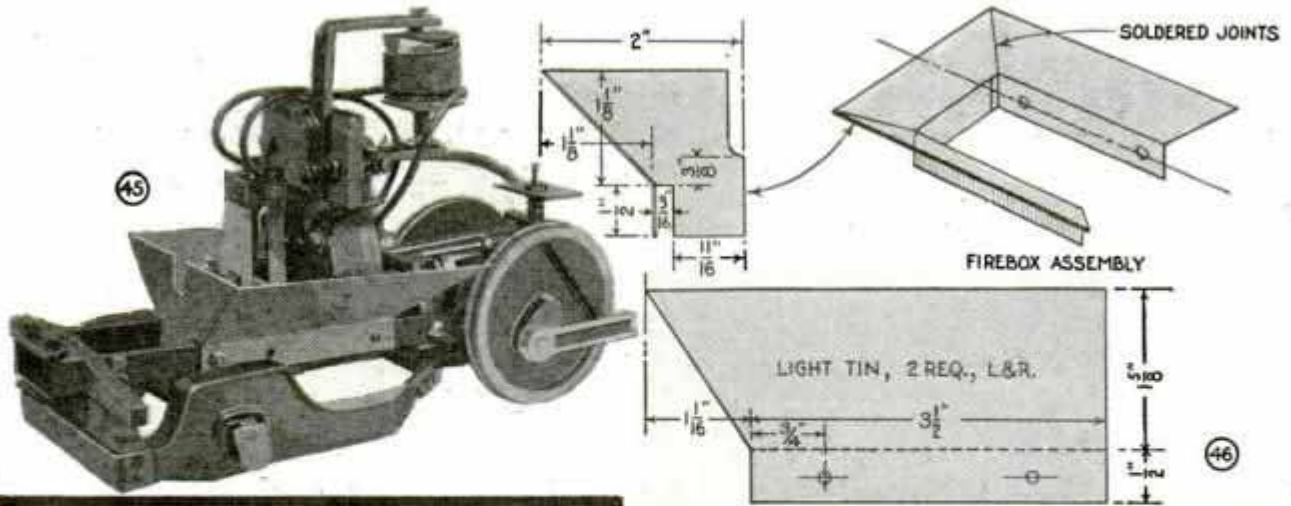
can be done quickly, the type referred to removing both the crimped edge and the top. Lacking this can opener, the next best thing is a three-cornered file. By using the corner of the file and the crimped edge of the can as a guide you can make a true cut without damaging the can.

As you will see from Fig. 38, the cans are mounted on a rod, the rod passing through wooden plugs driven tightly into the ends of the cans. Once you have the cans set up in this way you will have no trouble soldering at the joints. After soldering, the two halves are joined with a curved strip of metal as in Fig. 44, the metal strip developed and cut to the radii shown in the drawing.

The boiler fittings shown in Figs. 40 and 43 were all made from strips of sheet metal, pieces of heavy wire to simulate the piping, small cans and can lids, and disks cut from brass rod. A search will turn up plenty of this sort of material and Fig. 43 gives you a good example of what can be done with it. In adapting such materials you must, of course, keep a close watch on your blueprint dimensions. The same thing holds when building up a boiler shell in the manner just described.



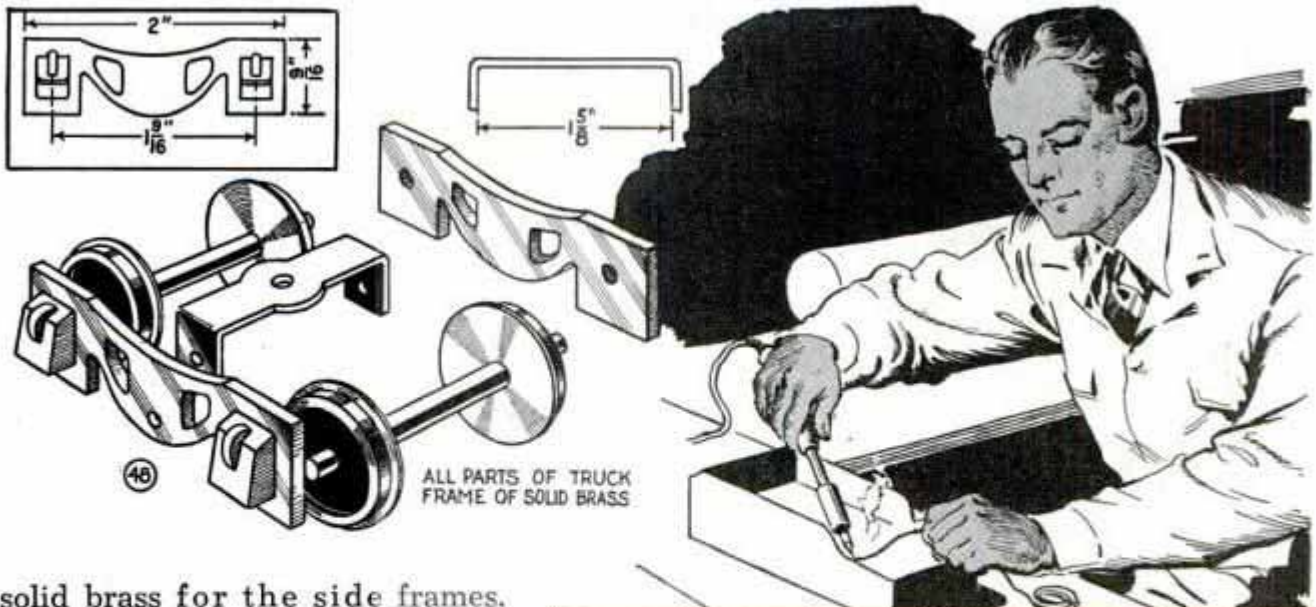
Passing on to Figs. 45 and 46 you find a detail which is of some importance when you come to mount your boiler on the chassis. This is the lower housing shown in place in Fig. 45, and made for the purpose of inclosing the motor and drive, and at the same time simulating the grate assembly. As you will see from Fig. 46 it is simply a sheet-metal job, the dimensions making it suitable for use with the type boiler shown in Fig. 43. On certain types of boilers the firebox shell comes well down over the chassis and makes this part unnecessary.



Now, it should be remembered that the boiler shown in Figs. 40 and 43 is adapted only to a certain type of locomotive. Should your blueprints call for the construction of a "K-4 Pacific" type, for example, your boiler will differ considerably in general design. If your blueprints show the scale of this type to be $\frac{1}{4}$ in. you would go at the boiler construction as in Fig. 47, the upper details of which show the boiler and firebox shells and the hardwood forms used in making them. In building this type of boiler you will find brass the handiest material to work. The boiler shell is a single tapered tube joined at the bottom with a soldered seam. You

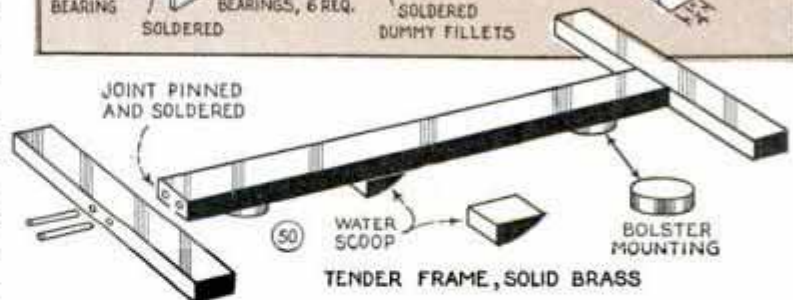
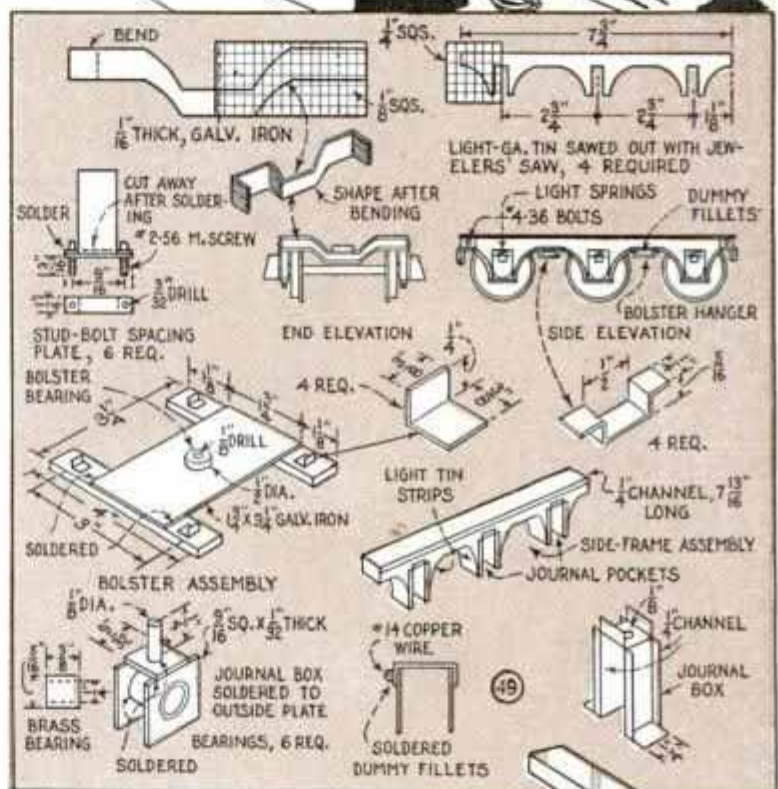
roll the sheet brass over the wooden form and hold it with two hose clamps while you solder. Then the firebox shell is bent over the form and hammered lightly to make it take the exact shape required. Then you solder in a headpiece and in turn solder this to the end of the boiler shell. Now the cab, two types of which are detailed in Fig. 47. The design shown in the right detail is the same as that on the boiler in Fig. 43, while the left detail shows the cab suited to the type boiler just described. As you see, the top and sides are formed from a single sheet soldered to the front and back, the latter parts being sawed out of $\frac{1}{16}$ -in. brass. With the cab joined to the boiler according to the blueprint dimensions your boiler shell is ready for the fittings. If you have been careful about the essential dimensions, you are not likely to have any difficulty fitting the boiler on the chassis and getting it fastened securely in place. Generally the method is the same, regardless of the design. What is commonly called the diaphragm plate, shown in Fig. 47, bolts to the tail lug of the chassis, and the smoke-box end of the boiler rests on the cylinder-block saddle, to which it is usually fastened with a screw.

Now the tender: First you make a pair of trucks as in Figs. 48 or 49, depending on the type called for in the blueprints. Part II, published in a previous issue of Popular Mechanics, tells you how to build up the truck wheels from stock materials. The four-wheeled frame shown in Fig. 48 is a simple job, but the six-wheeled truck in Fig. 49 is a somewhat more complicated affair. In the $\frac{1}{4}$ -in. scale, you can use the

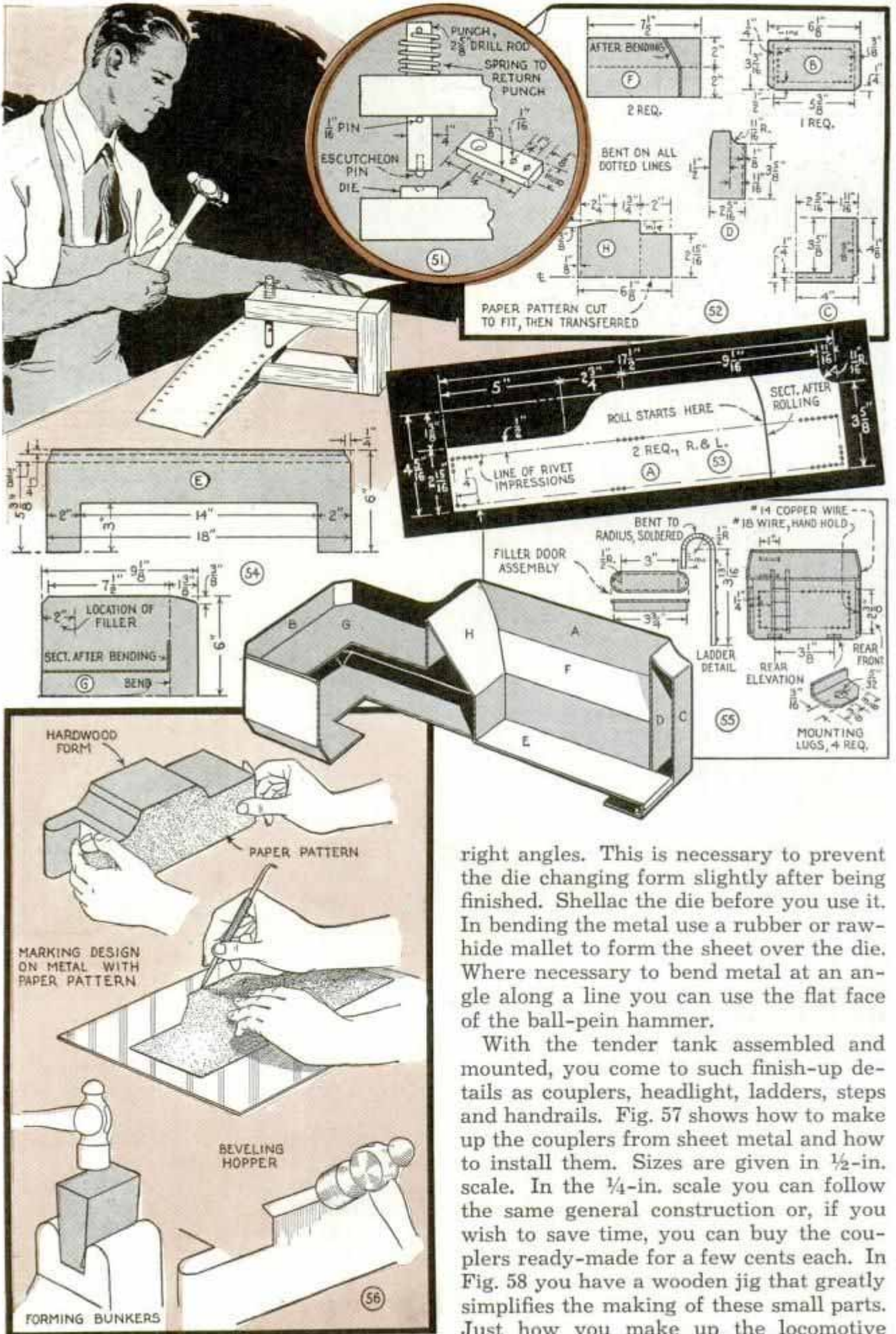


solid brass for the side frames, thus eliminating considerable assembly work. Fig. 50 brings you a general design for the tender frame, and though these, of course, are not all alike, you will generally find them similar in essential features. Your blueprints will tell you what to do in the way of detail, and the design nearly always permits you to make the frame up out of solid pieces of brass, joined with solder and pins. The trucks must always be attached to the frame in such a way that they can swivel freely.

Beginning with Fig. 52, you have the details of parts which go to make up the tender tank. Again this construction is typical, though you will find it varies with the type of model. Figs. 53, 54 and 55 complete the details of the sheet-metal parts and show also a cut-away view of the finished job. Fig. 51 turns up an important detail, that of adding rivet impressions to give the work a pleasing reality. This is easy to do with the simple impression die made as in Fig. 51 and shown in use in the illustration at the left. You can also use your drill press or a small arbor press for this job. All that is necessary is to make a suitable die, and use the drill-press spindle as a plunger. Fig. 56 shows another method of building up the tender tank, using a single continuous sheet for the sides and back. This method, using the hardwood die, works out particularly

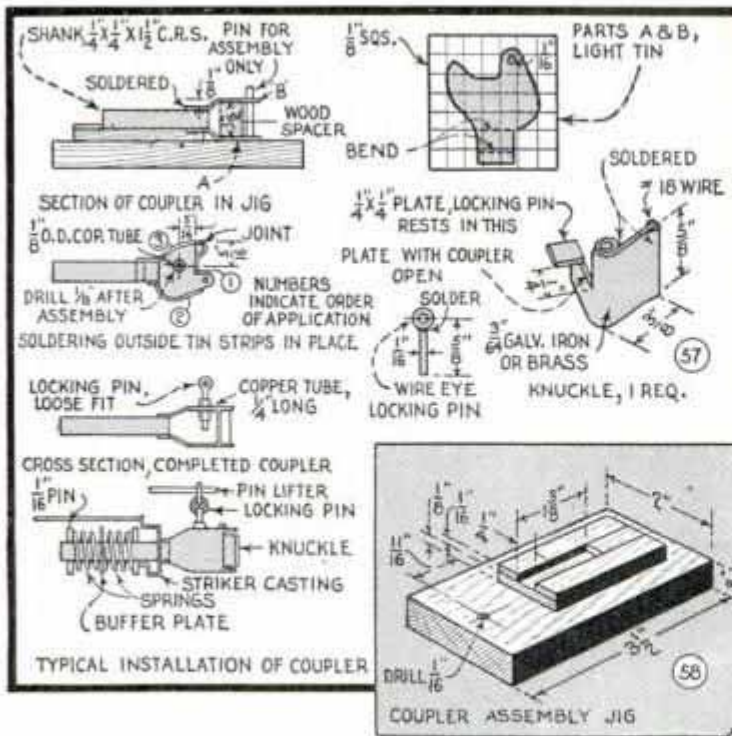


well on the small-scale models, as it simplifies the structural details and yet retains all essential features of the design. Here, in order to meet the blueprint specification, you have to make allowance on the hardwood dies for the thickness of the metal. The dies should be formed from a block consisting of a number of pieces of hardwood glued together with the grain at

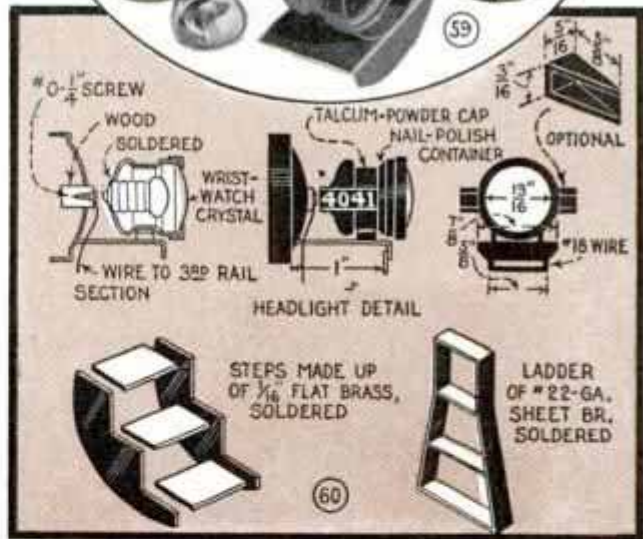


right angles. This is necessary to prevent the die changing form slightly after being finished. Shellac the die before you use it. In bending the metal use a rubber or rawhide mallet to form the sheet over the die. Where necessary to bend metal at an angle along a line you can use the flat face of the ball-pein hammer.

With the tender tank assembled and mounted, you come to such finish-up details as couplers, headlight, ladders, steps and handrails. Fig. 57 shows how to make up the couplers from sheet metal and how to install them. Sizes are given in 1/2-in. scale. In the 1/4-in. scale you can follow the same general construction or, if you wish to save time, you can buy the couplers ready-made for a few cents each. In Fig. 58 you have a wooden jig that greatly simplifies the making of these small parts. Just how you make up the locomotive



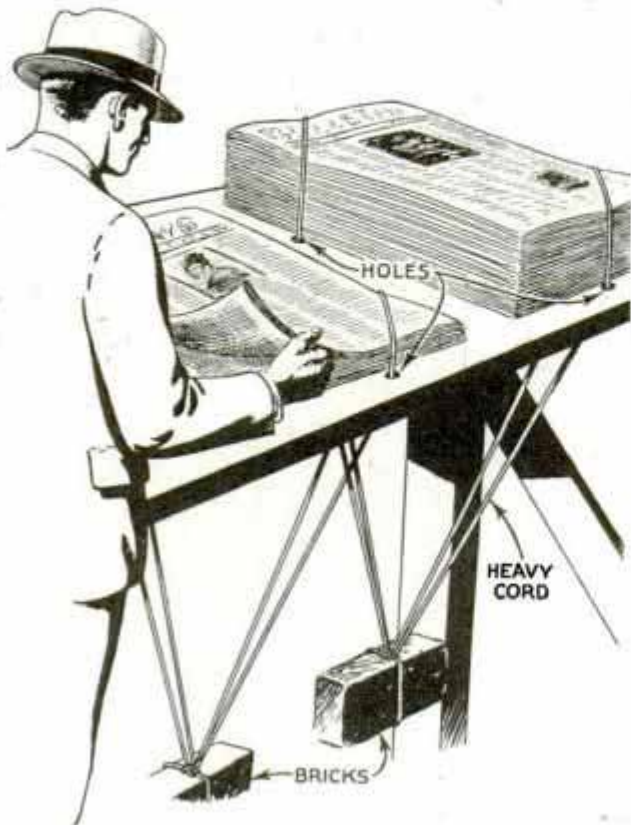
headlight depends on what your blueprints and the type of locomotive call for, but Fig. 59 shows a typical installation of this kind. As an example of how you can adapt common materials, the headlight shell or housing shown in Fig. 59 was made from the friction top of a large talcum-powder can. Now to finish up the job, you make and install the balance of the small parts shown in Fig. 60. Then you're ready for painting. The latter is a tricky job and requires care. First of all, the surfaces to be painted must be clean, which means that all oil, grease and dirt, and particularly all traces of soldering flux, must be removed; otherwise your paint will not adhere to the metal. It will help to touch here and there with a file. Your boiler should be painted black, and a dull-gloss black enamel can be used on the chassis and wheels, excepting the rims and the valve gear, which, if not bright metal, can be coated with a very fine quality aluminum enamel, applied with a camel's-hair brush. Keep your paint thinned to an easy brushing consistency; a heavy paint always results in a messy, unsatisfactory job. If you are careful, only one coat should be necessary. There are several simple tricks in painting a model that will save time and result in better work. When you are painting wheels, for example, have at hand two brushes, one for laying on the paint, the other for brushing it out. The latter



brush is never dipped in the paint. By working two brushes in this way, the second brush will pick up any excess paint laid on by the first. To prevent sagging of the paint film on flat surfaces where you cannot let the work dry in the horizontal position, lay on the paint with the loaded brush, then finish with the dry brush.

(To be continued)

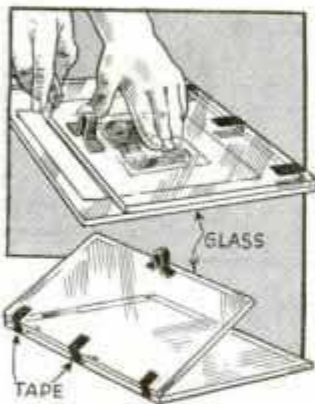
Newspapers on Stand Weighted with Cords and Bricks



Unsightly weights to hold papers on outdoor stand replaced with neat arrangement of weighted cords

Instead of placing weights on stacks of newspapers displayed on outdoor stands, one dealer uses weighted cords, which he loops over opposite ends of the stacks. The cords extend down through holes drilled in the stand top and have weights tied to the lower ends.

Photos Trimmed in Glass Binder



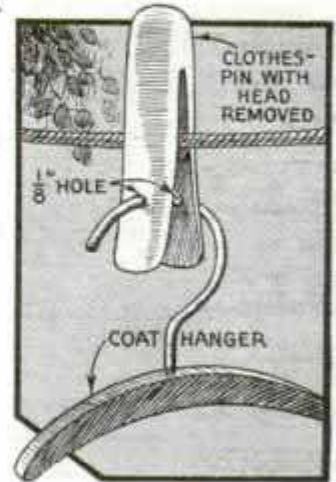
The amateur photographer who does not care to go to the expense of purchasing a photo trimmer can make a substitute from two small panes of glass, one being a little wider than the other. The panes are hinged together at one side with adhesive tape, which is also used to provide a finger grip. In use, the upper glass is raised and the photo is slid into the desired position. Then, pressing down on the cover glass,

the operator may trim the photo quickly with a razor blade, using the glass as a straightedge. The sharp edges of the glass should be smoothed with emery paper.

the operator may trim the photo quickly with a razor blade, using the glass as a straightedge. The sharp edges of the glass should be smoothed with emery paper.

Keeping Coat Hanger on Line

When you hang garments on a clothesline to air, suspend the hangers with clothespins and they will not blow off. Take an ordinary clothespin, drill holes through the legs and insert the hanger hook as shown.



Soap Scraps Ground into Flakes

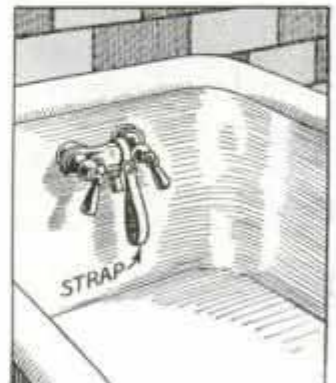


Instead of throwing away scrap pieces of soap, it is a good idea to keep them in a container and when several have accumulated, run them through your meat grinder for use as soap flakes. The grinder produces long strings of pulverized particles, which are broken up into flakes by simply stirring the mass.

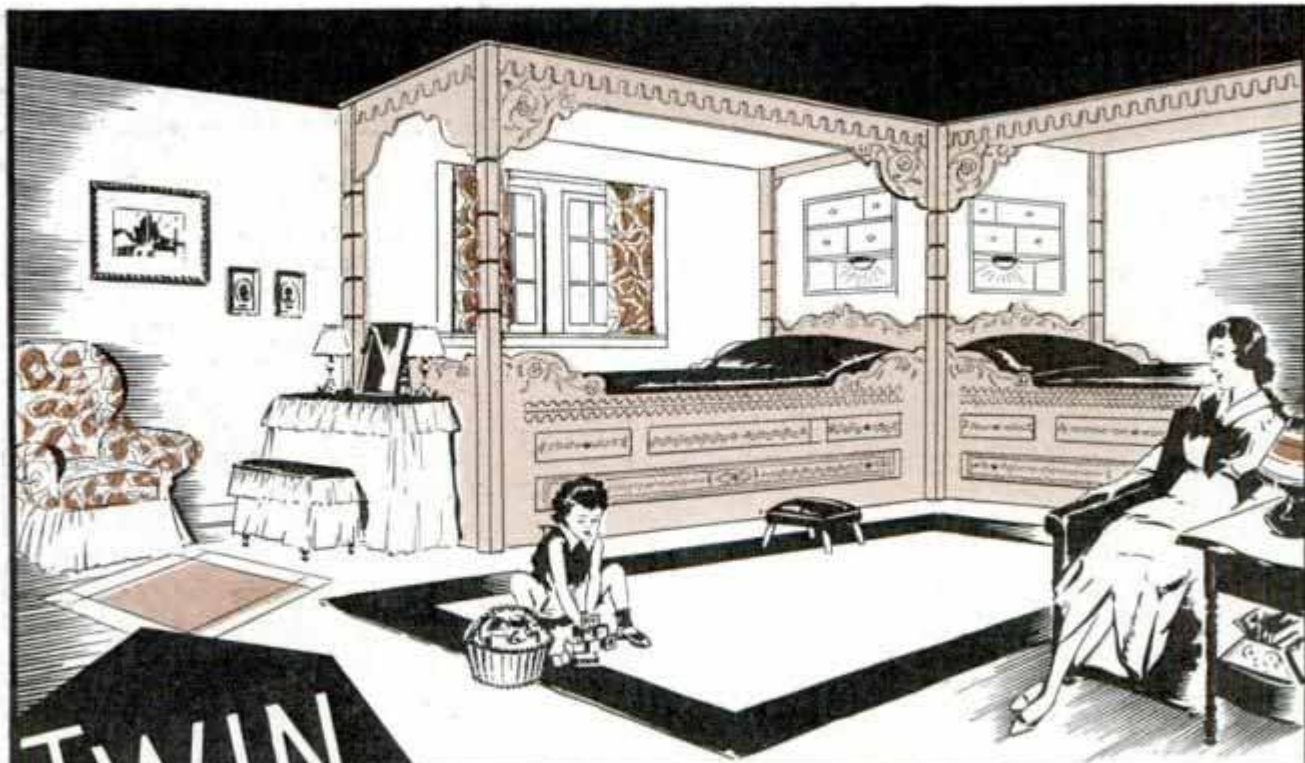
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Handgrip on Bath-Tub Faucet

Those who have difficulty in getting out of a bath tub will find that a rubber strap buckled to the faucets is an aid in lifting themselves from a sitting position. A man's rubber belt or a piece of rubberized cloth folded several times and sewed is ideal for the purpose.

