

WITH THE AMATEUR SKY PATROL

POPULAR MECHANICS

★

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN No. 410428

NOV.
25 CENTS



SEE PAGE 649

**PREFERRED AT HOME
PREFERRED ABROAD**



Harry McQuinn, Ronnie Householder and Bob Swanson, three of the leading, most consistent winners in midget car racing, use Champions.



MONTLHERY, FRANCE—Trevoux and Maclure in their Champion-equipped Riley, won in Group 1 in the French Grand Prix.



BARCELONA, SPAIN—Nuvolari, in a Champion-equipped Alfa-Romeo, won the Pena Rhyn race through the streets of Barcelona.



GOSHEN, N. Y.—Rex Mays, 1935 Pacific Coast AAA champion, won the 100-mile national championship race here using Champions.

As an exacting car owner you undoubtedly know that there is a gradual deterioration in spark plugs resulting in loss of power, speed, acceleration and economy as mileage accumulates. If you are no longer satisfied with your car's performance and want a smoother, more economical and more dependable engine, do as most automotive engineers recommend—install new Champions. You'll be surprised at the new snap, the easier starting, faster acceleration and, above all, the greater economy that only Cham-

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Spark Plugs
Champions
Use**

pions insure. That's why Champions are chosen and recommended by most automotive engineers and why practically every race throughout the world in the last thirteen years was won by engines equipped with Champion Spark Plugs.


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Economical
Engine
Performance?**




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Mom used to tell me to bring home some 60-watt bulbs. Now she always says, "Be sure to get 60-watt General Electric MAZDA lamps." She's wise now! She has learned that good lamps like these STAY BRIGHTER LONGER and don't waste electricity. So now when I go to the store for lamp bulbs, I always look for the trademark  on the end of each bulb.



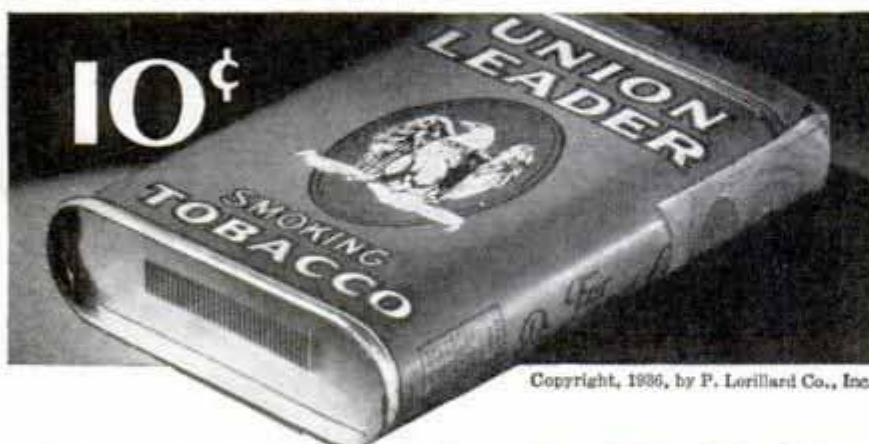
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LONGER

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Popular Mechanics Magazine

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November, 1936

Vol. 66, No. 5

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Hitch Your Wagon to a Car

THE canvas-topped prairie schooner, first home on wheels, carried the pioneers across the plains and helped push our frontiers westward to the Pacific. Today America is returning to the covered wagon era, and the modern rolling home again is extending our boundaries by releasing us from permanent abodes and giving travel a new value. Today's prairie schooner is a streamlined, luxury-crammed "cottage" on rubber-tired wheels and it is hitched to a 100-horsepower car instead of to a team of oxen. Thousands of families are living permanently or part time in trailers and trailer manufacturers are swamped with orders. Watch next month for the first of two trailer articles, illustrated with eight pages of Coloroto pictures.

Next Month

VISUALIZE a flying boat weighing 1,500 tons with 200,000 horsepower in its engines and accommodations for 500 passengers in its hull. It seems a Jules Verne dream but flying boat designers think you may be buying a one-day ride to Europe in such a giant within twenty years. Read "Future Titans of the Skies" next month.

Training a T-Man

EVERYONE knows of the exploits of the G-Men, but have you ever heard of the T-Men, the trigger squad of the Treasury Department? There are more than 5,000 of these T-Men affiliated with the Secret Service, White House police, Customs service, or employed as guards in other departments. A story next month tells of the rigorous training it takes to make a T-Man.

Flying Caterpillars

THE Caterpillar Club is one of the most exclusive in the world, but no one seeks membership in it. To join it, you jump. You leap from an airplane to save your life and trust your neck to a parachute. If you survive, you automatically become a Caterpillar. The Club has more than 800 members and the leaps which landed them in it are woven into an absorbing adventure article in the December issue.

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This One



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Motorists Wise

SIMONIZ

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STRANGE BUT TRUE



540,000

AUTOMOBILES FROZE UP LAST WINTER

(OFFICIAL STATISTICS)

THOUSANDS OF THESE CARS FROZE UP AFTER THEIR OWNERS HAD PUT IN ALCOHOL ANTI-FREEZE. THIS WAS POSSIBLE BECAUSE ALCOHOL, OR ANTI-FREEZE BASED ON ALCOHOL, BOILED AWAY WHEN THE WEATHER TURNED WARM BETWEEN COLD SNAPS



THERE ARE APPROXIMATELY **50 BRANDS** OF ANTI-FREEZE ON THE MARKET WITH AN ALCOHOL BASE, BUT CALLED SOMETHING ELSE!

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ALL WINTER LONG



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How Can I—a Business Man—Really Learn Law at Home?



YOU are not alone in asking that. Practically every man has seen where knowing law would have helped his success. The structure of business is held together by legal relations—and the man who knows law has a distinct advantage—for himself and his firm.

Again, countless occasions arise outside of the office—leases, insurance, inheritance questions, domestic affairs, taxes and trust agreements are but a few—on each of which you may lose unless you know something of law.

Again, legal training gives you what the business world prizes highly and rewards liberally—a keen, analytical mind, the ability to judge shrewdly and to act with surety.

But whether you want law for personal and business values, or intend to prepare for a bar examination, the same problem confronts you. How can you acquire that knowledge?

You can't go back to school or spend years in a law office. But there is one road open to you—*home study*—a road that some of the greatest leaders have traveled—men like Lincoln, Grant, Disraeli, John Marshall, Coolidge—who mastered this important subject in hours that otherwise would have been wasted.

It *can* be done, of course—thousands have done it—yet what you want to know is—can *you* reasonably hope to do it? Will it hold your interest, or will you find it drudgery? And—most important of all—will you really benefit by it?

You are quite wise in asking these questions—in holding your decision until they are answered.

And these paragraphs are written to help answer your questions so far as LaSalle law training is concerned. Let's get right down to facts.

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Second: Out of this experience in training so many, LaSalle naturally has perfected the material and methods of teaching law by home study. No matter what your situation, your handicap, your education, your needs and desires, etc.—we have already trained some man in similar circumstances.

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More, these men—in preparing this Library—kept in mind always that it was to be used for home study. They knew it was for men like you—busy men who would study it at night, on trains, in spare moments in offices or stores—men who must find it clear and engaging, yet complete and reliable. So they wrote directly, simply, interestingly.

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Fifth: In certain permitted states, each year, LaSalle-trained men pass the bar examination with honor. And if you are interested in Law for your business success—as most of our members are—we would like you to read a booklet called "Evidence." In it hundreds of business men and lawyers tell you exactly what this training has meant to them in more money and advancement. There is no charge for this book. It is yours simply for the asking. Just fill out and mail the coupon below.

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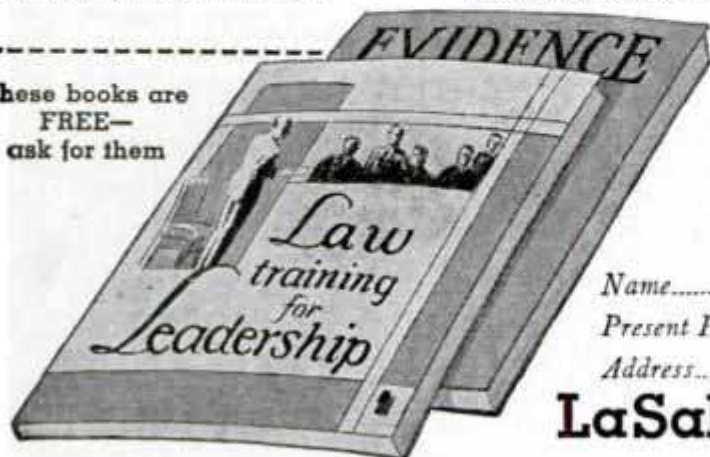
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Where the Canaries Sing Bass

—and we manicure our nails in cigar cutters

By "Bugs" Baer

Famous Author and Humorist

AN UNGRATEFUL child is sharper than a serpent's tooth. But it is dull compared with a Gillette Blade, which is so keen that a lightning bug couldn't find its edge even if he had two tails.

I am Mayor of Rufftown, which is so tough the canary birds sing bass and we manicure our nails in cigar cutters. Nobody in our town ever shaved until the Gillette Blade was invented, but now we all shave twice a day, including the children, Aunt Ella and the iron deer on the front lawn.

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With these important facts before you, why let anyone deprive you of shaving comfort by selling you a substitute! Ask for Gillette Blades and be sure to get them.

GILLETTE SAFETY RAZOR CO., BOSTON, MASS.

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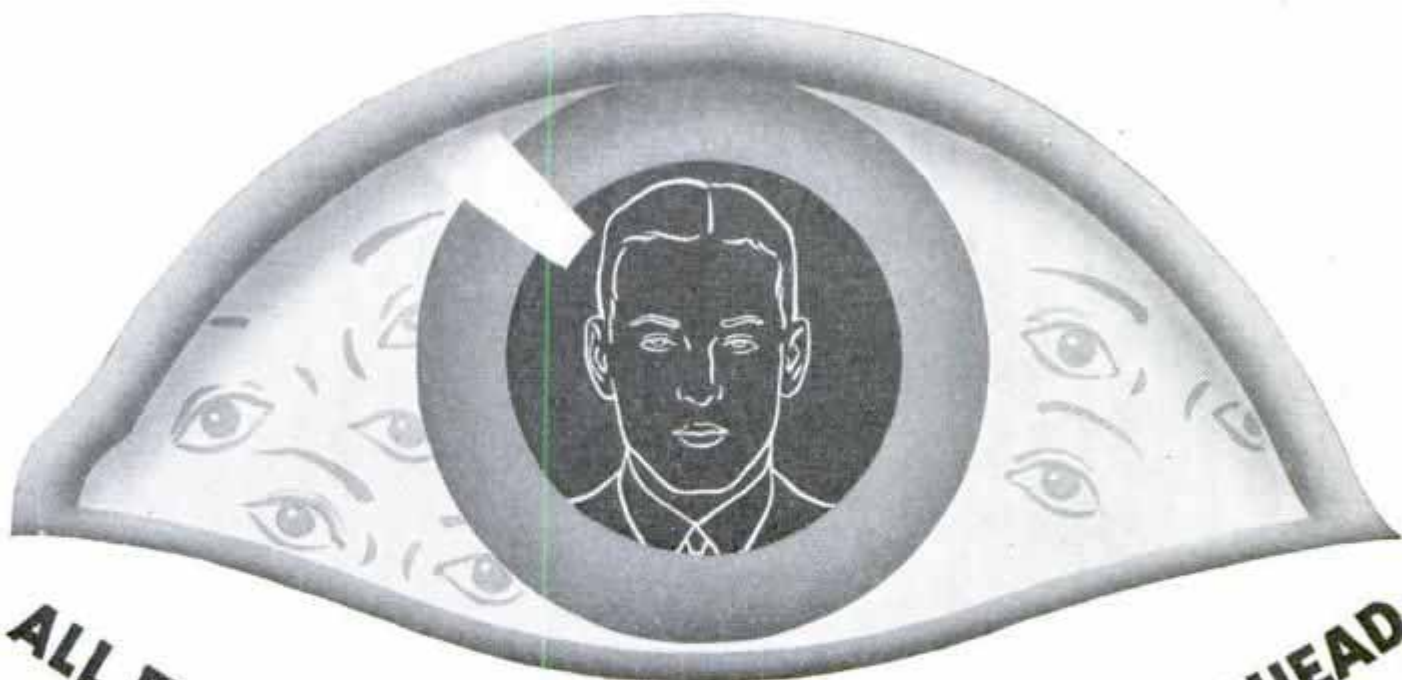
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ALL EYES ARE ON THE MAN WHO LOOKS AHEAD

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who looks ahead knows the importance of training, and other men who have looked ahead and gone some place know that I. C. S. offers the right kind of training. Look ahead — mail this coupon!

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| | | <input type="checkbox"/> Chemistry |
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| | | <input type="checkbox"/> Fruit Growing |
| | | <input type="checkbox"/> Poultry Farming |
| BUSINESS TRAINING COURSES | | |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Service Station Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> First Year College Subjects |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Business Correspondence |
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| <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Mail Carrier |
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| | | <input type="checkbox"/> Grade School Subjects |
| | | <input type="checkbox"/> High School Subjects |
| | | <input type="checkbox"/> College Preparatory |
| | | <input type="checkbox"/> Illustrating |
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| DOMESTIC SCIENCE COURSES | | |
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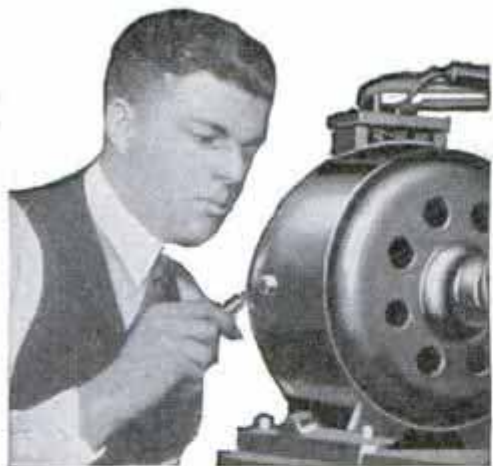
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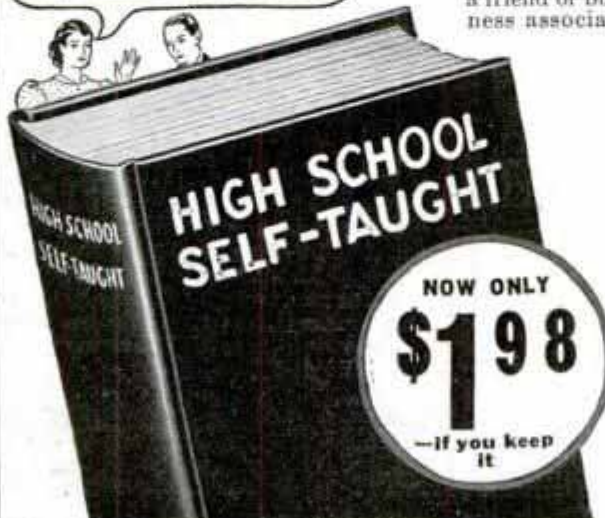


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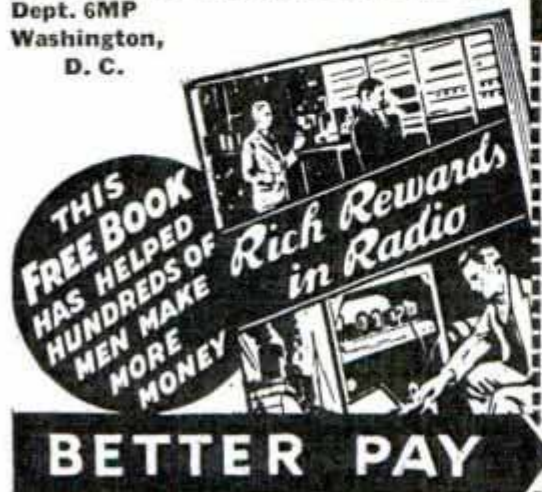
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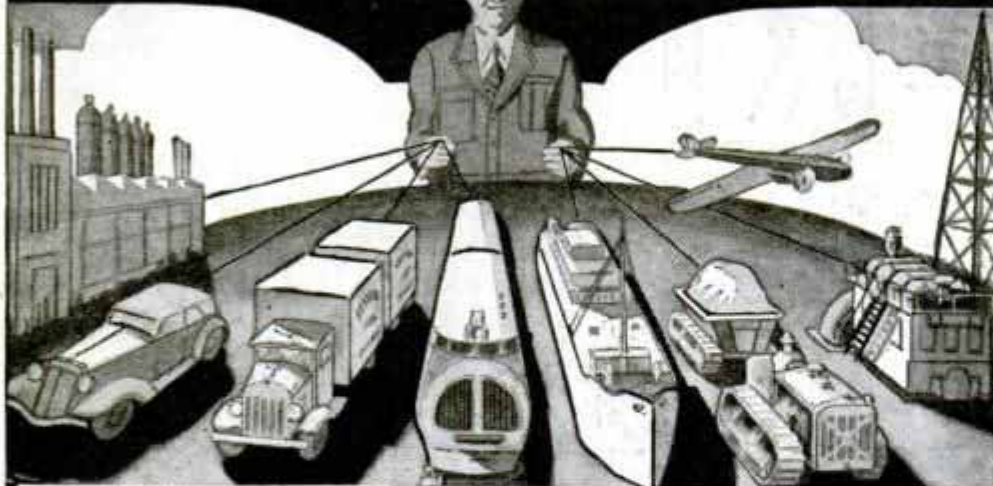
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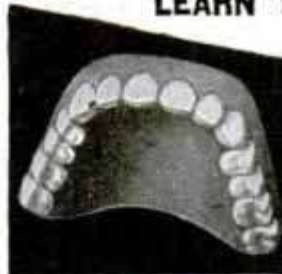
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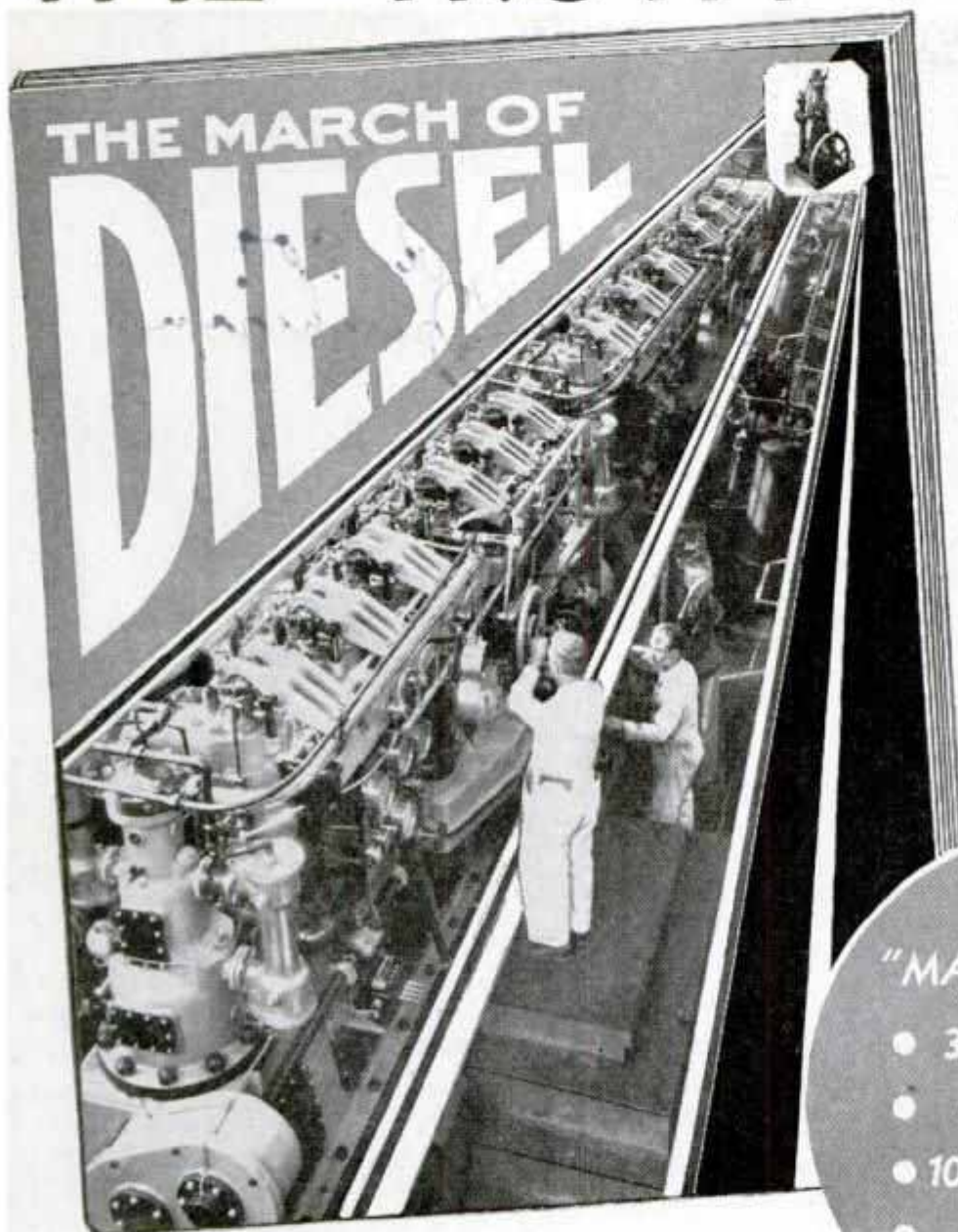
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By Richard McP. Cabeen, *Chic. 900.*



Interesting naval cover from Shanghai. These covers bear postal markings of foreign men-of-war on stamps of their countries and naval cancellation on U. S. stamp

WHILE stamp collections are started in many ways, a large percentage grow without plan or guidance. In the early stages a stamp is a stamp even though torn and smudged. The beginner will not believe one stamp of the same variety can be worth more simply because it is cleaner and undamaged, or has better centering or a fairer cancellation.

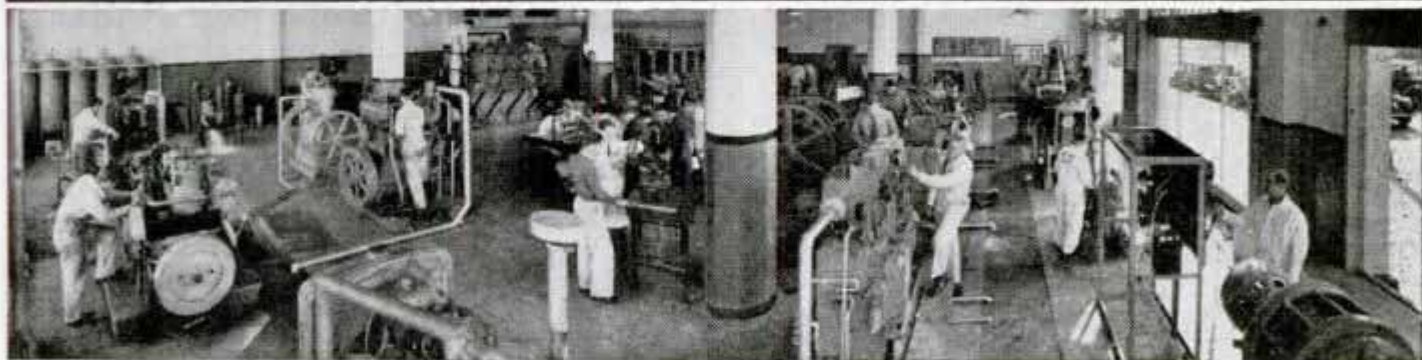
Later when comparisons are made with other collections or with exhibits, the beginner notices some are better than others, and that this comes about through the selection of nicer copies of stamps, and through the care used in arranging the album, rather than through any difference in money spent. For the first time "condition" is noticed, and it should teach the collector to select his stamps when buying them. Years ago young collectors

looked upon unused stamps as fakes or counterfeits, but following the world war, and the changes in value of monetary units in many countries, millions of left-over stamps were sold to dealers for packets. These may be mixed with the used stamps in an album without detracting from its appearance.

The beginner's first lesson should be on preparing stamps. They should never be "skinned" off the paper for this almost always damages them. They should be soaked in lukewarm water just long enough to dissolve the gum. Now scatter them over a newspaper and when partly dry transfer them to a book with soft paper pages for complete drying. A weight placed on the book will increase the crisp flatness, but may delay the dry-

(Continued to page 34A)

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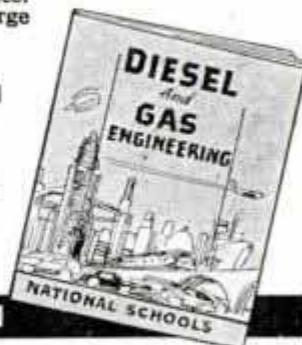
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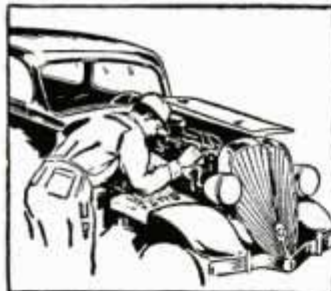
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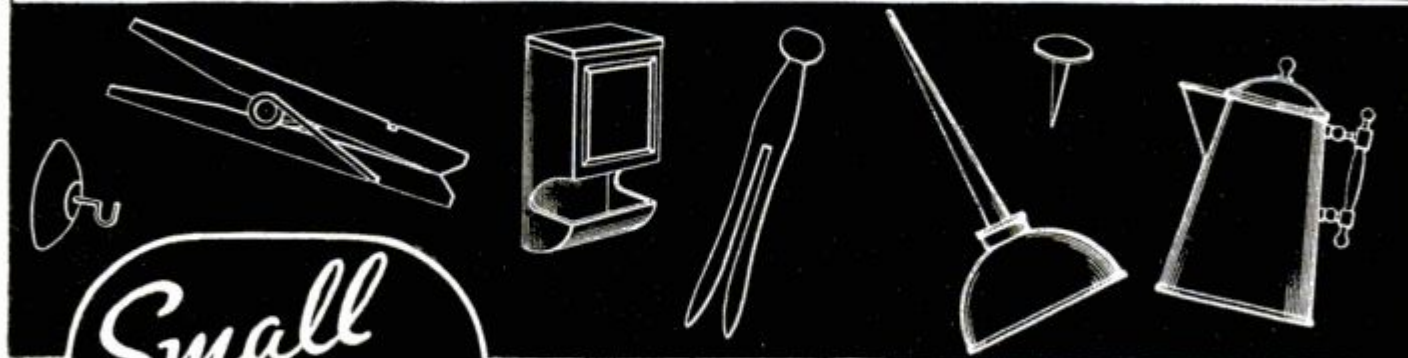
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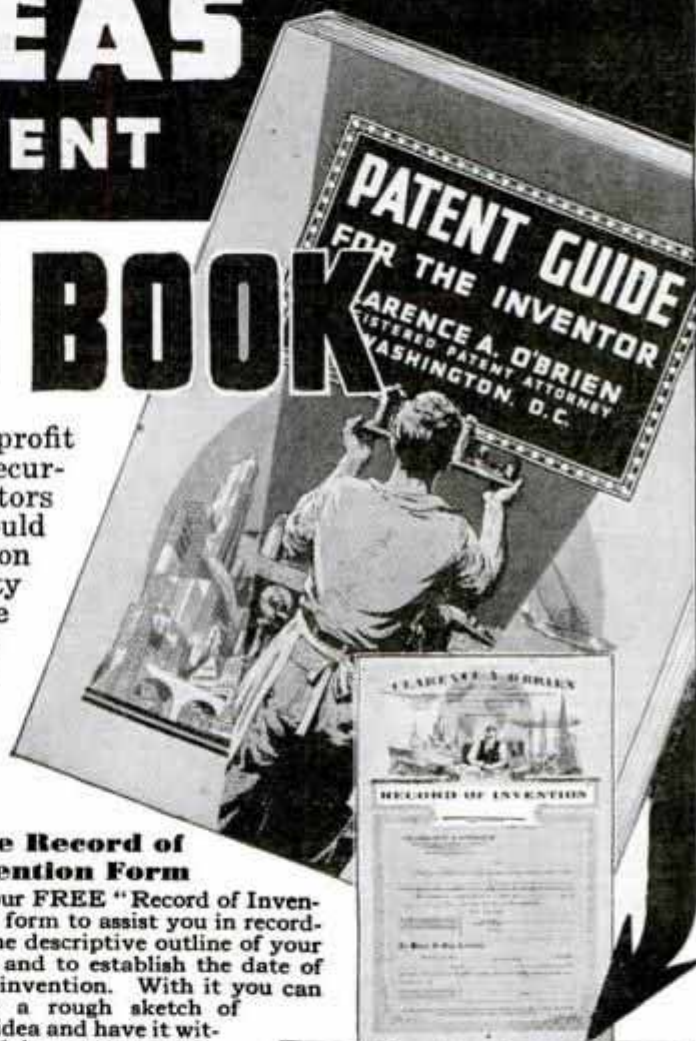
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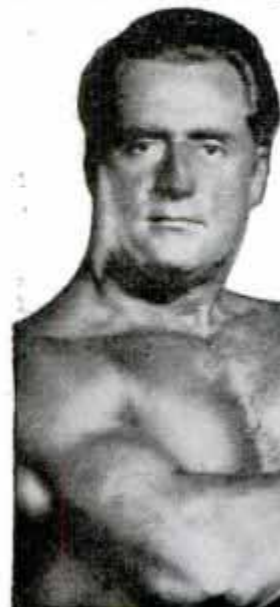


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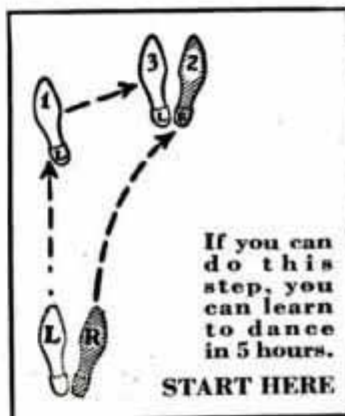
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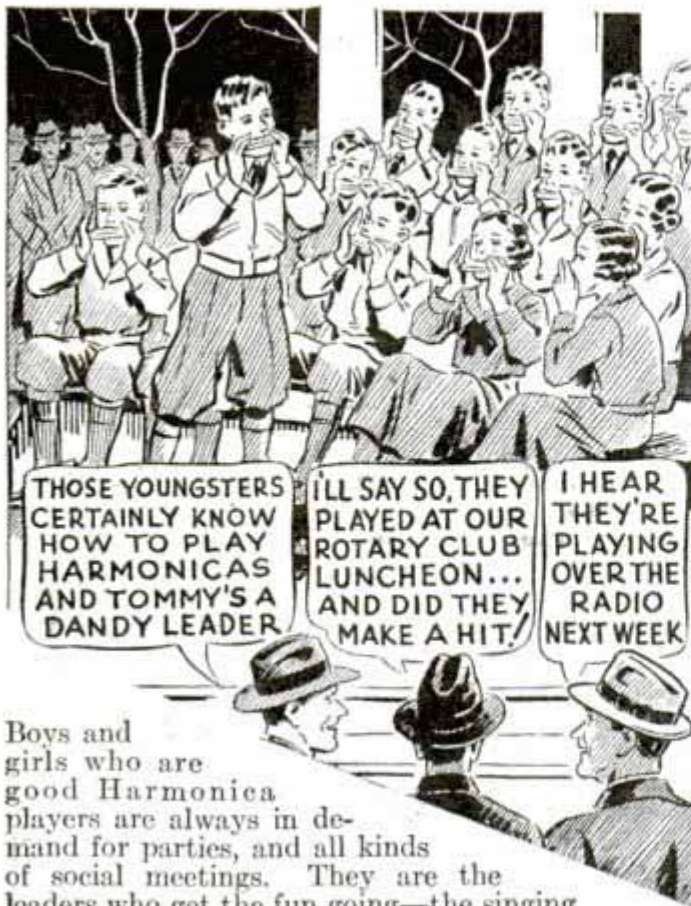
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STAMPS and COLLECTING

(Continued from page 20A)

ing process. There will be a few mishaps when soaking the first lots, for some ink is soluble in water, some changes color when wet, and some gum will not dissolve. A little salt added to the soaking water will tend to set the color in some red stamps which “bleed,” and a little vinegar will loosen the gum.

Stamps printed in fugitive and changeable colors may be freed of paper by placing them face up on wet blotters. A difficult combination occurs in some British colonial stamps printed in soluble colors upon a chalk-surfaced paper, and which are provided with an almost insoluble gum. These cannot be soaked without losing the design, and paper must be removed by moistening from the back. To prevent curling, place the stamps face up on a sheet of celluloid and dry under pressure. Many stamps may be soaked in hot water but it is best to use cool water when handling unknown varieties.

Recent articles about rotary intaglio stamps, such as the current low values of Great Britain, call attention to size variations which occur from time to time. Since the process by which the stamp design is transferred from the die to the copper printing cylinder is photographic, it is difficult to set the step and repeat camera so a duplicate plate made later will not show a variation in the stamp size.

Similar results were found in the rotary offset United States stamps issued in 1918 and 1920. In the first two plates made for the three-cent value, the stamp designs measured nineteen by twenty-two millimeters, which closely approximated the size of the regular flat-plate engraved stamps, but in later plates the size was progressively reduced until the stamps finally measured about eighteen and one-half by twenty-one and one-half millimeters. The size variations in the rotary press line engraved United States stamps are due to other causes.

Recent Issues and Discoveries

The new stamps made available to collectors recently include many interesting and beautiful designs. The sale of stamps

(Continued to page 70A)

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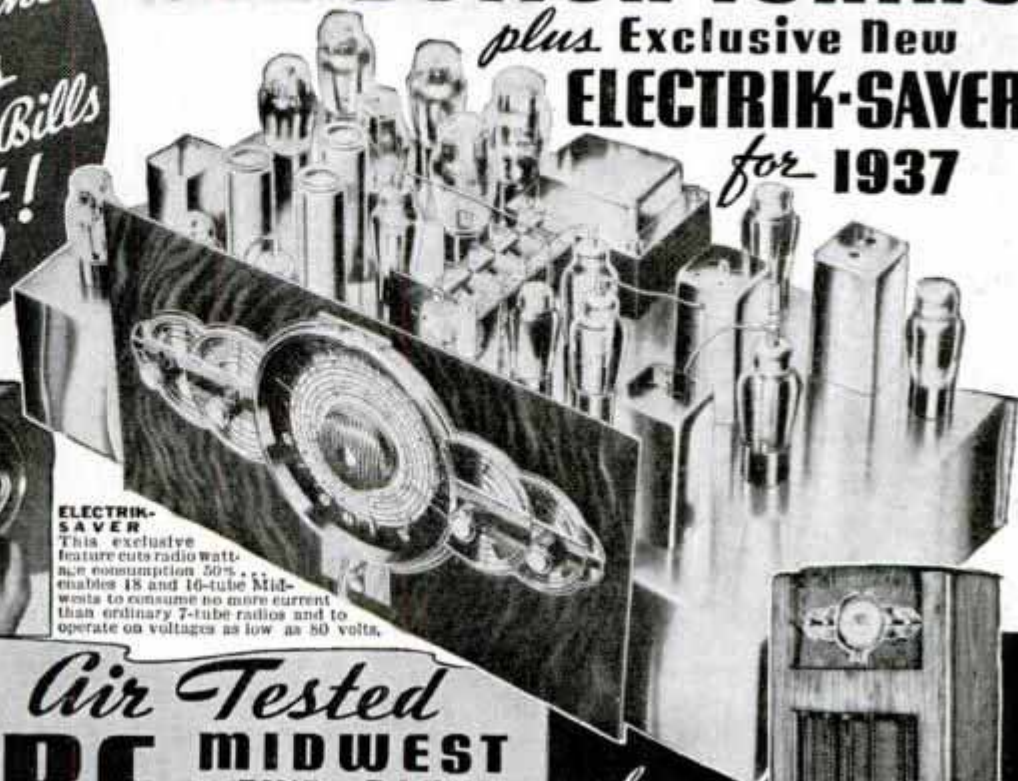


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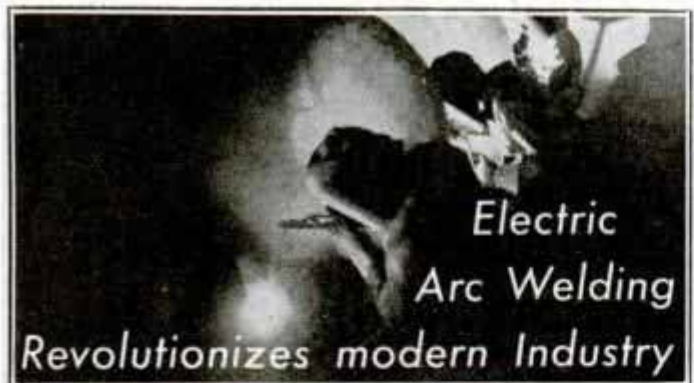
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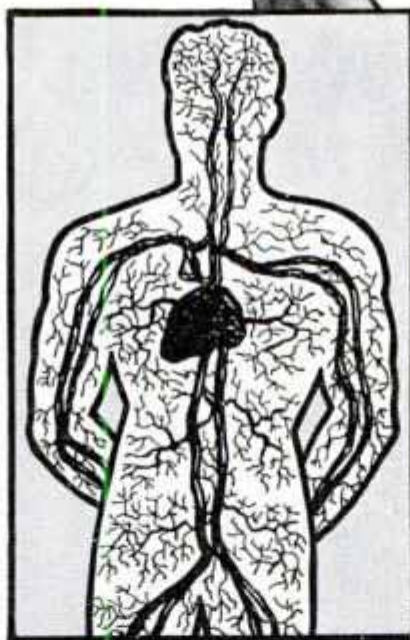
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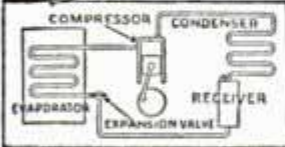
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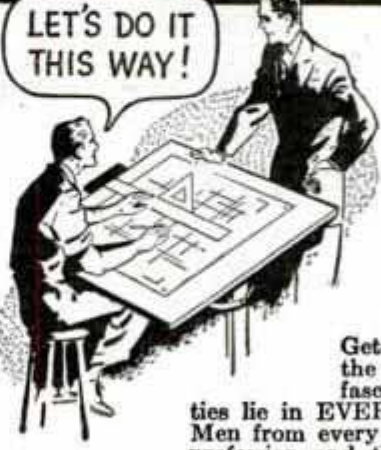
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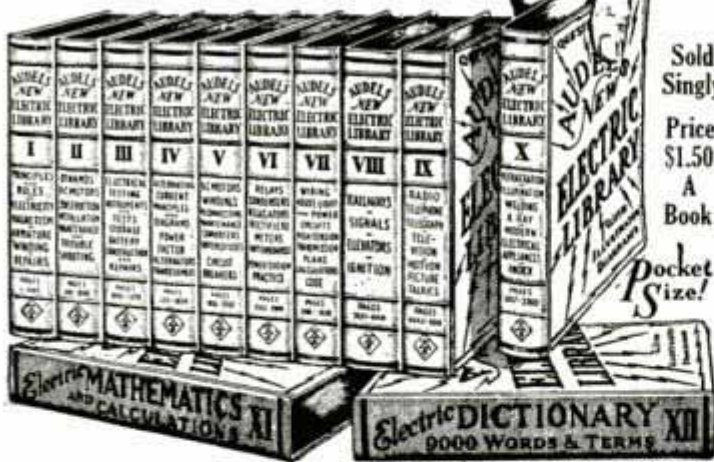
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SILVER Jubilees 50 varieties mint \$2.50; 100 different British Colonies 20c; 200—70c; 500—\$3.00. Lists free. Approvals. Westminster Stamps, 5060, London, Canada.

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CLERKS. Assistants, bookkeepers—Make your services big paying. Particulars free. Write Business Service, Rockville Centre, N. Y.

BECOME A business detective. Make money in your spare time. Pleasant work. Good fees. Details free. Business Detective System, 1009 Oak Street, Elmira, N. Y.

MRS. M. earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848-A60 Lincoln Ave., Chicago.

I'LL Give you groceries at wholesale besides splendid opportunity to make up to \$45.00 in a week. Brand new Ford sedan given as bonus. Details free. Albert Mills, 2907 Monmouth, Cincinnati, Ohio.

MAN Wanted—Manufacturer established 46 years will finance responsible man with complete stock of guaranteed food, farm and household necessities—you pay when sold. Mighty attractive proposition. Good living right from start with steady increase for industrious man. Big value combination deals, premiums and fast-selling specials now in effect. Jacob Van Dyke of Michigan sold \$441.21; Maurice Vander Haar of Michigan sold \$378.15; and B. M. Anderson of Utah sold \$530.55 in one recent week. Pleasant outdoor work. Experience not necessary. No slack seasons or layoffs. Write today for "No-Investment" offer. McCannon and Company, Room 66LS, Winona, Minn.

AGENTS WANTED

SAVE Gas! Miracle invention of the age—Typhoon super charger. Motorists astounded! More power! More life and pep! More miles per gallon of gas! Unbelievable economy! Split-second pick-up, smoother operation—brings new thrill to motoring. Operates automatically, drives gases uniformly under pressure to all cylinders. Owners everywhere report gas savings up to 33% and more. Requires no servicing—ever! Saves money the instant you step on the starter. Coin money demonstrating to car owners and fleet operators. Typhoon Manufacturing Company, 321-7 Equitable Building, Baltimore, Maryland.

NEW 3-Way profit plan on Christmas greetings includes box containing 16 fine French-fold greetings, 16 envelopes, and 48 new NipApart Christmas seals, 80 pieces costing you 25c. Also personal greetings and individual cards at prices making sales easy. You double your money. Be first. Get sample set on approval. American Card Co., Dept. A-95, Lancaster, Pa.

ASTOUNDING New electric water heater. Plugs in light socket. Tremendously fast seller. \$2.25 brings sample. Industrial Laboratories, Des Moines, Iowa.

UP To \$32 in a week. Sell great line of hosiery backed by definite replacement guarantee, covering holes, snags, runs. Write for samples quick. Wilknit Hosiery, Desk 37-L, Greenfield, Ohio.

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

BIG Money selling to stores. Thanksgiving; Xmas signs. Retail 25c, cost 5½c. Also wreaths, gift wrappings, etc. Samples free. Variety, 41 W. 17th, New York.

300% PROFIT In new self-starting no-flint cigar lighter. Retail 50c. Sample 25c. Get details quick on wonder seller. New Method Co., Box PM-47, Bradford, Pa.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers, by late method; experience unnecessary. Simple plan of manufacturing at home starts you in big money making business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

NEW Cleaner—Amazes everybody. Cleans everything. Washes clothes snow-white quickly. Spots, stains removed like magic. Startling demonstrator. Free samples make fast sales. Quick repeater. Immense profit. Write quick for "free sample." Super-X Cleaner Co., 11, Berwyn, Illinois.

WANTED—Men for good paying work with a large shoe company. Good pay every day. Free shoes as bonuses to "go-getters." No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. F2, Chippewa Falls, Wis.

MAKE More money selling shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Sales outfit free. Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

AGENTS! Dresses 33c, men's suits \$1.50-\$2.00, shirts 46c, ties 6½c, chiffon hose 42c. Amazing prices. Big profits. Catalogue free. Liquidation, AB-550 East 43rd, Chicago.

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

MEN—Women \$3 to \$6 daily. Selling 25c household necessity that repeats. Three to ten sold in every home. Free sample. Write Puro Company, 3107 Pine St., Dept. R-2046, St. Louis, Mo.

MAKE Up to \$12 day with sensational extract deal. Everybody buys. Particulars free. Wyatt, Box 2322, Houston, Texas.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 11A, 4525 Ravenswood, Chicago.

MAN Wanted, by shoe manufacturer established 33 years, for sales work. Ready cash daily and extra bonuses to producers. No experience needed. Your own shoes at factory prices. Sales outfit sent free. Write Mason Shoe Manufacturing Co., Dept. A7, Chippewa Falls, Wis.

MONOGRAMMING Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 6365, Philadelphia, Pa.

EASIEST 25c Seller. Has thousand uses. Simple demonstration gets the money. Sample 25c. Dozen \$1.50. Don't pass this up. Parmer, 645 West 66th St., Chicago.

MEXICAN Feather pictures. Christmas novelty. 50c (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Mexican Art, Apartado 1593, Mexico City.

450% PROFIT In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMG-47, Bradford, Pa.

BUY Wholesale 1000 bargains. Catalog free. Products Company, Gary, Indiana.

BIG Money. Commissions daily. Free clothing. Sell quality raincoats, jackets, overcoats. New styles—Lowest prices. Sales kit free. Goodwear, 712-A Roosevelt, Chicago.

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

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 126 West 22nd, New York.

SELL Popular cosmetics. Liberal commission. Samples 50c. Cienet Mfg. Co., Box 222, Kansas City, Kansas.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., PMM-47, Bradford, Pa.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

MAKE Daily profits with fastest selling line of men's ties in America! Priced \$1 to \$9.60 dozen. Over 100% profit! Unbeatable guarantee backs you up. We pay postage. Write for catalog and free samples swatches. Boulevard Cravats, 22 West 21st St., Dept. M-24, New York.

AMAZING Light discovery. Patented Amplifiers reduce electric bills 25% to 50%. Needed by every store, factory, office. Huge profits for distributors—salesmen. Wonderful demonstrator. Write today for convincing proof and no risk initial stock offer. Apex Lamp Works, 150-PO West 25th, New York.

AGENTS! Make \$5 daily selling quality household necessities. Over 250 guaranteed positive repeat sellers. Atlas Products, 2129 S. Broadway, St. Louis, Mo.

STOP Squealing—Start crowing!! Drive to country—"movies"—afternoons. Work mornings—home. No canvassing! National Folio-A, Station "D," Los Angeles.

CAMPAIGN Ties—Pictures of Roosevelt, Landon, Lemke on rayon ties. 2 samples 25c. \$7-100. Legion Tie, 703 Broadway, New York.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 126 West 22nd, New York.

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

YOUR Favorite cigarettes free! Selling tinselled Thanksgiving-Christmas signs! 11"x14" costs 5½c—retails 25c. Sample free. 21 boxed Christmas cards 35c—retails 85c. Lowy, Department 669, 8 West Broadway, N. Y.

BE Your own boss! Operate used-new clothing business from store, home, auto. 200%-300% profit. Everything furnished. Catalogue free. Portnoy, 566-G Roosevelt, Chicago.

SANTA Claus that talks. Magic, mysterious. Works like phonograph. \$3 per dozen. Sample 30c. Talkie Toy Company, 4151 Irving Park, Chicago.

MAGAZINES. Sell new and renewal subscriptions. All publications. Full or spare time. Highest commissions. Pay daily. Mission Circulation Company, Box 802, Santa Barbara, California.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory Chemists, BD-1142 Sunnyside, Chicago.

GOLD Reflecting letters for store windows. Large sizes penny each. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate, detailed analyses. Catalog free. B. Thaxly Company, Washington, D. C.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

UNIQUE Printed specialties. Money-getters. McPherson Stamp Works, Middletown, Connecticut.

SELL Neon tubes 65c foot, neon signs, neon plants complete \$395.00. Marcella's, 742 Strong, Schenectady, N. Y.

AGENTS—Men-women. Big profits supplying perfumes to families. Laffer & Co., 741-PM, St. Louis, Mo.

NEW Item—New plan—No selling. Free samples. Quick cash returns. Werth Bros., 825 S. Wabash, Chicago.

AGENTS—Route men: Here's a fast selling, big profit item. New scientific cleanser and specially designed brush for false teeth. Nothing else like it. Needed by one out of three persons over forty and many younger. Easy to demonstrate and sell. Nelson Products Co., 31 N. Garfield Ave., Alhambra, Calif.

500,000 ARTICLES At lowest prices. Lists 10c. Duffy, Covington, Ky.

I WANT Men for local tea and coffee routes. Make up to \$42.50 first week. No experience needed but must give prompt service to families on your route. I send everything; no money risk. Write Albert Mills, 2911 Monmouth, Cincinnati, Ohio.

AMAZING Finish, thousand uses. Sells itself. 150% profit. Dime brings sample. King, 612 North Michigan, Chicago.

EXCELLENT Trouserpresser, stretcher, creaser, hanger \$1.00. \$7.00 doz. Perfect pants hanger stretcher 10c. 60c doz. Get circulars. Widness, 208 Van Buren St., Brooklyn, N. Y.

CHRISTMAS Cards—50 beautiful folders, name imprinted, cost 65c, sell for \$1.00. Samples free. New England Art, North Abington, 206, Mass.

SELL North American oil burners. No experience needed. Write for free particulars. Wrenn Burner Service, Nashua, New Hampshire.

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

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

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

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

MAKE And sell your own products. Employ agents yourself. We supply formulas and full instructions for making toilet preparations, perfume, flavoring extracts, soap, household specialties. Valuable booklet free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

COSTS 1c—Sells 25c. Make non-explosive cleaner from benzene crystals. 1c gallon. Sample 10c. Literature free. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

AGENTS: Smash go prices! Santos coffee 12c lb. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Carnation Co., PO, St. Louis, Mo.

NO Boss! Sure cash! Silvering mirrors, autopaarts, reflectors, combination outfit. Write Sprinkle, Plater, 128, Marion, Ind.

BOOKS Covering hundreds of subjects. Big catalog for 3c postage. Popular Mechanics Press, Room (C36), 200 E. Ontario St., Chicago.

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

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

SALESBOARD Men—New put and take jars. Details, samples free. Tom Thumb, Dept. PM, Nauvoo, Ill.

GUARANTEED Double-edged blades 50c hundred up. If there's anything else you want, write us; we have it. Samples sent. Steven Spencer, 412 E. 51, Brooklyn, N. Y.

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

BIG Profits eyeglass necessity. Cleans, polishes, prevents steaming. Sample ten cents. Shurberg Chemical, Hartford, Conn.

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

HIGH-GRADE SALESMEN

BIG Money maker! Amazing invention closes all doors silently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Unlimited market stores, offices, factories. Free demonstration furnished workers. Kant-Slam, Dept. K-62, Bloomfield, Ind.

BIG Money makers: Large line work uniforms, raincoats, pants, shirts, etc. Advertising embroidered. Low prices. Every business, individual prospect. Free outfit. Dove Garment Co., 1733 Milwaukee Ave., Dept. 904, Chicago.

GIVE Away free 1936 short wave and home radios, also full electric automobile radios with our unique "Punch Sales Card Plan." 2 sales daily pays \$203.88 weekly profits. Write for our free starting offers. DeLuxe Mfg. Co., Dept. 278, 173 W. Madison, Chicago.

MAKE Jobber's profit on fastest selling truck and window signs. Send \$3 for dozen 4-color "100% Locally Owned" decalcomanias. Sell \$1.00 each. 1427 Welton, Denver, Colorado.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4347-C Ravenswood, Chicago.

NEW Punchboard line. Free 32 page full color catalog. Nothing to carry. Larger cash commissions daily. Season now! Lea-Moore Co., 180 Adams, Chicago.

WANTED County dealer: Man with car to demonstrate and service for large manufacturer. First class job. 248 Fyr-Pyter Company, Dayton, Ohio.

MAKE More money selling shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Sales outfit free. Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

EARN \$5000 Annually distributing astounding new product. Industrial Laboratories, Des Moines, Iowa.

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. No capital or experience needed. Steady work for right man. Rawleigh's, Box K-2-PPM, Freeport, Ill.

SALESMEN—Sell 2000 business cards \$1.50; 1000 watermarked letterheads \$3.00; 1000 20 lb. envelopes \$3.00. Your commission 33%. Free sales kit. Dept. P, Star Publishing Company, Corsicana, Texas.

NEW Drycleaning clothes brush. Revolutionary invention. Cleans clothes like magic. Homes, offices buy instantly. Phenomenal profits. Outfit free. Kristee, Dept. 260, Akron, Ohio.

SPECIALTY Salesmen—Glider skates; new invention for youngsters; sell toy, hardware, sporting goods, jobbers, dept. stores, etc.; 79c retailer; big comm.; write Glider Skate Co., 3129 W. 49th Place, Chicago.

LUCKY Star sales stimulator sells on sight! Pays to \$4.50 commission on \$7.95 sale. Free sales kit. Repeat Sales Co., Univ. Bldg., Denver, Colo.

SALESMEN—Sell calendars. Complete line, all sizes, including jumbos; beautiful subjects. Samples free! Flemming Calendar Co., 6543 Cottage Grove, Chicago.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, New Jersey.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Ferrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

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

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

WANTED: Reliable, energetic salesman who knows farming, to sell Martin poultry buildings and corn cribs direct to farmers on easy terms. Big profits—permanent income. Martin Steel Products Co., Dept. 8, Mansfield, Ohio.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 220 Southern Boulevard, N. Y.

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

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mdse. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 11810, Spencer, Ind.

TIRE Accessories—Tiger-Grip tire patches, guaranteed 10,000 miles, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$60.00 weekly, and much over. Exclusive territory. Economy Rubber Products, 812 Burkhardt, Dayton, Ohio.

REPRESENT Auto tool manufacturer, selling only automatic tool of kind, fully patented, moneyback guarantee. First time sold direct. Garagemen want it on sight. Hurry! MacGregor Tool Co., 1316 Folsom Street, San Francisco, California.

SALESMEN: Sell complete line book matches, labels, salesbooks, pricing sets, garage forms, calendars, business stationery, etc. Free deals. Comm. daily. Free sales portfolio. David Lionel Press, 312-MP So. Hamilton, Chicago.

BE Independent. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lefcourt Bldg., Newark, New Jersey.

EDUCATIONAL AND INSTRUCTION

PLEASANT Profitable years with a hobby. Stamp brings this descriptive folder. Byron, 82 Wadsworth Ave., New York.

MEN—Women. Get government jobs. Start \$105 to \$175 month. Prepare now for next announced examination. Short hours. Influence unnecessary. Common education usually sufficient. Full particulars, list positions and sample coaching tests free. Write today. Hurry. Franklin Institute, Dept. R3, Rochester, N. Y.

HOME Study courses. Earn degrees: arts, literature, sciences, chemistry, engineering, psychology, philosophy, theology, English, education, languages law, business and commerce. Numerous others. Low cost; easy terms. Catalog on request. Thomas Jefferson University, 749 Independence Boulevard, Chicago.

LEARN Spanish. Everyday phrases easy with pronunciation English, Spanish. Copyrighted authoritative wonderbook, mail 25 cts. Prischmann, Box 1792, El Paso, Texas.

"SHORTHAND Simplified" (complete) \$1.00. Free lesson. Erskine Simmons, Cromwell, Conn.

JIU Jitsu now simplified, shows everybody self-protection. 5 samples for dime. Wandekirk, Suite 5PK, 2504 West Seventh, Los Angeles.

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

BECOME An investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM-116), Hoboken, N. J.

GET A government clerk job. File clerk, P.O. clerk, statistical clerk—all good jobs. Men-women, age 18-50. Want to qualify for next entrance test? Details free. Write, Instruction Service, Dept. 101, St. Louis, Mo.

LINGUAPHONE—Unique language method brings voices of native masters into your own home. 23 languages. Write for free booklet. Linguaphone Institute, 32 Rockefeller Center, New York City.

DO You like to draw? Learn illustrating, designing or cartooning in spare time. Write today for talent test (no fee). Give age and occupation. Federal Schools, Inc., Dept. 116, Minneapolis, Minn.

REPAIR Upholstered furniture. Illustrated course of instruction, including a full set of upholsterer's tools \$7.50. Money returned if not satisfied. M. Swider, 260 19th St., Brooklyn, N. Y.

ACCOUNTING, Leading to C.P.A. \$100.00. Earn tuition. Graduates placed. 25 cents first lesson. National School of Commerce, Chattanooga, Tenn.

LEARN Shoe dyeing, course \$1.25. Frank Lento, 36K12, Punxsutawney, Penna.

SALESMANSHIP! Ten lesson course in aggressive selling complete for dollar. Ruth Publishers, 729 S. 6 St., LaCrosse, Wis.

BE An investigator. Earn big money—Travel. Crime detection newspaper and particulars free. National System, 425-G, Fremont, Nebraska.

BE A super salesman. Learn how to use your mental powers. Our course is the answer. 3c stamp brings particulars. Super Salesman Institute, 402 North Warren, Saginaw, Michigan.

SHORTHAND In 30 days. Wonderful Boyd system. Free catalog. Chicago Home Study Schools, 801 Reaper Block, Chicago.

SHORTCUT Business training. New, complete, simplified shortcut "Business Tech" course trains you at home, for promotion and more pay. 1/2 the usual cost and in a fraction of the time. Get out of the rut—and on the road to success—quickly, easily. Postcard brings free book which tells how. Write Institute of Business Technology, Dept. AT-313, Chattanooga, Tenn.

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

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

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration, Diesel. Stevenson's, 2098A Main, Kansas City, Mo.

LEARN Latest methods solving arithmetical problems quickly. Frederick A. Smith, 2410 Smalley Court, Chicago.

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

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

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

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

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

ZEJAY. Remarkably simple secret language. Correspondence, detective work, etc. Instructions 1c. Zendu, Burbank, Calif.

AUTHORS' SERVICE

SHORT Stories marketed. Write, Hursh Service, Box 1013, Harrisburg, Penna.

CARTOONING—COMMERCIAL ART

CARTOONING Course:—30 lessons, over 500 illustrations, drawing pens and pencils, \$1.00 complete. Scovell Studios, Box 748-P, Hollywood, Calif.

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

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

COMIC Strips written. Gags for free lance cartoons supplied. Welton Tinney, Wlmsboro, Texas.

SIGN Painting taught by successful sign painter. Dime brings literature. James Meagher, 71 Dunham St., Norwich, Conn.

CARTOONISTS! Markets, rates, requirements—25c. Mueller, Phillips, Glen Ellyn, Illinois.

MAKE \$25.00 Weekly duplicating advertising cartoons. Write, Palsley-K, Kinloch Bldg., St. Louis, Mo.

ADVERTISING AGENCIES

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3432, Chicago.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Service, Atlantic City, N. J.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago.

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine rate-guide, free. Chicago Union Agency, 20 West Jackson, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

FOR ADVERTISERS

NEW Live salesman's and inspirational magazine. 15,000 circulation. Classified rate 4c per word. Send a trial ad now. Sample copy free. Mutual Crusader, Berwyn, Ill.

SPECIALIZE Writing sales letters, advertisements and folders on approval. Thompson Advertising Agency, Youngstown, Ohio.

DRAWINGS For all types of advertising. Reasonable. Armin Reinke—Artist, Oshkosh, Wisconsin.

50 CO-PUBLICATIONS: 4c Word. Bryant, Box 4684-E, Kansas City, Mo.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Service Bureau, 4258-C Drexel, Chicago.

BUSINESS SERVICE

ESTABLISH New York offices at Times Square! Ideal personal, business mailing address. Builds sales; adds prestige. Room number unnecessary. Mail forwarded daily. Only \$1.00 monthly! Paramount Office Service-G, 140 West 42nd, New York.

CHICAGO! Business-personal mail address, representation, forwarding; \$1.00 month. Established 1919. General Business Service, 56 West Washington.

DELAWARE Charters: Complete incorporating and organizing service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

ALL International legal matters. Lic. Victor Prieto, Mexican Attorney at Law, P. O. Box 122 M. Jurez, Mexico.

\$1.00 MONTHLY Maintains Chicago office. King, 612 North Michigan Avenue.

RUBBER STAMPS AND OFFICE SUPPLIES

\$1.00 METAL Pocket case self-inking address stamp 60c. Fehlbeg, Lacrosse, Wis.

SPECIAL! 3 Lines 25c. Knob handle. Owl, 6452 Kenwood, Chicago.

WRITE For free catalog. McKechnie Brothers, 11E36 Calvin, N. Dak.

NAME Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

2 LINES 25c, 3 Lines 35c. Stamprite, PP43, Springfield, Mass.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

CUSHION Mounted, one-two lines, 25c; three, 35c. All kinds. Stamp Works, 814 Bradley, Peoria, Illinois.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

GUARANTEED Letter-size hectograph duplicator \$1.00 cash or C.O.D. Send for circular. MultiPrinter Company, 5710 Woodlawn, Chicago.

REBUILT Standard size and new portable typewriters at bargain prices. Write for prices. Hoyt's Store, Sac City, Iowa.

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business. "Excellograph" rotary stencil, clay and film duplicators \$3.85 to \$37.50. Prints anything. Typewritten, penned, drawn, traced. Colors. Folder free. Pittsburgh Typewriter Supply, Suite 518, Pittsburgh, Pa.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

SUCCESS! Prestige! Distinctive stationery!! Samples. Write, Hall's Printing, Dalton, Massachusetts.

MODERNISTIC Two color gummed labels, 7/8 x 2 1/2. 250—three lines—25c. Ad-Man, 301-N, New Jersey, Indianapolis, Indiana.

QUALITY Printing. 500 envelopes, \$2.00 postpaid. Raymond Whitney, Johnson, Vermont.

1000 HI-QUAL-I-T Business cards—Special—\$1.19. Shinn, 1038FL, Bellflower, California.

500 TWO-COLOR Letterheads \$1.75. Samples free. Colorpress, 333-P State, Detroit.

PRINT Your own. Bargains, presses, type. List 3c. Exchange D-14, 22 Orient, Meriden, Conn.

ENGRAVURE Printing. Lowest possible prices. Samples free. Sunko, Mohawk, N. Y.

PRINTING That satisfies, complete samples, prices. Jobey Press, 3932 Madison Street, Chicago.

LETTERHEADS, Envelopes, etc. Samples, prices, for stamp. Wilsonprint, 707 Cherry, Long Beach, Calif.

AGENTS Wanted—\$2.35 line of letterheads—envelopes. 4719 Wisconsin, Milwaukee.

2000 CAMPAIGN Or business cards \$1.00. Postage extra. Kalata, Ironwood, Michigan.

LABEL Value headquarters. Specimens free. Labelers, 6618D Quimby, Cleveland, Ohio.

250 BOND Letterheads or envelopes \$1.00. Woods Press, Bedford, Penna.

MATCHES—1,000 Books \$4.50. Finest quality book matches printed with your advertisement. Send \$1.00 with order. VanDorn Company, Ottawa, Ill.

250 BOND Letterheads or envelopes, \$1.00. Moverco, B-241-P, Milton, Pa.

\$1.85—1,000; ENVELOPES, Letterheads, statements, circulars. Midwest Printing, Northfield, Minn.

500 ENVELOPES And 550 whitebond letterheads, \$3.50. Webpress, Farmland, Ind.

GUMMED Labels. All kinds; write, samples. JBSCO., Box 93, Holyoke, Mass.

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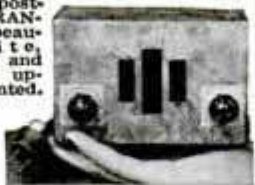


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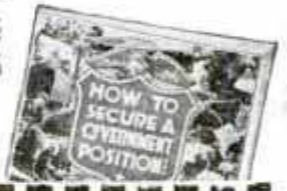
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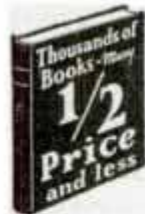
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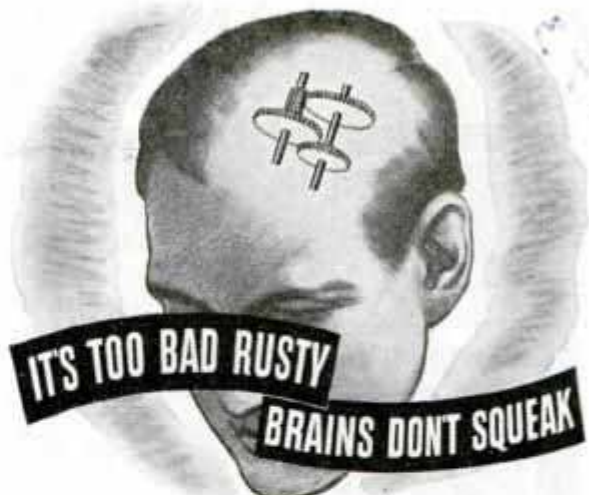
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STAMPS and COLLECTING

(Continued from page 34A)



Some of the new stamps which have been made available to collectors recently and which include many interesting and beautiful designs

to collectors plays an important part in the postal program of most countries.

France has issued stamps to honor the centenary of Rouget de Lisle, author of the Marseillaise, and for the one hundred and fiftieth anniversary of the death of Pilatre de Rozier, pioneer balloonist. Her most recent issues honor the famous French socialist, Jean Jaures, and the Canadian monument at Vimy Ridge. Germany has issued two values for the International Health congress at Hamburg. Brazil has a symbolic design to honor the Eucharistic congress.

A bicolored set of four values in very large size has been issued by the Dominican Republic. These show a view of the ocean drive known as George Washington avenue in Ciudad Trujillo, and have an inset portrait of President Trujillo at the upper right. Italy has stamps inscribed "Etiopia," in Italian and Amharic, showing the portrait of Victor Emmanuel of

Italy, and bearing the inscription of "Poste Coloniali Italiane." A new stamp from Yugoslavia shows a portrait of Nikola Telsa.

A novel set has been issued by Netherlands for the three hundredth anniversary of the Utrecht University Foundation. The six-cent stamp shows a profile of Pallas Athene, and a twelve and one-half cent shows the portrait of Gysbertus Voetius. Danzig has a series of stamps to mark the one hundred twenty-fifth anniversary of the foundation of the city of Brosen, and Cuba honors Gomez with two stamps.

The stamp mistake of the year will be found in the Bermuda stamp pictured in this column last month. The yacht upon that stamp was to be the "Viking," owned in Bermuda, but a mixup occurred and the stamp shows the "Lucie," owned by an American.

The Cover Collector

Interesting covers from Shanghai with the postal markings of all foreign men-of-war in the harbor on stamps of their respective countries, and with a United States stamp and naval cancellation may be obtained through J. N. Lawrence, Regimental Hospital, 4th Reg't., U. S. Marines, Shanghai, China, c/o Postmaster, San Francisco. Send twenty cents in coin to cover everything.

Coin Notes

An interesting commemorative half dollar will be issued in connection with the one hundredth anniversary of the establishment of Bridgeport, Conn. It will bear the portrait of P. T. Barnum.

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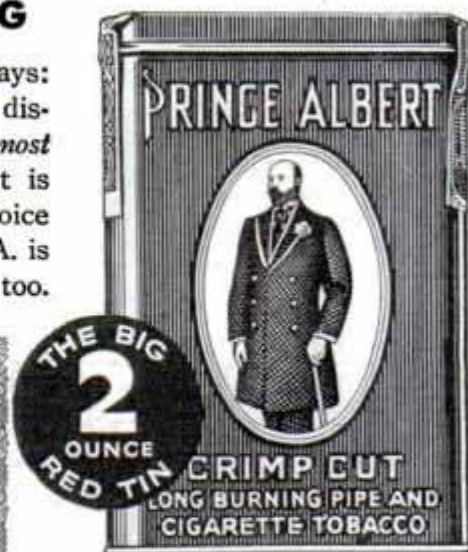
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Vol. 66

NOVEMBER, 1936

No. 5

#1029

The MODERN FIREWALKERS



Fire walkers clothed in asbestos leaving burning plane

IN a large field an airplane rests with tail pointing upward, nose buried in the ground. A group of men are gathered about the ship and to passersby this seems to be the scene of a serious accident. A closer inspection, however, reveals something unusual about everybody and everything in this field.

A man is emptying cans of gasoline into a deep tray beneath the wreck, and combustible materials heaped about the fuselage are also soaked with it. While puzzled spectators gasp, another man deliberately applies a match to the pile. Then, with the exception of two men dressed in what appear to be diving suits, everybody runs for safety. In a moment the entire wreck is bathed in flames that leap twenty-five to thirty feet high.

Suddenly a movement is seen in the midst of the flames. Inside the cockpit a helmeted figure appears to be struggling feebly for freedom. An excited onlooker points a shaking finger.

"There's a man inside," he screams, "trapped in the pilot's seat!"

His words go unheeded. Several seconds pass, then the two shrouded figures near the burning pile move closer to the flames and pass inside them. The helmeted man in the cockpit rises calmly from the roaring inferno, and is lifted out by his two assistants. They walk unconcernedly toward a man holding a stopwatch.

"Two minutes!" says the timekeeper. "Everything O.K.?"

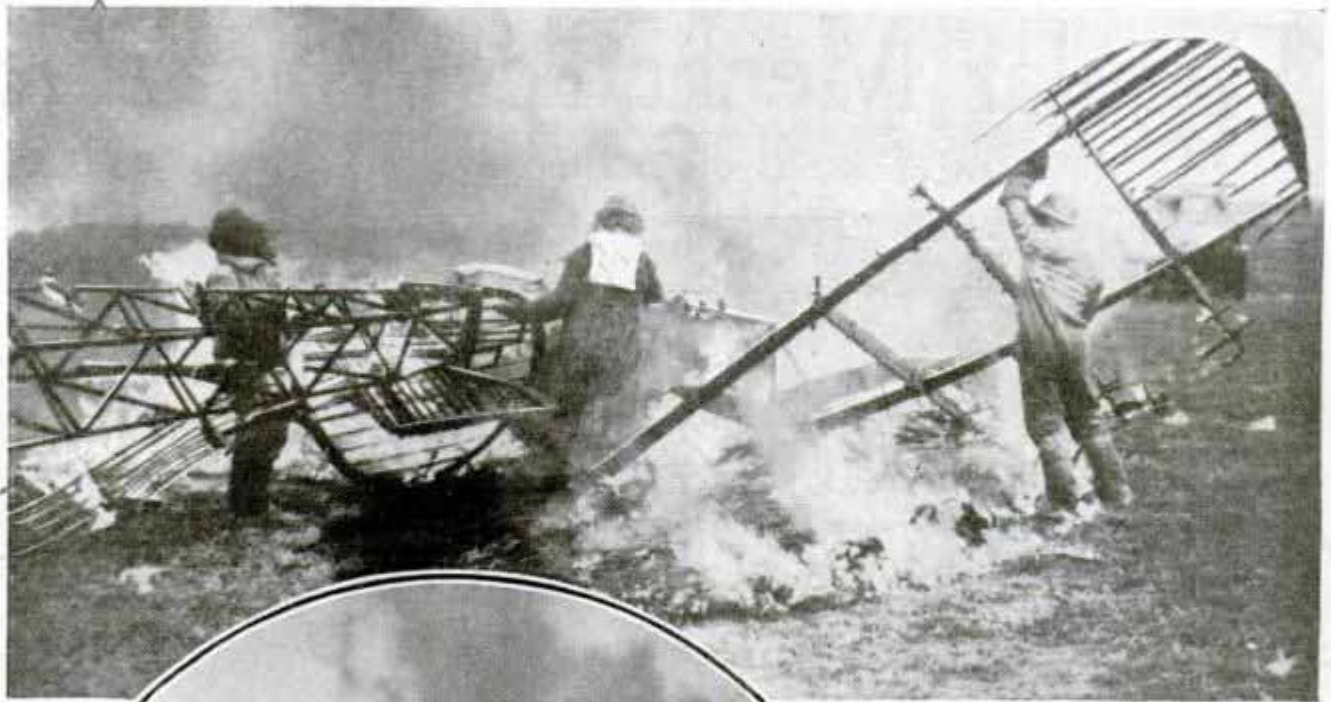
"Absolutely," replies the man from the blazing cockpit.

Con. Stephen Swift and associates

see Sept 1937 - 344

see Nov 1936

Bedwell, Strong, Saprat, Griso, ...



Photos by Authenticated News
 Fire fighters clothed in asbestos suits standing amid flames of blazing ship and, below, man in asbestos leaving plane after sitting in blazing cockpit for five minutes

only after a long series of dangerous experiments. Although asbestos was in use more than 2,000 years ago, it was regarded as merely a curiosity until the middle of the nineteenth century. With the advent of steam and electric engines and the daily use of inflammable materials in factories and households, however, men began to take a serious interest in the queer fire-resisting substance discovered by the Greeks. For the last fifty years asbestos has proved an indispensable material to engineers, and now scientists realize we are only beginning to appreciate its real possibilities.

During the last five years experiments have been conducted at Slough, in England, under the direction of T. G. Bedwell, and here a suit has at last been evolved which makes firemen fireproof and enables the wearer to sit in a furnace heated to 1,700 degrees, Fahrenheit, and come out unharmed. At Slough they will place a glove on your hand which enables you to grasp a white-hot bar of iron and hold it

(Continued to page 152A)

Slough Laboratories

Journal of the American Society of Mechanical Engineers

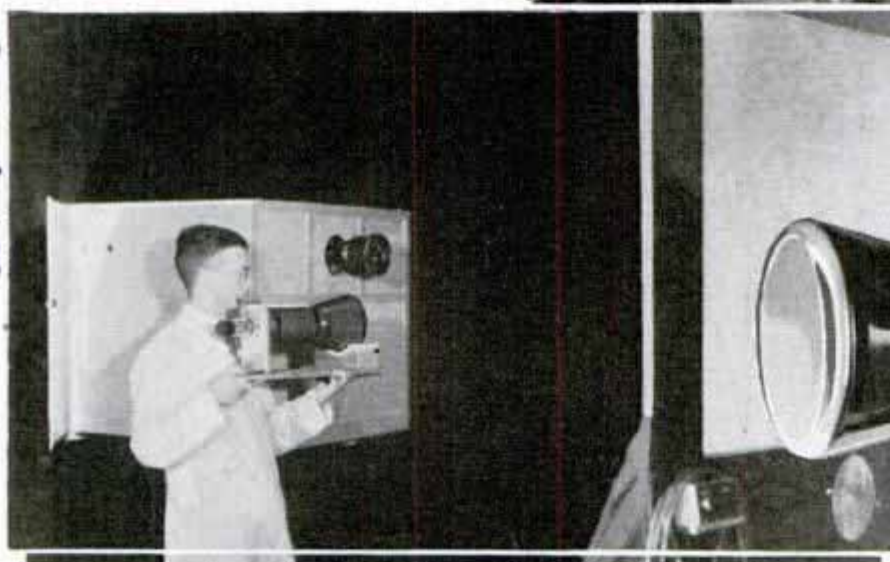
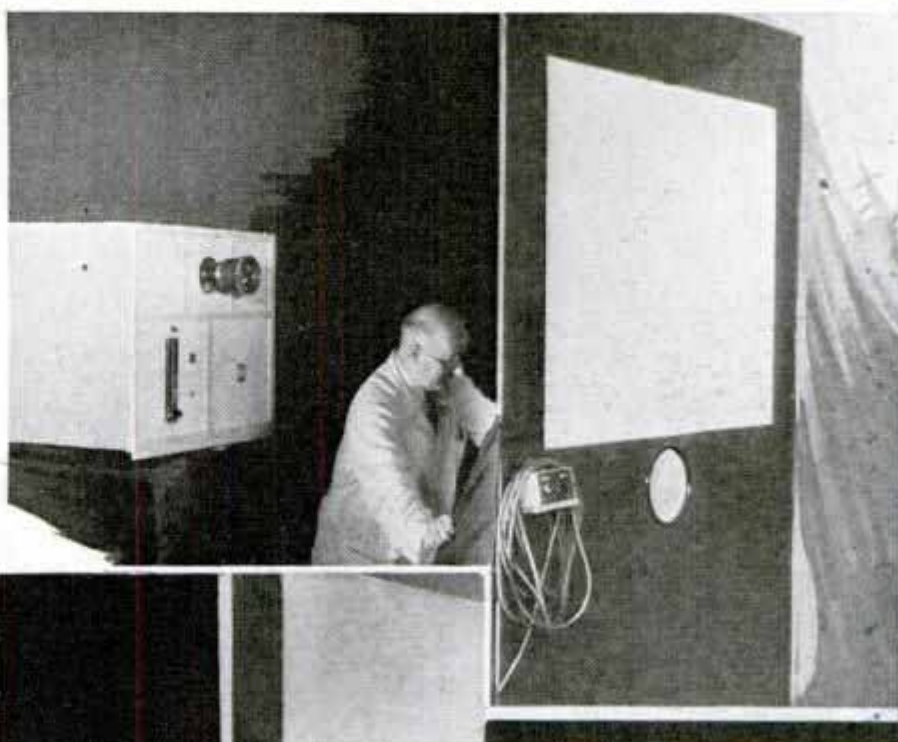
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The Berlin Laboratory

Flat Cathode Tube Sharpens Television Image

Cmd W. E. Schrage, 230 W. 97 St. New York

Distortion of the television picture has been solved in Germany by development of a flat-screened cathode-ray tube, ground with the accuracy of an optical lens. Reception tubes previously had a convex reproduction surface which resulted in vague definition and distortion. To design a flat-faced vacuum tube strong enough to withstand outside pressure when evacuated, American glass four-tenths inch thick was used. For large projection—hitherto the spectators had to sit close to the small receiver to see the picture—high voltage is used, electrons in the tube bombarding the screen at 12,000 miles per second and projecting a brilliant image three by four feet in area



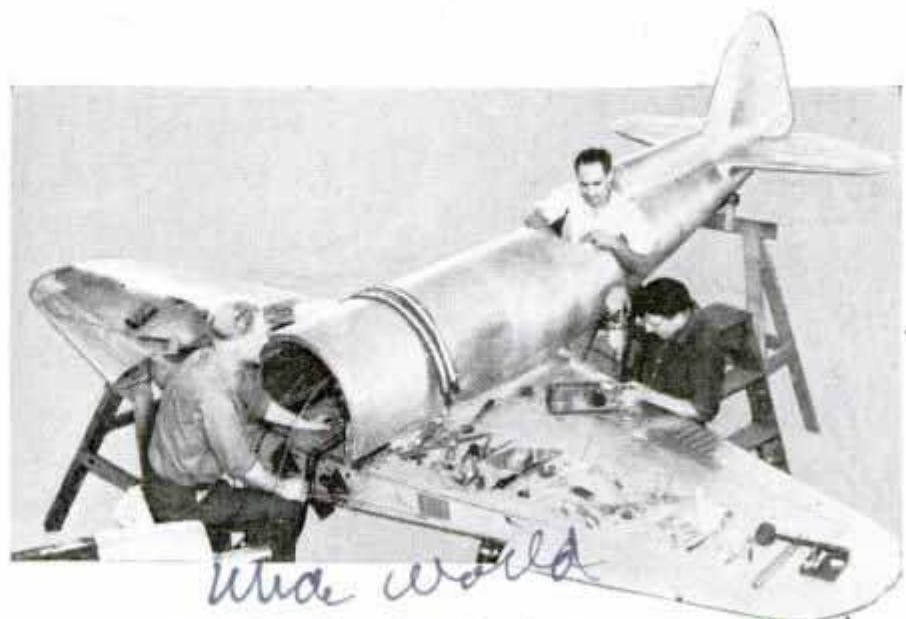
Focusing the television tube on a three by four foot screen and projecting a brilliant image by high voltage. Observe the flat cathode-ray tube

2.2.2. Conf. New York

F-119

Fast Midget Racing Plane Has Fifteen-Foot Wing Spread

Capable of a top speed of around 300 miles per hour, a tiny racing plane with a wing spread of only fifteen feet was completed recently. The midget ship is only nineteen and one-half feet long. It has a fuel capacity of forty gallons and a cruising range of 250 miles at high speed. Radio receiving equipment is among its features. The plane's power plant is a six-cylinder engine with a displacement of 550 cubic inches.



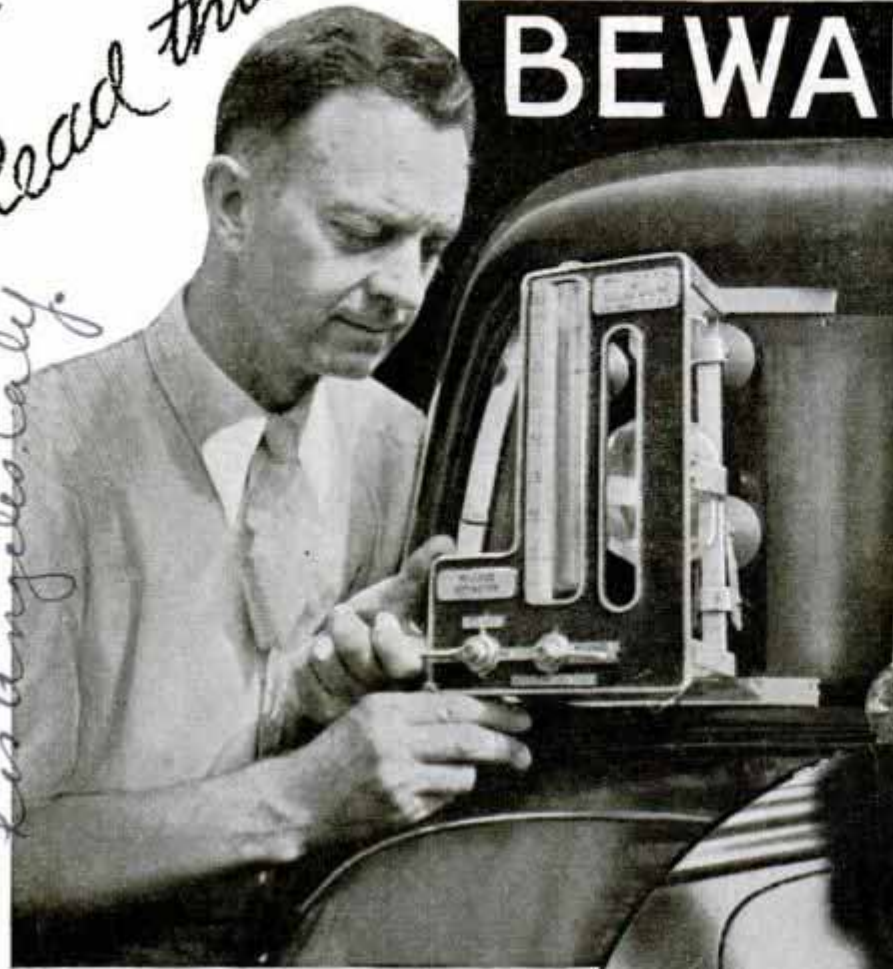
Assembling the midget plane for its speed trials

What would
Being built by Harry B...

BEWARE The

ed fuel had exactly the same characteristics as the original gasoline.

This racket started many years ago, a gasoline authority recalls, when someone discovered fuel knocks seemed to be reduced when ordinary moth balls were dissolved



"FIVE More Miles per Gallon!"
"Removes Carbon!" "Stops Oil Pumping!" "More Power with Pep Tablets!"

When you see signs like these, stop, look and beware! Magic fuel elixirs and cure-all compounds that are sold in tablet, powder, pill or capsule form to motorists comprise a wide-spread highway racket. There are hundreds of such preparations on the market that you can buy for a dime or a dollar, but few of them are any good. Some are actually harmful to motors.

Recently a liquid "vegetable compound" said to be distilled from a rare desert plant was investigated. The usual claims of increased mileage and decreased carbon were made for it and to prove it was harmless the salesman would drink one of the tiny bottles that sold for a quarter right before your eyes. It was useless, too, laboratory men decided after they had followed directions on the label and stirred half an ounce into a gallon of gasoline. The treat-

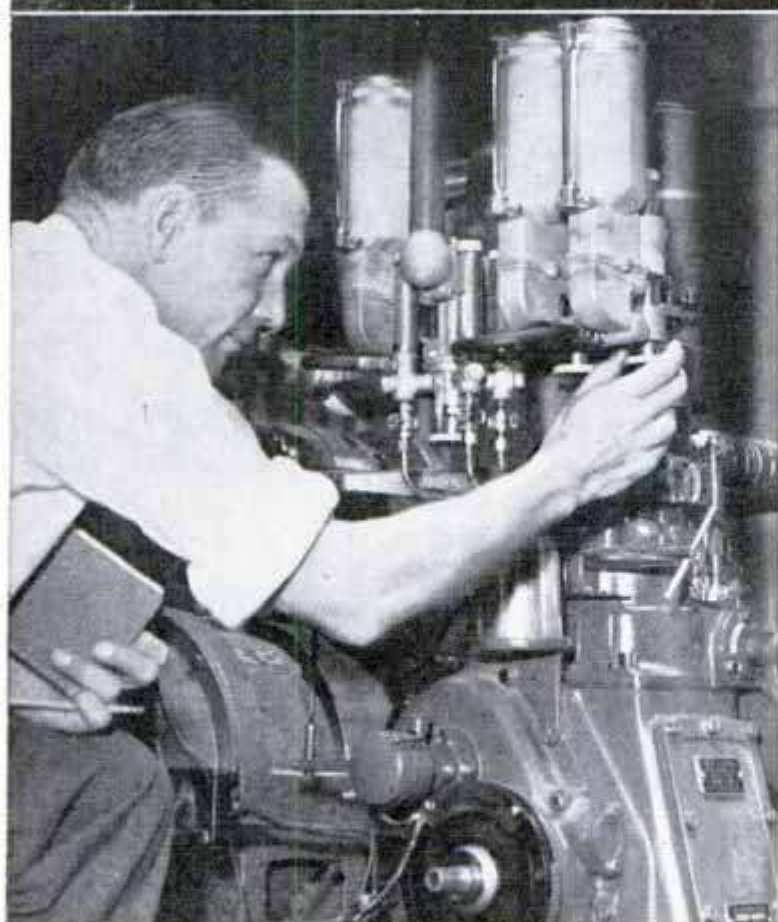
Top, measuring tank used to determine accurate mileage of gasoline. Below, putting moth balls in your gasoline tank has same effect as many dopes and increases carbon

in the gasoline. The next step was to give the moth balls a fancy name and sell them at a good price. Ever since then naphthalene, the basic ingredient of moth balls, has been peddled in powder, liquid, and pellet form as a carbon remover and fuel economizer. Naphthalene and other coal tar products really have some effect in suppressing detonation, but unfortunately

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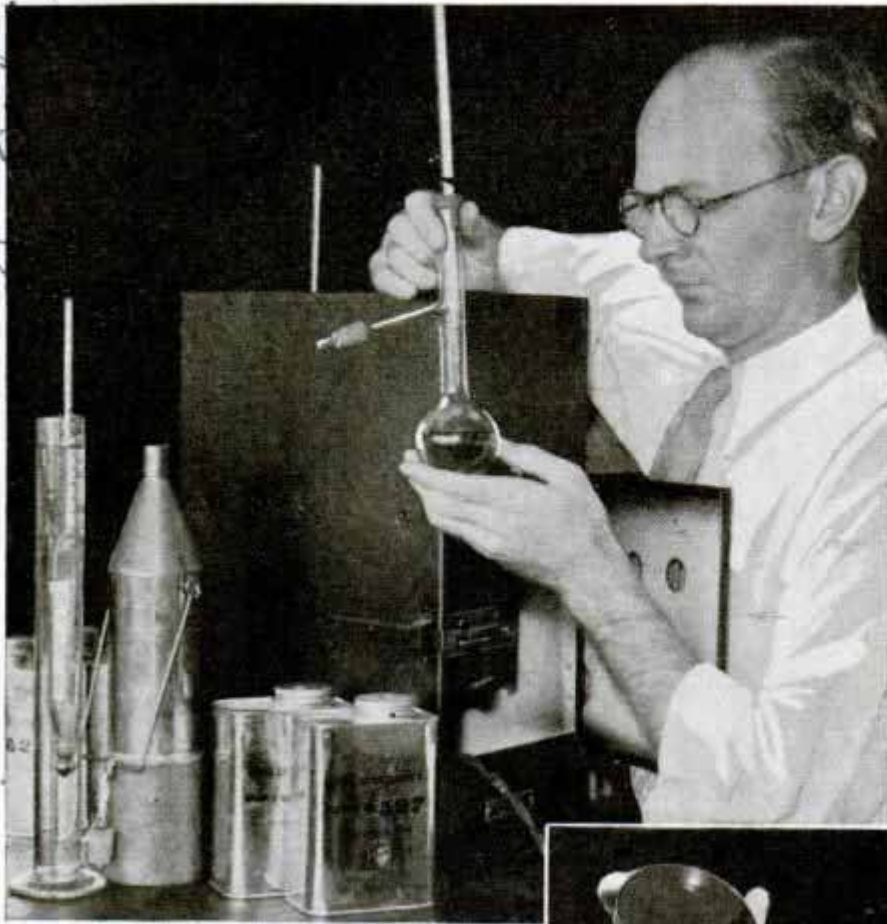


Top, fuel being tested for sulphur content by California Testing Laboratory and, below, adjusting "knock engine" to get exact anti-knock quality of fuel

they create excessive carbon deposits in the combustion chambers, leaving the motor in worse shape than it was before.

A typical "magic gas" powder about which startling claims were made was investigated by the Milwaukee Better Business Bureau. After its tests the bureau issued a warning that the powder neither increases the power nor the octane rating of a fuel, hence it has no effect on economy.

The Bureau of Standards, after testing hundreds of such compounds, declared that "in no case has the treatment of gasoline with one per cent or less of such dope been found to have any significant effect, beneficial or otherwise, unless the dope affects the tendency of the fuel to knock or detonate." A publication of the American Automobile Association reported after similar tests that not a sin-



splendid mileage improver because it was highly radioactive. The laboratory test staff rejected it too after tests showed that no matter what else it might be good for, it was useless as a fuel ingredient.

In another case a laboratory tested a dope and found it did all the inventor claimed. The liquid had splendid anti-knock qualities but a complete analysis showed the material contained



Testing volatility of fuel to which dope has been added and, below, discoloration of upper dish shows excessive gum formed in a doped gasoline

gle instance had been found in which fuel dope decreased carbon deposits, knocks, or caused any improvement in the general operation of the automobile to an extent that could be measured.

Don't let a money-back guarantee fool you. One company offered to refund the purchase price of ten bottles if they failed to reduce the carbon. The company will do exactly that, if and when a disgruntled customer comes in with the empty bottles and definite proof that carbon was not reduced. The point is that few customers will use that many bottles, and only a few of those who do will bother to claim the guarantee if dissatisfied. This is known as the "one tenth of one per cent racket," which is just about the percentage of dissatisfied customers who actually ask for their money.

One man who had a "more miles" compound claimed he extracted it with kerosene from a rare mineral deposit. Perhaps he did, a laboratory staff for an oil company admitted after they tested it, but they couldn't find it improved gasoline. Another had a dope he declared was a

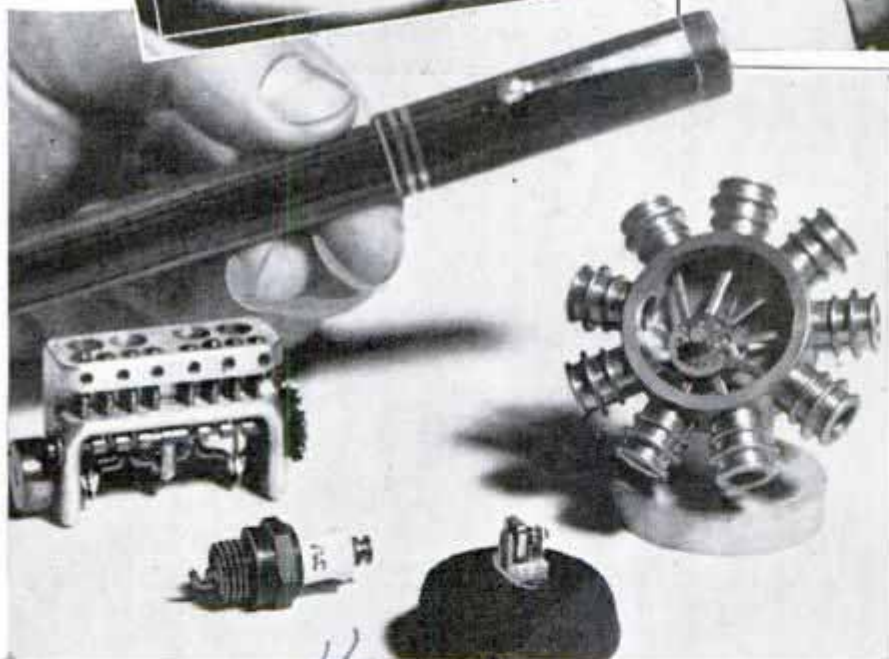
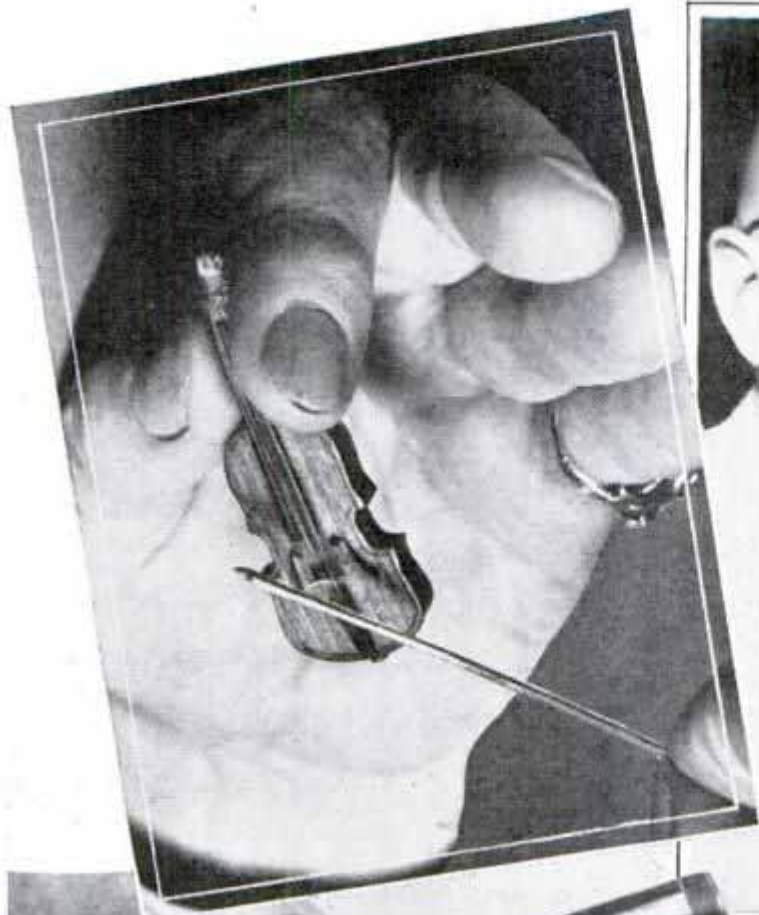
tetraethyl lead, a recognized anti-knock compound, which the "inventor" had secretly added to his mixture. In another instance an aromatic compound extracted from Indian tea looked good until it was learned that copious quantities of benzol were required in the extraction process. This was a case in which the discoverer was unaware that benzol alone is a very effective knock suppressor. But benzol, at about forty cents per gallon, is too expensive to use as a knock inhibitor in the quantities necessary.

