

JUNE

Radio Set for Tourists

N.S.E.
25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK GREAT BRITAIN No. 418428

REG. U.S. PAT. OFF.



SEE PAGE 896

Can I Guarantee You a Job?

\$3,000
to
\$10,000
a year in
this easy
work

*I'll make You an Expert
Mechanic in 8 Weeks*

**I Will Pay Your Railroad
Fare—Board You—Give
You a Kit of Tools FREE!**



I mean just that! In 8 weeks you can become an expert mechanic. I will train you so that you can become a foreman in any shop, or own a big-paying business of your own. I will equip you so that you should easily make from \$3,000 to \$10,000 a year, regardless of what you are now doing.

George Smith, Ohio, was working on a farm for \$50 a month. He came to my school and took my course of training. Now he is making \$800 a month from his garage and sales agency. A. J. Beall, West Virginia, is another McSweeney-trained man who has made good. Last year he cleared \$85,000 from his garage and Chevrolet agency.

Millions of Dollars Waiting

And I tell you that you have the same chance to get into this big money after you have finished my specialized course. There are seventeen million automobiles and thousands upon thousands of tractors in use today. Millions are added each year. All of these machines are going to need repairs. There is a big demand for men to do this work. And the man who knows how is going to make big money, steady money.

Personal Training

I want to make one point clear. When you come to my school you are going to receive personal training. I work right with my instructors and students. I'm "Mac" to everyone. I'll help you. I'll see that you get the finest training in the world. I'll equip you so that you can go out and say, "I am a McSweeney-trained man," and step into a position that will pay you from \$40 to \$100 a week.

Free Railroad Fare— Free Board

I operate three schools—Cincinnati, Cleveland, and Chicago. I will pay your railroad fare to the school nearest your home. I will board you free for eight weeks. I will give you a special tuition rate.

And, if you will act at once, I will give you a valuable kit of tools free when you graduate, so that without delay, without a penny of extra expense, you can go right out and begin to earn big money.

Get the Facts

Never before have you had an opportunity like this. Take advantage of it before it is too late. Don't keep plugging away at a poorly paid job. Don't waste your best years working for some one else. Send for my big free book that tells you how to become an expert mechanic in 8 weeks. Write in immediately for special Tuition offer. Just sign and mail the coupon and I will prove to your own satisfaction that you can make from \$150 to \$500 a month in this easy work.



Geo. Smith owns an auto and repair shop at West Alexandria, Ohio. He makes \$20 week.



Emmanuel Rushfeldt, Alberta, says: "Earning \$10 a day and only 20 years old."



Louis Beimer at 24 was made foreman over men many years older. That's not luck—it's McSweeney training.

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for
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BOOK!**

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Chicago, Ill.

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Cincinnati—Chicago—Cleveland
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big performance
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Radiola III

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is Meeting the
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It has made America the radio center of the world, through the high-power radiotelegraph circuits that link our country, by direct radio communication, with seven countries of Europe, with Asia and with South America.

It has developed radio ship sets, and a ship-to-shore radio service that makes the high seas safer, and aids all marine commerce.

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With its associates, the Radio Corporation of America maintains ten powerful broadcasting stations, whose programs serve the whole nation: WJZ, WJY, WGY, WBZ, WRC, KDKA, KOA, KFKX, KGO, KYW — from New York to California!

By its extensive research in the development of Radiotrons, the standard vacuum tubes of radio, it has made contributions of inestimable value to radio progress.

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California

This One



RUD4-UJJ-1NSR

60 MILES ON A GALLON OF GASOLINE

TESTS SHOW FORD CAN RUN 60 MILES ON A GALLON

The amazing fact that a Ford can run 60 miles on 1 gallon of gasoline was recently brought to light through tests conducted by America's foremost engineers, where it was shown that a gallon of gasoline contains sufficient heat units which if properly atomized and mixed with air would give this additional mileage. Great strides have already been made in this direction by the recent invention of a simple attachment which can be installed in a few minutes without any alterations to the motor. It is common for Ford Owners to make from 40 to 44 miles per gallon after this marvelous device is attached.

MOST WONDERFUL INVENTION TODAY BRINGS JOY TO FORD OWNERS

Starts Ford Instantly

Starting a Ford Car in cold or zero weather is something every Ford Owner dreads—everybody realizes that difficult starting is an abuse on the starter and battery. Thousands of Ford Cars are "laid up" during the Winter just for these reasons. This great difficulty has been overcome. The SUPER positively starts a Ford Car instantly in the coldest weather.

Marvelous Device

The SUPER is no trick affair—requires no mechanical adjustments and contains all the scientific principles of carburetors costing \$20 to \$35 and in its natural action uses up every particle of unused gasoline and breaks it up into a perfect vapor. The hitherto impossible is now realized by the SUPER.

Everybody Satisfied

Saves 3 to 7 Dollars (Per Month)

The best investment I ever made. The SUPER is saving me from three to seven dollars each month, besides putting new life into my motor.

A. H. WORRA, Iowa.

Makes 44 Miles Per Gallon

I have tried the SUPER and the results of the experiment are satisfactory. One quart of gasoline run my Ford 11 miles over improved roads which is just about again as far as I could run with the plain Ford Carburetor.

G. E. YODER, Penn.

Finds That Our Claims Are Correct

I find that your claims for increased mileage are correct and that a big saving is made by your SUPER. In fact, the best device I have met with in that line.

M. J. VAN LEEUWEN, Mass.



The
Heart
of the
Motor

Eliminates Oil Pumping in Front Cylinder

What a wonderful relief to Mr. Ford Owner when he realizes that he can run his car without the motor pumping oil in the front cylinder. Sounds like an awful lot to expect of any device, but that is what the SUPER does and this is only one of its many advantages because it puts real efficiency into any Ford Car.

Complete Combustion

The SUPER is so designed that it takes advantage of the present Ford Carburetor and properly atomizes the light as well as the heavy elements of the fuel, converting every atom of gasoline and kerosene into power preventing liquid fuel from passing into the cylinders, thus avoiding carbon formation and oil dilution.

Easy to Sell

Sells Like Hot Cakes

This is a recent letter from one of our distributors: "Enclosed find draft for 200 more SUPERS, rush as I need them badly. I sold and banked \$104.00 in one day. Hope to sell 1000 SUPERS next month."

A. W. LEONARD, Penn.

Making Big Profits Every Noon

I have been working the SUPER at noon only. Yesterday noon I made more money with the SUPER than I did at my 11 hours' hard work in the factory all day.

J. L. LEHNER, Wis.

Had No Previous Selling Experience

This letter shows what ambition does: "I sold six SUPERS in less than 2 hours tonight. I think it's a pretty good start—for it's the first thing I ever sold."

E. MANGOLD, Ind.

\$60.00 TO \$150.00 PER WEEK EASY

You just can't help making Big Money selling the SUPER because a trial sells itself and soon everyone in the neighborhood get talking about this marvelous device. Men like Leonard, Shaw, Manner, Kinsley, Peters, Sands, Beck and Hall are not exceptional salesmen, but just the type of men that saw an opportunity and were quick to grasp it when within reach. No previous selling experience is necessary, just a little ambition on your part to make money is all we ask and we will extend the same opportunity to you. Spare time will pay you well. If you can devote your entire time so much the better, because the SUPER is a whirl-wind seller and takes hold in a locality like wildfire.

Men Wanted Everywhere To Introduce

We want distributors in all parts of the country to take orders and deliver the SUPER and to look after the repeat business that is bound to follow and to such distributors we are willing to assign territory. You do not have to own a Ford to take up this proposition but if you have a Ford it is easier to explain its many advantages. However a Trial of the SUPER convinces the most doubtful person and tells a wonderful story.

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426-868 Eleventh Street, Milwaukee, Wis.

GENTLEMEN: Please mail me full free particulars about your wonderful invention.

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County

State

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iron, art in rough

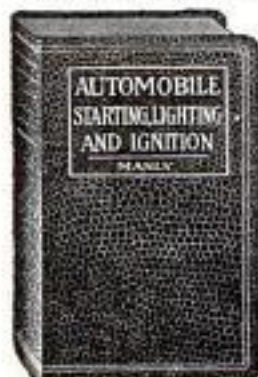
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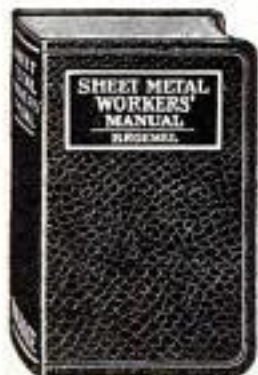
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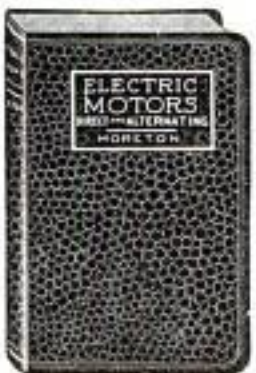
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Double and triple your present earnings —stopping this waste

The loss to railroads and manufacturers, due to the improper crating of merchandise, runs into the millions of dollars. Practically every dollar of that loss is preventable.

The trained Traffic Manager knows what to do to eliminate that loss. Every day his specialized training proves its worth in dollars-and-cents savings to the company that employs him—proves his right to a handsome salary.

Take the matter of scientific packing. A well-known concern manufacturing Kitchen Cabinets—acting on the recommendation of its Traffic Manager—worked out a plan for detaching the legs of the Cabinet and shipping the entire outfit in corrugated paper cartons. In a single year the total saving resulting from this change amounted to \$136,000. How is *that* for an opportunity to show results?

Again—take the matter of classification, weighing and routing. In 1923, the saving effected by the Traffic Department of the Woolworth Company—thru the application of a scientific understanding of Traffic Management—amounted to more than \$200,000. Do you wonder that the man who heads that department commands a big five-figure salary?

How do men prove their title to such salaries?
—By saving big money for the firms they work for.

Traffic Management— A Field of Unlimited Opportunities

Traffic Management is a new and rapidly growing profession in which men who make good command incomes ranging from \$50 to \$200 a week, and even better. Ten thousand a year for an experienced and capable Traffic Manager is *not* large. At least three of the leading automobile manufacturers pay their Traffic Managers twice that figure.

"Big men," says J. Ogden Armour, "are simply small men who have had a chance to grow." **Give yourself that chance!**

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Present Position.....

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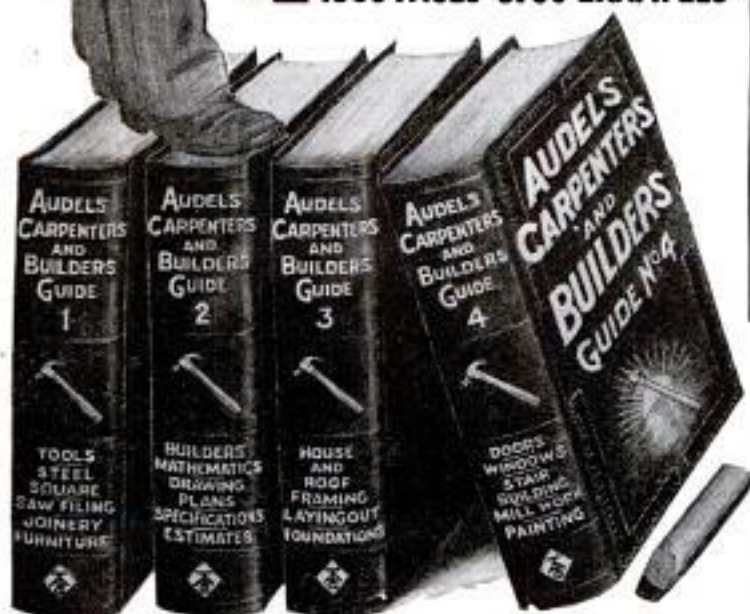
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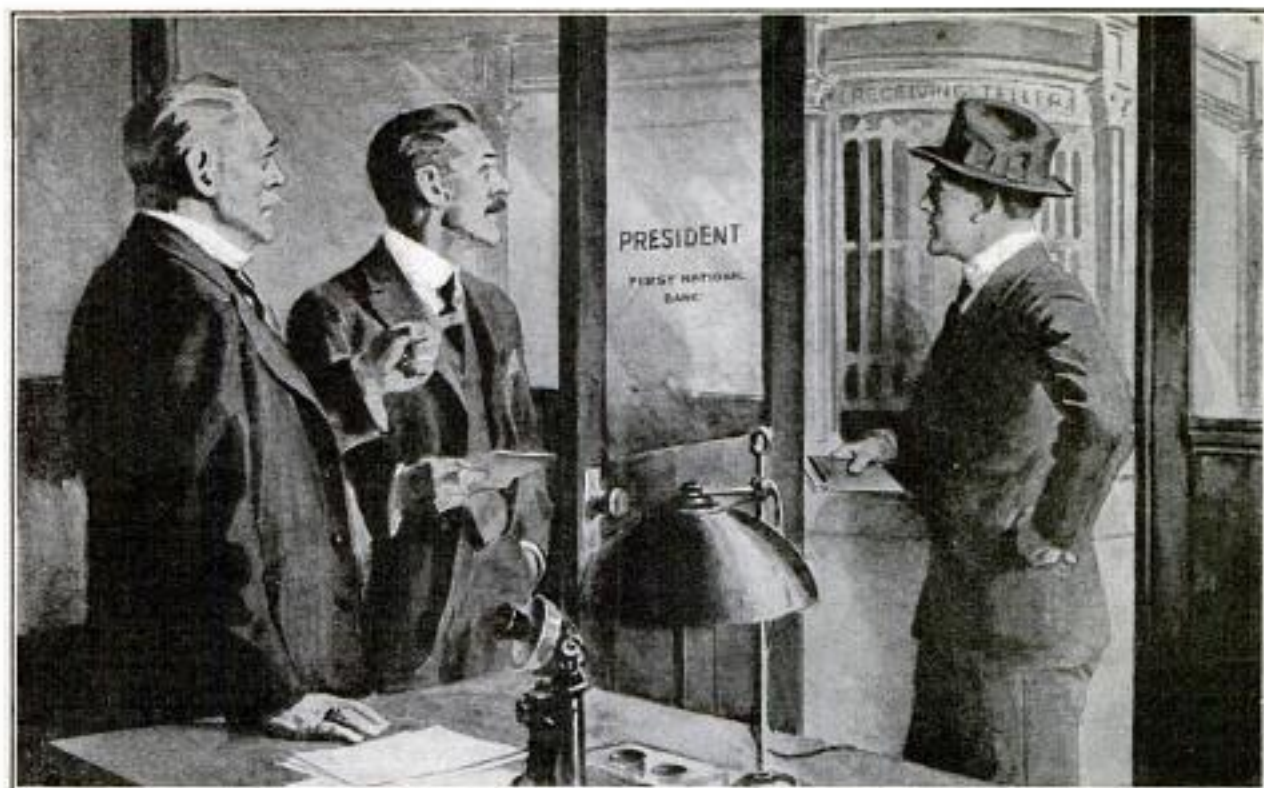
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| <input type="checkbox"/> Personnel Organization | <input type="checkbox"/> Better Letters |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Show Card Lettering |
| <input type="checkbox"/> Business Law | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Banking and Banking Law | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Accountancy (Including C.P.A.) | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Nicholson Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Common School Subjects |
| <input type="checkbox"/> Private Secretary | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Spanish | <input type="checkbox"/> Illustrating |
| | <input type="checkbox"/> Cartooning |

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| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Airplane Engines |
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| <input type="checkbox"/> Radio | <input type="checkbox"/> Mathematics |

Name.....

Street.....

Address..... 3-6-24

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

Occupation.....

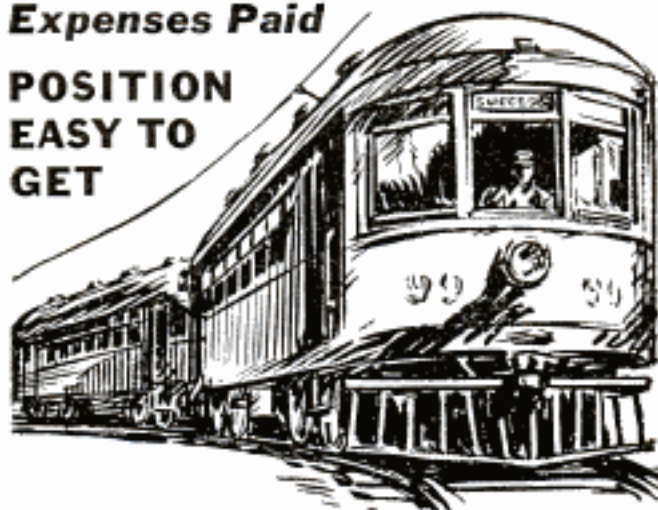
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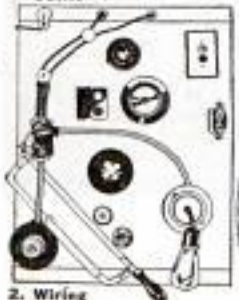
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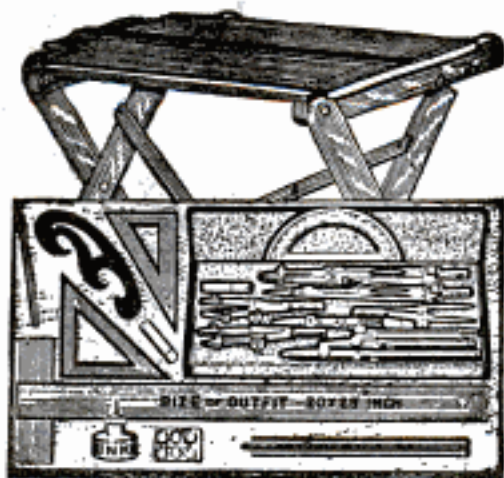
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In addition to my other offers, I have made arrangements whereby you may earn a regular \$90 drafting course while you are my student. I want to offer every inducement to ambitious men anxious to succeed in a big way. Big companies issue calls every day for skilled draftsmen to fill good paying positions. A trained man can be reasonably sure of a good job all the time. Write for details.

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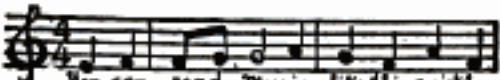
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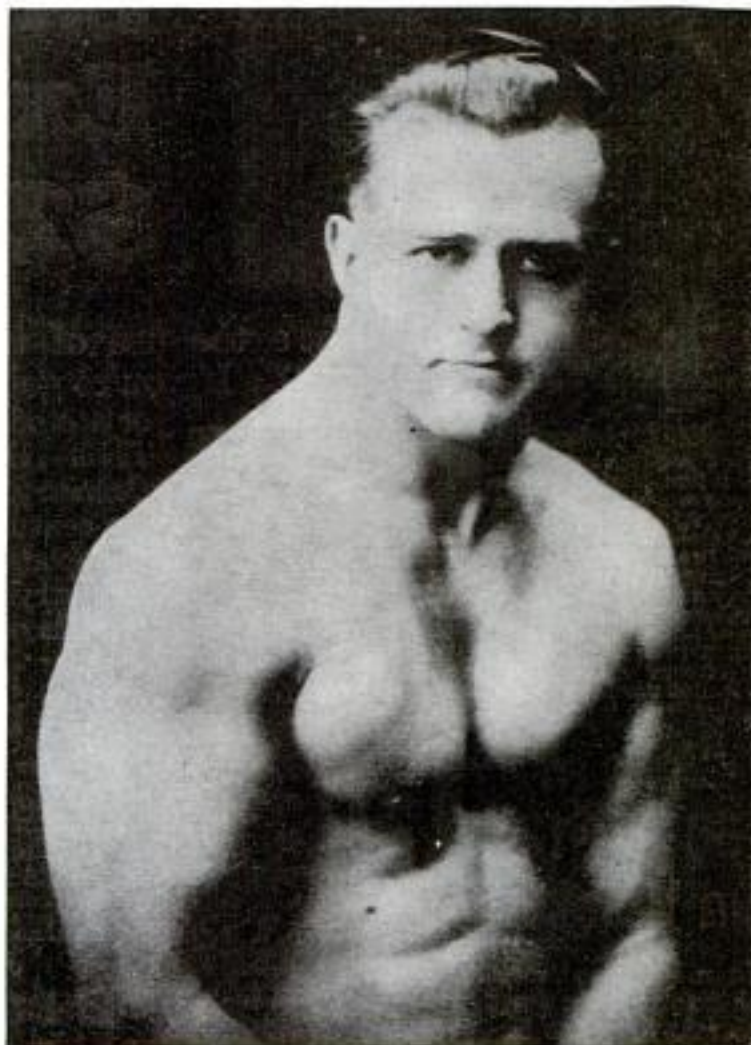
Don't try to make excuses. You are just out of luck. It's your own fault. You can't blame anyone but yourself. What are you going to do? She is going to find you out.

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You're Fooling Yourself

—if You Think These Big Pay Records Are Due to LUCK!

But don't take my word for it! When I tell you that you can quickly increase your earning power; I'LL PROVE IT! FREE! I'll show you hundreds of men like yourself who have done it. And I'll show you how you can do it, too.

I'LL come directly to the point. First you'll say, "I could never do it. These men were lucky." But remember the men whose pictures are shown above are only four out of thousands and if you think it's luck that has suddenly raised thousands of men into the big pay class you're fooling yourself!

Easy to Increase Pay

But let's get down to your own case. You want more money. You want the good things in life, a comfortable home of your own where you can entertain, a snappy car, membership in a good club, good clothes, advantages for your loved ones, travel and a place of importance in your community. All this can be yours. And I'll prove it to you, Free.

First of all get this one thing right: such achievement is not luck—it's KNOWING HOW! And KNOWING HOW in a field in which your opportunities and rewards are ten times greater than in other work. In short, I'll prove that I can make you a Master Salesman—and you know the incomes good salesmen make.

Every one of the four men shown above was sure that he could never SELL! They thought Salesmen were "born" and not "made."

When I said, "Enter the Selling Field where chances in your favor are ten to one," they said it couldn't be done. But—I proved to them that this Association could take any man of average intelligence—regardless of his lack of selling experience—and in a short time make a MASTER SALESMAN of him—make him capable of earning anywhere from \$5,000 to \$10,000 a year. And that's what I'm willing to prove to you, FREE.

Simple as A. B. C.

You may think my promise remarkable. Yet there is nothing remarkable about it. Salesmanship is governed by rules and laws. There are certain ways of saying and doing things, certain ways of approaching a prospect to get his undivided attention, certain ways to overcome objections, batter down prejudice and outwit competition.

Just as you learned the alphabet, so you can learn salesmanship. And through the NATIONAL DEMONSTRATION METHOD—an exclusive feature of the N. S. T. A. System of Salesmanship Training—you gain the equivalent of actual experience while studying.

The N. S. T. A. System of Salesmanship Training and Employment Service will enable you to quickly step into the ranks of successful salesmen—will give you a big advantage over those who lack this training. It will enable you to jump from small pay to a real man's income.

Remarkable Book, "Modern Salesmanship" Sent Free

With my compliments I want to send you a most remarkable book, "Modern Salesmanship."

It will show you how you can easily become a Master Salesman—a big money-maker—how the N. S. T. A. System of Salesmanship Training will give you years of selling experience in a few weeks; how our FREE Employment Service will help select and secure a good selling position when you are qualified and ready. And it will give you success stories of former routine workers who are now earning amazing salaries as salesmen. Mail the attached coupon at once and you will have made the first long stride toward success.

National Salesmen's Training Ass'n

Dept. G-12

N. S. T. A. Building

Chicago, Ill.

National Salesmen's Training Association, Dept. G-12,
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Send me free your book, "Modern Salesmanship," and Proof that I can become a MASTER SALESMAN.

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Start to make money quick, like P. Noyak of Freeport, Pa. He says, "I was a laborer at \$4.00 for ten hours. NOW it's \$10 for 8 hours. Easy Work. You did it for me."

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Address.....

Town.....State.....

Occupation.....

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I study each person's individual condition and adapt my methods to your own requirements. My system is unique—there is nothing else like it. It eliminates all possible harm of over-exercise. If you value feeling fit, if you want to make good in your present occupation or avocation, you should begin at once a regular system of home training under my personal instruction. I'll send you my book that tells you all about it—it's FREE—send for it NOW—this minute.

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| <input type="checkbox"/> Nicholson Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
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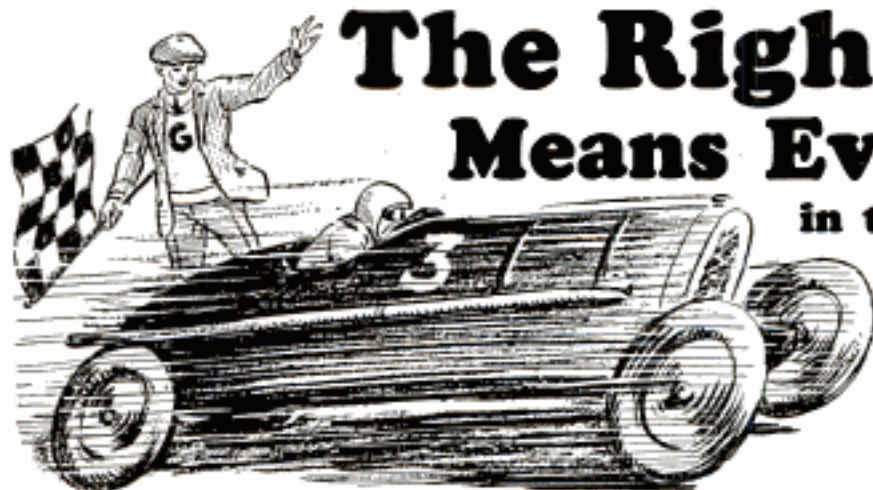
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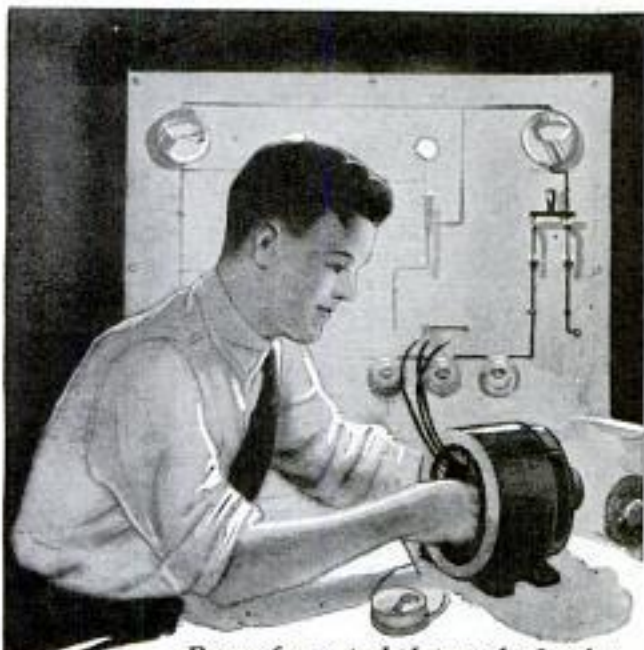
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SCHEMER, Alliance, Ohio, prints Big profit schemes, one subscriber making \$25,000 from three; another \$10,000 from one. Try your luck. Three months, 25c; copy, 10c.

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SIGNS and Showcards Easily painted with Letter Patterns. Large variety of Styles and Sizes. Sample for stamp. John Rahn, A2433 Greenview Ave., Chicago.

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We Start You in Business, furnishing everything; men and women, \$30.00 to \$100.00 weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; booklet free. W. Hillier Ragsdale, Drawer 4, East Orange, N. J.

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GOOD Money easily earned at home spare time Silvering Mirrors. Glass Embossing, Chipping, Frosting, Gold Leafing, etc. Patterson & Co., Brookville, Ky.

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IF You Want to Sell Your Business for Cash quickly and privately, we take the prospective buyer directly to you at our expense, no matter where located. We specialize in selling out-of-town businesses. If your business is worth \$5,000 or more, write us The Mutual Security System, 48 W. Washington St., Chicago.

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MILLERITE: Here it is! You've read about this New Wonderful Ethyl-Super-Fuel Ingredient for Gasoline—Increases Mileage—Saves Gas—Knocks Carbon—Easily Mixed from my simple Formula—profits great—\$5,000.00 to \$50,000.00 for you if you hurry!! Don't pass this by you'll be sorry—but send today for full descriptive literature of this and other valuable Formula Lists describing latest, biggest selling specialties in all lines as Menditt, Fabric Menditing Cement, Marcel Permanent Hair Curling Fluid; Denta-perl Tooth Whitener; Balloons and other thin dipped rubber goods; Flynox—few drops kills roach flies; Amazon Self Vulcanizing Repair; Pro-Tex-U only Guaranteed Fire Extinguisher; Pure Food Products; Toilet, Medical, Household, Automobile Office Specialties—latest in all lines. 27 years supplying the best in Formulas and manufacturing information. Highest References. Miller, Chemist, Tampa, Fla.

\$25 WEEKLY selling finest, most complete line of men's \$12.50 suits, boys' two pants suits \$10.95. Guaranteed Union made to measure. Four latest patterns. Also top-coats, vests, caps, riding breeches. Big commissions advanced. Free attractive outfit. Double Service Manufacturers, 1327-35 Y, Washington, Chicago.

AGENTS—Salesmen—Dealers—Crew Managers: Make \$75 to \$100 a Week. New Invention—Sensation of 1925, just out. Every car owner buys on sight. "Fixit" Rubber Repair for tires and tubes. Vulcanizes without heat or tools. Seals punctures and blow-outs. Saves tire repair bills, increases mileage on castings. Sample free. Marquette Rubber Company, 2325-2327 Wolfram St., Dept. 32, Chicago, Ill.

MAKE \$60.00—\$100.00 weekly: Sunlite instantaneous cleaner for windshields, show windows, etc. Big quantity seller. Amazing offer free. Summit Specialty, West Hoboken, N. J.

DO You want to earn money in your spare time? We have a wonderful offer to make ambitious men and women; no previous experience necessary; no money required; write today for plans. American Products Co., 2333 American Bldg., Cincinnati, Ohio.

AGENTS—Moose Corn and Callous Remover will build you a steady repeat business. Send today for pocket size trial outfit. The Moss Company, 230 Searle Bldg., Rochester, N. Y.

BIG Opportunity for agents to take orders for dresses and sportswear, \$2.00 to \$15.00. Good for \$50.00 to \$100.00 weekly; pay daily. We deliver and collect; experience not necessary. The Jeanne Co., 306 S. Franklin, Chicago.

WE pay \$18 a week, furnish auto and expenses to introduce our Soap and Washing Powder. Bus-Beach Company, Dept. A42, Chippewa Falls, Wis.

WANTED, several hundred men to represent manufacturer taking orders for shirts, raincoats, topcoats, sweaters, overalls. Big commissions daily. Send for free sample outfit. Northern Sales Co., 219 Northern Office Bldg., Chicago.

BE your own boss selling all wool tailored-to-measure trousers \$5.75 up. \$2 commission every order. 10 orders daily easy. Beautiful outfit free. Write all about yourself today. Lincoln Tailoring Co., 34-C East 12th Street, New York.

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

CREW Manager—Distributors, \$500 monthly easy selling "Magic Gas," new discovery. \$1.00 box equals 33 gallons gasoline. Proven, guaranteed. Your name on boxes. 500% profit. Write quick. P. A. Lefebvre & Co., Alexandria, Ont., Canada.

ORANGEADE, in powder—just add cold water—most delicious drink you ever tasted. Fine for home, parties, picnics, dancers, etc. Start in this business—big money easily made. Send dime for ten glass package, postpaid. 7 kinds, Cherry, Grape, Lemon, Strawberry, etc., for 70 glasses only 50c. postpaid. Morrissey Company, 4417-25 Madison St., Chicago.

EASY Money! Shivering mirrors, Auto-parts, tableware, Outfits; Plans Free. Sroinkle, Pfister 128, Marion, Ind.

START Mail Order Business; Watch Yourself Grow. Cost 5c. Sell by Mail for \$1. Make \$15 to \$30 daily. Information Free. Desk A, Surety Service Company, 551 Harvard St., Rochester, N. Y.

A DEVICE Which Shines Shoes in a Minute without Soiling Hands. Tested by "Good Housekeeping." A Dollar Bill for One Black and One Tan Outfit Will Start You Earning 150% Profit. Everett & Barron Co., Bloomfield, N. J.

WANTED Agents. To Sell The King Vaporizer for Fords. A Perfect Device for its purpose. Something new and regular. Makes your Ford run better. Throttle down slower, saves gasoline and a permanent necessity for all Fords. Retail Price \$1.00. Sell two to agents for the price of one. With interesting terms. The Whitely Supply House, 1720 E. Highland Ave., Muncie, Ind.

AGENTS. New Selling Plan! \$1.25 premium free to every customer on a \$2.00 sale, consisting of 8-oz. Vanilla, 6-oz. Shampoo, 4-oz. Lemon Lotion. A big hit everywhere. Complete details free. Territory going fast. Write today. The C. I. Torgstad Company, Dept. 6, 29 South Clinton St., Chicago, Ill.

ORGANIZERS and solicitors make good money enrolling members in national organizations working for a modification of the Volstead Act. Apply at once. The National American League, Dept. A, 42nd and Broadway, New York City.

AGENTS! Sell Women's Dresses! New Spring line, 75 styles \$6.75 to \$19.95. Direct selling cuts price in two. Last season part-time Agents averaged \$55 weekly. Full time good for \$100 to \$200 a week. Build permanent business. 89% repeat orders. Samples actually Free, no deposit. Carlton, Inc., Dept. 153, 337 S. Franklin St., Chicago.

\$8.50 TO \$20.00 daily easy—Introducing New Insured Hosiery for men, women, children—37 styles, 37 colors. Must wear or replaced free. Repeat orders sure—Nyland made \$395 one month—Edwards, \$460.60—Mrs. Bone, \$445.25. Why not you? Even spare-time work should pay you \$3.00 per hour—Your Pay Daily in Advance—We deliver and collect—you spend all your time writing orders—No experience or capital needed. We furnish elegant outfit—all grades, colors, including silks. No matter what you are now selling, it will pay you to get our offer. Maccabee Textile Company, Station 2566, Cincinnati, Ohio.

AGENTS: Something New. Two best selling specialties out. 25c brings both. Value \$1.25. Money back if not pleased. Spors Co., Lessor Center, Minn.

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

EASY Money Applying Gold Initials, Monograms on automobiles. Anyone can do it. Simply transferred from paper; takes 5 minutes. Make \$1.50, cost 5c. Samples free. "Raleco," 325 Harrison, Boston, Mass.

\$15 TO \$25 daily is easy with our distinctive, big-selling line of hosiery. Extraordinary values. Extra bonus paid monthly. No experience or capital necessary. Sales kit free. Write Horsey-Bassett Co., 610 Main St., Crisfield, Md.

WONDERFUL invention eliminates needles for phonographs. Preserves records. Abolishes scratching. Day's supply in pocket. \$20 daily. Sample on approval if requested. Everplay, Desk B-6, McClurg Bldg., Chicago.

AGENTS. \$20 daily easy selling household necessity every woman wants. New invention reduces price. Big profit. Fagley & Halpen, 37 No. 2nd St., Dept. 5, Philadelphia, Pa.

QUIT Chasing Rainbows. We are placing on the market a new and powerful sales getting auto accessory. Just patented and first introduction to the sales field. Unlimited earnings; be the first agents; investigate. Geo. A. Schmidt, 505 So. 16th, Omaha, Neb.

NEW Camera takes and finishes pictures inside camera in one minute. Make money selling cameras or taking pictures. Crown Co., Dept. 951, Norwalk, Conn.

SELL Tapestry Buffet or Dresser Scarfs, 19x34 inches, Blue and Tan effect. Readily Sold—Good Profits. Cost \$1.25 each, sells \$2.00 to \$3.00 each. G. A. Payne, Box 102, Station D, Columbus, Ohio.

BIG New \$2 Seller! Each sale nets you \$1. Every household, hotel, merchant, autoist takes one or more. Secure your territory quick. Volk Mfg. Co., Dept. P, Cincinnati, Ohio.

AGENTS—Big money demonstrating oiling device for all makes of autos. Every driver a prospect. Small investment. Exclusive rights to live wires. Free demonstrating sample for your own car. Write H. G. Saal Co., Dept. A-135, 1890 Montrose Ave., Chicago, Ill.

START Mail Order Jewelry Business of your own. Big profits in Jewelry. Every mail brings money. Everything furnished. Catalogs printed in your name. Your orders for goods filled at wholesale as needed. Sample catalog 15 cents. Particulars free. Acheson, 2218 West Cary, Richmond, Va.

PORTRAITS, photo pillow tops, frames, sheet pictures, medallions, merchants' signs, food products, rubber aprons, guaranteed hose, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30 days credit. Jas. C. Bailey Co., Desk A-6, Chicago.

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

AGENTS, Salesmen—Sell New Thermo-static Automatic Carburetor Control Attachment for Fords. Big Profits, full or part time. Burns 95% air. Doubles Mileage. Attached in 2 minutes. No drilling. Does automatically exactly what Ford manual says do by hand. Cadillac now using Thermo-static Carburetor Control under Blanche license. Write today. A. C. Blanche & Co., Dept. 805HX, 602 Lake St., Chicago.

GOODYEAR Mfg. Co., 174X Goodyear Bldg., Kansas City, Mo., is making an offer to send a handsome raincoat free to one person in each locality who will recommend it to friends. Write today.

27,000 RECORDS guaranteed with one Everplay phonograph needle. Preserves records. Abolishes scratching. Day's supply in pocket. \$20 daily. Sample on approval if requested. Everplay, Desk T-6, McClurg Bldg., Chicago.

AGENTS, Salesmen, Demonstrators, you will have the devil's own time trying to find a better seller than "Zippo." If there was such a thing we'd have it. Splendid profit on 50c "Go Getter" repeat article that sells on ten second demonstration. Works While You Watch It. Demonstrates value, while others waste time making claims. New discovery! Greatest Scientific Triumph of the age. It's the berries. Haven't room to tell our story here. Write immediately. Karam-Smith Co., 605 Bozart St., Ft. Wayne, Ind.

\$50,000 PICTURE Man Friedman made canvassing. Beginners can make \$100.00 weekly with my sales talk. Experienced men make more. Free book "Profits in Portraits" explains. Samples Free. Picture Man Friedman, Dept. 8-H, 541 W. Lake Chicago.

AGENTS—\$75 Weekly Selling Nustle guaranteed hosiery. Your pay daily. You write orders, we deliver and collect. Special Monthly bonus. Sample outfit furnished. Nustle Hosiery Mills, Dept. 1-6, Philadelphia, Pa.

WALL and Auto Emblems—all lodges, \$10.00 daily easy. Every member buys. Absolutely new. No competition. Big full-spore time money maker. Write for free sample plan. Crafts, 3314A Lawrence, Chicago.

\$61.50 WEEKLY. Introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Samples free. Experience not necessary. Write today. Luthier Mfg. Company, Dept. 542, Cincinnati, Ohio.

AGENTS—A piston ring tool, admitted by all mechanics as the cleverest and most needed ever invented. Positively sells on sight. Take orders. We deliver and collect. Get territory and order books free. Sample tool \$1.25 Postpaid. Art Tool Co., Spokane, Wash.

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

MCDONALD Silver Polish sells fast. Large 1-ounce package and terms 10c silver. Daniel McDonald, 18 Agawam St., Lowell, Mass.

GET into Line with Gilbert's Home Wires Necessities. Good Profits. Easy Sellers. Six Samples for \$1.00. Gilbert Sale Co., Milford, Conn., Box 267.

MEN and Women: Sell a live one. All or spare time. No experience necessary. Samples and full particulars 25c. Profits 85c. Mutual Supply Co., Bradford, Pa.

AGENTS, energetic men, every city, earn \$12—\$15 daily with Ideal Dust Shields; millions of prospects; unlimited field; quick cash sales; build mail order and direct business; send for free folder and learn how. Ideal Equipment Co., Canton, Ohio.

AGENTS, Monogram Automobiles, 15 Million prospects. \$1.50 profit every \$1.50 sale. Wilbar made \$29.50 first day. Free samples. Worcester Monogram Co., 345, Worcester, Mass.

AGENTS—Novelties from Germany and Japan. \$20.00 a day easy. Write for selling Proposition. License unnecessary. Sample free. Boston Supply House, 1035-39 Milwaukee Ave., Chicago, Ill.

AGENTS sell Minutemen for tires and tubes. Every auto owner buys when demonstrated. Costs 2c repair, saving 60%. Superior to vulcanizing. Amazing profits and repeat sales. Hart made \$85.00 first week. Particulars and free sample. Colonial Rubber Co., Dept. 17, Philadelphia, Pa.

SELL Union Label All-Wool Made-to- Measure Suits direct to wearer for \$24.50. Scott System Wholesale Tailors, 99M, Bedford Street, Boston.

AGENTS to demonstrate and sell to car owners Nationally advertised Auto Polish that removes the dull, cheapening film from motor cars; quickly restores the factory lustre, and leaves a glass hard, bone-dry dust-proof surface. A scientifically correct cleanser that is each year saving thousands of car owners the expense of repainting, yet the cost is only \$1.00. Agents everywhere proving that quick sales follow demonstrations; and profits grow steadily from repeat business. For free testing sample and details of agency, address C. S. Mfg. Co., 502 N. Whittier St., St. Louis, Mo.

AGENTS: Gingham House Dresses \$8.50 dozen. Retail \$1.50. Sample \$1. Write for free 200 sure seller catalog. Economy Sales Co., Dept. 304, Boston, Mass.

FREE booklet describes 52 plans for making \$20.00 to \$100.00 weekly in home or office business of your own. Downs Co., 2322A Myrtle, St. Paul, Minn.

AGENTS wonderful song. Sells at sight. Sample 15c. Irt McDaniel, Lebanon, Ind.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for Free book, "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, 5892 Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 154 and 155.

STARTLING New Invention for the Lawn, medicine bottle for the lawn and garden. Turns water to medicine for the lawn yet uses only water. Attach it to a hose, turn on the water and watch the crowds gather to see what's going on, makes water roll up like a smoke bank. Gets 'em all. Takes the place of sprinkler, everybody buys. Sells for only \$2.00. Agents make half and more. Selling by the thousands. Nothing like it. Write for our proposition. Lawn Inventions Company, La Crosse, Wis.

LE ROY BLADES made \$71.25 Profit in first 45 minutes. New mechanical wonder showed 38% saving on gas in 14,000 mile test. Gives more power, speed, pep. Removes carbon. Easily attached. Guaranteed by bank bond. Exclusive territory. One free to introduce. Air-Vac Co., 712 Tacoma Building, Chicago.

AGENTS—Make high as \$10.00 daily, selling our product, every home a prospect, make \$1.50 on every sale. Information free. Write today. Starke Pharmaceutical Co., Gble Bldg., St. Louis, Mo.

BOYS—Men—Agents profit splendidly with latest Novelties; Acry Stylo Fountain Pen, Push Button Knives, Pocketscopes, Bamboo Pens, half price. Catalog free. Acry Smith, Detroit, Michigan.

SUMMER here—Are you ready? Quickest, easiest seller for warm months. Men, Women, Boys, Girls, easily make \$1.00 per hour. Repeat all summer. No real competition. Free Sample. William Haigh Co., South Calvert St., Baltimore, Md.

MEN Wanted—To earn \$50 to \$100 per week introducing a fast selling auto accessory. \$2.00 profit on every \$1.00 sale. Will send a sample at our risk. Write Strinsky Co., Dept. D-15, Pukwana, S. Dak.

AGENTS Wanted, Men and Women, \$10.00 to \$12.00 daily selling Sanitary Tooth Brush and Paste Holders. For particulars write Justman & Frisk, Box 216, Fort Atkinson, Wis.

MAKE—Sell Your Own Goods—Formulas, Processes, Trade-Secrets. Modern master methods. Catalog free. B. Thaxly Co., Washington, D. C.

SOMETHING new—Presto Rubber Repair for tires, tubes; all rubber goods put on cold, no heat, acid or tools; vulcanizes itself in few minutes. Sells to auto owners and dealers, sample free. Pioneer Products Co., Dept A, Reebing, N. J.

FREE Information, Latest Big Money Make, Walland, Box 4338, Station B, Kansas City, Mo.

ENERGETIC Men, women, everywhere, earn \$10 daily with Miracle, the new, different, better polishing cloth; sells on sight; orders come quick; big profits; sample free; our folder tells how to start money coming fast. Oliver Gandy Co., Crisfield, Md.

YOUR picture (colors) on Watch Fob, \$1.50; Vanity Case \$1.95; Pocket Mirror, \$1.00; 3 mirrors, \$2.00. Photo returned unharmed. Black Studio, Los Angeles.

NO Boiling, No Freezing standing or running in any climate. Ten million Ford owner prospects. Splendid territory open. Airolok Products, Box 705A Willow Street, Long Beach, Calif.

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

AGENTS, 100% profit selling Hold-the-Ironing Board covers the year 'round in every home. Ideal, Dept. M, 281 Fulton Street, Brooklyn, N. Y.

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

WANT Information on thousands fast-selling articles? Write Institute, 15 Moore, New York.

ESPERANTO—Learn Esperanto and become our agent. Good income. No expense. Free sample lesson. Benson School of Esperanto, 20 E. Mercer Street, Newark, N. J.

ANY man handy with paint brush can start furniture refinishing, painting, gilding, jobbing and handyman business on nearly nothing; mostly all profit; experience not needed. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold, it vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 505.

BUILD splendid business making chipped glass number and name plates, signs, medallions. Write for particulars, Simplex Utility Co., 1133 Broadway, New York.

AGENTS Wanted—Either sex, 100% profit, 3 household necessities, 6 formulas, \$3.00 value for \$1.00, to a limited number. Evans Mfg. Co., Pine Bluff, Ark.

\$100 FIRST Two Weeks—made by Weiland, Johnstown, Pa., selling "Slide-O-Graf Jr." Novel, effective—slowly advertisement projector. Sells fast, big non-competitive field. \$14 Profit every sale. Standard Slide Corp., 287 W. 48th St., New York.

\$15 DAILY Easily Made; Great Opportunity Men and Women, Experience Unnecessary. 95c Profit every Dollar. A Whirlwind Seller. Write Quick, Particulars 10c. Erikson, Finley, No. Dak. R. 239.

SIGN Men—Handy Men—Make easy money with our Gold Window Sign Letters—Easily applied. Get the Styles that Sign Painters use. Sign Painters Letter Co., 1116 Forest Ave., Chicago.

MEN—Women. We give free \$15 gold pen and pencil to first person in your community to introduce Easy Mend. Agents make \$100 weekly. Easy Mend patches like magic. No one will darn or sew patches after using it. J. Moore, without previous experience, made \$18 first day. Write for offer. W. Thos. Barnett Co., 1834 Montmain, Des Moines, Iowa.

SELL big garages 10-Minute Drying White Paint for floor guide marks. Big sales to towns and cities for safety zone marks. Free samples. Territory Rights. Other specialties. Fasdzra Company, Phoenixville, Penna.

AGENTS earning money selling Automatic Mutilage Pencils. Greatest utility known. Big demand everywhere. Sample 25c. Particulars free. Regal Co., 4154 Hyde Park, Kansas City, Mo.

AGENTS, Crew Managers, make big money. Postal brings particulars. Over 200% profit. Guaranteed line. County Representatives wanted. Midwest Drug Company, 191 E. Nighthelm St., Columbus, Ohio.

\$50—\$100 WEEKLY. Every man must buy. Tremendous repeat business. Other wonderful money-makers that sell to stores, homes and factories. Goldman Sales Co., 309 5th Ave., New York City.

CHANGEABLE letter show window signs. Every merchant a prospect. Large profits. Send for free sample offer. Maze Manufacturing Co., 108 N. Dearborn, Chicago.

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

FREE Sample Outfit, No Deposit, New Plan, making tremendous hit. Fit-to-measure \$6.45 Shoes. Experience unnecessary. No competition. Big Money. Quick Repeat Business. Large income appointing subagents. Satis-Factory Co., Dept. PM-2, 215 Randolph, Chicago.

60 MILES on 1 Gallon. Wonderful Vapor Humidifier for autos, 1 free to introduce. Critchlow, P3110, Wheaton, Ill.

NEW—Original—Exclusive Reddy Rubber Outfit containing big book of illustrated directions covering 101 uses for old inner tubes. Makes handsome hand-bags, repair rubber footwear, etc. Quick sales—big profits. Write for details. Reddy Rubber Co., 1491 Marvin, Akron, Ohio.

AGENTS make real money without risking single penny selling our new Paste and Powder hand cleaners. Cleans dirtiest hands perfectly clean without injury; sure repeater. splendid opportunity; write today. Hamler & Co., 2903 Grand River, Detroit, Mich.

OPPORTUNITY: Metal Weatherstrips installed without removing cash. Exclusive Agents wanted. Allan Manufacturing Company, Box M, Morris, Ill.

GET posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 22.

BOYS, Girls, Men, Women, wanted to sell Monogrammed Stationery. Agents Outfit 10c. Nass Specialty Printing Company, North Wales, Penna.

O. K. BATTERY Charger. Guaranteed not to injure your battery. Agents, Garage men make big profits. County and state rights. Sample charge two batteries \$1.00. O. K. Battery Co., 2131 North Main St., Los Angeles, Calif.

MARVELOUS Radio Gas Lighter sells instantly to every user of gas. Good for 10,000 lights. Retail only 25c; costs \$10 a gross. Your profit 18c on each sale, \$20.00 on gross. Send \$1.00 for sample dozen with self-selling plans. U. M. Masterlite Co., 110 East 23rd St., New York.

WHEBE to buy 250,000 articles Wholesale. Actually worth \$50. Particulars stamp. Wholesale Supply Co., Valdeosta, Ga.

DIRECT Engine-Driven Tire Pumps for Ford cars. Clagett Mfg. Co., Marlboro, Md.

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

SELL Midget Bibles. Greatest novelty of the age. Big profits. Sample and full particulars, including a wonderful selling plan, all for dime. George Kreyling, Bound Brook, N. J.

AGENTS to sell High-Class Auto Cleaner and Refinisher. Big Profits to right men. The Sterling Company, Joliet, Ill.

NEW carbon remover, automatic—only two moving parts. Nothing like it. No liquids, powder or dope. Want high-grade men with cars. An eighteen-karat knockout. Write By-Pass Valve Co., Plattsmouth, Nebr., U. S. A.

WONDERFUL Sapphires. Exclusive special cutting like diamonds, wear forever, same satisfaction at fraction of cost, all colors, finest grade \$3 carat wholesale, new sales plan, stones only or mounted. Importer: Paver, 152 Dewitt, Buffalo, N. Y.

AMAZING new invention, reproduces cartoons, sketches, music, typewritten, handwritten matter 60 copies per minute. Thousands from one original. Whirlwind seller. Big commissions. Write today. Duplicopy, 624 Jones St., San Francisco.

AGENTS—manufacture goods you sell. 24 money making formulas, and big catalog 10c. Mehler, Box 453, Chicago.

AGENTS—Sell new fast selling valve grinder, retail \$3.50. Send \$1.75 for sample outfit and territory. J. & B. Mfg. Co., Springfield, Ill.

\$9.75 FOR 1,000 Embossed Window Sign Letters. Perfectly Cut. Free Samples. Foil Sign Works, 1965 Telegraph Ave., Oakland, Calif.

AGENTS, Distributors, Crew Men average \$40-\$100 with Harker Products; 10c brings sample of leader; money back if you wish; free folder shows how to start small and grow big. Act; Send today; big surprise awaits you. Harker Co., Bridgeport, Conn.

MANUFACTURE chipped glass house numbers. Particulars. Beveridge, 160-22 Locust Avenue, Jamaica, N. Y.

EARN \$45 to \$85 extra a Week, Selling beautiful Shirts. Commission in advance. We deliver and collect. Write quick. Fashion Wear Shirts, Dept. 468, Cincinnati.

UNIVERSAL Demand—Large Profits. Sell Zey Waterless Soap. Every auto driver needs it for cleaning hands after changing tires, etc. Parke Corporation, Kalamazoo, Mich.

AGENTS—70c profit on \$1.00 Sale—New—Different. Auto Cleaner and polish. Your name on label; appoint sub-agents; exclusive rights. Laboratories, 213 Griswold, Detroit, Mich.

AGENTS—be manufacturers. Make and sell your own products. Big profits. Permanent repeat business. Information free. Jos. D. Carney, 5425 Lake Park Ave., Chicago.

NEW Office Articles, One for typewriter. Reape Mfg. Co., 2827 Myrtle St., Oakland, Calif.

\$5 STARTED me earning \$200 weekly with Mail Order business. Anyone can do the same. Outfits furnished. Particulars free. Peerless Service, 447 Waterville, Me.

NEW Fountain Automobile Washers. Unexcelled main or sideline. Live sellers. Liberal profits. Samples furnished. Money back guarantee. Hanson Mfg. Co., 4121 Lake St., Chicago.

AGENTS—N-R-G Laundry Tablets, the old reliable money-maker for live agents. Millions sold—200% profit—sales waiting for you. Clothes washed spotlessly clean in 10 minutes without rubbing. Free samples. N-R-G Company, B 732 N. Franklin, Chicago.

TAKE orders \$12.50 nationally advertised Wearwell guaranteed suits and topsuits. Latest styles. Big profits. \$2.00 outfit free. Prompt delivery. Territory open. Write immediately. Consumers Wearwell Mfg. Co., Dept. A, 728 Roosevelt, Chicago.

SELL Ford Owners most efficient timer on market. Agents everywhere coining money—\$50 to \$75 weekly. Haines sold forty first week. Wonderful side line. Write Dept. 30, Auto Sun Products Co., 555 West 6th St., Cincinnati, Ohio.

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

TURN Your Spare Time into Cash. Make big commissions every day selling Fifth Avenue Tablecloths. Julian J. Pann, 24 East 21st Street, New York.

MAIL Order Business. Excellent side line. No Stock to Carry. Details Free. Hunt Co., Morrisville, Pa.

NEW Specialty. Costs 15c. Sells for 50c. Real \$1 value. 30 other wonderful sellers. New inventions, all necessities. Agent's Outfit Free. Write Quick. General Products Company, Dept. 7, Newark, N. J.

AGENTS—I pay every Saturday night. Take orders, house, street dresses. Experience unnecessary. I deliver and collect. Save customer half. Write without obligation. Carol Lee, 1206 Gateway Station, Kansas City, Mo.

AGENTS—It's easy to sell our patent fibre house brooms. Halston made \$114 one week. 100% profit. Great repeater. Protected territory. Write quick. Weaver Broom Company, Box A, Jonesville, Mich.

AGENTS: Big Profits; Gold Sign Letters. Easily Applied. Samples Free. Liberal Offer to General Agents. Interstate Sign, 3953 Armitage Ave., Chicago.

150% PROFIT selling our mysterious stain remover for clothing, leather, etc. Pulgentine Co., 801 Farragut, Bay City, Mich.

AGENTS—Millions of women will buy the New Sharp-Easy. Write today for particulars about the big profits made selling this quick moneymaker. Premier Mfg. Company, Dept. 813, Detroit, Mich.

SALESMEN—Make \$300 to \$500 monthly selling Morey Rim Tool to trade and car owners. Quick, easy sales. Best season just starting. Write for special offer. Morey Rim Tool Co., Sect. P, Blissfield, Mich.

LIGHTNING Battery Charging Fluid! Make it yourself! See my ad under "Automobile Supplies." Murphy, Chemist.

BIG Money Selling Gold Initials. Quick Sales. Every Car Owner Buys. You Charge \$1.50—Make \$1.44 Every Sale. Your Profit \$20 Daily. No License. No Experience. "Samples Free." NuLife Monogram Company, Hartford, Conn.

\$3.00 VALUE for 30c. Everybody buys Pitkin's New Process non-alcoholic food flavors and saves \$2.70. Present sales force making big money. Some valuable territory still open. Send for free sample and prices. A big opportunity to establish a big business. No capital necessary. J. M. Pitkin & Co., 725 Pitkin Bldg., Newark, N. Y.

AGENTS: Something New for Billiard, Pool, and Club Rooms. Greatest Amusement Games ever played. Brooks Novelty Company, 1185 44th St., Brooklyn, N. Y.

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

DUSTLESS Sponge Cloth. New Invention. (1) Rub—Dusts, Cleans and Polishes Automobiles, Furniture, Pianos. Retalls (50c)—Costs (16c). "Sample Free." NuLife Sponge, Hartford, Conn.

LEARN Bricklaying in a School run by Building Contractors. Circular Free. Associated Building Employers, 314 A. B. E. Building, Grand Rapids, Mich.

AGENTS. Make \$1 to \$5 an hour; Rapid fire seller; Over 100% profit. If you are a live wire, write at once to J. Forte, Fairfield, Calif.

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

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

TAILORING Salesmen: Our guaranteed \$21.50 and \$31.50 all wool tailored to order suits are \$10 to \$20 cheaper than store prices. Commission in advance. Protected territory. Beautiful assortment 6x9 swatches free. Manager, Dept. 1000, 843 Adams, Chicago.

AGENTS, specialty salesmen get this good money now. Let us start you in business with Cleaneze and make you independent; you can earn \$10 daily; Cleaneze sells to homes, automobilists, offices, public buildings, etc. Repeats over and over. Free folder sent on request. Gelbach, Manager, Lebanon, Pa.

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

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

MAKE big profits selling large nationally advertised line \$12.50 suits and topcoats, also raincoats, neat waterproof kitchen aprons, umbrellas. Jackson Raincoat Company, 728 Roswell, Chicago.

AGENTS sell the latest novelty, "The Gold Digger Pin"; every modern girl wears one. Send 25c for sample and information. Money refunded if desired. Big Profits. Turnish Studios, Stapleton, New York City.

NEW Marvelous Pocket Cigar Lighter. No friction. Sample 25c. Rapid Mfg. Co., 799a Broadway, New York.

\$40-\$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS—Men and Women. 35 Million women are anxiously waiting to buy the 3-in-1 Hot Water Bottle-Icebag-Fountain Syringe combination. Commissions daily. No delivering. Write for startling money making plan. Lobl Manufacturing Corporation, Middleboro, Mass.

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

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

\$4 CASH with every sale of Capt. Burke's Fire-Fox, only pistol-type extinguisher on market; operates with one hand; used on U. S. Airplanes; undersells all competition; stops bandits as quick as it puts out fires; factories and institutions buy in quantity; \$20 a day easy. Write for sales plans. Burke Fire-Fox Sales Co., Desk A, Cincinnati.

AUTO owner tire agent wanted each locality to use and take orders for handmade Mellinger fabric and cord tires; guarantee bond 8,000 and 12,000 miles (no seconds); shipped prepaid on approval; get your tires free; no capital or experience required; make \$100 to \$200 weekly. Write for wholesale prices and sample kit. Address, Mellinger Tire Co., Dept. 300, Kansas City, Mo. or Dept. 300, Philadelphia, Pa.

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

GREATEST Sensation—11-piece toilet goods assortment selling like blazes at \$2.00 with \$1.25 Dressmaker's Shears Free to each customer. Winner for 15 years. Davis Products Co., Dept. 59, Chicago.

AGENTS: Our gold-eyed needle cases are wonderful sellers; immense profits; \$50 to \$300 weekly; proof and particulars free; sample outfit 15c. Factory prices. Paty Needle Co., 231 Davis Square, Somerville, Mass.

AGENTS Wanted—For Red Dog Tube Patch. Repairs largest blow-outs or punctures without heat or cement. Startling demonstration sells it. 300% profit. If you can't stand "big money," don't answer. Exclusive territory. Samples free. Auto Products Co., Marion, Ind.

SELL Beautiful \$7.00 Red and Black Oversized hand made Fountain Pens for \$3.50. Cost you \$1.75. With bonus \$1.55. Post card brings full details, or C. O. D. sample, at wholesale price. Johnson Pen Co., Dept. P, 117 So. First St., Rockford, Ill.

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

EVERYBODY Needs and Buys the "Business Guide." Wells cleared \$1,150 in 25 days. Send for sample. It's Free. Nichols Co., Dept. 4B, Nanterville, Ill.

AGENTS Wanted. Your chance in life to own dignified profitable business. We teach you practical insurance. Earn \$1,000.00 yearly. No capital required. Office at home. Dent. M. Room 215, 75 Montgomery St., Jersey City, N. J.

GOLD X-Ray Novelty. The perfect illusion! See the bones in your hand, lead inside a pencil, etc. Rapid seller, large profit. Samples and particulars for 25 cts., stamps or coin. Yankee Novelty Co., 98 Third Ave., N. Y. City.

AGENTS—Sell Newark Felt Rugs on sight. Best values on market. Big, satisfactory plan. Write quick for information and plan. Newark Felt Rug Company, 27C Sixteenth Ave., Newark, N. J.

AGENTS, sell guaranteed shirts and hosiery. 60 styles. Large advance commissions. Make big money without investing a nickel. Write A. Helix Hosiery, 390 Broadway, New York.

ROBT. H. INGERSOLL of \$1 Watch fame wants good men to sell his Dollar Stopping outfit, an ingenious invention for sharpening all makes of safety razor blades. Great economic value. Meeting with nationwide approval. Easy to sell. Big repeat business. Agents having remarkable success. Full particulars, Robt. H. Ingersoll, 476-D Broadway, New York City.

AGENTS—Sell Magic Washing Compound. Your name on package. Great repeater. 300% profit. Miller made \$1,000 in 6 weeks. Sample free. "Besco," 1943-W Irving Park, Chicago.

AGENTS, both sexes, we manufacture and control new household article. Fast seller. Big profits. Exclusive territory. Write Now. Connolly, 123 Liberty St., New York.

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

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

PORTRAIT Agents in Hawaii, Cuba, the Philippines and all foreign countries, write for catalog and lowest prices on Guaranteed Portraits and Frames. Samples Free. Picture-Man Friedman, Export Dept., 541 Lake St., Chicago.

\$20 PROFIT daily selling needlebooks; costs 3c-5c each; sells 25c, value 50c; Three samples 25c. Catalogue Free. Needlebook Specialty Co., 861 Broadway, New York.

PORTRAIT and Photo Medallion Agents—Artist Portrait Painting—reproduced from any photograph, finished on canvas just like an expensive oil painting—the new sensation and the biggest money maker in the specialty field. Take orders in combination with the famous P. & G. Photo Medallions and make a steady "clean-up"! Write Now! Pudlin & Goldstein, Dept. "A," 259 Bowery, New York.

300% PROFIT—Quick, easy seller, Klean-Rite. New Clothes Washing Compound. No rubbing. Women simply amazed. Free premiums makes sales easy. Fast repeater. Distributing samples free. Everybody grabbing for territory. Write quick. Hestover Products Co., 19478, Irving Park, Chicago.

SELLS Like Blazes. New Instant Stain and Rust Remover. For clothing, table linen, etc. Fine premium every sale. Big Quick Profits. Free Outfit. Write Today. Christy, 505 Union, Newark, New York.

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

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

AGENTS—Good salary and commission selling "Ratskill" new rat and mouse exterminator ready for use; no bait required; non-poisonous; rodents die outside premises; no odor. Empire Specialties Co., 1549 N. Wells, Dept. 301, Chicago, Ill.

AT Last—World's Greatest Adding Machine. Almost human. Retalls \$15; work equals \$300 machine. \$500 monthly easily made, demonstrating to stores, offices, garages, factories. Simple, easy; adds, subtracts, multiplies, divides automatically. Speedy, accurate, durable, handsome. Five year guarantee. Tremendous demand, amazing profits. Liberal trial offer. Protected territory. Write quick. Lightning Calculator Corp., Dept. F, Grand Rapids, Mich.

\$100.00 WEEKLY and over. Selling our newly patented auto specialties. Free sample and particulars. Jackson Mfg. Co., 1321 16th St., Denver, Colo.

BIG money and fast sales; every owner buys gold initials for his auto. You charge \$1.50, make \$1.44 profit. 10 orders daily easy. Samples and information free. World Monogram Co., Dept. 18, Newark, N. J.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 401, Amsterdam, N. Y.

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

KU-KLUX-KLAN lucky Kluxer pocket-piece and Katalog 10c. Agents making big money. National Emblem Company, Box 1174-PM, Omaha, Nebr.

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

WASH Clothes the new way. Use the Torrent Automatic Washer. You will be delighted. Special offer to one in each locality. Storm Royalty Co., 2010 Enright Ave., St. Louis, Mo.

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

TURN your spare time into dollars selling Polmet Polishing Cloth that cleans all metals without liquid, paste or powder. Returns 25c. Our agents say it sells like "hot-rakes." Prove it yourself with free sample sent on request. F. C. Gale Co., 122 Edinboro St., Boston.

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

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

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

AGENTS: 500% profit. "Happy Home Maker Shampoo" builds your own big business. Martin of Indiana made \$75.00 in one day. Missouri man made \$750.00 one month. Exclusive territory. Geo. A. Schmidt & Co., 235 W. North Ave., Chicago.

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

SELL Shirts and Overalls direct to wearer. Big profits. Work full or spare time. No experience required. Big variety dress shirts with splendid line Union-made work and flannel shirts, overalls, coveralls and khaki pants. Write today for free selling outfit. The Nimrod Shirt Co., Dept. 8, 4712 N. Kedzie Ave., Chicago.

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

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

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

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

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

AGENTS—Send for free sample "Pretzel"—washday wonder. You can clear at least \$20 to \$100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory. Credit given. Empire Specialties Co., 1549 N. Wells, Dept. 101, Chicago.

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

AGENTS: Big Profits. Best and cheapest window letters made. Easily applied. Discs bring five samples. Particulars free. Stalbright Co., 1115 Second Ave., New York.

WONDERFUL! Startling! Amazing! Our Ex-Cel Luminous Crucifix and Magical (Luminous) Necklace shine brilliantly in the dark. Sell on first demonstration. Big profits to you. Write for further particulars, or better still, send for sample and territory protection immediately. Crucifix \$1.50, Necklace \$1.00, postpaid. W. G. Hannan Co., Dept. B, 57 E. 18th St., Chicago.

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

INSTANT Weld. Repairs largest punctures without cement or heat. Lenn's profit one day. \$26. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T, Minneapolis, Minn.

EARN \$10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Decle Laboratories, 1133 Broadway, New York.

AGENTS sell Wolverine Laundry Soap. Wonderful repeater and good profit maker. Free Auto to hustlers. Wolverine Soap Co., Dept. B27, Grand Rapids, Mich.

EVERYBODY uses extracts. Sell Duo Double Strength Extracts. Complete line household necessities. Big repeaters. Write today. Duo Co., Dept. E1, Attica, N. Y.

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

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

MAKE \$17 daily—Finest Extracts, Food Products, Toilet Preparations, Household Necessities. Credit: Sample Case Free. Write for amazing offer. Perkins Products, B-6, Hastings, Nebr.

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

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

HIGH GRADE SALESMEN WANTED

COULD You Sell a \$40.00 Suit for \$21.50? You don't have to have experience in selling clothes or any other selling experience, for that matter. We'll give you a powerful, impressive selling outfit and careful and complete instructions. We'll train you in a way that will assure you earnings of \$75.00 to \$150.00 a week or more right from the start, provided you're honest, thoroughly dependable and willing to work hard. We're an old established house of unquestioned reliability. We're particular about the men we take. If you too are particular about the house you work for, let us hear from you and tell us all about yourself. Address Dept. 424, William C. Bartlett, Inc., 350 West Adams Street, Chicago.

SALESMEN—A quick selling news service for retail stores. Liberal commissions; free selling outfit; future for right man. Illustrated Current News, New Haven, Conn.

TRAVELING Salesman—To carry complete line of luggage on commission basis only; no advance; monthly commission settlements; references required. Petersburg Trunk & Bag Co., Petersburg, Va.

DISTRIBUTORS—Tremendous Money Maker. Revolutionary Electric Soldering Iron. Operates from Dry Cells or Storage Battery. Solders Instantly. Complete Kit retails \$2.00 only. Rapid Fire Sales. Protected Territory. Write Regent Mfg., 16 Trinity Bldg., Boston, Mass.

RESIDENT Salesman Wanted—every Country. New remarkable plan. Rugs direct at Mill prices assures good income weekly. No investment. Write Malsley-Payne Mfg. Co., 29-5 Sudbury Street, Boston, Mass.

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

NEVEST Invention: Sells Every Office, home and store. Automatically takes slack and kinks out of cords on telephones, electric irons, Radio Receivers. \$25.00 Daily. Sample on approval if requested. Neverknot, Dept. 61, McClurg Bldg., Chicago.

GET into the tailoring business. It's one of the most profitable of all lines in the selling field—particularly when you are handling a good line of goods at a price that meets and beats competition. Our line does it. It offers an exceedingly fine line of men's tailored-to-measure clothes at a very attractive price, with a liberal profit to the salesman and a liberal cash bonus besides for good work. Bark of the line is a house of unquestioned reputation and responsibility, giving unequalled service and real co-operation to the salesman. We can use a few more good men this season, but they must be good. This does not necessarily mean that they must be experienced, but they must be honest, ambitious and willing to work hard to make the most of the opportunity we'll give them. If you know yourself to be such a man we'll be glad to hear from you and we know you'll be glad to hear from us when you get our reply, which you will promptly. When you write address Dept. 673, Goodwear Chicago, Inc., West Adams Street at Peoria, Chicago.

SALES Representative wanted for well-known specialty; prefer man experienced in selling mill superintendents and factory executives. Olmsted, 95 Commercial, Boston, Mass.

SELL advertising pencils. Big profits. Lauber Pencil Works, 740 Hodapp, Dayton, Ohio.

DISTRIBUTORS—Screw-holding Screw Driver, Handiest Tool ever invented. Unlimited Market. Exclusive Territories. Big repeat earnings! Write, Coburn Tool, 734 S. Boylston, Boston, Mass.

\$15.00 DAILY Easy. Sensation of 1925. It's new, just out. "Fixit" Rubber Repair for Tires and Tubes. Fastest seller, and biggest money maker in America. Act quick. Sample free. Marquette Rubber Co., 2323A Wolfram St., Chicago.

KENDALL Sealer and Moistener under new aggressive management. Returns \$2.00. No sales resistance. Quick, snappy sales in every office and many homes. Salesmen write quick for big money-making offer. New England System, Franklin, Mass.

VENDING machine salesmen, sensational new plan sells newly invented combination gum machines by hundreds; six machines in one; new slug-proof device; \$50 to \$250 weekly. Hurd, wholesale department, 681 Ridge building, Kansas City, Mo.

SALESMEN and District Managers to sell constantly used, repeating building specialties to factories, public institutions and building owners of all kinds. Products established over twelve years among thousands of largest users, including U. S. Government. Immediate big earnings and promotion with \$100,000.00 company to ambitious capable men. Write at once. The Colocraft Company, 925 W. 10th, Cleveland, Ohio.

AUTO Accessory Salesmen calling regularly on dealers and garages wanted to act as territorial distributors of De Luxe Ford Accessories. Unusual opportunity for right men. For further information write Bronzo Alumina Corporation, 212 Winchester Avenue, Buffalo, N. Y.

GOING West, East, North, South, Anywhere—"Kiy-Glare" will take you—man or woman—"Smiling Through"—Quick sales to every motorist; unusual profits. Sample 50c. Franklin Company, 1508 Kasota Bldg., Minneapolis.

I PAY men \$50 to \$100 a week to care for my business in their home territories. Amazing new kind of brush waves bobbed or long hair as it brushes. Millions of women and girls read my advertising in big national magazines and are eager to obtain this astonishing brush. Over 300,000 sold last year. 80% cash profit for you the minute order is taken. Write today for territory franchise. Wavex Company, Dept. 166, 319 So. Michigan Blvd., Chicago.

\$100.00 A WEEK profit permanent business of your own. County rights. No competition. Small investment. Sample free. Carlin Laboratories, Broadway Bldg., Milwaukee, Wis.

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

SALESMAN: If You Think in Terms of \$6,000 the First Year, Write Me. Strong line for retail stores. Nationally advertised. Established concern has unusual opportunity. Liberal weekly advance to product. Geo. R. Williams, 1922 Euclid Avenue, Cleveland, Ohio, Dept. 209.

LARGE old-time Tire Manufacturer wants high-grade salesmen and agents on commission basis to represent and sell one of the greatest lines of tires on the market today. Hundred of thousands in use. New plan enables you to build a business with income of from \$2,500.00 to \$10,000.00 a year, one of the greatest money-making opportunities ever offered by a well-rated, reliable company. Write quick before territory is assigned to some one else. Simplex Tire & Rubber Co., 2935 So. Michigan Ave., Dept. 6, Chicago, Ill.

NEW carbon remover, automatic—only two moving parts. Nothing like it. No liquids, powder or dope. Want high-grade men with cars. An eighteen-karat Knockout. Write By-Pass Valve Co., Plattsmouth, Nebr., U. S. A.

ARE You Old at Forty? See our advertisement on page 149 of this issue. The Electro Thermal Company, 2137 Main Street, Steubenville, Ohio.

SALESMEN—New specialty, just out; every merchant a prospect; \$35 daily possible. Write today. St. Louis Novelty Co., 1504 South Grand, St. Louis, Mo.

SALESMEN—Calling on grocers, butchers, drygoods, etc. Sell pricecards, posters. Commission 30%. State line, territory. Frank Johnson Co., 116 John St., New York City.

CRAM'S new paved road maps, handy inexpensive style for advertising and premiums, sell on sight. Full or sideline. Proposition and samples on request. George F. Cram Co., 111 North Market St., Chicago.

CALENDAR Salesmen Wanted—Experienced. High-grade exclusive copyrighted subjects. Protected territory. Liberal commissions paid promptly each week. Offermann Art Works, Buffalo, N. Y.

RESPONSIBLE representatives wanted for new marvelous Pocket Cigar Lighter. Sells on moment's demonstration to consumers and dealers. Big profits and exclusive territory rights. Send for particulars and selling plans. Enclose 50c stamps for sample. U. M. Masterlite Co., 110 East 23rd St., New York.

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SALESMEN: If you are making a cent less than \$100 weekly, you owe it to yourself and family to investigate this opportunity. U. C. A. salesmen earn \$300 to \$1,000 monthly. Basic improvements eliminate competition on our new product. Selling plans developed by thousand-dollar-a-month men double earnings of salesmen. To secure nationwide distribution of new line in shortest time, we offer ground-floor opportunity for those joining sales force now. Higher commission, special monthly bonus, exclusive territory. Write today for proof. Department D, U. C. A. Bldg., Los Angeles.

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

60 MILES on 1 Gallon. Wonderful Vapor Humidifier for autos. 1 free to introduce. Critchlow, B.J.121, Wheaton, Ill.

SALESMEN—A Salesboard That Takes the place of a slot machine. Something new. Write for particulars of this interesting and profitable business of operating and selling Salesboards. Square Hole Board Co., 129 Scherer Ave., Newark, N. J.

TAILORING Salesmen: Our guaranteed \$21.50 and \$31.50 all wool tailored to order suits are \$10 to \$20 cheaper than store prices. Commission in advance. Protected territory. Beautiful assortment 6 x 9 swatches free. Manager, Dept. 1059, 843 Adams, Chicago.

TAKE orders for shoes direct from manufacturer to wearer. Experience unnecessary. Full or part time. Mason Shoe Mfg. Co., 12th Ave., Chippewa Falls, Wis.

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SALESMEN to sell complete line of Advertising Thermometers; liberal commission. The Ohio Thermometer Company, 521 East Pleasant Street, Springfield, Ohio.

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WANTED—Tailoring Salesmen, make \$60 to \$125 per week. Biggest merchants in many towns have started with our line. We are the largest made-to-measure tailoring house in the country, furnishing elaborate sample equipments, including 500 all-wool fabrics. You make your own profits from \$8.00 to \$15.00 on each order. Guaranteed absolute satisfaction, perfect fit, best workmanship, or no sale. Write for line and all accessories to be sent free. Tell us all about yourself. Address N. O. Perry, Sales Manager, Box 483, Chicago, Ill.

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

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SALESMEN Can make \$5.00 a day selling our Calendars, Pencils, Signs, Advertising Novelties, Yardsticks, Whistles, etc. Liberal terms. Sells entire year. Fine side line. Local and traveling agents. Model Calendar Co., Dept. 225, South Bend, Ind.

WERE You Ever Offered a Grocery Store? Our proposition is better. You can handle flour, canned goods, dried fruit, coffee and entire line of groceries as well as radio sets, paints, roofing and automobile oils and tires with no rent to pay; no money invested, take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 226, Chicago, Ill. Reference: Any bank or Express company.

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TRAVELING Salesmen calling on retail stores wanted by large manufacturer to sell unique line of business-boosting articles. Year round, fast selling, main or side line. If not earning \$150 weekly, address Elvaser Works, 222 Charles St., Boonville, N. Y.

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ABSOLUTELY no competition selling Val-Style millinery. Live wires earn \$50 to \$150 a week. Write for liberal offer and exclusive territory. Val-Style Hat Co., 767 Val-Style Building, Cincinnati, Ohio.

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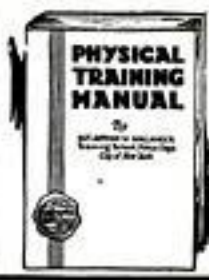
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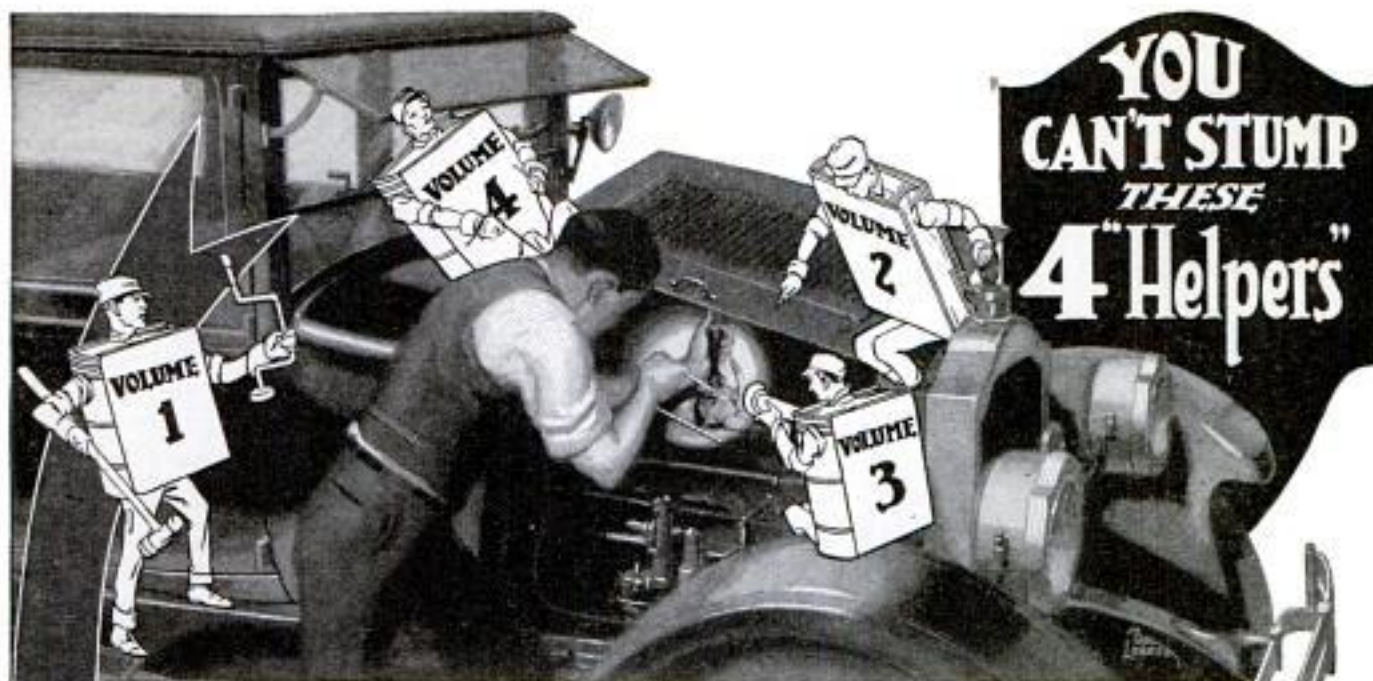
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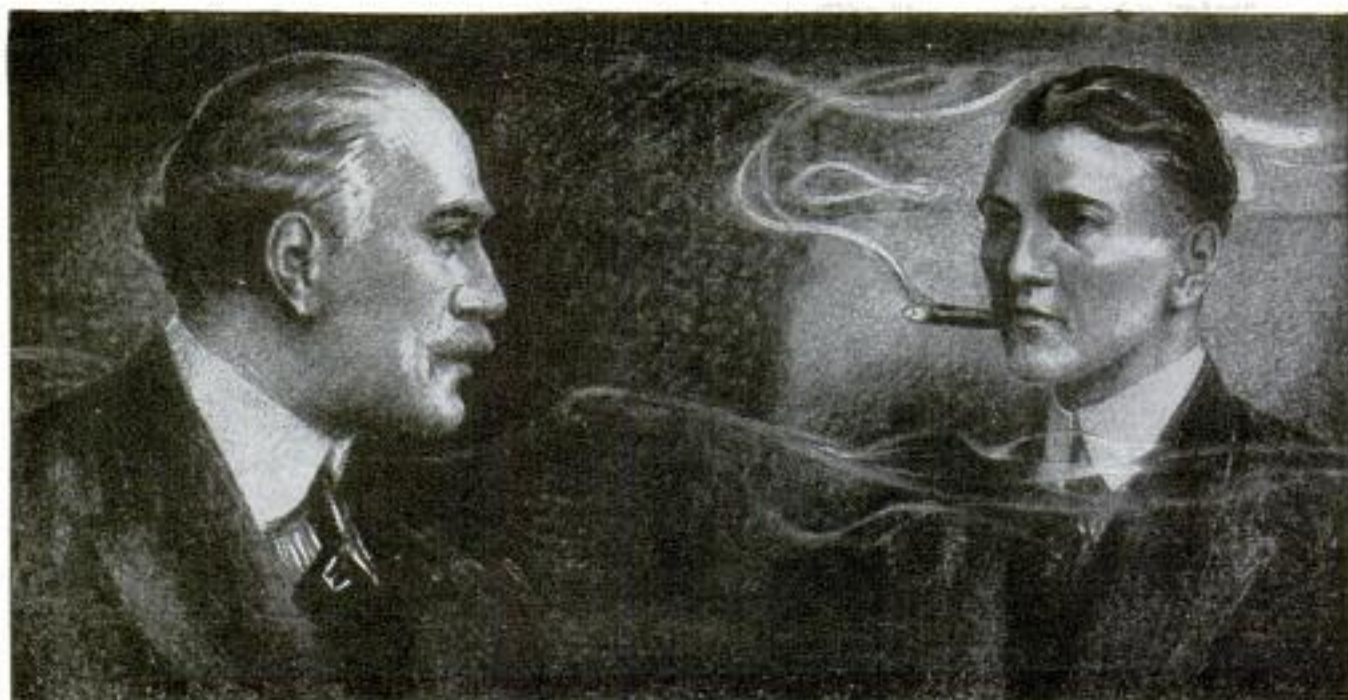
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Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, depose and say that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 462, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 500 East Ontario St., Chicago, Ill. Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Managing Editor, L. H. Weber, 200 East Ontario St., Chicago, Ill. Business Manager, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Second. That the owners are: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.) L. H. Weber, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill.; First Trust and Savings Bank, Trustee for H. H. Windsor, Jr., Chicago, Ill.; Lina B. Windsor and Henry H. Windsor, Jr., Executors of the Estate of Henry H. Windsor, deceased, Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINDSOR, Jr., Editor and Business Manager. Sworn to and subscribed before me this 29th day of March, 1925. J. GRAHAM, Notary Public. (My commission expires June 17, 1925.)



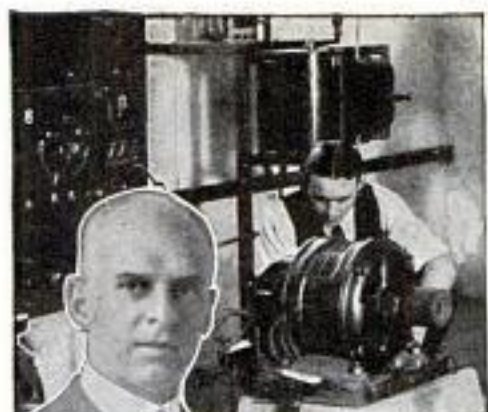
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Be a Trained Man—Successful!

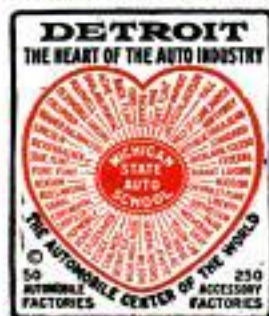
Fellows just like you step out and make great successes. Trained men are wanted all the time—everywhere! More than 17,000,000 autos need service and repairing. Millions of tires and batteries to be kept in commission. More men needed for good jobs. More garages—more electric service stations—more tire-repair shops—welding shops—battery stations needed. This means amazing opportunities for the men who start now. Fit yourself to win a good job, or to start a business of your own. Very small capital is needed. You are right at the door of big money if you decide now to make this your business.

LEARN AUTOS, TRUCKS AND TRACTORS IN THE HEART OF THE INDUSTRY

Without any previous experience—just a liking for mechanics—you can learn the auto business from A to Z in a few weeks here in Detroit—the heart of the industry. Then step out, equipped with knowledge and training, to a future of certain, big money making. You have big advantages, learning the business here. It's the fountain head of the auto business. You are taught under factory endorsed methods. You learn both theory and practice on latest equipment. Go through the great Ford plants. Visit the other auto factories—learn their methods first hand. The Michigan State Automobile School, in Detroit, the auto center, is the logical place to learn the auto business.

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A thorough training in Detroit, at the "Michigan State," fattens your pay envelope if you are working for others, or puts more profit in business for yourself. **You can take a full Automotive Course in 12 weeks, or my big "Master Course" in 30 weeks.** Or specialize in any one of its money-making branches; you can be an Auto Electrician; a Tire Expert; a Battery Service Man; a Repair Man; a Welder; a Machinist; or Tractor Specialist. Free Course in Garage Management, Business Methods and Selling included. Classes are always open. Jump on the train for Detroit and get started now.



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"We do not know of a better automobile school than the MICHIGAN STATE."

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The demand for trained men is greater than the supply. Look into any garage—everybody is busy as bees, have more work than they can do. Men working overtime, all at extra pay. That means big money for repairmen and boss. These money-making opportunities can be yours, too, with "Michigan State" training. The years ahead are predicted to be the **biggest years of the industry**. That means certain money-making advantages to men who start in the business **now**.

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This is the new Oakland Six with four-wheel brakes, one of the many fine cars that are here for you to practice on. Here you learn on up-to-date, new equipment. All types of cars, engines, axles, transmissions, electrical systems. Other new cars and engines in our equipment are the new Packard Straight Eight with four-wheel brakes, Packard Twin Six, new Buick with four-wheel brakes, Cadillac Eight, Hupmobile, Reo, Oldsmobile, G. M. C. truck, Hudson, Overland, and many others.



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You can start your course here any day. **Jump on the train for Detroit now.** If you can't come at once you can begin to learn at home by my new Home Study Method. Then come here later to finish. No extra charge for the Home Study Training. Write me for full information. Or use the coupon. This is your opportunity to get ahead. Act now. A. G. ZELLEN, President.

(We do not enroll colored students, except for our Home Study Course)

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We help you get part time work to help pay expenses while in School. Or work days and take our evening course; many do this. It starts them to success. Ask for details, and explain your circumstances fully. We are here to **help you succeed.**

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Get all the interesting facts. Send for information, illustrated with photos of school equipment, and letters from graduates. It tells you how you can get a good paying job—how you can go into business for yourself with little capital. Mail the coupon or send us a postcard today. Write now.

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Send me FREE and without obligation complete information about Detroit-training to make the most money.

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ALL of the Chemistry, Pharmacy and other books listed below were written and prepared by well-known authorities in this field and are used by leading colleges and technical schools throughout the country. They contain much material that is not available in any other form — anywhere. They are complete, authoritative, profusely illustrated, yet surprisingly low in price. Studied faithfully, there is no doubt that they will help you to gain a greater mastery of your work and secure a better position and a larger salary.

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Complete training includes receiving and sending at speed of 30 to 40 words a minute; and all other duties of big-pay jobs. R. R. course includes train operation, block signal, etc. Radio course prepares for land or sea operator's position. Telegraphy the stepping stone to base-job and enormous salaries.

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JOBS FOR MY GRADUATES

Free employment service finds positions when you finish. Write immediately for my special offers, free book and easy terms. Dept. 801.

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\$3,000 to \$10,000 a year. How to build, repair, install, sell radios now, quickly learned. Simple, easy home-study plan, 1000-mile set free with course. Low cost, easy terms. Send now for free big book on radio opportunities.

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ALL METAL ADJUSTABLE PANTOGRAPH

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One of our Iowa students started in a very small way—now doing over \$30,000 a year. Another in Wisconsin, over \$10,000 the first year. Day or night classes. Call or write for FREE BOOK

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FREE TRIAL For Men and Women AT HOME



Try Violet Rays

for your ailment. It is the latest achievement in the field of medicine for HEALTH, BEAUTY and VITALITY.

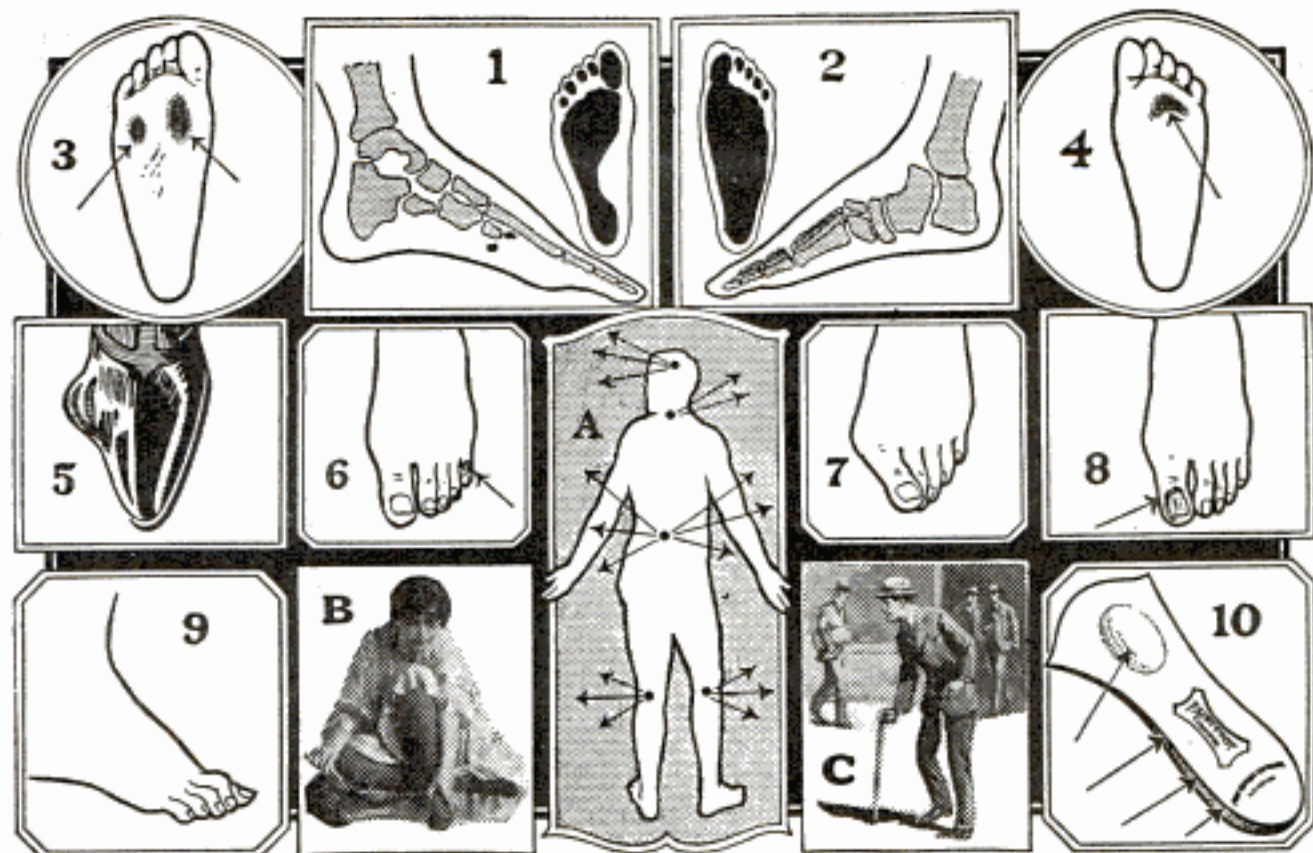
Thousands are being benefited by the use of VIOLET RAYS in Homes, Doctors' offices and Hospitals. High grade Beauty Specialists are also using Violet Rays to improve scalp and skin.

Violet Rays work quickly—without the use of medicines. Save doctor bills—write for illustrated FREE book showing ailments successfully treated with Violet Rays, testimonials from Physicians and satisfied users and get details of our FREE TRIAL Offer.

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Why Foot Pains Go in 5 Minutes

Five minutes is now the time limit for foot and leg pains. Reports from people who were chronic sufferers tell of practically instant relief from all sorts of foot troubles, also relief from leg and back pains and headaches, caused by feet out of order. A wonderful new, scientific invention, known as Fairyfoot Cushions, has brought astounding, sensational results. The amazing reports seem almost incredible, but a very special offer enables you to prove without a penny's risk that this great invention will do the same for you.

What Ails Your Feet

Twenty-six bones form the arch of the foot. Even one of these bones getting out of place puts abnormal strain and pressure on the muscles and nerves—the pains appear.

It is displacement of these bones by the weight of the body, too much standing or ill-fitting shoes that causes "flat foot." The weight of the body is thrown out of balance and the foot is often crowded down into the shoe, causing bunions, corns, calluses, ingrowing toenails, hammer toe, or Morton's toe, and the shoes become misshapen and run over at the heel.

Then you have agonizing pains in the feet and often leg pains, backache, headache, "rheumatism" and nervousness. Let the arch drop over so little and trouble starts. You can't always see that your foot is flat—it may look all right—but the merciless pains tell you that something has gone wrong.

How Fairyfoot Cushions "Position" the Feet

These wonderful Cushions (highly recommended by orthopedists and physicians) bring relief by "positioning" the feet. They

point the toes straight ahead, causing the arches to take their natural position. They also direct the body's weight to the ball, heel and outer part of the foot, where Nature intends it to be. Every bone and muscle is put just where it belongs.

Fairyfoot Cushions are very flexible, and while positioning the foot normally, gently massage and exercise the muscles which have become soft and flabby and give them strength to support the readjusted arch.

Stiff metal devices can't give this kind of pressure and strengthening exercise. They act merely as supports and actually allow the muscles to become weaker. They usually have to be fitted and adjusted by experts. They are heavy and clumsy. Pads and bandages are mere makeshifts.

You don't have to adjust Fairyfoot Cushions, and they weigh less than an ounce. Fairyfoot Cushions are made in 50 different sizes to fit the daintiest slipper or heavy shoe—no costly made-to-order appliances to pay for.

Your feet also regain their correct shape. The instep, the heel, the toes all stay in their proper positions. Your shoes keep their shape, your suffering has vanished. Results are immediate. Guaranteed in five minutes.

Heed the Danger Signals

Any pain in your feet, legs or back means most likely that something is wrong with your feet—something that needs attention right away. Don't assume that these pains will "cure themselves." Even a few slight twinges may point to a condition that will mean serious trouble later on. Fairyfoot Cushions will correct the cause of the trouble and then the pain must go.

Proved by Thousands

Letters like these, from former foot sufferers, show what Fairyfoot Cushions will do. "I had to hobble on a cane. With Fairyfoot Cushions I walk perfectly."

"Had a bad case of fallen arch. Fairyfoot Cushions have completely corrected it."

"Leg and back pains all gone now, thanks to Fairyfoot Cushions."

"Bunion and Morton's toe have gone, also my pains and nervousness. Fairyfoot Cushions did it."

"The first real relief I have had from foot pains in 10 years."



How to Order

Place stockinged foot on piece of paper and trace outline of foot with pencil held vertically, as shown above. Send this and also write size and width of shoe in coupon.

Send No Money

So sound are the scientific principles on which Fairyfoot Cushions are made, so remarkable have been the results obtained in "hopeless" cases, that we gladly send them on free trial.

The regular price is \$3.00, but for a limited time we offer Fairyfoot Cushions for only \$1.50. Pay only when postman brings them. Or you can send money in advance if you wish. Either way. Make the 5-minute test—see how quickly the pains go. Then wear them 30 days and if not satisfied return them and we refund your money. Send coupon today.

FOOT REMEDY CO.
22nd Street and Millard Avenue
Dept. 27 Chicago

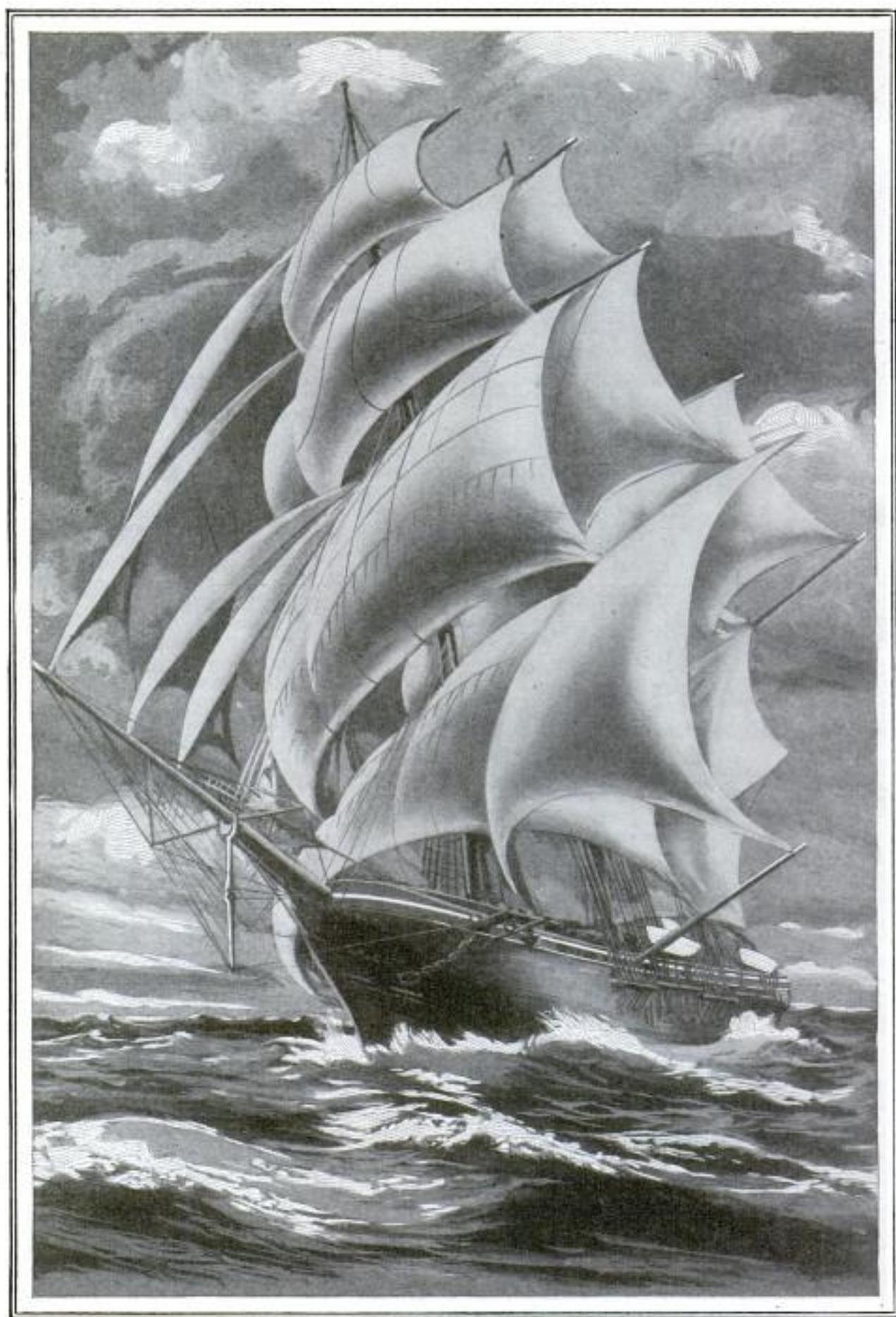
Enclosed is outline of my foot. Send me the Fairyfoot Cushions. I will pay special price, \$1.50 plus small postage charge, on arrival, and will make the 5-minute test. Am also to have privilege of wearing them 30 days at your risk. If I am not satisfied, I will return the Cushions and you will refund my money.

Name.....

Address.....

Size Shoe..... Width.....

State Man or Woman.....



Gone Is the Full-Rigged Ship "Running Down the Easting" with All Sail Set, Driven from the Sea by the March of Steam, Whose Belching Funnels Are Giving Way to the Smokeless Motorship—See Page 956

2707 Williams Service, 32 Union Square, East, New York City.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 43

JUNE, 1925

No. 6



When Radio Turns Doctor

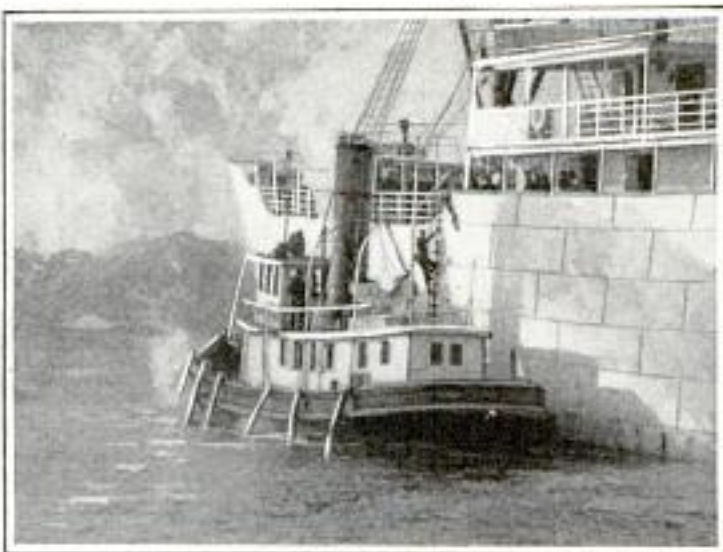
Public-Health Service Ambulances, Summoned by Radio, Meet Incoming Ships to Take Off Sick Seamen Who Need Hospital Care

AROUND a table in the offices of Marine hospital No. 70, down by the waterfront in New York city, a half dozen doctors sit. They are diagnosing the case of a patient who may die within a few hours unless they solve his symptoms and provide the proper treatment. Yet they have not seen their patient who is 600 miles or so away in the sick bay of an ocean freighter. With all his symptoms and complaints he is represented at the medical conference by a small sheet of white paper lying on the conference table—a radio message from the captain of his ship. With

only that to go by, the half dozen doctors—commissioned officers of the United States public health service—analyze the case and send directions winging back through the air to the ship more than half a thousand miles away. In the usual course, a few days later, a laconic message, "Patient well; thanks," and the skipper's signature will come back.

Last year, the following message ticked in from the freighter "Casey," somewhere on the Atlantic ocean.