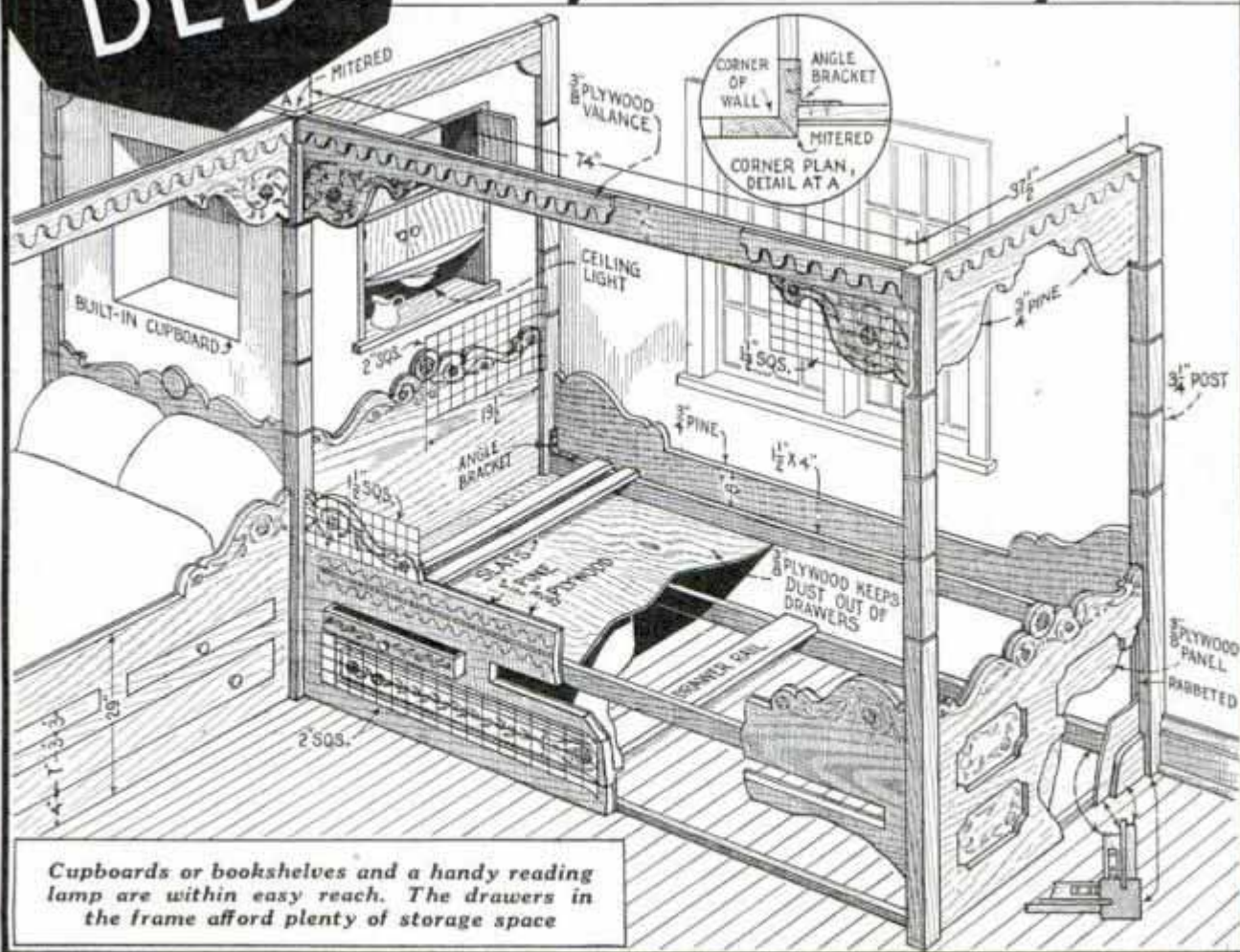


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**TWIN
BEDS**

BUILT INTO CORNER
require minimum space



Cupboards or bookshelves and a handy reading lamp are within easy reach. The drawers in the frame afford plenty of storage space

Long Bands from Inner Tubes by Diagonal Cutting



Use water liberally on both the blade and the work to make cutting easier

Rubber bands of almost any length can be made by cutting diagonally across an old inner tube. The angle at which the cut is made determines the length of the band. I find these bands are just the thing to hold cloth covers on barrels, and are useful in many other places where bands, cut from large tubes in the usual way, are too short. — A. H. Waychoff, Tempe, Ariz.

Kettle Lid Held by Wire on Bail When Draining Vegetables



Soldered across the bail of a large kettle, a wire will hold the cover tightly against the top of the utensil, when draining hot vegetables, so that steam cannot escape at this point and burn the hand or arm. Also, there is no possibility of the lid slipping, which often happens when holding

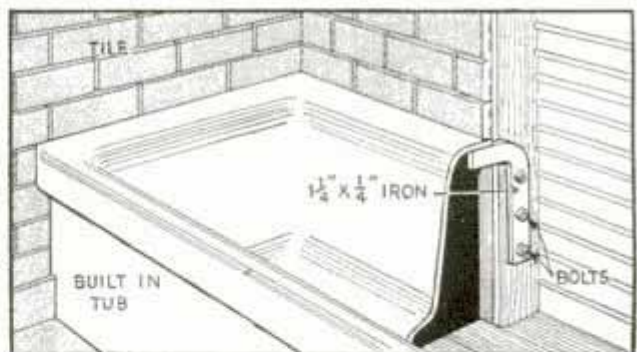
it with one hand while tipping the kettle with the other, as all the weight is carried by the bail and small handle on the side of the kettle. Before soldering the wire in place, give each end two or three turns around the bail to get a good joint.

Giving Artificial Bouquets Odor of Natural Flowers

To give an artificial bouquet the lasting fragrance of natural flowers, dampen a small piece of blotting paper with perfume and wrap it around one of the center stems in the bouquet where it is hidden. A few turns of thread will hold the blotting paper in place. If a perfume is used having an odor peculiar to the natural flowers represented in your bouquet, the effect will be quite realistic.



Bath Tub Anchored to Studs Will Not Part from Wall

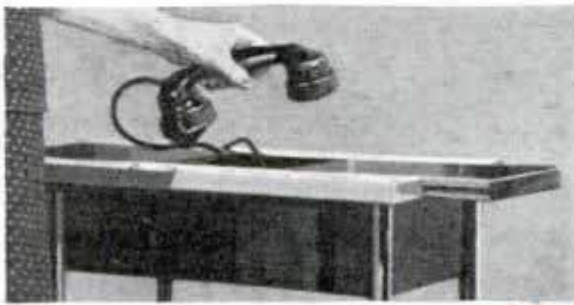


Tendency of built-in bath tub to part from wall prevented by brackets bolted to studs

If you are going to install a built-in bath tub, support the rim next to the wall with iron brackets bolted to the studs. Then the brackets will hold the tub close to the bottom edge of the tile or plaster so that shrinkage of timbers or settling of the foundation, which takes place to a certain extent in all houses, will have less tendency to pull the tub away from the wall, thus leaving a crack that is difficult to keep filled with cement.

22 03 994

The Latest in METAL FURNITURE



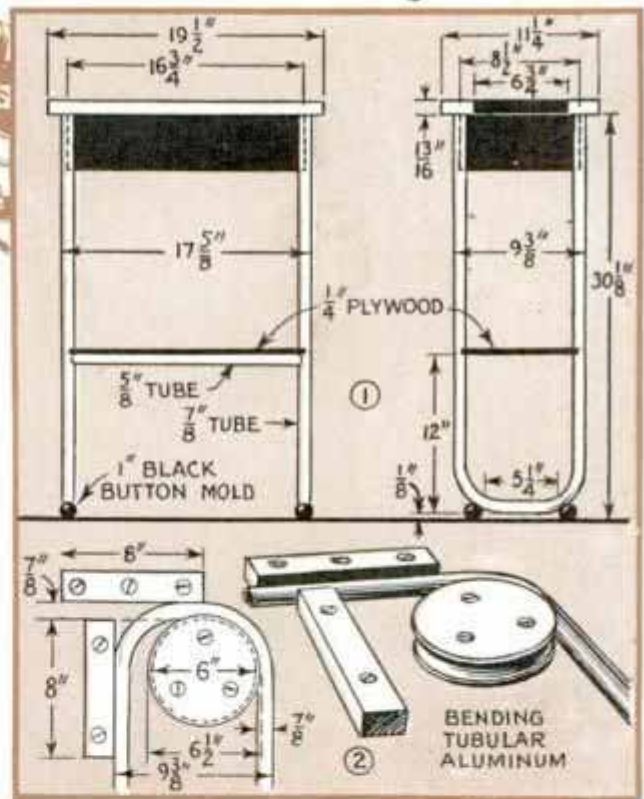
PART III

A CONSOLE TABLE in Bakelite and Aluminum

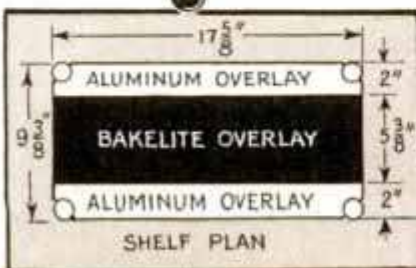
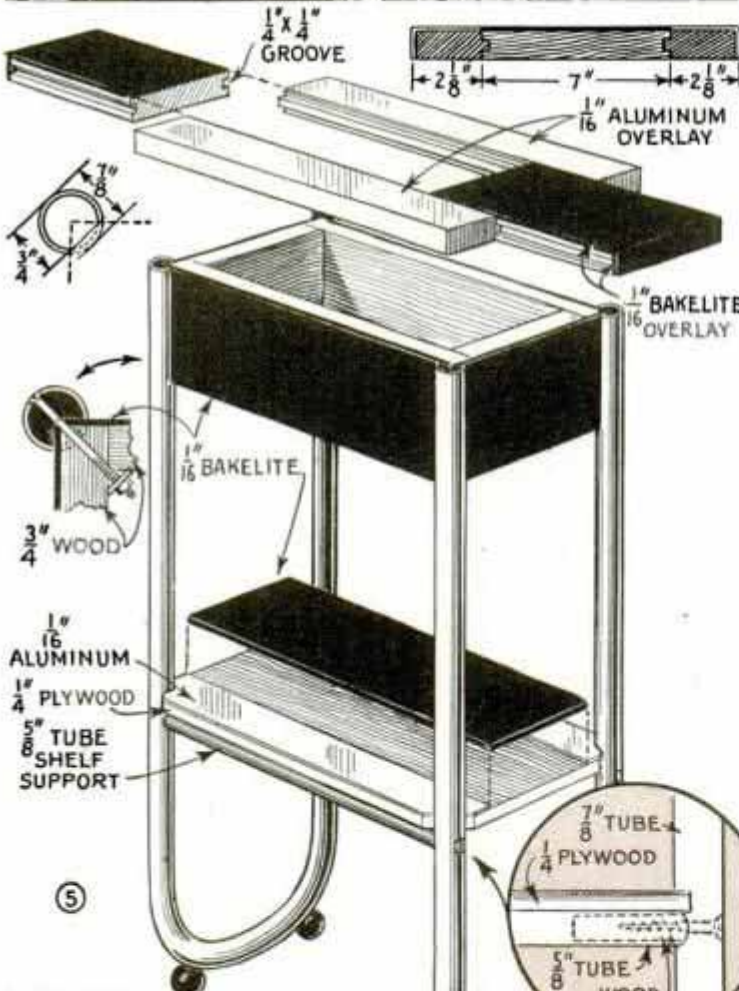
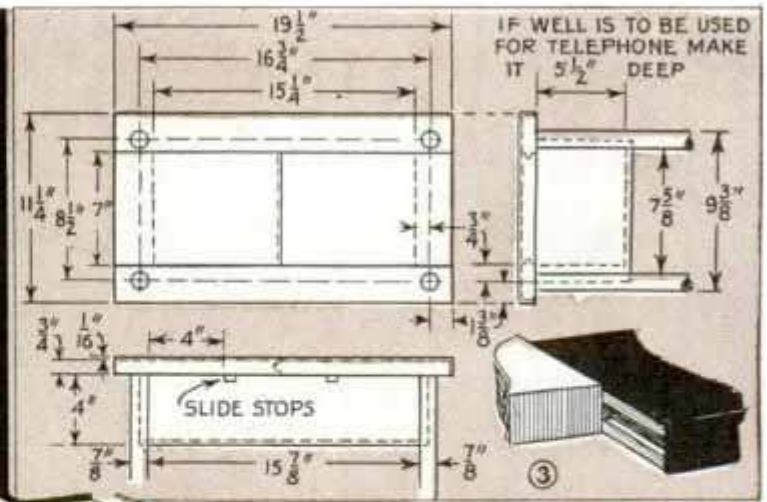
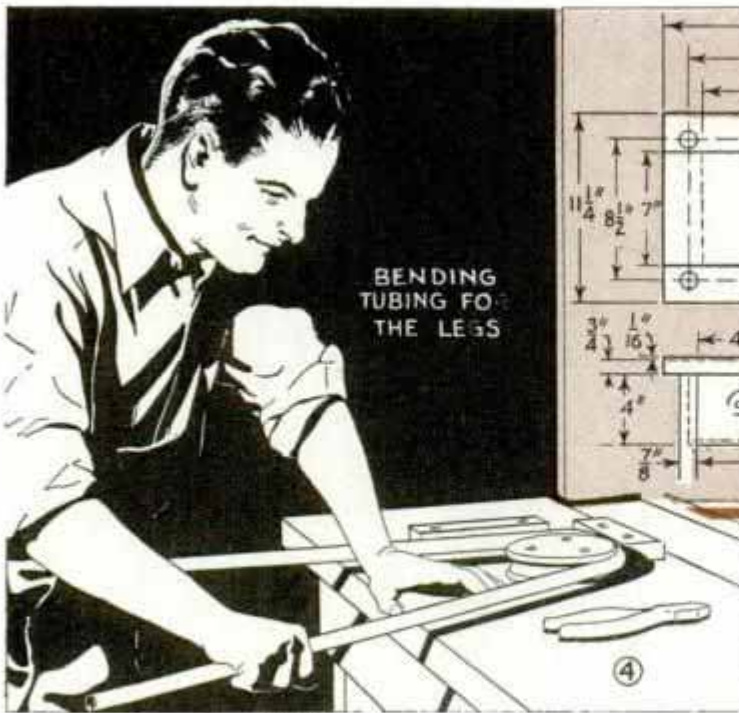
By Walter T. Warde

A SLIDING top, over a deep compartment, makes this console table doubly useful. When closed, the top presents the pleasing contrast of polished Bakelite or other attractive sheet material and aluminum. By making the compartment the proper depth, it will house your telephone. Or, by omitting the top entirely and lining the compartment with sheet lead, you have an attractive fernery. By cutting down its height, the table makes a smart night stand.

Figs. 1 and 5 give you the over-all dimensions and a clear idea of the assembly. It's a good plan to get out the top, and the end and side rails first. These parts are cut from 3/4-in. plywood, as in Fig. 3, allowing 1/16 in. for the overlays. When you come to the tongue-and-groove joint between the sliding and stationary members of the top, notice that the groove is cut in the sliding member. Now, when gluing the overlays to these parts, be careful to see that the aluminum overhangs the outer



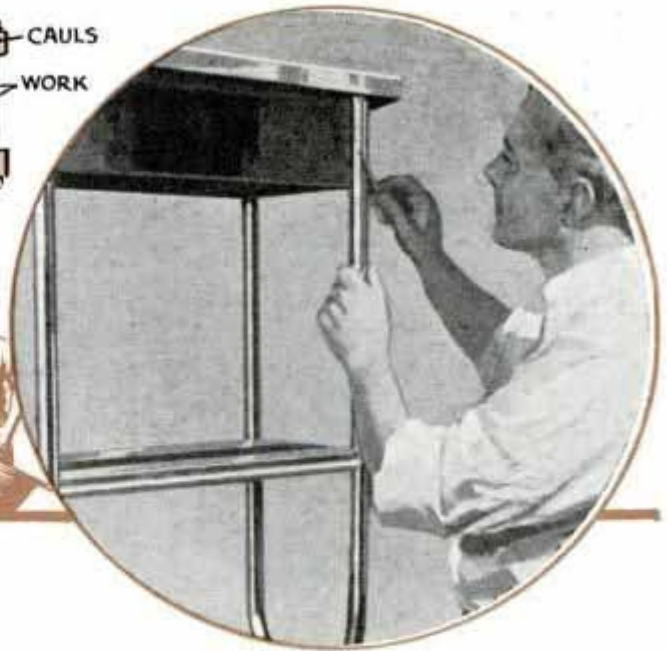
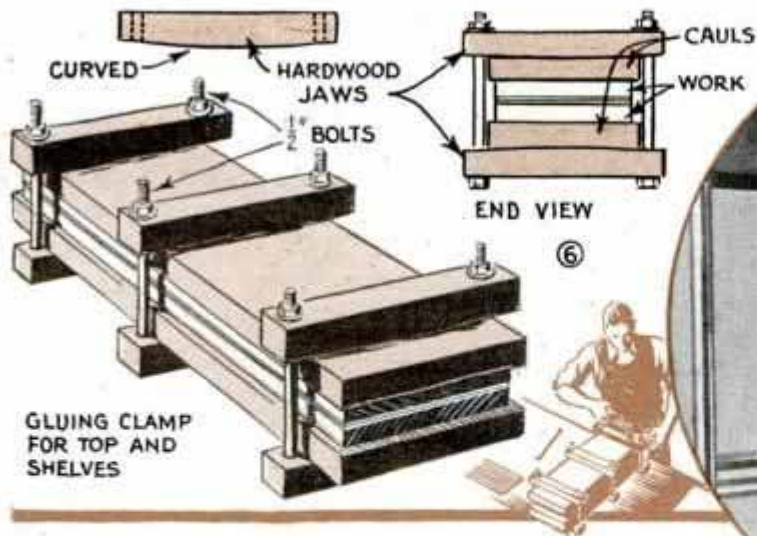
edges of the stationary members 1/16 in., and that the opposite edge is exactly flush. Fig. 6 shows how to build a press for gluing the metal and Bakelite overlays to the wood. Note that on the end rails, the Bakelite overlay must overhang the ends 1 3/16 in. Before gluing the overlays to the rails first rabbet the lower edges of these to take the piece of 1/4-in. plywood, which forms the bottom of the compartment.



Then glue up the rail assembly like a box, fastening the butt joints with screws. With a board and several C-clamps to give a uniform pressure, it is then an easy matter to glue on the Bakelite overlays. Use a waterproof casein glue for this purpose. To glue the overlays on the top members, simply stack the parts in the press shown in Fig. 6. Don't forget the aluminum strips on the outer edges and ends of the two stationary top members. With the overlays in place, you next rout or chisel a groove on the lower side near the end of each sliding member to provide a handhold. To finish this part of the job, make up the shelf. The lower detail in Fig. 5 gives the dimensions and the size of the overlays. When you glue the aluminum sheets to the wood, roughen the underside of the metal to give the glue a better hold.

Now you're ready to bend the tubing for the legs. Get two 6-ft. lengths of aluminum tubing, 7/8-in. diameter with 1/16-in. wall. Fig. 2 shows how to make the bending jig. Plug one end of each tube with a hardwood dowel, fill the tube with dry sand and plug the other end in the same way. Then bend in the manner shown and cut the ends to exact length. Fig. 5 details





what you need to know about the assembly. First, cut away the tubing at the upper ends to take the corners of the compartment. This must be done with some care to assure a neat fit. Then drill a hole diagonally through each corner to take a No. 10-32 duralumin bolt. See the details at the left in Fig. 5. Also drill each leg at the bends for No. 8 duralumin wood screws, 1½ in. long. Fig. 1 gives the position of the holes. The screws hold the button molds, or ball feet. Countersink the screw holes slightly so that the head of the screw can be filed flush. Use oval-head screws and bolts.

Fig. 5 shows how to attach the lower

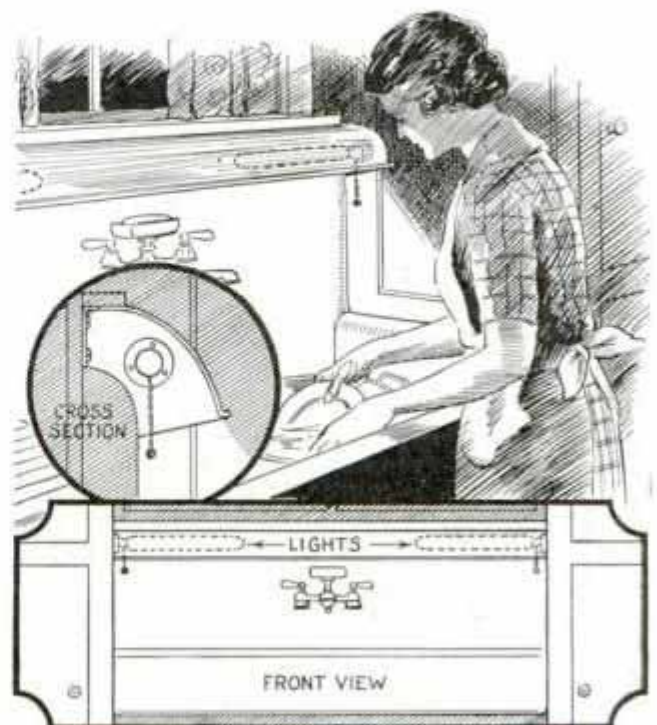
shelf to the legs. Care is necessary in filing the ends of the tubing to assure a neat fit. Duralumin screws, 1½ in. long, are used to hold the ends of the shelf supports, which are of aluminum tubing 5/8 in. in diameter. To complete the assembly, attach the top to the rails, using angle brackets and small screws. Then screw the plywood bottom in place. To finish the table, smooth up all of the rough spots with a fine file, then carefully buff and polish all the metal surfaces.

Showcase Lamp on Sink Fits In with Modern Kitchens

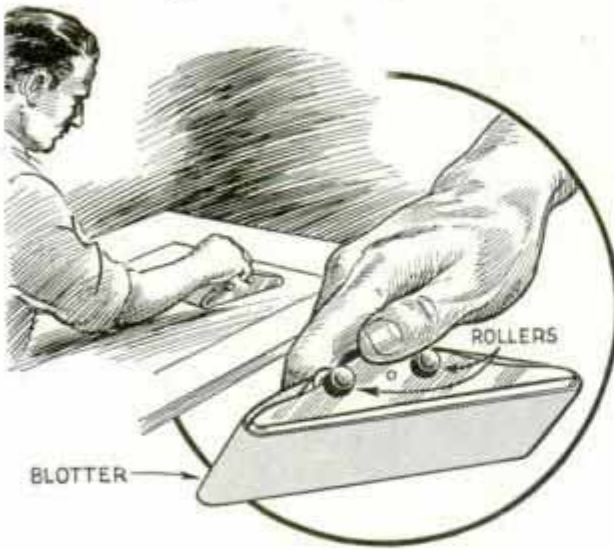
Casting a soft light on a sink without blinding the eyes, this lighting fixture is in keeping with the modern kitchen. Formed from strips of chromium-plated brass, or monel metal, the fixture is fitted at the ends with sockets and showcase lamps, which are operated with pull chains so that one or both may be turned on. The fixture appears best on sinks set below windows or between built-in cabinets.

Fitting Candles in Candlesticks

If the opening in a candlestick is slightly larger than the candle to be placed in it, soften the end in hot water. Then put it in the candlestick and press down firmly to spread the tallow and fill the opening. Another method is to pour melted paraffin into the opening, insert the candle and hold it until the paraffin hardens.



Desk Blotter from Small Plane Has Quick-Change Surface

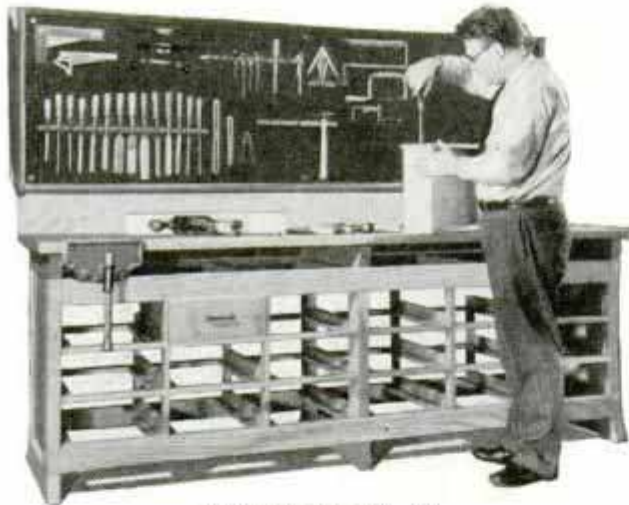


Rollers should bind slightly between the sides of the plane to keep the blotting paper from unrolling

When the bottom of this blotter becomes soiled, a small knob is turned to expose a new blotting surface. The holder is made from a small plane with the plane iron removed and the sides drilled to take two hardwood rollers on which a strip of blotting paper is wound. To get the rollers in place, it may be necessary to drill the ends and then insert short dowel spindles while they are held between the sides of the plane. If the spindles project $\frac{1}{4}$ or $\frac{1}{2}$ in. on one side of the plane, the knobs can be glued to them easily.

☐ A novel method of coloring single-weight photographs is to tint the backs with water colors, then dip them in a solution of paraffin, 4 parts, and linseed oil, 1 part; the coloring is then visible through the backs of the photos.

Why Not Start a Home Workshop?



Cabinet Workbench—898

DRILL PRESS—895: Pipe fittings. $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

BELT SANDER—579: Heavy-duty type. Angle-iron framework and a 5 by 46-in. belt—25c.

VERTICAL SPINDLE SANDER—560: Fine for curved surfaces. Table 10 by 17 in.—25c.

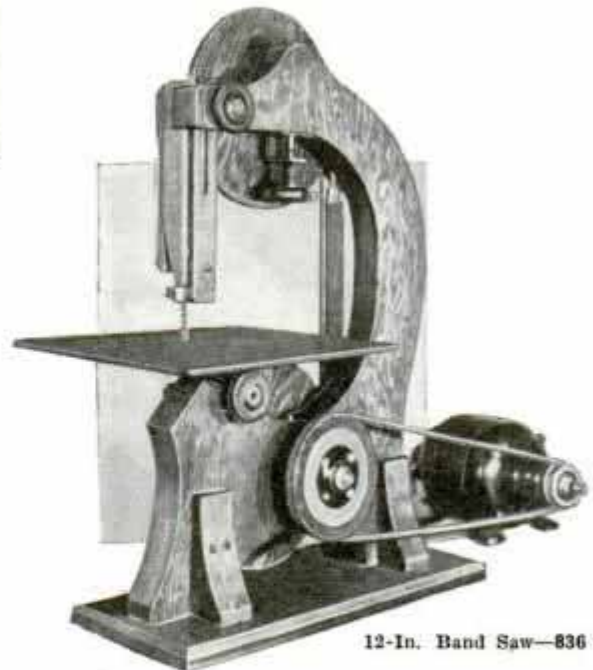
All six blueprints listed above will be sent to you prepaid upon receipt of \$1.00, or separately for 25c each. Also send 12 cents for our booklet "What to Make" which lists hundreds of other blueprints for practical craftsmen. These include plans for home improvement, furniture, novelties, toys, boats, models, outdoor sports, and many other miscellaneous subjects.

A few homemade machines will enable you to get into this interesting field. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need.

CABINET BENCH—898: Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.