The oil companies are not interested in testing compounds of lead, iron, nickel, aniline, benzene, or xylene. The anti-

(Continued to page 154A)

California Testing Laboratory, 1429 1/2 Santa Fe Ave. Los Angeles, Cal.

Thousands of Tiny Things in Odd Collection



Top, left, perfect little violin. Right, reading prayer on pinhead. Bottom, comparing fountain pen with midget Ford motor, spark plug, tiny electric motor and miniature Lindbergh engine (right)

that time he went blind. Also in the museum is a Chinese junk with sails set, sixteen men on deck and eight portholes behind each of which stand two men, with 257 Chinese characters on the bottom of the junk. This object was carved from the pit of an olive. Then

Three thousand silver spoons that fit into a hazel-nut shell, ivory camels small enough to pass through the eye of a needle and 25,000 other objects in miniature are in an odd collection of tiny things assembled by Jules Charbneau of Spokane, Wash. The collection also includes a pin on the head of which is engraved the Lord's prayer, a feat which occupied an artist for twenty-five years. At the end of

there is a tiny electric toaster, one-half inch wide and three-quarters of an inch long. The smallest Ford motor, a four-cylinder model which will run, is one and one-half inches wide. It is only a fraction smaller than an operating model of the Lindbergh transatlantic plane motor. Also there is a Bible verse written on a glass plate and framed by the eye of a small needle, but invisible to the human eye.

1750 Palm Ave.
Seattle.

Keystone

Vertical handwritten text on the right margin, possibly a date or page number.

Twin Unit Starts "Installation Plan" Train



and by adding similar cars or articulated units an entire light-weight streamline train can be built up. The twin unit weighs about the same as a standard steel sleeping car. The forward car has sleeping rooms on two decks, the uppers reached by three steps. Rooms are air-conditioned and have individual regulators for heating and cooling. In the upper room there is a luggage locker, and a folding aluminum table in each room can be used for writing or serving meals. The observation car contains a compartment, double bedrooms, buffet and lounge. The body of the cars is of alloy steel, and their interior and furniture finished

One car a double-decked sleeper and the other an observation-lounge, a two-car articulated unit has been built as the first section of an "installation plan" streamline train. It can be used as the rear unit of a train of old type cars today,

with aluminum alloy. Outside, the finish is gun-metal shade accented by black and gold striping. A streamline skirt along the sides conceals the batteries and tanks under the car, but leaves the trucks exposed for servicing.

Genl. George A. Kelly U.P. The Pullman Co. 79 St. Adams Chicago

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LINES of light illumine the aisles of the "City of Los Angeles," and corner lamps in each berth focus bullets of light over your shoulder.



LUNCHEON on the transcontinental streamliners is served on a tray that folds into the seat ahead.

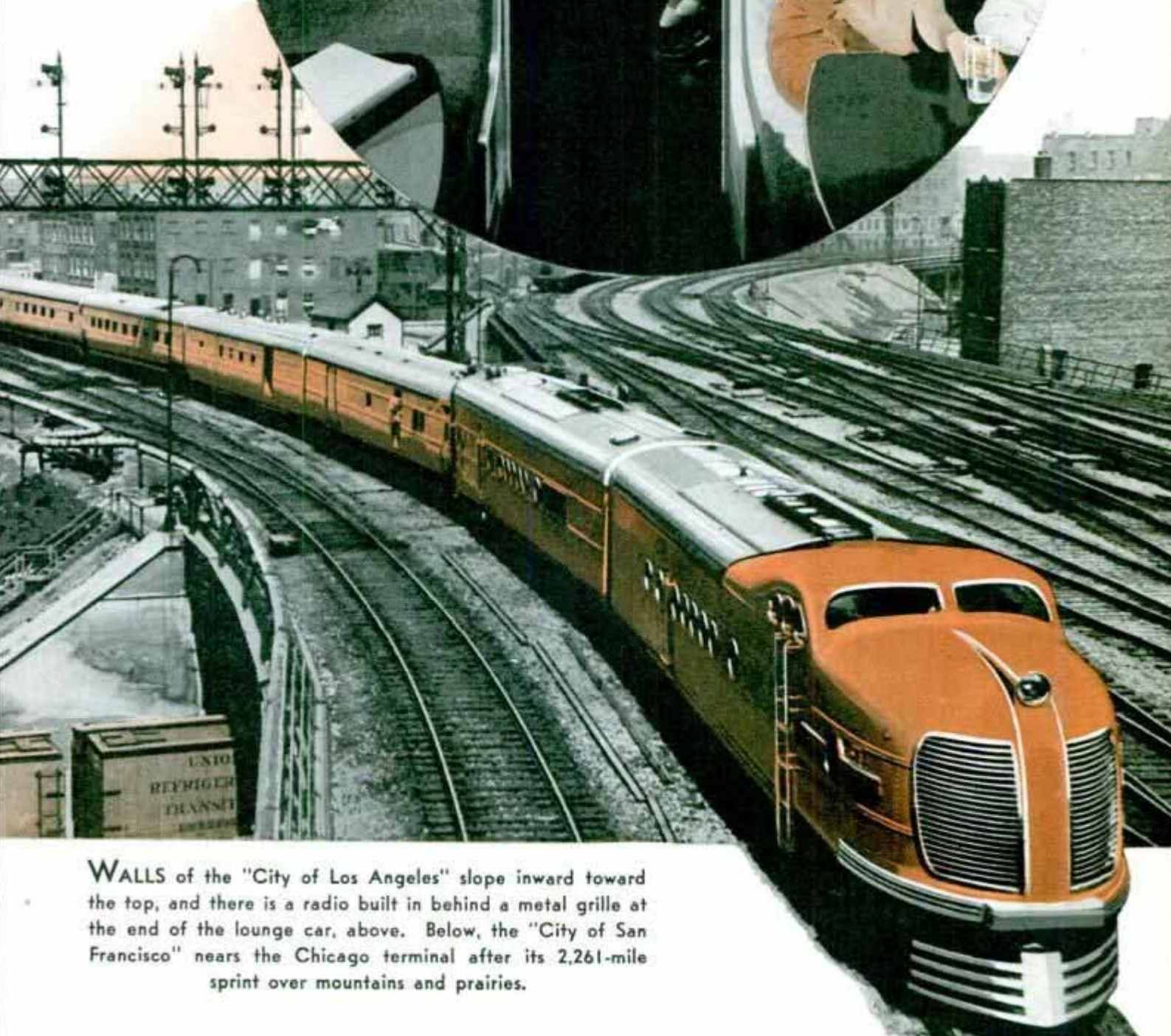
PART II

IT took ninety years to start the revolution that set the streamline train on its time-shattering career. You knew that revolution had come when you read that the fiery old iron horse had been stabled and in its place, trailing a string of coaches straight and smooth as an arrow's shaft, was no grimy black engine but a strange new power car of "cobalt and sarasota blue, golden olive and pimpernel scarlet." Like an arrow the streamliner shot across the country, caught the public imagination, beckoned a new generation that thought the railways outmoded and slow to come for a thrilling hundred-mile-an-hour ride in this aluminum bullet.

A new era in railroading was beginning, yet its seeds were buried ninety years ago. For the streamline train was first prophetically suggested in a British patent granted in 1846 to Sir Henry Bessemer, inventor of the Bessemer steel process. He proposed a "wedge form" for the piston carriage of "atmospheric railways," to "diminish atmospheric resistance and allow the carriage to move at higher velocities with less power. The wedge



7814



WALLS of the "City of Los Angeles" slope inward toward the top, and there is a radio built in behind a metal grille at the end of the lounge car, above. Below, the "City of San Francisco" nears the Chicago terminal after its 2,261-mile sprint over mountains and prairies.



MORE like an intimate club room than a railway car, the rear end of the Alton railroad's "Abraham Lincoln" is an air-conditioned solarium.

form may be used both in the fore and hind parts of carriages or of trains, in addition to the closing of the intermediate spaces." In 1865, as the American Civil War closed, U. S. patent No. 49,227 was issued to S. R. Calthrop for a train designed to diminish wind resistance, but the train was never developed. At the turn of the century the "Windsplitter," America's first streamline train, was given trial on the Baltimore & Ohio tracks in Maryland. It was designed by F. U. Adams of Chicago, a newspaper man. It never was placed in scheduled service, and the streamline idea slumbered on.

The epoch of the streamliner was born, at last, of necessity. In 1920 the railroads carried a peak-year load of 1,235,-

000,000 passengers. In 1933 only 433,000,000 passengers chose the rails for their thoroughfare. Passenger-miles dwindled from forty-seven billion in 1920 to a little more than sixteen billion in 1933. What drastic, dramatic gesture could lure back the lost passengers to the railways?

The streamliner was the answer. Dramatic "packaging" for the traveler. Mighty power plants wrapped in color—"sarasota blue and pimperl scarlet," for one—that would draw thousands every day to watch them roar by, and would pile up a waiting list of passengers.

The railroads borrowed style from giant air transports and from streamline automobiles. But speed called for more



LUNCH counter service is an innovation on the "Abraham Lincoln." Here the Chicago-St. Louis passenger is served quickly at reasonable prices.

than mere styling, and the railroads went to the automotive manufacturers for an engine that would haul million-pound trains—built at a cost of a dollar a pound—across the continent day after day at eighty and ninety mile speeds without breakdown. Speed was nothing new to the old iron horse, for a record of 127.1 miles per hour marked up by the Pennsylvania's Broadway Limited in 1905 has yet to be challenged by today's fast trains. Even today the Chicago and North Western's conventional steam "400" matches the better than mile-a-minute pace of the streamline steam "Hiawatha" and the Diesel-electric "Zephyr" between Chicago and St. Paul. But sustained speed, a thousand miles nightly from Chicago to Denver,

two-thousand-mile sprints from Lake Michigan to the Pacific, called for an engine with long-distance stamina, and the Diesel was given the assignment.

Climb into the massive yellow power car of the "City of San Francisco," one of the newest and most powerful of the growing fleet, and watch the engineer start his eleven-car streamliner on its journey of two nights and a day to the bay city from Chicago. Half-way across Nebraska this speedster will overtake the steam train that left Chicago eight hours in advance.

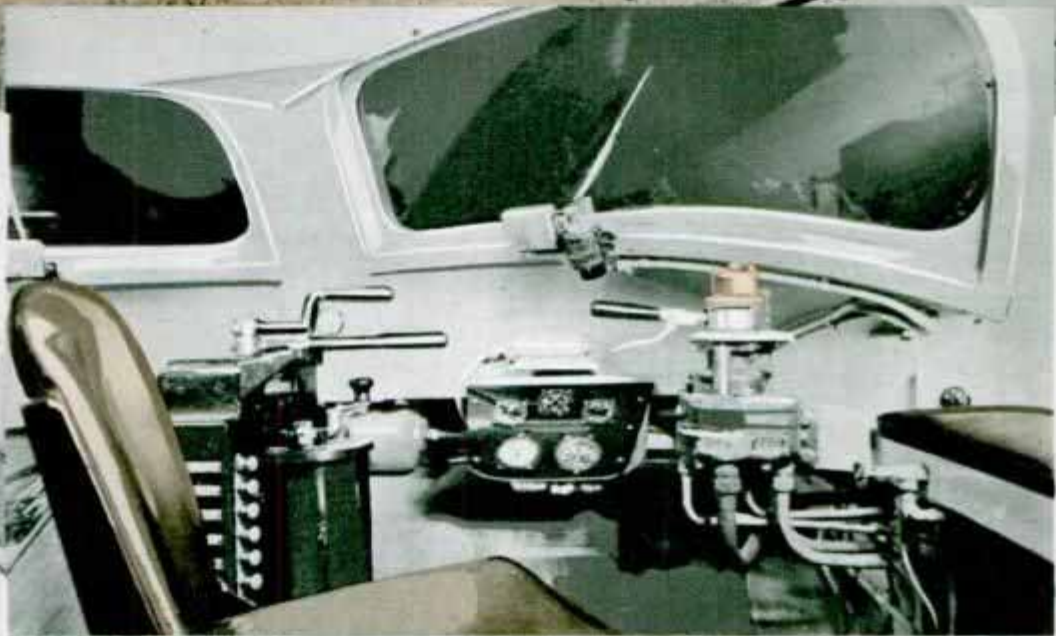
The Diesel-electric engineer is half automobilist, half electric motorman. His "fireman"—an obsolete term—climbs down into the grey power room that resembles the engine room of a great ship,

WINDOWS make upper berths of the California-Chicago streamliners attractive, and there are folding steps instead of ladders. Below, the chef on a speed train mixes a salad bowl.



starts the Diesels as you would start an automobile engine, and rejoins the engineer in the cab. Three auxiliary motors have already been running, furnishing power for lights, air-conditioner, brake lines. Given the "highball," the engineer releases his brakes, sets the motor in "series" and advances the controller to "Speed 2." The mighty locomotive starts forward almost imperceptibly—a jolt is all but impossible with articulated, shockproof coupling—the controller is advanced again and the purr of the Diesels becomes a roar as





CANADA'S first streamline engine, top, a giant steam locomotive hauling crack passenger trains of the Canadian National railroad. Center, a view of the controls in the cab of a Diesel-electric power car, and below, the Milwaukee road's "Hiawatha" putting on its spectacular daily show between Chicago and St. Paul.





FRONTIER days are remembered in this unique room on the "City of Denver." With its pine walls decorated with old photographs and posters, it is reminiscent of the pioneer west.

the electric drive draws more and more power. When the train reaches a speed of thirty miles an hour the controller is thrown back, as if to shift gears; the motor is switched from "series" to "parallel" and again the controller moves forward. There are eight speeds on the controller. At sixty miles an hour the engineer switches beyond "parallel" into the high cruising range, and the streamliner hits its stride.

Like an automobile, the Diesel is watercooled and the crew must keep its

temperature around 160 degrees. Dials in the cab show the engine temperature, train speed, and air-brake pressure. There are warning lights to indicate overheated motor and low lubricating oil. Instead of semaphore signals, the automatic train control flashes a light in front of the engineer if the track ahead is obstructed, and if he fails to reduce speed in acknowledgment of the warning, the train is automatically brought to a stop. Temperature of the motors can

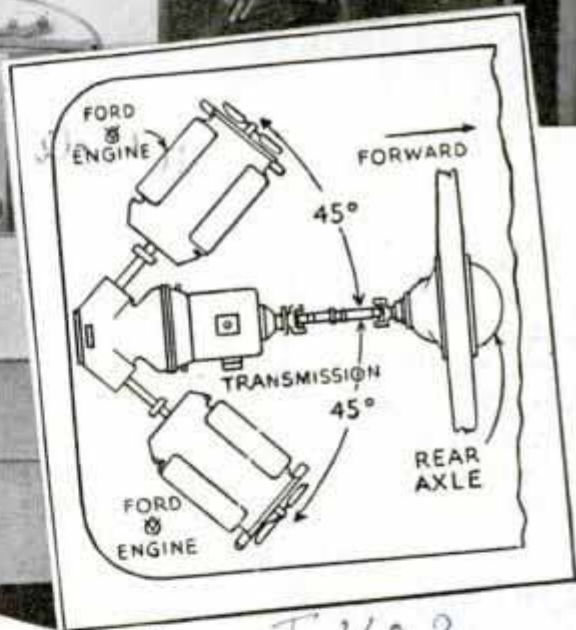
(Continued to page 132A)

Twin Motors with Single Clutch Drive Big Bus

Two eight-cylinder motors set at forty-five-degree angles to the transmission shaft, with a single clutch, give remarkable smoothness and flexibility to a sleeper bus just built in California. Accelerating swiftly like a steam-powered vehicle, it cruises at fifty-five miles an hour yet travels smoothly in high gear as slowly as ten miles an hour. The twin engines are at right angles to each other, connected into a single bevel-gear drive unit that provides sixteen-cylinder synchronized performance. If one motor fails, the bus can travel on the remaining engine. Being interchangeable, a new motor can be installed with little loss of time at the re-



Latest sleeper bus and interior view of compartments during day travel. Diagram illustrates how its twin engines are connected to single drive shaft



pair depot. Designed for the utmost passenger comfort, the bus is air-conditioned and is of the "sleeping car" type with eight compartments, accommodating thirty passengers as a day coach and twenty in berths at night. There are four reclining chairs in a glass-enclosed front observation compartment. Each compartment contains three single berths and a lavatory. The motors are mounted at the rear of the bus, which is built of aluminum.

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

Pineapples Ripen Much Faster When Treated with Acetylene

Gas a pineapple with acetylene—the gas used in welding torches and once used in automobile headlights—and your pineapple will blossom and bear fruit four times as fast as if left to nature. A patent granted to a Hawaiian pineapple grower describes his method of treating the plants with acetylene before their normal flowering period. The pineapple plant is either gassed in a sealed chamber or sprayed with acetylene-saturated water. Five treatments of twelve to eighteen hours are enough to speed up the ripening process.

granted to K. O. ... Hawaii

Mrs. Stanley Meagher 4322 Century Blvd. Los Angeles, Calif.

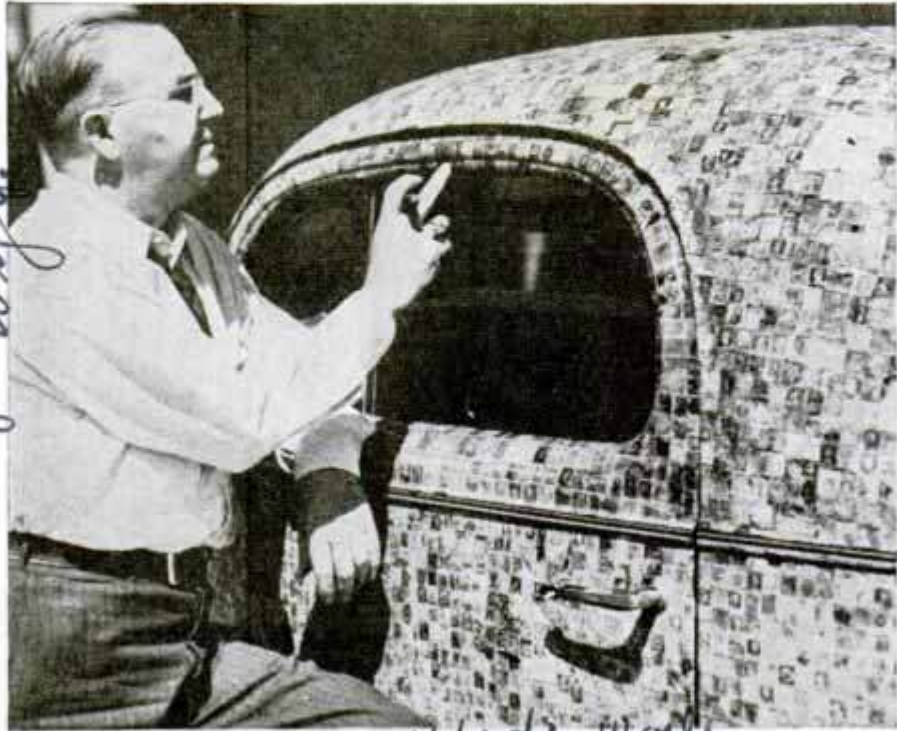
Photo - Wm. R. Haas
Cine Opera Aldy
Chicago

30 1936
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1936

Stamp Collection on Wheels

T-1110 Covers Every Inch of Auto

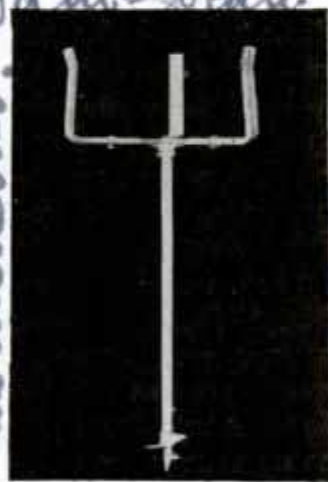


Automobile covered with more than 10,000 stamps. Five girls worked for six weeks pasting the collection on the car

One stamp collector has evolved a novel way of displaying his collection of more than 10,000 stamps. He set five girls to work pasting them on his automobile. When they finished after six weeks of labor, every inch of his car was covered with stamps, thus transforming his automobile into a rolling stamp exhibit.

Garbage Can Kept Off Ground by Adjustable Holder

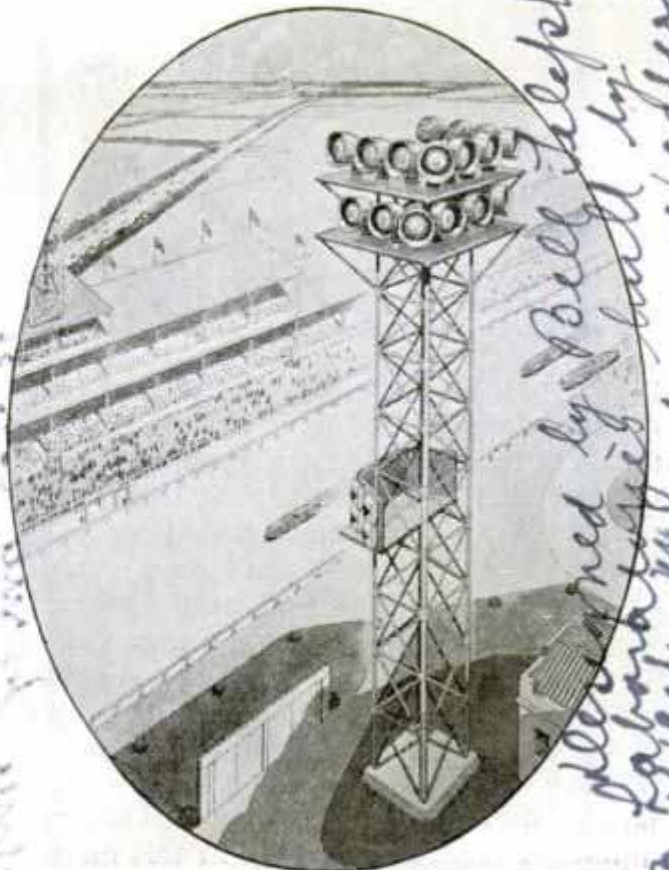
Adjustable to any size of container, a garbage-can holder keeps the can off the ground at a convenient height to reach but away from cats, dogs and other animals. It consists of a metal standard supporting an adjustable holder. The standard is screwed into the ground and provides a substantial support for



the can. The holder permits free circulation of air and sunlight about the can and also prolongs its life since it retards rusting by keeping it off the ground.

Sound Projectors on Tower Give Race Results

Atop a tower 100 feet high, super-power projectors will announce race results at the pretzel-shaped Roosevelt Raceway at Westbury, Long Island. In addition to announcements, transcriptions and radio broadcasts also will issue from the projectors, into which may be fed a total of 20,000 electrical watts from a bank of audio amplifiers. This energy is converted into 10,000 acoustic watts. Grouping the long-range projectors at one



Sound projectors for race course atop 100-foot tower

Ed Hadley, Casper, Wyo.

Wide world

T-1104

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T-109

Western products

Designed by Bell Telephone Laboratories, built by Westinghouse Electric Corp., West. N.Y.

463

point instead of placing smaller loud-speakers at different points accomplishes clear and distinct reproduction, free from confusing echo effects, it is claimed. The search-light-shaped speakers atop the tower have their sound beams trained so as to cover remote portions of the course where spectators park their cars.

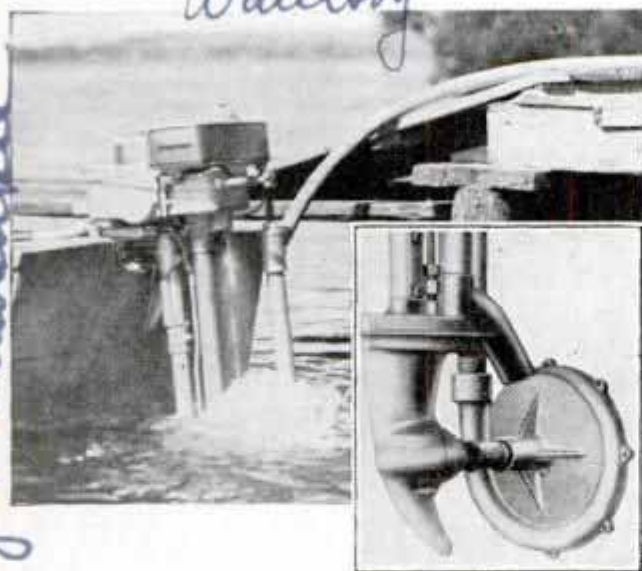
709.2
Baby Antelopes Ride to Zoo in Rancher's Flying Boxcar



Wide World
Bar J.
Wyoming rancher unloads one of his sky-riding antelopes from the plane in which he took twenty-three animals to eastern zoos

Fill 3
Outboard Motor Drives Small Water Pump

Attached in place of the propeller, a compact centrifugal pump for use with an outboard motor supplies cottage or camp with an adequate water supply. The smallest single-cylinder outboard will deliver a full stream through a hose 250 feet long, while small twin motors will handle two streams. An old barrel, elevated for a gravity supply system, can be filled rapidly for fire protection. In



Outboard motor operating water pump. Inset, the pump attached to motor

tests the pump delivers thirty-five gallons per minute with a two and one-half horsepower motor running full speed. The pump works on motors from one and four-tenths horsepower to five horsepower.

Twenty-three baby antelopes from the plains of Wyoming rode the skyways in style on their way to eastern zoos. Rounded up by Charles J. Belden at his Pitchfork, Wyo., ranch, they were loaded aboard his flying boxcar and flown east. Several were delivered to zoos in American cities and two were consigned to Germany aboard the Zeppelin "Hindenburg."

Fill 6
Hinge Screws Started at Center by Using Special Punch

Screws can be started accurately at the center of hinge holes by using a simple tubular steel punch. Through the middle of the punch moves a sharp pointed pin which is driven into the wood to start the hole for the wood screw. The lower, beveled end of the punch is inserted in the screw hole in the hinge, the beveled part centering it exactly. Then the protruding end of the pin is struck with a hammer.



A. W. Iserström Co.
634 - 8th Ave. N.Y.C.

817.50 job Milwaukee

Outboard Motors
Car. 4143-91

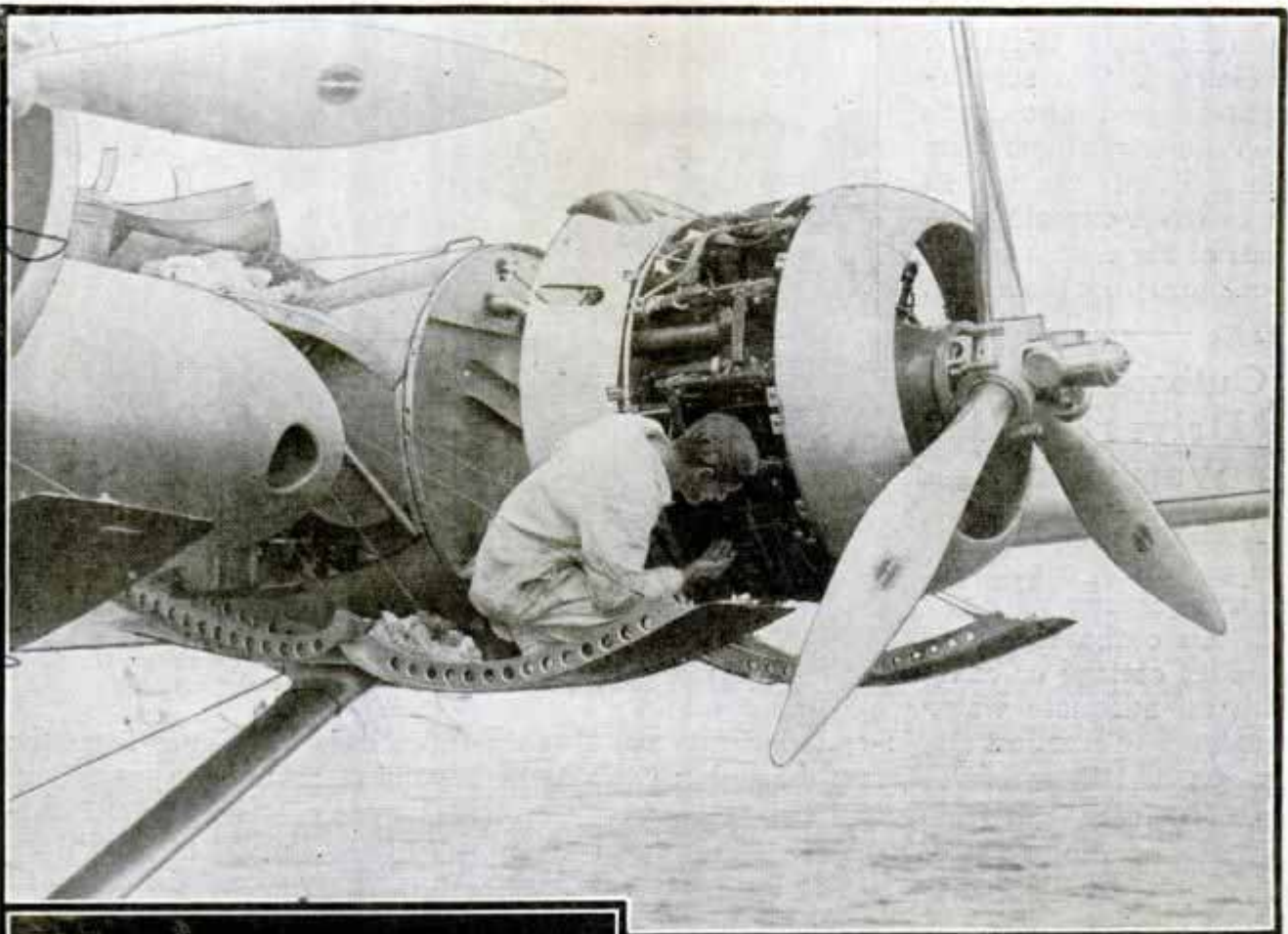
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7896

4 W. K. S. S. H.
New York

LEARNING to FLY

Pan. American Airways, 135 E. 42nd St., New York



SUPREMACY on the ocean airways lies in the hands of a small band of airmen, the most skillful transport officers in the world.

Flying crews for Pan American clippers pass through the most intensive training ever given to men in charge of land, sea or air craft. Now five years old, the first ocean-flyers' school was organized by Col. Charles A. Lindbergh and other ranking officers of P.A.A. The school began in the Caribbean area, but now its operations have been extended to the Pacific, and soon they may include the Atlantic.

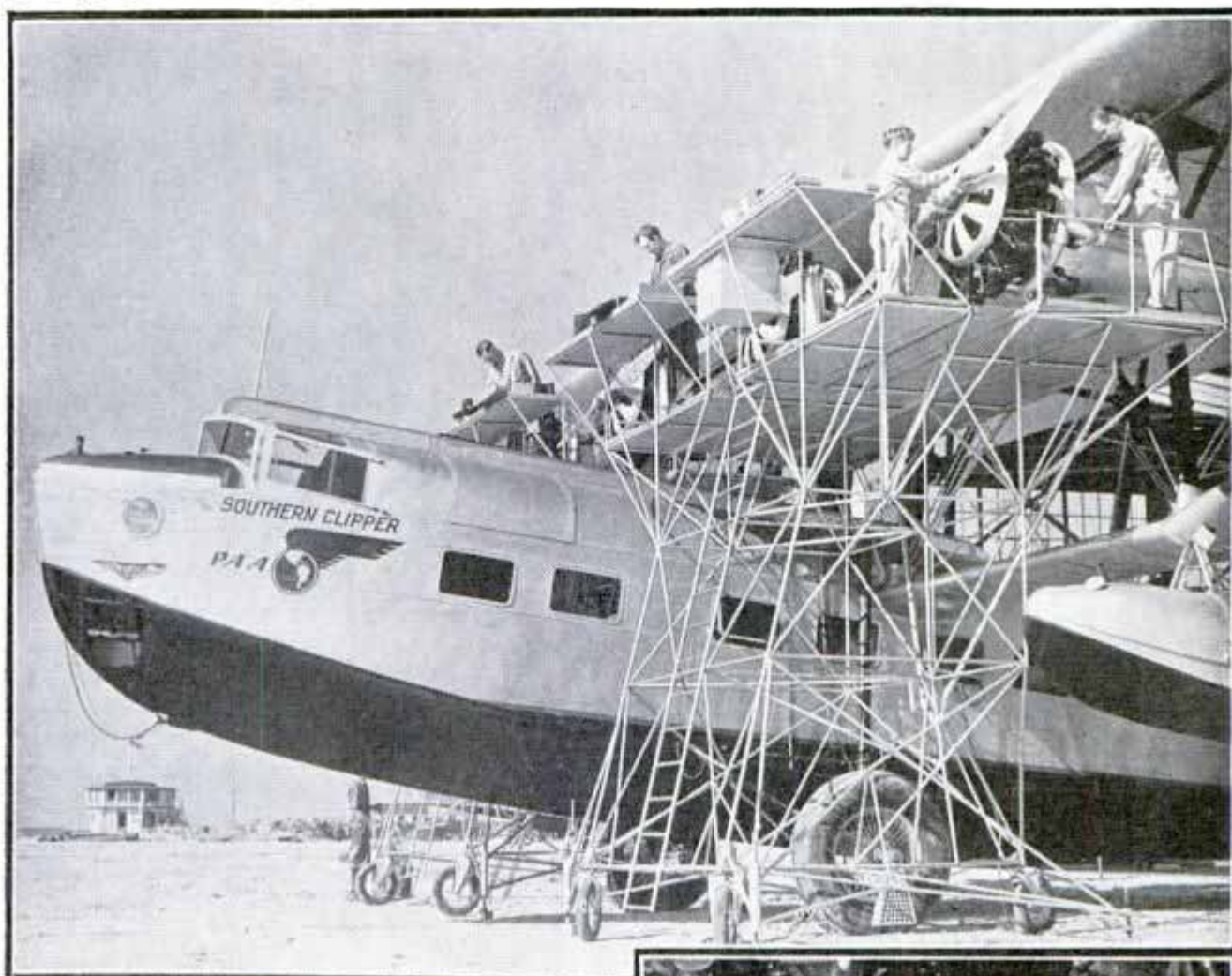
Anticipating a boom in transoceanic passenger, express and mail service, the company is training enough officers to handle the clipper ships when they are ready to go. More than 100 men already have taken their final examinations for responsible posts. They are the nucleus of a small army of expert pilots, engineers, radio operators, mechanics and navigators who will be in charge of America's destiny on

and maintained by P.A.A.

Junior officer, top, working on one of the clipper engines and, below, a student studying the mechanics of a clipper power plant

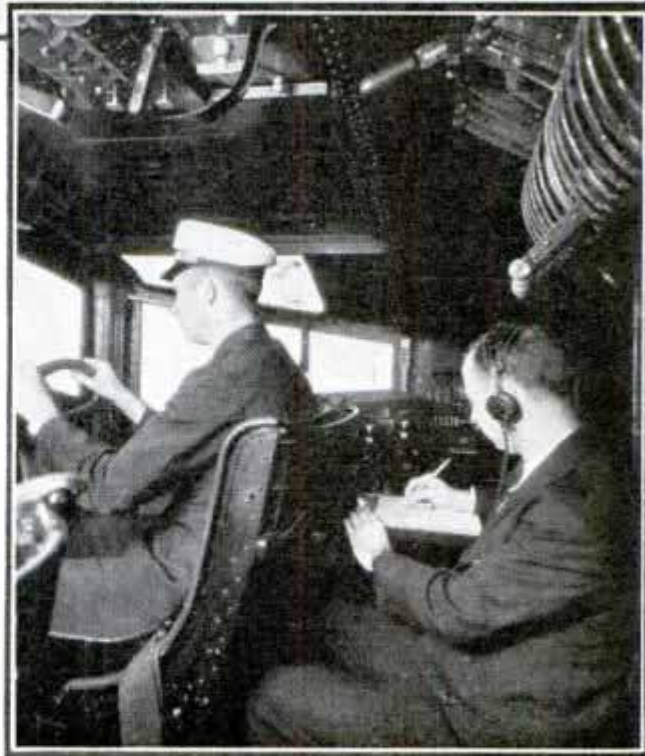
7895

the CLIPPERS

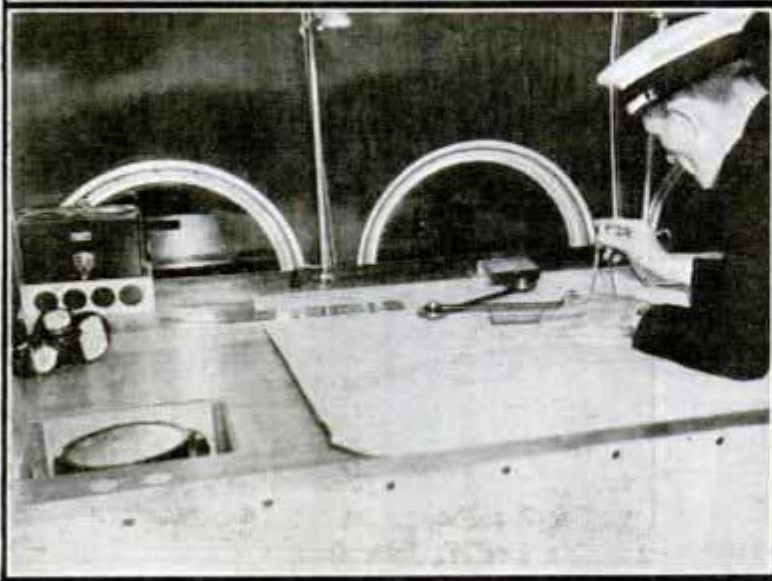
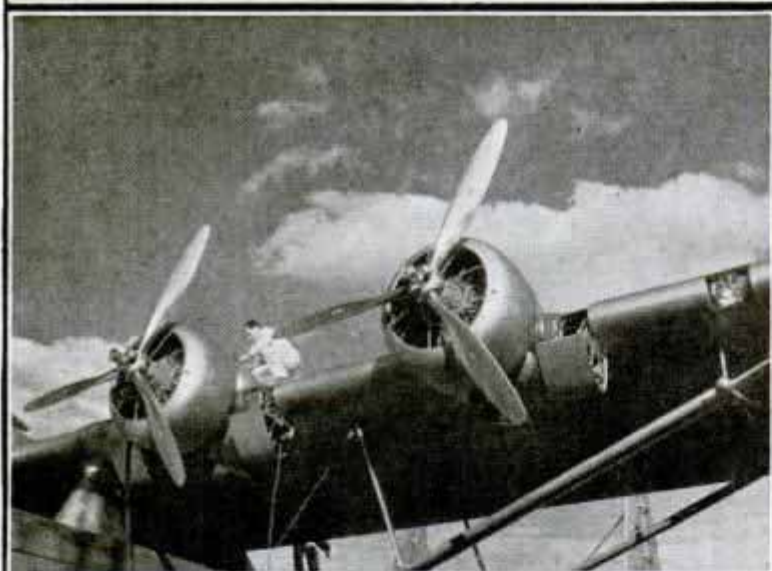
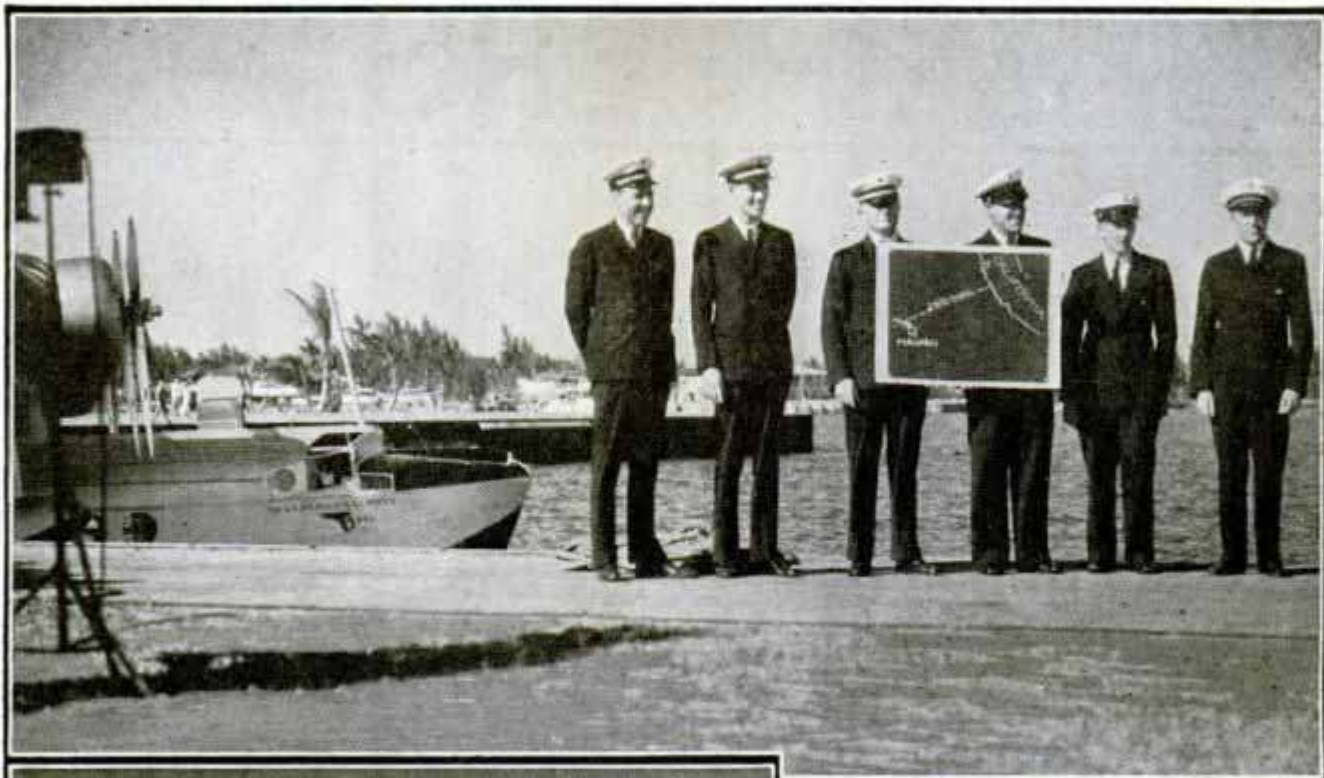


the ocean airways. Five years ago, engineers of this international air line were convinced that long-distance ocean flying was not only practicable, but that it would become an accepted fact within a relatively short period. That was when Col. Lindbergh and his associates mapped out a course of training for ocean flyers. They worked out the first conception of a flying boat crew as it is known today: captain, co-pilot, navigator, radio officer and flight engineer. All must be specialists in their chosen field, but in addition, they must be interchangeable. At a moment's notice, one officer must be able to assume complete responsibility for another's duties.

This is like having a train conductor who can drive an engine, and an engineer who can pinch hit as a conductor. To train men so exhaustively, schools were set up at divisional headquarters. Pilots, no matter how extensive their experience; passed



Crew servicing a clipper ship with the aid of a portable scaffold and, below, pilot and radio operator in cabin of clipper

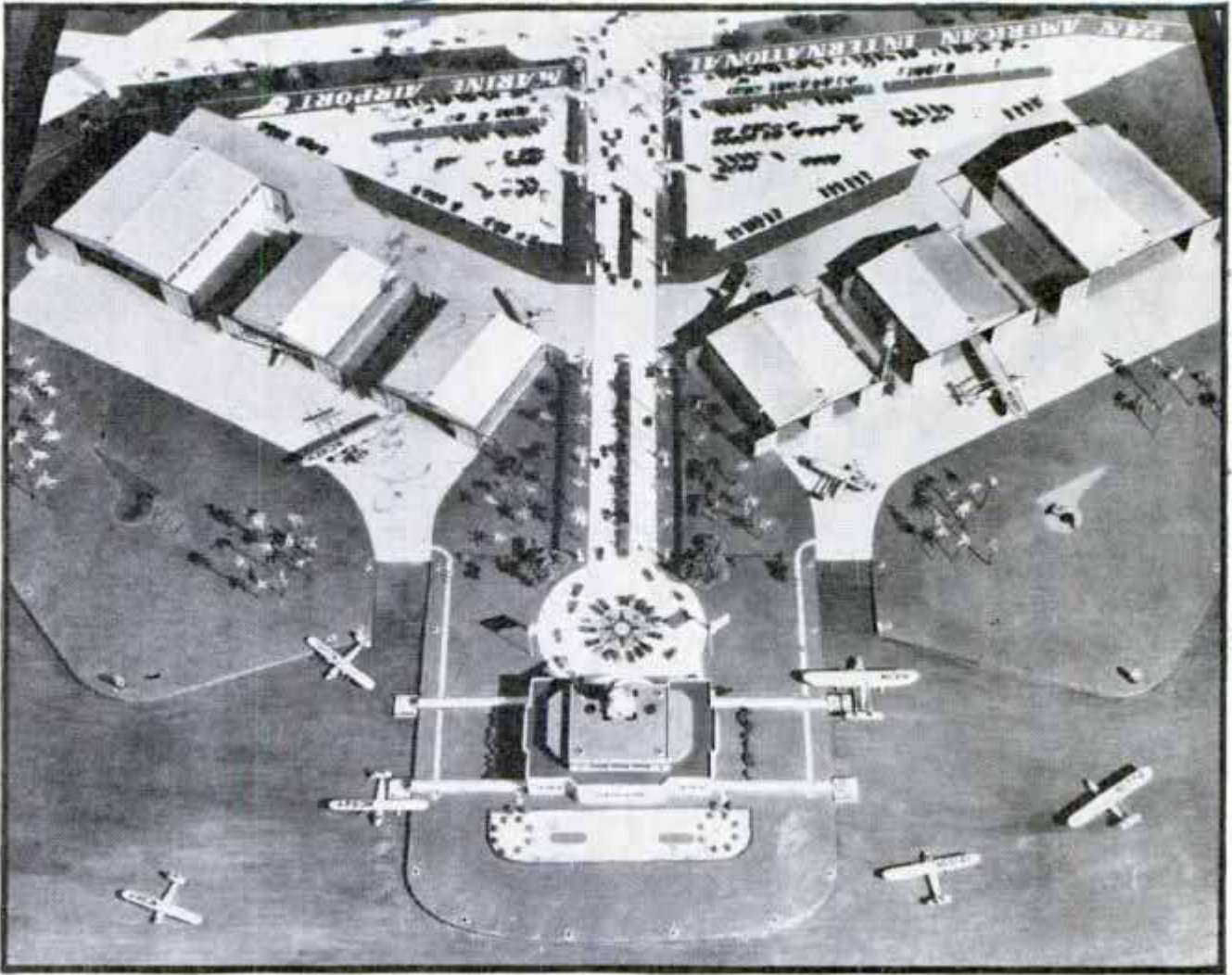


Trim clipper ship crew, at top, ready for a flight. Center, two of the engines of a clipper. Bottom, officer in navigation room of clipper ship

through instruction in blind flying, and were given a chance at the controls of all the common types of aircraft. All flying personnel took courses in meteorology, navigation, and radio. New pilots were given long training periods in engine shop work. For years after joining the line, they served as assistant pilots, as junior officers, and clerks in charge of every detail of clearing cargoes and caring for passengers.

The requirements for becoming an apprentice pilot in the ocean-flying school are unusually high. To qualify for training, a candidate must be a graduate aeronautical engineer, the holder of a transport pilot's license, and not over twenty-four years old. If he passes the preliminaries, he receives a thorough education in the international transport business. This takes in a lot of ground. It begins with traffic handling and clearances, then leads to radio construction, radio operation, engine mechanics, airplane mechanics, and piloting.

To become a finished clipper-ship officer, he is also schooled in foreign languages, international



law, international maritime law, seamanship and kindred subjects. If these courses are passed, the candidate is in line for a rating as junior pilot. This rating implies he is a qualified traffic man, a licensed engine mechanic, a radio operator, a licensed mariner and a master seaman.

The next rating is flight engineer, for which the requirements are still higher. To become a first officer on an ocean clipper, you need at least 5,000 hours of transport flying and at least three years of service with the company. You must also have a supervisory knowledge of engines, airplane mechanics and radio operation, besides being a graduate navigator. The next highest rating, captain, requires 7,000 hours of experience in transport flying and four or five years with the company.

Officers who give evidence of superior judgment and ability, and who have all the foregoing qualifications, are in line for the highest rating—master of ocean flying boats. This title implies the holder knows how to man every post on an ocean clip-

(Continued to page 139A)



An international airport where clipper ships land and depart and, below, signal light for an approaching clipper.

I 1093.

Secret, Mech

Secrets of Earth's Interior Revealed in Mineral Hall

And. Lester L. Pelton

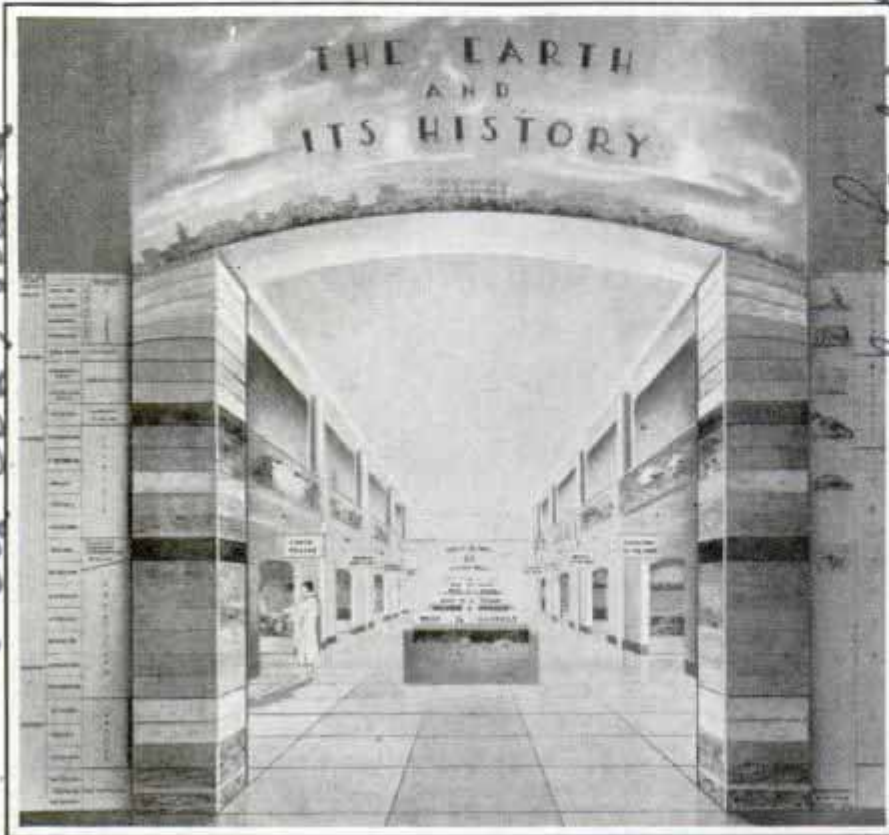
headlamps carries sufficient current to dimly light the lamps and has a capacity sufficient to prevent fire when the circuit is shorted. In addition, the system has a thermostatic switch in parallel with the resistance which periodically bridges the resistance and causes the lamps to light up brightly. Another system has a thermostatically controlled switch which causes the headlamps to flash on and off when there is a short circuit.

F 1116

Hydraulic Car Jack Pulls Fence Post Up with Chain

Fence posts and even small stumps can be pulled up with an all-purpose hydraulic jack designed for use in automobile, garage, farm or shop. Twenty inches high at its low point, it has a lift of fifteen inches and can hoist 3,000 pounds. The chain and hook employed to haul up posts are detachable, and the base is demountable. A pin-point release valve allows automatic and positive control in lowering the load.

Cont. George Eckhardt. 2047 1/2 Park Ave. Chicago



Design of mineral hall, showing its wall of rock strata. Inside are numerous exhibits which help to tell history of earth's interior

With its walls constructed of rock strata found under Philadelphia, a mineral hall at the Academy of Natural Sciences reveals the secrets of the earth's interior. The mineralogical age of each strata in the walls is shown, with the strata drawn to scale. The entrance is like entering a cross section of the earth. On one side of the door are figures of animals which occupied the earth during the various ages. These figures are reconstructed from fossils. In the hall are exhibits showing details of the earth's interior.

at its low point, it has a lift of fifteen inches and can hoist 3,000 pounds. The chain and hook employed to haul up posts are detachable, and the base is demountable. A pin-point release valve allows automatic and positive control in lowering the load.

Car Lighting System Guards Against Road Trouble

Designed to warn the motorist of trouble in the circuit, and at the same time to keep the lights burning sufficiently to reach a garage, a new automobile lighting system has been introduced. When a fuse blows out, or other trouble occurs, the system gives a noticeable signal. A heavy resistance connected in circuit with the



Jerking a fence post out of the ground is a simple job with a hydraulic auto jack and chain

F 1117

Pat. # 2,037,058

Assigned to Packard Motor Car Co. 1580

American Esunder

712 st 2nd Milwaukee, Wis

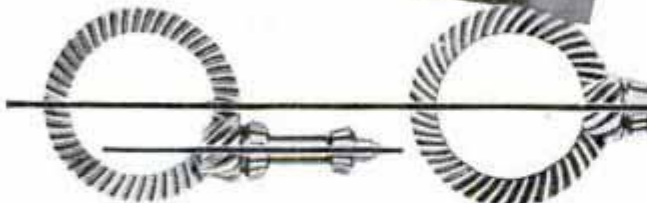
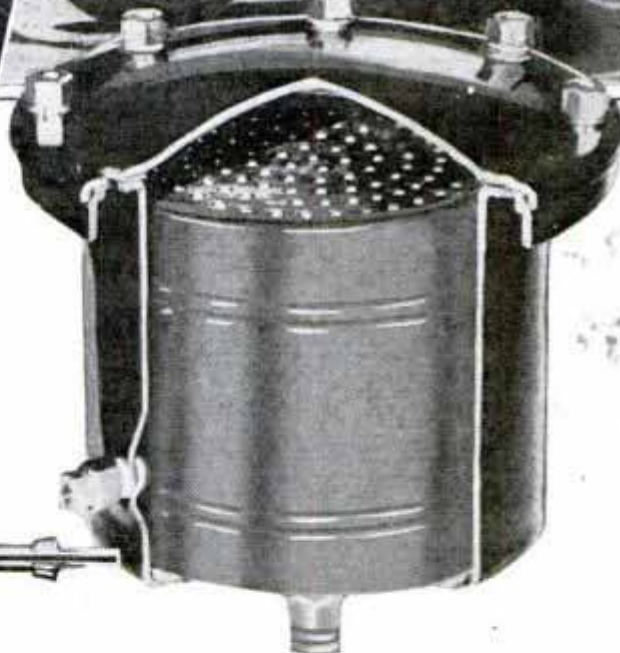
Auto Makers Turn to Easy Control, Economy

That the automobile industry is turning from its former goal of more speed to simplified control, quietness of operation, longer life and economy is indicated by the 1937 Studebaker. Outstanding in this new model are the overdrive transmission which may be cut in or out at any speed above thirty-five miles per hour by operating the accelerator; the hypoid rear axle which permits lowering the body floor without using a tunnel or sacrificing road clearance; direct-acting shock absorbers built into the chassis; the twin lever steering for easier parking and improved control at road speeds; rubber-insulated universal joint for smoothness and quietness at



Length

Studebaker 1937



Top, right, the new Studebaker. Left, photo-diagram of built-in defroster. Bottom, left, sketch showing how hypoid axle permits lowering body floor. Bottom, right, oil and motor cleaner

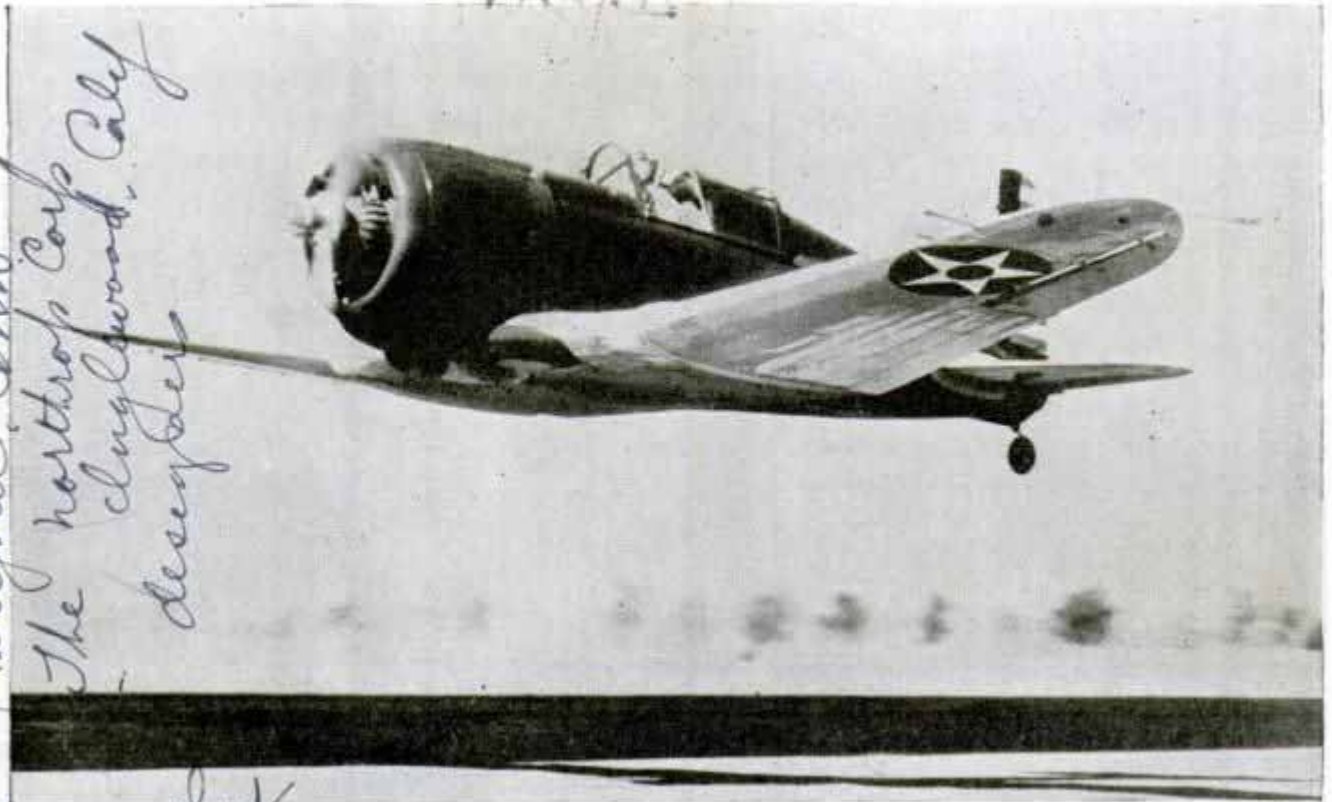
high speed; improved shifting which permits the amateur to change gears without clashing, and an oil and motor cleaner which eliminates frequent changing of oil. Except for seasonal changes in winter or summer, the oil need not be changed. Instead, a new filtering element is installed in the cleaner when the oil becomes dirty. Instructions on the crankcase dip-stick

show when the oil is regarded as dirty. Another innovation is the built-in defrosting equipment which is used with the heater. Two air ducts opening just below the rear of the windshield at the top of the instrument panel carry warm air upward and against the windshield when connected to the heater. This warm air clears the windshield of frost.

Studebaker 1937

All-Metal Plane Makes Five Miles a Minute

Developed by Chance-Vought
The Northrop Corp
Inglewood, Calif
described



This fighting ship is an all-metal, single-seater, low-wing monoplane equipped with a 750-horsepower engine and capable of a speed of 300 miles per hour

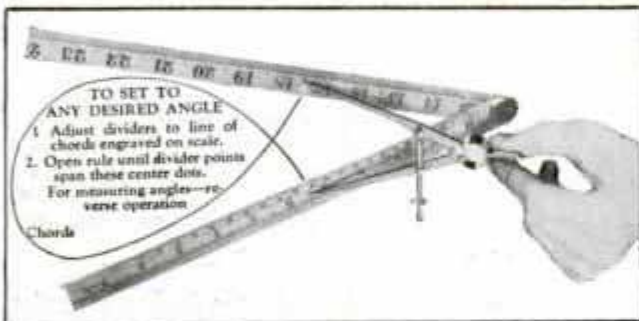
Capable of a speed of 300 miles per hour, an all-metal war plane recently underwent successful test flights in the east. The fighting ship is a single-seater, low-wing monoplane equipped with a 750-

horsepower engine. Among its features are completely retractable landing gear, wing flaps, and cowl flaps to control engine cooling. The pilot sits far forward where he has virtually unlimited visibility.

Jointed Foot Rule Measures Angles with Aid of Dividers

With the help of an ordinary pair of dividers, a jointed two-foot steel rule can be set at any desired angle and the rule

line of chords until the two points exactly span the distance from zero to forty-five degrees. With the dividers locked in this position, the rule is spread until the divider points exactly span two center dots on the rule. Then the rule is opened at a forty-five degree angle. To measure an angle the rule is opened to agree with the angle and the procedure is reversed.



Rule is set at angle by opening divider to proper span on chords then spotting it on center dots

itself can be used to measure an angle. On one arm of the jointed rule a line of chords from zero to 120 degrees is engraved. To set the rule at forty-five degrees, for example, the dividers are opened along the

Super-Steam in Welded Pipes Used by Auto Makers

Carried in a welded pipe system, super-steam is used in making automobiles. Steam heated to 900 degrees Fahrenheit flows from the powerhouse of the Ford plant to various parts of the vast factory, so hot that the pipes carrying it glow cherry red. This heat, and a pressure of

George Scher Co
125 Lafayette

Detroit Free Press

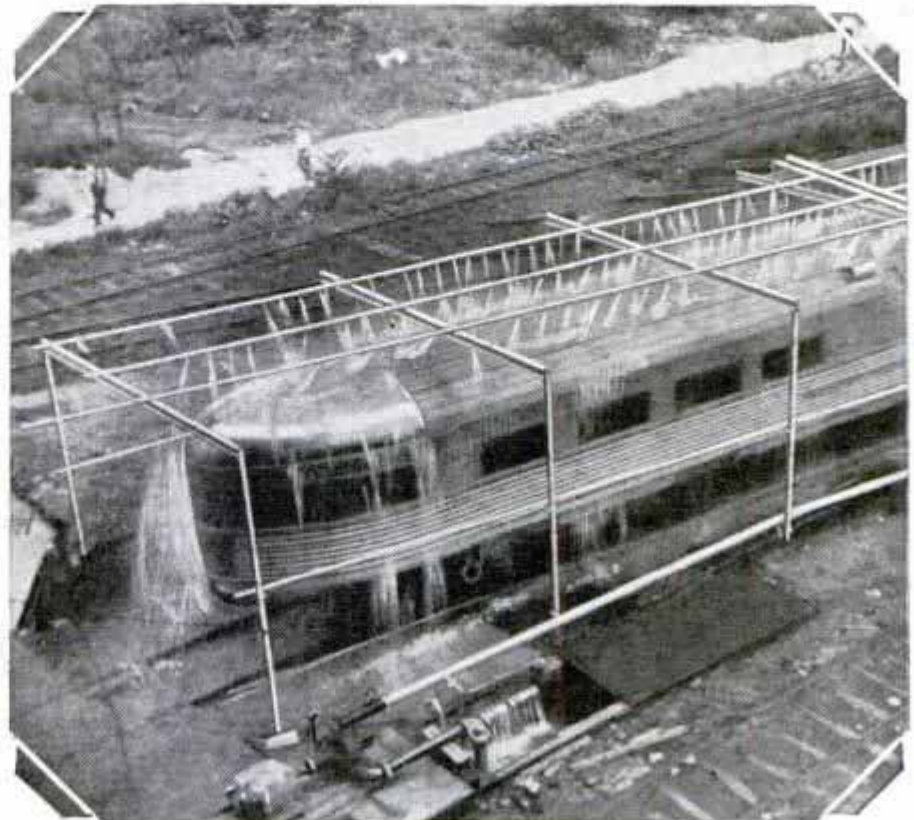
Orange plan. #1087

Mfg. Co.

25th and Bernting Park Ave. Phila

more than 1,200 pounds to the square inch, made it necessary to find a better way of connecting the pipes than by flanged and bolted or threaded joints. So the entire installation was welded, a total of 1,600 joints. To complete the job a "stress relieving machine," to take the stresses out of the freshly welded joints, was built.

Stainless Steel Railroad Car Tested under Water Spray



Streamline rear car of stainless steel train is given shower bath on track at factory to determine whether there are any leaks in its armor

#1056
Reed-Toned Organ of Three Octaves for Children

Learning to play an organ is more fun than work when the tiny instrument has the reed tones and action characteristic of the full-sized organ. A miniature organ developed for children has a span of three octaves, and there are two pedals. The "works" are concentrated in the smallest possible space.

Stainless steel cars being built at Philadelphia for a streamline train are given a thorough baptism under water sprays to test them for leakage. Although the stainless steel is as thin as a dime, it is four times stronger than ordinary steel and being shot-welded, no rivets are necessary.

F1098
Taillight Bracket That Bends Prevents Breaking

Eliminating the principal cause of breakage of brackets, lamps and lenses on trucks and trailers, a flexible lamp bracket of heavy canvas webbing bends when the vehicle is backed into an obstruction. It is made of heavy fabric belting suspended from an angle iron attached to the truck. The light is fastened to this flexible hanger which "gives" if an obstruction is encountered.



Midget organ for children has only three octaves but possesses tone and action of real reed organ

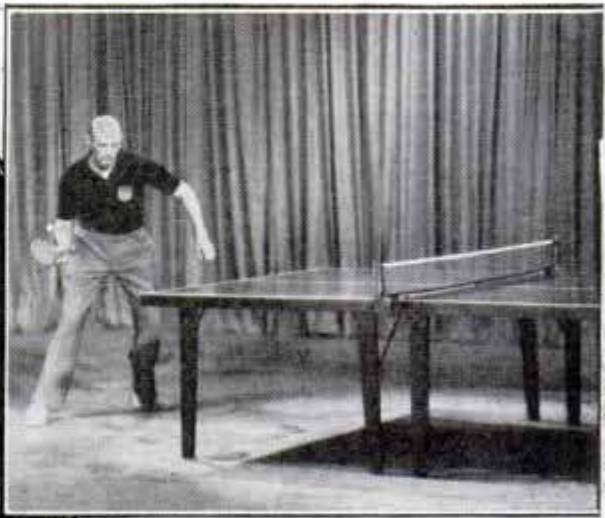
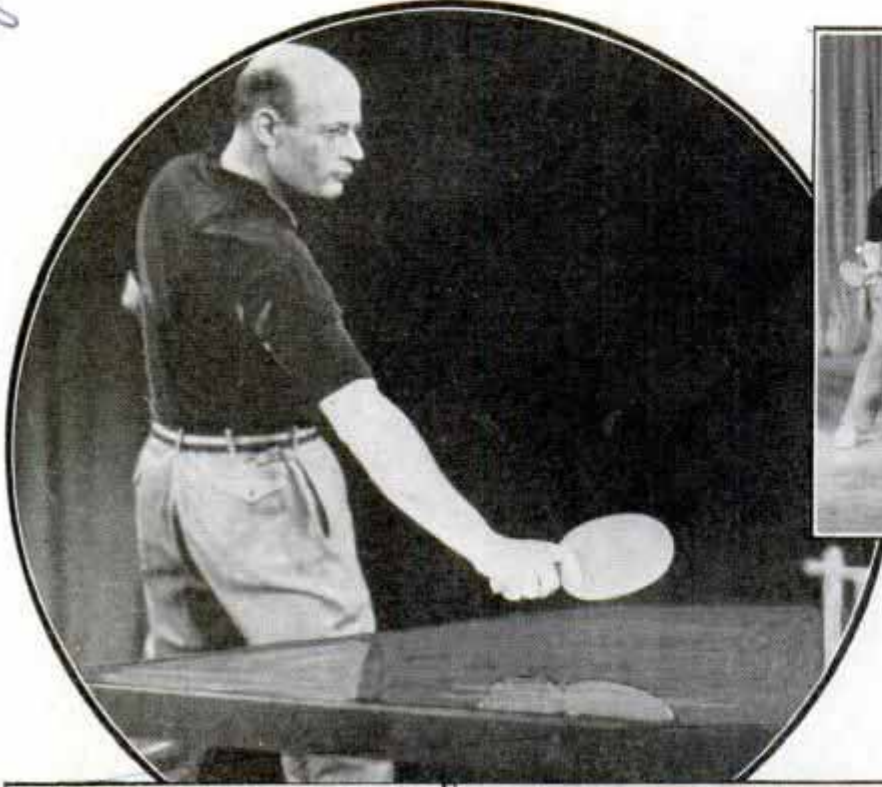
Estey Organ Corp.

Trailer Company, Baltimore, B. Island, Baltimore, America's Best

Feb 10-14

The SPIN SHOTS

100 W. Monroe St. Chicago



Left, finish of backhand chop. Above, chopping ball which has just left racket

By Coleman Clark
Former National Champion

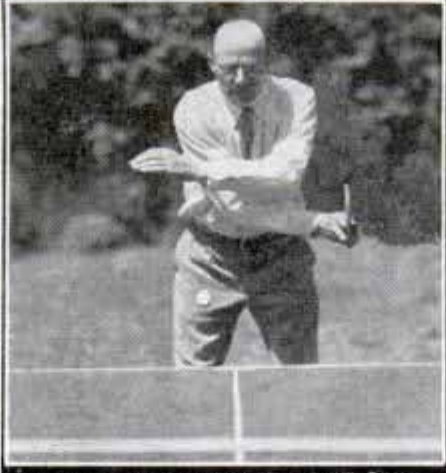
OF ALL the games in which a ball is used, table tennis by all odds is the "spinniest."

Willie Hoppe, the billiard wizard, puts plenty of "English" on the cue ball and Dizzy Dean flicks his wrist and manipulates his fingers as he whizzes the revolving ball through the air to get his "upshoots," "outs," "ins" and "drops." Every golfer knows one sort of spin makes his ball slice and a different one brings about a hook. Smart lawn tennis players consciously impart certain spins or twists to the ball to force their opponents into errors. Even top-notch bowlers get more strikes if they roll "hooks" by a simple twist of the wrist as the ball leaves their fingers.

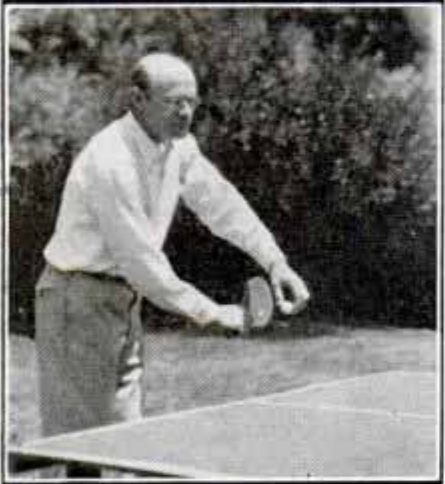
In all these sports the ball revolves in the course



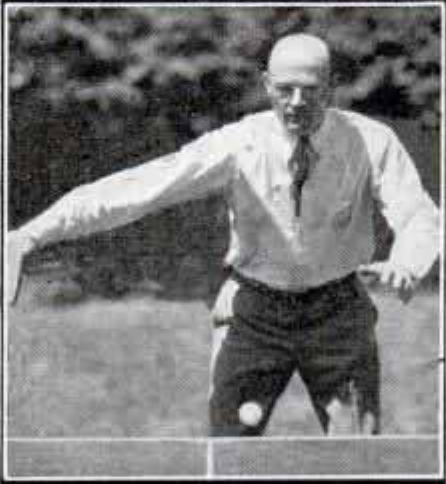
START OF RIGHT-TO-LEFT SIDE SPIN SERVICE



FINISH OF RIGHT-TO-LEFT SIDE SPIN SERVICE, NOTE VERTICAL POSITION OF RACKET



START OF LEFT-TO-RIGHT SIDE SPIN SERVICE



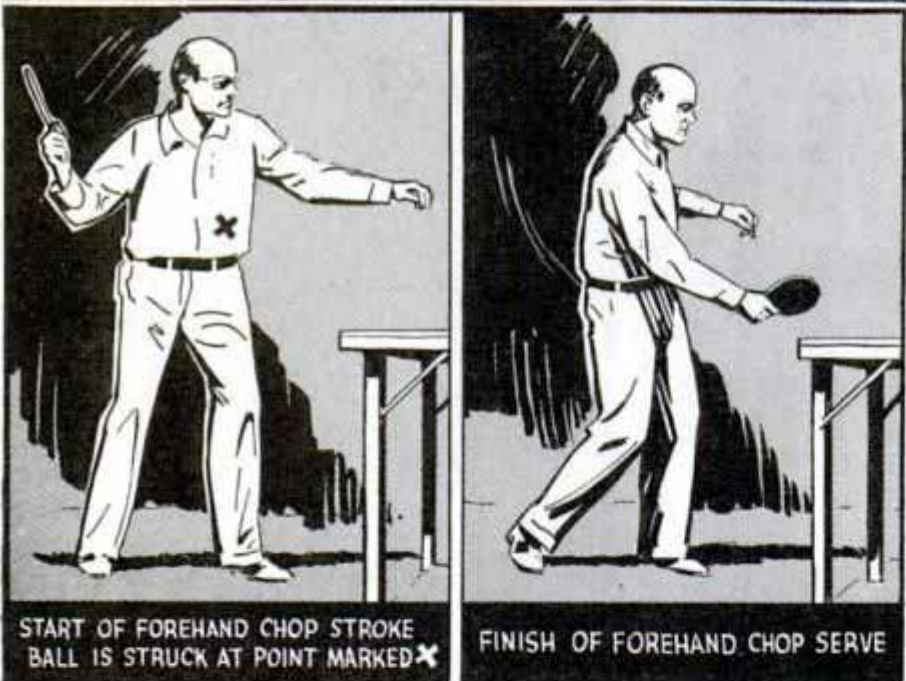
FINISH OF LEFT-TO-RIGHT OR BACK HAND SIDE SPIN SERVICE

see page 19 3 6 8 3 4

see May

Walter Brennan Corp.

Commonwealth



The author, top, left, illustrating the tennis grip. Note position of index finger on blade and that hand presses against the throat

Before telling you how to make spin and trick shots, I want to urge you to adopt the so-called "tennis" grip, the most natural and effective way to hold the racket. The winning shots and most of the trick shots are learned quicker and can be executed more effectively if this grip is used rather than the old-fashioned "penholder" method, still seen frequently among novice players. Also, use a racket surfaced with pebbled rubber which will give you better control and provide the means of imparting added English to the ball. Wooden and sandpaper rackets, of course, are still available.

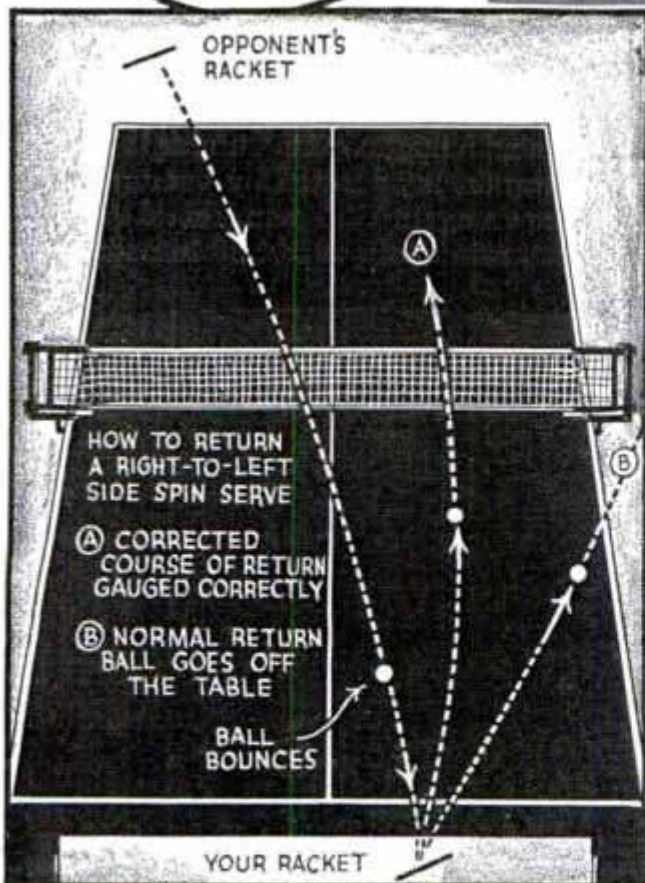
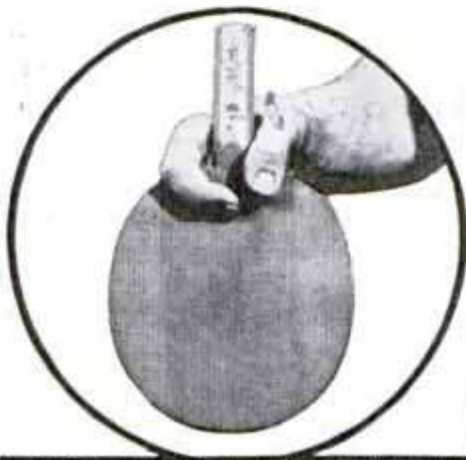
We are now ready to deliver some fancy spin serves to make your receiver sit up and take notice. Let us first try the right-to-left sidespin service, so named because the stroke starts from the right side of the body and winds up on the left. Take a position a foot or two behind the table. The ball is held in the fingers of the left hand approximately waist high. The racket is held outstretched in the right hand and to the right side and the blade of the

will fool the other fellow and enable you to return safely spin shots directed at you. All this may give you the impression that such shots are difficult to learn. Such is not the case. Many of them are very easy to master and it will surprise you how simply you can outwit your unsuspecting adversary and win point after point. Spin is part and parcel of the modern game and one of its greatest fascinations. Besides no one can become proficient without understanding the underlying principles.

racket must be at right angles to the table. Now quickly draw racket and ball together, releasing the ball when the racket reaches the center of the body. As the hands cross one another in delivering the stroke the left should be in front of the right. Get plenty of zip into the shot and keep the blade of the racket upright through the entire sweep of the stroke. This serve will impart violent sidespin on the ball and unless the receiver realizes what you are doing the chances are he will return

the ball clear off the table to your left side. This will score a point for you and should give you a kick if you enjoy outsmarting your opponent in any game.

The twin to this is the left-to-right sidespin serve. In this instance, deliver a backhand sidespin serve which starts on the left side and finishes on the right. The ball is held in the fingers of the left hand well out in front of the body. The racket hand lies across the



Top, the old-fashioned "penholder" grip, left, as compared with the modern tennis grip

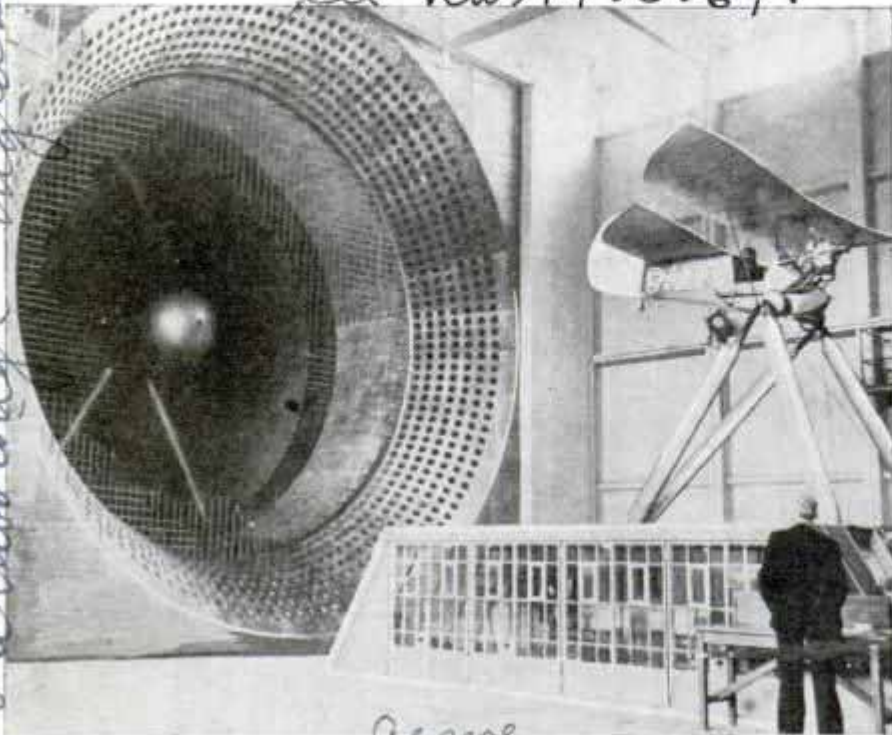
body with the racket about opposite the left hip. Draw the right arm quickly to the right and release the ball just as the racket crosses the middle of the body. This action will give you a powerful sidespin which your opponent most likely will return off the table, this time to your right side. Practice these two sidespin serves until you can put them on the table every time and at the same time put a lot of stuff on the ball. Then spring them on your friends and watch their faces.

But suppose your opponent springs these spiny sidespin serves on you. Are you going to be caught napping? Not if you follow this simple rule. Be sure to aim your opponent's service to the side of the table from whence the serve started. In other words, push the ball back in the direction opposite to that which your adversary's racket moved in slicing the ball. If it started from his left side, aim your

(Continued to page 148A)

Wind Tunnel Blows a Storm to Try Wings of 'Flying Flea'

see no. 1935-648



Pilot puts tiny "flying flea" through paces under buffeting of stiff winds from air tunnel to test its airworthiness

So small that it was completely dwarfed by the giant wind tunnel, a plane called the "flying flea" recently was subjected to severe tests to prove its airworthiness. The ship, with a pilot in the cockpit, was mounted in the center of the air channel. Then the velocity of the wind stream was increased steadily until the little ship rocked and quivered, as though in a storm. In comparison with the wind tunnel, the plane appeared almost a toy.

will be a basic factor in future stratosphere flying, he predicts. While air cooling is important for hot weather, the greatest benefit from air conditioning, he asserts, comes in winter through proper humidification of the air. Dining rooms on some modern steamers already are air conditioned, and Mr. Carrier believes that entire vessels some day will be thus treated. Then portholes may be replaced with false windows decorated with artificial light, he hazards.

Windshield Cleaned by Jets of Water While Driving

Controlled by a button on the dashboard, an automatic windshield washer will keep the glass clean while driving. Two small chromium-plated nozzles mounted on the cowl just in front of the windshield wipers are the only external parts, the glass jar used as a reservoir for clear water being mounted under the hood. The fountain is operated by vacuum, two jets thrown against the windshield removing dust, rain spots, mud and insects.



Spray of clear water from jar under hood cleans windshield at touch of button on dashboard

Ships Without Portholes Seen in Air-Conditioned World

Office buildings without windows in the lower floors and ships without portholes are predicted for the air-conditioned world of the future by Willis H. Carrier, known as the "father of air conditioning." Double windows or a special type of double glass will replace ordinary windows as air conditioning becomes general, and the industry will bring comfort to hospital patients and to sufferers from hay fever and pollen asthma, believes Mr. Carrier. The cabins of airplanes already are air conditioned for comfort and such conditioning

at Royal Aircraft Establishment Farnborough England

F1139

Carrier Corp. Newgreen

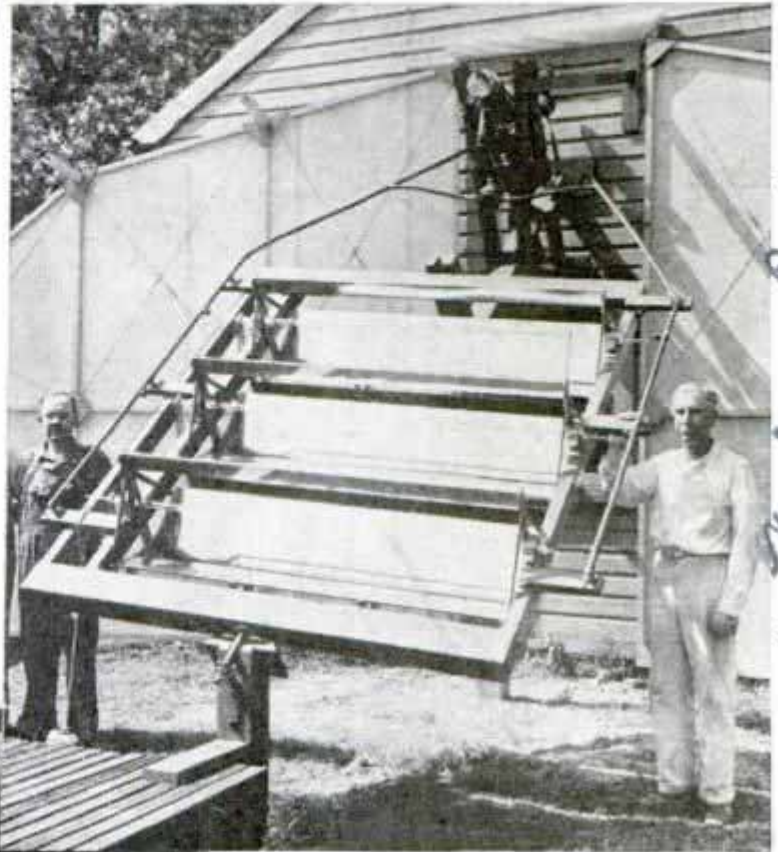
Price Products Corp. 817 Washington

7 1050.

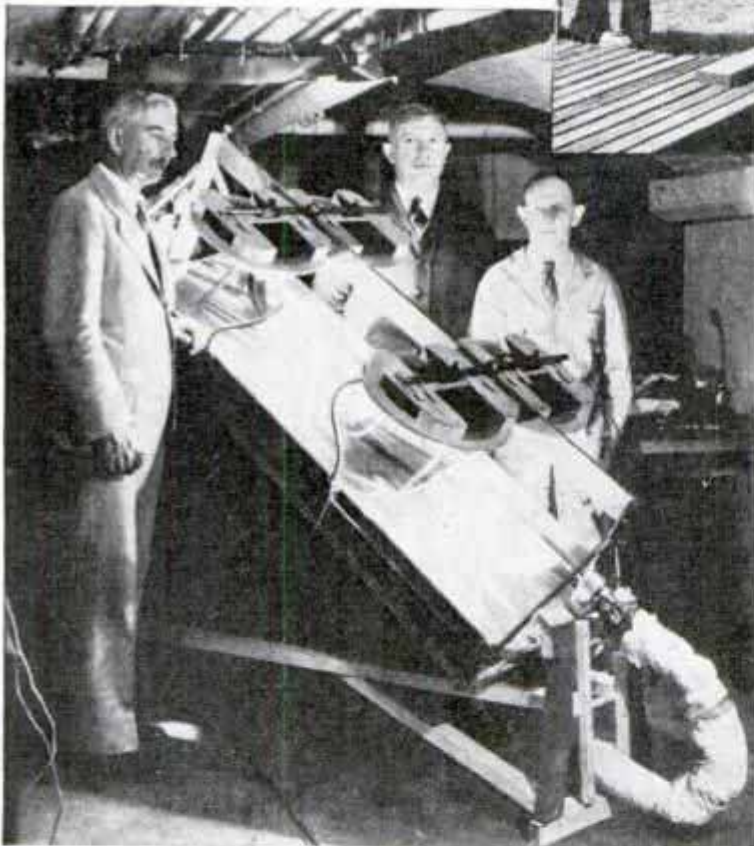
Washington, D.C.

Sun's Rays Harnessed to Run Steam Engine

One of man's great ambitions—to harness the sun to a steam engine—has been achieved. Dr. C. G. Abbot, secretary of the Smithsonian Institution, has developed a solar heater and demonstrated that it would operate a one-half horsepower steam engine with sufficient efficiency for commercial purposes. The sun's rays are his fuel. Caught in three parabolic cylindrical mirrors of sheet aluminum, the rays are reflected in high concentration upon tubes of Pyrex glass. Passing through two concentric tubes of glass respectively one and one-fourth and seven-eighths inch in diam-



Top, aluminum mirrors focus sun's rays on tubes containing liquid which absorbs heat, flowing through pipes at side to boiler where steam is generated. Left, Dr. Abbot and aides with solar heater



concentric tubes a vacuum is maintained so that the heat of the liquid is retained. Superheated, this chemical is circulated through pipes to a boiler where it generates steam. Experimentally, this solar heat engine had an over-all efficiency of fifteen per cent in producing steam power. Dr. Abbot believes the time may come when, with coal and oil supplies dwindling, sun power may become essential. Even with the apparatus available today, he says, the sun can be harnessed for cooking, refrigeration, evap-

eter, the rays reach a central one-half inch Pyrex tube which is metal plated on top and contains a black chemical, a chlorinated diphenyl compound to which a small amount of lampblack is added so that the liquid absorbs virtually all the sun's rays. Although liquid at ordinary temperatures, it still does not boil or flash at 662 degrees Fahrenheit. Between the

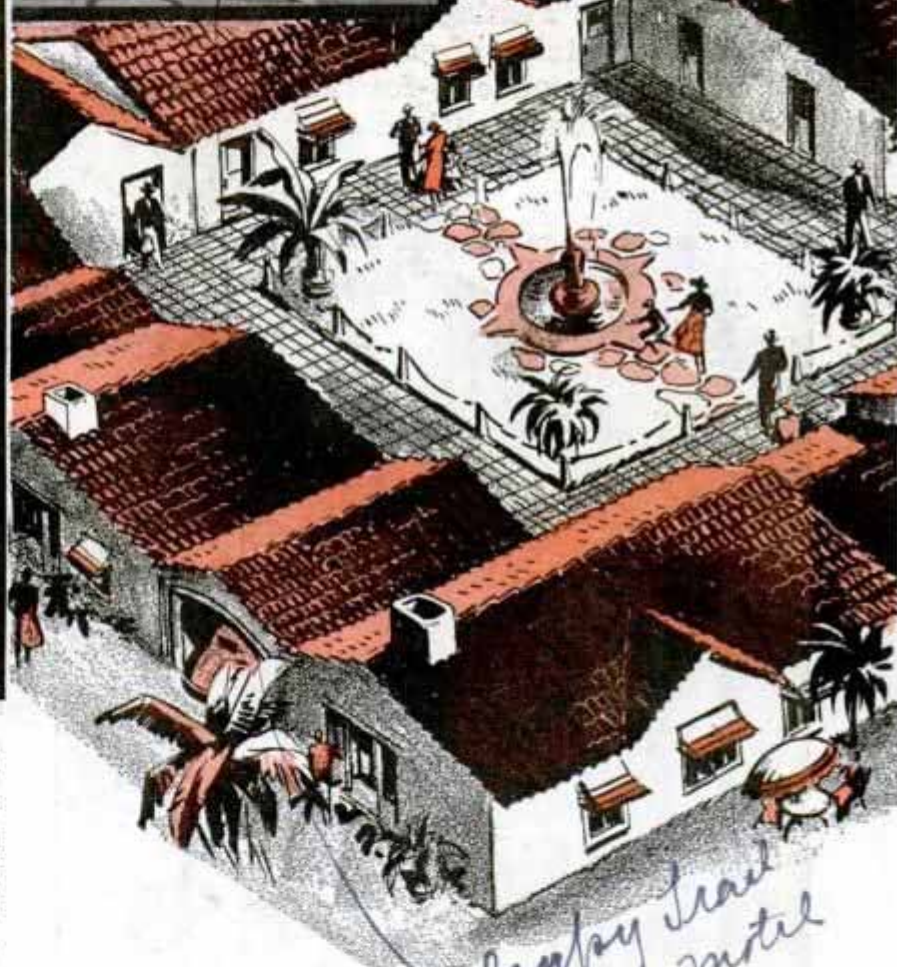
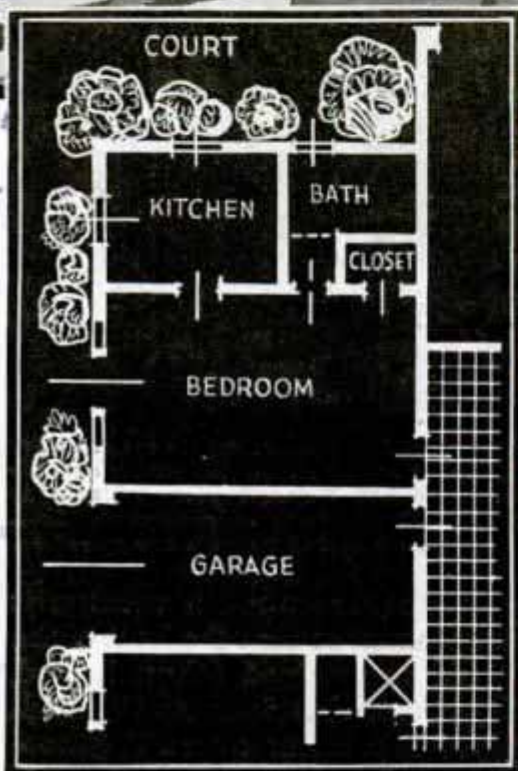
oration and small power plants. Ranches and communities in cloudless regions are manifesting interest in development of sun power.

☐Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Photo from Kaufmann & Fabry Co. 425 W. Washington Chicago.

Handwritten notes at the bottom of the page, including "Photo from Kaufmann & Fabry Co. 425 W. Washington Chicago."

"COURTS"



Drawing showing ideal arrangement for motor court and layout of one unit. Above, lobby of a Pasadena court

YOU can see the world through a windshield today and live in your own private home each night while you're doing it. Not the dwelling you started from, of course, but one offering similar comforts, luxuries and privacy.

You'll find these overnight homes in motor courts, and if you've never spent a night in a court cottage, a pleasant surprise awaits you. The motor court is a recent development of the motor age, an individual type of accommodation designed specifically for motorists, entirely unlike any form of "night lodging" heretofore available.

It's not a tourist park, it's not an auto camp and it's not a hotel, although it in-

cludes some features of each. It's a collection of miniature homes clustered around a central service and administration building and combines the natural beauty of a park setting, the freedom and informality of an auto camp and the comforts and luxuries of an up-to-date hotel.

