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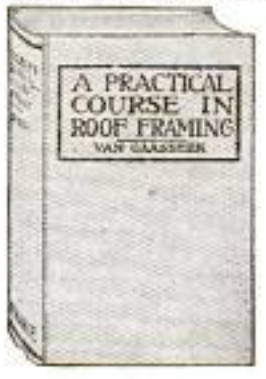

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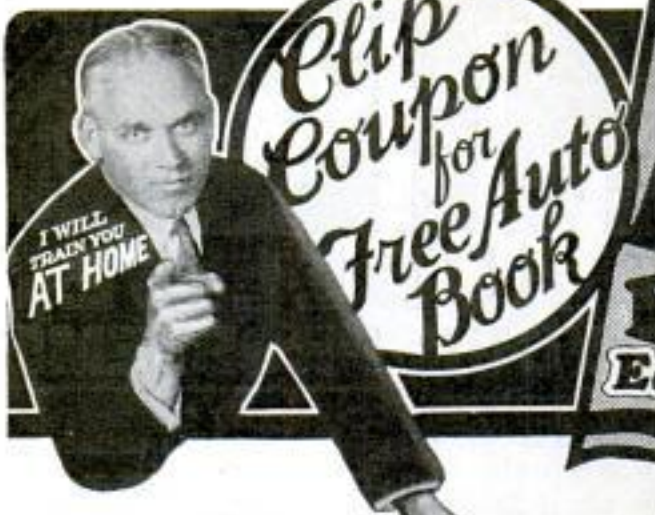

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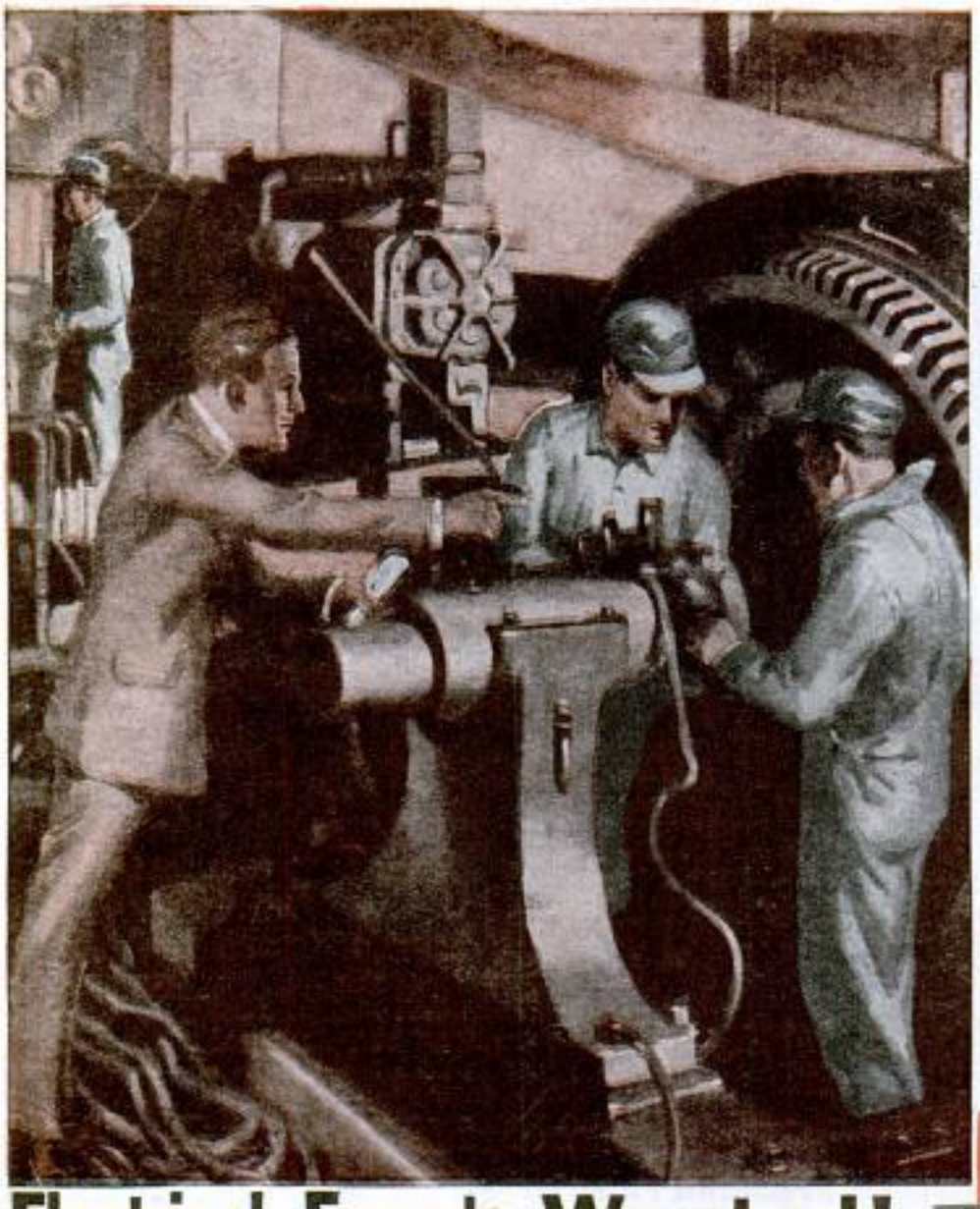

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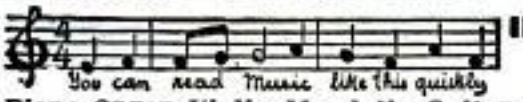

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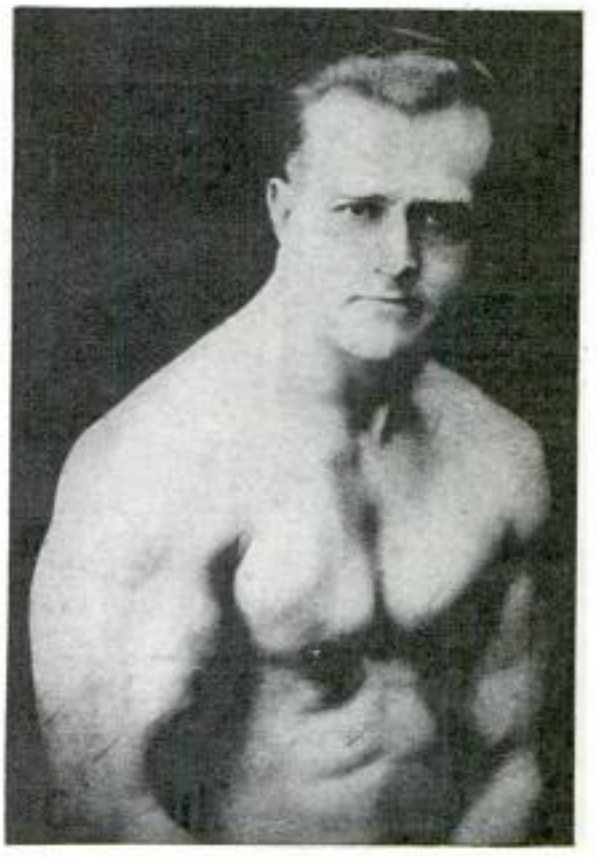

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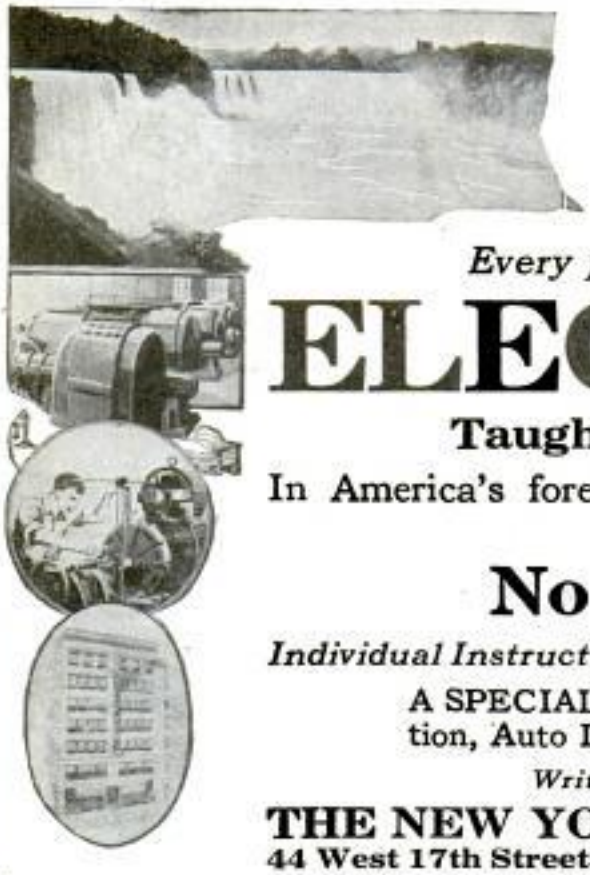

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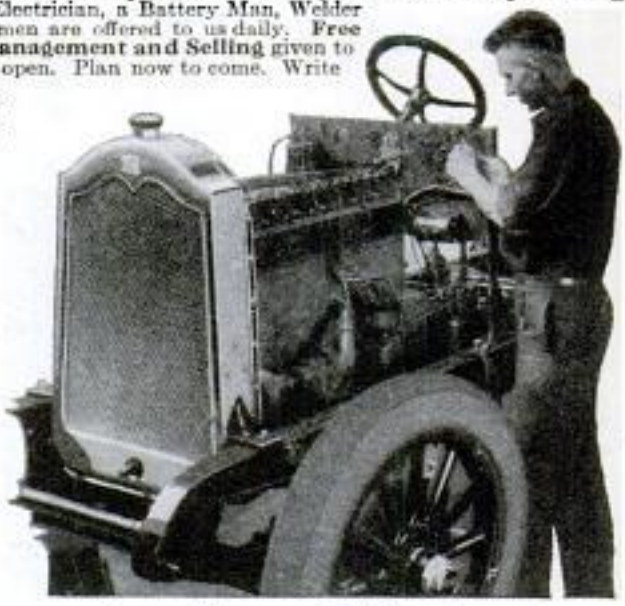

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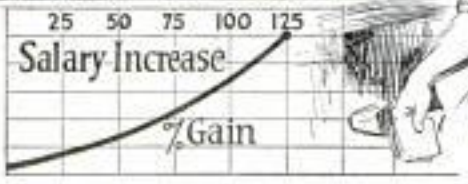

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OPTEX — Perfect Eyeglass Polishing Cloth. In Beautiful Leather Holder. Agents Making Big Money. Amazing Sales at 25c. Send Dime for One. Robinson and Powers, Reading, Mass.

AGENTS—Sell the wonderful new chemically treated, glass cleaning and polishing cloth, cheaper, quicker and better than chamois or cleaning compounds. New York department stores now using it for showcases and mirrors. Big seller, steady repeats. 35 cents, 20 cents profit. Send 15 cents for convincing sample. Albapol Distributors, 52 Vanderbilt Avenue, New York.

ORIENTAL Perfumes bring 100% net profit. Good sellers and better repeaters. Romoda Parfumerie, Inc., Woodlawn 10, Chicago.

AGENTS—Write for Free Samples. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn $100 weekly and bonus. Madison Mfgrs, 511 Broadway, New York.

AGENTS: Big Money Monogramming by Transfer Method. Catalog Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

INSTANT Weld. Repairs largest punctures without cement or heat. Lem's profit one day, $56. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T, Minneapolis, Minn.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-D North Clark, Chicago.

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ARE You the Man? Can you sell $40 All-Wool Suits and Overcoats for $23.50? If you can, my line will pay you $50 a week for spare-time up to $100 a week for full time. I supply everything free. Big Sample Outfit. Men's and boy's suits. Your commission paid in advance. No delivery or collecting. To secure this money-making opportunity you must state experience if any, territory you will cover regularly, and two references. Orders waiting from old customers, so hurry! Dept. CC-13, John G. Longworth & Sons, 1301 W. Congress St., Chicago.

I WANT a Partner-Agent to take care of my business in your town. I furnish everything including the world's finest line of 175 household products, and split the total selling price with you 50-50. Beautiful sample outfit makes selling easy. Toilet Preparations, Food Products, etc. Highest quality—lowest prices—quick sales—permanent repeat business. I pay largest commissions in this line and offer free Chrysler or Hudson Coach besides. Get my amazing offer quick. Address me personally. Sidney F. Mills, Director of Sales, Health-o-Products Co., Dept. FF-106, 117 Duane St., Cincinnati, Ohio.

BUILD splendid business making chipped glass number and name plates, signs, medallions. Write for particulars. Simplex Utility Co., 1123 Broadway, New York.

AGENTS—Men or women—clean up hundreds of dollars. New Perfection Clothes Line Reel! 7 out of 10 buy on quick demonstration. Simple, strong, neat, practical. Always works. Puts up tight line in a jiffy and holds it taut. Made from auto body sheet steel, polished finish. Greatest invention in years to make wash day easier. Women delighted. Just what they have been wanting. Write quick. Niagara Mfg. Co., 918 Main St., Lucas, Ohio.

AGENTS. Boys, Girls, make $10.00 selling biggest toilet Shampoo Soap deal in the world. $1.00 dozen, large Turkish bath towel free. Henry Moritz, 1969 West 77th, Cleveland, Ohio.

10c PUTS your name on mailing list year. Hundreds latest money makers from manufacturers, wholesalers. Kentucky Agency, Covington, Ky.

ADVERTISING in all magazines and newspapers at publisher's lowest rates. Rate Book free. Taylor's Advertising Service, Dept. F, Freeport, Ill.

AGENTS! At last! Mason fruit-jar opener that opens 'em; Easily, satisfactorily. Sample 15 cents. Jiffy Opener Company, Bay City, Mich.

$15 DAILY easy—Your Pay in Advance—Introducing New Insured Hosiery. Must wear or replaced free. No capital or experience required. Just show samples. Write orders. Samples furnished. All colors, grades, including silks. Macochee Textile Company, Station 5869, Cincinnati, Ohio.

NEW Specialty costs 3c, sells for 15c. 30 Other Big Profit Sellers. Agents' Outfit free. Write quick. General Products Co., Dept. 7-D, Newark, N. J.

NEW Plan for Agents: Goods supplied on credit. Big line. Fine outfit free. No money needed. Write quick. Blair Laboratories, Dept. 54, Lynchburg, Va.

EMBOSSED Display Signs Mean Big Money, and independence for you. Sell every merchant. Make 250% profit. This proposition is different. Write and see why. Artistic Sign Works, 799 Broadway, New York.

EVERYBODY Buys Davis' Nifty Toilet Goods Assortments. Useful, handsome gifts free to our customers. Over 250 high quality products. All repeaters. 100% profit. 25 years of success. Write! Davis Products Co., Dept. 56, Chicago.

AGENTS: No experience; Making $100 week. Gold Leaf Window Letters and Script. Consolidated Company, 636 South Dearborn, Chicago.

GENERAL Distributors, Agents, Salesmen, wanted for quick-selling automobile specialty; can average $75.00 to $100.00 weekly, selling direct, to the trade, thru subagents; lifetime opportunity for men looking for A No. 1 sales proposition; permanent business that yields results right from the start. Free folder explains. Atkinson Co., Mfgrs., Cynthiana, Ky.

MANUFACTURER'S Agents and Salesmen to sell Spray Finishing Equipments to Factories — Public Institutions — Garages—Paint Contractors. Factory established 20 years. Four Factory Branches—National Distribution. Big Financial Rating. Ask any Banker. Pauche Air Brush Co., 1900 Diversey Blvd., Chicago, Ill.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for Free Book "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, 5895 Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 156 and 157.

ARE you old at forty? See our advertisement on page 162 of this issue. The Electro Thermal Company, 2137 Main St., Steubenville, Ohio.

AGENTS: It's a winner. Combined cigarette and match case. Sells on sight to cigarette users and dealers. Write for particulars. All-In-One, 1931 Park Ave., Minneapolis, Minn.

MY "Photo Art Rings" sell on sight. 50c brings sample and proposition which protects you from any financial loss. Satisfaction Guaranteed. Russell Johnson, Clarkfield, Minn.

AGENTS, handle our fast-selling household necessities. Wonderful opportunity for hustlers. Russo, 3011 Bronxwood Avenue, New York.

AGENTS—Specialty Men: Big profit; quick sales; big repeater. Tompson Stropper strops any Safety Blade perfectly. Old-fashioned stroke. Complete outfit includes steel Stropper, Strop, Hanger. Sells for $1.00. If you mean business, write for special Proposition. Tompson Stropper Co., 306 Coca Cola Bldg., Kansas City, Mo.

$25.00 REWARD for any Corn Great Christopher Positive Corn Cure cannot remove. Good for Warts, Bunions, Moles, Callouses. Price 35c. Sell Reliable Hair Food for Dandruff, Itching Scalp, Falling Hair and Premature Grayness. Absolutely guaranteed to grow hair. Price $1.00. Agents wanted. Reliable Specialty Corporation, Buffalo, N. Y.

YOUR photo on Novelties. Black (42), 844-B West 17th, Los Angeles.

FREE Booklet describes 52 plans for making $20.00 to $100.00 weekly in home or office business of your own. Downs Co., 2323A Myrtle, St. Paul, Minn.

YOU Can Make Good Durable Paint and Varnish 40c per gallon. Write Dept. 2, Emmelmann Bros. Mfg. Co., Indianapolis, Ind.

SCIENTIFIC Gas Saver. All autos. 1 free to introduce. Critchlow, M121, Wheaton, Ill.

AGENTS—Don't Risk 1c; Sell Franklin Better Food Specialties to regular customers. Money-making plan free. Franklin Products, 107 Weston, Clinton, Iowa.

MANUFACTURE neck shaving guards, low cost, tools you have, every home a prospect. Sample fifty cents. Big profit. W. C. Bridges, 528 Mulberry, Muscatine, Iowa.

EXCLUSIVE territory to live wires for distributing circulars of newly invented necessities and getting orders. American Necessities Distributors, 302 Broadway, New York City.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147 New Jersey Ave., Brooklyn, N. Y.

AGENTS—$60 to $200 weekly putting up our Burnished Genuine Gold window letters; scripts. Experience unnecessary. Free samples. Premier Letter Co., 121 N. Franciscl, Chicago.

WE'LL make a classy suit for well dressed man over 25 who will wear and show to friends and help us introduce. Write for order blanks, etc. Chicago Tailors' Ass'n, Dept. 699, Sta. C, Chicago.

AGENTS—good, steady income. Exceptionally useful household article. The Handyrap Company, Newark, N. J.

WONDERFUL! Startling! Amazing! Our Ex-Cel Luminous Crucifix and Magical (Luminous) Necklace shine brilliantly in the dark. Sell on first demonstration. Big profits to you. Write for further particulars, or better still, send for sample and territory protection immediately. Crucifix $1.50, Necklace $1.00, postpaid. W. G. Hannan Co., Dept. B, 2589 So. State St., Chicago.

GREATEST temper-saving device! Takes slack and kinks from telephone and electric iron cords. $25 daily. Samples on approval if requested. Neverknot, Dept. 91, McClurg Bldg., Chicago.

IMPORT Your Own Goods. Big German Export Magazine printed English offers thousands bargains. Products low priced, no competition. Sample copy 50c. P. Abea Specialty Co., 263 Fifth Ave., New York.

AGENTS and Salesmen who are willing to apply themselves and make 15 to 20 calls daily can easily earn $10 to $20 every six working hours. The line is attractive and the business pleasant. Every home, every office, every factory or place where many are employed furnishes your customers and the opportunity for numerous sales. Your profits are about 400% and the orders rapidly run into money. We give you complete cooperation and prompt service. Even those without previous selling experience succeed beyond their fondest dreams. We want to send you full particulars and simply ask your name. A postal will do. Write at once to Perry Novelty Corporation, Desk X-11, 1793 Jerome Avenue, New York City.

WILLIAMS' No-Water Hand Soap., in tubes, has taken Auto owners by storm; washes dirtiest hands perfectly clean without water; easy demonstration makes quick sale. 150% profit. Williams Co., Dept. 265, Montclair, N. J.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

MAKE $25 to $50 Week, representing Clow's Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 31, Philadelphia, Pa.

$300 FIRST Two Weeks—made by Weigand, Johnstown, Pa., selling "Slide-O-Graf Jr." Novel, effective—sidewalk advertisement projector. Sells fast, big non-competitive field. $14 Profit every sale. Standard Slide Corp., 207 W. 48th St., New York.

LIVE Agents Make $10 Day selling Eureka Strainer and Splash Preventer for every water faucet. Takes on sight. Widely advertised and known. Get details today. A. B. Seed Filter & Mfg. Company, 73 Franklin, New York.

IF you want to control the greatest sell-success to homes in years, write quick. Tremendous repeater. Quick money. Juvenile Outfitting Company, 716 Market Street, Philadelphia, Pa.

SELL the Livest, Quickest Selling Specialties Ever Known—Famous "Hahway" self-lighting pocket Cigar Lighters and Gas Lighters. Low Prices. Easily Demonstrated. Sell to Dealers. Employ Sub Agents. Exclusive Territory. Make over 100% Profit. P. Bernhardt, 148 Chambers Street, New York.

EARN big money fast applying gold initials to autos. Every owner buys—$1.35 profit on $1.50 sale—particulars and samples free. Write quick. Lithogram Co., Dept. 17, East Orange, N. J.

ONLY one sale a day means $200 per month! Marvelous new adding machine. Retails $15.00. Work equals $350 machine. Adds, subtracts, multiplies, divides, automatically. Computes feet and inches. Speedy, accurate, durable, handsome. Five-year guarantee. Offices, Stores, factories, garages, lumbermen buy one to dozen. A fortune for live agents. Write quick for protected territory and free trial. Lightning Calculator Co., Dept. F, Grand Rapids, Mich.

BIG Profits, New $3.50 Automatic Adding Machine. Quick Sales. No competition. Ten daily easy. Absolutely accurate. Fully guaranteed. Pocket size. Business people everywhere positive customers. Exclusive territory to workers. Act quick. Bassett Company, 1458-H Hollywood Ave., Chicago.

SELL Lightbrite Electric Signs. They make you big money. We finance you. Price kills competition. Write for information. Modern Sign Co., Inc., 5721 Woodward Ave., Detroit, Mich.

AGENTS sell Minitmend for tires and tubes. Every auto owner buys when demonstrated. Costs 2c repair, saving 600%. Superior to vulcanizing. Amazing profits and repeat sales. Hart made $85.00 first week. Particulars and free sample. Colonial Rubber Co., Dept. 17, Philadelphia, Pa.

AUTO owner tire agent wanted each locality to use and take orders for handmade Mellinger fabric and cord tires; guarantee bond 8,000 and 12,000 miles (no seconds); shipped prepaid on approval; get your tires free; no capital or experience required; make $100 to $300 weekly. Write for wholesale prices and sample kit. Address, Mellinger Tire Co., Dept. 300, Kansas City, Mo. or Dept. 300, Philadelphia, Pa.

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AGENTS—At Last a Practical Fire Alarm for the Home. The Automatic Fire Alarm Rings Door Bell when Fire gets near it. So simple anyone can install. $1.00 brings one with instructions. Automatic Fire Alarm Co., Box 193, Duluth, Minn.

AMERICAN Woolen Mills Co., Dept. 6041, Chicago, are making a free suit for one agent in each community to introduce their fine tailored to order suits at $18 and up. Write them today for their offer.

AGENTS—Make $75 to $100 a Week. "Pixit" Rubber Repair Seals punctures and blowouts. Sample free. Marquette Rubber Company, 2325BB Wolfram St., Chicago.

NEW camera takes and finishes photos in one minute. Make money selling cameras or taking photos. Exclusive territory. Crown Co., Dept. 951, Norwalk, Conn.

NEW Marvelous Discovery "Bestever Powdered Hand Soap" Works like Magic. Removes grease, grime paint, stains without harm to hands. Sells like wildfire to Stores, Factories, Garages. Quick Repeater. "Sample Free." Write immediately. Bestever Products Co., 1945 E. Irving Park, Chicago.

$20 DAILY—Newly patented specialties; Beauty Outfits; big sellers, repeats. L. A. Seymour, 263 Fifth Ave., New York.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404, Amsterdam, N. Y.

MOST Wonderful Seller. 96c Profit every dollar. No stock to carry. License unnecessary. Sample free. Mission Factory PM, 519 No. Halsted, Chicago, Ill.

WONDERFUL Vapor Humidifier for autos. 1 free to introduce. Critchlow, X121, Wheaton, Ill.

$20 PROFIT daily selling self-threading needles, needlebooks; cost 3-5c each; sell 25c; three samples 25c. Catalog free. Needlebook Specialty Co., 661 Broadway, New York.

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.

SELF-THREADING Needles, Needle Books, Machine needles, find sales in every home. Fine side lines, easily carried, big profits, sample and catalogues free. Prentice Lee, 145 East 23rd St., New York.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds jewelry world and deceives experts! Beautiful Sample case Free! $100 weekly! Write Quick! Rajah Diamond Co., Dept. F-7, Salisbury, N. C.

YOU can be your own boss with our Key-Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

SOMETHING new—Presto Rubber Repair for tires, tubes; all rubber goods put on cold, no heat, acid or tools; vulcanizes itself in few minutes. Sells to auto owners and dealers, sample free. Pioneer Products Co., Den't A, Roebling, N. J.

EVERYBODY Needs and Buys the "Business Guide." Wells cleared $1,150 in 55 days. Send for sample. It's Free. Nichols Co., Dept. 4B, Naperville, Ill.

AGENTS make 500% profit handling auto monograms, window letters, transfers, novelty signs. Catalog free. Hinton Co., 1153 N. Wells St., Chicago.

AGENTS—Double your income. Make sales in every home. Give away 50c premium every 50c sale, and still make 150% profit. Write today for free sample offer. Premier Mfg. Co., Dept. 813, Detroit, Mich.

SKAT Sales Agents Wanted. All or Part Time for Skat Hand Soap, Metal Polish, etc. Strictly Commission. The Skat Company, Hartford, Conn.

NEW Marvelous Self-lighting Gas lighter. Sells on demonstration. Sample 25c. Gross $10. Rapid Mfg. Co., 799a Broadway, New York.

SELL Books by Mail! Big Profits! Particulars Free! Elfco, 523 S. Dearborn, Chicago.

AGENTS, Distributors, Crew Men average $60-$100 with Harker Products; 10c brings sample of leader; money back if you wish; free folder shows how to start small and grow big. Act; Send today; big surprise awaits you. Harker Co., Bridgeport, Conn.

200% PROFIT selling Gem kettle bottoms. "The article with a dozen uses." Housekeepers buy on sight. Columbia Specialty Co., Box 73D, East Liverpool, Ohio.

MILLIONS lost by forgery. Wonderful new $5.00 Check Writer perforates, inks in three colors. Equals work of $60.00 machine. Five-year guarantee. Full or side line. Protected territory. Write quick for details and free trial. Safety Devices Corporation, Dept. P, Grand Rapids, Mich.

WANT distributing agent for Hanslick, powdered handsoap; removes anything from the hands without injury to skin; everybody a customer; great opportunity for hustler to get in business; sample free. Solar Products Co., G 124, West Lake, Chicago.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marut Company, Tribune Bldg., New York, N. Y.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 25c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 201, St. Louis.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stabrite Co., 1115 Second Ave., New York.

TO secure agents or salesmen or for selling (want) ads in largest newspapers and magazines. Price list No. 30 sent free. Ankrum Advertising Agency, 20 W. Jakson Blvd., Chicago, Ill. The largest classified advertising agency in the U. S.

WASH Clothes the new way. Use the Torrent Automatic Washer. You will be delighted. Special offer to one in each locality. Storm Royalty Co., 3610 Enright Ave., St. Louis, Mo.

A BUSINESS of Your Own—Make and Sell Chipped Glass Name and Number Plates, Checkerboards, Signs. Large Booklet Free. E. Palmer, 512, Wooster, Ohio.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Derma Co., Dept. A, St. Louis, Mo.

AGENTS: 500% profit. "Happy Home Maker Shampoo" builds your own big business. Martin of Indiana made $75.00 in one day. Missouri man made $750.00 one month. Exclusive territory. Geo. A. Schmidt & Co., 236 W. North Ave., Chicago.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

SELL Shirts and Overalls direct to wearer. Big profits. Work full or spare time. No experience required. Big variety dress shirts with splendid line Union-made work and flannel shirts, overalls, coveralls and khaki pants. Write today for free selling outfit. The Nimrod Shirt Co., Dept. S, 4712 N. Kedzie Ave., Chicago.

MAIL-ORDER Houses and Distributors; We pack French made beauty creams, face powders, perfumes, toilet preparations with your label. Chemist, 944A North Clark, Chicago.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Priscilla"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

Agents make $100 Week placing Advertising Cigar Lighters with glass front. Every dealer wants one. Average profit $25 each. Write for free plan. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

AGENTS Wanted to represent our guaranteed 100,000 mile puncture proof auto tire. Tire Demonstrator free. Write for particulars. Everlasting Tire Co., 6225 S. Halsted St., Chicago.

AGENTS $1. Retails $3. Your Profit $2. Wonderful, pocket Adding Machine with Magic Writing Pad. Particulars Free. Typewriter Supply, 905 Hersch Bldg., Pittsburgh, Pa.

IF you want good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. Geo. F. Baker, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

"HOW to Sell Patents" free. Patent News-O, Washington, D. C.

WHY work for others? Sell by mail. Let Uncle Sam work for you. Particulars Free. National Enterprises, Box 1174-PM, Omaha, Nebr.

"KKK" Sample pocketpiece 10c. Katalog Kluxer jewelry free. Agents wanted. Morris, Box 1174-PM, Omaha, Nebr.

MAKE $100 Weekly in Spare Time. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays $100 profit. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. Ozarka, 802 Washington Blvd., Chicago.

10,000,000 FORDS need "Greater Grip" Fan Belts. Big Profit selling Dealers. Write quick. Teuscher Belting Co., St. Louis.

EASY Money Applying Gold Initials, Monograms on automobiles. Anyone can do it. Simply transferred from paper; takes 5 minutes. Make $1.50, cost 5c. Samples free. "Raleo," 1043 Washington, Boston, Mass.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission Factory PM, 519 No. Halsted, Chicago, Ill.

CAN you sell to colored people? Write, Eaton Co., Dept. 101, 2500 Second Ave., Birmingham, Ala.

HIGH GRADE SALESMEN WANTED

SALESMEN — Get this big sensational, order-getting shirt outfit Free. Sell Stylemor Shirts all year round. It's Chicago's Wonder shirt line. Advanced fall showing of smartest, snappy patterns. Large double swatches, low prices, quick service, makes shirt selling easy. Bellard of Texas made $46.00 in two days. We deliver and collect. Write today for big free outfit. Stylemor, 81 W. Van Buren, Chicago, Ill., Dept. 650.

SALESMEN—Our Profit Sharing Plan makes big increase in your earnings on our high grade guaranteed shoe line at popular prices direct to wearer — sure repeaters. Liberal proposition. Working outfit free. Territory going fast. Big opportunity to build a business of your own. Write for particulars. Perry Shoe Company, 701 East Lake Street, Minneapolis, Minn.

SALESMEN for easy selling specialty, Beautiful Attractive, Appealing. Luminite Window Bulletin increases merchants' business 100% to 200%. Protected territory. Big Commission. Thousands being sold. Build yourself a big permanent business. Display Products Co., Ltd., 106 Gibraltar Bldg., Kansas City, Mo.

DISTRICT Salesmen: We want honest, dependable men to act as district representatives and take orders for our line of all-wool suits and overcoats all at one low price of $23.50. Our line is nationally advertised and so, easy to sell. We supply finest selling outfit, give thorough training and powerful co-operation. If you want greatest money-making opportunity in sales field today and can show us that you are reliable and responsible, let us hear from you. Address Dept. 578, William C. Bartlett, Inc., 850 W. Adams St., Chicago.

COUNTY Sales Managers, every state, appoint, control agents, take orders; new fast-selling Kiddie Play Suits made in Sunny California; sold to homes. No deliveries. Big season on. Sunkist Factories, Dept. D, Ontario, Calif.

SALESMEN—Earn $50 to $75 per week selling Lynx Golf Counters, every player a prospect. Write today for information. E. D. Claridge, Pelham, N. Y.

MANUFACTRER of new type, water, steam and heat proof fibre transmission and conveyor belting. Substitutes leather belt. Costs less. Want high grade salesman who can sell mills and factories a high grade necessity. Good and permanent income, repeats credited. Superspeed, 170 Summer St., Boston, Mass.

"SUCCESSFUL" Mail Order Business! Complete details—25c! Surety Service, 551 Harvard St., Rochester, N. Y.

$145.60 WEEKLY. Wonderful Vapor Humidifier for autos. 1 free to introduce. Critchlow, R121, Wheaton, Ill.

SALESMEN and Agents who will work can make from $50.00 to $100.00 weekly on an investment of only $2.75. Only high grade, energetic men having ability to sell office and business men will be given protected territory. For "go-getters" here's a real opportunity. Write Adamson & Co., 142 No. St. Clair, Toledo, Ohio.

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FREE selling outfit — substantial commission, bonuses and prizes. Make big money selling our tailored-to-measure suits and overcoats at $10 to $15 less than local tailors charge. Five prices that meet every purse—$18.50 to $36.50. Highest quality, all-wool, guaranteed, perfect fitting garments. 150 choice patterns. Absolute "no-pulling-out" hair cloth fronts. Positive 8-day service. Protected territory. Free advertising. Experience unnecessary—our Sales Manual tells you "how." Write us about yourself giving two business references for quick action. Wholesale Direct Tailors, Dept. 1201, Elliott St., Buffalo, N. Y.

SALESMEN—New invention retailing for 50c. Every Electricity User sure purchaser. Good repeater. Protected territory. Big Profits. Anning Mallar, 35 South Dearborn, Chicago.

OIL or Coal? "The Burning Question," interesting booklet, discusses high efficiency low-priced residence oil burners. Copy free. Write E. L. Miller, Manufacturer Climax Burners, 33 Climax Bldg., Kansas City, Mo.

SALESMEN using cars. New specialty; carry stock, sell deliver, collect. Sideline or mainline. Sell Hardware, Accessory, Merrantile, Notion. Burgan Co., 216 E. Ontario, Chicago.

SIDELINE Salesmen: 35c article, eliminate automobile accidents; big profits. Sample Free. French, No. 626 Buder Bldg., St. Louis, Mo.

BEST Seller. Jem Rubber Repair for tires and tubes; supersedes vulcanization at savings of over 800%; put it on cold; vulcanizes itself in two minutes; guaranteed to last life of tire or tube; sells to every auto owner and accessory dealer. Get particulars how to make big money and free sample. Amazon Rubber Co., Philadelphia, Pa. Dept. 510.

MAN, do you want a Permanent Profitable Business of your own Selling Men's and Boys' Ready-to-Wear All-Wool Suits and Overcoats? We undersell stores. Free outfit to reliable man. If High Quality, Low Price, Prompt Deliveries, and Service mean anything to you, write Henry W. High Company, 602, 306 S. Franklin St., Chicago.

$10.00 DAILY easy. We start you in auto accessory business. No investment, no experience necessary. Exclusive territory Victor Products Co., 1760 Lunt Ave., Chicago.

SALESMEN, $10.00 to $20.00 a day easy. No experience necessary. Big fall Shirt line now ready at prices to meet competition everywhere. Everything from work shirts to silk shirts, including latest plain and knitted bottom flannel shirts and blouses. 24 hour service. Wonderful opportunity spare or full time for live workers. Sheridan Shirt Co., 702-706 W. Roosevelt Road, Chicago, Dept. P-6.

MR. BRUSH Salesmen—Old established New York Brush Manufacturers require the services of men in all territories to sell their extensive line of Sanitary Twisted in Wire Brushes. We pay larger commission than any other Brush House in the country. Write immediately for our proposition. Wire Grip Sanitary Brush Corporation, 15 Mercer St., New York.

SALESMEN given protected territory to sell Doublewear Shoes direct from factory to wearer. Our new measure board insures perfect fitting. Write for particulars and list of open counties. Doublewear Shoe Co., Manufacturers, Minneapolis, Minn.

SALESMEN Wanted: Auto Key Purse. New Invention. Wonderful side-line. Low price, long life advertising specialty. Wide Awake Advertisers will use thousands. Commission 20%. Novelty Cutlery Co., 522 McGregor Ave., Canton, Ohio. Established 1879.

GO into Business for Yourself. Make storekeeper's profits without storekeeper's troubles and expenses. We'll show you how. In fact we'll put you into business, furnish everything you need to get started, teach and train you, carry all stock for you and all without the investment of a penny on your part. However, you must have selling experience or at least the ambition and desire to sell, and above all, you must have the willingness to work hard for success. If you have these, we'll take you and work with you until we've made you a success. We have done it with hundreds of others. We can do it for you—provided you are honest, willing to work hard and follow instructions. If you are, write us. You'll hear from us at once with facts. Address Dept. 785, Goodwear Chicago, Inc., 844 West Adams Street, Chicago.

A REAL Opportunity for Accessory Salesman. The manufacturer of a unique Timer for Fords that retailed for $3.95, decided to concentrate on another product and sold us the entire manufactured stock. You can make money selling this well advertised and favorably known timer to your owner customers at a price less than the regular dealers paid. The supply is limited. If you want your share, act quickly. $2.00 Brings Sample, Full Details, and Special Prices. Accessory Products Company, Box 39, Indianapolis, Ind.

SALESMEN—Four Square Suits reduced to $9.99. Same deposit. Four patterns. Guaranteed two years. Write quick for free outfit. Stone-Field, JA 2354 Wabash, Chicago.

SALEMAN: If You Think in Terms of $6,000 the First Year, Write Me. Strong line for retail stores. Nationally advertised. Established concern has unusual opportunity. Liberal weekly advance to producer. Geo. R. Williams, 1922 Euclid Avenue, Cleveland, Ohio. Dept. 200.

SELL Personal Christmas Cards. Big Commissions. Priced to meet competition. Outfit free. Send references. Greeting Card Shop, 160 N. Wells St., Chicago, Ill.

$100—$200 WEEKLY. Men with slight knowledge of motors who can reach car owners can earn $200 weekly without making a single sale. If they can also make sales, profits may reach $15,000 yearly. W. Y. Phillips, 235 West 27th St., New York.

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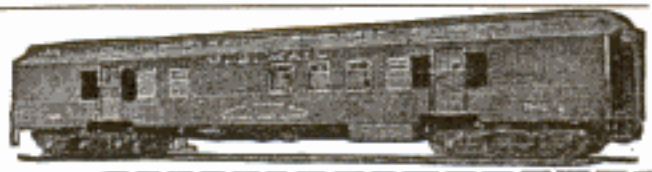

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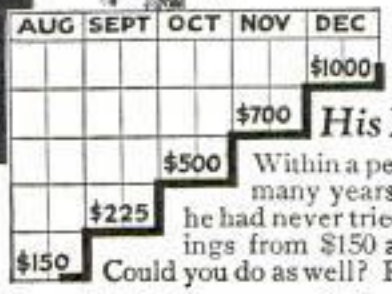
$12,000 a Year in December



With or without previous experience, Salesmanship offers you a field of unlimited opportunity

For Years a Letter Carrier, at $1,800 a Year—in Five Months $12,000 a Year

His Experience May be Yours

Within a period of six months, J. J. Graney, for many years a letter carrier, stepped into a field he had never tried, made good, and boosted his earnings from $150 a month to around $1,000 a month. Could you do as well? Read in the paragraphs that follow—

How J. J. Graney Climbed to Success by
The LaSalle Salary-Doubling Plan

J. J. Graney had never sold goods in his life. He was a letter carrier earning top pay of $1,800 a year. He determined to quit—and turned to LaSalle for help. Before he had completed his sixth assignment of the LaSalle course in Modern Salesmanship, he tackled the job of selling real estate in a rapidly developing suburban district. The first month he made $225; the second month $500; the third month $700; and in a letter to LaSalle he writes—"The present month I expect to earn more than $1,000."

S. N. Williams, a Kentucky man, was actually in the selling field, but not doing as well as he wished to do. He, also, turned to LaSalle for help. "My salary was practically doubled a short time ago," he writes, "but my greatest satisfaction comes from knowing that the amount of business I have written this year is easily five times greater than before."

When are *you* going to give yourself the chance in this world that you're entitled to? Isn't it better to follow a clearly-defined and well-organized *plan* which you *know* will lead you to greater and greater earnings than to trust your advancement to day-to-day experience—missing opportunity after opportunity, just because you have never mastered the art of selling?

Whether or not you have had sales experience—that is not important, The point is that any man of average intelligence who will follow the LaSalle *salary-doubling plan* can quickly multiply his earnings. And this fact applies with doubled force to the man now in the field who is sincerely striving to increase his volume, to really *sell* in dozens of places which he now is forced to leave without an order.

The complete story of the LaSalle *salary-doubling plan* which thousands of men have followed with such gratifying results is outlined in a fascinating book entitled "Modern Salesmanship." This book tells clearly of the opportunities in the selling field—points the way to a quick mastery of the very methods whereby the big producers top the list year after year, earn big five-figure salaries. The information contained in this book is of priceless value to the man seriously ambitious to make a real success in the selling field. And—the coupon brings it to you *free.*

If your future is worth a two-cent stamp and two minutes of your time—place the coupon in the mail TODAY.

LASALLE EXTENSION UNIVERSITY
The World's Largest Business Training Institution

Dept. 964-SR **CHICAGO**

Please tell me about your *salary-doubling plan* as applied to my advancement in the business field checked below. Send also copy of "Ten Years' Promotion in One," all without obligation.

☐ **Modern Salesmanship**

☐ Business Management
☐ Higher Accountancy
☐ Law: Degree of LL. B.
☐ Traffic Management
☐ Railway Station Management
☐ Commercial Law
☐ Industrial Management Efficiency
☐ Banking and Finance
☐ Modern Business Correspondence and Practice
☐ Modern Foremanship and Production Methods
☐ Personnel and Employment Management
☐ Expert Bookkeeping
☐ Business English
☐ Commercial Spanish
☐ Effective Speaking
☐ C. P. A. Coaching

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NEW!

No. 486 Eveready Layerbilt "B" Battery. 45 volts. Length, 8 3/16 inches. Width, 4 7/16 inches. Height, 7 3/16 inches. Weight, 14¼ pounds. Price, $5.50.

The greatest improvement

ABSOLUTELY new in construction—perfected through years of research, the new Eveready Layerbilt "B" Battery is as superior to the old type as a tube set is to a crystal.

Heretofore, all dry "B" Batteries have been made up of cylindrical cells—no one knew how to make them any other way. The new Eveready Layerbilt is made of *flat* layers of current-producing elements compressed one against another, so that every cubic inch inside the battery case is completely filled with electricity-producing material. Layer-building heightens efficiency by increasing the area of zinc plate and the quantity of active chemicals to which the plate is exposed.

After the most rigid laboratory tests, more than 30,000 of these new Eveready Layerbilt "B" Batteries were manufactured and tested by use under actual home receiving conditions. These tests proved that this new battery is far superior to the famous Eveready Heavy-duty Battery No. 770, which up to now we have ranked as the longest lived "B" Battery obtainable.

On 4-tube sets, 16 mil drain, it lasts 35% longer.

On 5-tube sets, 20 mil drain, it lasts 38% longer.

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Radically different!

It's all battery. With every cubic inch packed to capacity, it contains about 30 per cent more electricity-producing material. All chance of loose or broken connections avoided by contact of full area of carbon plate against zinc plate. The scientifically correct construction.

ever made in "B" Batteries

On 6-tube sets, 24 mil drain, it lasts 41% longer.

On 8-tube sets, 30 mil drain, it lasts 52% longer.

The new Layerbilt principle is such an enormous stride forward in radio battery economy that we will bring out new sizes and numbers in this Layerbilt form as fast as new machinery is installed. For the present, only the extra-large 45-volt size will be available.

Buy this new Eveready Layerbilt No. 486 for heavy drain service. It far exceeds the performance for which Eveready Radio Batteries always have been famous and is, we believe, by far the most economical source of "B" current obtainable.

Manufactured and guaranteed by
NATIONAL CARBON CO., Inc.
New York San Francisco
Canadian National Carbon Co., Limited
Toronto, Ontario

EVEREADY HOUR
EVERY TUESDAY *at* **8 P. M.**
(Eastern Standard Time)
Beginning September 29th, 9 P. M.
(Eastern Standard Time)
For real radio enjoyment, tune in the "Eveready Group." Broadcast through stations—

WEAF	New York	WEAR	Cleveland
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WEEI	Boston	WWJ	Detroit
WFI	Philadelphia	WCCO	Minneapolis & St. Paul
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EVEREADY
Radio Batteries
–they last longer

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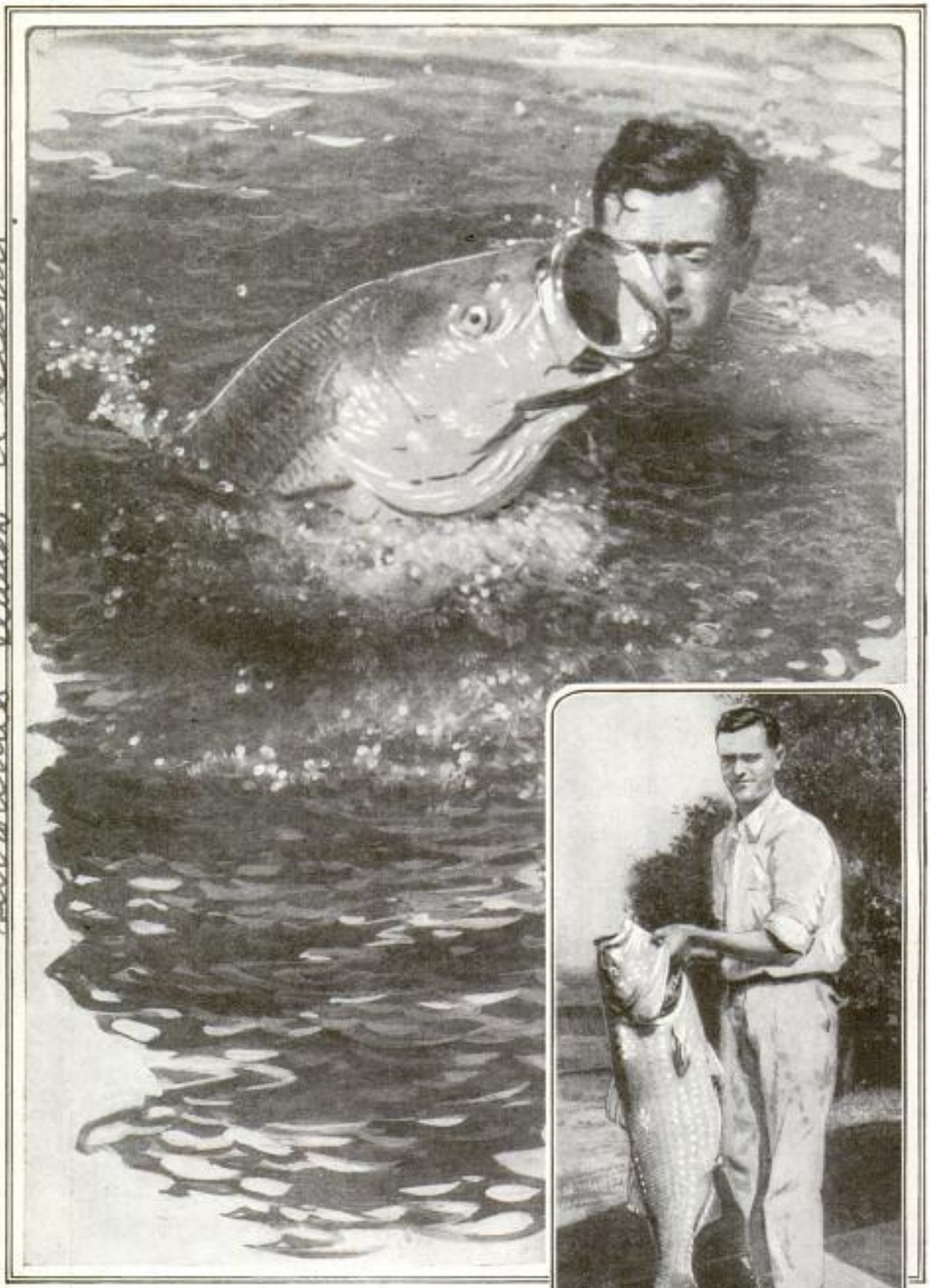

Failing to Land This Forty-Four-Pound Deep-Sea Bass after a Hard Battle with Hook and Line, a California Fisherman Dived Overboard and Wrestled the Big Fish into Submission in a Furious Fifteen-Minute "Hand to Fin" Fight in Which He Was Nearly Knocked Out

a. Holland Lutton, with montezuma sheepshead which surrounded Lutton & Holland.

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Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 44 SEPTEMBER, 1925 No. 3

Fingerprints Lie? YES, Science Answers

FINGERPRINTS, supposed to be an infallible means of identification, since no two persons ever leave prints exactly alike, are in fact susceptible to forgery and fraud. The first man to succeed in reproducing a forged finger mark, Milton Carlson of Los Angeles, has won fame by analyzing handwriting, typewriting, finger marks and other written or imprinted records whose genuineness is in question.

Armed with a laboratory full of microscopes and measuring instruments and a battery of enlarging cameras and photographic apparatus, he has upset some of the most carefully constructed legal cases in recent years. The handwriting of any individual, he declares, betrays not only the man's character but the mood he was in when he wrote, whether calm, frightened or angry, and under his expert analysis, using greatly enlarged photographs which magnify the original many thousands of times, he has proved his point, at least to the satisfaction of various juries. In a sensational manslaughter case on the coast some years ago, the

Milton Carlson, with His Microscope and Delicate Measuring Instruments, Examining a Forged Power of Attorney Which Convicted a Man of Murder

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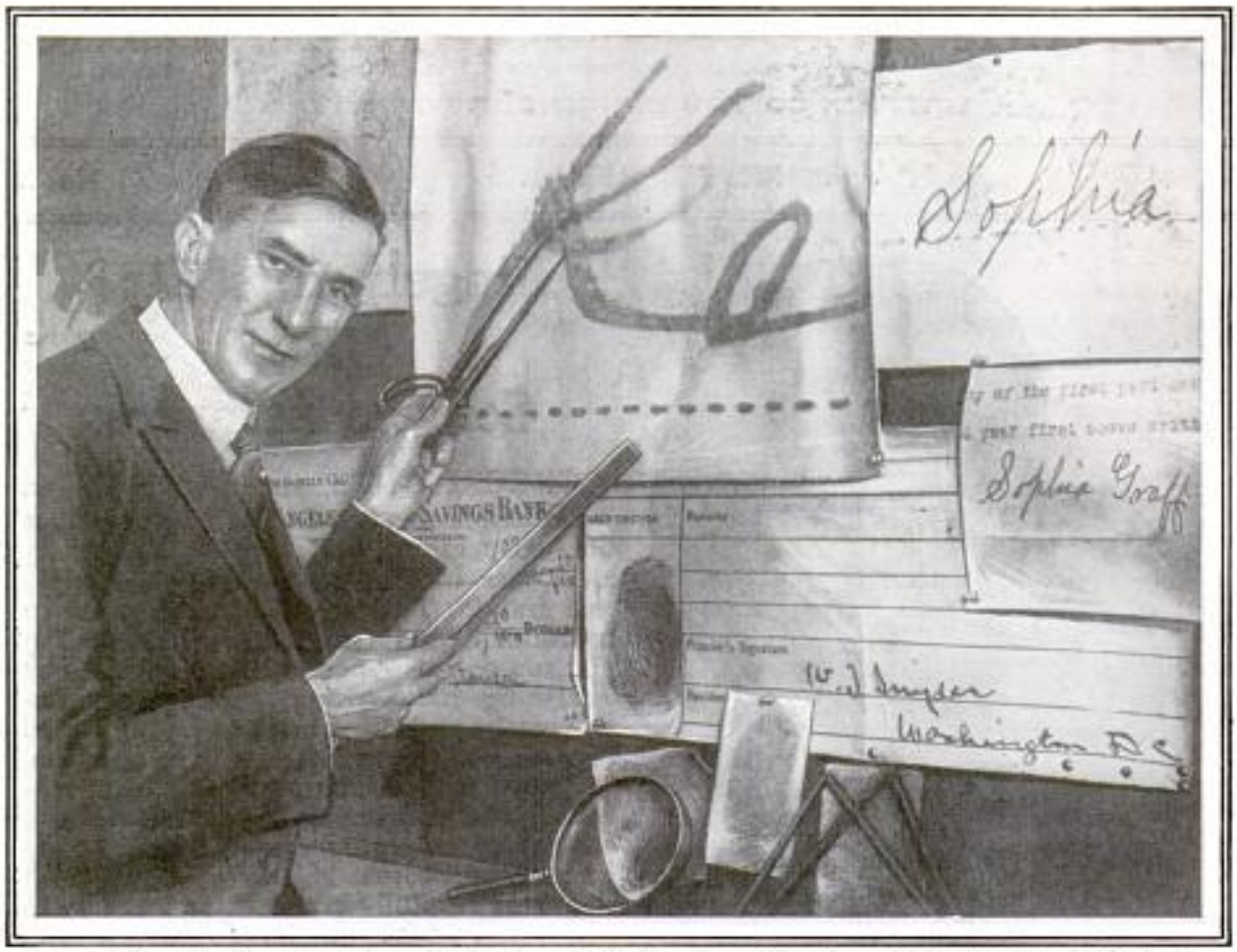

Forger's Error in Beginning Upper Right Line of "K" Too Low Was Corrected by Washing It Out with Acid, But by Same Process Carlson Brings It Back Again

state's prosecution was based largely on fingerprints left on a hotel door, and claimed to represent the prints made by a man and woman in a death struggle. Carlson demonstrated in court that a smudgy print supposed to be the hand of the man defendant was actually made by the skin of some third person, and therefore could not have been a part of any death struggle. The defendant was eventually acquitted.

Given one fingerprint, he has shown that it is possible to reproduce it as easily as a signature is reproduced with a facsimile rubber stamp, opening a new field to forgery. Use of finger marks in witnessing wills and other legal documents, Carlson also claims, would open the door to endless fraud, since a fingerprint could be stolen from the person owning the finger while he was asleep, unconscious, or even after death.

A handwritten signature is far better evidence of genuineness than the writer's finger mark, Carlson asserts, since the forger may be tripped up by an expert analysis of his writing, the pen marks left in the paper, the paper itself, and even the surface on which the paper was supposed to have rested while the writing was being done. In one case he produced a greatly magnified photograph of the table surface to show that it was entirely too rough to have permitted writing with a pen on a thin sheet of paper in the manner claimed by the witness.

Even the best forgers can never produce an absolute facsimile of a signature. No person ever signs his name exactly the same twice, but his formation of letters and other characteristics are sufficient, under expert analysis, to stamp the genuine and expose the false. In one famous case Carlson testified that the opinion of an expert as to the genuineness of a signature or other writing was superior even to that of the person who did the writing.

"Do you mean to say that you know more about my handwriting than I do?" the attorney questioning him asked.

"I have said," Carlson answered, "that the opinion of an expert is frequently of more weight than the opinion of the person who wrote the questioned writing."

The attorney passed on to other questions, but shortly after produced a piece of paper on which there appeared a number of sentences in seemingly different

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Photo-Micrograph of Table Top Proves Fine Pen Could Not Produce Smooth Lines on Paper Resting on It

Carlson with Knife on Which He Forged Fingerprints in Blood to Prove the Identification System Is Not Infallible; Left, Enlargement of a Love Letter That Betrays the Author

Genuine Signature and Forged One, Superimposed to Show Differences; This Forgery Convicted a Man of Murder Despite the Fact the Dead Body of the Victim Never Was Produced

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Carlson with the Newest and Latest Micrometer Attached to a Miscroscope for Delicate Measurements

Police Fingerprint Identification Card, and, Below, Various Signatures of the Same Man, Showing How One's Writing Varies Until Only an Expert Can Determine the Genuine

handwritings and asked the expert to tell how many people did the writing and how many pens were used. Carlson asked time to examine it under his microscope and carried the slip away at noon recess. After making his examination, he proceeded to produce a copy of the writing on a similar slip of paper, and on returning to court laid the copy on the attorney's table.

When the crossexamination was resumed, the lawyer picked up the paper, studied it a moment, and then, with heavy sarcasm demanded:

"Mister expert witness, if you have sufficiently examined this paper, be pleased to tell this court how many people wrote upon it."

"One person," Carlson replied, "and he wrote with one pen."

"Are you sure?"

"Absolutely!"

"I will prove that it was written with two pens, for I wrote it myself in this very court room," shouted the attorney, producing the two pens as he spoke.

"Oh, that's just a copy you have there," Carlson explained, producing the original from his pocket.

Careful scientific work led Carlson to demonstrate that forty-three supposedly genuine Hawaiian postage stamps, valued at $200,000 because of their extreme rareness, were rank forgeries. An overartistic letter "a" in the words "Hawaiian Postage" was the first blunder which Carlson discovered under the microscope, and it resulted in testimony that forced the seller of some of the stamps to return $65,000 paid to him by a collector.

A second blunder of the forger, as exposed in court, was the cancellation mark on one set of the forgeries. A pair of two-cent Hawaiian missionary stamps were stuck to a clipped portion of a letter (envelopes were not used in those days, the stamps being placed to seal the latter). The paper of the alleged letter was of correct quality for the supposed year of writing, but Carlson showed that the ink of the supposed cancellation mark had smudged the clipped edge of the letter paper, a clear impossibility as the clipped portion was cut through the writing of the letter. And finally he demonstrated that the stamps had been printed from engraved plates, whereas the genuine ones of that day were produced from hand-set type.

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MOVIE CAMERA AND PROJECTOR FIT IN HANDBAG

Taking and displaying motion pictures are brought within the range of the layman by a combination movie camera and projector that weighs about five pounds and can be carried in a small handbag. The camera alone is about the size of an ordinary vest-pocket instrument and yet is equipped to expose a film thirty feet long containing 1,200 individual pictures. When developed, the reel can be projected clearly on a screen of any size from ten by twelve inches to twenty-eight by thirty-six inches. The cartridge containing the reel is about three inches in diameter and the film itself about three-quarters of an inch wide. The camera may be loaded without resorting to a dark room, and in exposing, it is reeled off in the same manner as the standard instrument.

ISLANDS MADE OVERNIGHT TO LINK CITIES

Stretching out like broad lily pads in Biscayne bay, Fla., a series of artificial islands have been made to connect Miami beach with the mainland through a long causeway for automobiles. The isles are described as having been made overnight because of the rapidity with which they were artificially formed. Trees and vegetation will be planted on them.

FINGER EXERCISER FOR PIANIST KEEPS MUSCLES LIMBER

Individual muscles of the fingers are kept strong and supple for piano playing by an exerciser a Frenchman has developed. The fingers are clamped in sockets fixed to an eccentric actuated by turning a crank with the other hand. The action is said to counteract the natural tendency of the fingers to move in unison, giving each digit exercise that cultivates independent movement. The inventor asserts that five to seven minutes' use of the device is equal to half to three-quarters of an hour in actual playing practice.

Fingers Are Clamped in Felt-Lined Holders, and When Crank Is Turned, Digits Are Given Vigorous Exercise

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Islands That "Grew Overnight," Connecting Florida Mainland with Resort near Miami

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GYRO MOVIE CAMERA GIVES CONTINUOUS ACTION

Movie Operator Following an Actress through the Set with a Camera Held Steady by an Electrically Driven Gyroscope, Which Prevents Flicker Due to the Swaying Walk

Movies taken without the aid of a tripod, and with the cameraman following the action from room to room and taking a continuous film, instead of the usual cuts from scene to scene, have been introduced in America. They are made with an English gyroscopic camera. The addition of a gyroscope to the usual picture-taking outfit makes it possible to carry the machine around without imparting to the pictures swaying motions as the cameraman walks. With ordinary cameras it is impossible to hold the machine in the hands while taking pictures without having the characters jump around the film because the camera is not steady. The new machine is operated by electricity, the same batteries turning the high-speed gyroscope and winding the film. The operator has only to press a button to start or stop the action.

HERDSMEN USE ELECTRIC GOAD INSTEAD OF STICKS

Live-stock herdsmen in Ireland are using electric batons instead of sticks and heavy clubs while driving flocks to market. It has been found that beating the animals on the long way over rough roads is not only unnecessarily cruel but reduces the weight of the stock. Steers, for instance, sometimes lose twenty-five pounds and lambs from two to four pounds. The head of the goad contains a small piston. When the stick is gently pressed against the animal's flank, contact is made with an electric battery which gives a slight but not painful shock, sufficient to persuade even a stubborn animal to move on its way.

DASH LIGHT, OIL GAUGE IN ONE INSURE PROPER LUBRICATION

Combined in one unit, an auto dash light and oil gauge are so adjusted that when the supply of lubricant gets below two quarts, the lamp will not flash when the button is pushed. This is a sure signal that replenishing is necessary. The operation is controlled by a tilting oil bucket in the transmission which catches the liquid when the motor is running and makes an electrical contact only when the button is snapped and there is sufficient oil. As soon as the engine stops, the liquid drains from the bucket through a hole at the base.

¶Snow is white because the crystals reflect light like the facets of a diamond.

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ELECTRIC INCUBATOR LIKE HEN HEATS EGGS ON TOP

Instead of heating the eggs evenly on all sides, an electric incubator that has produced an average of ninety-five per cent hatches in a series of experiments, follows the simple and natural method of the hen by applying warmth from above. A thin sheet of rubber is placed over the rows of eggs, corresponding to the hen's breast, by which, under normal conditions, the eggs are heated from fourteen to twenty degrees more at the top than they are at the bottom before they are turned. The present average of hatchings is sixty per cent of the eggs handled.

FOOD POWER SHOWN BY TESTS ON TREADMILL

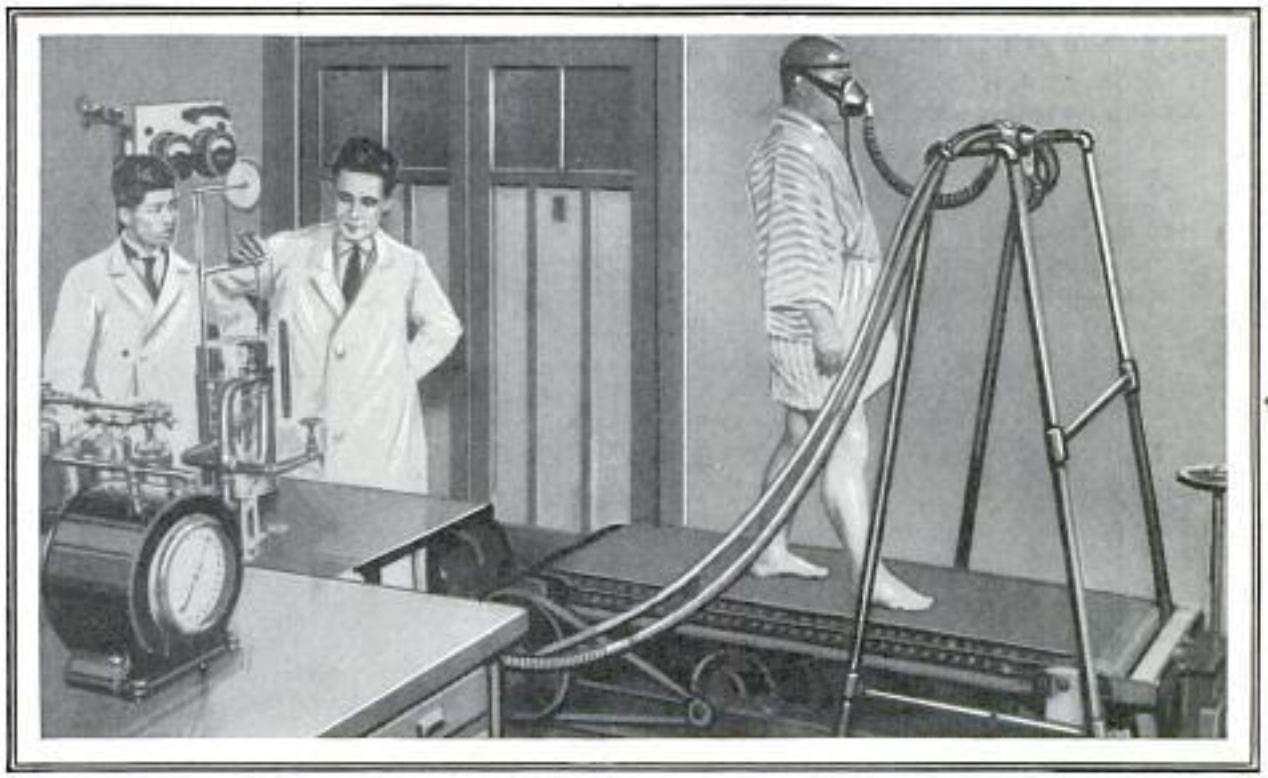
Japan, with its millions of inhabitants and comparatively small agricultural area, faces an ever-present food problem. Using delicate balances and recorders, a Japanese scientist is seeking to find the minimum of plain food on which the average man can endure his daily toil. The subject is fed balanced rations, decreased daily, and walks and runs on an endless-belt arrangement for several hours every day. Through the force exerted on the belt and by his respiration through a funnel attached over his nose and mouth, it is determined how his strength lasts.

MAIL-BOX POST COMBINES UTILITY AND NOVELTY

Securely holding the rural-delivery mail box where it can easily be reached by the

Symbolic of Government Delivery Service, Figure of Uncle Sam Supports the Mail Box

carrier, an oak post cut in a pattern that represents Uncle Sam and appropriately painted, forms a novel highway decoration as well as a useful article for the farmer. It is four feet high, firmly set, and the arms are bolted to the body. The post has been patented.



Japanese Soldier Undergoing Treadmill Test of Muscles and Lungs, to Determine Least Amount of Food That Will Sustain an Able-Bodied Man in His Daily Labor

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PORTABLE ELECTROPLATING SET OPERATES ON BATTERIES

For refinishing tableware, lighting and household fixtures and automobile parts, a portable electroplating outfit is operated on low voltage from dry cell or storage batteries without the use of tanks. The plating part proper consists of a pad and two insulated cables provided with clips. The positive wire leads to the pad which contains a dry composition in finely powdered form made up of acids and the metal that is to be deposited. The negative side of the battery is "grounded" to the article to be plated. In operation, the pad is first soaked in water for five minutes, then passed slowly over the surface. The electric circuit is completed when the plater touches the article, affording the necessary action for depositing the metal. A coating heavy enough for practical purposes is obtained in about three minutes and the manufacturers assert that the brushing movement with the pad has a burnishing effect and prevents oxidation.

Electroplater Pad Is Equally Useful in Touching Up Auto Nickel Parts and in Brightening Spoons

ENGLAND TO HONOR ANIMALS KILLED IN THE WAR

Tribute is to be paid to the beasts that served the British armies during the world war in a memorial statue to be erected in London by the royal society for the prevention of cruelty to animals. Included in the group will be a wounded horse and dog on a granite base which will be decorated with a frieze representing the animals which helped in the war.

CENTURY OF PHOTOGRAPHIC ART IS OBSERVED IN FRANCE

Although he discovered the camera only one hundred years ago, the name of the inventor of the picture box has been lost to the world, it has been revealed during a celebration in France of the hundredth anniversary of photography. And because the unknown and his secret vanished, French scientists worked eight years to do the thing he had accomplished already. In 1833 they took the first landscape photo, requiring seven hours of exposure. Shabbily clad, a young man priced a magnifying lens in a Parisian shop one afternoon in 1825. He confided to the proprietor that he had discovered how to transfer an image to paper and fix it there. A photo of the Pantheon was produced in proof. The shopkeeper was given a flask of fluid and told how to use it to sensitize paper. Then the stranger went away. Rush of business made the merchant forget his instructions. Daguerre and Niepce started to work on the same idea. They made little headway until they happened to lay a silver spoon on metal treated with iodine and found the spoon's image on the metal. Silver iodide was promptly prepared and an image transferred to it. Another accident completed the process, vapor from spilled mercury having touched the plate and developed it. Then a Frenchman discovered hypo for a fixing agent.

REVOLVING ERASER SERVES ALSO AS PENKNIFE

For typists, draftsmen and others, a disk eraser has been fitted to a plunger holder so arranged that the rubber spins about by thumb pressure on a small button. It reverses for further action when the knob is released. Besides the eraser, the tool has a small knife that may be used for opening envelopes, cutting paper or for removing ink. In operation, it is held by the first and middle fingers inserted through loops.

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Hundred Miles An Hour?

Winner of a Race down the Hudson with the Twentieth Century

Gar Wood

HAVING beaten the Twentieth Century limited from Albany to New York and raced and defeated an express train running between Miami, Fla., and Gotham, Gar Wood, famous motorboat racer, has started work on a craft in which he hopes to cross the Atlantic ocean in two days next spring. Six big twelve-cylindered Liberty airplane motors will furnish the motive power, the boat will be steered by gyro-compass, and is expected to develop better than 100 miles an hour, faster than any man has yet ridden the water. The craft will be a flat-bottomed, multiple-step hydroplane 100 feet long, built along the general lines of the "Baby Gar I," which beat the crack train from Florida to New York. It will have accommodations for seven people and will carry 3,500 gallons of gasoline, while provisions will be made for refueling from a boat stationed in mid-ocean.

If Wood succeeds, he will not only have set a new world's record for boat speed, but will have clipped more than three days from the transatlantic record for the fastest passenger liner. Behind the proposed sprint to Europe is the same motive which prompted the motorboat designer and racer to outrace two fast trains —a desire to popularize motorboating and show that high-speed water craft cannot only get one to his destination quicker, but furnish one of the most thrilling sports in the world for the passenger.

"Why should the railroads be carrying all the passengers?" he asked following his race down the Hudson in which he beat the crack railroad train of the east by forty-one minutes. "Why shouldn't this great river be utilized? Why not a line of boats capable of a speed of forty to sixty miles an hour with a nominal fare and a ride such as the kings of the world might envy? It may be done.

"My proposed dash to Europe is to demonstrate conclusively the advance made in power-boat construction in recent years. A boat capable of making 150 miles an hour is not an idle dream."

Gar Wood, one time boy mechanic and a self-made millionaire in his early thirties, has been the world's king of water speed for several years. With "Miss America II" he successfully defended the Harmsworth trophy, donated by the late Lord Northcliffe, and set a record of 80.567 miles an hour. The boat has been rebuilt for this year's international races, and a new multi-step hydroplane added to his flotilla. Several of his boats have made as high as ninety miles an hour in private trials.

How does it feel to travel ninety miles an hour on the water? The wind resistance seems strong enough to blow off the eyelashes or peel off a layer of skin from

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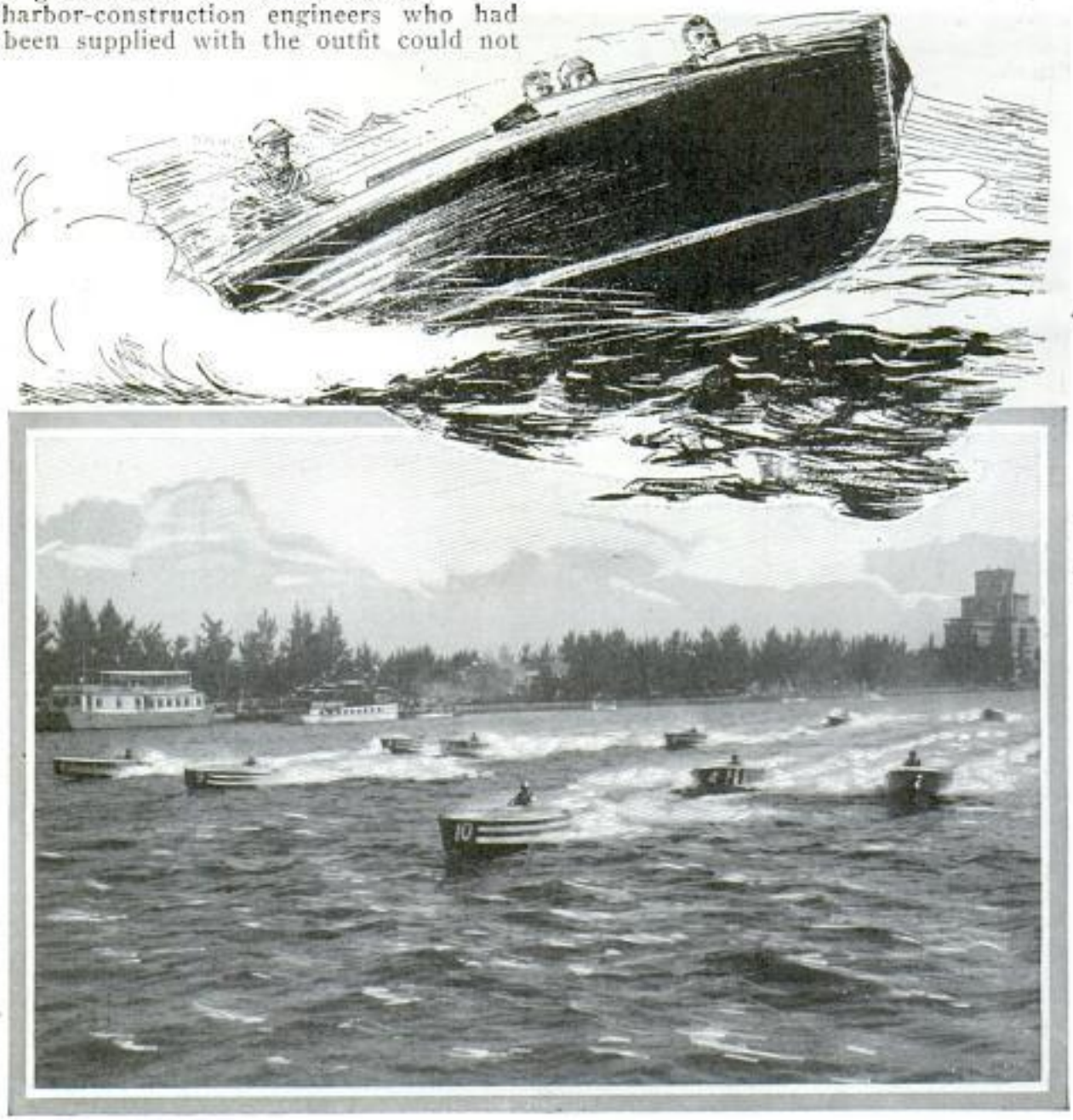
the face. Even the old-style single-step hydroplanes, such as the "Miss America" and the "Baby Gar" line, lift their bows high in the air, squat down on their sterns and fairly fly over the tops of the waves. With twelve-cylinder Liberty engines roaring and exhaust stacks belching straight up into the air there is no attempt made to muffle the racing boats. They make fully as much noise as a high-speed airplane with open engine.

Wood has been interested in boats since his earliest childhood—his father was a ferry pilot on a Minnesota lake many years ago—and at the age of thirteen, young Gar broke into the ranks of marine mechanics when he became chauffeur of a government launch at Detroit. The harbor-construction engineers who had been supplied with the outfit could not master the crude new-fangled internal-combustion motor, but the thirteen-year-old boy, who had been building model boats driven by clockwork for several years, took the engine apart, reassembled it, and it ran.

The government engineers let him run their motorboat that summer, and started his interest in gasoline engines. They were just coming in for boats, but were growing common in automobiles, so Wood became an automobile mechanic. As recently as 1912, he was operating a small machine shop in St. Paul and specializing in the repair of small automobiles.

One day he watched a coal truck pull up next door and was an interested spec-



Ten Race Boats, Built on Same Lines, Powered Alike, and Even Carrying the Same Weight of Pilot and Ballast, Which Furnished a Thrilling Series of Races in Florida Waters Last Winter

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"Teaser," Another Speed Boat Which Beat the Century from New York to Albany

tator while the driver heaved away at a hand windlass and slowly elevated the dump body.

"Why don't you get a machine to raise the load for you?" he asked.

The driver explained there wasn't any such thing, and Wood offered to make one. He drew up his plans that night for a hydraulic hoist, to be driven by the truck engine, and submitted the drawing to an expert engineer. "How much lifting pressure to the square inch do you expect to get out of that gear pump?" the expert inquired.

"Enough to lift a load of coal."

"Well, you won't get it. That idea may look all right on paper, but it isn't practical."

Other engineers confirmed this judgment, and a patent attorney declined to handle the papers. The attorney's assistant had more faith in Wood and obtained his patent for him. The first hoist was built, and despite its crudities, developed 350 pounds' pressure to the square inch. The owner of the coal truck that had suggested the idea to Wood bought the hoist. A second one was made and showed 500 pounds' pressure. Now none leaves the factory until it has been tested at 1,800 pounds.

Word quickly spread through motor-truckdom that a young mechanic at St. Paul had a good invention. A truck manufacturer ordered all the hoists that could be made in the St. Paul plant, and in 1914 suggested that the plant be moved to Detroit. That was the start of the Gar Wood fortune, and his present race-boat business. He was only thirty-three years old at the time he established the Detroit factory.

In his St. Paul days he had become interested in fast motorboats, and in 1911 cruised down the Mississippi to Dubuque, Iowa, to attend the regatta of the Mississippi Power Boat association. He met a man who owned a fourteen-foot craft powered with a six-cylinder, two-cycle engine. The boat had lots of speed, when and if it ran at all. Wood volunteered to overhaul the engine and then drove it in a race, winning at thirty miles an hour, quite a record in those days. In 1913, he raced the first boat of his own make at Keokuk, Iowa, and won all events in its class. His racing achievements since that time have become classic.

Gar Wood is not superstitious—he says so himself—but he never goes out in a racing boat without carrying two toy teddy bears as passengers. They have been his mascots for fifteen years. Back in 1910, as Mrs. Wood tells the story, she bought the first teddy as a gift to a friend's child. It cost fifteen cents, at a special sale. When Wood saw the bear he asked for it, so Mrs. Wood went back to buy another. The sale was over and the second bear cost twenty-five cents. Wood

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"Baby Gar IV," the Boat with Which Wood Raced the Crack Train, Showing the Arrival at New York and in Action En Route down the Hudson River When He Beat the Century by Forty-One Minutes

claimed it, too, and the friend's child finally received a drum for a present.

The Wood mascots have become famous in racing circles, and a friendly rival once offered $5,000 for just one of the good-luck bears. Garbed for racing, the two toys appear in suits made for them by Mrs. Wood. In their fifteen years on the water, they have worn out several suits, she says. Each bear wears a tiny cork life preserver of regulation style.

"I'm not superstitious," Wood explains, "but I wouldn't think of racing without those bears for anything in the world. Nearly every time we go out without them something happens. Once we broke a gear box and another time cracked a cylinder."

Wood treats his racing boats with the same care that a Derby winner gets in a racing stable. "You know you have to be just as careful with a racing boat as you are with a race horse" he says. "Before we start a race we go over every inch of our boats to see that they are in the right condition. We measure them to make sure the hull shape hasn't changed. Just a fraction of an inch change in the angularity of the different planes would decrease the boat's speed perhaps as much as ten miles an hour.

"A racer is always removed from the water after a race, carefully sponged out, and placed in the cradle. The engine is covered with a blanket. If we left the boat in the water, the wood would swell and might warp the shape. We don't take chances on anything."

One of the features of the attempt to cross the Atlantic in record-breaking time will be the use of a Sperry gyroscope—known as "Metal Mike"—for steering.

This device automatically holds a boat to the course that has been laid out with less deviation than would be possible with a human helmsman.

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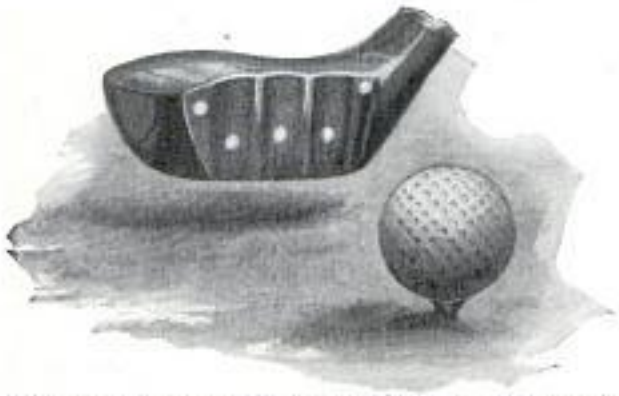
LETTERS SENT BY SKYROCKETS BETWEEN OCEAN ISLANDS

Between some of the reef-bound islands of the Tonga group in the Pacific ocean, where it is dangerous or impossible for steamers to land, an unusual form of air-mail service solves the problem of getting letters into the postal channels. Skyrockets are used to shoot the missives to ports where steamers call. Half a dozen letters are attached to the stick of a big rocket which is aimed toward the island. The fuse is ignited and the shaft, with its burden carefully shielded from the sparks, roars upward, falling on the beach of the adjacent land where it is picked up. While some of the letters are intended only for local delivery, others are bound for America, Europe and other countries. In the course of a year, it is said, quite a number of missives that find their way to persons in distant lands and all over the world, begin their journey on the stick of a skyrocket.

GOLF CLUB HAS GROOVED HEAD TO PREVENT SLICING

To stop the sidewise or rotary motion that causes the "hook" or "slice" in driving the golf ball, an amateur enthusiast has devised a club with rounded ridges and grooves instead of the usual flat surface. It is so designed that if the ball is struck slightly off center by one of the ridges, it tends to settle into the nearest adjacent pocket, while contact squarely on top of the ridge or within the groove produces about the same effect as though the head were flat. The inventor does not claim that the club will produce a straight drive down the fairway irrespective of the swing of the club, but that it will send the ball in a straight, true line according to the direction in which the face of the club is pointing when it strikes the ball.



Grooves in Driver Head Are Intended to Start Golf Ball on Straight Course

FOLDING TABLE FITS THE LAP FOR READING OR WRITING

For students, artists, sick persons or anyone who wishes to read or write in a reclining position or while seated, a folding table that can be quickly adjusted to suit the user, is now on the market. It is made of two-ply wood boards which are joined by six legs that have hinges and ball-and-socket joints arranged with sliding locks in such a way that as many as 2,500 different adjustments can be made. The table weighs but three pounds and folds into a compact piece, twelve inches wide, eighteen inches long and one inch thick. It has a removable cleat for holding a book in position, keeps the reading or writing matter the correct angle for proper vision and leaves both hands free.

Lap Table in Use, with View of Legs and Sliding Locks That Afford Many Adjustments

SWITCH KEY IS DOUBLE LOCK ON IGNITION AND GEARS

With a combination ignition and transmission lock now on the market, the driver can hardly forget to make his car secure against theft. A turn of the ignition-switch key, in a slot on the dashboard, simultaneously locks the gearing. The attachment will not function until the gear-shift lever has been placed in the neutral position and thus the car cannot be locked while driving. Its operation is purely mechanical and it is not difficult to install.

¶ Grasshoppers have been found on mountain summits as high as 18,000 feet.

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PUSH CAR WITH SEAT FOLDS FOR CARRYING

With a seat on which either a passenger or a bundle may be carried, a combination of a wagon and a pushmobile has been invented. The car folds up flat so that it can be stored in little space or carried in an auto or a railroad coach. It is light in weight and has six rubber-tired, very low wheels which are mounted on two runners that guard against tipping over. A grip for the hands is placed above the seat, between two uprights. The little vehicle is strongly made, in order that it may be used without risk of accidents through breakage.

Using Six-Wheeled Push Car as Bundle Carrier and Folding It Up for Storing

BOAT PUMP PURIFIES POOLS WITH CHEMICAL SOLUTION

Swimming pools are sterilized quickly and thoroughly by pumping a chlorine solution into the water from a special rig that can be carried in almost any small boat. The apparatus consists mainly of a small gasoline-driven pump, a mixing chamber in which water is combined with the chemical in the proper proportions, and a distributing outlet at the rear. The stream pouring out through this vent has sufficient force to propel the boat so that the operator need only steer and regulate the apparatus. Tests are said to have shown that treatment of this kind reduces harmful bacteria to a negligible amount.

Pumping Chlorine Solution into Water at Swimming Beach; Storage Tank toward Prow of Boat, Mixer in Center

LUXURIES FOR ALL GIFT OF POWER

Thanks to power and mass production, the daily work of the average man today will exchange for more comforts and conveniences than a king's fee would have purchased a few generations ago. The clothes now worn are spun in great power-driven factories, and the family spinning wheels of past generations are to be seen only in attics and museums. The newspaper is made in a power-driven machine and printed upon a power press. The food a man eats has been planted and harvested by power-driven tractors, prepared by power-driven machinery and brought to his table by power-driven transportation. He takes a power-driven trolley or railroad or ferry or auto to his place of business. A power-driven elevator carries him to an upper story. Power-actuated devices have prepared and delivered to him the material upon which he labors and power drives the machine which he perhaps operates. Even the executive is dependent upon power for the delivery of his mail and for the current that operates his telegraph and telephone. And in his home, how many of the luxuries he enjoys — rugs, carpets, dishes, pottery, cutlery—could he afford if they had to be made by hand?

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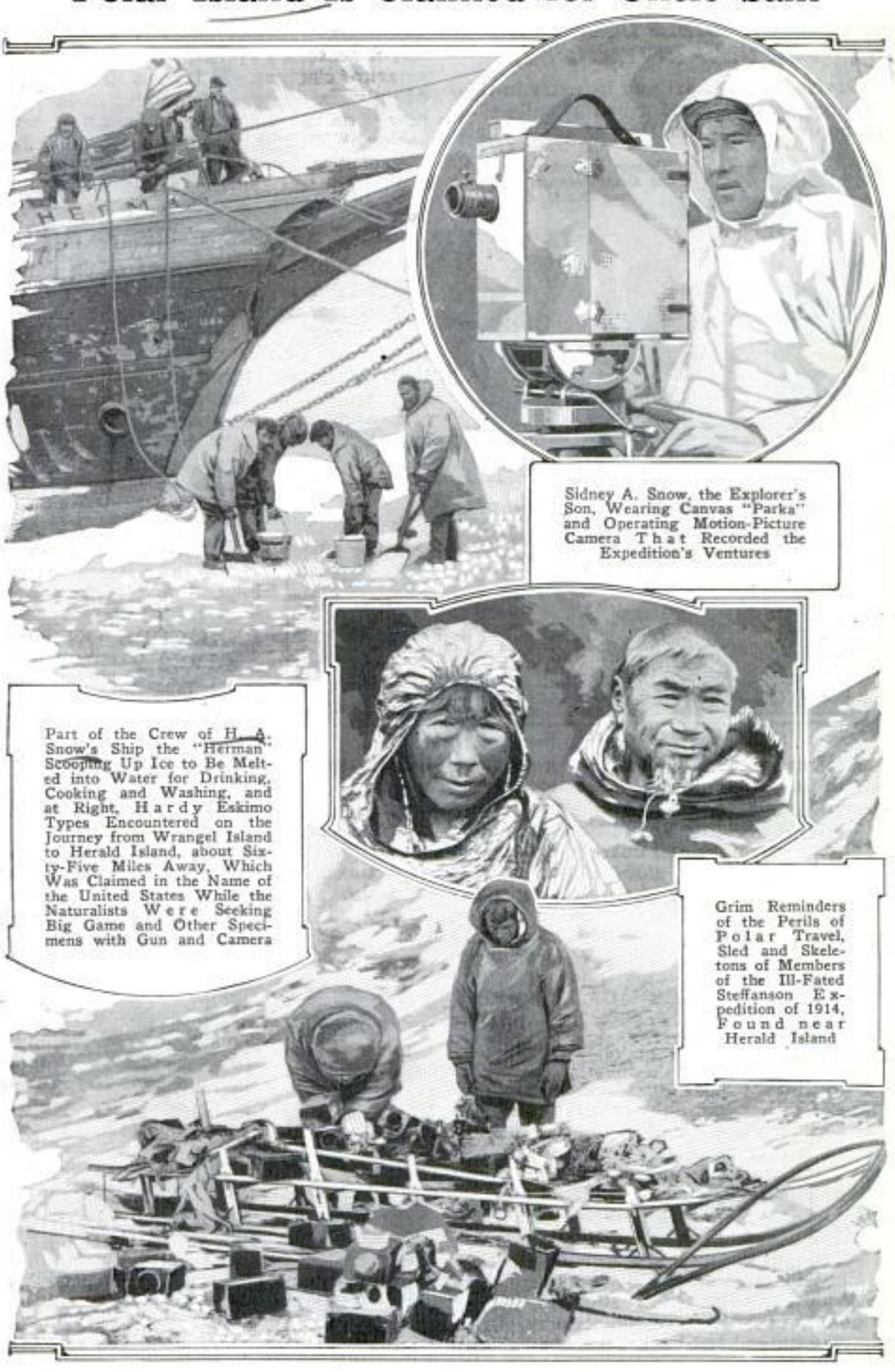
Polar Island Is Claimed for Uncle Sam



Sidney A. Snow, the Explorer's Son, Wearing Canvas "Parka" and Operating Motion-Picture Camera That Recorded the Expedition's Ventures

Part of the Crew of H. A. Snow's Ship the "Herman" Scooping Up Ice to Be Melted into Water for Drinking, Cooking and Washing, and at Right, Hardy Eskimo Types Encountered on the Journey from Wrangel Island to Herald Island, about Sixty-Five Miles Away, Which Was Claimed in the Name of the United States While the Naturalists Were Seeking Big Game and Other Specimens with Gun and Camera

Grim Reminders of the Perils of Polar Travel, Sled and Skeletons of Members of the Ill-Fated Steffanson Expedition of 1914, Found near Herald Island

Bottom Photo © H. A. Snow

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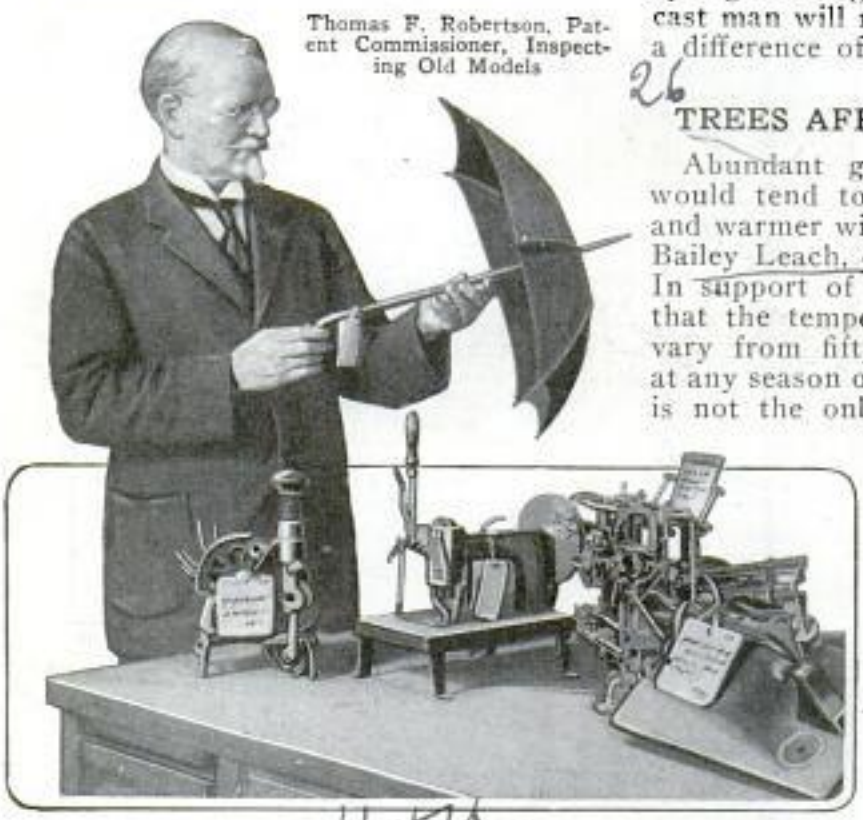
SALE OF MODELS CLEARS WAY FOR NEW INVENTIONS

Development of art and industry in this country was revealed when a collection of approximately 150,000 patent models



Thomas F. Robertson, Patent Commissioner, Inspecting Old Models

was taken from the shelves for an auction sale to make room for new arrivals at the busy office in Washington. There were odd types of folding umbrellas, automatic stamping machines and hundreds of other devices that had been gathered since early colonial times. A few of the models, such as the steamer-unloading arrangement patented by Lincoln, and others of special historic significance, were saved for permanent exhibit.

WEATHER FORECASTS CORRECT NINE TIMES OUT OF TEN

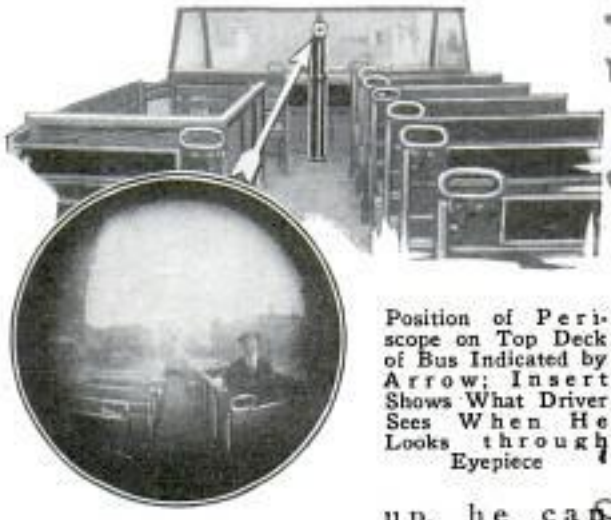
Nine times out of ten when the United States weather bureau forecasts "fair and warmer" or "snow and colder," the prediction is correct, statistics show. To be exact, the weather "sharp" foretells conditions rightly in 88.4 per cent of his attempts. In some sections his work is easy, in others difficult. On the Pacific coast, for instance, there are seasons when he can be almost certain of rain every day for months. But local showers cause trouble in other parts of the country. One Illinois city had two inches of rain during a recent month. Another, only fourteen miles away, had six times as much. Different seasons govern prophecies of temperature changes. It takes a drop or rise of only six degrees in summer to bring a new prediction, while in autumn and spring it is eight, and in winter the forecast man will not change his chart unless a difference of ten degrees is foreseen.

TREES AFFECT TEMPERATURE

Abundant growths of trees in cities would tend to produce cooler summers and warmer winters, according to Wesley Bailey Leach, city forester of New York. In support of this theory, he points out that the temperature of a tree does not vary from fifty-four degrees Fahrenheit at any season of the year, so that its shade is not the only source of relief on hot days. In the winter, the tree is warmer than the air. By absorbing water from the earth and emitting it through the leaves, the trees also lower the temperature.

PERISCOPE ON BUS GIVES VIEW OF TOP DECK

The driver on the lower deck of a motor bus is able to see the seats on the top by means of an instrument brought out by a Chicago manufacturer. It consists of a periscope placed in convenient position so that he commands a full view of the upper deck from the wheel. When he is about to pass under elevated railroads, he thus can note if all the passengers are seated, and if anyone attempts to stand



Position of Periscope on Top Deck of Bus Indicated by Arrow; Insert Shows What Driver Sees When He Looks through Eyepiece

up, he can warn him to sit down or stop the bus before a serious injury results.

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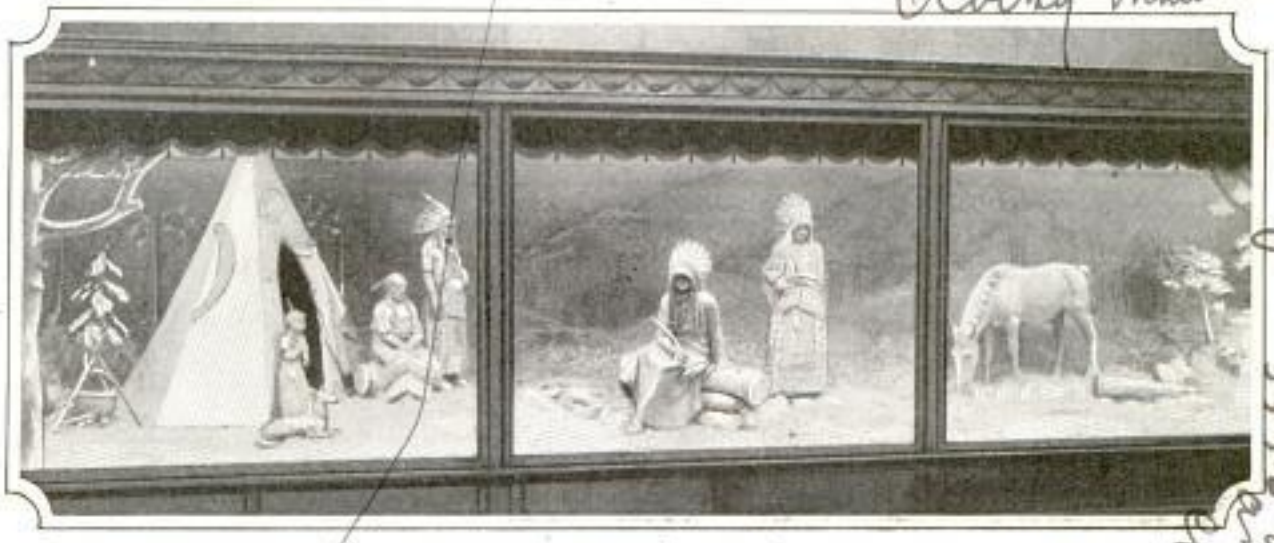
PRINCE IS CARVED IN BUTTER AS AN INDIAN CHIEF



Booth Exhibit of Indian Scene Modeled in Butter and Showing the Prince of Wales, at the Right of the Center Panel, as a Chief of the Tribe

One of the features of the Canadian exhibit at the Wembley exposition near London was an Indian scene modeled in butter and depicting the Prince of Wales as chief of the tribe. The figures were life size and a realistic background and special lighting in the display cabinet added to the naturalness of the group. Three and one-half tons of butter were required to make a panel fifty feet long.

BOW AND ARROW FOR FISHING USED IN SOUTH AMERICA

Instead of a hook and line, some of the Indians in the River of Doubt country in South America, use bow and arrow on their fishing trips. The feat taxes their skill in handling canoes and their ability as marksmen. Many of the fish are large and beautifully marked so they can easily be seen in the clear water. Picking out a prize specimen, the Indians will sometimes follow it for hours, deftly guiding the crude log dugout until they reach a position to attempt a shot. If the arrow finds its mark, the native does not hesitate to leap out of the boat and capture his quarry, which sometimes is nearly as big as he is. Often the squaw accompanies her husband on his trips or meets him on his return, carries in the fish and the weapons, and cleans the catch with clam shells, then cooks it with herbs and vegetables.

FOLDING CANVAS-RUBBER BOAT IS CLOSED BY SNAPPERS

Snaps along the seams for closing the sides aid in the quick assembling of a portable boat of vulcanized rubber and canvas mounted on a wooden framework. It can be put together in ten minutes and carried in a bag when folded up. It is shaped like a canoe and has proved popular with oarsmen for excursions along the Thames and other rivers in England.

Fitting Top of Collapsible Boat Together with Snap Fasteners That Can Be Undone Easily and Hold Securely

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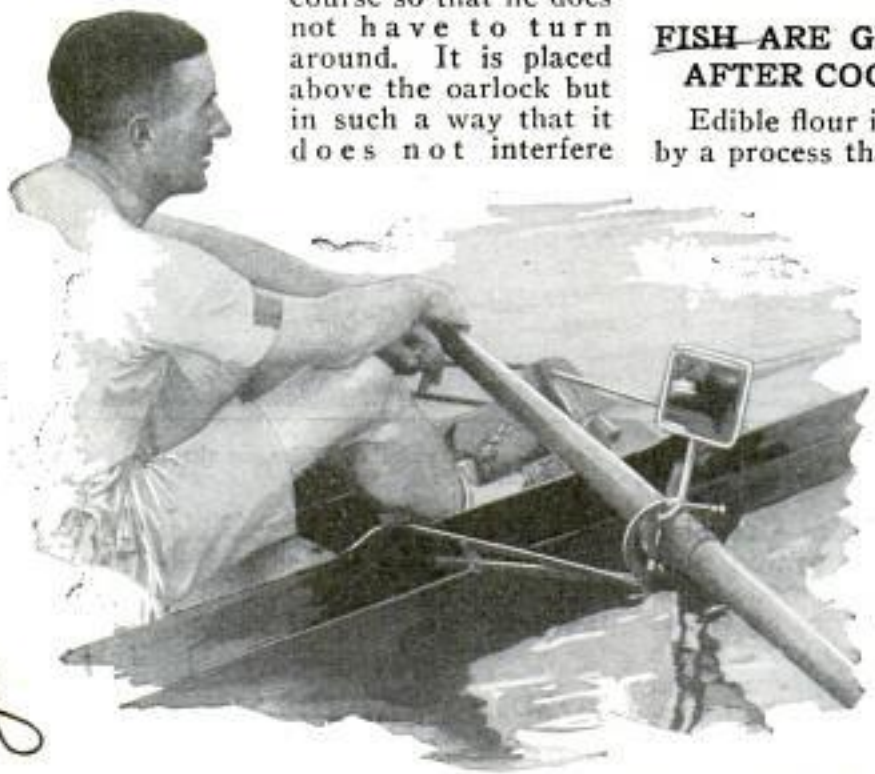
ROWER STEERS BY MIRROR ATTACHED TO OUTRIGGER

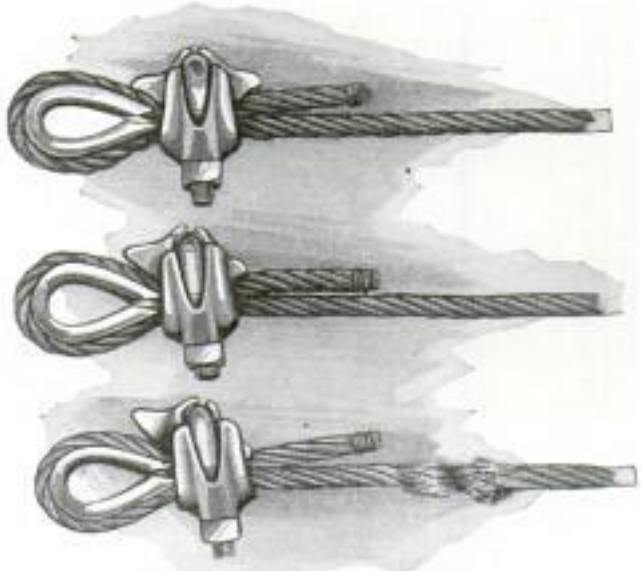
Attached to the side of racing skiffs, a small mirror gives the rower a view of his course so that he does not have to turn around. It is placed above the oarlock but in such a way that it does not interfere with rowing, and can be adjusted to the angle that gives best results.