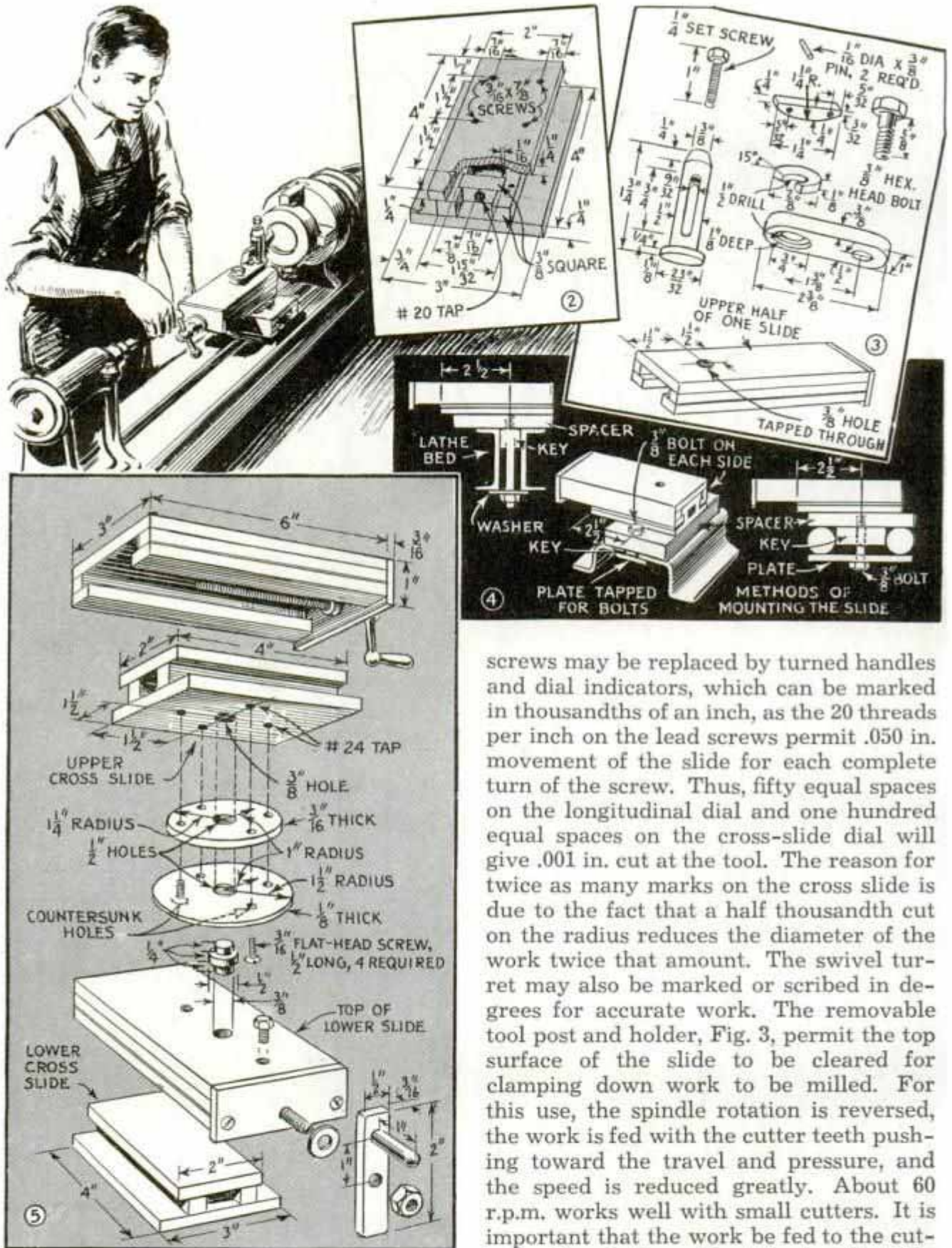
22-IN. SCROLL SAW—771: Pipe fittings and hardwood. Has sewing-machine drive—25c.

12-IN. BAND SAW—836: Smooth running and sturdy. Cuts 2-in. stock easily—25c.



12-In. Band Saw—836

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



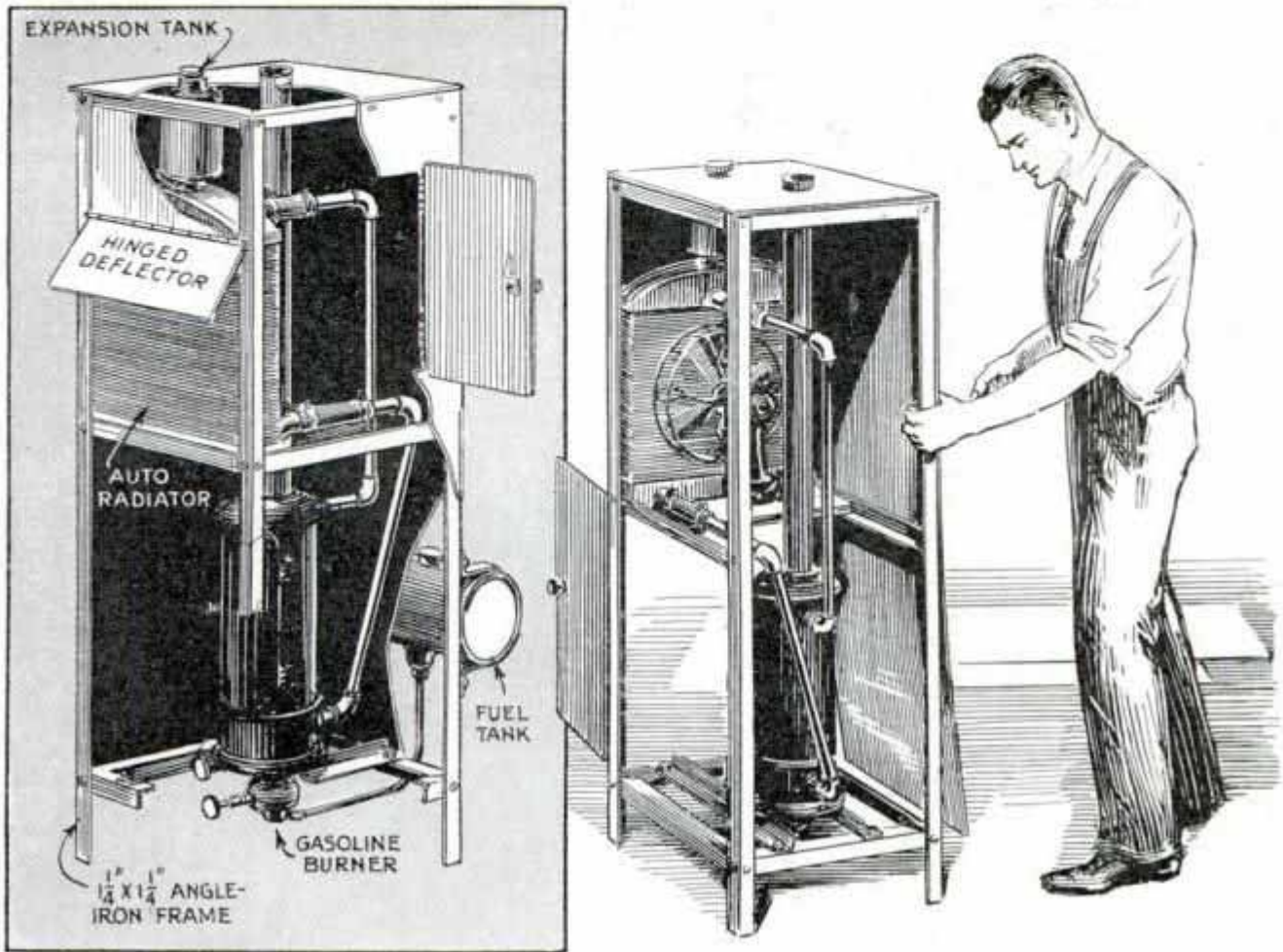
sizes. For a 7-in. swing, omit the block and attach the key and stud directly to the bottom surface of the lower slide.

Fig. 5 shows the swivel arrangement for making angular cuts, using two metal disks. The handles shown for the lead

screws may be replaced by turned handles and dial indicators, which can be marked in thousandths of an inch, as the 20 threads per inch on the lead screws permit .050 in. movement of the slide for each complete turn of the screw. Thus, fifty equal spaces on the longitudinal dial and one hundred equal spaces on the cross-slide dial will give .001 in. cut at the tool. The reason for twice as many marks on the cross slide is due to the fact that a half thousandth cut on the radius reduces the diameter of the work twice that amount. The swivel turret may also be marked or scribed in degrees for accurate work. The removable tool post and holder, Fig. 3, permit the top surface of the slide to be cleared for clamping down work to be milled. For this use, the spindle rotation is reversed, the work is fed with the cutter teeth pushing toward the travel and pressure, and the speed is reduced greatly. About 60 r.p.m. works well with small cutters. It is important that the work be fed to the cutter uniformly throughout the length of the cut. Any irregularity in the feed is likely to cause breakage.

☛ If one of your sheep dies, wait for a day before attempting to pull the wool and the job will be easy.

Self-Contained Heating Unit for Small Shop



For heating small shops, garages, basements, etc., or for occasionally heating a small portion of a large shop, warehouse or other building, when it is not desired to start up the heating plant, this portable unit will come in handy. It consists of a gasoline water heater, an auto radiator and an electric fan to force air through the hot core of the radiator. The entire assembly is mounted inside a sheet-metal cabinet, of which the framework is angle iron. If illuminating gas is available, a gas water heater can be substituted for the gasoline heater, the gas being led to the heater through a length of regular gas hose. Pipes leading from the heating coil are connected to the radiator with regular radiator hose. A small expansion tank is mounted in the radiator filler hole, and a door, either wood or metal, is provided in one side of the frame for inspecting the fan. If it is necessary to change the position of the unit frequently, large casters on the cabinet legs will help.—Joseph H. Gibbons, Oak Park, Ill.

Compression Gauge Is Protected with Rubber Ring

Slipped over a compression gauge as shown, a rubber ring used to remove fruit-jar lids not only cushions the instrument against shocks if it is accidentally dropped, but the knurled edges of the ring afford a good grip for the fingers when the hands are greasy. The rings can be obtained in any store that handles canning equipment.



☞ To keep a camera lens clean when not in use, glue a disk of felt to a disk of cardboard and slip it inside the outer lens flange.

Jig Steadies Door When Mortising It for the Lock



The jig is made of $\frac{1}{2}$ -in. iron rod and the ends are pointed on a grinding wheel

Straddling the edge of a door, a length of iron rod bent to the shape shown and pointed at the ends makes a jig to hold a door while mortising it for a lock. Where it is necessary to mortise doors after hardwood floors have been laid, you can set the pointed ends of the jig on a thin piece of stock. Then, by standing on the end of this to prevent it from sliding, the door can be held securely at any position.

Using Straight-Shank Drills in Regular Brace



Drills may be used in an ordinary brace if they are first wrapped with abrasive paper where the chuck grips them. Be sure to have the abrasive side

against the drill. Small drills that will not fit in the brace chucks can also be built up with wrapping until they can be used in a brace by this method.—Pat MacDon-ald, Jackson, Mich.

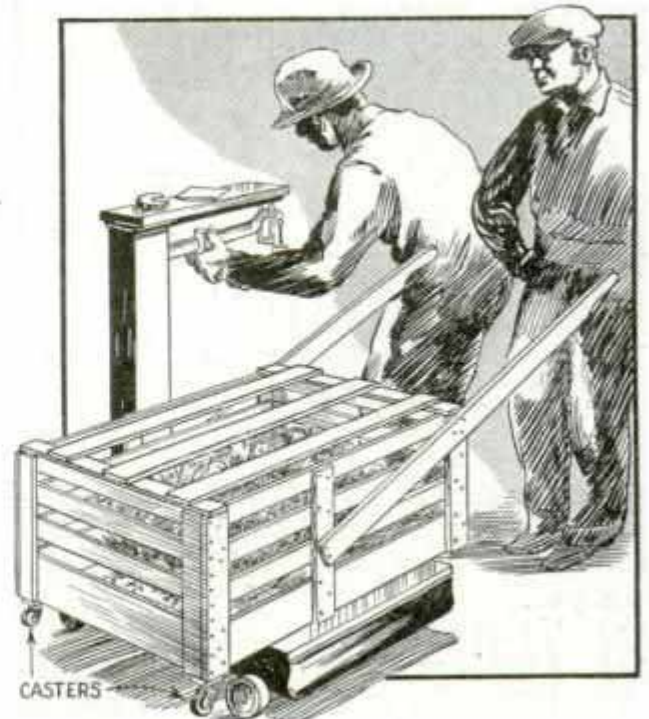
Officer's Star on Wristband

In order to have both hands free to meet an emergency when making his identity known to a "suspect," one plain-clothes officer wears his star on his wrist. The star is hidden by his coat sleeve, yet it is instantly brought into view by lifting the arm to raise the sleeve.



Wheeled Crate Saves Time at Poultry Station

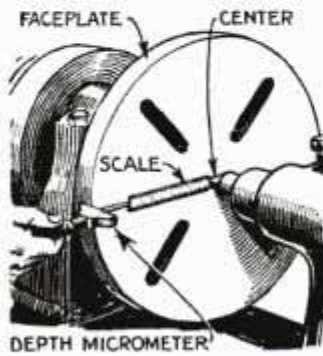
To save labor and time in weighing and handling poultry at a produce station, a wheeled crate is used. The fowls are loaded directly into it from trucks or wagons, weighed immediately and then wheeled into the feeding and shipping rooms without extra handling. When wheeled over the scales, the crate is lowered to a horizontal position which lifts the wheels.



Poultry loaded into this crate is weighed and then wheeled to shipping room without extra handling

Lathe Center Set Accurately

Here is a simple method of determining whether or not the tailstock center of a lathe is accurately centered. The tools required are a scale and a depth micrometer. If the latter is not available, an ordinary depth gauge is the next best thing. See

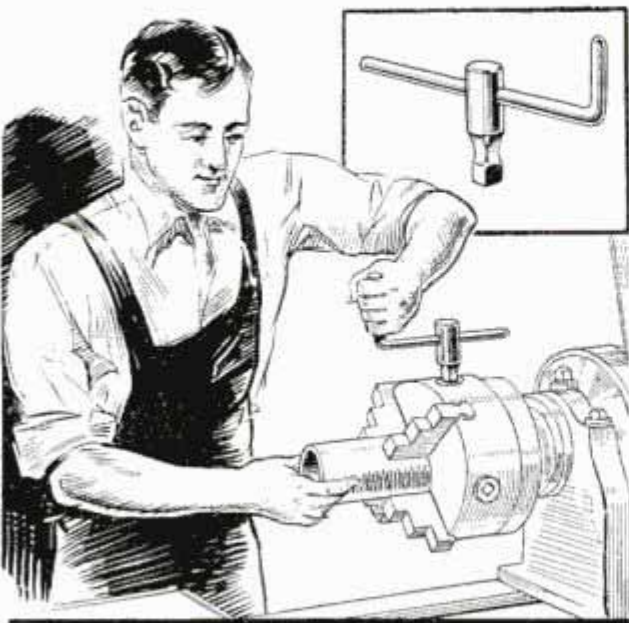


that the outside of the faceplate runs true and advance the center until one end of the scale, when laid flat against the faceplate, rests against it. Now measure the distance from the outside of the

faceplate to the end of the scale with the micrometer depth gauge. Then place the scale on the opposite side of the faceplate. If the center is "off" it will show double the error on the micrometer.

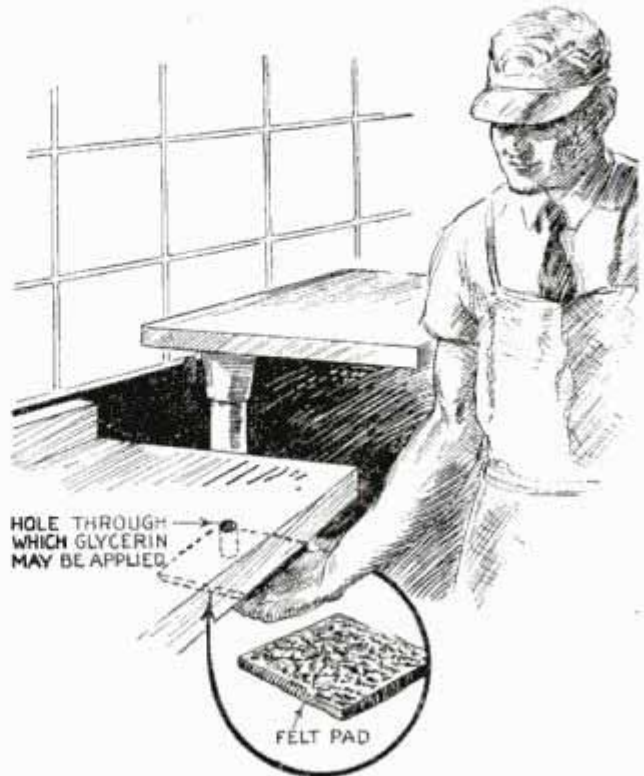
Crank Handle on Chuck Wrench Gives Quick Action

Substituted for the handle of a lathe-chuck wrench, a crank handle will save time on turning jobs requiring frequent re-chucking. A length of drill rod or shafting of small diameter will do for the handle, which is bent to the shape shown with the aid of heat.



When time in production turning counts, this crank-handled wrench is a small but profitable investment

Printer Moistens His Fingers on Pad Fastened to Press

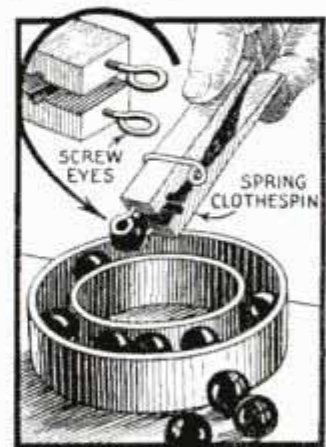


Pad on feedboard of printing press to moisten fingers with glycerin, saves time for operator

Tacked to the underside of the feedboard on a job printing press, a felt pad provides a good glycerin applicator for moistening the operator's finger tips. Glycerin is fed to the pad through a hole drilled in the feedboard directly over the center position of the felt as shown.

Ball Bearings Assembled Quickly with Spring Clothespin

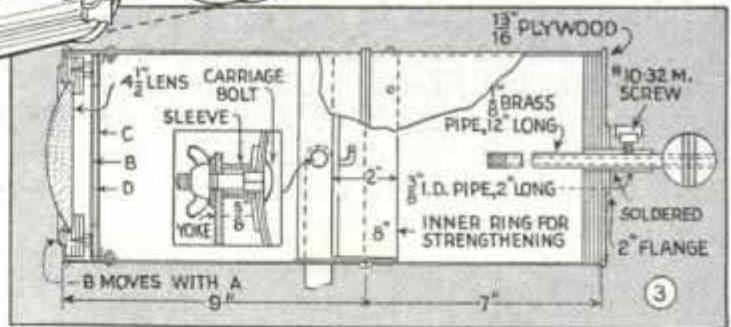
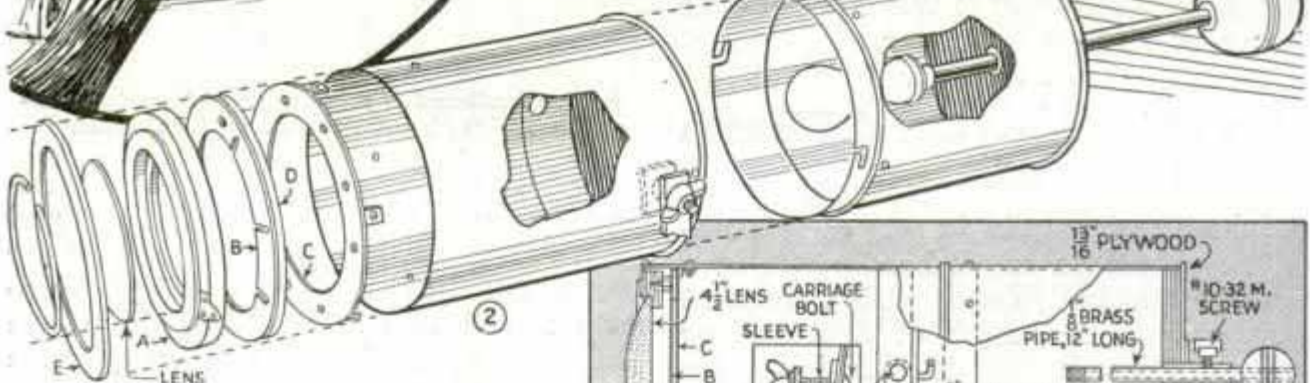
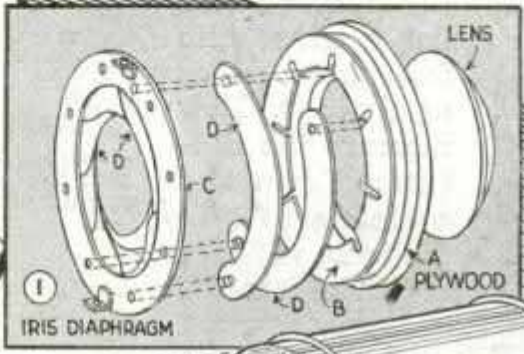
Instead of trying to assemble small bearings with the fingers, make up the simple tool shown to handle the balls. It is a spring clothespin having the ends of the jaws squared up and small screw eyes driven into them as shown.



Old auto headlight reflectors coated with aluminum paint make good light shades around farm buildings.

S.R. 1937

Photo "SPOT SPOT"



Light intensities giving a wide range of shadow effects, are obtained with this home-made photo "spot," because the iris diaphragm and the sliding light can be adjusted to suit any job at hand

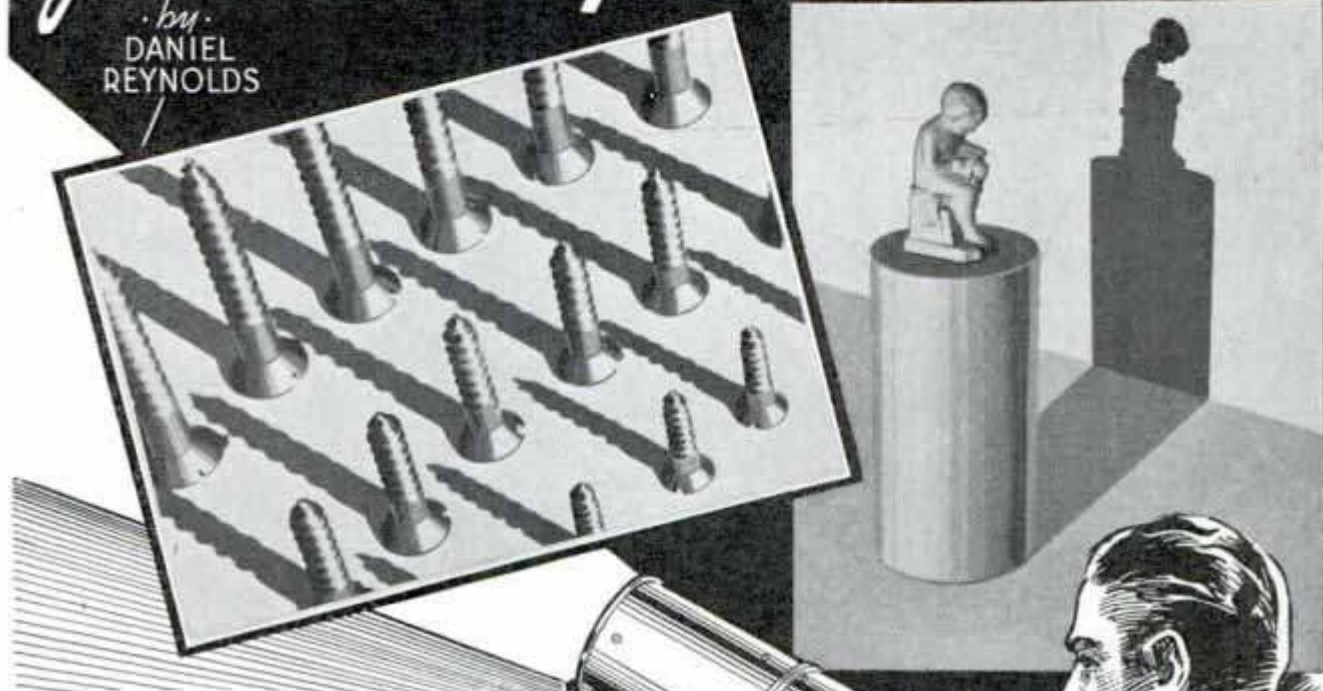
BUILT of two 5-qt. oil containers, an inexpensive condensing lens, and tin obtained from flat cigarette containers, this spotlight does work rivaling expensive equipment. The whole thing will cost you less than two dollars. Masking for sharp shadows is done by means of an iris diaphragm operated by simply rotating the lens mount as in Fig. 7. The size of the projected spot is regulated by maneuvering the focusing rod, and the shadow is sharpened by closing or "stopping down" the lens.

First you get a 4 1/2-in. diameter condensing lens, which is obtainable from any photo supply house. The body of the spot

is made from two 5-qt. oil containers as in Figs. 2 and 10. These are usually obtainable from any filling station. The cans are 9 in. in length and about 6 3/4 in. in diameter. The ends are carefully removed and any projections filed down. One of the containers is then cut down to 7 in. in length. This is best done with tin snips, the can being held in the left hand and the snips in the right. The container is rotated toward you, cutting the metal on a spiral. By using this method the can is not distorted and may be cut exactly to the line. Next, a plug disk of hardwood is turned to fit this end of the container as in Figs. 2 and 3, and held with 1/2-in.

gives Sharp Shadows

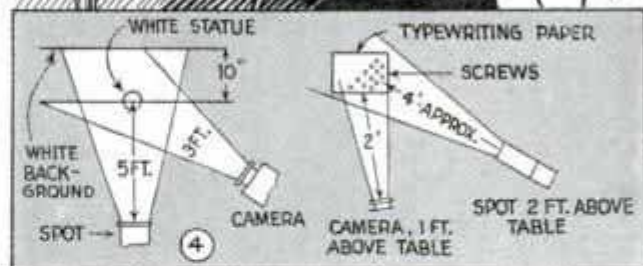
DANIEL REYNOLDS



Emphasizing ideas! By employing "shadow repetition" as in the two examples above, there is no limit to interesting composition and forceful presentation in photos

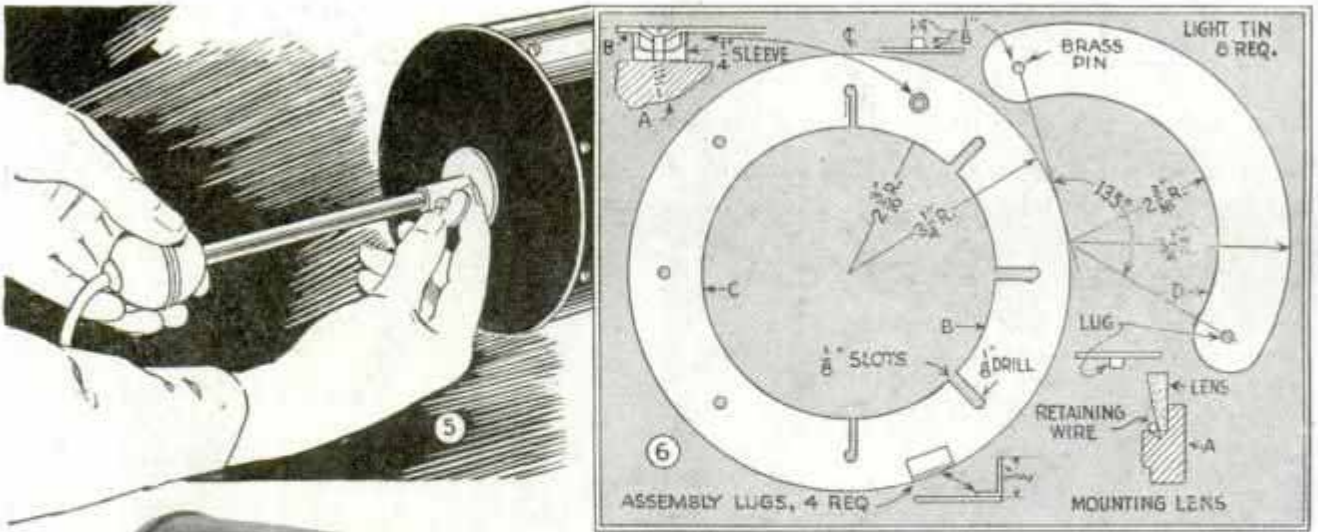
round-head screws, eight screws, evenly spaced, being used. One end of the other container has a ring E soldered in place as shown in Fig. 2. This retains the lens mount and diaphragm assembly. The two containers are locked together as shown in Figs. 2 and 3. A strip of heavy tin, 2 in. wide, is bolted on the inside circumference of the rear container. This strip projects 1 in. The front container is placed in position and a hole drilled through both the container and the strip. The container is rotated to the right $\frac{3}{4}$ in. and a second hole drilled. The metal between these holes is removed and a $\frac{1}{8}$ -in. bolt slipped through the hole in the front section and soldered. Using this as a guide, three other locking slots are cut in the strip. This provides four locks, or "bayonet" catches, and permits the spotlight to be taken apart quickly for bulb changes. The joint is also shown in Figs. 9 and 10.

