AY All-Wave Receiver—Page 831 25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 762

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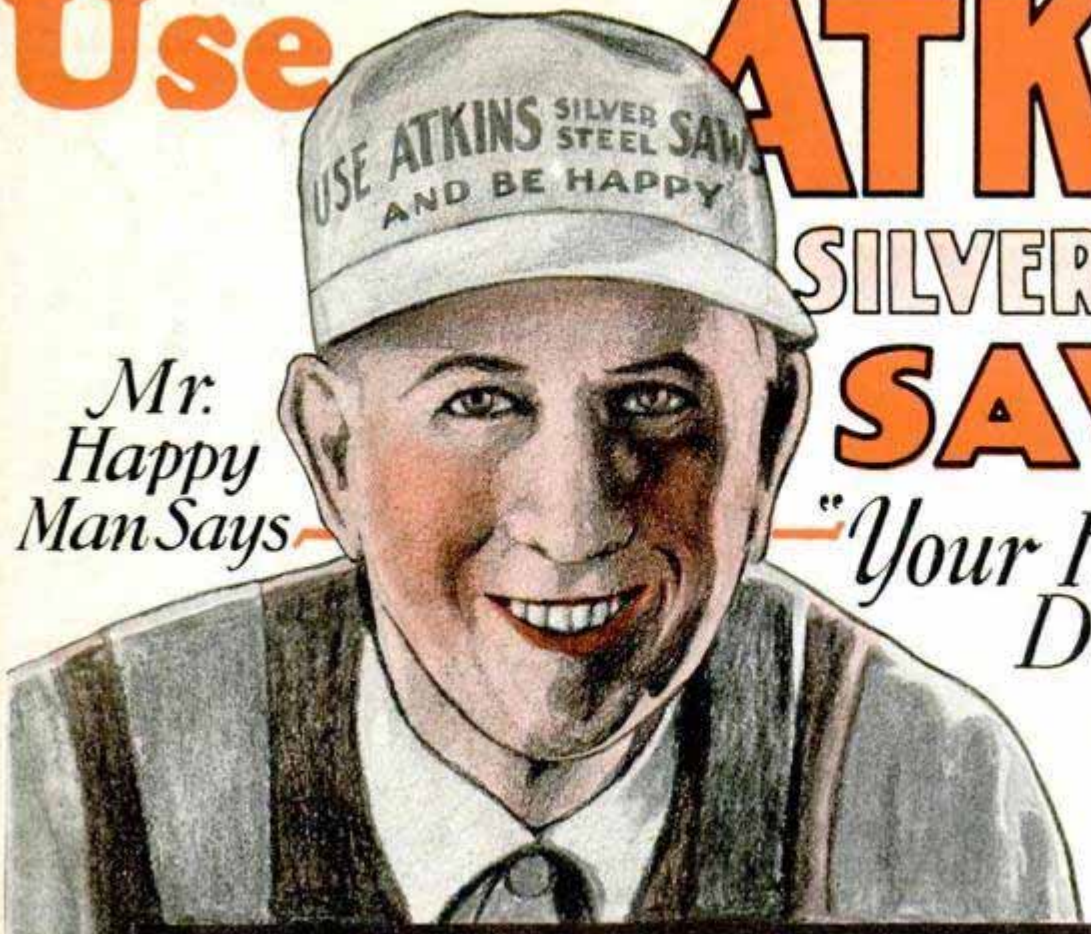

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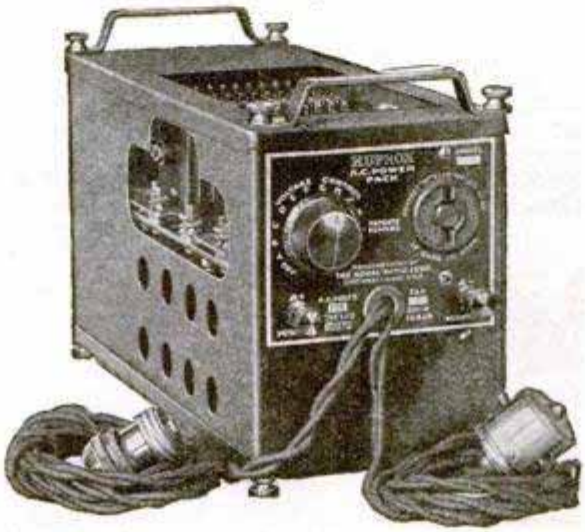
Makes any radio an A.C. Set using ordinary 199 or 201 Tubes! No harnesses, adapters or wiring changes!



The Kuprox A. C. Power Pack is now offered in kit form! In fifteen minutes time, with only a pair of pliers you can build your own A. C. Power Pack to operate any radio as an A. C. set using ordinary 199 or 201-A Tubes. There are no tricky adapters or makeshift harnesses to hook onto your set—no changes in set wiring. The Kuprox A. C. Power Pack supplies direct filament current to your set from an alternating current socket—makes any set an A. C. set regardless of the circuit. Instead of having to buy expensive A. C. tubes it permits the use of the much more efficient 199 or 201-A tubes for A. C. reception.

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For information send for free folder describing the Kuprox A. C. Power Pack Kit.

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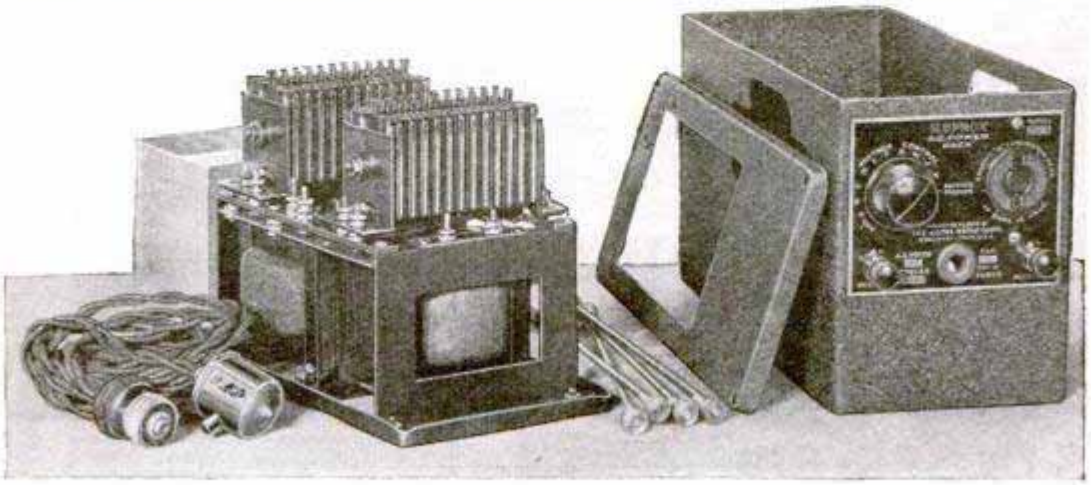

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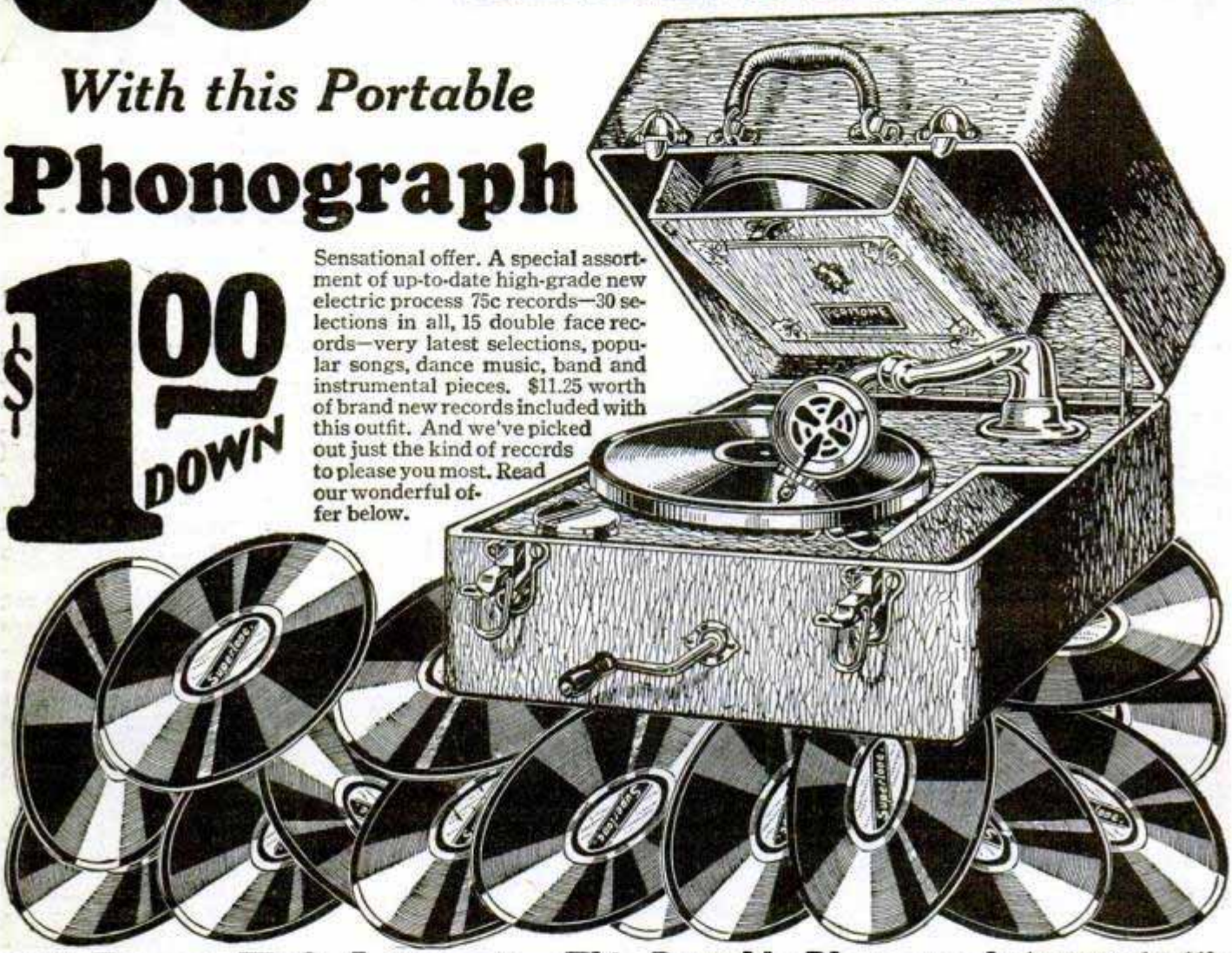

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SUPPLEMENTARY INDEX MAY

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Vol. 49 — Contents for May, 1928 — No. 5

Special Features

Rubber from a Hole in the Ground 705
Photographing the Secret of Life 710
America Spreads Its Wings 723
Four Years at West Point 739
Beware of Sunburn 754
Gambling with Death at Sea's Bottom 762
True Stories of the Manhunters 770
Tracking the Weather to Its Lair 779
Raising the Iron Horse from a Colt 786
Growing Precious Stones 795
How Your Eyes Fool You 803
Easy Tricks with String 819

Camera Reveals Undersea Wonder 806

Advertising
billboards like stage sets give better display 752
wooden man advertises lumber industry 737
Airplanes
balloons on wings to keep afloat 800
seaplane carried on liner for pleasure trips 714
Airship—with all metal bag to be run by steam 733
Altimeter—registers slight changes 760
Art—early American, primitive, inspired by magic 794
Astronomy—forty years to draw map of the stars 817
Automobiles—Accessories
air-inflated bumper to decrease damage 737
angular steering wheel relieves fatigue 734
bed on running board simplifies camping 777
carrier locks luggage and fits any car 748
clamp to hold logbook fits on dashboard 810
four-wheel jack system controlled from dash 709
keyless dash lock fastener has luminous dial 778
license plate snap fastener eliminates bolts 799
lock holds car if brakes fail 767
mirror inside car is travel convenience 785
Automobiles—Repairing—brake drums refaced while still on car 792
Automobiles—Tires
automatic pumping unit maintains pressure 736
pressure equalizer helps reduce wear 757
Aviation
balloon to soar nine miles for aerial research 767
compass and belt latch add to air safety 816
"fortune teller" for airmen reveals flying fitness 806
life-saving suit has paddles 768
safety promises great future for flying 799
scientists study "air bumps" to aid aviators 753
to be stimulated by airports over railway yards 818
Blackboard—of glass to save eyestrain 778
Boats
run by hand lever instead of oars 713
seagoing auto boat to aid Geographic Society 708
Bottles—sealing with glue saves U. S. thousands 720
Camping—all comforts of home in auto tourists' camp 816
Cancer—in mice and chickens relieved by radio waves 737
Cards, Playing—automatic bridge scorer eliminates figuring 807
Carnation—that changes hue gains beauty in fading 736
Chemical Warfare—smoke screen guards Panama from air attacks 759
Cheese—"cosmetics" for 793
Church—to split landslides protects village 802
Clock
alarm, electric wall unit needs no winding 732
electric, turns on radio, electric stove or iron 721
huge, tells exact time on split seconds 758
operated by temperature changes 777
tested with X-rays to reveal best grades 802
Collar—built-in rack 753
Coal—pulverized, burned in locomotive saves labor 818
Concrete—surfacing tool for, saves hand labor 778
Crane—traveling wood, lifts heavy trusses 813
Dancing—on roulette floor wins prizes for couples 720
Dogs—rubber boots for, keep mud out of house 735
Drum—easily played without sticks 778
Electric Lights
better and cheaper show progress 735
cold light from rare gases rivals the sun 801
ornate street lamps to give strong light 818
tent pitched on pole protects pedestrians 732
unusual street, used for covered sidewalks 758
Electroplating—to make transparent metal 761
Elephant—moved in chains to prevent escape 718
Emotions—of children studied with electric register 747
Exposition—"Iberian-American" in historic Seville 809
Fire Fighting
firemen's school helps reduce losses 721
foam blanket smothers fire in oil tank 748
gasoline and electricity replace glory of fire horse 716
Fires, Underground—breathing rocks keep burning 768

[Continued on Page 4]

Helium for Lighters 714

[Contents—Continued]

Fish and Fishing
- fighting monsters of fishermen's paradise ... 812
- fish dried on ship's rigging to save extra handling 749
- war waged on pirates to protect salmon ... 810

Germanium—found in copper-smelter dump ... 732
Goggles—two-color glass, help in facing lights ... 749
Goldfish—stone "sponge" for bowl saves changing water 721
Golf—folding legs on bag ... 734
Hair—machine tests strength before and after marcelling ... 793
Hose—timesaving clamp for ... 714
Household Devices ... 814
House Plan ... 880
Humidifier—without motor saves electric current ... 799
Iron, Electric—safety-button reduces fire peril ... 753
Knife—meat, combined with saw ... 737
Life Saving—guards have cabin equipped with radio ... 785
Lightship—with vertical beam to guard river mouth ... 761
Lock—without key for door foils burglars ... 782
Locomotive—battery-oil-electric to speed switching ... 708
Magnets—hollow, found stronger than solid ... 783
Messenger Boys—aided by lighted badges for caps ... 778
Milk—air vents in can top prevent souring ... 810
Minerals—modern divining rod helps explore earth's riches ... 784
Moths—chemical in clothes hanger helps prevent ... 794
Motorcycle—pole riding latest outdoor sport ... 793
Motor Trucks—rollers on front to prevent accidents ... 768
Moving Pictures
- folding home-movie screen quickly set up ... 794
- gorilla-man adds touch of realism ... 736
- theaters on wheels reach street crowds ... 735
- "trick shots" printed from straight film ... 707

Mower—for track, clears weeds from railroad line ... 749
Neckties—built-in rack ... 753
Nutcracker—metal squirrel ... 783
Oxygen—portable outfit aids treatment of disease ... 761
Paints and Painting
- oil from grape-seed waste used in making paint ... 810
- spray outfit is run from lamp socket ... 767

Parks, National—permanent residents getting ready for summer tourists ... 750
Paving—turntable breaker speeds street work ... 753
Pearls—"culture" distinguished from real by X-rays ... 817
Photography, Submarine—undersea wonderland revealed by camera ... 806
Popcorn—in rainbow colors, has bigger "pop" ... 783
Radio
- homemade howl preventers ... 833
- ice melted from wires with electric "toaster" ... 793

Radio—Aerials—loop built on Japanese umbrella ... 839
Radio—Applications
- cab drivers called for hotel guests ... 818
- "detective" on meter traps current thieves ... 747
- loud speaker speeds up trains in switchyard ... 760

Radio—Batteries
- homemade relay for trickle charger ... 838
- valve on tester prevents dripping ... 828

Radio—B-Eliminator—shielding for the homemade ... 836
Radio—Coils—handy mounting for homemade ... 840
Radio—Condensers—dust-proof midget ... 833
Radio—Loud Speaker
- control unit aids reproduction ... 825
- disk cutter for cone speakers ... 833
- rubber feet for ... 840
- simplified connections for portable ... 838
- throws voice mile in the air ... 800

Radio—Pictorial ... 829
Radio—Receiver
- simple three-tube all-wave ... 831
- wired units ... 840

Radio—Reception—sound-absorbing multiple walls to improve ... 734
Radio—Repairing
- insulated points for set testing ... 837
- testing and trouble shooting ... 834

Radio—Tubes
- how to prevent blowouts ... 840
- simple tester for experimenters ... 839

Railroads
- double-decked car speeds auto shipments ... 817
- on flume uses auto to haul lumber ... 758
- ticket printer to reduce expenses ... 777

Razor Stropper—with antiseptic solution to kill germs 759
Reindeer—herded by airplane ... 792
Safes—gas guard for small, to foil burglars ... 708
Sculpture—largest statue of Christ for South America 761
Ships—spring paddles to develop speed ... 719
Shoes—500 kinds of materials used in women's ... 757
Skating—"hot ice" for rinks ... 817
Smokers' Accessories
- cone in bottom of pipe bowl insures cool smoke ... 752
- filling station for cigar and cigaret lighters ... 734

Snakes—myths are disproved ... 748
Steel—made at cost of iron by new process ... 752
Stockings—needle knits up runs ... 801
Submarines
- inventors seeking to make safe ... 784
- life suits for crews to aid in rescues ... 715

Subway—built in deep ditch to save tunneling ... 799
Telephone Books—old, chopped to make pulp for paper 824
Theater—missing-key board for patrons ... 785
Thermometer—wet and dry combined in one ... 712
Toothpick—of rubber prevents decay ... 783
Traffic—police carry lighted clubs to direct ... 810
Tricks, Strong-arm—of police that subdue unruly prisoners ... 776
Trolley—grease on wires helps remove ice ... 777
Typewriter Supplies
- carbon and ribbon tester fits in pocket ... 732
- ink fount prolongs life of ribbons ... 798

Umbrella—slip cup holds ribs together ... 798
Violin
- combined with horn produces full tone ... 713
- metal sound post improves tone ... 816

Vise—support to hold work helps prevent damage ... 824
Washing Machine—electric weighs fifteen pounds ... 720
Weather—gauges measure sun's heat for data ... 813
Windmill—run by shutters gives long service ... 747
Windows—pictures painted on, to save washing ... 802
Zoo—barless, to have electrically heated rocks ... 709

AMATEUR MECHANICS

Automobiles—Accessories—homemade cigar and pipe lighter ... 856
Automobiles—Fuel—gauge and clean-out pipe for gravity gas system ... 858
Bath, Shower—for the farm ... 861
Bottles, Milk—protected by hinged board ... 862
Broom—inner tube band protects furniture ... 847
Canoe—how to recanvas ... 841
Dahlias—new scheme for stakes ... 860
Fisherman—protectors for watch and cigarets of ... 848
Gas Jets—metal guard keeps children from ... 848
Hogs—funnel for the slop trough ... 858
Paints and Painting—nature as a guide for color schemes ... 847
Pewter—repairing broken articles ... 859
Plaster Casts—green-bronze finish for ... 861
Range—cleaning kerosene ... 862
Rhubarb—to grow long and tender stalks ... 847
Ship Models
- Flying Cloud ... 849
- making sails, blocks and deadeyes for ... 846

Shoes—tanning without dye ... 848
Smokers' Accessories—homemade cigaret lighter ... 861
Solder—coloring to match brass ... 848
Surfboard—improvement for ... 862
Tent—self-closing mosquito netting for doorway ... 846
Valve Wheels—tool for turning hot ... 847
Veneer—to fasten loose ... 857
Water, Hot—from outboard motor ... 858

SHOP NOTES

Arbor—chain prevents slipping ... 866
Automobiles—wrecking car has motor-driven hoist ... 866
Automobiles—Repairing—to refinish tops ... 879
Babbitt—handle rest for ladle ... 873
Birds—making a concrete bath for ... 869
Boats and Boating—mooring motorboat to dock ... 879
Bushing—removing ... 878
Door—how to repair with bolts ... 868
Draftsman's Supplies—device for cutting paper squarely and quickly ... 878
Emery-Cloth—doubling length of strips ... 879
Flowers—shop on wheels ... 874
Harrow—seat for ... 876
Lath, Wire—cutting for gables ... 874
Lathe—driving finished work without dogs ... 871
Lighting Plant—priming the engine ... 872
Liquids—pouring two from a single spout ... 877
Merchandise—sliding shelves for, save store space ... 865
Newsboys—change holder for ... 867
Photography
- exposure meter for reflex cameras ... 863
- temperature in developing negatives ... 867

Router—emergency ... 874
Silo—cheap, homemade ... 873
Soldering—pneumatic plant for the shop ... 875
Spring, Coil—unwinding ... 874
Steel—machining cold-rolled ... 868
Tank, Water—renewing old ... 866
Tar—practical container for melting and pouring ... 868
Tool—for laying out keyways ... 867
Typewriting—holder for cards aids typist ... 872
Vise—pipe support for heavy ... 877
Water—pumping clean, from a cistern ... 873

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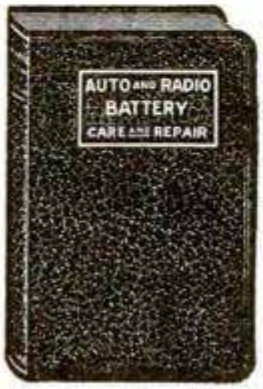

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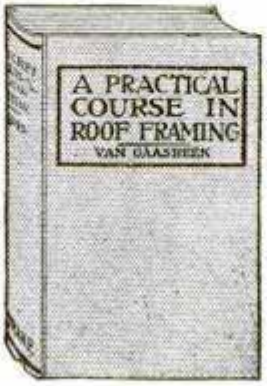

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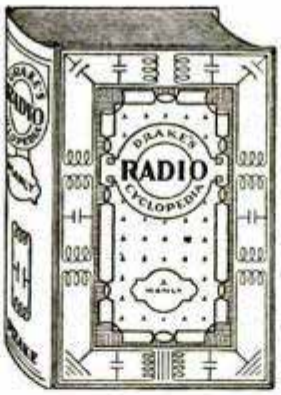

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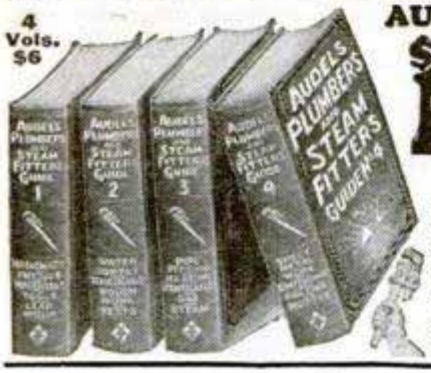

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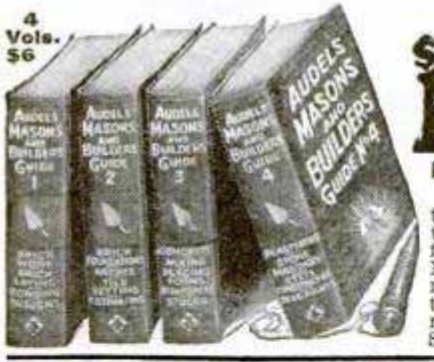

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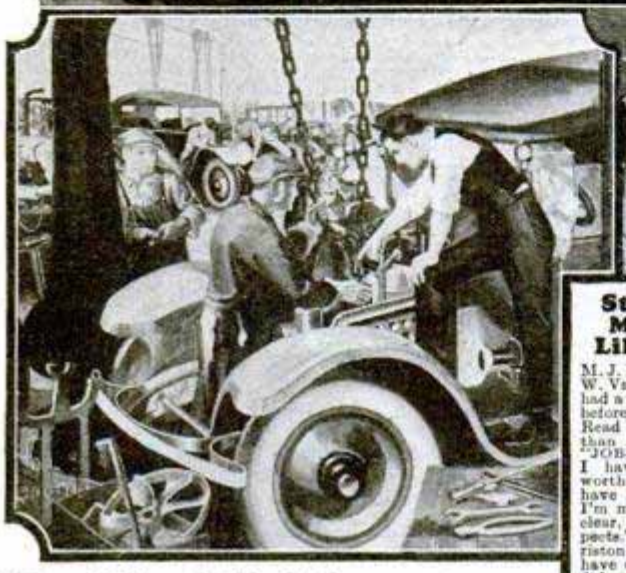

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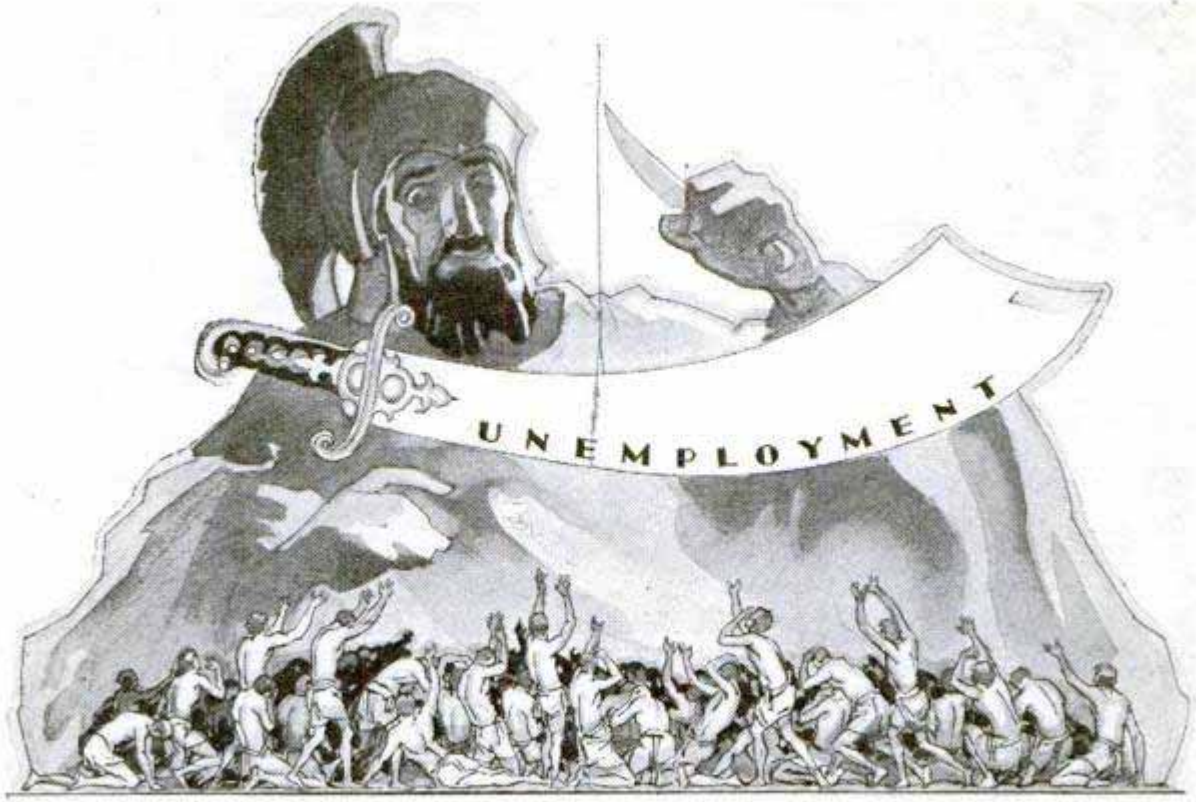

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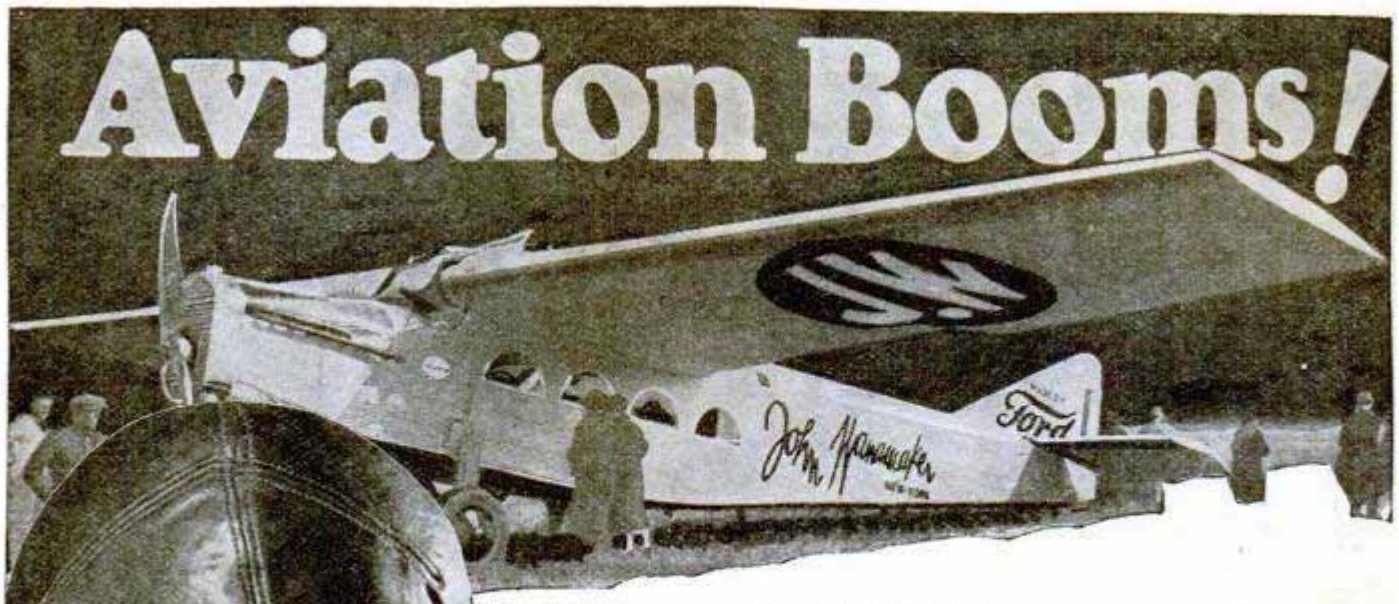

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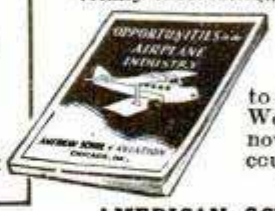

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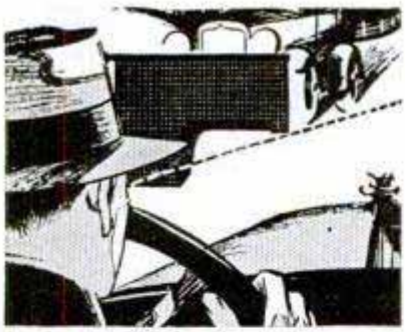

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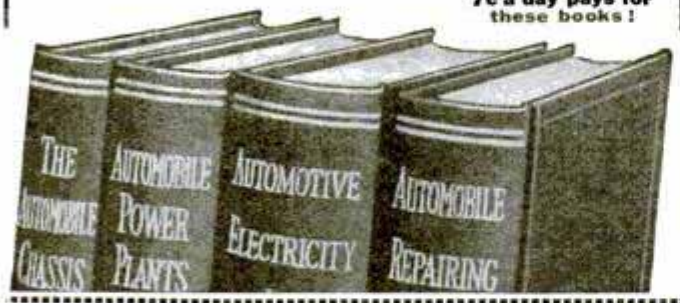

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Dept. K, 15 N. Wells St., Chicago, Illinois

Test Your Art Ability FREE

If you like to draw, test your natural sense of design, proportion, color, perspective, etc., with our Art Ability Questionnaire. Learn if your talent is worth developing, and how much training you will need. You will be frankly told what your score is.

Many Federal Students are making $2,000, $4,000, $5,000 and $6,000 yearly. The Federal course is recognized everywhere by art employers and buyers of commercial art. Learn at home in spare time, without previous training. *Personal, individual criticisms of your work.* Get this free test—send the coupon now for your Questionnaire. Please state age and occupation.

Federal School of Commercial Designing
633 Federal Schools Bldg. **Minneapolis, Minn.**

Send me your free Questionnaire

Name.....

Age.....*Occupation*.....

Address.....

Kill This Man!

THERE'S a devil inside of you. He's trying to kill you. Look out for him! He tells you not to work so hard. What's the use? the boss only piles more work on you. He tells you not to bother with your body. If you're weak—you always will be weak. Exercise is just a lot of rot. Do you recognize him? Of course you do. He's in us all. He's a murderer of ambition. He's a liar and a fool. *Kill him.* If you don't, he will kill you.

Saved

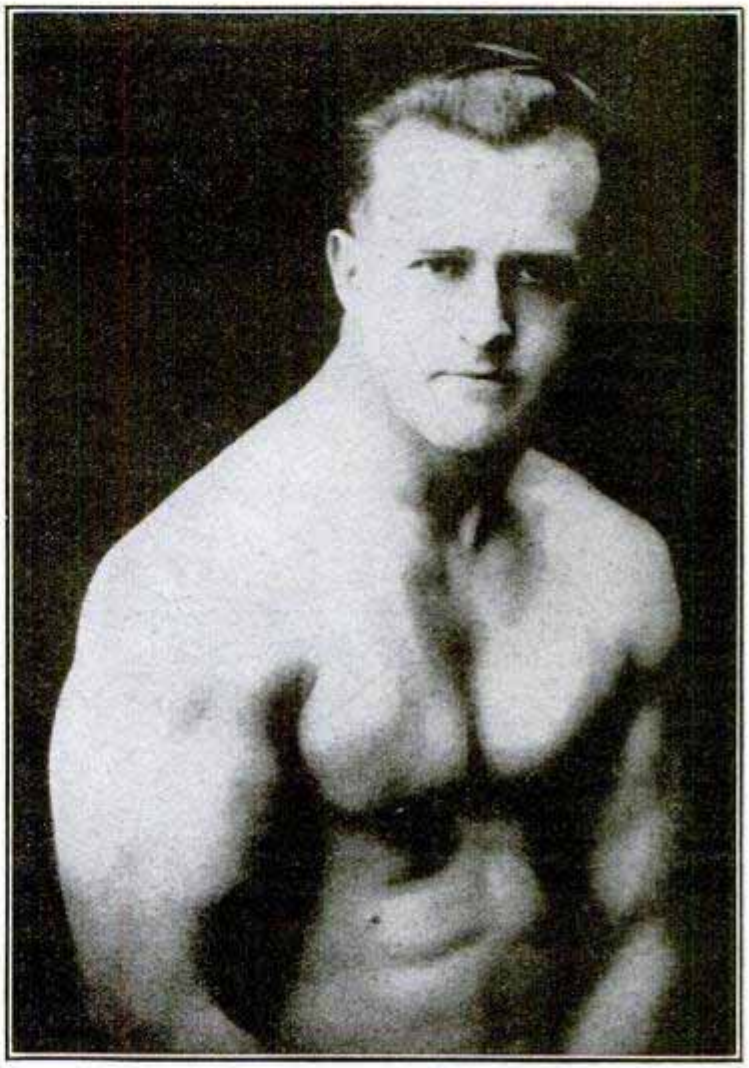
Thank your lucky stars you have another man inside of you. He's the human dynamo. He fills you full of pep and ambition. He keeps you alive—on fire. He urges you on in your daily tasks. He makes you strive for bigger and better things to do. He makes you crave for life and strength. He teaches you that the weak fall by the wayside, but the strong succeed. He shows you that exercise builds live tissue—live tissue is muscle—muscle means strength—strength is power. Power brings success! That's what you want, and gosh darn your old hide! you're going to get it.

Which Man Will It Be?

It's up to you. Set your own future. You want to be the Human Dynamo? Fine! Well, let's get busy. That's where I come in. That's my job. Here's what I'll do for you.

In just 30 days I'll increase your arm one full inch with real live, animated muscle. Yes, and I'll add two inches to your chest in the same time. Pretty good, eh? That's nothing. Now come the works. I'll build up your shoulders. I'll deepen your chest. I'll strengthen your whole body. I'll give you arms and legs like pillars. I'll literally pack muscle up your stomach and down your back. Meanwhile I'll work on those inner muscles surrounding your vital organs. You'll feel the thrill of life shooting up your old backbone and throughout your entire system. You'll feel so full of life you will shout to the world, "I'm a man and I can prove it!"

Sounds good, what? But listen! That isn't all. I'm not just promising these things. *I guarantee them!* It's a sure bet. Oh, boy! Let's ride.



EARLE E. LIEDERMAN, *The Muscle Builder*

Author of "Science of Wrestling," "Muscle Building," "Secrets of Strength," "Here's Health," "Endurance," etc.

Send For My New 64 Page Book "Muscular Development"

IT IS FREE

I don't ask one cent. And it's the peppiest piece of reading you ever laid your eyes on. I swear you'll never blink an eyelash till you've turned the last cover. And there are over four dozen full-page photos of myself and some of my prize-winning pupils. This is the finest art gallery of strong men ever assembled. And every last one of them is shouting my praises. Look them over. If you don't get a kick out of this book, you had better roll over—you're dead.

Come on, then. Take out the old pencil and sign your name and address to the coupon. Remember, it's something for nothing and no strings attached—no obligation. GRAB IT!

Earle E. Liederman

Dept. 2005 305 Broadway, New York City

DON'T SEND ONE PENNY

—

YOUR NAME AND ADDRESS ON A POSTAL WILL DO

EARLE E. LIEDERMAN

Dept. 2005, 305 Broadway, New York City

Dear Sir: Please send me, without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

Name.....

Street.....

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

$800% PROFIT In One Month!

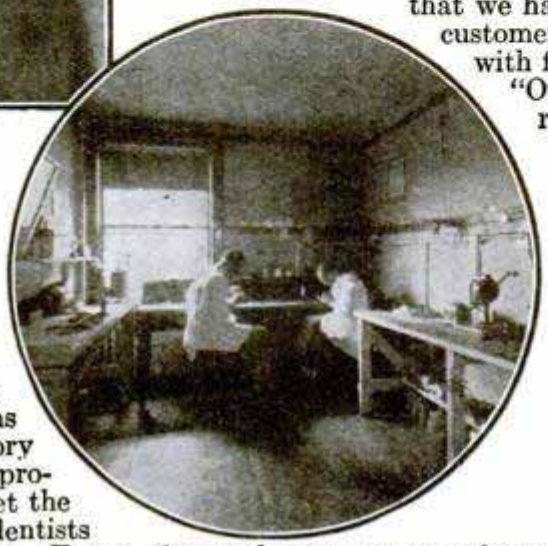
Read This Fascinating, True Success Story of Two McCarrie Graduates Who Have Been in Business Only a Year

"I have been very busy and don't get much time to write letters these days. We turned out $1100.00 worth of work in April, so you can realize that we have developed speed. We are getting more customers right along and we keep them satisfied with first class work and service.

"Our expense, including materials for April, runs about $300.00, which leaves a profit of approximately $800.00 for the two of us. This has been about the average since the first of the year, and it's not bad for two of your boys who have been in business only about a year. I think Dental Laboratory Work is better than anything else to make a quick, permanent success, if one can turn out first class work.

"I think I am making the training you gave me pay big profits."

Yours truly,
GEORGE LARSON.



George Larson and His Dental Laboratory

64,000 Dentists Need Laboratory Work

Mechanical Dentistry is the laboratory bench work which the dentist turns over to the laboratory worker. Master this profession and help meet the demand of 64,000 dentists for laboratory work. Every city and every town where dentists are located offers work to the mechanical dentist. We train you in a few months in day or night school for this uncrowded field—no classes—no books—no special educational requirements.

You Have This Man's Opportunity in Mechanical Dentistry

Larson's letter is only one of many such letters we have received. **"No trick for me to make $20.00 a day,"** writes one McCarrie graduate, and another says, **"I was a $30.00 a week bookkeeper and have built a dental laboratory business netting me $150.00 a week and growing all the time."**

You Can Do What Larson Did

It's a big jump from a $35 a week factory worker to half owner of a laboratory paying $800 a month profit. That's what Larson did! And what he did, you may do! Leave your blind alley job—enter this big-paying profession—enjoy a dignified, pleasant occupation—be your own boss—go and come as you please. Master the art of Mechanical Dentistry and when you complete your course you may either get a job as a laboratory worker or go in business for yourself. It takes but little capital to equip a small laboratory and build up a big paying business. Think what that would mean to you—a car, a fine home, trips whenever you like—all the thousand and one luxuries you crave but can't gratify. Follow Larson's example—mail the coupon. It's your one-way ticket to success!

We Teach You in a Few Months to Make

Rubber Plates:
Partial upper or lower plates with soldered, cast, or wire clasps, palatal bars, lingual bars, etc. McCarrie students learn to make full rubber plates of every type, including Vulcanite base-plates, butted gums, carved gums, etc.

Crowns:
Two-piece, seamless, open-face, Richmond, cast-base porcelain, Carmichael, split-pin, carved (swaged) cusp, cast cusp, etc.

Bridge Work
Fixed and removable bridgework. Interchangeable teeth, gold dummy, sanitary porcelain dummy jobs — Roach, Gilmore, Bischoff and all forms of cast-clasp work.

Metal Base Dentures
Cast bases of aluminum, gold, Watt's metal, etc. Both centrifugal and air pressure casting machines used. Free catalog tells all about the course. **WRITE TODAY!**

Work Your Way Through School

We will assist you in finding a spare-time job to meet part of your expenses while taking McCarrie training. And we will help you find satisfactory living quarters when you arrive.

McCarrie Schools are located in CHICAGO, DETROIT, CLEVELAND, BOSTON, PHILADELPHIA
DAY and NIGHT SCHOOLS

INTERESTING BOOK FREE

Our illustrated, free book on Mechanical Dentistry will acquaint you with some surprisingly interesting facts. It tells about the thriving profession of Mechanical Dentistry—the way to swift and certain success. And it tells about the progress of many of our graduates—men who have succeeded beyond their expectations, also full details of our liberal offers. Mail the coupon and find out more about this fascinating opportunity.

FREE BOOK

MAIL COUPON

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1338 S. Michigan Ave.
Dept. 164, CHICAGO, Ill.

McCarrie School of Mechanical Dentistry,
1338 S. Michigan Ave.,
Dept. 164, Chicago, Ill.

Without obligation, please send me your free Book with complete information about how I may become a Mechanical Dentist, how you will help me open a laboratory, how you will help me find a job while I take my training, etc.

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St. No. or R. F. D.....

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

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Imagine A Book That Holds Between Its Covers A Message So Amazing That Its CASH VALUE Is Considered By Many Equal to 52-Weeks' Pay. See For Yourself Why Business Experts Have Called It "The Most Astonishing Book Ever Printed". Send For Your Copy Which Will Be Mailed You Absolutely Without Charge.

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OVER $10,000 A YEAR

"I owe much of my success to N.S.T.A. training. It has enabled me to learn more, *earn* more, and BE MORE. I am now President and Treasurer of a national organization and my earnings this year will exceed the 5 figure mark."—C. V. CHAMPION, Danville, Ill.

$7,286 LAST YEAR

"I was working as a clerk earning $1,000 a year, trying to support a wife and three children when I enrolled with N.S.T.A. After completing the Course, my first year's income tax was more than **double** the old salary. Last year my income tax showed earnings of $7,286. My grateful thanks will always be due N.S.T.A. for opening my eyes to the opportunities offered by salesmanship as you teach it."—F. J. WALSH, Box No. 1586, Springfield, Mass.

FROM $15 A WEEK TO $7,500 A YEAR

"A few years ago I was working in a shop for $15 a week. Today I am making $7,500 per year. I can only speak words of praise for N.S.T.A. for it raised me from that $15 a week job in a shop to $7,500 a year as a salesman!"—C. W. BIRMINGHAM, 1712 W. 1st St., Dayton, Ohio.

AT the top of this page you will see a much reduced photograph of a surprising little volume that works wonders for ambitious men. . . . And at the left you will see the photographs of three men who have achieved real success by applying secrets they discovered after reading this book. Yet they are only three out of thousands who have taken this same simple route from poorly-paid routine jobs into a field where they are now earning up to $5,000 and $10,000 a year.

The Secret of Earning Big Money

Stop a minute and study the faces of the three men pictured at the left. Notice that there is nothing extraordinary in the appearance of any one of them. As a matter of fact, they are simply ordinary fellows like dozens you meet every day. Their success (wonderful as it may seem) is due in large part to choosing the type of work which is capable of yielding real money to men who go into it!

Figure it out for yourself. Most kinds of jobs are worth just so much and no more. No matter how hard a man works, he simply can't increase his cash value. The salaries of clerks, mechanics, etc., are definitely limited, and the opportunity offered these workers is practically negligible.

But how different with Salesmanship! Master Salesmen are the very life-blood of any business. Upon their efforts depend the profits which any concern makes. No company can exist without them—and there is almost no limit to the importance which a salesman can achieve in the eyes of a firm employing him. No wonder they are able to enjoy luxuries most other men can only dream of—And no wonder they are called the "Aces" of twentieth century business!

Proof That You Can Become A Master Salesman

Yet despite all the wonderful advantages enjoyed by Master Salesmen, proficiency in this fascinating field is surprisingly easy for a man to achieve—without losing a day or dollar from his present position. During the past twenty years the National Salesmen's Training Association has developed thousands of everyday, ordinary men into Master Salesmen, able to earn money ranging up to $5,000 and $10,000 a year and even more. These men were from every walk of life, and yet, by showing them the simple, easy, certain methods used by all successful salesmen they were turned into capable producers—sometimes earning five to ten times as much as they had earned before.

No matter what your occupation is, there is no reason why you cannot make good as a salesman. Salesmanship is governed by rules and laws. There are certain ways of stimulating keen interest, ways to overcome objections, batter down prejudices, outwit competition, and make the prospect act. You can learn these vital secrets quickly and easily.

Information Worth a Year's Pay—FREE

If "Modern Salesmanship" cost several dollars a copy you might hesitate. But it is now FREE. We cannot urge you too strongly to take advantage of this opportunity to get without cost information on how to raise your pay.

It is a simple act to fill in and mail the coupon, but look what it did for the men on this page. It may be worth a year's pay to you; it can easily bring you bigger earnings. Why not send for the book and full details—TODAY?

NATIONAL SALESMEN'S TRAINING ASSOCIATION

WORLD'S OLDEST AND LARGEST Exclusive SALES TRAINING INSTITUTION

Dept. E-100, N. S. T. A. Bldg. Chicago, Ill.

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Chicago, Ill.

Please mail me FREE your illustrated book, "Modern Salesmanship" and particulars of membership in your Association and its FREE Employment Service.

Name.....

Address.....

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

Age.....Occupation.....

How Fred Fisher made $30 a week *Extra* in Spare Time with the TENOR BANJO

Found Course Easy Right from Start; Now Enjoys More Friends, More Parties

"Had no dea it was so easy, until I received my first two Lessons. Ever since then, things have gone right along easily. Nobody could go wrong with your clear, sure method. I now have more friends, and never miss any house parties. Recently I have been earning thirty dollars a week, in my spare time, playing in a cafe. There is always a job for a Tenor Banjoist."—Fred Fisher, 123 Ridge St., Steelton, Pa.

YOU Can Learn Quick Right at Home to Make

BIG SPARE-TIME MONEY

Why "wish" for plenty of friends, fun and ready cash when you can have them—QUICK! Our tested, easy system—"The Play-Way"—in 1 to 3 months at home will teach you how to make $5 to $15 an evening for spare-time playing; $65 to $100 a week or even more playing in orchestras, etc. Be popular, be invited everywhere; have the money you want. Don't let lack of cash keep the good times and good things of life away from you any longer! Learn quick and earn quick! Find out now about the Tenor Banjo Play-Way to Popularity and Big Pay.

C. E. Samwell, 20 Devonshire Ave., Brantford, Ont., (shown above) writes: "Was only quarter way through Course when playing in one of the best orchestras here. Have found Tenor Banjo a real easy, sure way to Big Money. My playing now paying for fine $550 Banjo. Owe success to you."

FREE BOOK tells how

This inspiring book—that has shown countless others the short-cut to SUCCESS—is yours FREE immediately upon receipt of the coupon below. No obligation—we'll rush it to you gladly. It will show you how to get the friends you want, the popularity you deserve and the money you need—*quick!* Get all the facts about this fascinating method. The same amazing course that taught Fisher, Samwell and thousands of other prosperous Tenor Banjoists can teach you, too. No knowledge of music or notes necessary. No extras to buy. We teach everything, furnish everything you need. Clip the coupon, fill it in and mail at once.

Big Tenor Banjo Records and Outfit FREE When You Enroll

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The same day we receive your enrollment for this tested, time-saving Course, you are shipped a handsome, full-tone, professional size Tenor Banjo worth $20—lessons and Complete Outfit—and correct, fool-proof Demonstration Phonograph Records of every selection in the Course!

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A. F. Bloch, President,
New York Academy of Music,
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Dear Mr. Bloch: Please rush me your FREE Book telling how I too can make a Quick Success and Big Money with the Tenor Banjo.

Name.....

Address.....

$25.00 DRAWING COURSE for $2.98

Haven't you often wished that you could draw cartoons, illustrate some idea, sketch some pretty face, etc.? You can do all of these things. One of America's most famous Cartoonists and Illustrators has developed a great, simple system for success in all branches of Commercial Art. This system has revolutionized the entire theory of drawing. It means that drawing can be as easy for you as writing—much simpler than learning shorthand, bookkeeping or typewriting. We are now placing this original system for learning Drawing, Art and Cartooning, consisting of 34 lessons with over 500 illustrations, within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course. If we fail to make this claim good, we will refund every cent paid us. By eliminating a large office force for answering correspondence, expensive catalogs, etc., we are enabled to make a price of $2.98, the cheapest price ever known for a high-grade, home study course. Many have sent us letters similar to that of Rob't P. Davis of Detroit, who wrote: "I can't see how you ask so little. It is more than I expected." Learn to draw. It is a big asset, no matter what field you are in.

Send No Money

Just order the course and on arrival pay postman **$2.98** plus a few cents postage, payment in full for the entire Course and Drawing Outfit. If not entirely satisfied, return within five days and we will Refund Money. Address:

If you order the course at once, we will include a drawing outfit, consisting of artist's pencils, pens, paper, erasers, thumb tacks, etc., enabling you to go to work without any additional cost.

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Learn to Dance

This New Easy Way

You can learn all the modern dances—Charleston, Black Bottom, Valencia, Canter, French Tango, St. Louis Hop, Latest Waltzes, Fox Trots, etc., at home easily and quickly. New chart method makes dancing as simple as A-B-C. No music or partner required. Learn anywhere, anytime. Win new popularity. Be in demand at parties. Same course of lessons would cost $20 if taken privately.

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Just send your name and address. We'll ship the complete course—323 pages, 49 illustrations—without one cent in advance. When package arrives, hand postman only $1.98, plus delivery charges, and this wonderful course is yours. Try for 5 days. Money back if not delighted. Send your name NOW. Bargain Book Catalog FREE!

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Learn at Home In Spare Minutes

No need to leave home. Hold your job. I'll bring your training to you. You can learn during your spare time. My easy-to-learn, practical course has put hundreds of fellows who had only a few minutes a day to study into big pay jobs. You don't have to be a college or high school graduate to become a Radio Expert. Many of my students and graduates now making big money didn't even finish the grades.

You Get Six Big Outfits Without Extra Charge

I teach Radio the right way—the practical way. I give you six big outfits of Radio parts (not toys) and show you how to build approximately 100 different circuits, locate, repair and remedy receiving set troubles. Three outfits you build are shown on this page. You build practically every type of receiving set known today. Thus you learn the "why" and the "how"—get a complete, thorough, rounded-out knowledge that shows its worth in your pay envelope. Full details in my big book.

Earn $15, $20, $30 a Week Extra While Learning

Deloss Brown, South St., Foxboro, Mass., made $1,000 from spare time jobs before he even finished his course. Frank Toomey, Jr., Piedmont, New York made $833. G. W. Page, 1807 21st. Ave., Nashville, Tenn., says the course brought him $935 spare time profits. No need to scrimp, save and deny yourself good things to pay for this course. It's the world-famous course that pays for itself.

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That's the agreement I make with you when you enroll. It's my way of showing you that I'll give you the training and service you need and want. You are the only judge.

64-page Book FREE For the Asking

I will gladly send you my 64-page book of information on N. R. I. training and the money-making opportunities in Radio without a penny's cost to you. Send for it *Now*. Clip or tear out the coupon today. Find out what Radio offers you, and how my Employment Department helps you get into Radio after you graduate.

Address: J. E. SMITH President, Dept. 5H, National Radio Institute, Washington, D. C.

Read What Big Money these N.R.I. men are making

High as $75 a Week

"I am only about half way through the course but I have made as high as $25 in one week in a retail Radio store. I estimate my total income, as the result of my knowledge of Radio, around $3,000 to date. I know I could not have picked a better course."
FRANK REESE, 301 WALNUT ST., COATESVILLE, PA.

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"I am now making between $55 and $70 a week, thanks to your thorough course in Radio. Only recently, in one day, I picked up $12 clear profit in a little over four hours on three service jobs. What a difference from the old chauffeur job paying $50 per week and slaving 54 hours to make it."
EDWARD ZENNER, 377 EAST 140TH ST., NEW YORK CITY.

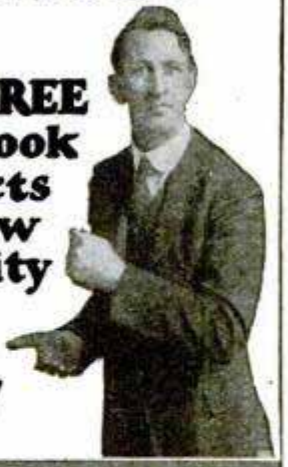
Learn Radio the Practical Fascinating Way

You can build 100 circuits with the 6 big outfits of Radio Parts I give you

3 of the 100 you can build

Originators of Radio Home Study Training

I'll Show you how MANY MEN are MAKING $50 to $250 A WEEK in this New Business



Send for FREE 64 Page Book giving facts on this new opportunity

Act Today

Mail This FREE COUPON NOW

J. E. Smith, President,
Dept. 5H, National Radio Institute,
Washington, D. C.

Dear Mr. Smith: Without obligating me in any way please send me your Free book, "Rich Rewards in Radio" with information on your Practical Home Study Radio Course.

Name ..... Age.....

Address .....

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

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Learn at Home

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It is a profession which offers almost unlimited opportunities for advancement to men who combine natural mechanical ability with special technical training.

For this is The Age of Machinery. Almost every convenience, luxury or necessity which we enjoy today depends on machinery for its production or adaptability to our needs. Every new invention multiplies the opportunities for competent designers, builders, erecting engineers, etc.

One of the best ways to train yourself to secure a position as a Mechanical Engineer is through the home-study courses of the International Correspondence Schools.

These courses are especially arranged to meet the needs of the student who studies at home. The theoretical work is stated in simple and clear language and engineering data is reduced to a form in which it is easily applied.

The courses are also particularly helpful because they are written by well-known mechanical engineers who have had years of practical experience in this field.

Just mark and mail the coupon and we'll gladly send you Free Booklets describing the I. C. S. courses in Mechanical Engineering or any other course in which you are interested.

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Without cost or obligation, please send me one of your booklets and tell me how I can qualify for the position or in the subject *before* which I have marked an X:

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- ☐ Mechanical Course
- ☐ Draftsmen's Course
- ☐ Mechanical Drawing
- ☐ Shop Practice
- ☐ Machine Shop Work
- ☐ Toolmaking
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- ☐ Internal Combustion Engines
- ☐ Aeroplane Engines
- ☐ Diesel Engines
- ☐ Refrigeration
- ☐ Electrical Engineering
- ☐ Power House Electric
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- ☐ Structural Engineering
- ☐ Structural Drafting
- ☐ Mining
- ☐ Metallurgy
- ☐ Chemistry
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- ☐ Sheet-Metal Workers
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- ☐ Cartooning

Name.....

Street Address.....

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

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada.

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Use new safe Eaglerock planes. Transport pilots instruct you. Solo and dual flying. Thoro ground mechanics. Primary and advanced flying, all branches.

QUALIFIES for commercial license from Department of Commerce. Take examination in your training plane from officer stationed here. No expense. Transport pilot course also, 200 solo hours.

FREE Simply send name for complimentary pass entitling you to free trip in Eaglerock plane and full details of practical instruction for commercial flying graduates in commercial work.

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Make money taking pictures. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free book, OPPORTUNITIES IN MODERN PHOTOGRAPHY and full particulars

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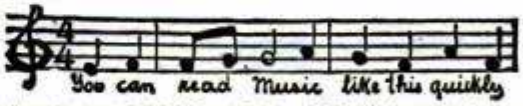

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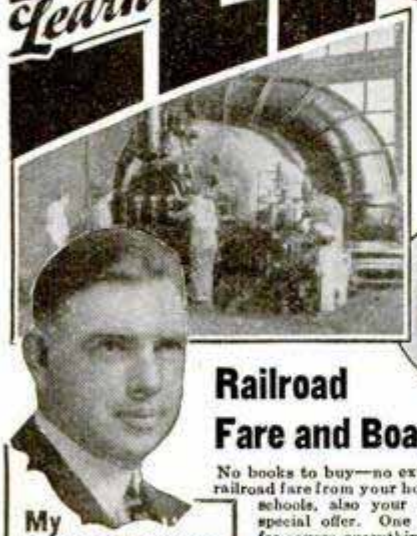

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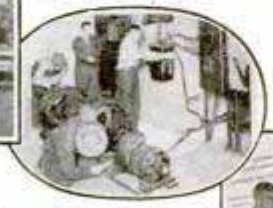

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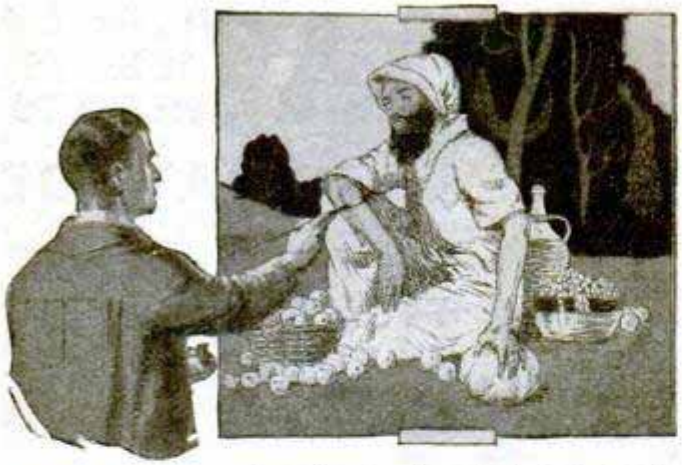

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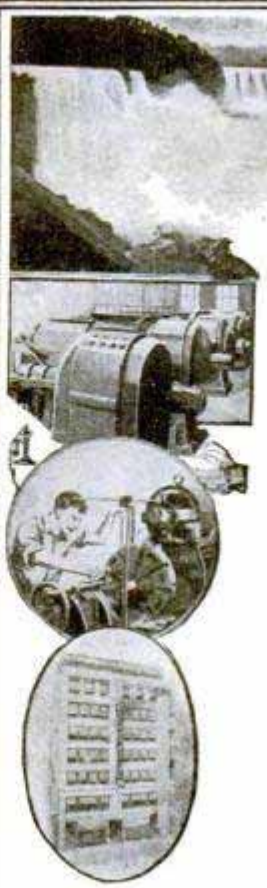

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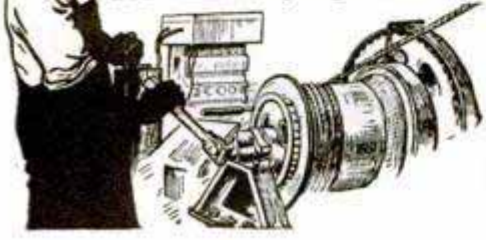

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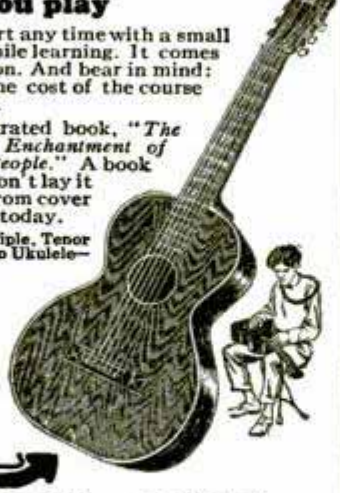

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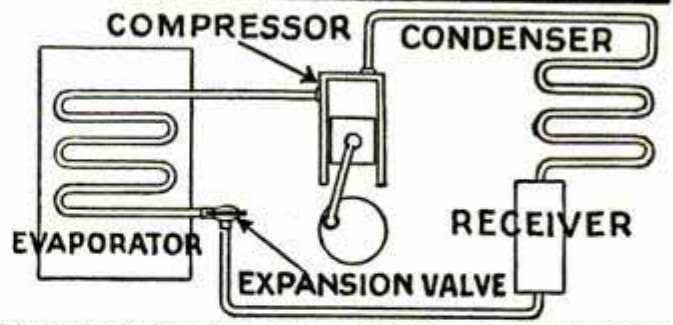

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I NEVER was much of a dancer. But when our club gave this affair I couldn't stay away. Even now, I should have been sitting safely on the "sidelines"—if only the fellows hadn't made that sarcastic remark.

"Show them you can do it! Show them you can dance as well as they!" my pride whispered. And I would!

But halfway across the hall my courage died. I was nearly paralyzed with fright. There she was, waiting expectantly—Marion Blake, an exquisite dancer—graceful, poised, at ease. Suppose she should refuse? Suppose she should leave me in the center of the floor? Oh, wouldn't the fellows chuckle then!

The Unexpected Happens

"I'm—I'm sorry"—I stammered. "I guess——"

"Why, of course, I'll be glad to dance!" she interrupted. And before I realized it we were swallowed up in the dancing throng.

What a terrible ordeal it was for me! And twice as bad for her. I stumbled through the steps. I trod on her toes. I tried desperately to keep in time with the music. Yes, my dancing was inexcusable—hopelessly out-of-date!

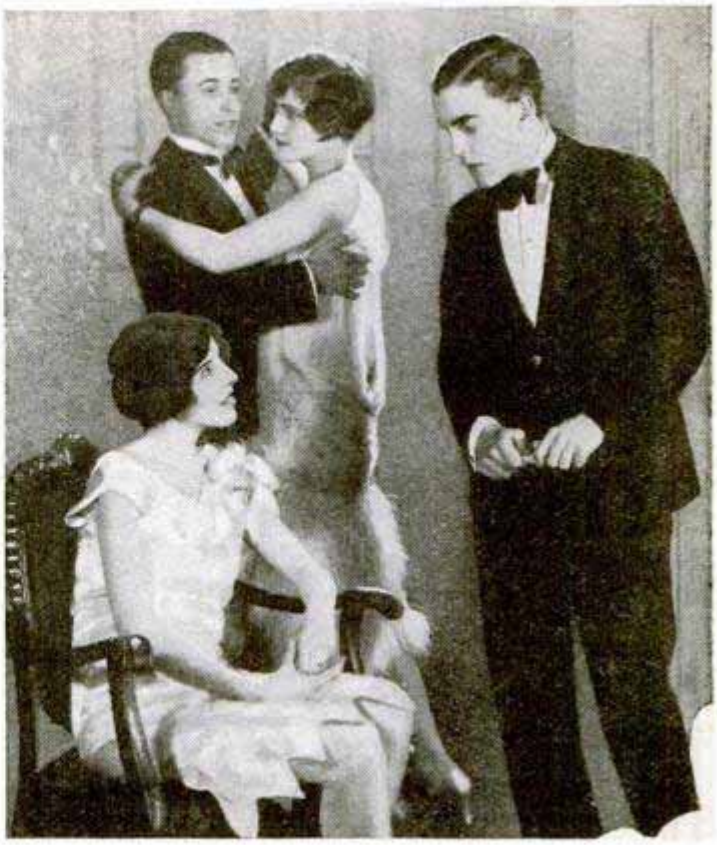
Suddenly she suggested that we sit out the rest of the number. I blushed furiously "Now, it's coming!" I thought. "Now, she is going to tell me what she thinks of my nerve!"

But I was in for the surprise of my life. "Jim," she began softly. "I'll be frank. You're not the best dancer in the world. But you're certainly not the worst. What you need is 'brushing up' on the latest steps. Why don't you get in touch with Arthur Murray?"

"Arthur Murray! Arthur Murray!" I repeated. "He teaches dancing by mail. You can't learn that way!"

"No?" and Marion arched her eyebrows. "The truth is, that's *exactly* the way I learned—even though no one *does* suspect it!"

Naturally I was astounded, but the next evening I found one of Arthur Murray's ads and clipped the coupon. Then I mailed it, asking for his free booklet and five free lessons. If Marion could become a wonderful dancer that way it was certainly worth investigation—especially since I didn't risk a penny.



But halfway across the hall my courage died. I was nearly paralyzed with fright. There she was, waiting expectantly—Marion Blake, an exquisite dancer—graceful, poised, at ease. Suppose she should refuse? Suppose she should leave me in the center of the floor?

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WHAT'S more, Hinton's hundreds of thousands of miles in the air—much of it flying of a difficult, pioneering character—is only **one** side of his remarkable experience. The thing that so many other star performers lack—the thing that makes Hinton what he is today, a real Maker of Men—is his ability to share his knowledge with others in a clear, simple, interesting manner. As proof of that, consider Hinton's record during the War. He was one of the crack pilots singled out by the U. S. Navy to instruct recruits. Under his capable, seasoned eye, hundreds of newcomers learned their Ps and Qs of Aviation; made their first excursions into the clouds. As further proof, look at the recently written letters below—from men who have gotten their foothold in Commercial Aviation entirely because of Hinton's help. Letters like these are not exceptional—they come to us all the time.

There's Your First Step—That BOOK

Don't say: "Gosh, there's no way for ME to break into Aviation," until you've read Hinton's FREE Book. It opened the eyes of Wilbur Damuth, Frederick Thompson and several hundred others. When they first wrote to Hinton, they were skeptical. They didn't realize that Aviation is MORE than a pilot's pastime—MORE than a big, exciting adventure. But they changed their minds in a hurry—and have been glad ever since—the moment they met up with Hinton in the interesting pages of his big, FREE book. Are you, too, willing to listen? Can you stand a great surprise? Will you pause for fifteen minutes to look into Aviation's future—YOUR FUTURE—through Walter Hinton's eyes? If your answer is YES!—just use the coupon. It's your signal to Hinton that you want to hear more.

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The business world has taken to the air in earnest. Letters fly from coast to coast. Nation-wide passenger service is well under way. During the past eighteen months, Ford-Stout planes, operating between half a dozen cities have already carried more than 20,000 people. And there's a daily passenger schedule from Chicago to San Francisco and between scores of other important centers. Yet our growth in the air has just begun. The unbelievable things you see today will be nothing within five years. And men who today are poor, misplaced, discouraged, unknown—will soon be riding on the wings of success. See Aviation's future ahead of the crowd. Get your training; get BUSY—while the industry is young. Get ahead in Aviation before Aviation gets ahead of you.

Get Your Ground Work Where You Are —AT HOME

While others are looking on and wondering—YOU CAN BE TRAINING. Right at home, in spare time, Hinton will fit you for a job while your chance to grow fast is greatest. Hinton's carefully illustrated course takes you over a plane inch by inch; shows you all about construction, rigging, motors, instruments, theory of flight, air navigation—EVERYTHING. It's the foundation for any one of Aviation's fifty highly paid branches. Beyond that, Hinton tells you how to get a job; where your training will bring you most. If it's actual flying you seek, he'll even see that your rates are specially reduced. There's much too much about Hinton's service and Aviation's opportunities to tell you on this page. But if you're wise, you won't pass to the next one until you've called for the book below.

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"Can he really play?" a girl whispered. "Heavens, no!" Arthur exclaimed. "He never played a note in his life."

They Laughed When I Sat Down At the Piano But When I Started to Play!—

ARTHUR had just played "The Rosary." The room rang with applause. Then to the amazement of all my friends, I strode confidently over to the piano and sat down.

"Jack is up to his old tricks," somebody chuckled. The crowd laughed. They were all certain that I couldn't play a single note.

"Can he really play?" I heard a girl whisper to Arthur.

"Heavens, no!" Arthur exclaimed. "He never played a note in all his life . . . ."

I decided to make the most of the situation. With mock dignity I drew out a silk handkerchief and lightly dusted off the keys. Then I rose and gave the revolving piano stool a quarter of a turn. The crowd laughed merrily. Then I started to play. Instantly a tense silence fell on the guests. I played the first few bars of Liszt's immortal Liebestraume. I heard gasps of amazement. My friends sat breathless—spellbound! I played on.

A Complete Triumph!

As the last notes of the Liebestraume died away, the room resounded with a sudden roar of applause. I found myself surrounded by excited faces. Everybody was exclaiming with delight—plying me with rapid questions . . . "Jack! Why didn't you tell us you could play like that?"... "Where *did* you learn?"—"Who *was* your teacher?"

"I have never even *seen* my teacher," I replied. "And just a short while ago I couldn't play a note."

"Quit your kidding," laughed Arthur, himself an accomplished pianist. "You've been studying for years. I can tell."

"I have been studying only a short while," I insisted. "I kept it a secret so that I could surprise you folks."

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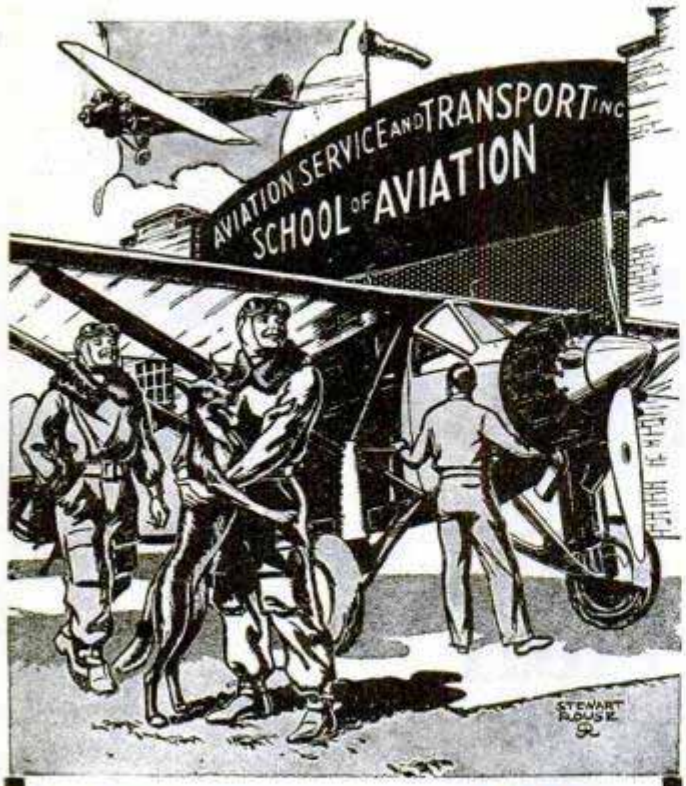

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Copying drafting lessons prepares you to be only a "tracer." This new "Job-Method" gives you actual drafting-room jobs in a new one-step-at-a-time way. With pictures which you can understand almost without reading the "lessons." And that is why the American School-trained Draftsmen can qualify for a good job at big pay when they graduate.

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Drafting is easy, fascinating work. Short hours. Big pay. And the Draftsman is always in line for promotion to executive positions. This training is *complete*. It includes high school subjects (if you need them) and all the Engineering and Mathematics Drafting experts require.

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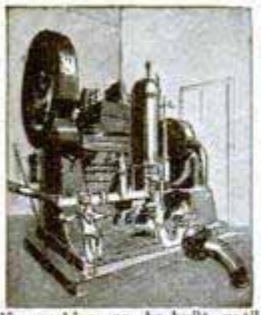

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Never has the world seen anything like the building boom of today. This has created enormous demand for real Draftsmen.

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The big money in Drafting goes to men who specialize in Machine Design, or Electrical Drafting, or Architectural Drafting, or Structural, or Automotive. It is not enough merely to know *general* Drafting practice. You must know how to calculate and design and plan original work. You need many Engineering subjects to fill the kind of a Drafting position that pays $60 to $125 a week. The American School *now includes this specialized training in its Drafting course.*

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Fine, imported instruments like these help you learn Drafting quickly and easily. These standard quality, full size instruments, board, table, triangles, T square, ink, protractor, etc., given to every student without extra cost.

FREE Job Service!

The American School now offers its students and graduates, without cost, the services of an efficient employment department keeping in constant touch with employers of Draftsmen all over the U. S. We have placed hundreds of men in good, big-pay Drafting positions. We've made this training so complete, so practical, so easy to master, that our students **are bound to make good.** And so, because the demand for real Draftsmen continues to exceed the supply and because this training actually prepares men for good Drafting positions **we back it with a Free Employment Service.**

O. C. Miller, Director Extension Work

The American School

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Lessons Actually FREE

learn at home in spare time!

Draftsmen Wanted! $60 to $125 a Week!

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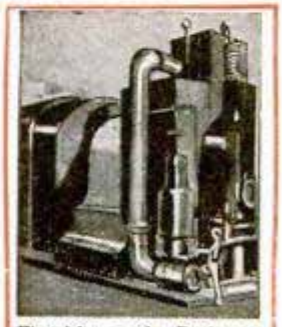

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Department of Buildings

Gentlemen: The same day I received my diploma I got word that I was one of the two candidates who had successfully passed the examination for Deputy Commissioner of Buildings of the City of Chicago, a position paying $3600 per year.

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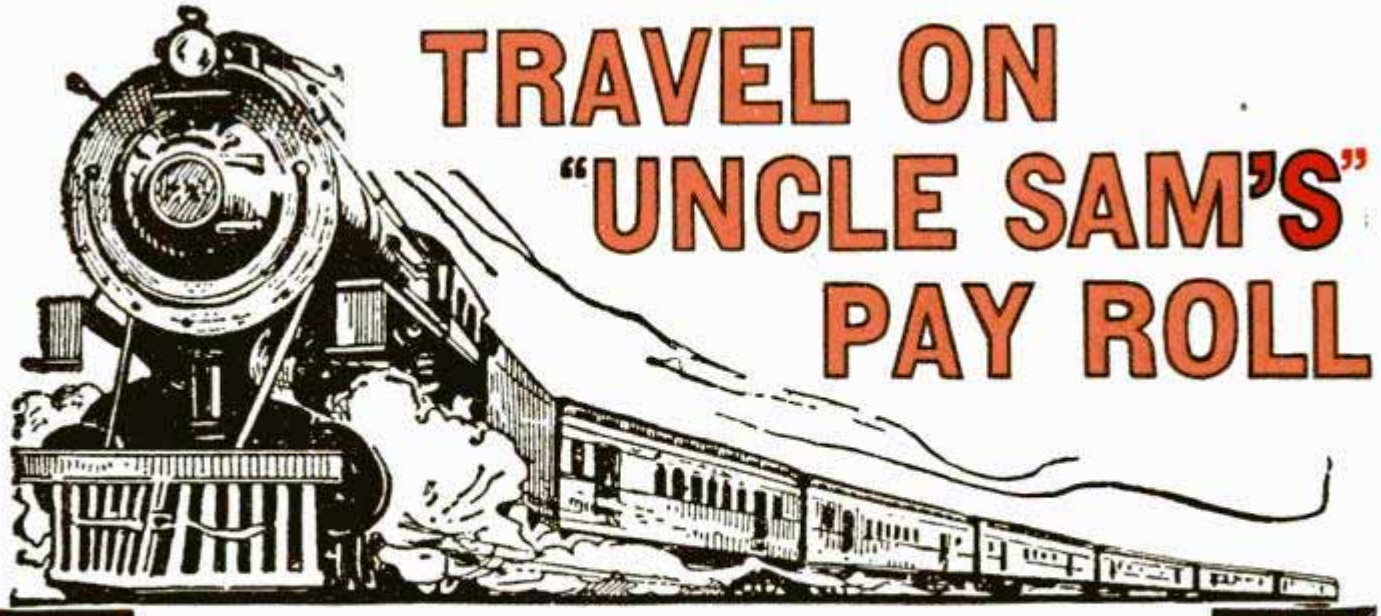

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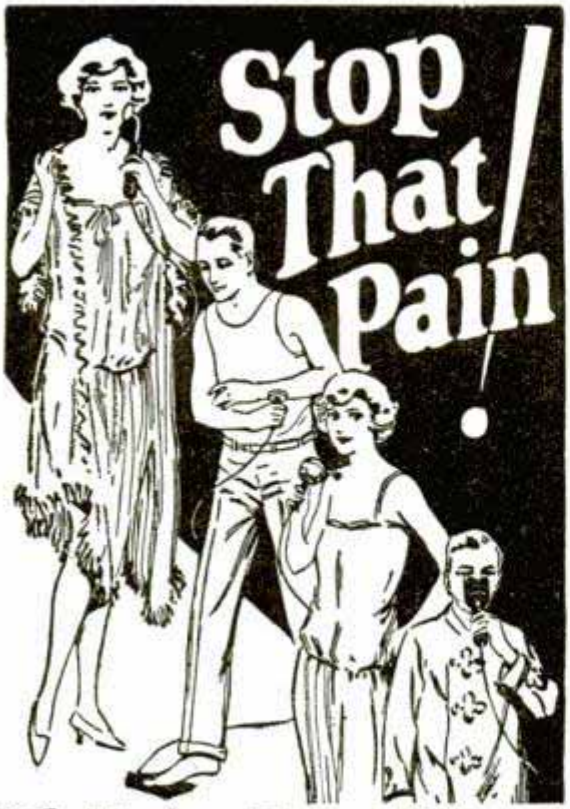

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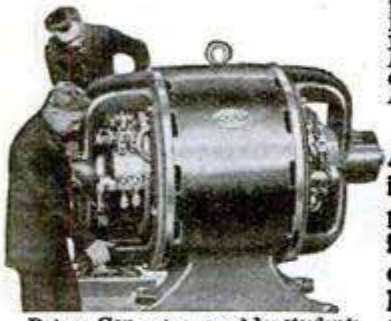

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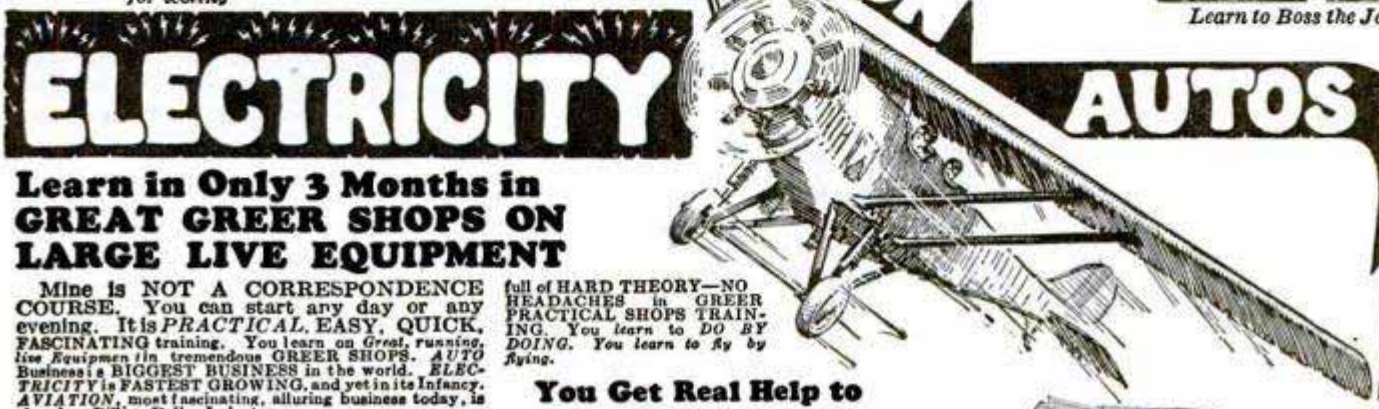

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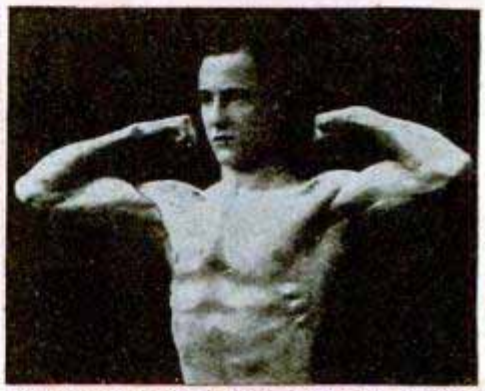

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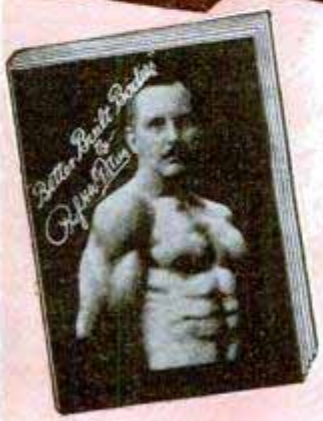

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"And now for my smashing offer! To introduce KRISS-KROSS stropper I will give you an amazing new kind of razor free. Really 3 razors in one. Can be made straight or T-shape in a jiffy. Comes with 5 special blades."

Naturally, I was vitally interested because cool, slick painless shaves are what every man tries to get and usually can't! And then at the bottom of the ad, I saw a little square:

"AGENTS: Make big money as a KRISS-KROSS representative—$75 to $225 a week. H. King made $66 in one day. J. C. Kellogg made $200 in 7 days."

First Step to Success!

At first I was skeptical about the money-making part of it. But the stropper sounded so extraordinary that I sent for it. When it came, I saw it was even more astonishing than I had imagined. I took it over to show a friend and in less than 5 minutes he asked me to get him one. While we were talking, two more friends dropped in and made the same requests that I get them each a KRISS-KROSS outfit! When I left, I had nearly $5 cash profit in my pocket—money **I had not made one single effort to get!**

I saw my chance and grabbed it! The KRISS-KROSS people gave me exclusive territory, a wonderful lot of sales helps and a big, illustrated salesmanship course book that contained selling secrets worth $100 cold cash to me! My first week I made $180! The next 3 days I made $104. Just think of it! It didn't seem to take any effort. The orders rolled in like water over a waterfall!

Mr. Paige's experience is typical of that of hundreds of KRISS-KROSS representatives. Practically every man who takes up this astonishing proposition writes us that he is making money faster and easier than he ever dreamed possible. Right now more KRISS-KROSS representatives and agents are wanted—to earn $30 a day and up. Find out about it today! Clip the coupon and mail it at once! You'll never regret it. Paige didn't! So act at once!

Rhodes KRISS-KROSS Corp.
1418 Pendleton Ave. St. Louis, Mo.
Dept. E-372

Rhodes KRISS-KROSS Corp., Dept. E-372, 1418 Pendleton Ave., St. Louis, Mo.
Please send me full details of your amazing KRISS-KROSS Stropper, with list of generous commissions, and tell me how I can make big profits with it in my full or spare time.

Name.....

Address.....

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

Electrical Experts are in Big Demand!
—L. L. Cooke

I Will Train You at Home to fill a Big-Pay Job!

It's a shame for you to earn $15 or $20 or $30 a week, when in the same six days as an Electrical Expert you could make $70 to $200—and do it easier—not work half so hard. Why then remain in the small-pay game, in a line of work that offers no chance, no big promotion, no big income? Fit yourself for a real job in the great electrical industry. I'll show you how.

L. L. COOKE
Chief Engineer

Look What These Cooke Trained Men are Earning

Makes $700 in 24 Days in Radio

"Thanks to your interesting Course I made over $700 in 24 days in Radio. Of course, this is a little above the average but I run from $10 to $40 clear profit every day; you can see what your training has done for me."
FRED G. McNABB,
848 Spring St., Atlanta, Ga.

$70 to $80 a Week for Jacquot

"Now I am specializing in auto electricity and battery work and make from $70 to $80 a week and am just getting started. I don't believe there is another school in the world like yours. Your lessons are a real joy to study."
ROBERT JACQUOT,
2005 W. Colorado Ave.,
Colorado Springs, Colo.

$20 a Day for Schreck

"Use my name as a reference and depend on me as a booster. The biggest thing I ever did was answer your advertisement. I am averaging better than $500 a month from my own business now. I used to make $18 a week."
A. SCHRECK,
Phoenix, Ariz.

$3500 A Year For Beckett

"When I began with you I was just a common laborer, going from one job to another, working for anything I could get, and that wasn't much. Now my salary is $3,500 a year and the Company furnishes me with an automobile."
C. O. BECKETT,
108 Maple Heights,
New Lexington, Ohio

Be an Electrical Expert
Earn $3,500 to $10,000 a Year

Today even the ordinary Electrician—the "screw driver" kind—is making money—big money. But it's the trained man—the man who knows the whys and wherefores of Electricity—the Electrical Expert—who is picked out to "boss" the ordinary Electricians—to boss the Big Jobs—the jobs that pay $3,500 to $10,000 a Year. Get in line for one of these "Big Jobs." Start by enrolling now for my easily learned, quickly grasped, right-up-to-the-minute, Spare-Time Home-Study Course in Practical Electricity.

Age or Lack of Experience No Drawback

You don't have to be a College Man; you don't have to be a High School Graduate. As Chief Engineer of the Chicago Engineering Works, I know exactly the kind of training you need and I will give you that training. My Course in Electricity is simple, thorough and complete and offers every man, regardless of age, education or previous experience, the chance to become, in a very short time, an "Electrical Expert," able to make from $70 to $200 a week.

No Extra Charge for Electrical Working Outfit

With me, you do practical work—at home. You start right in after your first few lessons to work at your profession in the regular way and make extra money in your spare time. For this you need tools, and I give them to you—5 big complete working outfits, with tools, measuring instruments and a real electric motor.

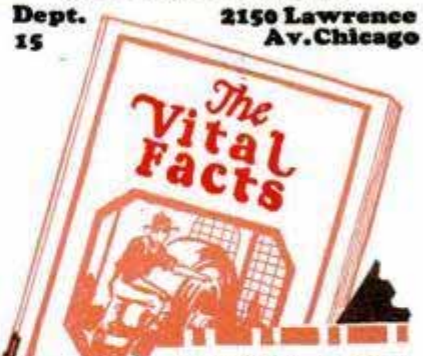
Your Satisfaction Guaranteed

So sure am I that you can learn Electricity—so sure am I that after studying with me, you, too, can get into the "big money" class in Electrical work, that I will guarantee under bond to return every single penny paid me in tuition, if, when you have finished my Course, you are not satisfied it was the best investment you ever made. And back of me in my guarantee, stands the Chicago Engineering Works, Inc., a two million dollar institution, thus assuring to every student enrolled, not only a wonderful training in Electricity, but an unsurpassed Student Service as well.

Get Started Now — Mail Coupon

I want to send you my Electrical Book and Proof Lessons, both Free. These cost you nothing and you'll enjoy them. Make the start today for a bright future in Electricity. Send in Coupon—NOW.

L. L. COOKE, Chief Instruction Engineer
L. L. COOKE SCHOOL OF ELECTRICITY
Dept. 15 **2150 Lawrence Av. Chicago**



5 big outfits given to you — no extra charge

MAIL COUPON FOR MY FREE BOOK

L. L. COOKE, Dept. 15, 2150 Lawrence Ave., Chicago — The Man Who Makes "Big-Pay" Men

Send me at once without obligation your big illustrated book and complete details of your Home Study Course in Electricity, including your outfit and employment service offers.

Name .....

Address .....

Occupation .....

The "Cooke" Trained Man is the "Big Pay" Man

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Advertisements in this section, 30 cents per word, each insertion, minimum 10 words, payable in advance.
To be inserted under proper classification in June issue, copy should be in our office April 18th

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ADVERTISERS—Obtain surprisingly fine results from a 24 word ad in our list of 108 trade magazines for only $3.85; 24 words 9 metropolitan Sunday papers $5.00. Read The National Mail Trade Journal, America's leading mail order magazine. We have written advertising campaigns that have produced as high as $10,000 in business first month. Why waste your money on poorly written literature when we will write your complete campaign and give you continual advertising and business counsel for $10.00 year? Send 25c for sample copy of our magazine and advertising booklet, listing many magazine, newspaper, mailing list, printing buys. The Waring Advertising Company, Dundee, Mich., or Chamber of Commerce Bldg., Toledo, Ohio.

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INCH Display 50 Monthlies Thrice $8.00. Admeyer, 4112M Hartford, St. Louis, Mo.

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DISTINCTIVE—Imitation typewritten letters (mimeographed) samples, price list upon request. Letter Service, 1706 East 8th, Kansas City, Mo.

40 WORDS Insert 50 magazines $2.00. Empire Agency, Shawano, Wis.

ADVERTISE In weekly papers. Lists free. Keator, Hartford Bldg., Chicago.

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POWERFUL Letters, literature, advertisements, illustrations; eighteen years successful experience; reasonable charges. Consultation absolutely free. Finkel-Advertising, 15p- Fairvew, Jersey City, N. J.

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SALES Letters $10. Cecile Serpa, Box 948, New Bedford, Mass.

LETTERS, sales literature written. Long experience. Reasonable. L. Bartells, 504 52nd St., Milwaukee.

SALES PROMOTION

RESULT Getting Copy; letters, folders, booklets. Whole campaigns prepared. Nominal charge. Write now. Shaffer, 14 Polk St., Indianapolis.

$50 TO $50,000 Daily Sales Developed During 28 years for clients by our direct mail plans, copy, campaigns. One product, 1923, an idea; this year $100,000 orders booked. Fifty year old concern desired 50 national representatives in 1925; we produced 40 in three months. 700 dealers in 10 months at $3 each, for another. Ten years Sales Promotion Manager Larkin Co. Submit sales problems for Free diagnosis. James C. Johnson, 118A Woodbridge Ave., Buffalo.

YOU'R Product will sell. Have us find prospects, customers, or write letters, folders, mail-order ads and complete campaigns that get business. Outline your problem to "Mail Merchandisers," 578 Maccabee Bldg., Detroit.

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SIMPLIFIED Liquid-gas carbon remover for cars with windshield cleaner, vacuum tube or priming cup. Works to perfection without soiling your hands. Agents wanted. E & M. Laboratories, 10101 Nelson Ave., Cleveland, Ohio.

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AUTO Parts, New, Used—Lowest prices, largest stocks, bankrupt supplies, motors, wheels, rear ends, radiators, transmissions, generators, gears, tops. Brightman, 2065 Main St., Hartford, Conn.

YOU Are wanted to resilver mirrors at home. Immense profits plating autoparts, tableware, etc. Write for information. Sprinkle, Plater, 77, Marion, Ind.

RADIATORS at wholesale prices. All standard makes. Satisfaction guaranteed. Send for prices, stating make and model. Independent Radiator Co., 1119 S. Wabash Ave., Chicago.

AUTOMOBILES

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TRUCK Owners—Stop shoveling, dump your loads. Dependable Hoist Co., Streator, Ill.

BATTERIES AND BATTERY SUPPLIES

MONEY-MAKING Battery Shop Equipment at low prices. Catalog free. Pier Equipment Mfg. Co., Box 301, Benton Harbor, Mich.

BATTERIES—How to make and repair. Radio and auto. Formula and complete instructions $1.00. Arthur Clarke, Paris, Tex.

AUTOMOBILE SERVICE EQUIPMENT

JUNK Tires converted into saleable mds. with our Hoxie. $200 starts you. Vulcanizing tires pays 100%. Have shop outfits near you $50 up. Portable electric paint spraying outfits complete, only 50 lbs. $61 delivered. Equipment Exchange, 108 East 11th, Los Angeles, Calif.

BUILD Business with the best of air service. Bring car owners to your doors—no matter what branch of automotive service. Costs less to operate than others. Easy pay-for-itself terms. Free trial. Write D. C. Jenkins, Box M585, Troy, Ohio.

CARBURETOR Troubles? We repair all makes. We also give a generous allowance on your old carburetor for a new one. Everything guaranteed. Factory representative, "The Carburetor Man," 3847 W. Madison St., Chicago, Ill.

BE A Battery Man. Buy one of our improved transformer type Scioto Battery Chargers. Four sizes. We specialize in battery shop equipment and supplies. Wholesale only. Adams-Barr, Columbus, Ohio.

BIG Opportunity in 8 hour battery charging. Let me tell you how you can install equipment with practically no investment. Earn $150 to $300 monthly from it. Bargains in used outfits. Write today. I. C. Helmick, Box M583, Troy, Ohio.

NEW Charging units that will charge from 1 to 5 six volt batteries from 32 volt line, direct current, neat and compact, guaranteed. $15.75. General Distributing Company, Security Storage Building, Duluth, Minn.

BIG Profits in automotive electrical service with use of low priced testing equipment. Small down payment brings it—pays for itself with handsome profit besides. Write for details, no obligation. E. C. Galbreath, Box M584, Troy, Ohio.

BATTERY Charging is profitable; requires small capital. We have gang chargers for any size shop. All models are guaranteed. Write The Rollaway Motor Company, 128 Southard Ave., Toledo, O.

FOR FORD OWNERS

FORD Model T owners who want to "pep" up their cars, who wish to take long steep hills on high, who perhaps desire extreme speed and who want to get the best out of one of the best motors which has ever been built, should use Avaco Valve Actions which scientifically increase valve capacity. They are durable, easily installed, inexpensive. Honest money-back guarantee. Write Auxiliary Valve Action Company, Fitchburg, Mass.

UNDERSLUNG With "RKO" Swing Lo Irons. See "Red-i-Kut" ad page 136.

MOTORCYCLES, BICYCLES AND SUPPLIES

MOTORCYCLES Cheaper than Bicycles. $25 to $50. Easy terms. Tires $2.50; Frames $3; Forks $3; Tanks $5; Wheels $4; Chains $2; Saddles $5; Handle Bars $5; Engines $15; Auto Tires $3; Airplane Engines $15; Bicycle Tires $1.25. Send 50c for catalog. Price Cutter Deninger, Rochester, N. Y.

SLASHING Price Reduction! Fine Harley-Davidson motorcycle bargains. New, used and rebuilt motorcycles, $50.00 and up. Send for our new Free Bargain Bulletin just off the press. Knuth's Harley-Davidson Agency, 2525 Fond du Lac Ave., Milwaukee, Wis. Exclusive Harley-Davidson Distributors.

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LEARN to Fly; $100.00 including Solo. We guarantee to solo you regardless of the number of flying hours required. Our instructors are ex-army aviators and air-mail pilots with wide experience. Our training equipment is the best obtainable. Our course requires about two weeks, depending on the individual. No bond required, no charge for breakage. Eight years without an accident. 76 students graduated in 1925. Commercial aviation is a rapid growing industry. Don't delay! Enroll now in one of the oldest and best known flying schools in Ameria. Write for booklet. Robertson Aircraft Corporation, operators of the United States Air Mail, St. Louis-Chicago, Lambert-St. Louis Airport, Anglum, Mo.

JOIN National society for promotion of aviation, one of America's fastest growing aviation societies. No dues, assessments, extras of any kind. $2.00 covers all costs. You receive beautiful pair silver wings; home study lessons on aviation flight principles with drawings, diagrams, dictionary of aviation containing 300 aviation terms, definitions. Aeronautical dope sheets giving valuable data on 400 airplanes, airplane motors. In lesson form, not a book. Enroll now enclosing $3.00. Everything will be mailed immediately. N. S. P. A., Dept. PMC, 412 6th St., Los Angeles, Calif.

COMPLETE Flying course. We guarantee to teach you to fly safely and steadily regardless number hours needed. Course includes practical flying instruction, theoretical principles, mechanical knowledge of airplanes and motors. All instruction on modern aircraft by licensed Transport Pilots of long experience. Write for free booklet. Von Hoffmann Aircraft Co., Distributors for Ryan Monoplanes and Eaglerock Biplanes, 205, Lambert-Saint Louis Flying Field, Anglum, Missouri.

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INSTRUCTION In flying, drafting, designing, also shop course. Actual work given in these courses. Write for information and rates. Classes now organizing. Wallace Aircraft Co., 4710 Irving Park Blvd., Chicago, Ill.

SEE Our new cabin monoplane at Detroit Aircraft show. Wallace Aircraft Co.

BUILD It yourself for $188.00. The famous Heath "Parasol" sportplane. Safest to fly; simplest to build. Wings come already assembled. Send 10c for catalog. Heath Airplane Company, Chicago, Ill.

ADVICE In glider and airplane contruction. Blueprints price list, 25 cents. J. P. Schroeter, 452 Broadway, Milwaukee, Wis.

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FLYERS, Students: Send 25c coin for our complete course in designing, building and flying. Dix Engineering, Dept. B, Box 302, Allentown, Pa.

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SCALE Model Airplanes ready to fly—all types. Send dime (3 for 25c) for Flying Glider and catalog. The Clinton Toy Co., Box 141, North Haven, Conn.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instruction 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, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 140 and 141.

"AERODRIVE" Propeller boat attachment blueprints, 50c. Propellers, 4', $8.75; 5', $13.25; 6', $16.50; others proportionately. Leather helmets, $1.50; goggles, $3.00. Ostergaard Aircraft, 4309 N. Narragansett, Chicago.

FLYING Instruction complete. Two lessons, $1.00 each. Church, 1603 Golden Gate Ave., San Francisco.

"SKYWARD Ho!" New book by Derek White on your future in aviation. Opens road to career, fame, fortune. Sent free. Write at once. Parks Air College, 213 Missouri Theatre Bldg., St. Louis, Mo.

THE American School of Aviation announces a new correspondence course in Mechanics of Aviation. A thorough training in Practical Aeronautics. American School of Aviation, Dept. 1871, 3601 Michigan Ave., Chicago, Ill.

YOUNG Fellows interested in aviation, write! We will help you to get your plane. Cumberland Airways, 123 South East Ave., Bridgeton, N. J.

LINDBERGH Photographed with his plane, beautiful, closeup, 30c. Martin, Bristol, Pa.

BIGGEST, Best Catalog Model Airplanes, Parts, Supplies; 5c postpaid. Ideal Company, 19 West 18th Street, New York.

PARACHUTES. Specify weight. Thompson Bros. Balloon Co., Aurora, Ill. Established 1903.

SEND Dime for 12-inch mounted propeller and circulars on free three-foot model aeroplane. No selling. Aero Shop, 3050 Hurlbut Ave., Detroit, Mich.

BOYS Build It! Model A-10 complete kit 75c. Guaranteed to fly. 1295 Colton, Detroit.