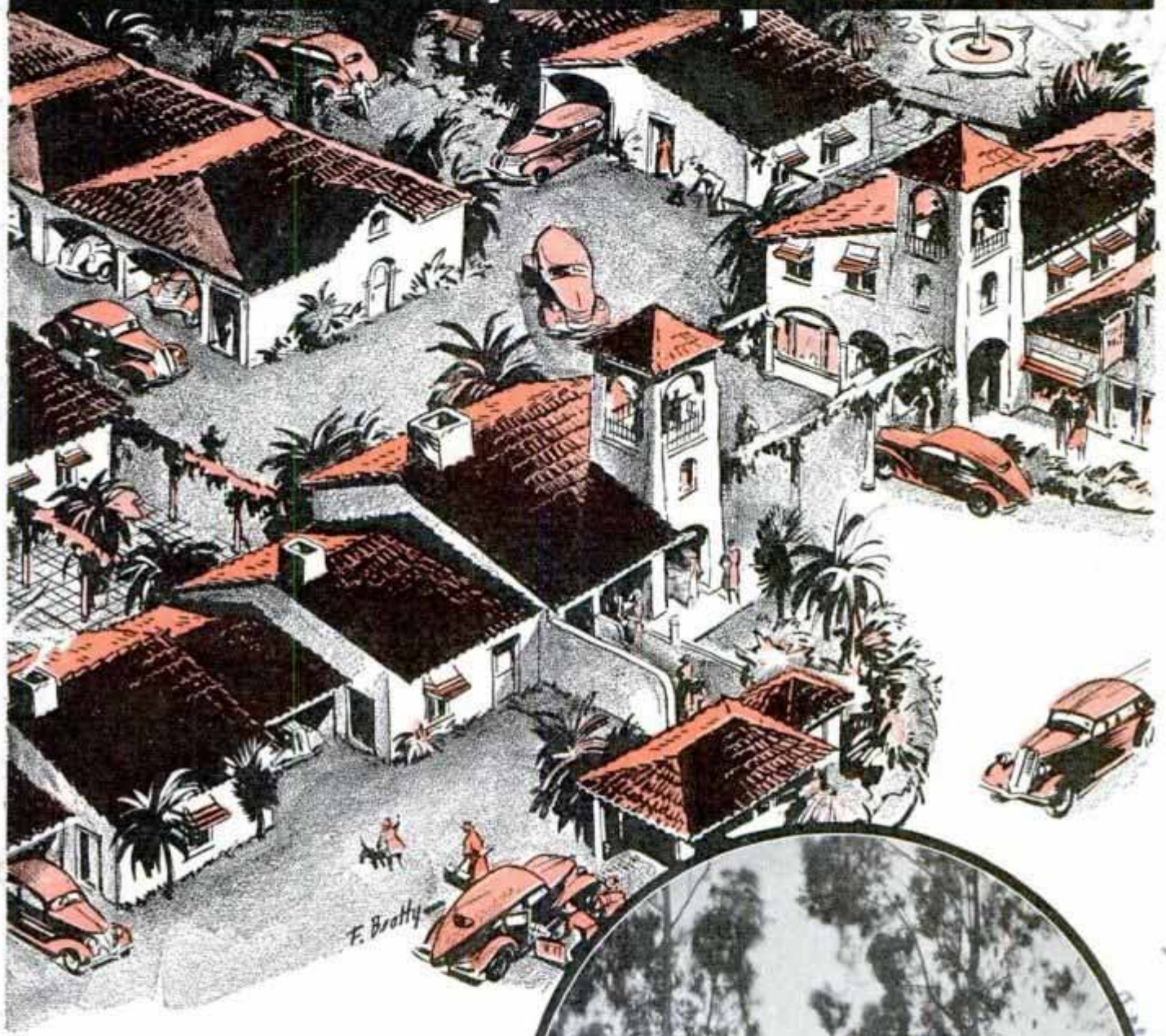
You'll find them today in or near the larger cities and towns west of the Mis-

*United Motor Courts 3230
Hollywood Ave. Santa Barbara, Calif*

*2896
James Campbell*

Esperanza Motel

offer **Luxury for MOTORISTS**



issippi and through the southwest. Tomorrow you are likely to find them dotting the highways throughout the country for the idea is rapidly spreading eastward.

They are solving a problem that motorists have wrestled with ever since the first adventurous driver sallied forth in a horseless buggy, a pair of goggles, a long linen coat and a cloud of dust to conquer strange trails. This driver had only two choices. If he could afford it and could find one, he headed for a hotel and hoped for the best. If he couldn't, he camped out, cooked his meals in the open

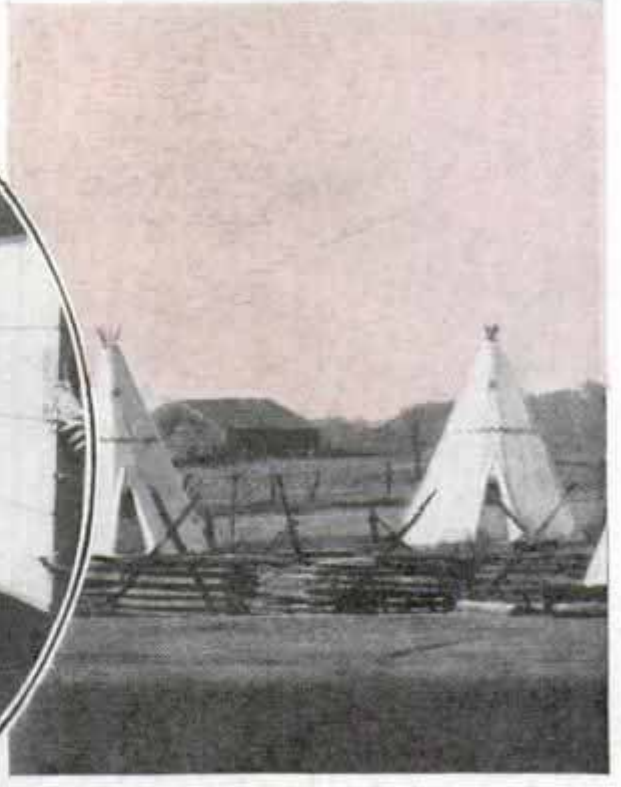


Motor court in Santa Monica, Calif. Note the U-shaped court and the substantial construction of the individual cottages in this lodge

Proctor Motor 675

Vertical handwritten text on the right side of the page, possibly a date or reference number.

Real north eye
Real pass eye



Registering in a motor court, a Denver court and bedroom of a court cottage



and slept in a tent or possibly in his car.

But despite the discomforts, more and more motorists persisted in "making trips." It got so more travelers were arriving by auto in some sections than by train. So cities and towns began laying out camp grounds equipped with water hydrants, outdoor ovens and crude comfort stations. They proved a boon to the camper, but didn't aid the chap who wanted shelter of a more permanent kind. Later home owners along traveled highways saw dollars rolling past their doors and "rooms for tourists" signs began to appear. Then some astute service station owners built a few wooden shacks, installed beds, tables and chairs and the first cabin camps vied with the other forms of accommodation.

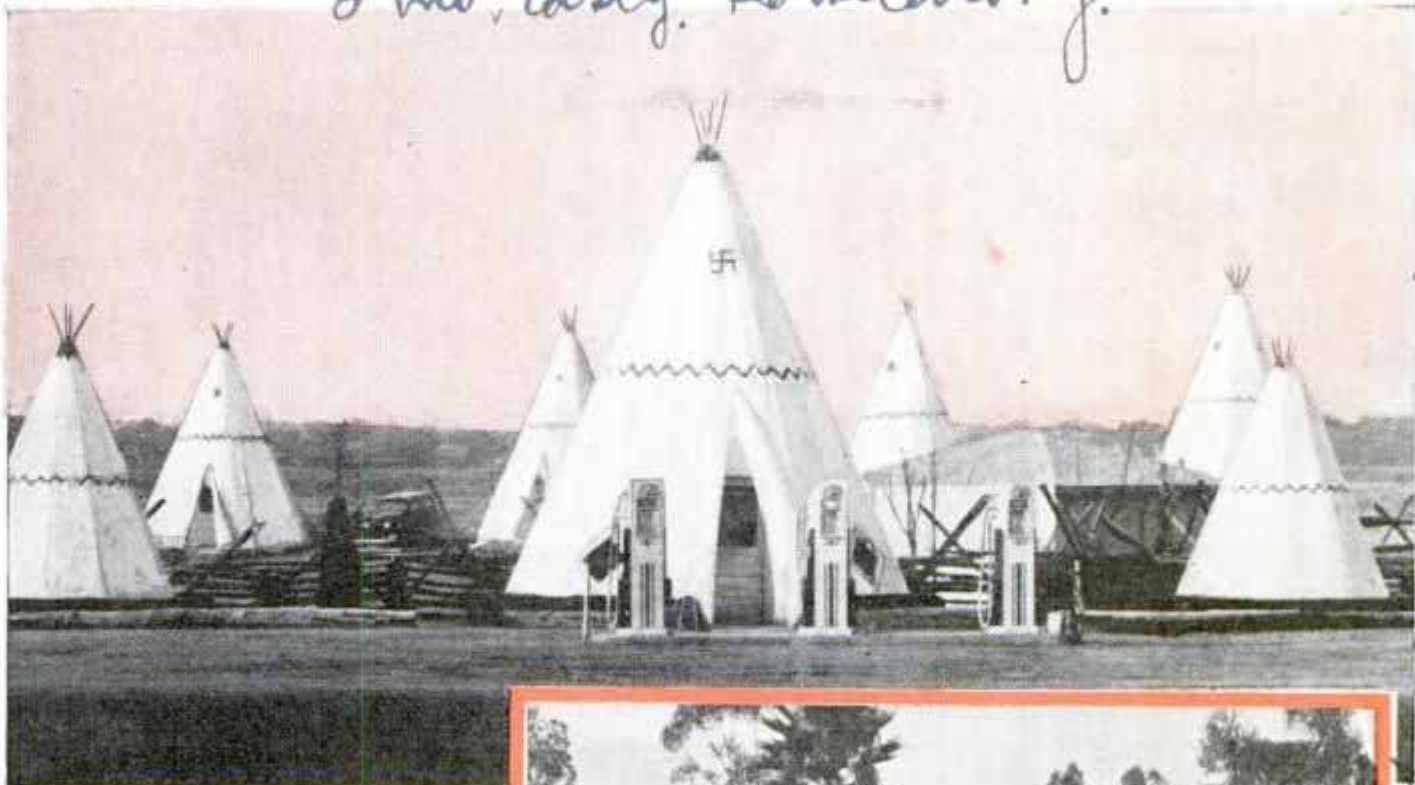
Each had its own particular advantages and disadvantages for motorists. Hotels offered more comforts and luxuries, but usually were located in congested, noisy sections and were the most expensive type of lodgings. Camp grounds were least expensive and



Denver, Col
El Royale Motor Court
Denver, Ariz

Denver, Ariz

*Wigwam camp
3 mi. East of Horse Cave Ky.*



*Indians Trading Post
Highway Travel*



Motor court in Pasadena, Calif., and a Kentucky camp modeled after Indian wigwams. Each wigwam has hot and cold running water

sometimes free, but comfort facilities were limited. Some cabin camps attracted undesirable customers and the motorist lured by a "rooms for tourists" sign had no way of knowing in advance the accommodations offered in such a private home.

The motor court combines most of the advantages of the above types of accommodation and eliminates the disadvantages. It is a collection of individual homes, each particular home intended to meet the needs of some particular motorist. Let's drive in and inspect a typical court in California.

You'll find it set back from the highway among shade trees. You drive into a U-shaped court with a crushed stone or concrete driveway and stop at the office building. The owner-manager greets you and you walk along paths lined with trees, shrubs and flowers to one of the thirty or more cottages, each separated from its neighbor by a garage. The construction of the group in this particular state is likely to be stucco of Spanish or Mission architecture with tile roofs.

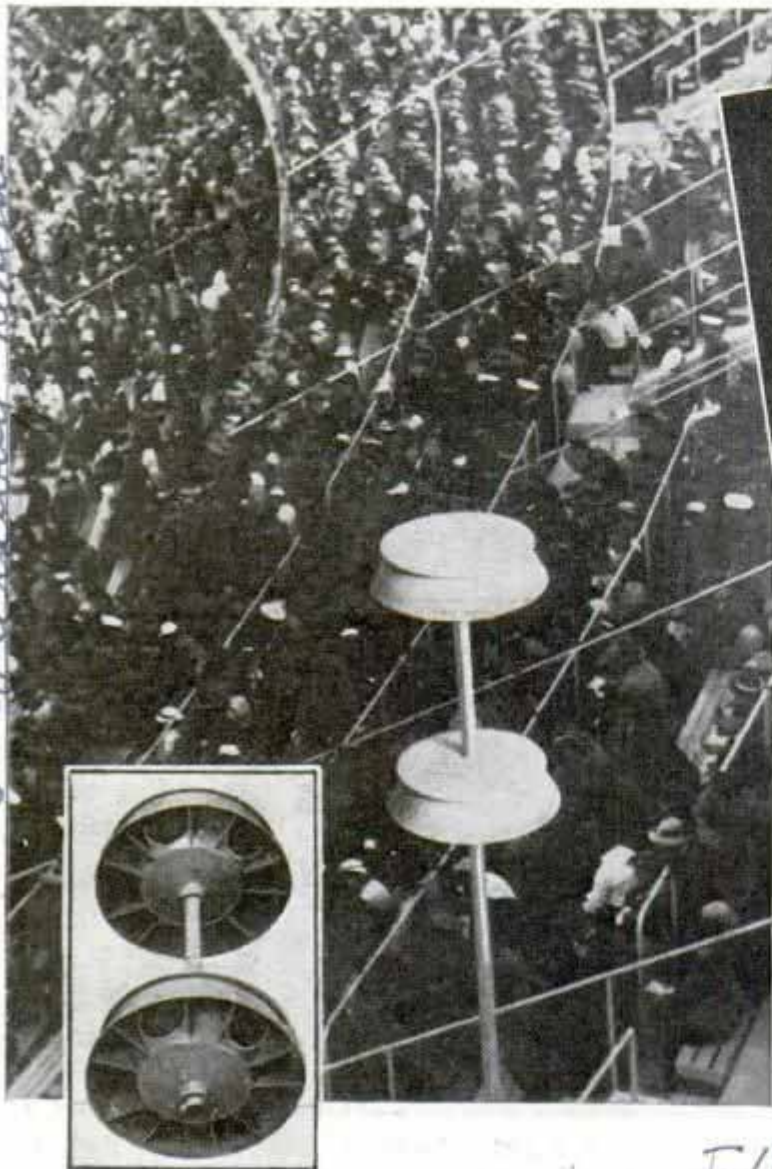
You enter a large living room with thick

carpet covering the entire floor. There's an overstuffed divan, two or three easy chairs, a desk, occasional tables, reading lamps, pictures on the wall, possibly a telephone and built-in radio. It's as comfortable and luxurious as any room in a good hotel. But this is only the living room. Adjoining it is a bedroom with comfortable twin beds, dresser, chairs, dressing table and a large closet. You note steam radiators in living room and bedroom, supplied from an underground central heating plant. The bedroom is carpeted too. Then there's a kitchen, completely equipped with table, gas range, electric refrigerator and you may find dishes and silverware in their places in the cupboard. Perhaps there's also a dinette with a folding bed tucked away in a closet to pro-

(Continued to page 118A)

'Umbrella' Loud-Speakers Are Free from Echo

Emb. W. & Schrage, 510 W. Calhoun St. Pasadena, Calif.



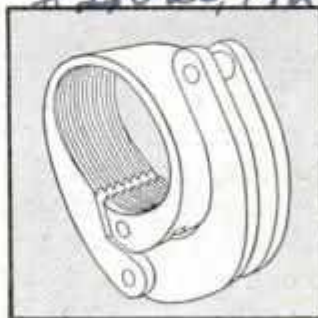
Left, view of Olympic stands with "umbrella" speaker installed. Inset, underside view of the speaker. Right, microphone wrapped in sponge rubber to reduce noise during broadcast of regatta

Free from echo effects and double sounds, a new type of loud-speaker was introduced at the Olympic games in Germany. The speaker somewhat resembles a double umbrella and its secret of eliminating echo lies in the wings and deflectors arranged inside the "umbrellas" so that the sound is radiated downward only. Five medium size speakers are installed in each of the two umbrellas, with each loud-speaker unit located to cover a certain sector of the grandstands. Another method of reducing noise in the public address system used at the Olympics was by means of a crystal microphone mounted with the pre-amplifier in a tube and wrapped in sponge rubber to exclude unwanted noise. This device was used by the announcer in the motor launch which followed the crews in the regatta.

F1017

No-Roll-Back Brake for Auto Works Automatically

Offered as a simple means of preventing the car from rolling backward on an incline, a new safety brake is designed for installation on the transmission main shaft behind the rear main bearing and in front of the universal joint. When the car is brought to a stop on a hill



the brake keeps it at that point without any operation by the driver. A clamping ring locks the shaft, holding the car on any incline. The device is handy for start-

Pine St. Melinda Alexander, Va.

P. R. Wheeler, Cranif
P. R. Wheeler, Cranif

ing upgrade, since the driver is free from brake operation. The car is placed in gear, as usual, and started forward when the driver removes his foot from the clutch. Shifting into reverse is accomplished as usual, the brake releasing automatically. The brake is enclosed in a housing which is a part of the transmission housing or which is secured to it. It runs in a bath of oil.

301 Richmond Road

Steering wheel cover Co

F1037
Auto-Wheel Cover Prevents Hands from Slipping

Another contribution to motoring comfort is the cotton jacket for the steering wheel. Not only does it take the chill off the wheel in winter, but it is cooler in summer driving, absorbing perspiration and preventing the hands from slipping. The steering wheel cover is made of a durable, washable cotton fabric.



White gloves are kept clean when the steering wheel is covered with a washable cotton jacket

Robot Engine Built in Japan Is Driven by Remote Control



Acme
Model streamline electric locomotive built by Japanese is understood to have an automatic braking mechanism and remote-control drive

Automatic train control is understood to be a feature of a mysterious robot locomotive model built in Japan. Streamlined, but of a design unlike any conventional locomotive, the details of its mechanism have not been revealed. It is believed, however, that it will be operated electrically by remote control and will be equipped with a braking mechanism which will stop it automatically if the rails ahead become dangerous.

F1064
Photo Enlarged with Air Brush Guided by Electric Scanner

Photographic enlargements are made in watercolor or ink by "remote control" under a method just devised in England. The original photograph is placed on the surface of a revolving cylinder while a photoelectric "eye" scans it, transmitting electrical impulses which control air pressure operating a brush that paints the image on paper or canvas wrapped around a synchronous cylinder. No sensitized photographic paper is needed for reception. The photograph can also be copied or enlarged on any flat surface. This method may be adapted to long-distance transmission of pictures by telegraph or radio.

Developed by Jiro Aoyama
London, E. England
53 New Broad St. London, E. England

Keep Kloss 75c

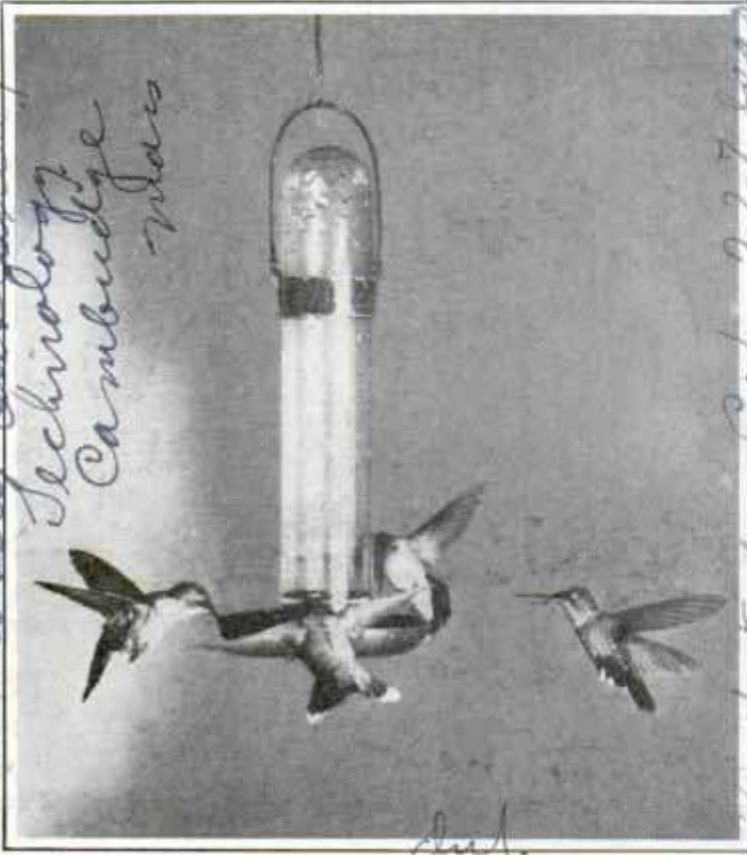
Camera Aug. 19 16 1910

Photo Electrograph

Hummingbirds' Swift Wings Stopped by Speed Camera

#1043

Method of Photography developed at Massachusetts Institute of Technology Cambridge Mass



Hummingbirds hovering around vial of sweet liquid stand still as camera shutter opens for one hundred-thousandth second

Only the ultrafast eye of the speed camera can stop the throbbing wings of the hummingbird as if motionless in air. An exposure of one hundred-thousandth of a second resulted in a remarkable photograph of four ruby throated hummingbirds hovering around a vial of sweetened fluid. Although the wings of the tiny birds were beating nearly sixty times per second, the speed camera stopped the action.

Albright, etc. Grand Island 22508

Window with Double Glass Aids Air Conditioning

#1034



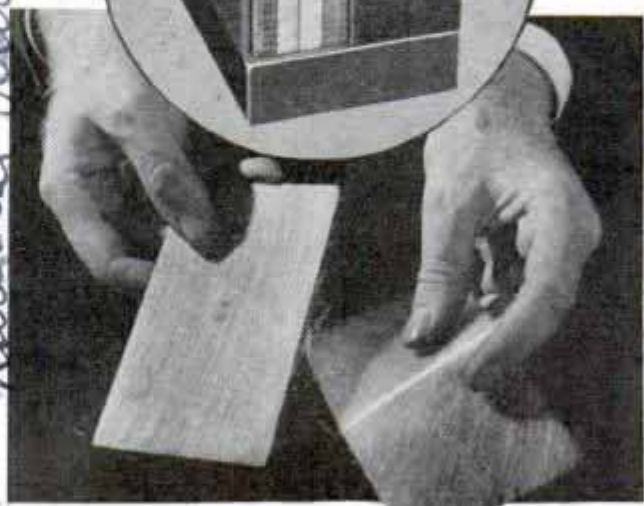
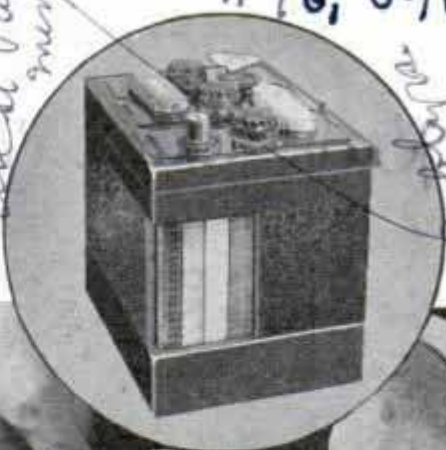
Designed for use in homes equipped with air-conditioning apparatus, a double-glass window with a three-fourths inch dead air space is now on the market. Heat losses through windows

are said to be reduced more than fifty per cent and condensation and frosting are eliminated, under normal conditions. The window may be removed to permit cleaning of the inner glass surface.

Battery That Outlasts Auto Protected by Spun Glass

#1042

Carrying the guarantee that it will last as long as you own your car, a "lifetime" automobile battery is being introduced this fall. The secret of its claim to long life is a mat of spun glass that protects each positive plate. Adopting a principle that has been used in giant electric power plants of submarines, locomotives, dreadnaughts, traction motors and industrial plants for fifteen years, the flexible web of porous glass sheaths the plate and prevents tiny particles of lead from dropping away. In the ordinary battery, continual vibration and wear attack the active lead, breaking it down, weakening the power of the battery and shortening its



Cutaway view of battery with positive plates wrapped in spun-glass mats, shown below

17 28 Parkway National Battery Co. Lowell Mass

#16,548

1936 29th Street New York City

life. In the new type the glass permits the electrolyte to reach the positive plate freely, in fact, aiding in its equal circulation to all parts of the plate, and offering no resistance to the current. Since less space is required for deposit of sediment at the base of the battery, there is more room for plates, and the plate area is twenty-two per cent larger than a comparable battery of the usual type. The lifetime battery will sell for one or two dollars more than the ordinary battery.

1968
**Auto in Movies
 Offers Tips
 to Industry**

Containing many features which might be considered and possibly adopted by the automobile industry for incorporation into future models, a streamline car appears in one of the latest motion pictures. Its flowing lines result in a body with low wind resistance without sacrificing eye appeal.

47063.
**Television Turret Camera
 Sends Movies of Olympics**

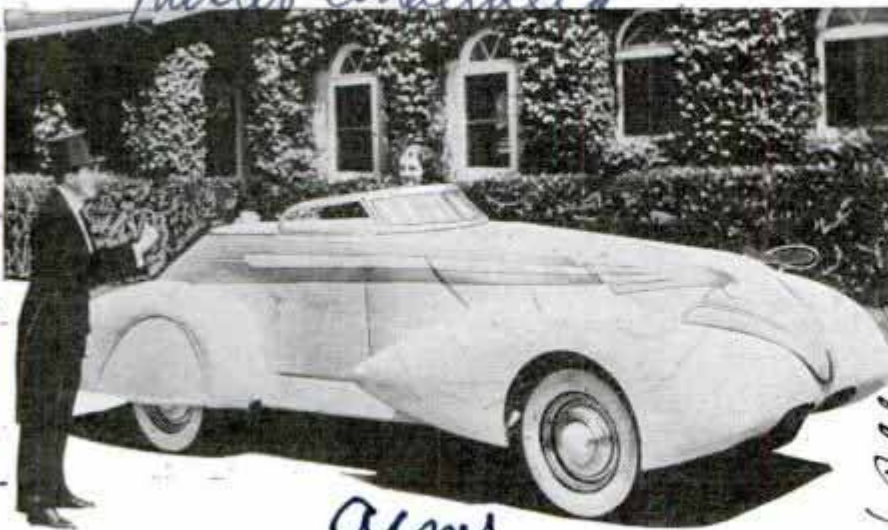


Wide World
 Focusing its big eye on Olympic sports events, television camera transmits moving picture of international games to spectators miles away

Bleacherites ten miles away from the Olympic stadium saw the sports events by television. Mounted on a movable pedestal like a turret gun, a television movie camera trained

its giant eye on the international games and transmitted the action pictures to distant bleachers and to a projection room in the German post-office headquarters. Done experimentally, the reception was not always clearly defined.

Commercial use of explosives in the United States totaled 30,349,819 more pounds in the first half of 1936 than during the same period of 1935.



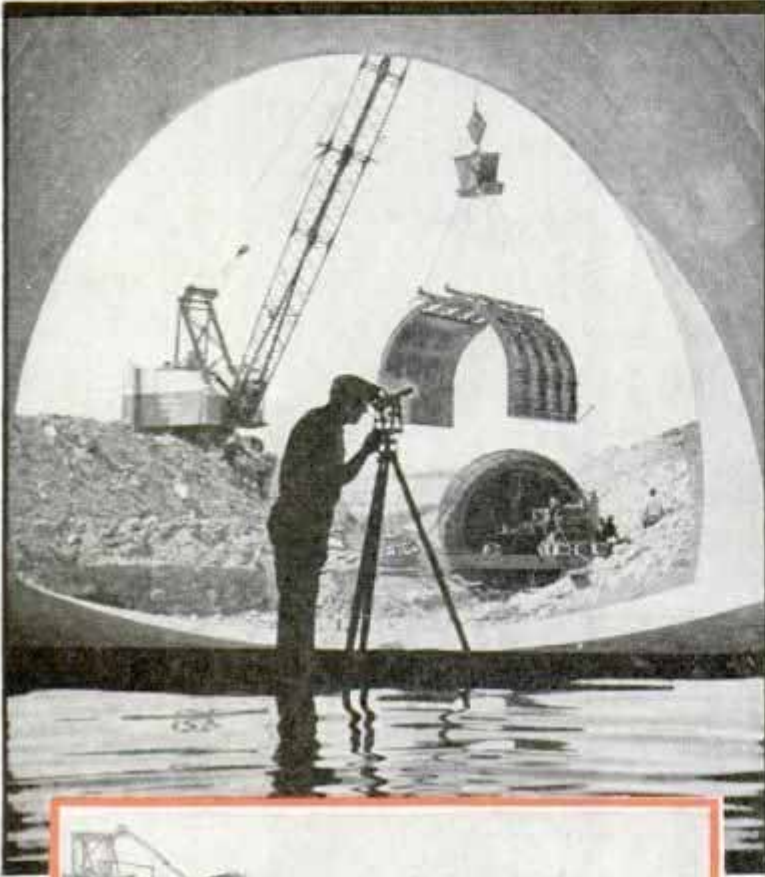
Acme
 Hollywood's ideas about how an automobile should look are incorporated into this car which was constructed for a recent movie

see...
103 Park Ave New York
 Jack Haley. Betty Furness

1881

1144 S. Grandview St.
Los Angeles, Calif.

BUILDING a RIVER

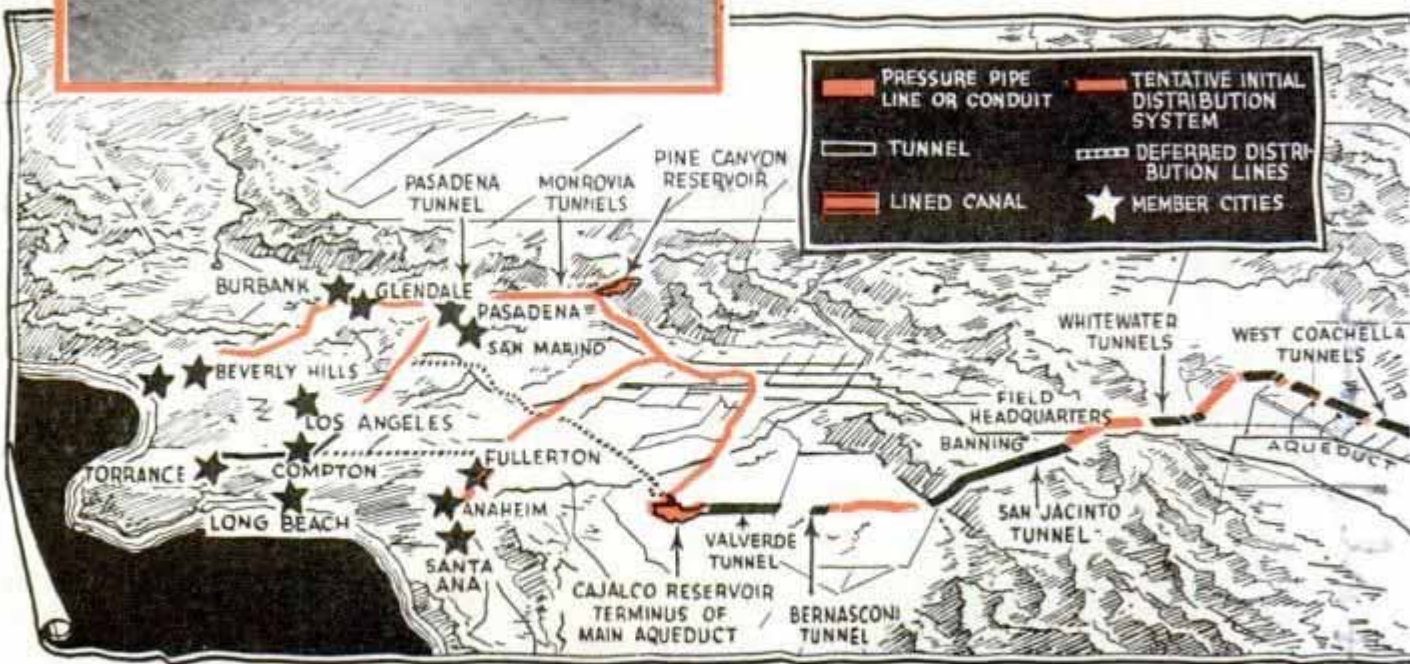


WATER, in southern California, means life. Its absence means parched vegetation, barren, thirsty soil, eventual death.

For years the area has waged a grim, incessant war against an encroaching desert with precious water transported more than 200 miles from the Sierras. That seemed a long distance to carry water, but the region contented itself with the thought that the Sierras offered an inexhaustible supply of the life-giving substance.

But a few years ago startled citizens of the south coast awoke to the fact that the area was outgrowing its water supply. Unless more water was found, the desert eventually would win, after all.

So southern California set out to find more water. A survey revealed plenty of it—in the snow-capped Rocky mountains. The Rockies are a long way from California, but nevertheless the snow of the Rockies will be running through Los Angeles faucets in a few years. The situation was met



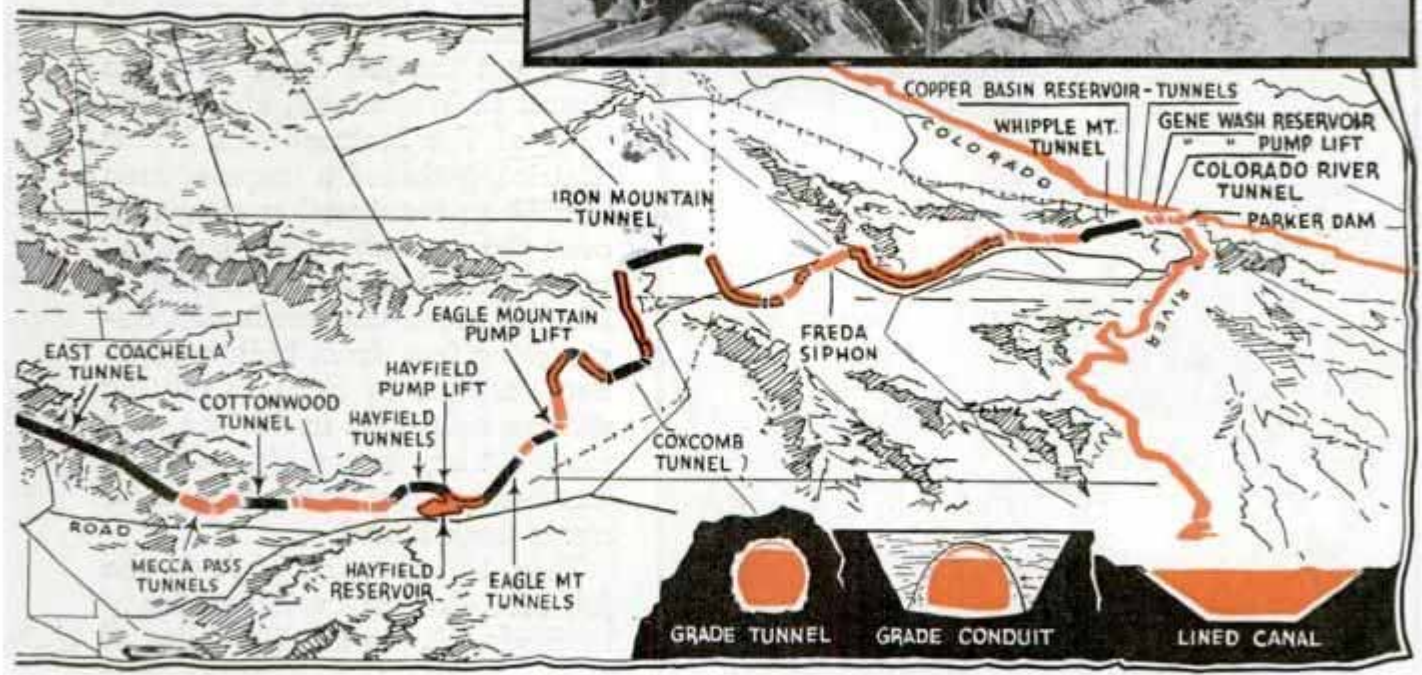
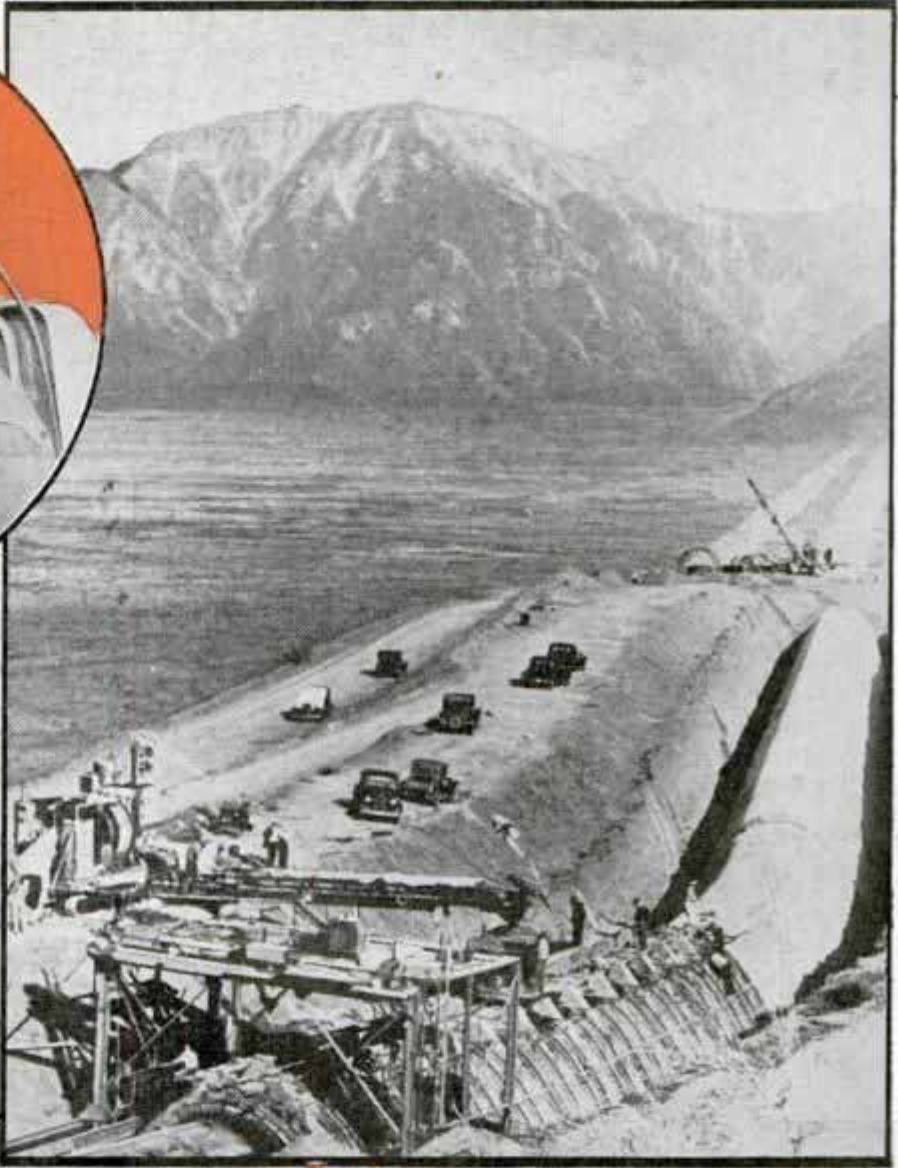
Top, engineer peering through level from interior of huge aqueduct conduit. Center, giant paving machine lining floors and walls of open canal. Bottom, map of the aqueduct route from Colorado river to coastal plain of southern California

7887

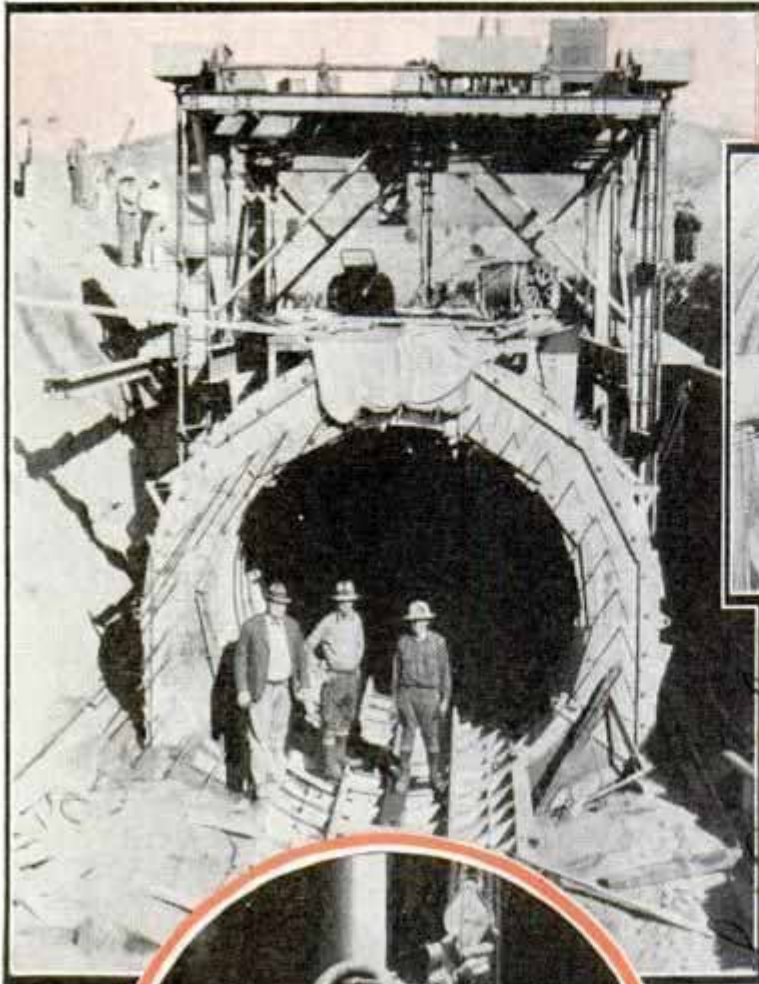
in the DESERT



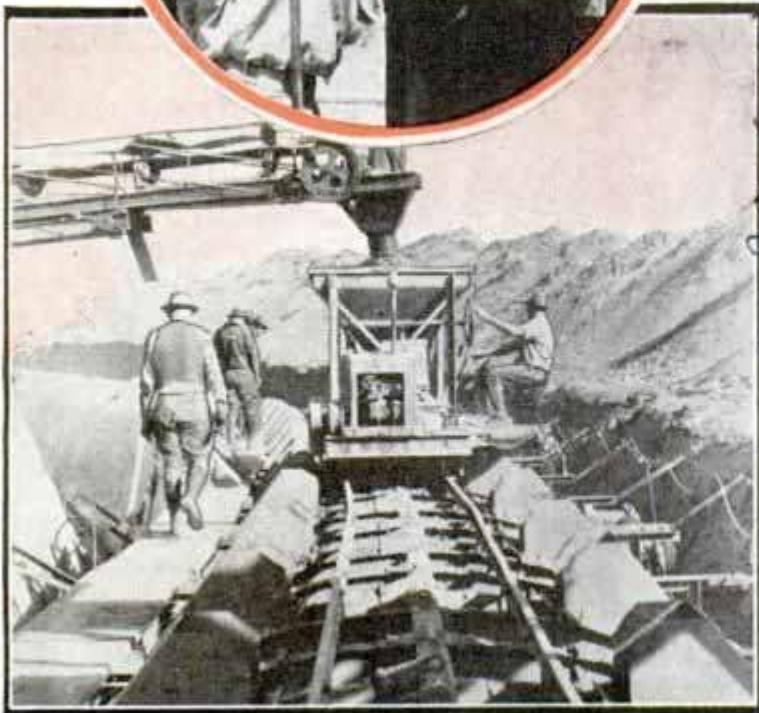
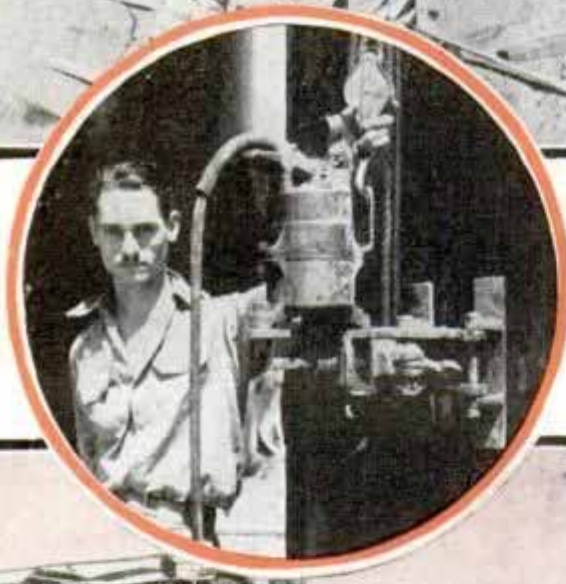
by putting 9,000 men to work on the world's biggest aqueduct project, creating an artificial river that will connect the Colorado river with Los Angeles 300 miles away. Stretching across a land of rattlesnakes and cactus, over desolate desert wastes, piercing mountains, and tunneling un-



Top, left, member of tunnel rescue squad and his equipment. Right, like a great snake, the concrete conduit and the parallel road stretch out into the desert as thousands of men push forward with the greatest water-supply program in history



Left, end of siphon section. Right, "cherry picker" which enables cars to pass. Below, mechanical hands which pat concrete and wheeled concrete hopper



der small streams, the aqueduct will have a capacity of more than one billion gallons per day.

Ordinarily, a job like this would take a generation. Los Angeles wants the water three years from now, six years from the time work was started. Keeping up with this high-pressure schedule means breaking construction records. Unexpected difficulties must be handled without losing stride. Underground rivers that flood tunnels, sand that pours through the cracks in sheet piling like water, excessive temperatures above and below ground, all must be anticipated.

To get the job done in time Frank E. Weymouth, chief engineer of the Metropolitan Water District, gathered a corps of men famous in construction camps all over the country. Each superintendent can boast of having had a hand in some unprecedented engineering feat, from building spidery bridges in Peru to cutting shafts a mile deep in African gold mines. They are a tight-lipped, hard-working crew who have never been licked.

Even this gang couldn't do the job on schedule with ordinary methods. There are 108 miles of tunnels in the project and most of them will be large enough to handle a train. In the longer tunnels

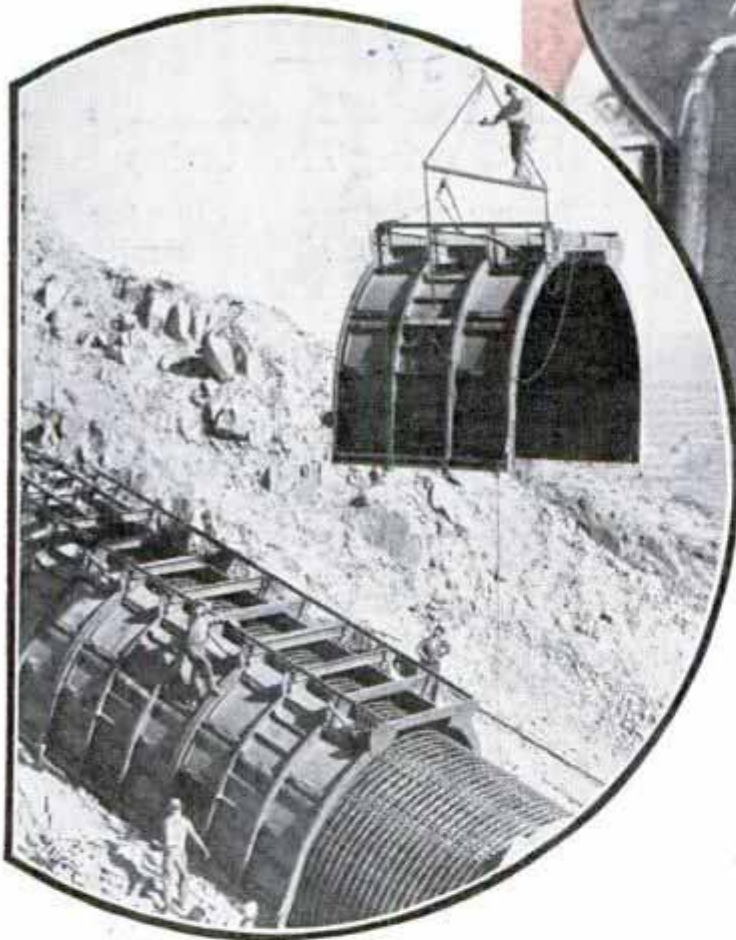
J. G. W. Shud. Los Angeles

such as an eighteen-mile bore that follows the backbone of the Coachella range, the engineers are pushing the work from as many as ten faces at the same time by means of elevator shafts leading from the surface to the grade of the bore.

Machinery takes the place of hand labor in modern tunneling. Drilling machines and dynamite break down the face of the rock, traveling belts and electric shovels load the broken material on cars, and tiny electric



Welder on aqueduct project and lowering form into place prior to pouring concrete



structure that closely resembles a caisson.

When ordinary machines won't do the work the engineers invent something new. One is the "grasshopper," an elevated track from which empties are dropped for loading. Another is a huge ungainly structure that looks like a bridge turned upside down, a traveling "paver" that places a smooth concrete lining on the floor and walls of the open canals used for crossing parts of the desert. The paver lines 1,000 feet of canal a day. A canal trimmer something like the paver cuts and smooths the canal walls.

On other sections the water is to be carried in long reinforced concrete conduits. Ordinarily, conduit is precast in sections, then assembled on the spot. On this job, it is manufactured at its perma-

(Continued to page 120A)

locomotives snake the cars out to the dumps. In one tunnel a battery of pumps is sucking up 15,000 gallons of water a minute to keep up with the inflow of ground water while the miners, clad in oilskins, seal up the tunnel walls with fast-hardening cement. In another tunnel leading through saturated strata of sand and clay the miners are working inside a

Floating Fire-Hose Monitor Is Controlled Like a Horse

Seattle Wash Fire Dept



Here is the monitor, creeping over the water while its operator ashore guides it with reins like a horse

Controlled with reins like a horse, a new fire-hose monitor creeps on the surface of the water to fight the flames under docks and near water-front buildings. It is propelled by the force of the water pumped through the hose. The device is expected to find wide use in port cities, since it provides a new means of reaching sources of fires which have been inaccessible to other apparatus.

turbine pump which transmits light oil to a turbine motor which delivers its torque to the drive shaft. The mechanism is contained in a compact housing which replaces the flywheel. After moving the control lever from neutral to high-speed forward position, the driver steps on the accelerator and the transmission automatically takes care of the gear movement. Acceleration at twenty miles per hour is double that of the conventional transmission, the rate gradually tapering off until at forty-four miles per hour engine and propeller shaft speeds are about equal. There is no mechanical connection between engine and rear wheels, so the car runs much more smoothly.

F1058

Bust Modeled from Sponge by Carving Thin Strips

Sponge is a strange medium for the sculptor, yet striking results can be obtained with it. Slicing sponges into wafer-thin strips and then overlaying the strips to form the contours, a Filipino sculptor modeled the bust shown in the accompanying photograph. It was shaped with only a photograph for a guide.



This bust was sculptured by cutting strips of sponge and laying one over another to form the contours

F1096 Gear Shifting Is Eliminated in Latest Transmission

Gear shifting and operation of the clutch are eliminated in an automotive transmission announced by Bendix. The device consists of an engine-driven hydraulic

*Bendix Products Corp
Bendix Division of Chrysler Corp*

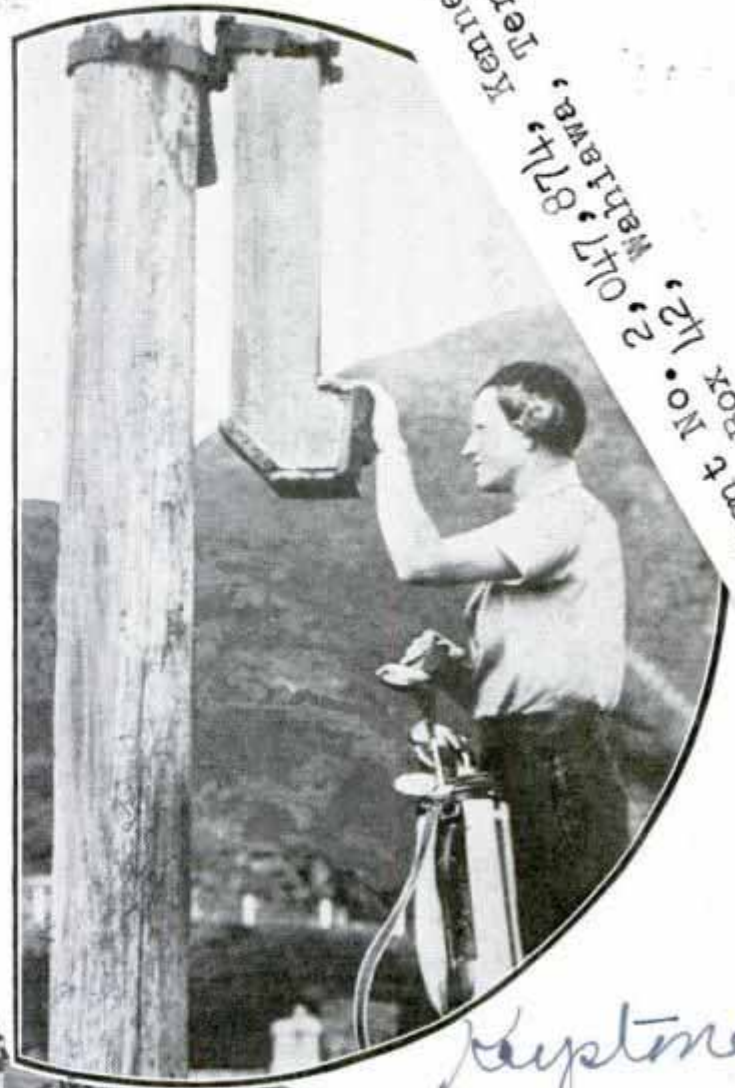
*and I vor affordabl.
60 Fireboat's no-horner*

*Student
Clark Chicago
15-8 n.
speech*

Golfer Sights Green in Thirty-Foot Periscope

When hazards are mountain-high, a golfer really needs a periscope. There is one hole on the Aberdovey course in North Wales where the green, only 165 yards away, is quite out of sight and it's not safe to drive until you have peeked in the periscope to learn whether the foursome ahead has putted down and moved out of the way. The periscope is thirty feet high. Sand hills form the natural hazard that obscures the view from the tee.

Before teeing off on one 165-yard hole on a golf course in Wales you must look through this thirty-foot periscope to see whether the players ahead are still on the green, obscured by high sand hills. Right, a close-up of the view-finder



Patent No. 2,017,874, Kenneth R. Kerr
 Patent No. 1,201,787, Kenneth R. Kerr
 Patent No. 1,201,787, Kenneth R. Kerr
 Patent No. 1,201,787, Kenneth R. Kerr

Keystone

J 106 C

Curved Mirror on Auto Fender Gives Wide Rear View

Instead of the usual small, flat mirror inside the car, a deaf motorist at Washington has mounted a convex curved mirror on his automobile fender to obtain a wider circle of vision toward the rear. To the deaf driver, the unheard warnings of other cars, sirens and bells of ambulances and fire trucks are added hazards. The curved mirror on the left front fender gives him a clear view of the rear and eliminates the "blind spot."



No data

Mounted on left front fender of his automobile, this curved mirror gives deaf motorist a broad view of traffic to rear

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

Cond. Deal. L. Horse

Elbow-Handled Sweeper Dusts under Furniture

F1072



Elbow handle of this carpet sweeper drops almost to floor without making operator stoop

Without stooping, a housewife can tidy up floors beneath the furniture with an elbow-handled carpet sweeper. Its hinged handle automatically opens and closes according to the distance of the sweeper box from the operator, and the sweeper hugs the floor without extra pressure. The grip is curved, and rubber bumpers all around protect polished furniture. At its lowest position the elbow handle is almost parallel with the floor.

Pre-Shrunk Oil to Make Paint Is Discovered by Accident

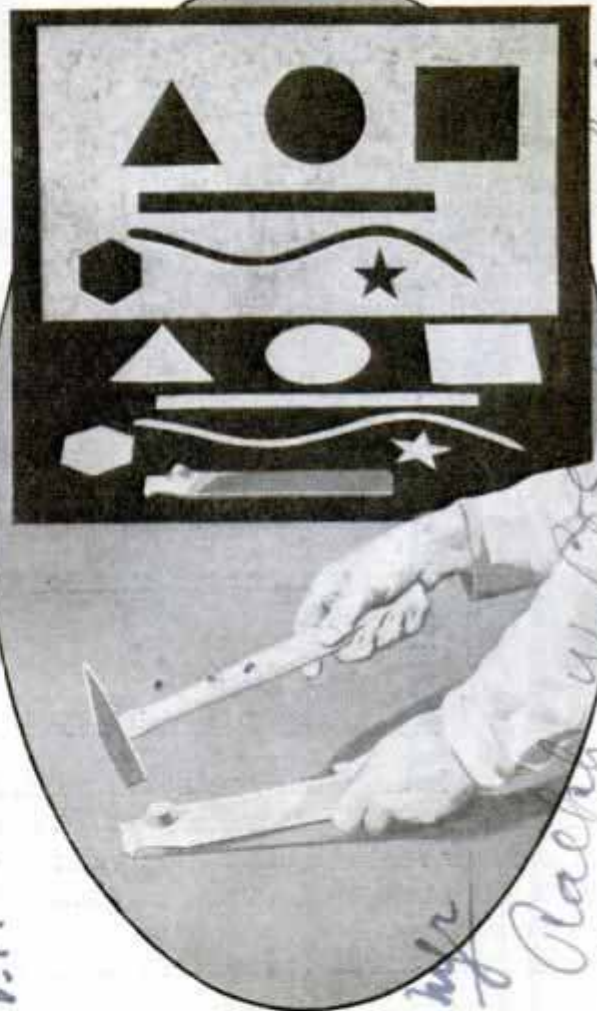
Purely by accident, industrial chemists have discovered a way to "pre-shrink" oil used as a vehicle for paint. Raw oil shrinks in weathering, and if it can be pre-shrunk the paint should have longer life. The use of tung nut oil in paint has been limited by its tendency to solidify suddenly under high-temperature treatment. In trying to find a formula to prevent solidification, chemists hit upon a mixture of forty-five

per cent soy-bean oil with fifty-five per cent tung oil. During one trial 100 gallons of the mixture weighing 775 pounds were heated, then found to have shrunk to ninety-seven gallons still weighing 775 pounds. Accidentally, the research men had found a formula for pre-shrinking oil.

Tool for Cutting Sheet Metal Leaves Edges Smooth

Designed to cut sheet metal without distorting or stretching the edges, a new tool handles work up to sixteen gauge. It is used with a hammer. Holes of any shape and size down to two-inch radius in eighteen-gauge iron can be cut and the tool will cut smaller holes in lighter metal.

\$ 2.50 on market



Top, some of the shapes which may be cut in metal with tool shown in use at bottom

either flat or formed sheets. Small pieces are clamped in a vise for cutting but larger pieces having sufficient weight do not require such handling. The tool is useful in shops working on auto bodies.

Science Service
20/365

F1102

Soy. paint

M. J. Jaggard and J. M. Gage. O'Brien Carmel Co.

White Carb.
Capt. A. H. Canton.

M. J. Jaggard

Insect Farmers Reap a Fortune in Butterflies

Ten thousand dollars for a butterfly! An English collector paid that for one rare tropical fly, the "Charaxes Fournierai," of which there are but two known specimens—and that is why butterfly farming is a profitable, yet little-known industry. Among the loveliest things in nature are their flashing, fluttering, brightly pigmented wings. They are coveted by private collectors, natural-



© London Daily Herald
Covering trees and shrubs to protect caterpillars while they feed and enter the chrysalis

flowers, herbs, vegetables, mulberry trees, scented rosemary, bayrose, beech, sycamore, even nettles and dandelions—whatever will please the fastidious palate of the caterpillar. At the proper time this "fodder" is collected in sacks and the caterpillars that thrive best on that particular diet are put in with the leaves. Twelve thousand swallow-tail butterflies are bred at one time, bringing enough income to pay the "farm hands" good wages. When the caterpillar starts weaving its chrysalis the farmer isolates it in a small "pen" to prevent spread of infectious disease. Another species is given a bit of bark, a matchbox or tin in which to await transformation. Others are

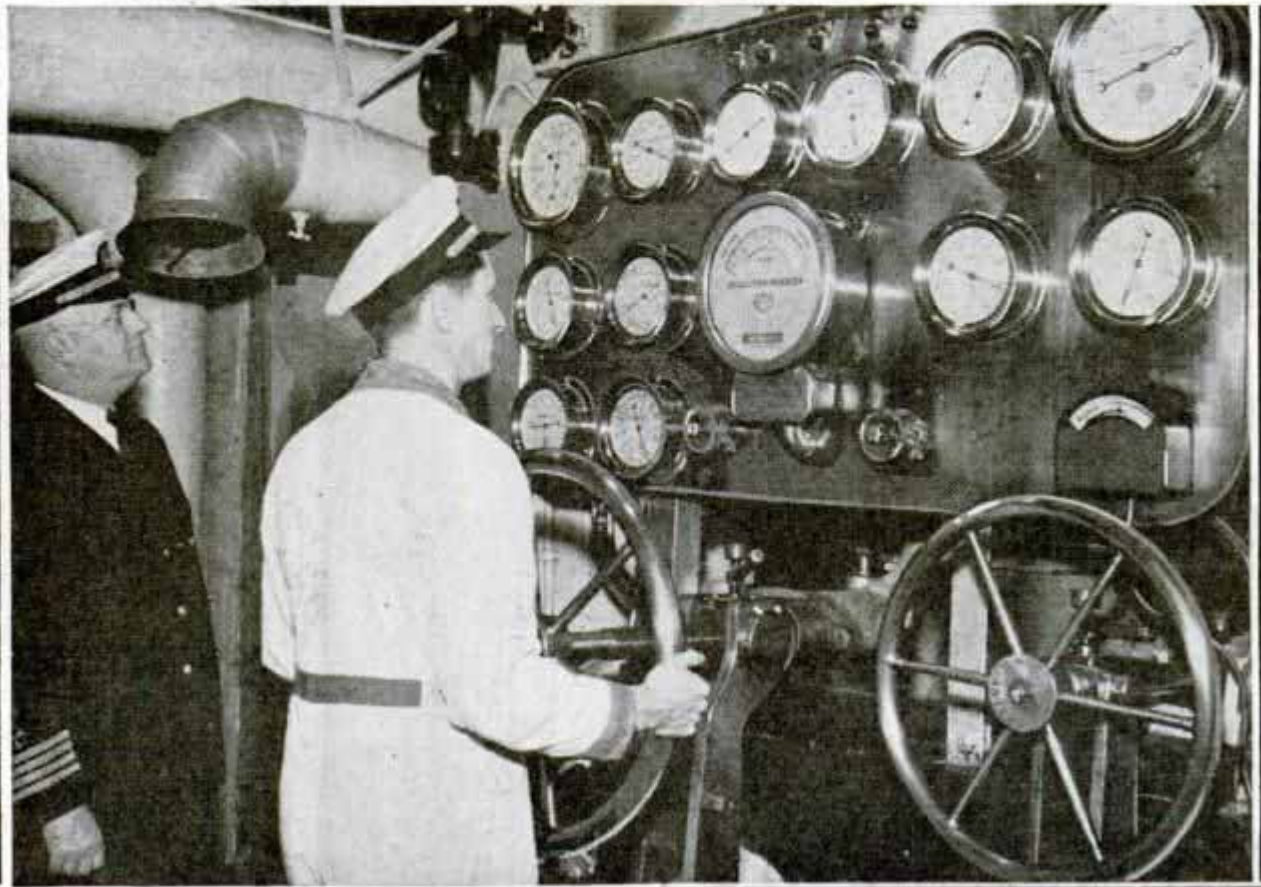
left in treetops which are completely swathed in huge bags to protect them from birds. A brilliant blue butterfly from the Dutch East Indies may bring \$300, and a gorgeous "morpho" from the Amazon tropics would bring a fortune if it could be raised in captivity. Instead, the only way they can be captured is by

nets in Brazilian treetops.

L. Neuman (owner)

*Colombene 29 Dec 1909
 (death, Mr. London England
 Wilkins, Esq.
 Bexley Kent
 David, Bexley*

With the SEA-GOING

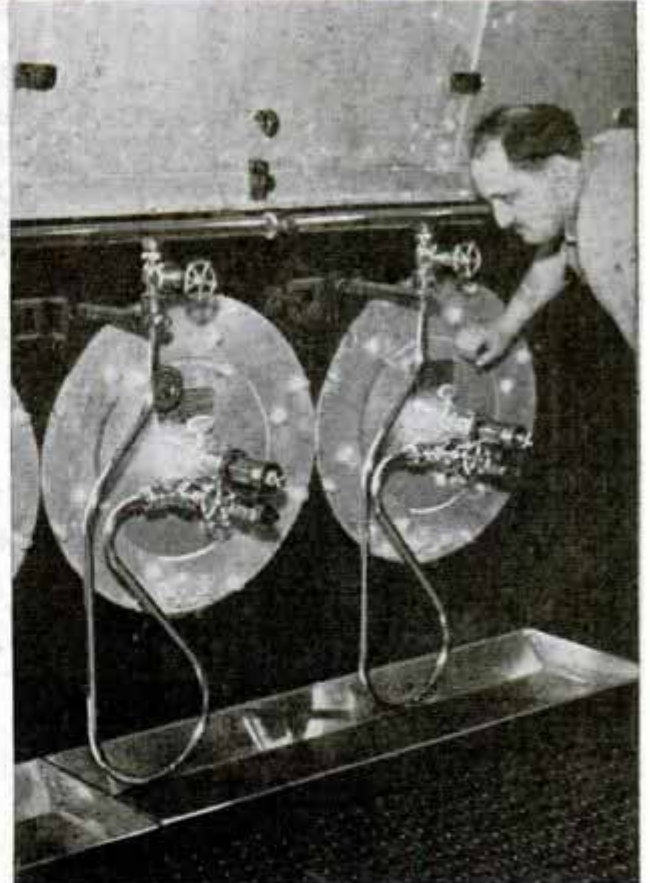


GETTING a big liner to sea looks easy. With the tugs alongside and the shore lines cast off, a junior officer on the bridge swings the handles of the engine room telegraphs over to "Slow Speed Ahead."

Down on the operating platform of the engine room a horn blares and the pointers on the telegraph dials turn to the command. Engineers at the port and starboard engines wind their throttle wheels out and steam begins to hiss into the high-pressure turbines. Shafts spin, the propellers turn over slowly, and the ship begins to move. It takes only three men to start a 26,000-ton liner.

But it's not as easy as that. For the last five or six hours the engine room gang had been preparing for the command. Raising steam takes time. Ponderous as the engines are, they are almost as delicate as fine watches. A 25,000-horsepower plant gets more care than the sensitive engine of a race car.

Aboard the S.S. "Monterey," one of the fast Matson liners on the California-Australia run, Chief Engineer H. T. Keene calls his officers together half a day before



Engineer, top, at main throttle of port engine of the "Monterey." Note the many dials to show engine performance. Below, fireman, regulating flow of fuel oil on a modern vessel

215 Harbor St. San Francisco, Calif.

21961

ENGINEERS

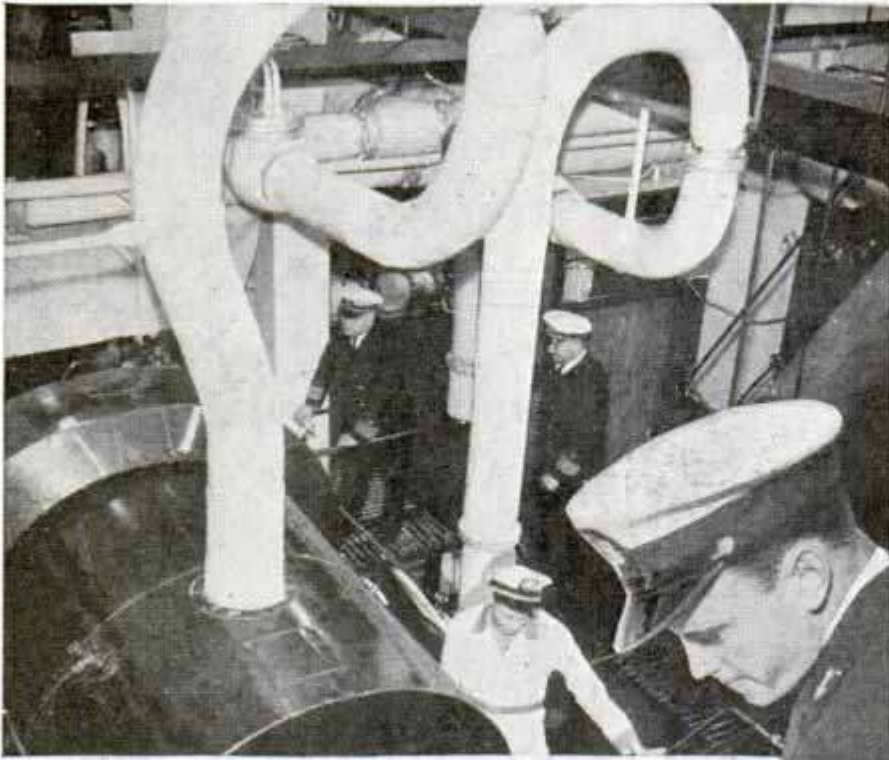
sailing time and lays out a schedule. Fires must be started up under eight or ten boilers, steam must be raised to a superheated temperature, and the big engines must be slowly and evenly heated up. Even in an emergency it would not do to hurry the warming process. To blow steam at 750 degrees into a turbine while it is still cold would warp and twist the rotor, thus damaging the fine blades and seriously crippling the ship. When a liner docks for only a few hours or



Top, baby steering wheel attached to "metal mike" on bridge with which liner may be steered. Below, opening main steam line leading to turbines. Getting up steam requires several hours on a modern ship

when it might have to maneuver on short notice, the engineers keep steam up and the engines warm so they are always ready.

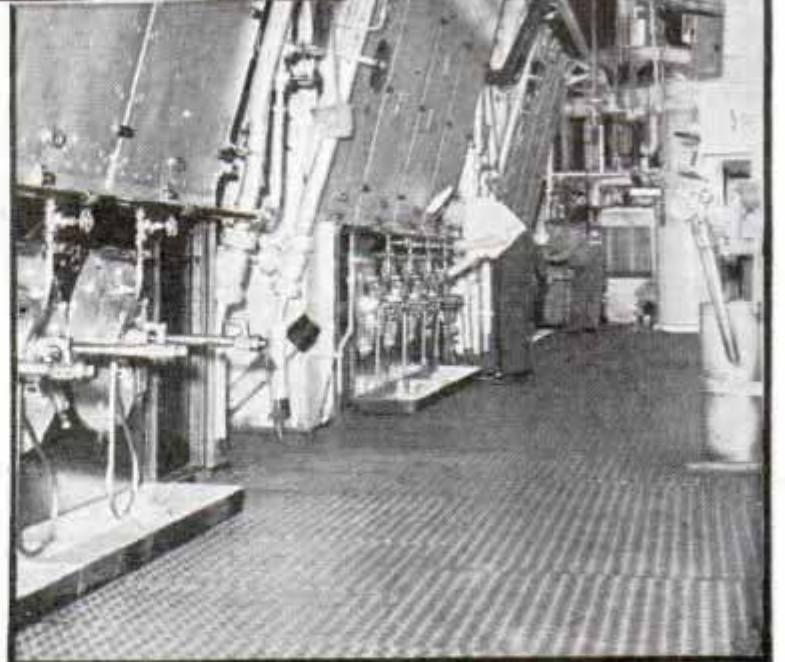
One of the first steps in warming is to start a series of pumps. One of them circulates cooling water through the condensers, another pumps barrels of lubricating oil through the engine bearings. Other pumps begin to lift water out of the feed tanks and boost it on its way to the boilers where it passes through first and second stage heaters. After evaporation in the boilers, it passes through a series of superheaters from which it emerges as superheated steam. Meanwhile partial vacuums are created inside the turbines and condensers by means of steam ejectors that



draw off water vapor and air.

Finally, the engines are ready for warming up. Each throttle is "cracked" to release a little steam that rushes through the high, intermediate, and low pressure turbines of the engines. Little by little, the vacuum inside the turbines is increased and more steam is admitted until the engines begin to turn. With the engines partly warmed up, they are operated ahead slowly and then astern for twenty-five minutes so all parts of the rotating units can come up to an even temperature. From then until sailing time, each engine is turned over for a few revolutions every few minutes to prevent it from cooling.

At sea the engine room is the hot spot of the ship, much hotter than the fire rooms in these days of fuel-oil furnaces and forced draft. Away from the small "islands" of cool air coming down the ventilators, thermometers in the moist atmosphere usually read around 100 degrees. Every minute the big ship is at sea, an engi-



neer stands close by the throttle of each engine. No one below knows when an order is coming down from the bridge, or whether the next order will be an emergency command. As a result, every order is treated as an emergency and executed with split-second speed. An engine room log records everything that happens during a voyage. The yeoman in charge writes down each command transmitted from the bridge, together with the hour and minute. He also reads the faces of forty or fifty instruments that show the condition of every part of the power plant and keeps records of the readings.

(Continued to page 140A)

Top, insulated steam lines leading to turbines. Center, officer on bridge signaling to engine room. Bottom, furnaces in fire room which superheat steam before it is admitted to the turbines

Vancouver, B.C. Canada

Giant Figure of Christ in Odd Church Design

378 859 4



Designer's sketch of new plan for church. Giant figure of Christ at Gethsemane would be made of copper. At night special floodlights would provide a halo and illuminate the entire structure

Patents have been issued for an odd architectural design for churches. The plan calls for a giant figure of Christ, to be constructed of burnished copper, which would dominate the church building made of cement in natural stone color. The de-

sign has Christ seated on a rock at Gethsemane, with the church entrance in the rock, beneath the flowing robes of the figure. A halo for the figure and illumination for the entire structure would be provided by a system of floodlights.

Edges of Paper Strengthened with Tough Tape Binder

F1095

Due to frequent handling, the edges of drawings and other valuable papers are

often mutilated. To overcome this difficulty, a small taping machine binds the edges of any sheet or flat material with a protective border which won't tear, lays flat, handles easily and files smoothly. The tape is applied without heat or moisture, the user merely turning a crank on the binder with one hand and guiding the sheet with the other. Rollers form and press the tape on the edge of the sheet. By binding a piece of cardboard and a piece of Cellophane of equal size on three sides, a convenient transparent folder is formed to keep on the desk for sketches, notes and data sheets.



Taping machine which binds edges of sheet of paper with border which prevents mutilation from handling

Code Wall, 378 E 59th Ave
Vancouver, B.C. Canada

56 York St. Vancouver 9 B.C.

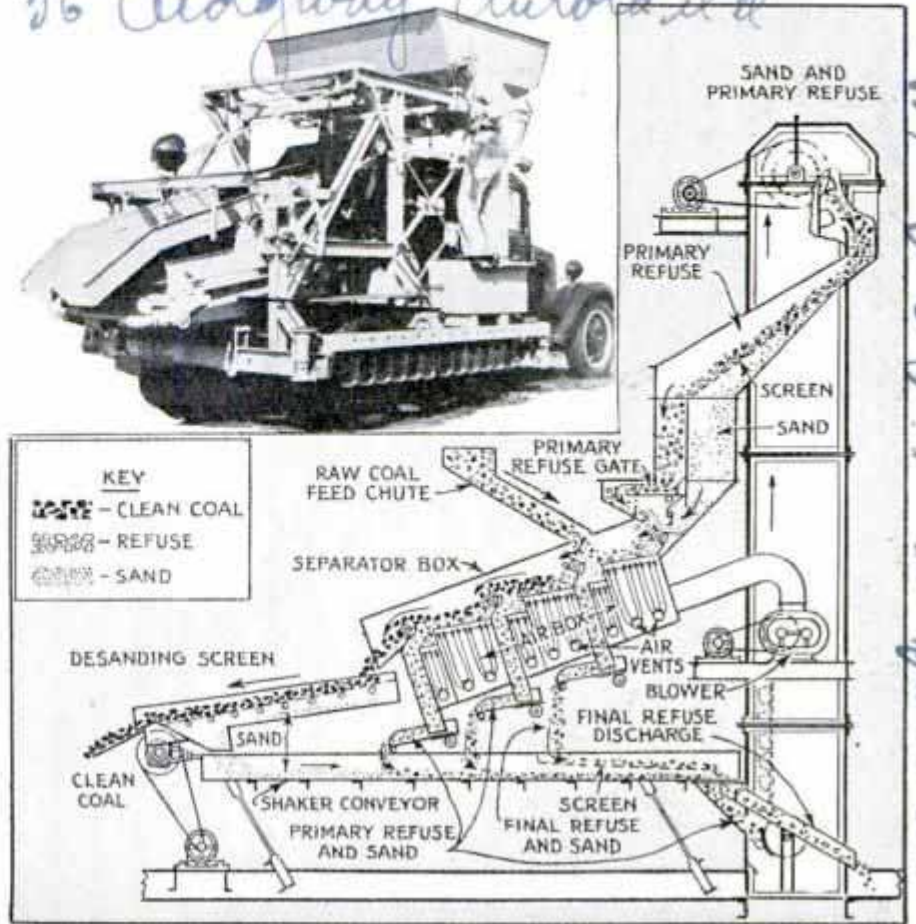
\$18.50 complete

Vertex Co. 5 local

Coal 'Dry Cleaned' in Portable Air-Sand Plant

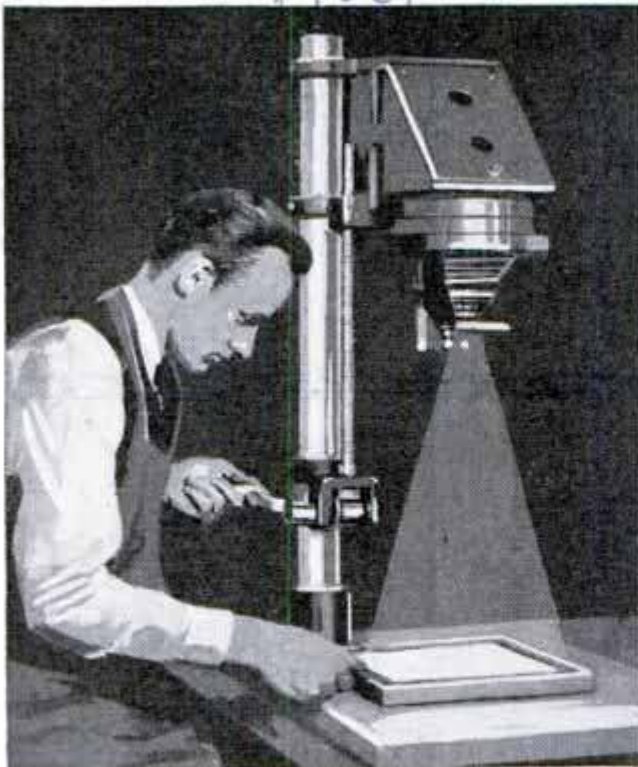
*Stephens-Adams Mfg Co.
36 Ridgway Aurora Ill*

Operated without water, a "dry cleaner" for coal has been mounted on a truck for use anywhere. It employs air-sand, an artificial dry liquid, for separating the coal from slate and for similar specific gravity separations. The air-sand liquid is formed by bubbling air continuously through a mass of fine, dry sand. This makes a quicksand on which the pure coal floats through the cleaning box and into the chute while slate and sulphurous impurities sink and are discharged through gates in the bottom. A simple arrangement recycles and recirculates the sand. The plant is made in units up to 100-tons capacity. Costs of dry cleaning the coal are said to be small.



Top, coal-cleaning plant mounted on truck chassis. Bottom, diagram showing how the coal is cleaned by separating from other substances

Photo Enlarger Reflects Light Protecting Film from Heat



Turning the hand crank of this photo-enlarging outfit adjusts the projector to desired print size

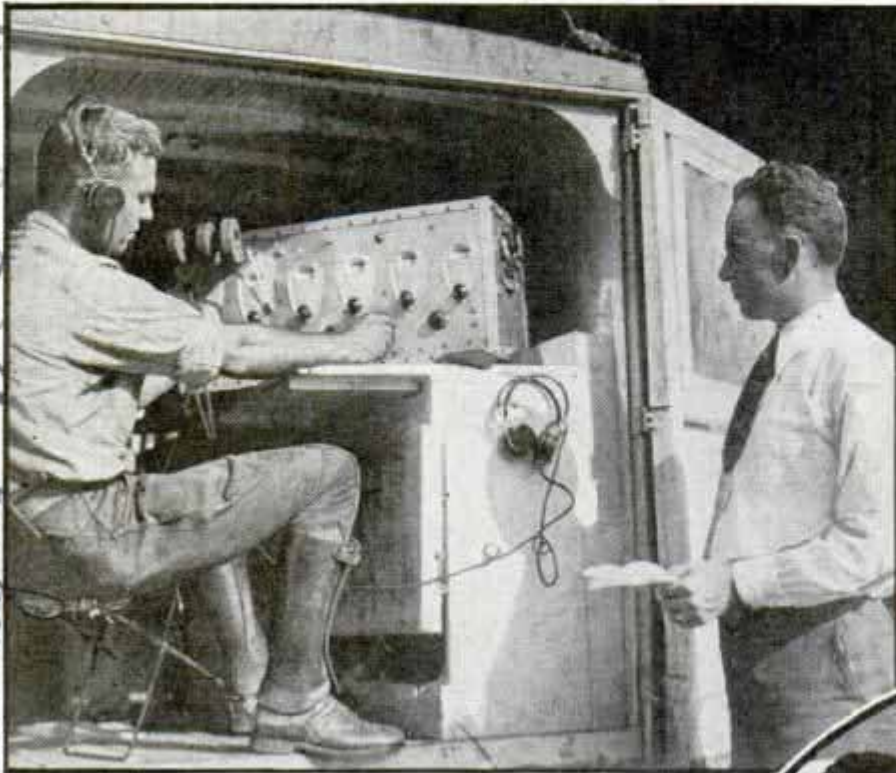
By using a series of condensers, reflectors and a ground-glass shield, a photo-enlarging outfit attains positive control of light values and screens out heat that might damage the negative. Any lamp up to 1,000 watts can be used, the light proceeding from a back reflector through the ground-glass shield, which can be raised; through a condenser lens to a mirror that throws the light down at right angle through two more condensers to the negative, the lens and the paper. The machine head is readily adjusted up and down for print size by turning a hand crank, and the focus is similarly adjusted by turning a screw. The castings are of machined aluminum.

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

Barhead Box 194

Chicago 20 N. Wacker

Uncle Sam's FOREST



plane in metal shockproof containers. A motor pump, with 2,000 feet of hose is loaded into a lightweight steel box with parachute attached. Other strange-looking containers are hustled aboard and the plane zooms aloft with its load.

The boss of the ground crew assigns a number of men to start trenching in order to "pinch" the fire, then begins talking to the radio observer in the



Forest ranger reporting fire and, at top, sending radio weather reports to fire crews from truck

"FIRE starting on degree 372 approximately twelve miles southwest from station three."

The supervisor in the main ranger station of a huge western national forest hangs up the telephone receiver and stretches a cord across a map from station three on the 372-degree mark in the required direction. He doesn't do anything more—yet. In a moment the phone rings again.

"Fire starting at degree 171 about nine miles northeast from station two."

That's what the supervisor has been waiting for. On the map he stretches a second string from station two, and where the two cords meet is the exact location of the blaze.

"All right, boys, let's go," he orders. "Can't use the trucks—no roads. Tell the airport to drop a fifty-man equipment outfit and one centrifugal pump; there's a stream near."

The men set out, some on foot, some on horseback. All portable equipment is packed and ready at the station. Each man takes what he can comfortably carry and proceeds to the fire. Meanwhile, at the nearest National Forest landing field, fifty fire-fighting units are packed in the

plane now circling overhead. "Drop the pump near the stream!" he orders.

A black object comes hurtling from the plane and is suddenly checked by a mushrooming parachute. It is a pump, capable of shooting twenty-two gallons a minute at 200 pounds pressure. Other smaller objects come plummeting down. They are pack units composed of a five-gallon can of water, hose and lever pump.

*Cmh C. d. van der...
1424 - N. W. N. W.
The Champlain, Aft. 23-9
Washington, D. C.*

78730

FIRE FIGHTERS



Here we have a picture of Uncle Sam's newest forest-fire fighting equipment in action. A combination of expert scientific detection, transportation facilities stepped up to the maximum of efficiency, and a system of "cafeteria delivery" of any equipment needed by air, has become so effective that, according to recent reports from the National Forest Service, less than one-tenth of one per cent of the total national forest acreage was destroyed by fire last year. After five years of exhaustive laboratory research, resulting in the large-scale inventing of machinery peculiar to the needs of forest-fire fighting, the official guardians of over 200,000,000 acres of forest lands have at their command almost every known kind of fire-fighting equipment that can possibly be brought into play. Ultramodern methods of synchronizing old and new equipment, accurate and speedy methods of locating the tiniest incipient fire, new mechanical devices for automatically digging firebreaks and a ground-to-air-to-main-ranger-station ra-

Photos by U. S. Forest Service

Fire truck ready to start for a forest blaze and, at top, digging a fire trench



ly different. Cutting through heavy brush while digging through to earth is a slow process, and the fire often catches up with the spade wielder. So our engineers have developed the automatic brush cutter, a power-driven circular saw arrangement that cuts through tough underbrush, leaving the way open for the shovel man. The brush cutter does the work of several men in far less time—and time is most important in fighting forest fires.

dio communication system are but a few of the latest advancements made by the engineering and research staff of the Forest Service.

"Within the past three years," says David Godwin, associate chief of the fire-fighting division of the service, "the service has built fifty-five landing fields at strategic sections, mostly in the far west. No matter where a fire breaks out, it can be reached in a short time by plane. Furthermore, thousands of miles of roads have been built, closed to public traffic, but used exclusively by forest rangers and CCC boys in fire fighting.

"Until recently, the main method of fighting a fire was to line up a number of men, arm them with picks and shovels and have them dig trenches parallel to the line of fire and thus attempt to pinch it out. In connection with this, upon favorable conditions, with the wind not too strong, backfiring was attempted, the uprushing current of air caused by the approaching conflagration drawing the backfires to it, despite the adverse wind.

"Today, trenching is still the major means of fighting fires, but the methods involved are entire-



Top, ranger reporting fire by radio. Center, transporting fire boxes in a section where the only roads are trails. Bottom, plane used for patrol work

"For the first time we have reached maximum efficiency in spotting fires. For years the army air corps cooperated with us by keeping forty planes constantly in the air to report fires. This system served as an excellent primary stage of the present method of detection. However, accurate location directions cannot be given from a fast-moving plane and the territory was not covered 100 per cent. Our present system of fire towers, manned day and night, keeps every square inch of national forest lands under constant observation. In almost every instance, fires are reported by two or more rangers at these stations, and by simple geometry applied on a chart map, the superintendent can deter-



Ranger using fire finder to spot a blaze and, below, Forest Service truck used to fight fire

mine the exact location of the fire down to the acre.

"Many times, of course, there are roads near the fire, which are not open to the public, but built for just such emergencies. Then the mobile ground units get into action. Tractors with plowlike arrangements for digging fire trenches, trucks, carrying men equipped with 'pack extinguishers,' picks, axes and shovels form the vanguard. Airplanes report progress

to the ground boss. Automatic brush-cutters zip into action. A unit of our very latest equipment, a counterpart of a city fire truck, is capable of shooting powerful streams of water, and if no supply is available in near-by stream or lake, it carries a huge tank which can be refilled at headquarters.

"The whole battle is carried on as efficiently as any wartime maneuver. Planes and ground crews keep in constant contact by radio, and if equipment is needed in a hurry, it is dropped from the air by parachute, or 'free-dropped' in specially constructed nonbreakable containers. If the blaze is a large one and men must stay on duty for several days, the planes drop food as well as supplies.

"For the past three years the service has been building a system of reservoirs, pipelines and dams in small streams for a permanent water supply. At first the notion of men walking around with five gal-

(Continued to page 128A)

2706 8 59 44
St Louis Mo

Timing Switch for Enlarger Insures Right Exposure



Automatic timer, on table, turns off photo enlarger at expiration of interval set on its dial

Inserting an automatic timing switch between the electric outlet and the photograph enlarger assures accurate exposure of the print. The switch is calibrated in seconds from zero to sixty, and turns off the enlarger at the expiration of the interval set beforehand on the dial. It has a ruby light which illuminates the dial and also serves as darkroom light.

Motorboats Hoist River Uphill to Supply Power for Refinery

So low was the Mississippi river this year that motorboats were employed to "lift" river water into a channel supplying power for a large oil refinery at Wood River, Ill. The river, at a record low stage, had fallen below the level of the intake channel and the refinery, 4,000 feet from the inlet, was threatened with a shutdown. Pumps being unavailable in the emergency, a river man suggested building a low

dam of wood stakes and planks across the mouth of the intake channel. Six small motorboats were then placed seven feet from the dam and securely fastened, stern ends to the dam. Pipes twelve inches in diameter and about eight feet long were arranged to take the wash from the propeller and lift it over the dam into the channel. When the engines were started each propeller thrust about 1,500 gallons of water a minute up and over the dam.

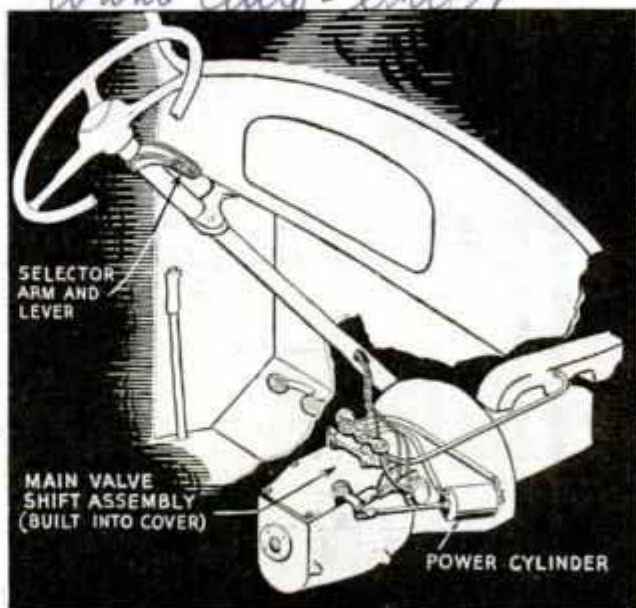
Lock in Cork Seals Bottle Tight Preventing Use of Poisons

To safeguard against mistaken use of poison, a cork containing a lock which seals the bottle has been invented. Twist the key in the lock and two metal balls are pressed against the neck of the bottle.



Vacuum Gear Selector for Autos Shifts Quietly at Finger Tip

At the touch of a finger tip you can shift gears silently with a vacuum-operated gear selector which has just gone into production. Built as a unit in the transmis-



Vacuum gear-shift unit built into transmission cover is controlled by lever on steering post

J. A. D. Instrument Co.
216 N. Vermont St.
St. Louis, Mo.

Evans Auto-Shift
Evans Products Co.
St. Louis, Mo.

F1086

William Dougherty
10 and Pine St. St. L.

Evans Auto-Shift
Evans Products Co.
St. Louis, Mo.

vacuum gear selector unit

sion cover, it can be installed in any conventional automobile transmission. Both construction and operation have been made quite simple. Gears are controlled from a lever at the top of the steering post. In shifting, you can either depress the clutch in the usual way and then move the selector lever, or first set the lever at the desired gear and then press down the clutch. The mechanism is operated by a vacuum suspended cylinder, in which vacuum is maintained at all times.

1065

Camera on Radiator Cap Photographs Accident

Just to advertise his trade, a Washington photographer mounted an inexpensive miniature camera on the hood of his automobile—and accidentally it became an expert witness to an accident. Unintentionally the motorist had left a film in the camera, which was set for an exposure. A minor collision jarred the shutter, and when the film was developed the photographer was surprised to find a perfect picture of the collision. Now the photographer always loads the camera and has the shutter release set so that a bump would expose the film.



Camera on hood is ready to snap picture of wreck

Motorcycle's Dive into Canal Is Latest in Crowd-Thrillers



Daring motorcyclist photographed as he dived his machine into canal in a new crowd-thrilling stunt

Latest in stunts devised for thrilling sport-show crowds is the dive of motorcycle and rider from a height of eighteen feet into a canal at Vienna. An Austrian soldier, wearing uniform complete to steel helmet, performs the stunt, which is a feature of the Vienna police department's water-sports show on the Danube canal.

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

Carl Best, L. J. Lane,
142 31st St. W.