Mirror Adjusted to Side of Skiff Gives Rower View of Course So He Will Not Have to Turn Around

SAFETY CLAMP FOR WIRE ROPE PREVENTS SLIPPING

Wire cable is held in a secure and practically slip-proof loop for hooks, fastenings and other attachments by means of a friction clamp with a cam arrangement that grips the strands more tightly should any movement occur, and at the same time does not damage the wire. In addition, it gives warning when the safety load on the cable is exceeded. Resting in normal position, it is square with the wire, but if the strain increases beyond the "safe working strength," the cam turns slightly, exposing a red spot which serves as a warning to stop or to proceed with care. As the load increases, the cam continues to turn and tighten.



Clamp Twisted under Strain

FISH ARE GROUND INTO FLOUR AFTER COOKING AND DRYING

Edible flour is being prepared from fish by a process that is said to be in successful operation at a western plant. After cleaning, the fish are fed into a cutter somewhat like a meat grinder, then cooked under pressure to break the oil cells and pressed into thick cakes. These are dried, the flesh separated from the bones and the material sifted, ground into a fine flour and cooled. The oil, recovered as a by-product, is prepared for special uses or sold as it is.

WEEDS SPREAD DISEASES

Certain weeds and wild plants are carriers of diseases that damage garden produce and fruit trees, according to W. A. McCubbin, of the Pennsylvania department of agriculture. It has been found that the red cedar is the source of the yearly outbreaks of rust that attacks apples, quinces and pears. Wild currants and gooseberries harbor the white-pine blister rust and the European barberry is the host of the black-stem rust that gets into the wheat. Other disease-spreading plants are the round-leaved mallow, which is said to be the source of the rust that attacks hollyhocks, and the wild cucumber is made responsible for damages to the crop of cultivated varieties by being a carrier over winter of the so-called mosaic disease.

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How To Save Your Eyes

Properly Shaded Lamps Keep the Glare Out of the Reader's Eyes and Throw the Light on the Book

TWENTY-FIVE million of the 42,000,000 men and women in America who are gainfully employed have defective eyesight, which, added to poor lighting, is causing at least 100,000 of them to lose their positions each year, according to recent surveys. Insurance statistics traced 91,000 accidents to poor light and bad eyes last year, with a loss to the workers involved of 3,000,000 productive days.

Scientific lighting is one of the youngest engineering subjects, and despite rapid advances since the invention of improved electric lights back around 1908, the Eyesight Conservation council of America finds there are not only thousands of factories and offices still poorly lighted, but far more homes.

The investigators also have discovered that poor lighting is as often the result of too much light as of too little, a condition made possible by the high candlepower of electric lights. The chief source of poor lighting is the use of unshaded electric globes, casting a glare directly into the eyes.

The survey also shows that of the 24,000,000 school children of the country 6,000,000 have defective eyes, and that a large portion of them are studying under conditions that are bound to prove injurious, in later life if not now.

The alarming increase in defective eyesight is due to "old eyes and new times," according to Dr. Charles W. Crankshaw, infirmary director at the home office of a great insurance company. Human eyes are old-fashioned, he explains, because they were adapted to comparatively feeble artificial light, and have not changed to meet the demands of modern life. The eye also was adapted by nature for work in the open, seeing things at a distance, and not for the close application required in modern factories and offices.

Of the 2,000,000 industrial accidents that occur annually the number of eye injuries is put at 200,000, and in many states special compensation is provided for the loss of an eye, while most insurance policies make extra provision for blindness.

"The eye is about the most sensitive and delicate organ of the body," Dr. Crankshaw says, "and yet it is probably the most abused. In educational institutions and in industrial plants, every effort is made to protect and preserve the eyesight of the public. Yet the individual members of the public, the persons upon

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Here Is a Candidate for Glasses Before He Reaches Manhood; Light in Front of Him Is Reflected from Paper into His Eyes; Always Shade an Electric Globe

whom the suffering will fall, are often shamefully careless. There is little excuse for poor lighting in the home now. The fault is generally in the habits of the individuals.

"They read or work either in an inadequate light or in a strong glare. They are indifferent as to whether the light shines into their faces or comes from behind and above, as it should. When such persons suffer from headache and nausea, they rarely connect the disturbance with their eyes. They blame it on indigestion and probably subject their stomachs to a dose of some strong remedial medicine, thereby creating a disorder that formerly did not exist."

The Eyesight Conservation council ascribes much of the poor home lighting to the failure of owners to change their electrical equipment to keep pace with the development of the science of lighting. Old-fashioned chandeliers, which provided gas jets in case the electrical system failed, are still in use, throwing the glare directly down, instead of reflecting and diffusing the light from the ceiling and walls.

"One of the most common evils found in home lighting," the council says, "is the bare lamp, usually so low as to be directly in the line of vision, causing eyestrain, and at the same time giving poor illumination. There are specially designed fixtures for correcting not only this condition but also the many other objectionable features of the old-style equipment.

"Where the present installation does not provide sufficient light, portable lamps in great variety are available and can be used advantageously. Floor lamps, table lamps and small ornamental lamps, in addition to augmenting the light, are appreciated by the householder because of their

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A Lesson in Hanging Chandeliers; Note How the Upper Position at the Left Would Throw Rays into the Faces of Persons Seated at the Table, While the Lower Light Protects the Eyes but Obstructs the View; at Right, a Correctly Hung Light Illuminates the Ceiling Too

Unshaded Lamps, at the Left, Produce an Unpleasant Glare, While at the Right the Same Four Lamps, Correctly Shaded, Focus Their Beams on the Table; Proper Lights and Shades Are Available for Every Room of the House, So There Is No Need of Risking the Eyesight

Reading Lamps Should Illuminate the Whole Paper or Book and Be So Placed as Not to Throw the Reader's Shadow on the Reading Matter; at Right, a Properly Placed Lamp of the Right Height Casts Its Rays over the Shoulder, Throwing the Shadow Off to One Side

Side Lights Are Necessary for Mirror; a Centrally Placed Lamp, at the Left, Leaves the Face in Shadow, While Side Lights, at the Right, Illuminate the Face, and the Mirror Then Reflects the Illumination; Proper Shades Are Necessary with Side Lights to Diffuse the Glare

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Above, Improperly Placed Kitchen Light Throws the Worker's Shadow in the Sink, While Correct Lighting Removes It, as at Bottom; Center Shows Eye Strained by Glare, and Below, a Normal Eye

flexibility and decorative value.

"Although the essential requirement of lighting in the home is the elimination of eyestrain, the decorative possibilities should not be overlooked. The most pleasing and comfortable effect is produced by skillfully combining utility and ornamentation.

"Artistic shades and colored lights are mediums of expressing individuality in furnishing the home. However, great care should be taken in the use of colored lights, in order not to defeat their real purpose. Colored lamps and dimly shaded lamps are not intended for reading and close work, for eyestrain is caused by improper and insufficient light."

Experts advise that the reading lamp should always be behind and slightly above the reader's head, so that the light will fall over the left shoulder of a right-handed person or the right shoulder of one who is left-handed. They warn against letting children study at a table lighted by a table lamp in the center, or a chandelier above the center, since the light rays falling on the white paper at an angle will be reflected into the eyes. Most architects nowadays make careful provision when they design a house for plenty of outlets, both base plugs and wall and ceiling lights, yet in many homes the kitchen is neglected and no proper work lights provided. Kitchen fixtures, light engineers say, should include a central light in the ceiling, so that any shadows cast by it will be greatly foreshortened, and special work lights above the table, sink or kitchen cabinet. If the ceiling light is of the inverted type, and the ceiling and upper walls painted a light color, the special work lights can frequently be avoided, since the diffusion of the light and the absence of strong shadows will give an evenly distributed light even in the farthest corners.

The question of adequately distributed electric connections is one that should be carefully considered when planning a new house. The dining room needs side lights, properly shaded. The bathroom should have a ceiling light and wall lights beside the mirror; bedrooms may have ceiling and wall lights, and a bed-side lamp, if desired. Clothes closets and inclosed stairways, especially cellar stairs, should also be well lighted, to guard against accidental injuries.

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SEAWEED PRIZED AMONG STRANGE FOODS OF JAPAN

Japanese Women Drying Seaweed on Bamboo Racks Before It Is Baled and Shipped for Food; the Growth Is Gathered from the Beaches When the Tide Recedes

Many and strange are the foods relished by the men and women of Nippon. For instance, raw fish is a regular diet with the natives, but one of the most unusual items to western people is seaweed. When the tide recedes, beaches in various parts of the islands are dotted with people gathering the growth and carrying it to drying racks of bamboo, where it is spread out on small slabs. After being thoroughly dried in the sun, the weed is baled and shipped. As a dish it is boiled and commonly eaten with rice.

31

NATURE KNITS CEMENT CRACKS THROUGH MOISTURE'S AID

Concrete which has cracked will heal its wounds, if kept moist, just as a broken bone repairs itself, and with the new growth stronger than the rest of the material, it is reported at the end of a long experiment. One and one-fifth tons' pressure per square inch was applied to new concrete cylinders in 1917. Many fissures were caused. For eight years the blocks were exposed to the weather, then examined again. Most of the cracks had refilled. Pressure was applied again. The old crevices did not open, although new ones appeared.

3463

CLAW LINKS FOR TIRE CHAINS INCREASE AUTO SAFETY

Auto-tire chains with cross links that have sharp, protruding points shaped to grip almost any kind of surface and hold the car from skidding are now on the market. Besides the added safety they are said to provide, they present a smooth back to the tire itself so that the rubber cannot be cut or bruised. The chains are furnished for standard or balloon tires or for motorcycles, and tests are reported to have demonstrated their efficiency on slippery pavements and ice.

Universal Shid. Less Chain Co, Niles, Mich.

Prof. Duff A. Abrams, Lewis Institute, 1949 W Madison Chicago

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SHAVING SET IN BRUSH HANDLE HAS MIRROR IN TOP

Specially suited to travelers and campers who wish to carry little luggage, a complete shaving set has been devised that fits in the handle of the brush. A mirror is set in the top and there is sufficient space for extra blades.

Pocket Shaving Outfit in Use; Mirror Is in Top of Brush Handle

Soap enough for several shaves is provided in a small cake which is partly protected by tinfoil.

THREADLESS CONDUIT BOX CUTS COST OF WIRING

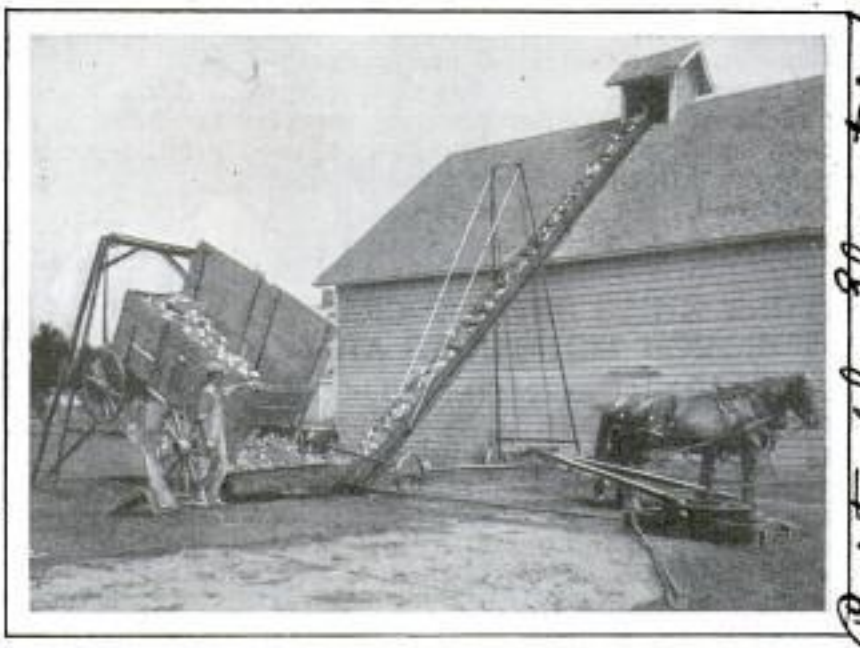
Sections of electric conduit are joined without the necessity of cutting threads, by a box holder that grips the pieces in a bushing and with a locknut that can be tightened sufficiently with but one or two turns. The box is covered by a metal or porcelain lid, which is easily removed when access is desired for alterations or repairs. Decreased installation costs are possible by using this fitting, it is claimed, while elimination of exposed threads gives the conduit greater life, decreases the likelihood of breaks and, as the box is adapted to a wide variety of alterations, it simplifies making changes in the circuit. Since threads need not be cut, lightweight tubing often may be used with the boxes, it is asserted.

FIRE DANGER IN ENGINE OIL GREATER THAN GASOLINE

Hot engine oil thrown upon the exhaust pipes in an airplane crash is a greater fire hazard than the gasoline, tests at McCook field have shown. Old planes were sent against a wall to break them into pieces while "slow" motion pictures were taken. The films showed that the lubricating oil, hurled from the engine and striking the white-hot exhaust pipes, caught fire almost instantly and subsequently ignited the gasoline. In no case did the gasoline take fire first. Then the exhaust pipes were ripped from several planes before they were caused to crash. None of these planes took fire.

CHAINLESS STEEL GRAIN LIFT SAVES FARM LABOR

Corn, either shelled or on the ear, wheat, oats and other small grains are hoisted into storage bins and cribs with a horse or motor-driven steel elevator that has no chains to get out of order and is equipped with buckets that are easily adjusted and hold more than a peck when full. The carriers run on one-piece racks within steel tracks and are so arranged that the weight of the descending buckets largely offsets the ascending load, reducing the amount of power required to run the elevator. The outfit can be adapted to various sizes of cribs, has large capacity, and besides the advantage of greater durability resulting from fewer moving parts cannot be damaged or climbed by rats.



Filling Corn Crib with Elevator That Has One-Piece Carrier Racks Instead of Chains, to Decrease Wear and Breakage

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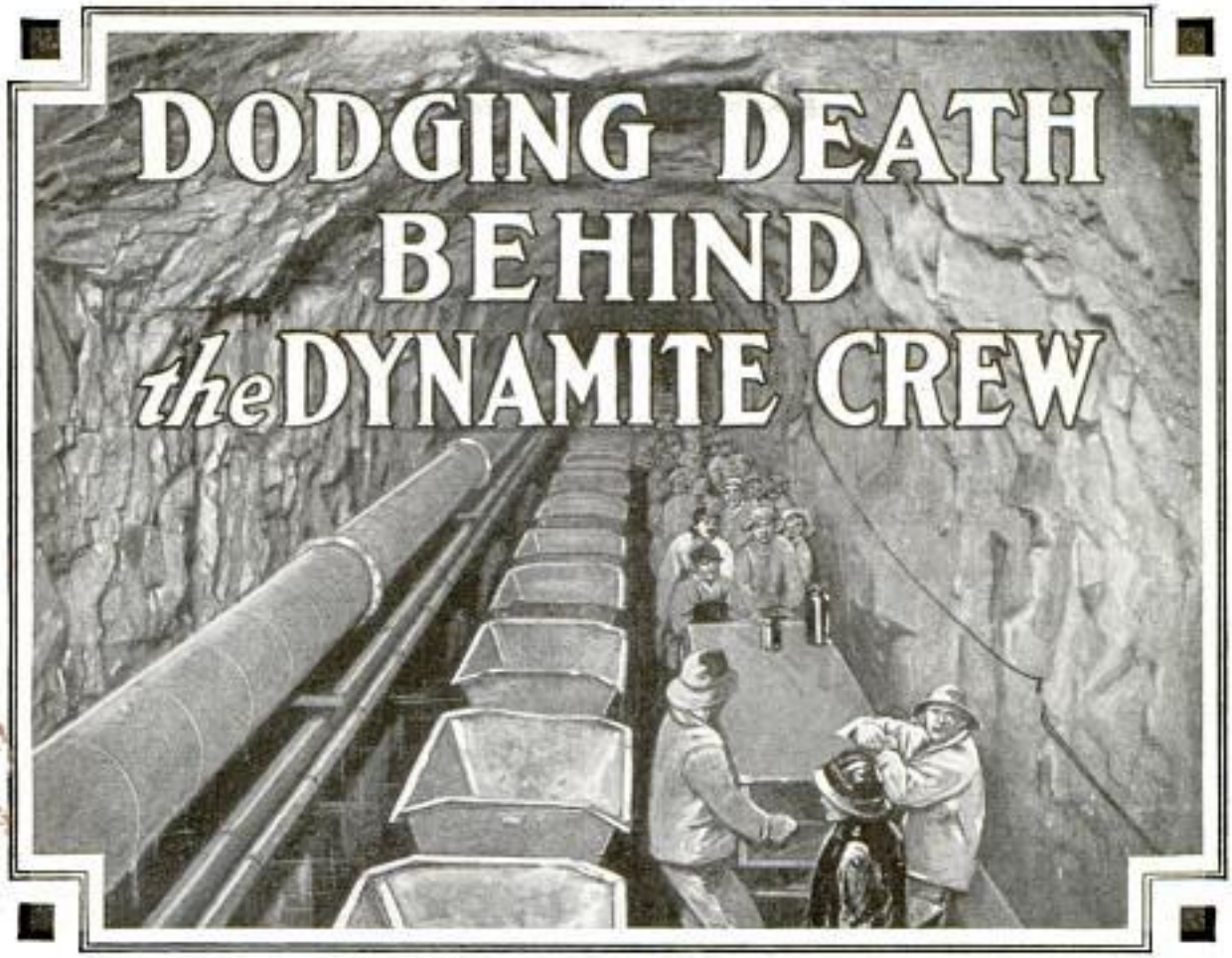
DODGING DEATH BEHIND the DYNAMITE CREW



Trainload of Muckers Riding to Work in Rattling Dump Cars, Bound for the Heading of Giant Water Tunnel Being Blasted Out Far below Lake Michigan

miller

HARD-ROCK men? Once you become one you'll be one always. I've been at it for upward of thirty years, started when I was twelve years old, up in the copper country, at the Calumet and Hecla. Been at it ever since—copper mines, iron, gold and silver, railroad tunnels, and for the last ten years water tunnels. Don't ever expect to do anything else."

With rubber hat pushed back on his head, seepage pattering on his raincoat, one foot in its rubber hip boot planted in a puddle of water and the other perched on an empty dynamite box, "Bart" Milano, tunnel boss and hard-rock miner, watched the muckers toiling at the "bench" below, and above the roar aired snatches from a miner's life.

The scene is two hundred feet below the sky-blue waters of Lake Michigan and two miles east of Chicago, which means two miles out in the lake. The exact spot is the heading of a new thirteen-foot water tunnel, the heading being 2,700 feet from the one shaft which leads up, via a cable elevator, to the surface and safety.

Two narrow-gauge tracks stretch along the tunnel floor. Along one, a puffing little gasoline-burning steam locomotive trundles by with a string of dump cars, piled high with glistening white limestone. Up the other two men push a small car loaded with boxes of dynamite, fifty pounds to the box. They are the dynamite crew, bound in to the heading to knock another fifteen feet or so of solid rock loose. Limestone is fairly soft and easily mined, but at that it takes around thirty-seven pounds of high explosive for every foot the tunnel advances.

"See those fellows there?" and Bart waved behind him to where the miners were setting up their air drills against the face of the heading. "Most of them have been miners in the copper country or in the gold mines out west, but for the last ten or twelve years they've all been right here doing hard rock work under Chicago

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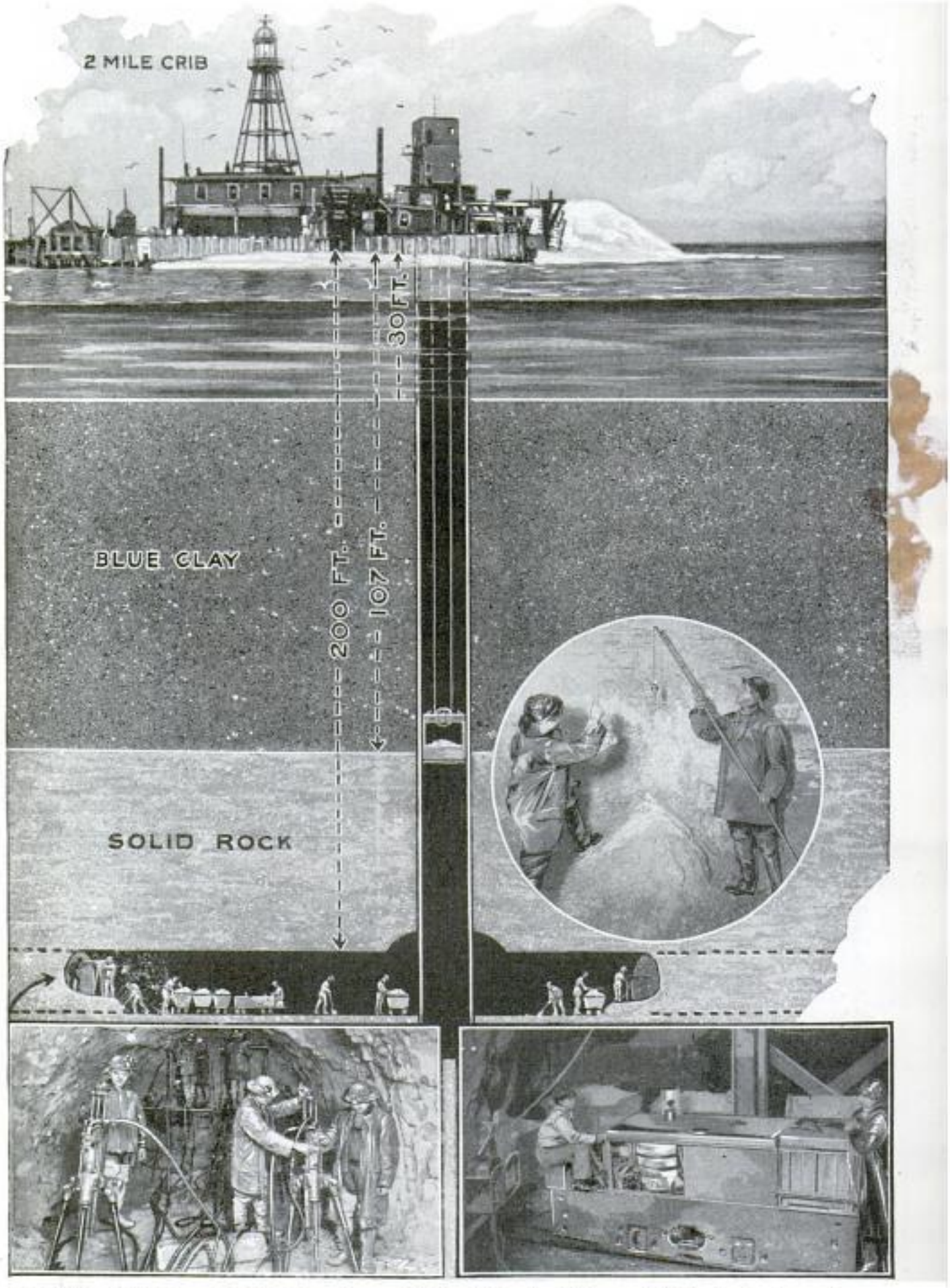

Island from Which Tunnel Is Being Dug, Above, with Sketch Showing Underground Work; Insert, Surveyor's Plumb-Bob Lamp; Below, Air Drills and Mine Locomotive

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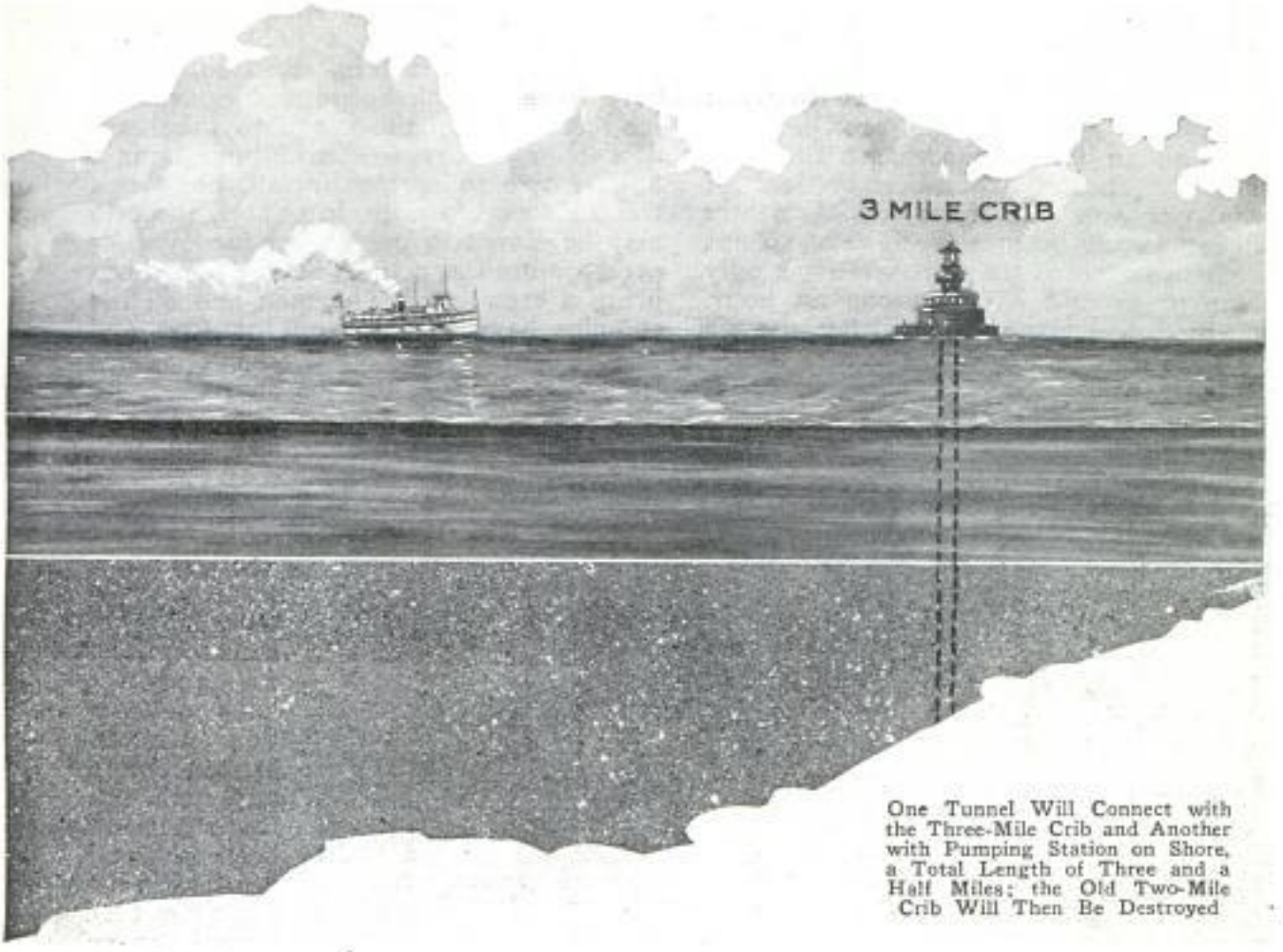

One Tunnel Will Connect with the Three-Mile Crib and Another with Pumping Station on Shore, a Total Length of Three and a Half Miles; the Old Two-Mile Crib Will Then Be Destroyed

and the lake. Look at the muckers down there. Two, three, maybe half a dozen nationalities doing the hardest work on earth, shoveling sticky, water-soaked rock all day, but most of them have been right on the job for years, some as long as the miners. Once it gets into the blood it sticks and they seldom quit.

"Why, take that big fellow over there on the wheelbarrow. He owns a lot of property, flat buildings, you know, but he's right down here shoveling and wheeling with the best of them for his nine dollars a day."

The miners who drill the holes for the dynamite sticks, are paid a dollar and a quarter an hour, ten dollars a day, but like the muckers they earn it. Watching the mucking crew shovel the broken rock away to clear the tunnel heading for the next shift of miners is like watching a high-speed movie. For seven hours, with the exception of a ten or fifteen-minute halt for lunch, they toil furiously and wind up the day with a final spurt that clears the last of the heap off the bench just before the air-hammer crew arrives. Up on the bench, shoveling into wheelbarrows, or down on the tunnel floor hoisting the shovelfuls into dump cars, the muckers move so fast the eye can hardly keep track of the motion.

With his back to a dump car that stands almost shoulder high a mucker will heave twenty-five or thirty pounds of limestone over his shoulder all day long without ever looking back, and yet never miss the car. As he digs forward into the heap he is constantly increasing his distance from the car, until new tracks can be laid, yet the flying stones tossed backward never miss the mark.

And the wheelbarrow men, on the wooden runway above the cars, pick up their loads of several hundred pounds, trot down the narrow twelve-inch path, slippery with constantly dripping water, dump the rock into the cars below, and dash back again, constantly on the run.

"They like it here," the tunnel boss was explaining, "that's why we have kept the crew together so long. Good wages, hours aren't bad, and homes in a big city instead of some little mining camp.

"Nice thing about hard-rock work is it's clean. No dirt and gas like in coal mines. Look at this tunnel. Only one shaft and we are twenty-seven feet from that but there's no dust, the air's clear as crystal, and the ventilation system keeps it fresh.

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And it isn't gloomy like a coal mine. Pleasant and cheerful instead. That white rock reflects the electric lights until it's as bright as daylight. Nice place to work down here these hot days, too. Always cool and an even temperature the year around. There's around sixty feet of solid rock over our heads and it's nearly 170 feet to the bottom of the lake, so not much water seeps through. We are only pumping around 7,000 gallons an hour.

"This job is rather unusual because we are only working from one end. Usually we start at both ends and meet in the middle. They couldn't find any place on shore for a shaft for this job, though, so they had to build up this island in the lake and we do all of our digging from here. It's two and a half miles from the shaft to the water pumping station on shore where we are going to land this tunnel, and when we get it done we are going to turn around and dig a sixteen-foot bore the other way for more than a mile to hook on to the three-mile crib."

Milano, the Tunnel Boss, Holding Dynamite Stick to Be Tamped into a Shot Hole

Chicago gets its water supply from Lake Michigan, through tunnels which terminate in cribs, or intake stations, from two to four miles off shore. The oldest of them all—the two-mile crib—was built sixty years ago, and when the new tunnels are completed it will be abandoned and blown up to clear the obstruction to navigation. It is from an island built on piles around this old crib that the two new tunnels are being driven. Three tunnels already lead from the crib to the pumping station, but after the sixteen-foot bore to the three-mile crib is completed, the old tunnels will be connected with the new, the superstructure dynamited, and all the water mains will receive their supplies from the much newer crib a mile farther out, where the water is in less danger of pollution.

"Because we have no shore shaft to work from we can only put in about eight months a year out here," Bart continued. "We have a bunk house and emergency food supplies on the island to take care of a crew if they are storm-bound for a day or two in spring or fall, but when the ice pack blows in, in winter, the crib may be closed to navigation for days, or even a month at a time, so it isn't safe to bring a crew out. The men and all the supplies have to come out on tugs and scows from shore."

"Ever have any bad accidents?" he was asked.

"Only one on this job, a man fell down the shaft. Of course, we have quite a few injuries, broken bones, and such, but there hasn't been a bad accident among the tunnel men in Chicago since the fire on the Edward F. Dunne crib job about twenty years ago. Forty-two men lost their lives in that, some were burned to death and others drowned. They were working from a wooden island built out in the lake just like this one, and they had a wooden bunkhouse where the crew off duty was sleeping. It was along in the winter time and very cold. Dynamite, you know, gets bad in winter, freezes and drives the nitroglycerin into little globes. Something set off the dynamite on the crib and wrecked the place, and then the fire broke out. Lots of the boys were trapped in their bunks. Others, with their clothes on fire, jumped into the ice-cold water and were frozen and drowned."

As he spoke a roar like an express train swept down the tunnel, battered at protesting eardrums, rising into a shrill shriek. Accompanying it came a terrific blast of air.

"Come on, let's get up the tunnel a way," Bart shouted above the noise. "They're linking up the air hose."

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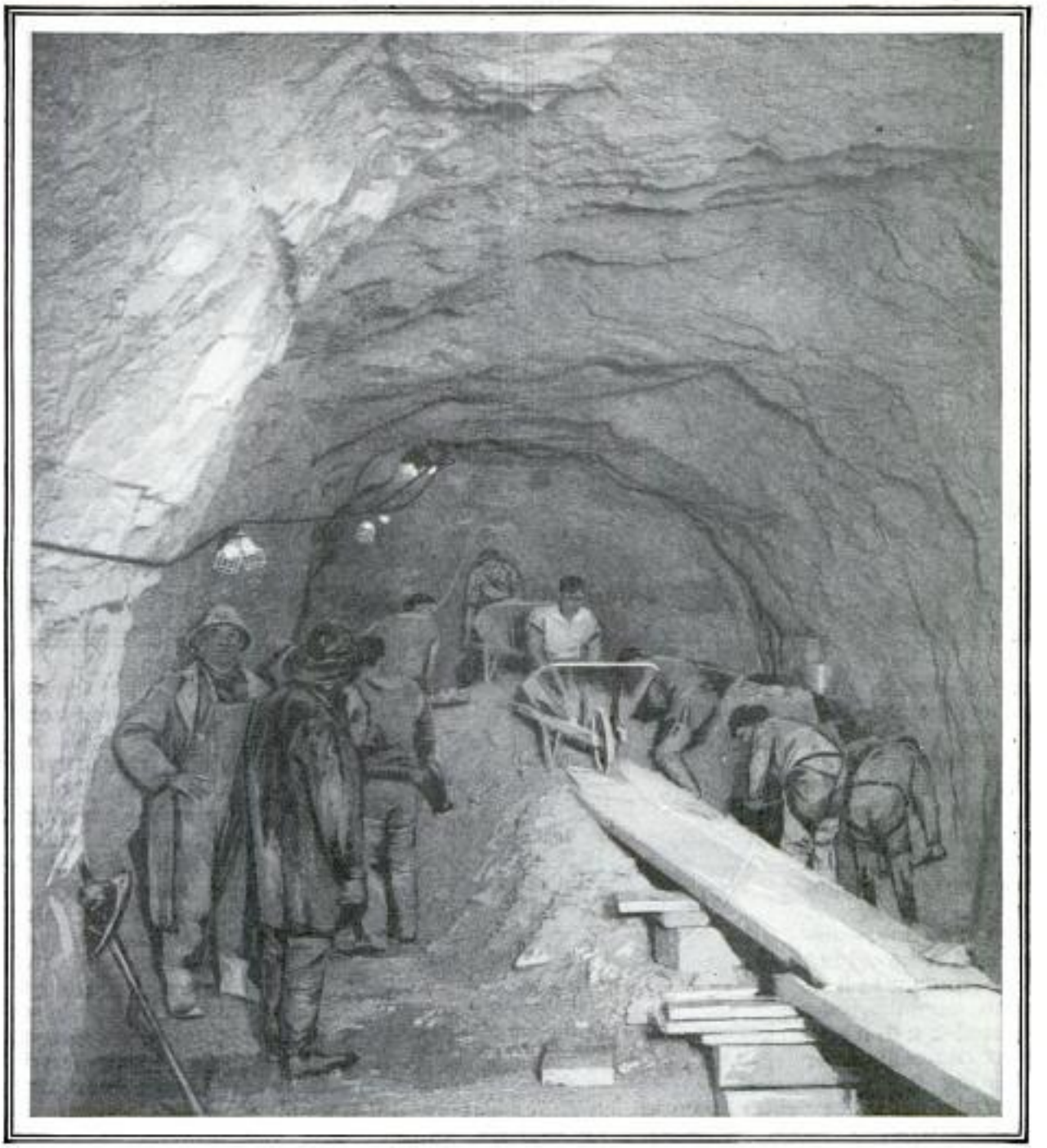

Muckers on the "Bench" at the Heading, Laboring to Clean the Dynamited Rock Away Before the Next Shift of Miners Comes on Duty; from Bench to Ceiling Is Just Half the Tunnel Height

The miners, real hard-rock men of the bore, had completed the set-up of their tools. A half hour before each had come walking down the plank bridge above the muckers, carrying from seventy-five to 150 pounds of iron on his shoulders. One would have the huge tripod, another the cylinder and feed, and a third a set of tools for an air gun. Others brought in reels of wire-bound rubber hose, and finally two lugged in the great forty-foot sections of three-inch steel-wrapped main feed hose, each terminating in a huge valve with six outlets for the drill connections.

The bench drills were mounted on their tripods to drill straight down, while two four-inch steel columns, each with two lifting jacks at its base, were raised before the face of the heading, screwed tight against the roof, and two air drills swung on each, ready to drill the holes straight into the tunnel.

Engineers had preceded them and lined up the bore from instruments mounted far back on platforms below the roof, where carefully determined positions gave their exact location. With one man at the instrument and another holding a miner's

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Engineer, Top Left, Holding Miner's Lamp to Guide Surveyor in Locating Center of Face; Painting the Face for the Miners, Top Right, and Air Drill, Below

open-flame cap lamp against the tunnel face, they took their bearings, each being marked on the white stone by turning the lamp around and smudging the spot with smoke. A plumb bob, suspended from a long pole and with a lamp inside it, was lighted and held near the ceiling for sighting its height.

With the exact center from which the bore should proceed determined, a measuring stick was produced, one end held at the center mark, and as the other swept around the circle the outline was traced on the white rock with red paint, showing the coming miners where to drill their shot holes.

As Bart moved away down the tunnel toward the distant shaft the drills swung into action. Multiply the din of one pneumatic riveting hammer, as you hear it on some tall steel-building skeleton, by about six and you have the sound of one giant mining drill. Multiply that by four for the face drills and add two more for the bench machines, then confine all the uproar in an echoing tunnel of solid rock, and you have the approximate noise in which the hard-rock miners work.

The warm, humid air from over the lake comes down under high pressure, which makes its heat still higher, and as it escapes from the drills into the cool dampness of the tunnel it turns into thick fog. In an instant the bright glare of the electric lights disappears, leaving only a sickly, yellowish spot in the murk, while the miners, with cap lights shedding a faint beam, bend over their bucking chattering drills.

"It's a great life," Bart shouts when he can make himself heard again. "You couldn't get those fellows away from it. Mining is a funny business. Sometimes we get new fellows to fill a vacancy. They come out from town on the tug, enjoying the idea of getting paid regular wages for taking a boat ride to the job. Then they go down in the bucket, work one shift, and lots of times we never see them again.

"But those that do like working below never quit. It gets in their blood and they'll be hard-rock men the rest of their lives."

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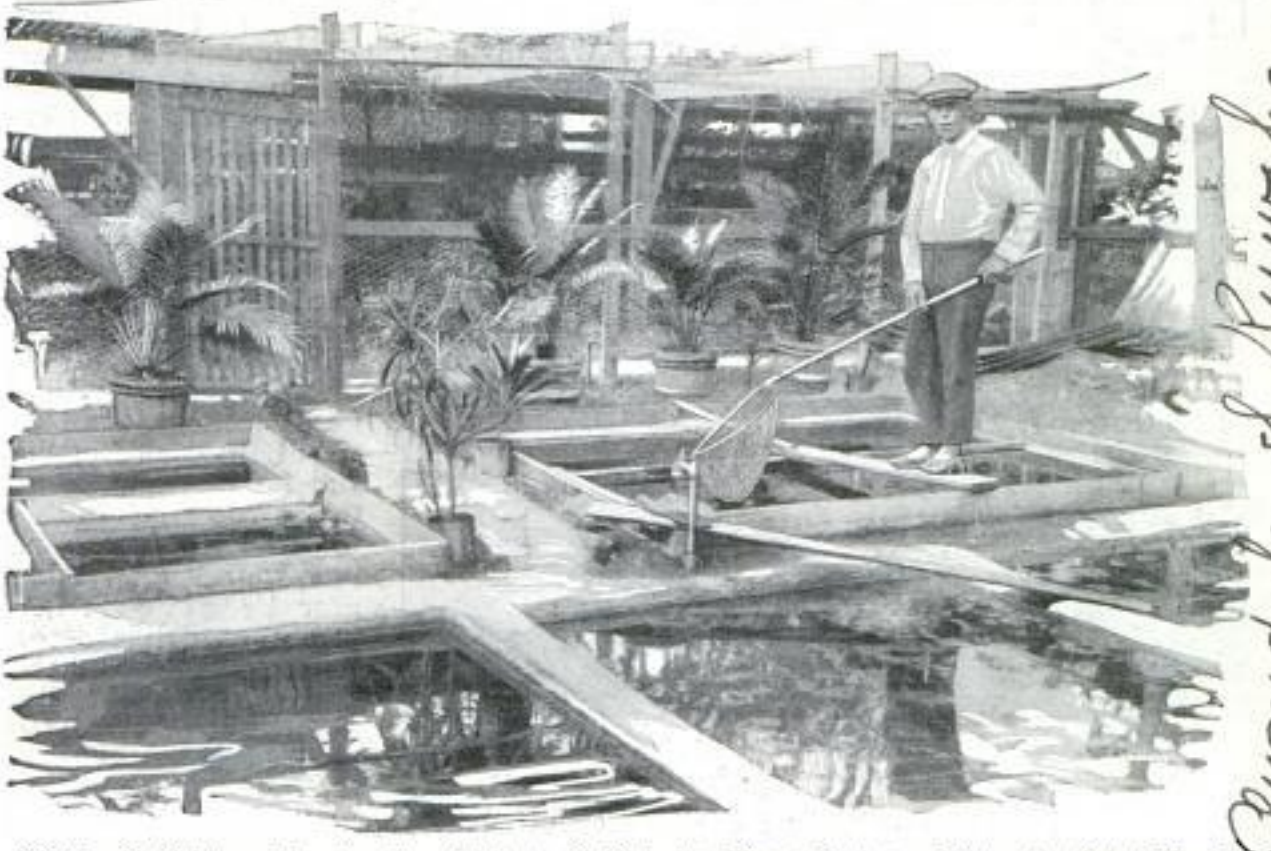
GOLDFISH RAISED BY THE MILLIONS ON FARMS



Owned by S. Kuwahara near Honolulu.

Netting Goldfish from Hawaiian Farm Tanks to Be Rushed to Distant Markets; Millions Are Raised Yearly But the Demand for Them Is Said to Exceed the Supply

Many millions of goldfish are being reared yearly and still the demand is greater than the supply, according to a report issued by one of the breeders. An Indiana farm, for instance, has bred 5,000,000 of them during the past twelve months. Others in Maryland, Iowa and Kansas are operated on an equally large scale. From $15 to $45 a thousand is paid for young goldfish by the dealers. Goldfish are comparatively new in America, a navy officer bringing them here from the Orient in 1878. In China, first, and then in Japan, they have been under cultivation for many centuries. The goldfish, as seen in bowls or parks are not a natural product. The wild fish is without especial adornment and is a dull olive in color. By interbreeding, the orientals produced the brilliant types from which American farms are now rearing their stock. One firm in the middle west has 200 ponds covering 100 acres. Here all sorts of experiments are made in order to produce the most brilliant coloring, the weirdest shapes, and the most attractive fins, including fish with such transparent fins and scales that they can hardly be seen when they are motionless.

3461

ONE HAND FILLS DRAFTING PEN FROM SPECIAL INKWELL

Drafting pens can be filled with one hand in a special bottle, set on a flat-bottomed stand to prevent tipping over. It has a tightly fitted top with a rubber washer to eliminate evaporation. The weight of the wrist upon a lever to which the cap is attached, opens the bottle and raises a filling spoon to such a position that the ink can be introduced easily into the pen. The top goes back to the bottle when arm is raised.

Filling Drafting Pen with One Hand: the Wrist Lifts Spoon to Proper Position

Kolesch & Co, 133 Fulton St
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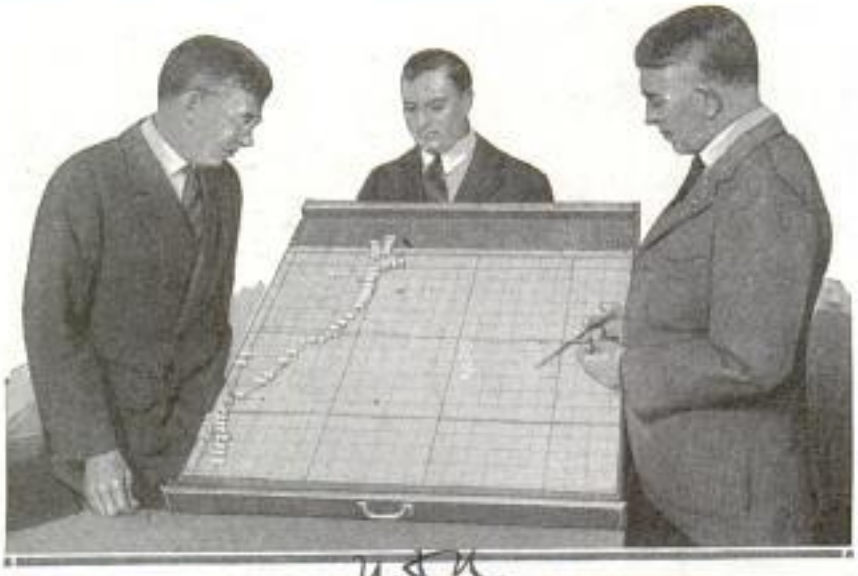
COAST MAP AIDS DRY CHIEFS IN RUM-FLEET BLOCKADE

Like admirals of a navy in war time, chiefs of the prohibition department and of the coast-guard fleet, pore over a map of the Atlantic coast line while studying plans for blockading the rum runners. Strategic points are noted by flagged pins, and with this guide, the directors are able to study the movements of their own ships and attempt to solve the tactics of the others and locate possible places of landing.



Studying Plans for the Rum Blockade with Aid of Map on Which Important Coast Points Are Marked by Flags

MILK IS FROZEN INTO BLOCKS FOR DELIVERY IN ALASKA

No rattle of cans or bottles announces the arrival of the milkman in Nome, Alaska, for the reindeer milk or cream which he delivers is frozen into blocks equal to a pint or a quart. A white cord imbedded in the block serves as a handle. The product is wrapped in oil paper and as long as it remains frozen, quantity and quality are preserved.

MOVIES AID BISON FARM TO PAY PROFIT TO OWNERS

From a patriotic desire to preserve one of the nation's frontier animals from extinction has grown a buffalo ranch in South Dakota that has developed into a profitable enterprise for the owners. Thirteen hundred head of pure-bred bison are paying returns on the cost of raising, the income being derived from sale of the meat and in several other ways. Mounted heads sell for $500 to $800 each. Cured hides, to be used for robes, bring $150 to $200 more. Even the horns are sold, a good set netting thirty dollars. Wealthy men, at certain times of the year, are furnished with whooping Indians and cowboys, and allowed to hold a real buffalo hunt, in the style of the forty-niners. They drive their horses alongside the plunging herds and are allowed to shoot one bull each. They pay well for the privilege. Moving-picture companies, seeking early American locations, are assessed thousands of dollars for the right to use the buffalo ranch in their pictures. Presence of two Indian reservations near by gives them plenty of native actors. Cowboys are available, too. Cities and owners of private preserves are steady customers for bison. The animals are captured by roping just as steers are at round-up time. Little care is necessary in raising the buffalo, it is said. It is simply given the range of the ranch and the chief effort is to keep it from straying.

ONE HANDLE FOR FIVE TOOLS HELPS GARDEN WORK

Less space is required for storage and the task of carrying the tools is simplified by a garden outfit that has five separate implements, each fitting a common handle. The heads screw into the grip, are made of aluminum and are suited to practically every need such as weeding, hoeing and shoveling.

Garden-Tool Set Showing How Same Handle Is Used on Any One of Implements

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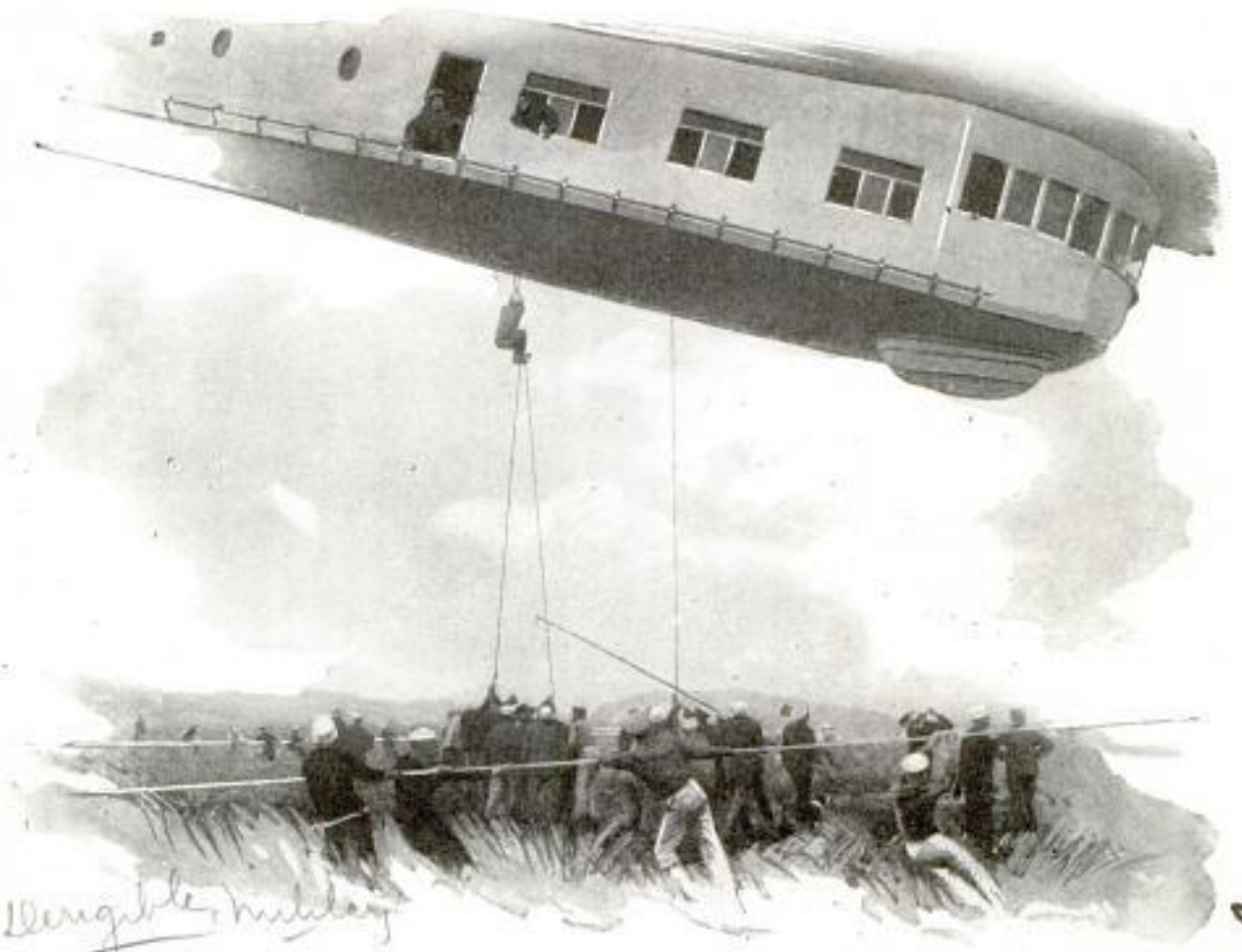

Struggling to Get the Airship "Los Angeles" into Its Hangar at Lakehurst; Members of the Ground Crew Climbed up Ropes and into the Cabin to Weight It Down

LANDING AIRSHIP LOS ANGELES COSTS THOUSANDS IN GAS

Twenty-three attempts, requiring the efforts of many men and the release of $6,000 worth of helium gas, were made before the airship "Los Angeles" was made fast and placed in its hangar at Lakehurst, N. J., after a trip to St. Paul, Minn., had to be abandoned because of engine trouble. When the big bag was a few feet from the earth, members of the ground crew, after hauling down the nose, climbed up a rope and walked aft to help bring the stern down. Landing is usually accomplished with much less difficulty, under ordinary conditions, but in this case consumed twelve hours.

3403

CARS UNLOADED BY VACUUM SAVING TIME AND LABOR

As an indication of what may be done to reduce the expense of unloading cars of bulk material such as grain, cement, lime, sand and like substances, a vacuum system installed by a paper company to handle shipments of fine white clay is said to be saving much time and labor. Hose three inches in diameter, from which the air is withdrawn by a motor-driven vacuum pump, is inserted into the material and it is thus sucked up and deposited directly into storage bins. This saves shoveling, waste and rehandling. One man, it is said, can unload twelve tons of clay an hour with a single nozzle.

Unloading Car of Fine Clay Directly into Bins with Suction Hose Instead of Shovels

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The Dust Recovering & Conveying Co.
2128 St. Clair Ave. Cleveland, Ohio.

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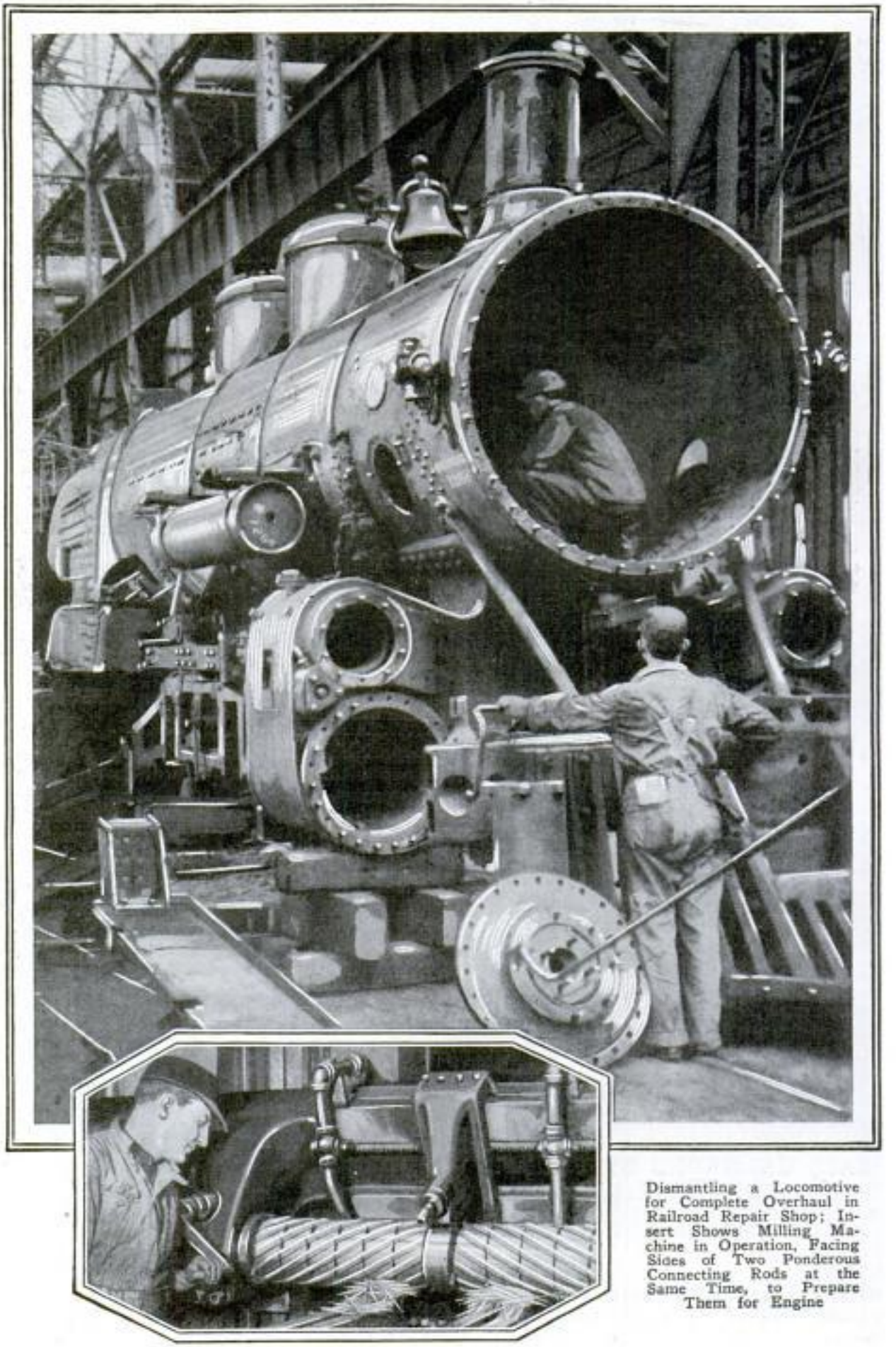

Dismantling a Locomotive for Complete Overhaul in Railroad Repair Shop; Insert Shows Milling Machine in Operation, Facing Sides of Two Ponderous Connecting Rods at the Same Time, to Prepare Them for Engine

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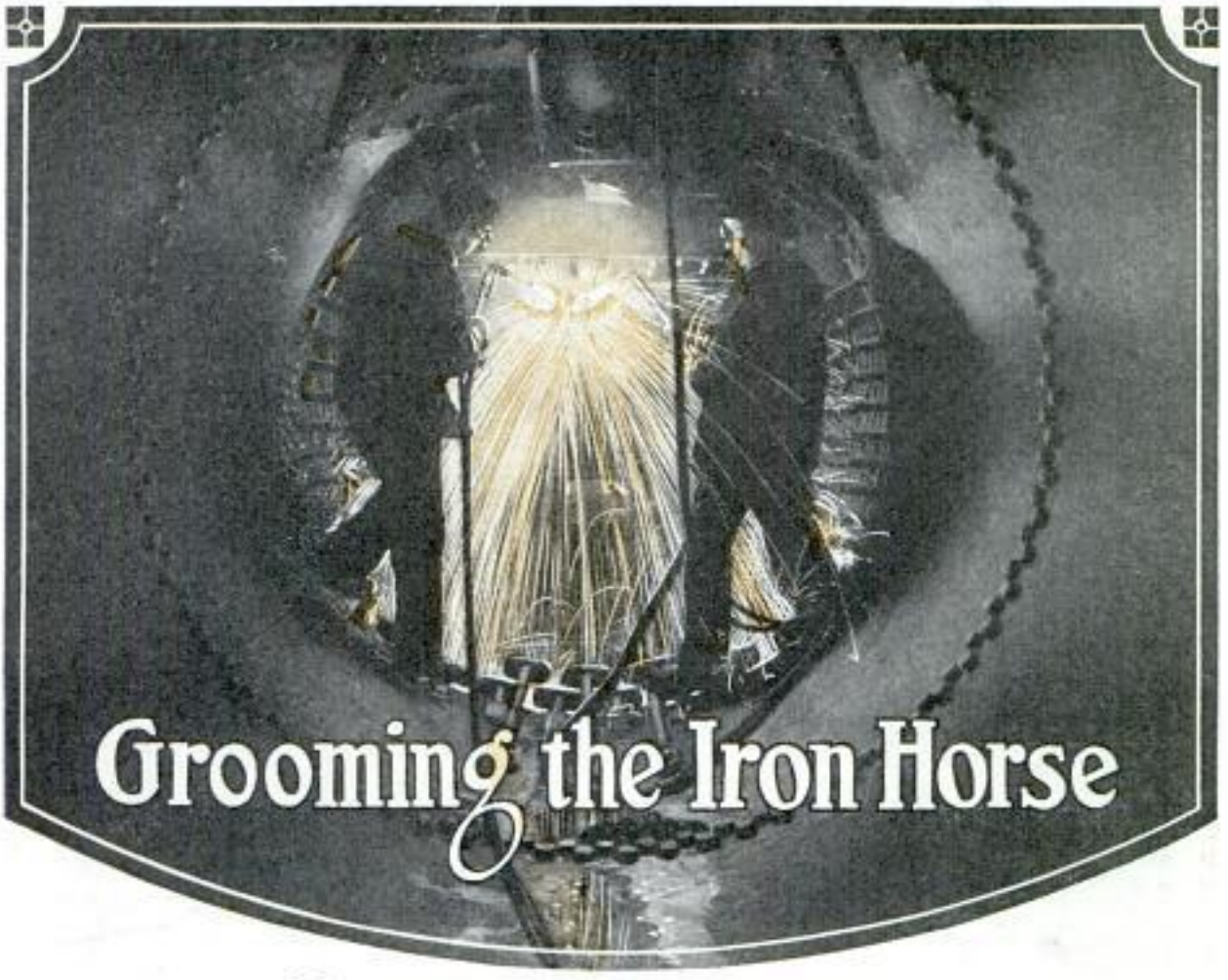
Keystone View Co 91-7th Ave New York 2319



Grooming the Iron Horse

"A LOCOMOTIVE has more parts than the human body and it is subject to almost as many ailments."

The division superintendent of motive power of a large mid-western line was speaking while half a dozen switch engines were snorting outside the terminal and a big passenger locomotive stood panting in the train shed after a run from the south.

"Look at those things on the table there," he said, pointing to a motley collection of articles at one side of his office. "They are the causes of engine failures, breakdowns that delay a passenger train more than five minutes or a freight more than twenty minutes on its regular schedule." There was a piece of air hose that had torn out the day before, with an ugly four-inch slit in its side, causing a fast train to be twelve minutes late; an odd collection of valves that had gone wrong, and a ponderous connecting rod that had failed on a slight grade.

"The failures are black marks against the division," the superintendent went on. "Every man in the department fights against them and they are succeeding too. Nineteen years ago, we had a failure for every 8,000 miles of run. Today, we run an average of 175,000 miles to a failure. Better materials, better repair machinery, better knowledge of what an engine will do and how it should be treated, partly explain it."

But preventing engine failures is only a detail of the repair department's task. There are more than 65,000 locomotives in this country. Half of these are in the freight service. Each is a separate power plant capable of earning twenty-six cents every minute. But a close survey of all the roads of the country shows that freight engines, on the average, make a run of only a little over fifty-nine miles a day and work just four hours out of the twenty-four. A large share of the rest of the time is spent in the hands of the engine doctors. One of the problems of the roads is how to shorten the "sick leave" for the engines, get more running time out of them and thus save dollars for themselves and for the public. Maintenance bills for engines alone on one large system amount to twenty-four cents per mile today or an average of $6,400 per engine per year. Higher figures prevail generally. A single major operation on one of the steel giants that pull the trains, involving remodeling and replacement

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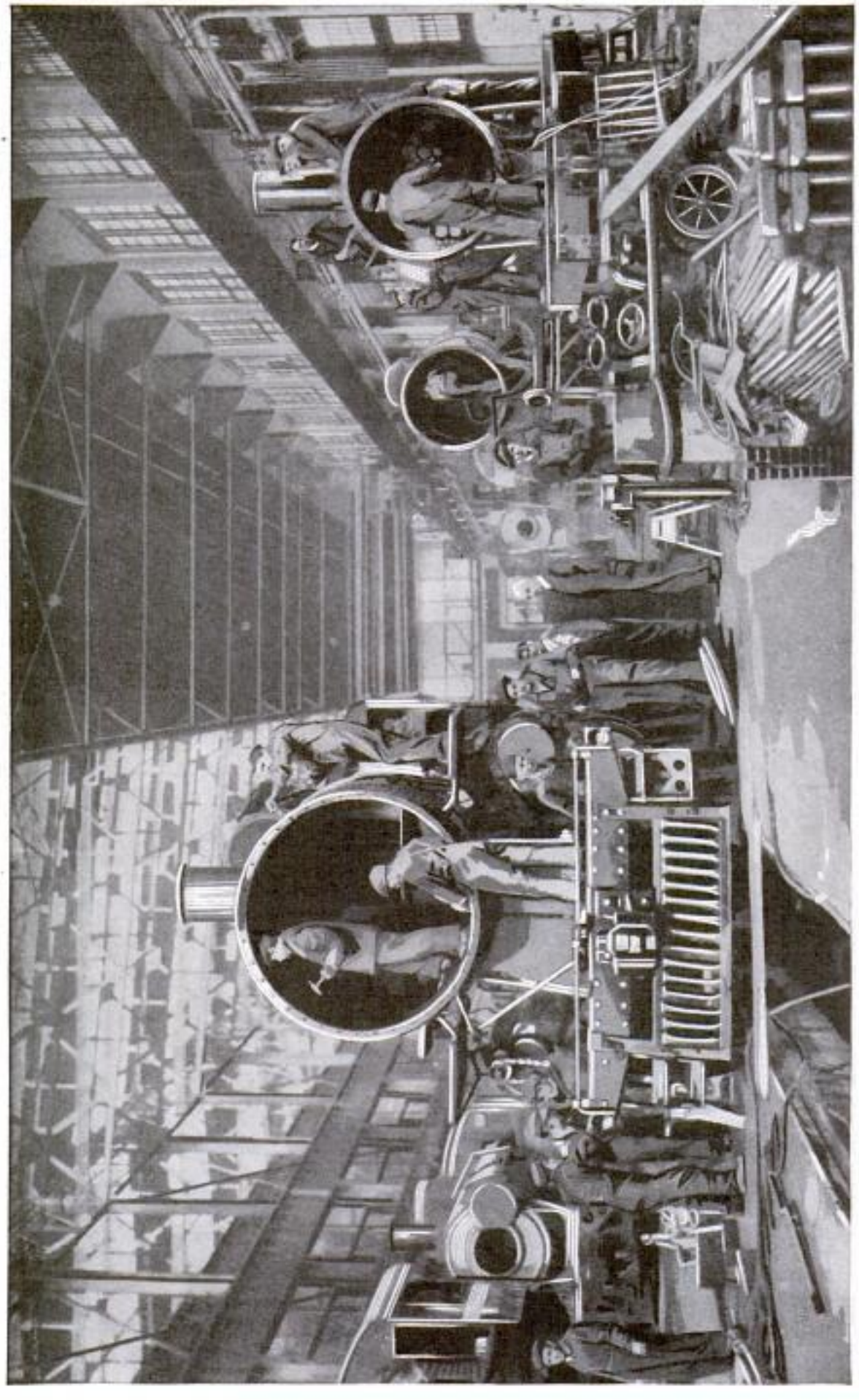

Inside the Busy Locomotive Ward of a Large Shop, the Pits Are Arranged So Repairmen Can Crawl under the Engines, and the Work Moves through the Department Progressively to Make Way for New "Patients"

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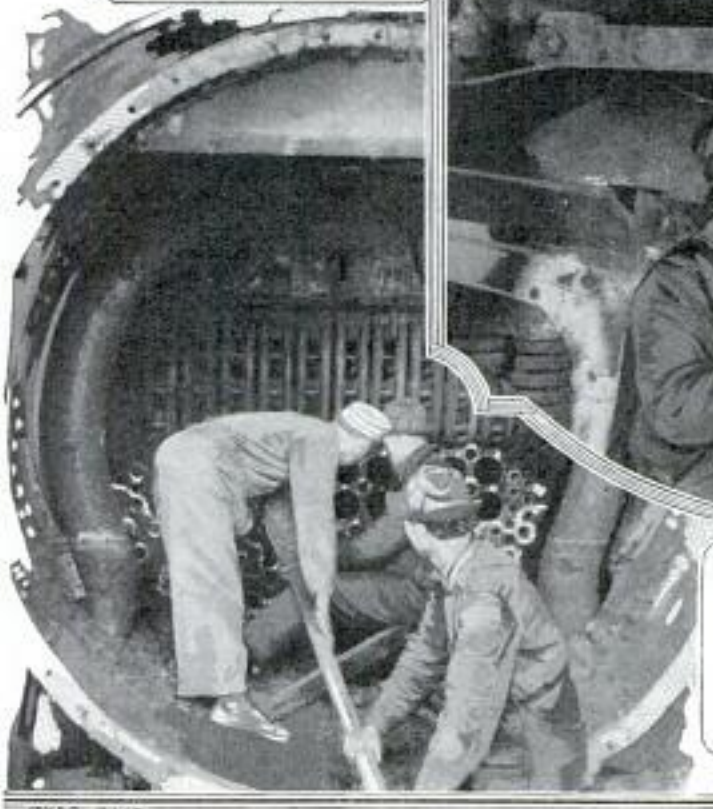
Swinging Drivers into Wheel Department for New Tires and, Left, Testing the Steam-Trip Apparatus That Automatically Rings the Bell Before Putting It Back on Engine



Acetylene Torches Are Often Used to Cut Away Rivets and Other Parts That Defy Hammering in Dismantling; Left, Putting New Flues in Locomotive Boiler, a Vital Organ of the Iron Giants That Needs Constant Attention and Repair

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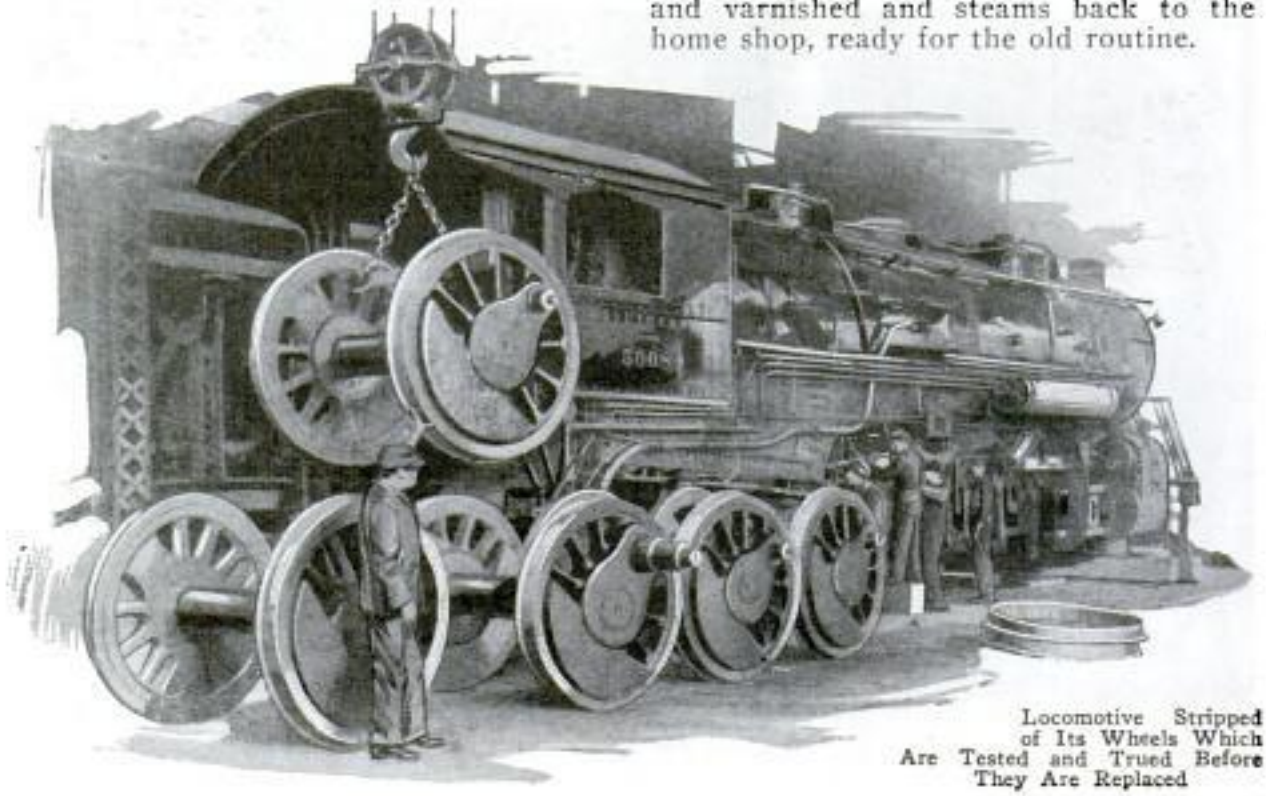
of parts may cost as much as $30,000. Many of the afflictions that send engines to the "sick lists" can be remedied at the roundhouses and are detected by the engineer at the end of his run. A crew is kept constantly busy making minor repairs, but when parts wear out and the engine has run its assigned mileage, it is eligible for the big repair shops where it goes for from ten to thirty days. An emergency or word from the proper official, will send an engine to the pits at a moment's notice, but unlike human patients, locomotives cannot "play sick." Before they are even eligible to a general overhaul, providing it is not an emergency case, passenger engines must have completed 120,000 miles of service and freight engines 80,000 miles, on the basis of engineers' reports. Switch engines are assigned only 50,000 miles and this is figured on a time basis at six miles per hour whether they move or not. The stopping, starting and jarring incident to their toil, are figured to their credit. When the allotted mileage has been run, a survey committee makes a detailed examination of the engine. If it is in good condition, it may be allowed to remain longer. If it is assigned to the shops, a report is made out showing the repairs that are needed.

A typical shop plant with its tracks and buildings some 700 feet long, will occupy perhaps 100 acres, and employ from 1,000 to 2,000 men. The engine house proper is so arranged that fifty or more locomotives can be tended at once.

If a complete overhaul is necessary, the engine is entirely dismantled. A first step is to remove the driving wheels by lifting off the boiler after all interfering parts have been loosened or taken away. The boiler is raised by a giant overhead crane that can pick up an engine and carry it around as easily as a man lifts a cigar from the table.

The stripping crew, some of them armed with keen-cutting acetylene torches, remove the engine's outer jacket, take out the asbestos and fire-brick lining, remove steam chests, spring rigging, pistons and driving boxes; the boiler is sent to a special shop with the fire box for repairs, and all that is left is the mere skeleton of the engine.

As parts are taken to the various departments for overhauling they are first cleaned in baths of a boiling lye solution to remove grease and dirt. Each part is marked with the engine number to prevent confusion when reassembling starts. In many shops the work is done progressively, the engine moving along as it is reassembled to give room for others. Boiler and other tests are given in the roundhouse at the shop yards, and then the engine, before it is painted, is taken on a trial run. Passenger engines must make at least one trip in the freight service, hauling two-thirds the regularly assigned tonnage, before they are admitted back to their former rank. If the trial trip shows that all parts are working satisfactorily, the engine is painted, lettered and varnished and steams back to the home shop, ready for the old routine.



Locomotive Stripped of Its Wheels Which Are Tested and Trued Before They Are Replaced

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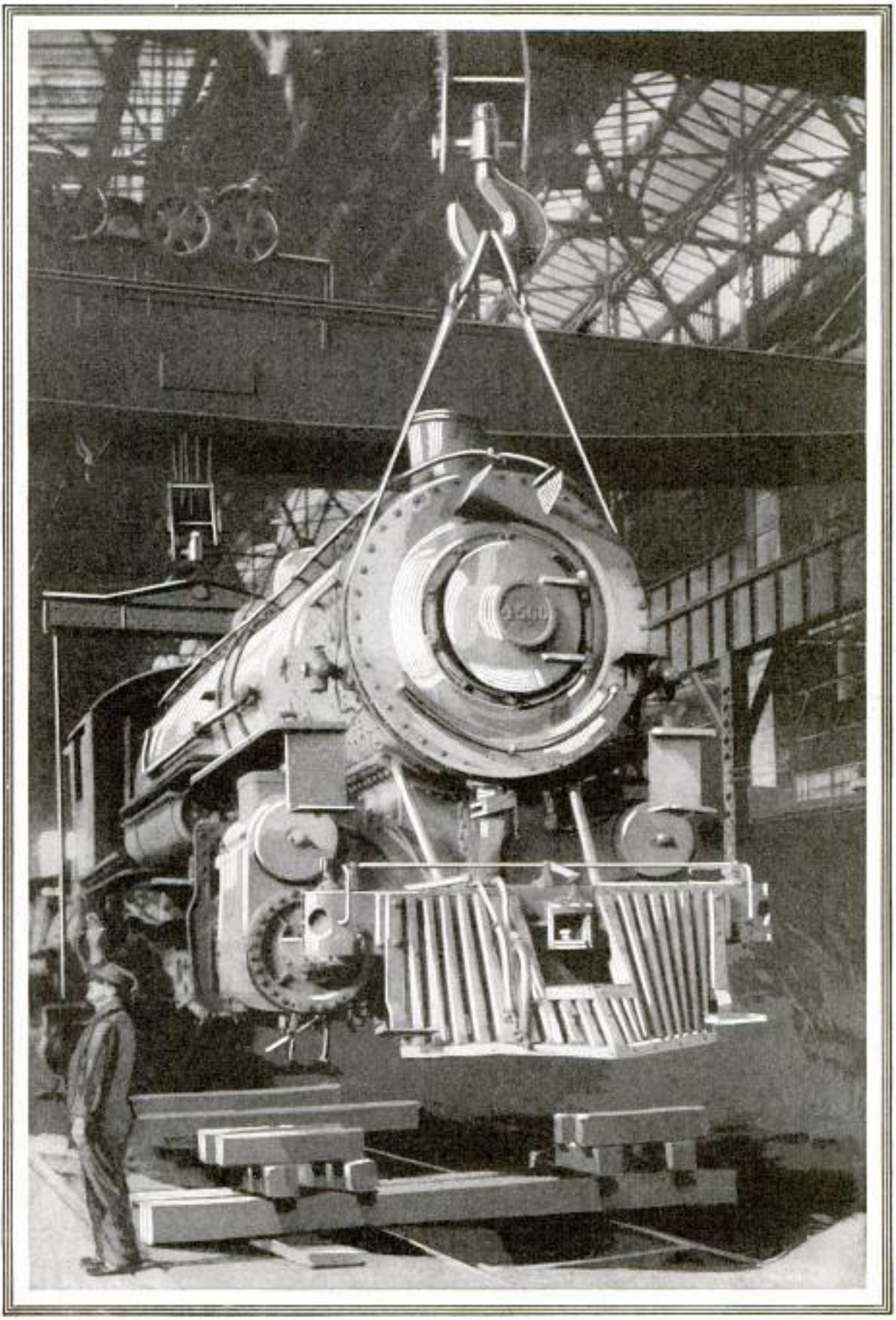

How Electric Cranes Speed the Work of the Locomotive Surgeons; Lowering a Mighty Engine to the Pit for Further Dismantling After Its Wheels Have Been Removed

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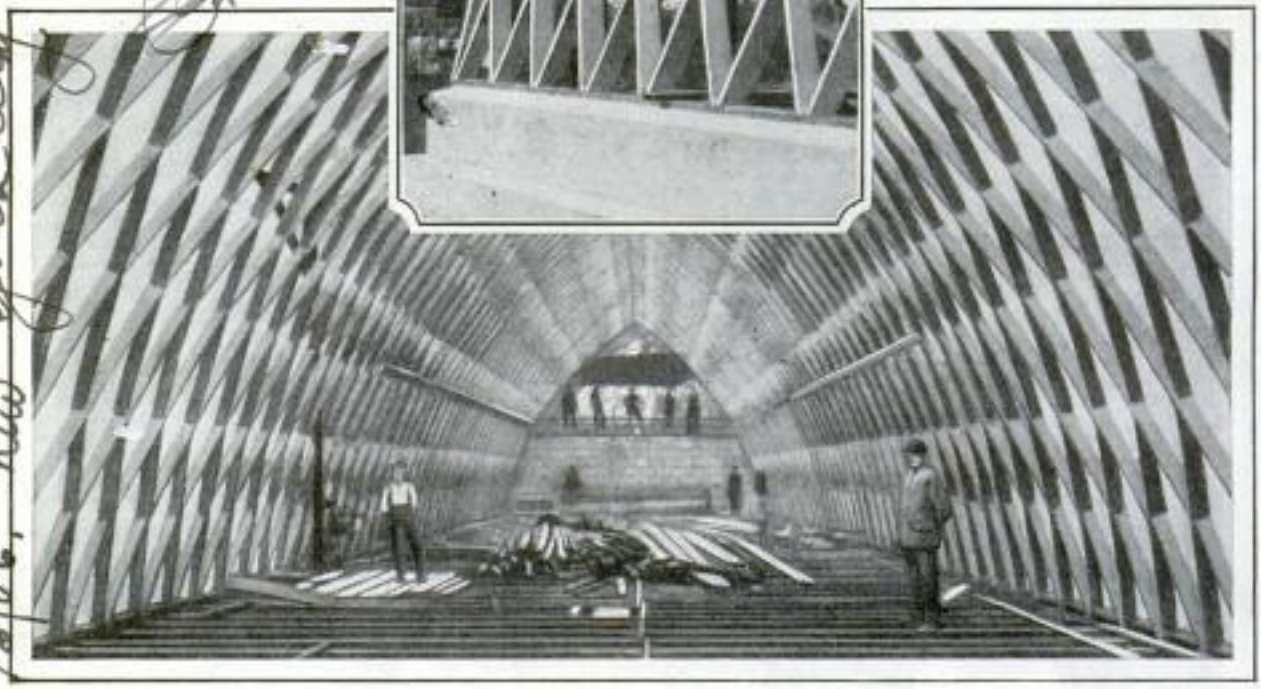
NEW TYPE OF ROOF AND WALL REDUCES BUILDING COSTS

Instead of long beams or trusses, a patented arch roof is made of short ribs joined into a netlike form. The pieces are shipped cut and ready to erect, reducing waste at the site of the building. Roofs of this type give greater freedom in the upper half story of cottages, for instance, as no columns are necessary; they withstand heavy weights and wind pressure and may easily be dismantled by unbolting the sections, which may be used again. They are erected quickly and involve no heavy lifting, and any kind of roof covering may be used with them. Economy and simplicity are likewise claimed for a system of concrete wall construction, using only a small percentage of cement, with sand, pumice stone, gravel or lava as the other ingredients. The mixture is cast so that the walls form a solid unit. The molds are built to conform to the ground plan of the house and may be used many times.



Arch Roof of New Construction and Detail Showing How Curved Segments Are Bolted Together to Form a Sort of Net Which Is Strong and Quickly Erected

ELECTRICITY TO TEST MILK TELLS ITS RICHNESS

A new use for electricity has been developed as a result of experiments conducted by Dr. Hugo Fricke in the Cleveland Clinic Foundation laboratory, which resulted in the measuring of the butter fat content of milk by passing an electrical current through it. Experimenters have known for generations that the conductivity of a liquid varied in proportion to the amount of non-conducting solids suspended in it, but no one found a practical use for the interesting phenomenon until Dr. Fricke discovered it was a much more precise way of testing milk than the customary process. The Fricke test has been found useful also in making blood analysis.

POCKET LAMP USED AS "GUN" FOR FLASHLIGHT PHOTOS

Almost any electric pocket lamp can be converted into a flashlight "gun" for photographers' use with a little fitting that replaces the lens. It consists of a small pan for the flash powder, a short piece of fuse wire and a simple arrangement for connecting to the batteries. To fire the gun, the button on the lamp is pressed in the usual way. This causes the fuse to become heated instantly and ignites the charge.

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As flame and percussion caps are eliminated, there is little chance of accident, and the outfit takes up small space, making it especially suitable for the amateur.

SUNLIGHT AS BRAIN FOOD

In addition to their beneficial physical effects, the rays of natural or artificial sunlight are declared to serve the purpose of a brain food, according to Sir Henry Gauvain, a British surgeon. Proper exposure to sunshine, he says, if carried out in a rational and instructed way, increases the intellectual output, and he offers as proof, comparative mental tests made on two groups of children in two different London hospitals. Those who were receiving special treatment at one institution where sun exposure was regularly given, manifested such great mental superiority over another group not so treated that the difference could be credited only to the sunlight effect.

RADIO SET INSTALLED ON BED TO COAX CHILD TO SLEEP

Going to bed early is no longer a hardship for the little daughter of an eastern radio engineer for she has a receiving set close by her pillow on which she can listen to the good-night stories. The instrument is attached to the back of the bedstead in such a way that the dials are within easy reach and there is a socket for inserting the ear-phone plug. To prevent listening too long overtime, the set is

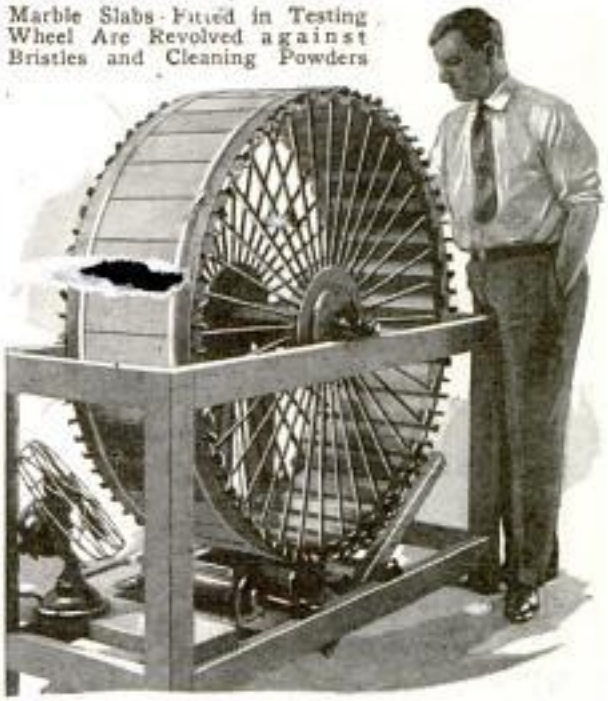
Listening to the Good-Night Stories on Radio Set Concealed behind Bedstead

easily disconnected. The installation is also convenient for invalids or for the fan who enjoys music while attempting to go to sleep, since it saves table space and is hidden from view.

BEST WAY TO SCRUB MARBLE IS SOUGHT IN TESTS

Resistance of various floor marbles and finishes to the scrubwoman's brush when

Marble Slabs Fitted in Testing Wheel Are Revolved against Bristles and Cleaning Powders



different kinds of scouring and cleaning powders or just plain water are used, is shown on a testing wheel at the bureau of standards. Samples of the materials are placed in slots on the outer rim of the wheel and clamped in position. At the bottom is a brush to which the cleaning element is applied. The action of the bristles and the powder on the surface of the samples is closely observed.

STRANGE "LINGO" OF LINEMEN IS PUZZLE TO HEARER

"Grab the dinkey and dolly and see if the grunt has the deadman handy to get the stick." A Kansas telephone subscriber overheard the above order spoken by the lineman of a crew at work on an installation job. Puzzled, he appealed to the information bureau of the public-service companies and the words were interpreted to him as follows. A "dinkey" is a small cart used to carry the poles which are called "sticks," the "dolly" is the board fitted with a roller for handling them and the "deadman" relates not to funereal matters but to the forked tool which is used in hoisting poles into position. The "grunt" or the "ground hog" is the lineman's helper who supplies tools or materials, any such article being denoted by the term "gimmick."

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3331 Capt. Norman G. McLoyd
1717 St. Paul St
Baltimore, Md.

Heart of the World's Perfume Supply; Peasants of Southern France Picking Parma Violets

Rare Perfumes Made as Centuries Ago

How Thousands of Tons of Flowers Are Turned into One of World's Costliest Luxuries Every Year

ALTHOUGH thousands of tons of fresh flowers are used every year in making perfumes—one of the world's most expensive luxuries—the methods of extracting scents do not differ greatly from those used centuries ago.

Everyday blossoms still form the basis of all really good perfumes, although synthetic, or artificial, preparations are employed in cheaper varieties. There are 4,300 kinds of blooms grown in Europe, but only about 400 possess agreeable odor.

Special farms devoted to the cultivation of roses, jasmine, the acacia and violets are plentiful in Italy and southern France, while England takes pride in the lavender fields of Surrey and Hertfordshire. Extracting the scent from the flowers is a slow and expensive process. A single ounce of pure essence of roses takes about 220 pounds of flowers, and when distilled has a selling value of more than ten dollars.

Another rare substance used in scent manufacture is ambergris, which brings between thirty and forty dollars an ounce. It results from disease in the spermaceti whale and is found in small lumps floating on the sea. The ambergris, with a gland secretion of the civet cat, found in Africa and the Orient, and musk from the musk deer of India and central Asia, is used to fix the odor of perfumes and give greater stability.

Fresh supplies of ambergris are eagerly sought and, since this substance depends on the state of health of the whale family, this is a product for which crop forecasts are impossible. Agents of the perfumers will travel halfway round the world to examine a newly found supply and bid for it. There is sharp competition for every offering. One French factory recently rejoiced at obtaining a lump of exceptional size, weighing 190 pounds. This rare discovery cost the company 2,000,-

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Courtesy Henri Manuel

Mixing Formulas Are Closely Guarded in Perfume Laboratories

Plucking Sun-Sweetened Orange Blossoms for French Perfumes; Entire Families for Many Generations in Succession Owe Their Existence to Cultivating Blooms for Their Aromatic Qualities; Typical Scene on the Mediterranean

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000 francs—equivalent to slightly more than $100,000.

"This is the biggest piece ever found," explained an official, "and its possession is good insurance against shortage. Our men were grieved to find that the block contained a great many claws and beaks of seafowl, because the weight of these is a dead loss, while there will be further loss in the two weeks of labor required for their removal. We've got to have ambergris though, and we were glad to take it, beaks, claws and all."

The usual method of making perfume consists of boiling the flowers in a huge cask that has a pipe connection with another. As the water boils, the vapor given off passes through the pipe into the second cask, the coolness of which turns the steam into liquid again. This becomes the essence, or essential oil, from which the scents are made by mixing and dilution. When particularly delicate perfumes are involved, dozens of sheets of glass, each in a separate frame, are laid out and smeared with tallow. The blooms are sprinkled on top and kept at a certain temperature for from twelve hours to three days until the fat is saturated with the odors. Then it is scraped and in this condition is known as "concrete," a product somewhat resembling chewing gum. The scent is removed by mixing the concrete with alcohol and distilling the mixture to remove the tallow.

Some perfumery manufacturers perform every step, from the growing of flowers to the extraction of the oils and the production of the bottled odors, ready for the dressing table. Many, however, do not undertake flower raising or flower treatment, but buy their raw material from plants devoted to the production of essential oils and nothing more. The flowers may be defined as the raw material for the oils, while the oils constitute the raw materials for perfumery.

The essential-oil manufacturers sell their products in solid form or as diluted extracts. The concretes are shipped in wooden boxes, with inner wrappings of heavy black paper. Liquid products go forward in steel casks or wicker-covered glass demijohns, and small shipments in glass bottles packed in wood. When the oils reach the perfumery plant, the operations become cloaked in mystery. No visitor is ever allowed to enter the mixing rooms, for the processes are secret, handed down from father to son for many a generation. In these rooms chemistry and nature unite to blend a thousand shades of aroma.

The perfume industry has an individuality altogether unique. France has thousands of households whose members have not worked in other lines for many generations. Certain factories pride themselves on unbroken control by a single family for close to 200 years. In one factory there is an old man who occupies the position of "official smeller."

Thousands of French Peasants Rush the Reaping of Perishable May Roses, Trucks Hasten the Dewy Petals to the Stills and Macerators of the Perfume Factories

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Old-Fashioned Stills, like Those Used by Moonshiners, Often Extract Aromas from Flowers Right in the Fields of France, While the Petals Are Still Fresh

The smeller is a distinct type. This man claims to be able to tell the exact composition of any perfume that may be offered. He insists that his nose enables him to tell what the mixture is made of, down to the last blossom. Because of this gift he is a valuable member of the staff, through his work of scenting the secrets of rival firms in new creations.

The center of the world's perfume industry is in the sunlit regions of southern France where there is a district in which the flower crop is the staple product. This area covers a strip along the Mediterranean coast, extending from Toulon to the Italian frontier. In this stretch of more than 2,500 acres, the peasants devote themselves almost exclusively to the task of providing raw material for the perfume factories of Grasse and Paris.

Rose cultivation occupies 1,700 acres surrounding Grasse, and there is an annual consumption of close to 3,000 tons of rose petals. The greater part of this material is used for the production of rose water and the essence of white rose. In the case of the latter there is strange misnaming, as white roses play small part in the manufacture of this essence. The rose perfume of the world's markets is distilled from red roses. Experience has shown that the blossoms of the lighter tints possess the highest aromatic value, yet they are classified as red.

The great factories of Grasse use orange blossoms by the thousands of tons. In the course of a year the consumption will equal a quantity sufficient to load a freight train more than a mile in length. The yield in essential oil is surprisingly slight. The process requires the use of 100 pounds for the production of an ounce or two of essence. With such materials as orange peel, lemon peel, and rinds of similar physical properties, the producer finds it possible to procure the essential oils by means of pressure. This is the simplest form of extraction.

In the case of mint the entire plant is utilized. Five hundred pounds of this growth will yield one pound of essential oil and between six and eight quarts of mint water. Geranium blossoms are important factors in the manufacture of rose water and eau de cologne. Violets have suffered more from synthetic competition than the flowers of any other plant pertaining to the industry. It is conceded that the greater part of the violet odors reaching the market are of artificial origin.

Particular attention is given the appearance of the package in which the perfume is sold. In one factory a staff of 3,000 wrappers and packers is divided into rooms accommodating from fifty to 250 workers each. All operations are minutely specialized. At one table a dozen girls will do nothing but affix labels; another dozen will adjust the film of silk or chamois with which the cork is enveloped; others will cut silk cords or tie them; still others will wrap the bottles or insert them in their individual cartons.

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Portrait of President Coolidge Stitched by Immigrant Girl in Bits of Colored Silk Thread

PORTRAIT MADE WITH NEEDLE AND BITS OF SILK

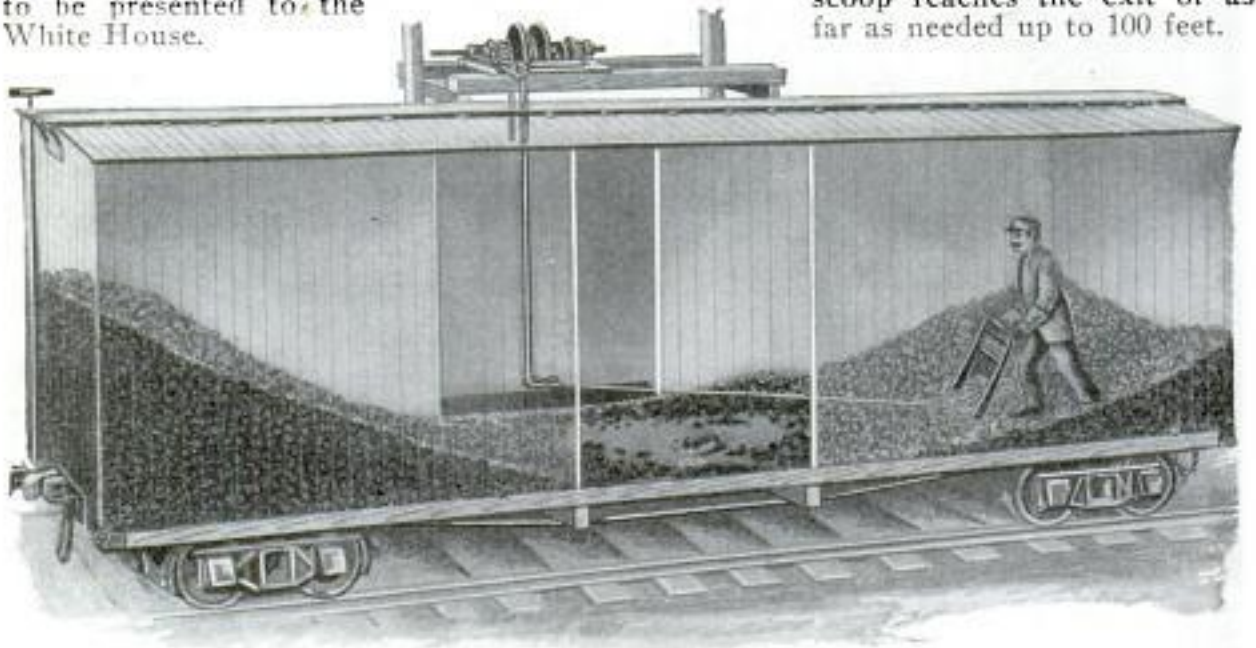
Using only a needle and bits of silk thread, an immigrant girl has produced a striking portrait of President Coolidge. The picture which is in colors, has attracted much attention because of the skill shown in its construction. Together with a portrait of Mrs. Coolidge, worked out in the same material by the girl, it is to be presented to the White House.

GLOW OF EYES IN DARKNESS DUE TO REFLECTED LIGHT

Eyes of animals and of human beings sometimes glow when coming out of the darkness, not because of phosphorescent matter in the eyeballs as has been supposed, but because of the light which they reflect, according to scientists. The eyes are like mirrors, and since the rest of the body is in darkness, the effect is more noticeable. Experiments were made with a number of animals shut up in rooms where there was absolutely no light. No glow was visible but when a few rays were permitted to enter, the luminous shine in the creatures' eyes was at once apparent. It has been asserted that the eyes of negroes shine in the dark while those of white persons do not. Scientists say that both glow alike but the effect is more noticeable in dark-skinned persons because of the stronger contrast between the complexion and the eyes.

POWER SHOVEL SAVES LABOR IN UNLOADING CARS

In unloading coal, lime, sand, gravel, cement, seeds and other bulk materials from railroad box cars, a power shovel is being used which, it is said, can do the work of four men. The winding mechanism is mounted on a framework and connected to a line shaft, gasoline engine or electric motor. The operator pulls the scoop backward and stops. A little slack in the rope is released which causes the rope to be wound on the drum until the scoop reaches the exit or as far as needed up to 100 feet.



Power Scoop Unloading Car of Coal; Winding Drum on Frame Outside Is Adjusted to Pull Shovel to Door After Workman Has Imbedded It in Material

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RAPID SPARK-PLUG CLEANER BURNS OFF CARBON

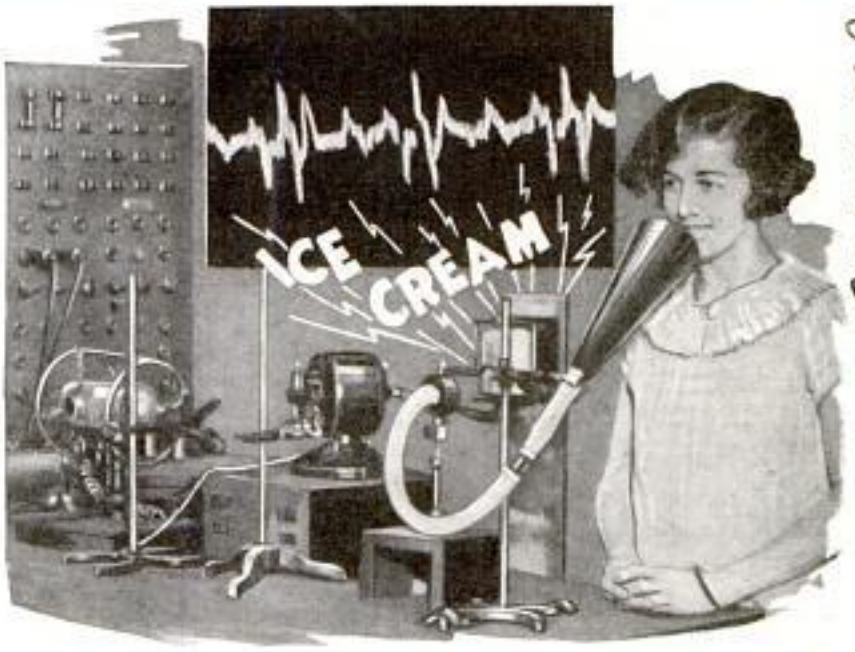
Spark plugs are quickly cleaned in an attachment that fits on practically any kind of gasoline motor. It consists of a small chamber that is screwed into one of the spark-plug holes or replaces a petcock, and is so arranged that flames from the combustion chamber pass through it and into the spark plug which is screwed to the attachment from above. As the flame passes through, it becomes mixed with air flowing in through vents in the side of the cleaner, so that a bath of fire and oxygen strikes the plug where no oil can reach it. A few seconds of this treatment is said to be sufficient to clean almost any plug. The cleaner is left on the car permanently, and only one is needed as each plug is removed as soon as cleaned and a fouled one substituted.

RESALE OF PASS-OUT CHECKS STOPPED BY RUBBER STAMP

The Filipinos have a non-transferable pass-out check which is as effective as it is novel. Cockfighting is the favorite pastime. The pits are immense affairs of bamboo where the people—men, women and children—gather by the thousands. They stay all day long, and even into the night since the advent of electricity. Pass-out checks are necessary, but it was found that the possessors often resold them at cut rates. To protect themselves against loss of business, the managers adopted the use of a rubber stamp in lieu of the customary pasteboard ticket. As the patron passes out of the inclosure, the rubber stamp is pressed on his hand, and the mark readmits him.

VOICE IS PICTURED ON SCREEN WHILE PERSON TALKS

In an apparatus that projects a curve picture of the voice upon a screen while the person is talking, scientists expect to find a great aid in electric and medical research. As the vibrations pass through a tube into the mechanism, they produce corresponding waves of light which are visibly registered, enabling observers to study differences in voices, defects in speech and the effect of currents of various frequency upon the curve produced.



"Ice Cream" Says the Girl, and as She Speaks a Jagged Line Picture of Her Voice Appears on Screen

BOOTH FOR HEADLIGHT TESTS AIDS AUTO SAFETY

Regular inspection of automobile headlights is a requirement in California, and one of the first sights that greets the tourist's eye after crossing the state line on some of the highways is a little shed where his lights are given a careful test. This is done by focusing the rays upon a chart at the far wall of the booth. It is marked to show where the brightest area should be so that the lamps can be adjusted to avoid unnecessary glare.