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TWENTIETH Century book of recipes, formulas and processes, 807-page cloth bound book containing 10,000 money-making formulas for manufacturer, workshop, laboratory, office and home. Sent prepaid for $4.00. Send dime for 48-page catalog of practical, scientific, mechanical and industrial books. Midland Products Co., Dept. 185, 524 Courtland Ave., Park Ridge, Ill.

HYPNOTISM Easily learned. Lessons guaranteed. Postpaid, $1.10. Smith Pub. Co., Dept. 3, Springfield, Mass.

CURIOUS Books, Unique Novelties, Stunning Pictures. Samples, 10 cents prepaid. Linds, 214 W. 34th St., New York.

INDUSTRIAL Alcohol. Wright's book. Full directions for making, fully illustrated. $2.50. Spon & Chamberlain, 120 P.M. Liberty Street, New York, N. Y.

FREE. Wonderful 624-page Dictionary. Box 29C, Station L, New York.

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NEW YORK Views, 25 full sized colored postcards 25 cents. Large book, over 150 photographs interesting places, $1.00. Zmora, 321 Avenue "A," New York City.

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AMAZE and Mystify! New 1928 "Fun-Magic-Mystery," profusely illustrated; explains many tricks. Also catalogs 750 Tricks—Illusions—Jokes—Puzzles—Books—Imported Novelties at Reduced Prices. Postpaid 10c. Lyle Douglas, Station A-5, Dallas, Texas.

MAGIC—Tricks, Books and Supplies. For Amateurs as well as the great professionals. Anyone can learn through our instructions. Feature Acts in Mind-Reading, Spiritualism, Rope Ties, etc. Large illustrated Professional Catalog, 20c. Chicago Magic Co., 140 So. Dearborn St., Dept. B, Chicago, Ill.

FREE with $25 order die box. Send 20c for our large catalogue of tricks, wigs, sensational escapes. Oaks Magical Co., Dept. 548, Oshkosh, Wis.

SEND Me 10c. Receive "Hindu-Magic" beads. Also directions. Entertain yourself. Mystify friends. Indoor and outdoor fun. Send coin. Klugherz, Stevens, Pa.

FOOL Your Friends: We send your friends picture postcards of New York City with you your name signed. 10c each. Roth, 1414 Prospect Ave., Bronx, New York.

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SEVEN Magical Delusions and Catalogs—25c. Gilmagico, Morgan Park, Ill.

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PLAYS, Musical comedies and revues, minstrel music, blackface skits, vaudeville acts, monologs, dialogs, recitations, entertainments, musical readings, stage handbooks, make-up goods. Big catalog free. T. S. Denison & Co., 623 So. Wabash, Dept. 11, Chicago.

LEARN Ventriloquism by Mail—Small cost. 2c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room S-259, Peoria, Ill.

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NOVELTIES, CURIOS, ETC.

DRIBBLE Glass: Slits in beautiful cut glass allow water to dribble down chin, causing great merriment. Adapted for parties. Price 35 cents. Correll Novelty Co., 3404 Madison, Peoria, Ill.

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ALL For $1.00. Here is a complete collectors outfit, to help you start your stamp collection the right way. The Imperial outfit contains the Imperial album. Spaces for 4,000 stamps, 100 pages, illustrated throughout. This is the genuine Imperial album bound in the blue cover. 300 guaranteed stamps from many of the principal stamp issuing countries of the world, all different. 1,000 high grade stamp hinges, 1 millimetre scale and perforation gauge. I guide to stamp collecting, an illustrated hand book for the young collector covering every phase of the hobby. All for $1.00. And we will send free with it our 80 page price list of packets, sets approvals, albums, catalogs and accessories. Scott Stamp & Coin Co., 1 West 47th St., New York, N. Y.

MYSTIC "Queer Country" Packet! Contains scarce stamps from the following strange lands: San Marino, Antioquia, Congo, Cyprus, Fiji Islands, Gwalior Hyderabad, Iceland, Jhind, Kenya, Uganda, Lebanon, Monaco, North Borneo, Nyassa, St. Thomas Prince, Eastern Roumelia, Siam, Sierra Leone, Tanganyika, Trinidad Tobago, Ubangi, Upper Volta, Wallis Futuna, Alaouites. Get this wonderful packet of "freak countries" and make your friends envious! Price only 10c to approval applicants! Write today. Mystic Stamp Company (Dept. 8), Camden, N. Y.

500 DIFFERENT Stamps for 25c! Big Collection 500 Different Stamps from Bosnia-Herzegovina, Crete, Epirus, Hong Kong, Iceland, Kenya and Uganda, Liberia, Malta, Nyassa, North Borneo, Orange River Colony, Siam, Wallis and Futana, and other "hard" countries. Catalogue value $10.00. Price only 25c to Approval Applicants! Special Bargains, 1,000 different 79c; 15 triangle stamps 49c; 100 Africa 45c; 100 Asia 50c; 100 Balkan States 35c; 100 British Colonies 25c; 100 French Colonies 30c; 100 Portugese Colonies 50c. All 8 packets for $3.00! Illustrated Lists Free. Loma Stamp Co., 3926 32nd Street, San Diego, Calif.

$1.00 FREE. Black U. S. Postage, Given Away with each order. Pioneer Stamp Album with 500 illustrations. 150 different stamps from 40 countries, Syria, Lebanon, Hejaz, Liberia, New French Colonies, British, Portuguese Colonies, South Africa, Australia, 500 hinges, 36 page illustrated catalogue. All for 15c. Big Commission to Agents for the Best approval sheets of stamps ever offered. Write for sample outfit. Hussman Stamp Co., Dept. M, 620 Olive St., St. Louis, Mo.

ANCHERS $$$ Outfit—only 12c! Fine triangle stamp; set German stamps with (pre-war) value forty million dollars (interesting!); perforation gauge, mme. scale; small album; airmail set; scarce stamp from smallest republic on earth; newspaper set; packet good stamps from Travancore, Malay, Dutch Indies, etc. Entire outfit for 12c to approval applicants! (Nice pocket stock book, value 25c, with every order!) Ancher Stamp Co., 148½ Clerk St., Jersey City, N. J.

WONDERFUL collection 205 different stamps from Gwalior, Haute-Volta, Kouang-Tcheou, St. Thomas, South Africa (Springbok), and other "hard" countries; fine triangle stamp; package hinges; millimetre scale, ruler; copy largest stamp in the world (China "Wild Goose," cat. 40c!); big illustrated lists. Total Value $4.50. All for 10c! Also approvals. Indian Stamp Co., 103 Howard St., Bangor, Maine.

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PATENTS. Time counts in applying for patents. Don't risk dalay in protecting your ideas. Send sketch or model for instruction 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, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 140 and 141.

WITH $50 Equipment you can have business of your own; no selling or repairing experience required. Render service every autoist is glad to pay for. Boy can operate. Write Motor X-Ray Co., 1095 Market St., San Francisco, Calif.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

MIRRORS Resilvered at home. Costs less 5 cents per square foot; you charge 75 cents. Immense profits plating like new, brassy worn-off autoparts, reflectors, tableware, stoves, etc. Outfits furnished. Details free. Sprinkle, Plater, 127, Marion, Ind.

AGENCY Wanted. Can sell anything. Krakower Novelty Co., 2822 East 7th St., Brooklyn, N. Y.

CHEMICAL Expert furnishes Manufacturing Formulas and Processes with complete working directions. Reliable individual service only. No lists. Charges reasonable. Correspondence invited. Dr. Arthur VanHeeden, 2410 Congress, Chicago.

BUSINESS Profession of your own and earn big income in service fees. See Stephenson Laboratories, display ad. page 133.

LEARN Blue printing, earn big money. Instruction outfit including paper, chemicals, etc., complete, $2.50. Photoprint Co., 4 Branford Pl., Newark, N. J.

START Your Own Business! Sell through agents, mail order or retail. Fastest selling lines. Small investment, big profits. Particulars free. H. M. Wilson, 800 N. Clark St., Chicago.

CIRCULAR Free. Learn how to sell novelties by mail under my instruction. Hadwil, 96A, 74 Cortlandt St., New York.

SAVE Money! Big directory tells where to buy half million articles wholesale. Your copy $1.00. George Lundgren, Millington, New Jersey.

AN Income from an acre of ground. No ginseng raising. Particulars, stamp. Geo. L. Brockman, LaPorte, Ind.

CARPENTERS, Builders: Detailed drawings and sample showing easy method of constructing factory type rolled in groove window screens. $1 postpaid. Cooper, Box 3781, Tampa, Fla.

START Own Business. Home, office. Free folder describes 27 money making opportunities. No outfits. Elite, 38 Elizabeth St., New York.

PERPETUAL Royalty Interest, 640 acres, entire section, for $10. Warranty deed covering all minerals, including oil, gas and potash, famous West Texas mineral region. May make you independent. Write for free information. Southern Investment Corporation, 301 Kress Building, Houston, Tex.

FINANCE Wanted—To install new machinery for manufacturing new combination barrel funnel, Patent No. 1,636,789. Wm. H. Sigley, Sylvan Grove, Kans.

SELL Better Books by mail. Particulars free. Green, 15788 Parkside, Detroit, Mich.

WE Pay One Dollar each for money making ideas acceptable for our publication. Just out, new booklet, "Novelties and Specialties you can make and sell at home." 25 cents. New Ideas Publishing Co., Box 6068, Kansas City, Mo.

MAIL Dealers' Wholesale Directory, where to buy thousands of articles, 10c. Lester-Marie Co., Box 1244, Chicago, Ill.

FREE Printing with successful formulas. Samples, particulars. Voltine Agency, Roswell, N. Mex.

HAVE Your own manufacturing business. Our formulas show you how to make quick selling, large profit, small capital specialties. Also will analyze any sample—show you how to make it. Send for lists. C. A. Black & Co., 1140 W. 6th St., Cleveland, Ohio.

GET Into the building cleaning business. Fortunes will be made. Clean bricks, stones, hardwood surfaces the solvent way. Complete instructions with formulas Five Dollars. Industrial Cleaners, 3768 Second Blvd., Detroit, Mich.

ARTIFICIAL marble sanitary flooring instructions, covering wood or cement flooring ½ inch thick, fireproof, waterproof, all colors, low cost. Ornamental casting, concrete, plaster, papier-mache decorations, garden furniture, statuary, flexible molds. 18 years instructing the public; particulars and illustrations free. Chris. Mahler, Huntington, N. Y.

CHEMICAL Expert will furnish Formulas and Trade Secrets. All lines. Lists Free. W. L. Cummings, Ph. D., 228 Gordon Ave., Syracuse, N. Y.

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YOUR Name in directory, 10c, brings big mails from everywhere. Eureka Supplies, 624 Barnett, Kansas City, Kans.

GIFT Shoppe, for pleasure and profit; one dollar brings drawings and instructions. Bryan's Shoppe, Medina, Ohio.

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MAKE Big Profits with a Fur Farm in your backyard. Chinchilla Rabbits, Muskrat, Mink. Write for facts. 252 Conrad's Ranch, Denver, Colo.

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. Hillyer Ragsdale, Drawer 4, East Orange, N. J.

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BUILD your own business selling Annie Blain Flavors. New Repeat System. Geo. S. Parker, New Brunswick, N. J.

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TELEGRAPHY—Both Morse and Wireless—taught thoroughly and quickly. Tremendous demand. Big salaries. Wonderful opportunities. Expenses low; chance to earn part. School established fifty years. Catalog free. Dodge's Institute, H St., Valparaiso, Ind.

20TH Century Manual of Ry. and Commercial Telegraphy and Radio Telegraphy, by F. L. Meyer. Of this excellent book F. H. Tubbs, Superintendent Western Union Tel. Company, in Chicago, says: "I consider this work of distinct advantage to students of telegraphy, and am glad to recommend it." Pay postman $2.00 and postage when he delivers it. Popular Mechanics Co., Room 805, 200 E. Ontario st., Chicago.

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SUBSCRIBE To The New Popular Chemistry! A monthly chemical magazine containing the latest chemical news, experiments, formulas, recent advancements in medicine, and other interesting features. Three trial copies 30 cents. One year, $1.00. Book catalog free to yearly subscribers. Popular Chemistry, Dept. YP, Swedesboro, N. J.

YOUR chemical problem solved and working formula or process furnished for $5.00. Write me. W. Stedman Richard, Industrial Chemist, Box 2402, Boston, Mass.

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FORMULAS—170 Money makers and big illustrated catalog 20c. Ideal Book Shop, (K) Park Ridge, Ill.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc., 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

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GUARANTEED Formulas for world's largest selling specialties. Play safe, get my valuable lists, special formulas. Catalog describing Apex formulas, all lines. "Exclusive but not expensive" 30 years supplying particular people, with unequaled service. Miller, Chemist, 1706-H Tampa, Fla.

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AGENTS WANTED

AGENTS: Fixit Rubber Repair is the wonder of the age. It is semi-liquid, chemically prepared pure up-river Para Rubber. Applied cold, without heat or tools, it quickly vulcanizes itself to tube or casing. Repairs punctures or blowouts. Agents make big money—best season now. Auto owners, garages, service stations, fleet owners will welcome the opportunity of saving 800% on tire repairs and of increasing mileage of their tubes and casings. Send $1.00 for full size sample or write for free particulars. Marquette Rubber Co., 23251I Wolfram St., Chicago.

PRIVATE Brand Toilet Articles, household specialties, perfumes, soaps, extracts, etc. We pack the goods for you under your private label. With your name on the goods you get all the repeat business. Don't sell for others but build up a profitable business for yourself. Highest quality merchandise. Extremely low prices. Quick shipments, on both large and small orders. Write immediately for lowest wholesale prices and complete information regarding our amazing offer. Address supply department, National Scientific Laboratories, 1904W Broad, Richmond, Va.

WANTED! Ambitious, industrious person to introduce and supply the demand for Rawleigh Household Products. Good openings near you. Make sales of $150 to $600 a month or more. Rawleigh Methods get business everywhere. No selling experience needed. We supply Sales and Advertising Literature and Service Methods—everything you need. Profits increase every month. Low prices; good values; complete service. W. T. Rawleigh Co., Dept. 63PPM, Freeport, Ill.

NOCK-O—New kind of aluminum cleaner brings profit. A real money maker, $50.00 a week spare time, $100.00 a week full time. NOCK-O works quicker and better. Endorsed by the largest manufacturer of aluminum in America. Combines a cleaner and a polish, removes all stains and discolorations. We will mail a full sized container postpaid upon receipt of 25c. Agents request plan with order. Nock Chemical Laboratory, Eighth and Sarah Sts., S. S., Pittsburgh, Pa.

FREE—Strawberry Stemmer and Pineapple eye remover, with every sample Pea and Bean Huller. Shells Peas and Beans in a jiffy. Saves ½ to 1 hour time preparing peas and beans for a meal. No more stained and sore fingers. Every Housewife Buys. Send $1.00 today for Huller and big money-making offer. Money-back guarantee. Home Pea and Bean Hulling Machine Co., Marietta, Ohio.

AGENTS—I'll pay your bills, give you steady income for rest of your life, if you will take care of my business in your locality, full or spare time. You be my partner, make $15 a day. Distribute teas, coffees, spices, extracts, things people eat. I furnish everything; world's finest super sales outfit containing 30 full sized packages; low prices; big repeat business; $25,000 guarantee on quality. I go 50-50 with you. Get my amazing offer. C. W. VanDeMark, Dept. 102-E, 117 Duane St., Cincinnati, Ohio.

$13.80 DAILY In advance (Send for sworn proof), introducing new insured hosiery. 57 styles, 40 colors, guaranteed seven months. No capital or experience required. You simply take orders. We deliver and collect (or you can deliver, suit yourself). Credit given. Pay you daily, monthly bonus besides. Summer line now ready. We furnish samples. Spare time will do. Milton Mathews, Park 5865, Cincinnati, Ohio.

IF We send you two of our newest inventions—wringer and dust mop—will you demonstrate and take orders? Every housewife eager prospect. Pays $75 weekly. No money required—samples loaned free. Write Delphos Mop Co., 1015 Washington, Delphos, Ohio.

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AGENTS: Portraits, photo-pillow tops, frames, sheet pictures, medallions, photo-jewelry, guaranteed hose, laundry tablets, food products, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30-days' credit. Jas. C. Bailey Co., Sta. C-5, Chicago.

$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. Sample free. Picture Man Friedman, Dept. 8-G, 541 W. Lake, Chicago.

MAKE $11.00 Daily selling our lucky 11 toilet goods assortment at $2.25 giving free 2 piece carving set. Each sale makes steady customers. E. M. Davis, Dept. 56, 2301 Canal, Chicago.

DRINKS. The best you ever tasted, concentrated true fruit flavors, cherry raspberry, strawberry, grape, etc. Just add water and sugar. Can be kept on ice for a week. 30 quarts (150 glass size) $1.00; 3 for $2.50 postpaid. 80c clear profit on every dollar selling at 5c a glass—beautiful signs free. Also 10c packages soft drink powders, makes 10 big glasses delicious drinks. Big sellers to families and stores. Seven packages, assorted flavors (70 glasses), with full particulars, 50c postpaid. Chas. E. Morrissey Co., 4417 Madison St., Chicago.

JUST Out—New Patented Apron. No strings or straps—$20.00 a day every day; over 100% profit; commissions daily. Write for free offer. Sta-Put Co., Dept. 205, St. Louis, Mo.

BRING Home the Bacon! Selling Christy's Polishing Cloth. Polishes all metals in a jiffy. Easy to demonstrate. Everybody buys. Unusually handsome profit. Write for free sample. Christy, Inc., 5767 B'way, Newark, New York.

AGENTS Wanted—$50-$75 weekly. New patented ironing board covers. Other fast selling novelties. Samples free. American Braiding Company, 329 West Monroe, Dept. D, Chicago.

AGENTS—$20 A day is waiting for you! Our fast-selling household specialties bring big, quick, easy profits. Orders everywhere. Steady repeat business. No capital or experience necessary. Write for special introductory offer. American Products Co., 1891 Monmouth, Cincinnati, Ohio.

HIGHEST Commissions to distributors and salesmen on our interesting chemical specialties. Get our samples and prices first, it pays to ask experts. Peoples Chemical Laboratory, 2519 So. Crawford Ave., Chicago, Ill.

MAKE Extra Money in your spare time. Secrets of successful agents and salesmen explained. Send 10c for next 3 big issues of my book, containing over 500 best money-making ideas and rare opportunities. L. Bernard, 22 E. 12th St., Cincinnati, Ohio.

AGENTS: Men and Women make big money taking orders for our beautiful dress goods, silks, wash fabrics, handkerchiefs, hosiery, fancy goods. 1,000 samples furnished. The National Importing Co., Dept. E-100, 573 Broadway, New York.

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NEW Invention—just out; autos washed without water for 6c; no liquids; amazing chemical cloth does everything; one snappy operation removes mud like magic; prevents blurred windshields; 250,000 sold by agents; **details free. Security Mfg. Co., Dept. 5,** Toledo, Ohio.

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BIG profits distributing 5c candy specialties to dealers. Fast sellers. Exclusive territory. Universal Sales Company, 631-B Wilson Ave., Brooklyn, N. Y.

WE Trust Agents!—Starter Stock and Reorders on Credit—no bond signers. Finest line 200 guaranteed Extracts, Pure Foods, Toiletries. Big Profits. Write for details. Perkins Products, E-3, Hastings, Nebr.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tujunga, Calif.

WE Have the finest needle case, self-threading needles, needle threaders. $50.00 to $200.00 weekly. Samples 25c, particulars free. Empire, 1549 N. Wells, Dept. 201, Chicago.

WRITE Atlas Sign Works for free working equipment. Beautiful window sign letters. Penny each! Any size. Wonderful offer to general agents. K1032 E. 55th St., Chicago.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods, Experience Unnecessary. Carnation Co., 2480, St. Louis, Mo.

THERE'S Money in it! Increase your income: Start a business of your own! Be your own boss! Trimplex Hair Trimmer offers something new! A patented wonder hair cutter, sells like wild fire. Every man, woman and child uses it in safety, absolutely solves the problem of the barber. Just attach Trimplex automatically, to any Gillette razor. No fussing, can be removed any time in a jiffy. List price $1.00 including Gillette razor free. Money back if you want it. Agents territory available now. Write Dept. A-3. The Trimplex Company, 44 West 50th St., New York.

100 MORE Active men to introduce "Chieftain" Guaranteed Tailored Shirts, 3 for $4.95. Latest novelties, colors, styles. Dickman, Illinois, in 3 weeks made $589; Sinton, Texas, in 12 days, $219.60; Bend, Iowa, in 16 days, $334.80. Why not you? No experience or capital needed. We deliver and collect. Full working outfit free. Cincinnati Shirt Company, Shop 1585, Cincinnati, Ohio.

TURN Your spare time into cash, selling Komic Kards. Dime brings samples. Information. Robert Fleming, 331 Weeden St., Pawtucket, R. I.

WHY Sell Non-Essentials? Home necessities repeat. Duo Double Strength Extracts, toilet articles, full line of specialties, can't be beat. Big profits. Write quick. Duoform Co., N-1, Attica, N. Y.

FLAVORING Extracts—Bottle yourself! Concentrated—add water! Free labels, whirlwind sellers. 500% profit. Money-making opportunity. Write Thomas Manufacturing Company, Indianapolis, Ind.

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WELLS Cleared $620.00 in one month with "Business Guide" and free legal service. Write for free outfit. Prof. Nichols, Dept. 3, Naperville, Ill.

AGENTS: To sell our new metal folding hat and coat hanger; every home or office will buy it. Bd. Gause Mfg. Co., Elkhart, Ind.

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SEND For Free Sample of "Ride Airs" and I'll tell you how $20.00 profit a day will be easy for you. No selling experience necessary. I'll prove that! If you are a hustler write me today. Hamilton, Desk C-5, 532 W. 27th, Los Angeles, Calif.

COUNTY Distributors—Fifty monthly sales per 100,000 people secures exclusive. Household appliance retails $1.00—saves $7.00 annually. Big commissions. $aver, 1962 Glendale, Los Angeles.

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DON'T Read this unless 300% profit interests you. Everybody buys on sight. Free sample. Magic Products, Dept. 418, 332 East 31st, K. C., Mo.

EXCLUSIVE Territory now being assigned. Make big money selling genuine imported Swedish razor blades; fit Gillette type. Gives wonderful velvet-smooth shave—long lasting—money saving. Remarkable repeat item. Send $1.00 for 10 blades and introductory offer. Act promptly. Superflex Safety Blade Co., 11 Park Place, New York City.

ENERGETIC Direct Salespeople, demonstrate greaseless doughnut baker and prepared doughnut flour to housewives. Tremendous market. Big money. Permanent position. Advancement. Research Laboratories, Savage, Minn.

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EXPENSIVE Silk Dresses. Our slightly handled showroom samples sold cheap. Peddlers, storekeepers, ladies with home dress parlors, etc. Write Hirschlar's, 249 West 34th, New York.

75c PROFIT On $1.00 sales. Auto, furniture and glass cleaner. Your name on label. Exclusive rights. Free sample. Mfg. E, 213 Griswold, Detroit, Mich.

AGENTS, $72 A week. Biggest line guaranteed cutlery ever offered. Knives, razors, etc. We give exclusive territory. Extra commission. Big money for spare time. Write quick. Novelty Cutlery Co., Desk 1631, Canton, Ohio.

OH HELLO! Why didn't I see this before? Christy's Iron Rust and Stain Remover sells like blazes. Write for free sample. Christy, Inc., 5067 B'way, Newark, New York.

WANTED—Dist. agents for "no name"" powdered hand soap. Free samples. Get the business. Brackman & Co., 2638 So. Trumbull, Chicago.

WOMEN—$2 An hour spare time; 100% commission; new idea sanitary necessity; sells on sight; every woman buys; new feature never before used; designed by physician; revolutionizes old uncomfortable methods; pay every day; no deliveries, no collections; no experience or capital required. Write Mary P. Coleman, Meriden, Conn.

NIFTY, Amazing new discovery! Big seller! Quick repeat. Sample. Nifty Co., 1260 California St., San Francisco.

"MYSTIC" Polishing Cloth. Fast seller. Free sample. "Mystic" Co., 1260 California St., San Francisco.

MAKE Money. Part or full time. Details 25c. (none free). "What and How"" to sell everybody. We want best representatives. Opportunity is knocking. Answer! United-Canada Manufacturers, (PM) Ottawa, Canada.

SAVE Lives—make money; everyone needs Ioderm ointment for infections, gangrene, festers, boils. Saved ear from amputation. Write Pugh. Agents wanted in every shop and town. Sample 50c, three for $1.00. Ioderm Company, Bala, Pa.

SELL "Lustra" Polishing Cloth, rapidly replacing metal polishes. Great sideline—sample free. Schrieber, Nashville, Ill.

POLMET Polishing Cloth removes tarnish from metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retails 25c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

AGENTS! For free oversize Fountain Pen proposition write Jackson, 716 W. Exchange, Owosso, Mich.

NO Peddling. Start own business. Home office. Big profits. No outfits. Free particulars. Elite, 38 Elizabeth St., New York.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instruction 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, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 140 and 141.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 24.

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MAKE Big money. Be the electrical dealer in your town. Sell a big line of low priced, quality appliances. Write for our selling plan. Dandyline Products, 4420 N. Western Ave., Chicago, Ill.

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MAKE $25.00 Daily selling colored Raincoats and Slickers, Red, Blue, Green, Etc., $2.95—Hat free. Commissions daily. Outfit free. Elliott Bradley, 230 So. Wells, Dept. AB-5, Chicago.

ENGRAVED Nameplates, signs, numbers, initial, desk, city nameplates. Big profits. Hilton Specialty, 90 Stewart, Providence, R. I.

TWO Money makers for agents. "Francia" Pocket Adding Machine retails $4.85. To you $1.00. "Excellograph" Rotary Stencil Duplicator $37.50 retail. Write Typewriter Supply, 102 Hersch Bldg., Pittsburgh, Pa.

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AGENTS To sell patent socket wrench. Big seller. Good commission. Howard, 2417 No. Ashland Ave., Chicago.

TIMERS For Fords and Fordsons. Sure sellers. Big market. 100% profit on your investment. Tisch Auto Supply Co., 212 Division Ave., So., Grand Rapids, Mich.

TIRE Agents—Car Owners. $5 to $10 allowed on old tires, free 7 day mileage test on new Mellinger heavy duty tires, 15 months guaranteed, free tire offer to agents. Make $50 weekly spare time. Write for amazing offer, powerful selling kit given agents and wholesale prices. Mellinger Tire Co., Dept. 282, Kansas City, Mo., Warren, Ohio, Oakland, Calif.

AGENTS—Green, brown, black and silver finished aluminum hand engraved name plates. Big profit. E. S. Evans, Webster, Mass.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS: Liberal commissions and bonuses selling high quality hosiery, handkerchiefs, scarfs, men's ties, curtains, bedspreads, linens. Also a big line of dress goods, silks, etc. 1,000 samples furnished. Write quickly. The National Importing Co., 573 Broadway, Dept. E-100B, New York, N. Y.

AGENTS—For "Aladdin" polishing cloth. Enormous demand everywhere; 200 per cent profit. Sample free. L. Dougherty, 518 West 39th St., New York.

BIG Profits—Selling device described on page 146, this issue. Act quick. Illinois Stamping & Mfg. Co., 220 N. Jefferson St., Chicago, Ill.

HANDSOME Profits 'supplying leading self-repeating auto necessity; no competition; pay daily; write today; best season. Topco Mfg., Dept. X Sta. H, Cleveland, Ohio.

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100% PROFIT Made distributing imported oriental perfumes and cosmetics. Sample case absolutely free. Write Romola Perfumerie, Inc., Dept. K, Armour Station, Chicago.

MARVELOUS New combination pen-pencil in colors, wonderful seller. Over 100% profit. Agents wanted everywhere. Write for details immediately. Momco, 59 Park Place, New York City.

AGENTS—Sell all steel wire brushes. Stores, shops and garages. Big discount. Territory now open. C. S. Brush Works, 18 E. 16th St., Chicago.

AGENTS—$65 Week selling guaranteed can opener; latest patent device proves big seller. Sample furnished. Territory open. General Mfg. Co., Box 244, Oak Park, Ill.

BIG Money selling sealair rubber weld for $1.00; costs you $4.95 dozen prepaid, your name printed on boxes and circulars. Sealair Rubber Co., 577 East 163rd St., New York City.

THERE Is no excuse for being out of a job. Direct selling is lifting thousands of men and women out of non-employment and low pay rut. Send 10c in stamps for our very helpful booklet, "How to become a direct salesman," also a free sample copy of "Opportunity," the magazine that helps people make more money. Address Dept. PM5, Opportunity, 750 N. Michigan Ave., Chicago.

SPINNING, Red, white and blue auto light colors for cowl. See page 152 this magazine. Get in on ground floor.

AGENTS: Big commissions and bonuses taking orders for our big line of fashionable dress fabrics, handkerchiefs, quality hosiery, fancy scarfs, linens, etc. 1,000 samples furnished. The National Importing Co., Dept. E-100A, 573 Broadway, New York, N. Y.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

ATTRACTIVE Lodge Emblems for autos. Embossed, engraved, never tarnish. 100% profit. Belle Mfg., 96 Friendship, Providence.

A NECESSITY For home, farm and garage. Something new. Agents write to Sunshine, 324 West 42d St., New York.

THREAD-CUTTING Thimble 25c. Seller Sample 15c. Irvel, 3973 Elston, Chicago.

AGENTS Wanted—One minute demonstration sells it; startling new glass cleaner for windows, windshields, showcases, mirrors. Send 30 cents for sample. Fenton Co., 3744 78th St., Jackson Heights, New York.

ARVEO Polishing Cloths offer big profits to salesmen. Sample and particulars free. Arveo Industries, Box F 147, Gross Ile, Mich.

KWIK Straw Hat Cleaner is demanded by millions. Need more agents. Allan, Harahan, La.

AGENTS—Big profits selling stores 5c candy specialties. Colonial Co., 312 E. 33rd, New York.

AGENTS—New Invention! The Perfect Tie Catch. A necessity, makes wonderful demonstration. Sample 10c. Write for particulars. Novelties, Room 420, 1265 Broadway, New York.

AGENTS — Sell All-Steel Storm-Proof Window Ventilators. Something different. Year round demand. Every home or public building needs them. Empire Mfg. Co., Washington, Iowa.

BIG Money selling 25c article you make yourself. Costs you 5c. No license required. 25c pkg. free. C. C. Manufacturing Co., B-522, Dayton, Ohio.

AGENTS—Sell gents fine fountain pen and pint best ink $1.00. Cost you $6.00 dozen. Sample of each $1.00 postpaid. American Distributors, Department A, Peru, Ind.

STRANGE Invention! Pays $25 daily. Keeps telephone and iron cords from tangling and kinking. Prevents iron scorching. Saves electricity. Samples free. Neverknot, Dept. 5A, 4503 Ravenswood, Chicago.

FREE Sample—Latest novelty signs for every business. Merchants buy on sight. 500% profit. Ever-Ready, 50 E. 9th St., New York.

AGENTS $75 Weekly selling latest embossed card signs, two-color show cards, changeable signs, flashing plugs. All merchants buy. Franklin Co., 3322 3rd Ave., New York.

GRAND Opportunity, 150 fast sellers; 50% commission and valuable premiums given free to active agents. Send for special sample case offer. Colonial Chemical Co., Pittsburgh, Pa.

AGENTS—Something new. $75—$200 weekly selling $7.50 washing machine. Does work of high priced machines. Biggest profits. We deliver, collect. Free sample offer. (Weighs 4½ pounds). Act. Merlo Mfg. Co. (manufacturers), Desk 4-A, Aurora, Ill.

$10 EVERY Day. Will send sample of new wringer mop with big steel plate on approval. Convince yourself at our risk. Kleanezy, Dept. G-19, Delphos, Ohio.

ANY Salesman can earn $75.00 to $200.00 a week selling our patented real art genuine gold leaf window letters. No experience necessary. Sell on sight. Big demand all year round. Any one can put them on. Buy for cash and sell for huge profit. General agents can collect big commissions on original and repeat business. Free liberal samples. Write today for complete proposition. The Tablet & Ticket Co., 1015-1021 West Adams St., Chicago, Ill.

OUR Agents earn from $50 to $200 weekly selling genuine diamonds, watches, jewelry through beautifully illustrated catalog. Cash or credit. Unusually liberal proposition. Free outfit by return mail. No investment! Any hustler can do it easily. Write Sterling Diamond & Watch Company, Nationally Known Jewelers, Est. 1879, 1540 Broadway, Dept. A150, New York.

MAKE $50 to $75 A Week. Everyone needs shoes. Sell Mason's all-leather shoes, amazingly low prices. 85 styles—men's women's, children's. No experience needed. Big outfit free. Mason Shoe Mfg. Co., Dept. 225, Chippewa Falls, Wis.

$15 A DAY Sure. Sell guaranteed solid leather shoes. Unequaled low prices. 85 styles; men's, women's, children's. Free outfit offers complete line shoes, raincoats, leather coats, puttees. Consolidated Shoe System, Dept. 515, Eau Claire, Wis.

MAKE $2.00 Every Hour. Sell every home wonderful preparation; mends hosiery and clothing without sewing, invisible. Results guaranteed. Send for free sample of work. Queen City Laboratories, Dept. PM-5, Cincinnati, Ohio.

EARN More Money. Manufacture your own products. Particulars free. Edward Marschalk, Ramsey, N. J.

AGENTS—Street Men! Get this new red hot bonanza! Majik Mirror. A novel pocket mirror. Held to light shows bathing beauties, art poses or advertisements. Send 25c for samples. Standard, 48th St. and Broadway, New York.

MAKE And sell your own goods. No machinery. Guaranteed formulas. Catalog free. Clover Laboratories, (E) Park Ridge, Ill.

AGENTS—Make $20 Daily. Wonderful article. Amazing new profit opportunity. Women buy quickly. Orders repeat. We deliver and collect. Write quickly. Knights Mfg. Co., 37 Hamilton Blvd., Buffalo, N. Y.

WHERE To buy 500,000 articles wholesale. 84-page directory offers agents unlimited opportunities. Free particulars. Pruitt System "F," Brookfield, Ill.

AGENTS Become a regular established McConnon dealer; buy on credit; sell for cash or credit. 228 absolute household necessities; all repeaters. Enjoy a sure income 52 weeks per year, year after year. City or country trade. Capital, experience unnecessary. McConnon & Co., Dept. S70, Winona, Minn.

AGENTS: Make $3.00 an hour taking orders for our 40 fascinating kitchen specialties. No competition. Write quick. General Products Co., Dept. D207, Newark, N. J.

$100 WEEKLY—Appointing agents Mother Hubbard Foods. No canvassing, delivering or investment. Mother Hubbard Products, 554F Congress, Chicago.

GET This. $1.00 auto necessity. 100% profit. Repeats like gasoline. Guaranteed. Taylor Products-Mfg. Co., Columbus, Ohio.

BUY Direct: Hosiery, lingerie, neckwear, at lowest mill prices. Defy competition. Make $150.00 weekly. Ask for catalog. Superior Knitting Co., Dept. 12, New Haven, Conn.

AGENTS, $300 Month. Bonus besides. Sell guaranteed silk hosiery. Must wear 7 months or replaced. Producers earn auto. Write for samples. Free silk hosiery for your own use. Betterknit Textile Co., Silk 2431, Greenfield, Ohio.

BIG Pay every day—Complete guaranteed line direct to wearer—dress shirts, work shirts, overalls, coverlets, work pants, sweaters, underwear, playsuits, $10-$15 daily; experience unnecessary. Big outfit free. Nimrod Co., Dept. 8, 4922-28 Lincoln Ave., Chicago.

AGENTS, Men and Women. New spring and summer line ready. Raincoats, Underwear, Shirts, Sweaters, House dresses, hosiery, playsuits. Big commission. Catalog free. May Co., Pancoe Bldg., Chicago.

COME To work with us. New spring outfit ready. Our agents make $15 daily selling shirts, underwear, sweaters, raincoats, boys' suits, hosiery. Northern Sales, 101 S. Wells, Chicago.

AGENTS, $240 Month. Bonus besides. Sell finest line silk hosiery. Beats store prices. Guaranteed to wear 6 months or replaced. Start on credit. Producers earn auto. Write for samples. Wilknit Hosiery Co., Dept. 4631, Greenfield, Ohio.

EARN $25.00 Daily. Sell colored slickers, raincoats, $2.95. Hat free. White trimmed trench coats. Spring overcoats. Outfit free. H. Clark, 232 So. Wells, Dept. DA-5, Chicago.

MIRRORS Resilvered at home. Costs less 5 cents per square foot; you charge 75 cents. Immense profits plating autoparts, reflectors, tableware, stoves, refinishing metalware, etc. Outfits furnished. Details free. Write Sprinkle, Plater, 128, Marion, Ind.

HUSTLERS, New kitchen article; big seller. Box 71, York, Penna.

AGENTS—100% Profit demonstrating a new product! Surfacine keeps metal surfaces free of rust and gives furniture and woodwork a semi-permanent polish. The Surfacine Co., 3123 W. 22d St., Chicago, Ill.

AGENTS — Just Out! $8.88 for men's suits! Anyone can sell. Commission $3 in advance. Free sales kit. 888 Company, Dept. EC-7, Fort Wayne, Ind.

BLADES For Gillette $1.45 per 100. Sample package 10 blades 25c. Merchandise premium card earns $100 weekly. Spiegel, 225 Canal, Dept. C1, New York.

NEW Invention—400% profit. Liquid quick mend for fabrics and hosiery. Stops runs. Every woman buys. Hundred other fast sellers. J. E. Johnson Co., Dept. 465, 6129 Wentworth Ave., Chicago.

AGENTS—Get Vanilla extract at one cent a bottle. Also new Black Walnut flavor. Adams Foods, Harvey, Ill.

EVERY Housewife is waiting for this new kitchen specialty. Just out. Sells at sight. Over 200% profit. Send for pocket sample today. Universal Utility Co., Dept. 232, Gloversville, N. Y.

200% PROFIT—$100 weekly selling John D. Jr. powdered handsoap in shops, garages, filling stations, etc. Best repeater on market. Write for territory and free sample. John D. Robnett & Sons, 2143P Carroll, Chicago.

AGENTS Make 6 to 8 dollars a day selling a new clothes line tightener. Winds up with crank and sells on sight. Send 35 cts. for sample. Wm. Sigler, 9 Mack Road, Poughkeepsie, N. Y.

HOUSE To house canvassers can make $7.00 to $15.00 per day selling my new style clothes line tightener. Price $1.75 per doz., $14.00 per gross. Mfd. by L. S. Harvey Co., 157 Southmayd Road, Waterbury, Conn.

COUNTY Agents Wanted. 50% commission on tried and proved automobile spring oiler. Nothing else like it. Sells on sight—every motorist wants them. This is a good proposition; don't pass it up. Send for full particulars. Harvey Spring and Forging Co., Racine, Wis.

SELL Union Label Printing. Brand new proposition. Trade cuts free. 40% commission with or without deposit. Elaborate outfit free. Meyerson, 1132 So. Racine, Chicago.

LADIES—Gents Felecia Cigar Lighter. Best patented lighter on market. Clean up $50.00 daily. Sample $1.00. Hamburg Import Company, 27 West 33rd St., New York.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

WRITE For New Low Prices, direct from manufacturer, Flashy Felt Rugs. Attractive colors and patterns. Popular size $13.50 dozen. Sample Rug $1.40. Newark Felt Rug Co., 416-F Morris Ave., Newark, N. J.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Co., 403 Searle Bldg., Rochester, N. Y.

STOP: 200 Fast-selling specialties from many parts of world. Proposition hard to beat. Write for Free Wholesale catalog. Spors Co., Lesueur Center, Minn.

$31.00 PROFIT—with $1.50 Outfit—Big Money—Easy Work. Selling Gold Monograms for Automobiles, Luggage, Windows, Wagons. No Experience. No License. "Samples Free." NuLife Monograms, Hartford, Conn.

AGENTS—We start you in business and help you succeed. No capital or experience needed. Spare or full time. You can earn $50-$100 weekly. Write Madison Company, 566 Broadway, New York.

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

MANUFACTURE Radiant glass name and number plates, mirrors, signs, etc. Besides teach others! Investigate! Radiant Signs, 15905 Alden, Detroit, Mich.

$75-$200 WEEKLY. Genuine gold leaf letters for store windows, easily applied. Get the styles good sign painters use. Sign Painters Letter Co., 11416 Forest Ave., Chicago.

HERE It Is—newly invented auto necessity that goes big with new Ford; particulars free. Suburban Box 10, Mt. Washington, Ohio.

AGENTS, $75 weekly up. No experience required. Selling plans free. Sample pocket lighter 25c, flasher plug 50c. Other big winners. Write Elbee Trading Co., 799-T Broadway, New York.

AGENTS Wanted everywhere for new fast-selling device in universal demand by Motorists. Absolutely protects driver from glare of oncoming headlights. Sample pair postpaid $1.00. Eliminator Sales Company, 561 Broadway West, Vancouver, Canada.

WIDESPREAD Demand for Our New Food Drink and new Flavorings (Black Walnut, Peach, Dixie Bouquet, etc.). Many other fine products. More agents needed. Blair Laboratories, Lynchburg, Va.

PREPARED Shoe-Shining Mit. Just Invented. (No Polish Required.) Treated Felt Side Cleans, Polishes. Prepared Side Preserves. Waterproofs. Retails (25c)—Costs (8c). Customers Advertisement if desired. (Sample 15c.) NuLife Shine, Hartford, Conn.

AGENTS Wanted to sell Men's Hats direct from factory. Write for catalog. Model Hat Mfg. Co., Dept M-14, East Orange, N. J.

AGENTS make $10.00 Daily selling Non-Splash Water Filters on sight. Best canvasser's article on market. Investigate. Write for particulars, Desk 14, Seed Filter Company, 73 Franklin Street, New York.

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

REPLATE brassy worn-off Automobile Parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. $1.00 half pints. Post Paid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

$50.00 WEEKLY easy, Applying Gold initials on Automobiles. No experience needed. $1.45 profit every $1.50 job. Free samples. "Ralco Monograms," X1043 Washington, Boston, Mass.

WANT Distributing Agent for Handslick, powdered hand soap; removes anything from hands; everybody a customer; sample free. Solar Products Co., J-2142 S. Troy, Chicago.

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-D North Clark, Chicago.

SUCCEED With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

"HOW to Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! M. L. Rund, Mgr. Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

GOLD-LEAF Sign Letters; copyrighted Manufacturing Instructions; profits 1,000%. Johnston Co., Quincy, Ill.

JIFFEX—Pays all profit! Invest $1.00, make $20.00. Enclose $1.00 bill, receive charges prepaid Jiffex for 10 gallons (80 pints) earning you $20. Jiffex Amazing Glass Cleaner, cleans, polishes windows, windshields, showcases without water, soap or chamois. Wonderful demonstrator. Everybody buys on sight! Receive also many other agent's profitable paying propositions. Satisfaction guaranteed. Miller, Chemist, 1706-F Jetton, Tampa, Fla.

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.

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.

AGENTS—Here's a New One. "Bestever Powdered Hand Soap." Sells like wildfire. Marvelous Discovery. Removes grease, paint, ink, oil, in fact anything from hands. Cannot harm skin. 150% Profit. Great Repeater. Agents simply coining money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 4315W Irving Park, Chicago.

AGENTS—Sell stores 5c candy Specialties. Lorrac Products, Albany, N. Y.

$16 A DAY Easy—I start you in auto accessory business; no investment; no experience necessary. Landin, 4206 Montrose Ave., Chicago.

$10 DAILY. New, highly practical, useful 50c article for every home and office. Sells on sight. Hydrawlik Corp., Roselle, N. J.

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

MONOGRAM Automobiles, $1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

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

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

AGENTS make $100 week furnishing Cigar Lighters to merchants on free advertising plan. Particulars sent free, write at once. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MAGIC Polishing cloth—Great Seller. Big Profit. Free Sample. Get this proposition. Newton & Co., 50 Main St., Newark, New York.

$1,000.00 REWARD if this is not the greatest money-making house to house proposition ever known. N. R. G. tablets wash clothes in 10 minutes without rubbing. Free Samples. N. R. G. Co., H232 W. Superior, Chicago.

SHOW Us the housekeeper who likes to clean stair corners. Earn big money installing Ideal Corner Dust Shields. Write today. Ideal Stairway Equipment Co., Canton, Ohio.

OUR Luminous Crucifix Shines in the Dark. Every one amazed at the wonderful effect. Easily demonstrated—easily sold. W. G. Hannan Co., 2543 So. State St., Chicago.

SOMETHING New. Every motorist a buyer of our electro-magnetic-emergency Wonderlamp; takes only one minute to demonstrate and make a sale; no experience necessary; $5.00 an hour easily made; full time or evenings. Write for sample. Wonderlamp Co., 926 Fisk Bldg., Dept. 10-A, New York.

AGENTS—Engraved name plates, signs, numbers, etc., easily sold, profits large. Brett Bros., Roxbury Crossing, Boston, Mass.

AGENTS Send for free sample "Fretnot." Washes clothes snow white without rubbing. $5.00 daily and more easily made. Credit given. Empire, 1549 N. Wells, Dept. 101, Chicago.

INSTANT Weld Welds Rubber Instantly. Stock's Profit One Day $72.25. Enormous demand. Exclusive territory. Free sample. Tourists Pride Manufacturing Co., Desk G, Minneapolis, Minn.

AGENTS And Mail Dealers cleaning up with Lanowa Combination. 200% profit. Everything furnished. Write quick for sample. Fraser Products, 212-J Westport, Kansas City, Mo.

CALIFORNIA Perfumed beads selling like hot cakes. Agents coining money. Big profits. Catalog Free. Mission Factory P, 2328 W. Pico, Los Angeles, Calif.

NO Dull Times Selling Food. People must eat. Federal distributors make big money; $3,000 yearly and up. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with sample case, license and Free Samples for customers—Sure repeat orders. Exclusive territory. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

REAL Whirlwind Seller—Nopulout Custom Shirt. Every man buys them. Patented—no competition. Liberal commission. Free selling kit. Make $15 up daily taking orders direct from consumer at manufacturer's prices. District or local agents. Write Nopulout Shirt Co., Dept Y, Hazleton, Pa.

PHOTO Medallion Men and Women, the largest line of Photo Novelties in the world. Lowest prices, quickest service. Send for catalogue showing over 200 money makers. Photo medallions, photo medallion clocks, photo mirrors, photo fountain pens, photo powder compacts, photo jewelry and photo buttons. Gibson Photo Jewelry Co., 608-614 Gravesend Ave., Brooklyn, N. Y.

GOLD-LEAF Window letters and script signs. No experience; 500% profit. Samples free. Meyer writes 5 days profits $141.36. Consolidated, 69-U West Van Buren, Chicago.

AGENTS, New invention! Quickedge Sharpener. Just out. Patented. Big winner. Sharpens any knife or shears in less than minute. Guaranteed. Biggest seller we ever offered. Big profits. No competition. Write quick for particulars. Quickedge Sharpener Co., Dept. 48, Canton, Ohio.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds and deceives. Beautiful case free, $100 weekly. Rajah Diamond Company, F20, Salisbury, N. C.

SEND name, address on postcard. Free introductory copy Modern Salesology Magazine; 1000 money-making opportunities offered by big reliable firms; no obligation. Salesology Magazine, Desk B-38, 500 No. Dearborn, Chicago.

SELL men's neckwear; wonderful proposition. Astor, 318-M Broadway, New York.

A BUSINESS of Your Own — Making Sparkling Glass Name and Number Plates, Checkerboards, Signs. Big Book and Sample Free. E. Palmer, 512, Wooster, Ohio.

32 SECONDS complete tire change by Detmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days, cleared $100. Anderson, Mont., sold 1400 in 14 weeks. Get details for good territory. Harvest time Now. M. Morey Rim Tool, Buffalo, N. Y.

15c PROFIT On every 25c sale. Box 500, Shreveport, La.

AGENTS—Brush and Broom Catalog with sample Case Assortment of 50 different kinds of Brushes sent without deposit to responsible Brush Salesmen. National Fibre Broom Co., St. Louis, Mo.

HIGH-GRADE SALESMEN WANTED

MR. BRUSH Salesmen—Old established New York brush manufacturers require 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, 41-51 East 11th St., New York City.

DISTRIBUTORS For Time-Saving, Money-Saving, Money-Making, E-Z Mend products. Marvel Mfg. Co., 401 Broadway, New York.

SALESMEN Can make $10 a day selling our Business Record and Income Tax Report Book. Complete record of the year's business. Local and side line. Sample outfit free. Pershing & Co., Dept. F, South Bend, Ind.

EARN $20 A Day. Established income for life selling for $1 a year. $1,500 accident policy. Write W. C. Stone, 11 So. LaSalle, Chicago.

BIG Pay Every Day! Complete guaranteed line direct to wearer. Dress shirts, work shirts, overalls, coveralls, work pants, underwear, sweaters, playsuits, $10-$15 daily; experience unnecessary. Big outfit free. Nimrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

EARN $25.00 Daily. Sell colored slickers, raincoats, $2.95. Hat free. White trimmed trench coats. Spring overcoats. Outfit free. H. Clark, 232 So. Wells, Dept. DA5-S, Chicago.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

SALESMEN, Big commission selling "Superior Rebound Control" to garages and auto owners. Send for free literature and sales plan. Superior Rebound Control Sales, 2905 60th St., Kenosha, Wis.

MAKE Extra Money in your spare time. Secrets of successful agents and salesmen explained. Send 10c for next 3 big issues of my book, containing over 500 best money-making ideas and rare opportunities. L. Bernard, 22 E. 12th St., Cincinnati, Ohio.

CAN You sell a washing machine for $9.75? Agents are making $75.00 to $300.00 weekly showing new automatic washer to housewives. Thoroughly cleans and sterilizes. No rubbing necessary. Write for protected territory. Storm Royalty Co., Inc., 3601 Enright, St. Louis, Mo.

EASY To sell complete line of groceries, paints and auto oils from samples to consumers. Steady, profitable work; no capital or experience necessary. Commission advanced. Liberal credit. Loverin & Browne, Wholesale Grocers, D1500 So. State, Chicago.

IMITATION Ice Cream. Amazing new product. No freezing. Made at home in 2 minutes. Solidifies milk into delicious dessert; 8 dish sample with money making plan 10c. Creamojell Co., St. Paul, Minn.

YOU Can make big money introducing new changeable letter signs. Every merchant buys. Fast sales; big profits. Write for exclusive territory now. Changeable Sign Co., Department M, Redlands, Calif.

TOOL Salesmen—Sell to auto mechanics, guaranteed line of 120 Oldforge tools—wrenches, pliers, chisels, screw drivers, punches, tool boxes. Exclusive territory. Give complete information about yourself, first letter. Quality Tools Corporation, New Wilmington, Pa.

MAKE $50.00 Saturdays and Sundays. Wonderful opportunity entire summer. No experience necessary. Information free. Write today. Benson Camera Co., 23-K Delancey St., New York.

SALESMEN—Cemetery, Memorial Park, Mausoleum. Experienced and inexperienced. Urgent need of men. You can earn more. Free information. J. Joerg, 326 Mt. Vernon, Grand Rapids, Mich.

MAKE Big Money—Sell our nationally known all wool tailored to individual measure suits $23.50—$29.50. Commissions $4—$5.00. Your big opportunity! Large sample outfit free. Write General Tailoring Co., Dept. 5, 529 S. Franklin, Chicago.

TOOL Salesmen and mechanics with some sales ability sell our line electrical tools to auto mechanics and garages. Easy sales, and very liberal commissions. Barker Specialty Co., Girard, Pa.

SALESMEN—Sell salesbooks and special printed business forms. Excellent side line, substantial commissions. We deliver and bill customer. Write Shelby Salesbook Co., Shelby, Ohio.

SALESMEN—125 Varieties brushes, 60% commission, $25-$75 weekly profit on agents. Neway Brush Factory, Hartford, Conn.

NO Peddling. Start own business. Home office. Big profits. No outfits. Free particulars. Elite, 38 Elizabeth St., New York.

MEN, Here's an amazing money-getter. Only four $7.50 sales daily to doctors and merchants nets you $120 week profit. Business necessity endorsed by national concerns. Write for our interesting offer today. Adjustment Bureau, Dept. P, Mobile, Ala.

JUST One Changeable Letter Electric window display with moving colors and light—The Luminate. Our boys get the big money. Don't risk patent infringements—sell the original. 1928 refinements and added features make todays' Luminate irresistible. A weather-proof number for outdoor use. Join the Luminate money-makers. Display Products Company, Ltd., 405-9A, East 31st St., Kansas City, Mo.

A GOOD Line: Suitable for all or part time. Can be sold in big cities or small towns any place. Every business house needs envelopes in different sizes, weights and qualities. Many buy in large quantities. Our line includes stationery and is very complete. The samples are flat, carry easily, weigh little, look good; prices reasonable. Commission liberal and paid promptly. You would like our offer. American Envelope Co., Mexico, Mo.

MAKE $25.00 Daily selling colored Raincoats and Slickers, Red, Blue, Green, Etc., $2.95—Hat free. Commissions daily. Outfit free. Elliott Bradley, 230 So. Wells, Dept. AB5-S, Chicago.

LARGE Manufacturer made to measure raincoats and gabardines, has unusual hustlers' proposition. $75 weekly easy. Outfit free. Standard Raincoat, 367 Sixth Ave., New York.

WONDERFUL Invention Seals Fifty Envelopes minute. Sells on sight at $3.50. Exclusive territory. Kendall Sealer Co., G20, East Jaffrey, N. H.

BIG Season Just Ahead. Advertising pencils most popular every day—every business prospect. Our line repeats. Big commissions. Established in 1902. North American Pencil Works, 126 So. Clinton, Dept. 55-L, Chicago.

MEN—Sell dependable shrubbery, fruit trees, etc. Steady demand. Complete co-operation. Commissions paid weekly. We deliver and collect. Write Perry Nurseries, Dept. R-5, Rochester, N. Y.

A PAYING Position open to representatives of character. Take orders shoes-hosiery direct to wearer. Good income. Permanent. Write now for free book "Getting Ahead." Tanners Shoe Mfg. Co., 355 So. C St., Boston, Mass.

SELL Union label printing. Brand new proposition. Trade cuts free. 40% commission with or without deposit. Elaborate outfit free. Meyerson, 1132 So. Racine, Chicago.

40% COMMISSION selling printed business stationery at knock-out prices. Part or full time. Free outfit. L Process Service, Minneapolis, Minn.

COLLECTS Money from the Dead-Beats. Retails—$5.00. Cost—$1.00. Profit $4.00. "New Method." Every Storekeeper, Doctor buys quickly. Wonderful Money Getter. Federal Association, Hartford, Conn.

WERE You Ever Offered a Grocery Store? Our proposition is better. Let us tell you how you can handle groceries, auto oil, tires and paint. No rent, no investment in goods. Big pay. Write. Just say, "Show me." Hitchcock Hill Co., Wholesale Grocers, 38 Kinzie, Dept. 50, Chicago.

PUNCHBOARD Salesmen. $200 weekly. Liberal plan assures sales. Latest assortments. Nothing to carry. Full commissions on repeats. M & L Sales Co., 182 No. Wabash, Chicago.

"STERLING" Rotary Shackle Padlocks. Sells readily to hardware dealers everywhere. We pay liberal cash commission, and make laid-down prices. Pocket samples and order book furnished. Write us stating territory covered. Sterling Lock Co., Minneapolis, Minn.

SALESMEN—Become Independent. Own your business; experience unnecessary, selling our $7,500 Accidental Death; $50 Accident; $25 Sick Weekly Benefits—$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. $250,000 deposited Insurance Department, Universal Policy, Dept. A, 40 Clinton Street, Newark, N. J.

ALL-YEAR-ROUND Profitable business selling wonderful new water softener and cleaner. Removes grease, oil, ink and dirt quickly. Every home and business place a live prospect. 100% profit. Big repeat orders. Exclusive territory. Write for free sample. Seacoast Laboratories, Sea Bright, N. J.

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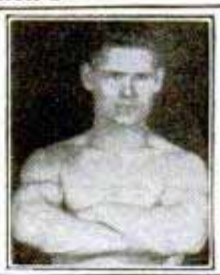

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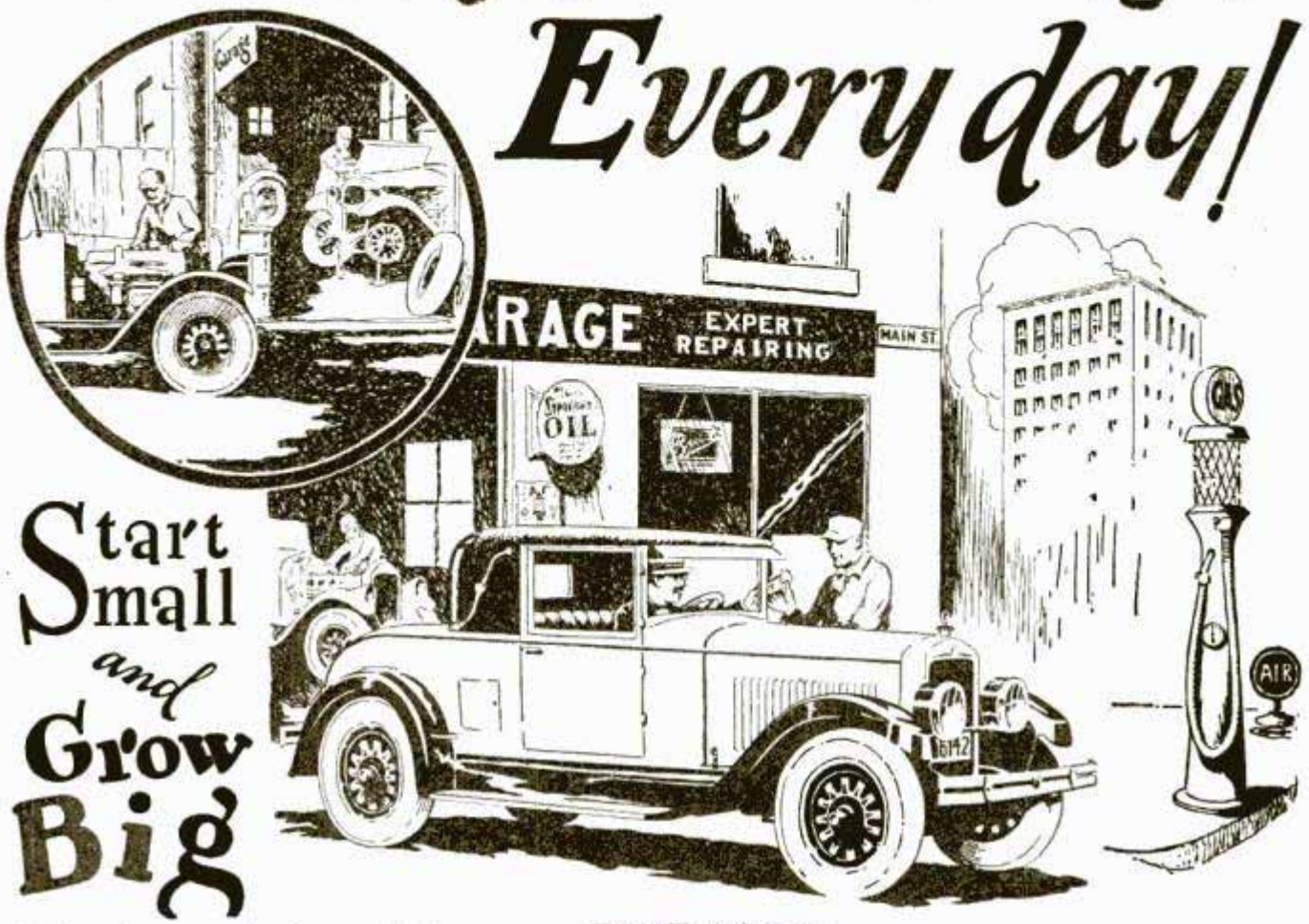

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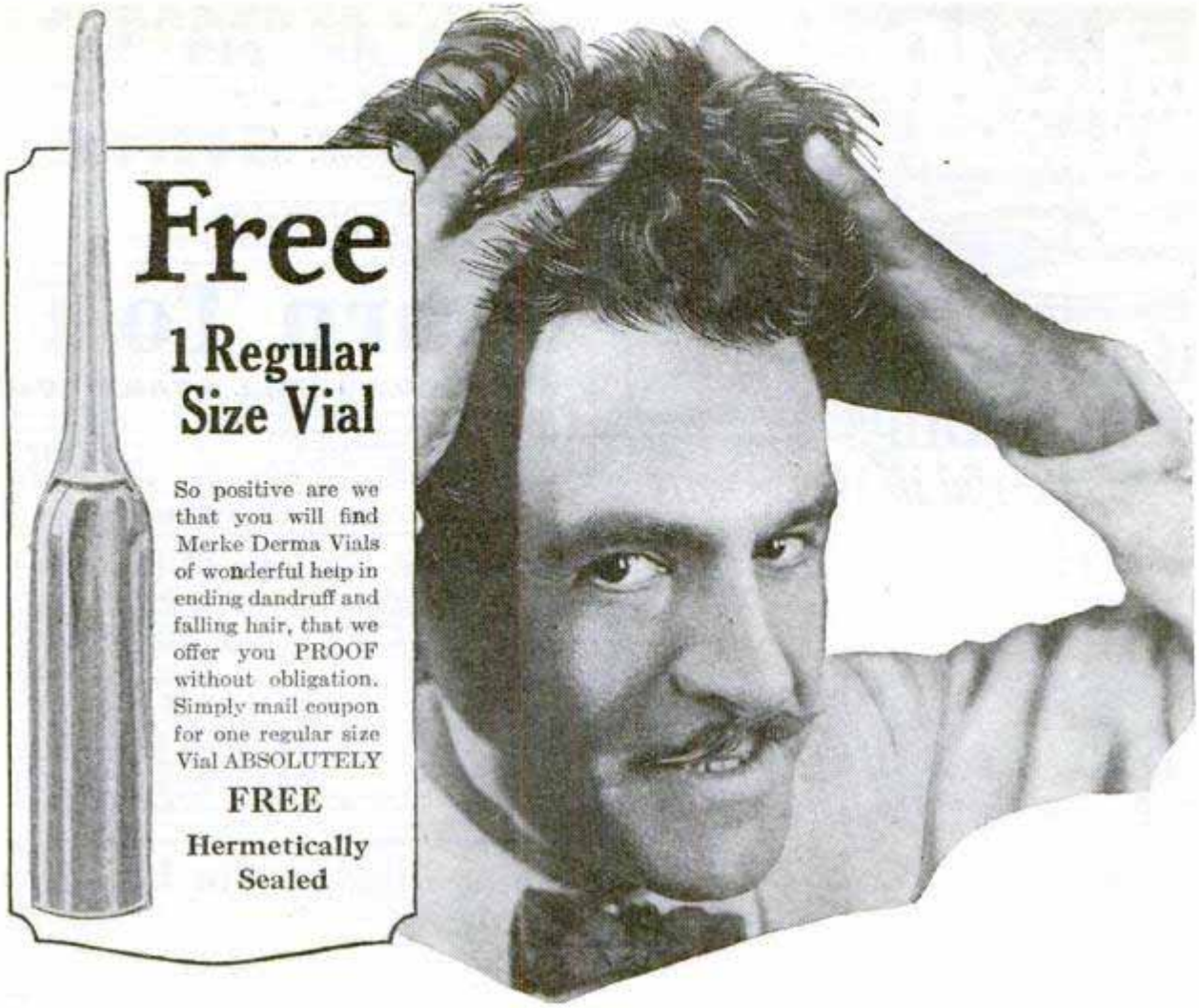

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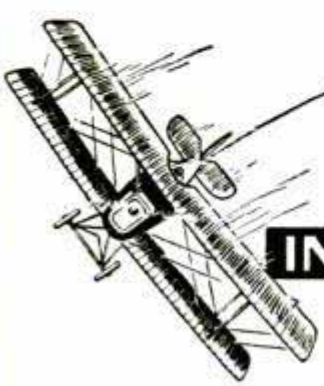

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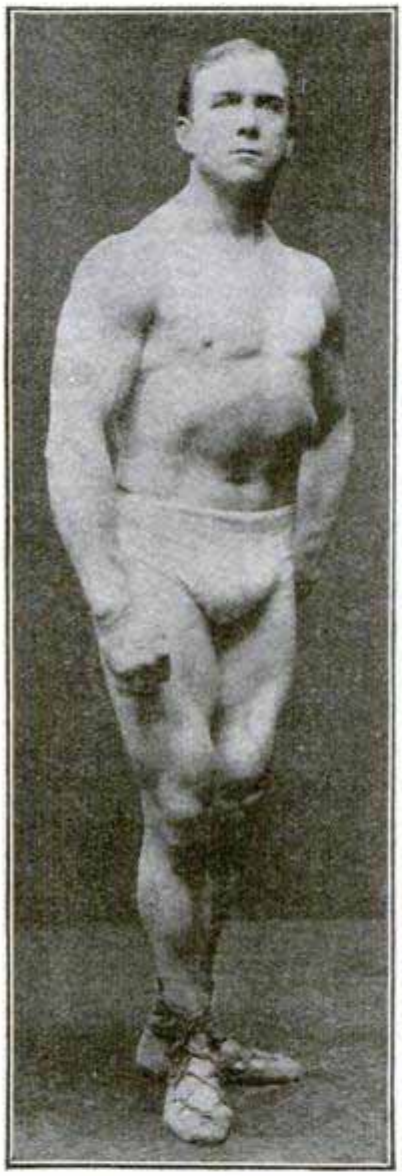

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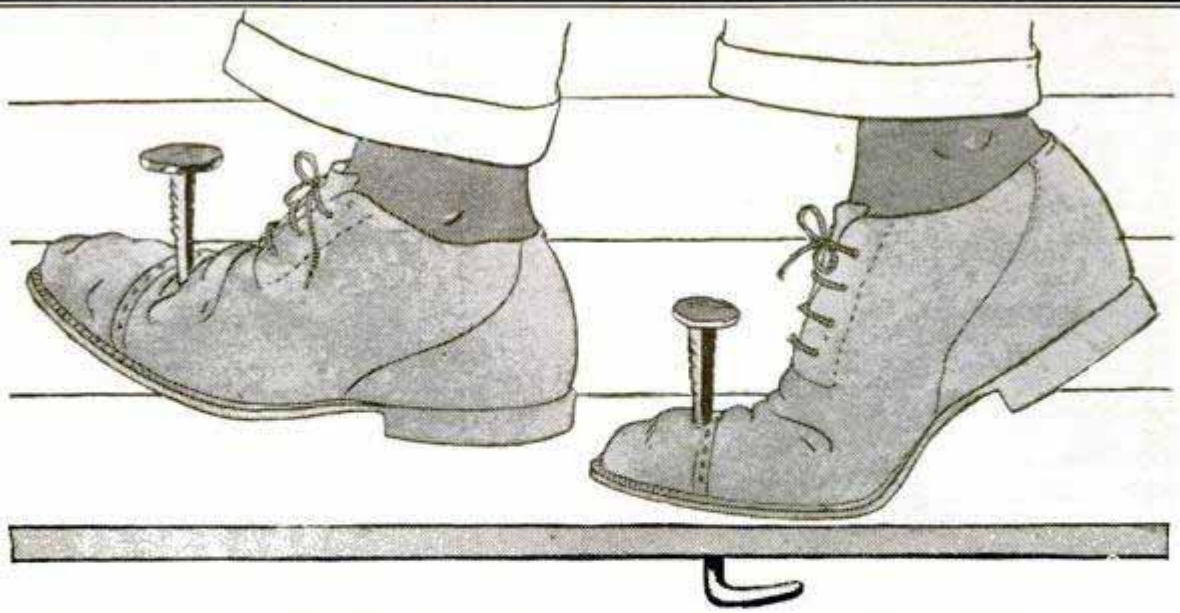

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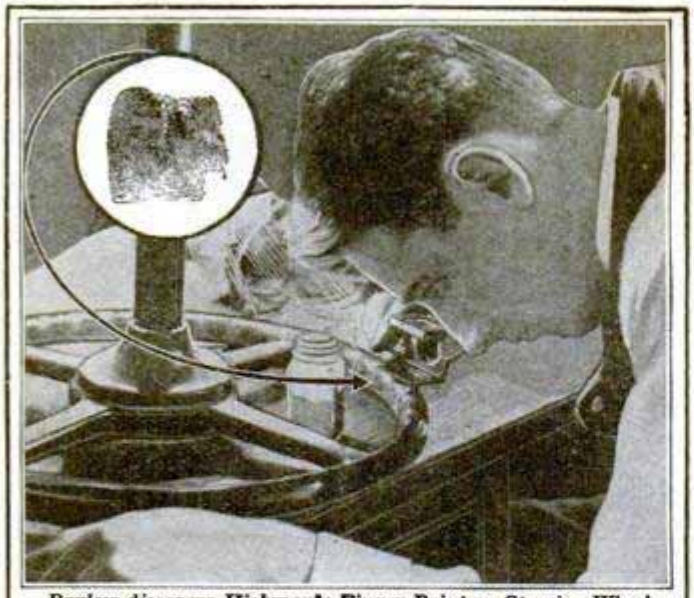

Barlow discovers Hickman's Finger Print on Steering Wheel

How Finger Prints Got HICKMAN!

You know the hideous tale—little Marian Parker kidnapped, foully murdered, her torn, mutilated body stuffed in a suitcase—delivered to her grief-stricken father for ransom—and the fiend drives off in the night—lost, unnamed, unknown—safe but for FINGER PRINTS! Yes, these telltale marks *cleared the mystery* surrounding this crime of unprecedented brutality and absolutely *identified* William Edward Hickman as the fiendish murderer. Fame and rewards go to the Finger Print Expert in this case. Fame and rewards await you, too, if you learn Finger Printing!

Barlow Does Great Work!

Barlow Taking Hickman's Finger Print After Capture

It was Sergeant H. L. Barlow, Finger Print Expert of the Los Angeles Police Department who, after working continuously for 72 hours with intense concentration, forged link by link the finger print evidence which indisputably identified the ghoulish murderer as William Edward Hickman and made his actual capture only a matter of time. Today Barlow is famous the world over as a Master Finger Print Expert! You can learn Finger Printing too! Easily!—Quickly!—at Home!

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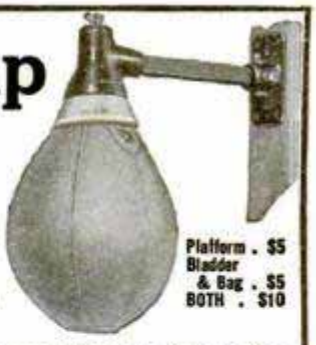

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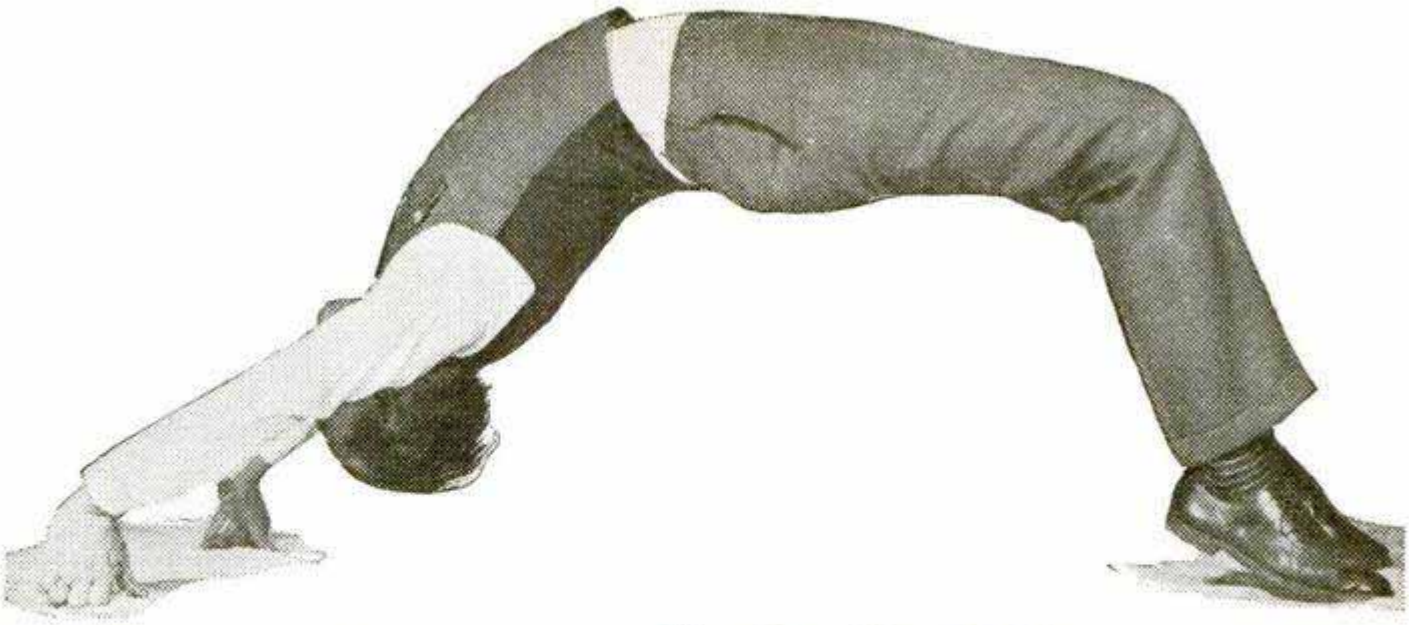

Ruptured 38 Years Is This a Miracle?

A SUDDEN STRAIN AT THE AGE OF TWELVE. . . . THIRTY-EIGHT YEARS OF PAIN AND DISCOMFORT . . . NOW AT FIFTY RELIEF AT LAST.

"I HAD despaired of ever getting relief from torture, uncomfortable devices, and fear of strangulation. Then came the day that I learned of this remarkable new discovery. It appealed to my common sense, so I sent for it. Almost immediately I felt its wonderful relief. In a few months I was a new man. Today at 50 I enjoy life as a normal man should."

Is this a miracle? No. Thousands of others have also discovered the almost magic power of an amazing new invention which has revolutionized old-fashioned methods of helping hernia. Although only recently announced to the general public, scientific men have been watching with keen interest the tests made within the last eighteen months. The inventor, an American scientist of note, quietly offered it to a limited number of sufferers in every stage of replaceable rupture. The results are of keen interest to medical science.

A New York man who has suffered for 20 years reported it to be the first device he has ever publicly endorsed—a 90-year-old man writes that his hernia has almost disappeared. . . . A Nebraska man says that he has forgotten he is wearing it. . . . Physicians praise it as an entirely new departure. . . . And now it is available to every rupture sufferer in America!

Seals Rupture With a Quarter

Now a queer little device—little larger than a quarter—weighing less than 1-25th of an ounce—reduces rupture by a new method called "sealing," a modern method heretofore impossible with old-fashioned appliances. No longer need hernia sufferers wear awkward steel springs, weighty cushions, unclean leg-straps, and other make-shift devices that were always slipping off the wound.

Magic Dot cannot possibly slip off—for it anchors to the acute point of rupture. More, it allows free blood circulation to tend to knit the tissues over the wound, and heal it much like every other wound is permitted to heal. This exclusive advantage is important, says science. For the old-time "pressing" method with its harsh pressure, common sense warns, prevents free blood circulation and nature's healing process cannot fully operate. Test this fact—press the finger against the skin and note the white spot remaining. The spot is white because blood cannot circulate under harsh pressure.

No More Heavy, Unclean Crotch or Leg Straps

This new modern way is like no other appliance in the world. It is an appliance for human beings. It enables the wearer to bend, cough, run, jump or sleep in any position without fear of the appliance slipping down. For Magic Dot is protected by a flesh-soft air-porous pad which has no hard corners or harsh surface to grind into the flesh and which flexes with every move of the body. It "breathes." A new kind of comfortable method gently supports the pad. So it is no wonder users say they forget they are wearing it! And no wonder it is healing thousands of rupture cases like those quoted here.

So confident are the inventors that Magic Dot will relieve and delight every sufferer—even cases of many years standing—that they are making an amazing "SEE IT FIRST" offer. Send no money. Be under no obligation. Simply get full description and details of this unusual offer. Learn how easy it is to reduce rupture at home in an amazingly short time and banish pain and discomfort forever. Use the coupon.

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Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

Not a Substitute

Tobacco Redeemer is in no sense a substitute for tobacco, but is a radical, efficient treatment. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves, and will make you feel better in every way. If you really want to quit the tobacco habit—get rid of it so completely that when you see others using it, it will not awaken the slightest desire in you—you should at once begin a course of **Tobacco Redeemer** treatment for the habit.

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A single trial will convince the most skeptical. Our legal, binding, money-back guarantee goes with each full treatment. If **Tobacco Redeemer** fails to banish the tobacco habit when taken according to the plain and easy directions, your money will be cheerfully refunded upon demand.

Let Us Send You Convincing Proof

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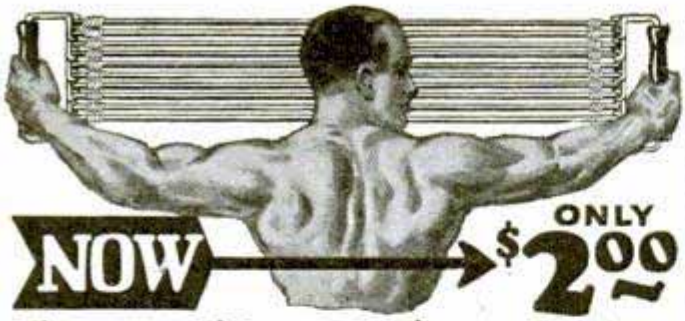

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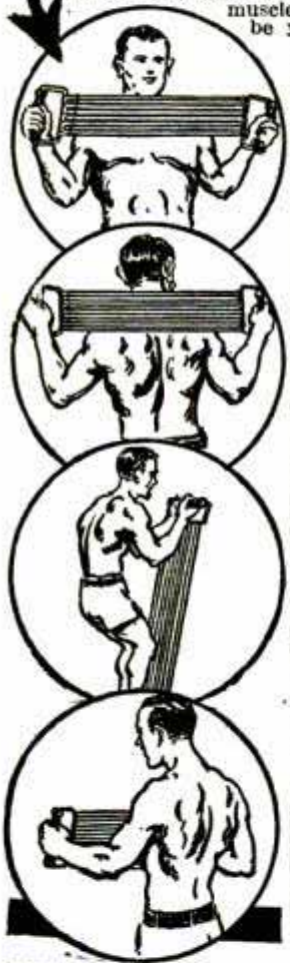

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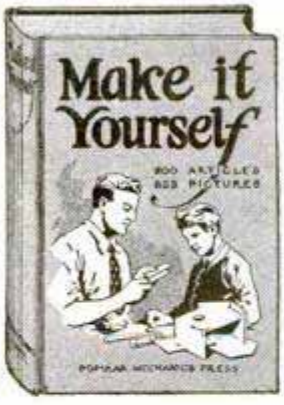

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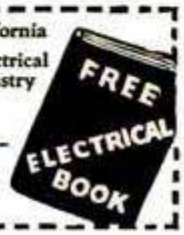

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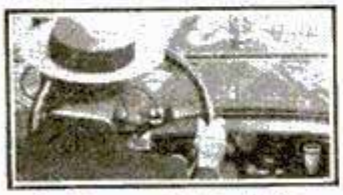

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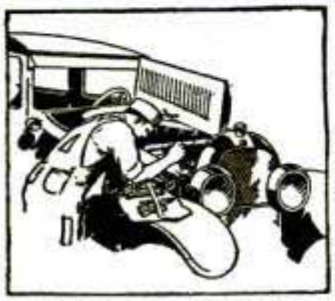

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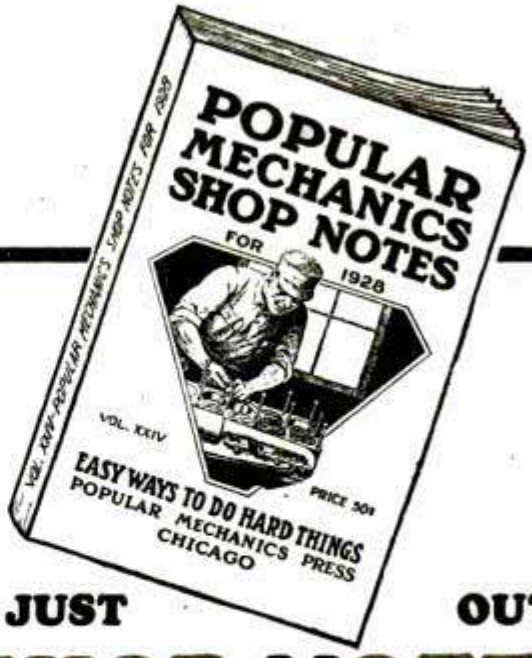

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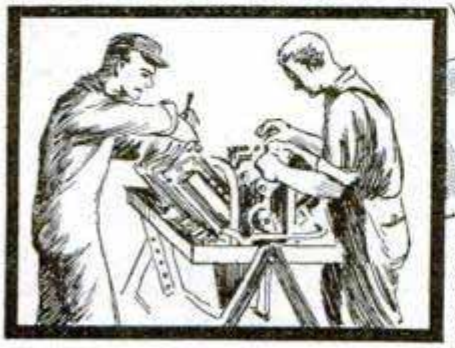

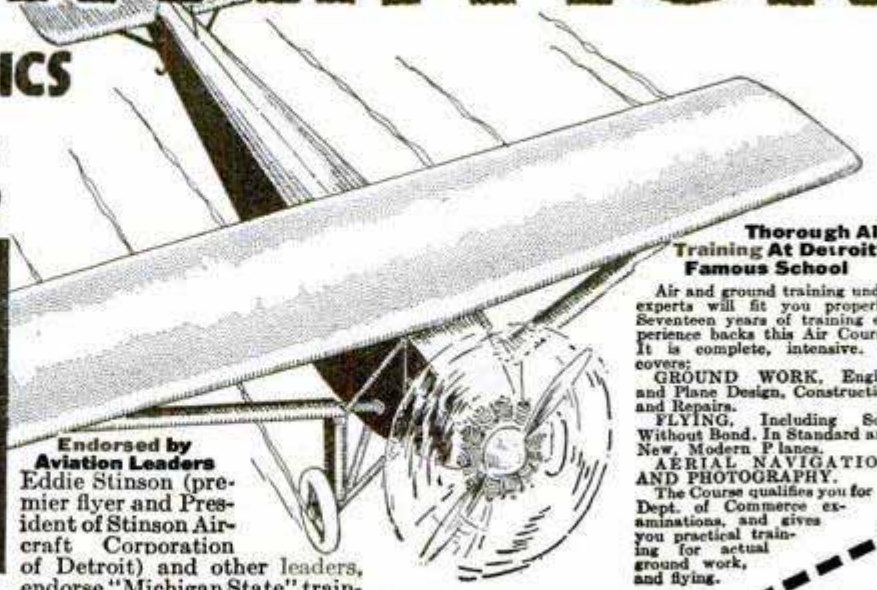

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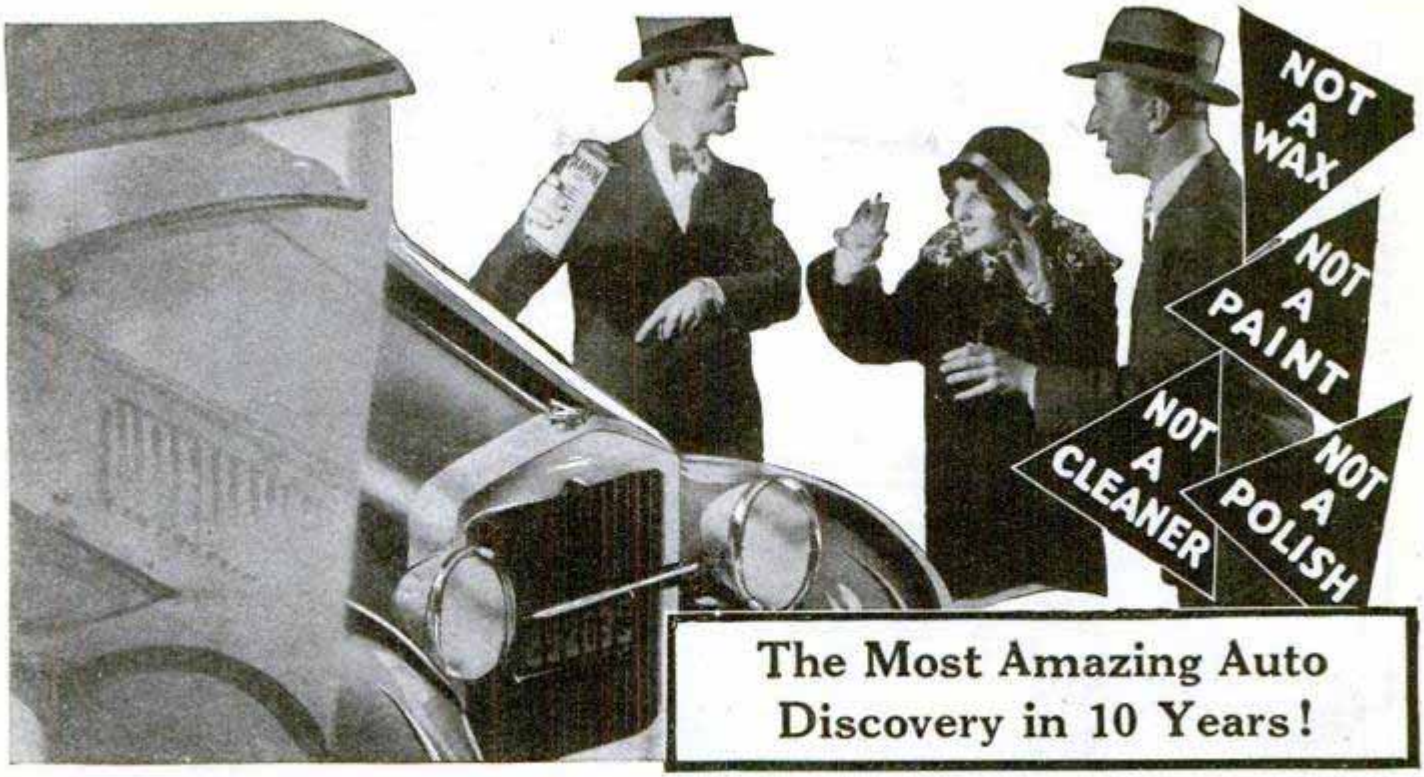

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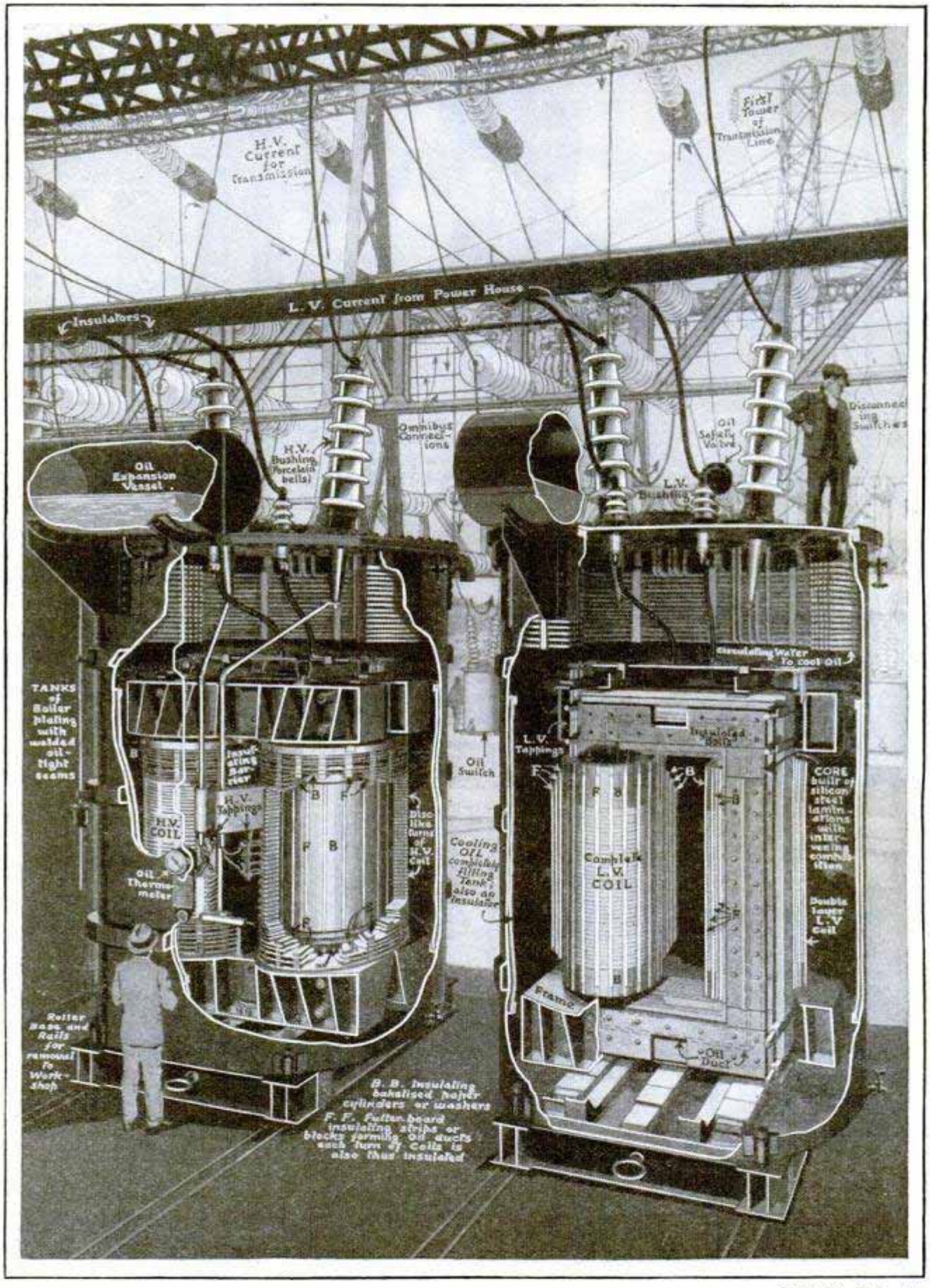

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18, Shakespeare
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Popular Mechanics Magazine
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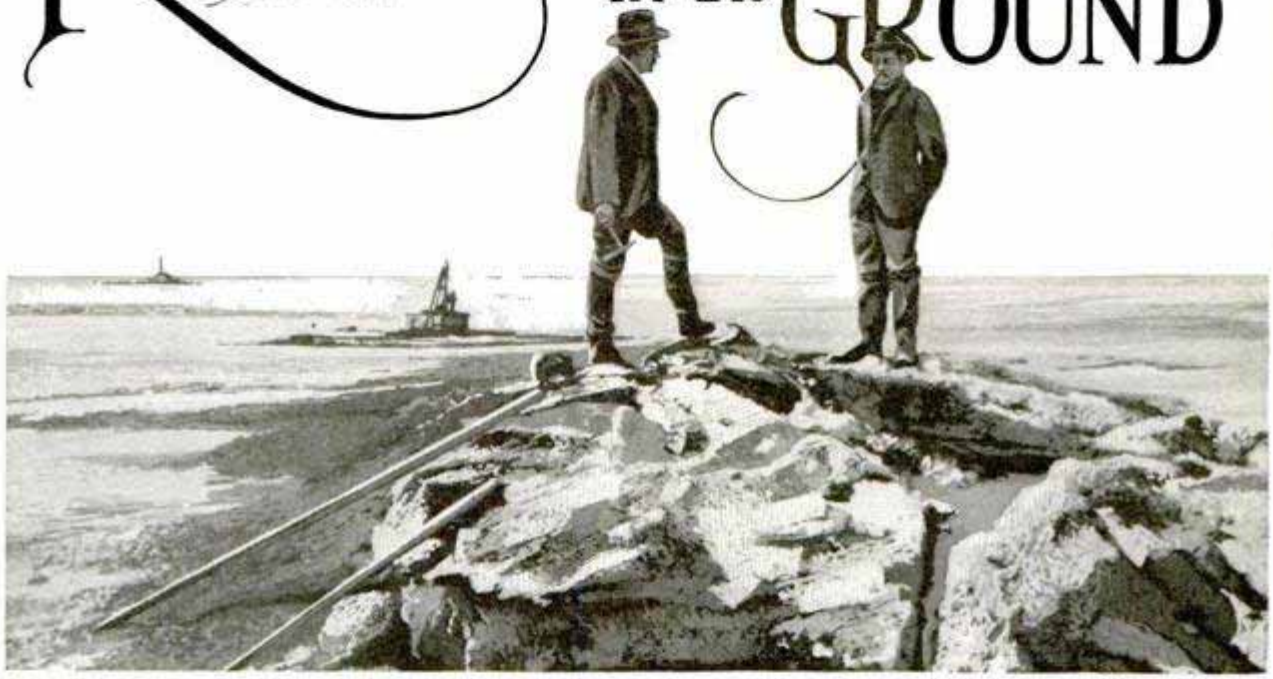


Bitumen Vent, or Crater, at the Edge of Great Salt Lake; the Thick Liquid It Exudes, When Combined with Reclaimed Rubber, Produces a Material for Hard-Rubber Articles

By H. H. DUNN

AUTOMOBILE tires, battery boxes, running-board mats, all produced from beneath the waters of the Great Salt lake, are the latest contributions of science in the world-wide search for new sources of rubber and for rubber substitutes. From shafts, six feet in diameter, sunk with steel caissons to depths of 125 to 140 feet, about 2,000 acres of an unusual deposit of bitumen on the northeastern shore of the western arm of the lake are being drained.

The resulting product is a black, viscous, molasses-like liquid, consisting of 99.9 per cent of "saturated sulphur oil created by the decay of fossil remains, and sealed into clay beds of this region," according to a bulletin of the United States geological survey.

This bitumen, the only deposit of its kind in the New World, is cleared of its impurities and combined with reclaimed rubber from discarded automobile tires and inner tubes to form a rubber "remake," or substitute, which has been found to fulfill all demands on battery boxes, switches, corners, and similar things of hard rubber. Made into automobile tires, it is claimed to be better than any reclaimed tire on the market. It is not as good as new rubber for tire manufacture, however, but is considered superior to any of the rubber substitutes.

For hard-rubber articles, ranging from battery boxes to combs, it is claimed to be superior to rubber from the point of cost, since the bitumen-rubber can be produced

at about one-fourth the price of standard crude rubber. As to wearing qualities, insulation, and similar factors, the hard rubber made from the bitumen-reclaim is declared equal to that made from the best vegetable rubber.

The amount of rubber required to make one automobile tire is equivalent to the production of two rubber trees through two whole years. Rather more than 200,000 tons of automobile tires are discarded each year in the United States. Of this, about fifty-five to sixty per cent can be reclaimed to the point at which it can be used successfully to mix with the bitumen base, in the now virtually fixed ratio of sixty pounds of bitumen to fourteen pounds of old-tire reclaim.

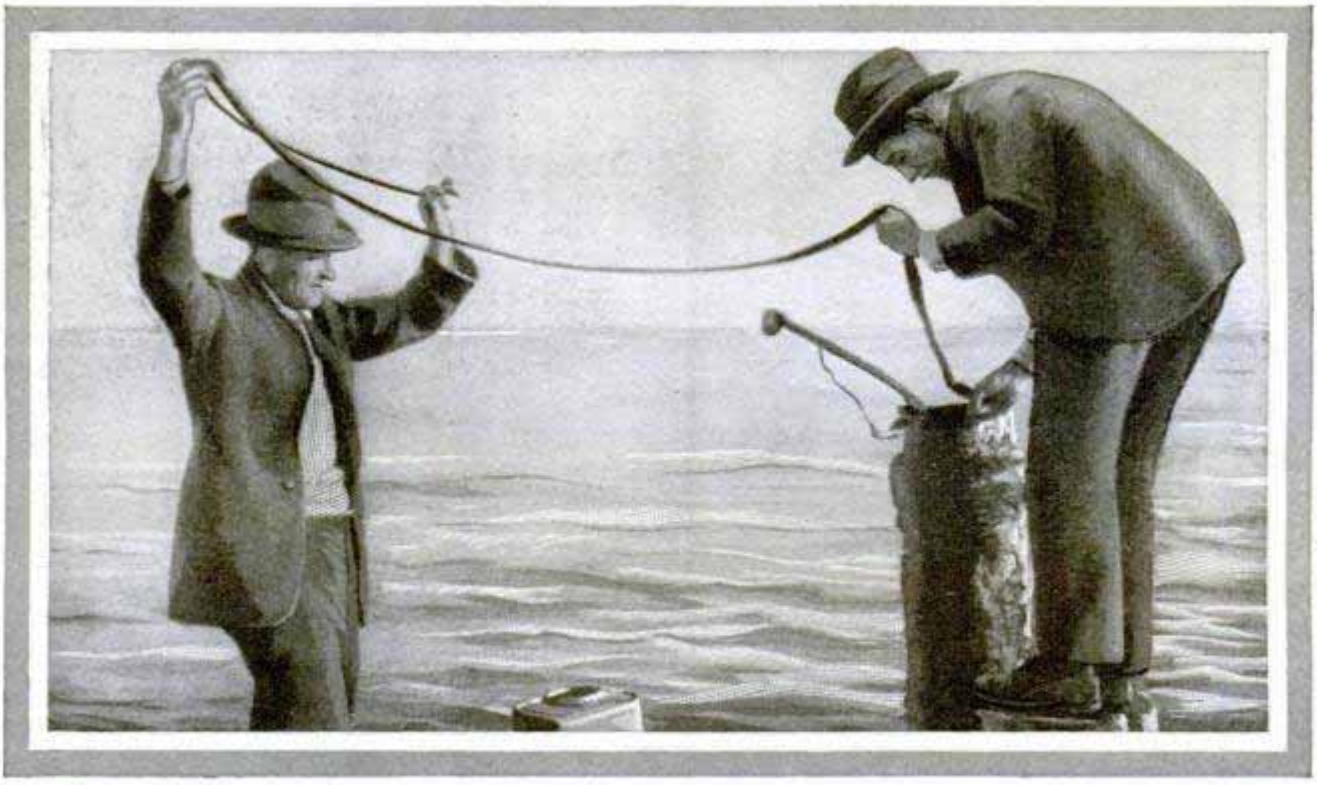
The Utah deposit of bitumen is one of three known beds of this material, two of which are in South America. The two latter are thirty-nine to forty-four per cent pure, requiring extensive operations to clarify them and bringing the cost up to a prohibitive mark. The Salt lake deposit, so far as tapped, is virtually ready for use. The Utah deposit is described by the geological survey as follows:

"The occurrence of this asphaltic substance appears, so far as now known, to be restricted to the shallow portion of Great Salt lake one-fourth to one mile from the present shore line, immediately southeast of the Rozel hills. It there exudes through the unconsolidated material on the bottom of the lake, and bubbles up into the water in the form of hollow spherical or tubular masses, one to two inches in length, and of threads and hairs, six to eighteen inches in length.