"Request consultation as to advisability of extraction of infected tooth. Maranzas." A sailor had the toothache, and



Public-Health Physician Boarding a Ship via the Jacob's Ladder at Quarantine

2707



Radio Officer on the "Leviathan," Which Has Given Wireless Medical Service to Many Ships

Leidy and Hislop diagnosed the ailment as ptomaine poisoning. For two days the men of the freighter were treated by radio instruction. Then this message came back to the "America": "Your directions followed. All but six now on duty. They are recovering fast. Thanks and God bless you. Bon voyage."

At another time another freighter called to the "America," stating that a member of its crew was in dreadful agony. The doctor then aboard the "America" studied the case by means of the scant data supplied, and then prescribed by radio. The following day a message was received from

Captain Maranzes had a pair of forceps. In the old days he would have used them and the sailor would have suffered the consequences, if any. But with the radio available, the captain called in professional assistance and after the exchange of several messages regarding symptoms, the following advice was sent through the air.

"Do not extract. Apply continuous hot compresses to cheek. Give five grains aspirin every four hours. Give patient a dose of salts immediately. Wash out mouth every hour with alkaline antiseptic. If no alkaline antiseptic, use a teaspoonful of salt to a glass of warm water. Take temperature and pulse every four hours. Keep us informed of condition."

"Patient shows signs of tetanus, lock-jaw; blood discharge very light color; one-quarter grain of morphine no effect," was the next message from the ship.

"Continue treatment previously recommended. Have patience," was the reassuring reply. The captain did, and the following day closed the case with a brief message saying:

"Patient greatly improved. Thanks for services rendered."

Once the U. S. liner "America" picked up a stray message from a lone freighter stating that nineteen members of its crew were suffering from a painful malady. Only the vaguest details were forthcoming, as would be expected from laymen. The vessels at the time were some 300 miles apart—obviously a case of long-range diagnosis. Putting their heads together and working on the meager details, Drs. C. F.

an Italian steamer some 300 miles away in an entirely different direction saying, "Many thanks to S. S. 'America.' We had sick member of crew suffering from similar ailment. Prescribed same as directed for other steamer. Our patient recovering. God bless you." So, what was intended for a specific case also came in handy for another. In this particular instance the radio medical service of the "America" had been truly broadcast.

More than one operation has been performed successfully by a ship's crew, working under the direction of a surgeon many miles away. In some instances the surgical instruments have been of an improvised nature—kitchen knives, ordinary scissors, pieces of wood, and so on—but always quite in keeping with the lay hands that wielded them. Surgical cases, such as acute appendicitis, must be caught in the nick of time lest they prove fatal. In their incipiency, lay methods will work greater wonders than the efforts of the foremost surgeons when the case has advanced to the fatal stage. Hence radio operations have been the means of saving many a life which would otherwise have had to be forfeited for lack of early surgical care.

To aid the radio work, a standardized medicine kit has been developed, and legislation is being sought to compel every American merchant ship which does not carry a physician to provide one of the standard outfits. By having the same medicines and instruments on every ship, the radio treatment of cases will be greatly

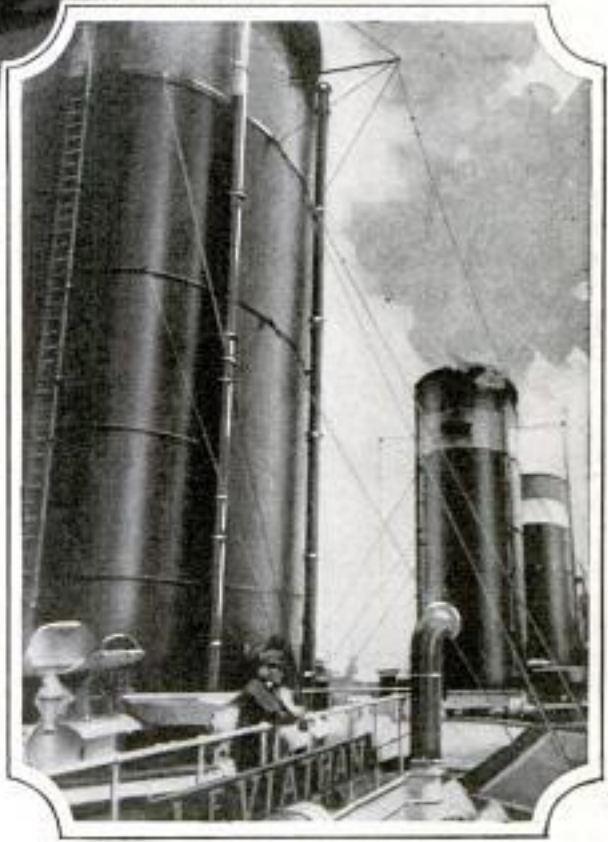


Radio Office Ashore, Where Hospital Messages Are Handled, and, Right, the Ship's Aerials

simplified, since the doctors can fit the treatment to the medicines and instruments which they will know the ship's captain has.

Merchant-marine officers also are being required to take short courses in simple first-aid treatment, and are learning something of medical terminology. One ship's captain, advised by wireless to give a patient a "tepid sponge," radioed back and wanted to know what that was. In reply the doctors translated it into a "lukewarm bath," and ever since the word "lukewarm" has replaced "tepid" in treating radio cases.

The radio medical service had its beginning four years ago in an idea of Captain Huntington's, chief of the medical and first-aid course for seamen at the seamen's church institute, New York city. The service expanded rapidly and soon enlisted the active aid of the public health service and the Radio corporation of America. Wireless doctoring and the treatment of sailors ashore is only a small part of the work of the public health service. It handles the

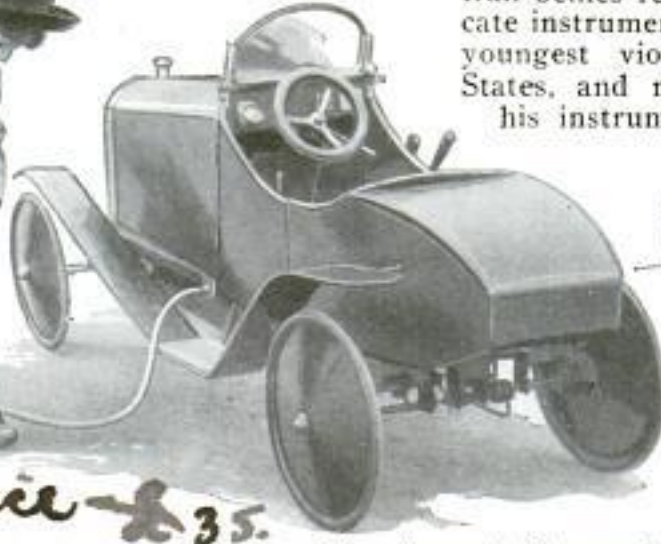


inspection of sailors and passengers at quarantine, the examination of immigrants at Ellis island and fumigation of ships, and is the agency which guards against interstate spread of epidemics.

New York Times 2/21/25

W. G. P. Model Engineering Co. 2944 Central High School

Southfields, London, S.W. 8
Southfields, England, Eng



Price \$35.

© Henry Miller
When His Car Is Out of "Fuel," This Young Driver Charges the Compressed-Air Tank with a Foot Pump and Drives On

CHILD'S AUTO IS DRIVEN BY AIR AT FIVE MILES AN HOUR

Driven by a compressed-air cylinder that may be recharged with a bicycle foot pump, a motor car for children develops a speed of five miles an hour and will run a quarter of a mile on one "filling." Steering wheel, windshield, running board, brake levers, and other parts, are modeled closely after those of a real motor vehicle, and the body is built on roadster lines of a late pattern. The car is the work of a British inventor.

SCHOOLBOY AS VIOLIN MAKER RIVALS FAMOUS MASTERS

Knowledge in woodworking that he gained in the high-school shops has been turned to good account by Edward Davis, seventeen years old, of Washington, D. C., who has fashioned four instruments, two of which he has sold for \$1,000 each. He started his enterprise as the result of a schoolmate's challenge that he could not make a fiddle that would play. Undiscouraged by the fact that some of the unusual tools required in making the seventy-three different parts and pieces of a violin could not be obtained in Washington, the boy made the implements he needed. Among these was a plane half an inch long with a blade less than a quarter of an inch wide. The backs of the instruments are made from Tyrolean maple and

the fronts from spruce. Scooping out the frail bellies required great skill with delicate instruments. Davis is said to be the youngest violin maker in the United States, and musicians who have tested his instruments declare that they are fully comparable with those made by experts.

2995 DECAY KILLS MORE WOOD THAN FIRE

Decay of wood in the United States causes an annual loss equivalent to 3,696,137,000 cubic feet of standing timber, or 16.5 per cent of the total quantity removed from the nation's forests each year, according to Dr. Reginald H. Colley of the bureau of plant industry. Fungi, attacking ties, poles, pulpwood and other forest products and rotting millions of feet of standing timber, are the most important agents of destruction, not excepting fires, floods, and insects, he declares. Better methods of preservation, he believes, would save 1,726,774,000 cubic feet of timber yearly, or about thirty per cent of the new wood grown each year, so that, by stopping all preventable decay, the same result would be attained as by increasing

the present new forest areas thirty per cent annually. Rot, it is estimated, claims 782,145,000 cubic feet of fuel, pulp, tanning, distillation and excelsior woods, and 2,913,992,000 cubic feet of lumber, ties, mining timbers, fence posts, furniture wood, and the like.



© National Photos
Young Davis in His Workshop, a Sample of a Finished Violin and Another in Process of Construction

A. P. Model Aero & Engineering Co.
Pioneer House, 185 Replingham Road,
Walthfields, London, S. W. 18, England.
e-B 35, carriagepaid in United Kingdom.
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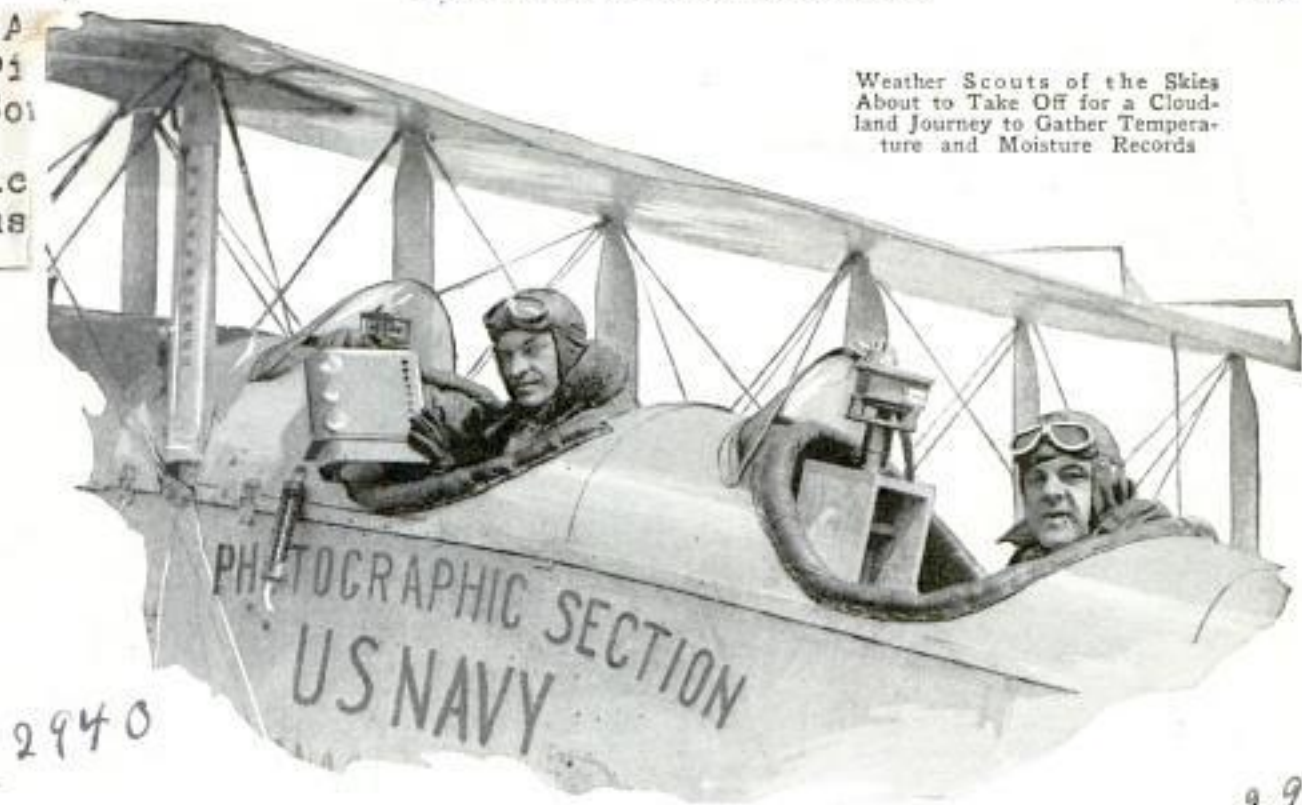
the G
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BUREAU O



D. A
Pi
Sol
Pric
Plus

Weather Scouts of the Skies
About to Take Off for a Cloud-
land Journey to Gather Tempera-
ture and Moisture Records



**WEATHER STUDIED IN AIRPLANE
—FOR GOVERNMENT REPORTS**

At the naval air station near Washington, observers circle at high altitudes in a specially equipped two-seater airplane to gather temperature and humidity records. They co-operate with the weather bureau in their reports. A conspicuous feature of the ship's apparatus is a large thermometer attached to one of the struts near the pilot. It will register a temperature of sixty degrees below zero.

2748

**CROSS-WORD PUZZLE INDICATOR
GUIDES FANS TO ANSWERS**

As a guide toward solutions for cross-word puzzles, an indicator with a series of movable alphabets can be used to aid the fan in forming proper letter arrangements before they are written in the squares. By making up test words on the device, various combinations of letters can be tried out, saving erasures and changes on the puzzle chart. The indicator, which can be carried in the pocket, does not require a pencil for marking and its construction permits as ready operation as a small adding machine.



Cross-Word "Finder" by Which Letter Groups May Be Tried before Marking on Puzzle

**MINER FIGHTS WITH CANNIBALS
WHILE SEEKING GOLD**

That adventure still lives in the South seas and that cannibals still are active in spite of the advance of civilization, is shown by reports of a battle a miner had not long ago with the "jungle devils" while seeking gold in the interior of New Guinea. Ignoring the advice of older residents, he had pushed far into the wilderness with only a few friendly natives. As the party was stumbling through the dense undergrowth at midday, the black leader screamed and went down with a spear thrown from ambush in his breast. His companions fled, leaving the white man to fight the unseen foe with his rifle. For more than ten hours, he battled the

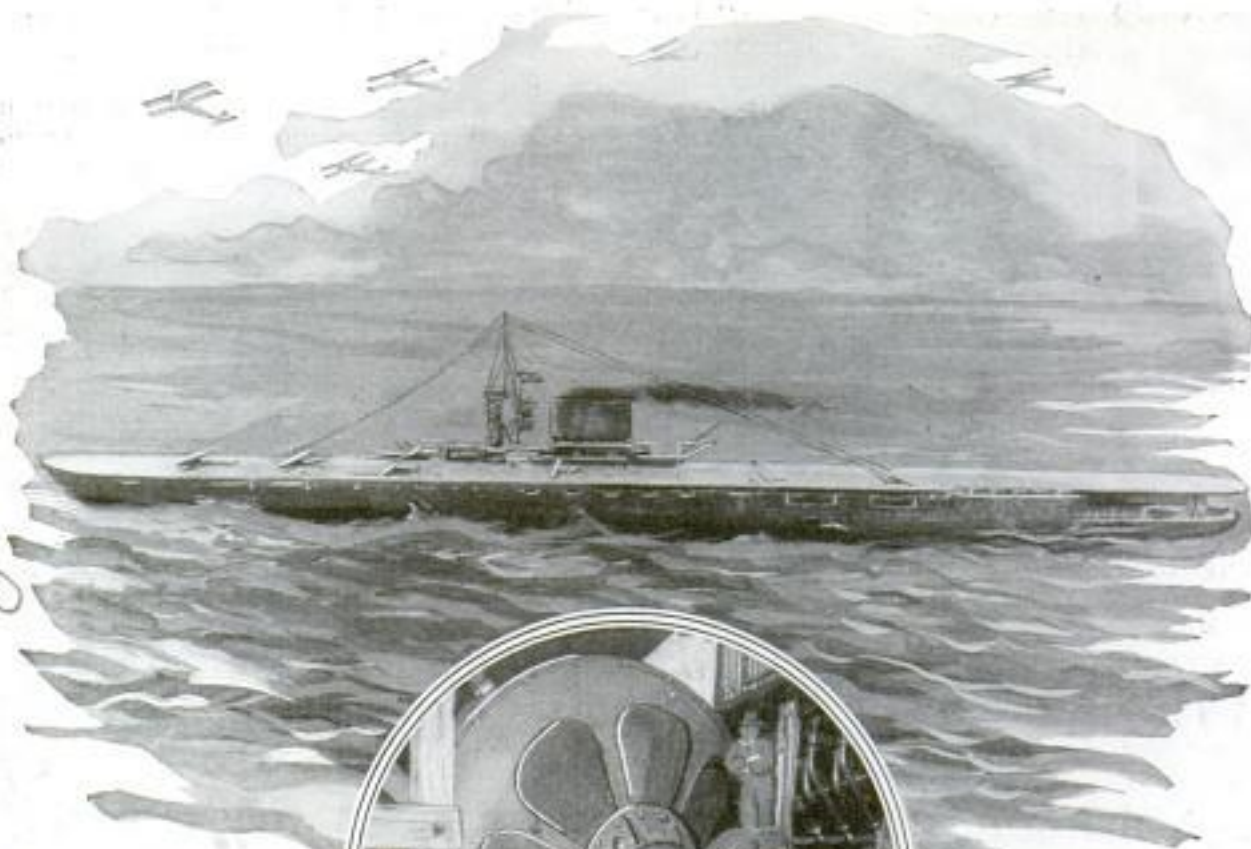
cannibals who remained hidden behind thick foliage. Darts from their blowguns and spears wounded him in the nose, back and leg. He was finally rescued by other white men who had learned of his danger from the fleeing natives. A few weeks before, the savages had attacked a small village, capturing a number of victims.

2987

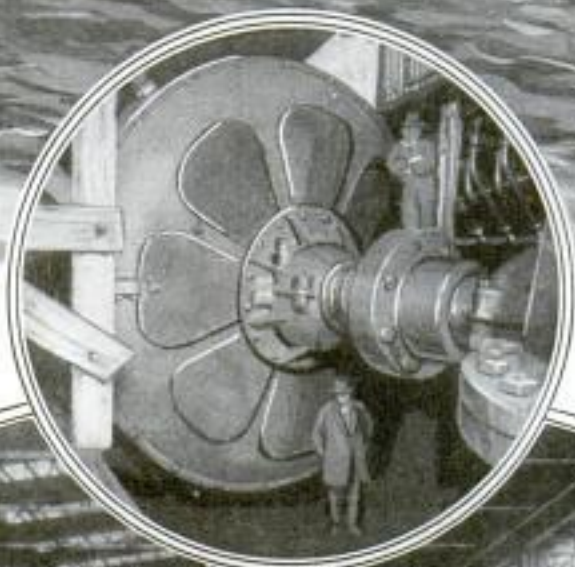
Francis Leitch, Esq. Box 1090, Vancouver, B.C. Canada

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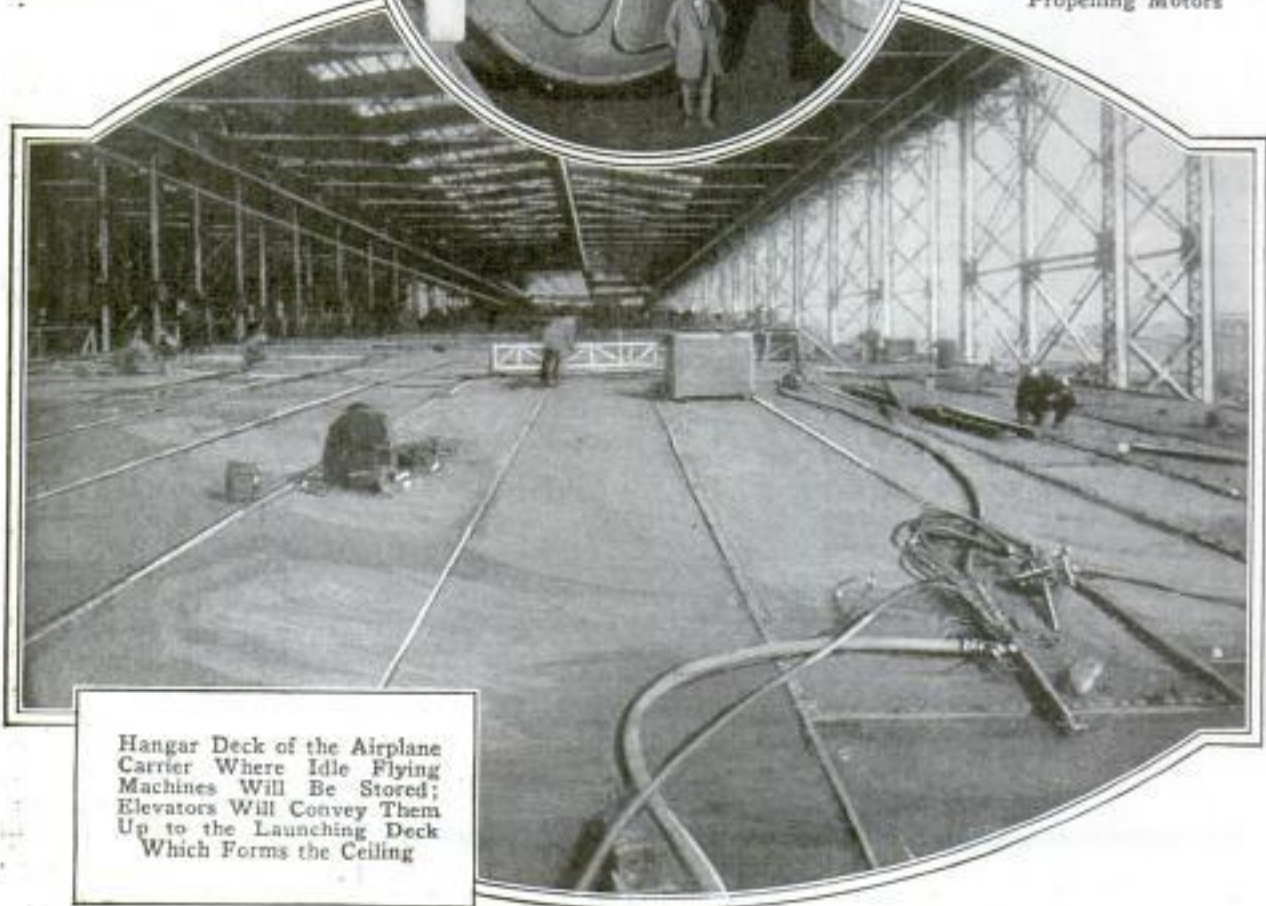
United Newsfeatures
461-8th Ave
New York



Drawing Above Shows the Low but Graceful Lines the "Saratoga" Will Present in Service, Despite Its Huge Weight and Length



Left, Comparison between the Size of Workmen and One of the Craft's Eight 22,000-Horsepower Electric Propelling Motors



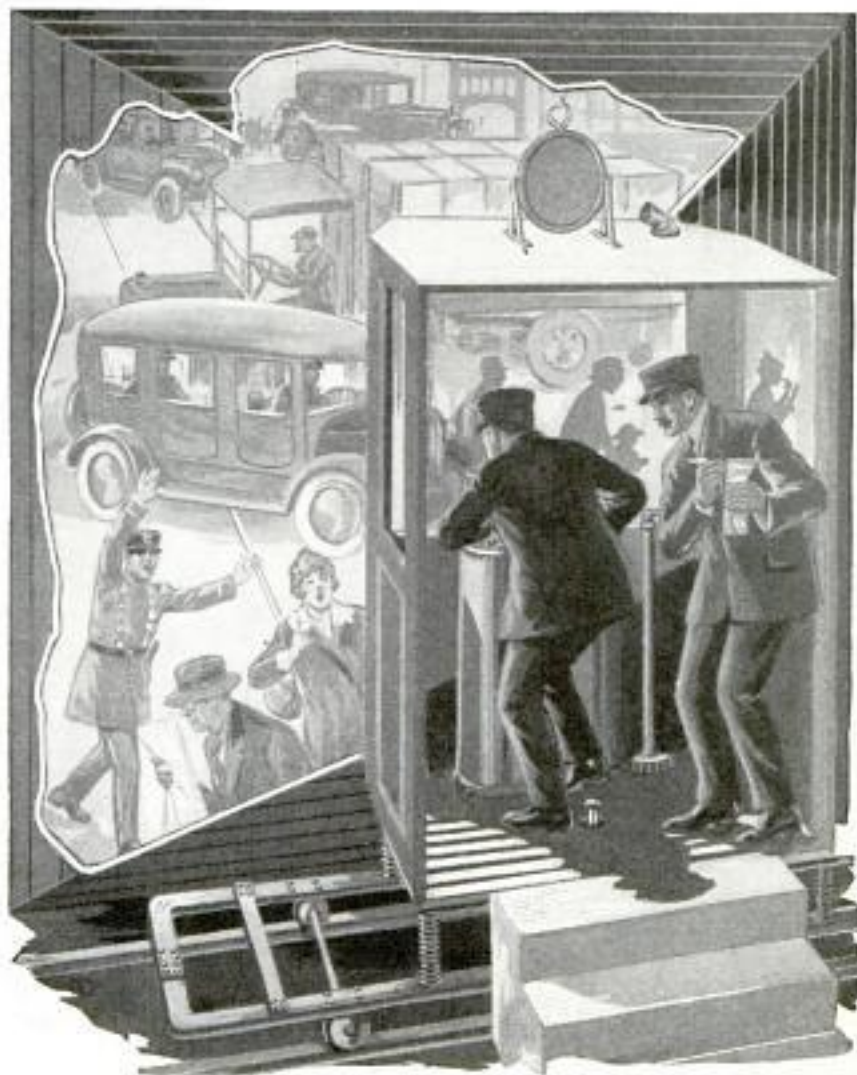
Hangar Deck of the Airplane Carrier Where Idle Flying Machines Will Be Stored; Elevators Will Convey Them Up to the Launching Deck Which Forms the Ceiling

POWER OF AIRPLANE CARRIER TO EQUAL ENERGY OF CITY

Propelled by giant electric engines generating a volume of power surpassing the energy of a city of almost 2,000,000 able-bodied men working continuously, the naval airplane carrier "Saratoga," now under construction, will be supplied with 180,000 horsepower to operate its vast equipment. Over its top will be a flying deck, 888 feet long and 105 feet wide, covering the craft from stem to stern, and forming the world's largest floating aviation field. Two huge elevators between decks will carry the machines from the storage space below to the landing platform where they can "hop off" as easily as on a ground track. Seventy-two airplanes will be "mothered" by the monster sea-going hangar, which will be capable of a speed of about forty miles an hour. To defend its cargo during combat, the vessel will carry a heavy equipment of high-powered guns. The main battery will consist of eight eight-inch rifles in four turrets built on an "island" on the starboard side, where mast, uptakes and superstructures will be placed to leave the flying deck free from obstruction. For the repair and upkeep of its quota of aircraft, the ship will be provided with ample facilities for performing practically every mechanical service and supplying all replacement parts necessary to the most up-to-date hangar. Hoisting apparatus will be available to take aboard and launch seaplanes not fitted for deck landing, and in capacious chambers below decks, tons of high-explosive bombs will be carried. Half of the aircraft will be made up of machines of heavy-duty types, but the "swarm" will include fighting, bombing, torpedo, scouting, and observation planes. Put to commercial use, the electric power could supply the city of Boston with all the current required for light, heat and power.

TRAFFIC-JAM MOVIES USED TO TEST MOTORMEN 2869

As a final test for the fitness of apprentice trolley motormen to successfully operate through busy thoroughfares, a



Movies of Congested Street Traffic Employed with an Imitation Street-Car Cab to Test Skill of Apprentice Motormen When Facing Emergencies

street-car system in France places the beginners on a platform, equipped to represent a car cab, facing a motion-picture screen on which reproductions of traffic are thrown. The reels are made from the front of a moving car while passing through crowded districts and include situations of risk that demand skill in the operation of a vehicle to be safely avoided. When the motorman takes his position in the imitation cab, the scene is stationary, but as he moves the controller to start, the film is set in motion. As the traffic conditions on the reels are mainly such as are met with in everyday running, the student is called upon to slow up, stop and apply the brakes in emergencies to demonstrate his alertness and ability.

La Science et La Vie
March, 1925

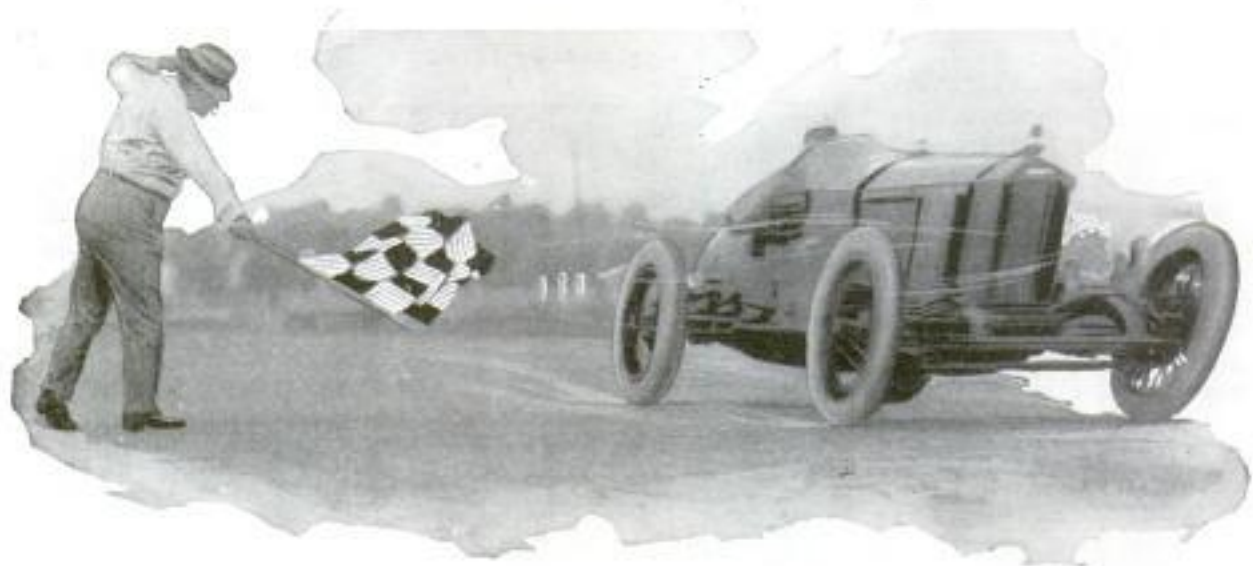
Cont. F. E. Duesenberg 309 S. Berendo St

POPULAR MECHANICS

Los Angeles, Calif.

888

21749



Burning 'Em Up on the Speedways

Testing Ground for Motor Ideas Shows What Next Year's Pleasure Car Will Feature and What It Will Discard

THE 122-cubic-inch racing car, weighing all of 1,400 pounds, and with an engine one-third smaller than that of a Ford, will make its farewell tour of American racing tracks this year, preparatory to being discarded for something even smaller. Next year's racers, with a cylinder capacity of 91.5 cubic inches, will turn a new page in the history of automobile development. When you divide a total cylinder capacity of 91.5 cubic inches among eight racing cylinders, the resulting bore is so small that it is not much larger than the diameter of the crankshaft.

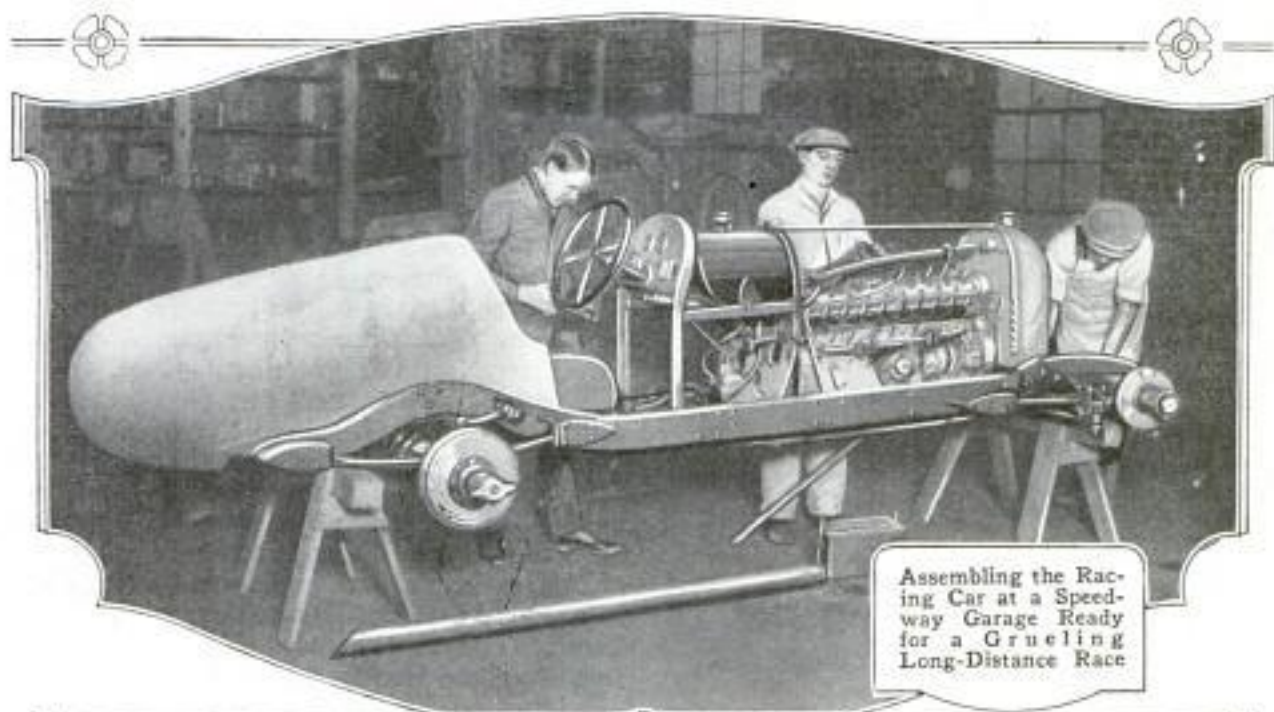
As usual the race track, laboratory of the pleasure car, is several years ahead of commercial automobile development. This year's racers, like those of

last year, will feature superchargers. The first pleasure car with a supercharger will not be on the market before late this year, or early next. Only the highest-priced cars will have it at first, but if the price of gasoline goes up, the cheaper cars will

come around to supercharging in time. Practically every major advance in pleasure automobiles, with the sole outstanding exception of the balloon tire, is a development of the race track. Build them and break them up, then rebuild them until they won't break, that has been the rule with the racing designers until the possibilities of any given size have been exhausted. Then they start work on another size. It is a far cry from the 600-cubic-inch class,



Fred E. Duesenberg



Drivers Lose Track of Time and Distance. So the Pit Crew Keeps Them Posted with Lap Numbers, Their Position, and Advice Now and Then about the Position of Rival Drivers, or Obstructions from Accidents on the Course



raced back in 1911 at the first Indianapolis 500-mile race, to the 122-cubic-inch single-seaters of this year, or the 91.5 one-passenger racers of next. Ray Harroun won that first Indianapolis classic in a big six-cylinder Marmon of 447.1 cubic inches' displacement, while Ralph DePalma, who came in sixth, piloted a Simplex with a 597.2-cubic-inch motor. Stripped for racing, his machine weighed 2,700 pounds, and in a pinch his motor would turn up to 2,000 revolutions per minute.

The Duesenberg which Joe Boyer drove to victory at Indianapolis last year weighed 1,400 pounds, had eight cylinders, a displacement of only 122 cubic inches, and the racing speed for his engine was around 5,000 revolutions per minute, with an even higher rate possible for short spurts.

Harroun's winning speed in 1911 was 74.59 miles an hour. Boyer drove the 500 miles at an average of 98.24 miles an hour.

Since that 1911 race, American and European builders have fought year after year for supremacy in design, and their developments, reached independently, have frequently arrived on both sides of the ocean at the same time. When Fred Duesenberg introduced the first eight-in-

line American racers at Indianapolis, in May 1920, three foreign cars were present with eight-in-a-row engines. A V-type eight, the year before, and DePalma's twin six, in the same season, had been the only cars to pass the six-cylinder size.

Two years after Duesenberg and the foreign designers introduced the eight, the old four-cylinder racer had practically disappeared. Out of the first ten cars finishing in 1922, nine were eights and one was a four, and it got ninth place.

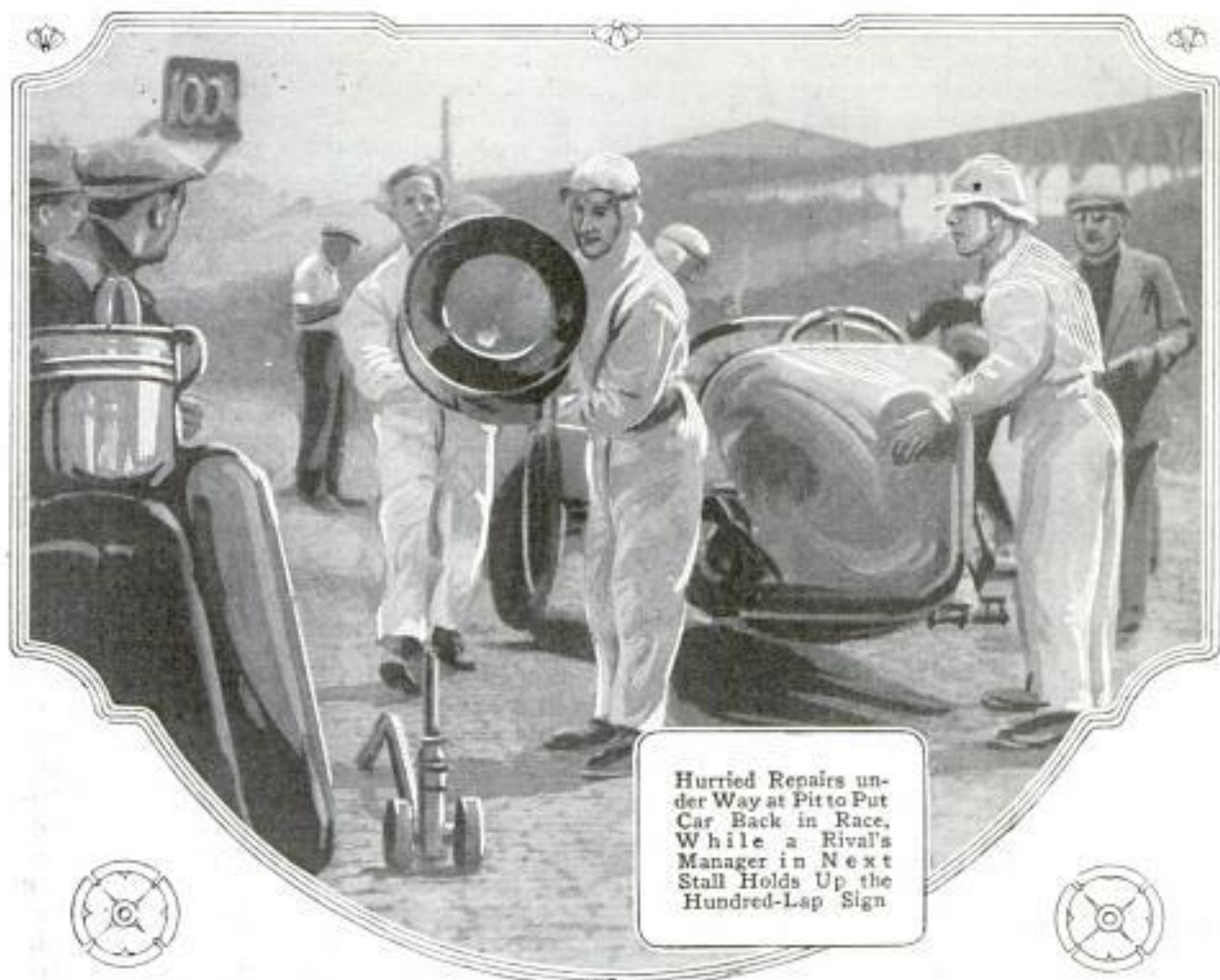
Three names stand out in American motor development since the first of the Indianapolis races—Duesenberg, Harry Miller and Louis Chevrolet. Miller has worked alone, while both the others have been assisted by their brothers.

Duesenberg's first eight-straight engine is a story of motor-car development in itself. The motor owes its birth to the fact that the racing-car builder had been ordered to Florida by his doctor in the winter of 1918. Having nothing else to do but be sick, he set to work in bed and developed the engine, had the patterns made and parts cast, and sent for the late Jimmy Murphy and George Dennis to take charge of the construction. The drawings were not completed until February, and two of the motors were racing at Indianapolis on May 30. He was the first to develop a supercharger for an American racing car, and worked out the

THE GROWTH OF SPEED

THE following table shows the progressive development of racing cars in the Indianapolis races, with the constant lowering of sizes, increase in cylinders, and increase in average speed of the winner:

600-CUBIC-INCH CLASS			
Year	No. of Cyl.	Cubic Inches	Avg. Speed
1911	6	447.1	74.59
1912	4	490.8	78.70
450-CUBIC-INCH CLASS			
1913	4	448.13	76.92
1914	4	380.2	82.47
300-CUBIC-INCH CLASS			
1915	4	274	89.84
1916	4	274	83.26
1919	4	274.6	88.06
183-CUBIC-INCH CLASS			
1920	4	182.5	88.50
1921	8	182.5	89.62
1922	8	181.44	94.48
122-CUBIC-INCH CLASS			
1923	8	122	90.95
1924	8	122	98.24



idea at church on a Sunday morning while listening to the organ play. The supercharger, Duesenberg says, is the biggest forthcoming improvement in the pleasure car. Before it is perfected, however, it will be necessary to produce a dependable source of power, with a steady speed, to turn the blower.

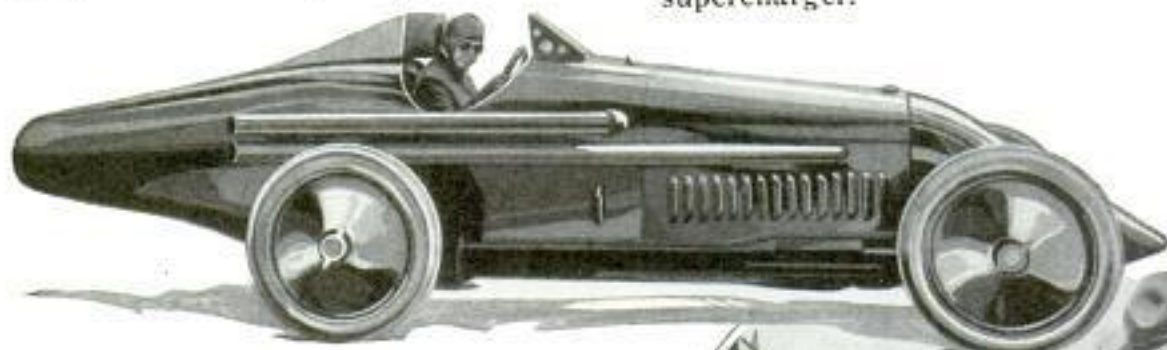
The supercharger is designed to maintain engine compression when the intake ports are opening and closing in minute fractions of a second, with the engine running, as in a racing car, at 5,000 revolutions per minute, or more. An engine with a compression ratio of six to one will give a gauge compression reading, say, of 95; but at 5,000 revolutions, this would drop to 68. The supercharger forces the mixture in under a pressure of about two and one-half atmospheres, just enough to keep the compression reading up to 95. It is nothing but a revolving cone-shaped turbo-wheel, which turns at such terrific speed that the gasoline fed into it flies apart into atoms.

Duesenberg is one of those accidents of the automobile field who rode into it mounted on a bicycle. Holder for fourteen years of the world's record for the unpaced two and three-mile distances on two wheels, he became interested in gasoline engines through the desire to have a motorcycle to pace him in exhibition races. No motorcycle made in those days could compete with "Dusey's" legs, so he set to

common in those days, while practically nothing was raced under the 450-cubic-inch size, but the Duesenbergs started off with three little 220-cubic-inch machines, and won a number of races. Next they turned to 350-cubic-inch four-cylinder racers, and cleaned up the 450-inch class. The cylinders were cast separately, so they provided an extra set of cylinders and pistons and overnight could turn the 350-inch cars into 300-inch motors. One day they would race in one class and the next day be out again in the other.

Racing cars so far below the standard classes of the day permitted them to do much of the pioneer work which led to the steady lowering of car sizes until the present 122-inch class was reached—and it is now going by the board for something still smaller, though as an official class it is but three years old. When Carl Fisher, head of the Indianapolis speedway, announced, after the 1919 race, that the 300-inch machines would be dropped, he gave as his reason that they were entirely too fast for the famous brick oval, built as a testing laboratory and not as a speed track. The winning speed that year was 88.06 miles an hour. Last year, with 122-inch cars, the winning speed was 98.24, and the cars were safer than the 300-inch class.

That increase of 10.18 miles an hour in five years is a tribute largely to the work of Duesenberg in developing the eight-cylinder car, four-wheel brakes and the supercharger.



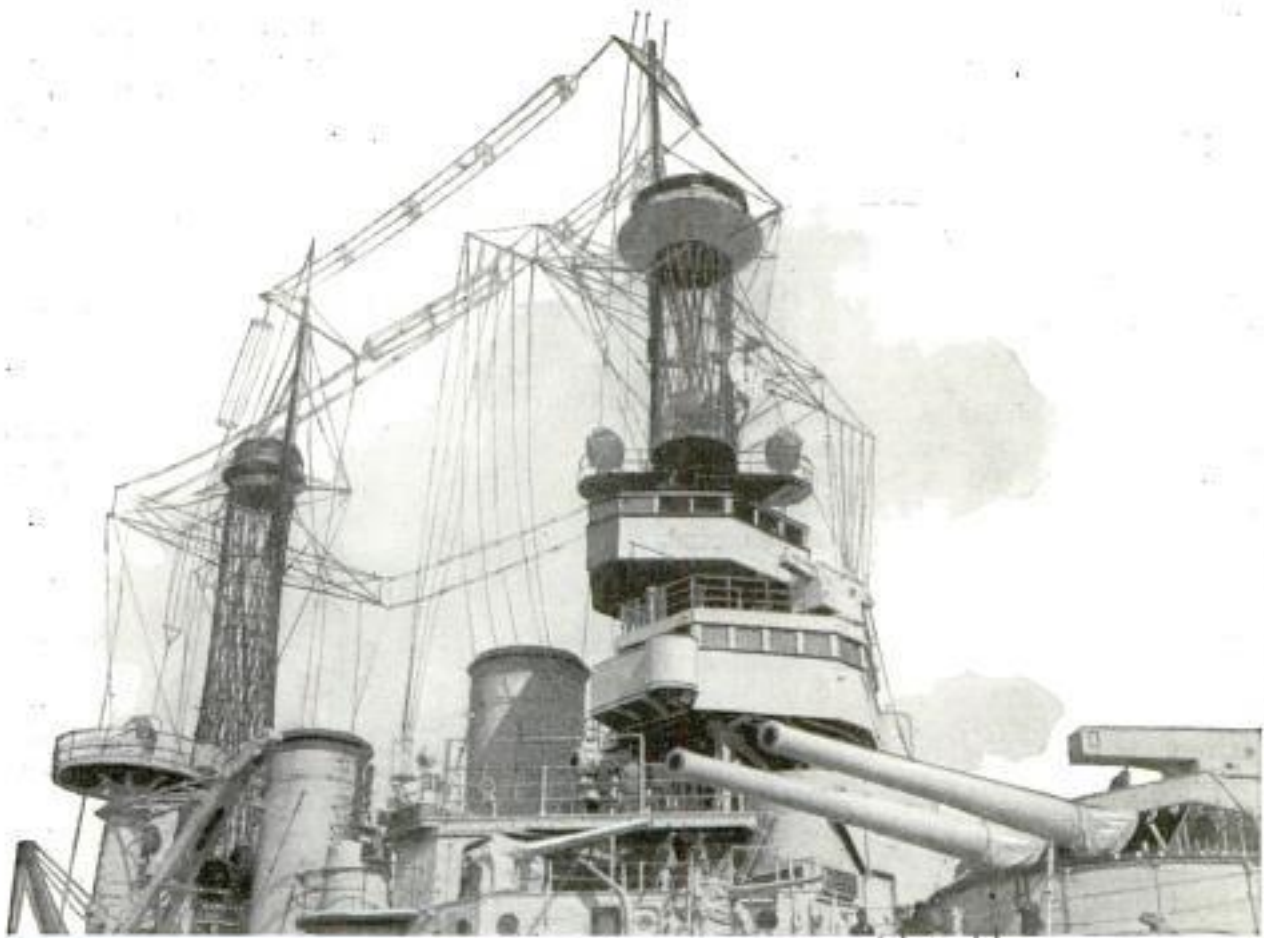
Tommy Milton Driving Sixteen-Cylinder Duesenberg at Daytona Beach the Day He Made 156 Miles an Hour, and, at Right, Electrical Timer Clocking Him

work and built himself a gasoline engine and mounted it on a bicycle.

He campaigned some of the earliest auto racers in the old stock-car days, finally ending up in a bad smash which left his shoulders too badly crippled ever to pilot a racer again. Then he turned to designing, and, with his brother August, began producing special racing jobs, and started his career as one of the best-known automobile designers in the world.

Six-hundred-cubic-inch classes were





Battleship "Arkansas" with Its Network of Radio Antennæ and Lead-Ins Strung between Masts; the Cage Type Predominates Because of Its Greater Efficiency in Small Space

2970
CAGE TYPE OF RADIO AERIALS SAVES BATTLESHIP SPACE

Radio antennæ of the cage or "sausage" type are more widely used on our battle-ships than other kinds, because they save space and generally have been found more efficient. A single ship may have several transmitting sets, evidenced by a network of aerial wires and lead-ins rigged between the masts. One antenna, usually the highest, is devoted exclusively to sending official code. The others are used for vessel-to-vessel communication.

3006
LEATHER KEPT FOR TEN YEARS

That leather of good quality kept for ten years, under ordinary conditions does not lose more than fifteen per cent of its strength, was shown by experiments of the bureau of standards. Belting stored in the laboratory for a decade was found to be only slightly weaker than new material of the same grade, indicating that articles made from it would be preserved for an indefinite period if subjected to normal atmosphere, ventilation and light, while dampness and sunlight appear to have a

harmful effect on the leather. It is believed the results of the studies will enable manufacturers of shoes, luggage and similar goods to alter shipping and storage practices, since such articles may be capable of many years of service even though they might not reach the user until one to three years after they are made.

2918
LEDGE ON BOTTLE NECK MAKES REMOVAL OF CAPS EASY

Metal caps can be pried off with a coin, knife blade or other flat article on a bottle that has a ledge around the neck just below the locking rim to afford leverage. The operation does not mutilate the top; hence it can be used again, and the danger of chipping the glass is eliminated, as is also the trouble of hunting for a bottle opener.



Dept. of Commerce Bulletin
 4/1/25

Alton, Ill.
Alton, Ill.

Cont. Jos. A. Coyle, 521 W. 14th Ave.
 Denver, Colo.
 POPULAR MECHANICS

2975

STEAM SHOT INTO OIL WELLS TO RENEW FLOW

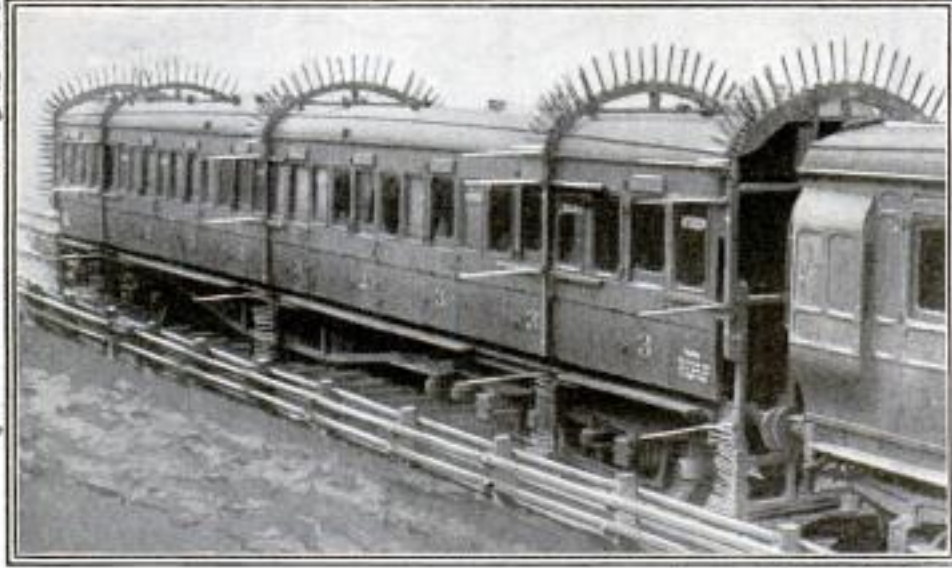
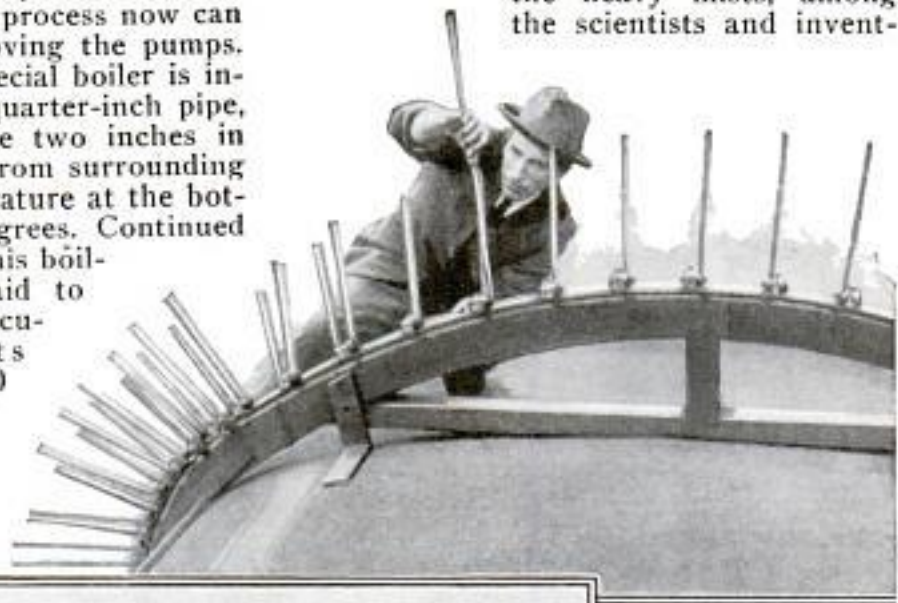
Steam, heated to 1,100 degrees Fahrenheit and injected at 1,000 pounds' pressure, is being used successfully to renew the flow in oil wells that become clogged by the congealing of the salt and paraffin content. The method produces somewhat the same results as exploding nitroglycerine, but is said to be more effective as it does not drive the paraffin back into the sand, but dissolves it so that it can be drawn off. With the equipment invented by a Colorado man, this process now can be applied without removing the pumps. Steam generated in a special boiler is injected through a three-quarter-inch pipe, incased in an outer one two inches in diameter, to insulate it from surrounding oil. It raises the temperature at the bottom of the well to 240 degrees. Continued for eight or ten hours, this boiling-out treatment is said to entirely remove the accumulated paraffin. Tests made at a depth of 2,200 feet, resulted, according to reports, in an increased flow of eighty-five per cent.

mfr. Dec Wells Recovery Co., 429 Temple
 Court Bldg., Denver, Colo.

can be arranged to represent the exact height of the rolling stock and are connected to signal bells inside the car, to warn the inspectors when an obstacle is struck. 2974

LONDON SEEKS CURE FOR FOGS AMONG WORLD'S INVENTORS

In an attempt to combat the deadly fogs which regularly envelop the city during the winter months, the London county council is seeking a means of dispelling the heavy mists, among the scientists and invent-



ors of the world. Many exterminators have been tried, but none has resulted in any great degree of success. One method tested consisted of suction fans attached to condenser boxes, which drew in the murky mist, and by means of heat, turned it into normal air and permitted it to pass off, leaving the

Tunnel-Testing Car with Rows of Spikes to Touch Obstructions, and Measuring One of the Prongs Which Are Wired to Bells

2546

"HEDGEHOG" CAR USED TO TELL IF TRAINS CAN PASS TUNNELS

Sets of adjustable spikes have been attached to the roof of a car on an English railroad to determine if new equipment can pass safely through tunnels and under bridges, or signal boxes and other objects along the right of way. The projections

dirt particles in a receptacle. The apparatus was capable of "reducing" several hundred cubic feet of fog a minute, but even a light formation would require about 750 of the machines, on streets, roofs and poles throughout the city. The cost of such an installation, it is claimed, would amount to \$25,000,000, and much more in the case of denser fogs.

Southern A. R.

Kansas City Times

3/28/25 Copyrighted material

STAR EQUALS HALF
MILLION SUNS

2981

Equaling the radiation of 600,000 stars as bright as the sun, the S. Doradus, believed to be the most luminous star known, loses two and a half trillion tons of its mass a second, by its action of producing light, according to Prof. Harlow Shapley, of the Harvard College observatory. The diameter of this giant of the skies is much greater than that of the earth's orbit, which is about 186,000,000 miles in length. The huge luminous body is classed with the stars known as variables, owing to their changing periods of maximum brilliancy. The report states it has been growing brighter for the past twenty years.

2824

CLOCKWORK BIRD
LURES LARKS

Skylarks in France are being killed in such great numbers by the use of a wooden "insect" placed on the end of a pole that efforts are being made to stop the sale of the device. The lure has two wings which revolve rapidly by means of a clockwork, and there are small mirrors to catch the sunlight. The birds, attracted by the glitter, fly down and are shot by a hunter who conceals himself behind bushes.



W. S. W.

Run by Clockwork, the Mirror-Studded Wings Whirl in the Sunlight to Lure Larks



Courtesy The Sphere

Veterinarian Administering Medical and Surgical Aid to Animal Pets of London's Poor Quarter, in a Motorized Hospital That Renders Free Service

March 74, 1925. P. 309

MOTOR HOSPITAL FOR SICK PETS
TREATS ANIMALS ON STREET 2921

Skilled treatment for sick and disabled animals is dispensed by veterinary surgeons who tour the poorer quarters of London with a miniature hospital installed in a motor truck. Dogs, cats, chickens, horses and practically every other kind of pet are brought by owners to the motor dispensary for first-aid and medical attention. The veterinarians are fully equipped to perform almost any service for the ailing animals, and after attending to their needs, give valuable advice to the owners regarding the care of the pets in health as well as in illness. In six weeks of work in one large district, more than 1,600 cases were treated during the evenings. The automobile hospital was established to reduce disease and disability among animals of those who cannot afford to pay for attention to them.

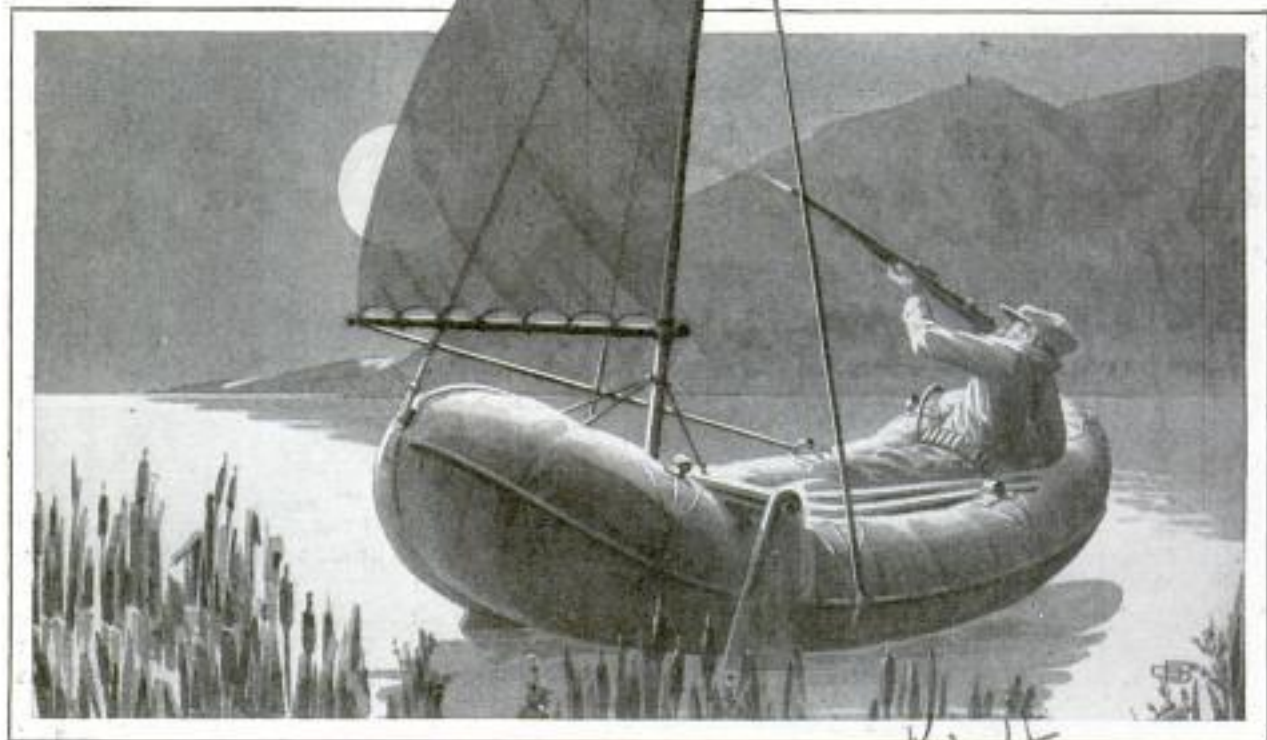
2875
maker unknown.

**BOAT LIKE AIR MATTRESS RUN
BY OARS AND SAIL**

Using a collapsible hull of waterproof fabric, which is pumped up like a tire, a new boat recently exhibited at the third annual hunting show in Berlin, Germany, provides a novel form of navigation in shallow and reed-grown lakes. The craft has an inflated sausage-shaped rim, with a fabric bottom. Outriggers on either side assist in bracing the short mast, to which is bent a leg-of-mutton sail. Steering is done with a short oar slipped through a metal holder at the stern, and when wind is lacking, the mast may be taken down and oars shipped in oarlocks on either side. Because of its extremely light weight and ability to support a heavy burden with light draft, the boat is expected to be especially useful in the duck marshes. With the sail lowered and mast unsteepped, the shape of the hull is such that it can be built into a duck blind with ease. The craft is said to be practically non-collapsible. Dragged ashore at night, its air-inflated skin would be available as a mattress for the occupants, while, when deflated, it is easily transported. Though stanch enough to withstand moderately rough weather, the boat is, of course, principally designed for use in the quieter waters of rivers, lakes and inlets.

**TORNADO PHONE-ALARM PLAN
PROPOSED TO SAVE LIVES**

A telephone-alarm system to warn persons of the approach of tornadoes has been suggested by Dr. W. J. Humphrey of the weather bureau. There is no certain way of foretelling their coming, he says, but when they strike, word could be telephoned ahead in time to save lives, it is believed, as the storms, contrary to popular belief, average only about thirty miles an hour and move in a relatively straight path. They generally do not damage an area wider than a quarter of a mile. As shown by the disastrous storm that swept southern Illinois, Indiana and Missouri last March, great damage and loss of life may result when they strike populous centers, but statistics prove that a single house is more likely to be destroyed by fire or lightning than by tornadoes even in districts where these severe winds are common. Several years ago, the weather bureau made an effort to forecast tornadoes, but the warnings were uncertain and spread so much fear that the plan was abandoned. Scientists believe that airplanes can be used in studying these storms, as the machines can circle around them, enabling photographers to take pictures, furnishing data that would be of great value.



Air-Filled, Collapsible Boat for the Use of Sportsmen in Navigating Shallow Waters, Which Cannot Upset and Is Propelled by Either Sail or Oars



Battery Practice inside Cage of Netting on Deck of the "Mississippi" Gives Players an Early Start toward a Championship Team When the Spring Training Season Opens

2821.

BASEBALL NET ON SHIP DECK PERMITS PRACTICE AT SEA

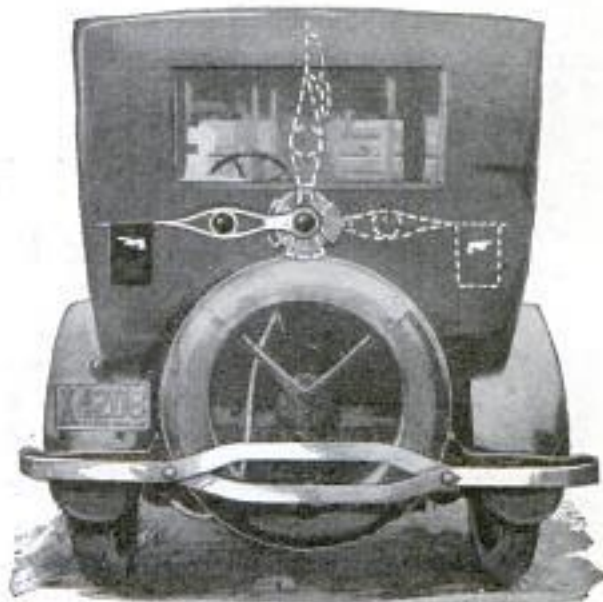
Sailors on the U. S. S. "Mississippi" get their early baseball practice while at sea by rigging a large net on the deck, and, on the improvised "diamond" within, have daily workouts at pitching, catching and batting. The cage has a roof of meshing to keep wild balls from going over the top and is large enough to accommodate several men at one time.

2816.

AUTO STOP AND TURN SIGNAL IS CONTROLLED AT WHEEL

Attachable to the front or rear of the car and controlled by buttons on the steering wheel, an electric traffic signal that indicates stops and turns by a combination of lights, a pointing hand and a loud bell, has been patented. It is patterned after the semaphore system in use on railroads and is operated by a small electric motor. To signify a stop, the pointer is swung back and forth three times. At night, this causes a red light to move like that of a switchman's lantern giving the universal signal for a halt. Turns are signaled by pointing the arm to

the side the car is to take. Each sign is accompanied by a gong which rings automatically, and a red flag with a white pointer hand is an additional aid in the daytime. A neutral or safety position is indicated when the pointer is vertical and a green light is showing at the center. The device is independent of the brakes.



Rear Signal at Left-Turn Position with Dotted Lines Indicating Neutral and Right

Inv. George W. Michael, 29 Stark St.
Wilkes-Barre, Pa.

Acme Foundry & Machinery Co

898 Coffeyville, Kans. POPULAR MECHANICS

2829

Cmt. J. H. Alderson
Melkever, S. D.

AUTOMATIC-LOADING SCRAPER SAVES TIME AND EXPENSE

SINKING OF LOFTY DOME TO BE STOPPED BY DEEP CAISSONS

For all kinds of slip scraper work where material is to be hauled, an automatic

The "flow" of foundation soil responsible for the sinking of the huge golden



With This Rig, the Team Dumps the Scraper Load and Empties It into the Truck in One Continuous Operation

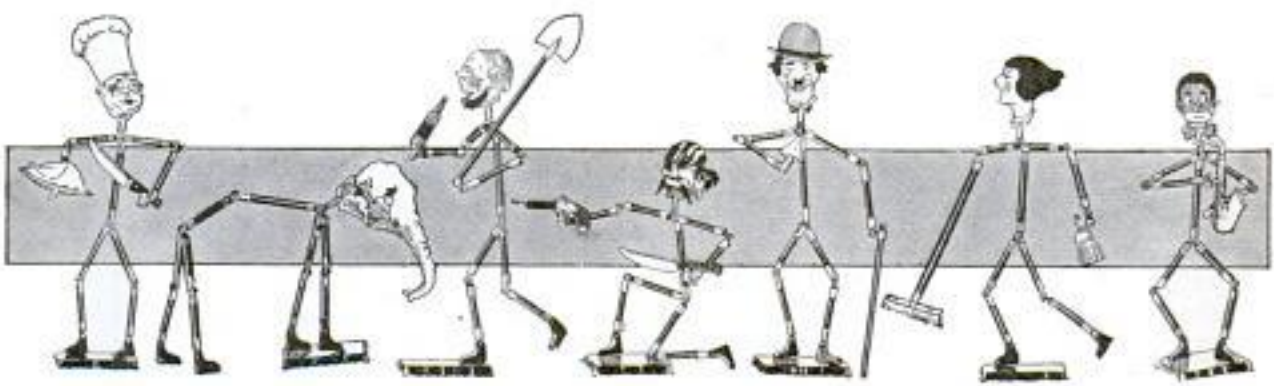
dome adorning the state capitol building of South Dakota is to be stopped with caissons which will pierce the earth for twenty-seven feet. In addition, the footings that support the structure on which the dome rests, are to be encircled by retaining walls of sheet-steel piling, one-half inch thick. The soil slides have caused the dome to drop three inches since the edifice was erected fifteen years ago. Though the structure cannot be lifted back into place, it is claimed the anchoring of the soil,

loader has been devised that is operated by the same team of horses that does the excavating without unhitching or stopping them. It consists of a hopper attached to a geared arm, both fixed to a flat base placed in position by the side of the truck. After the scraper is dumped into the conveyor, it passes onto a track where it engages a hook, and as the horses proceed, the load is lifted and emptied into the wagon. An automatic spring permits the hopper to return to the ground for another filling without too much force, and the scraper is released from the hook as soon as it reaches the end of the track. This arrangement, it is claimed, makes a bridge or tunnel trap unnecessary, saves the use of extra teams and men, and because the operation is continuous, there is a marked saving in time. The equipment has a lifting capacity of 2,000 pounds.

which undergoes a slow but steady shifting, will halt the downward movement of the building's roof and cupola.

2905
JOINTED SHAPES TO FORM DOLLS—TEACH AND AMUSE CHILDREN

Character dolls, toy animals and midget figures of a wide variety can be made by children with sets of jointed frames attached to small supports to hold them upright. Only the bodies, arms and legs are represented in the flexible skeletons; the heads, hands and other parts are to be supplied with paper cut-outs and attached with little clamps provided for that purpose. The joints permit many different postures and by suiting the face and additional equipment to the character they wish to depict, children gain instruction and learn to draw on their imagination.



Samples of Character Dolls and Postures Obtained with Frames; They Have a Broad Base and the Universal Joints Can Be Bent Dozens of Ways for Variety

Kim-Reiniche Co
11-6th Ave New York City

Behind the Scenes in a Puppet Show



PUPPETS so marvelously constructed that the little two-foot-high dolls convey the illusion of full-grown people as they strut across the stage, fight, make love, dance, sing and talk, have revived one of the world's oldest forms of entertainment.

For a great many years the marionette show had fallen to such low estate in America that an occasional Punch and Judy pair for amusing the children was the sole survivor. Then a New York artist and illustrator, Tony Sarg, captivated by the grotesque charm and humor of some puppets he saw in London, revived the almost dead art and, by applying modern methods, brought it to a higher state than when it flourished in ancient Greece and Rome, or later still in China, Japan and Siam. The old-time puppets were either manipulated by the thumbs and fingers of the operator, being thrust up from below the stage level, or else were of the style of those still used in Italy, heavy ungainly figures suspended from wires. Sarg's puppets, on the other hand, are dainty little twen-

ty-four-inch dolls, with movable legs and arms, tongue and eyes, and even chests that rise and fall in simulated breathing. They are so complicated in construction that some have as many as twenty-six separate control strings, while few have less than twenty-two. The strings are of strong black thread, invisible to the audience. To handle so many separate strings, Sarg designed a controller, a device consisting of crossed pieces of wood with strings attached at the ends of the various sticks. The original controller, a four-string type, was two straight pieces of wood joined in the center to form a cross. Wrist strings were attached to either end of one cross-arm and the knee strings to the ends of the other. By rocking the controller, alternately lifting and lowering the ends, it was possible to make the puppet's legs alternately rise and fall, to produce a walk, or to raise and lower the hands. From that simple beginning the twenty-two string controllers have been developed.

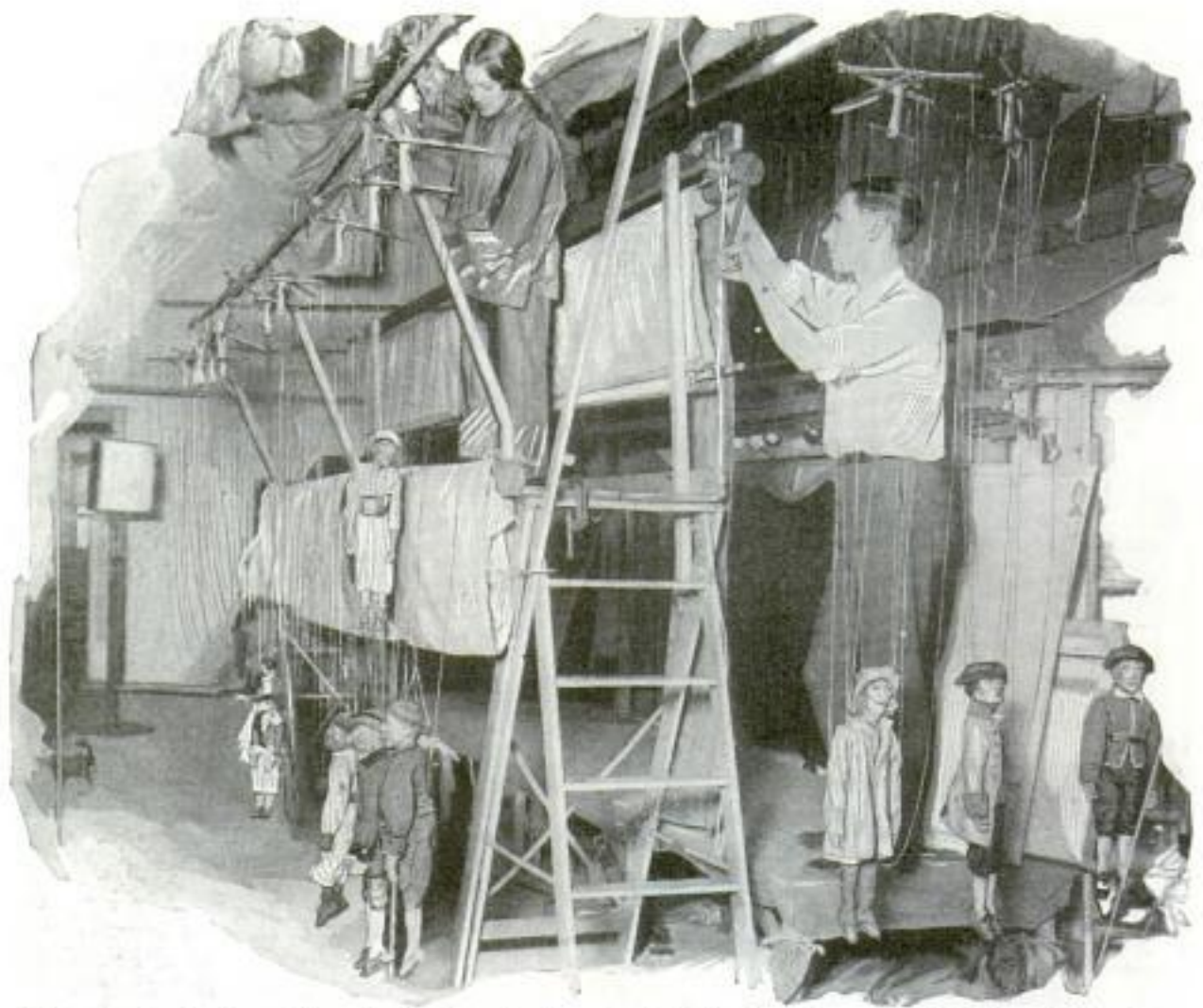
When Sarg first entered the puppet-show business he employed and trained a



Tony Sarg

54 W. 9th St
New York

2658
900



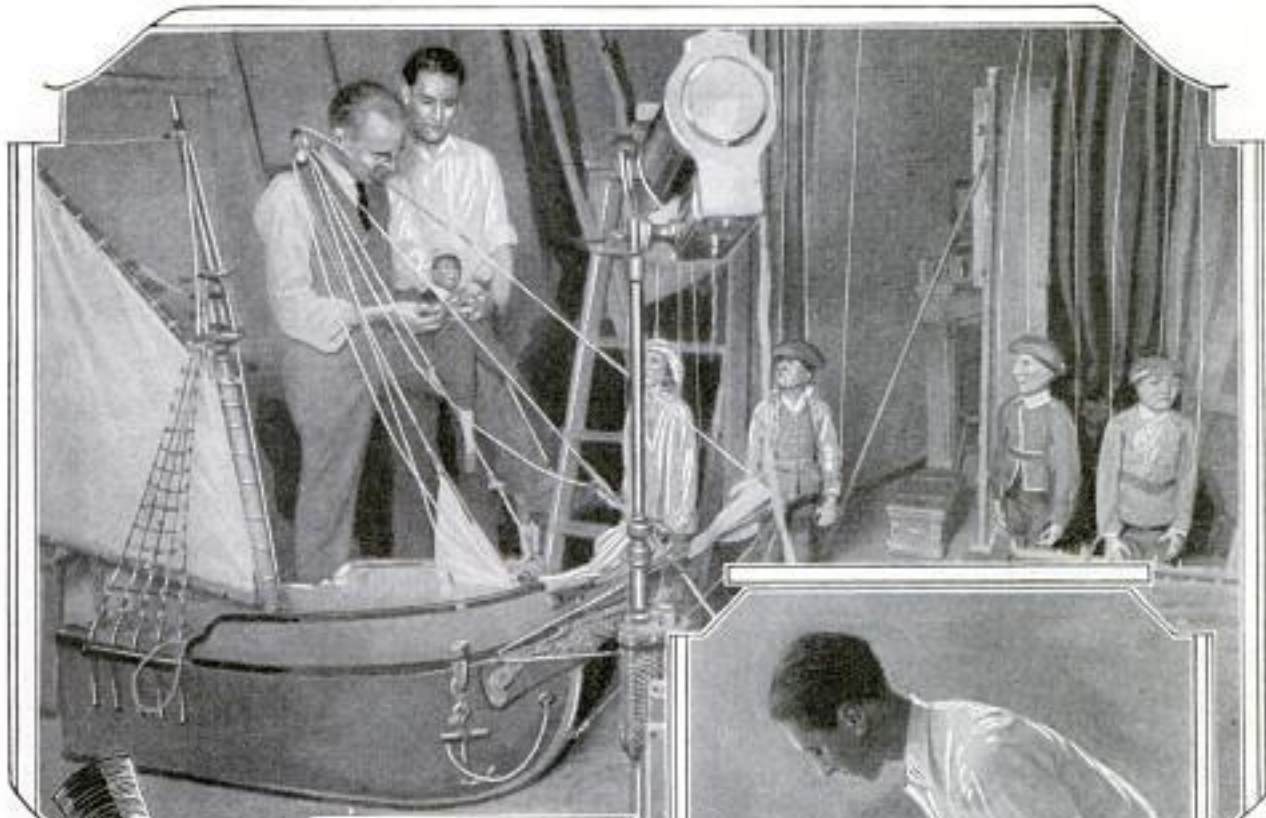
Preparing for the Puppet Show by Hanging the Characters for the First Act on Their Hooks and Mounting the Back Drops and Curtains

cast of "puppeteers" to manipulate the strings, and a cast of actors to remain hidden in the wings and speak the lines. The resulting cast was so big the members were in each other's way, and the pay roll so great that the show, while an artistic success, was a financial failure. Later he eliminated the speaking actors, and now the same cast pulls the strings and speaks the lines.

To be a puppeteer requires careful training. The men and women who work the strings are placed on platforms above the visible stage. They must be able to handle more than twenty strings without producing any false motions, memorize and speak the proper lines, and, if strings become tangled or some accident momentarily delays the action of the play, they must be quick-witted enough to extemporize lines and action to cover the accident. The joints of the dolls are very loose and flexible, and the trunk of the body is cut away and part of an old stocking substituted, so that the puppet can sit down in a normal position, with none of the stiffness of an ordinary

doll. The feet of the male dolls are filled with shot to keep the body properly erect and the skirts of female characters, if long, are weighted for a similar purpose. If the play calls for short skirts the feet must be weighted too.

Heads of the marionettes are carefully carved from wood and then painted in the proper colors, while wigs of natural hair are fitted. All of the stage settings are carefully designed in the right proportions to fit the two-foot characters. The proscenium arch itself is but six feet above the stage floor. The result of the careful balancing produced a remarkable and unexpected result. When the first show was presented, there were calls for the author at the end, and Sarg stepped out onto the stage, apparently leading the little leading lady by the hand. There was an astonished gasp from the audience, and then a burst of applause. Friends rushed back stage to tell him that when he walked on the stage he appeared to be twelve to fifteen feet high and as though he weighed about 500 pounds. The audience had been watching



Sailors Bold and a Ship Suggest a Pirate Play or Deeds of Daring in a Storm on the Howling Main



All Strings Lead to the Wooden Controller



Putting the Finishing Touches on an Actor



Two "Puppeteers" Working a Nineteen-String Manikin. One Holding the Controller and the Other Manipulating the Hand Strings

the marionettes so long and were so under the spell of their natural acting, that they had come to accept them as living actors, so that when Sarg appeared, he seemed to be a veritable giant. The illusion was seized on by the artist, and, ever since, his marionette shows have closed with the manager appearing on the stage among the dolls, a trick which never fails to produce gasps of amazement from the audience.

Remarkable effects are obtained with the tiny dolls. In the play "Rip Van Winkle," the audience was mystified when the puppet representing Nick Vedder, the innkeeper, sat down in his comfortable chair, put his pipe in his mouth, took a long puff, and then blew a column of real smoke into the air. The effect was made possible by an ingenious arrangement of rubber tubes. One tube runs from Veeder's mouth through his body and emerges in the middle of his back. A second tube runs from back stage up through the floor, and inside one rear leg of Veeder's chair, emerging just above the seat. The arrangement is such that when Veeder sits down, if the puppeteer handling his strings manipulates him into the correct position, the tube in his back slips over

the one in the chair, making a good connection. Back stage an operator is watching through a peephole in the curtain, and holding a lighted cigaret in his hand. When he sees Veeder's pipe go up to his mouth the operator puffs on his cigaret, and blows through the tube. Wisps of smoke emerge from the pipe bowl. Then Veeder lowers the pipe and smoke curls from his lips.

In "The Green Suit," a fat puppet, bewitched by Doctor Magicus, shrinks to alarming thinness, and afterward is restored to his original size. Inside the doll is a rubber bag, somewhat like the bladder in a football. This is inflated when the puppet is to be fat, while a tube running back stage makes it possible to let the air out when he grows thin, and blow him up again when it is time to become fat again. Originally a toy balloon was used instead of a heavier rubber bag. One day the young woman who was doing the blowing was carried away by her part and blew the puppet up until he burst. The actor speaking the lines cleverly improvised a few lines and covered the situation.

One of the most remarkable of the Sarg marionettes is porter Gruffanuff in "The Rose and the Ring," who is turned into a door knocker by a fairy whom he has insulted, and later brought back to life when the fairy relents at the end of the play. The figure of Gruffanuff is fitted with two complete sets of strings, thirty-six in all, one set being manipulated from the overhead platform and the other from back stage. The body of the porter is hollow and so are his legs. As long as he stands upright he appears like the other dolls, but when the moment for the transformation into a door knocker arrives, the back-stage set of strings, which pass through a small opening in the back-drop door where the knocker should be, are pulled, and the body is drawn through the hole, leaving only the head sticking out as a knocker. Gruffanuff shrieks with pain as his body is pulled through the hole. At the close of the play the fairy transforms him back to life, the strings leading to the overhead platform are pulled and the body emerges again.

An amusing bit occurs in "The Three Wishes," another of the Sarg plays, when Margaret wishes for a string of sausages, and an instant later finds them attached to



Ballet of Marionettes in "Puss in Boots," at a Performance before Italy's Monarch



Two Dignified Characters from the Puppet Stage of Japan



Huck Finn Ready to Live Aagin in Mark Twain's Immortal Story

the end of her nose! The sausages are hidden in the pocket of her apron, with a string running from them through her nostril and up to the operator. When the time comes for the sausages to appear he pulls the strings and the sausages fly up and attach themselves, apparently, on the unlucky girl's nose.

Anyone can produce marionette plays at home, Sarg says. His little daughter has her own troupe of puppets, which she made after suggestions furnished by her father. For the home play, Sarg suggests a supply of characters can be made from ordinary rag dolls, purchased at any toy store. The stage can be built up from an old wooden box, with a cardboard proscenium arch, and a cardboard background to hide the operator. The stage is mounted on a table, and the operators handling the strings stand on the same foundation. Toy furniture provides the stage fittings, and scenery and backgrounds may be painted on cardboard. A window shade with roller makes a good stage curtain, which is very necessary as it must be pulled down quickly if any accident happens to tangle the strings of the characters. Arch and other fittings should be designed in proportion to the size of the

dolls. With two-foot puppets he uses a six-foot high arch.

In using ordinary dolls for puppets, the arm and leg joints should be loosened to work freely, the head loosened to turn easily, and, if possible, the chest of the body should be emptied of stuffing to permit the marionette to bend and sit down. For children, he advises only seven strings to start with, two being fastened to the knees, two to the wrists, and two to the ears to turn the head, and the seventh to the middle of the back. The two knee strings are fastened to either end of a short wooden bar, to be worked with one hand, and the other five led to a cross of two bars. The ear strings go to either end of the crosspiece, the two wrist strings to the front end of the other strip, and the cord from the middle of the back to the rear end of the same strip. A loop of cord attached to the crosspiece slips over the hand when the puppet is in use, and serves to hang it on a hook when it is not in action. A wooden peg or nail is driven in the cross at the center, and a hole made in the extra stick attached to the knee strings, so that it can be slipped over the peg to free the other hand when this may be found necessary.



The March of the Wooden Soldiers with Their Bright Pink Cheeks Expresses the Sly Humor Which Marks Many of Tony Sarg's Marionette Shows

East Pittsburgh, Pa.

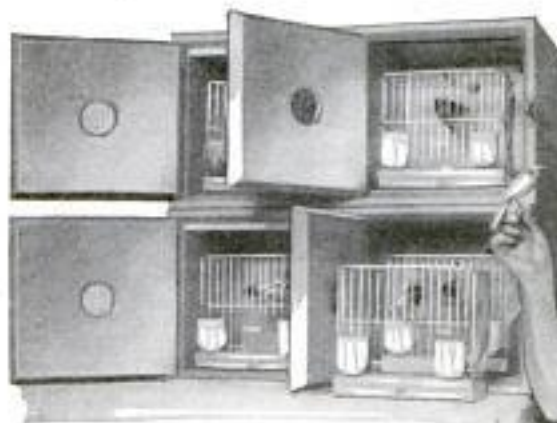
2916
New York Times
3/21/25

Mrs. P. E. McCoy,
1951 Escondido Escondido
San Francisco, Calif.
905
CANARY CAGE WITH THICK WALL
HELPS BIRDS LEARN TUNES 2823

RADIO CONTROL ON RAILWAYS TO START AND RUN TRAINS

A radio system capable of operating railway trains, throwing switches, and providing means of communication with passengers, all from a central point, has been described by G. T. Allen, of the Westinghouse Electric and Manufacturing company. It is entirely possible, he said, through a combination of electric and radio supervisory control, to start a train without a crew from a station, operate it at full speed, or to slow or stop it, automatically in compliance with automatic block signals, permitting a central dispatcher to control and supervise completely all movements of trains on a system. The carrier-current of signaling and communication, as the process is called, is based on the principle that wireless waves will practically follow along the course of wires without leaving them, if propelled in a certain way. A combination of the automatic-telephone art and the radio into a wireless-telephone system has been worked up by C. A. Boddie, of the same concern, and, the speaker said, has operated perfectly for over a year on an extended power system. The carrier-current system is a method of communication by radio which can be operated at any point along a system of power-transmission wires, similar to those of an electric railway, and the inventor claims it produces greater clarity than is possible with the ordinary telephone line covering an equal distance. Any switch on such a system may be thrown without affecting other switches, he stated, and practically any operation can be performed at a distance without wires even though one of the stations may be in motion. A central operator could be informed by the same method of the various performances.

Canaries that can whistle "Yankee Doodle" and other simple tunes are being raised by a California woman, and one of her helps in teaching the



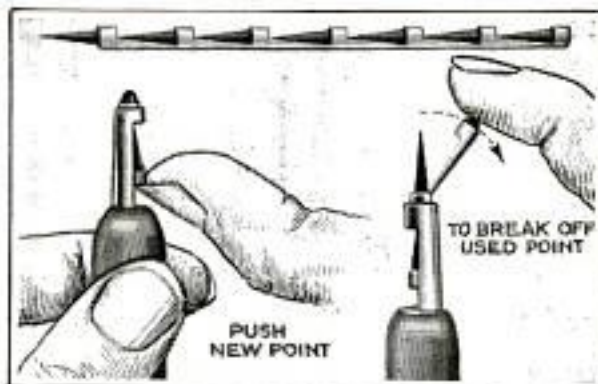
Whistling and Singing Practice for the Feathered Pupils; Walls of the Cage Boxes Are Insulated to Deaden Distracting Noises When the Birds Are Shut Up in Them

pets is a soundproof outer cage for each bird. This prevents them from hearing the chirpings of their neighbors and thus confusing other songs with the ones they are being taught. All the cages are arranged so that the birds can hear phonograph records used in training them. Canaries that appear to have unusual ability are given special lessons with a piano.

2340

NEW POINTS ARE PUT ON PENCIL BY BREAKING TIP OF HOLDER

When the point of a self-sharpening pencil designed as an inexpensive time-saver is to be replaced, the used stub of lead can be quickly broken off to expose a new tip for writing. The sections are carried in a notched tube of soft metal and each point is finely tapered. As the pieces wear down the filler can be pushed outward and broken off with a slight twist of the fingers. As each portion is removed the following one is uncovered in proper position for use. Fillers are made to extend the full length of the pencil and are readily inserted in a few seconds.

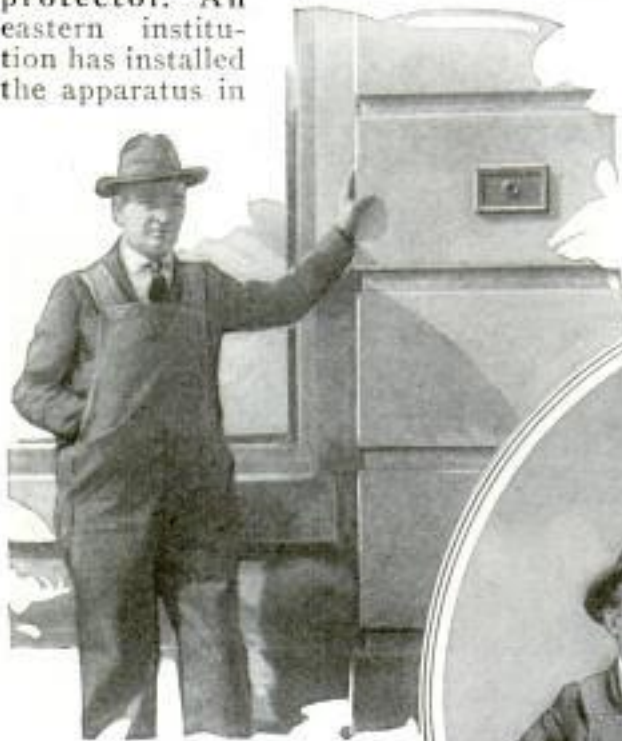


Self-Sharpening Pencil on Which Point Is Renewed by Breaking Tip of Holder

U. S. Pencil Co.
1808 Third St.
St. Paul, Minn.

PERISCOPE GUARDS BANK VAULT FROM BURGLAR RAIDS

Valued in the war as the hidden eye that enabled soldiers to look safely out of their trenches, the periscope has been adapted to the purposes of peace as a bank-vault protector. An eastern institution has installed the apparatus in



such a way that a watchman can keep vigil over the vaults from the sidewalk, without entering the building or giving marauders any clue that he is around. Near the safe is an arrangement of mirrors set to reflect the area surrounding the deposit boxes into a telescopelike tube that leads to a peephole in the outer wall of the bank. A glance into this opening gives the watchman a full view of the vault room. In case intruders are found, he can send in an alarm while remaining on guard.

2924

WASTE STEAM IN PAPER MILL YIELDS ALCOHOL AND OIL

Turpentine, pine oil and wood alcohol are being collected in large quantities at a southern paper mill from the fumes arising in the cooking of the pulp. The products are expected to yield more than \$150,000 a year from what has heretofore been considered waste. This saving is in line with similar economies now being practiced at several modern plants. Tree tops

*Cont. Essex. H. Holden
Highfield View
Lapton View Road
Chesterfield, Eng*

and limbs, once considered useless, are now sent to the mills and ground into pulp; lath, broom handles and other articles are made from slabs; trimmings and sawdust are used for fuel. Even the pine cones are collected for the seedlings they provide to replant cut-over tracts.

2920

RADIO CALMS SWARMING BEES AND AIDS HONEY YIELD

By introducing radio among his numerous hives, a European beekeeper claims he readily pacified the young swarms, enabling them to be easily removed to their



Upper Photo Shows Periscope Peephole on Outer Bank Wall, through Which Watchman Observes Vault Room Reflected by Mirrors Below

new homes. Bees, it appears, are peculiarly susceptible to sounds, especially drumming noises. When these sounds are not produced artificially, a buzzing noise is made by the insects, but the energy thus expended excites them. To avoid this, the radio loud speaker is placed near the hives, with the result that its sounds attract the bees' attention and seem to pacify them while they are settling in their new homes. In this way no time is lost in setting the hive in order and gathering honey for the combs.

Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

*289
Portland, Maine*

*Times. Peayune
3/22/20*

279 2
cont. S. B. Winters District
National Bank Bldg.
POPULAR MECHANICS
Washington, D.C.



Fire-Fighting School to Save Forests

Boy Scouts Are Taught How to Put Out Experimental Blazes
Started in Woods of New Mexico Preserve

WHAT will be the toll of the forest fire this year? As tourists set out for their summer playgrounds in Uncle Sam's woods and the dry season approaches, some 20,000 alert rangers and specially hired forest firemen in state, government and private service, are anxiously scanning the horizons daily for traces of raids from the "red enemy" that last year consumed about 537,000 acres of our national forests alone in more than 8,000 separate fires. The dryness of the season was held chiefly responsible, but more persons are flocking to the parks each year, and eighty per cent of all the forest fires, according to government officials, are caused by human carelessness. Lightning ranks second.

The trees will have at least one factor in their favor—a larger number of experienced fire fighters on the job than ever before, organized in units, in many parks, and equipped with fast horses, motors and airplanes. Forest fires, like their city and town cousins, are tricky. There is a technique to the business of fighting them. When blazes get beyond control, appeals for experienced men are broadcast. Veterans came pouring in from New Mexico and Arizona, three years ago, when devastating fires swept through California to

take charge of hundreds of willing but "green" and sometimes too enthusiastic volunteers who unwittingly helped the fire occasionally, instead of quenching it. But the forest service is not waiting for fires to train veterans. It is making them in a school where officers of the service are the instructors and actual fires, set in real woods, are the laboratory material.

This school is kept in the Mazaró national forest, in New Mexico, where a stretch of woodland has been set aside for the purpose of training boy scouts and others in the correct methods of suppressing the flames. The students dig trenches, make flank attacks and learn how to charge the foe. The tactics of fighting a forest fire are said to be not unlike those of an army in battle. In the early stages, if there is no wind, a fire generally spreads in a circular area. If driven by a breeze, it assumes the form of an ellipse or an oval with the smaller end at the point where it started and burns slowly against the wind. The fighters, divided into two groups, endeavor to cut the line of fire in half and advance toward the head where the flames are being fanned by the breeze. In mountain areas, while efforts are made to extinguish as much of the fire as pos-

sible, a big conflagration can best be handled by driving it toward natural barriers, such as lakes or steep barren cliffs, or surrounding it with a back-fired strip so that it will kill itself.

These tactics, so far as is practicable with the position of the tract in which the fire is started, are taught the pupils at this unique school. They are also shown how to use some of the implements the fire fighters carry. These include an auger for boring powder holes to blast out old stumps and snags from the path of advancing fires; axes, brush hooks and knives; hoes for scraping away pine needles, grass and leaves; shovels to smother sparks and flames and dig trenches; water bags and buckets. With the portable hand pump for extinguish-



ing purposes has come a portable torch for saving time in setting back fires to make barren gaps where flames will halt.

Students are likewise taught the importance of using their heads. "Fighting forest fires is not a particularly hazardous job," declares Col. William B. Greeley, chief of the forest service. "It requires cool heads, common sense and an experi-

enced and trained force. There are times, however, when a fire breaks over the fighting line and causes a stampede among green men." Resourcefulness is considered as big an asset to the fire fighter as it is to the soldier making a night attack on an enemy trench. Applicants to the service sometimes get this question from an examiner: "What would you do with a fire fighter who broke his leg on the fire line?" The reply and the time it takes to formulate it are an index to the mental alertness of the candidate.

That this quality is often tested is borne out by many incidents in the fire fighter's career. For instance, speeding down a steep hill in a burning forest zone, a big motor truck loaded with forest rangers collided with another. The firemen leaped to safety before the crash which wrecked



Fighting Forest Blazes in Oregon; Using the Portable Torch to Set a Back Fire; Fellers Sawing Down Snags and, Bottom, Smothering Flames with Dirt

2793

910

American Cable Co
291 Broadway
New York

POPULAR MECHANICS

the vehicles, but they found themselves surrounded by the fire. They promptly ripped the gasoline tanks out of the cars, carried them to a tiny stream and covered them with wet sacks. The flames were halted, and both men and fuel were spared by a little quick thinking.

Systematic forest protection in the United States is only about twenty-five years old. While much has been accomplished with forces of trained rangers, and airplane patrols that not only keep watch for fires, but make maps of forest areas for the guidance of the fire fighters, the task of protecting the timber supply from the hazards of flames, is said to be only one-third done. Fire prevention is regarded as three-fourths of the national-forest problem, an important issue to not less than fifty different industries that depend on wood, from builders of homes to makers of clothespins. The other fourth is the job of replanting burned and cut-over areas, a territory said to be equivalent to the combined forests of Germany, Holland, Belgium, France, Switzerland, Spain and Portugal. Lumber, in the last eighty years, has advanced three and one-half times faster in price than the average staple commodity, and consumers are paying an annual freight bill of about \$250,000,000 to have boards hauled from the Pacific coast to the Atlantic ports near regions that once abounded with native timber. Three-fifths of our original lumber already is gone and the demand is

four times greater than the rate trees are being grown. The total number of forest fires throughout the country is between 30,000 and 40,000 annually. In 1924, the field service to protect our forests in national parks cost less than \$3,000,000 in salaries and wages.

To greater thoughtfulness from the public, increased vigilance and improved skill on the part of trained fire fighters, the government largely entrusts preservation of its precious woods.

2890 *Tru-Lay*
**NEW WIRE ROPE FOR INDUSTRY
RESISTS UNSTRANDING**

One of the disadvantages of wire rope—its tendency to unwind when cut or broken—has been overcome in a cable now on the market. Its strands are “pre-formed” before they are united in the completed product, that is, they are twisted into the shape they are to assume and then combined. This, it is claimed, not only keeps them together, but also distributes the strain more evenly, prolonging the life of the rope. When individual wires break, they lie flat instead of sticking out of the cable and fraying. A special steel fitting is also provided that grips the strands firmly, permitting the use of shackles and turnbuckles. The cable is now being manufactured in sizes up to one-inch in diameter, and is in use for oil drilling, industrial hoisting of all kinds and in factory and shop operations.



Rakes Often Are Effective Weapons against a Forest Fire; Fighters Close to the Front Lines Use Them to Scrape Back the Twigs and Leaves on Which the Flames Creep Toward Trees and Logs

**MOUNTAIN MOVES
 MANY FEET**

Traveling slowly, with a wavelike motion, "Moving Mountain," a peak about 2,000 feet high, in Colorado, is shifting at the base and spreading across Rio Blanca valley. The slope of the mountain, said to be formerly at an angle of forty-five degrees, appears to be rolling down into a more gradual incline. In little more than a day the mountainside has moved 300 feet, and is reported to be disturbed by tremors resembling the slight rolling of the ocean surface. The present activity of the peak is said to be the second of its kind at that point in fourteen years, the last movement resulting in a considerable change in the position and formation of the mountain. Similar activities have been observed in other hills in nearby regions.

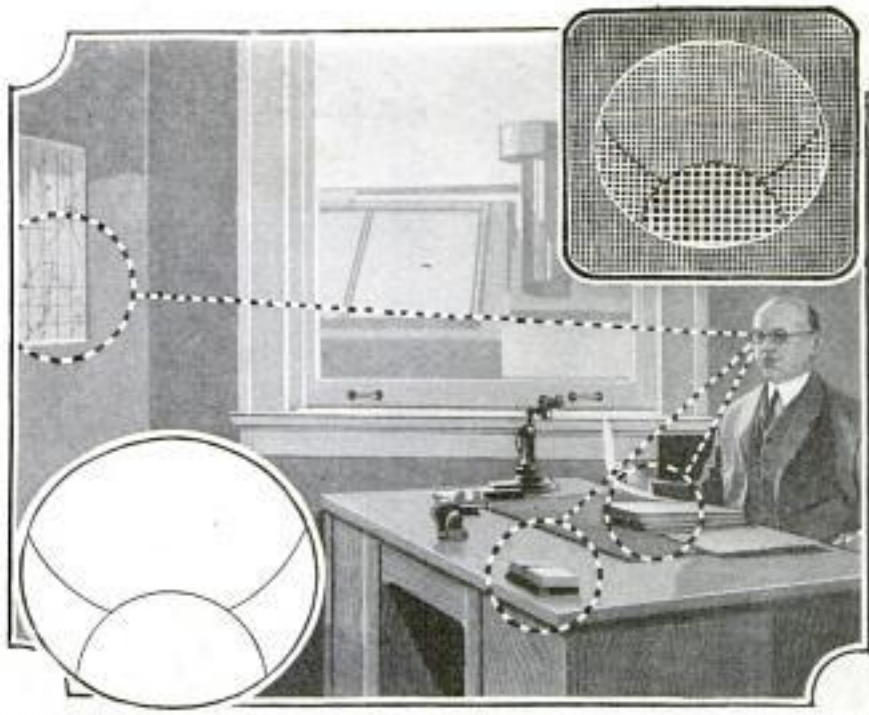


Diagram of Lens, Its Three Magnifying Fields Shown in Upper Corner, and Different Ranges It Allows Wearer in Actual Use 2865

**THREE PAIRS OF GLASSES IN ONE
 PROVIDED BY NEW LENS**

Science has produced an additional aid to faulty eyesight in a lens that affords three fields of vision instead of the two furnished by the usual bifocal glass. It consists of four sections ground from a single piece, an upper one for far sight, a lower part that magnifies distinctly for close work, and on either side of these, an intermediate area for distances of eighteen to fifty inches. A chief advantage claimed for this lens is that it eliminates the blind spot or "jump" where the two surfaces on the bifocal glass are joined. Light is deflected here and does not reach the eye. More accurate correction of vision is obtained with the three-field lens, it is said, and the danger of accidents through failure to see steps and obstacles is decreased. The user employs the intermediate area by a sideward glance and quickly becomes accustomed to glasses of this type. They are aimed to fill the needs of business men, motorists, mechanics and clerks.