Car Entering Booth for Tests That Tell If Headlights Are Adjusted Properly

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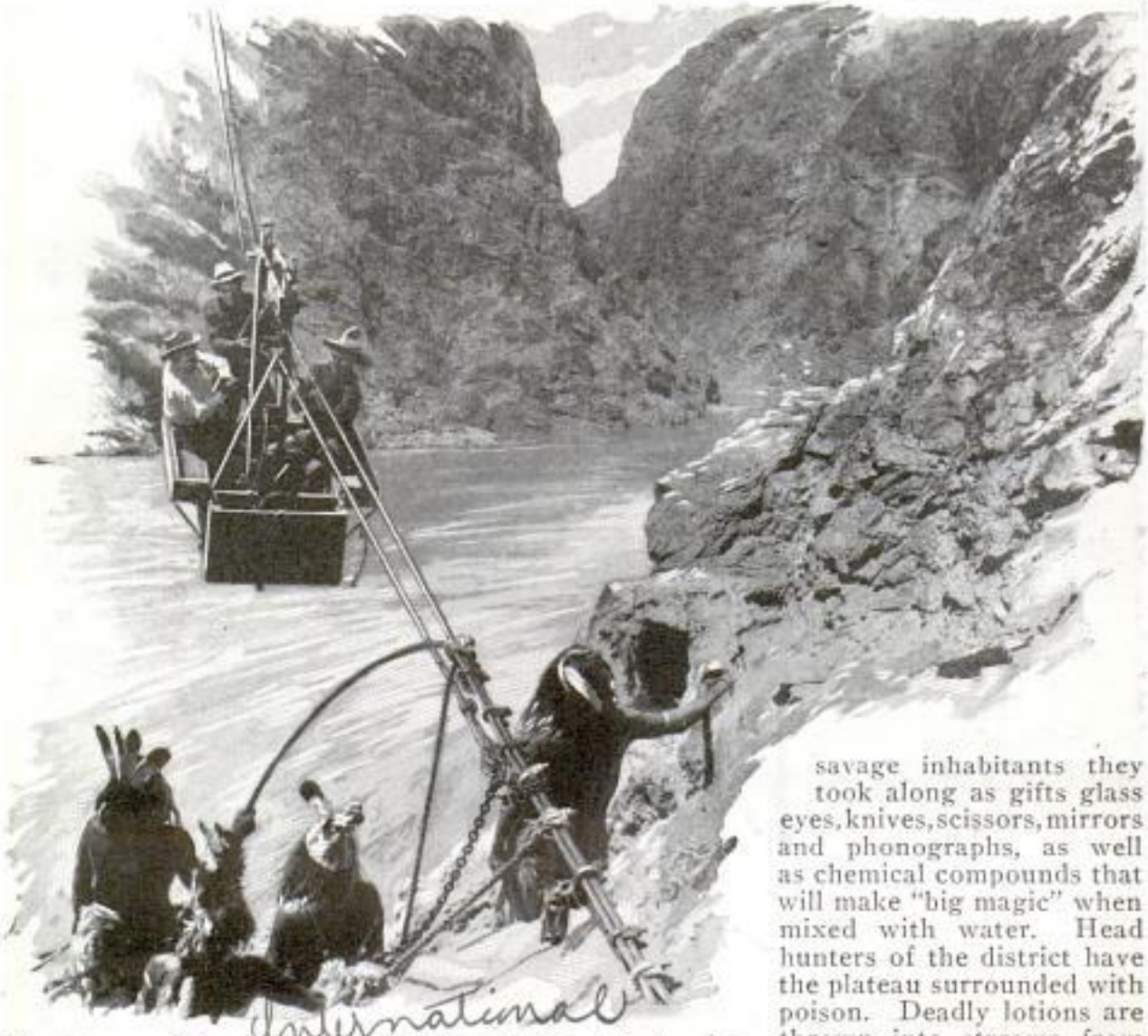
GIANT DAM TO HARNESS THE COLORADO RIVER



The Governor of Nevada, Attended by Indians in Native Headdress, Inspecting the Site of the Proposed Colorado River Dam

Water sufficient to irrigate 2,000,000 acres and to generate 600,000 horsepower will be impounded by the proposed dam across the Colorado river, one of the world's greatest engineering feats. The cost is placed at approximately $75,000,000, and it is expected that ten years will be required for construction. The dam will be 600 feet high, 200 feet long at the base, 1,000 feet at the crest, and will create a reservoir, calculated to extend approximately eighty miles upstream.

BRAVE JUNGLE DEATH TO MAP SOUTH AMERICAN PLATEAU

Two English explorers are plunging into the tangled jungles of northwestern South America to map a hitherto unexplored 800-mile plateau. To placate the savage inhabitants they took along as gifts glass eyes, knives, scissors, mirrors and phonographs, as well as chemical compounds that will make "big magic" when mixed with water. Head hunters of the district have the plateau surrounded with poison. Deadly lotions are thrown into streams from which the explorers must take their drinking supply. Arrows tipped with venom are set in traps along the path. The adventurers hope to discover a "lost tribe."

READING GLASS ON STAND LEAVES HANDS FREE

A reading glass has been fitted to an adjustable stand which permits the lens to be fixed in any position or angle without the need of tightening screws or catches. The bracket cannot be knocked over easily and is designed to aid in holding papers, on which the glass is focused, flat on the table or desk. A clamp in the base of the holder

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is provided for attaching the device to the arm of a chair or the edge of a table so the reader's hands may be free. This arrangement also eliminates the strain on the eyes resulting from the unsteadiness of a glass held in the hand.

SWEET-CORN CROP IS DOUBLED BY CROSSING STRAINS

Six tons of sweet corn per acre as against three and one-half tons of the standard evergreen variety, are reported for a new strain called "red evergreen" developed by the Connecticut agricultural experiment station. Chemists first took two good breeds of corn and by constant self-fertilization developed in them great purity but little vigor. Then the strains were crossed and the required vigor obtained. Almost doubled yields were reported immediately.

SHOWER BATH FOR STREET CARS KEEPS WINDOWS CLEAN

To remove dirt from the top of street cars and thus prevent streaking of the windows after a rain, a spray shower in use in a southern city quickly reaches all parts of the roof and gives the sides of the car a thorough rinsing. The pipes are bent so that the water falls forcibly on the area to be cleansed, and in five or ten minutes, a car is given a washing that requires but thirty or forty gallons of water. A spray once every four days, with a window cleaning in between, keeps the cars in good condition.

Shower Bath for Street Car That Keeps Tops Clean and Prevents Window Streaks

UMBRELLA FOLDS INTO ROLL ONLY TEN INCHES LONG

So that it can be carried in the pocket or in a small traveling bag, an umbrella has been constructed with a telescoping handle, folding ribs and top, forming a roll but ten inches long and two inches in diameter. A twist of the lower section of the grip, when it is collapsed, folds the top which becomes locked into a neat parcel. To open the umbrella, the handle is turned in the opposite direction.

Folding Umbrella Extended and Collapsed in Roll, Only Ten Inches Long, to Fit in Pocket

EAR TROUBLE CAUSED BY DUST BREATHED BY WORKERS

That dust and fumes in the air are often a cause of deafness is a conclusion reached by government scientists after exhaustive tests. In such cases inflammation of the lining of the nose spreads to the auditory organs. Continuous disagreeable noises, tests on animals prove, also cause a slow departure of the hearing. Aviators undergoing swift changes of air pressure and temperatures, may burst the eardrums. In some trades gases of chemical poisons affect the auditory nerves through the nose membranes. Soldiers and sailors, listening to cannon discharges in inclosed spaces, and caisson workers, under great pressure far below the earth, are endangering their hearing constantly. Experiments with animals developed the fact that high-pitched noises are far more likely to have a detrimental effect on hearing than lower sounds.

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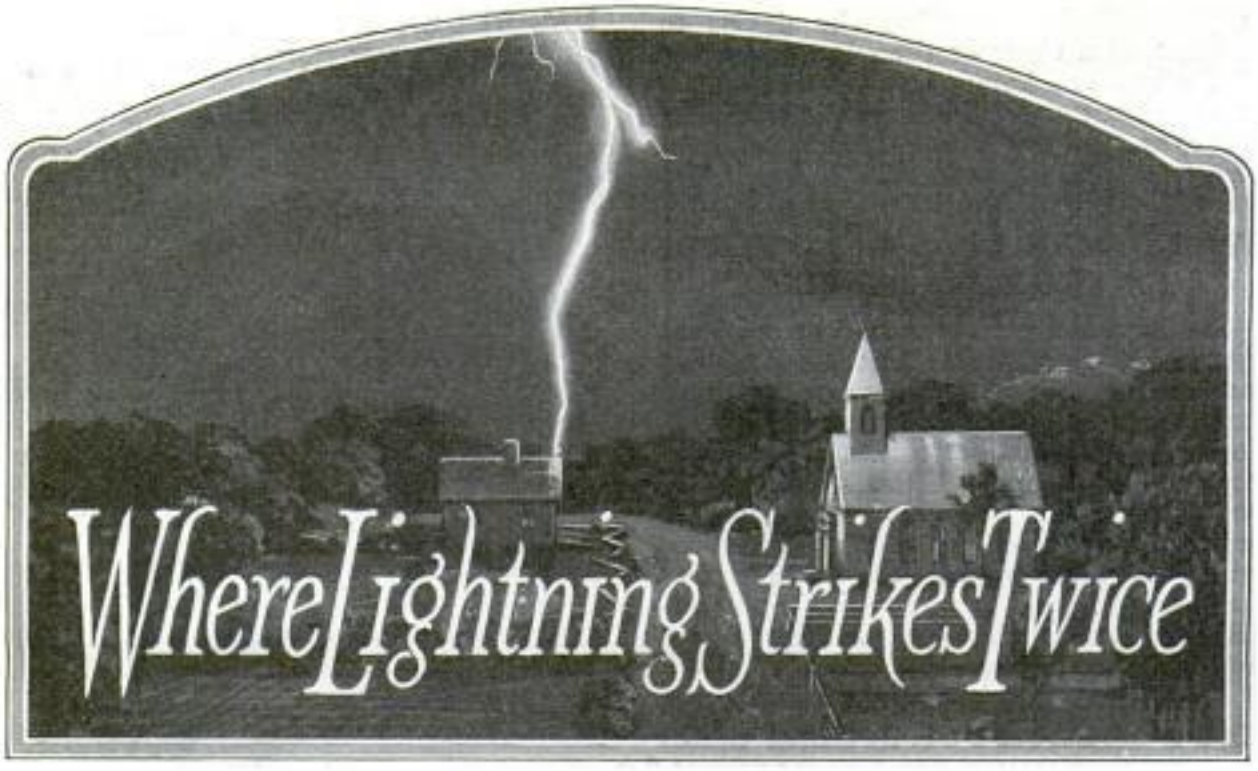

Man-Made Lightning Bolt Striking Miniature Village

By J. EARLE MILLER

WHAT place is safest in a thunderstorm?

Inside a metal building, or one protected by lightning rods, is the answer to this question given by the insurance companies.

Get under cover when lightning begins to play, but that doesn't mean a tree out in the woods or fields. It is far safer to stay in an open prairie than to seek protection from the storm under a tree. Likewise, they advise you to keep away from wire fences, hill tops, small sheds and shelters, or other isolated objects that may attract the discharge.

Thick timber is fairly safe, on the theory that, with so many trees around, the chances are the bolt, if one comes, will strike some other tree instead of that you are standing under. If you are caught in a storm, a cave or depression in the ground, a deep valley or canyon or the foot of a steep or overhanging cliff will afford fairly good refuge from a possible stroke of lightning.

If you are inside when the storm breaks, it is not necessary to hunt a thick feather bed and cover up your head. It is true that there is no case on record of anybody ever being killed by lightning while lying in a feather bed, but there are plenty of other safe places in the house. One of these is in the center of a downstairs room, well away from open doors or windows and as far removed as possible from a chimney, stove, electric-light wire, telephone or any metal object that projects through the walls or roof of the building.

If a person is struck by lightning, efforts to revive him by artificial respiration should be made, since lightning rarely kills outright. Usually the victim is only badly stunned and can, if treated promptly, be restored to consciousness.

One of the oldest bits of folklore—that lightning never strikes twice in the same place—has been disproved by the scientific investigations of the underwriters' laboratories, which pass on all fire-hazard prevention methods adopted by the insurance companies. The old saying has its origin in the fact that, when lightning struck once, there was seldom anything left for it to strike again, but the superstitious came to believe that the storm's path never was the same twice.

As a result of the underwriters' work, they advise everyone living in the country or sparsely settled neighborhoods to make every effort to get the lightning to strike many times in the same place, by providing lightning rods for it to strike at. A properly installed lightning rod draws off the accumulated electricity during every storm and passes it into the ground without harm to building or occupants. One of the best examples of taming the lightning is the Washington monument,

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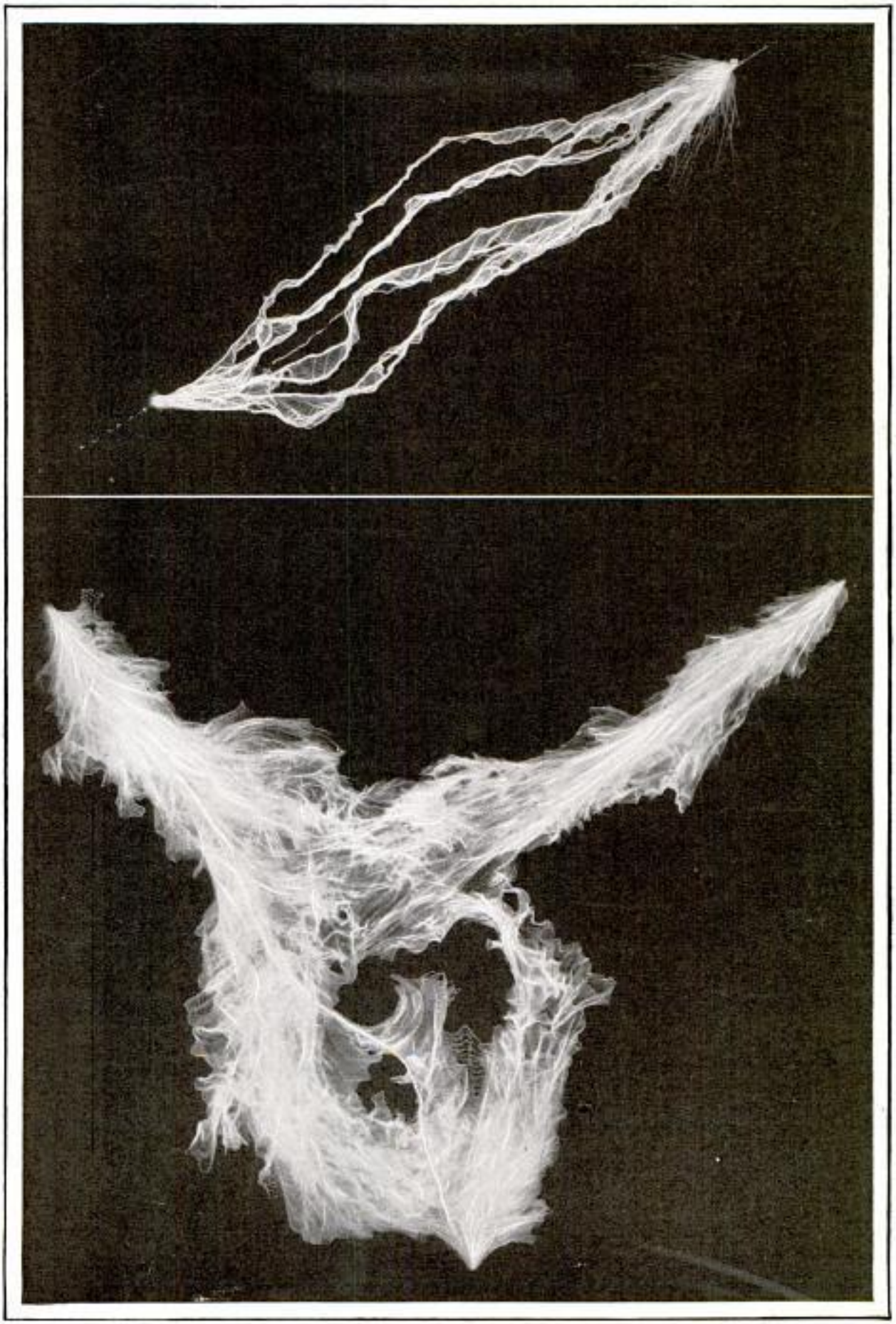

Above, Man-Made Lightning, a Million-and-a-Half-Volt, Fourteen-Foot Flash, and, Below, a Million-Volt, Nine-Foot Three-Phase Arc, Both Produced in the General Electric Laboratories

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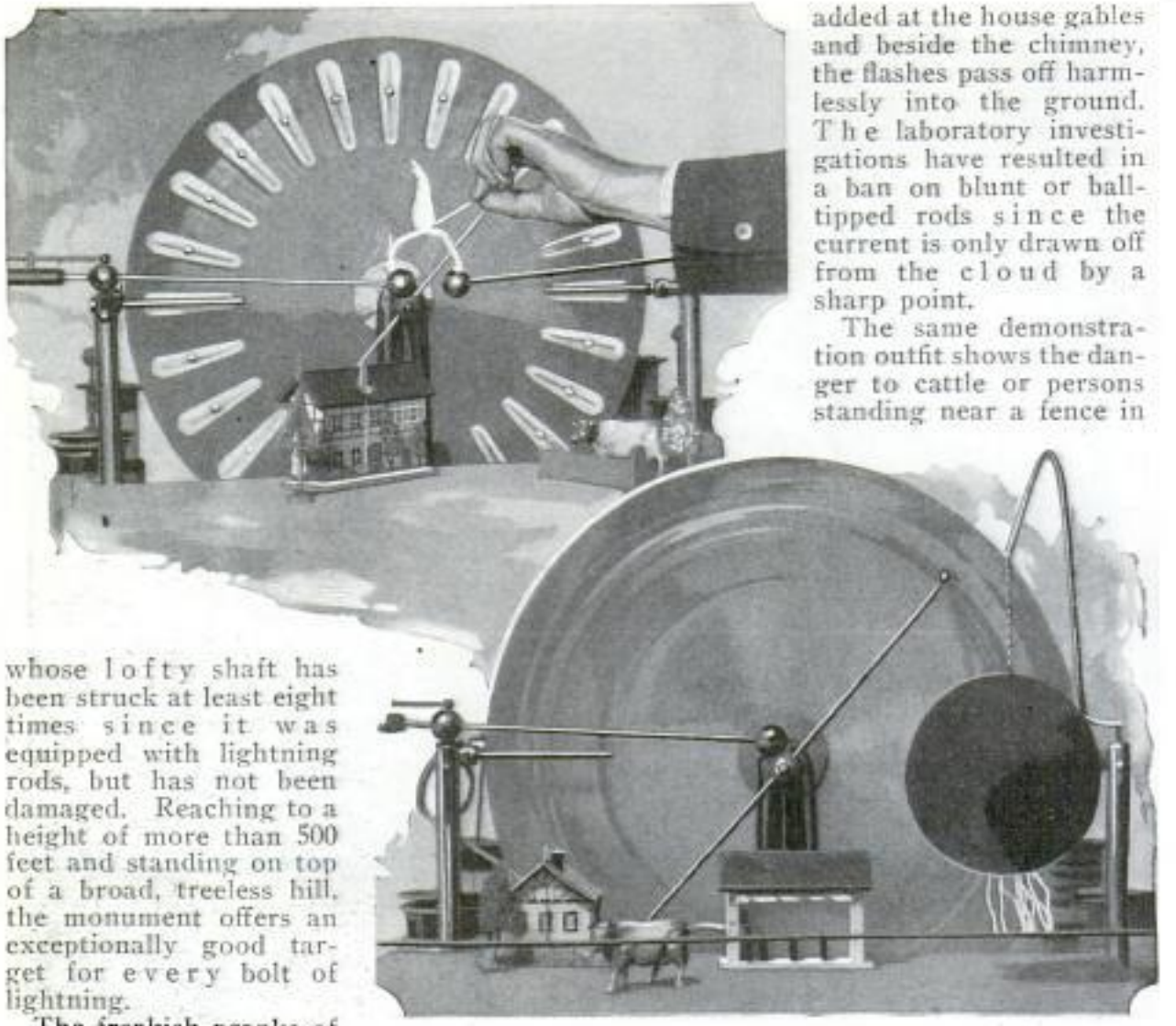

Electric Arc Drawn Aside by a Match Flame, Just as Heat Ascending from a Chimney May Attract It, and, Below, "Lightning" Descending from Black "Cloud" Strikes Fence and Follows This to the Toy Cow

whose lofty shaft has been struck at least eight times since it was equipped with lightning rods, but has not been damaged. Reaching to a height of more than 500 feet and standing on top of a broad, treeless hill, the monument offers an exceptionally good target for every bolt of lightning.

The freakish pranks of lightning are well known, but careful study by the underwriters' experts showed that for every so-called freak there was a sound reason. With a static machine, and a collection of tiny toy houses, barns, animals and people, the scientists in the laboratory are able to reproduce on a small scale the happenings of a thunderstorm. A sheet of cardboard, coated with tin foil and covered with black cloth produces a "cloud" which hangs from one lead of the static machine and sways over the toy farm. With a bit of tin foil in the upper story of the farm house to represent a metal bed, a tiny tin chandelier hanging from the ceiling below and a toy woman standing near the tin stove, it is possible to demonstrate how many people have been killed in the fancied security of their homes.

The flash from the cloud leaps to the house roof, down to the metal bed, pierces the floor to the chandelier, runs down it and then jumps to the woman, and from her to the stove. With small pointed rods added at the house gables and beside the chimney, the flashes pass off harmlessly into the ground. The laboratory investigations have resulted in a ban on blunt or ball-tipped rods since the current is only drawn off from the cloud by a sharp point.

The same demonstration outfit shows the danger to cattle or persons standing near a fence in an open field. A wire, representing the top strand of the fence, draws the flash from the cloud and passes it on to a toy cow standing near by, and through her foot to the ground. Then a small piece of wire is leaned against the fence, with one end resting on the ground, which is a tin-foil sheet covered with green cloth and connected to the other side of the static machine, and the flashes cease, insuring the cow's safety. The underwriters advise that every wire fence be well grounded at frequent intervals by connecting the wires to iron rods driven several feet into the earth.

Besides insisting on sharp tips for lightning rods, the laboratory also frowns on fancy colored balls, ornamental horses, cows and roosters and other "Christmas tree ornaments" on them. If the farmer wants a weather vane, they advise that it be constructed separately, since the revolving vane may wear through the cop-

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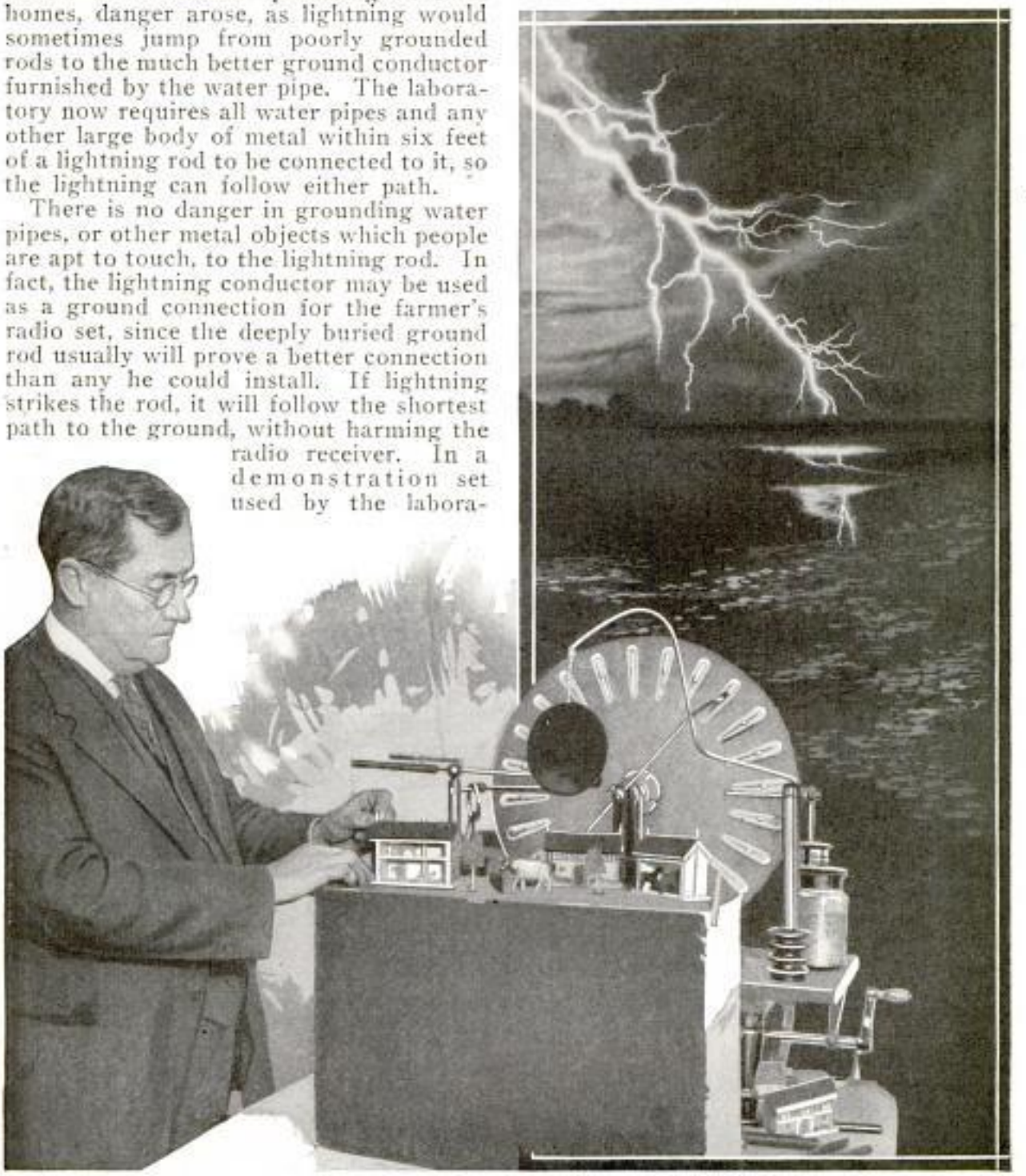
per tubing of the rod. The standard specifications adopted by the insurance companies limit the surface area of any lightning-rod ornament to eight square inches, which effectively bars those added in the old days to help sell the rods.

The main work of the laboratories in co-operation with the government bureau of standards, has been in determining the causes which sometimes lead to a rodded building being struck, and then devising means to offset the danger. With the installation of modern plumbing in farm homes, danger arose, as lightning would sometimes jump from poorly grounded rods to the much better ground conductor furnished by the water pipe. The laboratory now requires all water pipes and any other large body of metal within six feet of a lightning rod to be connected to it, so the lightning can follow either path.

There is no danger in grounding water pipes, or other metal objects which people are apt to touch, to the lightning rod. In fact, the lightning conductor may be used as a ground connection for the farmer's radio set, since the deeply buried ground rod usually will prove a better connection than any he could install. If lightning strikes the rod, it will follow the shortest path to the ground, without harming the radio receiver. In a demonstration set used by the laboratory this is shown by passing the charge created by a static machine to a tin-foil "cloud," from which it jumps to a heavy grounded wire, representing the lightning rod. While the electrical charges are crackling and leaping from cloud to rod, a person can hold the rod in his hand without feeling the current. The chief points of the underwriters' standard are rods on every high point of a building, sharp tips on each rod and two conductors far apart from each point to the ground.



Putting Lightning Rods on Toy House, Used with Static Machine by Underwriters' Laboratories to Demonstrate Correct Wiring Methods, and Above, a Real Lightning Flash

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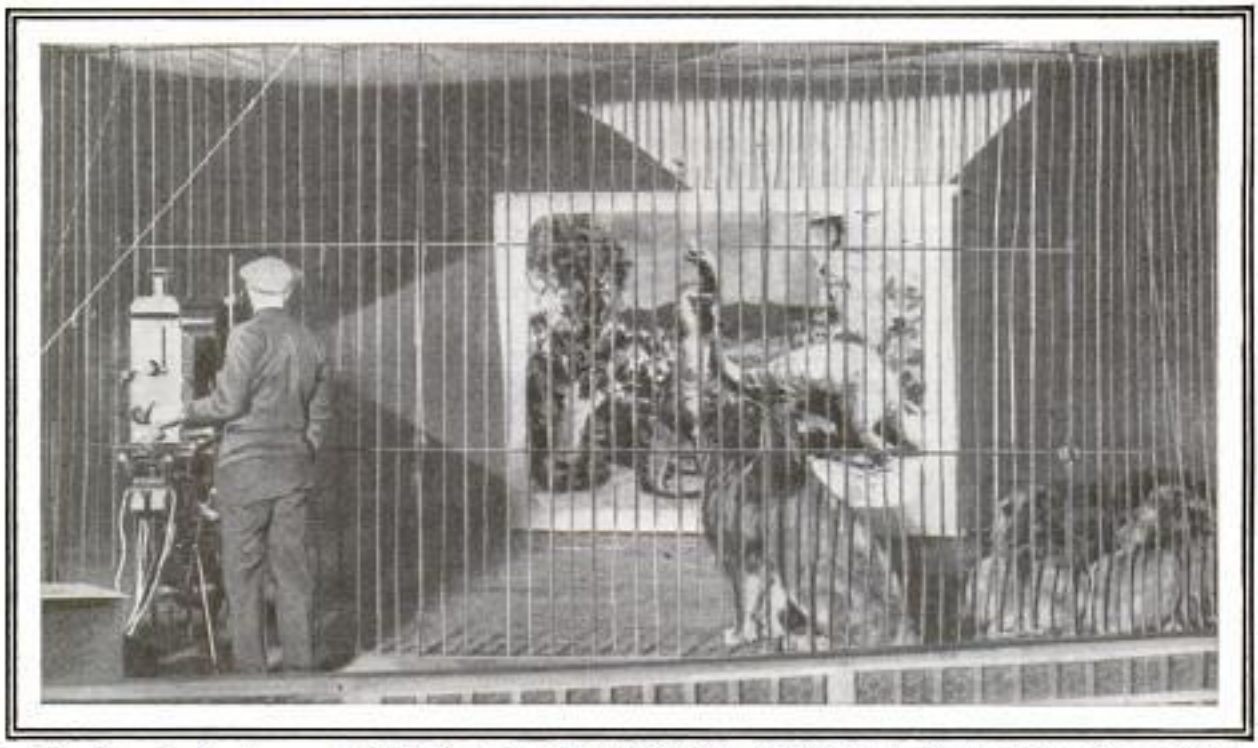
LIONS BATTLE FILM MONSTERS SHOWN IN CAGE



After Cowering in Apparent Fright in a Corner of Their Cage, Captive Lions Became Enraged at a Film Depicting Prehistoric Monsters and Tore the Screen to Ribbons

Lions were used as critics of a motion-picture film depicting realistic models of prehistoric animals as though in actual combat. A projector was set outside the cage and the film thrown on a screen within. The lions evidently considered the "invaders" real for after cowering in one corner of their prison, they became enraged and tore the screen in an evident effort to kill the huge monsters.

CLAMP FOR CONCRETE FORMS SAVES TIME AND WORK

In constructing concrete columns, a notched metal clamp for binding the forms

Clamp in Position on Concrete Column, Showing Wedge That Fits into the Notches

has been found a time and labor saver over wooden holders. Quickly adjusted to a box of large or small size, it is fastened by driving a wedge into a space between the teeth on the side of the bars. It is said to hold the form in a rectangular position, to be removable in less time than metal or wooden straps and to prevent the column boxes from bursting while the concrete is being poured.

SINKING OF OCEAN'S FLOOR CAUSE OF EARTHQUAKES

Sinking of the floor of the Pacific ocean and the resultant settling of the high mountains that form the axis of North and South America, produce earthquakes such as have visited California, Montana and other western states, according to Prof. J. Paul Goode of the University of Chicago. Evidence that the sea bed is sinking is seen in the old beach lines along the coast and by soundings. As this motion occurs, it causes a rush of ocean water at that point and consequent greater pressure on the molten mass that is believed to underlie the upper strata. This pushes the mountains up too high. The gradual settling back process may produce uneven strains and a fracture of the earth's crust, resulting in the sharp shocks that characterize the earthquake. The fall may be only a few feet but its effect may be disastrous to cities. Prof. Goode asserts that the sinking of the ocean bed is lifting up the continental mass faster than it is wearing down so that the mountains probably are "growing" continuously at the rate of several feet in a century. It is believed that dis-

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turbances of the earth's crust will continue in the zone around the Pacific for many years to come. The centers of them, Prof. Goode pointed out, are Alaska, California, Mexico and Central America.

ROTOR YACHT RACES SAILBOATS AND MAKES GOOD SPEED

Racing a fleet of ordinary sailing yachts, a boat equipped with Flettner rotors held its own with canvas sails in any kind of breeze in tests in Germany. Like its big brother, the Flettner schooner tested last winter, the new yacht is propelled by the action of air currents striking a tall, hollow metal tower, which is revolved at a fixed speed by an electric motor.

As explained in Popular Mechanics several months ago after the sensational tests of the first Flettner ship, air currents striking a revolving cylinder are deflected in such a way as to cause excess pressure on one side of the cylinder and a semi-vacuum on the other, with the result that the ship is propelled forward at approximately right angles to the direction from which the wind comes. By varying the speed of the revolving cylinder and using the helm it is possible to tack closely into the wind. Although the surface area of the yacht rotor exposed to the wind was only a fraction of the sail area of the yachts racing against it, the rotor boat had no trouble in keeping pace with the old-fashioned sailing ships.

Flettner Rotor Yacht Racing with Sailing Craft in Speed Test

NEEDLE'S MAGIC WINS FAME FOR WOMAN ART EXPERT

By close study of the different methods of weaving in all parts of the world, a French woman has won wide recognition for her skill in restoring old laces, ancient tapestries and beaded bags. European dealers in antiques send her their priceless goods to be restored by the magic of her needlework. Her first work was done in Switzerland, but since then she has traveled extensively.

© Keystone

French Expert at Work on a Piece of Beading Which She Has Learned to Restore

DANGER IN FILLING GAS TANK AVOIDED BY IRON CHAIN

As the result of the destruction of an automobile in England, said to have been due to a spark caused by frictional electricity resulting from filling the gas tank, precautions have been taken to avoid this peril. One oil company has issued orders that before filling any car the tank must be connected to the earth by means of a chain. The car, having rubber tires, is insulated from the earth, but the chain conducts away any static electricity generated by the gasoline running through the pipe or into the tank.

¶That a man who lives to be sixty years old will have consumed nearly five tons of carbon to maintain the body heat, is estimated by scientists.

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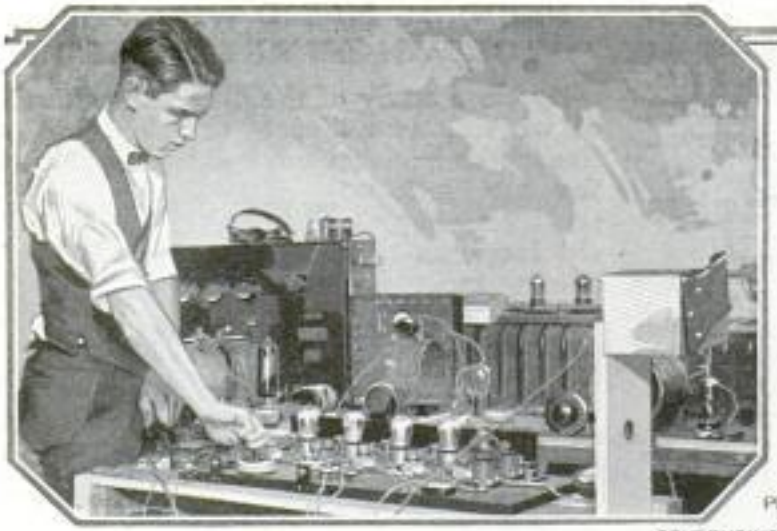
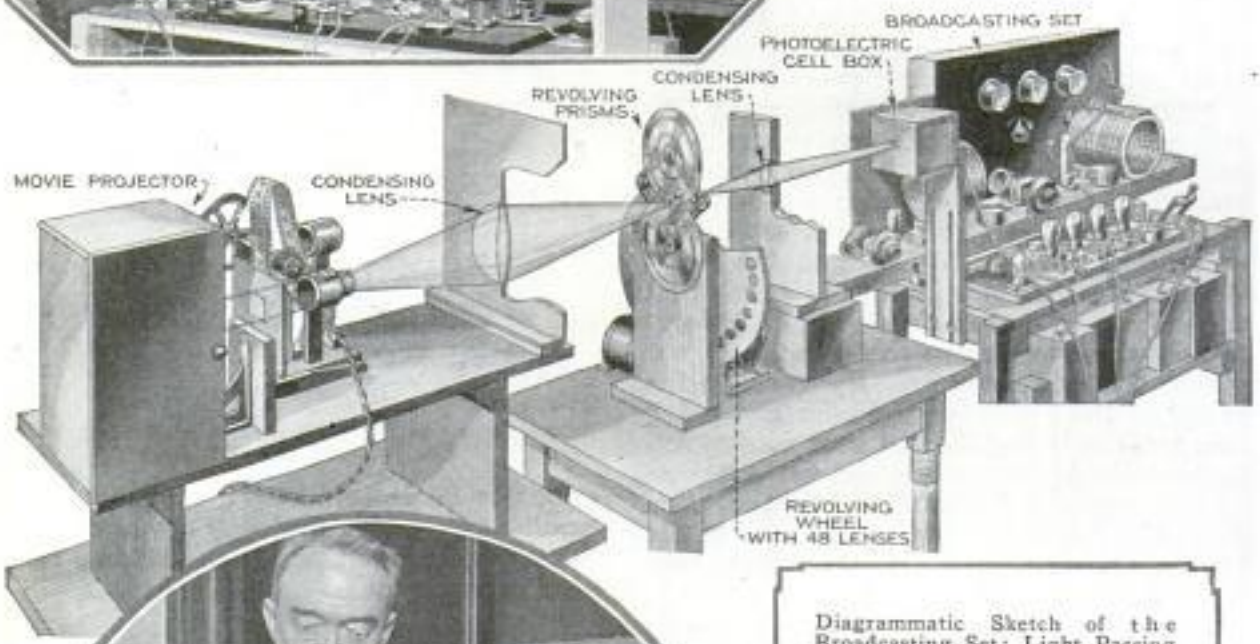
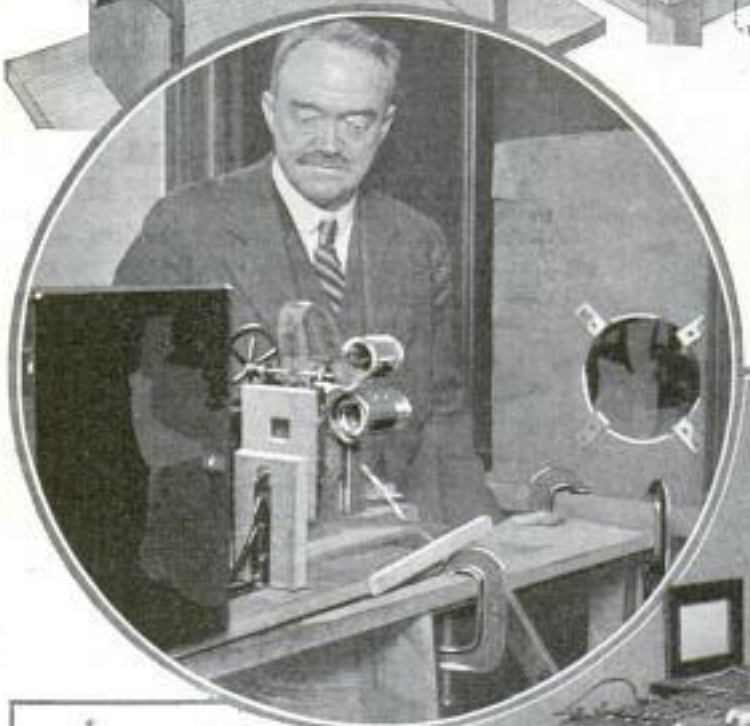
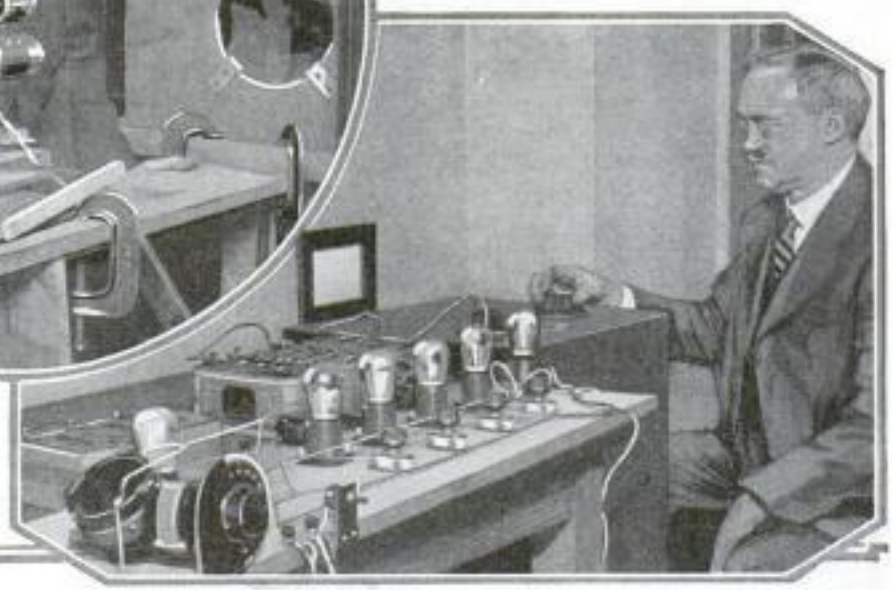


Left, Broadcasting Apparatus of the Radio-Movie Outfit; the Wooden Box on the Upright in the Right Foreground Contains the Cell Which Changes Light into Electrical Impulses; These Are Amplified by Apparatus Much Like a Radio Receiver and Then Pass On to the Sending Outfit in the Left Background



Diagrammatic Sketch of the Broadcasting Set; Light Passing through a Movie Film Is Condensed to a Tiny Beam, Directed by Revolving Prisms, Sliced Up by a Series of High-Speed Lenses, Caught by a Light-Sensitive Cell, Turned into Electric Current and Sent Out through the Air





Above, Jenkins with His Movie Projector; Right, Receiving Set and Movie Screen

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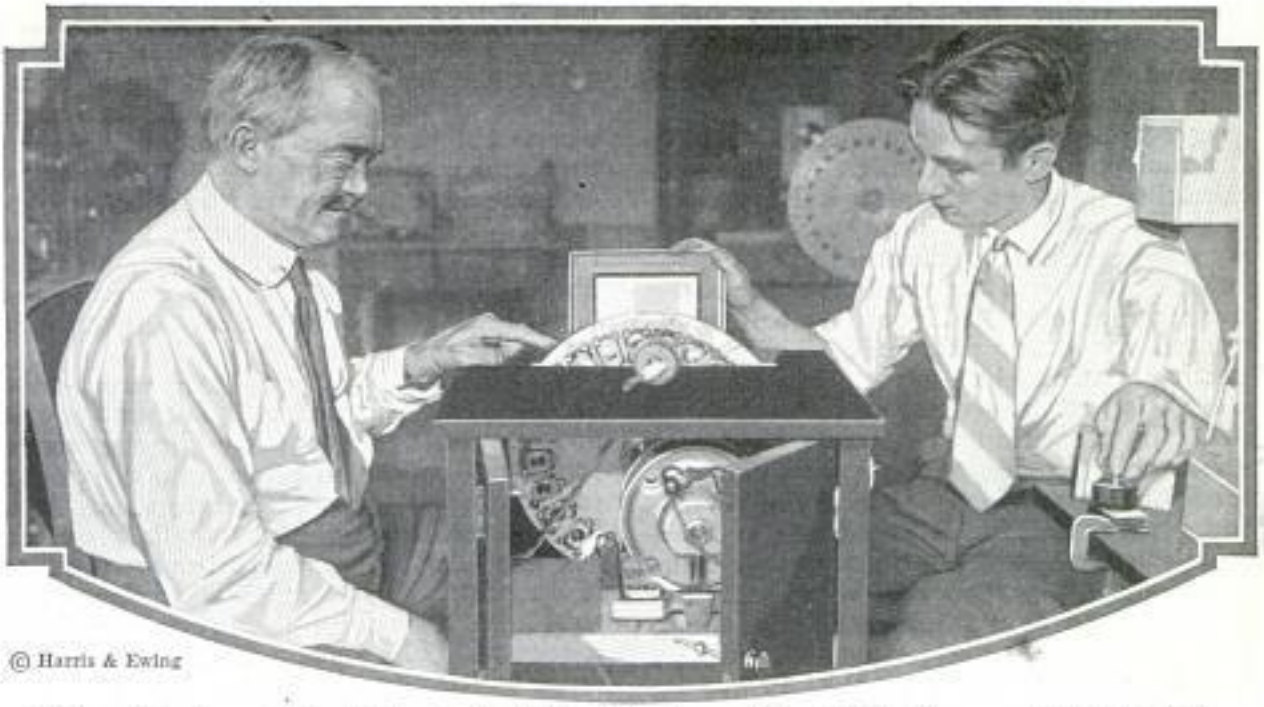

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C. Francis Jenkins and His Assistant with the Revolving Lens and Small White Screen on Which the Radio Movies Are Flashed

1519 Connecticut St, Washington D.C.

Moving Pictures Sent by Radio

Screen Views Are Successfully Transmitted Several Miles through Air and Reproduced in Washington

ON the wall of a small room in a laboratory in Washington hangs a large cardboard bearing in black letters the cryptic sign:

"They said it couldn't be done, but the fool didn't know it, so he went ahead and did it."

Below the sign is a small but complicated machine. It cuts the circular glass prisms that have made the transmission of pictures and movies by radio possible.

The laboratory belongs to C. Francis Jenkins, one of the most active, yet least known inventors in the world. When he first conceived the idea of sending photographs and movie films through the air by wireless, Jenkins designed a revolving glass prism which should catch the light projected through the film and cut it up into slices. He figured on reducing the film of a single photograph to 400 parallel slices, to be transmitted one at a time.

With the prism designed, he appealed to the manufacturers who produce prisms cut from optical glass. They studied the drawings, and said it couldn't be done. To cut such a shape was a mechanical impossibility, their engineers pointed out. So Jenkins went home and proceeded to build a machine to do the job. It took months of disappointing experiments and an expenditure of $120,000 before the first machine worked. But now above that pioneer device there hangs the cardboard sign, Jenkins' answer to the experts who say that anything can't be done.

Not long ago the inventor gave a demonstration before Secretary of Commerce Hoover and other notables, transmitting two movie films from the naval wireless station at Anacostia, D. C., to his laboratory in Washington. One was the pioneer film, the first ever transmitted by wireless. It was just a strip showing the arms of a windmill revolving in the wind. The other was part clipped from an ordinary movie showing a famous actress playing her part on the stage.

On a little screen in a darkened room, the guests saw the windmill arms take form and spin round as the inventor manipulated a dial on an ordinary seven-tube superheterodyne receiver. Out at Anacostia the ends of four feet or so of the windmill film had been fastened together and it went round and round through an ordinary motion-picture projector.

Then the projector was stopped, the film removed, and that of the actress substi-

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tuted. While the change was being made, the screen in the laboratory remained dark. With the new film in place, the operator at the transmitting end pressed the button, the projector came to life and on the screen miles away the actress began to go through her part.

Radio movies mark an amazing step forward in wireless science, but the apparatus that makes them possible is mostly built up of standard parts or things invented for other purposes. The broadcasting station that sends them through the air is just an ordinary outfit.

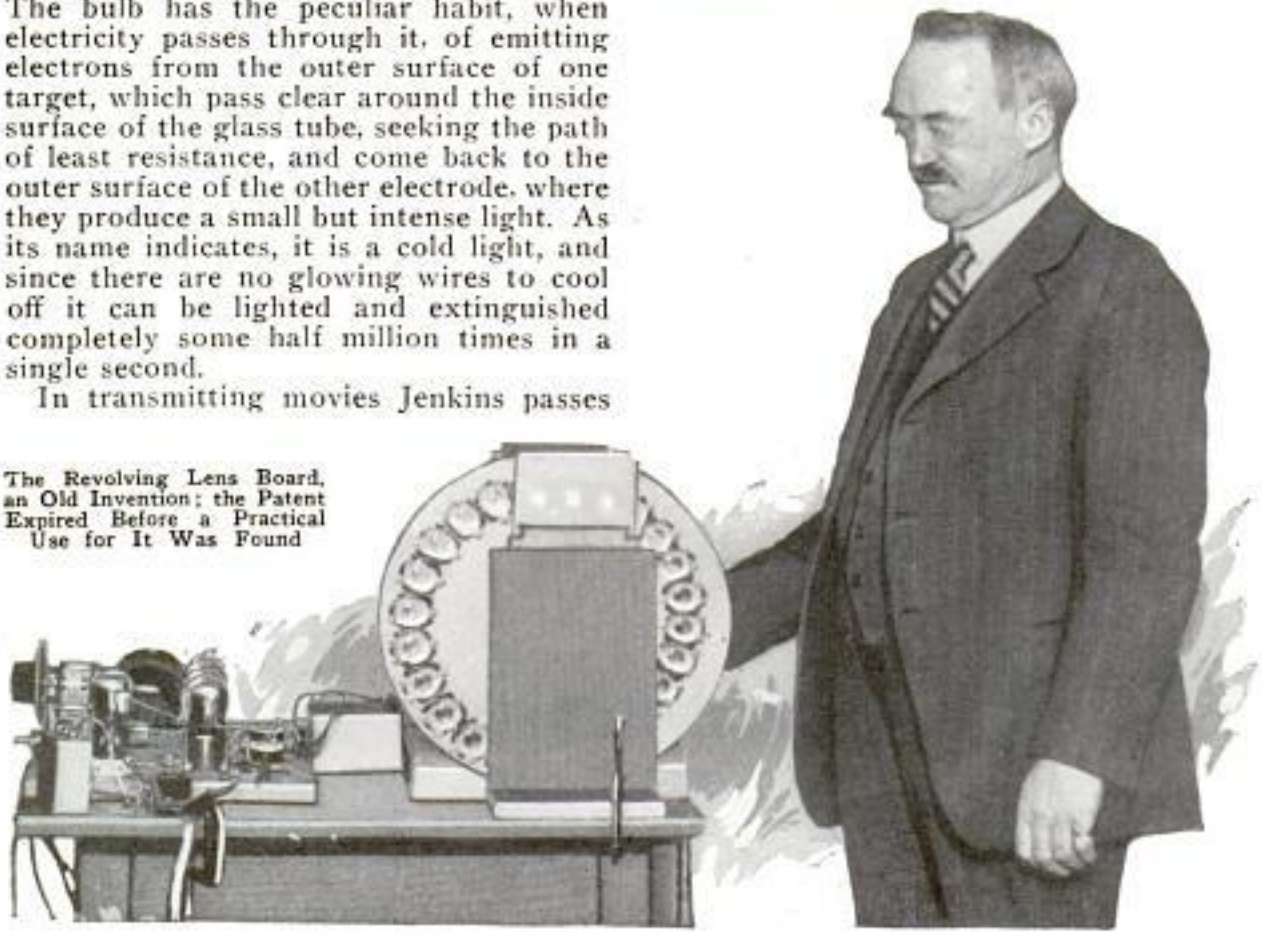
Of the three things that make the transmission of movies possible, two are Jenkins' own inventions. One is the revolving glass prism, but it was conceived primarily to send still photographs by radio. The second is a revolving wooden board, some sixteen or eighteen inches in diameter, with forty-eight separate camera lenses set near its outer edge. It was invented more than twenty years ago by Jenkins as a part of a movie camera he was then working on.

The third important unit is a "cold-light" bulb invented by Prof. D. Farlan Moore. It is about the size of a peanut radio tube, but instead of a vacuum it contains a small amount of gas. Inside the bulb are two small targets of metal. The bulb has the peculiar habit, when electricity passes through it, of emitting electrons from the outer surface of one target, which pass clear around the inside surface of the glass tube, seeking the path of least resistance, and come back to the outer surface of the other electrode, where they produce a small but intense light. As its name indicates, it is a cold light, and since there are no glowing wires to cool off it can be lighted and extinguished completely some half million times in a single second.

In transmitting movies Jenkins passes the picture projected by the machine through the revolving prism, in front of which the forty-eight lenses are also revolving at high speed. Each lens as it passes catches up a fragment of the picture and passes it on to a light-sensitive cell, which converts rays into electric currents. The cell is of the same kind as those used in sending pictures by telephone. The light cell is connected to the broadcasting outfit in the same manner as a microphone.

At the receiving end the seven-tube set picks the broadcast signals out of the air, amplifies them through the usual tubes, and from the seventh tube, instead of translating the signals into sound in a headset or loud speaker, sends them to the gas-filled bulb, where the current, as it fluctuates, lights and extinguishes the cold light several hundred thousand times a second. The light passes through another prism, another revolving lens, and then shines on the small screen as a motion picture.

Jenkins is cautious about making predictions for the future, but hopes that the day is not far distant when the radio listener at home can tune in on his favorite movie star or see the film of a great public event within a short time after it has occurred in some distant city.



The Revolving Lens Board, an Old Invention; the Patent Expired Before a Practical Use for It Was Found

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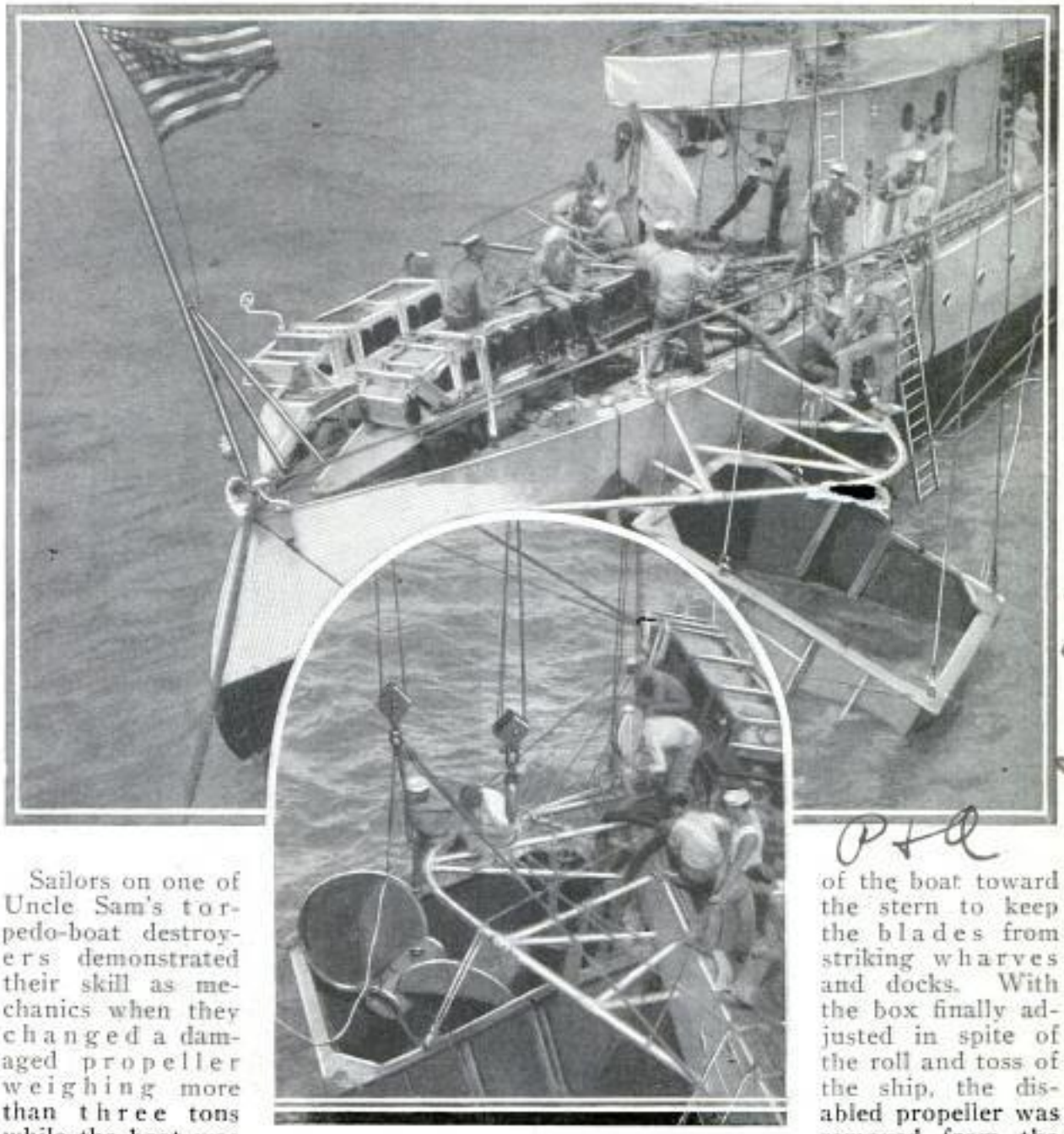
CHANGING PROPELLER AT SEA TESTS SAILORS' SKILL



Changing a Propeller Blade at Sea; Looking Down on Torpedo-Boat Destroyer from Repair Ship

Sailors on one of Uncle Sam's torpedo-boat destroyers demonstrated their skill as mechanics when they changed a damaged propeller weighing more than three tons while the boat was still at sea. The fleet's repair ship came alongside to aid in the work. Then the destroyer was canted to one side and a large steel box, open at the top, was lowered from a boom on the repair ship and made fast to the destroyer as a work chamber. Its shape conformed to the side of the boat, it was calked around the edges and the water was kept pumped out of it. Tipping the destroyer exposed the damaged blades sufficiently to allow access to them, as propellers on destroyers project well out from the sides. For this reason, it is necessary to guard them with struts or brackets built out on each side of the boat toward the stern to keep the blades from striking wharves and docks. With the box finally adjusted in spite of the roll and toss of the ship, the disabled propeller was removed from the shaft, lifted out with tackle, and the new one lowered from the repair ship and placed in position. The entire job consumed only four and one-half hours.

ALCOHOL FROM PRICKLY PEAR FOR MOTOR FUEL

A process for extracting alcohol from the prickly pear, of which there are thousands of acres in Australia and other countries, promises important use of this hitherto worthless plant. According to the discoverer of the method, the alcohol is suitable for motor fuel.

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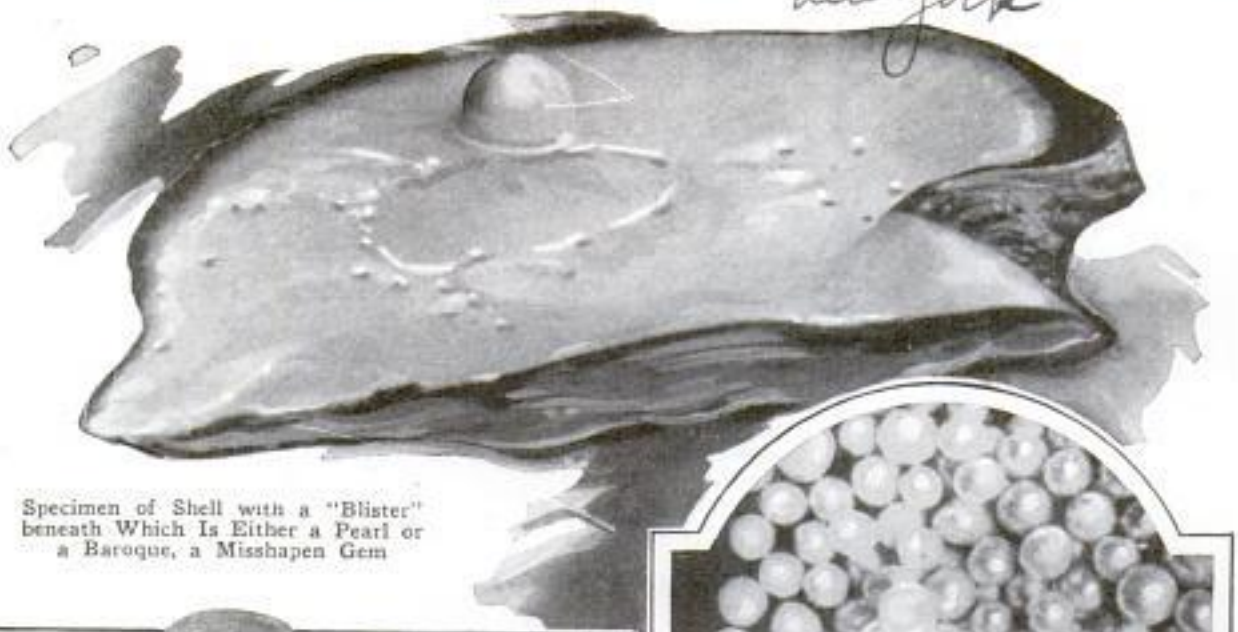
Romance, Dangers and Thrills in



Specimen of Shell with a "Blister" beneath Which Is Either a Pearl or a Baroque, a Misshapen Gem

Thousands of Dollars' Worth of Pearls Are Represented in This Pile That Fishers Have Collected; Size, Shape and Color Are Important Points in Judging Their Value

Opening and Weighing Shells at Port Headland

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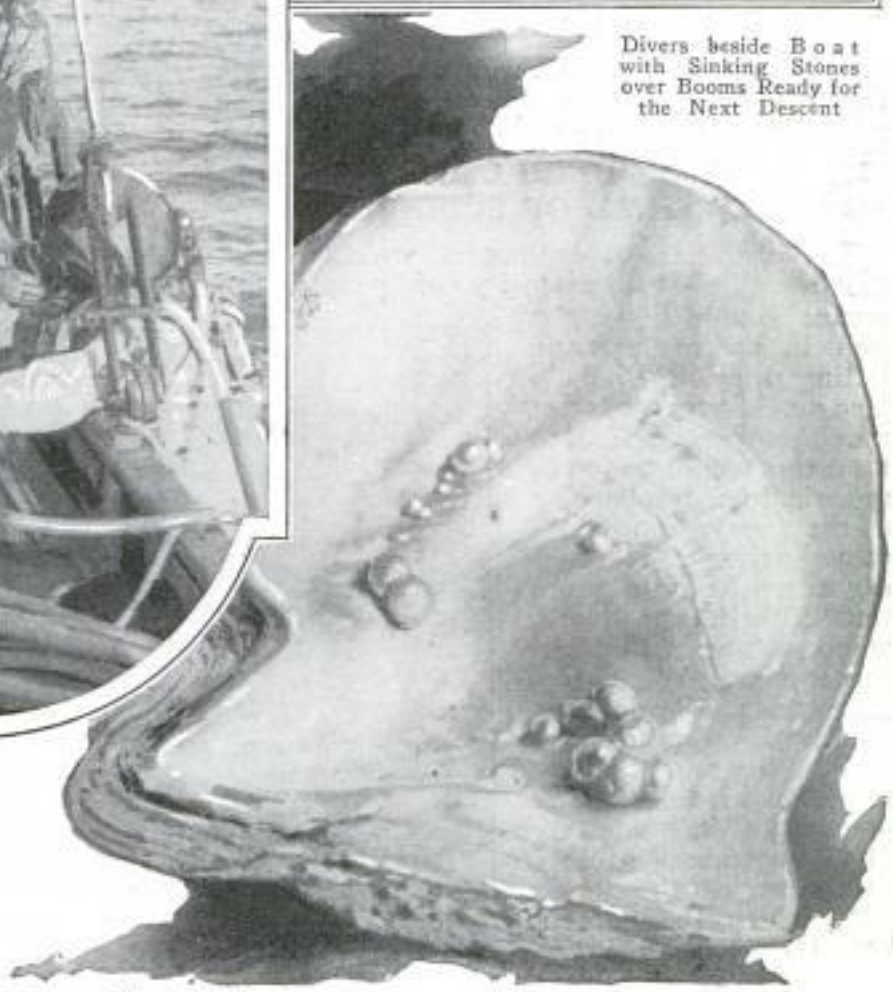
Life of Pearl Fishers in Australia

Cleaning the Gems as They Come from the Shells, an Important Task Assigned to Experts Only

Divers beside Boat with Sinking Stones over Booms Ready for the Next Descent

Regulation Diving Suits Are Used on Some of the Fishing Grounds, and Here the Pearl Hunter Is About Ready to Slip over the Side in Quest of Shells That Contain Riches Such as Pictured at Right



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JANITOR COURSE FOR TEACHERS INCLUDES PLUMBING

Included in the curriculum at the Colorado state teachers' college at Greeley, is

Teachers Learning Correct Method of Firing a Furnace, Part of Janitor-Engineering Course

a course in janitor-engineering. Practical instruction is given in the proper methods of firing furnaces, oiling, ventilation, electrical repairing and plumbing.

DRILLING OF DEEP OIL WELLS TAXES SKILL OF SCIENCE

The operation of drilling oil wells, to the mind of the majority of people, means simply digging a hole in the ground and letting the oil spout. The actual process is not much more complicated than this where the wells are shallow, but most of the supply is now obtained from holes ranging from 3,000 to more than 6,000 feet in depth, where obstacles that tax the ingenuity of chemists and mechanics are continually interfering. One of the most bothersome of these is the pressure of the gas. If this becomes greater than that of the water with which the well is kept filled while drilling, a blowout results, usually with the expensive effect that the hole is completely ruined. Various methods have been employed to counteract this, such as increasing the weight of the clay and water mixture that washes out the bit cuttings and plasters the sides. A lead compound was used, but this was so heavy that it settled and became useless. Then experiments were made with iron oxide. But this fluid is a dark red in color which frequently concealed the oil showings, and as it conducts electricity, it acted as a corrosive to the destruction of casings and drilling tools. The most satisfactory material used so far, reports state, is barium sulphate, commonly called barite. It makes a fluid between two and three times as heavy as water which does not corrode or damage the steel surface of the tools or the casings and has excellent "sliming" qualities, that is, it plasters the walls of the hole efficiently. Within the past few months the method has been employed in certain western oil fields and the results, it is said, have been entirely satisfactory.

AUTO LAWN MOWER HAS SEAT FOR ITS OPERATOR

A motor-driven lawn mower being marketed in England is equipped with a seat for the operator. A roller smooths out the marks left by the cutter and presses the turf into good condition for golf greens, croquet or tennis courts. The mower is said to have a capacity of 1,000 square yards in less than twenty minutes, consumes only little fuel and its operation is simple.

Auto Mower in Use; Weight of the Operator Helps Press Turf

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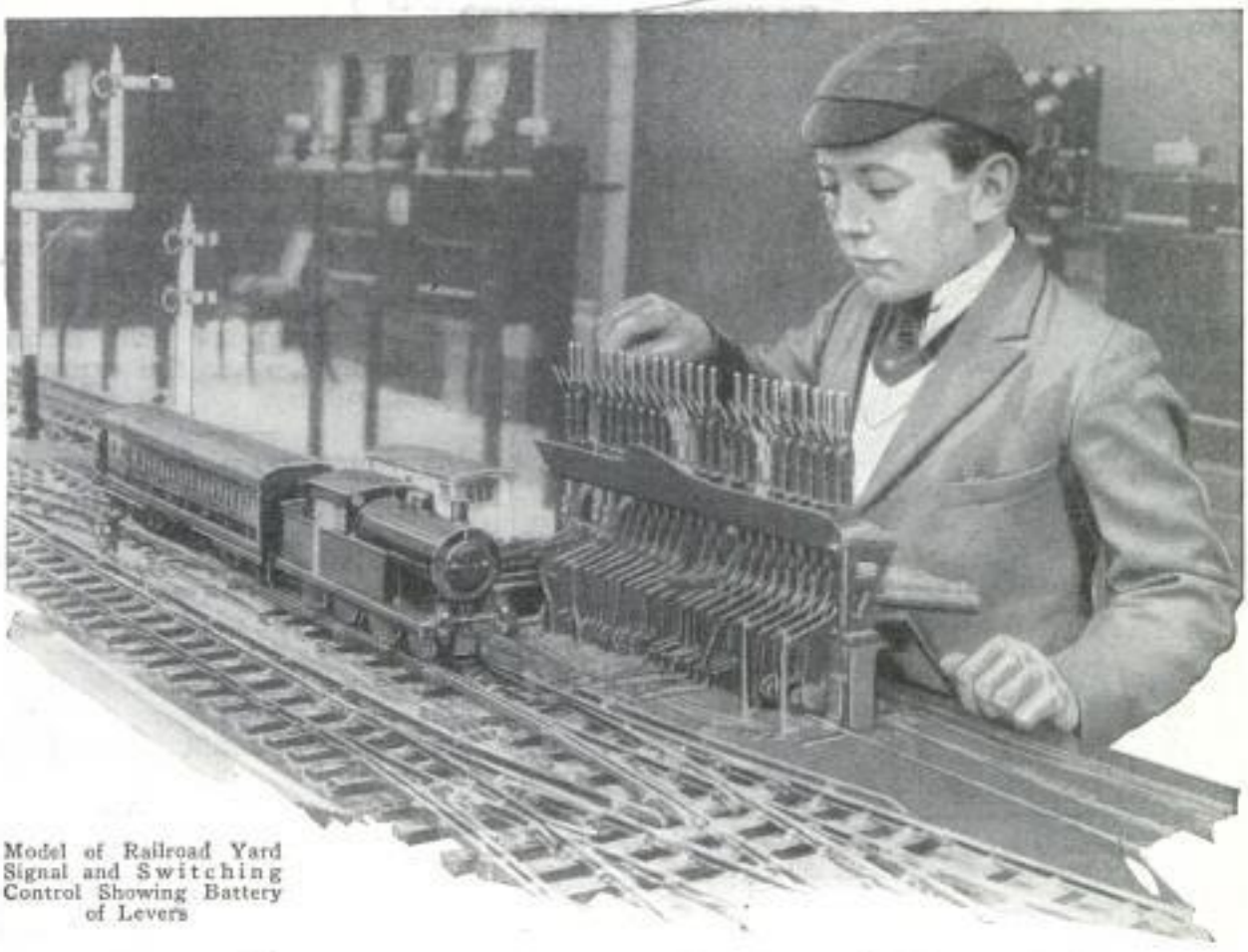
THREE HUNDRED MILES OF TRAINS SHOWN ON BOARD



Model of Railroad Yard Signal and Switching Control Showing Battery of Levers

How trains are watched from a central signal tower over 300 miles of British railways was illustrated graphically in a working model displayed at the Wembley exhibition. Signal posts, switches, lights and the automatic-lever installation for shifting trains to other tracks and guiding them in and out of the terminals, were represented in small-scale duplicates that responded to operation just as the real equipment does.

CITY LIFE IS MORE HEALTHFUL, ACCORDING TO STATISTICS

Life in the city is more healthful than that in the country according to Dr. George E. Vincent, president of the Rockefeller foundation, which last year spent more than $7,000,000 in health work throughout the world. In spite of the popular belief that outdoor tasks, fresh foods and close contact with nature afford the country dweller superior physical condition over his city cousin, many tacts point in the opposite direction, Dr. Vincent finds. A recent examination of 3,478 male students in one of the large universities of the middle west showed results that were distinctly favorable to cities of over 50,000 population as compared to the small towns, and those from the large cities showed the lowest number of physical defects. Physicians have found that the better health protection the city affords often more than offsets the natural advantages of country life.

FOLDING GRILL FOR OUTDOORS FITS "CANNED HEAT" STOVE

For the tourist or camper who prepares meals with "canned heat," a folding grill to fit a collapsible stove can be closed up as easily as a jackknife and packed away in a small space. The utensil is valuable as a toaster or to cook hurried lunches where a large stove cannot be set up. In summer cottages, or kitchens where a great amount of heat is not desirable, the grill can be made ready for service in a few minutes and requires no extensive cleaning. During the hot season, it can be employed to replace large fires for preparation of light meals.

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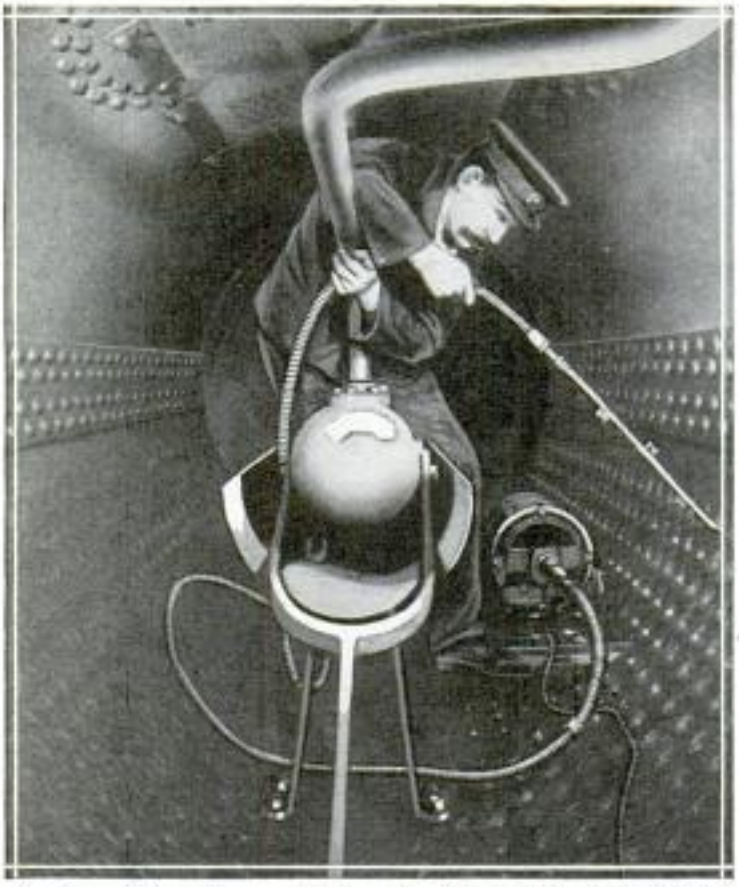


Cleaning Boiler Flues with Portable Motor-Driven Outfit That Reaches Difficult Places and Saves Time

MOTOR FOR CLEANING FLUES SAVES TIME AND DIRT

A motor-driven swab is in use in Germany for cleaning boiler flues. The outfit is portable and operates through a flexible cable so that it can reach difficult places where there is little room. Besides saving considerable time and labor, the apparatus spares the worker the unpleasantness of getting covered with soot and dirt.

SECRET ACID-PROOF CEMENT HAS MANY USES

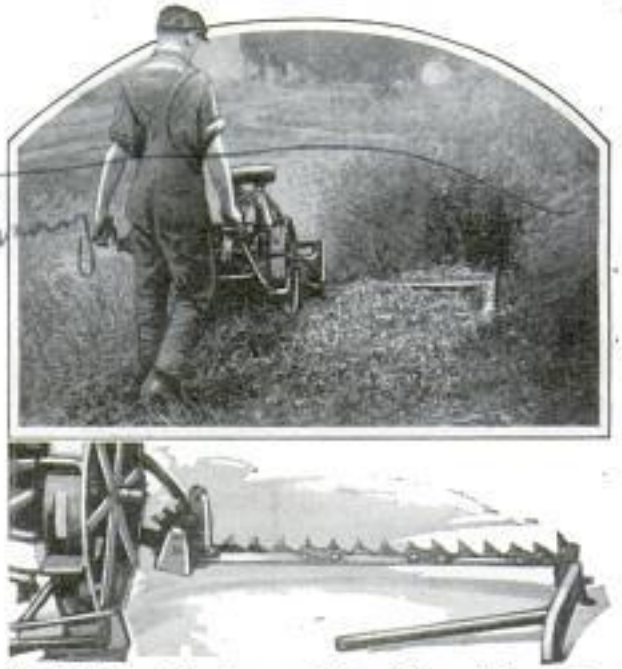
Cement that is said to be specially suited to lining tanks and vats because of its acid-proof qualities is now on the market in a granulated form. It is of metallic composition and contains a certain percentage of sulphur. The process is secret. In use the material is applied while heated to a molten state. It cools quickly and hardens to its maximum strength in a few moments. According to the manufacturers, it can be re-used simply by cleaning it thoroughly and melting it again. It is also said to be suited for setting iron fences and castings in stone or concrete, and has a compression strength of 12,000 to 14,000 pounds per square inch.

PHONE "GOSSIP RATE" PROPOSED

To encourage the greater use of the telephone, special "gossip rates" have been proposed by the mayor of Hampstead in England. In that city the demand for phone service is heaviest between the hours of six and nine in the evening. Lower tolls are to be charged for "over-the-wire visits" and conversations held during the daytime, when the exchange is not so busy.

CUTTER BAR CONVERTS TRACTOR INTO MOWER

By adding a cutter-bar attachment to a garden tractor now on the market, the implement is converted into a mowing machine for cutting weeds and grass in small areas or in places where an ordinary mower would be cumbersome. The bar is three and one-half feet long and is divided into three-inch sections. A clutch arrangement is used to throw the cutter and tractor out of gear when necessary, leaving the motor running. The engine develops about two horsepower and will run from four to eight hours on a gallon of gasoline. Its speed varies from sixty-five to 275 feet per minute on high gear and from thirty-five to 150 on low.



Small Tractor Mowing, and Close View of Cutter Bar Showing Arrangement of Knives

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FOUR YEARS AT ANNAPOLIS

II—The Second Year

CUSTOM and tradition require that the three classes left behind at the naval academy shall weep large and copious tears when the graduating first-class men receive their diplomas, but the tears shed are of the crocodile variety. For the boy entering his second year at the academy, passing from the "plebe" class into "youngster" year, the event has particular importance. His left coat sleeve, hitherto bare of insignia, now blossoms out with one narrow band of gold braid, the first stripe in the upward path which may lead eventually to the broad bars of an admiral. In addition, a squadron of grim gray warships has anchored in the bay and a day or two after graduation of the first class the three groups remaining will go aboard for a long summer cruise. For a third advantage, the third-class man can draw $5 a month from his $780 a year pay, instead of the $3 monthly of a plebe. Next in importance is his first "Sep leave," the entire month of September, to be spent at home on his first vacation since donning the uniform. And finally, when the academic year begins again in October, he will be entitled to "hop leave," a privilege not extended to plebes. Uncle Sam pays his midshipmen well, with board and a free education for four years as well as $65 a month salary, but the boy at the academy sees little of the money while there, for $240 a year is set aside toward purchase of his ensign's outfit when he graduates, and the cost of his clothing and equipment during the four years of study is also deducted.

The entire regiment of midshipmen, numbering about 2,000 men, is divided for drill purposes into four battalions, one for each class, and in each battalion there are two companies. A midshipman commander for the regiment is appointed from the first class, acting under the commandant of the regiment, who is a line officer of the navy. Under the midshipman commander are lieutenant commanders for each battalion, and lieutenants and petty officers for each company.

During youngster year the future naval officer's studies grow harder as he begins to delve more deeply into physics, chemistry and the naval sciences—seamanship, navigation and engineering. Work with the sextant and other navigating instruments is carried on regularly, alternating with active practice in operating the ships attached to the academy.

With the increased privileges which go to the midshipman who has graduated from the plebe class, there is no relaxation in discipline. The academy book of regulations specifically lists thirty major offenses punishable by special action of the superintendent, who at present is Admiral Noulton, and 175 lesser breaches which carry specified numbers of demerits.

Next month will tell of the life of a second-class man—the third year at the academy.

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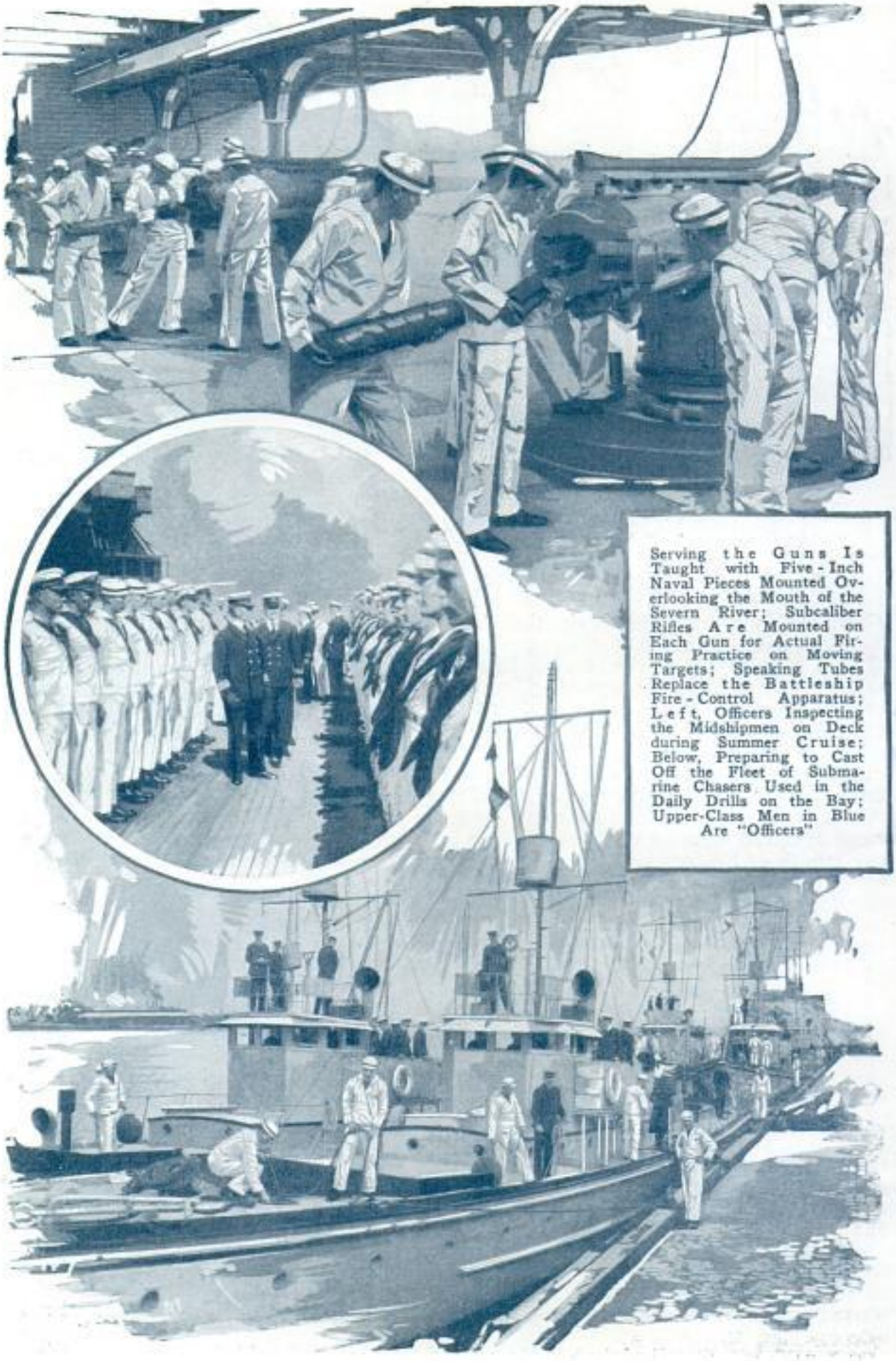

Serving the Guns Is Taught with Five-Inch Naval Pieces Mounted Overlooking the Mouth of the Severn River; Subcaliber Rifles Are Mounted on Each Gun for Actual Firing Practice on Moving Targets; Speaking Tubes Replace the Battleship Fire-Control Apparatus; Left, Officers Inspecting the Midshipmen on Deck during Summer Cruise; Below, Preparing to Cast Off the Fleet of Submarine Chasers Used in the Daily Drills on the Bay; Upper-Class Men in Blue Are "Officers"

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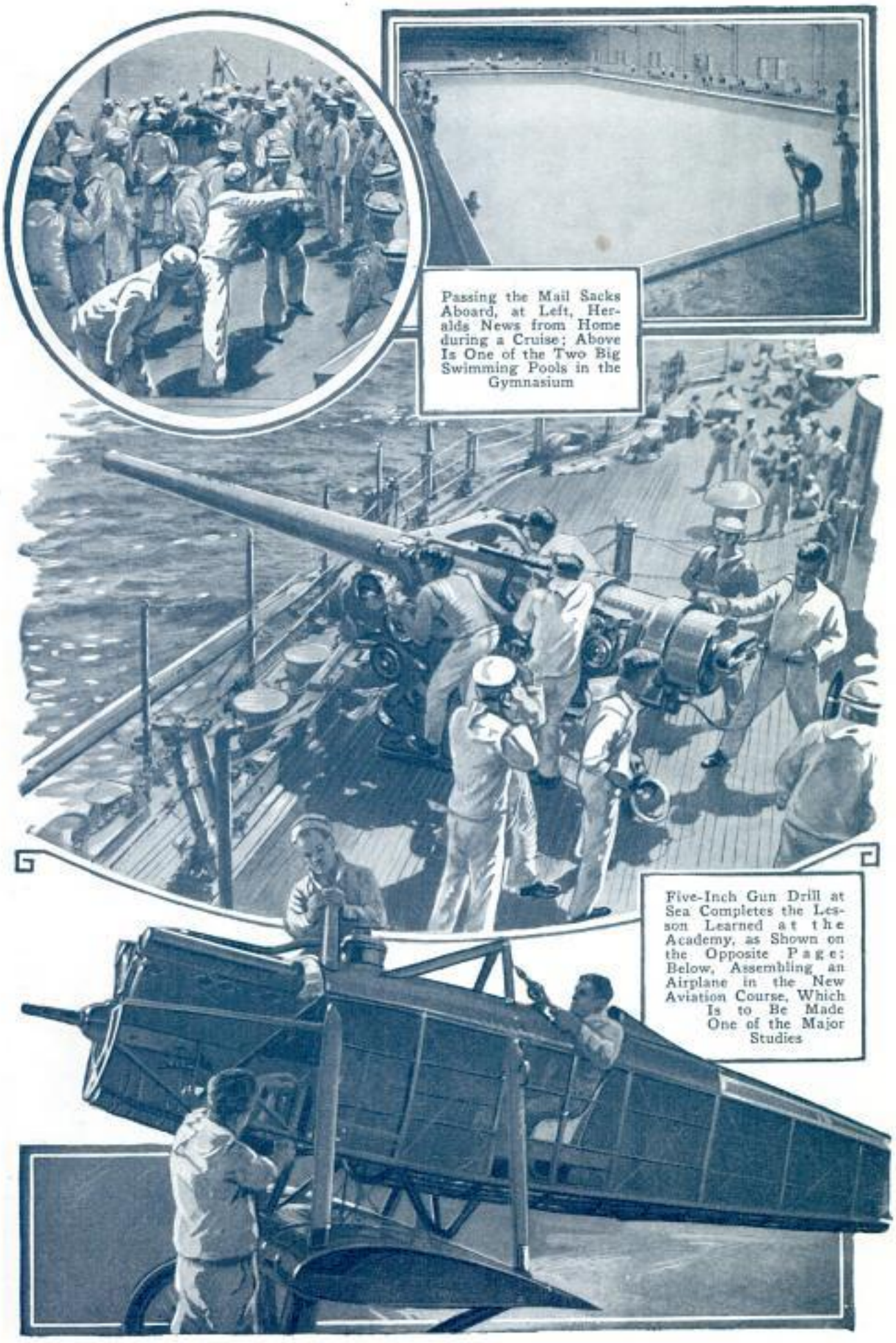

Passing the Mail Sacks Aboard, at Left, Heralds News from Home during a Cruise; Above Is One of the Two Big Swimming Pools in the Gymnasium

Five-Inch Gun Drill at Sea Completes the Lesson Learned at the Academy, as Shown on the Opposite Page; Below, Assembling an Airplane in the New Aviation Course, Which Is to Be Made One of the Major Studies

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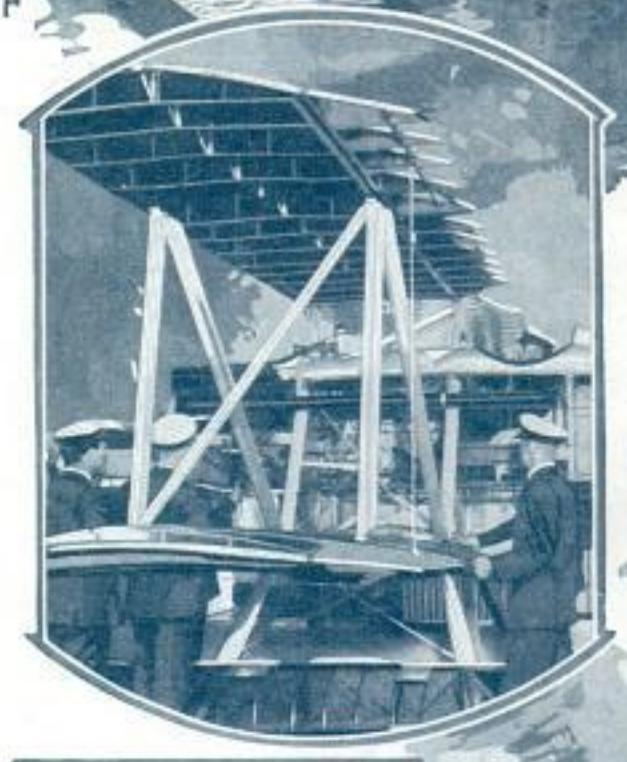
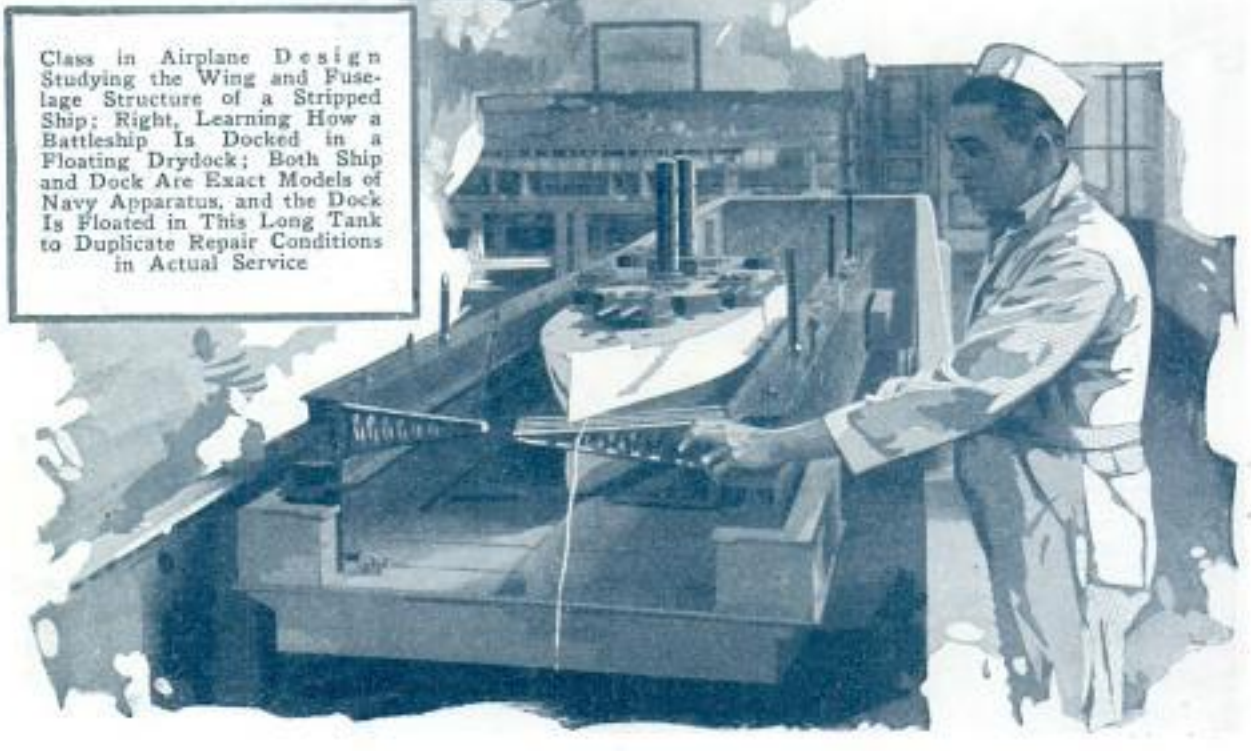
Catboats with Sails Hoisted Preparatory to the Start of the Afternoon Drill on the Severn; Below, One of the Many Ancient Guns Which Dot the Yard; This One Is a Trophy from the Philippines, Where It Was Used First by the Spaniards and Later by the Native Rebels



Class in Airplane Design Studying the Wing and Fuselage Structure of a Stripped Ship; Right, Learning How a Battleship Is Docked in a Floating Drydock; Both Ship and Dock Are Exact Models of Navy Apparatus, and the Dock Is Floated in This Long Tank to Duplicate Repair Conditions in Actual Service



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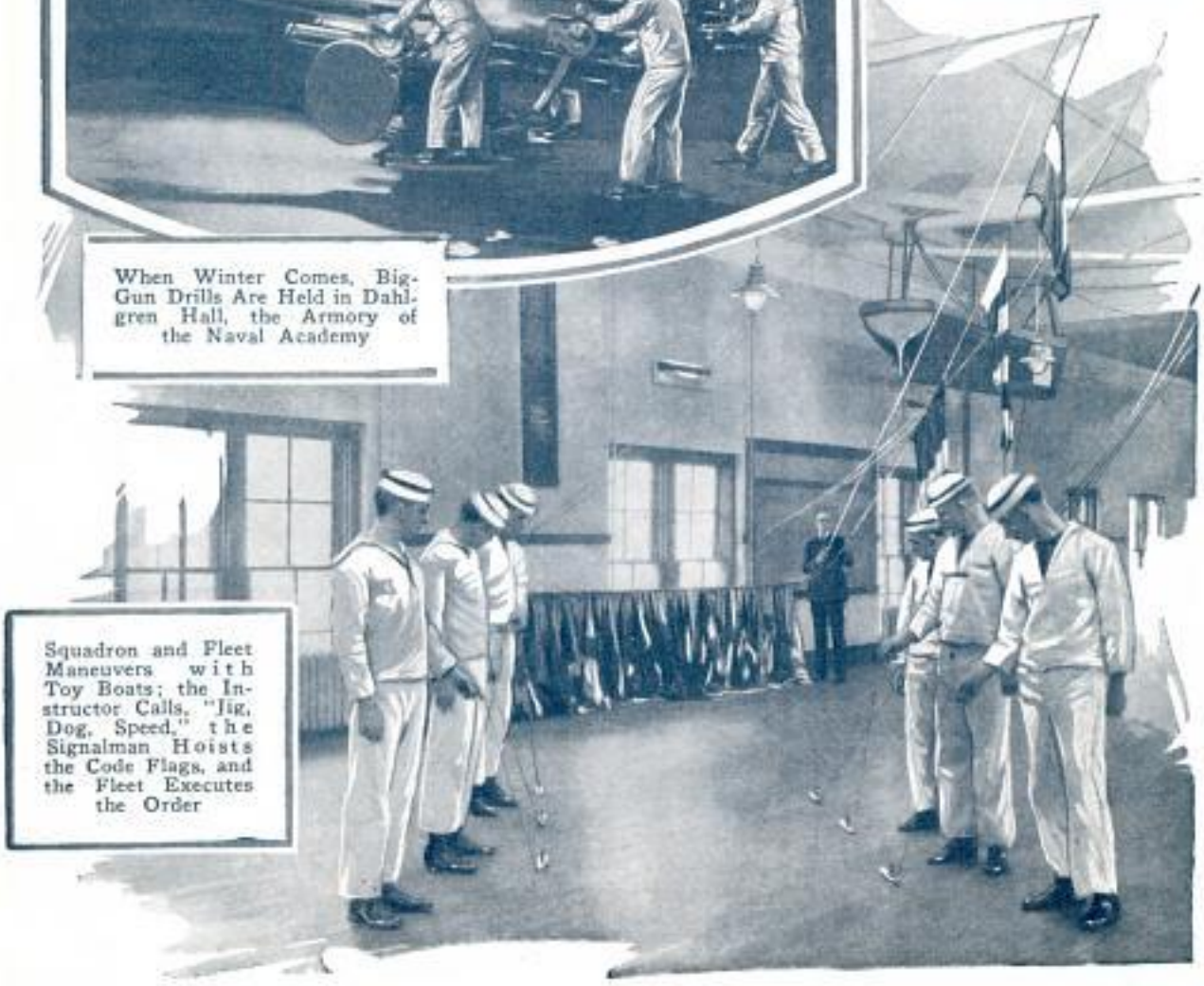
The Secretary of the Navy and the Admiral Commanding the Academy Passing the Colors at Inspection of the Regiment; the Academy is Visited Frequently by Distinguished Persons

When Winter Comes, Big-Gun Drills Are Held in Dahlgren Hall, the Armory of the Naval Academy



Squadron and Fleet Maneuvers with Toy Boats; the Instructor Calls, "Jig, Dog, Speed," the Signalman Hoists the Code Flags, and the Fleet Executes the Order

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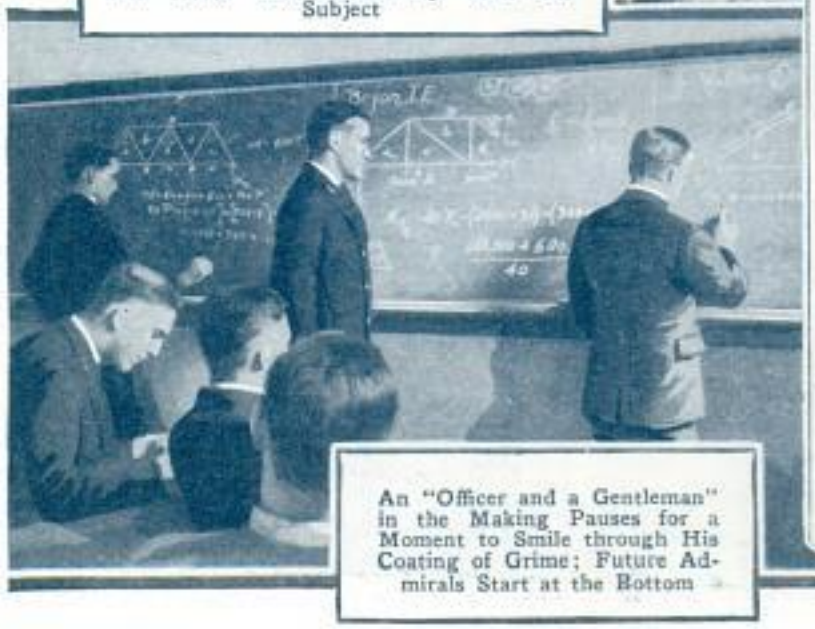
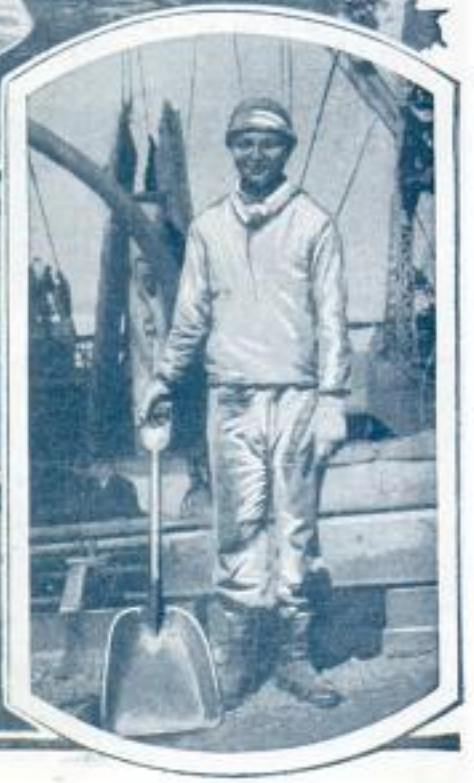
Movie Shows on the Open Deck Are One Source of Amusement during Evenings on the Summer Cruise; the Screen Is Rigged above the Frowning Turret and the Middies Sprawl on Deck or Climb to Vantage Points on the Other Turrets, Superstructure and Masts; Below, a Busy Scene While All Hands Fall Too and Coal Ship; Next Comes the Task of Washing the Vessel

Below, Midshipmen Must Learn to Illustrate Their Problems Clearly and Quickly on the Blackboard; Then the Middy Stands By to Await His Turn to Recite and Show His Familiarity with the Subject





An "Officer and a Gentleman" in the Making Pauses for a Moment to Smile through His Coating of Grime; Future Admirals Start at the Bottom

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Crew Starting Out for a Training Spin; the Academy Can Put Eight of These Shells in the Water at Once, More than Are Possessed by Any Other American College

Above and Left, When the First Class Graduates, the New First-Class Men Make a Wild Dash to the Basin and Leap In to Baptize Their New Class Rings

The Navy Goat, as Famous as the Army Mule, Is a Noble Old Patriarch Who Accepts the Attentions Showered on Him with the Dignity His High Office as Mascot of the Varsity Football Team Requires; Its Long Beard and Solemn Expression Have Made It Famous

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Classes Go On during the Summer Cruise, Explaining the Practical Problems Raised Each Day; the Armor of a Big-Gun Turret Makes a Fine Blackboard for This Open-Air Class; Right, in the Academy Classrooms Blackboards Front and Rear Enable Half the Class to Work at the Board While the Other Half Recites from the Problems Worked Out on the Other Side of the Room

The Deck Force Takes an Afternoon Siesta, Making Up for the Sleep Lost When They Were Routed Out in the Early Morn to Clean the Deck

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NEW METHODS SPEED SUBWAY BUILDING

Subway building, recent figures disclose, has been cut about in two as to manual labor and time by modern tools, but the cost has doubled. A few years ago the cost of a single-track mile of subway was $1,000,000. Now it is $2,000,000. The reason is the increased price of labor and material. This is more than balanced, a leading engineer said recently, by the speed that electricity and compressed air have brought to building underground tunnels. Where it formerly was necessary to open streets to construct a subway, the new small revolving power shovel does the digging in a small space. Clumsy old tripod drills, wasting space, have been replaced by jack-hammer drills of compact type for heavy cutting. Where blasting once ate out old masonry, pneumatic chipping tools now do the work less expensively and without danger, the portable air compressor making this possible. Hoisting engines and other machines operated by electricity have junked steam apparatus. Electric mules now do the drudgery of the old hay-eating animal once used in all underground workings. Cement is conveyed from outdoor mixers to the forms through pneumatic pipes.