"The source of these seepages appears to those who have prospected this ground to be a bed of asphalt, two or three feet thick, which is encountered eighty feet below the present lake bed, and an underlying series of asphaltic beds, three to five feet thick, which alternate with beds of clay to a depth of 140 feet at least."

More recent surveys indicate that the actual area underlaid by this bitumen covers about 3,000 acres, most of which is now under about five to ten feet of water, though at the time of the accidental discovery of the deposits, in 1861, they were largely above high-water mark, Great Salt lake, in the intervening sixty-seven years having risen until now the bituminous bed is almost covered.

From the time of General Conners' visit until about twelve years ago, this remarkable bed of bitumen lay idle. Then an effort was made to find petroleum there, and several test holes were sunk. It was found, however, that the maximum depth



Pulling a Rope of Crude Bitumen from One of the Wells; the Material, Practically Pure, Possesses High Viscosity and Great Ductility, as the Picture Shows

to which oil-well drilling equipment would penetrate the bituminous limestone was eight feet. No oil was found and the project was abandoned. About five years ago, prospectors going over the same terrain found a black, thick liquid, about the consistency of tar on a very cold day, slowly flowing out of the five-inch casings in the holes which had been drilled for oil. Bubbles through this heavy and virtually odorless liquid indicated that subterranean gases were forcing it out. Tests in several laboratories, showed it to be unlike any other asphaltic or petroleum product in the United States.

Within the year, a new method of mining this bitumen is being tried successfully. Holes, six feet in diameter, are dug with the aid of steel caissons dropped through the water. These shafts are sunk to points below the several beds of bitumen. The caisson wall is then tapped, at the level of the bed, and barrels placed below the tap holes. Into these the bitumen flows more rapidly than the gas will raise it to the surface of the ground. It is, of course, impossible to pump the product from the beds. When the barrels are filled, they are lifted out of the caissons and are ready for immediate shipment to the makers of reclaim rubber.

Owing to the high altitude of Great Salt lake, and the low temperature of the water and land during the winter, this bitumen can be produced only in the summer. Steam pipes, however, are being sunk with the caissons, and will be forced into the beds of bitumen in order to soften it and assist the flow into the barrels.

MOVIE "TRICK SHOTS" PRINTED FROM STRAIGHT FILM 219

Enlargements, unusual effects, close-ups, and other special pictures, can be printed directly from a straight film in an apparatus that is expected to be of great aid to commercial and amateur movie producers. It saves the taking of special pictures, enables the proper arrangement and matching of close-ups and other scenes and permits a wide range of so-called "trick" effects. For instance, in a film of African game animals, the subjects in the original were so far from the camera, that they could not easily be distinguished. The printer was used to make enlargements of them from the straight film, the new reel showing the animals as though they were but a few feet from the instrument. In a picture of a swimming meet, a diver was made to appear as though springing from the board, then his feet touched the water, he rose again in the air and landed back on the diving board. All these effects were taken from the original film which simply showed the subject in the usual action. Large films may be reduced for use in home projectors and small ones enlarged for the big machines.

Samples of Motion-Picture Effects That Can Now Be Printed Directly from Straight Film

Designer and builder - Fred Barber.

Container of Tear Gas Releases Fumes When Safe Is Tampered With

GAS GUARD FOR SMALL SAFES TO FOIL BURGLARS

Adapted to installation in small safes, a tear-gas container releases its baffling fumes should anyone attempt to tamper with the combination. A sufficient quantity is provided to assure that an intruder will be driven from the room.

BATTERY-OIL-ELECTRIC ENGINE TO SPEED SWITCHING

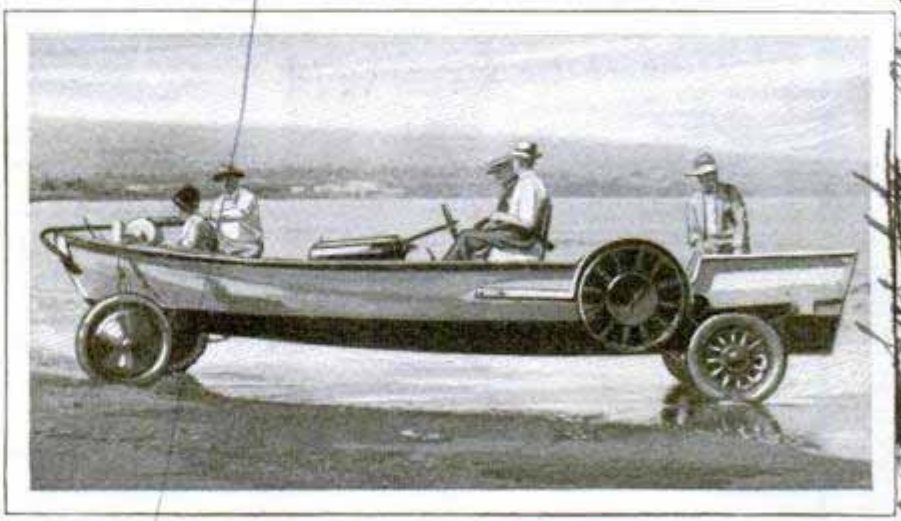
For service in its freight yards, a locomotive recently purchased by the New York Central railroad can be operated in four different ways, either by storage batteries alone, from the batteries and engine generator together, from a third rail or from an overhead collector. This wide choice of operating methods was installed because the engine is for duty in yards that are not wholly electrified as well as in those that are, and also for service through city streets. The storage battery has 218 cells and weighs seventeen tons. It is charged by a 300-horsepower engine, connected directly to a 200-kilowatt generator. The locomotive is over forty-six feet in length and weighs about 128 tons in working order.

RUST IN AIRPLANE CURBED WITH BOILING OIL

To preserve the steel-tube framework of airplanes from deterioration by rust, a special oil treatment is administered after the frame is assembled. Small holes are bored in the parts and boiling linseed oil is injected under heavy pressure. The flow is continued until the oil begins to squirt out of special openings provided for the purpose. About twelve gallons are required for the average modern commercial airplane. After the oil bath, the oil is drained off and the holes sealed with rivets.

SEAGOING AUTO BOAT TO AID GEOGRAPHIC SOCIETY

Scientists of the National Geographic Society have been experimenting with an automobile boat in their research work off the Hawaiian islands. The craft is sixteen feet long and is propelled by light steel paddle wheels, two feet in diameter. These are turned by a small automobile engine. The outfit makes twenty-seven miles on land and two miles in water.



To Aid the National Geographic Society Explorers; Boat on Wheels That Can Travel Land or Water

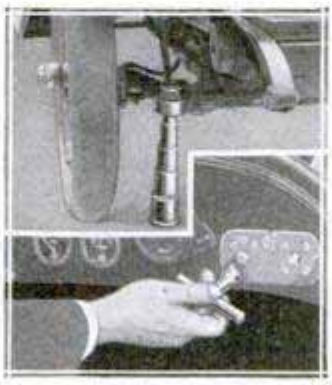
BARLESS ZOO HAS ELECTRICALLY HEATED ROCKS

Model of Barless Zoo and Grounds Being Prepared by Chicago Zoological Society, and Architect Edwin H. Clark with Model of Bear Pens

A community kitchen, completely equipped hospital, ultraviolet-ray glass and many other luxuries, are being provided for the animals and insects that will inhabit Chicago's 196-acre barless zoo. It is the first project of its kind in the world to have been planned and laid out as an entire unit, before actual construction. Provisions are being made for more than 3,600 animal specimens and 200 species of insects. The insect department will feature ant colonies in glass houses, where spectators may study the interesting habits of the inmates, and glass-sided hives for the bees will show how they store their honey and arrange the comb. So far as possible, natural surroundings will be furnished the animals. Instead of being pent up in cages, many of them will have large, open play yards, equipped with pools and rocky retreats. No bars will surround them, as high walls and moats will be so constructed as to prevent escape, yet not interfere with a view of the animals from the outside. The rocks for the pens are being made from cement and granite on a wire base. An aged appearance is obtained by a sandblast treatment. It is planned to introduce resistance wires in some of the rocks to keep them dry and warm in damp weather. This scheme has been followed with great success in a foreign zoo where a number of monkeys are kept in comparative freedom. The grounds have been laid out to provide ample space for parking automobiles near the main exhibits. The animal city has its own light, power, water and sewer system, and part of it will be completed this year.

FOUR-WHEEL AUTO-JACK SYSTEM CONTROLLED FROM DASH

Permanently installed on the axle of each auto wheel, steel hydraulic jacks are controlled from the dash so that the driver need not get out of the car to raise or lower them. According to reports, the system has been tested on practically all kinds of roads and has proved satisfactory. Any one or all the wheels are raised simply by inserting a key wrench in a control panel on the dash.



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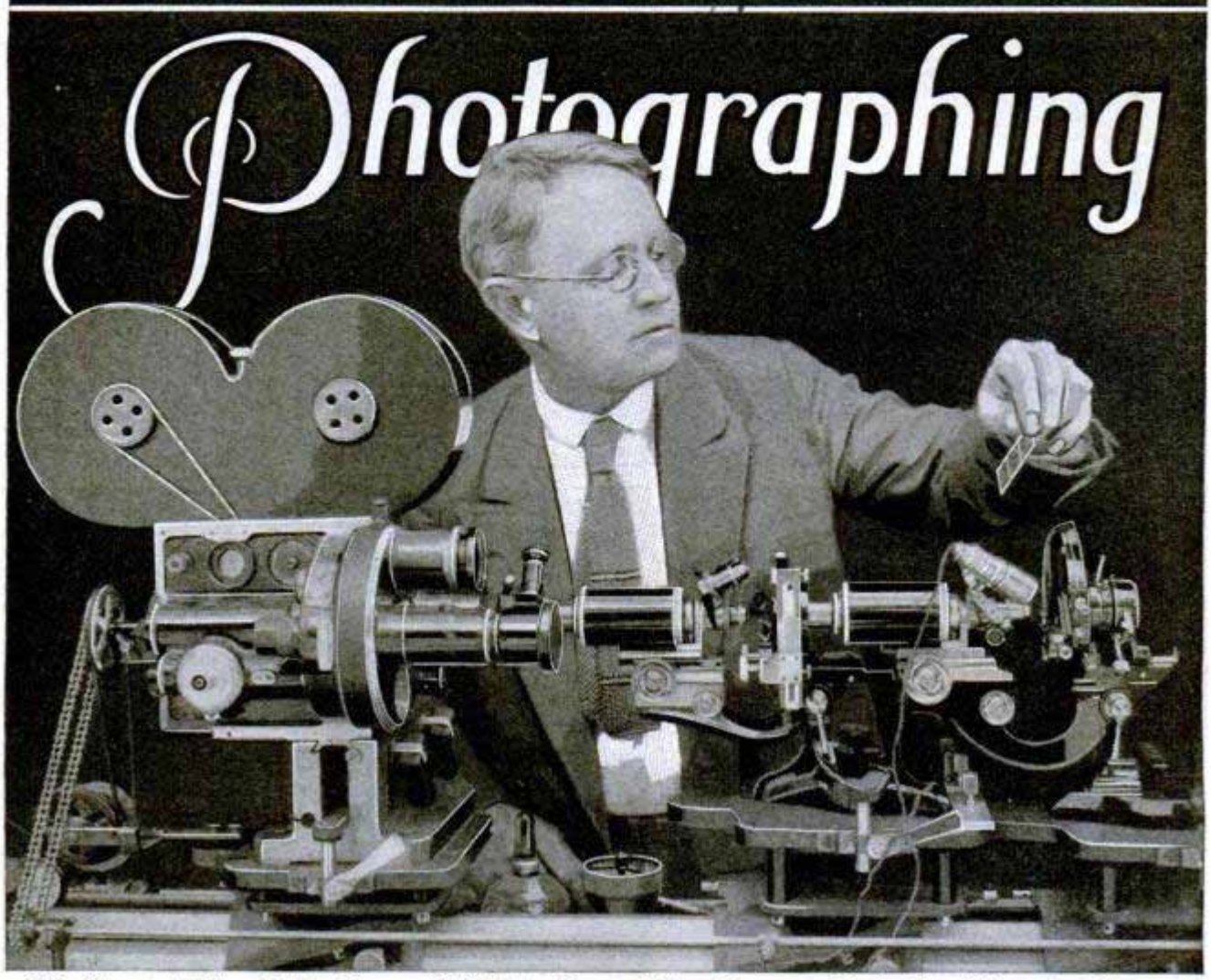
7754 East End Ave.
Chicago

Photographing



This Slowest of Slow-Motion Cameras Will Take One to Thirty Pictures a Week, Magnifying the Object as Much as 100,000 Times; It Is Geared to a Motor

SINCE the beginning of time men have sought the secret of life, without much success until the inventive genius and patient research of Arthur C. Pillsbury, combined with the motion-picture camera, recently revealed the activity of the life unit in flowers, which bears a striking resemblance to that of animals. And now it has become possible for chemists to build the life unit identical in every respect, save one, with nature's own creation. That one exception is the activity which is life itself.

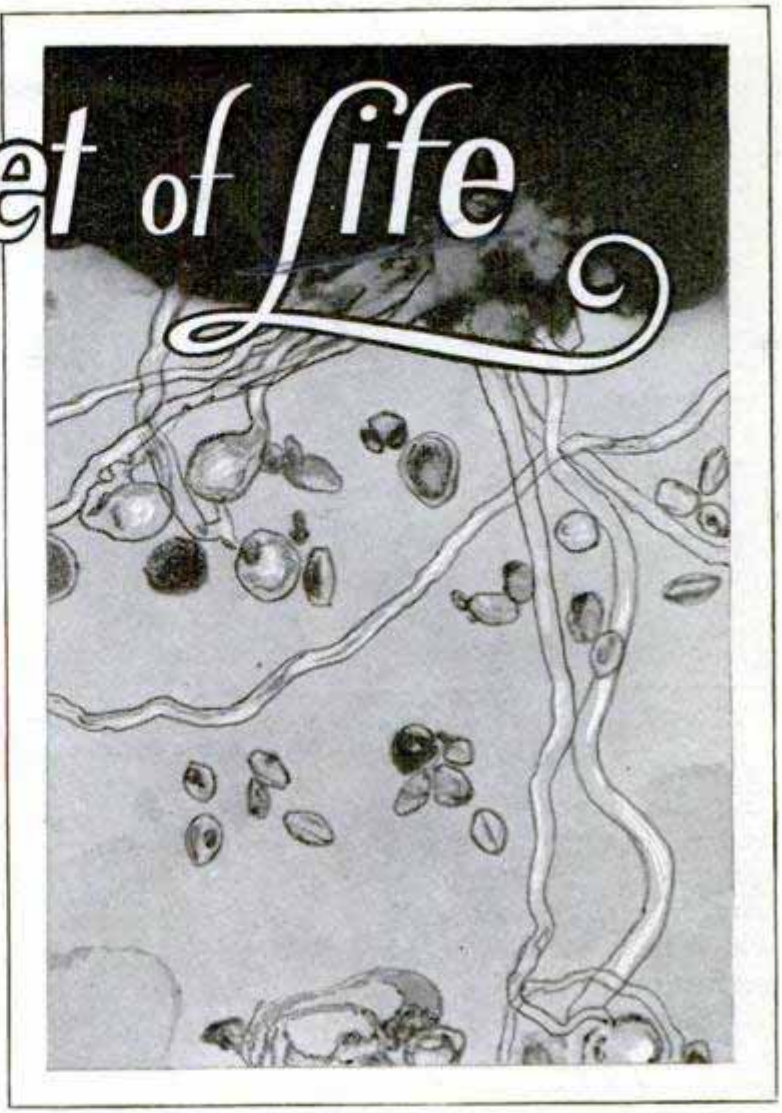
In his laboratory in Yosemite park, where Mr. Pillsbury has been engaged in research work both for the government and on his own initiative, the naturalist has succeeded for the first time in the history of science in obtaining a motion picture of the unit representing the life principle in a grain of flower pollen. And, so far as is now known, there is but one kind of flower which produces pollen that contains a life unit that can be photographed alive. That is the spider lily, a native of the Hawaiian islands.

It had been Mr. Pillsbury's ambition, for years, to photograph alive that smallest spark of life, the smallest known living thing. With ingenious mechanical contrivances of his own invention, he photographed, or attempted to photograph, the life unit of every plant that came under his observation. It could not be done because the life unit within the tiny grain of pollen—invisible to the eye—invariably was the same color as the pollen itself.

But while on a trip to the Hawaiian islands, Mr. Pillsbury began the study of the spider lily. Within its pollen he discovered a red life unit, and he knew that at last he was to see the thing that put life into plants and trees at work.

Carefully he gathered the pollen, which can be seen only when in clusters, and painstakingly separated the microscopic grains or cells. By previous experiments

the Secret of Life



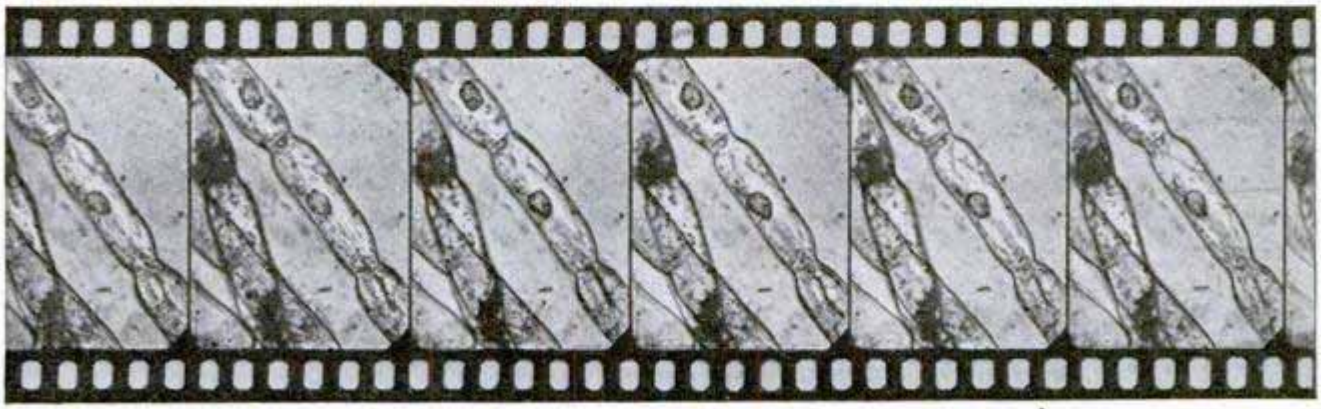
Swirling Particles within a Grain, Photographed to Show Pollen of One Plant Combining with Another Flower

he had discovered that the pollen remained as though it were asleep unless it was saturated with a proper solution containing sugar. Into a drop of the sugared solution, on a little glass slide, Mr. Pillsbury placed the invisible grain of pollen and then set his remarkable cameras for the great experiment.

Within a few hours the grain began to swell. It reached the point where an outer skin burst along the egg-shaped surface. The clockwork camera, photographing the image of the cell rather than the cell itself, revealed that within another hour the second, or inner, skin began to emerge from the pollen grain and convert itself into a squirming vein which moved frantically up and down in the drop of water and through which, very shortly afterward, crept the tiny spot which was the life unit, seeking the stigma of another flower with which to join and so produce a new flower in the plant world.

It took a camera and equipment that could magnify 100,000 times to get that picture. An average man, shown on the screen magnified to that size, would be about 133 miles tall. That gives some idea of the power and fineness of photographic equipment necessary to do such work among the unseen mysteries of life.

The equipment was not available when Mr. Pillsbury began his experiments. Indeed the necessity for such cameras and lenses had not been felt until the naturalist himself created the need. First he had to devise a clockwork mechanism control-



A Six-Foot Man Would Be 133 Miles Tall If Magnified as Much as the Invisible Grain of Pollen; the Life Unit Is the Dark Spot in the Vein, Here Photographed Alive for the First Time

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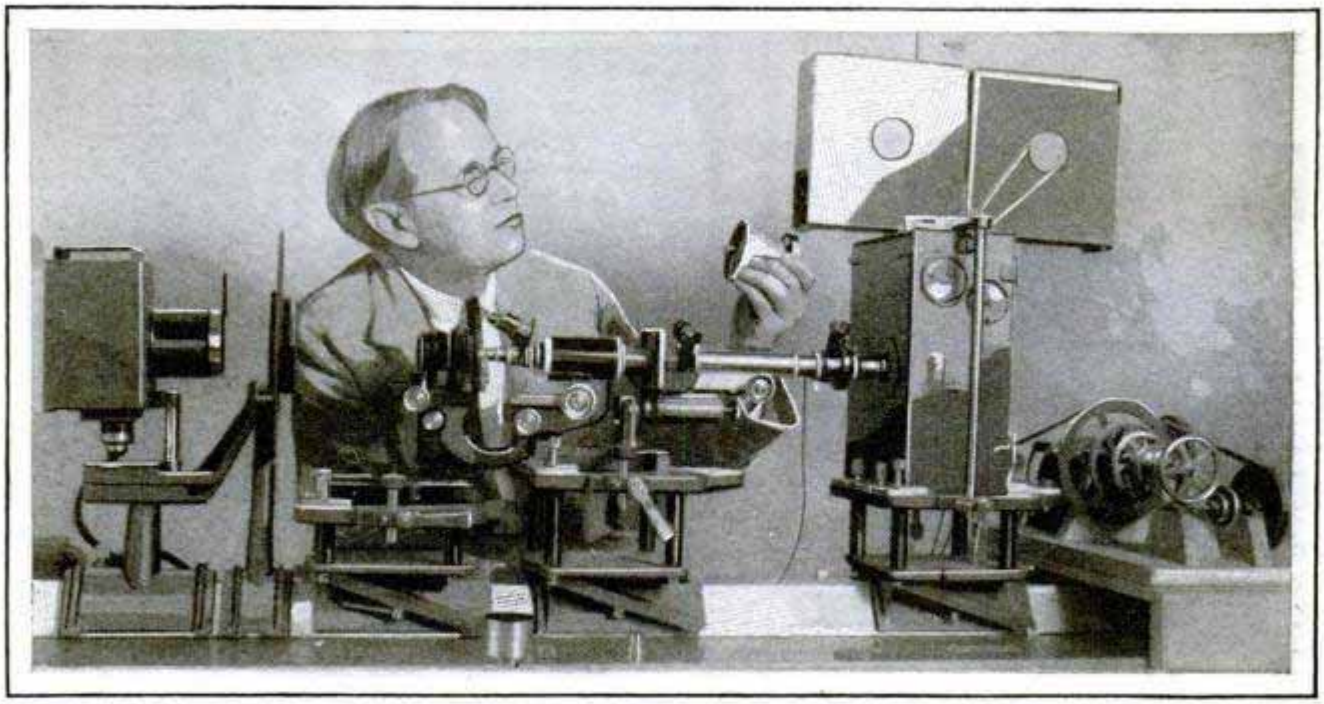


With His Motor-Driven Camera the Botanist Can Compress into a Minute of Movies the Growth and Action of Flowers over a Period of a Week or More

ling the exposures of the camera film, and then a device that would crank the camera at the proper rate of speed to compress within a minute the growth which may have taken a week. Then the vexing problem of obtaining lighting apparatus of a proper kind had to be solved.

To regulate the speed of the camera he employed a motor which drives an elaborate system of selective gears and pulleys by means of which he can take as many as thirty snapshots a second or only one in a whole week.

Having got that far, Mr. Pillsbury ran into the difficult situation of not getting good pictures of some of his subjects because light was shining through them rather than on them. There was no adequate dark-field illuminator made, so the naturalist again became a mechanical engineer and retired to the laboratories of Leland Stanford University to design and produce his own.

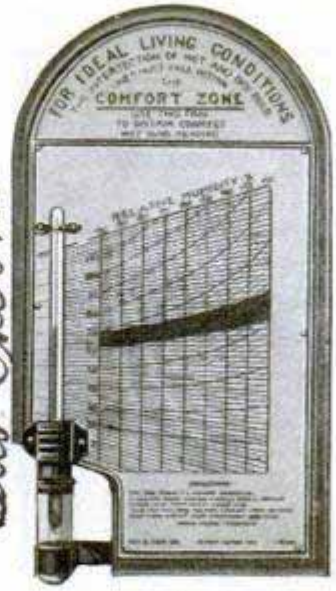
Out of a piece of brass with a silvered interior he contrived a small device to attach to his camera that would cut off all direct light rays but so reflect the rays as to make them shine with equal and proper brilliance on all sides of the object to be photographed. But all of his subjects are living and some cannot be seen under ordinary light. To stain them would kill them. So Mr. Pillsbury got around that by devising a system of differential light filters, in varying colors or wavelengths, each fitted to a particular subject.

And so it has become possible to reveal movements and secrets of life that heretofore have been one of the profoundest mysteries of existence.

WET AND DRY THERMOMETER COMBINED IN ONE

266

Both wet and dry-bulb thermometer readings may be taken from a single tube in a combination gauge that quickly indicates the relative humidity of the air. The dry-bulb reading is taken in the usual way. To find the relative humidity, the bulb is moistened in a very simple manner by means of an attachment to the instrument and fanned with a small paddle, also included with the thermometer, until the mercury drops to the lowest point it will move. This gives the wet-bulb reading. At the intersection of the lines marking the wet and dry temperatures, the relative hu-



Dual Therm.

Same size 82.75

E. Vernon Hill Co.,
131 N. Clark Chicago

midity is obtained. This is indicated by percentage figures on one margin of the card. For the further service of the user, a section of the gauge is colored to show a "comfort zone" within which lie the most satisfactory temperature and humidity conditions. Using the thermometer takes but a few seconds.

DYNAMITE STORED IN BIG TREE IS WELL PROTECTED

The twisted, hollow trunk of a huge "cream of tartar" tree, near a mine in South Africa, has been converted into a safe storage house for hundreds of pounds of dynamite, needed for blasting. The manager of the mine discovered the tree while looking for a site on which to construct a magazine for explosives. A wooden door was fitted into the natural opening, shelves were provided fastened with brass nails to reduce the likelihood of sparks, and the tree was then insulated with a lightning rod. Before entering the storage house, workers stop at a "changing room," where they put on special slippers, free from iron.

BOAT RUN BY HAND LEVERS INSTEAD OF OARS

Working hand levers back and forth turns the propeller and so runs the boat, in an apparatus that can be fitted to almost any small craft. Less skill is required to operate this system than oars, and the exercise also develops the muscles.

Boat Driven by Propeller Which Is Turned by Pumping Hand Levers, Much Like a Railroad Handcar

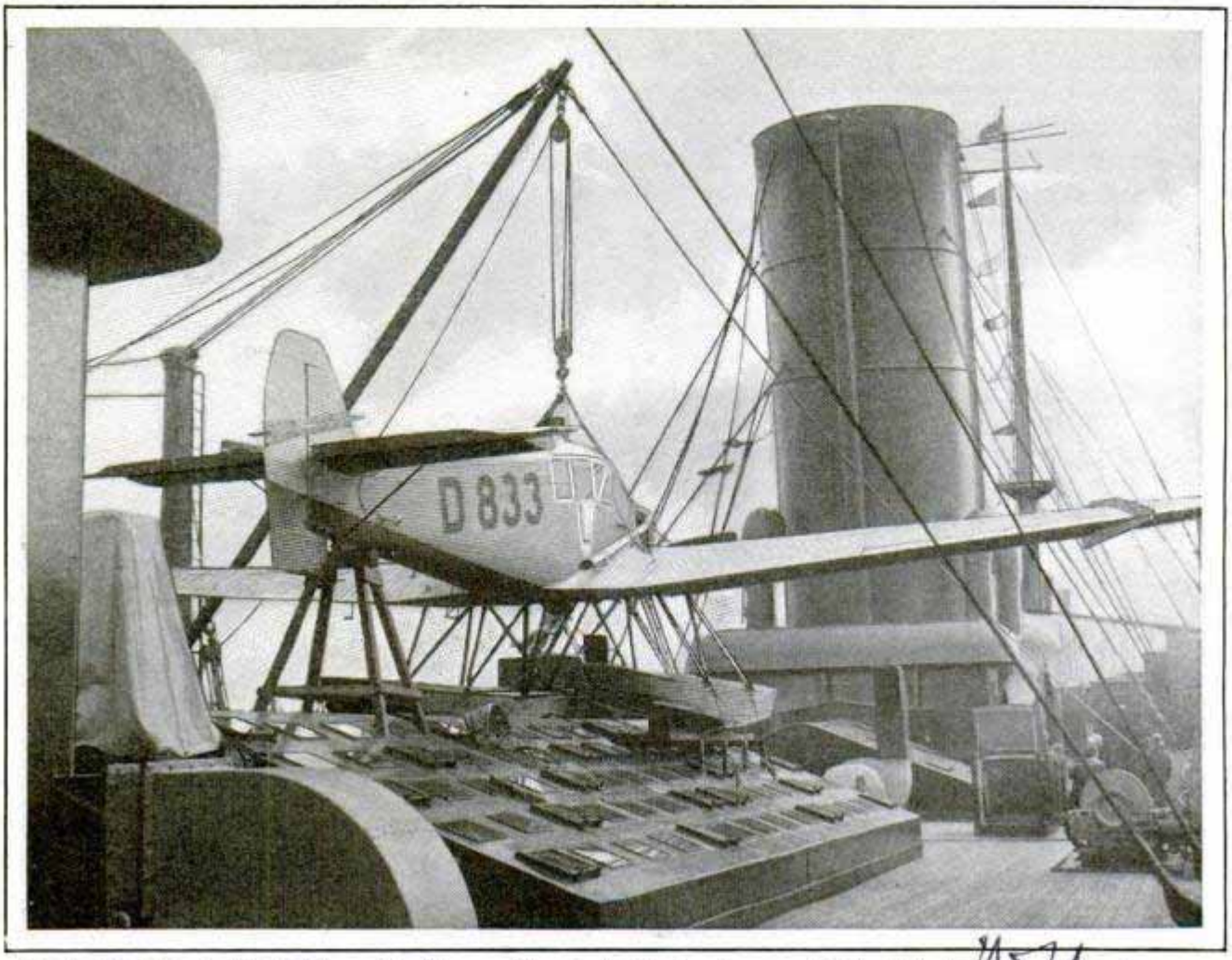
Amplifying and Improving the Tone of the Violin through Metal-Horn Attachment

COMBINATION VIOLIN AND HORN PRODUCES FULL TONE

Fitted with a horn attachment, a violin is said to have a much fuller and rounder tone than the usual instrument. The soft quality the wood produces is said not to be destroyed, though the horn is of metal.

SUPER-SUBMARINE TO CRUISE EIGHT THOUSAND MILES

Equipped with ten torpedo tubes and possessing a carrying capacity of thirty-two torpedoes, the huge submarine "Redoutable," recently launched at Cherbourg, France, will have a cruising radius of 8,000 miles. Its tanks will hold sufficient fuel to enable it to remain from its base for two months. Besides the torpedoes, it is armed with a five-inch deck gun, a two-inch anti-aircraft piece and a half dozen machine guns. Its engines develop 6,000 horsepower and it has a submerged speed of twenty-three miles an hour.



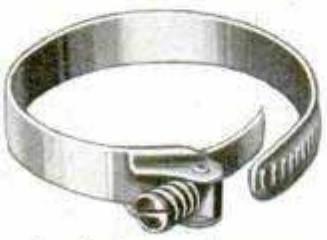
Ready for Trips to Ports Where the Steamer Cannot Dock; Seaplane on Deck of the "Columbus," to Accommodate Passengers Who Wish to Call at Remote Places

SEAPLANE CARRIED ON LINER FOR PLEASURE TRIPS

Ports where the steamer "Columbus" is unable to dock on its West Indian cruises, may be reached in a seaplane which is carried on the deck for the benefit of passengers desiring to take side trips through the air. It is quickly lowered and can land near the ship for easy reloading.

TIMESAVING CLAMP FOR HOSE ALSO USED ON RADIO

Adjustable to many sizes of hose, a quickly attached clamp, now on the market, exerts equal pressure around the entire circumference. Its chief feature is a special screw which engages with the end of the band slipped under it in such a way that the clamp can be securely tightened with a few turns of a screwdriver. The unit is well adapted to use in radio construction as a ground clamp and for various other electrical purposes.



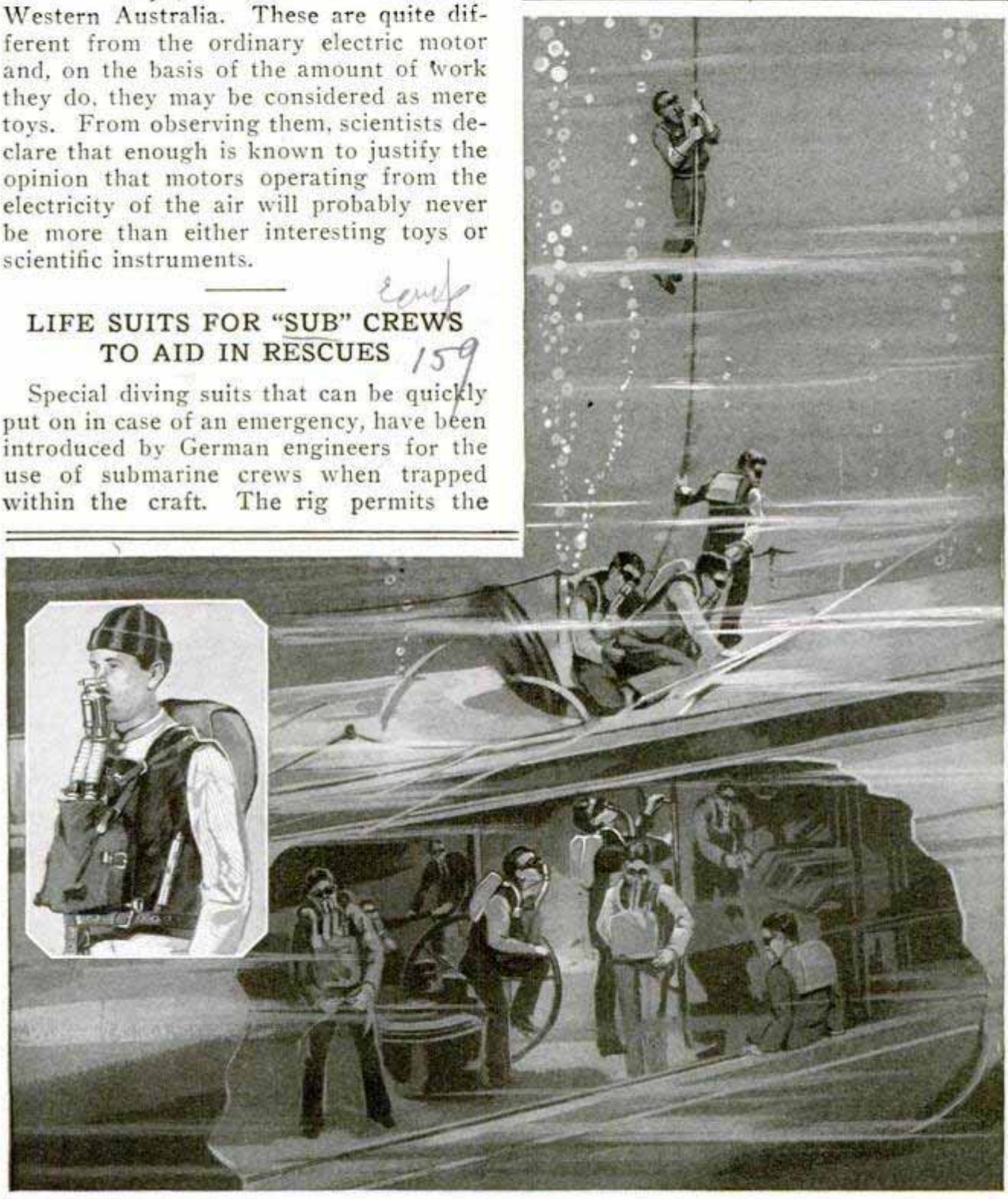
AIR'S ELECTRICITY TOO FEEBLE FOR PRACTICAL POWER

There is electricity in the air and hundreds of inventors, lured by the idea of something for nothing, have attempted to make use of it. But if a collecting antenna for the atmospheric electricity covered the whole state of Wisconsin, only about one ampere of current would flow at the dangerously high potential of 20,000 volts, and, in terms of ordinary electric power, this output of power would be worth only about $1 an hour, researches by the department of terrestrial magnetism of the Carnegie Institution, at Washington, have shown. Such an antenna, the height of that of the Arlington, Va., government radio station but covering the entire earth, would collect only enough elec-

tricity to cause a steady current of not more than 1,000 amperes to flow from the antenna to the earth. Some of the most efficient atmospheric-electricity motors thus far invented are scientific instruments called "electrometers." They have been in constant operation for several years at the observatories of the Carnegie Institution at Washington, D. C., near Huancayo, Peru, and near Watheroo, Western Australia. These are quite different from the ordinary electric motor and, on the basis of the amount of work they do, they may be considered as mere toys. From observing them, scientists declare that enough is known to justify the opinion that motors operating from the electricity of the air will probably never be more than either interesting toys or scientific instruments.

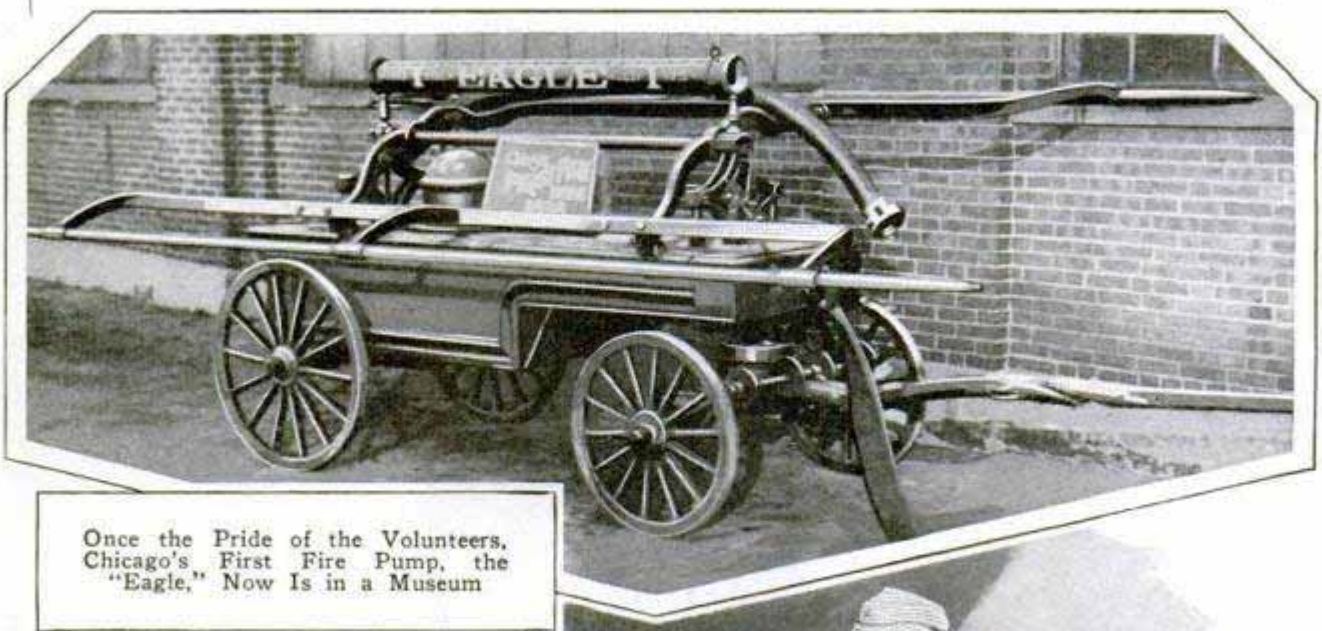
LIFE SUITS FOR "SUB" CREWS TO AID IN RESCUES

Special diving suits that can be quickly put on in case of an emergency, have been introduced by German engineers for the use of submarine crews when trapped within the craft. The rig permits the wearer to rise to the surface where he can float for an indefinite period, protected from the water by his apparel. In addition to these suits, a telephone buoy is released from the submarine, rises to the top by compressed air, and is available for connection with ships above so that direct contact can be had with men still imprisoned below.



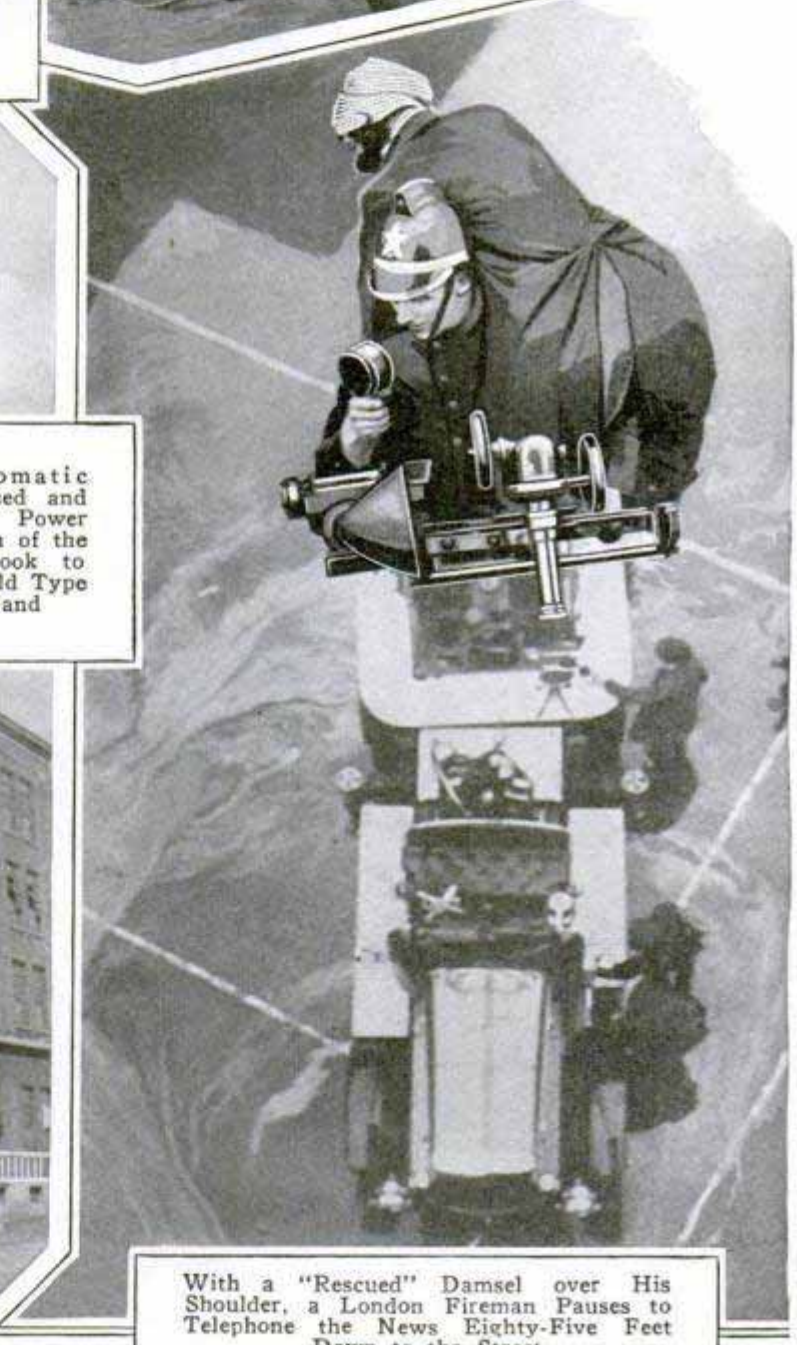
Close View of Diving Mask for Submarine Men, and Drawing to Show How the Crew Might Escape from Sunken Craft after Adjusting Their Special Suits

ROMANCE OF GASOLINE AND ELECTRICITY TAKES



Once the Pride of the Volunteers, Chicago's First Fire Pump, the "Eagle," Now Is in a Museum

New Automatic Ladder Raised and Lowered by Power in a Fraction of the Time It Took to Crank the Old Type Up by Hand



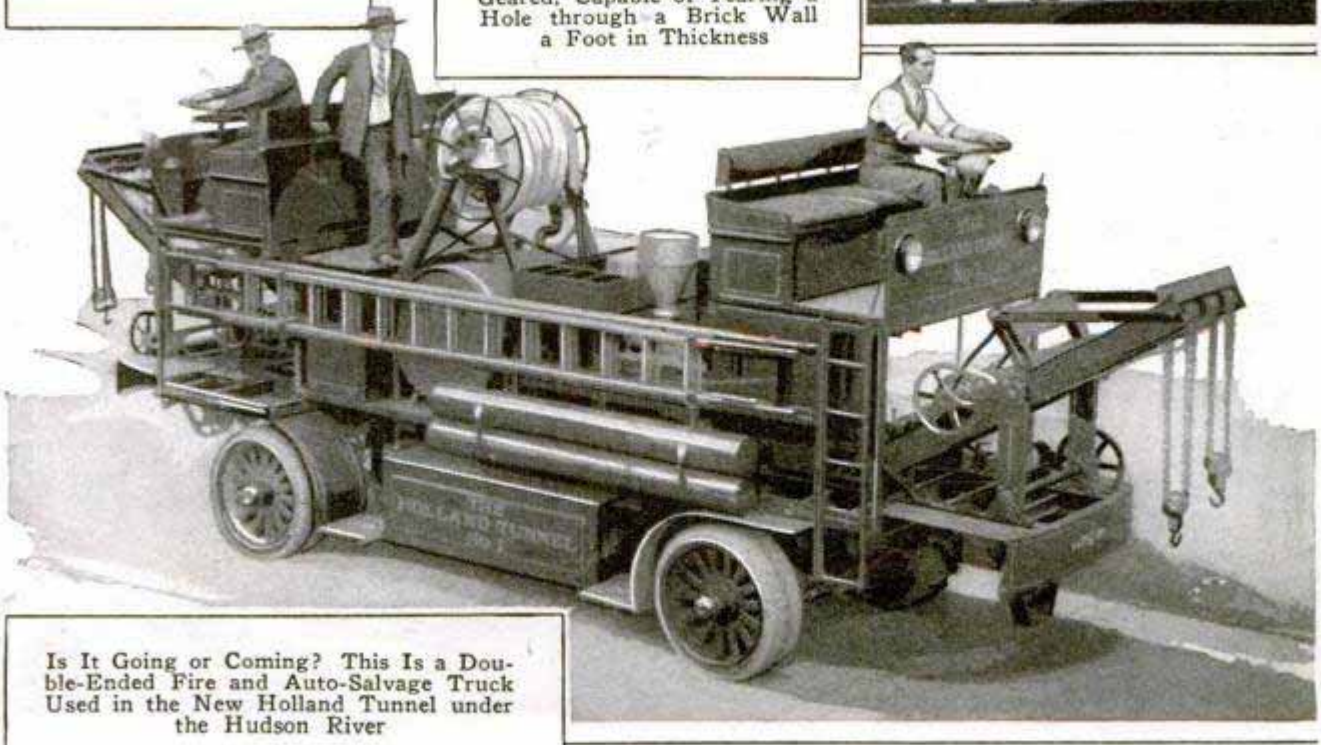
With a "Rescued" Damsel over His Shoulder, a London Fireman Pauses to Telephone the News Eighty-Five Feet Down to the Street

PLACE OF DEPARTED GLORIES OF THE FIRE HORSE

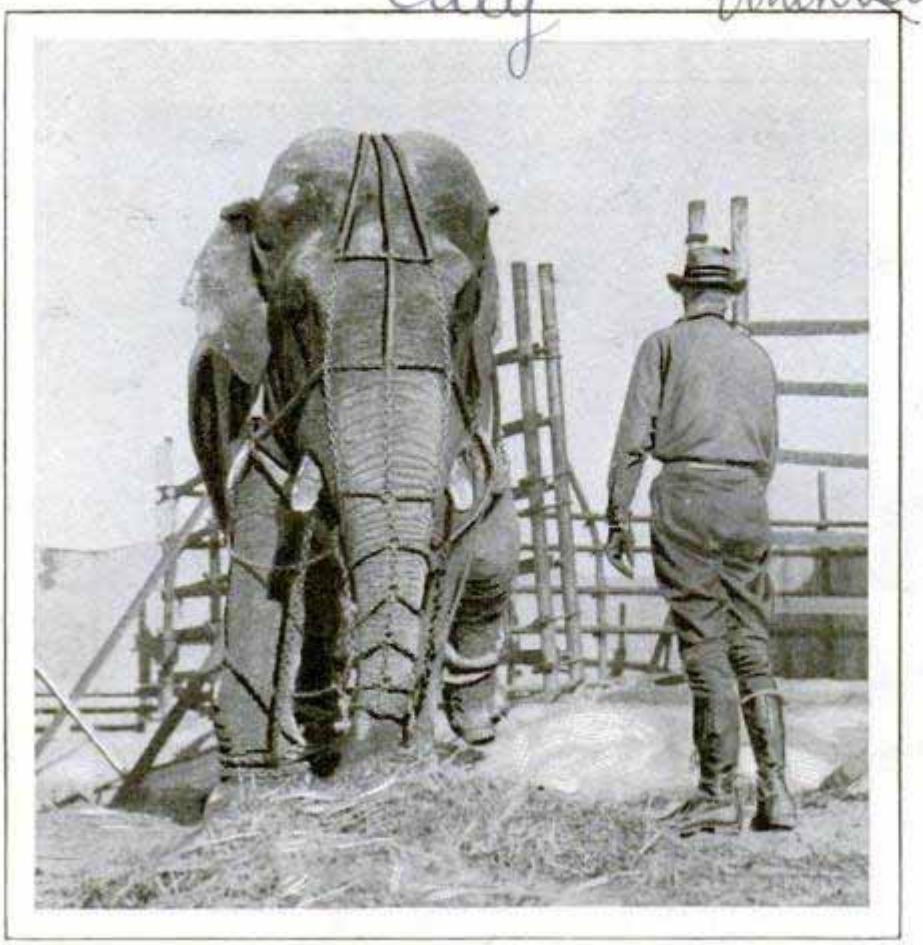
First Gasoline Replaced the Horses, and Then It Took the Place of the Steam Engine; So, Prancing Steeds and Showers of Sparks Have Departed Forever from the Glories of the Fire Run

This Combination Pump, Ladder, Chemical Truck Takes the Place of Three Horse Outfits

Modern Nozzle, Mounted and Geared, Capable of Tearing a Hole through a Brick Wall a Foot in Thickness



Is It Going or Coming? This Is a Double-Ended Fire and Auto-Salvage Truck Used in the New Holland Tunnel under the Hudson River



"Tusko" in Heavy Bonds before Being Moved to Winter Quarters; the Big Elephant Behaved Perfectly during the Trip

ELEPHANT MOVED IN CHAINS TO PREVENT ESCAPE

Keepers took no chances recently when moving "Tusko," a ten-ton circus elephant, from its steel pen to winter quarters. The animal was shackled with 450 feet of strong chains, leaving it just enough freedom to walk. Its trunk was also bound in chain armor and three other elephants were used as an escort to curb any show of temper. "Tusko" gave no trouble.

RADIO WAVES PENETRATE ROCK FIVE HUNDRED FEET

That radio waves will penetrate rock strata to a depth of 500 feet and more, was shown by tests conducted under the supervision of the bureau of mines in Colorado. In one demonstration, strong reception was obtained at a depth of 220 feet from a Denver station, fifty miles away, and in another, "mushy" results were received at a depth of 550 feet. This reception, however, was about as good as could be had above ground at the time, for conditions in general were unfavorable. The test was made 200 feet from the main shaft in a cross-cut. A pipe came down the shaft and followed the cut up to eighty feet from the observation point.

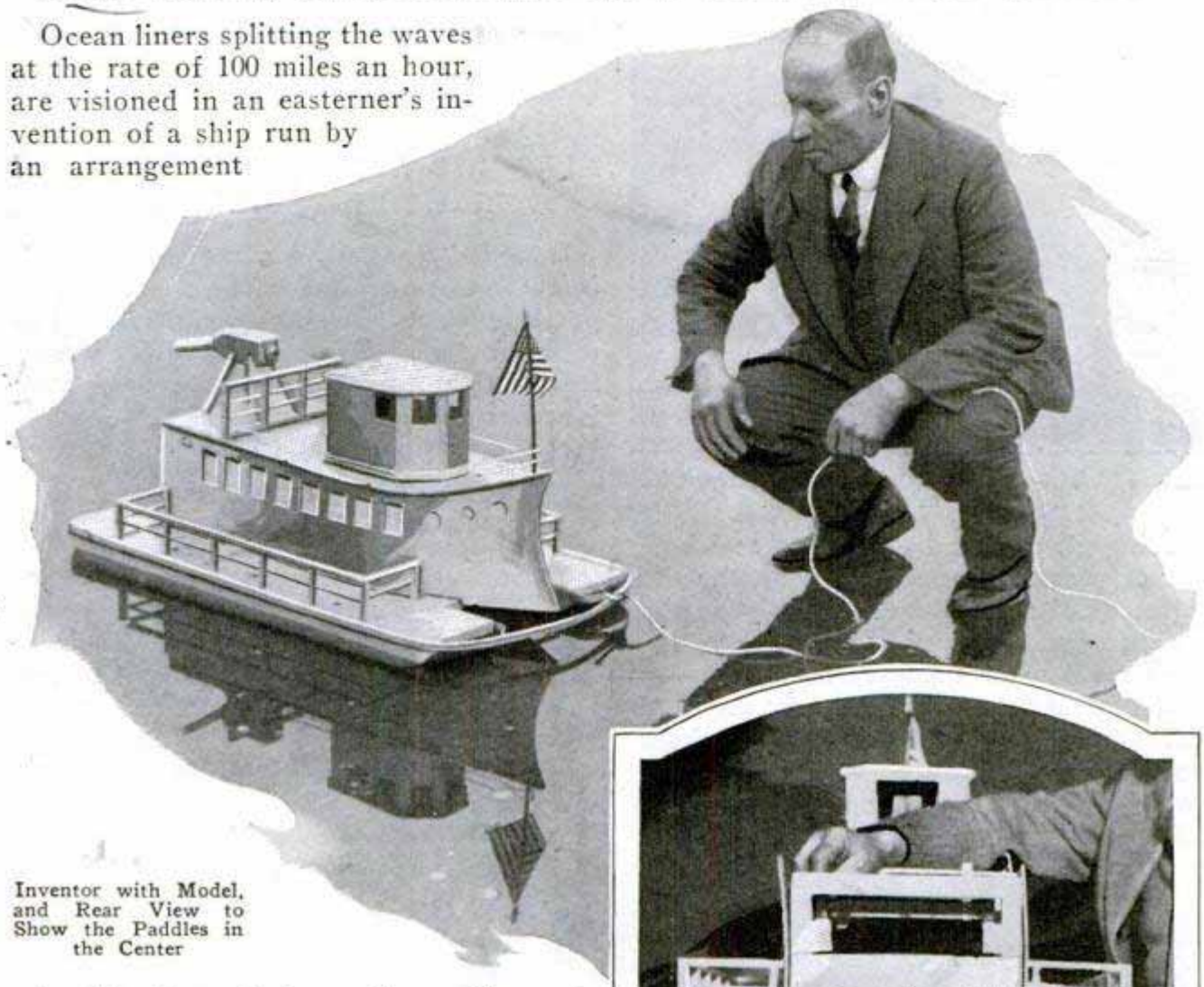
SOUND-MEASURING GAUGE AIDS TUNERS

Sounds are now accurately measured by a gauge that shows the number of vibrations and their wavelength, for the aid of piano and other instrument tuners, teachers and workers in the field of sound generally. It consists essentially of a brass tube with a hollow piston rod inside that terminates in an ear piece. An air chamber is thus formed, and sounds entering it cause a certain response which is detected on the ear unit. By a simple mathematical formula, the number of vibrations in that sound can be determined. The gauge may be set to respond to different tones, as when tuning a piano, and will measure the buzz of a bee, the chirp of a bird or the sound of the human voice.

Tuning a Piano with Aid of Gauge, Seen on Shelf above the Keys; It Accurately Measures Sound

SHIP WITH SPRING PADDLES TO DEVELOP SPEED

Ocean liners splitting the waves at the rate of 100 miles an hour, are visioned in an easterner's invention of a ship run by an arrangement



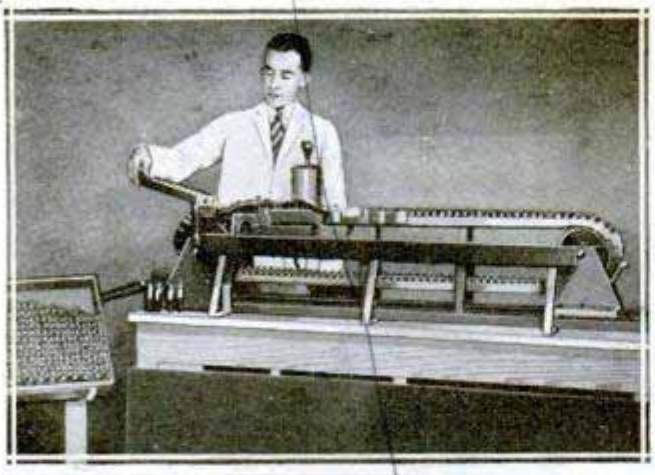
Inventor with Model, and Rear View to Show the Paddles in the Center

of paddles instead of propellers. The paddles are said to offer practically no resistance to the water, overcoming the "drag" that retards progress in the ordinary propeller. There is a system of springs to help move the paddles and, as they return to position for a fresh stroke, they fold back, so that they are moved with but little loss of forward effort. An oil or gasoline-burning engine furnishes the power. Besides this feature, the craft is to be mounted on two buoys on either side of the hull to reduce the tendency to roll in high seas. A model of the ship, on which a patent has been obtained, is said to have performed satisfactorily.

RADIO "EAR AND BRAIN" TO AID SECRET BROADCASTING

Radio conversations without the fear of eavesdropping are promised in an electrical "ear and brain" apparatus recently demonstrated. A distorted record of human speech was made on a phonograph disk by transforming high-frequency tones into low frequencies. The result was an unintelligible gibberish. While these sounds were issuing from the record, an electrical "ear" was held in front of the horn. It was like the pick-up transmitters used in broadcasting studios, and carried current into another electrical unit, the "brain," where the tones were restored to their proper frequencies. The original speech, easily understood, was heard from a number of loud speakers to which the brain was connected. When the ear was withdrawn, the loud speakers stopped and the garbled language was heard as before.

SEALING BOTTLES WITH GLUE SAVES U. S. THOUSANDS



Machine Which Seals Bottles with Ordinary Glue Instead of the Usual Wax

Using glue instead of wax to seal bottles of preparations sent out by the department of agriculture, a chemist in the bureau of animal husbandry has effected great savings for the government, as one man can do work that formerly required ten. Another of his inventions is a rubber stopper as a substitute for those of cork. To extract liquid from the bottles, the rubber is pierced with a needle. The hole seals up automatically after the needed quantity has been withdrawn, thus preventing the remainder of the liquid in the bottle from spoiling.

ELECTRIC WASHER IS PORTABLE, WEIGHS FIFTEEN POUNDS

Intended especially for fragile garments, infants' clothing and similar articles, a portable electric washer weighs but fifteen pounds. It is operated with current from a lighting socket, has few parts and is said to do thorough work.

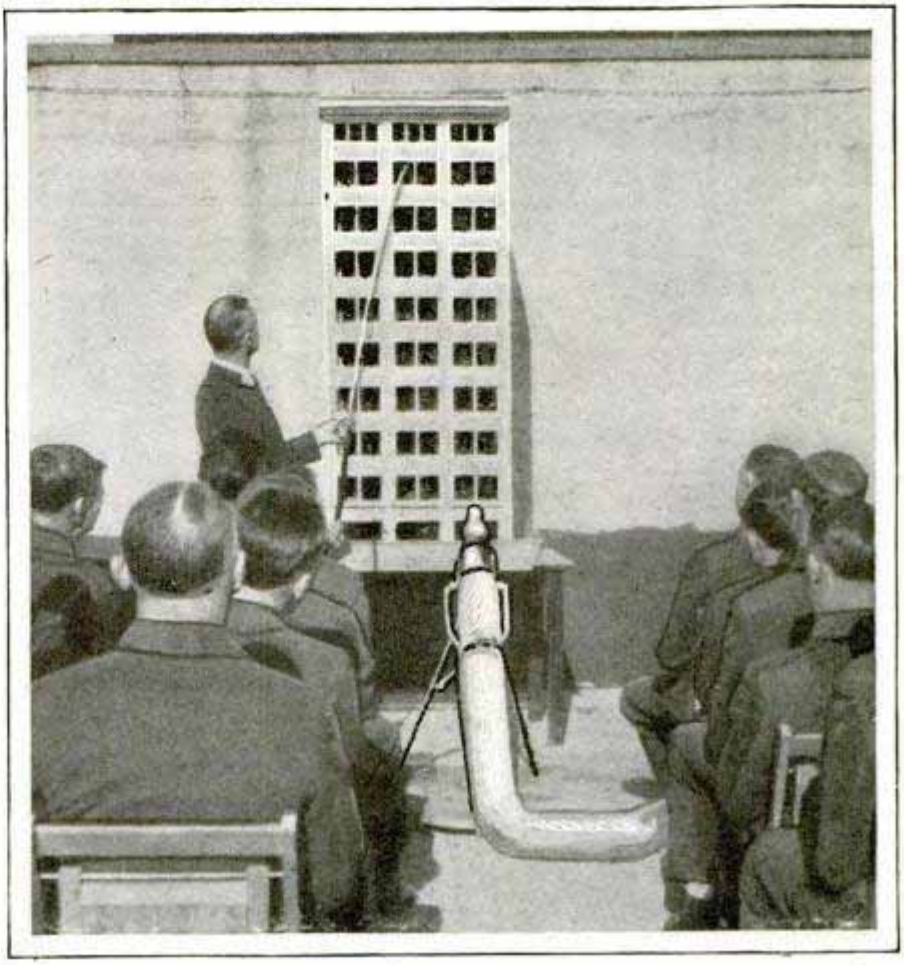
DANCES ON ROULETTE FLOOR WIN PRIZES FOR COUPLES

Patrons of a New York grill have a chance to win a prize at the end of the dances, for the floor is marked off in a spiderweb pattern with numbers corresponding to those on a wheel of fortune which is spun and stops with the music. The couple standing on the number winning on the wheel is awarded a prize.

Unusual Method of Distributing Prizes to Dancers, the Winner Standing on the Number Indicated by a Wheel Which Spins as Long as the Music Is Being Played

FIREMEN'S SCHOOL HELPS REDUCE LOSSES

There are many tricks to fighting a fire and most of the effective ones are taught student firemen in Los Angeles at an outdoor "college" that makes special use of models to illustrate the lessons. For instance, should a blaze break out in the upper floors of a skyscraper, where is the best place to direct the streams of water? The instructor, employing a small hose, shows that the flow will do the most good if it is thrown against the ceiling of the floor on which the fire is burning. As it strikes, it spatters and spreads farther than it would if simply shot in through the windows in a hit-or-miss fashion. Besides demonstrating the best practices in combating fires, the school teaches the use of the latest forms of apparatus and many other essential points.



Skyscraper Model Used in a Firemen's School to Demonstrate the Best Methods of Fighting Blazes

STONE "SPONGE" FOR GOLDFISH SAVES CHANGING WATER

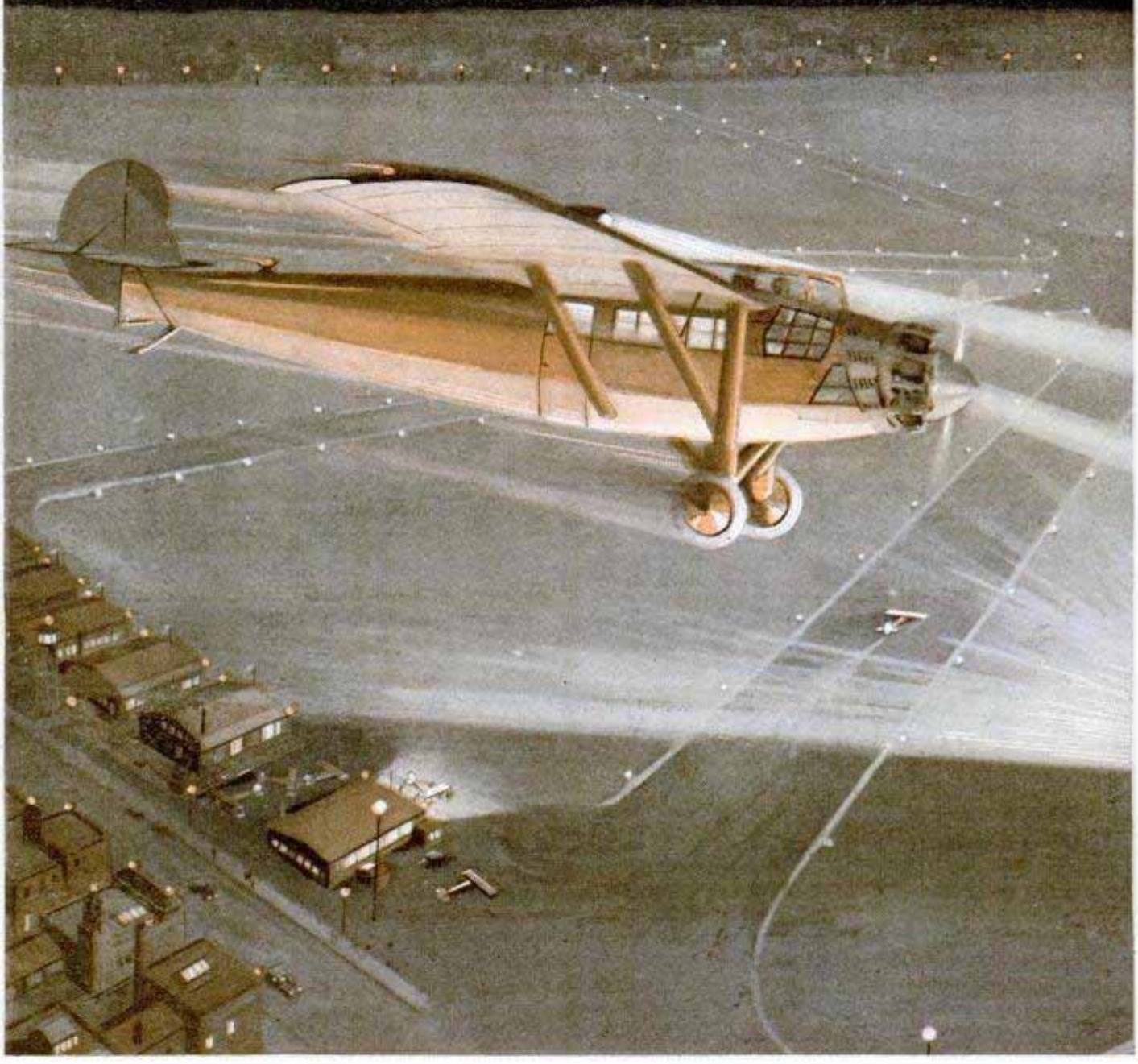
Water in the goldfish bowl will remain fresh and healthful for three months or so by placing a chunk of special chemical rock at the bottom. About half a pound to a gallon of water, is the proper proportion. The rock absorbs various impurities and produces the effect of an attractive grotto in the bowl.

MEMO CLOCK TURNS ON RADIO, ELECTRIC STOVE OR IRON

Almost as efficient as a human companion, an electric clock, devised by an eastern inventor, is equipped so that it can be used to turn the radio set on or off any time during the twenty-four hours, switch the electric stove, iron or other appliance into operation or shut off the current and also remind the owner of important engagements at any hour. This is accomplished by means of a memorandum attachment at the side and an alarm bell which rings for a few seconds at any time set. A small card, noting the appointment, appears on the front of a small cylinder. As many as twenty-four of these reminders can be put on at one time and set so that they will appear automatically in proper order whenever desired. The alarm bell can be used with or without the time-switch arrangement that operates the electric appliances, or with the memorandum attachment.

¶In proportion to the size of their bodies, insects have larger wings than birds.

America

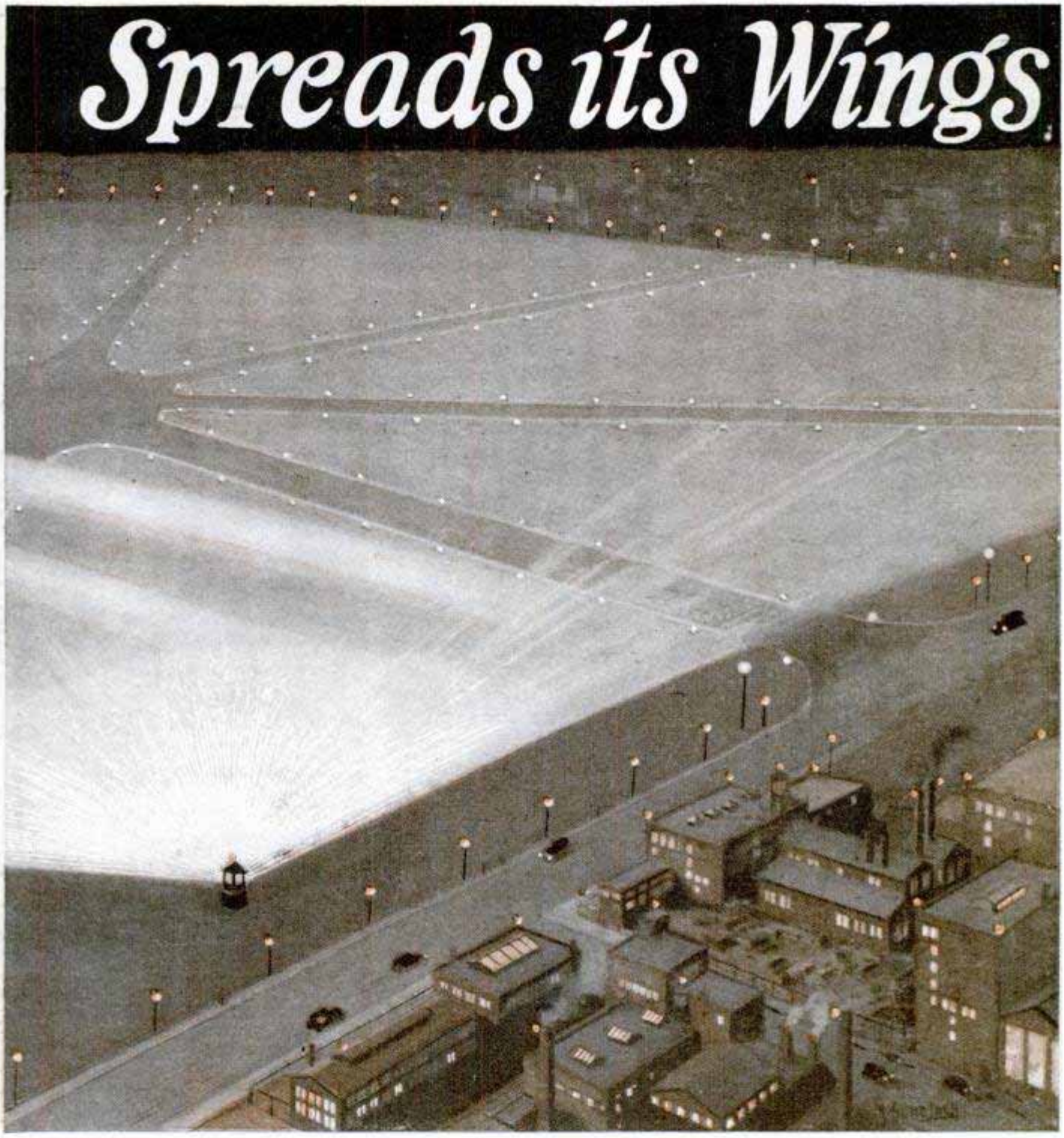


By J. EARLE

EVERY day and every night commercial airplanes, operating on regular routes, carrying mail, and in some cases express and passengers, too, are flying far enough over the United States to equal a trip around the world.

On Jan. 26, 1928, the post office department had 8,711 miles of contract air-mail routes in operation and another 3,362 miles, to be started as quickly as planes could be delivered and landing fields prepared. That is a total of 12,073 miles, and the trip of a single plane each way every day would total more than 24,000 miles of flying. But some of the routes are covered twice daily, and the New York-Chicago airway, a distance of 712 miles, is flown both day and night, and frequently, to use a railroad term, the mail travels in "sections," for more than one

Spreads its Wings



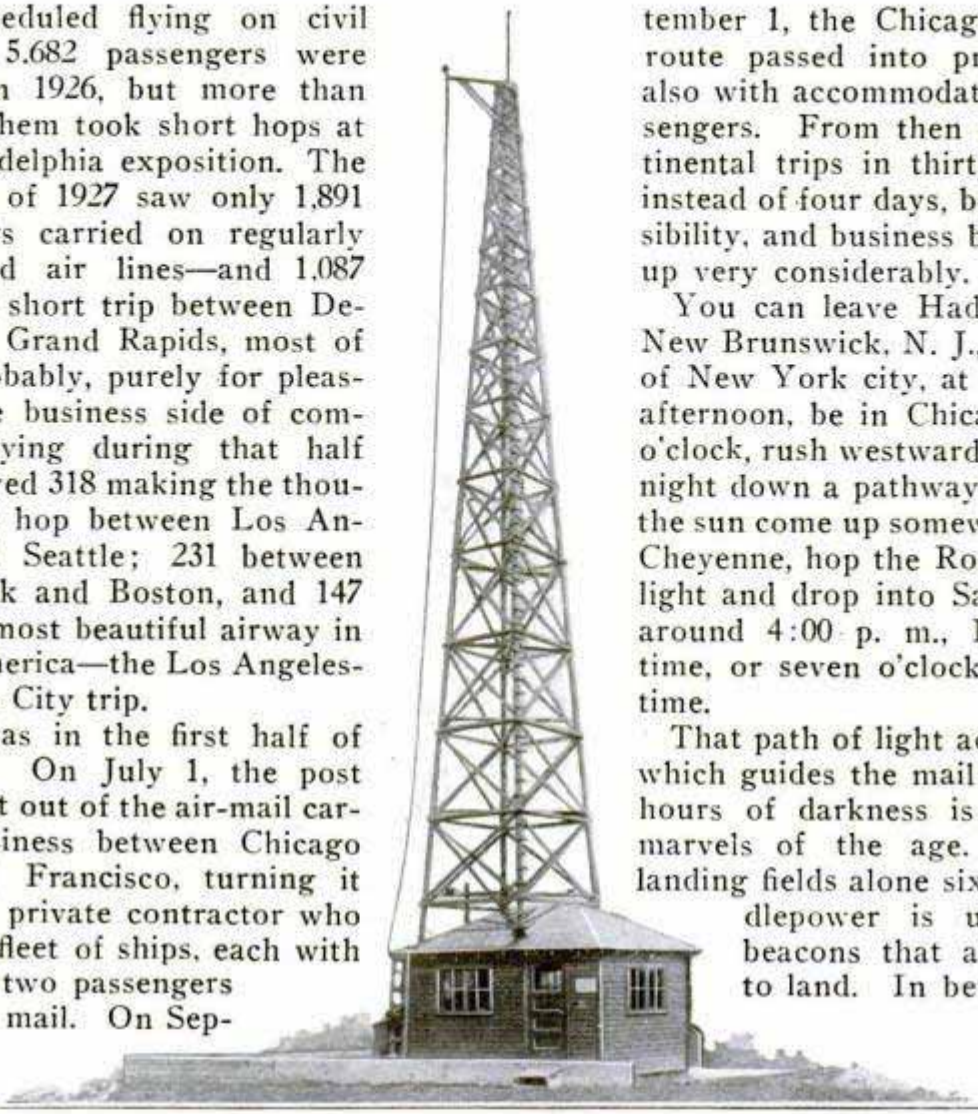
MILLER

plane is necessary to transport the load. Other countries in some cases have longer air routes—France operating one of 4,000 miles from Paris to Senegal—but the United States leads the world in both total mileage and volume of mail carried. A single one of the thirty-four contract mail routes last year carried more mail than all the air lines of Germany combined.

With the world's greatest regularly scheduled air traffic, the United States, however, has been slow to turn to the air for passenger transportation. Within the last year, or roughly since Lindbergh climbed aboard his plane alone and started his flight for Paris, there has been a marked change. After years of waiting, the land where the airplane was born has begun to try out its wings, and found they are safe.

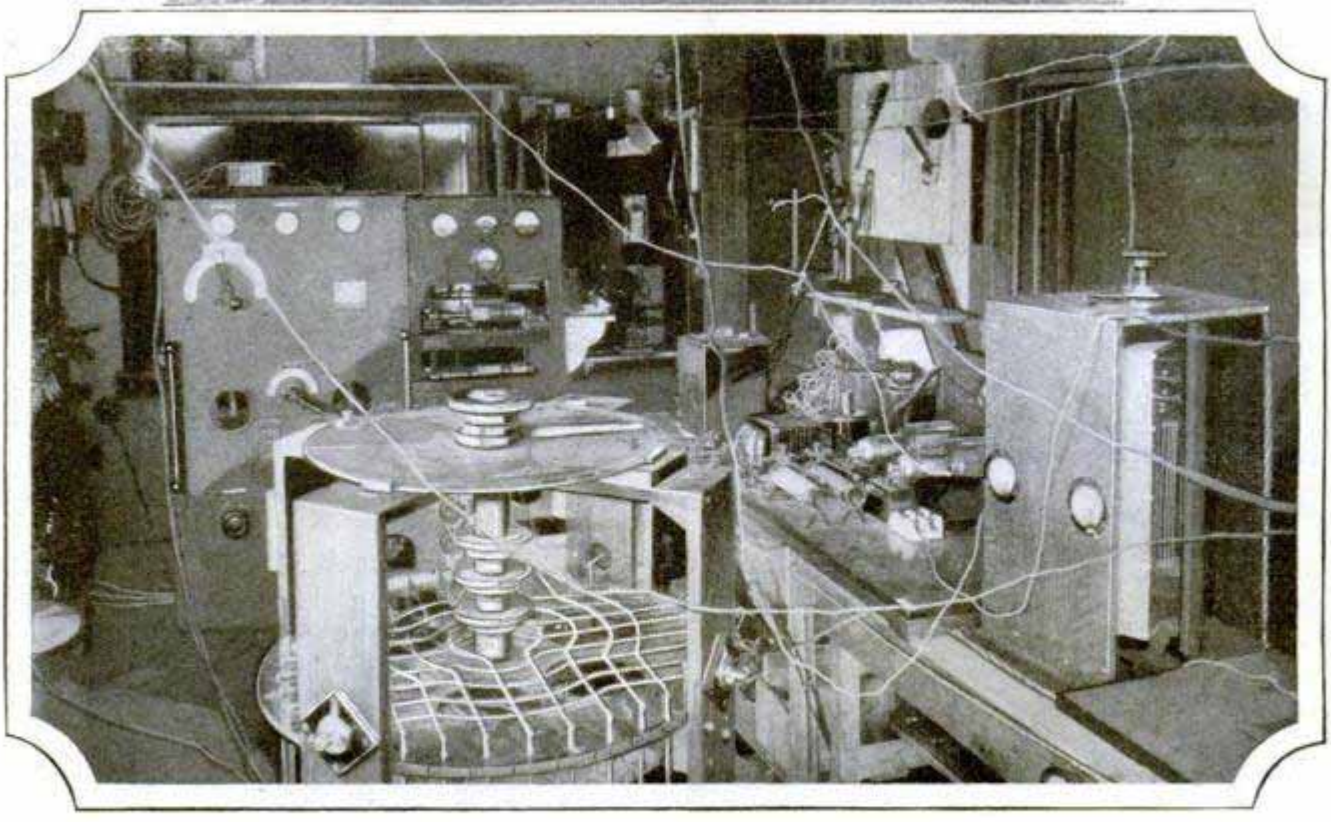
In scheduled flying on civil airways, 5,682 passengers were carried in 1926, but more than 3,500 of them took short hops at the Philadelphia exposition. The first half of 1927 saw only 1,891 passengers carried on regularly established air lines—and 1,087 made the short trip between Detroit and Grand Rapids, most of them, probably, purely for pleasure. The business side of commercial flying during that half year showed 318 making the thousand-mile hop between Los Angeles and Seattle; 231 between New York and Boston, and 147 over the most beautiful airway in North America—the Los Angeles-Salt Lake City trip.

That was in the first half of the year. On July 1, the post office went out of the air-mail carrying business between Chicago and San Francisco, turning it over to a private contractor who started a fleet of ships, each with room for two passengers as well as mail. On September 1, the Chicago-New York route passed into private hands, also with accommodations for passengers. From then on transcontinental trips in thirty-one hours, instead of four days, became a possibility, and business began to pick up very considerably.

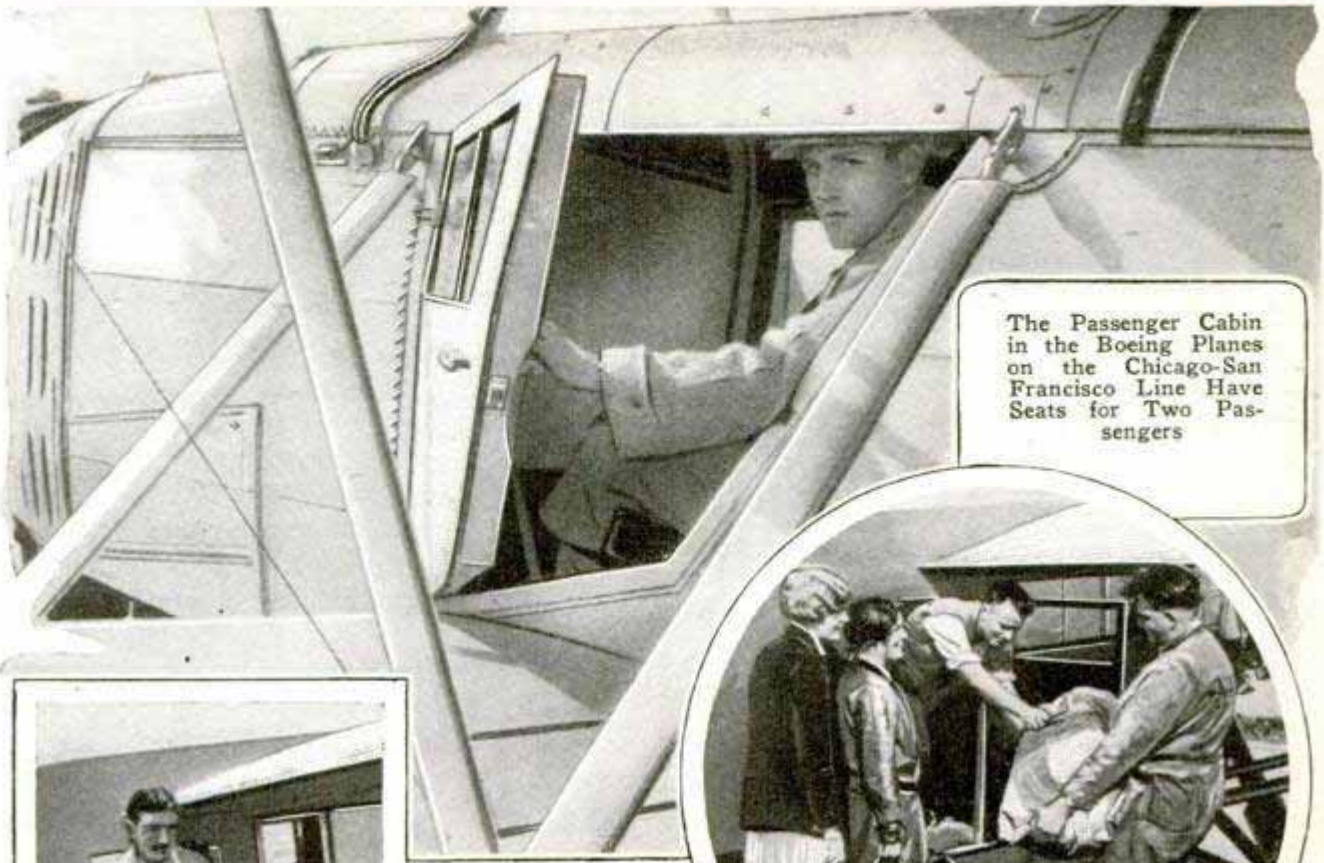


You can leave Hadley Field, at New Brunswick, N. J., just outside of New York city, at 12:15 in the afternoon, be in Chicago at seven o'clock, rush westward through the night down a pathway of light, see the sun come up somewhere around Cheyenne, hop the Rockies at daylight and drop into San Francisco around 4:00 p. m., Pacific coast time, or seven o'clock, New York time.

That path of light across the sky which guides the mail through the hours of darkness is one of the marvels of the age. At twelve landing fields alone six billion candlepower is used in the beacons that aid the ships to land. In between, every



The Nerve Center of the Far-Flung Air Lines Is the Radio Room; Guiding Wireless Beacons Are Already Being Tried on the New York-Chicago Run by U. S. Engineers



The Passenger Cabin in the Boeing Planes on the Chicago-San Francisco Line Have Seats for Two Passengers

Right, Loading Mail and Passengers in a National Air Transport Plane; Left, a Golfer Arriving; Each Passenger Is Allowed to Carry Twenty-five Pounds of Baggage Free

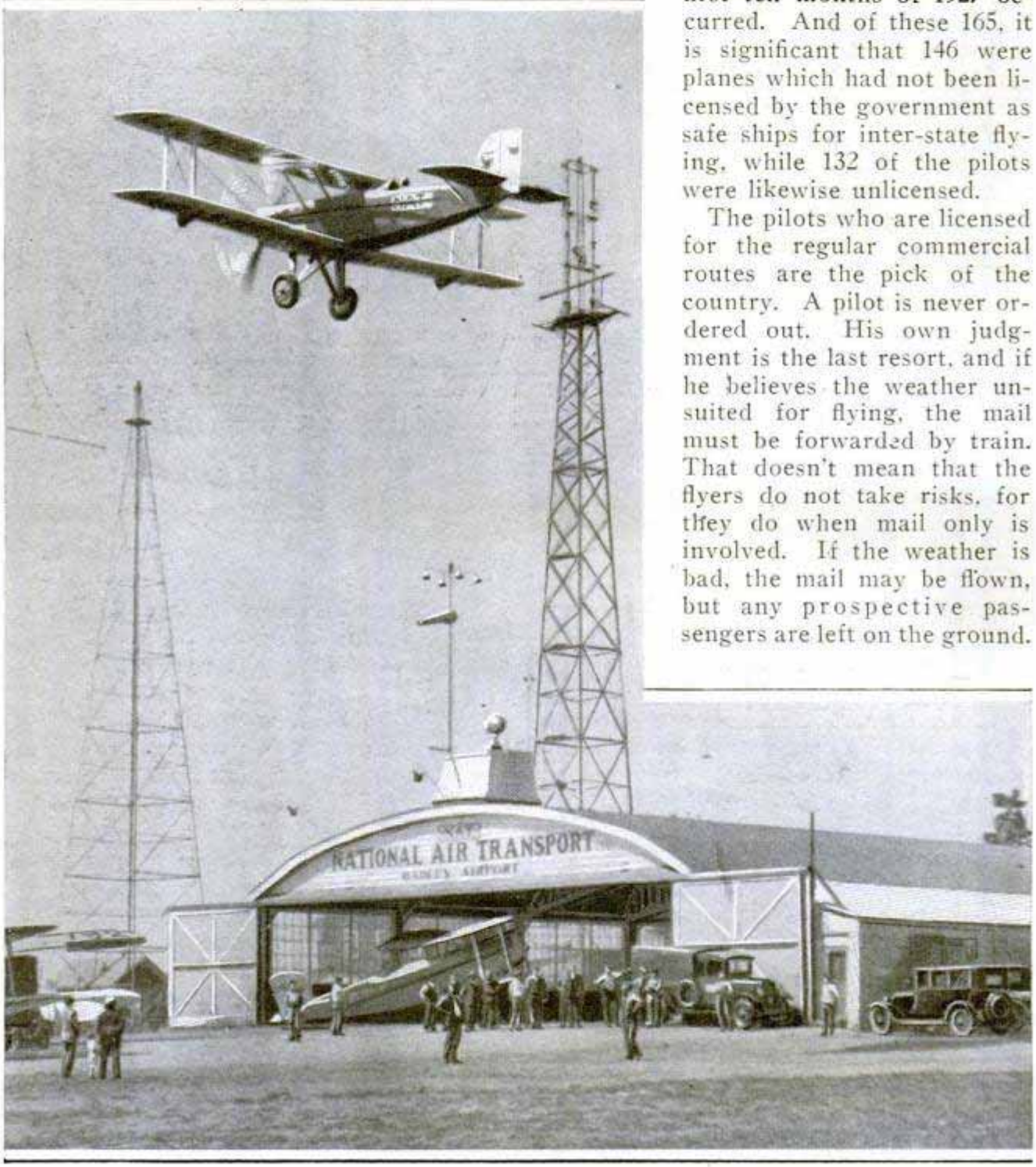
The Pilot Checks In His Cargo of Passengers on His Logbook; People, Mail and Express Are All Carried by the N. A. T.

twenty-five miles, a revolving searchlight sweeps a pencil of light across the sky from dusk to dawn to point out the way, and at intervals of three miles or so, smaller flashing lights serve to mark the aerial highway.

The regular and emergency landing fields, the beacon lights for night flying, and the testing of pilots and airplanes have all been so perfected that an accident on any regularly established airway is a rarity. The insurance companies have recognized this fact by amending their policies to pay the same benefits for aerial accidents, on regular commercial routes, as they do for death met in such ways as falling downstairs in your own home, slipping on a banana peel, or being run down by an automobile.

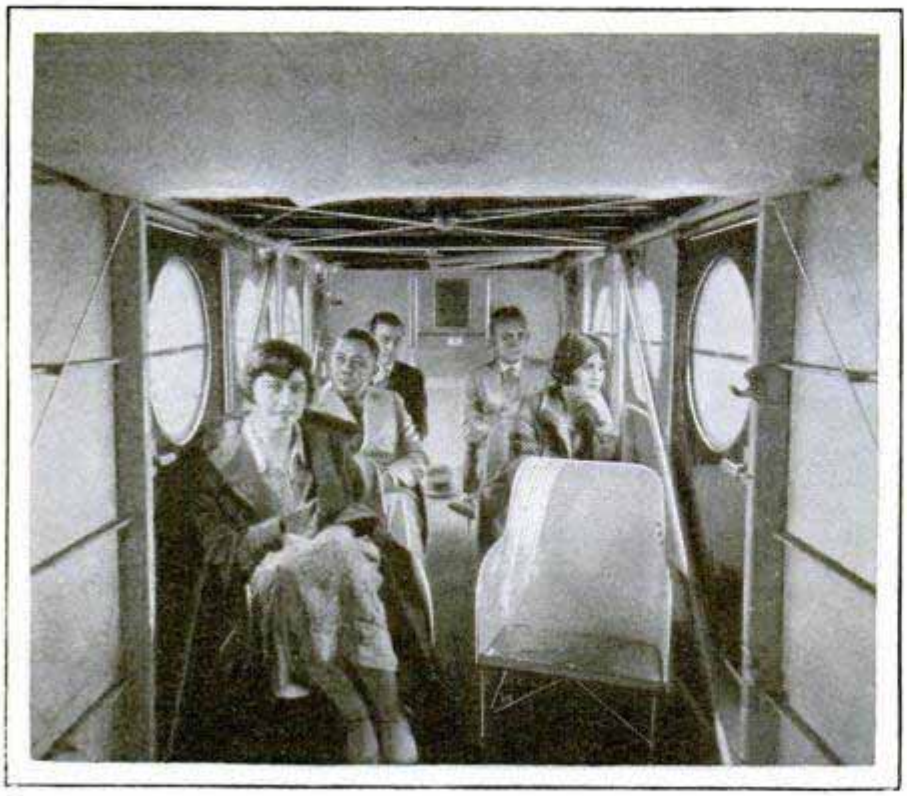
Insurance benefits, however, do not cover accidents while a passenger in the war-time plane of a gypsy flyer. It is in such pleasure-hopping machines that the majority of the 165 accidents listed in the first ten months of 1927 occurred. And of these 165, it is significant that 146 were planes which had not been licensed by the government as safe ships for inter-state flying, while 132 of the pilots were likewise unlicensed.

The pilots who are licensed for the regular commercial routes are the pick of the country. A pilot is never ordered out. His own judgment is the last resort, and if he believes the weather unsuited for flying, the mail must be forwarded by train. That doesn't mean that the flyers do not take risks, for they do when mail only is involved. If the weather is bad, the mail may be flown, but any prospective passengers are left on the ground.



The Pilot Sits Far Back toward the Tail, with Roomy Mail and Express Compartments Filling the Space between Him and the Engine; Start of a Flight at Hadley Airport

From the Canyons That Lead North from the Battery, at the Tip of Manhattan Isle, to the Towering Skyscrapers That Line the Chicago River Is Nearly a Thousand Miles, but Just a Comfortable Afternoon's Ride on the Transcontinental Planes; Hopping Off from Hadley Field, New Brunswick, N. J., after Lunch, the Passenger Alights in Chicago in Time for Dinner, or He Can Continue Westward through the Night and Be in San Francisco at 4:00 p. m., Next Day



Comfortable Chairs and a Roomy Cabin Make Air Traveling Pleasant; This Is the Interior of a Ten-Passenger Douglas

Take a typical winter night at an airport. The phone rings and the field manager lifts the receiver.

"McGinn, at LaPorte," comes the message. "I'm down here, ice on my wings. Fog over everything. Can't get through."

"Train your mail," the manager directs, and hangs up.

Three other pilots are lounging around the clubroom, waiting for mail from the east to arrive in Chicago before taking to the air. With Pilot W. S. McGinn reporting down, prospects for taking off appear slim, the talk turns to bad weather, and the evening's "ground flying" begins. When aviators talk shop, it goes by the name of ground flying.

"Looks bad," comments Pilot Addems, one of the trio. "Worse even than that freak snowstorm that got me last week." Visitors ask for the story.

Addems was westbound from Cleveland, flying at 1,500 feet. At McCool, Ind., he picked up the beacon light clearly, and everything seemed safe for the few minutes' run into Chicago, when suddenly he sped into a blinding snowstorm.

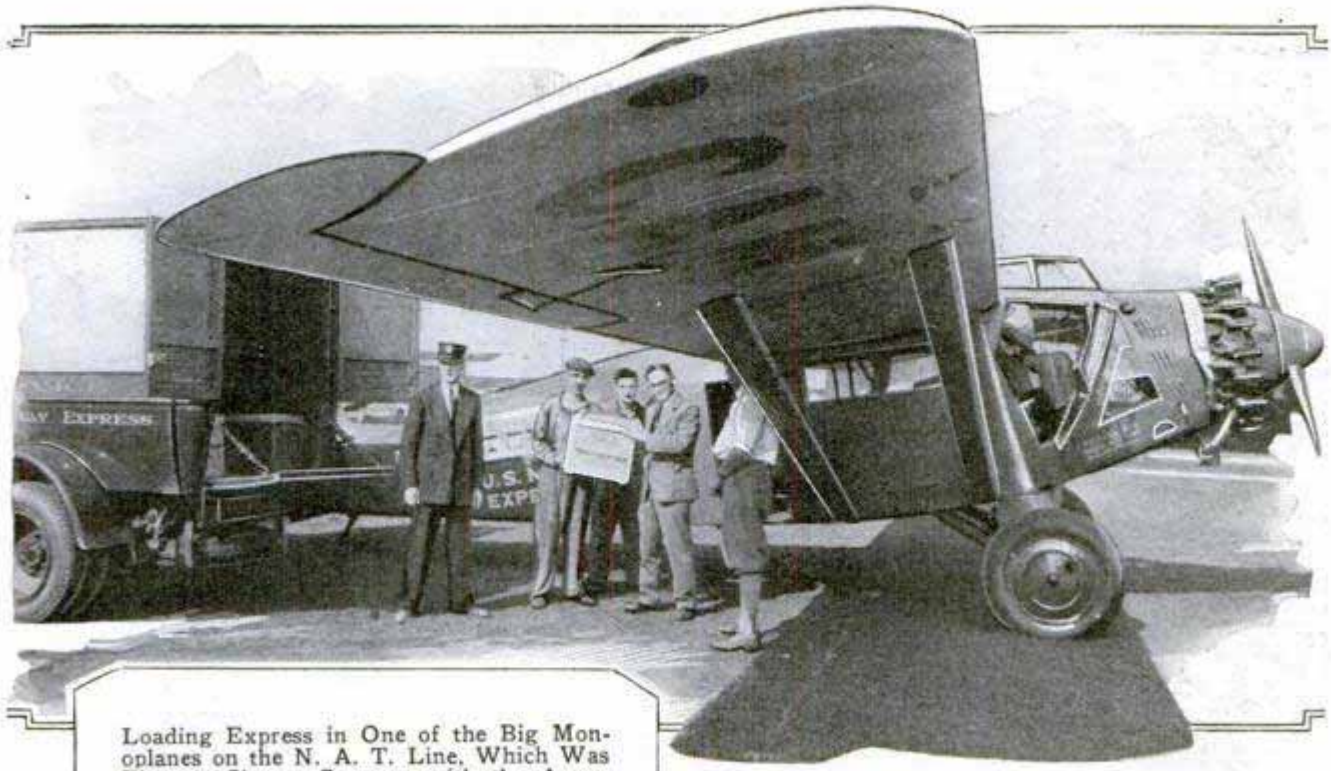
The compass chose that moment to go bad, but Addems kept flying on, though he couldn't see beyond his wing tips. He had been going long enough to have passed Chicago, so came down in hope of sighting a landmark. At 250 feet he did see something—the cold, black water of Lake Michigan, indicating he was miles to the north of his course.

Completely lost, not knowing how far out over the lake he was, his gasoline gauge showing but five gallons in the tank, he settled lower, turned on one of his wing-tip lights and pointed it down toward the water to catch the drift of the waves. On the strength of their direction and a wind observation he had made before striking the snowstorm, he turned left and climbed a few hundred feet. A few moments later he sighted the shore, then the blast furnaces at Gary and landed, with less than a quart of gasoline left. As the story is finished, the telephone starts to ring again.