F1097

Hot Gas Mixed with Steam Cuts Heating Cost

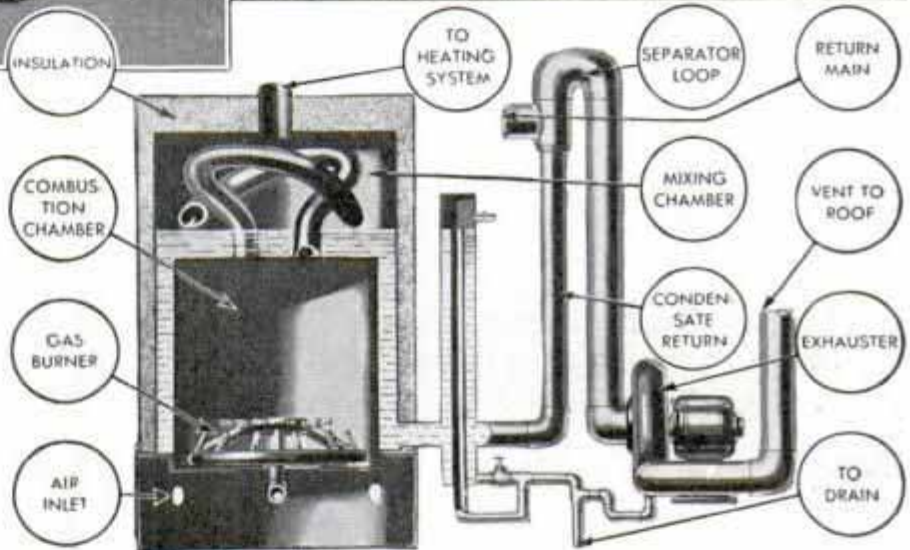
Saf. J. Neak



both the steam and the products of combustion carrying their heat through the radiators. A one-sixth horsepower motor regulates air supply, circulation and exhaust. Because of the method of collecting condensate and returning it to the generator, there is a minimum of corrosion and tests established that corrosion would be less than in an ordinary steam heating system. The plant heats up rapidly because only a small amount of water is needed in the jacket and because the hot gases reach the radiator quickly. The heater, applicable wherever gas is available, is designed for a five to seven room house, and in larger buildings extra units

C.A. DuBois Co. 450 E. Ohio, Chicago, Ill. 2/42

Steam mingles with the burned gases in the radiators of a home heating plant which, in laboratory tests, has attained an efficiency of ninety-seven per cent in fuel use. The gas-vapor heater has just been placed on the market. Because its air supply is controlled, a large amount of gas can be burned in a small combustion chamber and the heating plant is therefore quite compact. Around the combustion chamber is a water jacket. Exhaust vents lead the products of combustion into a space above the water where the steam and the spent gases are thoroughly mixed. This gas-vapor mixture flows through the piping to the radiators, where the moisture condenses and the gas cools. The condensate flows back to the water jacket and is reheated and circulated again, while the cooled gases are separated and, under pressure, discharged through a flue to the outside. In a new home equipped with this heater, a chimney would be unnecessary. A vent pipe only two and one-half or three inches in diameter is sufficient to exhaust the gas through the roof. There is practically no loss of heat in this system,



Heating unit for five to seven room house and diagram showing how burned gases mix with steam and circulate through radiators

are added. Where steam or hot-water systems are already in use, they can be converted to connect with the gas-vapor heater. It is thermostatically controlled.

Instinct Center of Animal Found at Middle of Brain

Instinctive actions of animals are controlled from the middle of the brain. Prof. E. Grunthal of Wurzburg University found the instinct center by searching for structural details more highly developed in the animal brain than in man's. He believed that man is superior to the animals in intellectual ability but inferior in instinctive actions. In the animal mid-brain, Professor Grunthal found what he believed were

Science News 8/26/12

Wurzburg Germany

the organs of instinct, containing nerve centers more numerous and highly differentiated than in the human brain. These nerve centers or nuclei were numerous in the brains of bats, rabbits and mice; less plentiful in carnivorous animals and fewest in brains of gorillas and orangs. In man and chimpanzees, the nuclei are about the same type and number.

Air Intake Built Like Gun Supercharges Racing Car



Acme
It looks like a cannon mounted on an armored car, but it is really the air intake duct for the supercharger of a racing automobile

Two-Faced Mirror for Day or Night Motoring

One side of a reversible rear-view mirror for automobiles has a crystal-clear face for daytime driving, and the other side is a jet black glareproof mirror that kills the blinding reflections during night driving. Either side provides clear vision



Twist the mirror and you have a vanity, a daytime glass or a glareproof mirror for night driving

of the road to the rear. The mirror is turned and locked in position either way by a simple twist of the wrist, and it can also be held in a vertical position for use as a vanity glass.

What appears to be a weapon of war on Capt. Woolf Barnato's racing car is really only part of a forced-induction system. The gunlike projection sucks in more air as the automobile gathers speed, supercharging the motor. Oliver Bertram, British racing driver, is seeking new speed records with Barnato's car, a Barnato-Hassan special.

Rain Gauge Read Once a Year Shows 451 Inches Rainfall

In one of the wettest spots on the globe, the rain gauge is read just once a year and the annual average precipitation is 451 inches. The gauge is at the top of Mt. Waialeale on Kauai, westernmost of the larger islands of Hawaii. In unusually wet years the rainfall sometimes reaches 600 inches. Because of the difficulty of reaching the peak through dense forest, undergrowth vegetation and sticky mud, a huge gauge which need be read only once annually was installed. It is of copper and will hold 900 inches. Tests of evaporation showed practically no loss, so the scientists assume evaporation at zero. Mile-high Mt. Waialeale is a moisture trap for rain-laden subtropical winds.

☐ Rambler roses planted along the right of way of the New York, New Haven and Hartford railroad not only beautified the line but their roots reduced soil erosion.

Handwritten notes on the right margin:
Hassan special
Barnato
Acme
F112
F112 4
demonstrated 8/25/36
reduced soil erosion

Handwritten note at bottom left:
Sands Mfg Co

Handwritten note at bottom right:
Roadways Age 8/1/36

Floral Windmill Is "Grown" from Thousands of Plants



This windmill in a park at Buffalo, N. Y., is made of twelve thousand plants. It is lighted at night

More than 12,000 plants of the Echeveria and Alternanthera species were "grown" into a decorative windmill in a park at Buffalo, N. Y. Delaware Park greenhouse gardeners constructed the windmill and arranged its floral designs. Lighted at night, it attracts thousands of admirers.

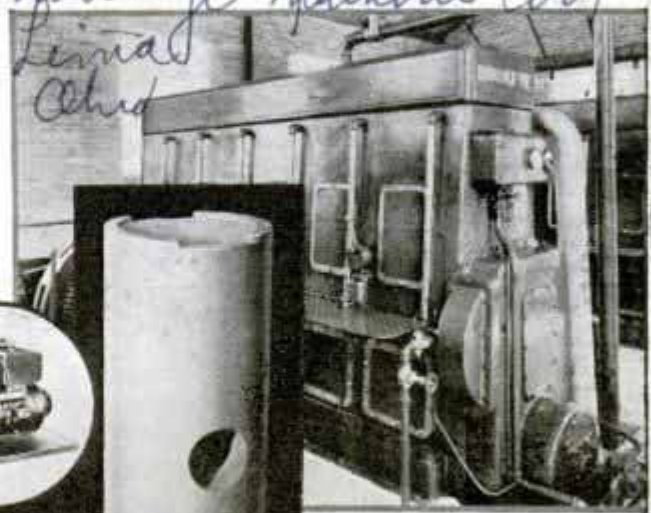
Trees Used as Windbreak Save Fuel in Farmhouse

Trees planted around a farmhouse are not only a source of fuel but actually save fuel when they grow into an effective windbreak. Tests by the U. S. Forest Service showed that winter temperatures are two to six degrees higher in winter on the leeward

side of a windbreak than on the windward side, and that heating requirements of a house unprotected by trees are tripled when cold winds exceed twenty miles an hour. Three or four rows of trees eight to twelve feet apart should be planted 100 to 150 feet from the house.

Midget and Giant Pistons Both Made of Aluminum

Aluminum pistons such as are being employed in modern high-speed automobiles also are being adapted to many other types of engines, both large and small. A striking contrast in size is offered by the aluminum-alloy piston produced for the engine of a fifty-seven pound portable lighting plant and that turned out for a 450-horsepower Diesel engine. The lighting-plant piston weighs three ounces, while the one for the Diesel is nine and one-half inches in diameter, nineteen inches long and the casting before it is machined weighs sixty-four pounds. Tests have been made with such pistons for Diesels fifteen to thirty inches in diameter. These pistons in iron weigh up to 300 pounds while the same size in aluminum would weigh one-third that much.



Tom Thumb and giant aluminum pistons used in portable lighting plant, in circle, and in big Diesel engine

Edwin S. Weinheimer, Supel.
U. S. Dept. of Agr.
no. 647
W. R. Williams

12802
Motor
F1085
Beaumont, Alameda
am 2 shells. 12802

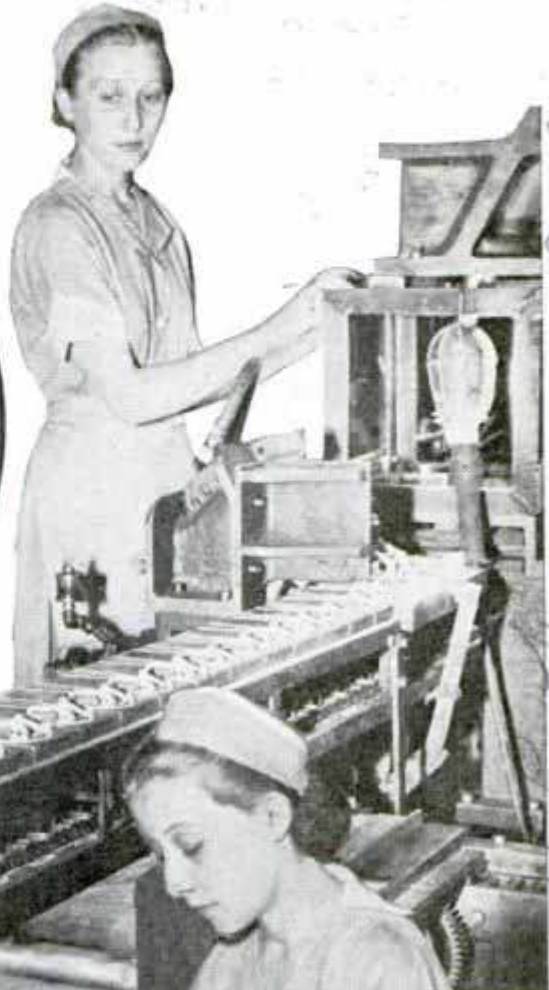
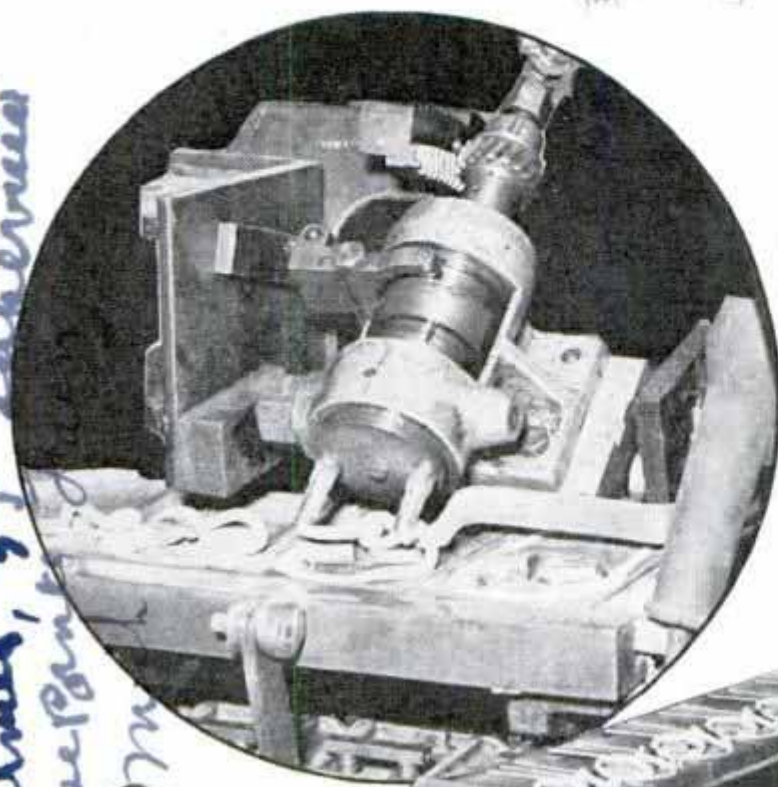
Buckeye Machine Co.
Leina
Alred

W. R. Williams

Pretzel Bending Machine Solves Problem

Chas. H. E. Farmer, 37 Labernia Ave. Lanes Point, Md.

Chas. H. E. Farmer, 37 Labernia Ave. Lanes Point, Md.



Accomplishing what once was considered as impossible for a machine, a new pretzel bender turns out 900 completely twisted pretzels per minute. It more than equals the work of fifteen expert pretzel-bending girls. The machine is an odd assembly of wheels, endless belts, air hose and electric motors, yet it handles pretzels with far more skill and speed than the best worker. Circle, top, machine at work. Center, pretzels ready for cooking. Bottom, expert worker bending pretzels by hand

FIG 41

Mower Cuts and Cleans Lawn Like a Vacuum Sweeper

Resembling a vacuum cleaner both in form and action, the latest lawn mower cuts the grass and then sucks the cuttings, leaves, twigs and other small rubbish into a container. Thus it does a thorough job of cleaning as it goes. Cutting is done by scythe-like rotary blades which are turned by direct drive from a gasoline

engine. The cutting blades of the mower are adjustable and can be set to cut the grass to any height desired. The blades are hollow-ground, and it is their rapid revolving that creates the suction which draws the mowed grass and rubbish into the large container located at the back of the machine.



Mess Power Speculators, Hds, Parks

F 582.

8649 Lookout Mountain
Hollywood, Calif

WEATHER *Made-to-Order*



NATURE cannot be relied on to provide a thunderstorm or a cloud bank on the particular day a movie director desires to shoot such an effect, so Hollywood studio technicians use mechanical equipment to produce these and many other natural phenomena.

There are machines for making noiseless rain, sleet, or snowstorms, while other paraphernalia set fires and control the extent of the destruction, or produce fire which can be projected, artificial sun rays, dust, fog, and wind effects. These tools are as much a part of motion-picture making as the camera itself and in most instances the artificial effects photograph better than the real and are more con-



Top, scene from "Mary of Scotland" as ship is sighted. Below, camera cabin used in rain sequences during filming of "Anthony Adverse" by Warner Brothers. The rain was produced by man and not by nature

for the MOVIES



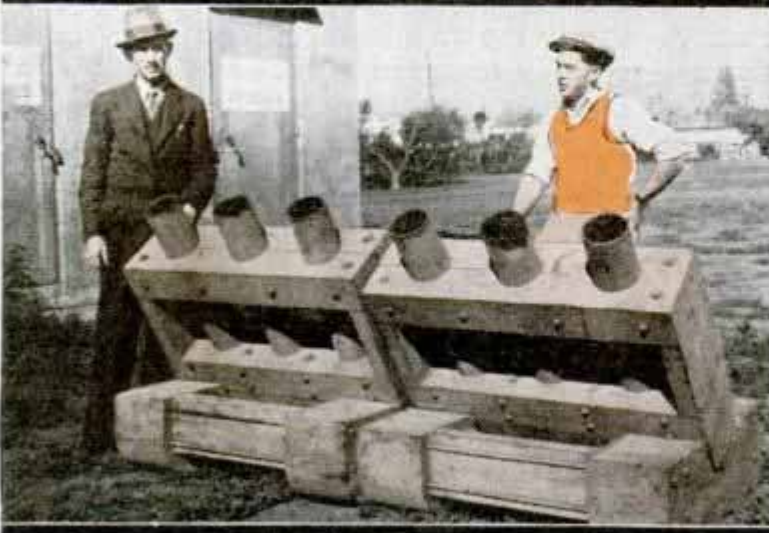
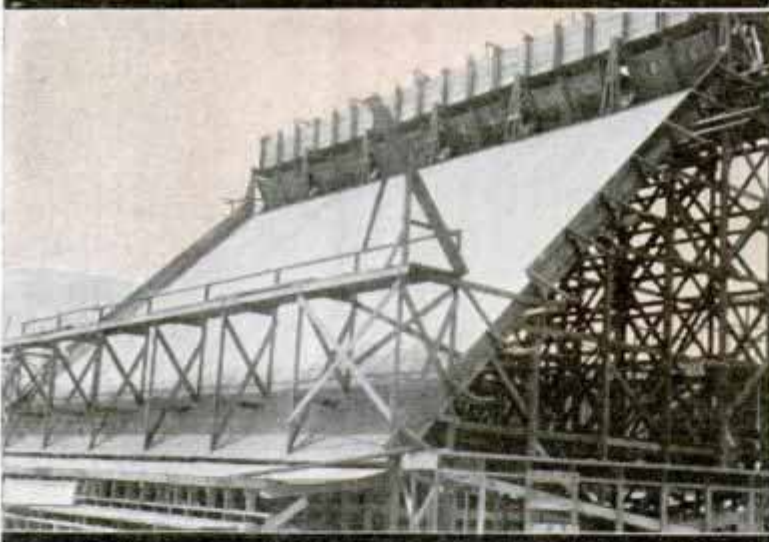
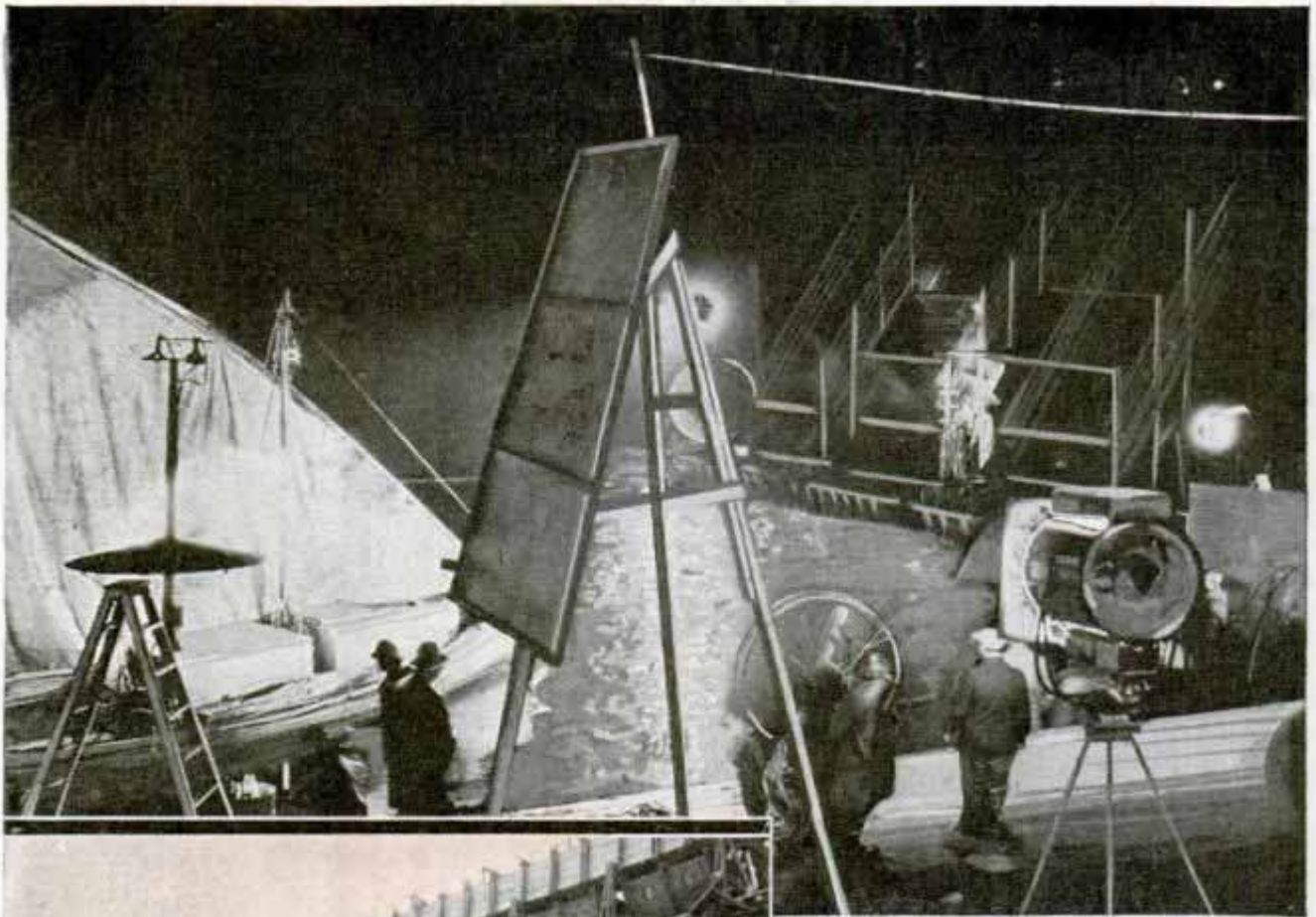
Camera and technical crew ready to film a blizzard. Marble dust and artificial snow are used in creating the illusion of a howling winter storm

vincing on the screen. Rainstorms of many kinds can be produced at a moment's notice with devices made by Harry Redmond, head of the R.K.O. special effects department. Misty rain is made by compressing water to about 150 pounds pressure and then releasing it through a fine jet. The jet has a half-inch thick wall around an elongated cavity the thickness of a pencil lead in which is a V-shape cut. The water strikes the cut, and is sprayed into a mist almost dry because of its fineness. Each jet covers an area of about fifty feet, and about 100 are used at once.

For rain effects around street lamps at night, Redmond uses a special jet eight inches long, with a one-half inch interior

cavity tapering toward the end. Arranged spirally around the jet are V-cuts which bite into the water stream because of the taper. At the end of the jet is a spray attachment. The large drops from the spray "catch" the light for movie rain drops while the V-cuts add the needed mistiness for proper photographic effect. Only a small portion of a set is made wet with this device.

When rain is seen pouring down outside movie windows, the part you don't see is a "rain tube" consisting of a one and one-quarter-inch iron pipe made into a rectangular form. Into the pipe are drilled holes the size of a pencil lead. Low-pressure water gives the rain-drop effect. A



Sound stage tank in which boat scenes are made, outdoor set, and apparatus for making artificial clouds and overhead fire effects for the movies

pan below the window out of camera lines catches the water.

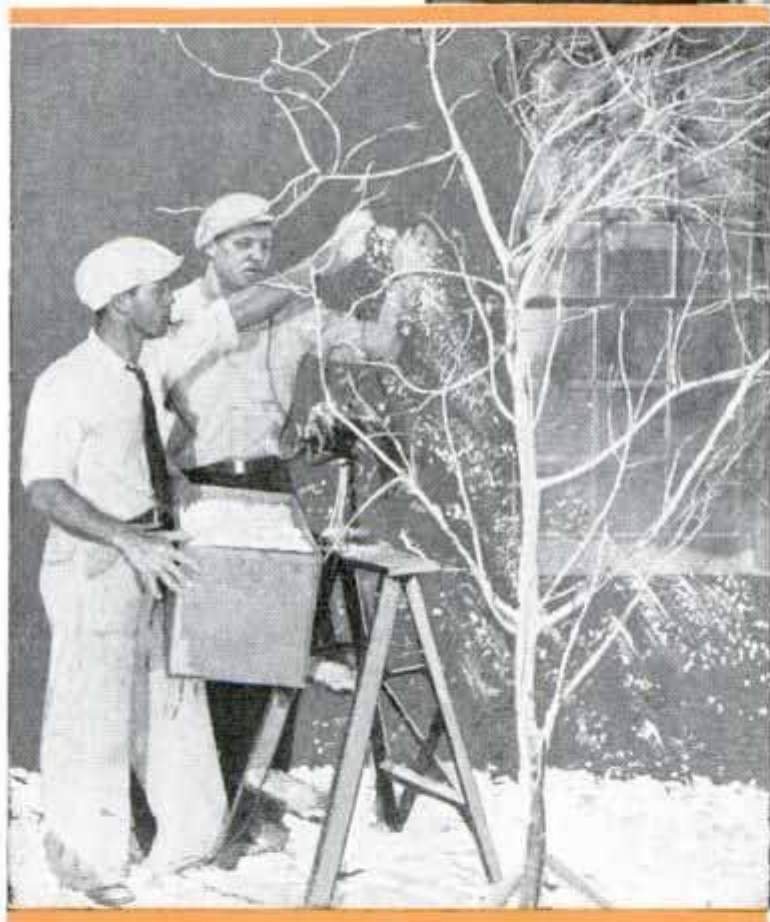
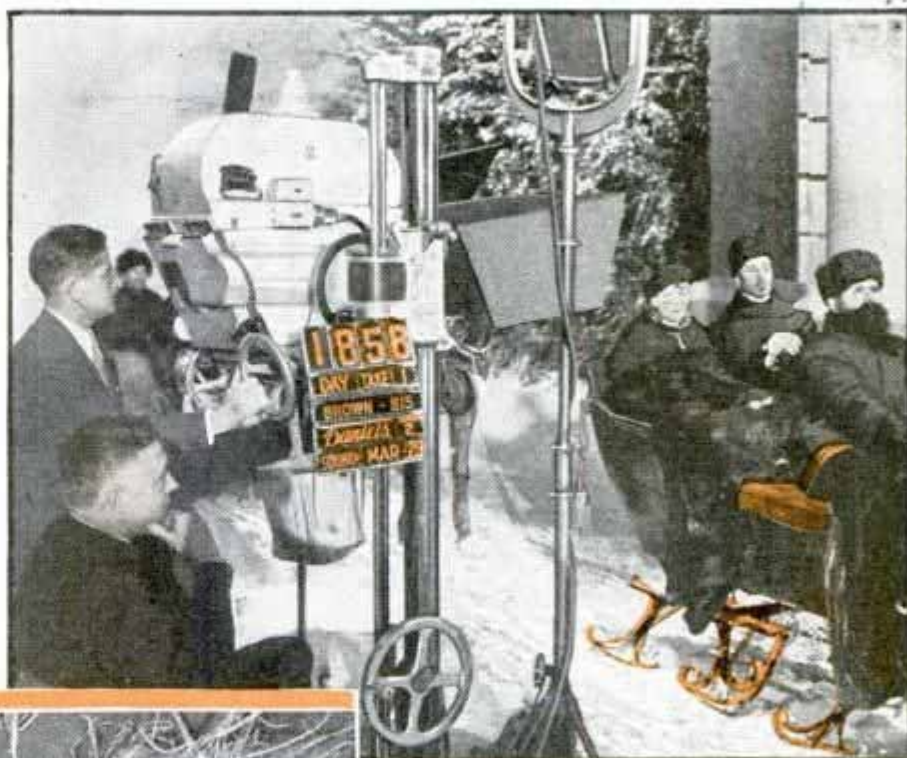
For more elaborate rainstorms sprays known as "acorn jets" are screwed into pipes. The spray jet is shaped like an acorn with fine holes drilled into the "nut" portion. The pipes are suspended above the setting and are attached to a three-stage pump of 750-gallons-a-minute capacity. From 1,000 to 3,000 feet of pipe and hose are required for the usual rain scene. Increasing the pressure of the water adds to the fogginess of the rain.

When rain is to be "silenced" so it won't interfere with the sound recording, excelsior is laid about the set to absorb the noise. If artificial rainstorms are needed on location, tank trucks transport the water to the outdoor setting and pumps build up pressure to 125 pounds in the pipes to get the storm effect from the jets.

In the R.K.O. film "Mary of Scotland," a cloudburst effect was gained by shooting water from a

fire hose into four-bladed propellers turned by 400-horsepower airplane motors. Wind machines are used to create the "blown effect" of slanting rain. By ejecting fuller's earth into the wind machines the effect of wind tugging at the clothes of the actors is produced. Without the fuller's earth, the illusion would not be so realistic.

Several new fog machines using chemicals are being used. The old-time "fog-bucket" from



Top, filming winter scene in M-G-M picture, "Anna Karenina."
Below, creating winter scene on sound stage

which an air jet sprayed lubricating or mineral oil is not extensively used because of the effects of the oil-laden atmosphere on the actors and their costumes. Instead, complicated machines manufacture fog according to the demands of the director. For "Mary of Scotland" Director John Ford asked Redmond for a special fog which would hang with clear spaces be-

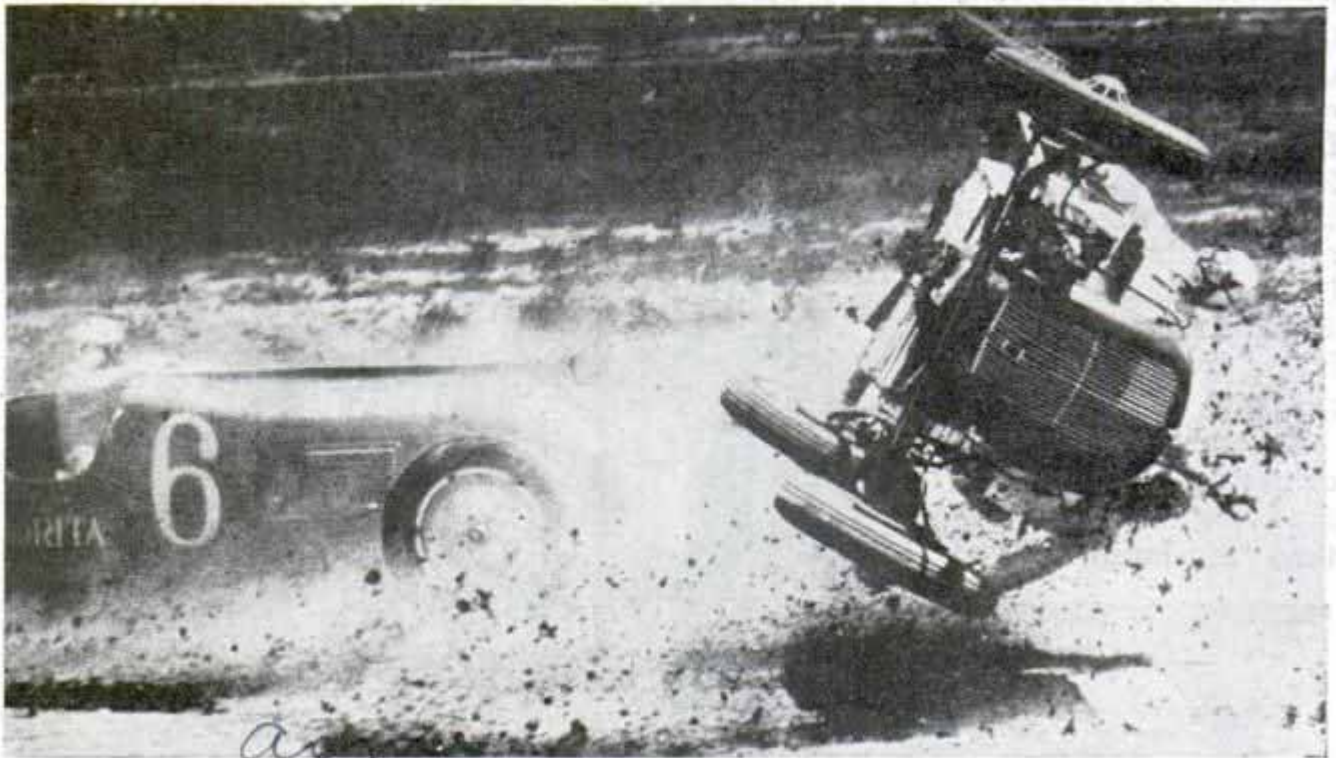
tween layers of fog. The first layer was to cover the ground with a four-foot blanket, and over this was needed six feet of clear air. Above the clear air was required another layer of fog. A special machine was used that electrically carbonized oil and then, by a muffled-air arrangement, laid it as microscopic particles in a vaporous air mixture. By controlling the carbonization the height at which the particles floated could be ascertained. A small blower in the fog machine gave the drifting movement characteristic of fog.

Spray arrangements made after the principle of the paint spray gun are used when an impenetrable fog bank is needed. The chemical, silicate tetrachloride, is put in the spray gun and instead of air pressure, compressed ammonia gas operates the spray which lays a dense low-hanging fog through which the camera cannot photograph. The chemical is also used for making artificial clouds in miniature settings. Titanium tetrachloride is used for smoke effects.

Another very light and almost colorless fog is made chemically by a machine which

(Continued to page 130A)

Smashup on Race Track Caught by Camera



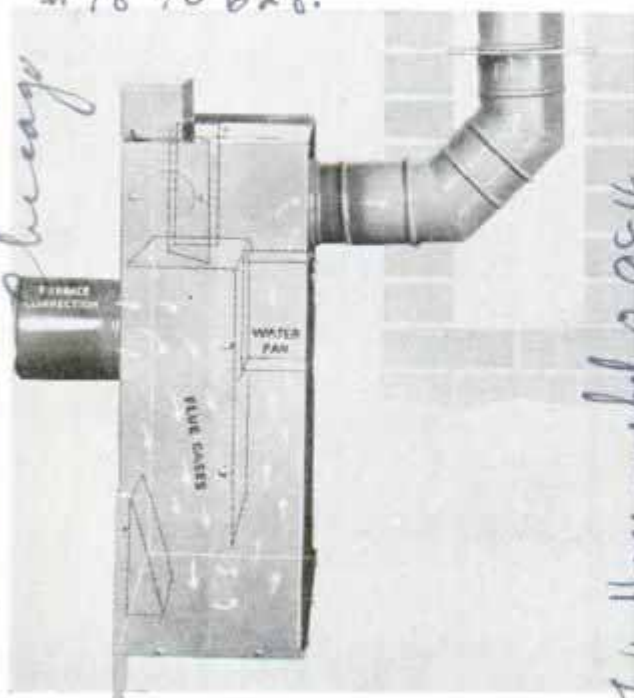
This remarkable photograph shows one racing car turning over, all four wheels off the ground, right in the path of a second speeding car. None of the men in the two cars was seriously hurt

Just as one speeding car turned over in the path of another during an all-Japanese championship race, an alert photographer pressed the bulb of his camera. The resulting picture was full of smashing action, a rare shot of automobile racing. The over-

turning car is shown in the air with the second car swiftly bearing down, its driver unable to avoid a smashup. Judging from the picture, it seems impossible that the drivers could have escaped death, but they were only slightly injured.

Condensation Engineering Corp.
 335 S. Western Ave.
 #1044
 #1840628

Moisture Eliminator Prevents Chimney from Corroding



Cutaway drawing shows how condensed moisture is collected in water pan to be re-evaporated

Condensation of vapor in the chimney, a cause of constant disintegration of the bricks, mortar and flue lining, can be controlled by installing a condensation eliminator developed recently. In the efficient furnace there is little waste of heat up the chimney, but as a result there is heavy condensation of moisture with a slightly acid content which attacks the chimney. In a gas furnace, from six to twelve gallons of water are generated in vapor form for each thousand cubic feet of gas burned. The condensation eliminator, installed at the base of the chimney, controls up-draft and down-draft. It collects the condensed moisture during the warming-up period and when the furnace is hot, the water is re-evaporated and carried out of the chimney as vapor. An acidproof flue lining protects the porous brick and mortar, and leaves a dead air space between it and

Tel. Haymarket 0984

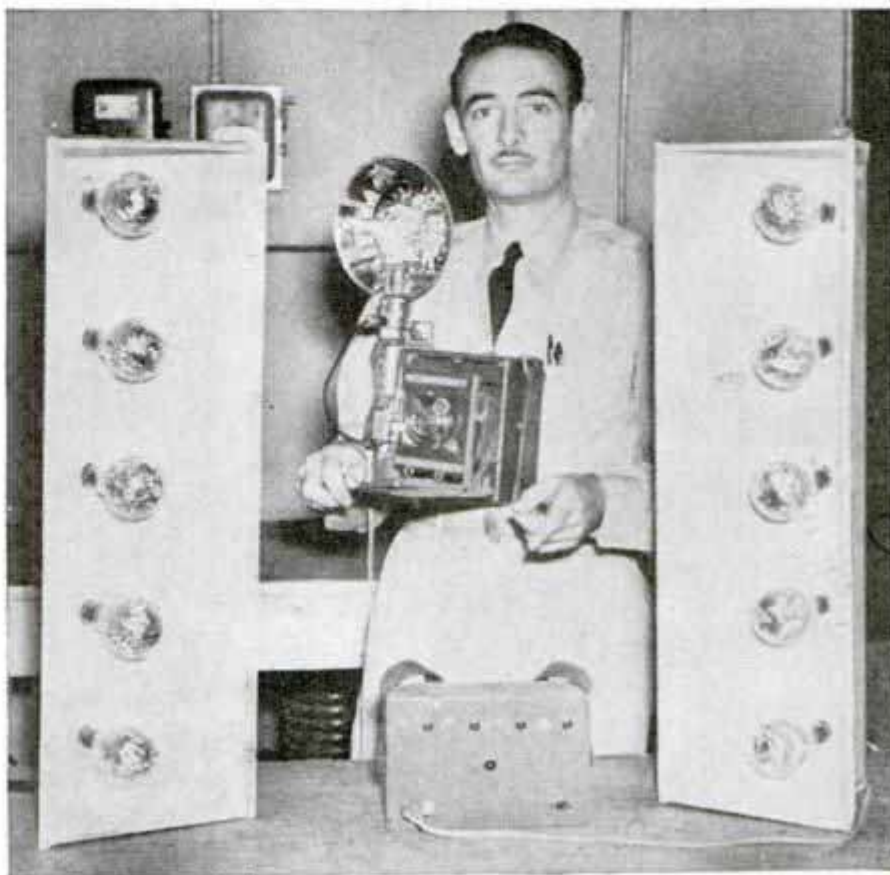
the chimney, tending to prevent absorption of heat by the bricks and to maintain a stack temperature high enough to evaporate the moisture and carry it away.

F1018

Battery of Photo Flash Bulbs Synchronized by Control Box

"Walking" Radio Station Sends One Mile

Operating on low power and ultra-high frequency, a new "walking transmitter" introduced recently by one of the larger broadcast companies has a working range of one mile. It consists of antenna and radio-frequency oscillator concealed in a cane, a microphone on a wrist strap, batteries in a money belt and audio amplifier and modulator in a binocular case. Its first use was for roving interviews at a political convention, the voice of the speaker being transmitted to a central station nearby and rebroadcast.



Portable multiple control box on table in center fires ten flashlight bulbs simultaneously with bulb attached to camera

Firing an entire battery of flashlight bulbs simultaneously with the click of the speed camera shutter has been accomplished by the development of a multiple control box. The ordinary synchronizer opens the camera shutter at the peak of the flashlight. With the multiple control, as many as ten photoflash bulbs arranged at strategic points within a radius of 100 feet can be touched off in unison, literally flooding with light the area being photographed. The control box is a compact case containing bulbs and switches, supplying its own current.

Rubber Wrapper Keeps Soap Water and Weather Proof

Applied to 'cakes' of soap by a special quick-vulcanizing process, a rubber coating water and weatherproof has been developed for wrapping soap. To unwrap, the coating is stripped off by pulling a small tab on the side. The wrappers may be colored. The coating is impermeable to the perfume of the soap.



Patent No. 2,042,104, John P. Kane, 16 Park Avenue, New York, N.Y.

...is the "walking transmitter." Note the microphone strapped to announcer's wrist

John P. Kane
16 Park Avenue
NY
Penney Radio Camera
Japan
Central

Exhibit Ave.

Spray Gun and Enlarger Print Photo on Wall

511-5th Ave N Y C

Photographie & spraying Ltd. 15 Elizabeth St. d. d. London England. had igel on market in U.S. 12/19/36



Top, projecting negative on sensitized wall and fixing it with spray gun. Mask, shown at lower left, is worn for protection while spraying sensitive emulsion. Right, the finished mural photograph

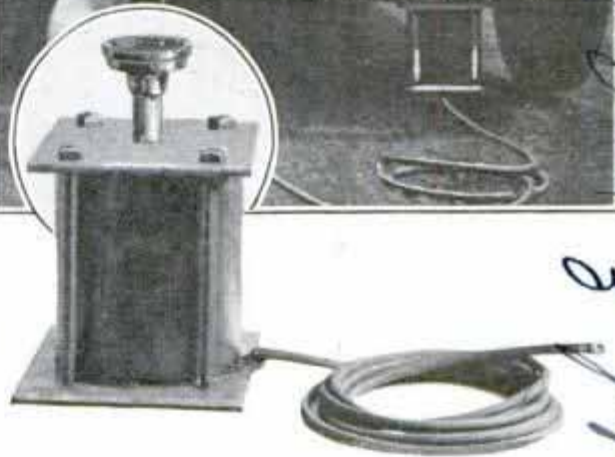
One evening you walk past a tall office building whose brick wall on one side is bare and windowless. The next morning you are amazed to discover a huge mural photograph printed on those bricks. With a spray gun, sensitive emulsions and an ordinary enlarger, photographic artists today are actually printing pictures on interior walls of plaster or canvas, exterior walls of brick or wood. They can even project an imperishable photograph on a cement sidewalk, on metal—on virtually any solid surface. The process takes but a few hours. First a patented emulsion is spread over the entire surface with spray guns; the photograph is projected with an ordinary enlarger, and is developed and fixed again with the spray guns. The pic-

Cont. Paul Lambert. Photographie & spraying Ltd. 47 St. St. London

71045

ture dries quite rapidly, the speed of the entire process depending upon the roughness of the surface. Since the image penetrates as far as light carries it, the photograph becomes a part of the surface and is impervious to weather. Homes, offices and stores are being decorated in this manner. Outdoor advertising finds the mural photograph a new and attractive medium, for a lasting picture or poster or design can be printed overnight on a billboard or wall. Theater scenery can be printed with utmost realism. On plywood and plaster the mural photograph has a soft luminous effect quite attractive for decorative purposes. In spreading emulsion on the wall, the spray-gun operator wears a mask to protect himself from inhaling fumes.

Air from Tire Jacks Up Car in Ten Seconds



Top, jacking up wheel with air from spare tire. Bottom, the air-operated jack

Silent Gasoline Road Drill Tested in War on Noise

Self-contained and operated by gasoline, a silent road drill has been tested as a means of reducing noise in England. The drill lacks the familiar clatter of drills now in use on highways and streets. Hardly more than a steady hum can be heard as the drill pounds to pieces various kinds of pavement or breaks up rock.



Official trying out the noiseless road drill which is operated by gasoline engine

Demonstrated by Isaac Kight & Co

Mar 28 1942

London

Milton Chamberlain, Milton M. Nottingham, England

Entirely automatic and requiring no manual operation by the car owner, the latest jack is raised by air from one of the tires. Five pounds of air elevate the car sufficiently to permit changing a tire or wheel. Loss of five pounds from normal operating pressure will not interfere with travel to the next service station where the tire may be inflated to full pressure. The jack is easy to use. Its air hose is screwed onto the tire valve after the jack has been placed to raise the car. When the air hose is connected properly, the jack immediately starts lifting the car and the complete operation occupies only ten seconds. The car is lowered by unscrewing the hose from the tire.

Glass fishing line made of braided fibrous glass threads has been found stronger than linen or silk line of equal diameter.

Messrs. Warsop, Patent

Experiment made by C. C. Ashaway

3876 W. Warren Ave

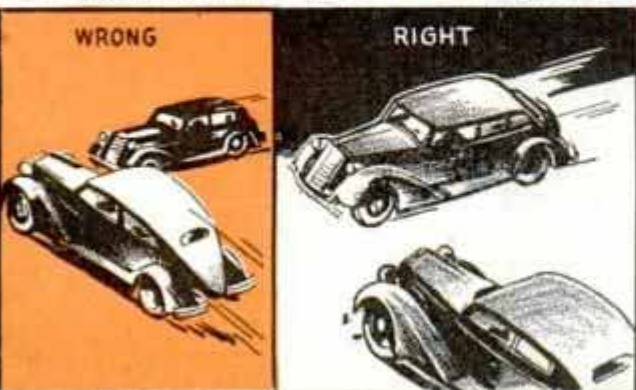
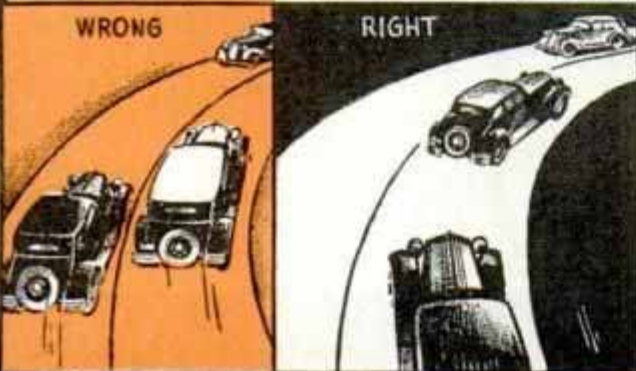
Mc Cabe, 2071 & 21st, Eastmont, Mich.

Mr. Ralph E

C. C. Ashaway

F809.

Why GAMBLE



Acme
By H. W. Magee

THERE'S one law which, sooner or later, is going to stop every reckless or careless driver. That's the law of averages. And when this law of averages is applied to traffic accidents today, the rows of cold figures scream a grim warning which every sane motorist should heed because you can't break this law without eventually breaking your neck.

From 1922 through 1935 automobile accidents snuffed out the lives of 380,000 persons in this country. That's more than twice the total of those killed in action or who died of wounds in all the wars in which we ever participated. It's more than the combined population of Wyoming and Nevada, and about the same as wiping out the population of Vermont or Indianapolis. And deaths continue to mount.

Last year 40,000,000 motorists burned up 16,250,000,000 gallons of gasoline driving 26,250,000 cars over our 3,250,000 miles of roads. Statistics of the National Safety Council show this traffic resulted in 37,000 deaths—an all time high—105,000 persons permanently disabled, 1,180,000 others temporarily disabled and 6,500,000 accidents causing damage to property. And that's one death for each eighty-eight miles of highway, one permanent disabil-

Right and wrong driving practices and, at top, one New York company teaches its drivers caution with the aid of this dummy which rolls out unexpectedly

Spray Gun and Enlarger Print Photo on Wall

712
I 10 53

Exhibit Ave.
511-5th Ave NYC

Photographers & Praying Ltd. 15 Elizabeth St. d.W.
London England.
had igel as market in U.S.
12/19/30



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Cont. Paul Samboit Photographers

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F1018

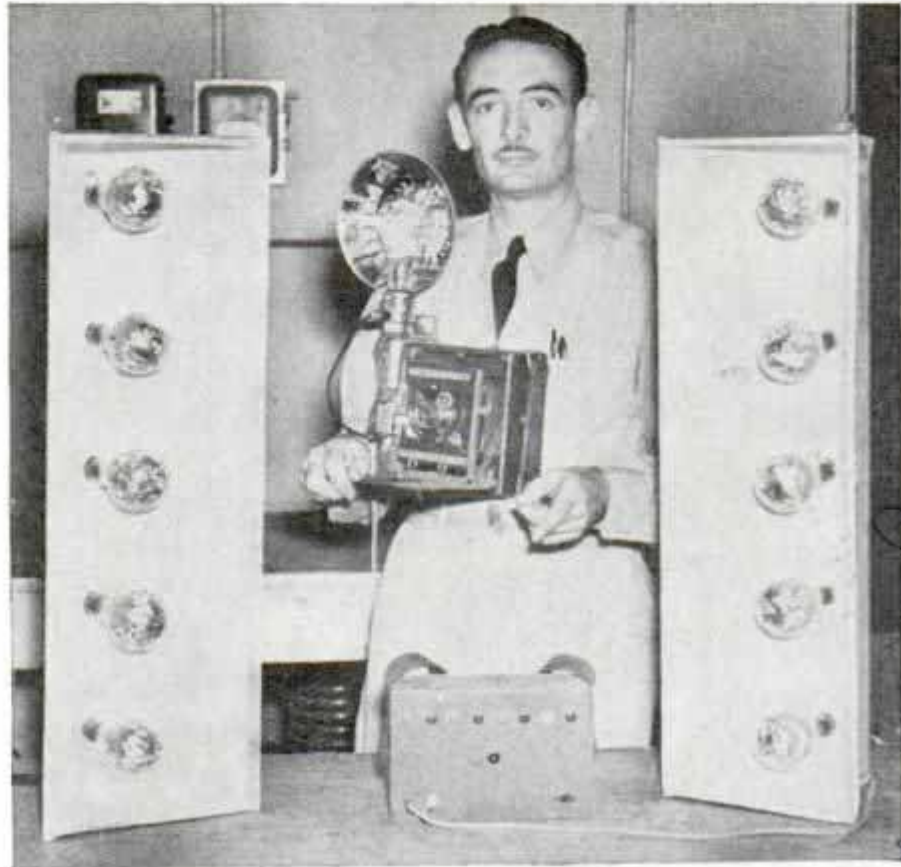
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Here is the "walking transmitter." Note the microphone strapped to announcer's wrist

Battery of Photo Flash Bulbs Synchronized by Control Box



Portable multiple control box on table in center fires ten flashlight bulbs simultaneously with bulb attached to camera

Firing an entire battery of flashlight bulbs simultaneously with the click of the speed camera shutter has been accomplished by the development of a multiple control box. The ordinary synchronizer opens the camera shutter at the peak of the flashlight. With the multiple control, as many as ten photoflash bulbs arranged at strategic points within a radius of 100 feet can be touched off in unison, literally flooding with light the area being photographed. The control box is a compact case containing bulbs and switches, supplying its own current.

#991

Rubber Wrapper Keeps Soap Water and Weather Proof

Applied to cakes of soap by a special quick-vulcanizing process, a rubber coating that is water and weatherproof has been patented for wrapping soap. To unwrap a cake, the coating is stripped off by tugging at a small tab on the side. The wrappers may be colored. The coating is permeable to the perfume of the soap.

John Parlane wife
1/16 Parlane wife
d.w.

Handwritten notes on the right side of the page, including "Perry Leidy's Camera" and "Lester's Camera".

Handwritten notes at the bottom of the page, including "Columbia Broadcasting" and "Lester's Camera".

7809

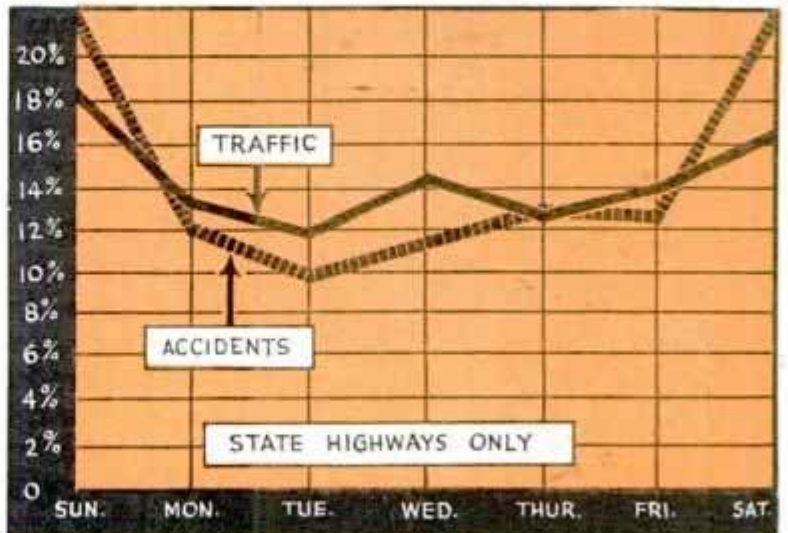
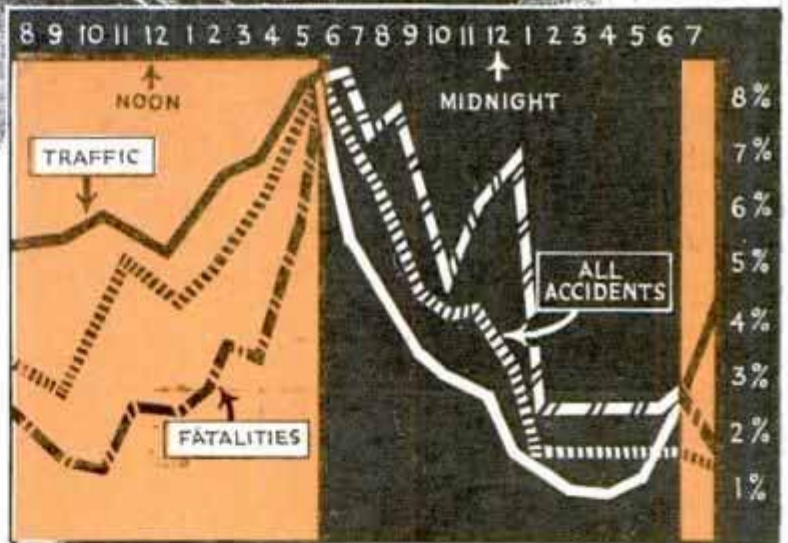
with DEATH ?



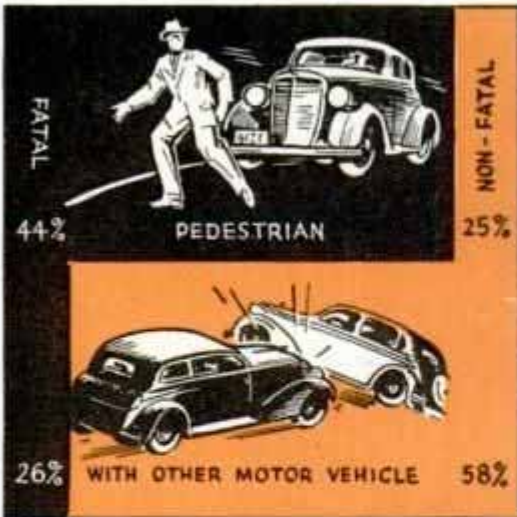
ity for each thirty-one miles, one temporary disability for every three miles and a property damage accident for each half mile. Truly death and destruction stalk our highways.

There's just one message in all these figures—be careful or be killed. But how do these statistics concern you directly? You consider yourself a careful driver, you've never killed anyone, never injured anyone, perhaps never dented a fender. Well, that's where the law of averages comes in. If the present traffic accident rate continues, one out of every twenty persons in this country will be injured or killed in an automobile accident within five years. And that includes you!

Just jot down your name, then add the names of nineteen relatives and friends. One of you will be killed or injured in a traffic smash-up by 1941 by the law of averages. Here's another way of looking at it. Write down the



Top chart shows traffic accidents around the clock and bottom one shows accidents through the week. The two charts indicate that safest time to drive is about 3 a.m. on Tuesdays



names of three children in your neighborhood. Two of the three are sure—not likely, but sure—to be injured in auto accidents during their lifetimes if the present rate continues. Or perhaps you have a sixteen-year-old boy. If he looks forward to a lifetime of driving and is exposed both to driving and pedestrian hazards, your son also is certain, by the law of averages, to be hurt in a traffic accident unless the present rate is reduced.

Not a very cheerful outlook, is it? Now let's compute the economic loss in addition to human lives wasted. Last year we spent about \$2,638,000,000 for new cars and trucks. During the same



Road illuminated with 400-candlepower incandescent lamps and reflectors. Left, types of fatal and non-fatal accidents



period accidents cost us more than \$1,600,000,000 in wage losses, doctor and hospital bills, insurance overhead and property damage. Thus for each \$1,000 spent for new cars in 1935, another \$600 went for accidents. Most of that was money wasted. Some of it was your money—paid in high insurance rates if for nothing else. Project this loss over the next ten years and you have a figure approximating half the national debt.

So there you are. Automobile accidents are costing you money whether you have accidents or not, and by the law of averages you or someone close to you will be killed or injured in one within five years if present conditions continue.

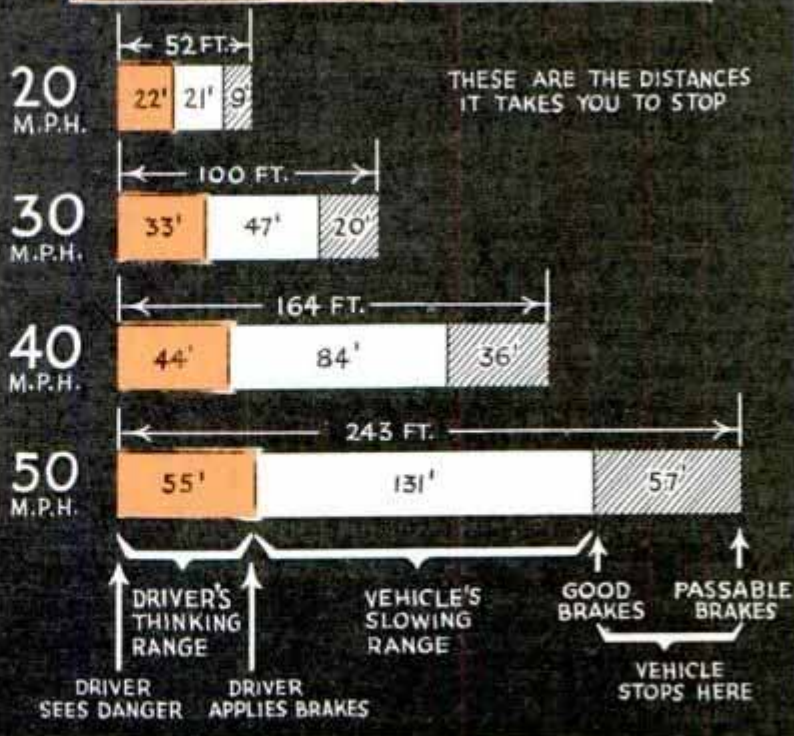
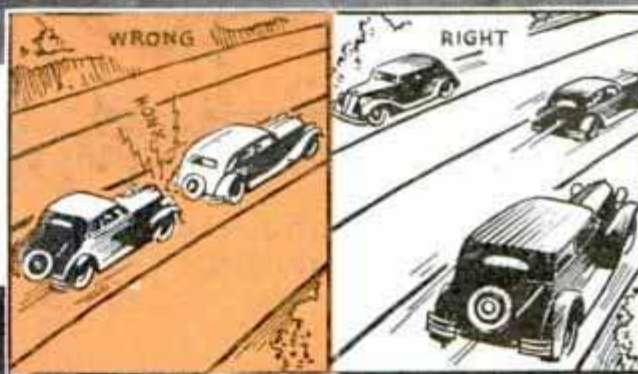
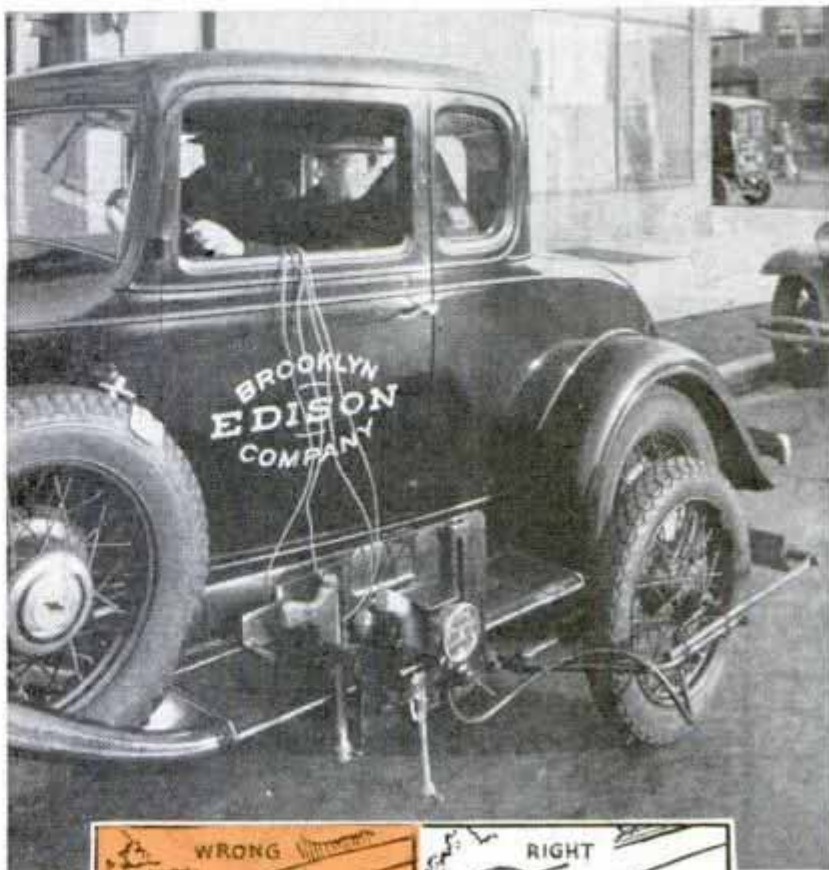
"So what?" you say. "I'm a very careful driver. A lot of other fellows are causing all this. They ought to be ruled off the highways. But why pick on me?"

Well, you'll be just as dead if the "other fellow" kills you as if you do the job yourself. And are

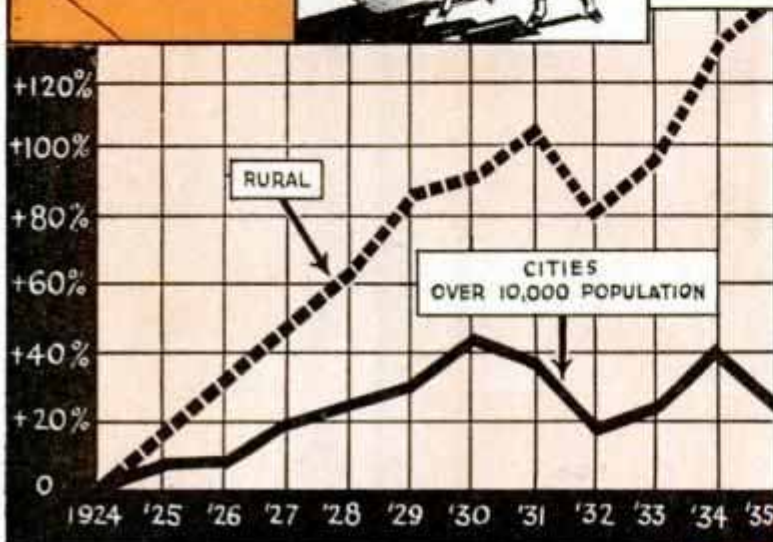
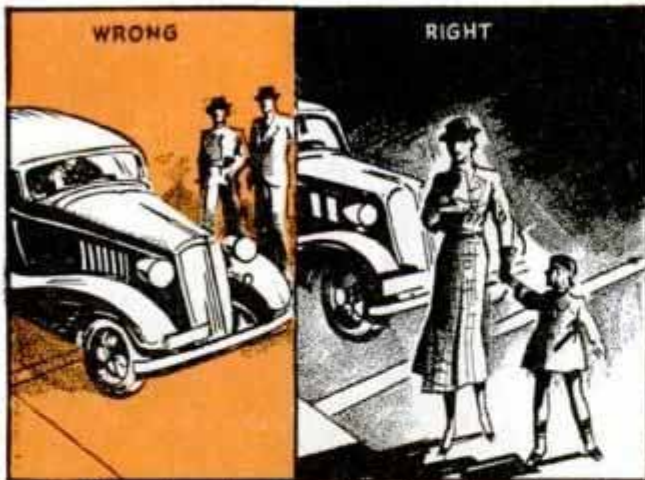
you careful every minute you're behind the wheel, or do you think you are? For every accident last year which went to pile up the grim total of death and destruction, there were literally hundreds of near accidents—situations when something almost happened but didn't. Every driver has had these narrow escapes—some call them "lucky breaks." Now accidents don't just happen; someone causes them. It's human to blame the "other fellow" but the other chap can't always be in the wrong. You've got to accept part of the responsibility, at least part of the time.

Who had all those thousands of accidents last year? Some were physically defective, some didn't know how to drive. But the great majority were competent drivers who had acquired careless habits. They went too fast, passed on hills and curves, sped through intersections, jumped the lights and did a thousand and one other foolish things until the law of averages caught up with them. They didn't actually want to have an accident, but neither did they want sufficiently not to have one.

And that's the secret of staying out of trouble on the highways today. You've got to prevent the accident before it happens. And the best way to do that is to check up im-



Distances required to stop with good and fair brakes. Top, machine for measuring reaction time and distance required to stop after driver applies brakes



mediately on your driving habits. If every one of 40,000,000 drivers discarded all careless and dangerous practices today, the deaths, injuries, property damage—and insurance rates—would drop tomorrow. If you'll overhaul your own driving practices, you'll go far toward avoiding an accident.

First, let's consider speed. Modern cars do seventy, eighty or even ninety miles an hour with ease. But can your brain go ninety miles an hour, or even sixty? Cars and highways are faster, but your reaction time isn't. And it still takes time to think. It takes about three-fourths of a second on an average. So from the time you see the heifer until the time you do something about it, your car travels about fifty-five feet if you're doing fifty miles an hour. Then after you get your foot on the brake, you need nearly 200 feet more to stop—unless you have poor brakes.

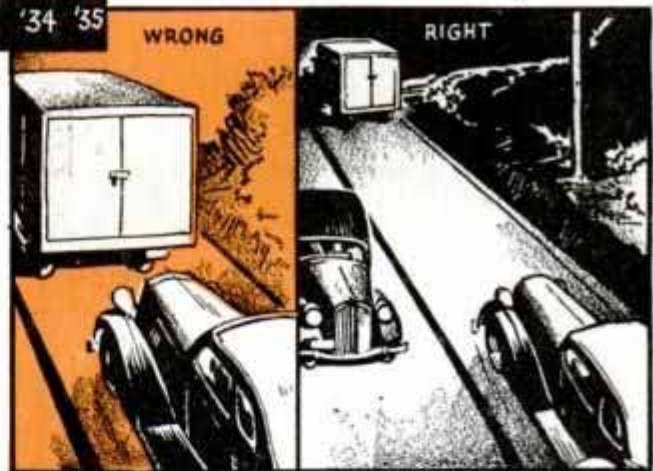
Did you ever do sixty at night on a good stretch? The chances are you were driving "blind" and didn't even know it. With good brakes and good road conditions, you need about 330 feet to stop at sixty miles per hour. Now if your lights enable you

to see only 200 feet, your stopping point at any moment is almost 150 feet beyond the distance you can see ahead. You would even be out-driving 300-foot head lamps at that speed.

Here's another startling conception of sixty miles an hour. At that speed your car has enough momentum to travel 120 feet straight up if it could "take off." So when you do sixty you might as well be 120 feet in the air if you hit something.

Just another way of saying that hitting a stationary object at sixty creates the same impact force as though the car were to drop from the top of a twelve-story building.

The higher the speed, the worse the accident. One accident in eleven is fatal at fifty miles per hour and above. At speeds of twenty and under, only one accident in sixty-one is fatal. But just driving under fifty isn't any insurance against accidents. Most of them occur at speeds under



Right and wrong ways of doing it and chart showing how deaths on open road are going up while fatalities in cities are going down

that figure. It's quite easy to determine the type of accident you are most likely to have. Just study the kind most drivers had last year.

So here's a tip that will reduce your chance of killing someone nearly fifty per cent—always be on the lookout for pedestrians. Nearly half of last year's traffic fatalities were traveling afoot. The ratio of injuries to deaths is twenty to one for pedestrian accidents. Nearly 7,000 pedestrians jaywalked to their death last year but, on the other hand, mistakes by driv-

ers accounted for about two out of every three accidents of every type. If you're in the habit of letting pedestrians look out for themselves, you stand an excellent chance of killing someone. Incidentally, school children, trained to watch traffic, made a better safety record than adults last year.

Car defects cause, or help cause, at least fifteen per cent of all accidents, it is estimated, so here's another tip. You minimize your chances of killing or being killed by proper maintenance. Poor brakes and glaring lights are the mechanical defects blamed for most such accidents.

One serious mistake in driving may be your last, so don't be lulled into a sense of security just because you're on the open road. Since 1930 traffic deaths for large cities have been declining while deaths on the open road have been climbing. And don't think you are careful just because you exercise caution in turning. Nine out of ten vehicles involved in fatal accidents last year were going straight ahead. Even at intersections, most accidents involve vehicles going straight ahead. If you cross the center line occasionally, or pass on a hill or blind curve, you should be interested to learn that twenty-six per cent of all fatal accidents and fifty-eight per cent

(Continued to page 125A)

Latest Clock Has a "Voice" to Announce Time

Sleepyheads may be awakened in the near future by a clock which announces



in clear tones, "Seven o'clock," or whatever the hour may be. Such a clock has been developed by a communications laboratory. It has an odd caricature face and a "voice" circuit which will put the exact hour into words.

It is synchronized with a nationwide time service. The clock may be used as a train announcer, with a microphone connected into the speech circuit for making announcements other than telling the time.

Handy Kitchen Wrenches Have Rubber Teeth



Rubber-toothed wrench is put to varied uses around kitchen lifting hot dishes and gripping jar lids

Saving the hands from cuts and burns, two wrenches with rubber teeth or jaws serve many purposes in the kitchen. One is handy for canning, serving to lift hot jars or cans from the water, to hold the jar while the cap is tightened or loosened, to grip wide-mouth jars and to lift potatoes, corn, bottles and cans from hot water or the oven. The other wrench grips the cap of any screw-top bottle, jar or can, removes hot pans and pots from the stove, removes hot lids from cooking vessels, lifts hot clothes from washer to wringer, cracks nuts and is strong enough for a pipe wrench.

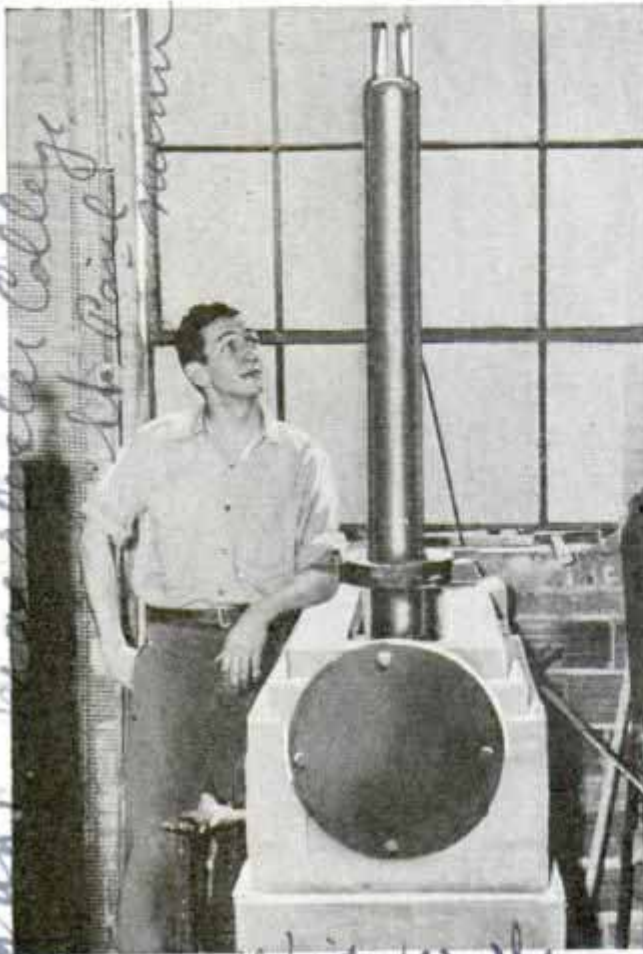
Wright Clock Co. 1935 Broadway New York

Espritale - Cabote
United Sales Corp. 37 W. 22nd St. New York, N.Y.

Wright Clock Co. 1935 Broadway

Rochester NY

F1051
**Gas Extracted from Clover
by Inexpensive Process**



Wide World
This is part of the apparatus with which commercial gas may be extracted from clover

Dr. Wm. D. Williams, Nashville and Harold G. Williams, Chicago, Minn.
Claimed to be commercially practical, a process for extracting gas from roadside clover has been discovered by two Minnesota chemists. After manufacturing gas in their plant for several months, the chemists announced that 3,000 acres of clover would be sufficient for making a year's supply of gas for St. Paul's domestic and industrial users.

F1022
**Popular-Size Films Developed
in Adjustable Tank**



Amateur photographers can develop their own films in an adjustable tank which is made to accommodate various popular sized films. Just made available, the tank

will hold a quart of developer and is of stainless acid-resistant steel. The exposed film is wound on a reel in the darkroom, immersed in the tank of developer and covered. The rest of the process can be done in daylight, for the tank cover has a light-trapped opening through which solutions and rinsing water can be poured in or out without exposing the interior. The film remains in the tank until ready for drying. To change from one size film to another requires only a shift of the upper flange from one notch to another.

F1052
**Sunlight Cast into Dark Rooms
by Automatic Reflector**

Several hours of sunlight can be cast into dark rooms of city apartments and hotels by means of an automatic reflector. The device follows the sun whenever it is visible, sets its mirrors to catch its rays and then reflects them by a complicated series of prisms and mirrors to any 1,300-foot square area desired. The machine may be set up on the roof of an adjoining building to reflect the sunlight into rooms located on inside courts or perhaps on air shafts of large buildings.



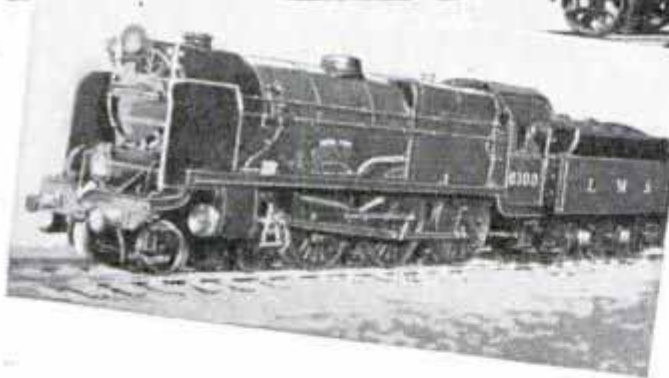
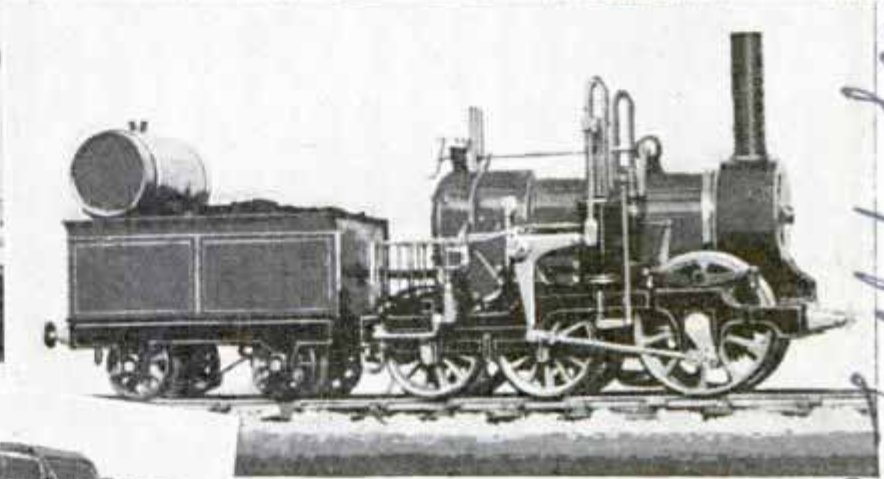
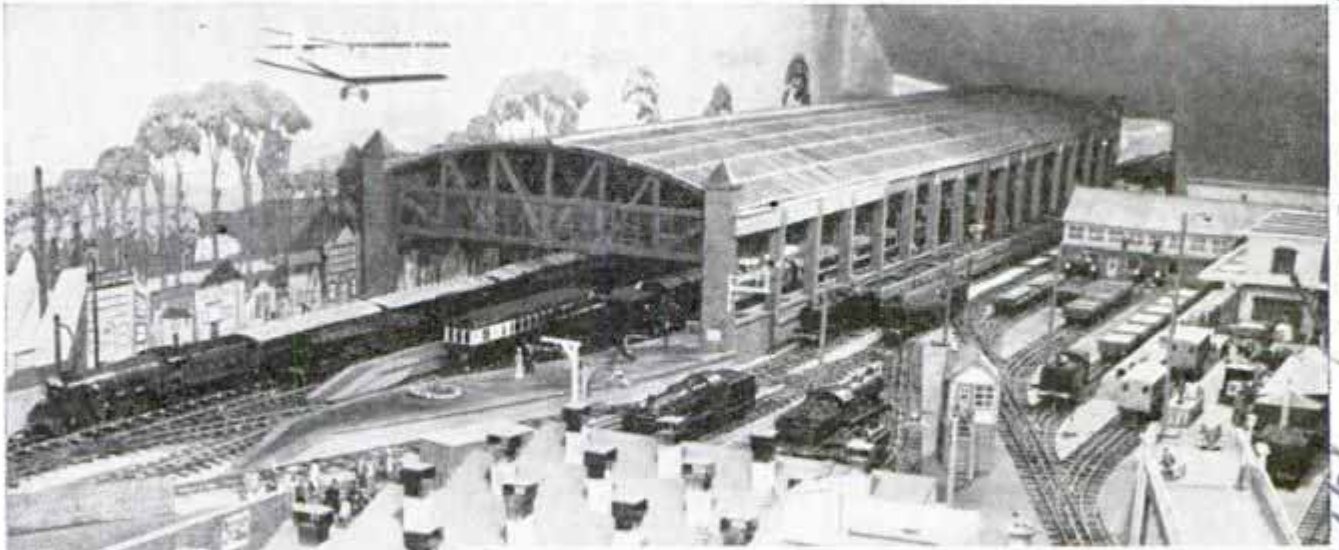
Wide World
This odd arrangement of mirrors reflects sunlight into rooms on dark courts and airshafts

Dr. Wm. D. Williams, Nashville and Harold G. Williams, Chicago, Minn.

Wide World
Dr. Wm. D. Williams, Nashville and Harold G. Williams, Chicago, Minn.

Wide World
Dr. Wm. D. Williams, Nashville and Harold G. Williams, Chicago, Minn.

Famous Trains in Miniature on Model Line



Several views of model railroad. Note the two miniature engines which are exactly like locomotives famous in English railroading circles

Operating on a model railroad constructed in Scotland are the miniatures of such famous trains as the Rocket, Royal Scot, Princess Royal, Cock O' the North, Flying Scotsman, King George V and others. The line is 800 feet long and its rolling stock consists of more than thirty locomotives, 100 freight cars and fifty passenger cars. The track has seventy switches, both electrically and manually operated. All locomotives, and the automatic couplings fitted to all cars, are controlled from one control board. The entire system is electrically interlocked. The track runs through six tunnels and is illuminated by more than 300 miniature electric lamps. The builder, C. W. Meredith, has spent thirty years on the model railroad. Sitting at the switchboard he can break up trains, shuttling cars and locomotives from one track to another, and perform many other intricate movements of the trains.

F1020

Electric Unit Sterilizes Dirt and Eliminates Weeding

Inexpensive sterilization of dirt is possible with electrical equipment consisting of four heating units with mountings. The florist or specialty grower builds these units into a wooden vat or container. Dirt to be cleaned of plant enemies, such as weed seeds, insect life and fungi, is placed in the container and the electricity turned on. A thermostat maintains automatically temperatures of 160 to 180 degrees Fahrenheit, raising the temperature of the soil sufficiently to destroy the plant enemies.

Em. G. Sabod - Smith American Council
Sturbridge - Scotland

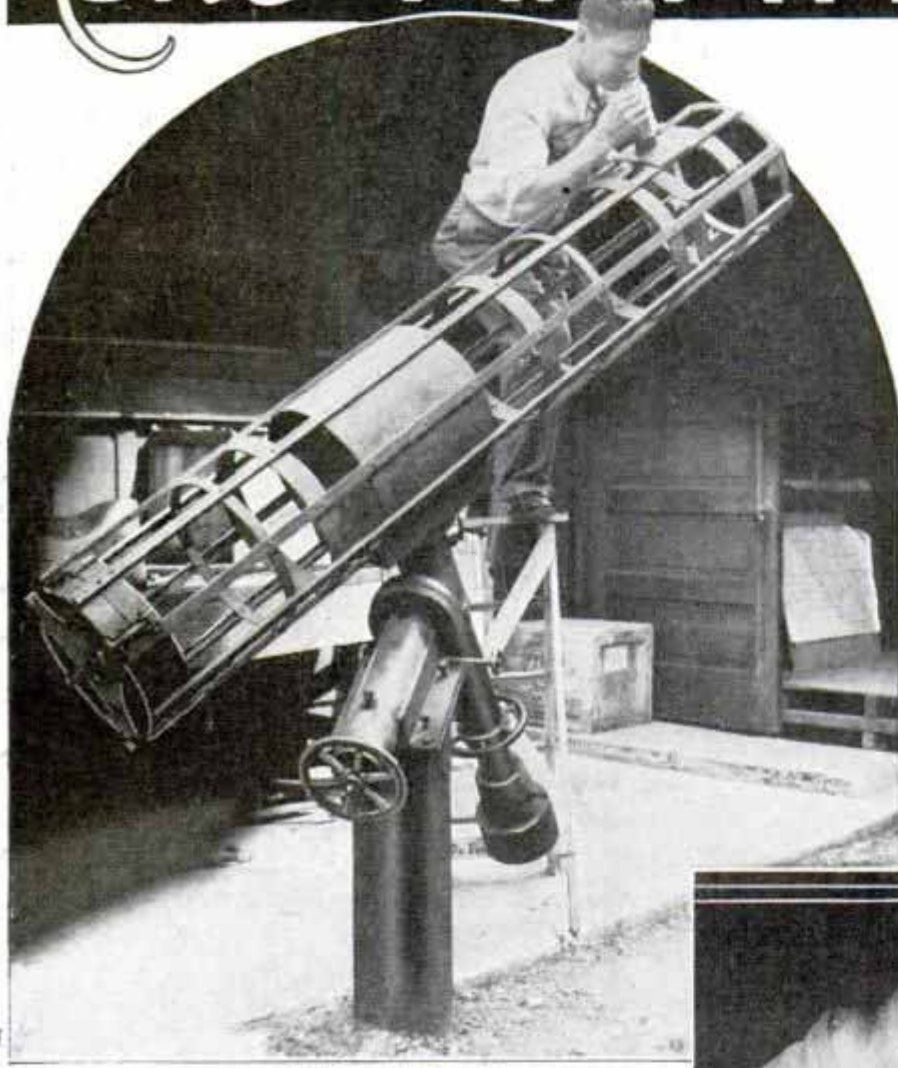
built by C.W. Meredith

General Electric

F845

10555 Hulman Ave
Los Angeles Calif

The AMATEUR



"This leaves several spectacular fields of research open for amateurs," says Porter, who is acting as consultant for the new 200-inch giant telescope in California. "One of these is hunting for new comets and another is looking for some of the minor planets. Lunar occultation is another field in which amateur astronomers can do important work. The moon is not as steady as you might think and is often ahead of or behind schedule. We know the stars are steady, so by taking the exact time at

FOR a few dollars you can create an observatory in your back yard and with a homemade telescope explore the sky for new comets and planets.

Amateur star gazers are on the job in all parts of the world and frequently a member of this star patrol finds a new dot of light in the sky. It may be a new comet, an unknown planet, or a faint star that suddenly has exploded. Amateurs are actually beating professional astronomers in discovering new heavenly bodies.

The reason for this, explains Russell W. Porter, "patron saint of amateur astronomy," is that professional astronomers are usually busy on special problems and hardly have time to sweep the skies on the chance of spotting something new. Also, the large instruments of the observatories have small fields of vision which permit only tiny patches of the sky to be observed at a time.



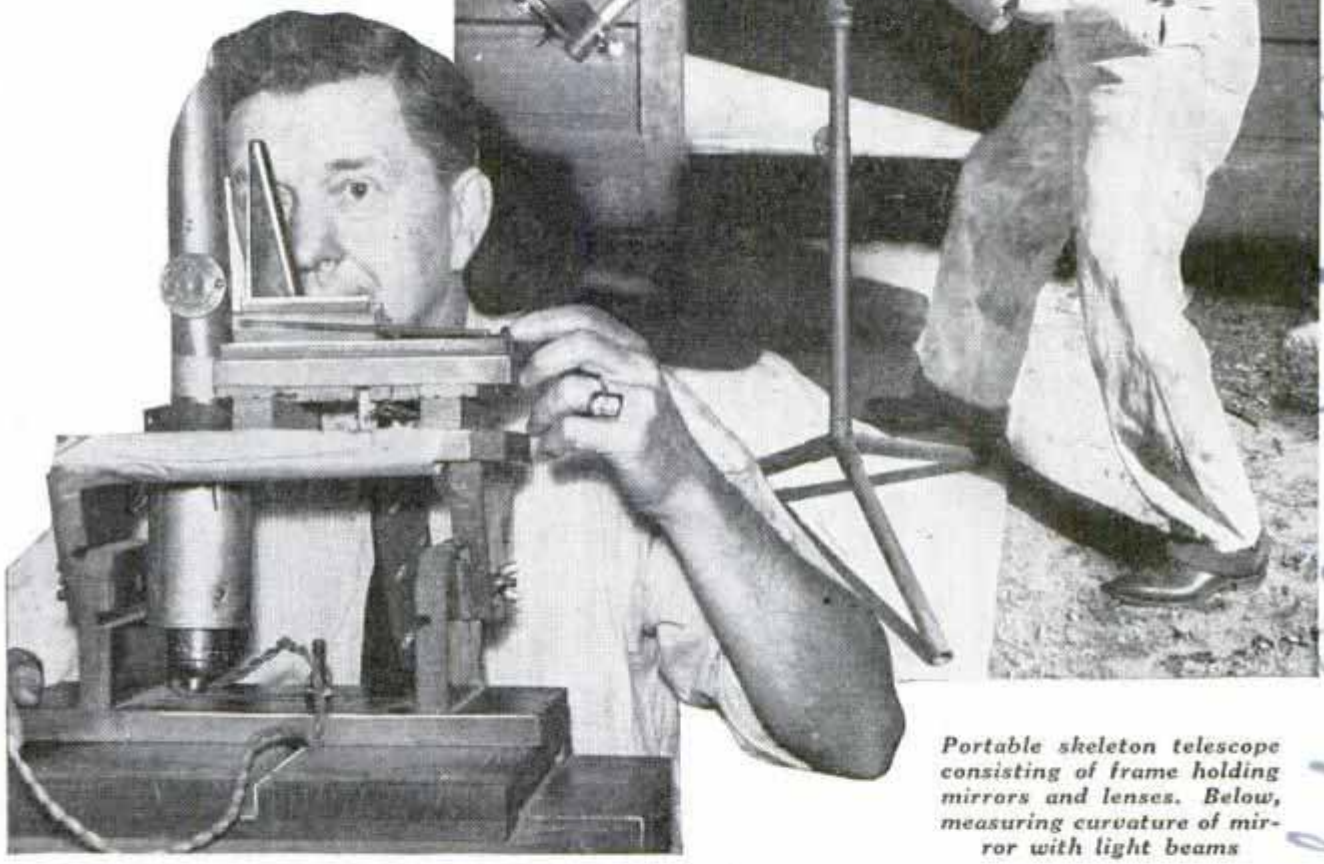
Polishing surface of twelve-inch mirror, and large amateur telescope with skeleton tube

Left. Making - \$3.00. + 895.

SKY PATROL

which certain stars go into eclipse, behind the moon, amateurs may collect facts from which the reasons for the moon's behavior may be found.

"Small comets that go parading back and forth through the solar system are often observed by am-



Portable skeleton telescope consisting of frame holding mirrors and lenses. Below, measuring curvature of mirror with light beams

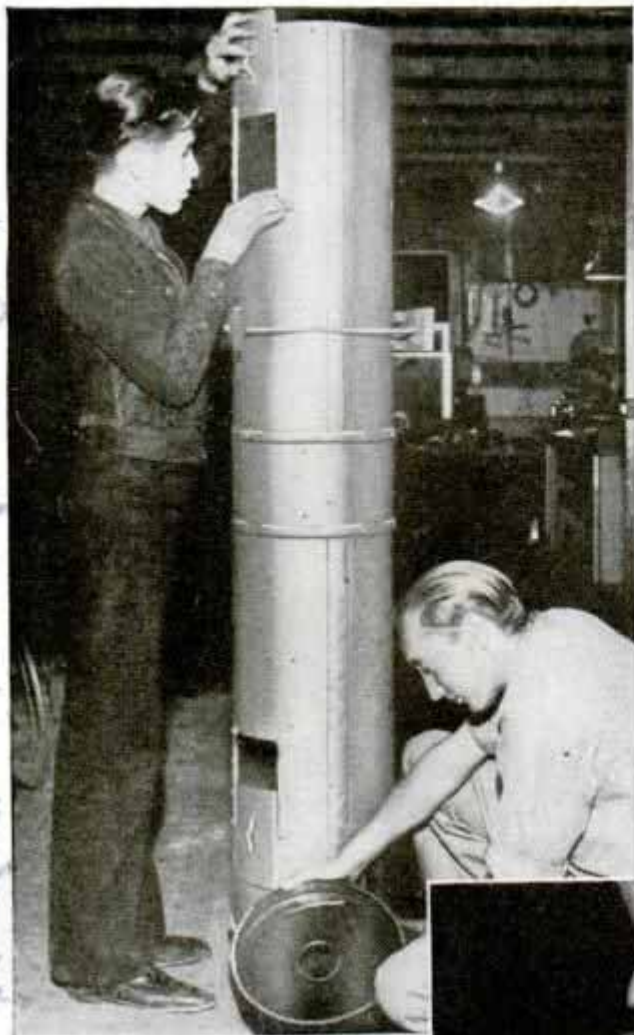
ateurs and when a new one is found the comet is usually named after its discoverer. There are thousands of small planets in our solar system about which little is known. Most of these are too small ever to be seen, but it is probable amateurs will discover a few more of the larger masses among the minor planets.

"Professional astronomers are also aided by amateurs in the study of variable stars. These wax and wane in brightness. The amateurs keep track of the varying brilliance of these stars and draw up charts of their behavior for the observatories.

The sensational 'blowing up' of 'Nova Herculis,' a star normally 20,000 times brighter than our own sun, was first observed by an English amateur. In less than a month's time after it started to expand, 'Nova Herculis' increased its brilliance 160,000 times. Most of the variable stars observed since the beginning of the century were first found by amateurs."

Strange as it sounds, you can usually see the stars much better with a home-made telescope than with the mightiest instruments of the observatories. Small telescopes reveal the stars as steady, bright

Telescope built at the Newtonian Engineering Astronomical Society, 2608 W 8th Los Angeles.



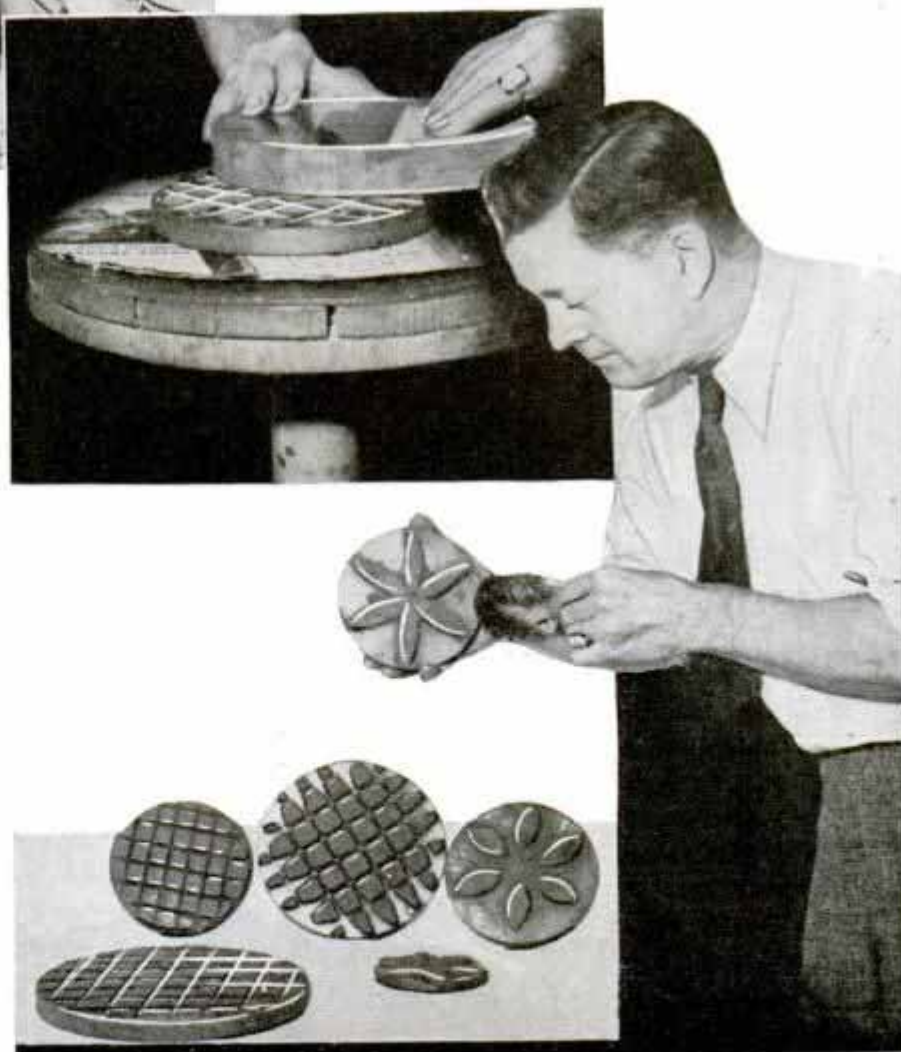
time with the vibrations. "Seeing" is usually much better after midnight when the atmosphere has cooled off.

Early this year an Ohio draftsman, Leslie C. Peltier, discovered a new comet with a six-inch telescope he made himself. A few months later the comet was only a couple of light-minutes away from the earth and was the first that could be seen with the naked eye since 1927. Peltier made his first telescope eighteen years ago and is the discoverer of two other comets, as well as co-discoverer of three more.

Amateur telescopes are simple affairs, consisting of a curved glass reflecting mirror, a small mirror mounted diagonally above the main mirror to reflect its gathered light outside the tube, and an eyepiece that magnifies the image. These parts are assembled on an equatorial mounting that allows the telescope to be pointed at any part of the sky.

You can build such an instrument for

pin points of light, while in the larger telescopes the stars seem to dance and jiggle. Even the moon trembles and blurs. Planets are just as hard to see, although through amateur telescopes the planets appear to be bright, steady disks. This is because with the largest telescopes the "hot stove effect" of atmospheric disturbances is very pronounced. The twinkling of a star becomes a steady dance and astronomers must wait for exceptionally quiet nights to make visual observations. Routine stellar photography, however, may be made at nearly any time because the astronomers guide their cameras to keep



Top, tube and "doughnut" mirror of twelve-inch telescope. Center, polishing mirror for small telescope. Bottom, polishing tools used to create final curve on mirror glass

about \$12 and up, although one amateur completed his for a cash outlay of \$1.50. He found a thick piece of glass suitable for grinding out a curved mirror surface and used the lenses from an old pair of binoculars for the eyepiece, mounting them in a wooden spool. He picked up enough pipe and tubing in a junk yard to make a rigid mounting.

Glass for a mirror six inches in diameter costs about \$3, or you can use the heavy pane from a ship's porthole. Sections of large stovepipe or heating pipe make a satisfactory telescope tube although a solid tube is not necessary. A skeleton tube or merely a framework to hold the optical parts in position is enough. A good mounting on which to place the telescope can be assembled from the gears and rear end of a junked automobile. Many amateur telescope clubs assemble all the necessary parts into inexpensive kits which the members buy.