After Being Knocked from Its Guardian Position by a Steamer, the Lighthouse Lamp Is Raised from Water with Derrick

AUTO JACK LIKE SELF-STARTER IS RUN BY CAR BATTERY

Operated like the automobile self-starter, a jack for raising or lowering the car, has its own small motor, which can be run from the auto battery and is controlled by a small lever at the side. The jack is sturdily constructed and takes up but little space.

LIGHTHOUSE WRECKED BY SHIP SALVAGED WITH DERRICKS

Usual conditions were reversed in a heavy fog in the harbor at Bremen when a freight steamer crashed into a lighthouse guarding the entrance, toppling the structure into the water. The lamp and other parts were salvaged with cranes and derricks, to clear the harbor of menacing obstruction and for rebuilding the light.

INSECT CENSUS IS BEGUN

A national census of insects in the United States has been started by the department of agriculture. It is to deal with the origin, habits and actions of all species in the hope that forecasts may be made of the periods in which they are most likely to appear in great numbers.

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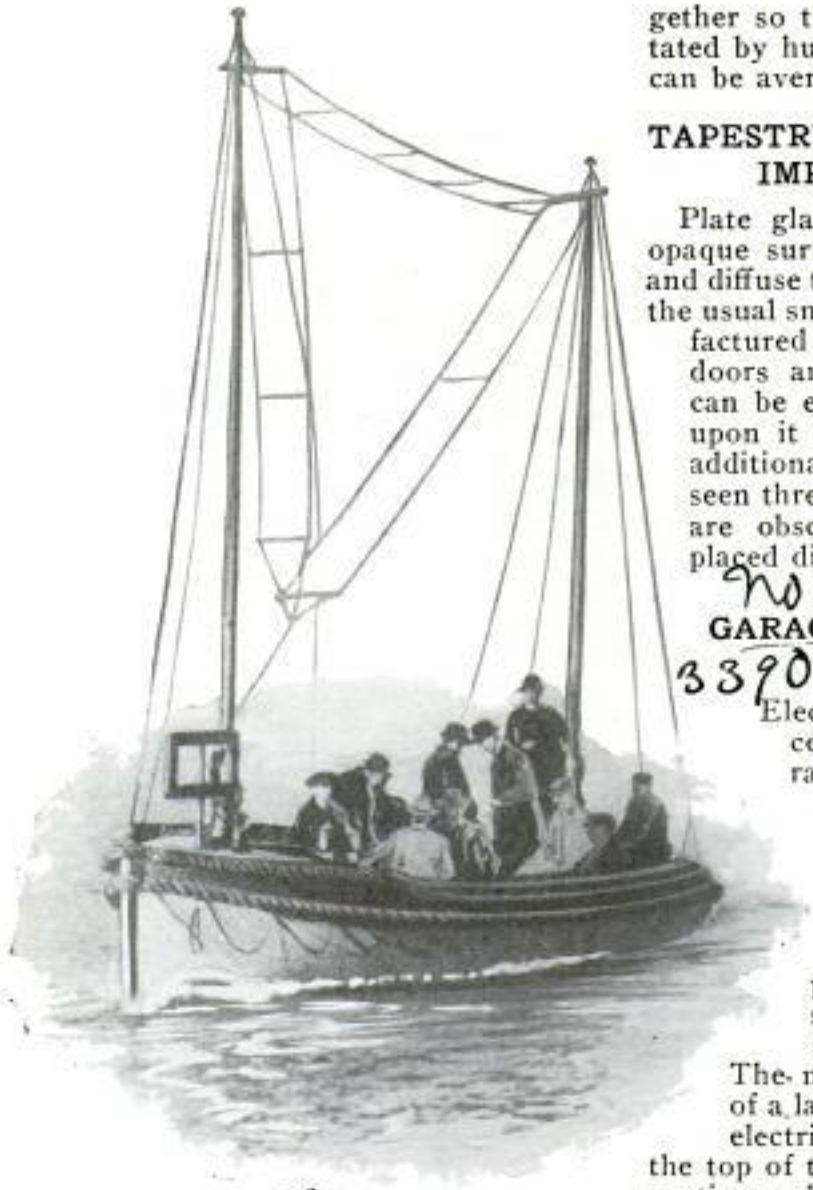


Equipped with Its Wireless Set, the Lifeboat Is Less at the Mercy of the Sea

RADIO-EQUIPPED LIFEBOATS TO REDUCE TOLL OF SEA

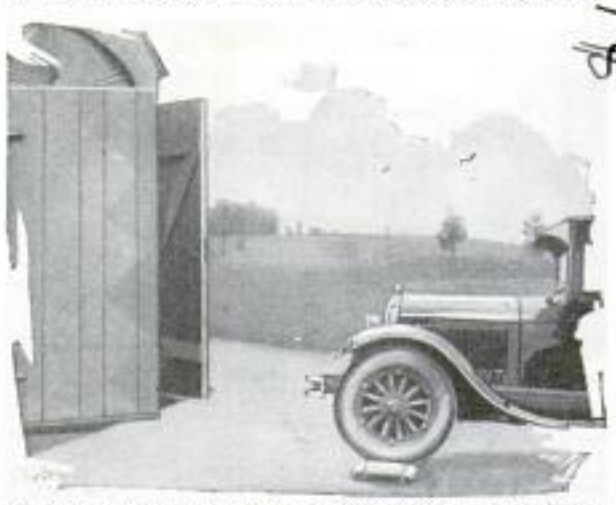
With wireless-equipped lifeboats, capable of communicating with rescue ships, and each other, the annual toll of lives resulting from accidents at sea is expected to be greatly reduced. The first of such boats to be fitted with Marconi radio apparatus are those of the ocean liner "Orbita." Each one of the emergency craft is thirty feet long and accommodates forty-five persons. In the past, passengers forced to flee damaged vessels, have often drifted for days in open boats before they were sighted and picked up. The wireless-fitted boats, by keeping in constant touch with searching ships may greatly hasten rescue and prevent the loss of many lives due to exposure. They may also be aided in keeping the lifeboats together so that danger and delay necessitated by hunting widely scattered groups can be averted.

TAPESTRY GLASS FOR INTERIOR IMPROVES LIGHTING

Plate glass with a wrinkled or semi-opaque surface that is said to break up and diffuse the light rays more evenly than the usual smooth product, has been manufactured especially for office partitions, doors and interior screens. Designs can be etched, mitered or sandblasted upon it for decorative effects and an additional advantage is that objects seen three or four feet away through it are obscured but are distinct when placed directly against the glass.

GARAGE DOORS OPEN AS CAR TOUCHES SWITCH

Electricity is now being used successfully to open and close garage doors by a push button or by the weight of the car on a ground plate in the roadway outside. This eliminates the necessity of getting out of the auto, keeps the doors tightly closed to prevent banging with the consequent damage, and in winter saves garage-heating bills. The mechanism consists principally of a large pair of gears rotated by an electric motor. Force is applied at the top of the doors through strong connecting rods, and the adjustment is such that the action is smooth and there is power enough to sweep away an ordinary fall of snow. A push button is used inside the garage and one may be installed outside if the ground plate is not desired.



As Car Runs over Plate, Electrical Contact Is Made and Garage Doors Swing Open

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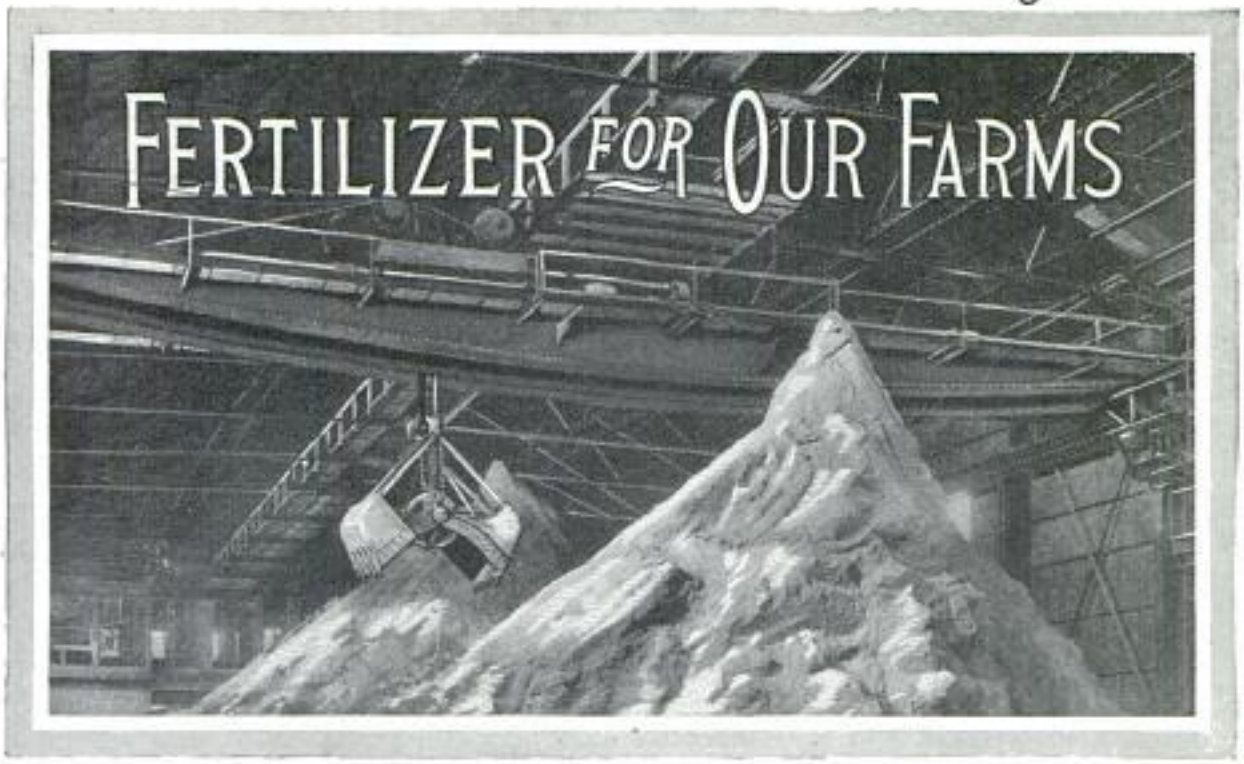

By FRANK RIDGWAY

FEEDING our farm and garden soils with the fertilizer needed to insure the yield of our food crops is one of the nation's biggest problems.

Most of our land is now occupied, and by reason of constant planting and harvesting, without proper restoration of plant food, millions of acres of formerly bumper-yielding lands are now depleted and known as abandoned farms. Each year all our farms are becoming less productive, while the population is steadily growing.

Figuratively the American farmer is the commissary of a great restaurant where hungry plants are fed. In the pantry—the soil—the farmer carries an abundant supply of nearly all the food elements that are needed except three or four—nitrogen, phosphorus, potassium and lime. With decreased buying power during the last few years, the supply of these elements has run low, but with better conditions there is a tendency to return to the use of more fertilizers, especially in the southern and eastern states, where the soil frequently has to be enriched year after year in order to produce a profitable crop. These states use commercial fertilizers chiefly in order to get quick results. A mixed commercial fertilizer for wheat is selling at $35 to $40 a ton. In the mid-western and western states, where the soils are generally richer, the problem of maintaining the fertility becomes less acute and immediate, but none the less important.

Farmers believe that Muscle Shoals does not offer a solution to the great task of supplying cheap fertilizer. It has been estimated that if the plant were run full tilt, it could not turn out enough nitrogen to supply the needs of one-seventh of the total tillable acreage of the state of Illinois alone. Its operation undoubtedly would be a big factor in the fertilizer industry, however, as it might be used to regulate prices.

Foresighted farmers of the Mississippi valley are using the cheap home method of building and maintaining the fertility of their soils through the use of limestone; legume crops, such as alfalfa, clover, soy beans, and cowpeas, and raw rock phosphate. In this manner they are virtually running little Muscle Shoals plants on their farms. The clovers and alfalfa plants have the unusual and mysterious ability of taking nitrogen from the air and storing it in the soil for later use by other vegetation. This action takes place through the medium of bacteria or germs—the workers of these miniature fertilizer factories—which live in wart-shaped growths on the roots of the plants and lock up the nitrogen in these tiny storerooms. The clover or alfalfa crops are turned under to rot in the soil, where the nitrogen will be waiting to feed corn, oats, cotton and similar crops which can-

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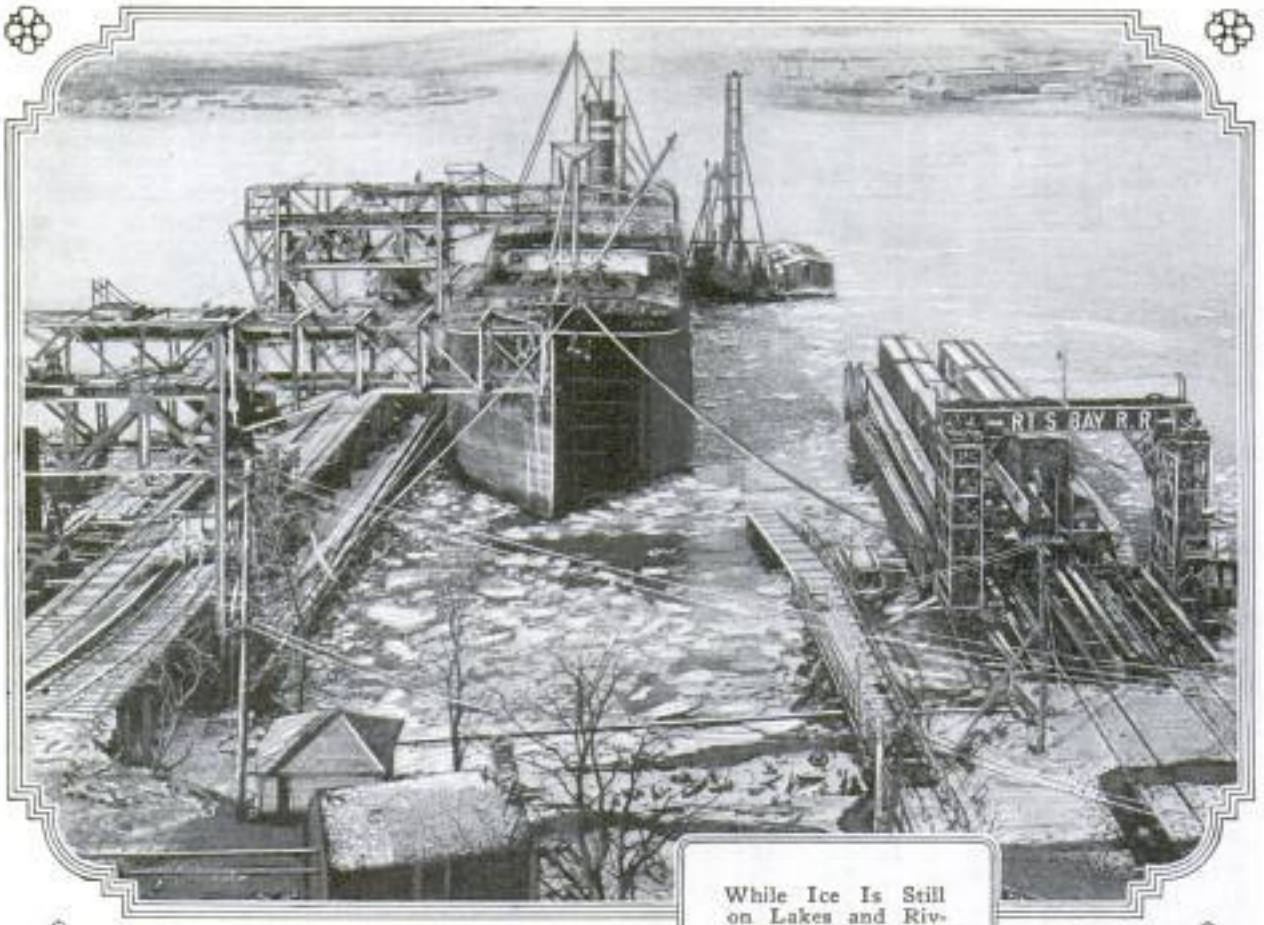
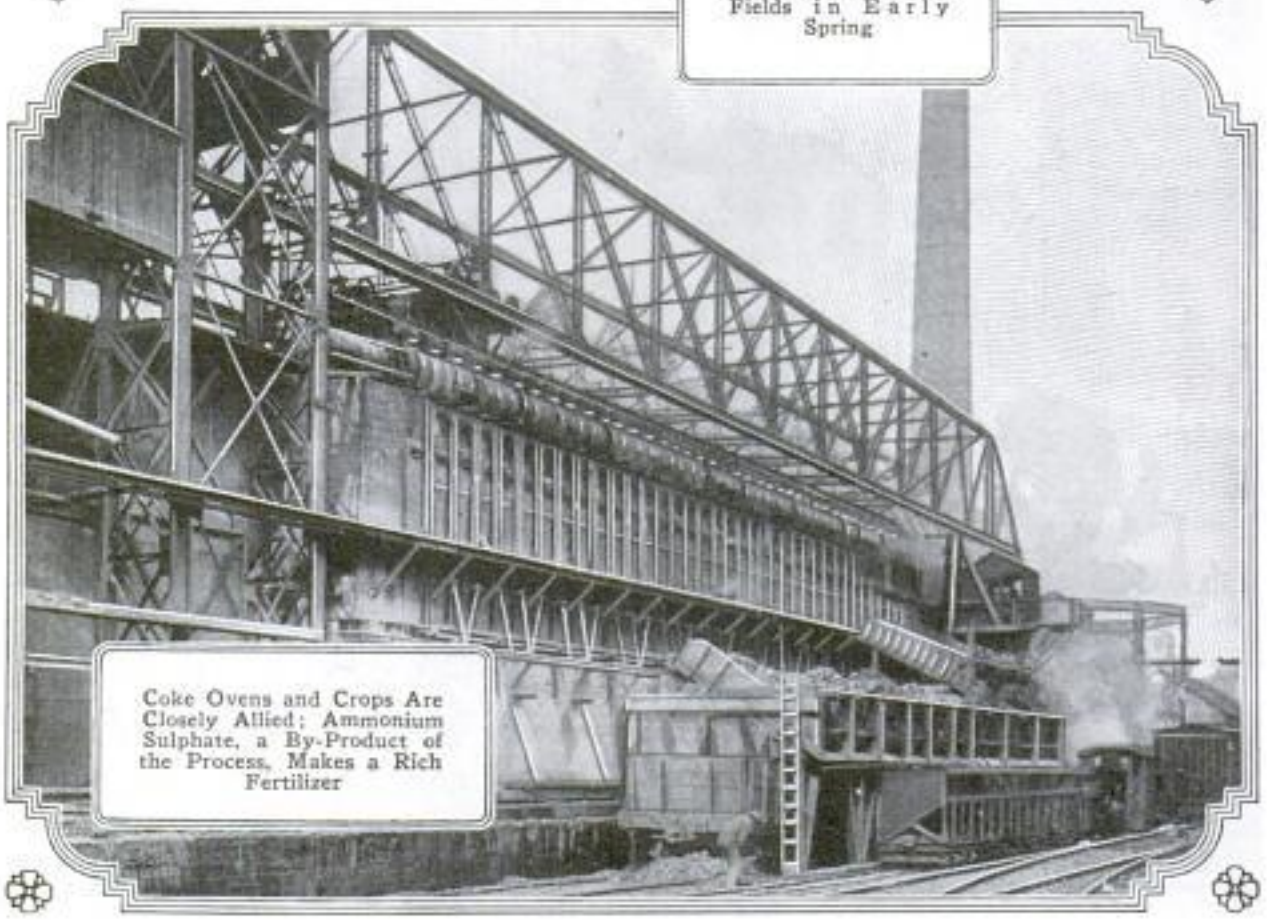


While Ice Is Still on Lakes and Rivers, Ships Are Loading Fertilizer for Treating the Fields in Early Spring



Coke Ovens and Crops Are Closely Allied; Ammonium Sulphate, a By-Product of the Process, Makes a Rich Fertilizer

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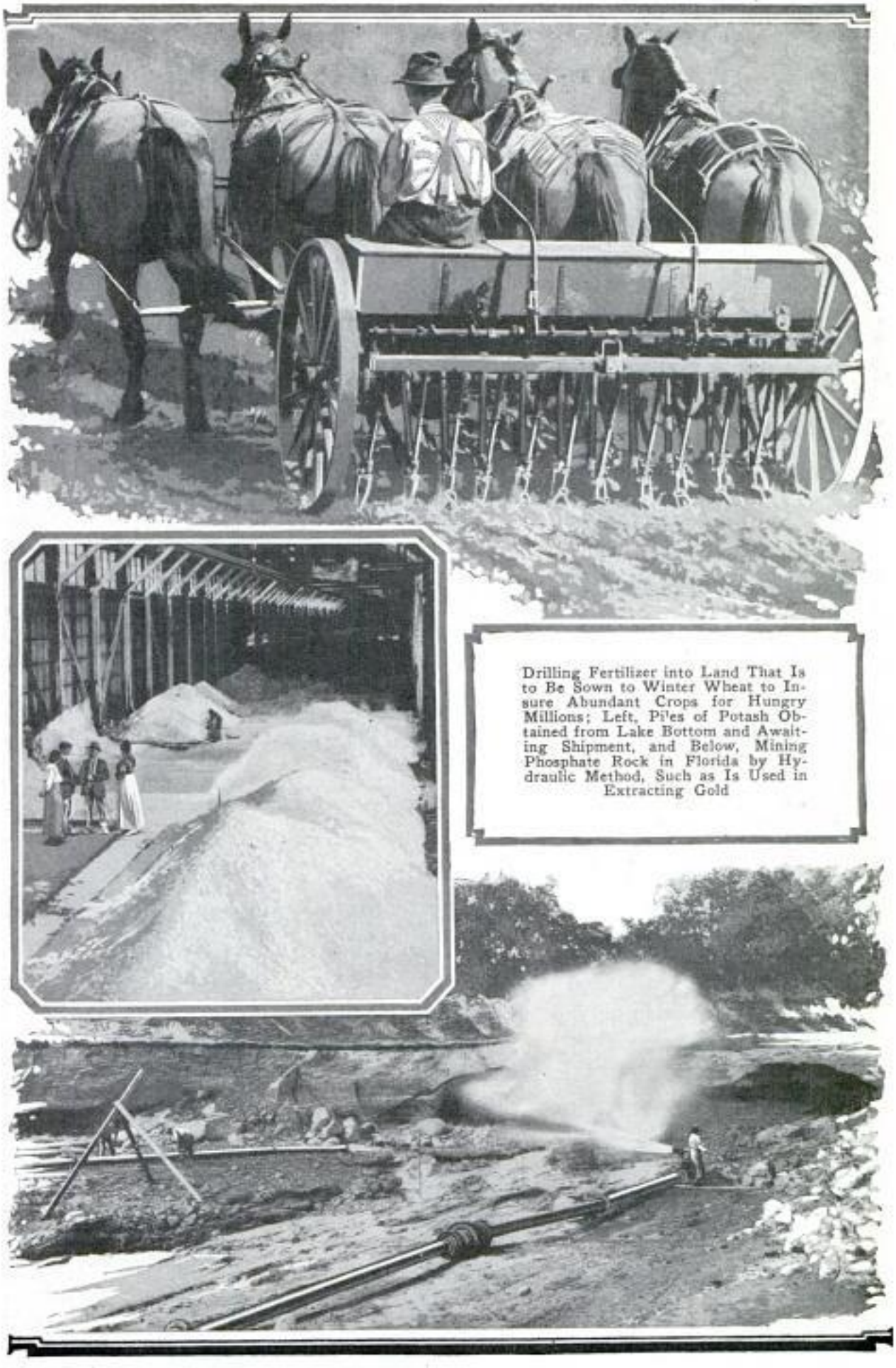

Drilling Fertilizer into Land That Is to Be Sown to Winter Wheat to Insure Abundant Crops for Hungry Millions; Left, Piles of Potash Obtained from Lake Bottom and Awaiting Shipment, and Below, Mining Phosphate Rock in Florida by Hydraulic Method, Such as Is Used in Extracting Gold

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not gather their own nitrogen. These little plants must have a rock foundation. Most soils, especially the poor ones in the older sections, are sour and have to be sweetened before they will grow clovers and alfalfa. Crushed limestone—the sugar needed in the pantry—has to be fed at the rate of about three tons to the acre before legume plants will thrive. Agricultural limestone costs about $2 a ton. Last year, United States farmers used 2,000,000 tons of it, and Illinois alone 500,000 tons. By raising clovers and alfalfa to produce nitrogen, American farmers are becoming less dependent upon supplies from Chile, which cost $6 a ton. There is practically no limit to the nitrogen available. Eighty per cent of the atmosphere is free nitrogen. Nitrogen accumulates in the soil also through the lightning's flash. Every bolt burns the air in its path into oxides of nitrogen which are washed into the earth by rain, according to authorities. Notice the magic growth of grass following a thundershower, when a new supply of nitrogen is carried down to the roots, thus renewing the life of lawn and meadow.

Seaweed Is the Ocean's Contribution for Better Crops, and Tons of It Are Gathered Yearly for Fertilizer

Phosphorus, another one of the fertilizer ingredients that is used in the home method, is known among soil physicists as the limiting element. In emphasizing the importance of phosphorus, an eminent scientist once said, "No phosphorus, no brain." While it is true that this element is actually contained in the tissues of the brain, he might have added, no phosphoric acid, no food, no bone, no flesh, no life, since this vital compound enters into the structure of plants, animals and men, and upon it our existence depends.

There is a shortage of phosphorus in most of the soils throughout the Mississippi valley. In the top seven inches of tillable soil in this region there is lacking 1,000 pounds of phosphorus to the acre. It is common practice to apply one ton of ground rock phosphate to the acre just as it comes from the mines in Tennessee and other places. There is about 260 pounds of phosphorus to each ton of the raw material, so it would take four tons of rock phosphate to make up for the deficiency in most of the Mississippi valley soils. Some mid-west farmers have found that the use of this quantity pays big dividends. Little if any of the phosphate leaches out of the soil; it remains in the ground until taken up by plants. Sweet clover, red clover and, to some extent, alfalfa have the ability to utilize phosphate in the raw form. Here again, by turning under the legume crops grown on phosphate-treated soils, the phosphorus, like the nitrogen, is left in the soil ready to be taken up by corn and small-grain crops grown later on.

Until a half century ago practically all phosphoric acid for fertilizer purposes came from bones, which are scarce today. Not so long ago tons of buffalo and cattle bones could be picked up on the bleak western plains. With the buffalo practically extinct and cattle slaughtered in centralized packing plants, this source of phosphorus is no longer available. But great beds of phosphate rock have been found to replace it. The United States owns the greatest phosphate deposits in the world, supplying her own needs and exporting an average of 500,000 to 1,000,000 tons a year.

Germany and Alsace have the world's largest deposits of potash, another plant food that is usually stored in limited quantities among the supplies in the farmer's fertilizer pantry. Relief is coming through the potash resources found in the greensands in New Jersey, the kelp in California, potassium carbonate in Nebraska and the deep-lying beds of potash found in Texas oil fields.

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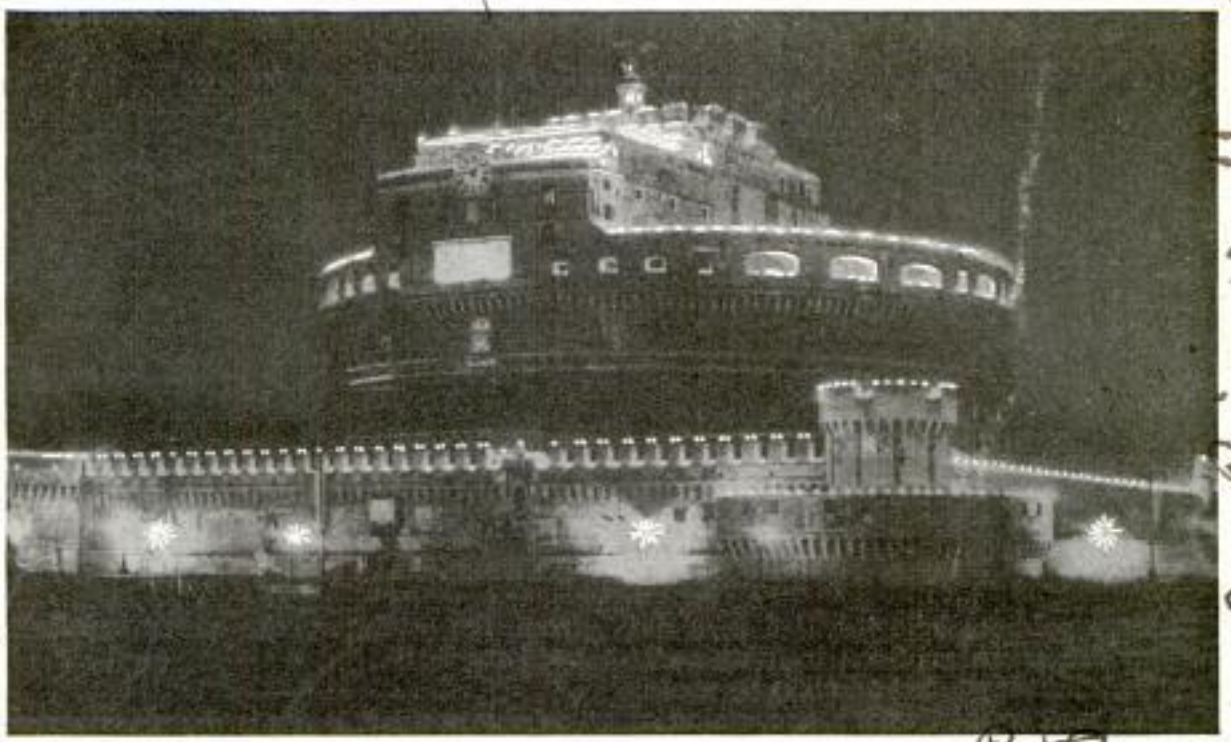
ROMAN RUIN TRACED IN LIGHTS FOR WAR FETE



Softened in the Glow of Hundreds of Lights, the Battlements of Castle San Angelo Form a Luminous Frame for the Massive Pile, Gaily Lighted for a Modern Roman Holiday

Outlined in hundreds of electric lights as one of the displays during Italy's celebration of the tenth anniversary of her entrance into the world war, the arches and battlements of the castle San Angelo in Rome were strikingly revealed at night time. Floodlights bathed the upper portion of the huge structure and the tracery of lamps along the wall in front formed a sort of luminous frame for the background. The lights further emphasized the solidity of Roman architecture.

BARGE LIFTS ITSELF ON LEGS TO ESCAPE HIGH WAVES

When waves run high in Port Weller harbor, Ontario, a barge, which is being used in connection with rock-drilling operations, lifts itself above the surface by means of four legs, one at each corner. Wire cables attached to hoisting engines pass over the tops of the spuds and rollers are adjusted to the scow so that it can slide up and down. Under normal conditions, the barge is anchored and floats on top of the water. The leg arrangement was installed by engineers who wished to keep the base steady enough to permit drilling even when the waves were high.

SCOOTER RUN BY AIR POWER HAS SPEED CONTROL

Driven by compressed air from a thin aluminum tank fitted alongside the rear wheel, a scooter being manufactured by an English firm, adds thrills to children's sport and encourages their mechanical bent. A foot throttle in front regulates the speed, and the pump for refilling the tank also serves as a seat, the barrel being the support and the circular handle the cushion.

Scooter with Air-Tank Motor; the Seat Is the Pump, the Speed Control in Front

Popular Mechanics Magazine does not publish the name of maker or seller of any device described in its pages, but this information is kept on file and will be furnished free to our readers by addressing our Bureau of Information.

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ARTIFICIAL HILLS HELP KEEP CHINESE TROOPS FIT

Up and Down over This Series of Steep Earthern Steps, March the Chinese Soldiers to Get Training in Climbing and Descending Hills Although Their Drill Ground Is Flat

Chinese soldiers being drilled in a flat country are given artificial training to fit them for climbing hills and cliffs by means of a dirt wall topped with a succession of short stairway platforms. The men are marched at quick pace to the top of the wall and then proceed along the irregular contour, up one side the hillocks and down the other, always in military order and at fixed marching time.

CRANKCASE-OIL DRAIN ON DASH SAVES CRAWLING UNDER CAR

Installed on the dashboard of the auto where it is within easy reach, an oil drain for the crankcase eliminates the necessity of getting under the car and insures more prompt attention to the detail of changing the oil. The attachment is operated by a twist of a key inserted in a slot. This unlocks a valve, permitting the lubricant to flow out. The valve, a length of flexible shafting and the dash piece constitute the outfit, which is not difficult to install. A similar arrangement is provided for draining water from the radiator, the same key being used for both.

Crankcase Drainer and How It Fits

MOUNTAIN FALLS INTO RIVER AND MAKES NEW LAKE

Map makers are changing their plats of western Wyoming's topography because of a recent caprice of nature by which a great mountain of rocks was hurled into a river and formed a new lake, seven miles long, a mile wide and 200 feet deep. High up in the Teton national forest a towering cliff tottered for a moment, then plunged into the Gros Ventre river with a roar that could be heard for miles. Acres of huge trees were smashed into bits of kindling. The river was completely blocked and within five minutes the rushing mountain torrent had formed the lake. A waterfall was also caused when the water arose to the level of the fallen rock barrier and slipped over the edge to the old river course below.

¶Crystal detectors are used for receiving wireless signals on eighty to ninety per cent of the world's ships.

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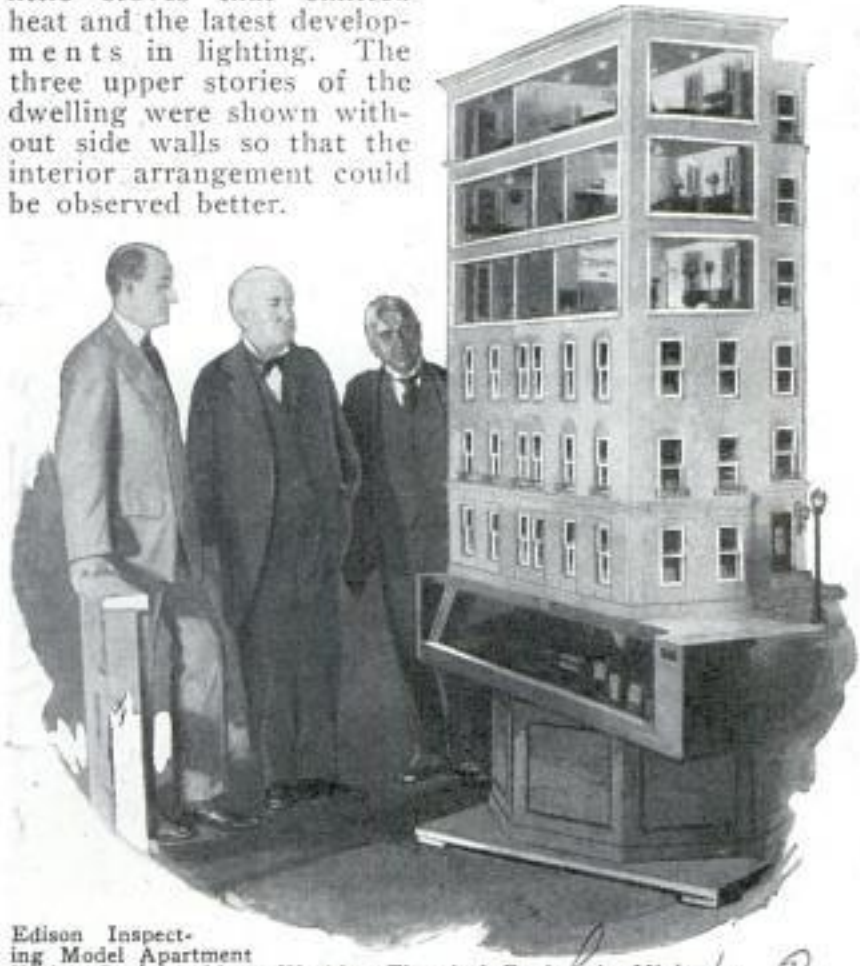
SPONGES ARE SEA BEEHIVES FOR COLONIES OF SHRIMPS

Living sponges are the "beehives" of the sea, according to the discovery of Dr. Charles J. Fish, one of the scientific staff of the steamer "Arcturus" which is cruising tropical waters. The "bees" are a species of tiny snapping shrimp that swim freely about but rush to the canals and passages of the sponge when danger threatens. Whole colonies of this species as well as other forms, use the hive, it was found, sharing a sort of partnership with the sponge which is itself a marine animal. The openings in which the shrimps find refuge are its mouths.

MODEL OF ELECTRIC DWELLING SHOWS USES OF CURRENT

How Edison's discoveries have been adapted to modern requirements was seen by the great inventor himself almost at a single glance when he inspected a realistic model of an apartment house featuring electric equipment at an eastern exhibition. It contained seventy different electrical appliances such as tiny elevators that ran up and down, fans that whirred, little stoves that emitted heat and the latest developments in lighting. The three upper stories of the dwelling were shown without side walls so that the interior arrangement could be observed better.



Edison Inspecting Model Apartment Which Contains Many Working Electrical Devices in Miniature

Preparing to Use Binoculars Attached to Holder and Released by Coin in Slot

EYE GLASSES RENTED ON BEACH FOR DIME IN SLOT

Visitors at beach resorts in California are afforded the use of binoculars simply by dropping a dime in a slot on the holder which contains the glasses. Before the coin is inserted, the instrument is tipped up and locked at an angle that prevents use, and as soon as a person is finished, it falls back to that position. The support is placed at a convenient height and a revolving metal base, on which the binoculars rest, permits turning them in a complete circle.

HOLDING BREATH HEALTH TEST

The length of time one can hold his breath is considered a measure of physical fitness, according to Dr. F. W. Wittich of the University of Minnesota. As a method of diagnosis, it can be classified with taking the temperature, pulse and respiration rates, he declares. Inability to hold the breath for thirty seconds after inhaling deeply, is considered a sign of disorder in business and professional men, the physician asserts.

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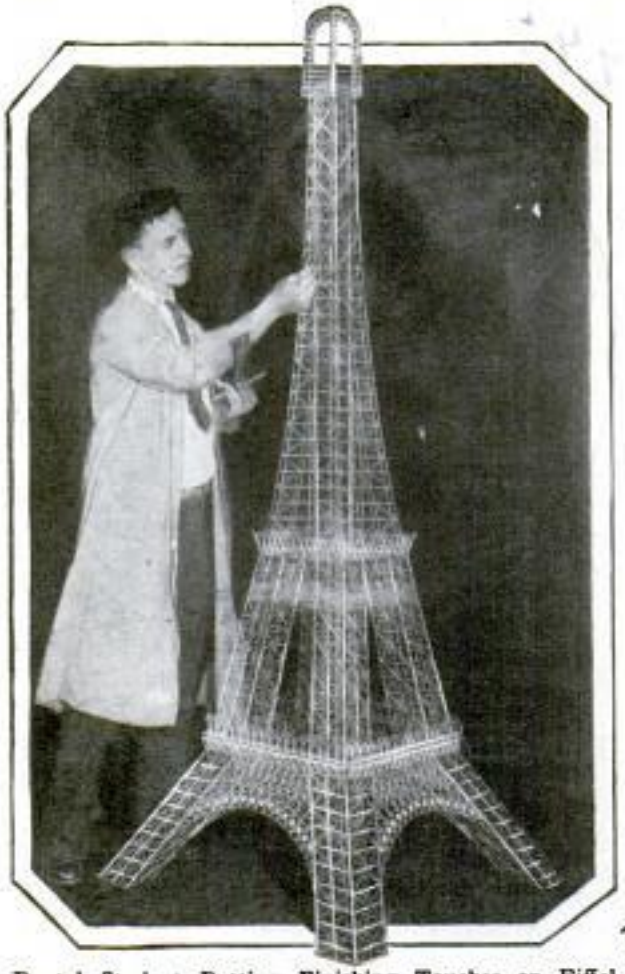


Dental Student Putting Finishing Touches on Eiffel Tower Model Constructed of Toothpicks

EIFFEL TOWER OF TOOTHPICKS MODELED BY BOY

Using only a pot of glue and pair of tweezers, a New York boy has constructed a realistic model of the Eiffel tower of toothpicks. About 300 hours were spent on the work and approximately 11,000 picks were used. Proportions were reproduced carefully and the rigidity of the model in such fragile material emphasized the correctness of the engineering principles followed in building the real tower. The task was undertaken as a diversion from studies in dentistry.

PHONE GIRLS OF MANY LANDS

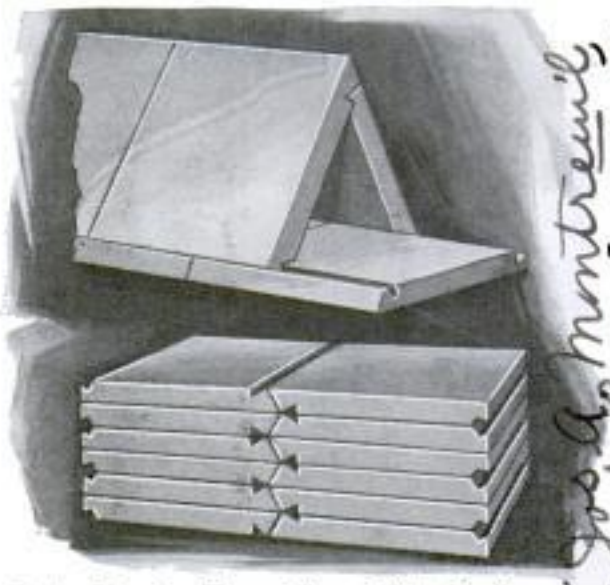
Although the telephone instrument is fairly well standardized throughout the world, methods of using it vary widely in different lands. In Abyssinia, messages are written out and then handed to an operator who shouts them into a receiver, being the only one allowed to use the instrument. Widows with families are preferred as operators in Cuba, and the exchange is located in the homes. Since the Turkish customs forbid a Moslem woman to leave the harem, the operators are Greeks or Armenians. German telephone girls are not allowed to wear jewelry or to bob their hair, and in Russia, it is a penal offense to address an operator by any term except "comrade" or "citizeness." English exchange workers are called "telephonists."

SELF-MENDING AUTO TIRE STOPS LEAKS FROM PUNCTURES

An inner tube for automobile tires which, it is claimed, will prevent the loss of air from punctures, has been patented. By molding the rubber walls in a special shape, they are made to contract tightly at any point at the instant an opening is pierced. Constructed like ordinary tires, the puncture-proof tubes are designed to employ the tendency of rubber to resist stretch. The tube is said to be easily installed, and since it cannot wrinkle or fold when inflated inside the casing, the surfaces are said to be free from wear and cracks generally caused by the friction of old-style tubes with the outer covering.

TRIANGLE-SHAPED DRAIN PIPE FOLDS FLAT FOR SHIPPING

Drain or culvert pipe of triangular shape and composed of interlocking slabs that may be piled flat for packing or shipping, has been patented by a Canadian inventor. It is made of material which is said to be durable and strong enough to withstand heavy strains, and the smooth outer surface is planned to resist the effects of thawing and freezing. The sections are not difficult to put together and the joints can easily be made water-tight.



Drain Pipe Set Up to Show Triangular Shape, and Sections Folded for Shipping

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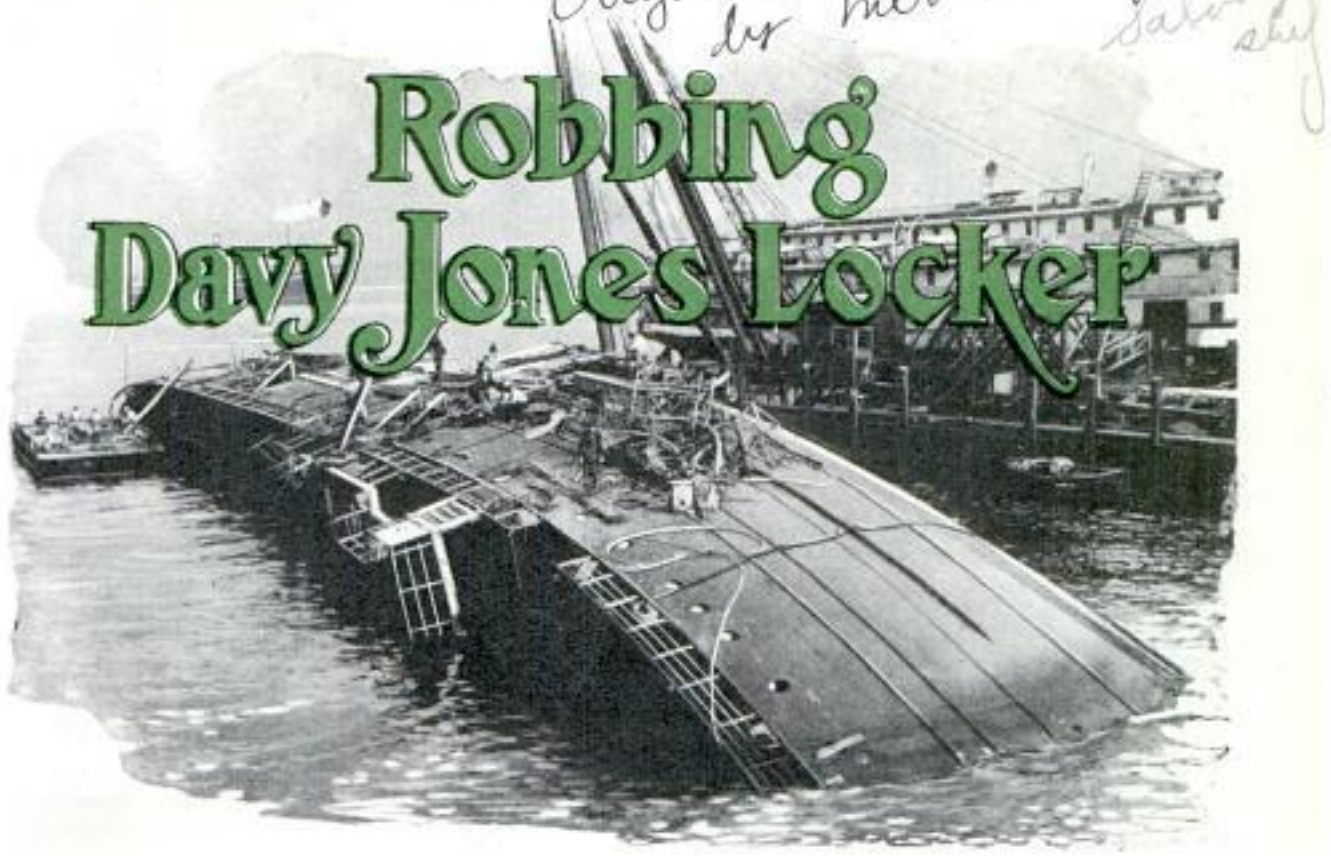

Robbing Davy Jones' Locker

Untold Millions Lure Treasure Hunters—War Secret of England's "Mystery Towers" Is Finally Solved

By HAROLD T. WILKINS

THE Bank of England, guarded nightly by a company of crack soldiers, is said to submerge its treasure vaults in twenty feet of water. Yet its wealth is small indeed compared with that which lies on the sea floors of the world.

If Davy Jones' locker could be made to yield but one quarter of the heaped treasures of gold and silver and precious jewels scattered at the bottom of the oceans since the first galley manned by dark-eyed Phoenicians drove upon the rocks, the whole world's war debt would vanish like mist before the rising sun.

Full 252 feet beneath the sea off south Ireland, lies the liner "Lusitania" sunk by a torpedo nine years ago. Under the wreck of twisted girders and jammed cabin ways, it is declared, is a safe containing $6,000,000 of bullion, jewelry and valuables. Marine salvors are asking themselves whether this treasure can be recovered. At such a depth, a diver incased in the ordinary helmet and rubber suit would be crushed by the tremendous pressure. But an American syndicate, which has purchased the rights in the "Lusitania," believes that this task is not too great for modern science. The cleverest brains are grappling with the problem. An American, Capt. Benjamin Leavitt, has devised a suit of strong armor by which he recently broke all records for deep-sea salvage work and recovered a $600,000 cargo of copper that had lain since 1869 within the wreck of the British

Two Submarine Adventurers in Characteristic Armor, Exploring the Sea Bottom

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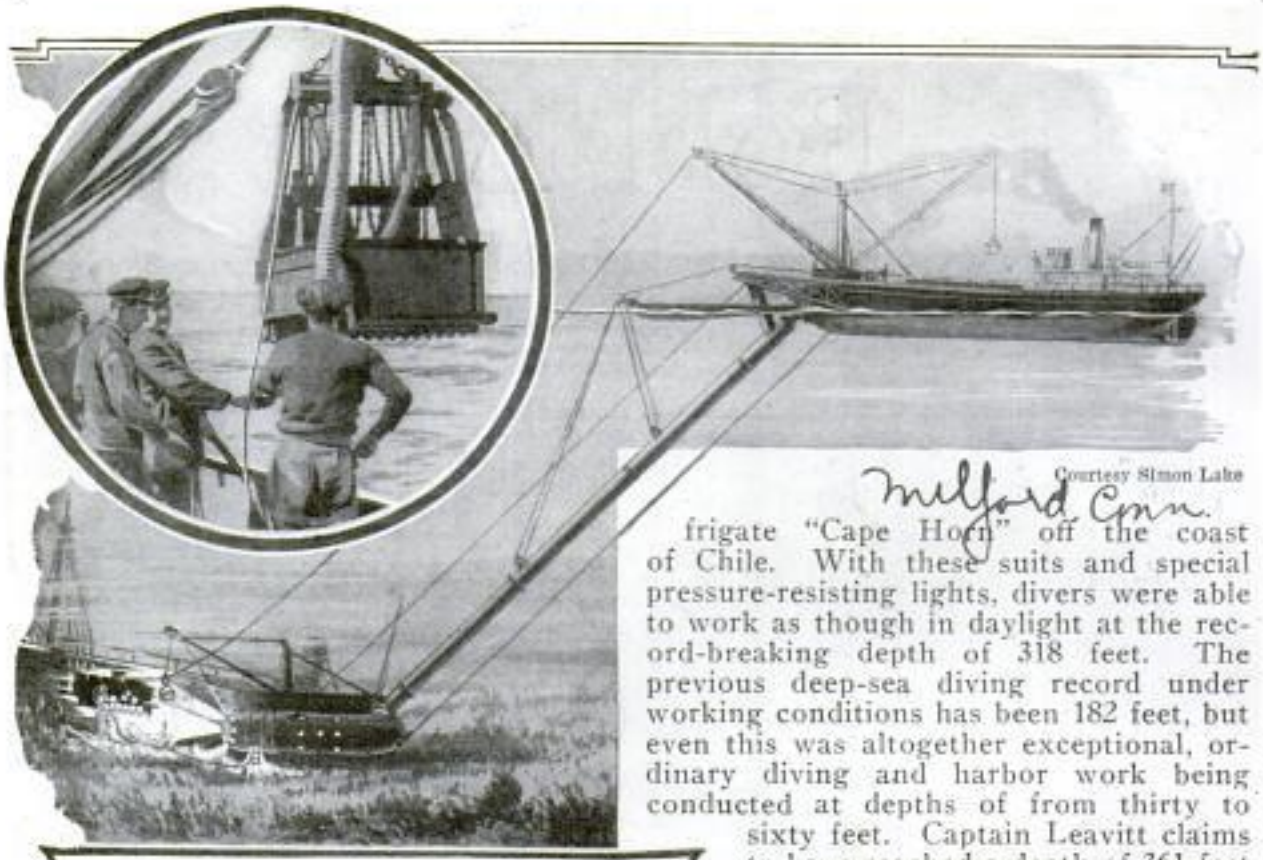
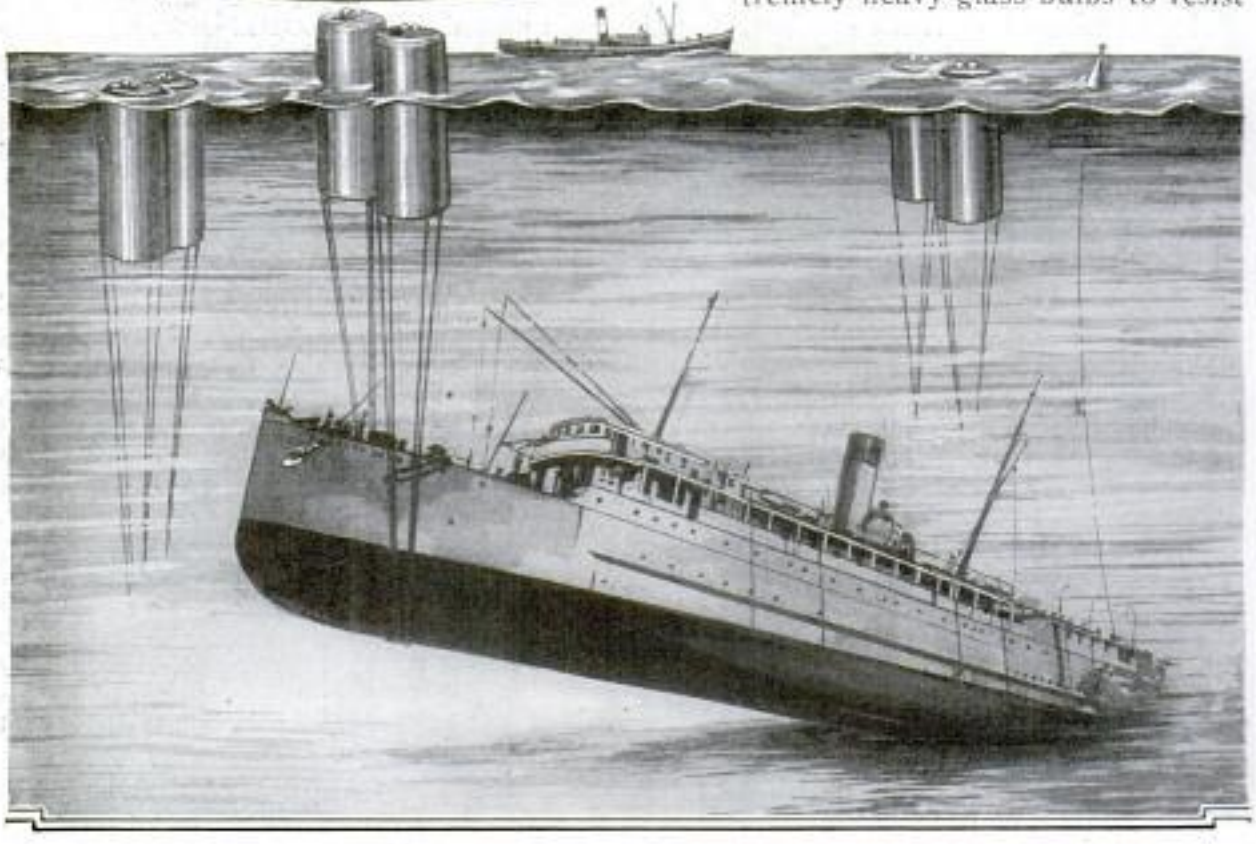


Courtesy Simon Lake

A Combined Grapple and Sucker That Penetrates the Deepest Sea Sand; Steel Access Tube to Aid in Salvaging Sunken Ship, and a Leverage Plan for Floating Craft Free of Bottom by Means of Buoys

frigate "Cape Horn" off the coast of Chile. With these suits and special pressure-resisting lights, divers were able to work as though in daylight at the record-breaking depth of 318 feet. The previous deep-sea diving record under working conditions has been 182 feet, but even this was altogether exceptional, ordinary diving and harbor work being conducted at depths of from thirty to sixty feet. Captain Leavitt claims to have reached a depth of 361 feet in trial descents, thus exceeding by 179 feet the greatest accredited record for experimental deep-sea diving.

The lamps used were large, vacuum-type incandescents with extremely heavy glass bulbs to resist



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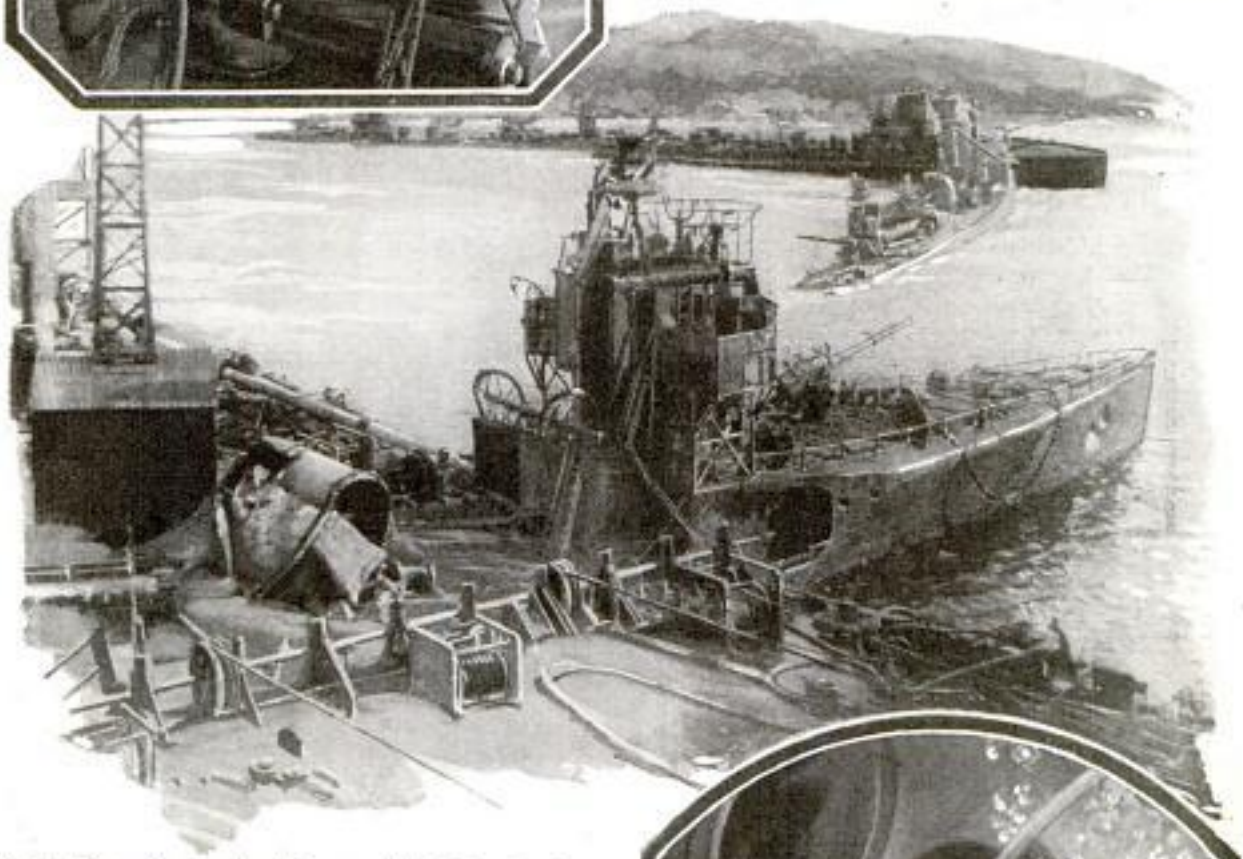
Probably outfit made by Neufeldt + Kuhnke Kiel, Germany. 2511

Lever Frederick Maskell

suit, a specially constructed chamber supplies the diver with air at the proper pressure for four hours.

Another method is to use diving bells made of heavy armor plate which may be lowered to the sea floor so men inside can work electrical drills, claws and hammers, projecting from the bell and turned by current from the salvage ship's dynamo. Inset in the wall of such a diving bell, it is proposed to use portholes with thick glass through which the men can peer at the wreck on the sea bed. Propellers would move the bell around the hull, and telephones and electric lights would make the interior a submarine factory.



Diver Descending to the "Laurentic"; Salvaging German Battleships at Scapa Flow; Diver Using Torch to Cut Ship's Steel Sides

the pressure of the water, which at a depth of 350 feet is 155.4 pounds, or slightly more than ten times normal air pressure, sufficient to crush an ordinary lamp like an eggshell. Each lamp is fitted into a bronze cap with a rubber gasket, and the wires for conducting the current are incased in cable.

Captain Leavitt's armored diving suit is made of manganese bronze, a composition that is proof against the corroding effect of salt water. The joints are ball-bearing, and the flexible sections consist of interlocked copper tubing wrapped and lined with sheet rubber. On the back of the

Top Photo © Farringdon Center, Courtesy Cox & Danks

Lindon Leavitt - Lusitania Salvage Co, 17 Battery Place New York

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Simon Lake
Bridgeport. Conn
see also Nov. 1930
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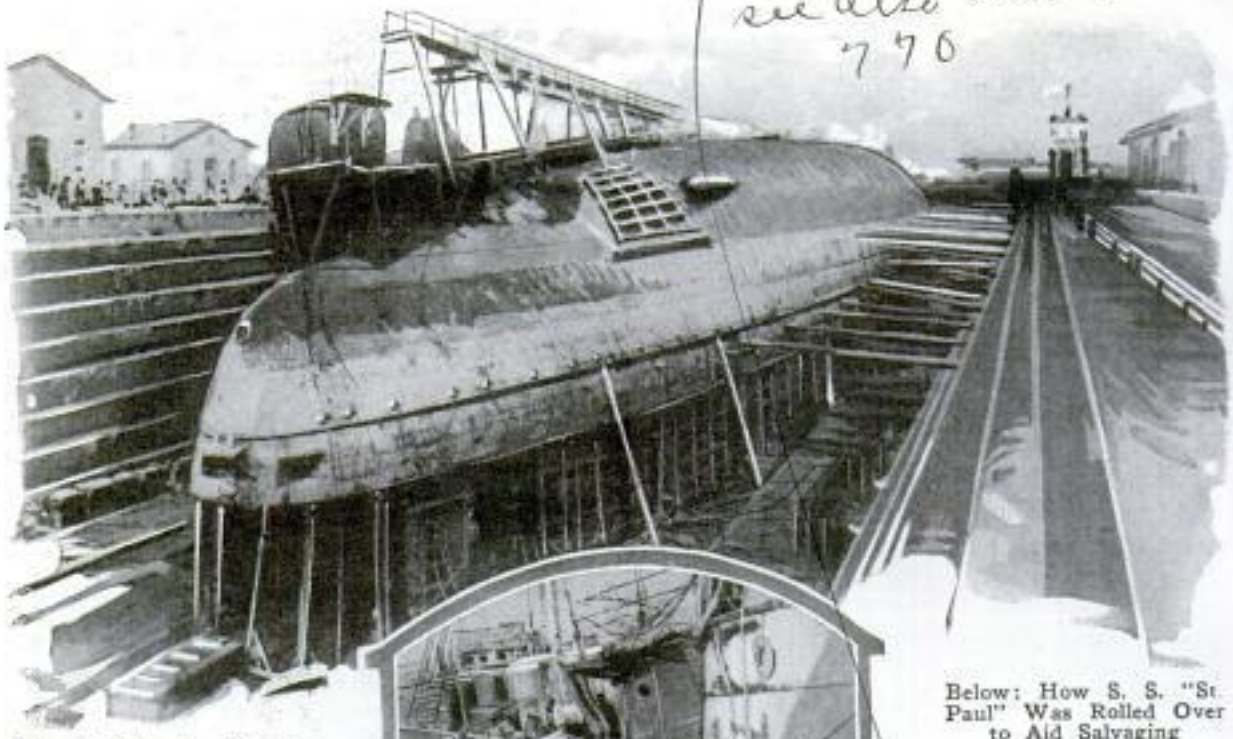
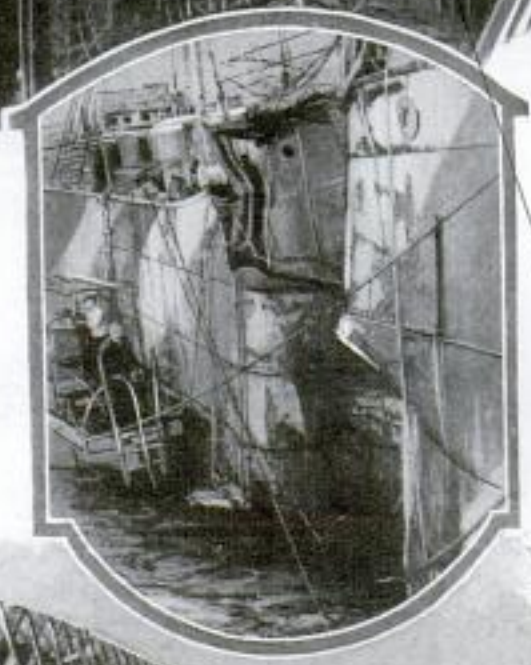
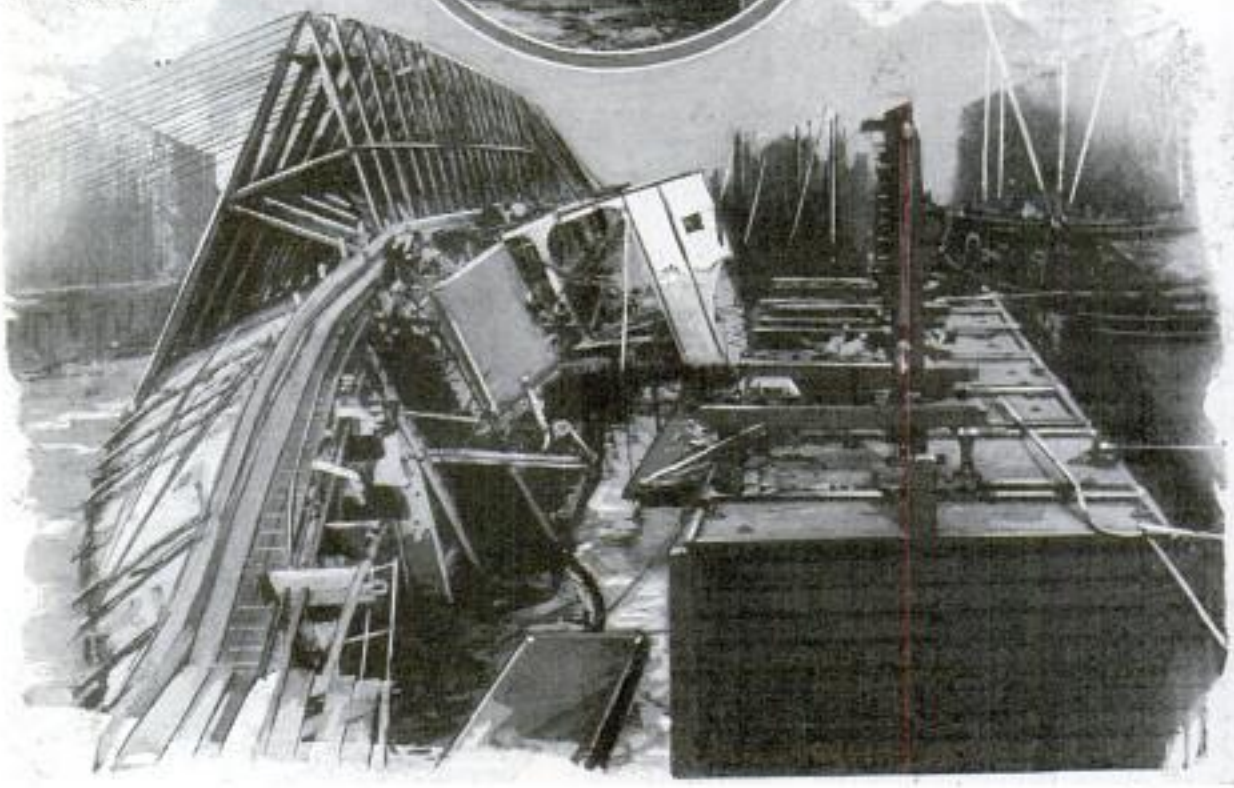


Below: How S. S. "St. Paul" Was Rolled Over to Aid Salvaging



Two Difficult Salvaging Jobs That Show Skill of Divers

But the most wonderful of all machines which have invaded the underwater world is a craft that runs along the sea bed on motor-driven wheels, has a door through which the diver can step out onto the bottom, and is connected with the salvage ship by a tunnel called an "access tube." It is the invention of Simon Lake, who christened this craft the "Argonaut." By



Bottom Photo, © Merritt & Chapman

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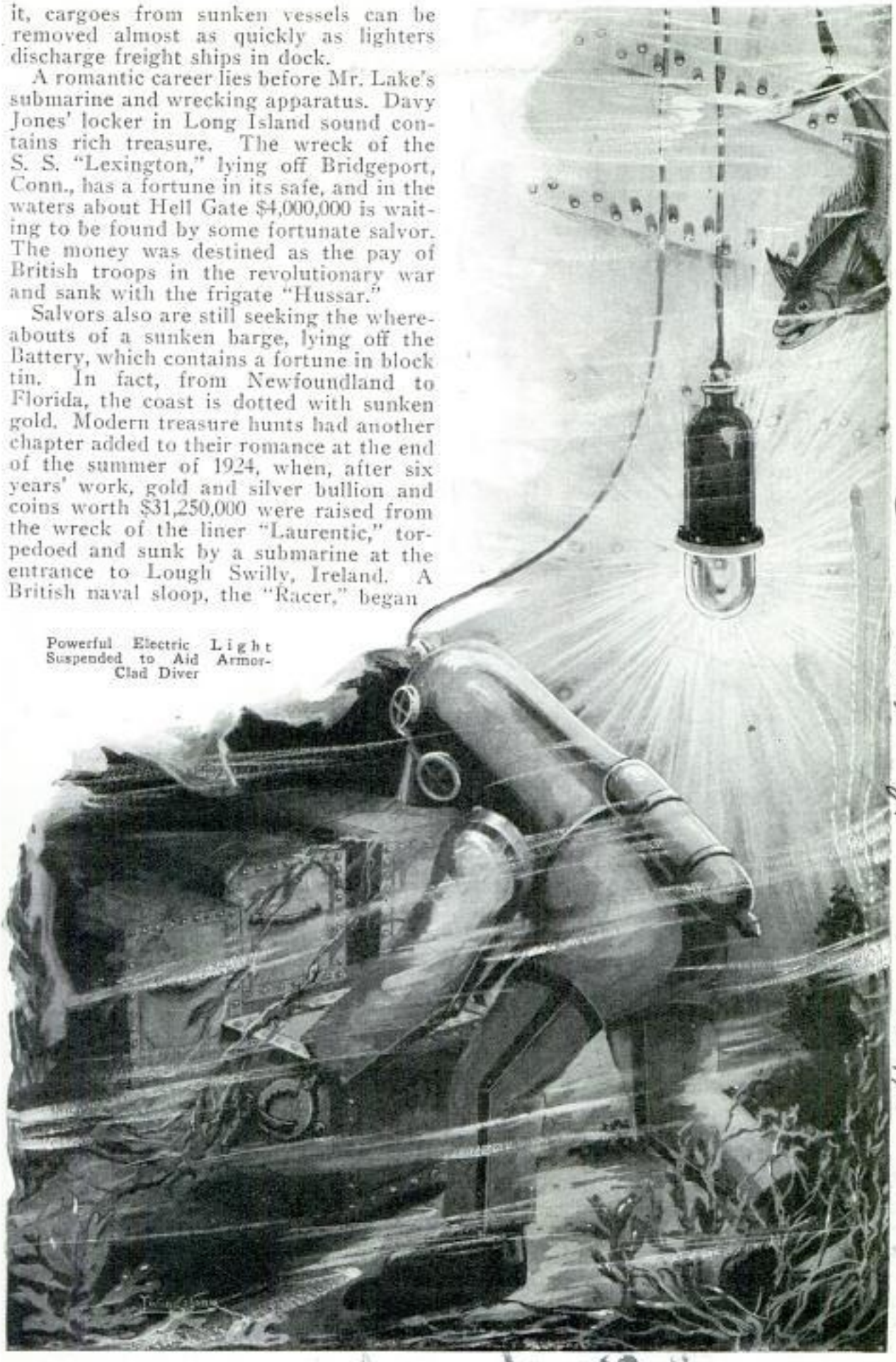
it, cargoes from sunken vessels can be removed almost as quickly as lighters discharge freight ships in dock.

A romantic career lies before Mr. Lake's submarine and wrecking apparatus. Davy Jones' locker in Long Island sound contains rich treasure. The wreck of the S. S. "Lexington," lying off Bridgeport, Conn., has a fortune in its safe, and in the waters about Hell Gate $4,000,000 is waiting to be found by some fortunate salvor. The money was destined as the pay of British troops in the revolutionary war and sank with the frigate "Hussar."

Salvors also are still seeking the whereabouts of a sunken barge, lying off the Battery, which contains a fortune in block tin. In fact, from Newfoundland to Florida, the coast is dotted with sunken gold. Modern treasure hunts had another chapter added to their romance at the end of the summer of 1924, when, after six years' work, gold and silver bullion and coins worth $31,250,000 were raised from the wreck of the liner "Laurentic," torpedoed and sunk by a submarine at the entrance to Lough Swilly, Ireland. A British naval sloop, the "Racer," began



Powerful Electric Light Suspended to Aid Armor-Clad Diver

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the task of salving this treasure in 1920, when it was found that under the pressure of strong currents the "Laurentic" had broken up into a confused mass of steel plates. They raised 600 gold bars that year and 300 the next year, and, in 1922, by the use of a gold-finding instrument invented by Prof. E. E. Brookes, they recovered 900 bars of gold and silver. Divers had to blast their way with dynamite to the liner's strong room.

To raise treasure wrecks from the sea, Mr. Lake has devised a special salvage vessel which would pump into a drowned ship such as the "Lusitania," a buoyant solution of cellulose, balsa wood and paraffin wax. The water would be forced out through ports in the ship's hull and cause it to break away from the sea bed and float on the surface. Three hundred tons of this solution could be pumped in an hour into the wreck's hull, and a dead weight of thousands of tons lifted above water. The cellulose solution, which would fill every part of the hull would be dislodged by jets of high-pressure steam when it reached drydock.

One of the secrets of the war, long jealously guarded by the British admiralty and even now known to few people in Britain, was the purpose of the "mystery towers," huge six-sided floating buildings, rising 130 feet above the sea at Shoreham, on the south coast of England. Their real use was not, it is whispered, for naval defense or assault, but to raise from the sea many torpedoed ships lying twenty fathoms deep. The mystery towers were built of concrete, in tiers and boxes, each unit four feet square by two feet, and assembled on a beach where they were strengthened with steel girders. Sluice gates with pumps to admit or expel water were at their base. They were floated out to sea on a high tide.

On reaching a wreck, water was admitted by the sluices to the base of the towers, which were lowered one on each side of the wreck, and hawsers passed from them under the keel of the sunken boat. Finally the water was pumped out, and the mystery towers then rose, dragging up the wreck with them.

Miss Mary Naylor Preparing for Deep Dive, and Stranded Steamer That Was Freed by Blasting Reef

Bottom Photo, Courtesy Merritt & Chapman

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GOLF BALLS REPAIRED AT HOME WITH SIMPLE OUTFIT

When golf balls get sliced, out of round or otherwise disfigured, most players discard them regardless of the fact that the core may be practically as good as new, and with a little fixing, the ball might be made suitable for many more games. Repairing can be done at home and with little trouble with an outfit, now on the market, consisting of an aluminum die, paint and paint remover, covers and patches. For instance, the ball is slightly cut or lopsided due to the core having shrunk away from the cover. The sphere is placed in the die with a small piece of old covering, the thumbscrews tightened and the die submerged in hot water and boiled for five minutes. Heat and the resulting expansion restore the ball to its proper shape. After it is cooled and painted, it can scarcely be told from a new one. Covers can be changed with but little more work. If desired, the player's name can be engraved in the die so that the balls can be plainly marked, saving confusion on the links.

Golf Ball before Treatment, the Die with Thumbscrews Used to Clamp It, and Remolded Sphere Which Can Scarcely Be Told from a New One

ELEPHANT PATHS IN AFRICA USED BY MOTORISTS

Trails that were beaten through the African jungles by herds of elephants many years before highways were built by human hands now provide excellent roads for bicycles, motorcycles and autos, which are being used in steadily growing numbers in that country. They are as hard and smooth as can be desired, are from four to five feet in width and, in some places, extend for hundreds of miles through dense age-old forests that otherwise would be altogether impenetrable. For centuries, they have been used by the natives as the only lines of communication in many districts. The great antiquity of these trails is indicated by the fact that in some sections where the ground is rocky, it has been worn smooth by the feet of the ponderous beasts.

RADIO SIGNAL-ALARM SYSTEM HELPS CATCH CROOKS

By means of a selective signal-light system and a central radiocasting station, New York police headquarters can communicate with any one or all of the stations in the city at one time almost instantly after knowledge of a crime is received. This spreads an invisible net about the fugitive and also permits citizens to aid in the capture of the lawbreaker if they desire. The signals are flashed in the proper combination from a transmitting apparatus consisting of a set of levers moved to certain stops. This notifies the desired stations to be on the alert. As soon as the call is completed, the message is put on the air from station WNYC. Civilians, tuning in, can hear the report and may be able to offer assistance in watching for stolen cars and in other ways.

Selective Radio Alarm-Signal Transmitter for Calling Any Police Station Desired and Spreading News of Crime

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BOOK HAS SEVEN-FOOT PAGES TURNED BY ELECTRICITY

Containing a history of the southern states, a book measuring six feet ten inches by four feet seven inches and weighing 500 pounds, is being exhibited. The volume is richly illustrated by hand and has nineteen leaves which are turned at regular intervals by an electric motor. It is said that this is the largest book ever made, its nearest rival being a bible measuring five feet two inches by three feet, in the Upsala university, Sweden.

Enormous History Book in Its Special Binding with Turning Mechanism for Each Page, Operated by Electric Motor

POCKET DIAL TELLS DRILL SIZES TO SAVE TIME AND ERRORS

Machinists, designers and workers in various mechanical lines are saved costly errors and much time by a pocket-size gauge that shows almost automatically what size drill to use on various jobs, and gives other valuable information. It is only five inches in diameter, one-eighth of an inch thick and consists of a number of dials, properly numbered and lettered, that are turned by means of toothed disks at the side. For instance, a No. 8 taper pin with a quarter of an inch taper to the foot is to be used and the worker wants to know what size drill to employ for the reamer. A turn of the taper disk to size No. 8 shows that a 13-32 drill should be chosen. The diameter of the large end of the pin and of the small end of the reamer also is shown. Other disks give distances across flats and corners of square, double depth of U. S. and V-threads, and the number, size, thickness and diameter of Woodruff keys.

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Pocket Dial That Tells, by Turning the Toothed Disks at Sides, Correct Drill Sizes to Use

WHEN A DIAMOND TURNS PALE

Why "fright" sometimes causes even a costly diamond to turn pale has been explained by a gem expert in Amsterdam. In the cutting, a diamond that shows traces of yellow, sometimes has a "fright" through receiving a blow and fracture. As a result, one half turns pure white, due to the accidental splitting off of the discolored portion which caused the entire stone to appear dark.

"IVORY-PLATED" AUTOS RETAIN BEAUTY OF FINISH

For refinishing motor cars, a coating that is much like the material used for the backs of imitation-ivory hairbrushes and other toilet articles, is sprayed on the body by compressed-air. It is said to be durable, proof against fading, and to keep a permanent gloss. Successive coats are put on at intervals of thirty minutes, then the car is allowed to stand overnight to dry. It is next rubbed and polished to give a high glaze. Two workmen can finish a sedan in a little more than a day. Two test cars were coated with this material two years ago and are said to have been unaffected by the ordinary soaps, oils and dust that mar most finishes, while the luster appears to have improved with age. The cost is said to be cheap in view of the effect.

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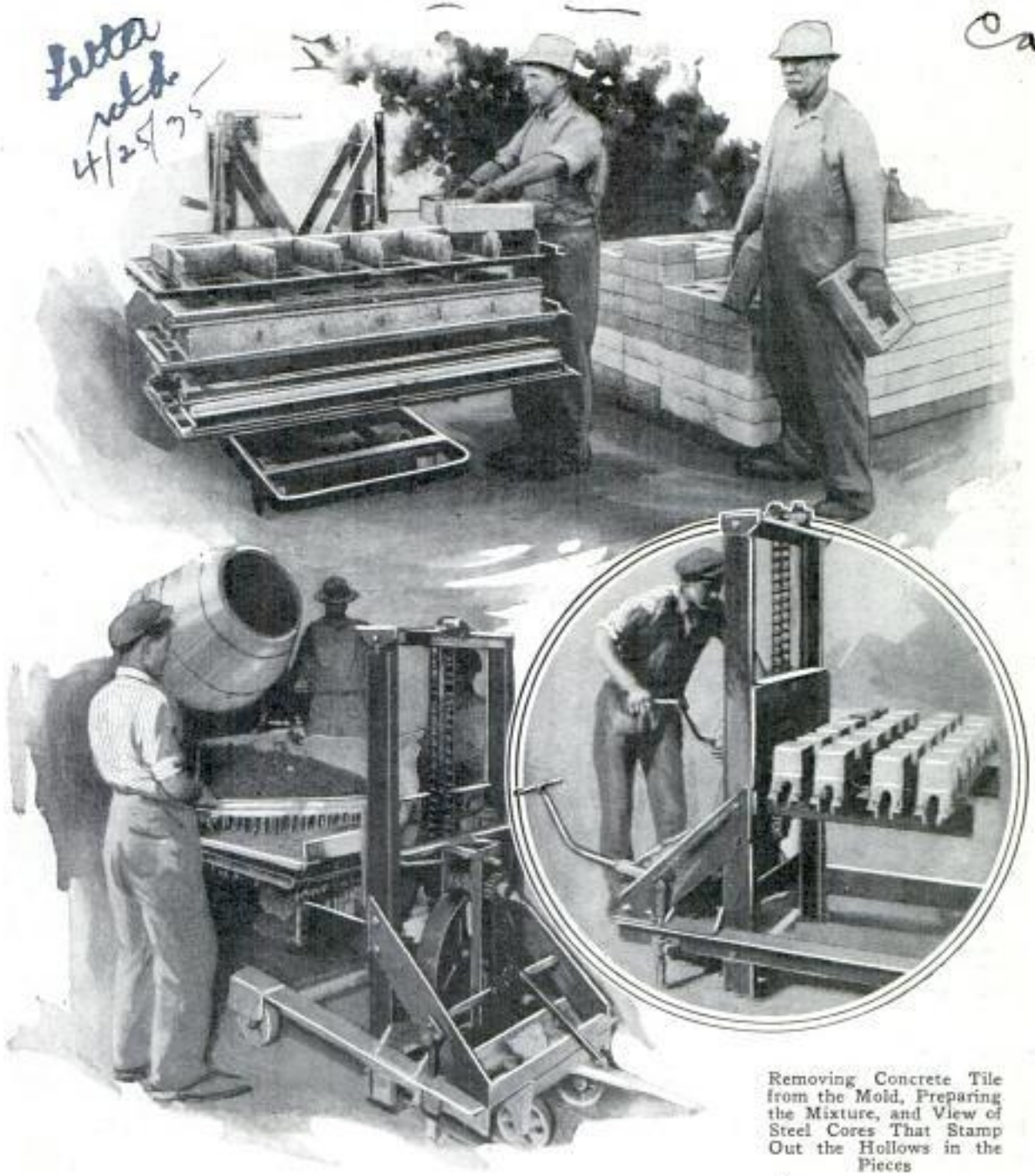
3380 Superstile Machinery Corp
Huntington Park, Los Angeles Calif

STEAM-CURED CONCRETE TILES SPEED BUILDING

Letter rec'd. 4/25/35



Removing Concrete Tile from the Mold, Preparing the Mixture, and View of Steel Cores That Stamp Out the Hollows in the Pieces

Concrete poured into steel molds and cured in steam chambers under pressure, is used to make fire and moisture-proof hollow tiles which are said to have many advantages. It is claimed that while blocks made by this process will carry loads of from sixty to eighty tons, they are so light that bricklayers can place them with one hand. As one six-inch tile is the equivalent of three and one-half bricks, this results in a saving of labor and speeds up building operations. Recent tests made to demonstrate the insulating qualities of these steam-cured units, are reported to have shown a temperature of 1,800 degrees Fahrenheit inside the wall while the outside remained cool to the touch. The manufacturing equipment includes a concrete mixer with tamper and vibrator, steel molds and cores, a lifting truck, stacking machine, sprayer pump, and a low-pressure boiler to feed the steam tunnels in which the final curing takes place.

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Call-Hunting in the Northern Wilds

Big-Game Seekers Find Canadian Forests a Near-at-Hand Paradise without Journeying to Distant Lands

By EARLE W. GAGE

Asheville, N.C.

WHILE the moose population of the United States has dwindled down to about 7,000 head, more than 10,000 head are killed each year in Canada without any sign of extinction of the monarch of the forest. It is the same with other choice animals.

No hunter who has traversed the trails of the north can withstand the lure. It gets into the blood and each year it draws him back.

There is a tang in the air. The trail gleams white in the rays of the moon; the spruce are touched with frost. Suddenly, through the solitude there booms a deep, somewhat harsh call; then from a distance a full-throated reply. It is the voice of the "Lord of the Wilderness"—the bull moose. This call forms the base of the most thrilling, though perhaps not the most sportsmanlike method of hunting. To imitate it and lure the forest monarch within range of their guns, Indian and half-breed guides twist a strip of birch bark into megaphone form, and send through it the quaint cry, "Ou-u-u-orak! Ou-u-u-erak! Ugh! Ugh!" During the early season, this form of hunting may be followed in such moose reserves as Maine, Nova Scotia, New Brunswick, Quebec and northern Ontario. If the hunter wishes to do call-hunting, he should start for the scene of action not later than the middle of September. The earlier he starts the better his chance. He need only bring his wearing apparel and rifle. Supplies and provisions can be obtained at the local stores.

Moose with Horns Seventy-Seven Inches between Tips

During September and early October, moose in northern districts are hunted by watching or calling by the shores of ponds, deadwaters and lakes. The success of the hunt depends largely on the weather; if the fall is very dry the game will usually come into the water, as many as a dozen giants being counted at one time. With muzzle straight out in front, and a huge pair of antlers held well back over his shoulders, the bull moose, when in water or on a sandy bar, offers a splendid target, and if the hunter can hold steady, two or three shots should win a trophy to be proud of. With the early fall rains, the herds move back to higher land, on the ridges, where they must be "still-hunted," despite leaves and heavy foliage. Many amateur woodsmen esteem the caribou more highly as a game animal than the moose. The virgin wilderness of the north is a caribou paradise. Great game reserves, such as that in Northcumberland county, N. B., which is 400 square miles in area, provide a safe breeding place for all kinds of game, particularly caribou. Thousands roam the forests today where twenty-five years

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Bringing Out a Trophy from the Big Game Country; Indian Calling Moose

Black Bear; Below, Grizzly Bagged with Aid of Young Half-Breed Fox Hounds

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ago they could be counted in hundreds. Caribou may be stalked with ease on a windy day, but cannot be run down, no matter what the depth of snow, and so they escape in the closed season the butchery that too often befalls the moose and deer. Smaller than the moose, similar to the reindeer, the caribou usually is found in herds, which roam from place to place in search of food. This makes it possible to kill from six to ten fine specimens from one stalking expedition.

Hunting big game in the primeval forest is, at best, strenuous sport. Thousands of men who, at some trouble and sacrifice, have temporarily set aside their business cares for a much-needed vacation, have found that they were "too soft" for the life of the trail. It is not necessary to organize tedious expeditions to distant regions, as with the South African big-game hunter. Probably there has never existed before and elsewhere the combination of virgin hunting grounds and simple means of access that northern Canada offers.

During the early season, by camping out, it is possible to cover a large territory. It is a delightful experience, when one is able to do canoeing, to camp out.

Under the direction of experienced guides and trained woodsmen, the modern big-game hunter, at comparatively small expense, may establish his headquarters in the heart of the wilderness, from which parties set forth. Some of the more elaborate of these outfits, in equipment and conveniences, leave little to be desired in comparison with modern hotels.

These guides are versatile men. They paddle and cook, perform all other laborious tasks, and lure the monarch of the forest from his haunts. All that is expected of the hunter, if he really wants the animal, is to shoot straight. It is hunting de luxe, the chase concentrated into a minimum of time with a maximum of comfort, which is what the average man, who is a hunter for only a few days each year, desires.

New Brunswick has a unique organization, known as "the moose riders of the Nepisiguit." To qualify for membership, a sportsman must find a moose swimming in a lake, crowd it near shore by fast paddling and then jump on the animal's back, remaining long enough on his strange mount to be photographed. A trick worth trying!

Back from Moose Hunt; to Qualify in One Sportsman's Club, Hunter Must Mount Live Animal Swimming and Have Picture Taken

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LARGEST POWER PLANT COSTS FIFTY MILLION DOLLARS

With 100,000 more kilowatts of power capability than projected at Muscle Shoals, the world's greatest electrical generating station is being rushed to completion in New York. Three million six-room houses could be lighted by the plant's output of 700,000 kilowatts. All electrical needs of any state in the union, save New York could be supplied by it. At a cost of $50,000,000, the structure is being erected with an eye to demands of 1930. Efficiency innovations include steel water tubes for boiler lining, instead of brick. Traveling coal towers will bring 500 tons an hour to the furnaces, direct from ships. Neither fuel nor ashes will ever touch the streets, which will keep 500 trucks out of traffic tangles. Eight hundred thousand gallons of water will be drawn from the river every minute to feed the boilers.

LAND CRABS THAT EAT CROPS HAVE SIX-INCH CLAWS

Huge land crabs that sometimes are more than ten inches broad and have claws over six inches long are causing great damage to crops in southern Florida and proving a problem to state and national agencies. They honeycomb the soil on the borders of drainage ditches and paths with their burrows, from which they venture at night, destroying tender plants and even the roots of fruit trees. In the spring, they migrate in great numbers and boldly pass through gardens and over roads to the sea. They retire to their holes in midsummer and shed their shells. At this time they are considered a delicacy by natives of the West Indies, where they are also found in abundance.

Specimen of Huge Land Crabs That Are Proving Destructive to Crops in Southern Florida

LINCOLN HIGHWAY'S WEST END MARKED BY MONUMENT

To mark the western terminus of the famous Lincoln highway, a statue known as the "Three Shades" has been erected overlooking the Golden Gate, near San Francisco. It stands close to the water's edge and a loop in the road permits automobiles to drive around it and get a close view.

Monument of the "Three Shades" Erected at the Western End of the Lincoln Highway, Overlooking Golden Gate

ARTESIAN WELLS RUN TURBINES TO SUPPLY LIGHT AND POWER

Specially designed turbines are being installed in artesian wells in the south to run dynamos for light and power in an effort to offset the high prices of fuel due in part to the rapidly diminishing forests. The wells, sunk to depths varying from 300 to 1,500 feet, have a constant flow and maintain sufficient pressure to run the apparatus. As much as ten horsepower can be developed from a six-inch stream in some localities, it is said. Current is led into storage batteries. Surplus water is used for supplying house mains where possible. The turbines are replacing large overshot water wheels.

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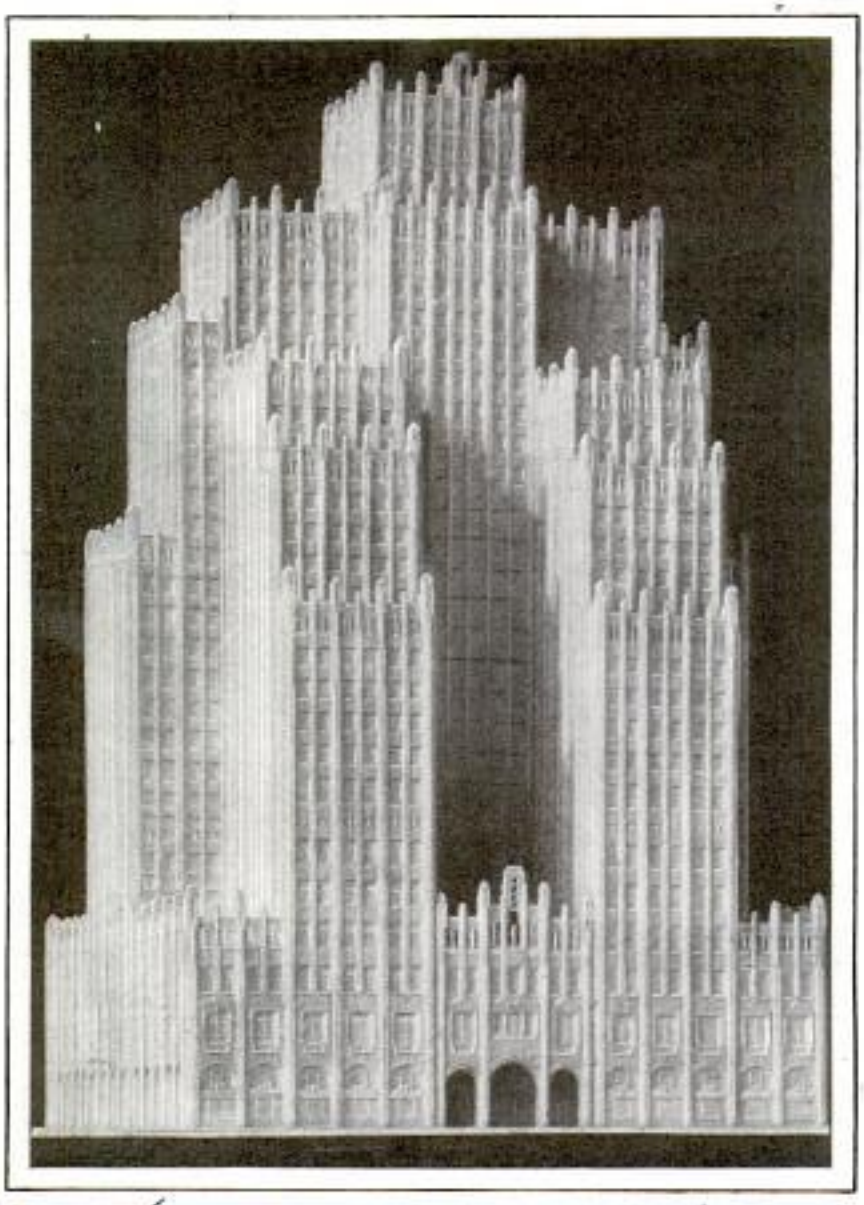

Model of Southwestern Bell Telephone Building for St. Louis That Illustrates Terrace Type of Construction

SKYSCRAPER BUILT IN TERRACES TO COST EIGHT MILLION

Stepped-in skyscraper construction, the style that architects have evolved to solve problems of floor space and lighting in large cities, is exemplified in the Southwestern Bell Telephone company building now being erected in St. Louis, Mo., at a cost of $8,000,000. It occupies an entire square at the base and rises, by a series of symmetrical terraces, thirty-one stories to a height of 368 feet eleven inches from the curb to the parapet. Twenty-six stories will be used for office purposes, two for the distribution of heating pipes, one for elevator equipment and one for a mezzanine promenade just above the ground floor. On the twenty-first story will be a large auditorium with no pillars to obscure the stage. Proportion and effect were studied by the architects as well as the demands of space. The whole building appears as a harmonious mass of graduated towers welded into a single structure.

VOICE-PRODUCING VIBRATOR AIDS THE DEAF

More than half of a number of cases of deafness treated in England are reported to have been definitely improved by the use of an instrument called the "electrophonide" which reproduces the tones of the human voice. The sounds are caused to pass not only through tones and semitones but through all the vibrations between 80 and 3,500, and are transmitted to the ear by means of modified telephone receivers. The object is to enable the patient to hear the human voice with the aid of the apparatus, thus "educating" the ear to the better reception of sounds unassisted. The treatment is not a certain cure, but has been helpful especially in cases where buzzing in the ears was the chief ailment. Three mechanical larynxes form an important part of the instrument.

CYLINDER PARTS LUBRICATED BY OILER ON MANIFOLD

An oiler that can be installed on an automobile engine without changing any part of the motor is said to prevent carbon. Attached to the intake manifold, it sprays a small supply of vaporized oil into the cylinders with each stroke of the pistons, lubricating the entire combustion chamber and keeping

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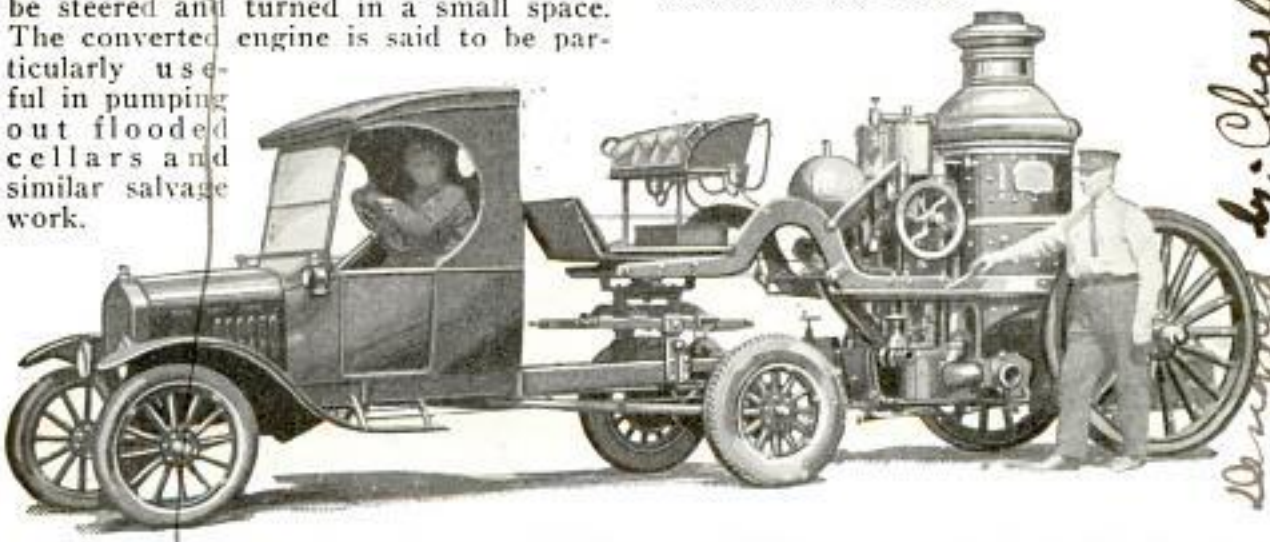
carbon from hardening or crystallizing. By combining it with the gasoline mixture, it is said the lubricant reaches every crevice of the upper part of the motor, insuring smooth, moist working surfaces and increasing mileage from two to five miles for each gallon of fuel. Once put in place, the oiler requires no attention other than occasional filling when the reservoir runs dry, and since it has no working parts to get loose or choked up, it saves cost of repairs.

BIRDS SPOIL RADIO RECEPTION WITH NEST IN FUSE BOX

Trouble chasers carrying earphones with fishpole attachments and amplifiers, recently located the nest of a pair of sparrows as the source of a disturbance which for several weeks broke up radio reception near South Weymouth, Mass. The interference was steady, day and night, and extended over an area of several square miles. It was discovered when a loop receiving set pointed directly at a pole carrying three fuse boxes through which a 5,000-volt current was carried. One of the boxes, when opened, was found to contain a sparrows' nest. The birds had broken off a piece of fuse, causing a break in the circuit. The three overhead wires formed a perfect antenna.

OLD FIRE ENGINES MOTORIZED BY ADDING AUTO CHASSIS

Old horse-drawn fire engines have been successfully motorized at St. Paul, Minn., by removing the front wheels and mounting the forward end on the rear of an automobile chassis. The chassis is mounted on a pivot which permits the outfit to be steered and turned in a small space. The converted engine is said to be particularly useful in pumping out flooded cellars and similar salvage work.



Galloping Horses Replaced by the Auto in Answering Fires; Old Engine as It Appears Attached to Gasoline Car with Special Chassis

SANDWICH TOASTER IN CABINET USES LAMP SOCKET

Sandwiches are toasted in plain view of the customers in a cabinet arrangement that occupies counter or floor space only three feet long by eighteen inches wide and obtains electric current through any convenient lamp socket. The toasting is performed on a grill that slides out at one end of the cabinet and has a tray beneath to catch crumbs. Above the toaster, is a shelf for display purposes and below are drawers for holding bread or stocks of sandwiches. A cutting board, pans for dressings, a butter bowl and an electric flasher on top of the cabinet are other features of the outfit.

Sandwich-Toaster Cabinet Complete; Grill Slides Out at Right; Below Are Storage Shelves

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Adjusting Battery of Floodlights on Torch and Hand of Statue of Liberty

FREEDOM'S TORCH KEPT BRIGHT BY MASSED FLOODLIGHTS

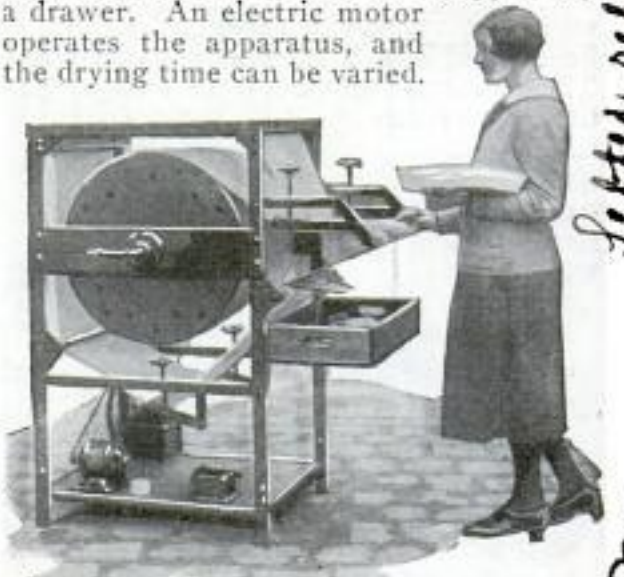
America's famous statue of liberty, the gift of the French nation, standing on Bedloe's island in the harbor of New York, is equipped with a system of 252 massed floodlights illuminating the torch held aloft by the figure. The statue, until recently in charge of the army, has been made a national monument by presidential proclamation. This year the government has appropriated $5,711.46 for its care, of which most will go for lighting.