2767
**FIRST-AID CARS FOR AUTO ILLS
 SERVE MOTOR CLUBMEN**

When motorists belonging to a Chicago club call for aid in car emergencies, first-aid trucks equipped with a winch and cable, devices for starting stalled engines and complete apparatus for curing almost every auto ill, are sent to their assistance. A fleet of about twenty of these rescue cars has been established in what is known as the "mudhen cruiser unit" and is expected to render far greater help than was possible with the former motorcycle sidecar equipment. The cable is 200 feet long, permitting the first-aid truck to remain on solid ground and connect with a stranded or mired car with little difficulty. A specially designed generator and over-size storage battery have been installed for starting cold engines or reviving run-down batteries.



Rear of First-Aid Truck with Windlass, Tow Rope and Tool Box in Body

Chicago Motor Club
 Operated by Yellow Cab
 Trust Co.

Bausch & Lomb Optical Co.,
 Rochester, N.Y.

Chas. Herbert Martin A. Roman
New York Bureau of Public Safety
 912 *New York City* POPULAR MECHANICS *2712*



Automatic Horn and Lights That Tell When Car Exceeds the Lawful Speed Rate

HORN HOWLS AS AUTO SPEEDS TO WARN DRIVER

281

Automobile drivers who run their cars faster than traffic rules allow can be warned by a horn which sounds and turns on lights when the speed limit is reached. Fastened to the front of the machine, the signal starts automatically and keeps up its noise until the pace is slackened within the rate for which the device is set. Even with speed gauges, the horn acts as an accurate caution should there be any defect in the operation of the meter. Attached to traffic patrolmen's cars or motorcycles, when trailing speeders, the signal may be used as a means of telling whether the "suspect" is traveling faster than the law permits or not.

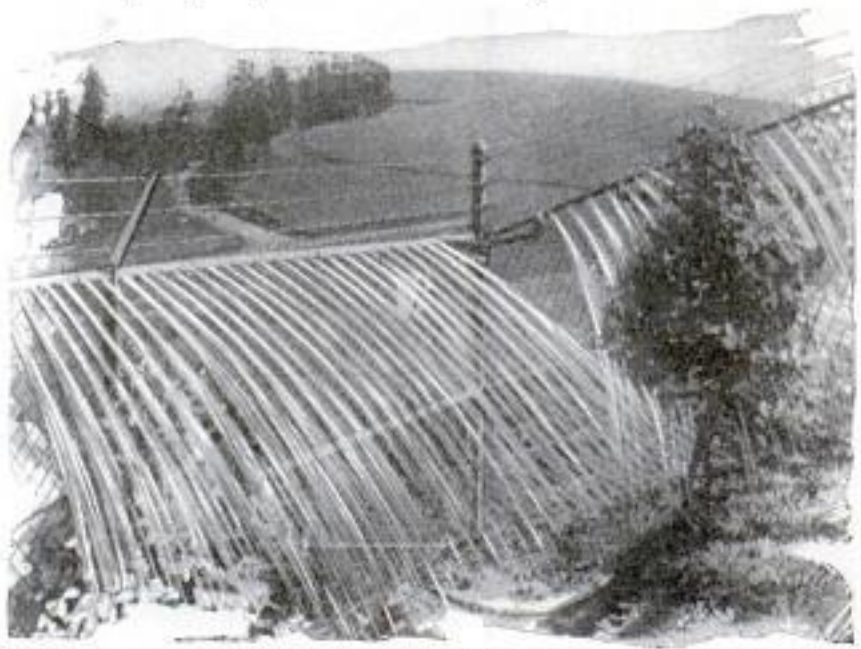
☐ In California, more than 10,000 farmers' wives cook by electricity, according to a power distributing company.

SMOKE SEEN AS CANCER CAUSE IN SOOT-POLLUTED CITIES

Coal smoke and soot in large American cities cause an annual property damage of about \$7.66 per capita, the bureau of mines estimates, and to this evil, another serious charge is added by Dr. J. B. S. Haldane, a British health authority. He declares that these agents may prove to be a source of cancer. As products of incomplete combustion, they are said to contain the same bodies found in tar and soot by which cancer has been produced artificially in animals in laboratory experiments. A general lowering of resistance to various diseases is also attributed to the smoke-polluted atmosphere in many large cities. The evil is being combated by careful firing and use of smokeless fuels.

n. s. water on pipe
9. 11. 12 by innovation
FENCE RAIL ACTS AS WATER PIPE TO SUPPLY LAWN SPRINKLERS

2554
 Iron pipe used as the top rail of a wire fence surrounding a park in California is being employed to conduct water for sprinkling the lawns and flowers. The tubing is connected at the corners and taps are inserted at intervals so that water can be supplied at any point around the inclosure. By serving a double purpose, the rail eliminates the expense and labor that would be required to install an underground system. Leaks in the line can be quickly detected and repaired in a short time, thus saving losses of water which might otherwise continue over long periods before being found.



Watering Hedge and Lawn Border through Top Fence Rail Made of Pipe Which Has Been Perforated to Serve as Sprinkler

Southern California
Water Co. Copyrighted material
caul

29.3



interesting

Experimenting with Pilotless Aircraft: When Catapult Is Released, the Plane, with Motor Running, Shoots Sharply Upward; from Then On, Radio from the Boat Is Its Unseen Guide

PILOTLESS PLANE LAUNCHED FROM TRAP ON WARSHIP

Guided in their flights by sensitive radio-control apparatus, pilotless airplanes being tested in France and England are launched from a catapult arrangement on the bow of a warship. The steel runway points upward at such an angle that the plane swiftly gains sufficient altitude and, once in the air, the craft is steered by radio impulses sent from wires rigged on the ship's masts. While this innovation in flying is yet in its infancy, experiments already indicate its practical success.

BEEES CAGED WITH PLUM TREES TO INSURE RICH CROPS

In the great plum-growing districts of northern California, bees are being caged with the trees to insure pollenization of the blossoms with pollen only from other trees of equal quality. Much loss has been occasioned to growers in the past due to cross-fertilization of their pure-bred plums with pollen from wild species and inferior varieties of the domestic fruit, resulting in crops of poorer grade and smaller size. A framework covered with strong mosquito net is built around each tree, and a hive of bees is installed in the inclosure when the blossoms begin to appear. Freshly cut flowers from plum trees of equally good grade with the one caged,

are supplied to the insects each day and from these blossoms the little workers carry the pollen to their home tree. Cages have also been equipped with wheels so that an entire orchard can be covered with only a few of the inclosures in a short time.

OILCAN CRATE TIPS IN POURING AND PREVENTS WASTE

An oilcan crate equipped with a stand that automatically adjusts itself to the normal position can be easily tilted for pouring the liquid, protecting the clothing of the handler and preventing waste or splashing. The container is also fitted with a movable spout which avoids dripping after the holder returns to an upright position, thus keeping the outside clean and dry. When the tilting attachment is not required, it can be swung up over the can and becomes the top of the crate. No hinges or protruding nails, injurious to clothing, are present on the box, which has been patented.



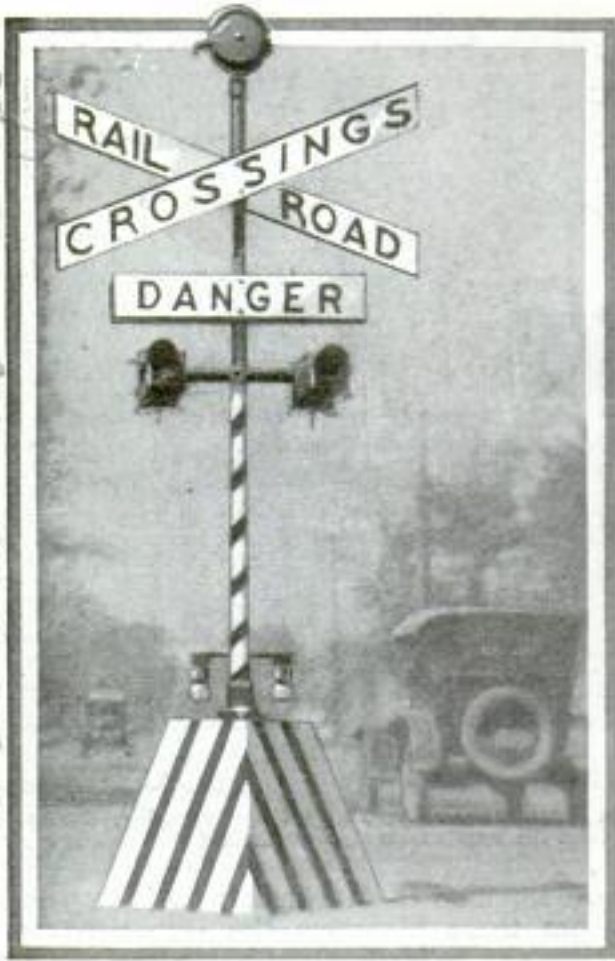
*Comp. A. D. Lunn
2722 Lincoln St
Berkeley, Calif.*

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1465
914

Chicago Daily News
3/27/25

Pl. N. W. Co. in
323 S. Wells St. Chicago
7-124



Plainly Striped Crossing Sign Placed in Middle of Road as Warning to Motorists

WARNING SIGNS IN ROAD CENTER LESSEN CROSSING DANGER

Increasing the safety of autoists and others using the highways, danger signals are being placed squarely in the center of roads leading to railroad crossings. Drivers of approaching machines are forced to turn out a trifle to avoid a collision and naturally notice the sign. Encased in a concrete base, the signal cannot be broken by the impact of an automobile and painted in distinctive colors, it is visible for a long distance in both directions.

ANNEXING OF SOUTH SEA ISLE ADDS TO U. S. DOMAIN

Known to map makers under five different names, Swains island, a tiny dot of land in the South seas, is only a mile and a half long and a mile wide, but since its discovery, believed to have been made by Spanish explorers in 1606, has been independently governed. To geographers it has existed as Quiros, Gente Hermosa, Olosega, Jennings island, and as Swains island will now appear on the map as part of the United States, since its recent an-

nexation by this country. The isle has a population of seventy, and is surrounded by a coral reef with an opening at one end through which small boats can pass.

WHAT DOLLARS COST TO MAKE

According to Charles S. Dewey, assistant secretary of the treasury, it costs one and seven-tenths cents to print a dollar bill and it has a very short life. But a silver dollar can be minted for one cent and it lasts indefinitely. This is said to be one of the reasons for the government's desire to put the metal coins into circulation. It is estimated that 40,000,000 silver dollars, replacing that many paper bills, would save the government \$1,000,000 a year.

SUITCASE ON FOLDING WHEELS IS AID TO TRAVELERS

Intended mainly for travelers who do not wish to go to the expense of hiring taxis or porters when only small distances are to be covered, a suitcase with folding, rubber-tired wheels and a long steering handle has been devised. The running gear is strongly attached to slide rods within two tubes at the top of the case, and when the carriage is not desired, the wheels, with their forked spindles, are drawn close to the carrier and the handle folded down so that the outfit occupies little space. The supports are stout enough to permit a small child to ride astride the case.



Suitcase with Wheels Folded and in Use as Cart for Hauling Small Child

Kansas City, Mo.
3-17-25

Wm. F. Johnson
24, 3rd Ave. (Copyrighted material)
Borrow-in - Furness, Kansas



By G. H. DACY,

*1050 N. W. Second St
Miami Fla*

ONCE the refuge of runaway slaves, the homing grounds of the Seminole Indians, the mystical Everglades of sunny Florida are now being drained and groomed as America's potential sugar bowl.

At an aggregate cost of \$22,000,000, the greatest swamplands of the whole world are being reclaimed and adapted to truck crop and sugar-cane production. The leading agricultural experts of the country have surveyed the Everglades, analyzed the black-muck soils which are from five to twenty feet deep and have proclaimed the region a tropical Eden.

The formation of the 'Glades is peculiar and has developed unusual drainage conditions. These soils cover a tract as large as the combined areas of Rhode Island and Delaware. Ages ago, this vast belt was nothing more than the rock-lined bottom of the ocean. Enormous quantities of vegetation have accumulated and decayed there. Today the Everglades is the largest zone of peaty muck known to man. Vast volumes of water are impounded within its rock-rimmed borders. Mighty

Lake Okechobee, the largest lake in Florida—thirty-five by forty miles in extent—acts as a sort of sump basin. By lowering and controlling its waters, engineering science is draining the Everglades. For this project is not only a gigantic drainage enterprise, it is also a water-control system which, when completed by means of ditches, dikes, canals, locks and pumps, will handle the normal and flood waters of the district.

Six canals are now in operation carrying the surplus moisture of the Everglades down to the sea. Ten million dollars have been expended and hundreds of thousands of acres of Florida's most fertile soil have responded profitably to intelligent cultivation. Florida is preparing to complete the stupendous drainage project by the expenditure of \$12,000,000 for additional canals and lateral ditches which potentially will convert great areas of idle acres into well-tilled farms.

Three years ago, two large sugar mills were built near the rim of the Everglades. Previously, it had been demonstrated that sugar cane could be profitably grown.

The earliest settlers in Florida brought with them supplies of sugar cane from which they established new patches. The Seminole Indians, the runaway slaves and the outcasts of civilization who once lived in the swamps, all raised their supplies of sweets from sugar cane. From these pioneering attempts, the current industry came into being. Untoward floods have complicated the cane harvest during the last two seasons. These washouts occurred because the Everglades drainage system had not been completed. But when the water-control enterprise is finished, the drained Everglades will become America's newest sugar bowl. The 3,500,000 acres of swamplands yet to be drained have been organized and an adequate engineering survey and plan of reclamation have been worked out and accepted. Work is now under way to finish the last lap of a salvage project which will liberate another agricultural empire from water-logged bondage in the land of our last frontier.

"What is the matter with Louisiana as a sugar-cane supply source?" you logically may inquire.

A dread disease of sugar cane, known as mosaic, which stunts the growth of the cane and curtails the sugar yield now is dominant throughout the Louisiana sugar-raising country. The only known control is to develop disease-resistant varieties of cane. Louisiana must now look to other southern states for future seed supplies. Florida is most propitiously located

to supply this seed, for the sugar-cane growing regions of Florida are wholly free of infection. Furthermore, Uncle Sam's experts in Florida have developed one species of cane which is resistant to the destructive disease.

Latterly, congress made a special appropriation of \$25,000 to establish a sugar-cane research station in the Everglades in the vicinity of Canal Point, seventy-five miles from West Palm Beach. Here the government will test every variety of sugar cane to ascertain its adaptability to Everglades conditions. It was through previous experimental work of this character that the mosaic-resistant species was originated. The national sugar experts now have available enough of this seed to plant fifteen acres. They expect from this planting to produce enough seed and cuttings to save the Louisiana sugar industry from portending failure.

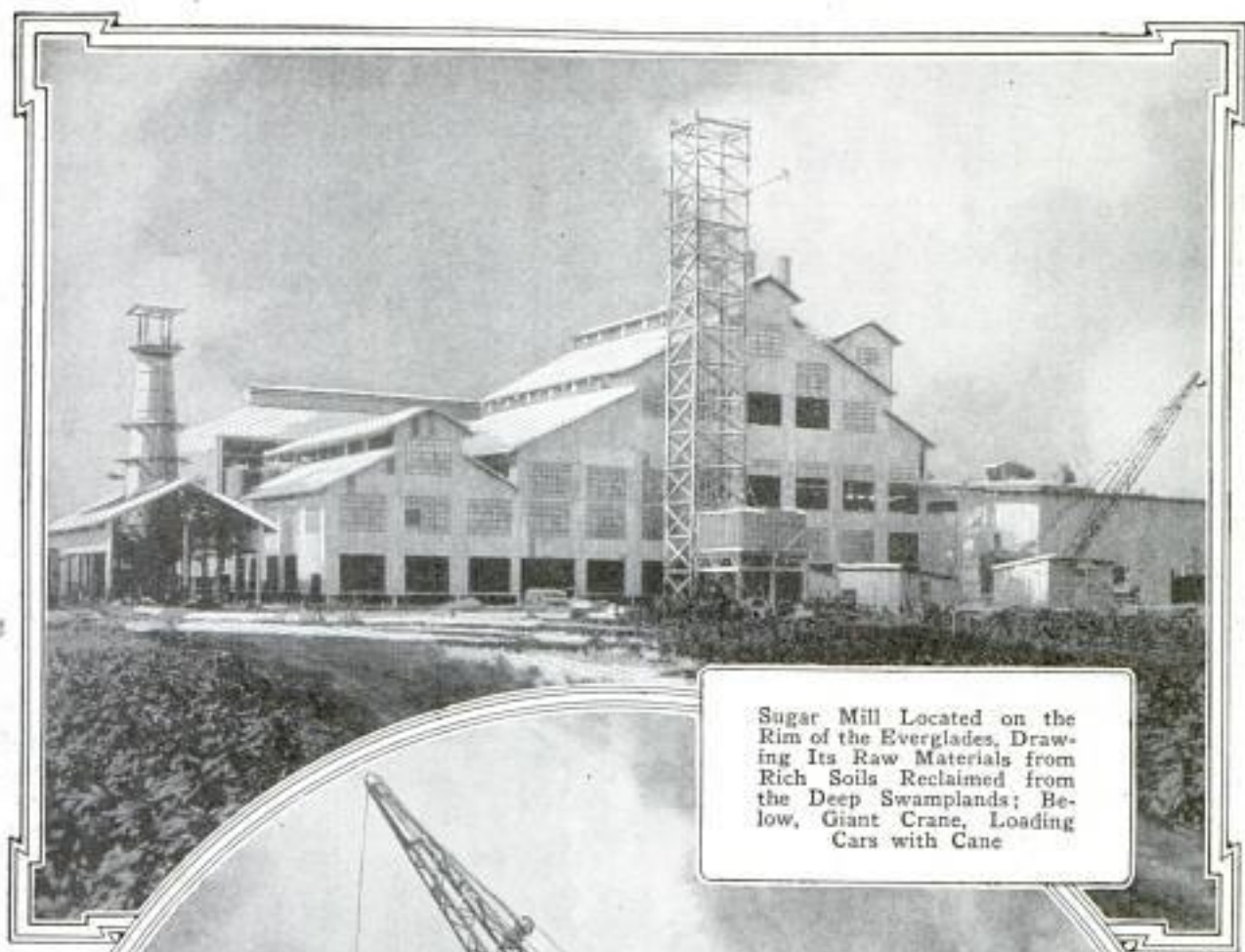
Uncle Sam now has available forty of the parent plants of the La Purple, Kassoer, Uba, Java and Crystallina varieties of sugar cane that have demonstrated their value in Florida as well as a number of new specimens from the Virgin islands. The government experts also are making scientific studies of wind velocity as it affects sugar-cane culture. Moisture gauges are exposed at various points in order that tab may be kept on any changes which occur. An interesting feature is the propagation beds, which are provided with oil-burning heaters to hasten the germination of seed samples which are tested.

The yield of sugar cane has run as high as sixty tons to the acre in the Everglades. This production is four times as large as the average yearly crop in Louisiana.

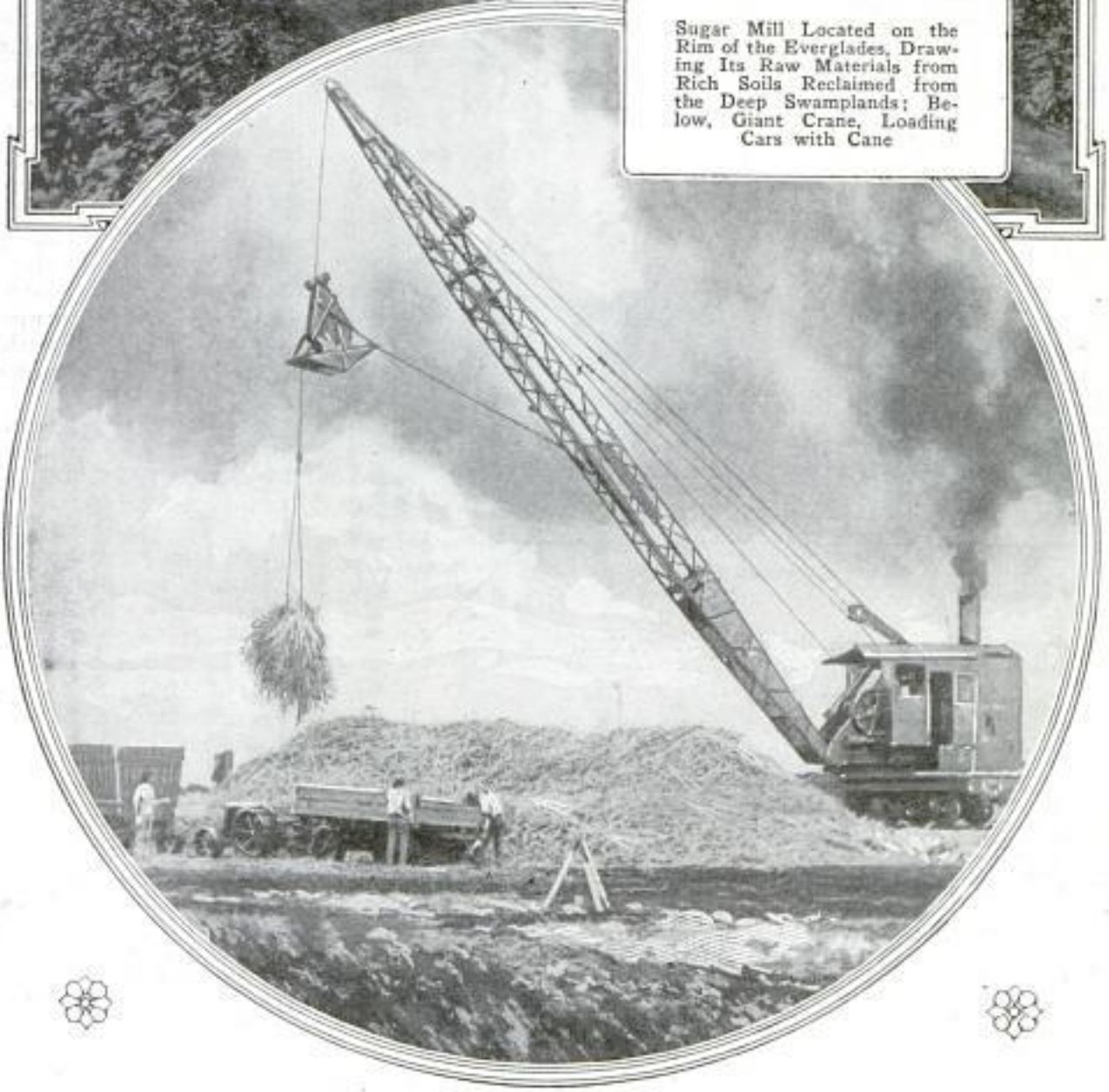


Specially Designed Cars, Emptied by One Operation of a Dumping Tipple, Facilitate the Hauling of the Newly Harvested Sugar Cane from the Field to the Mills

2741



Sugar Mill Located on the Rim of the Everglades, Drawing Its Raw Materials from Rich Soils Reclaimed from the Deep Swamplands; Below, Giant Crane, Loading Cars with Cane



no information
918

Chicago Daily News
3/26/25

POPULAR MECHANICS

PHONE ON FIREMEN'S HELMETS
TO AID RESCUE WORK

U. S. FLYERS COIN NEW TERMS
TO DESCRIBE WORK

Helmets fitted with a telephone, to enable fire fighters in a smoke-filled building

2951 Just as the army and navy have their special slang expressions, so the air service has developed a vocabulary all its own.



Firemen, Demonstrating the Portable Telephone Outfit; Speaker Is Carrying Batteries, Receiver and Mouthpiece Are Concealed under the Other's Helmet

to communicate with their comrades outside, have been tested in the east. The cable is carried on a reel that unwinds behind the firemen. The batteries are carried in a frame at the side of the operator who remains in the street. The helmet also serves as a gas mask to protect the wearer.

ISSUE "GRASSHOPPER" STAMPS

To finance a campaign against grasshoppers, the Mexican government has put a special postal tax in operation. All domestic mail matter will be subject to an extra charge, and a special "grasshopper" stamp on each parcel will represent the payment of the tax.

lengthwise, "zooming" is to climb sharply for a short period, and "sausage" is the name for a small dirigible or balloon.

2945 GIRL FINDS NEW MOTOR FUEL WITH AID OF SUGAR

Said to be twice as powerful as gasoline and costing but half as much to produce, a new motor fuel has been discovered by a fifteen-year-old French girl. A chief ingredient is "irol," a heavy explosive for which chemists unsuccessfully had been seeking a solvent, but which the girl finally dissolved with ordinary table sugar as a principal substance in the process. At the dinner table one day, she suggested to her father, in whose laboratory she worked as

maisons - Lafete
Chime
Laurent

2952

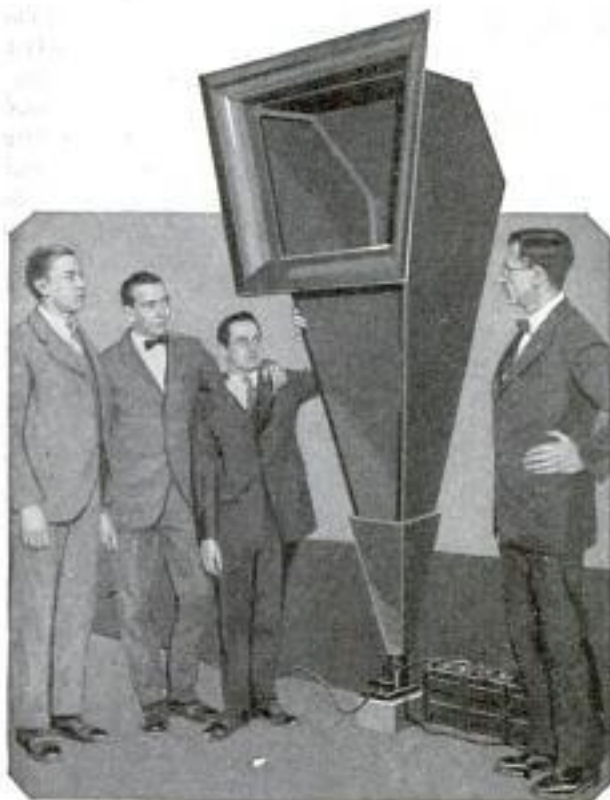
Harry Nichols
Mexico City, Mex.

Mlle. Irene Laurent
Paris, France

junior assistant, that the explosive might be adapted to use by means of carbon in the form of sugar. The father dismissed the idea as impractical, but the daughter started experiments. After trying a number of supplementary chemicals, she finally found a mixture which converted the explosive into a yellowish liquid suitable for use in motor engines. First tests were made with the family automobile, in which the fuel fully demonstrated its effectiveness. These tests have been followed up by experiments on a larger scale and the results of them also are reported to have proved altogether successful.

LOUD SPEAKER NINE FEET HIGH HELPS TEACH PUPILS RADIO

Radio instruction for pupils of a Brooklyn high school is simplified and made more entertaining with the aid of a loud speaker, eight and one-half feet high, erected in the assembly hall. It is connected to an eight-tube superheterodyne set and is said to produce tones of such quality and distinctness that they can be heard easily by persons in distant parts of the large room. It was constructed by members of a radio club at the school and



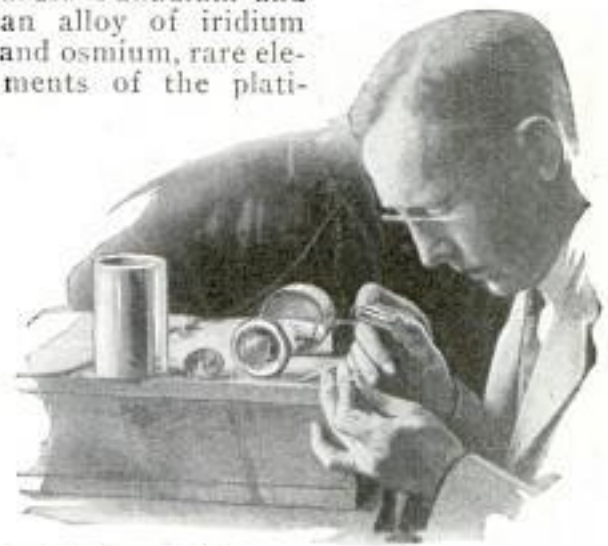
Giant Wooden Loud Speaker High-School Pupils Constructed for Use in Assembly Room

the greatest care was exercised in putting it together in order that undue vibration and loss of volume might be avoided.

Technical High School

METAL WORTH MORE THAN GOLD USED IN TESTING MACHINE

Metals more precious than gold are used in a machine built by the bureau of standards. Palladium and an alloy of iridium and osmium, rare elements of the plati-



Copyright, Harris & Ewing

Precise Steam Gauge of Metals More Precious Than Gold Used in Bureau of Standards Tests

num family, and pure silver are employed in constructing this costly piece of laboratory apparatus. A tiny bit of the alloy of iridium and osmium, no larger than the top of your small finger, has a valuation of \$15. A fragment of palladium, not as large as a common office rubber eraser, costs in the neighborhood of \$75. Pure silver, while not so costly as some other precious metals, is more or less expensive when used in quantity. The construction of this mechanism of precious metals, however, will serve the needful and useful purpose of formulating precise steam tables. That is to say, if you are one of the millions of citizens who ride on railway trains or otherwise a beneficiary of the motive power or use of steam, this bit of laboratory equipment does not represent extravagance, as it will enable engineers and others engaged in harnessing and using steam to better understand its behavior and to apply it more efficiently. Water vapor, or steam, as it goes through this experimental apparatus, built of precious metals, would contaminate the baser elements and thus impair the usefulness of this testing equipment. This is not true with respect to the palladium and pure silver. The vapor or steam thus controlled and studied will have a temperature of about 575 degrees Fahrenheit and a pressure of 1,250 pounds to the square inch, yet this assembly of costly metals will not corrode or otherwise be contaminated by the action of this hot vapor.

3/25/25

Berkeley, Calif.

2680

ONE-MAN TRACTOR SCOOP REPLACES MANY TEAMS

With a tractor scraper now on the market, one man, it is said, can do the work of several horse outfits on grading or



Rear View of Tractor Scraper, Showing How Control Is Managed from Driver's Seat

similar jobs. It has a revolving scoop controlled from the driver's seat by simply pulling a rope. With little effort it can be adjusted for dumping, spreading, leveling or loading, and each operation is performed while the tractor is going forward. Thus the trouble of reversing and delays in stopping are eliminated. The scraper is durably made, has no parts that need oiling or attention, and is manufactured in five, six and seven-foot sizes.

2955

PUTTING DIAMONDS TO WORK

Diamonds employed in industry are mostly used in their natural state. They are sometimes cut for special work, but are generally set in steel holders for truing and shaping grinding wheels. Two types are commonly employed, "borts," those of crystal formation, and "carbons," the black Brazilian stones which are generally considered to have greater resistance than the others. The supply of these is limited and their use is largely confined to drilling. Diamonds also are used in stone saws, wire dies and glass cutters.

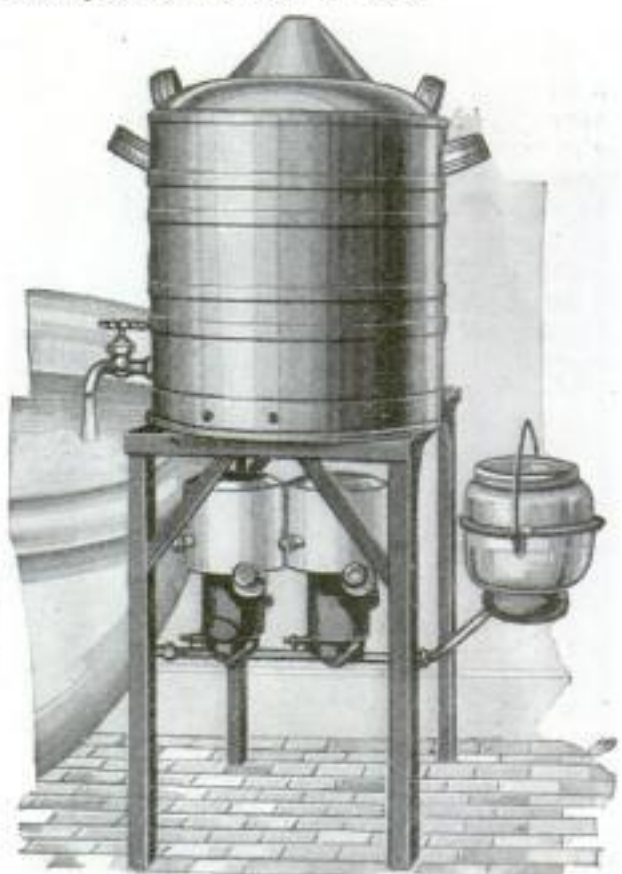
2956
COPPER AND TIN SUBSTITUTES DEVELOPED IN GERMANY

Aluminum is being used as a substitute for copper in the electrical industry in Germany, in spite of its softness and low melting point. Conductors of this metal with steel tubes are now often used. Technically pure aluminum, it has been found, possesses some of the qualities which cause hardness in duralumin, the alloy of which the framework in the dirigible "Los Angeles" is made. Small additions of copper and magnesium seem to improve the basic aluminum when it is subjected to high temperatures. Lead is taking the place of tin as an alloy for bearing metals, but bronze is still being used for heavy work.

2675

PORTABLE OIL WATER HEATER REQUIRES LITTLE SPACE

For homes where running hot water is not available, a portable kerosene heater that occupies but fifteen inches of floor space, may be placed beside a bathtub, sink or laundry basin where it is to be used to save carrying, splashing and other discomforts. A faucet at the bottom lets the water run out directly from the container, thus preventing loss of heat.



Filling Bathtub from Portable Heater, Which Is Specially Suited to Small Rooms

The Holstream Heater Co.
9002 Richmond Ave. S.E.
Cleveland, Ohio.

Brass World

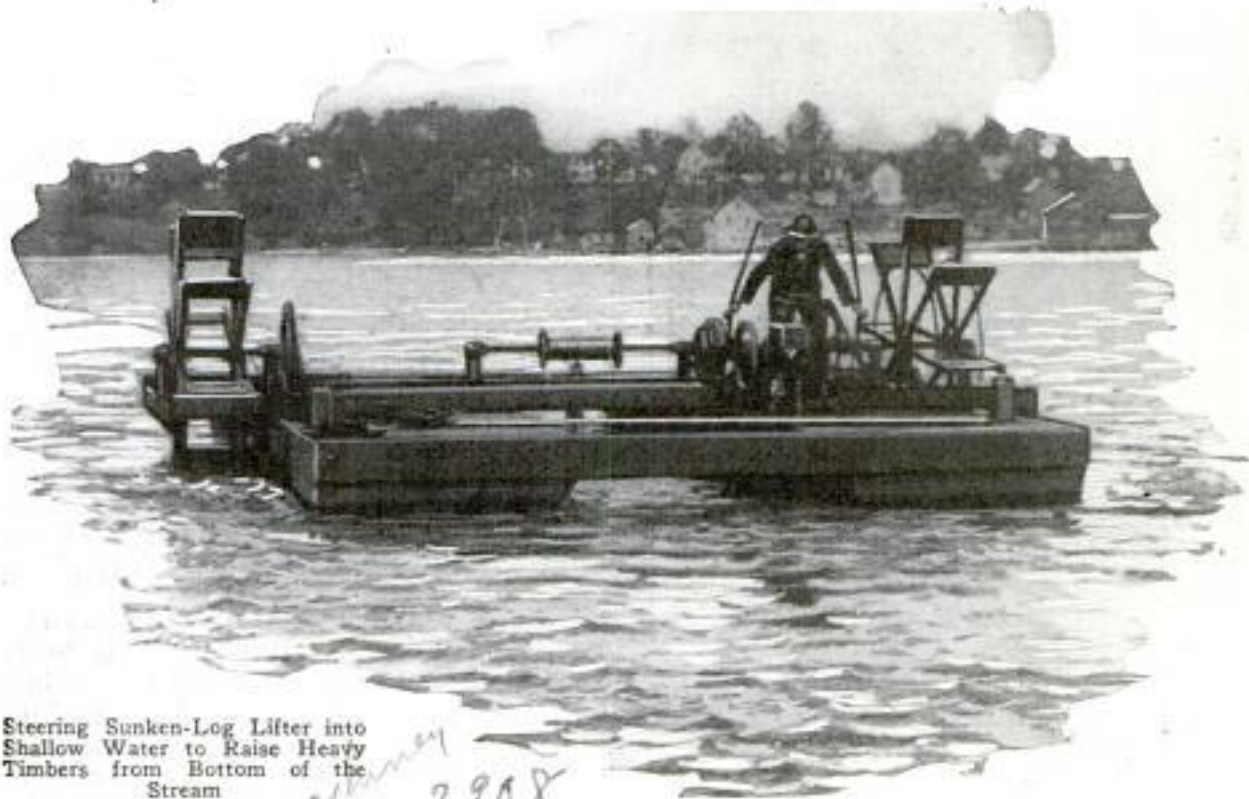
3/25/25

2908 Mrs. Arthur J. Zepf

POPULAR MECHANICS

921

90 Arthur Zepf Lumber Co.
Charlevoix, Mich.



Steering Sunken-Log Lifter into Shallow Water to Raise Heavy Timbers from Bottom of the Stream

W. A. ...
2908

SUNKEN-LOG LIFTER DOES WORK OF OVER FIFTEEN MEN

To economically reclaim sunken logs, a lifter has been made that may be operated by two men in from twelve to eighteen inches of water. It is said that it will easily do the work of from fifteen to twenty men working with the old hand methods. The device is operated by a small gas or kerosene engine installed on bargelike floats. By reversing one of the paddle wheels, the craft may be turned around within its own length. The machine is especially adapted to reclaiming logs through the south, on account of the free movement in shallow waters.

2947

PAIN FINDER LOCATES CAUSE OF STOMACH ILLS

Vagrant aches and pains which often afflict the stomach and are hard to identify may now be accurately located and classified by an instrument resembling a miniature seismograph, the device with which earthquake tremors are recorded. The pain finder, devised by Dr. W. C. Alvarez, of the University of California, is said to register the course of such ills in almost any part of the abdomen and to clearly reveal every step of the digestive proc-

Berkeley, Calif.

esses. By the recorder, the passage of food through the digestive tract can be closely followed, and the exact spot and instant of the setting up of any trouble definitely learned in a few minutes. The instrument, called the multiple-electro-enterograph, is said to obtain its data by means of a pendulum swung in a vacuum tube, and marks its records with a needle.

2617

AUTO SPOT AND TROUBLE LIGHT ARE COMBINED IN ONE

An automobile spotlight which can be quickly removed from its position for service as a trouble lamp, clamps to the bottom of the windshield frame. A ball movement allows the rays to be directed to any point in front of the car. Focusing is done by pulling the light in or out through the collar. When needed for repairs the lamp can be easily lifted from the holder by loosening a small screw. It throws a wide beam of light which can be adjusted as the driver desires for reading road signs or illuminating the path ahead.



Bursfield Auto Lite Co.
Indianapolis, Ind.



Street-Car Safety Exit Which Is Automatically Opened by Passenger's Weight as Car Stops

SAFETY DOOR ON CAR OPENED BY PASSENGER'S WEIGHT

The weight of a passenger standing at the exit in the vestibule of a trolley causes a safety door to open automatically when the car comes to a stop. As the rider

leaves the car step, the door shuts, releasing a control lock which prevents the motorman from starting again until all entrances and exits are closed. The apparatus is so delicately adjusted that the weight of a small child is sufficient to operate the device, which relieves the crew to devote more attention to traffic and other duties. It is believed the self-operating exits, which were developed by the Chicago street-car system, will serve to reduce accidents materially.

2901

FLOWER SCENTS IMPAIR VOICE, SINGING EXPERT DECLARES

According to a European authority, the mere act of smelling strongly scented flowers temporarily impairs the voice, while if indulged in unchecked, it may prove disastrous if the singer is attempting high notes before an audience. Violets, roses, the lily-of-the-valley, the narcissus and the white lilac are said to be especially harmful in that they prevent clearness of vocal sounds. Violets, if freshly cut, vary in effect according to different individuals. In some cases, they cause an almost total loss of voice, while in others, they create a peculiar hoarseness and dryness in the throat. Rose scents act similarly, although the white and yellow varieties usually impair the voice less than the red-bloom scents, it is reported.

Com. George H. Holden, Halifax, N.S., Canada
Com. J. W. Dapton, Broad, Chesterfield, Eng.

HELIUM TO HELP DIVERS AND THE "SAND HOG"

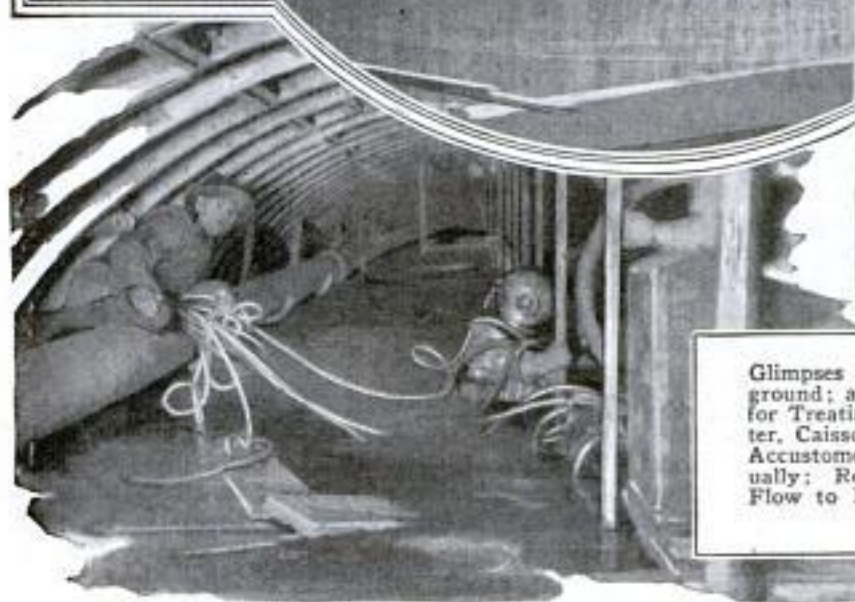
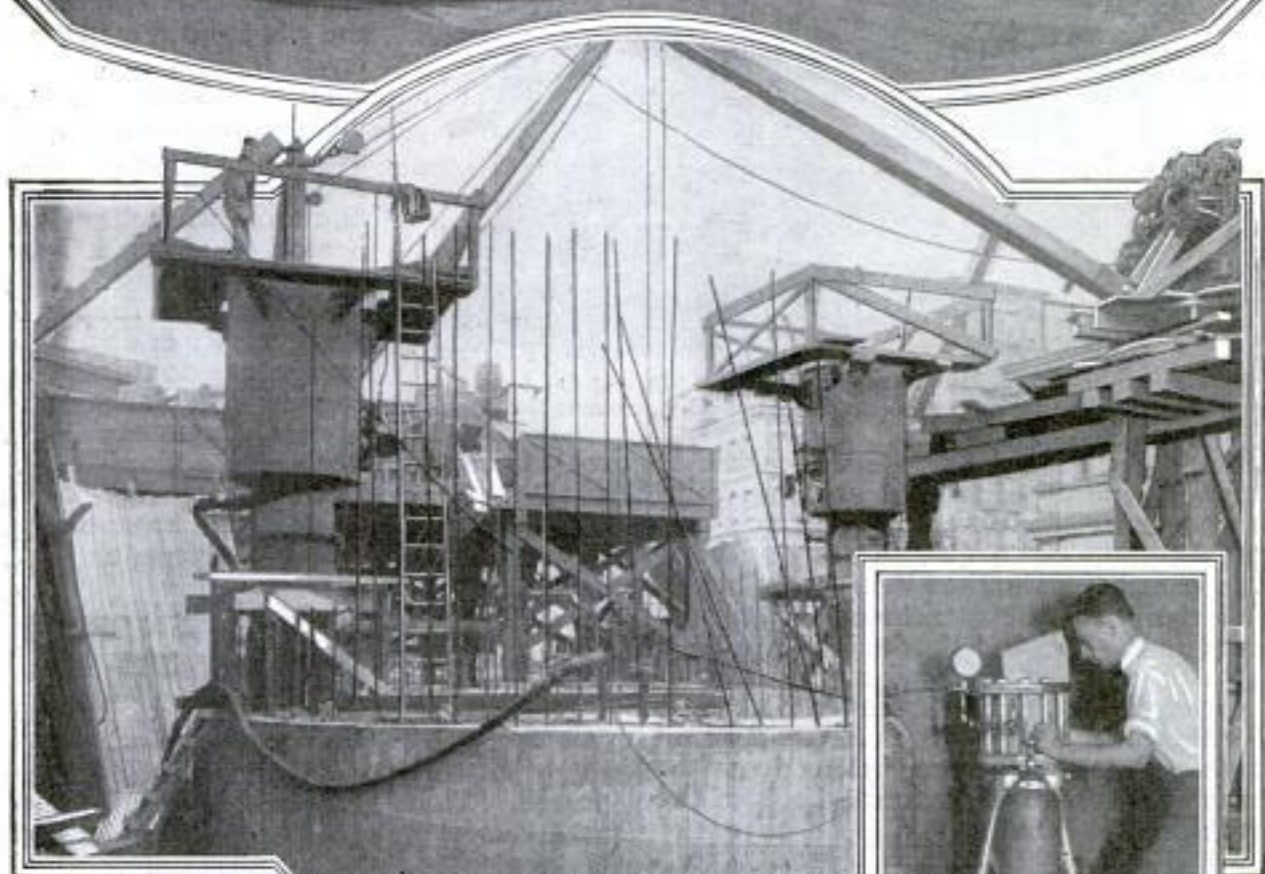
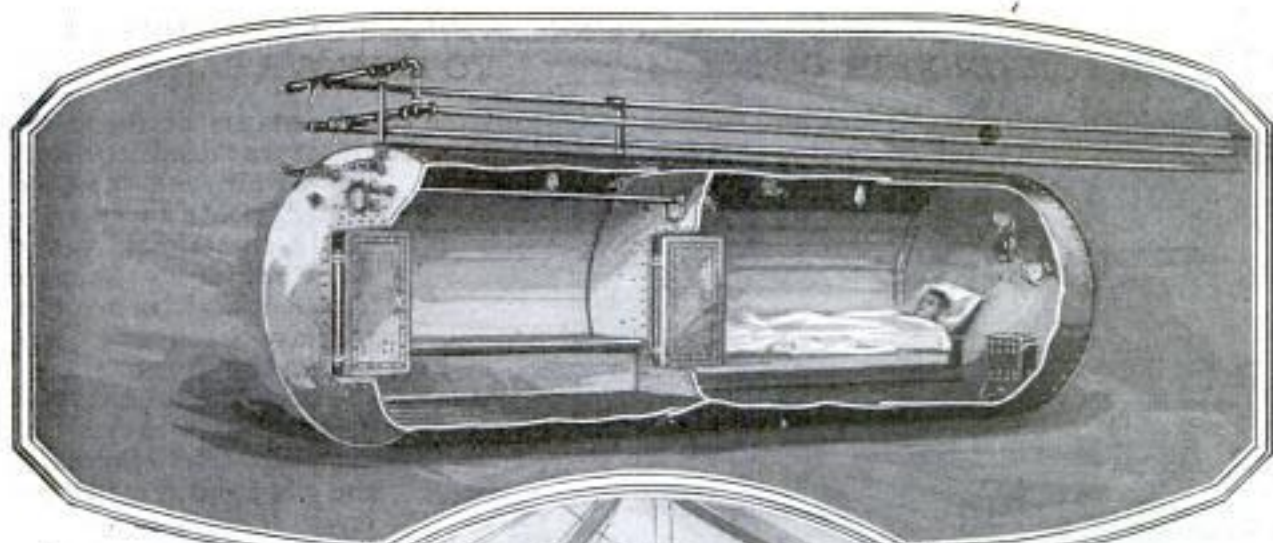
Helium, the wonder gas that will not burn or explode and which is therefore in great demand for lifting Uncle Sam's giant airships, is now to be used in deep mining operations, submarine tunneling, bridge building and other tasks that can be conducted only with the use of compressed air. Workers on these jobs perform their labors under tremendous pressure and after they have finished, it is necessary to "decompress" them, that is, restore them gradually to normal air conditions. Heretofore, nitrogen-oxygen mixtures have been used for this purpose and decompression has been a long process attended with some danger because of the tendency of the nitrogen to leave bubbles in the blood which are likely later to produce paralysis or death. Experiments conducted by the bureau of mines on guinea pigs and men have shown that, if helium is mixed with the oxygen instead of nitrogen, the danger of formation of bubbles

is greatly minimized and the decompression process takes only one-sixth of the time required for the present method. With the use of helium, it is believed, divers will be able to labor for longer periods than they now can and penetrate to greater depths. When men get caisson disease they are treated in a steel lock. The helium-nitrogen mixture, it is predicted, will prove useful here also. Pressure in the lock is raised to that at which the victim has been working and is kept for some time at this point to eliminate bubbles that may have formed in the blood, then gradually reduced to normal conditions. The apparatus is cylindrical and is divided into two compartments of equal size. The inner one is fitted with a cot for the patient and various instruments for the physician's use. The victim can be observed through a glass window in the side, and the pressure is regulated by both outer and inner controls.

Bureau of Mines

Com. R. S. Shackwell, 319 Monroe Blvd, Chicago, Ill. 828

2819

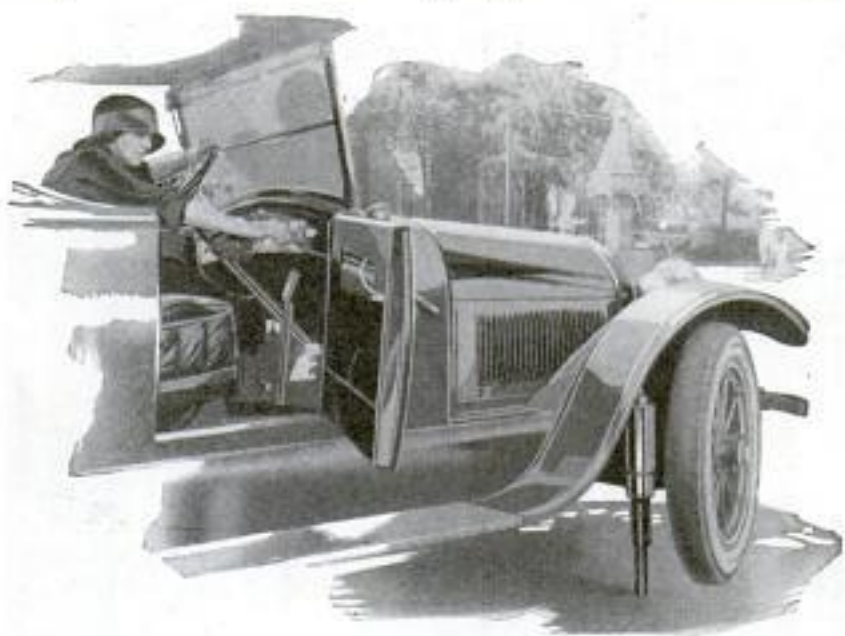


Glimpses from World of Work Underground; at Top, Cross Section of Cylinder for Treating Compressed-Air Illness; Center, Caisson Locks in Which Men Become Accustomed to Different Pressures Gradually; Regulating Helium and Oxygen Flow to Restoration Tank, and Diver at Work in Subway

2846 **SHOCK ABSORBER AND JACK ARE COMBINED IN ONE**

67

A combination hydraulic jack and shock absorber has been invented to give greater



Raising Right Front Auto Wheel with Combination Jack and Shock Absorber by Releasing Inner Cylinder from Control on Instrument Board

riding comfort and use in emergencies. It consists mainly of two telescoping cylinders operated by oil pressure from a motor-driven pump under the engine hood and controlled from the instrument board. On the road, the attachment is said to take up the jars and shocks in the manner of a big spring, and when the jack is needed, the extension cylinder that is to lift the car is forced out as a stream of oil enters it through copper tubing from the pump. Any one or all four wheels of the auto may be lifted.

2897 **NEWSPRINT MADE FROM STRAW TO SAVE WOOD PULP**

With the increasing shortage of wood pulp, comes an encouraging announcement from London that a Frenchman has discovered a process for making newsprint paper from straw. The only chemicals he uses, it is reported, are common salt and lime. The brittleness of the product, which heretofore has limited its use in this field, is said to have been overcome. Not long ago, an English daily appeared for the first time, printed entirely on this material. A factory is under construction in Canada for making it at the rate of fifty tons daily. Waste straw that now is being destroyed in great quantities each year will be utilized. The new paper is said to be white and tough.

Christian Science Monitor 3/18/25

2863 **TENNIS BALLS THAT WON'T LEAK TO IMPROVE GAME**

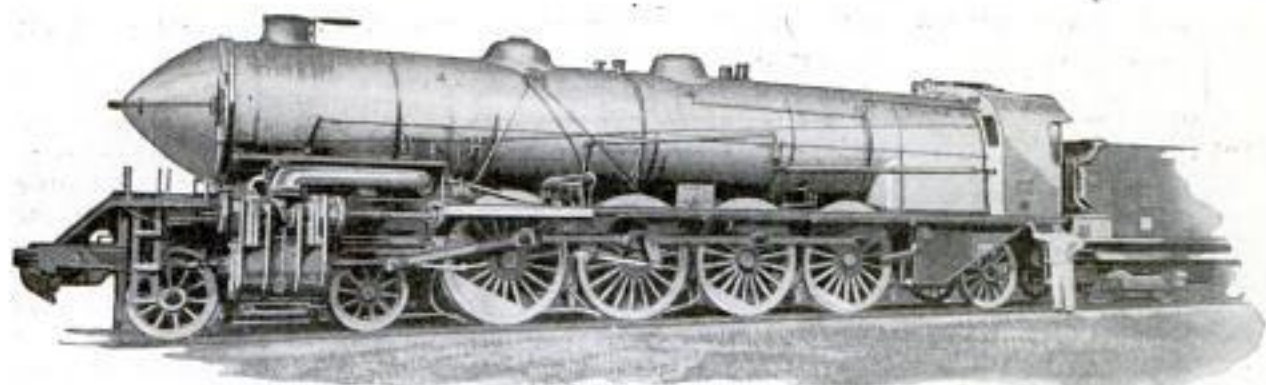
One of the disadvantages of the usual tennis ball is that it grows "dead" through loss of air, and the plug placed inside to seal the shell sometimes interferes with its bounce. These difficulties are said to have been overcome by an improved manufacturing method an expert golf-ball maker has evolved. He eliminates the plug entirely by using two guttapercha spheres. They are cemented together, a rubber skin put over them, and then they are placed in a mold where they are heated to about 300 degrees Fahrenheit. This vulcanizes the rubber to the guttapercha and causes gas to form and expand the ball to the proper diameter. The mold is cooled in ice water, and a felt covering slipped over the rubber. Balls made by this method, it is said, can be standardized as to bounce and compression.

2815 **REMINDER ALARM ON TIMEPIECE CAN BE SET FOR ANY MINUTE**

The elapse of any number of minutes can be marked by a reminder clock which rings an alarm when the interval has passed. Time, from one to ninety minutes, can be indicated by the signal, which is controlled by the adjustment of a small figured dial. The timepiece is designed to be fastened to a wall or may be set on a table. Used to time processes in factories and laboratories, the instrument serves as an accurate guide, relieving workmen for other tasks while awaiting the completion of the measured operation. It may also be employed in the kitchen to prevent overcooking of foods. An ordinary twelve-hour alarm is also contained in the clock, which is independent of the short-interval timer.



Kaweye Clock Co
 Copyrighted material



Bullet-Nosed Locomotive for Express Service on French Railroad Is Built to Pierce the Air Like a Projectile, Decreasing Wind Resistance at High Speeds

2843

ENGINE IS SHAPED LIKE BULLET TO RESIST WIND PRESSURE

For hauling heavy express trains on a French railroad, a locomotive that rivals the monsters common in this country, has just been put into operation. It weighs 118 tons, is over fifty feet long and has eight enormous driving wheels. Its nose is shaped like the sharp end of a bullet to reduce the air resistance. A low smokestack with a swinging lid, a cab without side windows and a general streamline design are other points that distinguish the engine from the usual locomotive.

2950

LIMIT TO SPEED OF AIRPLANES IS SEEN BY DOCTORS

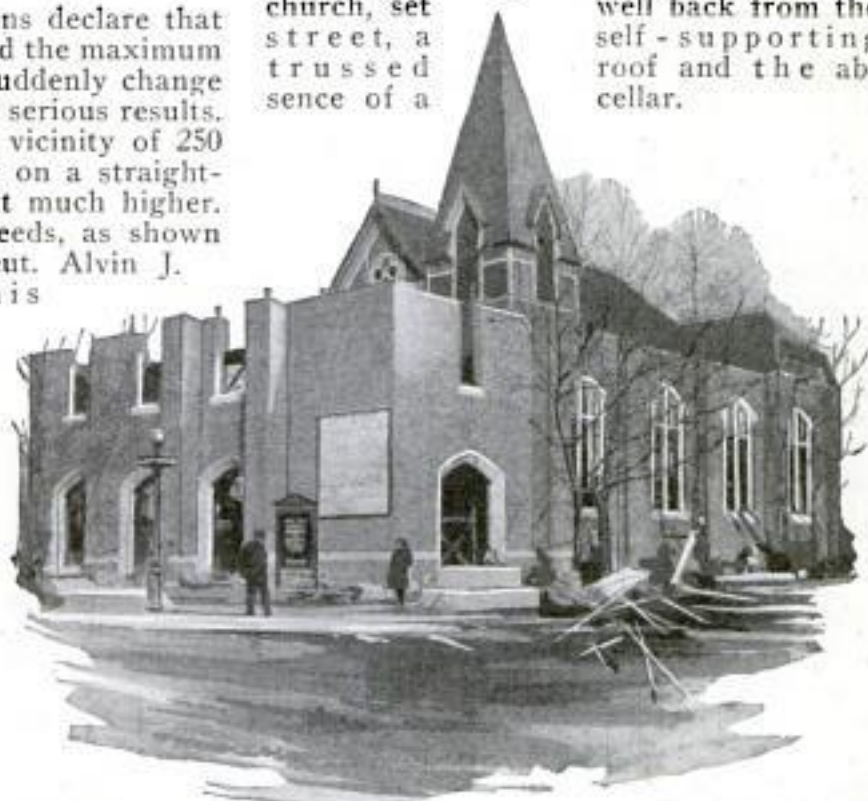
Army air-service surgeons declare that aviators have about reached the maximum speed at which they can suddenly change direction without suffering serious results. The rate is placed in the vicinity of 250 miles an hour. The limit on a straight-away, they say, can be put much higher. On the turns, at high speeds, as shown by the experience of Lieut. Alvin J. Williams, who banked his plane around sharp curves while flying at a rate of nearly 245 miles an hour at the Pulitzer races in 1923, the centrifugal force exerted on the body and its effect on the blood, cause the flyer to become practically unconscious. Greater speeds, the surgeons say, might rupture a vital blood vessel. The height limit is placed at 45,000 feet. Even with oxygen apparatus, it is believed that, at greater altitudes, the available

oxygen supply in the lungs would be too low to sustain life. At extreme heights, aviators suffer drowsiness, fits of giggling and laughing, muscular weakness, shortness of breath and impairment of the intellect and judgment.

2892

NEW CHURCH BUILT ABOUT OLD WITHOUT STOPPING SERVICES

While workmen were erecting a larger brick church around a smaller frame one in New York city, weekly services and other activities of the congregation were interrupted only to lay the floor of the new structure. Timbers from the wooden church were carried through door and windows of the outer building. The task was simplified by the position of the old church, set well back from the street, a trussed self-supporting roof and the abcellar.



While Brick Walls of New Church Were Rising around Old Wooden Structure, Services in Latter Were Not Interrupted

*Chicago Daily News
3/27/23*

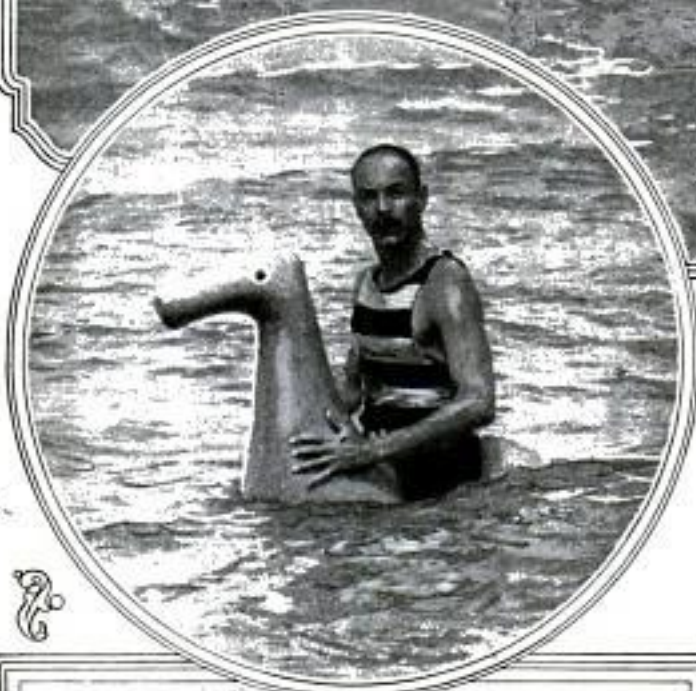
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C... ..*

Latest Fads and Fancies in Water

Inch boards. Marshall Field & Co. Chicago



Chinese Games on Life Rafts for Tables, and Surf-Riding on a Rubber Horse That Rolls Over in the Breakers, Add Novelty to Beach Sports



Acrobatic Stunts on a Skimming Surf Board Furnish Thrills for Spectators and Test the Nerve and Skill of a Plucky Team of Performers Who Must Balance with Utmost Care



Fighting Crabs Entertain an Audience at Ring-Side Seats

Sports Seen at Nation's Beaches



Swimmers May Enjoy Radio Concerts from a Set on Pool Platform; Right, a Floating Rubber Tub Permits Combination Sun and Water Baths



Lighting His Way with Flaming Torches Held in His Hands and Gripping the Tow Rope in His Teeth, This Skillful Aquaplane Rider Enjoys the Daring Sport at Night



Taking It Easy Is Often the Best Way to Solve the Cross-Word Puzzle

Marshall Field & Co., Chicago

Surf board Alex Taylor & Co. 22 E 42nd New York.

2888



Polishing Metal Mirror before Shipment; Reflection of Workman Seen as Clearly as in Glass

POLISHED METAL FOR MIRRORS IS SUBSTITUTE FOR GLASS

Sheet metal covered with a highly polished nickel preparation is being used as a substitute for glass mirrors on table tops, doors and many other places. Aside from the obvious advantage in being proof against breakage—an important factor both in shipping and in service—it is said to cost less than glass, is easily kept clean, and will not rust. The metal is manufactured in a variety of shapes.

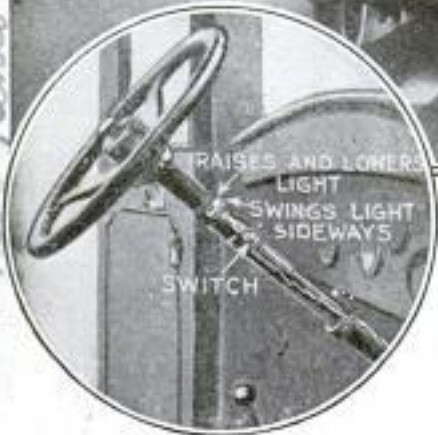
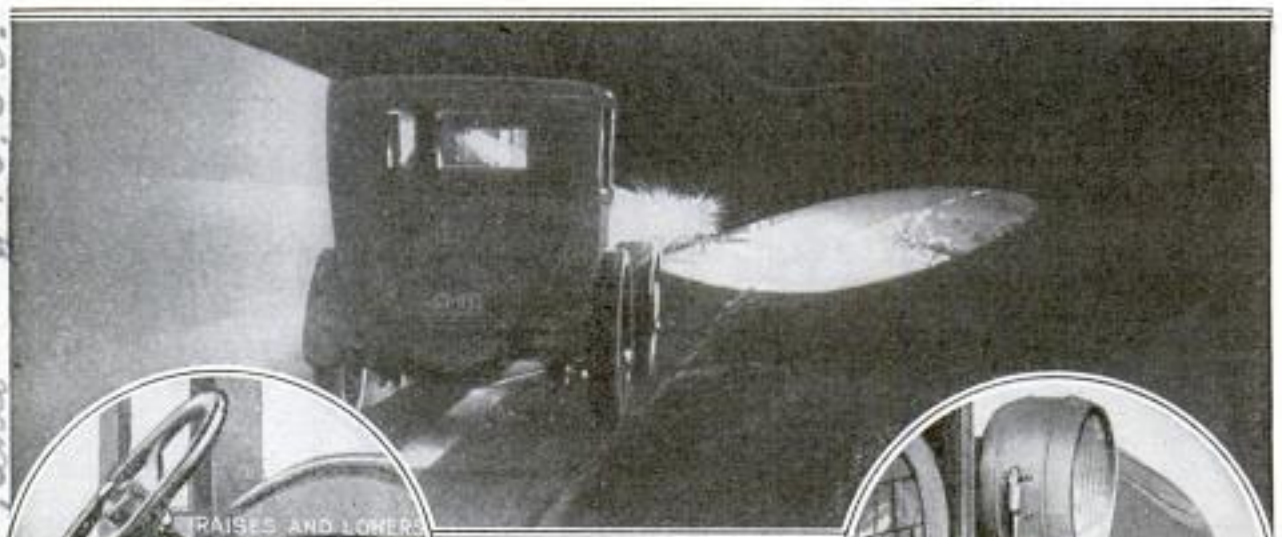
ANIMAL LIFE OF AUSTRALIA PRESERVED IN MUSEUM

To provide for the future study of the country's disappearing wild animal life, a national museum has been established at Canberra, Australia, in which will be kept specimens of native species displayed in their natural surroundings. With the advance of civilization and increase in domestic animals, the unique wild life has been greatly depleted. Although many private collections have been donated to the new institution, it is believed the gathering of most of the rarer specimens will be a difficult task owing to their scarcity.

SPOTLIGHT ON CAR FRONT TURNS BY LEVER AT STEERING POST

An automobile spotlight with the switch and control on the steering column moves at a touch and can be turned in any direction by the driver without changing position. As the lamp itself is placed low on the front of the hood, it cannot obstruct the motorist's view of the road and requires no piercing of the windshield or marring of the frame for installation. The rays of the light are below the line of sight of approaching traffic, reducing risks of night accidents often resulting from blinding glare. Although easily swung about, the lamp cannot be jarred from its position after the rays have been once fixed in any direction.

Marwell, Toledo Gear Co, 1702 S. W. 2nd St., Toledo, Ohio, 8-13, 50.



Spotlight Worked from Steering Post of Auto, Casting Rays to Avoid Blinding Oncoming Driver; Left, Construction of Control Lever on Post, and Right, How Light Is Placed at Front of Car



2927 New York Times Nov. 18, 1926

3, 22, 26

GEOLOGISTS SERVE AS SCOUTS IN RAILWAY DEVELOPMENT

Geologists often prove as important to a railroad as the engineers. Acting as scouts, they examine deposits of ore, oil and other resources, and explore mountains and wildernesses, using pack trains to take them far beyond beaten trails. Facts that they gather concerning the land are passed on to the road's agents, who use the information to induce industries to locate along the line. When a railroad plans or is asked to build an extension, word from its geologist may decide the matter, as his survey tells if the new territory is rich enough to warrant development. Not long ago, a railway asked its geologists to examine some deposits of gypsum. Their analysis showed that the area held 90,000,000 tons of the material. A plant was built, and it is expected to be a producer of railroad traffic for several years to come. Studies of the timber supply and of water problems in arid regions also are made by these scientists, who save the companies thousands of dollars annually and eliminate much of the speculation as to reasonable returns from new lines.

LIFE-SAVING SUIT WARMS BODY - AND HAS WATER-TIGHT CAP

Persons are said to be able to remain in ice-cold water several hours without dis-



Demonstrating Life-Saving Suit That Acts as Float and Keeps Wearer Warm; Hood Can Be Drawn over Head When Needed

comfort in a life-preserving suit that has a hood arrangement fitting tightly over the head and shoulders and heavy mittens for the hands. It is declared to be so well insulated that the body heat of a person wearing it is retained and no moisture can seep in. The arms and legs can be used while wearing the garment, and the head covering may be adjusted for better protection against high waves or extremely cold weather.

FIRE ALARM RINGS DOORBELL WHEN SET OFF BY HEAT

Wired to the doorbell, a fire-alarm attachment for the protection of the home, rings the signal automatically when the temperature reaches a certain point. It operates on somewhat the same principle as the overhead sprinkler devices for extinguishing fires, being extremely sensitive and certain to function. The bell is rung instantly and keeps ringing until the temperature falls or the alarm is cut off.

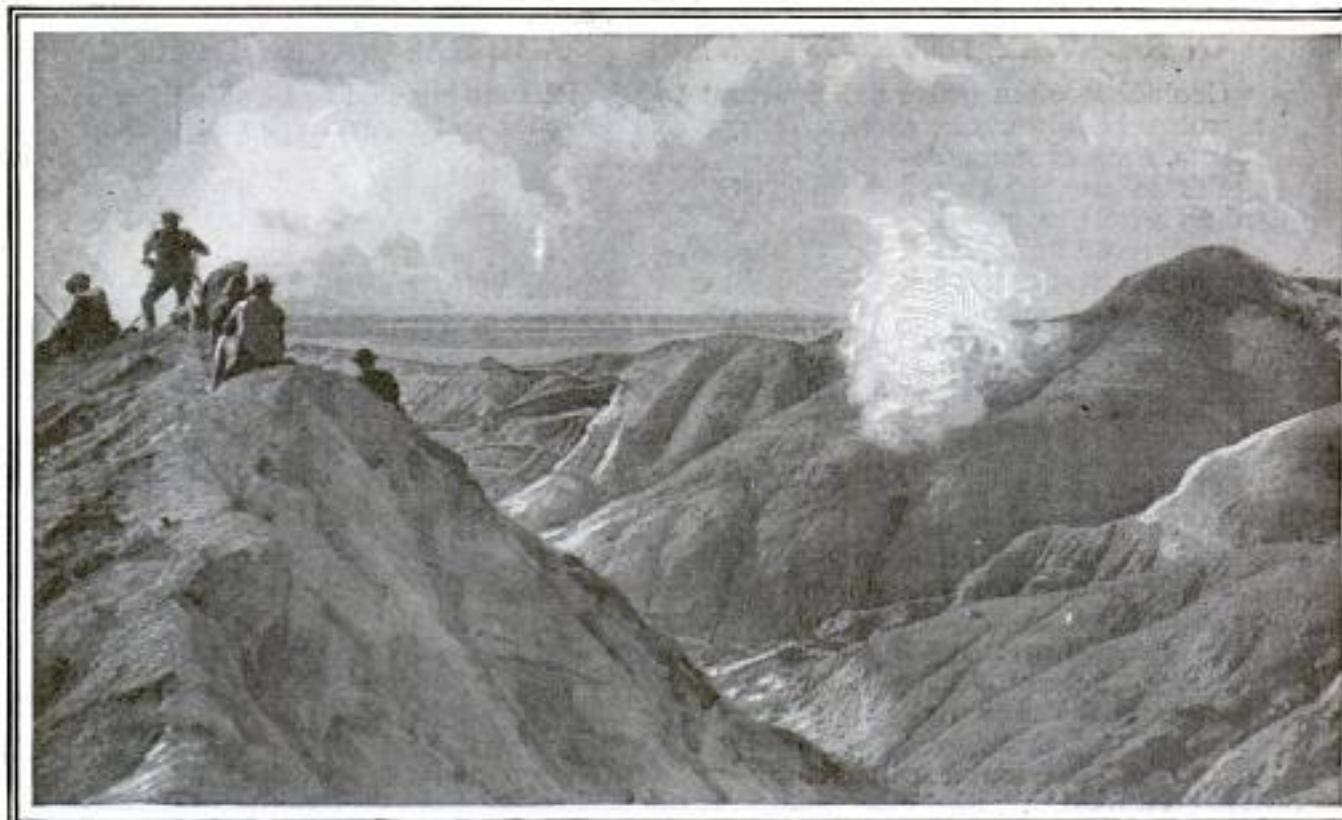


MONUMENT TO HONOR BURRO

Members of a Colorado mining association have decided to erect a stone or bronze monument to the burro in recognition of the help the animal has given in the development of the west. Although the butt of jests and sometimes the victim of ill-treatment, the burro's good qualities, dependability, strength and endurance, long have been appreciated by pioneers, prospectors and adventurers who have been seeking fame and fortune off the beaten trails.

3, 22, 26 37 New York Times

Dynamite Blast in the Desert Unearths



Setting Off One of the Blasts Which Ripped Open the Barren Hillsides to Uncover the Secrets of Life That Existed Millions of Years Ago near the Mohave Desert

By C. W. MACFARLANE

DID you know that camels originated in North America? And that the only representative now existing on this hemisphere of this once vast tribe is the llama of South America?

Or that the now dry and arid Mohave desert was once a verdant plain? And that, from five to eight million years ago, giraffe-camels, three-toed horses, and other totally extinct creatures cropped its grass and herbage in untold numbers?

An expedition, composed of Los Angeles scientists, accompanied by the writer and a motion-picture cameraman penetrated the desert fastnesses of the barren Mohave and brought back an answer to the questions propounded above.

Organized and headed by Dr. A. J. Tiejé, widely known paleontologist, the expedition succeeded in bringing back the bones of animals, which, according to scientific estimate, lived from five to eight million years ago, and that may have perished in an ancient volcanic catastrophe.

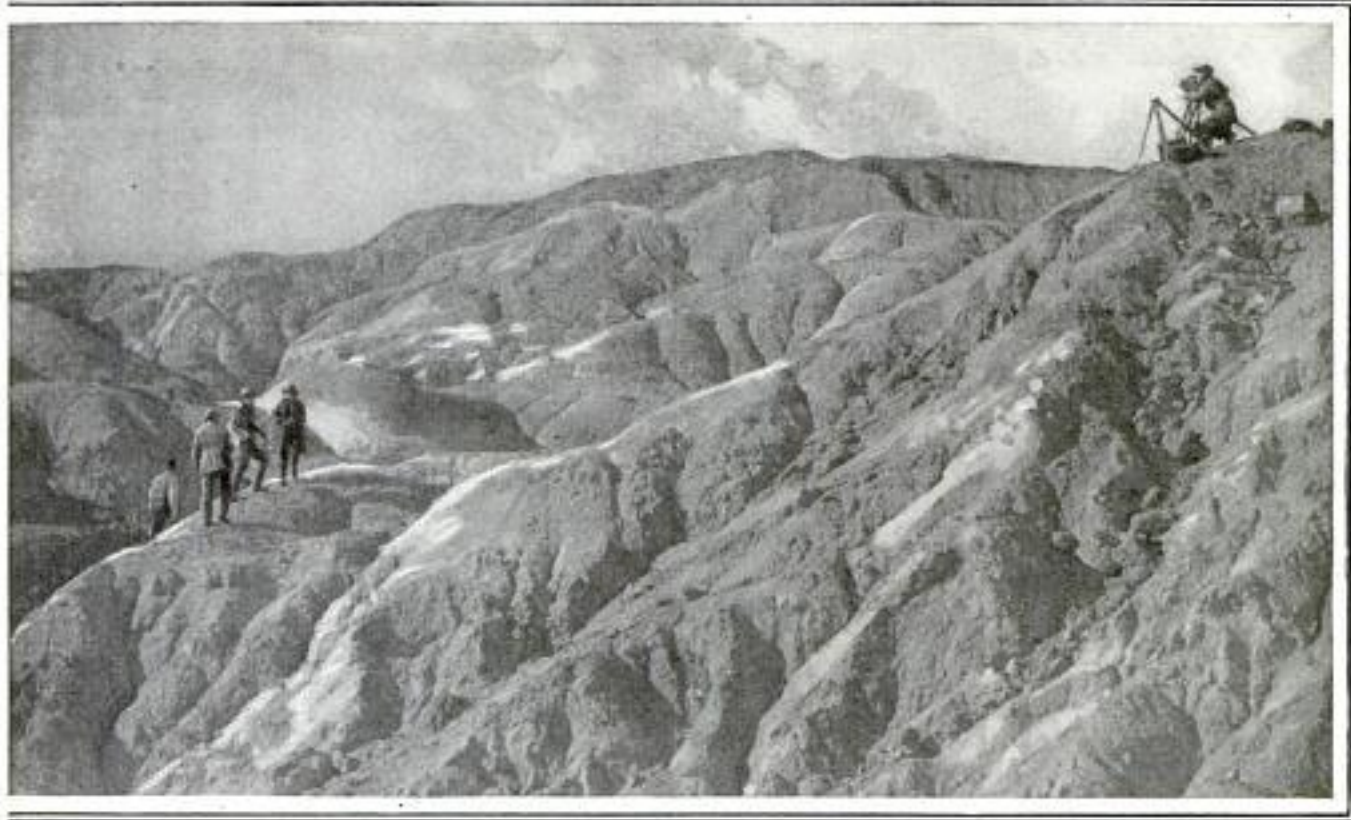
In appearance the fossil-bed area is as fantastic and as odd an earth formation as you will ever see. Whole slices of mountainsides have been pushed up in steplike layers. Here are hundreds of little mounds like chicken croquettes on a huge platter. There are lofty towers pattern-

ing their jagged silhouettes against the desert sky. Whole castles and cathedrals stand forth in bold relief, and mingled with these are hundreds of lesser formations whose contorted and irregular shapes defy description. It is weird and seems of another world. But, forsaken and desolate as it is, this lonely region carries a record of life now vanished from the earth that is fascinating and almost overwhelming.

Diligent search soon revealed the presence of hundreds of very much broken up pieces of fossilized bones, some of them showing the marrow channel, and others parts of the rounded ends of joints. Most of the specimens were found lying on the surface, exposed by the rains which had washed away the ashen blanket that had covered them for so many millions of years. With the profusion of so many fragmentary specimens, it seemed likely that underneath lay other more complete remains, and, acting upon Dr. Tiejé's suggestion that a small charge of dynamite might uncover a skull, drilling was started preparatory to placing the dynamite.

Now, to be told that a bone, or anything else for that matter, is from five to eight million years old, and to be asked to believe it, is a rather large order; therefore,

Animal Bones Five Million Years Old



Scene of the Expedition's First Fossil Find Which Resulted in the Determination to Shatter the Surrounding Soil with Dynamite in Search of Additional Specimens of Prehistoric Bones

it is perhaps well to add a few enlightening remarks concerning the composition of the fossil-bed area. Scientific scrutiny established the material into which our drills were now punching to be principally volcanic ash, laid down apparently in what a scientist would term the Upper Miocene period. In the geologic calendar, Upper Miocene designates the close of the middle period since the beginning of the age of mammals. Authorities differ, but this period is usually placed at about five to eight million years ago. Back of the age of mammals lies the age of reptiles, who, according to the best scientific authorities, ruled the entire earth, land, sea, and air, for a period of approximately thirty millions of years. This was the age of the gigantic carnivorous *Tyrannosaurus*, which

reached a length of forty-seven feet or more, and was eighteen to twenty feet high. Back of the reptiles was the age of fishes, and back of that the age of invertebrates. From this reckoning, some idea can be gained of the antiquity of the fossil beds.

With the dynamite placed, the fuse lit, a muffled roar reverberated sharply from the torn stratified walls which rose around us and struck an answering note in the beatings of our hearts as we ran to comb the cavernous holes made by the blast.

No skulls were uncovered, but from the shattered gray ash we rescued part of the thigh bone, which was identified as belonging to *Alticamelus*, a high-necked camel, and portions of the foreleg of the same animal, and in sorting, found the tooth of *Merychippus*, a three-toed browsing horse. It was a



Fossil Fragments Torn from the Earth That Reveal Secrets of a Little Known Era

With the Movie Camera, the Exploring Party Recorded the Story of a Handful of Fossil Bones Thousands of Centuries Old



fortunate find, for strange as it may appear, scientists tell us that the camel tribe originated in North America and was long confined to that continent, while at the present day this once vast tribe is represented only by the llamas of South America and the true camels of Asia, having completely vanished from its former home.

When this animal roamed, the now dry and arid Mohave desert had considerable grass and herbage, with frequent water holes, much the same as certain parts of Africa, and for unknown distances the country was low, open and rolling. The present desolation has been due to some volcanic upheaval.

WATER MAINS MADE ON SPOT CUT CONSTRUCTION COSTS

Combination steel and concrete water mains can be made on the spot in a temporary works by a new system in use in England. The skeletons of the tubes consist of metal strengthened, inside and out, by spiral bars which retain the concrete body. These frames are rolled from ready-cut material as needed, eliminating any waste of raw products. By



molding the pipe as it is laid, losses resulting from left-over supplies are greatly reduced since only sufficient lengths are cast to finish out a line. After the sections are constructed they are heat-dried and left to "season" in the open air for about ten days. The method does away with the cost of transporting the pipe. Joints of the sections are welded and sealed by the acetylene torch, forming a tube which is reported to be capable of withstanding high water pressures.

After severe volcanic eruptions, the earth's temperature is said to be reduced for long periods because of the floating dust that is sent to high altitudes, intercepting the sun's heat.

*Emb. C. A. Gearroyd, 2796
129. 2796
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Kansas City Times
2939. 3/25/25

Dr. H. P. Olausson
Hutchinson, Kansas.

COUNTRY'S AUTOS WILL SEAT SEVENTY MILLION PERSONS

Motor cars and busses in this country, it is estimated, have a seating capacity of at least 70,000,000 persons, about three times as many as can be carried on all the railroad cars. About two-thirds of the population could ride at one time at thirty miles an hour on hard-surfaced coast-to-coast roads, and there are about 2,500,000 miles of other roads suitable for auto traffic.

2873

AUTOMATIC CAFE SERVES FOOD WITHOUT USE OF COINS

Quick service for restaurant patrons has been a fact for some time both in cafeterias and coin-in-the-slot places where dishes are kept in sanitary, glass-front compartments until purchased. But the bother of handling money and waiting in line in front of steam tables, where food often is long exposed, are common objections. These, and other shortcomings of such eating places, are said to be eliminated in a restaurant that combines the principles of the usual cafeteria and automatic lunch counter. As in other shops, foods are kept in separate, covered holders, but to get them, all the customer has to do is to insert a card in a slot. This has perforations at the top that automatically release the lock, and at the same time the price of the article is stamped in a column. When the dish is withdrawn, a light flashes in the compartment, informing an attendant behind that the place needs refilling. When he has gathered what he wants, the patron pays the



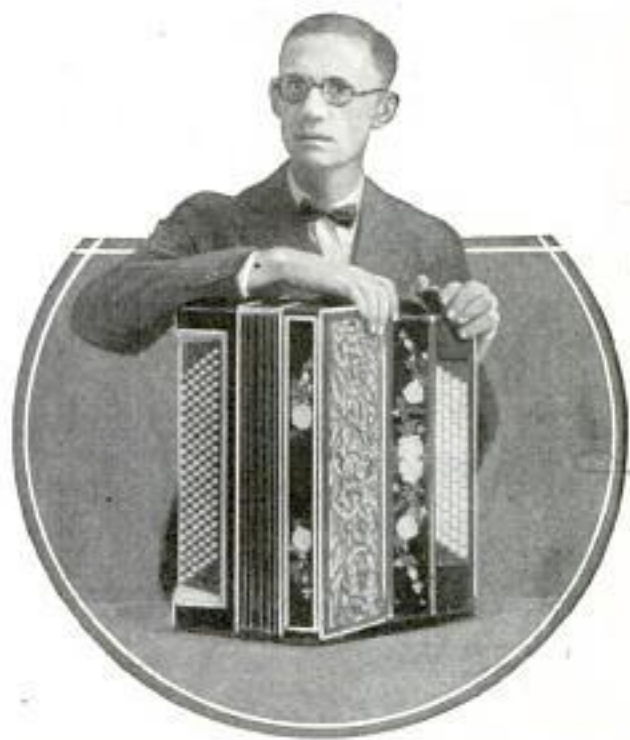
Food Compartments and Slotted Card That Is Stamped with Price as It Unlocks Them

cashier the total of the sums shown in the columns of his card. This self-service plan has fifty-three patented features.

The Antenna Co.
Brd. Minnesota
St. Paul, Minn

NEW KEYBOARD ON ACCORDION SIMPLIFIES PLAYING 2878

A violin-accordion, differing from the usual instrument in that its left-hand keys are operated in the same way that finger-



Easily Played Accordion with Four Rows of Left-Hand Keys for the Melody Part

ing is done on string pieces, has been patented by a Kansas musician. Knowledge of the piano keyboard is not essential, and anyone familiar with the violin, mandolin, banjo or cello, it is said, can play this accordion after but little practice. Bass parts are fingered with the right hand on the usual arrangement of stops, but can be learned easily, as the melody is carried by the left on four vertical rows of keys corresponding to the four strings on other instruments.

2938

TUBERCULOSIS SOON TO VANISH — BRITISH DOCTOR SAYS

Twenty-five years from now, tuberculosis will be as uncommon in the British dominions as leprosy is today, according to Dr. C. W. Saleeby, of the London medical institute. He also predicts that infant mortality will be reduced to almost nothing and that successful ways will be discovered to combat cancer. Largely through preventive methods, the death rate from tuberculosis has steadily decreased in the United States. In 1910, the fatalities from this affliction of the lungs were nearly 140 for each 100,000 population and in 1922, less than one hundred.

Chicago Evening Post
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Sold by Lyman + Beverly. 243 S. W. Adams

2858



Inside the Passenger Car of Trans-Channel Airplane in Use between France and England; above the Windows Are the Life-Belt Holders with Release Straps within Easy Reach

PLUG IN BATTERY LIGHTS LAMP TO SHOW DANGER HEAT TO SHOW DANGER HEAT

A plug that registers the danger heat of automobile storage batteries has been made to light a warning lamp on the instrument board, indicating overcharging, "shorts," low water and other imperfect conditions and injuries. The plug is easily attached, and only one is required for all three cells. Since damage to practically any part of a battery will cause it to heat, the high temperature in the cells affects strips of delicate metal in the tube result-



Close View of Plug and Tube, and Their Appearance Installed in Storage Battery

ing in the closing of the electric circuit connected to the lamp.

LIFE BELTS CARRIED IN PLANE TO REDUCE JOURNEY HAZARDS

In addition to comfortable seats and a roomy car for passengers on an airplane that makes regular trips across the English channel, life belts have been provided for the safety of the occupants. They are within easy reach and can be put on quickly in case the machine should meet with an accident while passing over the water. The windows of the craft are made exceptionally broad to permit easy escape.

UNDERTOW IS CALLED MYTH

Undertow, much feared at bathing beaches, is a myth, according to Dr. W. M. Davis, of Harvard university. Of course, he says, there is a return movement of water after each wave, but it is reversed by every succeeding wave. A genuine undertow, that is, a strong bottom current setting permanently away from shore, he holds, can arise only under peculiar circumstances. A deep "pocket" beach between two headlands will develop a steady bottom current when a wind blows in from the sea.

Dr. W. M. Davis, Harvard Univ. 22/25

2858 Mrs. Green

nauticus 2/28/25

Cont. L. O. Dichenovs
534 2nd St. St. Louis

FAN-TAIL PADDLE WHEELS GIVE BOATS MORE POWER 2934

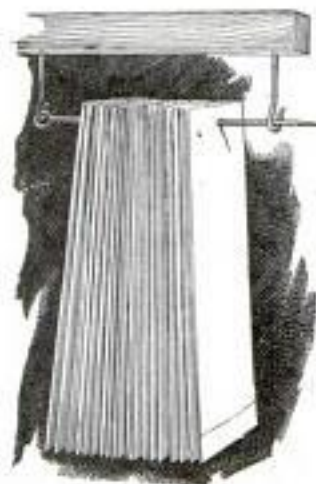
Shallow-draft vessels equipped with a series of six paddle wheels set fanwise at the stern, develop greater power than the side-wheel types according to German tests. This method, known as the Lloyd system, is said to overcome many of the difficulties presented by the limited widths of such craft at the beam. The arrangement, which seems to be especially adapted to towing vessels, has been applied to a tug designed for service on the Rhine, and an increase of twenty-five per cent of towing power over that of the ordinary side-wheeler was shown in tank tests.

MAN PAID TO WATCH CHIMNEYS TO PREVENT SMOKE 2931

Whenever one of the 265-foot chimneys at an eastern power plant emits thick, black smoke, a big gong clatters and the firemen in charge run to their boilers to correct the nuisance. The warning signal is sent in by the chimney watcher who sits in a little coop in the yard where he can command a clear view of the flue tops. As soon as he detects too dense a cloud, he throws a switch that rings the gong. There are three eight-hour shifts of watchers each twenty-four hours.

HOLDER FOR PAPER BAGS SAVES SPACE AND CLERKS' TIME 2880

A holder for paper bags, designed for groceries and similar stores, keeps the sacks out of the way, but convenient to the reach of clerks when needed. The hanger can accommodate many different-sized bags, which are released by a slight jerk from the worker's hand. Besides keeping the articles clean and dry, the holder avoids waste of the sacks, which are often damaged or badly soiled when deposited on counters or shelves. Several thousand bags can be suspended on the rack, which is easily installed and may be folded up for shipping. The device is patented.



CAMERA STAND FOR LOFTY VIEW FOLDS INTO SMALL PACK 2860

A camera tripod which can be extended to several times the height of ordinary



Lofty Photographers' Tripod Which Elevates Camera above Obstructions When Taking Pictures

stands is being employed by a Cincinnati photographer to take pictures of tall buildings. The attachment enables the operator to get the "shots" over the heads of pedestrians, avoiding interruptions caused by passers-by obstructing the field of the lens when photographing from the street level. Large structures may also be included in the lens with more detailed effect with the tripod, as it brings the camera in better line with its object. To work the camera after it is set up on the lofty stand, the operator uses an extra-high stepladder. On thoroughfares where trolley and light wires are strung, the arrangement elevates the lens above such obstructions.

Of the 20,000 persons killed in automobile accidents in the United States last year, thirty-two per cent were children under fifteen years old.

Navagansett Electric Lighting Co. Providence, R. I.

Mrs. E. C. Lemenov
Emporia, Kans.

*Greene Tweed & Co
1371 Lincoln St.
New York*

WRENCH WITH SOCKET IN HEAD HAS RATCHET HANDLE

271

With a socket form of head and a ratchet handle that can be turned in a



Ratchet Wrench Needs No Re-adjustment after Socket Is Slipped over Nut

forward or reverse direction, a wrench now on the market is said to permit reaching and turning nuts in difficult places and is not likely to slip off when once adjusted. The socket stays in place until the operation is finished, thus eliminating the need for fitting it repeatedly to the nut to get a new grip. The long handle gives ample leverage and by turning a pawl close to the socket, the motion can be reversed.

ENGINE COST IS CUT IN HALF BY USE OF HIGH PRESSURE

An engine driven by steam generated at a pressure of 3,200 pounds to the square inch, or 218 times the ordinary atmospheric pressure, has been safely operated at Rugby, Eng., for six months. Water is heated to over 700 degrees Fahrenheit under this pressure and is then turned into steam without any extra heat. If water is heated in an ordinary boiler to near the boiling point, a large amount of extra heat is required to turn it into steam. It is this additional heat, known as the latent heat of vaporization, which is so costly an item in the fuel used in steam engines. Water heated under sufficient pressure, rises to what is called the critical point,

and it will then turn into steam with practically no extra heat. At the critical temperature and pressure, a gallon of water will be converted into only a gallon of steam, the high-pressure steam only occupying the same space as the water. The engine is capable of 1,500 horsepower, and is said to save half the fuel and one-third the boiler space required by ordinary types. The extremely high pressure of the steam is first reduced to a point suitable for operating a specially designed turbine, and then is again decreased for driving a lower-pressure turbine.

2638

WHERE ALL MILK GOES SHOWN BY GOVERNMENT FIGURES

Out of every dollar spent for food, about twenty cents goes for dairy products, according to the department of agriculture. It is estimated that every person in the country drinks an average of fifty gallons a year, an increase of about eight gallons over 1917. The per capita consumption of butter is also said to be increasing. It was nearly 16.5 pounds last year and only 14.6 pounds in 1918. About one fourth of the yearly milk supply is made into butter. Less than four per cent of the milk goes into cheese and about three and one half per cent for condensed milk, the use of which is growing.



Almost as Much Milk Is Wasted as Goes into Ice Cream, This Chart Shows

*Pub. in America
256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300*

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Striking Patterns Expressed by the Weaver of Cloth Are First Arranged by an Artist from Combinations of Various Shades and Designs

Why Your Clothes Wear Out Too Soon

Tests by Government Experts Point Way to Longer and More Useful Life for Fabrics

IS it true, as housewives sometimes assert, that clothing and household fabrics now being manufactured are of poorer quality than those made before the war? That tablecloths, sheets, towels, and other linens do not last as long as formerly? That portieres, upholstery, rugs, curtains and other textiles used in the home must be replaced more frequently?

A series of interesting mechanical tests to determine these facts are now being made by government textile experts at the bureau of standards. The tests contemplate, in addition, the preparation of specifications for fabrics that will stand harder wear.

It has been found, for example, that it is possible to use reworked wool and produce a fabric which is superior in wearing qualities to one containing all virgin wool. It has been shown that very often the kind of fiber used in fabrics is less important for certain uses than the closeness of the weave.

In testing the goods, the experts make

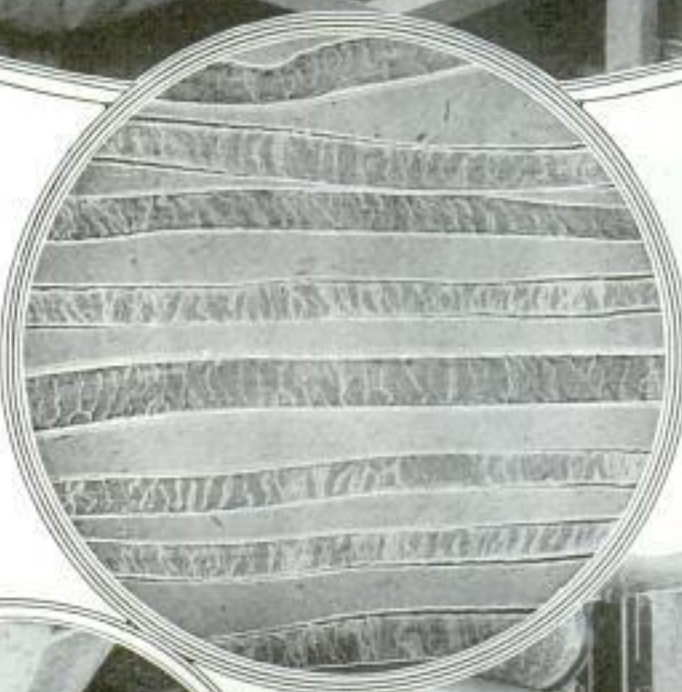
allowance for the fact that wearing apparel and house furnishings receive harder wear nowadays than in grandmother's time. Parlors, for example, once held sacred to be opened only on rare occasions, are now used by the entire family, with resultant heavier wear on rugs and upholstery. The modern housewife changes the bed sheets and towels more frequently, and uses the napery more often. Motoring and other outdoor activities, naturally, are a tremendous strain on clothing.

The tests consider the whole problem of fabrics from the production of the raw fibers in the cotton fields and on the sheep ranches, through the gin, the spinning of the yarn, and the manufacture of the cloth. They are made in a special laboratory insulated with cork so that atmospheric conditions of temperature and humidity may be artificially regulated and hence, each test will be made under identical conditions.

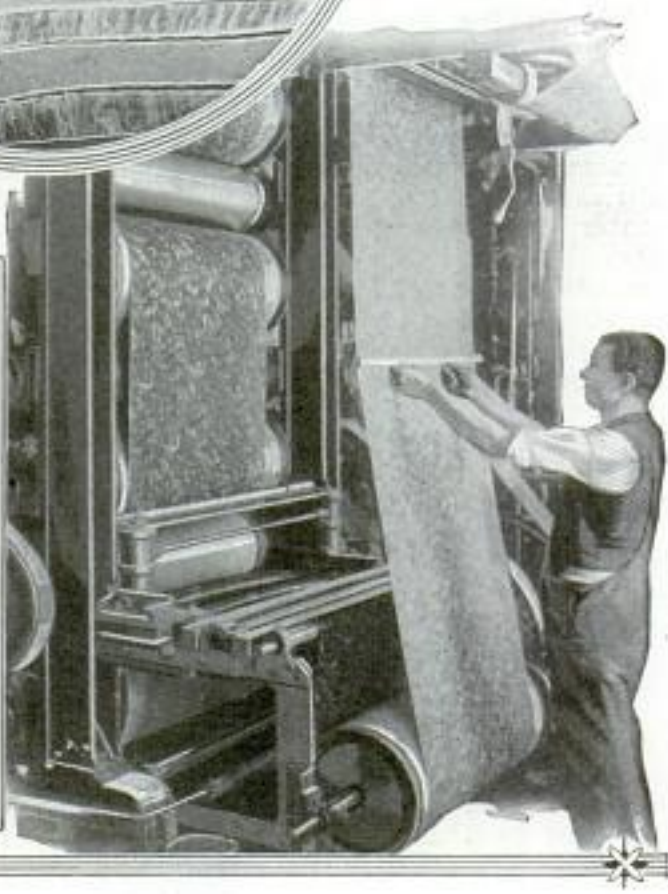
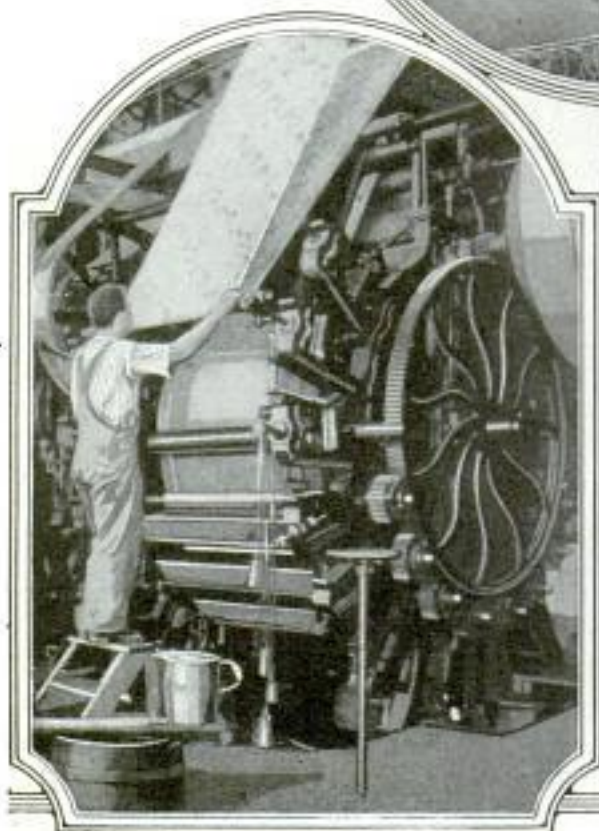
One of the testing machines is an abrasion device which rubs two pieces of



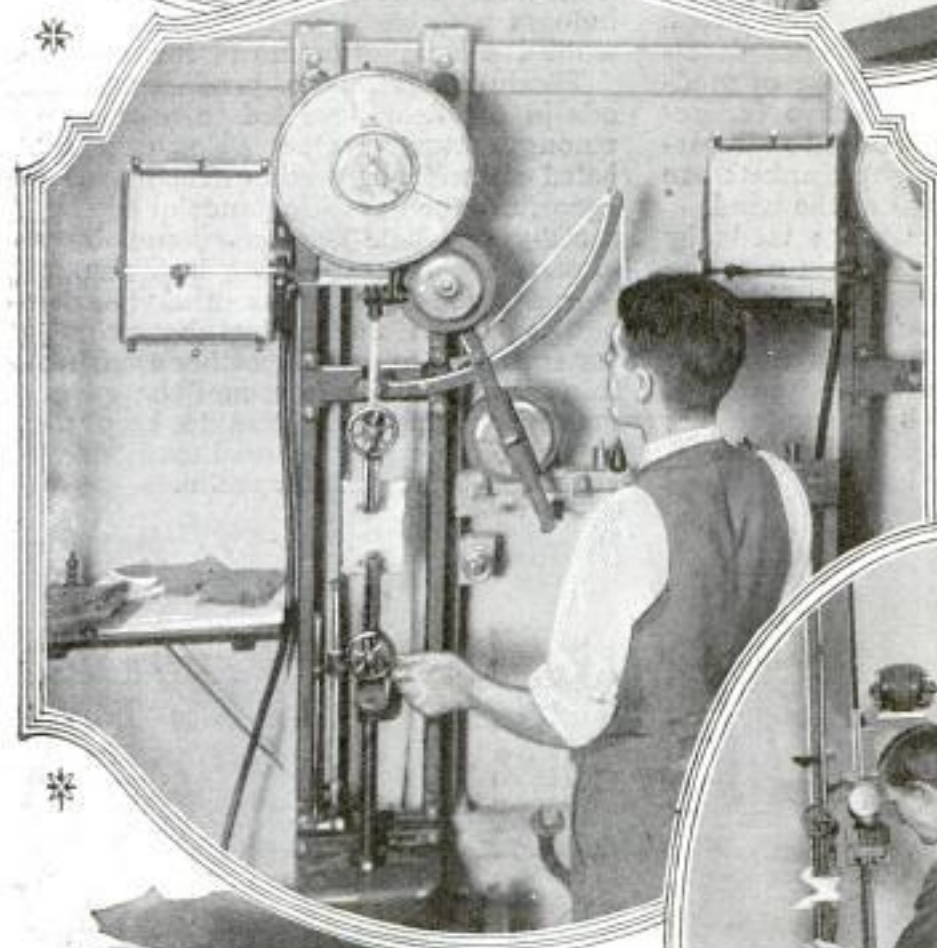
Blankets Are Tested for Their Efficiency as Comfort Producers and Health Protectors on This Electric Device Which Measures Heat Retained by the Cloth and the Amount of Air That Escapes through the Fabric; Right, Wool Fibers Magnified 500 Times by Textile Experts in an Effort to Determine the Strength and Structure of Raw Materials from Which Our Clothing Is Made



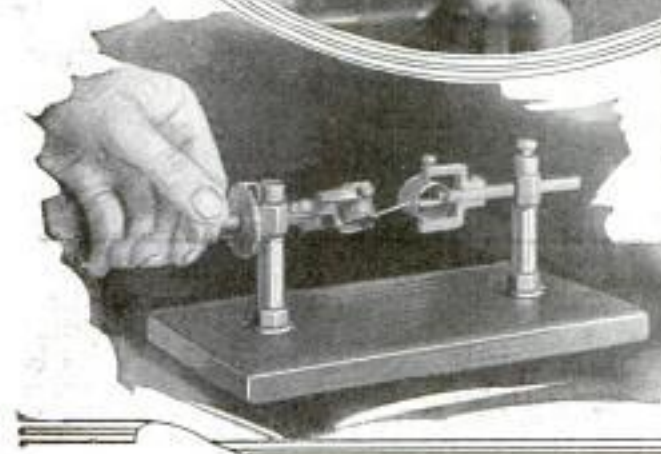
Below Is Shown an Attendant in a Weaving Factory Measuring the Width of the Web of Patterned Cloth as It Passes through the Machine; Left, Preparing Finished Cotton Material on a Huge Press Where Designs Are Applied by Printing Them from Engraved Rolls of Metal or Wood Coated with Dyes That Can Be Worked Together without Mixing or Running into Each Other



2599



Where the Standards of Cotton Fabrics Are Set by Textile Experts of the Agricultural Bureau, Who Keep an Accurate Record of Their Findings; Left, Registering the Pull Required to Break a Strand of Cotton Fiber; Below, Left, Instrument That Tests the Twist of Wool and Cotton Threads, and Right, Determining the Resistance of Sheets to Rips and Tears



250
 fabric together until they are worn through. The pressure is adjusted to approximate actual wearing conditions. Such a test recently made for the army developed a commercial cloth that, when used in trousers, would enable the wearer to sit down 97,000 times before the cloth was worn through.