The focusing rod is a piece of $\frac{1}{8}$ -in. brass pipe, 12 in. long. One end is threaded for a keyless socket and the wire is led through the pipe. A brass bushing is used



Here's the way you arrange camera and lights for photos like the ones shown above

to provide a bearing for this rod through the wooden disk as shown in Fig. 3. This is simply a piece of $\frac{3}{8}$ -in. brass pipe, 2 in. long. A brass flange 2 in. in diameter is sweat-soldered to the bushing and holds the assembly securely in place. The focusing rod can be locked in any position by a thumbscrew made from a No. 10-32 ma-

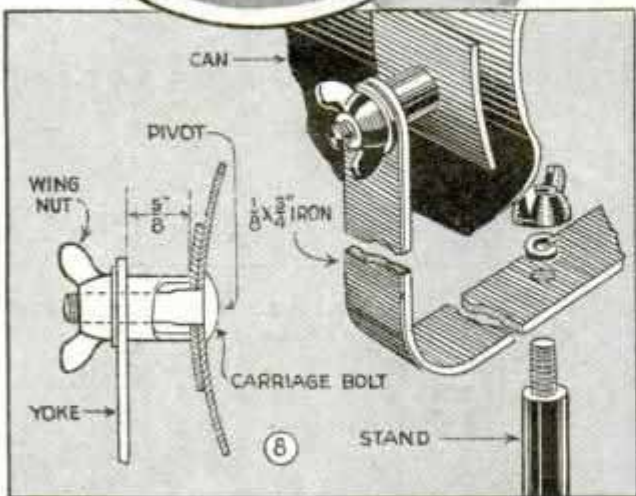


chine screw, a piece of flat brass being soldered in the slot to provide a wing for turning it as in Fig. 5. A hole is drilled and tapped in the bushing to take this screw. You can turn out a hardwood knob to fit over the end of the rod or it may be left plain. In either case, be sure to remove any burrs from the

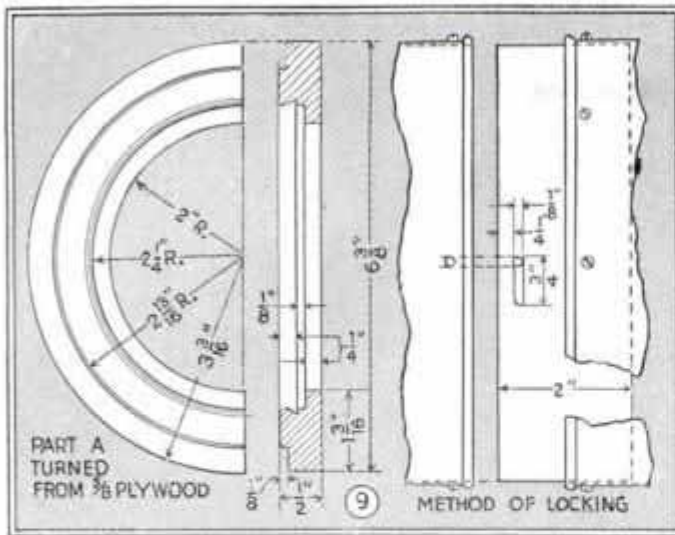
end of the pipe to prevent the wire covering being cut.

Fig. 1 shows clearly the parts and assembly of the iris diaphragm and Fig. 6 gives the necessary dimensions. First, you need eight segments, D in Fig. 1, cut from light tin. A short brass lug, cut from 1/8-in. tubing, is soldered in the position shown in Fig. 6. These lugs act as bearings in the rings B and C, in Fig. 1. The lugs should be up on similar ends of all segments and down on the other. Otherwise it will be impossible to assemble. The rings B and C, Fig. 1, are cut from heavy tin to the size given in Fig. 6. When completed they are set aside until the lens mount is complete. The latter you will find detailed in Fig. 9. It is turned from a piece of 5/8-in. plywood.

The lens seat is detailed in Figs. 2, 3 and 9. The lens is held in place with a wire ring as in Fig. 2. This mounting permits it to be removed easily for cleaning. After the mount is completed, part B is screwed in place on the back. The segments D are placed in position as in Fig. 1. The four mounting lugs are now bent to shape but not drilled, and are soldered to the ring, part C. This ring is placed in position and the entire assembly clamped

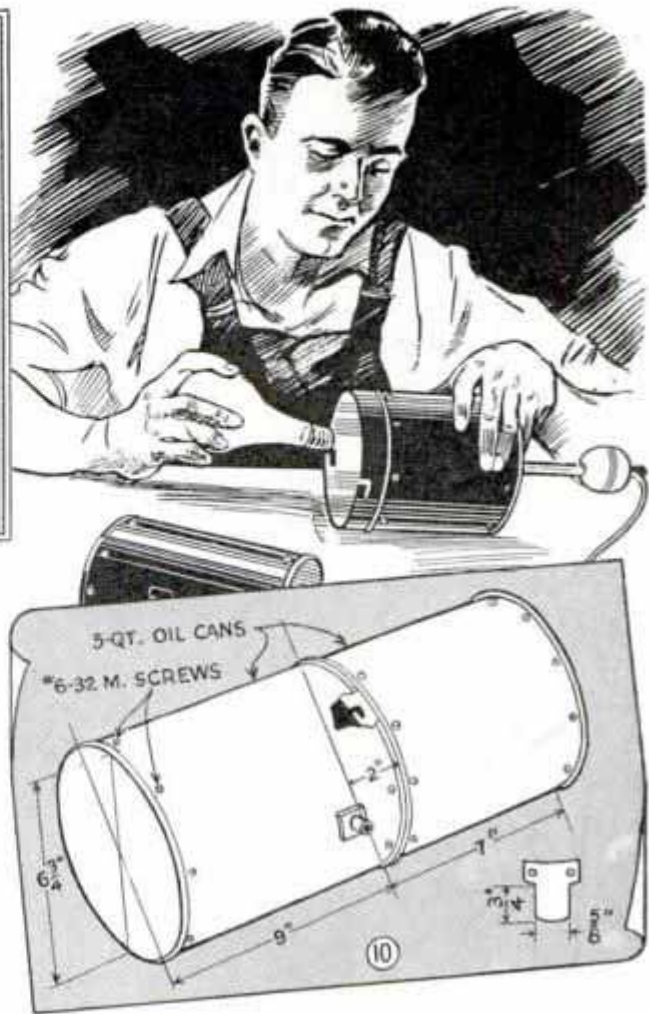


Tightening the thumb nut, Fig. 5, locks the sliding light. In the iris diaphragm (Figs. 1, 2 and 6) eight curved blades converge toward the center to restrict light, when the lens mount is moved, Fig. 7. By loosening the thumb nuts, Fig. 8, the spot has a wide swing both vertically and horizontally



together. The assembly is next slipped into the open end of the spotlight and the location of the lugs marked on the walls, after which it is removed and holes for the screws are drilled in the walls of the spot only. The diaphragm assembly is then returned to its position and the location of the holes marked on the lugs. Do not force the parts too closely together; allow for a free motion. Remove the assembly and drill the holes, then bolt permanently in place. The supporting ring at the pivot point of the spot is simply a 2-in. band of heavy tin bolted to the inside of the body. This is located 7 in. from the end of the forward half. The two pivots are $\frac{1}{4}$ -in. carriage bolts passed through the sides of the spot as detailed in Fig. 8. The yoke of the mounting is made of strap iron, the assembly of which is also shown in Fig. 8. The stand can be made up from an old lighting unit, or you can get any suitable weighted base about 12 in. in diameter and fit a standard made of sections of telescoping brass tubing. The stand should permit raising the spot to a height of about 7 ft. The barrel of the spot is painted flat black on the inside to prevent rings caused by reflections on the bright tin. The cord leading to the socket should be rubber covered and about 15 ft. in length. A switch in the cord is a convenience in operating the spot.

☐ Stretching a straight piece of Nichrome wire evenly will decrease its diameter and increase the resistance of a given length; the same effect is obtained by pulling the wire through a folded piece of emery paper a number of times.



Bayonet-type catches at the joint permit the barrel to be "broken" for easy renewal of photoflood lamps, which provide illumination. The simplicity of the barrel construction and the lens assembly is also evident from these details

Non-Slip Fasteners for Gates

Instead of using wire loops to fasten the free end of a wire gate, try two pieces of auto tire as shown. You will find these much better than wire as they are more resistant to weather, more flexible, and provide greater friction against the gate pole, thus reducing the possibility of cattle opening the gate by rubbing against the fasteners. A hack saw is bent for cutting the tire pieces, which should be spiked to the gate post in the position indicated in the drawing.



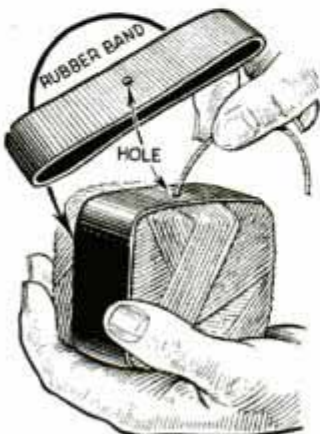
Displaying Shoes on Box Cover Keeps Samples in Pairs



Merchant keeps sample shoes in pairs by using original box as display fixture in show window

To avoid confusion in mating shoes displayed in a window or showcase, one merchant uses the original box as a display fixture, setting one shoe on the box and leaving the other concealed inside. Notches are cut in the box and cover, after which the latter is bent to lock the two together as shown in the detail.

Twine Kept from Tangling with Rubber Band



Large balls of twine that are unwound from the inside can be kept from tangling by cutting a wide band from an old inner tube and slipping it over the ball as shown. The twine is pulled through a small hole in the top

side of the tube. Friction between the edges of the hole and the twine tends to keep it from being pulled out accidentally.

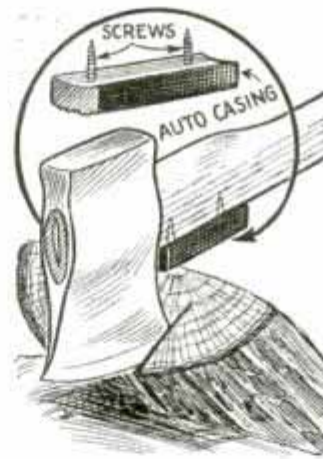
Locking a Dial Telephone

To prevent an unauthorized person from using a dial telephone in an office where an attendant is not always on duty, apply a small padlock as shown.



The lock shackle is slipped through the last finger hole in the dial, thus preventing anyone from operating it.

Ax Handle Protected by Rubber When Splitting Wood



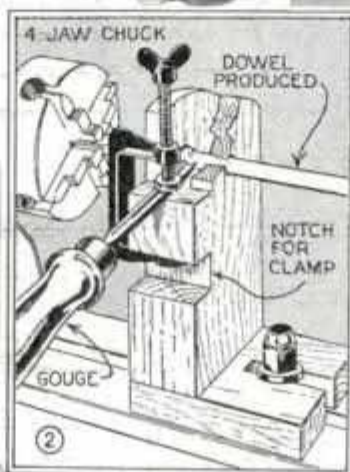
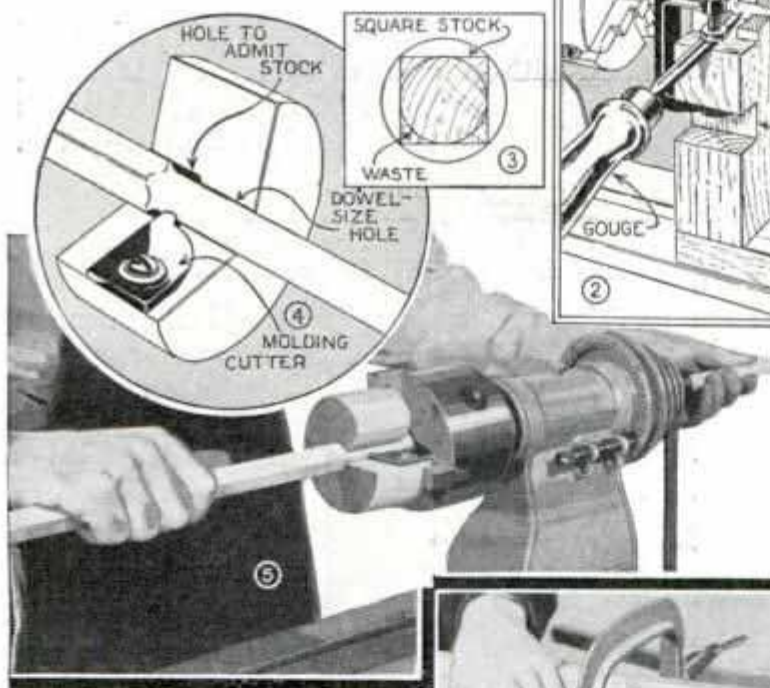
Screwed to an ax handle as shown, a piece of rubber cut from an old auto casing will protect the handle against excessive wear when splitting wood. Also, the rubber will cushion the shock to the shoulders if the user overreaches the work.

Steam-Heating Green Concrete to Prevent Freezing

To give freshly poured concrete a wet cure during freezing weather, engineers on a Civilian Conservation Corps project used steam generated by boilers, which were improvised from old oil drums. A battery of these boilers, which held enough water for about 12 hrs. of firing, the length of time necessary to keep up steam to prevent freezing, were placed on a temporary concrete foundation over a fire pit. Steam from the boilers was carried through pipes, closely covered with tarpaulins, and passed out through a series of $\frac{1}{4}$ -in. holes drilled into the pipes at 1-ft. intervals.

DOWELS *easily made* *in Home Workshop*

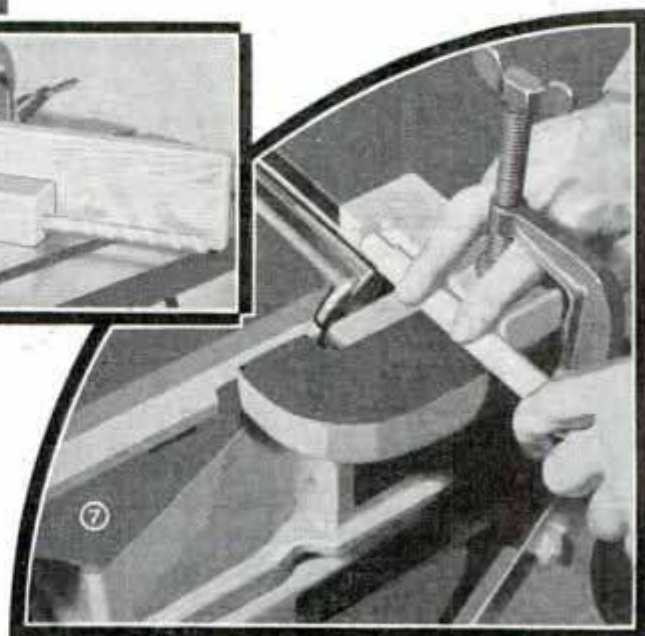
DOWELS can be made readily with simple jigs. Figs. 1 and 2 show how to make the $\frac{3}{8}$ -in. size. The stock is first ripped to $\frac{3}{8}$ in. square. A four-jaw chuck is fitted to the lathe spindle, and the jaws are set to permit a sliding fit for the wood while retaining enough grip to drive it. Feeding the square stock through the hollow headstock spindle with a pusher block, as in Fig. 1, produces the dowel stock as the wood goes through the jig. The hole on one side is $\frac{9}{16}$ in. in diameter to take the square stock, while the hole on



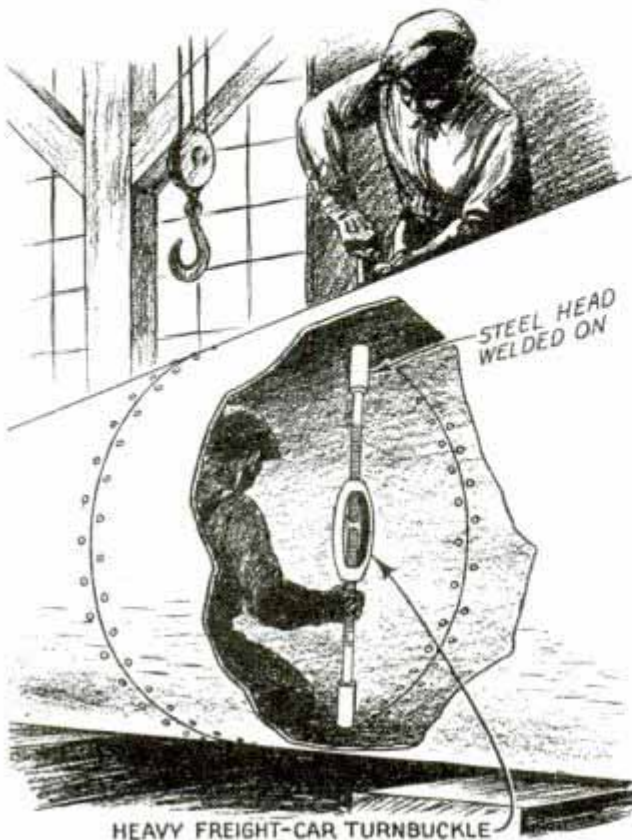
take a light cut. Another useful kink is shown in Fig. 7. This pictures a perfect method of cutting shoulders on stock dowel rod. A jig is made up to clamp to the jointer table, and the jointer is set to the right depth. Feeding the dowel stock to the shoulder of the jig and then slowly turning it against the rotating knives produces a uniform smooth shoulder.

the opposite side is the dowel size. See Fig. 3.

A reversal of this method is shown in Figs. 4 and 5, which can be used for dowels up to about $\frac{5}{8}$ in. in diameter. Spiral dowels can be made on the circular saw as shown in Fig. 6. The jig is a wood block through which is drilled a hole the same size as the dowel stock. The block is clamped to the miter gauge, the gauge being set at an angle across the table and clamped to the table. The saw is set to



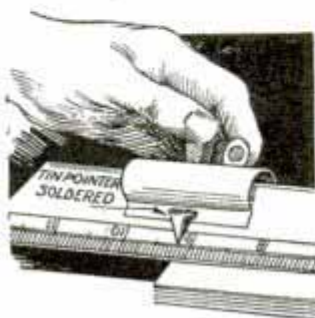
Adjustable Dolly Saves Labor for Riveter's Helper



If various jobs require adjustments beyond the range of one dolly, make several of different lengths

Easy to handle and quickly adjusted, this dolly is used in a boiler shop to save time and labor for the riveter's helper. It is a large turnbuckle, such as used on truss rods of bridges and freight cars, having steel heads welded to the ends to accommodate the rivets. This tool has the advantage over the usual dolly in that it can be adjusted to rest the lower end against a solid object as shown, thus enabling the riveter to do a better job than is generally possible with the regular dolly, which must be held against the rivet.

Ruler Has Movable Pointer to Mark Measurements



Instead of marking certain measurements on a ruler with a lead pencil until they can be copied, thus marring the edge of the ruler, solder a small tin pointer

to a paper clip of the type shown. This can be slipped over the ruler to mark any measurement without marring the surface for future use.—Philip J. Suttlemyre, Hickory, N. C.

Brush Has Rubber-Band Bristles for Use in Photo Developer

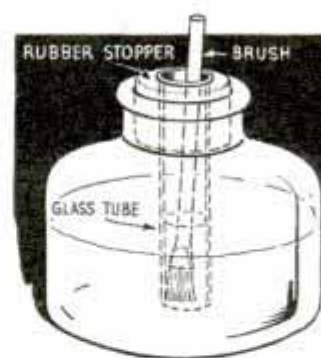
Instead of swishing your fingers back and forth across a photo print, submerged in a developing tray, to wet it and remove air bubbles, use this brush and avoid stained fingers, which often damage undeveloped prints when handling them. The brush is a hardwood stick with a bunch of rubber bands bound to it as shown, the lower ends of the bands being cut off to make the bristles.—K. F. Keith, St. Petersburg, Fla.



The brush is a hardwood stick with a bunch of rubber bands bound to it as shown, the lower ends of the bands being cut off to make the bristles.—K. F. Keith, St. Petersburg, Fla.

Non-Spilling Bottle Saves Acid

You can avoid spilling soldering flux or other acid, used around a workbench, by altering the rubber stopper as shown.



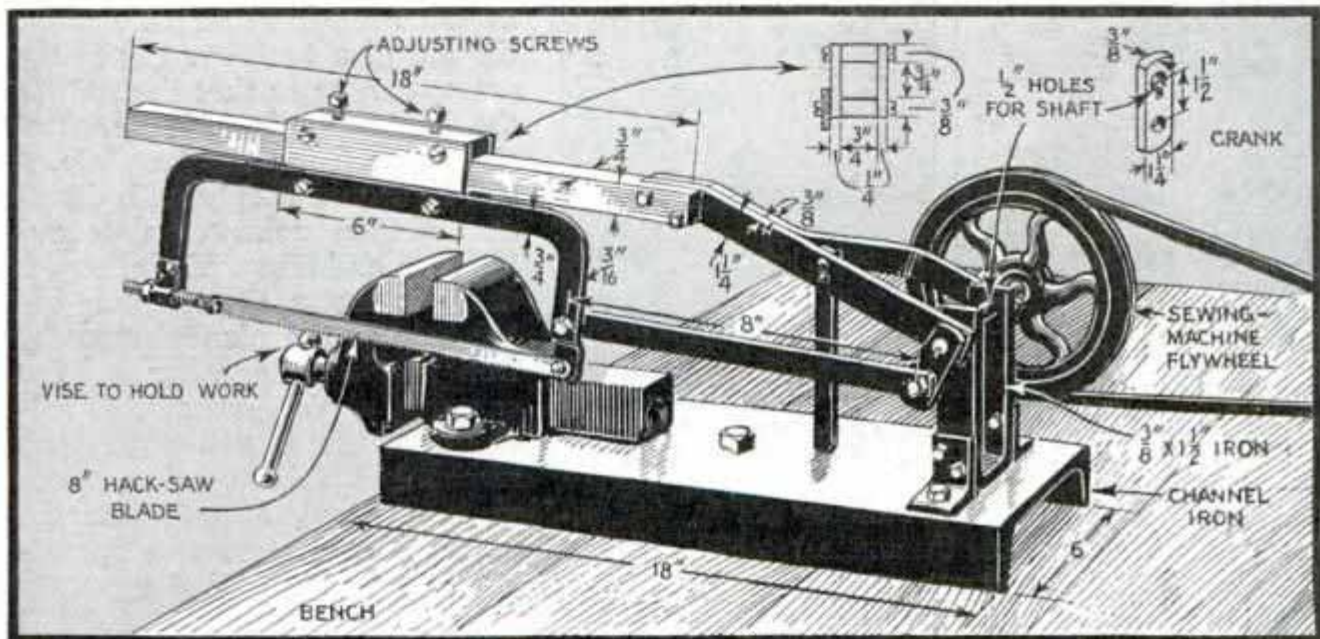
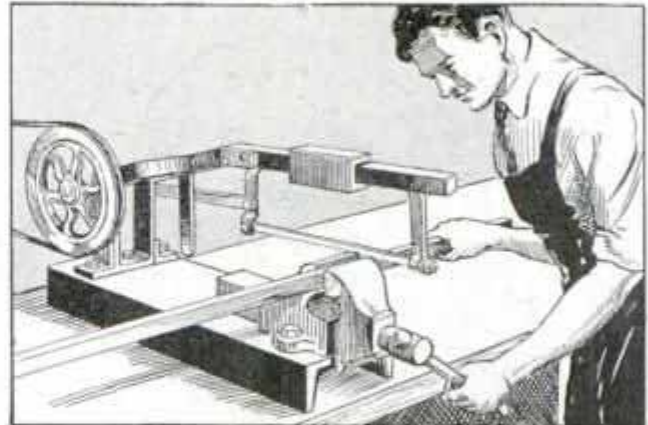
Drill a hole in the center of the stopper to take a glass tube, which should be long enough to extend within about $\frac{1}{8}$ in. of the bottom of the bottle. As the level of the acid is the same in both the bottle and tube,

the swab brush can be dipped into the tube, and only the small amount of liquid in the latter will be lost if the bottle is tipped over. A small rubber disk slipped over the brush handle will keep out dust.

□ When sign cloth is not available, signs can be painted on ordinary unsized cloth by using shellac to which the desired pigments are added.

Hand Hack Saw Is Rigged for Motor Drive

In small shops where need of a power hack saw does not warrant the expenditure of purchasing one, this homemade outfit will take care of the occasional heavy sawing job. A small vise, a piece of channel iron, an 8-in. hack-saw frame, a grooved wheel from an old sewing-machine flywheel, $\frac{1}{2}$ -in. shafting and a few pieces of flat iron make up the principal items of the material list. The slide bar is made from a piece of cold-rolled steel $\frac{3}{4}$ in. square, one end of which is bolted to a



yoke formed from two pieces of $\frac{3}{8}$ by $1\frac{1}{4}$ -in. flat iron. The angle of the yoke, with the slide bar, depends on the size of the hack-saw frame. A U-shaped piece of $\frac{3}{8}$ by $1\frac{1}{2}$ -in. flat iron supports the drive shaft, to which are keyed the grooved flywheel and the crank. The slide, to which the saw frame is bolted, should be fitted carefully to the bar and provided with adjusting screws to take up any play.

Tinting Aluminum Paint

When aluminum paint is too light for some uses, it may be tinted by the addition of pigment ground in oil. This gives a finish of a soft color with a metallic sheen. Add the pigment to the paint a little at a time, using just enough to give the desired color. Keep the mixture stirred, and brush it out well to avoid spots of aluminum on the surface.

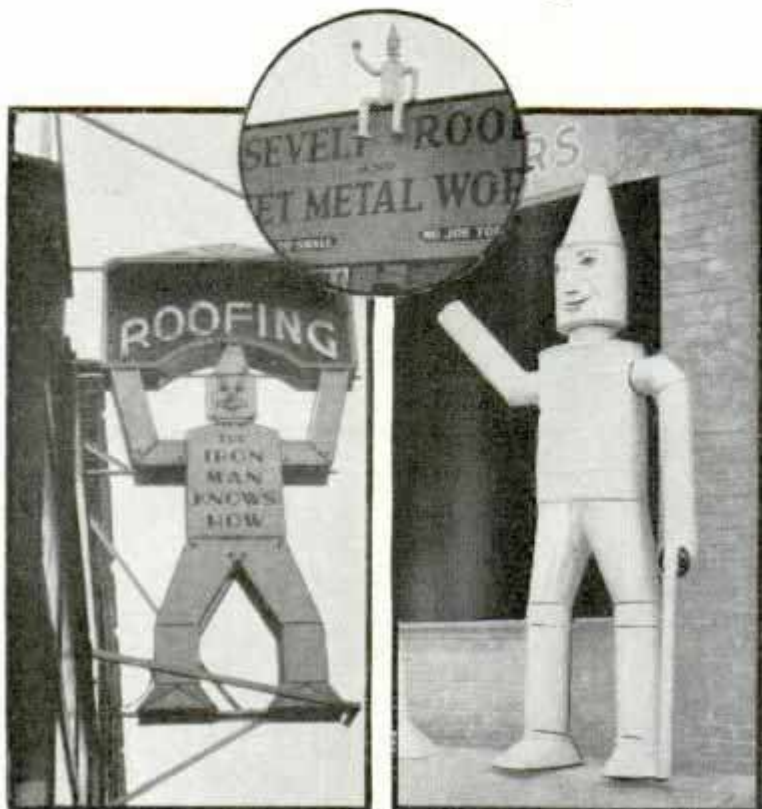
Lamps Removed from Ceiling with Paper Cone



An emergency tool to remove electric lamps from high ceilings is made by rolling newspapers into a long, slender cone, the large end of which will fit snugly over the lamp. Then, by slightly moistening the inside surface of the paper, the lamp will not slip inside, and it can be screwed out of the socket easily.