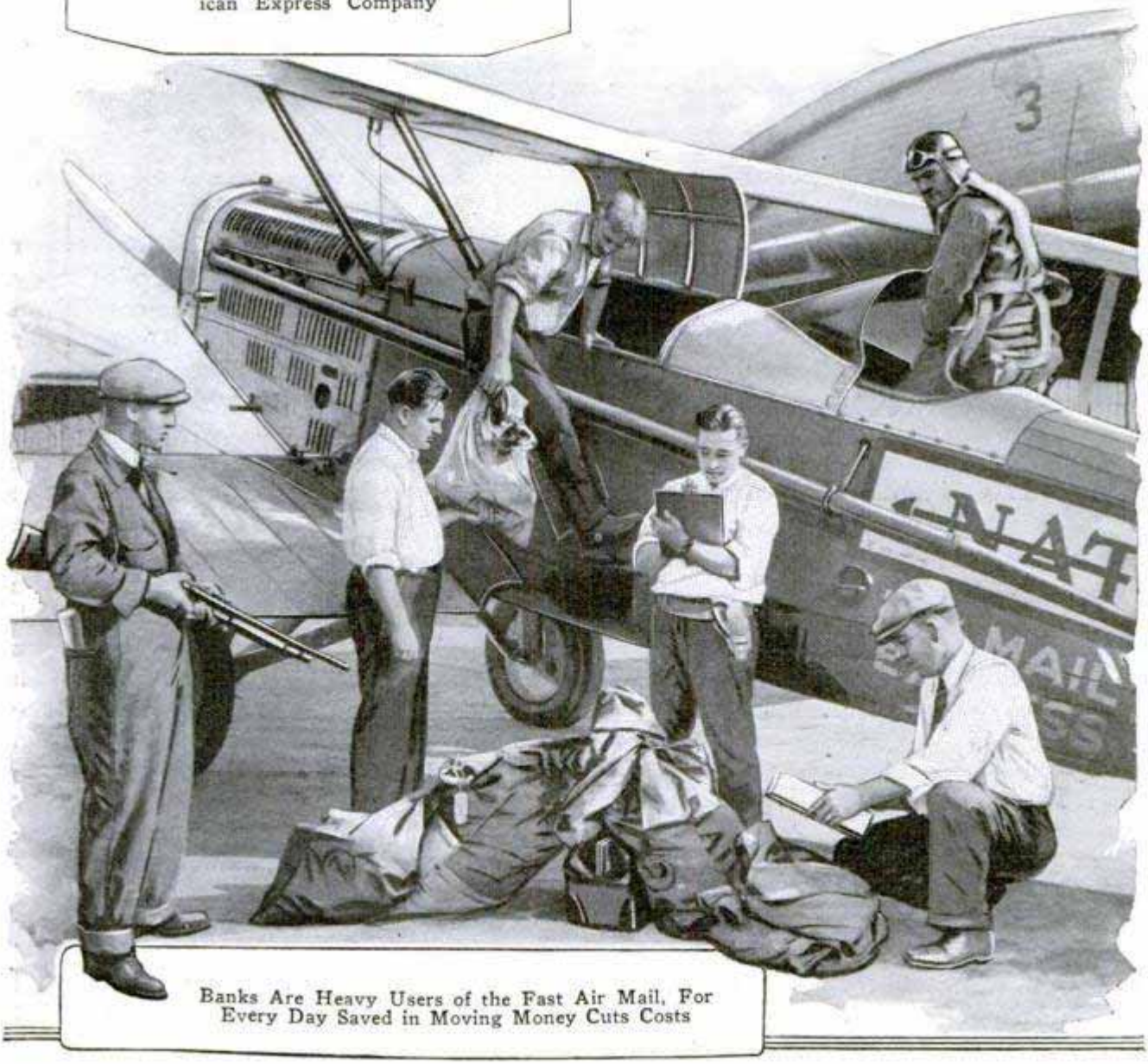
"This is the field at Lansing," comes the message. "A plane just passed flying west. Think it's McGinn, as LaPorte and McCool report he hopped off again. Better light up for him."

Opinions of the weather are hastily revised. If McGinn could get off again, the weather must be improving, so the San Francisco and Kansas City mail is loaded and the pilots take off. In the meantime there is no trace of McGinn. The half-billion-candlepower beacon is burning in a vain effort to penetrate the fog. An hour later his ship comes in, with another hair-raising report.

Everything went well until after he had passed Lansing, at the southeastern edge of Chicago and almost within diving distance of the mail terminal. Then he ran into fog, and ice began forming on the edges of the wings. He did a quick bank, in an effort to turn and get back to the Lansing field, but could not get out of the fog. Next he started to climb over it, but the gathering ice threatened to bring the ship down. He had dropped all but two of his landing flares, and was saving those for the last emergency—if it should



Loading Express in One of the Big Monoplanes on the N. A. T. Line, Which Was First to Sign a Contract with the American Express Company



Banks Are Heavy Users of the Fast Air Mail, For Every Day Saved in Moving Money Cuts Costs

This Big Three-Motored Keystone Plane, Carrying Ten Passengers, Has an Insulated Cabin to Keep Out the Heat of the Tropical Sun, For It Flies the Caribbean Route

become necessary to make a parachute descent.

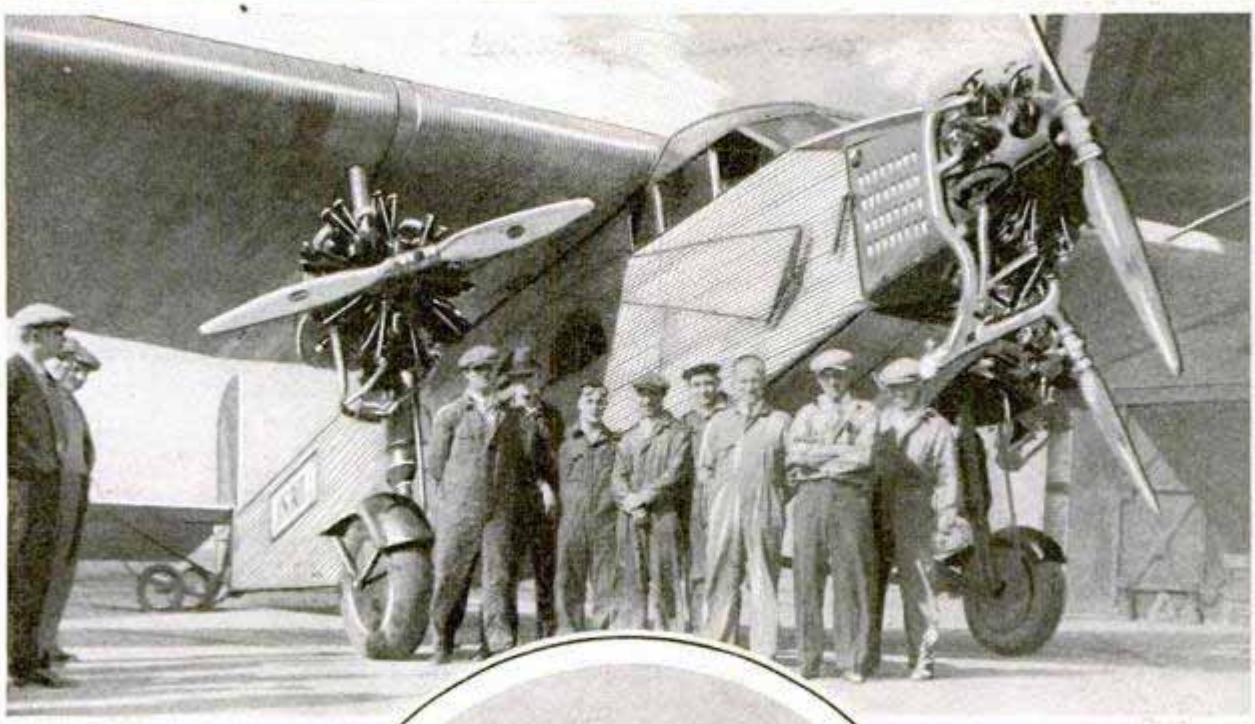
Finally, he dropped them, but the fog was so thick they failed to illuminate the ground. Then McGinn began loosening his safety-belt buckle, preparatory to stepping off into the mist. At that moment he sighted a pink glow—above him. Pink lights don't glow in the sky at midnight. The only possible place for it to be, he reasoned, was on the ground. The answer was that he was flying the ship upside down—and didn't know it!

Opening the motor wide, he succeeded in getting enough speed to climb a bit and straighten out, right side up. The glow could only be South Chicago or Gary steel mills, and from there he could set his course for Chicago. He had been lost an hour.

The pay of a pilot varies according to the work he does. Night flyers get more than daytime aviators. One airway operator, figuring the expense of operating the average commercial plane, costing $12,000 to $14,000 and engined with a Wright "whirlwind" motor, such as Lindbergh uses, fixes the bill at 35.28 cents per mile. Of that 7.5 cents is the pilot's pay and .6 cent the state insurance carried on his life. The biggest item is 8.6 cents per mile for depreciation. Then comes five cents a mile for gasoline and oil, 4.83 cents for office expenses, and 2.41 cents for advertising and selling, while the cost of the two terminal fields is charged up at the rate of 1.3 cents each per mile the plane is flown.

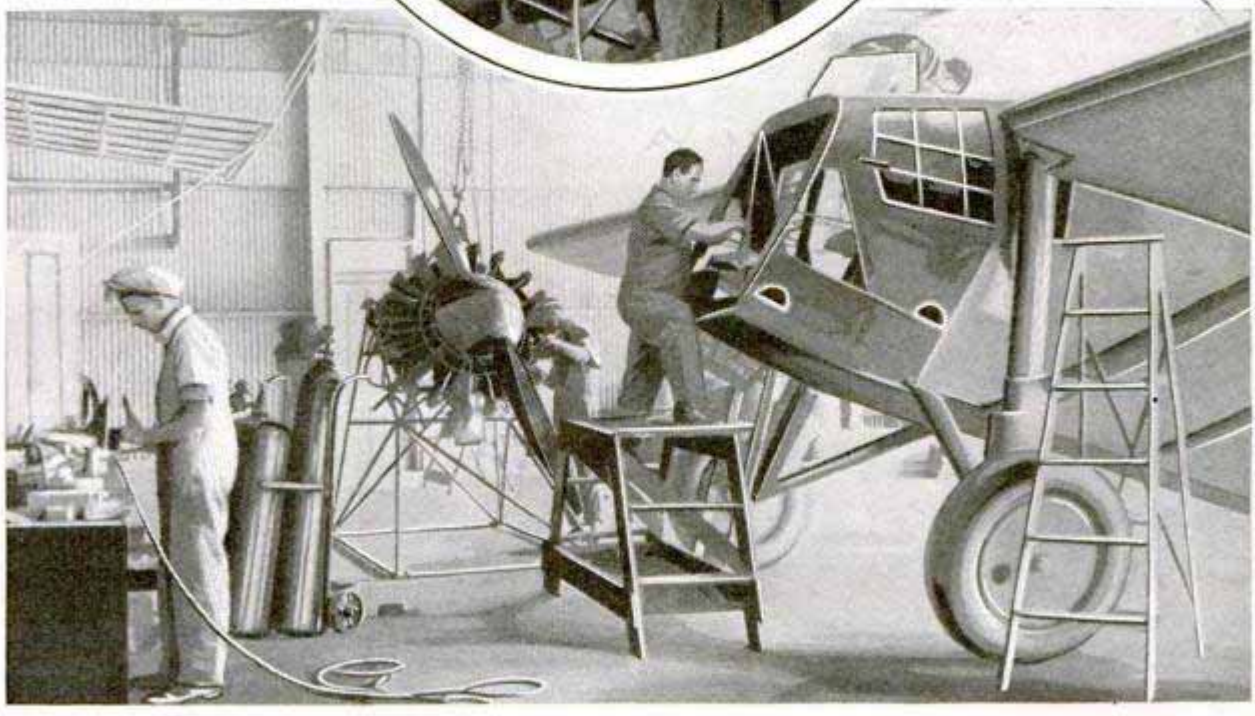
Private or commercial planes can be bought in about any price class desired. One of the air-trade papers lists forty-four manufacturers who are in production with seventy-two different types of ships, listing from $695 to $40,000, according to size.

During the first month of 1928, according to Major Clarence M. Young, director of aeronautics of the department of commerce, one-third of the industry alone produced 1,525 planes, with 1,239 unfilled orders on the books. It took nearly a quarter of a century after the Wright brothers' success at Kitty Hawk for the United States to find its wings, but once found they are being used to good effect.



Ground and Aerial Crew of a Sight-Seeing Bus, Above; This Big Three-Motored Ford-Stout All-Metal Ship Is Used to Carry Visitors over Chicago Both Day and Night, Making Regular Scheduled Flights; the Sight-Seeing Business Is a Lucrative Side Line at Most Flying Fields, Drawing Customers from the Thousands Who Flock to Watch the Arrival or Departure of the Air-Mail Planes

Modern Thick Wings, Which Have Replaced the Old-Time Bamboo and Cotton Affairs, Provide an Excellent Place to Hide the Plane's Gas Tanks, but Make a Step-ladder a Necessary Adjunct for the Filling-Station Attendant; Below, Changing Motors on the Air-Cooled Ships Is an Easy Job, For the Engine and Propeller Lift Off in One Piece, and a New One Is Quickly Substituted



TENT PITCHED ON LIGHT POLE PROTECTS PEDESTRIANS

Portable Tent to Shield Pedestrians, with Side Raised to Disclose Workmen

To guard persons on the sidewalk from flying fragments of iron, workmen on lamp-post standards in Philadelphia, rigged a canvas tent, about eight feet in diameter, to the pole on which they were engaged. The plan proved successful during an extensive overhauling of the standards, and the work was further expedited by a special platform, made in two half circles, on which the men rested.

ELECTRIC-ALARM WALL CLOCK NEEDS NO WINDING

Forgetting to wind the alarm clock will have no unpleasant results with an electric unit an eastern inventor has introduced, for it requires no winding, merely to be set at a time when the person wishes to be called. It operates without noise, save when the signal is sounding, and rings for fifteen minutes. A large dial surrounding the operating knob simplifies the task of setting the alarm.

FIRES WITHOUT MATCHES

Under favorable conditions, it took about three minutes to make a fire before the days of matches, but if the fuel was damp, half an hour or more was required. Cigaret lighters are a comparatively recent invention, but contrivances similar to them, even if far more complicated, were in use more than 100 years ago. In 1786, a "portable fire box" was introduced. It contained a small bottle of a phosphorous compound and small sulphur-tipped matches. When a match was dipped into the bottle and withdrawn quickly, it usually burst into flame. Until 1835, the familiar lighting outfit for the average home was the tinder box. In the seventeenth century, a tinder-box pistol fired by an alarm clock was introduced.

CARBON AND RIBBON TESTER FITS IN POCKET

Comparative tests of typewriter ribbons and carbon paper are easily made with a pocket-size unit now on the market. Impressions are taken on a roll of paper, sixty-five feet long, held on a reel. Steel type, actuated in somewhat the same way as the characters on a typewriter, but by means of a crank, make the test impressions. The outfit weighs only a pound and is durably constructed.

RARE MEDICAL ELEMENT FOUND IN SMELTER DUMP

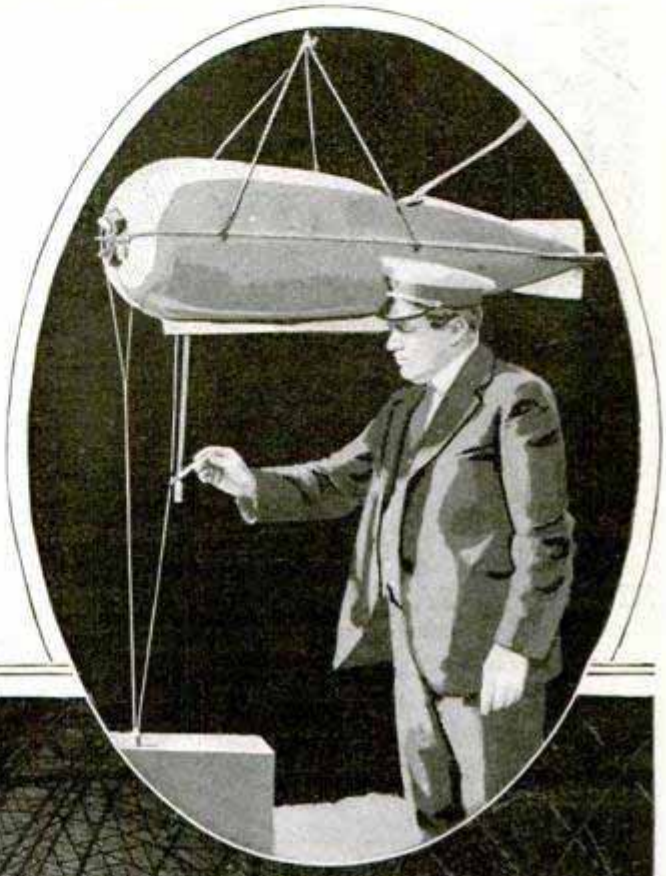
An extensive search for a plentiful source of germanium, a rare chemical element, has ended successfully in one of the least expected places, the scrap heap of a copper smelter. Dr. Jacob Papish, of Cornell university, has found the substance in concentrated form among the

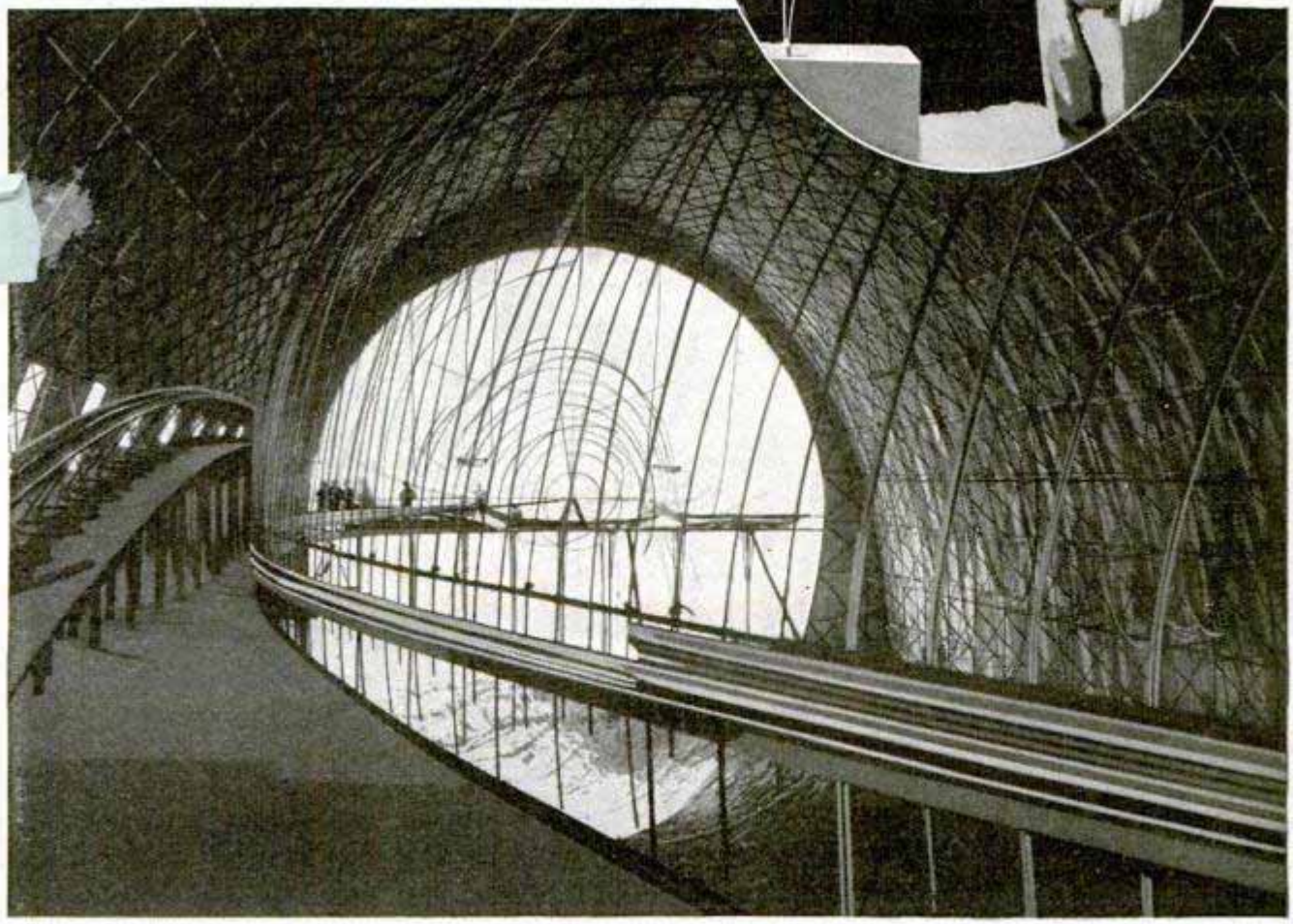
waste which remains after copper has been extracted from a certain mineral. While no wide use for the element has yet been found, it is believed to have medicinal properties, and already has been employed in the treatment of anemia. Chemists believe that, now an abundant supply of germanium is available, work will be found for it to do. This was the case with vanadium, radium and other rare materials. Dr. Papish discovered the substance when the mineral was subjected to extremely high temperatures. A spectroscope, by which the peculiar light emitted by the element was detected, aided in finding and identifying it.

AIRSHIP WITH ALL-METAL BAG TO BE RUN BY STEAM

130

Interest has been aroused in an airship, now under construction in California, for it is to have an all-metal bag and the propeller will be run by a steam turbine. Besides these features, it will have a landing elevator and other characteristics not ordinarily found in aircraft of this type. The method of propulsion is said to differ from that of the usual ship. The propeller creates a vacuum immediately before the bag with the result that a stream of air, flowing around the ship, pushes it forward.





Framework of a Metal Dirigible under Construction in the Hangar, and a Model of the Ship, with Its Designer; the Builders Work from the Movable Platform in the Foreground

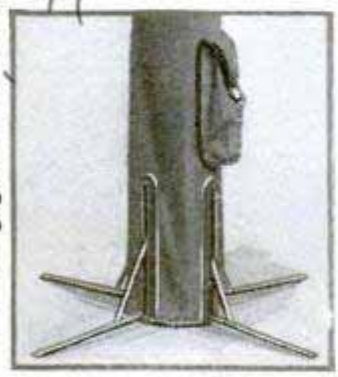
Inventor, Capt. Thomas B.
Los Angeles, Calif

Built like an Auto Gasoline Pump, This Filling Station Supplies Cigar Lighters

FILLING STATION FOR LIGHTERS LATEST SMOKERS' AID

For the accommodation of owners of cigar and cigaret lighters, a filling station, modeled after a gasoline pump, has been introduced. Maintained in some convenient shop, it is a time and trouble saver and makes it unnecessary for individual users to purchase supplies of lighting liquid, which is likely to be wasted by evaporation or by getting spilled.

FOLDING LEGS ON GOLF BAG SERVE AS CADDY



Golfers who do not wish to hire a caddy have a convenient bag at their disposal in a unit equipped with folding legs that hold the bag erect when wanted and then shut up close to the sides so as not to interfere with walking or carrying. The feet are controlled by a push rod and do not damage the greens in any way.

¶T-shaped metal hangars for the private plane owner have been introduced.

SOUND-ABSORBING MULTIPLE WALLS TO IMPROVE RADIO

Walls of several layers instead of one, are playing an important part in improving radio reception and in reducing unpleasant echoes in auditoriums. Engineers, working on the problem of better acoustics, have found that a single perforated partition, set a short distance from the main wall, greatly improves the acoustics of a broadcasting studio, and that three layers of glass of different thicknesses are also effective. Each piece has its natural frequency and sounds of a similar pitch would be transmitted. Sounds that get through the first layer are stopped by the second, while any that leaked through the latter would be stopped by the third. Sounds of high pitch are largely absorbed by layers of felt, porous tile or wood fiber mixed with felt. If the wall is covered with felt and then, an inch away, a piece of perforated building board is placed, the low-frequency sounds are much more completely absorbed. Still better is the effect of two layers of building board, with two air spaces.

ANGULAR CAR-STEERING WHEEL RELIEVES FATIGUE

As a substitute for the usual round automobile steering wheel, an angular one has been introduced to spare the driver the fatigue that results from grasping a curved wheel and to make it easier to guide the car. The chief advantage of the new shape is that it permits the hands to assume a more natural position, there is less necessity to grasp the rail tightly, thus decreasing the strain on the wrist and fingers, and the angles enable the operator to push and pull on the wheel so that but little effort is required to turn it. An additional feature is that the circumference of the wheel may be enlarged without cramping the driver, as the half toward the seat may be removed and replaced with a slightly curved bar of wood, which allows the driver abundant room and easier entrance and exit.

Movie Trucks in Europe Display Films to Street Crowds through Screens in the Truck Bodies

MOVIE THEATERS ON WHEELS TACH STREET CROWDS

The influence of the motion picture has been extended in Germany and Austria by means of automobile theaters, displaying the films on the side of the truck from projection machines within. The cars visit various towns and cities and show the pictures to crowds that gather. When bad weather prevents the open-air display, the machines are taken to a store or other convenient interior. The autos are also equipped with loud speakers.

BETTER AND CHEAPER LIGHTS SHOW ELECTRIC PROGRESS

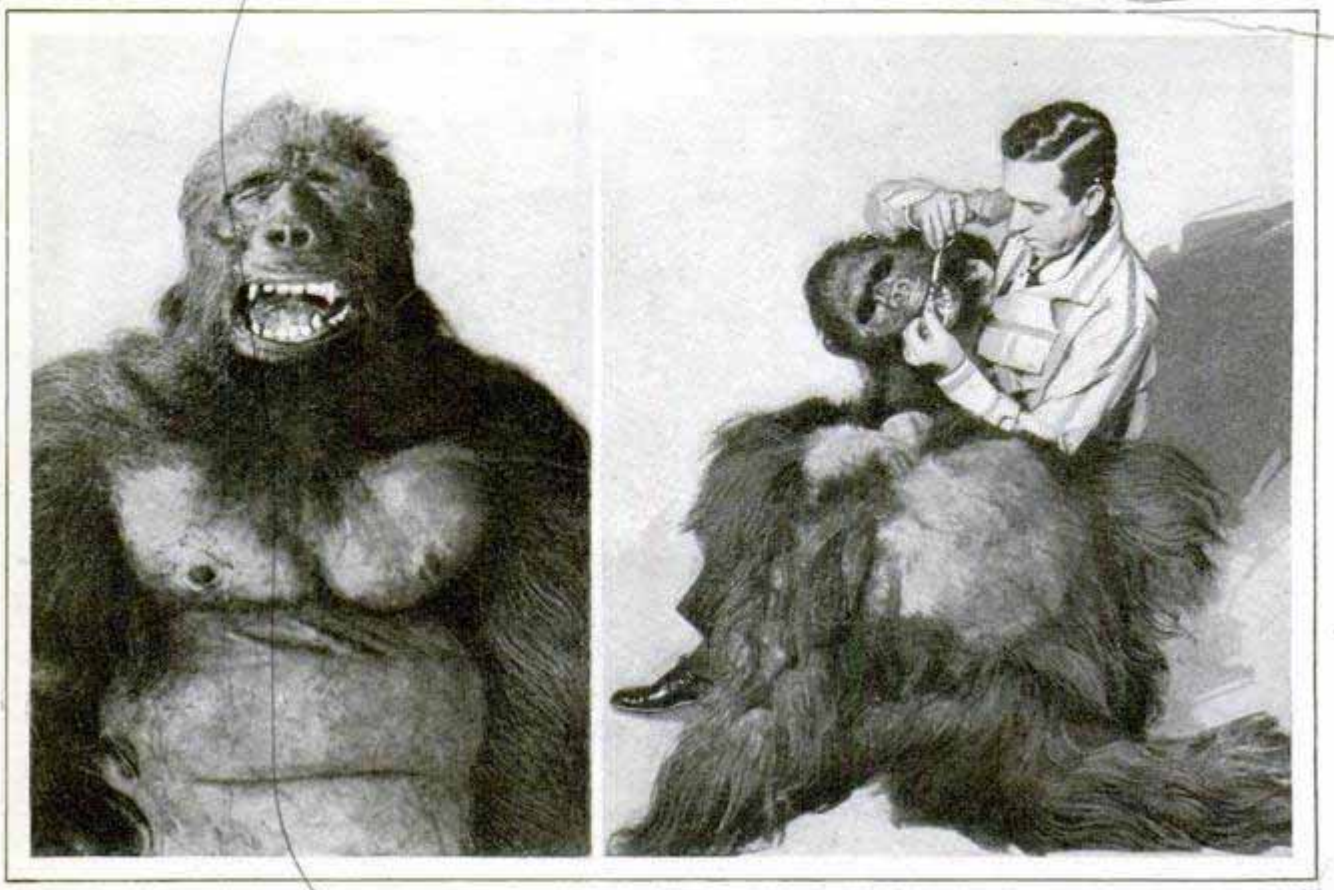
Today we are receiving thirty times as much artificial light for the same amount of money as we did 100 years ago, illumination experts estimate. Authorities say, that, for the last century, the average home has spent approximately $24 per year for lighting. On this basis, the sperm and tallow-candle user enjoyed some 10,000 candlepower-hours, kerosene and illuminating gas yielded 15,000 candlepower-hours, and improvements in these systems afforded 60,000 candlepower-hours. But the latest electric lights give 300,000 candlepower-hours for the same amount of money. The price of a postage stamp a day pays the difference between good and poor lighting in the average home.

RUBBER BOOTS FOR DOG KEEP MUD OUT OF HOUSE

Rubber galoshes have been introduced for dogs, to keep their feet warm and dry and also to prevent tracking mud into the house Here is "Peter Pan," pet of Ted Clark, President Coolidge's secretary, stepping along in his rubber boots.

Rubbers for the Dog's Feet Solve the Problem of Mud Tracked onto the Carpets

GORILLA-MAN ADDS TOUCH OF REALISM TO MOVIES



Realistic Movie-Gorilla Costume, with Mechanism in the Head and Limbs to Reproduce the Actual Movements of the Beast; Faking Wild Animals Is Becoming a Film Art

The costume is usually incidental to the actor, but in the case of a gorilla disguise, used by Freddie Humes, a motion-picture performer, the big mask is almost as important as the operator himself. Inside the huge costume, Humes is able to reproduce the movements of a real gorilla with remarkable realism, due to the special mechanisms by which the disguise is operated and controlled. One of the most important parts of it is, of course, the horrible head with its large teeth and lips and fierce eyes.

TIRES PUMPED AS AUTO RUNS KEPT AT RIGHT PRESSURE

Stopping the car to inflate the tires is no longer necessary with an automatic pumping unit installed on the hub. As the wheel turns, air is forced into the tire and when the correct pressure is reached, the air is sent out through another valve so that the tire cannot be overinflated. When the pressure falls below the correct point, a valve opens and the air again flows into the tire. This attachment insures against unnecessary wear on the tires by keeping them at the proper pressure at all times, and, in case of a slow puncture, the pump will often keep sufficient air in to permit running to a service station, or to the destination, before repairs need be made. The unit can be set to give just the pressure required for all the tires, is not difficult to install, and tests have shown that it operates successfully for long periods without attention.

CARNATION THAT CHANGES HUE GAINS BEAUTY IN FADING

Instead of becoming less attractive as it withers, a carnation, produced in England, assumes a delicate gray color, more beautiful than its shade when fresh, according to reports. It is a medium-size blossom with heliotrope stripes.

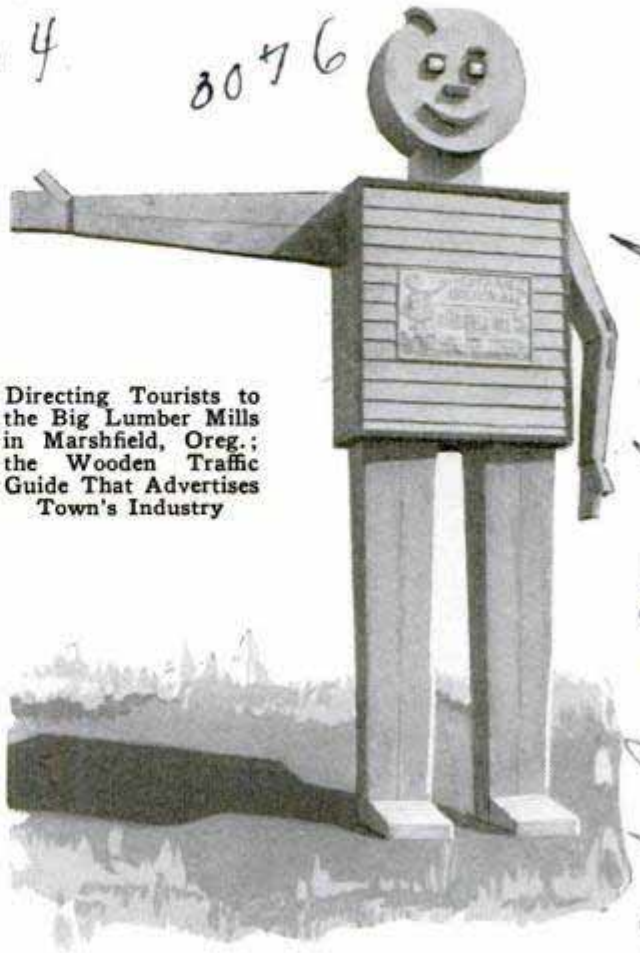
RADIO WAVES RELIEVE CANCER IN MICE AND CHICKENS

By the use of high-frequency electricity, close in wavelengths to the short waves employed in radio communication, the public-health service has obtained interesting results in the treatment of cancer in mice and chickens. The animals, afflicted with tumors artificially acquired in the laboratory, were improved by being subjected to exposures of oscillating electricity produced by vacuum tubes similar to those in radio sets. The frequencies ranged from 8,300 to 135,000 kilocycles per second, or wavelengths below about forty meters. The most effective frequencies were found to be about midway between the extremes used. Some of the mice suffered a shriveling of the ears and tail, due to the current, but many were perfectly normal after the process that had a helpful effect on their cancers. Workers conducting the tests make it clear that the method is still in its early experimental stages, and that such treatment of human beings is probably far in the future. The dosages of electricity were much greater than could possibly be received from radio broadcasting, hence radio, as now known, will not aid in the treatment of cancer.

KNIFE AND MEAT SAW IN ONE LATEST KITCHEN AID

Two useful implements are combined in one in a meat knife with a saw on the upper edge. It is especially adapted for camping use as well as for the kitchen. Saw blades are easily renewed when necessary and can be tightened with a screw adjustment.

¶The Popular Mechanics Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished.



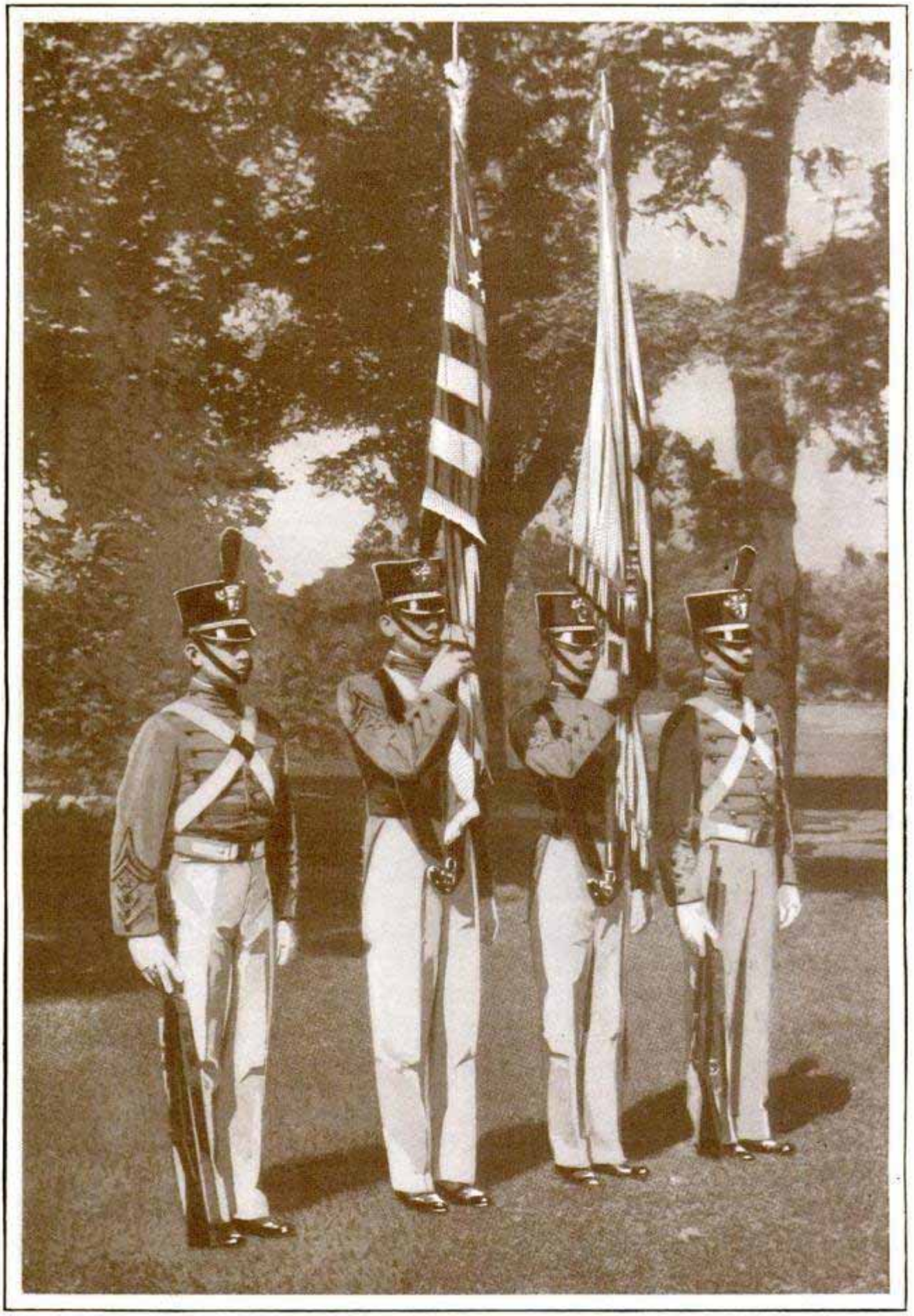
Directing Tourists to the Big Lumber Mills in Marshfield, Oreg.; the Wooden Traffic Guide That Advertises Town's Industry

WOODEN MAN AS GUIDE POST ADVERTISES INDUSTRY

Lumbering is one of the chief industries in Marshfield, Oreg., and travelers are apprised of the fact by a huge wooden man pointing to the mills. The figure is as high as a house, and is constructed of boards manufactured in the town.

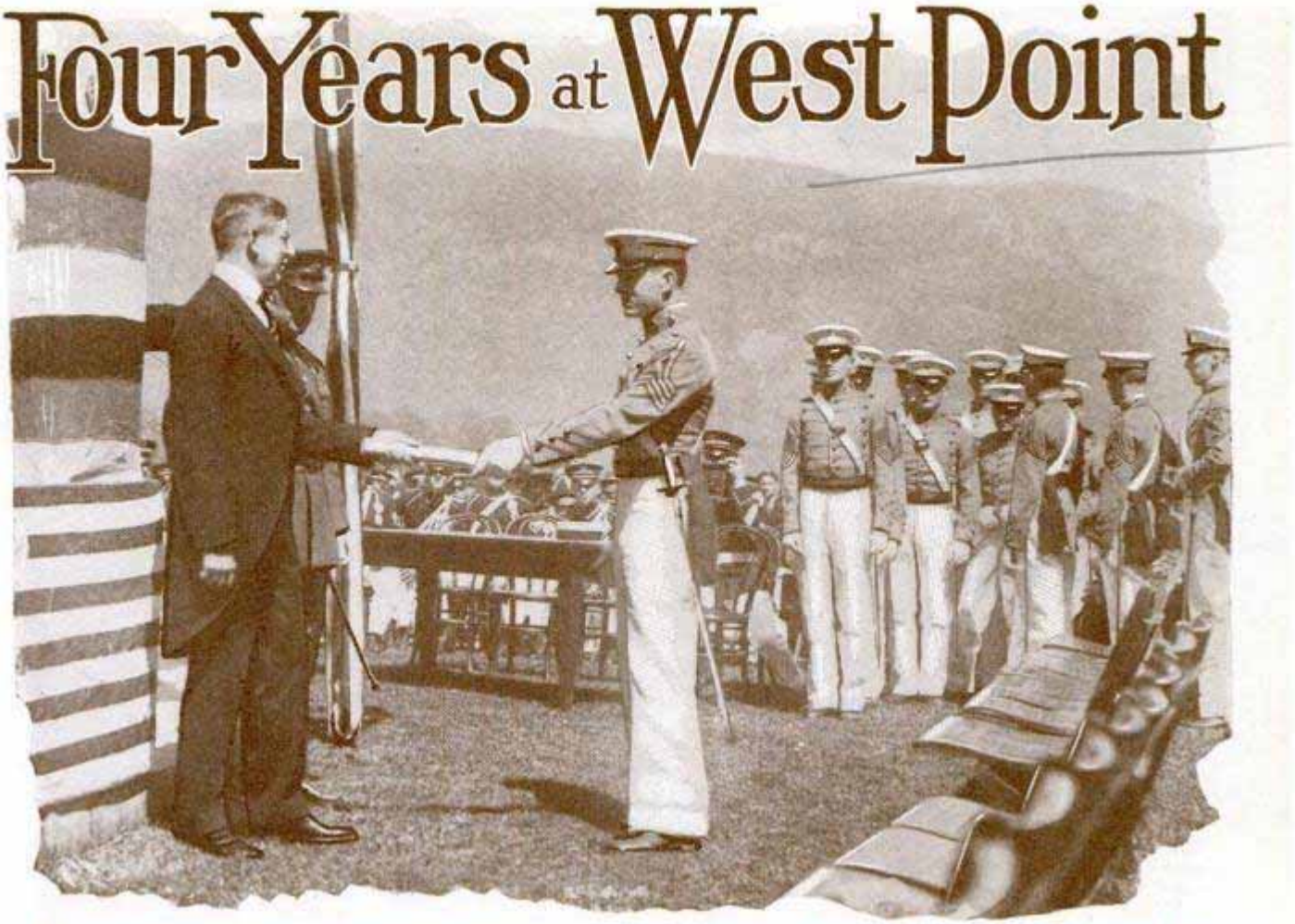
AIR-INFLATED AUTO BUMPER TO DECREASE DAMAGE

To minimize the likelihood of damage to either auto in case of a head-on or rear-end collision, a western man has devised an air-inflated bumper to be used in place of the ordinary steel units. It is simply a section of heavy hose, six or eight inches in diameter, vulcanized at each end and holding about forty pounds' air pressure. A valve of the kind used on tires is provided for inflating the bumper.



The Color Guard at West Point, with the American and Military-Academy Flags; the Dress Uniforms, with Their Crossed Belts and Gray Coats, Have Come Down from Washington's Army

Four Years at West Point



The Cadet's Biggest Day, When the Secretary of War (in This Case Dwight F. Davis) Hands Him a Diploma and He Is Ready to Go Out in Life as a Second Lieutenant

II—The Last Two Years

BACK from his first vacation—more than two months having been spent at home—the future army officer enters his third year as a second-class man, for classes at the military academy, as at Annapolis, grade down from the top. Regulations are a bit less strenuous, week-end leaves are obtainable, and Saturday night hops are the rage.

There is no relaxation, though, in either work or discipline, but some promotions are available. When he sews on his two stripes of gold lace as a second-class man, and his two of black braid as class emblems, he becomes eligible to selection as a sergeant. If he wins one of the places, he takes his position in the three battalions of four companies each which constitute the famous cadet corps.

Another year, and another stripe of gold and stripe of black on his sleeve, and he is a senior. Work and play remain the same, with the added duties of the rank of captain, lieutenant or first sergeant of the corps. In turn the senior becomes officer of the day, and special attention is devoted to developing the qualities of leadership.

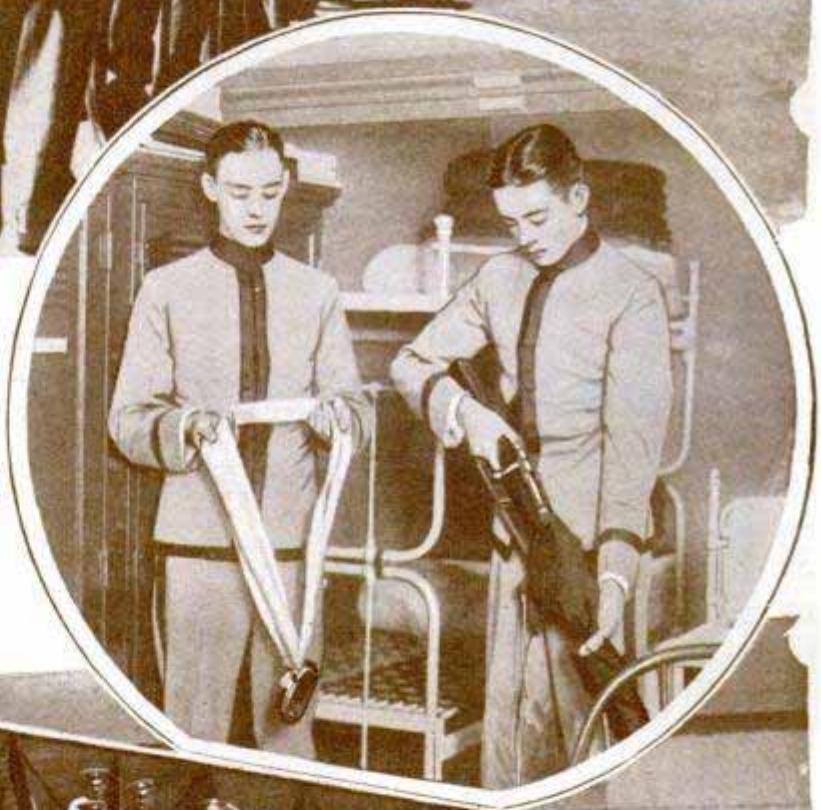
With the coming of spring there is one important relaxation in discipline. Instead of being put to bed at taps, he is allowed to sit up until midnight pouring over his books for the final examinations.

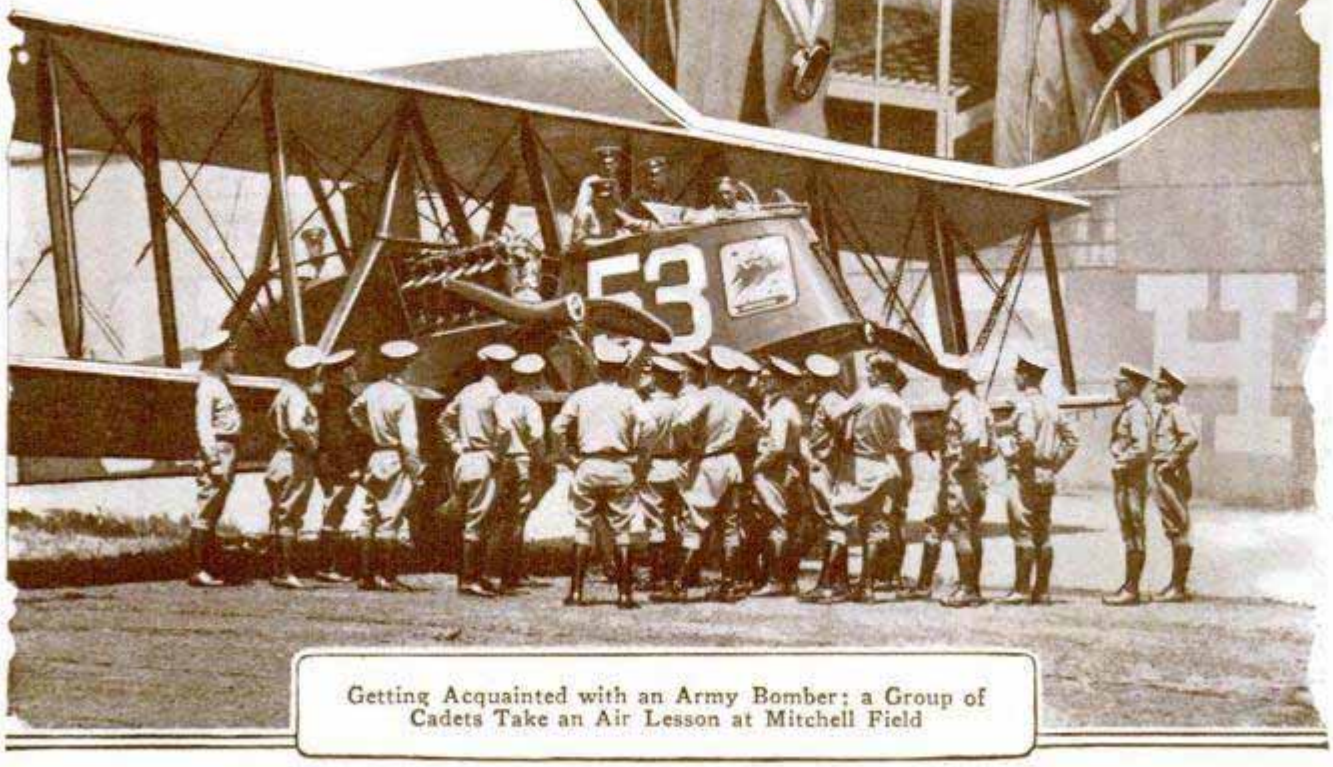
Physical examinations are given before he enters, and each year during the course, but with the approach of June week the seniors get one final physical test to determine their fitness to become officers.

June week is the grand climax of the four-year grind. Every night there is a hop, friends and relatives and sweethearts crowd the hotels of the near-by village. There are no more guard tours, but a final graduation parade the day before commencement.

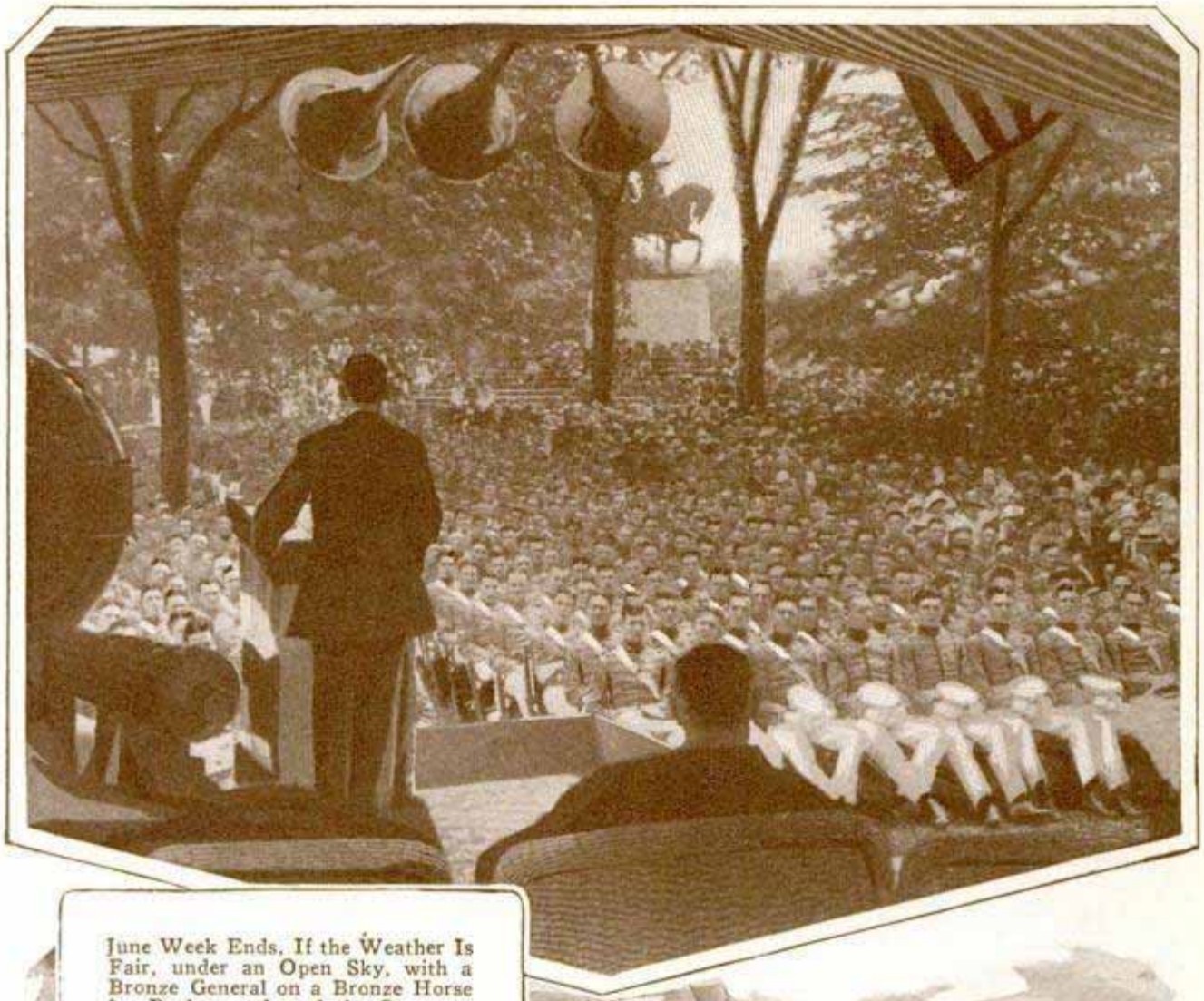
The next day graduation exercises at Battle Monument, a diploma, and a full-fledged second lieutenant, U. S. A., has been made.

Future Generals in the Rough Being Taught to Stand Erect with Heads Up and Shoulders Back; Upper-Class Men Take the Plebes in Hand Even Before Their Uniforms Have Been Issued and Try to Instill the Rudiments of That Smartness That Has Made the Corps Famous throughout the Land; at Right, Assembling and Inspecting Equipment Preparatory to Departure for New York for the Parade That Preceded the Annual Army-Navy Football Game, Before Differences over Eligibility Arose

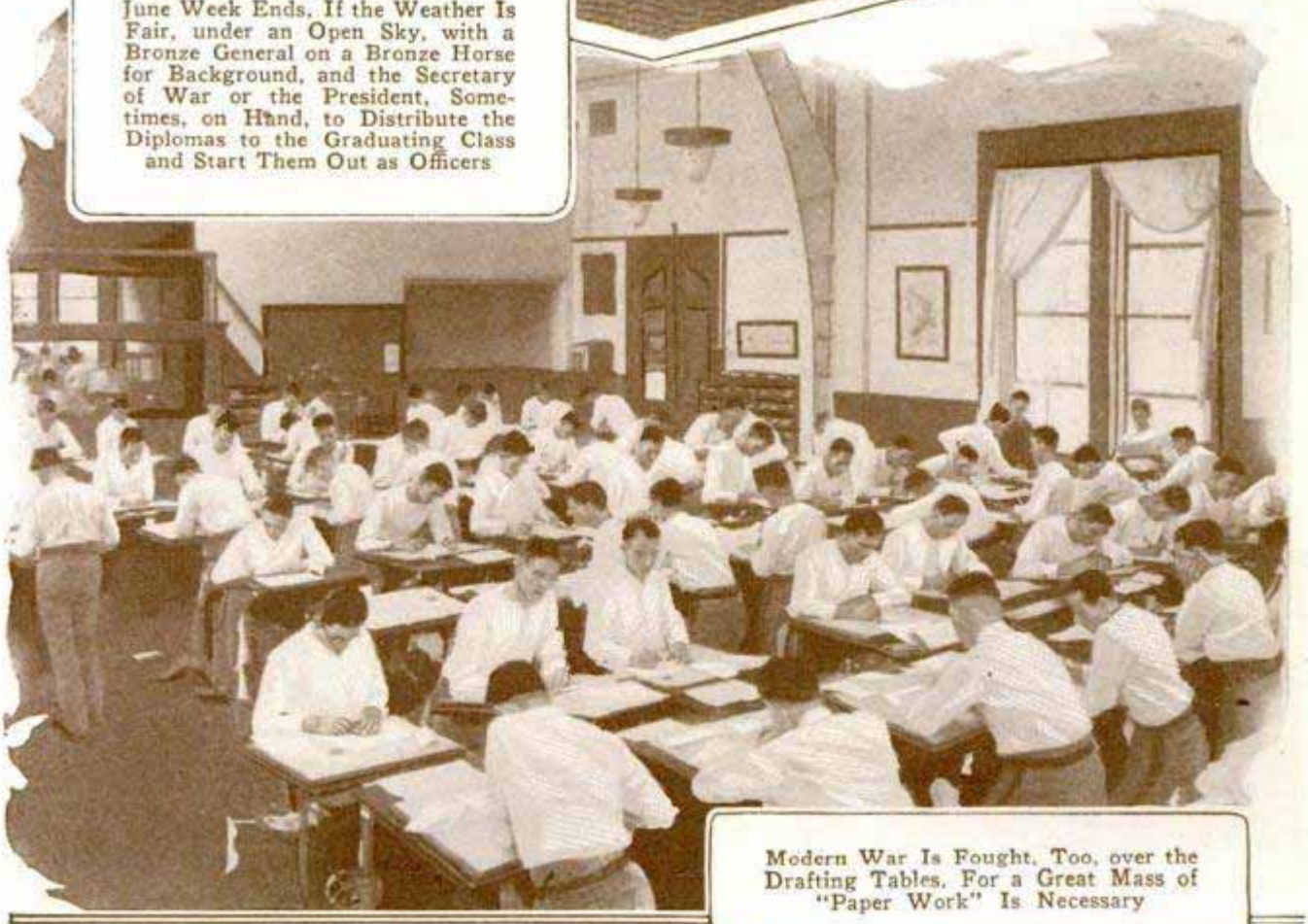




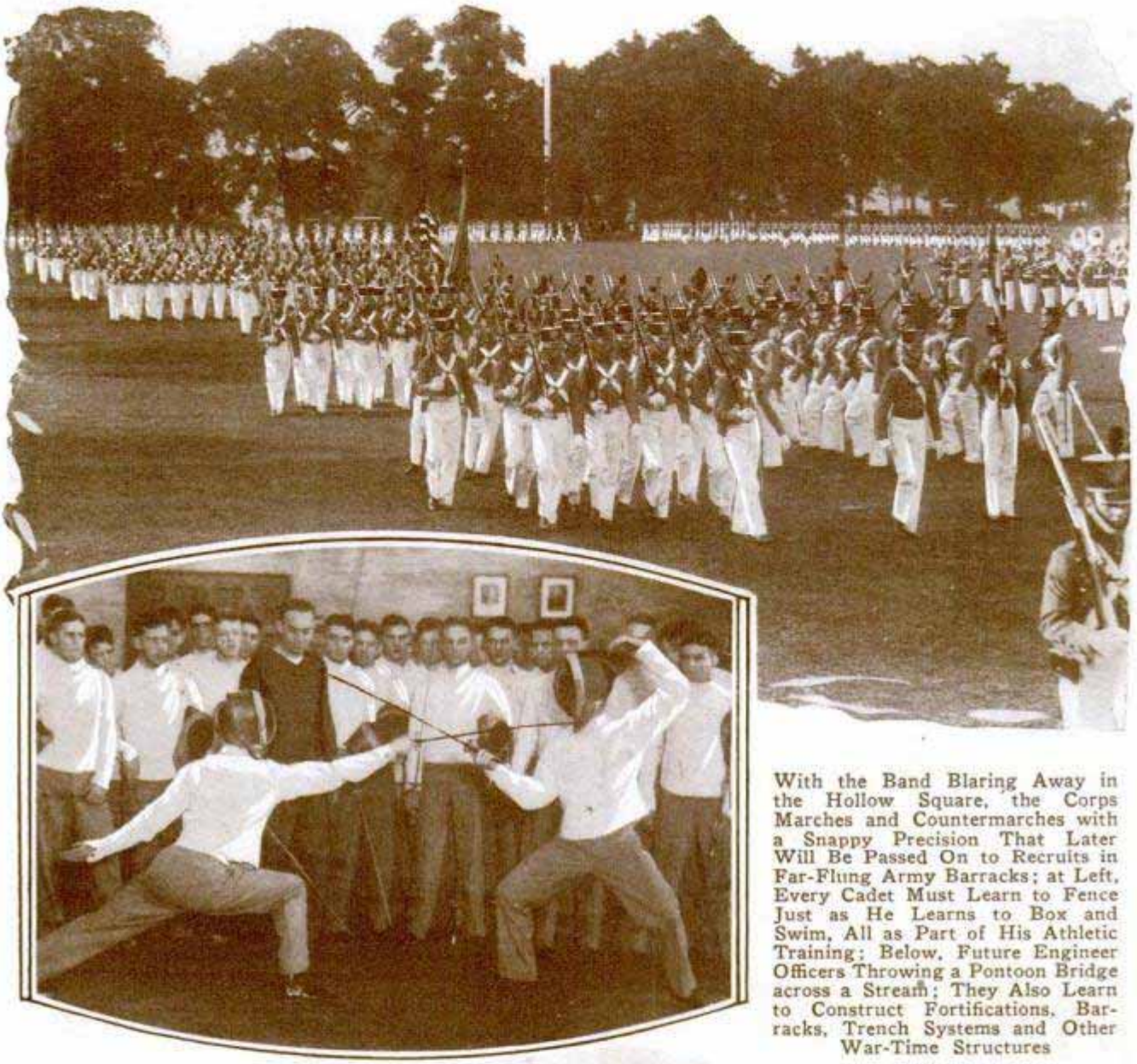
Getting Acquainted with an Army Bomber; a Group of Cadets Take an Air Lesson at Mitchell Field



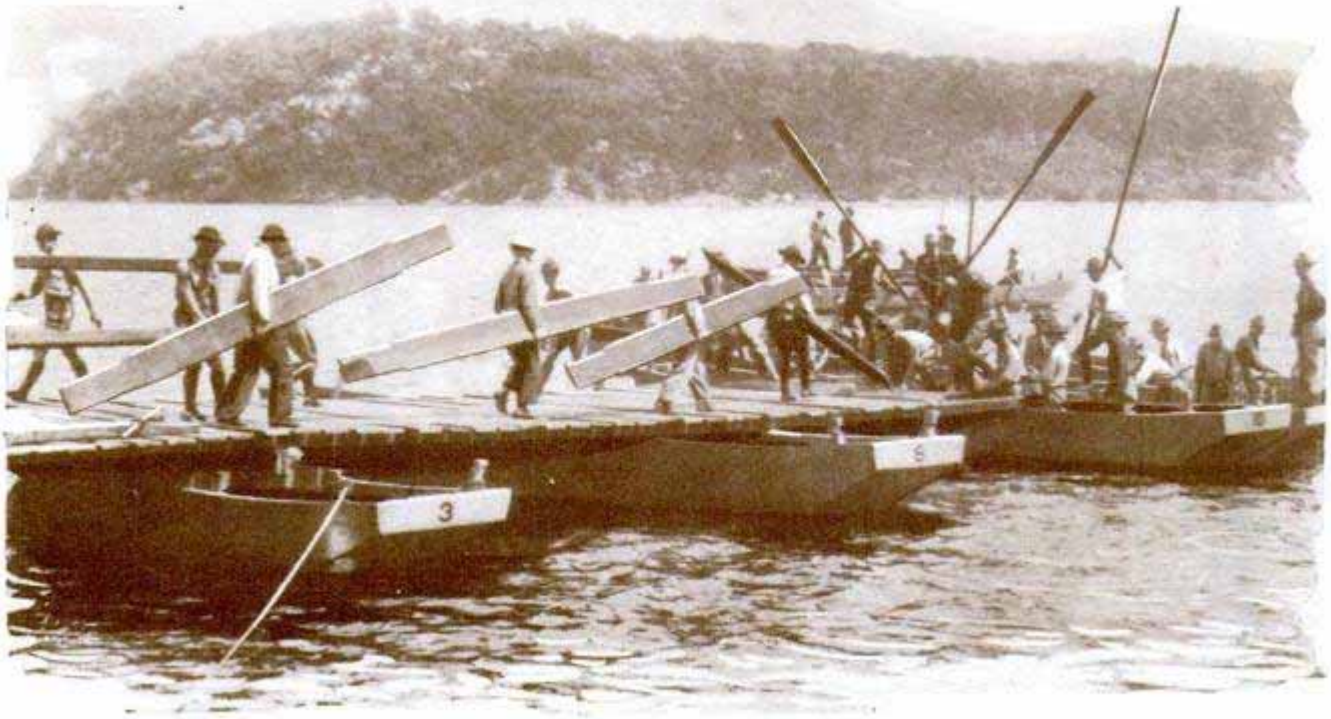
June Week Ends, If the Weather Is Fair, under an Open Sky, with a Bronze General on a Bronze Horse for Background, and the Secretary of War or the President, Sometimes, on Hand, to Distribute the Diplomas to the Graduating Class and Start Them Out as Officers

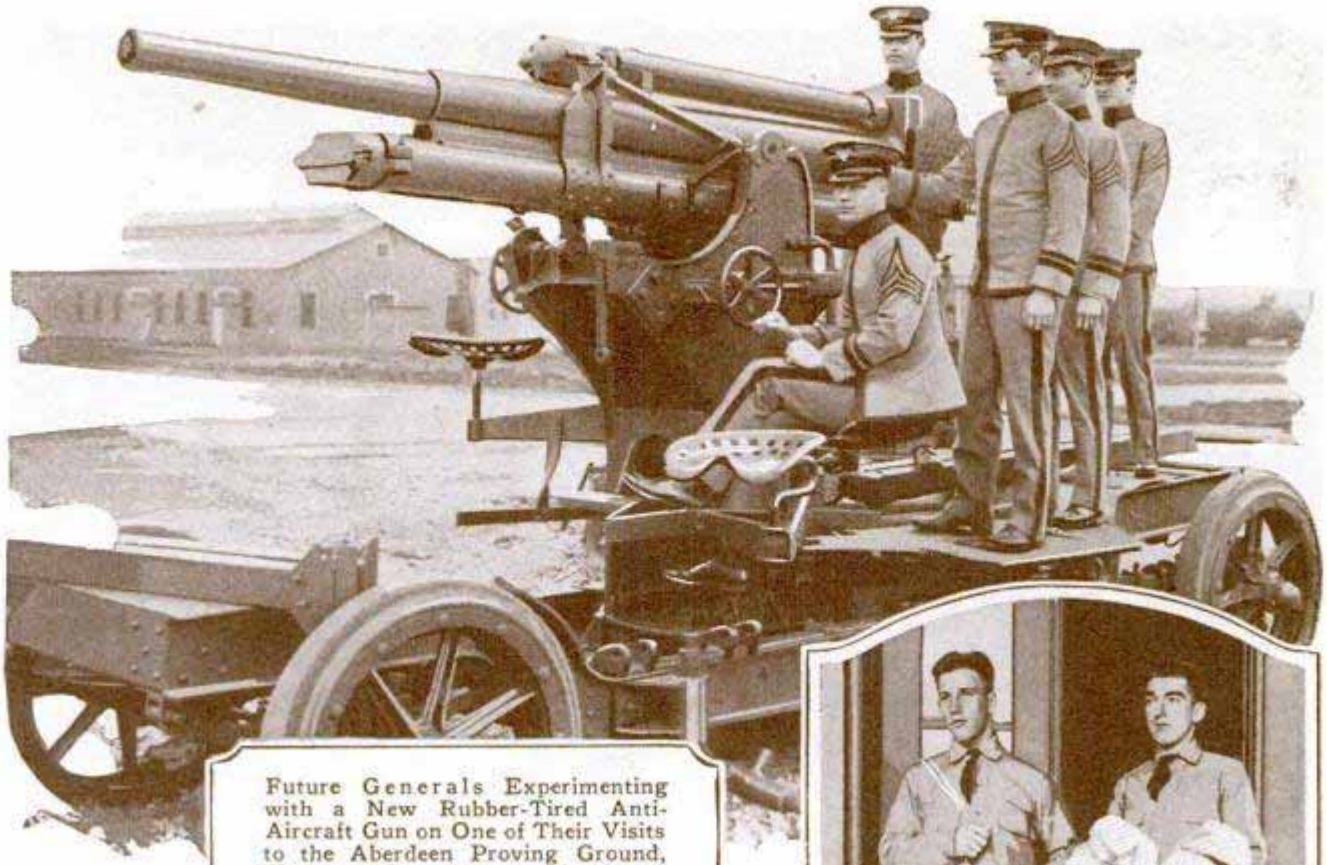


Modern War Is Fought, Too, over the Drafting Tables, For a Great Mass of "Paper Work" Is Necessary



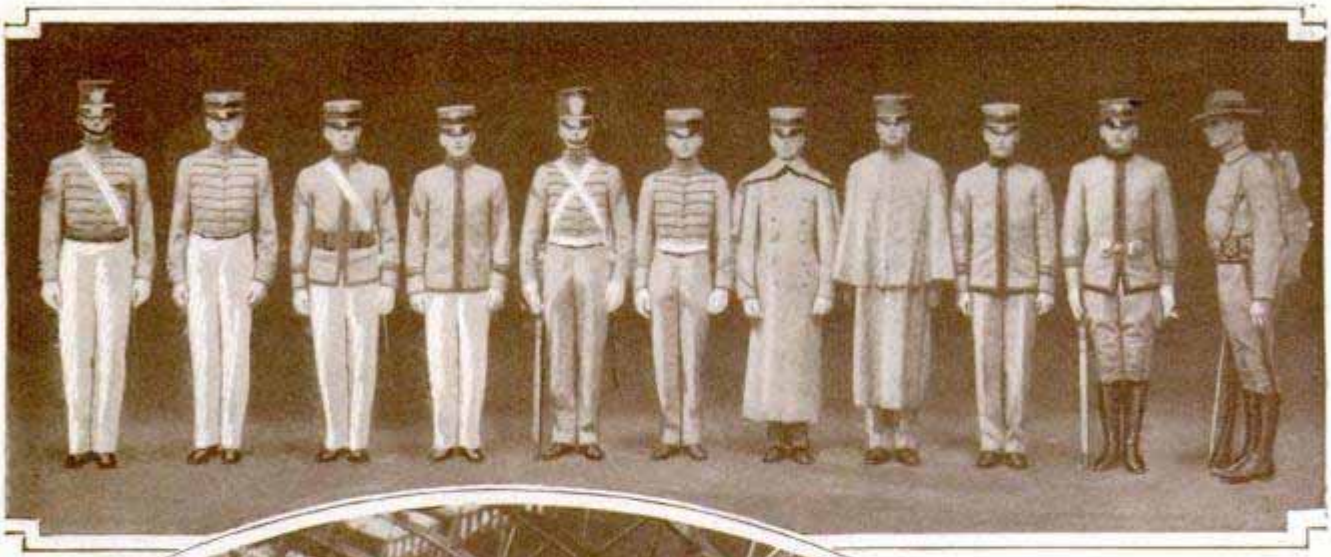
With the Band Blaring Away in the Hollow Square, the Corps Marches and Countermarches with a Snappy Precision That Later Will Be Passed On to Recruits in Far-Flung Army Barracks; at Left, Every Cadet Must Learn to Fence Just as He Learns to Box and Swim, All as Part of His Athletic Training; Below, Future Engineer Officers Throwing a Pontoon Bridge across a Stream; They Also Learn to Construct Fortifications, Barracks, Trench Systems and Other War-Time Structures

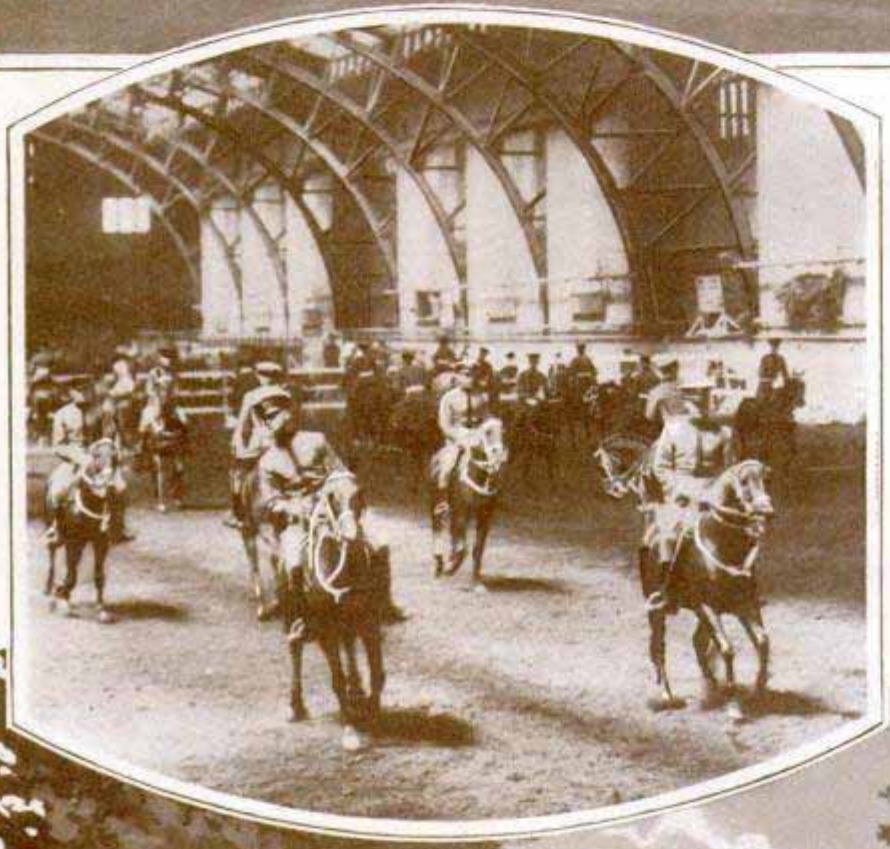




Future Generals Experimenting with a New Rubber-Tired Anti-Aircraft Gun on One of Their Visits to the Aberdeen Proving Ground, Where They Get a Chance to Watch the Weapons of the Future Being Tested; at Right, Plebes Delivering Laundry to Upper Classes

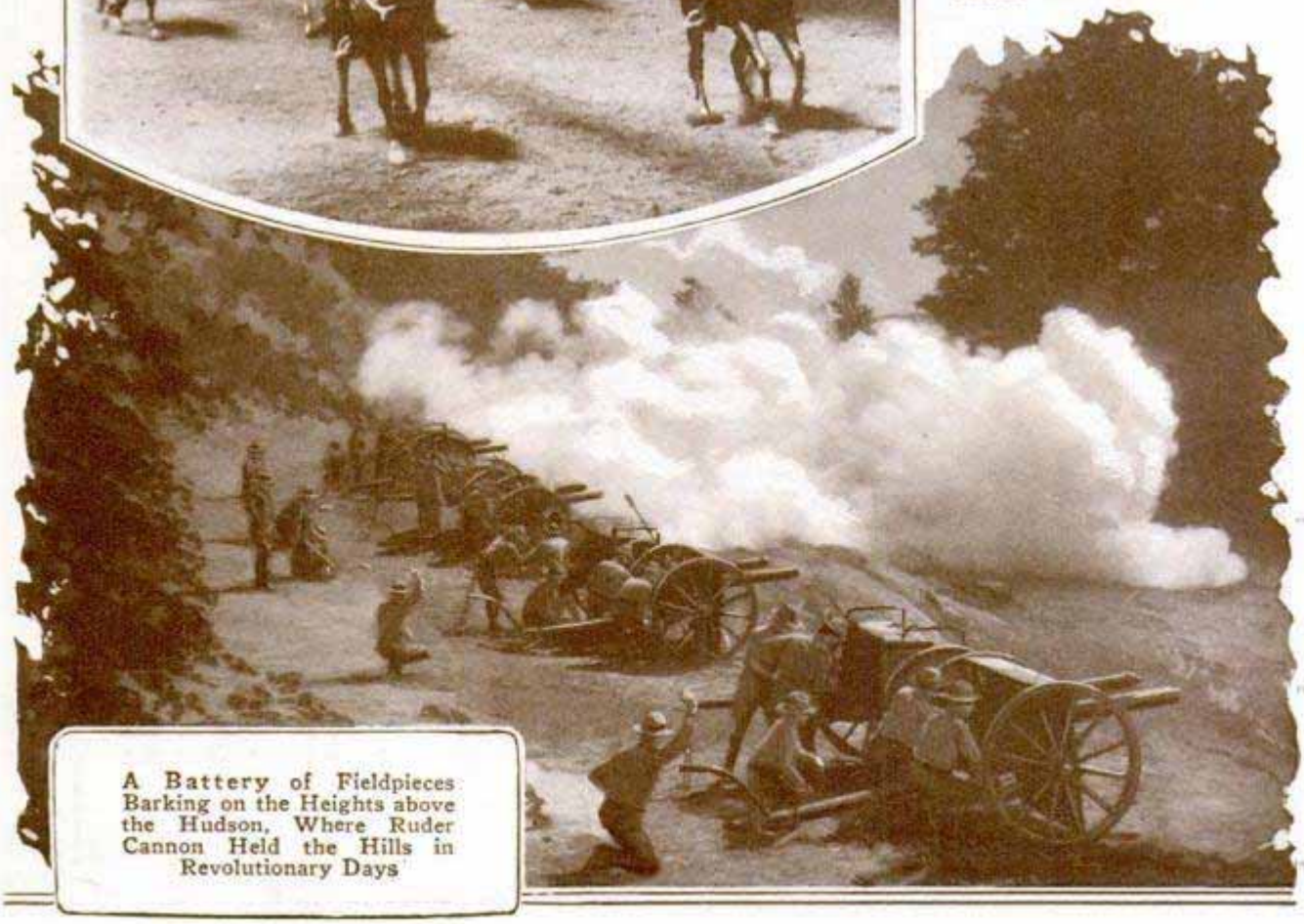
A Trio of Hurdlers at Track Practice; the Army, Like the Navy, Believes in Every Man Having a Part in Athletics; There Are No Confirmed Side-Line Cheerers in Either School



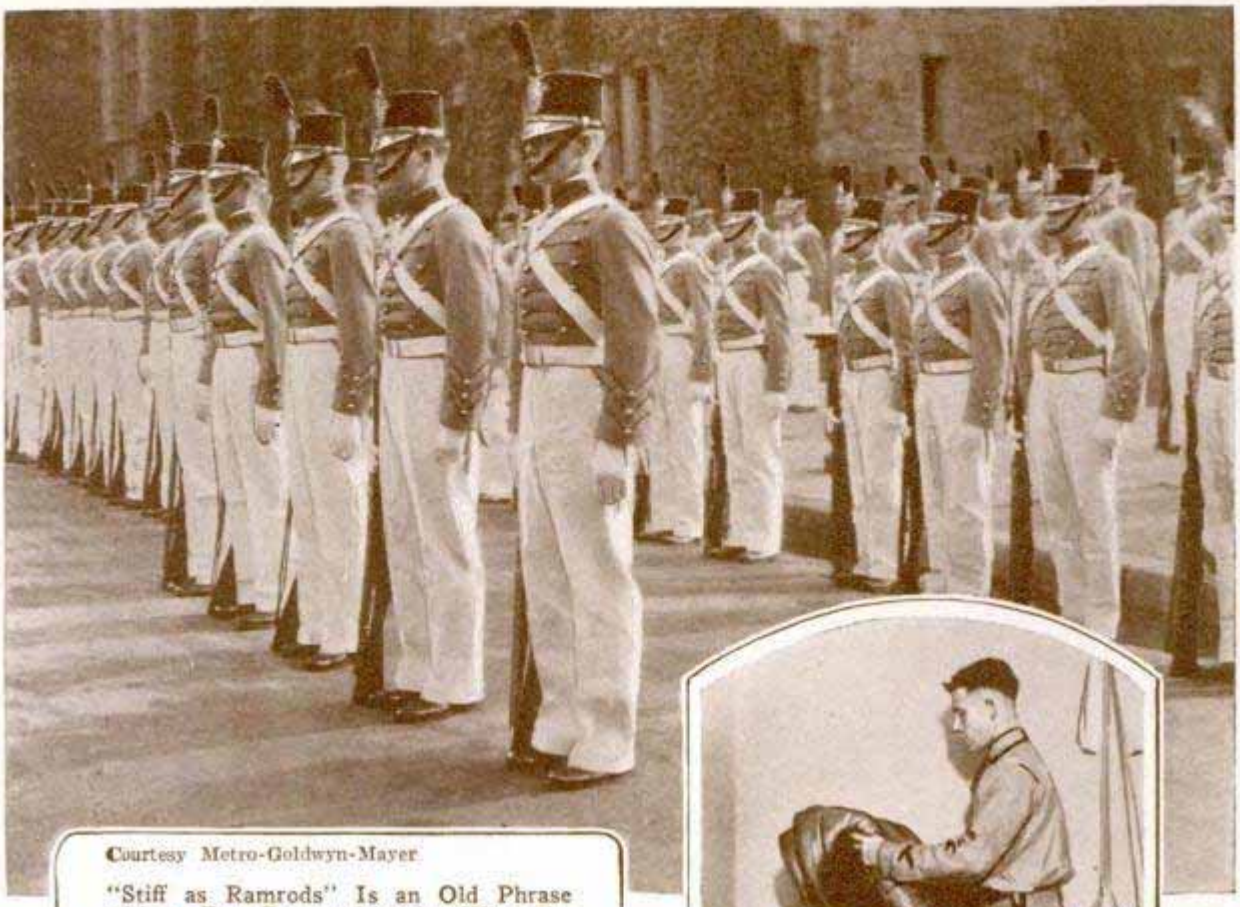


What the Well-Dressed Cadet May Wear for Various Occasions; It Takes Eleven Different Outfits, as Shown Above, to Equip Him for His Various Duties, and to These May Be Added the Ever-Useful Dungarees for Such Special Occasions as Riding inside an Oil-Spattered Battle Tank or Tinkering with the "In'ards" of a Refractory Motor Truck; at Left, the Enormous Riding Hall Provides Space to Teach Every Cadet to Be a Finished Horseman, For an Officer Must Ride and Stay on His Horse over Any Kind of Ground

Courtesy Pathe-De Mille

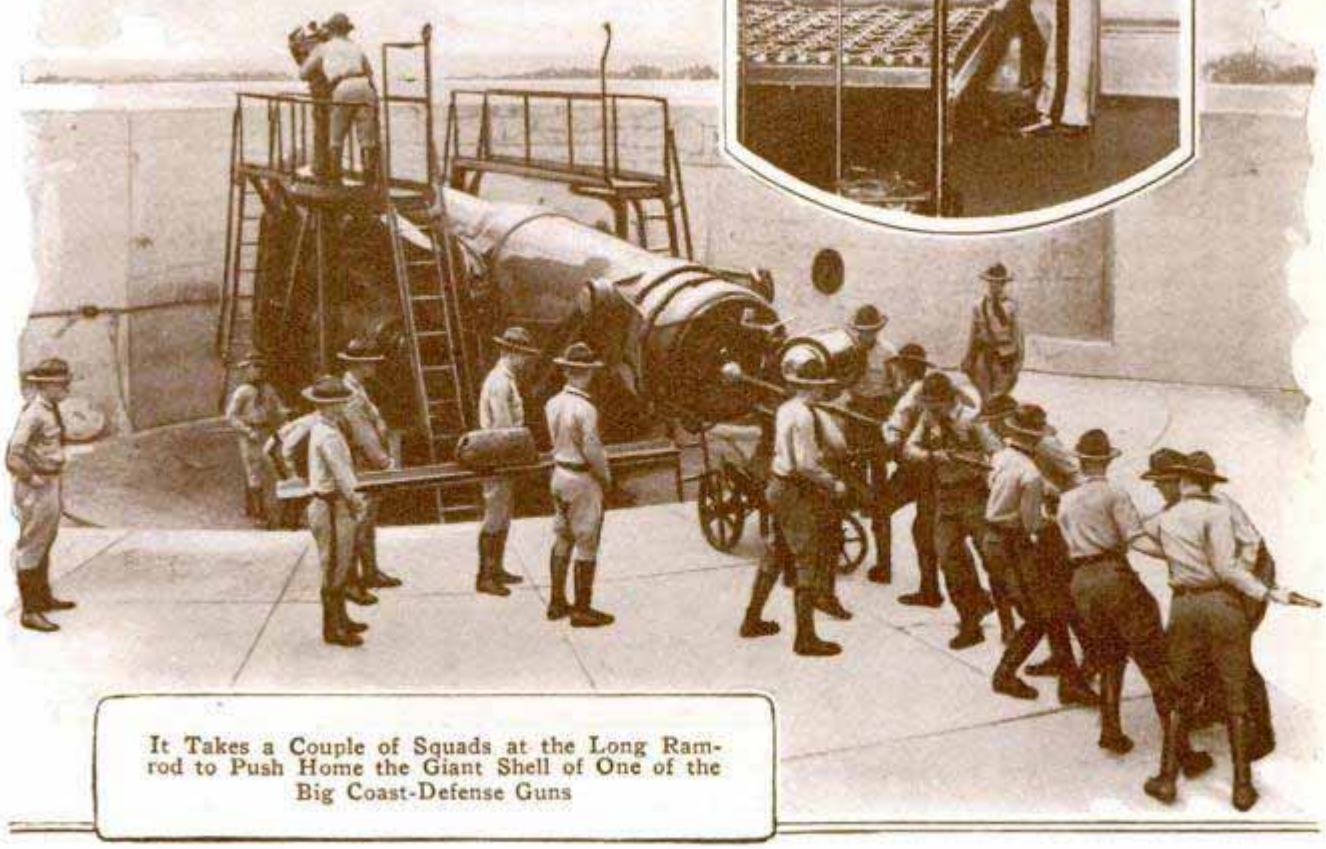


A Battery of Fieldpieces Barking on the Heights above the Hudson, Where Ruder Cannon Held the Hills in Revolutionary Days

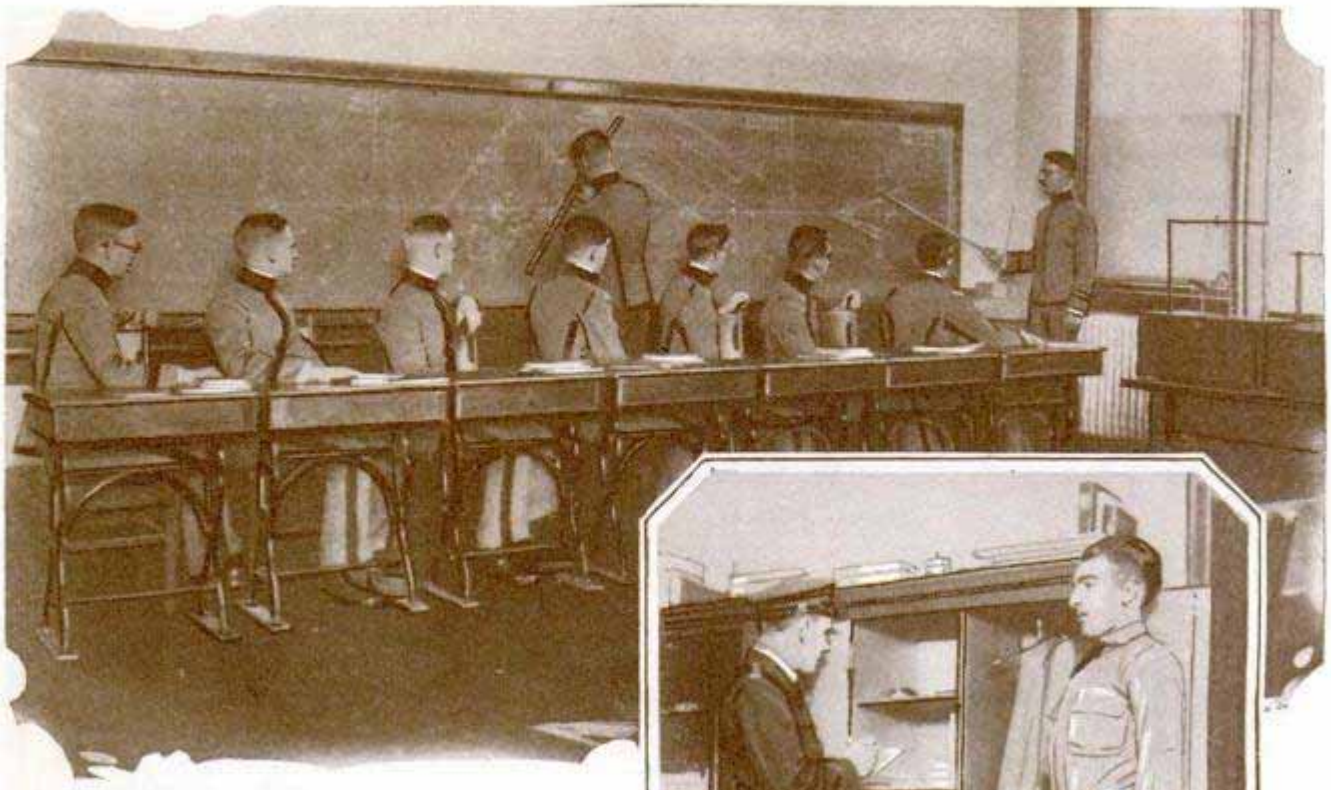


Courtesy Metro-Goldwyn-Mayer

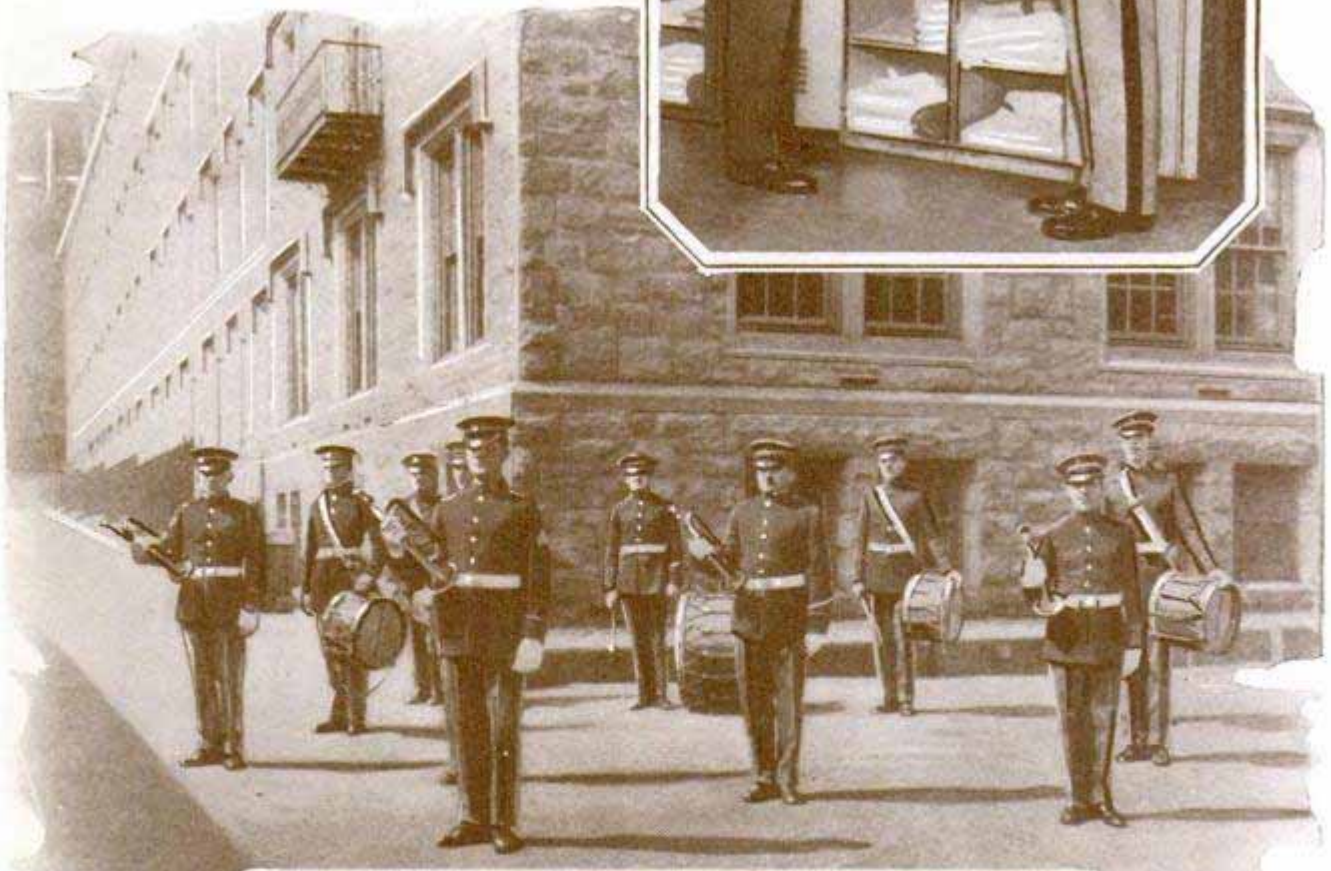
"Stiff as Ramrods" Is an Old Phrase with an Ever-Present Meaning When the Corps, in Dress-Parade Uniforms, Lines Up on the Drill Field for Inspection; Right, There Is No Maid Service



It Takes a Couple of Squads at the Long Ramrod to Push Home the Giant Shell of One of the Big Coast-Defense Guns



War Has Become So Scientific a Subject That the Cadet Who Cannot Master Higher Mathematics Soon Disappears from West Point; Above Is a Section of the First Class Watching a Bit of Blackboard Work; at Right, Daily Inspection of Quarters, When Every Article Must Not Only Be in Its Place, but the Whole Effect Must Be One of Scrupulous Neatness



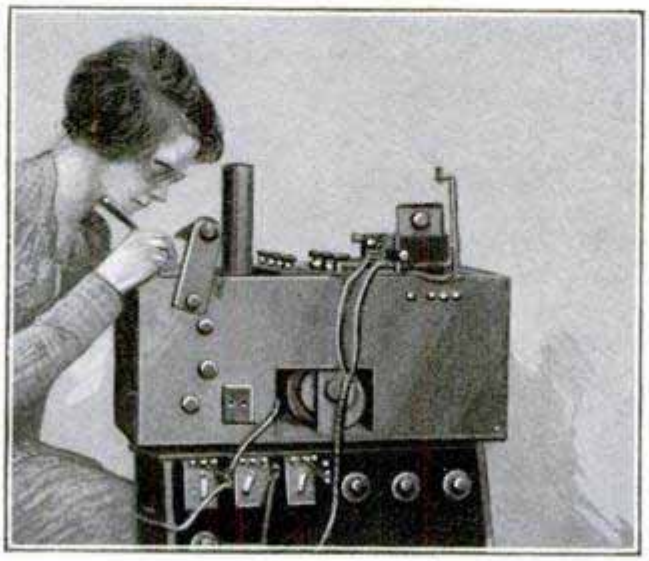
There Are Enlisted Men at West Point, and among Their Duties Is That of Getting the Future Officers Out of Bed; the Reveille Crew Is Appropriately Named the "Hell Cats"

INCREASE SPAN OF HUMAN LIFE THIRTY-EIGHT YEARS

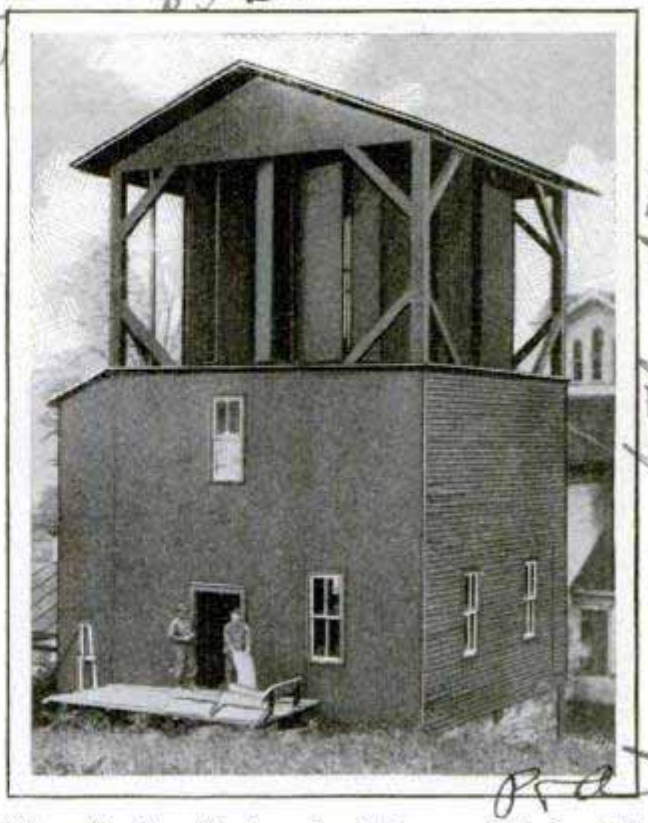
Since the sixteenth century, the average span of human life has been increased from twenty-one to fifty-nine years, according to data presented by the Pennsylvania department of health. Better living conditions, more effective ways of combating and controlling disease and more extensive health education are the chief factors responsible for this lengthening of life. Research has shown that during the period from 1501 to 1600, the average life span in Geneva was twenty-one years. This is compared with the present average span of fifty-nine years, prevailing in the state of Wisconsin, and accepted as a criterion for the world as a whole. Authorities believe that the span of life will go on increasing as science continues to solve the problems of disease.

STUDY EMOTIONS OF CHILDREN WITH ELECTRIC REGISTER

As an aid to persons entrusted with the instruction of young children, an electrical instrument introduced by a professor at the University of California, "takes pictures" of the emotional response of the youthful subjects to various stimuli, such as fear, joy, etc. The apparatus operates on somewhat the same principle as the "lie detectors" which have been employed by police departments. Connections are made to the child by small wires leading to silver plates in the sole and in the ankle of the shoes. A sudden disturbance of the child's mind may cause an increase or decrease in skin moisture, with a consequent variation of the electrical conductivity of the subject. This change is noted on a strip of paper. With the help of the register, the professor believes, harmful tendencies in the child may be recognized and counteracted during its education.