Another device measures the heat-retaining properties of fabrics. This consists of a square metal plate, electrically heated, and provided with means for measuring its temperature and the amount of electricity required to keep it at the temperature of the test. Samples of the fabric are clamped down on both sides of the plate so that no heat can escape except through the fabric. The escaping heat is measured electrically, because the conversion of electricity into heat is made without loss.

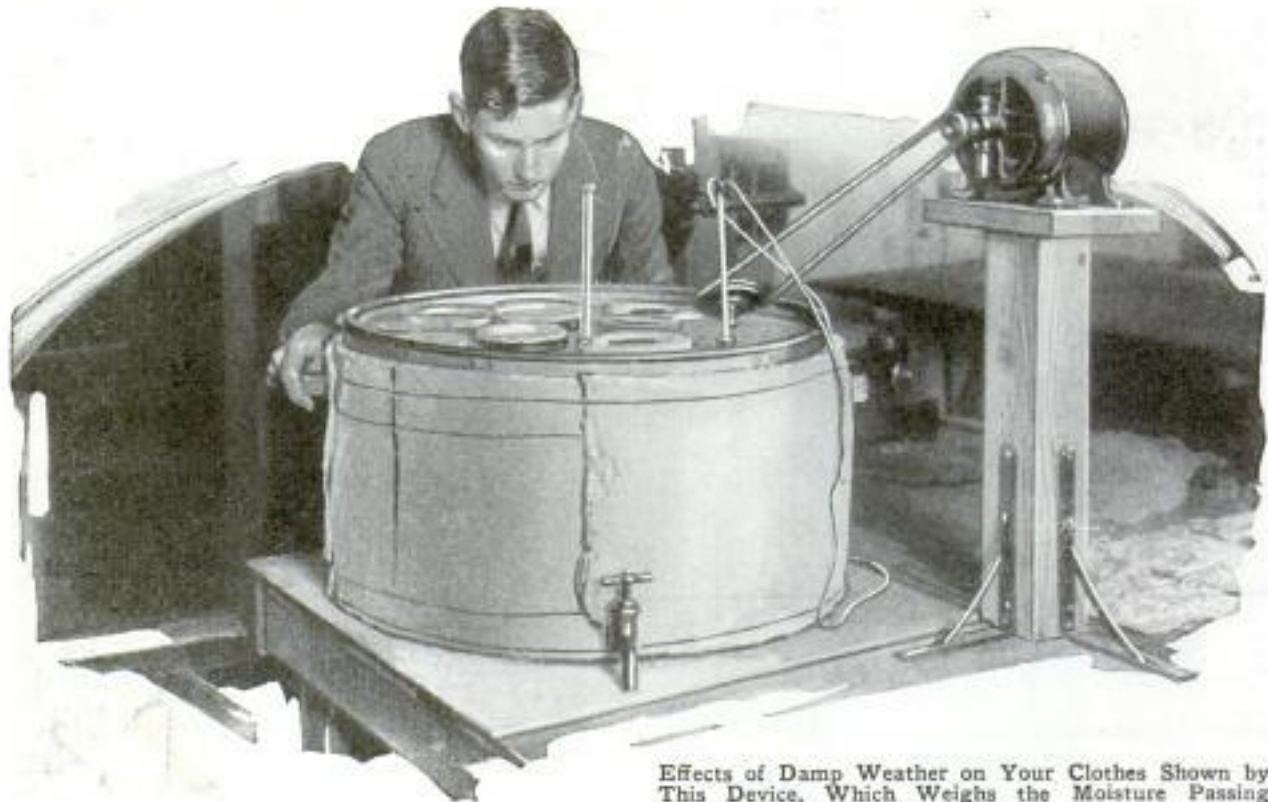
A test of blankets in this device developed the information that those of moderate density are most effective for retaining heat when not exposed to air currents, but that heavyweight blankets are more effective in keeping out the wind.

Wind permeability tests are made by fastening a sample of the fabric over the open mouth of a cylinder into which air is pumped at low pressure, a gas meter being used to measure the amount of air escaping in a given time. Resistance to moisture is determined by tying samples over small glass beakers containing water. The beakers are weighed at intervals and

the loss of moisture noted. The tests show that increased thickness of fabrics give a proportionate increase in resistance to heat flow. Resistance to the passage of air currents increases with the closeness of the weave, and hence with the density. Resistance to the escape of moisture also increases with the density.

Comparing cotton blankets with woolen, the bureau found no significant difference in the heat resistance or in the resistance to passage of air or moisture. Cotton blankets, however, are apt to be stiffer than wool and fit less closely around the neck. They also have the undesirable property of absorbing moisture, whereas wool repels moisture. On the other hand, cotton blankets are much cheaper than wool and can be used to good advantage indoors with sheets. The advantages of wool are most pronounced for camping.

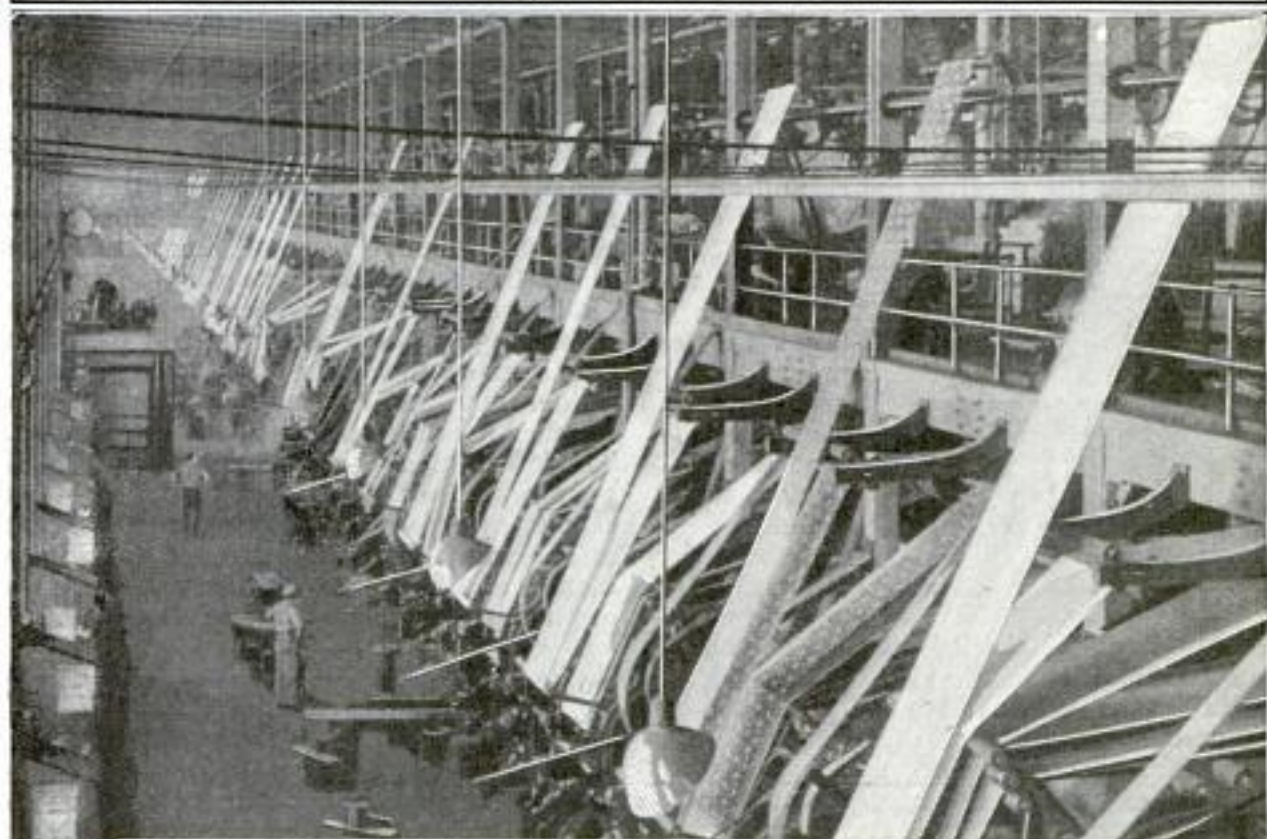
The investigations of production methods in the field have led to a campaign among cotton growers to protect their baled cotton from weather damage. Damage of as much as 370 pounds of cotton in a 500-pound bale has been found by the experts where cotton has been exposed over a period of several months. The damage is caused mostly by absorption of water from the ground rather than from rain falling on the bale, and the government is urging producers to keep their cotton off the ground on boards and to cover the bales with tarpaulin.



Effects of Damp Weather on Your Clothes Shown by This Device, Which Weighs the Moisture Passing through Fabrics



Inspectors Examining Samples of Raw Cotton Collected from Shipments of Material Produced by Plantations of This Country; Careful Study Is Made of Moisture and Damage Sustained in Transportation



Printing Department of a Cotton-Fabric Mill Where Miles of White Cloth Are Covered with Brilliantly Colored Patterns as It Races through the Rolls of Machines Which Turn Out Thousands of Bolts a Day



Running-Board Lamps Installed, a Headlight on Right and the Left One Casting Glow to Rear; Inset Gives Close View of Lamp

AMPLIFIER - CONTROL SWITCH REPLACES PLUGS AND JACKS

An all-purpose switch that can be mounted on the receiver panel, and eliminates the use of plugs and jacks for controlling the various amplifying stages in the modern multi-tube receiver is now available. The amplifying units of the receiver are brought into action by simply turning

the knob. Bakelite cams on the shaft are arranged to make and break the circuits as the knob is turned, and a fan-shaped switch blade, mounted on the shaft at the rear, makes and breaks the filament circuits to the tubes, so that only those required for the stage used are lighted.

Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

LAMPS ON RUNNING BOARDS ELIMINATE GLARE

By placing auto lamps on the running boards and directing the one on the right-hand side forward and the left one to the rear, an effective way of eliminating the glare from the usual headlights and of aiding the driver has been devised. Approaching autoists are protected from the full rays of the right lamp by the front fender but ample illumination is thrown upon the road where it is most needed. The left light, shining behind, is to be used only when on the highway or on dark streets, affords a useful tailpiece and helps in backing. The lamps are not difficult to install and serve as brilliant step lights in entering or getting out of the car.

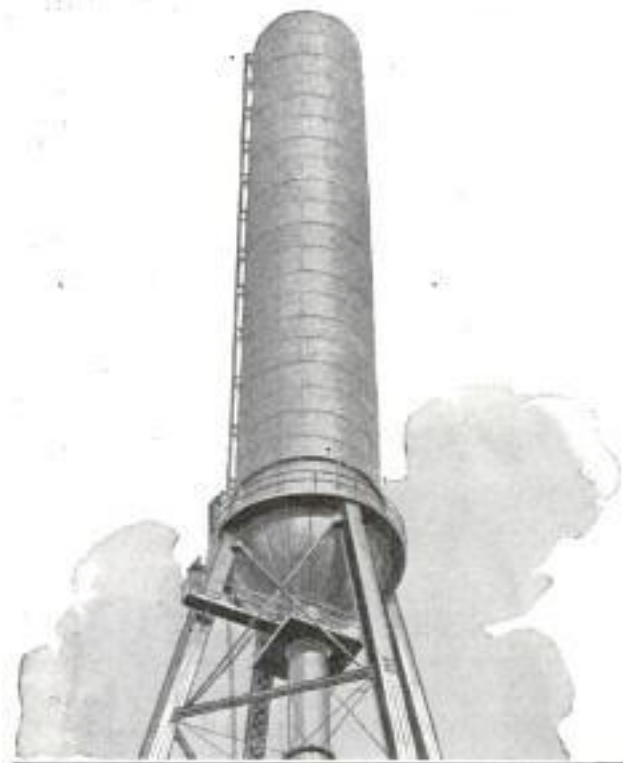
PLANTING FLOWERS BEES-LIKE INCREASES HONEY YIELD

Experiments conducted by an English bee expert go to show that by catering to the insects, or planting the flowers they prefer, the honey yield may be increased as much as twenty per cent. Apart from clover, bees show a preference for currants, loganberries and gooseberries, followed by the sycamore and the raspberry. Most bell-shaped flowers are also attrac-

tive and provide abundant honey sources, while mignonette has been found to attract bees for more than a mile from their hives, and the common hollyhock even farther. It is asserted that by planting those flowers most preferred by bees as near the hives as possible, the time spent in traveling to and fro is given to the storing of larger quantities of honey, and the berry yield is increased through more efficient fertilization as the bees serve as distributors of the pollen.

BIG TANK IS SAFETY VALVE AGAINST FLOODS

As a safety valve to guard against heavy pressures and floods caused by thaws or breaks in dams, a hydroelectric power company's water line in the Sierra Nevada mountains has a huge tank constructed at the top of a 265-foot tower. Any greatly increased flow which reaches a point of danger to the system causes the water to surge up in the tank and run out over the sides, thus relieving the strain on the structures below. The water is conveyed by gravity to the power plant through twenty-six miles of pipe and canals from sources high up in the mountains and this makes necessary the unusual height of the



Huge Tank Serves as a Safety Valve for Water Line during Pressures and Floods

tank. From the base of the safety valve there is a drop of 1,900 feet to the giant turbines.

HOBBY-HORSE CHAIR ON SPRINGS KEPT CROMWELL IN TRAINING

One of the reasons for Oliver Cromwell's fame is the fact that he successfully



Premier Baldwin Seated in Spring Chair Cromwell Used to Keep Fit for Cavalry Duty

developed the cavalry units of his army to a high degree of efficiency, demonstrating the value of horses in many battles. An interesting sidelight on this phase of his career has attracted attention recently in a curious armchair with a seat resting on high springs extending above the bottom frame. When home from campaigns and too busy to take regular exercise on his mount, Cromwell is said to have exercised in this chair, bouncing up and down for a short period each day to keep himself accustomed to the motions of horseback riding. The relic is now in the possession of Premier Baldwin of England and was demonstrated by him when friends visited him at his residence.

NAILS ARE GIVEN BETTER HOLD BY SPIRAL GROOVES

Packing cases coming from Europe have been found fastened together with tennypenny nails that have spiral flutes in the sides to afford a better grip on the wood. The grooves also decrease the likelihood of splitting the boards and help in driving the nail straight.

Cuth Milton A. Ayer, 567 Sanchez St. San Francisco, Calif.

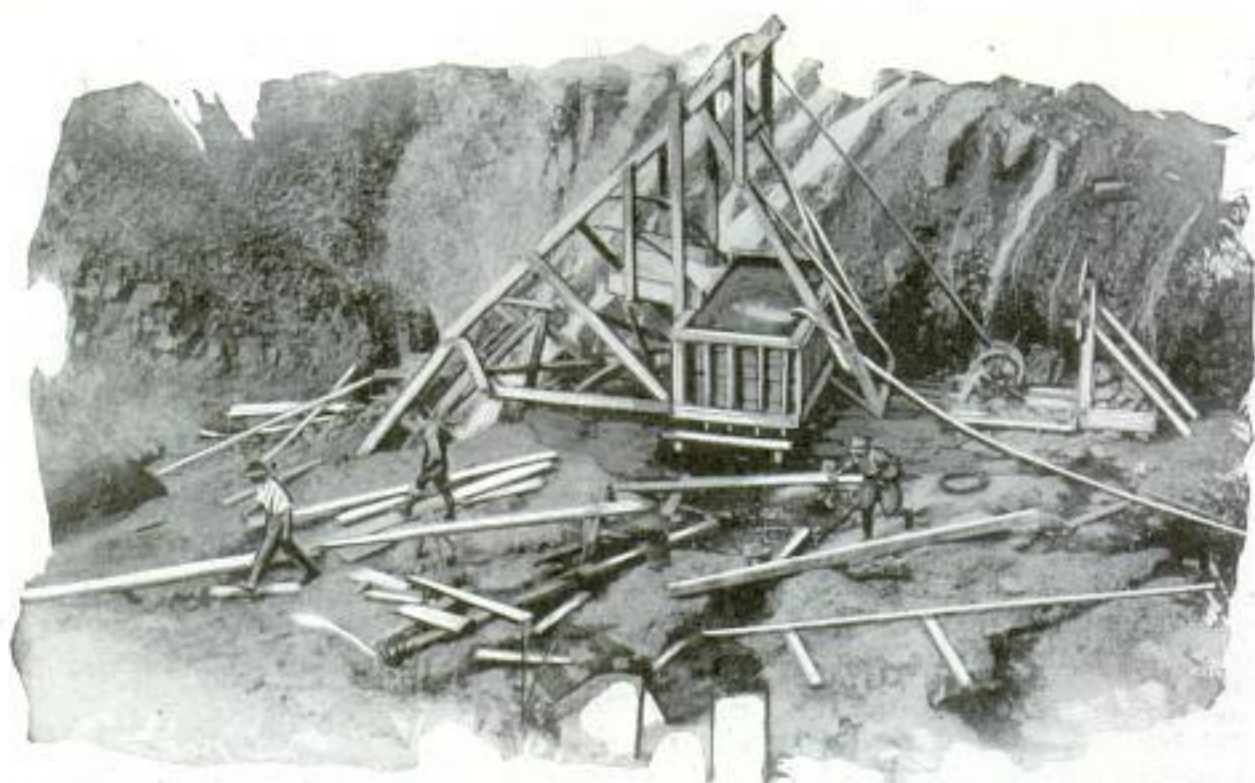
2548

21

Wide World

2838

Sold by George W. Coran, 912 Broadway, Utica, N.Y.



Top of Elevator Shaft with Receiving Box into Which Salmon Are Dumped before Being Released into the River Again

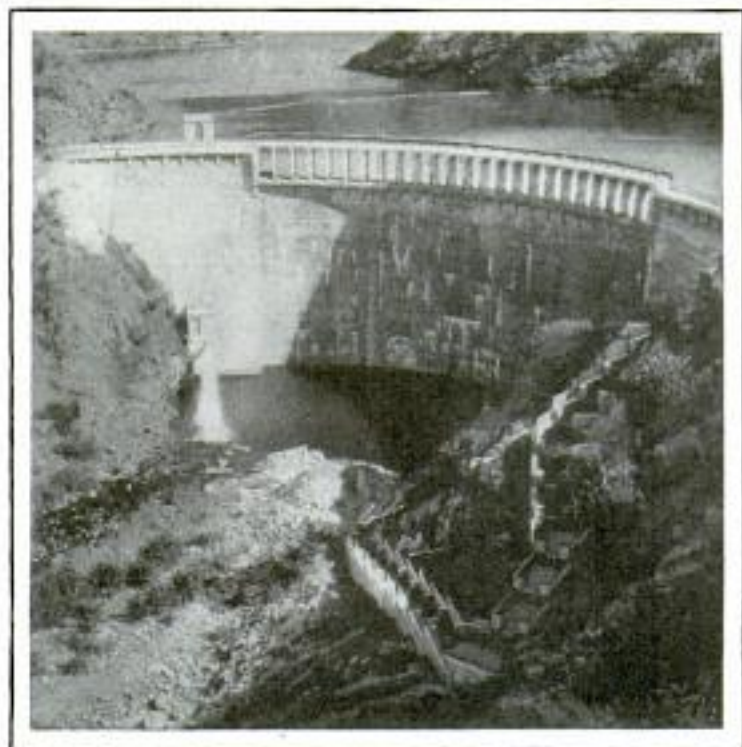
Elevators Save Lives of Salmon

ELEVATORS to lift fish over the tall hydroelectric dams in the far west have been tried out successfully on the White Salmon river in Washington, and as a result they will be ordered by the state for all dams which are too high for the fish to scale by the usual fish ladder. A fish ladder is a series of shallow pools, arranged in step formation, and with a small amount of water diverted to them at the top of the dam. The fish flop into the lowest pool, and then by successive jumps rise from step to step until they top the dam. Average salmon, however, will not climb more than thirty feet, though

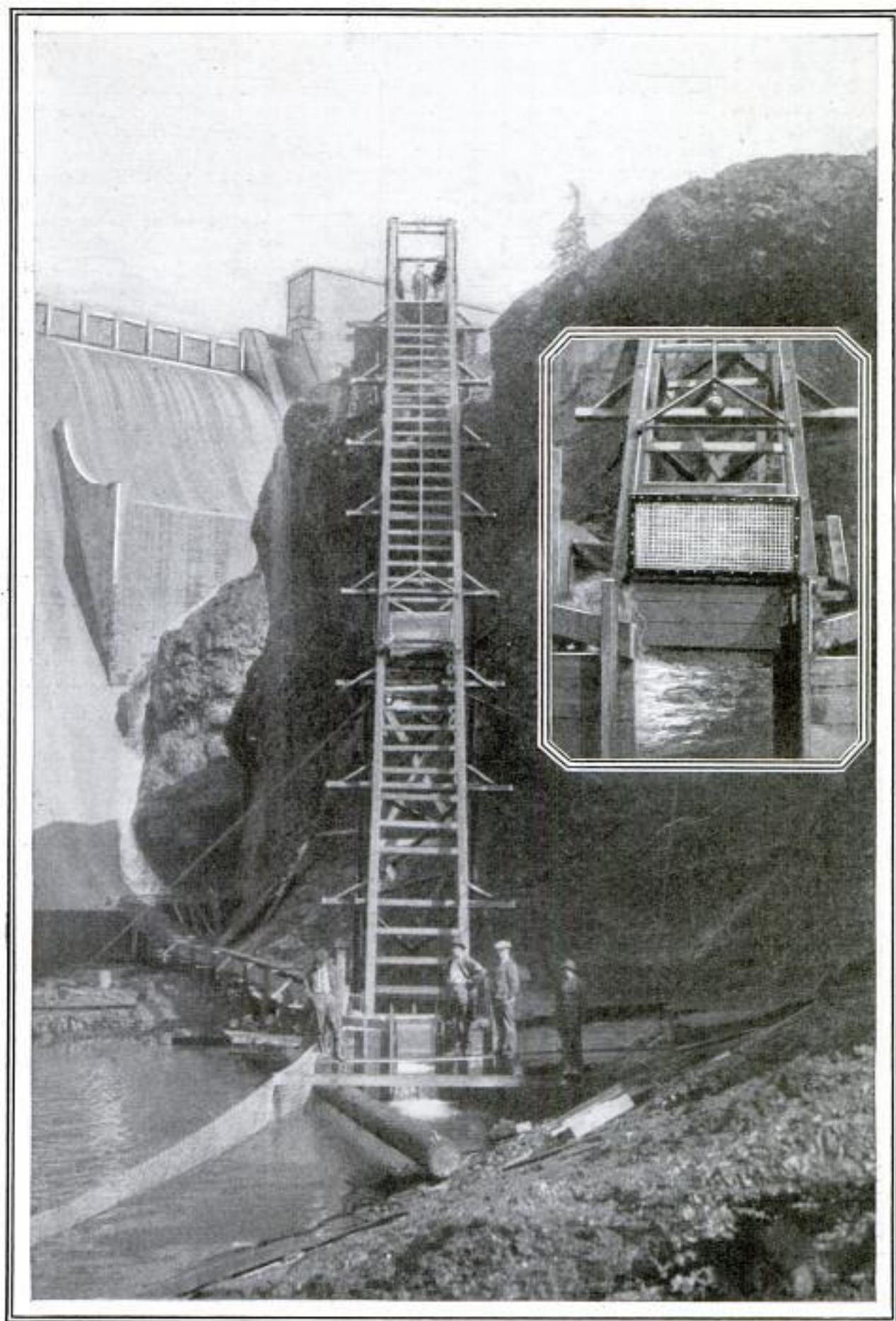
steelheads have negotiated seventy-foot ladders.

The elevator, developed by Prof. John N. Cobb, of the University of Washington, promises to solve the difficulty of getting the fish to the spawning beds upstream.

It is a simple wire-mesh basket, traveling up an inclined hoist, with an electric motor to operate it and an attendant in charge. A "waiting room" is provided for the fish at the foot of the dam, in the form of a large wooden tank, anchored near the shore, with its top edge a foot above the river surface. Water is diverted into the tank, to spill over the edge. The appearance, to the



Fish Ladder, in Foreground, on San Clemente Dam



Elevator Hoist and Basket on the White Salmon River, with the Corral for Gathering Fish Below; Inset Shows Basket Leaving Fishway Box

2702

fish, is much like the usual lowest pool of a fish ladder, and the salmon, when they find they cannot negotiate the surface of the dam, jump into the box. When a sufficient number of "passengers" has entered the elevator, the attendant lowers the cage down rails into the bottom of the box, lets it rest a moment, and then raises it, scooping up all the fish in its passage. The experiments already made have disclosed that the fish can be lifted over the dam without injury, although the cage holds no water.

While the fish elevator is more expensive than the ladder, requiring electricity and an attendant to operate it, the investment is expected to prove worth while.

SHIELDS PROTECT LINEMEN FROM CHARGED WIRES

Danger from electric shocks which menace linemen engaged in a maze of

constructed of heavy insulating material, the sleeve-like guards can be quickly clamped on the cable and insulators, and protect the men from contact with electrified surfaces among which they work, eliminating the need of cutting off the power until the tasks are finished. Shields are also made in shapes to conform with the cross-arms of the poles, for use in cases where the pieces are covered with ice or water and likely to be charged with current. Equipped with the shields, electricians are free to move about with greater ease and can work with greater efficiency.

DAM BUILT ONLY TO BE BURST AS TEST OF CONSTRUCTION

An experimental dam costing many thousands of dollars is to be built and then immediately destroyed to test the latest engineering theories in relation to the constant-angle arch type of construction.

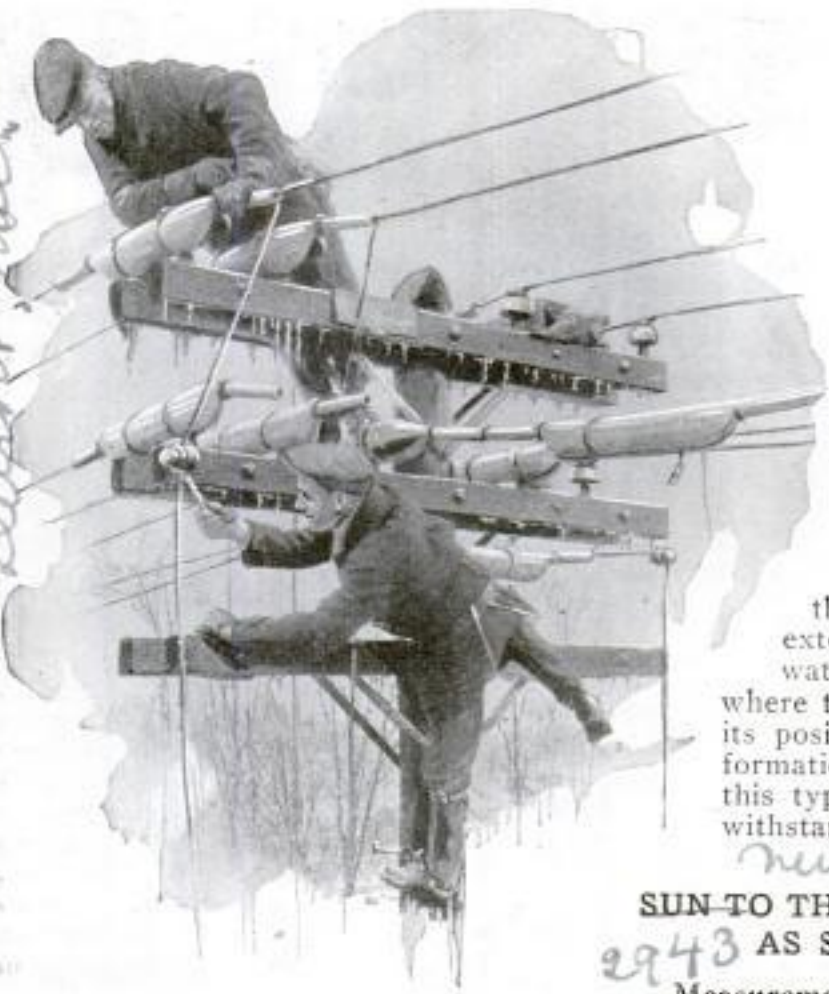
The experiment, made in connection with an intended expenditure of \$35,000,000 for a flood-control system in California, is expected to prove the value of thinner arch construction than has been tried in the past. The dam will be 140 feet long and sixty feet high, when the first tests are made with special instruments installed in the concrete to measure stresses, deflection and temperature changes as the volume of water is increased. After such data have been obtained,

the height of the arch will be extended to 100 feet, and the water permitted to rise to a stage where the wall may be forced from its position, in order to obtain information as to the maximum load this type of arch construction can withstand.

SUN TO THROW OUT MORE HEAT AS SPOTS INCREASE

Measurement of the sun's heat since 1920 show that for over two years it has been below normal, according to C. G. Abbott, of the Smithsonian Institution, who says it is now reaching normal again. Comparison of the number of sun spots gives the reason. During periods when

Linemen Protector Co. 850 Pennsylvania Bldg. Detroit, Mich.



Linemen Guarded by Shields against Contact with Wires While Repairing Broken Electric Cables

charged cables at the top of transmission poles, is considerably lessened through the use of special shields that fit over the wires for a distance of several feet. Con-

Chicago Daily News 3/26/25

2943 **SUN TO THROW OUT MORE HEAT AS SPOTS INCREASE**

Chicago Daily News 3/26/25

Mrs. Cora X. Conie
New York City
Christian Science
Monitor 3/25/25

2826

PATCH ARTIST SEWS POSTER ADS FROM COLORED RAGS

Needle and thread serve the purpose of brushes in the hands of a poster artist who



Copyright, Keystone View Co.
 Patch Artist Stitching a Cloth Poster Ad from Bits of Fabric That Make the Picture Look Real

forms attractive designs with patches of colored cloth. Each piece of material is of proper shade and shaped to fit neatly in place on the figures. Where special cuts of wearing apparel are to be displayed, the entire garment is stitched into the design, presenting a realistic effect. By using the same fabrics in the signs as are made up into garments, the artist is able to portray a gown or suit almost exactly as it would appear on the wearer. In addition to saving window and show-room space, the process does away with the need of elaborate wax figures which represent a great expense to merchants. Materials can be used repeatedly, since the posters may be taken apart and re-formed into other designs as styles and seasons change.

2944

AUTO WITH TWO FRONT ENDS FACES BOTH WAYS

For the purpose of advertising his business, an Oregon automobile dealer built a car with a false hood, driver's seat and steering post to replace the rear end, giving the machine the appearance of facing in both directions. As the substitute structure is an exact duplicate of the orig-

Auto in front
Front end is back
of car and vice versa.

inal front, the machine attracts much attention as it speeds grotesquely along the streets or is drawn up at the curb. The strange car is employed by the owner in the routine of his business, and the false front can be used to carry tools and other service equipment.

2954

PLATINUM FOUND IN AFRICA COVERS LARGE TRACT

Extensive deposits of platinum discovered in the Transvaal districts over a tract of land sixty to a hundred miles in length, have been described by Drs. P. A. Wagner and E. T. Mellor, of South Africa, who state that the conditions under which the metal was discovered are similar to those occurring in Colombia and the Ural mountains, from where the world received ninety-five per cent of its supply of the mineral before the Great War. The platinum is said to exist in two well-defined strata, among material rich in iron, and in deposits washed out of such soils by the action of water. A little more than a decade ago, the combined production of platinum in the world amounted

to over 300,000 ounces annually, but in the past few years has dwindled to about one-sixth that volume, owing mainly to reduced output from the Russian source.

TRAPDOOR INSIDE MAIL BOXES TO PREVENT THEFT

To make mail boxes secure against theft, an English inventor has devised a trapdoor arrangement that fits inside the holder to prevent taking letters from the slot. When the mail is put in, the top flap automatically closes the trap, which is above the bottom of the box. But as soon as the flap is released, the lower door falls back, allowing the mail to drop into the main compartment where it can be reached only by unlocking the box.



U+U
 Copyrighted material

How to Keep Your Car New

By WILLIAM ULLMAN *Woodward usage*

WITH air cleaners, straight-eight motors, four-wheel brakes, balloon tires and many other improvements coming into wide use on our modern automobiles, the average motorist is beginning to find the answer to the oft-repeated question, "What next?"

The next great improvement, according to those who have paid the penalty for retarding its progress, is intelligent use of all of the new features as well as of those which have become such integral parts of the average automobile as to be consistently abused and neglected. Improvements in driving, motorists are finding, will do more to cut operating costs, better performance and increase safety than any half dozen new inventions that might be added to the present motor car. With a little co-operation from its operator, any car can reach new levels of ability and usefulness.

There have been two stumbling blocks to progress in this direction. In the first place, bad habits in driving grow on one so rapidly that a very destructive driver soon reaches the point where he resents advice. And, in the second place, the new improvements in cars along mechanical lines have been such as to lead the driver to believe that the modern car almost runs itself.

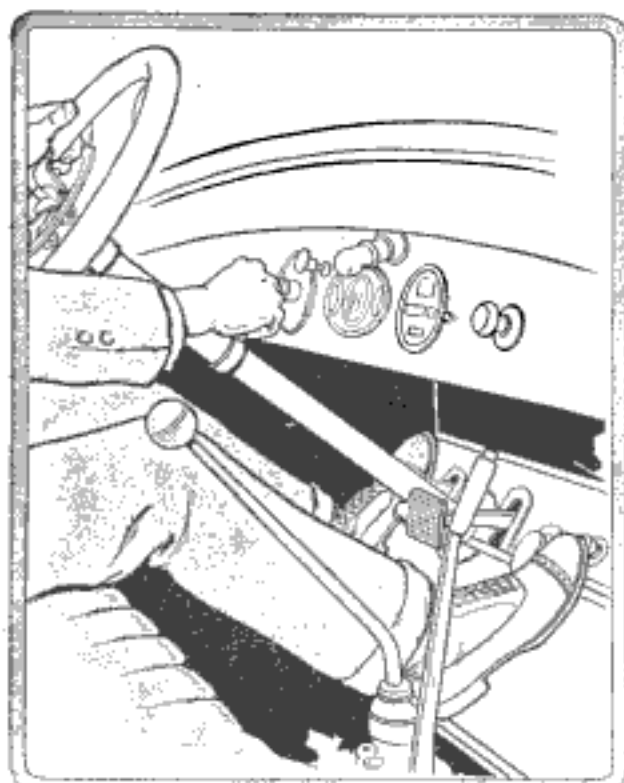
Perhaps nothing illustrates both points better than the situation with respect to the clutch. Ever since the first repair man began to prosper, drivers have been tearing out rear ends because of their habit of letting in the clutch suddenly. When they were criticized for this brand of abuse, they argued that the rough action of the cone type of clutch rendered

smooth starting exceedingly difficult, if not impossible, with many cars. But now that the disk and plate types have become practically universal in America, the average car owner goes right on letting in the clutch carelessly. Instead of tearing out the rear end, however, he is wrecking the clutch.

The average car today is capable of running at from two to sixty miles an hour in high gear. The engines, being of the light, high-speed type, will not stall until the brakes are actually set. They will accelerate without nursing. This means that, for the bulk of one's driving, nine-tenths of the results desired under any conditions can be obtained by wise use of the accelerator and the service brake pedal. Riding the clutch and frequent disengagement of this unit are relics of the old days when slow-speed, heavy engines would not throttle down without stalling, nor give anything approximating flexibility without slipping the clutch.

Improvements in driving, like improvements in the automobile itself, await simplicity. Set the hand throttle to a position that will provide enough gas for the minimum speed in high, and then use the accelerator for your speed variations. Just taking the foot off the accelerator will serve as a brake, for the car will then have to drive the engine, and that serves to kill momentum. A dab of the brake pedal will serve for a more definite slowing down of the car, while a little forethought in studying the traffic conditions will often make a complete stop unnecessary, thus saving the car the sort of work that sacrifices future results.

Many cars "buck" when the driver's



To Start, Push In Clutch, Press Starter and Then Switch On Ignition

foot is removed from the accelerator merely because the hand throttle is set for too little gas. Much of the natural braking power of the engine is sacrificed through setting the hand throttle for too much gas, so that the engine keeps on pulling when the foot is released from the accelerator. The smooth performance

is there, so why not use it? The car that now troubles its owner can be spared the junk heap through this sort of co-operation, while the new model, with its inherent features of superiority, can give surprisingly better results with 1925 ideas in driving.

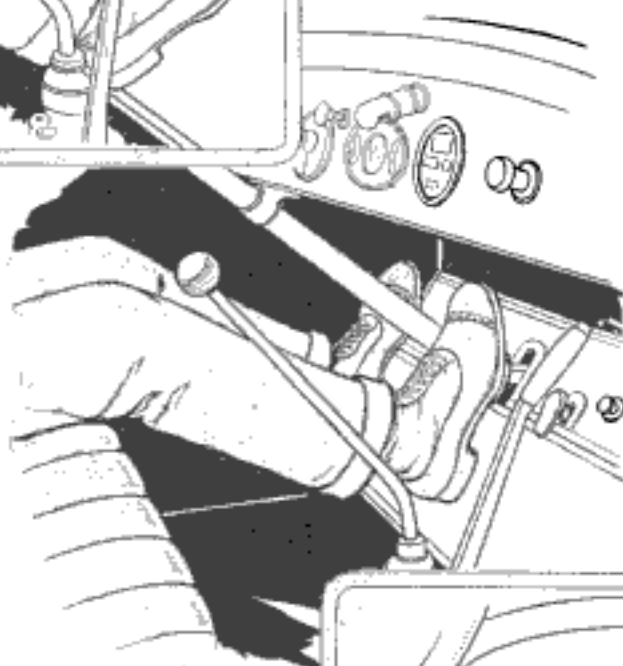
The average driver would probably resent being told that he does not even know how to start his motor efficiently. But this does not alter the fact that a little snooping around any public garage will show him taking five times the required time to get the engine into working shape.

One mistake is as old as the self-starter, but the few car owners who are aware of it contend that it is just as much

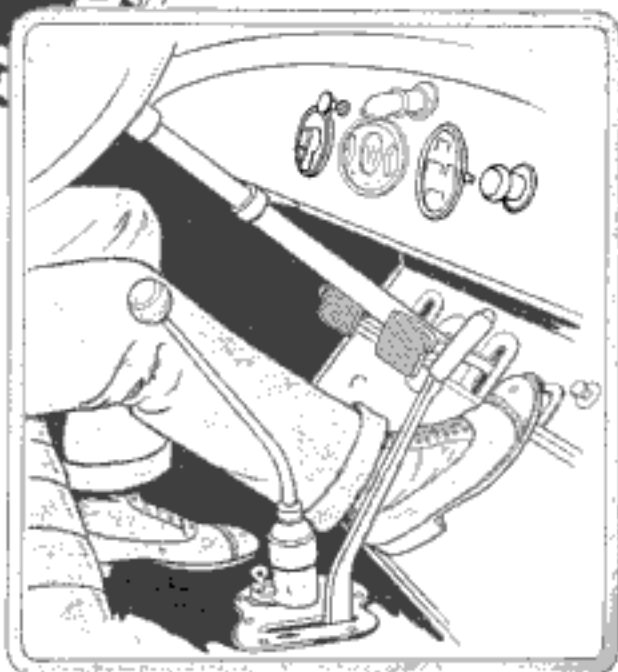
of an obstacle to quick starting today as it ever was. This is the habit of switching on the ignition before stepping on the starter. The chief function of the starter is to create enough suction in the intake manifold, through action of the pistons, to cause a healthy spray of raw gasoline from the carburetor jet, and to create as high a compression of whatever gas forms as is possible under the adverse circumstances. The quicker the starter spins over the engine, therefore, the more favorable conditions will be for starting.

To assure the starter every assistance it is only logical to permit it to drain all the current it needs from the storage battery. That is why the first step in cranking a cold engine should be done with the lights and ignition off and the clutch out. After

the engine has been turned over a few times, then switch on the ignition. The spark will then catch one of the cylinders with a more readily combustible mixture. When the driver starts by switching on the ignition, it often happens that the spark ignites some of the earlier and weaker charges of gas



Don't Drive with Your Foot on the Clutch



This Is the Proper Driving Position for the Feet—the Right Foot Only Being Used

vapor. These are not of a proper mixture for a real start. That gives him the well-known half-dead action of a cold motor, and starts him on the way to flooding the engine with raw gas, and other difficulties. Unfamiliarity with the type of ignition on one's car is another reason for many starting troubles. A number of cars are now equipped with semi-automatic spark advance, which means that in cranking it isn't necessary to retard the spark so far as is necessary in cranking a car of the conventional spark-control type. Some manufacturers do not recommend any retarding of the spark for the semi-automatic type, since the danger of back fire in cranking is very remote with this arrangement. Thus the driver who retards a spark that is already partially retarded simply encourages sluggish action on the part of the engine.

A favorite trick in pulling out of the garage is to allow the engine to race moderately, obtaining slow speed out of the car itself by only partially letting in the clutch. Owners are pleased with the way this plan helps to warm up the engine and save time, never realizing that anything saved is more than offset by the strain on the clutch facings. Usually the friction created in this starting process is not sufficient to injure the plates themselves, but the facings or linings are often badly damaged.

The use of the choker is illogical in nine starts out of ten. So much has been written regarding the danger of excessive use of this device that most drivers today are running to the opposite extreme. There is a constant cry for something to take the place of this troublesome control, but lack of improvement along this line does not trouble the car owner who is wise enough to adopt a few new ideas in driving.

Watch the average driver during the starting process. Time and again he will try to start a cold motor without first pulling the choke control all the way out. This means that the first dozen or so turns of the engine are waste effort, the cylin-



In Driving down a Hill Always Let Your Engine Act as a Brake—It Will Save Burned-Out Linings

ders merely starving for want of something to fire on. Then, after the engine has started, the usual thing is to push the choker all the way in and keep the engine from stalling by opening the throttle rather wide. Aside from the possible damage to the bearings, this practice simply means that, while the engine will usually keep going, some of the cylinders are not firing half the time because the mixture is far too lean. The owner thinks he is sparing his car the hazards of crankcase dilution by sparing the choker, whereas, on the contrary, he is actually inviting dilution through loading up some of the cylinders with unburned gas vapor or raw gasoline.

Here is the automobile being improved by the addition of oil purifiers and crankcase rectifiers, yet here is also the average driver offsetting the advantages. In one of the new cars offered this year the circulating water passes through the crankcase in such a way as to warm the congealed oil in starting and keep the oil cool during hot weather or at high speed. But such valuable improvements are meaningless if improvements in control do not go with them. The driver who operates his engine wisely saves himself the expense of burned bearings, either at high or low speeds in summer or winter.

There has been a lot of talk about balloon-tire "shimmy." Front-wheel shimmy is as old as the automobile; but thousands of drivers never encountered it until they started to use balloon tires, and then automatically blamed it on this new development in pneumatics. The truth of the matter is that nine-tenths of all so-called balloon-tire shimmy is the result of driving too fast over rough roads. Without balloon tires most of the drivers who experience this quivering of the steering gear would probably turn turtle.

Similar psychology applies to the use of four-wheel brakes. Drivers have tried to stop dead at unreasonable speeds. Only the other day a car with balloon tires and the finest type of four-wheel brakes skidded and turned over because the driver thought that steering didn't matter. Knowledge of the truth in these stories is encouraging the progressive driver to operate his car even more carefully than in the days when tires were narrow and smooth and when brakes could not even be relied upon to work. He will then obtain from his car the results these new improvements were intended to produce.

Any driver who does not discover some-

thing new each time he takes the wheel is not keeping up with the progress of motordom. A driver who has discovered the danger of habit in operating a car, throws some light on this subject when he says that he is never satisfied until he feels that he and his car are working as a unit.

When there is close co-operation, he points out, it isn't necessary to keep dabbling the brake pedal or shifting gears or otherwise wearing out the car prematurely. He lets off a little on the gas and allows the natural loss of momentum to do the work of the braking force whenever possible. He never shifts into high in traffic, when he knows he will have to go right back into second. He coasts.

Every day finds him discovering some new way to get better results from the car, all of which is another way of saying that each day he learns something that will help cut down depreciation and repairs.

The biggest developments are coming in the line of driving. The driver has been the automobile's weakest link, and too many of the improvements in the car itself have served only to make it weaker.

Your car is only as good as you drive it. Try that on your straight-eight.



Never Drive in Such a Way That Sudden Applications of the Brakes Are Necessary—a Steady, Even Pace Will Get You There Quicker and Save Your Car and Tires

RADIO AERIAL LIKE STOVEPIPE SENDS OR RECEIVES 2965

A radio antenna designed for installation either with a broadcasting unit or receiving set, is shaped like a stovepipe and is said to make possible greater selectivity and more volume than the ordinary aerials. The device, which is formed by a series of wire windings, was tested on a 250-watt station at McCook field and was reported to operate with greater efficiency than other types in general use at that point. Its inventor claims its application may result in considerable changes in the method of broadcasting and receiving.

BATHTUB IN MOTOR-BUS FLOOR ADDS COMFORT TO CAMPING

Motor vehicles fitted for long cross-country tours are furnished with an added



Ready for Service at the End of a Dusty Journey, the Motor-Bus Bathtub Is Concealed in the Floor

SAWDUST WALL COVERING

Economy of time and cost is sought in a patented wall covering made principally of sawdust and that is applied with a damp roller. It is said to adhere equally well to brown or white finish plaster, wallboard or galvanized iron, only one coat is needed, and none of the material falls to the floor. The tendency of sawdust to stain is reported to have been overcome by boiling it in a borax solution.

SMOKER KIT FOR AUTO OR TABLE HOLDS CIGARS AND CIGARETS

For use on the instrument board or other convenient place in the car, or for the table or desk, a compact metal kit that hold cigars and cigarets and has space for a box of matches and ash tray, is always within easy reach, keeps the tobacco in good condition and eliminates loss and muss. It has a compartment on each side opened by a small button and is finished to harmonize with the upholstery of the auto or the furniture of the home. Models are also made with electric lighters installed and a similar box holds a vanity case.



convenience in a bathtub built into the floor and concealed by a trap lid when not in use. The basin is fastened securely so that it cannot rattle when the car is moving, and is emptied by removing a plug in the bottom.

OVER SIX MILLION PEN POINTS USED IN POST OFFICES

To keep its patrons supplied with writing implements, for next year, the post office department will furnish 6,185,000 pen points for distribution to the nation's 52,000 stations. The public will also be provided with 480,000 holders to accommodate the great volume of nibs. The pens are almost every style so that a point may be found on the post-office desks to suit practically any writer. For the same period of time at least 900,000 quarts of writing fluid will be required to keep the inkwells filled, and 500,000 large sheets of blotting paper will be used up.

Dr. no. Maj. Arin E. Marvel,
Chief Engr. Dayton, Ohio.

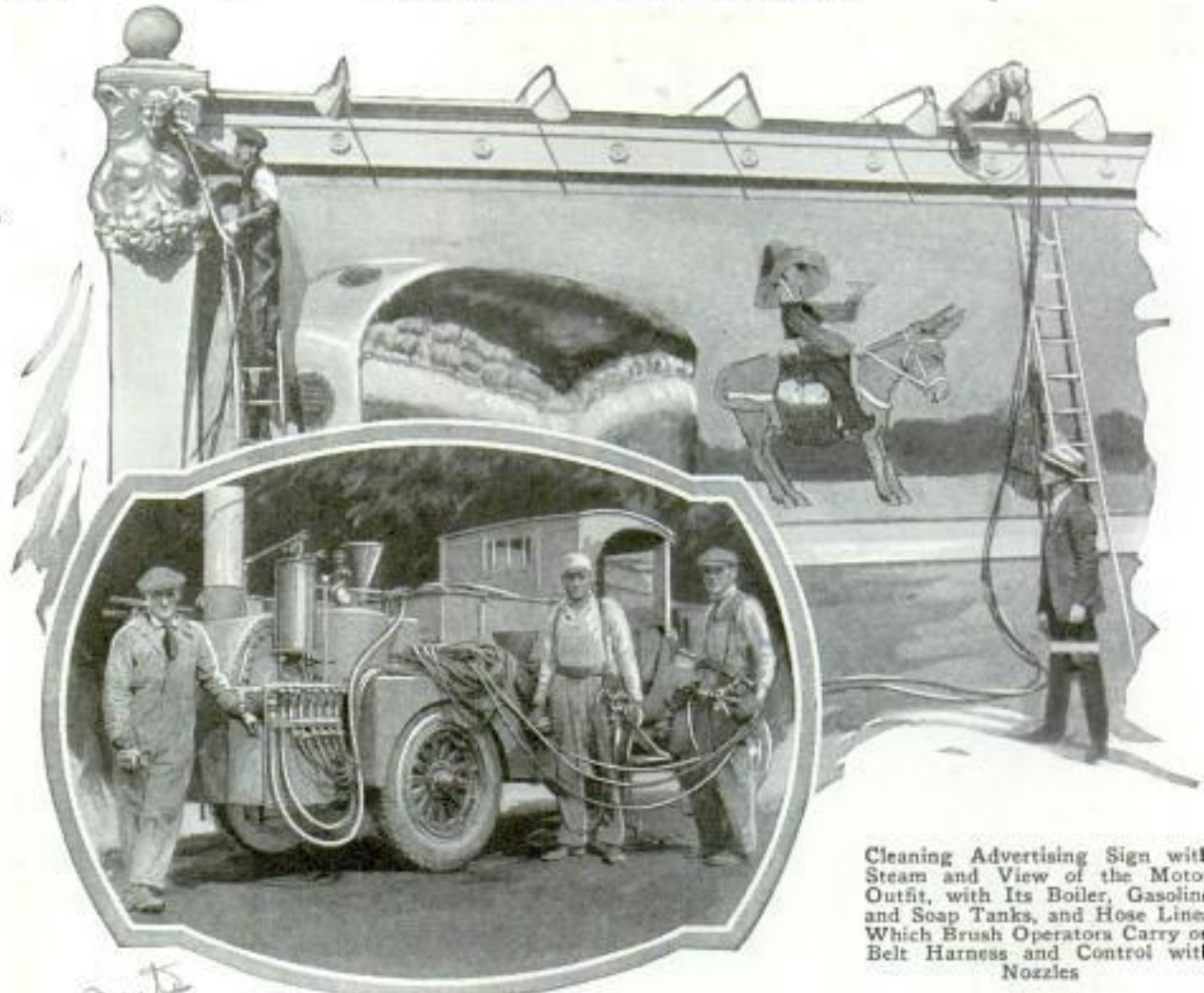
*Shown at Dept. of Hygiene & Sanitation
Blymphria, London, England*

Dr. no. Michael...

2971

*American Brass Novelty Co. Grand Haven, Mich.
#3-50 - 4000 + 1000*

*New York - James
3/29/25*



Cleaning Advertising Sign with Steam and View of the Motor Outfit, with Its Boiler, Gasoline and Soap Tanks, and Hose Lines Which Brush Operators Carry on Belt Harness and Control with Nozzles

auto
SEAT ADJUSTER ON SMALL CAR
ADDS EASE AND SAFETY

For the short-legged driver who has difficulty in reaching the pedals of an automobile, a sliding seat adjuster that can be installed with little trouble, reduces the discomfort of running the auto and lessens the likelihood of accidents. It is essentially a moving platform set in a runway that is controlled by a geared shaft and operated by a single small metal wheel on the base of the seat. By simply turning the knob, cushion and back are set at any



desired distance. There is no loose play, preventing accidental moving by a jolt of the car, and the parts are so arranged that they cannot easily get out of order. Extra cushions and other makeshifts are eliminated with this adjuster, which is now made especially for the sedan type.

See page 1
Richard d. ne
Lanford, Conn.
 \$7.50

STEAM CLEANER ON WHEELS
2925 KEEPS SIGNS NEW

A steam-cleaning outfit on wheels is being successfully used to renovate advertising signs. The equipment consists of a 300-gallon tank of water to supply the boiler, and two smaller ones for gasoline as fuel for the burners and for soapy water. Lines of flexible steel hose, each fifty feet long and inclosed in rubber with control valves for regulating the amount of steam, soap and water, extend from the tanks. The nozzles are carried by the operators on a belt and shoulder-strap harness. With this apparatus, it is claimed, two men can clean a sign in a fourth of the time required by other methods.

2964
STEAMER AS CHEMICAL PLANT
TO EXTRACT OCEAN BROMINE

Abundant supplies of various chemicals may be obtained from the sea, it is predicted, if success attends the venture of the steamship "Ethyl" which has been fitted up with refining apparatus to tap the Atlantic ocean of its bromine, a material used in the manufacture of ethyl gasoline,

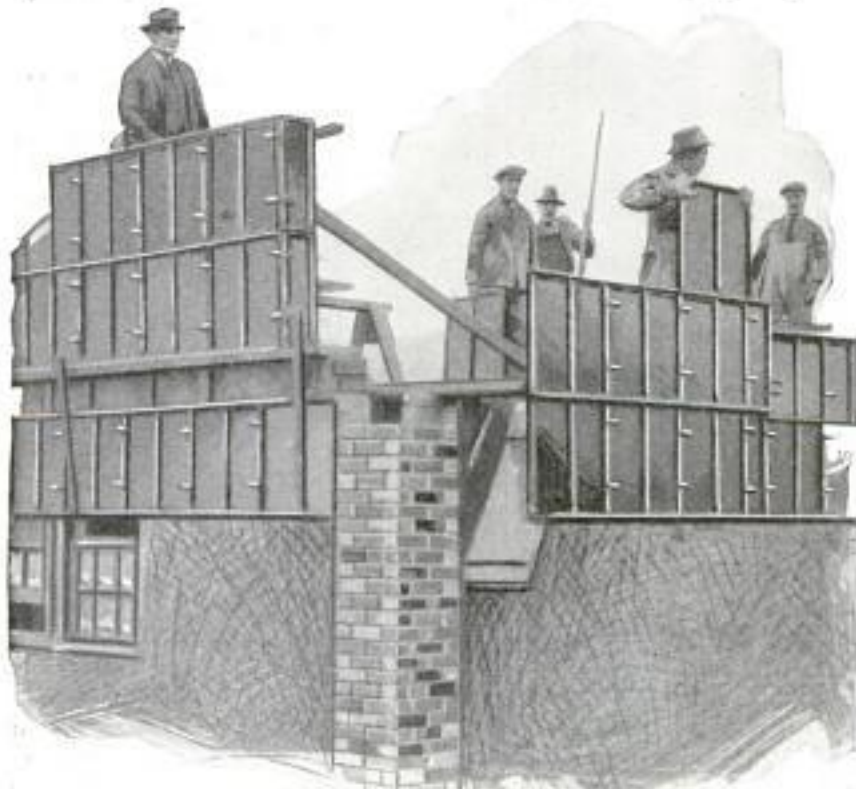
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motion-picture photography and in medicine. It is estimated that there is a pound of this substance to every 1,700 gallons of sea water. It is now obtained by laborious processes from mineral springs and from potash deposits in Germany. The "Ethyl" will draw aboard and discharge water at the rate of 7,000 gallons a minute, retaining the chemical in its refining devices. A fleet of similar boats is proposed to extract also other substances if this experiment proves practical.

2866

GYP SUM MIXED WITH CONCRETE SAVES TIME IN BUILDING

Gypsum, the material used for the finest plaster walls since the days of the ancient Egyptians, is now helping to build, almost overnight, substantial dwellings for American citizens. A specially treated grade of it is put in the concrete and poured into forms like those used in ordinary cement work. Heat generated by the gypsum causes the mixture to set in about thirty minutes, it is said. A new course can thus be poured on top of the first one with little delay, and fewer forms are needed. In New York, a two-story residence was completed to the roof in only twenty-two working hours, it is reported. A recommended mixture is one part sand, three parts cinders to one and one-half parts of the cement and gypsum.



Putting Up the Forms for a New Course of Gypsum-Concrete on Layer Already Poured



When the Card Is Shaken the Outline of the Funny Face Changes into Many Grotesque Shapes

SHAKE OF CARD CHANGES FACES ON FUNNY CARTOON

A toy amusing to both old and young is a cartoon of a funny man that changes faces when the card on which it is printed is shaken or lightly tapped. The outline of a portion of the features is loose so that it can be made to form a variety of grotesque pictures. Since the head and shoulders of the drawing are printed and in colors, the slightest vibration of the article produces a complete caricature. By moving the flexible line with the fingers, figures resembling the popular characters of the comics may be easily created.

OIL FIELD FOUND IN ARGENTINA

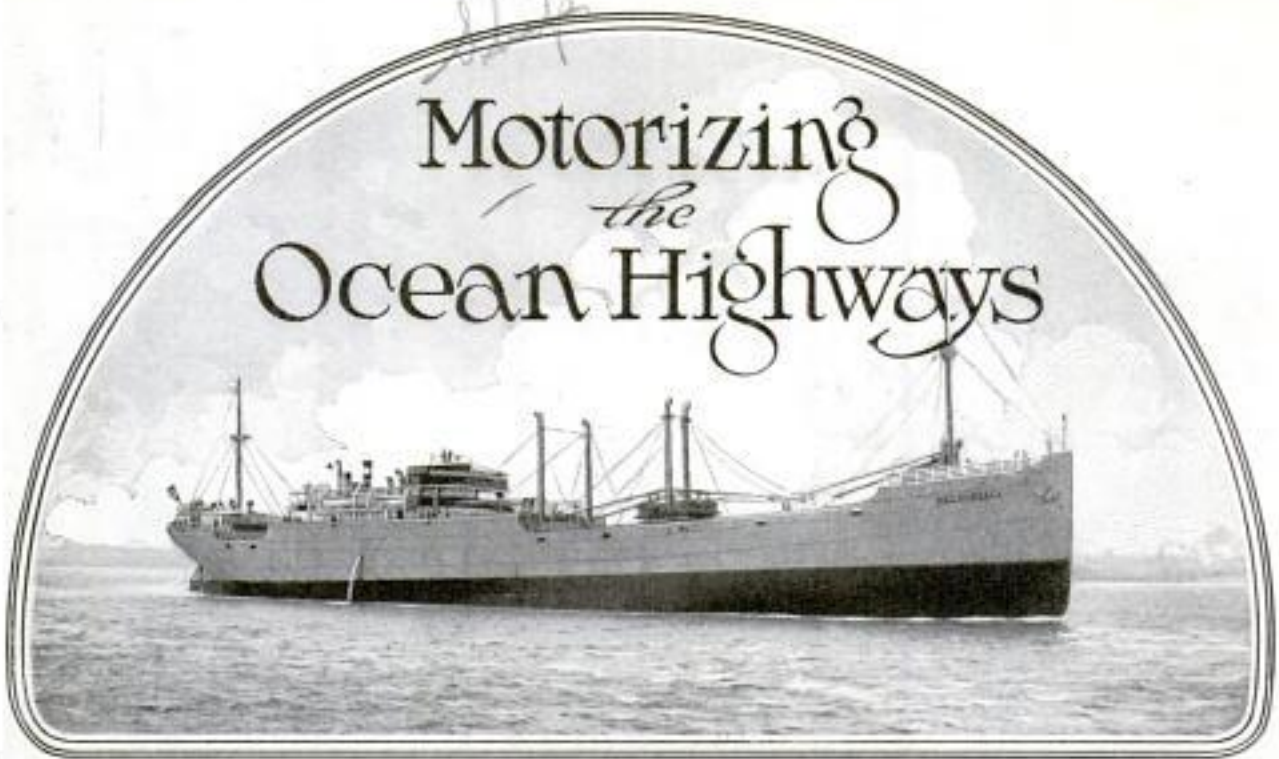
Traces of oil have been discovered by road engineers who were drilling for water near Magdalena, Argentina, only sixty miles from Buenos Aires, according to reports. Should the supply prove to be of commercial value, it will be of great economic importance to that region, for the oil now refined there must be carried a six days' journey in tank steamers.

Robertson & Molyneux Co. City of Gimpo, N.Y. 2962

Structolite - U.S. Gypsum Co. 205 W. Monroe, Chicago

Emb. George S. Brady c/o American Embassy Buenos Aires, Argentina

Motorizing the Ocean Highways



Courtesy Burmeister & Wain

Norwegian Cargo Vessel "Borgestad," Typical of Latest Motorships; It Burns Six Tons of Oil Every Twenty-Four Hours and Has a Cruising Radius of 50,000 Miles

By H. T. WILKINS

IN the spring of 1926, a radio message flashed from Sandy Hook lighthouse to Manhattan will announce to expectant New York the passing of a splendid 20,000-ton motor liner up the Narrows to New York harbor. No dense pall of smoke will belch from the funnels, for there will be no funnels.

This motorship will be the advance guard of a great fleet of transatlantic liners, marking a silent revolution of the sea and forecasting the passing of the turbine ships, with their twin, triple and quadruple smokestacks. The day of the gigantic liner is over, according to no less an authority than Harold A. Sanderson, chairman of the White Star line. Motorships already are rapidly replacing steam tonnage in the merchant fleets of the world.

This quiet revolution in marine engineering is the outcome of the wonderful engine invented thirty-two years ago by a German engineer, Dr. Rudolph Diesel, and brought by him to perfection in the Augsburg factories in 1900. Congress is alive to the vital part the motorship will play in the race for commercial prosperity and power on the high seas of the world. In its last session of 1924, it rushed through a bill authorizing the shipping board to spend \$25,000,000 in converting fifty of its steamers to motorships, and

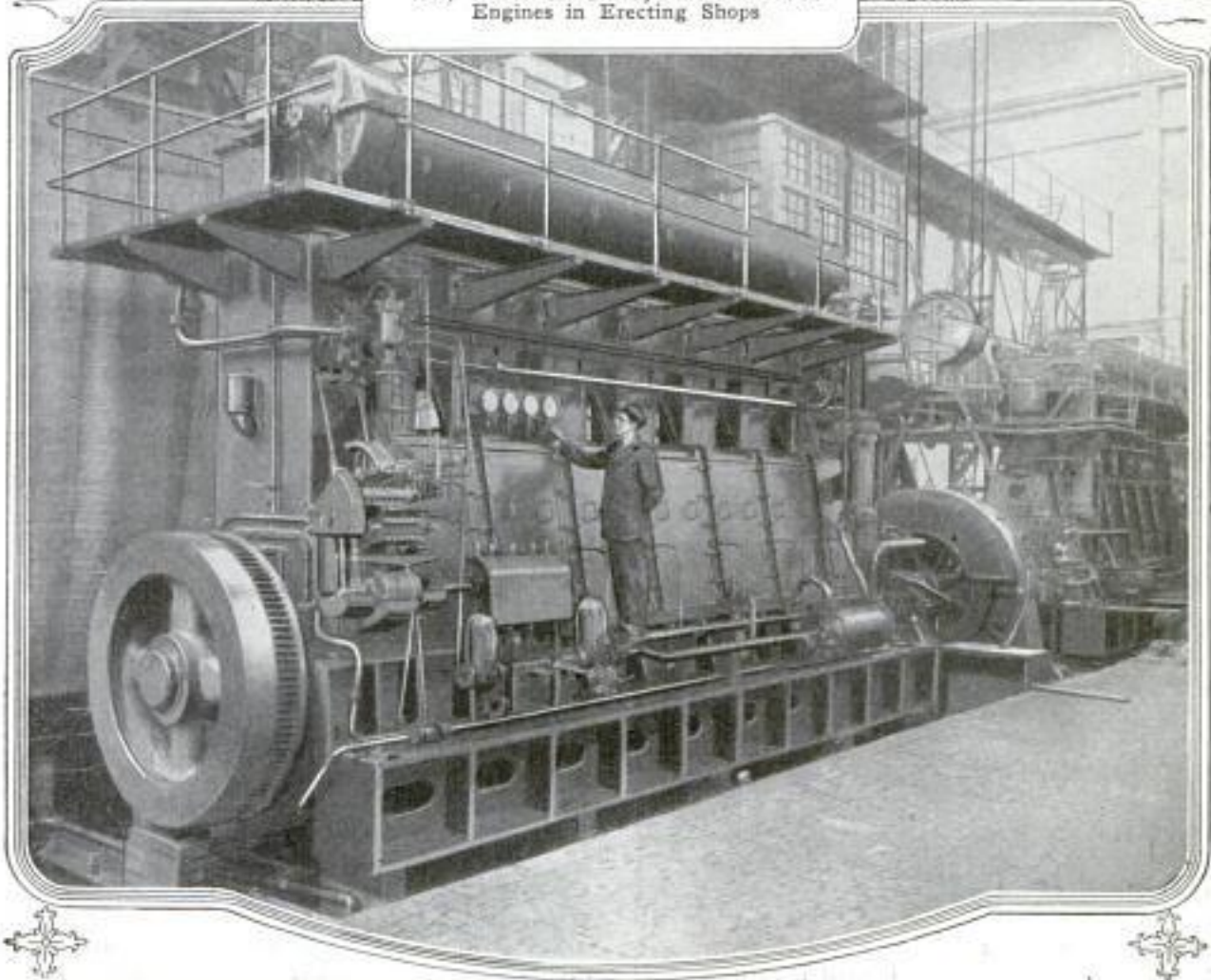
the board has just let contracts for eighteen Diesel installations.

In the Diesel system, power to drive a ship on the sea or a railroad locomotive on land is obtained by the burning of a mixture of gas in the cylinders of an engine resembling that used in an automobile, except for the fact that no electric spark is needed to fire the gas. How is it done? The air in the cylinder of a Diesel engine is compressed with a force of 500 pounds to the square inch. This compression raises the temperature of the air to about 1,000 degrees Fahrenheit. So hot does it become that oil, sprayed into the cylinder at the high pressure of 750 pounds to the square inch, immediately takes fire. Greater heat is caused, resulting in an expansive force which drives the piston, and, finally, the ship's propellers.

Commercially, the advantages of the motorship are very great. Boats driven by Diesel motors save seventy-five per cent on the space needed to carry fuel, the importance of this being that more space is made available for cargo, with appreciable effect on the earning power of the ship. The fuel bill of a motorship is small compared with that of a steamship or an oil-burning ship with boilers. At sea, a motorship of average size will consume fifteen tons of fuel a day, where an oil-burning steamer would need thirty tons.



Looking Down from an Airplane on a Queen of the Seas, the "Majestic," Leaving New York Harbor, and, Below, View of Six-Cylinder Diesel Engines in Erecting Shops



Upper Photo © H. Maxwell; Lower Photo Courtesy Burmeister & Wain



Recalling Days Before Steam Ruled; Glimpse of Masts and Rigging of Large Danish Barque That Still Responds to Hemp and Canvas

A high-seas motorship can also carry more cargo than a steamship of the same size, because a vast amount of space in the engine room of a steamship is taken up by boilers, which are not needed by the motorship.

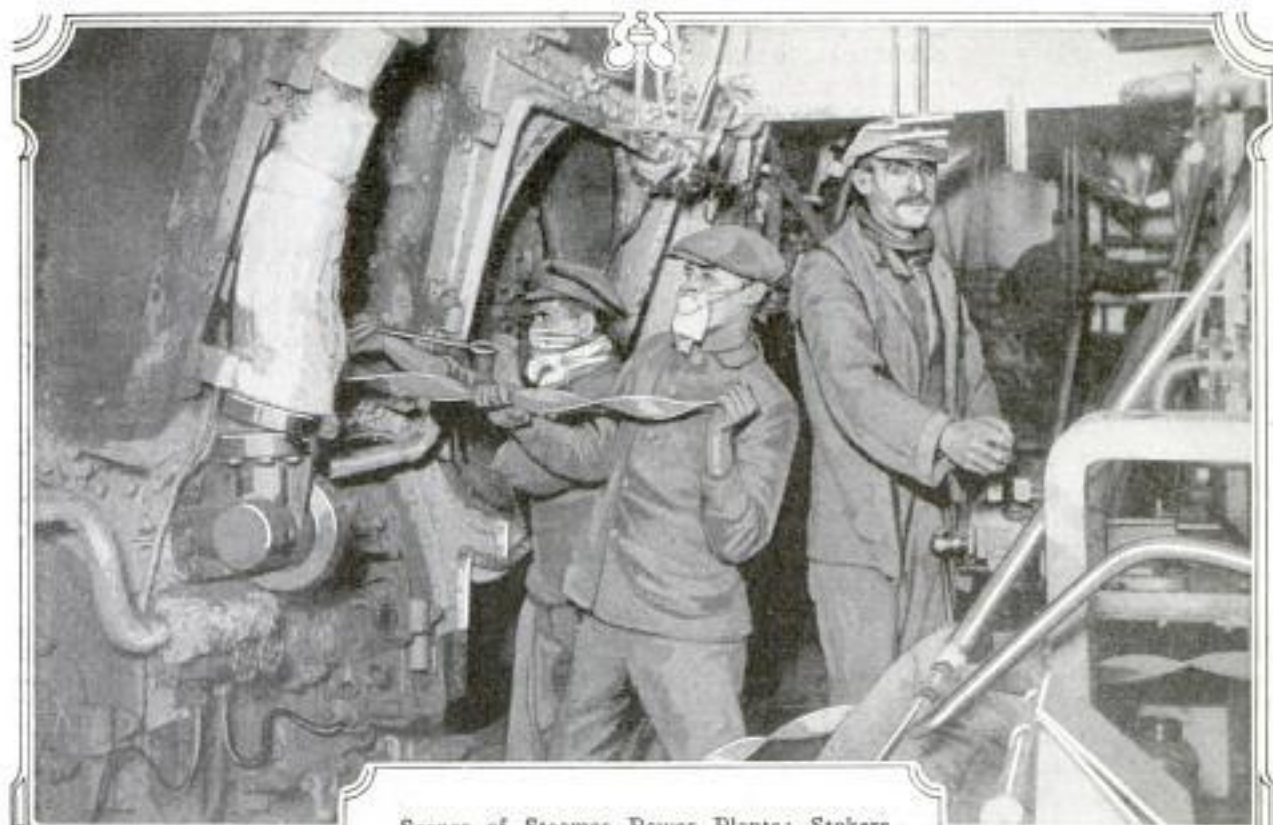
Water-ballast tanks, holding a non-paying element on the steamship, are absent from the motorship, as may be seen in the case of the "Fulda," built and launched by the German Weser company at their Bremen yards, in the spring of this year. A novel feature of the "Fulda's" hull is a "bulge," which does away with the need for water ballast, and replaces it with oil. The net result of this innovation is that the "Fulda" can carry twenty per cent more cargo than a steamship of the same size.

On the human side, we now witness the passing of the grimy, toil-worn sailor undergoing the exhausting labor of coaling a ship under a hot, tropical sun; or, stripped to the waist and sweating in the inferno of a steamship's stokehold in equatorial waters, shoveling coal into a caldron of flame, or spraying oil under ship's boilers at a gasping heat.

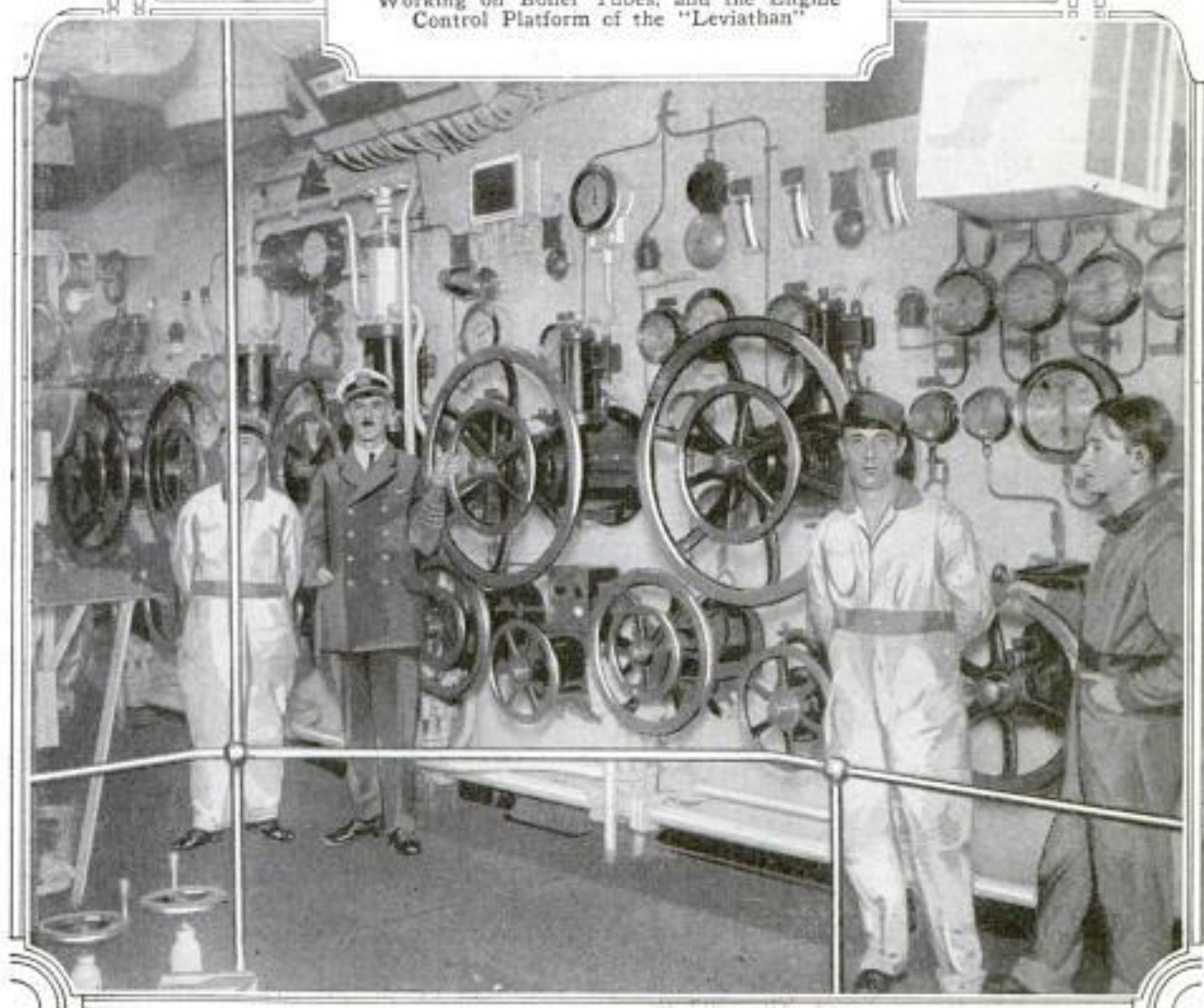
In Europe, the small Scandinavian countries are vying with each other in transforming their ocean fleets to motorships. The Swedish-American line now has under construction a twin-screw ship with accommodations for 1,650 passengers. The craft is about 17,000 tons gross and will make a speed of around seventeen knots. The power will be supplied by two six-cylinder, four-cycle, double-acting engines. The craft is expected to reach New York in June.

Mr. Gunnar Knudsen, the ex-premier of Norway, is president of a company which has just launched a new twin-screw, 6,800-ton motorship, the "Borgestad," with a speed of ten and three-fourths knots. Burmeister & Wain of Copenhagen, the first to place a Diesel installation in a large-sized cargo vessel, are the builders of the "Borgestad" and the sister ship "Selandia."

Use is second nature, even in engineering and mechanics, and there are not a few people who would feel a pang of regret if the familiar smokestack disappeared from ocean-going ships. Funnels, however, are of no real use on a motorship; but, for appearance sake, they are none the less installed. A British-Indian Diesel ship, doing a coast trade in eastern waters, uses her funnels merely as ventilating shafts up which foul air from the ship's interior is expelled by a powerful blast. The Hamburg-South America shipping line was last year compelled to equip its



Scenes of Steamer Power Plants; Stokers Protected from Fumes by Masks While Working on Boiler Tubes, and the Engine Control Platform of the "Leviathan"



powerful motorship "Monte Sarmiento," with two dummy smokestacks because ignorant immigrant passengers think no ship can be safe without smokestacks!

Not only have motorship owners been forced to put smokestacks on their vessels, but they have also had to give them air whistles apparently emitting steam. A siren sounded on an ordinary steamship, warning other vessels approaching in the fairway, gives rise to a "white feather" of steam as well as a piercing blast. The pilot, standing in the wheelhouse of his tug, sees the white feather blowing from the siren even when he cannot hear the sound of the blast.

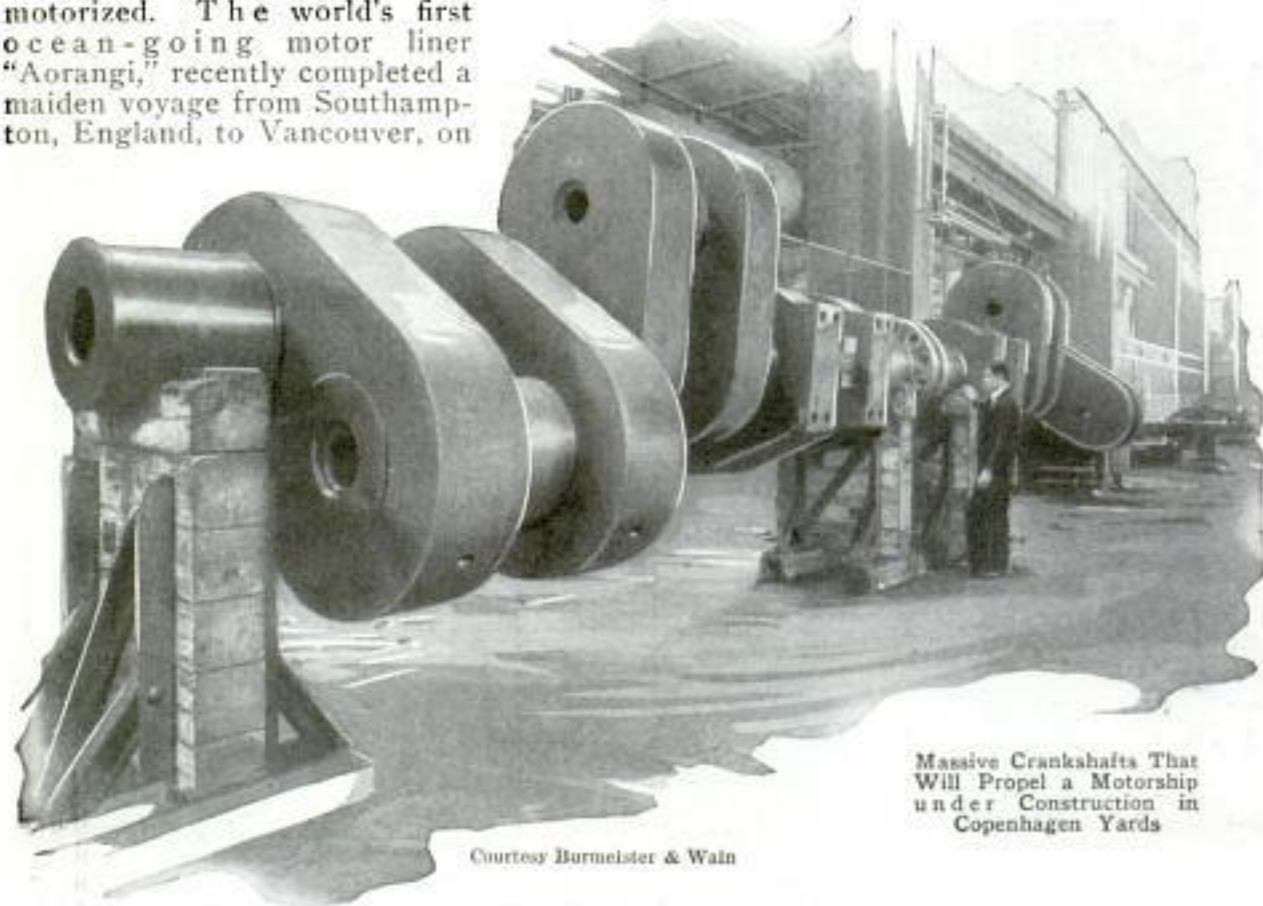
On the motorship, in the ordinary course, he would see no smoke, since the siren would be operated by air or electricity. The American Sperry gyroscope company has overcome this difficulty by devising a visible air whistle, blown by compressed air, and emitting a white cloud of smoke in much the same way as military airplanes send out smoke screens. As soon as the whistle valve is opened, air is let into a nozzle which takes "liquid smoke" from a tank and blows it out in a white cloud from the siren.

The battle between oil and coal is growing fiercer, Lloyd's register for shipping for 1925 showing that more than half of all the tonnage under construction is motorized. The world's first ocean-going motor liner "Aorangi," recently completed a maiden voyage from Southampton, England, to Vancouver, on

the round trip to New Zealand and back. The motorship kept up an average speed of seventeen and one-quarter knots on the voyage out to Vancouver, burning fifty-six tons of oil daily not only in the Diesel engines but also for such auxiliary purposes as those of the laundry, cooking and steam heating. When the "Aorangi" reached Vancouver, she had burned 1,250 tons of oil, at a cost much less than that of coal under a steamship's boilers or oil from an oil-burning liner's sprays, on a similar voyage. At a trial trip in English waters, the "Aorangi" reached eighteen and two-thirds knots an hour.

This motorship, which is the climax of twenty years of experiments in marine engineering, has four screws and carries 970 passengers and 330 officers and crew. Hardly any firemen or oil trimmers are needed on this boat, which is so free from vibration that, during a violent gale on the trip, the ship's saloon seemed practically as motionless as a hotel lounge ashore. A specially sprung dance floor, and a radio cabin, with wave and spark instruments which can receive newspaper messages and shore broadcasting programs, are some of the boat's features.

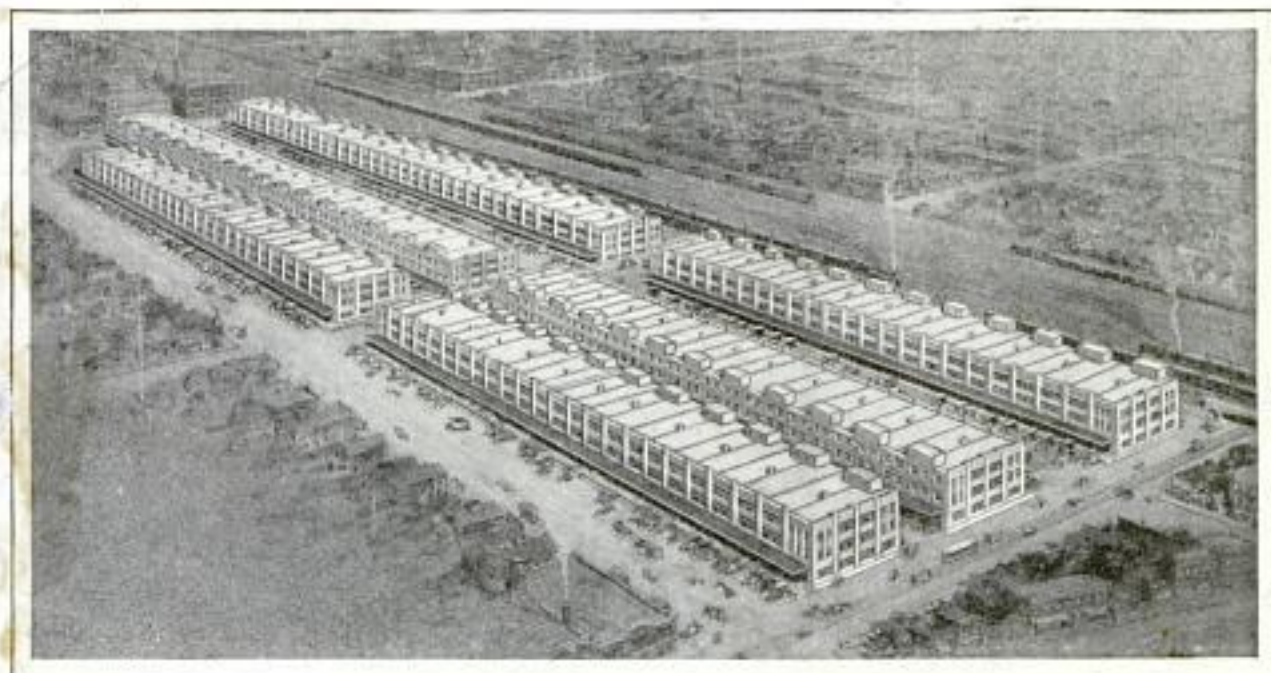
A novelty in life-saving devices on board the ship consists of motor lifeboats, each carrying fifty people and launched by automatic davits.



Massive Crankshafts That Will Propel a Motorship under Construction in Copenhagen Yards

Courtesy Burmeister & Wain

2878 Cont. W. W. Hackwell, 319 Monroe
 (Blay, Chicago)



Architect's Drawing of the Gigantic New Produce-Market District in Chicago Where the Foodstuffs of a Great Part of the Nation Will Be Received and Distributed

2078
HUGE MARKET TO CUT FOOD BILL OF NATION TEN MILLIONS

Reduction of handling charges of foodstuffs and elimination of waste caused by transportation delays and accidents to shipments of farm products, it is claimed, will result in an estimated saving of more than \$10,000,000 on the food bill of the nation, when the new produce-market district in Chicago is completed. The market, which will be the largest of its kind in the world, is scientifically planned to accommodate more than 300 concerns dealing in foodstuffs. The district will be devoted almost entirely to wholesale exchange, and will occupy six city blocks and consist of 165 buildings in which an annual business of approximately \$500,000,000 will be transacted. The structures are to be three stories high with a combined floor space of 2,000,000 square feet. Along the entire fronts of the buildings, loading platforms will be provided for trucks, wagons and other vehicles.

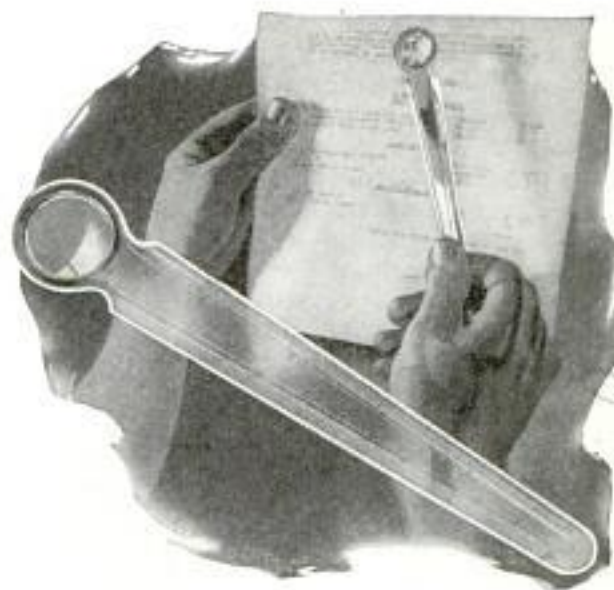
2717
GLOVE LEATHER FROM TREES IS SUBSTITUTE FOR KID

A vegetable leather which is said to compare favorably with the animal product and costs less than one-fourth as much in the manufacture of cheap kid gloves is being produced from the "mitsumata" plant. It is prepared by stripping off the bark and removing the inner layer of wood while it is moist. This is passed through various chemical processes which render

it pliable and warm. The material is easy to work up, and the gloves, when finished, readily "give" to the hands, and do not interfere with the circulation.

283
RULER WITH MAGNIFYING GLASS USED AS LETTER OPENER

Reading glass, ruler and letter opener are combined in a single convenient article for the desk or pocket. The lens is at the blunt end. The ruler is divided into inches on one side and millimeters on



Ruler and Letter Opener with Lens, and How It Is Used as a Reading Glass

the other, while the blade is shaped to cut pages or open envelopes neatly and easily.

Bausch & Lomb Optical Co.
 Rochester, N.Y.

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 Mr. V. ...
 Highland ...
 ...

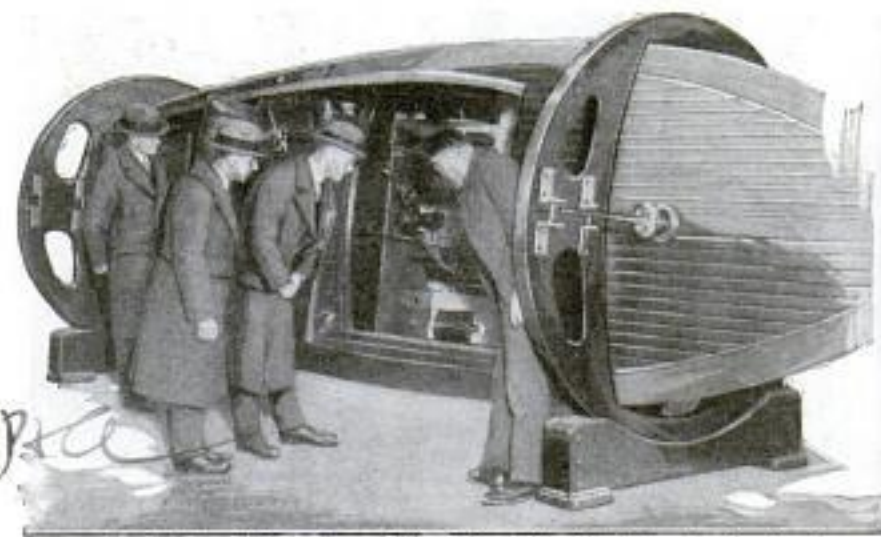
New York Times
3/15/25

**BOAT SHOWN IN CRADLE FRAME
TO GIVE INTERIOR VIEW**

Visitors at a motorboat show were able to inspect the interior of one of the craft

**FIFTY MILLION MEALS IN YEAR
SERVED IN DINING CARS**

Food consumed by the railway dining cars of the country for one year would be sufficient to supply a town of 600 people for a period of seventy years and allow every person three meals a day. To serve this amount of foodstuffs to travelers, the diner services lay approximately 50,000,000 table covers, and to provide the meats for the menus requires about 30,000 head of cattle. About \$2,000,000 is spent for bread and butter during the year, and 8,000,000 pounds of beef and 2,000,000 pounds each of fish and ham are used up in the same length of



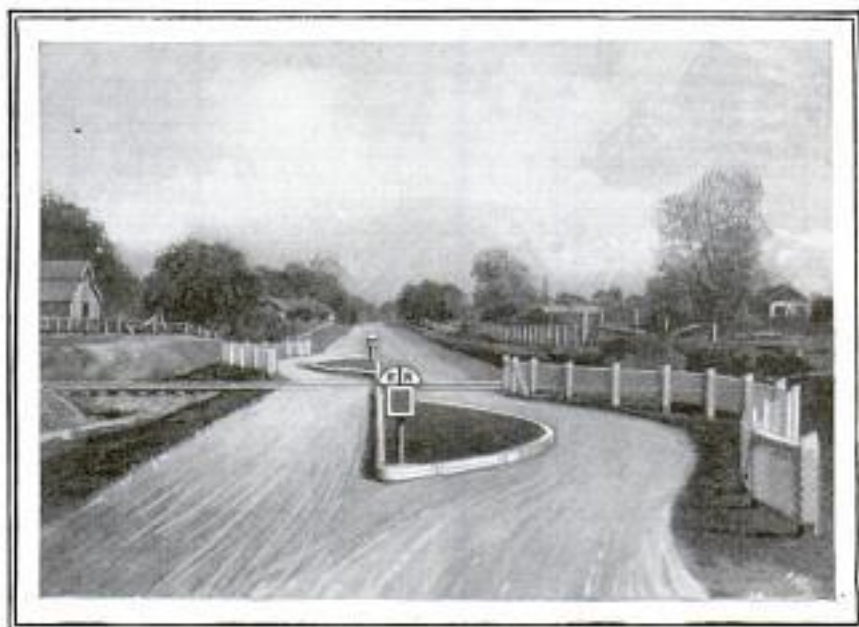
Inspection of Boat's Interior at Show Was Simplified by the Cradle Frame Easily Tipped at Any Angle

without difficulty as the boat was locked in a cradle which the attendant could tilt to any desired angle. Collars at the ends held the prow and stern and they were inserted within grooved supports resting on the floor.

**S-BEND IN STREET AT CROSSING
REDUCES AUTO HAZARDS**

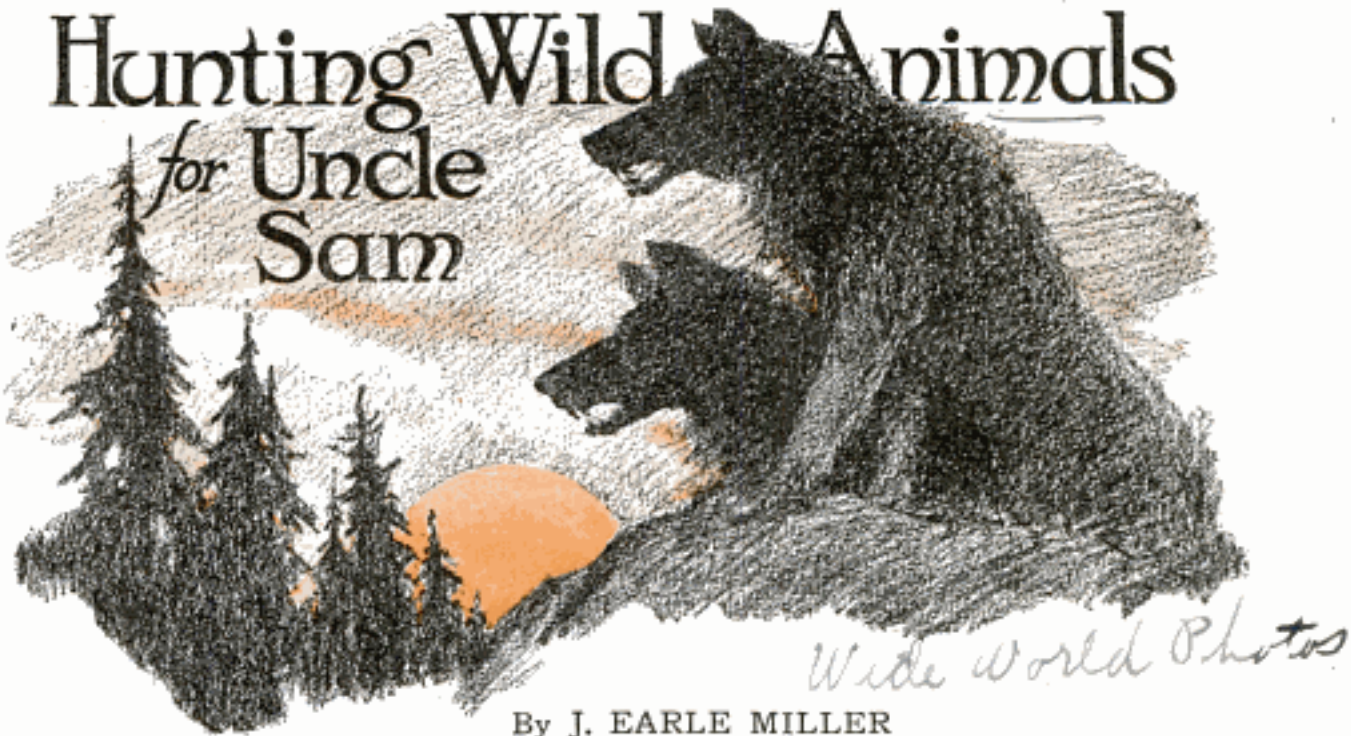
As an experiment in safety, a novel arrangement of the road and crossing signs is being tried in Florida at a grade intersection with a railroad. At the right, on either side of the track, the street is curved and is guarded by a stout wire fence to keep autos from plunging through. Motorists are thus prevented from driving straight across the rails and in slowing down for the curve, naturally become on the alert for trains that may be approaching. The sign, supplemented at night by a bright red lamp, is placed in the middle of the road at the end of a plot bordered by a white curb, which serves to emphasize the warning. The curve is said to discourage drivers from attempting to beat trains across the tracks, one cause of many accidents.

time. More than 6,000 dozens of eggs and almost 17,000 quarts of fresh milk and cream are served in a day, while the potatoes consumed annually are equivalent to the yield of 6,000 acres of planted land. A year's provision of oranges amounts to 2,500,000, and 1,250,000 grapefruits and 3,250,000 pounds of sugar are required to satisfy the appetites of the nation's travelers. Out of one hundred patrons it has been learned that practically eighty-five order coffee with their meals. Thirty-five of the same number will take roast beef. Chicken is the next favorite meat, after which come fish and steaks.



Twist in Road at Railway Crossing for Greater Safety; Strong Fences Guard Sides and Also Serve as Warning Signs

Hunting Wild Animals for Uncle Sam



Wide World Photos

By J. EARLE MILLER

MORE than \$1,340,000 was spent by federal and state governments during 1924 for the destruction of predatory animals and rodents. The resulting campaign was one of the greatest drives ever staged against dangerous and destructive pests, from bears and wolves down to house mice.

Four hundred and twelve picked hunters bore the brunt of the campaign against the meat eaters, who were taking toll of cattle, horses, sheep, hogs, chickens, deer, mountain goats, elk, and even the game birds in the west and parts of the east, northeast and southern states. They were the federal game hunters, and every one is an expert with rifle, trap and poison. When the season closed, they counted up the skins or scalps of 38,591 predatory animals, and estimated that about 100,000 coyotes had been poisoned.

The bag brought in included 562 wolves, 237 mountain lions, 193 bears, 3,507 bobcats and Canadian lynxes, and 34,092 coyotes. Of wolves alone more than 5,000 have been killed and scalped since the government hunters took over the job in 1915, in addition to hundreds which have died of poison and not been found.

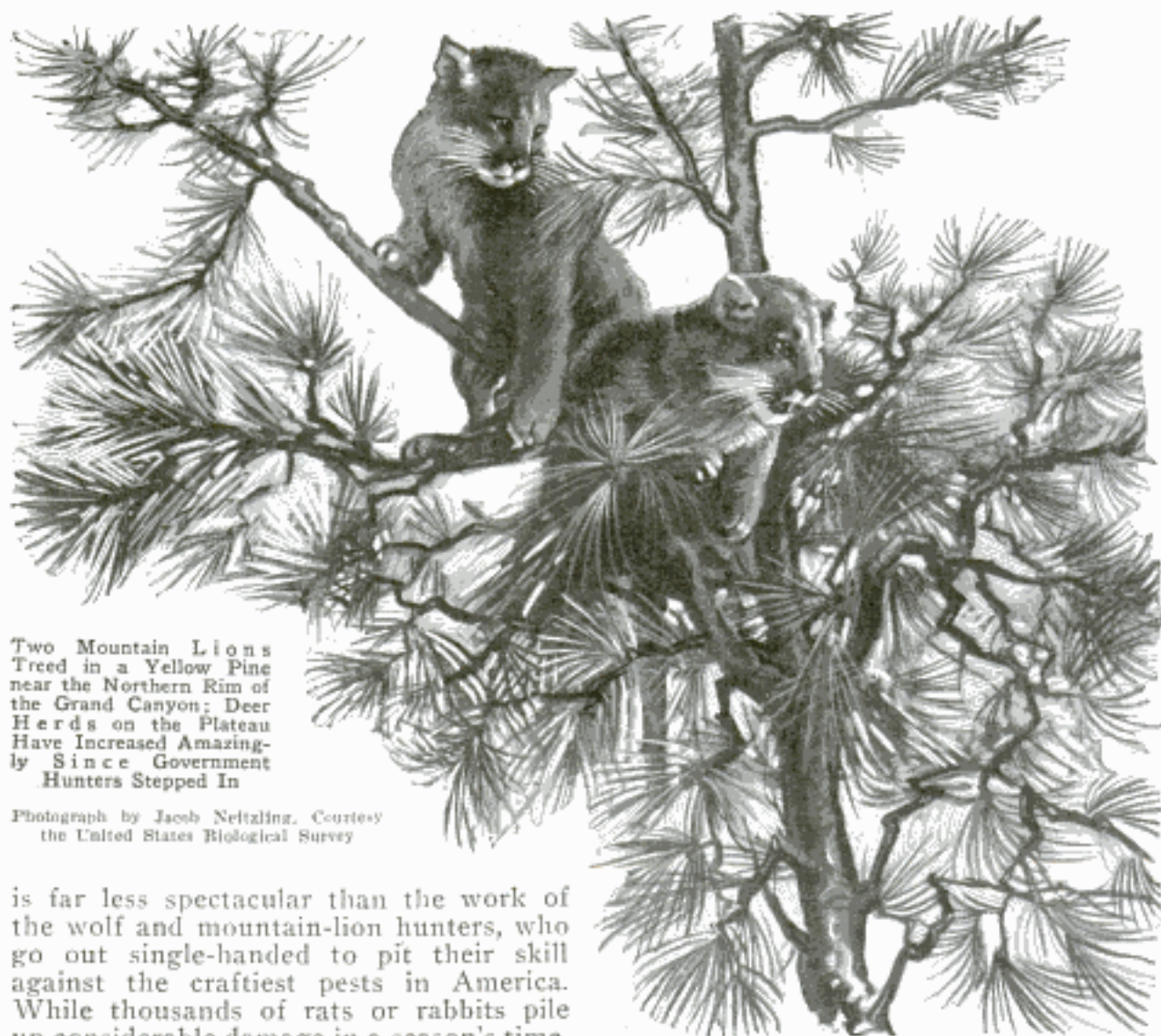
The predatory-animal campaign, while the most spectacular, is but a small part of the work done by the bureau of biological survey of the department of commerce, in co-operation with various states and cities. The war on destructive and disease-carrying rodents is even more important. The year's work included campaigns against prairie dogs, ground

squirrels, pocket gophers, jack rabbits, cottontails, snowshoe rabbits, woodchucks, field mice, cotton rats, kangaroo rats, house rats and mice. No less than 66,000 farmers and stockmen co-operated in wiping out rodent pests on 8,000,000 acres of land during the year, while whole cities joined in anti-rat and mice campaigns. Since 1916, 12,000,000 acres of federal land and 105,000,000 acres of state and private lands have been practically cleared of pests by carefully organized poisoning, trapping and gas attacks on underground burrows. Seventy-two million dollars' worth of crops have been saved by this work alone since 1916, the bureau estimates.