BLUE IS BEST LIKED COLOR WITH RED SECOND

As a result of several thousand tests, scientists have decided that blue is the world's favorite color. Red is second choice. It was found that as a rule the higher the education, the smaller the number who pick red as their first choice. The preference for red decreases as education increases. The same color preference was found in persons of different ages; young children were much more likely to pick red than those who were older. The first tests were made more than thirty years ago among 4,500 visitors to the Chicago World's Fair. The colors used were white, yellow, red, violet, green, orange and blue. The majority selected blue as their favorite color with red a poor second. More recently, of a group of several hundred Indians the vast majority of the full-bloods picked red as their favorite hue while the half-bloods were about solid for blue with red as second choice. More than 1,000 negroes selected blue, with orange, green, violet and red following.

PHOTO-PRINT DRIER GIVES TWO THOUSAND AN HOUR

A gas-heated rotary print drier has been made which delivers 2,000 dry and flat prints an hour. An endless belt of cloth absorbs the surface moisture of the prints and carries them through rollers and over a hot cylinder covered with fine cloth which distributes the heat evenly over the surface of the drum. When the prints have passed around the cylinder they are dropped into a drawer. An electric motor operates the apparatus, and the drying time can be varied.



Rapid Print Drier in Operation; Moisture Is Removed by Endless Belt and Heated Drum

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2868 Capt. C. Moran, 3825-13th St N.W. Washington, D.C.

Harnessing War Gases for Peace-Times

DISCOVERY by the chemical warfare service of the United States army of a toxic paint for ship bottoms which discourages the attentions of barnacles, and of a similar product for marine piling which repels the attacks of marine borers, has added two more successes to the long list of achievements of the army's youngest branch in peace time.

The discoveries are being patented to protect the government's interests, but will be made available for private use and are expected to save millions of dollars annually through protection of the underwater structure of docks and breakwaters and through elimination of loss of time while ships undergo frequent dry-docking and cleaning.

The two achievements have called attention to what is probably the most active peace-time department in the army, since all its discoveries are inextricably bound up with such great and necessary industries as dye and chemical manufacture and the production of artificial fertilizers. Although only four years old last June, the chemical warfare section has a remarkably long list of discoveries to its credit.

Its existence is due to the fact that foreign governments have so far failed to ratify the treaty negotiated by the United States to abolish gas warfare, and there is no present indication that the nations which participated in framing the treaty ever will formally sign it. The army, in the meantime, decided that until the treaty was actually in force, the United States would have to follow the example of other nations and maintain a chemical branch.

Starting with the imperfect gas equipment created on the spur of necessity during the World War, the army chemists have gone far ahead of anything which foreign armies are known to have achieved. Among their inventions is a gas mask with a canister containing protection against every gas which has been used in warfare, as well as against every known gas which may conceivably be used.

The same mask, however, has been converted to peace-time use in mines and industries and for firemen. Its success is due to the discovery by an army officer attached to the chemical section of "hopcalite," which affords protection against carbon monoxide, the odorless and tasteless gas which forms the deadly part of illuminating gas and which also is found in mines and some industries.

The army chemists have likewise discovered a material which affords protection against ammonia fumes, and by combining this substance with hopcalite and materials which afford protection against other gases, a complete all-around mask has been produced for industrial use. Some of the new gas masks are far removed from the earlier types used in the war. A special mask for navy use is so designed that the wearer can operate all the controls and communicating devices of a battleship without exposing himself to danger. He can talk through voice tubes and telephones, use binoculars, range-finding devices and other optical instruments. A special type of mask is furnished for submarine crews, with hopcalite in the canister to guard against the

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Top, Army Tank in Action, with the Crew Protected by Steel Plates and Gas Masks from the Deadly Fumes of Bombs Bursting All about Them; Below, a Twenty-Five-Pound Bomb of Flaming Phosphorus Dropped Squarely on the Battleship "Alabama's" Mast

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Top, Left, "Shooting" Ground Squirrels Deep in Their Burrow with Chloroarsenate; Above, Killing Texas Cactus Plants by Jabbing Them with Hollow Needle Which Carries Stream of Poison Gas

Wooden Framework, Covered with Canvas, Forms Gas "Room" for Cow While Products of Chemists' Skill Rid Her of Ticks; Right, Deadly Chlorocyanic Gas May Safely Be "Shot" by Hand from New-Style Cartridge Which Mixes the Elements Dry

re Chemical Warfare
Agriculture, Bull. 284
Washington, D. C.
— American Cyanamid Sales Co. New York
511 W 42nd St.
re further information

Cyanogas. U. Liquid can be used for rodents, insect pests, probably also for weeds - if mixed with water.

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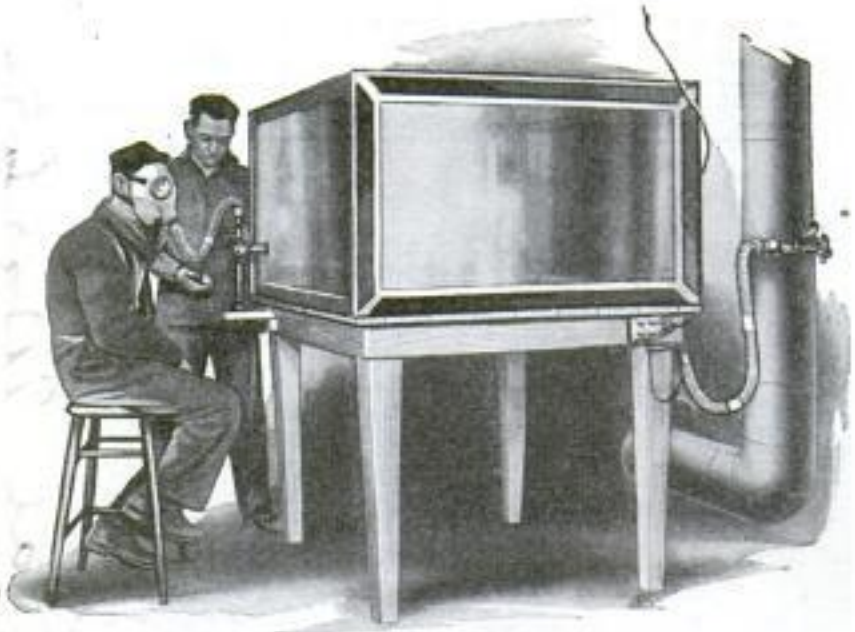


Tear-Gas Effects Are Measured by Inhaling through Gas Mask, the Mixture of Air and Gas in the Glass Chamber

ever-present carbon monoxide left in air which has been repeatedly used.

Another mask has been developed to protect aviators against gas shells and gas clouds. It is so constructed that it is worn as part of the regular helmet, with valves by which air may be drawn in from the outside when gas is not present, or through the canister in time of danger, while an extra valve can be switched to the oxygen supply tank at high altitudes.

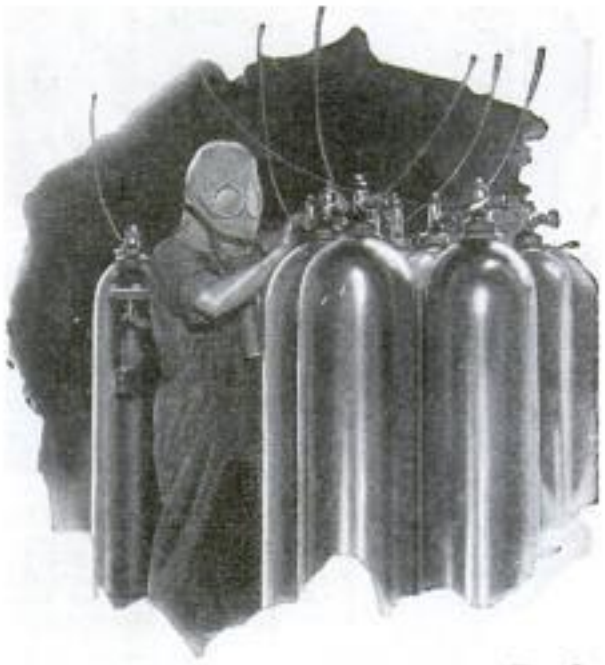
Like the application of the gas mask to peace-time use, nearly every development of the chemical section is available for purposes other than warfare. Experiments have been successfully made in spraying orchards with blight-killing poisons and in attacking the cotton boll weevil from the air. Both, however, were the result of the development of an aerial smoke screen, which could be laid down from speeding planes.

It might be thought that the only thing necessary to spray liquids from an airplane would be a tank from which the material could be poured. Experience showed, however, that the speed of a plane was so great that it atomized the released liquid, leaving it suspended in the air. The difficulty was solved by using compressed air to build up sufficient pressure in the tank so that the liquid was forced backward at a speed equivalent to that at which the plane was moving forward. The result of equalizing the speeds is that the expelled liquid virtually "stands still" in the air, and then falls vertically in long streamers like rain.

The public health service asked the army chemists to find a substitute for hydrocyanic-acid gas for fumigating ships. The gas in use was effective for removing rodents and vermin, but being colorless and tasteless, it gave no warning of its presence and frequently killed stowaways or seamen who ventured into the hold too soon. The army first tried chloracetophenone, the most recently discovered tear gas, and while it was found to give ample warning, it remained so persistent that it caused delay in returning the ship to duty.

Another tear gas, cyanogen chloride, was then mixed with the hydrocyanic gas, and found effective, so that it is now in use. The tear gas, while poisonous, is effective in mixtures of only one-eighth of the dangerous strength, and it persists long enough after the hydrocyanic gas has gone to make the ship safe.

Chlorocyanic-acid and chloroarsenic gas have been made safe for the killing of obnoxious plants, spraying of cattle, and other purposes through combinations which not only make the deadly cyanogen gas visible, but give it a smell. Through a dry process of mixing the gases as needed, equipment is now available which any amateur can use in safety.



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Repairing a Leak in the Chlorine-Tank System Used to Purify Water for New York's 7,000,000 Drinkers

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2868

Nobody Envies the Gas-Mask Tester's Job, for He Determines Whether They Are Good by Trying to Breathe Gas through Them

All-Purpose Mask, Developed by Army Chemists, Is Equally Useful When Throwing a Hand Grenade on the Battlefield, While Testing Toxic Chemicals in the Laboratory, and in Mine or Factory, Since Its Canister Holds Protection against All Known Poison Gases

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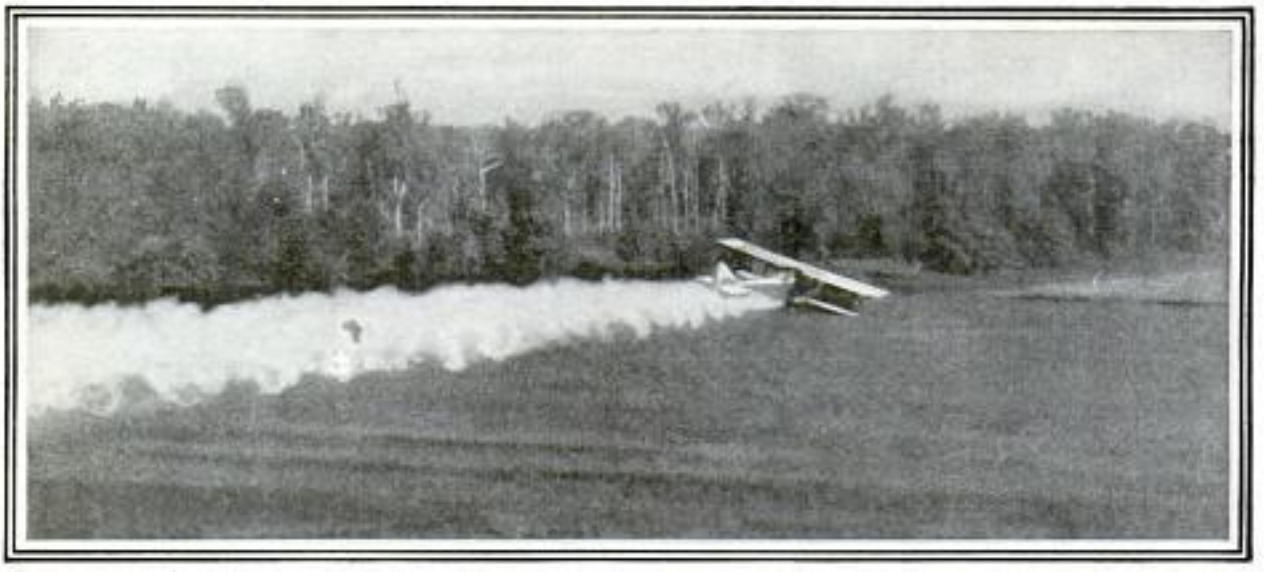

Dusting a Field with Insect-Killing Poison by Spreading It from Low-Flying Airplane; Note the Spiral Effect on the Dust Cloud, Caused by the Propeller Wash

Chlorine reacting on metallic arsenic, under pressure, generates a gas which is being used in Texas to eradicate cattle tick. The gas is sprayed over the cattle in a dense cloud, killing the vermin almost instantly, while the arsenic penetrates the animal's skin and heals the sores. Chlorocyanic generators, packed in portable cases not much larger than a folding-camera case, are being used to kill the prickly pear, a form of cactus. The gas cloud is forced down through a long hollow needle, which is jabbed into the base of the plant. The deadly gas flows through every leaf and within three days the cactus plant is flat on the ground, with every spine dead, so that it cannot grow up again.

Chloroarsenical gases are also being used to change ordinary sulphur wells to give much more valuable waters for medicinal baths, producing either arsenic or iron water as desired by varying the chemicals used. A cartridge containing metallic arsenic and other chemicals is attached to a long tube from a tank of chlorine gas, and then dropped 200 or 300 feet down into the well. The chlorine is then turned on and forced through the arsenic cartridge, turning the metallic arsenic into an incandescent substance which vaporizes and is forced out into the water. The same gas has been used to kill all bacteria and insect larvae in swamps and stagnant water, the cartridge being "shot" beneath the surface, allowing the chemicals to spread through the water.

The tear gases developed by the army have themselves been put to a wide variety of uses, principally in hand grenades for breaking up mobs or driving desperadoes out of buildings; in bank-vault protection devices, and in prisons to break up riots and attempted jail deliveries.

"No human being has been found," says Brig. Gen. Amos Fries, chief of the chemical warfare section, "who will stand up before a heavy concentration of chloracetophenone. The one who feels it strike his eyes will forget everything but the desire to get out of it. He may know perfectly by practice and principle that no injury will result; he may know that within an hour, or less, his eyes will be cleared and no inconvenience suffered. He may know this as the result of dozens of trials and yet the gas affects him just as powerfully after a score of trials as on the first occasion."

Along with its other work, the army has developed the use of chlorine as a means of curing common colds, whooping cough, influenza and other respiratory diseases, both in human beings and animals. Chlorine, the first gas ever used in modern war, when it was introduced by the Germans at Ypres in 1915, has long been used by water departments to kill typhoid and other disease germs in municipal water supplies. Introduced in minute quantities it is very effective, without being dangerous. The army first used it publicly to cure the colds of President Coolidge and a number of congressmen, and then demonstrated its value to animals by halting an epidemic of influenza among the cavalry mounts at Fort Hoyle.

While peace-time applications have been numerous, the army has not neglected the war side of its work. New gas shells, trench mortars, projectors which may be linked up in batteries of scores or hundreds and fired by electricity, and new gases have been developed. Consid-

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2868

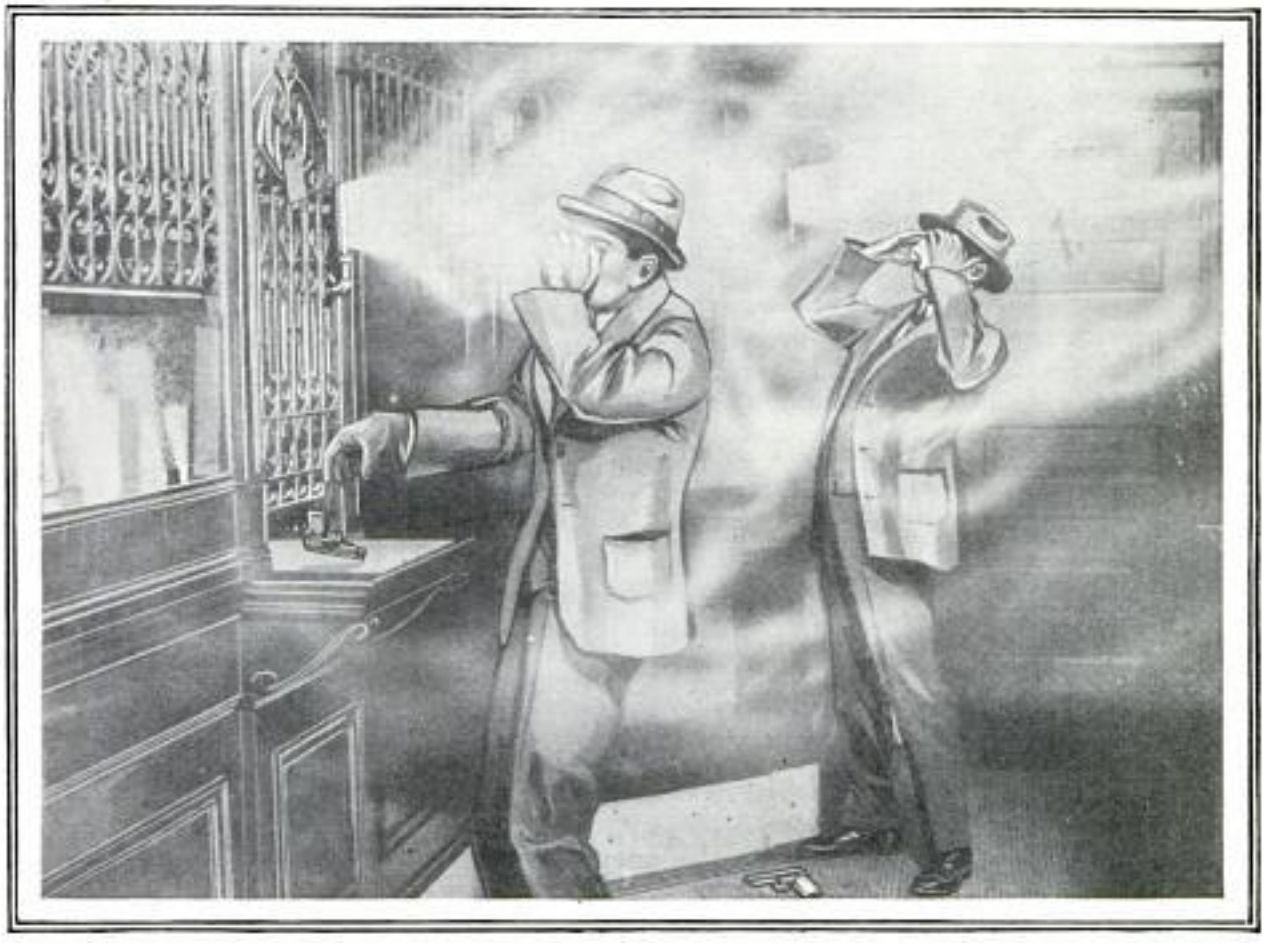
erable attention has been paid to phosphorus hand grenades, aerial bombs and shells. Phosphorus, when released, bursts into flame, and can only be extinguished by immersion in water or oil. Its effect is so terrifying that it was the only thing the German machine gunners, pick of their shock troops, would not stand up against. Used against ships at sea it will drive anti-aircraft gunners to cover and set fire to any exposed inflammable material. It also establishes an impenetrable smoke screen, which is fed for some time by the burning particles.

The development of phosphorus, however, has a peace-time application, too, since the uses of the rock from which it comes are numerous. South Carolina, Florida and Tennessee all have immense beds of phosphates from which come, among other things, fertilizer, acids for industrial uses and an alloy for metallurgical use. The housewife doing her baking with self-rising flour is far removed from war, but a phosphorus product, monocalcium phosphate, makes the flour rise.

With all the development of chemical warfare, mustard gas, which came into general use in the latter part of the war, and the phosphorus shells and bombs, remain the two best war aids, according to General Fries. Other gases are more deadly, but no way has yet been found to liquefy them at any ordinary pressure, or else they are lighter than air, and would rise instead of descending along the ground to attack troops.

"Much has been said of new gases being discovered," General Fries said in his last report to Congress. "Agitators and careless speakers refer to these gases in terms that indicate that they have supernatural powers. That is ridiculously erroneous. It is also very seriously misleading.

"Along with supernatural gases, goes the continual talk of death rays, electrical currents and the like which will destroy all life at great distances. Practically all these ideas are just as foolishly wrong as the supernatural gases. All known rays and powers obey certain definite laws. Here and there advances are made in understanding those laws and directing them; but it is believed proper and safe to say that no real scientist can yet foresee the day when such control of these substances will be possible that life and machinery can be destroyed at anything but short distances."



Bank Bandits Drop Their Guns and Burst into Tears When the Teller Steps on the Button That Releases Clouds of Choking, Blinding Gas Directly into Their Faces

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SCORING BOARD FOR FOOTBALL SHOWS TIME LEFT TO PLAY

Installed where it can be seen by both players and spectators, an automatic scoreboard for football games shows the

Football Scoreboard with Time Dial at Parsons College

downs, yardage that must be gained, which team has the ball and how much time is left to play. A clocklike dial on top of the board, divided into fifteen intervals, has a hand that points to the figures indicating the number of minutes remaining. This indicator is not official, but helps the teams and observers by eliminating much guesswork. A swinging board is turned to show which team has the ball. Painted in the colors of the college and inscribed with a motto, the board is quite attractive.

WORDS YOU USE MOST

About half of the daily conversation of the average person involves the use of only forty-three words, according to British experts who have investigated the matter. The words are: and, be, have, it, of, the, will, you, to, about, all, as, at, but, can, come, day, dear, for, get, go, hear, her, if, in, me, much, not, on, one, say, she, so, that, they, these, this, though, time, we, with, write and your.

ELECTRIC BRAKES ON BUSSES CONQUER STEEP HILLS

Using driving motors as brakes when going downhill, a new type of gas-electric bus has made its appearance in Albany, N. Y., where hilly streets have presented a serious problem in operating heavy coaches. The regenerative braking system is the same as that used by the Chicago, Milwaukee and St. Paul trains on the electrified divisions in the Rockies, where the driving motors are changed into generators, turned by the momentum of the train as it descends a grade, and the magnetic resistance set up in them acts as a brake, handling the heaviest train at a fixed speed without the use of air brakes. The busses are equipped with six-cylinder ninety-horsepower engines, driving 125-volt, 200-ampere generators. The current from the generator operates two electric motors, one geared to each rear wheel. The first of the new busses was driven from the factory at Kent, Ohio, to Albany, and the regenerative braking system handled the 14,100-pound coach over the Allegheny mountains without trouble. Air and hand brakes supplement the electric system.

SPREADER GEARED TO WAGON SAVES TIME AND LABOR

For distributing fertilizer, applying road material or dusting plants with insect-killing chemicals, a rotary spreader, geared to the wagon, saves time and is claimed to do the work more evenly than other implements. It fits into the endgate and is rotated by a chain drive attached to the rear axle. With this spreader the material need be handled but once and it is said to be especially suited to laying calcium chloride on roads as a substitute for oil in keeping down dust.

Using the Spreader to Apply Dust-Laying Chemical Directly from the Wagon Box

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2933 Walter S. Kaye. Chief Identification Section War Department.

TRACING UNCLE SAM'S FAMILY WITH FINGERPRINTS

During the last nineteen years, 19,638 persons have been identified through fingerprint records in the adjutant general's office at Washington where there are approximately 90,500,000 separate impressions on file, made from the 7,500,000 men who have enlisted in the United States army since 1906. As has been the experience elsewhere, the army has found that the system permits practically no error. Included in the government's collection of marks are those from 50,328 Smiths, 40,101 Johnsons, 28,902 Browns and 27,938 Joneses, yet no two are alike. Before this plan of identification was adopted, soldiers were marked with daubs of nitrate of silver or were vaccinated on the left leg. But these systems were abandoned as too costly.

In the Identification Office at the War Department Where Fingerprint Records Are Kept of Millions of Soldiers

3411

WATERPROOFING SILK OR LINEN DOES NOT AFFECT COLOR

Silk, linen, cotton and mixed goods of various weaves, colors and designs are waterproofed by a method which is said not to detract from their natural shade, luster or texture, and permits washing, quick drying and ironing when temperatures not over 240 degrees Fahrenheit are used. Since no rubber is employed, the treated articles are free from its objectionable odor. The substance coats the fabric with a durable film which has been found specially adapted to use in hospitals as it is not affected by various chemicals and impurities, and since garments are left pliable and of natural softness after being treated, it is suitable on sport clothes of various kinds, porch-pillow covers, awnings and like articles exposed to the weather.

Not being made. 1/22/26.

3026

PHONE BRACKET ON COIN BOX SAVES ROOM AND TROUBLE

Added utility is given the telephone coin box and need for a separate stand is eliminated in a bracket that fits the top of the box to hold the instrument. Two spring clamps on the sides grasp the base of the phone and the bottom extends far enough to prevent tipping over. It is quickly adjusted to the box, protects table and keeps the telephone where it can be reached handily while inserting the coin.

W. Olff & Co. 105 W. Monroe, Chicago

Protex well Mfg. Co. 589 E. Illinois, Chicago

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"TOM SAWYER" AND "HUCK FINN" MEET AGAIN IN STATUE

Mark Twain's boy heroes, "Tom Sawyer" and "Huckleberry Finn" are shown

Model of "Tom Sawyer" and "Huckleberry Finn" Statue for Mark Twain's Home

in their favorite meeting place at the foot of "Cardiff Hill" in a statue presented to the city of Hannibal, Mo., where the great American writer lived for many years. The sculptor has presented the figures adventure-bound through the woods as though the boys had stepped from one of the stories. The piece is one of the few similar memorials in which characters from the work of the persons celebrated have been chosen for the subject.

BLADE SHARPENER ON HARROW WHETS WHILE TEAM WORKS

Hooked to the hub of the blade on a disk harrow, a sharpener attachment has been invented that is operated by a handle from the driver's seat and whets the edge as the team or tractor pulls. It consists of a long bar, bent at one end to fit around the disk spool, and a casting having at one end a guide bar and at the other a grinding blade. The guide and sharpener rest on the side opposite to the handle, which is simply swung to one side in order to clamp the attachment to the disk. The grinding blade is easily adjusted to obtain the desired bevel and the device can be used on either the right or left side of the harrow. This saves removing the disks, keeps them always in good working order and saves the farmer time and labor.

BABY-CHICK CLINIC ON TRAIN AIDS POULTRY RAISERS

Ohio state university and the agricultural experiment station co-operated recently in aiding the poultry raiser when a special train was fitted as a baby-chick clinic to teach farmers how to save the newly hatched arrivals from the common ailments that claim an estimated thirty per cent of all produced each year in that state. The equipment included an operating table with all necessary accessories and exhibits showing the results of improper and proper feeding, the effects of various diseases, and how they may be identified. Wherever the train stopped, crowds of poultry raisers gathered and were instructed by those in charge of the special. One of the displays featured the value of sunlight to young chicks as contrasted with the weakening influence of shaded brooding places. But where sunlight cannot be enjoyed, it was shown that a mash containing cod-liver oil might produce almost the same results.

OIL TIMER REMINDS AUTOIST TO CHANGE LUBRICANT

Risk of burning out automobile bearings and injuring the engine through failure to drain off and change the oil at proper intervals is greatly reduced by a timer that marks the limit of mileage which can be safely traveled with each supply. The register can be set in accordance with speedometer readings, and is installed on the instrument board, where the driver cannot fail to see it. Once adjusted, the instrument can be locked to prevent tampering or movement of its figures by vibration. When more than one person operates the same car, the device aids in keeping an accurate check on the life of the lubricant, eliminating guesswork and acting as a constant reminder.

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3364. Cont. Ithac Vincent Wilcox, Takoma Park, Washington, D.C.

STEAM DRAWN FROM WELLS TO DRIVE DYNAMOS

Scene in the Alexander Valley, Calif., a Natural-Steam Power Plant Which Is Being Tapped by Borings and Harnessed to Develop Electricity for Commercial Purposes

In the Alexander valley of California steam wells are being drilled and the pressure from them will be used in the development of electric power. Two shafts have already been completed to a depth of over 370 feet, and a third is being sunk with machinery driven by steam taken from the first. The outlet is guarded by a safety valve, and when this opens, the roar of escaping steam may be heard for several miles. It is estimated that the two finished borings will produce 1,500 kilowatts and that a battery of dynamos driven from additional wells will make a power plant of very large capacity.

3410

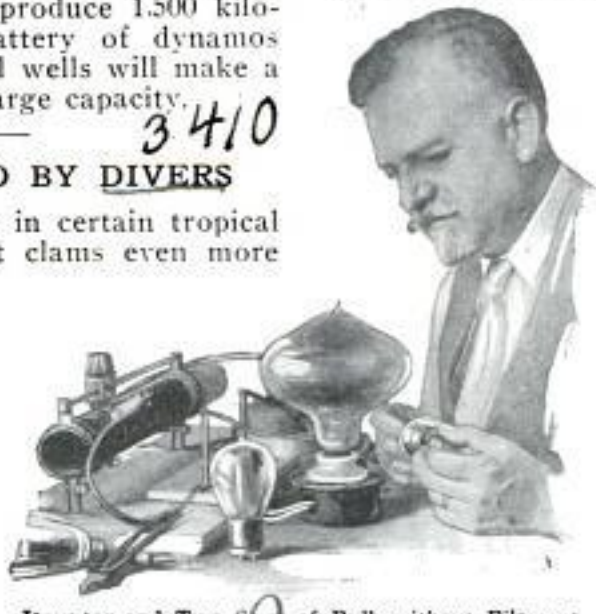
CLAMS FEARED BY DIVERS

Sea divers, working in certain tropical waters, fear the giant clams even more than the sharks, according to reports. The monstrous bivalves lie half open, and should the unwary diver step into them, the shells snap shut, holding the prisoner sometimes until death. While sharks are dangerous, they do not always attack. Another obstacle that the deep-sea diver encounters is the giant sponges. They grow to great heights, making the bottom of the ocean harder to walk through than dense underbrush.

3316

LIGHT BULB HAS NO FILAMENT AND SAVES ELECTRICITY

Saving of fifty per cent in current consumption is one of the features claimed by the inventor for an electric-light bulb that has no filament. Two fine, stiff wires, unconnected, are used instead. The lights have been made in a 500-watt size for street-lighting and a smaller one for house purposes. It is said that the bulbs cost no more than the ordinary ones to manufacture and that they are more durable.



Inventor and Two Sizes of Bulb without Filament

¶ Alaska gives more tin that all the rest of the United States.

Conrad Schickerling Newark, N.J.

New York Home News 6/10/25

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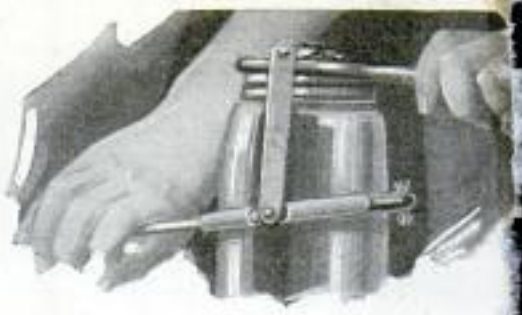
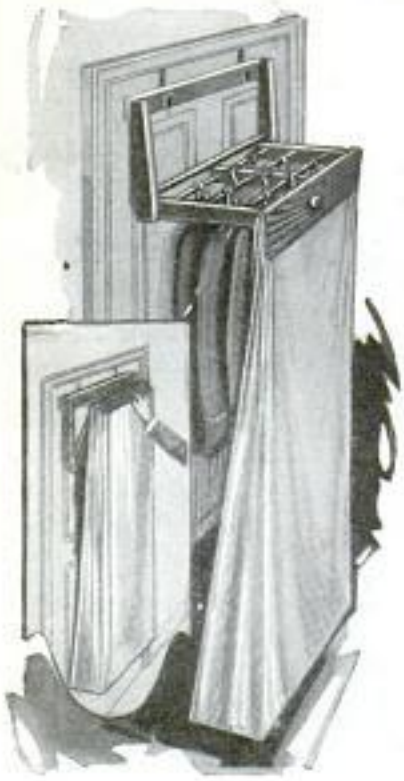
Time and Money-Saving Too

Whipping Cream Is Done without Splashing in Beater Above, That Can Also Be Adjusted for Mixing Eggs, Squeezing Fruit or Sharpening Knives on Emery Wheel Attachment

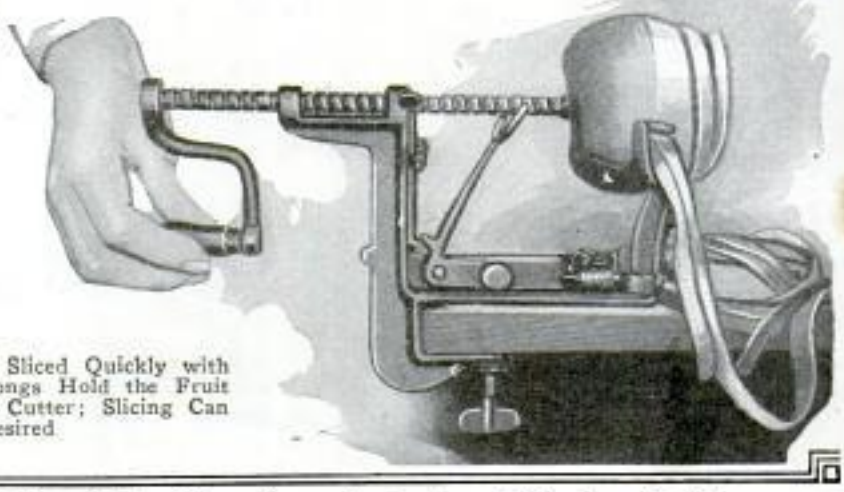


Wrench and Holder Combined Saves Burning Hands When Canning Fruit; Rubber Pads Protect Glass

Curved Aluminum Pan Scraper Has Three Holes for Inserting Fingers; Right, a Curtain-Rod Bracket That Prevents Bar Falling Out and Requires No Taps



Left, Folding Wardrobe Hooks on Door and Has Dust Screen to Protect Clothing; Right, a Griddle Made of Aluminum, Copper and Galvanized Steel for Better Heat Diffusion



Apples Are Pared, Cored and Sliced Quickly with Crank and Ratchet Knife; Prongs Hold the Fruit While It Is Revolved Past the Cutter; Slicing Can Be Omitted if Desired

Anyone wishing further information on devices described in the editorial pages can

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for Woman's Workshop in Home

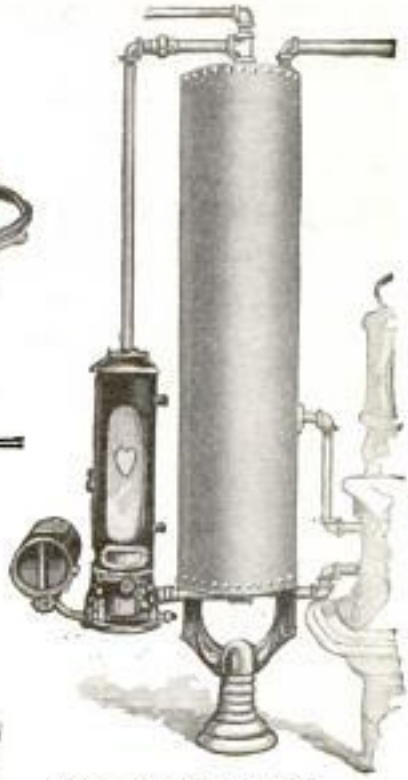
Many Housewives Have Become Radio Experts These Days and Here Is a Hand Tool for Quickly and Neatly Stripping the Insulation from Wire; Below, Egg Separator Cup with a Slot through Which the White Runs Off

Cookies or Biscuits Are Baked without Greasing This Sheet Aluminum Pan, Which Has a Strong, Riveted Handle and Rounded Corners to Make Cleaning Easy

Fly-Proof Spring Lid for Milk Jug Has Strainer for Pouring

Electric Comb That Smooths and Dries Your Hair in One Operation

Liquids Are Heated Quickly in Small Quantities in Electric Cup at Left, Planned Especially for Hospitals and Nurseries



Water Heater for Country Homes Burns Kerosene, Gives Advantages of City Plumbing and Is Simple and Safe

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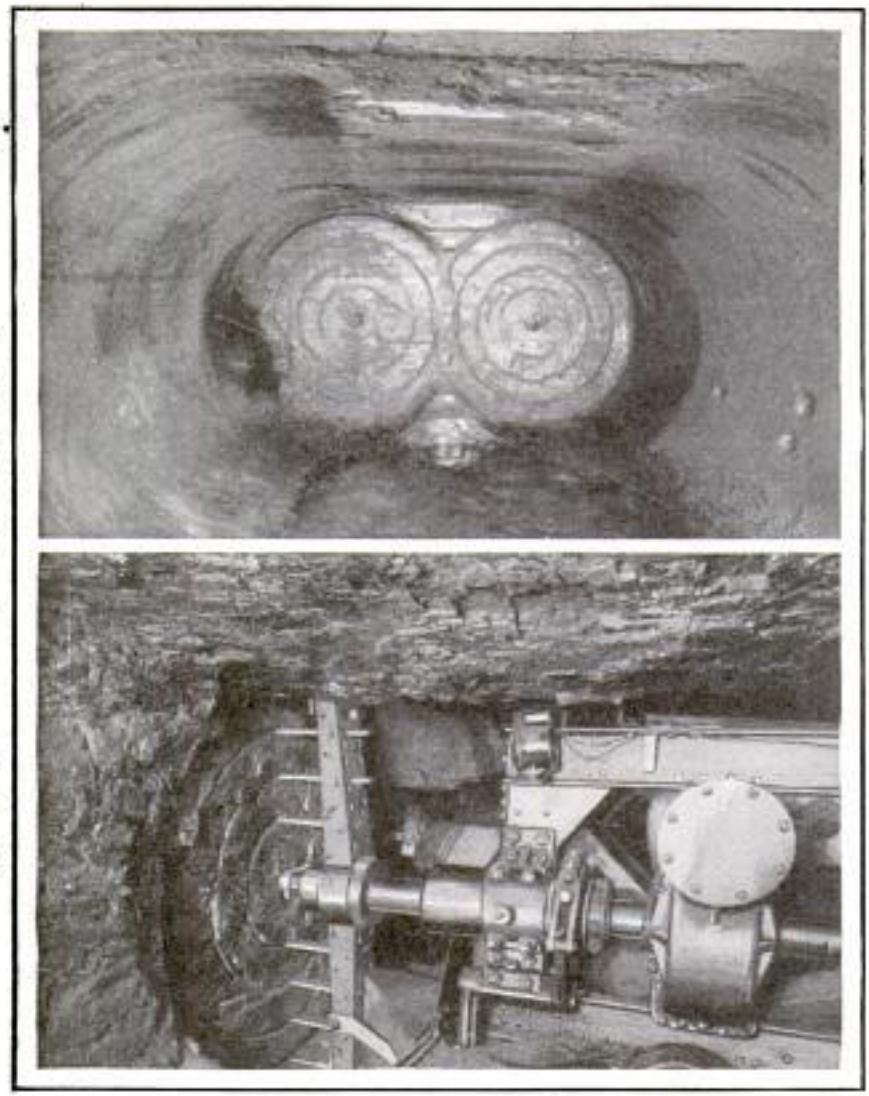


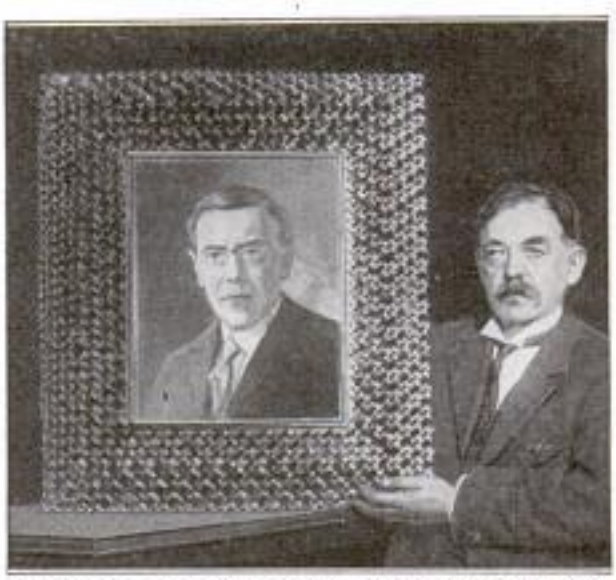
Appearance of Ledge After Machine Has Bored into It, and Revolving Cutter at Work, Grinding Channels into Coal

MECHANICAL MINER DIGS COAL AND LOADS IT INTO CARS

Coal is cut from the seam and loaded into cars without the use of explosives and at a considerable saving in time and labor with an electrically operated mining implement mounted on wheels that carry it forward as the work progresses. The coal is removed with two heavy steel cutter bars or arms that revolve in slightly overlapping circles and have adjustable steel teeth that bite into the material. When the main shafts turn, the cutters grind circular channels into the coal which is next broken off by means of a wedging roller that pries it loose until it falls in front of the machine back of the bars. The segments left between the circles are removed above and below by a cutter chain. The coal is swept upon a conveyor and delivered to the cars behind. The apparatus is advanced or reversed by means of a hydraulic jack which also keeps it in alinement. Not more than three men are needed to operate the equipment, coal has been mined with it at a power cost of only two and one-half cents a ton, and the outfit requires little attention except to sharpen the cutters from time to time. In this respect it is said the machine has mined 130 tons of coal without any necessity for sharpening or renewing the cutters either in the chain or in the cutter bars.

WILSON PORTRAIT IN CARVED FRAME OF MANY WOODS

Carved from 1,964 pieces of wood, a panel made by Emiliano Terrazas, of Los Angeles, has been set with the portrait of Woodrow Wilson, as a memorial. Three months were consumed by the artist in cutting out the numerous bits of material that form the frame. Appearing to be knit together in a lacelike pattern, the delicate sections are firmly held in place. Ordinary handling, it is claimed, cannot dislodge the pieces.



Woodworker and Picture Frame He Carved and Dedicated to Memorial Portrait of Woodrow Wilson

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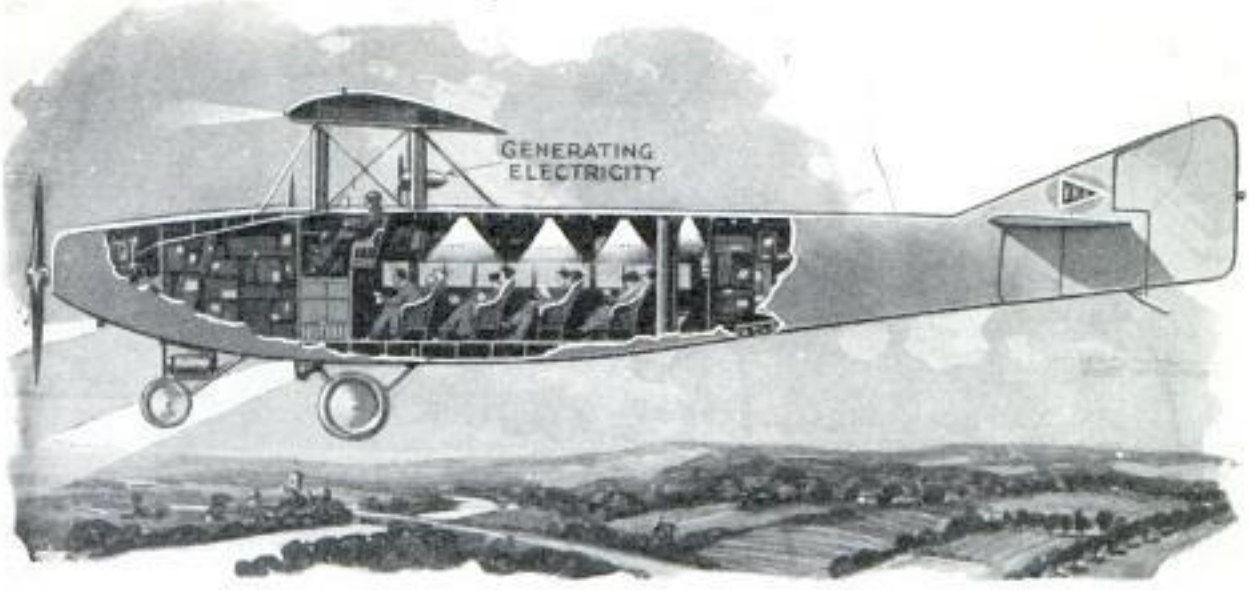
LATEST FRENCH AIR LINERS TO HAVE FOUR MOTORS



Drawing of French Airplane, with Interior Exposed to Show Passenger Compartment, Baggage Space and Pilot's Position; besides the Forward Motor, the Craft Has Two Others at the Sides

Airplanes equipped with three and four engines and capable of carrying eight or more persons and their baggage have been adopted in France to meet the demand for greater safety and comfort. These huge liners of the skies are peculiar to the French companies, no other country, as yet, having developed them to any extent. A chief advantage of the additional motor equipment is that it reduces to a minimum the necessity of forced landings. The demands of night flying and of the increasing freight traffic are also better served with the larger planes. One company is installing a number of four-engined ships and another has added three more three-engined planes to its fleet of ten already in operation. Many of the planes have one 400-horsepower motor in front and one 260-horsepower engine on each side.

SEEDS SHOT FROM PLANTS

Nature's effort to continue its species is shown by many garden plants which throw off their ripened seeds with the force of a bullet driven by a small charge of gunpowder. In such cases the pods are held in a state of tension. As the growth continues the fiber becomes taut until, when the capsule is fully developed, it opens suddenly and shoots out the contents. The common wistaria has a seed resembling a pistol ball in size and shape and it can hurl it to a distance of fifty feet. The wild geranium and the gorse are also among the shooting plants. But the most striking instance is that of a palm growing in Ceylon, which hurls a heavy, pointed kernel with such force as to cause serious injury to passers-by.

COIL SPRING ON TRACTOR SEAT EASES DRIVER'S TASK

To ease the jolts on the driver as the tractor moves over rough ground, an auxiliary coil spring has been found effective and can be attached to other implements as well. It is inclosed in a cast-iron frame that is bolted directly to the vehicle and also holds the single spring rest on the usual type of seat. It absorbs shocks before they reach the main support.

Tractor Seat with Spring at Base Which Is Connected to Frame to Relieve Jars

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3054

Finding the Joys and Hazards of Alpine Climbing Here in America on the Rugged Sides of the Famous Nisqually Glacier in Mt. Rainier National Park

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3054

Thrills of Mountain Climbing Lure Crowds to Peaks in National Parks

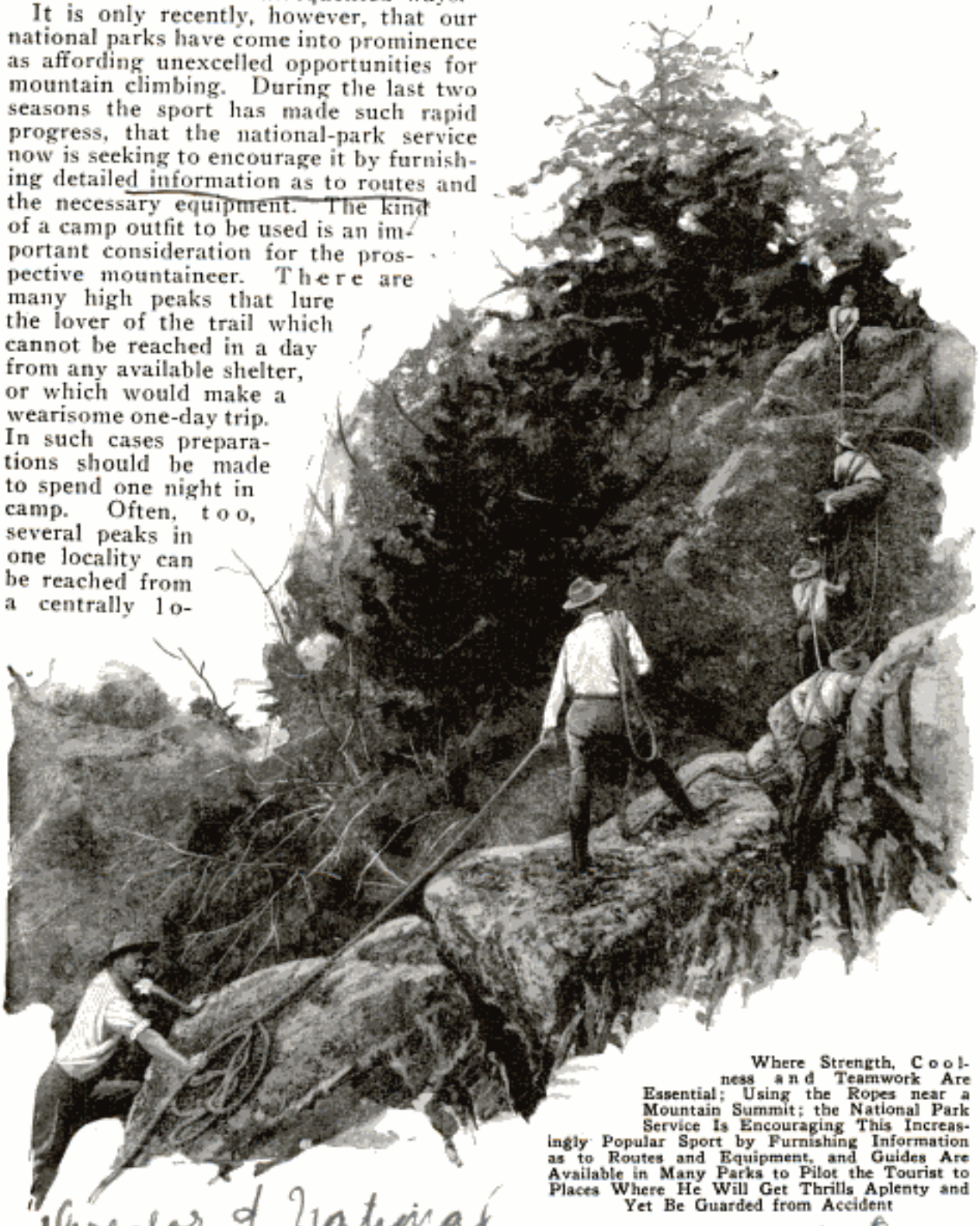
By ROBERT H. MOULTON

Board of Trade - Chicago

MOUNTAIN climbing is by no means a new form of recreation. Switzerland and other rugged areas annually attract thousands of tourists and certain localities of our own country are visited each year by those whose love of outdoor life leads them into unfrequented ways.

It is only recently, however, that our national parks have come into prominence as affording unexcelled opportunities for mountain climbing. During the last two seasons the sport has made such rapid progress, that the national-park service now is seeking to encourage it by furnishing detailed information as to routes and the necessary equipment. The kind of a camp outfit to be used is an important consideration for the prospective mountaineer. There are many high peaks that lure the lover of the trail which cannot be reached in a day from any available shelter, or which would make a wearisome one-day trip. In such cases preparations should be made to spend one night in camp. Often, too, several peaks in one locality can be reached from a centrally located camp, and thus tiresome trips back to hotel headquarters each night are obviated.

Nights in the high mountains are usually very cold, and climbers expecting to camp out overnight should take along



Where Strength, Coolness and Teamwork Are Essential; Using the Ropes near a Mountain Summit; the National Park Service Is Encouraging This Increasingly Popular Sport by Furnishing Information as to Routes and Equipment, and Guides Are Available in Many Parks to Pilot the Tourist to Places Where He Will Get Thrills Aplenty and Yet Be Guarded from Accident

Director of National Park Service Washington, D.C.

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3054

sleeping bags. If a pack horse is used, one of the greatest discomforts of camping, the carrying of heavy packs, is done away with, and more elaborate equipment may be carried. Few cooking utensils are necessary.

For a summer trip into the high mountains one should wear clothing that would be used in October at lower elevations. The climb makes one warm, but the cold wind of the summit quickly chills the climber. It is best to carry the extra clothing on the way up and put it on when the summit is reached. On a trip of more than one day it is advisable to have a change of clothing.

A suit of corduroy, or other strong material, that will keep out the wind or a light rain usually is needed. On a one-day trip in midsummer a suit of khaki may be worn instead of the heavier suit, provided the weather is favorable. The lightest clothing often feels excessively heavy and warm during the climb, but even the warmest may be insufficient on the top. A sweater is always useful. Knickerbockers are ideal for mountain climbing, and flannel shirts are preferable to those of lighter material.

Heavy boots or shoes with leggings, waterproofed and well broken in, should be worn. High boots are preferable. Hobnails increase the durability of shoes and add to safety. A good plan is to have an extra sole put on the boots as soon as they are broken and then add hobnails.

It is advisable to wear two pairs of heavy socks, the outer pair at least being of heavy wool. Soaping the inside of the sock, or using a liberal amount of talcum powder, will tend to prevent chafing or blistering. Gloves will be needed, both for warmth and to protect the hands from being scratched. A small pack sack with shoulder straps does not inconvenience one appreciably and the weight, if less than ten pounds, is scarcely felt. A good pair of field glasses adds considerably to the enjoyment of the view from the top of a mountain and a small lightweight compass, although not often needed, should always be carried. A compass in which the needle can be lifted from the pivot should be selected, to prevent damaging the delicate pivot.

Finally, a piece of candle should always be on hand because the trip may be prolonged after dark, and some member should carry a lightweight rope, from ten to twenty feet long, for difficult scrambles.

Courtesy Dr. C. O. Schneider

Climbers Who Plan to Stay Out Overnight Are Advised to Carry Sleeping Bags Which Are Easier than Tents to Transport and Afford Plenty of Warmth

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MIND KEENEST AT EIGHT A. M. TESTS WITH STUDENTS SHOW

Tests performed on 112 college students by Dr. Donald Laird of Colgate university, indicate that the average mind does its best work at eight o'clock in the morning and its poorest at four o'clock in the afternoon. Wednesday is the best day of the week for keen mental accomplishment, and Saturday the worst. Nine different tests were devised, including problems in addition and subtraction, memory exercises and a psychological question, such as, "What is wrong with this room?" The students had been given previous examinations which showed that their intelligence was about equal, and were divided into squads of sixteen each. For six weeks they were put through the trials at eight and ten o'clock in the morning, one and four o'clock in the afternoon and eight, nine and ten p.m. So that they would not make special efforts on particular days and thus destroy the value of the tests, they were kept in the dark as to the real purpose of the experiments. In all, 4,704 test blanks were scored, 17,000 numbers added, 20,000 squared and 53,000 subtracted in compiling the results. Wednesday stood first in five of the nine trials, with Tuesday second.

HOLLAND LOSING WINDMILLS

Because of the increasing cheapness and economy of electric motors, windmills in Holland are said to be disappearing slowly. Few new ones are being built and little is being spent on repairs for the old ones. A mill that costs $10,000 will develop but eleven and one-half horsepower and the wind blows with working strength for an average of only 1,440 hours a year, so that the motors, in view of their constant service and reliability, are proving far more economical than the mills.

MATTRESS IS USED AS A BOAT IN WATERPROOF TEST

To demonstrate that a mattress now on the market is waterproof, one of the factory representatives mounted a small gasoline motor on one end of the pad and rode for several hours on a river, using the mattress as a boat. Later the improvised craft made a successful voyage from Keokuk, Iowa, to St. Louis, Mo. A fiber filling is employed as stuffing and its water-resisting qualities give it exceptional sanitary advantages over absorbent mattresses, the manufacturers declare.

Starting River Voyage on Mattress as Boat to Demonstrate Waterproof Qualities of Fabric

3280.

TOOTHBRUSH RUN BY MOTOR HAS DETACHABLE HANDLE

Teeth are cleansed efficiently and the gums given a healthful massage with a rotating toothbrush operated by a motor supplied with current from the house-lighting circuit. A dustproof receptacle, fitting over the mouth protector, provides a sanitary case for the bristles when they are not in use. Speed of the instrument is controlled automatically by pressure on the brush which strokes the upper teeth in a downward direction and the lower ones upward, the motion recommended by dentists for the best results. The appliance weighs less than eight ounces.

Motor Toothbrush and Socket Plug; Bristles Revolve in Detachable Handle at Different Speeds

New York Home News
6/16/25
dw. Jno. E. Henderson
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Los Angeles Calif.
New York Waterproofing Co Boston. summary 1 of 1
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Liquid-Air Vaporizer in Use for Treating Skin Infected with Poison Ivy

SKIN TREATED WITH LIQUID AIR TO CURE POISONING

A cure for skin irritations caused by poison ivy, poison oak and eczema is reported to have been discovered in liquid air by a technical expert of the University of California, who also has devised a safe and simple instrument for applying the remedy. In its natural state, liquid air is dangerous to handle as it inflicts painful burns, but this obstacle has been overcome in a vacuum bottle arrangement that allows only a vapor to reach the skin. Besides the liquid air, it contains a heating element supplied with electric current from a light socket. The warmth causes the air to turn to vapor which passes through a nozzle, at a pressure of five to ten pounds, upon the surface to be treated. A trigger automatically cuts off the heat when the apparatus is not in use, and also controls the vapor blast as desired. The discovery was made by chance, when the inventor, seeking relief for poisoning which he had suffered, dipped a wad of cotton in liquid air and rolled it over his infected arm. A path of frost was left showing where the skin was superficially frozen. The irritation stopped and a second application removed the blisters. Then the vaporizer was developed to make application of the remedy free from danger.

TREES PLANTED WITH CANNON ADORN STEEP CLIFFS

Shrubbery and trees now growing on the rocky crags known as Craigybarns, on the estate of the duke of Atholl, near Dunkeld, Scotland, were grown from seeds shot into the crevices from cannon. The owners desiring to relieve the barren appearance of the cliffs, which are too steep to be scaled by man, caused two saluting guns to be used for the unusual sowing. Tin canisters were made and filled with seeds of suitable plants. These odd projectiles were fired against the rocks, and as they burst the contents were scattered in all directions. Some of the seeds took root in the cracks and a rich plant growth is the result of this clever plan.

ELECTRIC MAP MADE BY BOYS AIDS GEOGRAPHY TEACHER

Eighth-grade manual-training students in a Cincinnati school devised an electric-lighted map of South America to aid their teacher in lessons on that country and to promote greater interest in geography. Bulbs were concealed behind the map and lighted by a set of switches in front. Each lamp was located at a spot behind the map corresponding to a section in the country that yields an important product so that by throwing one or more switches, the locations under discussion could be illuminated. The map can be carried around as a picture.

Map with Two Areas Lighted by Means of Tiny Switchboard Control at Bottom

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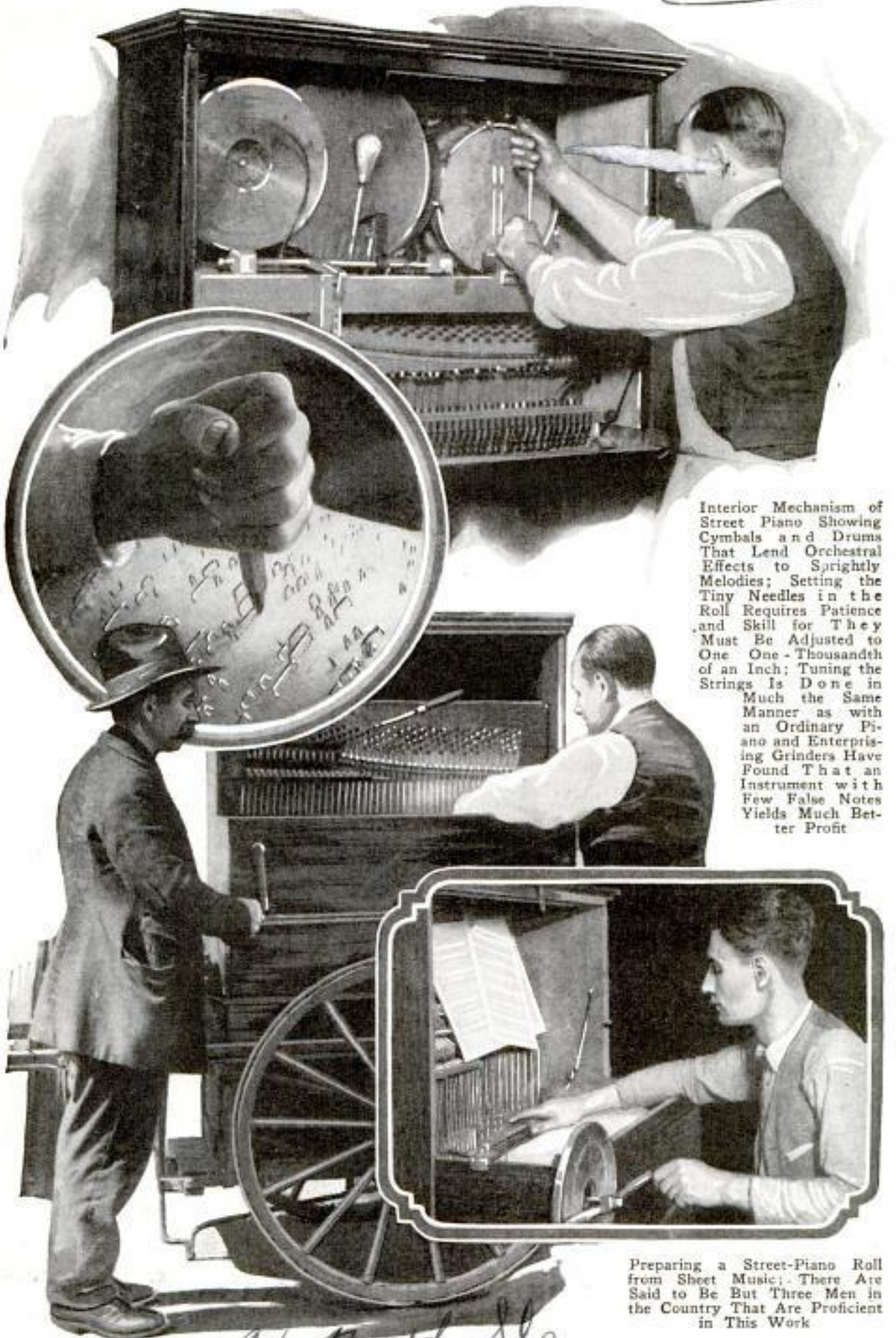
How Tunes Are Put into the Hurdy-Gurdy



Interior Mechanism of Street Piano Showing Cymbals and Drums That Lend Orchestral Effects to Sprightly Melodies; Setting the Tiny Needles in the Roll Requires Patience and Skill for They Must Be Adjusted to One One-Thousandth of an Inch; Tuning the Strings Is Done in Much the Same Manner as with an Ordinary Piano and Enterprising Grinders Have Found That an Instrument with Few False Notes Yields Much Better Profit

Preparing a Street-Piano Roll from Sheet Music; There Are Said to Be But Three Men in the Country That Are Proficient in This Work

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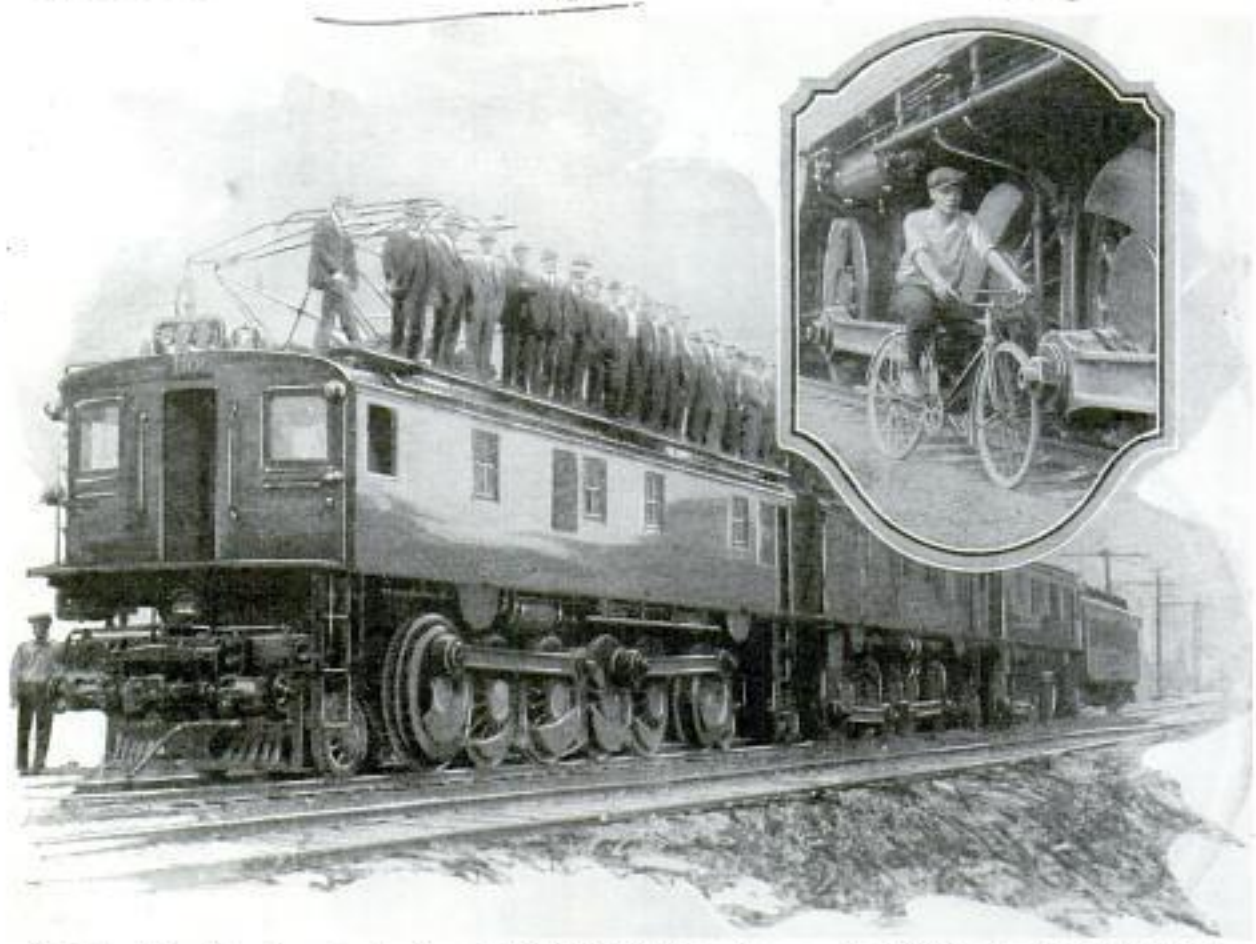
LARGEST LOCOMOTIVE IS RUN BY ELECTRICITY



It Looks Like Three Separate Engines, but in Reality Is Only One—an Electric Monster That Can Haul a Loaded Train Two Miles Long; Inset Shows Size of Drivers

The world's biggest and most powerful locomotive is an electrical giant 152 feet long, weighs 1,275,900 pounds and is rated at 7,125 horsepower. Because of its great length, it is built in three sections so that it can round curves safely and each unit contains two motors so that the entire assembly may be considered as six engines in one. The cabs are sixteen feet high and more than eleven feet wide. During speed and power tests, it was found that some of the five-foot driving wheels could be locked and the current thrown to other motors without injury to them. It is estimated that the engine can haul a loaded train almost two miles long. It is so arranged that it regenerates power and sends it back into the transmission line when going down steep grades. It successfully passed first running tests under the supervision of officials of the makers, and of the Virginian railway, the owners. This engine is the first of a series of twelve ordered by the road.

REAR-ELEVATING END-DUMP BODY FOR COAL AND SAND

A hand-operated dump body for light automobile-truck frames is rear-elevating and empties from the end. A door in the tailgate is provided for unloading coal, sand and similar material into small openings. In traveling position, the hopper is within easy reach of the ground and, when high lifts are not required, the ordinary end dump can be used alone. A telescopic chute furnished with the body is carried underneath and may be quickly attached to the tailgate.

Dump Body for Light Trucks; It Is Operated by Hand and Includes a Chute

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Christian Science Monitor
6/10/25

3160

BIG-GAME ANIMALS INCREASE IN NATIONAL FORESTS

3389

That America's big game in the national forests has within the past year increased by 44,000 head, or to a total of 687,000 head, is shown by the latest census taken by the forest service. Deer are most numerous, there being 550,000. The states credited with the largest number of deer are California, Oregon, Montana, Idaho, Arizona and Alaska. Elk have increased in all western forests, to 52,600 head. Antelope, or pronghorn, are in less satisfactory condition, there being few more than 5,000. Moose appear to have decreased from 8,000 to 5,100, and the number of mountain sheep is given as 12,400 and of mountain goats as 17,200. Among the predatory animals, not counted as game, the records show 38,700 brown and black bear and 5,600 grizzlies.

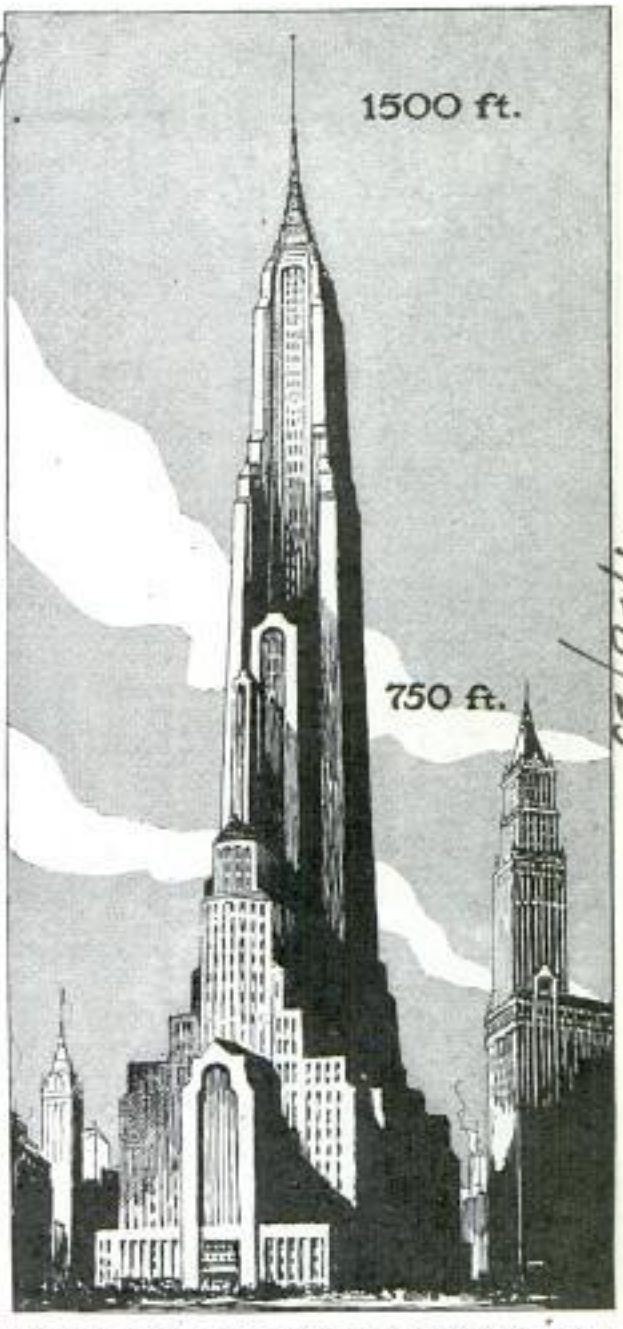
3379

DETACHABLE SHOE-HEEL PLATE AIDS IN ROUGH CLIMBING

When tramping through steep or rocky country, fishermen, hunters, surveyors and others may be saved from disastrous falls and protect their shoes by means of a detachable plate that is held in position by steel straps and can be put on or taken off in little time. It fits squarely over the regular heel and is kept from slipping by a rear brace and a front strap that passes under the instep. Protruding corners on the plate help grip the ground. The attachment is durable, easily carried when not in use and besides helping the wearer in difficult places, keeps the heels from rounding off.

HEIGHT OF FUTURE SKYSCRAPER FIFTEEN HUNDRED FEET

How high can a skyscraper be built in conformity to the zoning laws and be practicable from an engineering standpoint? A New York architect replies, 1,500 feet and presents a sketch of a lofty pinnacle in steel and stone, a block square at the base, "stepped in" at successively higher stories until it tapers into a needle-like point nearly twice the height of the Woolworth tower. Such a b[illegible] it is said, has been endorsed by engineers and does not conflict with the regulations. Towers such as this, it is predicted, will not be uncommon in the coming city. Harvey W. Corbett, president of the New York architectural league, declares that in the metropolis of the future, the automobile will have disappeared from the streets, the city will be half a mile high, and traffic will be handled on sliding platforms. Buildings will have terraces like hanging gardens adorning the lower levels, and all construction materials will be colored, to fit the locality and to produce the most artistic effects.



Drawing of Skyscraper of Future, Showing Its Height Compared with Woolworth Tower

Christian Science Monitor
4/23/25

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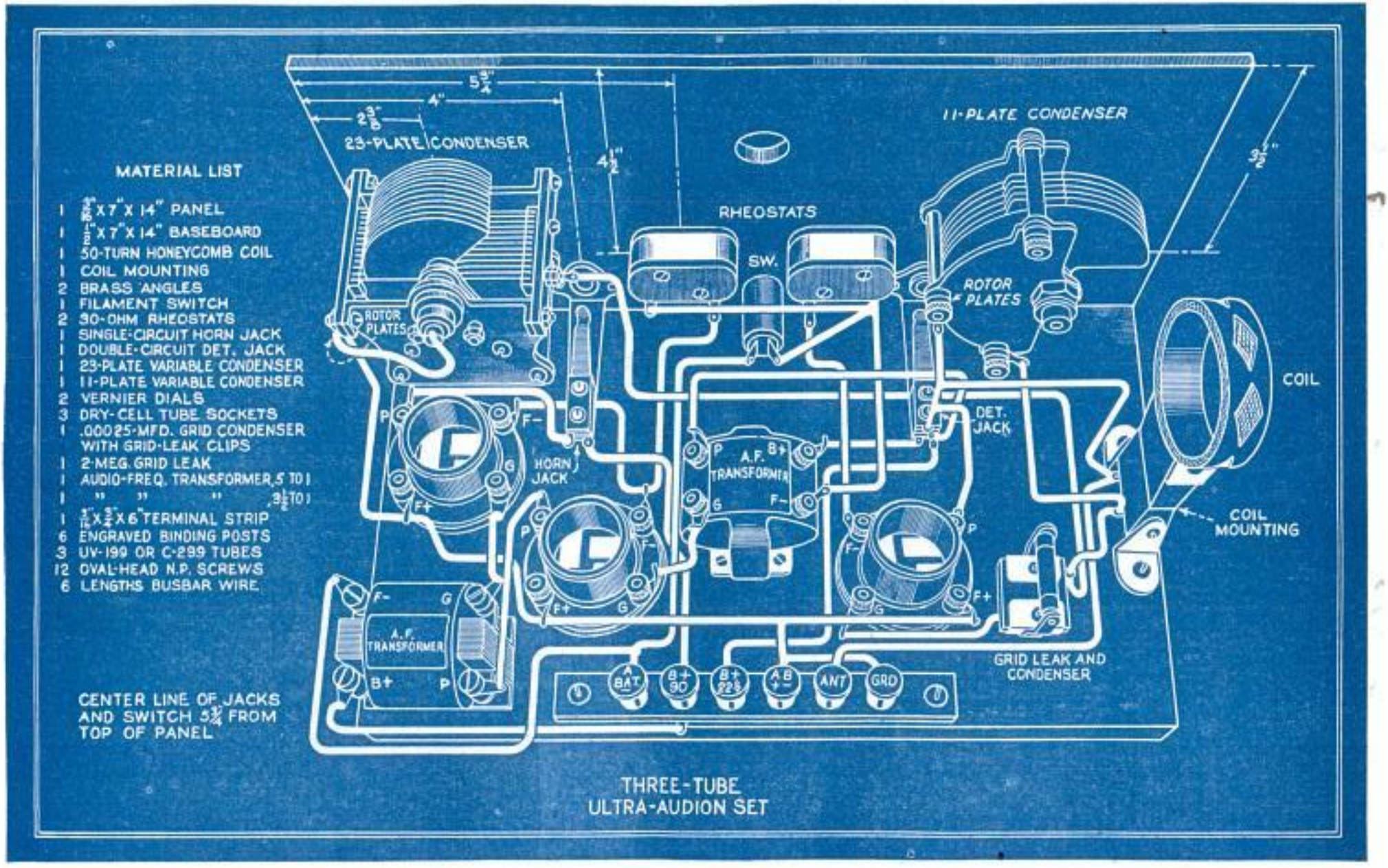

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Making a Three-Tube Ultra-Audion

Article Also Tells How to Add One Step of Audio-Frequency Amplification to Any Set

By HARRY STERLING

THE ultra-audion circuit has been a very popular one with our readers. It was first published as a one-tube receiver in the April, 1924, issue and again as a two-tube loud-speaker set in the May, 1925, number. The insistent demand that a third tube be added to the two-tube receiver prompted Popular Mechanics radio laboratory to show the reader how to add this step without changing the layout of the receiver.

This is a simple matter to the advanced experimenter, but often puzzles the beginner. The blueprint diagram shows the method of placing the second audio-frequency transformer at the rear of the baseboard and the additional tube in front of the transformer, directly behind the 23-plate variable condenser; this will be of advantage to those who have built the set as described in the May issue, as there is sufficient room for the tube socket and transformer. Some experimenters may prefer to use a 3½-to-1 ratio for both of the audio-frequency transformers, or a transformer with a 2-to-1 ratio in the second stage. The horn jack is now connected to the plate of the last tube and both steps of audio-frequency amplification are obtained through this jack. The wiring is so plainly shown in the full-page diagram that little need be said regarding it. The addition of the second step of amplification gives great horn volume, and this volume can be controlled by the amplifier rheostat. Either UV-299 or C-399 tubes can be used, or if the reader prefers the standard tubes, such as the UV-201A or C-301A, all that is necessary for such a change is to substitute standard sockets for the small tube sockets, provided the rheostats are of the carbon-pile type specified, which are adapted to either type of tube. The type of A-battery to use, of course, depends on the kind of tubes used. If difficulty is encountered in getting down to the shorter wave lengths, use a smaller coil, or shorten the aerial. For the longer wave lengths, use either a 50 or 75-turn coil. It is a good plan to provide coils of 25, 35, 50, and 75 turns, which can be plugged in and out at will; the result is a set that is far more flexible than the average receiver now in use.

Rear View of the May Set with One Step of Audio-Frequency Amplification Added

This receiver, like all others making use of this type of circuit, will reradiate if not properly tuned. Never force the tubes to the "spilling-over" point, as it is always better to get good clear signals at a reasonable volume than too much volume at the expense of tone. The many letters we have received from our readers regarding the distance records obtained with this simple circuit show it to have an exceptional range for a two-tube set, and with the additional step of amplification this range will be materially increased.

It is to be remembered that good results do not entirely depend on the type of receiver used; much depends on the operator, as well as on a good ground and aerial. The complete material list and wiring diagram are given on the blueprint page for the benefit of those who have not yet constructed the receiver as described in the May, 1925, issue. If greater room is desired for laying out the instruments, a larger panel and baseboard can be used, for example, a bakelite panel

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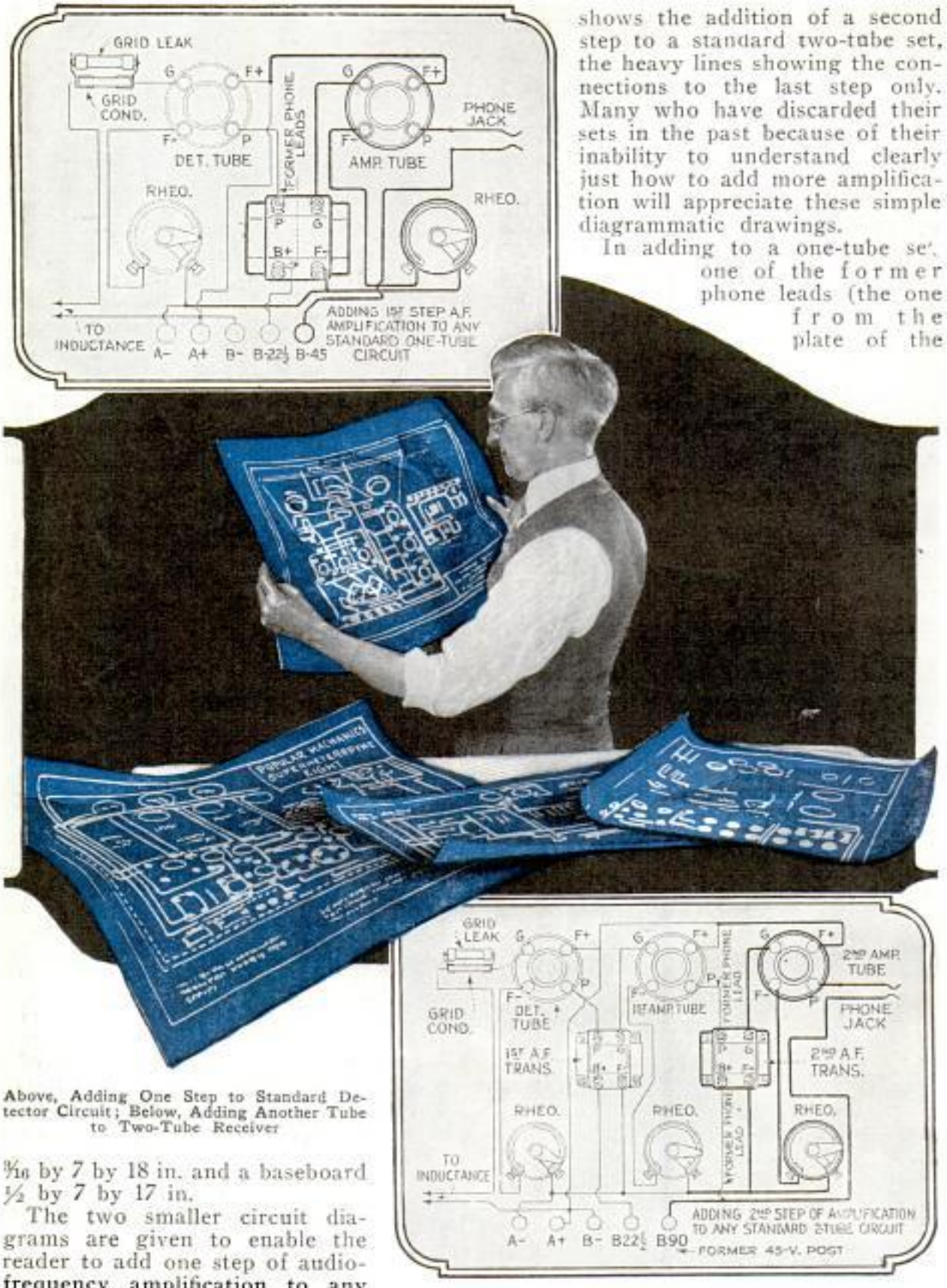

Above, Adding One Step to Standard Detector Circuit; Below, Adding Another Tube to Two-Tube Receiver

shows the addition of a second step to a standard two-tube set, the heavy lines showing the connections to the last step only. Many who have discarded their sets in the past because of their inability to understand clearly just how to add more amplification will appreciate these simple diagrammatic drawings.

In adding to a one-tube set, one of the former phone leads (the one from the plate of the tube) is connected to the P-post on the transformer, and the other (the 22½-volt B-battery lead) to the transformer B-positive post. In the second case, the B-positive post is connected to the 90-volt line.

⅜ by 7 by 18 in. and a baseboard ½ by 7 by 17 in.

The two smaller circuit diagrams are given to enable the reader to add one step of audio-frequency amplification to any standard type of receiver. The upper diagram shows the method of adding one step of audio-frequency amplification to a simple detector circuit. The heavy lines show the additional connections necessary for this purpose. The lower diagram

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NINE TUBE SUPERHET Serves All Purposes

By FRANK L. BRITTIN

COAST-TO-COAST range, unusual volume with splendid tone, push-pull amplification, storage A-battery, a nine-tube set complete with batteries, horn and loop, all in a case measuring only 17 by 17¾ in. and weighing but 50 lb.; these are the features of the latest set developed by Popular Mechanics radio laboratory—and the cost to build and equip it completely is only $176.35. No effort has been spared to make this an all-purpose set in the fullest sense of the term, a receiver as well adapted for the home because of its compactness and beauty, as it is ideal for the picknicker, the camper and tourist in its portability.

The case of Popular Mechanics All-Purpose Set is of standard make and can be divided into two compartments, the upper for the instrument and the lower for the horn and batteries. The lid is fitted with a pocket for the folding loop which, in use, is plugged into a socket in the top of the case. A hinged door at the rear leads to the battery compartment. A new feature is the small 4-volt glass-case storage battery, mounted on a soft-rubber base and fastened by means of a brass bracket. This battery only weighs about half as much as the number of dry cells required to operate nine tubes. The small double-pole, double-throw switch on the inside of the rear door serves to switch the A-battery from the receiver circuit to the charger. The charger leads are connected to the switch with Fahnestock clips. When fully charged, the battery will last from ten days to two weeks, with average use. For recharging with the standard type of charger use a resistance unit supplied to cut the rate down to the proper amperage, or the special charger supplied by the maker of the battery. The B-battery consists of five 22½-volt units of the vertical type, connected in series. This unit is about the same size as the usual No. 6 dry cell. The total voltage —112½ volts—is recommended for best results. The horn is 9½ in. long and is mounted between the A and B-batteries. A strip of sponge rubber is used to strap the horn to the base of the case and flex-

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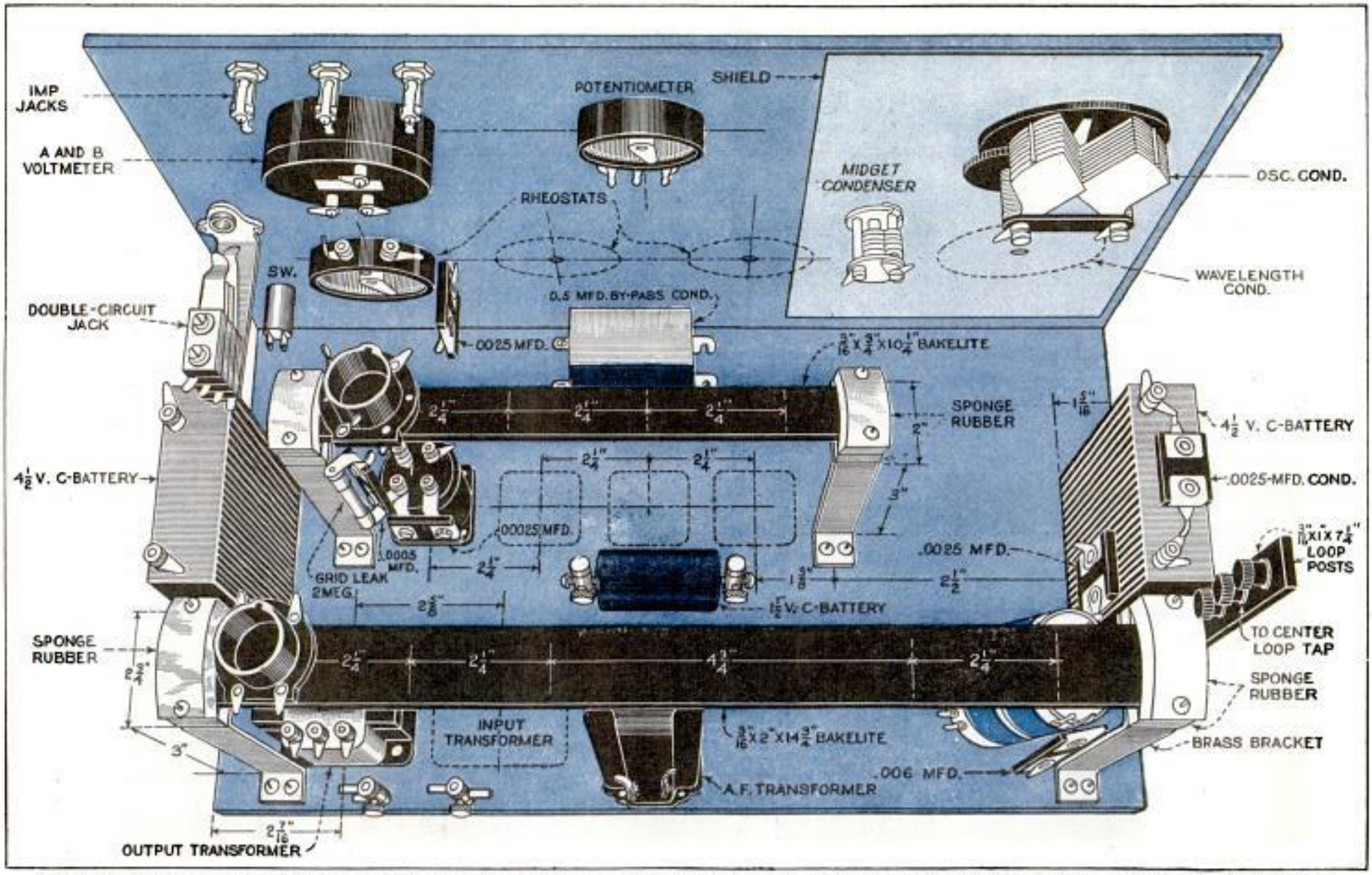

Construction Diagram of the Panel and Subpanel Assembly, Showing the Positions of the Various Instruments, and How the Tube-Support Strips Are Fitted to the Brackets with Sponge Rubber to Eliminate Vibration Troubles

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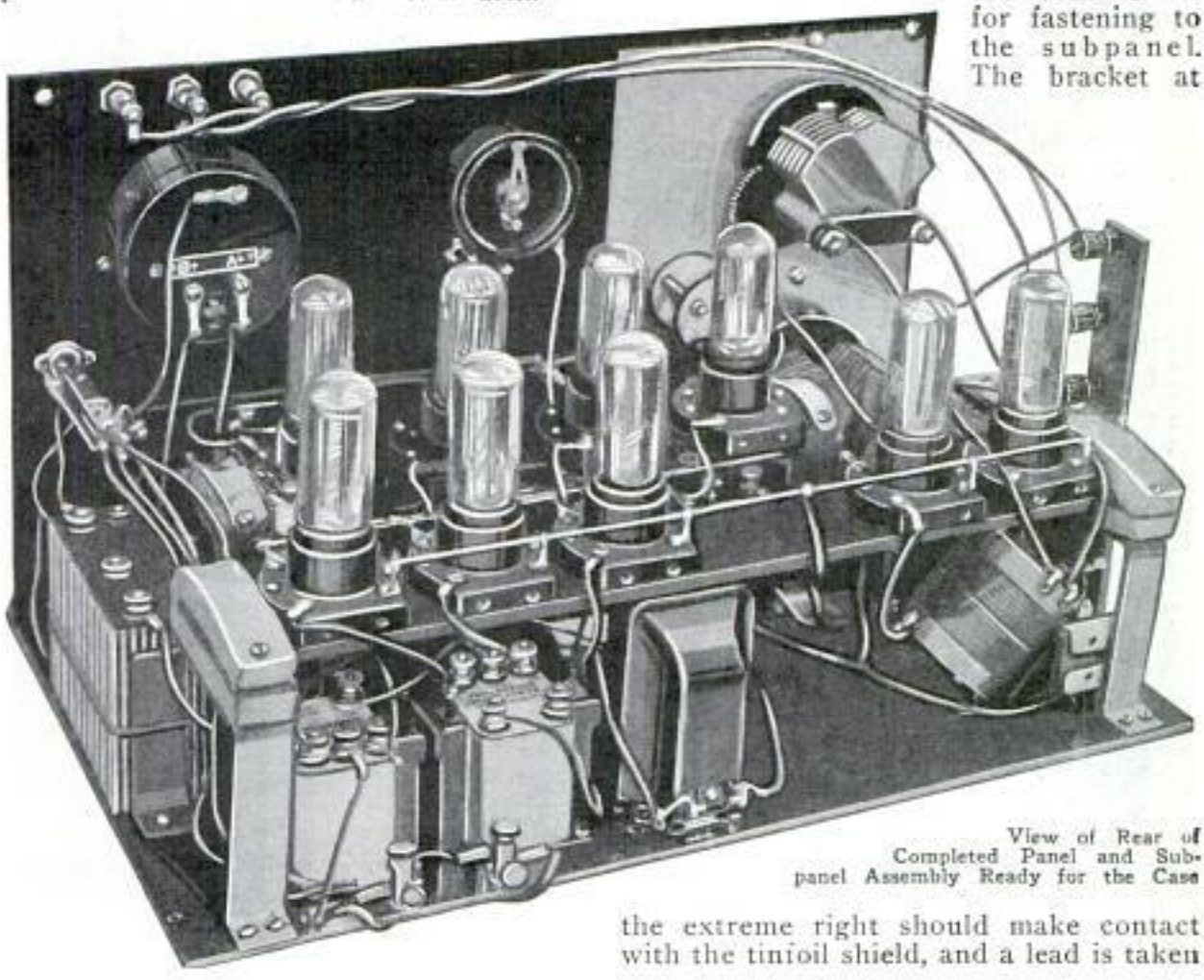
ible rubber-covered wire for connecting the batteries. Lugs are soldered to the ends of the leads, and each lead is marked for identification.

The layout is given in the blueprint diagram (page 478). The bakelite tube strips are supported on brass brackets by means of two strips of sponge rubber. The rubber pads are pierced and screwed loosely to the tops of the brackets and the bakelite strips inserted between the pads, which are then tightened. The oscillator and first detector-tube sockets are mounted at the right of the longer strip, and on the extreme left, the sockets for the audio-frequency transformer and the input and output tubes of the push-pull power amplifier; this mounting strip should just clear the top of the audio-frequency transformer. The 1½-volt battery is mounted in the center of the subpanel by means of two double binding posts; the upper holes in these posts are tapped for 6-32 brass machine screws, ¾ in. long; these hold the battery in position and serve as connectors. The two 4½-volt C-batteries are mounted on the subpanel by means of brass brackets, and held in place with heavy rubber bands. All holes in the subpanel can be drilled with a No. 27 drill.

Use tinned-copper lugs under all binding posts, and No. 14 tinned-copper busbar wire on the intermediate-frequency transformers, and on the filament posts of the sockets and rheostats only. All other leads are made with flexible rubber-covered wire. The double-line wires in the blueprint diagram are the busbars. Complete as much as possible of the wiring on both panels before mounting the front panel on the subpanel. The front-panel assembly requires no explanation, as the position of the various instruments is clearly shown. The 25-ohm rheostat controls the first and second detector-tube filaments; the next rheostat at the left controls the intermediate-frequency tubes and oscillator tube, and the rheostat at the extreme left the audio-frequency tube and the push-pull amplifier tubes. The filament switch is of the push-pull removable-key type. After all wiring possible on the front panel has been completed, mount the front panel on the subpanel by means of three small 1-in. brass brackets; these run under the subpanel and are fastened to the front panel with flat-head black-japanned machine screws; use ordinary round-head brass machine screws of the same size for fastening to the subpanel. The bracket at the extreme right should make contact with the tinfoil shield, and a lead is taken



View of Rear of Completed Panel and Subpanel Assembly Ready for the Case

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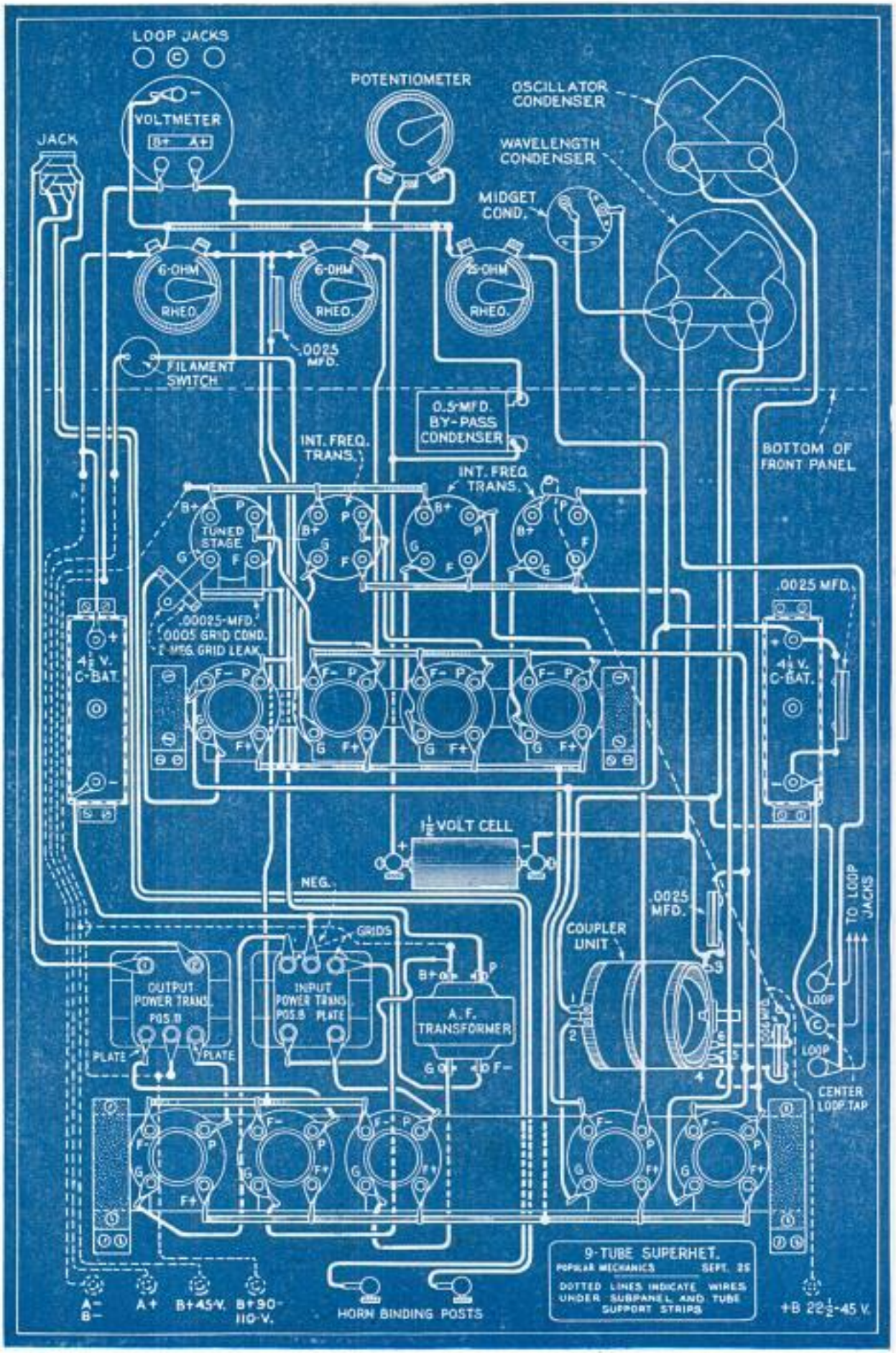

Simplified Wiring Diagram of the All-Purpose Receiver; the Double Lines Indicate Busbars, and the Dotted Lines the Wiring under the Subpanel

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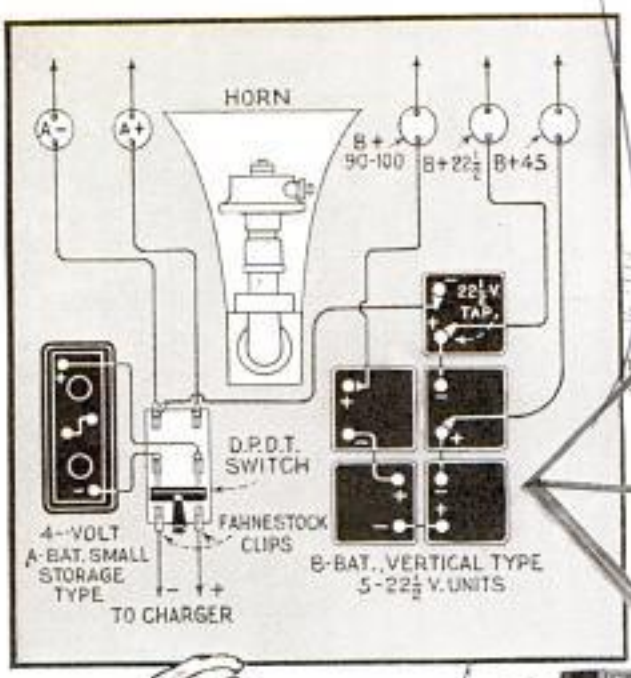
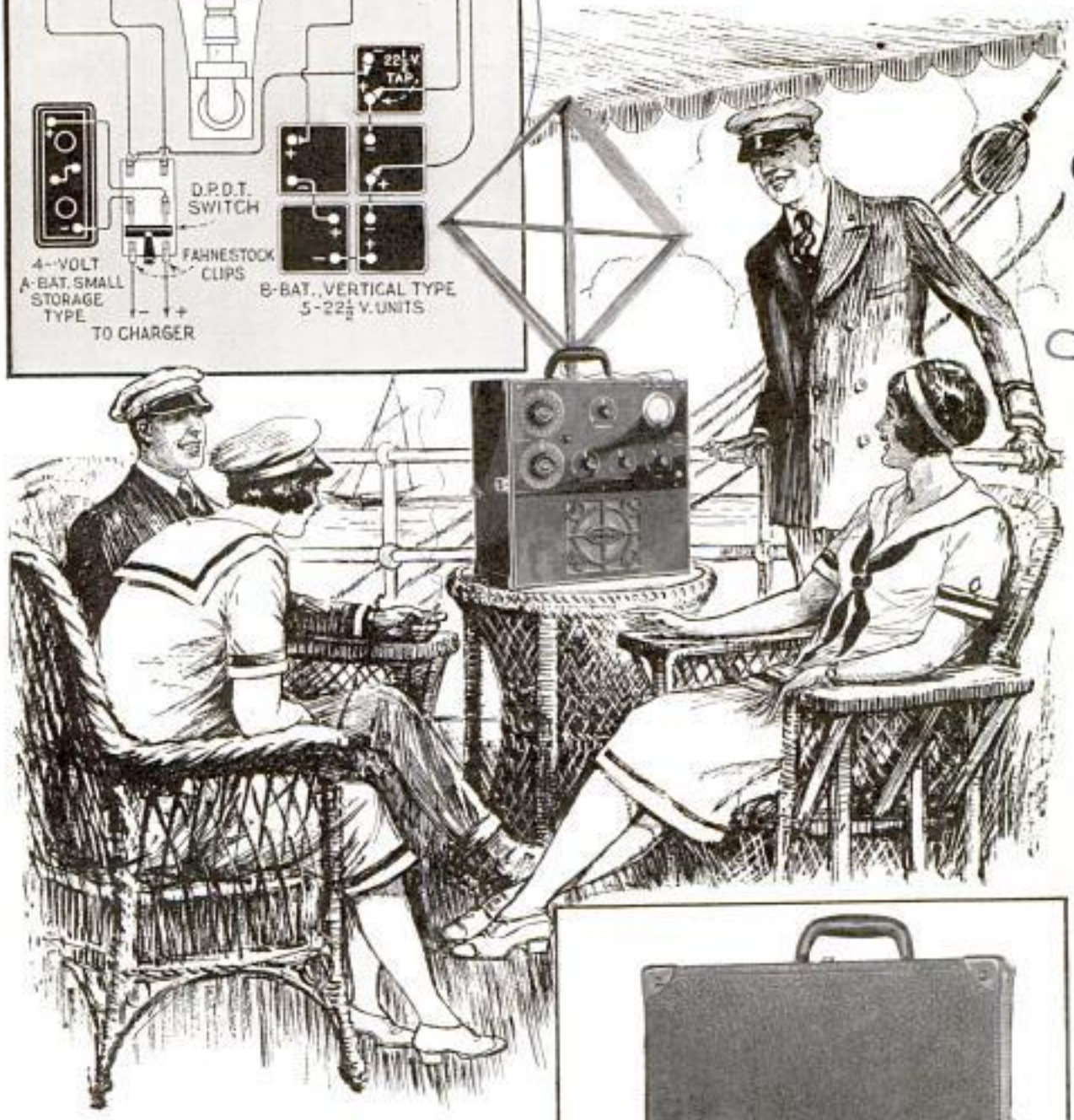
densers. After the circuit has been completed, connect rubber-covered flexible leads to the loop binding posts; these leads should be long enough to clear all tubes, and run along the upper edge of the front panel to their respective jacks. The





Above, Connections of Battery to Receiver Circuit and Charger; Below, Back of Case Open, Showing Batteries and Horn

from this bracket to the nearest common A and B-negative lead. Complete the wiring, carefully soldering all connections. Use tinned-copper lugs on all condensers, both fixed and variable, fastening these to the condensers with short brass screws. Do not hold the soldering iron to them any longer than necessary, as excessive heat will destroy the small con-

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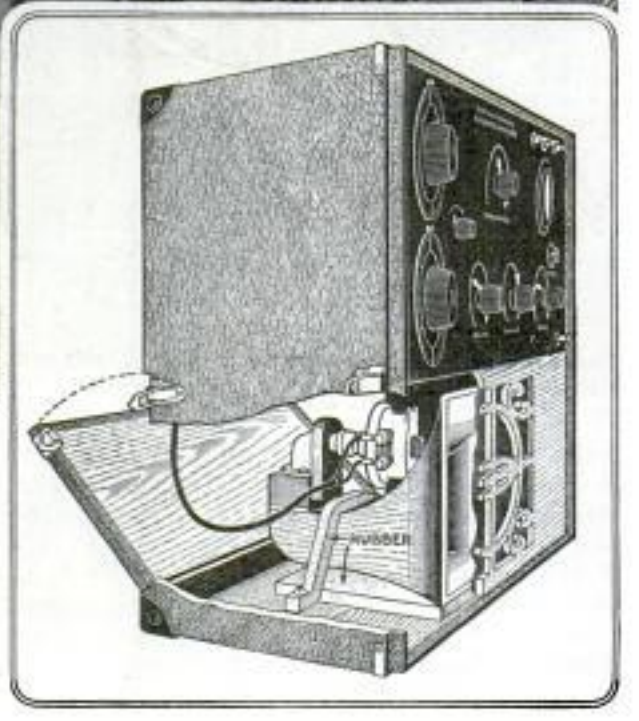

Above, How Loop Fits in Pocket in Case; Below, Section of Case, Showing the Sponge-Rubber Mounting for the Horn

center jack and the corresponding loop binding post are marked with the letter "C" in the diagram, and must be connected together. The other two loop leads may go to either of the imp jacks. Bunch the loop leads together and tie with thread. A small hook is placed inside the upper part of the case near the front, and the flexible leads are put on this hook when the instrument is mounted in the case. Wood cleats should be screwed to the inner sides of the case so that the subpanel will be supported in the correct position. Two small brass brackets are to be mounted inside the upper corners of the case, with one bent, and drilled and threaded for a 1-in. 6-32 brass machine screw. These screws extend through holes drilled in the panel to clear them easily, and are fitted with hard-rubber binding-post heads, which hold the panel firmly in the case and provide an easy method of removing the instrument.