☐ Rubber sponges are useful for removing excess water from photographic films.

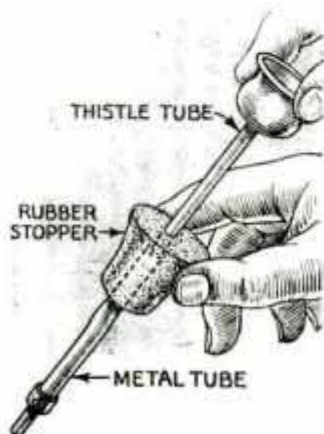
Sheet-Metal Shop Is Advertised with Robot-Like Figures



Located at strategic points about the premises of a sheet-metal shop, these figures catch the eye of anyone passing by

Suspended above a sidewalk or set in other prominent places, these sheet-metal figures not only attract attention, but they are so appropriate to the business they represent that the location of the shop is thoroughly impressed on the minds of shoppers. The figures are assembled from sheet-metal parts peculiar to the business, such as tin, stovepipe, hot-air furnace ducts, etc., and are mounted carefully so that wind will not loosen them.

Metal Tube in Rubber Stopper to Remove Thermometer

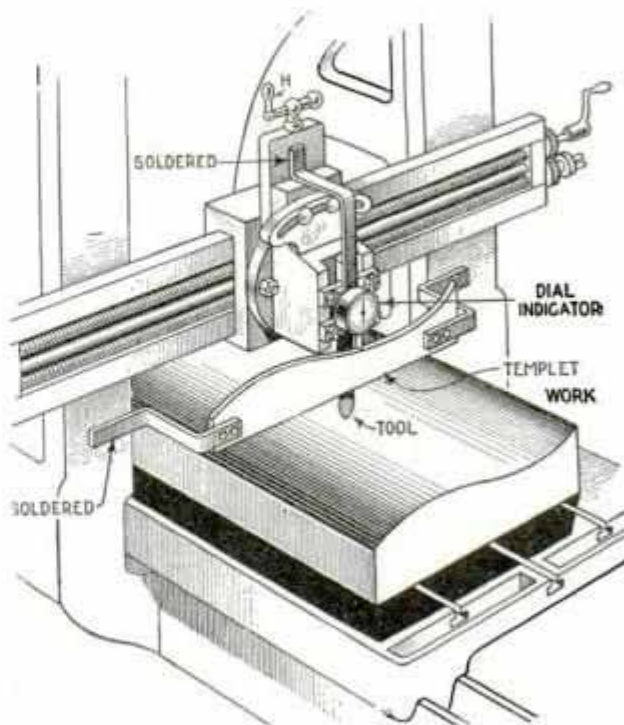


In my work as an instructor of chemistry, I often had difficulty in removing a thermometer or thistle tube from rubber stoppers without breakage. To eliminate this trouble, a metal tube was pushed

into the bottom of the stopper to take the thermometer or thistle tube as shown. The metal tube, which must be of a size to take the thermometer with a snug, sliding fit, can be sharpened on one end as an aid in pushing it into the cork.—Earl H. Baugh, Port Townsend, Wash.

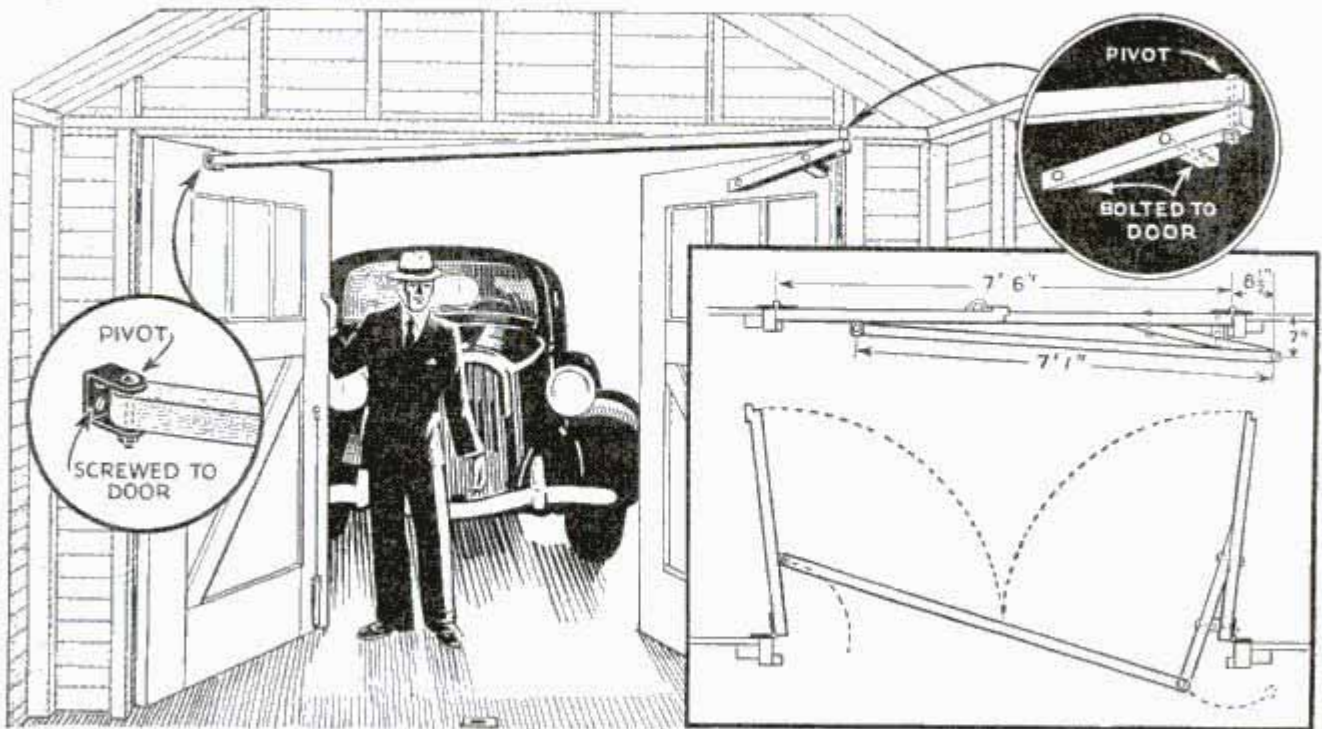
Irregular Work Machined on a Planer

Much irregular work that is usually finished by hand can be machine-finished in a planer with the aid of a template cut to the same contour as that desired for the finished work. If $\frac{1}{32}$ -in. sheet zinc is used for the template, it can be scored deeply with dividers and then broken off, thus saving time and filing. The set-up is made as shown, the template being held to the planer frame by iron brackets. Another bracket carrying a dial indicator is soldered to the depth-adjusting mechanism. In use, a fine, power cross-feed is engaged, after which the indicator hand is kept at zero by operating the handle H as the indicator pointer follows the contour of the template.



By keeping indicator hand at zero with depth adjustment, work is machined to contour of template

Double Garage Doors Work as Single Unit



Opening or closing one of these double garage doors, which are connected together in tandem, will cause the other one to move correspondingly at the same time. The arrangement consists of a stationary arm bolted to the top rail of one door, and a cross member pivoted to the arm and to a pivot screwed to the other door. It may

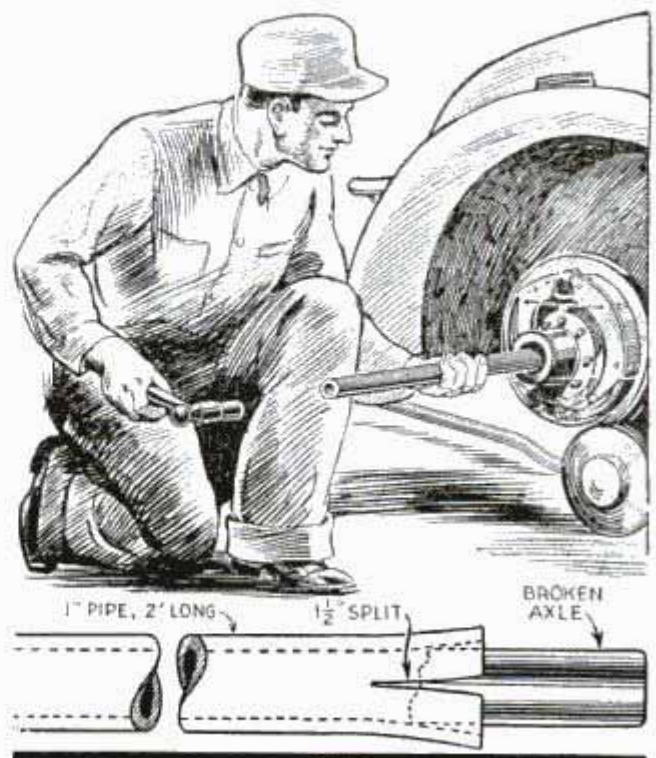
be necessary to bevel one end of the stationary arm so that it can be bolted at an angle in order to clear the casing when the doors are closed, the exact angle depending on your particular casing. Large washers at the joint of the arm and cross member minimize friction.—A. G. Morton, Toronto, Ont., Can.

Broken Axle Removed in a Jiffy with this Pipe Extractor

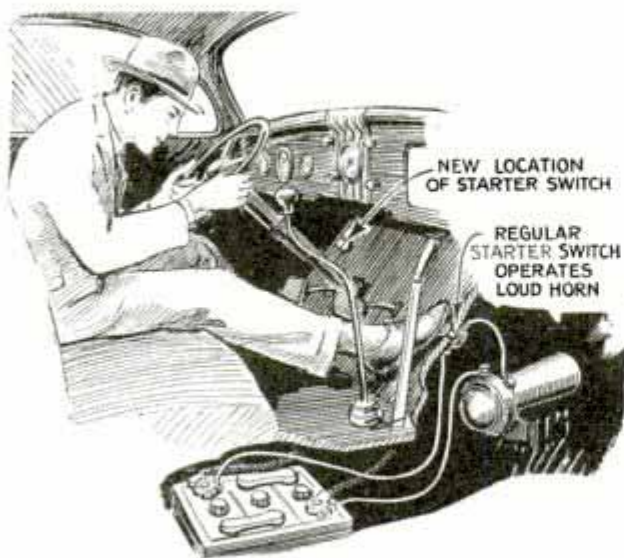
To extract a broken axle from an auto easily, take a 2-ft. length of pipe having an inside diameter slightly smaller than the diameter of the axle, and slit one end back about $1\frac{1}{2}$ in. with a hack saw. Then drive a tapered pin into this end to spread it slightly. When the pipe is started over the end of the axle, a few light blows with a hammer will wedge it so that the axle can be pulled out. It is a good idea for the garage man to have several extractors.

Checking Antifreeze Solution

When the level of the antifreeze solution in your radiator is too low to be reached with a hydrometer for checking, try making the test while the motor is running at a fair speed. Often, action of the circulating pump will raise the solution so that it can be reached.



Dual Starter Switches Foil Thief Trying to Start Car



Starting motor is wired to auxiliary switch and loud horn is wired to regular starter switch

I have an alarm on my car by which anyone pressing the starter switch sounds a loud horn. The secret lies in wiring the starting motor to an auxiliary switch placed well up on the floor boards where it is unnoticeable. A loud horn is wired to the regular switch, which would naturally be used by anyone unfamiliar with the arrangement.—Joe E. Early, Mayetta, Kan.

"Make-Up" Mirror on Sun Visor Is Always at Hand

If your car has two visors, the one on the right side may serve the additional purpose of holding a small "make-up" mirror. Cemented to the rear side, the mirror takes no extra space, is out of sight when the visor is folded against the top, but is still convenient for its purpose at

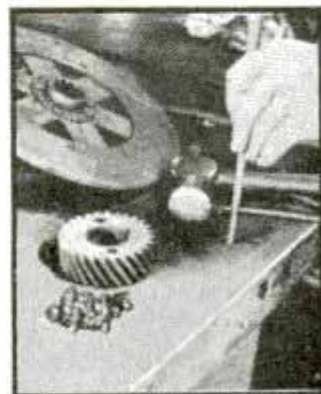


Adjusting visor as in shielding the eyes brings mirror at a convenient height for use

any time. The provision of such a mirror will avoid the trouble of constantly readjusting the rear-view mirror, otherwise used, which is rather annoying to the driver.—Ernest Dean, Erie, Pa.

Rivets Punched Out on Gear to Keep Bench Tidy

See the pile of rivets near the gear? They were punched out of a worn clutch facing while it was held over an old gear so that they would not be scattered over the workbench. I always use this method to collect the rivets when removing clutch facings, brake linings, etc. It saves time in cleaning up and helps to keep the workbench tidy.—Billie Burgan, San Diego, Calif.



Position of Front Wheels Shown by Marks on Steering Wheel



As an aid in steering a car away from a curb after it has been parked, one motorist wrapped pieces of adhesive tape around the steering wheel at the top and bottom. Before applying the tape, set the front wheels in a straight-ahead position. Then, when you get into your car, a glance at the tape shows which way the wheels are turned.

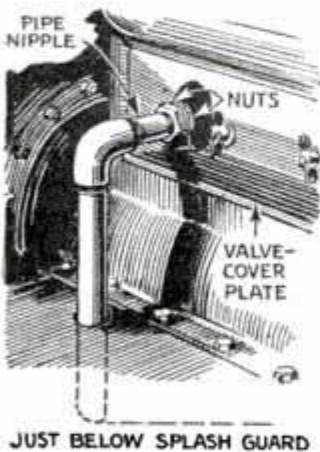
Ammeter Indicates Condition of Storage Battery

Sudden changes in the charging rate of an auto generator, as indicated by the dash ammeter, may mean shorted cells in the storage battery rather than actual generator trouble. If these changes are

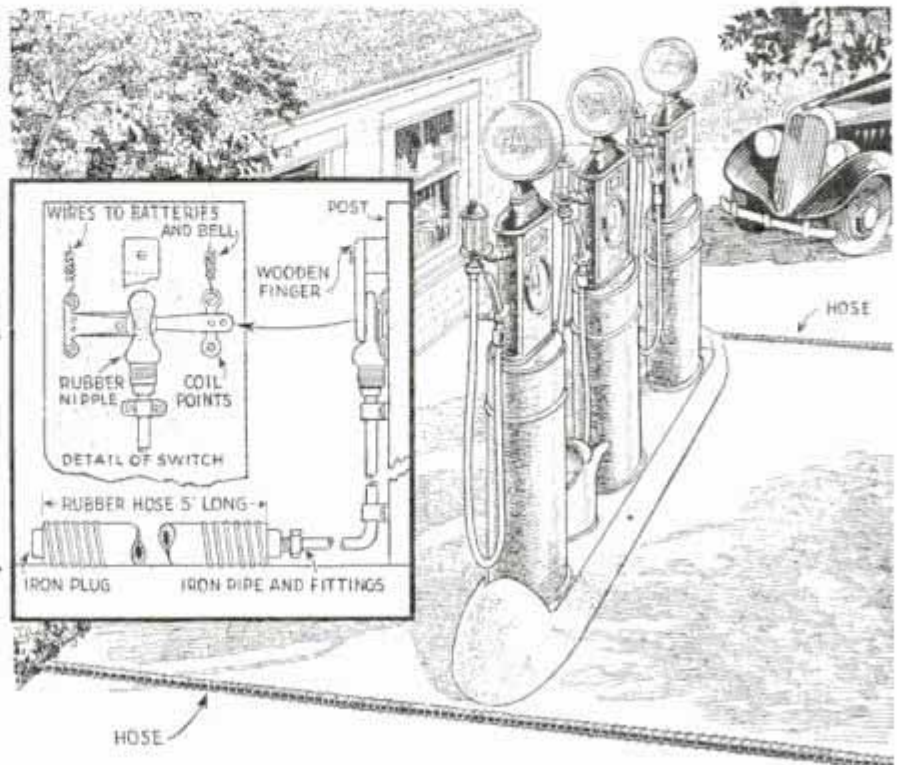
accompanied by failure of the starter to show its usual power, then the battery should be examined. The changes in the charging rate may be either upward or downward, depending on the type of generator used on the car. If the generator is of the compound-wound type, the charging rate will increase when the battery is in a discharged condition, or when a cell is shorted. But if the generator is of the simple third-brush control type, then the charging rate will drop appreciably when a cell becomes shorted, thus leading one to suspect the condition of the generator rather than the battery. An accurate double check may be made of the battery by testing each individual cell with a voltmeter, a shorted cell indicating a lower voltage than the others.

Crankcase Kept Free of Gases with Homemade Ventilator

If your car does not have a crankcase ventilator, and the motor has the valve plate on the side, except the valve-in-head type, the job of installing one is quite simple. Just cut a hole in the valve-cover plate near the rear end and install a pipe assembly as shown. Have the vertical pipe long enough to extend below the motor splash guards. When the car is in motion, the gases and vapors pass out of this pipe as the fan and the movement of the car force air into the crankcase through the breather pipe.



Car Announces Its Arrival at Gasoline Filling Station



Two vibrator points from a model-T Ford coil serve nicely for the switch as they are easily operated by expansion of the rubber nipple

At filling stations, garages and other service shops where the attendant, due to work in some other part of the building, does not notice the arrival of a customer, this "mechanical watchman" will ring a bell or sound a horn when a car pulls in. Two lengths of small garden hose are plugged at the ends and filled with radiator alcohol. These are placed in front of the station directly across the path of incoming cars. When the car wheels pass over the hose, they are compressed, forcing the liquid into a rubber nipple, which then expands and closes a switch in the bell or horn circuit as shown in the detail. The nipple is connected to the ends of the hose with small pipe and fittings or copper tubing. Both hose may be connected to one switch, although the arrangement will be more sensitive if a separate switch is used on each hose. In the latter case, both switches are wired to the bell.

☛ If you want your auto dash light to throw a colored light, wrap the bulb with colored Cellophane, binding it in place with a strip of adhesive tape.

Extra Arm Chalk-Marks Tire in Check-Up on Parking



Chalk on handle permits officer to mark tires for overtime parking without getting off motorcycle

In a western city where police officers check up on overtime parking by leaving

a white chalk mark on the tires every 45 min., this motorcycle patrol of two men makes use of an extension handle, which permits marking the tires while merely pausing. The handle is shown in the detail, and consists of a short metal holder pivoted to the end of a hardwood stick. A short coil spring attached at an angle between the chalk holder and stick makes the device flexible to prevent it from being broken easily.

Ice on Windshield Removed by Heat from Your Hand

When ice forms on your windshield and stops the wiper, try holding the palm of your hand against the glass on the inside. Heat from the hand is often sufficient to loosen the ice so that the wiper will resume operation. It will be necessary to do this at frequent intervals, but at that it is better than stopping the car frequently and getting out in the storm to scrape it off with a knife.

The Next Issue

"ARROWHEAD"—A TRIM, FAST AND ABLE SLOOP

Are you looking for a 21-ft. sailboat that will handle well in either a light or stiff breeze—one that has been thoroughly tested and will accommodate up to ten persons? If so, this sloop may just suit your purpose. The job can be tackled by the average craftsman and does not involve any serious difficulties in construction because the entire hull is built over a form.

HOW TO DESIGN THERMOSTATS FOR ALL PURPOSES

For furnace controls, fire alarms, sign flashers, etc. Tells how to figure size and shape of thermostatic metal, amount of resistance wire, etc.

CAPE-COD CUPBOARD OF COLONIAL DAYS

Just the thing to finish a breakfast room in colonial design. This sturdy cupboard has ample drawer space to store linen and silverware.

SANDER HAS FLEXIBLE BELT

Especially suitable for the home craftsman and small shop owner. The belt runs freely and is pressed down with a block to contact the work.

MODERN COFFEE TABLE

Another pleasing piece of metal furniture, flat aluminum legs contrasting with a black top of Bakelite. A removable tray doubles its usefulness.



TAKE TO THE OPEN ROAD

WHEN springtime comes, be ready to take to the open road with a 1936 Harley-Davidson. Make every leisure hour a joy to be long remembered.

The new '36 models are something to get steamed up about. *Motor improvements* bring performance almost unbelievable. *Balance* that makes riding effortless. *New streamlining*, airplane-like in grace. *Color combinations* that fairly sparkle. The snappiest streamlined sidecar you ever saw. . . . All available in the 45's, 74's and a new 80 cubic inch Twin. Don't wait. See your nearest Harley-Davidson dealer Now! Ask him for a Free Ride—let him explain his Easy Pay Plans—and send in the coupon.

MAIL THIS COUPON

Ride a

HARLEY-DAVIDSON

HARLEY-DAVIDSON MOTOR CO.
 Dept. P, Milwaukee, Wis.
 Send colorful folder illustrating and describing the 1936 models. Postage stamp is enclosed to cover cost of mailing.

Name _____
 Address _____
 My age is 16-19 years, 20-30 years,
 31 years and up, under 16 years.
 Check your age group.

Movie Tricks That You Can Do

(Continued from page 391)

or a parade of toy circus animals and performers. It is slow, tedious work. The secret of smooth animation, Toland says, is showing a very slight advance in action each time the camera is started. Most beginners hurry too much, with the result that animation is too fast and jerky when the scene is projected. As many as thirty poses may be filmed to show an animal taking one step. Toys should have joints stiff enough to remain in place when posed.

In Hollywood, storms and shipwrecks are often filmed in miniature. You can shoot quite convincing toy wrecks by remembering two simple rules. First, the camera must be placed low, at eye level with the miniature. A toy train looks just like a toy train when filmed from above, but if the camera is placed at the track level it becomes quite realistic. Try posting the camera at a curve to show the train rushing toward you and then curving off just as it fills the screen. Remember that model airplanes or trains look exactly like what they are—toys—if you destroy the illusion with full-sized objects in the background. The second rule to bear in mind is that full-sized objects like ships move slowly while toys move rapidly. An ocean liner rides out a storm with slow, smooth action; a toy ship in a tank bobs like a cork. To make the toy ship pitch realistically on the screen, film the action at three or four times normal speed. Then, projected at regular speed, it becomes slow motion and the toy simulates the action of the full-sized object.

"Try building a miniature hangar," Toland suggests, "and photograph a model airplane making a landing. With the plane suspended and guided by threads and its propellers spinning, you will have a realistic picture. To produce a crash, let the plane glide steeply down a thread into the ground in front of the camera. First break the wings and glue them lightly back in place so that the slightest touch will break them off. As soon as the crash occurs stop the camera, touch a match to the model and then begin filming again to show the airplane burning. You can make a wet-weather landing with a sprinkler, or fake a night landing by using a heavy filter over the lens."

One Hollywood man with an amateur camera filmed a deep-sea drama right on his kitchen table and it proved spectacular. First he made several scenes of tiny fish by shooting through the side of a glass aquarium. He made a lively looking "octopus" by carving the body from ballasted cork and drilling holes through which he inserted live angleworms. When dropped in the aquarium the angleworms twisted and writhed like the tentacles of a real octopus. The cameraman projected these pictures on a ground-glass screen on his table. In front of the screen he modeled a sandy sea floor, with rocks, kelp and seaweed, and a puppet doll dressed as a deep-sea diver, operated with threads like a marionette. Then, shooting pictures of his miniature diver against the background screen showing the swimming octopus and fish in slow motion, he had an "impossible" picture that appeared real.

For a back-yard stunt, shoot a movie of a boy precariously walking a high tight-rope. He really walks on a board camouflaged by the rope tacked along one side, but place the camera so that the rope fully conceals the plank and the picture is thrillingly deceptive. Or try turning a cat into a monster for a nightmare sequence. Suspend a clear pane of glass near the lens and film the cat through the glass in the normal manner. Then let a little warm castor oil flow down the glass and the picture will become distorted. If you live near the sea you can make the ocean write titles for your film. Build a dyke to hold the waves back from a small part of the beach, print your title in the sand and film it with the camera upside down. After running off a few feet, have someone break the dyke and allow a wave to wash out the letters. As this scene runs in reverse at the beginning of your picture, you will first see a clean stretch of sand, then a wave flows over it and recedes, leaving the title magically printed in the sand. Or arrange paper letters on a smooth surface, film the title upside down, then have someone blow the letters away. Projected in reverse, the letters appear to fly into their places. A little knowledge of Hollywood tricks can turn an ordinary film into a movie both artistic and spectacular.

268 Cash Awards for PICTURES AT NIGHT



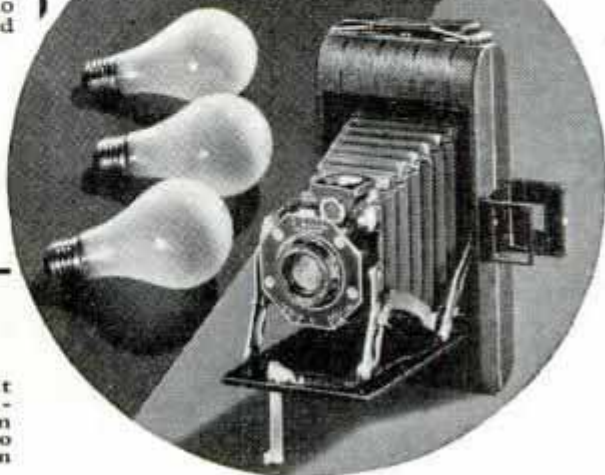
G...take your camera tonight and make some pictures at home. It's easy with Mazda Photo-flood or Photoflash lamps and Kodak "SS" or Kodak Verichrome Film . . . and you may win a valuable cash award.

You don't have to be an expert to win . . . it's the human interest of your pictures that counts. There's no expensive equipment to buy . . . any camera that can be set for "time" will do.

IDEAL COMBINATION FOR PICTURES AT NIGHT

KODAK "SS" FILM . . . ultra-sensitive to rays of artificial light, ideal for night pictures with any camera. **MAZDA PHOTO-FLOOD LAMPS** . . . give brilliant light, last for many pictures, cost but 25¢. **SIX-20 KODAK JUNIOR (f.6.3)** makes snapshots indoors, at night, when used with Kodak "SS" Film and two or three Mazda Photoflood lamps. For 2¼ x 3¼-inch pictures—\$13.50.

Accept nothing but the film in the familiar yellow box.



\$2500 for Night Pictures

89 CASH AWARDS every month during January, February, March, 1936

- 2 awards of \$100 each
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RULES

1 Any number of pictures made on or after January 1, 1936, may be entered. Entries must be post-marked not later than midnight of February 15, March 15, and April 15—the three closing dates. Contests are open to any ama-

teur in the United States and Canada (except employees of Eastman Kodak Company and those engaged in the manufacture or sale of photo supplies).

- 2** Prizes will be awarded *only* for pictures made at night, either indoors or outdoors, by artificial light. Winners will be chosen solely on subject interest and appeal, not on technical excellence. The decision of the judges shall be final.
- 3** Each prize-winning picture with negative and sole rights for advertising, publication, and exhibition in any manner, shall become the property of the Eastman Kodak Company. If winning picture is of a person or persons, their (or, if under 21, the parent's) written consent to use the picture must be furnished before prize can be awarded.
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Four Bridges in One

(Continued from page 382)

over tidal waterways were sufficient to scare off many. It does look complicated on blueprints, but actually it is nothing more than a combination of sound engineering practice and common-sense construction. All the best theories for speeding, sorting and safeguarding traffic are incorporated in it.