(Continued to page 116A)

T1010
**Midget Radio for Policemen
 Is Carried in Pocket**

Latest equipment for the English bobby is a miniature radio receiving set with which he picks up instructions from police headquarters while on duty. The set is so small that the policeman carries the complete outfit in his pocket.



Will World
 Listening in on a London bobby's pocket radio set to orders broadcast from police headquarters

T820
**Twenty Miles to the Pint
 Is Motorcycle's Record**



Economical motorcycle has its "outboard" engine mounted over the front wheel.

One hundred twenty miles on less than three quarts of gasoline is the record of an "underslung" type motorcycle built by a Los Angeles man and exhibited at the San Diego exposition. Its wheels are less than knee-high and equipped with balloon tires. The one-cylinder motor drives the front wheel with a belt.

T1040
**Fruit Trees Fed from Bottles
 to Speed Up Growth**

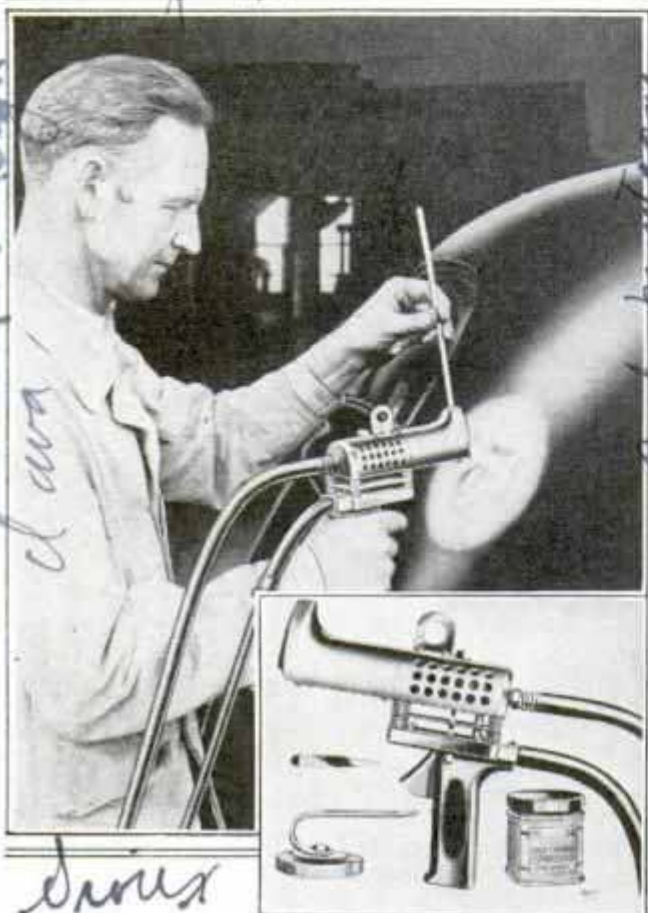
Fruit trees in a Kent, England, research station are being grown on nourishment fed them from bottles, much in the manner of rearing babies. Small holes are made in the tree trunk for insertion of the ends of flexible tubing connected to inverted bottles of special chemical solutions hung in the top limbs. The trees absorb the chemical plant foods direct. Water may be supplied the trees in the same manner during droughts. The bottle-feeding method speeds up growth and makes possible direct feeding of any part of the tree which may be undernourished.

The Director, East
 Malvern Research

Click! Handley too! Call
 station, Mr. Wardstone.

Spray Gun Applies Solder and Heats the Metal

9 42.50



Spray gun for applying molten solder which is melted by electric element inside gun

any voltage, inc. 220
 Similar in principle to the paint guns used for applying lacquer, a spray gun has been developed for applying molten solder under pressure of compressed air. The tool eliminates the need for torches, soldering irons and liquid fluxes, the special body solder in bar form which is used being melted by an electrically heated element inside the barrel of the gun and converted into metallic spray by compressed air at a pressure of seventy pounds. The flux is part of a special compound in paste form which is applied to the surface being treated with a felt pad furnished with the gun. Little of the heat of the tool and the molten solder is transmitted to the metal panel, so the danger of igniting inflammable materials in contact with the panel is eliminated. A trigger switch controls both heat and air pressure. The gun is particularly adapted to filling dents in automobile fenders and bodies without removing the parts from the car. The secret of the tool's success lies in the ab-

presence of grease and dirt on the metal panel. A power sanding machine is used to remove paint, primer and rust before soldering and for smoothing the finished job.

Salt Makes Gravel Roads Dustless

Highways are being "salted down" in the Canadian provinces of Ontario and Quebec and rural sections of the United States. Experiments in Nova Scotia indicated that salt not only lengthened the life of clay and gravel roads but virtually eliminated dust. Salt mixed in the clay retards the evaporation of moisture when the road is first laid, and the growth of salt crystals as the road dries out tends to diminish shrinking and cracking.

Folding One-Wheel Trailer Has Beds for Four

Traveling on one knee-action swivel wheel, a folding trailer, which opens up to seven times its original size, has beds for four, a table which folds into the floor, refrigerator, food compartment, storage space



One-wheel trailer which folds into compact unit on road and expands into a home when parked

Albertson Co. Chicago Ill.
Clara
Emb. machine
Stewart Trallette Park
W.S. Co. Chicago Ill.
W.S. Co. Chicago Ill.

Special one
McLell Univ. Montreal

F 104 6

F 1013

Stewart
Yorkers
A.K. Stewart & Son

for stove and cooking utensils, six compartments for linen and toilet articles and two clothes drawers on the sides. The folding beds have mirrors and clothes hangers on the back. The trailer, which can be opened and set up for sleeping in a few minutes, may be parked independently of the car on folding legs with adjustable jacks. Canvas for spreading over the trailer can be set with four legs, making a canopy eighteen feet long and eight feet wide. Ten persons can be seated in the trailer when the beds are not in use. The chassis is connected to the bumper with double hitch brackets. Folded, the trailer is forty-seven inches wide, seventy-two inches long and twenty-four inches high.

Television Sender on Truck Transmits Olympic Pictures



Making movies of Olympic games atop a truck, preparatory to developing the film in the truck and transmitting television images

7963

Portable Hammock and Stand Handy for Outing

Easy to pack and carry, a new portable hammock with its own stand is handy for outings, the lawn, the porch or the penthouse. The stand comes apart for carrying. Upon assembly, the stand has hooks at each end for swinging the hammock.



Portable hammock with its own stand which comes apart for carrying and thus can be taken along on outings

During the recent Olympic games in Germany, experiments were conducted with a portable television transmitter mounted on a truck which could be moved about to record the various contests as they occurred. On the roof of the truck was a moving picture camera which made movies of the games. The film was developed in the truck and then run through the transmitting apparatus.

If you open your fountain pen in an airplane at high altitude, the ink will spurt because of the reduced air pressure.

New York 385 Madison Ave

Vagabond \$18.00

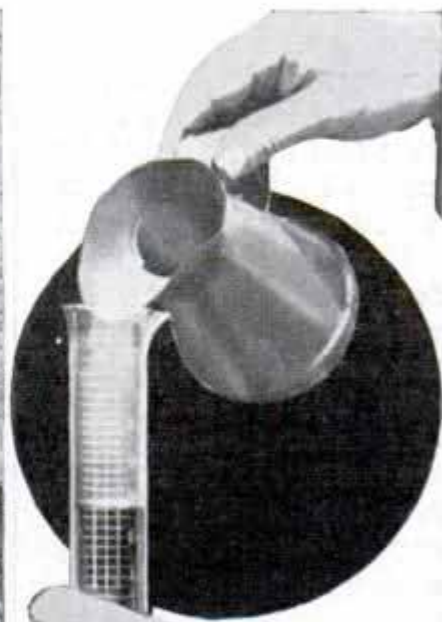
Marshall Field

Post Office

Wayne Univ. Eng.

Fisher Radio Co 11

Short-Measure Gas Costs Autoist Millions



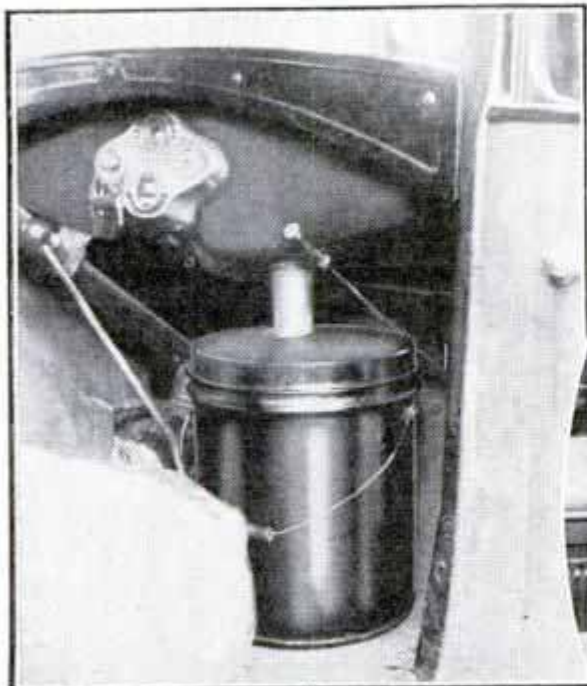
Due to ignorance or outright dishonesty of some filling station operators, automobile owners are paying millions of dollars each year for gasoline they never receive. Among the reasons for short measure on gasoline orders are: failure to prime the pump, failure to properly drain the "dry" type of hose; deliberate shutting off of the gas flow before the ordered quantity has been placed in the customer's tank; shorting the customer when he orders gas and then leaves for the rest room, and defective pumps. Top, left, inspectors pouring test order into measuring can. Right, measuring gasoline left in improperly drained hose. Below, "wet" nozzle with valve at end requires no draining because it is supposed to remain full at all times

add instructions to the inspectors

dist.

... ..

How to Get All the Gasoline You Order



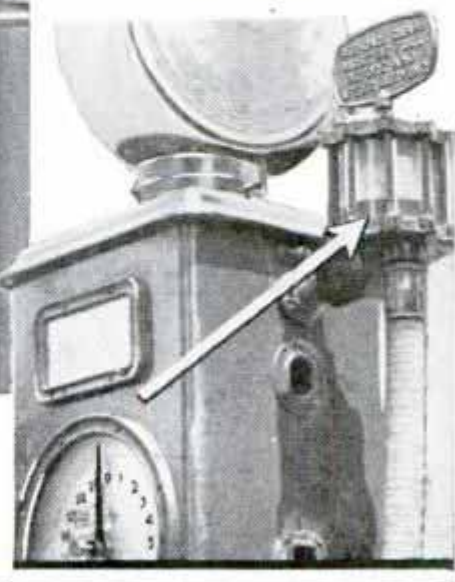
Above, concealed can in inspector's car received test order of gas which then was poured into measuring can as evidence of shortage



Above, improper way to drain "dry" type of hose. This type has no valve-controlled nozzle and motorist should receive all the gas in the hose. Bottom, left, proper way to drain hose so motorist gets what he pays for. By holding hose in this manner, all the gas runs out of line into customer's tank. Shortages up to one and one-half quarts result from improper drainage



Right, arrow points to the visi-gauge on gasoline pump. Note that the gauge is only partly full, indicating that the pump has not been primed. When the gauge is in this condition, the motorist does not get full measure. Inspectors warn customers to watch the gauge on this type of pump. Where portable pumps and old-style pumps without gauges are used, the customer is forced to rely on operator's honesty



Sinker Mold for Fisherman Turns Out Six Sizes

F1000.

Specialty mfg Co. East Liverpool
Hall's A East Ohio
Bor 7/3
B. B. Exchange Exchange



Sinker mold for the angler which turns out smooth, balanced pellets in six sizes

Fishermen now can pour their own sinkers with the aid of an inexpensive mold which turns out smooth, balanced lead pellets in six sizes. The angler can pour six sinkers at a time, or any single size in the series desired, the weights ranging from one-fourth ounce to two and one-eighth ounces. Two sets of eye rods are supplied so a second pouring can be made while the first is cooling. The mold is assembled and heated, after which it is ready to receive the hot lead.

Sound Film Traps Criminals by Recording Conversation



While the dictaphone has trapped many criminals by their own recorded words, its records can cover only a small space of time unless they are changed frequently. To over-

come this difficulty, Ivan Eremeeff, sound engineer, has developed an apparatus which automatically records every sound in a room for a week and the time it occurred. The apparatus has been made possible by the high development of micro-recording on a sound-film track. A sound film thirty-five millimeters wide can carry as many as ninety-six sound tracks. With 3,000 feet of film and ninety-six sound tracks available, a week's conversation can be recorded. A small concealed microphone picks up the sound. The recording apparatus is driven by an electric motor and can be located at a distance from the microphone. A repeater winds the film which passes over the recording apparatus again and again. Knowing the rate at which the film runs, it is simple to find the time any sound occurred.

Camera "Sees" Black Lightning as Bolt Hits Monument

When lightning struck the Washington monument recently, a cameraman snapped the picture and captured the image of both



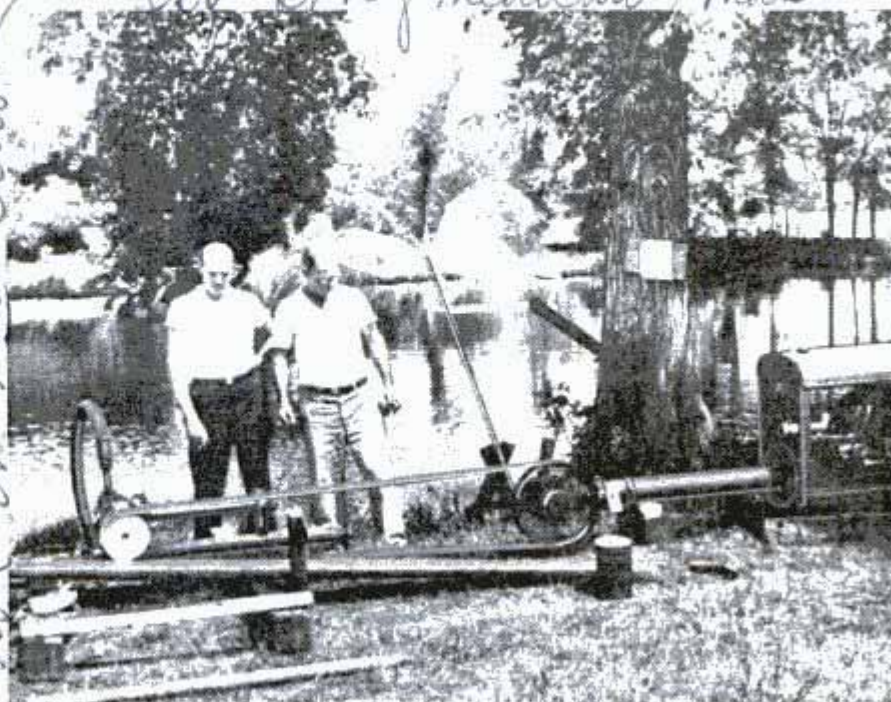
Harro & Conroy © The Washington Post
Picture taken as lightning struck Washington monument. Note "black" lightning at tip

Cheshin and 6/6
Phela

2094 January

the black and white light in the bolt. The black lightning, which appears on the photograph as streaks at the tip of the monument, is a photographic mystery. Dalvert M. Little, chief of the U. S. weather bureau's aerological division, says that scientists have never been able to explain black lightning. One theory is that the peculiar wave length of the light causes a chemical reaction on the photographic plate, making a black streak instead of a white one.

Pumps Save Fish from Death by Aerating Water in Stream



Saving fish from heat and lack of oxygen in water with aid of pump which throws fine spray into air where it picks up oxygen

Mask Guards Pilot of High-Flying Army Plane

For altitude tests in which the plane ascends to levels where the air is very thin, the British army pilot dons an oxygen mask which gives him an odd appearance. The mask supplies oxygen to the pilot when high altitudes are reached, protecting him against dizziness and difficult breathing.



Oxygen mask which protects British army pilots when they reach very high altitudes

Trout in one Massachusetts pool were saved from death from heat and lack of oxygen during the hot weather by aerating the water with the aid of three pumps which threw fine spray into the air. The water thus treated picked up sufficient oxygen from the air to supply the fish.

Census of Bacteria Population Shows Billion in Gram of Soil

When the census taker calls on a bacteria colony he needs a high-powered microscope and a high-powered adding machine. Scientists at an English agricultural station took the census of living organisms in a sample of ordinary soil. In a gram of soil—one twenty-eighth of an ounce—there were from one to four billion living bacteria, a million particles of spores of mold fungi and more than a million protozoa, tiny animals slightly larger than bacteria. In rich, well manured soil the bacteria population was even greater.

Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Long meadow Mass

How and when built

710 31

Acme

The Director Rothamsted Agricultural Station, Harpenden, Eng.

Wid. world



The LATEST

By Bob Becker

ALTHOUGH the right kind of gun, shells and hunting ground are of primary importance to the hunter, the experienced shooter knows many a trip can be spoiled by lack of the right kind of accessories. A \$500 shotgun of the correct gauge won't keep a hunter comfortable in a duck blind if he has the wrong kind of boots. And the hunter who hasn't the right kind of raincoat, can't enjoy a rainy day in the marsh even though he has the latest long-range ammunition.

Here are a few tips on clothing, boots, mittens, and other things which often mean the difference between pleasure and discomfort on a trip. Nothing is quite as important in the hunting field as correct shoes or boots. Cold feet, wet feet or footgear too tight or too big can spoil a trip. The sportsman in a mild climate can choose lightweight leather walking or field boots for winter hunts while the sportsman of the north has a choice of fourteen-inch or sixteen-inch waterproofed leather boots, or a combination made of both rubber and leather for slushy, snowy weather.

For ordinary field shooting in



Top, left, a well-equipped hunter. Note duck call on string, metal shell box in boat and heavy mittens. Top, right, upland game shooting calls for the lightweight leather boot. Center, handy game carrier and a dry-weather hunting scene in contrast to the one at bottom which really tests the hunter's equipment and clothing

2988



for the HUNTER

of Chicago reference Chicago

fairly dry weather many use a lightweight leather boot treated with a liquid dressing to increase its water-resisting qualities. With all-wool socks it offers real foot comfort. When the walking is very wet, the hunter can keep as dry as the Sahara by putting on a "pac" that has a foot of rubber and top of leather. You can use a lightweight all-rubber shoe or boot with a fourteen-inch top. Here's a trick to fix up the rubber and leather pac. First, have your cobbler put in removable arch supports. The boots naturally are roomy and fairly flat. By adding the arch supports your feet will not tire as quickly. If you like more heel on the boot, glue small rubber heels inside. Rubber is cold, but by adding a felt inner sole your feet will stay warm in cold, snowy weather.

In buying hip boots for waterfowl shooting, consider whether the major use of the boots will be in moderate weather or on very cold days. Also, do you have a lot of wading in water and mud? Many use two different types of boots for the two purposes. One model, fairly new on the market, is ideal for plowing the mud. It is a snug, "form-fitting" boot with ample foot and leg room, yet con-



Top, left, duck shooting on ice, a situation calling for sheep-lined moccasins in boots and trap-door mittens. Top, right, this hunter is uncomfortable in the blind because he has no seat. A combination shell box and seat is available. Below, hunting on ice for ducks, a handy boot drier and a winter hunting trip which requires proper clothing



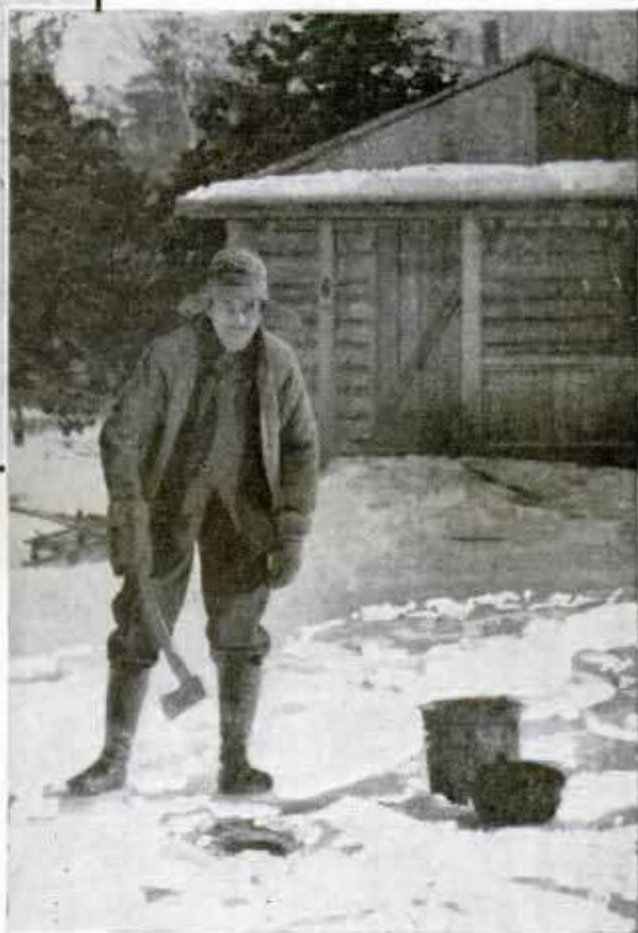
main parts are made of horsehide, reinforced by a knit top of pure wool. This fits the wrist snugly. The palm of the mitten for the right hand has a slit in it with a tiny "trap door" over it. To shoot, you just stick your trigger fingers through the trap door. Back they go into the mitten when the shooting is over. Another practical garment for the duck hunter is the rubber glove for picking up decoys. Taking in block decoys on a cold, windy day is hard on the

structured around the ankle so the mud can't pull it off. This is a lightweight model ideal for marsh hunting.

For cold weather, there is a boot available that is entirely different. This one has almost no ankle or instep because it is made to take a wool-lined moccasin. If you suffer from cold feet, try these boots with the moccasins. When you put them on, tighten up the straps over the insteps and you need not worry about losing them in the mud.

Rubber boots always get damp during a day's use. Hanging them up by the feet to dry out is not easy and the same problem comes when it is time to store them for the season. It is unwise to hang them by the tops because they get out of shape. A folding metal device weighing just six ounces makes the job easier. It attaches to the foot of the boot and holds it securely so the boot will drain and ventilate.

Next to the feet, the most important comfort problem of the hunter concerns the hands. For cold-weather hunting, many prefer the trap-door mitten. The



Two hunters equipped for ice, cold and snow and a serviceable, lightweight hunting boot

hands but these rubber gloves give complete protection as they are waterproofed and lined with wool fleece.

But if there is any one accessory the hunter finds a tremendous help on cold days, it's the little heat pack that can be "started" by simply adding water. For the man who waits on a deer run when the temperature is low and the ground is covered with snow, for the duck hunter in a

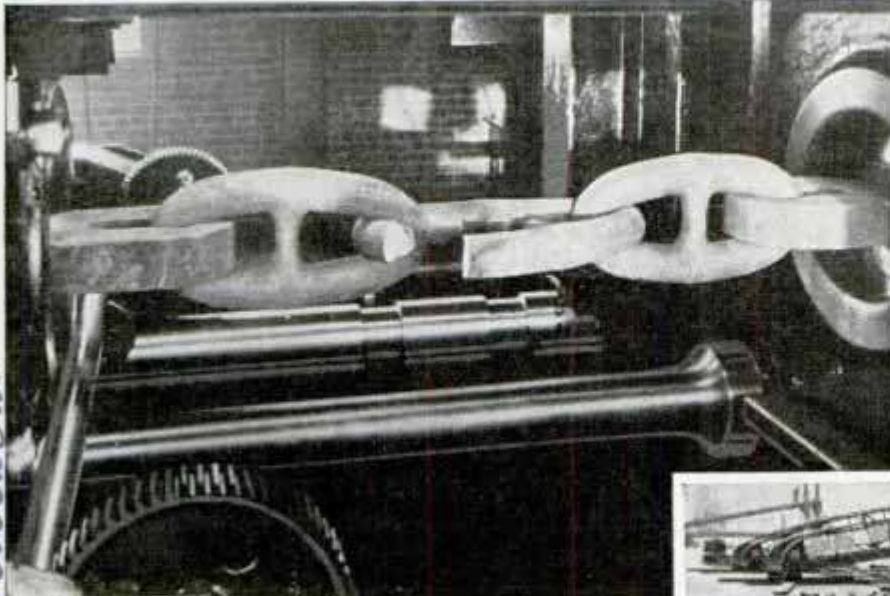
(Continued to page 146A)

1976

Long + Co
steel mfgs

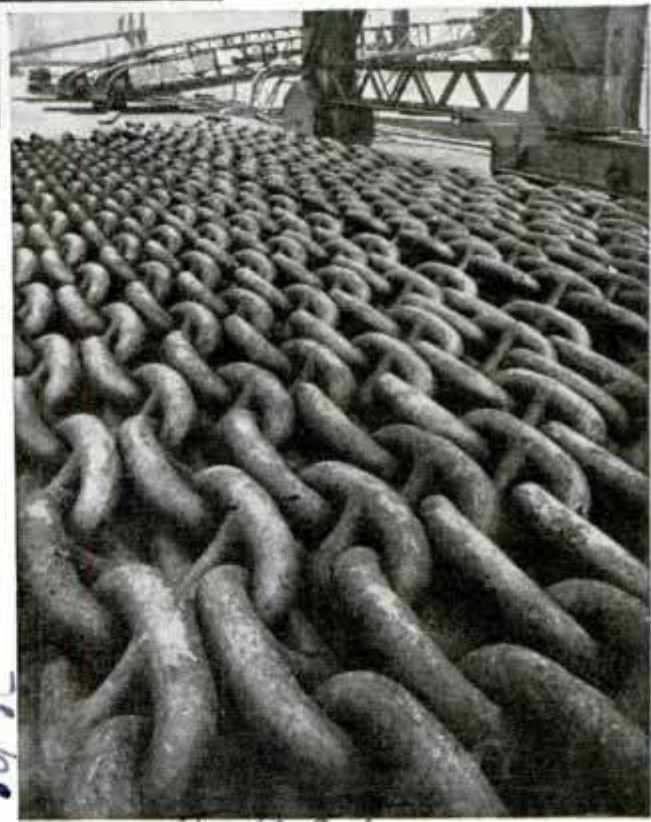
Liner's Anchor Chain Tested to Destruction

Middlesbrough
England



Left, here is what happened to a three-link section of the "Queen Mary's" anchor chain when a force of more than 600 tons was applied. Below, lengths of the liner's massive anchor chains ready to be placed aboard the ship

Walton



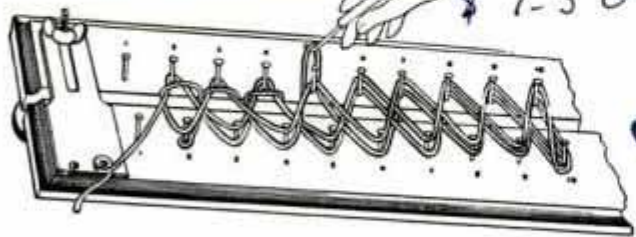
Before the liner "Queen Mary" went into service, her giant anchor chain was tested to destruction. In the first test the whole chain withstood a pull equivalent to 289 tons. Then three-link sections of the chain resisted a pull of more than 405 tons without signs of breaking. In a final test, the pulling machine exerted a force of 693 tons before a link fractured. Two similar three-link sections parted under pulls of 657 and 690 tons, respectively.

7996

Knitter with Numbered Keys Makes Hard Stitches Easy

Knitting is made easy for the novice with the aid of a knitting board fitted with two rows of sixty-five numbered keys each, making it a simple matter to follow instructions, even for complicated designs and stitches. A two-foot rule is stamped

\$ 5.50 - doll clothes
\$ 1.50



The numbered keys on this knitting board make it easy to form intricate patterns

on one side of the loom for measuring the work and a small counting device makes it easy to keep track of the number of rows knitted in making a garment.

The Peltone Co,

Poison Found for Locusts

Sodium arsenate has been found effective in poisoning locusts in Argentina where the pests destroy about thirty per cent of the country's crops. The country is obtaining more and larger machines to spray and sprinkle this poison during the autumn and winter when the locusts have to cross the desert regions, and again in the spring when they move south. Many methods have been tried in Argentina to combat the locust plague but none has been entirely successful. One of the most common methods has been to erect sheet-metal barriers to divert the insects into trenches where they can be destroyed.

71025

Dept. of Commerce

Ministry of Agriculture

Reported by Trade Commissioner
G. D. Walbridge
Bureau of Census

Electrical Robot Tells the Time Every Three Seconds



Listening to sound-track voice which recites the correct hour and minute every three seconds

Utilizing sound track movie film, an electrical robot operated by a synchronous motor tells the time in a loud, clear voice at three second intervals. It was designed particularly for use by radio stations and metropolitan telephone exchanges. There are two small endless belts of sound track film, less than twenty feet long; hours are recorded on one and minutes on the other. A scanning optic and photoelectric cell travel the length of the film and return every three seconds, and at the end of each trip the exact time in hours and minutes is announced. After twenty trips a cam moves the minute belt one notch, changing the time and the oral announcement; after sixty moves of the minute reel the hour film is moved up one notch. For advertising purposes, sound track carrying the name of an advertiser could be inserted for announcement with the time.

Fruit Is Kept Free from Decay by Iodized Paper Wrapper

Thin wrapping paper slightly impregnated with iodine is used in England to keep oranges, tomatoes, apples, peaches, plums, grapes and other fresh fruit from decaying. It was found that iodine pre-

vented the formation of mold on the fruit during shipment and storage, thus saving considerable loss. The small amount of iodine does not affect the flavor, nor does it hasten nor delay the ripening of the fruit.

Shielded Loop Antenna Helps Pilot Keep on Course

Enabling pilots to ascertain their location by a turn of a loop antenna and a simple calculation of a dial reading, an improved radio direction finder is being installed on Transcontinental and Western Air planes. The loop antenna, of the shielded type, has the property of reducing static to a minimum. In operation the direction finder consists of an auxiliary receiver and the antenna which can be turned on an axis to a position providing the best reception qualities in tuning in on any selected radio station. At the position



Arrow points to the shielded loop antenna which reduces static to minimum on direction finder

giving the best reception, a reading is taken on the loop dial. A pilot flying the radio beam needs to tune in only one station off the beam to determine his exact location. The angle denoted on the dial in relation to the direction of flight gives the accurate position of the plane.

not on market. To 5000 copies. Program John W. Wells. Club.

F105

F104

F103

British Food

R A

D I O . . .



73589

FOUR-TUBE *Transceiver* *for* FIVE METERS

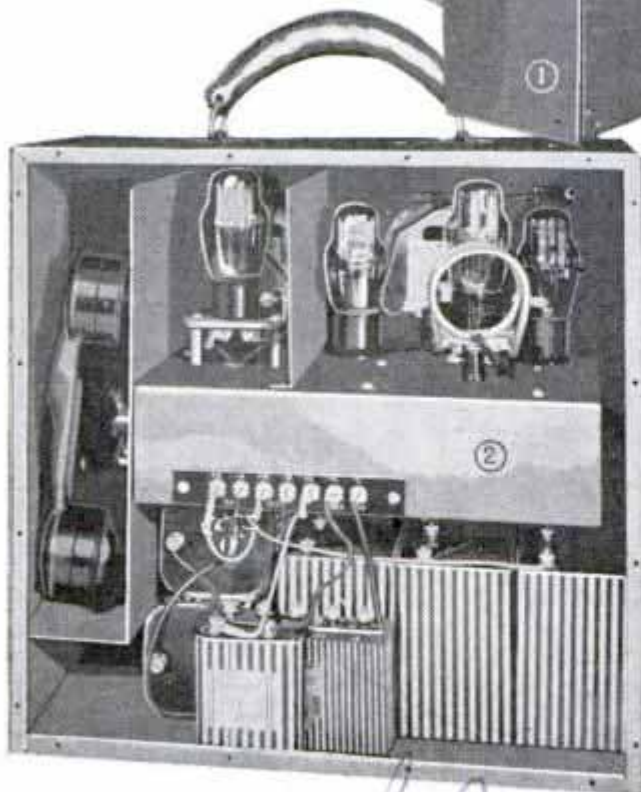
UNLIKE the usual 5-meter transceiver, this portable combination receiver and phone transmitter has separate tubes and tuning controls for the r.f. functions of the receiving and transmitting sections. The audio system, however, is common to both, acting as a signal amplifier for receiving and as a speech-amplifier and modulator for transmitting. Two independent 5-meter anten-



nas are used; therefore it is possible to adjust the transmitter

for maximum efficiency at the frequency desired, after which the entire band may be covered with the separate receiver control without making compromising antenna ad-

justments. The complete unit shown in the photos is called a "transceptor" by the designer in order to identify it from the ordinary transceiver. It employs two type-30 and two type-19 tubes, and is housed in a 7½ by 15 by 15-in. metal cabinet provided with a hinged cover to protect the controls as shown in photo No. 1. A back view of the unit with the rear cover removed, appears in photo No. 2. It will be noted that there is a shield between the receiving and transmitting r.f. circuits. A door in the side of the cabinet provides easy access to the handset compartment. Separate headphones and microphone may be used instead of the handset if preferred.



Wholesale Radio Service Co. 737
101 6th Ave New York

AMPLIFIER



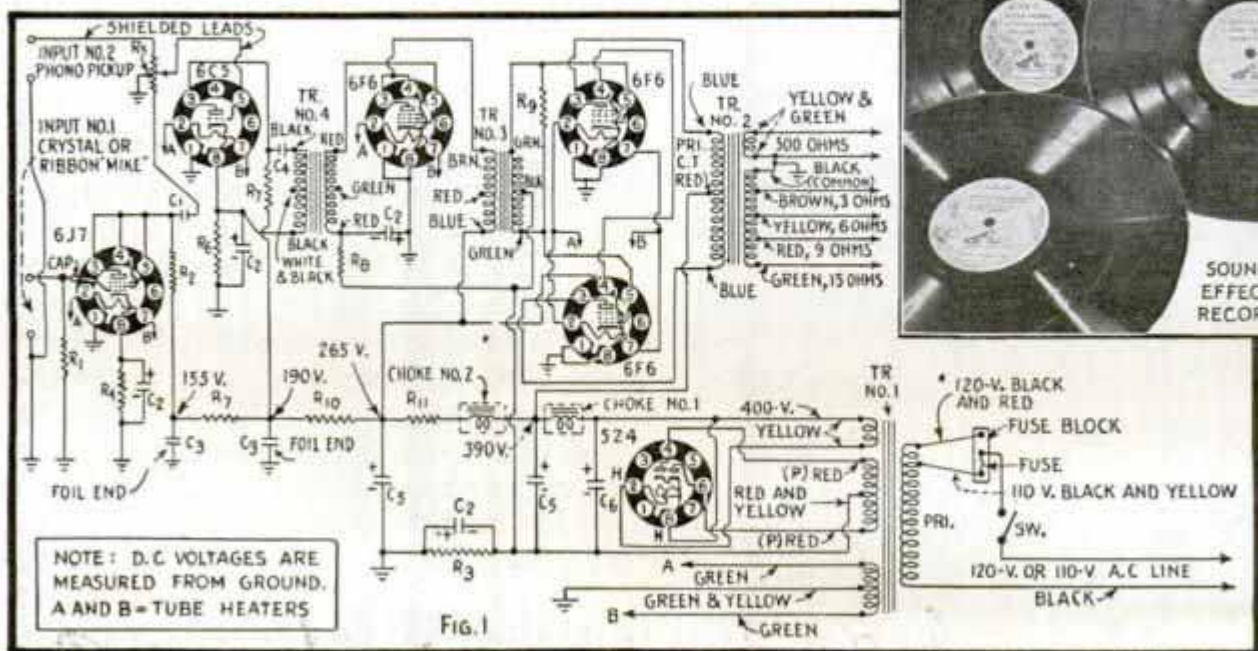
are inexpensive, and, when properly amplified and reproduced, add realism to amateur dramatic productions.

The two-channel-input amplifier to be described, is built from standard parts and delivers 18 watts of audio power, sufficient for auditoriums seating up to 500 persons. A single potentiometer controls the volume and permits the operator to select either the phonograph or crystal-microphone channel

ALTHOUGH the amateur actress in the above sketch is holding a doll in her arms, the audience hears a real baby crying lustily. This is only one of many recorded sound effects available for amateur theatrical use. Others include laughter, mixed cheers, applause, dog barking, angry mob, street and carnival noises as well as trains, airplanes and many additional background sound effects. These records, recorded from the actual sound sources,

at will. Adaptable for public address, dance orchestras and school use, the output is capable of operating from one to four loud-speakers.

Modern metal tubes are employed in an amplifier circuit which has a flat frequency response and practically no distortion.



150-Watt all-band TRANSMITTER



By

R. E. Davy—W9GKU
F. L. Brittin—W9DCX

OBTAINING maximum results with a minimum of parts, this all-band transmitter of advanced design might be compared to an improved model automobile motor for which the manufacturer claims some 500 less parts are required.

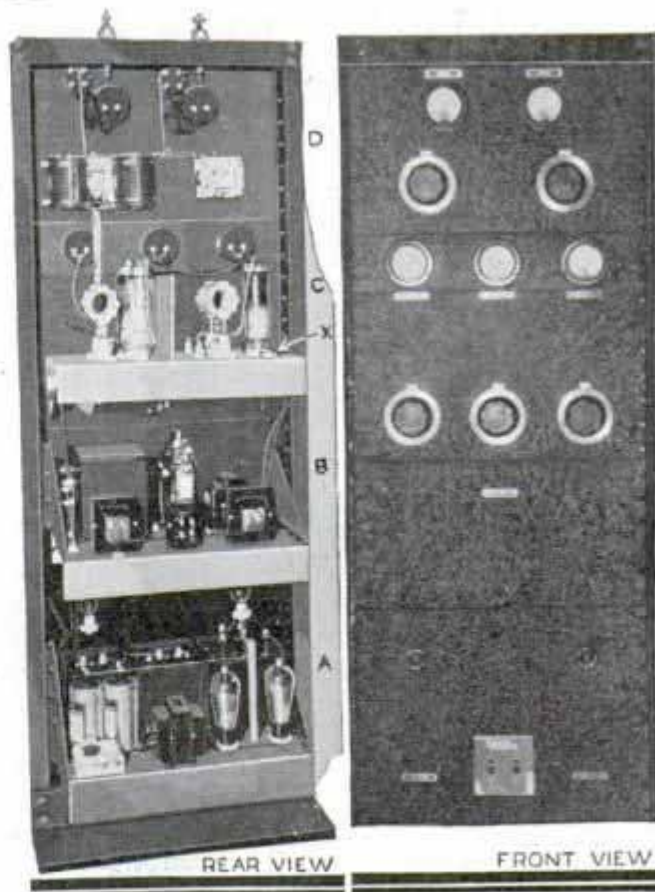
All-band transmitters usually consist of a crystal oscillator, operating at the lowest frequency "longest wavelength" used, and a number of frequency-multiplier stages and amplifiers, depending upon the power output desired at the highest frequency. As the frequency increases, so do the losses, making efficient operation more difficult; thus a transmitter which is perfectly stable on 160 or 80 meters may become erratic and operate at low efficiency on 40 or 20 meters. If the experimenter has to check through a number of doubler and amplifier stages it may be weeks before the trouble is located.

This 150-watt all-band transmitter has but two stages to adjust. A type RK-20 pentode tube is used in a "tri-tet" oscillator circuit which employs the tube both as an oscillator and frequency multiplier. The second stage consists of two RK-20's in push-pull as amplifiers; the high-power oscillator fully excites this amplifier either on the crystal frequency or harmonics. A 160-meter crystal also permits operation

on 80 or 40 meters, an 80-meter crystal further serves for 40 and 20-meters, while for 10-meters a 40-meter crystal is used.

The complete 2-stage R.F. section is mounted on a metal base 18 by 12 by 3½ in. deep. As the tuning condenser frames are grounded, they are mounted directly on the underside of the base together with the various fixed condensers, resistors, R.F. chokes and filament coils L and L. "Thru-panel" insulators with plug-in coil jacks are used to keep all wiring below the base. This

(Continued to page 126A)

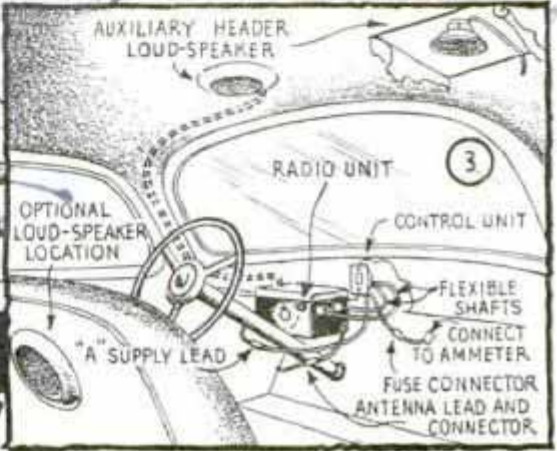
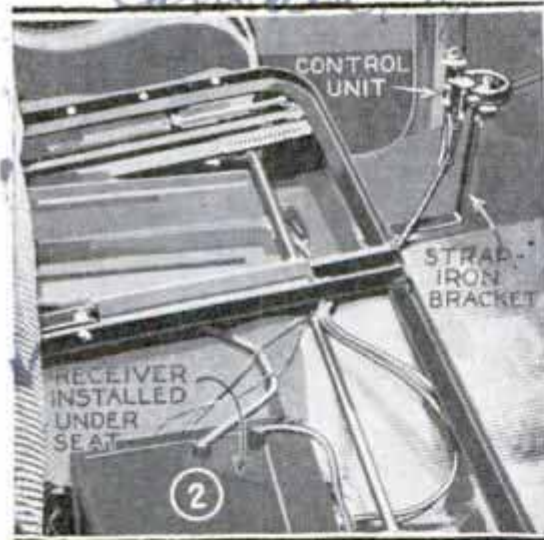


Easy Solutions for Everyday Radio Problems

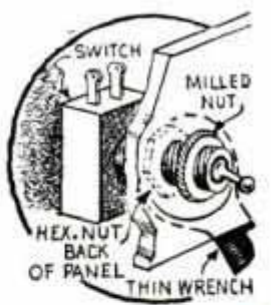
Several advantages are offered by the under-seat auto-set installation shown in photos 1 and 2. Out of the way but easily accessible for repairs, the receiver and antenna lead-in are kept as far as possible from interfering motor noises. The control unit is mounted on a metal bracket bolted to the seat frame, or floor, in a handy position for tuning without extending your arm to the dash. As the speaker leads do not pick up noise, it may be mounted behind the dash. Fig. 3 shows a universal-mounting roof header speaker easily installed with any car set; the kit includes a dome-shaped metal grille, cloth cover, mounting ring and hardware.



aca wya & ...



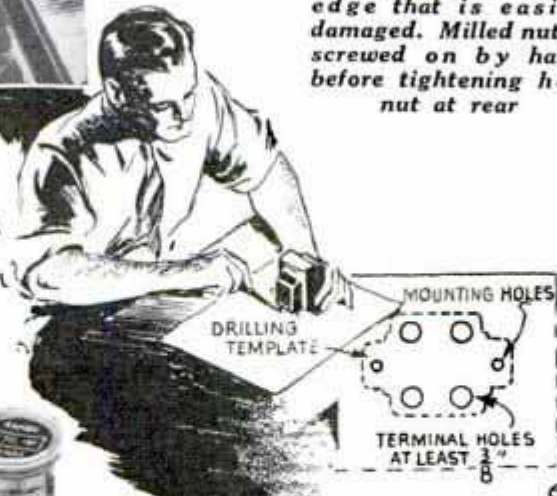
Right, thin wrench, used instead of pliers, for mounting panel-type toggle switch provided with round outer nut having a milled edge that is easily damaged. Milled nut is screwed on by hand before tightening hex nut at rear



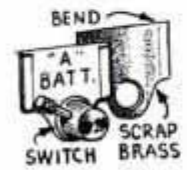
Left, time-saving mounting template for sub-panel-terminal transformer quickly made by pressing terminal lugs on paper to locate drilling centers for chassis clearance holes



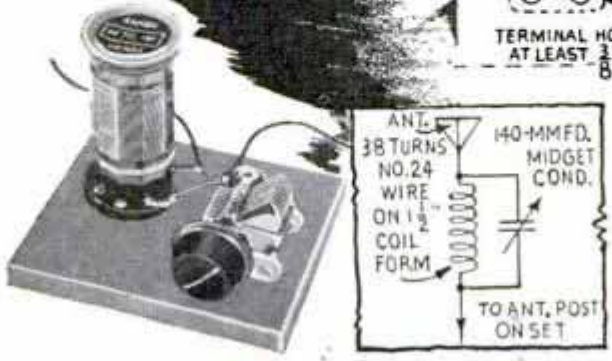
Above, protective mounting for cartridge-type paper, or electrolytic condensers, removes mechanical strain



Drain stoppers make chassis shock proof. Left, wave trap eliminates amateur code interference; standard or homemade plug-in coils used; winding given is for 80-meter band



Label holder for panel switches, and jacks, made from thin sheet brass held in place by mounting nut



Ultramodern Lounging Chair Has Built-in Receiver

I 3592



Complete with built-in antenna and a line cord for plugging into any convenient wall socket, this up-to-date receiver installation in a lounging chair provides both comfort and entertainment.

I 360 3 ——— Windcharger for Trailers

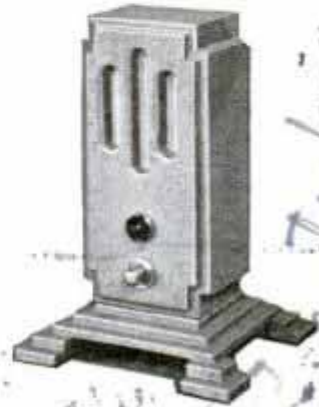
An auxiliary battery-charging unit for use on camp trailers and trucks employs a wind-driven generator. Installed as



shown in the photo, the unit begins charging at a road speed of about 22 miles per hour. An automatic cutout provides against damage when driving into strong winds. Generator connections can be made directly to the car battery or to radio and lighting batteries in the camp trailer.

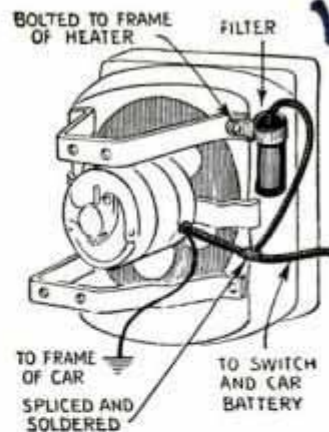
I 3684 ——— Desk "Mike" for Call Systems

Handy for desk and counter use with call and public-address systems, this compact unit contains a single-button carbon microphone mounted in cushion rubber and housed in a cast aluminum case. It is completely wired with push-type switch and protective condenser, and operates on 1½ volts at 4 to 6 ma. supplied from either a battery or the amplifier. A jewel is arranged so a pilot lamp and bracket may be installed when operating several of these microphones through one amplifier.



D 4507 ——— Noise Filter for Car Heater

Owners of older type auto sets can eliminate troublesome interference from the motor of their car heater by means of a simple noise filter mounted on the frame and connected as shown in the sketch.



Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are available without charge on receipt of postage.

NEXT MONTH—Beginner's Short-Wave Two-Tube with Universal Coil Selector. A simple and inexpensive battery set that anyone can build. Uses auto-type tubes and a 4-band coil-switching unit which holds four ordinary plug-in coils. Other features include construction details for a **Low-Cost "A-B" Power Unit.**

2702 Hawkeye Ave.

Southwestern Engineering Co.
Winchenger Corp.

Double
- \$ 10.00
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Spangley
Kleitachman
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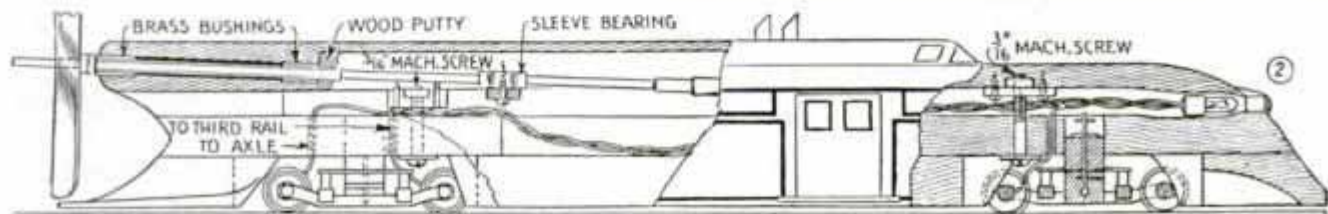


*the latest in
streamlined
model trains!*

By
Alexander Maxwell

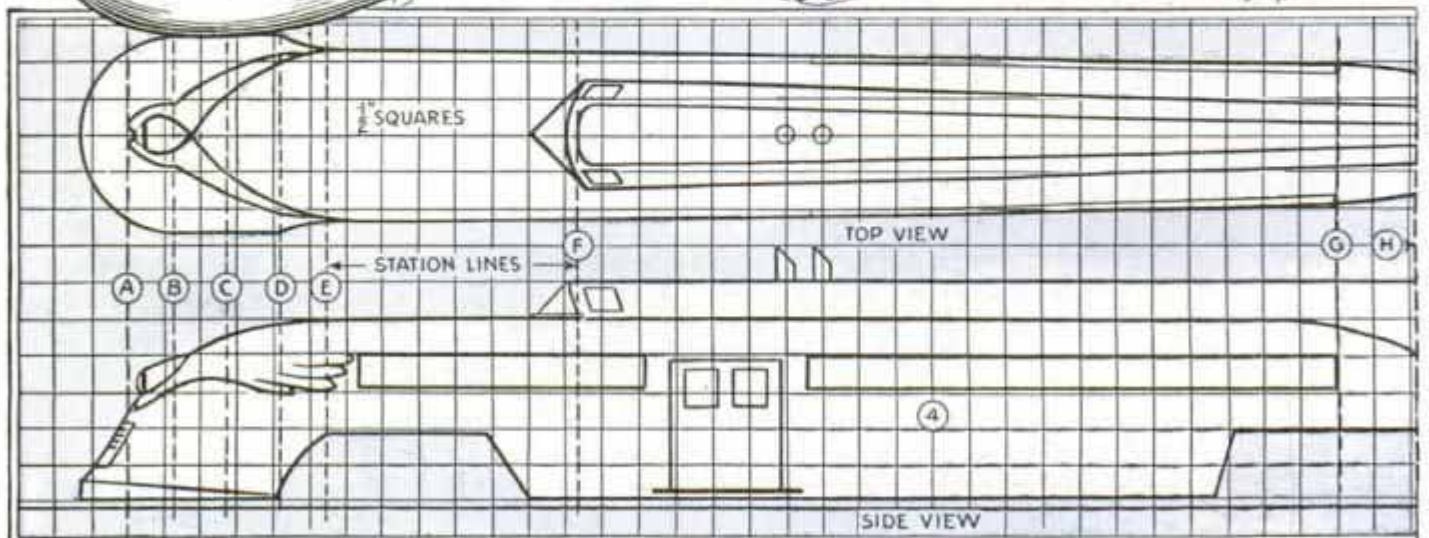
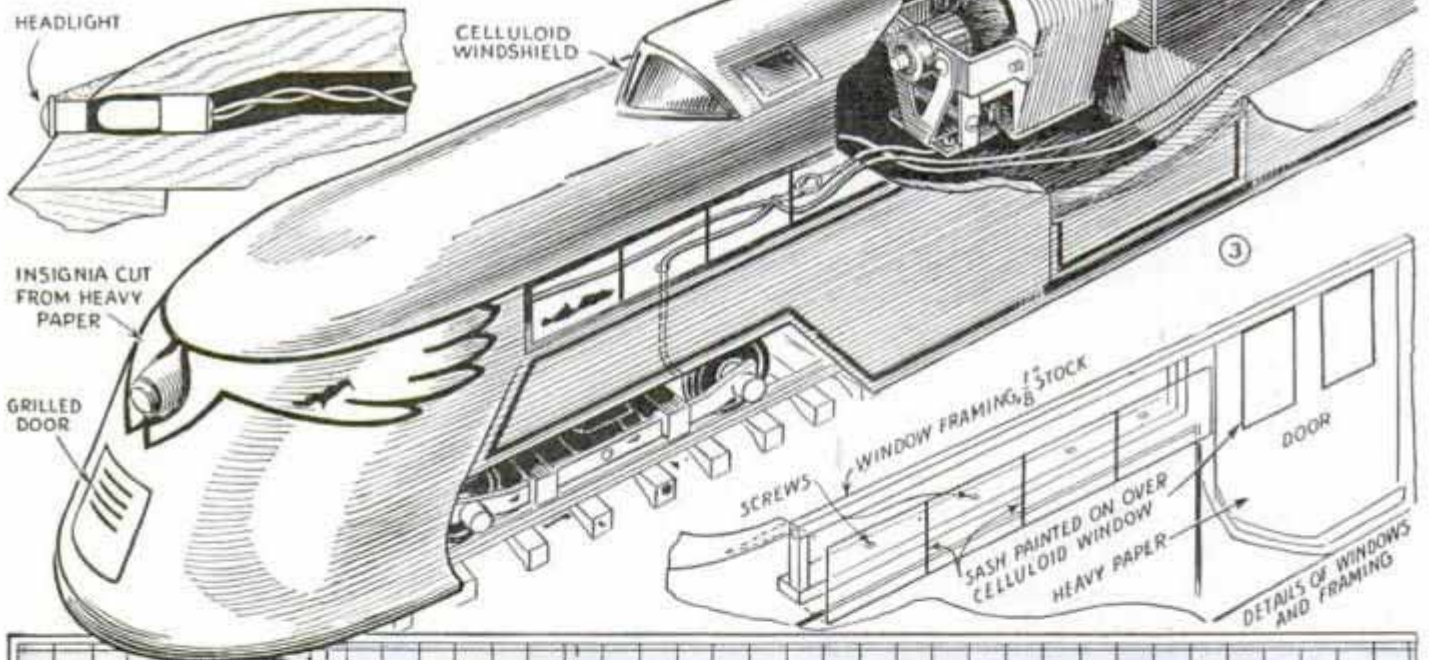
THIS striking model gives the attic rail-roader a real-life glimpse into the future of high-speed rail transportation. Along with ultramodern streamlining, it combines simplicity of construction. There's no need to spend long hours over a lathe when making the railplane for there is no machine work to be done.

You start out in the same way as you would in building a ship model. In examining Figs. 1, 2, and 4, you will notice that the body consists of five lifts, the $\frac{7}{8}$ -in. lower lift being in three sections to make room for the trucks. The second is solid, with a slot cut down the center. This lift and those above it are $\frac{5}{8}$ in. thick. The first three and the last two lifts are glued together as separate units and form the two parts you see in Fig. 1. The latter unit

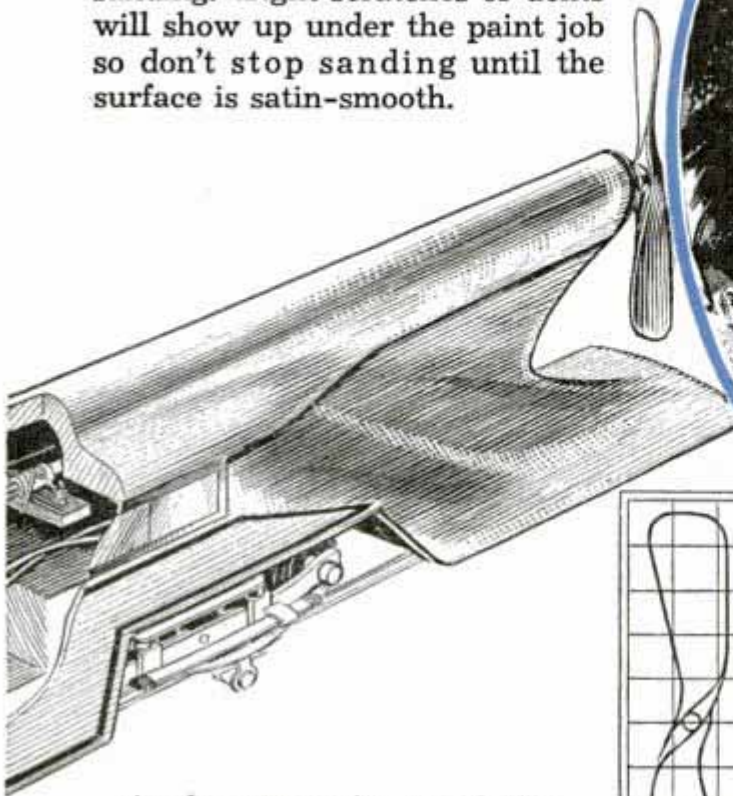




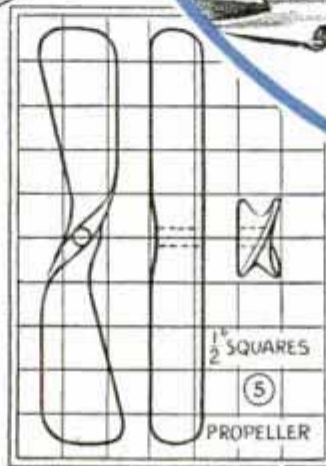
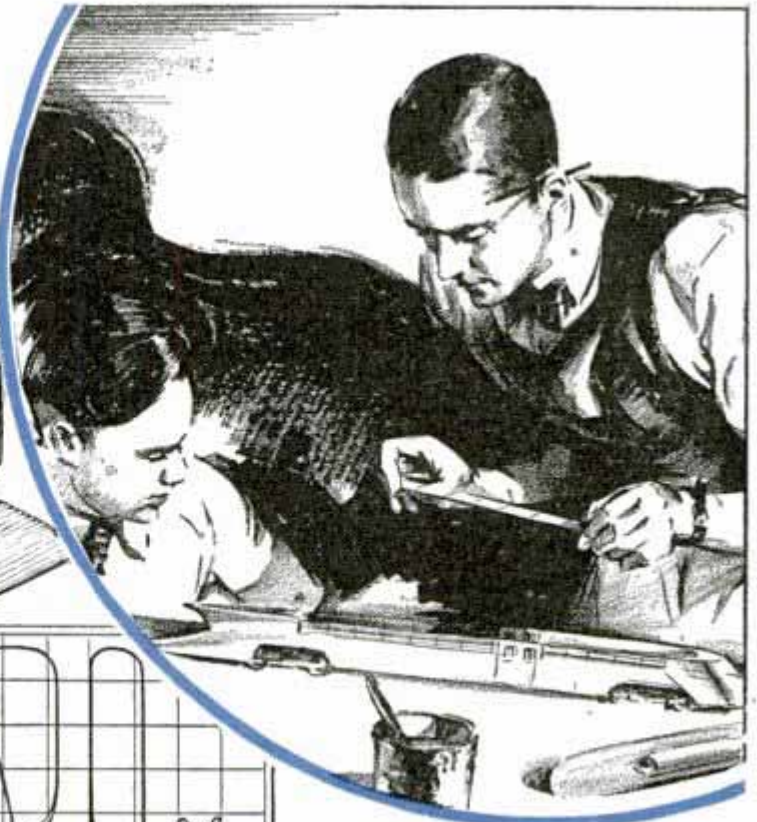
forms the removable roof. Use selected white pine and cut all the lifts slightly oversize. Before you begin carving, enlarge the right-hand detail in Fig. 4 to full-size and make $\frac{1}{8}$ -in. plywood templates of all the curved lines. This detail is shown on $\frac{1}{4}$ -in. squares. Notice from this that lines F to J inclusive will continue $\frac{1}{4}$ in. higher than indicated on the squared diagrams, as the top of the body is curved. Now fasten the two units together with two long screws driven up from the bottom and carve to the finish contour with a plane and gouge, using the templates on the station lines just as you



would in shaping the hull of a ship model. When you get to the final contour, give it a thorough sanding. Light scratches or dents will show up under the paint job so don't stop sanding until the surface is satin-smooth.



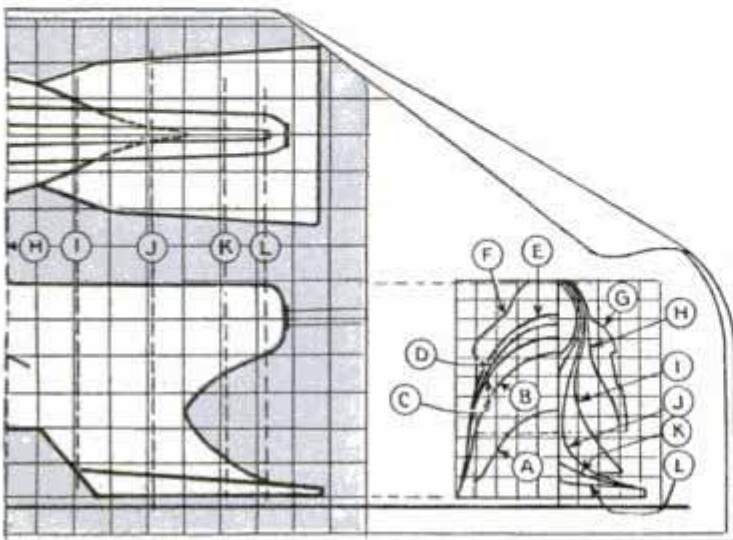
At this stage it's a good idea to give the wood a thin coat of shellac. Figs. 2 and 3 give you a clear idea of how the motor is mounted to drive the propeller. Dimensions of the motor and propeller-shaft compartments are not given as these will depend on the motor you use. The motor used to propel the original railplane is of the type designed for driving the conventional $\frac{1}{4}$ -in. scale model locomotive. Its free-running speed is about 6000 r.p.m. Motors of this type will usually run on 12-volts d.c. or 16-volts a.c. Though the motor runs cool-

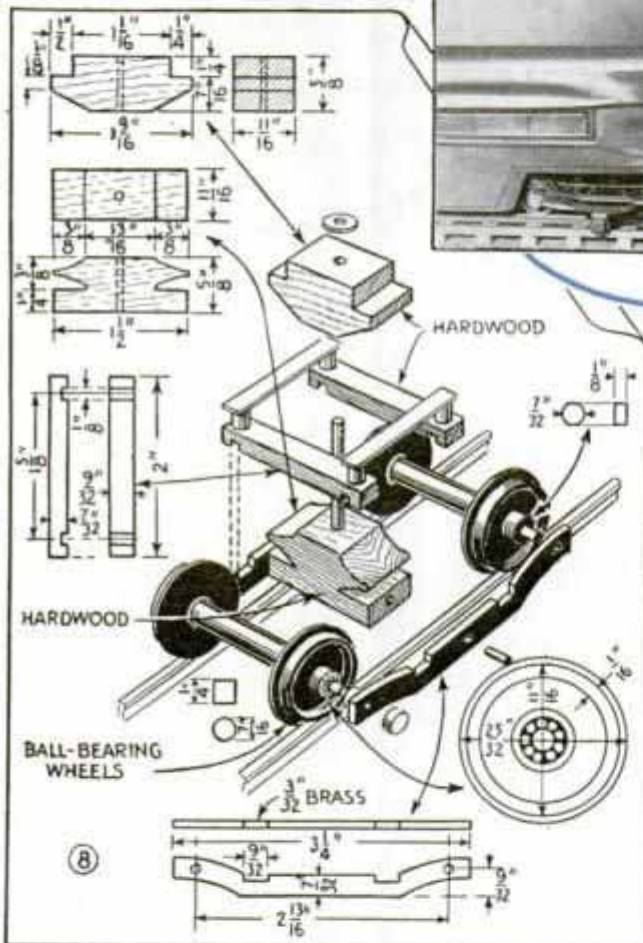
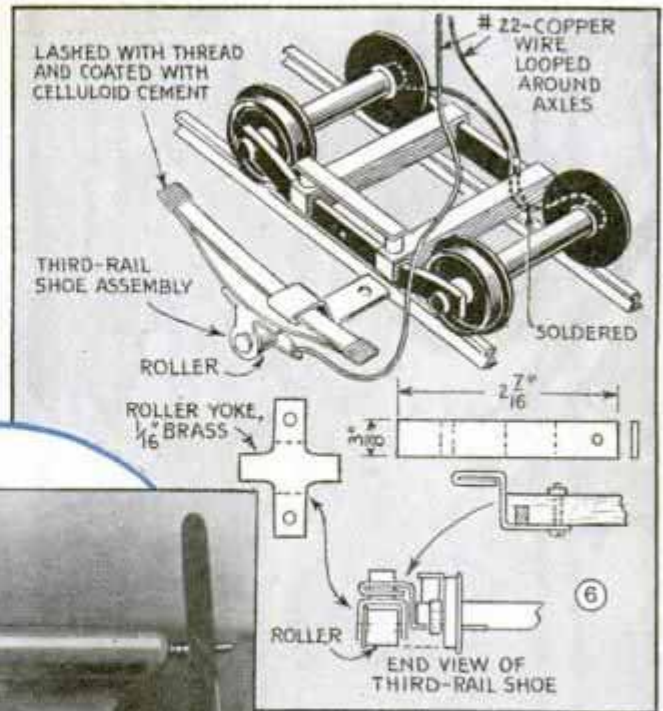


er on d.c. furnished by two storage batteries, a transformer delivering 16-volts a.c. will operate it.

Note from Fig. 1 that the entire power plant is fastened to the top section of the car body, the motor

dropping into the well which is already formed in the lower section as in Fig. 3. The motor, as you see, is bolted to a $\frac{1}{2}$ -in. brass angle plate, which is screwed to the roof of the "conning tower." It will be necessary, of course, to pare away some wood to get the motor in position to line up with the propeller shaft. The latter is a length of $\frac{3}{16}$ -in. drill rod connected to the motor through a flexible coupling made of rubber tubing as in Fig. 3. The ends of the rubber tubing are bushed with short lengths of brass tubing, and holes are drilled transversely through the meeting ends of the motor and propeller shafts for cotters made from ordinary pins. When you assemble the coupling, coat the sleeves and the inside of the rubber tubing with rubber cement. To allow for error, you use a $\frac{5}{16}$ -in. bit to drill the hole for the propeller shaft, Fig. 2. The shaft can be made to run in a long bushing, or "log," or it can be mounted in two separate bushings, as in Fig. 2. It must be carefully lined up so that there is a minimum of



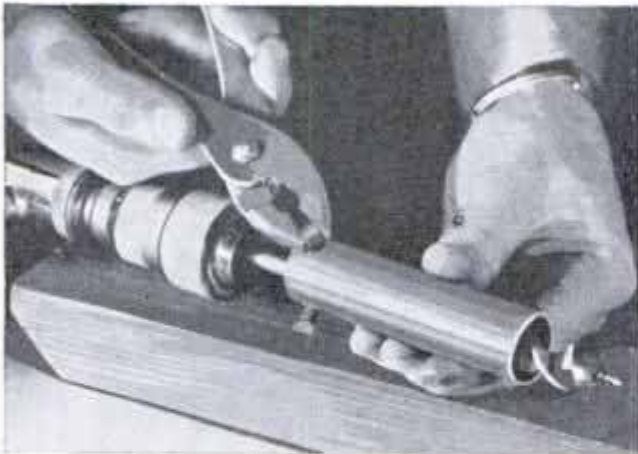


and 6. Use rubber-covered wire for all connections and solder all joints. Because the truck frames are wood, electrical connections are made directly to the axles as in Fig. 6. Use No. 22-ga. wire, spring the side member away from the wheel, and wind three turns of the wire around the axle. When the frame springs back it will hold the wire in place. Repeat the operation on the second wheel. Then make "pigtail" connections to this wire, solder them and connect to the car circuit.

Use aluminum paint with an asphalt base for finishing the body. Paint trucks yellow and black. Notice in Fig. 2 that the two members of the body are fastened together with $\frac{3}{16}$ -in. machine screws. The screws pass through a metal plate and turn into nuts mortised into the roof. The screws are located off center in the truck wells so that they may be reached with a screwdriver without removing the truck. When you test the railplane see that the track curves are banked and that the trucks take the curves without binding. It may be necessary to cut away more stock to allow the trucks to swivel freely.

This Depth Gauge Can't Slip

Made from a short piece of $\frac{3}{4}$ -in. brass tubing, this depth gauge will fit auger bits or drills from $\frac{1}{4}$ up to $\frac{3}{4}$ in. Adjustable

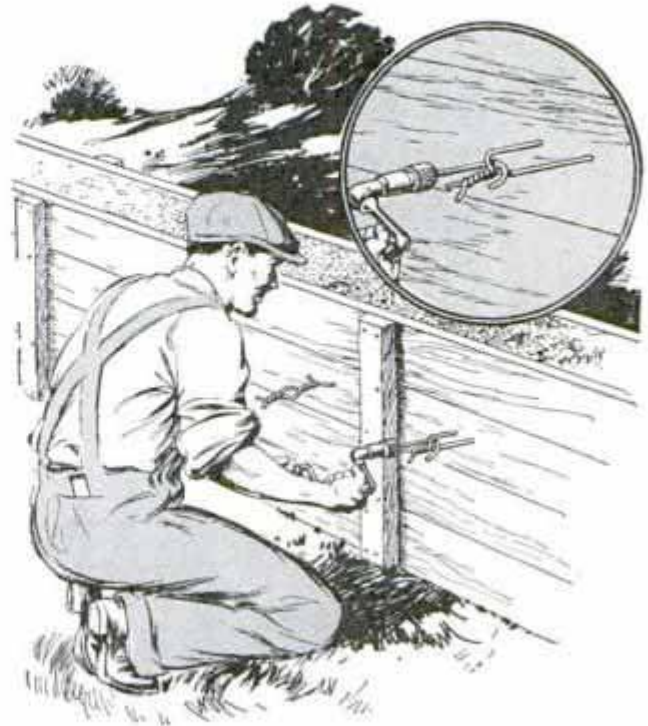


Locked in place with set screws, this gauge fits bits from $\frac{1}{4}$ to $\frac{3}{4}$ in. in diameter

for various depths, the gauge is held in place by three equally spaced set screws located close to the upper end. This gauge has an advantage over many others improvised for this purpose in that it cannot slip out of adjustment.

—E. E. Stanton, Huntington, Mass.

Anchor Wires in Concrete Forms Tightened Quickly



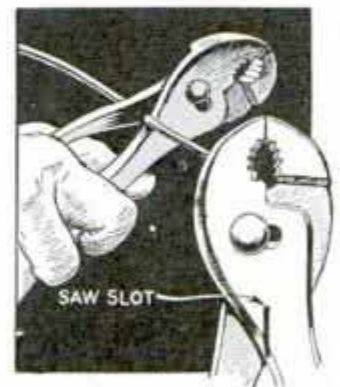
It takes only a few minutes to tighten a number of anchor wires in a form with this tool

Anchor wires placed through concrete forms to hold them from spreading may be tightened easily with a carpenter's brace in which a hook is inserted. The hook is easily made from a short length of iron rod, which can be held securely in the chucks of most braces.

Handles of Pliers Are Notched to Cut Wire

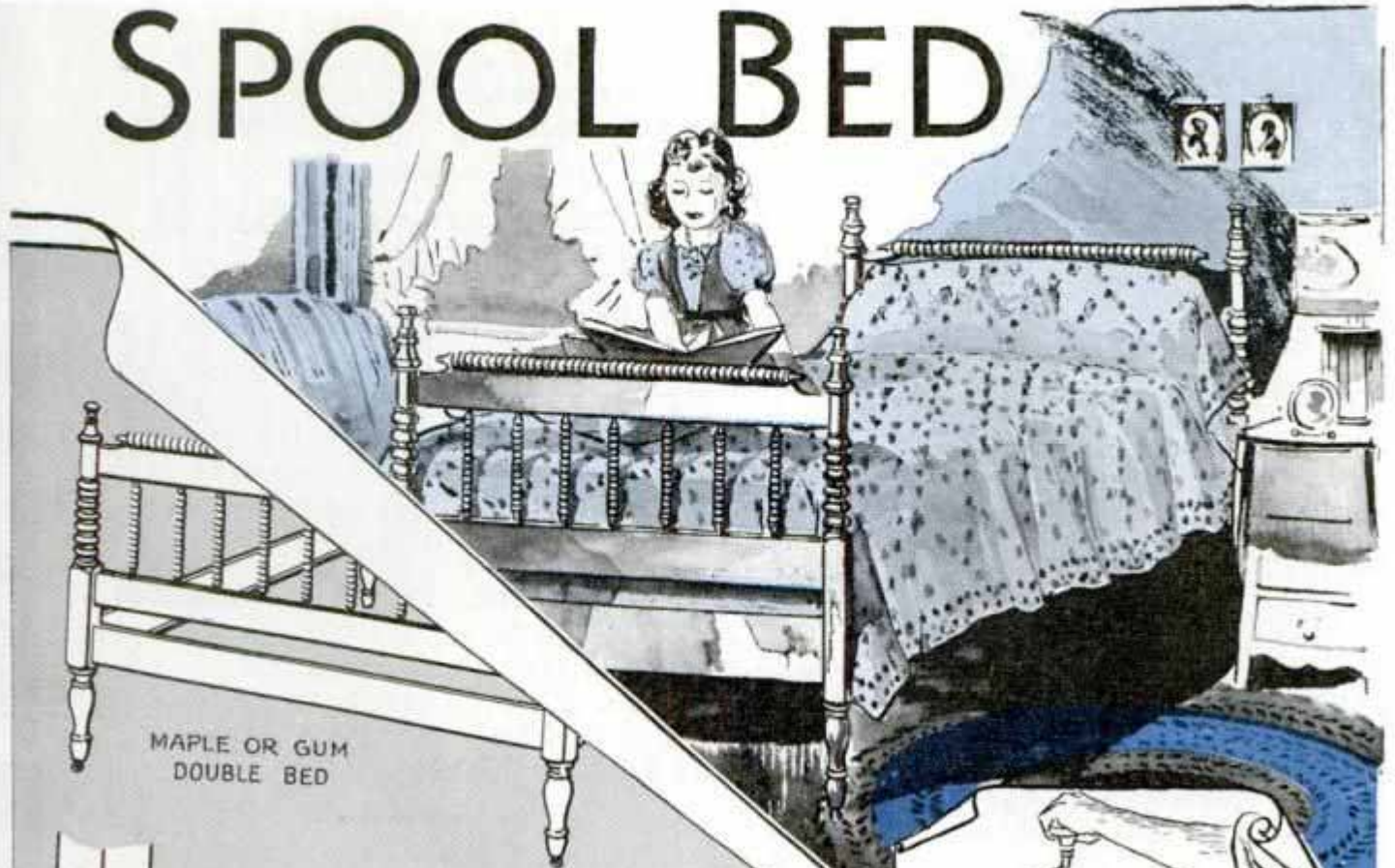
A pair of ordinary pliers can often be made into practical wire cutters by slotting the handles as shown.

Open the pliers about one-third of the way, grip them in a vise with the handles pointing upward. Then take a hacksaw and run the blade right between the handles so that a slot is made in both of them. This will form slots for cutting wire of small size. Larger slots can be cut by mounting two blades, side by side, in the hacksaw frame.

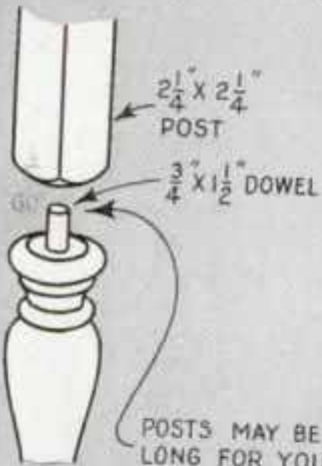


Larger slots can be cut by mounting two blades, side by side, in the hacksaw frame.

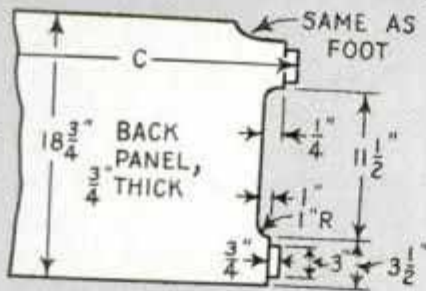
SPOOL BED



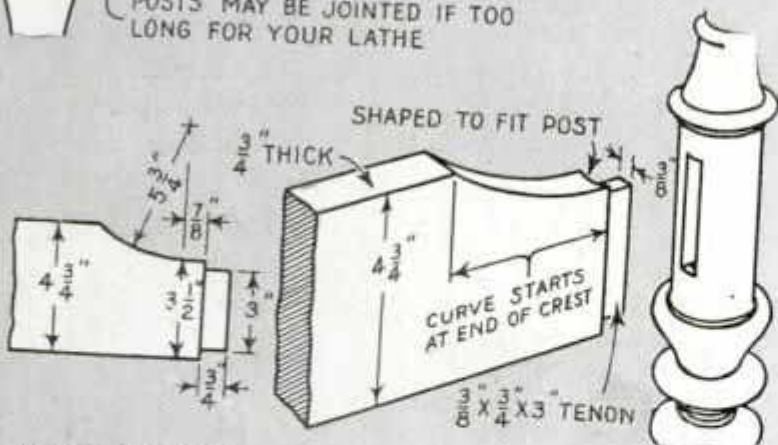
MAPLE OR GUM
DOUBLE BED



POSTS MAY BE JOINTED IF TOO LONG FOR YOUR LATHE



DETAIL OF BACK PANEL



DETAIL OF RAIL JOINT

NOTE - MORTISE CUT & PLUGGED WITH SOFT WOOD BEFORE TURNING

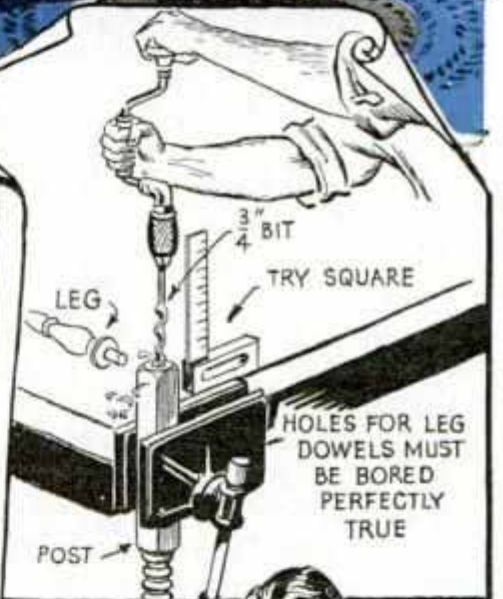
SHEET NO. 1

ISSUE

POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST. CHICAGO

BLUES

000954



Wheeled Ash Can Easy to Move on Floor or Walk



It's much easier to wheel a filled ash can to the alley than it is to carry it

Instead of carrying a heavy ash can, why not fit it with a couple of casters and wheel it to the alley? Bolt a couple of blocks to the bottom, near opposite sides as shown, one being considerably thicker than the other to keep the can level when casters are attached. It's a good idea to rivet a sheet-metal shield to the top of the can on the same side as the casters to keep the ashes from falling out when the can is tipped to wheel it.

New Feet for Your Sink Strainer



Does the portable strainer you keep around your sink cause black marks on the porcelain? If so, put three rubber feet on it. Get three small rubber bumpers and three faucet washers from the dime store. File off the points of the screws on the bumpers and drill a hole

at each corner of the strainer. Then screw the bumpers through the strainer holes into the washers.

—Walter A. Humphrey, Columbus, Ohio.

Rounded Surfaces Smoothed with Hose Sanding Block

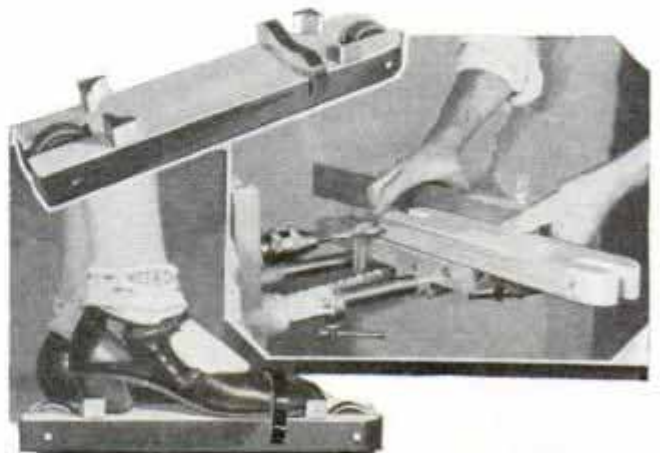
The next time you have a rounded surface to sand, such as a table edge, chair leg, etc., try using a short piece of large rubber hose as a sanding block.

Split it up one side and then cut a piece of sandpaper to fit inside. A small quantity of shellac applied to the back of the sandpaper will help hold it in place.



Mono-Scooter Is Speedy

With a little practice, you can get more speed out of this mono-scooter than out of a pair of roller skates. It is made from two roller-skate wheels and a hardwood block as wide as the shoe and about 5 in. longer. Round the ends of the block and slot them to take the wheels. Steel rods serve as axles, and washers are placed on either side of each wheel to keep it true. These should be lubricated. Triangular blocks serve as heel and toe plates, and a single toe strap keeps the scooter on the shoe. Tilting the foot to one side brings the block into contact with the sidewalk to get efficient braking.

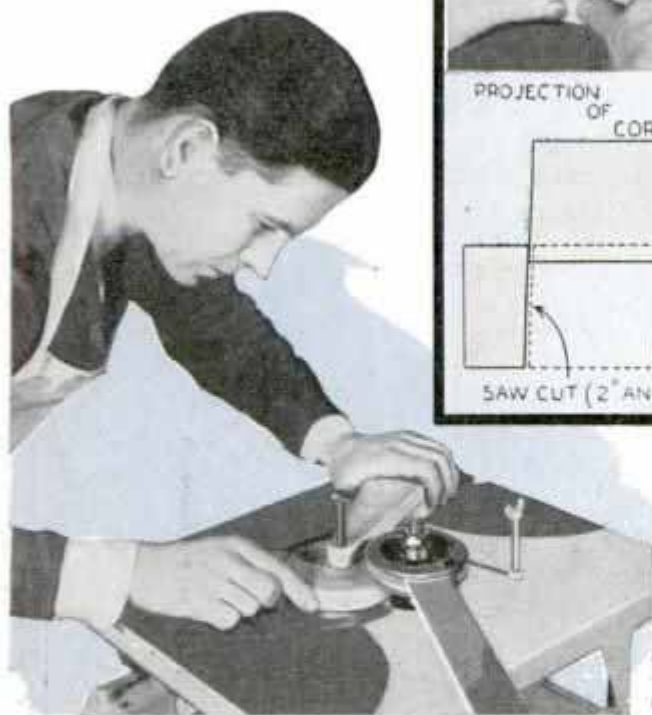


Strapped to one shoe, this mono-scooter will take you along at a fast pace

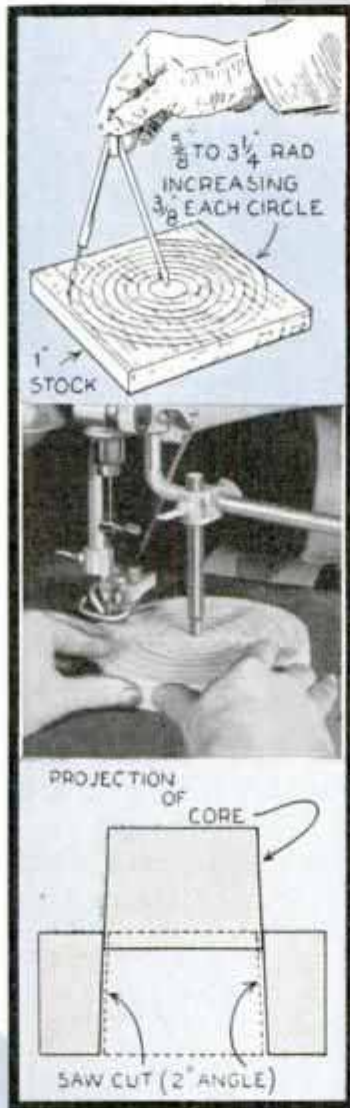
Angle Sawing for Economy

HERE'S a novel scroll or band-saw technique, which can be used to good advantage in making lamp bases, book ends, model boat hulls, and many other projects. The two lamp bases shown in the top photo are typical examples. Each of these bases is cut from one piece of wood, the size of the original board being the size of the largest piece of the base.

The "beehive" lamp base illustrates the procedure: The lines on which the stock is to be cut are laid out, starting with a radius of $\frac{5}{8}$ in., and increasing $\frac{3}{8}$ in. until a radius of $3\frac{1}{4}$ in. is reached. Small holes are drilled to permit the insertion of a fine scroll-saw blade, and the various rings are sawed out. The saw table is not level, but is on an angle of about 2 degrees.



Forms glued up in this fashion can be turned or otherwise machined to form wooden bowls, boat hulls, etc. The principle used is thoroughly practical, and will effect a considerable saving in material on production work where the nature of the project permits its use



COMPLETE LAMP BASES ARE CUT FROM ONE PIECE OF WOOD BY ANGLE SAWING

A center jig can be used, or the cut can be guided by hand. Each of the rings, being cut on an angle, will project a certain distance from the next larger ring. One of the illustrations shows how the rings are projected to form the lamp base. Glue is used to maintain the pieces in this position. In production work, a master form would be used to set each ring quickly at the required distance.

The small holes necessary for scroll sawing can be plugged or filled with plastic wood readily. The edge of each circle of the original lamp was rounded on the shaper, but a master form could be used for the same operation done on the lathe after gluing.

☐ Clothespins soaked in a soap solution and dried without rinsing, will not freeze to the line or clothes in cold weather.

Hat Rack Pivoted to Closet Door Utilizes Waste Space



WOOD DISK
This rack raises and lowers, the parallel links holding it horizontally in any position

Screwed to the door or wall of a small closet where space is limited, this hat rack is raised out of the way, utilizing waste space above the garment rails, and is lowered to a convenient height for selecting the hats. A wood disk carrying seven "mushroom" supports is pivoted to the door by means of two pairs of parallel links or arms, the link brackets on the disk being cut from heavy sheet metal, while those on the door are short pieces of angle iron. The pivot bolts or rivets should be drawn up snugly so that friction will hold the rack in any position.

—Jas. H. Rodgers, Toronto, Ont., Can.

Runners on Refrigerator Trays Make Removal Easy



You won't have any trouble removing ice-coated trays from your refrigerator, if they are fitted with wire runners, which permit only a small amount of metal surface to

come in contact with the freezing compartment. Suitable runners are made by bending pieces of heavy wire to a U-shape, as indicated. They can be slipped in under the trays loosely, or soldered on.

Holding Magazine Pages Open to Read Plans

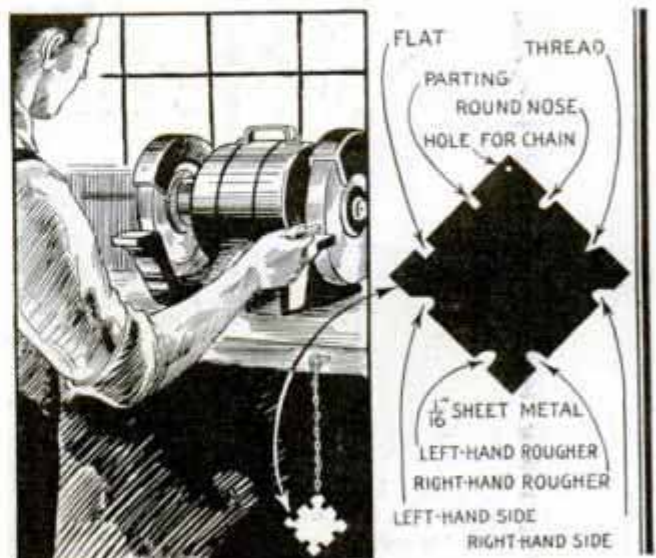
When building an article from plans given in a book or magazine, I find a trouser hanger of the type shown, handy for holding the pages open. Besides this, you can hang up the plans so that they are easy to



see, and where they will not become soiled.
—Vernon Tracey, Centerville, N. B., Can.

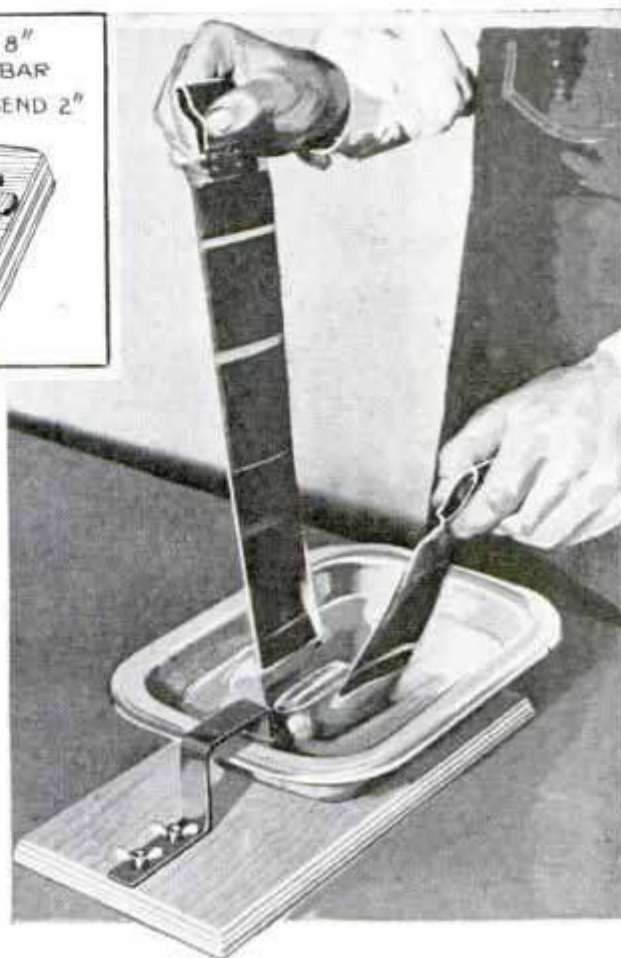
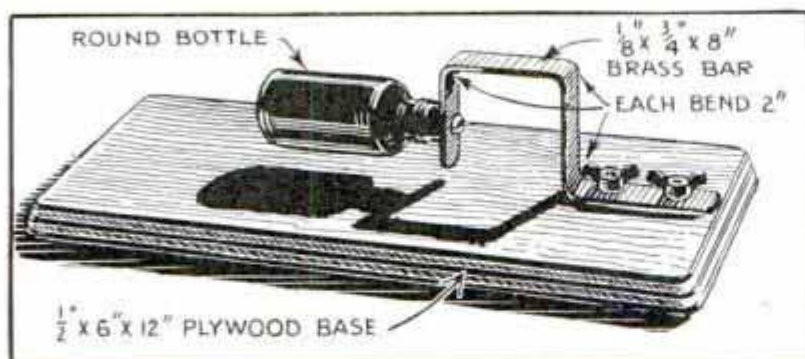
Profile of Lathe Turning Tools Checked with Special Gauge

Amateur lathe operators who have difficulty in remembering the exact shape to which various turning tools should be ground, will find this gauge a help. Take a piece of sheet metal of any convenient size and file the profiles of the various tools in the edges as shown. Attach it to your grinder where it will always be at hand. Different profiles may be ground on each end of a tool to save material.



You can grind your lathe turning tools correctly if they are checked with this profile gauge

Roll-Film Guide Simplifies Tray Development



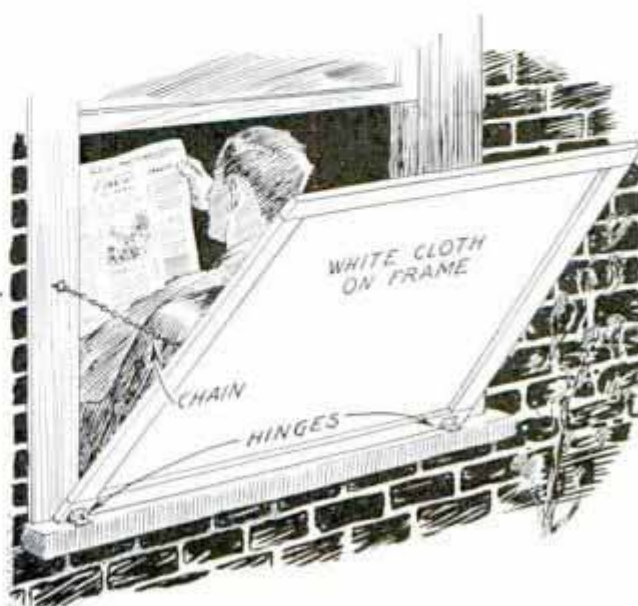
Eliminating the possibility of scratching the emulsion side of roll film, when developing it in a tray, this simple guide also effects a saving in developing fluid and prevents the film from curling and getting out of the tray. The guide consists of a small, round bottle, a brass arm and a plywood base. The parts are assembled as shown in the detail with the tray resting on the base as indicated in the photo. The bottle cap, which is cemented to the glass to keep it from loosening, is fastened to the end of the arm with a machine screw, and the arm is attached to the base with small bolts and wing nuts to permit easy removal, as it must be taken off to empty and clean the trays. It is best to use separate guides for developing and washing, and all metal parts should be given several coats of lacquer to keep them from affecting the fluids. In use, the tray is filled with enough fluid to come well over

the bottle, after which the film is slipped under the bottle, emulsion side out, and pulled back and forth through the fluid, this operation being continued for the length of time necessary to develop the film.—Robert J. Williams, Chicago.

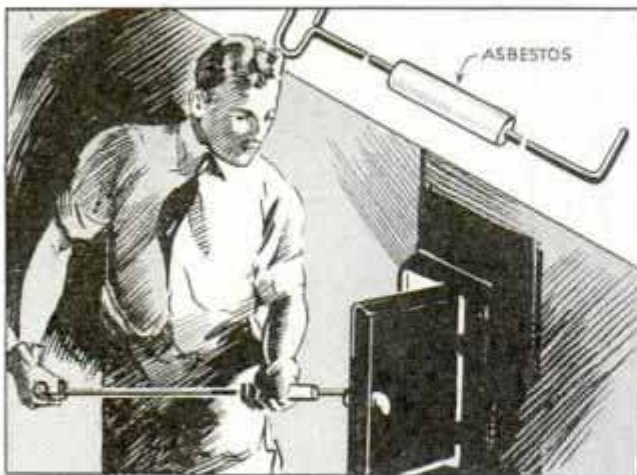
Rooms Facing Narrow Court Brightened by Reflected Light

If buildings are so close to your home that they darken the rooms, you'll be surprised how much the rooms can be brightened by setting white-cloth frames outside of the windows at an angle. The cloth is tacked to wood frames, which are hinged to the window sills, small chains being used to hold them in place. White oilcloth, or pieces of sheet metal, painted white, may be used instead of cloth, and they are easier to keep clean.