Now remove the instrument and connect the A and B-batteries for a preliminary test, using longer leads

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if desired. Connect the horn leads to the double binding posts at the rear of the subpanel, and run temporary leads to the loop, which is plugged in on the case or mounted on the wood base provided. Take one tube and place it successively in each socket after pushing in the filament switch and turning up the rheostats; this will show if there is any error in the filament wiring and eliminates the possibility of burning out all of the tubes should an error exist. If the tube lights correctly in all sockets, the remainder of the tubes can be placed in position. Set the rotor of the coupling unit at the loosest coupling point; this will be at an angle of approximately 45° and can be reset later. The midget condenser is for regeneration control, and can be set to best advantage during reception. Before attempting to tune the set, note carefully the position of the various controls on the front panel. The double-circuit jack can be used for phones or for an external horn. When a horn or phones are plugged into this jack, the horn in the case is automatically cut out of the circuit.

Turn the knobs of all the rheostats and the potentiometer as far to the left as possible, back off the setscrew in each knob and set the pointers at a uniform position at the extreme left, then tighten. To pick up a station a few simple suggestions will be helpful, although skill is quickly acquired with practice.

1. Push in the filament switch to light the tubes.
2. Set the potentiometer about one-quarter of the way up.
3. Turn up all the rheostats gradually, keeping the pointers at approximately the same position, until a soft hum is heard from the tubes.
4. Set the wave-length condenser at any selected point, say 30°.
5. Rotate the dial of the oscillator condenser 10° to 15° above and below the 30° setting, moving the dial slowly.
6. If a click or soft whistle is heard, indicating the presence of a station, but no words or music can be brought in, turn up the center rheostat, and the one at the extreme right.
7. When the point is located at which the signal comes in strongest, it may be that volume is still lacking; if so, turn up the first rheostat at the left. If a whistle or roughness is present, readjust the audio rheostat either forward or back until the signal is cleared. It may also be necessary to advance or back off the potentiometer. When the correct setting is obtained, little adjustment is necessary.
8. If nothing is picked up at the first setting of the condensers, move the wave-length condenser to another point and

Popular Mechanics All-Purpose Nine-Tube Superhet Solves the Problem of the Man Who Wants the Ideal Set for the Open as Well as for the Home

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rotate the oscillator dial slowly over this range as before. Continue this process over the entire range of the dials. The set can be very accurately logged.

9. If it is known that there are stations working and nothing is heard when the two dials have been moved over the entire range, it is possible that the oscillator tube is not working. If advancing the rheostats does not put the set in operation, check the battery leads and see that no error has been made. To determine whether the oscillator tube is oscillating or not, touch its grid terminal with the finger. If there is a click heard when the terminal is touched and another when the finger is withdrawn, the tube is oscillating. Next look for trouble in the tubes. See that each makes good contact in its socket. When signals are coming in correctly, change the tubes about from one socket to another until the best combination is found. Some tubes are better amplifiers than others, some better detectors and many tubes are poor when used as intermediate-frequency amplifiers. Good fixed condensers are essential, and must be as near their rated capacity as possible, especially the .00025-mfd. condenser across the secondary of the tuned-stage transformer.

10. When tuning for a station turn loop slowly from time to time, as this will often enable stations otherwise unheard to be picked up. After the set has been checked and thoroughly tested and the rotor of the coupler set at the angle for best results on some distant station, the instrument can be replaced. Set in the batteries, securing the A-battery to the side of the case by means of the brass bracket, and arrange the B-battery units in place. Before connecting the batteries to the instrument, see that the filament switch is off; also leave the tubes out of the sockets when connecting the batteries. The leads from the loop are then connected to the imp plugs and plugged into the jacks at the top of the front panel, care being taken to place the center lead in the center jack.

MATERIAL LIST

1 panel, bakelite, formica or radion, 3-16 by 9⅜ by 16⅜ in.
1 panel, bakelite or formica, 3-16 by 9½ by 16 in.
1 bakelite strip, 3-16 by ¾ by 10¼ in.
1 bakelite strip, 3-16 by 2 by 14¾ in.
1 bakelite strip, 3-16 by 1 by 7¾ in.
1 No. 425 Knickerbocker case (over-all dimensions 17 in. wide, 17¾ in. high, 12¼ in. deep.
3 No. 600 Remler intermediate-frequency transformers.
1 No. 610 Remler tuned-stage transformer.
1 No. 620 Remler coupling unit.
2 No. 631 Remler .0005-mfd. variable condensers, complete with dials.
2 6-ohm rheostats.
1 25-ohm rheostat.
1 400-ohm potentiometer.
9 sockets for UV-199 or C-299 tubes.
1 No. 855 Chelton midget condenser, low-loss type.
1 pair Thordarson push-pull power-amplifying transformers.
1 No. 285 General Radio audio-frequency transformer.
1 double-circuit jack.
1 Walbert lock switch.
1 Marco d.p.d.t. switch.
1 No. 55 Jewell d.c. voltmeter, combination A and B, 0 to 7½ and 0 to 150 volts.
1 No. 21 Clarion speaker, complete with unit, over-all length 9½ in.
1 No. UD 44 Philco storage battery, 4-volt type.
1 rubber base tray for above.
2 4½-volt C-batteries, large size.
1 1½-volt flashlight cell, large type.
6 doz. tinned-copper lugs, long type, round hole.
1 2-meg. grid leak, cartridge type.
3 Dubilier condensers, .0025 mfd.
1 Dubilier condenser, .006 mfd.
1 Dubilier condenser, .00025 mfd.
1 Dubilier condenser, .0005 mfd. with grid-leak clips.
1 Dubilier by-pass condenser, .5 mfd.
3 Eby binding posts.
4 double binding posts.
3 imp jacks complete with plugs.
1 Mathiesen loop, three-tap, small portable box type.
1 sheet tinfoil, 6 by 8 in.
5 ft. brass strip, 1-16 by ¾ in.
1 piece sponge rubber, ½ by 8 by 10 in.
8 brass machine screws with nuts, 6-32, 1¼ in.
36 brass machine screws with nuts, 6-32, ½ in.
18 brass machine screws with nuts, 6-32, ¾ in.
3 black-japanned screws, 6-32, ¾ in., flat-head.
2 lengths No. 14 tinned-copper busbar wire, round.
25 feet 7-strand flexible rubber-covered fixture wire.
5 22½-volt B-battery units, vertical type, 2½ by 2½ by 6 in. high.
9 UV-199 or C-299 tubes.

Large blueprints of this set, containing full panel drilling templates, dimensions of all brackets, construction details, wiring and schematic diagrams, are available. Send 75 cents for the set of three to the Radio Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

Small Jack Aids Efficiency and Saves Space

Undesirable capacity in a circuit can often be traced to the jack, and a small jack now available has been specially designed to eliminate this fault. This jack provides a sliding or wiping contact of large area under tension and, it is claimed, electrical resistance is reduced to a minimum. The jack occupies only one-third the space of the ordinary jack, and will be found useful in limited space.

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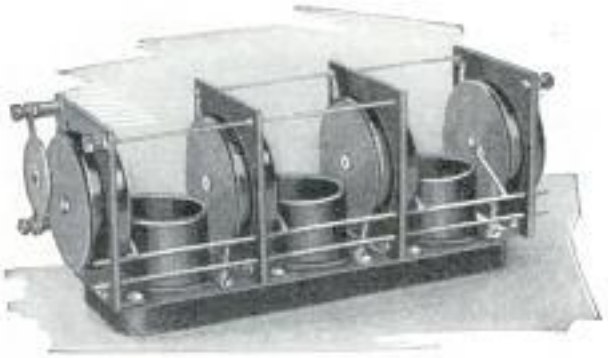
Self-Alining Bearings for Home Coil Builders

The greatest difficulty usually encountered by the fan who winds his own coils, and other instruments, is that of providing suitable bearings for the rotors. Appreciating this, an eastern company has placed on the market a number of different types of self-alining bearings that can be adapted to every kind of coil the home builder may need. The self-alining feature insures a smooth, even turning movement, and good electrical contact, regardless of the condition of the tube on which the bearings are mounted.

Wired Unit Saves Builder's Time

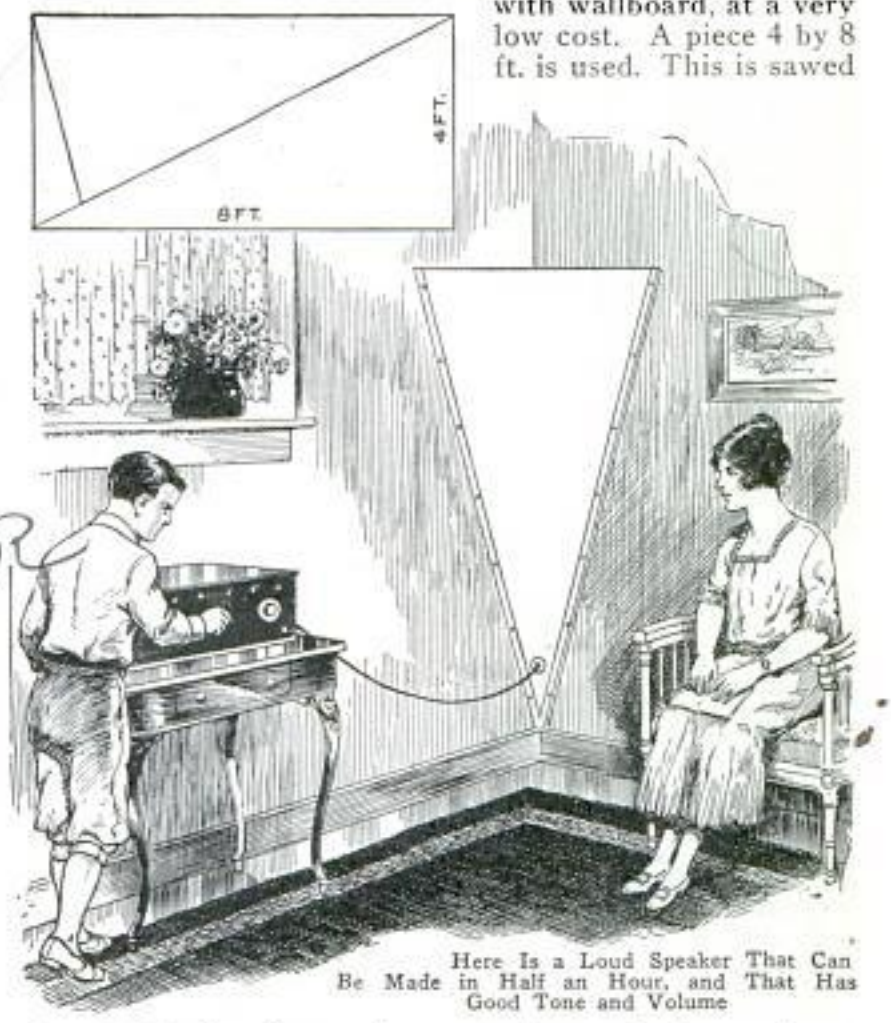
A combination of sockets with intermediate frequency transformers for superheterodyne circuits has lately made its appearance on the market. This compact form of assembly will recommend itself to set builders, as shorter leads are made possible, and less space is required behind the panel. The unit consists of a triple socket and three intermediate radio-frequency transformers, with a tuned-stage or input transformer, all wired and ready for use. A condenser of proper capacity is placed across the input transformer insuring maximum efficiency, with a minimum number of repeating points.



Compact Unit for Superheterodyne Receivers Saves Labor and Space in Building Sets

Loud Speaker of Wallboard Has Unusual Volume

A homemade loud speaker that will give good volume and pure tone can be built with wallboard, at a very low cost. A piece 4 by 8 ft. is used. This is sawed diagonally to obtain a triangle as shown in the diagram above the illustration. The triangle used is the upper one. A hole is cut close to the point to take a loud-speaker unit. The board is then fitted in the corner of the room near the receiver, and held in place with two light strips of wood, or quarter-round molding on each side of the triangle. Beveled wood strips can be used, with the beveled edge inside so that the wallboard can be slipped in and out of the frame if desired. This loud speaker is not unsightly, as one would think on first glance. It can be decorated in many ways, or covered with wall paper to match that of the wall, and, when treated in the latter way is quite inconspicuous. When used with a set capable of operating an ordinary horn, the volume is surprisingly large.—J. G. Brown, Evanston, Illinois.



Here Is a Loud Speaker That Can Be Made in Half an Hour, and That Has Good Tone and Volume

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Insulated wire may be used as an aerial, and sometimes will reduce interference.

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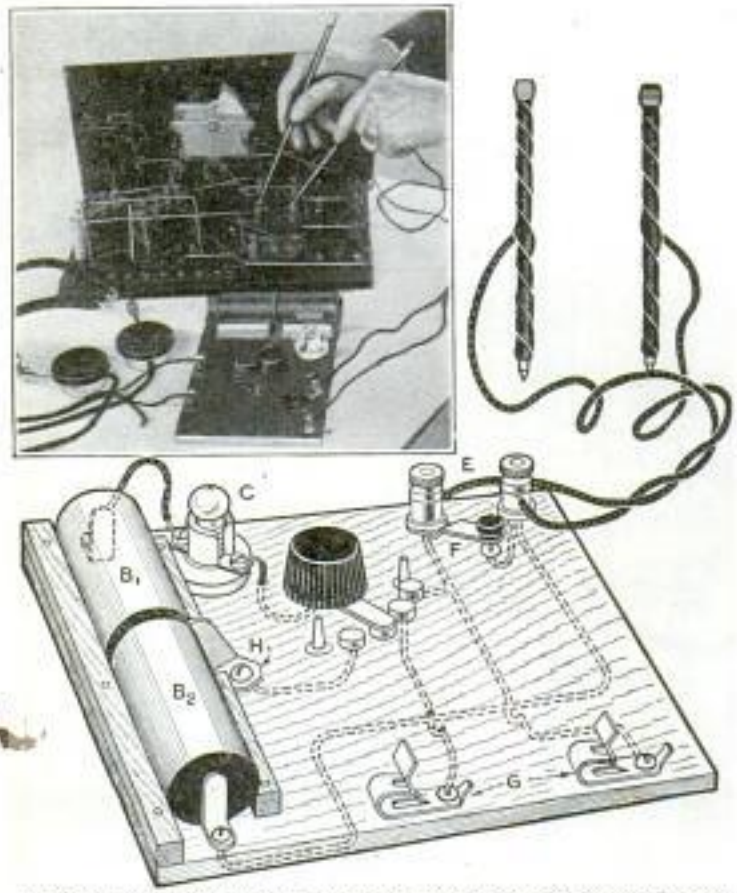
Handy Radio Test Board

A simple test board for radio circuits can be made easily from odds and ends found around any workshop. Since the judicious use of a flashlight, battery and a pair of phones will locate most defects, these units are used instead of expensive voltmeters and ammeters. Two small dry cells B_1 and B_2, a flashlight socket, C, and bulb binding posts for the two brass probes attached to flexible leads E, phone clips C, a switch with four contact points, and a key, F, are mounted on a ⅜ by 5½ by 7½-in. board. The probes, 6 in. long, are wrapped with electrician's tape.



A Simple and Easily Built Trouble Finder That Quickly Locates Defects in the Set; Above, Method of Using Probes to Test Coils

To test low resistances, the switch is placed on the right-hand point. This places the battery in series with the probes and flashlight. When the probe points are placed across a coil or connection, the light burns brightly. The greater the resistance, the dimmer the light. Tapping the key shorts the probes, and gives the most brilliant light, showing the test circuit to be working.

If the bulb does not flash when the probes are applied, test for high resistance as follows: Move the switch lever to the second point from the right. This puts the phones in series with the test circuit, and the clicks heard serve as the indicator. The current will be too small to light the bulb. This shows that the relatively high-resistance circuits are complete, and will also check imperfect contacts. A distinct click will be heard in the phones on making and breaking the probe contacts. For testing insulation, the procedure is the same. No click should be heard when the probes are touched to the parts supposed to be insulated, except the slight initial click that comes at the first trial. However, every time the probes are reversed, a click will be heard, where condensers are tested or condenser action occurs.

In testing for intermittent shorts or open circuits, the bulb and phones should be used in turn, and the parts operated under usual conditions. Faults will be indicated by changes or flickering of the light, or noises in the phones. The third switch point is dead, and is used for a convenient off point. The arrangement becomes a cell tester by placing the switch on the last point to the left. This throws the flashlight in series with the nearest cell, contact being made by the spring-brass clip H touching the base of the cell, and connecting with the last switch point. Cells are tested by noting the intensity of the light.

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New Condenser Spaces Stations Evenly over the Dial

A condenser that will spread stations uniformly over the dial is now available.

In the ordinary type of condenser the greater number of stations are crowded in the first twenty points on the dial, and almost all stations within fifty points. With this type of condenser, however, each point on the dial, over its entire range, represents a difference of ten kilocycles in tuning, and, as the government allots frequencies to stations ten kilocycles apart, a station will be found at each point on the dial, when all the frequencies are allotted.

Karas Electric Co.
4042 N. Rockwell
Chicago

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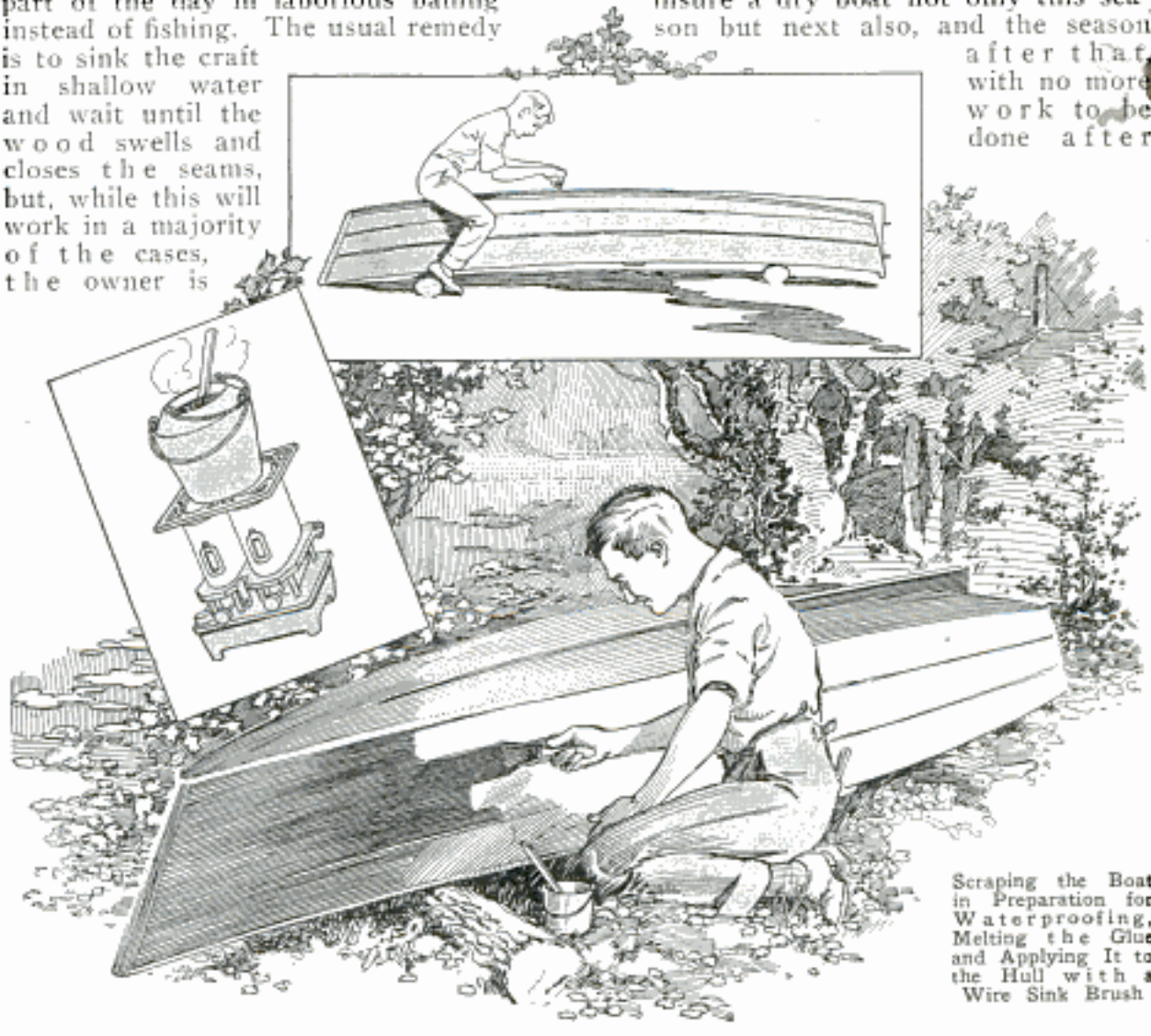
How to Make Your Boat Watertight

Simple Method Makes Old and Leaky Boats and Canoes as Good as New at Small Cost

THERE is nothing more annoying, upon reaching the summer camp on the lake or river, than to find the canoe or boat, after its long storage during the winter, gaping at the seams and ready to go to the bottom as soon as it is launched. Or to embark on a fishing trip, after looking the boat over and deciding that it will do all right, and then spend the better part of the day in laborious bailing instead of fishing. The usual remedy is to sink the craft in shallow water and wait until the wood swells and closes the seams, but, while this will work in a majority of the cases, the owner is deprived of the use of the boat for a period of several precious days.

The hull, of course, can be calked, but, after this is done, the owner is very likely to have the whole job to do over again next season, thus wasting more time. There is a way, however, to get rid of the annual overhaul, or wetting of the boat, or the continuous bailing, a way that will insure a dry boat not only this season but next also, and the season after that, with no more work to be done after



Scraping the Boat in Preparation for Waterproofing, Melting the Glue and Applying It to the Hull with a Wire Sink Brush

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the first job. Boats treated in this manner have been known to stand up for twenty years without further attention, and without necessitating the bailing of a single drop of water other than that deposited in them by the rain. The hull is also considerably stiffened, a factor of decided importance when an outboard motor is used, and the useful life of the boat increased by years.

Method of Covering Seams Where Entire Boat Is Not to Be Covered

This method of waterproofing a boat demands no expert knowledge, and is not expensive. The only things necessary are a supply of marine glue sufficient to cover the boat properly, some cotton cloth, a kerosene stove to heat the glue, a brush, some tacks and a hammer, and some old flatirons. The marine glue used should be Jeffery's No. 7 black, soft marine glue, or special marine canoe glue, according to the type of the craft. One pound of the glue will waterproof 3 sq. ft. of surface, so it is necessary to figure the area of the hull in order to get the correct amount to order. The cloth used should be heavy unbleached cotton cloth, of firm, close weave, which can be obtained at any dry-goods store. It must be purchased in one length, wide enough to cover one side of the boat completely, allowing for all curves, and a yard or two more than twice as long as the boat. It is cut in two, and each length used to cover one side of the boat. If the boat is clinker-built (lap-straked), it is well to cover the whole side, carrying the cloth to the gunwale. If carvel-built (smooth-sided), it will only be necessary to carry the cloth a few inches above the waterline.

The first thing to do is to scrape all the loose paint from the hull and remove all dirt and oil. Then remove the stem band at the bow, and, starting from the stern, stretch the cloth over one side of the boat, tacking it to the transom and the bow. Do the same with the other side, using ½-in. copper tacks, and allow the cloth to remain on the hull for about 24 hours. This stretches the cloth and makes it conform somewhat to the shape of the hull. When stretching, see that there are no slack places in the cloth. After the time specified, remove the cloth pieces and mark them for their respective sides.

Now melt the marine glue in any kind of suitable container over the stove, using a moderate flame and stirring it frequently. If a kerosene stove is not at hand, the glue can be melted over a small fire, but care must be taken that the flame is not too hot, as the glue must not be allowed to boil. The glue should be cut into small pieces before melting, and it should be carefully watched until it will drip from the stirring paddle like oil, when it is ready for use. It must be used as promptly as possible, and it must be liquid when used or it will not fill the seams properly. Apply it with a wire sink brush, or failing this, with the stub of a small whiskbroom, which, however, must be stiff and well bound. Apply a heavy coat to the entire surface to be covered. Now tack the end of one piece of canvas to the stern of the boat and start drawing it tightly toward the other end. Draw it as tight as possible and tack at the bow. Next tack along the gunwale, stretch, and tack along the keel. If the cloth is wetted before applying, it can be stretched more easily, and, when it shrinks, it will hug the hull more closely. However, if it is wet, care must be taken that it is thoroughly dry before the next operation.

The next step is to iron the cloth down into close contact. This can be done with either a flatiron or a gasoline or electric iron, which can be cleaned afterward with gasoline. The application of the hot iron causes the glue to sweat through the cloth. The iron must not be used as in ironing clothes, but rather with a wobbling motion, on its own axis, and it must be passed in this manner over the entire surface of the cloth, until the latter is black. The operations on the other side of the boat, are, of course, exactly similar to this. The iron must not be too hot, as this will prevent the cloth

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from sticking to the hull; a little experiment will enable the user to determine the proper heat. No excess of glue should be allowed to remain on the surface of the cloth, as this will later "bleed" through the paint. The cloth from both sides must lap over the entire width of the keel, and be perfectly ironed down; similarly at the bow. The cloth must lap over the sternpiece or transom about 1 in. and be well ironed down also. Trim off all rough edges and overhanging lengths of cloth.

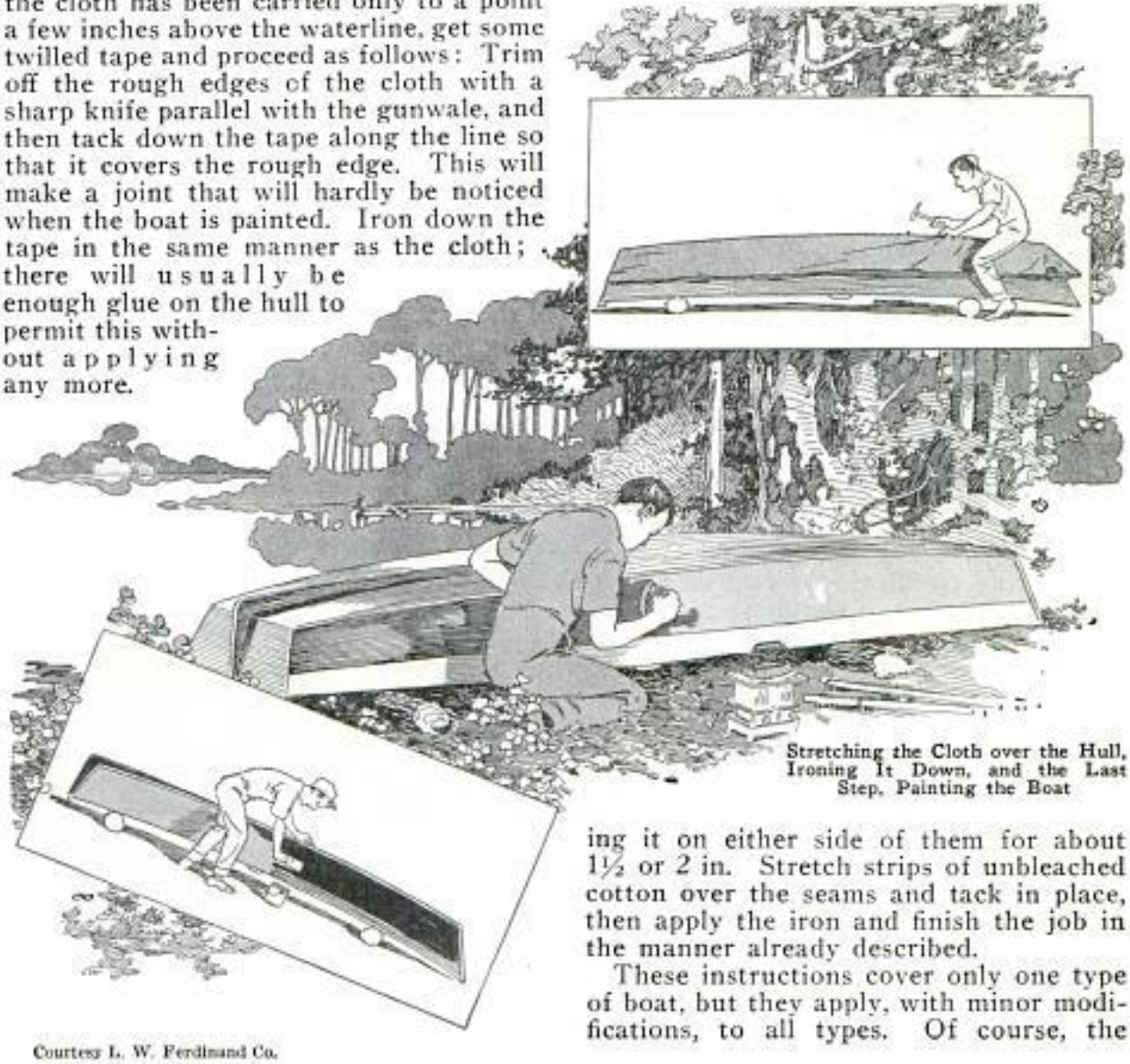
Now cut two pieces of the cloth about 2 in. wide, and long enough to reach from the keel to the gunwale along the joint between the side boards and the transom, and tack along the joint, allowing 1 in. on each side, then iron down into place. Feel all over the bottom of the boat for lumps caused by a little too much glue, and iron these down smooth.

If the boat is clinker-built, the cloth need only be trimmed at the gunwale and tacked neatly, but if it is carvel-built, and the cloth has been carried only to a point a few inches above the waterline, get some twilled tape and proceed as follows: Trim off the rough edges of the cloth with a sharp knife parallel with the gunwale, and then tack down the tape along the line so that it covers the rough edge. This will make a joint that will hardly be noticed when the boat is painted. Iron down the tape in the same manner as the cloth; there will usually be enough glue on the hull to permit this without applying any more.

After ironing, apply one or two coats of orange shellac to the entire hull, to prevent the glue from discoloring the paint, and, when the shellac is dry, paint the boat. Any good paint can be used for the purpose, and if a good finish is desired, the last coat should be well rubbed down with pumice and linseed oil, and two coats of good spar varnish applied. This last operation should be done in a warm room, free from dust.

When an old boat is being waterproofed, the keel and stem pieces should be removed, if possible, until the process is complete. When replacing them, they should be set in marine glue, to avoid leaks at the screw holes.

When it is desired to cover only the seams of a boat, proceed as shown in the small drawing. Melt the glue as before, and only as much as is required for immediate use. As it is used from the melting pot more can be added from the can. Apply a heavy coat to the seams, spreading it on either side of them for about 1½ or 2 in. Stretch strips of unbleached cotton over the seams and tack in place, then apply the iron and finish the job in the manner already described.



Courtesy L. W. Ferdinand Co.

Stretching the Cloth over the Hull, Ironing It Down, and the Last Step, Painting the Boat

These instructions cover only one type of boat, but they apply, with minor modifications, to all types. Of course, the

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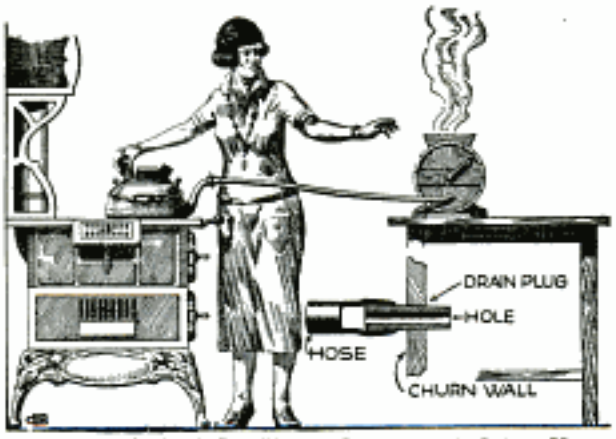
owner may vary them to suit his own boat; for example, on a flat-bottom boat with no keel it is feasible to apply the cloth in one piece, although it may be found more difficult to get a smooth job. If the job is done with care, a boat waterproofed in this manner will last a lifetime, and any small holes that it may acquire later in service can be patched in a half hour by the same methods.

Steam Churn Sterilizer

There are times when the churn is not scalded out immediately after it has been used, and this neglect makes it necessary



Simple Method of Sterilizing Churns and Other Utensils with Steam

to resort to more effective methods of cleansing. A simple method of sterilizing and deodorizing a musty churn is shown in the illustration. A hole is drilled in the drain plug of the churn, and the plug is connected to the spout of a water kettle by means of a length of rubber hose. In order to prevent steam from escaping, flatirons or other weights are placed on the lid. As is apparent, steam under considerable pressure can be forced into the churn, so that every corner is reached and thoroughly sterilized. A cork is used to plug up the hole in the drain plug when the hose is removed.

Preventing Ladders from Slipping

Anyone who has used a long ladder against a frame building knows its tendency to move sideways when one is working on one side. This danger can be eliminated in the following way: Tack or glue some strips of coarse emery cloth or sandpaper to the top ends of the stringers. Pieces of old inner tubing may also be used for this purpose. With the tips of the stringers so provided, many accidents will be eliminated.

Damp-Proofing Cement-Block Houses

Cement-block houses make attractive, durable and economical dwellings. They need no periodical painting and are comparatively easy to construct. However, there is sometimes a serious drawback to this kind of building, for unless properly treated, the walls often absorb considerable moisture from the air, and become too damp inside for comfort. To overcome this dampness it is necessary to coat the outside walls thoroughly with a thin mixture of pure cement, 1 part, and water 16 parts. This mixture is best applied with a whitewash brush and should be well worked into the pores of the cement blocks as well as into the cracks between them. It is advisable to wait one week before applying the second coat. In a rather dry climate one coat is sufficient. One sack of cement should be ample for double-coating an ordinary residence.

Novel Napkin Rings

On arriving at our summer cottage in April we found that we had failed to take along napkin rings, and as we did not like to use paper napkins and did not have the equipment to wash linen ones, the use of rings or some other method of identification was necessary. For a few days we used pins with different-colored heads as a makeshift, until I went to Portland where I hoped to buy some cheap rings, but as I could find none, I had to return without them. My wife declared something must be done as the pins were ruining the napkins. On looking over my negatives I found an overexposed film and the idea came to me that neat rings could be made from them. I soaked the film in a solution of hot water and baking soda and soon the emulsion was thoroughly stripped and the clear celluloid base was left. I cut the piece into strips, 1¾ by 5¼ in. in dimensions, and punched holes through each end ½ in. apart and about ⅛ in. from the edge. A piece of baby ribbon of a different color for each person completed the ring. These rings were so neat that everyone who saw them commented on their tastefulness.—Charles A. Blake, Peak's Isle, Maine.

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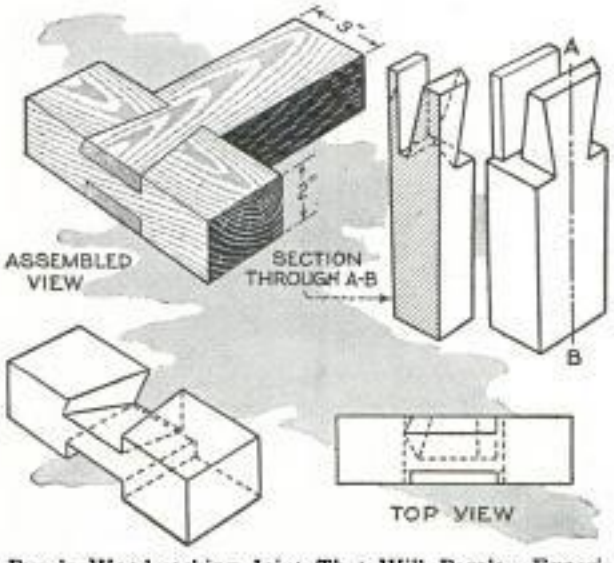
Keeping the Garage Warm

I have a neighbor whose garage is built as an addition to his home. When he put in his furnace, he cut a hole through the cellar wall and brought a pipe through it to a register in the floor of the garage directly under the engine. Now, no matter how cold the weather is, his car can always be started in a few moments; in fact, the whole car is kept warm, so that occupants are less likely to contract colds by sitting on chilly seats. There is, of course, a door opening from the house into the garage, and, therefore, it might be thought that exhaust gases would be present to a dangerous degree. However, as the car never needs warming up, the only fumes are those made while running in and out.—W. Mehanna, Bussey, Iowa.

Joint Puzzles Woodworkers

The interesting puzzle joint shown in the illustration, is within the scope of the average amateur and will perplex many an experienced woodworker. It is a combined bridle and dovetail joint. Any kind of wood can be used, but hardwood, although a little more difficult to work, gives a better finish and appearance, the 1½-in. stock being preferred. The dovetail joint is left much thicker near the shoulder than at the top, to permit the dovetail to slide in place easily. The joint must be



Puzzle Woodworking Joint That Will Perplex Experienced Workers

well glued so that it cannot be pulled apart.—C. Illingworth, Vancouver, Can.

¶When sewing heavy socks or canvas, powdered rosin on the fingers will aid in pulling the needle through.

Printing with Acetylene Light

In the rural districts and at summer resorts, where electricity is often not available and the amateur photographer has no

city gas at his disposal, he must give up printing photos unless he decides to do it with a kerosene lamp, which is a very slow process. However, he need not despair, for here is a method of rigging up an efficient printer in a short time. It consists of a shallow, wooden box, about 20 in. long, an old auto or motorcycle headlamp of the gas type, having a good reflector, and a tank of acetylene gas. The lamp is clamped to the end of the box and the tank is connected to the lamp with a length of rubber tubing. A smaller box is placed inside of the larger one, upside down, to serve as a support for the printing frame. With this arrangement printing can be done in one-third of the time required with a kerosene lamp.—C. M. Wilcox, Torrington, Conn.

Repairing Cracked Rubber Battery Jars

It is not necessary to discard a cracked battery jar, for it can be repaired in the following way: Widen the crack to a V-shape with a three-cornered file, so that the widened part of the crack is on the outside. Then get a broken phonograph record and cut off a piece. Place the jar on its side and, with a hot soldering iron, run the piece of record into the crack. When the jar has cooled, a neat, smooth job will be the result.—Frank N. Coakley, Buffalo, N. Y.

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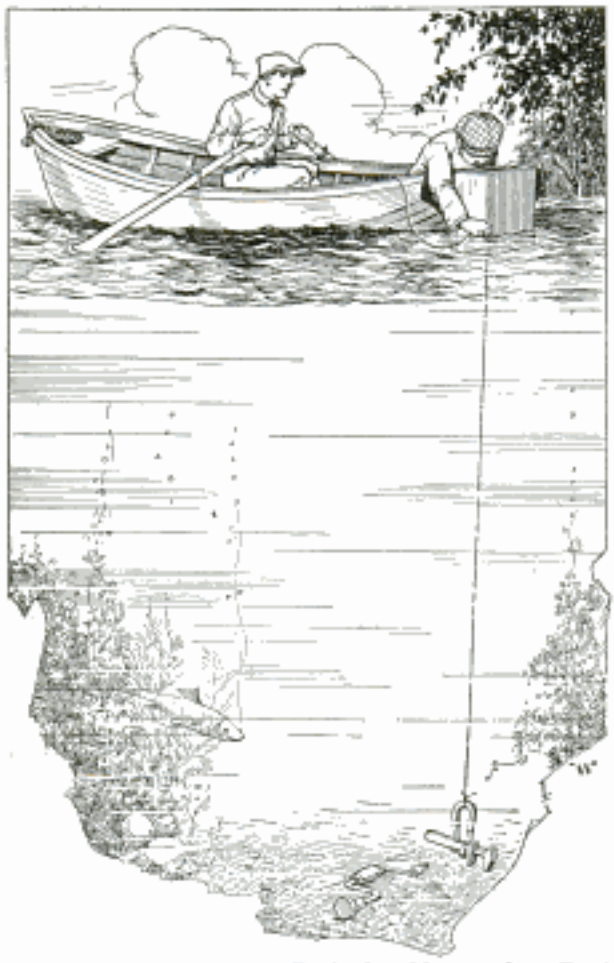
Salvaging Submerged Tools

When working over water it sometimes happens that tools fall overboard and are then given up as lost. However, I saved



Fishing Up Submerged Tools by Means of a Ford Ignition Magnet

over $50 worth of tools that had been accidentally dropped overboard, by the method shown in the illustration. All that is needed is a Ford magneto magnet and a length of strong cord. The magnet is securely tied to the end of the string and is lowered to the bottom to make contact with the metal tools; it has sufficient strength to hold them while they are pulled up to the surface.—Elmer M. Creighton, Avalon, Calif.

Pasteurizing Milk at Home

If you cannot obtain pasteurized milk and are doubtful about the purity of raw milk, you can pasteurize it easily at home on the gas range. Take a pail deep enough to allow water placed in it to reach the neck of a quart milk bottle. Place an inverted saucer in the bottom of the pail and set the bottle of milk on the saucer. Pour water into the pail up to the top level of the milk in the bottle. Put the pail containing the bottle and the water on the range and leave it there until the water boils. Then turn off the gas, remove the pail and let it stand, covered, for half an hour. Remove the bottle of milk and cool it quickly by letting cold water run over it. As soon as the milk is cool, place the bottle close to the ice in the refrigerator and keep it there until it is to be used. Boiling milk for three minutes will also make it safe for the feeding of infants.

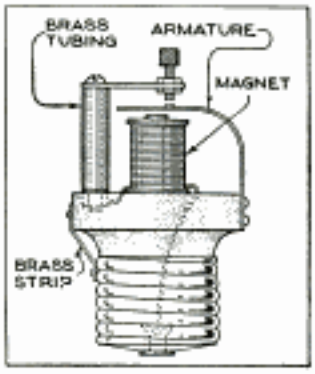
Removing Rusted Auto Wheel

After having failed by all ordinary means to remove a rear auto wheel that had rusted on, I hit on the following plan. I replaced the axle nut and turned it up tight, then backed it off one full turn and replaced the cotter pin. The car was allowed to run for a couple of days in this condition. At the end of that time the nut was removed and the wheel came off easily.—George Lukenbill, Gibbon, Nebr.

A High-Tone Buzzer Easily Made

The high-tone buzzer shown in the illustration, is made to fit into a lamp socket or fuse block, and gives excellent results when used for radio work or for test purposes.

The cap and fuse wire are removed from an ordinary fuse plug. Two small holes are drilled through the mica of the cap, one in the center and the other near the edge. The center hole is used in attaching the electromagnet and the outside hole in attaching the standard. A semicircle must be cut out of the brass edge of the cap around the standard, so that there will be no possibility of a short circuit at this point. The standard is made from a short piece of brass tubing fastened to the mica by means of a small bolt and nut. A portion of the porcelain should be chipped out to admit the nut, so that the cap will fit as tightly as before. The electromagnet is made by winding No. 24 enameled copper wire around a small flat-head bolt between two fiber washers. One end of the magnet wire is soldered to



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the contact inside of the bottom of the plug, as shown by the dotted lines; the other end is soldered to the nut holding the standard. After this has been done, the cap can be replaced over the porcelain. A brass strip is soldered to the edge of the cap and to the screw shell of the plug. The armature of the buzzer is made of clock spring. A fillister-head screw is used as an adjustable contact, and small nuts are soldered to the extending arm of the standard to hold the screw in place.—A. D. Keogh, Springfield, Ohio.

Stopping Leak in Wooden Water Tank

A leaky wooden tank can be made water-tight in the following manner: Find the approximate location of the leak, then take some dry cement and sprinkle it inside of the tank close to the staves on the bottom over and around the leak. When the tank is again filled with water, which is necessary to provide sufficient pressure, the cement will be forced into the crevices and will soon set. This repair method applies particularly to attic tanks, where the leak might destroy the plaster of the ceiling below.—W. C. Fink, Springdale, Pa.

Making Perspective Sketches

Sketching buildings and other objects in true perspective is usually difficult for the beginner, but can easily be done with the aid of a piece of clear glass. It is held against a tree or post or in any other way, and the outlines of the building are traced on the glass with a grease pencil. Of course, the glass must not be moved after the work has been started, and the worker must also keep his position exactly behind it while the sketch is being made. After the outline has been completed it is an

Easy Method of Making Perspective Sketches

easy matter to fill in the details.—J. G. Pratt, Washington, D. C.

Corn-Cutting Block

Corn ears can be cut up conveniently on the chopping block shown in the drawing. It consists of a small stump, the top of which is sawed to a V-shape slanting toward one side. This side of the block is cut away so that a pail to receive the cut ears

A Small Tree Stump Can Be Made into a Handy Chopping Block for Corn Ears

that drop will fit closely against it. A looped leather strap is nailed on the opposite side of the block to permit pulling it around or lifting it.

Staining and Painting Laths

A home builder, making some trellis work of laths, wanted to stain and paint them quickly. He plugged one end of a length of 2-in. pipe, and forced the lower end into the ground so that it would not tip over. Then he filled it with the stain or paint and dipped the laths. This method saved considerable paint and stain.—Mrs. V. S. Martin, Detroit, Mich.

Eliminating Linoleum Troubles

The failure or short life of linoleum is due in many cases to springy, worn-out and decayed boards, loose joints between the boards and large knots. These defects must first be removed to make the linoleum last longer. All the floor felt used will be of no avail unless the foundation is right.

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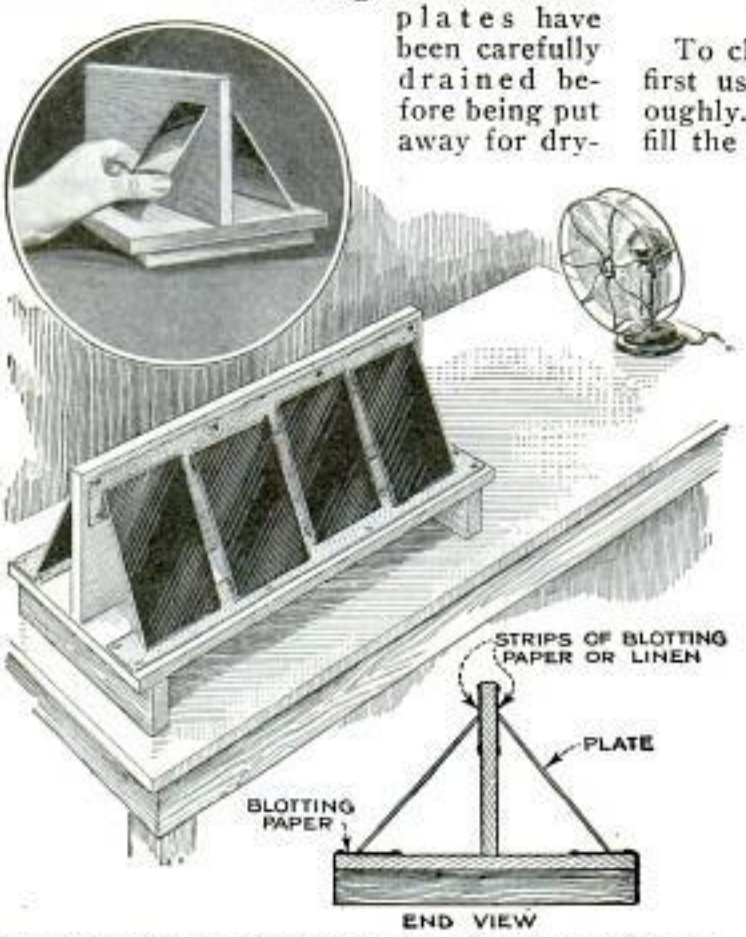
Frame for Drying Plates

Plates and films dry very slowly as the water draining from the sensitive coating collects at the bottom edges. Even if the plates have been carefully drained before being put away for drying, a great deal of moisture accumulates again in a short time and delays the process. In the new drying device shown in the illustration, this accumulation of moisture is prevented by resting the plate edges on strips of blotting paper. These absorb the moisture and spread it over a large surface so that it can evaporate in a few minutes. The framework of the device is made from two boards; a horizontal base and an upright, fixed at the center of the base. Where the plates touch the boards, strips of blotting paper or linen, about 2 in. wide, are tacked on. The friction between the plate edge and the blotting paper suffices to hold the plates in position; if flat films held in metal frames are to be dried with the aid of this device a narrow strip of wood may be nailed to the outside edges of the base, to prevent the frame from sliding off. The film side of the plates should face the base to prevent dust or grit settling on the sensitive side. An electric fan can be set up at one end of the frame, as shown, so that the current of air will hasten the drying.—C. A. Oldroyd, Barrow-in-Furness, Eng.



Simple Wooden Frame, with Strips of Blotting Paper Tacked On, Makes a Good Plate Drier

Restoring a Rusted Rifle

To clean the bore of a rifle or shotgun first use soap and water, and dry thoroughly. Cork the chamber tightly and fill the bore with the following anti-fouling solution, which must be freshly mixed at the drug store and kept tightly closed until used: Ammonia, containing 28 per cent gas, 3 oz.; water, 2 oz.; ammonium persulphate, ½ oz.; ammonia carbonate, 100 grains. Allow the solution to remain in the barrel half an hour but no longer, pour it out and immediately dry the bore thoroughly. Scrub it well with a new close-fitting brass-bristle brush. Then repeat the operation with the anti-fouling solution, drying thoroughly immediately after pouring it out, as before. Scrub the bore well for some minutes with patches heavily greased with rust remover, clean out the rust remover and oil the bore.—Earle W. Gage, Ashville, N. Y.

Improvised Electric Stove

Three electric toasters, which can be obtained for a small sum, make a good stove for preparing light meals and lunches. They are mounted on a ¾-in. board, about 6 in. wide and 2 ft. long, which is nailed to 3-in. side and endpieces. The toasters are wired in parallel and each one is provided with a separate single-pole switch, so that it can be turned on or off as desired. The wiring is all done underneath the top.—Milton A. Ayers, San Francisco, Calif.

Improvised Three-Burner Electric Stove for Preparing Light Meals and Lunches

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CELLULOID
Celluloid, Its Raw Material, Manufacture, Properties and Uses, by F. Beckman
MANUFACTURER $4.25

Craft for the Home Worker

By HERBERT C. McKAY

FOR those who enjoy home-craft work, there is nothing which will be found to be a more versatile medium than celluloid. This material is now supplied in various colors and various weights. The weights vary from the thin sheets about like heavy wrapping paper to any desired thickness. The heaviest weight ever required will be ⅜ in., and the 1/16-in. stock will be fine for imitation carving. The physical nature of celluloid is such that it may be carved, sawed, cut, turned or manipulated in any desired manner with the utmost ease. It does not split or crack readily, yet its texture is such that it is easily worked, and it is not expensive.

For the first experiments, the thin sheets will probably prove most satisfactory. Provide yourself with a half dozen sheets of celluloid in various colors. You will also want the following equipment: One set of air-drying china colors or a set of enamel colors; three small brushes; one stencil knife; assorted bronzes and celluloid cement. The last is made by mixing 2 parts of acetone and 1 part of amyl acetate. This is the cement used in patching motion-picture film. It is not truly a cement, but softens the celluloid and under slight pressure the softened surfaces of the material unite, making a joint of the nature of a weld.

In these days when the check book is so rapidly taking the place of the purse, the signature blotter has come to be recognized as a necessity. The small blotters furnished for this purpose soon become broken and soiled in use, but if provided with an "ivory" backing they will give long service and be ornamental. To make such a blotter, cut a piece of celluloid 3 in. long and ½ in. wide, Fig. 1. Cut the ends round and glue a strip of blotting paper to this celluloid. Then, in bronze, or enamel place some decorative design upon the back of the blotter.

If you wish to make a somewhat more elaborate blotter, it may be done this way. Cut three pieces of celluloid 1½ by 3½ in. In one piece cut a diagonal slit in each corner as shown in Fig. 2. To this cement a second piece by the edges only. You can now insert 1 by 3-in. strips of blotter in this holder by pushing the corners of the blotter into the slits. Cut an opening in the third piece of celluloid, large enough to serve as a frame for a photograph of vest-pocket size. Decorate the front of this piece and then glue the photograph to the back in such a manner that it shows through the opening. In this step ordinary glue must be used as the celluloid cement will not do. If you wish to make a completely finished blotter you will need in addition a sheet of the thinnest transparent celluloid and a fourth sheet of colored stock, Fig. 3. Cut the transparent celluloid the same size as the first sheet and cement this to the back of front sheet before inserting the photograph. Then glue the photograph in place and finally cement the colored stock to the back of the sheet covering the photograph. You will now have an opening in the front sheet and in this opening will appear the photograph protected by transparent celluloid, and the back is covered to conceal the mounting. Now with an eyelet paper fastener hinge the two completed sheets together, but do not crimp the fastener too tightly. The two sheets may then be swung apart, the fastener

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Steps in Making Nail Files and Check-Book Blotters; Carving and Fret-Sawing Heavy Celluloid for Paper Knife

acting as a pivot. This will expose the blotter. When not in use the whole is closed and the blotting surface protected.

By immersing the celluloid in water at about 110° to 125° F. and leaving it there a few moments, it may be bent in any desired shape and, after cooling, will retain this shape. This is of advantage in making such implements as a nail file. To make this article secure a blade from a discarded file or purchase a small file without a handle. If the tang is hard, it may be annealed by heating in an alcohol flame. Then drill a hole a little larger than the paper eyelet, and prepare the handle as follows: Cut a strip of celluloid ⅛ in. wider than the widest part of the blade, and 1 in. longer than twice the length of the blade from the point to the center of the hole, Fig. 4. Bend this strip in the middle by immersing in hot water. Then punch a hole through the two free ends at the same time. Insert the blade and set an eyelet through both thicknesses of celluloid and through the blade. The blade will now fold into the celluloid, jackknife fashion, Fig. 5. Finish the file by trimming the celluloid around the eyelet and decorating.

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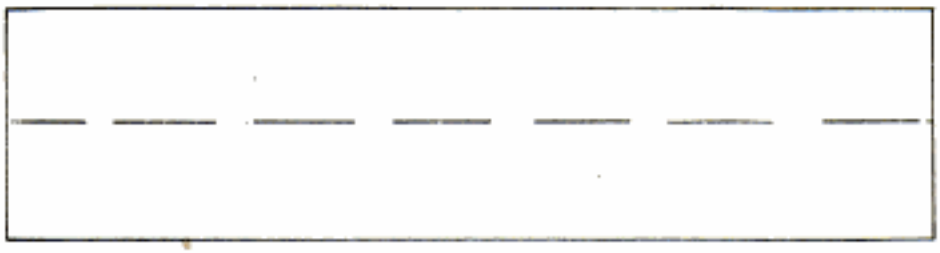
When you have made these smaller articles, you will be ready to attempt more ambitious forms of celluloid craft. A most beautiful desk set can be easily made. Cut the shapes for the four corners as shown in Fig. 6, and score them with a knife along the dotted lines. Immerse them in hot water, and, when soft, bend along the knife scores which will help to make the bends straight. Lay these under slight pressure until dry. Then cut two strips, about 8 in. long and 2 in. wide, Fig. 7. Score these down the center and bend to form two channels 1 by 8 in. Place under pressure to dry and cool. These strips are for decorative edges for the blotter. When cool, the channels and corners are set with edges together. There is enough spring in the celluloid to allow the blotter to be inserted, and this spring will cause the corners and channels to grip the blotter firmly. These pieces are now ready for decoration.

The rocker blotter is made by cutting a strip of heavy celluloid 3 by 6 in., Fig. 8. This is scored across each end and ½ in. turned back until it forms an angle of about 45° with the back. Now cut a piece of rather heavy tin plate, 3 by 6 in. Insert one end of this under each turned end of the back. This will form a curved spring plate. Cut a strip of blotter, 3 by 7 in., and after removing the spring, place the blotter over the spring and replace it in the back. This completes the blotter which is now ready for decoration. The treatment of the heavy stock is the same as with the thin, but in shaping a longer immersion in hot water is necessary and for cutting, a coping or fret-saw is to be used instead of the stencil knife or scissors.



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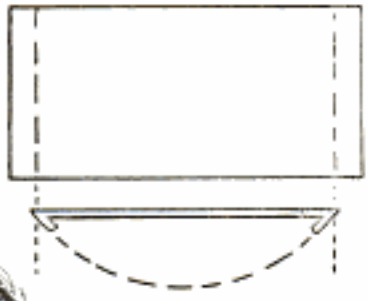

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6

Outlines of Corners and Edges for Desk Blotter and Celluloid Back for Rocker Blotter; Below, Finished Desk Set

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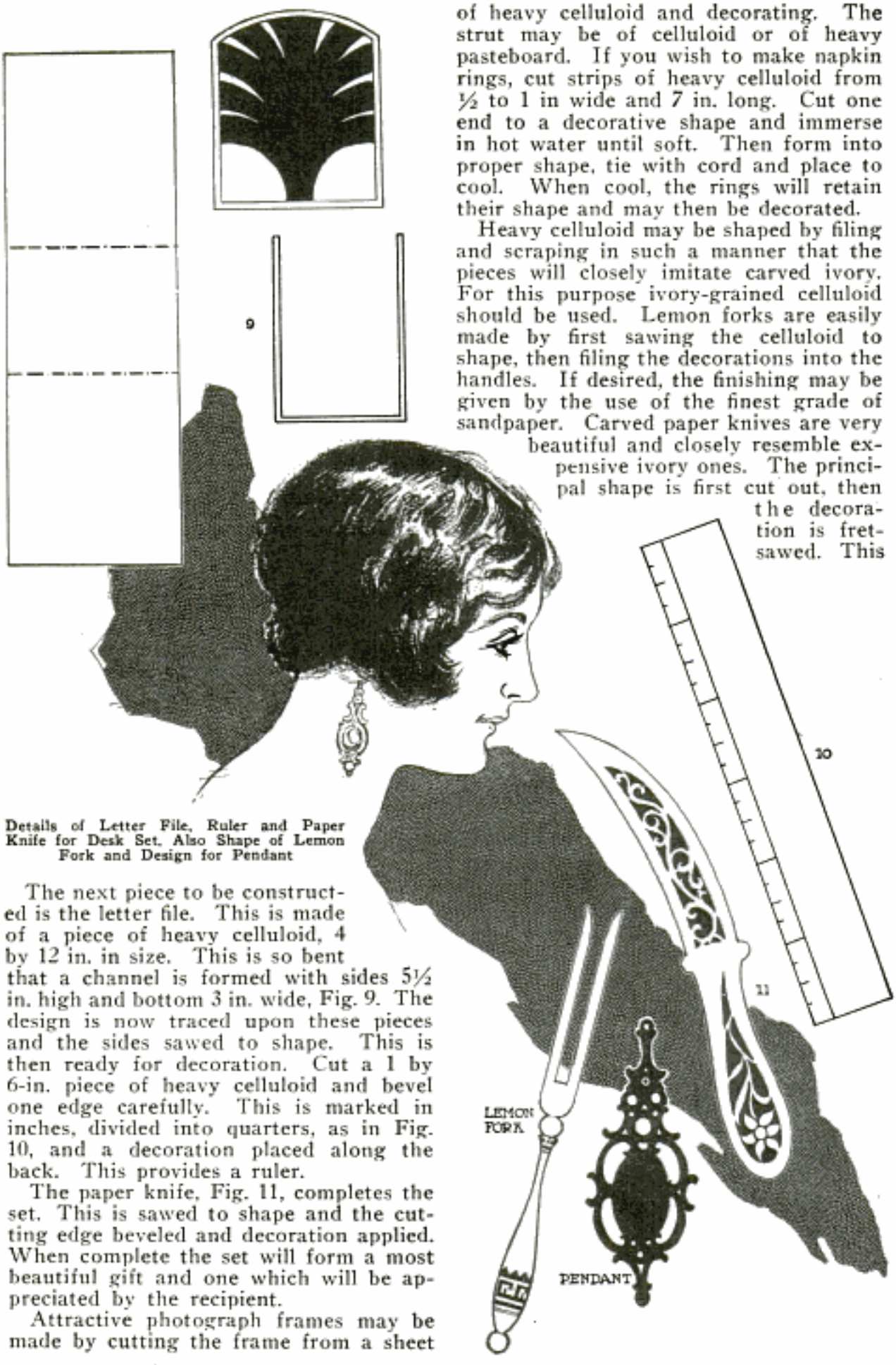

Details of Letter File, Ruler and Paper Knife for Desk Set. Also Shape of Lemon Fork and Design for Pendant

The next piece to be constructed is the letter file. This is made of a piece of heavy celluloid, 4 by 12 in. in size. This is so bent that a channel is formed with sides 5½ in. high and bottom 3 in. wide, Fig. 9. The design is now traced upon these pieces and the sides sawed to shape. This is then ready for decoration. Cut a 1 by 6-in. piece of heavy celluloid and bevel one edge carefully. This is marked in inches, divided into quarters, as in Fig. 10, and a decoration placed along the back. This provides a ruler.

The paper knife, Fig. 11, completes the set. This is sawed to shape and the cutting edge beveled and decoration applied. When complete the set will form a most beautiful gift and one which will be appreciated by the recipient.

Attractive photograph frames may be made by cutting the frame from a sheet of heavy celluloid and decorating. The strut may be of celluloid or of heavy pasteboard. If you wish to make napkin rings, cut strips of heavy celluloid from ½ to 1 in wide and 7 in. long. Cut one end to a decorative shape and immerse in hot water until soft. Then form into proper shape, tie with cord and place to cool. When cool, the rings will retain their shape and may then be decorated.

Heavy celluloid may be shaped by filing and scraping in such a manner that the pieces will closely imitate carved ivory. For this purpose ivory-grained celluloid should be used. Lemon forks are easily made by first sawing the celluloid to shape, then filing the decorations into the handles. If desired, the finishing may be given by the use of the finest grade of sandpaper. Carved paper knives are very beautiful and closely resemble expensive ivory ones. The principal shape is first cut out, then the decoration is fret-sawed. This

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will leave the article in rough shape. Then, with a sharp knife and fine files, round each piece until all roughness disappears. Finish by sanding with fine sandpaper wrapped about a match. If carefully done, the work will be most attractive. Earrings may be made which will surpass any that can be purchased in the stores, yet can be completed in a day. These are made in a manner similar to that employed in making the paper knife, except that the material is rounded on both front and back, as both sides are visible when the pendants are worn.

Various Celluloid-Craft Articles Easily Made by the Home Worker

Decorative chains may be made by fret-sawing the individual links and splitting them. When the chain is assembled, the links are cemented, and the chain will be to all intents solid. This may be combined with sawed and carved ornaments to make attractive girdles and neck pieces.

The suggestions given in this article together with the drawings will enable anyone, with a little practice, to make many other most attractive gifts from this material; and as this form of art-craft work is, as yet, more or less uncommon, such gifts in addition possess the charm of novelty and therefore should prove most acceptable.

Reviving Inking Pads

When inking pads reach the point where they do not ink the stamps sufficiently to make a good impression, merely turn them upside down for several hours or leave them turned upside down overnight, and the next day they will be in good shape again. Constant use absorbs and forces the ink from the top of the pad to the bottom, and turning the pad upside down allows the ink from the bottom to seep toward the top where it is needed.—H. A. Courtney, Atlanta, Ga.

¶A cover for the spare tire will pay for itself in a short time. It is estimated that an unprotected tire may lose as high as one-third of its normal mileage.

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Guard for the Sprinkler

It is quite difficult to water a lawn along a sidewalk with a sprinkler without annoyance to pedestrians. This trouble was satisfactorily overcome by use of the guard shown in the drawing. A piece of galvanized sheet iron was cut in an ornamental form, painted with a suitable design, and then soldered to two heavy-wire legs. By setting the guard into the ground at the proper distance from the sprinkler, the water can be kept away from the sidewalk. The size of the guard is dependent, of course, on the type and size of the sprinkler used.—Harold E. Benson, Boulder, Colo.

Sheet-Metal Guard Prevents the Sprinkler from Wetting Passing Pedestrians

Eradicating Insect Pests

Of the many domestic pests common in warm weather, the ordinary red ant is one of the most difficult to get rid of. It is particularly hard to poison, requiring a specially prepared, attractive bait, and it is not susceptible to the various "contact poisons," as are roaches and many of the agricultural pests. Ants, as well as all other insect pests, are usually attracted by food, such as starchy material, sugar, etc. Very often a complete and thorough house cleaning will do much to eliminate them. Where this is not effective, one of the best eradicators for these insects, ants included, is common cresol or cresylic acid, which can be obtained at any drug store or chemical-supply house. It may be applied in the concentrated form to the floor or other woodwork where the insects travel, or it may be diluted with an equal volume of kerosene before application. In the case of buildings supported on posts, it is usually sufficient to saturate these supports thoroughly with the cresol so that the pests cannot reach the building. When handling it, care must be taken that it does not come in contact with the skin or any part of the body as it will cause a severe burn. If it should come in contact with the body, it should be removed immediately by first washing the part with denatured grain alcohol (not wood alcohol) and then with plenty of soap and warm water. When diluted with kerosene, care must be taken to avoid danger from lights and fire. The cresol has a strong odor and can therefore only be used in places where this odor is not objectionable. The odor generally disappears in a few days or a week, but the effect lasts a month or more. Where the anthills can be found, cresol may be poured into the entrance and will cause considerable destruction to the inhabitants. This chemical also has a very high disinfecting or antiseptic value.—Chas. E. Mullin, Camden, N. J.

Basketball Scoreboard Made by School Class

The photo shows a basketball scoreboard somewhat out of the ordinary. The face is made of wallboard, with a covering of black slate and with figures and letters painted on it with white enamel. The name of the home team is put on with paint while that of the opposing team is chalked in each time. A set of number cards are also made of wallboard; these are painted black and the numbers are painted on in white. The cards are fitted with screweyes at the top and are hung on hooks screwed into the scoreboard. A clock with a large hand, indicates the time in minutes for each quarter, which is eight minutes. To indicate which quarter is being played, a hole is cut in the board and a round dial containing the numbers 1 to 4 is pivoted on the back. The photo shows how the quarter dial is turned.

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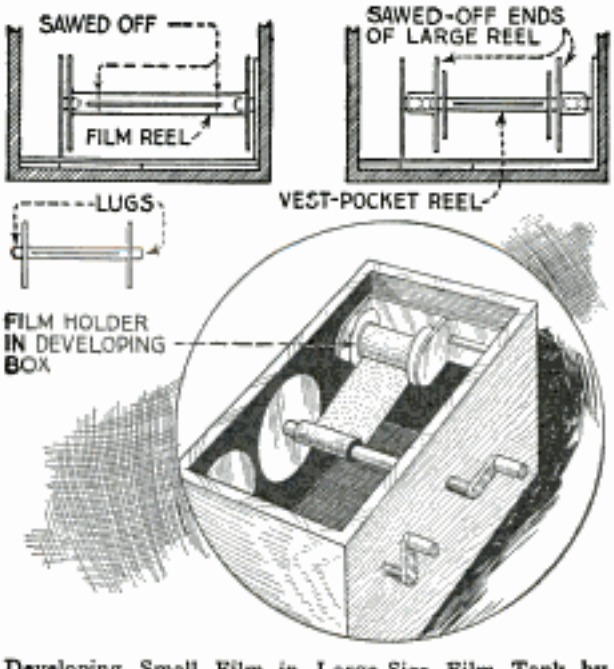
Cleaning Oil from Chassis

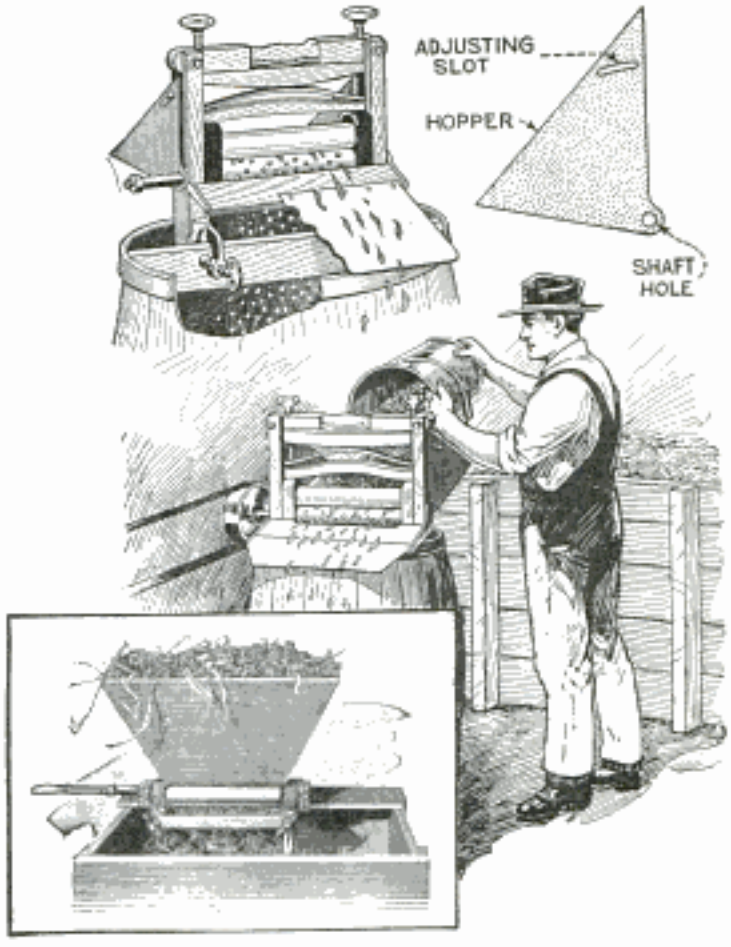
When you wash your car, the grease found on the chassis is quite difficult to remove. A good method of doing this is as follows: Into a tin can holding 2 qt. or more, pour 1 qt. of hot water; cut up one-fourth of a cake of yellow laundry soap into thin shavings and dissolve in the hot water, then add two or three tablespoons of gasoline to this solution. Use a stiff, medium-sized paintbrush, either flat or round, to apply the mixture to all the greasy places on the car. You will find that this will clean off the oil like magic.—J. H. Downie, San Antonio, Texas.

Film-Developing Tank Adapter

I wanted to use my 2½-in. film-developing tank for developing a small film used in a vest-pocket camera. As the smaller reel did not fit in the holder for the larger film, I made an adapter. A large-size reel was sawed off near the flanges, as indicated in the upper left-hand detail, and these flanges were pushed over the ends of the smaller reel, which permitted the flanges of the larger reel to fit in the sockets of the developing tank. This arrangement will hold the reel securely and permit the film to be unwound correctly.—Milton Robertson, Alameda, Calif.



Developing Small Film in Large-Size Film Tank by Means of an Adapter



Dry Peas and Beans Can Be Quickly Hulled with an Old Wash Wringer Equipped with Hopper

Shelling Peas and Beans

Shelling peas and beans can be accomplished quickly with the aid of an old wash wringer. Two kinds of hoppers are shown in the illustration. The one above is made of sheet metal, the sides being cut to the shape shown, and is attached to the wringer so that its bottom is level with the top of the lower roller. It is supported on the shaft, and is attached to the wringer uprights with wood screws, an adjusting slot being provided so that the hopper can be tilted to make the feed more or less automatic. The wringer legs are clamped to a length of 2 by 4-in. wood, which is nailed across the opening of a barrel.

The hopper shown in the photo is slightly different in construction. In this case the hopper is made of wood, and is mounted above the rollers of the wringer, which are arranged horizontally. After the peas and beans are thoroughly dry, they can be run through this improvised huller, the rollers being adjusted so that the peas and beans will not be cracked. The wringer may be driven by a small engine or motor or turned by hand.—A. C. Brundage, Rochester, Minn.

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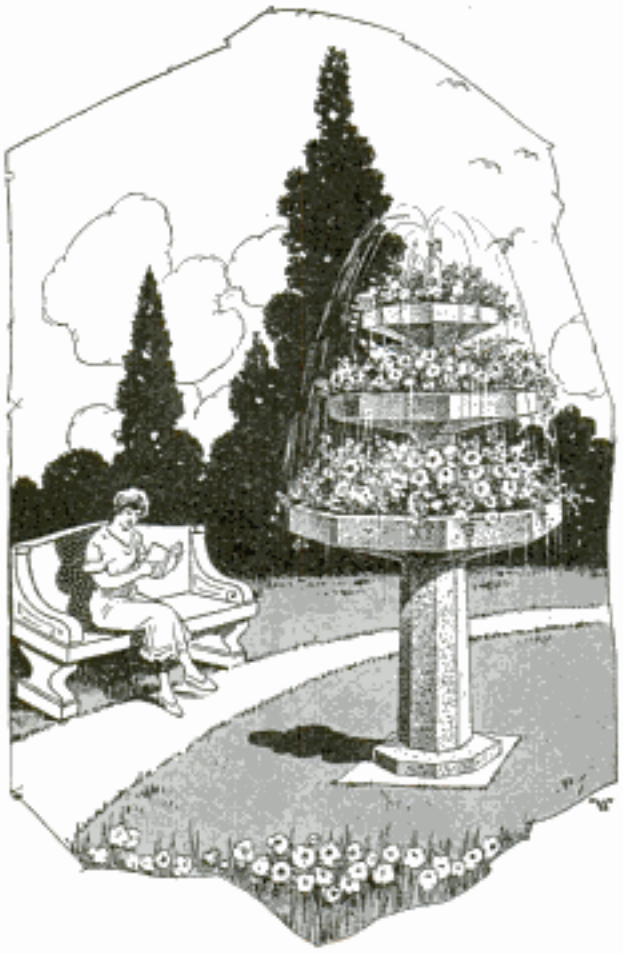

Novel Flower Bed with a Sprinkler Above Makes a Picturesque Addition to the Garden

Unusual Flower Bed Built Like Bird Bath

Resembling a bird bath, the flower bed shown in the illustration is quite unusual. It has three "decks" ranging in size from 16 to 30 in. in diameter. These are octagonal in shape and each is about 3 in. deep. The center post is 60 in. high. The frame is built first of wood, well seasoned and creosoted. This is covered with metal lath to which stucco is applied. The bed is securely fastened on a concrete base in the garden or on the lawn. A pipe is run up through the center post and is equipped with a small sprinkler at the end so that the flowers can be watered.—Dale R. Van Horn, Walton, Nebr.

Garage Drives of Crushed Stone

Crushed stone makes an excellent driveway from the garage to the street, if the owner cannot enter from the alley, and one that is not only attractive in itself, but is also cheaper than concrete.

The stone should be spread evenly over the drive to a depth of 4 or 5 in. and tamped down well, using a mixture of sizes. Over this, a top dressing of screenings should be placed, to form a sort of bond for the coarser material; this dressing should be 1 in. thick. A barrel of the screenings should be kept about the house so that ruts can be repaired while the drive is new, and before it has been rolled down solidly by the passage of the car. After six months' use, the drive will require little or no attention, and it will be found to last practically as long as a concrete drive.

Clean Chimneys Save Trouble

To function properly, a chimney must be clean, and many home owners will find that the only reason the furnace does not heat the house as well as it formerly did, is that the chimney has not been cleaned for five or six years. This is usually the most neglected part of the heating installation, in spite of the fact that it is just as important as any other part. Whenever the heating capacity of the furnace falls off and there is no sign of anything wrong in the furnace itself, try having the chimney cleaned.

Cheap and Novel Hall Seat

A child's crib, long out of use, was brought down from the attic and transformed into a neat, cheap hall seat, which served its purpose just as well as a purchased one. The crib was made of oak and was strong and sturdy. The rockers were removed and casters were fitted on the legs. The rail and spindles were removed from one long side, and a new heavy mattress obtained. This was covered with cretonne to match the drapery of the hall. Wooden slats were, of course, provided under the spring to give support. The crib was carefully scraped, sandpapered and then finished like the other furniture. Now it stands under the hall window and makes a comfortable seat.—Mary S. Hitchcock, Hannawa Falls, N. Y.

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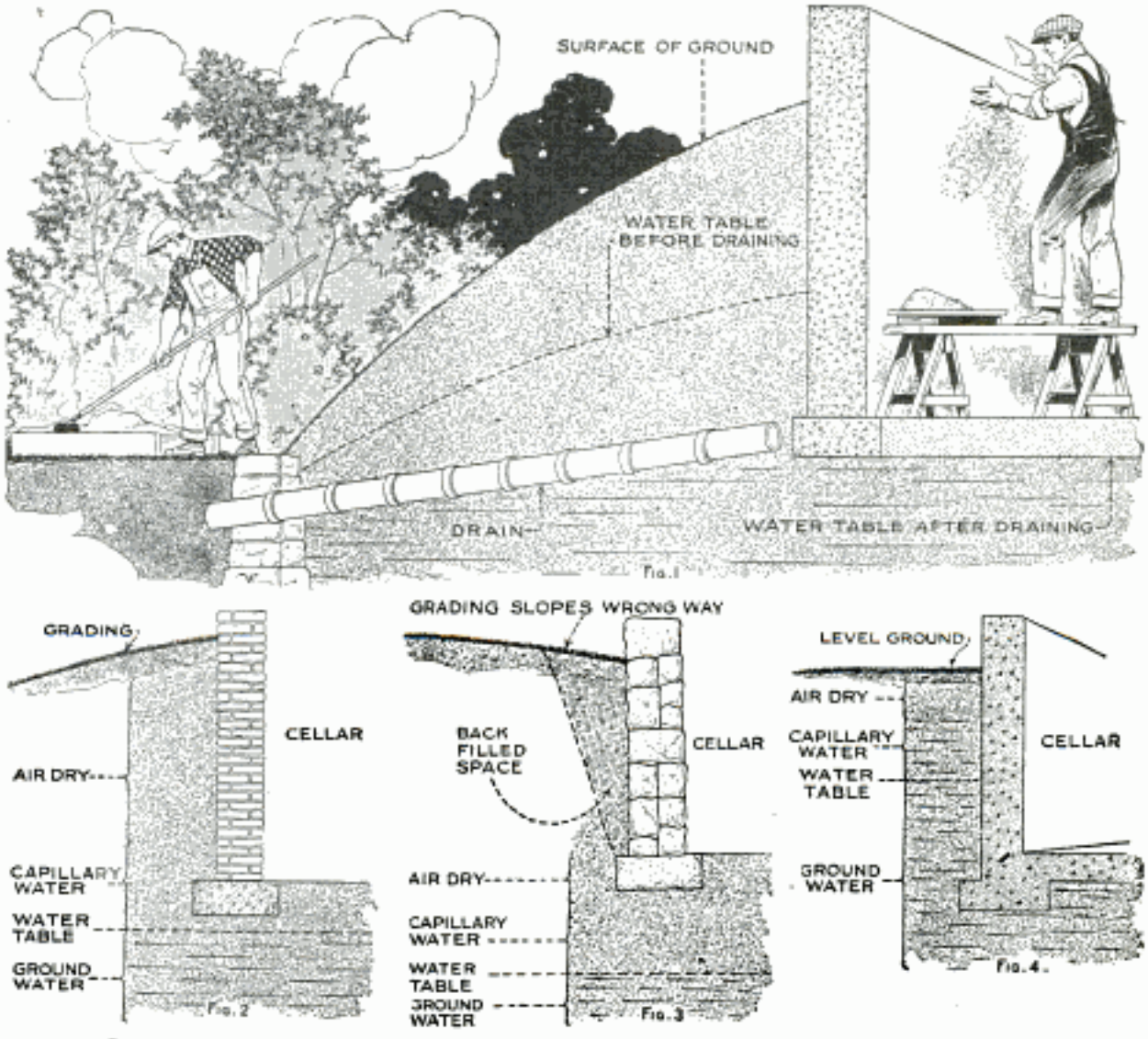
To Keep Your Cellar Dry

Easily Applied Ways to Add to Value, Comfort and Convenience of the Home

REAL-ESTATE dealers say that a good cellar adds $500 to the selling price of an average dwelling, and, while this may not be universally true, there is no doubt that the comfort, convenience and health of those who dwell in a house are considerably enhanced by a dry, clean cellar. Dry air is a poor conductor of heat, and it promotes evaporation, which is a cooling process. Moisture invites decay, corrosion and the growth of many forms of life that are injurious to man. For these reasons a dry cellar is better insulated and less subject to outside temperature changes than a damp one. The latter is a poor place for the storage of vegetables, fruits and other foods, and is bad for pipes, floors, tools and other utilities, as well as being unsanitary.

As it is better to avoid mistakes than to correct the consequences, the choice of a site is of the utmost importance. The essential points for the prospective builder to observe are the following: The site should be moderately elevated so that a fall in at least one direction from the building is obtained; the ground should be open and porous, so that air and water are admitted readily, like sands, gravels and soils capable of good cultivation. The vegetation should not be too plentiful, and the soil and subsoil should be clean; the site should be well and deeply drained. During the wet season of the year the ground water should be at least 10 ft. below the surface of the ground and preferably 15 ft. The distance between the ground water and the bottom



Conditions That Lead to Damp and Water-Logged Cellars, and One Method of Curing Them

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of the cellar depends to a great extent on the character of the soil and the type of floor to be used. In exactly the same manner as oil rises in a lamp wick, water will pass through the minute spaces existing in soil. This capillary rise in coarse sands and gravels may be no more than 2 or 3 ft., but in very fine sands, silts and clays it may reach as much as 8 ft. No site should be chosen before the source of the domestic water supply has been determined, its purity and abundance, and before fixing on the location of a suitable plot of ground in which to waste sewage and other drainage.

The causes of wet and damp cellars are diagrammatically represented in Figs. 1 to 4. In Fig. 1, the cellar bottom is below the natural water table, but in this case the ground slopes so that the table may be lowered by proper drainage. In Fig. 2 the grading slopes the right way and the water table is below the bottom of the cellar, but the cellar will be damp because the capillary water rises to the floor. Fig. 3 shows the condition when the water table is well below the floor, and the capillary water does not rise enough to do any harm; this has been nullified, however, because of poor back-filling and a faulty grade, so that surface water from the eaves, from rain or melting snow, can pass into the cellar. In Fig. 4, the cellar bottom is below the water table and drainage cannot be obtained.

Where a cellar, due to poor construction and grading, becomes a sump for the collection of water from downspouts, snow banks or other surface sources, a very effective method, and one that adds to the appearance of every low-set dwelling, is to place additional filling against the cellar wall, and grade it down to a smooth sharp slope that extends at least 8 or 10 ft. from the wall (see Fig. 1). It should be seeded with a good lawn grass

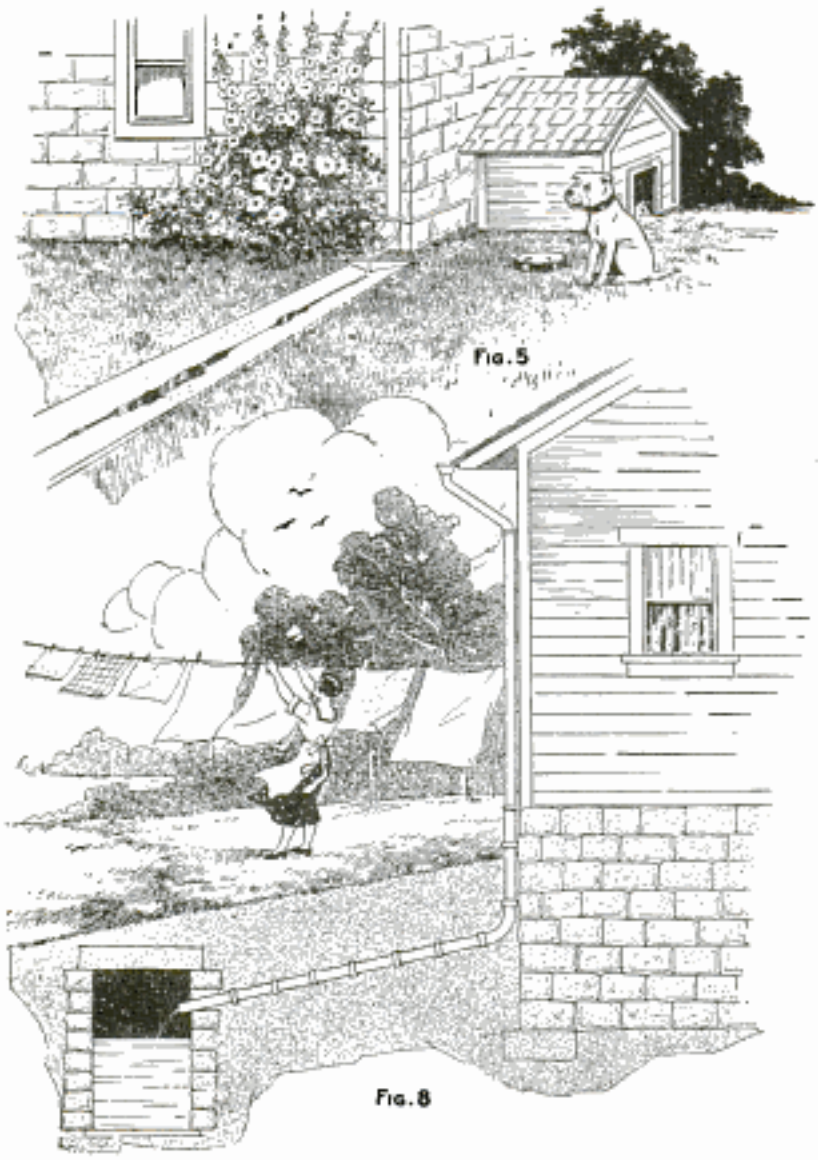

Fig. 5

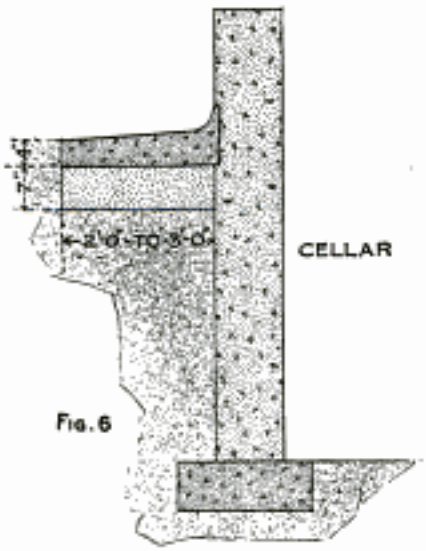

Fig. 6

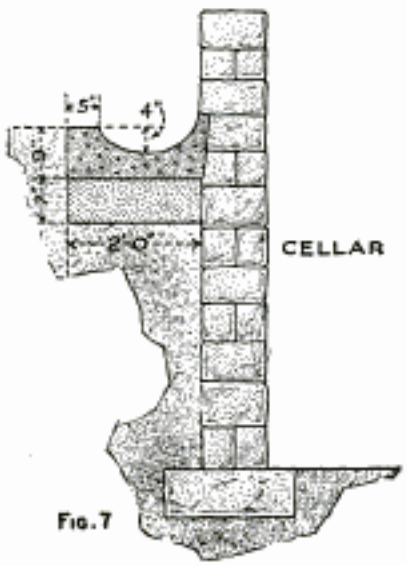

Fig. 7

Fig. 8

Two Methods of Curing Surface Seepage, and Two Ways of Leading Off Water from Downspouts

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and rolled well or otherwise firmed. To shed the water properly, it is essential that the grade be as steep as practicable. If necessary to grade as high as the cellar windows a curved or rectangular well or hatchway of brick or concrete should be

Left, Plaster Coat Applied over Coat of Damp-Proof Paint; Right, Use of Roofing Brush to Apply Damp-Proofing to Outside Wall

built around them, and hinged covers for closing these during a heavy rain or snowfall should be provided. Another method is to lay a sloping pavement or gutter, 2 or 3 ft. wide and composed of Portland cement, as in Figs. 6 and 7. The foundation for the walk or gutter should be of well-tamped cinders (not ashes), slag, coarse sand gravel or stone, and it should be wetted thoroughly just before placing the concrete. The wall surface adjacent to the concrete should be cleaned, brushed with a wire brush and roughened with a stone hammer, then thoroughly wetted and plastered with neat-cement mortar just before placing the concrete. For one-course work the concrete should be made in the proportions 1:2:4, laid 4 to 4½ in. thick and troweled, to a firm, non-absorbent surface with steel trowels. For two-course work the base course should be mixed in the proportions 1:2½:5, or 1:3:5, and laid 4 to 4½ in. thick, followed within 15 minutes with a ½ to ¾-in. course of 1:2 cement mortar worked to a smooth, hard finish with steel trowels. Only so much water should be used in the concrete that, under moderate tamping, it will just flush to the surface.

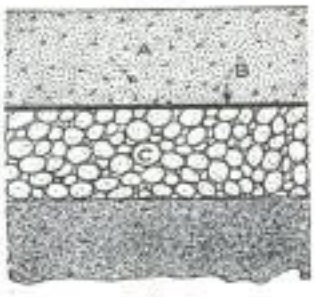

Fig. 9

Where no use is made of the rain water, it is always desirable to conduct it away from the cellar walls. In one house where the grading was excellent, water worked into the cellar after a heavy rain. The trouble was traced to a downspout, and it was remedied in the simple manner shown in Fig. 5. A small, half-round concrete gutter, with the top just level with the surface of the ground, and about 6 ft. long, was laid under the offending spout, and carried the water far enough from the wall to overcome the trouble. The same result may be attained by using a regular eave gutter, a U-shaped wooden trough, or a length or two of vitrified channel pipe on the ground. The water from the downspouts can also be led to a dry well located 15 or more feet from the building, as shown in Fig. 8, or piped to a suitable surface outlet.

Where the bottom or the walls of the cellar are within the reach of capillary water only, dampness, not standing water,

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is the consequence. This trouble may be eliminated by damp-proofing the floor and walls. Fig. 9 shows one method in common use for keeping capillary water away from cellar floors. The essential principle is that of an abundance of air-filled space C, secured, in this case, by a 5-in. layer of clean, coarse broken stone or screened gravel, between the ground and the concrete floor A. The concrete is mixed in the proportions 1:3:5, and is laid 4 in. thick. On top of the stone is laid a layer of cheap roofing paper B, to keep the fine materials in the concrete from settling between the stones until the concrete has set. The top of the concrete should be troweled to a smooth, hard surface.

Where it is desired to prevent or reduce dampness in existing stone, brick or concrete walls or floors, or to shed water down the walls, the simplest method is to apply two coats of specially prepared damp-proofing paint. The surface to be treated should be thoroughly clean, and the paint must be brushed into all pores, hair cracks and inequalities, leaving a smooth continuous coat. Where a painted floor is subject to heavy or constant wear it should be protected. A thick plastering of Portland cement, rich and smoothly troweled, is frequently used for this purpose. Similar treatment of the outside of walls, both above and below the ground surface, is a great aid in protecting the damp-proofing and preventing flaking and peeling. A large brush should be used in applying the bituminous paints to the outside of cellar walls. A roofing brush makes a good tool for this job. Where the use of damp-proofing paints and coatings is contemplated, one should always get full directions from the manufacturer.

When the cellar bottom is below the water table and a drainage outlet can be obtained within a reasonable distance, a drain should always be constructed for lowering the ground water at least as far as the bottom of the foundation walls and the underside of the cellar floor. Fig. 10 shows a 4-in. tile drain laid 6 in. below and outside of a cellar wall. The pipe should be sound hard-burned or vitrified drain tile, or ordinary sewer pipe with socket joints. Nothing smaller than 4-in. pipe should be used. The grade or fall should be smooth and regular and, to guard against settlement of the soil within the pipe, it should be made as great as possible. If it is certain that only clear water will enter the pipe, the fall may be as small as 3 in. in the foot. Each pipe should be carefully bedded its full length so as to avoid uneven loading and liability of breakage. The joints must be kept open about the thickness of a knife blade and, to prevent entrance of loose earth, should be wrapped with strips of burlap or similar material about 6 in. wide and 15 in. long, tied on with wire or stout string on each side of the joint. The pipe should be surrounded with fine screened gravel or broken stone, after which similar, but coarser material, say about ½ to 1-in. size, is used to cover the pipe to a depth of 1 ft. On top of the broken stone it is well

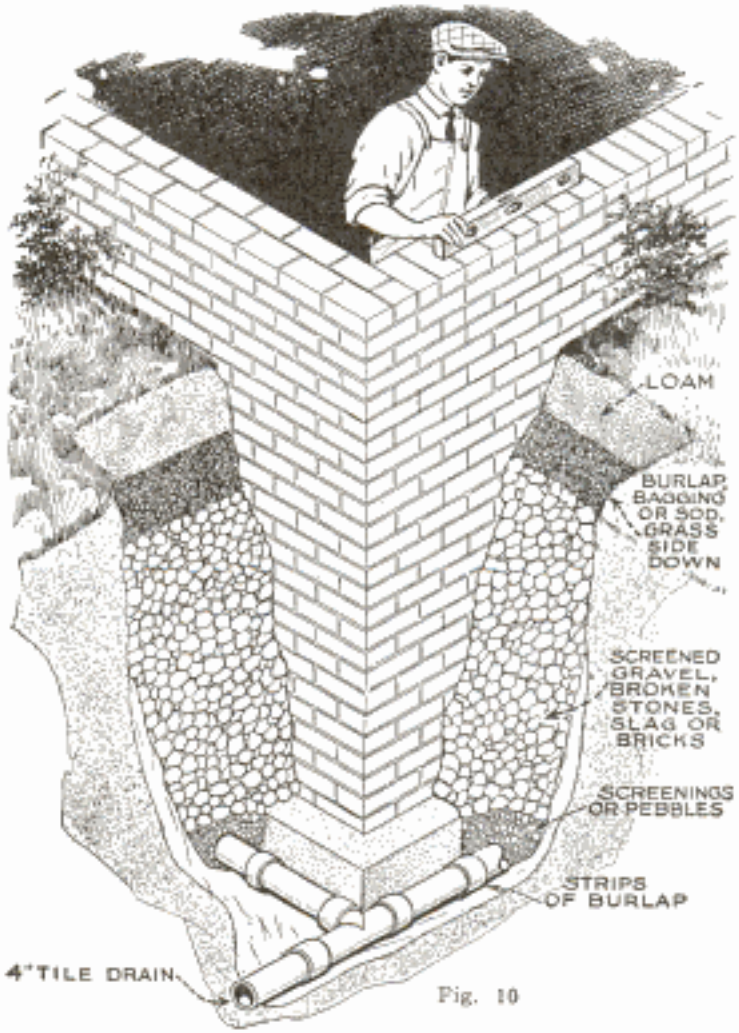

Fig. 10

Method of Laying Drain Tile outside and below Cellar Wall to Control Ground Water

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to spread burlap or bagging. Sods, grass side down, hay, straw or brush may also be used with fair success. Where the building is situated on a hillside, and the soil against the cellar wall is likely to be saturated, the coarse-stone filling should be brought up to the surface of the ground, and the top soil placed, graded and seeded in the usual way. A belt that not only collects ground water but effectively intercepts seepage and capillary water is thus placed around the cellar, or on the sides where the flow comes. If the site of the cellar is very soft or springy, two or three branch drains should be laid under the cellar floor.

Attractive Wren House

Of all the wren houses I have made during the last 20 years, I have never found one that will attract the birds as the one shown here does. It can readily be built by any boy with material taken from orange or lemon crates. The house is about 8 in. high and the gable can be cut to any design. The fence can be made of wood or metal; a strip of sheet metal from which punchings have been cut is useful for this purpose. After the house has been completed it should be given a coat of paint; a gray and white combination makes an attractive job. The house, which should be screwed together, to permit easy cleaning, is mounted on a standard or fastened to the limb of a tree.—Addison Bain, Marion, Ohio.

Attractive Wren House That Any Boy Can Make of Odds and Ends

Preventing Loss of Outboard Motor

After hearing several motorboat enthusiasts tell how they had lost their small outboard motor while attempting to transfer it from one boat to another or from boat to dock, and also coming very near losing my own in this way, I devised a simple safeguard against such a mischance. A 12-ft. length of ½-in. rope was fitted at both ends with snap fasteners, one to be attached to an eyebolt on the gunwale of the boat, and the other to the motor through a bolt hole. The rope is left attached to the motor at all times.—J. E. Hoag, Los Angeles, Calif.