Automobiles will run about in what appears to be the most bewildering fashion, but actually all the maneuvers have been planned by traffic experts. In all the nineteen miles of the bridges and their approaches, there are no obstructions, grade crossings, or stoplights. During the first year the bridge is expected to carry about 10,000,000 vehicles. Its capacity, however, is more than 30,000,000 vehicles per year.

To bring such heavily traveled highways together required painstaking planning. A prominent railroad engineer was consulted and told to design a traffic junction that would be as safe as any railroad junction. He invented what is now called the "flying junction," a traffic machine that can sort automobiles as efficiently as an electric eye sorts white beans from brown.

A motorist from New England or the middle west who wants to reach Long Island does not have to consult maps or try to find a short cut. He merely follows a clear-cut sign along the roadside and is carried over, under and around several dozen streets, tracks, highways and rivers as if he had the sole right of way.

The \$2,000,000 "flying junction" on Randall's Island is a triple-deck traffic sorter that brings together twelve lanes of fast-moving traffic without a stoplight. For traffic officials, the chief interest in the bridge lies in this invention. It has been tried on a miniature scale and engineers are satisfied it will work. Without it, the speed of traffic would be reduced considerably. One traffic stream from the junction will lead directly to the level of Randall's Island, now being transformed into a modern recreation park of 120 acres. One attraction in this park will be a \$1,000,000 Olympic sport stadium, seating 45,000 spectators.

The main unit in the Triboro group is a suspension bridge, 2,723 feet long, across the East river. The main span is 1,380 feet

long and the steel towers rise 355 feet above the water which flows 135 feet below the eight-lane swinging roadway. From the ground, the suspension cables appear to be no larger than a strand of rope. Actually they are almost two feet in diameter. There are 248 wire strands in each cable and thirty-seven cables on each side of the bridge; hence each side is held by 9,176 strands of wire. Each cable contains enough wire to reach half way around the globe. An odd spinning-wheel device was used to lay the wires for the suspension cables.

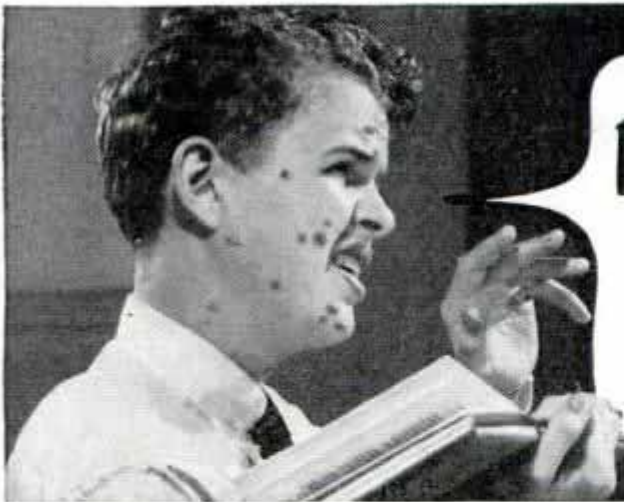
The anchorages on each side of the East river suspension bridge are huge blocks of concrete resembling pyramids. On the Long Island end, the anchorage contains 75,000 cubic yards of concrete and 1,600 tons of steel, costing \$884,000. Nineteen huge foundations were sunk into the soft ground of Ward's Island to support the arched concrete causeway which carries traffic on and off the main bridge.

The Harlem river crossing is a vertical lift bridge, with the largest lift span ever constructed, in terms of deck space used by traffic. The deck area covers 20,000 square feet, made of steel plate reinforced with an asphalt plank pavement. The twin towers of steel support a span 310 feet long. The span is raised by motors and concrete counterweights to allow the passage of ships. Four 200-horsepower motors are required to hoist the six-track roadway eighty feet higher than its regular position, fifty feet above high tide.

One of the engineering feats was the elevation of a railroad viaduct to allow the construction of an underpass. Heavy as it was, this involved careful manipulation, since it was necessary to equalize the stress and strain on all the steel members.

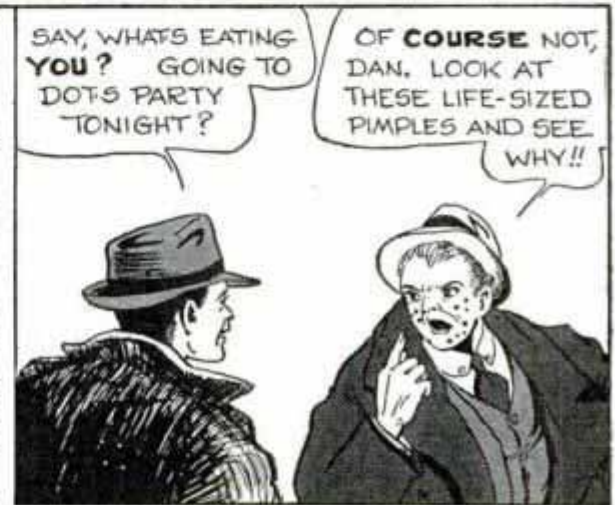
The bridge will carry much traffic which now chokes the approaches to other bridges across the East river, and will also provide a valuable connecting link between greater New York and the New England states.

☐ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.



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I've just seen 25th Century Magic

by **Graham McNamee**
Ace Radio and Sports Commentator

I HAVE SEEN amazing feats of skill in my years as a radio reporter and sports announcer—but I've just witnessed the most remarkable demonstration of skill and accuracy ever.

The other day I made an inspection trip through the Gillette factory in Boston where Gillette blades are produced. Here is a house of magic if there ever was one! The equipment there is as amazing as the mechanical wonders you'd expect to see 500 years and more from now.

These Gillette machines are so finely adjusted that they turn out shaving edges which are *invisible*—edges measuring about 1/80,000 of an inch in thickness! It takes sheer magic to measure edges as fine as these. And that's why they use an exclusive "magical" device called the "photo-electric eye" in which a beam of light gauges sharpness with amazing accuracy.

But there are more wonders—more 25th Century Magic. Can you imagine a hardening furnace room as cool and immaculate as an office . . . four-ton blade sharpeners adjustable to 1/10,000 of an inch . . . microscopes that magnify an object 3,000 times . . . hardness testers that use diamonds, real square cut diamonds . . . an X-ray-like machine that "sees" through steel . . . abrasives as fine as cake flour!

With all this amazing scientific equipment . . . this super-human accuracy, I don't see how Gillette blades could possibly be equalled for shaving comfort. In fact, if all men could see what I've just seen, I feel sure they'd always say "Gillette" when they ask for razor blades.



With facts like these before you, why let anyone deprive you of shaving comfort by selling you a substitute! Ask for Gillette Blades and be sure to get them.

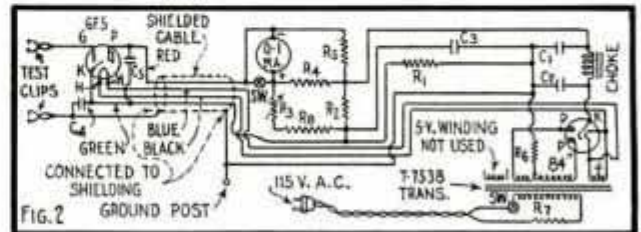
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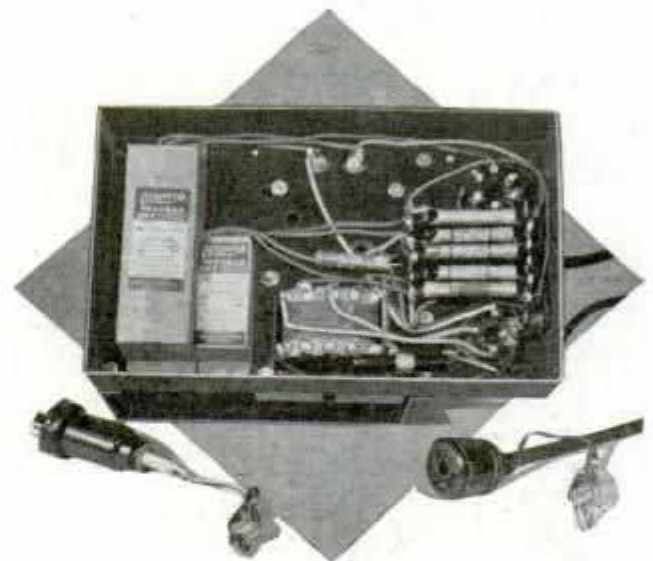
(Continued from page 421)

connections, and the schematic diagram is given in Fig. 3.

An 84 heater-type rectifier tube is used so that the rectifier will not warm up before the 6F5 tube starts drawing current; this prevents high voltage being placed on circuits prematurely, which might cause damage. Since the calibration remains practically constant from low audio to high radio frequencies, the instrument can



be calibrated by using a step-down transformer with an a.c. voltmeter across the secondary as a source of input voltage to the device. The range is about 2.3 volts; however, by using a multiplier, the range can be increased and the meter then calibrated on each step of the multiplier. A complete list of the original parts used and further information is available upon application without charge, if desired. When using the instrument, short the meter with the switch before turning on the line switch, let it heat up, then short the test



Underside view of completed unit

clips together before opening the meter switch. Now use the adjusting knob to set the meter to zero. Short the meter each time the test clips are moved and before removing the clips from the circuit.

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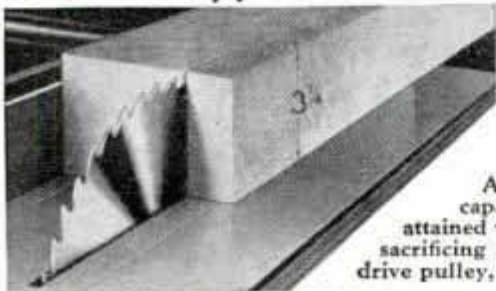
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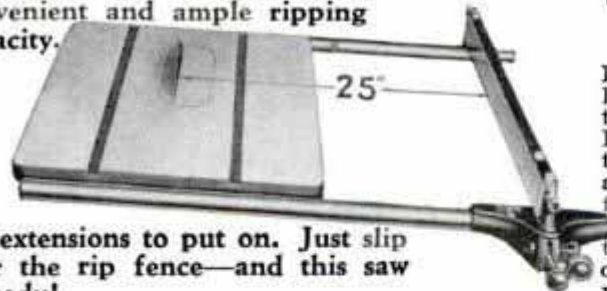
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Secrets of the Trapper

(Continued from page 349)

8/14/17

The artificial enclosure set will fool minks, raccoons and other fur bearers. Build an enclosure out of stakes or rocks rectangular in shape and open only at one end. If built of rocks, pile them as you would to make a fireplace for outdoor cooking. The width may be fifteen inches or more, just enough for a fur bearer to get in, yet narrow enough to force it to walk over a trap in the middle. Place your trap back from the entrance and cover lightly. Place bait with plenty of odor back of the trap. In snowy weather cover the top of the enclosure with boughs.

Traps set in the woods, along fences, in holes in trees, or in small gullies, will fool the stupid opossum, and there need be no special care in making the sets. However, it is best to make a careful set because your trap may pick up a raccoon or even a fox, and you'll find that often your raccoon and mink sets will catch opossums. For bait use pieces of fish or tainted meat.

The fox is sly and cunning but the pelt brings good money. For a water set for the fox, select a brook, a spring hole or a creek that is open. About a foot and a half from shore place a chunk of sod, a flat stone, or a piece of water-soaked wood a couple of inches above the water. The trap goes between this decoy or bait spot and the bank. Put the trap, chain and drag under water and cover with gravel or mud. The pan of the trap must be under water. Lay moss, sod or wet leaves on the pan so this covering stands about an inch above water. Now tie a big stone on the chain or attach a wood drag to it and put some scent on the bait spot.

In making sets for foxes in settled country, keep in mind the danger of placing traps where they may catch domestic animals. Pick locations well back in the woods, on hillsides or ledges, or on unused cow trails or woods roads. Foxes like to travel on these old "routes" so blind sets on the trails or roads often work. If there is snow on the ground, walk back and forth on the route to break a trail. Then set your traps in this newly blazed "avenue" which the fox will follow.

Keep your gloves on and don't walk around much until the trap is in location. Cover the pan with a small piece of paper,

then a light covering of snow. Be sure the chain and stake are covered to avoid leaving any signs you have stopped there. Several traps in a trail like this fool old Reynard. In rocky ledges, on hillsides or the side of ravines find a hole, under rocks or a stump, or dig one about six inches in diameter and a foot deep to give the fox the impression some animal was digging there. Place some scent or bait at the back of the hole and put the trap about a foot in front of the hole. Cover carefully and make the spot look as natural as possible. For scent, fish oil will do.

After catching your fur bearers, the next step is to skin them and put the pelts on stretchers. The mink, muskrat, weasel, opossum and skunk are cased. The raccoon and other large animals are skinned open. To make a cased skin, cut the skin around the vent, carefully remove the skin from the hind legs and take out the tail by placing it between the two parts of a green, split stick. Hold the stick and bone of the tail in one hand and the body of the animal in the other. Pull hard and the skin comes off easily. Then skin out the body, drawing the pelt off easily and keeping it as free of fat and meat as possible. Draw the skin from the front legs. Cut off the ears with a sweep of the knife downward toward the head proper and use your knife to free the skin from the nose. Now you have a pelt like a long slender pocket. This is a cased skin. Put it on a stretcher after removing all excess fat and meat. Unless you remove the fat and meat, you will have an imperfect pelt.

In casing the muskrat and opossum pelts you don't need the tails because there is no fur on them, so cut the skin loose around the tails. To make an open skin, cut the carcass on the under side from the point of the lower jaw back to the vent, and down the back of the hind legs. Also cut along the inside of the front legs and out across the breast. Remove the skin as cleanly as possible and place on a stretcher to dry. The stretcher will turn out a pelt of the general natural shape of the animal. The raccoon, however, is stretched nearly square. Stretchers for cased skins can be made of wood, but the amateur trapper will find it easier to buy all-metal ones.



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6/5/2-

How to Win the Soapbox Derby

(Continued from page 416)

after having observed numerous local Soapbox races, as well as the All-American finals, that the first thing for the designer to strive for is correct wheel alinement.

No matter how easy running are the bearings, or how free from rolling resistance are the tires, if the four wheels are not so mounted that each and every one tends to run in a true course, then the racer is handicapped from the start.

If, for example, the two front wheels toe in excessively, or are splayed outward, they impose a considerable drag on the motion of the car and, besides, increase the friction in the bearings.

Similarly, if the axles are flimsy, or the wheels are flimsily supported, then the car will sag in the middle so that its weight is not directly over the tread of the tires. That is, there will be less distance between the tops of the wheels over the axle than at the bottom of the wheels where they contact the ground. This greatly increases the load on the bearings and, therefore, acts to impede the progress of the racer.

My advice to builders of Soapbox racers is that they first of all strive for rigidity in the frame, and secondly, for axle or wheel supports so sturdy that they will hold the wheels accurately in line. Only after these essentials are achieved should the builder consider extra refinements such as steering-gear mechanisms, special bearings, various tire equipment, spring suspension, and streamlining.

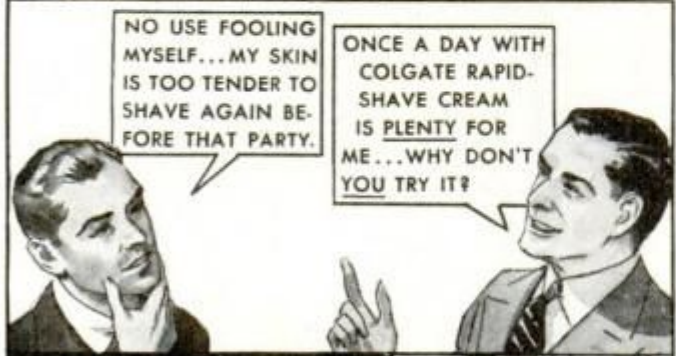
By A. J. MUSSELMAN

*Inventor of the "Doenut" Tire and
Builder of Racing Bicycle Tires*

First, I would become fully posted as to the All-American Soapbox Derby technical rules and be sure my car when finished would pass the official inspection of the technical committee.

I would do little worrying in regard to streamlining, wheel base, wheel tread, car weight, or even wheel bearings. Talking streamlining sounds good, but it does not mean a thing unless the car speed is near sixty miles per hour, and it will not be half that. Wheel bearings are important only to the degree that any good make of steel ball or roller type be used.

The brakes must be so constructed that the car is perfectly free to coast when



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BEFORE SHAVING AFTER SHAVING

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100 SHAVES

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200 SHAVES

speed is desired. The steering mechanism must be built firmly so the machine will hold a straight steady line and not wobble. An unsteady steering control will lose speed for the car.

A fifth wheel steering type, similar to a farm wagon, would be very satisfactory. Simply use sash cord with five or seven turns around a one and three-eighths inch revolving wood steering column. Have the cord pass over pulleys attached to the right and left sides of the chassis body. The two ends of the cord are tied to the fifth wheel shown herewith. The weight of the car is of very small importance.

The all-important component is the tire, in my opinion. Pneumatic tires probably will win the All-American Soapbox Derby (if their use is permitted by the official rules).

This derby is not a motor-propelling contest and the tires should be built primarily for coasting. The tread should be smooth, its width should be reasonably narrow and the carcass should be of cord construction laid at the proper angle to get coasting efficiency.

Of course, the tires, whether pneumatic or solid rubber, will have to be a commercial make because any special tire hand built by professional racing tire builders would make the total cost of the car much larger than the average boy or his father can afford.

Other engineers will tell next month how they think the Soapbox Derby car should be built.

Stone Age Tools in Wyoming Match Those in Europe

Crude stone axes and scrapers recently found by archaeologists in southwestern Wyoming bear a striking resemblance to stone age tools found in Europe and estimated to be a half million years old. The discovery of these prehistoric stone workshops in the west has revived a theory that the new world may have been inhabited by man in his early climb toward civilization. Prof. E. B. Renaud of the University of Denver said the Wyoming tools, found chiefly in the valley of Black Fork, match European relics dating from 500,000 years ago to the age of the Neanderthal man, 50,000 years ago.



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How Safe Is a Skyscraper?

(Continued from page 378)

"Since a great earthquake is supposed to have a vibration period of one or one and a half seconds, it is advisable to make a skyscraper frame nearly rigid, so its vibration period will be as small as possible, thus preventing a synchronism with the larger vibration period of the earthquake."

In Japan engineers determine the vibration period of a building by attaching a cable to a top corner and exerting a pull. When the cable is suddenly released, the building experiences a tremor. In this wise, the vibration of concrete buildings was found to be from .50 to .65 of a second, as against one to one and one-half seconds for an earthquake of considerable violence. Mr. Freeman stated that the best construction for a skyscraper is monolithic reenforced concrete deposited around a well-designed steel skeleton.

"The extra cost of quakeproof structures," declared Mr. Freeman, "involves competent engineering advice, good mortar sand, proper mixture of lime and cement, strong girders for floors and roofs, ties of steel rods for resisting the arch thrust and the use of reenforced concrete."

In all, about twenty-five earthquakes, big and little, take place every day. In a year there are about fifty of a destructive nature, but most of them occur beneath the sea. Every time an earthquake of a size worth noticing occurs, about twenty separate reports, from as many seismological stations scattered throughout the United States, speed into Washington in telegraphic code messages. From such reports, the location and intensity of the shock are calculated, and from studies of the records valuable facts about the interior structure of the earth are obtained.

There are about thirty-five earthquake observation stations in the United States which regularly publish their results. Many are located at universities, but several are operated by amateurs who have made a hobby of earthquakes.

In California, there is a system for gathering quake information from some 20,000 persons who do not operate seismographs. These observers are provided with printed cards on which they record information concerning any quake that happens to occur in the region. Information obtained with these cards has proved extremely

valuable in analyzing local earthquakes.

In addition, in regions of strong earthquakes, Uncle Sam's quake experts have enlisted the help of postmasters and others who canvass the region and obtain information that will be helpful in determining the distribution and intensity of the quake.

What Are the Odds Against You?

(Continued from page 341)

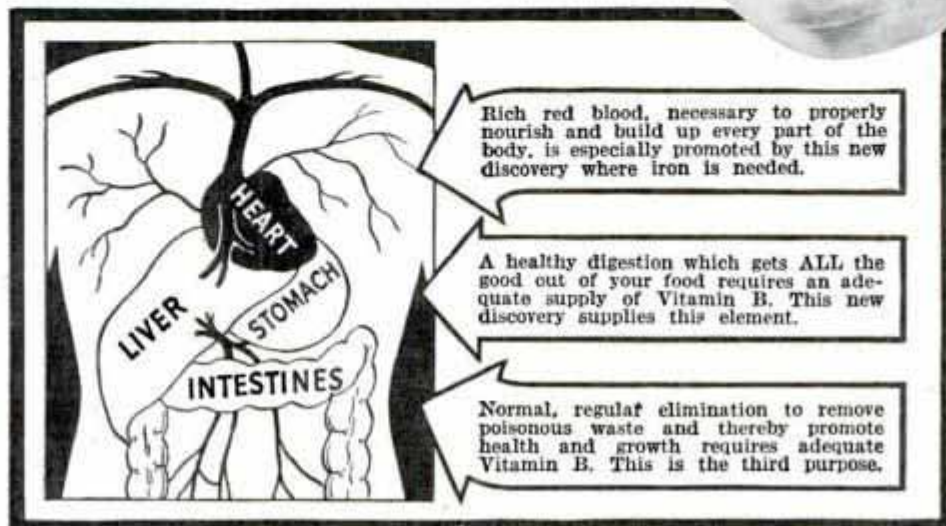
risk as only fourteen per cent of such cases are women. This is equally true of accidental death by firearms. Of the yearly toll of 3,100 lives, eighty-eight per cent occur to the male sex. Carelessness here has taken its largest toll, not while hunting in the field, but by haphazard handling of firearms in the home.

Do you think the steel worker on a skyscraper, the engineer of a fast train or the oil driller is taking more chances than you? If you do you're wrong, for here again the carelessness of the human machine takes its toll. Of six major industries, the farm claims the greatest number of accident victims annually. Agriculture exacts a tribute of 4,400 deaths a year; trade and service industries, 3,800 deaths; construction, 2,300 deaths; transportation and public utilities, 2,000 deaths; manufacturing, 1,900 deaths, and mining, quarrying, oil and gas wells, 1,600 deaths.

On a farm, you run the greatest risk from using machinery, and the second greatest from handling animals and livestock. Tractors, plows and circular saws have exacted their quota of death through carelessness while kicks by horses, mules and cows and attacks by bulls have added to it. On the other hand, in occupational risks, you take the greatest chance not in handling machinery but in handling objects. The latter is responsible for nearly twenty-six per cent of accidental deaths. Machinery accounts for twelve per cent.

Whether at work or at home, while traveling or engaged in sport, the odds against you are definitely set. While science continues its ceaseless efforts to lengthen these odds in your favor, it cannot mechanically control the considerable factor of human carelessness to any extent. The latest "foolproof" belt for window cleaners will not lessen the risk of accident if it is not worn. In the final analysis, your safety depends directly on you.

**SCIENCE NOW PROVES THERE'S
NO EXCUSE FOR THOUSANDS
TO BE SKINNY**



10 TO 25 LBS. GAINED QUICK—SAY THOUSANDS

NOW there's no need for thousands to be "skinny" and friendless, even if they never could gain an ounce before. Here's a new, easy treatment for them that puts on pounds of naturally attractive flesh—in just a few weeks!

Doctors now know that the real reason why many find it hard to gain weight is they do not get enough digestion-strengthening Vitamin B and blood-building iron in their daily food. Now with this new discovery which combines these two vital elements in little concentrated tablets, hosts of people have put on pounds of firm flesh—the women, normal curves—in a very short time.

Not only are thousands quickly gaining normal, good-looking pounds, but also naturally clear skin, freedom from indigestion and constipation, glorious new health and pep.

7 times more powerful

This amazing new product, Ironized Yeast, is made from special cultured ale yeast imported from Europe, the richest known source of Vitamin B. By a new process this yeast is concentrated 7 times—made 7 times more powerful. Then it is ironized with 3 kinds of strengthening iron.

If you, too, need Vitamin B and iron to build you up, get these new Ironized Yeast tablets from your druggist at once. Day after day, as you take them, watch skinny limbs and flat chest round out to normal attractiveness, skin clear to natural beauty—you're a new person.

Results guaranteed

No matter how skinny and rundown you may be from lack of enough Vitamin B and iron, this marvelous new Ironized Yeast should build you up in a few short weeks as it has thousands. If not delighted with results of very first package, your money instantly refunded.

Special FREE offer!

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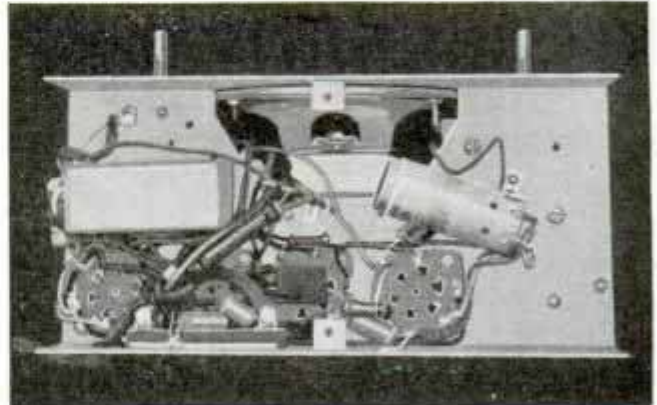
Address _____

Little Giant A.C.-D.C. Receiver

(Continued from page 423)

imum results, the builder should insist that they be exactly as specified. A complete list of the parts used can be obtained upon application, from our radio department without charge.

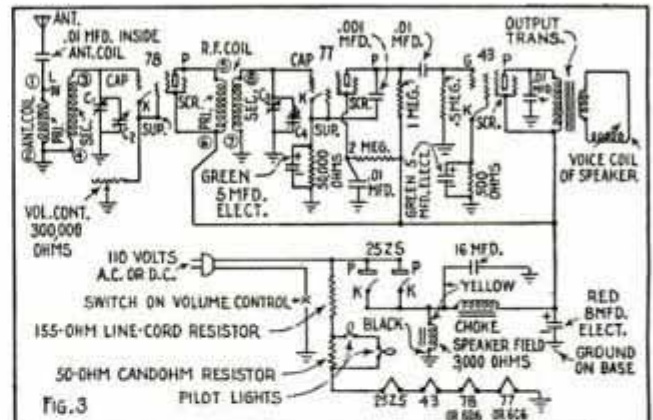
A simplified wiring diagram is given in Fig. 2. This underside view shows the base flattened out and all parts in their



relative positions. Rosin-core solder should be used for all connections; solder grounded leads directly to the metal base.

The cabinet inside measurements are: 5½ in. deep, 6½ in. high and 9¾ in. long. Fig. 3 shows the schematic circuit diagram. A large blueprint of all diagrams is available; those who wish it should specify blueprint No. R-220.

The 30-ft. flexible antenna, soldered to the lug indicated on the antenna coil, may



be thrown over a door casing or picture molding. To balance the set, tune in a fairly weak station and vary trimmer condenser C_2 with a small screwdriver for the loudest signal. Next adjust trimmer C_4 for still louder signal. These steps should be made in the rotation given and seldom require repeating unless the set is roughly handled.

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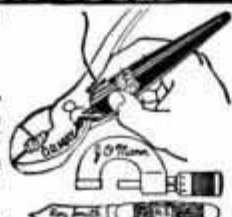
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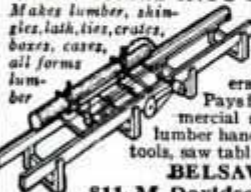


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THE NEW 1/2" JUNIOR (above):

Drives twist drills for drilling up to 1/2" holes in steel; augers for drilling up to 1 1/4" holes in wood. Also drives hole saws for cutting clean, round holes, from 3/4" to 3 1/2" diameter in wood, metal or composition. A husky, he-man tool that will make quick work of so many tough jobs you'll wonder how you ever got along without it. Universal motor. Real Black & Decker quality. A really great drill at a really small price.