Some of the small rodents are unbelievably destructive. One Arkansas farmer, with a nickel's worth of poison, bagged two cotton rats which, within a few nights previously, had gnawed and ruined 1,000 young citrus trees, worth more than a dollar each. Damage by jack rabbits to alfalfa and other crops is so great in several sections that widespread drives were organized to reduce their number. One Colorado drive netted 20,000 rabbits, which were shipped to Denver and distributed free among the poor. Two Kansas drives brought in 10,000 rabbits, 13,000 were bagged in North Dakota, 50,000 in one Oregon county alone, 25,000 in Texas, and in Utah 536 co-operating ranchers systematically covered 128,220 acres with poison and killed 340,500 jack rabbits in the greatest rabbit war yet staged. The wholesale execution of rodents, however,

*and coyotes 6 p. 54.
A 50. 44: 55-*

*Government Bulletin:
Directions for destruction of wolves*



Two Mountain Lions
Treed in a Yellow Pine
near the Northern Rim of
the Grand Canyon; Deer
Herds on the Plateau
Have Increased Amazingly
Since Government
Hunters Stepped In

Photograph by Jacob Neitzling. Courtesy
the United States Biological Survey

is far less spectacular than the work of the wolf and mountain-lion hunters, who go out single-handed to pit their skill against the craftiest pests in America. While thousands of rats or rabbits pile up considerable damage in a season's time, a single wolf has been known to kill \$25,000 worth of live stock, a good part of it out of sheer deviltry and not because of hunger. One of the most notable kills of the year was an old white wolf in Arizona, who had wantonly slashed the throats of sixty-five sheep in one night, and forty in another, while he averaged a calf for food about every four nights. The old wolf was such a wanton killer that a pack of from twelve to fifteen coyotes followed him and feasted off the kills he left. Stockmen estimated the white wolf's food bill was considerably over \$25,000 when he finally succumbed to a skillfully placed poison bait, set by a government hunter. The stockmen had placed a bounty of \$500 on the animal's head and many private hunters and trappers had worked for months at a time to earn the reward, but without success.

Another marauder, known as the "butchering wolf," was trapped in Colorado. It took its name from a peculiar practice of biting off the ears or tails of calves and even full-grown cattle after it

had killed one and eaten its fill. Hundreds of animals were mutilated before a government hunter was called in. He rode over the territory and marked the animal's habits and trails, then set his traps. The first inspection found the wolf caught.

A notorious she-wolf was killed by a hunter who rode its range south of Pueblo, Colo., for three weeks before he met the animal. She had been in traps several times, losing a toe on each front foot, the wounds healing so perfectly that her track had the appearance of a naturally three-toed animal. Another old wolf was trapped in Colorado, after it had preyed heavily on deer, cattle and sheep. When she finally met her end, the hunter found seven unborn pups. In three previous years her dens had been located and a total of twenty-one pups destroyed.

In many districts the hunters have thinned the wolves out so far that the remaining animals try to entice dogs away from ranch houses as mates. One was poisoned within thirty yards of a ranch-house door in Arizona when she



Bringing in a Full-Grown Mountain Lion, Above, and a Trapped Coyote Glaring at His Captor, a Biological Bureau Hunter

came down on such an errand. In one district along the Oklahoma-Arkansas border fourteen wolves were bagged in a few days, eleven being poisoned and three trapped, while hunters in southwestern Missouri accounted for ninety-three during the year.

Coyotes, while less dangerous than wolves, are considered far more destructive by the government, because they are so much more numerous. The coyote census indicates there are several million animals in the country, and since they have enormous litters, the hunters' work barely takes care of the normal increase. They are much cleverer than wolves in avoiding traps and poison bait, and as they are driven back by men, adjust themselves to new surroundings so easily that they are now found in the high rockies, in dense forests, and have even extended their range to Alaska and the Mackenzie river delta in the Arctic. They persist-

ently follow game and live stock in their seasonal migrations between summer and winter pastures, constantly preying upon the young, and even adults. They also destroy an enormous number of eggs and the young of ground-nesting birds, including sage hens, prairie chickens, quail, grouse and other kinds of fowl. They are as clever as foxes at concealing their dens, and actually rear their families close to ranch houses. One hunter located



eight dens near one ranch, and destroyed forty-eight young pups in them.

The war on the coyotes is mostly confined to poisoning, with some trapping. Poisoning is carried out on a large scale. Last year, 3,567,000 poison baits were established in an area covering 284,400 square miles. A Texas rancher, after studying government methods, established a poison line 100 miles long and found fifty-seven dead coyotes at the first inspection. An Oregon rancher bagged twenty-nine on his line, and one Arizona



Trapped Bobcat
Looks as Innocent
as a House Tabby;
Center, Placing Bait
for Coyotes



Timber Wolf, with
Long Record of
Killings, Snarls
to the Last

ranch killed 140 within a short time.

The mountain lion's kinship to the common house cat was turned against him for the first time during the last two years, when government hunters applied oil of catnip as a bait to cover their poison. The lure of catnip proved irresistible for wily old lions who had evaded poison sets for years. During the year, 237 full-grown mountain lions were poisoned or shot, bringing the total bag since 1915 to 1,236. One Arizona hunter, after having eighty



Skis and a Rifle Help Government Hunter Bring Down Two Idaho Wolves in Winter; Left, Biological Survey Hunters with a Coyote Shot at Long Range



came near a trap where the powerful odor was present.

Bears are protected as game animals and are only hunted down and killed by the government men when there is good proof that they have gone bad and become meat eaters, yet 193 were slain in seventeen states during the year. One notable kill was made in the Okanogan forest, in Washington, when a hunter shot an old grizzly which had

of his sheep wantonly slaughtered in one night by a lion, put out a poison and catnip-oil set and the next day found the offender dead.

Oil of catnip also proved a lure to bobcats and Canadian lynxes, the federal hunters getting 3,448 of the former and fifty-nine lynxes during the year. The catnip is used as a trap bait, and some hunters reported taking every bobcat that

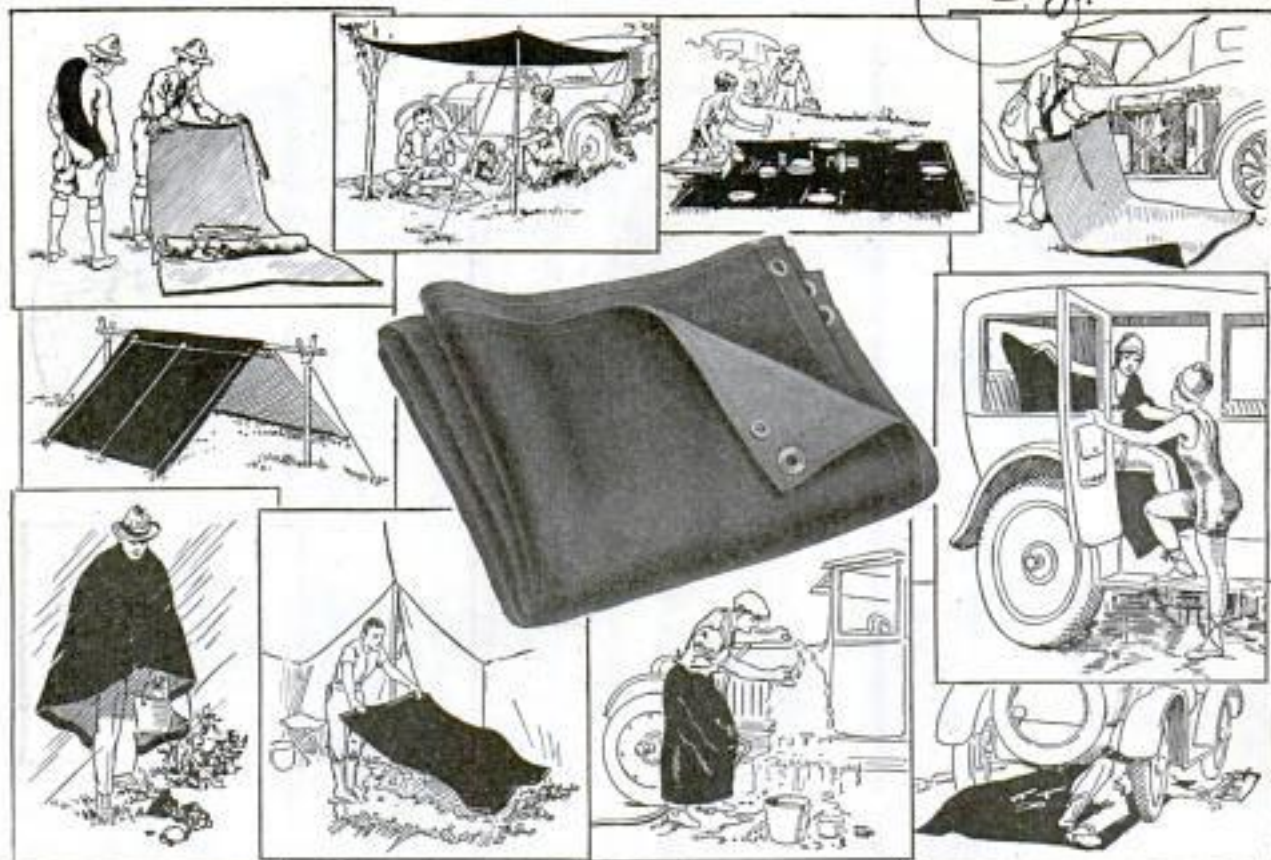
killed large numbers of sheep and cattle for three years.

The work of the hunters has also been spread to Alaska, where wolves, lynxes and, in some cases, bears were killing fawns in the reindeer herds being established for Eskimos and Indians. The government hunters are also wiping out the wolves on the islands off the coast, making them available for fur farming.

2720
968

C. J.

Price - about \$4.00



Serviceable Rubber Blanket That Makes an Ideal Addition to the Camp or Motoring Equipment and Some of the Many Uses to Which It May Be Put to Guard Health and Clothing

RUBBER BLANKET FOR CAMPERS SAVES HEALTH AND CLOTHES

A rubber blanket with eyelets through which ropes may be passed to make wrapping secure, can be folded up and slipped in the side pocket of an automobile. Snap fasteners are provided so the cover may be used as a poncho leaving the wearer's arms free for other tasks, or it may serve to spread over the ground to save the clothing when making repairs to a car. As it can be easily washed, the sheet can be placed over grass as a tablecloth for picnickers, and can be stretched between trees as a sunshade. Laid on the ground beneath a camp sleeper, it keeps both the bedding and occupant dry and warm. Thrown over a rope stretched between two trees or stakes, a pair of the blankets make a roomy waterproof tent.

RAIN ACTS AS AIRSHIP BALLAST SAVING VALUABLE GAS

Rain water at seven dollars a pound may seem a bit high in price, but it was worth that much to the dirigible "Los Angeles" on her return from Bermuda to the United States. A heavy storm was encountered during the voyage, and about 2,000 pounds of water accumulated on the huge envelope. On its arrival at the Lakehurst

hangar, this extra ballast permitted the ship to be brought to the ground without releasing any of the helium. The estimated value of the gas thus saved was \$14,000, making the rain water worth seven dollars a pound.

ADJUSTABLE SCHOOLROOM DESK-1354 CHANGED BY PUPIL

Mounted on a single pedestal, with one arm extending forward and holding the seat and another toward the rear and upward to carry the desk, a school desk has been designed that can be adjusted by the pupil in a few seconds to the proper height required for him to sit correctly and comfortably. Nine notches in the arms permit the desk and seat to be raised or lowered to as many different levels. The changes are accomplished by turning a handwheel and shifting a pin.



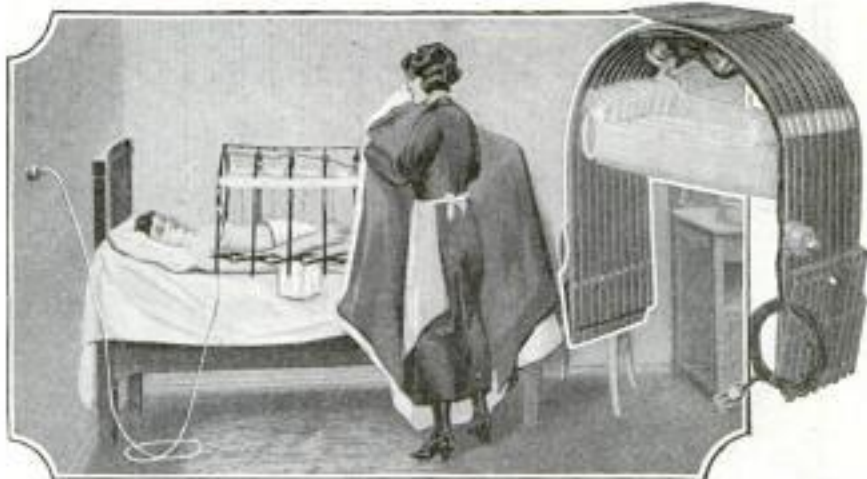
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H. G. E. Royer
65 Cincinnati, Ohio
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2896 at Sheffield University,
 Sheffield, England
 POPULAR MECHANICS

NON-TARNISHING SILVER KEEPS BRIGHT WITHOUT CLEANING

Silver said to resist tarnish and to stay bright without frequent cleaning or polishing has been discovered by an English scientist. Containing more than nine-tenths of the pure metal, the material can be worked by the ordinary methods with the same results as the common variety, and eliminates the need of coatings or other treatment to preserve the luster. With this property, it is claimed the non-tarnishing metal is valuable for use where the tendency of silver to blacken and grow dull necessitates considerable effort to keep its surface free from defacing blurs, especially when the objects are not frequently handled.



Placing Folding Electric-Light Bath over Patient for Treatment; a Blanket Covering Keeps the Heat In; Insert, Cabinet Collapsed

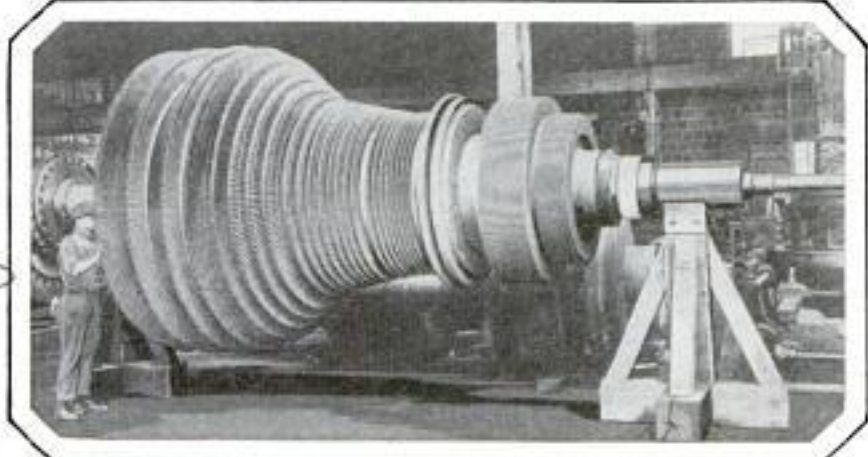
FOLDING ELECTRIC-LIGHT BATH IS EASILY PORTABLE

The benefits of treatment by electric-light baths may be enjoyed by a patient

with a collapsible cabinet designed for use in the home, hotel room, or wherever current is available for its operation. The apparatus is compactly constructed and can be folded into a small package for placing in a trunk. It can be set up on the bed in a few minutes, and where necessary, may be entirely handled by the user. The portable incandescent-light bath is said to be harmless to patients too delicate to withstand the effects of treatment with steam or hot-air appliances. Curtains and guards are provided for the lamps to prevent possibly dangerous contact with the patient or bed clothing.

TWO BARRELS OF OIL A MINUTE KEEP HUGE TURBINE COOL

Weighing nearly sixty tons, the huge rotor of a 45,000-horsepower steam turbine built for a Los Angeles lighting plant will produce so much heat in the bearings when operating that two barrels of oil each minute will be necessary to lubricate the mechanism and keep it within safe temperature. At full speed, the outside rim of the largest section of the massive cone will travel nearly 600 miles an hour. Approximately 5,000 small blades compose the series of rings which make up the apparatus. The turbine will be used with a generator to produce electric current.



Gigantic Turbine Rotor Which Requires Two Barrels of Oil a Minute

CAPTURED WAR STOCK SERVES FARMERS IN ARGENTINE

Practical use of quantities of light railroad material taken from Germany after the armistice is being made in Argentina as feeder lines. Nineteen small German locomotives, thirty-seven gasoline tractors and 2,300 cars, the kind employed to carry rations and munitions to the trenches, are hauling grain and potatoes from the farms to the stations. As the roads on the Argentine pampas become very bad after rains, the equipment has been of great service to the farmers.

built for Los Angeles Gas & Electric Co

mess. Siemens + Halske, A. G. Medical Section
 near Berlin Germany
 the main stock, missing in Argentina

South American
 Westinghouse Electric & Mfg. Co.
 Copyrighted material
 American

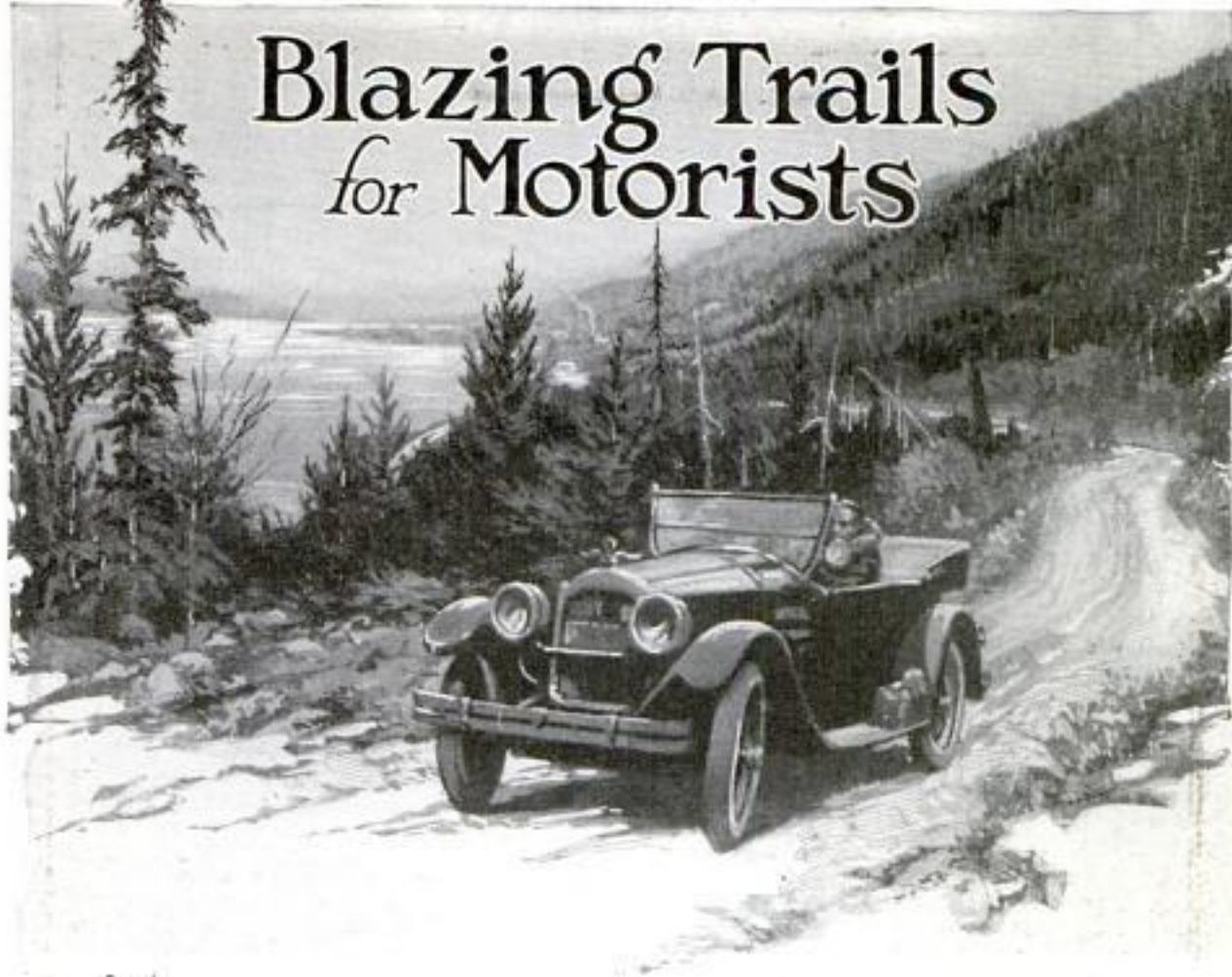
2754

Handwritten initials or mark.



Two Americans Who Made the First Trip from Winnipeg to Victoria, Can., Last Summer Found No Road through the Rockies, So Used the Railroad Tunnels in Passing the Divide

Blazing Trails for Motorists



Auto.

Road Mappers Risk Lives in Hunt for Routes; Dozens of Instruments Make Recording of Topography Almost Automatic

DO you know the best route from Kalamazoo to Kankakee, or, for that matter, from Portland to Portland, the one in Maine and the other in Oregon?

If you don't, Danny Nee can tell you, for D. J. Nee is the official pathfinder of America's automobile highways. He is the pilot of "Wayfarer IV," the American automobile association's scout car. You don't have to know Danny Nee or consult him personally to find the best route from where you are to where you want to go, for his findings in 600,000 miles of travel are ready in written form in the A. A. A. maps, distributed by the millions each year through the 700 clubs affiliated with the parent organization. Several other mapping crews are constantly at work helping add to the road knowledge of the country, but Nee is the king of the adventurous clan of pathfinders, having been at it longer than any of them.

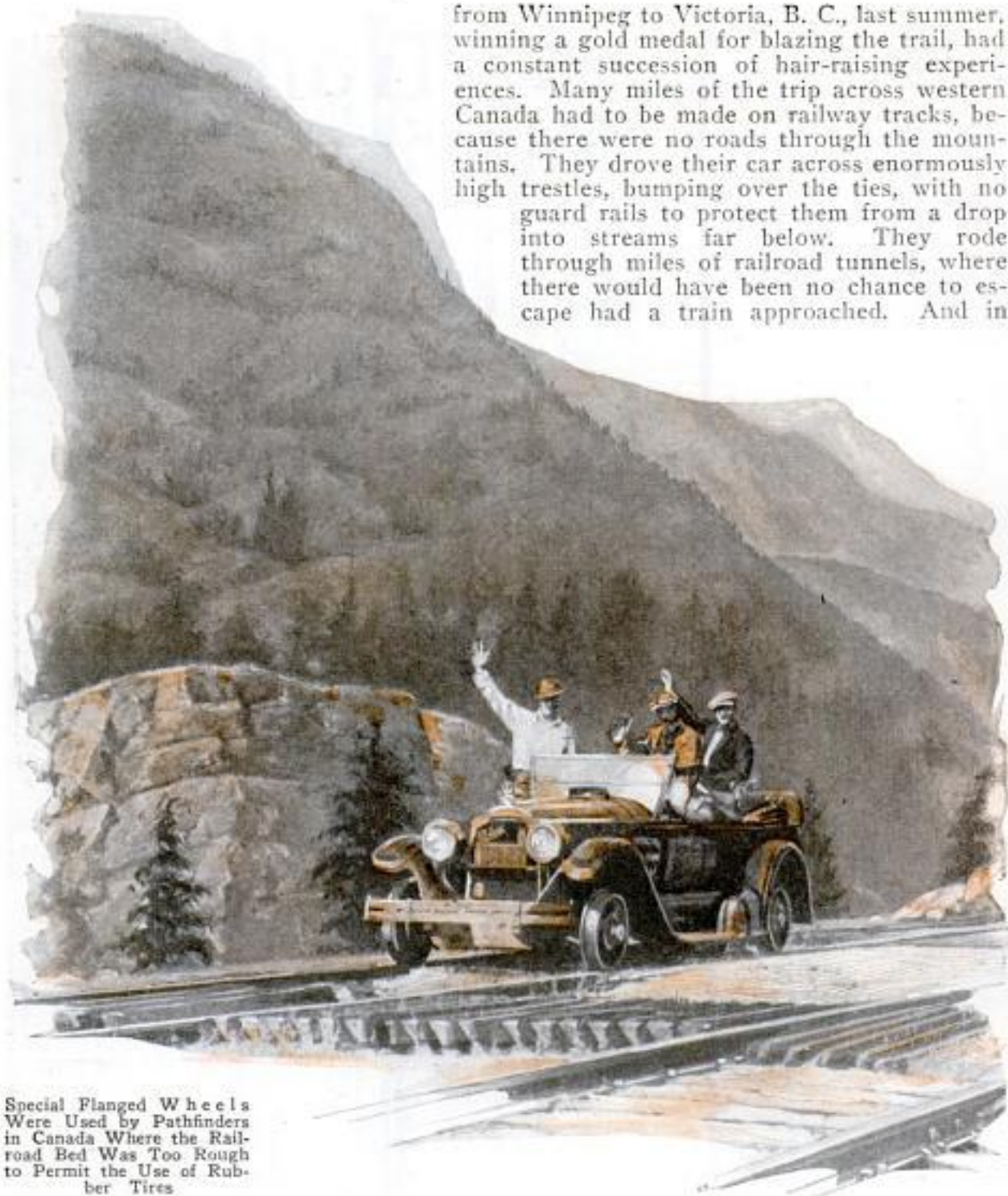
The life of a mapper is adventurous, for much of his work is done over highways that are roads on paper only, and exist

in fact as Indian trails or wild-game runs in the mountains, or perhaps as shifting sand in the desert. When the fine Roosevelt highway was laid out the mapping car plowed over rocky trails, forded swift mountain streams, bogged in river bottoms, and bounded and twisted up the winding game trails over mountainsides. One of the veteran drivers, back in those early days of road pathfinding, was marooned for eight days on a tiny island, hemmed in by a sudden flood. The only other living creatures within sight were a few prairie dogs which had sought refuge on the same hill, and during the last two days averted death by starvation.

The same veteran trail blazer was caught on the Apache trail with a radiator boiler dry and forty miles of desert sand to the nearest water. He had eight quart bottles of wine in his car (this was several years ago) and had to sacrifice all of them to keep the engine cool until the next water hole was reached. Curiously enough, his most trying experiences have

1108-6th st.
Washington, D.C. Copyrighted material

from Winnipeg to Victoria, B. C., last summer, winning a gold medal for blazing the trail, had a constant succession of hair-raising experiences. Many miles of the trip across western Canada had to be made on railway tracks, because there were no roads through the mountains. They drove their car across enormously high trestles, bumping over the ties, with no guard rails to protect them from a drop into streams far below. They rode through miles of railroad tunnels, where there would have been no chance to escape had a train approached. And in



Special Flanged Wheels Were Used by Pathfinders in Canada Where the Railroad Bed Was Too Rough to Permit the Use of Rubber Tires

been with insects. On one occasion in western Kansas swarms of locusts plastered the radiator until the fan could not draw air through it, and he was forced to stop until the migration passed. On another occasion the pathfinder and his crew were under medical care for several days following attacks by a huge swarm of mosquitoes in the Bad Lands of the Dakotas.

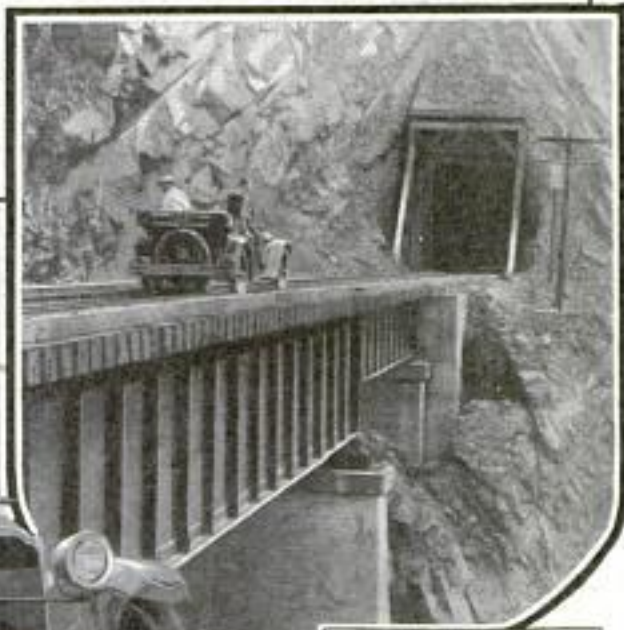
Austin F. Bement, vice-president and secretary of the Lincoln Highway association, who, with a companion, made the first automobile trip in history

between times they bumped over some of the worst future road sites ever met with.

The road-mapping job, though, has been simplified in recent years by the development of special instruments to record the desired information. Twenty to twenty-five recording devices and controls make up the instrument board of a pathfinding car, and the pilot and his assistant must watch all of them constantly, besides noting every left and right turn, hill and valley, crossroad and railway, and such landmarks as churches, schools and, in



Bouncing Along across the Trestle of a Canadian Railroad, in a Land Where Automobile Roads Are Still Unknown



Typical Going on a Pathfinding Trip through British Columbia, and, Left, Rocky Road Scoured by a Cloud-burst and Washout in Western Part of Canada



sparsely settled districts, even the big red barns. One of the biggest aids to mapping yet developed is a special adding machine carried by Danny Nee. Enough of the figure keys have been retained to jot down the mileage, and the rest have been equipped with special characters and abbreviations, which record, on the same long paper strip, all the information needed for the completed map. Nee simply pushes a button labeled "left turn," "curve," "right turn," "garage," "schoolhouse," "bad road," "railroad," or any other desired information, and the word or phrase is printed on the tape, with the

correct mileage from "zero," the starting point. The roll of tape, which is automatically accurate, is sent to the drafting department, to be used in preparing new maps, or checking old ones of the route. With all the recording devices used, the pathfinding cars are frequently able to make thirty miles an hour and at the same time take an accurate log of the road. Should the road to be mapped happen to be between New York and Florida or New York and San Francisco, New York is taken as "zero." A month out from Gotham the crew will reach Florida with the map log completed, while three months are sufficient to log a transcon-

tinental highway. Each day the tape from the adding machine is mailed back to headquarters in Washington, and by the time the crew returns from the trip, the map is well under way. The rough draft is compared with all existing maps of the same territory, and after every detail has been checked the measurements taken are plotted on government topographical charts, and these are then assembled for a section of the route connecting two centers of population.

For many years the drafting department faced a problem because westerners preferred written logs of the road, while the east and south liked road maps best. The A. A. A. recently solved the problem by publishing a strip map which combined log and map, with the written directions of the first printed alongside the corresponding point on the map.

But, getting back to Danny Nee and "Wayfarer IV," the best-equipped of the official pathfinding cars, he designed it after hundreds of thousands of miles of travel to master all conditions of the road, and installed in it every conceivable appliance for his work.

It has a grade meter which shows at a

glance the grade up or down a hill. An altitude meter to give the elevation above sea level; two speedometers, a thermometer, a barometer, and gas, oil and water gauges on the instrument board. The board also has room for three buttons which completely oil the car, controls for the twenty lights with which it is fitted, a graduated dimmer and an oil pump.

With four-wheel brakes and a powerful motor, roads ordinarily impossible mean little to the pathfinder. If the car bogs down, there are caterpillar sand belts for the rear wheels; if they fail, there is a powerful motor-driven winch, capable of pulling twice the weight of the car, and with sufficient cable to reach an anchor placed on firm ground. And as additional precautions, there are clips on the body holding a shovel, crowbar, extra front and rear springs, large containers for emergency gas and water, and a special bathometer on the dash to record the condition of the battery at all times.

The adding machine with its special characters is mounted back of the driver's seat, but within easy reach of either passenger. Besides all this equipment there are an autolog on the steering column for recording expenditures for gas, oil, repairs, etc., a visible note pad, two compasses, a small one on the dash and a large one in the top of the car over the driver's head; a clock and an electric cigar lighter.



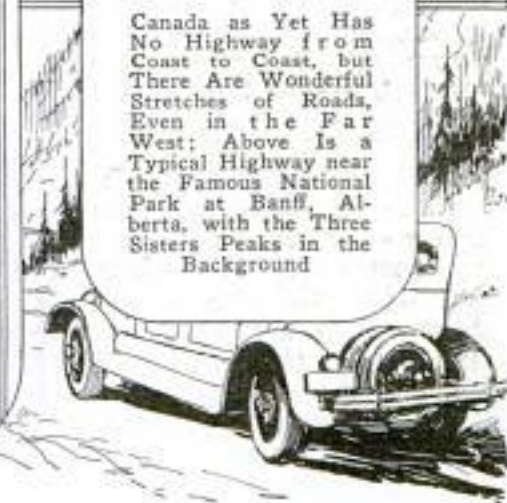
Out Where the West Still Lives and Indians Appear "in Person," instead of in the Films, a Scene on a Pathfinding Tour near Banff, Alberta; Note the Braids of the Unbobbed Brave

Drafting Room in American Automobile Association Headquarters Where the Pathfinder's Road Logs Are Translated into Maps for the Guidance of Future Auto Tourists across Nation's Highways



Instrument Board of Danny Nee's Official A.A.A. Pathfinder, Showing Mapping Aids

Canada as Yet Has No Highway from Coast to Coast, but There Are Wonderful Stretches of Roads, Even in the Far West; Above Is a Typical Highway near the Famous National Park at Banff, Alberta, with the Three Sisters Peaks in the Background



2760
976



Spillway of the Cornell Dam, in Croton River Valley above New York. Converted into Miniature Niagara by Floods That Caused Tremendous Losses of Water to the City

International

2760

CITY LOSES BILLION GALLONS OF WATER BY FLOODS

Melting snows and heavy rainfall in the Croton river valley above the Cornell dam which supplies New York with water, are estimated to have cost a daily loss by flood of 1,500,000,000 gallons. The wasted volume flowed over the spillway, which is 1,200 feet wide, into the gorge 150 feet below, in a torrent that resembled a miniature Niagara. Experts measuring the flow estimated the value of lost water at \$200,000 a day, based on the charge made for it by the city.

BOY DIVER FINDS PEARL WORTH FIFTY THOUSAND DOLLARS

What is called the world's finest pearl, a lustrous, peacock-green gem nearly three quarters of an inch in diameter and weighing almost thirty carats, has been found off one of the Gambier islands in the south Pacific ocean by an eighteen-year-old native boy diver. He parted with it for a small fortune, and the buyer is said to have been offered \$50,000 for the treasure. It is not an uncommon occurrence for the fishermen to go out in their little canoes in the morning and return at evening rich,

according to their standards. The find of the young boy, however, is said to be the largest in the records of the region.

PUNCHES IN LOOSE-LEAF BINDER CUT HOLES TO FASTEN SHEETS

Perforators fitted in a loose-leaf binder may be used to punch holes in papers to fit the fastening rings. A ruled scale is



also provided in the cover for the purpose of accurately measuring the points to be pierced. The punches may be adjusted for perforating other matter to fit different-sized files. If desired, the cutters can be removed from the

binder for carrying on a key ring and replaced whenever material is to be punched.

Miners' bunks are said to have given George M. Pullman the idea that resulted in the sleeping car.

2827

Christian Science Monitor
3/4/25

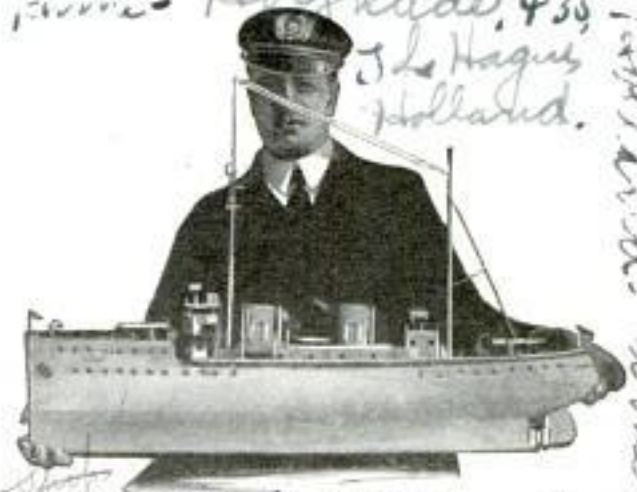
Patent Paper Punch
1506
Copyrighted
Baltimore, Md.

STENCH ALARM EMPTIES MINE IN TWENTY-NINE MINUTES

Two pints of a chemical of a noxious odor were used successfully in an iron mine in Minnesota as an alarm signal to get the workers out of the shaft. The substance was introduced into the air-discharge line at the engine house and penetrated the underground tunnels so thoroughly that men half a mile from the opening detected it. Within twenty-nine minutes from the time the chemical was circulated, 130 miners had received the warning, walked to the exit shaft and climbed 300 feet to the dry house. The odor was so strong that it worked its way through leaks in the air line and was spread by the regular ventilating system.

TOY WARSHIP RUN BY BATTERIES BUILT ON OCEAN LINER

Operated by a motor supplied with power from storage batteries and fully equipped with electric signal lamps and searchlights, a model of a Dutch destroyer built by an officer of an ocean liner has almost every accessory found above deck on the original of the copy. The hull is constructed of small strips of wood over a carefully laid keel and skeleton of the same material. The tiny craft can make fast speed in the water, and its motion can be regulated from the deck. A cook's galley has been provided where a toy stove and a set of kitchen utensils are installed. It required almost three years for the builder to complete the miniature and all work was done during trips on the Atlantic ocean.



Model Maker and Toy Warship He Constructed aboard a Liner during Transatlantic Trips

SELF-DUMPING SACKS ON TRUCK STOP WASTE, SAVE TIME

Sacks containing cement and similar materials when carried on a dump truck, can be emptied automatically without unloading them by means of fasteners which hold the bags upside down as the body of the vehicle is elevated. Besides saving much time and work, the hooks make it possible to carry cement with loads of wet sand and gravel without impairing its usefulness. Losses due to the material being blown away by the wind are also prevented. With the dumping attachments, large numbers of sacks may be emptied practically in the same time as required to pour out a single bag by hand. Hauled with other materials, with which it is to be combined, the cement is readily emptied.



How Self-Emptying Cement Sacks Are Fastened to Truck; Above, Load Ready for Dumping

Although the rolling and pitching of the liner often made the task difficult, the most delicate parts were successfully fashioned. The model is about forty inches long.

URGE ROADS BE COLORED GREEN

Minor eye troubles resulting from the reflected glare from gray or white auto roads in England are afflicting a great number of drivers, a British optician declares, and recommends that green coloring matter be mixed with the surfacing material to curb the evil. The effects are said to be most pronounced among drivers who are compelled to gaze at the road intently.

Emb. S. J. Harris, 7437 Carlton Ave Chicago

Built by. H. S. Antinice April 1924
Holland. Amsterdam
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Mr. W. H. Strath
Road Construction Co
Wisconsin Rapids, Wis

Chicago Evening Post
3/12/25

Used by National Surety Co.
115 Broadway

**SAFES IN MESSENGERS' VESTS
PROTECT BANK VALUABLES.**

Telltale bags carried by messengers when delivering valuable securities have



Vest Safe with Lid Off and in Carrying Position, Sewed under the Lining

often attracted holdup men, are easily snatched away and can get lost. To provide a safer way of carrying bonds and currency, a vest has been devised with a flat steel safe built into the lining and locked in front. The buttons and outer lap effectively conceal it, and it does not bulge sufficiently to be conspicuous. It cannot be opened except by the proper key. By using these safes, members of commuters' train crews, who are idle during bank hours, may be satisfactorily employed to make deliveries in some cities, thus eliminating the need for special messenger boys and obtaining the services of bonded men who are trained to a sense of responsibility. The steel compartments weigh but little and require no remodeling of the garment.

Six months is said to be the average life of a dollar bill.

**TARGET RANGE MINED FOR LEAD
WITH GOLD SLUICE**

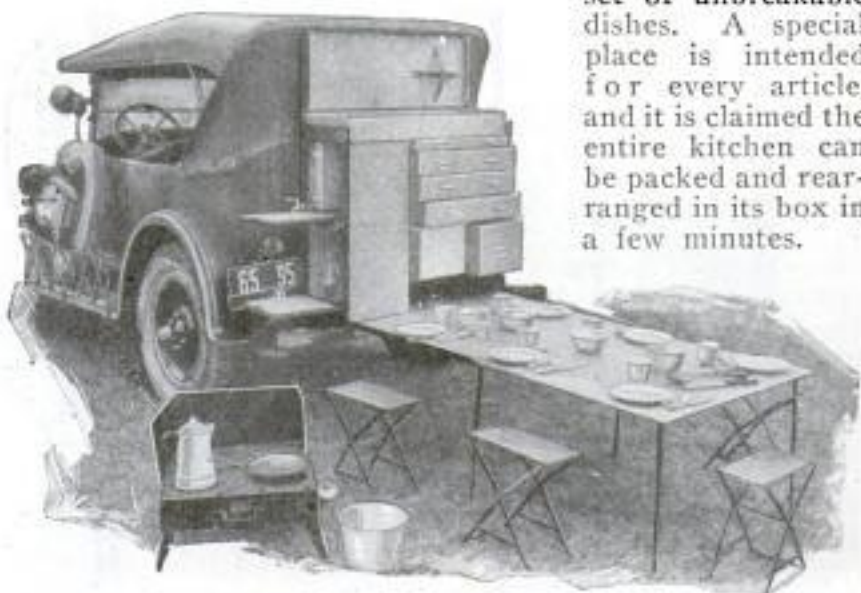
A unique and profitable lead "mine" is being worked in an abandoned cornfield long used as a target range by a western trapshooting club. Over the traps from which clay pigeons are flung, an almost steady hail of shot has been poured for years by sportsmen in practice and contests. The "prospectors" are reclaiming tons of this lead with a sluicing machine of the type that has panned many millions of dollars' worth of gold from the streams of the Pacific coast. Since most of the metal pellets lie within six inches of the surface of the ground, "pay dirt" was struck immediately with the first shovelful of soil lifted. It is estimated that approximately thirty tons of lead shot are scattered within the limits of the range, and a value of \$5,000 accordingly has been placed on the mining rights.

28
Conf. to E. W. Horn...
911 Du...
Portland, Ore.

**KITCHEN IN BOX FOR AUTO CAMP
PROVIDES HOME COMFORTS**

A portable commissary for automobile tourists, which holds an array of kitchen utensils and camp accessories, folds up into a cabinet and can be fastened to the rear of a touring car. The equipment includes a stove, complete set of cooking ware and refrigerator with water cooler attached. Ample space is provided for linens and storage of groceries and canned goods. The front of the cabinet folds out, forming a table with adjustable legs to hold the top level on uneven ground. Collapsible seats are carried in a separate compartment, as well as a full

set of unbreakable dishes. A special place is intended for every article, and it is claimed the entire kitchen can be packed and rearranged in its box in a few minutes.

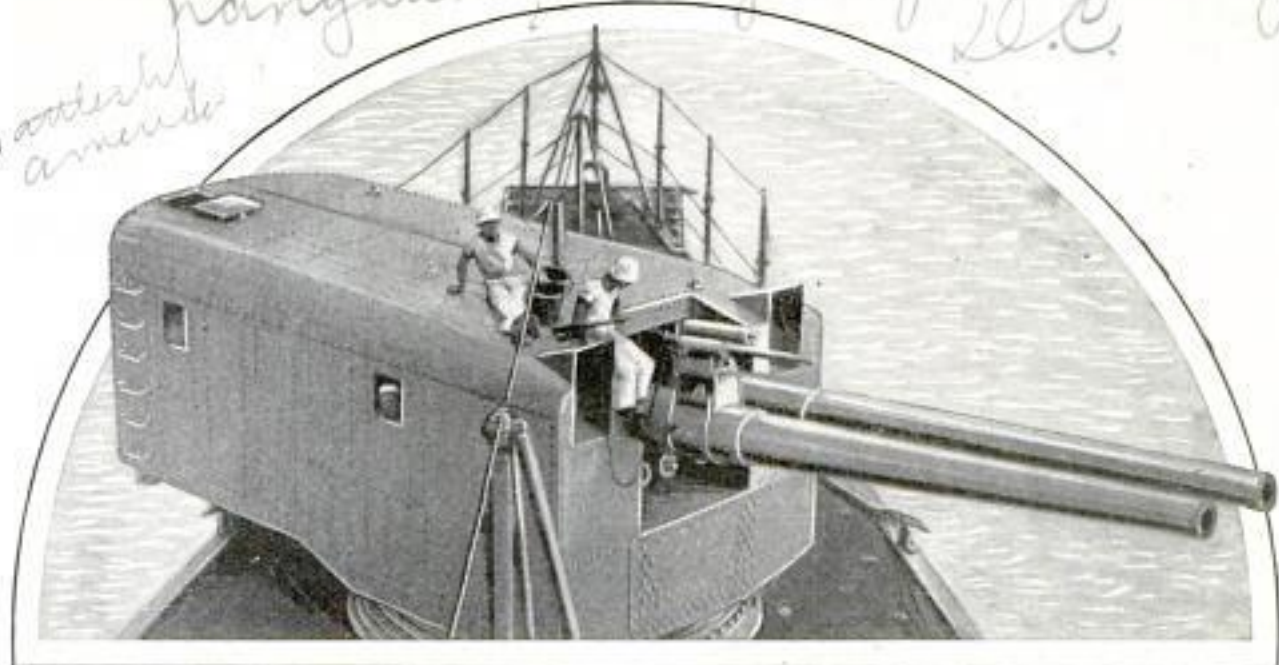


Campers' Auto Kitchen Prepared for a Homelike Meal in a Few Minutes without Detaching It from Its Place on the Trunk Rack

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2809 Cont. John W. Keaw, Bureau of
POPULAR MECHANICS 979
Navigation, Navy Dept. Washington
D.C.

*3 additional
ammunition*



One-Pound Subcaliber Gun Mounted on Top of Six-Inch Rifle in New Type Turret Used on Uncle Sam's Fast Light Cruisers

Training Sailors to Shoot

Little Guns Fastened on Big Ones Save Uncle Sam Nearly \$500 at Every Shot Fired during Preliminary Battle Drills

TRAINING Uncle Sam's naval gunners for the big-time shooting, when the fourteen, fifteen or sixteen-inch rifles crash in thundering salvos, is a most expensive pastime. It costs \$500 to shoot one of the big guns, or \$4,000 for an eight-gun broadside. Then, too, the life of a huge rifle is extremely limited, and only a very few practice shots may be indulged in before the gun must go back to the foundry for relining. But naval experts have solved the problem of training gunners economically, and now a crew may be drilled for months in actual firing practice for what it would cost to shoot the big rifle just once. They have introduced economy into target work by fastening a

light one-pound gun to the back of the big guns, and an ordinary rifle to the back of the one-pounder. A sailor straddles the barrel of the big gun to load the one-pounder or the rifle, but from there on, the sighting and firing are carried out just as when the turret gun itself is fired. The relative size of the three guns, and the distance each will fire, have been carefully calibrated, and targets worked out to the proper size and placed at the right distance, so that the sighting operations are the same for all three.

It costs about two cents to fire a rifle and eighty cents to shoot the one-pounder, as compared to the \$500 bill for the big gun, so that 25,000 rounds of rifle ammunition or 625 one-pound shells



Firing a One-Pounder Mounted on a Thirty-Caliber Battleship Rifle

may be fired for the cost of one charge for the turret gun, not to mention the great saving in wear on the latter.

Gun crews are not permitted, however, to waste even two-cent rifle cartridges or eighty-cent one-pound shells until they have had enough preliminary training to insure they will get some value out of actual firing experience. The training of the gun crews starts from the day a ship is commissioned. The gunnery officer culls the crew for the pick of the men, looking not only for the physical conditions but also for the mental qualifications that will make good gunners.

With the crews thus picked, practice starts with a dotter, a small device that fires a needle at a card. Everything about the dotter is on a reduced scale, but its mechanism is the same as that of a big gun, and even the firing trigger is a miniature copy. After the gunners thoroughly understand the mechanics of the piece and the mathematical factors that enter into its aiming, they are advanced to the big-gun turret, but only to fire the rifle that is attached to the back of the one-pounder mounted on the big rifle. When the crew become proficient with the small rifle, they graduate to the one-pounder, for more weeks of incessant drill, until finally they are ready to shoot the big gun for the first time.

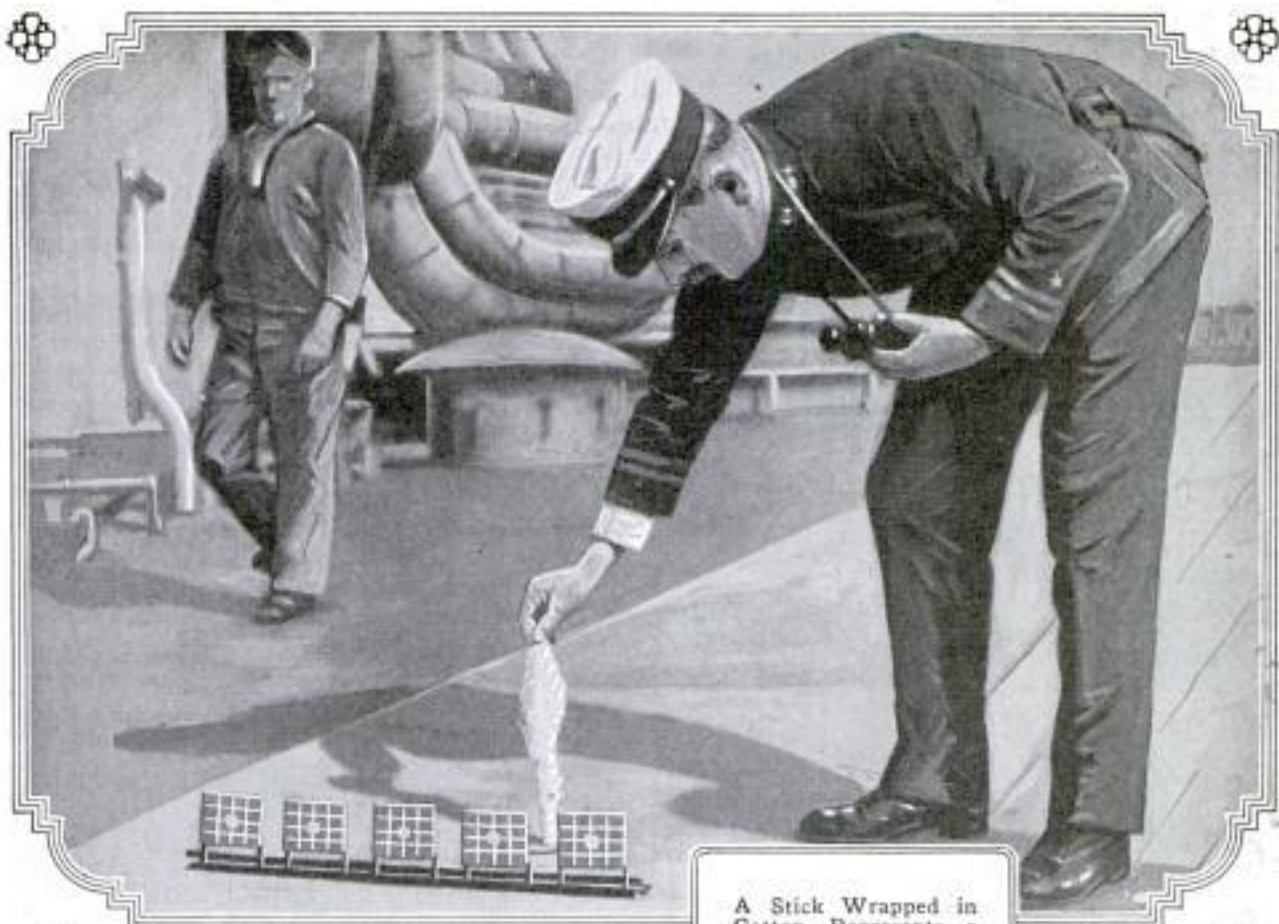
In the meantime every spare moment for weeks has been devoted to loading and sighting drill with the turret gun. Officers

with stop watches stand by and time each movement, until the crew become so letter-perfect and their actions so automatic that the required speed can be maintained without a flaw. A moment's confusion or a lost step in the co-ordination of the entire crew's movements might cause an accident of serious consequences under actual firing conditions.

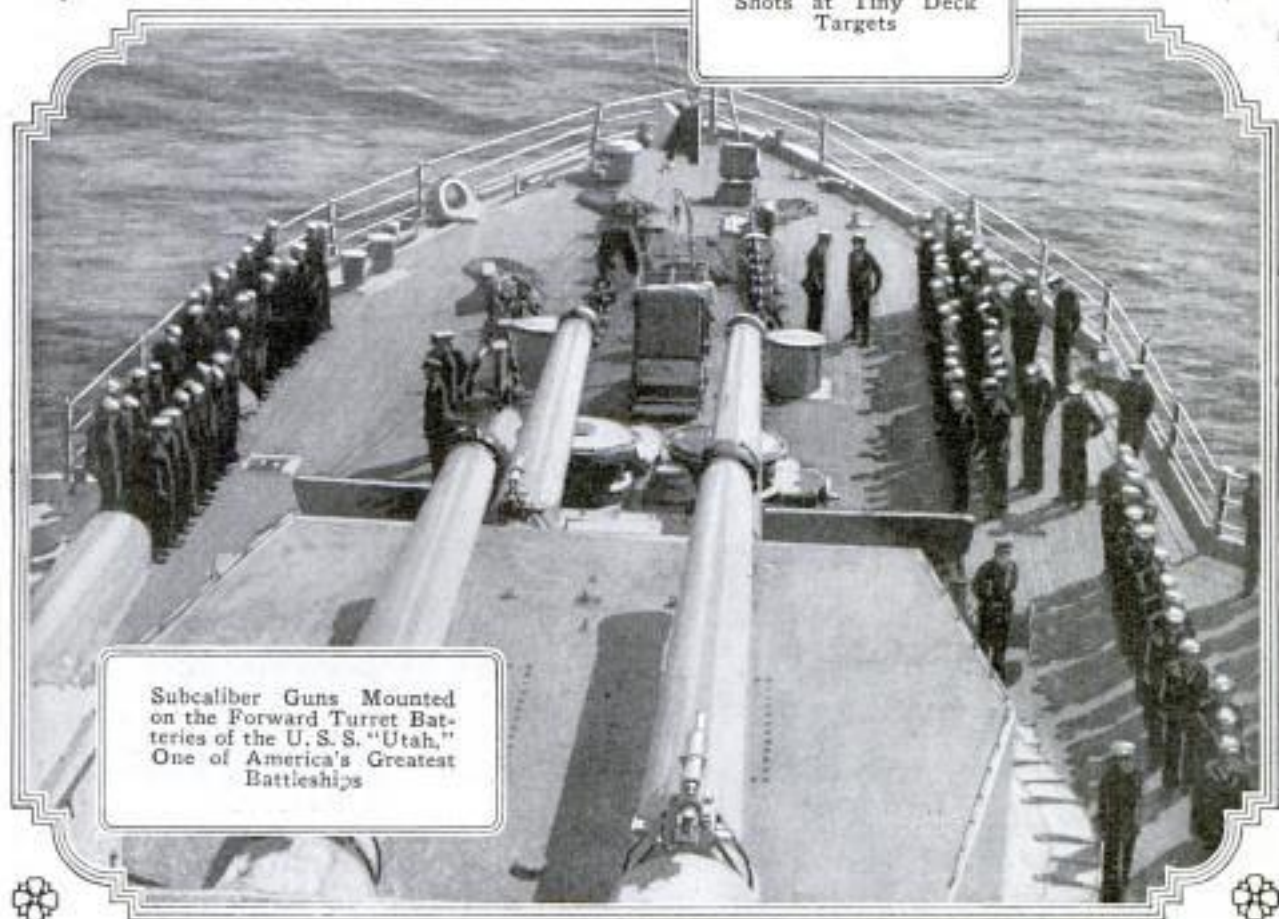
While the crews are drilling, the officers assigned as target spotters have also been practicing daily to perfect their judgment of distances. The first drill is made with a row of tiny targets two or three inches square, mounted on the deck. The spotter lies down on his stomach, 200 feet or more away, and focuses his binoculars on the targets, while a brother officer stands beside them with a stick wrapped in cotton. The cotton is to represent the geyser of water shot into the air by a shell which misses and plumps into the sea. The man holding it places the stick in various positions about the target and the spotter lying on deck calls the correction which he believes would have brought the shell on the target. By the time the spotter has trained his eyes, the gun crew is ready to start subcaliber practice with the small rifle and one-pounder, and the spotting officer graduates from his toy targets to the somewhat larger floating ones used for these small pieces. His advancement keeps step with theirs until he is calling shots on the big targets used for the occasional practice with the turret guns.



Gunner Sitting Astraddle the Big-Gun Barrel Loads the One-Pound Gun Which Is Pointed by Aiming the Five-Inch Rifle on Which It Is Mounted



A Stick Wrapped in Cotton Represents a Shell's Splash When Spotters Are Trained by Calling Imaginary Shots at Tiny Deck Targets



Subcaliber Guns Mounted on the Forward Turret Batteries of the U. S. S. "Utah," One of America's Greatest Battleships

COIN RUNS ELECTRIC BOOT-BLACK TO SHINE SHOES

An electric coin-in-the-slot shoe-shining machine has been designed for installation on street corners, in hotel lobbies and public dressing rooms, in hotel lobbies and public dressing rooms. The mechanical bootblack may be resorted to as a timesaver at any part of the day or night. With the insertion of a nickel, the motor is turned on, dressing is applied to the



Electric Shoe-Shine Vending Machine. That Is Operated by a Coin Inserted in a Slot

shoe, and a neat polish produced by revolving brushes. Only one foot can be placed in the device at a time. Handlebars are provided so users can maintain equilibrium during the operation.

FLYPAPER RAT CATCHERS TRAP PESTS LIKE INSECTS

With the erection of countless big buildings in the large cities and the continued destruction of old structures, expert rat catchers are called upon to combat the spread of rodent pests which do millions of dollars worth of damage each year to costly woodwork, wiring insulation and merchandise. While methods that have been employed to trap and kill the little animals for years still prove effectual in many cases, scientific means have been introduced by chemists and others in efforts to rid overrun areas. Rat boards, some-

what resembling flypaper, which imprison the rodents in a sticky substance, are being used with great effect. In a test on board a steamship infested with them, 182 rats were caught in one night. A dozen were ensnared on one board which occupied no more room than an ordinary trap. The expert trappers generally ply their trades at night, mixing and setting poisons especially devised to lure the animals infesting particular districts. Before such campaigns are undertaken, the hunter studies the area to acquaint himself with the various kinds of food the rodents have been devouring, so the bait can be made as attractive as possible to them. Ferrets are still widely used in killing off or driving rats from buildings. Hundreds of these wiry creatures are kept, and bred and trained by concerns specializing in the work. In New York alone there are about twenty-five firms, employing a large army of workers who make a business of destroying rats by both scientific and old, but time-proven, methods.

2754

BOTTLE OPENER WORN AS RING SAVES TIME AND TROUBLE

Vendors of soft drinks at ball parks, theaters and similar places are spared considerable time and trouble in removing the caps from bottles by a ring-shaped opener worn on the finger.



On the inner side is a notch which fits under the edge of the cap. A slight upward push is sufficient to remove the top. The opener is always in position for use, saves time required in handling or adjusting a tool that must be kept in the pocket and cannot easily get lost. It is also found convenient for home use and for camping and picnics.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described will be promptly furnished by addressing the Bureau.

Vertical text on the left margin: *New York Times 3/15/28*, *Ch. Mrs. J. L. Hamilton (and D. H. York) 3063 E 1st St, Oakland Beach, Calif*

Handwritten text at the bottom: *Esmeralda*, *terminating Co, 20.5.6. Burnside*, *500 2nd Ave. N.Y.C.*, *Portland Ore.*

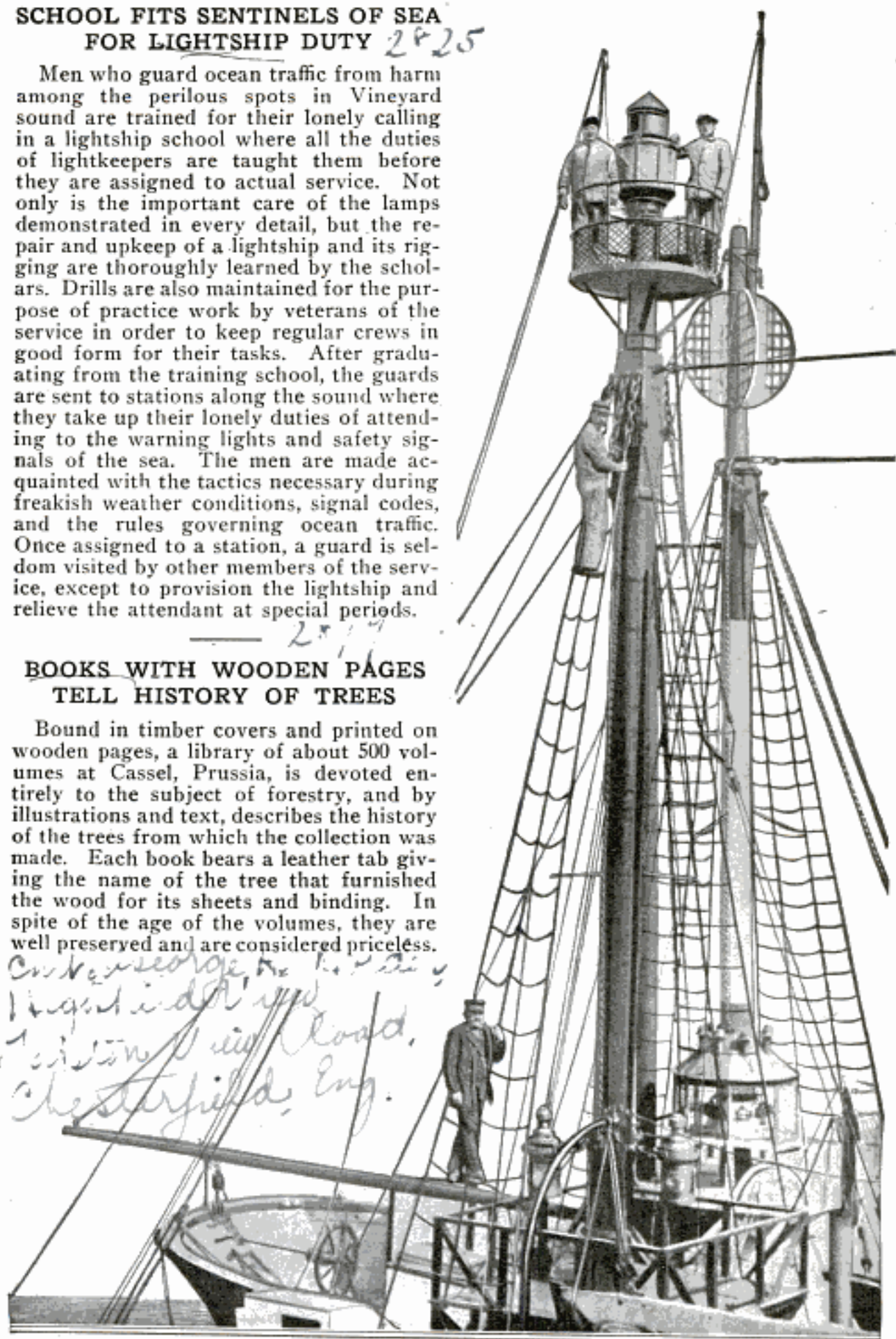
SCHOOL FITS SENTINELS OF SEA FOR LIGHTSHIP DUTY 2825

Men who guard ocean traffic from harm among the perilous spots in Vineyard sound are trained for their lonely calling in a lightship school where all the duties of lightkeepers are taught them before they are assigned to actual service. Not only is the important care of the lamps demonstrated in every detail, but the repair and upkeep of a lightship and its rigging are thoroughly learned by the scholars. Drills are also maintained for the purpose of practice work by veterans of the service in order to keep regular crews in good form for their tasks. After graduating from the training school, the guards are sent to stations along the sound where they take up their lonely duties of attending to the warning lights and safety signals of the sea. The men are made acquainted with the tactics necessary during freakish weather conditions, signal codes, and the rules governing ocean traffic. Once assigned to a station, a guard is seldom visited by other members of the service, except to provision the lightship and relieve the attendant at special periods.

BOOKS WITH WOODEN PAGES TELL HISTORY OF TREES

Bound in timber covers and printed on wooden pages, a library of about 500 volumes at Cassel, Prussia, is devoted entirely to the subject of forestry, and by illustrations and text, describes the history of the trees from which the collection was made. Each book bears a leather tab giving the name of the tree that furnished the wood for its sheets and binding. In spite of the age of the volumes, they are well preserved and are considered priceless.

*Can be seen at the
Lightship School
1111 North Main Road,
Chesterfield, Eng.*



Practice Drill Aboard School Lightship Where Guardians of Ocean Traffic among Perilous Spots of Vineyard Sound Are Trained in Duties of Their Lonely Calling

PORTABLE MOTOR-DRIVEN SAW SAVES HAND LABOR

A portable motor-driven wood saw which may easily be moved about for any

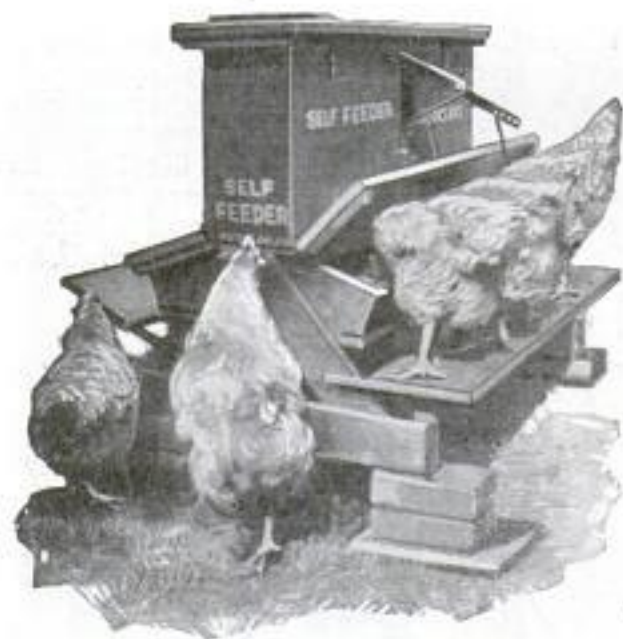
Cutting Small Lumber Sizes with Portable Motorized Saw That Can Be Used to Do the Work of Hand Tools



of 14,520 feet is reached, the ascent being gained by circling between precipitous gorges and tunneling into solid cliffs. At some places, it is necessary to travel eight miles to proceed only one mile. Flat, barren plains on the mountain summits more than two miles above the sea, give relief to the winding journey in straight stretches extending twenty-five and forty miles. More than 300 miles of the road lie on the Argentine side and sixty-five miles are in Chilean territory. Narrow-gauge railway and auto road will cost the former country about \$25,000,000 and will not be complete for three years. An American engineer is directing the work.

AUTOMATIC FEEDER FOR FOWLS PREVENTS LOSS OF GRAIN

Chicken feeders that may be placed in lots with other stock, are opened by the weight of the fowls and closed as soon as the birds leave, thus preventing hogs and cattle in the same lot from consuming the grain. The arrangement consists of a hopper with a trough on each side, protected by lids which are connected by levers with a shelf on which the chickens stand when eating. The weight of one is sufficient to raise the cover which automatically closes when the fowl hops off. The inventor found that the birds learned to use this feeder in one day; it kept sparrows from getting at the grain and mash, and



As Fowls Step on the Platform, Lid to the Feed Trough Opens Automatically

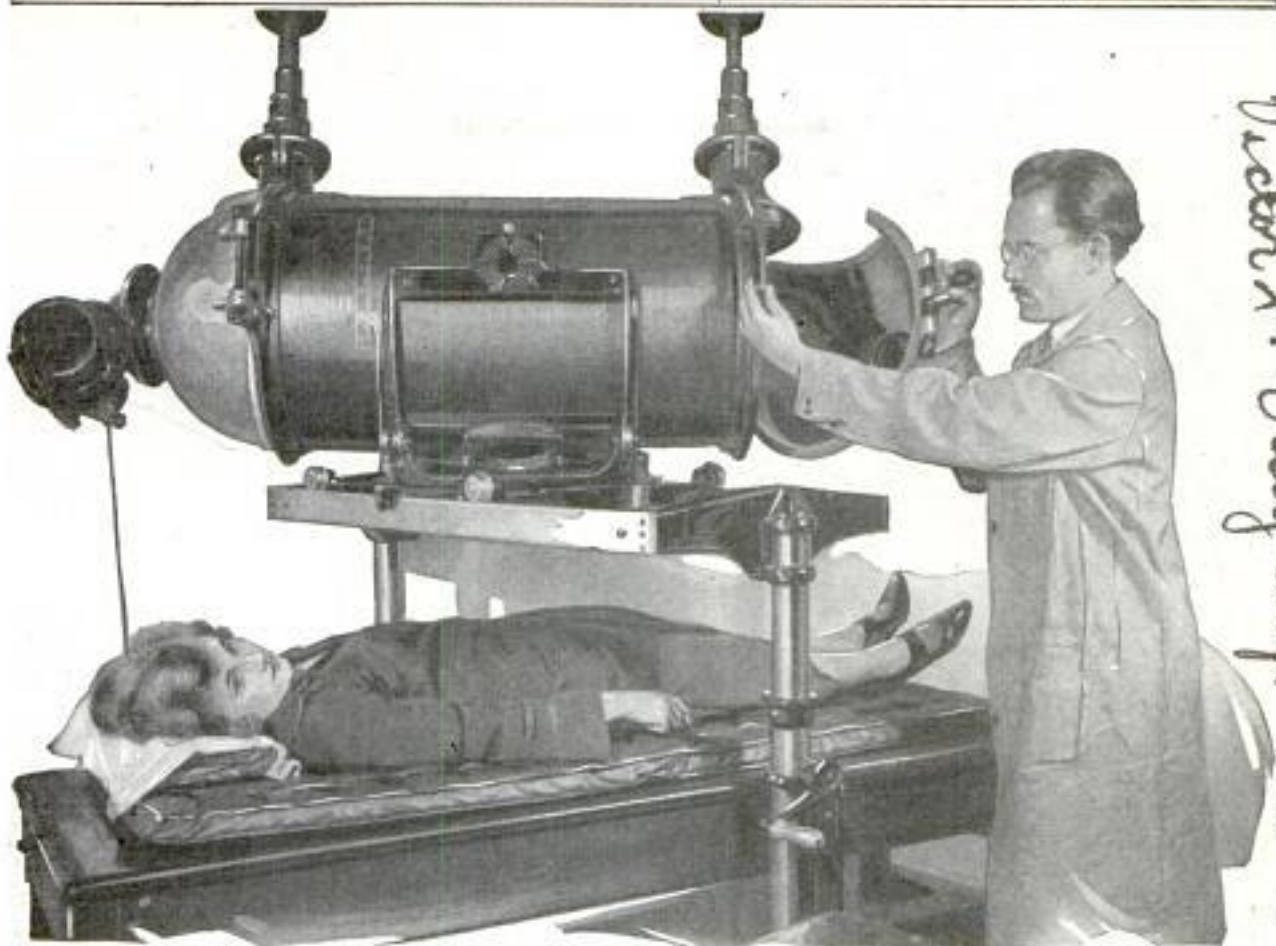
work where the ordinary hand tool is used, can be connected to a light socket for power. The machine is designed for service either on small buildings or houses or for medium heavy lumber where saving of time is important. The saw is of the disk type so arranged that the workman can handle small pieces of material without risk of injury. The device is also arranged to operate by gasoline motor for use in districts where electric current is not available.

AUTO ROAD ACROSS THE ANDES TO LINK ARGENTINA TO SEA

Following the line of the new trans-andean railroad that is literally being bored and chiseled into the steep ranges that divide Argentina from Chile, an automobile highway under construction will be devoted to tourist and to heavy-truck traffic. One hundred miles of it already have been completed. The road was begun about twenty-five years ago, but rumors of war between the two countries halted the work and only a mule trail was finished. When done, road and railway will rank among the greatest engineering feats of the world. At points, an altitude

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of the Embassy.

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Kaus



Modern Therapeutic X-Ray Machine, Inclosed in Lead Cylinder, with Single Aperture through Which Rays Can Fall to Reach the Patient Lying Below

Handling Invisible but Deadly Rays

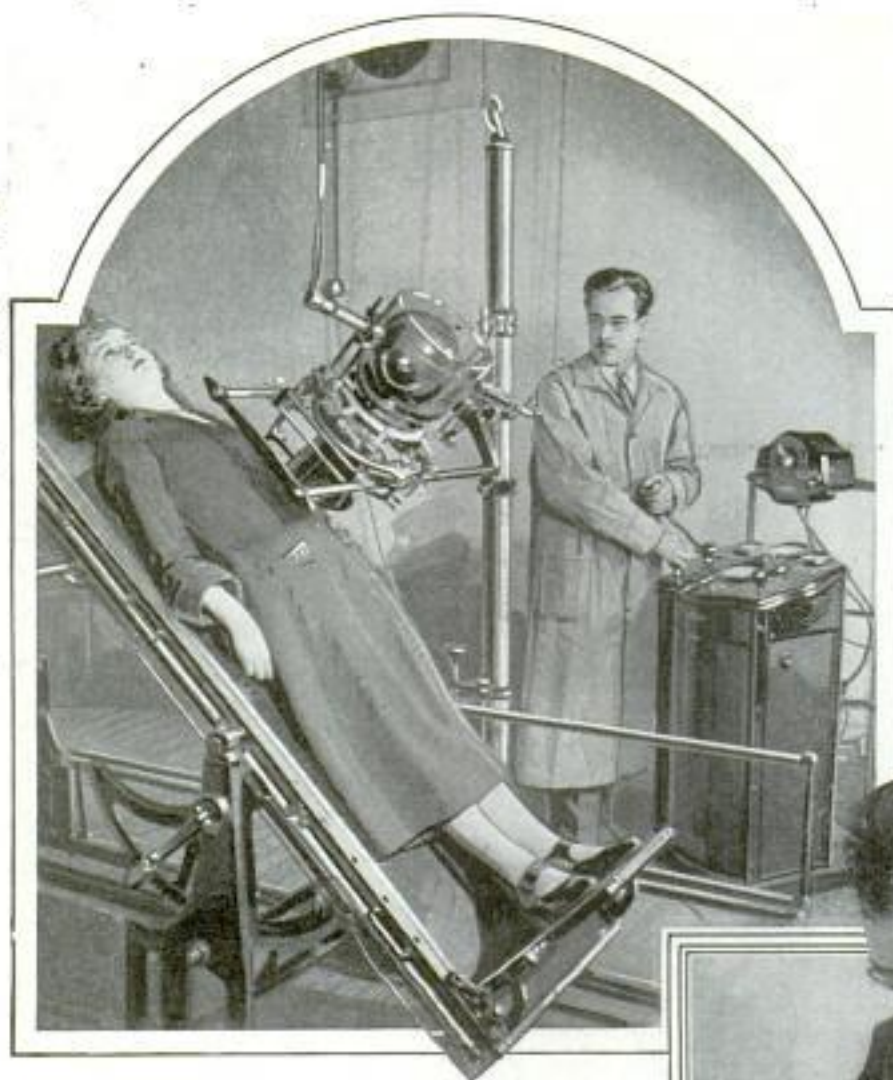
Radium and X-Ray, Which Have Claimed Lives of More than 140 Scientists, Made Safe by Elaborate Precautions

DISPATCHES from France that Prof. Bergonie, of Bordeaux, is slowly dying a terrible death from radium burns, contracted while treating patients, have revealed that the cause for which he and more than 140 other experimenters with radium and the X-ray have laid down their lives has been successful.

No one living today, scientists declare, has suffered burns from either of the dangerous rays during the last ten years, for the reason that the investigations of the scientific martyrs have made both safe to handle. The patient being treated with radium for the cure of cancer or other disease, or being photographed or treated with X-rays, has never been in danger, because of the short period of exposure. But the physicians and scientists and laboratory workers who were exposed day after day for months and years to the rays paid the toll, until bitter experience taught

the preventive measures. One of the greatest advances science has made is the substitution of radium emanation, or radon, for the pure radium salts in the treatment of patients. Only a few years ago radium, the most expensive substance known to man, was beyond the reach of all but a few very wealthy doctors or groups of doctors. A tiny tube containing an infinitesimal amount of the substance—fifty milligrams—was worth \$6,000, and every now and then the newspapers would carry accounts of such a tube being lost during an operation, or swept out by a careless janitor. With the discovery that radium salts, dissolved in water with a slight addition of acid, gave off emanation in the form of a gas, which could be captured in glass tubes, the price dropped so that it is now within the reach of everyone. A tube of the gas, about the diameter of a fine hair inside and five-thirty-seconds

Acme & International X-Ray Corp. 236 S. Wabash St. Chicago, Ill.



Giving an X-Ray Treatment, Above, and Right, Handling Radium While Sheltered behind Lead Shield

of an inch in length, sells for \$3, and is much safer to use. It can be planted right in the infected portion of the patient's body and left there, since it will exert its curative properties for about a month, and then becomes too weak to do any harm.

In handling the radium and preparing radon in laboratories elaborate precautions are taken to protect the chemist. The radium is dissolved in a small flask which could be held in the palm of the hand. A lead-covered glass tube leads from the top of the flask to automatic mercury pumps which draw off the emanation and the flask is then placed in a large safe, surrounded by a thick lead cylinder to protect people in the room from the rays. After the tiny glass tubes of gas are completed they are kept in a small lead safe, with four-inch lead walls, until shipped. The ability of lead to check the activity of radium rays is as definitely measured as the life of the material.

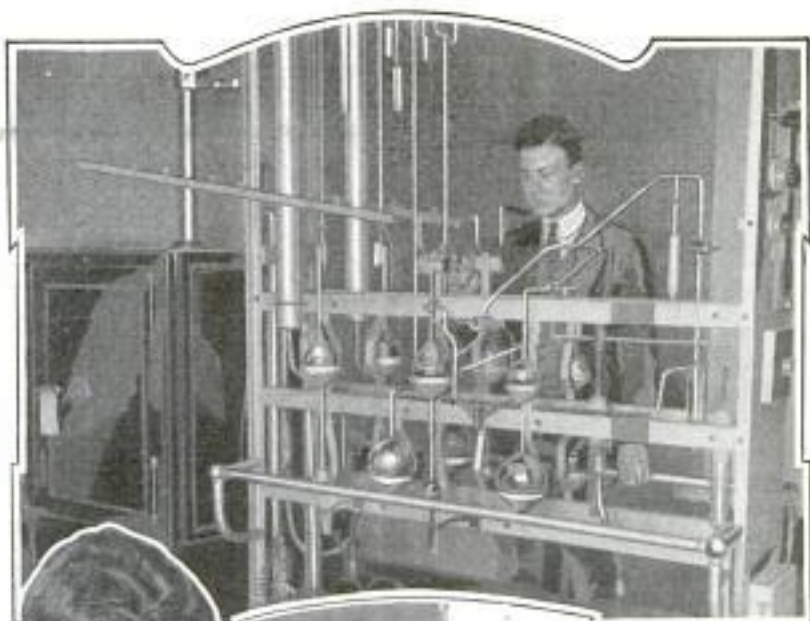
As given off by the radium, the

radon contains hydrogen and oxygen. An electrical heating coil, in one tube connected to the pumps, burns the hydrogen gas, while the oxygen passes into another tube, where it combines with chemicals to form water, leaving the pure radon to pass on into tiny tubes, no thicker than a pin and with an inside diameter the size of a hair. These tubes are drawn out to more than a meter in length. When about five inches at the end has filled with radon, the chemist applies a small gas jet, which burns through the tube, sealing both ends. The five-inch



piece containing radon is then placed on an ingenious machine with brass fingers dividing five inches into thirty-two parts. A gas jet behind the machine can be moved back and forth by turning a wheel. The chemist swings the gas jet to the space between the center fingers, two and

one-half inches from either end of the tube, and burns the glass in two, thus dividing his radon into two equal parts. Each of the parts is then burned in half, and each of the quarters in half, and so on, until the tube is reduced to thirty-two equal parts. These tiny tubes, so small they can only be handled with delicate forceps, are the radium "seeds" which physicians implant in infected tissue to treat it. The radium chemist places them in a box in his lead safe, until ready to fill orders and ship them. They are then tested with delicate instruments to measure their strength, and the required amount ordered by a physician is placed in a small glass phial, a half inch in diameter and an inch and a half long. The mouth is sealed by melting it over a gas jet. The usual



Automatic Pumps for Extracting Radium Emanation; a Gram of Radium Is in Lead-Lined Safe at Left



Machine for Cutting Tiny Radium-Filled Tubes Used in Internal Treatments

mailing package, unless instruments are required, is a simple block of wood, four inches square and five inches high, with a half-inch hole bored down the center. A bit of cotton is dropped into the hole, the phial follows, more cotton and a plug. The block is then wrapped and a mailing tag added.

The progress in handling X-Rays

and protecting the operator has been no less remarkable than the developments in radium research and use. Until the invention of the Coolidge tube in 1913 the X-ray operator could never be sure what his Crookes tube was doing, and many an operator, as a simple test, would place his hand before the tube and look at it through a fluoroscope. If he could see the bones he knew the tube was working. The result of such constant exposure, however, was burns, and eventually cancer or some other serious infection. With the invention of the Coolidge tube all doubt about the working of the machine vanished, and with modern equipment the operator can work in an adjoining lead-lined room without danger.



Taking an X-Ray Picture; the Apparatus in Front of Subject Is Fluoroscope



Adjusting the Model Glider Plane to Its Rigging, from Which It Was Released as a Target for Anti-Aircraft Guns to Test the Efficiency of the Marksmen and Ordnance

2834
GLIDER LAUNCHED FROM PLANE AS TARGET TO TEST GUNS

A target that tested the efficiency of anti-aircraft guns and marksmen without endangering the lives of pilots was provided at a mock air battle at Fort Monroe in a small glider released from an airplane. It was carried on a specially constructed framework upon the top wing. At a signal, a lever was pulled, the target, closely resembling an "enemy ship" floated free and as soon as the plane was out of range, shells from the guns began bursting around the glider, but it was not hit. The demonstration also involved the "bombing" of the fort, dodging searchlights and dropping explosives on a land target painted to resemble the deck of a battleship.

2839
FISH THAT CARRY OWN TORCHES ADD MYSTERY TO DEEP SEA

Among the marvels of life in the ocean deeps are various kinds of fishes that carry their own lighting plants to illumine the dark waters and help them seek for prey. They can turn the lamps on or off at will from mysterious internal "dynamamos." One specimen found three miles deep in the Pacific ocean had a sort of hinged lantern light that could be swung over its back or in front of its mouth and, at the

end, was a luminous lure or searchlight. Other varieties have rows of lights on either side and look not unlike small steamers with illuminated portholes, passing in the night. Further study of these submarine "electricians" is one of the objects of the expedition now at work in the Sargasso sea.

2710
CLIP FOR SAFETY-RAZOR BLADES MAKES HANDY TOOL

An inexpensive holder for discarded safety-razor blades converts them into a convenient tool for cutting cord and



paper or as a ripping knife for seamstresses. The holder is light and easy to handle and is designed to expose only one corner of the blade. When the edge is dulled, a new one is exposed by reversing the blade until all sides have been used. To prevent accidents, the blade can be pushed back into a guard or withdrawn altogether when the knife is not required.

Price 10 cents

**TRY TO MAKE SMOKELESS COAL
TO PURIFY CITY AIR**

A method for producing "smokeless coal" from the ordinary bituminous product is being sought at the University of Illinois. The fuel is to be used in domestic furnaces and stoves, as it is the theory of the scientists that these, and not factory fires, are the principal cause of air pollution in large cities. Already, sufficiently large quantities of the coal have been produced for home tests, it is said. The material is carbonized in vertical retorts made of a special alloy. In addition to the usual coke by-product, a rich gas with higher heat value than the common fuel, a new kind of tar, and oils that may be used for running automobiles, have been produced in the experiments, according to reports. So far, no other than Illinois coal has been subjected to tests.

Chicago News Item 3, 1925

2813

**STREET-TRAFFIC SIGNAL HAND
TELLS TIME LEFT TO CROSS**

Traffic-signal posts at a busy intersection in Los Angeles not only tell which way vehicles and pedestrians are to go, but also indicate how much time is left for crossing the street. This is accomplished by a slowly moving disk which rotates clockwise, covering part of one sign as it uncovers the other. When it is time to halt, a bell rings.



Rotating Disk on This Traffic Post Covers Signs Slowly, Indicating to Motorist If He Has Time to Cross

**HOLDER FOR PHONE RECEIVER
LEAVES HANDS FREE**

With a convenient holder for the telephone receiver, now on the market, a typist can use both hands in taking dictation directly from the instrument and is spared the inconvenience of adjusting a bothersome head apparatus that musses the hair and



Phone Receiver in Use, Allowing Stenographer Both Hands for Her Machine

causes delays. The device consists of a bracket on an upright length of flexible cable that may be swung to various positions. The rest is built into the same base on which the telephone stands and there is a weight for holding the receiver hook down when the operator has finished, thus making it unnecessary to remove the ear piece from its position.

2823

**CIGARETS SMOKED IN MINE
HELP DISCOVER ORE**

Over the entrance to the principal mine of a lead company in Arizona, hangs a portrait of "Antonio, the Cave Finder," an employe who roams about the underground passages puffing cigars. He keeps close watch of the smoke as it drifts away, and if he sees it disappearing through tiny breaks in the rock formation, the workings are extended in that direction which often leads to inner caves, rich in ore. Minerals in this region seem to have been deposited in cavities which lie in an approximately horizontal plane. The mine is said to have been enlarged by more than half a mile in this manner. Tunnels are driven under the caves and the ore is dropped directly into the cars that carry it out of the mine.

25.80

Time and Money-Saving Tools



For the Sick-Room or Any Window in the House, This Adjustable Ventilator Allows Fresh Air to Enter without a Draft, Keeps Rain from Floors and Prevents Children from Falling Out



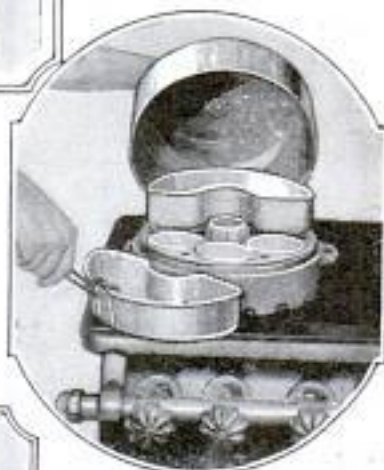
Traveling Kit, for Comfort of Mother and Child, Has Outside Rubber Pocket for Holding Soiled Clothing and Carries Two Aluminum Nursing Bottles with Other Articles Inside; It is Washable



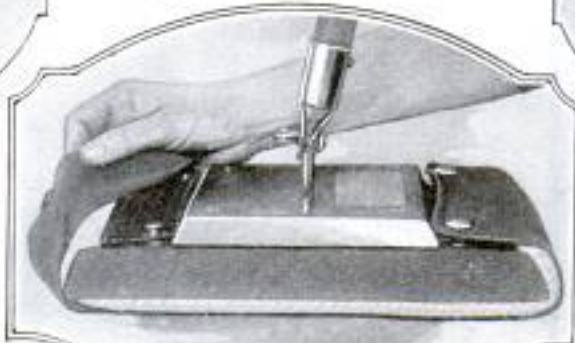
Here Is a Table Accessory That Saves Time and Bother in Passing Dishes, and Protects the Linen as Well; It Is a Revolving Center Board That Turns on Ball Bearings at a Gentle Touch and Will Hold a Full Dinner Service



Peeling an Orange or Similar Fruit without Breaking It and Losing Juice Can Be Done with This Cutter, Shown in Position for Grooving the Skin and for Prying It Off



Above Is a Fuel-Saving Cooker in Which Heat Passes through Indented Bottom and Is Prevented from Escaping by Asbestos-Lined Top; Left, Combination Floor Waxer and Polisher

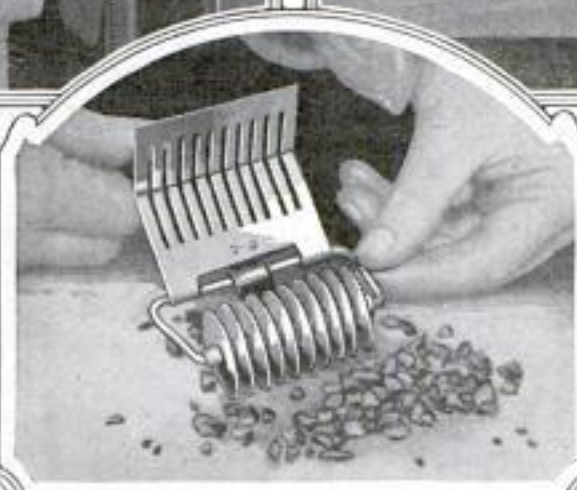


2580

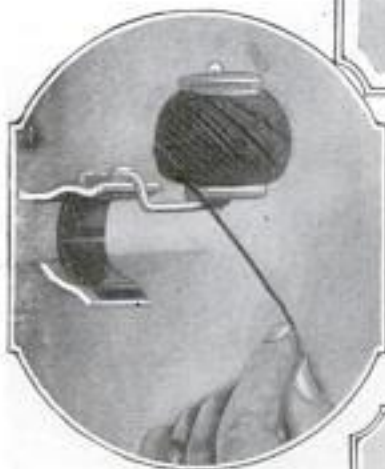
for Woman's Workshop in Home



For Women Who Travel, the Laundry Problem Is Simplified with Trunk That Has an Ironing-Board Attachment, Easily Set Up, Always Ready for Use and That Takes Up Little Room



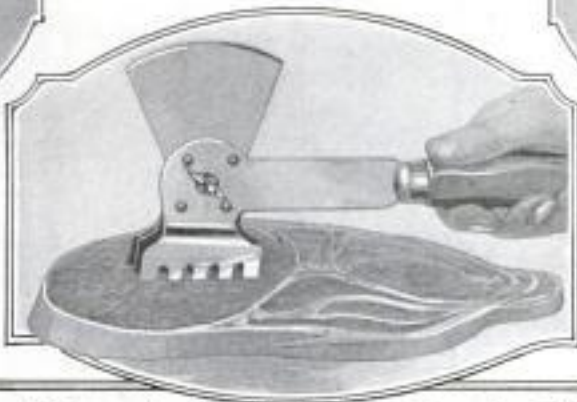
Delicate Fabrics Can Be Safely and Easily Washed at Home in This Little Hand Machine Which Also Is Useful at Camp; It Can Be Packed in Small Space and Has Few Parts



Foods Are Chopped Quickly with This Cutter with Revolving Circular Knives and a Metal Guard That Fits over Them to Keep the Blades from Getting Choked; Below Is a Combination Cleaver, Pan Scraper and Meat Tenderer; the Head Turns on Handle



Easily Clamped to Any Article of Furniture, a Holder Keeps Balls of Thread or Yarn from Getting Lost or Snarled and Can Also Be Used for String



Painful Accidents in Pouring Boiling Water Are Avoided with Kettle the Lid of Which Is Weighted to Keep It On; It Was Invented by a Woman

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

EYE TEST GIVEN AUTO DRIVERS TO QUALIFY FOR LICENSE

Owing to the belief that defective vision is the cause of many automobile accidents,



2574 Vision-Tester Employed to Determine Fitness of Auto Drivers to Operate Cars

the state authorities of Massachusetts require applicants for drivers' licenses to pass a thorough eye test. The examination is conducted by a board of experts who employ special apparatus to determine the sharpness of vision under conditions similar to those met with in traffic. Tests for color-blindness, range of sight and other important features of the eyes are applied. Out of 443 persons examined, 382 were recorded as having normal vision, while the remainder failed to pass the tests.

ORIENTAL RUGS TELL LEGENDS

Aside from their practical value as floor coverings, Oriental rugs play an important part in many social, political and religious ceremonies in the east, while the legends and symbols woven into their intricate patterns add to the fascination of collecting and studying them. Some are manufactured for special occasions, as the holy carpet carried each year from Cairo to Mecca to cover the caaba, the receptacle in which the sacred black stone of the

Mohammedans is kept. It is retained only one year, a new one being made to replace it and the old one cut up and sold to pilgrims. From the design, the village where the rug was woven sometimes can be told, and symbols of good luck, health, happiness, faith, strength, dominion, divine wisdom and glory frequently are worked into the patterns. White and green express joy; white alone, mourning; yellow, honor and distinction; red and purple, dignity, while black spells darkness and trouble.

WINDOW DISPLAY CHANGED BY TRAVELING SHELVES

2670 Moving show windows and shelves which continually change the displays have been invented. Shelves attached to a motor-driven chain go up from floor to the ceiling before the customer's eyes, move to the back and come behind the display. If the device is used in a show window, the descending shelves at the back can be made invisible from the interior, or concealed by curtains. The device is intended for use both as a show-window attraction and as storage shelves in the store. In the latter case, there is no climbing to reach goods on shelves, since the desired rack can be brought around and stopped at any point.



Mechanism of Moving Show Window: Top, Setting Speed of Motion, and Left, Display Shelves Ready for Operation

Mayers Movable Merchandiser Co. Copyrighted material

Massachusetts 30325
L. J. ...
L. J. ...



Ready to Whisk Passengers High over Plain and Forest to a Mountain Lake, the Airplane, with Propeller Turning, Waits at the End of the Bus Line

2907
**AIRPLANES LINKED TO BUS LINE
GIVE DUSTLESS JOURNEY**

At the end of a motor-bus route in California, the call, "Change cars," means a scramble from the big road car to a waiting airplane with pilot ready to speed the tourists over forest and desert to a lake far up in the mountains. The state railway commission has granted a permit for this joint air and motor line, and the air route has been made doubly secure by selection of emergency landing fields within the "dead" motor range of the plane. That is, there is a spot to land all along the way within gliding distance should the engines stop at any time. The scenic features of the trip by air are said to be heightened by the panorama of orange groves, vineyards and forest stretches, and the line is expected to appeal to travelers who wish to enjoy variety.

2656

**GERM-KILLING POWER OF SUN
PROVED BY TESTS**

Rays of sunlight have been imitated and tested for their effects on various germs by the bureau of standards. The beams, produced in small quantities and projected onto colonies of microbes, killed some of the germs in less than a second after the light struck them. The different wave lengths of the rays were measured and the numbers of germs killed by them in a given time figured up for comparisons in determining the most effective beams. The germ-killing power of sunlight has been known for a long time and is often employed by housewives in "airing out" things on bright days. The invisible rays are believed to transmit the energies that destroy some types of germ life.

**DESK HAS FIFTEEN THOUSAND
PIECES OF INLAY 2657**

More than fifteen thousand pieces of ivory, wood and pearl have been used in an inlaid desk set brought from Damascus. It is ornamented by paneled designs created with carefully carved bits of the various materials. There are more than



Set of Office Furniture Inlaid with More than 15,000 Pieces of Ivory, Wood and Pearl

a hundred different kinds of wood in the set and it required two and a half years for the artist to accomplish the inlay work alone. The chair, desk and wastebasket which comprise the suite are well matched and of ordinary size. The patterns covering the surfaces show great skill in piecing and fitting the richly colored blocks accurately together.

Eight states in this country are said to have more telephone instruments each than the whole of France.

Chicago Evening Post
2225

Dr. Wm. Williams Audler *Heimann*
 4919 N. Kelburn Ave *Trimmer Co.*
 994 Chicago POPULAR MECHANICS *Urbana, Ill.*
 2442

**TRUSS ROD FOR ICE-BOX DOORS
 KEEPS THEM FROM WARPING**

Ice-box doors that have a tendency to warp because of the damp air, thus pre-



Truss Rod in Place; Man Is Pointing to Sleeve for Tightening or Loosening It

venting tight closing and a loss in efficiency of the cooler, can be kept in alignment or straightened with the aid of an adjustable metal truss rod attached to the inside. It can be tightened or loosened with a sleeve section that turns on threads and is strongly fastened with an upper and lower bracket, while the center part curves outward to form a handle that helps in using the door.

2448

**ELECTRIC LAMP GIVES NO HEAT
 AND USES LITTLE CURRENT**

An electric lamp, invented by a French scientist, is said to burn without heat and glow for some time after the current has been turned off. Its secret lies in a fluorescent substance on the outside of a vacuum tube. The dim violet light in the interior of the tube causes this material to gleam brilliantly, and the illumination can be produced in almost any color desired and may be diffused to avoid eye strain. The lamp requires only a small amount of current, it is claimed.

**ARMY FINGERPRINTS FIND ONE
 MAN IN SEVEN MILLION**

The identity of any man who has served in the regular army since 1906 can be learned, and the entire record of the soldier laid bare in from ten to twenty minutes, through the fingerprint system the service has employed for almost twenty years to register its members. More than 7,000,000 men have been in the army since the method was installed, but data for any one of them can be located quickly by comparing his finger marks with those in the files. The operation of the system is so simple that, it is said, inexperienced clerks can accomplish successful searches in a few minutes, after a short instruction. Although there are on record more than 50,000 Smiths, 40,000 Browns and 28,000 Johnsons, it is claimed any one of them could be easily identified by means of the fingerprint system, which also has been used to expose frauds, to keep undesirables from enlisting, and to protect the government against false claims.

Chicago Daily News 5/11/23

**GRASS TRIMMER LIKE MOWER
 ELIMINATES STOOPING**

For trimming grass along walks, edges, borders, around trees and other places not satisfactorily reached with the lawn mower, a machine that is pushed by hand has been invented, doing away with the necessity of stooping as in using shears or a sickle. It is claimed that high as well as low grass can be trimmed as fast as the



Trimmer in Operation Showing Clean Edge It Leaves; Close View in Inset

person operating the device can walk. Strongly built of hardened material, it saves time and labor.

Heimann Trimmer Co.
Urbana, Ill. \$9.50.

Dr. Prof. Ruzier Paris, France.
Paris & Carbone.



Hand-Wrought Door of Iron; the Artist at His Forge, and Memorial Gates for Yale University

Art Wrought in Iron Revives Forgotten Handicraft

By FULLERTON WALDO
Public Ledger, Phila.

"I AM a blacksmith." That is Samuel Yellin's definition of himself. But noted critics of art declare that he has revived a lost art in his poetic yet practical treatment of wrought iron. He wrought notable things for the Cathedral of St. John the Divine in New York, for the J. Pierpont Morgan estate on Long Island, for the memorial chapel at Valley Forge. Visitors to the Harkness quadrangle at Yale will not forget the gate with its figures emblematic of the fidelity of Yale men serving their country in the army, the navy, the air service and the marine corps during the war.

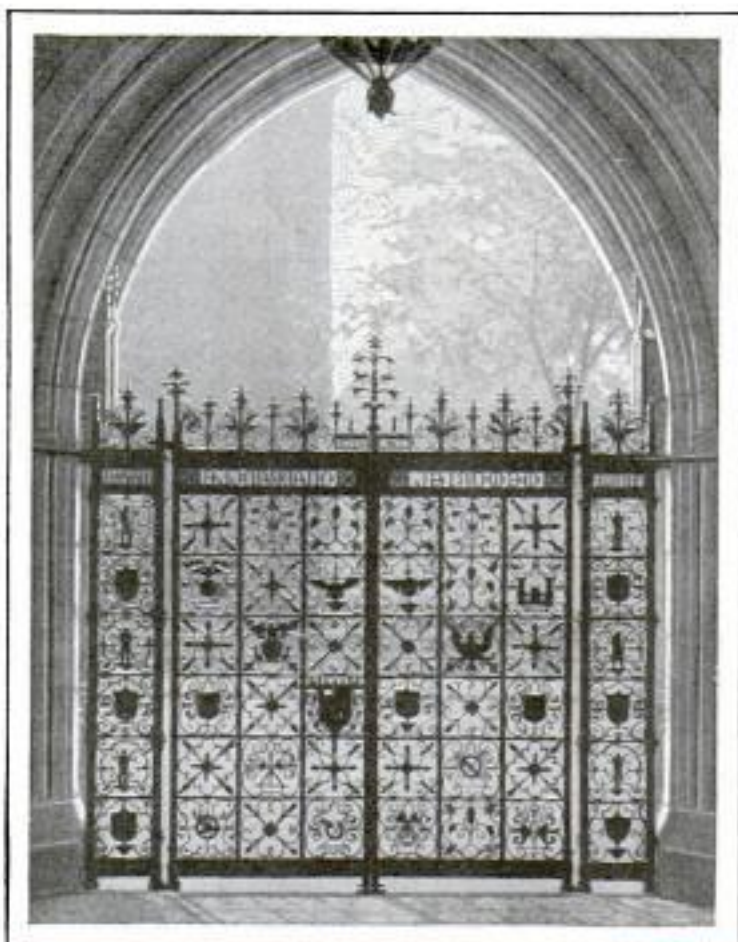
Those who have felt the beauty and the poetic quality of these achievements are naturally curious to know something of the personality behind them. Samuel Yellin is a Pole, born in Galicia thirty-

eight years ago. From the first he was steeped in an atmosphere of creative handicraft. At seventeen he was graduated a master in ironwork after an apprenticeship of five years.

"My emblem is a hammer," says Yellin. "When I go to Heaven I shall take hammer and forge with me, and if St. Peter won't let me in, I shall make a key of my own."

"My little boy—aged six—inherits my own passion for iron. He runs about the shop full tilt wanting to strike at all he sees, and I have to keep on the qui vive to see that he doesn't spoil things."

metal li... Arch Sh... Copyrighted material
65 20



Iron Gates Erected to Honor War Service of Men of Yale University in Which Variety of Design Lends Beauty to the Pattern

"It is my ruling passion in life to found a school of workers in iron. I find in the handicrafts today so much that is false, so little that is real. There is so imperfect an understanding of the limitations of material, and so faulty a recognition of the fact that one substance is the suitable medium for expressing certain ideas while another medium should be chosen when the objective is different.

"This is true even with some architects who should know better.

"Some of my clients come in here with positive ideas, and 'lay down the law' as to their wishes. If I think they are wrong, I refuse to give them what they want; but when they see the finished product they are pleased—they are glad I didn't let them have their way!

"I work in iron in the belief that I can say in it anything I wish. No material is more plastic, more ductile, more expressive. Some of my raw material I get from Sweden; most of it comes from western Pennsylvania. It is passed through no special refining process. I take it as I find it.

"I try subtly to vary a repeated design; the difference between the rigid forms of cast iron and my work partly appears in these irregularities, and the deliberate unevenness. Here a point is upward, and there it thrusts downward. Here a curve is outward, the next is inward. The workman in making a succession of vertical panels or a number of bosses, or finials, is not doing the same stereotyped thing over and over. Only the unperceptive will ask me why I avoid making every

leaf in a foliated design just like every other leaf. Infinite variety gives life to the pattern, be it large or small.

"Nor is the mottled effect where the hammer has fallen an afterthought for the sake of appearance. The marks of the implement are not added subsequently; they are incidental to the working of the iron. I will not have in what I make anything that is for show; it must be real, as the material itself, coming from the very frame of the earth, is altogether real."