☞ Unsightly deposits that often form at the water line of fish bowls and aquariums may be removed by rubbing them with a cloth saturated in vinegar; rinse the bowl thoroughly before filling with fresh water.



Cool Handle on Furnace Poker Prevents Burned Hands



No matter how hot the lower part of the poker gets you can always grip it with this sliding handle

Made by wrapping several turns of sheet asbestos on your poker, clinker hook or similar tools used around the home-heating plant, this sliding grip is always cool, regardless of how long the tool is kept inside the firebox. The turns of asbestos are cemented with water glass.

Dangers in Diving Helmets to Be Avoided

There is extreme danger in using home-made diving helmets. No person should attempt to submerge in such a device unless he is a good swimmer and is physically fit. For amateurs, a diving helmet must be designed so that it can be dropped off the wearer's shoulders any instant, and for this reason a harness must be avoided. The diver should be able to rise to the surface at will, without being dependent on anyone above. A diving helmet, therefore, should fit over the head with enough excessive space to permit "dumping" it by a forward movement of the body. A constant flow of fresh air pumped into the helmet through a single length, unspliced, non-kinking hose by means of a pump having a capacity greater than needed, must be provided to assure the diver enough fresh air. Never use hose that is joined and taped together. Breathing in a helmet should be easy, and the air inside should be as "fresh" as outside air; if this is not the case enough air is not being delivered and the hose or pump may be at fault. If the air inside seems stale, "dump"

the helmet at once—don't continue to wear it because, should the supply of fresh air be inadequate, gradual suffocation from lack of oxygen may result, and you may not be able to hold your breath until you reach the surface. For the novice, it may be best to leave the practice of diving to professionals, but if you are determined to use a diving helmet, no better advice can be given than to practice in water not over six feet deep until you are thoroughly aware of any emergencies that may arise. At no time should a person use such an apparatus at a greater depth than he can make a surface dive. Further, no novice should use the equipment until it has been tested by persons who are in a position to know whether it is safe.

Cutter on Spool of Heavy Thread



Attached to a spool of thread with a thumbtack, this handy cutter eliminates the trouble of locating a pair of scissors every time you wish to cut off a piece of thread. The cutter is made from sheet metal and filed to a sharp edge. In use, the

thread is brought down over the end of the spool and across the cutting edge.

Teeth on One Side of File Filled to Protect Adjoining Work

When smoothing the bottom of a narrow slot where it is necessary to prevent marring the adjoining work, coat the teeth on one side of the file with water glass. Apply it liberally and wait for it to dry. When the job is finished remove the water glass with a file card.



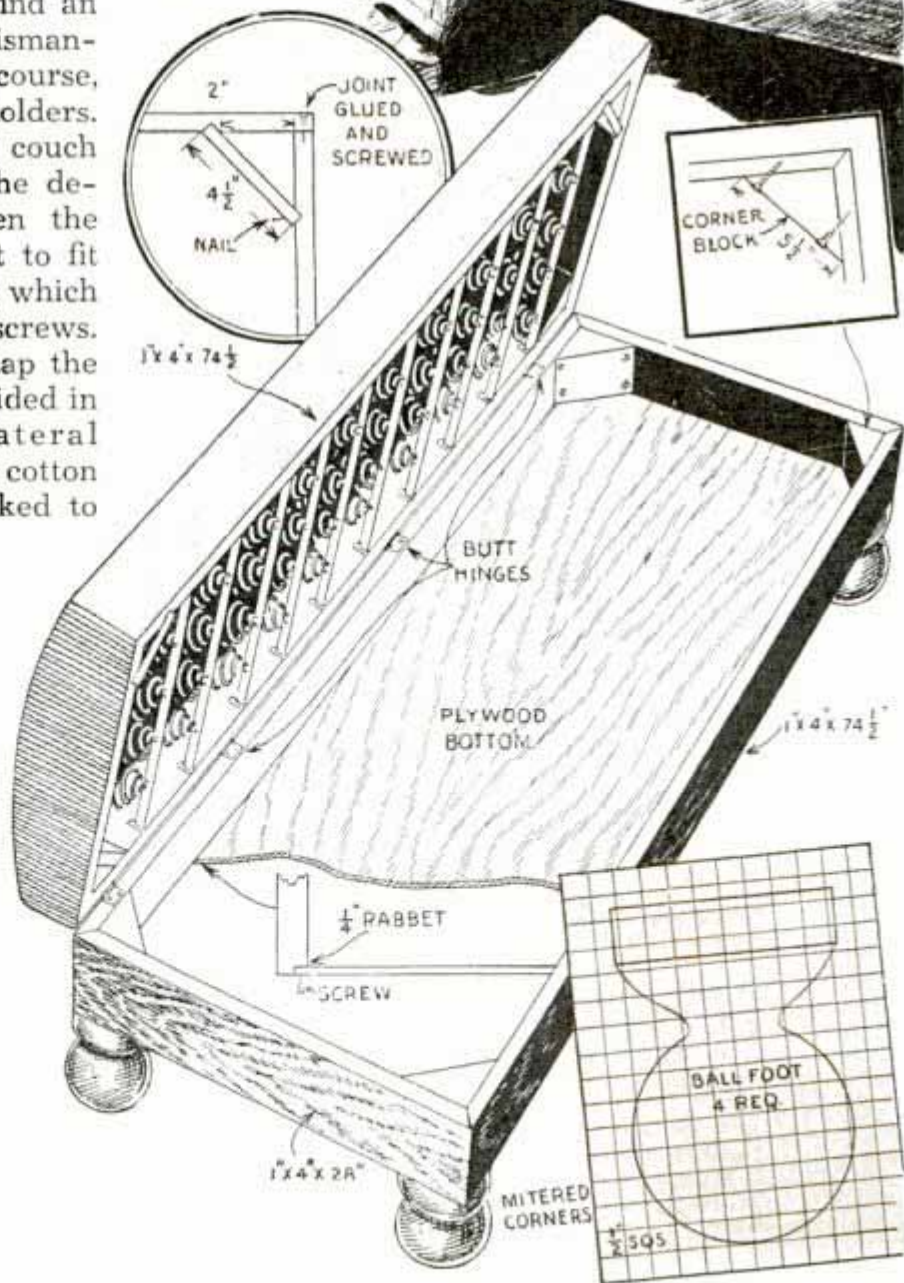
Upholstered DEN COUCH

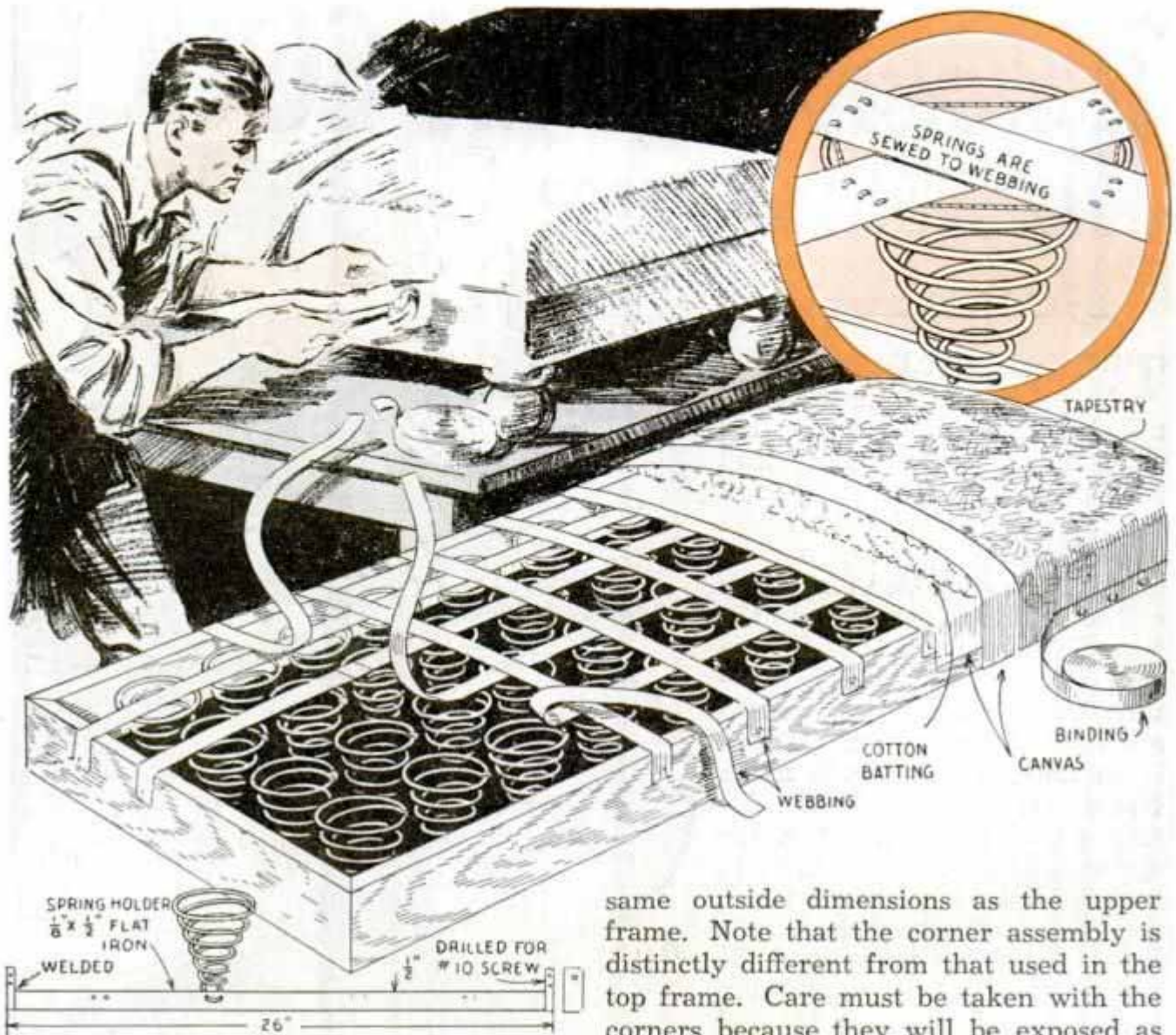
has storage space

By C. H. Deerwester

TWO frames of the same size hinged together, the top frame upholstered, the lower mounted on four turned legs and provided with a plywood bottom—and there's your combination couch and storage chest. The upholstery is so simplified that if you can drive tacks you can do the job. The first thing is to find an old set of bedsprings and dismantle it. What you're after, of course, are the coil springs and holders. Now, the top half of the couch frame is made up as in the details on this page. Then the spring-holder bars are cut to fit between the side pieces, to which they are anchored with screws. It is a simple matter to snap the springs into the holes provided in the holders. Next, both lateral and longitudinal strips of cotton tape or webbing are tacked to sides and ends of the frame. Each spring is sewed to the tape at the four points with a waxed string. The springs are first covered with a heavy material, preferably canvas, which is tacked at about 2-in. intervals completely around the frame. It is to be expected that the two outer rows of springs will be compressed to a greater degree than the inner rows.

Four rolls of cotton batting are spread over the canvas, layer upon layer. Be sure that the thickness of the padding is uniform then cover it





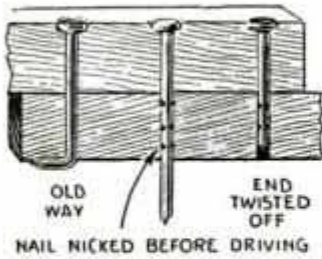
with an old linen sheet or other similar material, tacked to the frame in the same manner as the canvas. This cover will prevent the padding from shifting with use. When tacking the tapestry, be sure to draw it evenly to prevent wrinkles. Space the tacks about 1 in. apart and keep them in a line $\frac{1}{4}$ in. above the bottom edge of the frame. This precaution must be taken in order that the tacks will not show after the binding has been applied. The binding comes in various widths and can be purchased in any department store handling upholstery materials. It should be of a contrasting shade of the same color as the cover. For the back, pillows can be made of material left over from upholstering, filled with kapok, and fitted with slip covers of a matching color. This finishes the upholstering job.

The lower frame is now assembled as indicated in the details. It must have the

same outside dimensions as the upper frame. Note that the corner assembly is distinctly different from that used in the top frame. Care must be taken with the corners because they will be exposed as finished wood in the completed assembly. The plywood bottom should be placed immediately after the lower frame has been assembled. It can be nailed directly onto the underside of the frame and the corners beveled with a hand plane to prevent showing, or set in a rabbet and fastened with screws as shown. The legs can then be turned and screwed into place. The proper method of mounting is with screws driven through the four corners of the leg. This done, the hinges are mortised into the frames and fastened with screws. Use brass butt hinges with removable pins. You can now finish the lower frame and legs in any color you desire. First, give the wood a thorough sanding with progressively finer grades of paper. If you use an open-grain wood it will require filling with a paste filler, then stain, shellac and wax. Or, in place of the latter, you can use a high-grade varnish, laid on over a coat of white shellac.

Nicked Nails Easily Broken Off

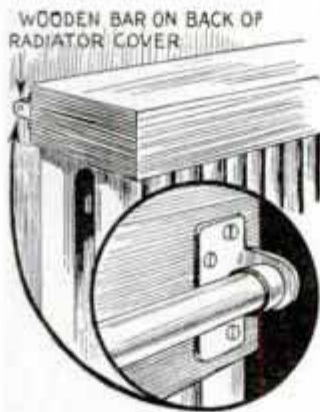
Where nails often must be used that are a little too long for the job, I find that instead of clinching the projecting ends it is better to file or cut a series of notches in each one as shown, before driving them. Then they can be broken off with a couple of twists. This method is especially handy on work where it may be necessary to use a plane after nailing.



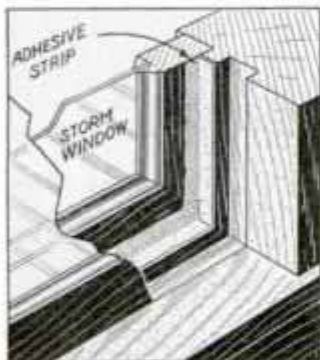
—W. S. Houseburg, Pittsburgh, Pa.

Garments Dried Out of Sight on Back of Radiator

By simply attaching a small wood or iron bar to the rear side of a radiator cover in your home, a dandy place for quickly drying stockings, handkerchiefs, etc., is provided. Your particular cover and the type of bar or rod you have will determine the method of attachment.



Storm Windows Sealed Tightly with Adhesive Tape



To increase the efficiency of a storm window that doesn't fit snugly in the casing, strips of tape, such as Scotch drafting tape, placed around the inside surface as shown, have been found effective in sealing the joints against passage of cold air. Before applying the tape, the surfaces that it contacts must be cleaned thoroughly so that it will stick. The tape is easily stripped off.

Minnesota Mining
April 10, 1971

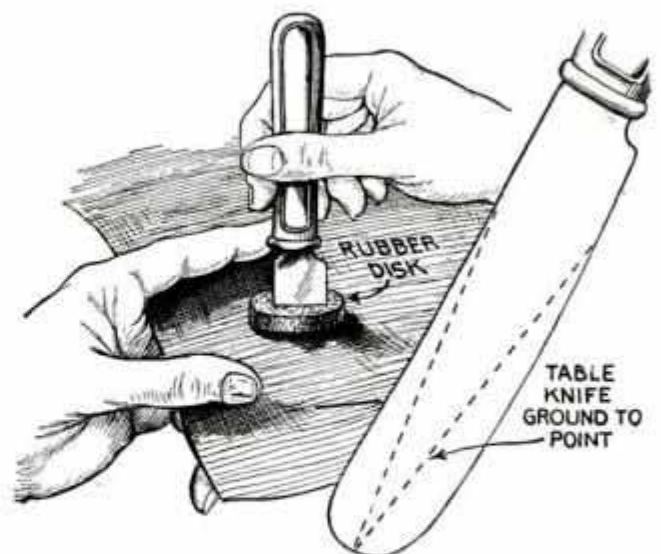
Why Risk Injuring Your Fingers in a Food Chopper?



Rather than push meat and other materials into a food chopper with the fingers, which may result in an injury, use a spoon as shown. A tablespoon is just the right size for the average chopper.

Buttonholes Punched in Cloth

Instead of cutting buttonholes with a pair of scissors, one seamstress prefers punching them with a spear-pointed tool made by grinding the blade of an ordinary table knife to a point as shown and then



Buttonholes quickly and accurately punched with blade of table knife ground to a spear point

sharpening both edges. A rubber disk with a slit in the center slides on the blade and serves as a stop so that a number of holes can be cut to the same width.

SAFE FUN *for*



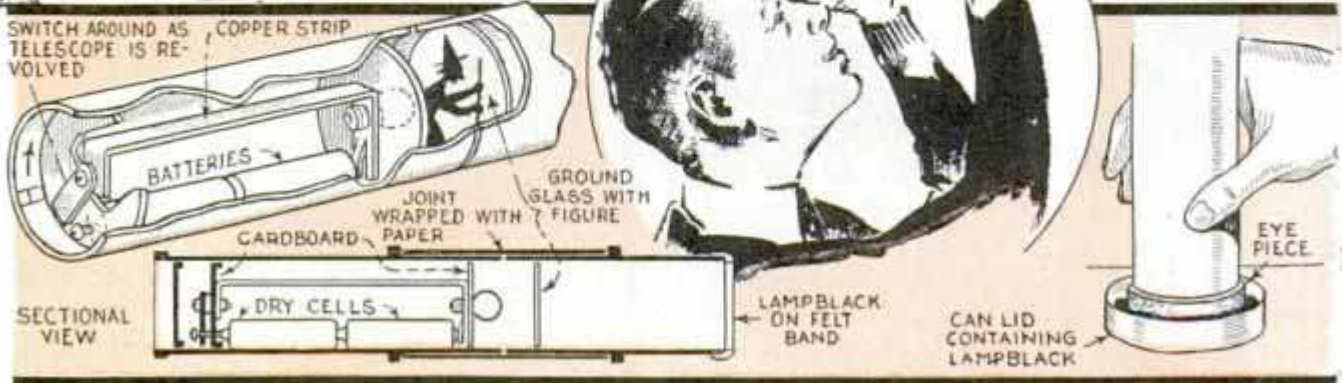
① When the party starts guests are fingerprinted "electrically"

UPON arriving, every member of this Halloween party must be fingerprinted and "mugged" as regular routine for identification records in the archives. The newcomer presses the thumb of his right hand down on the "ink pad," for which purpose ordinary carbon paper will do. This is pasted to a piece of sheet metal on a small box which contains two dry cells and a Ford vibrating coil, connected together as shown in Fig. 1. The "guard" presses a push-button switch the moment the guest touches the carbon paper and has his left hand on the table directly over another sheet-metal plate also wired up as indicated. The result is a sudden shock which is surprising but not harmful. To offset suspicion, it is a good idea to place the left-hand electrode under a tablecloth. Direct contact with the metal is not necessary. A long strip of metal along the edge of the table is better than a small plate as any one seated at the table naturally rests the left hand somewhere along the edge.

"Mugging" with an exploding camera



Another shocking episode, which may take place right on the "welcome" mat, is shaking hands with the "ghost host" who is a head taller than anyone in the party. See Fig. 11. He stands near the entrance and

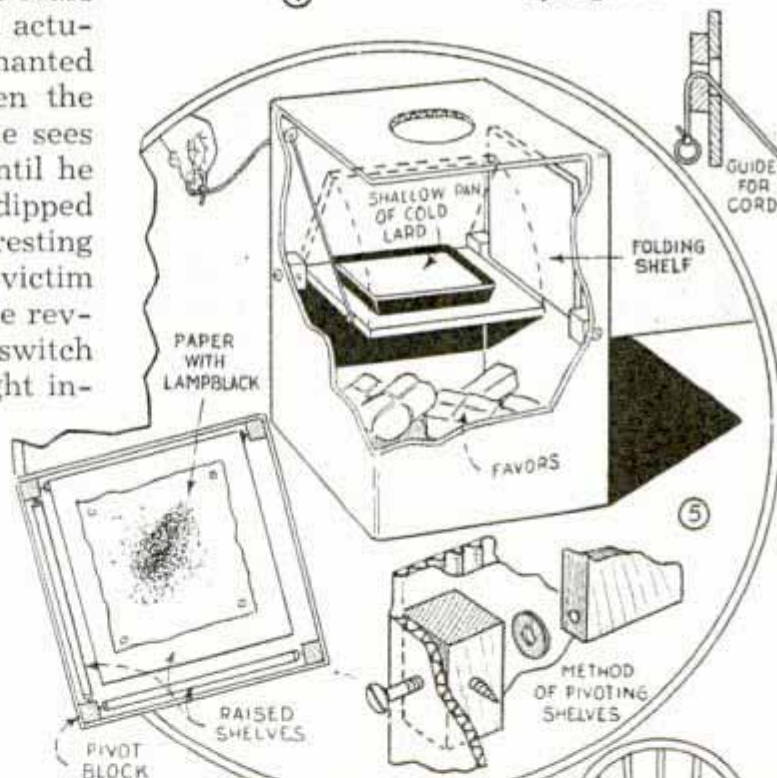


③ You will see a real picture in the telescope, but...

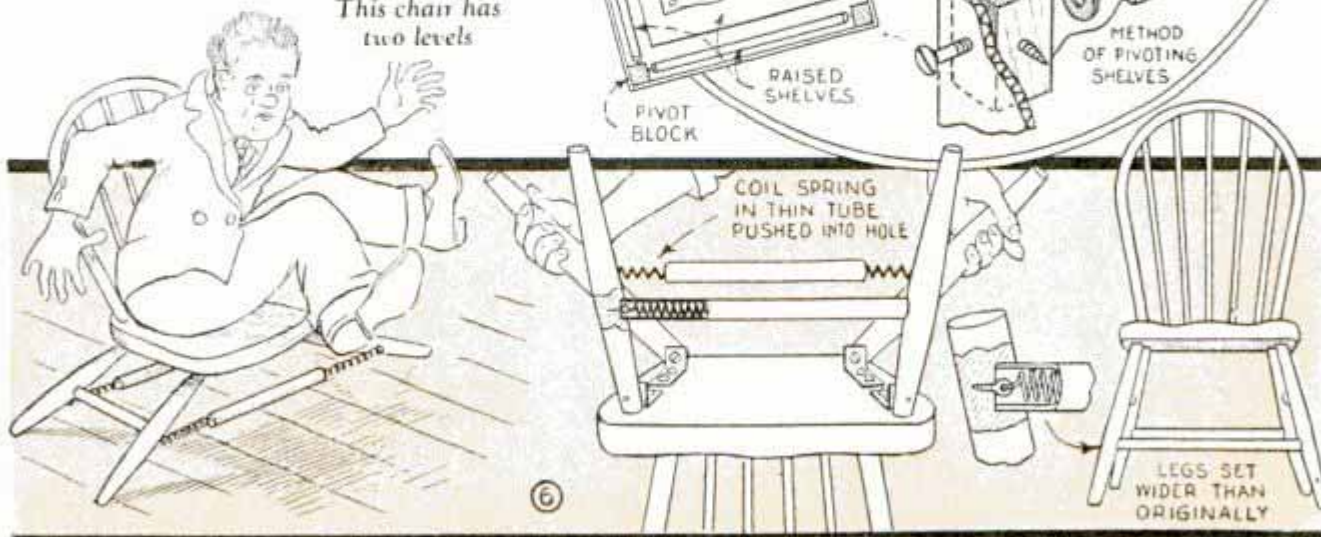
HALLOWEEN

extends his hand to the guest who takes hold of a cloth glove having four wiggly coil-spring fingers. These and a metal door mat are the electrodes, and are connected to a vibrating coil or a toy shocking machine operated by someone behind the ghost. The ghost has pearly eyes, which look as if they were suspended in void space of an empty hood.

The next job to get the records straight is mugging. This is done in a semidarkened room with a cardboard camera as in Fig. 2. The startling effect comes when the light is suddenly flashed and a cap pistol is fired at the same instant. After this, everything tried on the newcomer will be looked upon with great suspicion but he may be convinced to observe Mars without a shock or a scare. He will actually see something through the enchanted telescope, pictured in Fig. 3. When the star gazer first puts it to his eye he sees nothing, and is told to revolve it until he does. The eyepiece has a felt rim dipped in lampblack, which leaves an interesting ring around the eye. However, the victim has his reward for with one complete revolution of the telescope, a swinging switch lever makes contact and a small light inside reveals a witch or comic figure. To make the telescope, use a mailing tube about 14 in. long and 2½ in. in diameter. Cardboard partitions hold the lamp



This chair has two levels





Everything ahead recedes as you walk toward it

7

bulb and the revolving switch, which are joined by a copper strip. The switch must work freely. By making the tube in two parts, the assembly is easy. Paper wrapped around it completes the joint. Four bands of black paper are wrapped around the telescope to make the sooty eyepiece less conspicuous.

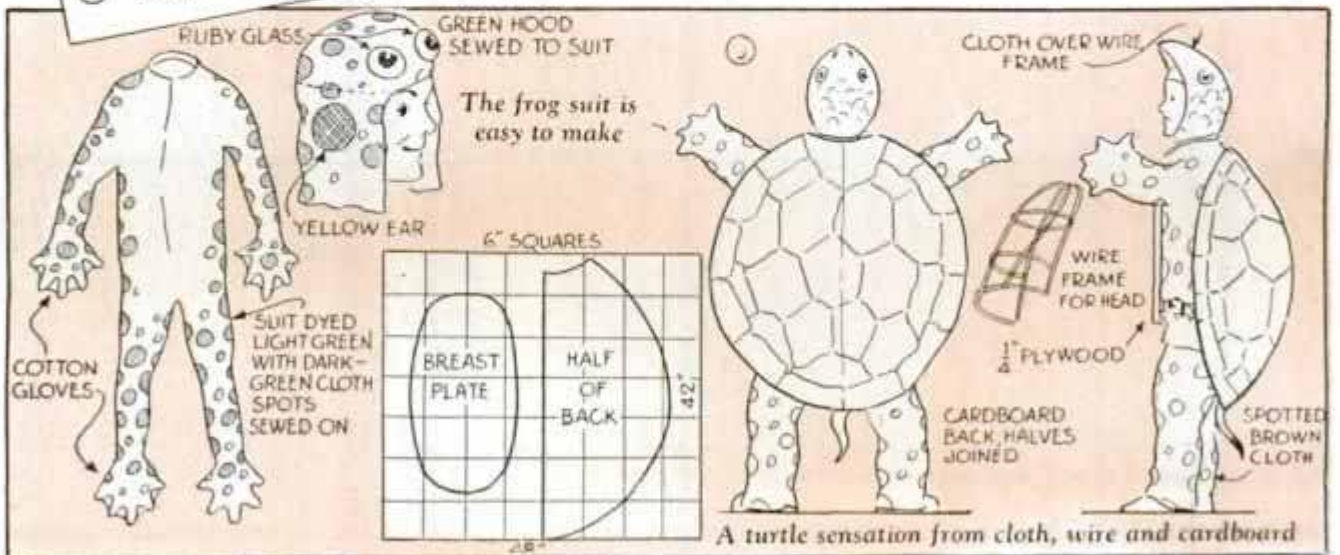
Fig. 4 shows an elaboration of the popular "grab-bag" idea. In this case a large carton is equipped with three shelves, which fold up against the sides of the box, giving free access to the favors for guests in the bottom. Lights are arranged so that the inside of the box is dark. After two or three merry-makers have drawn prizes from the box, an attendant "in the know" lets down one of the shelves by means of a concealed string. This shelf may have on it a shallow pan of lard, or a sheet of paper coated with lampblack or graphite and oil, or red grease—anything that will not flow when the shelf is in the vertical position. In the laughter which follows the victim's predicament, the attendant draws up the shelf and another guest is invited to draw from the box, this one of course brings out a favor. Eventually the other two shelves are let down to provoke more laughter.

A collapsible chair can easily be made from a common kitchen chair, and, if others of the same design are placed in the room, the tricky one will not be noticeable. Remove the legs and round off both ends as in Fig. 6. They are then joined in two pairs consisting of one front and one back leg connected with a rung. Coil springs, concealed inside of thin tubes are substituted for the front and rear rungs.



A surprise confetti shower

8



The frog suit is easy to make

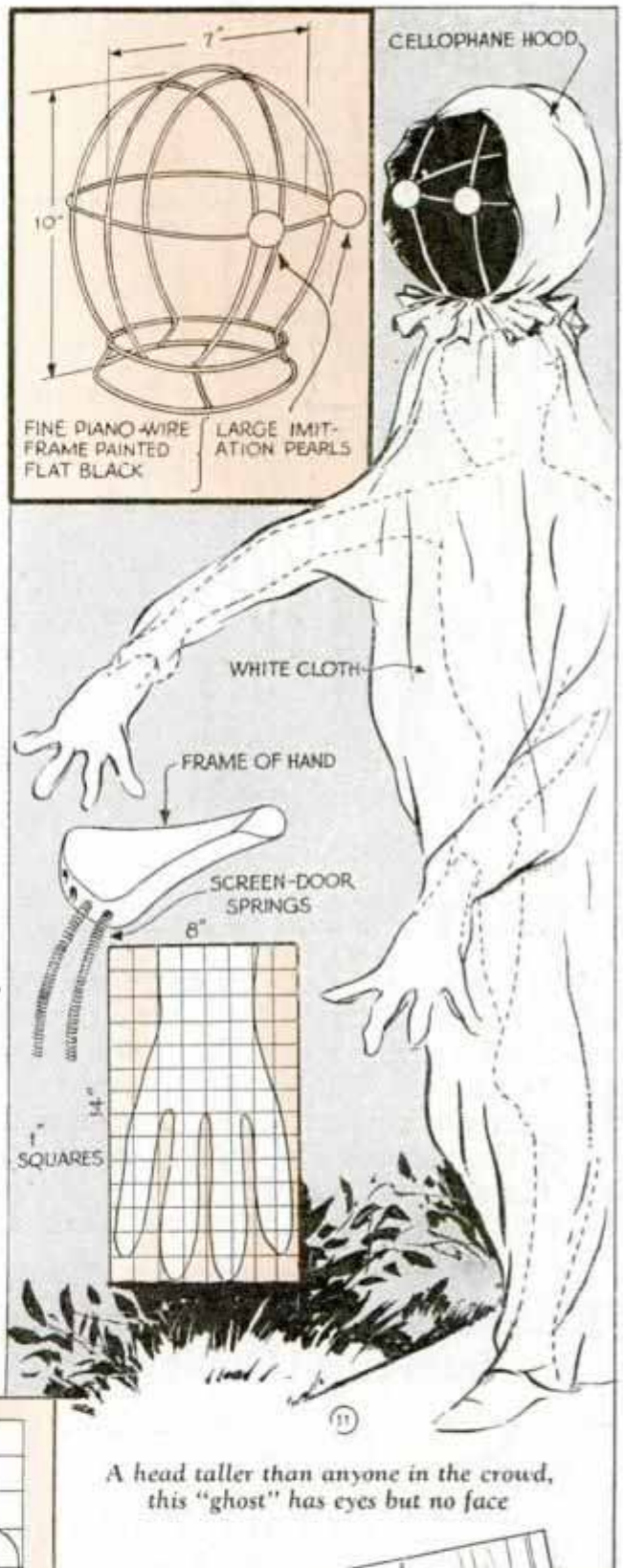
A turtle sensation from cloth, wire and cardboard

The tubes should fit into the holes formerly occupied by the rungs, and are painted to resemble them. As soon as a guest sits on the chair the tubes pull out and the chair sprawls. Strong tension springs should be used.

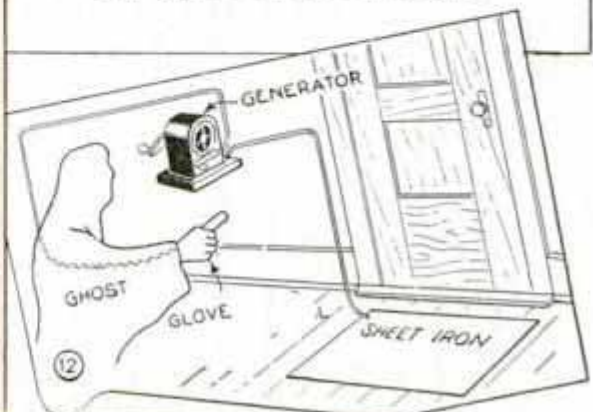
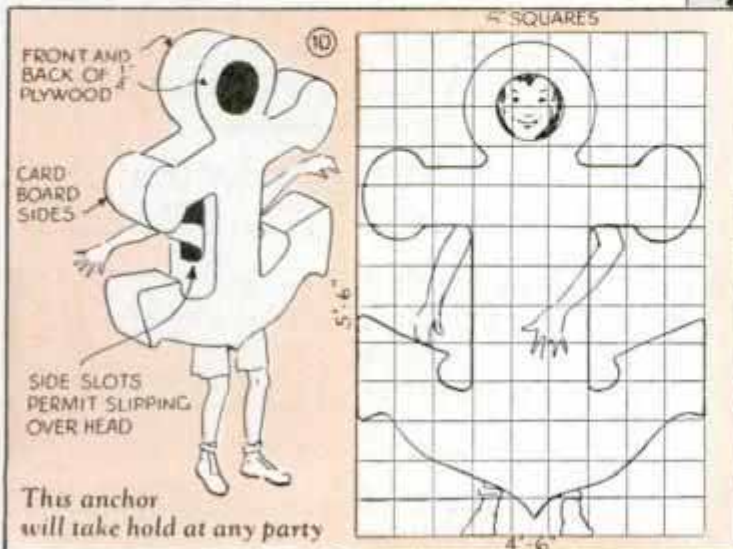
A most surprising effect is afforded by the "X-ray" helmet shown in Fig. 7. This, briefly, is a cardboard box with two mirrors arranged to throw the vision directly behind. The user of the helmet will have the strange sensation of seeing what appears to be the foreground receding from him as he progresses, and although there may appear to be an open door ahead, more likely he will fetch up against a wall.

For a confetti blizzard, an electric fan is rigged as shown in Fig. 8. This also can be operated by an extension switch. Make a large cardboard cylinder to fit over the fan frame, paste a disk of tissue over the front end, just enough to hold it until the blast strikes it, and then fill the space half full of confetti. When the unwary guest steps in front of the fan, he is deluged with a shower of confetti.

Ideas for Halloween costumes are pictured in Figs. 9 and 10. The frog suit is an ordinary union suit dyed a light green, with dark green cloth spots sewed or cemented on. Cardboard, plywood, wire and cloth are all that is necessary to make the turtle costume. By cutting the back halves as indicated and joining along the ridge with adhesive tape, a very convincing shell can be made. The anchor is simply made of plywood and cardboard, and the wearer should be clad in trunks and have tattoo figures on arms and legs painted with harmless coloring, such as fruit juice.



A head taller than anyone in the crowd, this "ghost" has eyes but no face



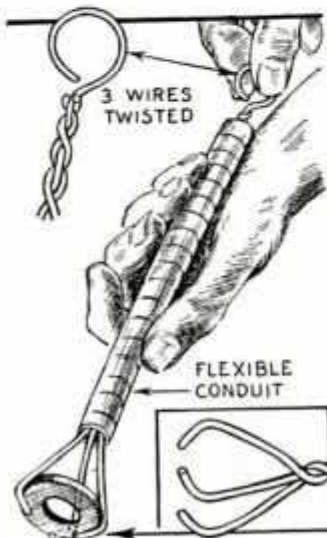
Twist Tamper Does Not Stick in Clay or Concrete



Twisting the tamper slightly tends to break the vacuum between it and the wet material

The tendency of wet clay or concrete to adhere to the bottom of a tamper can be avoided by giving it a slight twist as it is lifted each time. The twisting action tends to clean the surface of the tamper and break the vacuum that exists between it and the wet material. To facilitate twisting the tamper, a hand grip is provided.

Flexible "Finger" Picks Articles from Small Gratings

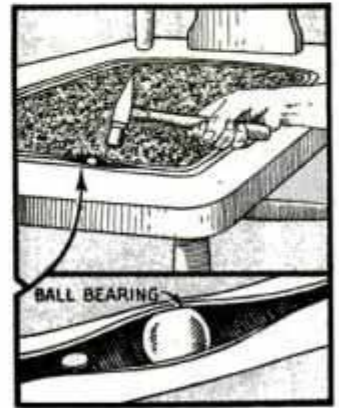


For retrieving small articles in places where you can't reach them with the hands, such as heating registers and gratings, you can use this simple "finger." It consists of three lengths of spring brass wire twisted together, leaving three prongs at one end,

which are bent to form jaws. Insert the assembly into a length of flexible conduit and form an eye on the other end of the wires. Moving them back and forth in the conduit opens and closes the jaws.

Upholsterers' Gimp Is Spread with Steel Ball

Instead of trying to hold upholsterers' gimp open with the fingers to keep it in place while driving the tacks, use a steel ball as shown. Besides keeping the gimp spread apart, the use of the ball lessens the danger of hitting the fingers with the tack hammer.—A. H. Waychoff, Tempe, Ariz.



Depth of Small Holes Measured with Automatic Pencil



Here is a simple method of measuring the depth of small holes. The point of an automatic pencil is inserted in the hole and the lead is forced out until it touches the bottom. When the pointed end of the pencil is even with the surface of the work the projecting lead is equal to the depth of the hole.

the surface of the work the projecting lead is equal to the depth of the hole.

Broom to Sweep Snow and Slush Stiffened with Wood Backing

Stiffened with a piece of plywood, an ordinary broom can be used effectively for cleaning sidewalks of fairly deep snow. Cut the plywood to the



shape of the broom and drill a few small holes through it to take fine wire, which attaches it to the broom. It is best to cut the plywood about an inch shorter than the broom straws so that they will project from the bottom edge. Thus, the plywood pushes the heavy snow, while the projecting straws sweep the walk clean.

Oven Rack Has Guard on Edge to Prevent Accidents



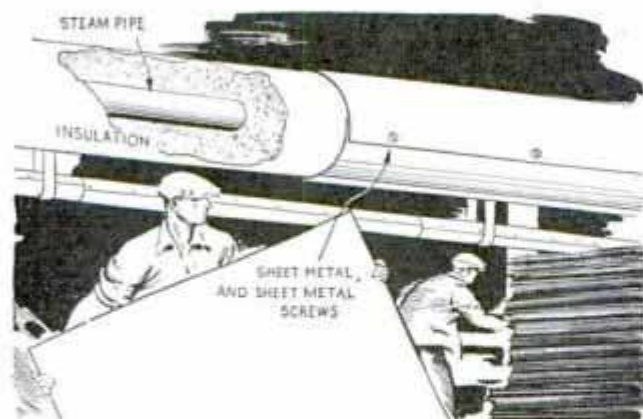
There won't be any danger of accidentally pushing a roaster off the rear edge of a wire rack in an oven if the rack is fitted with a metal guard as shown. To make such a guard, you simply bend a

piece of galvanized iron of suitable length at right angles, drill holes through the metal, and wire it onto the rack.

—L. H. Georger, Buffalo, N. Y.

Pipe Insulation in Metal Sleeves Is Well Protected

When heavily insulated steam pipes pass through a room where the insulation is likely to be damaged by objects striking



If some insulation has been knocked off your steam pipes, replace it and sheath it with sheet metal

or rubbing against it, you can avoid such trouble by encasing the pipes in sheet metal as shown. Use a metal light enough to be formed around the insulation by hand and fasten it at the seams with sheet-metal screws.

Putting Up Cloth or Paper Sign in Windy Weather



Wind cannot tear a paper sign when putting it up if it is rolled on a broomstick

It's a simple matter to put up a cloth or paper sign single-handed on a windy day, if it is first rolled on a stick. Fasten the free end of the sign and then gradually unroll it as you tack down the edges. With this method, the untacked portion of the paper is kept tightly rolled so that there is no chance for the wind to tear it.

—G. E. Hendrickson, Argyle, Wis.

Reflector for Photo-Flash Bulbs from Small Hand Mirror

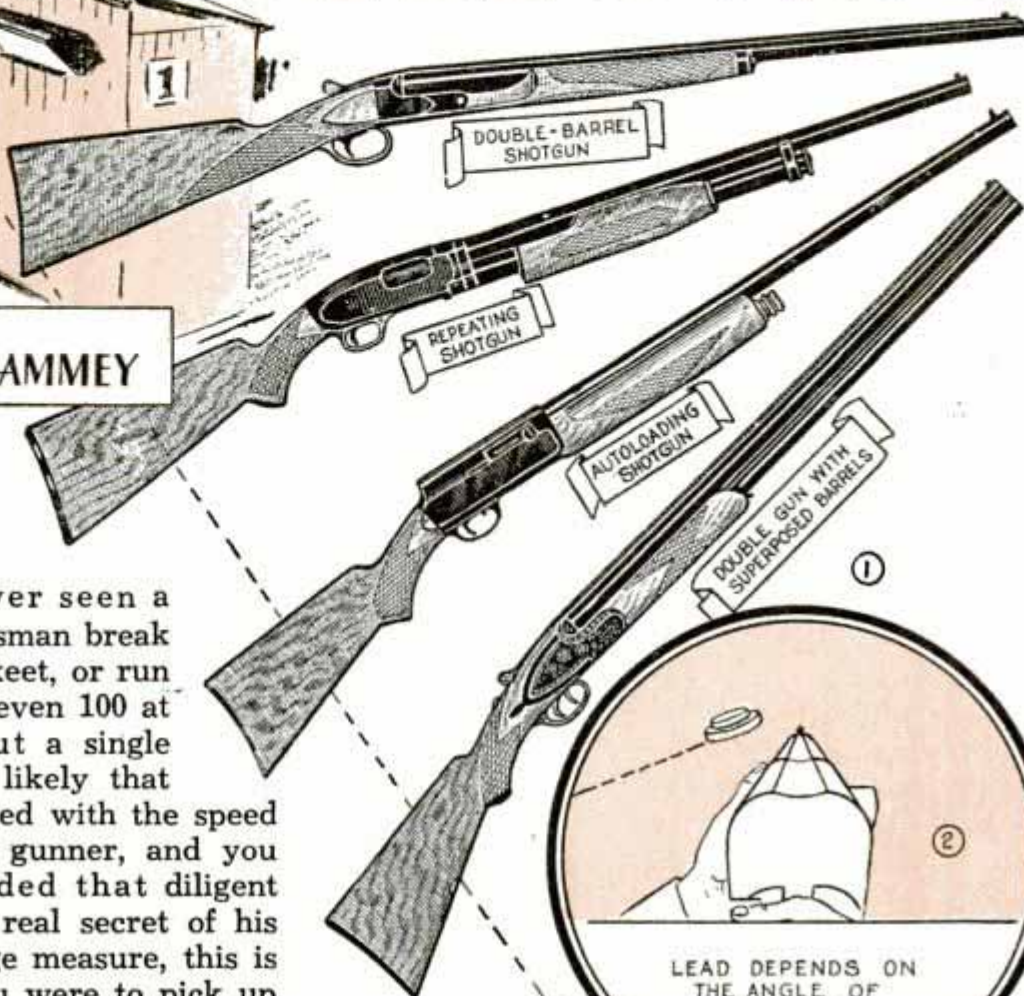
An ordinary hand mirror makes a good reflector for use with photo-flash bulbs. Just mount a porcelain wall socket on a small wood block and screw the latter to the handle of the mirror as shown so that the bulb, when inserted into the socket, will be directly in front of the mirror. To control the bulb, a small toggle switch should be fastened to the block within easy reach.—Paul Hadley, Piggott, Ark.



SELECTING



By
W. CLYDE LAMMEY

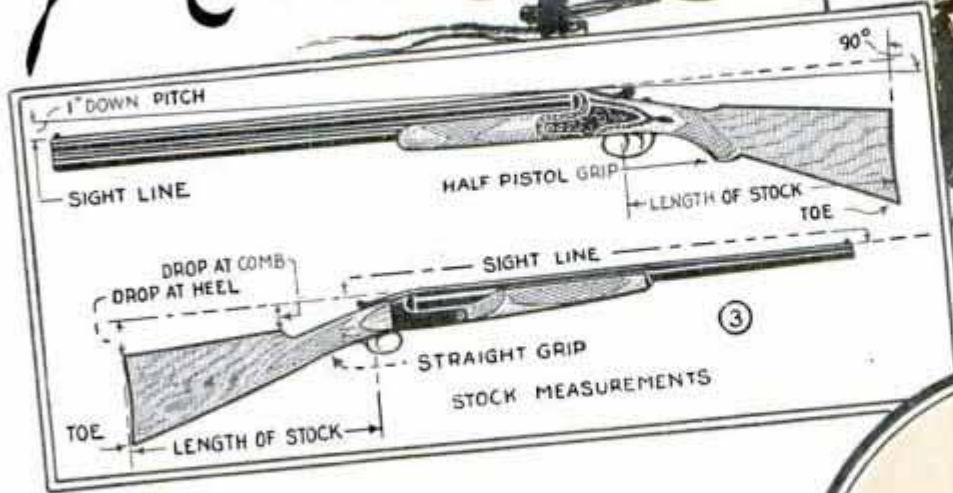


HAVE you ever seen a skilled marksman break "25 straight" at skeet, or run a string of 50 or even 100 at the traps without a single miss? If so, it's likely that you were impressed with the speed and form of the gunner, and you probably concluded that diligent practice was the real secret of his success. In a large measure, this is correct, but if you were to pick up his gun and throw it to your shoulder you might discover that it didn't suit you at all. Possibly you would have to make a conscious muscular effort to bring the barrel into alignment. This would slow up your speed in pointing the gun. Again, the design of the stock might cause your right hand to be cramped. In other words, the gun would not fit your needs individually, because the owner has selected it to suit his own taste and requirements, just like selecting and fitting a suit of clothes.

Skillful handling of a shotgun is a matter of speed. This does not mean a series of sudden, violent movements but rather a smooth, unbroken sequence of motion that gets the gun to your shoulder, your cheek on the comb, and your eyes on the object to be hit—all in a split second. Roughly, the effective range of the average shotgun is 35 to 40 yards. Because of this, the experienced gunner knows that when he steps up to a station on the skeet field and calls for his bird, or when swift-winged game flushes in the field, he must get into action instantly. In doing this his whole attention centers on the object to be hit; he is not conscious of the movements

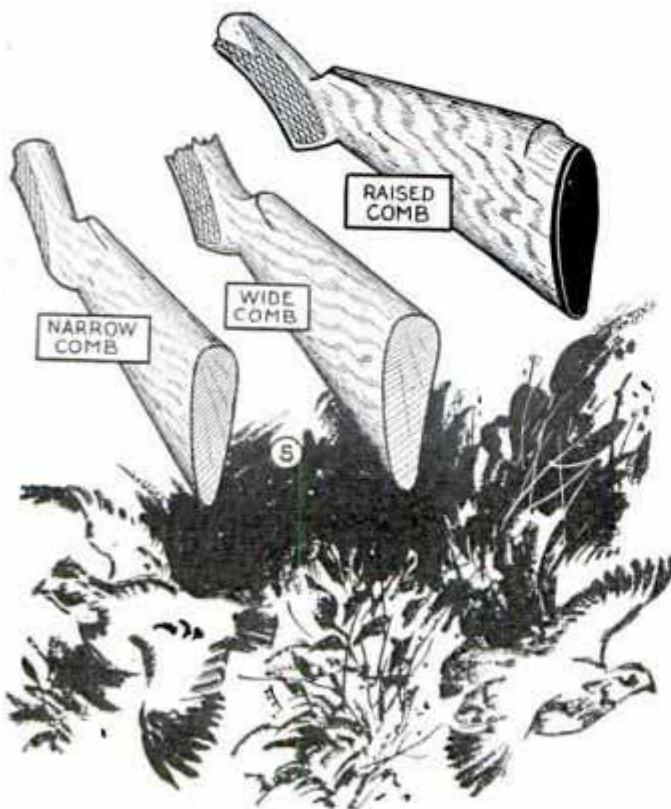


your SHOTGUN



required to bring the gun into position and fire it. You do not aim a shotgun like you do a rifle. Rather you point it, in much the same fashion that you point your finger.

Generally speaking, gun fit hinges on just three dimensions of the stock, which you will find in Fig. 3. These are the length measured from the trigger to the center of the curved butt plate, and the comb and heel drop measured in inches from the sight line. Manufacturers, considering the design of their own product, have worked out average stock dimensions that are intended to be suitable for



most shooters of average stature. Then there is the structure of the gun itself. For example, you might find a double gun, similar to that in Fig. 1, unsuited to you individually, while the repeating or auto-loading gun, with essentially the same stock dimensions, might fit exactly. This would likely be due to the variation in the type of gun rather than in the stock alone.

Now, to find out whether the gun in hand fits you individually: Sometimes this is rather difficult to determine fully at the outset. With any one of the four shotguns shown in Fig. 1, at your shoulder, go through the five positions shown in Fig. 7. In each case, the arrow indicates the direction in which the gun is pointing at the start of the swing. The foot positions are only approximations, of course, but if you practice them until you acquire the habit, they will help greatly in balancing for a quick shot. Remember that your arms must "lock" the gun to your shoulder; your feet do not move. Your body does the swinging. Now take the first two, in Fig. 7, as an example. At the start of the swing, in each case, hold the gun as in

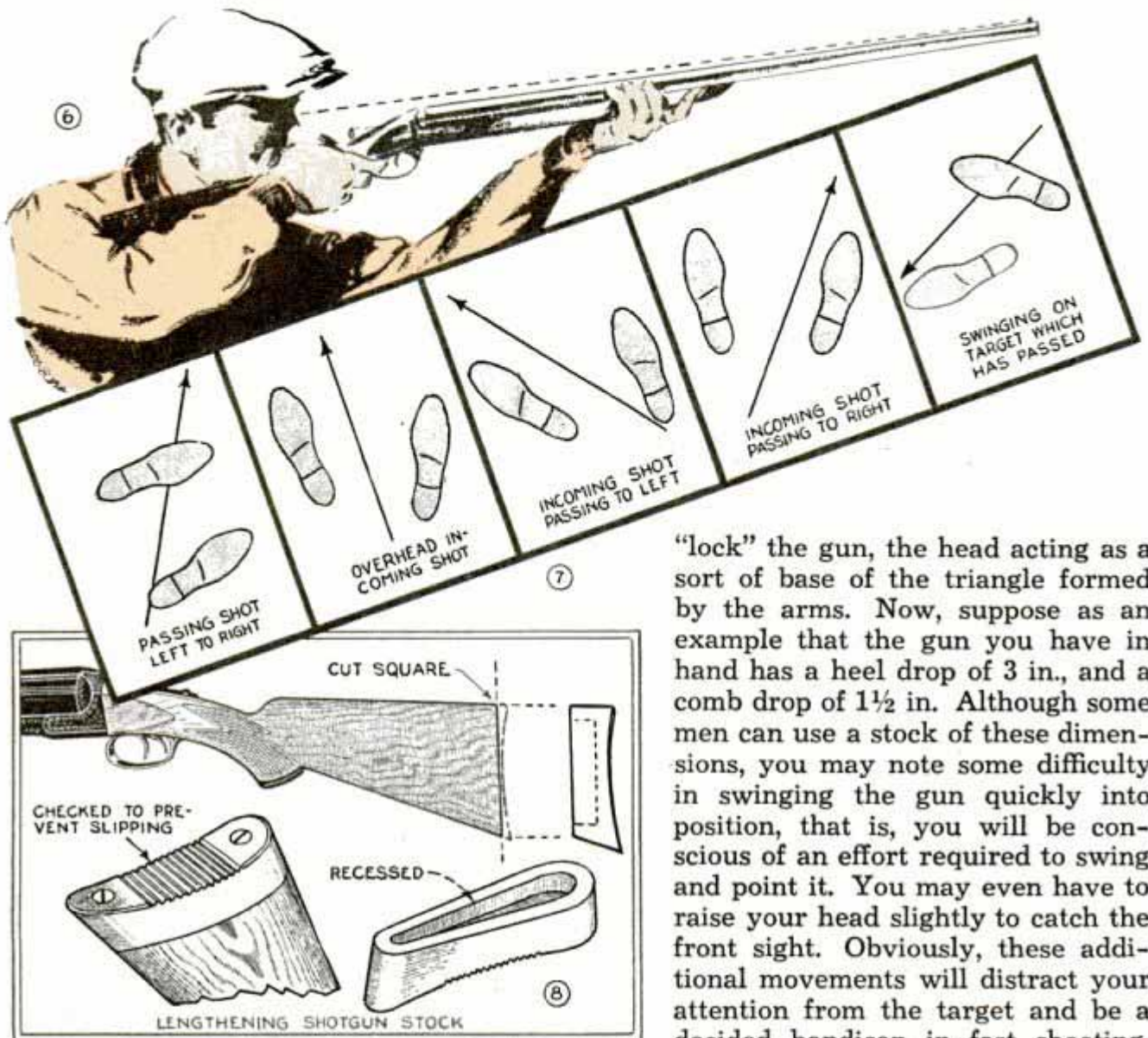


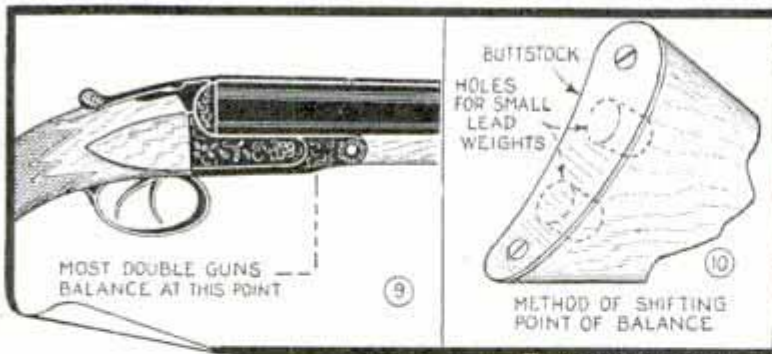
Fig. 6. In the first swing, left to right, you'll notice a gradual tightening of the muscular tension as you come around, also a more or less involuntary tendency of the cheek to slide backward on the comb. The latter will be more pronounced if the stock is too short for you, although it is not as evident as it will be when you try the second swing on an imaginary overhead incoming target. This time the cheek will tend strongly to slide forward. Some shooters take this shot with a backward body bend; others by arm swing.

Now go back to Figs. 2, 3 and 4. Most crack wing shots use a "straight" stock, which means, first of all, but little variation between the comb and heel drop, Fig. 3. Most of these shooters habitually "cheek" the gun hard, that is, the cheek is pressed firmly onto the comb in all shooting positions. This has a tendency to

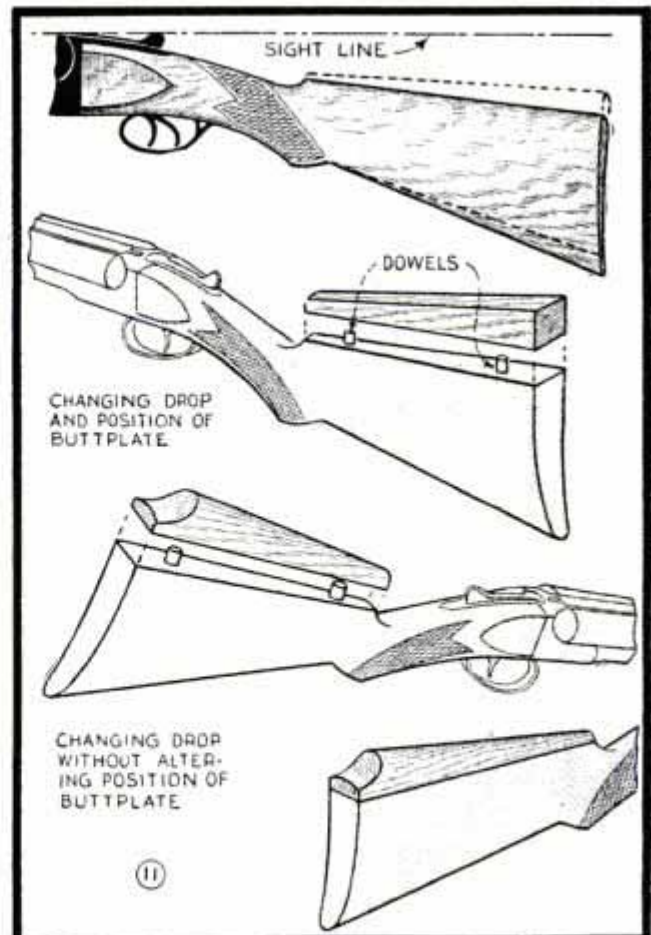
"lock" the gun, the head acting as a sort of base of the triangle formed by the arms. Now, suppose as an example that the gun you have in hand has a heel drop of 3 in., and a comb drop of 1½ in. Although some men can use a stock of these dimensions, you may note some difficulty in swinging the gun quickly into position, that is, you will be conscious of an effort required to swing and point it. You may even have to raise your head slightly to catch the front sight. Obviously, these additional movements will distract your attention from the target and be a decided handicap in fast shooting. Trying the same type gun with a

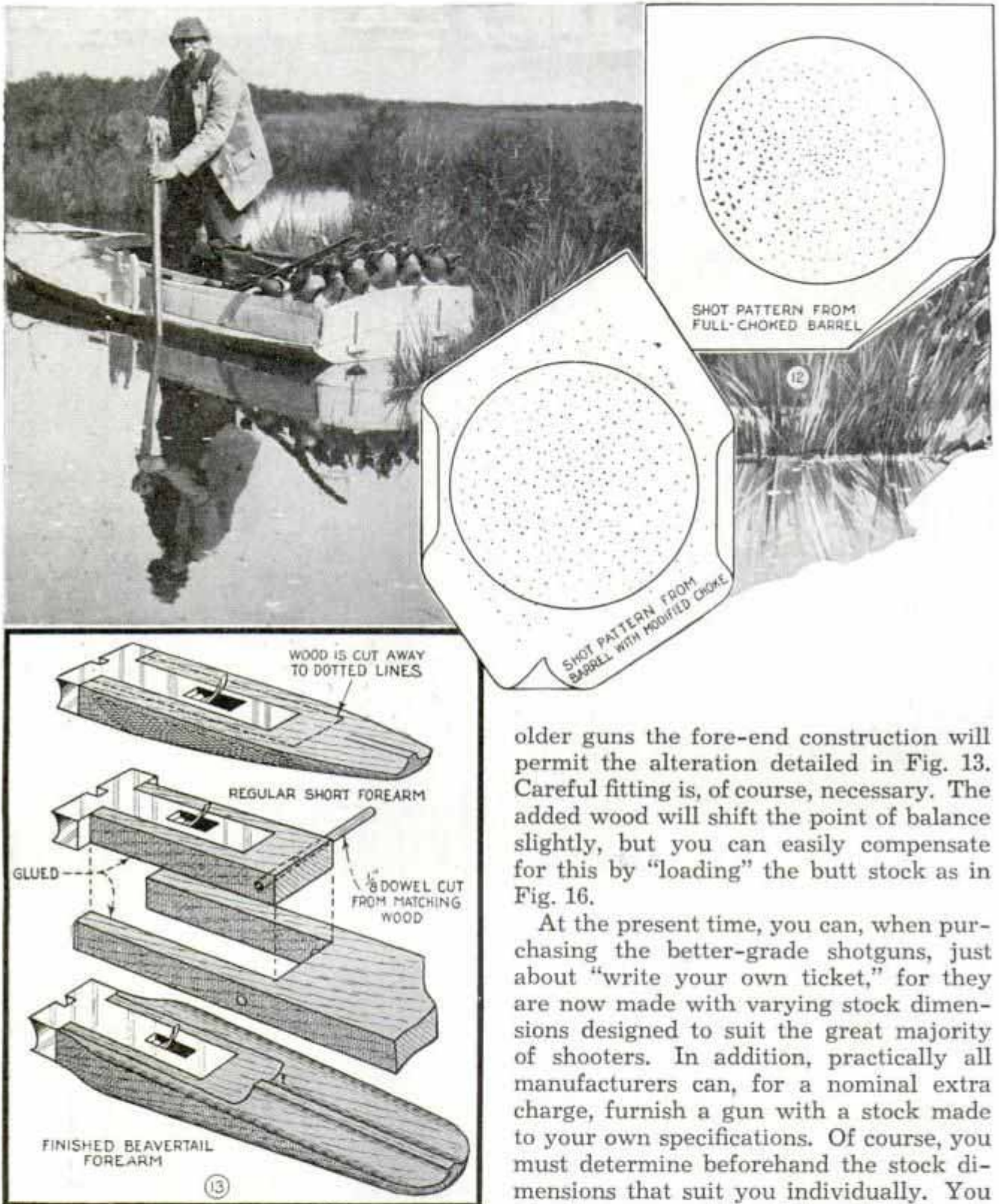
heel drop of only 2 in., the comb drop being 1½ in. as before, you will probably note a difference at once. The straighter stock will bring your eye above the breech as in Fig. 6, and the barrel, or barrels, will be in full view, as in Figs. 2 and 4. Such a position enables you to judge distance and lead quickly and accurately. Keep in mind that in all tests of this kind as well as in actual shooting, you should acquire the habit of keeping both eyes open. This utilizes a principle of stereoscopies, the value of which you can easily check by closing one eye and then attempting to gauge the distance quickly to either a moving or stationary object.

Length of the stock and degree of pitch also have something to do with the "feel" of a shotgun. Most shooters find that a stock length of 14 in. is right for them. This, combined with a heel drop of 2 or



2¼ in. and a comb drop of 1½ in., will prove suitable for a majority of those of average stature. Manufacturers can usually furnish such stocks as standard on the better grades of guns. Stocks are usually furnished with a 1-in. pitch, Fig. 3, but this also varies from zero to as much as 3 in. Certain physical characteristics may make it necessary to specify a special type of comb when selecting a new gun. For instance, if you are full-faced you will probably find a narrow comb, Fig. 5, more suitable. A man with a thin face will likely find a wide or raised comb an advantage. In all this the shooter must determine for himself, by experiment, just what stock characteristics suit him best. Fig. 8 shows one way of lengthening the standard stock that is too short. A new butt plate is made of a pressed-fiber material. The butt is squared and the longer butt plate is screwed in place and worked down flush with the wood. A rubber recoil pad will also accomplish the same thing. Any reputable gunsmith can fit the latter for a nominal charge. As a rule nearly all types of shotguns balance at a point from 4 to 6 in. above the trigger as in Fig. 9. Under certain conditions it may be advisable to shift this slightly to make a gun handle better. By taking off the butt plate as in Fig. 10, and boring two or more shallow holes in the stock you can move this point forward, or, by filling one or more holes with lead the point will be moved nearer the trigger. Another stock alteration is shown in Fig. 11. Here you can do either of two things, change both drop and position of the butt plate, or change the drop alone. Either is a comparatively simple job but it must be done with care. By raising the comb and butt plate as in the first two details, you can correct a tendency to undershooting. If you have an expensive gun, it's best to



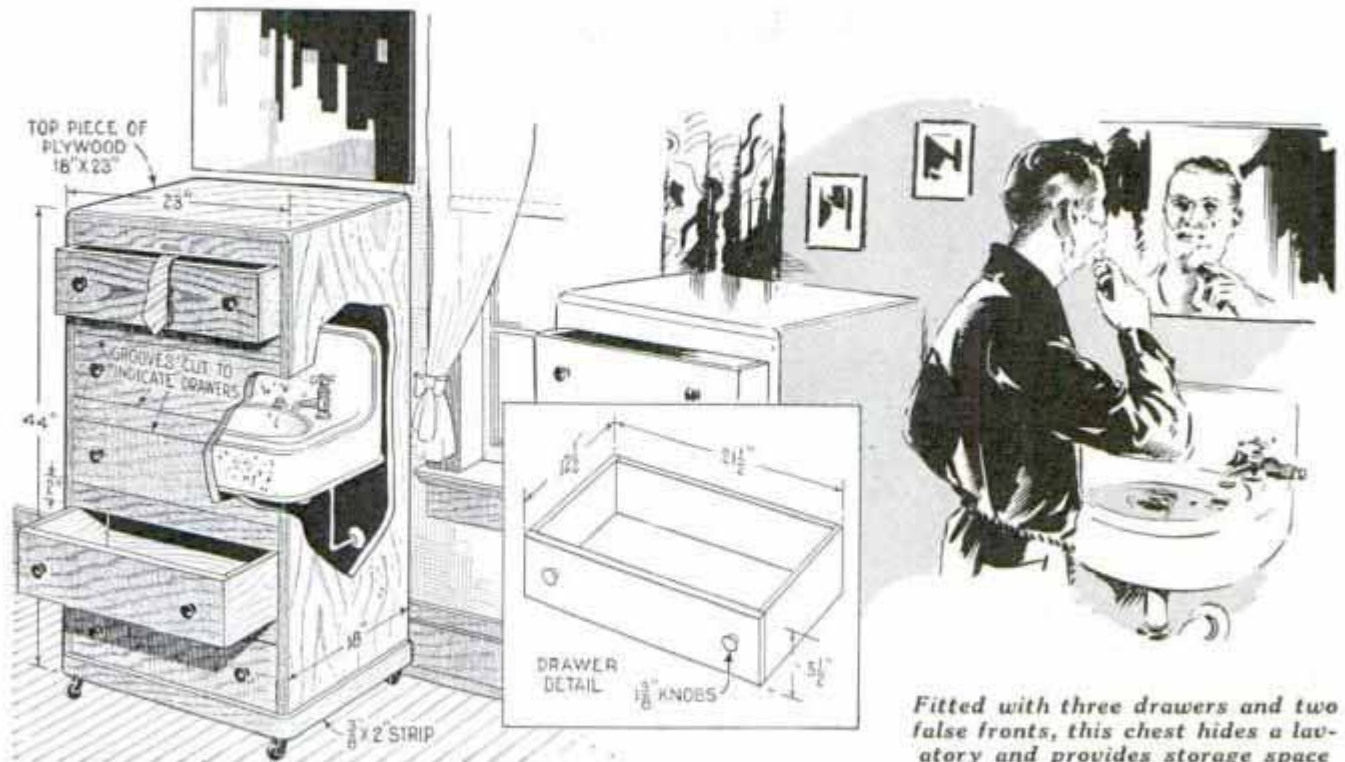


take it to a gunsmith to have this work done, as he can probably fit a new stock made to your own specifications for little more than the alteration would cost. But if the stock is plain, straight-grained wood, you can do the job yourself. It is only in later years that the "beavertail" forearm, or fore end, as it is also termed, has come into widespread use. Its real advantage is its greater length and width. On most

older guns the fore-end construction will permit the alteration detailed in Fig. 13. Careful fitting is, of course, necessary. The added wood will shift the point of balance slightly, but you can easily compensate for this by "loading" the butt stock as in Fig. 16.

At the present time, you can, when purchasing the better-grade shotguns, just about "write your own ticket," for they are now made with varying stock dimensions designed to suit the great majority of shooters. In addition, practically all manufacturers can, for a nominal extra charge, furnish a gun with a stock made to your own specifications. Of course, you must determine beforehand the stock dimensions that suit you individually. You also have a variety of barrel boring to choose from. These are the cylinder, or open bore, the improved cylinder, the skeet chokes, No. 1 and No. 2, the modified, the improved modified and the full choke. These terms signify the degree of choke boring. Fig. 12 shows two representative shot patterns. The modified barrel is the best all-around choice, but for quick work at close range the improved cylinder or skeet chokes are preferable.

Chest of Drawers Hides Single-Room Lavatory



Fitted with three drawers and two false fronts, this chest hides a lavatory and provides storage space

Built with two false drawers and three regular ones, this plywood chest is open at the back so that it can be pushed against a wall over a lavatory to conceal it, as is often desired in rooming houses, hotels and dormitories. The drawers are about two-thirds the depth of the chest, the top one sliding freely over the basin, while

the two lower ones slide under it and in front of the plumbing. The false drawer fronts are made by cutting shallow grooves in a solid panel, the use of four wood-knob drawer pulls adding to the deception. Four easy-rolling casters make it a simple matter to move the chest.

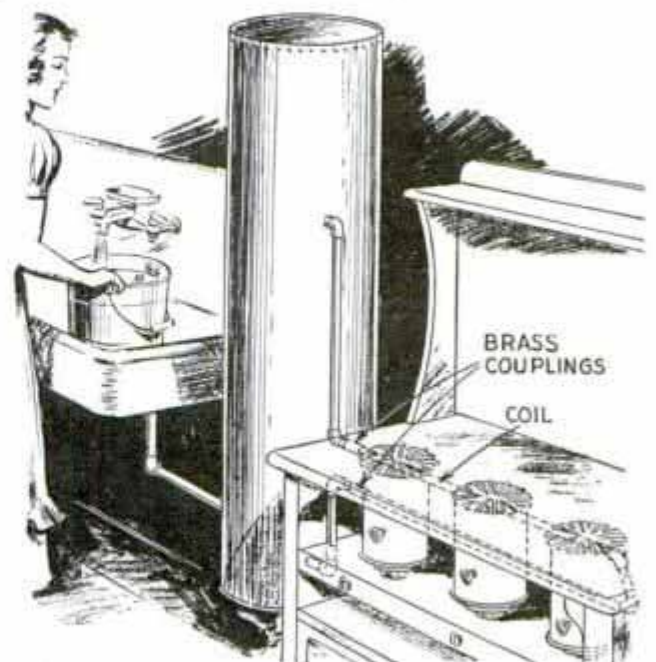
—Frank Beatty, Chicago.

Kerosene Cooking Stove Supplies Warm Water in Home

Those who live in homes where running hot water is supplied by a tank connected to a water back in a coal range, or to the heating plant, can have a supply of warm water when these are not in use by installing a coil in their kerosene cooking stoves. The coil, of course, is connected to the hot-water tank and passes over the top of the stove burners. If these are of the type that must be lifted to light the stove, be sure to make an allowance when making the installation. As the coil is below the cooking grates it is hardly noticeable and does not interfere with the regular use of the stove.

—R. V. Lovejoy, Lowell, Mass.

☐ Before handling fruits which tend to stain the hands, apply olive oil to the fingers and the juice will wash off easily.



Your kerosene stove will furnish warm water if you run a coil over the burners

Metal Spinings Lubricated by Ordinary Candle



A candle rubbed on the surface of metal-spinning work lubricates it nicely

I have found that a candle stub is satisfactory for lubricating the surface of metal while spinning it, and in many cases, where sheet lead and other soft metals are to be stretched to shape inside of a hollow form, it is superior to other lubricants I have used. Just hold the end of the candle against the rotating work, and friction will melt the wax, which will spread evenly over the surface. If maple dowels are used for tools, the wood ends pick up some of the wax, but even then an occasional application of the candle is advisable. This prevents cutting of the surface and, except for a final touching up with steel wool, the work is ready for the finish after having been spun to shape.

—Dale R. Van Horn, Lincoln, Nebr.

Thread Kit from Poker-Chip Rack

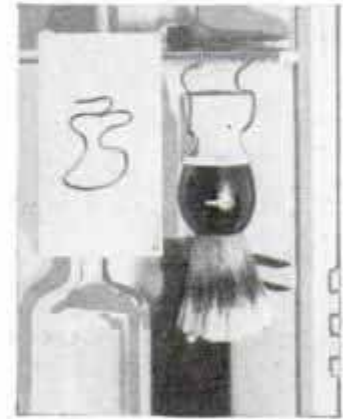


An old poker-chip rack makes a dandy kit to hold spools of thread. The openings in most of these racks will hold three spools of thread when set in a ver-

tical position, or four when they are laid horizontally. A disk of heavy cardboard glued over the bottom of each opening will keep the spools from falling out.

Shaving-Brush Holder on Shelf Suspends Bristles Downward

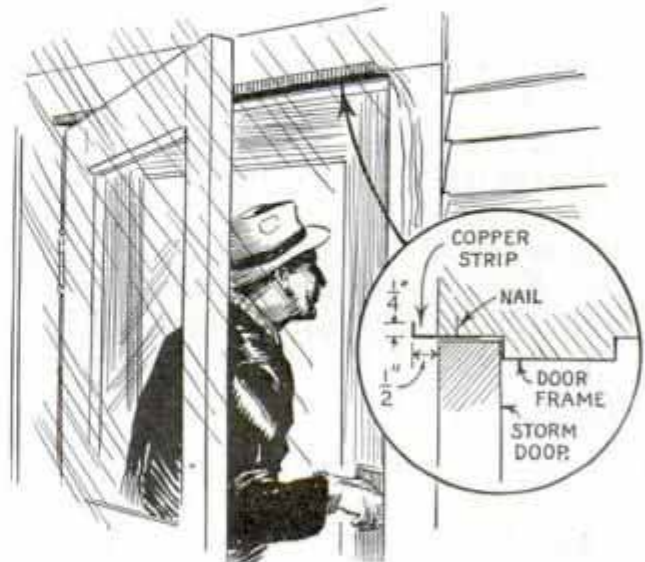
Bent from a piece of wire and clipped to a shelf of your bathroom cabinet, this shaving-brush holder utilizes space that is usually wasted. Besides, the bristles are suspended downward so that they dry much quicker than when the brush is set on a shelf in the cabinet.



—Robert Brightman, Brooklyn, N. Y.

Gutter Nailed over Storm Door Carries Away Rain

Have you ever opened a storm door during a rain and had water run down your neck from the casing above? If so, a copper strip with one edge bent upward at right angles and nailed to the underside of the top edge of the door casing will prevent such trouble. A liberal coat of nonhardening cement applied to the casing before nailing the copper in place will keep water from running between the wood and the strip.



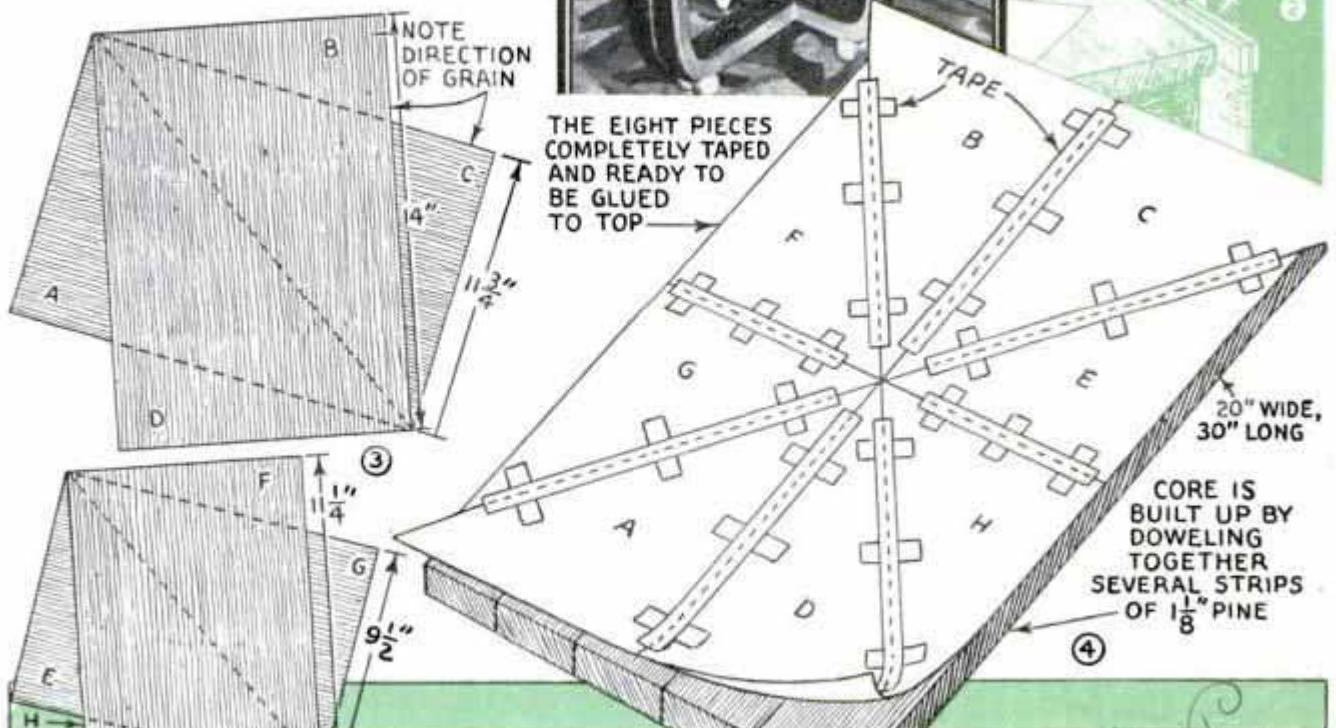
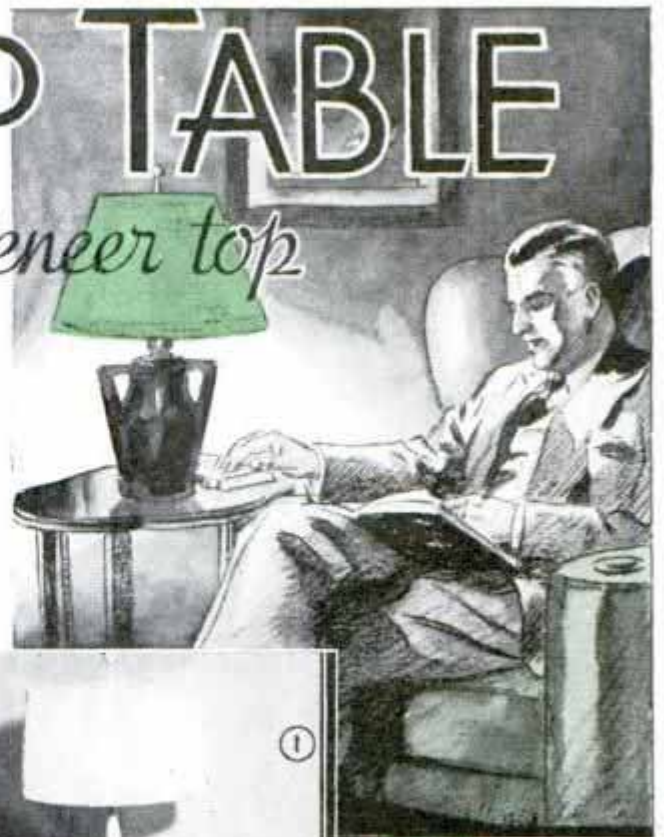
Water will not run down your back when you open a storm door if this small gutter is installed

Modern LAMP TABLE

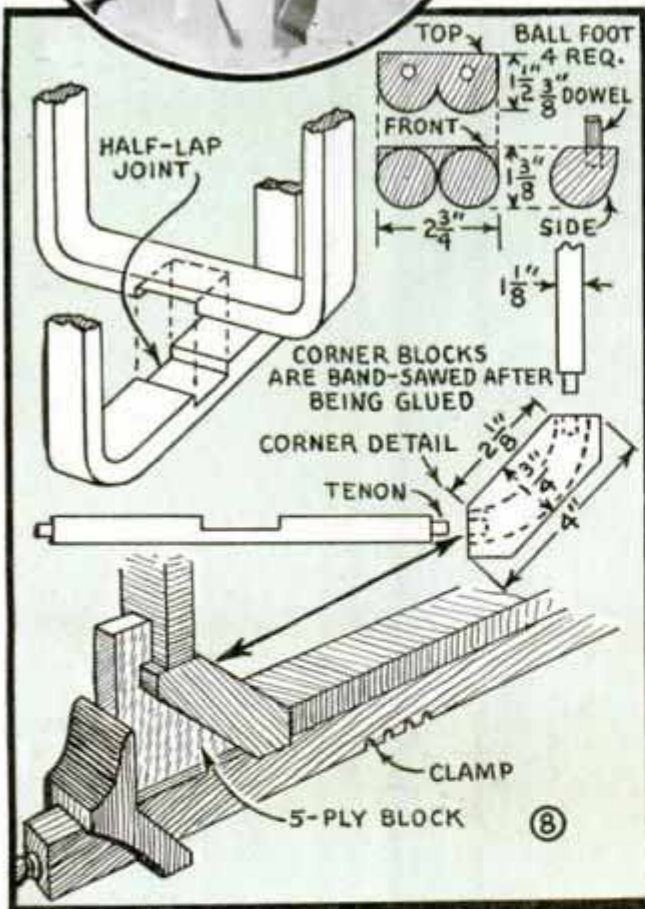
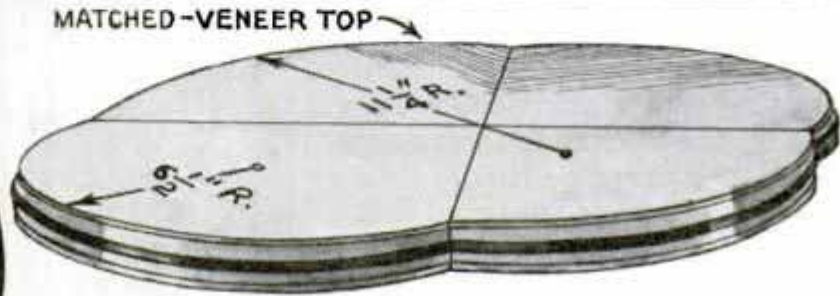
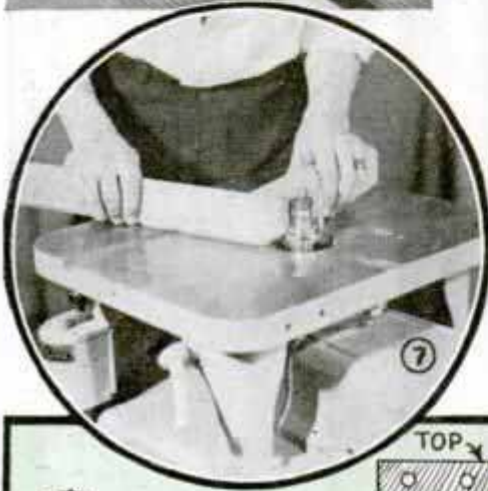
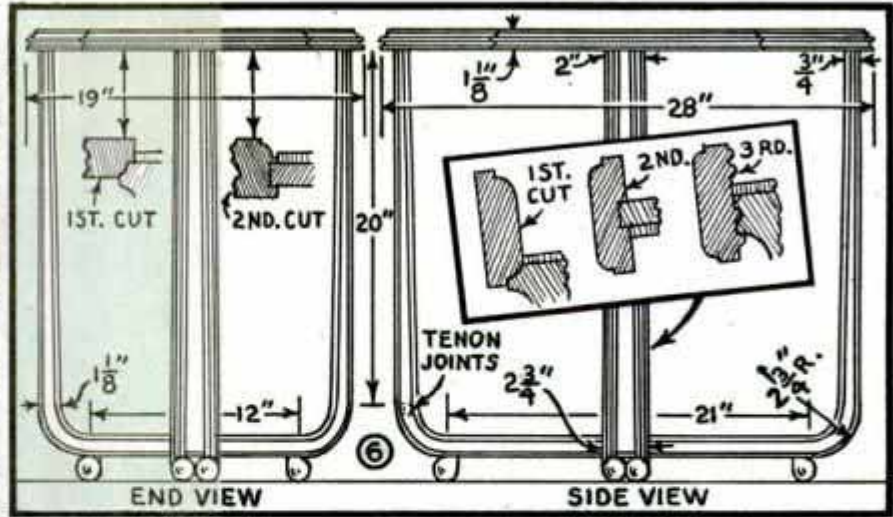
has matched-veneer top

HARMONIZING with a base of unusual distinction, the veneered "clover-leaf" top of this table forms a clever combination of period design with modern styling. Under the veneer a glued-up core of $1\frac{1}{8}$ -in. strips checks any tendency to warp. Simple butt glue joints and dowels are used in assembling the core, and applying the clamps alternately on opposite sides of the work produces a flat surface free of twist. After the glue has hardened thoroughly, one side of the panel is planed perfectly smooth. Center-lines dividing it each way are then made and the outline of the top is laid out with a compass following the radii given in the detail below Fig. 6.

Four pieces of $\frac{1}{2}$ -in. straight-grained veneer are required to form the "herringbone" pattern as in Figs. 3 and 4. By ordering veneer with the grain running the short way of two of the pieces, waste can be reduced to a mini-



no 10-0-



The four uprights of the leg assembly are joined to the horizontal members with four angle blocks. After sawing to the proper curve the molding is run on the edges, the molding being stopped at the halved joint

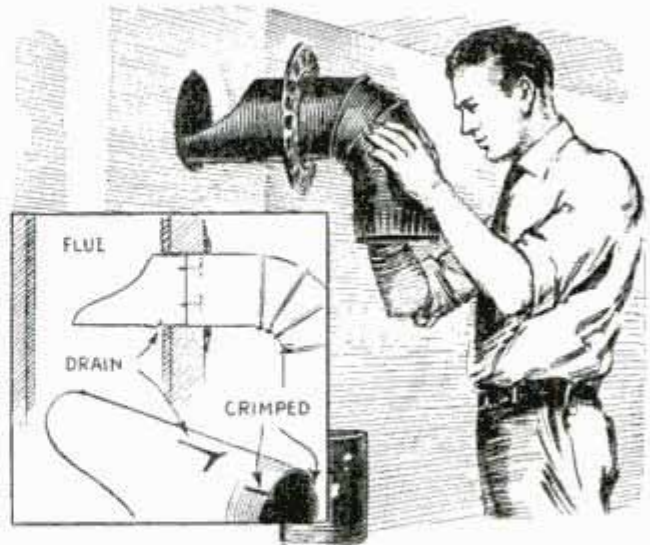
mum. Trim squarely both corresponding pairs of pieces to measure $11\frac{3}{4}$ by 14 in. and $9\frac{1}{2}$ by $11\frac{1}{4}$ in. respectively. To do this accurately, place the veneer between two pieces of scrap stock and plane it straight as in Fig. 2. Corresponding pairs are now placed diagonally one on top of the other and fastened down temporarily with tabs of gummed tape. The pieces are cut diagonally from corner to corner, using a straightedge for guiding the knife. When cut in this manner, two sets of four equal segments are produced. Pieces of corresponding size and grain are then selected and are cross-banded together with short lengths of gummed tape to form four triangular shaped assemblies as in Fig. 4. The joining of the four segments into one piece completes the taping, and the veneer is ready to be glued to the core. Sufficient clamping pressure can be applied with a number of handscrews and a few crowned edge blocks. Run the edge of a backsaw over the surface to roughen it slightly and then spread a uniform film of glue over the entire surface. When the glue becomes tacky, center the veneer sheet on the core, taped side up, and work out the wrinkles with a large dowel stick or a rolling pin. Any air bubbles appearing in the veneered surface can be split open with the edge of a razor blade. Lay a sheet

of heavy paper over the veneer, place a panel of $\frac{3}{4}$ -in. wood over this and begin applying the clamps. Remove the clamps after 24 hrs., trim the veneer $\frac{1}{4}$ in. back from the edge of the core and sand smooth. Fig. 6 details the molded edge.

The U-shaped legs are worked up from $1\frac{1}{8}$ -in. stock. Four pieces 21 by $2\frac{3}{4}$ in. for the uprights, and two pieces of the same stock, 23 and 14 in. long, for the half-lap sections, will be required. The four set-in corners are cut from a block measuring 18 by $1\frac{3}{4}$ by $2\frac{3}{4}$ in. Before the straight members of the legs are tapered, tenons are cut for the corner blocks. From the side and front elevations, Fig. 6, find the correct length for these pieces, allowing for tenons. The half-lap joint, Fig. 8, is carefully cut for a snug fit. Blocks for the curved corners are 4 in. long and are angle cut 45° to a length of $2\frac{1}{8}$ in. These are mortised to receive the tenons on the adjoining pieces. Dowel joints can be used, if desired. Tapering operation can be done on the jointer. However, the tapering of the width of the leg should not be done until after the corners have been glued and clamped as in Fig. 8. The corners are then scribed with a $2\frac{3}{4}$ -in. radius and are bandsawed outside the line as in Fig. 5 so that when sanded, the edges of the adjoining pieces will come flush. After cutting, the legs are tapered in width. The shaping must be done, of course, before the half-lap is assembled. In all shaping operations, the work is held on edge with the spindle collar bearing against the face of the work as in Fig. 7. Details of the leg molding are shown in Fig. 6. Molding cuts on the inside face of the legs are stopped at the half-lap. Attaching the ball feet, Fig. 8, completes the table as you see it in Fig. 1. These are bandsawed in much the same procedure as is used in cutting a cabriole chair leg; the scraps removed in the first cutting are saved and tacked back on to form a flat surface for making the final cut. The ball effect of the feet is then formed with knife, file and sandpaper. They are attached with $\frac{3}{8}$ -in. dowels and glue.

☞ "Wieners" may be roasted over an open fire by placing them in an ordinary corn popper, the long handle of which serves to prevent burns on the hands.

Getting Good Draft in Chimney Accommodating Two Stoves



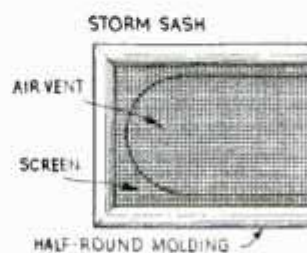
Chimney draft passing extended end of stovepipe creates strong suction in second-floor stove

After installing a stove on the second floor of a building where the same chimney also served a stove on the first floor, I found that the draft was very poor, due to the fact that there was a strong draft up the chimney from the lower stove. To eliminate this trouble, the end of the stovepipe was cut to the shape shown and pushed into the chimney for about two-thirds its width. With this arrangement, it was found that air flowing up the chimney created a strong suction inside the stovepipe on the second floor. A drain should be cut in the bottom of the pipe that extends into the chimney so that rain water will not collect in it.

—A. K. Ackroyd, Vancouver, B. C., Can.

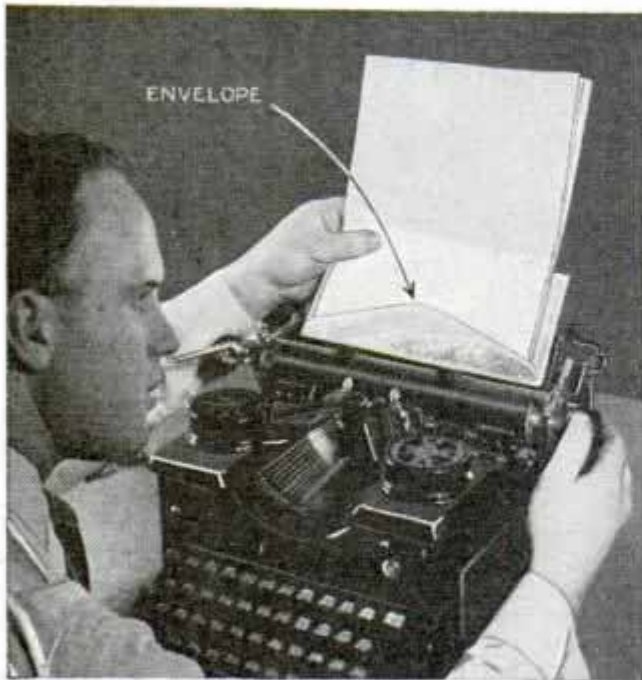
Window Ventilator Screened to Keep Out Insects

It's a good idea to put screen wire over the ventilator openings in your storm windows. Then, if a few warm days come, while the windows are up and you have to open the ventilators, insects cannot get in the house. Small,



half-round molding tacked over the edges of the wire will improve the appearance of the job.

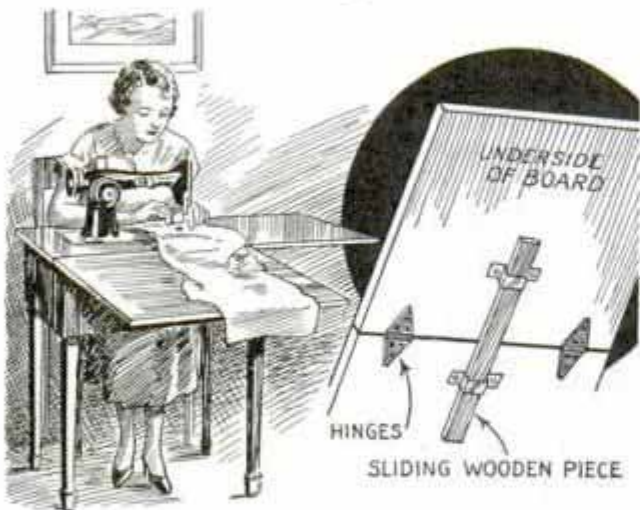
Paper Slipped into Typewriter with Aid of Envelope



It's no trick to get a number of sheets into a typewriter evenly when an envelope is used

The usually difficult job of putting several sheets of paper into a typewriter at one time is solved by using an unsealed envelope. Just assemble the sheets, slip the envelope over one edge as shown, and feed it into the typewriter. After the envelope passes under the platen it is removed.—George A. Smith, Quarryville, Pa.

Wider Top on Sewing Machine to Handle Large Garments



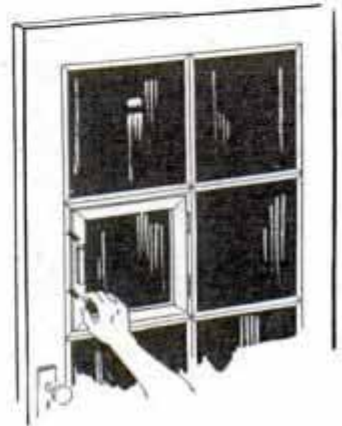
This hinged shelf will keep large garments from reaching the floor and getting soiled

Have you ever wished for a wider sewing-machine top when making large garments? If so, perhaps it's possible to hinge

an extension shelf to the rear side of your machine as shown. If you cannot use a sliding wood piece to hold the shelf in the raised position as indicated, maybe an arm or bracket can be pivoted to the machine so that it can be swung back against the rear side to let the shelf fold down when not needed.

Small Window in Storm Door Saves Heat

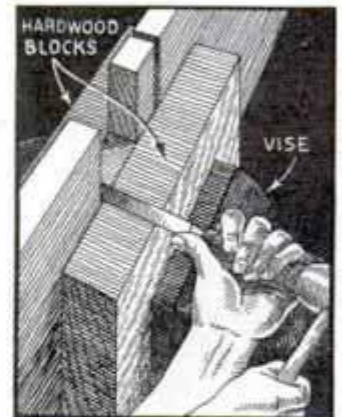
When answering calls, frequently it is not necessary to open a storm door during extreme cold weather if you substitute a tiny door for one of the panes. Besides conserving heat, this method is a welcome one to many housewives who do not wish to open the door to agents and peddlers. Also, small parcels can be taken in through the opening.—Abel F. McAllister, Chicago.