Electric Register That Gives an Index of a Child's Response to Various Emotional Stimuli



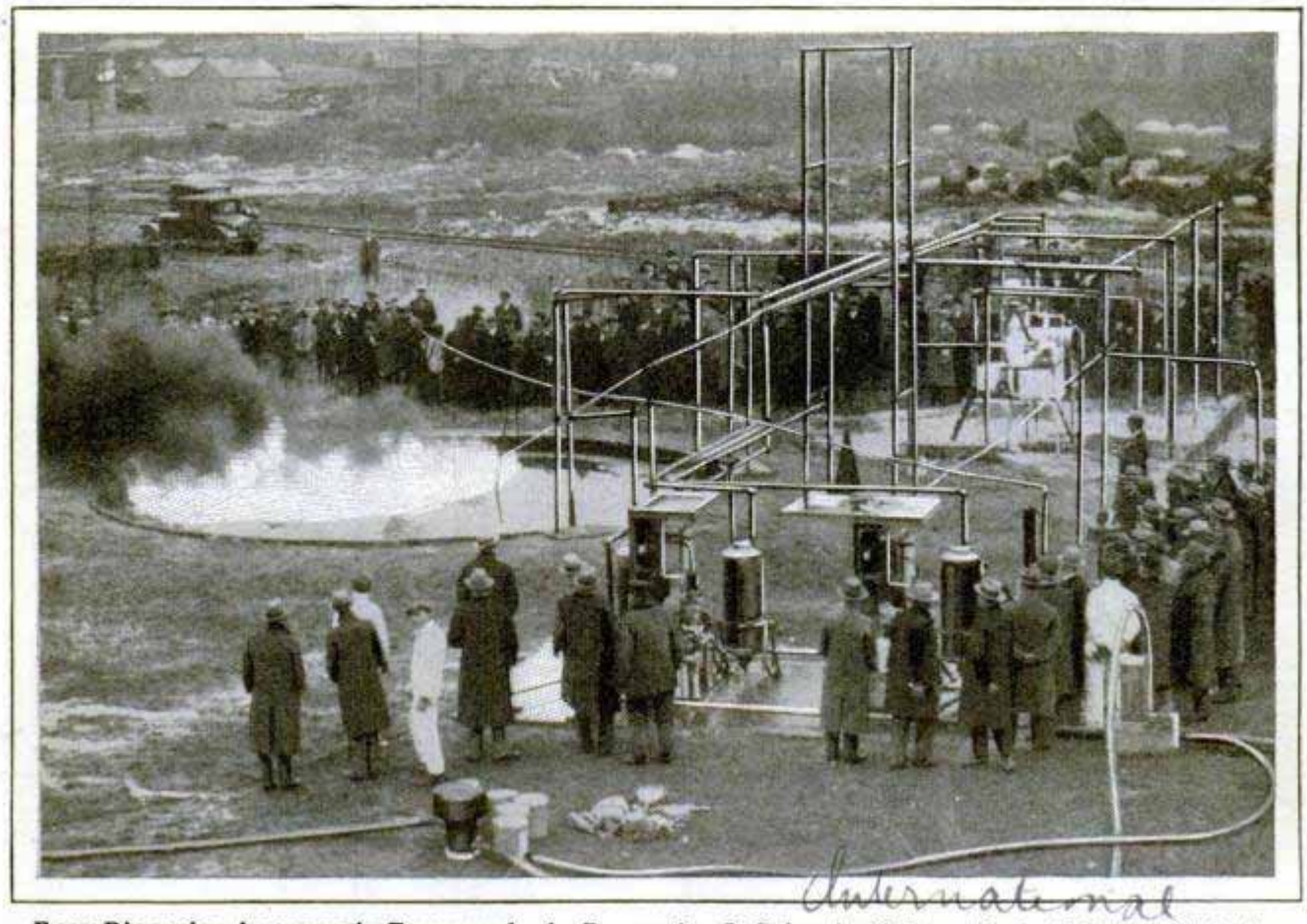
Where Shutters Replace the Customary Wheel; Odd Windmill on New York Farm, in Use Forty Years

WINDMILL RUN BY SHUTTERS GIVES LONG SERVICE

Housed inside a cupola and regulated by means of shutters that open and close, a windmill on a New York farm has been in use for more than forty years. The wheel can be shielded from the wind when the operators desire to shut it off, by closing the shutters.

RADIO "DETECTIVE" ON METER TRAPS CURRENT THIEVES

Radio is employed in catching electric-current thieves in a southern city. A miniature broadcasting unit is concealed within the meter and, in case of tampering, it sends out a continuous wave that may be detected by special receivers. It also registers an indication of the theft for the meter readers.



Foam-Dispensing Apparatus in Foreground; the Preparation Is Being Applied to a Pool of Blazing Oil during a Test; the Flames Were Smothered in a Few Seconds

FOAM BLANKET SMOTHERS FIRE IN OIL STORAGE TANK

An effective method of extinguishing fires in oil tanks and similar places, has been developed by spreading a blanket of a foam preparation over the blaze, cutting off the supply of oxygen. The foam is made by a special powder, mixed with water, the substance being directed over the burning material through pipes. It is quickly administered and has the additional advantage of preventing the spread of the blazing liquid.

SNAKE MYTHS ARE DISPROVED

Snakes that roll themselves up like hoops and pursue their victims with the speed of race horses, do not exist, but are simply one of the myths that have grown up about the reptile world, scientists declare. "Stinger" snakes that spear their prey and cow-sucking snakes are likewise creatures of fables, the bureau of biological survey reports, and it also has been proved, by repeated tests, that a rope laid on the ground will not keep snakes from crawling over and reaching a person sleeping on the ground within the barrier. The use of plants, like mountain ash, snake gourd and horseshoe geranium, does not repel snakes. It has also been found that the reptiles are immune to several of the poisonous gases.

CARRIER LOCKS AUTO LUGGAGE AND FITS ANY CAR

Adjusted to the running board of any automobile, a luggage carrier is fitted with a means for quickly locking a trunk or case to its frame, so that the article cannot jar out or be stolen. The rack is held to the running board with clamps and the locking unit is cushioned with soft rubber so that no damage is done to the car or to the trunk.

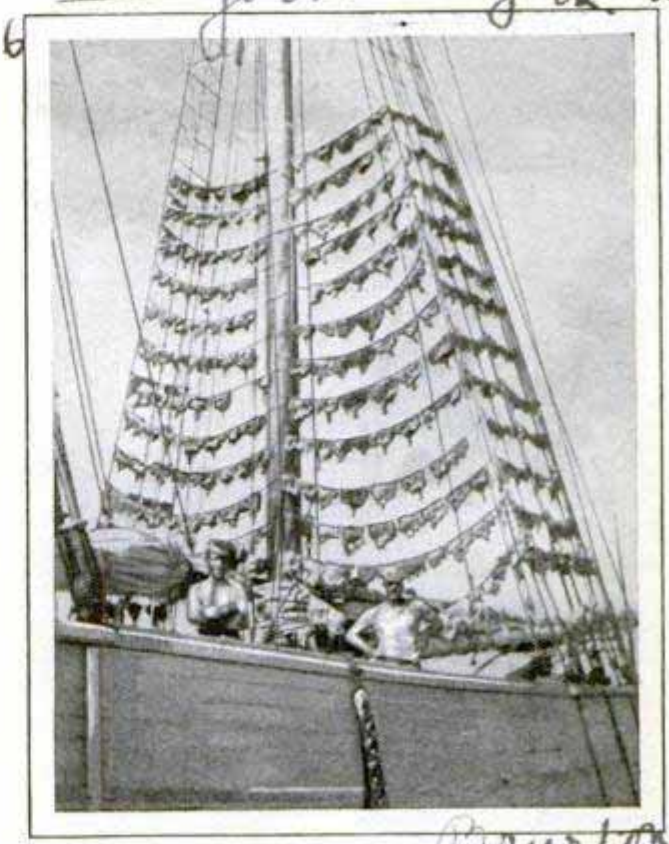
TWO-COLOR GLASS GOGGLES HELP IN FACING LIGHTS

Special dark glasses have been introduced for the help of sportsmen, auto drivers and others who must often face glare and strong light. They are composed of two wedge-shaped pieces of glass fused together, the upper part being of a dark gray-brown color and the other clear. When encountering a glare, the wearer simply lowers his head and looks through the top of the goggles until the offending light has passed, when he raises his head and enjoys clear vision through the uncolored portion of the lenses.

TRACK MOWER CLEARS WEEDS FROM RAILROAD LINE

A motor-driven machine to keep the weeds and grass cut alongside the railroad track has been developed by a Minnesota company. The mowing equipment is driven by a five-horsepower gasoline engine, and the machine is towed by any small gasoline-driven handcar. The cutting bars are carried on two I-bars, which can be adjusted for close or distant cutting. When the bars are fully extended, with the cutters run out to their ends, the knives will reach thirteen feet from either side of the tracks, and they can be raised or lowered to fit any contour of the banks. The knives cut five and a half foot swaths at each passage, and in heavy weeds, the outfit can make four miles an hour, cutting close to the track, or three miles an hour fully extended. Three men are required, two to operate the mower and one to pilot the towing handcar.

Keeping the Weeds in Check along the Railroad Right of Way; the Knives Reach Thirteen Feet on Either Side of the Track



Ship's Rigging Put to Novel Use; Drying Fish at Sea Helps Protect It from Dirt

FISH DRIED ON SHIP'S RIGGING TO SAVE EXTRA HANDLING

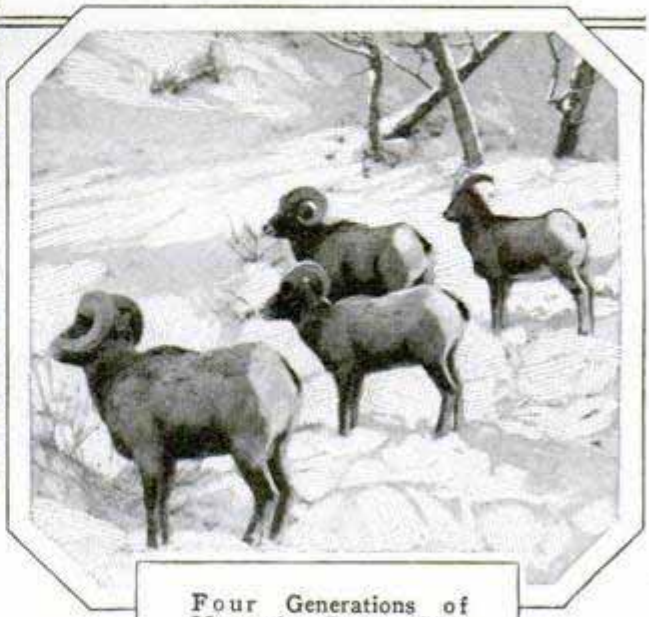
Curious use is made of the rigging of a fishing schooner, putting out from Havana, Cuba. Instead of taking the catch ashore for drying, the fish are hung on the lines of the rig where they are safe, comparatively free from dirt and exposed to the sun at all times of the day.

LAMP-POSTS BROKEN BY AUTOS COST CITY THOUSANDS

To replace lamp-posts broken by careless automobile drivers, costs New York city more than $17,000 a year, according to official reports. Last year, 345 posts were ruined or damaged in Manhattan, 134 in Brooklyn and fifty-four in the Bronx. The costs are generally collected from the offender or, in case of a fatality, from his estate, when the cause of the accident is found to be bad driving for which the killed operator is to blame.

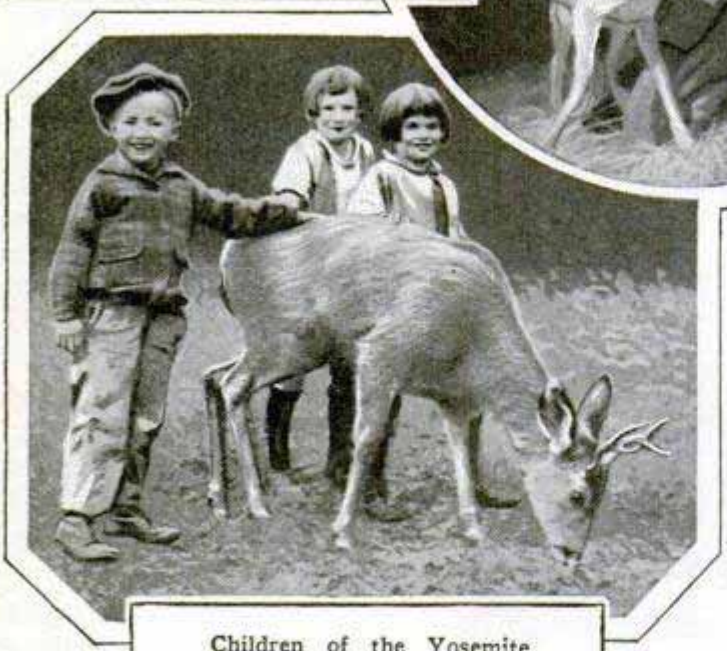
PERMANENT RESIDENTS OF THE NATIONAL PARKS

The Little Daughter of the Superintendent of Yellowstone with Two of Her Playmates; the Fawns of the Park, like Their Elders, Can Be Fed from the Hand



Four Generations of Mountain Rams Sunning in the Snow Fields of Yellowstone Park

Week-Old Buffalo Calf, and an Antelope Kid Being Introduced to the Feeding Bottle by Chief Ranger Sam T. Woodring, Left; Below, a Stag Pauses on the Alert



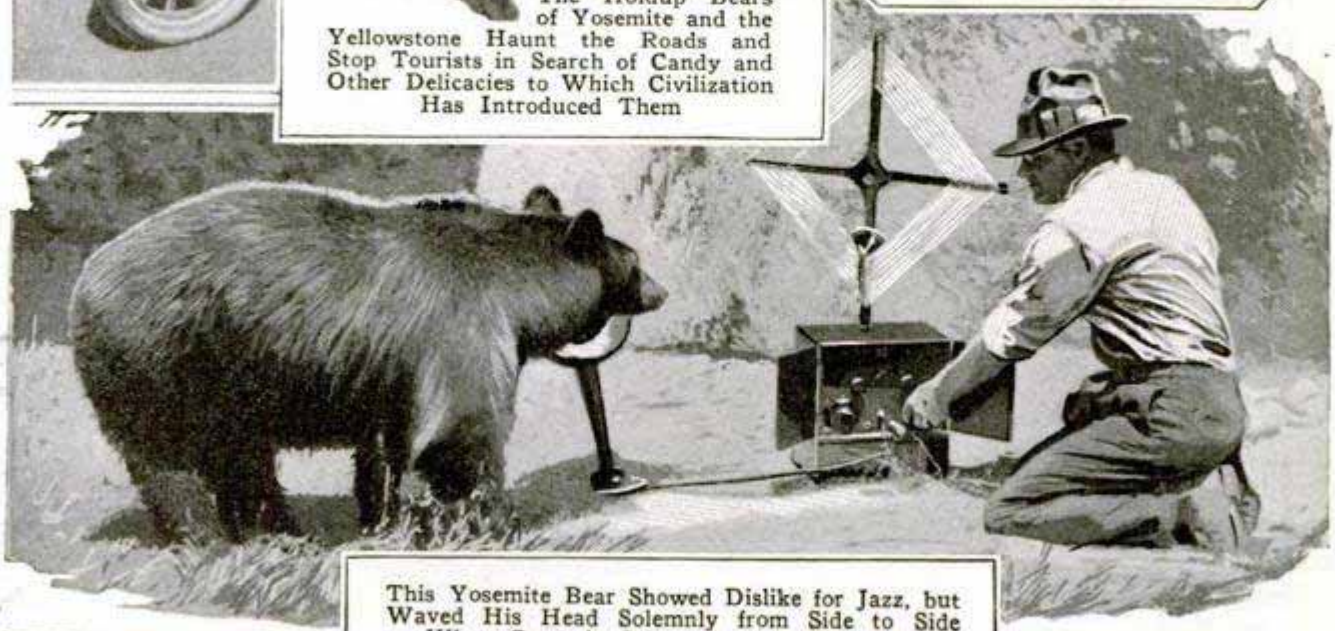
Children of the Yosemite Valley Grow Up with Deer for Pets

Center Photos, Courtesy Nat'l Park Service; Left Bottom Photo by J. V. Lloyd

GETTING READY TO ENTERTAIN SUMMER TOURISTS

Above and at the Right Are Some of the Friendly Bears of Crater Lake Park, Where Mama Bears Solve the Food Problem by Taking the Children to the Cook to Be Boarded

The Holdup Bears of Yosemite and the Yellowstone Haunt the Roads and Stop Tourists in Search of Candy and Other Delicacies to Which Civilization Has Introduced Them

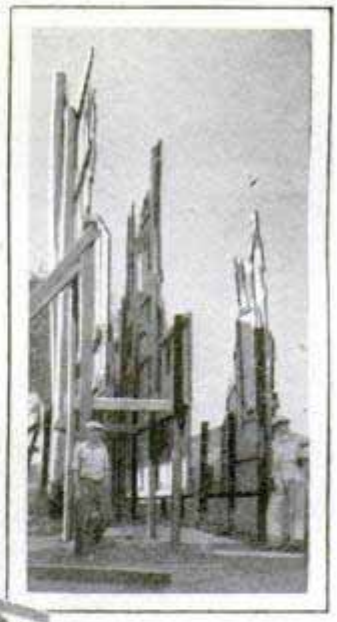


This Yosemite Bear Showed Dislike for Jazz, but Waved His Head Solemnly from Side to Side When Operatic Selections Were Received

Top and Right Center Photos © Fred H. Kiser; Bottom Photo by J. V. Lloyd

BILLBOARDS LIKE STAGE SETS GIVE BETTER DISPLAY

Billboards constructed after the manner of stage scenery have been introduced, the arrangement giving a better perspective, regardless of the angle from which the board is seen, although the front view is intended to be the best. The first boards of this type were made in three units, but larger numbers are possible, a chief advantage being that the display gives the impression of depth by this means. The plan also permits unusual lighting effects, and changes can be made in one of the sets without affecting the others.



Three-Section Sign That Gives Realistic Perspective; Arrangement of the Units Is Seen at Upper Right

MAKE STEEL AT COST OF IRON BY NEW PROCESS

Development of a process for the manufacture of steel without the necessity of coking coal, and at a cost not in excess of that required for the manufacture of pig iron, has been announced by the American Research corporation. Energy hitherto wasted in the blast furnaces and various chemical interactions are harnessed to supply the necessary heat, and other conditions, for the making of steel. The iron ore is first converted into "sponge." This is chemically treated, put into a special retort, then melted and finally alloyed to produce the steel desired. The process can be executed in single production units, permitting a great saving in fuel, according to officials of the corporation.

CONE IN BOTTOM OF PIPE BOWL INSURES COOL SMOKE

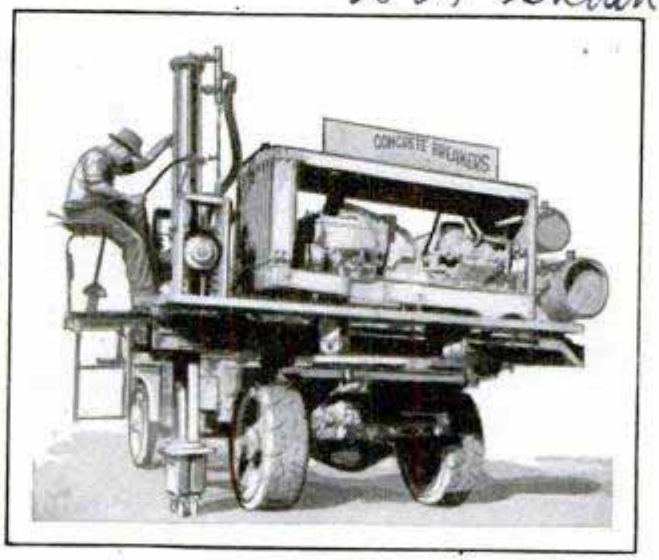
Inserted at the bottom of the tobacco pipe bowl, a perforated aluminum cone is said to keep the filling dry down to the last crumb, so that the smoke is cool, free from strong juices and more fragrant. The cone does not interfere with the draft, effects economy and makes the pipe easier to clean.

SCIENTISTS STUDY "AIR BUMPS" TO AID AVIATORS

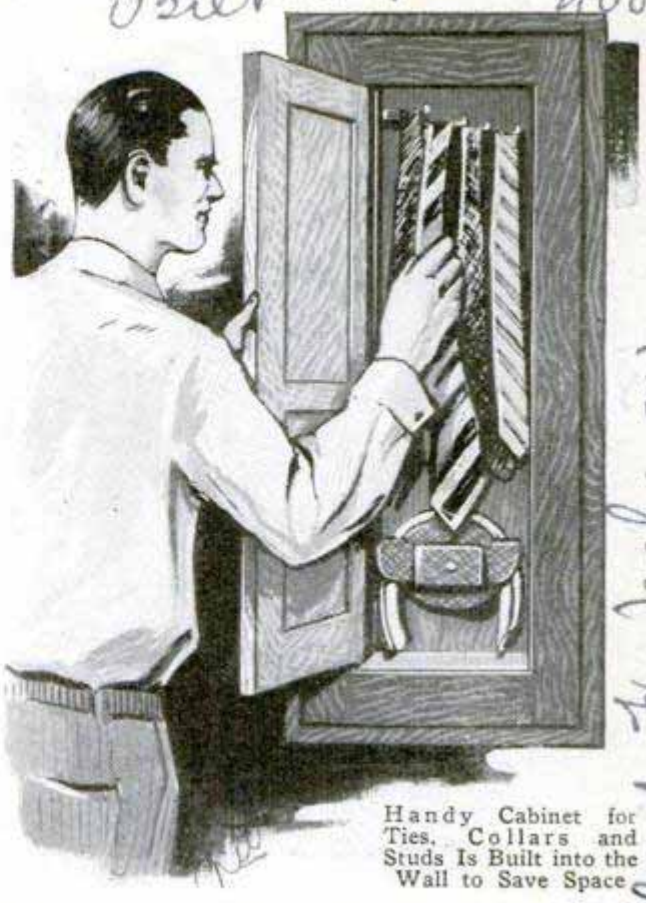
"Air bumps," which often play tricks on flying craft, are receiving careful study at the hands of weather-bureau experts. Ordinarily, the bumps are localized, and a seasoned pilot flies through them without difficulty. Not long ago, however, the air-mail service between Cleveland and New York, in both directions, was interrupted by forced landings, necessitated by the extreme roughness of the air. Two pilots had to battle for their lives. Pilot Smith's altimeter recorded tremendous fluctuations in altitude through the shifting of powerful air currents. He would have been thrown from the cockpit but for the straps that held him in. Experts ascribe bumpiness of this nature to two causes. One is the contrasting temperatures at different altitudes when the air is heavily loaded with moisture. The condensation and convection thus brought about, create sudden changes in the warmth or coolness of the air and establish vertical air currents which result in bumpiness. A contributory cause is the similar effect of mountain ridges.

TURNTABLE PAVING BREAKER SPEEDS STREET WORK

Ditches six inches to ten feet wide can be cut with the aid of a turntable pavement breaker which has been devised to expedite and simplify street work of various kinds. Only two men are required to operate it and the breaker may be run on the street while hammering up the sidewalks, a valuable feature, as in many cities the roadways are being widened by slicing off the walks. The adjustments for the turntable are so exact that the swing of the hammer to one side or another may be regulated within a fraction of an inch.



Concrete Breaker That Turns on a Table for Reaching a Wide Radius on Street Jobs



Handy Cabinet for Ties, Collars and Studs Is Built into the Wall to Save Space

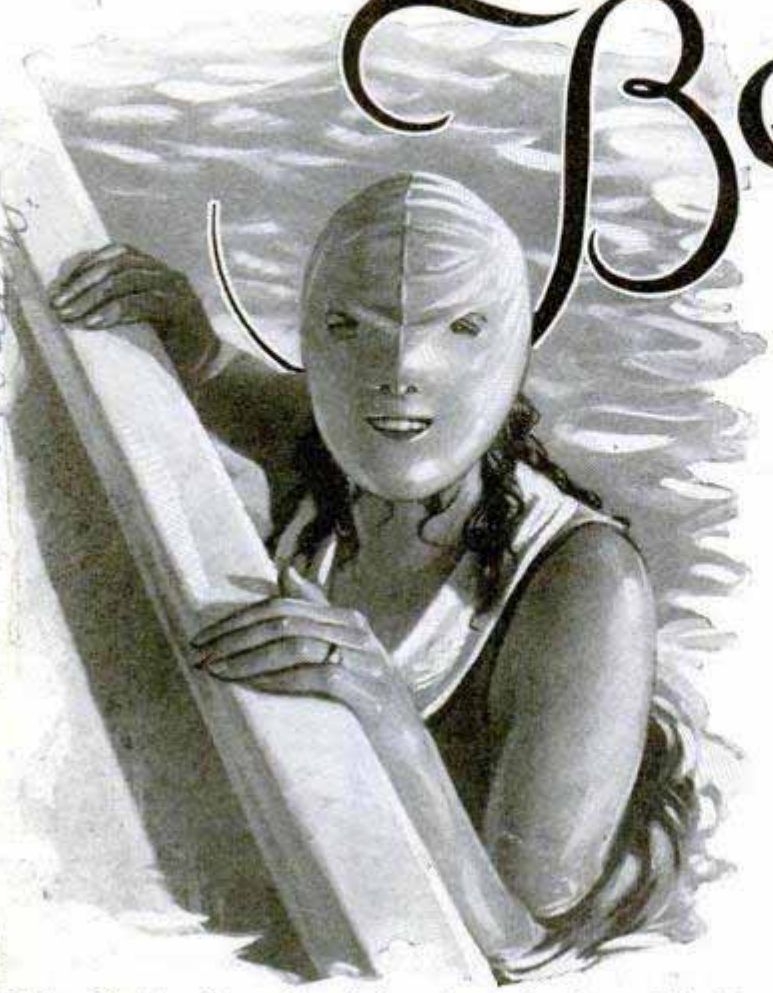
BUILT-IN TIE AND COLLAR RACK LATEST SPACE SAVER

One of the latest developments in avoiding waste space in apartments is a built-in cabinet for collars and ties. It contains racks for keeping the articles in a neat and orderly manner, there is a drawer for collar buttons and on the door of the case is a small mirror.

SAFETY-BUTTON ELECTRIC IRON REDUCES FIRE PERIL

To decrease the likelihood of fires from electric irons, a button control has been added to an iron of recent manufacture. As long as the button is depressed, the current remains on, but it is shut off as soon as the thumb releases the button. The arrangement does not interfere in any way with the normal operation of the iron.

Beware



Rubber Bathing Caps, Extended to Cover the Face, Offer One Solution to the Problem of Too Much Sunlight

By CRAG DALE

SUNSHINE is life, but it also leads to harmful physical effects, despite all that has been said and written about its great curative properties.

On golf course, swimming beach, tennis court and baseball lot, every year much harm is done to lovers of outdoor sports through sunburn, and in many instances the injury is greater in its ultimate effects than is the increased muscular power that is gained by the exercise.

Beware of sunburn!

Naturally anyone who ever has been badly sunburned realizes the inconvenient pain that follows, but, until very recently, it was not definitely known that the burn seriously impaired any organs of the body. Sunburn was taken as a matter of course, a necessary part of the tanning process that was bound to result from continued exposure to outdoor sunlight. And it was generally thought that the process was beneficial. So was it once thought that the bleeding of ailing persons was always useful in overcoming any disease.

Under the direction of Dr. A. C. Carlson, of the University of Chicago, Dr. Marie Hendricks has been carrying on minute experiments with sunshine and ultraviolet rays in a successful effort to determine whether overexposures would have injurious effects. Dr. Carlson announces that in every instance where overexposures have been applied to animals that consist of only one cell, that animal died quickly. The effect simply was the destruction of the cell. These experiments led to similar investigations on animals composed of many more cells, and even with humans. And the positive results are but now being made public.

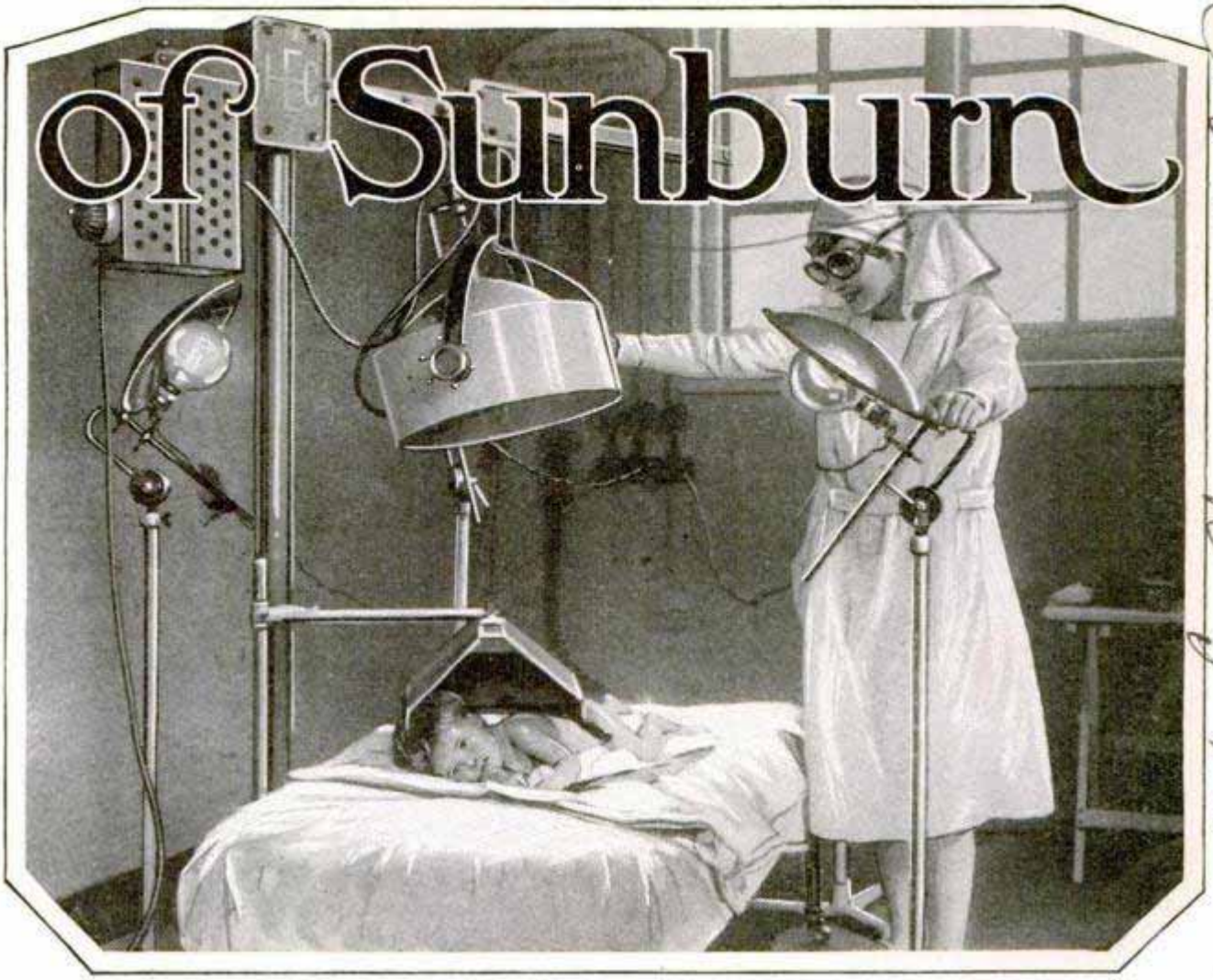
At Northwestern university similar researches are being carried on by Dr. W. T. Bovie and Dr. A. C. Ivy, one of the leading physiologists of the country. Both of them confirm Dr. Carlson's findings, and Dr. Ivy goes even a little farther with the theory that sunburn has harmful effect upon the adrenal gland, one of the most important ductless glands of the human body.

The immediate effect of sunburn on humans, explains Dr. Carlson, is the injury to the deep skin tissue.

"That injury," he said, "is nothing less than the destruction of the body cells in the area affected by the burn. Immediately following that destruction, a poison is formed in the body, with the result that the victim of the sunburn suffers great depression, both physical and mental.

"The worst kinds of overexposures are those that burn the eyes. The eyes are very susceptible to sunburn, especially if the sun is reflected from water, concrete or sand. The tissue of the outer surface of the eye is very thin and the blood lies

# of Sunburn



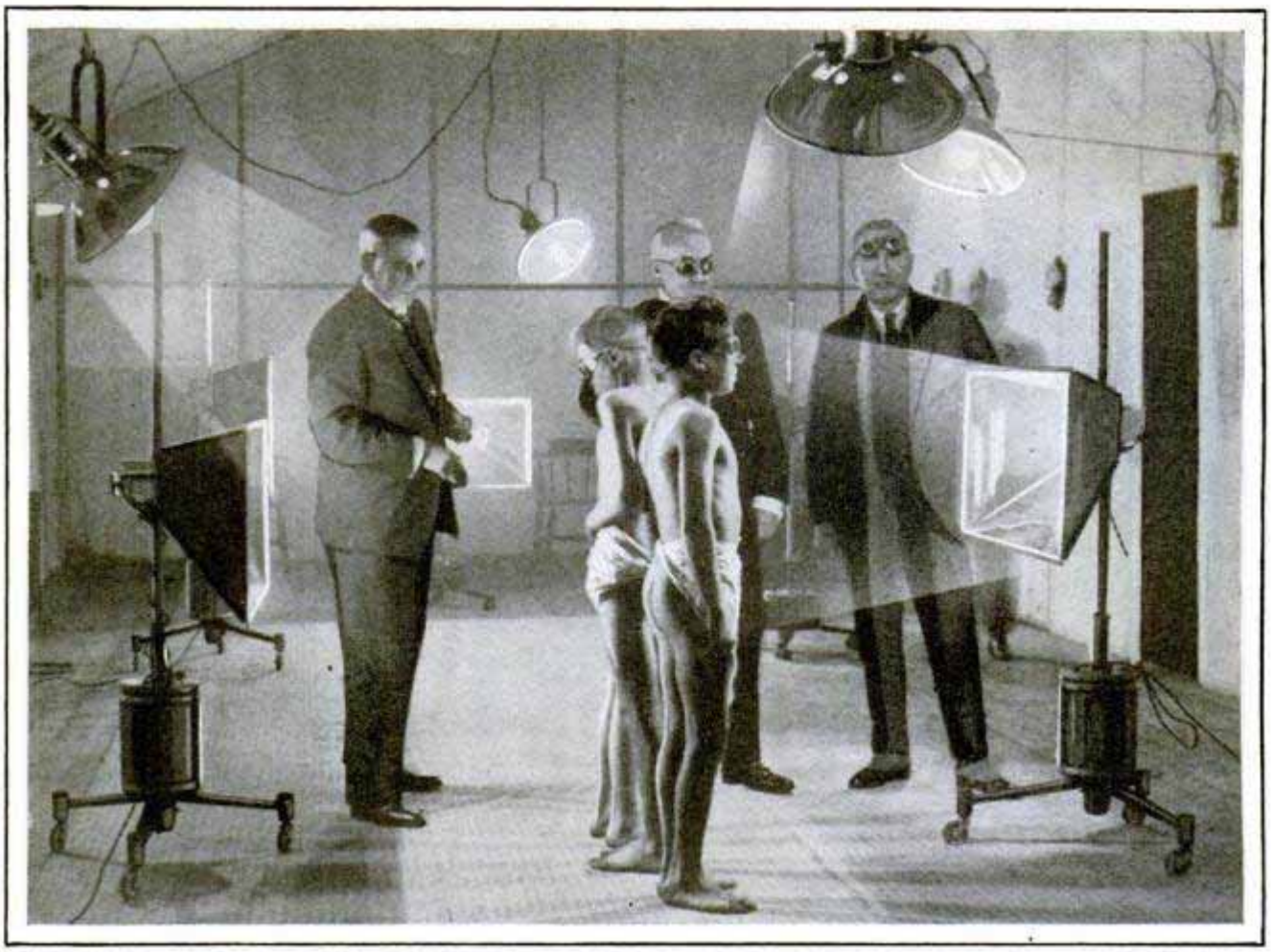
Artificial Sunlight Is Proving Beneficial in Treatment of Many Diseases, But Must Be Carefully Regulated to Avoid Harming Both the Patient and the Nurse through Burning

quite close to the surface. The ultraviolet rays easily penetrate into the blood, and when that occurs, there is a chemical change in the blood itself. We do not know the exact nature of that change, but we do know that the new or different blood compound quickly lowers the blood pressure in every case, and produces a quite undesirable shock, which, in extreme cases, might result in death."

Just how the ultraviolet light affects the blood is an unsolved puzzle, but Dr. Bovie suggests that the effect is a secondary action following the destruction of the surface tissue of the skin. Blood, he points out, is of the same ruby color as the glass used in the photographer's dark room, to shut off all but the red waves while plates are being developed. Nature apparently has provided man with a flowing sheet of liquid ruby glass to protect the interior of the body from the penetration of the more injurious light waves. But when the skin is burned, and the tissue destroyed, the blood stream must carry off the waste material, while furnishing food to build up new tissue. It is these impurities in the blood stream—some of which may be beneficial while others are decidedly harmful—that apparently do the damage.

Science has yet to find why the system may benefit through destruction of some of the surface tissue in the process of tanning. The apparent effect is to stimulate the system and tone it up so that it becomes more able to combat disease. One of Dr. Bovie's associates, suffering from periodical outbreaks of boils which resisted all efforts to suppress them, was finally cured by exposure to an ultraviolet lamp. Within a week the boils had disappeared. The only probable reason lay in some change in the blood stream which toned up his system to attack the infection.

Overexposure to one of the intense artificial ultraviolet lights, such as a mercury-vapor arc in a quartz globe, however, is a serious thing. Describing the effects,



Ultraviolet Lights, under Proper Supervision, Furnish Carefully Regulated Doses of Sunlight, but in Inexperienced Hands They Are So Dangerous Doctors Oppose Their Use

Dr. Bovie says that after such exposure he has been forced to stay in bed for several days. "I thought I would die—and kept wishing I would," he explains. Curiously enough, the sensations, even to the wish to die, were exactly the same as those experienced by an investigator in a southwestern university who a few years ago experimented with poisonous spiders to determine the effect of their bites. In each case the poisons apparently had the same physical and mental effects on the sufferers.

The manner in which the poison that is produced from sunburn is eliminated from the body is one of the reasons why it is so harmful—harmful even to the point of a pronounced anemic condition in the system of one who exercises constantly. Dr. Carlson has found that the elimination of that poison directly affects the kidneys and liver, putting an added burden on those organs and perhaps on the spleen.

Dr. Bovie thinks that too much exposure to sunshine or to violet rays in infancy, or in the early years of growth, may well be expected to dwarf an individual. In support of his belief, he cites the difference in stature between the natives of the tropics and of the temperate zones. He also points out that all known pygmies are black or bronze, indicating generations of exposure to the sun's heat and its ultraviolet rays.

"It is certain," he explains, "that exposure to sunlight increases pigmentation —tanning or coloring of the skin. It should be obvious that the greater and longer the exposure, the heavier will be the pigmentation, which is nature's armor against attacks of ultraviolet rays.

"Too much exposure certainly brings about a pronounced depression, even in people who live in the temperate zones. That depression, in all probability, has much to do with glands in the body that affect growth."

It is the naturally increased quantity of pigment, or coloring, in the skin of brunettes that makes them less easily sunburned than blonds. The pigment itself acts as an absorbent of ultraviolet rays.

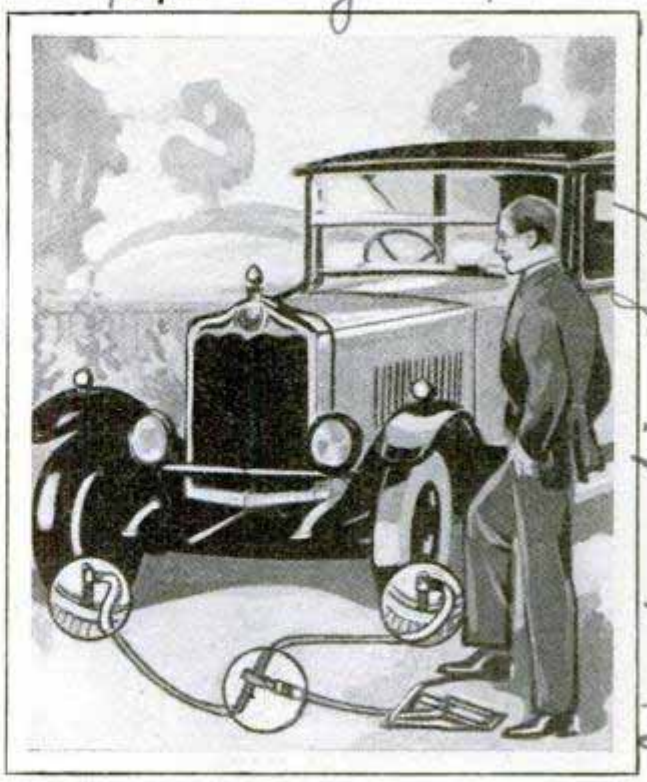
"The skin blisters," comments Dr. Carlson, "because of the heat under the outer layer. It makes the deep skin sweat or 'cry,' as it is called in the medical profession. The inability of the sweat to get through the outer skin is what causes the blister. That and nothing more. The burn will have killed the outer skin, of course, and as it is dead, it begins to be pushed away by the natural processes of skin repair. That is when the peeling begins. Part of the dead skin goes into the system as poison, and part of it vanishes into the air as scurf. The remainder is that which a victim of sunburn sees as strips of dead skin.

"As a matter of fact there is very little difference between a sunburn and any other kind of burn. Both are to be avoided.

"The man who starts out to play golf in the sun for the first time would do well not to expose his arms or his neck for more than five minutes at a time for several days," said Dr. Carlson.

"There are a few people who never tan. They are out of luck so far as being able to expose their skins is concerned, and I think it would be better for them to take their exercise in the shade unless they wear protective covering."

An Ultraviolet Lamp, Which Delivers the Healing Rays into the Mouth through a Quartz Tube



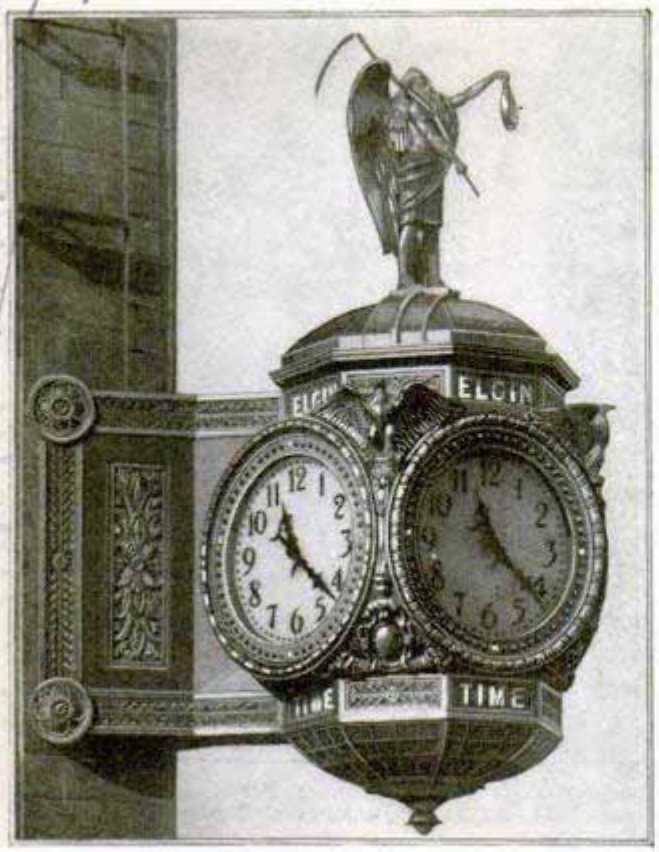
Pumping Both Tires at Once; Pressure Is Read on Gauge at Junction of Tubes

PRESSURE EQUALIZER FOR TIRES HELPS REDUCE WEAR

Automobile tires are easily inflated to exactly the same pressure with an equalizer that has been introduced in England. This insures safer and easier driving and a saving of rubber. Less time is required to inflate the tires as two can be blown up in about the same time as one. Air is supplied to two tires simultaneously, as there are valve connections to both from a main tube. Pressure may thus be quickly equalized and when the pump is used, both are inflated alike. A gauge reading is taken from a valve at the point where the tubes to each tire join. The pump is operated by a foot lever.

LINEN AND SNAKE-SKIN SHOES POPULAR AMONG WOMEN

Some 500 different kinds of materials are used in the manufacture of women's shoes, according to an official report of the industry. Linens of several varieties, satins and woven fabrics of many sorts are used, while calf, cow, goat, horse, snake, lizard and alligator skins are in great demand. In Belgium, shoes with wooden soles are still popular, although the all-wooden styles are little seen outside of Holland.



© E. L. Fowler

Twenty-Foot Bronze Clock That Is Kept Timed Electrically with Observatory Thirty-Five Miles Away

EXACT TIME ON SPLIT SECONDS TOLD BY HUGE CLOCK

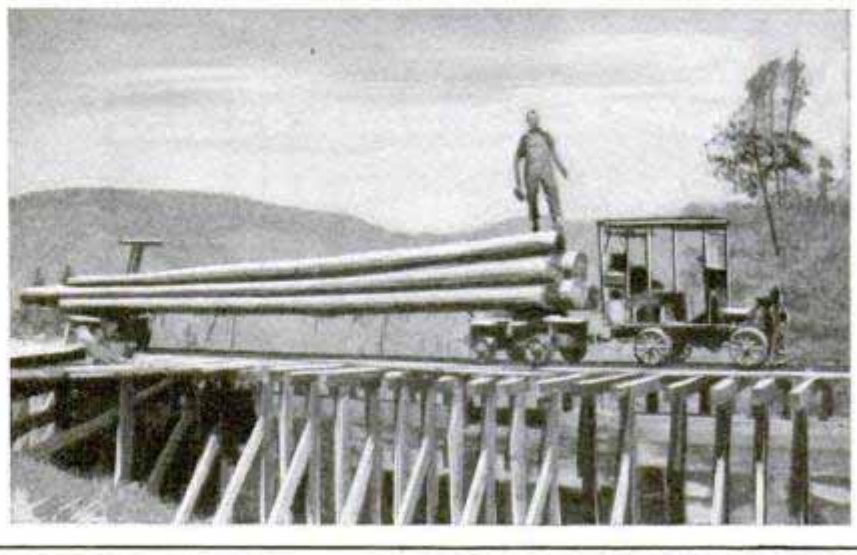
Correct time, to the fraction of a second, for every second of the day, is registered on an enormous clock installed on the outside of a Chicago office building. It is electrically connected with the observatory of the Elgin National Watch company, thirty-five miles away, where time is taken directly from the stars. The big clock thus is kept in perfect unison with the most exacting instruments known to science, and marks the longest installation of a synchronized system of this kind in the world. A special feature of the dials is that the passing of each second is accompanied by the flash of a red light. There are sixty flashes to the minute, successive lights gleaming one by one around the entire dial on each face. The quarter minutes are marked by the glow of a white light. There is thus no question as to whether the clock is running. The huge instrument is twenty feet high and is valued at $50,000. It is inclosed in a handsome case and weighs eight tons.

UNUSUAL STREET LIGHTS USED FOR COVERED SIDEWALKS

Street lamps of unusual design have been installed at Brawley, Calif. They were designed to overcome the problem created by arcades built over the sidewalks throughout the business district to protect merchandise and pedestrians from the heat and sun. Ordinary lamps would leave the sidewalks darkened at night. So, a special type of light was designed, having a post with two arms, each supporting a light. One arm extends out over the street and the other over the sidewalk.

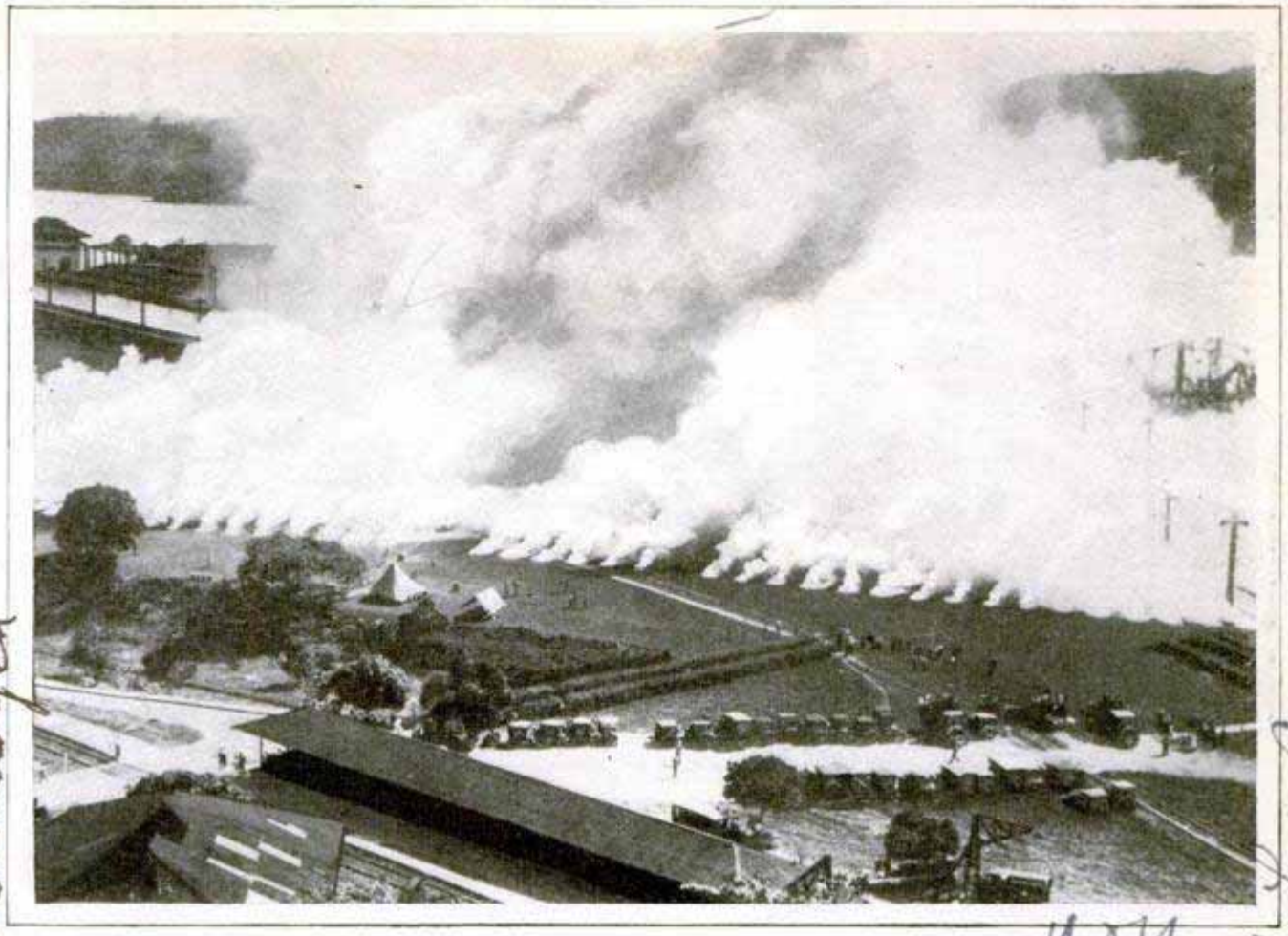
RAILWAY ON FLUME USES AUTO TO HAUL LUMBER

Double service is obtained from a flume in California that carries water to a power house and is also the "roadbed" for a railroad used for hauling lumber and an occasional passenger. The line is constructed on top of the flume and has an automobile truck for its engine. Because of the extremely sharp curves, it was necessary to limit the wheelbase of the car to forty-eight inches, and the ordinary wheels were replaced by flanged ones, set to a thirty-six-inch gauge track. The speed is limited to ten miles an hour and the line is sixteen miles long.



One of the Oddest Railroads in the World; It Is Built on Top of a Flume and the Engine Is an Old Motor Truck

SMOKE SCREEN GUARDS PANAMA FROM AIR ATTACKS



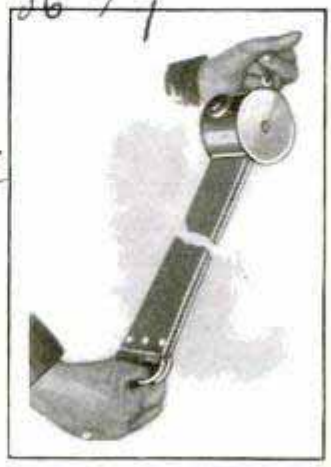
Spreading a Chemical Fog over the Panama Canal Locks; How the Smoke Screen Appears from the Air, Hiding Buildings and Land to Confuse the Flying Sharpshooters

Man-made fogs of chemical smoke have been devised to protect the locks of the Panama canal against attacks from the air. The accompanying official United States photograph shows how the chemical service laid down an almost impenetrable smoke screen during recent maneuvers, to demonstrate how a protective blanket of fumes could be drawn over the vital sections of the canal in case of an assault by enemy planes.

POT LETS PLANT ROOTS BREATHE AND WILL NOT BREAK

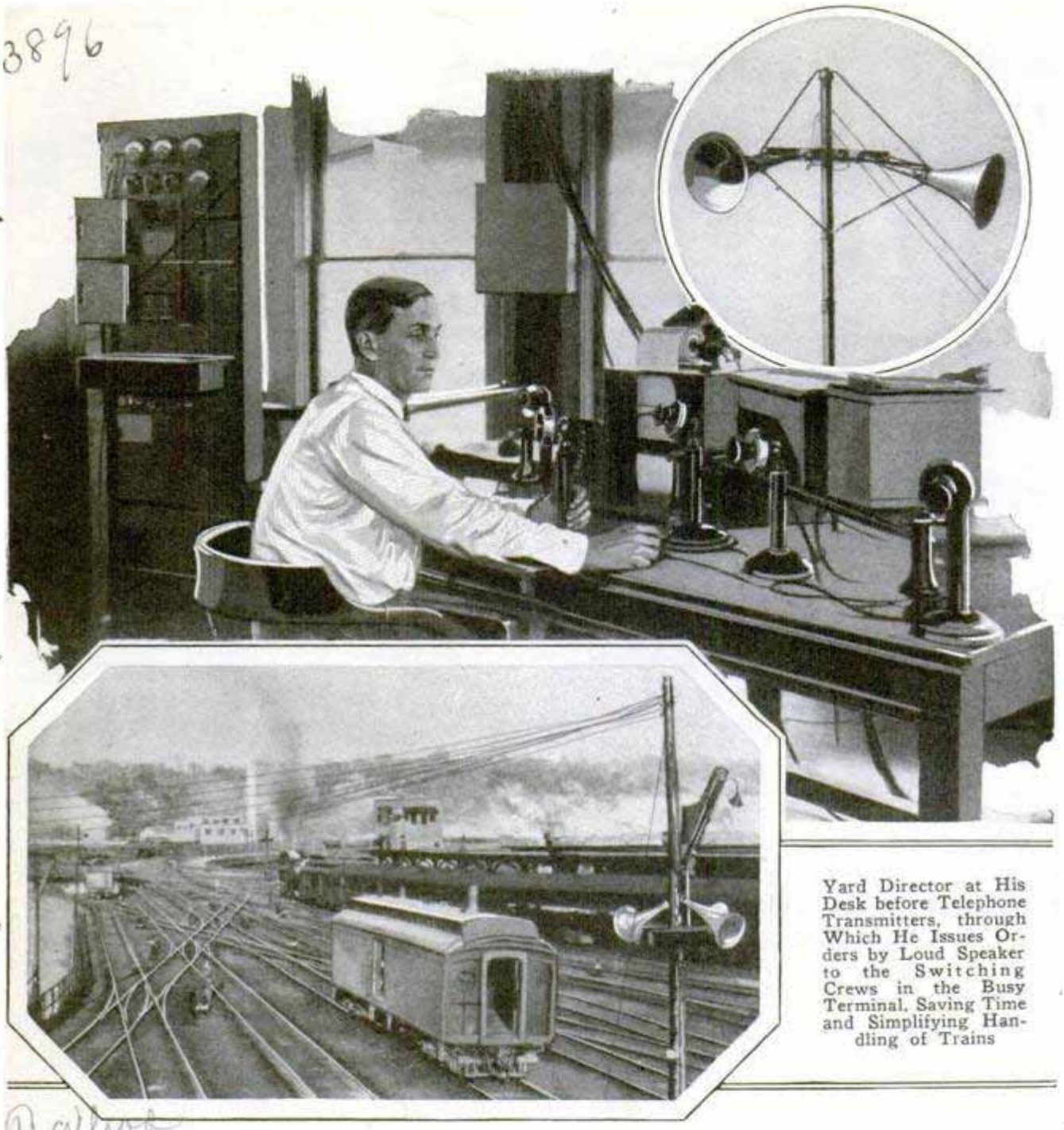
Far better development of plants is said to be attained in a special pot now on the market. Instead of clay or similar substances usually employed, it is constructed of a soil-forming material that is porous, will not break easily, and is intended to maintain the correct moisture content. The roots will not bind or mat, the danger of overwatering is eliminated, and the temperature is evenly preserved, as the pot does not radiate heat so quickly as clay, the manufacturers assert. By dipping it in various substances used to stimulate growth, the best development of the plant can be realized.

RAZOR STROPPER KILLS GERMS WITH ANTISEPTIC SOLUTION



To keep the razor strop in a sanitary condition, an antiseptic solution is applied from a little holder mounted on the housing within which the strop is wound. As the razor passes over the surface treated in this manner, it also is exposed to the germ-killing substance, to reduce the likelihood of infection.

LOUD SPEAKERS SPEED UP TRAINS IN SWITCHYARD



Yard Director at His Desk before Telephone Transmitters, through Which He Issues Orders by Loud Speaker to the Switching Crews in the Busy Terminal, Saving Time and Simplifying Handling of Trains

Train dispatchers in the union-station yards of St. Paul, Minn., have been given a mighty voice in a loud-speaker telephone installation, whereby orders can be issued from an office some distance away and distinctly heard by the switchmen where the trains are moving. Thirty-two projectors, or horns, are placed at strategic points along a "bottle-neck" stretch of track about half a mile long. The system is essentially the same as that used in amplifying public addresses and has been found of great aid in handling the more than 600 trains that pass through the busy terminal daily. Before the loud-speaker outfit was installed, the yard director had to walk to a window to give his orders.

GAUGE THAT SHOWS ALTITUDE REGISTERS SMALL CHANGES

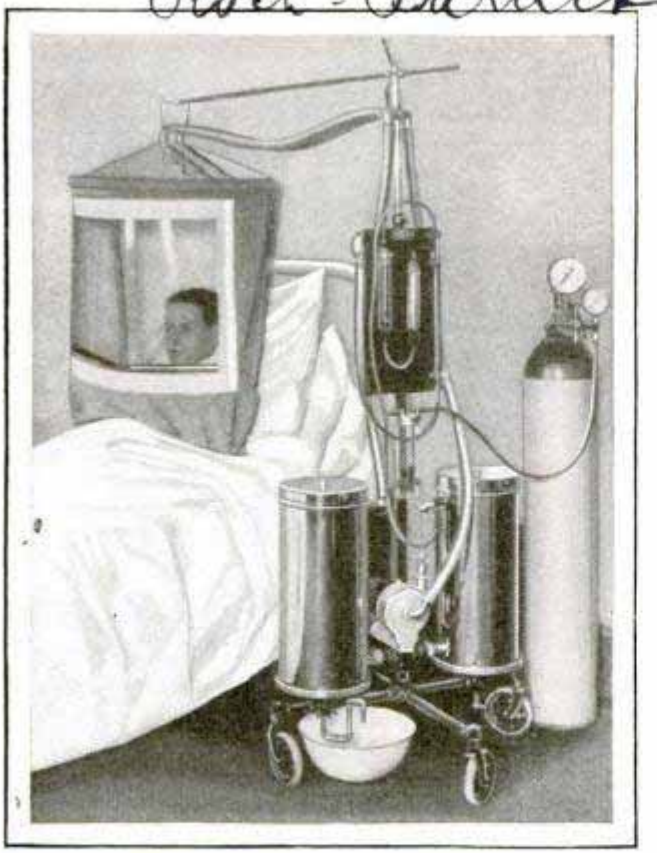
Differences in elevation as slight as six inches are recorded on an altimeter intended especially for surveyors, aviators and others when the use of more elaborate instruments is not practical. Readings are indicated on a dial, a hand moving according to the varying air pressure.

METAL IS MADE TRANSPARENT BY ELECTROPLATING

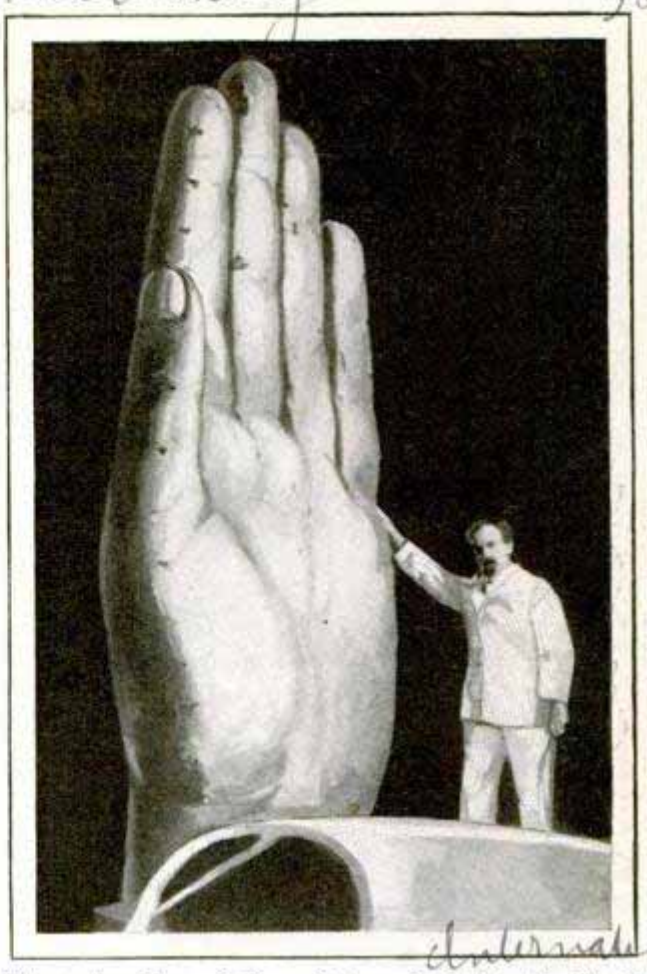
The process by which a German scientist is able to produce various metals in sheets so thin they are transparent is one of electroplating, it has been revealed. A solvent base, such as rock salt, is used. After coating it with graphite or other conducting material, the current is applied and a thin film of metal deposited. The base is then removed by dissolving it in water. To handle such thin sheets without damage, a heavy metal ring can be placed on the base, so that it supports the plated film and keeps it taut after the base is removed.

PORTABLE OXYGEN OUTFIT AIDS TREATMENT OF DISEASE

Oxygen treatments are given with good results, it is claimed, through the use of a portable outfit which can be wheeled to the patient's bedside and accurately controlled. As the oxygen mixture passes to a hood, covering the patient's head, it is cooled by ice, and impurities are removed from the air by means of a chemical substance acting as a filter.



For Beneficial Oxygen Treatments While in Bed; Portable Outfit with Its Tanks, Cooler and Filter



Illustrating Size of Huge Statue of Christ; the Hand in Comparison with Figure of the Sculptor

LARGEST STATUE OF CHRIST FOR SOUTH AMERICA

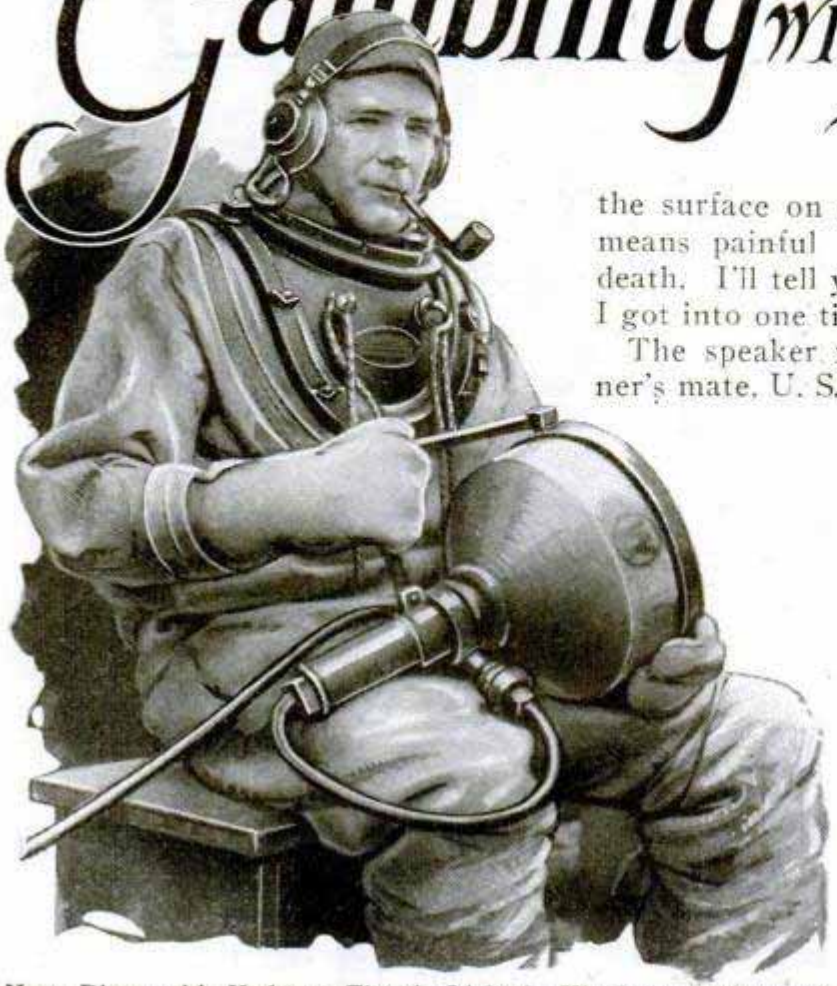
What will be the largest statue of its kind in the world is to be erected in the bay at Rio de Janeiro, a huge figure of the Christ, 100 feet high. It is the work of the Polish sculptor Landowsky, and its tremendous proportions are evident from the accompanying photograph of a detail of the hand.

VERTICAL BEAM ON LIGHTSHIP TO GUARD RIVER MOUTH

To guide vessels into the mouth of the Columbia river, a brilliant vertical searchlight is planned for a lightship at the entrance. It would be of 100,000 candlepower and visible for fifty miles in clear weather, it is estimated. The roll and pitch of the ship would help attract attention to the beacon, and in cloudy weather the beam, shining on the clouds and reflected by them, could be seen from a great distance, except in fogs. The present lights on the vessel are visible at scarcely more than five miles.

Boston Sunday Post
Boston, Mass

Gambling with Death



Navy Diver, with Undersea Electric Light in His Lap, Awaiting the Signal to Descend

By JOHN T. BRADY

"AIR is life to a deep-sea diver ordinarily, and lack of it for five minutes usually means death if he is down to any considerable depth.

"But my closest call came from too much air rather than too little," said Tom Eadie, continuing his story.

"And only a toehold saved me from the 'blow-up,' which most divers dread more than any other fate that can befall them.

"So it's hard for me to decide which is the worst feeling a diver can have at the bottom of the ocean. It's terrible to find yourself gasping for breath and to realize that your supply of oxygen has suddenly been cut off either by the fouling of your air line or a freeze-up.

"But sometimes I think it is even worse to feel yourself getting an overdose of air when you are helpless to shut it off or let it out of your suit, for then you are in danger of the 'chute-the-chutes' ride to the surface on a bubble of air that invariably means painful injuries at least—and usually death. I'll tell you about a bad fix of that kind I got into one time."

The speaker was Thomas Eadie, chief gunner's mate, U. S. N., the outstanding hero of the attempt to rescue the men who were trapped in the submarine "S-4" when she foundered off Provincetown, Mass. He was the first man to reach the wreck and determine that there were living men in it, and he was recommended for the congressional medal of honor for saving the life of his comrade "Whitey" Michels, a feat which Rear Admiral Frank H. Brumby, grizzled veteran of the seas, described as "the most deliberate, cold-blooded piece of bravery I have ever seen."

"This game is a constant gamble with death in a way," Eadie philosophized, "for when you go down you never know what's going to happen to you before you come up. So every dive is an adventure, and there's a fascination about the work that makes one forget its risks and dangers."

Eadie then went on, in his matter-of-fact way, to tell of the most harrowing moment of his nineteen years as a diver. He was working on the salvage of the "S-51," sunk off Block island, and had been tunneling a hole under the hull to enable the passage of a chain from one pontoon to another. A welcome signal had come from above notifying him that his hour was up—that is the limit of time a navy diver is allowed to work at a depth of 100 feet—and in response he had stepped on the decompression stage, as the platform is called on which a diver is raised.

"I was in buoyant spirits at the thought of going up," he smiled, "but suddenly I realized that I was getting altogether too

at Sea's Bottom

Assisting a Diver from the Pressure Tank after Treatment to Prevent the "Bends," and, at Left, Sailors on Duty at the Tank Controls, Slowly Lowering the Air Pressure in Its Interior

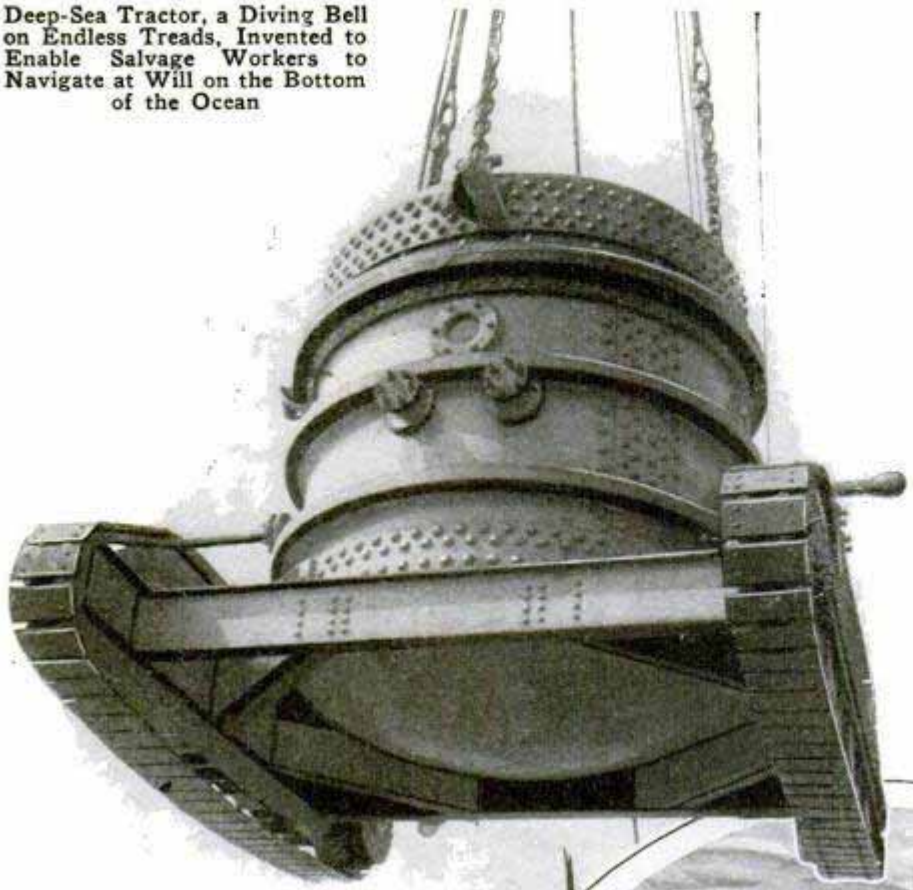
buoyant for comfort. 'Guess I better cut down on the air,' I thought, and I tried to open the exhaust valve on my helmet that is operated from the inside by pressure of the chin. But the valve was clogged with silt that had worked into it."

Again and again he jabbed his chin against the mechanism, but it was stuck fast and meanwhile his suit was rapidly ballooning. Soon it would have the buoyancy of a football, and he reached for the air-supply valve in an effort to close it. But he was too late.

"The excess air pressure in my suit suddenly threw my arms out straight from my sides so that I couldn't bend them," he explained, "and at the same time the stronger pressure in my helmet forced me down into the rubber suit as you would force a cork into a bottle.

"I was helpless, yet I knew I must not ascend. I would have shot my length out of water like a jumping fish on reaching the surface. So, as I sensed the 'blow-up' starting, I felt about with my legs, hoping my feet would catch on something that would be strong enough to hold me down."

Now the great danger of the blow-up comes from the nitrogen bubbles that form in the minute blood vessels and tissues of the body when it is subjected to abnormal air and water pressure. And if a diver is not properly decompressed, or brought up slowly from a great depth, in order to allow time for these bubbles to dissipate, caisson disease, commonly called the "bends," occurs, with grave danger of permanent injury or death to the victim. Such was the horrible prospect that Eadie



Deep-Sea Tractor, a Diving Bell on Endless Treads, Invented to Enable Salvage Workers to Navigate at Will on the Bottom of the Ocean

visioned as he kicked out his feet in a last desperate effort to save himself.

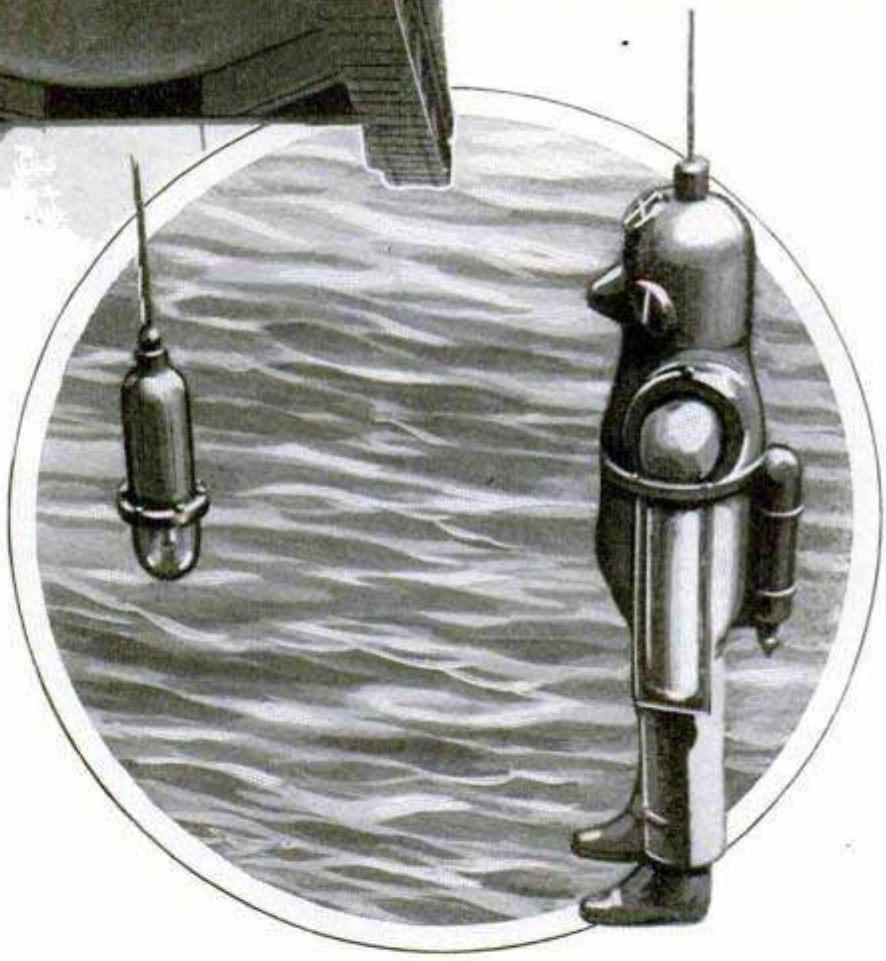
"Luck was with me that time," he went on. "Just as I thought I was done for, the brass toe clip on one of my boots happened to catch in the angle of one of the stage rods and that's all that held me from shooting to the surface."

Then the distention of his rubber suit by more air than it could stand tore it away from the metal breastplate in front, and with the outrush of air from the rent, Eadie gave a sigh of relief. He was at least safe from the blow-up. But a new danger was imminent. His helmet threatened to tear away from his suit entirely.

Deflation of the suit, however, gave him the use of his arms just in time to grab his helmet as it was leaving his shoulders, and he was able to hold it in place until he was finally brought to the surface, pretty much exhausted but still alive.

A group of the corps of divers working on the salvage of the "S-4" were gathered round Eadie on the deck of the "Falcon" as he spoke, and they listened respectfully to him, as usual on the rare occasions that he tells a personal experience.

"Now I'll tell one," announced chief torpedoman, "Whitey" Michels, when Eadie had finished.



Lowering a Diver to the Record-Breaking Depth of 318 Feet in a New Type of Armored Diving Suit, Which Resists the Tremendous Pressure

"Give me the air every time," he began, "and I'll take my chances on the blow-up, now that I've survived it once. I've had plenty of close calls in my years of diving but this last on the 'S-4,' when Eadie came to my rescue as I was passing out for want of sufficient air, owing to a fouled hose

line, was the worst ever. At two o'clock in the morning, I went over the rail of the 'Falcon.' She was then yawing at her moorings in the rising gale and spray was freezing as it struck her deck. I expected to land on the deck of the 'S-4,' but instead I landed on the bottom, and found myself sinking into a bed of mud. I thought I could walk out of it at first, but with each step I took I sank deeper, until I was stuck in the mire up to my waist.

"Then I telephoned the 'topside' to pull me out of the mudhole, and later I learned that it took the combined strength of thirteen men to free me, so you can judge how badly I was stuck.

"Then the cord of my portable light got tangled in the descending line, and, rather than waste more time in trying to release it after two or three futile efforts, I left it where it was and began groping my way along the deck in the inky blackness. Before I had gone ten feet, however, I discovered that my air line had become fouled somewhere and I signaled for help. Shortly after that I must have dropped from exhaustion. At any rate, the next thing I became conscious of was that a diver was helping me to my feet. It was Eadie, and he had gotten up before he had recovered from the effects of a previous dive to come to my aid.

Lowered over the Side on a Platform, a Navy Diver Starts Down to the "S-4," to Attach Air Lines in an Unsuccessful Rescue Attempt

"When he found me I was lying, face down, with my life line and air hose in a tangled mass across my back and pinning me in that position. After he got me on my feet I began to 'savvy' that he was trying to free my air line, but I couldn't help him much. In fact, I was so weak that I couldn't even hold his light for him. I don't remember much of what happened after that, but evidently I took excess air after he had freed me and blew up, for they found me floating around on the surface. They tell me I was like a cold-storage bird when they got me in the decompression tank. Later, I learned that I had been down nearly three and one-half hours and Eadie had been down over two hours in rescuing me."

Eadie then recalled how William Loughman got fouled at a depth of 270 feet while working on the "F-4" at the bottom of

Honolulu harbor, in November, 1915, and how Crilley brought him up from that depth after four hours of the most perilous kind of labor. Crilley also broke the world's record for deep diving on that salvage job by going down nearly 300 feet.

However, improvements in equipment have decreased hazards to a marked degree, and recently a double diving suit has been proposed so that an engineer may accompany the diver, make sketches or observations while submerged and so lighten the diver's task. The outfit is a "twin" affair with a separate steel suit for each man, but the two are joined to permit conversation and to prevent the workers from becoming separated and interfering with each other's operations. Such a rig would be of great service, it is believed, in making a submarine survey or examining a wrecked vessel preparatory to raising. Often the diver's information is incomplete and, if he is not familiar with the engineering factors involved in the task, his reports are likely to be misleading. With a trained man to accompany him, fewer dives would be necessary, it is believed, with a consequent saving in time, cost and risk.

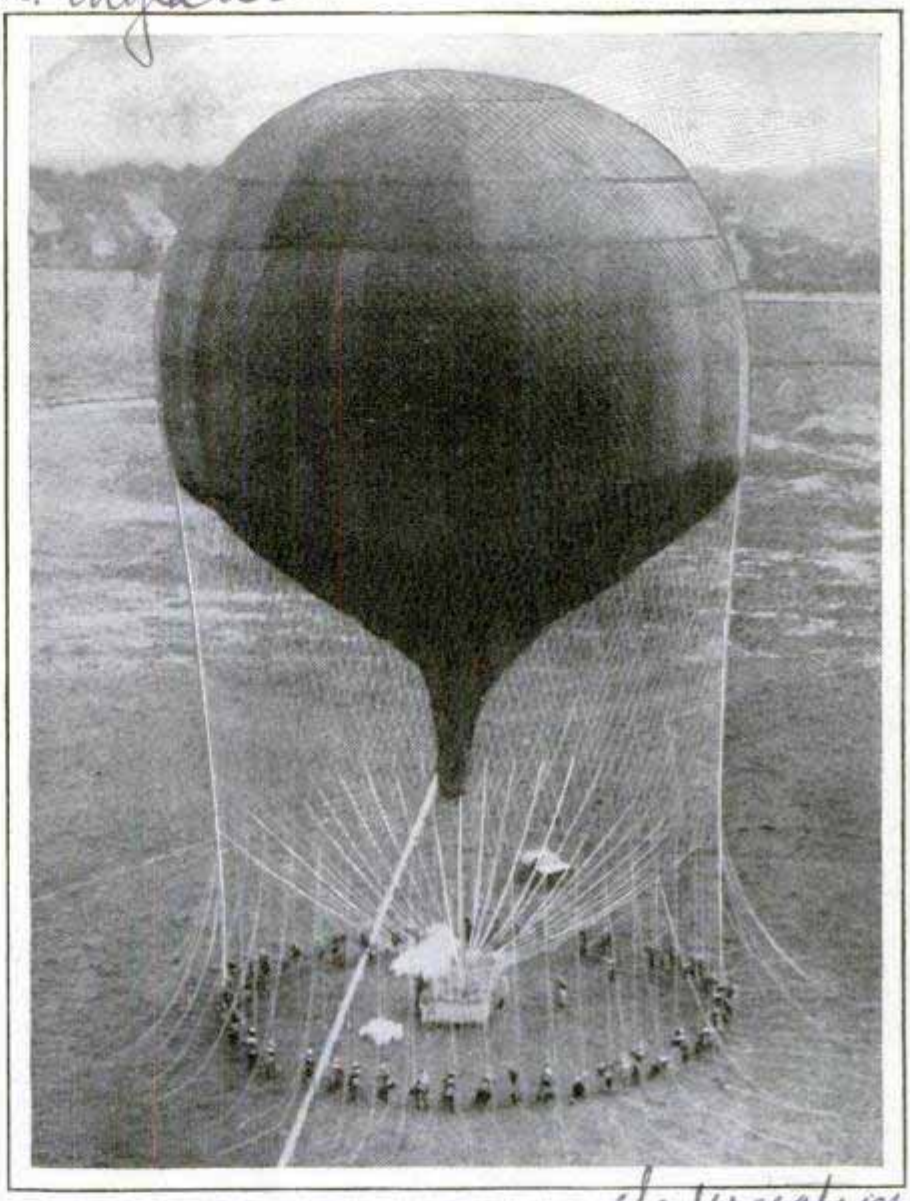
Divers play the most dangerous game in the world, a game that makes the roughest athletic sport look like a "pink-tea" party by comparison, a game that twists and tortures the body and bursts

A French Diver in Full Outfit Ready to Invade the River Seine, and, Below, a Radio Announcer Armed with a 1,000-Watt Lamp, About to Descend to Describe the Sea Bottom

the eardrums, a game that only the most cool-headed, resourceful men, in the prime of their strength, can play for only one hour at a stretch.

NEW INVENTIONS WANTED

Silent lawn mowers and motorcycles, methods of eliminating street noises, and a way to convert sound into energy are among the inventions the world needs, according to a pamphlet "What's Wanted," recently published by the institute of patentees in London. The list includes a number of practical suggestions to inspire an inventor's efforts, such as an unpuncturable pneumatic tire, a simple clamp to hold mixing bowls to the table so that both hands can be used, a non-leaking water tap, an attachment to keep glass stoppers in bottles while traveling, reinforced handles for chinaware and a means of keeping pleats in skirts. Among radio devices wanted is a speaker that will render foreign languages into English.



Preparing the Balloon Observatory for a Flight; the Huge Bag Is More Than Eighty-Six Feet in Diameter

BALLOON TO SOAR NINE MILES FOR AERIAL RESEARCH

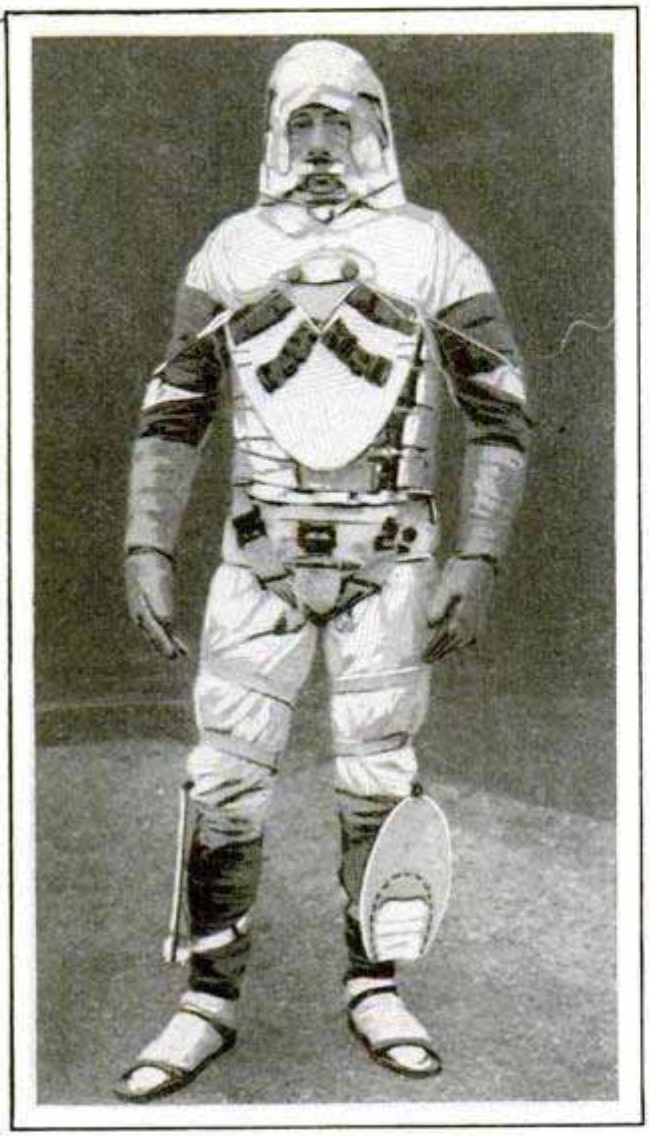
Explorers of the air are to use a huge balloon constructed in Berlin for research work in the upper altitudes. The huge bag is more than eighty-six feet in diameter and has been built to ascend to a height of nine miles.

PAINT-SPRAY OUTFIT IS RUN FROM LAMP SOCKET

Operated by current from a house-lighting socket, an electric spraying outfit is convenient for applying paints or lacquers or for disinfecting interiors. It is easy to clean and operate, and can be used satisfactorily by an amateur. The motor is suitable for direct or alternating current.

LOCK HOLDS CAR FROM BACKING IF BRAKES FAIL

Should the automobile start to roll back on a hill because of failure of the brakes, an automatic lock, installed on the differential or transmission, quickly functions, halting the car almost instantly. The unit is easily installed and is said to greatly promote safety in driving while relieving the operator of considerable worry.



To Help the Airman Paddle to Shore Should He Fall in the Sea; Note the Fins for Arms and Feet

LIFE-SAVING SUIT HAS PADDLES TO HELP SAVE VICTIM

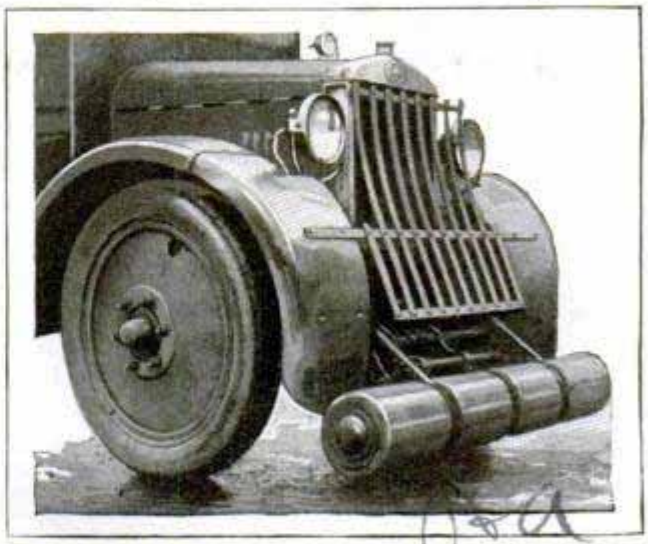
Designed particularly for the use of aviators making long flights across bodies of water, a life-saving suit is fitted with paddles on the legs and arms so that the wearer may push himself along with the least possible fatigue. The suit is made of rubber, cork and wool and the paddles also enable the victim to rest on his back in the water.

BREATHING ROCKS KEEP FIRES BURNING UNDERGROUND

In one of the Pennsylvania coal mines, a fire has been burning for seventy years. Repeated efforts have been made to extinguish it, in order that thousands of tons of anthracite, imprisoned by the blaze, may be taken out, but, so far, all attempts have been in vain. According to Prof. W. Spencer Hutchinson, of the Massachusetts Institute of Technology, one reason why subterranean fires of this nature are so hard to extinguish is that the rocks absorb sufficient oxygen to keep the blaze going. His opinion is substantiated by tests of the gases exhaled from rocks in a deep mine during a period of low barometric pressure. They were found to contain the same amount of helium as the atmosphere. Sealing the entrance to the mine, merely shuts off the oxygen from the opening. Enough is obtained through the soil and rock above to feed the fire. Deep in the heart of a mine at Butte, Mont., a fire is smouldering within a concrete chamber which miners constructed around it in an effort to smother it. This cement "trap" will eventually conquer the fire, it is believed, as practically no oxygen can enter through the walls. Water is effective in combating underground fires, but it often fails for the reason that it cannot penetrate to the heart of superheated rocks where the high temperatures are likely to persist for a long time, because the heat cannot escape.

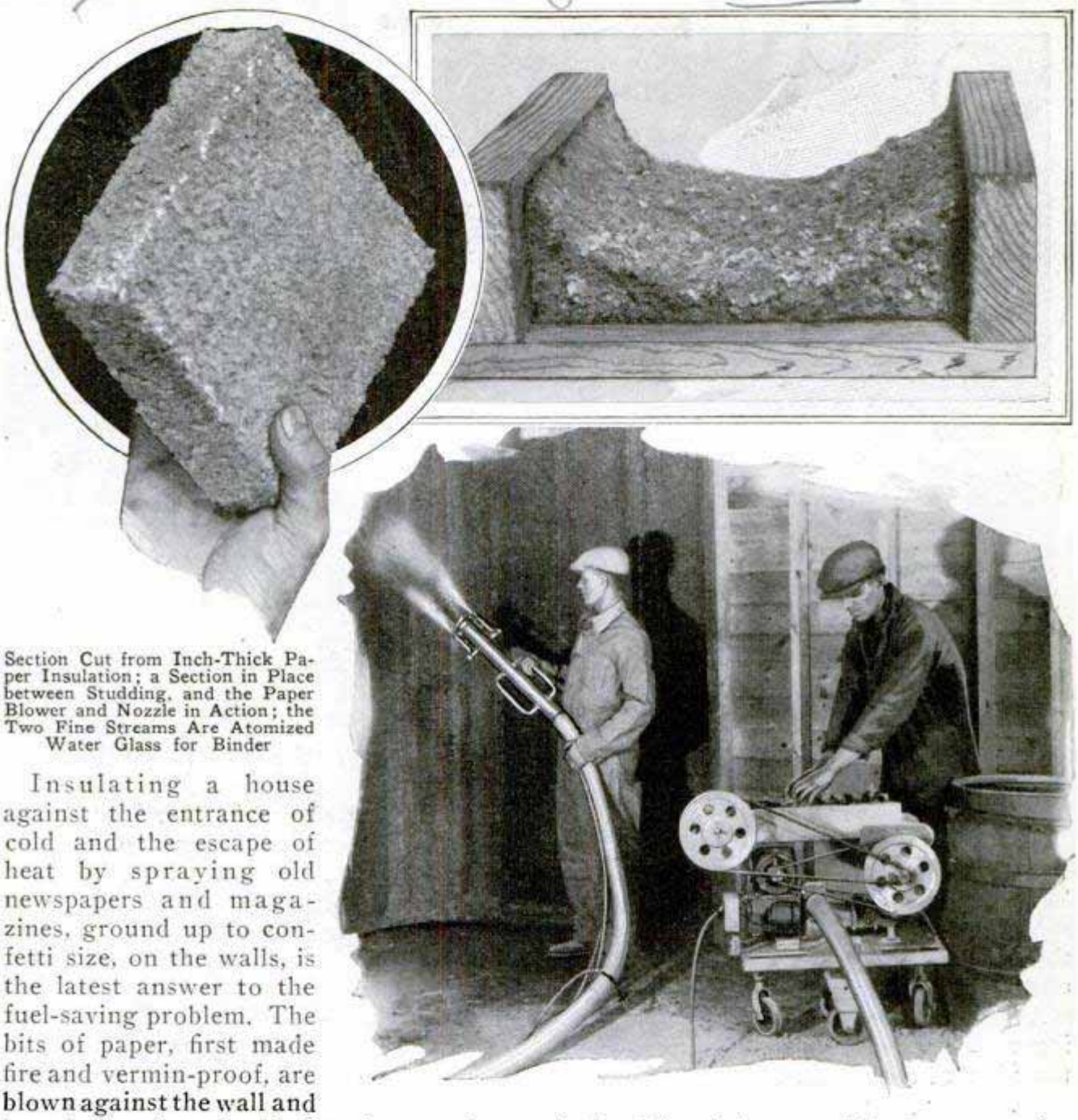
ROLLERS ON AUTO-TRUCK FRONT TO PREVENT ACCIDENTS

Rollers revolving in a direction opposite to that in which the wheels are turning, have been attached to an automobile truck in front, to reduce the likelihood of running over persons. The rolls are intended to lift any obstruction out of the path of danger or catch it on a fender like the cowcatcher of a locomotive.



Front Roller Revolves in Direction Opposite to That of Wheels to Protect Auto Victim

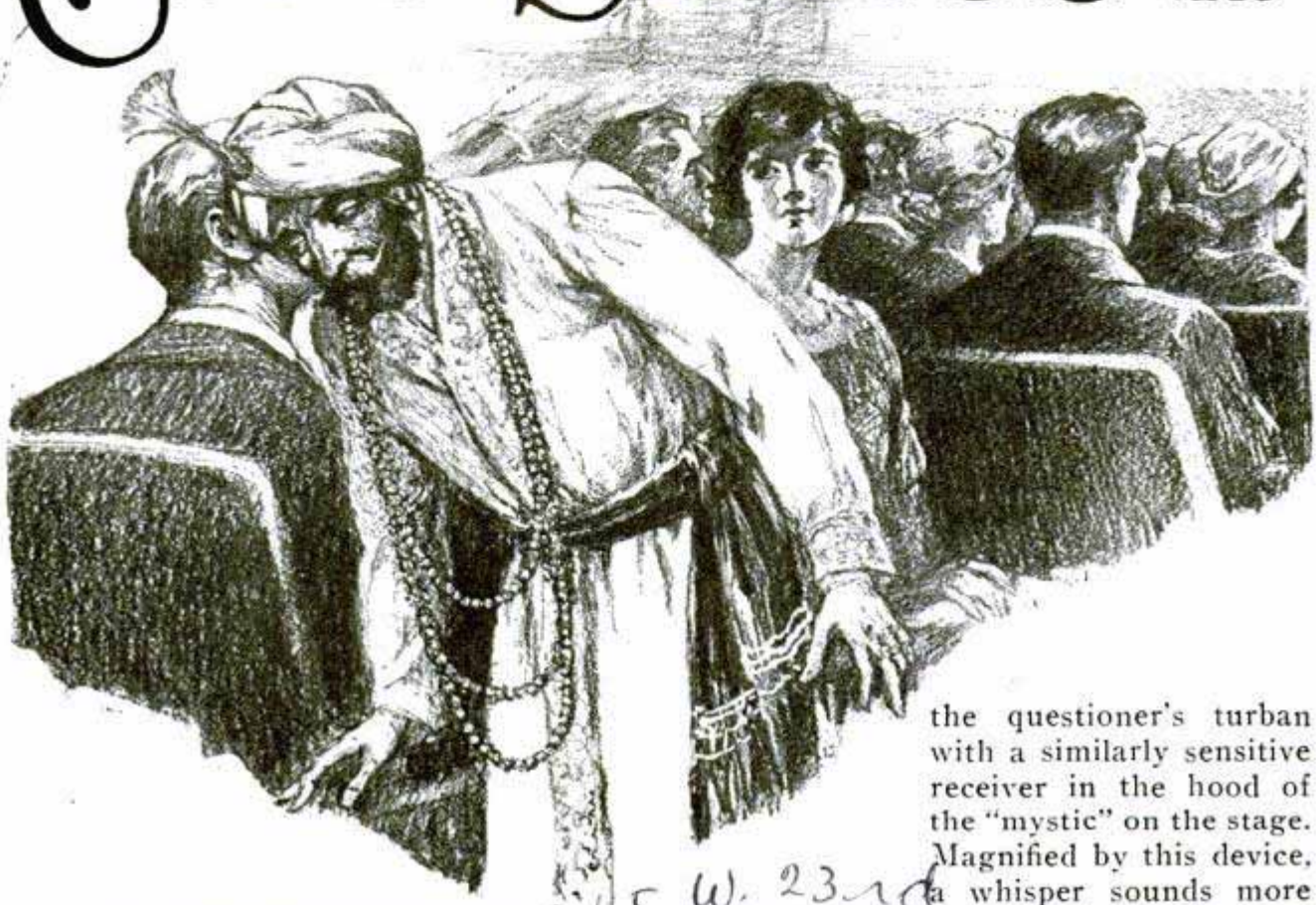
PAPER BITS BLOWN FROM HOSE INSULATE HOMES



Section Cut from Inch-Thick Paper Insulation; a Section in Place between Studding, and the Paper Blower and Nozzle in Action; the Two Fine Streams Are Atomized Water Glass for Binder

Insulating a house against the entrance of cold and the escape of heat by spraying old newspapers and magazines, ground up to confetti size, on the walls, is the latest answer to the fuel-saving problem. The bits of paper, first made fire and vermin-proof, are blown against the wall and bound there by a double jet of water glass. The resulting insulation is a soft, fluffy, woollike layer, which can be built up to any thickness required. Actual installations range all the way from a half inch to the full three and five-eighths-inch thickness of the studding—depending on how much the owner wishes to pay. Because of the fluffiness of the coating, it contains billions of air cells, which make it, according to laboratory tests at Armour institute, an exceptionally good insulator. In an analysis of a typical seven-room two-story house, built in Milwaukee and insulated with the paper preparation, Samuel R. Lewis, consulting engineer, calculated one inch of insulation would cut twenty-five per cent off the fuel bill each season, and two inches would save thirty-two per cent, the insulation being applied to the top-floor ceiling and sidewalls. In applying the paper, which is called "sprayo-flake," a portable gasoline motor drives a combined air compressor and dynamo, the one furnishing air for the water-glass atomizer, and the other current to operate an electric blower that forces the paper against the wall. The compressed air is piped into a barrel of the water glass, and from it the feed line runs to two small jets, set on either side of the spraying nozzle through which the paper emerges.

True Stories of the



By ARTHUR CHAPMAN

"WHISPER your name in my ear, please, and it will be repeated from the stage by the great Oom Ali, who hears all things."

A benign-looking East Indian, in flowing robe and white turban, loiters along the aisle of a theater, bending over here and there to get whispered names. To the amazement of the audience, each name is repeated by another oriental on the stage, whose face looks out of a hood so closely wrapped that it conceals his ears.