2758
TRAFFIC STOP SIGN OF RUBBER SAVES REPAINTING COSTS

To do away with constant repainting and replacement of traffic markers, a rubber stop sign which can be fixed on end in the street paving, bends under wheels of vehicles when they come in contact with it. While avoiding breakage, the flexible nature of the signal permits it to be placed where drivers cannot fail to see it. Resembling a metal sign sticking up in the middle of the road, its presence also causes many motorists to slow down to prevent running over the object, though it cannot be injured or damage tires. Almost any

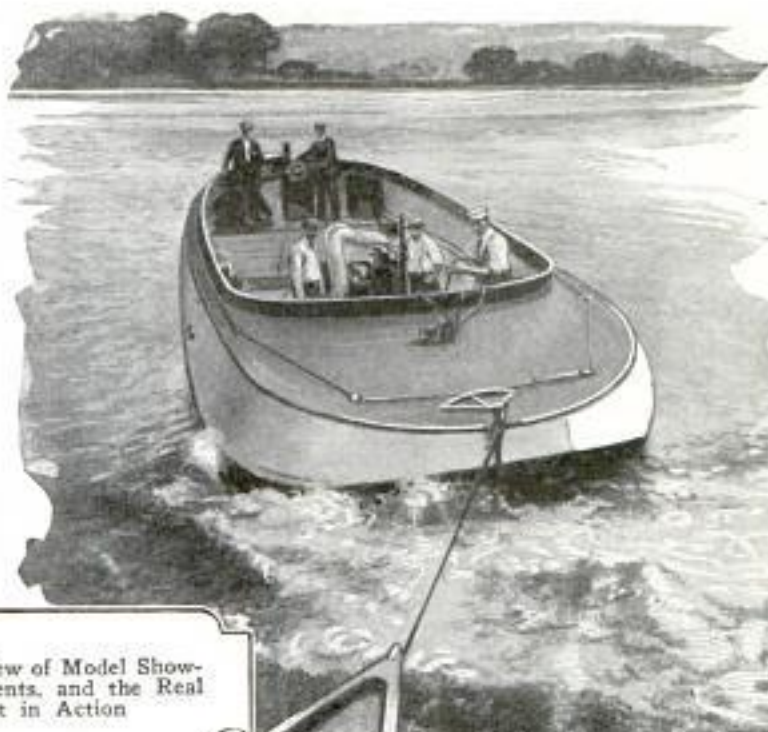
inscription may be placed on the sign which is said to withstand long wear.



Rubber Traffic Sign Installed in Street Paving

d.w. Fred J. Schrank,
 Akron, Ohio.

BOAT RIDES ON BUBBLES AND IS DRIVEN BY AIR



Bottom View of Model Showing Air Vents, and the Real Boat in Action

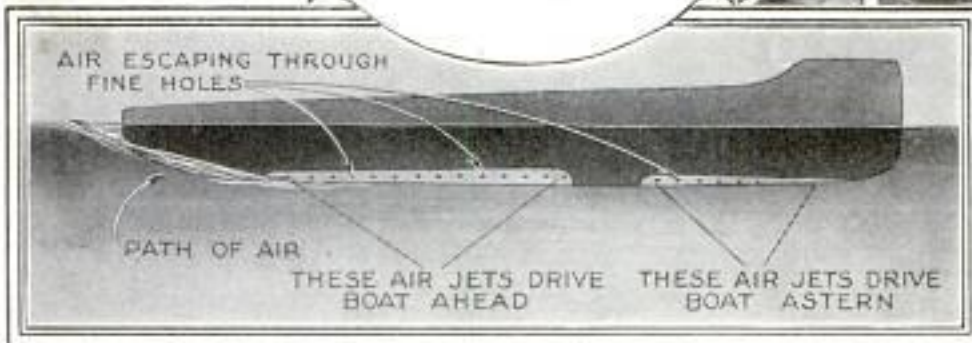


Diagram of Boat's Construction and Path of Air That Pushes It Forward or Back

Driving a thirty-three foot boat with a nine and one-half foot beam at a speed of nine miles an hour, yet using only three horsepower to do it, is claimed for a new compressed-air propelling system developed by an Australian engineer in England. The unusual boat, when under way, rides on a cushion of air, eliminating much of the friction between boat and water, which must be overcome with ordinary vessels. It is likewise claimed that the air cushion has a tendency to prevent accumulation of barnacles on the hull in salt water. The bottom is almost flat, and the entire after section is pierced by rows of tiny holes, through which the jets of air escape. Each row of jets is separated from its mates by fins, extending backward, to guide the air as it pushes aft and keep its force exerting a forward push. The forward half of the hull bottom has a few jets and fins, arranged in the same manner, to be used in reversing the craft.

cases to drive the vessel. The latest craft has the advantage, it is claimed, of developing greater speed in proportion to weight, and horsepower, because the cushion formed by the air escaping from the openings in the hull lessens resistance by about two-thirds. A larger boat employing the same system is planned.

ELASTIC LACES FOR SHOES

Shoe strings made of a rubber composition and recently introduced by an English manufacturer are said to stretch so easily that shoes can be taken off or put on without unlacing them. The strings are fastened at the top on the inside, thus eliminating the need for tying or knotting, and they cannot work loose. In games or on hikes, the elastic laces are said to relieve the pressure of the shoe on the foot. They are made in different colors. *Boscaglio*

Footwear improvements Ltd.
 86, Hatton Garden,
 London E. C. 1. Eng.

Patents - Messrs. Gordon & Barclay, Glasgow, W. J. C. & Co. England. Part of business

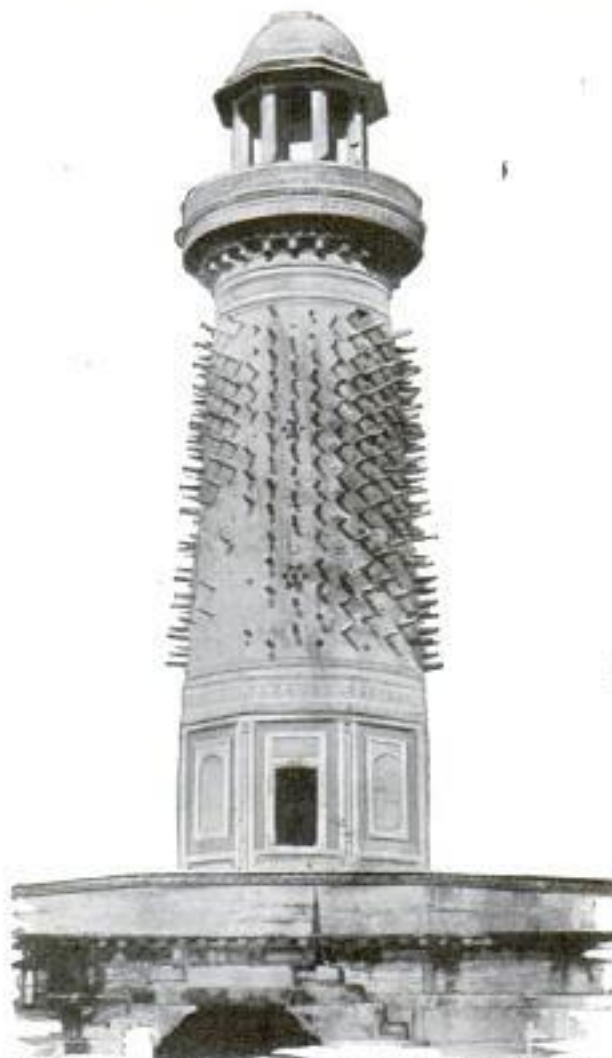
Compressed air has been used at various times for many years as a means of propelling a boat, the backward pressure of the escaping air being utilized in all

2844

998
2595

**TOWER ERECTED TO ELEPHANT
STUDED WITH IVORY TUSKS**

One of the landmarks in Bombay, India, is a ninety-foot stone tower studded



Tribute of an Indian Ruler to His Favorite Elephant, a Tusk-Studded Tower in Bombay

with ivory tusks and surmounted by a graceful dome above a railing of delicate latticework. It is the monumental tomb of the favorite elephant of a famous Indian ruler, and evidences the high esteem these faithful animals sometimes win in the hearts of men. In addition to their value as beasts of toil and burden, they are of great service on tiger hunts, and it is not unusual to have sixty or more elephants in one expedition. They have become even more popular with the advent of the motion picture, for the camera man has opportunities for "shots" at tigers in the long grass in which they hide, while riding safely on the back of his elephant. When the big beasts are wounded in encounters with the prey, their keepers carefully disinfect and treat the injuries, for the elephant appears to have little resistance against illness.

**WAR CAMPS EFFACED BY HOMES
AND INDUSTRIAL CENTERS**

Army cantonments used during the great war to train the country's millions of soldiers are being rapidly converted to attractive residential communities and industrial centers. The general layout of most of the military posts makes the areas readily adaptable for use as parks, building and manufacturing sites. Many have preliminary improvements already installed, requiring little preparation to meet the needs of home builders and factories. Camp Bowie, near Ft. Worth, Tex., now accommodates a community of several thousand bungalows, forming a popular residential addition to the city. Camp Logan, near Houston, and Camp McArthur, at Waco, also have been converted into fashionable residence districts. Flying fields and aviation camps, because of the buildings required by the air services, serve as admirable sites for industrial concerns, the hangars and shops affording valuable structures for housing commercial establishments. A large textile plant almost entirely occupies the grounds where Love field stood, near Dallas, and Barron field, in the neighborhood of Ft. Worth, is a busy colony of many different industrial concerns.

2228

**AUTOMATIC CHASSIS GREASE CUP
HOLDS SIXTY DAYS' SUPPLY**

Squeaks and rattles in the automobile chassis are said to be eliminated quickly and effectively with an automatic grease cup to supplement the regular lubricating system and which holds a sixty days' supply of semiliquid grease or heavy oil. It is filled with a regular pressure gun and is so constructed that the road shocks and vibrations drive a piston in the cup against the lubricant and force it into the supply chamber as it is needed. The position of the stem at the top indicates how much oil is carried in reserve and the cup fits any standard system. It is designed to reduce repair bills and replacement expense on king pins and spring shackle bolts.



National Automatic
Grease Cup Co., 1608 S.
Michigan Ave. Chicago

RADIO

The word 'RADIO' is written in large, bold, serif capital letters. On either side of the letters are silhouettes of people. On the left, a man stands and talks on a telephone, while another man sits in a chair listening to a radio on a table. On the right, a man sits at a table with a radio, and a woman and child stand nearby.

How to Build a Good Wave Trap

By E. R. HAAN

WHEN one lives in the immediate vicinity of a broadcasting station it is often impossible, with the average receiving set and even with many high-grade sets, to tune in any other station as

undesired signals effectively and thus eliminate all interference, or they reduce the volume of the desired signals to such an extent that these are hardly audible. Both objections have been overcome in the trap shown and described herewith. It was made and thoroughly tested in Popular Mechanics radio laboratory. Its efficiency was quite surprising; a powerful station, only a few blocks away, was suppressed so that not a sound was heard from it all evening, while other stations, operating on a wave length close to



A Wave Trap of Merit, Which Adds to the Enjoyment of a Small Tube Receiving Set as It Eliminates Undesired Signals of Near-By Stations

long as the neighboring station is on the air. In cities where several broadcasting stations are operating simultaneously, only a few receiving sets are able to eliminate local interference and pick up outside stations. However, by using a good wave trap any undesired station can be suppressed.

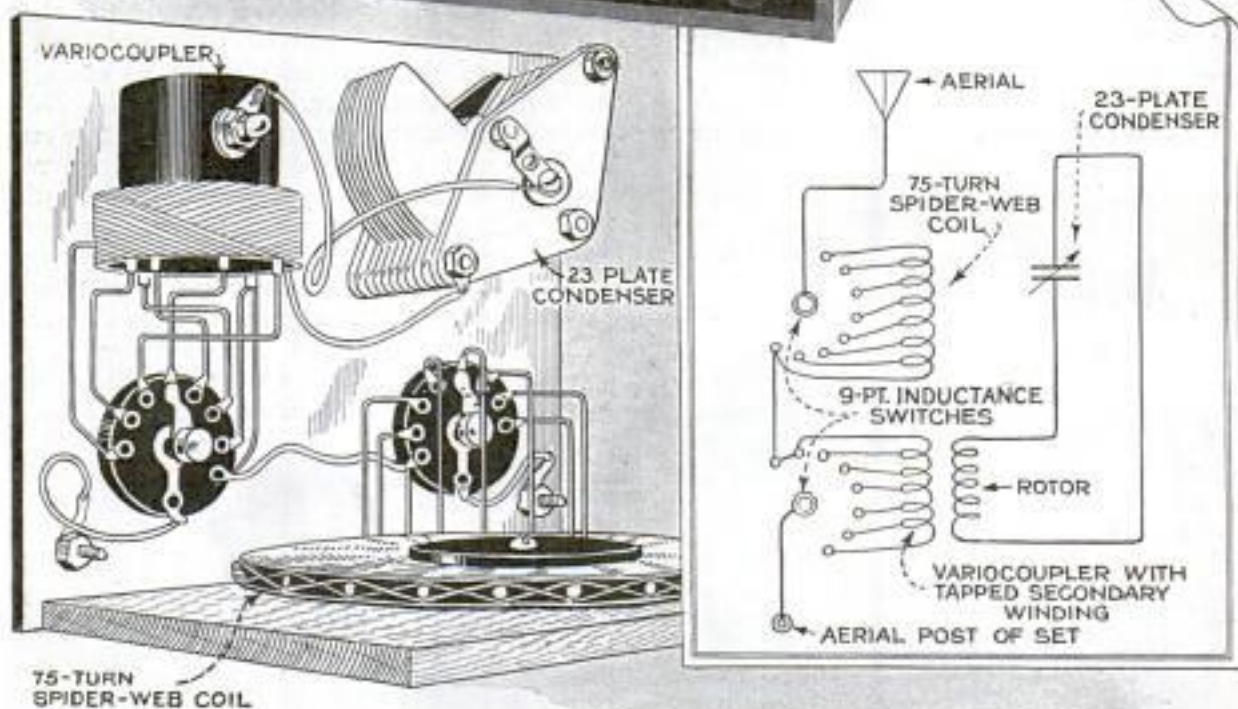
There are two common faults with many wave traps: They do not trap the



this one, were brought in with considerable volume. Of course, it is impossible to trap two stations operating on different wave lengths at the same



knobs are furnished with the inductance switches. When selecting a condenser, get a small one that can be readily mounted in the upper corner of the cabinet. Before



Completed Instrument and Diagrams Which Clearly Show the Method of Wiring and the Arrangement of the Instruments on the Panel

time. If the trap is adjusted to tune out a station operating on 370 meters, for instance, all other stations operating on this wave length will also be unheard, while there may still be interference from other stations. The trap is not recommended for use with crystal sets.

The instruments needed to construct this wave trap are a 23-plate variable condenser, a 75-turn tapped spider-web coil, a variocoupler with a tapped stator winding, two nine-point inductance switches and two binding posts. A neat, little cabinet having a 6 by 7-in. panel can be picked up at almost any radio shop, as well as two large dials, similar in size and design, for the condenser and variocoupler. As these dials are made to fit on the $\frac{1}{8}$ -in. shafts of condensers, a bushing is used on the shaft of the variocoupler to make the dial fit snugly. The smaller dials and

marking off and drilling the panel, carefully lay out the instruments on the back side so that they will not be crowded nor come too close to the sides and top of the cabinet after the panel is screwed in place. The spider-web coil is screwed to the baseboard and its taps are soldered to the lugs on the first inductance switch, in consecutive order, as shown in the schematic diagram; the taps on the stator, or outer winding, of the variocoupler are similarly soldered to the lugs of the second inductance switch. The levers of both switches are connected to the binding posts nearest them and the last tap on the first switch is connected to the first tap on the second switch. The rotor of the variocoupler is wired to the condenser, and the wave trap is ready for use.

On ordinary sets the wave trap is cut in the aerial line, as shown in the dia-

The Kinley Phonograph Co.
 No. 1501
 1001
 5-5-24

gram. On neutrodyne, radio-frequency sets and reflex sets it is connected to the grid on the last radio-frequency transformer and the grid of the detector, before the grid leak, if one is used. On regenerative sets the wave trap may be cut in the ground or aerial circuit, or shunted between the aerial and the ground. In the latter case, a .0005-mfd. condenser, connected in series with the wave trap, that is, between the aerial or ground and the wave trap, may be found advantageous. One of these methods is better adapted for one set than for another, and the only way to find out which is best on your set, is to try all of them.

In use, the signal to be trapped is first brought in at maximum volume by adjusting the controls on the receiving set, and then the wave trap is manipulated until the signal is entirely eliminated. Then the other signals can be brought in without interference. It will be found that the original dial readings of the set will be altered considerably by using the wave trap. Unlike most wave traps, this one does not decrease the volume of incoming signals greatly, and in many instances it has been found to increase the volume considerably. On a 3-tube regenerative set the wave trap served as a satisfactory aerial for local stations, the outside aerial being disconnected entirely. Although an undesired station is trapped on one point on the dials, its harmonic may be found at another point, a difficulty that no wave trap can overcome.

**Inside Tubular Aerial
 Is Full-Sized**

A tubular aerial designed principally for interior use is full-sized as far as the length of wire in its construction is concerned. Containing more than 130 ft. of copper strand, the antenna is 11 ft. long

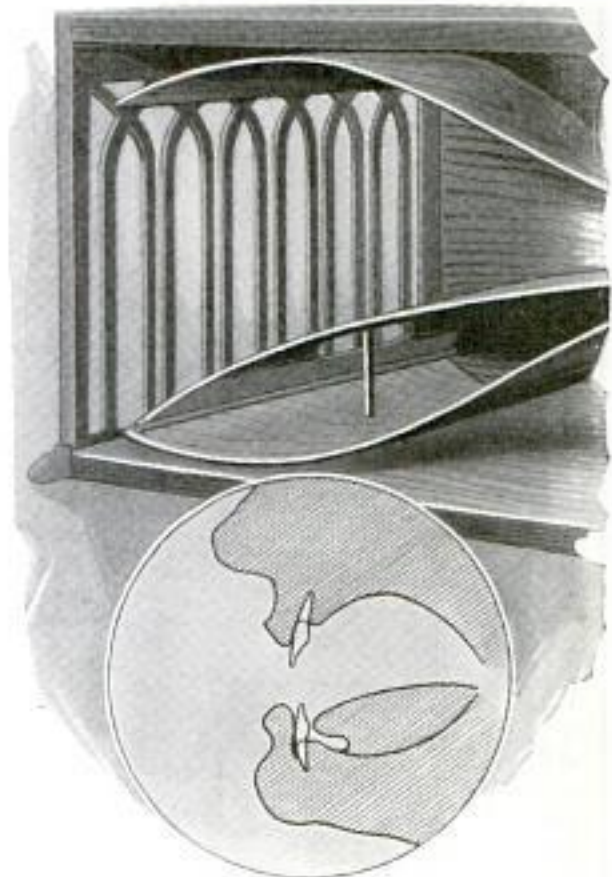


and 12 in. in diameter, and is patterned in the form of a squirrel cage. In rooms of less than 11 ft. in

dimensions, it can be strung cornerwise and is well suited for installation in an attic. Because of its size, it can be placed near the ceiling out of the way, and saves time and expense of putting up an outside equipment, although, if desired, the aerial can be set up for exterior service. In connection with an outside aerial, it may be used as a counterpoise.

**Loud Speaker Shaped Like
 Singer's Mouth**

Formed in the shape of a singer's mouth, a loud speaker, designed to produce the



Above, Section through New Loud-Speaker Sound Chamber; Below, Cross Section of Singer's Mouth

Original tones of voice and instrument, has a stressed sounding board representing the tongue and controlled by a sound post such as is used in violins. Two curved pieces of wood, arched to conform to the positions of the upper and lower parts of the mouth when singing, form the sound chamber top and bottom. The sounding board, which is tuned before assembly, is maintained at a constant pitch by the sound post. Overintensity of volume is prevented by an opening which equalizes the heavier tone waves and produces a soft smooth vibration, which reaches the listener with all harsh metallic effects removed. Owing to its highly sensitive quality, the loud speaker is claimed to amplify and naturalize any vocal or musical vibration that reaches the unit.

SELECTIVE 3-TUBE RECEIVERS with a good range were described in our Nov., 1924, and April, 1925, issues. These numbers may be obtained from the Circulation Department, price 25 cents each.

A Long-Distance Portable Receiver

By F. L. BRITTIN

A PORTABLE receiver for the automobile tourist or other traveler, with built-in loud speaker, all complete for a cost of \$75, including tubes and batteries, is the latest product of the Popular Mechanics radio laboratory.

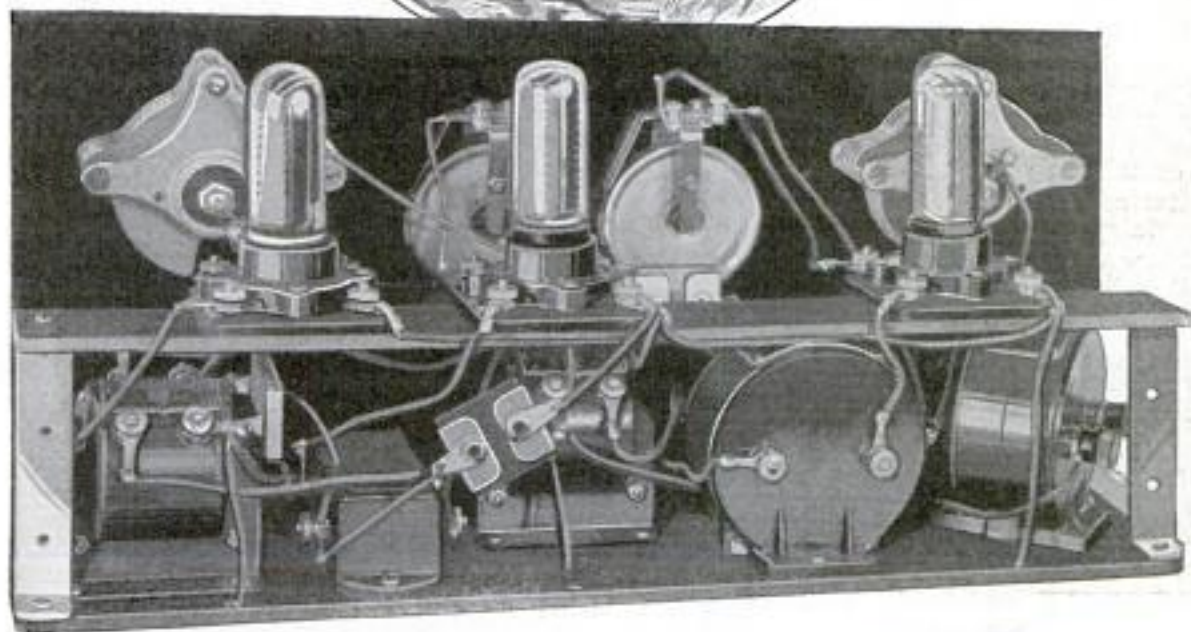
Built of standard parts which can be obtained at most radio stores and housed in a standard, leather-covered sample case—the kind that is built in quantities for traveling salesmen—the entire outfit weighs only 26 lb., is less than 15 in. high, by 16½ in. long and 6¼ in. deep.

Despite its compactness, the set is selective enough to tune out a station with a small movement of the dial and covers an exceptionally long range for a portable three-tube receiver. In tests under favorable Chicago conditions, using an 85-ft. temporary aerial and a 6-ft. ground lead, the stations heard with good volume on the speaker included WBZ, Springfield, Mass., KFAB, Lincoln, Nebr., and WBAP, Fort Worth, Tex.

While intended primarily for the tourist, the set is adapted for use at

home, too. The small built-in loud speaker, of course, has not as good tone as a larger unit; so the speaker connections are arranged in such a way that they can be disconnected quickly and a larger speaker or phones connected. All that is necessary is to pull one set of cord tips out of the small jacks and insert another pair. For use as a portable set, the 85-ft. aerial is carried wound on a spool, with two insulators handy for either end. In use, one end of the aerial can be drawn over the limb of a tree by first throwing a cord weighted with a stone over the branch, attaching the aerial, and pulling it up. An ordinary curtain rod, with one end sharpened and the other drilled and tapped for a small binding post, makes a good temporary ground for the auto camp.

A standard case, 14¾ in. high, 16½ in. long, and 6¼ in. deep, is used. The bakelite or formica instrument panel is ¾ by 7 by 15½ in. The arrangement of the instruments on this panel is clearly shown in the illustration. The base or subpanel is bakelite or formica, ¾ by 5½



Rear View of Instrument Out of the Case, Showing How the Tubes Are Mounted

by $15\frac{23}{32}$ in. The front panel is mounted on the subpanel by means of three small brass brackets, and is set $1\frac{1}{2}$ in. back from the front edge of the base to allow clearance for the dials and rheostat knobs when the lid is placed on the case. The instruments are mounted on the subpanel with $\frac{1}{2}$ -in. 6-32 brass machine screws, in the positions shown in the diagram. The universal-coupler unit at the extreme right is secured on the subpanel with one machine screw, so that it can be turned at an angle that will give the best results. Flexible wire must be used for the connections leading to this unit to permit this rotation. The correct adjustment cannot be obtained until the set is completely wired. The other instruments are set up in the order shown in the diagram: the tube sockets, of the shock-absorber type for UV-199 and C-299 tubes, are mounted on a strip of bakelite, $\frac{3}{16}$ by $1\frac{1}{2}$ by $15\frac{23}{32}$ in., and the bakelite strip on two brass brackets, $\frac{3}{16}$ by $\frac{5}{8}$ by $3\frac{1}{4}$ in. high, which are screwed on the base in the position shown in the rear-view photo. This places the tube sockets just above the transformers, and should be just the right height to allow the tubes to clear the top of the case when placed in the sockets.

The set is now ready to wire. Use rubber-covered wire of the flexible stranded type, obtainable from any electrical dealer. It is especially useful in portable receivers, where flexibility is one of the factors that makes for successful operation, due to the fact that tubes of the dry-cell type must be used, and all jars and vibrations should be minimized by flexible wiring and shock-absorber sockets, to eliminate microphonic noises in the horn or phones.

It will be noted that long leads for the 76-volt positive B, positive A and negative A, are taken through the subpanel to the battery compartment below the instrument. The positive-A and negative-B terminals are connected together at the batteries. The A-battery consists of three No. 6 dry cells connected in series; the B-battery of three No. 3156 Burgess $22\frac{1}{2}$ -volt units. These units are also connected in series. Two brass brackets, formed from $\frac{1}{16}$ by 1-in. brass angle bar, are screwed to the inside of the case on each side, $6\frac{3}{4}$ in. from the bottom of the case, to support the panel of the instrument, and a third bracket, cut from brass angle stock $\frac{3}{16}$ by 1 by 5 in., is mounted inside the case at rear to support the back of the base. The height of these brackets must be carefully determined to allow the front of the base to rest on the wood panel in the front of the battery compartment.

This wood panel is $\frac{1}{2}$ by $6\frac{11}{16}$ by $15\frac{23}{32}$ in., and may be of either poplar or basswood. It should be stained, and several coats of good varnish applied, rubbing down each coat with pumice or rotten stone. A hole, $3\frac{1}{4}$ in. in diameter, is cut in this wood panel to take the bell of the hard-rubber horn, which is secured to the rear of the panel by means of a block of wood, $\frac{3}{4}$ by $1\frac{3}{8}$ by $1\frac{1}{4}$ in. high. This block is recessed to hold the end of the horn in position, and a strip of brass, $\frac{3}{16}$ by $\frac{3}{4}$ by 6 in., is bent into a bracket around the horn and block, then screwed to the rear of the panel, making a solid mounting for the horn. A horn of this size does not come equipped with a loud-speaker unit, but the base cap can be furnished by the manufacturer for most of the standard units. A Baldwin type-C unit is used in the horn illustrated. The cord from the unit is brought through a hole in the panel, for connecting to the cord-tip jacks in the front of the instrument panel. A small hard-rubber bushing of the type used in electric-light fixtures is set in the cord hole in the wooden panel.

The instrument is now ready to test. Make this test before placing the instrument in the case. Connect the A and B-batteries to their respective leads and place the tubes in the sockets. Connect to the aerial and ground, use a pair of head phones and make the adjustment of the universal-coupling unit before placing the instrument in the case. First tune in some near-by station to maximum signal strength. Then, listening in with a pair of head phones, turn off the first rheostat at left entirely. The signal will probably still be heard, owing to the coupling between the universal couplers. To eliminate this, rotate the first coupler slightly. When a position is finally found where no signal is heard, fasten the first coupler permanently and do not disturb it again. Now to mount the set in the case. You will note two screws in the top of the instrument panel; these two black-finished brass screws are 6-32, $\frac{3}{4}$ in. long, and screw into the two small brass angle brackets, threaded to receive them and mounted on the inside of the case near the top. Disconnect the batteries, put the instrument in the case, reconnect the batteries and the set is ready for use.

Tuning the Set

1. See that good contact is made on the crystal detector; it may be necessary to screw the little knob all the way in to get a good contact; then back off the knob until the signal is clearest.



Upper Left, Lower Panel Removed to Show Arrangement of Batteries; Upper Right, Back of Wood Panel; Below, Two Views of the Complete Receiver

2. Turn up the rheostats about halfway.
3. Turn both dials slowly in the same direction and keep them at about the same reading. Listen carefully in the head phones, and when a signal is heard, turn each dial separately to the point where the signal is the loudest.
4. Adjust the contact on the crystal detector until it is at the point of maximum sensitiveness.
5. Turn the rheostats down, if necessary, to get the clearest possible tone.

To get the best possible results from the instrument, learn to control properly the temperature of the tubes, by adjusting both rheostats, for best volume and clarity of tone. Try interchanging the tubes, for

there is variation in the electrical constants of different tubes, even of the best makes. Reasonable care should be taken with any portable set not to subject it to hard knocks or falls. See that the A and B-batteries are strapped together and secured in place in the case, before taking the instrument on a trip. We have subjected this instrument to a great deal of rough treatment, and it continues to work nicely, so we do not hesitate to recommend it to our readers. The instruments are contained in one standard kit, easily obtained anywhere, and the builder is not obliged to hunt for parts to complete the set.

Free blueprints of this set, showing all details of construction and a full list of materials, may be obtained from the Radio Department, Room 515, 200 E. Ontario St., Chicago. The only charge for this service is 5 cents, to cover the cost of mailing.



THE wiring of a homemade receiving set seems easy, and there is nothing really difficult about the job, but there are a number of little points that should be observed if the finished set is to be an object of pride to the builder—and what radio fan is there who builds a set without determining that it is going to be the best set that ever was made? This article does not pretend to cover the whole subject of set wiring, but if it helps the reader to build a better set and makes the building a little easier for him, it will have achieved its purpose.

The first question that comes up in the mind of the builder is: What kind of wire shall I use? There is no definite answer to this, as so much depends on the taste of the maker and the design and purpose of the set. If the set is a portable one, for example, and is built so that the interior is not ordinarily exposed, then flexible stranded wire, rubber-covered, will be found ideal for the purpose. A set wired with this does not look as well as one wired with the ordinary busbar wire, but, on the other hand, the job can be done much quicker, as one does not have to be so careful to make nice bends. Also the flexible wire is non-microphonic, and this is an advantage in any set. The ordinary set, however, is built in a cabinet, with a top that can be lifted to give easy access to the interior. Everyone that looks at the set lifts the top to see the "works," and the builder naturally wants the wiring of the instrument to look as well as it can be made to look. The choice of the wire then falls between round and square busbar. The square wire is a little stiffer, and some think it makes a neater job, but I prefer the round variety. The wire is a little harder to straighten, as it comes in coils instead of in straight lengths as does the square wire, but it can be done. It will be found that spaghetti can be drawn over

the round wire with much greater facility than over the square, and if much of the tubing is used in a set, there is a great saving of time here. Also, in confined places in the set, the round wire is much easier to bend into shape with the fingers, and the appearance of the set can be made just as good, with a little care, as when the square type is used.

Next comes the choice of a soldering iron. If the reader expects to make many sets, it is well to get two, one light and the other heavy. Of course, the best type to use is an electric iron, but, if electricity is unavailable, good work can be done with a plain one. This can be heated by means of a blowtorch, as shown in Fig. 1, which, incidentally, shows a very good holder for the soldering iron, made from a length of busbar wire and a piece of wood. If a blowtorch is not at hand, the iron is heated on the oil or gas stove, by means of a Bunsen burner, or even with a tin of "canned heat." The same holder will serve nicely for the electric iron, and prevent the top of the table or bench from acquiring ugly burns. The heavy iron is shown in use in Fig. 2, on joints that are in the open, and this iron will serve for a majority of the joints in a set. However, there are places, as in Fig. 3, where the handiness of the small iron will be appreciated. If but one or two sets are to be made, the small iron, which costs about \$1.50, will serve very well. The smaller irons "burn" away rather fast if left switched on for long periods, so care should be taken to switch them off when not in actual use.

No soldering iron will do its work well if it is not tinned properly and kept tinned. Heat the iron, taking care, if it is a plain one, that it is not brought to a red heat, and brighten the point with a file as shown in Fig. 4. Spread some flux on a sheet of copper, brass or tin that has been pol-

ished, and rub the bright point of the iron over the fluxed surface, applying some solder to the point while doing so. This will coat the point with a layer of solder (if the point is hot enough) and this tinning must be preserved while the iron is used. If a plain iron is overheated the tinning will be burnt off and must be renewed. With an electric iron no attention need be paid to the proper heat, as it is designed to keep at this temperature automatically.

The quantity and kind of flux used in wiring a radio set are very important. As the wire used is tinned and the wiring lugs on the instruments are usually tinned also, not a great deal of flux is necessary in making joints. Never, under any circumstances use acid-core solder or an acid flux. Rosin-core solder may be used, although, in Popular Mechanics radio laboratory, a good non-acid paste flux is preferred. This is applied very sparingly to the joint, and care is taken that none of it creeps under the lugs when the soldering iron is applied. If rosin-core solder is used, be very careful that all trace of the rosin is cleared from the joint after soldering, as we have seen radio sets that refused to work simply because some rosin from the solder had happened to find its way under one lug.

When using solid wire, it is advisable to make as many of the bends before the

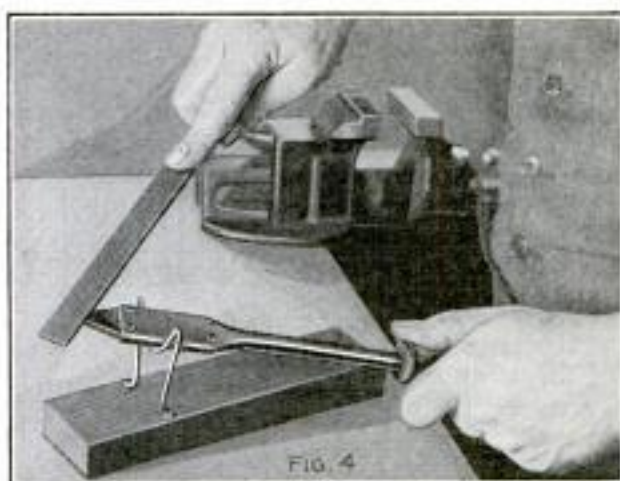


FIG. 4
Brightening the End of the Soldering Iron with a File in Preparation for Tinning



FIG. 5
Tinning the Iron on a Polished Metal Plate with Flux and Solder

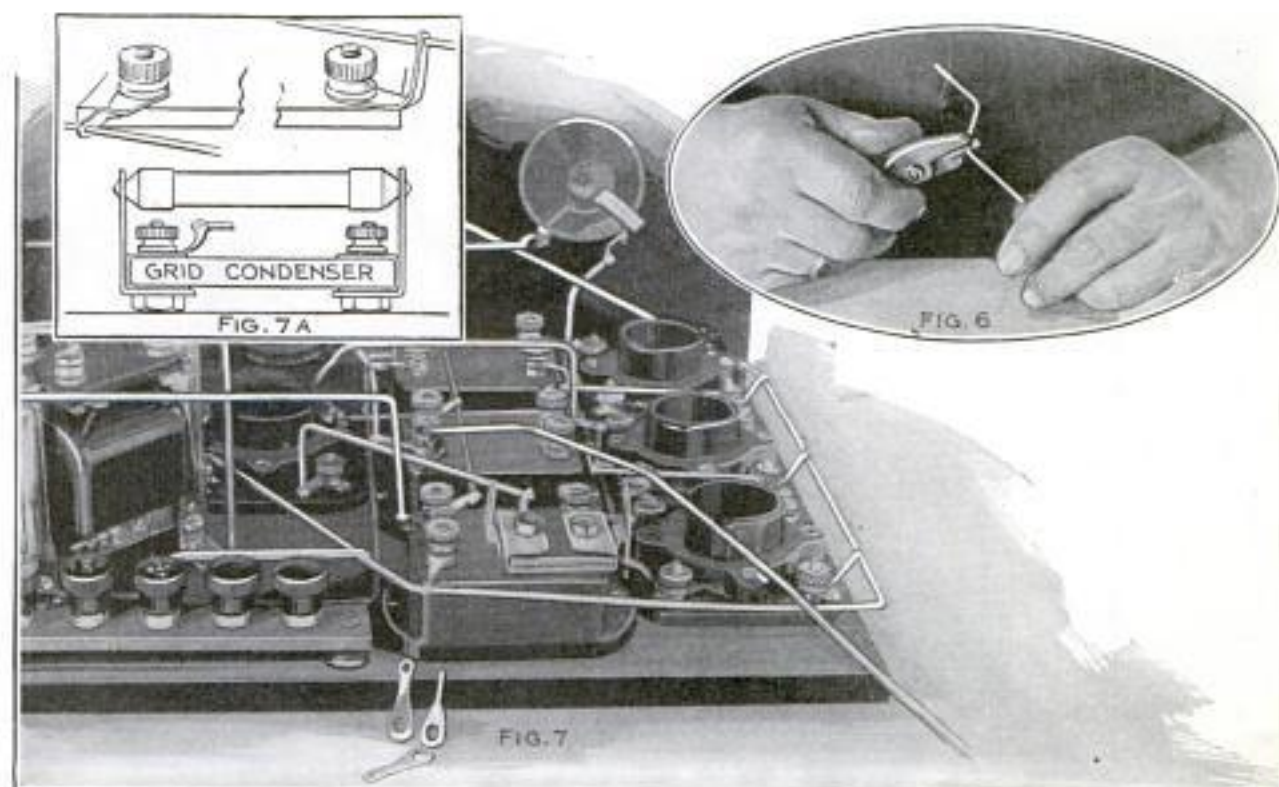


FIG. 7
Upper Left, Using Soldering Lugs and Mounting Grid Leak; Upper Right, Bending Solid Wire; Below, Rear View of Set Showing Uses of Soldering Lugs

wire is put in place as can conveniently be done. The bends should not be sharp but rounded somewhat. The best tool for this purpose is a pair of round-nose pliers, or one of the plierlike tools used for forming eyes in the ends of wire. This is shown in Fig. 6. Soldering lugs should be used under every terminal in the set. These can be bent and twisted in any way to suit the wiring. For instance, in the upper-left corner of Fig. 7A there is a drawing of a lug under a socket terminal that has been twisted at right angles and the wire run through the hole; this permits one straight wire to be used for either filament lead. In the right-hand corner of the same drawing is shown a lug bent up at right angles to catch a wire running across the terminal. Fig. 7 shows a set in which lugs have been used under the terminals, and the many ways in which they can be bent to suit the wiring and eliminate extra joints. Fig. 7A also shows a very neat way to mount a gridleak and condenser on a transformer; the terminal posts of the transformer pass through the holes on

the condenser, and the terminal nuts hold it tight as well as make the desired connection. A grid condenser mounted in the ordinary way simply hangs on its connecting wires, and this is not a very satisfactory method of supporting it. When using lugs, always cut off the projecting ends of wires that pass through the lug holes. This is easily done with a pair of end-cutting pliers, and adds to the appearance of the set when completed.

The commonest joint between wires in a radio set is a T-joint, where two wires meet and are connected at right angles to each other. There are three methods of making such joints, and these are shown in Fig. 9. Fig. 9A shows a T-connector that permits the user to make a very good joint, and also eliminates the trouble of holding the wires while soldering. The connectors can be obtained for a few cents a dozen in the radio store. To use, the connector is pinched around the wires as shown in the lower illustration at A, Fig. 9, and the joint soldered. Another method is shown at B, Fig. 9. Here one end of

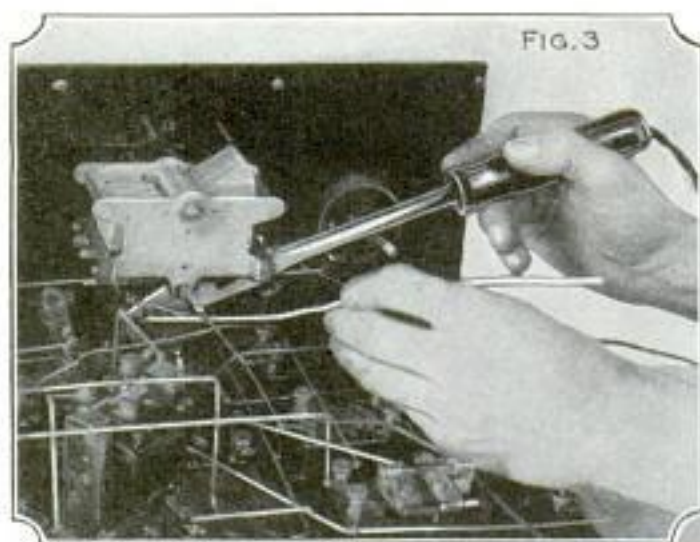
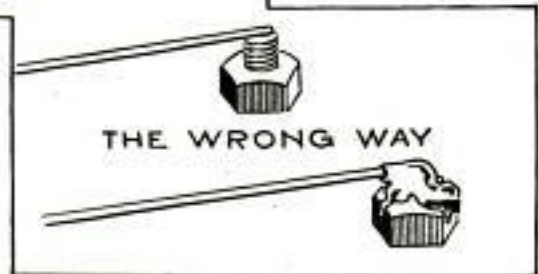
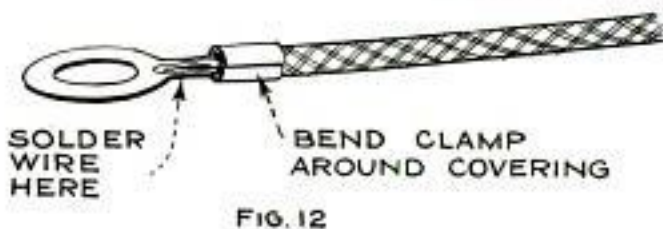
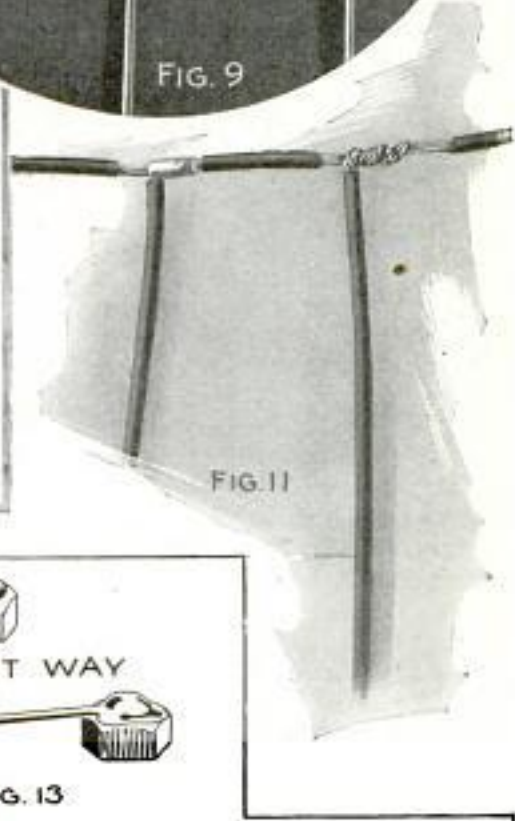
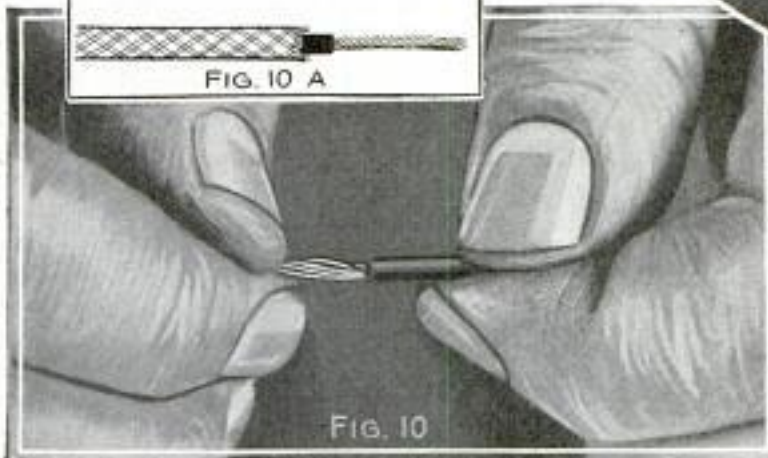
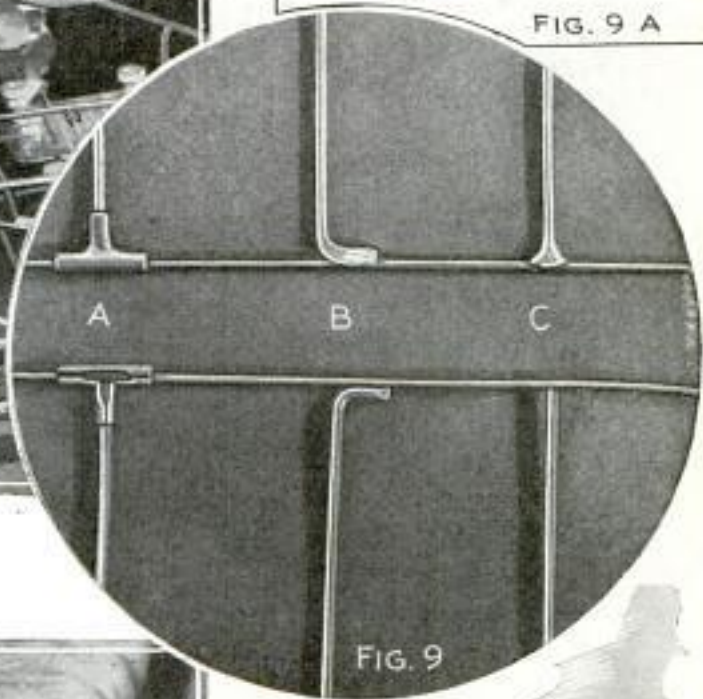
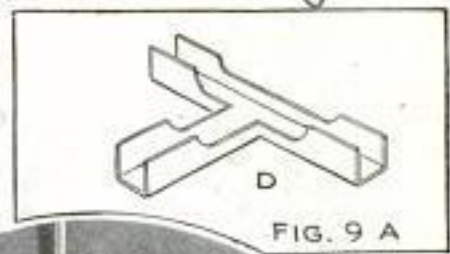
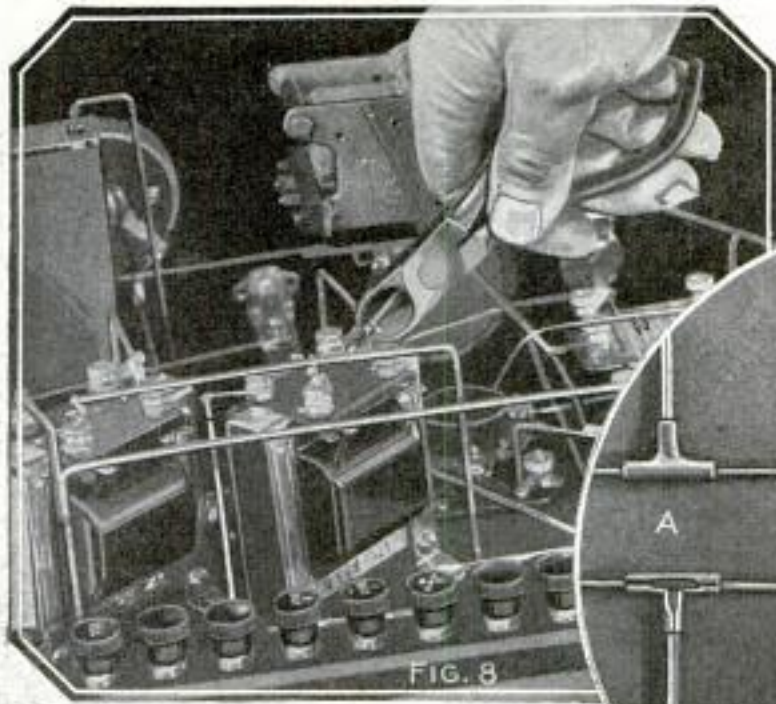


FIG. 1

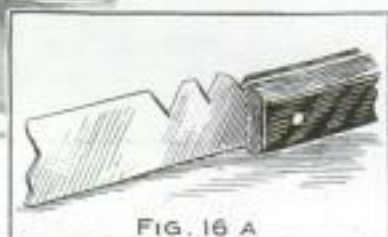
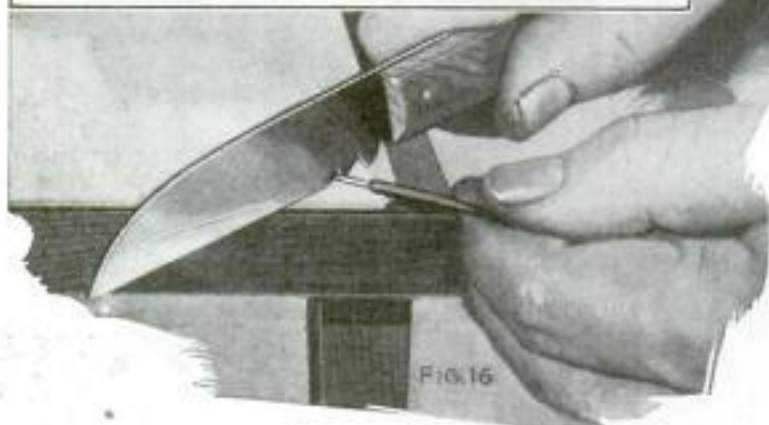
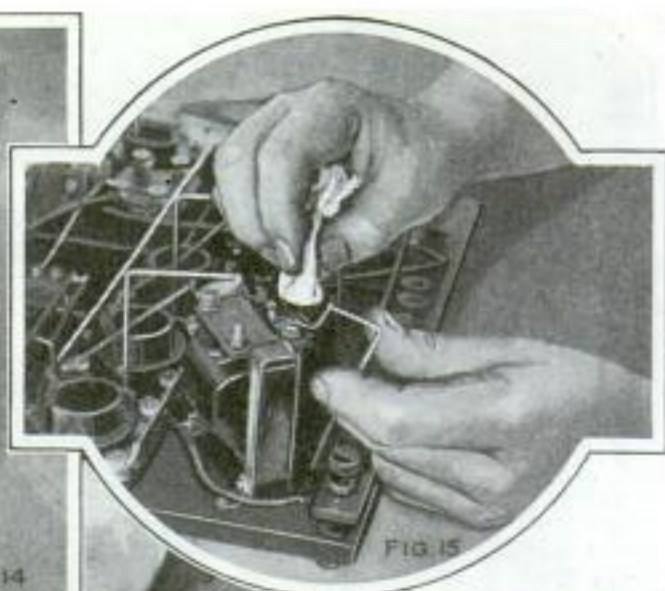
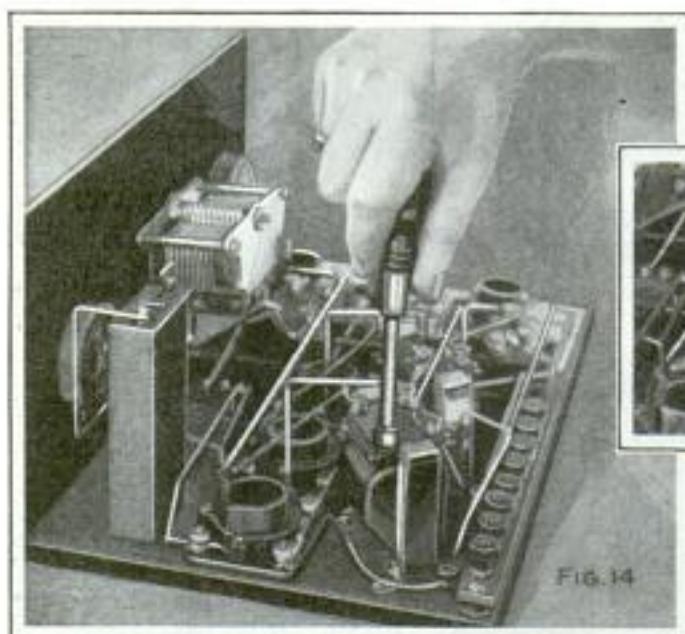


FIG. 2

Two Types of Electric Soldering Iron, Showing How Each Is Used; Below, Method of Heating Plain Iron, and Simple Stand



Cutting Off Ends of Wires; Proper Methods of Making T-Joints in the Wiring; Twisting the Ends of Flexible Wire and Jointing It; Finishing Ends of Connecting Leads and Correct and Incorrect Ways of Soldering Wires to Nuts



Upper Left, Tightening Terminals; Upper Right, Cleaning Terminals and Lugs; Below, Tool for Skinning the Ends of Flexible Wire and Manner of Using It

one wire is bent at right angles and butted against the other wire and the joint is then soldered. At C, one end of one wire is simply butted against the other and enough solder run around it to make the joint secure. The first method makes the best joint, but, in the absence of the connectors, the second method may be employed, and is preferable to the third. The bent-end joint (B) is not so neat in appearance as that shown at C, but it is the better joint. Remember that the purpose of the solder is simply to preserve a good joint, not primarily to make one. The wires should touch each other over as large a surface as possible. This is the real joint, and only enough solder should be used to insure that the contact of the wires will be preserved. Remember also that the solder is a much poorer conductor than the wire, and do not depend on a blob of solder to make a contact; it will make a contact, but not such a good one as the wires themselves.

When using flexible wires, be sure to twist the bared ends as shown in Figs. 10 and 10A. If cotton-covered leads are used anywhere in the set, the ends of the

insulation can be prevented from fraying further, after the ends are bared, by simply applying a drop of collodion to the end of the insulation. When making joints in flexible wire, make them as shown in Fig. 11, not as in Fig. 9. Twist the bared end of one wire around the bared spot on the other before soldering.

Leads that must be connected and disconnected frequently should be provided with copper lugs on the ends, as shown in Fig. 12. Two types of these lugs are available, with and without clamps. When using the former, the end of the wire is passed through the hole in the lug and soldered to it; with the latter, the end of the wire is passed through the hole as before, and the wire is pulled far enough to bring the clamps on the lug over the end of the insulation. The clamps are then bent tightly around the insulation, as shown in the lower drawing, and the wire soldered. The clamps take a great deal of the strain on the wire and also prevent fraying of the insulation.

Sometimes it is necessary to solder directly to nuts without using soldering lugs. When this must be done, remember the previous warning and make the joint as shown in the upper part of Fig. 13. Bend an eye on the end of the wire to fit

tightly over the projecting screw and then solder. Don't lay the wire on top of the screw and solder as shown in the lower drawing. This will make a joint, certainly, but a very poor one.

After all the wiring is done, go over every terminal on the set (Fig. 14) and see that they are tight, but, before doing this, take off the terminal nuts on all instruments, lift the lugs off carefully so as not to put any kinks or bends in the wire, and go over the terminals and the surfaces of the lugs with a rag moistened with alcohol (Fig. 15). This will clean off any trace of flux that may have crept under the lugs; it only takes a few minutes to do this, but it may save trouble later on.

A very useful tool when working with flexible wire is shown in Figs. 16 and 16A. This is a common kitchen paring knife with a couple of notches filed near the

handle end of the blade. The edges of the notches are filed sharp, and each notch must be just deep enough to cut through the rubber insulation on the wire it is intended for without severing any of the strands of wire. The manner of using the tool is shown in Fig. 16. It is used near one end of the table; the notch is brought down over the wire at the proper distance from the end and the wire revolved between the fingers so that the insulation is cut all around. The wire is then pulled out, still keeping the knife pressed down on the table; this strips the insulation from the wire and leaves the end bare, ready to twist. The whole operation is done in a fraction of the time it takes to describe it, and anyone who has skinned the ends of a number of lengths of wire by the ordinary method will appreciate the time saved by this simple tool.

Lettering on Panels

If one wants to finish a panel without waiting for the engraver, or whenever one is unable to have a panel engraved, the job can be done at home. The surface should first be cleaned with alcohol to remove the film of dirt and grease; the lettering can then be done with a fine lettering pen, using thin Chinese white or else draftsman's white ink. The lettering must be allowed to dry thoroughly and then given a coat of transparent varnish, using a soft varnish brush.

Novel Loud Speaker

Entirely different in design and operation from instruments of the conventional type, a new "hornless" loud speaker

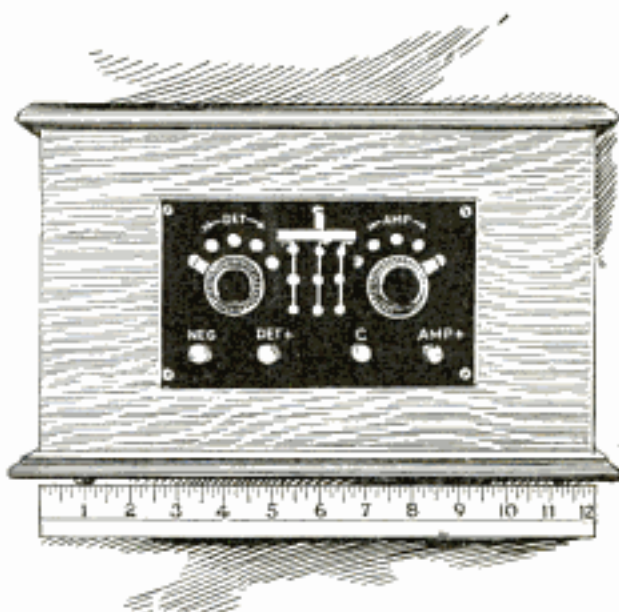


© U. & D.

has been developed by a Chicago inventor. Instead of a single more or less straight passage for the sound this type provides a zigzag path from the center outward, the total length of travel being 42 in. By this construction, the inventor claims, the tone reproduction is improved and the range of audibility enlarged so that persons sitting anywhere around the instrument can hear as well as those in front of it. Compactness is an obvious advantage of the speaker.

B-Battery and Charger in One Unit

An alkaline B-battery with a recharger, built in one unit and assembled in a neat 12-in. cabinet, is one of the latest solutions



Front View of the Combined B-Battery and Recharger; Note the Compact Control Panel

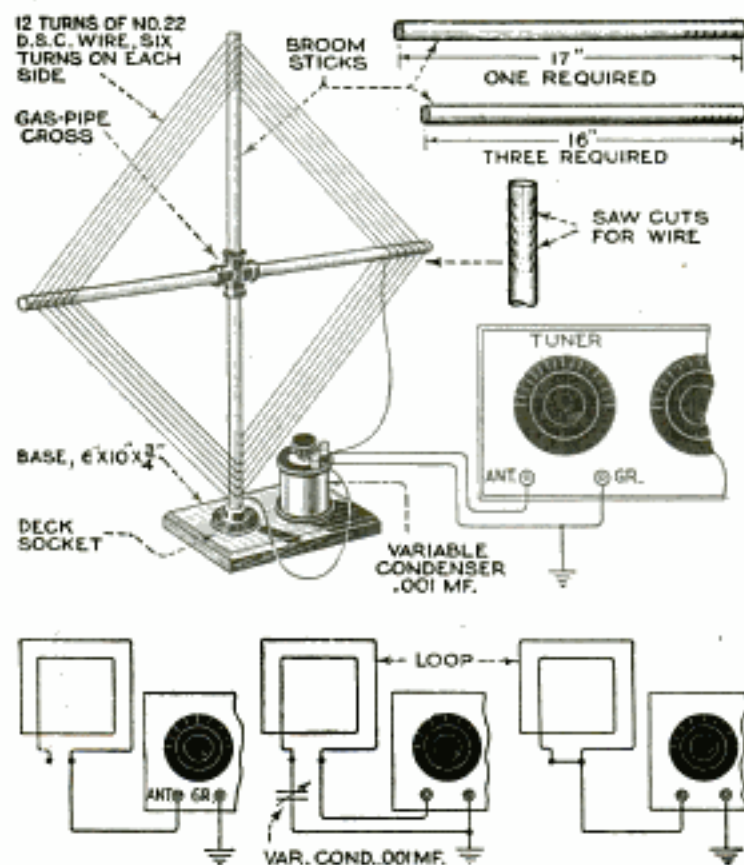
offered for the battery problem. Danger of acid boiling over has been eliminated by using alkaline-salt solution in the cells, and it is also claimed that there is less wear on the battery elements, which are said to be practically free from shedding and buckling, while sulphation of the plates is impossible. The combined battery-recharger is guaranteed to have sufficient capacity to handle the heavy drain of the superheterodyne or other multi-tube receivers.

Kimley Electric Co.
Buffalo, N. Y.

546-R.

Using Loop with a Neutrodyne

Many readers who have a neutrodyne set will no doubt wish to use a loop instead of an outdoor aerial. A simple one to construct is shown in the illustration.



A Neat Homemade Loop Aerial and Three Hook-Ups for Connecting It to a Neutrodyne Receiving Set

It consists of four pieces of broomstick, cut to the lengths indicated in the upper right-hand detail. Six saw cuts are made

on opposite sides at one end, to hold the wire, and the inner ends are screwed into a gas-pipe cross. Number 22 d.s.c. wire is used and six turns are wound on each side. The loop is held up, yet permitted to rotate freely, by inserting the 17-in. stick into a floor socket, which is screwed on a wooden base. Both ends of the wire are connected to a variable condenser of .001-mf. capacity, which is equal to that of any 23-plate condenser. From the condenser terminals leads are brought out to the receiving set and connected to the antenna and ground binding posts.

The three diagrams given in the lower part of the illustration show several other methods of hooking up the loop to the instrument, with and without the condenser. Each hook-up should be tried separately to determine which works best; this varies with different sets. The first figure at the left shows one end of the loop brought over to the antenna binding post, while the other end of the loop is open. A separate connection is made from the instrument to the ground. In the center figure the variable condenser is inserted in the lead from the loop to the ground binding post of the receiver, while the other end of the loop is connected to the antenna binding post. In the right-hand figure both ends of the loop are connected together and then run over to the antenna binding post.—F. L. Brittin, Chicago, Ill.

Adjustable Detector Replaces Crystal and Catwhisker

A detector that replaces the ordinary crystal and catwhisker, and eliminates the constant adjustment necessary in most reflex receivers, can be quickly reset with a common pin. The device requires no batteries and can be either fastened to a panel or connected to a pair of wires without mounting. It may be used as part of any crystal or reflex set and is claimed to work equally well in any position. A small hole is provided in the side of the tube for the insertion of a pin, when it is desired to



readjust the detector for increasing the volume of the set. It is easily installed and, when once adjusted, is said to produce smooth, uninterrupted reception.

Direction of Aerial Has Effect

All aerials are somewhat directional in effect, although the loop is popularly supposed to be the only antenna that has this property. If the radio fan will bear this fact in mind when erecting his aerial he may increase the efficiency of the set. For example, if the majority of the broadcasting stations that he expects to receive are to the north of his location, and he is erecting a single-wire antenna, the aerial should point north and south, and the lead-in wire should be taken off the north end, that is, the end nearest the stations.

49
Tower Radio Inc.
2620 Victor St.
Kansas City, Mo.

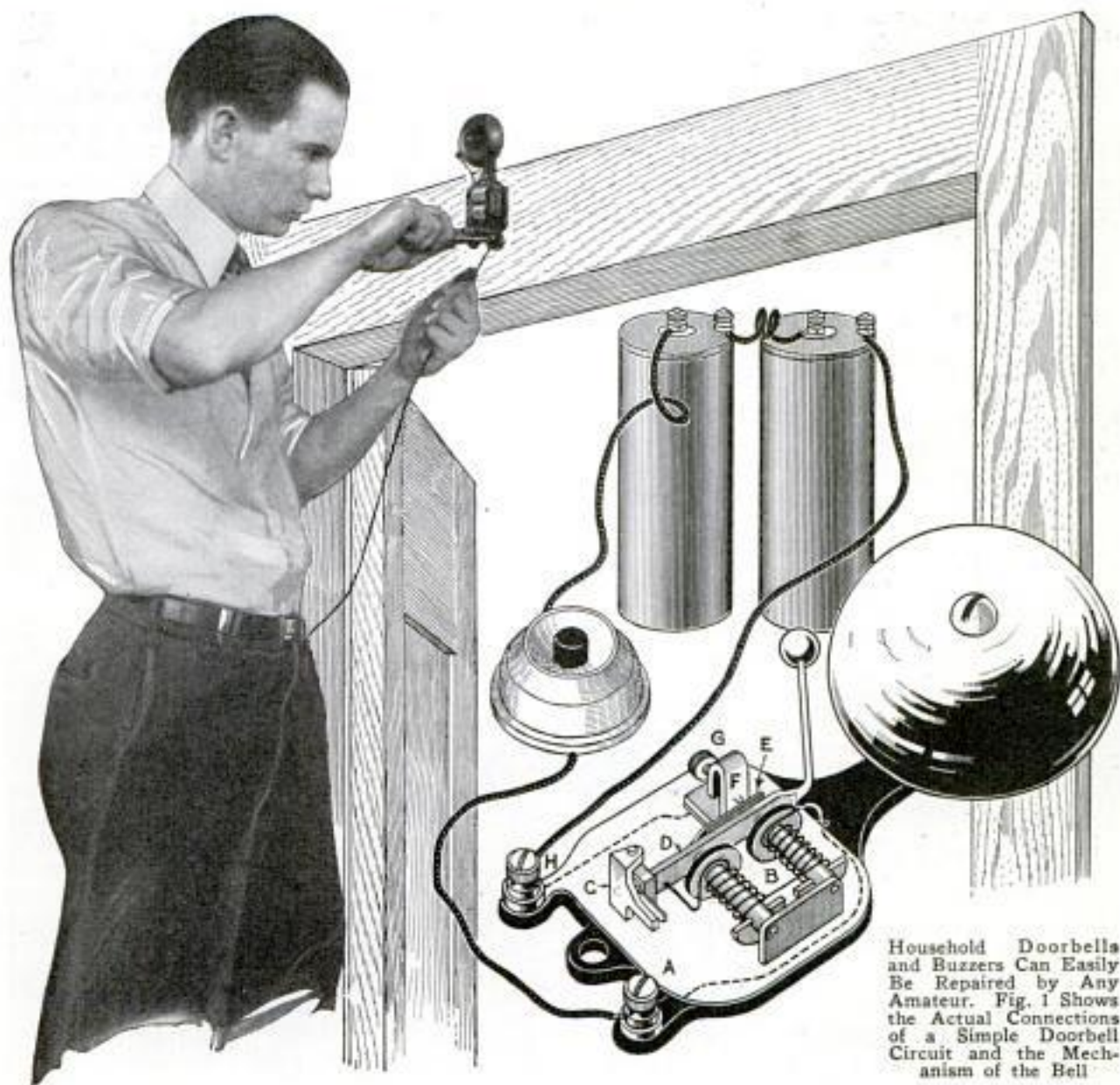


Fixing Doorbells and Buzzers

By E. R. HAAN

THE ordinary troubles experienced with electric doorbells or buzzers can easily be taken care of by the amateur without calling in an expert. All that is necessary is a little knowledge of the operation and construction of the apparatus and the ability to handle such common tools as screwdriver, a pair of pliers and a knife.

Both operation and construction are easily followed by reference to Fig. 1, which shows a battery-operated bell. Two dry cells are connected in series, that is, the center terminal of one cell is connected to the side terminal on the other cell, and of the two remaining terminals one is brought to binding post H on the bell and



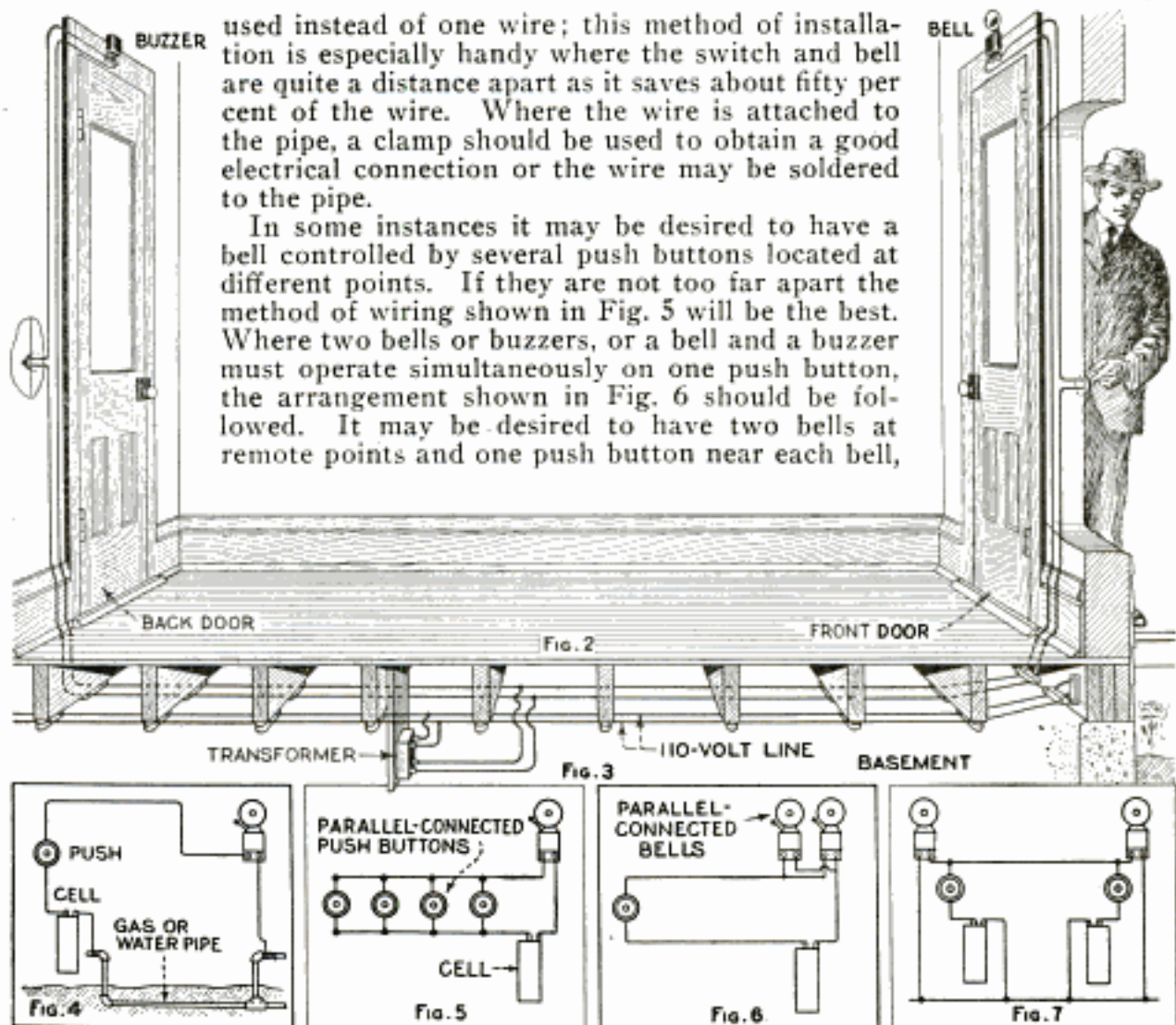
Household Doorbells and Buzzers Can Easily Be Repaired by Any Amateur. Fig. 1 Shows the Actual Connections of a Simple Doorbell Circuit and the Mechanism of the Bell

the other to one of the push-button terminals, while the other terminal on the push button is connected to the binding post A. By pressing the push button the electric circuit is closed and the bell rings. The current passes from the cells through the push-button switch to A, and through B, D, E, F, G and H back to the battery. These parts are respectively: B, the electromagnet; D, the armature; E, spring on armature making contact with point of screw G (which is held in bracket F). What happens when the current flows is that the cores in the electromagnet attract for a moment the armature and the hammer on the latter strikes the bell, but at practically the same instant contact is broken at E and F and the current flow stops, releasing the armature; however, only momentarily, for, so long as the button on the switch is pressed, current pushes on from the battery through A to the electromagnet, and the same thing happens over again so rapidly that the hammer strikes the bell with scarcely perceptible intervals. Therefore, when no bell is used, the apparatus is called a buzzer from the sound it produces. A light spring under the armature on pivot C aids this rapid back-and-forth movement. The amateur repairman can make all this much clearer to himself by providing himself with a secondhand doorbell and connecting it up as shown. Also take apart and dissect the push-button switch.

Although the experienced electrician may be able to locate certain troubles immediately, the amateur, to save time and to learn faster, had better work systematically, beginning, when the bell system does not work right, with the batteries. These may be dead or exhausted, and this is the commonest "trouble" encountered. It is easy to test the cells with a lamp from a small flashlight, but the cells show decided symptoms of exhaustion several weeks before they actually go dead, the action of the bell becoming weaker and weaker every day. One can then deal with the exposed parts that can be examined without disassembling, that is, the wires and their connections at the cells and the bell base. If the binding posts do not hold the wires firmly, tighten the screws, and if there is any corrosion found around the connections, clean them carefully to make good electric contacts. Next examine the insulation, which may have been chafed off at some corner; wrap any such points with friction tape, so that the wires cannot come into contact. If broken wires are met with, cut out the broken piece and splice in a new one, soldering and taping

the joints. Often these simple steps will suffice to restore an installation that will not ring at all or that rings intermittently or weakly. If they do not, unscrew the push button and see that the terminals hold the wires firmly, that the screws holding the contact springs are tight; that the springs come together and fly apart when the button is pushed and released, and that all contacts are free from corrosion. Remedy any defects by tightening screws, bending or replacing the springs and cleaning the contacts. Weak or loose contact springs may cause a bell to ring suddenly even though no one touches the button. Often it will be necessary to provide a new push switch to remedy troubles here. As a rule the mechanical parts of the bell ringer give little trouble. The bell hammer may have been bent some way so that it does not hit the bell, or bears so tightly against the bell that the armature cannot vibrate, but these troubles are easily remedied by loosening the screw and bending the hammer shank. Another reason why the bell will not ring may be found at the point where the spring E makes contact with the end of the screw G. The repeated and rapid making and breaking of contact here causes tiny electric sparks to fly back and forth between the screw and the spring, so that the tip of the screw is burnt off. Remedy this by scraping off any burnt part and readjusting the screw until the armature again vibrates freely.

In cities and towns where lighting current is supplied, a small bell-ringing transformer may be used instead of dry cells. The method of installing such a transformer is shown in Fig. 3. Two of its terminals are connected to the 110-volt line and the other two terminals to the bell circuit. The proper connections are all indicated on the transformer, so that no mistake can be made if the wiring is done carefully. The two terminals to which the bell circuit connects usually supply 6 volts' pressure. On some types of transformers there are three terminals on the bell-circuit side so that any voltage of 6, 8 or 14 volts can be obtained. The two outer terminals give 14 volts, the center and one end terminal give 6 volts, and the center and the other end terminal 8 volts. These voltages are marked between the terminals. Fig. 3 shows how a doorbell and a buzzer on the front and back door of the house are wired, each being controlled with a push-button switch, and run by city current through a transformer. When a gas or water pipe runs close to the bell and also close to the push button, it can be



Figs. 2 and 3, an Actual Installation of a Bell and Buzzer Supplied with Current through a Small Transformer; Below, Connections for Various Bell Installations in Home and Office

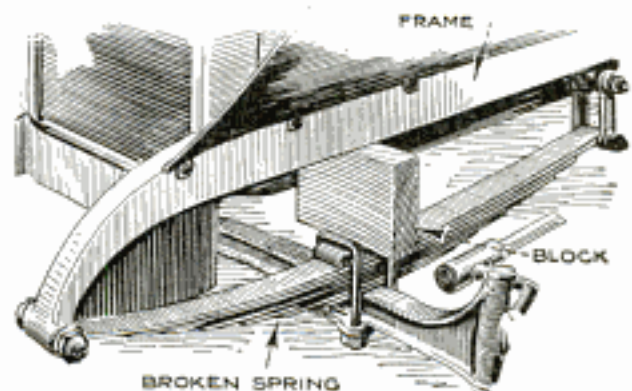
operating both bells at the same time. This arrangement, shown in Fig. 7, is handy between the house and barn on the farm, for example. The lower conductor, to which four taps are made, may be a

water pipe if one runs along the points indicated. In these diagrams a single dry cell is indicated to denote the source of current, but at least two dry cells should be used, or a transformer.

An Emergency Spring Repair

While driving over a rough mountain detour, I broke one of the front springs on my automobile. As I was about twenty miles from the nearest service shop, with five miles of rough road ahead, and as the break was a bad one, all but the bottom leaf being broken, an emergency repair of some kind was necessary. I jacked up the frame of the car and then inserted a piece of planking (which I found near by) between the frame and the broken spring, parallel to the front axle and directly above it as indicated. Of course, I wired the piece in place so that it could not work loose. With this repair I drove on to the repair shop without any trouble or diffi-

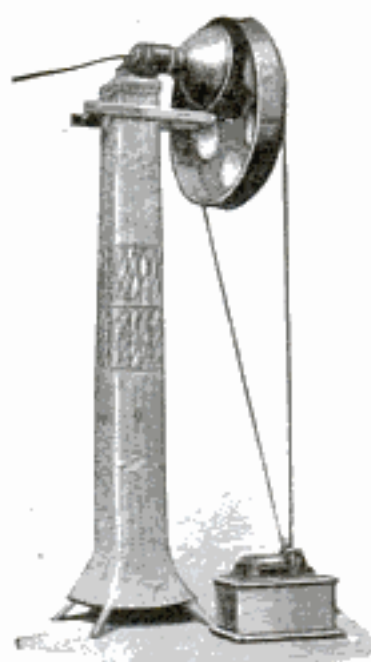
culty, although the bumps and jolts, taken by the frame directly, were unpleasant.—Hal. S. Borland, Asheville, N. C.



Block Inserted under Frame Is Good Emergency Repair for Broken Spring

Old Phonograph Used to Turn Color Wheel

In a small western dance hall where it was desired to use a color wheel but a small electric motor was considered too expensive, an old phonograph of the cylindrical-record type was found useful. It was placed on the floor, as shown in the photo, and a length of rope serving as a belt was run from the phonograph cylinder to the color wheel. To give a presentable appearance the spotlight and color wheel were mounted on an old wicker lampstand.—Charles W. Geiger, San Francisco, Calif.



How to Read the Future

Whether or not the householder "believes in signs," he would do well to pay heed to the following maxims, which are the result of long experience and study on the part of Mr. John J. Gilday, chief of the fire department of Hoboken, N. J.:

A crack in your chimney is a sure sign that you are going to move.

To see a paperhanger hang paper over a flue hole indicates an impending loss.

It is worse luck to look in a dark closet with a lighted match than to see the new moon over your left shoulder.

When the wind moans it is extremely bad luck to burn trash near your house.

If you smell gas or gasoline and look for it with a lighted match, it is probable that you are about to start on a long journey.

If you have a pile of rubbish in your cellar, it indicates that a crowd of people are coming to your house.

A quart of gasoline will cause an automobile to move three miles. A similar amount in household cleaning may cause three auto fire trucks and an ambulance to run a similar distance.

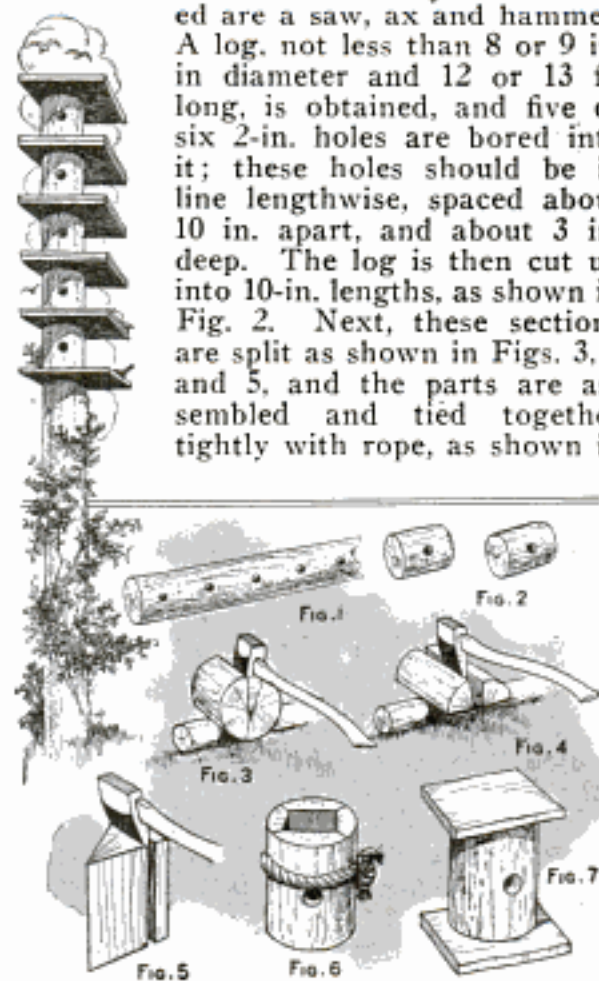
A child who plays with matches will gain experience—if he lives.

Wood for Cupboards, Cabinets and Refrigerators

One essential of woods used in making compartments for storing foods is the absence of strong odors. Cedars are not recommended for this purpose, although, if they must be used, they can be painted to kill the odor somewhat. Other woods, such as hemlock, pine, cypress and cottonwood, while they also have distinct odors, will not impair the quality of the food unless the latter is placed in direct contact with them. The wood used in building refrigerators is subject to extremely trying conditions. Light woods conform to the requirements better than the heavier and denser woods, but do not permit the beauty of finish possible with oak, ash or birch. Elm is a suitable wood and is, in fact, used largely in refrigerators because it stands the moisture well, and is not affected by repeated scrubbing.

Rustic Bird Houses

Novel rustic bird houses of odd design can be made from a saw log of straight-grained wood, preferably black oak or walnut. The only tools needed are a saw, ax and hammer. A log, not less than 8 or 9 in. in diameter and 12 or 13 ft. long, is obtained, and five or six 2-in. holes are bored into it; these holes should be in line lengthwise, spaced about 10 in. apart, and about 3 in. deep. The log is then cut up into 10-in. lengths, as shown in Fig. 2. Next, these sections are split as shown in Figs. 3, 4 and 5, and the parts are assembled and tied together tightly with rope, as shown in

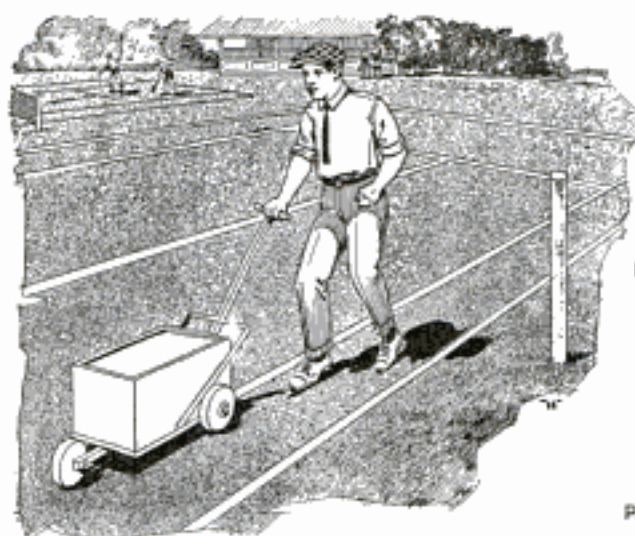


Novel Rustic Bird Houses Made from Log

Fig. 6. A number of 10 by 10-in. pieces of 1-in. board are nailed to the ends of these units, each thus forming an individual house, Fig. 7, and the rope is removed. The remaining part of the log can be set in the ground and the houses mounted on it, one above the other, as shown to the left. Bluebirds, woodpeckers, house martins and wrens are especially fond of these houses. If desired, a few crosspieces can be nailed to the log to form a trellis for a vine, which adds to the natural beauty of the arrangement.—Willis Mehanna, Bussey, Iowa.

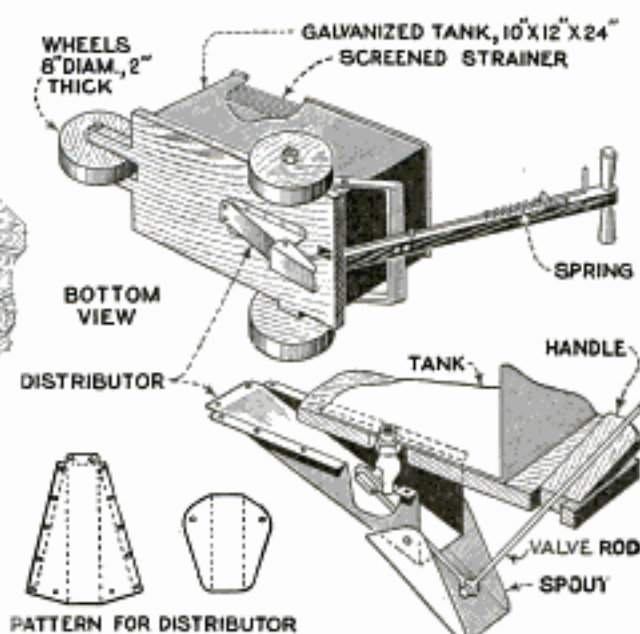
Tennis-Court Marker

Tennis-court lines laid with dry lime are neither lasting nor otherwise quite satisfactory. For this reason I made the



Constructional Details and Method of Using a Three-Wheeled Tennis-Court Liner Which Makes Durable Marks and Can Readily Be Made and Operated by Anyone

at the upper end and is held alongside the handle of the truck by means of a screweye and a small bracket. A coil spring is held on the rod between the bracket and a cotter key and washer, so that when the rod is released the gas cock will be turned shut. In use, a thin solution of slaked lime and water is mixed thoroughly and poured through the strainer into the tank. The right proportion of lime and water can best be determined by experiment; it has been found that a thin mixture is better than a thick one, as it soaks into the ground more easily. Before marking, the earth must be smoothed and rolled, then sprinkled.

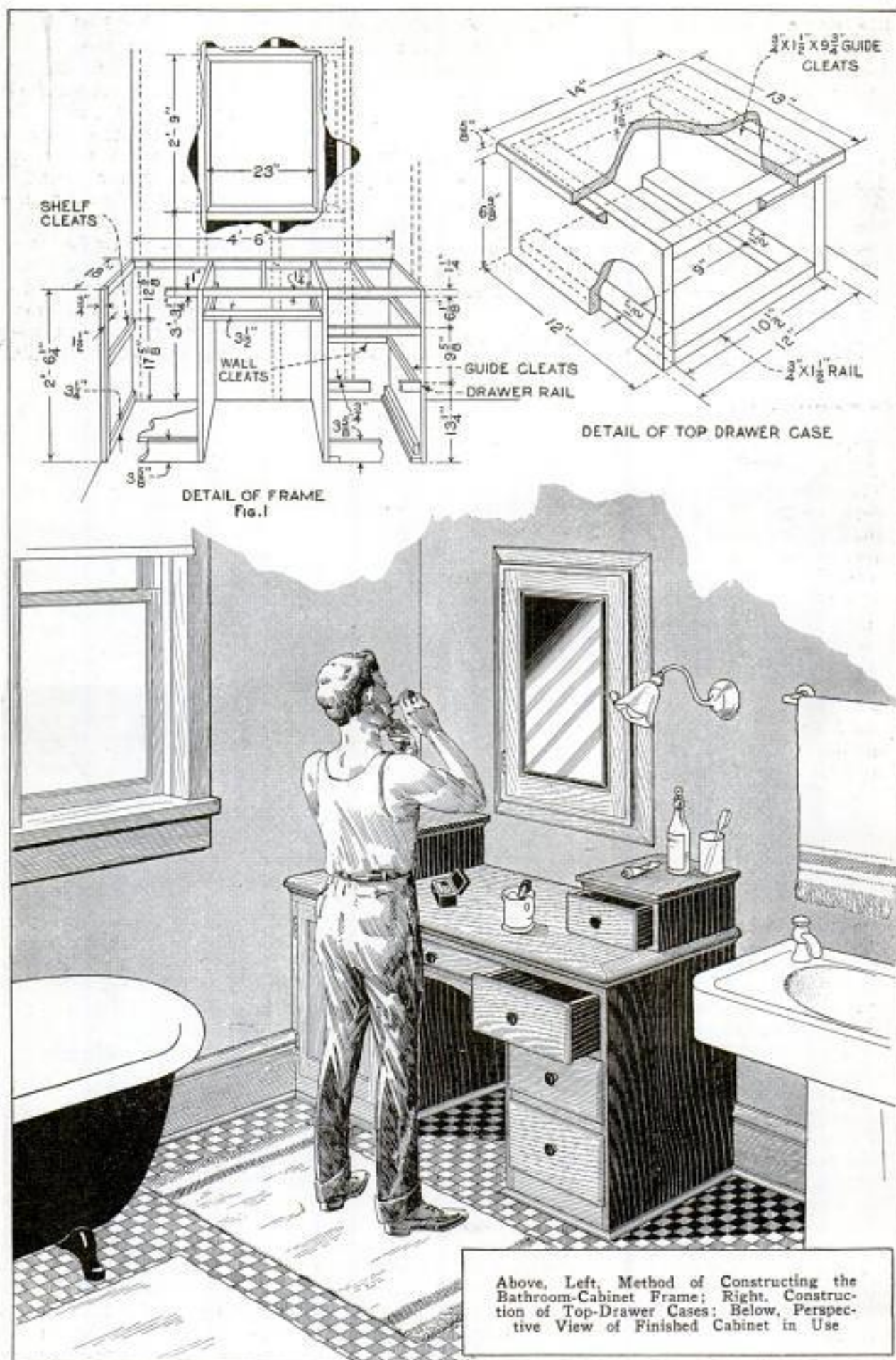


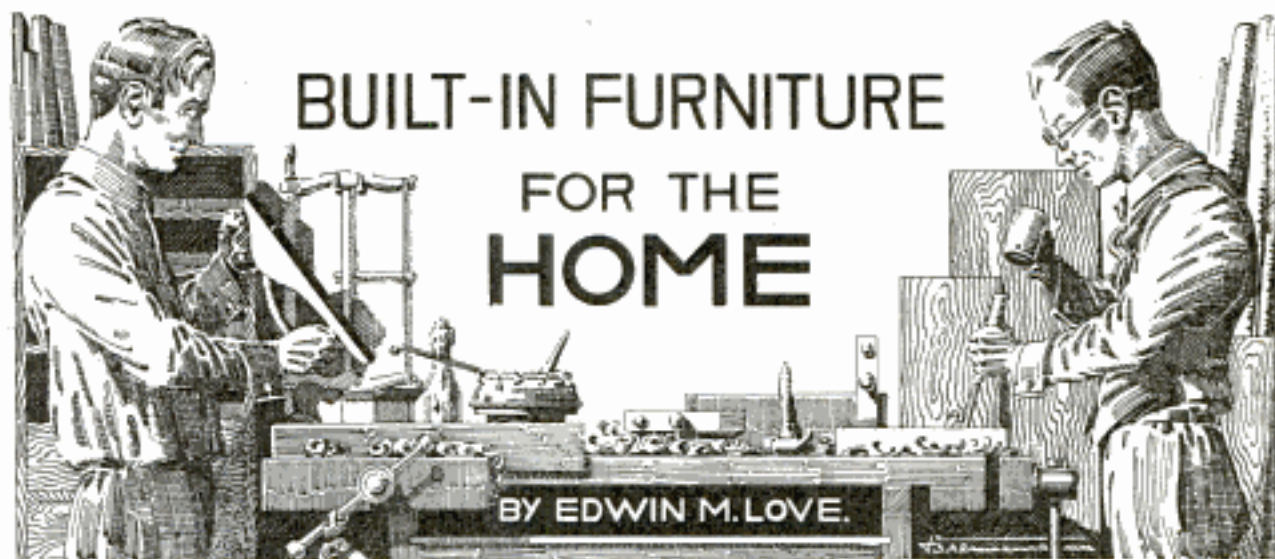
wet liner shown in the drawing, a simple machine that will make a durable smooth-edged line when thoroughly dry. The tank is made of galvanized sheet iron; it is about 24 in. long, 10 in. wide and 12 in. high, and is supported on a low three-wheeled wooden truck. The wheels are about 8 in. in diameter and 2 in. thick. A handle is fitted on the truck and is supported by a flat-metal bracket. In the top of the tank is a strainer and lid which hooks on the edge of the tank. A gas cock is soldered in the bottom, flush on the inside, and a two-piece sheet-metal trough or distributor is nailed to the bottom of the truck directly under the cock. The lower details show how the distributor is cut and bent. The cock is opened and closed by means of two metal rods pivoted end to end, the shorter one being bent around the handle of the cock. The longer rod is bent to form a finger grip

Never try to mark dry earth, as the solution will roll instead of adhering to the earth. After a few trials anyone will be able to make a smooth line.—Leroy Cox, Placentia, Calif.

Preventing Solid-Tire Wheels from Slipping

The cook at the navy-yard hospital at Charleston, S. C., has perforated solid tires on his truck. One day he got stuck in the mud and had a hard job getting out, so I sawed up a couple of old broomsticks into 8-in. lengths. These are stuck through the holes in the tires when the roads are muddy, or muddy spots are likely to be encountered, and he hasn't had any trouble since, as these sticks are very effective in preventing the wheels from slipping in the mud.—Harry W. Yeager, Charleston, S. C.





BUILT-IN FURNITURE FOR THE HOME

BY EDWIN M. LOVE

Part VII—A Bathroom Cabinet

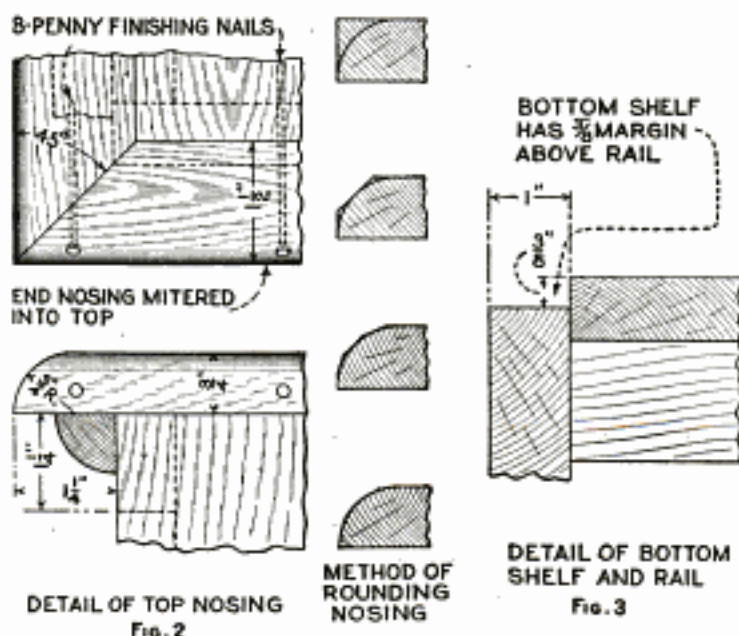
THE modern bathroom is incomplete without a linen cabinet of some kind. The dressing table illustrated is not only very useful as a storage place for towels, shaving supplies, and other bathroom accessories, but is unusually well proportioned and neat in appearance. Preferably it is built in combination with the medicine chest, the mirror door of which is the correct height for the use of a person seated at the cabinet, while not too low for convenient use for the man who prefers to shave standing up. However, if the bathroom is already equipped with a medicine case, the dressing table may be

built without it. The cabinet is 2 ft. 7 in. high to the main top, 4 ft. 6 in. long and 1½ ft. in depth. The edges of the board partitions form drawer and hanging stiles, thus making the construction very simple. Lay out on the back and end walls the levels for the cleats, which are all of 1 by 2-in. stock,

except for those near the floor. The top cleat at the back is 4 ft. 5¼ in. long, and its mate on the end wall, which butts against it, is 1 ft. 3¾ in. A like cleat, ¾ in. longer, is nailed 12½ in. below it, and resting on the floor a third, ¾ in. wide. The front ends must be plumb on the wall.

A ¾ by 1½-in. stile is then nailed to the wall, bearing against the cleats; and since it is likely to come between studs, it must depend temporarily on the cleats for its support. It is wedged to plumbness if the wall is out. The tops of the drawer cleats are spaced 1 ft. 1¼ in. and 1 ft. 10⅞ in. above the floor, and are 1 ft. 3½ in. long, the right-hand ends coinciding with a line plumbed ¾ in. beyond the end of the top cleat. On the floor, square lines from the wall locating the bottom of each partition, and lining to the insides, nail cleats of 1 by 2-in. stock to the floor. The one for the right end of the cabinet must extend 1

ft. 5 in. beyond the plaster, and the other two must just meet a line drawn on the floor from the end of the first cleat to a point 1 in. behind the front edge of the hanging stile on the end wall. Glue up the partitions from 1 by 10-in. stock, cutting them roughly to 2 ft. 6 in. in length, and driving three



corrugated fasteners across the joints on the back. Lay aside to dry, and glue up the top, using a 1 by 10-in. and a 1 by 12-in. board, cut to 4 ft. 9 in. in length. Also glue up 10-in. stock for shelves.

If the medicine cabinet is to be built, it is now time to cut the opening in the

plaster. Plumb a line from the center of the dressing table layout on the back wall, and locate a point 3 ft. 1 $\frac{3}{4}$ in. above the floor. With this as a base, center a rectangle, 24 $\frac{1}{2}$ in. wide by 3 ft. high, on the line, making it plumb and level. Remove the plaster within and saw out the laths. Cut off the studding thus exposed. This is difficult and tedious, but can be done by careful work without cracking the plaster on the other side of the partition. Square lines on the studding, and saw in as far as possible. Split out as much as possible of the piece to be removed, and then finish cutting off by alternately cutting to the line with a chisel and splitting out the waste. Cut off the lath nails and cut in the head trimmers, as shown in Fig. 1.

If one stud is not placed to act as a side trimmer, two studs may have to be removed, in which case neither end of the head trimmer can be nailed; but it must be spiked to the short studding above and below. Nail in side trimmers where required, keeping them 1 ft. 11 in. apart, and plumb. Nail the loose ends of the lath to these.

Stand the left partition against the wall in the floor position, and scribe to the floor and wall. After ripping, fit carefully to the wall and tack in place. Then plumb up from a point 1 in. in front of the line on the floor, level the top line from the upper edge of the top cleat, and level the top line for the shelf cleat from the cleat already in position on the end wall. Remove the partition, and cut to size. If the builder is very skillful he can speed up this operation by setting his scribes to the exact distance necessary to reduce the par-

tion to width when scribed to the wall, but in this case the front edge must first be carefully plumbed. Nail on the shelf cleat, keeping the front end 1 in. behind the front edge of the partition, but do not glue, as in that case shrinkage will check the wide board. If necessary, clamp the cleat to the board while nailing to take out any warp. Drive the nails at various angles to get a dovetailing effect. The other partitions are fitted in like manner.

Nail the partitions in place and brace the front edges by tacking a strip across them all. Test the tops for alinement and cut in the rails. Notice that the upper door rail is 1 in. wide, while the two other top rails are 1 $\frac{1}{4}$ in., making the top of the door line with the top lips of the drawers. Nail into the ends of the rails through the partitions with six-penny finish nails. The drawer rails must be level. The center cleat above the top drawer is 1 $\frac{1}{4}$ in. wide and prevents the upper drawer from sagging when opened. Fit the shelves, notching them around the upright stile on the wall, but keeping them back from the front 1 in. for the thickness of the door. If desired, they may be placed before putting up the partition.

The lower rail for the shallow center drawer is $\frac{5}{8}$ in. thick by 3 $\frac{1}{2}$ in., width horizontal; and slide cleats nailed to the partitions are notched underneath to strengthen the joint.

The elliptical brackets are laid out as shown in the diagram, Fig. 7. Using a string, or better, a fine wire looped at both ends with a total length of 1 ft. 6 $\frac{1}{2}$ in., the length of the long diameter AB, strike arcs through this diameter with one-half

MATERIAL LIST

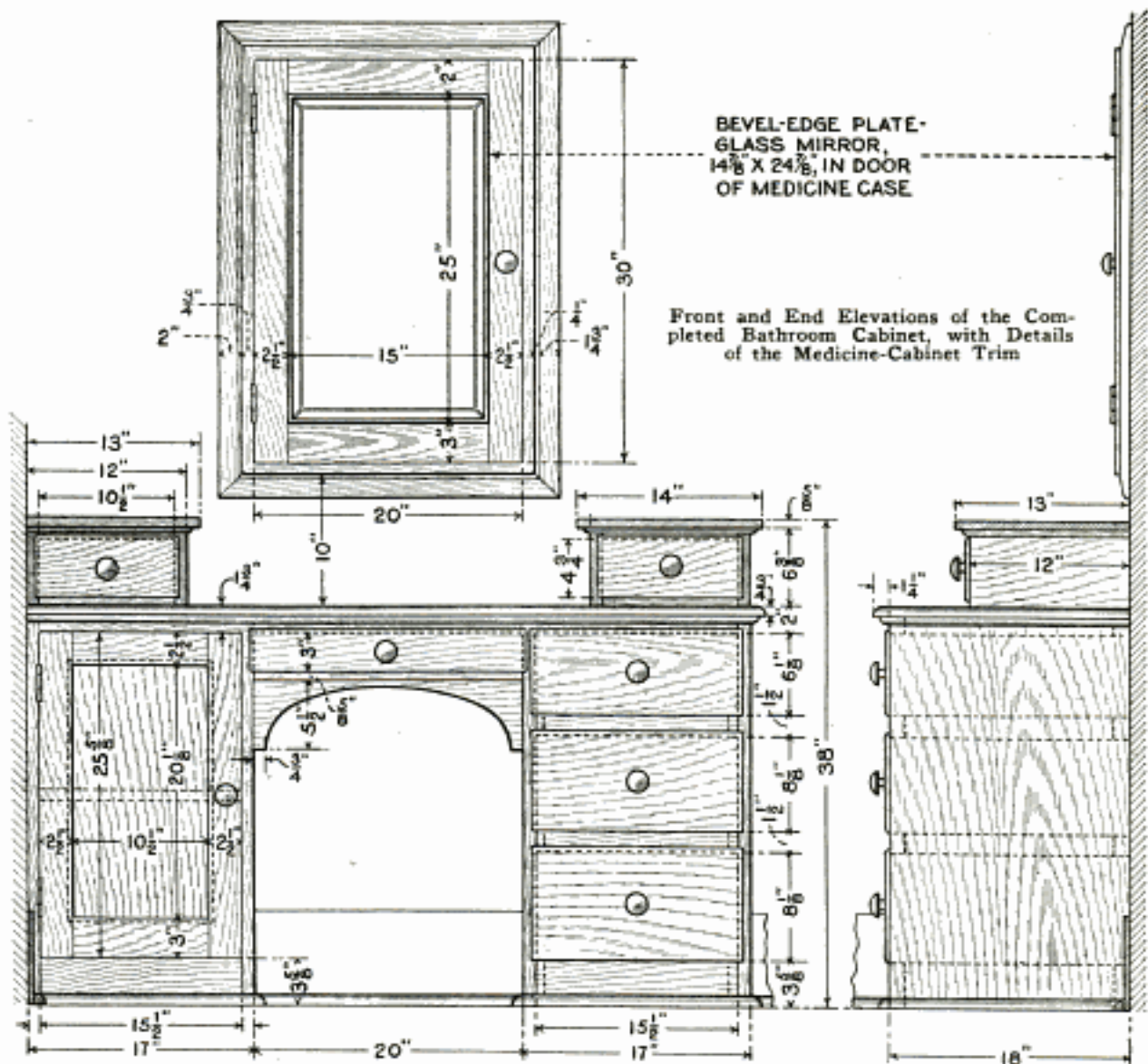
Dressing Table

1 piece, 1 $\frac{3}{4}$ by 4 in. by 3 ft., pine or fir, S4S, sanded.
 1 piece, 1 $\frac{3}{4}$ by 3 in. by 6 ft., pine or fir, S4S, sanded.
 1 piece, 1 by 2 in. by 10 ft., pine or fir, S4S, sanded.
 2 pieces, 1 by 2 in. by 12 ft., pine or fir, S4S, sanded.
 1 piece, 1 by 2 in. by 6 ft., pine or fir, S4S, sanded.
 1 piece, 1 by 3 in. by 4 ft., pine or fir, S4S, sanded.
 2 pieces, 1 by 10 in. by 16 ft., pine or fir, S4S, sanded.
 1 piece, 1 by 12 in. by 10 ft., pine or fir, S4S, sanded.
 1 piece, $\frac{3}{8}$ by $\frac{3}{4}$ in. by 8 ft., base shoe.
 1 piece, 1-in. quarter round, 8 ft.
 1 piece, $\frac{1}{2}$ -in. quarter round, 6 ft.
 1 piece, 1 by 4 in. by 2 ft., drawer front.
 1 piece, 1 by 6 in. by 2 ft., drawer front.
 1 piece, 1 by 7 in. by 2 ft., drawer front.
 1 piece, 1 by 8 in. by 2 ft., drawer front.
 1 piece, 1 by 9 in. by 2 ft., drawer front.
 1 piece, $\frac{3}{8}$ by 9 in. by 14 ft., drawer side.
 1 piece, $\frac{3}{8}$ by 6 in. by 6 ft., drawer side.
 1 piece, $\frac{3}{8}$ by 4 in. by 4 ft., drawer side.
 1 piece, 1 by 2 ft., $\frac{3}{8}$ -in. three-ply panel veneer.