Wood Slotted Without Splitting the Work

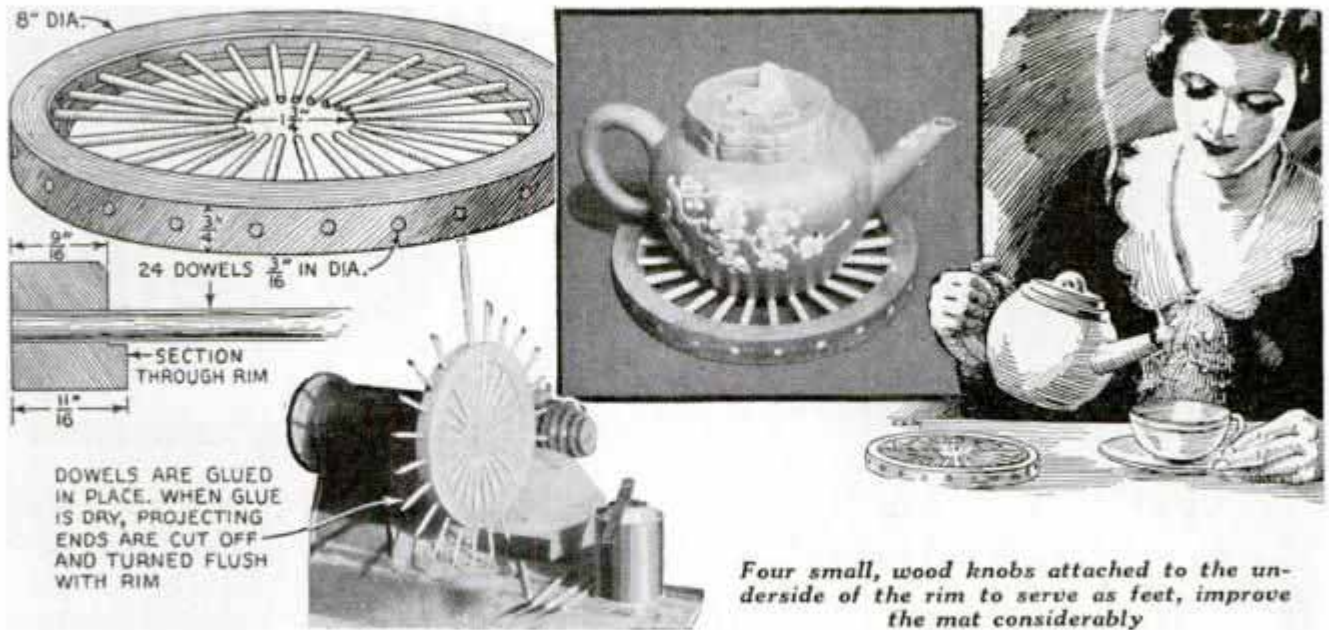
When making wide slots and insets in wood, I cut the part to be removed into several segments with a saw and clamp the work in a vise between two hardwood blocks, the top edges of which come flush with the bottom of the slot to be made. It is then a simple matter to cut out the wood segments with a chisel without any risk of splitting the work, as the blocks reinforce it on both sides.

—Ellis O. Hinsey, Philadelphia, Pa.



☐ An application of clear household ammonia and soap will usually remove spots of machine grease from washable fabrics.

Hot-Dish Mat of Wood to Match Your Table

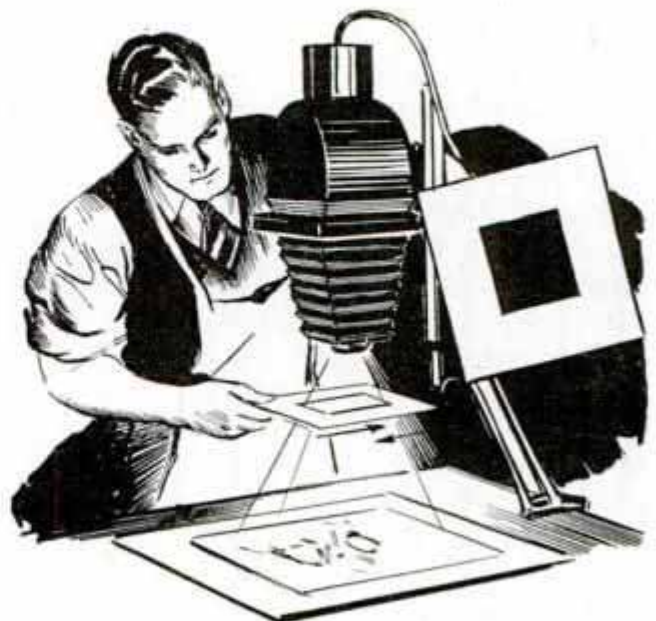


Resembling a hubless wheel, this hot-dish mat is decorative and can be made from a wood disk and some dowels. Mount the disk, which should be $\frac{3}{4}$ in. in thickness, on the screw chuck of your lathe and turn it to 8 in. in diameter. Then, $\frac{1}{16}$ in. from the edge, recess it to a little more than half of its thickness, leaving an untouched circle $1\frac{3}{4}$ in. in diameter in the center. Drill 24 equally spaced holes through the rim for $\frac{3}{16}$ -in. dowels. Be sure that each hole points true to the center of the disk. Insert the dowels, butting the

ends against the unturned portion in the center of the disk. This assures that they will project an equal distance inside the rim. Then pull them out about $\frac{1}{2}$ in., and coat the portion that goes inside the rim with glue, after which they are pushed back in place. When the glue has dried cut off the ends projecting outside the rim and turn them down flush. Now sand the rim, move the tool rest to the back of the work and cut out the center of the disk. Finishing the mat to match the table and chairs makes a nice job.

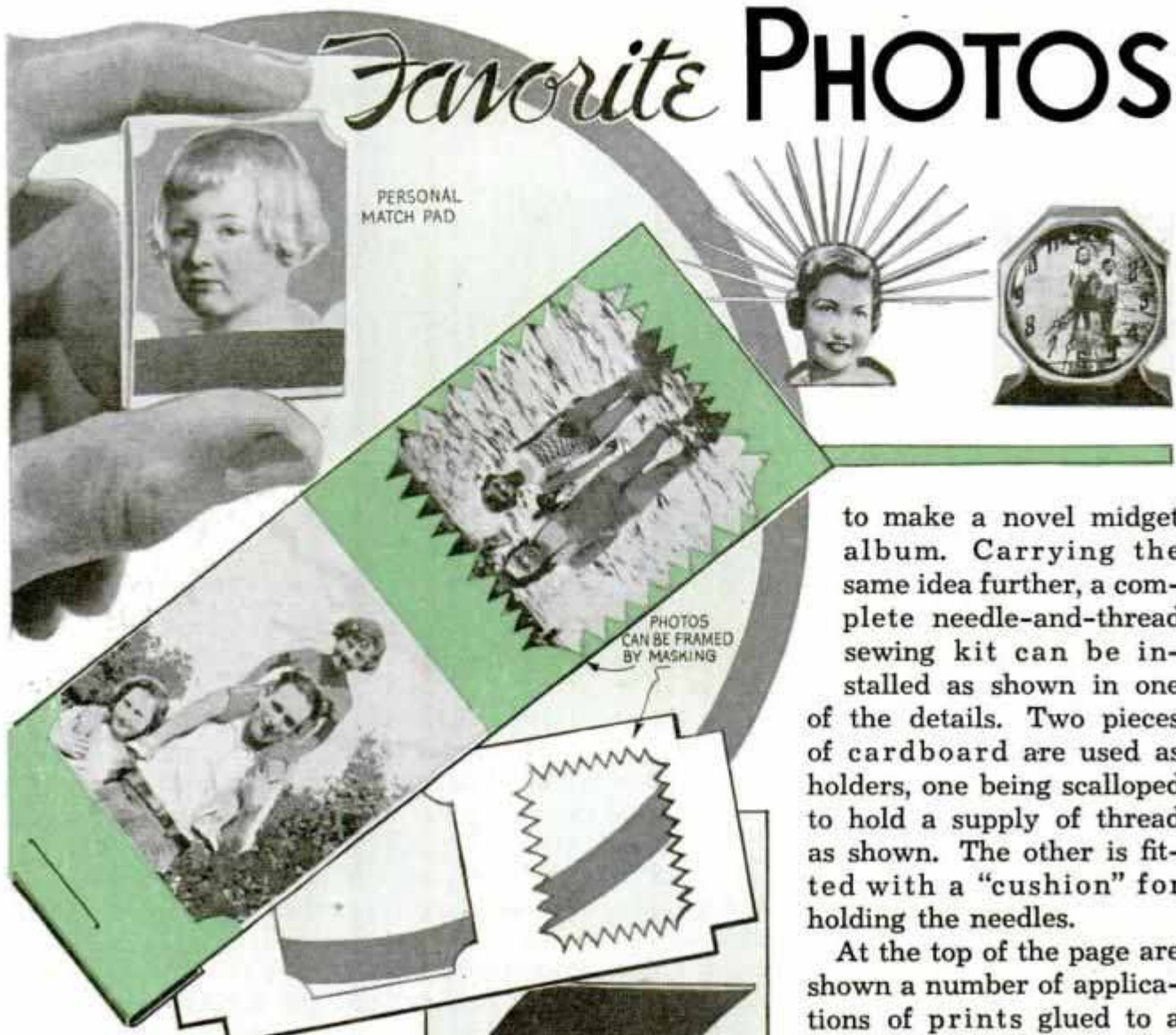
Photo Enlargements Vignetted with a Piece of Cardboard

Amateur photographers who want to vignette their photos when making enlargements, can do a good job with a homemade vignetter cut from cardboard. Get a piece larger than the printing paper to be used and cut an opening in it the shape you want. The opening should be smaller than the actual size of the image as it appears on the easel of the enlarger. When ready to make the exposure, hold the vignetter between the lens and the easel so that the light will pass through the opening onto the portion of the printing paper to be exposed. The card should be moved slowly backward and forward so that the edges of the photo will be softly blended into the border. The only requirement of this method is that the photo have a white or light background.



Anyone can do a fairly good job on photo enlargements with this cardboard vignetter

Favorite PHOTOS



to make a novel midget album. Carrying the same idea further, a complete needle-and-thread sewing kit can be installed as shown in one of the details. Two pieces of cardboard are used as holders, one being scalloped to hold a supply of thread as shown. The other is fitted with a "cushion" for holding the needles.

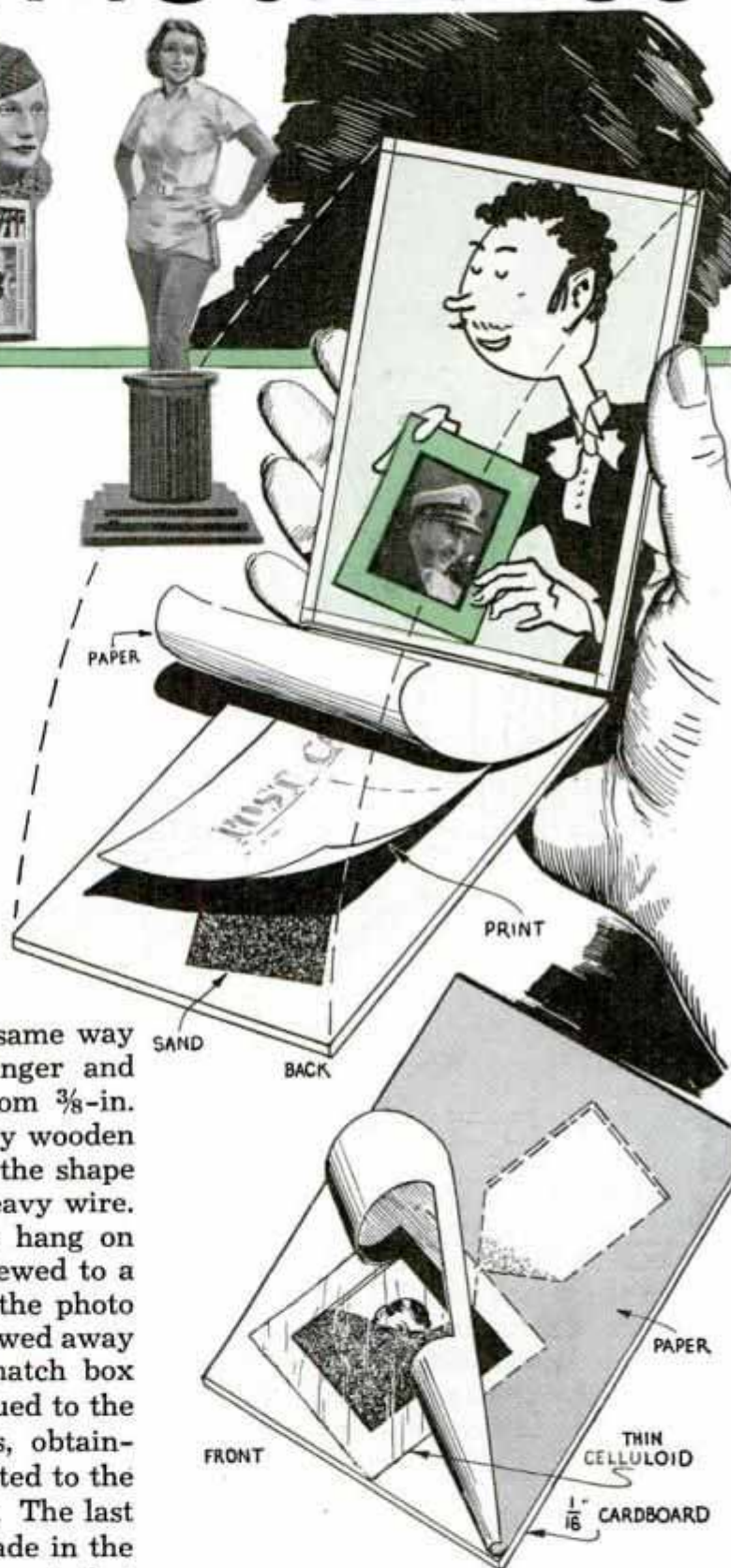
At the top of the page are shown a number of applications of prints glued to a plywood backing and then outlined by sawing to the border lines of the figure. The first one, left to right, is designed as a toothpick holder. A piece of $\frac{3}{8}$ -in. plywood is used as a backing. An enlargement of the head and shoulders is glued to the backing and sawed to the outline. Then a number of holes are drilled in the edge of the plywood to hold the toothpicks. The alarm-clock mounting is a more detailed project. Here you remove the original face, replace it with a photo print and then letter on the numerals with India ink. The print is glued to the plate which forms a backing for the original clock face. The latter is usually heavy paper

VACATION snapshots in a match pad, a favorite print on your coat hanger, in an "hourglass" mounting or on the face of the alarm clock—these are some of the novel mountings you can use to "individualize" your photo collection. Take the first one, a really personal match pad. Here the photos are printed on double-weight printing paper and an attractive border is formed by masking. The strip on which the photos are printed is then folded, the scratching surface is glued to one edge, and two rows of matches are inserted and stapled. Or you can omit the matches and insert instead, a number of prints

in NOVEL MOUNTINGS



and is easily stripped off. Care should be taken to center the main feature of the photo so that the job appears neat and attractive. Now, another method of printing the numerals is to place a thin sheet of celluloid—a piece of old film with the emulsion removed will do—over the original dial and trace the markings right on the film in India ink. In making the print, place the celluloid in contact with the negative used and print both at once. The numerals will then appear in white on the photo. They can be left white, or colored to obtain contrast. The third item, a coat hanger, is made in essentially the same way as the first except the entire hanger and backing for the photo is sawed from $\frac{3}{8}$ -in. plywood. You can use any ordinary wooden hanger for a pattern in laying out the shape and size. The hook is bent from heavy wire. The fourth novelty is designed to hang on the wall and consists of a base screwed to a piece of $\frac{1}{4}$ -in. plywood on which the photo is mounted. The plywood is then sawed away to the outlines of the face. The match box slips over a small block of wood glued to the base. Miniature boxes of matches, obtainable at any cigar store, are best suited to the purpose as they are small and neat. The last item is a photo ash tray and it's made in the same way as the match holder except that the base is larger and supports an ash tray or cup. This can be a radio coil form or a short length of brass tubing with a brass disk soldered to the bottom. In all cases the edges of the plywood backing the photo print



When you show this photo "postcard" to a friend just tilt it slightly and the picture showing through the "window" will be slowly blocked out. The secret is a two-compartment container, connected by a narrow channel through which fine sand runs from the hidden compartment after the fashion of an hourglass. Many variations of this same idea are possible

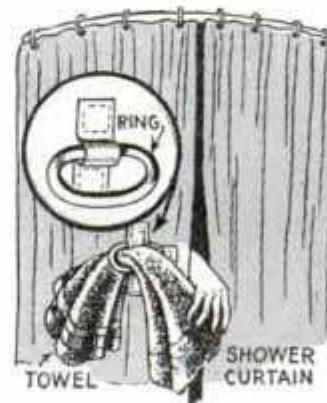


sand and paste on a backing of heavy, white paper. When you tilt the card, the sand runs slowly from one compartment to the other and either reveals the photo or blocks it out, depending on which way the card is tilted.

The photo book ends serve as an attractive mounting for either a full figure or a head and shoulders as shown. Making the cut-out is the same process as described before only two prints are used, the single print being reversed. Use wood or hard-pressed board for the base.

are carefully sanded and varnished. The "hourglass" mounting is a novel and mystifying attraction, but simple to make. The details show just how it's done. The cartoon can be anything appropriate that suits your fancy. It's drawn or traced on a sheet of white paper, the full size of the latter being the same as an ordinary post-card. A sheet of $\frac{1}{16}$ -in. cardboard is then cut to the same size as the cartoon. Two openings, connected by a narrow channel, are cut through the cardboard as shown. A thin sheet of celluloid is pasted over one of the openings and a "window" is cut in the paper on which the cartoon is drawn. This is glued to the cardboard. Then you put the photo in place under the window, fill one of the pockets with fine, sifted

Towel Hung on Shower Curtain Within Easy Reach



The problem of keeping a towel handy without getting it wet when taking a shower bath is solved by inserting it through a ring sewed onto the outside surface of the shower curtain. A large

wooden curtain ring will do the trick, and it can be attached with a short strip of cloth to match the curtain.

Removing Glass Stoppers



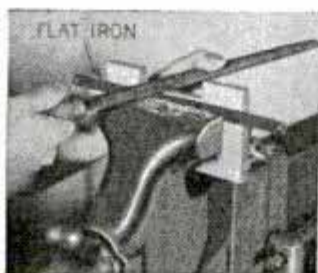
To lessen the chances of breaking a bottle when removing a tight-fitting glass stopper, run a few drops of mineral oil around the joint and apply heat from a candle or matches to slightly expand the bottle neck.

Rotate the bottle in the flame so that the glass will expand evenly.

—L. H. Georger, Buffalo, N. Y.

Work Filed to Given Line with Aid of Guides

When filing work down to a given mark, I find that the job can be done accurately by using a couple of metal guides as shown. These may be old hack-saw blades or a couple pieces of flat, hard iron placed on each side of the work so that their upper edges come exactly at the level to be reached with the file, after which the assembly is clamped in a vise.—Warren Hockert, Chicago.



Sweeper Has Pivoted Handle to Get Under Furniture



You can clean under low furniture with this sweeper without stooping sharply

Pivoted to the handle of a carpet sweeper, a short length of broomstick will enable you to clean under beds and other low furniture without stooping sharply or getting down on your knees. A piece of sheet metal or heavy tin bent as shown in the circular detail attaches the broomstick, which folds down against the sweeper handle when not in use.

Non-Skid Shoes Have Tape on Soles

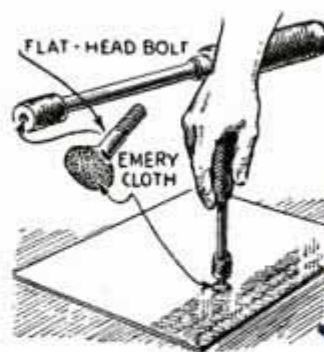


In an emergency, you can make your shoes practically slipproof for walking on icy walks by applying strips of adhesive tape to the soles as shown. Before applying the tape, be sure the soles

are clean and dry so that it will stick tightly. The tape will last a surprisingly long time, and can be quickly removed when it is not needed.

Swirl Machine Finish on Metal Can Be Done by Hand

Closely resembling a swirl finish made by machine, a metal graining can be produced with an ordinary push drill. Get a small flat-head bolt that will fit the drill chuck and shellac an emery disk to the head. Then put it in the drill and go over the metal surface as indicated in the illustration.



Transparent photos for decorating lamp shades can be made by treating Cellophane with one of the single-solution paper sensitizers now on the market.

22 W. Delaware, Compton, Calif.
 International Photo Laboratory
 1612 Lafayette, N.Y.

Composition Board Cut Smoothly by Sharp Tracing Wheel



With this sharpened tracing wheel, composition board can be cut more rapidly than with a saw

A carpenter who had difficulty in cutting composition boards smoothly with a saw, solved the problem by using a dress-makers' tracing wheel for the purpose. The teeth of the wheel were ground to needle points, after which it was drawn across the board, using a straightedge as a guide. One or two cuts will perforate the board to such a depth that it can be broken off easily. Also, it is possible to make curved cuts if the line is first marked on the board and carefully followed.

Cleaning Piano Keys

If the keys on your piano have become yellow, rub them carefully with one half of a lemon and cover them with powdered chalk. When this has dried, brush it off and polish the keys with a soft cloth.

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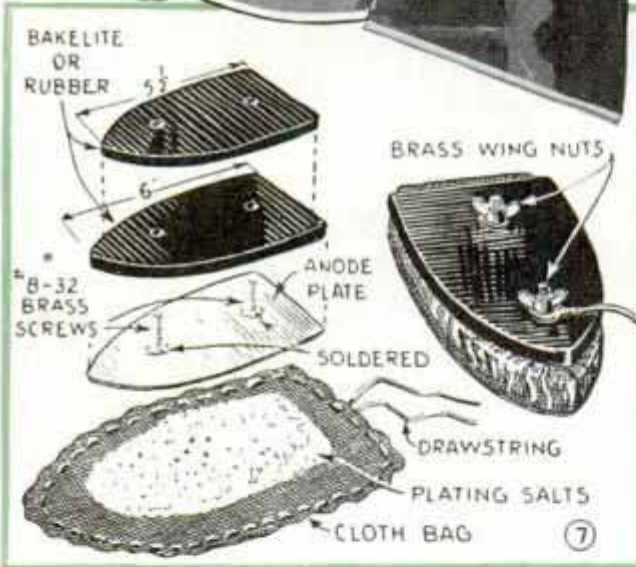
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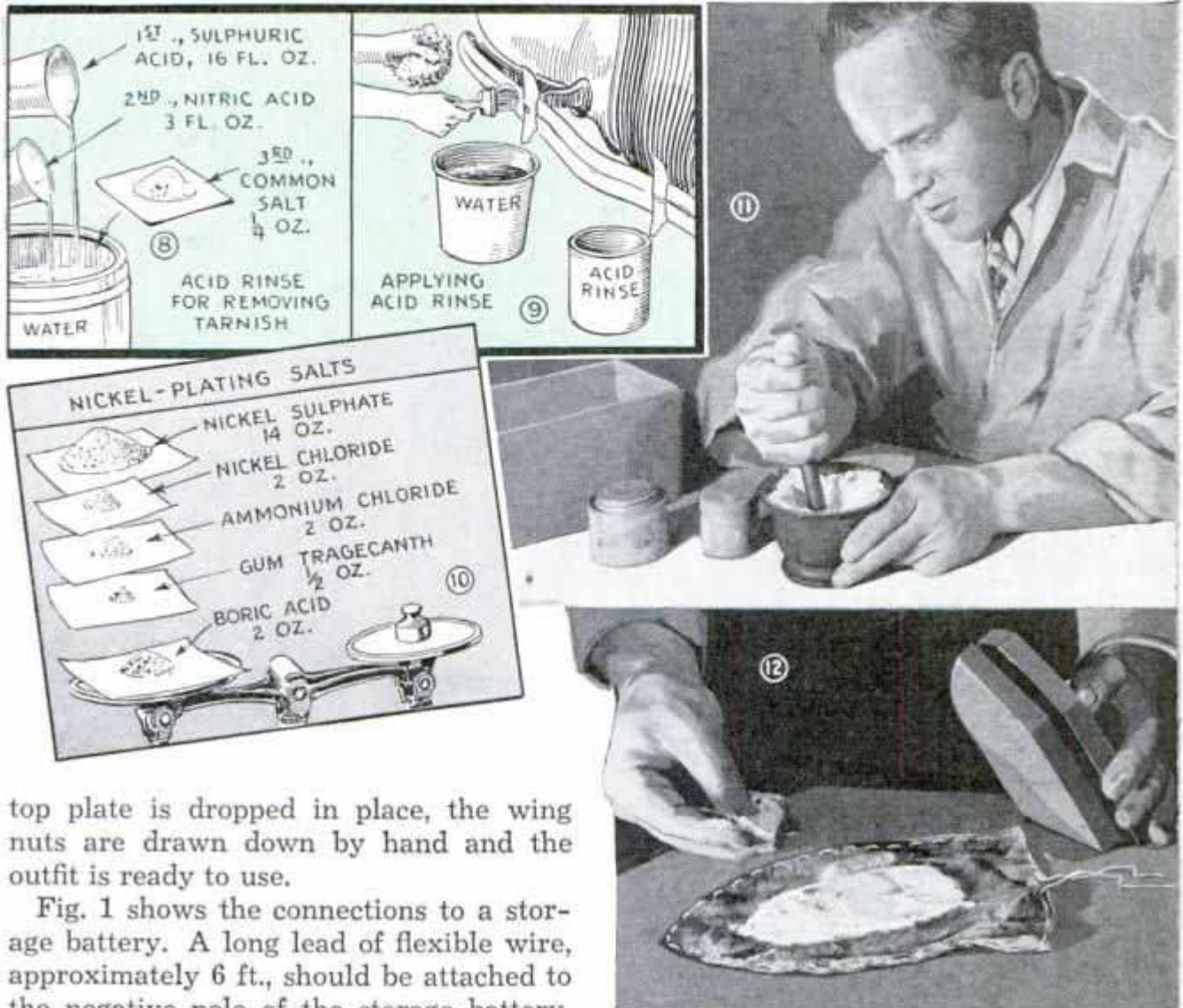
three times, washing out the brush thoroughly in between. Where solvents are used for cleaning, it is advisable to rinse the work thoroughly with soapsuds to assure the removal of any remaining traces of oil film. Soapy water will emulsify this film and thus make certain its complete removal.

Removal of Corrosion: If the metal surface to be plated is corroded or badly tarnished, it will be necessary to apply an acid rinse as in Figs. 8 and 9. A good wash for removing oxide can be made as in Fig. 8. In mixing acid solutions of this

type, it is important that the sulphuric acid be added slowly to the water, not the water to the acid. The solution should be made up and stirred in a 1-gal. glass or stone container. When applying the acid solution, it's best to wear rubber gloves to protect your hands. A medium-sized brush is used for applying the acid solution. Only a small amount of the surface should be cleaned at one time and, following the application of the acid, the surface should be rinsed off thoroughly with clean water to remove the acid as rapidly as it has accomplished its purpose of dissolving oxides and corrosion. After cleaning and thoroughly rinsing with warm water, the cleaned object should not be touched by the hands. It's important that all preparation for plating, such as arranging the equipment and mixing of the plating salts, be carried out before the cleaning operation is started.

Plating with Copper and Nickel: By this process, powdered electroplating salts are held in a bag attached to a holder and metal anode as shown in Fig. 7. The top plate and clamping plate are materials which do not conduct electricity, and the anode, shown in Fig. 2, consists of a sheet of the metal which is to be plated onto the work. For nickel plating, this must be a piece of sheet nickel; a copper sheet is used when plating copper. Brass machine screws register with the holes in the plates and one of these screws is sufficiently long to receive a nut and the terminal lug from the battery.

The bag for holding the plating salts is usually medium heavy duck, canton flannel, or other strong material and is equipped with a drawstring, as in Figs. 7 and 12, so that it can be pulled tight around the clamping plate. With the bag charged with plating salts and securely tied, the



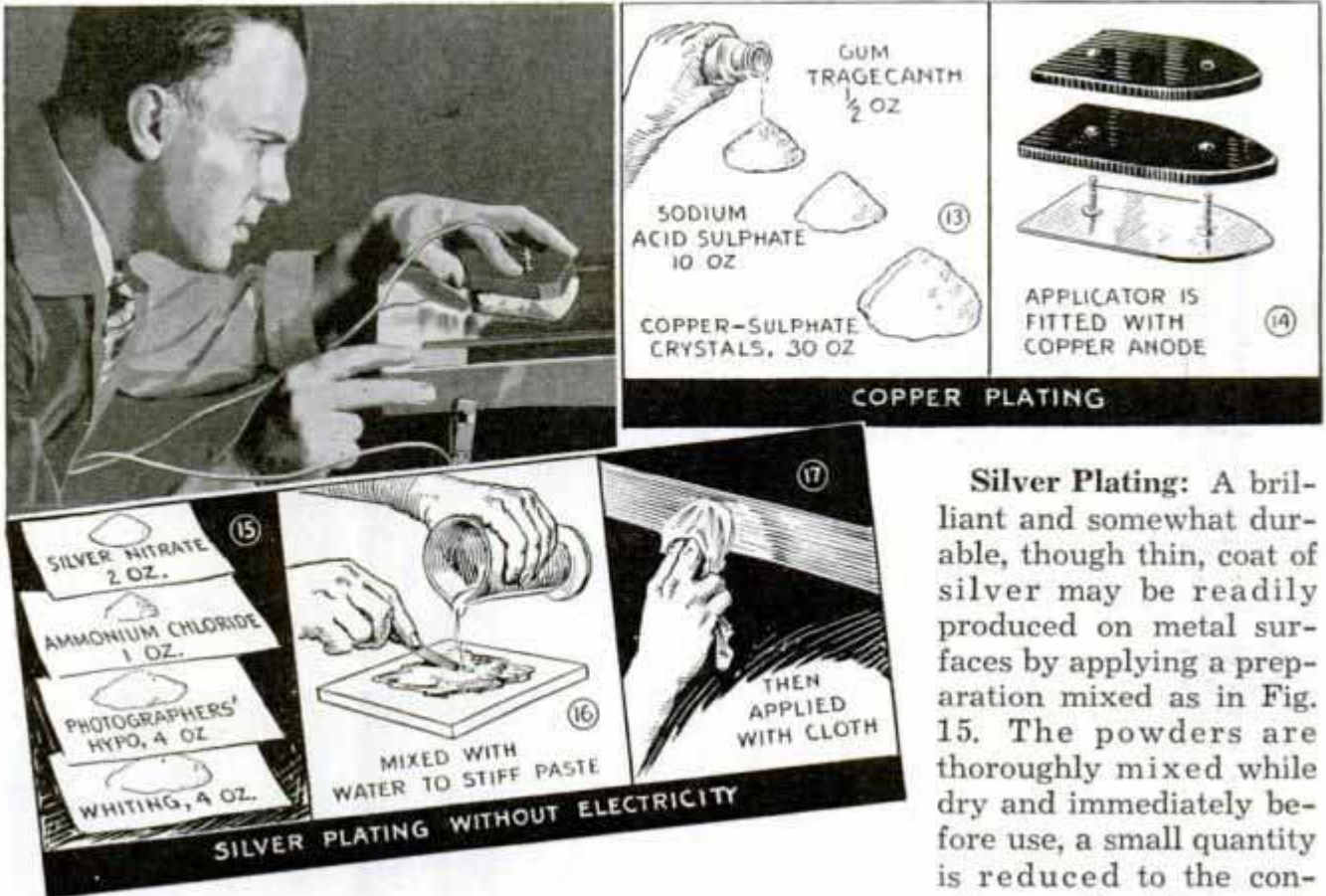
top plate is dropped in place, the wing nuts are drawn down by hand and the outfit is ready to use.

Fig. 1 shows the connections to a storage battery. A long lead of flexible wire, approximately 6 ft., should be attached to the negative pole of the storage battery. The other end of this lead is fitted with a heavy-duty battery clip which has enough spring action to take a secure "bite" on the part to be plated. The positive pole of the battery should be connected to a 6-ohm, heavy-duty radio rheostat which may be mounted on a small panel or clamped to the battery itself. The other terminal of the rheostat is connected by a 6-ft. length of flexible wire to the plater. To assure good contact, the end of the cable from the rheostat should be equipped with a terminal lug.

The only other equipment required to complete the assembly is a 1/2-gal. stone crock to hold the water into which the plating applicator is dipped from time to time as plating progresses. As the wet applicator is rubbed over the surface to be plated, the water, which has dissolved a part of the plating salts, makes electrical contact between the work and the anode exactly as if the unit were installed in a plating tank, thus completing the cir-

cuit so that the metal may be deposited. In electroplating by this method, it is important that the rheostat be adjusted with high resistance in the circuit at the start, and adjustments made as trials progress until the proper adjustment is found to produce the most satisfactory results.

Nickel Plating: Prepare the electroplating salts by mixing together the dry materials required and grinding them relatively fine, preferably in a mortar as shown in Fig. 11. An excellent formula for nickel-plating salts is shown in Fig. 10. The salts are carefully weighed and thoroughly mixed. Now, with all preparations made as described, the plater is rubbed over the surface to be plated with uniform strokes. A little experience will indicate the proper movement for the production of the best appearing plate. If the applicator is rubbed over the surface too slowly, the plate will become too thick in spots. To



Silver Plating: A brilliant and somewhat durable, though thin, coat of silver may be readily produced on metal surfaces by applying a preparation mixed as in Fig. 15. The powders are thoroughly mixed while dry and immediately before use, a small quantity is reduced to the consistency of a thick paste

avoid this, medium strokes are used with regularity and after the entire surface has been covered once, the operation is repeated until the plate has been built up to the desired thickness.

Certain metals, such as zinc, are rather difficult to plate by this method unless a special salt mixture is used. If the plating salts are made by mixing nickel sulphate, 9 oz., ammonium chloride, 2 oz., sodium sulphate, 14 oz., gum tragacanth (powdered), $\frac{1}{4}$ oz., and boric acid, 2 oz., it will be found that better results will be produced on certain metals which are otherwise tedious to coat with nickel.

The above formulas will produce electroplates of nickel which have the characteristic appearance of this metal. If a more silvery white finish is desired, the formula for mixing the salts should be compounded by mixing together nickel sulphate, 9 oz., cadmium sulphate, 2 oz., ammonium chloride, $2\frac{1}{2}$ oz., sodium sulphate, 10 oz., boric acid, 2 oz., and gum tragacanth (powdered), $\frac{1}{4}$ oz. The amount of cadmium sulphate added will determine the whiteness of the plate. If effects different from those produced by this particular formula are desired, the quantity of cadmium sulphate may be varied.

with water as in Fig. 16. The paste is applied to the well-cleaned surface to be silvered with a piece of cloth as in Fig. 17 in the same manner as would be used for applying metal polishes. To avoid stains on the hands wear rubber gloves. As the rubbing proceeds, a lustrous film of silver will be coated over the entire surface.

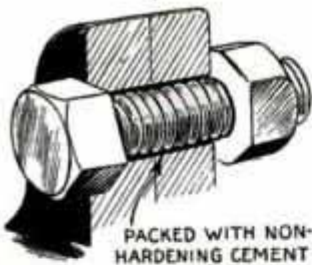
Copper Plating: If the well-cleaned surface to be plated with copper is wiped over rapidly with a solution made by adding copper sulphate, 3 oz., and sulphuric acid, $\frac{1}{4}$ fl. oz., to water, 2 qts., a thin, tenacious film of copper will be formed. In applying the above solution, rubber gloves should be worn and a piece of stiff fabric used for making the application. The surface should be gone over but once, inasmuch as repeated wiping with this solution will tend to remove the initial fine coating. After the surface has been covered with a thin film of copper by this means, it is washed with clean water. Any spots which have not been covered may be wiped over again to assure complete coverage. Although the above coating of copper is not sufficiently thick nor durable to be of any value, it will serve as a base over which a satisfactory copper plate may be applied with the plater. The salts,

Fig. 13, are ground to small particles and placed in a clean bag which is mounted on the plater equipped with a copper anode as in Fig. 14. The plating process is the same as that previously explained for nickel. The first application should be made briskly and with a minimum of overlapping to insure the formation of a smooth coating. After the first application, additional quantities of copper may be deposited on the surface to give the desired thickness of plate.

Final Polishing: In all cases, the finished electroplate should be polished to bring out the full luster of the metal. For this purpose, precipitated chalk or Vienna lime should be applied with a moistened polishing cloth. A motor-driven polisher such as that shown in Fig. 6, is useful if handled carefully.

Bolts Coated with Plastic Are Removed Easily

When bolts are used where it may be necessary to remove them frequently, just coat them liberally with a plastic or non-hardening cement, applying enough to fill the space between the threads and the sides of the hole. This will prevent rusting and, in many cases, permits using cheap, black bolts instead of coated or plated ones.



coat them liberally with a plastic or non-hardening cement, applying enough to fill the space between the threads and the sides of the hole. This will prevent rusting and, in

Harness Lines Have Rings to Ease Hand Strain

To ease strain on the hands caused by gripping the lines for long periods when driving a spirited team of horses, punch a couple of holes in each line and insert a key ring as shown. When holding the lines, let the rings rest behind the palm of the hand and you won't have to grip so tightly.



Steel Paper Cutter on Job Press Is Aid to Operator



No need to search for a knife or pair of scissors when this cutter is attached to the job press

This paper knife will be found handy for cutting strips for use when a new job is made ready. It is merely a flat steel strip screwed to the delivery board, with a thin washer under each end to hold it slightly above the board. When the pressman needs a piece of paper, he can slip a sheet under the strip and tear it off neatly and evenly to the size required. The cutter does not interfere with the normal use of the delivery board.

Roll-Up Tool Kit Is Handy on the Stepladder

An electrician who had to do considerable work on a stepladder used this kit, which could be unrolled instantly and supported conveniently on the top of the ladder. The kit is merely a piece of heavy canvas with several pockets sewed in one side and the ends hemmed to slip over iron-rod standards which are put into holes bored in the stepladder.



Sliding Board on Book Shelves Serves as Reading Table

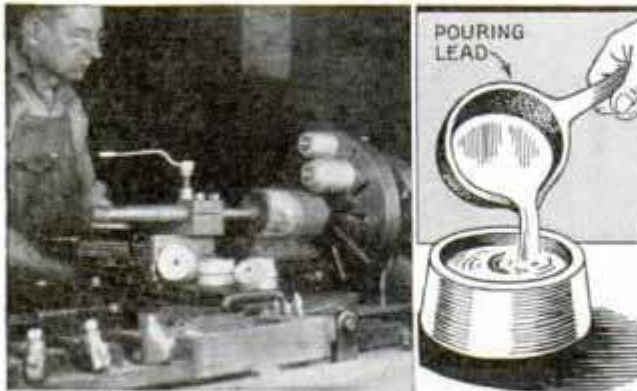


Sliding board saves steps by holding books while looking up reference data

In libraries, law offices and similar places, a sliding board attached to the underside of one of the book shelves will be found a handy support for an open book. Heavy plywood is just the thing for this purpose and slides to hold it can be shaped from sheet metal. A drawer pull may be screwed to the underside near the edge.

Faceplate Jobs at Higher Speeds Possible without Vibration

We made up a number of lead disks of different sizes and kept them at hand for



Lead weights of various sizes enable you to counterbalance a faceplate job in the lathe

counterbalancing faceplate work so that the lathe could be run at high speeds without excessive vibration. For forms in which to cast the weights, we used the

outer rings from discarded roller bearings ranging in diameter from 3 to 6 in. The weights were drilled in the center for attaching them to the faceplate, and the weight of each one was stamped on its surface.—J. H. Jobson, Mentone, Ala.

Auger Bits Are Rubber Capped to Protect Points

Slipped over the screw point of an auger bit, a rubber stopper protects it when carried in a box with other tools. These stoppers can be obtained for a few cents in a drug store, and it takes only a second to slip one of them over the bit.



Drawing Longitudinal Lines on Round Stock

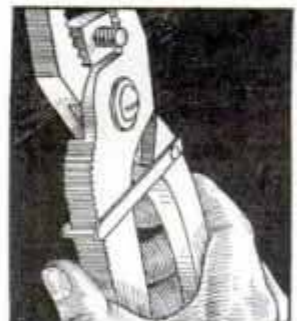


When a regular tool is not available for drawing lines parallel to the axis of a shaft or other cylindrical stock, a substitute tool for this work is a piece of angle iron or brass.

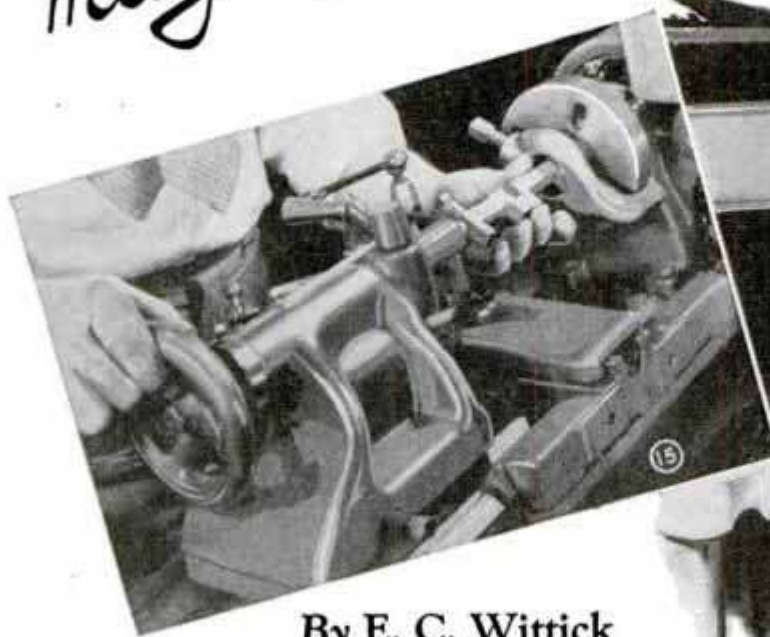
Such a tool will be found accurate enough for most ordinary purposes.

Locking Pliers on Work

When using a pair of pliers to hold work tightly, they can be made handy for this purpose by pivoting a U-shaped piece of metal to one handle to engage notches filed in the upper edge of the other one. Then the pliers can be locked on the work without having to keep a constant grip on the handles.—B. Stalsberg, Breton, Alta., Can.



Midget GAS ENGINE

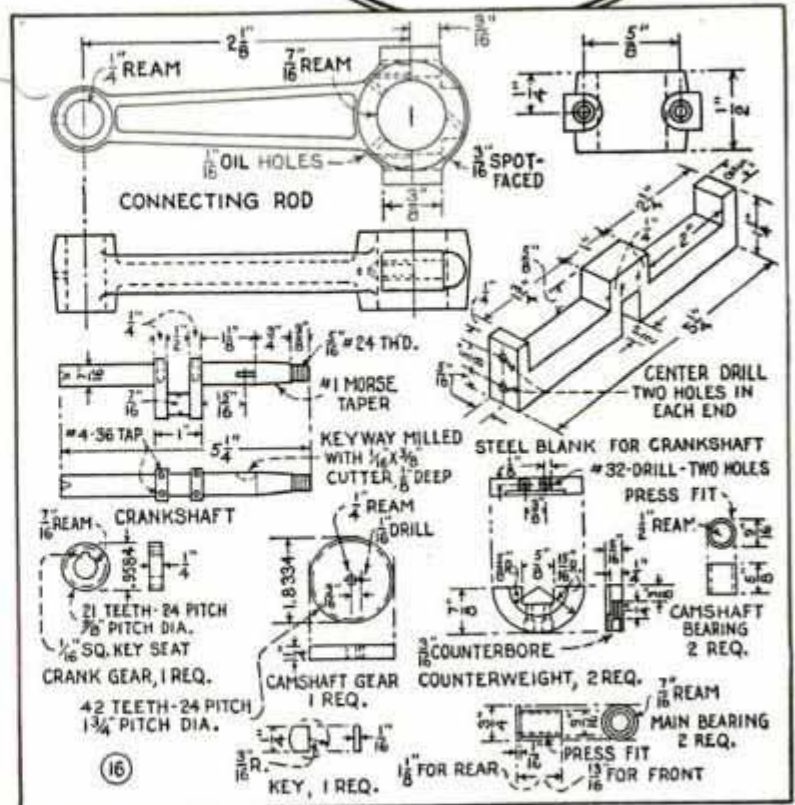
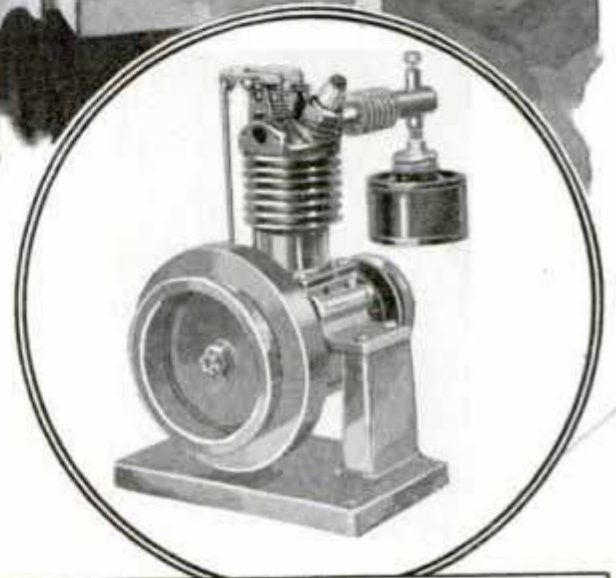


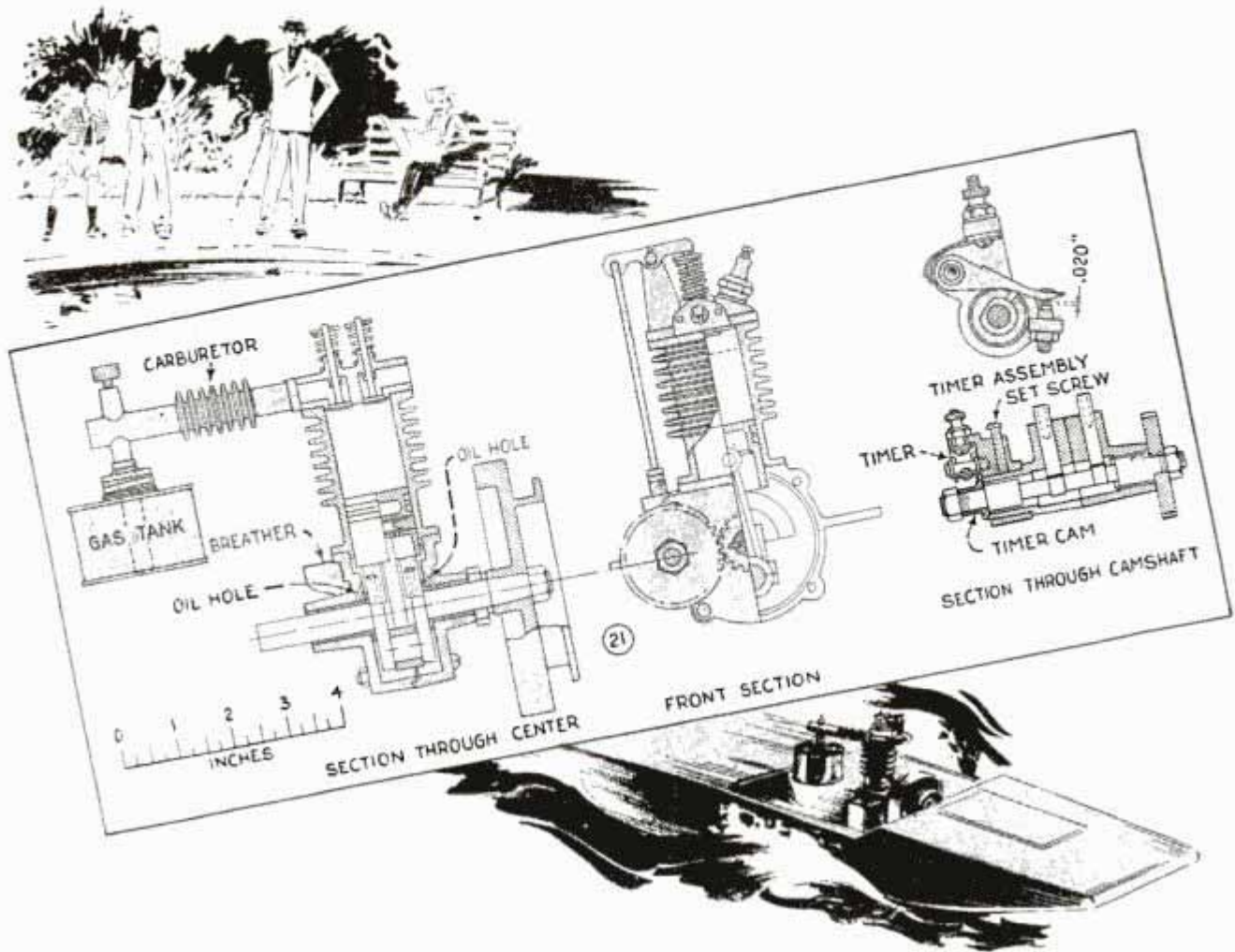
By E. C. Wittick

Part II—Machining the Castings

BEFORE you do any machining on the set of castings, it's a good idea to check the lathe centers for accurate setting, clean the chuck of all excess grease and chips, and see that the lathe tools are ground and shaped properly for the work. Be especially particular to see that your drills are properly ground. This means that the cutting edges of each bit must measure the correct angle, otherwise you are apt to have trouble doing the precision drilling necessary on this job.

Although you can begin with most any part, it's best to start with the cylinder casting, finish dimensions of which are shown in Fig. 17. Chuck this with the flanged end out for the boring and lower-end facing operations. Keep in mind that the first roughing cut must, in all cases, be deep enough to get under the scale on the surface of the casting, but make certain to allow sufficient stock under the roughing cut for finishing. The cylinder bore is brought to final dimensions with an expanding reamer. The best way of machining the outside of the cylinder barrel and the cool-





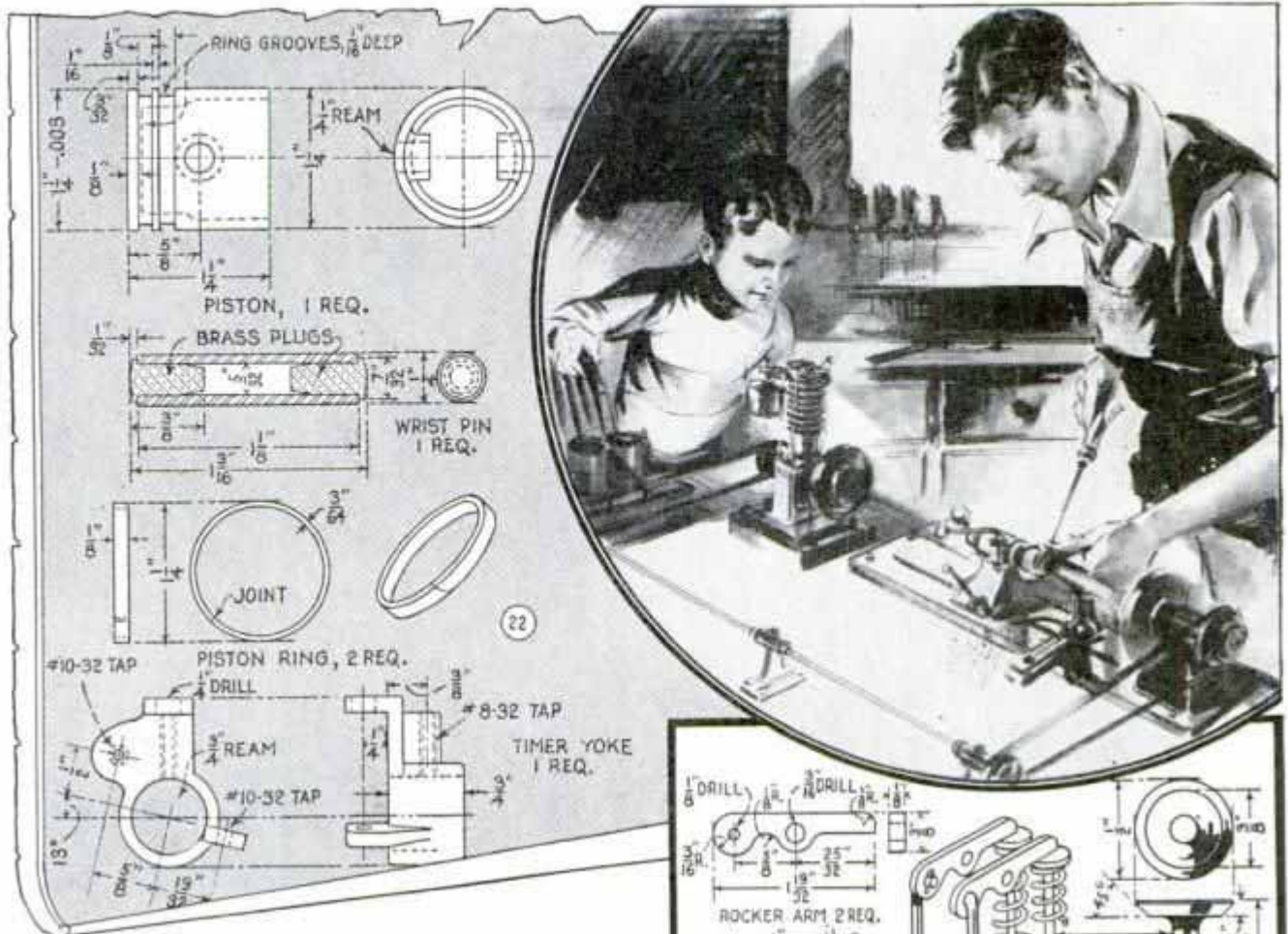
Now go back to Fig. 16 for details on the connecting rod and crankshaft. Because of its small size, the former is comparatively easy to finish up. At the big end, you first drill and tap for cap screws, then saw off the cap, which is fitted to the rod by filing or milling the meeting faces flat. The cap is then screwed to the rod. This done, you're ready to drill and ream the holes for the crank and wrist pin. Mount the rod on a mandrel to finish the sides of the bearings.

The crankshaft is made from a piece of flat, mild steel. The stock is $5\frac{1}{4}$ in. long and should be cut away by milling to the shape shown in Fig. 16. Then when the main and offset centers are located, mount in the lathe as in Fig. 15. Rough-turn the main journals, and finish-turn the crank pin. Cut off the projections with the offset centers and finish the main journals, then turn the taper and thread the front end. The keyway may be cut at this time. Counterweights are made from a steel disk which is finished true on a $\frac{5}{8}$ -in. mandrel, then split, paired and filed or milled to fit the crankshaft. The screw

holes should be laid out in the bottom of the square notch, drilled from that side and counterbored from the opposite side. When this is done the crankshaft should be marked through these holes and drilled and tapped. Bearings are made from a piece of bearing bronze mounted in the lathe chuck. Cut off each bearing as finished and press into place in the crankcase. After the bearings are in place drill $\frac{1}{16}$ -in. oil holes from the inside of the crankcase into the main bearings as shown in the assembly drawing, Fig. 21.

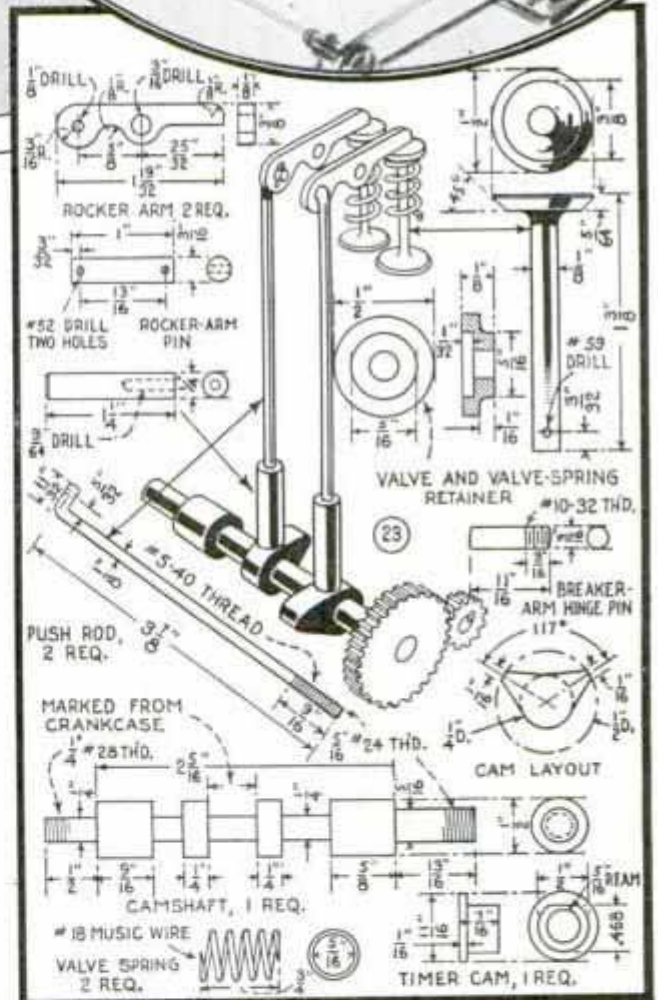
Next, the flywheel, Fig. 25. Rough-turn the casting on the outer side, then finish the inside, including the tapered hole. Mount on a tapered mandrel and finish the outer side. This procedure will give a true running wheel. The mandrel should be made just before the tapered end of the crankshaft is turned so that the same set-up can be used. To make duplicate setups the mandrel must be made the same length as the crankshaft.

The camshaft involves some hand work. After turning out the blank as in Fig. 23, you have to lay out and file the cams to



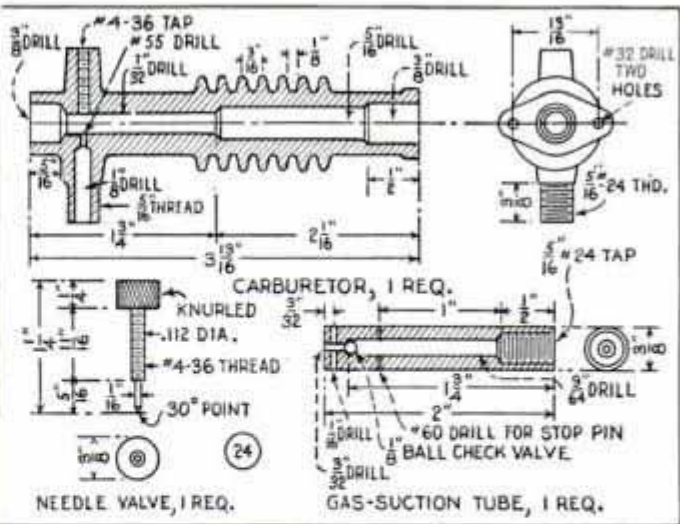
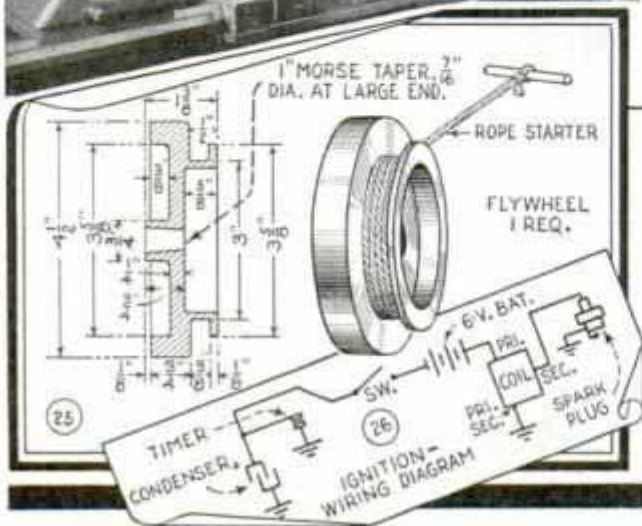
shape. Or you can make them by the cut-and-try method, the engine being assembled. With limited equipment, this may be the more accurate. However, the filing of the cams must be left until the valves, tappets, rocker arms, springs and push rods are made and fitted. Details on these parts you'll find in Fig. 23, with the timing gears detailed further in Fig. 16. This leaves only the timer yoke, Fig. 22, and the carburetor, Fig. 24, to complete the parts. Purchase of the valves and timing gears ready-made will save time.

To make and fit the camshaft you proceed as follows: File the exhaust cam to the shape shown in the drawing. The camshaft may be held between the lathe centers to do this, using the lathe merely as a vise. With the engine assembled, time this cam so that the exhaust valve begins to open about 30° before bottom dead center and closes on top dead center. Set the piston at the center of the intake stroke, which begins at 5° past top dead center and ends at 10° past bottom dead center, and mark through the tappet hole to locate the peak of the intake cam. Then file the cam to the shape shown. Both cams may have to be dressed a little one way



or the other to obtain the correct opening and closing points of the valves.

Assemble the engine in this order: Mount the piston on the connecting rod, put the rings on the piston, mount the connecting rod on the crankshaft, and assemble the crankshaft and crankcase parts.



Put on the cylinder and cylinder head, on which the valves, rocker arms and push rods have been assembled. Key the crank and camshaft gears, then insert the camshaft. Adjust the tappets to .002-in. clearance and time the valves. Put on the timer cam and place so that the flat is on top when the intake valve is at its closing point. Assemble the timer and set so that the points break at about 10° before the piston reaches the top dead center. The gap at the points should be from .018 to .020 in. The exact firing point is important and can be best found by experiment. Then put on the flywheel. If there is a slight gap between the crankshaft gear and the flywheel hub it should be filled in with a washer. Lastly, mount the carburetor, to which the gas tank and fuel suction pipe have been attached. Put in the spark plug.

Now the engine is ready for a running test. Mount it on a block of wood and clamp this in a vise. Wire up the ignition system as in Fig. 26. Put about a tablespoonful of oil in the crankcase, and fill the gas tank with high-test gasoline. Close the needle valve tightly and then open it about one-sixteenth of a turn, choke by placing a finger over the end of the car-

buretor and turn the flywheel a few times to draw gas up the fuel pipe into the cylinder. Wrap a stout cord around the cranking groove of the flywheel, switch on the ignition and pull the cord. If the engine fails to start, the spark timing and needle valve may need some adjustment. Normally, the engine should run at a speed of about 3,600 revolutions per minute.

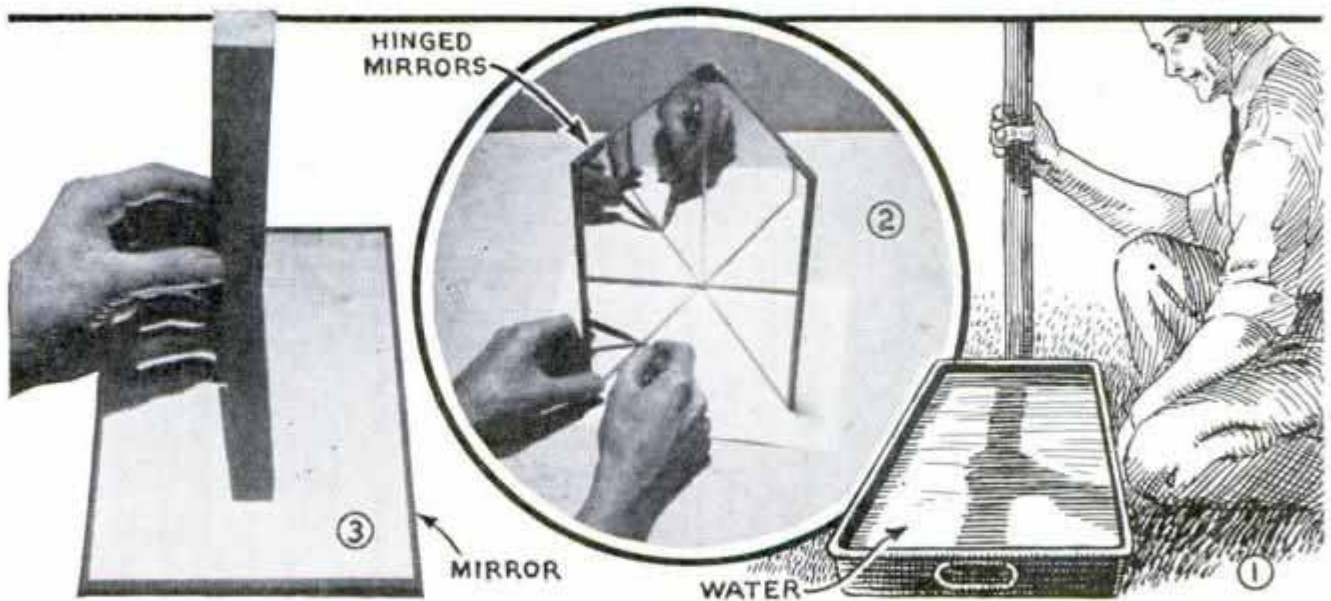
Add oil to the supply in the crankcase from time to time when the engine is running. Oil in the proportion of one teaspoonful per two ounces of gasoline may be added to the gasoline in the tank for the breaking-in period. A half-hour run with a load, such as pressing a stick against the inside rim of the flywheel, will serve to break the engine in. The breeze of an electric fan will help keep the engine cool during the running-in period.

Rubber Hose on Carpenter's Bar Avoids Marring Surfaces

When using a carpenter's bar to pull large nails and spikes in places where it is necessary to protect the surrounding surfaces, a short piece of hose split along one side and slipped over the end of the bar as shown will do the trick. The hose can be moved up on the bar out of the way or removed when it is not needed.



Mirror Used as Protractor Handles Many Jobs



When a protractor is not at hand, you can often substitute a mirror or even a pan of water and make a check by means of reflection. Fig. 1 shows how a pan of water is helpful in determining whether a post is perpendicular. When the reflection appears in line with the post, the latter stands straight one way. Then the pan is shifted around 90° and the check repeated. Two mirrors hinged together as in Fig. 2, which may be done with a strip

of adhesive tape, will help to divide a circle into a number of equal segments. The photo shows how to measure 60° or $\frac{1}{6}$ of a circle. Other angles are measured in a similar manner. The mirrors are adjusted so that the lower edges are in line with their images. In Fig. 3, a wood block is being checked to see if the end is square, which will be the case if the reflected edges are in line with the edges of the block, as observed from two adjacent sides.

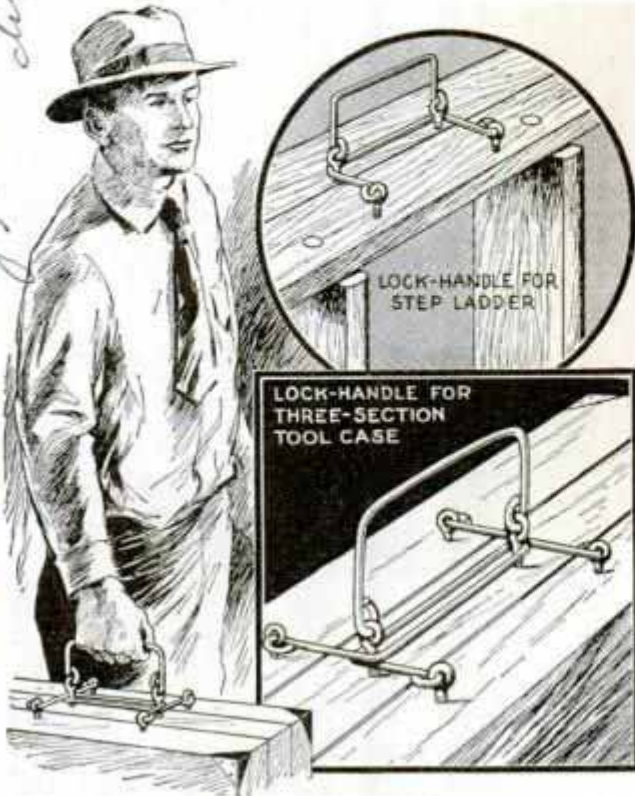
Tar Roofs Smoothed with Heated Roller to Imbed Gravel

To get a gravel covering imbedded thoroughly in a new or repaired tar roof so that it will not be dislodged easily by wind or rain, one contractor goes over it lightly with a self-heating roller. The heat from the roller softens the surface of the tar so that it seals tightly around the gravel. The roller can be made from a lightweight, 10-gal. drum, the sides of which must be smooth and straight. A flat-iron yoke to take a handle is pivoted to the drum ends, one of which has holes for inserting hot coals to heat the drum. A little coke or charcoal added occasionally will keep the fire going. The roller should be just hot enough to soften the surface of the tar, and do not apply too much pressure as this will force the gravel through the felt base.



☐ To protect valuable photographs against fading, usually caused by sulphur in the air, dip them in thin clear lacquer.

Tool-Kit Handles Made of Wire Are Interlocking



There is no possibility of a tool kit opening while carrying it, if these handles are used

After having his tool kit fall open while carrying it along the street, one carpenter removed the hook latches and substituted interlocking handles. They consisted of hinged wire loops, one on each side section of the kit in such a position that they dropped down over a similar handle in the center. These proved so handy that he used the same idea to prevent his stepladder from opening while carrying it.

Lathe Tool with "Stellite" Tip



On a job of turning a large number of narrow grooves in cast-iron rolls, we found a piece of Stellite welded to the lathe tool enabled us to increase the speed of both the lathe and feed screw

without burning the tip, thereby reducing the time of doing the job considerably. Also, we found that by carefully grinding the tip to size, both sides of the groove

could be finished in one operation, resulting in still greater saving of time. We have used Stellite on the tips of boring tools with good results, especially when working with cast iron.

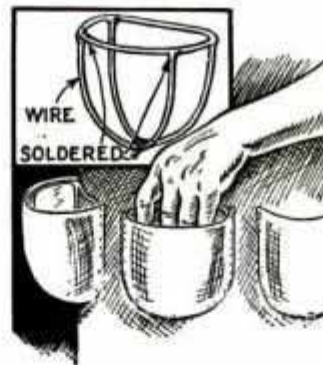
—M. L. Lowrey, Livermore, Calif.

Wrist Strap on Paint-Spray Gun Helps Relieve Strain

When using a spray gun continuously on a large job, much of the hand strain can be eliminated by a wrist strap as shown. The strap, which is looped around the gun handle and sewed, is fitted with a buckle so it can be adjusted to fit the wrist.



Pockets in Carpenter's Apron Kept Open by Wire Frame

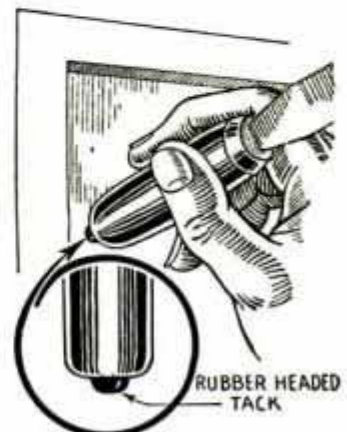


Inserted inside the pockets of a carpenter's apron, wire frames of the type shown will keep them open so that it is easy to pick out nails. The frames are made from fairly stiff wire and all joints

are soldered and then smoothed with sandpaper to protect the hands.

Rubber-Tipped Putty Knife to Set Glass Pane to Set Glass Pane

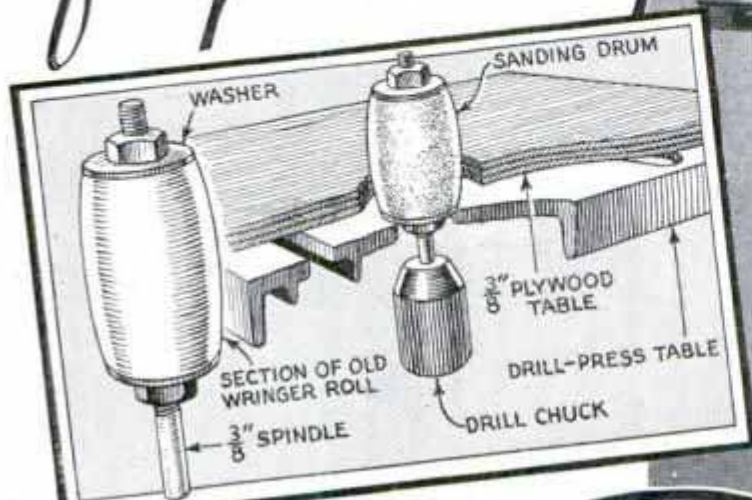
Glaziers who often tap a tight-fitting glass pane in place with the putty knife, will find that a rubber-tip handle will reduce the possibility of breaking the glass. Just drive a rubber-head tack into the handle.



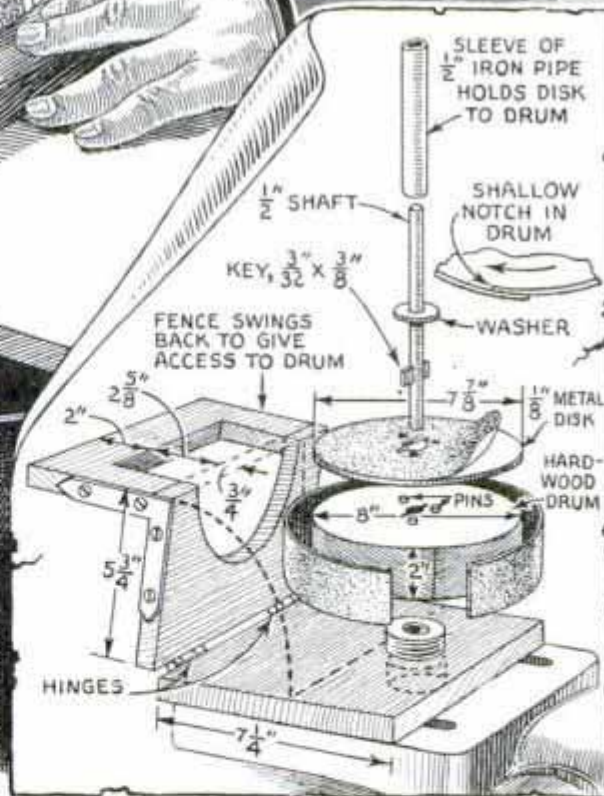
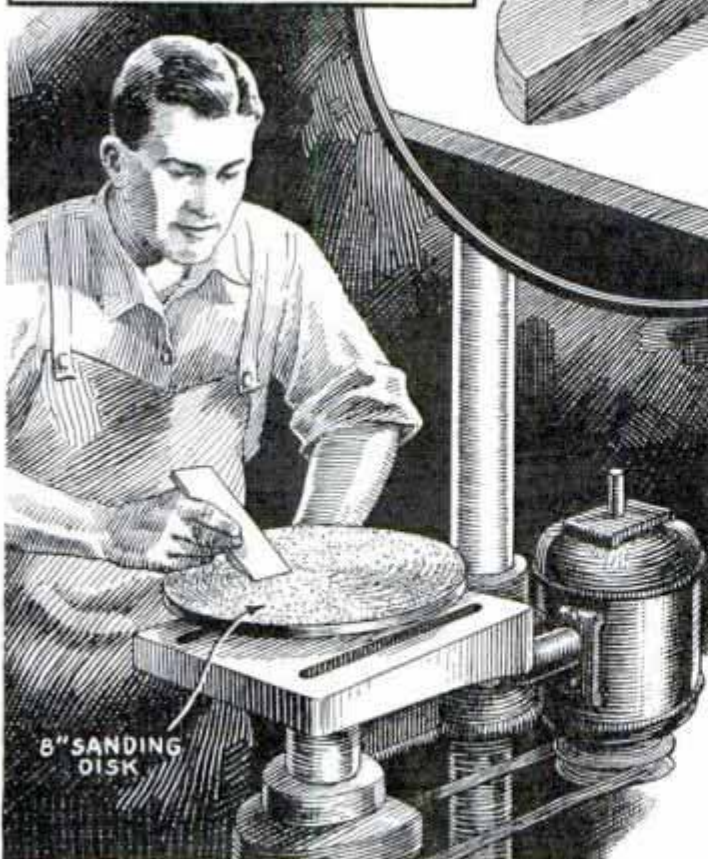
Haynes Stellite Co. / Haynes and Sunday / Kokomo, Ind.

Disk and Drum SANDERS

fit your drill press



By making a few sanding drums and disks of different sizes, you can handle most light sanding jobs that come up in your home workshop. The spindle sanding attachment above is especially handy for edge work, and you can oscillate it by moving the drill-press spindle up and down with the handle



In the drum sander above, the disks are interchangeable, making a wide range of different sanding surfaces available. Nested washers in the base serve as a thrust bearing. At the left, the drill-press head is inverted to drive an 8-in. sanding disk

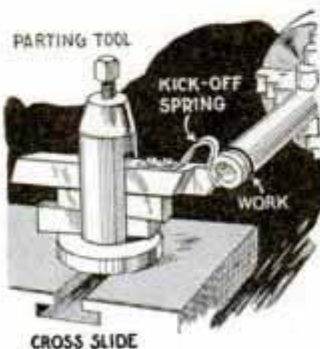
Tinner's Shears Operated by Foot Handle Large Wire-Cutting Job



Small shop owner quickly turns out large order for short wires with foot-operated shears

Having an order which required cutting several thousand short pieces of wire, the owner of a small shop that was not equipped for this work turned out the job quickly with a pair of heavy tinner's shears as shown. One handle of the shears was clamped in a bench vise, after which a strong strip of rubber fastened to the ceiling, and a wire fastened to a pedal on the floor were attached to the other handle. This permitted him to operate the shears rapidly with his foot as he fed the wire between the blades, a stop block, nailed to the bench, serving as a guide.

"Kick-Off" Spring Saves Time on Some Lathe Jobs

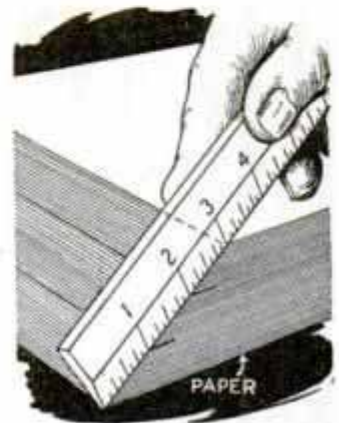


Many production jobs on a lathe can be speeded up by using this kick-off spring, which directs the parts into a box at the rear of the lathe as they are cut off with a parting

tool. The spring is bent to hug the work and is fastened to the top of the parting tool. It should touch the work before the parting tool so that when the latter advances the spring is compressed sufficiently to give the work a kick the moment it is severed.

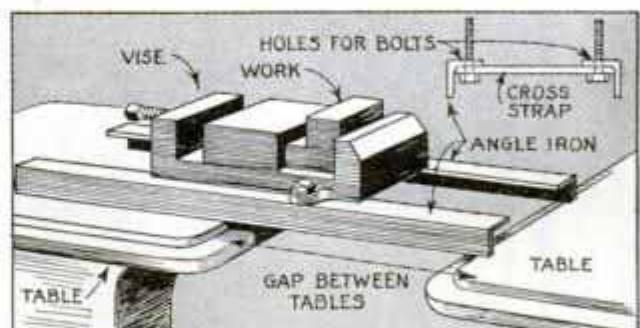
Dividing a Ream of Paper into Equal Parts

In printing shops and other places where it is often necessary to divide reams of paper into equal parts, the job can be done quickly with a ruler. If, for example, the ream is to be divided into three parts, place the ruler against the end of the paper and force the top back to slant the sheets until the measurement from top to bottom of the ream is exactly 3 in. as shown. A card or piece of paper inserted between the sheets at each inch mark on the ruler will mark the division lines.



Heavy Drill-Press Vise on Skids Is Moved Easily

In a shop where heavy drill-press vises often had to be shifted from one machine to another to complete a drilling job, the

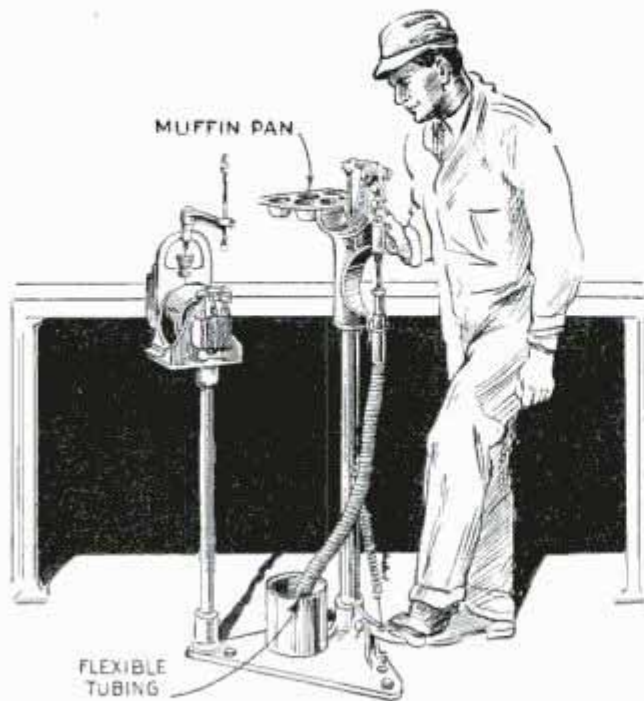


Heavy drill-press vises pushed from one machine to another to avoid lifting them

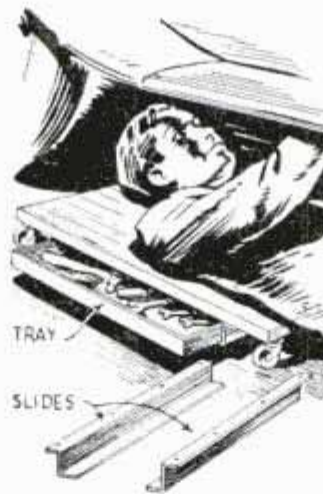
vises were fitted with angle-iron skids. This permitted them to be pushed from the table of one drill press to the table of the one nearby without lifting.

—H. Moore, Hamilton, Ont., Can.

Time Savers in Garage Increase the Profits



Here are three simple ideas that will save time on many jobs in your garage. The left detail shows a piece of flexible tubing attached to the anvil of a riveting machine so that the rivets fall into a can as they are punched from brake shoes, thus making it unnecessary to sweep up after each brake-lining job. A muffin pan fastened to the head of the same machine keeps several different sizes of rivets separated and always at hand. The right-hand de-

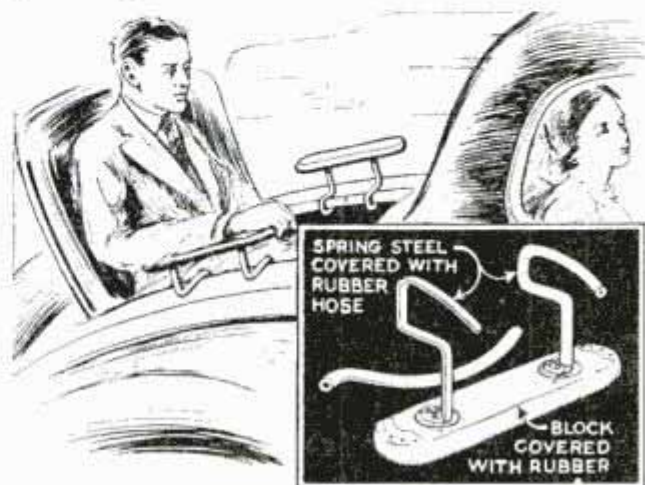


tail shows how two short, headless studs can be used as guides to install a cylinder head and gasket single-handed without damaging the latter. The upper ends of the studs are slotted to take a screwdriver so that they can be removed after a few of the cylinder-head bolts have been started. In the center detail, a creeper is fitted with a drawer in which several small tools are kept handy, thus making it unnecessary to crawl from under a car to get them.



Armrests Ease Shoulder Fatigue of Rumble-Seat Riders

Those who have ridden in rumble seats for any distance will readily understand the comfort afforded by these detachable armrests, which clip over the edges of the seat opening. Each rest consists of a wood block padded with sponge rubber to which are bolted two clips of flat, spring steel. Body construction around the seat opening will determine the shape to which the clips should be bent. After the armrests are completed, the steel clips should be covered with rubber tubing to prevent marring the car finish.



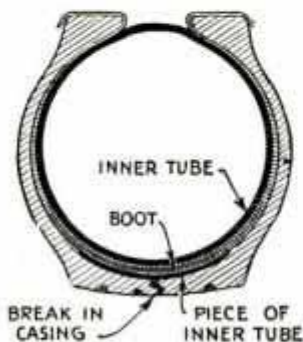
Roller on Luggage Compartment Aids in Removing Suitcases



Lifting and straining is unnecessary to remove heavy luggage when you use this roller

Salesmen and others who carry heavy suitcases and similar objects in their luggage compartments, will find that a roller mounted at the lower edge of the compartment opening is a great help in removing the luggage. Instead of climbing on the car and lifting the objects out of the compartment, you can stand on the ground and pull them out, letting them rest against the roller as they are removed. The roller may be made of wood, or from a piece of pipe filled with cement in which a rod is centered. The rod turns in metal brackets welded to the car body.

Cushioned Boot in Truck Tire Gives Long Wear



When installing the boot, the inner tube was cemented inside the tire directly over the break, after

Cushioned with a piece of inner tube, a large boot placed over a break in a truck tire was found to give longer wear than when it was used without the cushioning rubber.

which the boot was cemented to it in the regular way. In such an installation, the inner tube comes in contact with any foreign matter that works in through the break in the tire, and, being more resilient than the boot, withstands the wear better. Thus, the only function of the boot is to serve as a stiffening reinforcement over the break in the tire.

—J. A. Harper, Pinckneyville, Ill.

Small Parts in Gasoline Pan Retrieved with Brush

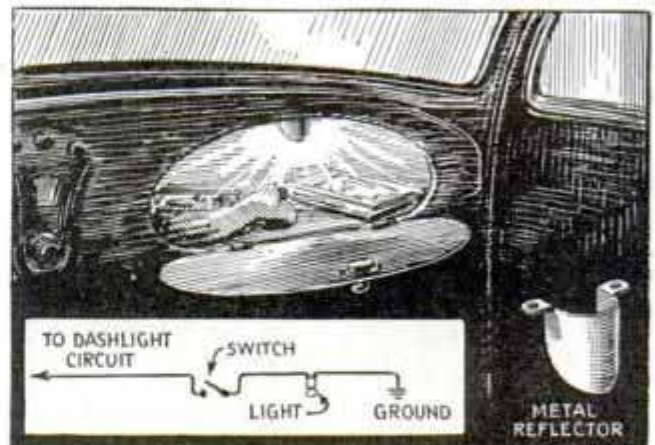
When using gasoline to clean small parts in a garage or shop, much of the dirt, as well as any overlocked nuts and keys, can be removed by straining the gasoline through the



bristles of a paintbrush. Just hold the brush in the mouth of the funnel as the gasoline is poured back into the can.

Lighted Glove Compartment Is Handy

Owners of cars that do not have lighted glove compartments can install a lamp in a short time. All that you need is a few feet of insulated wire, a 6-volt dash lamp

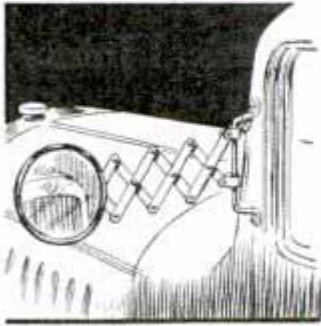


You won't have to fumble around to find an article in your glove compartment if this light is installed

and socket, and a toggle switch. Mount the socket in the top of the compartment, and wire it through the switch to the dashlight circuit or to the "hot" side of

the ammeter. Run another wire from the socket to the frame and ground it. The switch can be mounted on the instrument panel, or inside the compartment if you do not wish to mar the panel.

Adjustable Rear-View Mirror to See Behind Wide Loads



Truck drivers who haul loads of varying widths will find that a rear-view mirror attached to the cab with a "lazy tong," enables them to adjust it to see to the rear

of any load. The method of attaching the mirror to the lazy tong will depend on its particular type. The tong is fastened to the cab with a bracket.

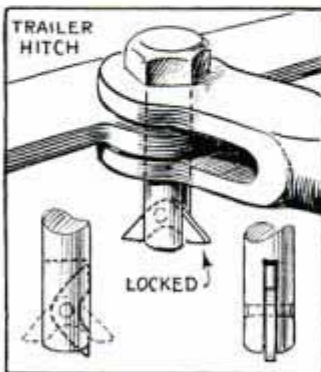
Battery Cushioned in Holder Against Shocks

Storage batteries in cars are often cracked or their bottoms are worn through because the hold clamps loosen, allowing them to bounce and slide around in the holder. This trouble can be prevented by wrapping a long, narrow strip of inner tube spirally around the crosspiece at the bottom of the holder to serve as a shock absorber for the battery.

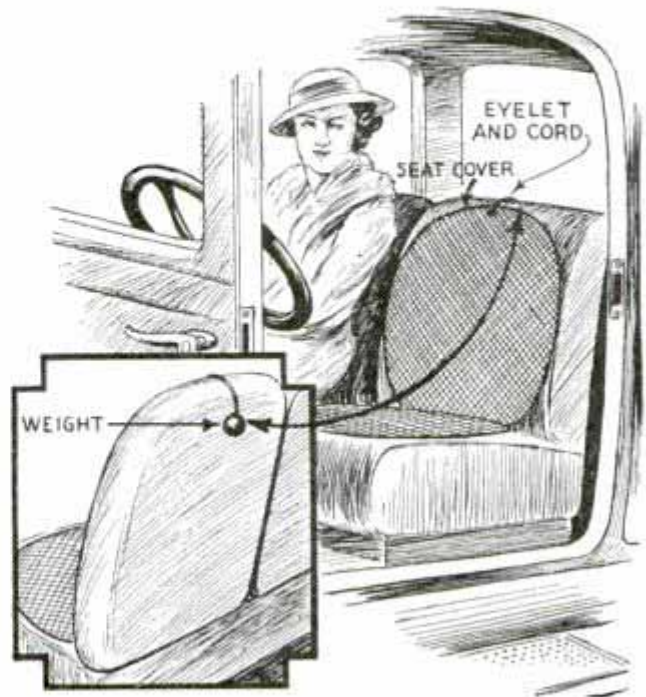
Trailer-Hitch Pin Locks Itself

There is no possibility of the pin in your trailer hitch working out if you use one of the type shown. It is merely a strong bolt slotted at the lower end to take a triangular-shaped key, which is pivoted in the slot. The shape of the key causes it to hang in a horizontal position with the ends projecting from the sides of the pin.

—Victor Busch, Flint, Mich.



Rattan Seat Cover Weighted to Keep It in Place

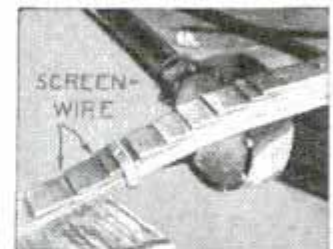


The problem of keeping the back of a rattan seat cover in place when you get out of a car is solved by a weight tied to the cover and placed over the back of the seat. As a light weight will do the trick, a fairly small steel ball, a medium-sized solid rubber ball, or a hollow ornamental knob of metal will serve the purpose.

Squeaky Car Springs Silenced by Screen Wire

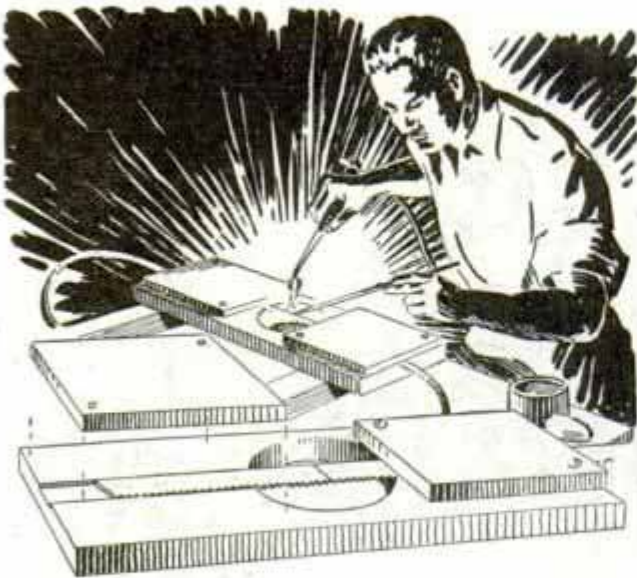
It has been found that squeaks in unshielded springs can often be stopped by slipping short pieces of grease-coated screen wire under the ends of the leaves. As the greatest points of friction are at the ends of the spring leaves, the screen wire retains the grease and lubricates these points much longer than is possible by merely spraying the springs with a penetrating oil.

—Jos. C. Coyle, Tucson, Ariz.



☐ When a glass stopper is not at hand for a bottle containing strong acids, an ordinary cork may be used provided it is first dipped in hot paraffin.

Jig Holds Band Saw in Alinement While Brazing Broken Ends



This simple jig eliminates guesswork when alining broken band saw to braze the ends together

To assure that the ends of a broken band-saw blade will be brazed together in perfect alinement, I clamp them in the jig shown while making the repair. It consists of a hardwood block grooved lengthwise

to take the blade flush, and two smaller blocks, which clamp it securely in place. A large hole bored in the center of the block allows the torch flame to pass around the saw blade without burning the wood. If desired, several grooves of different widths may be made in the jig to accommodate various saw blades.

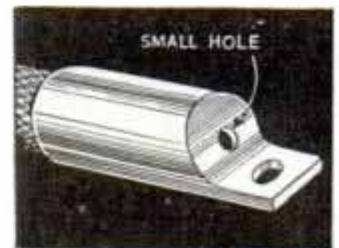
—W. C. Leckey, Aurora, Ill.

Making Good Electrical Joints in Terminal Lugs

Difficulty of completely filling terminal lugs with solder, when making electrical

connections can be eliminated if a small hole is first drilled in the base of each lug. This permits air and gases to escape without bubbling through the incoming solder. The holes are so small that

little solder is lost through them.