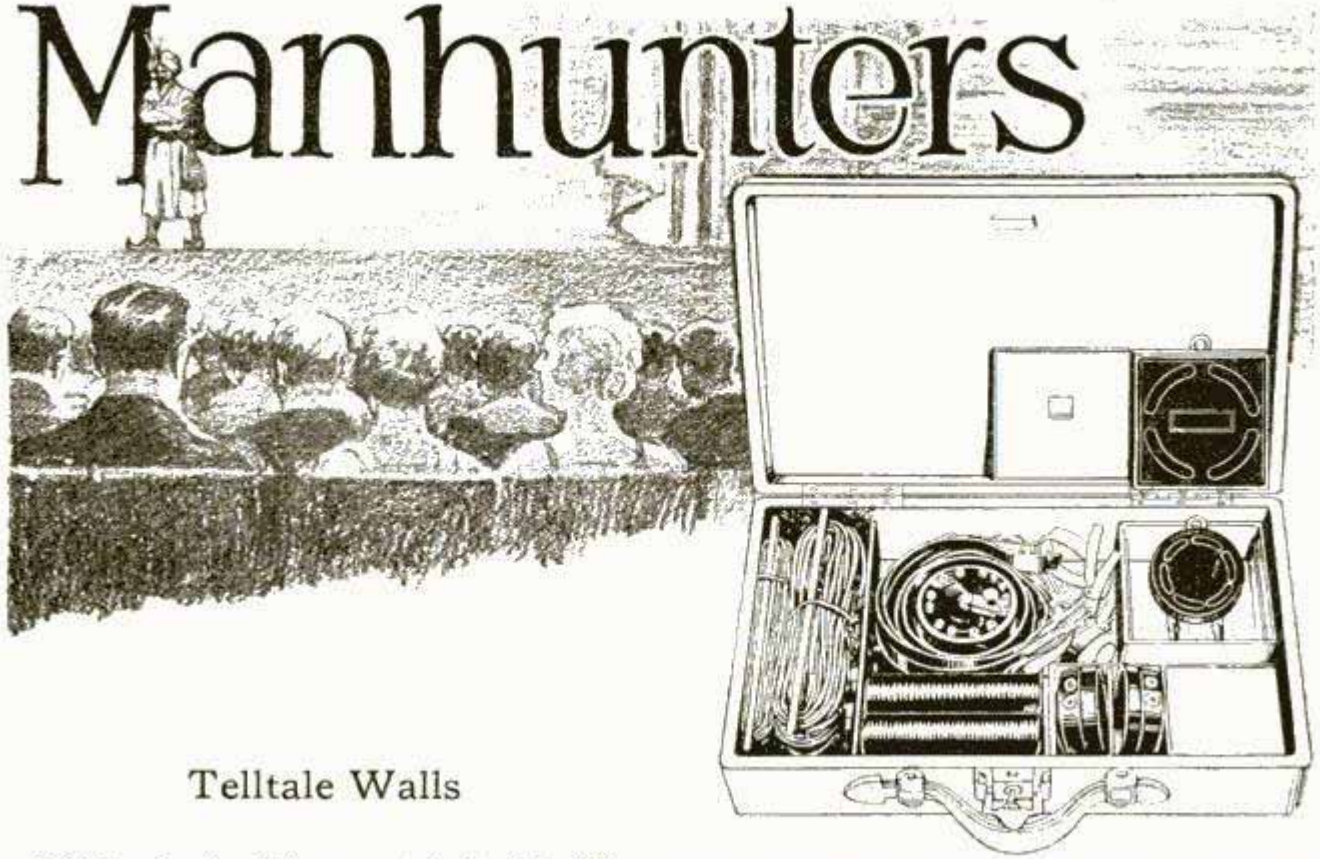
Back to the last seats in the theater, far out of ordinary earshot, the turbaned one makes his way, and names and messages are repeated without fail by the man on the stage. No one in the audience registers more genuine surprise than the persons whose words have been repeated. Clearly there is no "plant" involved, and the mystification is complete.

The audience is not aware that a tiny wire, the color of the carpet, connects a supersensitive transmitting apparatus in the questioner's turban with a similarly sensitive receiver in the hood of the "mystic" on the stage. Magnified by this device, a whisper sounds more plainly in the ears of the man on the stage than it does to the one who is bending over the theatergoer.

There is no enlightening of the audience, which goes home not knowing that it has had a working demonstration of an instrument that has proved to be a potent aid to the law in the capture of criminals of many sorts. A suspected murderer whispers a few incriminating words to a "pal" in their cell; a grafter "pays off" the funds of corruption or receives them in the supposed security of his home or office; conspirators gather to plot the destruction of life and property—and in each case the "mechanical ear," known as the detective dictograph, catches the telltale words and repeats them to stenographers who set down the incontrovertible evidence of guilt.

Detectives who have qualified as experts in the use of the dictograph have achieved convictions under circumstances so difficult that a Sherlock Holmes in real life probably would have confessed himself baffled.

Manhunters



The Dictograph Is a Compact Little Detective That Has Solved Many Famous Crimes

Telltale Walls

"Dick planting" is an art in itself. The detective dictograph receiver is so small that it can almost be concealed in the palm of a man's hand, and consequently it lends itself to all sorts of camouflage. It has been hidden in hats, umbrellas, and even in the cuffs of overcoats on racks; in the folds of window drapery, in chandeliers and desks, waste baskets, sofas, chairs and behind pictures. It has reposed in the center of a vase of flowers; it has been swung down chimneys into fireplaces, in front of which whispered conferences have been held. It has been used frequently in "dummy" telephones, and has been successfully hidden in the bare recesses of jail cells.

The most skillful bit of dictograph planting on record was worked out in the case of a political boss who had to be "seen" before any money was spent for public improvement. Efforts were made to trap him, without avail.

"The only place where he will talk money is in his bedroom," was the constant report.

This precaution on the part of the boss meant that it was going to be difficult to get the sort of evidence that would result in a conviction. The district attorney had called in a noted detective. The first thing done was to put the telephone of the boss out of commission. When he stepped across the street to call up the telephone company, a man in overalls rushed into the residence, saying that he had been sent to make the repairs. Access was thus secured to the bedroom and the telephone was repaired. Incidentally a dictograph was planted in the bedspring, the connecting wire being wound about the telephone wire and leading outside the house.

The next problem was to fix up the receiving end of the dictograph. There was a vacant store across the street, where a stenographer listened to all the graft conferences that went on in the boss' bedroom. When sufficient evidence had been secured, the boss was called before the district attorney.

"We know that you have taken money," said he. "We have you, all right, but we are convinced there are men higher up. If we confront you with your own words, will you tell us who is behind you?"

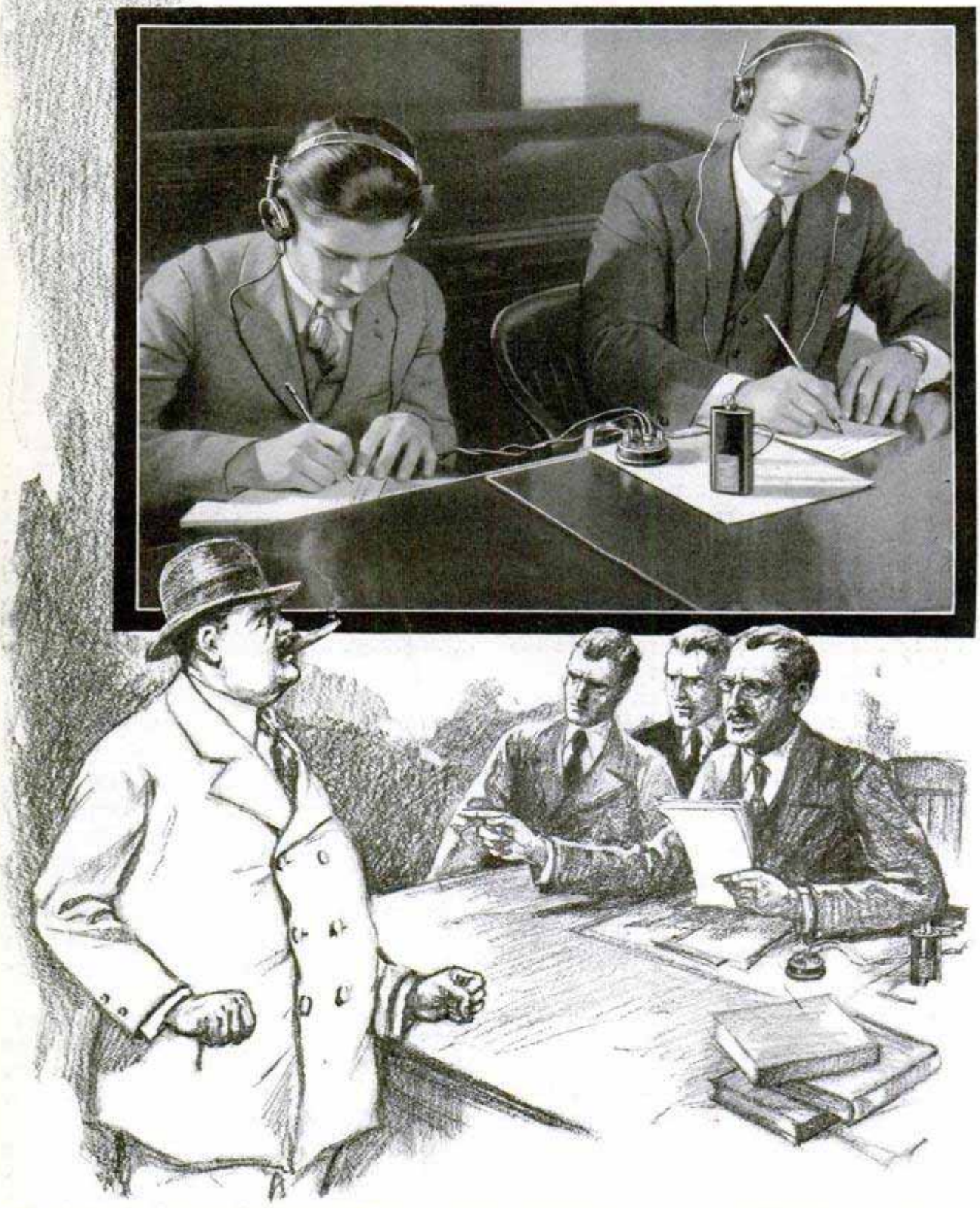
The boss turned green when he read the stenographic notes. He made a confession, implicating several higher-ups, but pressure was brought to bear. He repudiated the confession and went free. The idea was to get the boss again—but how? He was still holding his graft conferences,

Dictograph Products Corp. 220 W. 42nd St.

but this time not in his bedroom.

"He won't talk graft except in an automobile," was the report.

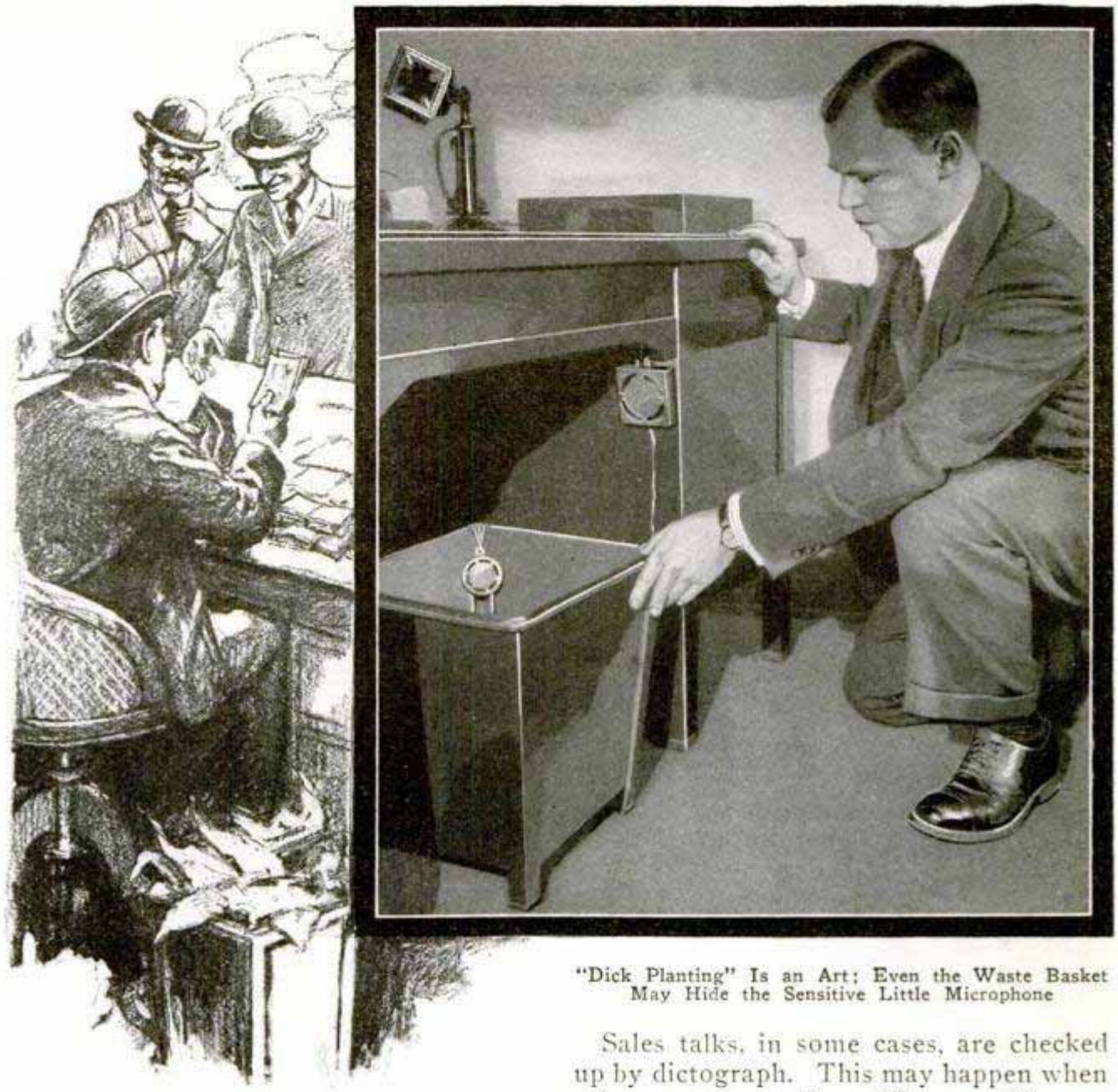
vited to talk over a "business proposition." The car was driven to the outskirts of town and pulled up at the curb in front of a schoolhouse. The chauffeur was temporarily dismissed. The deal was



Faced with the Stenographic Report of Secret Conferences in His Own Bedroom, a Political Boss Confessed; Above, Two Stenographers Taking Down Duplicate Reports

It looked like a poser, but the answer was finally worked out. The boss was in-

not completed that day, so it was agreed to talk over the final details on the day



"Dick Planting" Is an Art; Even the Waste Basket May Hide the Sensitive Little Microphone

following. In the meantime a dictograph was planted in the upholstery of the car.

Once more the trip was made to the lonely schoolhouse. The car was halted at the curb as before, and the chauffeur was dismissed for a stroll. But, just before he walked away, he picked up a plug attached to a wire which was lying in the grass near the gutter. This was plugged in at the rear of the car, establishing a connection with the dictograph.

The receiving end of the dictograph was in the schoolhouse. Stenographers in the building took down the details of the conversation between the boss and the supposed contractor, who in reality was a detective. After his conviction, the boss' final words were: "I'll never talk again, except in a balloon."

Sales talks, in some cases, are checked up by dictograph. This may happen when salesmen are meeting stiff competition on the road. Big orders are at stake, involving thousands of dollars, and these should not be lost because the opposition is putting up a better line of argument. So, through a skilled agent, the mechanical ear is planted where the sales talks take place, and then the desired comparisons are made. Surety companies, risking large sums of money on the integrity of cashiers and others in responsible positions, often use the dictograph in the necessary checking up on personal habits.

Railroad companies, which are besieged with all sorts of accident claims, make use of the dictograph on occasion. There is the case of a cow, which was killed because it persisted in trying to find grass on the barren right of way of a railroad. Mr. Owner's bill against the road was stag-

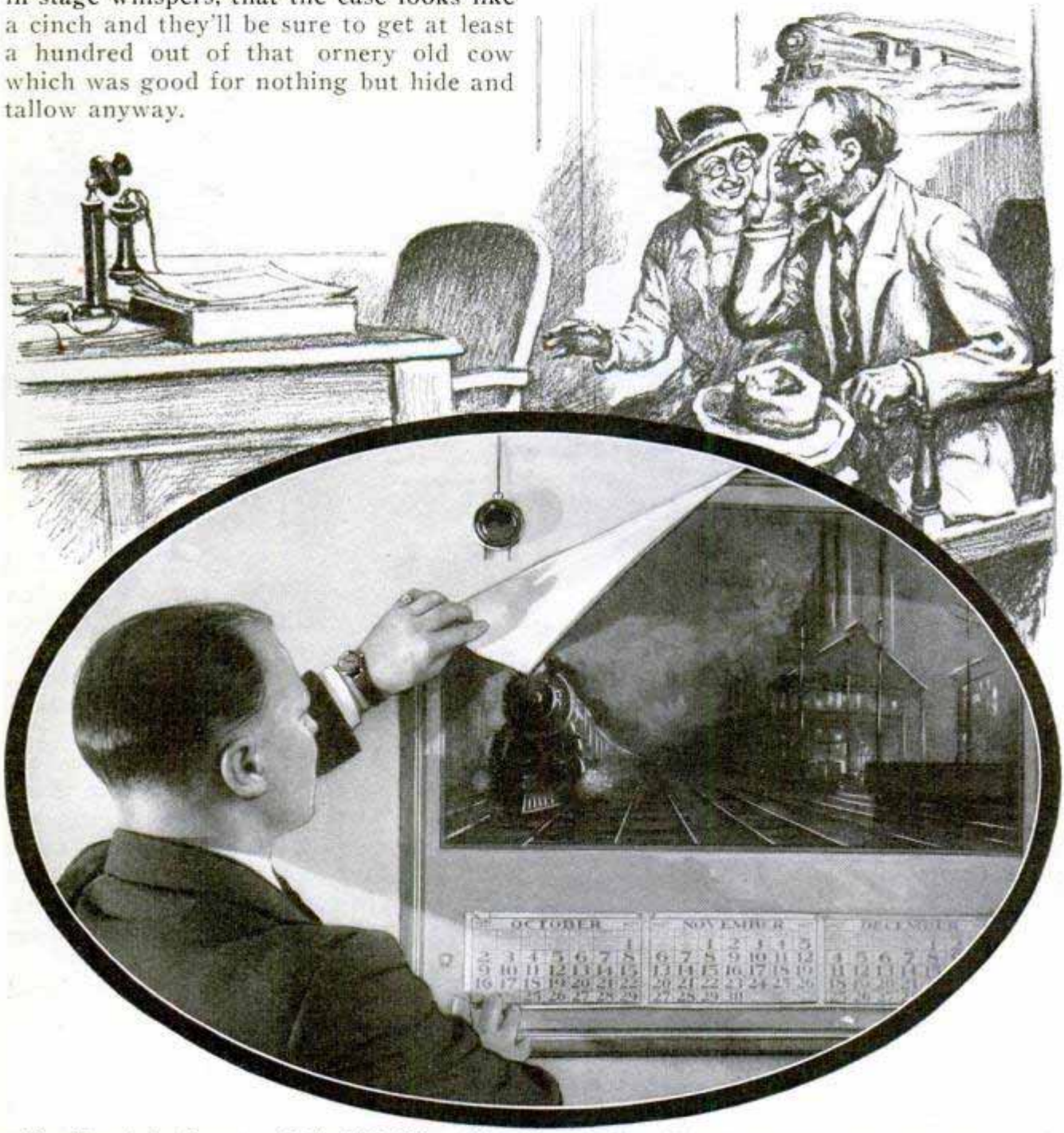
gering. It indicated that the cow was an animal of great value—a wonderful milker, a record breaker for butterfat.

Mr. Owner is invited into the office of the claim agent. The farmer and his wife are cordially received by him, who is a jolly chap—used to be a farm boy himself before he ran away and joined the circus and then drifted into railroad work.

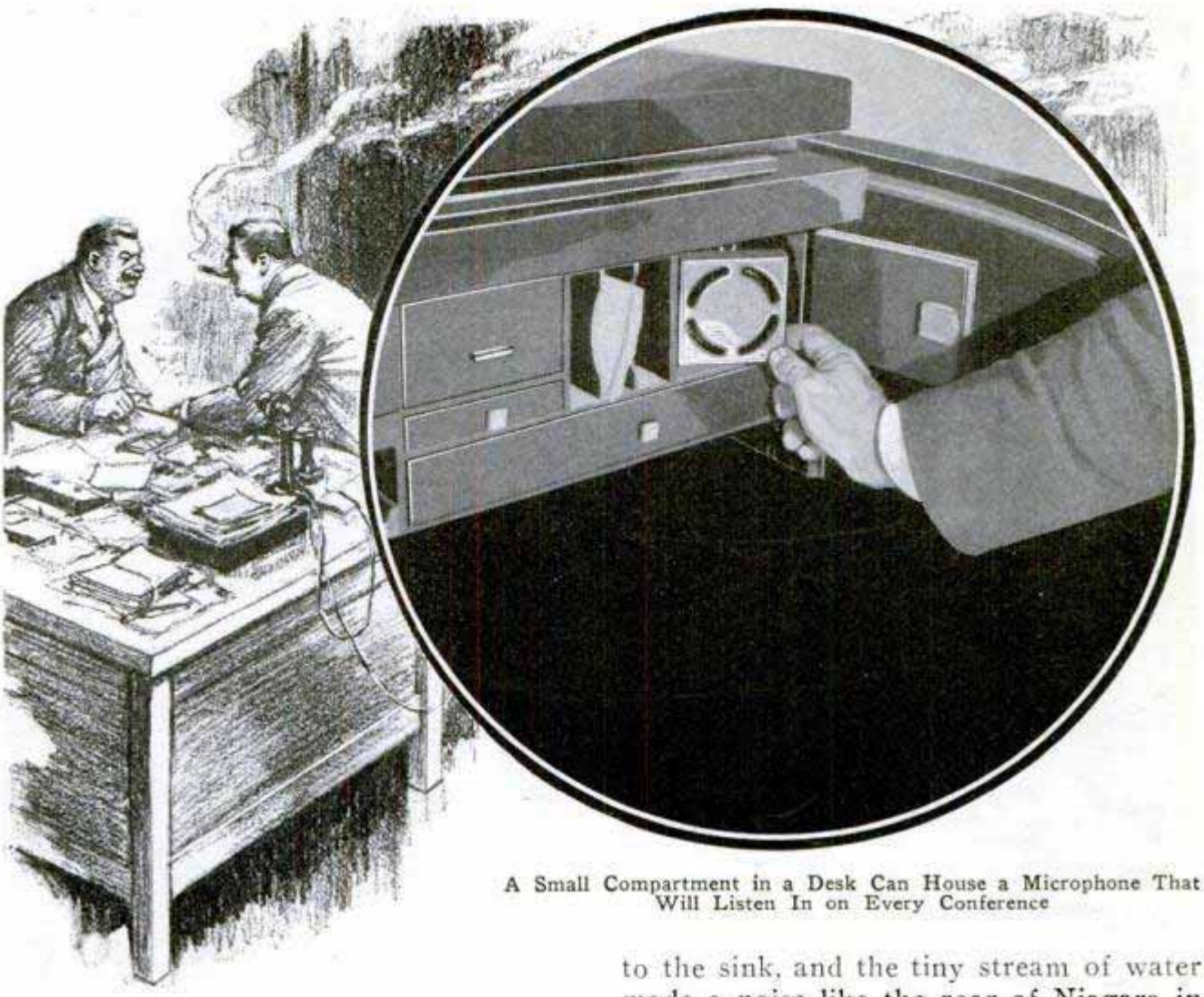
In the middle of a good story, the claim agent is called out of his office. Mr. and Mrs. Owner are left alone for a matter of ten or fifteen minutes. In that time Mr. Owner has jubilantly confided to his wife, in stage whispers, that the case looks like a cinch and they'll be sure to get at least a hundred out of that ornery old cow which was good for nothing but hide and tallow anyway.

To this day Mr. Owner does not know that there was a dictograph concealed behind a calendar above the claim agent's desk. All he knows is that a stenographer brought in a transcript of his whispered words, which would not look good in court, and the damage case was compromised with the claim agent for $26.03.

In criminal cases the detective who uses the dictograph always proceeds on the theory that the guilty person will talk freely to someone who is in his confidence. Any burden of guilt usually becomes too heavy to be borne alone. Perhaps a sus-



The Glee of the Farmer and His Wife When They Thought They Were Cheating the Railroad Turned to Grief, Because a Dictograph Was Hung behind a Calendar on the Wall



A Small Compartment in a Desk Can House a Microphone That Will Listen In on Every Conference

pected murderer is followed from place to place by a detective, who, in the role of a fellow lawbreaker, gradually gains the confidence of his man. The detective boasts of crimes he has committed, and, sooner or later, there comes a time when the suspect confides his own guilt to his supposed pal. Once more the mechanical ear fulfills its mission.

Life dramas, involving months of effort, elaborate stage settings, and the expenditure of thousands of dollars, revolve about the detective dictograph. If this tiny instrument fails at the climax, the whole dramatic structure collapses.

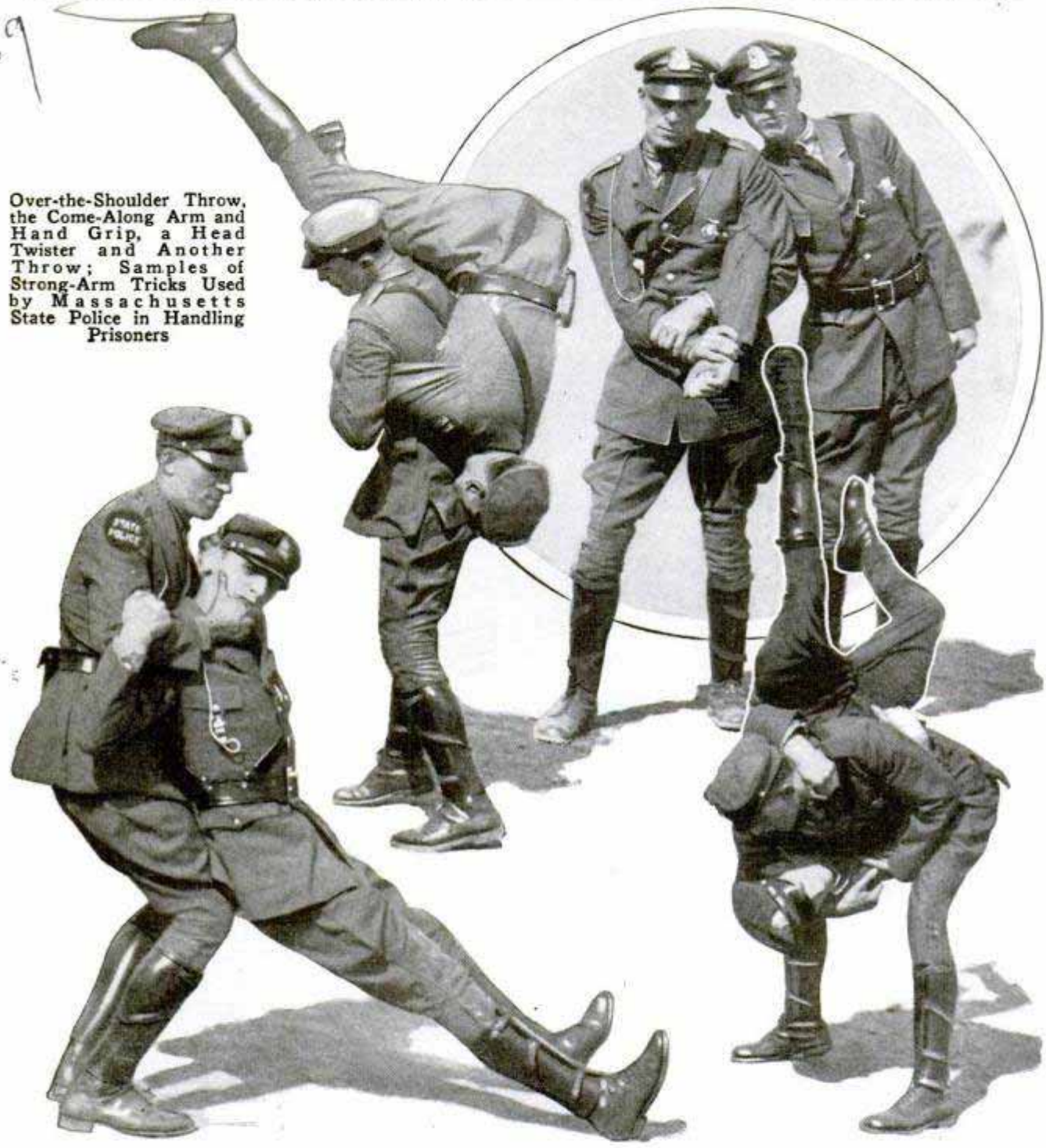
In an eastern city two men were suspected of the theft of a large amount of government bonds. They were put in a cell which had been planted with a dictograph with the idea that they might talk over the crime. The men began conversation in low tones, but one of them stepped over to a water faucet and got a drink. When he came away he left the faucet open. The dictograph was planted close to the sink, and the tiny stream of water made a noise like the roar of Niagara in the ears of the operator, making it impossible to hear what the men were saying. The men were taken to another cell where there was no running water. This time enough of their conversation was heard to establish their guilt.

In another case a dictograph was planted in the desk of a man who was about to put through a fraudulent deal. He suspected a dictograph trap and searched his office carefully—even looking through his desk—without finding the instrument. But, unfortunately for the operator, the suspected individual was not satisfied with the thoroughness of his search. During his entire conversation he tapped his desk with a pencil, preventing any record.

Playwrights have joyfully seized upon the dictograph as something with which to give new "kick" to worn-out dramatic situations, and it has figured in many crook and mystery plays. But nothing seems to equal the real life drama, in which this scientific aid to the law makes true the old saying that "walls have ears."

168 Hartmouth St.
Boston Mass
169

POLICE TRICKS THAT SUBDUE UNRULY PRISONERS



Over-the-Shoulder Throw, the Come-Along Arm and Hand Grip, a Head Twister and Another Throw; Samples of Strong-Arm Tricks Used by Massachusetts State Police in Handling Prisoners

Massachusetts state police have won wide recognition for their ability to subdue unruly prisoners, and much of their success is due to their skill in executing special locks and holds on their adversaries. Many of these tricks are known to other police organizations and some can be mastered by the layman, after practice, for his own defense. One of the most effective is known as the "come along." It does just what the name suggests, compels a prisoner to accompany his captor. It is an "arm-breaker" hold, obtained by grasping the victim around his right arm and using the right hand to hold the culprit by the wrist. If the prisoner struggles, his arm is likely to be broken at the elbow. A head hold is useful in forcing a man into a cell. The policeman places one of his arms back of the prisoner's head, the other, under the jaw. A twist will usually subdue the most unruly victim. There are two especially efficient ways of throwing an adversary. In one, should the policeman be tackled about the waist, he locks his elbows around the

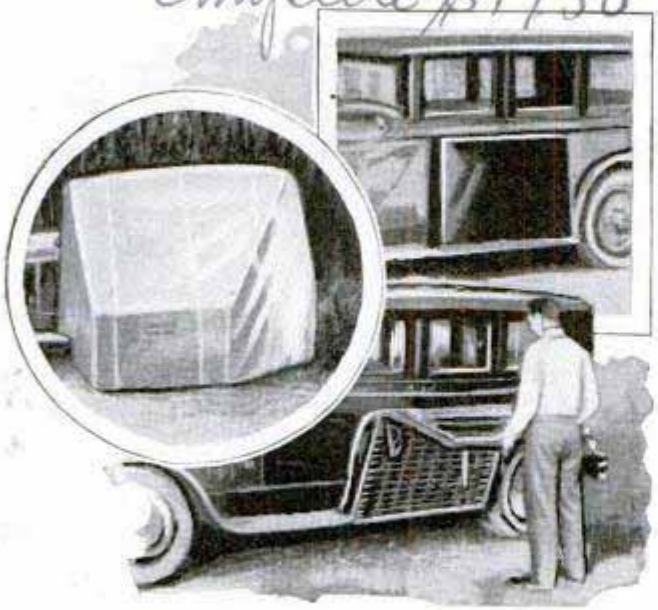
prisoner's arms and over his head. Then, with a quick upward heave, he throws his assailant over his back. The reverse hip lock is a similar maneuver. The attacker is thrown over the policeman's hip and then grabbed by the neck.

GREASE ON TROLLEY WIRES HELPS REMOVE ICE

Overhead wires of electric car lines are made to last longer and ice is more easily shaken from them in winter by keeping them greased. The experiment was tried in Toronto, Ont., where ice-laden wires proved a source of great trouble. It was found that the passage of the trolley wheels readily dislodged the sleet. Besides reducing arcking, the wear on curves was lessened about sixty per cent.

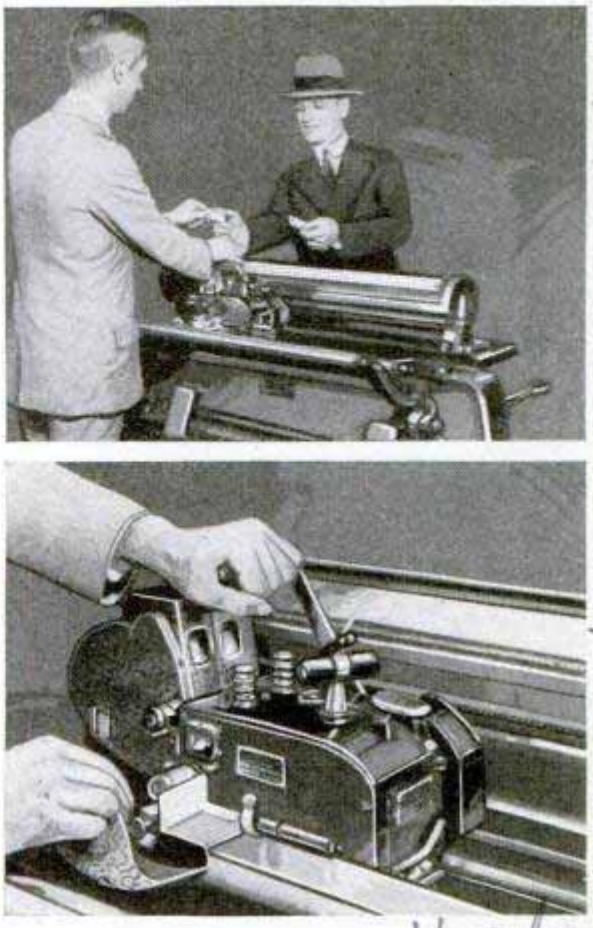
BED ON AUTO RUNNING BOARD SIMPLIFIES CAMPING

Attached to the running board of the automobile without the necessity of boring holes or using tools, a bed is carried like a luggage container and may be easily taken off and used at home at any time as a spare bed for a porch or room. It is rigidly constructed with a frame of angle iron without crossbars, and with it, is a tent canopy for shelter. A dust and waterproof cover protects the bed while on trips



Bed Folded, Covered by Canopy, and Being Extended; It Occupies Little More Space Than the Luggage

and under it is space for extra clothing and other articles.



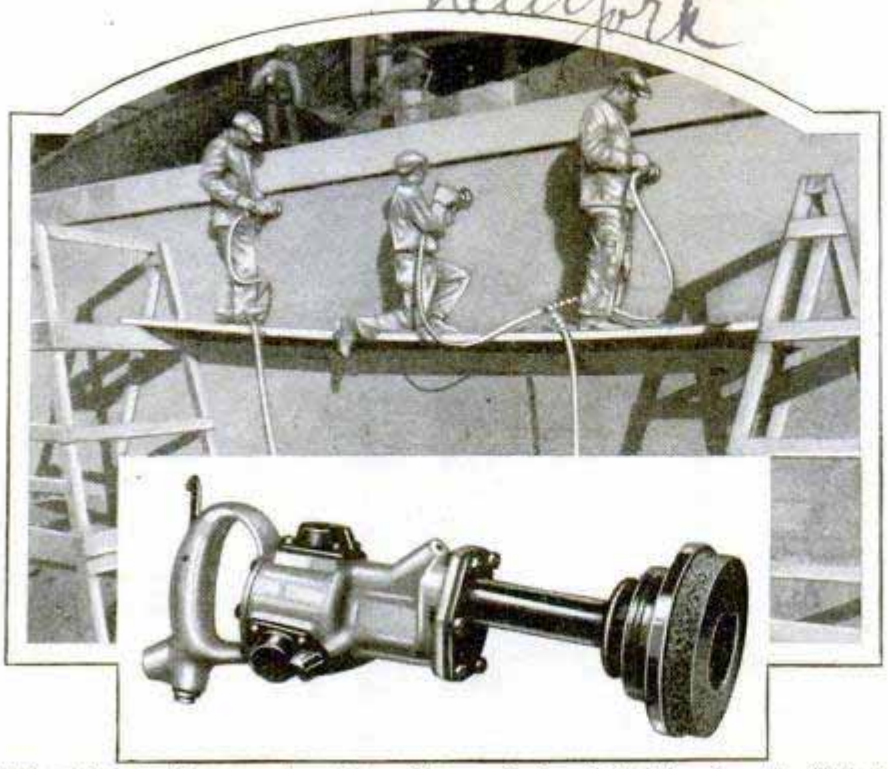
Printing Ticket for Passenger and Close View of the Printer; It Prepares Tickets as Needed

TICKET PRINTER FOR RAILROADS TO REDUCE EXPENSE

Almost every railroad has thousands of dollars tied up in printed tickets, but this investment will no longer be necessary, if a printing unit recently introduced proves successful. It prepares the tickets as they are needed, stamping on them the names of destinations, routes and other details. Clerks are also saved the task of additional application of rubber stamps, since the printer performs the complete operation and does it in little time.

THERMOMETER RUNS CLOCK

Energy captured by daily changes in the temperature, is utilized to operate a clock a Swiss engineer has invented. The motive power is essentially a long coiled tube filled with glycerine, connected with a cylinder into which a piston is fitted. When the glycerine is warmed and expands, it forces the piston out of the cylinder and lifts the clock weight. It is expected that this type of instrument will be especially suited for outdoor use.

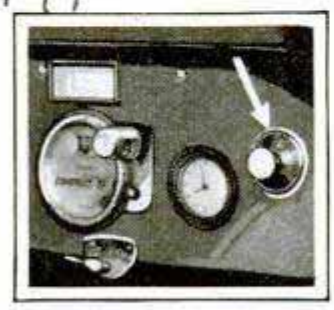


Using the Surfacer, and a Close View of the Unit Showing the Wheel Grinder Operated by Compressed Air

SURFACING TOOL FOR CONCRETE SAVES HAND LABOR

Operated by compressed air, a unit that quickly and easily smoothes concrete surfaces and removes form marks has been introduced to save time and labor. It can be used on either green or old material. An essential part of the outfit is a ring-shaped grinding wheel which is rotated flat on the surface and is kept from tipping on edge by means of a flexible joint in the wheel head. The tool weighs but thirteen pounds and special grinding wheels are provided for finishing and polishing monument and building stone.

KEYLESS DASH LOCK FOR AUTOS HAS LUMINOUS DIAL



Locking the car is as simple and natural a movement as turning the ignition switch with a keyless combination lock recently introduced. It shuts off both the gasoline supply and the ignition by a simple turn of the wrist, the exposed part being installed on the dash within easy reach. The dial, with the numbers by which the combination is set, is illuminated by a phosphorescent substance to serve as a constant reminder to lock the car at night and to make it easy to find. The combination is simple to form, and the lock can be released or fastened in a few seconds.

GLASS BLACKBOARD TO SAVE PUPILS EYESTRAIN

Blackboards of translucent ground glass, illuminated from behind, are proposed by a western professor as a substitute for the usual opaque, black surface, which is difficult to light so that it can be easily seen from all parts of the room. A test with a new board showed that letters on it were distinctly visible without strain, even when a combination of daylight and artificial illumination was used. Erasures were easy and the board could also be employed for the display of stereopticon slides.

MUSICAL DRUM EASILY PLAYED WITHOUT USE OF STICKS

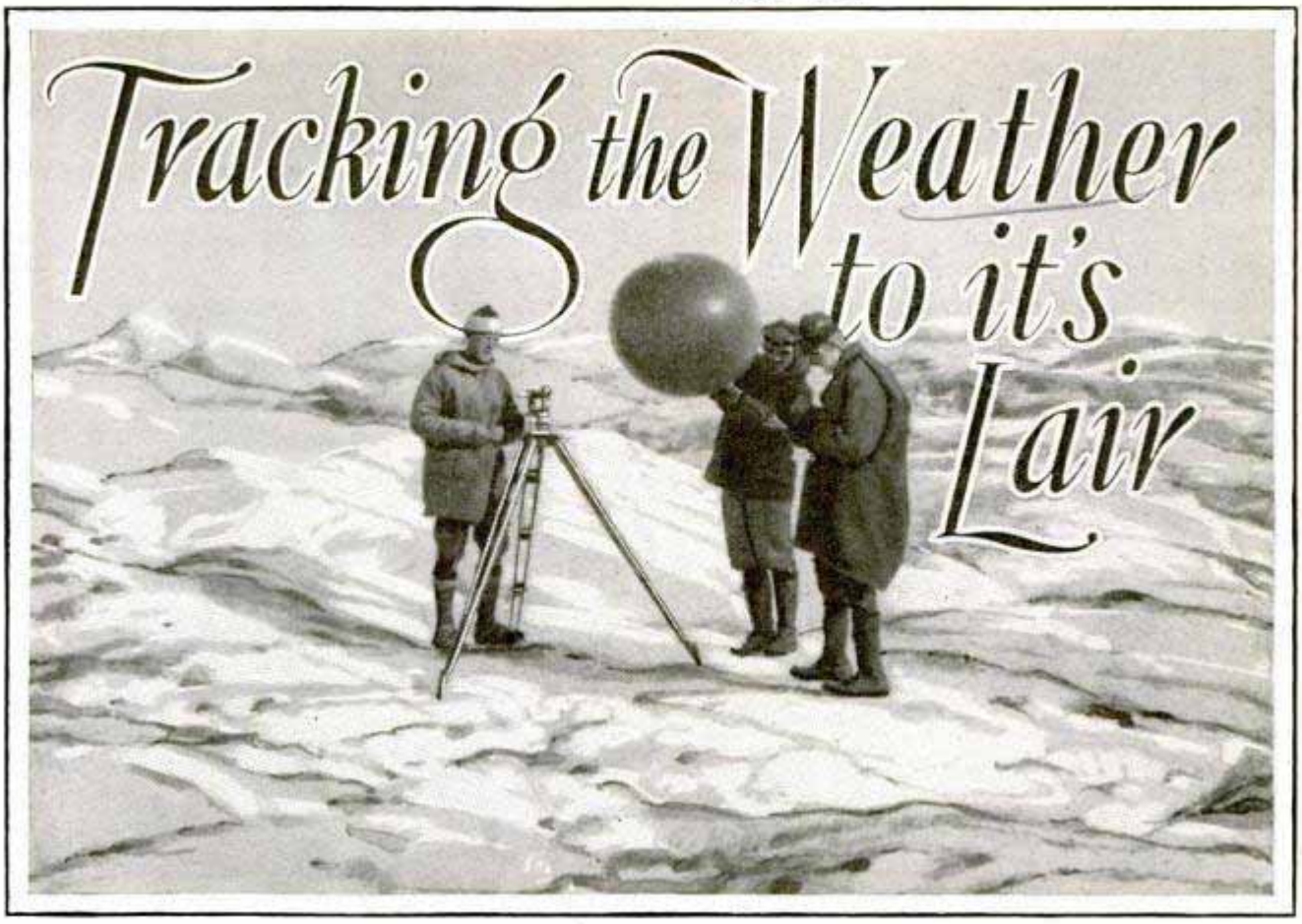
Boys can reproduce the beats of an experienced drummer, it is said, on a drum which is played by a pull-cord mechanism. With little practice most beats can be given accurately.

LIGHTED BADGES FOR CAPS AID MESSENGER BOYS

Messenger boys in London introduced something new in fashions when they appeared with luminous badges in their caps. The signs were of the type that reflect the light, and the letters "Via Marconi" could be seen far away—a considerable improvement over the former brass badges.

Michigan Daily
Ann Arbor, Mich

Tracking the Weather to it's Lair



Preparing to Release a Pilot Balloon on the Ice Cap of Greenland; the Balloons Often Rise to Heights of Eight Miles or More before Disappearing from Sight

FOUR men, linked to the outer world by the invisible tie of a short-wave radio set, have just finished living through the winter atop the great ice cap that covers unexplored Greenland. They risked their lives to study the weather of the North Atlantic at the spot where it is made, in the interest, primarily, of making future Atlantic airplane flights safe.

The cold winds that sweep across the vast ice fields of the huge island continent make the fogs and storms that were met by every transatlantic flyer, just as they had been met for hundreds of years by every ship that sailed across the northern ocean. When the frigid winds out of Greenland meet the warm airs over the northern curve of the Gulf stream, bad weather follows.

To chart that weather at its source and predict in advance when the ocean lanes would be safe and when flying conditions would be bad, Prof. William Herbert Hobbs, of the University of Michigan, has led two expeditions to Greenland in the last two years, and last fall he left four assistants behind to launch the daily weather observatory on the inland ice cap of the island.

Greenland, despite the fact that it was settled by the Norse Vikings long before Leif Ericsson pushed westward to Vinland in the year 1000, has remained one of the least-known spots on earth. It is only three years since Comm. Richard Byrd flew forty miles inland over the ice cap and came back to report that, once the steep gullies and ice ravines of the seaward slope were passed, the ice field stretched away as smooth and level as a ballroom floor—a perfect landing field for airplanes.

Because of the unbroken mass of ice, the interior is one of the world's coldest places, if not the coldest. Even in midsummer the thermometer may drop to thirty below zero, while in winter Greenland probably is colder even than the north pole.

Housed atop a mountain at the head of the great Sondre Stromfjord, one of the longest and largest fjords in the world, the expedition is but little more than 100 miles from its nearest neighbors at Hol-

Ann Arbor, Mich.

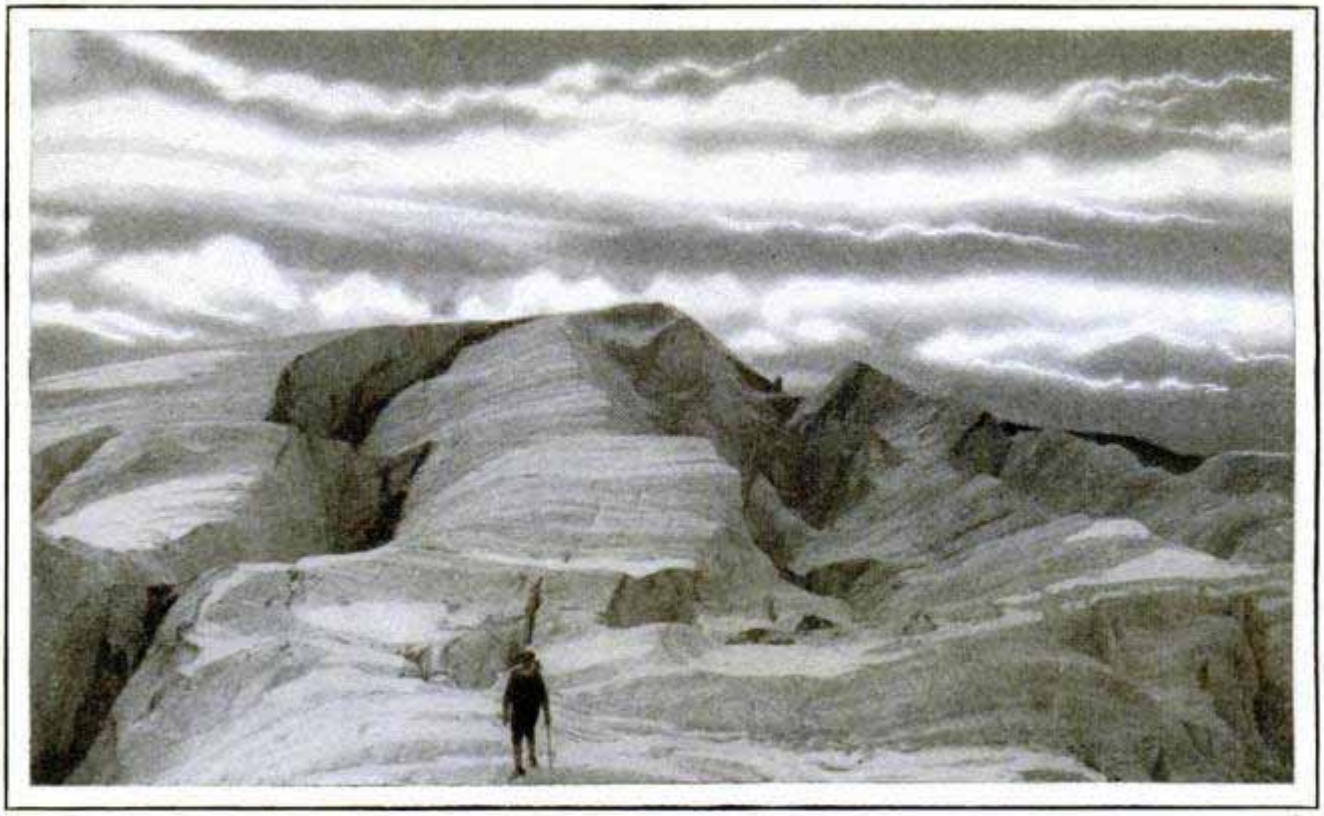
stenborg, a Danish settlement in southwest Greenland. To communicate with the Danish governor there, however, during the long winter night, it was necessary to send messages by short-wave wireless to Prof. Hobbs, who had returned to Ann Arbor, Mich., and he would then relay them by telegraph to New York, cable to Copenhagen, wireless to the Danish radio station at Reykjavik, Iceland, or Angmagsalik, on the east coast of Greenland, and from the latter station they would be in turn relayed to the governor at Holstenborg. On their long-wave receiver, the weather observers could hear the final delivery of their messages to the town a hundred miles away, days after they had started them on the journey of thousands of miles.

To reach their observatory the expedition had to follow much the same route, sailing from New York for Copenhagen to take the Danish government steamer which makes summer voyages to the Greenland colony. From Copenhagen it is a two weeks' trip to Holstenborg. There Prof. Hobbs chartered a little twenty-ton motor schooner to transport the supplies, building materials, dogs and men down the coast. On the way, the party was storm-bound in a small inlet for seven days by a terrific gale, during which two small boats full of supplies, which were being towed astern, went adrift and were only saved at great risk.

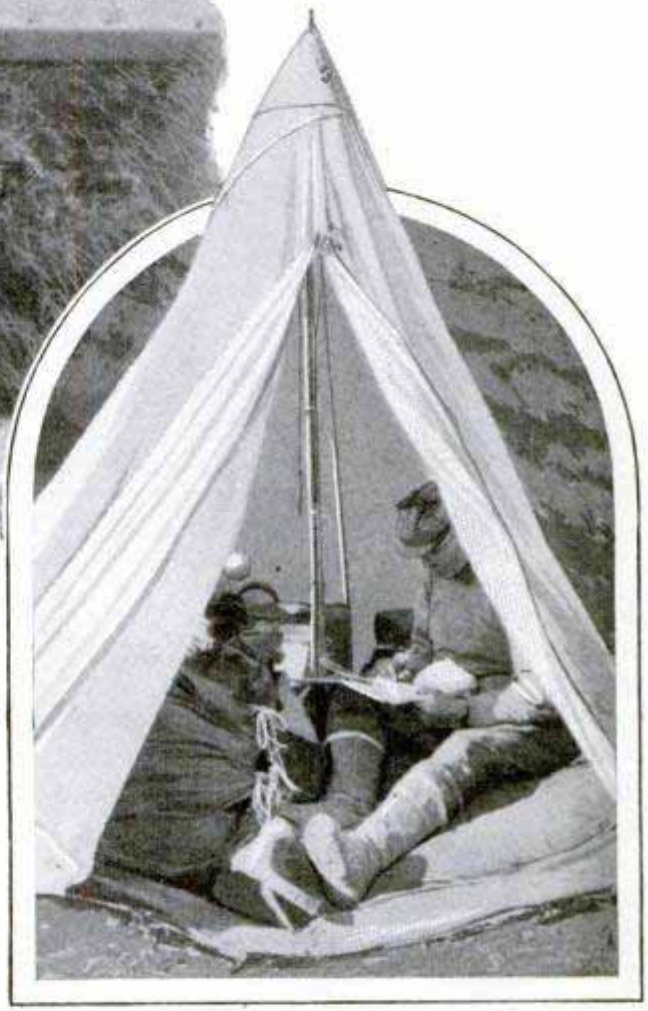
Reaching the head of the fjord in midsummer, all the building material, supplies, instruments and other equipment were packed on the backs of the men to the top of a mountain, 1,290 feet in height. The hill top commands the level country for miles around, and a small fresh-water pond, fifty feet below the summit, took care of the water supply.

Because of the terrific winter gales, the permanent quarters had to be designed to withstand enormous pressures as well as cold. A low, rectangular building, with a dome-shaped roof, was erected, banked on the outside by several feet of sod and rocks. Storerooms lined either side, with the living room centered between them, for further protection. The living-room walls were packed with insulating material and lined with water and wind-proof canvas. The only light was admitted through windows in either end, furnished with two sheets of plate glass and an air space between. Owing to the months of darkness in the winter, provision for daylight is not important in the far north.

Before the building was completed, an



This Is the Way the First Few Miles of the Glaciers Look; Back of the Broken Country Is Hundreds of Miles of Smooth and Level Ice on Which Airplanes Can Land with Ease



Two of the Hobbs Party in Their Winter Suits with the Long-Wave Radio Receiver; the Sod-Banked House Is in the Background; Below Is a Summer Tent on the Tundra

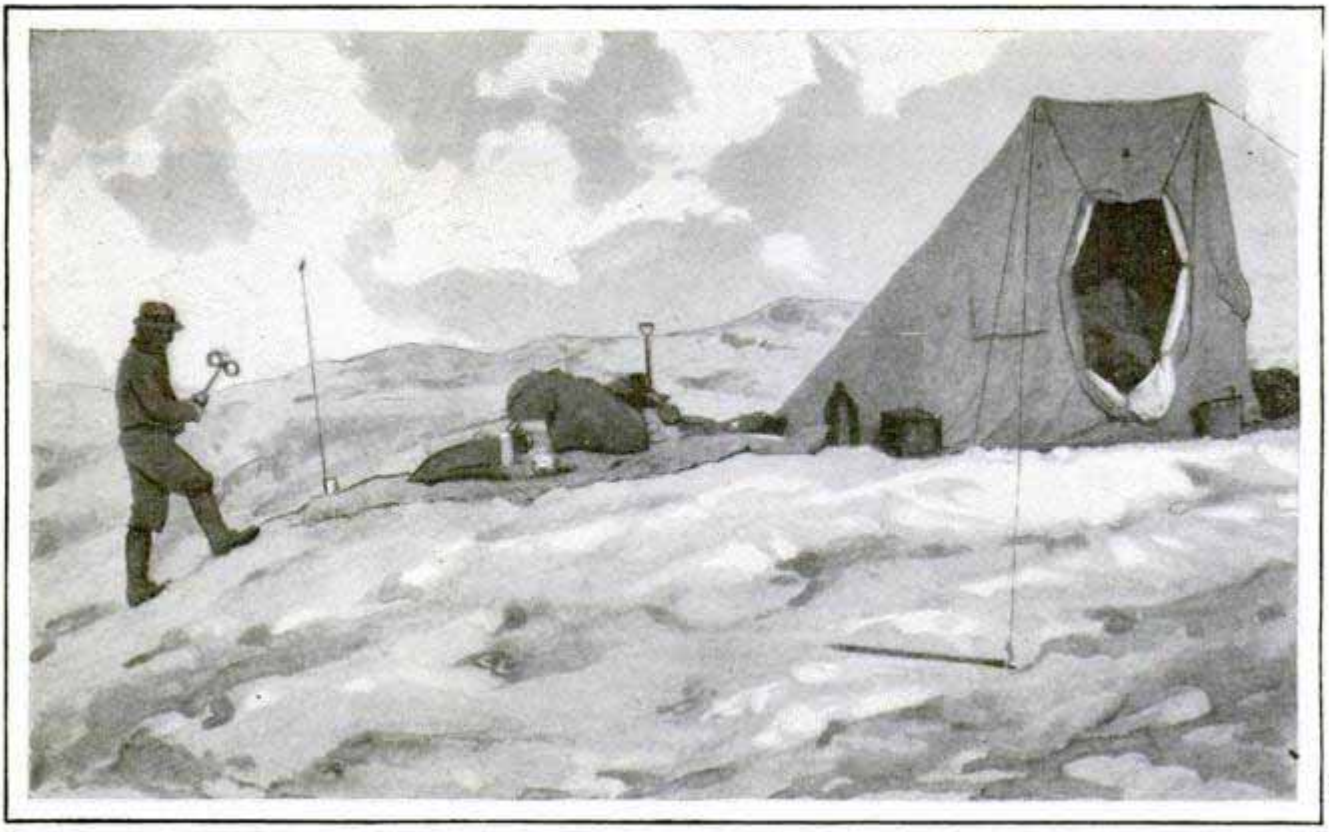
eighty-one-mile gale gave a thorough test of its construction. Complete weather recording apparatus, including barographs, thermometers, wind-velocity recorders, and other instruments, were placed in operation by mid-July, and daily ascents of pilot balloons begun. Owing to the height of the mountain top above the interior ice cap, it was often possible to follow the flight of the pilot balloons for nearly twenty-five miles, during which they sometimes rose 40,000 feet or more.

Prof. Hobbs led an expedition inland over the glaciers before returning to the United States in the fall. The ice cap, in summer, is entirely free from snow and, in the region along the coast, was found so pitted with crevasses and studded with hummocks that even light hand sleds could not be drawn, so supplies had to be packed on the men's backs. The going was so rough that only eight miles were made in six days.

The value of Greenland weather information was shown within a few days after the permanent camp was started, when the eighty-one-mile hurricane swept the mountain on July 21. Radio reports two days later showed great storms along the whole Atlantic seaboard. With further observations, it may be possible to send out radio warnings at least forty-eight hours before storms strike the ship and air lanes over the Atlantic.

Prof. Hobbs hopes later to extend the weather survey by exploring the interior of the island continent. Greenland's ice cap is 1,500 miles in length and half that in width. Next to the antarctic ice cap, which Comm. Byrd is planning to explore by airplane, it is the largest and loneliest desert in the world—a desert at an average elevation of two miles above sea level, and without a trace of life.

It is this ice cap that is the real home of the north wind, and not, as many have supposed, the frozen seas around the north pole, for temperatures there are often



Temporary Camp on the Inland Ice, with Prof. J. E. Church, Jr., One of the Four Who Wintered in Greenland, Preparing to Mount the Wind-Velocity Recorder

higher than over Greenland. Winds are produced by air currents of different temperatures. The tropics form a vast furnace from which heated air rises, to spread north and south, at high altitudes, toward the poles. When the warm air reaches the Greenland ice, it is sucked down and drained off as through a gigantic shaft. From the ice itself the cold and heavy air spreads out and starts the return over the North Atlantic toward the equator, to be heated again, completing the circuit.

Admiral Peary, who made sled journeys over portions of the ice cap in 1886, 1892 and 1895, found that the cold air was continually slipping down the great ice dome toward the sea, as more hot air was fed in from above. Quite independent of weather changes forecast by his barometer, he found the wind almost invariably blew in the direction of the ice slope.

The same effect can be produced, according to Prof. Hobbs, by a simple experiment. In a glass goldfish globe he placed a copper tank with a dome-shaped top, and on the top fixed a lighted cigaret. The smoke rose in a straight column above the globe so long as the globe was empty, but as soon as cold ice water was poured in, the downward current of cooling air drew it down the slopes of the dome.

When a storm starts eastward from the United States, it will practically blow itself out before reaching Europe, because its energy has been used up on the long trip over the Atlantic. But if it passes south of Greenland when another storm on the ice cap is in full swing, the energy of the latter is poured into the eastward-moving "low" and transforms it into a disturbance whose magnitude, when it reaches Europe, depends directly on the intensity of the Greenland storm.

2632

DOOR IS LOCKED WITHOUT KEY TO FOIL BURGLARS

Seal-Lock

Doors are made secure without keys by a seal slipped between the door and the jamb just above the catch. A curved lip holds it firmly in place, preventing dislodging from without, and the door is kept shut by a sliding brace on the seal, held in slots.

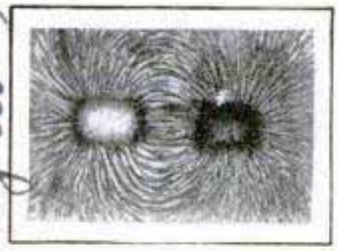
Steel Products Corp.
268- 12th St.
San Francisco Calif.

POPCORN IN RAINBOW COLORS HAS BIGGER "POP"

Popcorn with greater "pop" in it, and in yellow, white, red, black, lavender and other hues, has been produced by an Iowa farmer. The results have been obtained by careful selection and crossbreeding of varieties. By mixing stub-rice popcorn with bantam sweet corn, a kind was obtained with 1,000 kernels to an ear only three inches long, and that popped out twenty to twenty-four sacks to the pound. The usual yield is only twelve to fifteen sacks. Some of the prize varieties have been sold for $200 a bushel and as high as $3 a pound for seed purposes.

HOLLOW MAGNETS ARE FOUND STRONGER THAN SOLID

Hollow magnets developed abroad are considerably lighter than the solid type, and the power lasts longer and is greater. In a recent test, a hollow magnet, weighing less than half as much as a solid one, lifted twice as much. The unit is constructed of four thin sheets of metal with no core at the interior. In the solid type, the inner mass exerts a demagnetizing effect on the surface, but this effect is not found in the hollow magnet. A great saving of material is possible with this type—a factor of considerable importance because relatively expensive metals, such as chromium, tungsten and cobalt, are commonly used to increase the attractive power of magnets of the ordinary type.



TOOTH DECAY IS PREVENTED WITH RUBBER PICK

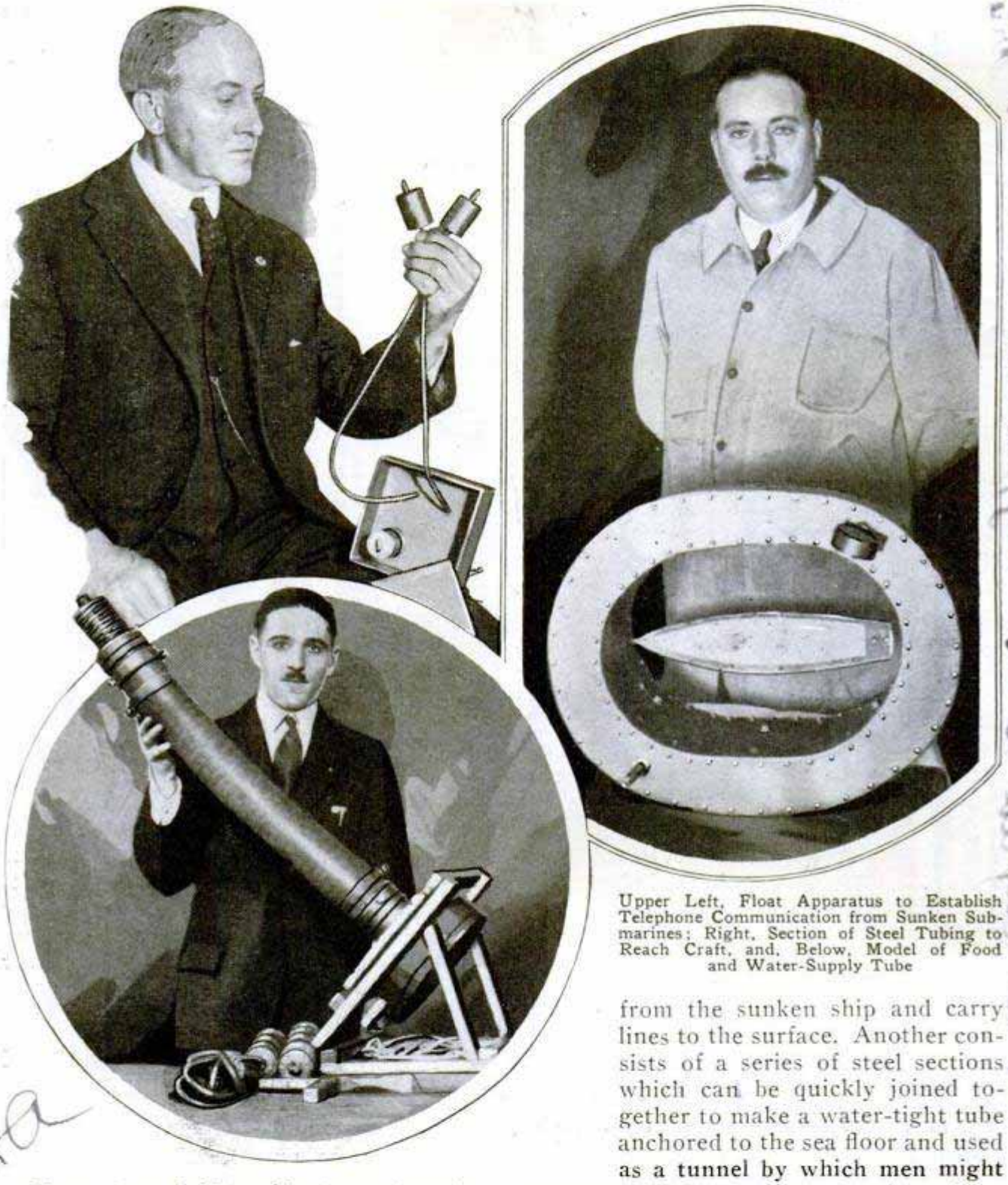
To treat the gums and remove particles of food from between the teeth without injury to the tissues surrounding them, a rubber-tipped pick has been introduced. The flexible part is so shaped that it reaches points that cannot be touched by ordinary means and it is also adapted to the application of a mouth wash or other suitable preparation to areas that may need treatment. A special feature of the unit is that the tip may be adjusted to almost any angle within the metal holder that serves as a handle and also as a case to protect the rubber from dirt. After using, the pick is easily sterilized and extra tips are furnished in sufficient number to last for a fair length of time.

Illustrating Use of the Tooth Preserver, and a Close View Showing How Rubber Tips Are Adjusted

METAL SQUIRREL CRACKS NUTS WITH LITTLE EFFORT

Efficient, and also useful as an ornament, a nutcracker has been introduced. The tail serves as a lever to actuate the jaws between which a hard-shelled nut can be broken with but little exertion on the part of the operator. The cracker is less than six inches high and ten inches long.

INVENTORS SEEKING TO MAKE SUBMARINES SAFE



Upper Left, Float Apparatus to Establish Telephone Communication from Sunken Submarines; Right, Section of Steel Tubing to Reach Craft, and, Below, Model of Food and Water-Supply Tube

Since the sinking of the submarine "S-4," numerous proposals have been introduced toward making craft of this type safer and to afford means whereby persons trapped inside them could be rescued. Among these are an outfit for sending air, food and fresh water to the crew in the submarine while establishing telephone communication with them and a floating apparatus which is to be released from the sunken ship and carry lines to the surface. Another consists of a series of steel sections which can be quickly joined together to make a water-tight tube anchored to the sea floor and used as a tunnel by which men might enter to perform necessary repair work or other tasks incidental to the salvage.

MODERN DIVINING RODS HELP EXPLORE EARTH'S RICHES

Secrets of the earth, inaccessible to the miner's eye or drill, are now revealed to the exploring scientist through the use of instruments that have replaced the "magic

Bulletin 21st & B St
Washington, D.C.
No. 260-B
2/14/28
3937

rods" of the unscientific diviners. These aids are in constant use in the quest of oil and minerals, telling the mining engineer where it is advisable to drill or dig. Rocks and other deposits in the earth have been found to have different physical properties which can be detected by suitable apparatus at the surface. Masses of light or heavy materials affect the gravitation of the earth near by and can be detected with a pendulum or gravity balance. Many rocks have different degrees of magnetization and consequently vary the strength and direction of the earth's magnetic field. Refined forms of the compass and similar instruments allow the geologist to measure any magnetic irregularities and speculate upon the cause. Small explosions can be recorded on seismographs to determine the difference in elasticity of the rocks, thus giving a clue to mineral deposits.

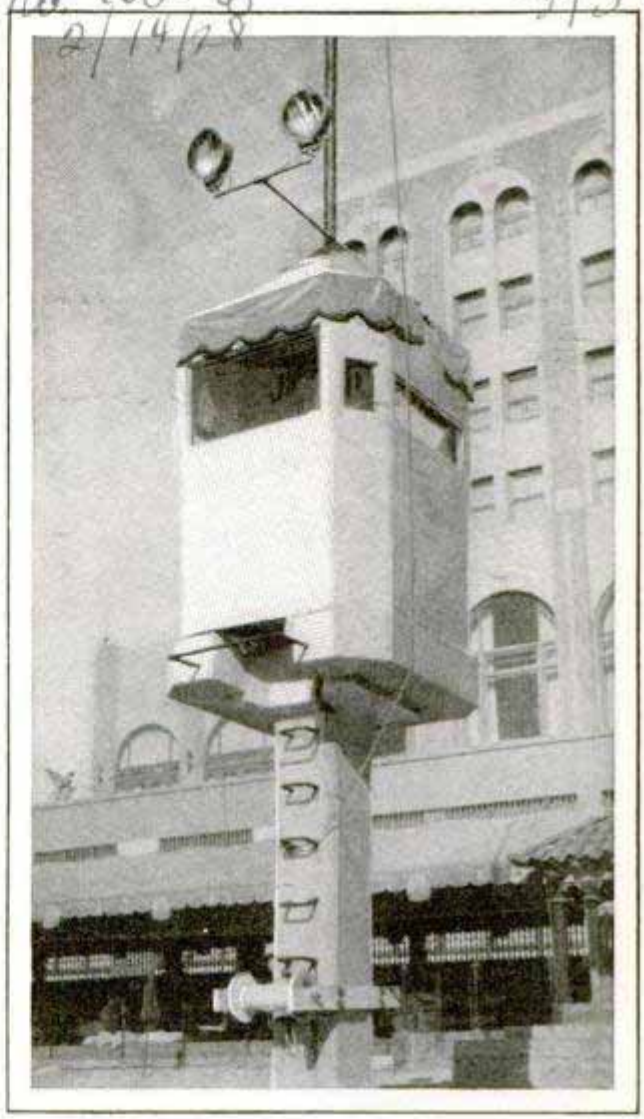
3821

MIRROR PINNED INSIDE OF CAR LATEST TRAVEL CONVENIENCE

Fastened to the upholstery on the side of the closed car's interior, a mirror may be quickly adjusted to any position desired and is attached without damage to the material. It is securely anchored so that it does not vibrate unduly and gives a distinct image. One used on each side enables occupants of the back seat to enjoy the glasses without leaning over.

Mirror Attached to Car Interior, and Close View Showing the Fastener

Turner Mfg Co.



Concrete Observatory Shelter for Life Guards at California Beach; It Is Equipped with Radio Apparatus

LIFE GUARDS' CABIN ON POST HAS RADIO CONNECTION

Life guards at the Santa Monica beach in California are snugly housed in a small cabin on top of a high concrete post, where they can command a wide view of the ocean. Besides being sheltered from the sun, they also have radio sets for communicating with other stations along the beach. Powerful searchlights protect bathers by night.

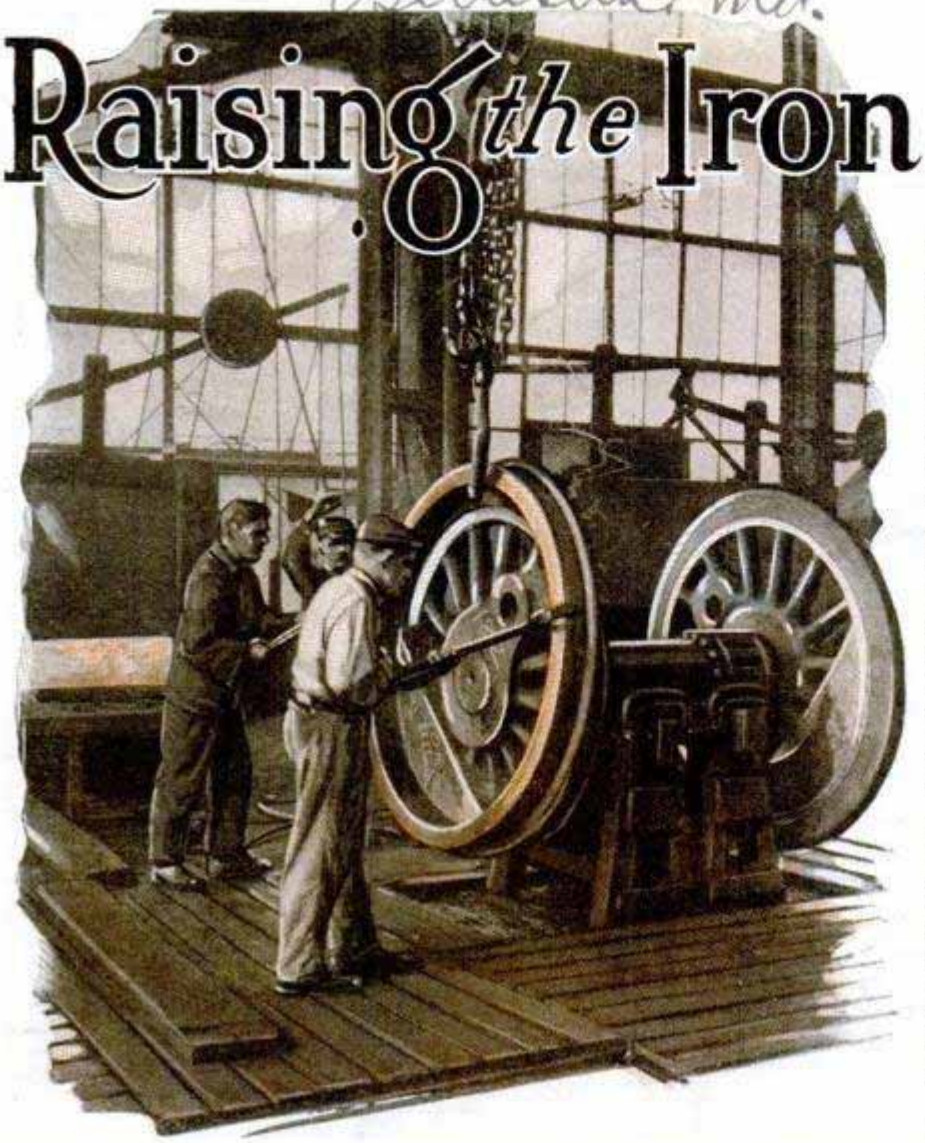
MISSING-KEY BOARD SERVES THEATER PATRONS

270

Keys found in a Portland, Oreg., theater, are hung on a board where patrons can see them and claim their property. "Is this your key?" a sign at the top inquires, and since the establishment of the rack, scores of grateful persons have derived service from the novel installation.

119 4639 Montgomery Ave
Bethesda, Md.

Raising the Iron Horse



Fitting a Red-Hot Rim, Heated to Expand It, over a Locomotive Drivewheel; Cooling and Contraction Assure a Tight Fit

BACK in the days when American industry was young and untried, a discouraged jeweler looking about for a better trade, formed a partnership with a machinist—and thereby one of the greatest locomotive factories in the world was born.

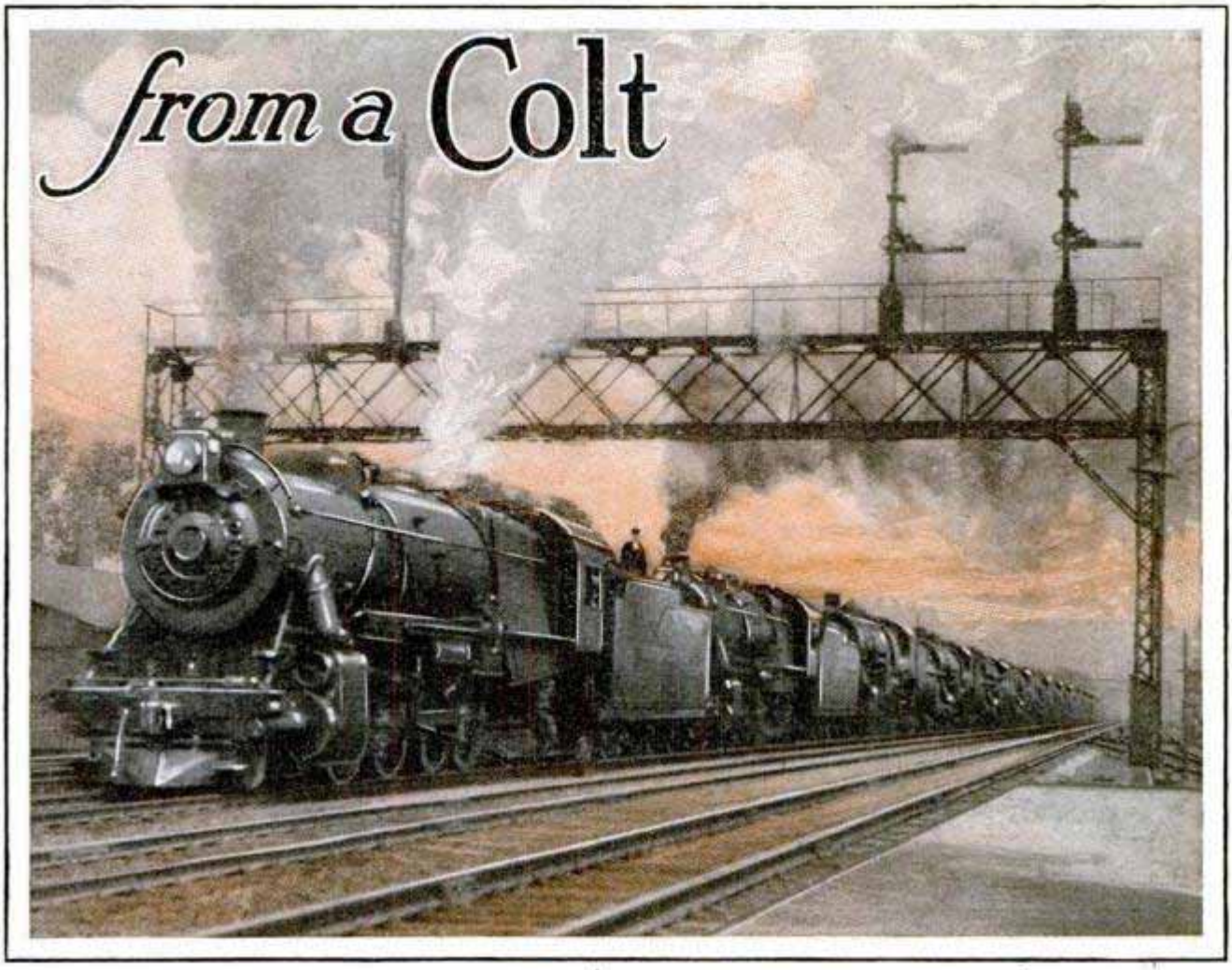
Matthias Baldwin, the jeweler, and David Mason, the toolmaker, didn't start out to make railroad engines, or any other kind of engines. Their plans covered bookbinders' machinery and cylinders for the calico printers of New England's cotton mills. Their first steam engine, a stationary vertical boiler, was born of necessity, for they needed a power plant for their new factory, and it was easier to invent one than to buy it. The engine was such a success that engine building became the major activity of the company, which soon narrowed down to one man, when Mason dropped out.

From the building of low-pressure, small-factory power plants, to a modern 2-10-4 locomotive complete with superheater and booster, is a long step, but Baldwin took it by easy stages. His first locomotive was the original "colt" that grew up to be the "iron horse" in America, for it was a baby-sized affair. The proprietor of the Philadelphia museum dropped in one day to tell Baldwin that Philadelphians were getting excited over reports of the success of steam trains in England. He suggested that a miniature train would draw crowds to the museum, and asked Baldwin to build the outfit.

With nothing but brief descriptions and crude sketches of Stephenson's "Rocket" and other English locomotives to go by, Baldwin turned out his first locomotive, and in the last week of April, 1831, this first engine to bear his name made its trial trip, on a circular track of pine boards reinforced with hoop iron, in the museum building. The Lilliputian locomotive drew two small wooden cars, providing seats for a total of four passengers.

Anthracite coal and pine knots furnished the fuel, and when the first Baldwin steamed along the hoop-iron rails, crowds flocked from a large section of the Atlantic seaboard to see the marvel.

Since that time, Baldwin and his successors in the company that bears his name, have built more than 60,000 full-sized locomotives, including many of the latest marvels of the rails, but none, probably, will ever be the mechanical rival of his first big job, the immediate successor of the museum engine.



A Train of Locomotives, Hauled by Two of Their Number under Steam, Starting across the Country for Delivery to a Western Railroad; the Engines Are Destined for Freight Service

The success of the museum demonstration brought an order from the Philadelphia, Georgetown and Norristown railroad company—a pioneer whose impressive name was only slightly shorter than its six miles of track—for a steam engine to replace the horses that then pulled the coaches over the rails.

An English locomotive had just been imported by another road, and Baldwin obtained an opportunity to inspect the parts before they were assembled. On the strength of that brief inspection, plus his previous experience building the small model, he turned out "Old Ironsides," the yearling of the future "iron-horse brigade."

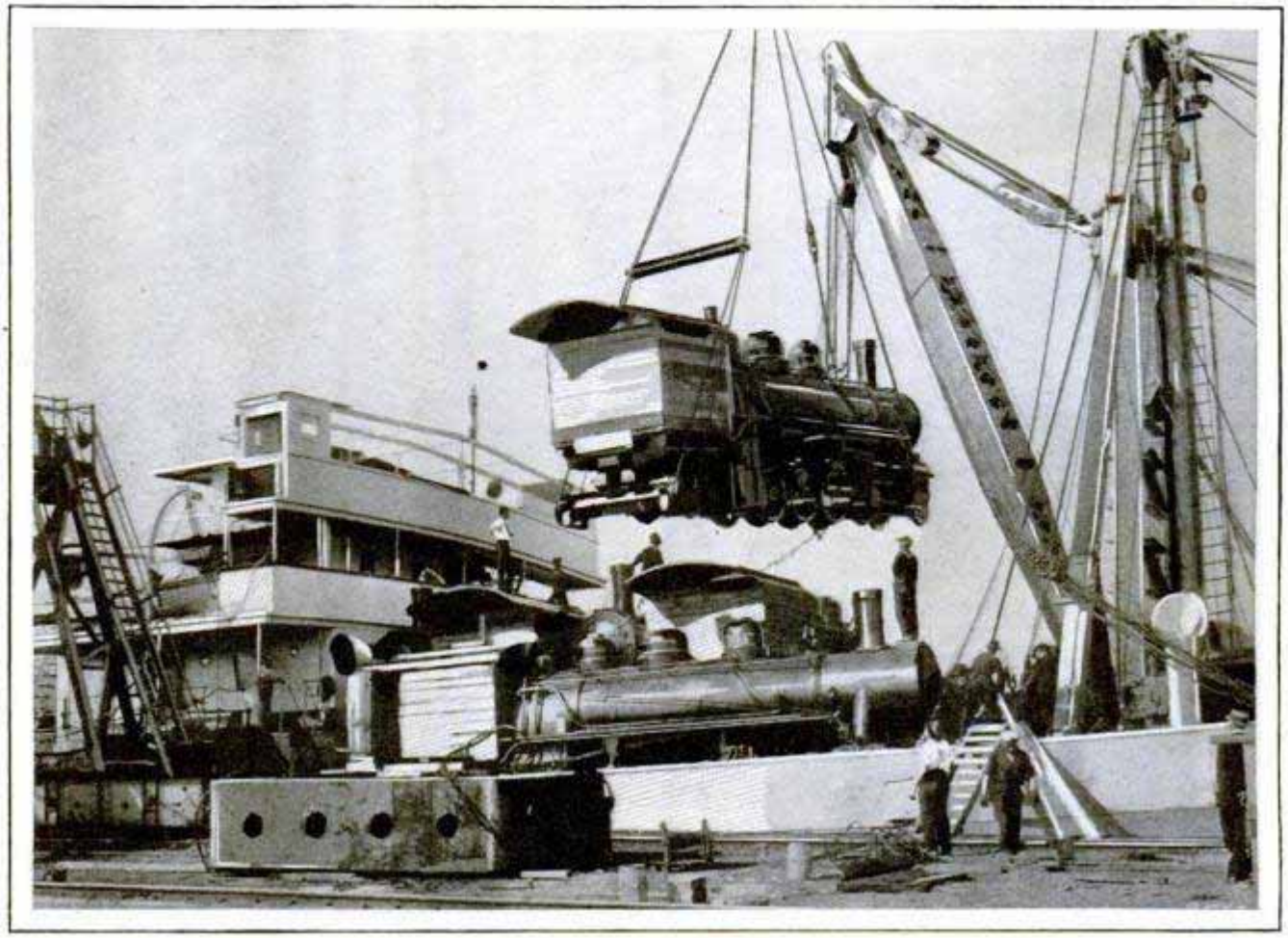
There were practically no tools in America suitable for engine building, and very few competent workmen. These few were blacksmiths, whose training did not extend much past the ability to weld an inch-square bar. Baldwin bored his first cylinders with a tool of his own design—a chisel mounted in a block of wood and turned by hand.

Despite the handicaps, a few days before Thanksgiving, seven months after the trial trip of the museum model, "Old Ironsides" took to the rails and did twenty-eight miles an hour over the bumpy track of the P., G. & N. R. R She was a four-wheeler, capable of pulling a thirty-ton load—a weight equal to about three-fourths the load of a modern average-sized coal car.

"This," said Baldwin, as he delivered the job to the railroad heads, "is our last locomotive."

Time, though, healed the scars of wrestling with that creative problem, and the lure of steam soon had him back in the fold. Just nine years later, he established a record by exporting the first locomotive shipped from the United States. Austria was the original purchaser and the export business, started then, has since grown to enormous proportions, for American locomotives are found all over the world.

The iron horse has changed remarkably since his colt days. The youngster didn't have a cab for the crew, he didn't have air



Loading Locomotives for Shipment to South America; the Engines, with Cabs Boxed, Are Loaded Intact by Special Derricks, and After the Hold Is Filled, Others Are Lashed on Deck

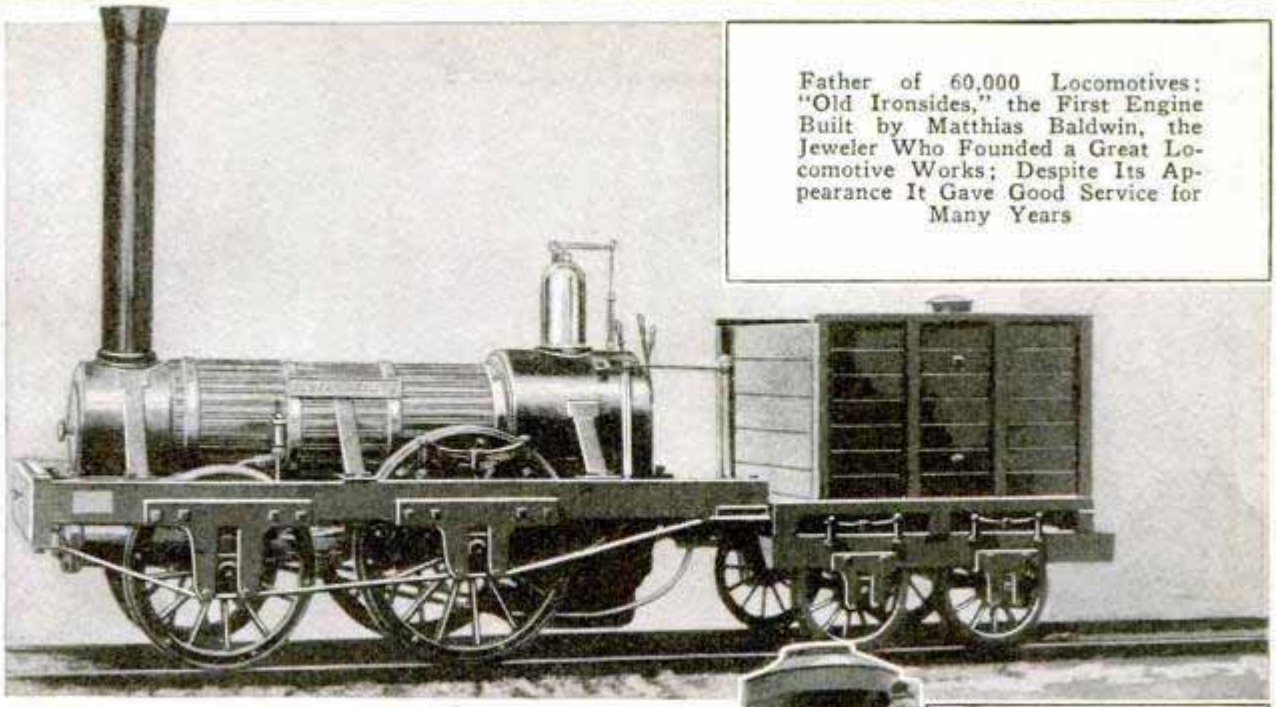
brakes to stop the train, he didn't have leading trucks or a pilot to put them under, and didn't have enough fire box to require trailing trucks, as the little wheels that follow the big drivers are called. His tender was a wooden box on wheels. He didn't have a bell or a whistle, a sand dome, a superheater, a flock of recording gauges, or any of the hundred and one gadgets that no locomotive engineer nowadays could do without.

The early engineer, as he appears in the old prints, was a stately figure standing out in the open, under—if it was a formal occasion—the sheltering brim of a tall and impressive beaver-fur top hat and even incased in a frock coat.

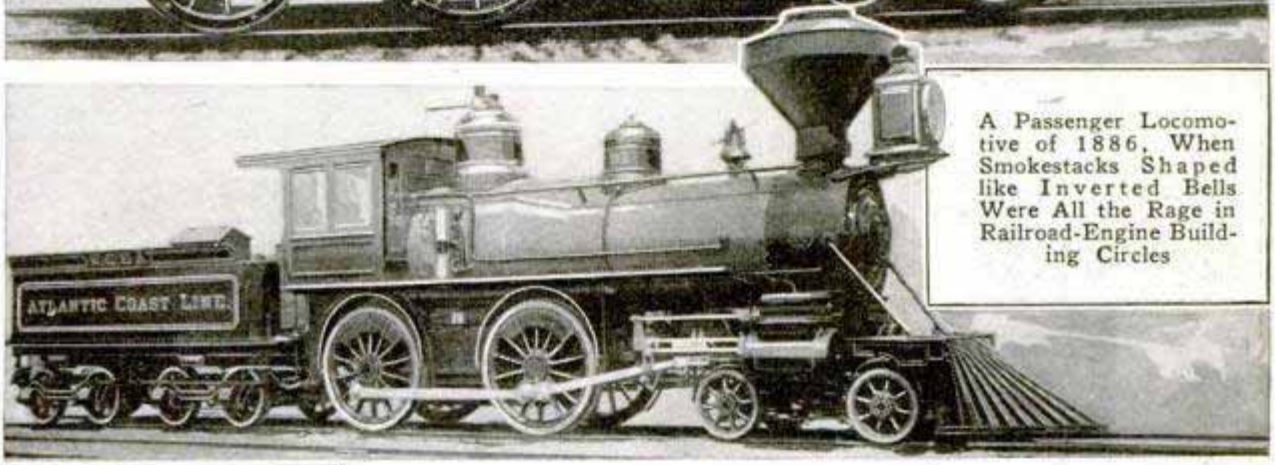
Compare that picture with the modern engineer, sitting at ease, probably on a well-upholstered seat, on the right-hand side of the engine cab. In front of and around him is a multitude of gauges, levers, knobs, wheels and other devices. He even rings the bell nowadays with a small steam engine, instead of pulling a lanyard, as in the past.

Within easy reach is the throttle lever, extending from the back head of the boiler. Just in front of him are two small levers which control the independent and train air-brake valves, and at his left side the long reverse lever sticks up through the floor. On some of the late models, a screw or power gear replaces the big reverse lever. The back head of the boiler is covered with recording instruments, under a shaded electric light. Steam gauges indicate the boiler pressure and steam-heat pipe pressure, and the water column shows the water level in the boiler. An electric pyrometer may be mounted to show the temperature of the steam entering the cylinders. Close to the brake valves are two gauges to tell the condition of the air-brake equipment. A host of small levers and valves control the water injectors, sander valve, bell ringer, whistle, headlight generator, stoker, steam to the train-heating line, and many other things.

There is one valve that produces the cloud of steam that spurts from the cylinders just before the engine starts. That

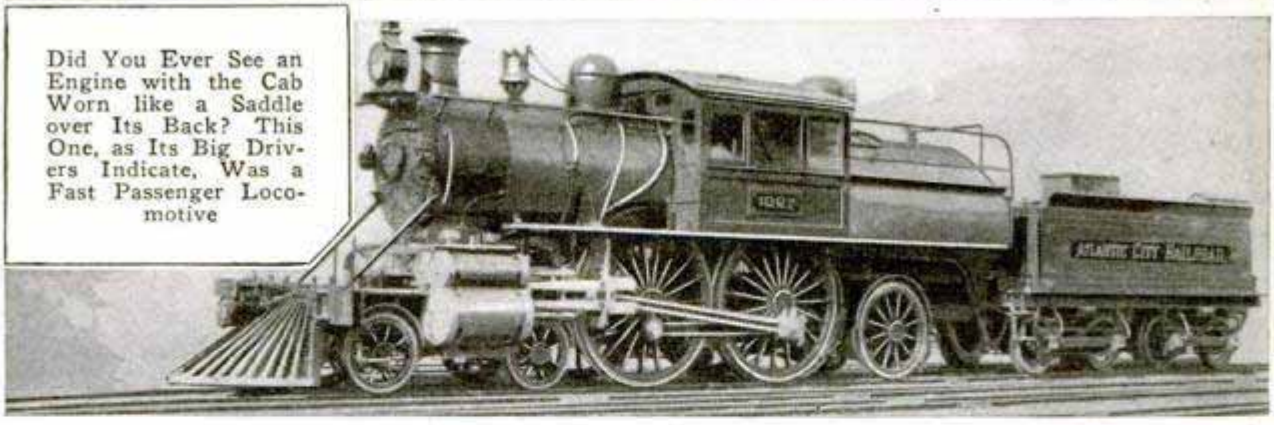


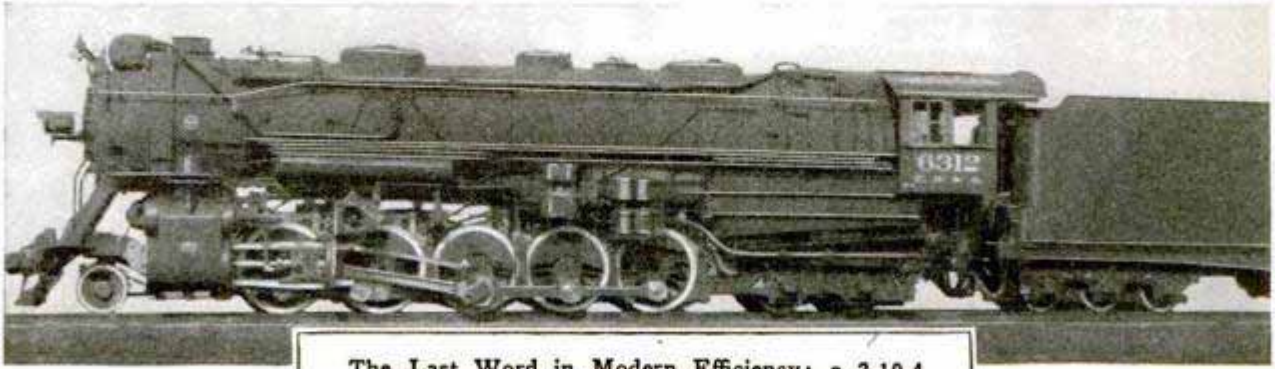
Father of 60,000 Locomotives: "Old Ironsides," the First Engine Built by Matthias Baldwin, the Jeweler Who Founded a Great Locomotive Works; Despite Its Appearance It Gave Good Service for Many Years



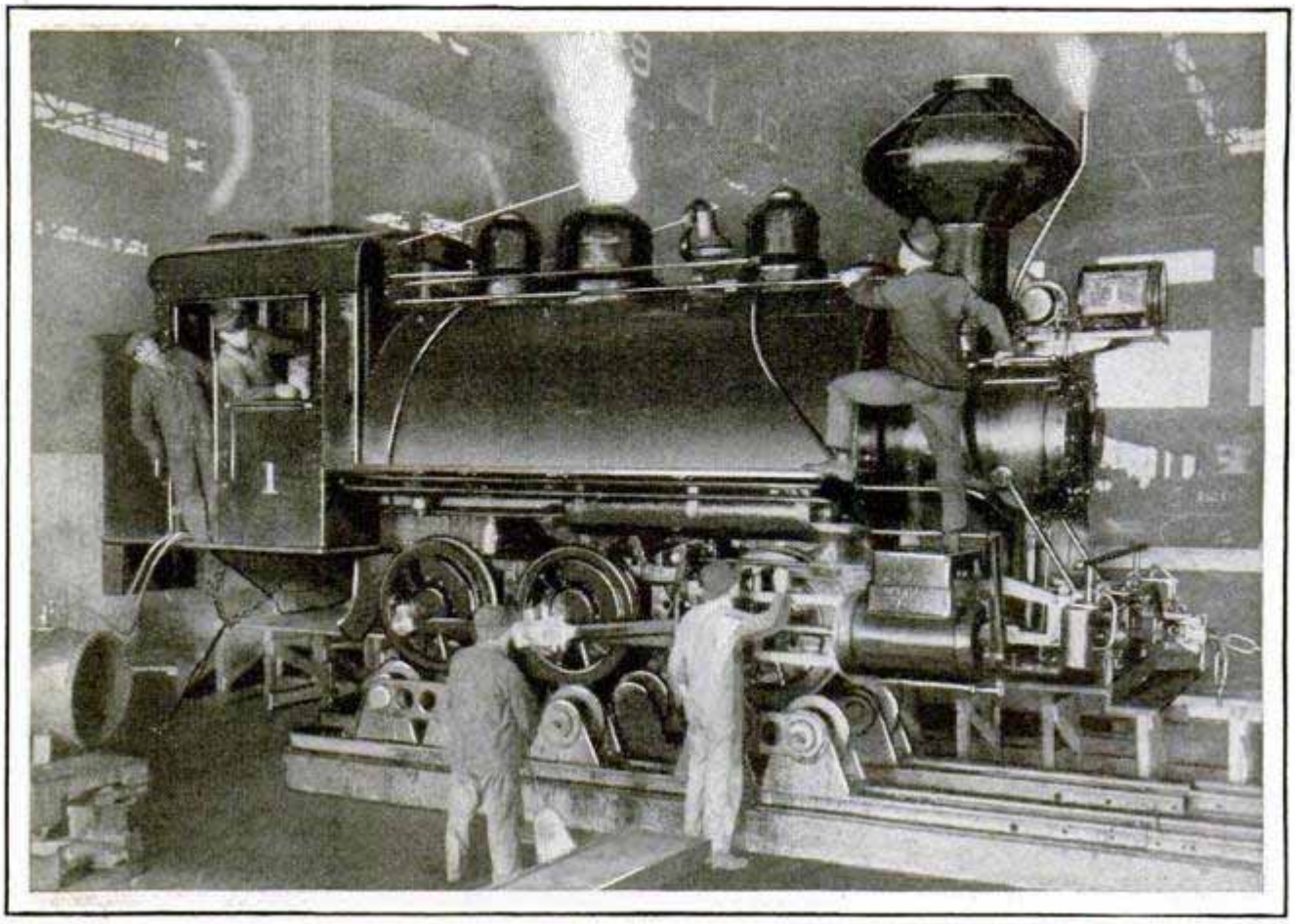
A Passenger Locomotive of 1886, When Smokestacks Shaped like Inverted Bells Were All the Rage in Railroad-Engine Building Circles

Did You Ever See an Engine with the Cab Worn like a Saddle over Its Back? This One, as Its Big Drivers Indicate, Was a Fast Passenger Locomotive





The Last Word in Modern Efficiency; a 2-10-4 Type (Count the Ten Driving Wheels) Built to Haul Heavy Coal Trains



Giving an Industrial Locomotive a "Road Test" on a Roller Track; Moving Parts Are Worn In and All Tests Made in the Shop by This Clever Arrangement

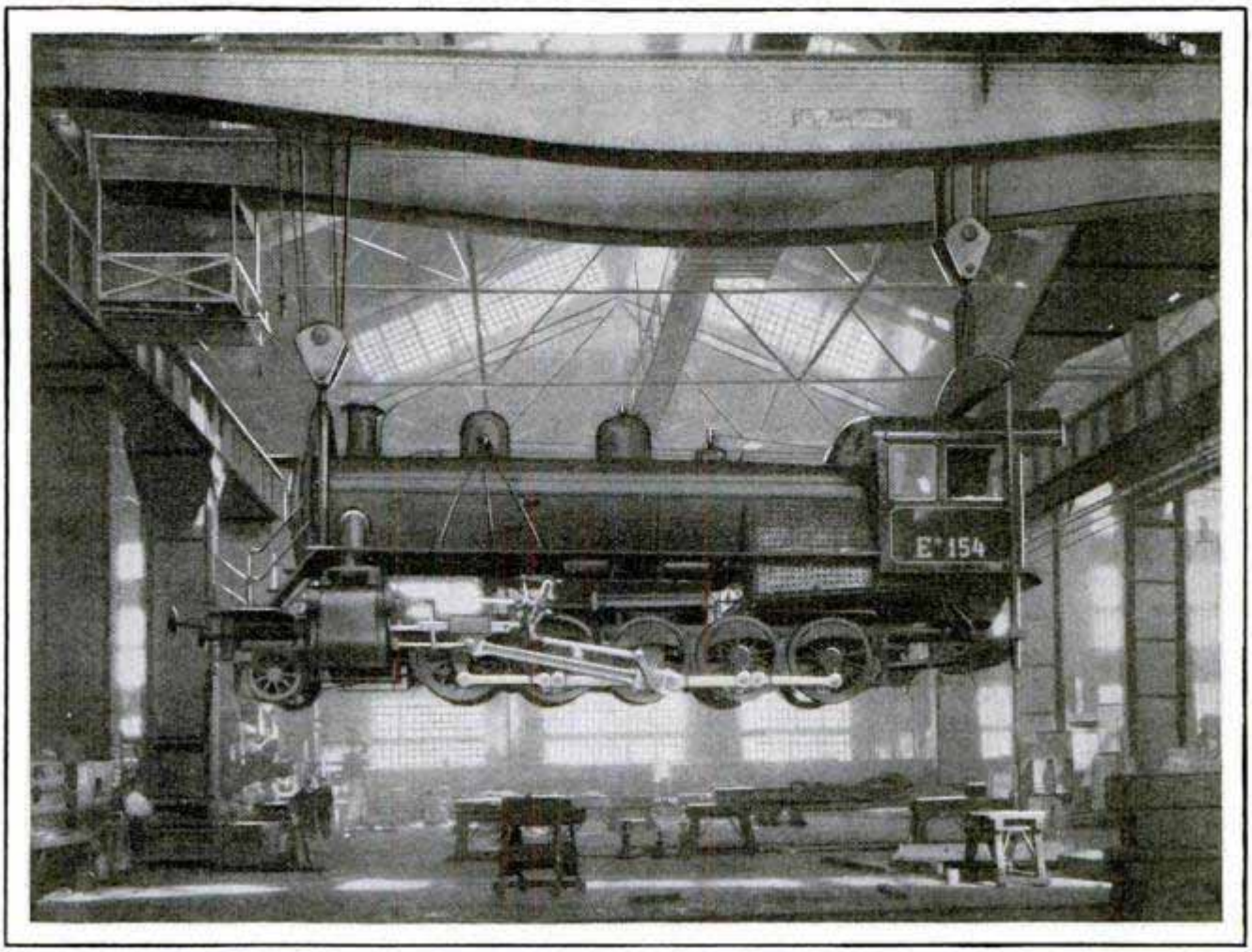
is done to blow out any water which may have condensed while standing still. Another produces the steam that jets from the side of the fire box occasionally. When it appears, it shows the enginemen have opened the blowout cocks to eject any sediment which may have settled at the bottom of the fire-box shell—the lowest point on the boiler.