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Drives twist drills for drilling up to 1/4" holes in metal; augers for drilling up to 1/2" holes in wood. Also drives wheels for light grinding, buffing, wire brushing, polishing, etc. A practical, handy tool that will make short work of a thousand-and-one odd jobs around the shop, home or garage. Universal motor. Dependable Black & Decker construction throughout. A great buy at its sensationally low price.

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All the Rainbow's Colors in Man-Made Stone

(Continued from Coloroto Section)

ceeded importations from Europe. Local production expanded rapidly from 3,700,000 barrels in 1898 up to 176,300,000 barrels in 1928 while capacity has reached over 270,000,000 barrels a year.

Improvements by ingenious pioneering Americans in manufacturing methods made this growth possible. The high cost, when manufactured by early methods, limited the use of this magic stone. Vertical kilns were tipped on their side, equipped with tires and bearings and rotated as they burned, at temperatures up to 3,000 degrees, producing a continuous stream of lava hot clinker to be ground into finished cement. First built twenty-five feet long, then sixty, it remained for Edison to demonstrate that longer kilns were practical. Edison also devised a system of fine grinding for cement, was first to use steam shovels for loading rock in quarries and introduced the well drill in quarry operation. Today the rotary cement kiln, a roaring inferno, is the largest moving piece of equipment used by industry. Some are over 400 feet long.

A low-priced fuel was needed for the new kilns so ingenious manufacturers powdered coal, used that and cut costs. To feed these giant kilns with raw materials, better grinding equipment was required to replace the early "coffee mills." So some Aladdin built monster crushers weighing as much as modern locomotives. To grind the cement clinker, smaller but more persistent mills were designed that grind and grind until the cement will pass a sieve that holds water, a sieve with 40,000 openings per square inch.

Growing up like Topsy, early cements varied widely. But practical engineers pushed back the veil of mystery and developed standard tests for comparing cements and concretes. And manufacturers put chemists to checking and controlling quality from the quarry, step by step, to finished cement—in all, over eighty operations. Minimum standards for quality, first established in 1904 by the American Society for Testing Materials, have been increased frequently. When these standards were first established, cement was used chiefly for foundations and mortar for heavy masonry walls. Its use in side-

walks and for building blocks was just beginning. The automobile was still in swaddling clothes in 1907, when the first concrete road was built in the United States.

Then Mother Earth growled, shivered, and wrought destruction in San Francisco and fire licked up the remains. While there were few concrete buildings in San Francisco, engineers were quick to appreciate the superiority of solid, massive concrete in resisting the earthquake and fire.

The use of surface veneers was so firmly established that little thought was given to making concrete, the trusty, humble servant, a thing of beauty too. Then came the World War and heavy artillery. Bases were needed quickly. Nothing but concrete would do. But armies couldn't wait for days for concrete to harden. So chemists made cement that hardened quickly. But it remained for a following generation to make a low-cost, high early-strength cement practical for everyday uses.

There came a steel shortage. Ships were needed. Why not concrete? Lighter than steel, but still too heavy. Chemists filled clay with air, burned it and had a new, lightweight aggregate that cut the weight of concrete over thirty per cent. Developed for light weight, it proved an effective barrier to heat and cold. Left exposed, it swallowed sound. But ships must be watertight. Ingenious builders put air hammers on the forms and vibrated them. Stiff concrete waltzed into place. Good concrete ships were built, some of 7,500 tons capacity. Vibration had planted a seed that grew into architectural concrete.

Came two great artist sculptors. One was commissioned to design a memorial to Time; the other was burning with desire to do the "impossible" with plastic stone. Lorado Taft won renown for a truly great design; John Earley made a faithful reproduction in concrete—plastic stone.

A mighty mountain torrent must be stopped. A gigantic stone must be fashioned to plug the world's greatest canyon. Only concrete is practical. But in so large a mass, the heat of hydration would destroy the concrete. A cool cement, which generates little heat in hardening, is needed. So chemists find cooler cements.

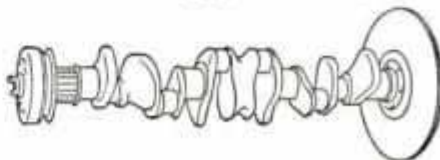
(To be continued)

SMOOTHER, LIVELIER POWER!

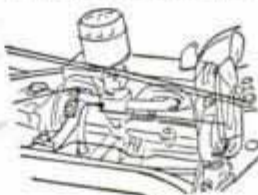
POWER in the 1936 Oldsmobile Six and Eight is smoother at every speed . . . performance more responsive in traffic, on the hills and on the open road. Electro-hardened aluminum pistons . . . lighter by 50% . . . and many other engineering advances contribute to Oldsmobile's velvety, spirited and economical performance. A few are pictured on this page. For a complete study of Oldsmobile's performance advantages, write to Olds Motor Works, Lansing, Mich., and ask for Free Catalog.



Oil under pressure is carried to the piston pins through rifle-drilled passages in the connecting rods. Special spurt holes in the rods spray oil on the cylinder walls.



Oldsmobile's crankshafts are accurately counterweighted and balanced both statically and dynamically. A vibration damper neutralizes torsional vibration. These are features which add to Oldsmobile's smoothness of performance.



Tri-cushion engine suspension, in which the engine rides on large, live rubber mountings, absorbs vibration and engine movement — contributes greatly to Oldsmobile's notable smoothness of operation.

New-type down-draft carburetion provides easier starting, quicker acceleration, greater power, more economy. Automatic choke control, built integrally with the carburetor, insures positive operation and simplifies cold weather starting.



The exact automatic spark advance for greatest gasoline economy is provided by Oldsmobile's new Vacuum Spark Control and Fuel Saver. This new engineering development also eliminates "spark knock".

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Wonders of the Scenic Engineers

(Continued from page 357)

the ship and built around it an exact reproduction of the houses and buildings that fronted Golden Gate harbor in San Francisco three generations ago.

Another skilled scenic engineer found in a recent script a demand for a boat which must withstand heavy weather. A few days later his staff produced at the studio a boat 125 feet long, mounted on hydraulic rockers so it would both roll and pitch as waves twenty-five feet high rolled down from a battery of thirty tanks mounted on platforms eighty feet high. In a half-hour another art director solved a problem which had perplexed a director for several days and which saved \$18,000. The scene called for a ship weighing 235,000 pounds, which had been built at a major studio, to move fifty feet away from cheering crowds standing on a movie dock. Instead of providing means to move the heavy ship set, the scenic engineer built a short, level track and had the camera pulled away from the ship, thus obtaining at a cost of \$100 the effect of the ship sailing.

On the Twentieth Century-Fox lot stands the world's most famous ship. It has been shown sailing perhaps fifty times in five years, yet it rests today as firmly on dry land as when built five years ago. It is a 278-foot section of an ocean liner. Built at a cost of \$100,000, the ship contains three decks strong enough to support 300 people. For each picture, the scenic engineer remodels its exterior to represent some new liner, but instead of sailing, the ship remains motionless while the dock slides down an inclined track.

The scenic engineer knows all the tricks of picture making, from the cameraman's job to short cuts in set construction. He may be called upon to produce the replica of some mythical foreign scene in a few days. Recently, for instance, Stephen Gooson, from his tiny office on the Columbia lot, produced scores of sketches, paintings and finally working drawings for construction of a Tibetan ranch for "Lost Horizon." This giant set required three months to build, involved transplanting 200 trees and building a range of hills seventy feet high. Yet from the wizard of scenic effects came every detail of this Asiatic scene which measured 1,000 feet long and 670 feet wide.

New Marvels in Metals

(Continued from page 323)

ready for hard use. Many bronze and copper electrical parts used in the automobile and electrical industries are now prepared by this process. Hardy and his assistants are trying to find a similar process for producing small iron and steel parts.

In the field of alloys, a recent contribution has been the permanent alloy magnet, "alnico." Heretofore we have depended upon electromagnets to do a great deal of work which alnico can do easier and cheaper. One pound of the new magnet alloy can attract and hold in suspension as much as sixty pounds. Many small motors and electric control devices which were heretofore operated by electromagnets can now use permanent magnet fields at a saving in cost.

For years the best magnets were made of hardened plain carbon steel. A few years ago an alloy of iron, aluminum and nickel was found to possess permanent-magnet properties. The addition of cobalt was the next step. Alnico was the result.

A tool manufacturer is now making certain tools from a "non-spark" alloy consisting of two per cent beryllium and ninety-eight per cent copper. A hammer made of this alloy may be pounded on an anvil and will not emit sparks. Such tools are especially useful around powder and chemical plants.

An iron-nickel-cobalt alloy called "fernico," which expands under heat at almost the same rate as the special glass used in vacuum tube construction was produced also. It has aided in the success of metal radio tubes, now used by many manufacturers. Fernico is used for the lead-in wires and also for metal eyelets set into the walls of the tube; rings of glass seal the space between the metal parts.

The most important decorative and protective finishes are chromium-plate, nickel-plate, copper, brass, cadmium, and tin. Among the most important elements used to beautify objects are silver, gold, platinum, and a recent newcomer—rhodium. Aluminum colors have recently become popular. Chemists have also produced a number of "cold dip" colors on solid or plated metals. Silver can be turned out in French gray, or matte. Copper and brass can be turned out in brown, green, blue-black, or old English.

General Electric Co. Schenectady, N.Y.

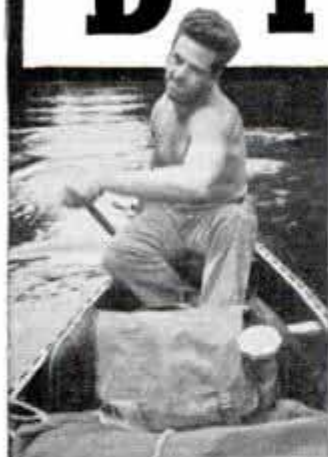
Aluminum Company of America Inc. Pitts.

6-1266

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D I G



in the
deep, dark
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Load up your duffle, some grub and an axe. Strike out for sport in the wilds. Follow the ribbons of water with ease . . . with the stroke-stroke-stroke of an Old Town. It's an Indian craft that's brought up to date! Light and responsive and tough.

See all the different models in the new catalog. Write for a free copy. Models for paddling, sailing or kicker. Prices start at \$68. Also a fine fleet of outboard boats, including large, seaworthy types for the family. Rowboats. Dinghies. Write today: Old Town Canoe Company, 233 Main St., Old Town, Maine.

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TIMKEN BEARING equipped. V bed ways. Hooded V belt drives. Convertible to back geared screw cutting. .001" accurate.



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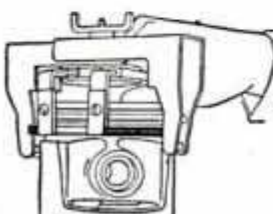
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Good profits made restringing racquets. 37 ft. string. Colors Purple, Green, Red or White—also White & Blue Spiral—with contrasting silk trim, awls, stringer's wax. Illustrated easy directions. Money back guarantee. Send for Free Catalog and Money Making Plan!

MAKE MONEY TOO! Send Check or Money Order \$1. which includes Postage and Insurance. Sent C.O.D., if desired, 15c extra.
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JIM DANDY CABIN TRAILER
Classy! Roomy! Easy to build at low cost! Plans and instructions only \$1.00—include all Diagrams, Sketches, Photos, Material List, etc.—Big Value! Mail Dollar Bill to Jim Dandy, Box 125-A, Wausau, Wis.

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Amazing new tool expands ring in natural shape. Prevents distortion and breakage. Puts rings on—takes them off pistons lightning fast. Adjustable, handles any ring from 2 3/4" to 4 3/8". Quick-set scale. Fully guaranteed. Price only \$2.75 postpaid. Order today—stop breaking and distorting rings.

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W. S. Rinehart, Louisville, Ky., designing an airplane theme for a college year book.

"I FOUND A WAY TO SAVE MONEY"

Gentlemen:

In my job of selling printing, I have driven my Plymouth over 47,000 miles in the last 18 months. This is a lot of traveling, and car upkeep is an item to be considered.

Therefore, I have figured out one way to save money: I selected four widely advertised oils; used each oil three times, 2,000 miles each time, a total of 6,000 miles on each oil. Two of the oils had to have four quarts added before 2,000 miles were completed. With one, I had to add two quarts.

But with Quaker State, I never used over one quart in 2,000 miles. That meant a saving of nearly fifty quarts a year as a result of this simple experiment.

All tests were made over approximately the same roads and same conditions.

Sincerely yours,

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Retail Price . . . 35¢ per quart

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When writing please mention Popular Mechanics

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£ 1873

Have You a Penny?

(Continued from page 373)



**Broken Furniture
easy to fix with
Plastic Wood**

It's easy to repair quickly and permanently—broken furniture, replace loose drawer pulls, loose casters, loose bathroom fixtures, fill cracks in floors, shelves, baseboards, window frames, plaster or cement—with Genuine Plastic Wood—just press this putty-like preparation into place and it dries quickly to hard wood—it's so simple and it costs only a few cents—try it and you'll say Plastic Wood is great.

USE THE GENUINE

Genuine Plastic Wood is actual wood in putty form, when dry it is hard wood that can be sanded, sawed, or carved—will hold nails and screws perfectly—will adhere to any clean, dry surface, wood, metal, porcelain or plaster—can be painted, varnished or lacquered—is waterproof and weatherproof.

Ask for the Genuine Plastic Wood—sold at all leading Paint, Hardware and Variety stores.



Plastic Wood also comes in white which is ideal for bathroom repairs.

PLASTIC WOOD

**MEND IT—
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The adhesive that's transparent—waterproof—stronger—more flexible. At hardware, stationery and dept. stores. 25¢ a tube



AUTO ENGINE SPEED CONTROL GOVERNORS

To control speed of any make of auto or truck engine, regardless of load changes, when used as a stationary or portable power plant. Fully guaranteed. No cash down. Governor speed range from 400 to

3000 R.P.M. Fine opportunity for established agencies. Circulars. Mfra. Candee-Smith Gov., 217 No. L. A. St., Los Angeles.

house in Baltimore. Their find had a face value of \$11,425, but coin collectors bid for the coins at auction and paid \$22,500.

Archaeologists consult coins as an important source of historical data on persons and events. Students of mythology, comparative religion, government, administration of justice, military equipment, commerce, traffic, industries, literature, customs and costumes of dim yesterdays have found in coins fruitful keys to knowledge and connecting links in the continuity of world history.

Coin collectors are in noble company. King Victor Emmanuel III of Italy has a collection of more than 100,000 pieces. Queen Christina of Sweden was an enthusiastic collector, and the collection of Louis XIV may still be seen in Paris. The largest public coin collection and numismatic library in the United States is housed in the museum of the American Numismatic Society in New York, other important collections being that of the Smithsonian Institution, the British Museum and the Chase National Bank. The world's first coins came into existence in Lydia, Asia Minor, about 700 B. C., when a metal called electrum, a natural mixture of gold and silver, was used.

Two of the most interesting coins in the history of American money are the "Pine Tree" shilling, a silver piece minted in Boston in 1652, and the Spanish-American silver coins known as "pieces of eight." The latter were legalized for use in America in terms of the shilling. To provide change, the "pieces" were cut into halves and quarters and even into eighths. A quarter of a piece of eight was called two bits of eight, hence the term "two bits," understood today to mean a quarter of a dollar.

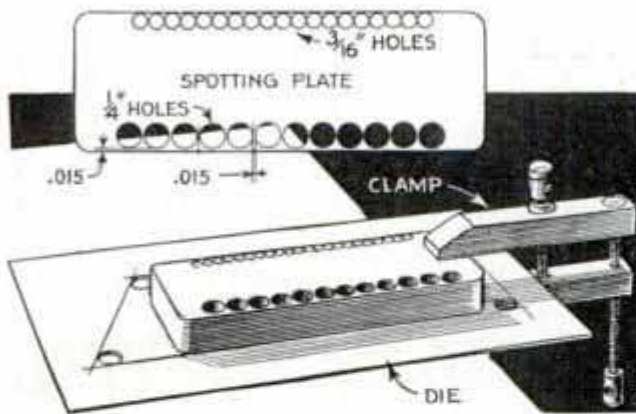
As in other hobbies, coin collecting includes those who speculate and those who buy "for keeps," for the story the coin has to tell. The motto of the true collector is "buy and never sell," but no one can be blamed for cashing in when the "big find" comes.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

London bag... Baltimore

By roadway and to both

Layout Jig for Diemakers



The Tool Is Laid on the Inside of the Contour Line and Clamped in Place

I have used a layout jig of the type shown for many years and find that it not only eliminates layout work and center-punching, but I am able to produce work more accurately than with other methods. The jig consists of a piece of tool steel in which a series of holes are carefully laid out, drilled, and then reamed to leave walls of about .015 in. in thickness between them. Their diameter can be made to suit the diemaker. As the tool must be hardened, it is best to leave a wall of about $\frac{1}{32}$ in. from the edge, and then grind the surplus metal off after hardening. If this is not done the thin edge may break during the hardening process. The tool should be used for "spotting" only, as the walls will crack through if used as a guide for drilling.—Charles Kugler, Philadelphia, Pa.

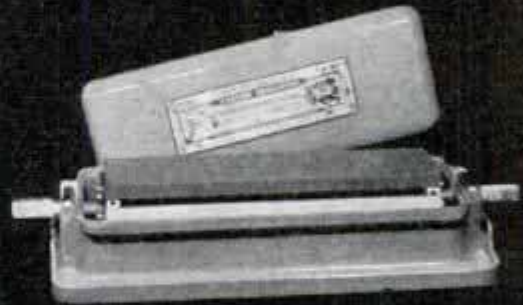
How to Make Canvas Fire Resistant

When canvas is made fire resistant with the following preparation, it will not blaze up from contact with flames or hot metal, but will only char in the places touched. To make the preparation, dissolve ammonium phosphate, 1 lb., and ammonium chloride, 2 lbs., in water, 6 gal. After soaking the canvas in this solution, the excess liquid is squeezed out and the fabric is dried. For delicate fabrics such as curtains, drapes and other hangings, which might be a fire hazard, dissolve borax, 10 oz., and boric acid, 8 oz., in water, 1 gal. After soaking thoroughly, the cloth is squeezed, not wrung out, and then dried.

☞ Use a dull knife instead of a sharp one to scale fish—it is less likely to cut the flesh.

NORTON ABRASIVES

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All-Wave Antenna Systems

(Continued from page 424)

other convenient way, without cutting the wires. If there is more line than necessary to reach the receiver, roll it up and fasten it in or near the set. Use either two single lightning arresters or one of the doublet type shown in Fig. 2. The arrester may be placed in the line at any point between the upper and lower couplers. Merely scrape the insulation from the wires for the binding-post connections and loop the wire around each post, using a separate wire from the center post to ground. Mount the set coupler below the chassis in the rear of the receiver, as illustrated in Fig. 3, so that the short leads from the coupler just reach the ground and antenna posts on the set. If the length of these wires is extended they will pick up noise. The red wire goes to the antenna binding post, and the black wire to the ground binding post or metal chassis.

The next, and final, step is to connect the transmission line to the binding posts on the set coupler, keeping the line away from all radio tubes.

For maximum noise reduction, the receiver may be connected to a cold-water pipe ground. Use heavy solid wire for this connection and if the set is an a.c.-d.c. or d.c. type it is necessary to use a small 1/4 mfd. fixed condenser in the ground lead as shown in sketch, Fig. 3. In d.c. districts try with or without external ground for best results. On receivers designed for a doublet antenna, make the set coupler connections as shown in Fig. 4. This applies to all similar doublet antenna systems now in use.

In locations where the erection of the double-doublet is not practical, an unbalanced doublet of the type shown in Fig. 2 will give similar results. This system is also available completely wired and ready for erection. The transmission line installation is exactly like that used for the double-doublet system but the short and long antennas are combined in a single horizontal unit. In this way the short antenna section does not require the 20-ft. angle which necessitates the use of rather high supporting masts. Ordinary clothes-line or window-sash rope should be used instead of wire for erecting these antenna systems; a coating of paraffin may be applied to the rope for weatherproofing.

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61301 Speech Without Words

(Continued from page 399)

up in the regular routine of work, include the following: On time—making sign of O followed by that for T, these signs preceded by shooting the arm up a number of times to indicate the number of the train; couple up trains and proceed—hooking hands together in half-closed position, and then waving the hand for the go-ahead signal; a track gang foreman asks the engineer of an approaching train how train No. 2 is going by holding up two fingers, and receives an answer from the engineer that the train is ten minutes late, getting this message across by holding up both hands with fingers outstretched.

The use of the finger signals for slow balls and fast ones, between catcher and pitcher at baseball games, is as familiar to the humblest sandlotter as to the top-notch in the big leagues, while everyone who gets into the streets knows what the traffic policeman means when his hand says "stop," "go" and "come on." The orator or stump speaker also, is understood when, his eloquence having had its intended effect upon his audience, the tumult and the shouting continue until his upraised hand asks that his listeners quiet down so he may go on.

Group collaboration in expression is shown in the waving of goodbye at ship departures, general applause by clapping of hands in theaters or at political rallies, raising arms straight up for indicating "aye" or "nay" at meetings during voting on proposed measures, and the exhibition in groups of the salute. The sign "thumbs down," which dates back to Nero's day as the symbol of death in the gladiatorial arena, is generally understood and used today as a conclusive sign of negation or refusal.

Considering the widespread use of hand signals in such a thoroughgoing machine age as that in which we live it would seem fair to predict that "the thousand-worded movements of the hands" are to be a permanent feature of human intercourse and that despite the introduction of mechanical signaling man must, or prefers, sometimes to resort to his hands for speech.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

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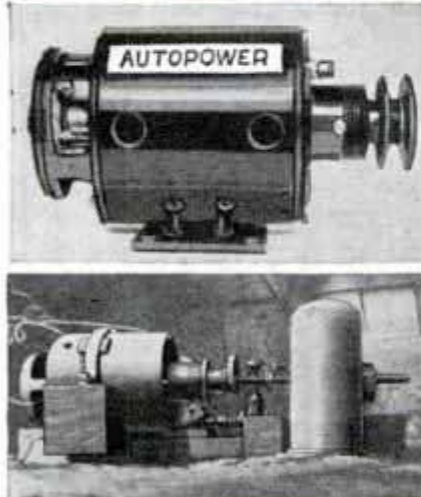
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CAN A HOLE HOLD WATER?
 Find Out!

e 10170 **Flying the Beams**
 (Continued from page 404)

ing a pilot he is "on course." One mile from the station the steady signal is about half a block wide and 100 miles away it is about seven miles wide.

Except for the ingenuity of the engineers a radio range station would send out its four beams at right angles to each other. The engineers bent the beams so they would point along the airways by tuning and balancing parts of the transmitter circuits and by supplying each radiator tower with different amounts of power. To bend the south beam to the east, for instance, additional power is supplied to the southwest tower and less to the southeast tower. That bends the southern beam toward the weakest side.

The beacons are sensitive to many conditions and the airways operators must keep a constant guard over them. A foggy night at a beacon station is apt to cause one of the beams, or all of them, to swing away from their courses. Apparently the moisture in the fog unbalances the capacity between the radiating towers and the ground, a condition also created by vegetation around a station. Nothing is allowed to grow within 100 feet of the towers and for a radius of 600 feet all shrubbery is kept close to the ground.

"Even the kind of aerial on an airplane makes a difference in receiving the sensitive beams," an engineer states. "An inclined aerial can cause an error in course position of as much as five degrees. One freak condition that still remains something of a mystery is the 'multiple course.' In mountainous or hilly country some of the radio waves in one quadrant seem to be reflected or refracted from a mountain-side into another quadrant. 'A' signals, for instance, may be bounced from a range of mountains over into an 'N' quadrant where the dots and dashes fit together to produce a steady 'on course' signal in a small area. After a new radio range beacon is installed a supervisor spends days flying around the station in circles to check the reception and mark the location of the multiple courses. Sometimes mountains seem to absorb part of the energy and weaken the signals. Over flat country the beams perform in a normal manner."

Another phenomenon of the radio range

(Continued to page 140A)

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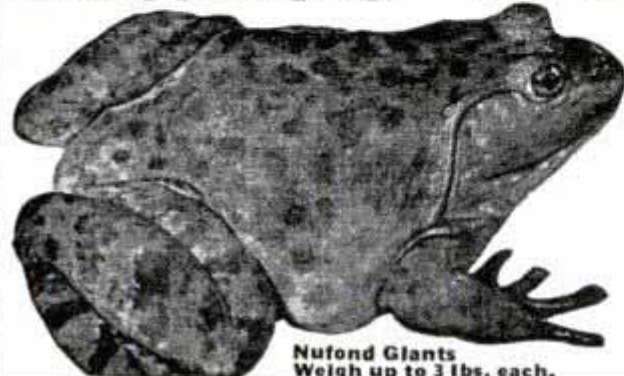
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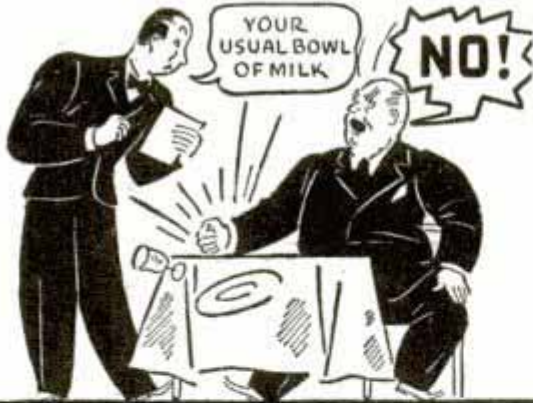
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Flying the Beams

(Continued from page 138A)

is the "cone of silence" above each station. A pilot approaching a beam station notices the signals become louder, then abruptly cease, and then start again. The period of silence is the time during which he was immediately over the transmitting towers. Flyers use the cones of silence to determine their position in foggy weather.

To take the place of the cones of silence, the department of commerce is studying a "spot reflector" transmitter that directs a narrow radio beam vertically from the ground. Instead of waiting for the silent period in his earphones, a pilot would know when he had passed over a beam transmitter by watching a red light on his instrument board. Attached to a tiny receiving set tuned to receive the beam of the spot reflector, the red globe would glow when the plane cut across the beam.

The spot reflectors are expected to be an important part of the blind approach system the department of commerce is installing at twelve major airports. It will enable a pilot to orientate himself with the field by means of radio and make a normal landing when fog hides the airport.

Two radio stations, one two miles from the field and the other 1,500 feet away in direct line, will be used together with groups of powerful lights that mark the landing area. A pilot would guide himself to the field by means of a radio compass, then fly back and forth across the vertical spot reflector beams of the two radio stations to establish his course. On his final approach the pilot would pass over the outer radio station at 800 feet, then assume a gliding attitude so as to have an altitude of 150 feet as he passes over the second station. After passing the second station he would complete the landing maneuver on a straight-ahead course by means of his instruments.