Preventing Loss of Outboard Motor by Means of Safety Rope Attached to Gunwale and Motor

Clean the Gutters

Home builders are often disappointed because the roof gutters rust away in what seems a comparatively short time, but the fault is usually their own. At least once a year the gutters should be thoroughly cleaned out and painted, especially on the inside. When this is done, the "drain" of the gutters should also be noted; that is, every length of gutter should have a uniform drop toward the downspout so that there will be no pockets in which water can collect and rust the gutter through. This means also that there should be a sufficient number of hangers or supports to each length of gutter to prevent any sag.

¶Always carry spare bulbs when motoring. They will prove very useful some dark night when a bulb burns out.

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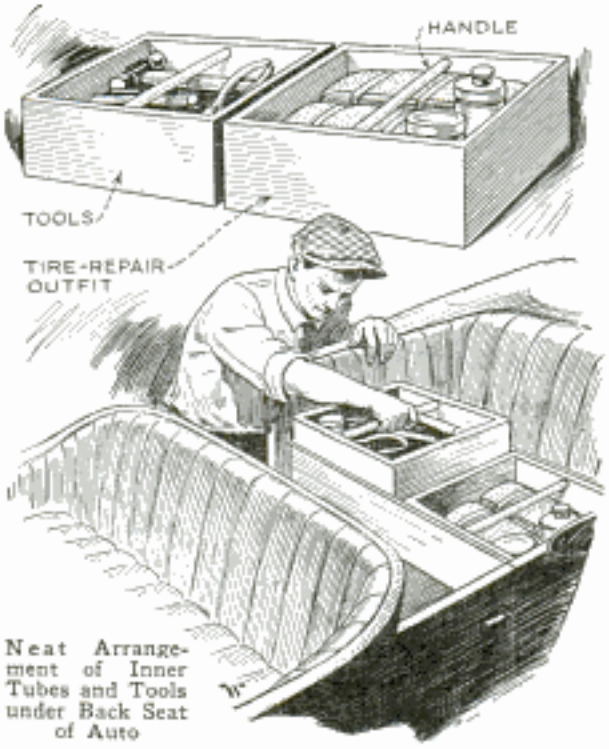
Neat Back-Seat Tool Box for the Automobile

Extra inner tubes, patching kits, tools, chains and a few rags are usually found in



Neat Arrangement of Inner Tubes and Tools under Back Seat of Auto

much confusion under the back seat of an auto. A method of keeping these articles in an orderly arrangement will save the tubes from being injured by the tools, and when anything is needed, it can be picked up instantly without rummaging through the whole space. Two wooden boxes are made to fit closely under the seats, one is used to hold inner tubes and patching kits, while the other is for the tools. The latter may be subdivided into as many smaller compartments as desired. A simple handle should be provided on each box, as shown.

Printing Masks Made of Cut Film

Discarded photographic cut film has proved to be suitable for making masks producing the white margins on photographic prints. It makes little difference whether or not the film is cleared of the gelatin coating, unless the silver deposit upon it renders it very black. It is removed by placing the film in running hot water. After the film has been thoroughly dried, it is immersed in a waterproof aniline-red dye, which can be obtained from any good hardware dealer. After the piece of celluloid has been dipped and dried, with the aid of a sharp knife or razor blade and a steel-edged ruler, the center portion is cut out to whatever size and shape are desired. The advantage of using these masks is that in placing the negative and the mask in position, one can readily see just how much of the picture overlaps the edges of the mask and better judgment can be used in masking when taking advantage of arrangement, composition, etc., of the picture. Due to the fact that the film has been dyed a true red, no light rays can pass through it that will affect the photographic paper and the portion under the mask remains white.

How to Clean Floors before Refinishing

Removing the finish from hardwood floors by means of the scraper or knife before refinishing is usually a job dreaded by the amateur mechanic. Most of the work, however, can be done as well by means of paint or varnish remover, a scrubbing brush and a package of ordinary kitchen cleaning powder. After applying the varnish remover to a small section of the floor, and allowing it time to soften the finish thoroughly, wet the brush moderately, dip it in the powder and scrub the floor vigorously. This will remove all the old varnish and leave a clean job. The section cleaned should then be wiped off with clean water, and a new part of the floor attacked.

Locating Lost Rifle Pin with Compass Needle

While out hunting sometime ago, I found I had lost the small pivot pin on which the trigger turns. I knew I must have dropped the pin within a space a few inches square, but could not locate it. Finally I removed the needle from my pocket compass and, tying it to a small stick with a short string, dragged the needle over the ground. In a very short time the small pin was found clinging to the needle of the compass. —Clyde E. Volkers, Terre Haute, Ind.

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Getting Rid of the Rats

Few and Simple Methods Are Needed to Keep the Farm Free, Experts Find

THE problem of rat extermination is an important one economically as well as hygienically, and a successful solution, no matter how costly, is well worth applying. Experts of the biological survey have found a few simple methods, which, consistently employed, will always lead to the desired results.

The all-important measures to be taken are the removing of food and shelter from the rats, poisoning and trapping them and, under certain conditions, fumigating their burrows. This is a case not only for individual effort, but also for community co-operation.

The most important methods of removing food and shelter are to store foodstuffs in rat-proof containers, to dispose of waste and garbage in tightly covered cans and to prevent the accumulation of trash, refuse and similar material. Lack of food and shelter not only reduces the breeding rate, but renders poisoning and trapping methods more effective. Trapping rats requires both skill and labor, but is necessary where the use of poison is not advisable. In trapping, the simple and inexpensive spring trap shown in Fig. 1, or any other of similar type, has proved to be the most effective catcher. In choosing a trap, the essential thing to look out for is a trigger that will release the spring at a very light touch, and that is provided with a hook or other means of holding the bait securely. Large triggers are better than small ones, as they provide a larger surface for the rat to step on, and may be used successfully, even without bait, along walls and runways. For best results, the following points should be observed: For bait, use rolled oats, fried bacon, bread and toasted cheese, raw or cooked meats, fish, nut meats, apples or carrots. These may be rendered more attractive by sprinkling rolled oats or cornmeal lightly over the trap. Also, vary the bait as much as possible, to lessen the sus-

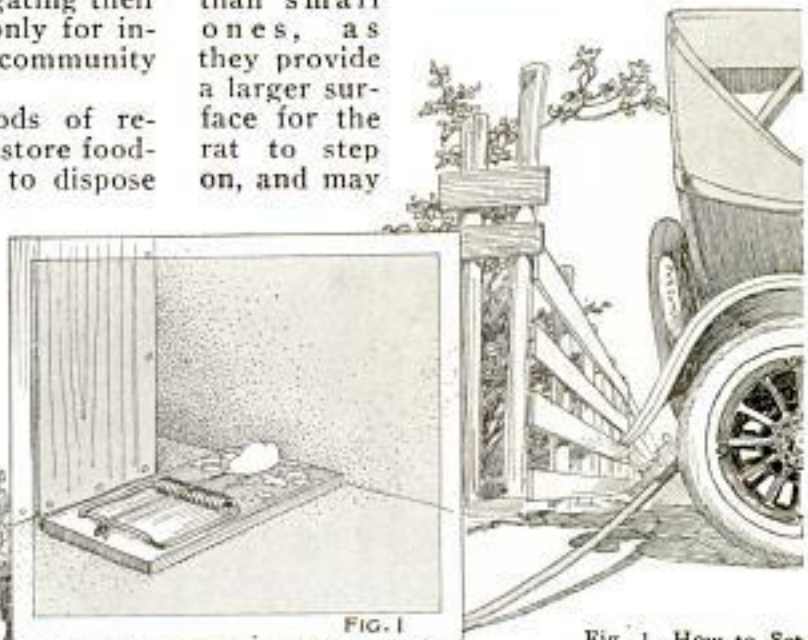

Fig. 1, How to Set Spring Traps for Best Results; Fig. 2, Method of Fumigating Burrows with Exhaust from Automobile

FIG. 2

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picion of the rats. The best place to set traps is in dark corners behind objects close to walls, as in Fig. 1; in fact, anywhere that a rat would run in seeking concealment. The trigger should be toward the wall, and, if some boards can be leaned against the wall as a runway for the rats over the trap, so much the better.

Bait should be fastened securely to the trigger, either by means of the hook or tied with fine wire, so that the trap will be sure to spring when the rat tries to remove the bait, and the trigger should be set very lightly. After most of the rats have been caught the others sometimes leave the premises. More often, however, the remainder become suspicious, avoid the baits and are more difficult to catch. The best remedy, in such cases, is to camouflage the traps. Traps set on the ground may be sunk slightly below the surface, and a small piece of paper or cloth placed over the trigger end to prevent dirt from getting under it and clogging the trap. The whole may then be covered lightly with fine earth or sawdust. The same method may be employed on hard floors by burying the traps in a shallow pan of meal, sawdust or grain, set in a runway. In stubborn cases, food may be exposed in the pans of meal until the rats take it without suspicion, and then the traps may be set in the meal. Plenty of traps must be used, at least a dozen for a heavily infested dwelling, and from 50 to 100 are not too many for farms and large buildings. The cost of the traps is small in comparison with the damage done by the rats. Before starting on a trapping campaign, food should be put out of reach of the rats, as far as possible. When the traps become foul, they should be scraped and boiled. Dipping the traps in melted paraffin will help to deodorize them and keep them in good working condition in damp places.

In many places burrows may be fumigated and the rats thus destroyed in the ground. Saturate a wad of some absorbent material with 1 oz. (2 tablespoonfuls) of carbon bisulphide and then push or throw it as far as possible into the burrow. All burrows should be closed with moist earth to prevent escape of gas. The carbon bisulphide is highly inflammable and explosive, and must be kept away from fire. Where there is only a small number of burrows, the exhaust of an automobile may be used to fumigate them. A hose is attached to the exhaust pipe, and the end of the hose placed in the burrow, and sealed in with damp earth

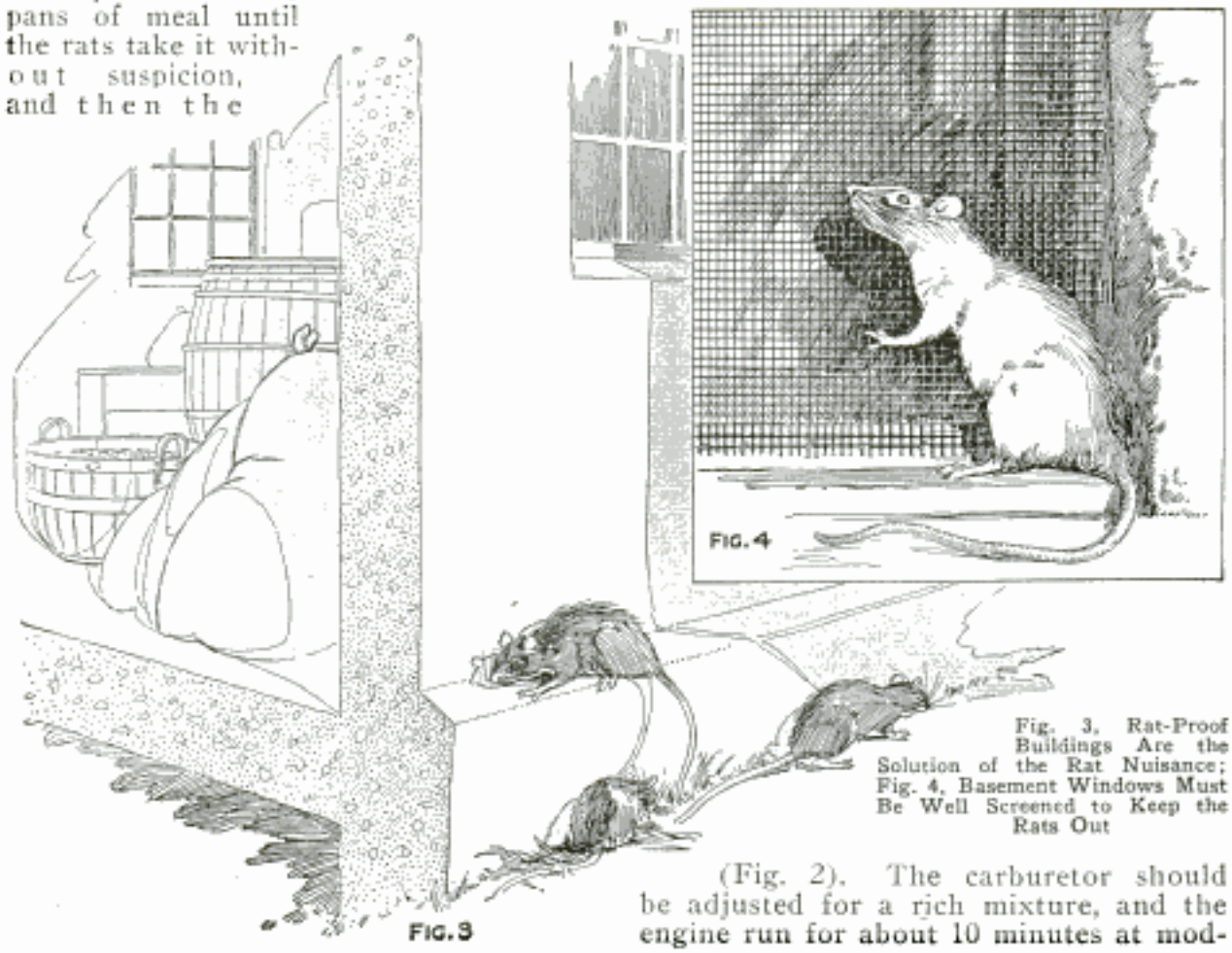

Fig. 3, Rat-Proof Buildings Are the Solution of the Rat Nuisance; Fig. 4, Basement Windows Must Be Well Screened to Keep the Rats Out

(Fig. 2). The carburetor should be adjusted for a rich mixture, and the engine run for about 10 minutes at mod-

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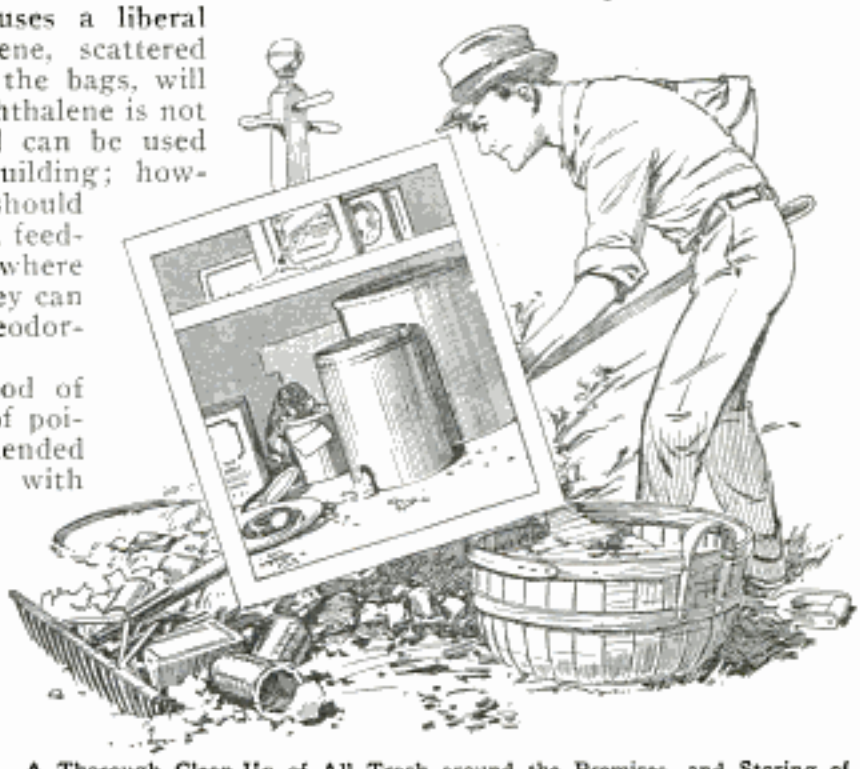
erate speed. This method may also be used effectively in destroying rats beneath floors in houses and barns, or in other places where a concentration of the gas may be obtained.

In sacked-grain warehouses a liberal supply of flake naphthalene, scattered about the grain and over the bags, will keep them away. The naphthalene is not injurious in any way, and can be used in any reasonably tight building; however, because of its odor, it should not be used where food and feedstuffs are stored, except where their nature is such that they can be thoroughly aired and deodorized before use.

The most efficient method of getting rid of rats is that of poisoning, and is recommended wherever it can be used with safety. Powdered barium carbonate is inexpensive, and seems best adapted for the purpose. It is odorless and tasteless, and baits containing it are readily taken by the pests. It is also slow in its action, so that the rats have time to return to their burrows or leave the building in search of water before they succumb. As with trapping, a variety of baits should be used, at least one each of the three following groups: Hamburger steak, sausage, fish, liver, bacon or cheese; thin slices of muskmelon, apple, tomato, cucumber, canned corn, squash, pumpkin, mashed banana, boiled carrot or boiled sweet potato; rolled oats, bread, cornmeal, flour or cake. The bait should be fresh and preferably of good quality. The poison should be worked into the soft baits in the proportion of 1 part of poison to 4 parts of the food, adding water when necessary to make the food moist. The carbonate should be sifted over the surface of sliced baits and well rubbed into them with a knife or the fingers.

A teaspoonful, or its equivalent, of each of the three or more kinds of baits should be exposed in the places frequented by the rats. In buildings, the bait should be placed on boards or paper so that it can easily be removed. A good method is to drop a teaspoonful of bait in each of a number of small paper bags, twist the tops shut and then place the bags where the rats can get at them. This serves to allay the suspicions of the rats. For safety's sake, the bags should be labeled "poison." Keep the poison out of the reach of children, and of domestic animals and fowls. In case it is accidentally taken, give an emetic of either mustard or salt dissolved in warm water. Follow vomiting with a liberal dose of either Epsom or Glauber salts. The only sure and final remedy against rats, however, is rat-proof construction. After a building has once been cleared of rats, all small openings should be closed with sheet metal, or with concrete containing broken glass, and by screening basement windows and other large openings (Fig. 4). Walls of all new buildings where there is no basement should be carried down to a depth sufficient to prevent the rats from burrowing beneath them, as in Fig. 3, and communities would do well to pass regulations requiring that all buildings be made rat-proof under competent inspection.



A Thorough Clean-Up of All Trash around the Premises, and Storing of All Food Out of Reach Are Essential

Concrete Mixing Water

The bureau of standards recommends the use of a small quantity of calcium chloride in the mixing water of concrete in order to hasten hardening. Tests showed that the addition of calcium chloride up to 10 per cent by weight, increases the strength from 30 to 100 per cent over that of concrete in which plain water is used, and that best results are obtained when from 4 to 6 per cent is used. However, as the chemical affects iron and steel, it will not do for reinforced concrete.

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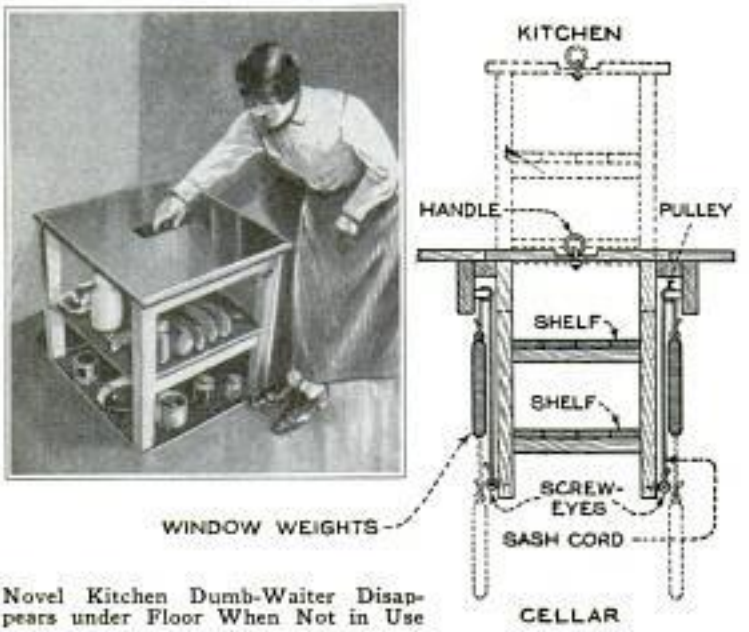
Novel Dumb-Waiter

Most dumb-waiters are run in a built-in shaft, but in many houses where it is impossible to provide one of these, the novel



Novel Kitchen Dumb-Waiter Disappears under Floor When Not in Use

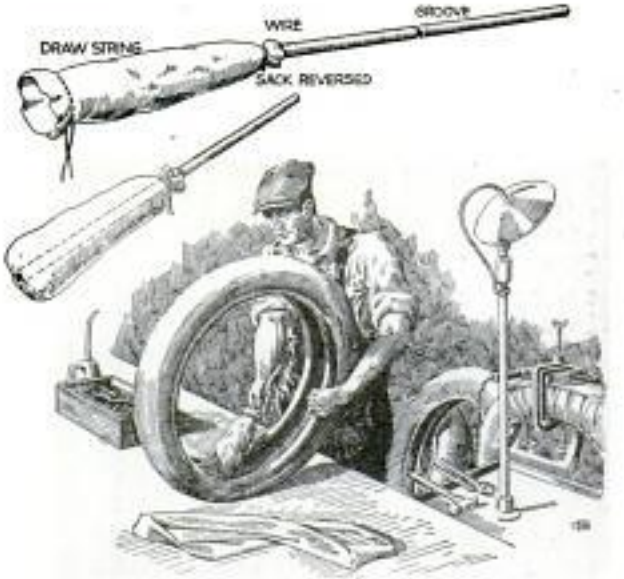
installation shown in the photo will prove satisfactory. It consists of a two-shelf lift, which disappears under the floor in a corner of the kitchen. The lift is made of four corner posts of 2 by 2-in. material, the shelves being placed about 2 ft. apart, and the top, when lowered, comes flush with the kitchen floor. Counterweights are provided to balance the weight and make raising and lowering easy. When not in use, the lift is pushed down into the cellar, where the air is cooler than in the kitchen. A slight pull brings it up again. Wooden cleats are screwed up tightly on the underside of the floor at the edges, and the top fits on these cleats snugly. It may also be found necessary —in fact, it is always advisable—to inclose the lift with tin sides so that there will be no possibility of getting dirt into the food, while sweeping the floor above the lift.—James Clark McGuire, Jr., Albany, N. Y.

Locating the Oiler

In the average shop, the oiling and belt repairing is usually done by one man who has his headquarters either in the oil room or in the millwright department. Often a belt breaks on an essential drive and some one is sent to find the belt man. After running around and telephoning, the repairman is finally found, but this wastes time. Here is a simple method of eliminating this delay. A number of 5/16-in. holes are drilled in a board and these are numbered to indicate various departments of the shop. Plugs are made to fit these holes by cutting up 3/8-in. dowel stock and tapering the ends. Some of these are shellacked red and others black. The board is hung up in the oiler's room. When he goes on a repair job in a certain department, say dept. No. 7, and intends to do some oiling in dept. No. 14 before returning, he inserts a red plug in hole No. 7 and a black one in hole No. 14. When someone wishes to locate him, a glance at the board gives the information.

Soapstone Sack for Dusting Tires

A soapstone sack for dusting tire molds or repaired tires is a necessity in every vulcanizing shop, and to add to its convenience, a Wisconsin repairman attached it to a handle, which greatly facilitates its use. With this improvement the sack can be inserted into the tires more easily, and the hot molds can be dusted without risk of burning the hands. The sack consists of a thin canvas sleeve, one end of which is wired firmly around the end of a short length of broom handle. The opposite end of the sack is provided with a stout drawstring. A groove is cut at the point indicated and the sack is then reversed and filled with soapstone. Tying the drawstring in the



Improved Soapstone Sack Makes It Easier to Dust Inside of Tires and Hot Molds

groove of the handle finishes the job.—G. E. Hendrickson, Argyle, Wis.

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Preventing Water from Seeping through Canal Banks by Mixing Clay in the Water; the Clay Particles Settle and Seal the Porous Walls

Clay Deposits Stop Canal Leakage

One irrigation district has found that where clay deposits are at hand, loss of water by seepage through earth canal banks can be practically stopped by sluicing clay into the canal flow. The clay is broken up and thoroughly mixed with water by means of hydraulic monitors, as shown in the accompanying photo. The mixture of clay and water then flows into the canal, mixes with the irrigation water and is carried along, the clay particles gradually settling and sealing the pores in the material forming the bed and sides of the canal. Deposition on the sides can be accelerated by lining the banks with weed mats before turning in the water. Besides stopping the leakage and conserving water for irrigation, such deposits eliminate the necessity of draining the lands along the canal. They also tend to strengthen the banks and to prevent sloughing.—Ivan E. Houk, Denver, Colo.

Dentist's Magnifying Lens for Mechanics

A useful device for a mechanic doing small scale work is the pair of magnifying lenses mounted on spectacle frames which are used by dentists for the examination of inlays, castings, etc. The lenses are mounted 4 or 5 in. in front of the eyes and the work is held at the common focal point of the lenses. The result is much superior to the use of the single lens, or the watchmaker's glass, for with the dental lenses stereoscopic vision or a perception of depth and solidity is obtained which is impossible with single-eye vision. Furthermore, the dental lenses are held comfortably in the spectacle frame and may be worn over the ordinary eyeglasses or spectacles.

Catching Drip on Spraying Rods

One of the disagreeable features of orchard spraying is that when the spraying rod is held vertically, or nearly so, the solution collects on the nozzle and drips down on the worker, which makes it necessary for him to wear a raincoat and hat. An effective method of preventing this is to attach an ordinary funnel to the spraying rod in the position shown in the drawing. Tape or wire can be used to fasten it to the rod securely. A rag stuffed into the narrow part of the funnel will prevent the collected solution from leaking through. When the rod is lowered, the spraying solution that has been caught in the funnel will run out.

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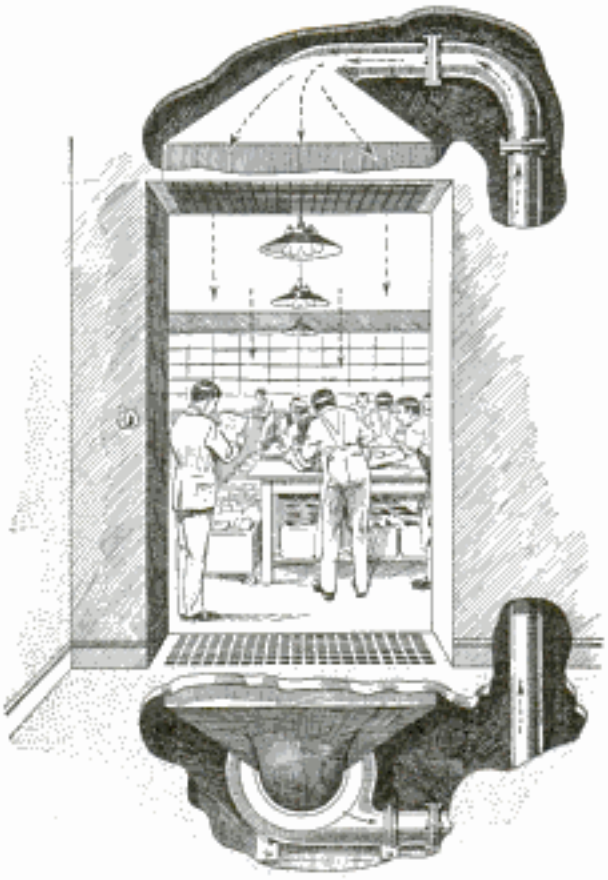
Installing an "Invisible Door"

A little-known item of factory equipment that might well be more generally adopted is the "doorless" or "invisible



Air-Stream "Door" That Is Draft-Proof and Keeps Out Flies and Dust, Yet Is Freely Passed by Workers

door." It is especially useful in places where there is much going to and fro.

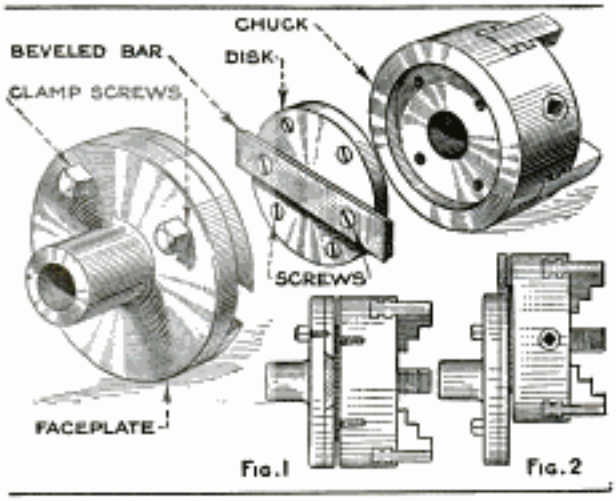
That shown in the illustration has been installed in food factories, where it is desirable to keep out flies and dust, and where, at the same time, constant coming and going make regular doors inconvenient. Besides keeping out flies and small insects, as well as dust and other injurious substances that are carried in the air, it is absolutely draft-proof, for it is, in fact, a strong current of air and therefore impervious to cross currents. It is "closed" by switching on a motor that drives a large blower fan, sending a continuous wall of air across the opening. The air covers the aperture more snugly than would a door of wood or metal. This air wall, or stream, will keep out rain or snow and will keep in the heat of the room in winter. At the same time it is not powerful enough to cause any inconvenience to persons passing through it, but a fly might as well try to get through a sheet of steel. The door is "opened" by switching off the motor.—M. Chapman, Chattanooga, Tenn.

Turning and Boring Eccentrics

With the self-centering chuck attachment shown, any eccentric can be turned or bored. The fixture is simple to make and can be easily and accurately set. The dimensions given below are suitable for a 4-in. chuck on a 9-in. lathe.

A metal disk, ¼-in. thick and finished smoothly on both sides, is turned down to fit accurately in the recess in the back of the chuck, and is fastened to it with screws. A bar of soft steel is screwed across the disk, as shown, care being taken to locate it centrally. The bar is ⅜ in. thick and slightly exceeds the diameter of the chuck in length, while the widths of the two sides are 1¼ and 1⅝ in., respectively, the edges being beveled to 60°. A solid faceplate, about ½ in. thick, smoothly finished and of the same diameter as the chuck, is fitted on the lathe spindle, and two segments, ⅜ in. thick, are attached to it as shown, one solidly, and the other with clamp screws. The segments are beveled and spaced so that they make a sliding fit over the bar on the chuck when the clamp screws are slightly loosened, but a tight fit when they are screwed up. The curved surfaces of these segments must coincide with the circumference of the faceplate.

After assembling the parts and mounting the whole attachment so that it is concentric with the lathe spindle, the ends of the crossbar are filed down to be perfectly even with the edges of the faceplate, as in Fig. 1. When turning or boring an eccentric, the two parts are set as in Fig. 2, the actual swing of the resulting eccentric



Attachment for Drilling and Turning Eccentrics on the Lathe; Fig. 1 Shows the Chuck Centered with the Lathe Spindle, and Fig. 2 the Chuck Out of Center

being just twice the distance the bar extends beyond the faceplate.

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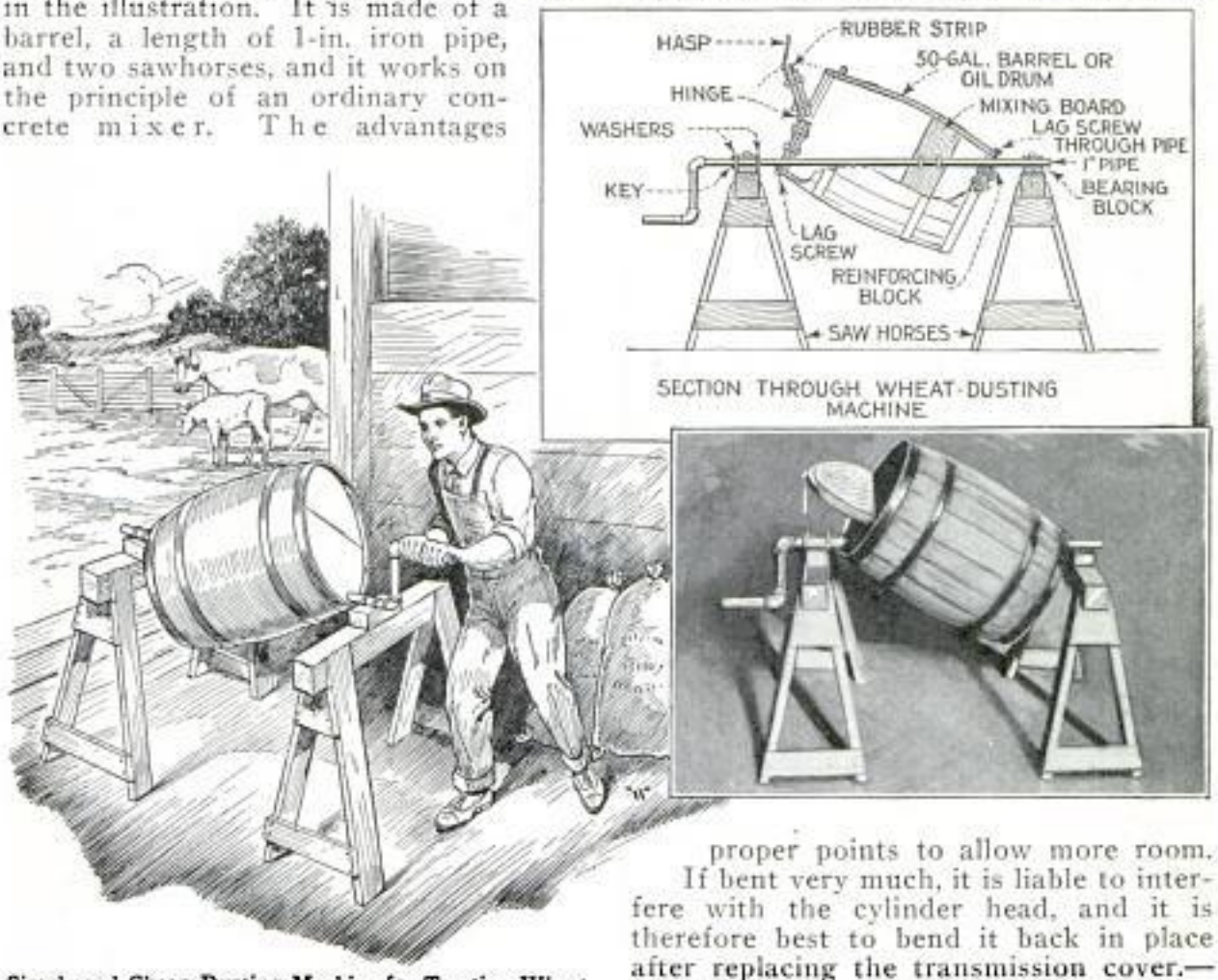
Homemade Wheat-Dusting Machine

A new machine for treating seed wheat for smut by the copper-carbonate process, which can be made on any farm, is shown in the illustration. It is made of a barrel, a length of 1-in. iron pipe, and two sawhorses, and it works on the principle of an ordinary concrete mixer. The advantages



Simple and Cheap Dusting Machine for Treating Wheat for Smut by the Copper-Carbonate Process

claimed for the machine are that it keeps the poisonous dust from being inhaled by the operator, that it will treat from 20 to 30 bushels of wheat per hour, and is easy to fill, empty and operate. It can be easily and cheaply made by anyone handy with tools. The copper-carbonate treatment possesses many advantages but machines are rather expensive and hand treating is dangerous to the workers.—John C. Burtner, Corvallis, Oreg.

Replacing Ford Transmission Cover

It is sometimes found that the metal dash on late model Fords extends backward at the lower edge far enough to prevent replacement of the transmission cover. The usual point of the trouble is below the steering column, where the boss for the starting motor on the front of the cover catches. The trouble is worse on machines without a starter, as the cover and screws for the starting-motor openings are left in place. The lower edge of the dash can be bent forward with a large monkey wrench at the proper points to allow more room. If bent very much, it is liable to interfere with the cylinder head, and it is therefore best to bend it back in place after replacing the transmission cover.—E. T. Gunderson, Jr., Humboldt, Iowa.

Marking Stairway Stringers

When installing a stairway in our shop, a carpenter used a convenient and time-saving method to lay out the stair stringers. Two short lengths of hardwood, with straight edges, were fastened together with bolts and thumbtacks, as shown in the illustration, so that the square could be adjusted between the strips to the exact measurements for the height and width of the tread cuts. The steps are laid out by sliding the square along the edge of the stringers.—G. A. Luers, Washington, D. C.

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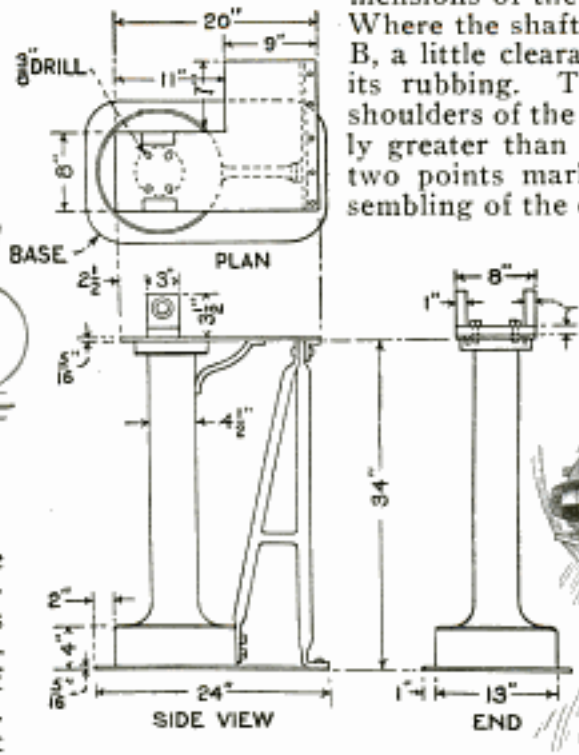
Making a Light Ball-Bearing Column Grinder

By RAY F. KUNS

HAVING need of a grinder for light work, such as sharpening drill bits, bearing scrapers, punches and chisels, and roughing down light fittings for engine stands, etc., the scrap pile was looked over for parts that might lend themselves to the building of such a machine. A column was located and this was brought up to proper height by fitting a brake drum under it. It was desired to have the motor mounted with the head so that the machine might be set as a unit and moved on occasion without a great deal of trouble in re-alining parts.

A piece of 5/16-in. boiler plate was obtained and from it a base for the brake drum and column was cut. Another piece of the plate was shaped for the top plate on which the grinder head and the motor might be mounted. As a support between base and top, several lengths of gas pipe were formed, and riveted and bolted in place as indicated in the drawing. A crossbar was welded into this brace to eliminate any tendency to vibrate. The drawings indicate the approximate dimensions of the various parts. Before laying out the plate with the slots for the motor support and adjustment, however, it will be necessary to have the motor at hand.



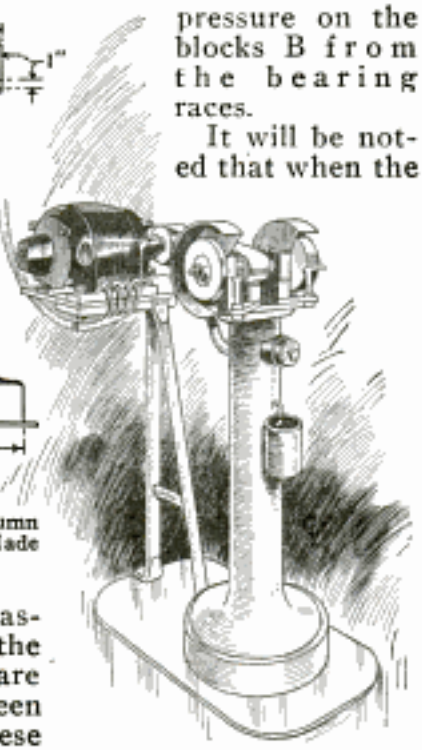
Plan, Side and End Elevations of Light Column Grinder for the Small Shop or Garage, Made from Scrap

The motor used in this case is a single-phase, ½-hp. machine. The pulley is 3¼ in., and drives the head pulley, which is 2 in. in diameter, at about 3,000 r.p.m., since the motor speed is 1,800 r.p.m. A 2-in. light single leather belt with a glued splice is used to drive the grinder head. This gives a drive free from any disturbing vibration.

The construction of the head is rather simple. The first consideration is the bearings. Those used in this case were salvaged from a worn-out motor generator. After the bearings are at hand some dimensions may have to be varied to accommodate them. Dimensions of shaft diameters are given here in order to indicate the approximate size desirable.

The blocks B, which are 1 in. thick and 3 in. wide, are chucked in the lathe and bored out to accommodate the bearings selected. Sufficient stock should be provided at the bottom of the blocks so they can be bolted to the plate A as indicated. After the supporting yoke, formed by the parts A and B, has been bolted together and the bearings installed, the exact dimensions of the shaft may be determined. Where the shaft passes through the blocks B, a little clearance is allowed to prevent its rubbing. The distance between the shoulders of the shaft, XX, must be slightly greater than the distance between the two points marked Y, otherwise the assembling of the emery wheels on the shaft would throw a pressure on the blocks B from the bearing races.

It will be noted that when the wheels are assembled on the shaft they are locked between flanges. These



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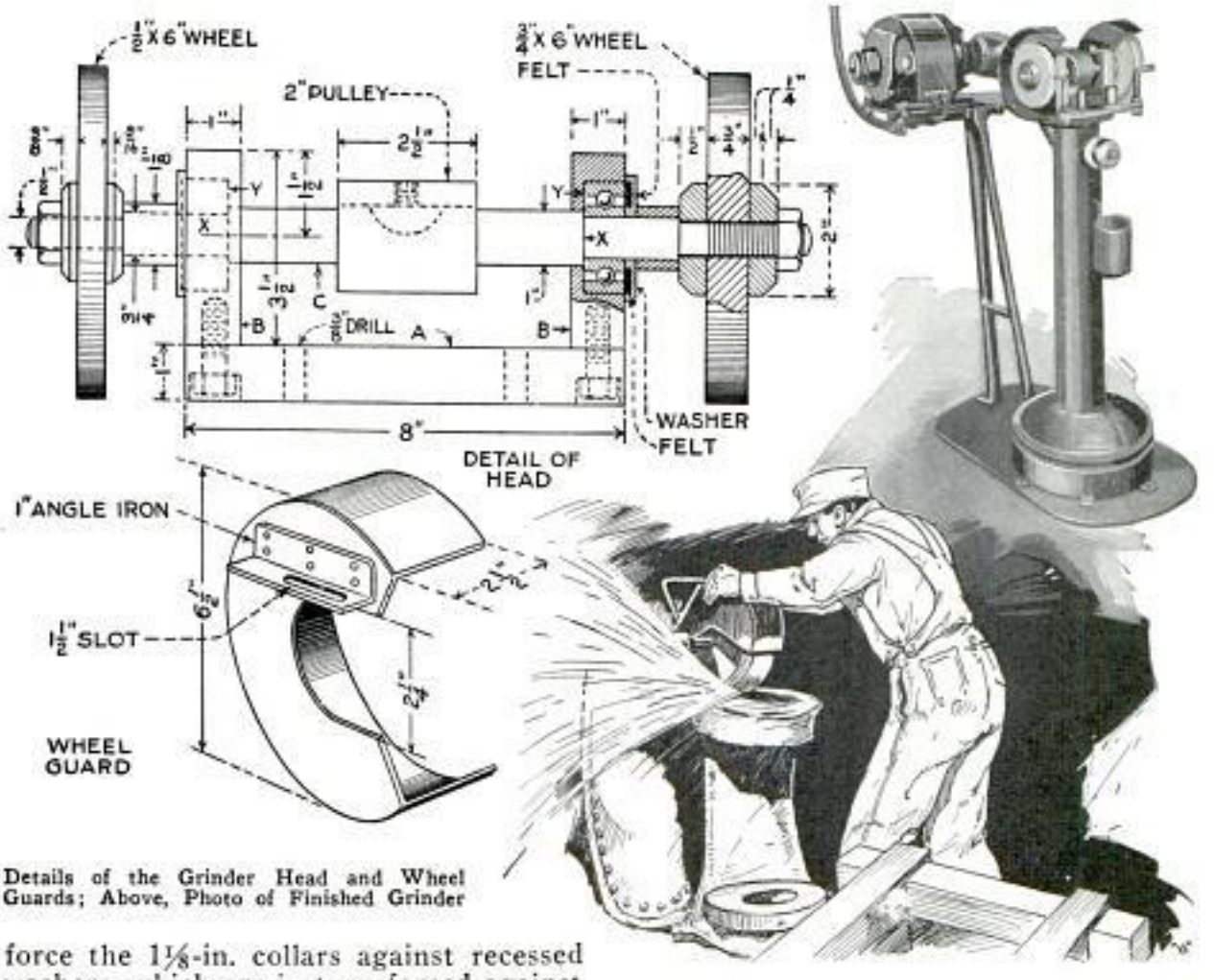

Details of the Grinder Head and Wheel Guards; Above, Photo of Finished Grinder

force the 1⅛-in. collars against recessed washers, which are in turn forced against the inner bearing races. This arrangement locks the parts together in such fashion that there is no end play other than that previously mentioned at X and Y. Since the races of the ball bearings are free at Y and rest against the felt washers on their outer faces, they are left free to properly aline themselves and, in case of need, will float in their housings a slight amount in either direction. When mounting well-fitted ball bearings, it is essential that this provision be made. Otherwise the heat generated in the shaft when the machine is in operation may be great enough to expand the shaft and throw an undue strain on the bearings. The washers are recessed on one side to provide for felt rings, which are depended on to prevent dirt and grit from entering the bearings

The shaft C may be made with the pulley integral from a 2¼-in. round machine-steel bar, or an old axle or propeller shaft may be used and the pulley made and secured on it as indicated. When assembling the shaft, it is necessary to remove one of the end blocks B. The threads are cut to run tight, as the load comes on the wheel. This means that right-hand threads are cut on the right end and left-hand threads on the left end of the shaft.

When mounting the head on the column, reasonable care must be used to see that it is not cramped or warped in such a fashion that the alinement of the bearings will be affected. The head is mounted 2½ in. from the front edge of the top plate of the column. This space may be used to accommodate the rests. These are made from machine steel. A bar of ⅝-in. steel has one end forged flat and bent over at right angles; the other end is threaded. This forms the rest for the work being ground and it is supported in a machine-steel plate ¼ by 1½ by 4 in., having a hole in each end. Knurled thumbscrews are used to lock the supporting plates in position.

The guards for the grinder wheels are made from 16-gauge sheet iron, fitted so as to be centered when the wheels are new. They are supported on the blocks B by means of an angle plate riveted to the guard and fastened to the block with a capscrew. Adjustment of the guard is effected by means of a slot in the angle plate.

No special provision is made for greasing or oiling the bearings.

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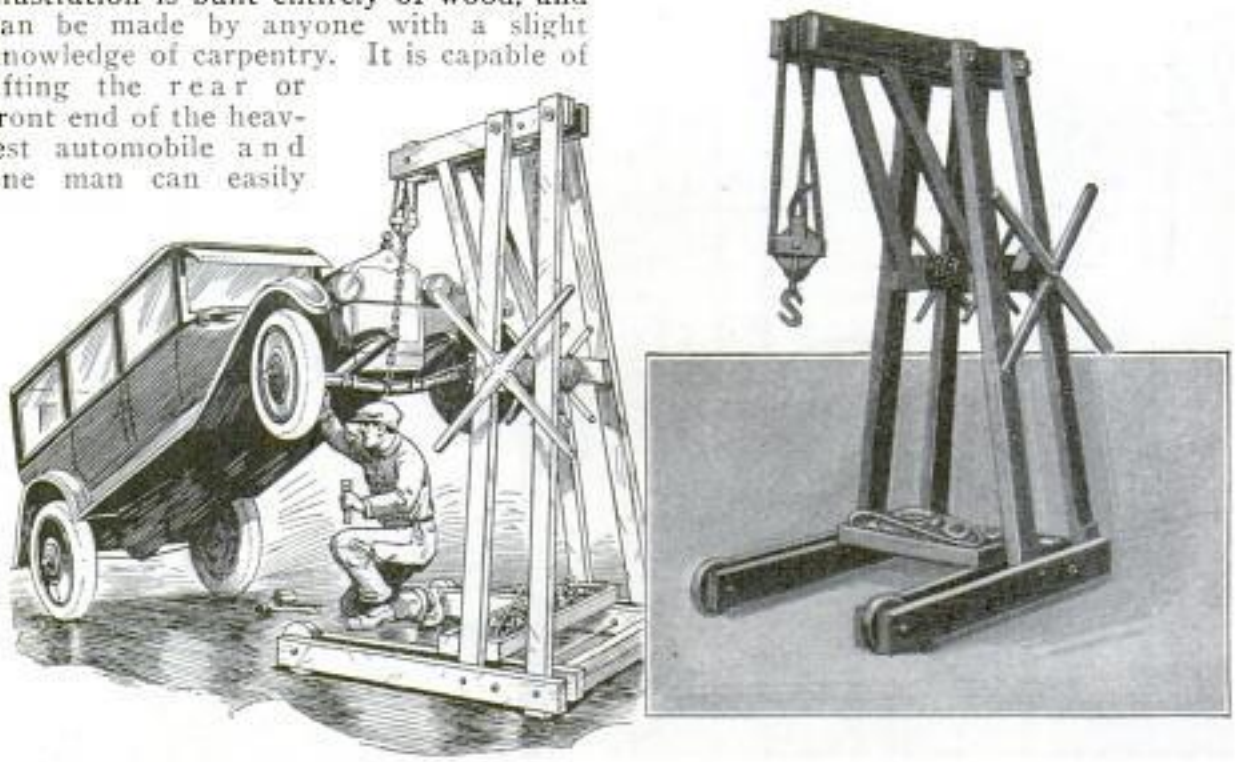
Homemade Derrick for Garage Is Easily Built

The derrick shown in the photo and illustration is built entirely of wood, and can be made by anyone with a slight knowledge of carpentry. It is capable of lifting the rear or front end of the heaviest automobile and one man can easily operate it. Ordinary 2 by 6-in. lumber, 5 ft. long, is used for the bottom supports. Four pieces of this length are required, two for each side. The upright standards are 4 by 4 in. by 7 ft. Four pieces of this size are also needed. The horizontal members at the top are identical with those on the bottom. Two pulleys are mounted near the ends, through which the rope or wire cable can be run to the windlass, which is mounted halfway between the top and bottom of the uprights. The windlass also is homemade, and is turned by wooden bars mounted on a sprocket. All the members are held in place by long bolts, and if the device is to be made portable, wheels can be provided between the lower supports. To lock the pulley in any position, place an iron bar across the windlass between the arms and the frame. This device can be made at a total expenditure of about $12.—Grover Brinkman, Okawville, Ill.



Wooden Derrick Which Is of Considerable Utility in a Garage and Can Be Made at a Total Expenditure of Only Twelve Dollars

Locomotive Air Pump Sweeps Floor

In a planing mill having a large floor space, which has to be swept every day, the air pump and the compressed-air tank of a locomotive are used to blow the shavings and dust from the floor. A rubber hose long enough to reach any part of the floor is provided with a nozzle, and a valve is used to hold the air at any desired pressure. This method clears the entire space in a short time and reaches places inaccessible with a broom.—L. M. Jordan, Vredenburgh, Ala.

Holder for Driving Staples

Anyone who has put up a wire fence knows how difficult it is to hold the wire tightly and drive the staple home at the same time. If much of this work has to be done, a staple driver of the kind shown in the drawing will be found useful. It is made from a short length of steel rod. One end is heated, and a drift of the same shape and size as the staple is driven in about ¼ in. deep. The drift forms a pocket for the head and body of the staple while it is being driven into the wood. After the holder has been removed, a single blow of the hammer will drive the staple home in the wood.

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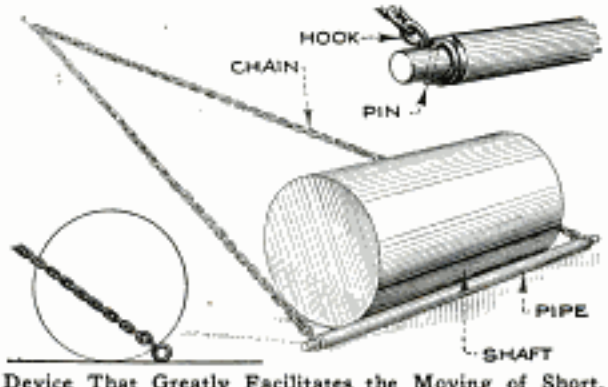
Eliminating Tie-Rod Rattle

Several devices are on the market for eliminating rattle due to worn tie-rod bearings on Ford cars. A simple way of accomplishing this end without the use of any additional parts, is as follows: Disconnect the tie-rod from the right-hand spindle arm after loosening the locknut back of the yoke on the tie-rod. Turn the yoke about one-eighth of a turn counterclockwise and tighten the locknut. The yoke will now have to be sprung in place on the spindle arm, the torsion being sufficient to prevent the tie-rod from rattling. Replace the spindle-arm bearing and a prolific source of rattle will have been done away with. This simple remedy has worked well on my car for over nine months.—Philip W. Gorman, Syracuse, N. Y.

Moving Short, Heavy Round Pieces

The weight of short, heavy round pieces being too great for one man to lift on and off a truck, in transporting them from one department to another in a factory the novel method shown in the illustration was used to roll the pieces along the floor. In this way the work was done easily and in much shorter time. A roller, consisting of a length of iron pipe and a steel rod to fit loosely inside, is placed behind the piece as shown. The ends of the rod project a few inches outside of the pipe and slip into specially formed links that are attached to chains. Small pins, driven through the ends of the rods, keep the assembly together. By pulling the chain, the pieces can be rolled where desired.—Harry Moore, Montreal, Can.



Device That Greatly Facilitates the Moving of Short, Heavy Round Stock

Compressed-Air Saws

Saint-Peter sandstone is a soft rock, and it was found that tunneling in it could be done much cheaper and easier by the use of saws operated with compressed air than by blasting. After much experimenting with different designs it was found that the saws shown in the drawing were most effective for this purpose. They are made of ¾-in. iron pipe, flattened to ½-in. thickness, the teeth being welded to one edge. The toothed part is 21 in. long and the teeth vary in length from ½ in. at the ends to 1 in. in the center. The spacing between the teeth varies like the teeth on a crosscut saw. At the front end they are much closer than at the back end. From front to back they are ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., 2 in., 2¼ in., 2½ in. and 3 in., center to center. In the center of each tooth a ⅛-in. hole is drilled through to the inside of the pipe. Three holes are drilled in the closed end of the pipe so that the air jets from two of them are directed straight forward and one down at an angle of 45°. The area of all the small holes must be less than the area of the inside of the pipe in cross section. A set of these cutting tools consists of two saws, one with a left-hand and one with a right-hand offset, and one blowpipe, which is used as a starter for the saws. A check valve is used to cut off the air.

Compressed-Air Saws Found Effective for Cutting Sandstone

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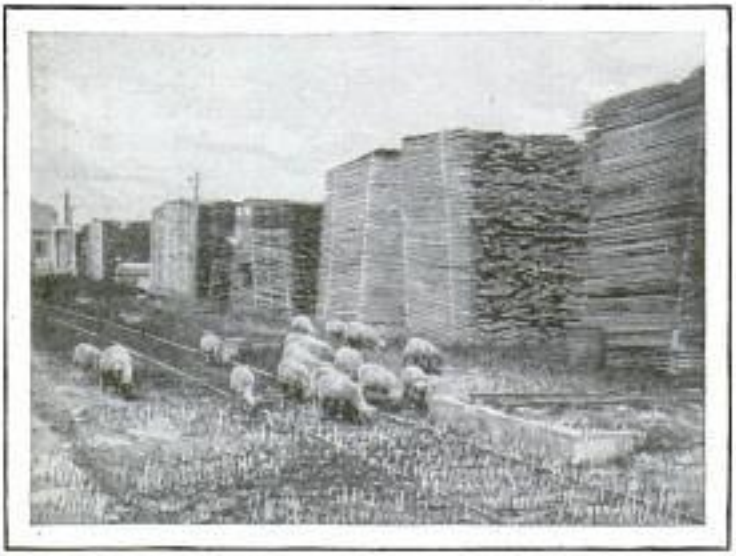
Sheep Clean Up Lumber Yard

Weeds growing in lumber yards around the piles retard the free air circulation, which is needed to hasten seasoning and prevent sap stain and decay, and when dry, the weeds add to the fire hazard. Pasturing a flock of sheep in the yard has been found very effective to keep the weeds down. Sheep seem to relish the hardiest of the weeds commonly found in lumber yards and their sharp hoofs also cut up the soil and prevent sodding. The mutton and wool obtained from them will pay for their upkeep.—Forest Products Laboratory, Madison, Wis.



Flock of Sheep in Lumber Yard Keeps Away Weeds and Grass Which Hinder Air Circulation in Pile

Etching Designs on Steel

Most mechanics are familiar with the common method of etching names and other marks on steel tools, which consists in coating the surface of the steel with paraffin, writing or cutting the letters or names through the coating with a scriber or other sharp instrument, then flowing nitric acid over the lettering and afterward washing off the acid and removing the paraffin. This method has many disadvantages, although well-etched lettering will last as long as the tool. However, unless the operator is good at making letters or figures with a scriber on the somewhat slippery surface of the steel, the result, though readable, does not look very well.

There is a much better way, and one that is practically as simple. It is employed in many of the largest plants for etching trademarks, names or special designs, on hand saws, bread knives, table knives and, in fact, on any flat steel surface. The first thing to do is to get a common rubber stamp of the name or design that is to appear on the steel. If only a name or some figures are wanted, the common rubber-alphabet outfit will do. The next thing is to carefully wipe off the surface of the steel where the etching is to be. The surface is then brushed with a thin coating of shellac which will dry in a minute or so. The rubber stamp is now pressed onto a pad saturated with caustic-potash solution, care being taken to wet the entire surface of the stamp, which is then pressed onto the coating of shellac, exactly where the design is wanted. The caustic potash at once eats through the shellac to the surface of the steel, and leaves the lettering or design clearly exposed. The potash is quickly washed off by rinsing with water, which has no effect on the shellac. Nitric acid is now flowed over the places where the shellac has been eaten away, and the acid quickly etches the outline into the steel. After the etching is deep enough, the acid is washed off and the shellac removed with a rag wet with alcohol. The beauty of this method is its simplicity and the fact that anyone can do a good job, with a little care.

Holder for Medicine Dropper

Laboratory workers, chemists, druggists, and others, will find a holder on small medicine bottles handy for keeping the dropper where it belongs and preventing its use with other bottles, where a mixture of two liquids, however slight, may be highly undesirable. The holder consists of a length of light wire, doubled and twisted as shown, an eye being left at one end to receive the dropper and the other end twisted around the neck of the bottle.—Lawrence F. O'Toole, Denver, Colo.

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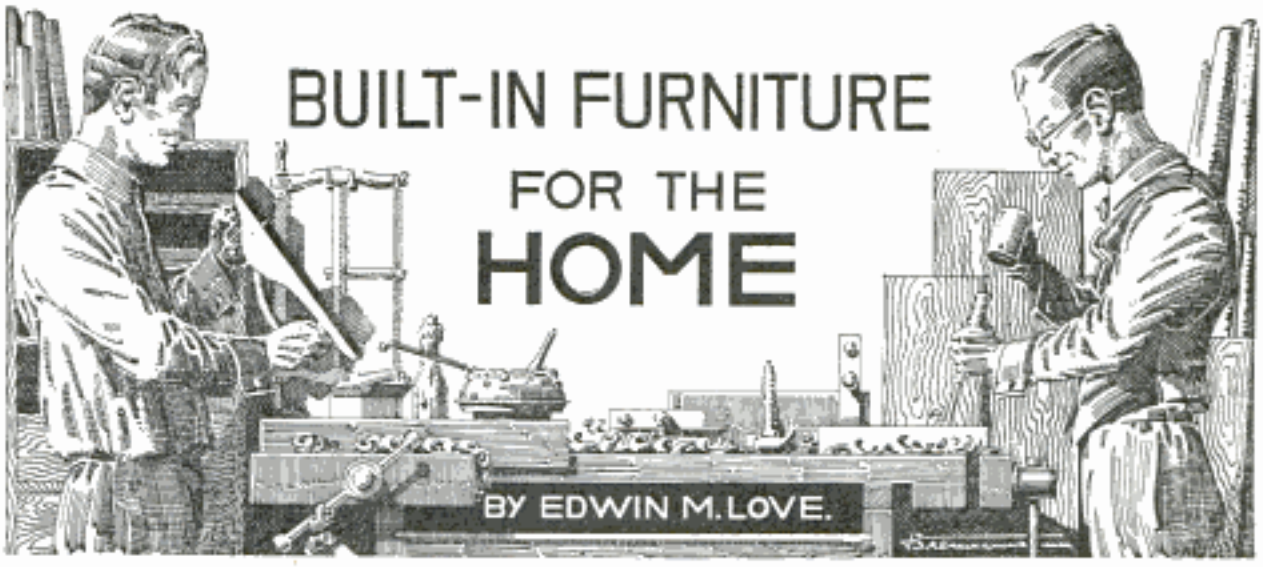

Part X—Bookcases

THIS article describes two types of built-in bookcases, one suitable for combining with the fireplace or writing desk, or for building as a separate unit, and the other of the pedestal type, built in a wide opening between two rooms. The second, by changing the width, can be adapted to almost any opening of reasonable size, and will serve either as a support for a jardiniere or as a base for a column.

The first is very simple to construct. It is 4 ft. ⅜ in. high, 4 ft. 1 in. wide and 11¼ in. deep, having shelves adjustable for height, and glass doors. The top, which is 13½ in. wide, is glued up of 1 by 12-in. and 1 by 3-in. stock, doweled together or reinforced on the underside with corrugated fasteners. While this dries, build the front frame of 1 by 2-in. net stock, cutting the stiles 3 ft. 11⅝ in. long and the rails 3 ft. 9 in. The top of the lower rail is 6¼ in. from the lower ends of the stiles, and the bottom edge of the upper rail is 4⅛ in. below the upper ends. The center stile is 3 ft. 1¼ in. long, and must be assembled with the rails before the latter are doweled to the stiles.

Make the ends of 1 by 12-in. stock, or, if desired to miter the corners of the cabinet instead of butting, so as to conceal the joint, glue up stock to the width of 13½ in. Cut to a length of 3 ft. 11⅝ in., and 5⅞ in. from the bottom cut a ¾-in. dado, ¼ in. deep, to receive the end of the shelf. Measuring up from this 6 in., lay off 2-in. distances on lines gauged 1½ in. from the edges for ⅜-in. holes, bored ½ in. deep as mortises for the pins of the shelf hooks.

On the wall selected for the backing of the case plumb two lines 3 ft. 11½ in. apart, and level across between them 3 ft. 11⅝ in. above the floor. Nail up a cleat of 1 by 2-in. stuff to the horizontal line. Scribe the end boards to the walls, being careful to keep the front edges plumb, and then assemble with the bottom, which is also of 1 by 12-in. stock. Glue and nail the frame to the

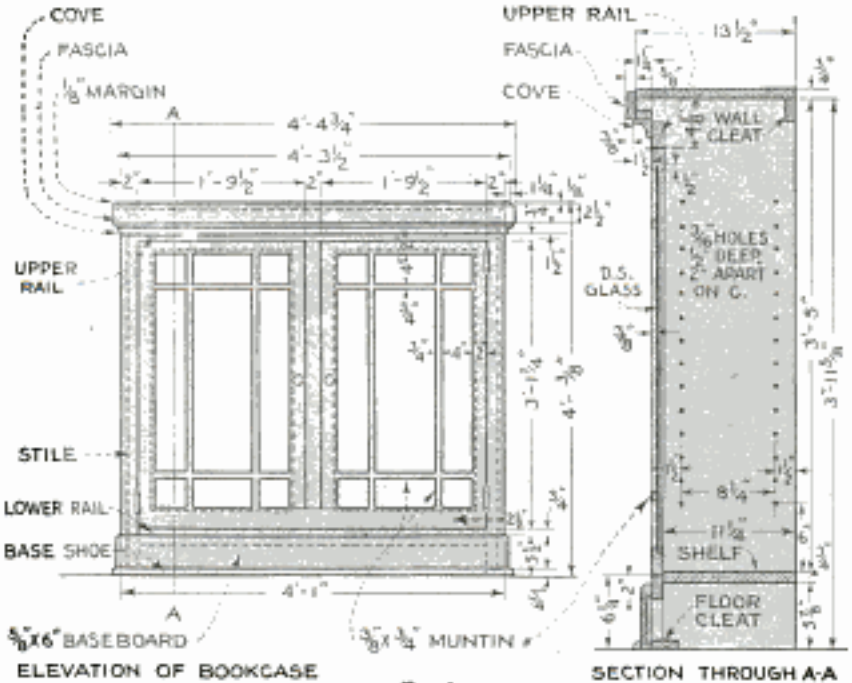

FIG. 1

Details of the Bookcase Designed to Fit with the Fireplace, or to Be Used as a Separate Unit in Any Room in the House

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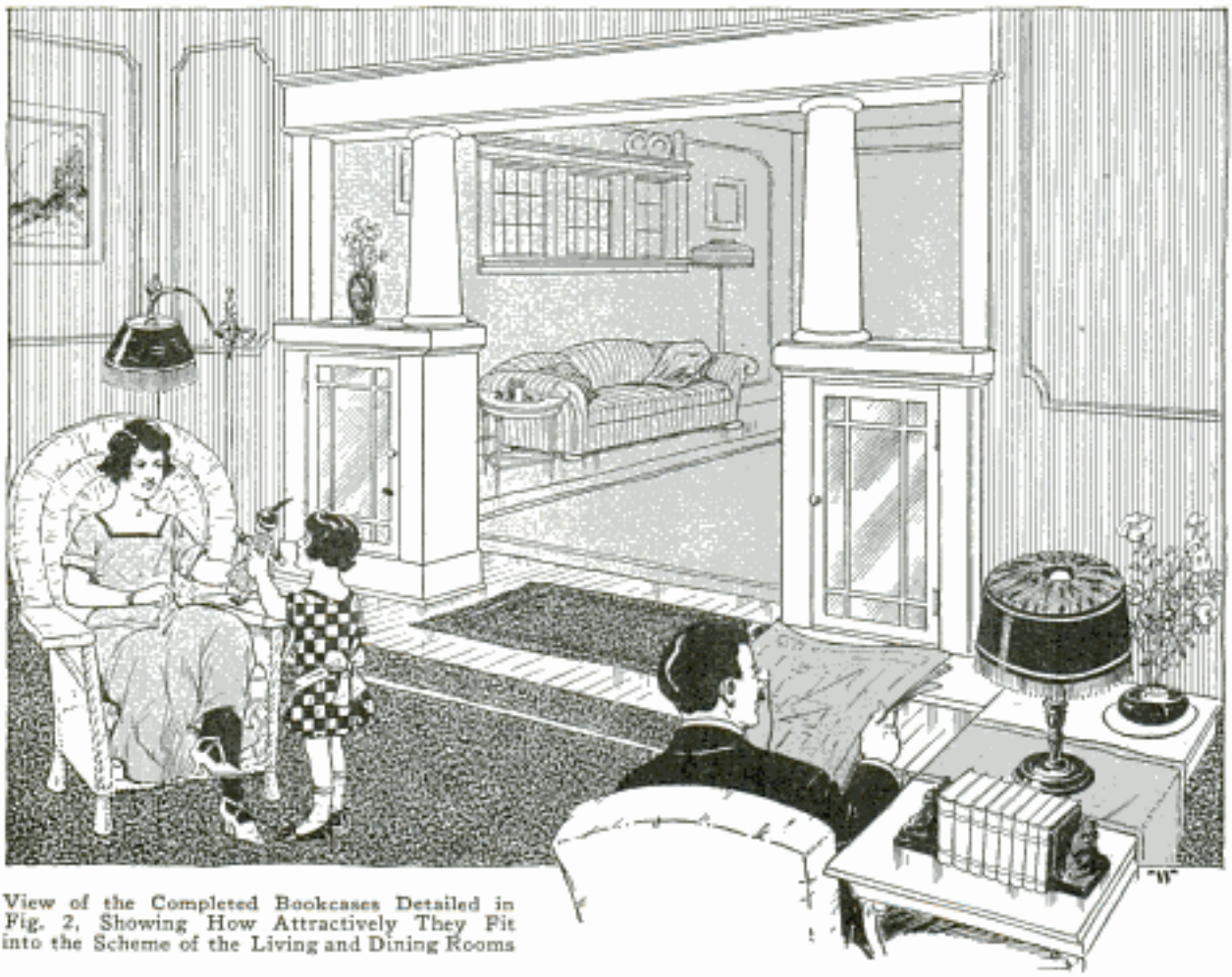

View of the Completed Bookcases Detailed in Fig. 2, Showing How Attractively They Fit into the Scheme of the Living and Dining Rooms

ends and put the cabinet in place against the wall, nailing to the ends of the wall cleat and toenailing the bottom to the floor. As backing for the top, nail one or two cleats over the upper rail and into the wall cleat. Miter the baseboard and shoe around the bottom, taking care that the margin on the lower rail is equal over the entire length, and miter around a backing strip for the fascia, made of 1 by 1¼-in. net stock, nailed 2⅝ in. below the top. The fascia, of ⅝ by 2½-in. net wainscot cap, is cut around to show a margin of ⅛ in. on the top. Miter the cove underneath.

Build the doors of 1 by 2-in. net material for stiles and upper rails, and 2½-in. net stock for lower rails, rabbeting ½ in. deep, leaving a lip for the glass to bear against. The doors are 1 ft. 9½ in. wide and 3 ft. 1¼ in. long. Make the muntins of ⅜ by ¾-in. pine, half-lapping them at the cross joints, and making the notches in the vertical bars tight enough to cause them to spring inward, thus forcing them against the glass. Secure to the stile and rail lips with ¾-in. brads. Do not set the glass until just before the last coat of paint or varnish, as this will finish the back of the muntins seen through the glass, and will avoid soiling the glass. In hanging, put the hinges on a line with the inside edges of the rails, and allow them to project ½ in.

Make the shelves of 1 by 12-in. stock, fitting them just loose enough to permit easy shifting, and mortising the ends to fit the hooks. Put the "crown" of the boards up, and the weight of the books will tend to straighten them.

The pedestal bookcase is designed for an opening 8 ft. wide in a 2 by 4-in. partition. In modifying the dimensions to suit a thicker partition or an opening of another size, good results are almost sure to be obtained if the following rules are observed: First, see that the projection of the top beyond the back of the casing of the opening is equal to the projection of the top beyond the face of the casing, which of course means that the projection of the body of the cabinet is equal in both directions. Secondly, make the case noticeably wider than it is high, or vice versa, but never square.

The cabinet illustrated is 3½ ft. high, 2 ft. ½ in. wide, and 9¼ in. deep. Glue up the top piece out of 1 by 12-in. and 1 by 3-in. stock. Using 1 by 5-in. stock, sized to 4½ in. in width and cut 3 ft. 5¼ in.

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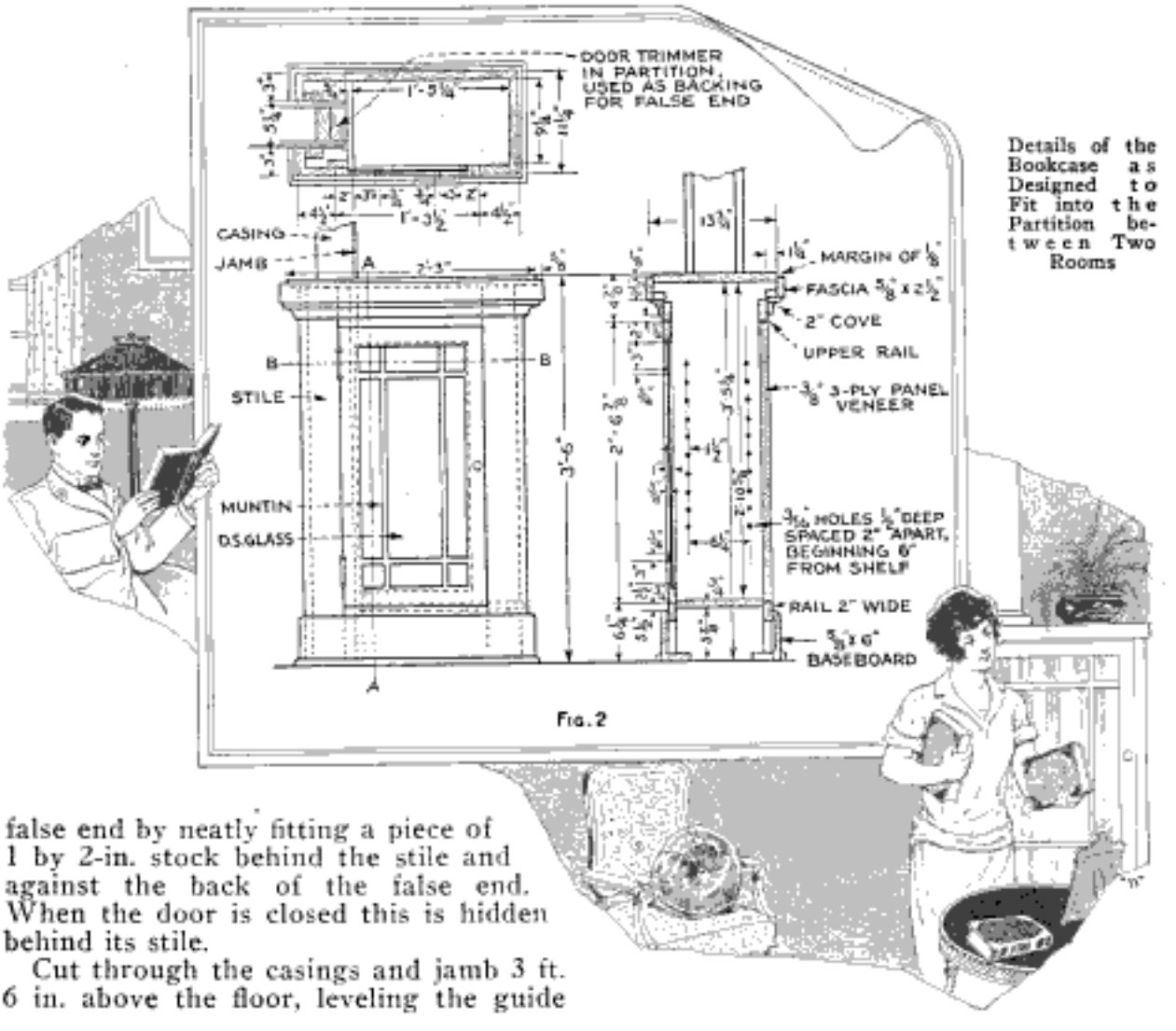
long for stiles, and rails of 1 by 2-in. net stock cut 1 ft. 3½ in. long, dowel together the front frame, putting the top of the lower rail 6¼ in. above the bottom ends of the stiles, and the bottom edge of the upper rail 4⅛ in. below the tops of the stiles. The frame for the back is made the same, except that stiles and rails are grooved ⅜ in. deep on the face edges to receive a ⅜-in. three-ply veneer panel, cut 1 ft. 4⅛ in. by 2 ft. 7½ in. When dry and surfaced, give the stiles a bevel of 45 degrees.

The outside end is of 1 by 12-in. stock, finished to a width of 11¼ in., both edges being mitered to fit the frame. A ¼-in. dado, ¾ in. wide, for the bottom shelf, is cut 5⅞ in. from the bottom, and holes for shelf hooks are bored as directed for the other bookcase. Make the false end 9¼ in. wide, using 1 by 10-in. stock dadoed and bored to correspond with the other end. Assemble both frames with the ends and bottom. The projection of the bottom above the rail forms a doorstop. Close the open space between the stile and false end by neatly fitting a piece of 1 by 2-in. stock behind the stile and against the back of the false end. When the door is closed this is hidden behind its stile.

Cut through the casings and jamb 3 ft. 6 in. above the floor, leveling the guide mark around, and remove the lower pieces. Cut floor cleats from these and lay out for the bottom of the case, nailing the cleats where they will serve as backing for the baseboard and for the ends of the cabinet, with due regard for plumbness and centering on the partition. Plumb a cleat on both sides of the partition to form backing for the "returns" or outside ends that butt against the plaster, and scribe suitable pieces of 1 by 4-in. stock to the plaster, plumbing lines on the outer edges by which to miter. Set the cabinet in position, nail and glue up these returns, and miter the baseboard and shoe around the bottom. It is advisable to put in the shelves, cut from 1 by 10-in. stock, at this time. Nail through the false end into the door trimmer and nail a cleat across the cabinet rails against the trimmer to help carry the top.

Notch the top to slip under the jamb and casings and over the plaster, keeping the opening narrow enough to drive snugly over the wall paper. Nail with eight-penny finish nails, miter the back-



Details of the Bookcase as Designed to Fit into the Partition between Two Rooms

Fig. 2

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ing strip, of 1 by 1¼-in. net stock, around the top 2⅝ in. down, and miter the fascia around as in the other cabinet. Build the sash doors 1 ft. 3½ in. by 2 ft. 6⅞ inches.

Sandpaper thoroughly with fine grit, removing all traces of scratches, other marks and glue spots before painting.

An alternative method of construction is to build the body of the cabinet of 1 by 12-in. stock nailed vertically against a suitable framework, the joints being covered with ⅜ by 2½-in. strips or battens, giving a paneled effect, but this is an inferior style.

MATERIAL LIST

First Bookcase

1 piece, 1 by 2 in. net by 16 ft., pine or fir, S4S, sanded.
1 piece, 1 by 2 in. net by 14 ft., pine or fir, S4S, sanded.
1 piece, 1 by 2 in. net by 8 ft., pine or fir, S4S, sanded.
1 piece, 1 by 1¼ in. net by 7 ft., pine or fir, S4S, sanded.
1 piece, 1 by 2½ in. net by 4 ft., pine or fir, S4S, sanded.
1 piece, 1 by 12 in. by 16 ft., pine or fir, S4S, sanded.
1 piece, 1 by 12 in. by 14 ft., pine or fir, S4S, sanded.
1 piece, 1 by 2 in. by 16 ft., pine or fir, S4S, sanded.
1 piece, 1 by 3 in. by 5 ft., pine or fir, S4S, sanded.
1 piece, ⅝ by 3 in. by 8 ft., wainscot cap, sanded.
1 piece, ⅞ by 6 in. by 8 ft., baseboard, sanded.
1 piece, 2-in. cove, 8 ft.
1 piece, ¾ by ¾-in. base shoe, 8 ft.
2 pieces, ⅜ by ¾ in. by 10 ft. for muntins, sanded.
2 pieces, D.S. glass, 1 ft. 6⅛ in. by 2 ft. 9⅝ in.
2 pairs, 2½ by 2½-in. loose-pin butts.
2 1⅜-in. glass drawer pulls (knobs).
2 frog catches.
1 doz. shelf hooks.
Cost of materials, about $6.75.
Time to build, about 16 hours.

Second Bookcase

2 pieces, 1 by 5 in. by 14 ft., pine or fir, S4S, sanded.
2 pieces, 1 by 2 in. net by 10 ft., pine or fir, S4S, sanded.
1 piece, 1 by 1¼ in. net, by 12 ft., pine or fir, S4S, sanded.
1 piece, 1 by 2½ in. net, by 2 ft., pine or fir, S4S, sanded.
1 piece, 1 by 12 in. by 12 ft., pine or fir, S4S, sanded.
1 piece, 1 by 10 in. by 12 ft., pine or fir, S4S, sanded.
1 piece, 1 by 10 in. by 8 ft., pine or fir, S4S, sanded.
2 pieces, 1 by 2 in. by 10 ft., pine or fir, S4S, sanded.
1 piece, 1 by 3 in. by 6 ft., pine or fir, S4S, sanded.
1 piece, 1 by 4 in. by 14 ft., pine or fir, S4S, sanded.
2 pieces, ⅝ by 3 in. by 8 ft., wainscot cap, sanded.
2 pieces, ⅞ by 6 in. by 8 ft., baseboard, sanded.
2 pieces, ¾ by ¾ in. by 8 ft., base shoe, sanded.
2 pieces, 2 in. by 8 ft. cove.
1 piece, ⅜ by ¾ in. by 14 ft., for muntins.
1 piece, ¼ in. three-ply pine or fir panel veneer, 1 ft. 6 in. by 6 ft.
2 pieces, D.S. glass, 1 ft. ¾ in. by 2 ft 3¼ in.
2 2½ by 2½-in. loose-pin butts.
2 1⅜-in. glass knobs.
2 frog catches.
2 doz. shelf hooks.
Cost of materials, about $11.50.
Time to build, about 25 hours.

Greenhouse Made of Wooden Frame and Storm Sash

Storm-Sash Greenhouse

Many houses are equipped with storm sash and it is common custom to use some of these for covering hotbeds. This suggested a further use in constructing a small greenhouse, which was found entirely satisfactory. The framework of the house is 19 ft. long, 8 ft. wide and 6 ft. high at the eaves. Eight posts of the frame were sunk into the ground to a depth of approximately 3 ft. Leaving a 2-ft. passage in the center, the soil on either side was excavated to a depth of 3 ft. and filled with fresh horse manure. This was covered with a layer of soil, about 1 ft. deep. The oxidation of the manure furnished considerable heat. At the Lacombe experimental station, at Manville, Alta., where this novel greenhouse was built, cucumbers and tomatoes were grown in it, which is impossible to do outdoors in this climate.—R. A. Meeks, Manville, Can.

Carbide can be kept indefinitely by sprinkling it with kerosene.

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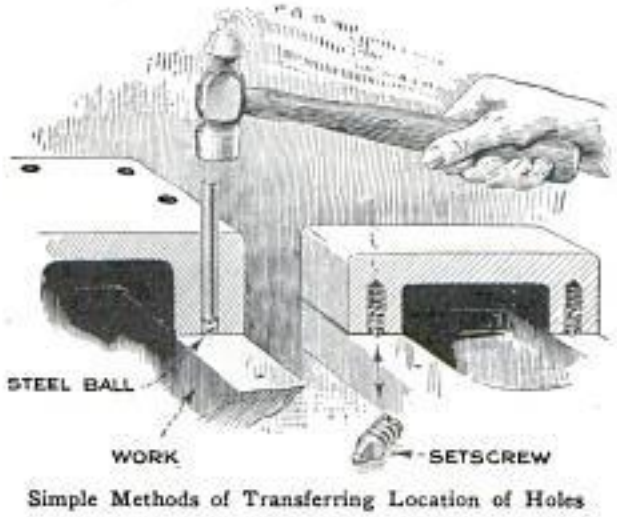
Improved Wiring for Tail-Light Plug

Ford tail lamps on models up to 1925 sometimes cause trouble by the light flickering or going out though the bulb and wiring are known to be good. They are often fitted with single-point lamps and sockets but two-point headlight plugs. The tail-light wire is connected to one of the points in the plug, as both touch the plunger in the socket. If the plug vibrates in its socket, this point may not make contact, though the dead one may. A remedy is to splice on a short length of wire to the regular tail-light wire and connect it to the other point in the plug, so that both are connected to the battery circuit.—E. T. Gunderson, Jr.

Transferring Blind Holes

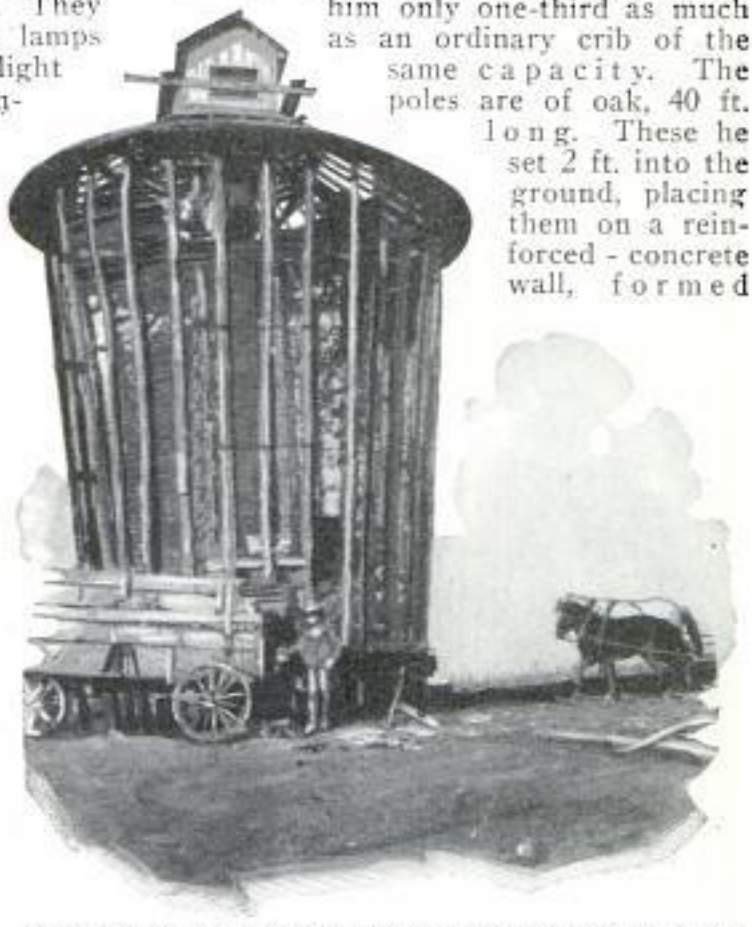
Blind holes can easily be transferred from one piece to another by the method shown in the right-hand figure. Small setscrews are ground flat on two sides so that they can be gripped with a pair of pliers and screwed into the holes. The ends of the setscrews are pointed in the center accurately and are allowed to project 1/32 in. so that after the top piece is put in place, it need only be tapped lightly with a hammer to center-punch the spots where the holes are to be drilled on the lower piece. With holes that are not blind a ball, the size of the tap drill, is dropped in the hole and a punch or a piece of rod and a hammer are used to tap the ball so that it will leave a slight impression.—F. J. Haas, Milwaukee, Wis.



Simple Methods of Transferring Location of Holes

Novel Corn Crib

To store an exceptionally large corn crop, an Illinois farmer built the circular crib shown in the photo, as this type cost him only one-third as much as an ordinary crib of the same capacity. The poles are of oak, 40 ft. long. These he set 2 ft. into the ground, placing them on a reinforced-concrete wall, formed by filling a trench, 1 ft. wide; then concrete was poured around the base of the poles to hold them in place. The poles were set 18 in. apart at the bottom and allowed to lean 4 ft. outward. The tops of the poles were securely bolted together by 2 by 8-in. planks. The rafters were bolted to the top of the outside rim of wood, allowing a 3-ft. overhang. The center of the rafters was fastened to four poles set to form a 5 by 5-ft. square. The opening was covered with a penthouse. The rafters were then boarded and shingled, and the wall put on. To afford lightning protection, he passed an insulated cable, 300 ft. long, over the top of the penthouse and into the ground on both sides. The floor was laid on 2 by 12-in. joists, which were held together by heavy bolts. Tin was nailed underneath the floor, joists and poles to make the crib rat-proof.—George F. Paul, Chicago, Ill.



Novel, Circular Corn Crib of Huge Proportions, Costs Less than Ordinary Crib of the Same Capacity

¶A good soldering flux is made by melting tallow and rosin together, forming it into sticks when cool.

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Projects for Vocational-Training Schools

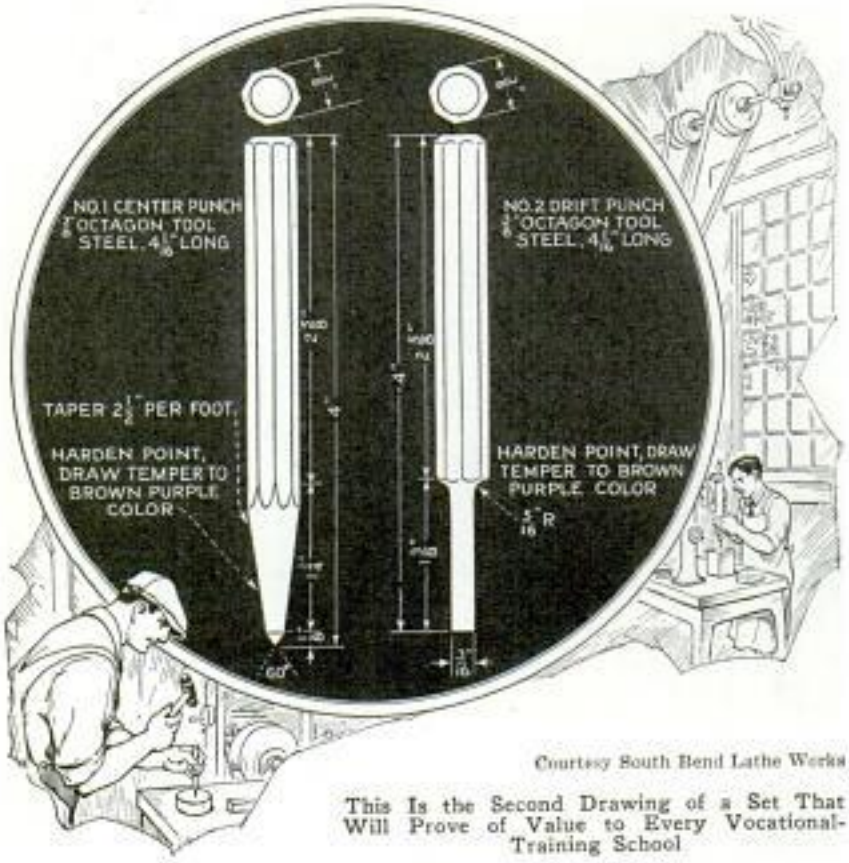
No. 2, Making a Set of Punches

Material required:

Tool steel, ⅜-in. octagon by 4 1-16 in. long; two pieces required.

Center punch; operations:

1. Select stock as per drawing.
2. Place stock in 4-jaw independent chuck, projecting 2 in. Adjust jaws so stock runs true.
3. Arrange belt for proper spindle speed.
4. Set compound rest at proper angle to obtain taper of 2½ in. to the foot; this is approximately 96° to the right.
5. Set tool for taper-turning.
6. Rough-turn taper, using round-nose tool, and feeding toward headstock with compound-rest screw.
7. Finish-turn taper, using fine feed for smooth finish.
8. Set compound rest 120° to the right; turn angle of point using same tool.
9. File machined section lightly to remove tool marks.
10. Polish with fine emery cloth and oil.
11. Turn stock end for end in chuck, projecting 1 in., and true as before.
12. Set lathe tool for facing.
13. Face end to length.
14. Set tool for chamfering.
15. Chamfer corner.
16. Transfer to forge; harden and temper for ½ in. from point.
17. Replace in lathe chuck and repolish.



Courtesy South Bend Lathe Works

This Is the Second Drawing of a Set That Will Prove of Value to Every Vocational-Training School

Drift punch; operations:

1. Select stock as per drawing.
2. Place stock in four-jaw independent chuck, projecting 2 in., adjust jaws so stock runs true.
3. Arrange belt for proper spindle speed.
4. Set lathe tool for facing.
5. Face end.
6. Set lathe tool for turning.
7. Rough-turn punch end.
8. Finish-turn punch end, using round-nose tool ground to form fillet at shoulder.
9. File machined section lightly to remove tool marks.
10. Polish with fine emery cloth and oil.
11. Turn stock end for end in chuck, projecting 1 in., and true as before.
12. Set lathe tool for facing.
13. Face end to length.
14. Set tool for chamfering.
15. Chamfer corners.
16. Transfer to forge; harden and temper for 1¼ in. back from punch end.
17. Return to lathe, chuck and repolish.

Soldering on Iron and Steel

Sometimes it is difficult to make solder stick on iron or steel. If the part to be soldered is dipped in a solution of copper sulphate (blue vitriol), it will be found that a film of copper is deposited on the surface of the metal, which greatly aids soldering.

Easily Made Grain Bins

A farmer, needing some grain bins to store wheat for his chickens, picked up two pieces of sheet-steel piping quite cheaply. He riveted a bottom on each and provided a removable top of the kind shown in the photo. The tops were shingled and the shingles stained green, while the rest of the tank was painted cream color. A large cock was provided at the bottom of each tank to permit removal of grain whenever it is needed.

Sheet-Metal Tanks as Containers for Chicken Feed

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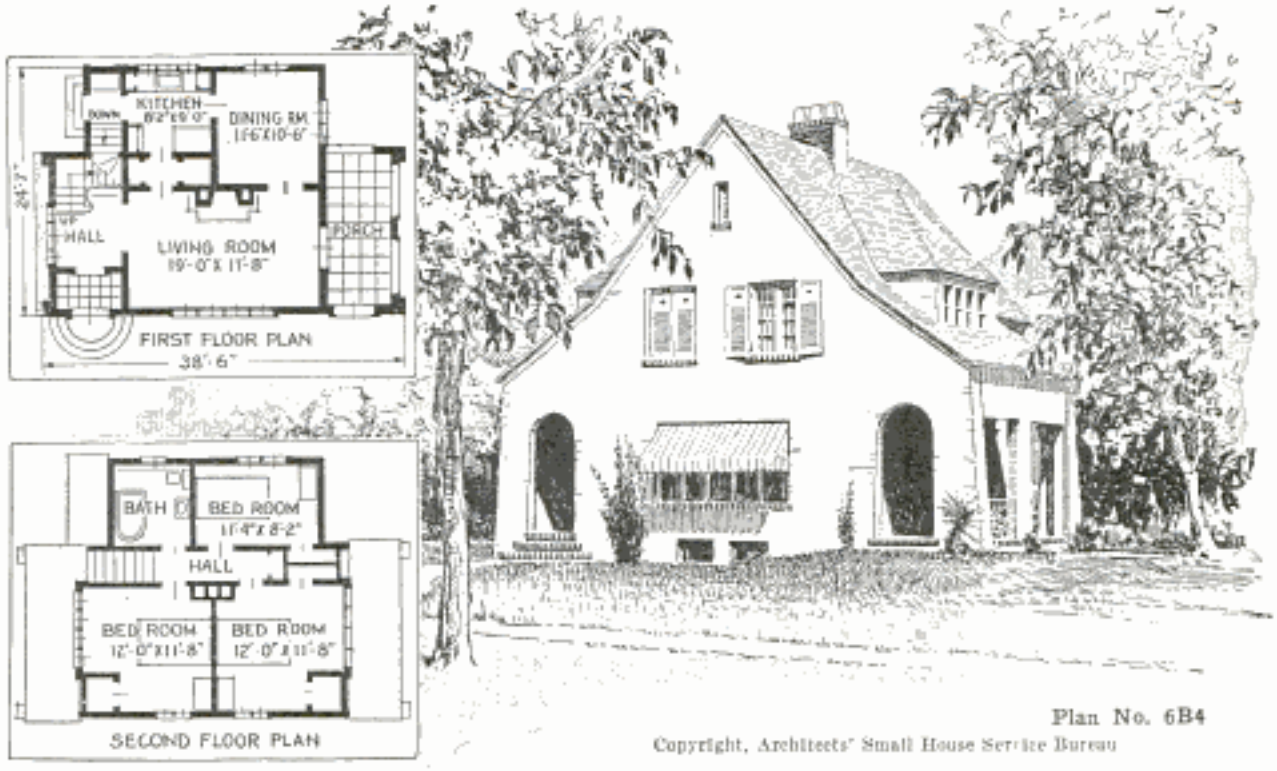
A Home of Value and Distinction



Plan No. 6B4

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THE modern trend in small homes toward houses of individuality and distinction, combined with the best value the money can buy, is well illustrated by this month's plan for a six-room stucco-finished home, designed for a fifty-foot lot.

Planning a home is a simple process if you go about it in the same way you would if you employed an architect. He would want to know before he started drawing, how many people your family comprised; your mode of living; whether you preferred quiet home life or did much entertaining, or whether most of your time was spent at office and clubs, and in addition would inquire as to the condition of your purse, your preferences in shape and exterior finish, and whether you desired any special conveniences.

If you consider this plan in the same way, here is an attractive though small home with a good-sized living room, suitable for evening entertaining, but with a compact kitchen and medium-sized dining room, a bit small, perhaps, for large dinner parties but able to seat a comfortable family group. The living room has a big fireplace for winter evenings, and in summer, the doors can be opened to make the fairly large porch, with its substantial cement columns, a part of the living apartment. Upstairs there are three bedrooms, sufficient for a growing family, or able to provide for overnight guests if the family is smaller.

The features of the house are numerous. For example, the hallway, with its triple window at the foot of the stairway, is especially attractive. A passageway between the living room and kitchen contains two spacious closets. Every bedroom has a good clothes closet, and one has two of them.

The exterior is finished in floated stucco over wood and metal lath, the stucco having a pinkish-gray tint which harmonizes with the hard-burned flash brick of the trim and the combination of light-blue and gray shingles on the roof. The sash and frames are painted gray while the old-fashioned wooden blinds with their quaint diamond cut-outs at the top are done in a green-blue and gray.

For the home workshop there is a basement under the entire house, with the exception of the porch, and here room is provided for the laundry, furnace, coal room, and storage room. The house as planned has a cubic content of approximately 16,850 cubic feet.

QUESTIONS regarding home building addressed to this magazine will be answered by the Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the department of commerce, United States government. Blueprints, specifications and material lists for the house shown above may be obtained at a nominal cost. Inclose self-addressed, stamped envelope for reply. If further information is desired send five cents and stamped envelope for a 24-page booklet explaining how the small homes bureau functions and showing twelve sample plans.

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Q. Please send me a circuit for a test buzzer. I am using a crystal receiver and find it difficult to locate a sensitive place on the crystal. A. Use a small buzzer of the common type. Connect this buzzer to a No. 6 dry cell, and place a small switch in the circuit. The vibrating reed of the buzzer is connected to the ground connection on the set or to the ground clamp. The circuit is given in Fig. 1.

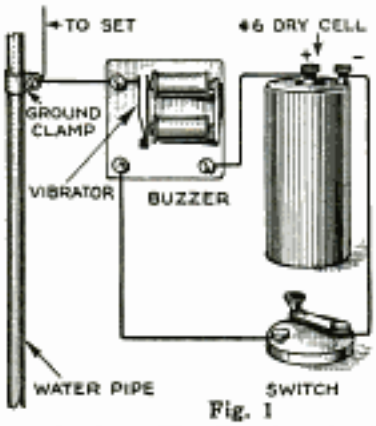

Fig. 1

Q. Do the reactivators now advertised really improve the quality of the tubes? A. Yes, many times the tube is better than when first purchased, after reactivation. The directions furnished with the instrument should be carefully followed by the operator.

Q. I have a three-circuit receiver of the common low-loss one-tube type. How can I add one stage of fixed radio-frequency amplification? A. The circuit is given in. Fig. 2. You will note that 45 volts is used on the plate of the detector tube, and 90 volts on the plate of the radio-frequency tube. Use UV-201A or C-301A tubes.

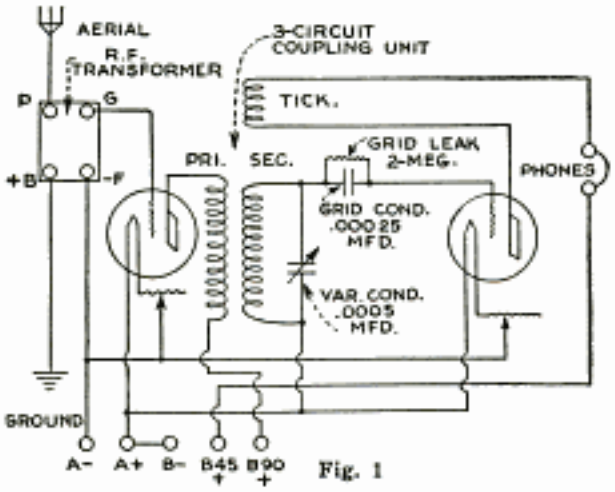

Fig. 1

Q. What size variable condenser must I use to tune to the lower wavelengths, and how must I connect it? A. A .001-mfd. variable condenser is commonly used for this purpose. If a still greater decrease is desired use a .0005-mfd. The variable condenser is used in series with the aerial.

Q. I live on a farm, some distance from the city. We have a 32-volt farm-lighting plant. Can I use this lighting circuit for the 6-volt A-battery voltage on my radio set? A. It is a simple matter to tap off three cells from the 16-cell bank. This will supply the necessary 6 volts. Use a double-pole, single-throw switch to cut the battery from the radio set when the generator is in operation. Do not neglect to throw this switch to prevent injury to the receiver. The diagram for the switch and connections is given in Fig. 3.

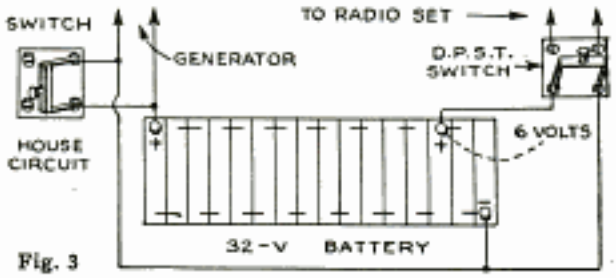

Fig. 3

Q. What is a variocoupler? This may seem to be a foolish question but the term means nothing to me. A. A variocoupler is a tuning unit, consisting of a stationary primary coil, and a movable secondary coil. It is an improvement over the old loose coupler. In some cases the primary coil is tapped off to a series of contact points, and a switch placed on the panel. The primary coil is connected to the aerial and the ground, and the secondary to the detector circuit.

Q. How are low-loss coils wound? What kind of a form is used, and how is the wire placed on the form? What size wire should I use? A. Draw a 4-in. circle on a block of wood 5 in. square; mark this off into 15 equal divisions. Bore holes and insert 3-16-in. pegs in the block. Use No. 18 d.c.c. wire and wind the coil as shown in the diagram Fig. 4, winding it over and under two pegs.