The first locomotives, like "Old Ironsides," had all their weight on four driving wheels, but as their size increased, to cope with bigger and heavier trains, the four-wheel swivel truck was devised to support the front end of the boiler and guide the locomotive around curves. As additional power was needed more driving wheels were added, and to make room for them, a single pair of pilot wheels sometimes replaced the leading truck.

Higher speeds called for more steam, and to produce it, the fire box became bigger and bigger, so a pair of trailing wheels or a four-wheel trailer truck had to be stuck under that end of the locomotive to carry the added weight. Soon there were so many different kinds of engines, each designed for a specific purpose, that some way of classifying them became necessary and the number of wheels was taken as the criterion. The result is such symbols as "4-6-2" for a Pacific-type passenger locomotive, or, perhaps, "0-4-0" for a switch engine. The figures indicate the number of wheels in each group, beginning at the front of the engine. A 4-6-2 type has four pilot wheels, six coupled driving wheels, three on each side, and two small wheels under the fire box. The presence of a naught indicates there are no wheels in that position. Switch engines, for example, are often built without either pilot or trailing wheels such as the 0-4-0 and 0-6-0 type, in order to concentrate the greatest possible weight on the driving wheels, to give the maximum tractive power. The more weight on the drivers, the more pressure exerted to keep them from slipping when starting.

Locomotives, by the way, are always rated according to tractive power, and not horsepower.

The capacity of the locomotive is really limited by its ability to start a train from



Rail Giants Require Cranes to Handle Them; This One Is a 2-10-0 Switch Locomotive, as the Concentration of Its Weight on Many Small Driving Wheels Indicates

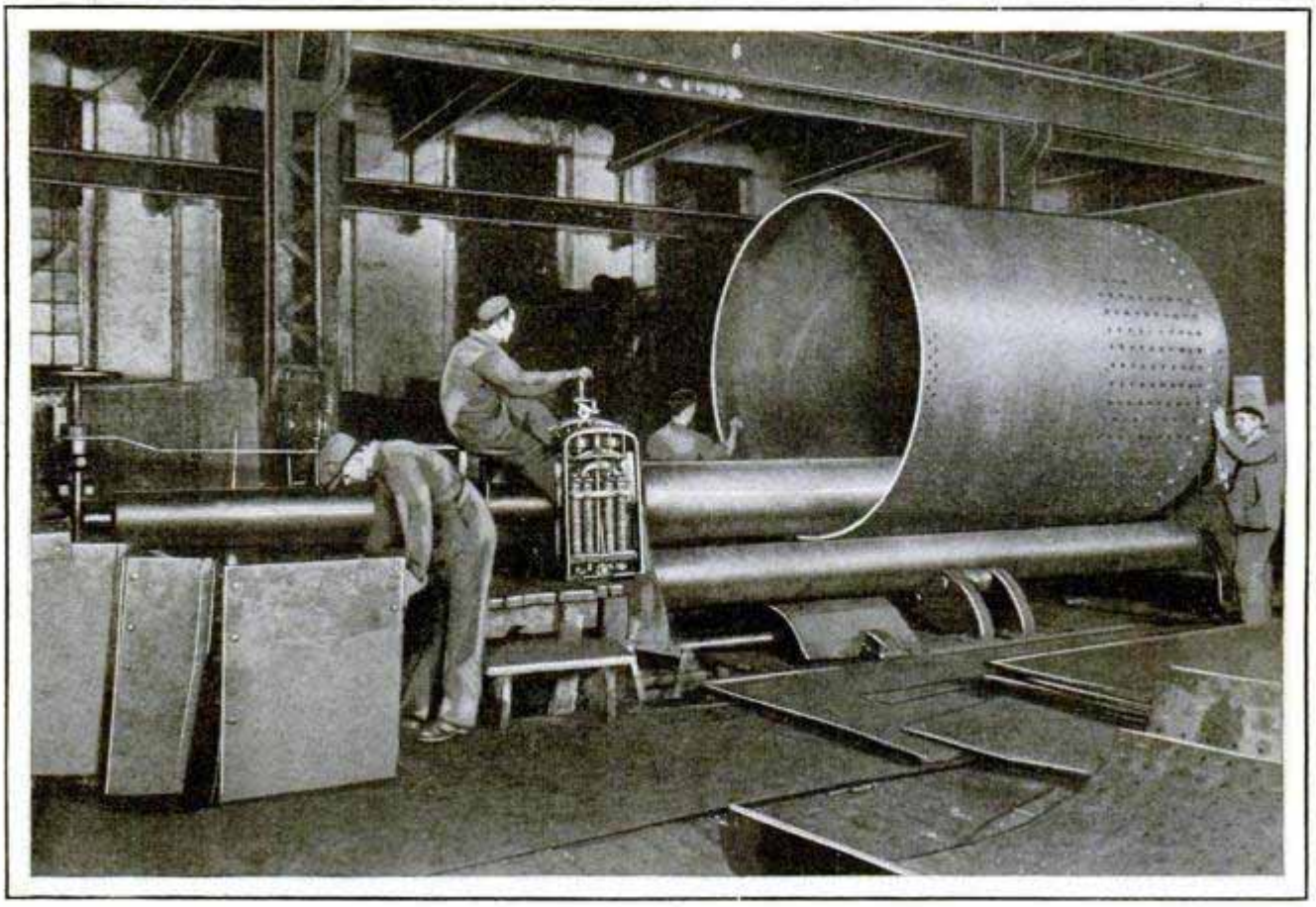
a standstill, so drawbar pull or tractive power is the standard of measurement. The boiler pressure, and the bore and stroke of the cylinders, determine it. Once the train gets up a speed of five to ten miles an hour, tractive power drops rapidly, and continues to decline as the speed increases, while the horsepower keeps on increasing until the boiler reaches its limit in supplying steam.

Railroad men have a very convenient way of determining how fast an engine will go, known as the formula of diameter-speed. Roughly, the maximum speed of an engine, in miles per hour, is the same as the diameter (in inches) of the driving wheels in engines. In other words, a freight locomotive with sixty-inch drivers will make sixty miles an hour at top speed, and a passenger locomotive with seventy-two-inch drivewheels can do seventy-two miles an hour.

Weight plays an important part in measuring what a locomotive will do, for without sufficient weight on the drivers, the wheels will slip on the rails and the formula of steam pressure, bore and stroke as a measure of tractive force ceases to work. In designing modern locomotives, the engineers plan to have approximately four times as much weight on the driving wheels as the tractive power needed. A Pacific-type passenger engine, to develop 40,000 pounds' pull at the drawbar, needs about 160,000 pounds on the drivers.

The bigger and better boilers and fire boxes of recent years have made it possible to add a third cylinder to heavy-duty mountain-type freight locomotives. The extra cylinder is mounted under the front of the boiler between the two cylinders of the conventional engine, and the front axle is forged with a crank, to which the piston rod is connected.

Another device to increase the starting power of freight engines is the booster, a small engine mounted under the tender and supplied with steam from the locomotive boiler. When a big train is to be started from a standstill, the booster is cut in and the engineer takes advantage of the tender's weight on its small-diameter



Heavy Steel Plates Are Bent, Drilled and Riveted by Mammoth Machines, in Contrast to the Painstaking Hand Labor Which Built Matthias Baldwin's First Engine Long Ago

wheels to develop considerably more pull.

While locomotives are classified according to the number and arrangement of their wheels, certain general types have acquired a special name associated in some way with the use to which the first of that type were put. Thus a Pacific type follows the general lines of long-haul, fast passenger engines, first developed for the western ends of the transcontinental roads. The Mikado 2-8-2 type got its name from the fact that the initial order was for the Japanese Imperial railways' heavy-freight service. These two, with the six-wheel switcher class, are the most commonly used, but many others have been developed for special service. There are Mallets, named after the inventor, compound Mallets and compound engines in general, meaning locomotives which first use the steam in high-pressure cylinders and then use it again in low-pressure cylinders; big 2-10-4 engines, giants of the roads, and even articulated locomotives, so long that they have to be jointed to get around the curves.

AUTO BRAKE DRUMS REFACED WHILE STILL ON CAR

Without removing them from the car, the brake drums can be refaced and trued with a simple unit that is said to function to an accuracy of one-thousandth of an inch. It is placed under the axle like a jack, the cutting member adjusted, and the automobile's motor is used to rotate the brake drum. The weight of the car holds the unit rigid so that there is little likelihood of chatter.

REINDEER HERDED BY AIRPLANE TO SAVE TIME AND LABOR

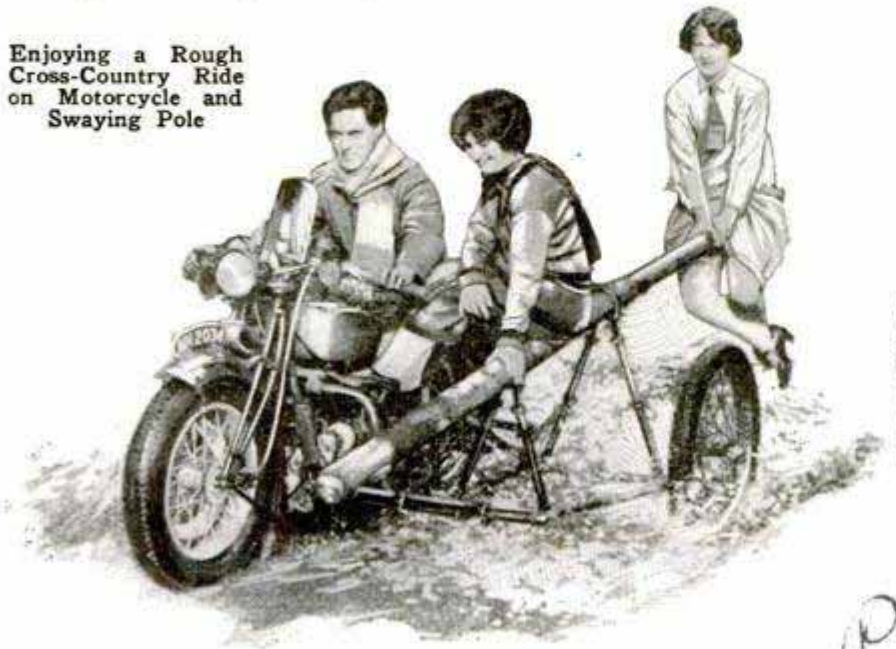
On some of the big arctic stock farms, airplanes are being used to herd the reindeer, according to reports. In two hours, one man can accomplish as much as seven in a much longer time in locating the animals and driving them together.

MELT ICE FROM RADIO WIRES WITH ELECTRIC "TOASTER"

By shooting electric current of high amperage through the antennæ of the naval radio station at Arlington, Va., engineers prevented the formation of ice on the wires during the latter part of the winter, thus saving costly breakages and interruptions in service. A special switching apparatus, functioning somewhat like an electric toaster, was devised for the process. To melt the ice, the antennæ were disconnected from the transmitter and transferred to other connections through which a circuit of 240 amperes was passed for ten minutes. The heat thus generated was sufficient to melt the ice, and then the wires were switched back to the transmitter set and service resumed. By means of special equipment, record was kept of the temperature at the ground and at the wires overhead so the operators would know when to apply the "toaster."

RIDING POLE ON MOTORCYCLE LATEST OUTDOOR SPORT

Pole riding has been introduced as a novel recreation by an English motorcycling club. The pole is attached to a special carrier, somewhat like a sidecar, and while one passenger clings to the elevated rear end, another sits at the other end to keep it from tipping up. The riders attempt acrobatic stunts while the driver of the motorcycle varies the amusement by riding over rough roads, and the like.



Enjoying a Rough Cross-Country Ride on Motorcycle and Swaying Pole

Machine That Measures the Strength of Hair before and after Marcelling

MARCELLED HAIR IS TESTED TO REVEAL STRENGTH

Does marcelling the hair or exposing it to other treatments make it brittle? A sensitive instrument, recently introduced by a research engineer, is said to answer the question with accuracy. It shows the strength and other qualities of the hair before and after the process and is also adapted to testing delicate wires.

"COSMETICS" FOR CHEESE

The art of make-up has been suggested for the cheese industry, but contrary to its usual function, it is to make the cheese look older. Chemists of the university of Wisconsin, seeking a way to prevent "slippery-rind" cheese, a condition that often results after the product has aged for some time, have reported that a preparation of lampblack, mixed into the paraffin coating of the cheese, removes the trouble. The outside will have much the same appearance as though it had aged in the usual manner.

Folding Movie Screen for Portable Film Projectors Can Be Carried in Own Case

FOLDING HOME-MOVIE SCREEN QUICKLY SET UP

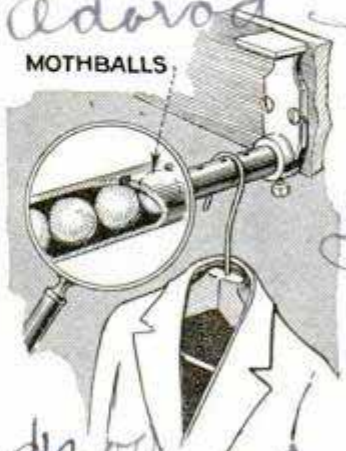
For the convenience of those who have home-movie projectors, a folding screen that can be set up or taken down in a few seconds, has been devised. It is inclosed in a handsome collapsible frame and the screen itself is on rollers so that it is instantly reeled up without the chance of crinkling or breaking. The frame base is rubber-protected, to prevent scratching furniture, and the screen stands alone. It is furnished in two surfaces, one of a metallic nature, that is said to reflect the maximum amount of light without haze and covers the greatest possible angle of vision, while the other is made of thousands of tiny glass globules imbedded in a special composition. This is said to eliminate all glare and affords a soft and pleasing effect.

MAGIC INSPIRED PRIMITIVE ART OF EARLY AMERICANS

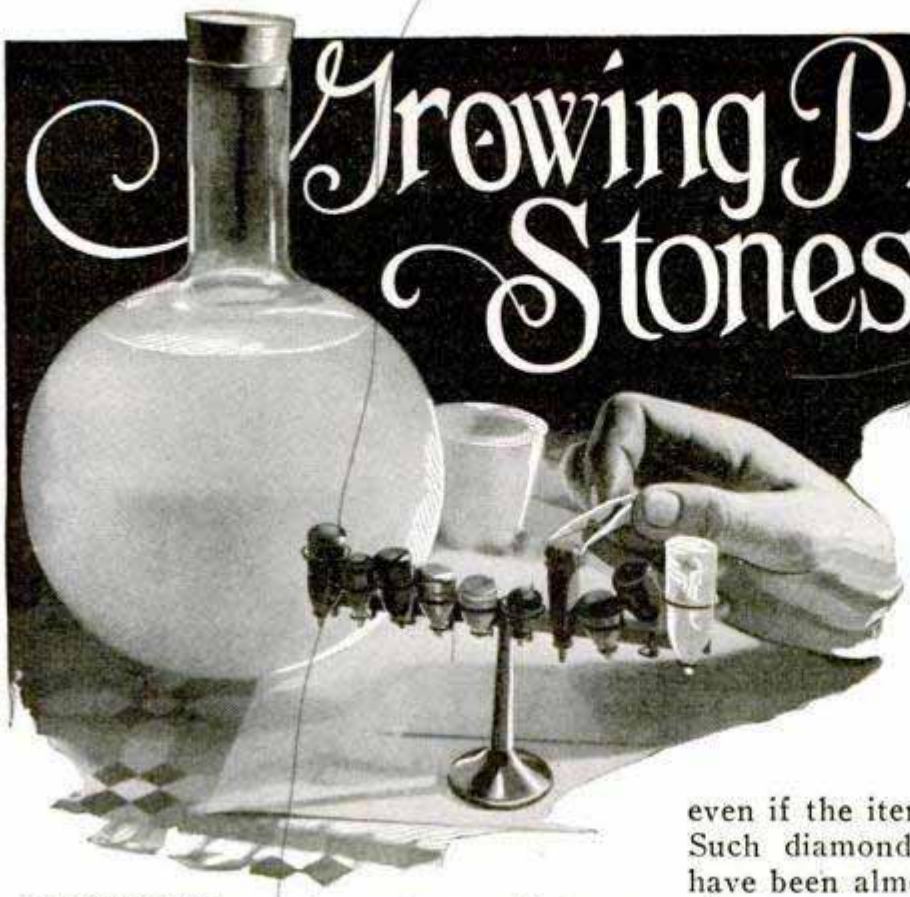
Like the cavemen of Europe, prehistoric Americans carved and painted pictures of animals and men to help in working magic, scholars declare. Mountain sheep and other animals, recognized in some of the early American art exhibits, were probably painted in connection with rites designed to make the herds of animals increase and so insure a plentiful supply of food. Other pictures marked the sites of water holes and important spots. Some of the moon-faced, angular figures of human beings scratched on the rocks are dancers in ceremonial rites and others appear to be deities. In Nevada and eastern California, explorers have found picture puzzles of angular design and elaborately drawn. Judging from the fact that they are sometimes found deeply buried beneath old mineral deposits, these are extremely ancient and their true meanings have, so far, not been interpreted.

CHEMICAL IN CLOTHES HANGER HELPS PREVENT MOTHS

Besides affording space for thirty to forty hangers, a garment rack now on the market holds moth balls or other chemicals in solid form to protect the fabrics. A compartment in one of the rods keeps the balls from getting lost and the fumes escape through openings. The hanger is adjustable to different lengths and may be attached with ordinary wood screws.



Growing Precious Stones



How the Jewels Look as They Come from the Fire, and Rack Containing Ruby and Sapphire "Boules" Uncut and Unpolished; in the Background Is a Container of Solution from Which the Jewels Are Prepared

GROWING precious stones that are more perfect even than nature can make them, and finally producing a gem that will be entirely new, is the task that George Everett Marsh, chemist by night and packer by day, has set himself and his associates, E. Menzel and Frank E. Challis. Already he has wrested from nature the secret of rubies and sapphires which he makes with a brilliance and clearness that vie with nature's best effort.

And his dream gem! On that they are at work. He thinks that it will be two-colored with a beautiful, fiery yellow center which slowly changes to ruby-red around a circular border. He almost has it now, but there still are some chemical and physical obstacles that must be overcome before he can offer it to the world.

These gems are not imitations, but are "grown" from the very substances nature uses to create her own rubies and sapphires, and these substances are made into one crystalline mass, called a "boule," perhaps weighing as much as 100 carats. There are only two gems which Mr. Marsh does not make. He can make the diamond, but at such high cost that the natural jewel is cheaper.

"It would take approximately 2,500 tons of iron to make one carat of diamond," explained Mr. Marsh. "You readily can see how impracticable such a process would be. Why, it would be almost impossible to provide facilities to melt the iron, even if the item of cost were overlooked. Such diamonds as have been produced have been almost microscopic in size and of no commercial value."

The other gem which is not made is the emerald. It is easy enough to obtain the raw materials for emeralds, but the element which contains the green coloring for the crystal invariably turns red under the heat necessary to fuse the substances. Any other color element that might be used—so far as is now known—would not have a close enough kinship to the basic emerald crystal to join with it.

The success Mr. Marsh has had in making synthetic stones is largely the result of his application to a hobby. He had received a scientific education at Massachusetts Institute of Technology, and even then had begun to turn his attention to the possibilities of creating gems. Shortly after he left college, his career as a chemist seemed doomed through the fact that a friend influenced him to join the office staff of one of the packers in Chicago. Immediate financial returns were more tempting, and Mr. Marsh, temporarily, put chemistry out of his mind.

But not for long. The search for the unknown was too great a lure to be ignored, and he set up a complete laboratory in the basement of his home. For twenty-one years he has worked in that laboratory at night. Three years ago he finally conquered the ruby and the sapphire, and

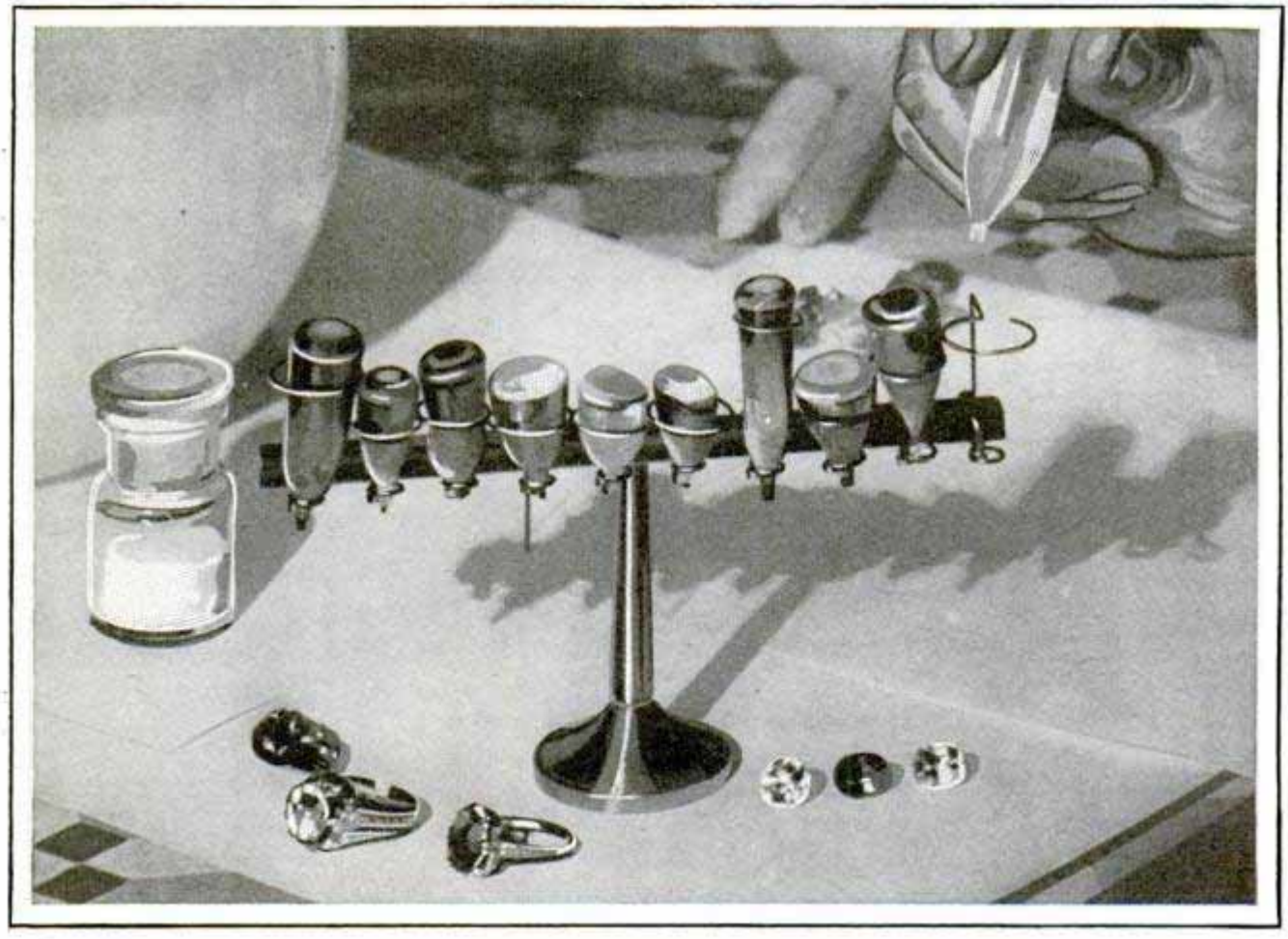
now they have become regular commercial jewels which may be had in almost any jewelry store in the country.

To begin with, Mr. Marsh knew from his chemistry lessons, that crystallized alumina is the white sapphire of nature. As early as 1837 small crystals of white sapphire had been produced synthetically, but the problem of getting gems of adequate size and of the color desired has just been solved by this enthusiastic chaser of jewel rainbows.

It had been assumed that the blue of the sapphire was caused by the presence of cobalt oxide. Nobody had ever found cobalt in a sapphire, but since cobalt oxide was used to give the blue color to glasses, enamels and glazes, its presence in the gem was taken for granted. Yet every synthetic sapphire was marred by an unnatural cloudiness. After eight years of patient effort, the blue sapphire was successfully analyzed and not a trace of cobalt was found. The color was due to the presence of a very small percentage of ferric oxide and a form of titanium. That was the real birth of the synthetic sapphire so far as its chemistry was concerned. The physical aspects of its creation offered no less handicap to its commercial production than had the chemical.

In his nights of research, Mr. Marsh finally worked out the process and the apparatus, in which his own ingenuity played so great a part, and in which so common a thing as an ordinary telegraph ticker is unexpectedly vital. The equipment consists of a high-temperature flame produced by ordinary gas and oxygen, directed vertically downward onto a small rod of aluminum oxide which is used as a pedestal on which to grow the stone. The pedestal is mounted on a movable rod which permits quiet and perfect control of the tip of the pedestal in relation to the flame. The blowpipe is so constructed as to give an absolutely symmetrical flame, and the pedestal is at all times in the axis of the flame.

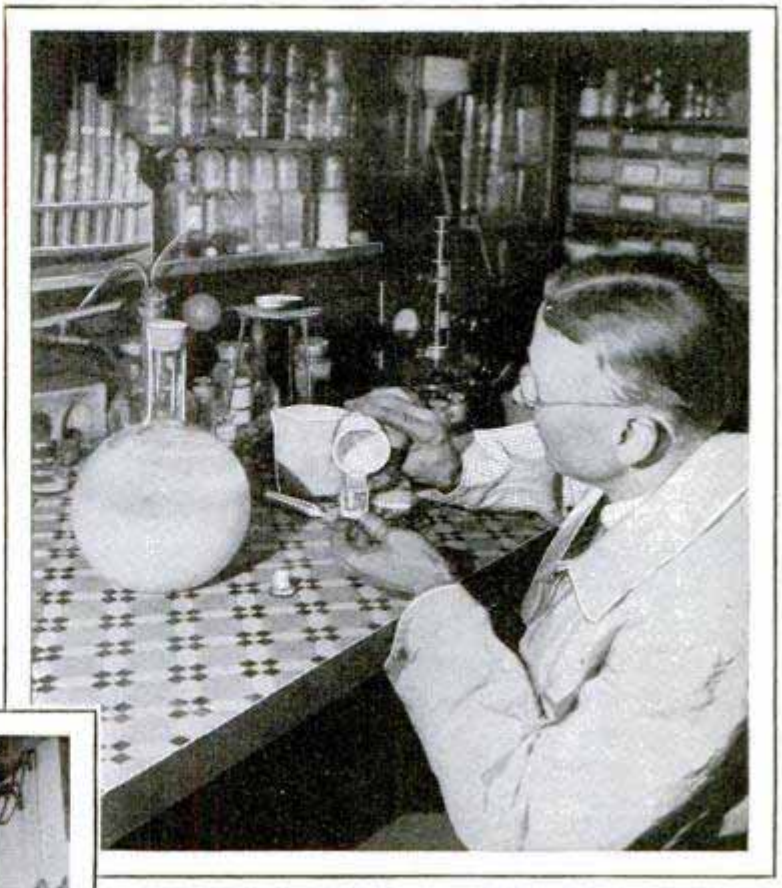
In the oxygen tube of the blowpipe, there is a cone-shaped chamber which contains the materials, in fine powder, that



Close View of the Uncut Jewels Contrasted with Set and Unset Sapphires and Rubies, Which Were Grown in the Basement Laboratory from Chemicals

are to be fused into the crystal of sapphire or of ruby. This chamber is constantly and rapidly vibrated by the use of a motor-driven telegraph ticker which strikes against the upper side of the cone. In that manner the even, free flow of the powder to its proper spot on the pedestal is definitely assured.

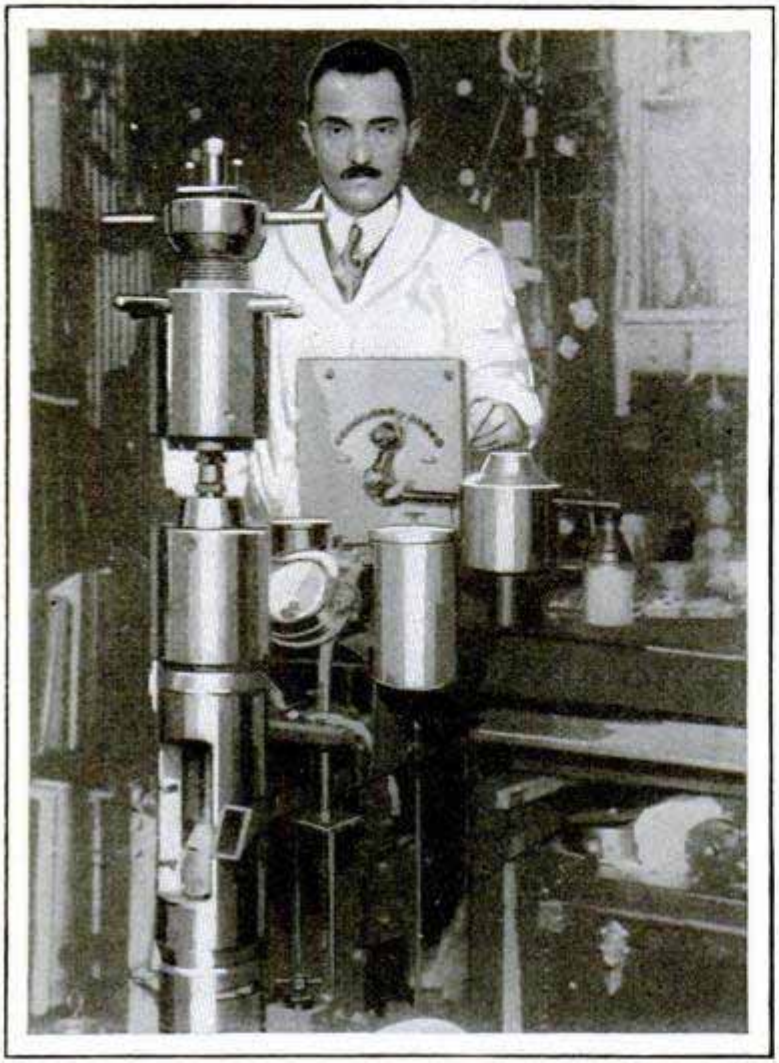
To conserve the heat, Mr. Marsh invented a cylindrical shield of alumina, insulated with asbestos. He now has decided to abandon the asbestos because of its shrinkage under the terrific heat—2,050 degrees centigrade—to which it is subjected. A small slit in one side of the shield enables the operator to watch and control the growth of the crystal.



Mr. Marsh Preparing Chemical Mixture and at the Furnace; He Is Inspecting the Flame through a Shielded Telescope

In the beginning of the creation of a jewel, the molten powder is permitted to become a part of the pedestal for the first few moments of its growth. Then a small round particle of crystal is developed and gradually widened out. As the crystal grows, vertically, the rod or pedestal is lowered. The speed of growth is rather slow, being about three to ten carats an hour, according to the gem and its color. The raw materials for both sapphire and ruby are alumina and the oxides—ferric for sapphires and chromic for rubies—which must be of the highest possible purity. The mixture of the raw materials must be absolutely uniform. Ruby material is prepared by dissolving alum of the highest purity in distilled water, adding a quantity of chrome alum to provide the chromic oxide. The amount of chrome alum to be added depends entirely upon the depth of the color desired. Every color and shade has its own chemical composition and its own characteristic set of internal strains under crystallization.

The imperfection in natural crystals may be caused by specks of foreign material or cloudy spots. Small crystals of other materials may appear, or the natural gem may have cavities or canals containing gas and water, or bands or zones of color. Most of these imperfections frequently are so small that they can be seen only under the microscope; nevertheless they go to establish the fact that natural stones rarely are flawless. Synthetic stones as made in the basement laboratory have none of those defects.



© Henry Miller

James Basset, French Scientist, Who Has Developed Process for Making Diamonds from Coal; Intense Pressure Is Employed to Effect Crystallization

Concerning his work, Mr. Marsh says:

"The chemist can surpass nature working in her Burma (India) laboratory, where she turns out the highly prized pigeon-blood rubies, worth $2,000 a carat, or her darker rubies with a purple tinge that she makes in her Siam laboratory. The production of the golden-rose sapphire—an exceedingly beautiful and rare gem found almost nowhere except in the possession of the maharajahs of India—would remain forever unknown to the world at large had it not been for the magic of chemistry.

"It gives one pause to think that a fifty to 100-carat ruby or sapphire crystal now can be cut into a gem after a few hours of growing—a growing which took nature eons of time to produce."

Mr. Marsh is not particularly interested in the commercial exploitation of the jewels he makes. Every crystal produced from his furnace is sent abroad to be cut and then resold in the United States. The fashion of today, which decrees colorful jewelry to match feminine gowns, has made a great demand for synthetic gems. But Mr. Marsh desires to devote his future time, not to manufacture so much as to the creation of another gem—one which nature, so far as known, has overlooked.

FOUNT PROLONGS LIFE OF TYPEWRITER RIBBONS

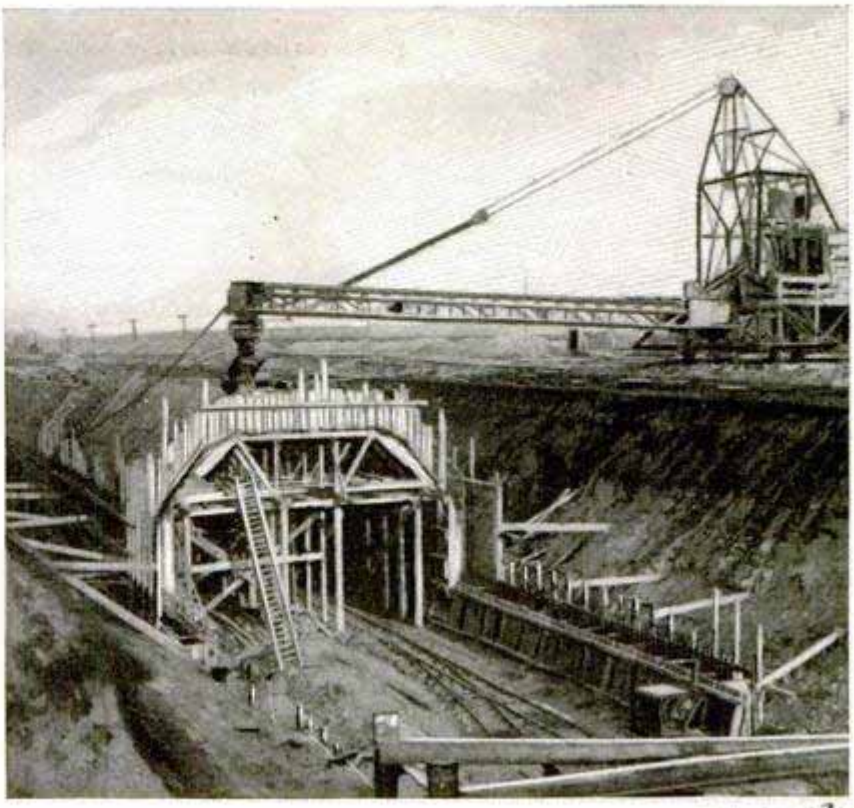
An ink fount for reinking typewriter ribbons, while in use, and which, it is claimed, will extend the life of a ribbon as much as twelve times, besides making uniformly inked work possible throughout that period, is being marketed by a Chicago manufacturer. Two of the founts are attached to the machine, one at either side, the ribbon feeding through them before passing under the type bars. Only the lower half of the ribbon is inked, the pigment spreading upward, so that it is evenly distributed through the upper section, which is in use. After a thousand letters have been written, it is claimed the last will be of exactly the same color density as the first. Designs suitable for all types of standard typewriters are to be produced.

SLIP CUP ON UMBRELLA GRIP HOLDS RIBS TOGETHER

In place of the familiar tie flap to hold the ribs of an umbrella together when it is closed, a slip cup which is part of the handle grip has been introduced. It slides down over the tips of the ribs which fit in a slot on the cup. The unit is made of attractive material and is decorated to match the rest of the grip.

SAFETY PROMISES GREAT FUTURE FOR FLYING

Aviation today is as safe as any other form of modern transportation, states the current report of the Daniel Guggenheim fund for the promotion of aeronautics. According to Harry F. Guggenheim, president of the fund, the airplane of the future will be safe even under adverse conditions. In 1927, the British imperial airways carried 52,000 passengers over 2,500,000 miles without a mishap. In 1842, eight English railroads carried 10,508 passengers 3,562,338 miles, but with a number of mishaps and fatalities. Up to the last of February this year, planes of the National Air Transport had flown more than 1,500,000 miles in this country with but one fatality and no injuries. Prizes totaling $150,000 have been offered by the Guggenheim foundation for developments in safer aircraft.



Building a Subway in Berlin; the Tunnel Sides and Top Are Constructed of Steel and Concrete After Channel Is Excavated

SUBWAY BUILT IN DEEP DITCH TO SAVE TUNNELING

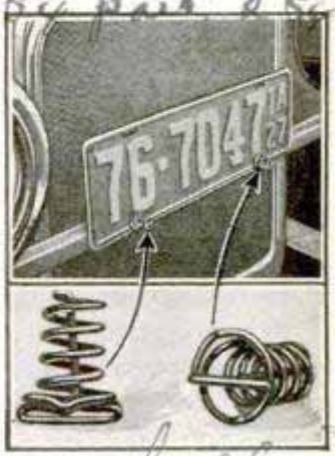
Instead of boring a tunnel to construct a subway, engineers in Berlin first excavated a deep channel, erected the forms for the inclosure and then filled in around the tube. This method is considered practical when no great depth is necessary and when the character of the ground permits easy digging.

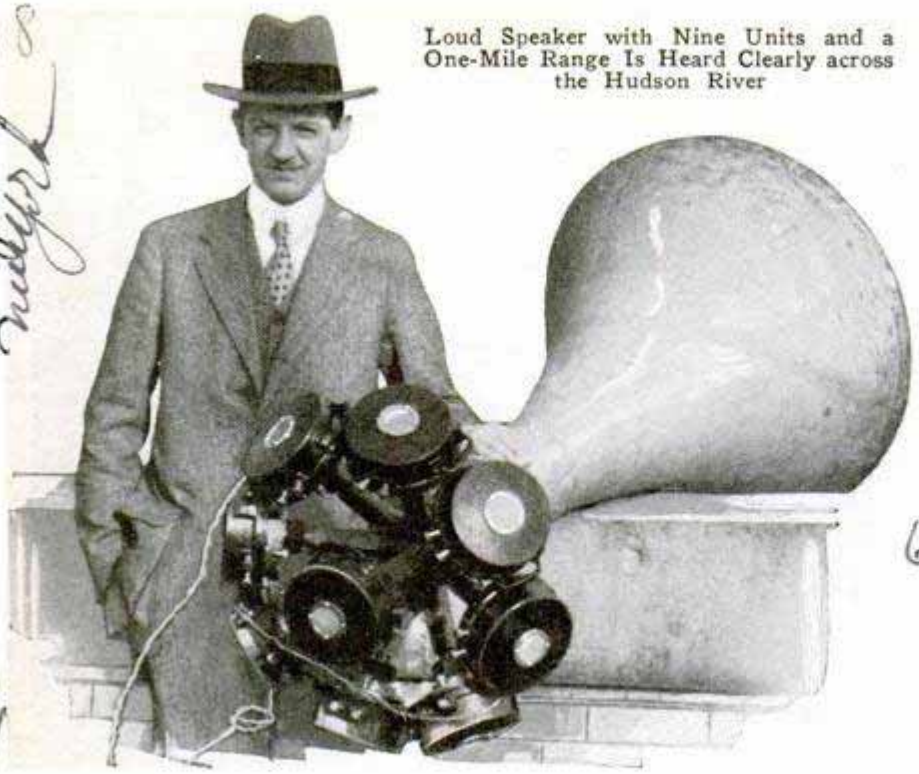
HUMIDIFIER WITHOUT A MOTOR SAVES ELECTRIC CURRENT

For keeping cigars or other merchandise moist, an electric flasher humidifier, now on the market, is operated without a motor, reducing the initial cost and the expense of upkeep. A special bulb is screwed into the holder basin around a wick that absorbs water from a container below. As the bulb flashes on, the heat causes a more rapid evaporation of the water and spreading of the moisture. It is necessary to operate the humidifier only two or three hours a day to keep the stock in good condition.

LICENSE-PLATE SNAP FASTENER ELIMINATES BOLTS

Instead of attaching the automobile license plate with bolts or screws, it may be securely fixed in place with spring snap fasteners made of strong wire. They are easily connected, given a quarter turn to tighten them, and remain firmly in position. An enamel prevents them from rusting.





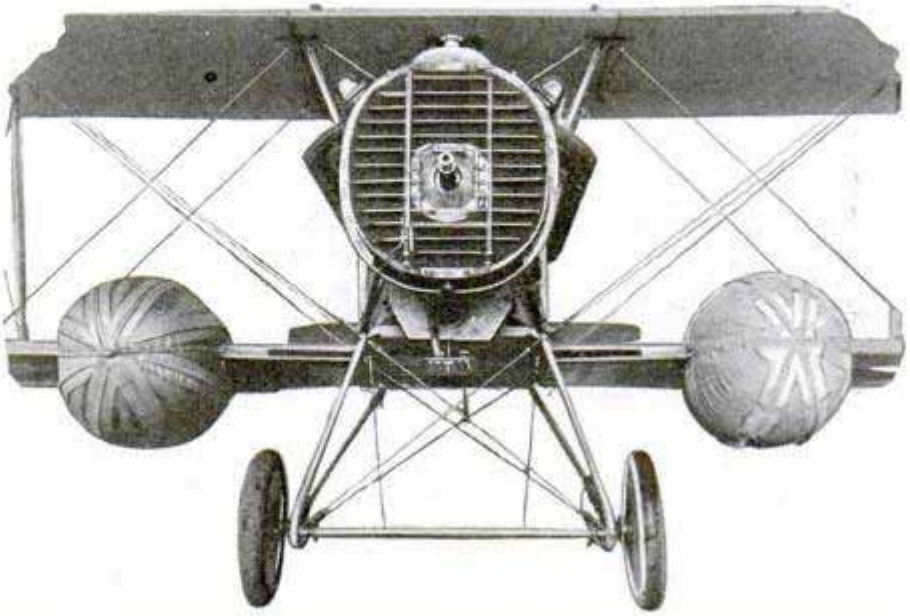
Loud Speaker with Nine Units and a One-Mile Range Is Heard Clearly across the Hudson River

LOUD SPEAKER THROWS VOICE MILE IN THE AIR

Commuters ferrying across the Hudson river to New York recently were startled when a giant voice, speaking clearly and distinctly, asked a mysterious and unidentified Mr Schwartz if he could hear the speaker plainly and followed the question with a booming "Ha! ha! ha!" that rattled the window panes on the distant New Jersey shore. The giant speaker, with a mile range, was atop the Bell building in New York, and R. W. King, the expert in charge of the demonstration, stood at a telephone on the Jersey shore, a mile away. Each time he spoke, the electric waves traversed the river bottom by cable and were delivered to the speaker on the roof. The voice, amplified to a giant tone, came winging back through the air, seconds later—slowed down to the speed of sound so the effect was much like an echo. The speaker units themselves are unusual, for the diaphragms are of very light aluminum, around which is wound a coil of thin aluminum wire, finer than thread. The current passes through the coil and vibrates the sheet of aluminum owing to the fact that the thin coil lies in close proximity to the iron pole pieces of the field magnets. The instrument is designed primarily for public-address systems, and the like.

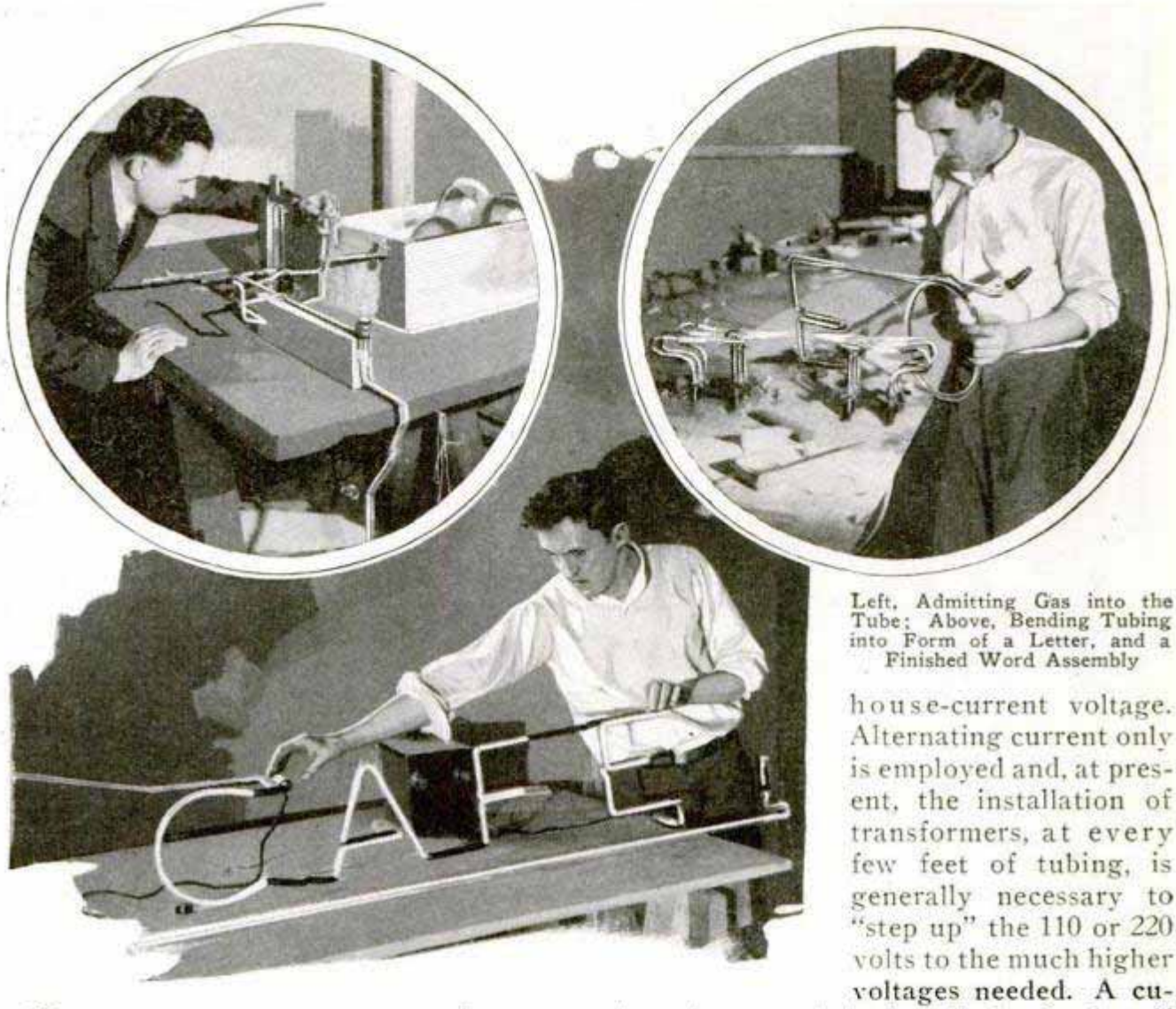
BALLOONS IN WING OF AIRPLANE TO KEEP IT AFLOAT

Successful experiments with small inflated bags attached to the lower wing of land planes, for the purpose of keeping them afloat if forced to descend on water, have been carried out at the air station at North island, San Diego, Calif. The balloons, which are not large enough to interfere seriously with the speed of the plane, are built onto the lower wing on either side of the fuselage and provide enough buoyancy to keep the airplane above water. Experiments are also being made with another type of float bag, carried in the cockpit in a deflated condition, and filled from a high-pressure gas cylinder in emergency by simply opening the connecting valve. It has the advantage of offering no resistance in flight



Small Balloons Built into Lower Wing of a Navy Biplane, to Keep the Ship Afloat in Event It Is Forced to Descend on Sea

COLD LIGHT FROM RARE GASES RIVALS THE SUN



Left, Admitting Gas into the Tube; Above, Bending Tubing into Form of a Letter, and a Finished Word Assembly

Not many years ago, neon and argon, two gases found in the air, were unknown, but today they are of increasing importance in electrical illumination. Advertising signs and other units are being made in large numbers of glass tubing filled with neon or a mixture of these gases. When electric current of high voltage is passed between conductors at opposite ends of the tube, a brilliant glow is produced. The neon alone gives a reddish light, neon and argon together with mercury produce blue. The light has great fog-penetrating powers, it is a "cold light," and only a fraction of the current is needed for a sign as compared with that burned by a bulb unit of equal size. So brilliant is the neon light that it is plainly visible in bright sunshine when ordinary electric lamps are hard to distinguish. There is promise that this form of illumination may be adapted to home use with an outfit that can be operated on ordinary house-current voltage. Alternating current only is employed and, at present, the installation of transformers, at every few feet of tubing, is generally necessary to "step up" the 110 or 220 volts to the much higher voltages needed. A curious feature of the installation is that, if the sign has been properly constructed, the gas will last for an indefinite period. The making of a sign of this type requires great skill. One of the most important steps is to obtain as complete a vacuum as possible in the tubing. The air is pumped out after the tubing has been bent to the required shape and the conductors installed. When the air is exhausted, the gas is let in, whereupon the tube is cut off and sealed.

NEEDLE TO MEND STOCKINGS KNITS UP RUNS

Fashioned like the knitting units employed in weaving stockings, a special needle for mending runs is easily used and effectively conceals the damaged area. No additional thread is necessary as the strands of the stocking supply sufficient material for the mending.

Window Pane Transformed into a Picture Gallery; Sketches on the Glass Hide Soiled Surface

PICTURES PAINTED ON WINDOWS TO SAVE WASHING

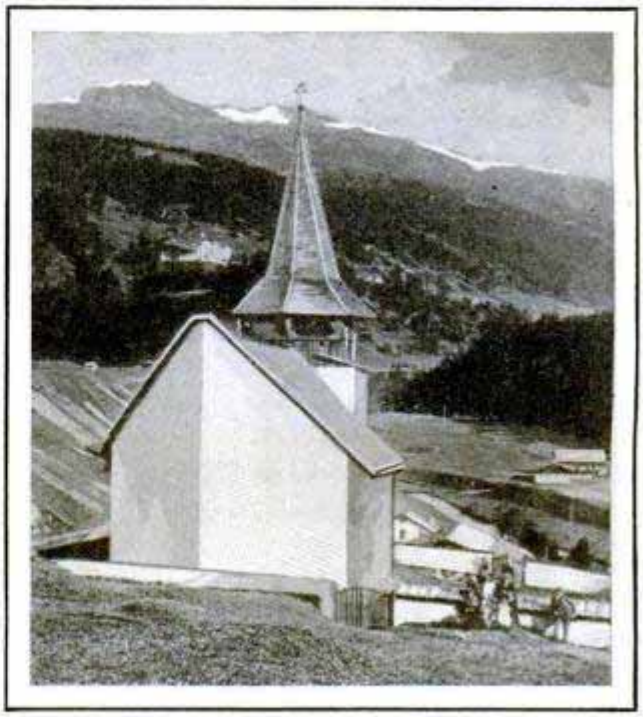
Members of an art colony in Boston have solved the question of keeping some of their windows attractive. Instead of having to wash the glass constantly, they merely use a paint brush now and then, for the panes are covered with decorative designs of wide variety and color. The plan is especially well suited for windows that are not greatly needed to admit light, and even painting the glass does not shut out all the illumination, as there are open spaces in the designs.

COAL IS TESTED WITH X-RAYS TO REVEAL BEST GRADES

X-rays have been applied in France to the testing of coal for purity in order to determine for what purpose the various grades are most suitable, an important matter in several industries, as, for example, coke production, briquette making and the like. There are two methods, one of which can be used to test lumps up to five to six inches in thickness as well as coal in powder form, while the other applies particularly to the latter. The first is based on the fact that the rays penetrate the carbon more readily than its common impurities so that the foreign substances leave darker shadows in the X-ray picture. The other method serves to determine the ash content of the sample and takes advantage of the fact that gases are made electrical conductors when X-rays are passed through them. Introduced into a gas-filled tube, connected with a source of electrical current, the coal specimen offers an additional resistance varying with its purity, and the passing current is measured by a suitable ammeter. In both cases, a standard of chemically pure carbon is used for comparison.

CHURCH TO SPLIT LANDSLIDES PROTECTS VILLAGE

In a Swiss village where landslides are not uncommon, the back of the church has been constructed as a V-shaped wedge to split an avalanche that might come against it. The walls are of unusual strength and thickness. Another effective means of guarding towns from landslides is to build strong stone walls on the mountain sides to interrupt the earth and snow masses. Flat shelves scooped out of the steep declines, also are efficient in halting a slide. In many instances the roofs of the houses are built at the same angle as the hill behind them so that an avalanche will pass over them.



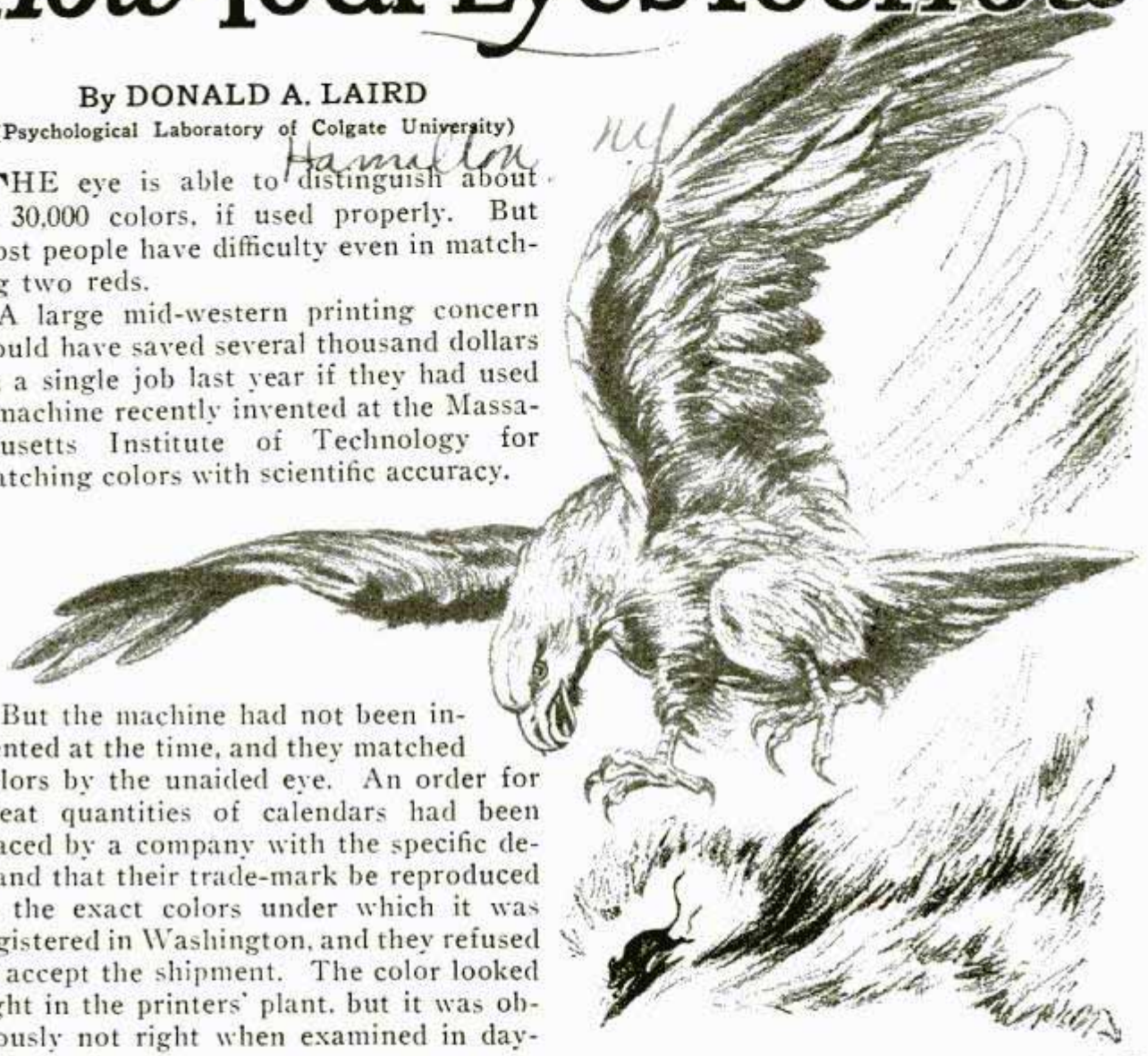
With Its Back to the Hills to Hold Landslides in Check; Swiss Church That Protects Village

How Your Eyes Fool You

By DONALD A. LAIRD
(Psychological Laboratory of Colgate University)

THE eye is able to distinguish about 30,000 colors, if used properly. But most people have difficulty even in matching two reds.

A large mid-western printing concern would have saved several thousand dollars on a single job last year if they had used a machine recently invented at the Massachusetts Institute of Technology for matching colors with scientific accuracy.



When the Hawk Sweeps Down on His Prey, It Is Motion and Not Color That Attracts Him, For His Eye Is Most Sensitive to Movement

But the machine had not been invented at the time, and they matched colors by the unaided eye. An order for great quantities of calendars had been placed by a company with the specific demand that their trade-mark be reproduced in the exact colors under which it was registered in Washington, and they refused to accept the shipment. The color looked right in the printers' plant, but it was obviously not right when examined in daylight by the customer.

Anyone is apt to make the same mistakes, and they may be as costly in the long run as the printers' error. Never do we see colors correctly unless we follow certain simple precautions; that is why counterfeiters are easily snared. They may make a perfect engraving of the spurious bills they are going to print, but the color will almost always trap them. Ultraviolet rays are especially useful in detecting the spurious bills by altering their entire color scheme in comparison with the genuine bill.

Everyone knows that colors appear different under various kinds of light. Yellow, for example, is invisible and appears black unless there are some yellow rays in the light that falls upon it. Along the north shore of Chicago is a new theater designed after the Spanish manner to the last detail. When the lights are on, it is resplendent with red and yellow painted designs. When the pictures are being shown, the eye can see just red and black designs; the yellow fades away the instant the lights are down. Why? When the pictures are being projected only a few red exit lights are burning in the auditorium. There are scarcely any yellow rays in these lights, so the yellow paint is invisible, that is, the yellow looks black, while the red stands out more brilliantly.

We have all had experience of this nature. I remember a friend who was very conservative and wore only blue serge suits. A few years ago when there was a

3362

Science Has Solved the Color-Matching Problem by Producing the Special Light That Makes Colors Appear as They Will in Actual Daylight

vogue of purple-colored suits for men, he bought one, thinking all the time it was blue serge. His eyes were perfect, but in the light in the store the material had looked like the conservative serge he had wanted. As soon as he wore the suit out of doors, the real color was apparent.

You or I might have taken the suiting to the front of the store and examined its color in daylight that came in the street door, to find the real color. As stores have become gigantic organizations, however, there is not enough outside light to make this possible. But science has provided a substitute.

In one department store there are hundreds of small bronze electric fixtures on the counters. These look like desk lamps, but have been especially engineered with a color filter placed below the electric bulb to give colors the appearance they have in the daylight.

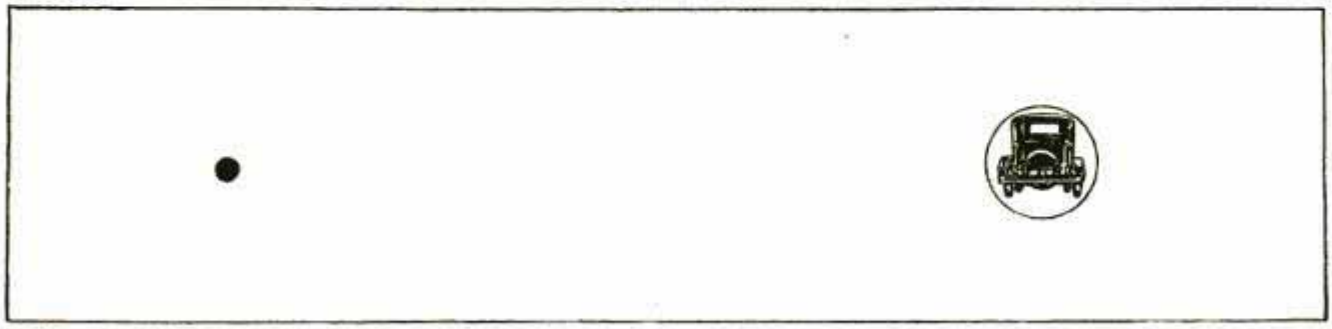
This is as far as a store can go in assuring that we will see the colors correctly, but unless we know how to use our eyes we are still likely to make some ludicrous, and possibly costly, mistakes.

There is contrast, for example. If we have been looking at a green color and then turn our eyes to a red, the red will look redder. Or, in case we have the red and green side by side, both colors will be intensified, the green will be greener, the red will be redder. This is why a red-headed girl who is sensitive about her hair should avoid green hats. A blue hat, on the contrary, will tone down the redness by this contrast phenomenon.

This illustrates two other precautions to follow in gauging colors, whether in personal clothes, or tempering, or mixing paints. One is that for three or four minutes before judging a color, the eye should not look at any color. A medium gray is the best to look at to prepare the eye for a correct estimate. The other precaution is that no other colors should be in the range of the eye while we are trying to judge a sample color. Looking at a large piece of gray felt or blotting paper prepares the eye for a correct match, and is also the best material on which to place the colors being matched. Any other colored paper is likely to be disastrous.

Only the central part of the eye, directly back of the pupil, is sensitive to color. When we look "out of the corner" of our eye, we cannot sense colors, but we detect motions better. The precaution that follows from this is to look squarely at the color to make sure that the eye focuses its image on the central part of the retina.

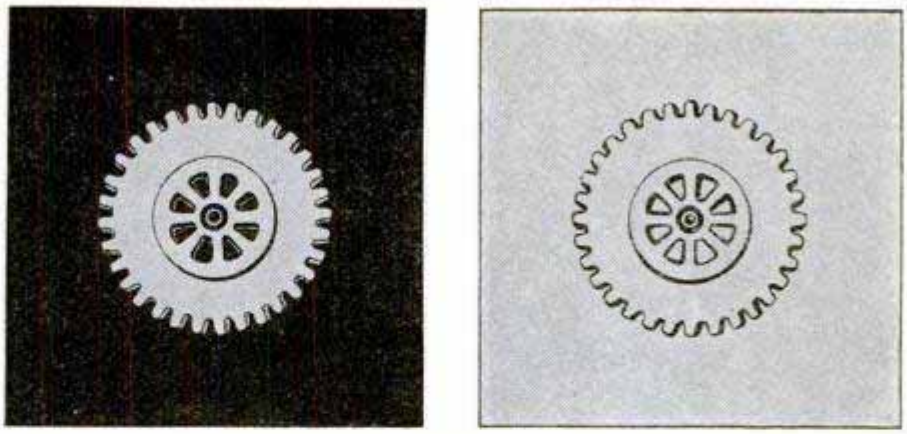
It has long been known that the Greeks used to paint their marble statues to give better effects. They also used to paint their temples. This was to add to the illusion. Objects look larger when they are red. The large woman, accordingly, should not wear great amounts of this



Close the Left Eye, Fix the Right Eye on the Black Dot, Move the Page Slowly Away, and, About a Foot from the Face, the Automobile Will Disappear, Being Focused on the Eye's Blind Spot

color. But a package in red will look larger than it really is. In early morning and late evening the sun looks larger than at noon; this is partly because it is predominatingly red at these periods of the day.

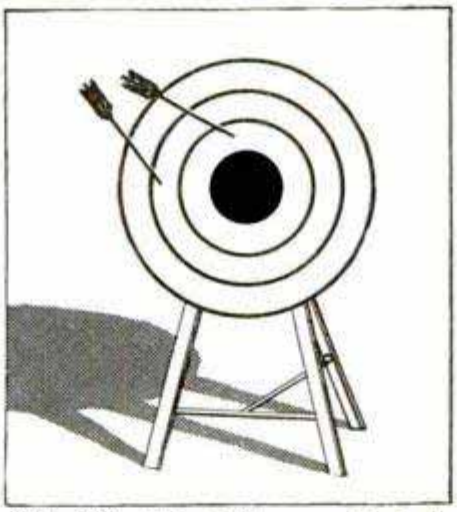
The red sun also looks closer than at noon when it is yellow. Red is known as an "advancing color," that is, red objects appear closer than they really are. Blue objects, on the contrary, appear farther than they actually are: blue is a "retiring color."



Two Gears in Exactly the Same Shade of Gray, Yet the Background Makes the One on Black Lighter, Apparently

A small room or hallway should not be painted red or green. These colors, the red especially, give an appearance of the walls coming toward the eye and make the place look smaller than it is. Blue walls will appear to add several square feet of floor space in a hallway by the illusion they create of bringing the walls farther from the eye.

Another interesting contrast between red and green is that a room decorated in red appears warmer than one of green or blue. Of course, the thermometer does not change because of the color, but it seems so to us. The reason for this peculiar deception is not known, but the deception itself is worthy of consideration.



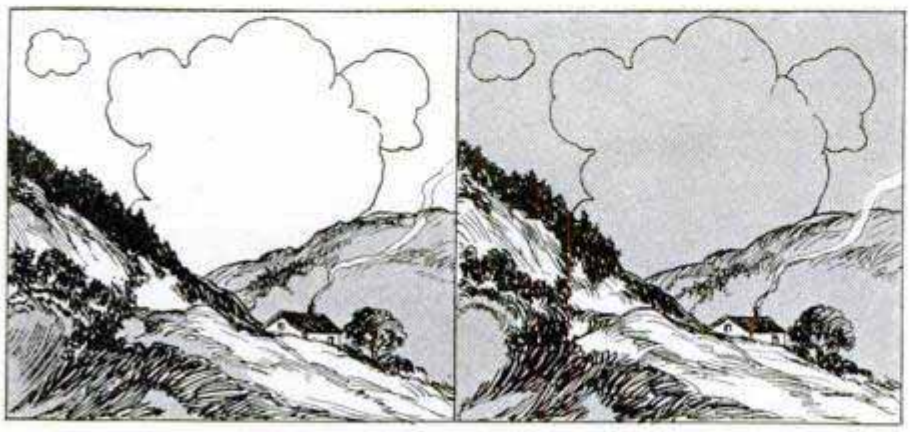
Clip This, Mount It on a Sheet of White Paper, Stare at It While You Slowly Count Twenty-Five; Then Look at the Blank White Paper and See an Afterimage in Which the Original Black Lines Appear Either Gray or White

Summer slip covers for furniture, or summer drapes, should be of blue hues to make the house more livable in the hot months. A red rug, in contrast, will add to the comfort of a home in winter by making it appear warmer. A general rule is to use reds in rooms with a northern exposure, blue and green in those facing south. I know of one man who adds a blue electric bulb to his fixtures in summer, while in winter its place is taken by a red bulb. Some theaters make similar changes.

Blue is also a more soothing color than red, which is known as an exciting color. In hospitals you will find very little use made of red colors except to mark exits. Blue or green is a good color for a study or bedroom.

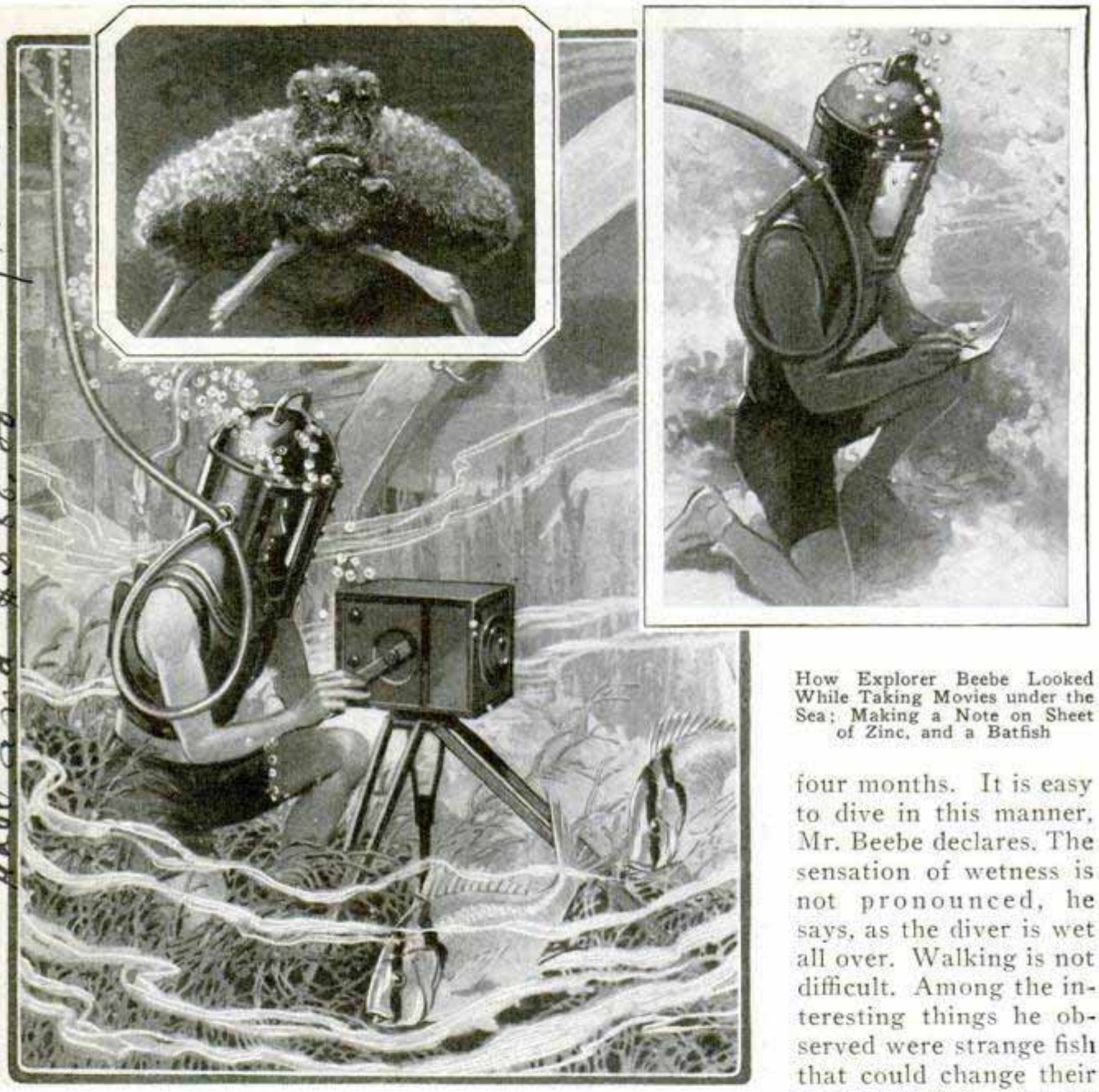
In the language of color, rose is an inviting color which suggests health, beauty and affection. Yellow is a cheerful color and suggests happiness. Purple is a royal color, suggestive of luxury, dignity and mystery.

The study of color is being applied daily to furnish more soothing and efficient office interiors, better light in factories and hospital operating rooms, and the wide range of new tints in lacquers for autos.



The Sky at the Left Appears Broader and Deeper Than the One at the Right; the Same Illusion Applies to a Hall Finished with Blue Walls

UNDERSEA WONDERLAND IS REVEALED BY CAMERA



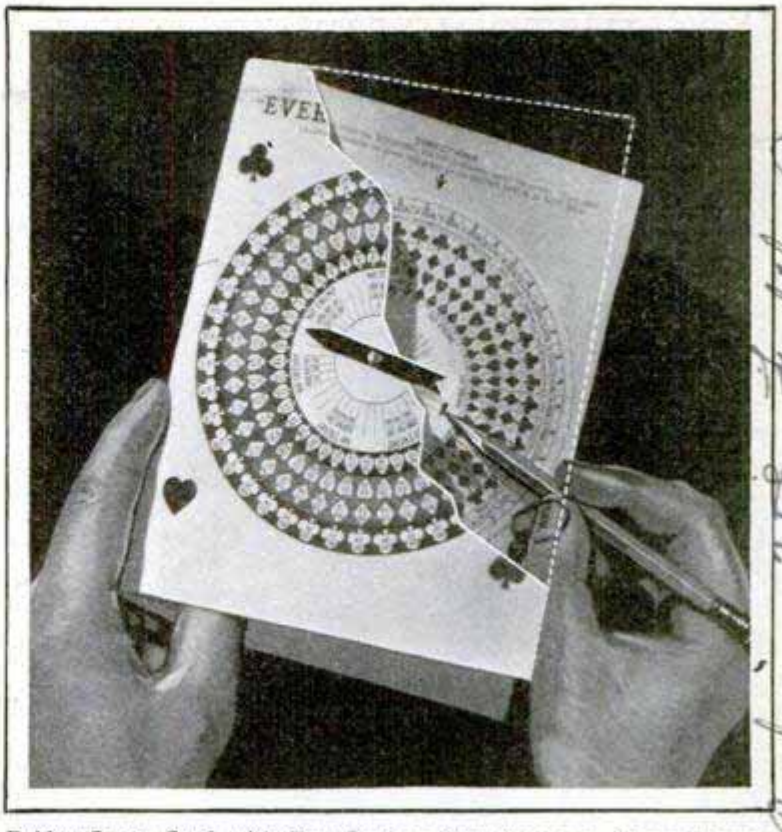
How Explorer Beebe Looked While Taking Movies under the Sea; Making a Note on Sheet of Zinc, and a Batfish

Further marvels of the deep have been discovered by William Beebe, director of tropical research of the New York Zoological society, who recently explored a submarine wonderland off Haiti, telephoning his observations to his secretary in a rowboat, and making notes with a pencil on small sheets of zinc while he walked among coral reefs. He wore only a swimming suit and a special diving helmet. With a steel-inclosed camera he was able to take motion pictures of the weird world about him. He descended, on one occasion, to a depth of sixty feet with his simple equipment, and averaged two or three hours a day below water for a period of four months. It is easy to dive in this manner, Mr. Beebe declares. The sensation of wetness is not pronounced, he says, as the diver is wet all over. Walking is not difficult. Among the interesting things he observed were strange fish that could change their colors swiftly, sponges that weighed hundreds of pounds, batfish with fins like human hands to help them walk about the floor of the ocean, and other species equipped with lights on long tentacles to guide them through the submarine darkness.

"FORTUNE TELLER" FOR AIRMEN REVEALS FLYING FITNESS

Careful examination of candidates for the army air corps is necessary, for training the men is a costly process and, if a man is physically or mentally unfit to become an aviator, the instruction is wasted. To help determine whether they will

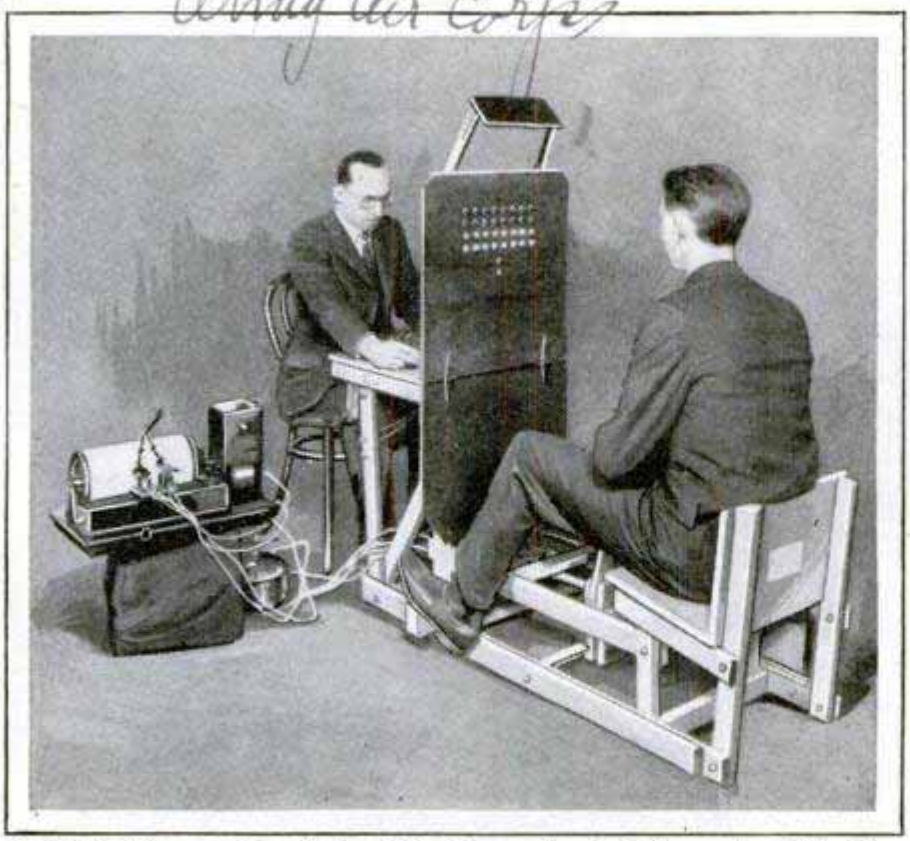
succeed or fail, use is made of an ingenious testing outfit, a "fortune teller" that is said to have revealed qualifications with great accuracy. The subject sits in a seat like that of the average plane, grasps a control stick and watches an assortment of electric bulbs on a board in front of him. When one of the red lamps glows, the candidate is supposed to shift the stick as rapidly as possible to another position. The time he takes to complete the maneuver is exactly registered, and as other lights appear, he is required to make other movements with the stick. At the end of the test, a graphic record of his performance is afforded the examiners who can judge with fair accuracy if the subject possesses the innate "air sense" and responsiveness to changing conditions so necessary in flying. At the flying school at Brownsville, Tex., the apparatus has received a thorough trial. Men whom the outfit revealed as probable "flying failures" were allowed to take the course, but in practically every case, they did not make good in the actual operation of a plane.



Bridge-Score Card with Top Surface Cut Away, to Show Magnet That Governs the Arrow

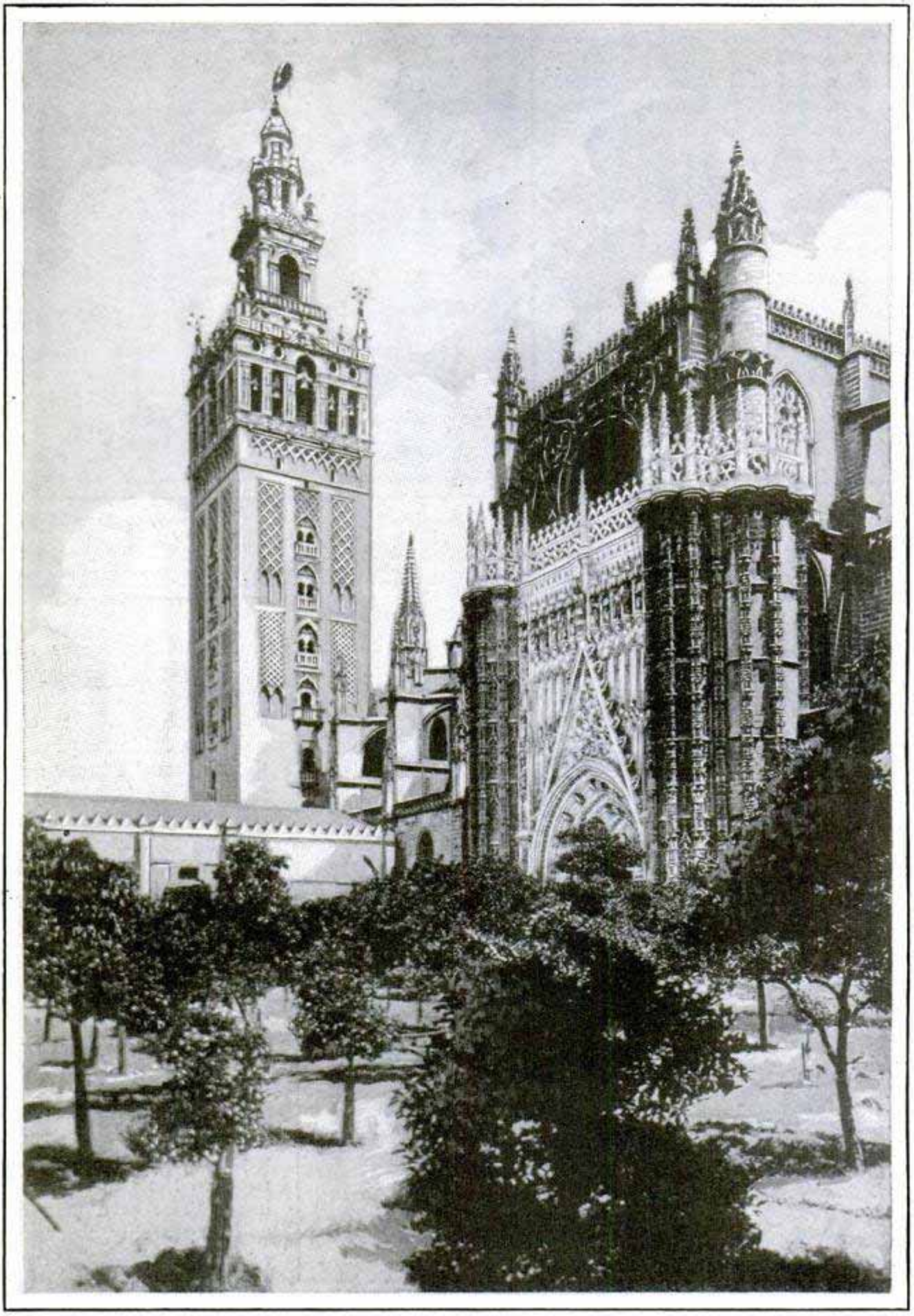
AUTOMATIC BRIDGE-SCORE CARD ELIMINATES FIGURING

Both the trick and honor scores are automatically computed for bridge players on an indicator that saves calculating in the usual way. It consists of a folded card with the key on the inner surface. This is simply a round disk marked according to the tricks and honors scored. It is turned until the proper division is opposite an arrow, then the outer leaf is folded down over the disk. A magnet in the leaf bearing the key sends an indicator around to a place on the outer table opposite the right score for any suit. The device also has a score card on the inside and rules of the game on the back. The card may be used repeatedly, as pencil markings on its waxed surface can be wiped off with a damp cloth.

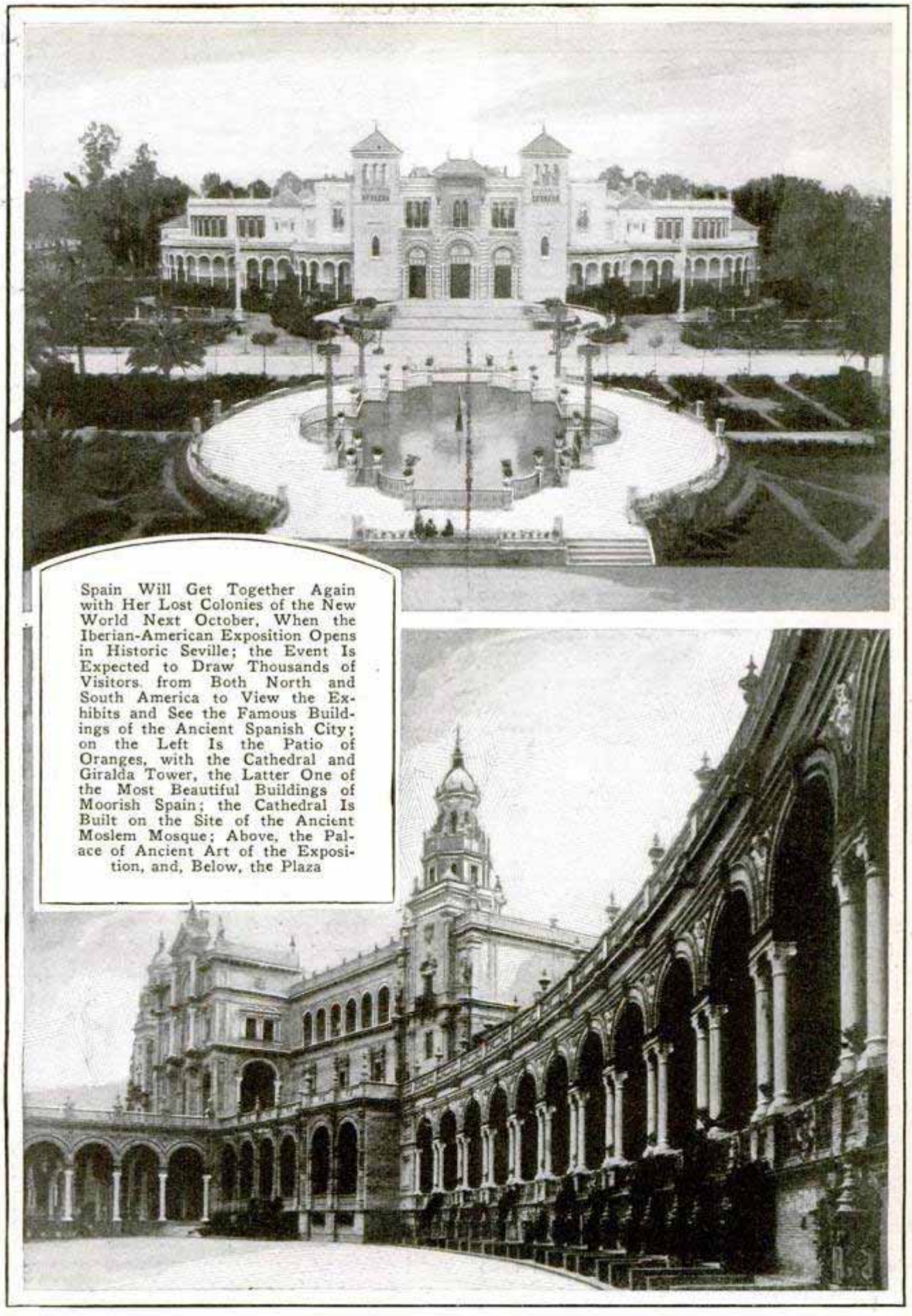


As Lights Show on Board, Candidate Responds with Movements of the Controls Similar to Those in an Airplane

HISTORIC SEVILLE TO SEE TWO WORLDS UNITE



IN SPAIN'S "IBERIAN-AMERICAN" EXPOSITION



Spain Will Get Together Again with Her Lost Colonies of the New World Next October, When the Iberian-American Exposition Opens in Historic Seville; the Event Is Expected to Draw Thousands of Visitors from Both North and South America to View the Exhibits and See the Famous Buildings of the Ancient Spanish City; on the Left Is the Patio of Oranges, with the Cathedral and Giralda Tower, the Latter One of the Most Beautiful Buildings of Moorish Spain; the Cathedral Is Built on the Site of the Ancient Moslem Mosque; Above, the Palace of Ancient Art of the Exposition, and, Below, the Plaza

Illuminated Club Helps Paris Policemen Direct Traffic at Night; It Has Red and White Bulbs

POLICE CARRY LIGHTED CLUBS TO DIRECT TRAFFIC

To assist in directing traffic at night, Paris policemen are carrying lighted clubs, somewhat like the illuminated baton of an orchestra leader. They are equipped with a red and a white bulb, both supplied with current from batteries attached to the policeman's belt. A switch exposes either of the lights desired.

AIR VENTS IN MILK-CAN TOP HELP PREVENT SOURING

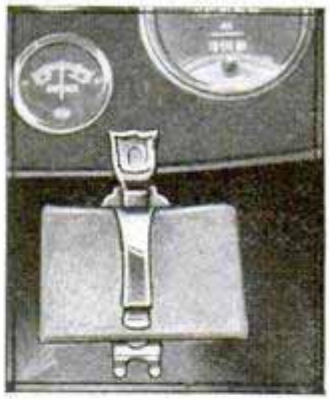
Small openings in the sides of the neck of a milk can, now on the market, permit the outside air to pass over the contents and also allow the natural heat of the milk to escape. The holes are so small that dirt is not likely to blow in, and the openings can be closed simply by twisting the lid. The vents also expedite the drying of the can when it has been set aside after steaming.

WAR WAGED ON FISH PIRATES TO PROTECT SALMON

Pirate ships have disappeared from the seas, but along the Columbia river and off the coast of Alaska, a type of free booter is busy, seeking the silver salmon instead of the golden treasure of old. Like his predecessor, he operates with stealth and cunning, finding the dark hours of the night best suited to his purposes. His craft is usually black in color, long, low and rakish, and he carefully pads his equipment with rubber to prevent making unnecessary noises. To combat the fish pirate, the authorities are using power and steam tugs, equipped with machine guns, range finders and powerful searchlights. Convicted offenders are fined from $100 to $500.

CLAMP TO HOLD AUTO LOGBOOK FITS ON DASHBOARD

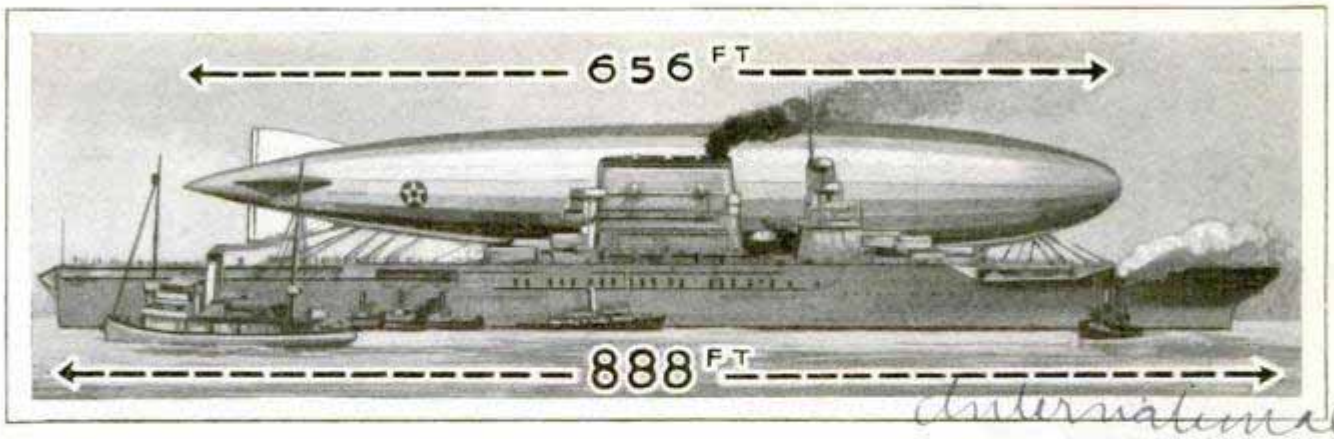
For keeping a record of the mileage made, when tires and oil were changed, and other data, a convenient auto logbook is fastened to a clamp attached to the dash. The holder is so adjusted that it can be swung back out of the way when the book is not in use or may be taken off altogether simply by releasing a thumbscrew. The book is especially handy for entering data in case of an accident, as it is within easy reach and is not likely to become lost. The clamp may also be employed to hold maps and other papers which must be consulted during a journey.



OIL FROM GRAPE-SEED WASTE USED IN MAKING PAINT

Adapted to almost all kinds of paints, varnishes, linoleums and for illuminating purposes, a cheap oil is extracted from grape-seed waste by a process developed in Italy. The average yield is said to exceed thirteen quarts to each thirty-three pounds. Seeds of the black grapes give more than those of the white varieties.

SHIPS OF SKY AND SEA MEET IN LANDING TEST



Composite Photograph Showing How the "Los Angeles" and the "Saratoga" Met in Successful Landing Test for the Airship While Both Craft Were in Motion

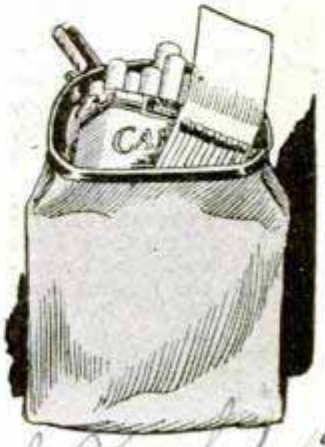
For the first time in history, a dirigible was landed on the deck of a sea vessel recently when the "Los Angeles" was moored to the "Saratoga," the navy's huge airplane carrier, during a test off Newport, R. I. Men in charge of both craft were required to exercise the greatest care and skill in accomplishing the feat, but it was done without mishap and indicates that the airplane carrier will have value not only as a traveling landing field for planes but may be used to service dirigibles and transfer passengers at sea. The two craft met while both were in motion.

THOUGHT A CHEMICAL PROCESS NERVE TESTS INDICATE

Proof that thinking is a chemical process is expected to come from experiments performed by Dr. Ralph Waldo Gerard, of the University of Chicago. He has demonstrated, for the first time, that nerve impulses result from an oxidation process, accompanied by the production of heat. His findings, it is believed, will help to clear up a controversy which has been going on among scientists as to the nature of nervous impulses. One school has held that it is a physical reaction, the other, that it is an oxidation process. Dr. Gerard tested the living nerves of frogs by subjecting them to 280 electric shocks per second. By means of a sensitive measuring apparatus, he found that the passage of one impulse through one fiber produced one-millionth of one-millionth of a heat unit. Measurement of the oxygen consumed and the carbon dioxide thrown off proved that these quantities corresponded to the heat produced. The conclusion was that the nerve gets its energy from the burning foodstuffs. So delicate is the process, however, that the energy used in a nerve to produce a single twitch of a muscle of the same weight, is 5,000 times less than the energy developed in the muscle. In a frog's leg, the muscle gives off one million times as much energy as the nerve which stimulates it. The nerve acts as a "fuse," each section setting off the next until the last "explodes" the muscle. Dr. Gerard found that the nerves contain enough oxygen to remain sensitive for hours of continuous stimulation without receiving a new supply of gas, but that this is slowly replenished from the blood after each impulse.