Radio compasses may become part of an airplane's equipment although they are not expected to supersede the radio beacons. A radio compass consists of a small loop aerial. The pilot moves the station selector of his receiver to the frequency of the station he wants to pick up, then turns his loop aerial to receive maximum volume. From then on he watches a needle on his instrument board. As long as the

(Continued to page 142A)



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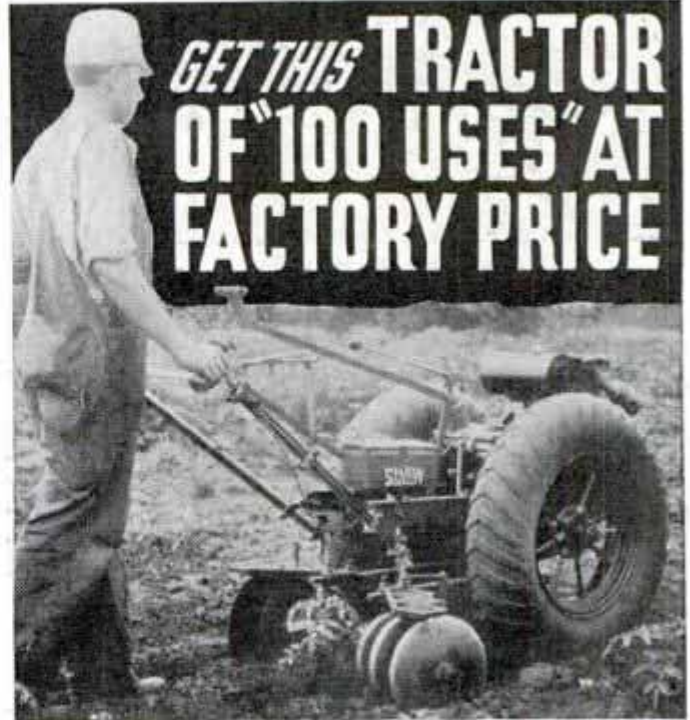
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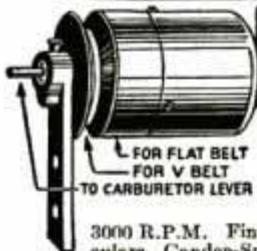
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21010 **Flying the Beams**
(Continued from page 140A)

plane is pointed toward the transmitting station the needle points upward, but moves to one side if the plane veers from its course. In tests at sea an airplane picked up several surface ships by radio compass and flew from one to another.

Most transport planes carry two receivers, one tuned to the airway's radio range and weather broadcast frequency and the other to the frequency of the air line's private stations. Over his air-line receiver the pilot obtains instructions that determine his route and where he should land in case the regular terminal is fog-bound. If an air line's transmitter breaks down, emergency messages are relayed over the radio range stations.

Many private and commercial planes have radio receivers by which they follow the beams but are not equipped with transmitters, so lighthouse keepers of the airways have a well-understood code of signals. When a flyer circles a station he means "Please broadcast the latest weather." The broadcast is acknowledged by dipping the wings or flashing the lights. If the pilot keeps on circling and gives short bursts with his motor the operator also broadcasts the name of the station.

Some keepers of the radio ranges lead lonely lives. The caretaker of the visual light at Little Lake Pass, Nev., is sometimes snowed in four months at a time. He has arranged a series of light signals for emergencies with the keeper of the next station seventeen miles away.

Many light beacons have no caretakers, the batteries recharging from a motor generator and the lights turning on and off by means of astronomic time clocks. Occasionally an inspection party visits each light to lubricate the equipment and replenish the fuel for the motor generator. Last winter an inspection party found the power house of the Mount Catherine beacon on the Spokane-Seattle airway covered by twenty-four feet of snow. They located the house by holes leading up from the exhaust stacks of the motor generator. They tunneled five hours before reaching the doorway and while inside the tunnel collapsed and the slide slammed the door shut. They escaped through a window, tunneled to the door, then dug their way out through the collapsed tunnel.

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The Next War—on the Sea

(Continued from page 366)

fighting, scouting, bombing and torpedoing planes.

These carriers present an extraordinary appearance. They are low and have an enormous flat deck known as the flight deck. It is longer than two average city blocks and about eighty-five feet wide. Stacks and navigation tower are mounted at one side of this flat deck. These ships amount to floating flying fields, with hangars, repair shops, and quarters for flying personnel and "ground" crew.

The "Ranger" carries seventy-nine planes. All can be dispatched in less than three hours and received back and stored below in an equally short time. In alighting on the flight deck, the danger is overshooting. To check the speed of alighting planes quickly, arresting gear is provided. Ordinarily this consists of steel cables stretched across the deck and fastened to some kind of a yielding resistance. Hooks on the bottoms of the planes engage these cables, the cables yield and quickly check the speed. The difficulty is providing a practical elastic checking system for the cable. Something has been developed recently which is said to eliminate the original troubles with this sort of arresting gear. It is another of the navy's many secrets.

Naval experts regard a superior air force as vital. The fleet which gains command of the air will have a tremendous advantage. It has been said that a navy, to take full advantage of the possibilities, should have from 2,000 to 3,000 airplanes. The huge Boeing bomber, wrecked during a recent test flight, weighed fifteen tons, had a span of 100 feet, over-all length of seventy feet, four engines giving a total of 2,800 horsepower, could fly 2,300 miles at an average of 255 miles per hour, and could carry nearly two tons of high-explosive bombs. A fleet of such bombers would possess indescribable destructive powers.

Possibly the next most important new naval development since the battle of Jutland, is the modern submarine. Compared with these latest undersea boats the submarines used in the World War were toys. Hull construction has been developed so boats from two to three times the size of

the old ones are practical and safe. Diesel engines of four times the horsepower and of but little more weight and size are used. Immensely greater reliability has been achieved. More comfortable quarters for the personnel are offered, so submarines in the next great war will be able to make long voyages and fight in distant areas.

The modern submarine is also more heavily armed and able to accept battle on the surface. This makes it a formidable surface fighting ship as well as a submarine. How all this is going to affect future fleet tactics in battle is an interesting problem. Whether the undersea boat will take part in major fleet engagements, or will be limited to preying on enemy commerce is a moot question.

German submarines in the World War wrought terrible losses on British merchantmen, but as the war continued, the British and American navies developed a system of counterattack that caused such heavy losses to German submarines that the German crews were reported to have mutinied. The system adopted for this anti-submarine defense to this day remains a secret. It seemed to consist of a combination of airplane and destroyer patrols in inland waters, and destroyer patrol of the open sea. From an airplane a submerged submarine is easily visible if the water is relatively smooth. When one was located, the nearest destroyer was notified. Guided by airplane, and assisted by listening devices, its location was estimated, and so-called "ash cans" of high explosives were dumped overboard. They had fuses which exploded their charges at a certain depth. A submarine within several hundred yards of one of these exploded ash cans received a terrific jolt.

Many German submarines thus were rendered helpless. The horrible lingering deaths of the crews had better be imagined than described. The bottom of the English Channel and the near-by ocean floor must be dotted with these death traps.

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(Continued to page 146A)

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(Continued from page 144A)

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BINOCULARS

men and shiploads of supplies steadily. The convoy system was so perfect that not one casualty occurred as a result of submarine attack. How many lurking submarines were discovered and sent to the bottom is another war secret.

How much of the success of this convoying was due to detectors has never been revealed. What form of detectors was used, if any, is also not known. Two forms making use of sound are possible. One consists of an underwater pick-up microphone. One is located on each side of the bow of a ship. Any relatively distant running machinery, such as a revolving propeller, is made audible by means of these. When the sounds received in the right pick-up are louder than those received by the left pick-up, the source of the noise is toward the right. When both receive the same intensity of sound, the source is dead ahead.

The other device depends upon reflected sound. Depth indicators are now built upon this principle. A ship at full speed can keep a continuous record of the depths under the keel. A sound is emitted under water and the time required for the reflection or echo to return from the bottom indicates the depth. A submarine lying silently on the bottom can be located by these depth indicators.

So much secrecy surrounds submarines that it is not safe to estimate what influence modern undersea boats will exert. In view of their powerful armament, their relatively large size, long cruising range and reliability, it seems likely they will develop an entirely new and unexpected form of destruction. Against them are the improvements in destroyers and the long list of secret systems developed to combat them. With all this new gear aimed at their destruction, these boats probably will have a precarious existence.

Since the World War the navies of the great powers have practically been made over. A typical battleship of today is a veritable floating citadel. Steam pressure of 300 pounds per square inch is used in turbines of 180,000 horsepower. These turbines operate electric generators which feed electric motors which in turn are directly connected to the propeller shafts. Armament has not been changed materially except in details. They already had

(Continued to page 148A)

NEW TYPE CHEAP OIL BURNER

Sweeping the Country!!

COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace—**HOTTER—CHEAPER—No Dirt or Ashes—Twice the Heat Quick at HALF THE COST.**

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Beats any oil burner ever gotten out for low cost, perfect performance. Burns cheap oil a new way, without pre-generating or clogging up. Quick intense heat by Simple Turn of Valve.

Try At Our Risk 30 DAYS' TRIAL

Prove it ends drudgery and dirt of coal or wood; cuts fuel bills in half, pays for itself quickly by what IT SAVES.

FREE SAMPLE FOR AGENTS

offered to one energetic man or woman in each locality who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now, spare or full time—mail in postcard today.

UNITED FACTORIES, C-751 Factory Bldg., Kansas City, Mo.

AGENTS Salesmen BIG MONEY
Drop Everything for this Quick Seller. Clark of Ind., sold 33 in 20 days. Get YOUR OWN oil burner FREE and make REAL Money. Write now.

Slips Into Any STOVE RANGE or FURNACE

Quick HEAT at Turn of Valve!



Make up to \$95 Weekly!

Hand Out FREE CIGARETTES

Show Men New Way To Smoke

We'll furnish you Free Cigarettes to give away in your locality. Ask any man to have a Free Smoke. Then hand him a LIGHTED Cigarette from beautiful pocket-size "MAGIC CASE." Just touch button. Presto! Out comes LIGHTED cigarette automatically. No batteries or electricity. Everybody wants one. Orders come fast. Profits pile up big.

15 Day Trial Offer

Get a Magic Case for 15 Days' Trial at our risk and amazing money-making facts. Write today. State favorite brand of cigarettes.

MAGIC CASE MFRS., 4234 Cozens Ave., Dept. C-370, St. Louis, Mo.

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CHANCE FOR BIG PROFITS

Women admire these bracelets—in real silver, stores get \$1 to \$3. Zeugner, N. Car., has sold nearly 1,000 in Silverite, still ordering. Pay 5c for 1/4" blank, 9c for 5/8", 12c for 1". Tool steel dies, set of 3, \$3; of 6, \$5. Nice profits if you're a salesman; real art for craftsmen. Write for catalog today.

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THE PLAN SHOP, 907 Palmolive Bldg. Chicago, Ill.



Information on any book free. Write Popular Mechanics Press, Chicago, Ill.

Get into this PROFIT MAKING BUSINESS

"Simplified" ARC WELDING



EARN \$150 to \$300 EXTRA Profit Monthly

New low prices on modern 40 Volt Simplified Arc Welding makes this money making service available to shops that up until now could not afford it. It opens the doors to hundreds of big paying jobs that carry a real profit for you. Hobart is far easier to operate, faster on each job—and guaranteed to bring quality welding to your shop. Don't miss today's opportunity to get into this most profitable business—extra profits will easily pay for your welder without expense to you.

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"ELECTRIC DRIVE"—In new small sizes as well as large, the new Hobart 40 Volt Welder is the most profitable shop welder you can own. Welds faster, saves current.

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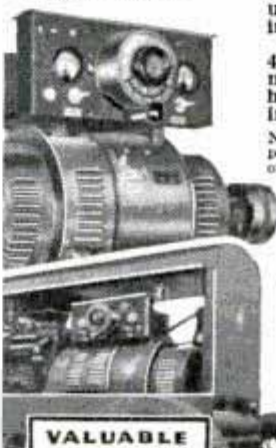
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Send FREE Manual on Welding. Attached letter tells about the work we want to do.

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MATCHES ALWAYS DRY!

—if you carry a Marble's water-proof match box in your pocket. Absolutely water-proof—holds supply for several days. Made of seamless brass, 3/4-inch in diameter. Only 60c at your dealer's, or sent postpaid. Get one today. Write for complete FREE Catalog.

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1936 Catalog! Listing over two thousand (2000) items. Just off the Press! Hot sellers—at the lowest possible prices!

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Double edge guaranteed razor blades—50c per 100. 56 different items in the Cosmetic line—your choice 5 1/2c each. Soap—3 bars to a package—4 1/2c. Pure Castile Soap—30c per doz. 13 oz. cans Talcum Powder—Dozen cans: 78c. 8 oz. Bottle Flavoring Extract—10c.

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And TWO THOUSAND (2000) OTHER BARGAINS!

In order to sell our goods at the lowest possible prices, we cannot send out these catalogs promiscuously. On receipt of 15c to cover cost of printing, postage, handling, etc., catalog will be mailed. With your first order, regardless of size, you deduct this 15c.

Only a limited number have been printed!

CONSOLIDATED SERVICE BUREAU, 140 N. Dearborn, Dept. 1C6, Chicago, Ill.

BUILD IT YOURSELF



Build your own vehicles with 10" x 2 3/4" Doenut tires with cadmium plated ball bearing disc wheels. Their performance is amazing.

This airplane type Doenut cord tire was invented by A. J. Musselman who developed the original air wheel for airplanes and motor vehicles. Requires only 12 to 15 lbs. air to carry loads up to 200 lbs. per wheel. These Doenut tires are revolutionizing the tire industry. They take less power to propel, literally float over road bumps and are winners in coasting contests. You can build any of these vehicles in a few evenings spare time at home. Send 25c for detail working blue print of any vehicle shown above except Derby Racer, or 50c for any three except Derby Racer blue print which is \$1.00. So you may see this amazing wheel performance quickly, we will send you your first complete wheel with tire at factory cost of \$2.00 prepaid. If it does not come up to your fullest expectations, return it for full refund.

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CASCO, THE HOMECRAFTERS FRIEND

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FREE! Generous test sample & 32-page gluing guide

Forty-three illustrations... dozens of ideas on building and repairing things easily, quickly and permanently. Write your name and address on a penny postcard. Say "Send free sample and copy of 'CASCO Gluing Guide.'" Hardware, Paint, Lumber Dealers Sell CASCO. The CASEIN MFG. CO. OF AMERICA, Inc. 352 Madison Ave. Dept. P, M, 336 New York



(Continued from page 146A)

the largest-caliber guns and as many of them as the ship could safely carry. The important changes include protection against torpedoes, the addition of anti-aircraft defense, and deck construction able to localize the injury from direct hits from bombs dropped from the air.

To find out what would best resist torpedo attacks, under-water caissons were built and torpedoed. A design of compartmented caisson was finally found which took the shock and localized the injury. Battleships and cruisers now have on the outside of their hulls, from the water line down, these curious caissons. They are called "blisters." They are compartmented, so they can be flooded as desired. If a ship is torpedoed, a few compartments of the blister will be flooded. Corresponding compartments on the other side of the ship are then filled with sea water and the ship thus is kept on an even keel to insure a level platform for continuing gunfire. A somewhat similar principle is used to localize injury from direct hits by bombs dropped from the air, so battleships and cruisers are fully prepared to meet the new attacks from below and aloft. The battleship thus is still the backbone of the fleet.

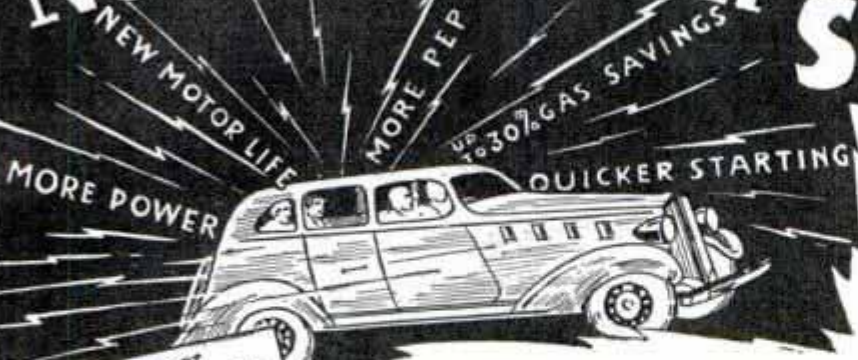
To fight these modern fleets requires men, and large numbers of them. This means food, supplies, refrigeration, hospitalization, and, for the ships themselves, repair and maintenance equipment on a huge scale. From 50,000 to 100,000 men are involved in a modern fleet. To keep this number of men fed, clothed and contented, to look after the sick and injured, requires a moderate sized fleet in itself.

No man can predict what will happen on the sea in the next great war. It is expected that a major engagement will involve huge fleets. This means hundreds of planes scouting, fighting and bombing in the air, probably some kind of warfare under the surface, and terrific long-range heavy gunfiring from the decks of hundreds of ships. The unloosing of the transcendent destructive power that has been prepared promises to precipitate destruction and death such as has never been beheld on earth.

(To be continued)

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS



AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, quicker starting, greater speed and smoother running.

Automatic -- Nothing Like It!

The self-starter — four wheel brakes — knee action — streamlining . . . and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

VACU-MATIC is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

USERS REPORT
3 to 7 MILES MORE PER GALLON
MOTORIST SAVES \$180.00 a YEAR

"On my V-8 Ford it works miracles. Its added power, acceleration and top speed has sold me. The results are unbelievable."—Ralph Fields, Mass.

"Very glad to say, the Buick showed an increase of 3 miles more per gallon."—A. V. Greve, Washington.

"On my Plymouth, I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of \$15 a month or \$180 a year. F. J. Peck, Calif.

"It saves me one gallon a day—now only 4 gal. buy 3 gallons each day—now only 4 gal. buy 3."—L. V. Sweet, Pa.

"I have twelve VACU-MATICS on cars now, and they all show an increase in mileage. The car owners are very well pleased."—Fred Taylor, Okla.

"I have been placing VACU-MATICS on expert mechanics' cars. All are well pleased."—J. W. Douglas, W. Va.

Guaranteed Gas Savings
 VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

Fits All Cars
 VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

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 VACU-MATIC offers a splendid opportunity for annual sales and profits. Valuable territories now being assigned. Check and mail coupon.

Free Details
 You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

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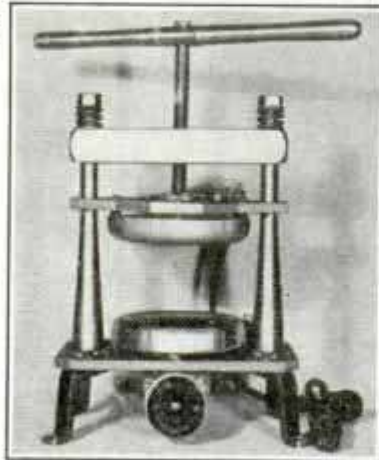
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Dentist Builds Office Press

Dr. B. E. Wratten of Wichita Falls, Texas, required a dental press in his office, so with the aid of an Atlas Lathe he made an electrically heated dental press. This press is used in making dentures where dry heat is wanted and has been in operation in Dr. Wratten's office for more than a year.



ATLAS DRILL PRESSES
\$14.45 to \$39.45

Four sizes, bench and floor models for all classes of work. Large heavy duty SKF Ball Bearings.

National Champ Meets Last Minute Emergency in Own Workshop... Wins Exciting Race!

Mr. Ward Angille is a widely known outboard racing driver, having won the national championship in 1935 for his class and setting 4 world's records, also high point champion for the Pacific Coast. The Atlas Lathe and drill press has played a big part in his success; for instance, the day before the championship race, he broke a propeller shaft in a trial run. A new one would



have to come from the factory many miles away, and he had to race in the morning—so he set to work and by 2 A. M. turned out a perfect shaft on his Atlas Lathe—and won the race next day.

His Hobby is Guns—Wins National Recognition on Atlas Made Model

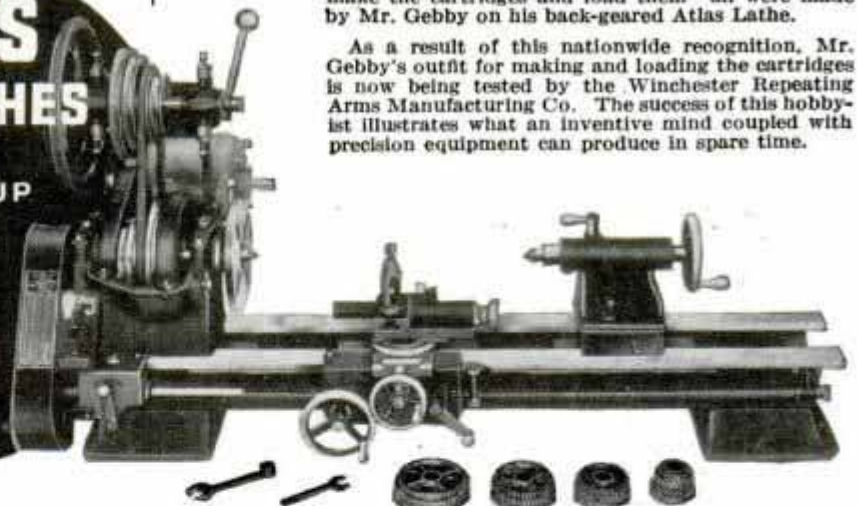


I. E. Gebby, gun hobbyist of Cincinnati, is making national news in firearm circles with a new rifle he designed and turned out on his Atlas Lathe.

In the November number of the American Rifleman, organ of the National Rifle Association, appeared a detailed story of Mr. Gebby's achievement. The rifle—barrel, front and rear sights, ramp, cover, even the cartridges used in the gun and the tools to make the cartridges and load them—all were made by Mr. Gebby on his back-gear Atlas Lathe.

As a result of this nationwide recognition, Mr. Gebby's outfit for making and loading the cartridges is now being tested by the Winchester Repeating Arms Manufacturing Co. The success of this hobbyist illustrates what an inventive mind coupled with precision equipment can produce in spare time.

ATLAS METAL LATHES
 FROM **\$54.75** UP
 LESS MOTOR
 BACK-GEARED
 MODELS START AT **\$82.50**



Here it is. The Atlas Back-Geared screw-cutting lathe—the lathe that will easily handle all your jobs—unquestionably today's biggest lathe value. Has automatic reversible power feeds—cuts 4 to 72 threads per inch, self contained counter shaft and motor bracket, V-belt drive, threading dial and many other exceptional features that are supplied as standard equipment. The accurately ground bed is 36"

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 Kindly send me the new 1936 Atlas Catalog of Lathes, Drill Presses, and Tools.

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5 ft. Flying Scale Models \$1

- 1/3 size of real planes
- 5 ft. Monocoupe (Illustrated)
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Build planes that are actually one-third the size of real passenger carrying planes! Send today for our new Giant Models—each a strong outdoor flyer—a \$10 value for only \$1. Everything is in the kit—including all liquids—nothing else to buy. Each of these G. H. Q. Giant 5 ft. model planes contains Full-size Plans, all ribs, formers and curved parts clearly printed on best grade Balsa. Complete with LARGE BOTTLES CEMENT AND DOPE, different colors Japanese Tissue, Special Endurance Rubber, finished Ready-Cut 3" Wheels, Wire, Balsa strips cut to size, Washers and Movable Controls, shock-proof Landing Gear, Scale Details, Lettering, Numbering and Insignias, Flight Log, etc. FREE information about our line of model airplanes priced from 10c to \$1.

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G. H. Q. MODEL AIRPLANE CO.

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Fits in any small pocket easily. Weighs only 4 ozs. as shown. Comes in four beautiful colors (Black, Blue, Brown, Silver). NO tubes, batteries, or electrical connections needed! Nothing to wear or need replacement—will last for years—only one moving part! Separate and re-tune broadcast stations with beautiful clear tone.

Range up to 50 miles—MUCH GREATER under good conditions—very little static or interference! Can be used by ANYONE ANYWHERE! NO CRYSTALS TO ADJUST! Absolutely complete with midget phone and instructions to use while in bed, hotels, at home, autos, offices, camps, on bicycles or any place you may be. No complicated or messy hookups—takes only a second to connect! THOUSANDS OF SATISFIED OWNERS. THESE ARE FACTS. Send only \$1.00 and pay postman \$1.99 plus postage on arrival or send \$2.99 (Cash, Money Order, Check). Ideal Gift. (Quaranteed. State Color. ORDER NOW!)

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MAKE \$30 TO \$40 A WEEK

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Makes old, dull lawnmowers cut like new. Mowers run easier, stay sharp longer—customers come back year after year. Start right at home. Attach the Ideal to your lamp socket. Sharpens any make of mower in 15 to 20 minutes—you get \$1.00 to \$1.50. Attachments for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc.

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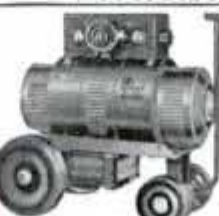
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ONLY \$10 MONTHLY
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EASY MONTHLY TERMS
You can earn \$300 to \$400 monthly profit on garage and general repair work with Simplified Arc Welding. No special experience required. Electric, gas engine or belt drive. 30 Days Trial—at our expense to prove its profit making ability. Write for details.



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Big profits washing cars. Saves two-thirds time, does better job. Savings pay for it. Tear out and mail this ad, checking items of interest to
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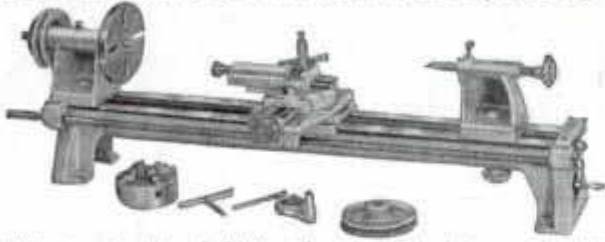
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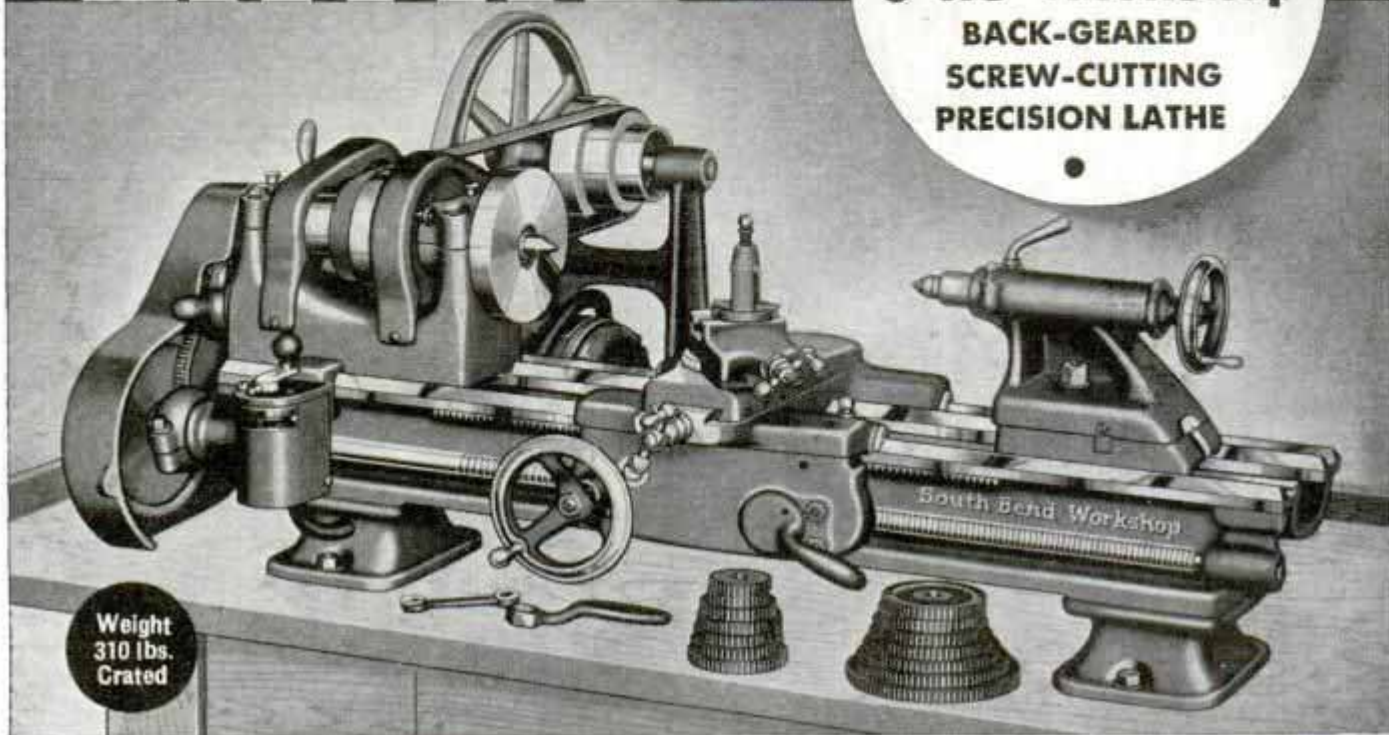
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