Fig. 4

Q. I have heard that a crystal can be used instead of the usual gridleak and gives better results. Is this so? What kind of a crystal should I use? A. An ordinary crystal detector of the mineral-to-mineral type or the cat-whisker type can be used. A good crystal, when properly adjusted, works nicely instead of the usual type of gridleak.

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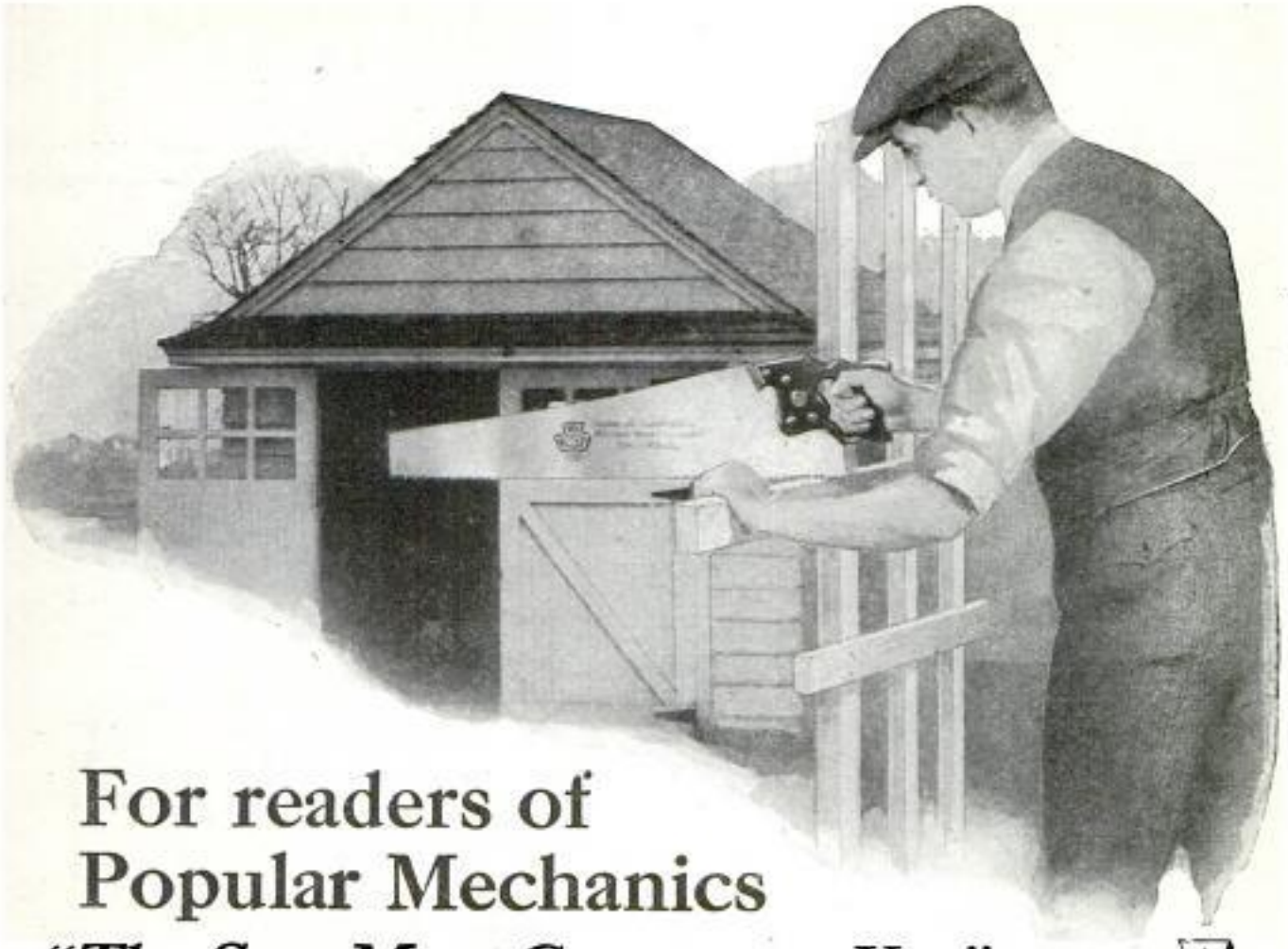

For readers of Popular Mechanics

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THE Disston Saw is the saw for the man who knows good work and wants to do it.

For the man who gets an added pleasure out of working with good tools.

It is just the saw for the kind of man who reads this magazine.

—

Eighty-odd years ago Henry Disston set down the things saw-users need in a saw and began making saws to meet those needs.

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The telephone door

More people enter our homes and offices by telephone than in person. Through the telephone door, traveling by wire, comes a stream of people from the outside world on social and business missions. Important agreements or appointments are made, yet the callers remain but a few seconds or minutes and with a "good-bye" are gone. We go out through our telephone doors constantly to ask or give information, buy or sell things, make personal calls and on dozens of other errands.

None of the relations of life is more dependent upon co-operation and mutual consideration than these daily millions of telephone journeys. It is the telephone company's part to furnish the means of calling and to place courteous and intelligent employees at the service of the public. Good service is then assured when there is a full measure of co-operation between users.

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BELL SYSTEM

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Tight against the cowl

yet he drills easily

He doesn't need space to revolve crank of "Yankee" Ratchet Breast Drill.

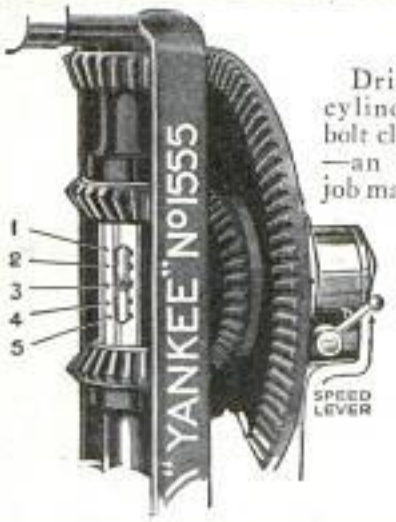
When set on DOUBLE Ratchet any slight movement of crank back and forth causes drill to cut continuously.

By doing the otherwise impossible jobs, a "Yankee" Ratchet Breast Drill saves the time and expense of taking down construction.

"YANKEE" Ratchet Breast Drill No. 1555

Five ratchet adjustments. Two speeds. 3-jaw chuck holds round shank drills up to ½ in.

No. 555. 2-jaw chuck holds both rounds and squares up to ½ in.



Drilling out cylinder head bolt close to cowl—an awkward job made easy by "Yankee" DOUBLE Ratchet.

Five Ratchet Adjustments

1. Plain Drill
2. Left-hand Ratchet
3. Right-hand Ratchet
4. DOUBLE Ratchet
5. Gears Locked

Some other "YANKEE" Tools

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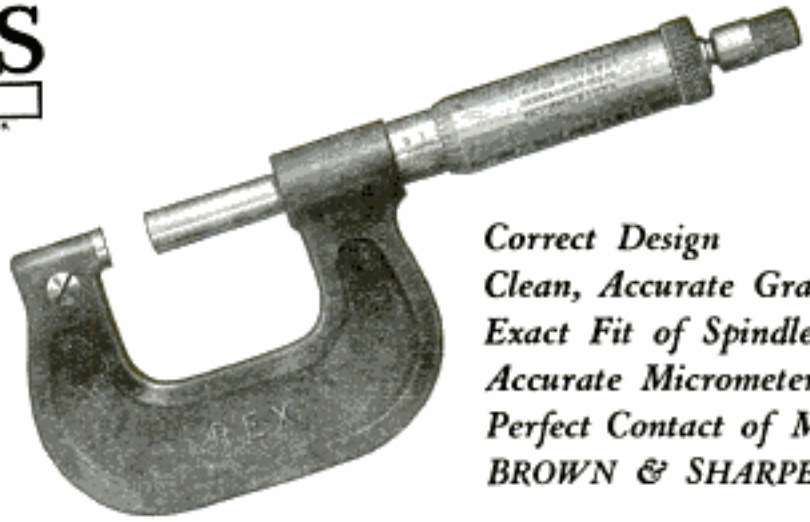

Correct Design
Clean, Accurate Graduations
Exact Fit of Spindle in Frame
Accurate Micrometer Screw
Perfect Contact of Measuring Surfaces
BROWN & SHARPE Quality

The "Rex" gives you all these things

IN examining the "Rex," you will first be impressed with the careful workmanship, the clean-cut graduations, the polished thimble and barrel, the smooth, enameled frame. The "Rex" is a High Quality Micrometer—only the price has been left moderate. Hold the "Rex" up to a strong light and turn its spindle down against the anvil. You will notice how accurately the measuring surfaces come together. Then there's the micrometer screw—the heart of the micrometer—cut to a standard.

—Remember, the "Rex" is a Brown & Sharpe Micrometer of the Brown & Sharpe Standard of Accuracy

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BROWN & SHARPE TOOLS

"Standard of the Mechanical World"

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And we would not have it otherwise. For childhood takes its pleasures with inexpensive toys—things that we should be able to give them. The message we would like to impress is that you can have the things you need and give your children the things they would like. The way is easy.

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"It's a Sky Terrier"

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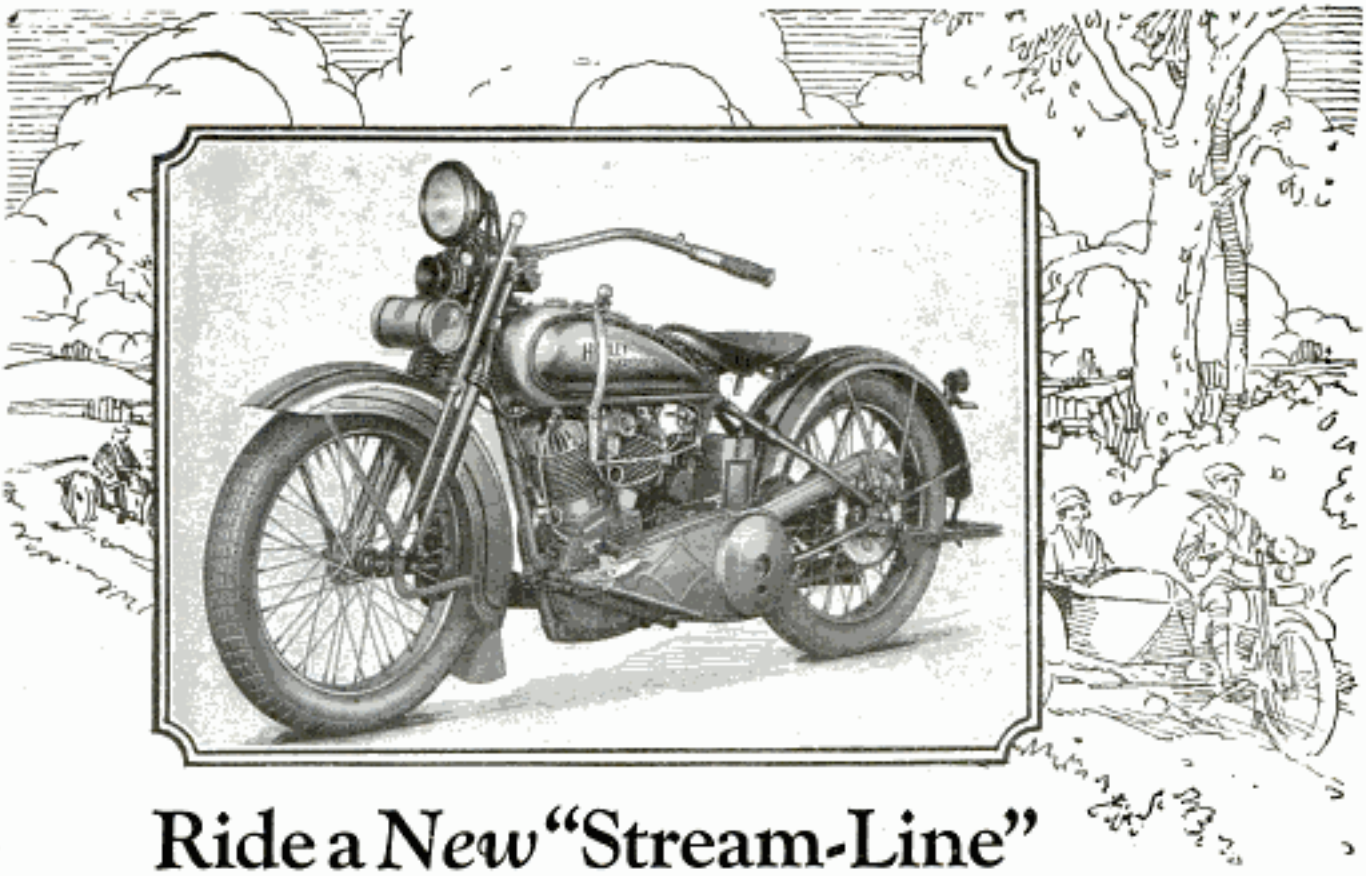

Ride a *New* "Stream-Line" Over the Thrill Trail!

HARLEY-DAVIDSON engineers have built sixteen improvements into their latest "Stream-Line" model — to provide still more comfort, economy and durability. They did not dare add more speed!

Notice the new, wide fenders—the balloon tires—the trim, handy switch panel. Your dealer will show you the other new features.

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HARLEY-DAVIDSON MOTOR CO., Dept. P. Milwaukee, Wis.
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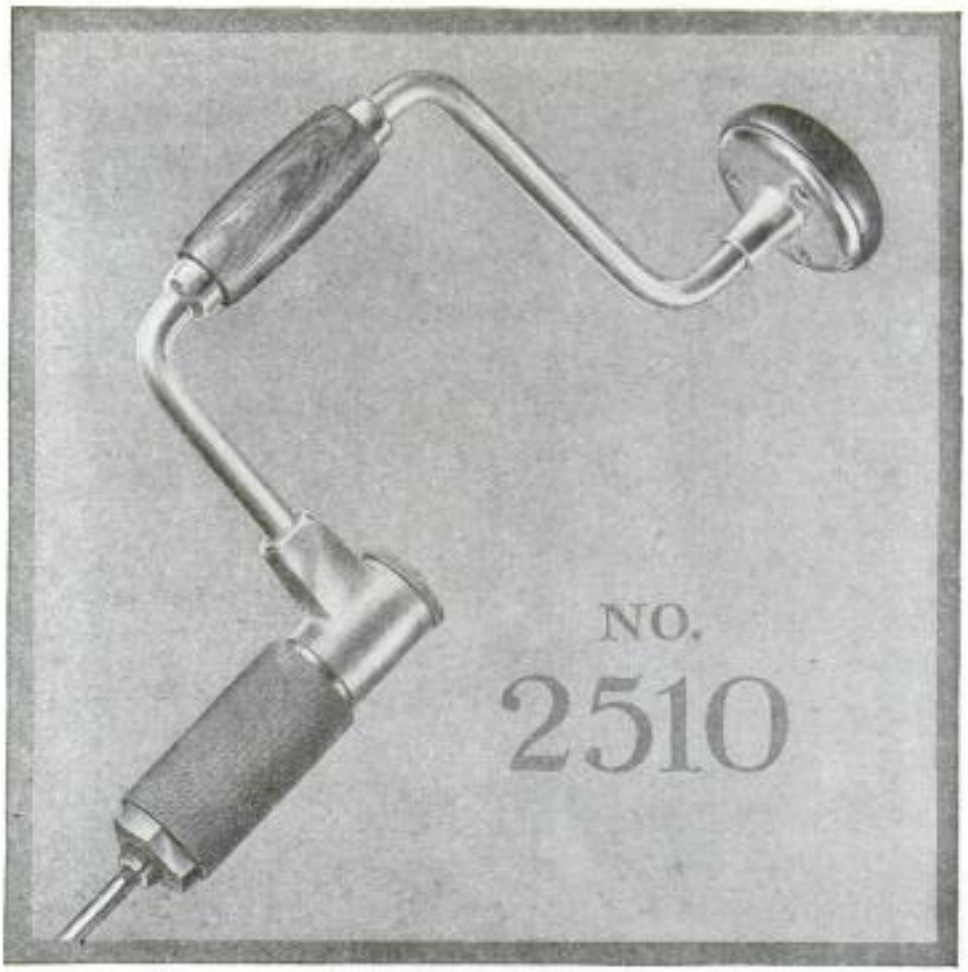

Here's *the Brace*, men

that you have dreamed of

OPEN up the jaws of that powerful chuck and feed it the biggest, fattest square shank you can find. Try an expansion bit if you have one. See how it slips through without a murmur. Put your hand around that finely knurled hardened steel chuck shell and run it down. How those jaws do grip!

Now drop in a Morse taper shank. Put the hexagon nose of the chuck shell in a vise and force it as much as you like. You can't hurt this little brute. That goes for the ratchet mechanism, too.

Where is the ratchet mechanism? Safely encased in that neat red enameled drop forging just above the chuck shell. Something entirely new—a patented feature—and this ratchet mechanism is as sure and as husky as it is different. Can you imagine yourself stripping a hardened tool steel dog 1¼ inches long that bites into teeth broached in a forged steel head? Just try to do it!

Need we add that the heavy steel sweep is nicely nickel plated, that the head and handle are polished rosewood, that the steel-clad head is set on roller bearings? Only the best of fittings could have a place on a brace like this one. You can't find a better bit brace. Closely priced, too—$6.20. Good hardware stores sell it.

GOODELL-PRATT COMPANY, GREENFIELD, MASS., U. S. A.

Toolsmiths

GOODELL-PRATT

1500 GOOD TOOLS

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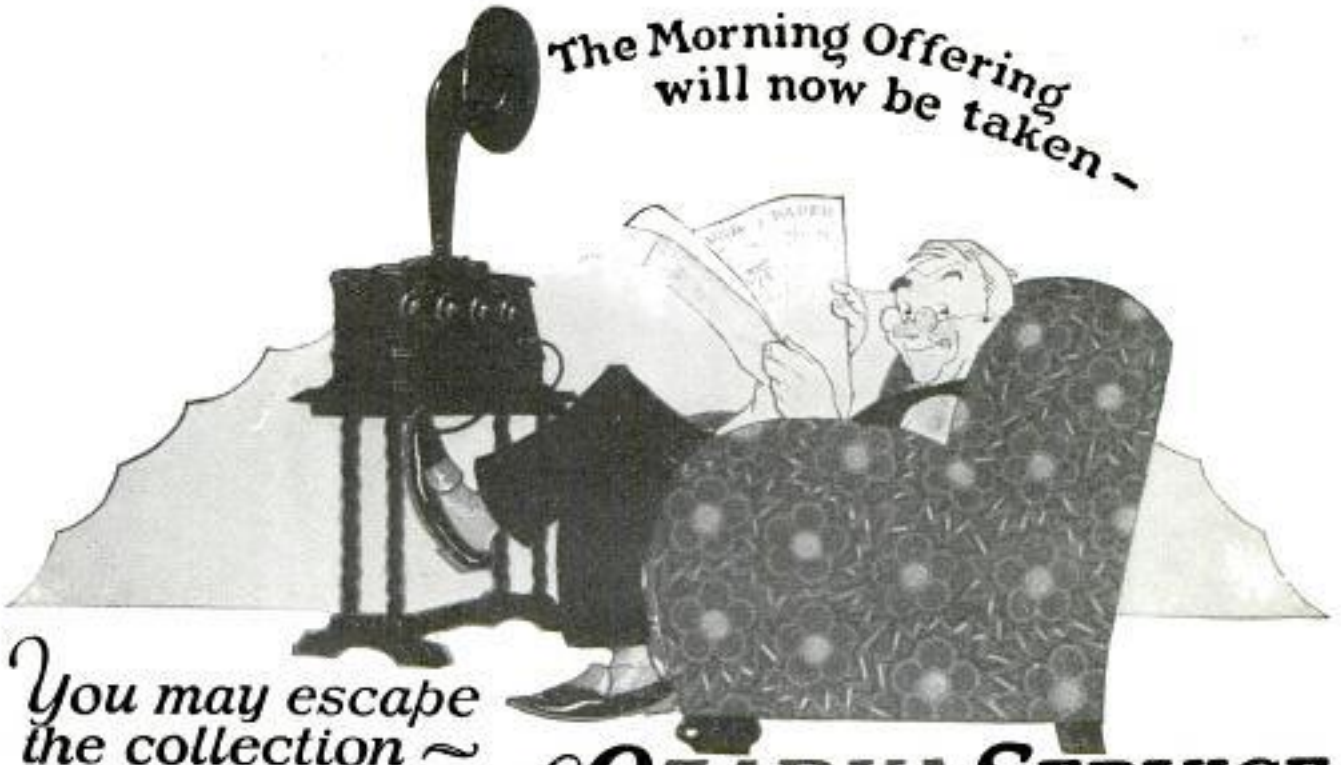

You may escape the collection ~ but not the need of OZARKA SERVICE

THE satisfaction you receive from your radio depends not on what it does once in a while—but night after night and month after month. Whether you grin or cuss depends on the service behind your radio.

Ozarka radio instruments are *only* sold by trained factory representatives, men who not only specialize in radio but sell and service Ozarkas only. 3,100 of these men, trained directly under Ozarka engineers constitute a service force, unequalled elsewhere in radio today.

When you buy a radio you'll compare appearance, tone, volume and selectivity by having various instruments set up in your own home but—that isn't enough—compare the service behind each one.

Any Ozarka factory representative will set up an Ozarka in your home—he will not even operate it himself, but will depend for his sale on what you yourself do. If you, by your own operating, do not bring in the distance, the volume and tone, you expect a radio to give, then you do not buy the Ozarka. If you do buy it, you can rest assured, no matter what happens, a competent service man is at your call at all times. No Ozarka representative can sell Ozarka Instruments without giving Ozarka service. You are entitled to such service—demand it!

That is why our book, "Ozarka Instruments No. 200," describing all models of Ozarka should be of particular interest to you. This book and the name of the Ozarka representative near you, will be sent immediately at your request. Please give name of your county.

We Have Openings for More Ozarka Factory Representatives

OZARKA Incorporated, is now entering its 4th year. From a beginning with one engineer, one stenographer, one salesman—our present president, the Ozarka organization has grown to over 3100 people. There must be some good reason for this growth.

Ozarka instruments have made good—they have more than met competition. Ozarka representatives have made good not only because Ozarka instruments were right, but because they have been willing to learn what Ozarka engineers were willing and capable to teach them—Ozarka unusual salesmanship and Ozarka service.

Radio offers a wonderful opportunity to men who are willing to start at the bottom and build. You need not know salesmanship, but will you learn what we will gladly teach you? You may not know radio, but we can and will teach you if you will do your part. With such knowledge and willingness to work, it doesn't seem possible that you cannot make good. Sign the coupon below, don't fail to give the name of your county. Better still write a letter, tell us about yourself and attach coupon. If interested in our salesman's plan ask for "Ozarka Plan No. 100."

OZARKA
118 Austin and La Salle Streets
Chicago, Illinois

Gentlemen: Without obligation send book "Ozarka Instruments No. 200" and name of Ozarka representative.

Name .....

Address ..... City .....

County ..... State .....

YOU'LL KNOW THE MAN BY THIS BUTTON!

INCORPORATED
118 Austin and La Salle Streets
Chicago, Illinois

Gentlemen: I am greatly interested in the FREE BOOK "The Ozarka Plan" whereby I can sell your radio instruments.

Name .....

Address ..... City .....

County ..... State .....

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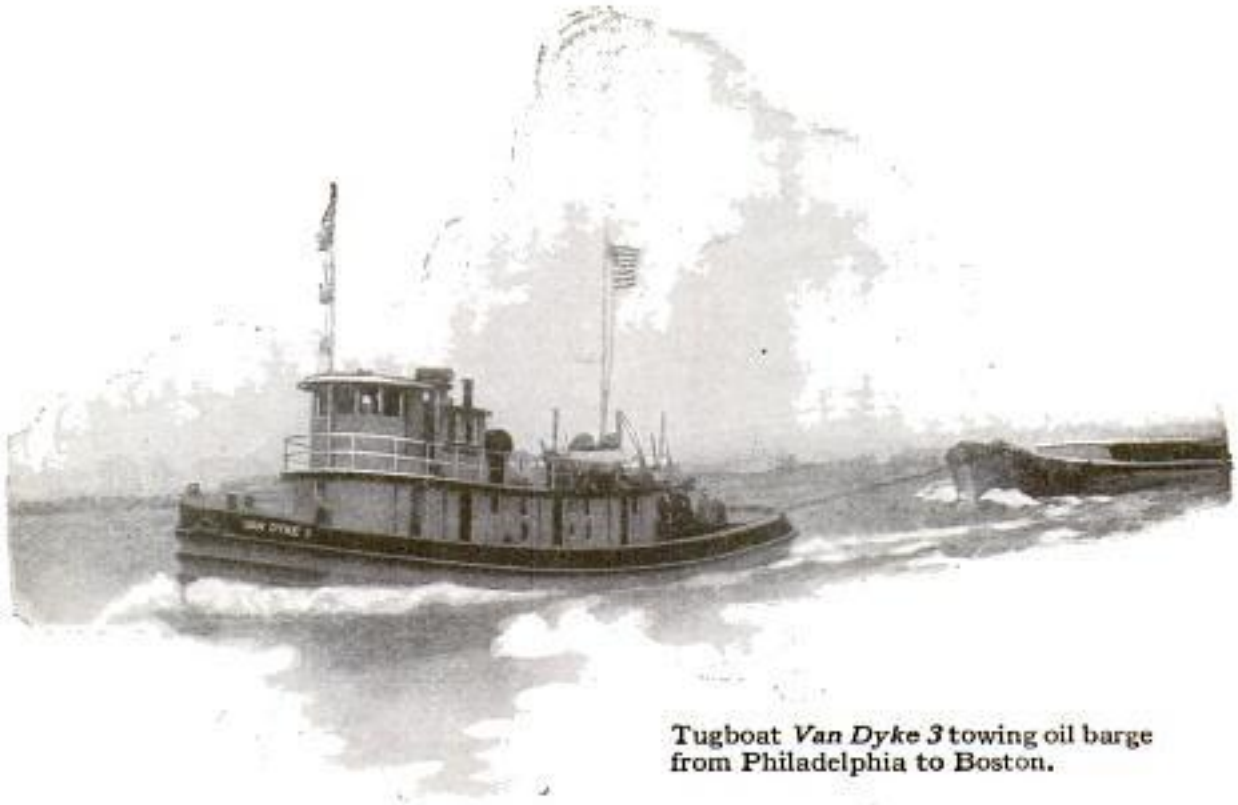

Tugboat *Van Dyke 3* towing oil barge from Philadelphia to Boston.

What is missing in this picture?

All electric equipment for this boat, and for two sister ships, was manufactured by the General Electric Company; which also makes electric motors large enough to drive battleships and small enough for sewing machines, washers, vacuum cleaners, and fans. Let electric motors work more for you.

Even a child can answer—this tugboat has no funnel.

It has no steam engine, either. No bunkers full of costly coal. No stokers. No smoke. No clouds of steam.

Clean electric motors, supplied with electricity by oil engine driven generators, keep this trim little boat continuously and inexpensively at work.

GENERAL ELECTRIC

6-5C

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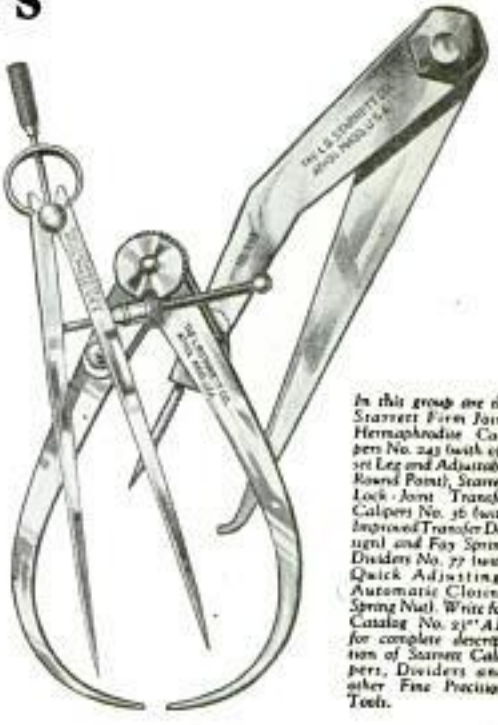
Why Do Good Hardware Stores Everywhere Sell Starrett Tools

Calipers and Dividers

Compare Starrett Calipers and Dividers with other makes and you will begin to see why Starrett Tools are preferred by particular mechanics everywhere. You'll find them made from a fine quality steel, tough and nicely tempered. The legs are strong, the springs have just the right stiffness for rapid, easy work, yet *holding* a given size faithfully. Set a pair of Starrett Calipers or Dividers in the morning and they stay set all day. The adjustment is particularly sensitive. Once you are accustomed to the "feel" of your Starrett you can work to surprisingly close limits. Caliper points are nicely shaped—divider points unusually accurate. Threads on nut are absolutely true.

Note the lightness and balance, the nice finish, the obviously superior workmanship in every part of a Starrett Caliper or Divider. None better—*at any price!*



In this group are the Starrett Firm Joint Hermaphrodite Calipers No. 243 (with offset Leg and Adjustable Round Point), Starrett Lock-Joint Transfer Calipers No. 36 (with Improved Transfer Design) and Fay Spring Dividers No. 77 (with Quick Adjusting, Automatic Closing Spring Nut). Write for Catalog No. 23 "A" for complete description of Starrett Calipers, Dividers and other Fine Precision Tools.

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS.

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If You Took Your Radio Tubes to the Jeweler's

And asked him to clean the corroded terminals, he would reach for a NICHOLSON X.F. Swiss Pattern File and, applying it lightly to the prongs of the tube, quickly assure a good clean contact.

You, of course, can do this as well for yourself and for all other fine filing should keep on hand NICHOLSON X.F. Swiss Pattern Files---the kind jewelers use for the most exacting work.

That we could take the skill of the old Swiss file makers---improve on it---and inject it into mass production, seems almost impossible.

But the sharp teeth, the perfect temper, the balance and the amazing uniformity of the X.F. Swiss Pattern Files, plus the verdict of the craftsmen who use them, prove that this has been done.

EXTRA TRADE X. F. MARK FINE

Swiss Pattern Files

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NICHOLSON FILE CO.
PROVIDENCE, R. I., U.S.A.

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The New, Patented Ivory and Glass

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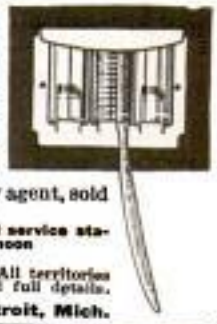
Worth 75c Given away **FREE** with each 50c sale of a standard size tube of

RE-AX DENTAL CREAM



Everybody buys dental cream and everybody buys Re-Ax to get the handy Tooth-Brush Holder that fastens on bathroom wall and keeps toothbrushes sanitary. **Everybody wants it.**

EARN $5 TO $20 A DAY!

No experience necessary. Shepardson, a new agent, sold 36 out of 37 calls. Read what others say:

"Sold 10 in one barber shop." "Sold 35 in a Ford service station during noon hour." "Sold 40 during noon hour in a manufacturing plant."

You can sell one in every house on every street. All territories good. Big profit. Send 25c for free samples and full details.

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Here's Your Own 6 Foot

Steel Pocket Tape with your own initials stamped on it

In extra fine nickel plated case; spring wind, center stop. Tape ¼" wide; 6 ft. long; clearly marked. For architects, draftsmen, mechanics, business men, and for many household uses.

Send your initials with order and

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and tape will be sent postage paid.
Returnable for full refund if not satisfied.

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AMERICAN RULE MFG. CO.
486 Johnson Ave., Brooklyn, N.Y.

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9 models, $25 up; speed, power specialties

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Ford underslung speedsters and bodies on display. Come in and inspect.

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PureWool $23.50 UNION MADE Suits and Overcoats

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Experienced men can easily earn **$100.00** a week at start. Our union made suits and overcoats at **$23.50** (none higher) are America's biggest values. We show latest nifty colors and styles for men and young men. Only **pure wool** fabrics. The overcoats are satin lined. Protected territory. Can use spare time men in some towns. Write today for application blank and free sample of the world's greatest clothing values. Address F. R. **HARVEY, Box 00, CHICAGO**

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is lathe value plus—more for the money than ever built before. Length over all, 30 in. Between centers, 14 in. Swing over bed, 7¾ in., includes counter shaft. Bronze taper bearings. Weight 60 pounds. Absolutely accurate. A real job. *Write today for circular.*

$60

The Sypher Mfg. Co. Dept. D Toledo, Ohio

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Ask for our Beautiful Diamond Book FREE. Shows all the new styles in rings and tells about our rock bottom prices and our charge account plan.

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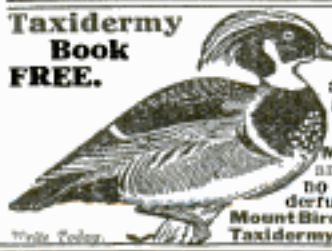

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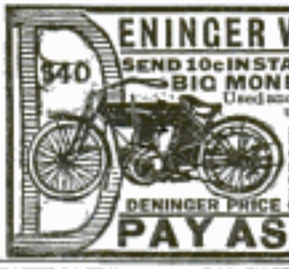

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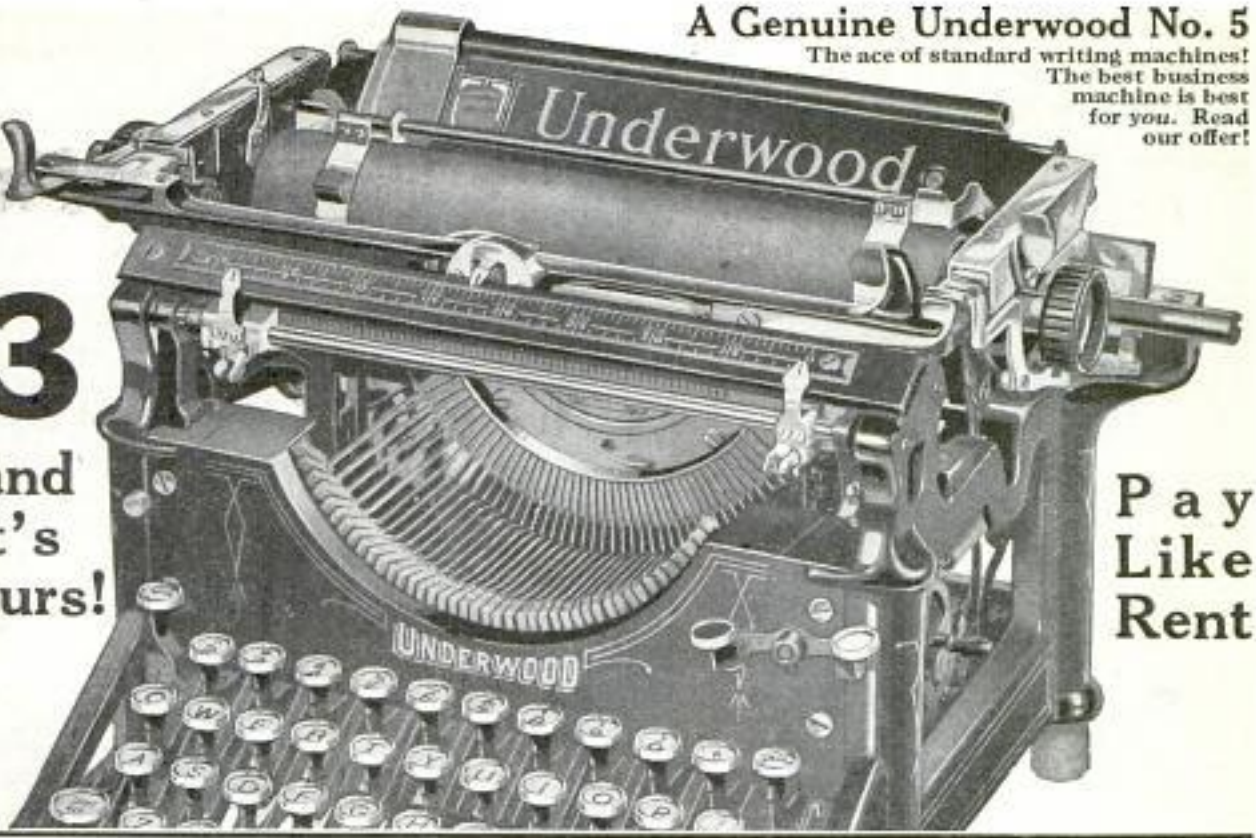

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WHEN you go to your dealer's to select parts for your Popular Mechanics' Circuit, be sure that you obtain genuine **FROST-RADIO** apparatus wherever specified. You will then be certain to get the maximum efficiency and best possible results from this wonderful circuit.

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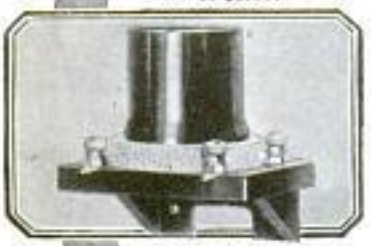

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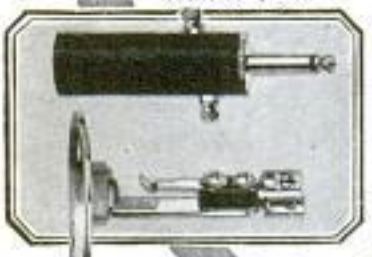

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Would you like to have me pay you from $30.00 to $100.00 every Saturday night? I will gladly do it if you will represent me in part or all of your time.

FREE

Sun and Tub Fast

Sizes: 32 to 44

(Misses Sizes in 16, 18, 20 and 22.)

My representatives not only earn big money, but also get the three dresses pictured above, free. There are twenty-five or more styles in my complete line, and I permit my representatives and their families to have anything they want from my line at special discounts.

No Capital or Experience Necessary in This New Business

It is said that there is nothing new under the sun—but this is a new business, and a new idea—a simple, easy way to make a good income the rest of your life.

I want representatives everywhere to demonstrate and show my beautiful and low-priced street, house and porch dresses. Since there is no collecting or delivering to do, no experience or capital is necessary. It's like having a store of your own without any capital invested. I am now paying 2,000 people for representing me and find that men and women are equally successful regardless of age or previous experience.

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There is nothing for you to learn—it's simple as A B C and you can put in as much or little time as you please—I pay you accordingly every Saturday night. All you do is show my styles, materials, etc., to your friends and neighbors—I do the rest by mail.

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If you would like your chance in this newest of businesses, you should write me at once because I want only one representative in each locality. If you wait you will likely be too late. Just send me the coupon below or drop me a postal card and I'll tell you all about this new, big paying opportunity. No obligation—if you like the idea, I'll be glad to add you to my pay roll—if you don't no harm is done.

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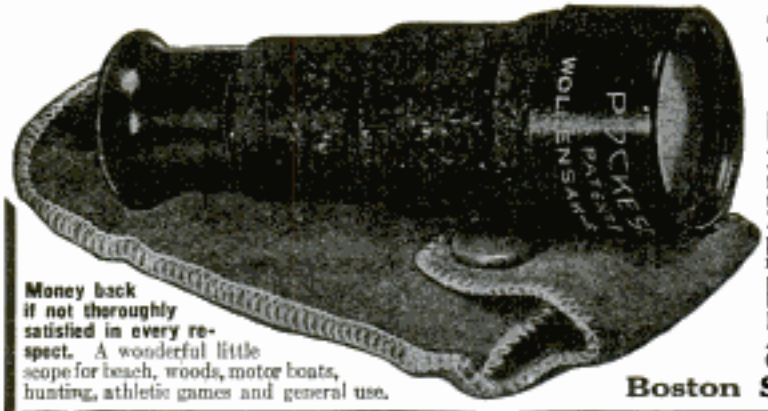

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$2 Postpaid with excellent limp leather case! Length closed 3 1-4 in., maximum diameter 1 3-16 in.

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Send No MONEY

To secure boosters for our unbeatable values, classy styles and perfect tailoring, we make this introductory *free* suit offer. Our new plan enables you to get one of our fine, made to order suits, in any style you like without spending money.

AGENTS WANTED Earn $9 to $18 DAILY Cash for you besides Free Suit for spare time showing our wonderful samples to neighbors and friends, we show you how, prices so low folks buy on sight, get cash and FREE SUIT. No experience needed. Biggest sample outfit, agents wholesale prices, real wool pieces, fashion styles, tape measure, simple directions. WRITE AT ONCE for FREE suit offer and Free sample outfit.

PROGRESS TAILORING CO., Dept. J-215, **CHICAGO**

AGENTS 500% PROFIT

GENUINE GOLD LEAF LETTERS

Sguaranteed to never tarnish. Anyone can put them on stores and office windows. Enormous demand, large profits. Paul Clark says: Smallest day $28.70. R. L. Reel made $920 in two months. Write today for free sample and liberal offer to general agents.

METALLIC LETTER CO., 433-B N. Clark St., CHICAGO

NEW AUTOMATIC ADDER, $3.50

Makes adding easy. It's accurate, quick, durable and easily operated. Capacity 8 columns. Saves time, brain work and errors. 75,000 pleased owners. Fully guaranteed. Price $3.50 delivered. With metal operating bands, $5.00 delivered. Agents wanted.

J. H. Bassett & Co. Dept. 281, 1458 Hollywood Ave., Chicago, Ill.

$85 a Week like play

Man or Woman

Big Money for you quick showing my line of charming ladies' silk lingerie and hose, receive profits in advance. No experience required. Miss Grace James averaged $35 a day spare time. R. G. Thompson earned $35 in 1 day. The secret of success is offering exclusive articles that women love at sight.

SELL PRINCESS RADIUM Lingerie and Hose

Profits in Advance

Free Handsome photos from actual models and actual samples of genuine "Princess Radium" silk, free.

These dainty garments, exclusive in design, not carried by any store, our low mfr.'s direct prices unbeatable. Splendid opportunity, big cash quick, write for exclusive territory, build a steady income. District managers wanted, territorial rights going fast, don't delay, write now. **ROBERTS-FRANK & CO** 1733 Irving Park Blvd. Dept. 239 Chicago

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NEW VEST POCKET ADDING MACHINE

Adds as rapidly and accurately as a $300.00 machine, yet fits the vest pocket. Easy to operate. 9 column capacity — best constructed portable adding machine made.

$2.95

Counts Up to 999,999,999 Total visible at all times. A pull of the finger clears it. Don't carry a pocket full of pencil stubs and scrap paper to do your figuring. Carry a Ve-Po-Ad.

10 Days' Trial Send no money. Just name and address and we will send machine postpaid. Pay postman on delivery $2.95. Use it 10 days to prove it does all we claim. Your money back if not perfectly satisfied. Don't be fooled by cheap imitations. Order your Ve-Po-Ad now from this ad.

Reliable Adding Machine Corp., Dept. 4C
184 W. Washington St., Chicago, Ill.

AGENTS Here's a money maker. Everybody wants one. Splendid profit. Write for special offer.

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HEAT Without Coal!

An amazing new invention that does away with Coal and Wood in Stoves, Ranges and Furnaces. Manufactured by the old, reliable INTERNATIONAL HEATING CO. Cost surprisingly low. Without waste, it burns Instant-Gas, a safe, superheated mixture of cheap fuel-oil and air.

THE FIRST **INEXPENSIVE** FURNACE BURNER THAT IS SATISFACTORY!

Here is a Furance Oil Burner that is **different.** Thousands who had been disappointed with cheap, ineffective Furnace Oil Burners —thousands more who curse the complicated, high priced burners— and other thousands who had been slaves to wood and coal are now enthusiastic users of the new INTERNATIONAL Burner because of its amazing simplicity, efficiency, and unequalled economy.

The International's combination safety and indicator valve, approved by Underwriters Laboratories of National Board of Fire Underwriters.

Write for 30 Day Free Trial

The new INTERNATIONAL Burner fits any hot air, steam or hot water furnace, and is the cheapest to install and operate. Burns without waste most economical fuel known, 96% air and 4% oil. The new INTERNATIONAL has no noisy motors, no moving parts, nothing to get out of order; action purely automatic, eliminating odors and smoke. The new INTERNATIONAL is always ready and safe. Cost unbelievably low. Installation quick and easy without damage to furnace. Can be moved if you move. Try the new INTERNATIONAL, and you'll never use any other. Low introductory price and 30 day free trial offer to those who write at once. This offer is for limited time only.

FITS ANY STOVE, RANGE OR FURNACE

Recommended and endorsed by leading institutions. Given highest rating.

Thousands of testimonials from 48 states.

It's amazing what this new burner can do. Four special models of this wonderful invention are made to fit any heating stove or range. Simply sets in firebox, and transforms oil and air into Instant-Gas, giving three times the heat of coal, and cheaper. Can be turned on or off in a jiffy. Better cooking and baking. Installed in five minutes; no damage to stove. Absolutely safe; lasts a lifetime. Sold on money-back guarantee. Over 60,000 INTERNATIONAL Burners in use. Write today for 30 day free trial offer and Free Book, "Scientific Oil Burning." Specify whether for stove or furnace. Use coupon for quick action.

INTERNATIONAL HEATING CO.

Dept. 154-J, 117 So. 14th St. ST. LOUIS, MO.

AGENTS WANTED

Agents, distributors and salesmen wanted at once. Write or wire for exclusive free territory quick. Now is the time to get started—jump into this immediately for a big season. Hundreds of men and women are making big money with the new INTERNATIONAL Burner. Adrian of Pennsylvania made $150 the week after he started, Fleurant of Rhode Island made $90 the first week, so did Clark of Nebraska. Palley of Iowa made $65 in three days. Bible of Wyoming earned $30 in two hours. Meade of Mexico made $126 in one day. Arnel of California runs up $40 in two days, and hundreds of others are cashing in big with the new INTERNATIONAL Burner. Highpowered salesmanship not necessary. The new INTERNATIONAL practically sells itself. Write at once for free sample offer and special agents' proposition.

INTERNATIONAL HEATING CO.,
Dept. 154-J, 117 So. 14th St., St. Louis, Mo.
Mail me, postpaid, your Free Book, "Scientific Oil Burning" and further information about your burner for:—

.....Stoves
.....Furnaces
(Check style desired)

For agent's sample offer, place (x) below. ☐

Name.....
Street or P. O. Box.....
City.....State.....

30 Days' Free Trial

Select from **44 Styles,** colors and sizes, famous **Ranger** bicycles. **Delivered free** on approval, express prepaid, at **Factory Prices.** You can easily save $10 to $25 on your bicycle. Prices **$21.50** and up. **$5 a Month** on any Ranger if desired. Parents often advance first deposit. Boys and girls can easily earn small monthly payments. Pay as you ride. **Tires** best quality, at factory prices, express prepaid. Lamps, wheels and equipment, low prices. **Send No Money,** do business direct with makers.

Mead CYCLE COMPANY DEPT. K-108 CHICAGO

Write today for free Ranger Catalog, factory prices and marvelous easy payment terms

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Write today for your copy. Save 50% direct from Manufacturer. No Middleman's Profit. OUR SPECIAL: 8 Room Electric Set, ready to hang, $24.50—Other bargains.

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Wear Resisting—Good Looking

EverlasbestoS Flooring

Laid over old floors or in new buildings

No dirt collecting cracks, seams or joints. Perfectly smooth —easily kept clean, sanitary. Resilient to the tread. Its perfected formula assures permanent usefulness and real economy. Its low first cost will surprise you. Used everywhere in apartments, kitchens, bathrooms, business buildings, factories, schools and theatres. Three colors—red, buff and grey. Better floors are a certainty with its superior ingredients and original, proved method of laying. Write now for catalog and sample

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Put on like Plaster
Wears like Iron
-waterproof
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Base and Floor one solid piece

A composition material easily applied in plastic form over practically any kind of floor. Laid about 3/8 inch thick. Imperial floor does not crack, peel or come loose from foundation. A continuous, fine-grained, smooth, non-slipping surface. No crevices to gather grease, dirt, dust, disease germs or moisture.

Ideal Floor for Kitchen, Pantry, Bath Room, Laundry, Porch, Garage, Restaurant, Theatre, Hotel, Factory, Office Building, Railroad Station, Hospital—wherever a beautiful, substantial floor is desired. Several practical colors. Full information and sample FREE of your first and second choice of colors.

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Different from all others—the NEW BENJAMIN AIR RIFLE

Made on a different principle from all other Air-Rifles.

The Benjamin is really a strong air-pump used to compress the air in the air chamber to any degree of power desired. From one to six strokes of the pump give all the force necessary. Each additional stroke gives increased power. The Benjamin works on the same principle as all air-drills and air-hammers—with this difference:

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You can't have accidents with a Benjamin. It's **safe, always**, because you control the power. The Benjamin never loses shooting force, and has no springs to get out of order or shake your aim. Write us for an interesting folder about this wonderful air-gun.

If your dealer does not handle same, send direct to factory.

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Ask your dealer for demonstration.

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Cuts down trees and saws them up FAST—one man does the work of 10—saws 10 to 25 cords a day. Makes ties. A one-man outfit. Easy to run and trouble-proof. Thousands in use. Powerful engine runs all other farm machinery. Uses Kerosene, Gasoline, Distillate or Gas.

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Take a hammer and drive as many nails into a tire as you wish, 50—100—500, it makes no difference. GALACITE seals the punctures permanently, as soon as they are made. We guarantee it for one year, but it will last indefinitely.*

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TREMENDOUS PROFITS. Agents and Distributers everywhere to demonstrate and sell to car owners, garages, filling stations. Work all or spare time in your own home town or traveling. GALACITE* sells itself. Every customer becomes so enthusiastic that he helps you sell his friends. **A revolutionary invention** that will make you independent. You can also manufacture and sell GALACITE* PUNCTURE PROOF INNER TUBES.

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All the best features of a Fountpen. Lasts longer. Writes smoother. Improves handwriting. Eliminates fatigue. GUARANTEED.

14 Kt. White Gold Point, Chased Rubber Holder, Lever Filler. Pocket Clip.

$2.00 By Mail

Your Name in Gold Inlay, 25c.

Write for Pen Catalog. Agents Wanted.

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Known the World Over for 40 Years.

I Pay Men $40 A DAY!

S. W. Allen of California made $40.80 in one day's "joyful work"! Hundreds of other men are reporting amazing incomes—many of them doubling and tripling their former salaries.

Just Wear This FREE Cap

Just wear this beautiful hand tailored FREE RAIN-PROOF Cap. When your friends see it, nine out of ten will want one like it. They can't resist the *Rain Proof* idea—it's so new and unique. You can make a splendid income in full or spare time. No experience is needed. "I haven't found a man who doesn't fall for the made-to-measure idea," writes Chas. Horstman. Send at once for FREE Selling Outfit. **Taylor Cap Mfgrs., Dept. S-M, Cincinnati, O.**

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Recording
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Sea Water
Ship Hold
Shower Bath
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Tin Cased—Common
Tin Cased—Hop Curing
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Write for information on any of above thermometers or booklet "Temperature; its relation to our health and comfort."

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Men's trousers are getting longer and wider. Girls' style fads come and go, but Mr. Man's conventional **Coat, Vest and Trousers** goes on forever.

Did you ever stop to consider how universal the demand for men's clothing really is? Every man, everywhere, wears clothes, and there is no other commodity that is more steadily in demand than clothing. As a selling proposition for the salesman, there is nothing to equal it as a consistent money maker, and a steady, permanent selling proposition.

What the great mass of clothes buyers today are asking for is a good All Wool, well made suit at a reasonable price. If you can meet this demand you will be able to get business every day in the year, and make steady profits every hour that you work with your sample line.

The Great Western suit at $24.50 meets the demand of today for a good suit at a low price. It undersells all competition. Sales are quick, sales are easy. Our values sell on sight to four out of every five men who examine the samples. Our values cannot be duplicated anywhere at less than $35.00 to $45.00.

When you take an order you collect a deposit of $4.00 from the customer. You keep this $4.00 as your profit. We then ship the suit direct to the customer for the balance of $20.50. That's all there is to it. It's the simplest, the most clean-cut, the greatest money-making selling plan ever devised. Active, full time men, are averaging six sales a day, which means $24.00 a day clear profit.

Your territory may be open now. We are covering all America, and will place one representative in every community from Cape Cod to Pasadena. If your application is accepted, no others will be passed upon, as long as you produce an active business.

We furnish our salesmen with big 9x13 samples, showing the goods in actual swatch cut right from the bolt. Don't experiment with untried lines. Select a line that can be depended upon to satisfy your customers and build up a permanent business for you. Connect up with Chicago's biggest old reliable clothing manufacturers. We have satisfied our customers for 30 years. Write at once to

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COUNTER Eveready SALESMAN

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100% to 150% profit on every deal. $12 initial investment starts you—buys 12 Eveready (with sales-attracting bell attachment, 25c each extra). Complete investment averages from $100-$200, depending on number of EVEREADYS put out. Profits quickly pay back your investment. Sell or lease EVEREADYS, then keep merchants supplied with stock (salted peanuts, candies, nut meats, etc.) Daily repeat orders. Our contact with big nut-meat specialty houses enables you to buy all your supplies wholesale—in separate bags or bulk.

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WHOLE OR PART TIME Volume steady business and big profits in short time. Nothing else like EVEREADY—automatic—easy refill—no hooks, clips or stickers. *Hurry*—ACT NOW—for exclusive rights in your community.

Dealers: If no "Eveready" distributor has called—remit $1.50. 10 days must prove claims or full refund.

THE INTERSTATE CO., 2402 E. 9th Pl., CLEVELAND, O.

(References: Midland Bank, Cleveland)

OR—start on "shoestring" with new EVEREADY Metal Easel Display—just out—write for details!

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$1 DOWN

Nothing less than 21 Ruby and Sapphire jewels is good enough for the **Burlington** masterpiece.

Quality and Style

Adjusted to second—temperature isochronism—positions, 25 year gold strata case, in 100 designs. Unsurpassed quality, rock-bottom prices. $1 down brings your choice. Balance in small monthly sums.

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Find out about this big special offer made for a limited time!

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a month for a few months—easy to own the famous standard WITTE Engine. Uses Kerosene, Gasoline, Distillate or Gas. Equipped with celebrated **Troublepreof** WICO Magneto. Simplest and cheapest to operate. **New device** makes starting easy. 60% surplus power. Sizes 2 to 25 H-P—all styles. Sold direct from factory to you on NINETY DAYS' FREE TRIAL. Write today for my new illustrated engine book—sent absolutely Free. No obligation to you.

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Those who wear them say:

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Simple—strong—durable. Wonderful little workers for all sorts of household and shop uses. Thousands in use. For all light power purposes. Attaches to faucet.

Two sizes: 4"—$4.25
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The higher the water pressure the more work they do.

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AMONG the 800 members of the great West Side Tennis Club at Forest Hills, N.Y., it was recently found that *7 out of every 10 wear Keds!*

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A sturdy athletic-trim Keds model—built for the hardest sports and vacation wear

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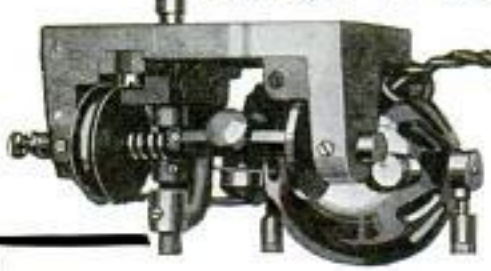

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We have a limited number of small motors which are greatly under-priced for quick clearance. You will never again equal this low price, when this lot is sold.

They are **universal motors,** 110 volts, 60 cycle single phase, complete with turntable, cord and socket for immediate use. 1400 R. P. M. Motor has 1" pulley with flange for ¼" flat belt. Housed in highly polished, nickel-plated shell.

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KING Instruments embody the finest craftsmanship and best materials of any made today—this catalog will tell you exactly how KINGS are made by

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Your Spare Pennies will pay for this Diamond Ring

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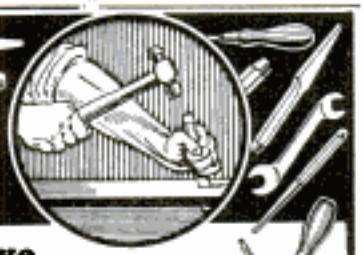

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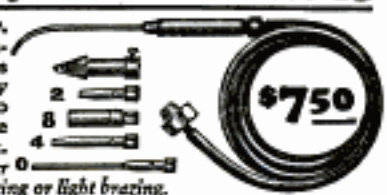

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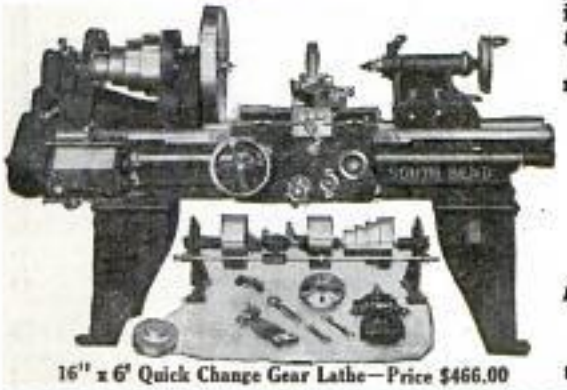

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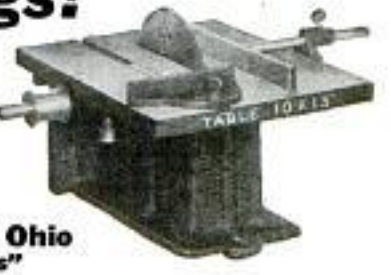

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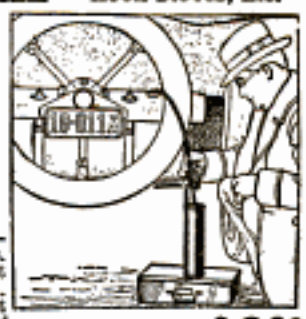

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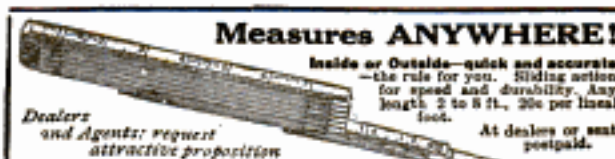

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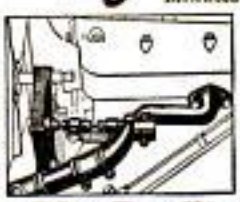

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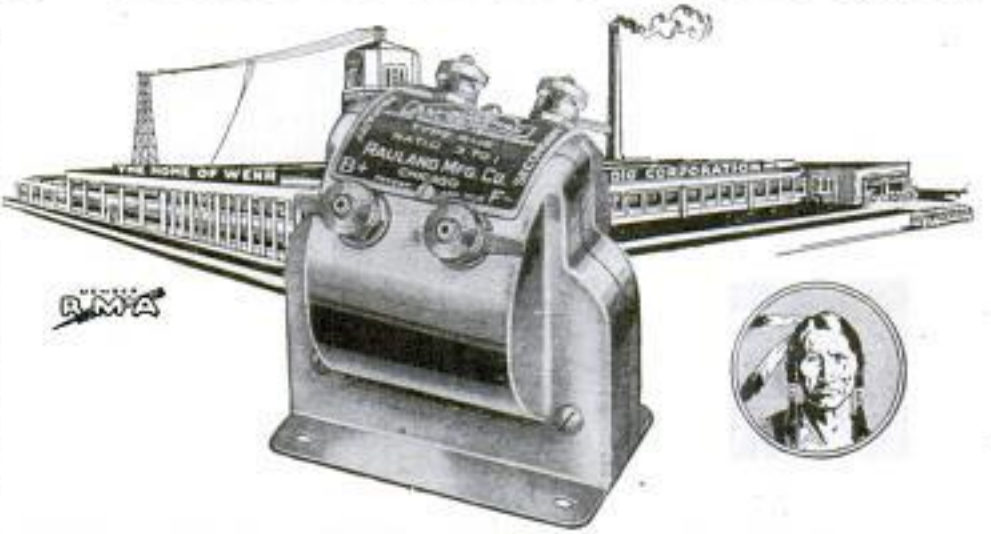

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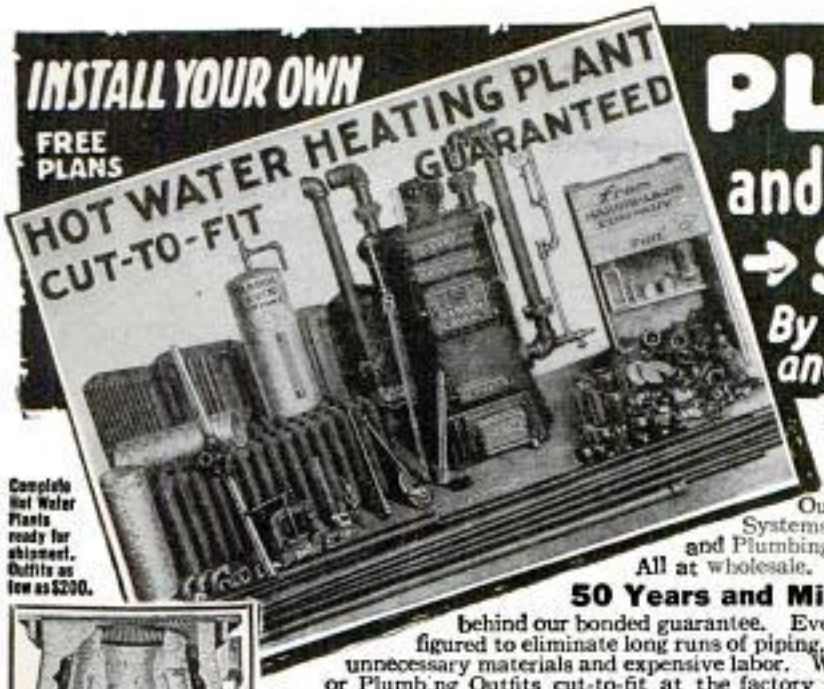

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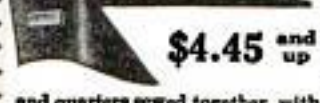

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5 New Joys

These you'll find—these new shaving joys, these comforts unknown before:

1. **Multiplies itself in lather 250 times.**
2. **Softens the beard in one minute.**
3. **Maintains its creamy fullness for 10 minutes on the face.**
4. **Strong bubbles hold the hairs erect for cutting.**
5. **Palm and olive oils bring one fine after-effects.**

To add the final touch to shaving luxury, we have created Palmolive After Shaving Talc—especially for men. Doesn't show. Leaves the skin smooth and fresh, and gives that well-groomed look. Try the sample we are sending free with the tube of Shaving Cream.

PALMOLIVE SHAVING CREAM

2953

10 SHAVES FREE and a can Palmolive After Shaving Talc

Simply insert your name and address and mail to Dept. B-1063, The Palmolive Company (Del. Corp.), 3702 Iron Street, Chicago, Ill.

Residents of Wisconsin should address The Palmolive Company (Wis. Corp.), Milwaukee, Wis

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OXO-GAS OIL BURNERS

OXO-GAS oil burner for ranges One of 20 types for all purposes.

For Furnaces, Ranges, Heating Stoves, Etc.

OXO-GAS, the cheapest, cleanest, most efficient fuel known to science, is made from kerosene or distillate, and air, mostly air. Burns with a pure blue flame of high heating intensity, as silently as city gas. *Over a million in use.* Manufactured by the oldest (est. 1906), highest rated and most responsible corporation. *Ask any bank. Send for Catalog* illustrating and describing twenty different, distinctive designs of oil burners for *Furnaces, Cook Stoves, Heating Stoves, Base Burners, Hot Water Heaters, etc.*

Agents Wanted Some choice territory for OXO-GAS agencies still open to thoroughly responsible parties. Your own locality may yet be unassigned.

GLORIA LIGHT COMPANY, 111-9 N. May St., Chicago, Ill.

12-Cell—24-Volt Storage 'B' Battery

Positively given **free** with each purchase of a WORLD "A" Storage Battery. You must send this ad with your order.

Send Your Order in Today

FREE!

To Each Purchaser of a WORLD 6 V. Auto or Radio BATTERY

WORLD Batteries are famous for their guaranteed quality and service. Backed by years of successful manufacture and thousands of satisfied users. Equipped with Solid Rubber Case, an insurance against acid and leakage. You save 50 per cent and get a

2-Year Guarantee Bond in Writing

WORLD Battery owners "tell their friends." That's our best proof of performance. **Send your order in today.**

Solid Rubber Case Radio Batteries

6-Volt, 100-Ampere	$11.25
6-Volt, 120-Ampere	13.25
6-Volt, 140-Ampere	14.00

Solid Rubber Case Auto Batteries

6-Volt, 11-Plate	$11.25
6-Volt, 13-Plate	13.25
12-Volt, 7-Plate	16.00

Send No Money Just state battery wanted and we will ship day order is received, by Express C. O. D., subject to your examination on arrival. **FREE** "B" Battery included. **Extra Offer:** 5 per cent discount for cash in full with order. Buy **now** and get a guaranteed battery at 50 per cent saving to you.

WORLD BATTERY COMPANY
1219 S. Wabash Ave., Dept. 6, Chicago, Ill.

World For AUTO and RADIO STORAGE BATTERIES

Approved and Listed as Standard by Leading Authorities including Radio News Laboratories, Popular Science Institute of Standards, Pop-ular Radio Laboratories, Radio Broadcast Laboratories, Radio in the home, and Lefax, Inc

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Nestler Rubber Fusing Stations

An opportunity is offered one man in each community to secure the sole and exclusive right to operate the famous Nestler Rubber Fusing Process of servicing pneumatic tires. Unlike any other method on earth. The Nestler method is the perfected and only known way of successfully retreading pneumatic auto or truck tires, including all sizes of **balloon tires.** Every car owner needs Nestler Service. Nestlerized repairs outlast the tire. No previous experience necessary. We teach you the business in two weeks or less. Moderate capital required. Big profit on each tire you do. Here is your opportunity to have a permanent and highly profitable business in your own name. Remember only one man can secure this profitable franchise in each community. Act now if you want to be that man. Write today for two interesting books describing the Nestler Rubber Fusing Process and the methods that are being employed by Nestler licensees everywhere to build up prosperous businesses.

NESTLER RUBBER FUSING CO., Inc.
Dept. P, 245 West 55th Street, New York City

FREE CATALOG Over 1,000 pretty Home Furnishings, Furniture, Rugs, Lamps, Silverware, etc. Save big money. Over year to pay. Small down payment. *Ask for Catalog 1000.*

Larkin Co Inc. **Buffalo, N. Y., Chicago, Ill., Peoria, Ill.**

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MAKE BIG MONEY—We supply stock and pay you following prices for all you raise: Belgian Hares $2 each—New Zealands $3 each—Chinchillas $4 each—Flemish Giants $5 each. 32 page illustrated book, catalog and contract, also copy of **Fur Farming** magazine, tells how to raise skunk, mink, fox, etc., for big profits, all for 10c. Address

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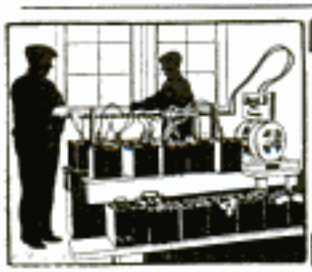
A Jefferson Tube Rejuvenator

Will keep your radio tubes like new. At leading Radio Stores **$7.50**

JEFFERSON ELECTRIC MANUFACTURING COMPANY
501 So. Green Street, CHICAGO, ILLINOIS



BIG PROFITS EVERY MONTH **WITH ONE DAY** BATTERY CHARGING

You can easily add **$150 to $300 monthly to your profits with money-making HB One Day Battery Charging Service.** No experience needed. **Complete instructions free.** Universal demand for One Day Charging means **big business from the start. Only $15 cash puts complete HB One Day Charging Outfit in your shop.** 30 days' free trial on **money-back guarantee.** Easy monthly payments—let your profits pay for outfit as you use it. Write for free bulletin 38.

HOBART BROS. CO. Box M9 TROY, OHIO

LOWEST PRICES-EASIEST TERMS-YOUR BEST MONEY MAKER

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Tasty-Crisps
"So Much Better than Good"

$15.00 an Hour and 80% is Profit

Talk about making money roll in! You can make potato chips—crisp, golden brown potato chips—right before the public's eyes, at the rate of about 150 sacks an hour—and sell them as fast as you make them, at 10c apiece. That's $15.00 an hour—and $150.00 in a ten hour day!

Your own business $6,000 to $10,000 a year!

All you need is a space 3 feet square and you can go in business. That's all it takes for the wonderful, sanitary, glass-enclosed Tasty-Crisp Potato Chip Machine. Works in any window—or at fairs and carnivals. Start a chain of stores if you want, and make money come faster. No big investment, no big rent—it's a year 'round money-maker. Double up on profits by selling retail and wholesale. Every season is Tasty-Crisp season.

Pays for Itself— 2 weeks to 4 months

No matter where you live, this machine makes money. $6,000 to $10,000 a year is a low estimate. Some operators are clearing $1,000 a month with one machine—more with chain stores. No other machine is like it—no other machine so completely enclosed, so completely automatic, so free from heat and fumes, so powerfully attractive to the public. Don't let this opportunity pass—write now, if you want to earn money beyond your greatest dreams of wealth and independence.

The Food Display Machine Corporation
Dept. PP9, 28 E. Jackson Blvd., Chicago, U. S. A.

REDDING & COMPANY
(Est. 1859) 9 West 23 St., N. Y. C.
Masonic Books, Monitors, Bibles, Jewelry, and Lodge Supplies
Send for catalogue 3 of Books and Jewelry; catalogue 4 of Lodge Supplies. No obligations. Mail orders promptly filled.

66 Miles on 1 Gallon
Wonderful Vapor Humidifier
For All Make Autos. Spare or full time Agencies Wanted Everywhere
1 FREE TO INTRODUCE
BIG PROFITS to any MAN WITH CAR
CRITCHLOW, Inventor, L-111, WHEATON, ILLINOIS

DONT BURN COAL
use cheap oil

New remarkable invention does away with coal or wood and saves money, time and labor. Simply sets in firebox of any **range, heating stove or furnace.** Most economical and lowest priced Oil Burner on market. Burns 96% air, 4% cheap oil and gives three times the heat of coal. Easy to install and operate. Absolutely safe. No noise, dirt or odor. Sold on money-back guarantee. 30 days free trial and special low price to first user in each locality. Write for free book on Home Heating. **Agents:** Write for sample offer and protected territory.

OKAY MFG. CO., Dept. 1898 East St. Louis, Ill.

It Pays to Buy a Good Pair

8 Power
32 Millimeter
Binoculars
With Genuine Leather Case and Straps
at $29.75 Postpaid.
TEN-DAY TRIAL - MONEY BACK GUARANTEE

The greatest value ever offered in our 42 years of experience. We know binoculars. You buy binoculars once—buy a good pair. Enclose check or order C. O. D. Limited quantity imported.
Write for Catalog, Binoculars $5 and up. Optical Goods Cameras.
WATRY & HEIDKAMP, Dept. 10 I, 17 W. Randolph Street, CHICAGO

General Tool Case
Size 8x8x20", weight 7½ lbs. A practical case for all uses. Has strong lock, key, large tray.

Mechanic's Tool Case
Size 12x8x20", weight 17 lbs. A handy case for all mechanics. Has 5 drawers, large lock, 2 keys.

MAIL ORDER PRICES
A $6.00 Value for $3.95
A $12.00 Value for $7.95

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A CLEAN HOLE *EVERY TIME!*

Only the huge production of Irwin Auger Bits permits their perfection at a moderate price. It enables the specification of special analysis steel, 50 separate operations on each bit, the training of specialists, and the concentration of the complete resources of this largest of woodboring tool manufacturers on the perfection of one type of tool.

Irwin quality can only be reproduced by equipment equal to Irwin's, and that can be found only at Irwin's plant. This means that an Irwin Bit will cut a clean hole every time, quickly and easily.

A COMPLETE ASSORTMENT

For home, handy man or carpenter, there is an Irwin set of general purpose bits that meet nearly every requirement.
These sets come packed in a handy container that protects the bits from rust and injury. Ask your hardware dealer to show you Irwin Auger Bits in sets.
If he does not handle them send us his name and we will send you an interesting booklet on the use, care and selection of bits.

Irwin Home Set, 6 bits - - $3.50
Irwin Handy Set, 10 bits - 5.50
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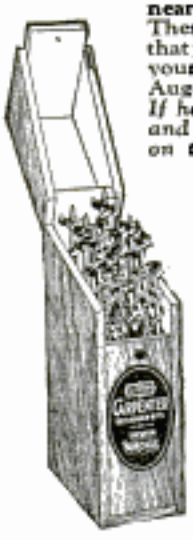
THE IRWIN AUGER BIT CO.
Wilmington, Ohio



The IRWIN Bit

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Stop that leak in a jiffy with SMOOTH-ON No.1

MAKES no difference whether its water leaking from the hose connections or radiator; oil or gasoline from the supply lines; or gas from a loose exhaust pipe, Smooth-On No. 1 will produce perfect and permanent tightness in a few minutes.

Write for FREE BOOK

Use it also for keeping grease cups, lock nuts and hub caps from dropping off, and for perfect sealing of cracks in bursted water jackets.

Write for free copy of the Smooth-On Automobile Repair Booklet and get Smooth-On No. 1 in 7 oz. or 1 or 5-lb. can from any supply house.

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SMOOTH-ON

Quick, Easy Cutting and Drilling

Saves Time, Tools, Temper
Smooth as Cream Contains No Abrasives

Agents Wanted!
A New, Practical Discovery makes steel, iron and all metal cutting easy.

Simply apply to cutting edge and sides of saws, drills, dies, etc. Send 25 cents for two-ounce sample can to J. E. MILLER, 1749 N. Winchester Ave., Chicago, Ill.

MYERS ELECTRIC IRON CORD HOLDER

A wonderful invention. Keeps cord out of way while ironing. Grips the ironing board. Tested and approved by Good Housekeeping Institute.

AGENTS WANTED
Sample 50 cents postpaid.

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AGENTS

Make big money selling beautiful, winged radiator caps to Ford owners. Simply pinch the wings and "lift out." Pinch wings to replace. No burned fingers. *Wings are always cool.* Seats securely. Locked with chain and T-bar. Cannot be lost or stolen. Patented. Heavy nickel plate on brass. Rustproof. Agents are making big money. State territory desired.

Send $1.50 for sample for your own Ford and receive one Crary Gasoline Tank Cap FREE.

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1638-C Penobscot Bldg., Detroit, Michigan

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DIAMONDS WATCHES

DIAMONDS for GIFTS — Genuine Diamonds Guaranteed — WATCHES for GIFTS

CASH OR CREDIT

The Diamonds in these Rings are brilliant, Blue White, high-grade Quality Gems. The mountings are Solid 18-k White Gold. Cased in handsome ring box.

To Be Successful, Look Successful — Wear a Genuine Diamond

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Over 2,000 illustrations of Diamond-set Jewelry, Pearls, Watches, Wrist Watches, Mesh Bags, Silverware, etc. Sent prepaid for your Free Examination. Catalog explains everything. You owe it to yourself to buy of an old established house, whose reliable reputation safeguards your interests. We invite comparison of quality and prices.

Satisfaction Guaranteed or Money Refunded

CREDIT TERMS: Goods delivered on first payment of one-tenth of purchase price; balance in equal amounts, payable weekly, semi-monthly or monthly, as convenient.

No 49—Wrist Watch, Solid 18-k White Gold Watch and Clasp, 17 Jewels, $55.00. Delivered on first payment of $5.50 then $1.00 A WEEK

No. 15—Elgin Watch, 17-Jewels, Green Gold, engraved, Assorted designs, 12 Size, gilt dial, $30. Delivered on first payment of $3.00, then $1.00 a Week

LOFTIS BROS. & CO. NATIONAL JEWELERS
DEPT. D-894
108 N. State St., Chicago, Ill.
Stores in Leading Cities

RADIO FANS—Listen in on WHT every Monday night **from 7 to 7.30, every Friday night from 9.30 to 10, central standard time. LOFTIS BROS. & CO.'S hour of music.**

DENTAL PLATE RETAINER

Specially designed for comfort and in 12 styles to fit any plate. If you have a loose, troublesome artificial plate try a Petry Patented Retainer. It is inexpensive. No metal heads press the palate. Cups made of pure rubber. *Write for circular.*

JACOB PETRY RETAINER CO.
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$100.00 EARNED BY YOUNG ARTIST IN 2 DAYS

Well-trained artists earn splendid incomes. The Federal home-study Course is a proven result-getter. If you like to draw, send 6c in stamps for 56-page book "Your Future." State your age and present occupation.

FEDERAL SCHOOL OF COM'L DESIGNING
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NEW! GRAB THIS FREE OUTFIT QUICK!

STAY-PREST Trouser Presser—wonderful new invention—looks efficient, and it is. That's why 250,000 have been sold already.

MY FIRST WEEK I MADE $93

"Since then I have earned over $100 every week," says S. L. Patterson, of Iowa. Many others making big money. No wonder! Millions of interested prospects. A quality product. Puts lasting crease in trousers. Takes out bagginess—smooths entire surface—demonstrates in 40 seconds. Sells quick to every man.

FREE Selling Outfit Your profits paid in advance. Simply write orders. We deliver and collect. Test it without cost, full time or side line. Send postcard for offer of free demonstrator. Join the big money-makers. Write today.

THE GETGEY-JUNG COMPANY
M-121, G. & J. Bldg. CINCINNATI, OHIO

Like a slap in the face

HE had failed to land the job. He had wanted it as he had never wanted anything before—and the President had seemed to like him at first too.

* * *

Nearly all young men are inclined to have a grimy-looking skin, spotted with blackheads and dull in appearance. Few realize that this hinders their success in life. Pompeian Massage Cream is the certain way to help you overcome this handicap by giving you a clear, ruddy complexion.

* * *

Clears the Skin: Pompeian Massage Cream thoroughly cleanses the pores. It helps clear up blackheads and pimples by stimulating healthy circulation, and by keeping the skin clean and the pores open.

Easy to use: Rub it in; rub it out. After shaving or washing rub it in gently. Continue rubbing and it rolls out, bringing with it all the dirt and skin impurities. Result—a clean healthy skin with clear, glowing color.

Your drug store has it.
Use it regularly at home.

SPECIAL OFFER
⅓ of 60c jar for 10c

For 10c we send a special Trial Jar containing one-third of regular 60c contents. Contains sufficient Pompeian Massage Cream to test thoroughly its wonderful benefits.

Pompeian Co., Cleveland, Ohio, Dept. 26.
Gentlemen: I enclose a dime (10c) for trial jar of massage cream.

Name_____

Address_____

City_____ State_____

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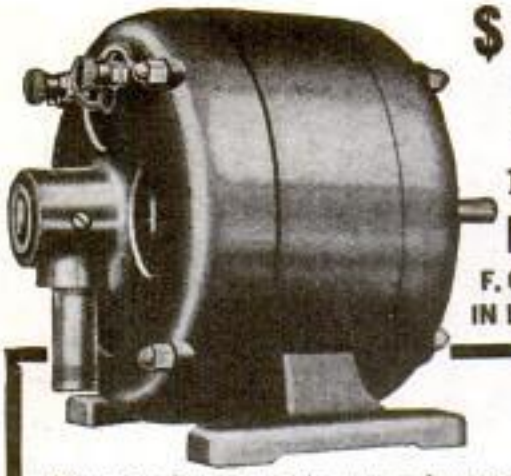

$11.50 for this 1/4 H.P. Motor

F. O. B. Chicago
IN LOTS OF SIX

Never before has this motor been offered at this price. Absolutely guaranteed or your money refunded (less return charges).

Motor has many exclusive features, which ensures long life—sturdily built. Runs cool.

Just the motor for lathes, small drills, and other machine tools, household washing machines, cream separators, ventilating fans, blowers, etc.

In lots of one, complete with pulley, **$13.50** each. In lots of 3, **$12.50** f. o. b. Chicago. 110 volts — 60 cycles single phase A. C.

Combined buffer and grinder **$20.00** f. o. b. Chicago. In lots of 3—**$18.00** each. Send cash with all orders.

Prices on other types of motors on request.

Northwestern Electric Co.
410-420 S. Hoyne Avenue, Chicago

A Revelation in Tone—Volume—Clarity

The Kellogg Symphony Reproducer brings the broadcasting studio into your very room, so realistic is its reproduction.

Piano music, the most difficult to reproduce, sounds so natural that you are completely carried away by its beauty.

Vocal selections retain all of the tone colorings of the artist.

Orchestra music is indeed a recreation, every instrument can be heard, clear and full.

Magnetic diaphragm control—used exclusively in the Kellogg unit—is the new principle that performs wonders in radio reproduction.

Nothing like it at twice the price—**$20.00** each.

At your dealers—hear one today.

The Kellogg Switchboard & Supply Company
1066 W. Adams St. Chicago, Ill.

Write for FREE RADIO Catalog!

Mail Orders Filled Promptly

CHICAGO SALVAGE STOCK STORES

Please Address Dept. PM 6

509 South State Street, CHICAGO, ILL.

RADIO

LOUD SPEAKING FACTORY GUARANTEED SET only $29.50

SEND FOR testimony of users and SPECIAL OFFER.
MIDWEST RADIO CORP'N
Pioneer Builders of Sets
407-A, [illegible] 8th St., Cincinnati, O.

AGENTS DEALERS WRITE

MIRACO GETS 'EM COAST TO COAST

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600 Punctures, but no loss of Air—with **Airlox Puncture-Proof Tubes!** Sensational, easy demonstration. Selling Airlox Tubes means a big, steady income for you.

Free Offer to Agents Write today for our special Free Offer. A quick, sure way to success.

Airlox Tube Co., 805 M St., Sioux Falls, S. Dak.

Como Duplex Transformers "The World's Standard Push-Pull Transformer"
Maximum Volume without Distortion
Price $12.50 per pair At All Leading Dealers
COMO APPARATUS CORP., Manchester, New Hampshire

UTAH LOUDSPEAKER

Ours is the strongest guarantee! Use it 10 days. If not the finest you ever heard, return it and get your money. **Dealers Everywhere.**

Utah Radio Products Co. Dept. 50, 1427 S. Michigan Ave. CHICAGO, ILLINOIS

Long-Eakins Co., 928 High St., Springfield, Ohio
Mail me at once your free catalog and full particulars about how to make big profits in the Crispette business.

Name_____

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Profit $1,000 Month Easily Possible!

Mohawk Radio

5 TUBES—JUST ONE DIAL TO TUNE

The De Luxe The Machine That Cheats the Printer

This Machine pays for itself over and over each year. It prints the Merchant's "ad" automatically on Roll wrapping paper in one or two colors as you pull the paper. Simple in construction, an ornament to any counter. Guaranteed for five years. Thousands already sold. Retail price $12.50. Big profits to Exclusive Distributors who are financially responsible and are looking for a Real, Live, Up to the Minute Proposition.

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The Traffic Cop of the Air

Add a **Forbend Wave Trap** to your Radio Set and "Police" your reception. Guaranteed to tune out any interfering station. The original and only successful **Wave Trap.** Sent postpaid on receipt of $8.50 or C. O. D. plus postage. *Send for Free Booklet.* **Forbend Electric Co., 15 E. So. Water St., Chicago**

Wave Trap

Hand Forged Razor Steel Blades, No. 57

Direct at Factory Prices

This $2 KNIFE $1.18 Postpaid

Hand Forged Razor Steel Blades

Handy shaped Blade makes this knife best for mechanics, sportsmen and farmers; light but strong; resharpened easily. Stag handle. German silver finish; blades file tested, hand forged from razor steel and warranted.

Sample $1.18 3 for $3.00 Postpaid.

Send for our 100-page List and *"HOW TO USE A RAZOR"* **FREE**

MAHER & GROSH CO., 106 A St., Toledo, Ohio

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Do Away With Steel And Rubber Bands

FREE TRIAL

Inner surface is made adhesive to secure the PLAPAO-PAD firmly to the body, keeping the PLAPAO continually applied and the pad from slipping. No straps, buckles or springs attached. Soft as velvet—easy to apply.

It's the Non-Slipping, yet Non-Rigid Pad and What is Within It That Counts

FREE to 5,000 Truss Sufferers

To the extent of 5,000 sufferers who may apply I will send, ABSOLUTELY FREE, a sufficient quantity of the Plapao to positively convince them that this is the only logical, commonsense way of treating rupture. Plapao is a highly astringent medication placed within the Plapao-Pad and being absorbed through the skin, creates a wonderful feeling of relief and at the same time tends to strengthen the weakened muscles and thus permanently close the rupture opening. The process of recovery is natural, so you'll have no use for a truss—you can throw it away forever! Old and young have testified under oath that the Plapao-Pads cured their rupture—many of them long-standing, aggravated cases—without delay from work. Patent allowed in U. S. and foreign countries. Awarded Gold Medal at Rome and Grand Prix at Paris.

Send No Money—for a sufficient quantity of the Plapao is sent without charge to enable you to give it a thorough test; you pay nothing for this trial now or ever. Write for it and full information today. Address Plapao Laboratories, Block 1427 St. Louis, Mo.

Foot Pains go in 5 minutes if you wear FAIRYFOOT CUSHIONS. Must help or no pay. Write to FOOT REMEDY CO., 22nd St. & Millard Ave., Dept. 28, Chicago Ill.

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Send For Our 1925
FREE BOOK OF BARGAINS
Containing a full line of bodies and accessories at exceptionally low prices. **Buy direct from the factory.**

$24.90 AND UP

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Body Division Dept. P-36
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THE GREATEST
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The Tostwich brings amazingly big profits and sales wherever installed—a patented process—makes sandwiches taste 100% better than ever before. Full information without obligation to you—write today.

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NO MORE BALD HEADS

WHEN our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials and booklet on "HAIR," sent sealed in plain envelope, FREE.

THE MODERN VACUUM CAP CO.
L-559 BARCLAY, DENVER, COLO.

ONLY $3 DOWN

For this

BALL-BEARING LONG WEARING L. C. SMITH

WE will send you this wonderful typewriter with **absolutely no obligation** to you whatsoever. You **send no money.** When the machine arrives, you deposit only $3 with your express agent and test this remarkable bargain thoroughly in your own home or office **for 10 days.** If you are not satisfied it is the **greatest value** and the **finest typewriter** you ever saw, just tell the express agent and **he will hand back every cent to you.** If you keep it, you send monthly payments so small you'll never miss them—just like rent. Our New Special **Prices are the lowest ever made** on the world famous **BALL-BEARING Silent L. C. Smith**—late style models—up-to-date, **full size perfect machines**—every modern convenience—absolutely finest quality rebuilt and guaranteed for 5 years. No other typewriter at anywhere near our price will give so many years of perfect service. We are the **largest exclusive dealers in L. C. Smith Typewriters in the world.** The **easiest running** and **longest wearing** typewriter ever built. Over half a million sold. Easiest to operate and learn.

FREE TO YOU NOW!

Complete Course of Lessons on Touch Typewriting; Operating and Instruction Book; Tools and Waterproof Cover—all free with each machine. Send for **Free Trial Plan; New Special Low Price Offer;** and **Booklet of Valuable Typewriter Information,** before offer is withdrawn.

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Send me your New Special Offer; Free Booklet of Valuable Typewriter Information; Your Catalog; and Free Trial Plan with no obligation to me.

Name.....

Address.....

"Been on a Vacation Bill?"

"No, Jim—I've stopped smoking. Gained six pounds in a week. You know how I used to smoke—a package of cigarettes and a cigar or two a day—it sure had some hold on me. But I'm cured—took a scientific home tobacco treatment—fixed me up in two weeks.

"Wasn't hard on me at all—noticed improvement the first day—I feel like a new man. It didn't interfere with my work—didn't leave any druggish after-effects—the money I saved in the last two weeks has paid for the treatment alone.

"Why don't you take it? It has cured men like you and me for over forty years—it is a doctor's individual prescription that sure fixes you up. Just send the coupon for full information NOW. No obligation. All correspondence is strictly confidential."

The Keeley Institute, Dwight, Ill.

Please send me, without any obligation on my part, your free booklet which will tell me how to rid myself of the tobacco habit.

Name.....

Town.....

Street..... State..... PM-9

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JUST ACROSS STREET FROM U.S. PAT. OFFICE.

At the right is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ. All drawings and specifications are prepared under my personal supervision.

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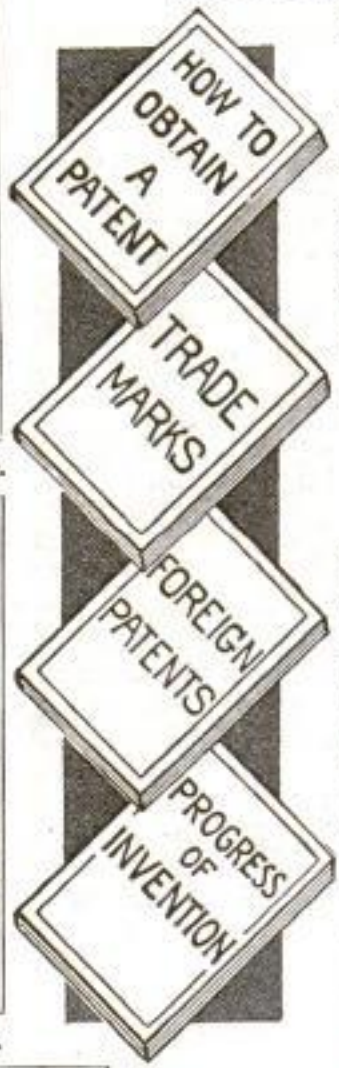

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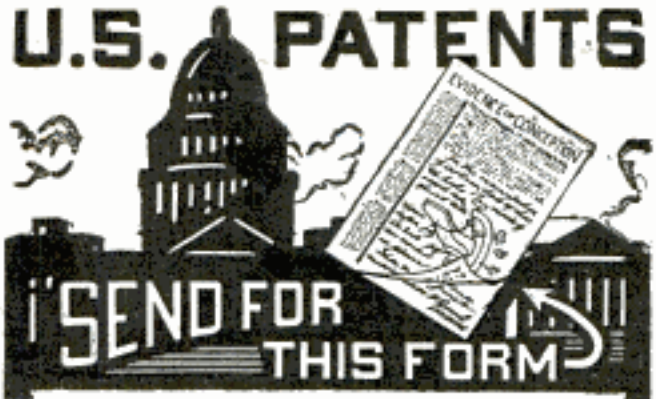

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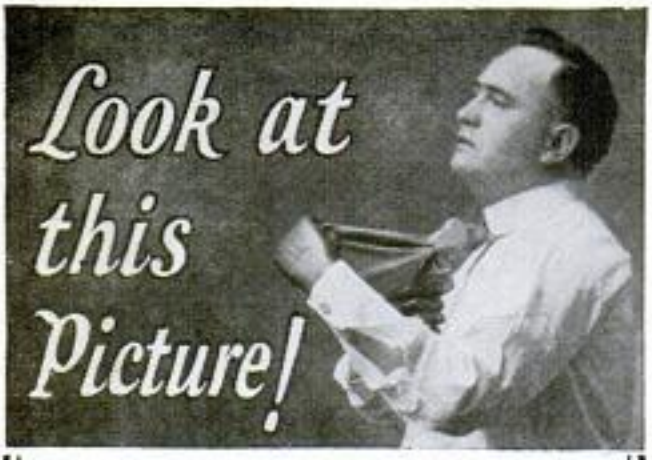

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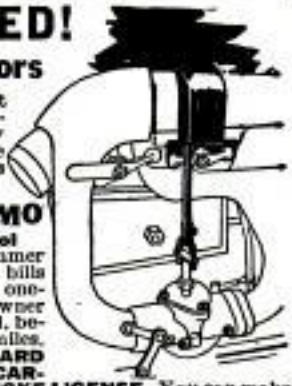

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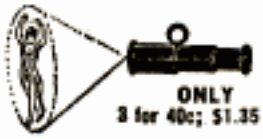

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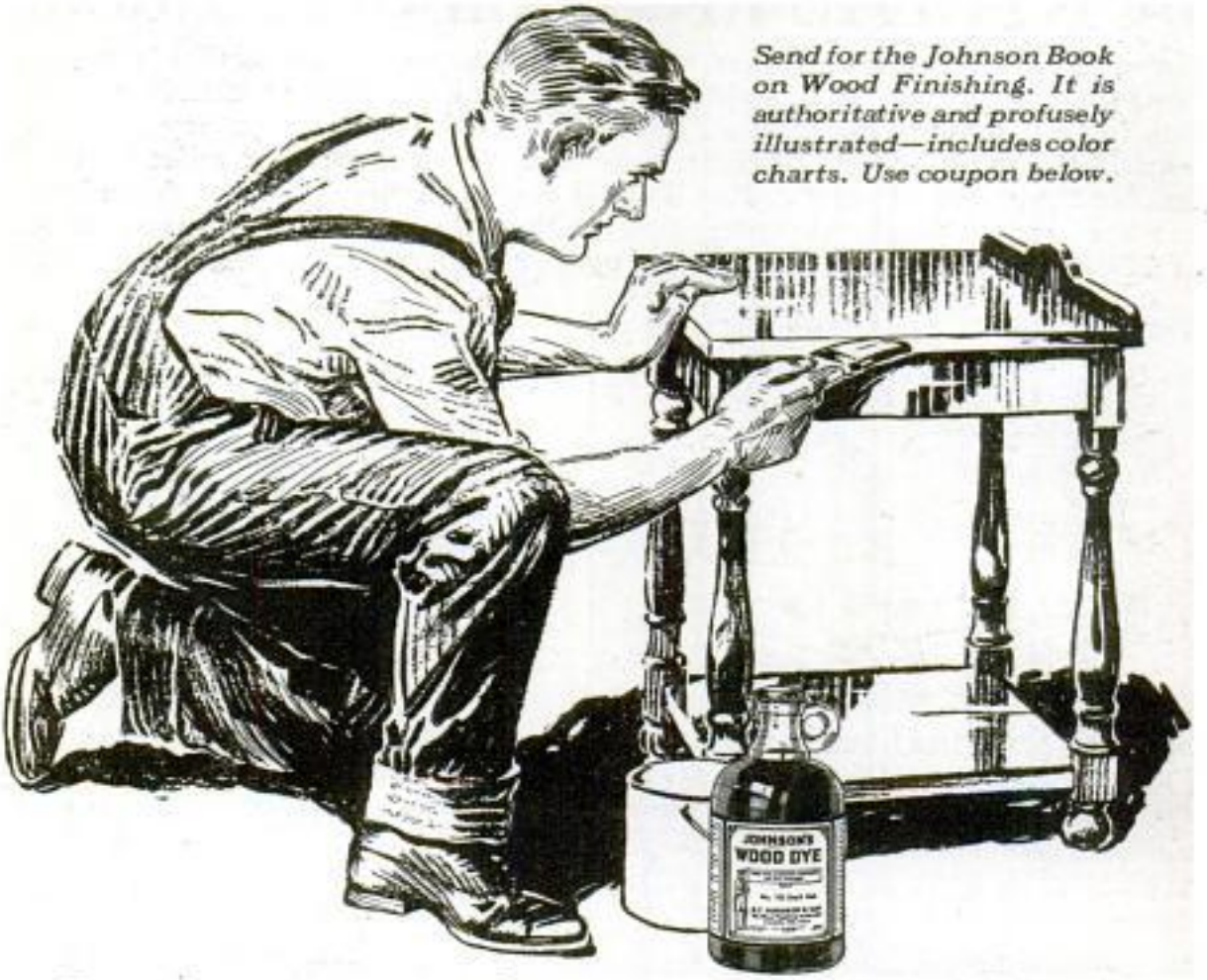

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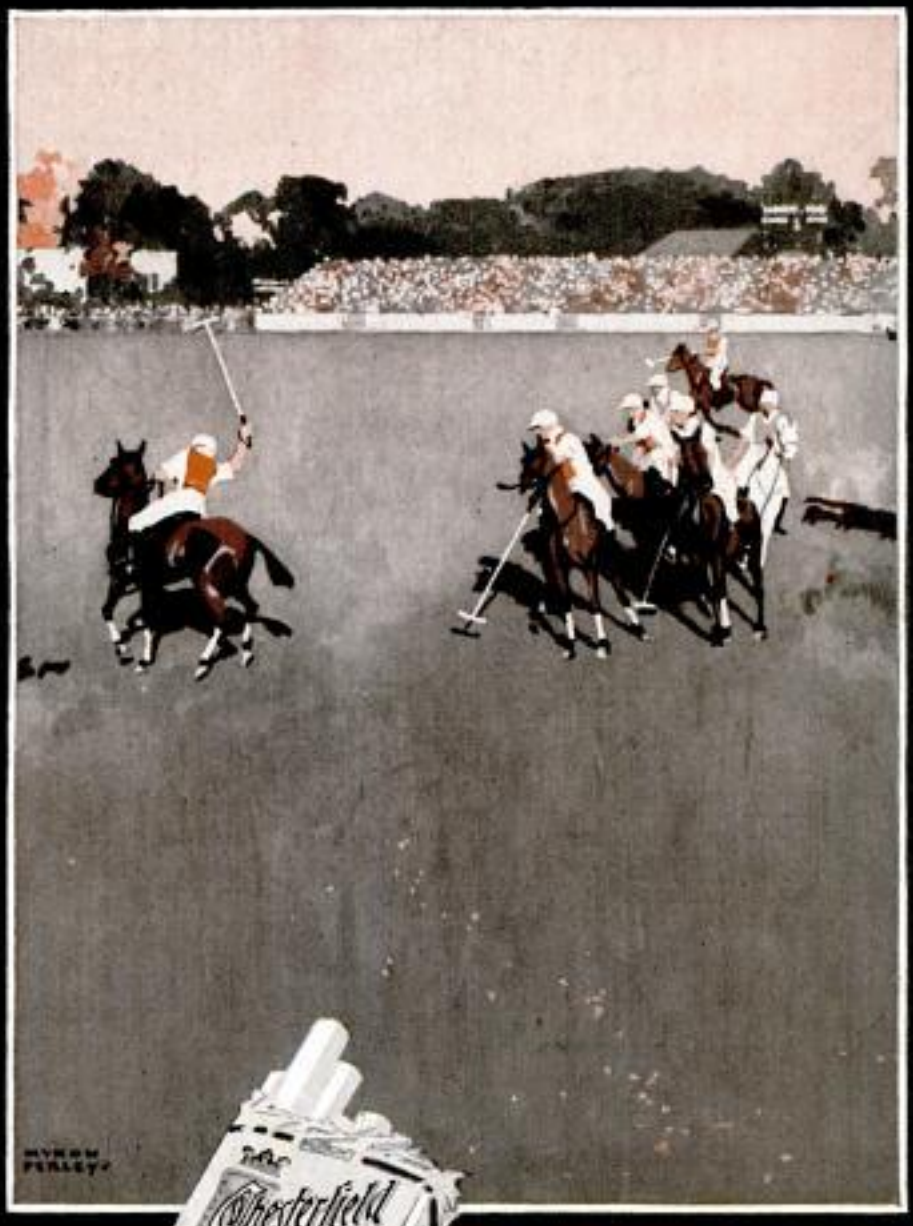

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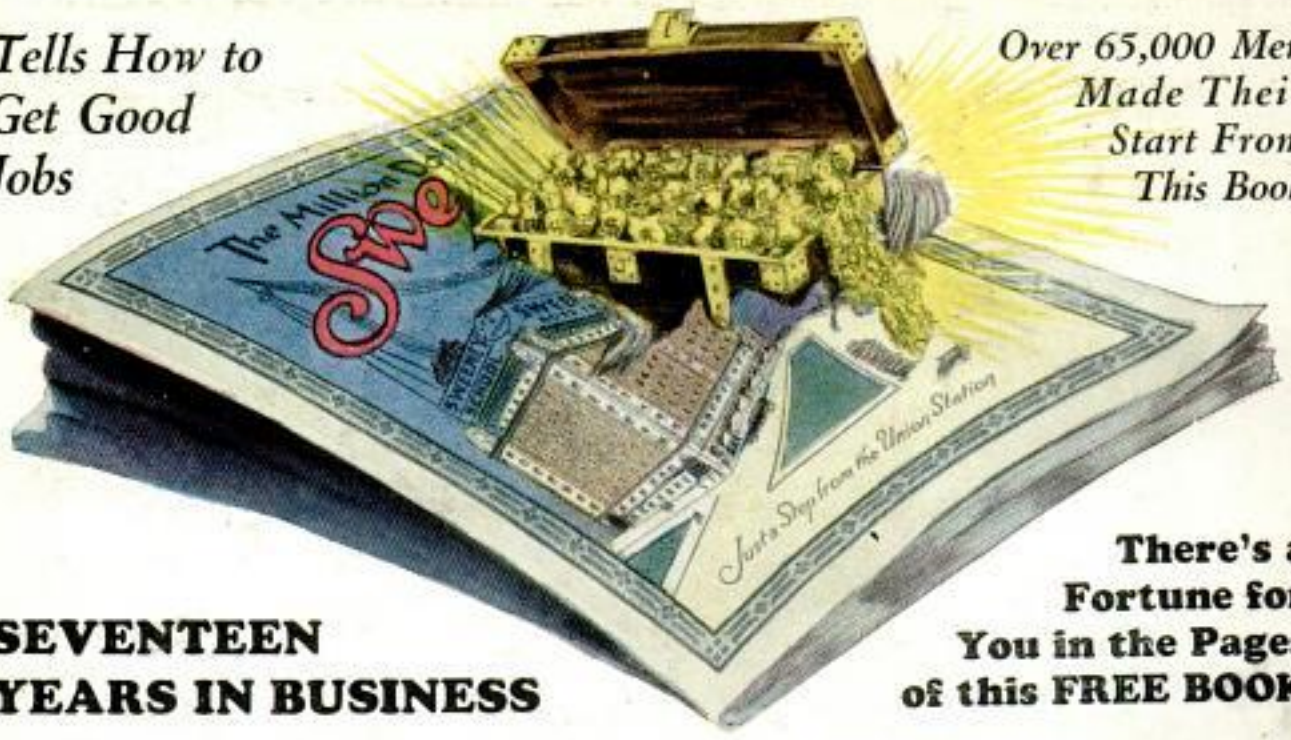

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