1 pair 2 $\frac{1}{2}$ by 2 $\frac{1}{2}$ -in. hinges.
 1 piece, $\frac{3}{4}$ by 6 in. by 14 ft., T & G pine, drawer bottom.
 1 piece, $\frac{3}{4}$ by 6 in. by 16 ft., T & G pine, drawer bottom.
 7 1 $\frac{1}{4}$ -in. glass drawer pulls (knobs).
 1 frog catch.
 Cost of materials, about \$9.50.
 Time to build, about 20 hours.

Medicine Case

1 piece, 1 $\frac{3}{4}$ by 3 in. by 8 ft., pine or fir, S4S, sanded.
 1 piece, 1 $\frac{3}{4}$ by 4 in. by 2 ft., pine or fir, S4S, sanded.
 1 piece, 1 by 6 in. by 10 ft., pine or fir, S4S, sanded.
 1 piece, $\frac{3}{4}$ by 6 in. by 8 ft., pine, drawer bottom.
 1 piece, $\frac{3}{8}$ in. by 3 by 3 ft., three-ply pine panel veneer.
 1 pair 2 $\frac{1}{2}$ by 2 $\frac{1}{2}$ -in. loose-pin butts.
 1 1 $\frac{1}{4}$ -in. glass drawer pull.
 1 frog catch.
 1 plate glass mirror, 1 ft. 2 $\frac{3}{4}$ in. by 2 ft. $\frac{7}{8}$ in.
 Cost of materials, about \$6.00.
 Time to build, about 7 hours.



the string as a radius and the upper point of the curve as a center. Drive brads at these intersections, loop the ends of the string over them and trace around with a pencil, which will give a sufficiently true ellipse. Cut out with a compass saw or by kerfing with a handsaw to the line and chiseling out the waste, finishing with spokeshave, rasp and sandpaper. When placing them set back $\frac{1}{4}$ in. from the face edges of the partitions and the rail.

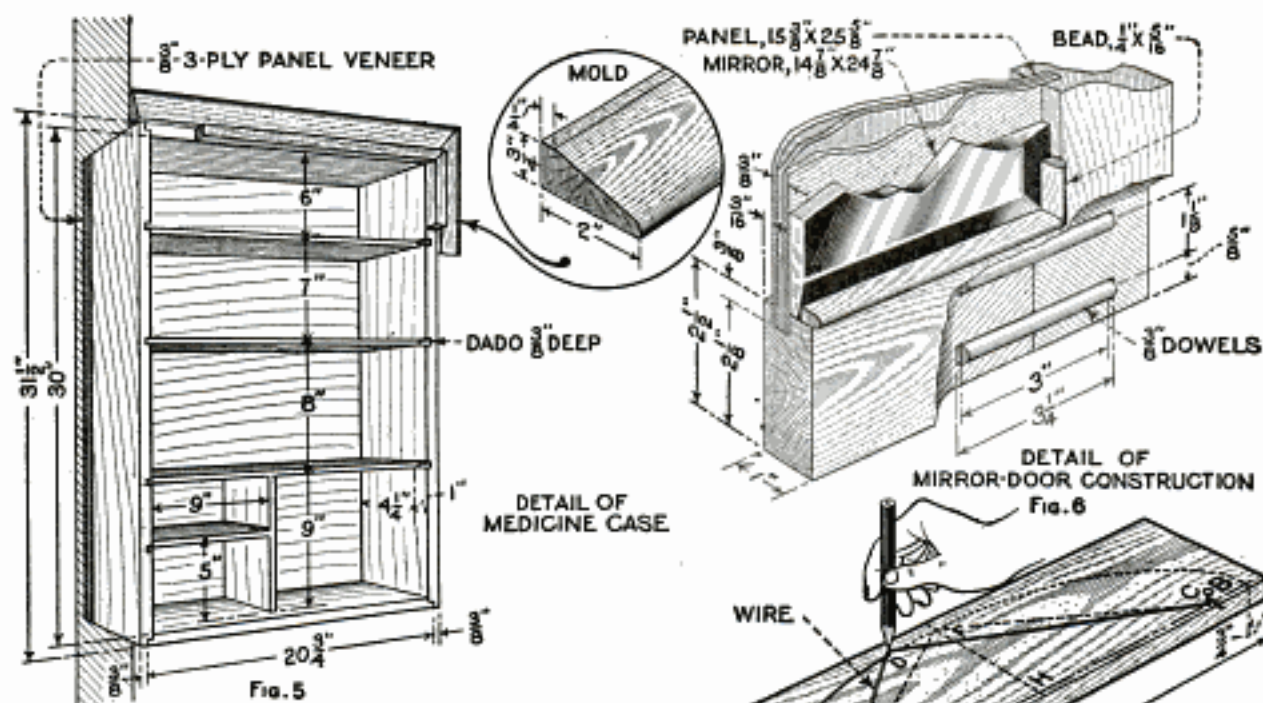
Scribe the top to the end wall and then to the back, and when fitted in position, mark the projection of end and front from the cabinet itself. Remove and miter into the end of a strip, $1\frac{1}{2}$ in. wide, as shown in the detail Fig. 2. Finally, round off the edge and nail into place.

The little drawer boxes on top are built in much the same way as the main cabinet. That is, the sides must be scribed to the table top and the walls, and bottom cleats must be supplied to act as drawer slides and to prevent warping of the sides. The

upper slides are kept flush with the lower edge of the upper rail. Make the tops $\frac{5}{8}$ in. thick with a 1-in. projection in front and at the ends, and miter around underneath a $\frac{1}{2}$ -in. quarter round.

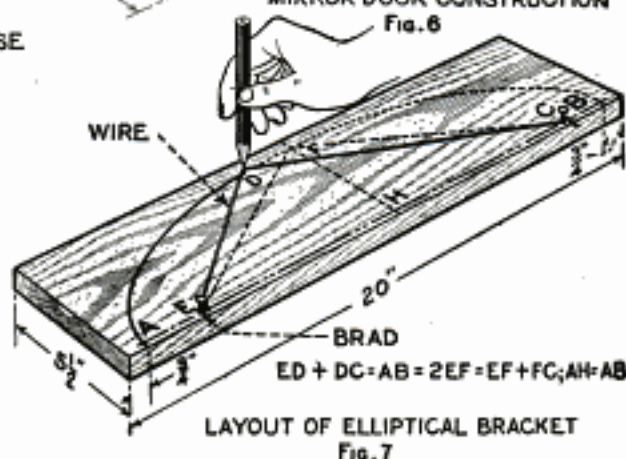
The drawers are made $\frac{1}{8}$ in. narrower than the openings and $\frac{1}{16}$ in. shallower for clearance, and have $\frac{1}{4}$ -in. lips, $\frac{3}{8}$ in. wide, on tops and ends of fronts, which close over the rails and stiles. Since the amount of material for the sides is so small, the material for the deep drawers is ordered 9 in. wide and ripped down to the required width. Rabbet the sides into the fronts and the backs into the sides, assembling the drawers and then sliding the bottoms in. Square carefully and tack brads through the bottoms into the sides to prevent racking. The side partitions and cleats serve as guides, so no strips on the bottoms of the drawers are required.

Build the door of $1\frac{1}{8}$ by 3-in. stock, sized to 1 by $2\frac{1}{2}$ in. for the stiles and upper rail, with the lower rail 3 in. wide, net. Cut



the panel $11\frac{1}{8}$ in. by 1 ft. $9\frac{3}{8}$ in. Surface down until the door has a clearance of $\frac{1}{16}$ in. on the shelves when hung. The hinges are lined with the inside edges of the rails and project $\frac{1}{2}$ in.

The medicine case is simply built of 1 by 6-in. stock, which, when jointed up, is $5\frac{1}{4}$ in. wide. The top and bottom, 1 ft. $8\frac{3}{4}$ in. long, fit in rabbets $\frac{3}{8}$ in. deep in the ends of the sides, the latter being 2 ft. $7\frac{1}{2}$ in. in length. The three long shelves, made of drawer-bottom material, are housed in dados, $\frac{3}{8}$ in. deep, and are therefore the same length as top and bottom. The short partition butts against the shelf above, but dados into the bottom, while the short shelf butts against it and dados into the side. Assemble the frame, nailing the corners in both directions, tack a brace across the front, and size the back edges to alinement, afterward nailing on a back of $\frac{3}{8}$ -in. three-ply panel veneer. Set the box plumb and centered in the opening in the wall with an equal projection all around, and wedge tight for nailing into



the studding with eight-penny finish nails. Make a plain mold similar to the detail and miter it around the case, fitting the thick edge against it. Round off the case corners. The mirror door is of the same construction as the dressing-table door, except that the panel groove is cut $\frac{3}{16}$ in. from the back edge, so that there will be room in front of the plate glass mirror to tack the retaining bead of $\frac{1}{4}$ by $\frac{5}{16}$ -in. pine. Before setting the mirror, paint the back edge of the mold, as this is reflected in the glass.

As with all other cabinets, sand thoroughly before finishing, remembering that the slightest scratch or hammer mark shows plainly when varnished or enameled.

Proper Care of Rubber Goods

There are two agencies that hasten materially the deterioration of rubber articles—heat and sunlight. At 160° F. articles that would otherwise last five or ten years are destroyed in a few weeks, and at higher temperatures the action is even more rapid. This explains the rapid deterioration of waterproof coats, hot-water bags, etc., which are thrown over steam radiators or hung over hot-air reg-

isters to dry. In direct sunlight, rubber bands that would ordinarily last from four to six years become useless in three months. The ideal storage place for rubber goods, therefore, is a cool, dark place.

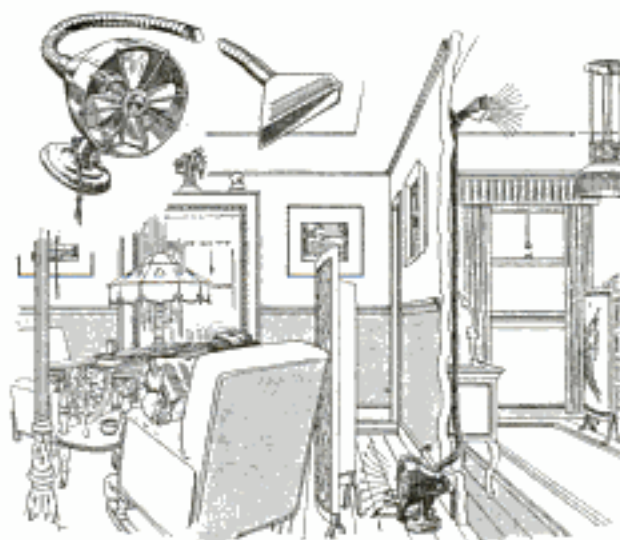
Oil has also a serious effect on rubber. It is absorbed by the rubber, and in a short time produces a soft spot. It is, therefore, of the utmost importance to remove any oil from rubber goods as soon as possible, and it pays to see that the two do not come in contact at all.

Wood for Shingles

The wood used for shingles must be very durable because they are usually exposed to the weather without paint covering or other preservative treatment. Cedar, cypress and redwood shingles give excellent results, although pine shingles have been known to last for many years. Fresh redwood shingles discolor the rain water that passes over them, and the cedars give it a disagreeable taste, but, after a few rains, the leaching ceases, and the shingles no longer impart any objectionable qualities to the soft water for the cistern.

Electric Fan Distributes Heat

During spring and autumn when the furnace is not used constantly, the mornings and evenings are apt to be rather cool, and it is then uncomfortable to sit in the living room without additional heat. When the kitchen stove is on and the kitchen is kept warm, it is an easy matter to bring the heat into the living room by the arrangement shown in the drawing. All that is needed is an electric fan, a vacuum-cleaner hose, about 10 ft. long and a large tin funnel. The latter is attached to the rear end of the fan and one end of the hose attached to the funnel, after the spout has been removed. The hose is brought through the wall and fastened to the wall of the kitchen near the ceiling. The fan is then started and it will draw the warm air from the kitchen, which will soon remove the chill in the



Electric Fan and Vacuum-Cleaner Hose Leading to Kitchen Remove Chill from Cold Room

adjacent room. To avoid a direct draft, a screen may be placed in front of the fan.—G. G. Grose, McComb, Ohio.

Blueprinting on Letterheads

Nearly every amateur photographer, after he has progressed beyond the stage of having a professional finisher make his



Blueprinting on Letterheads Can Be Done at Home by Simple Process

prints, desires some method of expressing his own individuality, but is deterred from attempting gum prints and other advanced artistic forms by the complicated processes involved. However, very pleasing prints on letterheads, wood and even on cloth can be made by the following method. Obtain a yard of ordinary slow-printing blueprint paper and then, working by the light of an oil or electric lamp with the paper shielded from direct rays, swab a portion of the surface with a tuft of absorbent cotton moistened with water. When sufficient solution has been taken up to transfer to the letterhead or other object upon which the photograph is to be printed, carefully swab that surface with the saturated cotton till the solution is drawn into it, working in such a manner that no streaks will be visible. After this is done, place the sensitized paper, wood or cloth in a dark closet to dry, and the next day print in direct sunlight until the shadows are well bronzed. Then wash in plain water and a pleasing print in deep blue will result. If the blue color is objectionable, it can easily be changed to a brown tint. This is done by first bleaching the image in a solution of household ammonia and then redeveloping it in a weak solution of tannic acid.—John D. Mayer, New York City.

Fitting the Outboard Motor for Cruising



By John Edwin Hoag

THERE are several hundred thousand users of outboard motors, all of whom are interested in getting the most for the smallest investment, as well as getting maximum service out of their motorized rowboats. The writer has done a great deal of boating with outboard-motor boats, including some lengthy cruises in quiet inland waters as well as at sea. In doing this, he has learned a great deal concerning the limitations of such low-powered water craft, as well as about the wide range of use such boats may have by the adaptation of certain homemade mechanical features to overcome limitations.

The average outboard motor has a fuel capacity of about a gallon—sufficient only for about two hours of operation with the motor at full throttle. Obviously, that fuel capacity is not satisfactory for lengthy cruises. Frequent refueling is undesirable largely because all outboard motors are two-cycle engines, which necessitates careful mixing of the lubricating oil with the gasoline. Of course, a quantity of ready-mixed fuel may be carried in the boat, but the transferring of this from container to motor tank is always a nuisance. To overcome this objection, I fitted my boat with a regulation Ford-car oval tank, having a capacity of approximately 10 gal. This tank is placed under one of the seats in the boat. The gasoline line to the motor is a copper tube, with a final 12-in. length of flexible metal tubing for connecting with the motor. The flexible tube reduces the risk of a broken gas line and leakage that might result from motor vibration. Gasoline mixed with lubricating oil won't

flow uphill, so a leather gasket is fitted under the filler cap of the 10-gal. tank to make an air-tight joint. An ordinary automobile tire-valve stem is soldered into the top of the tank, and a little air pressure furnished with a few strokes of an auto tire pump moves the gasoline to the motor. A shut-off valve is placed in the line where the flexible tube joins the tank of the outboard motor. This valve is kept closed except when refueling the motor. When refueling is desired, all that's necessary is to open the valve. The air pressure feeds the fuel into the tank of the outboard motor, and when the fuel begins to squirt out of the air vent, the motor tank is full. The valve in the line is then closed, and there's no more fueling trouble for another two hours, and then only a valve to be opened. The 10-gal. tank provides fuel capacity for twenty hours of cruising at full speed (six to eight knots), or for a distance of approximately 125 miles. There's no fuss, no muss, and no bother about this fuel system, and there is a substantial reduction in the fire hazard as compared with the old method of handling gasoline in open measures, slopping it about the boat, etc. If the outboard motor is to be removed, all that is necessary is to release the air pressure in the main gasoline tank, and disconnect the flexible line from the motor, about a two-minute job.

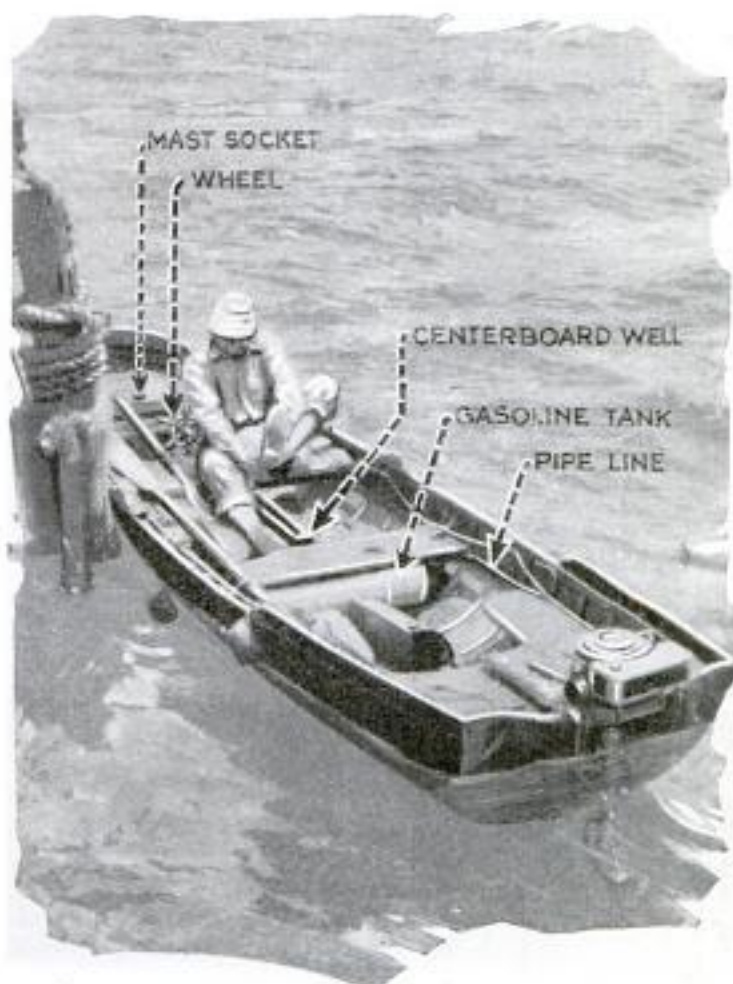
Many hours of cruising served to demonstrate that the noise, vibration and work of driving the boat from the rear seat, with one hand on the outboard-motor tiller handle continuously, consti-

tute a severe nervous strain. Also, the rear seat is by no means the most advantageous position from which to manage a boat because the steersman cannot see where he is going nor can he look out for floating seaweed, sedge grass, or fixed or floating obstructions that may be the cause of trouble. The logical place for the pilot when handling any kind of a boat is in the bow. Moreover, the average small boat makes better speed when the bow is loaded down than when it is high. A small yacht steering wheel was therefore obtained and mounted on a thwart between the forward gunwales, as shown in one of the accompanying photographs. Lengths of white line run from this steering wheel through gunwale pulleys, and are lashed to the outboard-motor tiller handle. Two lengths of copper wire and a push button provide a cut-out which can be operated at any time from the pilot seat to stop the motor. With this arrangement, the boat is steered from a comfortable upholstered seat well forward, away from the noise and vibration of the motor. The pilot sees where he is going, the bow is kept down as it should be and there's no strained or unnatural position to be occupied for hours at a time. After having accomplished these improvements and finding them thoroughly satisfactory, there was still one more alteration of vital importance to be made. That was some method for protecting the motor from moisture and spray when navigating in rough waters. The outboard motor will go out of business instantly if a good dousing of spray descends upon it. When it gets wet, its ignition system is shorted, and when this happens the motor

is done. It rains in most parts of the earth where these motors are used, and even the most placid lake of any considerable area can kick up enough of a sea in the right kind of a wind to stop the average outboard motor when a douse of spray comes over the bow.

The writer went to work with a few carpenter's tools, some white lead, and paint; did a little careful work and completed the water-tight motor cover shown in some of the illustrations. The thing is ridiculously simple, being nothing but a water-tight box with a hinged lid, built to fit over the motor and into the stern of the boat. When put over the motor it holds itself in place by being carefully fitted into the gunwales and stern of the boat. It is additionally secured, however, by means of four copper screen-door hooks. This cover can be applied or removed without disturbing the motor. Likewise, the application or removal of it can be done either on shore, or from the cockpit of the boat when in open water. By having the top of the box hinged, the lid can be raised to make the motor accessible for starting or for adjustments.

Tiny scuppers are cut into the wood where the lid parts join the main body of the box to carry off any water that might otherwise get to the motor through the joints. Some difficulty was experienced in keeping water from splashing up under the stern of the boat and getting into the motor when running before a following sea. This trouble, however, was overcome by providing a canvas "petticoat." This is a piece of canvas fastened to the rear of the motor cover with copper



General View of the Boat with the Motor Housing Removed, Showing the Gasoline Tank and Pipe Line and the Steering Wheel



Above, the Motor Housing Is Opened to Start the Engine; the Housing Is Removed Merely by Releasing a Few Hooks; Left, Cruising with the Housing Closed, and Right, View over the Stern, Showing the Canvas "Petticoat"

tacks. The lower end of it has a tunnel seam carrying a length of white line which is secured around the motor driveshaft frame. The whole assembly gives absolute protection to the motor, and keeps it dry and functioning, regardless of rains or troubled waters.

Although this boat is only 16 ft. long, and was intended for use only in quiet, protected waters, it is, with these improvements, a genuine little sea-going outfit. It has been up and down the coast for several hundred miles north and south of Los Angeles, and well out to sea on fishing trips when the Pacific has been just as rough as it ever gets. It has weathered storms that have caused other and bigger boats to seek friendly harbors. Its most recent accomplishment was a 200-mile cruise among the islands of the Santa Barbara group in the open Pacific off the coast of Southern California. On this occasion, the boat, carrying its owner, his companion, and 800 pounds of equipment, or a total load of more than half a ton, crossed stretches of open sea the longest of which was nearly 50 miles. Furthermore, during this cruise the boat had to be navigated by regulation deep-sea methods, being frequently 20 to 25 miles from the nearest land, and out of sight of land for a total period of approximately 20 hours—all this without a single motor failure nor any incident that could be termed as particularly thrilling, aside from a world of wholesome pleasure and enjoyment.

Preventing Auto Headlights from Rusting

Headlight glasses occasionally have to be removed and one often finds that this is a rather difficult task, due to the rust between the lamp and the rim of the glass, which may make it necessary to break the glass before the rim can be removed. The same trouble is sometimes experienced when the conductor plugs are detached from the headlights. To prevent this a little cup grease should be applied between these parts at the points indicated in the illustration. Although this expedient saves a lot of time and trouble most car owners neglect this entirely.



Springs on Bicycle Fork Make Riding Easier

Shock-absorbing springs attached to the front fork of a bicycle, as shown in the

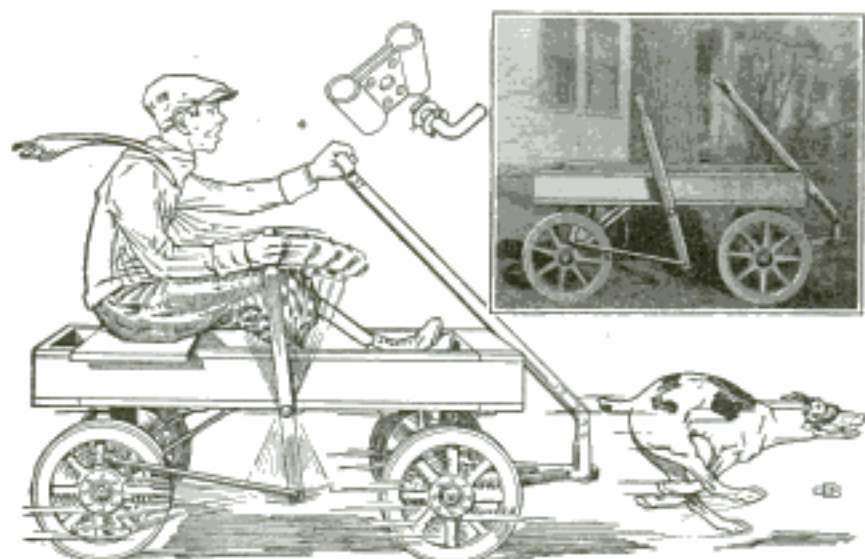


Extra Fork and Springs on Bicycle Reduce Vibration of Handlebar and Make Riding More Comfortable

drawing, will make riding over rough roads much more comfortable. On bicycles equipped with a small motor such an attachment is of special value. It consists of a length of $\frac{1}{4}$ -in. flat iron, about 1 in. wide, bent to a U-shape to fit over the front wheel as shown, and two screen-door springs. Holes are drilled at the ends to fit the hub axle and to take the bearing bolts, which hold it to the ends of the fork. Obviously, the nuts on these bolts must not be drawn up tightly but must be just loose enough to permit the piece to pivot freely on the forks, the nuts being pinned in place with cotter pins. It is still better to provide a sleeve around each bolt and then draw the nut up tight. Ordinary screen-door springs are attached to the handlebar with heavy wire hooks and also to the extra fork, holes being drilled to permit this. The distance from the hub-axle holes to the bolt holes should not be more than 2 in. to avoid undue strain on the springs.

Driving Coaster by Hand

A simple attachment on a coaster, as shown in the drawing and photo, can easily be made by any boy from material



Simple Attachment on Coaster Wagon Permits Driving It by Hand at Considerable Speed

that can readily be obtained anywhere. A heavy flat-iron clamp made in two parts to fit over adjacent spokes on the right rear wheel is screwed together and a hole is drilled through it to receive the end of a connecting rod, which is made of $\frac{1}{2}$ -in. round iron and bent at the end to run free of the wheel hub. A washer and pin are provided on each side of the clamp to hold the connecting rod in place, and a wooden handle, such as a length of broomstick, is pivoted to the side of the cart and to the other end of the connecting rod as shown. The upper part of the handle should be of sufficient length to permit the driver to slide his hand up or down until he finds a point where the propelling action is smoothest.—Loy E. Owen, College View, Nebr.

Substitute for Phonograph Diaphragm

The diaphragm of my phonograph reproducer was broken accidentally at a time when I expected to entertain visitors. In the emergency, I obtained an old photographic cut film and made a substitute which proved entirely successful. I traced around the broken diaphragm, cut out one of similar size from the film and drilled a hole in the center. The disk, thus made, was placed on the reproducer and the stylus bar connected to the diaphragm with a small screw.—Henry B. O'Connell, New Haven, Conn.

How to Apply Adhesives

In general, the surfaces to which adhesives are to be applied should be dry and free from grease or other impurities.

If the material is very porous, it may be necessary first to fill the pores by applying one or more preliminary coats of the adhesive, allowing each coat to sink in. The final coat must be put on very thinly and the surfaces to be joined pressed into the very closest possible contact. This applies especially to wood, china, etc., and joints made in this manner will be stronger than if a thick layer of the adhesive were applied.

Many adhesives can be kept for a long time without impairment of their strength, if they do not

decay or become moldy; others should be used as soon as possible after they are prepared. Some, which must be warmed before applying, often dry out or become stiff and should be mixed with water to give them the proper consistency.

Cleaning Stovepipes

Pounding stovepipes to remove the soot accumulated in them during the winter is ineffective and injurious. A better way is to use the easily made cleaner shown in the illustration. It consists of a



length of spring wire formed to a double cone-shaped spiral, about 6 in. in diameter at its widest point, and attached to a discarded broomstick as indicated. By inserting the cleaner into the end of the pipe and moving it back and forth, the inside of the pipe is scraped clean in a few

seconds. It is the soot particles sticking to the inner surface that absorb moisture and cause rusting during the summer, and pounding will not loosen them.

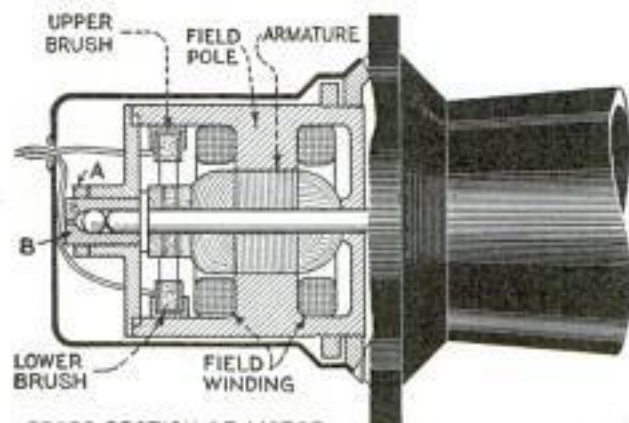
Auto-Horn Troubles and Remedies

By G. A. LUERS

AN electric auto horn is a needed accessory and must be kept in good condition. Still, because of constant use, it is apt to get out of order frequently. The trouble is usually easy to find and can readily be remedied by any driver or owner.

Every electric horn has a thin diaphragm, which is vibrated by mechanical means so that a sound is given off, the pitch of which depends on the rapidity of vibration of the diaphragm. Two methods are used to cause these vibrations, which divide electric horns into two classes, namely, motor-actuated horns and magnet-actuated horns. The cross-sectional view of these two types is shown in Figs. 1 and 3. The motor-actuated horn is the more expensive and is found on high-grade cars. It consists of a small motor on the shaft of which a toothed

wheel is attached so that the teeth strike against the end of a small button or pin on the diaphragm, as shown in Fig. 2. When the push button on the steering column is pressed, the motor is given a whirl, and the rapid succession of taps against the button causes the diaphragm to vibrate. The usual trouble experienced with such a horn is decreased intensity of sound. This is caused by slight wear of the button or teeth, and can be compensated for by moving the motor shaft toward the diaphragm just a trifle, so that the teeth will make closer contact with the button. This adjustment is made by loosening the locknut A, Fig. 1, and screwing in the adjusting screw B, which moves the armature. Care should be taken not to adjust it too tight, or the horn will not work at all. The current that the horn consumes varies from 3 to 8 amp., depending on the type of horn and its size. If more current flows than usual when sounding the horn, the bearings are perhaps dirty and are in need of lubrication. The oil hole should always be kept clean and a little thin oil applied about once each month. The armature, or movable part of the motor, should always turn



CROSS SECTION OF MOTOR-ACTUATED HORN
Fig. 1

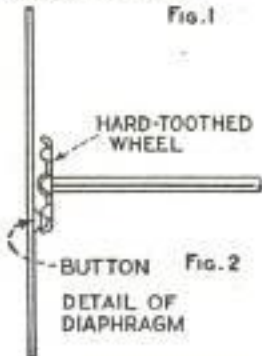


Fig. 2
DETAIL OF DIAPHRAGM

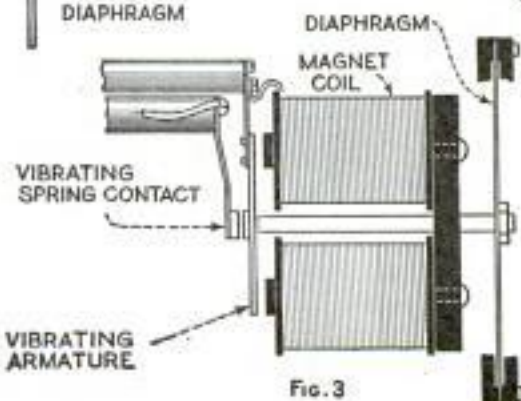


Fig. 3

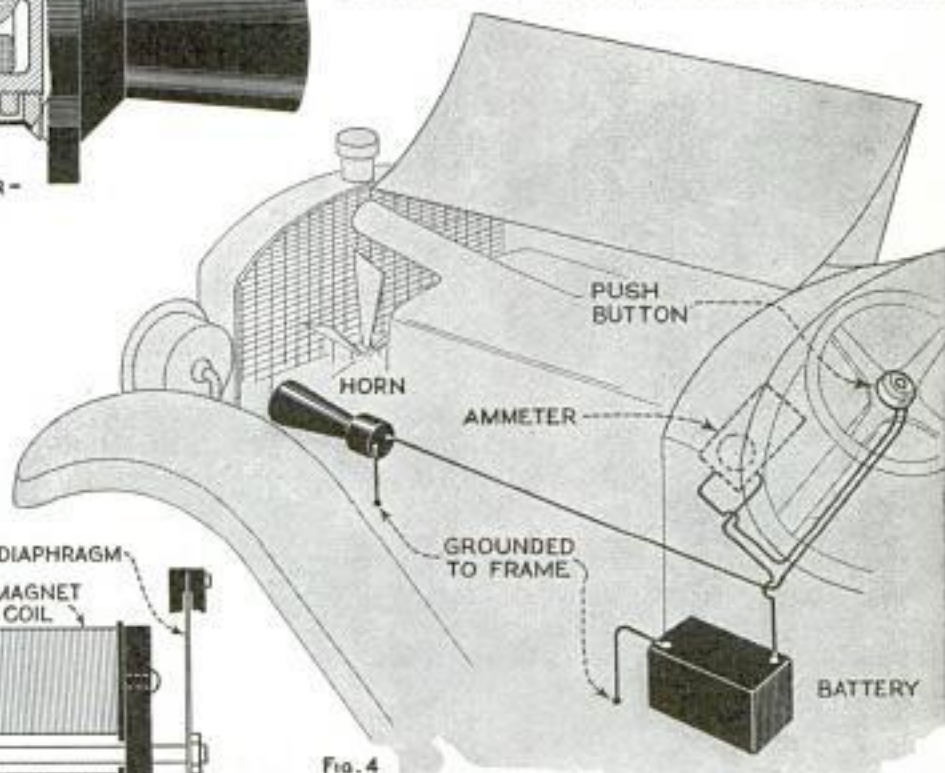


Fig. 4

Fig. 1, Motor-Actuated Auto Horn; Fig. 2, Diaphragm Vibrator in Motor-Actuated Horn; Fig. 3, Magnetic-Actuated Horn; Fig. 4, Actual Horn Circuit in a One-Wire System

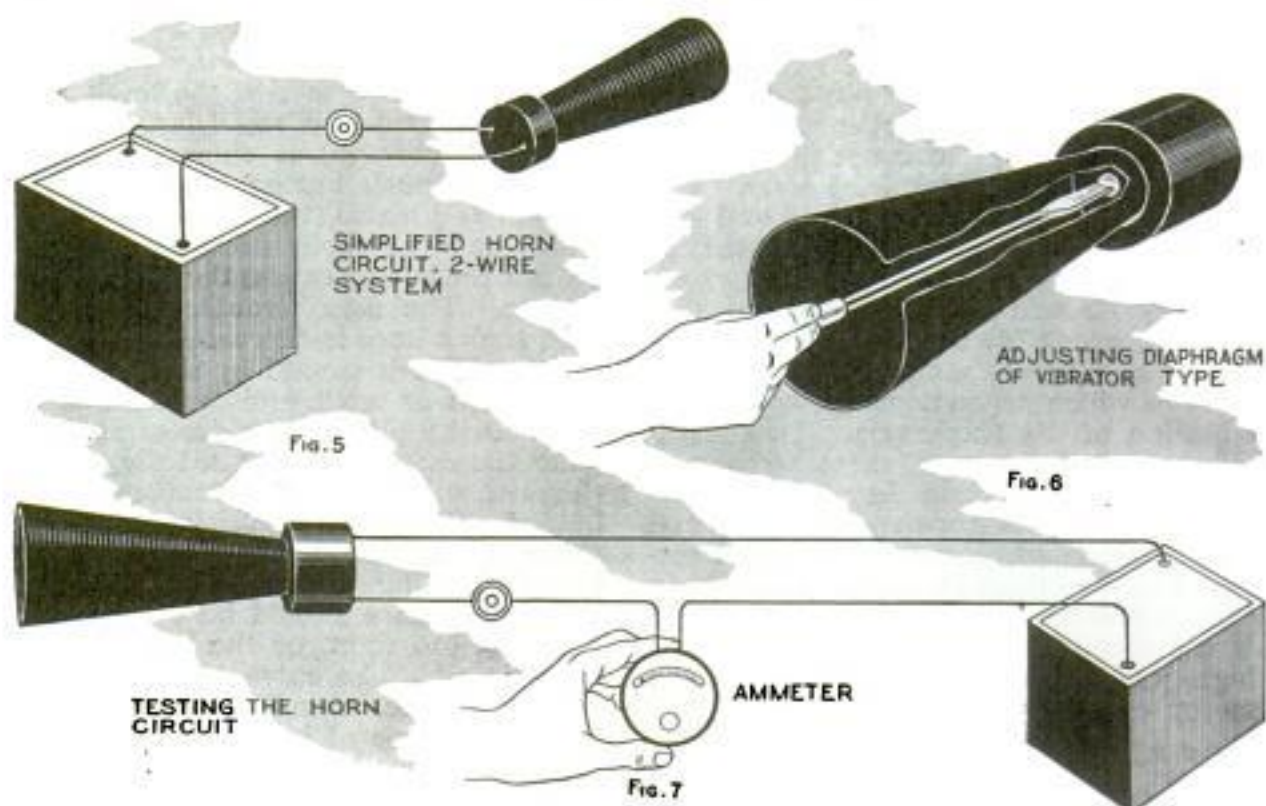


Fig. 5, Simplified Horn Circuit of Two-Wire System; Fig. 6, Method of Adjusting the Diaphragm of a Magnet-Actuated Horn; Fig. 7, Testing Horn Current Consumption in Absence of Dashboard Ammeter

easily when revolved by the fingers. The carbon brushes inside of the motor, which rub against the copper segments or commutator, should also be cleaned occasionally, as trouble will also be experienced when these are dirty. If the copper segments wear down faster than the mica insulating strips between them, the armature should be taken to a machine shop and the commutator dressed down on a lathe and made smooth with a strip of emery cloth.

The magnet-actuated or vibrating type of horn, shown in Fig. 3, is the more common type. It consists of a pair of small magnets, similar to those found in doorbells, and their action is also the same as the action of a common bell or buzzer, which is explained in an article on this subject on page 1013. In action, the armature vibrates and strikes against one end of a rod, the other end of which is screwed to the center of the diaphragm. The most common trouble experienced with this type of horn is also decreased volume and can be remedied by inserting a long screwdriver into the horn from the front and giving the screw on the diaphragm part of a turn, as in Fig. 6. The two points, one on the end of the spring contact and the other on the armature, make and break the current when the horn operates, and the tiny sparks between them tend to burn the contact surfaces, causing them to stick

and rendering the horn inactive. These should be cleaned to allow good electrical conduction. After some time the points, which should be made of platinum-iridium, may be so badly burned that they have to be replaced with new ones. Adjustment of the diaphragm should be made while the horn is operated until the right sound and volume are obtained.

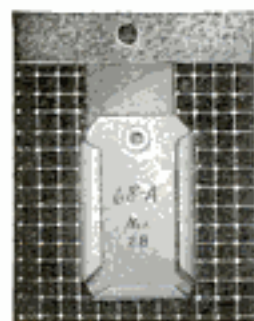
Another trouble often experienced in the horn circuit lies in the wiring to the horn. Breaks and shorts are liable to occur, and the only remedy is to trace the wires leading from the horn to the ammeter, push button and battery. An actual wiring installation of a horn circuit is shown in Fig. 4. This is a one-wire system. The current flows from the battery, through the ammeter and the push button, to the horn, returning to the battery through the frame, to which one side of the battery and the horn are securely grounded. If the wire is bare at any point and touches the metal on the car there will be a short circuit. This will not sound the horn, but will prevent it from functioning, and will discharge the battery in a short time. It often happens that such shorts occur only when the car is in motion, the vibration causing a bare spot on the wire to touch some metal part of the car. In this instance, the sudden increase in discharge shown on the ammeter indicates the trouble. Of course,

this may also be in other wiring, outside of the horn circuit. The remedy is to wrap friction tape over all bare places on the wires.

A frequent source of trouble, which prevents the horn from operating but does not show on the ammeter, is a break in the wire or a loose connection. A good method of finding the break is to take an ordinary doorbell, connect one binding post to the terminal of the car battery to which the wiring is attached, and the other binding post to a 10-ft. length of lampcord with a needle at one end. Then, beginning near the horn, prick the needle through the insulation of the wire to make contact with the conductor inside. The bell will not ring on the horn side of the break, but as soon as the break is crossed it will ring, which shows where the break is. Of course, during the test the push button switch should be kept closed. If no break is found and the bell will not ring at all, it is safe to conclude that the trouble lies in the push button. Push-button troubles on doorbells are enumerated on page 1014, and except for difference in construction the same remedies are applicable to auto push buttons.

Fig. 5 shows a horn circuit of the two-wire system. In this case, a separate wire is used for the return circuit instead of the frame of the car. On some cars the horn current is not indicated on the dashboard ammeter. The current flowing through the horn can then be determined by using a small pocket ammeter, connected in the horn circuit as shown in Fig. 7.

Tag Holder for Animal Cages



When guinea pigs, rats or other small animals are kept in cages, they have the habit of chewing the strings that hold the identifying tags. A little holder of galvanized iron, bent as shown in the illustration, prevents the animal from destroying the string or the tag,

and at the same time the latter can be readily removed and replaced.

Catching Small Mackerel and Blue Fish with Umbrella Swivel

A novel rig for use when fishing for small mackerel and blue fish which come into our bays in large numbers every year,



An Old Umbrella Frame Makes a Good Rig for Catching Mackerel

can be made from an old umbrella frame. First remove the handle and fasten a small swivel to the thin steel rod in its place, then attach a No. 3 Carlisle or similar hook with a long shank to the end of each rib. After baiting the hooks with killies for small blue fish, or with a bait made up of oil sardines mixed with flour and cotton batting for mackerel, suspend the rig from the end of a stiff rod and lower into the water not deeper than 8 ft. Do not be in a hurry to draw in your line when the first fish bites, for the theory is that when the first fish is hooked, he will begin to swim around in a circle, pulling the outfit around with him and attracting additional fish which will be more eager to catch the moving bait.—John D. Mayer, New York City.

Tools for the Home Handy Man

Have you ever started on a job around the house and had to stop two or three times during the work to buy or improvise tools before you could finish it? If you have—and who of us has not?—you will be interested in the article on tools for the home in the forthcoming August issue of Popular Mechanics. The tools described have been selected from the equipment of Popular Mechanics model workshop, and include all the home owner will need to do any ordinary job around the house, with valuable hints on their care and use.

Three-Sided Pan for Baking Cookies

Ever on the alert for methods of decreasing his labors, a baker found that a three-sided pan, which would cover the bottom of his oven, was a timesaver in baking cookies. The pan was made of medium-weight sheet iron. When the cookies are done, they are transferred to the pastry

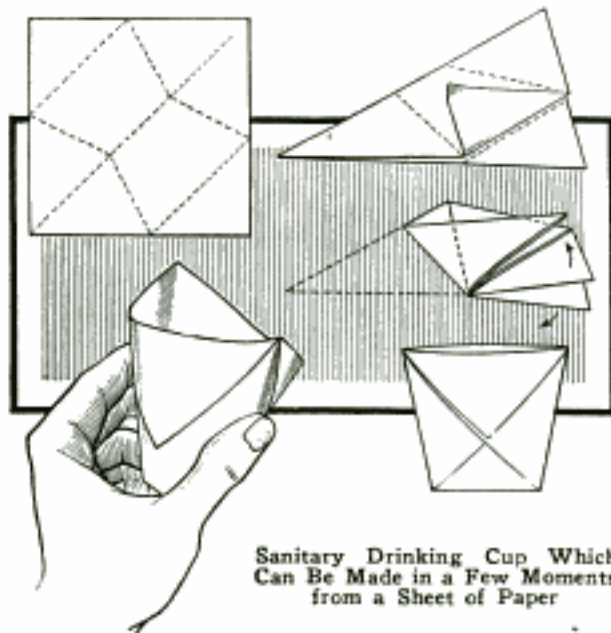


Three-Sided Pan Aids Baker in Transferring Cookies from Oven to Pastry Board

board, quickly and easily and without breakage, by sliding them off the pan, as shown in the drawing.—G. E. Hendrickson, Argyle, Wis.

Sanitary Paper Drinking Cup

When a drinking cup is wanted where there is none at hand, one that serves the purpose well can readily be made by folding an ordinary sheet of paper. The strength of such a cup depends, of course, on the water-resisting quality of the paper; some cups of this type have held water for 15 or 20 minutes before they started to leak. These cups are made in the following way: A square piece of paper is first folded diagonally and the two upper tips folded over, one forward and the other backward. The two side tips are then folded back, one over the other, in such a manner that they lie straight against the upper edge. To open the cup, the side edges are squeezed lightly between the thumb and forefinger, using one of



Sanitary Drinking Cup Which Can Be Made in a Few Moments from a Sheet of Paper

the fingers to prevent the topmost side tip from flying back. These steps are clearly illustrated in the drawing. Aside from their convenience, the cups are entirely sanitary, and, therefore, useful around picnic grounds and similar public places.—Albert Perez, Nicaragua, C. A.

Water Can for Grindstone

The upper part of an old acetylene generator, such as was used for automobile headlights a few years ago, makes a good water drip can for the grindstone. It is fitted with an adjustable needle valve to regulate the flow of water. As such generators are now seldom used one can be obtained for a small sum at almost any junk dealer's.—E. T. Gunderson, Jr., Humboldt, Iowa.

Digging Clams with a Hoe

As only the larger soft-shelled clams are desirable for making chowder, sea-coast residents who dig only a few dozen at a time will save much back-breaking labor by using a cut-down hoe in the following way: Walk slowly at low tide along almost any hard, sandy beach inside an inlet or bay, looking for the telltale holes that betray the presence of clams. When one is seen, scrape away a few inches of sand from the surface of the beach, and the size of the hole exposed will usually show whether the clam is large or small. However, do not be misled by the appearance of the hole on the surface, for very

often waves, breaking on the beach as the tide goes out, almost close the holes, and one is apt to think that a small hole indicates a small clam. When one is discovered, dig down at one side of the hole with the hoe for about 8 or 9 in. and then break away the sand on the side of the excavation, which permits one to remove the clam by hand. By working in this way, few clams will be broken and there

is no need of actually digging out any but the larger ones.—John D. Mayer, New York City.

How to Make a "Straddle Bug"

A Simple Sailing Model That Is Easily Built

By WM. ATKIN

Naval Architect

FEW tools are required to make the sailing model described in this article, and there is no tedious shaping and carving to be done on a hull. The hull in this model—if it can be called by this name—is nothing but a simple framework to hold the mast and three floats. This construction, while it does not give the model the speed of a "regular" body, permits the boat to be knocked together

very quickly, and, despite the unconventional design, the little yacht is really a splendid sailer.

Before going on with the details of construction, we will explain a few of the terms used in the drawings, to save trouble later on. The hull, or body of the boat, needs no description, nor does the mast. The latter, however, is braced by five lengths of wire; there are two on each side, running from a point near the top of the mast to the sides of the hull, and these

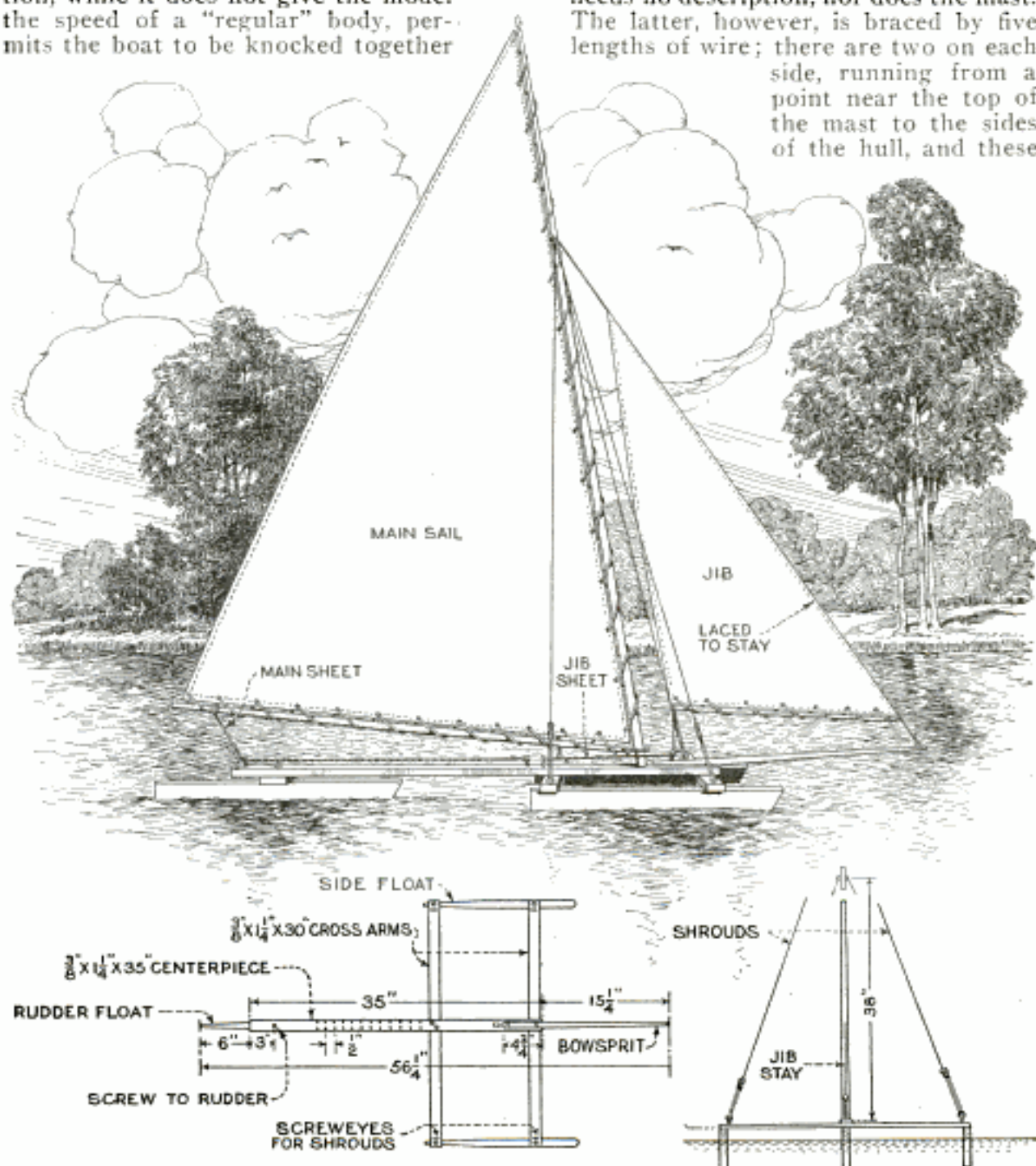
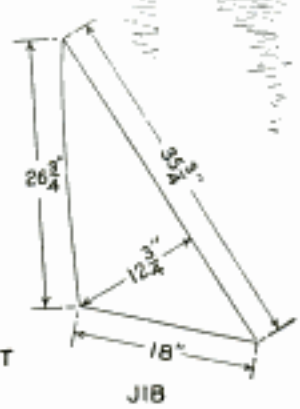
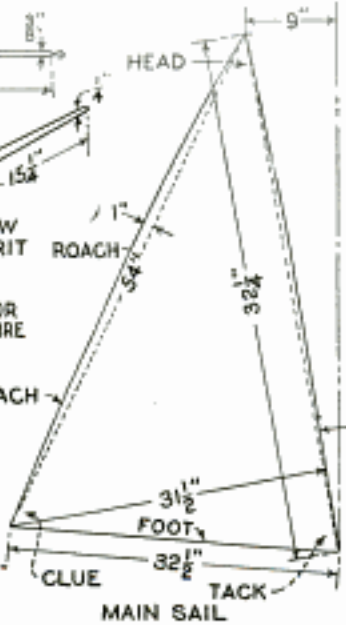
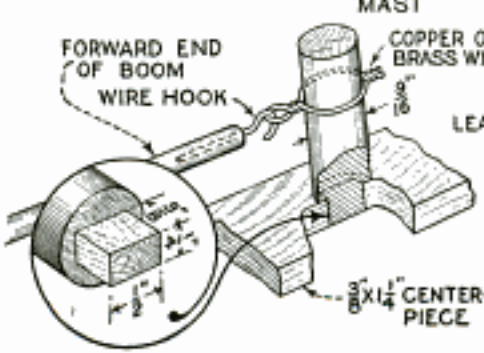
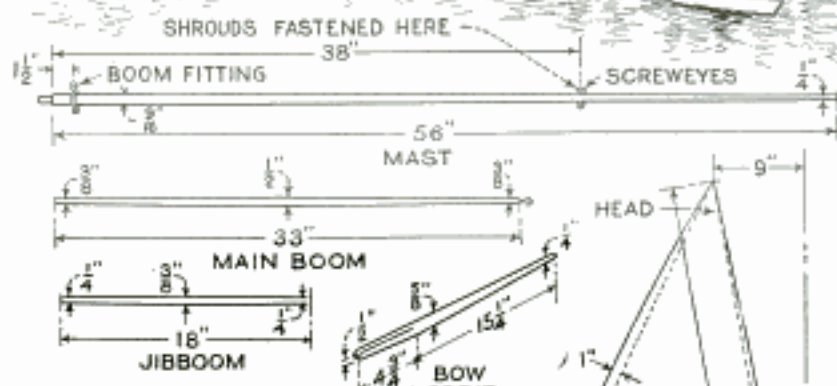
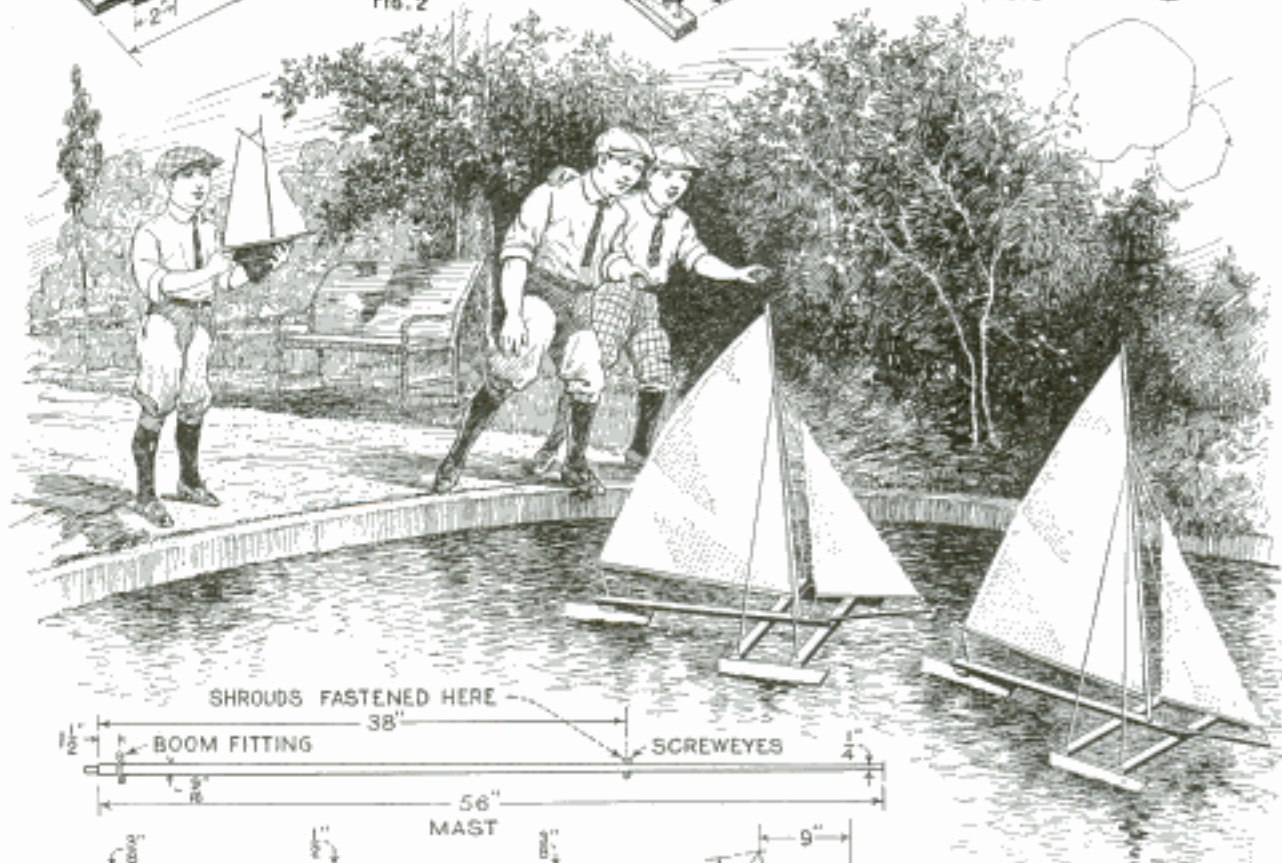
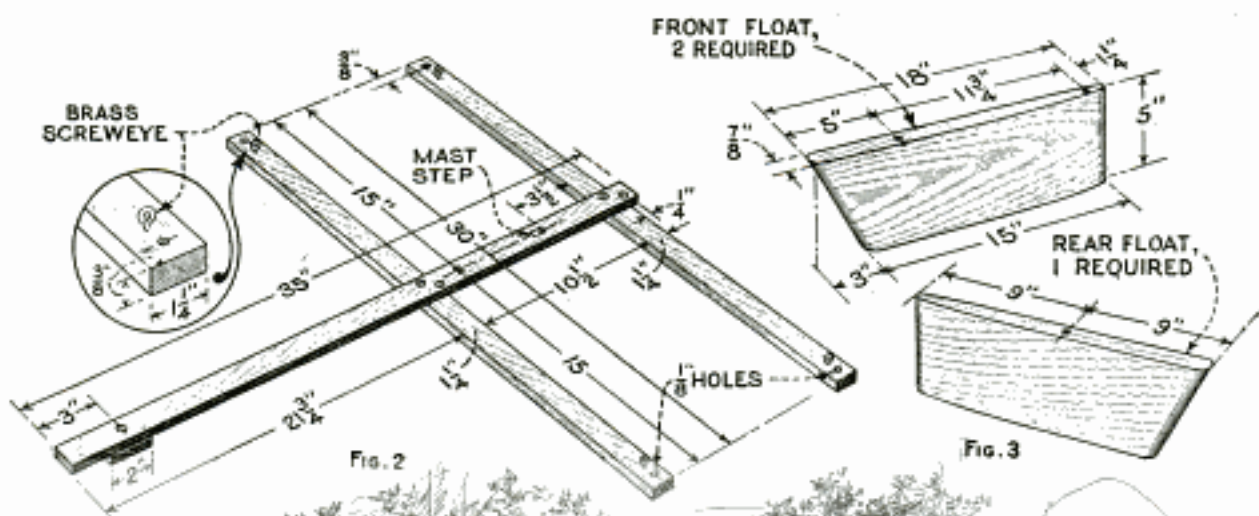


Fig. 1

Above, Elevation of the Simple Sailing Model, the "Straddle Bug"; Below, Plan and End View of Frame



Details of the Frame and Floats, and Dimensions of Mast, Spars and Sails

Fig. 4

Fig. 5

are called shrouds. Another runs from the same point on the mast to the end of the bowsprit, and this is called the jib stay. The bowsprit projects from the bow to carry the end of this stay, and to the stay is fastened the jib, or triangular foresail. The sail nearest the after (rear) end of the model is the mainsail, and in this case it is a "jib-headed" sail. The sails are lashed at the bottom to spars called the main boom and jibboom. On the sails, the upper end is the head, the bottom is the foot, the side next the mast on the mainsail is the hoist or luff, and the opposite side, the leach; on the jib, the side that runs on the jib stay is the hoist, and the inner side the leach. The leach of the mainsail is roached, or curved, to make it keep its shape. The angle that the sails are allowed to take to the center-line of the boat is governed by lines attached to the outer end of the main boom and the inner end of the jibboom, and these lines are the main and jib sheets. The corner of the foot at which the sheet is fastened is the

clue, and the opposite foot corner is the tack. Now for the construction.

The frame requires three pieces of white pine or poplar, $\frac{3}{8}$ in. thick by $1\frac{1}{4}$ in. wide. Two of these are 30 in. long and the third 35 in. long. Measure $\frac{1}{4}$ in. from one end of the 35-in. piece and fasten one 30-in. piece to it so that the forward edge of the latter comes to the $\frac{1}{4}$ -in. mark, and the crosspiece is exactly central; use two No. 6 brass screws, $\frac{3}{4}$ in. long. Fasten the other crosspiece similarly, so that the distance between the inner edges of the two is $10\frac{1}{2}$ in. Mark a point $\frac{3}{8}$ in. from the two ends of each crosspiece and in the center, and drill $\frac{1}{8}$ -in. holes, and $1\frac{1}{2}$ in. from each end drive in small brass screweyes for the ends of the shrouds. Measure 3 in. from the after end of the

centerpiece, and glue to the underside a block $\frac{3}{8}$ in. thick, $1\frac{1}{4}$ in. wide and 2 in. long, keeping the center of the block on the 3-in. mark. Drill a $\frac{1}{8}$ -in. hole through both centerpiece and block, on the mark.

Three floats must now be made. Make these of white pine or poplar, 18 in. long, 5 in. deep and $\frac{7}{8}$ in. thick. On two of them, cut one end as shown in the drawing, so that the bottoms are 15 in. long, round off the beveled ends, and, from a point about 7 in. from the after end, taper the floats so that they are about $\frac{1}{8}$ in. thick at the after edges, then round these. Drill $\frac{1}{16}$ -in. holes in the positions marked, and then fasten the floats to the ends of

the crosspieces with No. 6 brass screws, $1\frac{1}{2}$ in. long. The third, or rudder float, is exactly similar to the others, except that only one $\frac{1}{16}$ -in. hole is drilled in it, exactly in the center, and but one screw used to fasten it to the centerpiece, under the little block. Now drill two rows of $\frac{1}{16}$ -in. holes along the edges of the centerpiece (Fig. 6), spacing them $\frac{1}{2}$ in. apart, for the pins on the end of the sheets,

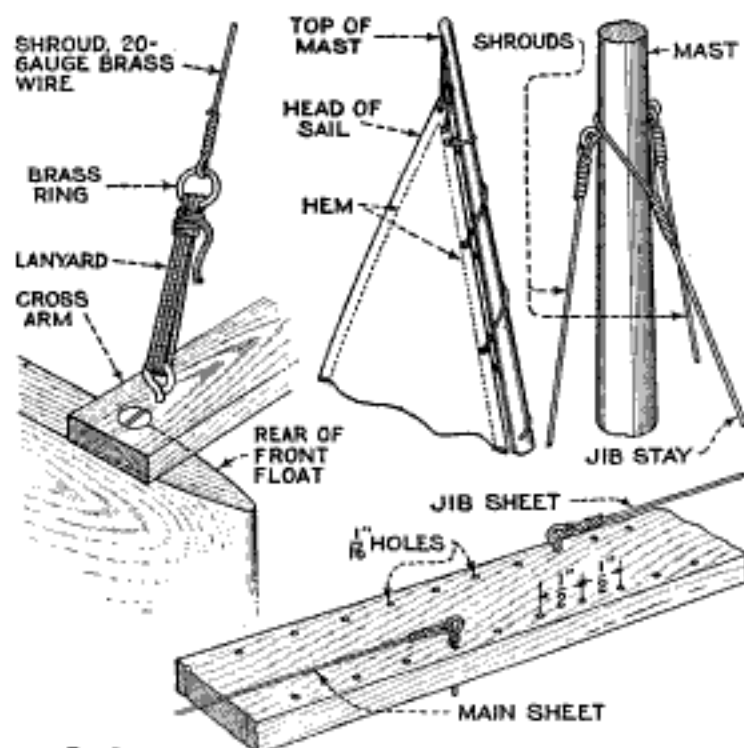


FIG. 6
Details of Shroud and Stay Fittings, Mainsail Lashing and Sheet Pins and Holes in Centerpiece

and cut out the mast step or hole. This hole is oblong in shape, $\frac{1}{4}$ in. wide and $\frac{1}{2}$ in. long, and should not be finished until the mast is ready to be "stepped." (See Fig. 4).

All of the spars are also made of white pine or poplar, and, when tapering these as shown in the drawings, the best way to go about the job is this: Taking the mast as an example, cut it a trifle longer than necessary, and about $\frac{3}{4}$ in. square. Still keeping it square, plane it down until it is $\frac{9}{16}$ in. square at one end and $\frac{1}{4}$ in. square at the other, the taper being straight. Now plane off the edges carefully until an octagon is produced, and plane off the edges of this in the same way. The mast can now be finished round with coarse and fine sandpaper without difficulty, cut to

length, the top rounded, and the oblong step cut on the foot. Notice that the main boom and jibboom taper from the center to the ends, and that the bowsprit tapers and is round only for $15\frac{1}{4}$ in. of its length. The inner end tapers a little, but is kept square to make it easy to fasten it to the "deck." Measure 38 in. from the deck shoulder of the mast and at this point drive in small brass screweyes to take the ends of the shrouds (Fig. 4). A piece of copper or brass wire is twisted around the lower part of the mast, $1\frac{1}{2}$ in. from the shoulder, and formed into an eye on the after side to take a brass hook on the end of the main boom. This is shown clearly in Fig. 4. Now step the mast so that it "rakes" or leans aft 9 in. from the vertical, measured at the top, and glue into place. The shrouds, which are of 20-gauge brass wire, can now be fitted. Each shroud is passed through the screweyes on the mast, twisted as in Fig. 6, and, about 2 in. from the deck, is passed through a small brass ring, then twisted around itself and cut off. Now, fasten one end of a length of fine fishing line to each ring, and pass them several times through the deck screweyes and the ring (Fig. 6). By drawing on these lines or lanyards, the shrouds are set up (tightened) and the mast straightened. The shrouds should not be set up until the jibstay is in place or the mast may be sprung (bent). The stay is formed with a loop on the upper end that passes over the end of the mast and rests on the screweyes; the other end is fastened to a small brass screweye on the

end of the bowsprit, as seen in Fig. 1. The sails are made of light-weight percale, and must be cut so that a $\frac{3}{8}$ -in. hem may be made on all sides. Remember that there is a 1-in. curve (roach) on the leach of the mainsail and a slight roach (about $\frac{1}{4}$ in.) on the hoist. The edges of the jib are straight. Twelve small holes are punched through the foot of the mainsail and 15 on the hoist; if small eyelets like those used on shoes can be put in these, so much the better—maybe the shoemaker will do this for you. Seven are also put through the foot of the jib, and about 12 on the hoist. The sails are laced to the booms, stay and mast through these eyelets by means of light fish line, as shown in Figs. 1 and 6. There are two small holes drilled at the head of the mast to take the end of the lacing and make it fast, and similar holes in the booms. The lacing on the hoist of the jib can be taken to the shroud screweyes and made fast there. The only work left now is the sheets. These are also of strong fish line. One end of the jib sheet is fastened to the after end of the jibboom, reeved through a screweye near the after end of the bowsprit and passed aft; it is then cut off near the end of the row of holes in the centerpiece, and fitted with a pin made of brass wire (see Fig. 6). The main sheet is fastened to the after end of the main boom, and leads down through the screweye in the end of the centerpiece, then forward.

The rudder screw should bind the rudder float tightly, but not so tightly that the float cannot be moved with the fingers.



Wire Attachment on End of Stick Facilitates Removing Clothes from Boiler

A Handy Tool for Washday

Most women use a short piece of broomstick for lifting wet clothes out of the boiler. The trouble with a round stick is that the clothes slip off while the stick is being turned to wind them on. A length of heavy galvanized-iron wire, bent and inserted through two holes drilled in the stick, as shown in the detail, will eliminate the trouble entirely. When the stick is turned the wire catches in the clothes without any danger of tearing them, and they can then readily be removed.—E. K. Wehry, Cedar Rapids, Iowa.

☛ Short lengths of $\frac{3}{4}$ -in. pipe driven at the corners of the flower beds prevent the hose from dragging over the bed and knocking down the flowers. The pipes should be at least 18 in. long and should extend 6 in. or more above the ground.



All Shop Notes published in 1924, in book form—Fifty Cents—from our Book Department

A Sewer-Pipe Septic Tank

By EARLE W. GAGE

COUNTRY homes are fast coming to enjoy city conveniences, and the inexpensive, easily built septic tank is aiding in this, since it brings a home sewage plant within reach of the 6,500,000 farm homes. Until now thousands of country people have not installed sewage systems

because they believe that the cost is low in the city but high in the country. This is not so according to figures collected by

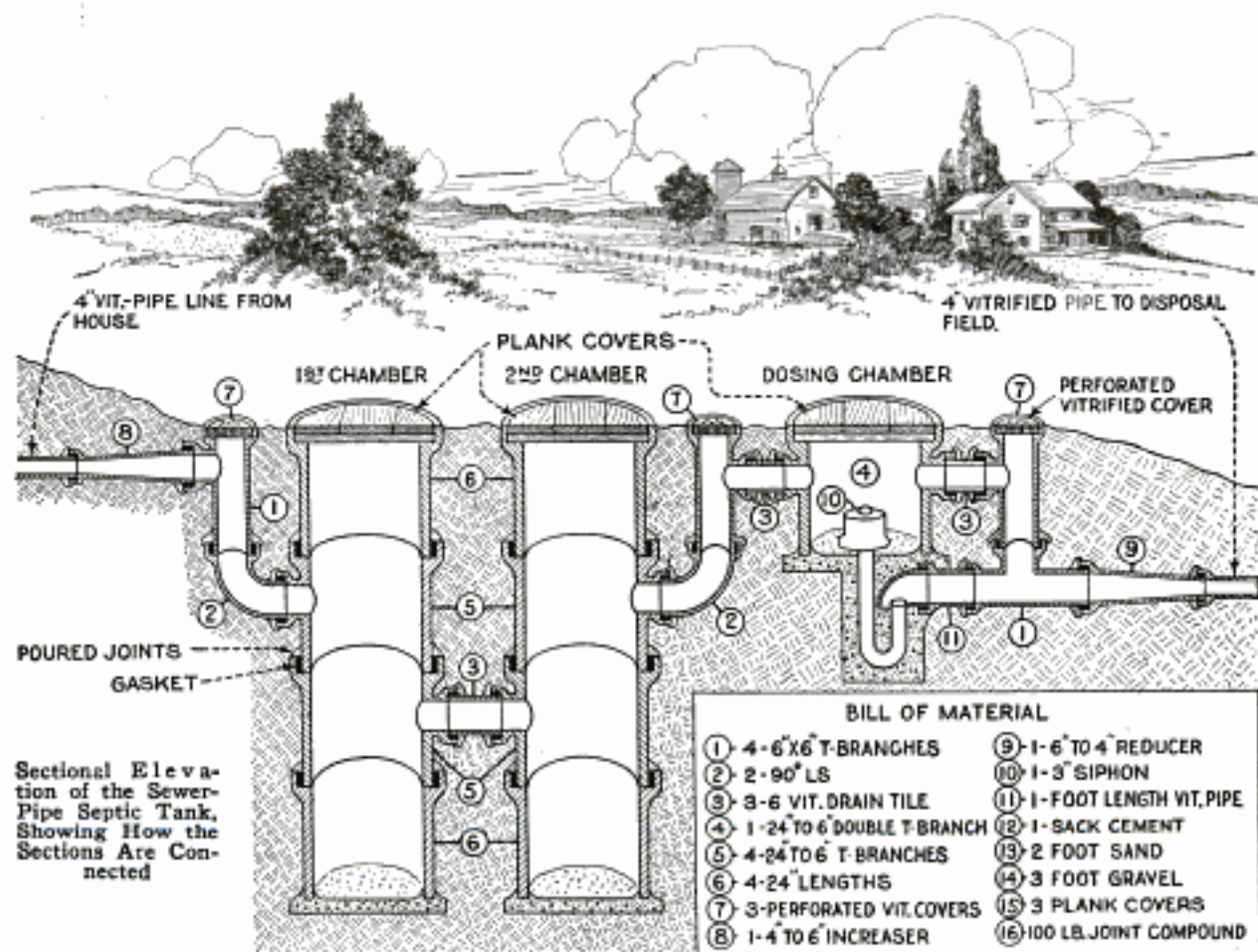
A Septic Tank of 24-Inch Sewer Pipe That Can Easily Be Made by Any Farmer and Will Serve a Household of Four Persons the Year Round



experts of the department of agriculture; referring to one city in the east, where the average home is valued at \$10,382, the average charge for sewerage, outside the house, is \$335. On the other hand, an average country home in the middle west is worth \$17,259 and yet a farm sewage-disposal system can be installed for less than what city folks pay for this convenience.

Safe disposal of farm sewage is not a passing fad, but a vital necessity, cautions the experts of Uncle Sam. A good plant

siphon may be omitted in those rare instances where it is feasible to discharge into salt water or into a large stream al-



for the purpose is an asset, because it greatly promotes the healthfulness of the country home.

Before undertaking construction, however, it is best to prepare a definite plan. The septic tank should be located from 50 to 100 ft. from any dwelling, and, if practicable, to the leeward of prevailing summer winds. The sewage-distribution field should be located downhill from any well or spring, and if possible at least 300 ft. from such water supplies. The disposal of all sewage should be through dry, porous, deeply drained ground. The distribution of the sewage in the land should be so apportioned that all of it is thoroughly absorbed and oxidized. Always lay sewers straight and below the reach of frost, ventilate them thoroughly and make the joints water-tight and root-proof. Makeshift methods, materials and devices should be avoided or used sparingly. Vent pipes should never be placed in the top of septic tanks or cesspools where they are near dwelling houses. In the construction of a sewage-disposal plant, the siphon or dosing chamber and

ready badly polluted. Disposal of sewage in a running stream should be a last resort, as such practice endangers water supplies downstream, and unless the volume and velocity of flow are good, may be very objectionable. It is economical and easy to make a septic tank out of sewer pipe. The vitrified-clay pipe will last almost a lifetime and give good service. The accompanying illustration shows how the pipes should be placed.

The construction of the tank calls for eight sections of 24-in. sewer pipe, each 30 in. long, comprising four sections of plain 24-in. pipe and four sections with 6-in. side branches. Four 6-in. tees and two 6-in. bends or ells are also required, besides two 4 to 6-in. increasers and several sections of plain 6-in. pipe. Proper fitting of the connecting line requires the two chambers to be placed about 4 ft. apart.

The depth of the excavation and level of the column base depend upon the level of the inlet from the house sewer, as will be seen in the drawing. The bases are of cemented brick or concrete, 30 in. square, and a plain section of 24-in. pipe is placed

upon each and cemented into place with bevels of cement mortar inside and outside the pipe.

The remainder of the structure, including the inlet, connecting pipe and outflow pipes should be assembled loosely before any more cementing is done.

Two 24-in. pipes with side branches should be placed above the pipes already in position. Cement the two sections together, calking the upturned bell joint with a small quantity of oakum or hemp, and pour cement grout into it, of the consistency of thin mush. The branches of the two lower pipe sections should be pointed directly toward each other, and those of the upper away from each other, one in the direction of the disposal field, and the other toward the 4-in. inlet from the house. Then the remaining plain sections are installed. The inlet consists of a 4-in. house drain connected to a 4 to 6-in. increaser, a 6-in. tee, and a 6-in. ell, the latter being cemented into the upper 6-in.

side branch in the first chamber. The outlet is similar and may be connected to the line leading to the disposal field. The outflow should be below the inlet.

The dosing chamber shown at the right of the second chamber is not necessary when the liquid outflow is discharged into a watercourse or a leaching cesspool. However, if this method of disposal is not practicable, for the reasons outlined previously, the dosing chamber may be constructed of a 24 to 6-in. double-tee branch and a 3-in. siphon, set in concrete and connected in the outflow line as shown in the drawing. The covers for the vents are of vitrified tile and are perforated; those for the three chambers are made of wood. All the joints must be thoroughly tight, and be grouted with cement or a bituminous compound. There are special joints made for work of this kind, known as "flex-form" joints, and the use of these will obviate any trouble due to settling of the earth around the pipes.

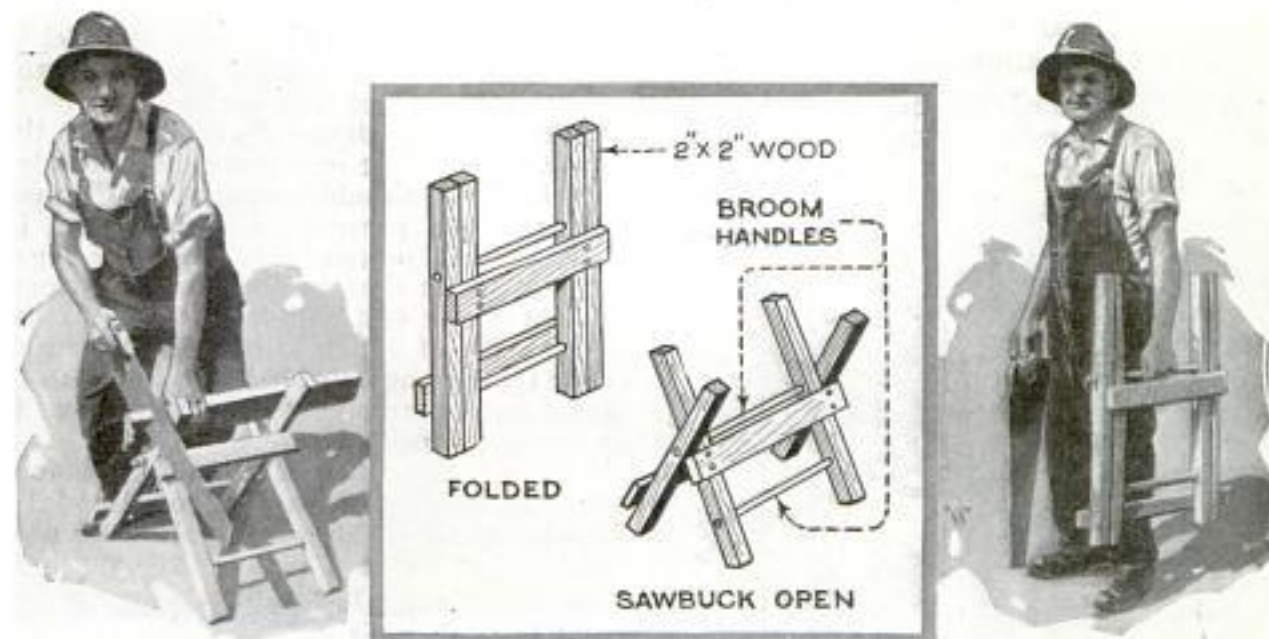
Light, Portable Sawhorse

Sawhorses are usually too clumsy to carry around, but where portability is required, the folding sawhorse shown in the photos and illustration will be found very useful. An additional feature, which makes them convenient, is the small space required to store them when not in use. Each horse is made of 2 by 2-in. or heavier stock, and a length of broomstick is passed through all four legs at the point indicated to serve as a pivot. Another length of broomstick is used as a cross-

piece, where a larger piece would be in the way when the horse is folded. The whole device weighs only about 6 lb.—Dale R. Van Horn, Walton, Nebr.

Shellac over Sap and Knots

White pine, or any white wood that requires treatment to prevent the penetration of sap or knots through white paint, should be given a thin coat of white or bleached shellac. It may be applied directly to the wood, which is the most common way, or on a primer of lead paint.



Folding Sawhorse Made of 2 by 2-in. Material Can Be Carried Around Conveniently, Stored in a Small Space and Weighs Only Six Pounds

Portable Ditch Bridge

On the sides of almost every graded road there are ditches, which must often be crossed with cars. A convenient meth-

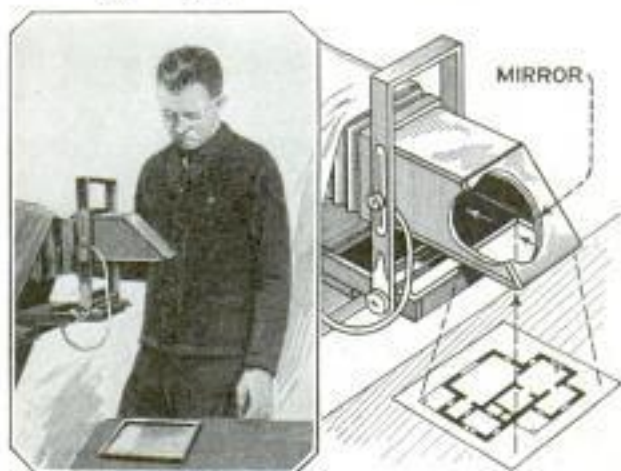


Portable Folding Ditch Bridge of Wood Is Helpful to Country Surveyors and Campers

od of doing this is to use a portable bridge of the kind shown in the photo. It is made from two pieces of 2 by 8-in. wood, long enough to span the ditch, and 2 by 4-in. pieces of the same length are nailed to the sides as shown. A 5-ft. crosspiece of the same material is bolted to the tracks, so that these are spaced to permit an auto to pass over them conveniently. Only one bolt is used to attach the crosspiece to each track, thus permitting the bridge to be folded up and carried on the running board if desired.—A. F. Miller, Bern, Kans.

Photographing Printed Matter without Plates

With the aid of the device shown in the drawing any printed matter can be re-

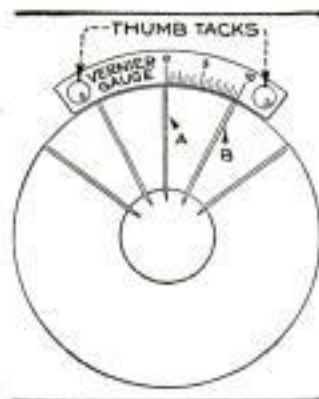


Reproducing Blueprint or Printed Matter Directly on Bromide Paper with Periscope Device

produced by photography without the use of plates or films. The device consists of a wooden box, made to fit over the front end of the camera, as shown, and having a small mirror set at a 45° angle to the lens. The matter to be reproduced is placed under strong light on a table top directly below the square opening in the box, so that it will be reflected into the camera. Ordinary bromide paper is placed in the film or plate holder. The writer has reproduced soldiers' discharge papers while the customers waited, the process taking only a few minutes. This method eliminates the need of color-sensitive plates and filters in reproducing blueprints.—E. M. Ball, Georgetown, S. C.

Draftsman's Dial Ruler

Draftsmen who have a large amount of dial-ruling or similar work to do will find the original, homemade ruler shown in the drawing, a valuable labor-saving device. A piece of bristol board or heavy glazed cardboard is marked with an 8-in. circle, which is divided into segments of 10° by means of a protractor. Lines are drawn from the circumference to a 2-in. circle, concentric with the 8-in. disk, as shown in the drawing. About $\frac{1}{16}$ in. to the



left of each radiating line, another one is drawn, parallel to the former; slots should be cut in the disk on these lines with a very sharp knife to insure clean edges. By referring to the drawing, it will be seen that the ruling edge (to the right) should be slightly longer than the other to prevent confusion when in use. A small piece of cardboard, the edges of which are drawn by setting the compasses to the 4-in. radius of the disk, and the length of which is sufficient to reach over two segments of the disk and also to take two thumbtacks for fastening, is used as a vernier gauge.

To use the ruler, it should be placed concentric with the drawing to be made; a small pinhole in the center makes this possible. To divide a dial in 10° divisions the vernier is not used, and it is only necessary to draw lines in each slot. To make finer divisions, place a pin in the center of the disk and fasten the vernier against the

top edge of the former. After drawing the 10° lines move the disk to the right until line A points to the next line on the vernier for 30-minute divisions, etc., continuing the drawing of lines all around the disk. The further application is obvious. For inking lines, the disk should be elevated at the center by a 2-in. cardboard circle, concentric with the ruler. A and B represent the drawing edges. This ruler can be used on work from 2 to 8 in. in diameter.

If desired, concentric circles can be drawn on the large disk, about $\frac{1}{8}$ in. apart to mark off the radiating lines so as to act as guides for determining lengths of division lines where the drawing is not to have a circular boundary for such lines. In this way every fifth or tenth line can be drawn longer for contrast on the dial drawing and yet it will be unnecessary to have a circular boundary drawn to insure equal lengths of such lines.

Cheap Homemade Tractor

A good serviceable tractor, which does the work of four mules, was built by a Georgia farmer from parts costing only about \$250. Of his discarded Ford automobile—which was worth about \$50—he used the engine, front wheels and steering apparatus, and purchased a pair of regular tractor wheels for \$165. A homemade frame was then made and the engine shaft cut off to fit. This tractor can turn around in a 17-ft. circle and is useful for all kinds of heavy hauling and farm work. By jacking it up and using a special flywheel, it can also be used for belt work. The accompanying photo shows the tractor as it is used to pull a mower. A top is provided to furnish shelter from sun and rain.

Homemade Tractor Run by Old Automobile Engine and Consisting of Front Wheels and the Steering Apparatus of Discarded Car, with Regular Tractor Wheels in Rear



Novel Shoe Store

In the children's section of an eastern shoe store one will find an odd canopied stand in the form of a merry-go-round,

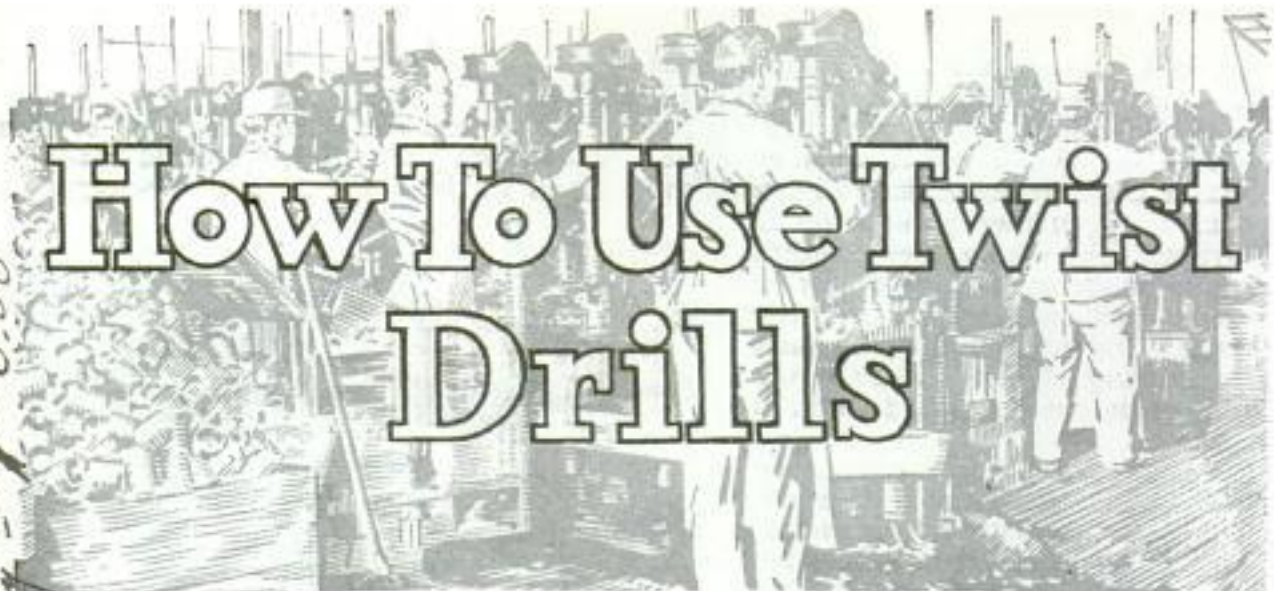


Novel Stand, with Canopy, Animal Seats and Painted Decorations, Proves Drawing Card for Children in Shoe Store

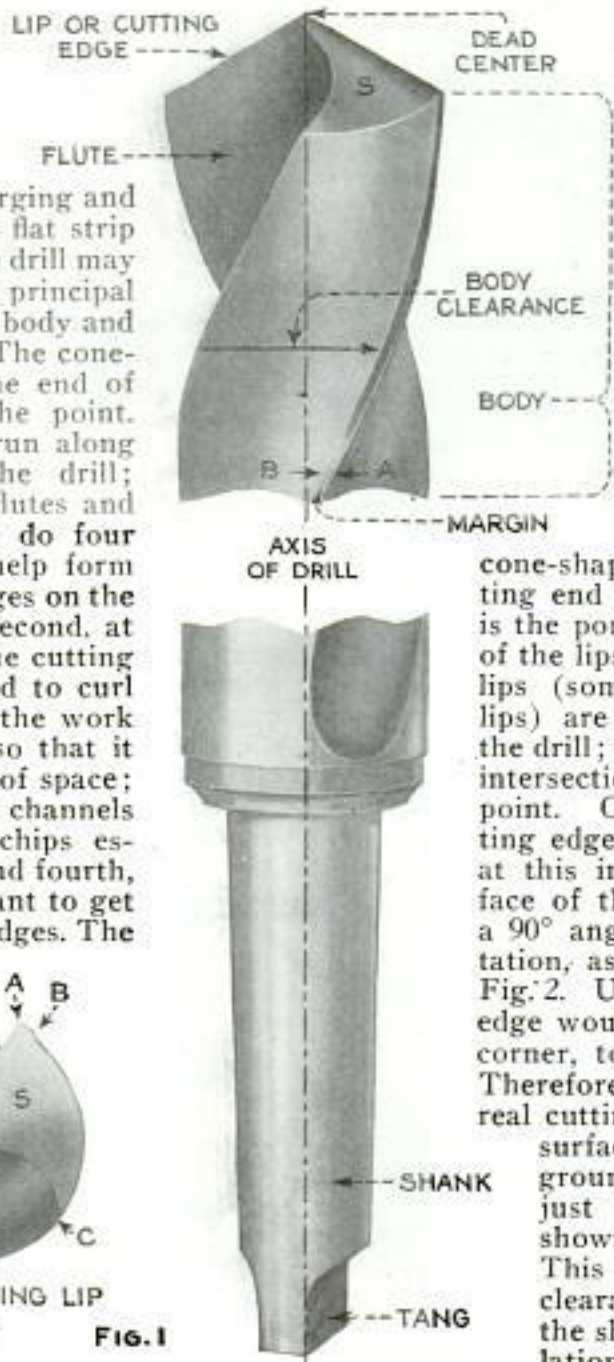
with several seats mounted on it, as shown in the photograph. The seats are designed to resemble rabbits, geese, goats and horses, and children take great delight in getting on the stand and sitting on one of these animal seats, while the clerk fits their shoes. The proprietor has found this affair good advertising, as its novelty not only impresses people but when the children need shoes they inevitably say, "Come, mama, let's go to the animal shoe store."—Mrs. David M. McPherson, Washington, D. C.

How To Use Twist Drills

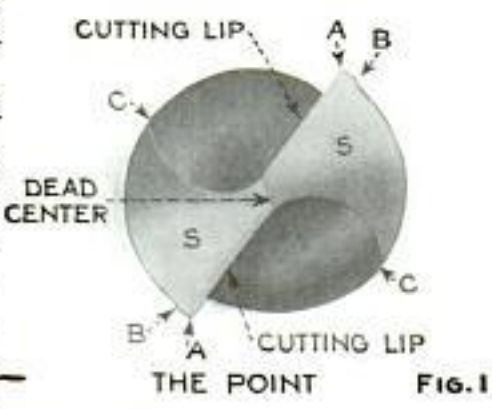
Drill Point Edge No. 22 from L. S. Starrett Co.
 Complete with 12" steel handle \$4.90. Studing head only - 3.00
 Actual may vary



THE twist drill is a special cutting tool — generally formed by milling a cylindrical piece of tool steel, or by forging and twisting grooves in a flat strip of that material. The drill may be divided into three principal parts: the point, the body and the shank (Fig. 1). The cone-shaped surface at one end of the drill is called the point. Two spiral grooves run along opposite sides of the drill; these are known as flutes and are shaped so as to do four things: First, they help form the proper cutting edges on the cone-shaped point; second, at their junction with the cutting edges they are shaped to curl the chip taken from the work tightly within itself so that it occupies a minimum of space; third, the flutes form channels through which the chips escape from the hole, and fourth, they allow the lubricant to get down to the cutting edges. The



dead center (Fig. 1) is the sharp edge at the extreme tip end of the drill. It is formed by the intersection of the cone-shaped surfaces of the point, and it should always be in the exact center of the drill. The point of the drill should not be confused with the dead center; the former, as the word is used in this article, means the entire cone-shaped surface at the cutting end of the drill. The heel is the portion of the point back of the lips or cutting edges. The lips (sometimes called cutting lips) are the cutting edges of the drill; they are formed by the intersection of the flutes and the point. Of course, a real cutting edge would not be formed at this intersection if the surface of the point were at only a 90° angle to the plane of rotation, as shown at the left in Fig. 2. Under this condition the edge would merely be a square corner, too blunt to penetrate. Therefore, in order to give a real cutting edge to the lip, the surface of the point is ground away, or relieved, just back of the lips, as shown at the right in Fig. 2. This relief is called lip clearance. Lip clearance is the shape of the point in relation to the lip, and is one



Courtesy Cleveland Twist Drill Co. ©

of the most vital subjects discussed in this article. Improper grinding of the lip clearance is a frequent cause of disaster. The narrow strip between A and B (Fig. 1) is called the margin. It is practically the full diameter of the drill and extends the entire length of the flute. The surface from B to C (Fig. 1) is of smaller diameter than the margin, and the depression thus formed in the body is known as body clearance and reduces the friction between the drill and the walls of a hole, while the margin (which is of full diameter) insures the hole being of accurate size. If there were no body clearance, more power would be required to overcome the friction between the drill and the walls of the hole and this friction might be sufficient to draw the temper of the drill itself. The web is the metal column that separates the flutes, and it runs the entire length of the drill between the flutes as shown in Fig. 3. The web is the supporting section of the drill—the drill's backbone, in fact. It gradually increases in thickness toward the shank (Fig. 4). This thickening of the web gives additional rigidity to the drill. The section shown at the bottom in Fig. 4 was cut from a drill near the point and the section at the top near the shank. The difference in thickness of the web at these points is shown by the small figures between the two sections. The thickening of the web as it nears the shank naturally decreases the area of the flutes, and, unless compensated for in some manner, this would seriously hinder the chips in their escape from the hole. Therefore, in order to offset

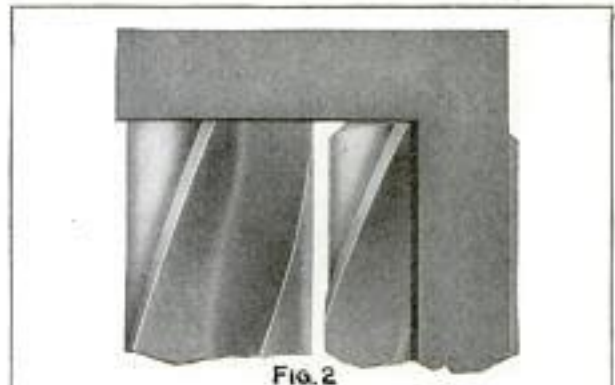


FIG. 2

The Drill on the Left Has No Lip Clearance; That on the Right Is Properly Cleared



FIG. 3



FIG. 4

Left, Web of Drill; Right, Sections of Drill Cut near Point and near Shank; Note Difference in Thickness

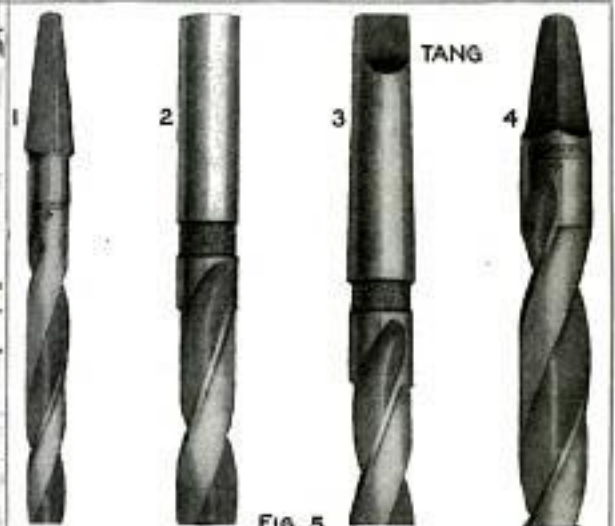
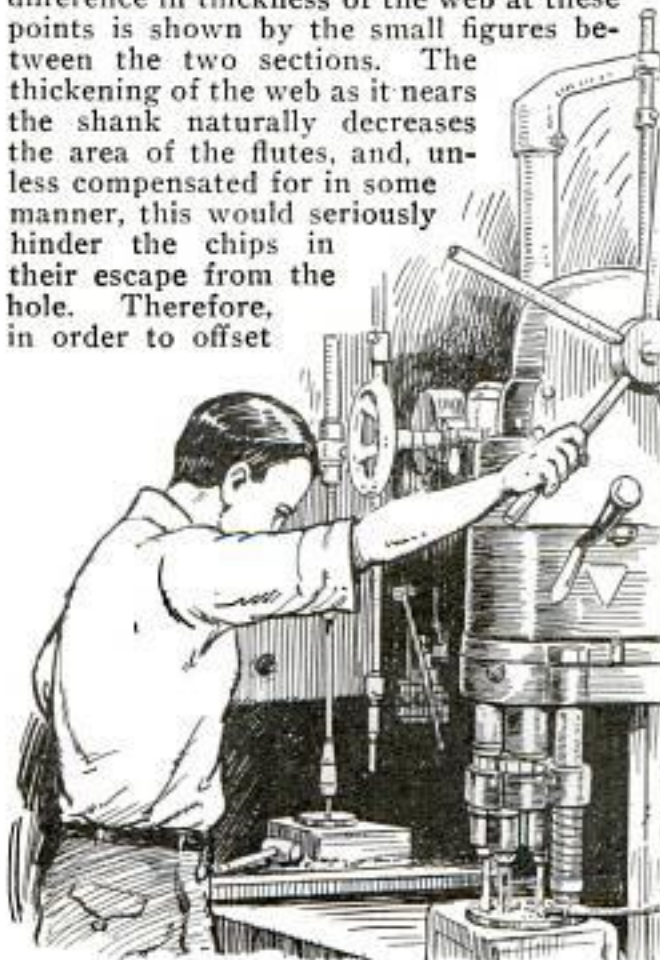


FIG. 5

Bit-Stock, Straight, Taper and Ratchet Shanks

the thickening of the web, the flutes widen as they approach the shank, thus keeping their sectional area substantially the same throughout their length (Fig. 3). The shank is the end of the drill that fits into the socket, spindle or chuck of the drill press. There are a number of types of shank, the most common of which are shown in Fig. 5. The tang (Fig. 5) is usually found on taper-shank tools only. It is the portion of the tool that fits into a slot in the socket or spindle. It may bear a portion of the driving strain, although its principal use is to make it easy to remove the tool from the socket by means of drifting.

Fully 95 per cent of the difficulties encountered in drilling arise from faulty grinding either of the point or of the lip clearance. In grinding a drill, three things must be considered: first, the lip clearance; second, the length and angle of the lips; and third, the location of the point and dead center in relation to the axis or center of the drill.

Lip Clearance

Lip clearance is most generally misunderstood. Lip clearance as stated before, is the relief given to the cutting edges in order to allow them to enter the metal without interference. To make clear just exactly what lip clearance is and does, let's look at a drill without any lip clearance (Fig. 6). Imagine this drill trying to cut into a piece of steel. It would be impossible, because the surface S would always be in contact with the metal, and would effectively prevent the cutting edge from biting farther into the metal. Such a drill would merely rub—around and around—without penetrating. Therefore, if the lip is to penetrate, if its edge is to cut, we must grind away the surface S back of the lips (this is called giving the drill relief). This is shown in Figs. 2, 7 and 8. A somewhat similar purpose is served by the bevel or relief that is given the bit in a carpenter's plane (Fig. 8A). This lip clearance is very important; in fact, the effectiveness and life of a drill depend to a large degree on the correct forming of this clearance. Bear in mind that it is not merely ground on the circumference of the drill but is applied to the whole surface of the point S, back of the lip.

The heel (surface of the point back of the cutting lip) should be ground away from the lip at an angle of 12 to 15°, as in Fig. 9. In all cases, this angle of 12 to 15° is the angle at the circumference of the drill. This angle of lip clearance should

be gradually increased, however, as the center of the drill is approached, until the line across the dead center of the drill stands at an angle with the cutting edges of not less than 120° or it may be as much as 135°, as in Fig. 10. For heavy feeds in soft material, the angle of lip clearance may be safely increased to the full 15°. Care should be taken, however, to see that the angle at the center of the drill—near the tip—is increased proportionally.

If the angle of lip clearance is too great, the edges of the cutting lips will break down (as in Fig. 11) when the drill starts to work, because they will not have sufficient backing to support them, just as a razor would break down if used to cut tin, because it is too thin and lacks sufficient support to stand the strain. If insufficient surface is ground away, in other words, if the angle is made less than 12°, the clearance of the point is so reduced that it ceases to be a cutting edge and refuses to bite into the metal—as in Figs. 2 and 6—and this condition may result in splitting the drill up the center (Fig. 12).