The Next Issue

MODERN LAMPS OF PLASTICS AND METALS

Beautiful lamps of subdued modern design that go well in any surroundings. Combining colorful plastics with satin-finished metals, which are easily shaped, the lamps offer the home-workshop owner handsome profits for his spare time.

FROZEN WATER PIPES THAWED UNDERGROUND

How to make a transformer to thaw out frozen water pipes underground. Operates from the 110-volt electric line in your home.

RAISED DESIGNS TAPPED IN BRASS

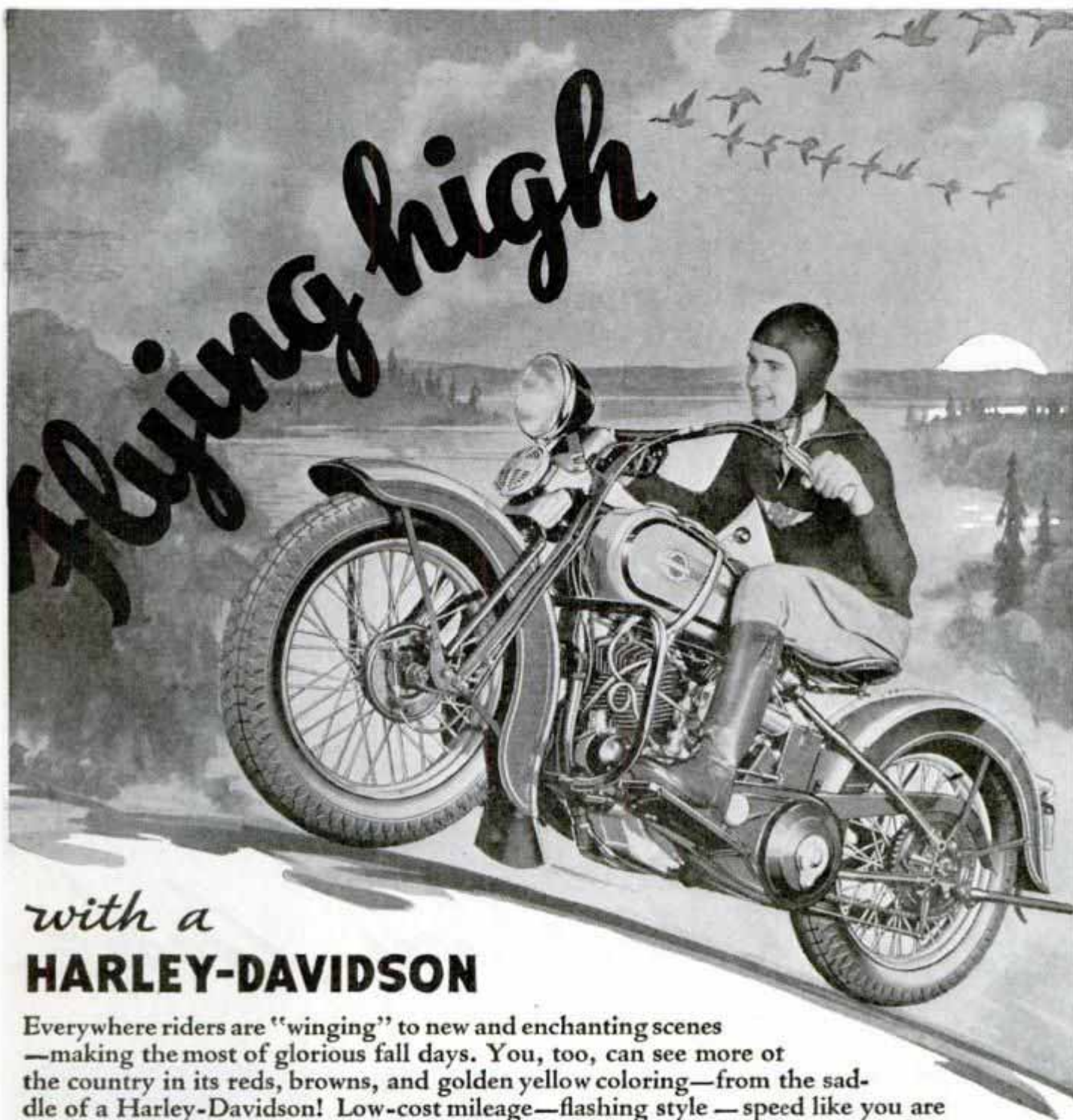
Artistic designs on brass in bold relief by tapping down the metal. Beautiful plaques and other decorations made with a hammer and punch.

OUTWITTING THE FUR BEARERS

Do you know the tricks of catching the fur bearers? This article tells how and where to make clever land and water sets that fool the wiliest animals.

OSCILLATING SANDER

Rugged spindle sander from inexpensive parts on which the spindle moves up and down as it rotates, giving the work a smooth finish free of sand scores.



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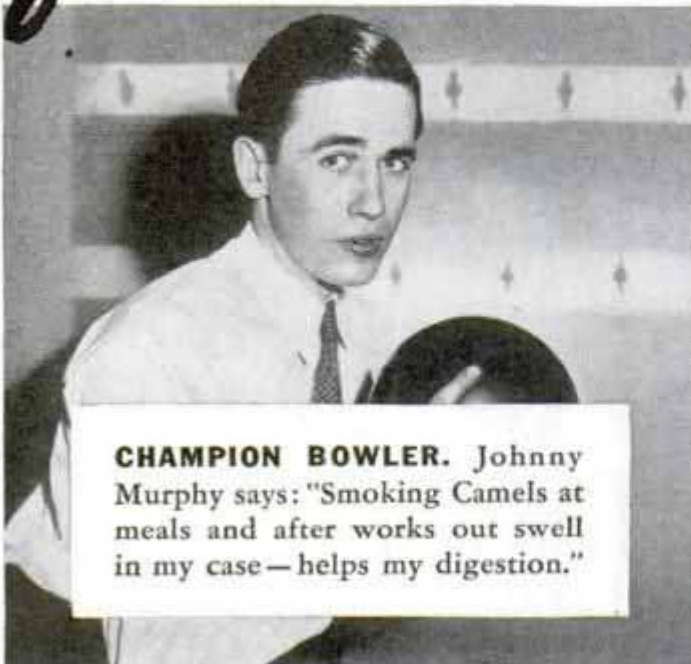
AFTER THE GREATEST FINISH under fire in golfing history, Tony Manero gets set for hearty eating by smoking Camels. He won the 1936 National Open Golf Tournament with a spectacular 282—4 strokes lower than the former Open record. His digestion stands the strain of the long grind because, as Tony himself says: "I'll go on record any time as one who thanks Camels for stimulating digestion. 'For digestion's sake—smoke Camels!' hits the ball right on the nose. I feel cheered up while I'm eating—enjoy my food more—and have a feeling of ease afterward when I enjoy Camels along with my meals. Camels set me right."

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...Turkish and Domestic...than any other popular brand.



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The Amateur Sky Patrol

(Continued from page 725)

The big job is grinding and polishing the mirror glass. It may take twenty or twenty-five hours to get the right concave surface so all the parallel light the mirror picks up is reflected back to one point. The rough grinding is done with different grades of carborundum by pushing a grinding tool back and forth across the surface of the glass, with the mirror glass mounted on a small table so the builder can walk around it slowly. The tool used is a glass disk similar to the mirror disk. The final operation is to polish the concave surface, and for this the grinding tool is covered with pitch facets and a compound of jewelers' rouge suspended in water is used. Then the disk is ready for its reflecting coat of silver.

With an inexpensive six-inch telescope you can see all of the major planets, the rings of Saturn, pick out craters on the moon only a mile in diameter, and make out the nebula in Andromeda that is 900,000 light-years away. A good telescope of this size will reveal stars of the thirteenth magnitude, as compared to the naked eye which sees stars of the sixth magnitude, and the 100-inch telescope on Mount Wilson with which stars of the nineteenth magnitude may be seen. Equipped with an electric "slow-motion" motor that turns the telescope across the sky at the same speed as the stars, long-exposure photographs may be made. Some amateur pictures of the sun, moon, and planets compare in quality with those made at the large observatories. Some of the amateur comet hunters do all their exploring by photography. With a camera hitched up with their telescope, they take pictures in which it is easy to pick out the long comet trails among the round dots that represent the stars.

During the day you can use an astronomical telescope for looking at interesting things on the earth. A six-inch instrument will allow you to read a newspaper a block away or tell the time from an alarm clock a mile away. With such a telescope you can see cars on a distant road as plainly as if they were across the street, or watch passengers on the decks of ships far at sea. With a red filter to cut through the blue haze, the individual

branches of trees on mountain tops 100 miles away have been seen. Many amateurs use heavy permanent mountings in their back yards to hold their telescopes steady and also have light portable tripods that enable them to set up their telescopes almost anywhere on automobile trips.

It is estimated that 10,000 amateur telescope enthusiasts in the United States, including the memberships of fifty clubs, have built their own telescopes. One association with 350 members in all parts of the country is doing work of professional importance in keeping track of the variable stars. Some of the instruments built by amateurs are as fine as any in the world for their size and are valued at thousands of dollars. One builder made his own patterns and castings for his electrically driven instrument and values the telescope at \$3,500. Other amateurs have developed new ideas in telescope gear that have been adopted by the large observatories. A simple solar camera that takes good pictures of sunspots was built by one amateur for a few cents. It consists merely of a light-proof film holder behind a shutter. The shutter is a very thin slit between two pieces of metal and is drawn rapidly across the photographic film by a piece of rubber inner tube when it is released by cutting a string. Exposures lasting one-six-thousandths of a second may be made.

Three amateurs, a bridge builder, a dentist, and a manufacturer, built an entire observatory which they presented to a university. Among their instruments they invented a "spectroheliokinematograph" which takes motion pictures of sun phenomena. Motion pictures are also taken of solar eclipses and the movements of Jupiter's moons.

"Amateur telescope builders should plan to use their instruments after they finish building them," Porter urges. "Often an amateur works many hours to finish his telescope, calls in the neighbors a few times to look at the moon, and then lays it away. Really, the most interesting part of his hobby has just started. With a few star charts and tables to guide him, there is always a chance he may make an important discovery."

7845

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It's easy to take pictures **AFTER DARK**

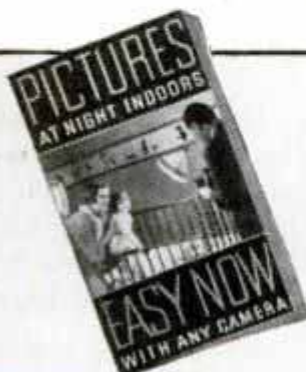
RUN through any collection of pictures, and you'll find that some of the finest are indoor shots—taken at night. For today films are faster; lighting has been improved. Try your skill in this new and exciting sport; start tonight.

Night pictures can be made with your present camera if it can be set for "time"; and if it boasts an *f.6.3* or faster lens, night *snapshots* are easily possible. Just load with Kodak "SS" or Kodak Verichrome Film and use Mazda Photoflood or Photoflash lamps.



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Accept nothing but the film in the familiar yellow box.

1896 "Courts" Offer Luxury for Motorists

(Continued from page 677)

vide room for Junior. And last of all there's a tile bath with hot and cold running water and a tub and shower.

There's nothing to do but drive your car into the adjoining garage, get your bags out of the trunk and "set up house-keeping." Near by there's a service station to condition your car for tomorrow's trip, and within walking distance you'll find a good restaurant and a grocery store to obtain provisions if you're doing your own cooking. After dinner you'll find outside your overnight home a comfortable bench where you can sit and admire your own individual flower garden and your own individual palm tree.

There's maid service if you need it and next morning you're ready to leave as soon as you step outside your home and stow your bags in the car. There's no tipping, no one to disturb you during the night and you disturb no one because your neighbors are far enough distant so your radio or conversation is inaudible.

And the price? Three rooms, bath and garage for your car in any good hotel offering similar conveniences would probably cost you at least eight or ten dollars, perhaps more. In the motor court your overnight home costs you from two to five dollars, depending on the size of cottage you require and the number in your party. Through the west, you can make a three weeks trip, live in a motor court cottage each night, and pay less than \$75 for this form of luxurious living.

The moderate rates are due to the location of the courts. Rarely are they found in downtown areas of high-priced real estate. You'll find them on the edge of the city or on the fringe of a quiet residential neighborhood. And while the construction is substantial, it is inexpensive as compared with the cost of a large hotel.

There's a business opportunity today in motor courts for the man with a few thousand dollars capital. A court of twenty to thirty units in an average locality can be constructed and furnished for from \$40,000 to \$50,000 including the ground, and credit usually can be obtained for part of this sum. Most courts provide a public lounge or lobby and some have their own dining rooms. One elaborate

southern establishment has separate quarters for chauffeurs and maids.

This indicates that a different class of motorists is attracted to the courts, also called "motels," "autels" and "autotels," than patronizes auto camps and tourist parks. You'll find your neighbors are people of means, driving good cars—people



Motor lodge at San Diego, Calif., typical of accommodations for motorists now available

you ordinarily would expect to find at the best hotels. They are attracted to the courts because of the conveniences offered.

Hotels which years ago did not accord a very hearty welcome to travel-stained motorists have seen the day when most of their guests arrive in their own cars, at least in many cities, and they are taking a lively interest in the motor court idea. So it will not be surprising to find motor courts conducted under hotel management. Some of the best today are run by oil companies or individual service stations.

One of the most pretentious organizations is United Motor Courts, an association of more than 100 individually owned and operated courts in the west and middle west. Members can only enter this association if their courts come up to certain high standards. There are also other associations of court owners in the west and southwest.

A few years ago touring motorists lived mostly in wayside shacks, clapboard cabins, private homes catering to tourists or hotels. Today they have available 1,500 de luxe motor courts, another 2,500 of exceptionally high standards and catering to people of substantial means, and 6,000

(Continued to page 120A)

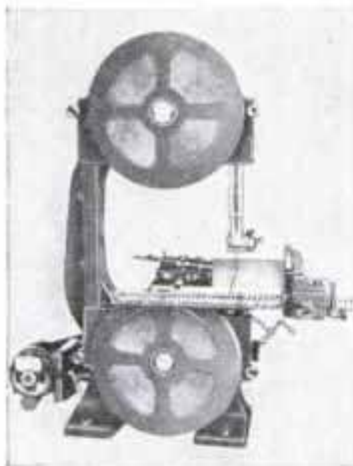
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(Series 700) Combines features never before offered! This tool will handle all three types of surfacing, yet it's a model of simplicity. Belt sanding on the upper belt surface, "stroke" surfacing under the lower belt surface, and butt-end or mitre sanding with the big 10" disc. Surfaces panels up to 13" wide—a feature never before available to you in a low priced machine. 4" wide belt, 18" between pulley centers. Tilting table at disc, with mitre gauge. For full details, send the coupon.

DRIVER SURFACER (Series 900)

A full production tool. Like the 700 Series, it surfaces wood, metal, plastics, fibre, etc. Has efficient dust collecting system. Rolling table under belt for "stroke" surfacing. Many other quality features.



16" BAND SAW

This new Driver tool has fine appearance and graceful lines, but doesn't stop at that! Cuts true; operates without vibration; protects operator; stands up without repairs. Cutting capacity 12", throat 16". One-piece frame. 18"x17" table tilts to 45°, with calibrated quadrant. SKF ball bearings. Completely guarded—no section of blade exposed while sawing. Get the whole story in the colorful 1937 folder!



10" TILTING ARBOR SAW

Massive, rigid frame, table 35"x26", full horsepower motor, heavy duty SKF bearings, 10" blade. Heavy tilting unit swings accurately, almost without effort. With motor recommended, zips through hardwood 3 1/4" thick—greatest capacity ever offered in this price class. Get full details in the new 1937 folder.



10" BENCH SAW

Has unusually large table, plenty of room in front of blade. Cuts full 3" stock! New "kick back pawls" prevent stock being thrown toward operator. New safety guard. Precision worm gear table tilting device. Positive mechanism for raising arbor and blade. Strong ripping fence. Splitter. Get details in the 1937 folder and you'll agree it's the biggest saw value ever offered.



• You can get Driver Engineered Quality in three full lines of Bench Saws, Band Saws, Jig Saws, Jointers, Drill Presses, Lathes, Flexible Shafts, and Motor Grinders. Walker-Turner Co., Inc., 1116 South Ave., Plainfield, N. J.

DRIVER *Engineered* POWER TOOLS

WALKER-TURNER CO., Inc.,
 1116 South Ave.,
 Plainfield, N. J.

Send me your colorful folder, giving full details on the Driver Line for 1937.

Name.....

Address.....

Due to the unprecedented demand for Driver Tools, delivery of new models will be somewhat delayed. Your local Driver dealer will be kept closely informed on delivery dates from the factory.

Building a River in the Desert

(Continued from page 685)

1981
X

nent location. The webs of reinforcing steel are bent to shape, forms are erected, and the concrete is poured in. When the forms are removed the conduit is ready for use.

One problem was to eliminate the hazards of the dangerous dry rivers of the desert. These rivers, nothing more than deep, dry arroyos, remain arid for months at a time. Then a wall of water ten or twenty feet high comes rushing down one of them. A tremendous cloudburst in an adjacent range of desert mountains is the cause. To prevent their aqueduct from being destroyed in such floods, the engineers are using huge inverted siphons to cross under the channels. That way, the artificial river will be carried safely under the sudden floods.

The project has disclosed that, if properly trained and cared for, men can work face to face with the pitiless desert sun all summer long without hardship. Heat exhaustion, the district's medical corps has learned, results from loss by evaporation of part of the normal saline content of the body. A prescription of a small amount of ordinary table salt per day, in a glass or two of drinking water, restores the saline balance and keeps the men in good shape.

Temperatures underground are almost as high as above the surface and the moisture from subterranean streams creates a humid atmosphere much more uncomfortable than the dry air above. In addition, the chemical action that occurs while concrete is hardening creates its

own heat, and the tunnels are lined with concrete. Thermometers in the tunnels have registered as high as 130 degrees.

The aqueduct cuts through one of the most highly mineralized sections of California, in a district where gold and other minerals are often found, so desert prospectors are following the construction crews and carefully sampling the rock taken from canal ditches and blasted out of tunnels. So far no ores of commercial value have been reported although numerous ledges containing very small amounts of gold, silver, copper, and other metals have been discovered. The digging has, however, led to the uncovering of tons of prehistoric bones. Teeth of sabertooth tigers, miscellaneous skeletons of dinosaurs and early elephants, and even fish fossils, have been unearthed in the tunnels. Petrified trees of types no longer existing also have been discovered.

Selecting the best route for the aqueduct was a tremendous task in itself. Much of the country west of the Colorado had never been surveyed and in some sections even general exploring was incomplete. Driving their light, specially built cars through the dry hills and guiding themselves by compass, the district's surveying parties accurately mapped 25,000 square miles. Seven possible routes were compared before the best one was selected.

More than a dozen temporary towns have been built in the desert to provide quarters for the men. Most of the dormi-

(Continued to page 122A)

Courts Offer Luxury for Motorists

(Continued from page 118A)

1996
X

camp and cottage courts where those of modest means and lesser requirements can obtain clean and wholesome accommodations and surroundings. These 10,000 courts and camps have a total of 225,000 cottages and units, 300,000 beds to accommodate 550,000 travelers nightly and represent an investment of more than \$200,000,000.

The rates in these "camps" range from a dollar to \$1.50 for two persons, and in

motor courts from \$2.00 to \$3.00 per couple and about \$4.00 or \$5.00 for four persons. The simpler your tastes, the less the cost. In the inexpensive ones, you may not find the luxuries of the de luxe lodge, but you'll find all of them clean and comfortable if you exercise just a little care in making your selection. So make a trip and try living in a motor lodge—you'll be as comfortable and find it almost as cheap as staying at home!

**IT ISN'T YOUR STARTER,
MISTER, YOU NEED
QUICK-STARTING GAS**

**HERE'S WHY ETHYL
GIVES QUICK STARTING**

(Reading time 37 seconds)

WINTER ETHYL has ALL three qualities that your motor—your starter—and battery are asking for. It is volatile, *to get in the cylinders* at the first turn. It is quick-starting, *to catch the first flash of the spark plug*. It is highest anti-knock, *to give extra power—to stop waste*.

And that's important, because knock cuts down power as it wastes both gasoline and oil; and in winter, driving and road conditions are at their worst. Your very safety depends on instant, full-powered engine response.

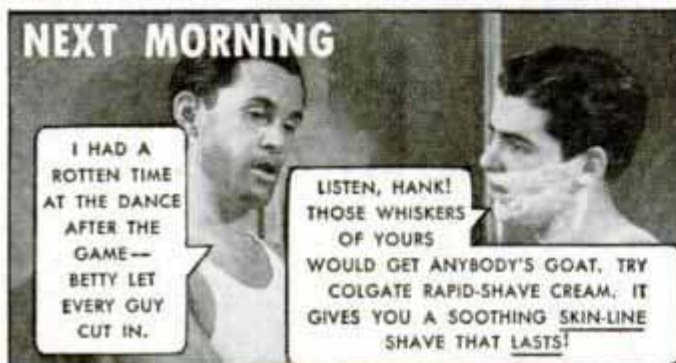
It will pay you to change to Ethyl as you change to winter oil and put anti-freeze in your radiator. Your driving this winter will be more comfortable, safer and more economical. And your motor will be in better condition when spring at last arrives.

NEXT TIME GET ETHYL



When writing to advertisers please mention Popular Mechanics

(Continued from page 120A)



BIG BUBBLES
LEAVE STUBBLE

SMALL BUBBLES
SHAVE CLEAN

BUBBLE PICTURES SHOW WHY

MOST LATHERS are made of bubbles too big to get to the *base* of the beard! Air pockets keep the soap film from reaching the whiskers. So the beard is only *half-wilted*.

COLGATE RAPID-SHAVE CREAM makes tiny bubbles that get clear down to the skin-line. Its rich soap film soaks your beard soft at the base. Makes your shaves last longer.



COLGATE "SKIN-LINE" SHAVES
LAST HOURS LONGER



25¢ LARGE TUBE
100 SHAVES

40¢ GIANT TUBE
200 SHAVES

tories are air cooled and each little city has its own ice plant. Half a dozen hospitals are maintained and all the camps have crews of trained rescue and first aid men. In spite of the new speed records that are being made, and the use of 7,000,000 pounds of dynamite, accidents have been considerably under average.

Water is the staff of life in southern California. Already served by a 233-mile aqueduct that delivers water fresh from the Sierras to Los Angeles, that city and twelve adjacent towns will actually tap the snow banks of the Rockies by means of the new aqueduct. Flowing down the Colorado and through the power houses at Boulder dam, the water will be diverted into the aqueduct 155 miles below the big dam. In all, the water will travel some 1,500 miles from Wyoming, Utah, and Colorado, on its way to kitchen faucets on the coast. The \$200,000,000 aqueduct will practically double the water supply of southern California and provide for a population of 7,000,000 people. It is estimated that from forty to eighty years will elapse before additional water supplies must be sought.

Here are some other facts about the aqueduct. Pumping plants along the line will use enough electricity to serve a city of 2,000,000 population. Before starting work on the aqueduct it was necessary to construct a paved trunk highway 150 miles long, a "baby" aqueduct of steel pipe 200 miles long to carry water from desert wells to the construction camps, a \$2,000,000 high-voltage power line along the right-of-way, and a private telephone system that includes five exchanges.

The steamer "Queen Mary," new Titan of the seas, could not during all her normal life, carry the excavated material from the aqueduct to England if this enormous mass of dirt and rock, equal to the bulk of thirteen pyramids the size of Cheops, could be delivered in New York for shipment abroad. The concrete for tunnel linings, and canals, siphons and conduits, would make a continuous six-foot-wide street walk extending from Los Angeles south to Buenos Aires. The 22,000,000 bags of cement wrought into the aqueduct would, if placed end to end, equal the height of 2,000 Mt. Everests.

(Continued to page 124A)

THOUSANDS AMAZED HOW NEW 3-WAY TREATMENT INCREASES WEIGHT



1

Rich red blood necessary to carry proper nourishment to build up every part of the body, is especially promoted by the easily absorbed iron in this new discovery.

2

A healthy digestion which gets ALL the good out of the food you eat, requires an adequate supply of Vitamin B. This new discovery supplies this precious element.

3

Normal, regular elimination to remove poisonous waste and thereby promote health and growth, requires adequate Vitamin B. This is the third important purpose.

SCIENCE PROVES IT'S
UNNECESSARY FOR THOUSANDS
TO BE **SKINNY**



Posed by professional models

Gains of 10 to 25 pounds in a few weeks, reported

DON'T think you're "born" to be skinny and friendless. Thousands of men and women with this new easy treatment have gained pounds of solid, normally attractive flesh—in just a few weeks!

Not only has this new 3-way discovery quickly brought normal, good-looking pounds, but also naturally clear skin, freedom from indigestion and constipation, new pep and popularity.

Scientists recently discovered that thousands of people are thin and rundown for the single reason that they do not get enough digestion-strengthening Vitamin B and blood-enriching iron in their daily food. Now the richest known source of body-building Vitamin B is cultured ale yeast. By a new process the finest imported cultured ale yeast is now concentrated 7 times, making it 7 times more powerful. Then it is combined with 3 kinds of iron, pasteurized whole yeast and other valuable ingredients in pleasant little tablets known as Ironized Yeast tablets.

If you, too, need these vital elements to build you up, get these new triple-acting Ironized Yeast tablets from your druggist today. Then day after day watch flat chest develop and

skinny arms and legs round out to natural attractiveness. Constipation and indigestion from the same cause vanish, skin clears to normal beauty—you're a new person.

Money-back guarantee

No matter how skinny and rundown you may be, try these new Ironized Yeast tablets just a short time, and note the marvelous change. See if they don't build you up in just a few weeks, as they have thousands of others. If not delighted with the results of the very first package, money back instantly.

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To start you building up your health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 5311, Atlanta, Ga.



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OR COLLEGE RING**
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Listen, fellows! This amazing offer is made by the Parker Pen Co., solely to introduce Parker Quink—the miracle ink that cleans your pen as it writes—a Parker or any other pen. For Quink dissolves sediment left by pen-clogging inks. Quink dries ON PAPER 31% faster, yet does NOT dry in your pen.

Get a bottle of Parker Quink today for 15c from any store selling ink. Tear off the box-top and on the back write the FULL name of your High School, Preparatory, Military, or Normal School, or College, and its location; also ring SIZE and style wanted (man's or woman's), and your name and address. Then mail box-top with 25 cents in coin to The Parker Pen Co., Dept. 782, Janesville, Wis. Your ring will be sent promptly. Offer limited to U. S. A. and may be withdrawn any time.



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TRAILER SUPPLY CO., Box 438-A, Wausau, Wis.

(Continued from page 122A)

No ordinary cement is good enough for this immense water-transport structure. Aqueduct engineers know that the gnawing teeth of terrific winds, of temperatures that soar above 130 degrees, and alkalis of fierce corrosiveness are striving constantly to rip asunder their efforts. The finer the cement the stronger its bonding qualities. So the 7,000,000 barrels of aqueduct cement was re-ground to face-powder fineness to add an important tenacity of life and strength to combat the merciless forces of nature. Men and machines may be seen nearly any day drilling out concrete cores which are taken to the desert-edge laboratories of the aqueduct administration where, with the aid of elaborate scientific instruments, they are tested for strength and endurance.

Under the crushing jaws of hydraulic compression gauges the cores are tried for their failure points. Others are locked in automatic refrigerators that dampen and freeze them, in ovens they are dried and heated, so that in a few weeks, they yield the same evidence as the same number of human generations in normal aqueduct life.

In general, the fewer the air holes, the stronger the concrete. So the aqueduct engineers invented a mechanical "patter" whose two steel hands, actuated by compressed air, jar rapidly against the freshly poured mixtures, compacting the concrete into what the system's builders believe is the closest knit construction of its kind ever developed.

To the layman such detail may seem trivial, fantastic. But the engineer knows that every irregularity means compounding friction, cutting velocity and capacity. And he's leaving no loophole whereby posterity, living in one of America's most productive agricultural and industrial communities, can point to an era whose inhabitants failed to secure its permanency by insuring for themselves a continuing supply of water.

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

Why Gamble with Death?

(Continued from page 719)

of the non-fatal ones last year occurred in collisions between automobiles. Passing on a hill or driving on the wrong side is an excellent preliminary to a collision.

If you're in the habit of looking after you get on the railroad track instead of before, you're headed for the same fate that overtook six per cent of those killed last year and five per cent of the injured. They were killed and hurt as the result of automobiles hitting or being hit by vehicles other than automobiles.

Ever take a curve too fast and find yourself struggling for control? If your 4,000 pound car hits a curve of 100 feet radius at thirty miles per hour there's a force of 2,400 pounds trying to pull you into the ditch. That's centrifugal force. Twelve per cent of last year's fatalities and six per cent of the injuries were caused by accidents involving no collisions with anything. Which might prove that anyone can round a corner on two wheels—once. And this brings up skidding. You can't blame a skid on the "other fellow." Twelve per cent of all rural accidents in Ohio last year were caused by skids. But when roads were wet, snowy or icy, one-fourth the accidents involved skidding. The lesson seems obvious—but remember also that four out of five traffic accidents occur on dry roads and in clear weather, so don't get careless just because the road is dry.

Night accidents are more serious than daytime ones and, on a mileage basis, the accident rate at night is higher. Traffic, accidents and fatalities reach their peak about five in the evening, and their low about three in the morning. Also there are fewer accidents on Tuesday than any other day in the week, and more on Saturdays and Sundays. So in theory, the safest time to drive is about three o'clock of a Tuesday morning.

But don't take a chance, even on Tuesdays, because the law of averages will beat you if you keep it up. Why gamble with death when you know death is going to win eventually?

☐ Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

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GRADUATE
TO
KAYWOODIE**

*The World's
Finest Pipe*

\$3.50
and up

No. 51B

**-AND YOU'LL NEVER
BE SATISFIED WITH
ORDINARY PIPES AGAIN**

This ad is here to tell you that tobacco in a Kaywoodie is an entirely different proposition from tobacco in ordinary pipes. It tastes better because (1) the Drinkless Attachment keeps it sweeter, cooler, drier (2) the briar wood in this pipe costs 3 times as much as ordinary briar (3) each Kaywoodie is shaped and cut to smoke sweet. More comfortable than ordinary pipes too—*feels* right in your mouth. Kaywoodie also draws freer than ordinary pipes, and is easier to clean (Synchro-Stem prevents sticking and yanking). Go to your dealer now and ask for Kaywoodie. Four finishes: Suntan, Walnut, Thorn and Dark. Send for Catalog. Enclose 10c for mailing. Kaufmann Bros. & Bondy, Inc., New York and London.

Drinkless, \$3.50 — Carburetor, \$4
Super-Grain, \$5 — Straight Grain, \$10



LEPAGE'S
Stronger
than the
Wood
It Joins!

See the surface of this block at right. Shows wood gave way, and not LePage's.

10,955 lbs. Pressure

● Illustration above shows side view of block of rock maple, one of the hardest woods, used in testing the strength of LePage's Glue. The dark vertical line is the glue-joint. The irregular white line shows where the wood itself gave way under 10,955 lbs. pressure.

That's proof of LePage's tremendous and lasting strength. Best thing in the world to make snug joints, reinforce nails and screws, fill small cracks and nail holes.

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*Expels
HOOK, TAPE
and ROUND
WORMS*



PULVEX WORM CAPSULES

150-Watt All-Band Transmitter

(Continued from page 740)

unit is shown at C in the rear-view photo of the 5-ft. homemade rack-and-panel assembly. The antenna-matching network is on panel D. For phone work, two RK-31's in class-B easily modulate the full input; this assembly is on base B and includes the Thordarson input, output and filament transformers. Combined plate and screen modulation is used, the T-7826 modulation transformer having secondary windings to

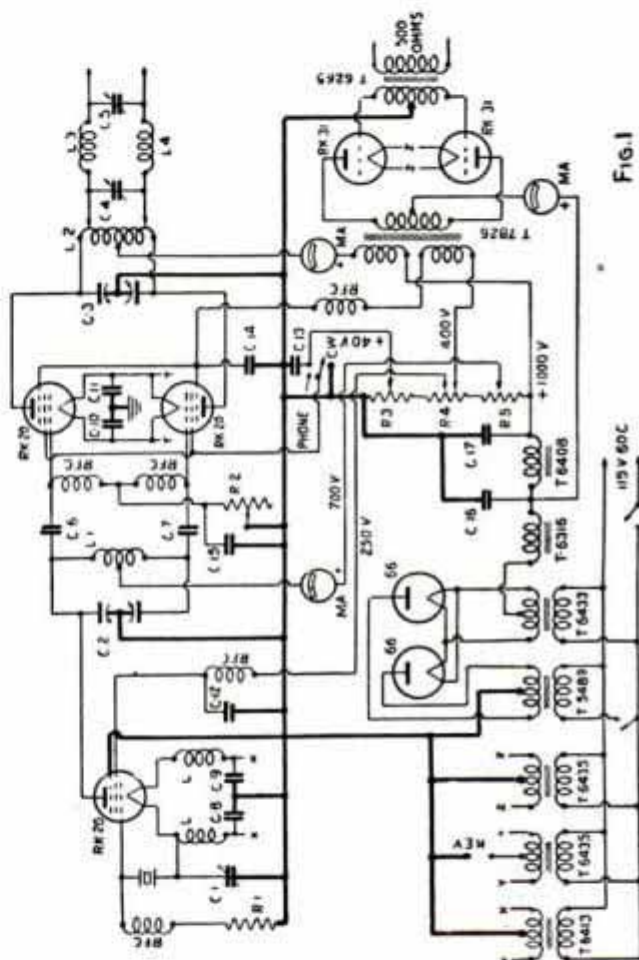


FIG. 1

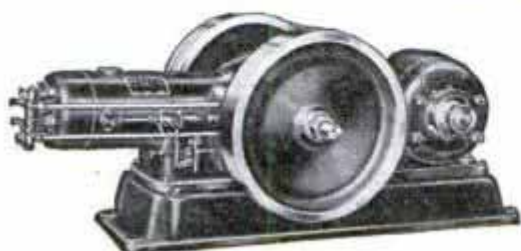
carry both the plate and screen current. An original material list of all parts used, including coil data, rack-and-panel construction details and tuning instructions is available from Popular Mechanics radio department without charge. The blueprint number is R-231.

Although this transmitter is not intended for beginners, the assembly is quite simple and adjustments are easy. A single power supply mounted on base A, furnishes plate and screen voltage to all tubes as indicated in Fig. 1. Any good 18-watt speech amplifier may be used for phone operation; a compact unit of suitable design will be described in an early issue.

WITTE DIESEL ENGINES

The unbelievable economy of the small Diesel has revolutionized power costs. With a Diesel, power bills are only a fraction of their former size. Where power is used 800 hours or more a year install a WITTE Diesel Engine and it will soon pay for itself.

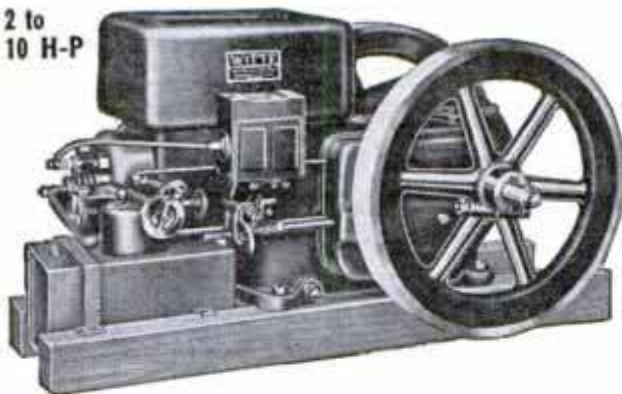
EFFICIENCY UP --- POWER COSTS DOWN



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Light and power users save 50% and up with a WITTE Diesel Light Plant. No peak load or stand-by charges. Current produced for less than 1c per kilowatt. Money saved every hour of operation. Alternating or Direct Current.

2 to
10 H-P



WITTE LOG AND TREE SAWS

"Saws 'em down and cuts 'em up." There is money for you to make with a WITTE, timber to be cleared, logs to be cut, wood supplied for fuel. WITTE outfits have safety lever clutch control, saw guide, automatic force feed, human arm swing and other exclusive features. Portable as a wheelbarrow. Engine may be belted to other power for year around use. Buy from a reputable firm.

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**NO-EXPLOSIVE FUEL
FIRE HAZARD**

**CASH or
TERMS**

5 and 10
H-P



The WITTE Diesel has the same important features and operating characteristics of the most modern large Diesels, and brings to the small power user the same startling economy and dependability. Fuel consumption is less than one-half pint of non-explosive fuel per hour per horse-power.

Thoroughly modern in every respect, the WITTE incorporates every worth-while advance in Diesel Engine design. Built of the finest materials ever embodied in Diesel Engine construction. Switch to WITTE Diesel power and **save your money**. Easy terms to responsible parties—immediate delivery.

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TYPE "J" ON WOOD SKIDS

Where the amount of power used does not warrant a Diesel Engine our Type "J" on wood skids or Type "K" on iron base is recommended. They are Enclosed, Self Oiling and have Timken Roller Bearings. Operate on gas, gasoline, kerosene or distillate. Lubrication is automatic. Run smooth as an electric motor. Consume less oil and fuel and deliver more power. Pronounced by experts years ahead in design and construction. Buy your power equipment from a power specialist. Try a WITTE and profit.



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The WITTE cuts logs into fire wood, cord wood, fence posts, cross ties and shingle butt lengths. It is the best sawing outfit ever built. There is no other saw like it.

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WITTE ENGINE WORKS

1748Oakland Avenue
KANSAS CITY, MO.

Uncle Sam's Forest Fire Fighters

(Continued from page 699)

lons of water on their backs and a dinky hose to fight a raging forest fire sounded ridiculous, but it was learned that fifty men carrying five gallons each can put out a lot of small fires that could quickly develop into big ones. And when one of the high-pressure pumps comes into action, efficiency in quenching the flames is decidedly stepped up. The pack units of water are used in 'mopping up' after the fire has been brought under control."

On duty the year round are 801 rangers and 149 superintendents. In the fire-hazard months of the spring, summer and fall, 2,599 trained fire guards are on duty. In addition, 81,770 boys from 481 CCC camps in national forests are on constant call. Furthermore, forest rangers in any state have a right to call on the common citizen in time of emergency. However, this is seldom done. This major defense line protects 160 national forests comprising 203,082,847 acres. Almost every forest has a superintendent with a trained crew of rangers under him. Every square foot of his park is covered by strategically placed observation towers. If roads and terrain are suitable, headquarters is supplied with water trucks and pumps and the superintendent is in radio communication with the nearest of the fifty-five airports. Each observation tower is equipped with telephone and radio as well as an "Osborne fire finder," an amazingly ingenious device for locating fires. It has on its surface a small replica of the map that always hangs in the superintendent's office. A small blaze located through one of these finders presents a fairly accurate determination of its location, and when two or more different stations report the same fire, which is almost invariably the case, the determination is accurate down to almost the square inch. Furthermore, rangers carry portable radio sets.

The highly efficient radio communication system of over 1,500 stations was almost wholly developed by research engineers of the service who maintain over twenty-five laboratories and workshops. These laboratories have developed and invented the brush-cutter as well as the motor pump dropped by means of a parachute from an airplane. The latter can

pump water 2,000 feet and deliver it at 200 pounds nozzle pressure, but weighs only forty-six pounds.

Another remarkable device, the "fire predictor," has just been put into use. After painstaking data on fires had been compiled during five years of experimentation a mathematical wizard evolved the "predictor." Taking into consideration such factors as location, type of timber, weather forecasts, visibility, time of year and other elements, the highly dangerous zones can be accurately indicated.

When a fire gets out of hand, the weather bureau is called to help. A truck, complete with meteorological and weather-forecasting devices, as well as sending and receiving radio station, goes to the scene. In fighting a widespread conflagration, knowledge of forthcoming thundershowers or changes in wind is important. Such news is radioed to the fire bosses who shift their lines of attack accordingly.

Despite laborious research work, only one chemical has been found that can be used to good effect in fire fighting. It is a form of carbon dioxide, known as a "fire foam." The main difficulty has been to get any chemical to stick on trees—the wind soon dissipates it. However, the introduction of licorice, of all things, has proved successful in making the carbon dioxide adhere. The combined mixture comes out of the nozzle like a white plume and sticks to whatever it hits. The service hopes to further improve its chemical equipment, and experiments involving hand and motor pumps, extinguishers and chemicals, are being conducted.

Mr. Godwin urges precaution on the part of citizens in preventing disastrous fires. Over half of last year's blazes were caused by careless smokers, campers and incendiaries, natives with fancied grudges against the service, or just plain "fire-bugs." The total destroyed area was about one-third of the total area of all the state parks in the United States.

Where is the danger of forest fires the greatest? Mr. Godwin says it is unquestionably the Montana-Idaho area. The region is very wild, in many parts inaccessible, and the dense covering of thickets makes blazes hard to control.



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When building your home receiver or Popular Mechanics radio circuit, be sure to use approved "BLUE RIBBON" Wholesale Radio Service Co., Inc., parts. They are the best obtainable! **Nothing is accepted by our research engineers which does not meet our exacting requirements.** This is your assurance of complete satisfaction when you "Buy Wholesale."

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Weather Made-to-Order for the Movies

(Continued from page 709)

combines the fumes of an acid and ammonia. The fog is conveyed to various parts of the setting by secreted tubes. The volume and density are controlled by the amount of air pressure.

In some outdoor settings where fog effects are needed and the settings are too large to inclose with walls, Redmond has developed a system of "laying" down a smoke wall which prevents the artificial fog from drifting away. The dense smoke wall is made with chemicals and hangs suspended long enough for the scene to be filmed. After the smoke walls are built up the fog is filled inside.

Snowstorms are made by sprinkling unbleached potato chips, corn flakes, or ground chicken feathers, according to the kind of storm needed. The "snow" is placed in drums two feet in diameter and four to sixteen feet in length situated above the setting. The drums which are revolved are made of wire screen, the mesh of which governs the kind of storm produced.

To simulate the early morning vapor which rises out of a meadow, "Dry Ice" is dropped in pans of water secreted about the setting. The vapor photographs very realistically. For snow on the ground, marble dust is used over which is sprayed silicate of soda to get the proper glistening effect. Corn meal ejected from special blowers makes a good sleet storm.

The sun's rays are fabricated by throwing a beam of incandescent light into the setting. Into the beam, ground mica is puffed to make a floating dust effect so the beam will photograph better. The sun's rays from reflected water which dance on the walls in ship scenes or water-front settings are made by throwing a beam of light into a polished pan containing a small amount of water. The jiggle and dance are gained by thumping the pan to agitate the water.

Fires which will burn in a prearranged manner are produced with special tools and chemicals. Fire is projected in shooting flames by what is known as a "fire head" for scenes where the entire setting is not to be destroyed or "spot" fires are required. A mixture of gasoline and oils is placed in a drumlike device into the head

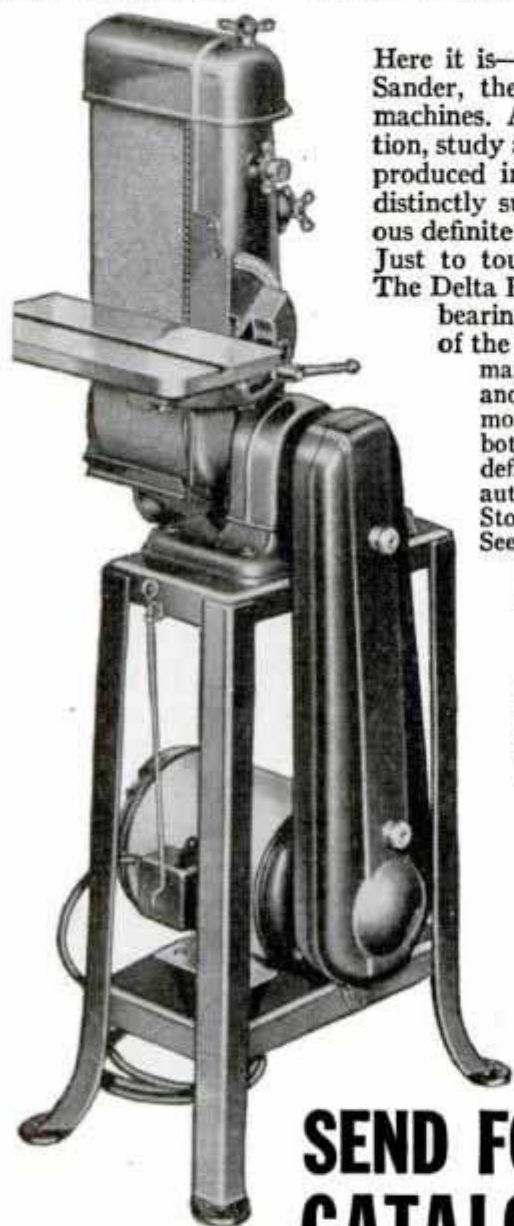
of which is inserted a large hand pump and controls. Leading from the drum is a manifold with a series of jets to which is connected copper tubing to carry the oil mixture to the desired places. The outlets are so placed that the confusion of shooting flames gives the illusion of a roaring fire. The size of the flames is controlled by valves behind the outlet jets. While one operator works the pumps to force the liquid into the pipes, a second controls the size of the fire at various points by manipulating the valves. To prevent a fire from destroying the entire setting, the woodwork is first soaked with water which permits the burning oil to cling to the wood and other parts of the setting although it does not ignite the materials of which the set is constructed. Some studios also fireproof the sets, or paper them with asbestos. By varying the oil mixture the flames can be timed to burn a certain number of minutes.

Explosive fire effects are produced by "shooting" pyro aluminum dust into a gas flame with a bellows or by air pressure. When an actor throws something and a little puff of dust is seen, the effect is gained by a compressed-air line and fuller's earth. When he dives through a flaming window, the flames are so controlled and timed that when he is actually going through the window there are no flames, although the action is so rapid the audience does not notice their absence. A trigger valve controls the duration of the flame so that when the actor jumps the flames can be shut off. However, some of the stunt men wear asbestos suits and actually dive through flames.

In every film the special effects department is called on to produce or fabricate some illusion. Things as simple as the burning of a flashlight require special mechanical and electrical equipment. Ordinary flashlights do not give enough light so a shell of a flashlight is converted into a movie flashlight. A fifty-candlepower automobile headlight globe is used which gets its juice from twenty-four flashlight batteries carried in a vest under the actor's clothing. The batteries are connected to the light by a wire which runs up the actor's coat sleeve.

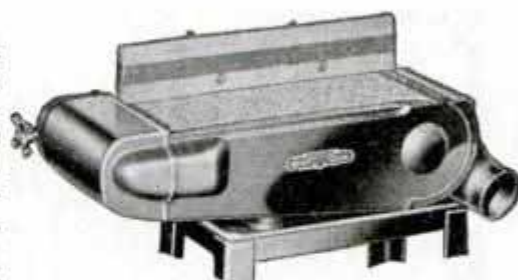
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A New "DELTA" Universal Sanding Machine



Here it is—the long awaited Delta Belt Sander, the very last word in sanding machines. As usual, careful experimentation, study and developmental work have produced in this Delta Quality Tool, a distinctly superior machine with numerous definite advantages and new features. Just to touch a few of the highlights: The Delta Belt Sander is completely ball-

bearing equipped, with all bearings lubricated and double sealed for the life of the bearing. It has a very large diameter driving drum which makes possible maximum power transmission, the sanding of long large pieces without interference, and eliminates need for rubber coverings. It has a 6 inch sanding surface. Is the most properly guarded and safest sander on the market today. Operates in both horizontal and vertical positions. Provided with efficient dust and shaving deflector with arrangement for suction fan. Tilting Table, Automatic Stop that automatically squares tilting table. Auto-Set Miter Gage, Adjustable Back Stop, Adjustable Fence, Lapless Sanding Belts, all available for this machine. See latest Delta Catalog for full details.



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Every man interested in motor driven tools for home or factory should see the new 1937 Delta Catalog. No pains have been spared to make the latest Delta tools the most complete and efficient line of low-cost motor-driven units ever presented.

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It is difficult to describe even briefly the chief features of this revolutionary new drill press. Five Speeds, Double Sealed "lubricated for life" Ball Bearings, Special Inverted Spline Spindle, Special Quill, Large Tilting Table, New Type Foot Power Feed—these are but a few of the scores of features that make this new Delta Drill Press a triumph in tool engineering. Yes—the price is low, unbelievably low for a tool of this size, weight, and quality. Get the complete story in the 1937 Delta Catalog.



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Important Note:

In order to eliminate conflict of trademarks in some countries, the Delta Mfg. Company of Milwaukee, Wis., U.S.A., announces that its complete line of "Delta Quality" tools will be known henceforth as "Tauco Quality Tools" in all countries of the world except the United States and its possessions. At the same time, we wish to state that "Tauco" tools and "Delta" tools will be identical in every respect in quality of materials, accuracy of workmanship design, conveniences, size, weight, and method of construction.

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WHEN you put anti-freeze in your car, you want it to *stay* in. Don't let a clogged radiator rob you! One cleaning with Sani-Flush (it costs a dime!) will last all winter. Sani-Flush removes rust, sediment and lime deposits that clog the delicate veins of a radiator. It's easy to use. It's safe.

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The New Era of Railroading

(Continued from Coloroto Section)

be controlled by shutters at the front of the locomotive, regulated from the cab.

At the end of the 2,260-mile run they park the big streamliner over a greasing pit and give it about the same care you give your automobile after a week-end trip. They vacuum and scrub the cars inside and out, man the grease guns and fill the oil and water tanks. The Diesel itself they leave pretty much alone. It's good for a few hundred thousand miles with scarcely a look. And that is why the Diesel-electric is stealing the show from the steam locomotive, which can travel just as fast. It takes no less than four steam engines—a change every 500 miles—to pull a passenger train from Chicago to the coast, with many another stop for coal, or fuel oil, or water. Half-hour stops for servicing are common. The Diesel spurns relief, stops no longer than ten minutes to refuel, keeps ordinary stops within a minute's span. The "City of Denver" pauses just forty-five seconds at Boone, Ia., for change of crew. It is this saving in operating delays, and its endurance at high speed, that enables the Diesel to clip twenty-two hours from the transcontinental time of the steam trains.

Too, the Diesel economizes in fuel and water, as well as in maintenance cost. It burns a relatively inexpensive fuel oil. It needs no boiler water, thus eliminating a cost item for such railroads as the Santa Fe, which must haul water in tank cars as far as 100 miles in dry regions of the southwest.

But the Diesel-electric locomotive still costs approximately two and one-half times as much as a steam engine, and its life span is unknown. No steam locomotive has been put to the test these Diesels are meeting. A decade may prove the old iron horse supreme, after all. Meanwhile the glittering streamliner of the new era has brought speed and glamour—and passengers—back to the railroads.

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

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS



AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, quicker starting, greater speed and smoother running.

Automatic -- Nothing Like It!

The self-starter — four wheel brakes — knee action — streamlining . . . and now VACU-MATIC! The sensational money saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

VACU-MATIC is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you —so practical it will save you many dollars on gas costs.

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 "On my V-8 Ford it works miracles. Its added power, acceleration and top speed has sold me. The results are unbelievable."—Ralph Fields, Mass.
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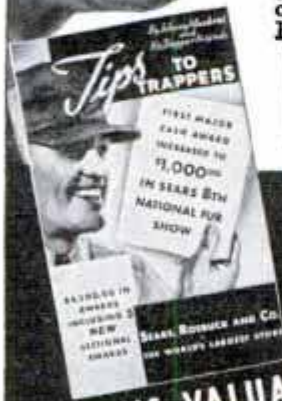
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Apply Plastic Wood to the uneven leg, set the piece of furniture on the floor, press down on it until it feels even, take off excess Plastic Wood around edges, let dry, then sandpaper smooth.

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Genuine Plastic Wood makes household repairs so easy and simple—use it to fix broken furniture, cracks in shelving, cracks in baseboards; holes around pipes, reset loose bathroom fixtures, loose handles, leaky window frames, boat repairs, cover counter-sunk screws; under paint, modeling decoys, fish lures, resetting loose tiles, etc.

EASY TO USE

Genuine Plastic Wood is real wood in soft putty form—when dry it is hard wood that can be carved, sawed, turned on lathe; will hold nails and screws without cracking, splitting or crumbling. Genuine Plastic Wood is waterproof and weatherproof—adheres to any clean, dry surface—comes in nine colors including white—takes paint varnish and lacquer perfectly.

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THE MODEL RAILROADER

Box 196-M

Wauwatosa, Wis.



Amplifier for Sound Effects

(Continued from page 739)

contact Amphenol tube sockets are used without metal adapter plates, being held in position by means of their retainer springs under the base instead of screws.

All four of the Jefferson transformers are fully shielded and provided with color-coded leads which are brought out

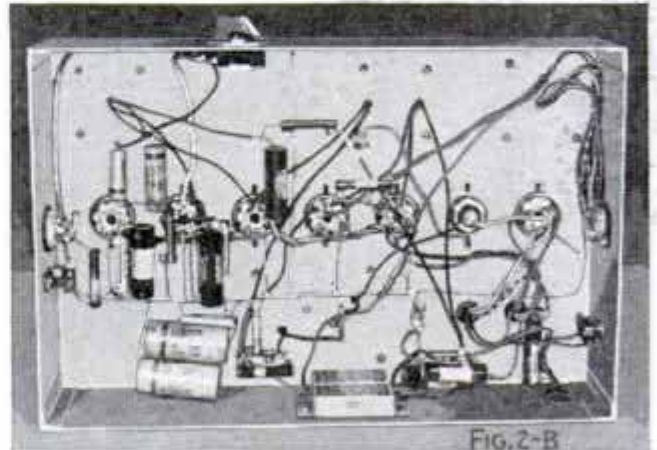


Fig. 2-B

through holes drilled in the metal base for sub-panel wiring. A drilling template for this chassis base is shown in Fig. 3, indicating the correct location and size of all mounting and lead holes, with the exception of a $\frac{3}{8}$ in. hole for mounting the potentiometer R_5 . It should be located at front, midway between the input and driver transformers. This metal base is available in a black crackle finish with all socket mounting holes cut, for those who do not wish to make their own; also an optional perforated metal cover for protecting the parts. The base lists for \$2.00 and the cover \$3.00 subject to the usual 35 to 40% discount offered to experimenters. An original list of all parts used can be obtained upon application to Popular Mechanics radio department, without charge. The blueprint number is R-230.

Photos 2-A and 2-B show the simple arrangement of all parts. Looking at the top-view photo 2-A, the transformers and chokes are located as follows: front, left to right, input, driver and output transformers; rear, left to right, choke No. 2, choke No. 1 and power transformer. Twist all heater leads and solder each tube socket connection carefully. Note that the electrolytic condenser C_6 is insulated from the base, the negative side being grounded through resistor R_3 . Fiber terminal strips

(Continued to page 136A)

BIG MONEY ASSEMBLING AT HOME

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— from Mead's, complete "cut-to-fit" kits at amazing low cost. **Ki-yaks:** 3 sizes for paddling or sailing. Also outboard model. Fast, seaworthy. Lift with one hand or take anywhere on auto. (Complete sail rig a few dollars extra.)

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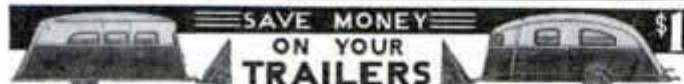
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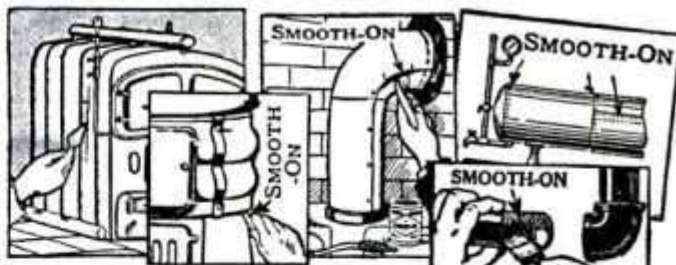


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"The Jigmaker" cuts wood up to 2" thick

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THIS cement hardens into metallic iron, costs little, is easy to apply and makes dependable permanent and emergency repairs that save the householder big sums.

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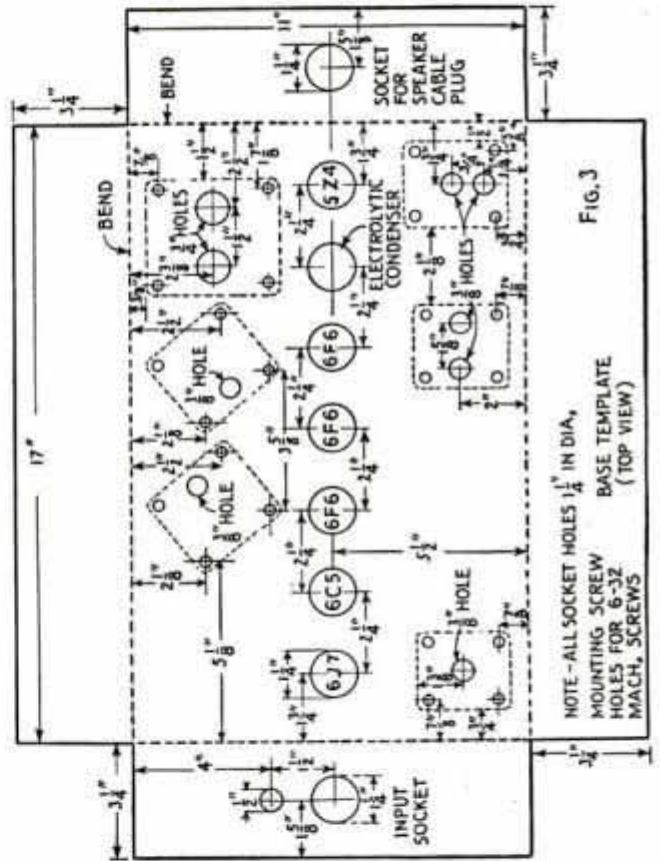
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(Continued from page 134A)

are used for convenience in wiring and help to support some of the fixed resistors and condensers.

Common ground connections are made to the heavy lead shown in Fig. 2; this consists of No. 12 bare tinned-copper bus-bar wire, the actual ground point being at the soldering lug on the mounting screw of choke No. 1. Ordinary wafer-type sockets are used for the speaker-cable plug and input sockets. The open-circuit input jack has a grounded mounting and was added for convenience when plugging in a crystal microphone. Your phonograph pick-up leads should be connected to a standard plug at the prongs indicated for input channel No. 2. Shield-



ed leads must be used where indicated, to prevent hum pick-up. The speaker, or speakers, may be any good self-powered dynamic type; a Wright-DeCoster unit was used in our laboratory tests. Note that the speaker socket provides a wide choice of voice-coil connections, one connection being made at common black and the other to the resistance value specified for your speaker. A separate 500-ohm outlet is provided for those who wish to use the unit as a speech amplifier for an amateur radiophone.

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Amazing money maker for farms, truck gardens, orchards, nurseries, poultry ranches, country homes, etc. Plows, discs, harrows, cultivates, mows lawns, cuts weeds. Runs belt machinery. 2 to 5 H.P. riding or walking types. Write for **FREE CATALOG, Low Factory Prices and 10 day Trial Plan.** Address *Nearest Office.*

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Learning to Fly the Clippers

(Continued from page 663)

per. The preliminary air-mail clipper service across the Pacific has been utilized primarily for the training of personnel. Six clipper ship crews already have been prepared for their difficult duties, and four of these crews will be assigned permanently to service in the Pacific division. To date, they have safely covered more than 200,000 miles without a mishap.

The flying personnel are not the only men trained especially for duties connected with the running of an ocean air line. There are scores of men in the ground crews—meteorologists, radio operators, operations men and inspectors. More and more, the air-transport business is becoming a complex organization whose activities call for the best men and the highest possible skill. Stations in such remote spots as Midway, Wake, and Guam are wholly or partly dependent upon supplies from the outside. But soon the land surrounding these newly established bases will be yielding fruits and vegetables the year round. Hundreds of tons of rich soil have been carried to the islands.

The success of this first ocean air line is largely due to the intensive training and rehearsal of the men in their assigned duties. After Captain Edwin Musick had made two round trips across the Pacific, he turned his command over to Captain Sullivan who had served under him as first officer. The other officers were also rotated from trip to trip, until six full crews had been trained for manning the twenty-five-ton Martin clippers. These men have amazed the world by the precision and near-perfection of their performance across the globe's widest ocean. When new lines shoot across the Atlantic, you will find these graduates of the ocean-flying school manning the new clippers.

Long before the twenty-five-ton Martins had begun to fly across the Pacific, the officers had been rehearsed and drilled for their respective duties. This is illustrated by a remark which First Officer Sullivan made to Captain Musick on their first actual crossing.

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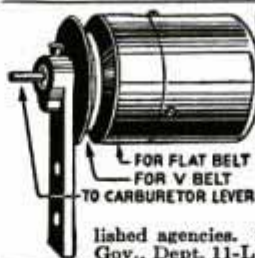


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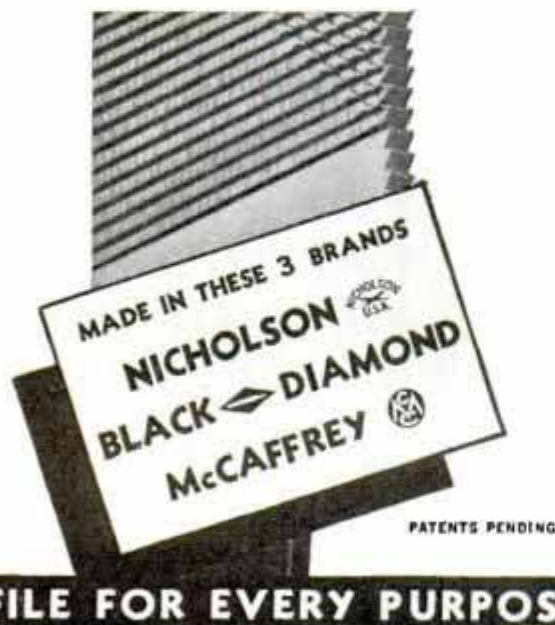


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A FILE FOR EVERY PURPOSE

1961 With the Sea-Going Engineers

(Continued from page 692)

The engine room telegraph is a two-way instrument. After an engineer has carried out a command, he pulls the handle of the telegraph around to match the position of the needle that points to the order. In turn, this swings the needle of the instrument on the bridge as a report that the command has been obeyed. In addition, a private telephone system connects the bridge and engine room.

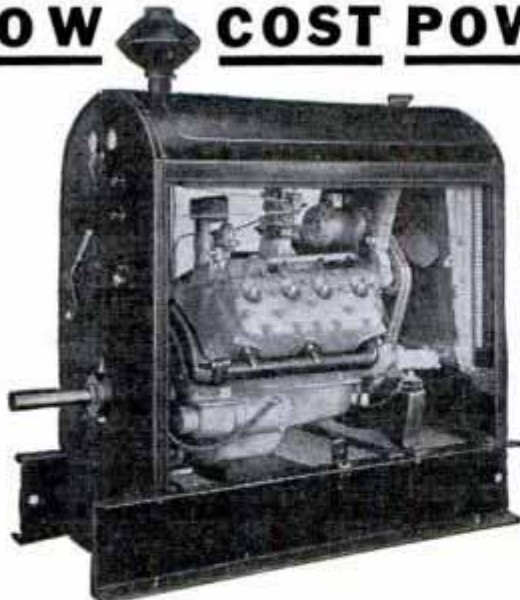
Aside from constant inspections to make sure that the engines are functioning perfectly, the engineers have an emergency system of red lights on their main instrument panels. If anything goes wrong with the water, steam, lubrication, or vacuum, the proper red light flashes. Lubricating oil flowing through each bearing spins a little metal flag projecting from the cap and as long as the flags spin attendants know the bearings are receiving oil.

When you enter one of the fire rooms of the "Monterey," you pass through an "air lock" that cuts you off from the rest of the world. The air in the fire rooms is kept under compression like the air in a deep-sea diver's suit to increase the draft in the furnaces. To enter the hermetically sealed compartment, you unlock a door leading to a small air chamber, lock it behind you, then open another door that leads into the fire room. That way, no air escapes. With both doors of an air lock open, you would hardly be able to stand against the gale of air escaping from the fire room. Each of the two huge fire rooms of the ship contains six boilers, with an air lock also separating the two rooms so the engineer in charge of one can raise or lower his atmospheric pressure without affecting the draft in the other compartment.

If the air pressure should fall off combustion would be incomplete and the ship would start to lay a dense smoke screen across the sea. The engineer in charge of each fire room can tell the efficiency of each boiler without leaving his post. Each boiler has a periscope that projects light through the gas passes of the boiler and to the instrument panel. A clear patch of light in a periscope shows the boiler fire is burning properly, while if a fire is smoking the smoke is visible in the peri-

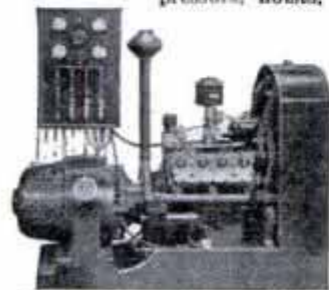
(Continued to page 142A)

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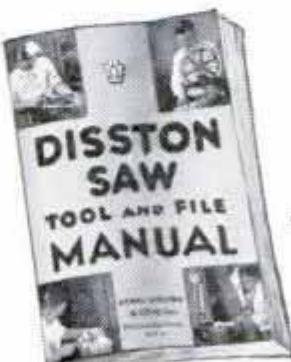
De Luxe Cross-Cut—Rip—Combination			
6" (1/8" hole) . . .	\$2.40	8" (1/2", 5/8", 3/4" hole) . . .	\$3.20
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Keystone Hollow Ground Combination			
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(Continued from page 140A)

scope. In spite of the furnaces the fire rooms are usually comfortable because "mechanical lungs" are constantly breathing in quantities of fresh air to maintain the forced draft.

These days ships are equipped with brakes but the brakes aren't used to stop the ship. Attached to the propeller shafts, they are called friction clamps and are tightened around a shaft to keep it from turning when an engine is stopped for adjustment or repair. Otherwise the drive of water past the blades of the idle propeller might cause it to spin, in turn revolving the engine.

An engine room crew can make almost any kind of repair at sea without calling for outside aid. One of the worst things that can happen is the stripping of blades of a turbine. When this happens the engine is stopped and taken apart, the stripped blades cleared away, and the engine re-started. Not as efficient as before, the turbine is still able to perform part of its work. Burned-out bearings can be replaced with hardly any delay. About the only breakdowns that would put one engine out of the running are a broken tail shaft or the loss of a propeller.

Not only are the engineers in charge of the power plant, but they are responsible for the maintenance of nearly all the mechanical gear on the ship. The large refrigerating plant, the intricate electrically operated bridge controls, fire extinguishing equipment, and the lighting and ventilating systems, the elevators and telephone systems, are under their control. There are large electrical and machine shops where repair work is done at sea.

A comparative handful of trained men keeps the engines of the "Monterey" running. There are forty-eight men below decks, divided into three watches of sixteen each, which in turn spend four hours on duty and eight off. These include firemen, oilers, wipers, electricians, machinists, and other specialized trades.

"Men on board ship perform just about the same duties they would in the same trade ashore," Chief Engineer Keene says. "There is not much difference between operating the engines that drive a ship and running a stationary steam plant in a city powerhouse, except that at sea break-

(Continued to page 144A)

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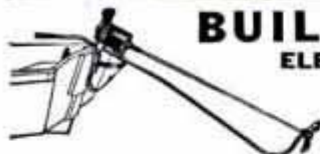


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\$3³⁵

A GENUINE DELTA

(LESS BATTERY)

(Continued from page 142A)

downs must be guarded against more carefully.

"A sea-going electrician throws switches, runs a motion-picture projector, or repairs an electric stove in the galley just as he would on shore. There is not much novelty between a water pump or steam line just because it happens to be on a ship. The hardest work of the engineers is done in port. When we are under way we simply operate the engines and keep them in good condition. After we dock we have a chance to tear down a condenser or make light overhauls that might have interfered with the ship's schedule at sea."

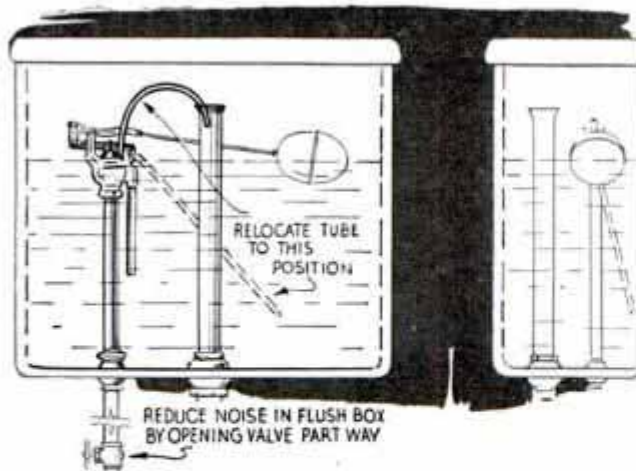
Like the captain, a chief engineer stands no regular watch. That means he is always on call and often gets less sleep than his assistant officers. In foggy weather and during any maneuvering he is always on the operating platform, overseeing the work of his engineers as they "answer bells" from the bridge.

On small ships the bane of the engineers is the heavy storms that pitch the propellers clear of the water. In such storms an engineer must gauge the lift of the ship and spin the throttle down every time the stern lifts, to check the engines and prevent the propellers from racing. Otherwise the vibration is apt to damage the engines and propellers. Such storms hardly affect the large passenger liners and in case such a ship should pitch its propellers clear, automatic governors keep the engine speeds down.

Just as in getting up steam, stopping a ship's engines is a long job. This time the purpose is to cool off the power plant slowly and evenly. In the home port, when the telegraph pointers down below move across the dials to "Finished with the engines," the engineers kill the fires under all but two boilers. These are needed to furnish steam for moving cargo and to keep the auxiliary power plants running. Then the main steam lines to the engines are closed and the last wisps of steam are drawn out of the turbines.

But the engines are kept turning, this time by means of small electric jacking motors geared to the shafts. For another hour, also, pumps are kept going to circulate lubricating oil through all the bearings. Finally, the engines cool down and the pumps and motors are stopped.

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The Latest for the Hunter

(Continued from page 734)

blind when a bone chilling north wind is blowing, and for other sportsmen who must face the elements, this heat pack often is a life saver. The pack is a square. It has a cover which buttons. When you want heat, you add about two tablespoonfuls of water, shake the contents of the bag until it gets warm and then slip it inside the container. It will generate heat for many hours. On very cold days, put one of these packs in the front of your hunting coat to warm your hands between shots.

The real test of the hunter's outside clothing is a snow or rainstorm on a cold day. It's fairly easy to assemble enough woolen underclothes, wool trousers, shirts, sweaters, and jackets for warmth on a dry day. But let it rain on a chilly autumn day and the hunter must turn to a different outfit. In a rain or snowstorm, the neck and back of the head are the first places to get wet and chilled.

To outwit the elements some rely on two equipment items. First, there is the parka-style rain shirt with a hood over the head. The second garment is the waterproof hunting coat that has in the collar a small compartment containing a waterproof hood. On a fair day the hood is tucked into place on the collar where a zipper arrangement keeps it out of the way. The parka rain shirt is a one-piece garment that slips over the head. It is made of heavy waterproof material, buttons around the wrists and has a hood to cover the head, thus keeping the rain from running down your neck.

Keeping shells, lunch and matches dry is a problem for the marsh or waterfowl hunter who parks in a blind for hours at a time where the wind and driving rain have full play. There is available a metal, waterproof shell box, oblong in shape, which costs about as much as three boxes of shells. Besides shells, this box will accommodate a small bottle of drinking water, extra matches, wooden duck caller, smoking necessities, an apple or orange, a bar of chocolate, and one or two film packs for the camera. Last but not least, the handle is recessed so you can use the box for a seat in a blind without "furniture."

One of the most practical things for the

waterfowl hunter is just a piece of heavy cord. Tie it to your duck, goose or crow call and drape it around your neck or you're going to be hunting for it continually and it will never be ready when you want it.

It's amazing how many pheasant and waterfowl hunters apparently have everything they need for comfort and then are in a dilemma as soon as a couple of birds are shot in the field. The reason is that they have no way to carry birds. Of course, most hunting coats contain big pockets for carrying game. These are very serviceable but many dislike the drag on the shoulders that results from putting birds in the coat pockets, so they use a game carrier. This puts the weight of the birds around the waist because it can be worn like a belt. This carrier has small loops into which you slip the heads of game birds,

For ducks there is an inexpensive rawhide carrier with five thongs on each end and slits to loop over the heads of birds. If you have ever tried to walk any distance carrying game birds you know how heavy they get after the first 200 yards. By using one of these carriers you can balance the birds on your shoulder easily. And it practically never wears out.

Last but not least, one of the handiest things for the upland game or marsh hunter is just a large belt or pocketknife. Often on marsh hunting trips you must either repair or build a blind. Without a big knife the job is not easy because you cannot gather many bundles of tall grass, weeds or willow branches without a knife or small belt axe. And with the knife or small belt axe, take a waterproof matchbox that will float in water, and a compass. No deer hunter should be into the woods without these. That waterproof matchbox is protection against the possibility of going without a fire some day when things do not go right. With a knife or small axe and matches one can face many an emergency in the woods.

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The Spin Shots of Table Tennis

(Continued from page 671)

return in that direction. After a little experimentation you will be able to handle these tricky serves with little trouble.

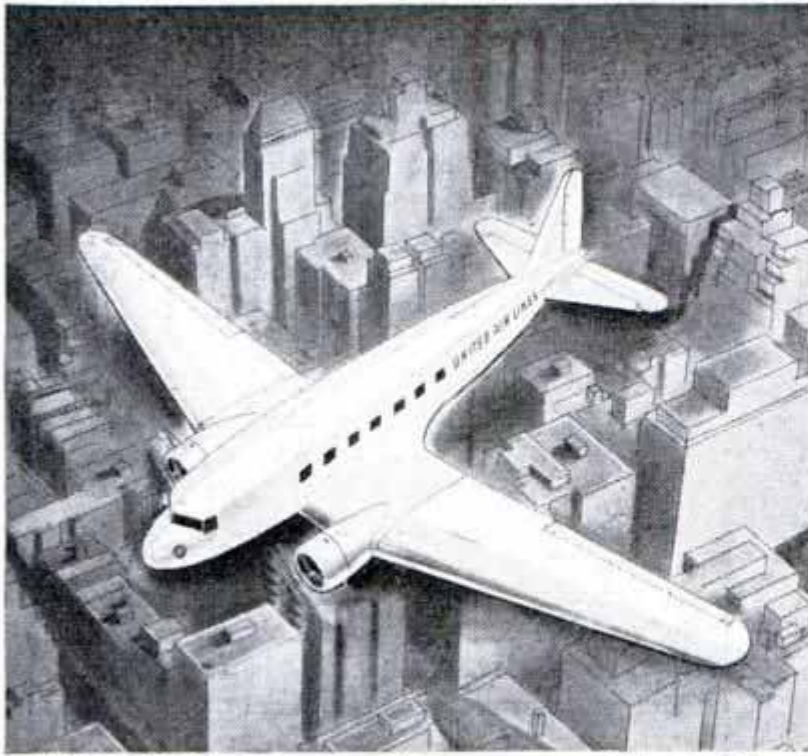
Sidespin serves are a valuable asset to your game because even though you don't score aces outright you have a good idea where the receiver will return them. If you know approximately where the ball is coming, you can get set to smash it for a sure winner.

Another effective serve is the chop. You do just that. The stroke starts shoulder high. Then you strike down and forward very quickly, keeping the top edge of the racket tilted backward during the entire stroke. This serve if properly executed will generate a lot of underspin on the ball and your opponent will be almost certain to stroke it low, into the net. Be sure to hit the ball crisply, using generous wrist action. Don't peck at the ball, and make sure to follow through. If the other fellow pulls this serve on you—and you should be able to mark its coming by watching him closely as he serves—simply aim the ball farther above the net than usual and keep the blade of the racket slanted backward.

Although finger-spin and knuckle-ball serves have been outlawed by the United States Table Tennis Association, they are still held legal in twenty-three other nations affiliated with the International Table Tennis Federation. While they may not be used in this country in official play, you can have fun experimenting with them and using them in informal contests. Practice will enable you to develop all sorts of weird varieties of these devilish deliveries—serves that will drive many rivals to distraction.

The easiest finger spins are the knuckle-ball types. Place the ball between the thumb and fingers of the right hand like a marble. The ball should rest on the side of the third finger and is held by the thumb and first finger. Now shoot the ball like a marble with the thumb doing the propelling onto the face of the racket, which is in the left hand. For variety change the position of the hand and the angle of the racket. For different spins the ball may be ejected by the thumb of

(Continued to page 150A)



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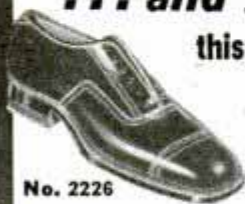
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(Continued from page 148A)

the left hand onto the racket, clasped in the right.

Still another variation involves holding the ball between the pad of the thumb and the nail of the middle finger, which in this case ejects the ball. Or hold the ball between the pads of the thumb and third finger. Now snap these fingers and this will shoot the ball spinning into the air. As it comes down, bat it with the racket and the rapid spin on the ball will give the receiver something to worry about.

But there are other tricky spin shots besides serves that can be used to advantage during an actual contest. Here is a real fooler, a shot that can be employed when you are on the receiving end of a serve. Some call it "Old Faithful" because the ball shoots high and abruptly into the air and reminds them of that spout of water in Yellowstone park.

It is easier to execute this shot successfully when the serve is delivered to your right or forehand side. Hold the racket pointing forward and tilted slightly backward. As the ball is served toward you, advance the arm forward and contact the ball with an upward lift on the half-volley or directly after it has touched the table. You sort of scoop the ball. The upward movement will cause the ball to soar high in the air, and the forward impetus of the stroke will impart excessive underspin. Try to so strike the ball that it will land just over the net on your opponent's half of the table. If you can do this the underspin should be strong enough to make the ball jump back to your side of the net without the receiver being able to even touch it with his racket. This will score a point for you even though your adversary finds it impossible to reach the ball. This return of service comes as a sensational surprise. It is not an easy shot to learn but if mastered it will give you no end of satisfaction. Of all the trick shots in table tennis, this shot probably is the most unusual and sensational.

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The Modern Fire Walkers

(Continued from page 642)

in comfort until the metal cools off. Or they dress you in a light suit of asbestos overalls, and hold a roaring blowtorch to your chest.

But this conquest of fire was far from easy, as you learn for yourself by talking with C. E. Bridgman, one of the young men accustomed to loafing inside glowing furnaces and sitting in blazing planes.

"We began experiments in 1933 to produce asbestos helmets, gloves and suits for fire brigades," he explains. "The first experiments indicated a new asbestos yarn was required, for when subjected to fire, gloves and helmets fell off the wearer in pieces. After this problem was solved, the helmet withstood fire, but there still were two serious defects and it is fortunate a dummy was used for this test, instead of a man. The dummy was seated in a large packing case, with wood wool soaked in gasoline heaped about it. We watched the flames envelop the dummy, and then a heavy piece of wood fell on the helmet that might have proved fatal if a man had been inside. Our next helmet had a crash-proof crown and a nice visor, but when I used it, my nose was burned. So we altered the shape, and made noses quite safe by using two pieces of mica with an air space between them.

"Before taking any serious risks in the open with a burning plane, we experimented with a furnace built at one end of a brick tunnel. I tried first to enter the tunnel without an asbestos suit, but the heat was unbearable. With the suit on, I was able to enter the tunnel in comfort and approach the furnace at the other end. It was warm inside the furnace, of course, but not uncomfortably so at first. I stood in the fire for two minutes before having to clear out, and under such circumstances this is a long time.

"After coming out of the fire there is a strong temptation to tear off the asbestos suit, but this would mean such a startling change of temperature as to be a shock to the human system. One has to 'cool off' for about twenty minutes before the suit can be removed with safety."

These asbestos suits are intended to be a part of the fire-fighting equipment at all

(Continued to page 154A)

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The Ideal Gift!



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Jim Dandy CABIN CRUISER

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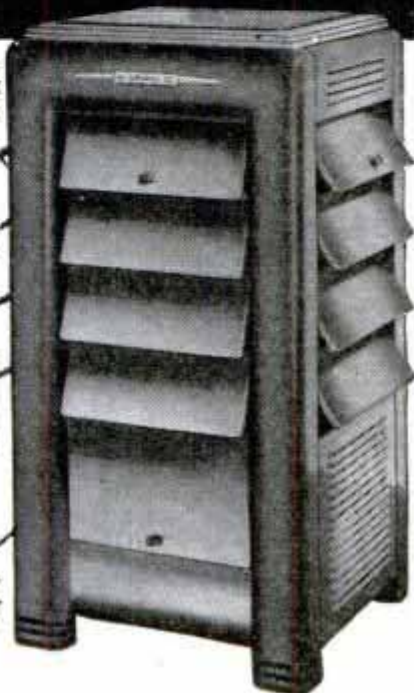
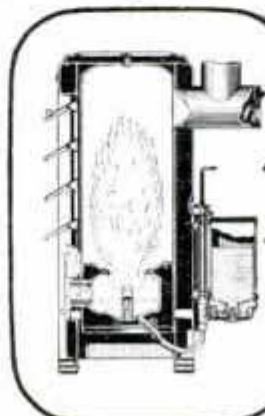
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A GENUINE Purolator will conserve the new supply...and keep it effective. It removes the dirt and grit and hard carbon that settle in the crankcase...get in the oil, and grind away at cylinder walls, bearings and valves. A GENUINE Purolator keeps the oil so clean it will even retain its color after thousands of miles of driving.

Don't neglect this important economy. Service garages everywhere will attend to it while you wait. Motor Improvements, Inc., Newark, New Jersey, makers of

PUROLATOR

The Oil Filter on Your Motor Car
LICENSED UNDER SWEETLAND PATENTS

(Continued from page 152A)

British airdromes. Asbestos experts also have developed a cockpit insulated against fire. A man wearing a heavy suit of asbestos was able to sit in an insulated cockpit, with the whole machine in flames around him, for five minutes.

The experiments at Slough have been watched by architects, shipbuilders, and chemical and paint manufacturers. Houses of the future may have ceilings lined with asbestos instead of laths and plaster. A fierce fire beneath a lath and plaster ceiling broke through in seven minutes, but the same fire failed to penetrate a ceiling lined with asbestos. Also it is quite possible to insulate a ship's engine room so a fire there cannot get beyond its walls. Big buildings such as schools and hospitals could be made safer by asbestos curtains fitted at the end of each corridor. The curtain is rolled up in a metal container, and is automatically released by the heat.

71061

The Gasoline Dope Racket

(Continued from page 646)

knock properties of these materials are well known and the ones with any actual value are already patented and available in the regular gasolines of responsible oil companies. One service-station operator in California ran his fuel business up to 3,000 gallons per day with a proposition that seemed sure-fire. He explained his gasoline gave better mileage because it contained a secret compound smuggled to him from Germany. He urged every customer to check the mileage from five gallons of ordinary gasoline, then have any remaining fuel drained from his carburetor, and fill up with five gallons of his special gas. Invariably the customer found he really did get two or three more miles per gallon with the treated brand. The secret of this performance was that when the service-station operator put in five gallons of his own fuel for a test run he always threw in a half gallon or more extra gasoline. This was hardly enough to register on the average gasoline gauge and yet was enough materially to increase the distance five gallons of fuel would go.

An even greater hoax was the tablets that seemed to change water into gasoline. In this case the "slicker" would drive into

(Continued to page 162A)

NEW-TYPE BATTERY GUARANTEED AS LONG AS YOU OWN YOUR CAR



BATTERY MAN: "This new battery whips over your motor in a flash, cuts your recharging costs, gives *super-power* for electrical extras."



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And because the life of a battery depends on the life of the plates, this new Electro-Pak Battery is built with the remarkable *patented* Kathanode construction — famous for its use on airplanes, submarines and railroads—consisting of flexible, porous, spun glass retainer mats specially designed to prevent the loss of the real power-producing materials in the

plates. Thus the plates last much longer.

And another big reason why this new Goodrich Kathanode Electro-Pak will save you money and trouble is its exclusive Power-Saving Top Cover. Dirt, corrosion and acid film which collect on top

of ordinary, unprotected batteries are shut out of the new Electro-Pak. You get all the power you pay for in this battery—for quick starts, bright lights and for operating all your other power-eating equipment at top efficiency.

Save money, time and trouble this winter. Ask your Goodrich Tire dealer to show you the new Goodrich Kathanode Electro-Pak—the battery that is guaranteed as long as you own your car. Remember, there's a Goodrich Battery for every car and pocketbook.

*Made under the Kathanode Patent.

**Only Goodrich Electro-Paks
Have this Power-Saving Top Cover**



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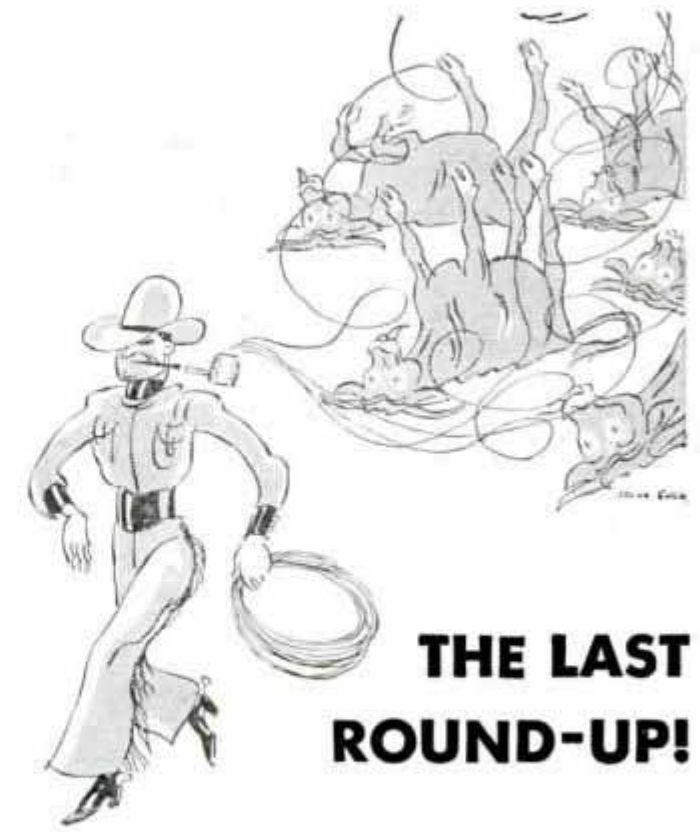
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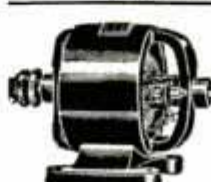
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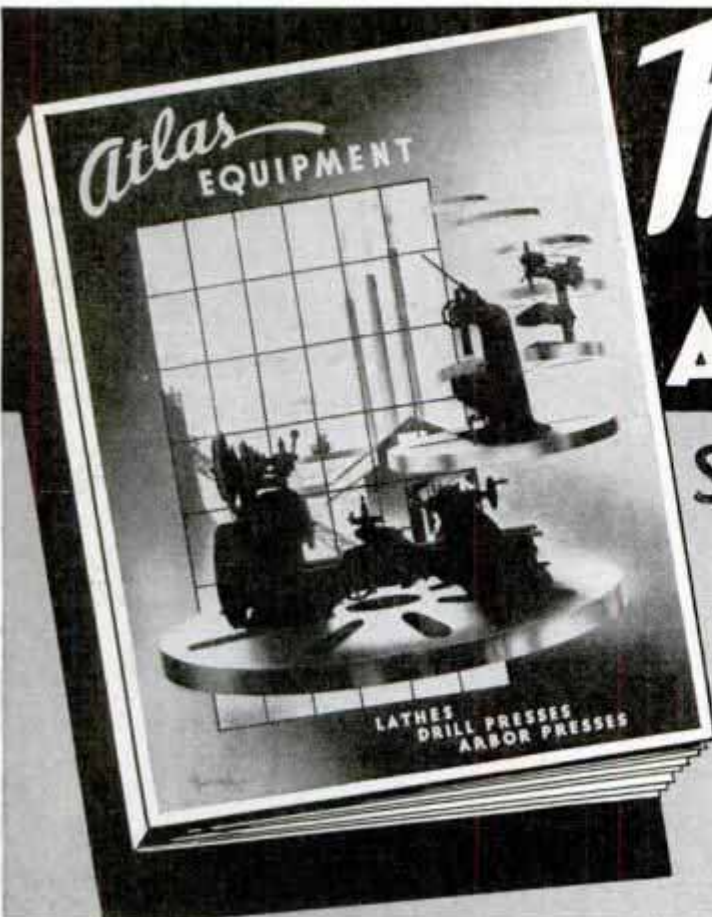
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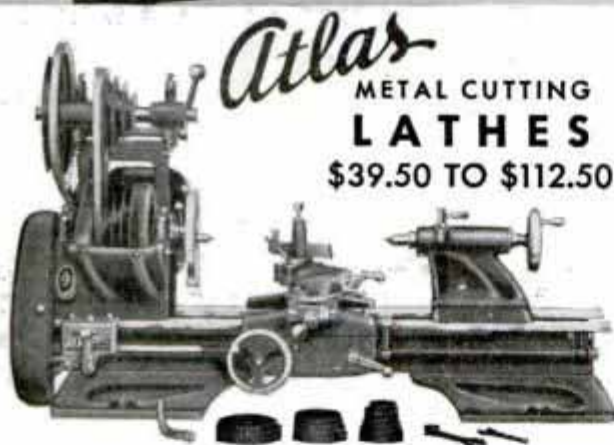
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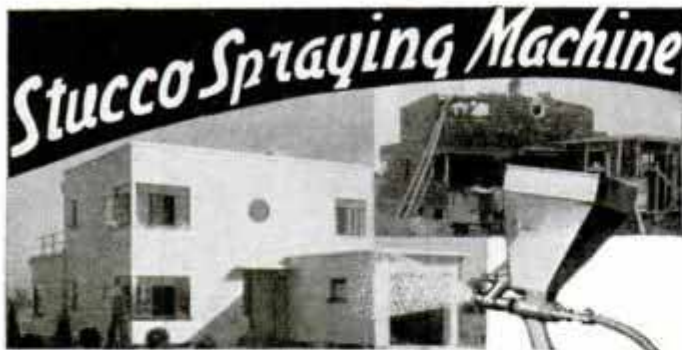
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(Continued from page 154A)

a service station and calmly fill his fuel tank with water from a hose. Then, to the amazement of the attendant, he would drop a couple of pills into the tank and drive off, his engine running as well as ever. Naturally, after this happened a few times, the attendant would give almost anything for some of the pellets. The motorist would explain that ordinarily he didn't sell any pills but finally would part with several packages he had in the car, getting \$15 or \$20 for enough to "convert 500 gallons of water." That was the last the service-station man ever saw of his money or the motorist. The answer, of course, was that the motorist had a hidden fuel tank and the rear tank into which he poured the water was just a dummy.

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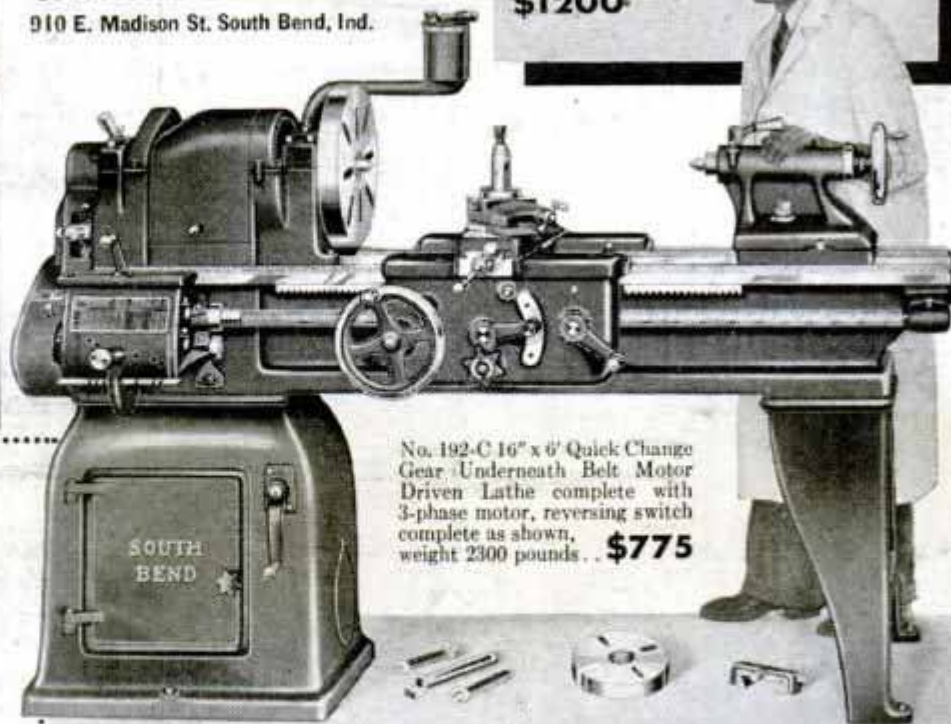
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No. 192-C 16" x 6" Quick Change Gear Underneath Belt Motor Driven Lathe complete with 3-phase motor, reversing switch complete as shown, weight 2300 pounds. **\$775**

SOUTH BEND Precision LATHES

CUT COSTS. AS THOUSANDS ARE DOING WITH THIS OIL



Save on Oil and
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START NOW to save with Mobiloil. It cuts oil costs—reduces repair bills.

This is because Mobiloil is clean, pure, tough—made by Socony-Vacuum's famous Clearosol Process.

Motorists everywhere are proving the economy of Mobiloil. They report savings

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SOCONY-VACUUM OIL COMPANY, INC.



See the 1936 Mobiloil chart
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A Tribute to Football

by Grantland Rice

Blocking backs and interference -
Fifty thousand wild adherents -
Tackle thrusts and headlong clashes,
Two yard bucks and dizzy dashes,
Head and shoulder, heart and soul,
Till you fall across the goal.



And another all-star eleven -

**THEY
SATISFY**