Requirements of the Lips

After we have properly ground the point, so that the angle of lip clearance is correct, our work is only half done. We must now cross-check our point grinding, and assure ourselves that, first, the two lips are the same length, and second, the angles of both lips, in relation to the axis of the drill, are equal and correct (Fig. 13). The angle of 59° is recommended as the best for ordinary purposes. If the lips are at the same angle to the axis (59°) and of equal length, the third requirement of good grinding, namely, the central location of the point and dead center, will be fulfilled. If the angle of the cutting edges is more than 59°, as in Fig. 14, the drill will not center properly, because the cone-shaped point, which should hold it in position, will be too nearly flat to perform this work. If the angle of the cutting edge is less than 59°, as in Fig. 15, the tool drills much less rapidly and more power is required to drive it, because of the additional length of the cutting edges. If we get the point in the center but different angles on the cutting edges (Fig. 16), the drill will bind on one side; only one lip or cutting edge will do the work, with resultant rapid wear on this edge, and the hole will be larger than the drill. Or suppose we get equal angles on the cutting edges, but, on measuring, we find the lips of different lengths; then both the point and lip will, of necessity, be off center. The result will be a hole actually larger

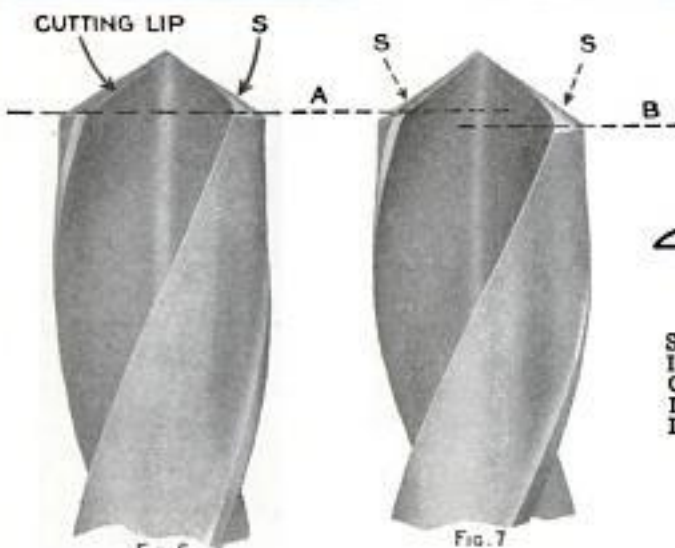


FIG. 6

FIG. 7

Both the Cutting Lip and the Heel, S, Are in the Same Plane

Note How Much Lower the Heel Line, B, Is than the Cutting Lip, A



FIG. 8-A

Showing the Bevel, Relief or Lip Clearance That Is Given a Carpenter's Plane, C Being the Clearance Angle; Practically the Same Purpose Is Accomplished by the Lip Clearance Given a Drill. It Permits the Cutting Edge to Penetrate the Metal

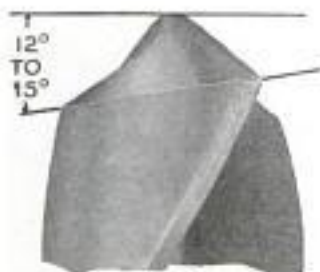


FIG. 9

Showing the Proper Way to Grind the Surface Back of the Cutting Lip; the Angle Indicated Is the Angle at the Circumference of the Drill. This Angle Should Be Increased as the Center of the Drill Is Approached so That the Dead-Center Angle Is Correct

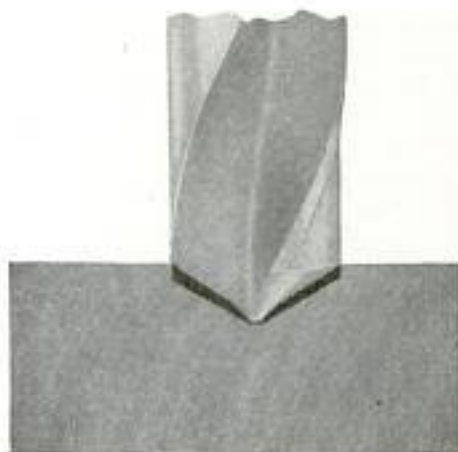


FIG. 8

The Cutting Lip Has Already Removed Considerable Metal Ahead of the Heel as Indicated by the Black Portions of the Hole on Each Side of the Drill

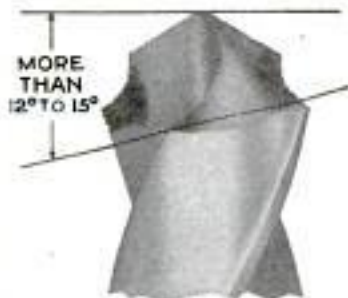


FIG. 11

Showing the Result of Giving a Drill Too Great Lip Clearance; the Edges of the Cutting Lips Have Broken Down Because of Insufficient Support

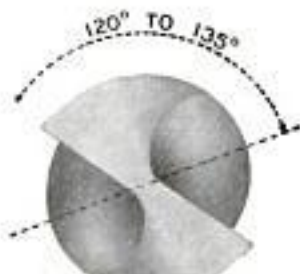


FIG. 10

Showing One Way to Gauge the Correctness of the Lip-Clearance Angle by Means of the Dead-Center Angle

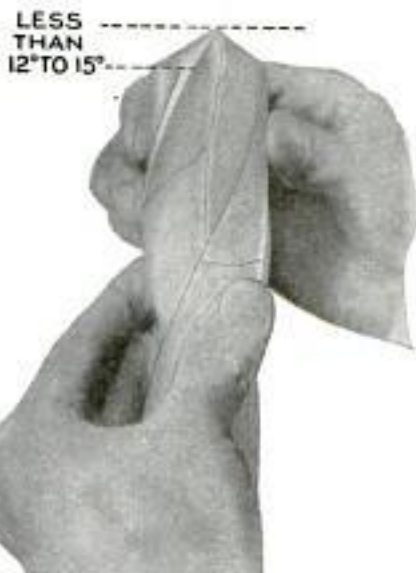


FIG. 12

This Drill Was Given Insufficient Lip Clearance; as a Result There Ceased to Be Any Cutting Edges and the Drill Split up the Center

than the drill (Fig. 17). The effect of this condition is the same as if the axle of a wheel were placed anywhere outside the exact center of the wheel. The strain on the drill press, in such a case, is tremendous and causes "weaving" or wobbling of the spindle, rapid wearing away of the drill and breakdowns from strains on spindle bearings, etc. Where we combine both of the above faults—unequal angles and lips of different lengths—we have the very peak of abuse. Under these conditions, the hole is larger than the drill and the strain on both the drill and press is terrific. (Fig. 18).

Particular attention is called to Figs. 16, 17 and 18, showing the results of unequal angles and lengths of cutting lips. Notice how much larger the hole is than the drill. Also notice, where the lips are of unequal length (Fig. 17), that the short

lip cuts the smaller hole while the longer lip cuts the larger hole, and how far from the true center the tip and point of the drill are located in these figures. This causes a strain that results in sideplay in the drill-press spindle.

Rake Angle

Another part of the drill, on which its perfect action largely depends, is the rake angle. This is the angle of the flute in relation to the work, as shown in Fig. 19. If the rake angle were 90° or more, it would not make a good cutting edge. If it is ground with too small an angle, however, it makes the cutting edge so thin that it breaks down under the strain of the work. In addition, the rake angle partly governs the tightness with which the chips curl within themselves and hence the amount of space that they occupy. Other

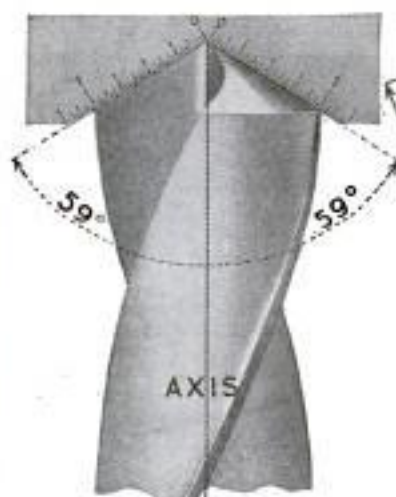
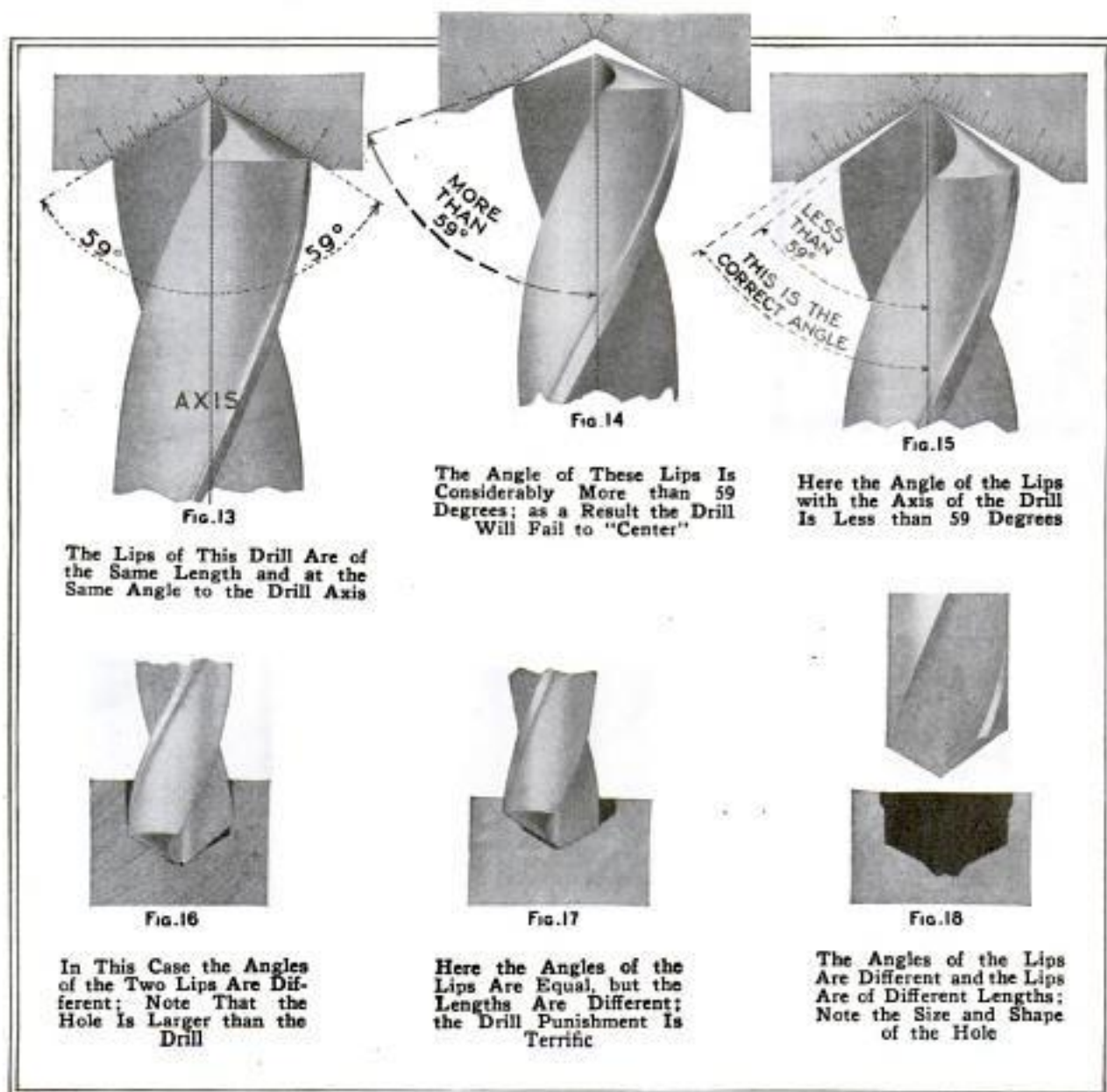


FIG. 13

The Lips of This Drill Are of the Same Length and at the Same Angle to the Drill Axis

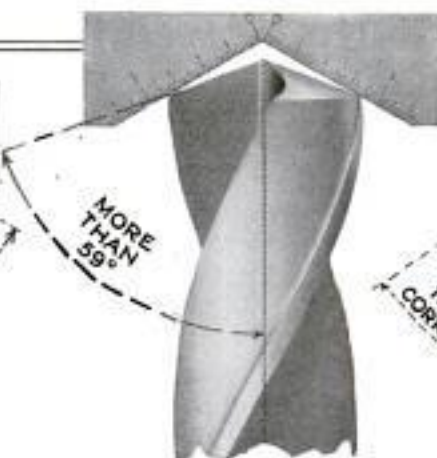


FIG. 14

The Angle of These Lips Is Considerably More than 59 Degrees; as a Result the Drill Will Fail to "Center"

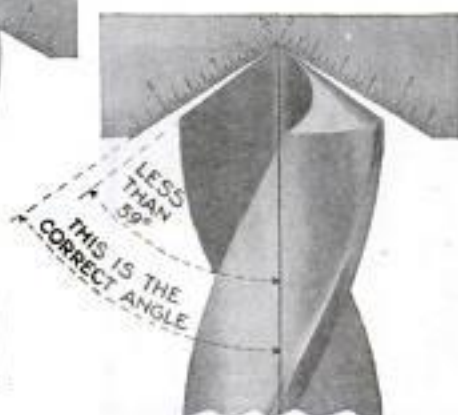


FIG. 15

Here the Angle of the Lips with the Axis of the Drill Is Less than 59 Degrees



FIG. 16

In This Case the Angles of the Two Lips Are Different; Note That the Hole Is Larger than the Drill



FIG. 17

Here the Angles of the Lips Are Equal, but the Lengths Are Different; the Drill Punishment Is Terrific



FIG. 18

The Angles of the Lips Are Different and the Lips Are of Different Lengths; Note the Size and Shape of the Hole

conditions being the same, a very great rake angle makes for a tightly rolled chip

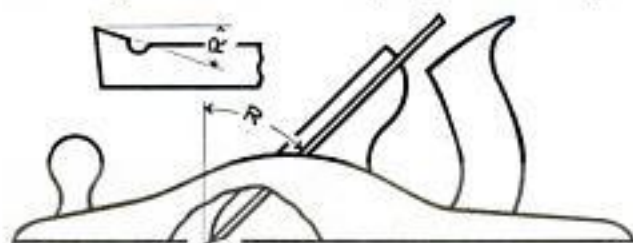


FIG. 19 A

Rake Angle on Plane and a Lathe Tool: Compare with Rake Angle on Tool Shown Below

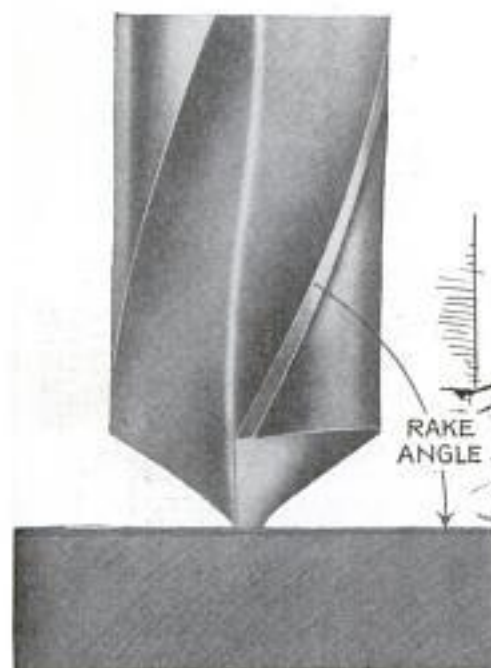
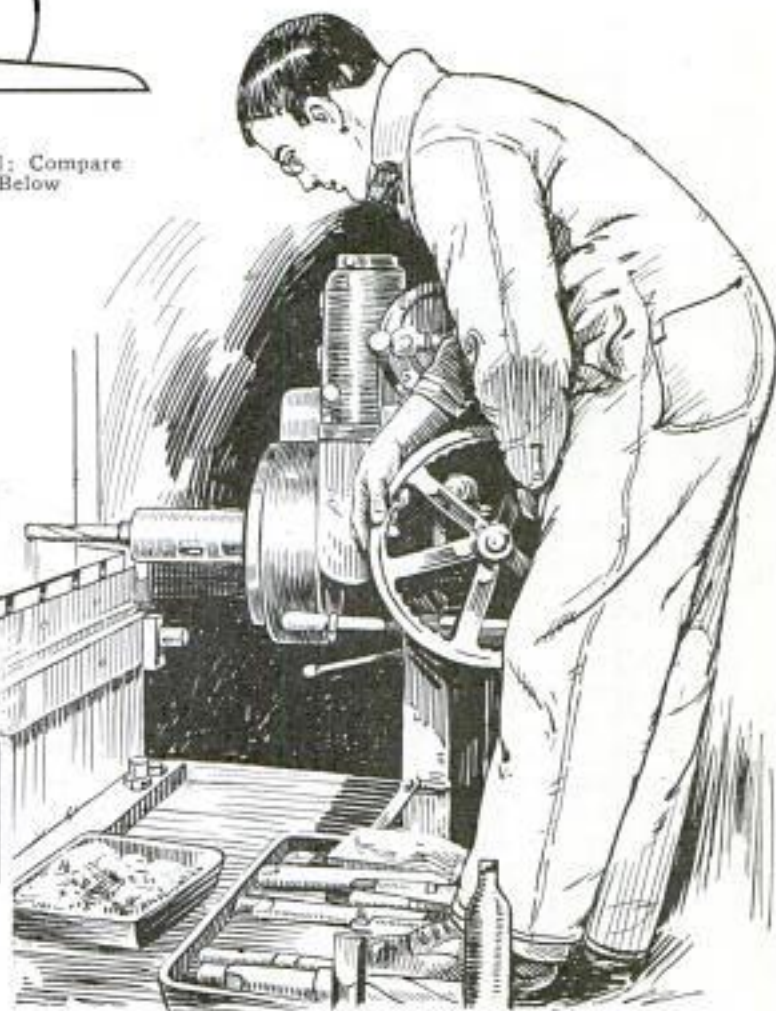


FIG. 19

The Rake Angle Is the Angle of the Flute in Relation to the Work

be changed except under special conditions, which will be considered later. For ordinary drilling, the rake angle established by the manufacturer of the drill is correct and should remain unaltered. Fig. 19A shows the rake angle on a carpenter's



while a rather small rake angle gives the chip a tendency to curl into a more loosely rolled spiral. The rake angle should not

plane and a lathe tool, and the purpose of rake on a drill is the same.

(Continued Next Month)

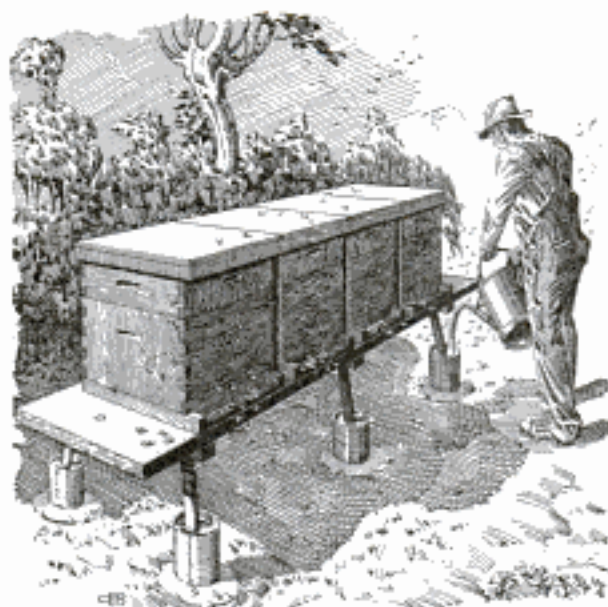
Remedying Worn Spindle Washers

When tightening Ford front-wheel ball bearings, which need a more careful adjustment than roller bearings, it is sometimes found that they are too tight or too loose after pulling up the locknut. If the bearings, cones and spindle threads are good, the cause of this is usually that the spindle washer, and the tongue and groove on the spindle, are worn. When the locknut is pulled up, the spindle washer and cone are carried with it for a fraction of a turn, which makes it too tight. When the locknut is backed off for another try, washer and cone are carried with it and

loosened, which is equally undesirable. A simple remedy for this trouble is to replace the spindle washer with a new one, which will take up part of the play, and also to turn up the washer by hand as far as possible before tightening the nut; this takes up the wear in one direction. To guard against the cone turning back, when loosening the nut in case the adjustment is too tight, the angle of the flats on the cone should be carefully noticed before loosening the nut. The cone can be reset by tightening it slightly to loosen the adjustment, because it has already been loosened by removing the locknut.—E. T. Gunderson, Jr., Humboldt, Iowa.

Protecting Bees from Ants

Every season thousands of farmers and bee raisers throughout the country find that ants and other crawling insects enter



Protecting Beehives from Ants by Placing Legs of Stand in Cans Filled with Water

the beehives and inflict considerable injury on the swarms, sometimes destroying them entirely. Many methods of guarding against these enemies have been tried with more or less success, but an effective barrier is provided against ant invasions by placing the hives on tables and setting the legs in small pails filled with water. Obviously the ants cannot get at the hives as they would have to cross the water to do so. It has been found advisable to mount three or four hives on one table, which is made of 2-in. planks held together with cleats. Holes, about 2 in. in diameter, are drilled in the ends of the cleats and the legs driven into these. The legs are set in small pails and the pails are filled with water. This method of protection has been tried and found entirely satisfactory.—H. H. Siegle, Emporia, Kans.

Water for Hardening

Good tool steel of high temper is very sensitive to differences in the water in which it is hardened. It has frequently been found that a tool which hardens perfectly in soft water will not harden nearly as well under the same conditions in hard water. If soap, greasy matter or dyes are present in the water, the steel will sometimes not harden at all. Distilled water is ideal for hardening and this can readily be collected from the exhaust pipes of a

steam plant. It is also important to have plenty of water available and, if possible, to have the water running slowly. When an insufficient amount of water is used, the first steel hardened will be quite satisfactory, but if the same water is used repeatedly, it soon becomes too hot to be effective. In general, good tool steel should require no admixture of chemicals to the water; the purer the water, the more satisfactorily it will harden the steel.

Effective Calf Weaner

Calves and colts are often difficult to wean and patented devices do not always prove effective. A simple weaner, which will be found satisfactory, can readily be made from a 10-lb. lard pail, the bottom of which is removed and the edges bent over so that there are no sharp projections. Ordinary bit straps are attached so that it can be held in place over the mouth. The animal can pasture in grass and is able to drink, but cannot suck.—R. A. Meeks, Manville, Alta.

Easily Made Distilling Flask

The chemical experimenter will find a discarded electric lamp, of 75-watt size or larger, useful for distilling liquids in the laboratory. Take a knife, or any similar sharp instrument, and turn up the brass



screw cap. Then with a pair of pliers give the cap a few twists to break up the hand cement so that the glass filament holder is exposed. The delicate part of the operation now follows: With a narrow file break the glass holding the filament leads so that it can be removed. The rough edges should be filed down smooth. A length of glass tubing, heated and bent to the shape shown, is inserted through a cork which fits the open end of the flask. It can then be filled with liquid and placed over a Bunsen burner.—Harold Faller, New York City.

Pulley and Gear



Speeds and Sizes



BY JAMES TATE

"WELL, Johnny, are you ready for your gear lesson? I don't suppose you will run into any more trouble with pulley jobs after yesterday's session, will you?" Bill grinned at the apprentice, who grinned back as he replied, "No, sir!"

"All right, Johnny,"—pulling some sheets of paper from a drawer in the desk—"here we go. The principles that we applied to the figuring of pulley sizes and speeds also apply to the same problems in gearing, whether straight gearing or bevel; the calculations for helical gears,

or, as many shop men call them, 'spiral' (although this term is wrong), you will not have to bother with for some time.

"If we have two gears running together as in this sketch (Fig. 1), the product of the diameter in inches and the revolutions per minute of one of them will equal the product of the diameter and r.p.m. of the other. In dealing with gears, however, we do not often refer to them by their diameters, but by the number of their teeth. You know that you are sent to the store-room for a 24-tooth gear, not for a 6-in.

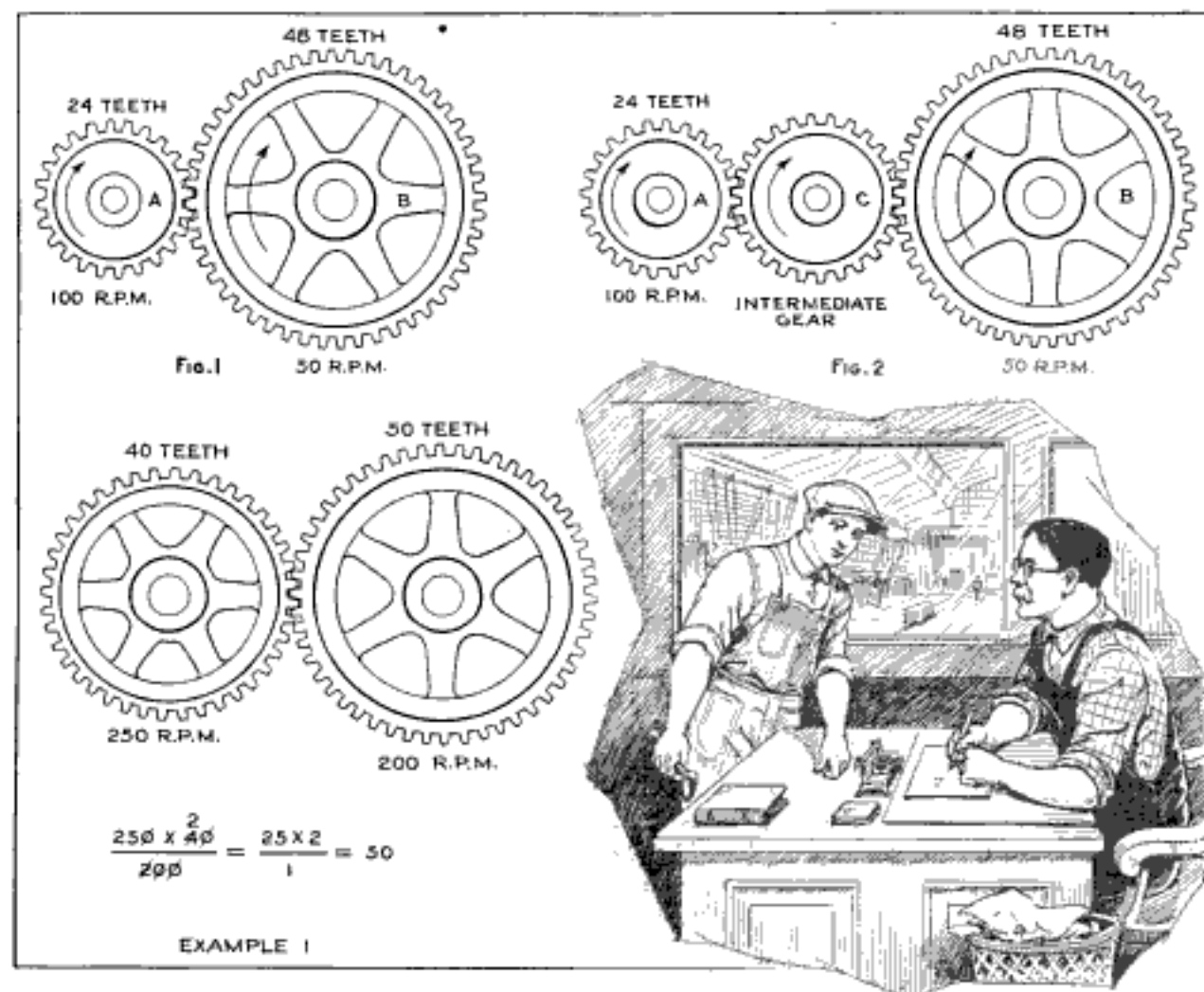


Fig. 1, Simple Gearing, Illustrating the Relation between Tooth Ratios and Speed; Fig. 2, Simple Gears with Intermediate Gear; Example 1, Illustration of Simple Gear Calculation

one. In gear calculations we can use the number of teeth just as conveniently as the diameter, so that the rule above could be given this way: The product of the number of teeth in one gear, and its r.p.m., is equal to the number of teeth in the other, multiplied by its revolutions per minute.

"For example, supposing one of the gears has 24 teeth and its speed is 100 r.p.m. and the speed of the other is to be 50 r.p.m., it must have 48 teeth, because the product of 24 and 100, the numbers relating to the first gear, is 2,400, which is also the product of 48 and 50. Now, looking again at these figures, don't you notice anything else about them? See, the smaller gear has exactly half the number of teeth in the larger and revolves at twice the speed. This gives a clue to the figuring of gear speeds, doesn't it?

"The simple rule for finding the speeds or numbers of teeth in gears is: Take the gear of which you know both the r.p.m. and the number of teeth and multiply these two numbers together. Divide the product by the number, whether number of teeth or r.p.m., that is known about the other gear, and the result will be the number you require.

"Suppose you have a gear with 40 teeth, running at 250 r.p.m., and you want it to drive another gear on a shaft that is to run at 200 r.p.m. How many teeth must you have on the second gear? Multiply 250 by 40; the result is 10,000. Divide this by 200, and the quotient, 50, is the number of teeth you require. Instead of figuring the sum out in this long manner, however, set the problem down in the form of a fraction (example 1), as we did in the case of the pulley calculations. Now we can strike out all the zeros in the lower line against those in the upper and divide the 2 into the 4, leaving only the 25 to be multiplied by 2 to obtain the answer.

"In calculations of this sort, it is always best to state the problem in the form of a fraction. Not only do you save time, but it is very easy to check over the figures, while if there are several multiplications and divisions scattered over the paper it is sometimes difficult to check the result, or to find an error. This is not so important in a simple problem like the one we have just dealt with, but in figuring a train of pulleys or gears a lot of time is saved, and chance for error is lessened.

"When two pulleys or gears are running together, one driving the other, the first is called the driver and the second the follower. You noticed before that it is the larger gear that runs slower, and the pro-

portion formed from the revolutions and diameters, or number of teeth, is called an inverse proportion, because the larger pulley runs at the slower speed, and the smaller pulley at the faster speed. Hence we say that the speed of a pulley varies inversely as its diameter, or teeth.

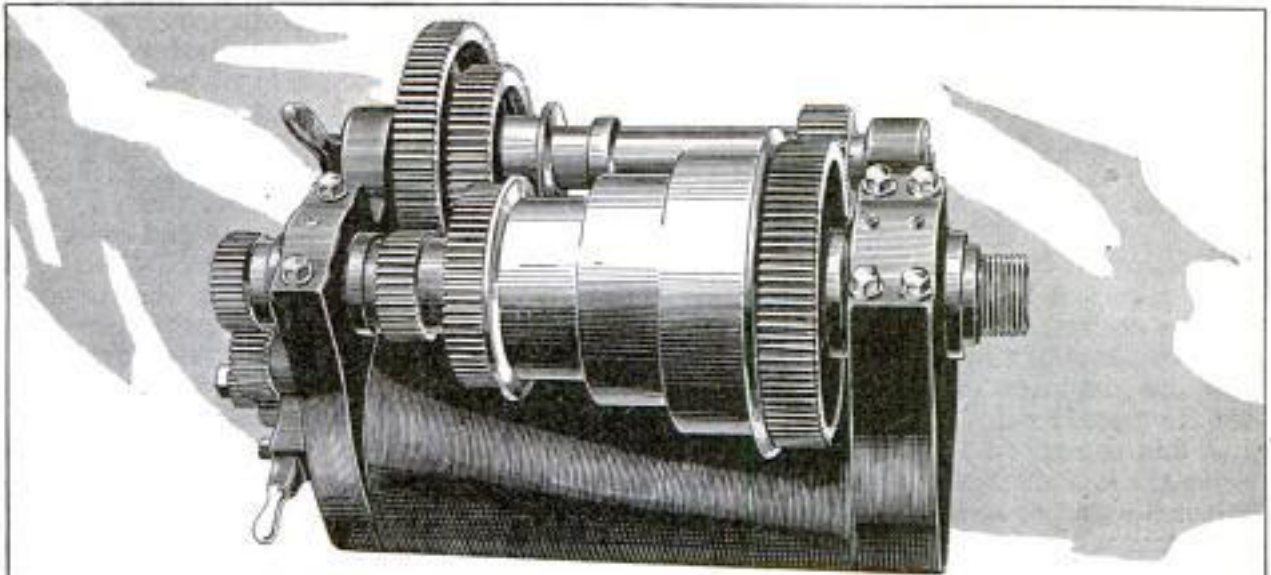
"The first sketch (Fig. 1) shows the simplest form of gear train, one driver and one follower. This sketch (Fig. 2) shows the same gears A and B, but with an intermediate gear, C, between them. This intermediate gear reverses the direction of the follower, and may be used for that purpose only, or may be employed to connect A and B without using larger gears. In this form of gear train, the gear C has no effect on the speed ratio of the gears A and B. Each will revolve at the same speed as they would if the intermediate gear were absent. In other words, the speed ratio of the gears in both sketches is the same, 2 to 1.

"When it is desired to make a very great change in speed, it is practically necessary to use two or more pairs of gears to do the job. This is also necessary, for example, in lathe work, when a thread must be cut for which simple gearing will not serve. A train of gears with two or more pairs in it is called compound gearing. The back gearing of a lathe is another example of this.

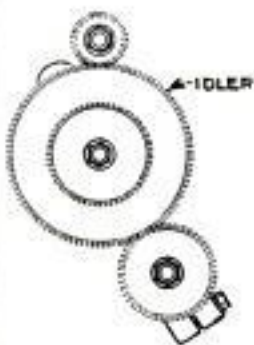
"Here is a common example of compound gearing (Fig. 3). In this sketch A drives B, and C, which is keyed to the same shaft as B, drives D. A and C are the drivers, and B and D the followers. Suppose A has 36 teeth; B, 60 teeth; C, 18, and D, 72 teeth; if A runs at 200 r.p.m., what will be the speed of D? The rule for finding this is exactly like the one used in a similar case for pulleys. Multiply the speed of the first driver by its number of teeth, and by the number of teeth in all the other drivers, and divide this product by the product of the number of teeth in all the followers. In this case, we multiply 36 by 200 and by 18; the product is 129,600. Multiply 60 by 72; the product is 4,320. Divide the second product into the first, and the quotient, 30, is the answer we are looking for.

"See again how much time is saved by the fractional form of the calculation (example 2); 36 divides into 72 evenly; 6 will divide both 18 and 60; the resulting 10 divides into 200, and the 2 below the line into the last 20. All that remains is to multiply the 3 and 10 and we have the answer.

"If we had known the speed at which the shaft on which gear D is fastened is



COMPOUND GEARING: DOUBLE BACK-GEARED LATHE HEADSTOCK

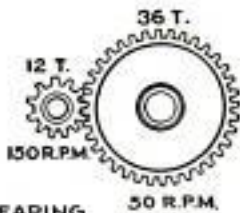


SIMPLE GEARING ON LATHE: WITH INTERMEDIATE OR IDLER GEAR



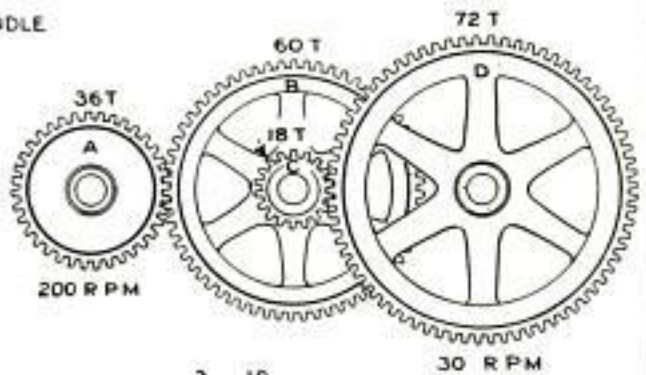
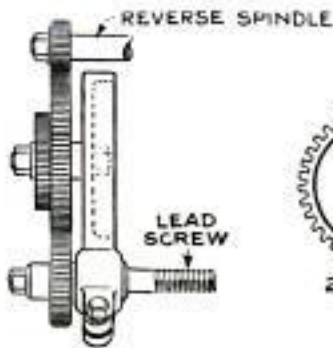
COMPOUND GEARING ON LATHE: WITH INTERMEDIATE OR IDLER GEAR

$$\frac{150}{50} = \frac{3}{1} = \frac{36}{12}$$



SIMPLE GEARING RATIO 3:1

EXAMPLE 4



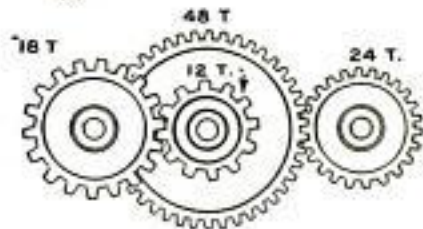
$$\frac{36 \times 18 \times 200}{60 \times 72} = \frac{3 \times 10}{1} = 30$$

EXAMPLE 2

$$\frac{36 \times 18 \times 200}{60 \times 30} = \frac{36 \times 2}{1} = 72$$

EXAMPLE 3

$$\begin{aligned} \frac{36}{12} &= \frac{3 \times 12}{2 \times 6} \\ &= \frac{(3 \times 6) \times (12 \times 4)}{(2 \times 6) \times (6 \times 4)} \\ &= \frac{18 \times 48}{12 \times 24} \end{aligned}$$



COMPOUND GEARING RATIO 3:1

EXAMPLE 5

Above, Example of Compound Gearing; Left, Above, Simple Lathe Gearing, with Idler; Left, Below, Compound Lathe Gearing with Idler; Illustrations of Compound-Gearing Calculations and Figuring of Gear Ratios

to run, and knew also the speed of gear A, and the number of teeth in gears A, B and C, but wanted to know what size of gear D must be, the problem would be similar (example 3). Multiply the speed of the first driver, 200, by the number of teeth in it and in the other driver, 36 and 18, and divide by the product of the r.p.m. of the last follower, 30, and the number of teeth in the known follower, 60; the result is 72, the desired number of teeth.

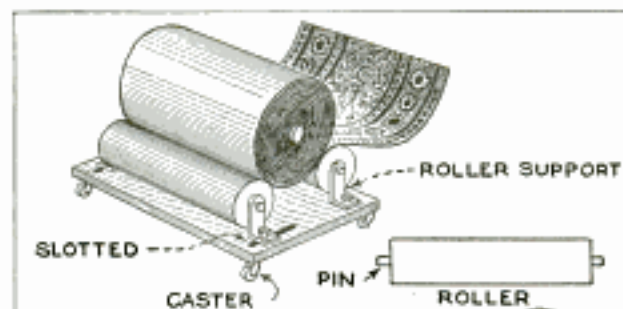
"Now, having all this clear in your mind, suppose you knew only the speed at which the first shaft runs, in this case we'll say 150, and the speed at which you desire to drive the last shaft, say 50, how would you select the gears? Set down the 150 and 50 in the form of a fraction (example 4). This represents the ratio that the speed of the first shaft has to that of the last. But a ratio of 150 to 50 is the same as 3 to 1, so we call the latter the speed ratio. Now, what gears can we use that have a ratio of 3 to 1? Gears with 12 and 36 teeth will do, provided that their center distances, when mounted on the shafts, will be correct. This is a matter for a designer and for more extended calculation, but we will suppose that gears having 12 and 36 teeth will fit. If the 12-tooth gear runs at 150 r.p.m., the 36-tooth one will run at one-third this speed, or 50 r.p.m. Simple enough, isn't it? Suppose again, however, that the 12 and 36-tooth gears won't meet, what shall we do? This is perhaps a case for larger gears, in which case we could use gears of, say, 20 and 60 teeth, or any others with a ratio of 3 to 1; we might also use an intermediate gear

with the 12 and 36-tooth gears, if the direction of motion of the last gear would be correct, or else we must use compound gears. Let us go back to the 36 to 12 ratio (example 5); suppose that the gears available have 12, 18, 24, 28, 32, 36 and 40 teeth, increasing by four teeth from 36 to 100. Resolve the upper and lower figures of the fraction into their factors (see a, example 5); in this case the factors are 3 and 12 above the line and 2 and 6 below. Let us call 3 (above the line) and 2 (below the line) one 'pair' of factors and 12 and 6 another pair. Now multiply each pair by some number, not necessarily the same in each case, that will give us values corresponding to the gears we have on hand. That is, multiply the 3 and 2 by, say, 6; this will give us 18 and 12. Then multiply the other pair by 4, which gives us 48 and 24. This gives us 18 and 12-tooth gears as drivers and 48 and 24-tooth gears as followers.

"Another method is as follows: Suppose our ratio is 10 to 1. Select two gears, say of 12 and 16 teeth to use as followers. Multiply 16 by 12; the product is 192. Now the drivers must have a product ten times as great, or 1,920. Select a gear that we happen to have on hand, and see if the number of teeth in it will divide evenly into this number. If we use a 60-tooth gear, and divide 60 into 1,920 the quotient is 32. We may then use 60 and 32-tooth gears as the drivers. This will give a speed increase of 10 to 1. If the speed is to be reduced in this ratio, of course the 12 and 16-tooth gears will be the drivers and the 60 and 32-tooth gears the followers."

Handling Heavy Linoleum Rolls

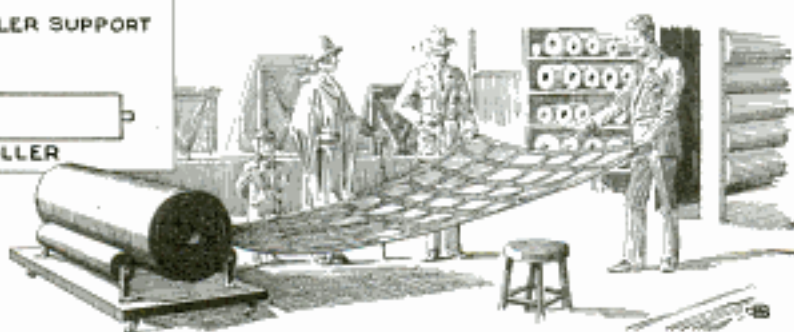
When large and heavy rolls of linoleum, carpet or similar materials have to be handled and shown in stores, the work can



Device in Store Supporting Large Rolls of Linoleum or Carpet Aids in Showing Them to Customers

be facilitated to a great extent by placing the most used

rolls on a device of the kind shown in the drawing. The rollers are made of wood, 2 or 3 in. in diameter and about one-half the length of the roll of material to be placed on them. Pins, driven into the ends of the rollers, act as spindles and rest in bearings, made from large angle irons, which are screwed to a wooden base made of 2-in. material. The base is provided with casters.



Thinning Oil Paint with Water

Place 1 lb. of white shellac gum and $\frac{1}{2}$ lb. of sal soda in a porcelain vessel and cover with water. Put the vessel on the stove and bring the water to the boiling point, letting it boil until the gum is entirely dissolved. Then remove it from the fire and allow it to cool, after which the liquid may be stored in bottles. Add $\frac{1}{2}$ pt. of this liquid to every quart of paint; stir well, and after the paint becomes thick, add cold water to bring it to a painting consistency.—A. A. Kelly, Malvern, Pennsylvania.

Watering Roots of Plants

When water is poured on the ground around a shrub or plant it spreads out over a large area and flows away—especially if the soil is hard—with the result that the roots do not get the needed moisture. During a recent drought, when plants and shrubs needed constant care, I found

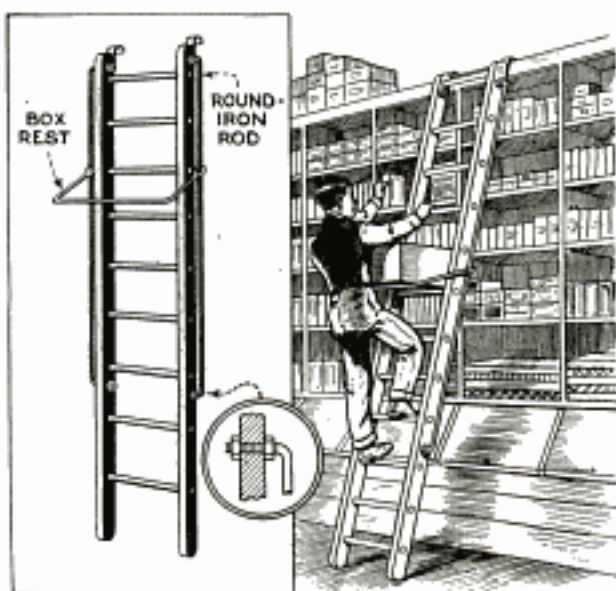
the method shown in the drawing entirely satisfactory. A hole, 3 or 4 in. deep, is made in the ground, close to the root and a bottle full of water is inverted and set in the hole. A milk bottle will do very well for shrubs but a pop bottle is better for small plants, while a jug or larger container is suitable for small trees. This method takes much less time than is required to pour water over the ground frequently, and also eliminates carrying and wasting so much water. In many soils, even when dry, a milk bottle filled with water at night will still contain some the next morning. When a pop bottle is used it is not necessary to dig a hole; just push it into the soil for a few inches.—W. A. Schaphorst, Newark, N. J.



High-speed reamers will often work in metal so refractory or tough that carbon-steel reamers would fail utterly.

Box Rest on Storeroom Ladder

A box rest on a storeroom ladder is a handy attachment as it holds the box while material is taken out or while space



Handy Box Support Attached to Storeroom Ladder Proves Great Help to Workers

is made for the box on the shelf. It consists of a length of $\frac{3}{8}$ -in. iron rod, bent as shown, and having the ends formed into eyes, which slide on two side rails, also of round iron, attached to the ladder as shown in the illustration. In use the rest is slipped up to the height where it is needed, and the box is then set on it and on one of the rungs. The weight of the box binds the rest to the rails and keeps it from slipping down.—Harry Moore, Montreal, Canada.

Making Blueprint Paper

When it is impossible to obtain blueprint paper, it can easily be made by sensitizing ordinary paper with a solution made in the following way: Dissolve $3\frac{3}{4}$ oz. of ammonium citrate of iron in 18 oz. of water in a bottle; also dissolve $2\frac{5}{8}$ oz. of red prussiate of potash in 18 oz. of water in another bottle. Equal parts of the two solutions mentioned above are then thoroughly mixed and applied to the paper with a broad brush or a sponge, making long parallel strokes and spreading the solution thinly and evenly. This is done in a dark room under ruby light, and the sheets are then hung up to dry in the dark room, whereupon they are stored away for use, without exposing them to light. The mixture of the two solutions will not keep and should be thrown away after it has been used.

Advertising Garden Hose

In the spring and summer when gardens and lawns need watering to keep them green and fresh, hose is often on



"Water Spray" Issuing from Garden Hose on Display in Window Proves Good Advertising Attraction

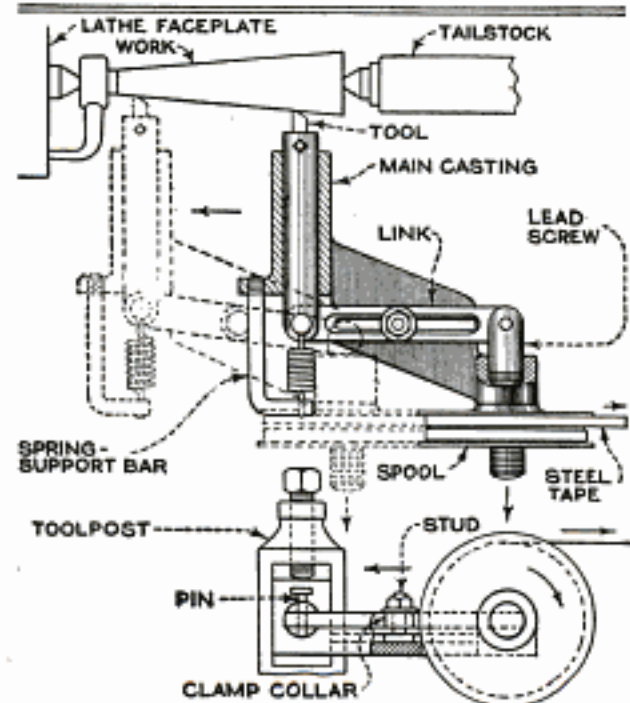
display in the hardware man's window. A striking imitation of water coming out of the hose will attract attention. This effect can be had by stretching a number of lengths of white cord from the end of the nozzle to a 2-ft. wire hoop, which is stapled to the side wall. The hoop must be perfectly circular and the lengths of cord tied on at equal intervals about 1 in. apart. The other ends of the cord are tied together and fastened to the nozzle, which may be done by passing a small piece of wire through the knot and inserting this in the recess at the end, then screwing the nozzle up tight to hold the wire. The hose is mounted on a reel which is pulled back to keep the cords taut.—R. F. Lufkin, Medford, Mass.

A Taper-Turning Tool for the Toolpost

The writer was recently called in on a job where the problem was to turn a quantity of parts like that shown in the drawing, on a regular engine lathe, without setting the tailstock over or using a standard taper attachment. The taper-turning tool shown was therefore designed and worked in a very satisfactory manner.

The cutting bit is held in the cutter bar in the usual manner by means of a set-screw, and the bar is free to slide in the main casting. It was found necessary to make this casting of malleable iron, as cast iron would not stand up under the vibration. Hinged to the end of the bar is a link, which may be pivoted at any point along its length on a stud fitted in a slot in the main casting; the link is also hinged at the opposite end to a lead screw, which operates in a square-grooved wheel or spool. A spring-steel tape or strap is wrapped around the spool, one end being fastened to the spool and the other to the lathe bed. All slack is taken up by a tension spring attached to the end of the cutter bar and to a support bar. The device is mounted in the toolpost, the toolpost screw bearing on the main casting of the attachment.

It is apparent that when the lathe carriage is moved to the left the anchored strap imparts a rotary motion to the spool. This draws the leadscrew in, which, in turn, forces the bar in, through the motion of the link. For extreme tapers, the lead screw can be made with an increasing lead, or with multiple threads. This device has also been applied to the turret of screw machines and to the spindle of a horizontal boring mill.—W. Bennett, Bloomfield, N. J.



Attachment for Lathe Toolpost for Turning Tapers



Q. Is there any objection to oiling the shafts of rheostats to make them turn easier? **A.** Oil should never be used on any radio equipment. In many radio devices the metal parts are used in making connections and a film of oil will cause interference. Oil is particularly harmful on the rheostats, since it heats up and carbonizes as the rheostats get hot, and thereafter produces "frying" noises in the receivers. Practically all radio equipment now on the market is designed to work without any form of lubrication.

Q. How long will dry cells last? **A.** The A-batteries should give about 150 hours' service. When a voltmeter connected across the terminals of a 45-volt B-battery registers less than 35 volts, it is time to replace the battery with a new one. In the case of A-batteries a voltage of 3.5 necessitates replacement, the proper working voltage of a new battery being 4.5. The voltage of A-batteries should always be tested with the set in operation, as an A-battery which is almost run down will show a higher voltage if it is lying idle, and a measurement taken under this condition would be misleading. A C-battery should not be allowed to drop to less than 4 volts. If you have no voltmeter, you may judge of the condition of the B-battery by listening to the click in the loud speaker as the plug is inserted in the loud-speaker jack. When the batteries are fresh, the click will be quite noticeable, but as the voltage drops, it will disappear entirely. Considerable power is lost, due to the resistance of unclean battery connections, and care should always be taken to see that a useful battery is not discarded when dirty connections are all that prevent its delivering the proper power. The illustration (Fig. 1) shows a common B-battery cut open. A is the zinc container of the individual cell; B, a moisture-proof wrapping around it; C, the sealing material; D, the partition between cells; E, the cardboard outer case; F, the top seal, and G, the webbing between the two seals.

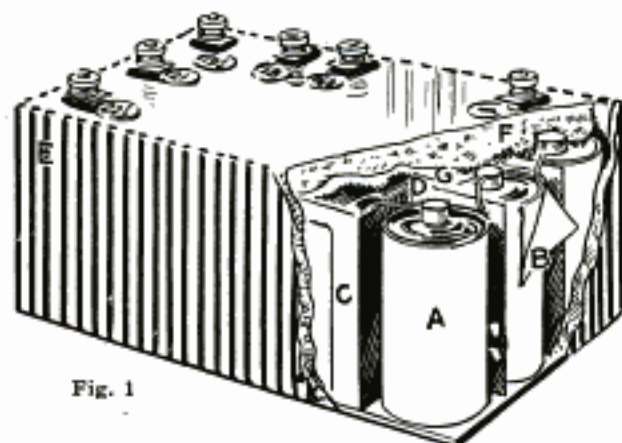


Fig. 1

Q. Can a B-battery be used until it is entirely exhausted, and if not, how long is it proper to use one? **A.** When the voltage of your B-battery drops to 60 per cent of its original value, it is time to replace it. A weak battery offers increased resistance, reduces the strength of signals and causes all sorts of battery noises. (See Fig. 2.)



Fig. 2

Q. How can I test my B-batteries? **A.** Never test a B-battery by shorting it with a screwdriver or other piece of metal to see if you get a good spark. This will soon ruin any battery. Always use a good high-resistance voltmeter for this purpose. An ammeter will not

do, and never use a cheap, inaccurate pocket instrument.

Q. Can you tell me whether a diode valve is the same thing as the ordinary American vacuum tube? **A.** All tubes are called valves in England, but the tube with

which you are familiar in this country would be a triode valve, since it contains three electrodes, filament, plate and grid. The diode valve, or two-electrode tube, was invented by Dr. J. A. Fleming before the discovery of the more efficient three-electrode tube. His tube lacked the grid. For a while they were used both as radio detectors and as rectifiers for alternating current. The present diode tube is used as an amplifier only.

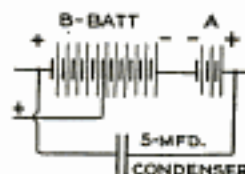


Fig. 3

Q. How can I eliminate battery noises which interfere with clear reception? **A.** Connect a .5-mfd. fixed condenser across the A and B-batteries, as in Fig. 3, and reception will be quieter.

Q. Is it all right to use acid flux for soldering radio connections? **A.** Do not use any acid soldering flux around a radio set. Rosin-core solder or the common soldering paste are the only safe forms of flux to use. If you use paste, use the minimum amount necessary, and remove all surplus with alcohol. Otherwise the molten paste which runs down under binding posts will cause very poor connections.

Q. Is it necessary to disconnect the A-battery when the receiver is not in use? **A.** If you have a potentiometer connected across the A-battery, it is; otherwise a considerable drain of current will occur through the potentiometer winding. The simplest and most convenient way of disconnecting the battery, is

afforded by a switch mounted on the panel.

Q. How can I tell when a dry-cell A-battery and a B-battery are worn out? **A.** If the signals become weak, and turning up the rheostats does not increase the volume, it is pretty certain that either the A or B-battery is run down. The B-battery should be tested with a voltmeter to make sure, and the A-battery with an ammeter.

Q. I am planning a set for a very shallow, compact box. Is it all right to mount the tubes horizontally above the other instruments? **A.** Never mount a tube horizontally, as the filament may eventually sag and rest upon the grid, making the tube useless. Tubes should always stand in an upright position.

Q. Is it more economical to use large size B-batteries than it is to use the small ones? **A.** The current capacity of the large batteries is so much greater that they should always be used when possible. Of course, in a portable set, where space is at a premium, the smaller batteries must be used.

Q. My receiver works satisfactorily in one room, but when I extend the aerial lead-in and move the receiver to another room, the signals are much weaker. Can you tell me the reason? **A.** Your trouble lies in the long lead-in running through the house when the receiver is moved. The walls and ceilings absorb much of the

radio frequency energy. Place the receiver close to the window through which the antenna is brought in.

Q. A 100-ft. antenna was specified for my set, but doesn't give good results. I am using 100 ft. of braided copper wire on the roof, and a lead-in of about 30 ft., soldered to the aerial about 50 ft. from each end. Can you suggest any change?

A. The length of an aerial is not the over-all length of the wire, but the distance from the lead-in to the end. With your arrangement you have in effect a 50-ft. two-wire aerial, instead of a 100-ft. single wire. Take the lead-in tap off one end of your 100-ft. strand and your trouble will be cleared up. (See Fig. 4.)

Q. Is there any possibility of a storage battery accumulating so high a charge as to become dangerous?

A. Strictly speaking a storage battery does not store up electricity as such. If it did, the voltage would rise to very high figures, just as when electricity accumulates on a condenser. What happens in the storage battery is that the charging current deposits a chemical on one of the plates of the battery. When you stop the charging current and connect the wires to withdraw electricity, this chemical dissolves again in the battery and produces electricity. What is stored in the battery is really this chemical, not electricity itself.

Q. I am very much interested in the details of the rebuilt Reinartz set described in your March issue. Please publish the hookup of this receiver. A. This is the ordinary Reinartz hookup, and a schematic diagram (Fig. 5) is given herewith.

Q. Why does a nail driven into a live tree make a good ground, while one in a dead tree does not work?

A. The live tree contains sap which is not pure water, but contains various salts in solution. The sap is a very good electrical conductor. The dead tree has no sap, and hence makes a very poor conductor.

Q. How can I build a transformer for use on direct current?

A. This cannot be done. The principle of the transformer applies only to alternating current, or such pulsating currents as you have in a radio receiver. With alternating current, each time the current direction changes a magnetic wave is produced around the primary coil and this wave creates the pulse of current in the secondary coil. With direct current there would be no such alternating magnetic wave, and accordingly no current produced in the secondary. While radio currents are direct, yet there are successive impulses which give the same effect as an alternating current, and hence make transformers in radio possible.

Q. I want to erect an aerial from my house to an adjoining one, but there is an electric-light power line running through the yard and the antenna would have to pass over it. Will the power wires interfere with the working of my set?

A. Do not erect an antenna either over or under electric-power wires. Several persons

have been killed while pulling antenna wires over power lines, and if the antenna is placed below them, there is always the danger that the power wire may break, fall on the aerial and ruin the receiving set or injure anyone operating it.

Q. How can I stop radiation from a single-circuit receiver?

A. Add a single stage of radio-frequency amplification in front of your single-circuit receiver, and this will cut out radiation from your antenna. The radio-frequency amplifier itself, however, should never be allowed to oscillate. Neutralize the first stage in the same manner as a neutrodyne, and thus be sure that you are not disturbing your neighbor's reception.

Q. Can you tell me how to make an amplifying transformer for audio-frequency amplification?

A. Don't try to make one. You would only give yourself a lot of trouble, and end by producing an inferior instrument. It is best to buy one of the reliable machine-made transformers to insure getting good results from your set.

Q. Is it necessary to disconnect the battery from the set to charge it?

A. Yes; never turn on the charger when the battery is connected to the receiver, or you will blow out your tubes, or the line fuses.

Q. How can I get rid of body capacity?

A. Connect the rotary plates of the variable condenser to the ground, or if the variable condenser is in the secondary circuit, connect the rotary plates to the filament side of the circuit. If the trouble is experienced with the plate variometer, connect the stator windings to the plate and the rotor windings to the B-battery.

Q. Should the ground wire run straight down into the earth under the spot where the receiver is placed? I have been told it can be fastened to the radiator pipe.

A. The radiator pipe may be used, but is not so satisfactory as the cold-water pipe. The heating pipe goes only to the furnace, while the water main gives a ground under the entire city. It is not necessary to ground the receiver beneath the set, but the length of ground wire should be figured in the total length of the aerial; in other words, if a long ground connection is used, the aerial should be shortened accordingly.

Q. Can a hard tube be used as a first detector in the Popular Mechanics superheterodyne?

A. We recommend only the soft tube for the first detector and a hard tube for the second. If the set is built of the parts specified and according to the drawings given, we know it will work satisfactorily. We cannot guarantee the same results if different parts are used.

Q. Is radio-frequency amplification employing resistance coupling satisfactory?

A. It is feasible for high wave-length work, but is not so efficient on the shorter wave bands more generally used in broadcasting. The large internal capacity of the vacuum tubes causes this.

Q. Is it all right to shellac the windings of a coil to keep them from slipping?

A. Never use shellac or paint on any radio instrument. A small bit of sealing wax dropped on the edge of the winding of a coil is sufficient to hold the wires from slipping. The end of the wire should be passed through three small holes drilled in the end. (See Fig. 6.)

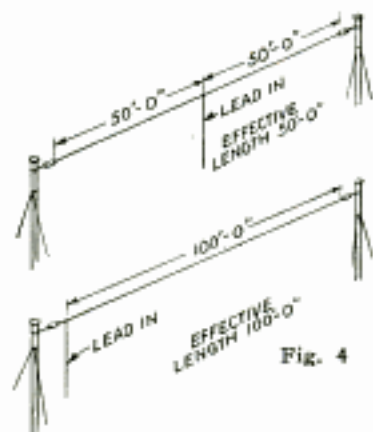
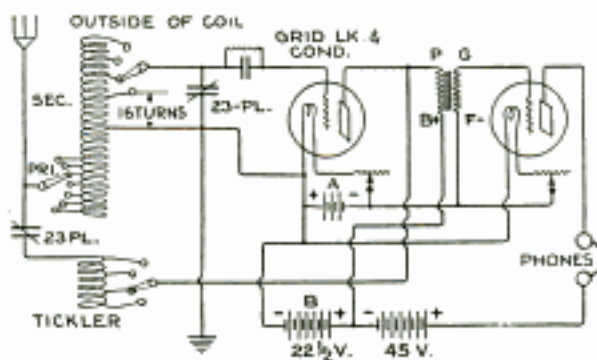


Fig. 4

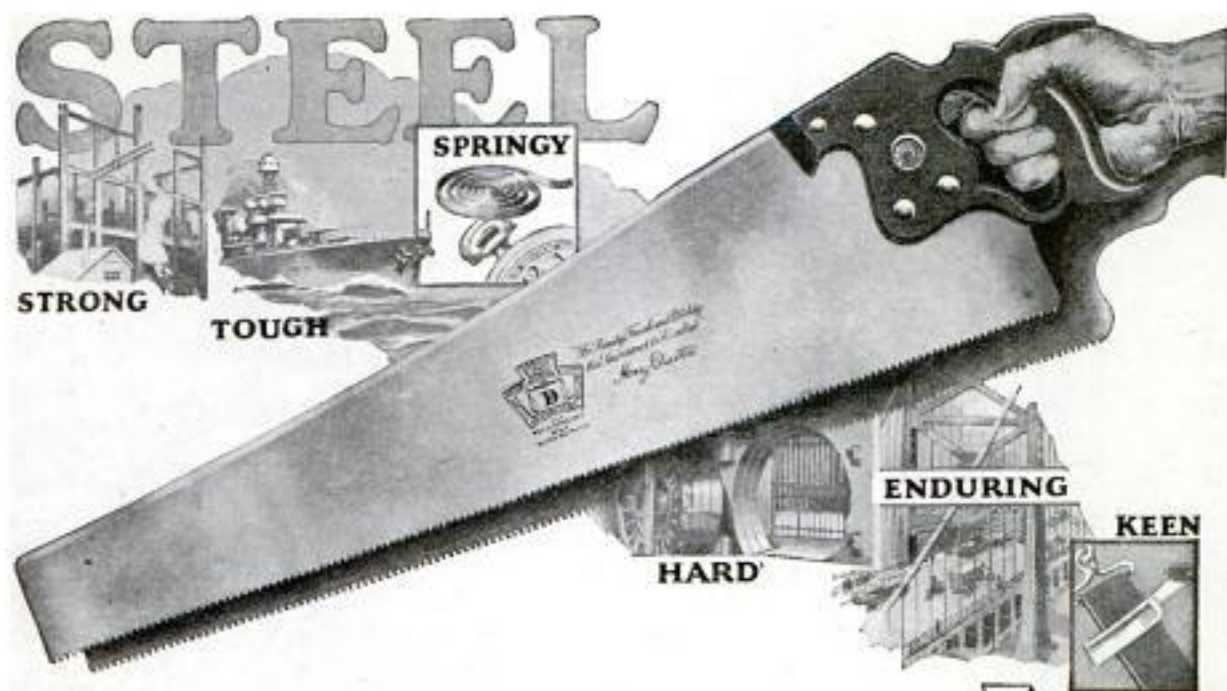


1-STEP REINARTZ HOOKUP Fig. 5



Fig. 6

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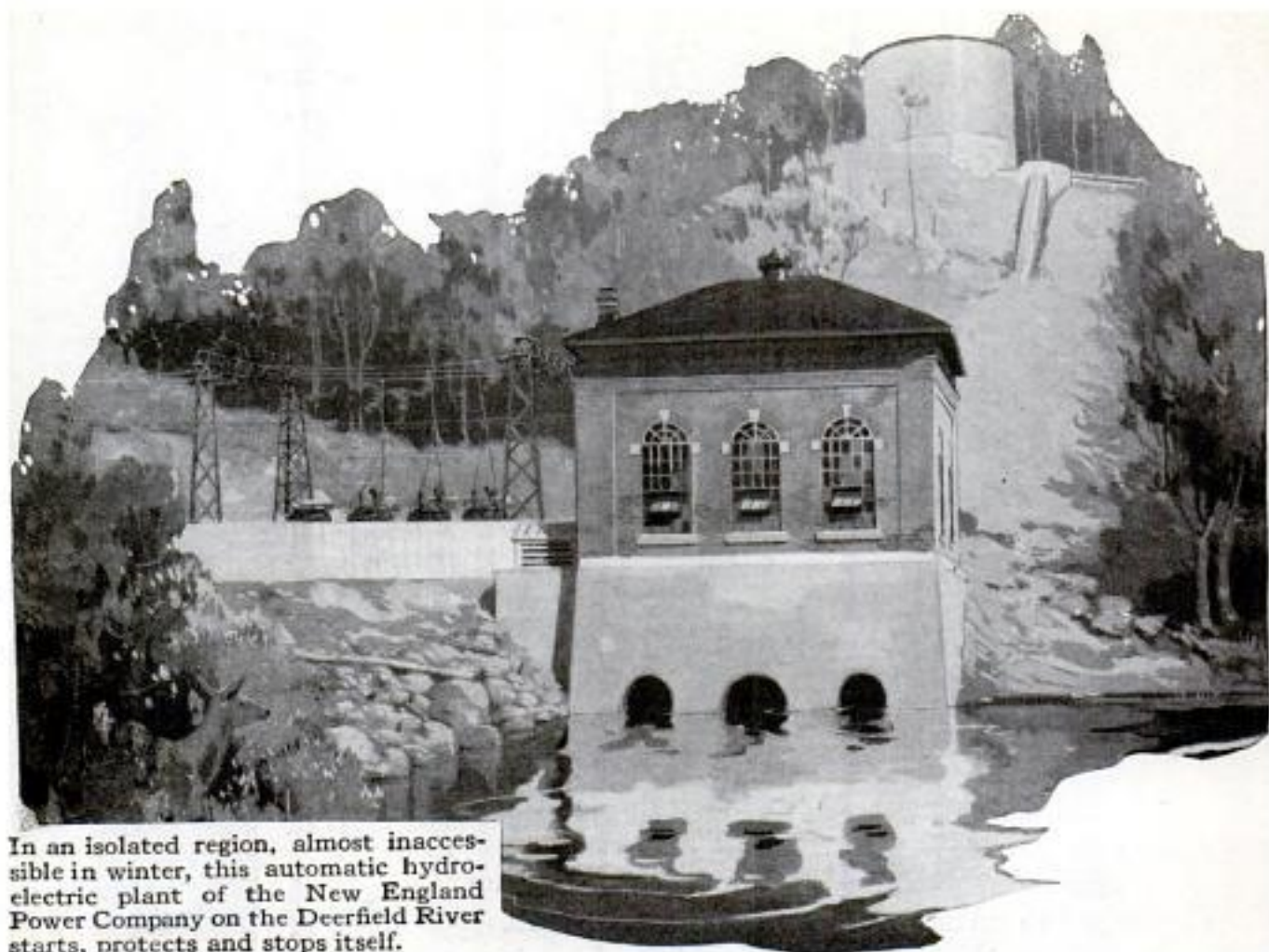
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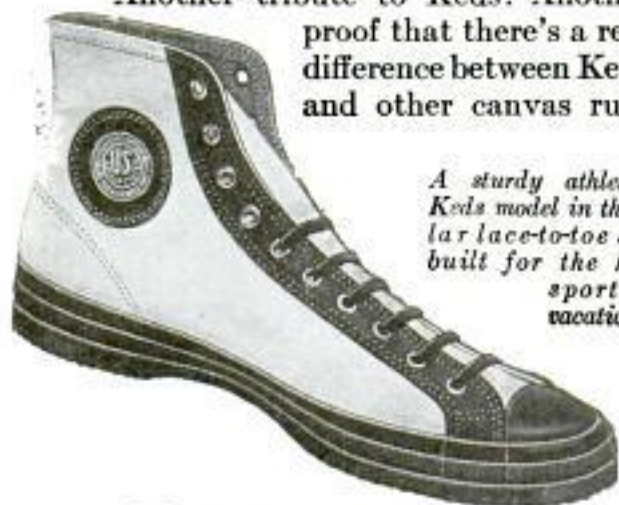
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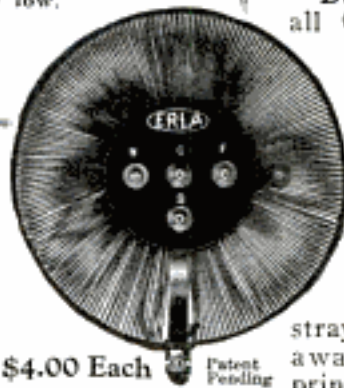
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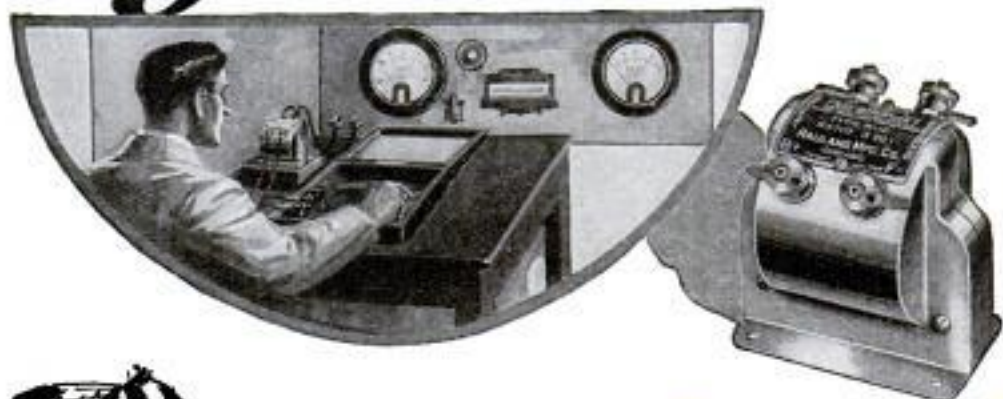
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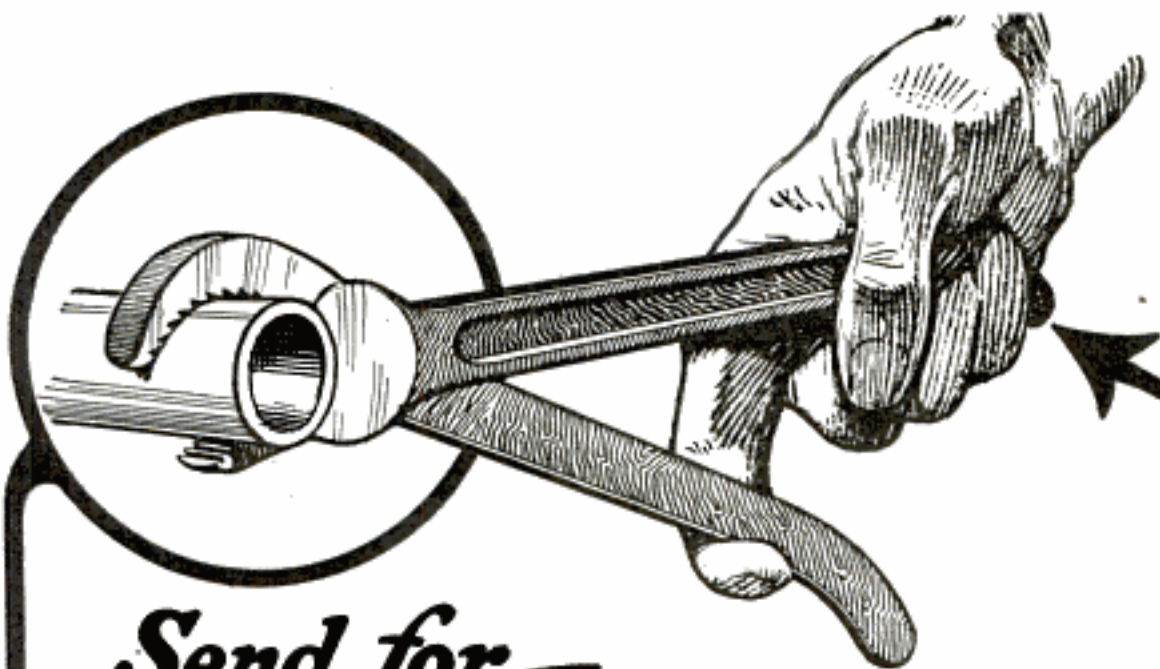
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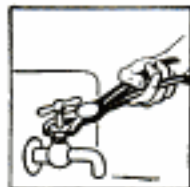
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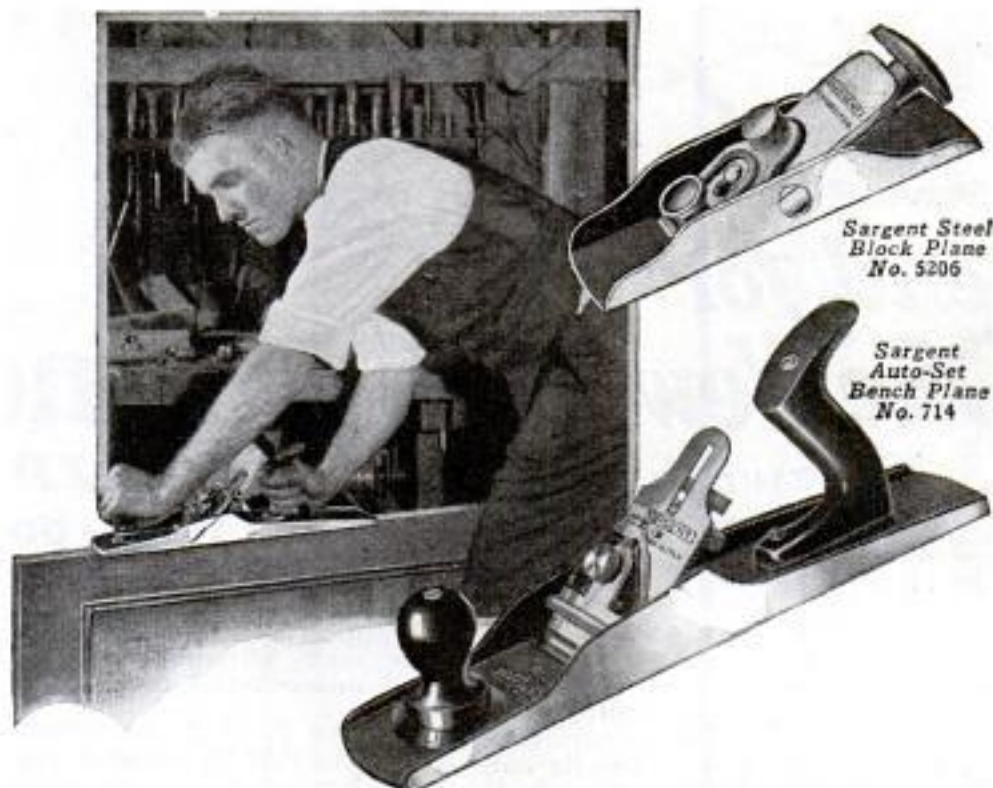
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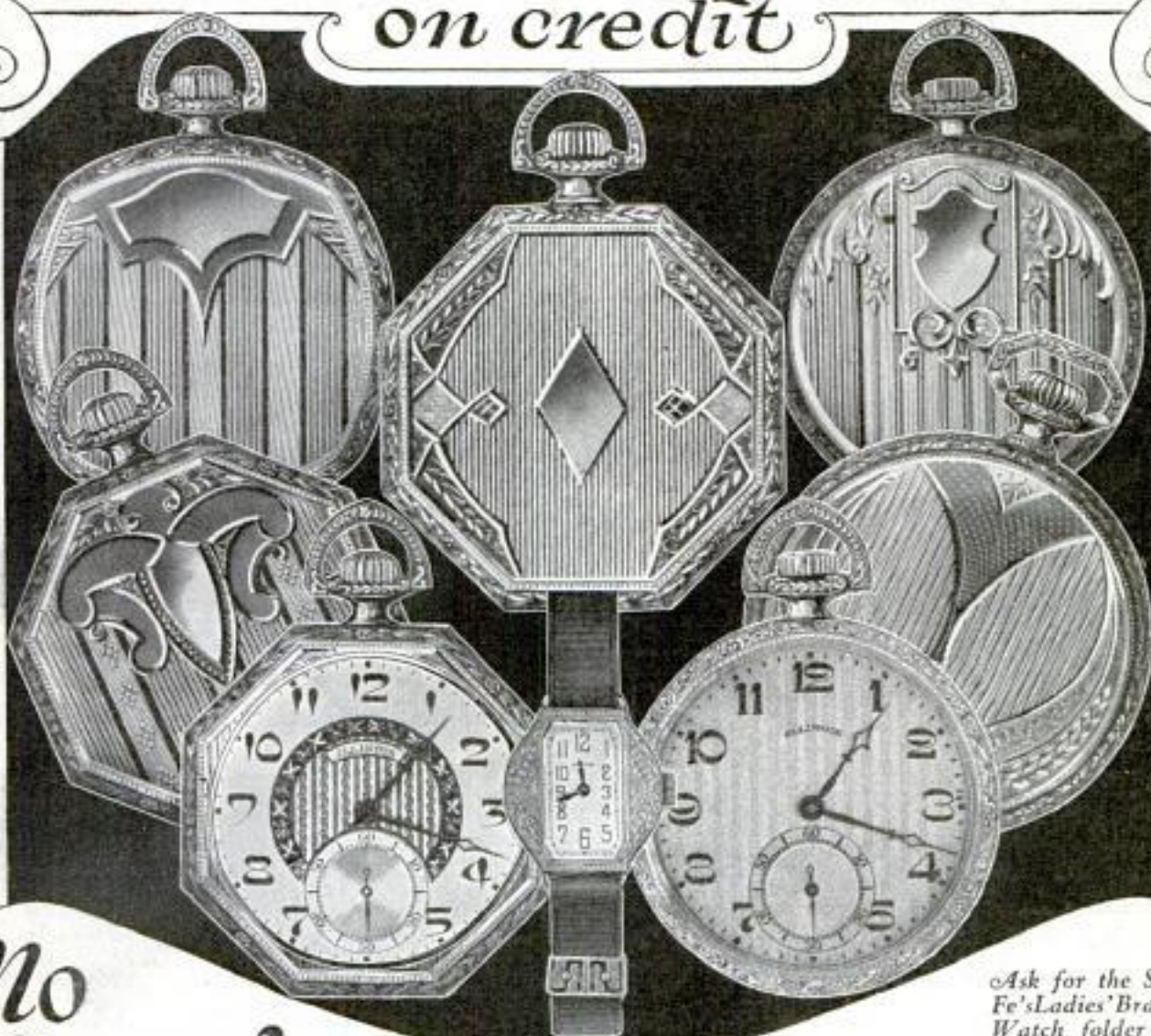
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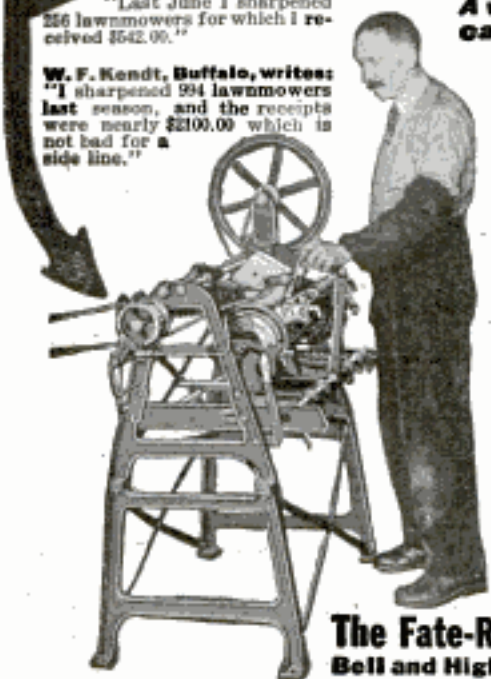
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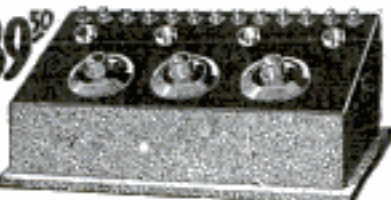
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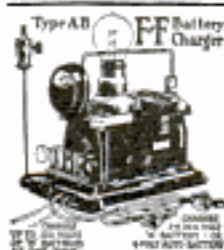
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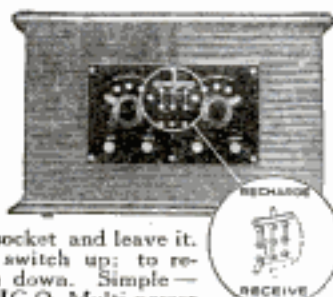
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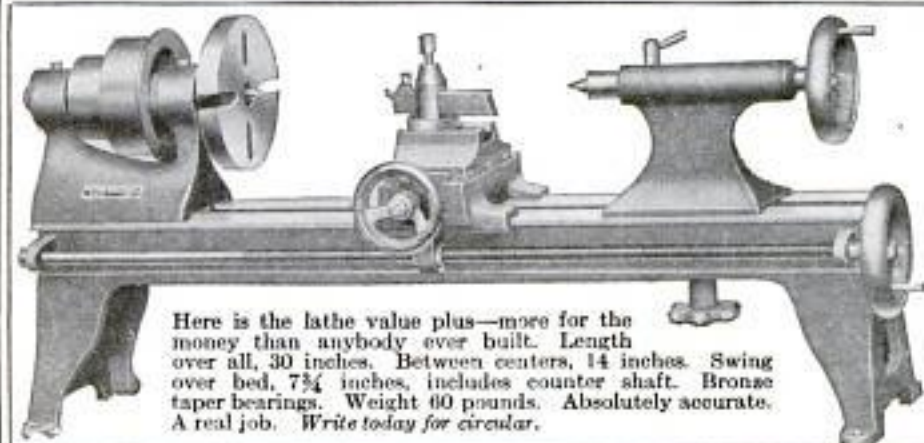
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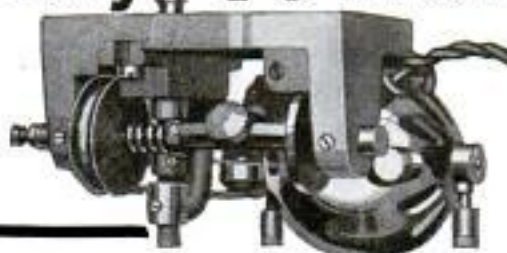
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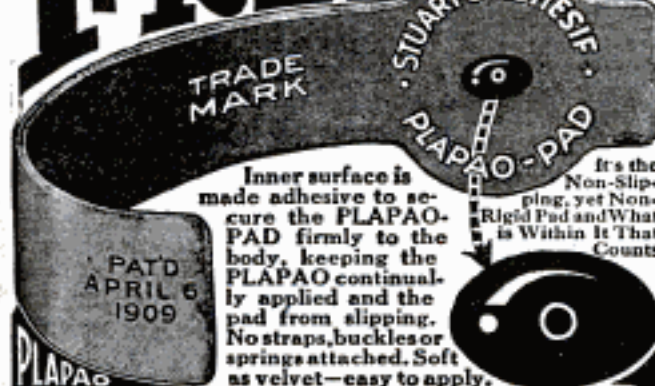
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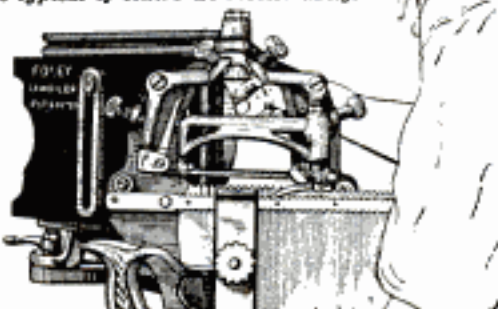
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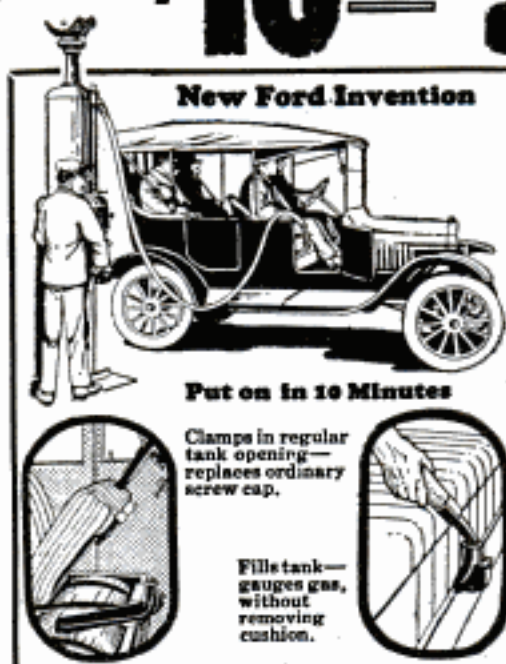
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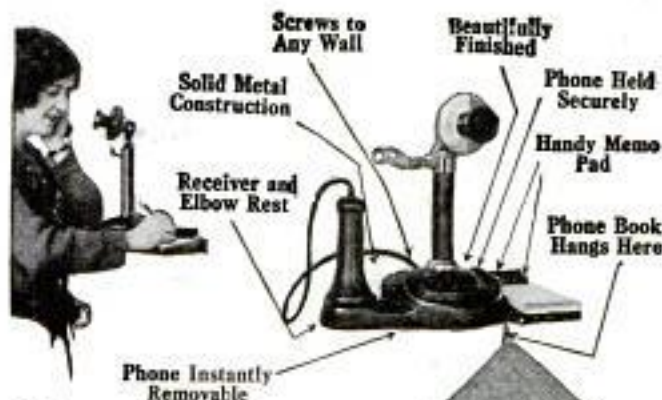
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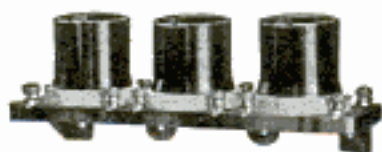
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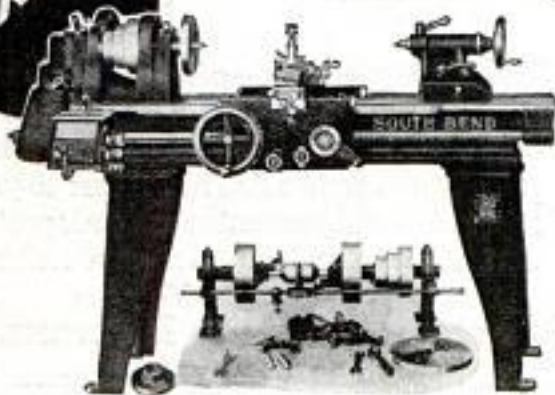
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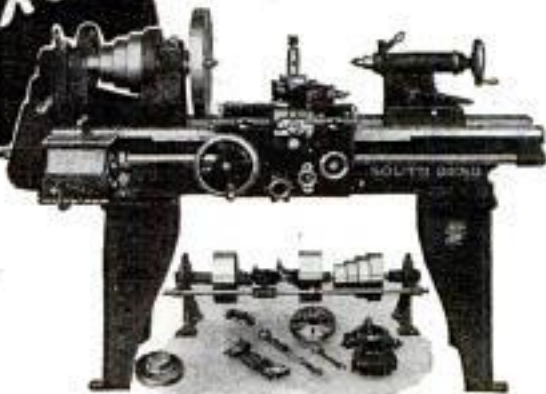
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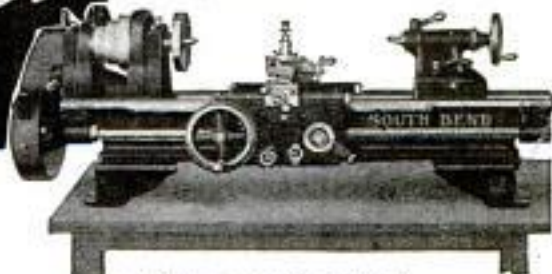
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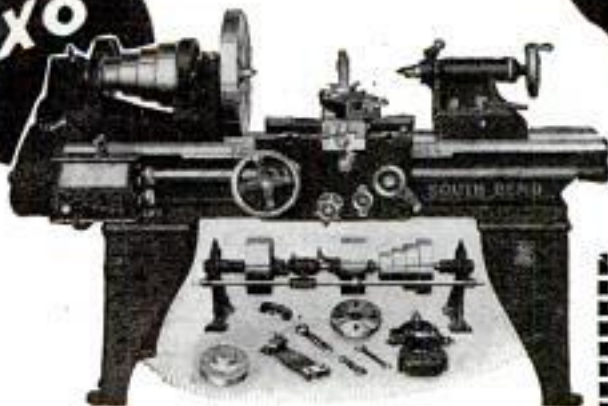
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today is our Bear Cat Cord. Never in the history of automobiles have tires gained such popularity in the great competitive market of Chicago as Simplex-made tires have. There is a reason for this great popularity. It will pay you to investigate!

SEND TODAY for Our STEADY INCOME PROPOSITION

If you are the man who wants to represent an old time tire company financially independent and established; if you want to sell the kind of goods that enable you to go back to your customers for orders again and again; if you want to sell tires so good that you will automatically build for yourself a business no one can take away from you; if you want to have a steadily increasing income of from \$2,500.00 to \$10,000.00 a year, fill out and send the coupon at once. To make certain of your home territory get it into the mail today. Do it now! At once!



The STANDARD Tires Wherever You Go

Everywhere, you see Simplex-made Tires. The better dealers sell them and recommend them—and they are used on thousands of all kinds of cars. The motorist who uses one set of Simplex-made tires never buys anything else.

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Without delaying a single minute clip this coupon and mail it. We'll send you all particulars and a copy of one of the most enlightening books ever written—"The Paved Road to Independence." Show how you can easily make big money right now—and bigger money every day hereafter.

Clip the Coupon Now!

Simplex Tire & Rubber Co.
2035 S. Michigan Ave., Dept. 5, Chicago

Send me full particulars of your proposition which will assure me a steady, always increasing income, also a copy of your book, "The Paved Road to Independence."

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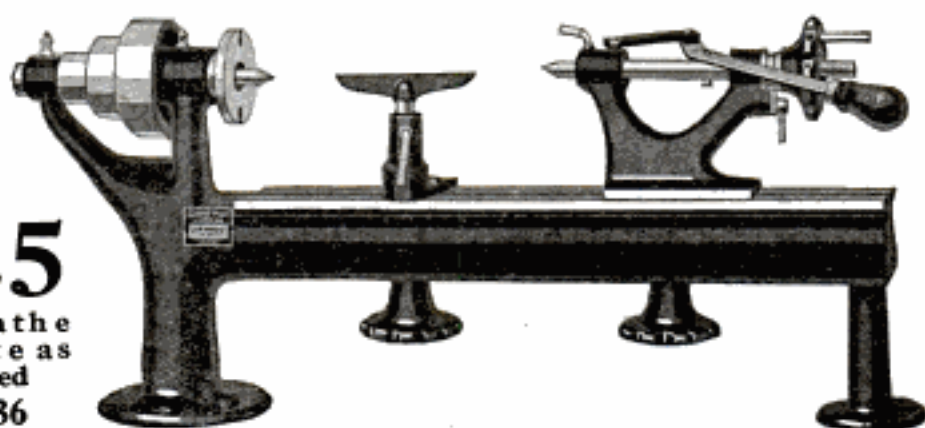
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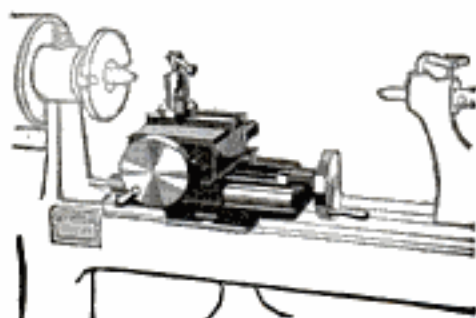
(Own a Car?)..... (Ans. Yes or No)

SIMPLEX TIRE & RUBBER CO.
2035 S. Michigan Ave., Dept. 5, Chicago, Ill.

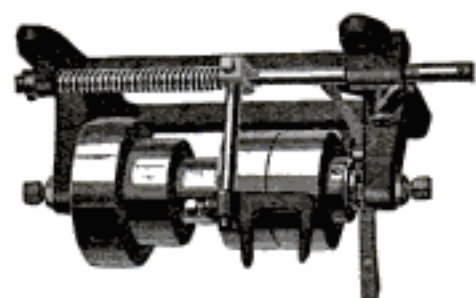
No. **125**
Bench Lathe
Complete as
Illustrated
Price \$36



For that home shop of yours



No. **132** Slide Rest
Price \$16



No. **130** Counter Shaft
Price \$11

Bench Lathe No. 494

Same construction as No. 125 above, but slightly larger. Length over all, 31 inches. Height 11 1/2 inches. Swing, 7 inches. Extreme distance between centers, 18 inches. Weight, 36 pounds. Price, \$40.

YOU can do all sorts of turning and boring jobs the minute you set up this lathe on your bench. Just the right size for a small workshop. Length over all, 25 inches; height, 11 1/2 inches; swing, 7 inches; extreme distance between centers, 12 inches. Weighs only 30 pounds.

Well-made and finished with black and red enamel. The bed is milled. All working parts handsomely polished. Live spindle has a cone bearing to take up wear. Tail stock has screw and lever feed. Cone pulley has three steps—1 1/2, 2 1/2 and 3 1/2 inches in diameter.

A complete line of attachments are available to fit this lathe, such as slide rest, lathe tools, compression check and collets, milling attachments, turret attachments, etc.

Interesting Bench Lathe Booklet Free

Shows all the Goodell-Pratt Bench Lathes, also various attachments that enable you to do all sorts of turning, boring, milling, sawing jobs, etc. Gives the amateur mechanic many new and valuable hints for working out his ideas. A post card will bring you a copy of the booklet free. Just ask for the Goodell-Pratt Special Bench Lathe Booklet.

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526 TREMONT BUILDING, BOSTON, MASS.

December 20, 1924

Remington Typewriter Company,
132 Federal Street,
Boston, Mass.

Gentlemen:

I want to tell you all about the splendid service rendered by the Remington Portable Typewriter on our recent polar expedition.

This expedition left Boston on June 16, 1923 and returned on September 20, 1924, a period of fifteen months. We were frozen in for 230 days at Refuge Harbor, North Greenland, at a latitude of 78-degrees-32-minutes, with a temperature often at 48 degrees below zero.

Our little Remington Portable was used for taking and sending radio messages and also for writing a daily newspaper for the ship, which was posted on the mast each morning so that the men might keep in touch with the outside world. We received radio messages concerning the deaths of President Harding and Wilson, also information on conditions in Germany and France, on the fishermen's race, the World's Series baseball games, etc. More than 150,000 words were written on this Remington Portable, and Mr. A. P. Robinson, who used the machine most of the time, states that it never failed him, and although carried about in all kinds of weather, it was always ready to do the work.

The Remington Portable had absolutely no repairs made on it during the entire trip except to be cleaned and oiled. Although the case shows a little wear and tear, the machine itself is in perfect condition.

Yours very truly,

Donald B. Macmillan

ENTHUSIASTIC owners are constantly paying tribute to the unusual ruggedness and reliability of the Remington Portable.

This little machine possesses every feature common to the big office typewriters. No wonder

that it is the recognized leader, in sales and popularity.

You need a Remington Portable, and every home needs one. Write today for our illustrated "For You, For Everybody." Address Dept. 12.

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Agents
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Send No Money Simply write a postal saying that you want **Popular Mechanics New Carpenter's Handbook**. It will be sent C. O. D. and you may pay the postman the price of the book and the few cents postage when he delivers the book to you. If you live outside the U. S. or if you are not at home when the postman delivers your mail, send \$1.00 with your order.

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Room 706, Popular Mechanics Bldg., 200 E. Ontario Street, Chicago, Ill.

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Popular Mechanics New Dollar Book—Outdoor sports appeal to us all. But the fun is double when you make your own devices. There are 226 clearly written and concise articles telling how to make equipment for new and popular sports of many kinds in the new **Outdoor Sports book**. There are clever devices for such sports as:

Swimming	Trapping	Photography	Kite flying
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GALACITE will repair a puncture in ONE MINUTE without taking the tire off the wheel or rim; and in addition it will make the tire Puncture Proof for life. GALACITE seals instantly and permanently, punctures, leaks, porous places and leaky valves. No more flat tires, no more getting out and changing tires in a hot sun. No soiled clothes. A scientific laboratory product. Tested in every part of the United States. Backed by a MONEY BACK GUARANTEE to do everything we claim. Guaranteed not to injure tube, valve or tire; on the contrary it preserves and lengthens the life of tube and tire, often

INCREASING TIRE MILEAGE FROM 10,000 TO 12,000 MILES

Take a hammer and drive as many nails into a tire as you wish, 50—100—500, it makes no difference. GALACITE seals the punctures permanently, as soon as they are made. We guarantee it for one year, but it will last indefinitely.

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EARN \$5,000 TO \$10,000 A YEAR

TREMENDOUS PROFITS. Agents and Distributors everywhere to demonstrate and sell to car owners, garages, filling stations. Work all or spare time in your own home town or traveling. GALACITE sells itself. Every customer becomes so enthusiastic that he helps you sell his friends. A revolutionary invention that will make you independent. You can also manufacture and sell GALACITE PUNCTURE PROOF TUBES.

ACT QUICK SEND NO MONEY. Just your name and address will bring complete particulars by return mail. Get this information right now. Test it out. Get started while the field is still unworked.

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Sell this new tire casing repair. Mends casing holes in 30 seconds, and they stay fixed! Plug is inserted from inside with special Kex needle. Kex plugs plug tightly—keeps out water, dirt, sand. Makes a perfect lasting job! Every garage, tire repair shop, and auto supply store a live prospect. Kit including 50 Kex plugs and needle—\$3.50. No competition! Get Salesman's proposition for your Territory Now!

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What the Trirdyn gets where it's hotter than Summer!



Crosley Trirdyn—on the Sahara Desert at mid-day—brings in Radio-Paris on the loud-speaker!

Not only at mid-day, but in February—in Northern Africa and far hotter than any American Summer. The picture above, a post card snap shot sent from Tunis to Mr. Crosley, by D. F. Keith of Toronto, Ont., tells this story on the other side:—

Tunis, North Africa, March 3, 1925

Dear Mr. Crosley:

Fishing here is rotten but radio is fine. On the Sahara, using three tubes on the Trirdyn circuit, reception from Paris came through on the loud-speaker. Along the South coast of the Mediterranean, using this set, six or eight high power European stations came in with good volume by day-light and all of them after dark. Can usually get a few American after 1 a.m. Can you fish with us this year?

Cordially,
(Signed) D. F. Keith

Further details on the margins of the picture:—

Sahara Desert, 250 miles south of Algiers, February, 1925. Receiving noon-day concert from "Radio-Paris", Paris, using aerial and counterpoise.

Who said summer in America is a poor time for radio—if the receiver is a Crosley Trirdyn? Every radio fan—actual and aspiring—is invited to think this over and then act.

On the Trirdyn is the beautiful new Crosley Musicone, radio's most startling development. The Musicone's abilities and its beauty are so superior that we expect it to replace half a million loud-speakers this year. \$17.50.

The Crosley Radio Corporation, 615 Sassafras St., Cincinnati
Powel Crosley, Jr., President

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JOHNSON'S WOOD DYE

Johnson's Wood Dye is just what you need for the artistic coloring of all wood. With it you can finish inexpensive soft wood so it is as beautiful and artistic as hard wood.

Johnson's Wood Dye is easy to apply—dries in four hours—will not rub off or smudge—and penetrates deeply, bringing out the beauty of the grain.

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I am giving away these 15,000 mile cords to secure demonstrators and boosters. If there is no authorized Mellinger agent in your locality, I want you to show and demonstrate Mellinger Tires on your own car. I will ship these magnificent cord tires fully prepaid. **Be the first from your neighborhood** to get my confidential advertising offer.

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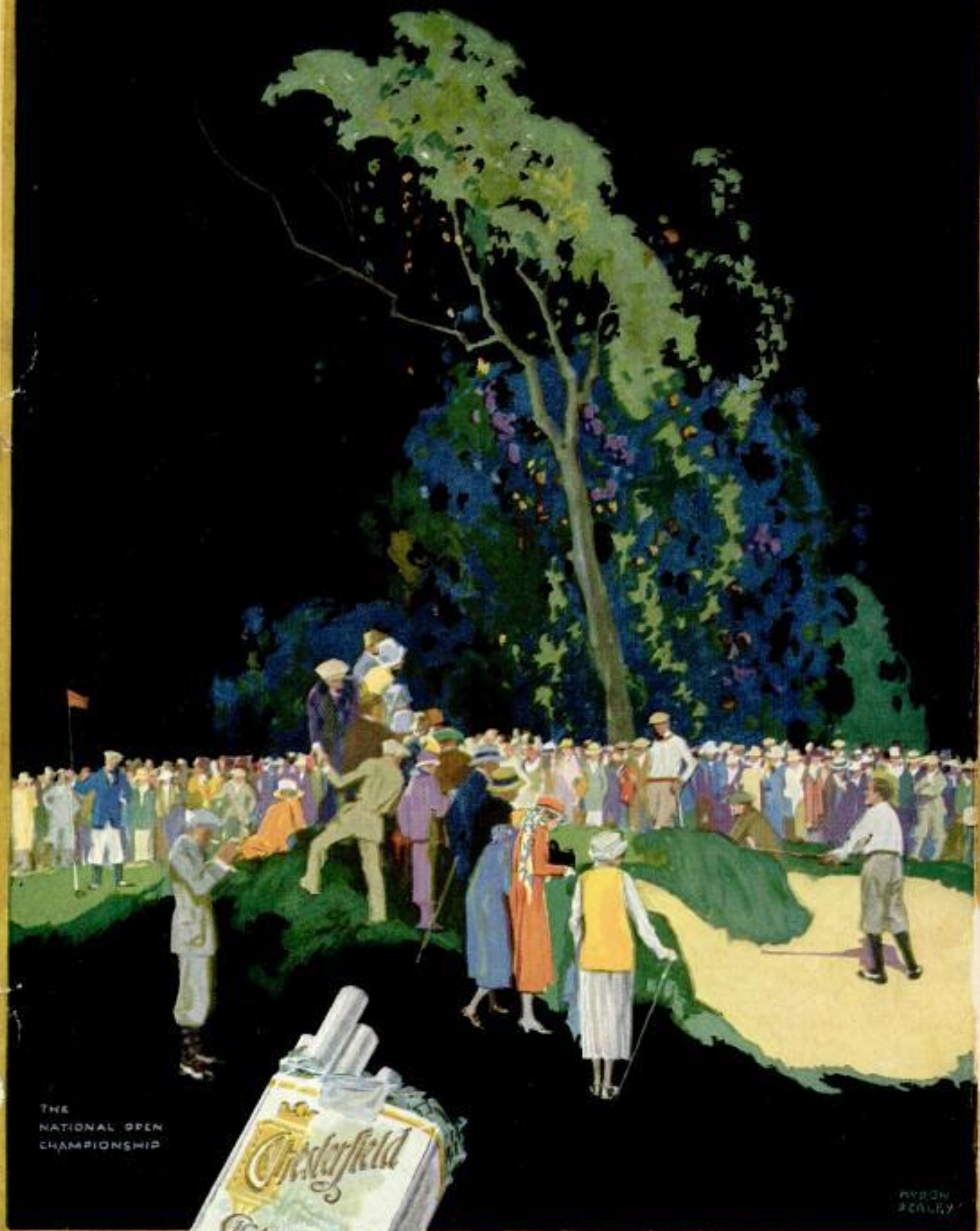
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