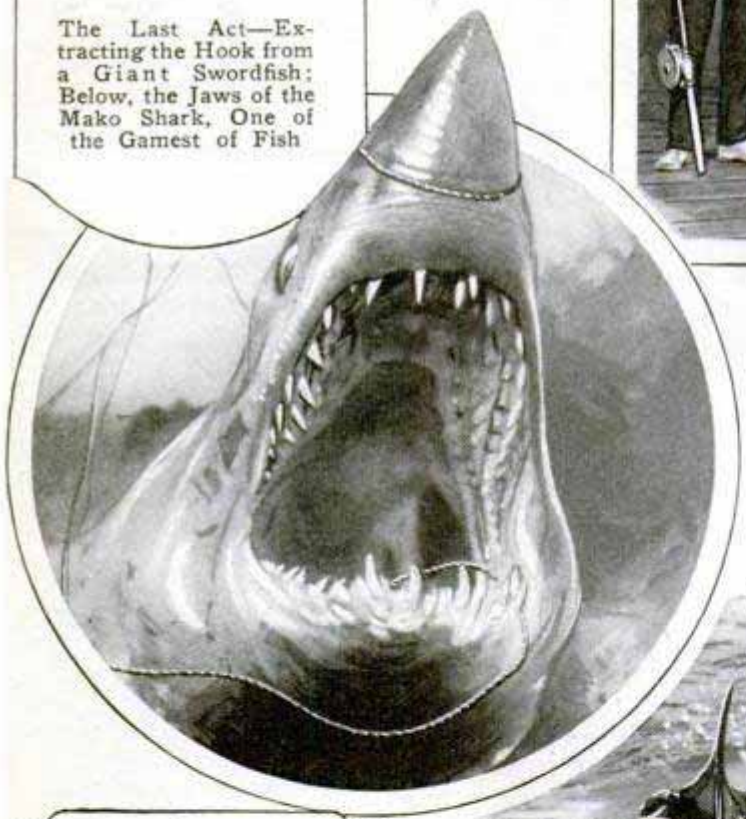
RUBBER POCKET FOR BATHERS KEEPS ARTICLES DRY

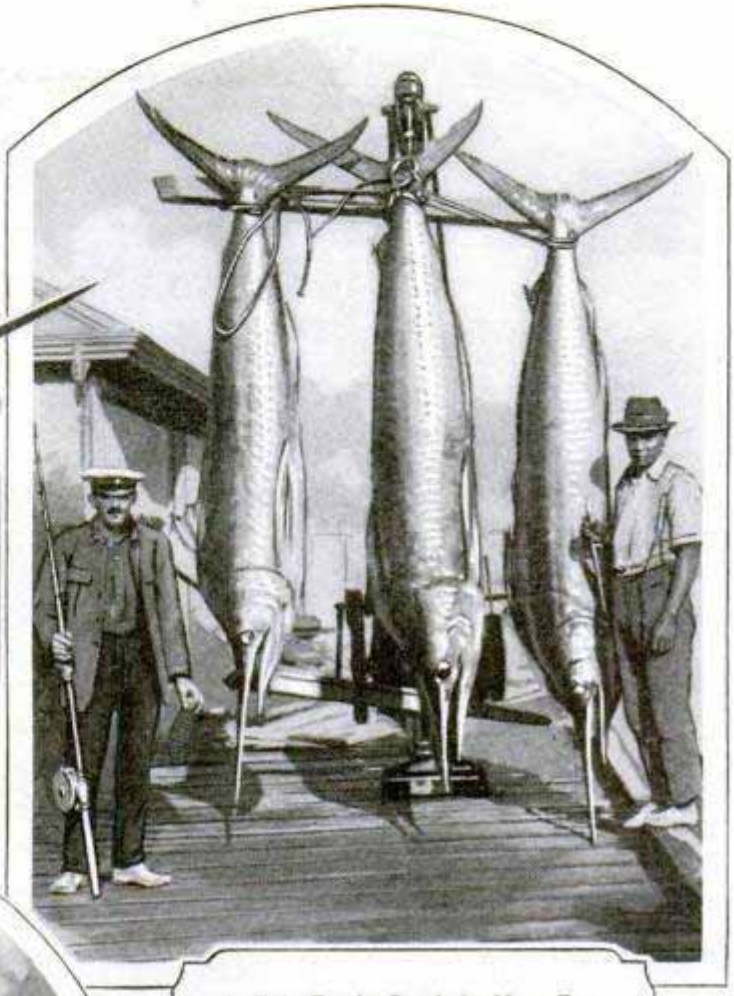
Necessary articles, such as matches and handkerchiefs, may be carried while swimming in a rubber pocket recently introduced for the bathing costume. It has a specially designed lock to foil thieves and is said to be entirely water-tight. It is made in various styles and colors to match the popular types of suits.



FIGHTING MONSTERS OF FISHERMEN'S PARADISE

The Last Act—Extracting the Hook from a Giant Swordfish; Below, the Jaws of the Mako Shark, One of the Gamest of Fish





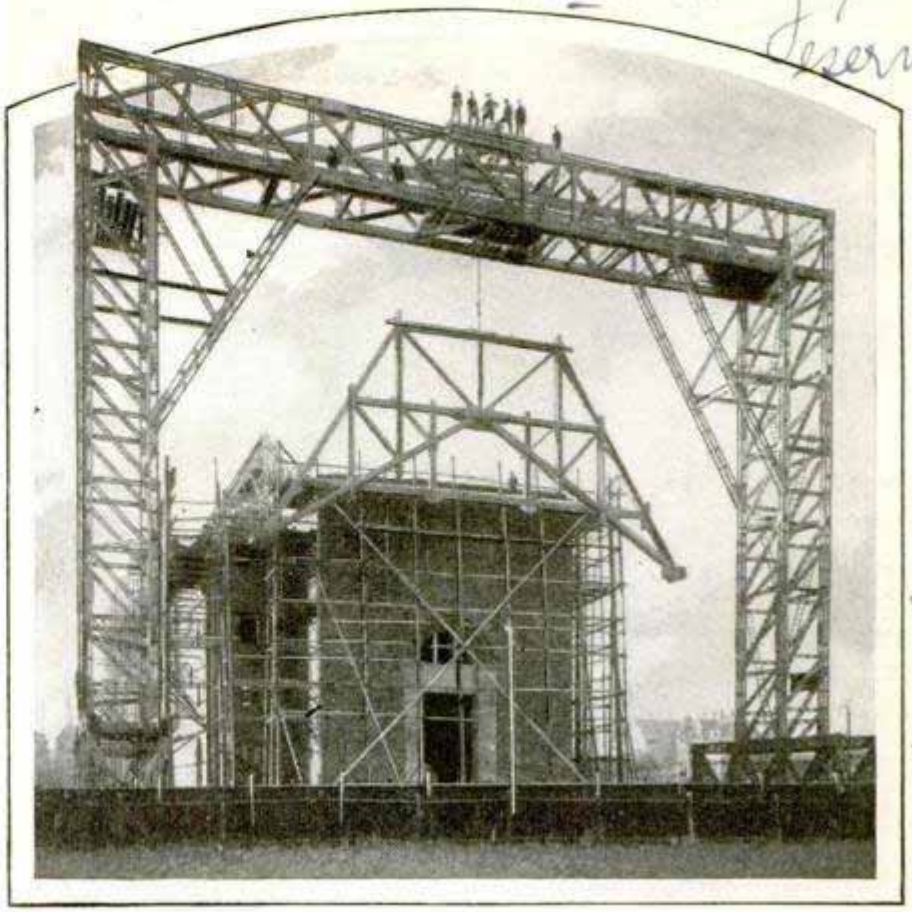
A Fair Day's Catch in New Zealand, Where Zane Grey and Other Famous Anglers Go for Ocean Sport; These Three Swordfish Were Taken on Rod and Line, and Not by Harpooning

The Bay of Plenty and Bay of Islands, on the Northern Coast of New Zealand, Abound in Fighting Fish; in the Latter Bay, Zane Grey Took a 1,000-Pound Swordfish, the Largest Ever Caught by Rod and Line; at the Right Is the Final Chapter in Such a Capture

GAUGES MEASURE SUN'S HEAT FOR WEATHER DATA

Although the sun is about 93,000,000 miles away, scientists are able to estimate its heat with the aid of special instruments. Two of these, invented by Dr. Charles G. Abbot, secretary of the Smithsonian Institution, and made by Andrew Kramer and L. B. Aldrich, of the institution's staff, have been sent to the Australian observatory at the new capital city of Canberra. They are similar to those used in other observatories in various parts of the world and are being used to determine the relation between solar radiation and weather. One is a pyrheliometer which measures the heat received from the sun at the surface of the earth. A sunbeam is admitted through the tiny aperture and, as the heat is absorbed by a small blackened disk, the effect of the rays is recorded on a special thermometer. The other instrument is a pyranometer which measures the intensity of brightness of the sky or any part of it, as the area around the sun. By determining the brightness of the sky, it is possible to gauge the transparency of the atmosphere. With this unit, readings that formerly took three hours to obtain can be made in about ten minutes.

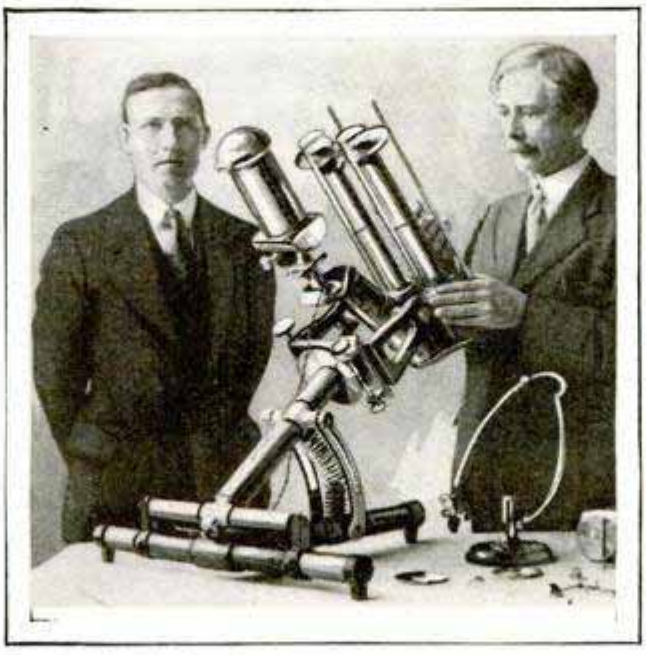
¶Our Bureau of Information will answer all questions regarding articles in this magazine.



Where Wooden Beams Did the Work of Steel; Huge Traveling Crane That Handled Trusses Weighing Ten Tons Each

BIG TRAVELING CRANE OF WOOD LIFTS HEAVY TRUSSES

To swing the ten-ton trusses of a German church into place, engineers constructed an enormous traveling crane of wood instead of steel. It had a span of more than 114 feet and was over ninety-eight feet high. Fir timbers, fastened together with steel pegs, were employed, and considerable engineering skill had to be exerted in constructing the crane, to allow for the right amount of bending under the heavy weights lifted and wind stresses, and to place the timbers so that strains would not be exerted at right angles to the fiber.



Courtesy Smithsonian Institution

At the Right, Dr. Abbot with His Assistant, Inspecting Instrument to Measure Sun's Heat

3598

To Save Work

Combination Brushes and Rinser for Washing Dishes Lightens This Unpleasant Task; There Is a Steel-Wool Scrubber for Sticky Plates; the Water Is Forced with Considerable Speed through Knife-like Openings in Nozzle for Effective Cleaning and Rinsing

Each Necktie Is Kept in Plain Sight and Hangs Flat in This Convenient Wall Rack for Twenty or More

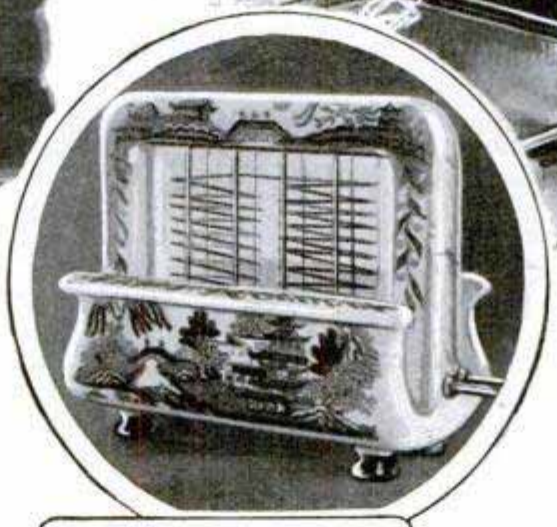
Urn That Burns Wood Alcohol to Purge Air of Smoke; Perfume May Also Be Sprinkled on the Wick, if Desired

Aluminum Kettle Has Flat Top for Warming Plates or Other Articles; at Right, a Timesaving and Lasting Memorandum Roll for the Wall

3898

in Your Home

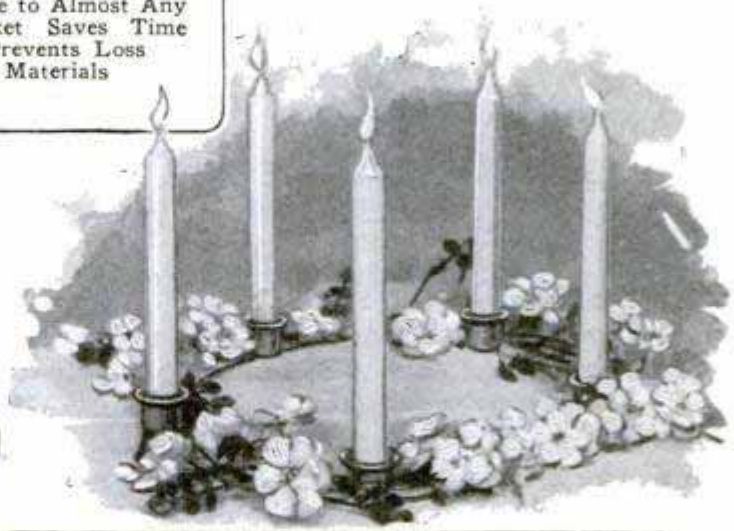
Sanitary Double Bag for Soiled Clothing Saves Confusion as Well as Steps



China Bread Toaster for the Table Is More Decorative and Will Not Tarnish; Metal Parts Are of Stainless Steel and It Is Easy to Clean with a Damp Cloth

Lifting Rack for the Aluminum Roaster Makes It Easy to Remove the Contents and Reduces the Danger of Dropping the Meat or Other Articles

Below at Left, Spool Rack Attachable to Almost Any Workbasket Saves Time and Prevents Loss of Materials



For a Candle Halo around the Birthday Cake or Other Decoration, a Loop of Holders Mounted on Wire Is Quickly Adjusted

ALL COMFORTS OF HOME IN AUTO TOURISTS' CAMP

Comfortable Quarters for Automobile Tourists in San Antonio, Tex.; the Building Consists of a Number of Individual Apartments, Furnished with Most of the Conveniences of a Luxurious Hotel

Electric lights, gas, hot and cold running water, refrigeration and almost all the conveniences of an up-to-date home are provided for travelers in an automobile tourist camp at San Antonio, Tex. It consists of a series of small apartments, each an individual unit and with its own equipment, so that families may have full privacy. Linen, kitchen utensils and other articles are supplied and all at a moderate cost. The rates are considerably cheaper by the week or month.

COMPASS AND BELT LATCH ADD TO AIR SAFETY

A new type of airplane compass, in which the "card" is the outer surface of a sphere, and a new form of safety belt latch that eliminates the danger of fumbling for the fastenings, when forced to leave the plane by parachute in an emergency, are two of the latest aids to flying. The new compass has less tendency to be deflected by the pitching and spinning of a plane, and gives a more accurate reading in any position. The spherical card is floated within a hollow ball, eliminating the usual gimbals, and because of the construction of the instrument, it can be mounted flush with the instrument board, instead of projecting from it. The bull's-eye glass front also acts as a magnifying lens, greatly enlarging the figures and making the instrument easier to read. The safety belt, instead of a buckle, has a post with a hole through it. The post projects through any one of a series of eyelets, and a cotter pin, attached to a short lanyard, which in turn is fastened to the belt, passes through the hole. To unfasten the belt it is only necessary to grasp and pull the lanyard.

METAL SOUND-POST FOR VIOLIN IMPROVES TONE

Marked improvement in the tone of a violin is said to be attained by the introduction of an aluminum sound post installed between the top and back. It strengthens the body of the instrument besides increasing the beauty of the sound.

X-RAYS DISTINGUISH "CULTURE" PEARLS FROM GENUINE

By means of X-ray tests, natural pearls can be distinguished from the "culture" varieties. This latter kind is usually made by placing a spherical particle under the shell of the oyster and allowing the mollusk to deposit the shell substance around it, resulting in the pearl. The X-ray photograph reveals this spherical center which is not present in the pearl formed wholly by natural methods. The culture variety is not to be confused with the artificial pearl, which usually is simply a bead of some sort coated with a preparation made from essence of pearl, a fish-scale product. Acid tests reveal the nature of this kind or the coating may be peeled off with a knife.

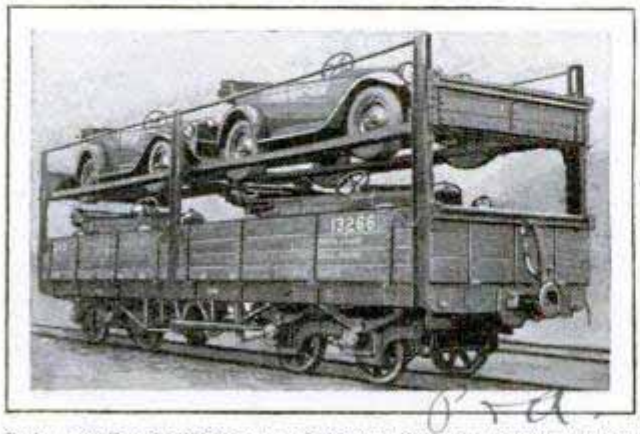
Skating on Chemical Substance Which Is Said to Be as Slippery as Ice; It Is Poured on a Wood Base and Is Soon Ready for Use

"HOT ICE" FOR SKATING RINKS TO KEEP YOU WARM

"Hot ice" has been invented recently by a Berlin, Germany, chemist for use on the floor of skating rinks. The ice looks like hoarfrost, and has a melting point many degrees above the temperature at which ordinary ice melts. The inventor claims that, exercising on this ice, skaters will feel quite warm even if they are wearing scanty clothing, or a bathing suit. A new skating rink at Breslau will have the first floor to be made of this material. It is poured onto the wood where it "freezes," or sets hard in a few minutes.

DOUBLE-DECKED RAILWAY CAR SPEEDS AUTO SHIPMENTS

To facilitate the shipment of automobiles in South Africa, a double-decked railway car has been introduced. It holds the cars securely in place to prevent damage while en route, is easily loaded and unloaded and reduces the train length.



Safe and Rapid Delivery of Motor Cars in South Africa Is Afforded with Double-Decked Railway Units

DRAWING MAP OF THE STARS TAKES FORTY YEARS

After forty years of patient work, astronomers at the Oxford and Greenwich observatories have about completed a huge map of the heavens. More than 15,000,000 stars were photographed and 30,000 charts were prepared, which are to be assembled and printed Nineteen observatories in various parts of the world co-operated.

ORNATE LAMPS FOR BOULEVARD TO GIVE STRONG LIGHT

For More Artistic Street Lamps; Ornate Lights for Los Angeles Boulevard Give Brilliant Glow

Highly decorative electric lamps have been adopted for a boulevard in Los Angeles as part of a plan to improve the appearance of the city. Besides being the most ornate yet installed there, they are among the largest and will make it one of the best lighted in the city.

PULVERIZED-COAL LOCOMOTIVE SAVES LABOR

An interesting new type of steam locomotive, burning pulverized coal, is being tested in Germany. Outwardly, it resembles a standard locomotive but for the striking design of the tender, which is entirely inclosed and, in the place of a coal bunker, has a boiler-shaped, horizontal tank carrying the powdered fuel. By the operation of a few valves, fuel is conveyed by an ingenious attachment from the tender into the fire box, in order there to be burnt without any residue or smoke. Any low-grade fuel, such as coal dust and refuse, rough lignite or peat, can be employed for the pulverized-coal locomotive, resulting in a twofold profit, the simplifying of the operation and leaving the high-grade lump coal free for other purposes. The use of pulverized coal also does away with any risk of ignition by the projection of sparks.

AIRPORTS OVER RAILWAY YARDS TO STIMULATE AVIATION

Construction of platforms over railroad yards for the use of airplanes in landing and taking off, is being considered by some of the lines entering New York. According to aviation experts, the idea is entirely practical, since it has been demonstrated that planes can be handled safely within small landing areas, the success of the battleship airplane carrier being due largely to that fact. It is also planned to erect a landing "field" on top of one of the modern skyscrapers in New York.

CAB DRIVERS CALLED BY RADIO FOR HOTEL GUESTS

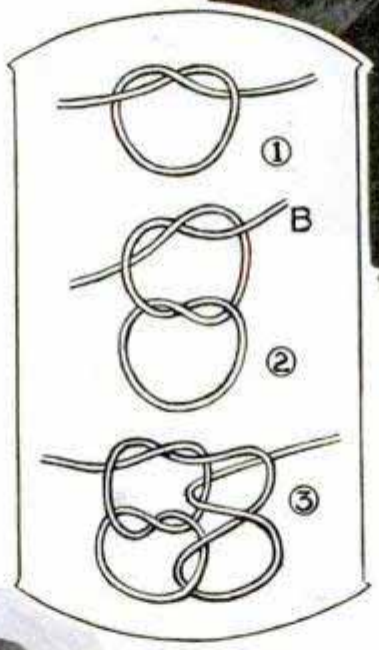
Guests at a Chicago hotel are not annoyed by the whistling of the doorman for taxicabs, as a loud-speaking telephone system, utilizing radio apparatus, has been installed. From his post, the attendant calls out the name of the person who wants his chauffeur, or signals for a cab, and the voice is broadcast from loud speakers at the cab stand.

Summoning a Cab from Hotel Lobby by Radio Telephone; Loud Speaker Is Installed near Stand

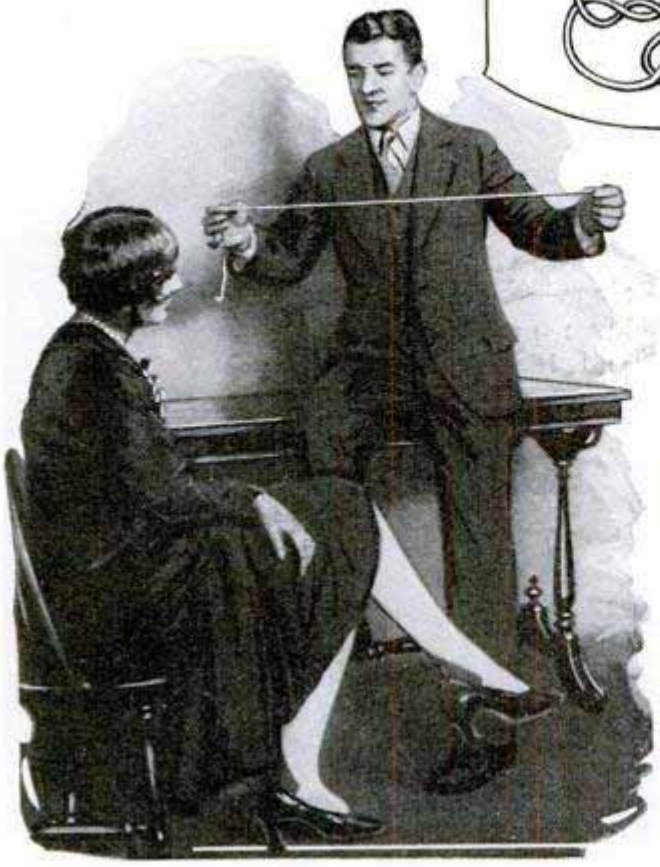
Easy Tricks with String

TAKE a piece of string ....All string tricks start that way. Take a piece of string. Tie a single overhand knot in it as shown in the picture. Tie another knot in it as shown below. Then twine the end B through both knots. Now, if you will pull gently on both ends, the knots will magically disappear. Magicians call it the "Dissolving Knot." Besides being a quaint bit of mysticism, it is the best of a dozen answers to that archaic riddle: "When is a knot not a knot?"

Take a piece of string. Tie the two ends together to make a loop. Ask a spectator to hold a pencil upright in his hand, and loop the string over the end of the pencil as shown. Next loop the string over your left hand. Grasp the string at the point A, and loop it once over your left hand to form Fig. 6. Take the double string at the point B, and drop it over the end of the pencil. There! The trick is finished. By pulling the string at the point C, Fig. 4. the loop will obligingly slip away from the pencil. That one might be said to answer the question: "When is a loop not a loop?"

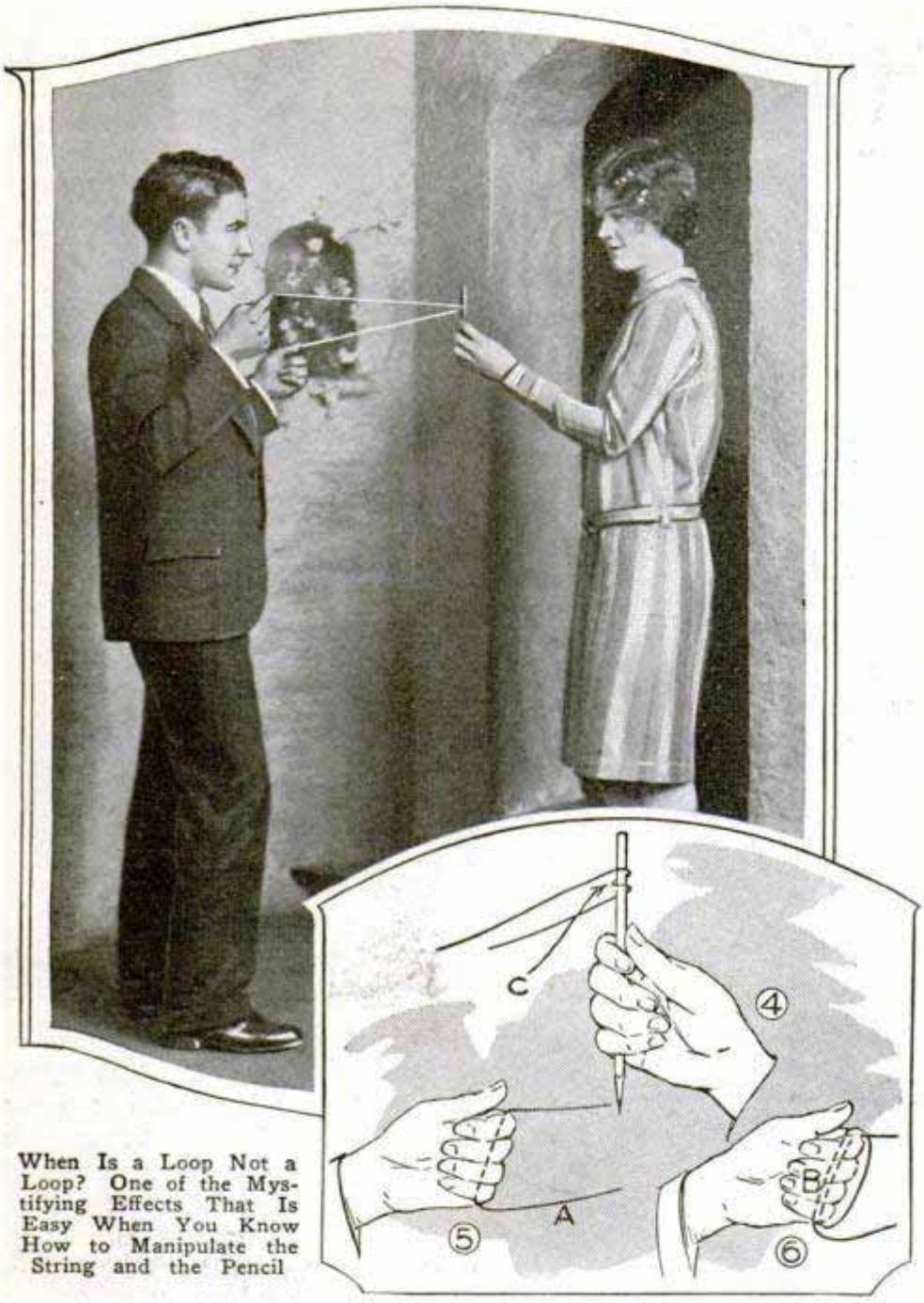


The Dissolving Knots, a Magician's Trick That Anyone Can Perform by Tying the Knots as Shown in the Diagram at the Left



How is this?

The performer takes a piece of string. He ties several knots on it and seals it in an envelope. On several slips of paper the performer writes various numbers called out by the audience. A spectator selects one of these, and the remaining slips are burned—this in order to prevent any deception. The spectator then unfolds his slip, and finds written on it the number 4. The envelope is unsealed and the string taken out. On it is found four



When Is a Loop Not a Loop? One of the Mystifying Effects That Is Easy When You Know How to Manipulate the String and the Pencil

knots—the exact number as was written on the slip selected by the spectator!

That's what you would call a good trick. And it's dead easy. Take a piece of string. On the string tie four knots. Seal the string in an envelope. Sit down several feet away from the audience and request someone to call out a number. "Seven?" "Thank you!" And right there you put in the master touch, for instead of writing a 7 you really write a 4. You write 4's on all of the slips regardless of what is called out, but be sure that someone calls a 4 before you finish.

Need I explain further? The spectator naturally picks a 4 in his "free choice," since there "ain't nothin' else but 4's." By burning the remaining slips you destroy some very telltale evidence.

The next one is called the "Slave Bangle."

Take a piece of string. Have a spectator tie your wrists with the string—an end to each wrist—leaving about twenty inches of string between your hands. The next step is to exhibit the Slave Bangle, which may be any ring large enough to slip over your hand. Pass it out for examination. Explain to the audience that the stunt is to get the bangle onto the string without untying the wrists. After receiving the ring back you walk to the far end of the room. When you return, the ring is daintily hanging on the string, and your wrists must be untied before the Slave Bangle can be removed.

The explanation of this one is simplicity itself. You have two rings—exactly alike. One of these you have previously slipped over one hand and hidden up under your coat sleeve. When you turn your back to the audience, it is a simple matter to slip the original ring into your pocket, and then slide the hidden ring down onto the string. And there you are! Another mystery!

Here's another knot that is not a knot!

Take a piece of string. Tie three knots on it as shown by A, B and C, Fig. 7. You will notice that the right end of each knot is on top, while the left end is under the string. That is important. Gather the knots in your left hand as shown in Fig. 8. Slip the end Y through the whole

Four Knots in a String, a Hatful of Slips with Numbers, and the Spectator Chooses the Right One

bunch, as shown by the dotted line. Ask the fair spectator to blow hard. Pull the ends X and Y, and the knots will melt away.

Of course, no article on string tricks would be complete without a "Cut and Restored String," so....

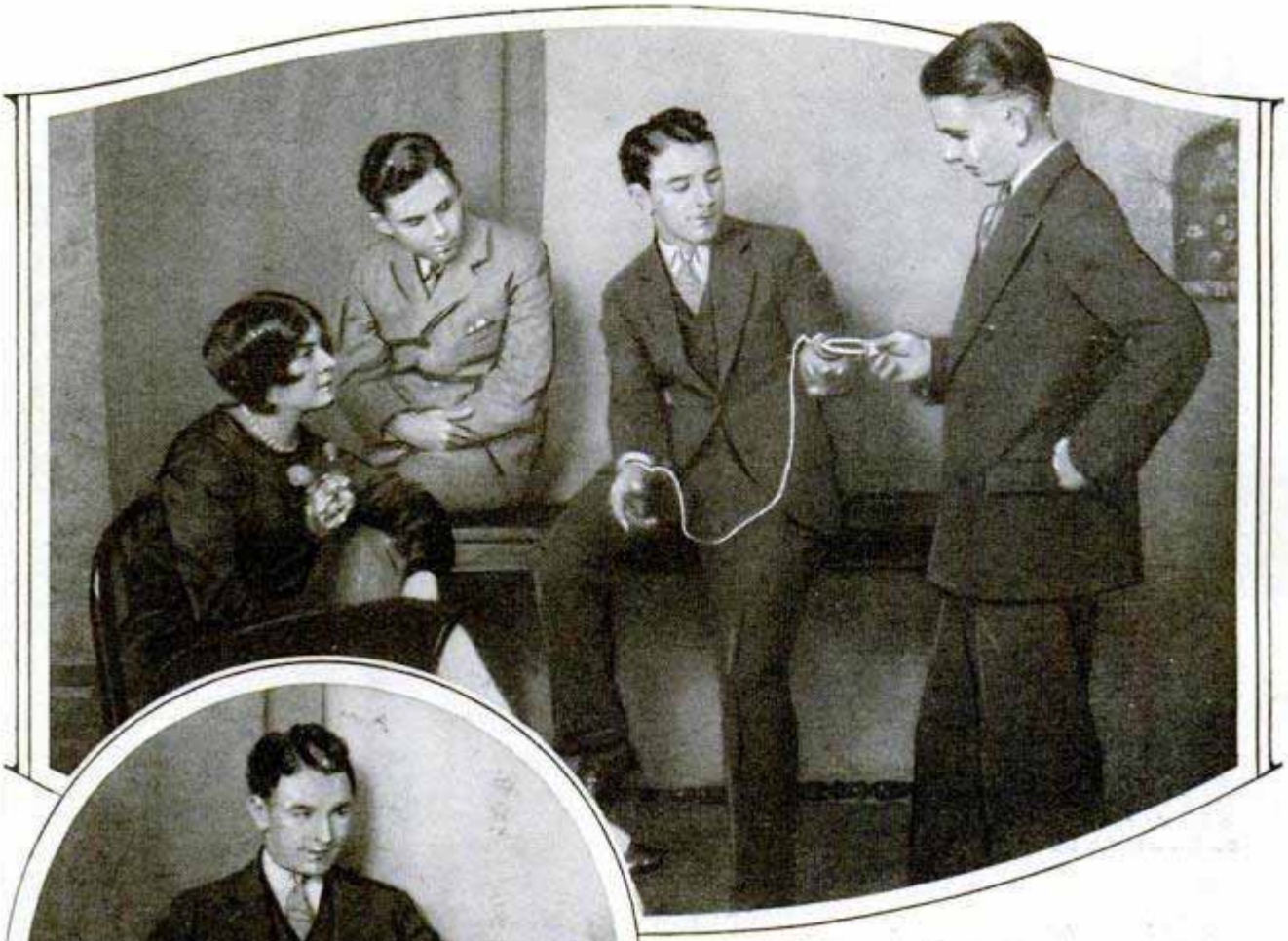
Take a piece of string. Insert the string into a sealed envelope, the ends of which have been cut off. Have two spectators hold the ends of the string as shown in the lower photo on page 823. The problem, in this case, is to cut the envelope in two without destroying the string.

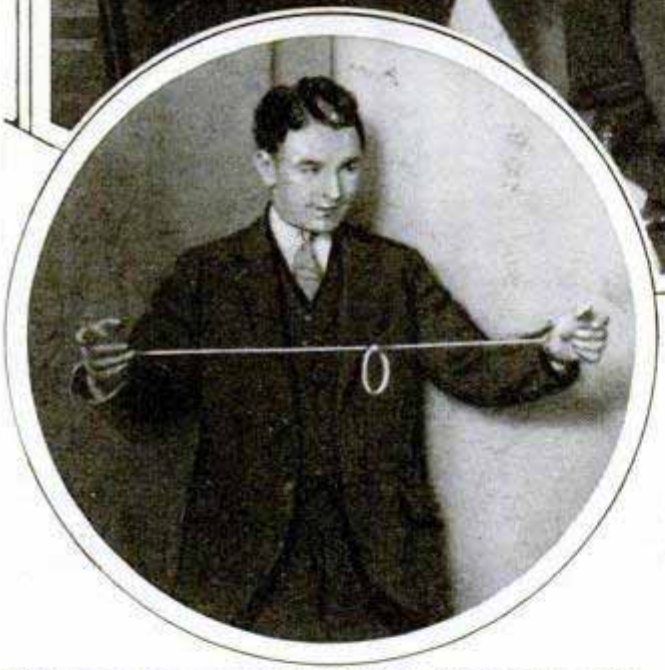
To perform this little swindle, you must previously prepare the envelope by cutting a long slit in the back of it as shown in Fig. 10, extending from one edge of the envelope to within one-half inch of the other edge. If the front of the envelope is always kept upward, your audience will be none the wiser of this. The actual cutting is done with a pair of scissors and in two quick snips. On the first snip, cut into the envelope about one inch, being careful not to cut the string. Withdraw the scissors. When inserting the scissors for the second cut, push the point over the string and down through the prepared cut in the back of the envelope. Then the final snip—and there you are!

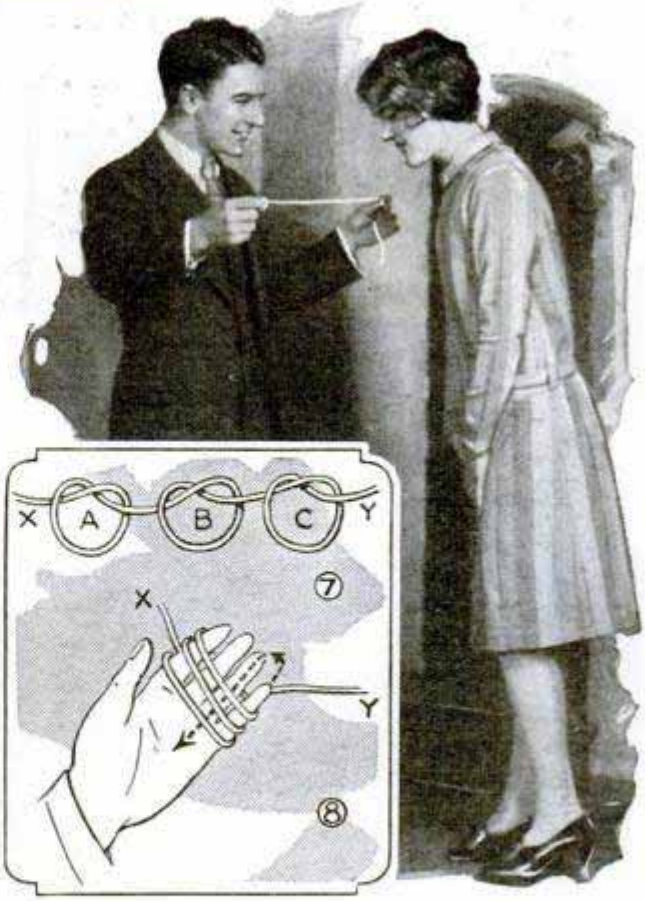
It would be a good stunt, don't you think, to take off your coat while your thumbs were tied together? Yes? Well, listen!

Take a piece of string.... Hold the string in your hands as in upper photo, page 824, palms to the audience. Then turn your hands over and clasp your fingers together—that is, all the fingers but the right index, and this one you secretly insert in the loop of string as shown to the right.

396







Mystery of the Slave-Bangle Trick, Above and at the Left, and Below, a Photo and Diagram That Explain How the Vanishing Knots Can Be Blown Away

After that clever little piece of work, you can allow the spectator to tie your thumbs up as tightly as possible, and still have enough slack to disengage your thumbs and remove your coat. That, of course, you do in an adjoining room, coming in with the coat over your arms and your thumbs still tightly tied.

Tricks with string, or rather with light rope, were in their heyday in the sailing-ship era, but many of what the sailors called "tomfool" knots have been relegated to the list of forgotten accomplishments.

If you have a fairly large and thin silk handkerchief, you can do a trick that is even more clever than if it were done with string, besides being much easier. The trick is to hold the handkerchief in one

hand and with a flip of the wrist tie a knot in the cloth. With a bit of practice it can be done so rapidly that the audience cannot detect how the knot materializes. Here is the way: Starting slowly until you have mastered the movements, hold your right hand out, with fingers extended and thumb raised, and over the first finger drape the handkerchief, which is first folded into a narrow strip, an inch and a half or thereabout in width. The cloth is draped across the fingers so that both ends are approximately equal.

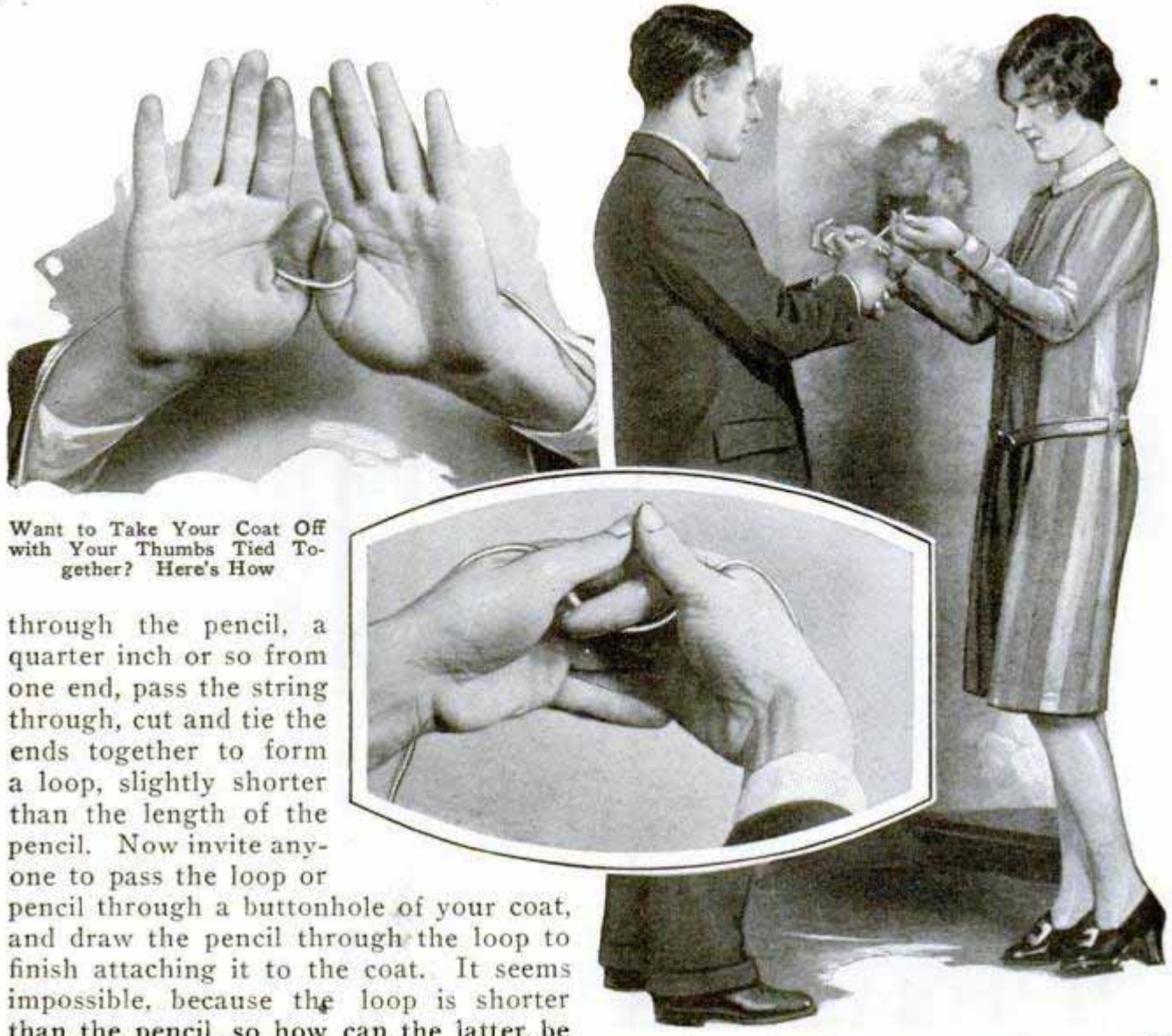
One Way to Cut a String and Then Restore It Is to Use This Prepared Envelope

Now double the third and little finger to clasp the handkerchief within the palm, and fold the thumb down against the cloth, until the thumb tip touches the bent joint of the third finger.

Next turn the hand sharply, the thumb revolving toward the right. This will cause the loose end of the handkerchief to swing upward, and at the top of the swing the thumb is extended under it, holding it to form a loop. The first and second fingers are then bent down to catch the loose end, hanging beneath the little finger. They draw it up and through the loop, and the knot is tied.

Repeat the trick slowly until you learn the sequence of moves, then begin to speed it up. When completely mastered, the folding of the third and little fingers, the lowering of the thumb, and the turning of the hand to flip the end up for the loop all occur simultaneously.

Several pages back we told of a trick done with a pencil and a loop of string. Here is another, using the same paraphernalia. Take a piece of string, bore a small hole



Want to Take Your Coat Off with Your Thumbs Tied Together? Here's How

through the pencil, a quarter inch or so from one end, pass the string through, cut and tie the ends together to form a loop, slightly shorter than the length of the pencil. Now invite anyone to pass the loop or pencil through a buttonhole of your coat, and draw the pencil through the loop to finish attaching it to the coat. It seems impossible, because the loop is shorter than the pencil, so how can the latter be passed through without cutting it off?

The answer is simple. Spread the loop of string over the cloth around the buttonhole, draw the buttonhole through the loop, pass the pencil through the hole, and the trick is done. Or you can reverse the process and take it off. Be sure to call the attention of the audience not only to the fact that the loop is shorter than the pencil, but that the pencil is longer than the loop. While they are analyzing that, you can do the trick.

CHOP PHONE BOOKS INTO BITS TO MAKE PULP FOR PAPER

When telephone directories become obsolete, they are usually gathered and sold to waste-paper companies for conversion into pulp and the manufacture of new paper. They are torn in two lengthwise, then chopped into small bits in a powerful machine and finally churned in a vat with chemicals that help prepare the material for suitable pulp.

SUPPORT TO HOLD VISE WORK HELPS PREVENT DAMAGE

When small objects are held in a vise, it is often necessary to apply such great pressure that damage to the article is likely to result. This is said to be avoided by using a special support recently introduced. It is quickly attached to the jaws of the vise and forms a strong rest against which enormous force can be applied without the danger of slipping or marring the work. The support is firmly held with clamps and springs of piano wire.

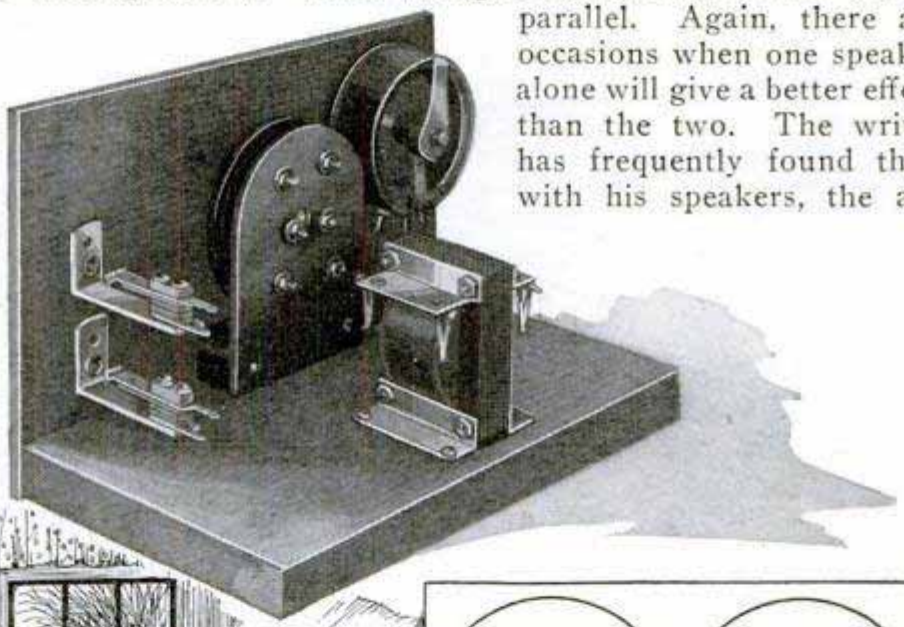
Control Unit Aids Reproduction

By HERBERT C. McKAY

FEELING the need of some simple control to improve reproduction without changing the receiver in any way, the writer built the little device described and illustrated in this article, and obtained excellent results. Quality in radio reproduction depends on several factors, some of them, as, for instance, lack of good modulation at the broadcasting station, atmospheric disturbances and interference of local nature being beyond the set owner's control. Most of the large broadcasting stations are now developed to a point where they do send out programs of quality from an engineering standpoint, but the average radio receiver with speaker is not able to reproduce them faithfully.

This article will not deal with the receiver circuit. There are, however, several things that the average owner can do to improve reproduction at the speaker itself. It is questionable if there is a single speaker capable of absolutely pure reproduction of the full range of the human voice and orchestral music, although this undoubtedly will come. Fortunately there are several types of reproducers available, covering different ranges, and two speaker units may be combined so that the effective range of one covers the dead spot of the other. It is possible then to combine the two to provide quality reproduction at comparatively small cost.

In order to do this, the two speakers cannot be hooked to the set at random. There are times when a connection in series will give better results than one in parallel. Again, there are occasions when one speaker alone will give a better effect than the two. The writer has frequently found that, with his speakers, the an-



Above, Control Unit Partially Assembled, Showing the Relative Position of the Parts

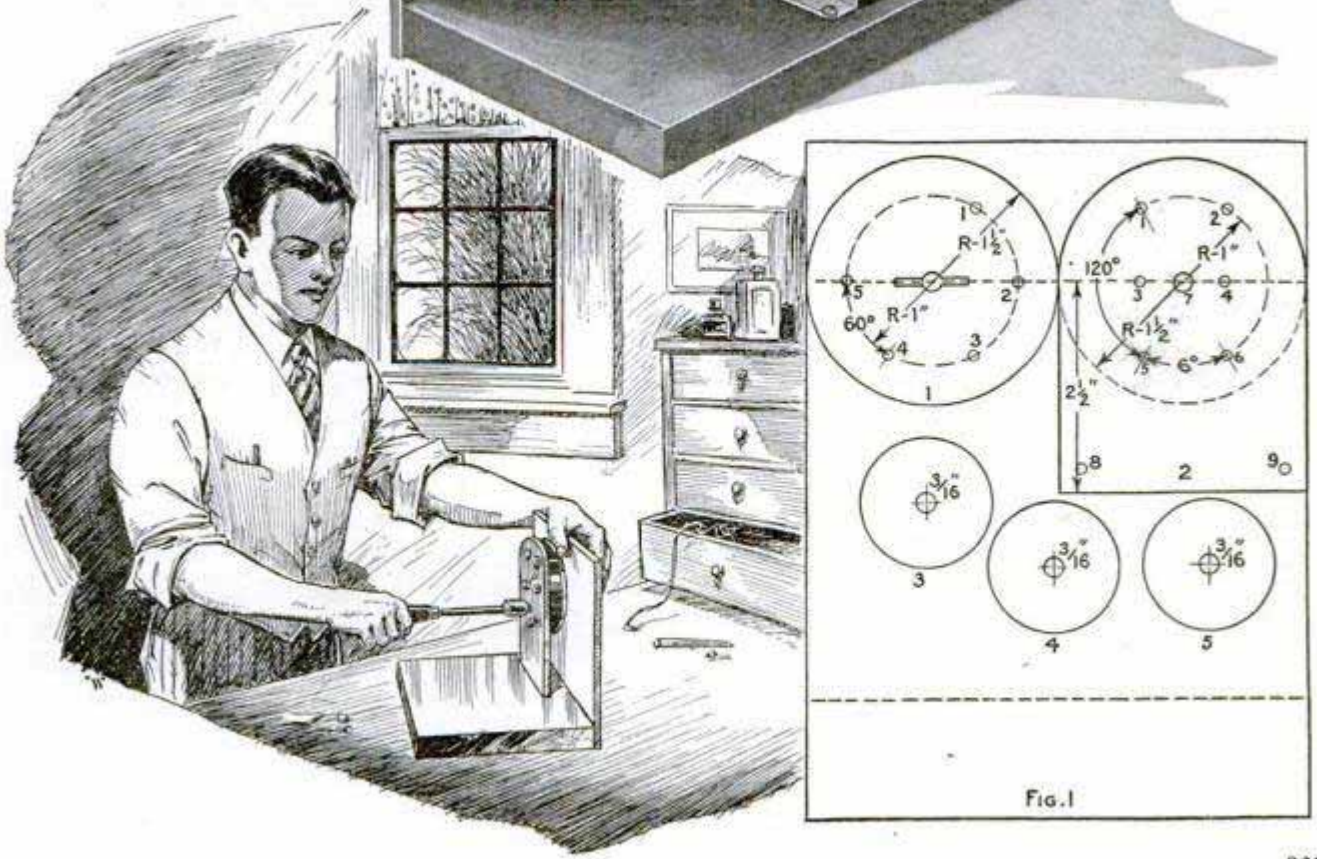


FIG. 1

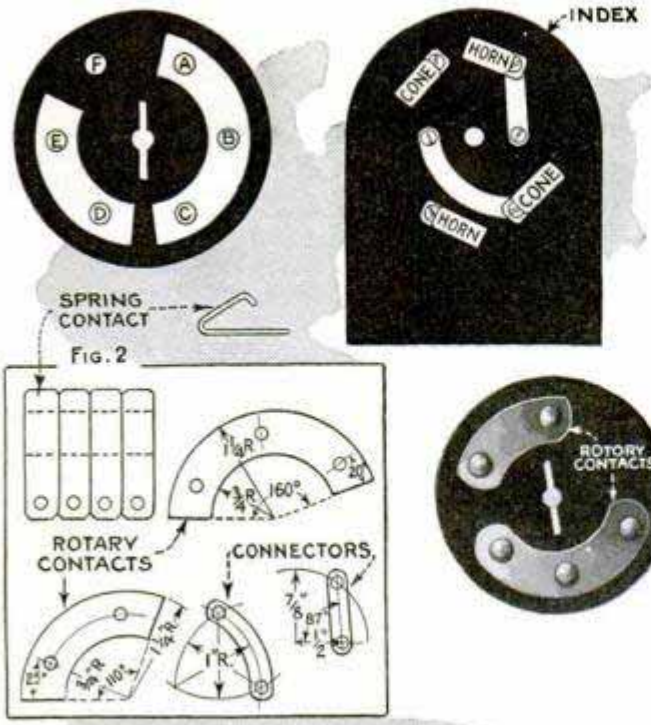


FIG. 2

high-voltage d.c. being harmful to the speaker, an output transformer is included in the control device and adds greatly to the handling range of the speakers; similarly, a volume control for the horn alone is provided and, last but not least, a volume control for the set where there is none, a variable resistance of 500,000 ohms being employed for this purpose. With these needs in view the control unit here described was found to meet all requirements.

In the construction, the sizes are of no great importance. The panel may be cut to

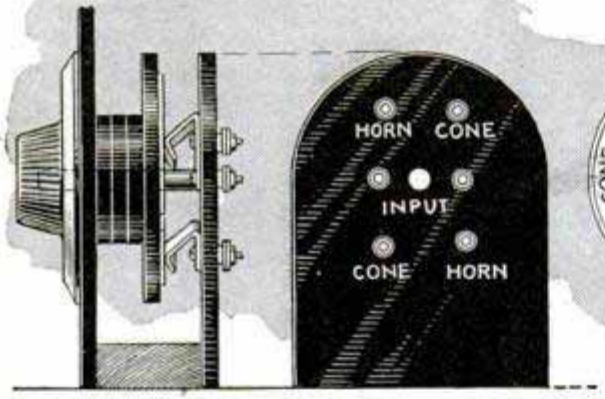


FIG. 3

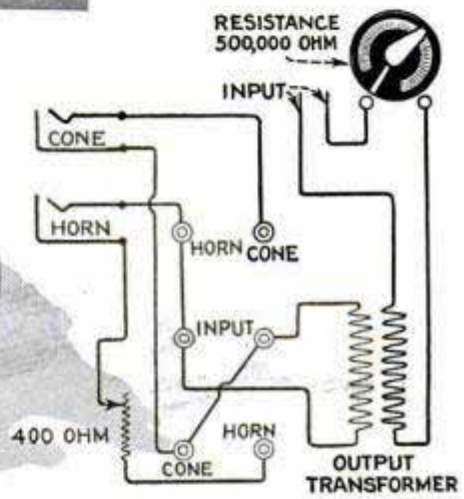


FIG. 4 WIRING DIAGRAM

Construction Details and Schematic Wiring Diagram

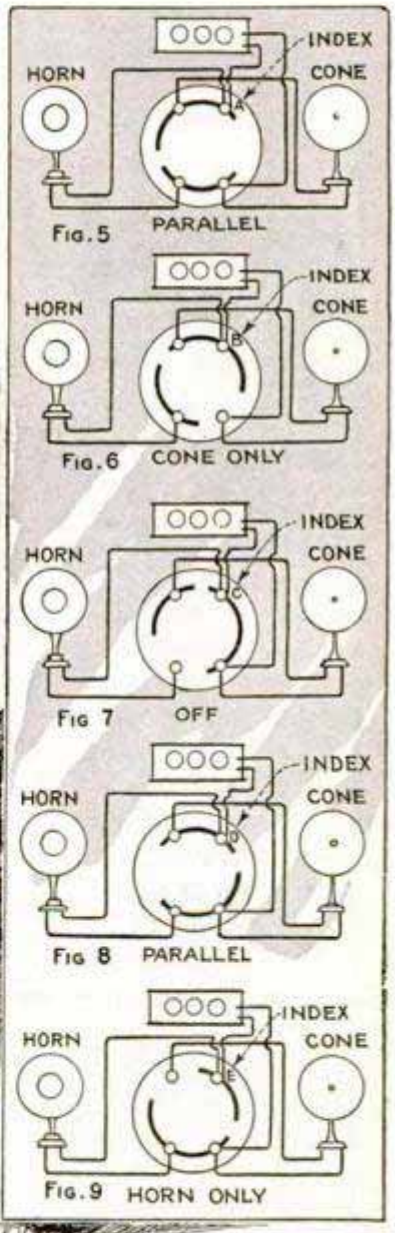
nouncer's voice came in sharper and more distinctly with the horn alone, when experimenting with a combination of cone and horn. This is true of any music or sound of sharp-cut quality. On the other hand, an orchestra, violins and vocal music came in best with a combination of both horn and cone, while, on organ music, the cone alone was best. This will not hold true with all sets and speakers, and the best combinations can only be found by trial. A variable-control device is required for these instant changes, and it must incorporate parallel, series, horn alone, cone alone and on and off switches.

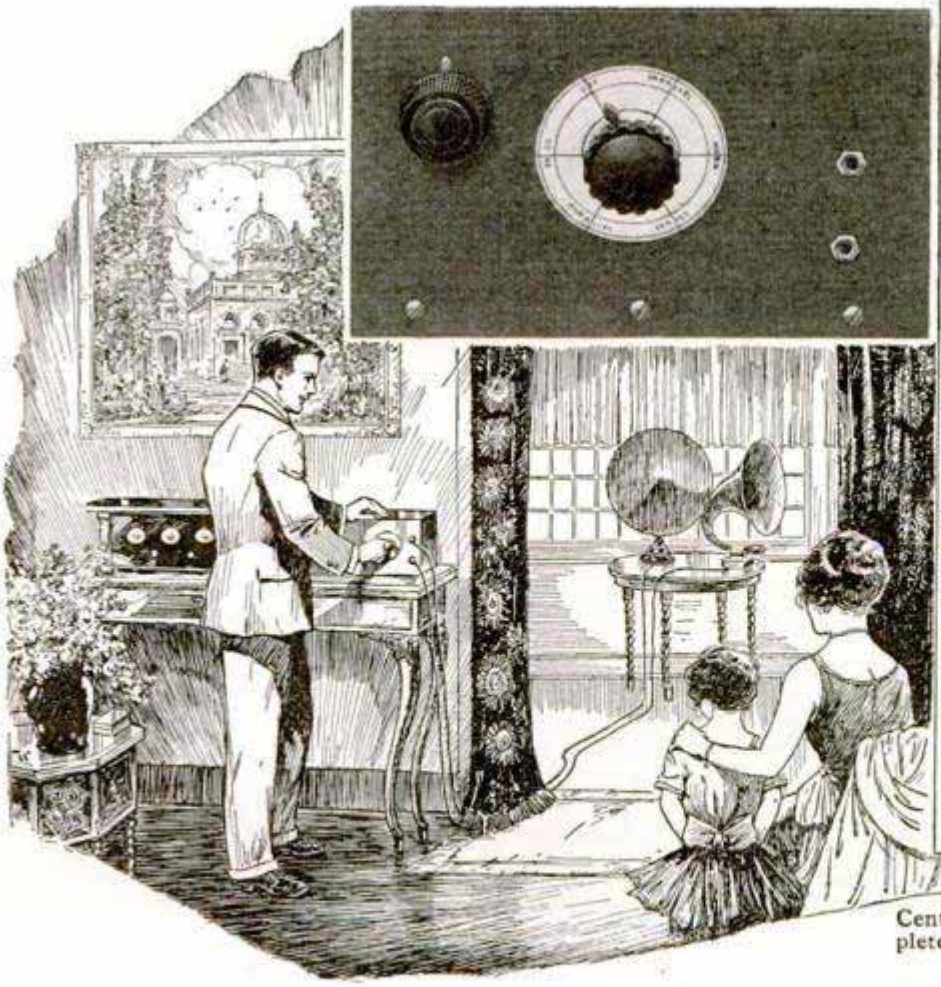
Another point in the modern use of radio is that the owner frequently wishes to move the speakers about the house and, therefore, the control device should be portable. It is common practice to use power tubes and high B-voltage. This fit any small cabinet at hand, or the instruments mounted in the set cabinet or in a cabinet-speaker if available. The simple layout is shown in the rear-view photo on page 825, the rotary pole-changing switch at the center, two single open-circuit jacks at the left and the 500,000-ohm variable resistance at the right on the front panel. The output transformer, which may be any of the modern types, is shown on the baseboard directly behind the rotary switch. The materials required for the switch are: a small rheostat knob, a piece of 3/16-in. rod, 2 in. long and threaded at one end for 1/8 in.; a piece of 1/8-in. bakelite or hard rubber, 6 in. wide and 8 in. long; a strip of thin copper sheet, 2 in. wide and 10 in. long; five split-shank copper rivets; six 6-32 by 1/2-in. machine screws; fourteen 6-32 hexagon nuts; twelve washers for the screws; two pins,

3/64 by 3/4 in., and a disk of white cardboard, 3 in. in diameter.

The rubber or bakelite is cut as shown in Fig 1; the switch base (marked 2) is 3 in. wide and 4 in. long, with one end cut on a 1½-in. radius. Seven holes are drilled in the base, as shown in No. 2; six for the 6-32 screws and the center hole for the 3/16-in. shaft. The rotary plate (No. 1) is a disk of the same insulating material, 3 in. in diameter Six holes are drilled in it; five for the copper rivets and one for the shaft. Note that the shaft hole is slotted for the driving pin. Disks 3, 4 and 5 are 1½ in. in diameter with 3/16-in. center holes, and serve only as thrust washers to insure positive contact between the rotor and stator of the pole-changing switch. Four spring contacts, two switch plates and two connecting strips are cut from the copper strip as shown in Fig. 2; smooth all rough edges with a fine file and sand the surfaces. It may be necessary to flatten the strips to remove the curl formed by cutting.

We are now ready to assemble the rotary switch, but little comment is needed here, as the illustrations in Fig. 3 are self-explanatory. If difficulty is encountered in locating the holes in the copper connectors and contact plates, the switch base and rotor may be used as templates. The stator spring contacts are screwed to the stationary plate and bent over to make good wiping contacts on the rotary switch plates, as shown in Figs. 2 and 3. The contact plates are riveted flat to the rotor disk, as shown in Fig. 2. At a point 5/8 in. from the threaded end of the 3/16-in. rod, drill a 3/64-in. hole through the rod. Cut a pin, 3/4 in. long, to fit this hole and insert it in the shaft; this pin engages the slot in the rotor. Now place the three small washers 3, 4 and 5 upon the plain end of the shaft, insert the shaft through the hole in the front panel, and fasten the rheostat knob in such a position that the pin prevents





Center, Front Panel Partially Completed, Showing the Switch Knob and Cardboard Disk in Position

more than 1/32-in. play in the assembly. The rotary plate is then placed on the shaft, and the unit is ready for mounting.

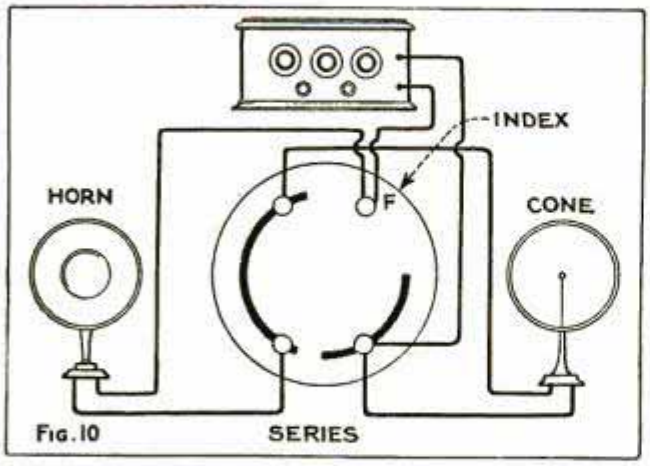


Fig. 10

A block of wood, 1 in. wide and from ½ to ¾ in. thick, according to the thickness of the bakelite or hard-rubber disks, is used as a base spacer for mounting the unit, holding the assembly to the baseboard. This block is screwed in position and the assembly will then look like the side view at the lower left in Fig. 3. The 3-in. white-cardboard disk is prepared as shown to the right of the side view; the knob is removed from the shaft on the front panel and the disk pasted to the panel. Now make six marks with a sharp file or similar tool on the edge of the rotary switch plate, five of the marks directly opposite one of the rivets, while the sixth is placed opposite F in Fig. 2. Letter each of these stations A, B, C, D, E and F, as shown, after which make an index mark on the edge of the stationary plate at the point indicated in the illustration at the right. Now turn on the rotary disk opposite the index mark, which is the cone-only connection. Place the rheostat knob in position with the pointer just over the mark "cone" and secure it with the setscrew, and the switch is completed.

The 500,000-ohm variable resistance and two single-circuit jacks are mounted on the front panel approximately as shown in the photo on page 825. The writer suggests that a 400-ohm potentiometer be mounted at the upper left on the panel in the vacant space above the jacks. The potentiometer is used like a rheostat, by employing the lever connection and one side of the resistance, and places this resistance in the circuit on one side of the horn jack, as shown in the wiring diagram, Fig. 4. It will be seen that the output of the set is controlled by the 500,000-ohm resistance at the input of the unit, passed into the output transformer, then delivered to the mid-contacts of the switch, and from there to the horn and cone jacks. The 400-ohm resistance controls the horn volume independent of the cone and receiver volume.

Figs. 5 to 10 show the method of using the control unit for the various combinations better than a written explanation, so little further comment is necessary. For the benefit of those interested, it may be said that the set used by the writer is an eight-tube superheterodyne of standard design with transformer-coupled a.f. amplification; with the unit described excellent reproduction has been obtained.

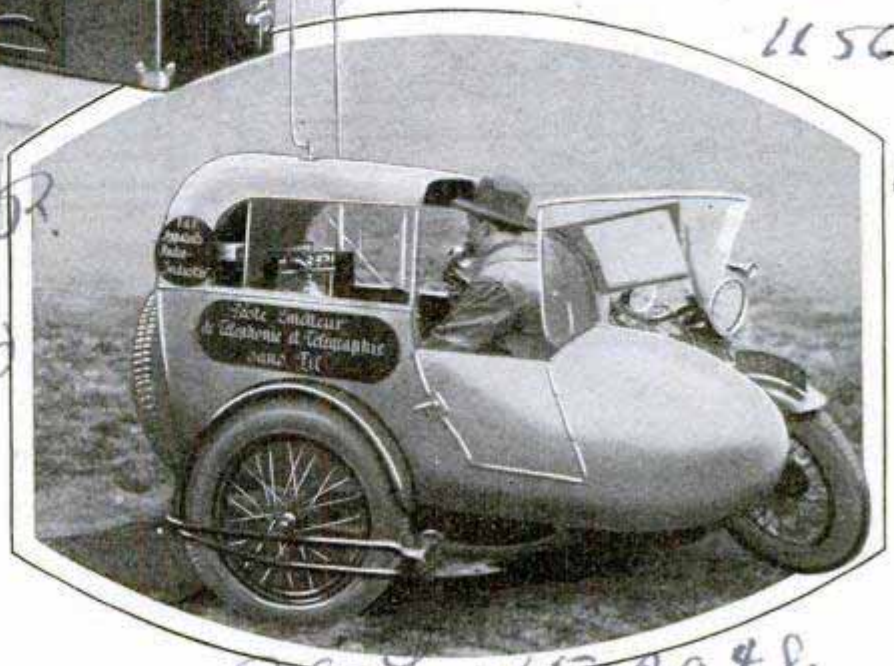
Valve on Battery Tester Prevents Dripping

An automatic valve on the tip of the hydrometer illustrated herewith prevents acid from dripping on rugs and floors, so that those who have had such accidents occur will appreciate this new device. Another interesting feature will be noted in the sketch at left, which shows how the float is raised by the acid to the narrow part of the barrel, and held in the center, making reading easy. The valve is shown at right. As the tip is withdrawn from the battery, a rubber cap automatically slides over the opening in the lower end, preventing dripping while the reading is taken and spraying when drawn into or forced out of the tip.

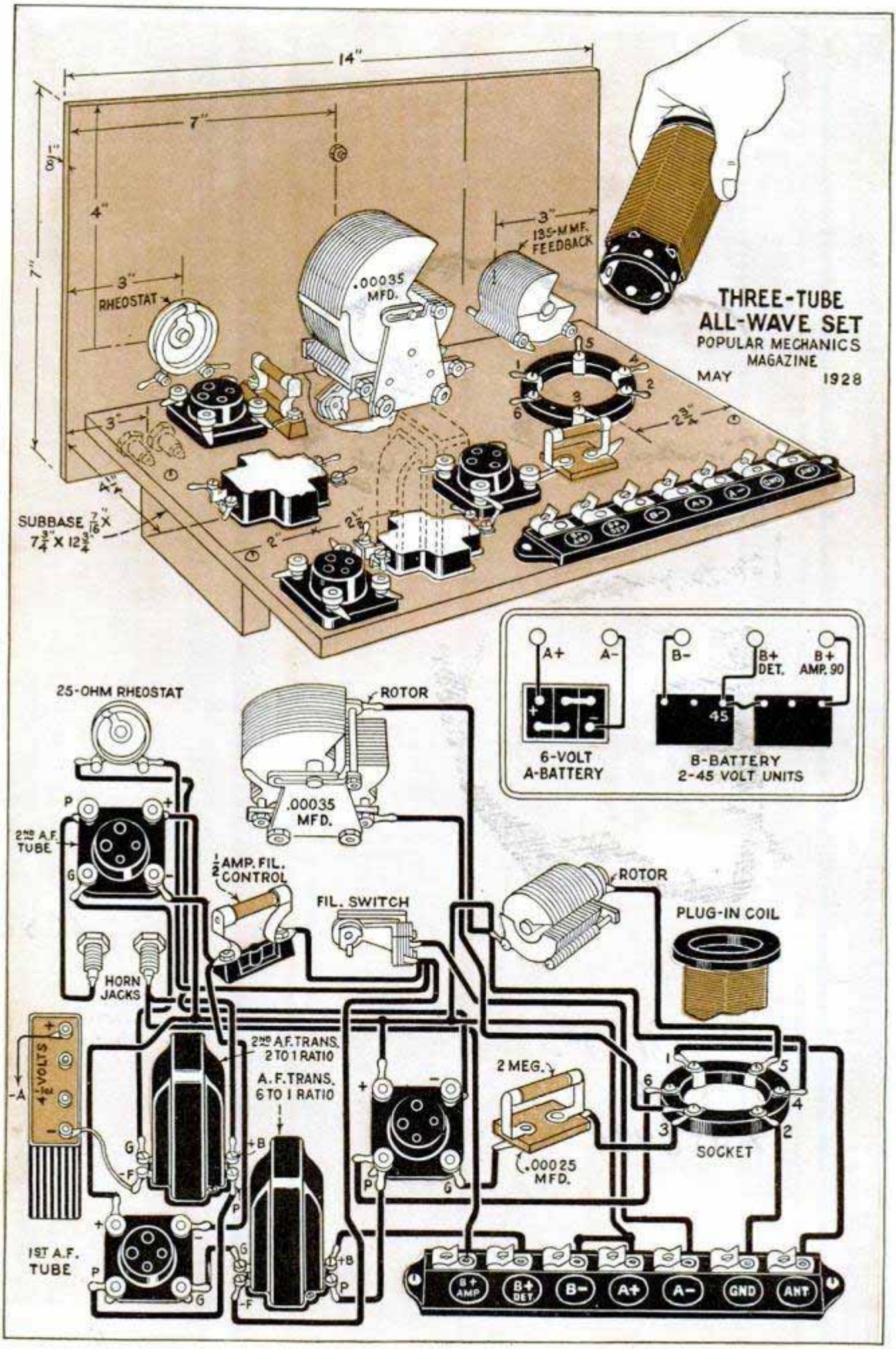
Facts and Fads for Radio Fans

Joe Sullivan, of Toledo, with His Home-Grown Loud Speaker; He Collects Gourds, Removes the Seeds and Then Thoroughly Dries the Gourd, after Which a Loud-Speaker Unit Is Fastened to the Small End

Above, Recording Edison's Late Radio Interview on a Dictaphone of His Invention, 3,000 Miles Away from the Point Where He Delivered the Address; Miss Eva Buerg, of San Francisco, Is Shown Recording It for Posterity; Left, Miss Gail Walker of Honolulu, aboard the "City of Los Angeles," en Route to Hawaii, Is Listening In on Programs from Distant Stations; the Ship Carried a Number of These Receivers



Right, This Motorcycle Outfit for Radio Reception and Transmission Was Demonstrated Recently at the French Army Camp at Satory; Numerous Other Applications of the Motorcycle and Sidecar for Military Use Were Also Shown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7"
8 1/2"
4"
7"
3"
RHEOSTAT
3"
135-MMF. FEEDBACK
.00035 MFD.
THREE-TUBE ALL-WAVE SET
POPULAR MECHANICS MAGAZINE
MAY 1928
SUBBASE 7 7/16" X 7 3/4" X 12 3/4"
A+
A-
B-
B+ DET.
B+ AMP. 90
45
6-VOLT A-BATTERY
B-BATTERY 2-45 VOLT UNITS
25-OHM RHEOSTAT
ROTOR
.00035 MFD.
2ND A.F. TUBE
1/2 AMP. FIL. CONTROL
FIL. SWITCH
ROTOR
PLUG-IN COIL
HORN JACKS
4 1/2 VOLTS
2ND A.F. TRANS. 2 TO 1 RATIO
A.F. TRANS. 6 TO 1 RATIO
2 MEG.
.00025 MFD.
SOCKET
1ST A.F. TUBE
B+ AMP
B+ DET.
B-
A+
A-
GND
ANT

Simple Three-Tube All-Wave Receiver

By FRANK L. BRITTIN

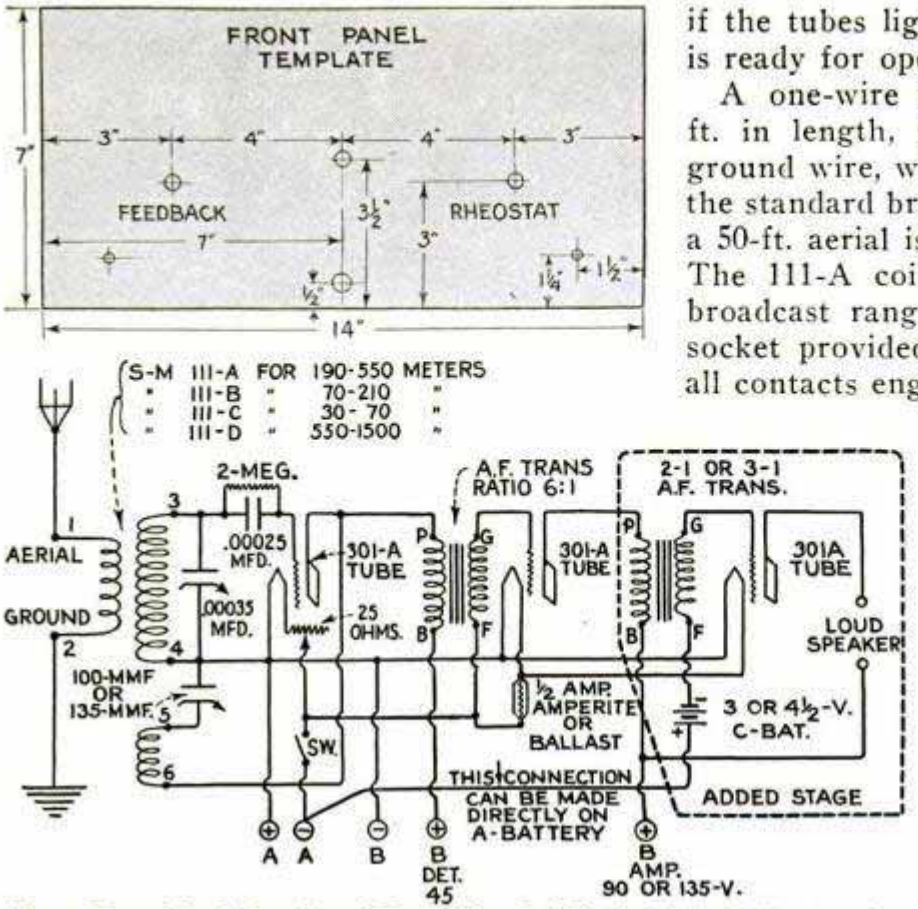
THIS simple receiver, which is ideal for the beginner, appeared in the October, 1927, issue and met with the enthusiastic approval of our readers. It was first described as a "Two-Tube All-Wave" set that would operate a loud speaker. A second a.f. amplifier stage has been added in answer to numerous requests for greater volume on the speakers now in common use with the larger sets. With the addition of the second stage, the set is now capable of good DX-range at loud-speaker volume, and can be used with any of the late types of speakers. The low cost, simple construction, wide range of wavelengths available, and the fact that the set can be operated with either the large or small tubes make it an ideal receiver for the beginner.

The layout given is intended for use with the large tubes, but if dry-cell tubes are employed, substitute a No. 120 amperite for the ½-amp. filament control and a 4-volt storage battery or three No. 6 dry cells in series, for the A-battery. The parts cost about $27.75, the price varying slightly in different localities. The a.f. transformers are $6 each and the coils, with the exception of the type tuning from 550 to 1,500 meters, cost $2.50 each; the last-named coil is $5. The coil socket specified will take any of these coils, which may be plugged in and out as desired. The X-type spring-suspended tube sockets are a standard type which is suitable for either kind of tube without changing the wiring.

The front panel and baseboard layout are shown on page 830; the wood baseboard is supported by two ¾ by 1 by 3½-in. blocks, also of wood. The front panel is screwed to the baseboard at front, with two 1-in. round-head nickelplated wood screws, the filament switch and horn jacks being located below the baseboard. Those who built the former two-tube set will notice that very few alterations are necessary to add the third tube and transformer. The choke coil has been dropped from the assembly, and the first a.f. transformer moved to the right to make room for the first a.f. tube. The socket at front, formerly for the first a.f. tube, now becomes the second a.f. socket, and the filament leads are not changed on this socket. The simplified wiring diagram is given on page 830 and also a separate diagram, showing the battery connections which are the same as before, with the exception that the positive lead from the 4½-volt C-battery is to be connected to the negative terminal of the A-battery. Flexible rubber-covered hookup wire is used for the circuit and all diagrams are complete in every way for the entire construction of the set. The position of the added stage is pointed out in the photo on this page; note that as much of the wiring as possible is run down through holes drilled in the baseboard. The rear-view photo on page 832 shows the neat appearance which is due to the lack of exposed wiring. The schematic diagram of the circuit, with the front panel drilling template is given on page 832, as well as a list of the various coils suitable for the set.

This View Indicates the Position of the Added Transformer and Tube

When wiring the circuit, use soldering lugs under each terminal, and solder all connections securely, taking care that a good, tight connection is made and that the solder flows smoothly into the joint. The writer has examined several sets lately



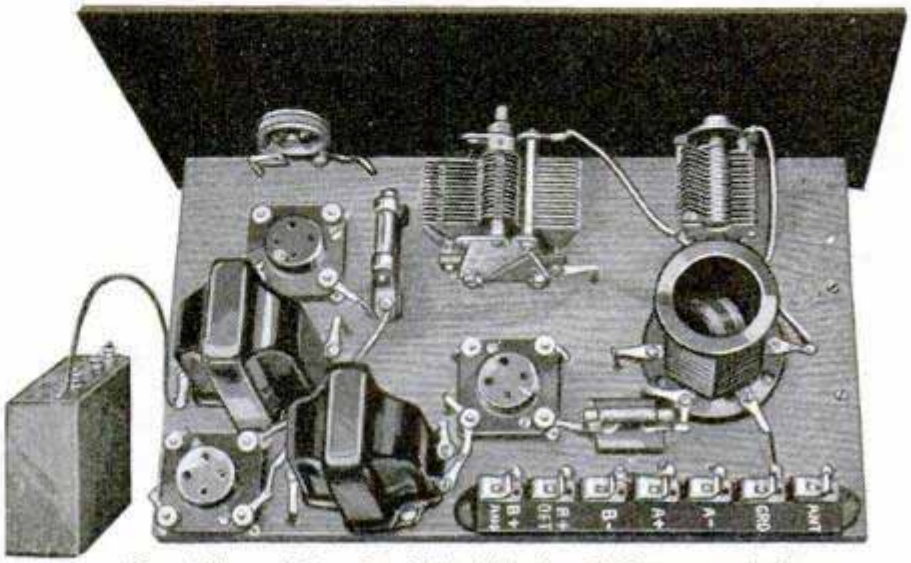
Above, Front-Panel Template; Below, List of Coils for Various Wavelengths, and Schematic Circuit Diagram

that were built by beginners, and in each case the soldering had been done with an insufficiently heated iron. A slight pull on such a connection suffices to break it off and these "chewing gum" joints will never do in a radio set. Note carefully the rotor connections of both variable condensers. The small condenser may be either 100 or 135 mmf. Do not judge the capacity by the number of plates, as this varies in different makes; the capacity will be found marked on the box in which the condenser is packed.

Make all grid and plate leads as short as possible, being careful not to run them parallel at any point. The rheostat controls the detector tube only, while the filaments of the two amplifier tubes are controlled by the automatic control unit. After the wiring has been completed, connect the batteries, turn on the filament switch and place one tube successively in each socket to test the circuit; if the tubes light as they should, the set is ready for operation.

A one-wire aerial, not exceeding 100 ft. in length, including the lead-in and ground wire, will give the best results on the standard broadcast wavelengths, while a 50-ft. aerial is best for the short waves. The 111-A coil will cover the common broadcast range. Plug the coil into the socket provided for it, making sure that all contacts engage with the bosses in the base of the coil form. Turn on the filament switch and rotate the dial of the large variable condenser, keeping the plates of the small condenser about half out, then slowly turn up the detector-tube rheostat until a slight hissing sound is heard in the loud speaker or headphones. Continue to rotate the large condenser dial until a station is heard, then readjust the small condenser to the best setting for volume and clarity. It need not be reset for every station; rotating the large condenser dial will bring in one station after another. Keep the detector rheostat at the lowest point consistent with good results.

Stations, once logged, can be found again at the same dialing; if the small condenser is set at too critical a point, the set will easily become unbalanced with a resulting loss of the station. Therefore, keep it set at a point where this does not



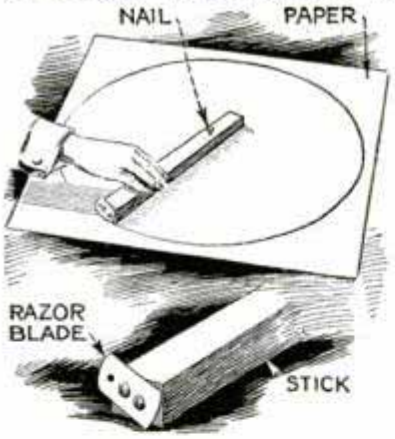
Rear View of Completed Set, Showing C-Battery at Left

happen. The a.f. transformers used in this set are capable of producing excellent results if you have a good loud speaker. While such an instrument will cost as much as the set, the results will be worth the expense.

A complete material list with the name and price of each part used in the original model will be sent free of charge to any address; a postal card will bring you this list. If you wish a large detailed blueprint of the wiring diagram and layout, this is available for 25 cents to cover cost and mailing; address Popular Mechanics radio department, 200 E. Ontario st., Chicago, Ill. Specify blueprint No. 132.

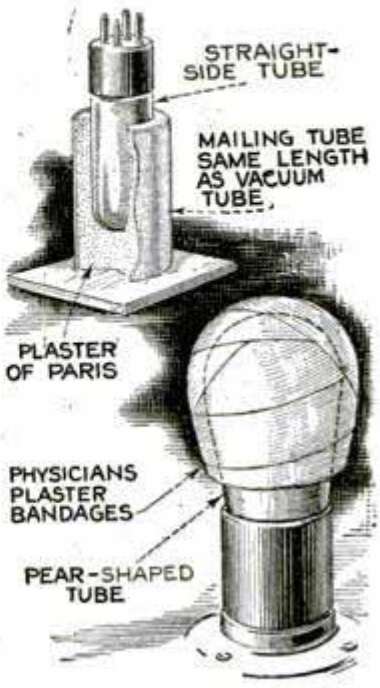
Disk Cutter for Cone Speakers

A useful tool for cutting paper for homemade cone speakers can be made by fastening a safety-razor blade to the end of a stick in the manner shown in the illustration. A hole is drilled near the other end of the stick for the nail used as a pivot. The heavy paper is fastened to a flat surface with thumbtacks, and the nail is driven through the hole in the stick into the center of the paper. When the stick is swung in a circle the razor blade cuts a neat and perfect disk.—R. J. Williams, Chicago, Ill.



Homemade Howl Preventers

Simple and effective howl preventers may be made of plaster of paris in the manner shown in the sketch. Detector tubes not mounted on spring-suspended sockets are the worst offenders, as they are especially affected by microphonic disturbances. The preventer merely changes the vibration period of the tube to a point that does not interfere with the elements within the tube. The small straight-sided tubes of the dry-cell type are treated as shown in the upper sketch, a mailing tube of suitable diameter providing the outside case for the mold. The inside diameter of the cardboard tube should be ⅜ in. larger than the diameter of the vacuum tube. The writer has found that this device works best if about ½ in. of the glass tube is left exposed, wherefore the paper tube should be cut about the same length as the vacuum tube to be treated. Pour a small quantity of plaster into the mold, grease the glass tube with a thin layer of vaseline and set the tube centrally in the mold; the latter is then completely filled with the plaster. Keep turning the tube after the plaster has started to set, so that it can be removed from the cast when completed. Any rough places in the casting can be scraped smooth after the tube has been removed. For the larger pear-shaped tubes a different process must be used; physicians' plaster bandages are employed, or a similar bandage may be made by impregnating ordinary gauze bandage with plaster. These are wound on the tube after being soaked in water.



Dust-Proof Midget Condenser

The midget variable condenser shown in the photo is dust-proof, well insulated and easily mounted. It may be used as a balancing condenser, variable grid condenser where fine adjustment is required to match dial readings, and also in any of the usual wave-traps. It is of the mica type, with plates shaped to provide a capacity range said to be twice that of ordinary mica condensers.

RADIO TESTING and TROUBLE SHOOTING

by

E.R.Haan

PART I

MANY radio-set owners know enough about their receivers to correct minor troubles without outside help, but a far larger number do not; and this series of articles is written especially for the man who knows scarcely any more about his set than how to tune it. The articles will also be helpful to the service man and to those who wish to extend their general knowledge of the subject, whether they anticipate trouble or not. Few of us seek trouble, but it often comes when least expected, and knowing where to look for the fault and how to correct it, frequently will save an interesting program when the set "dies" just as company comes in. More than this, however, the satisfaction of being able to "do his own fixing" and the ability to talk radio intelligently, will more than compensate any radio fan for the little time he need spend in acquiring this knowledge.

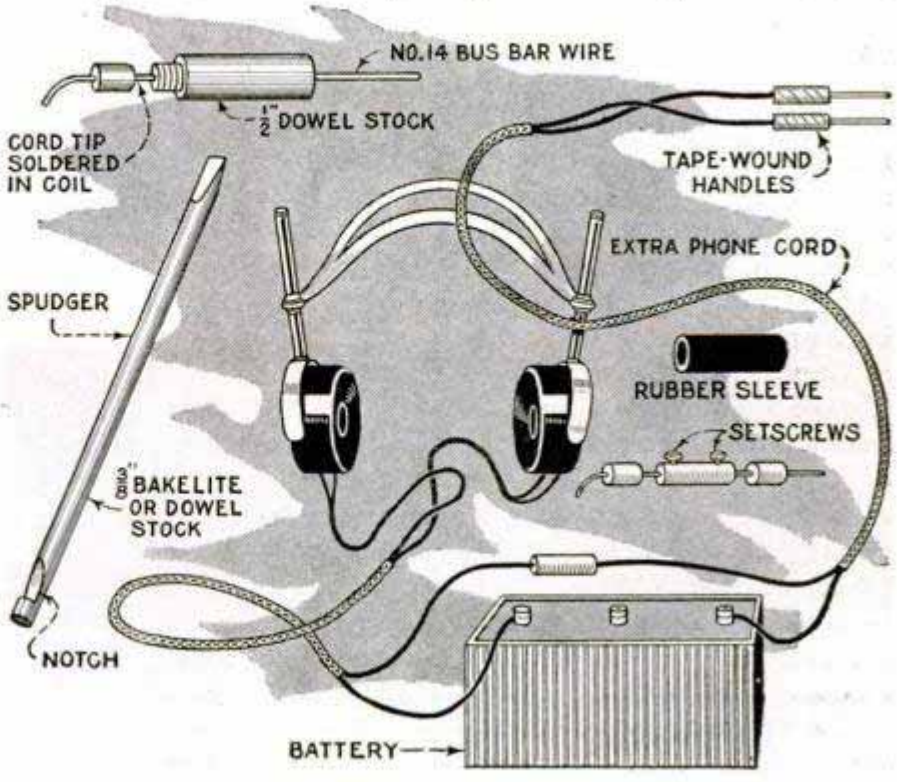
No one can expect to hang a picture without a hook or a hammer, neither can we repair or correct trouble in a set without some tools. Every radio owner should have a simple outfit of tools and instruments for testing, maintaining and repairing his receiver. It is not advisable, however, for the average fan to purchase the more expensive instruments, which he would seldom use unless he intends to go into radio-service work as a spare-time occupation. The sketch shows a headphone tester of simple construction, which is generally useful for the detection of open and short circuits, grounds, and faulty conditions in the receiver or the accessories. It consists of a battery connected in series with an ordinary pair of headphones, and two specially made testing tips. It is provided with an extra cord, as indicated, to facilitate connecting and disconnecting the battery. The use of an extra phone cord is handier than separate flexible leads. A connector of the type shown is handy for connecting cord tips, a short length of rubber tubing being slipped over it so that there will be no possibility of short circuits by accidental contact with the battery terminals. Testing tips with insulated handles should be provided. They are made as follows: Get a length of ½-in. dowel stock and cut off two pieces, each about 2 in. long. Drill a hole through the center of these pieces, just large enough to permit a length of No. 14 round copper wire to be pushed through. The end of the wire is bent to form a small coil in which the tip is soldered. Rubber tape is then wound over the wooden handles in order to provide good insulation.

Adjustments must sometimes be made while the receiver is in operation, as, for instance, in the midget balancing or neutralizing condensers. No metal tools should be used for this work, as the capacity of the operator's body and of the tool may interfere with the accuracy of the adjustment. A "spudger" (shown in sketch) will serve the purpose better. It consists of a 6 or 8-in. length of ⅜-in. wooden or bakelite rod, one end of which is cut or filed down to a screwdriver edge, and the other notched. Besides being useful for making adjustments, this tool will also be found handy for locating loose connections and for cleaning and bending up socket prongs, the notch being used for the latter operation. The spudger can be inserted between the wires without danger of short circuits, but care must be taken not to bend the wires, as this may cause them to come in contact with each other and result in a short circuit.

In radio receivers, it is absolutely essential that all the connections are mechanically and electrically tight. If this is not the case, there may be considerable loss of energy from high-resistance joints, or reception may be noisy owing to loose connections. For this reason all wires attached to soldering lugs must be securely soldered. A cheap electric soldering iron, which can be obtained for about $1, will meet the needs of the average fan, who uses it only occasionally. The service man, of course, requires a better grade.

The simple tools required for radio-repair work may be picked up at any department or hardware store at little cost. A medium-size screwdriver, having a long, narrow shank; a smaller one, also narrow; a pair of 5-in. pliers with narrow nose; a pair of long-nose pliers to get in between instruments, and a pair of side cutters are the tools used most frequently. A paring knife with two notches filed in the edge, near the handle, will be useful for removing insulation from wire, and for scraping joints, etc. A hand drill is often needed for drilling and countersinking. No. 27 and No. 36 drills are the sizes most used in radio work, the latter being the proper size for tapping holes for 6-32 machine screws, and a countersink is needed for reaming out holes to permit flat-head or oval-head screws to come flush with the panel. A long tapered reamer is also handy for enlarging holes where the proper size drill is not at hand. In order to drill the holes accurately, the spot should first be centered with a small prick punch. This will prevent the drill from shifting before it seats itself. A small flat file and a round file are often useful. Occasionally there will be need for a hacksaw. A couple of screwdriver-type socket wrenches, to fit the small and large nuts of the 6-32 screws should be included in the kit. If the owner has a storage battery, a hydrometer is necessary to examine the condition of charge. The use of this instrument will be explained in a later article. A strip of emery cloth, some fine sandpaper, friction tape, some soldering lugs, a few lengths of No. 14 copper busbar wire, and a few lengths of "spaghetti" tubing will also be handy.

Some of the most useful meters for radio purposes are shown in one illustration. The condition of B-batteries and the voltages applied to the plate circuit of



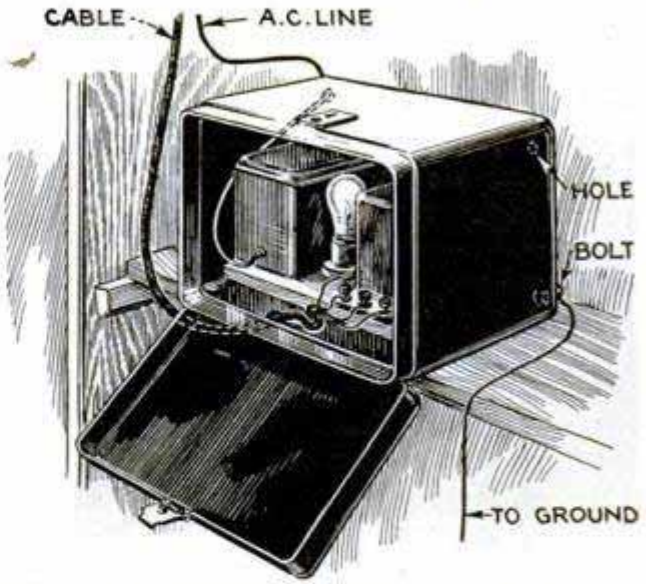
a receiver can be determined accurately only by means of a voltmeter. When a B-eliminator is used to supply the plate current, a high-resistance voltmeter is necessary to determine the exact output. A low-resistance voltmeter will not do for this purpose because it consumes so much current that it gives an erratic reading during the test. It should cover a range of from zero to the highest voltage obtainable from the B-batteries or the B-eliminator.

A small pocket-type ammeter, having a range of from 0 to 35 amp., is generally used for "flashing" dry cells. However, a more accurate method of testing such cells is the use of a voltmeter, reading from 0 to 3 volts, graduated in tenths of a volt. A milliammeter is not essential for the average-set owner, although the service man often may need it. If it is to be used for testing the plate current of the individual tubes, it should have a 0 to 10-milliamp. range, and for testing the total plate-current draw of a receiver, it should have a 0 to 50 range. It should be remembered, when using voltmeters and ammeters, that, as a rule, the former are connected directly across the terminals of a device of which the voltage reading is to be taken. Ammeters, on the other hand, are hooked up in series with the device or devices of which the current consumption is to be ascertained.

(To Be Continued)

Shielding for the Homemade B-Eliminator

Homemade B-eliminators are seldom shielded to prevent induction hum, but the hum can be eliminated and the instrument protected from dust and injury by installing it in a metal container as shown in the sketch. If specially made, these metal boxes are rather expensive. Therefore, in casting about for a convenient and cheap substitute, the writer called at an automobile-supply house and explained his need to the salesman. A steel step box of the type used for tools or auto battery was suggested, and proved ideal for the purpose. These sturdy black-lacquered boxes are of standard make and may be obtained in various sizes. The one shown in the illustration is 7¾ by 9 by 11¾ in. inside measurements and housed the eliminator nicely. The box is laid upon its side with the catch up, the set cable being brought in through a hole drilled below. The bolt holes in the bottom, now at rear, serve for the ventilation and outlet for the ground lead. The holes should be enlarged to provide sufficient ventilation to prevent the case from heating. The lid



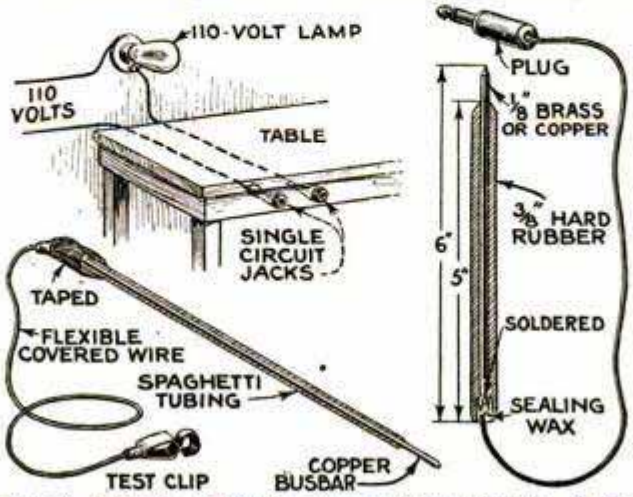
Eliminator Installed, Showing the Method of Bringing Out the Various Leads

may be dropped down when it is desired to examine the eliminator. Being dust and fireproof, the case also protects the instrument.—L. Harrison, Redondo Beach, Calif.

THESE valuable kinks have been written especially for Popular Mechanics Magazine by prominent radio experts. They represent not merely ideas, but practical advice from the best technicians in the profession on methods that will help make your set more efficient in operation, more convenient to handle or easier to build.

Insulated Points for Set Testing

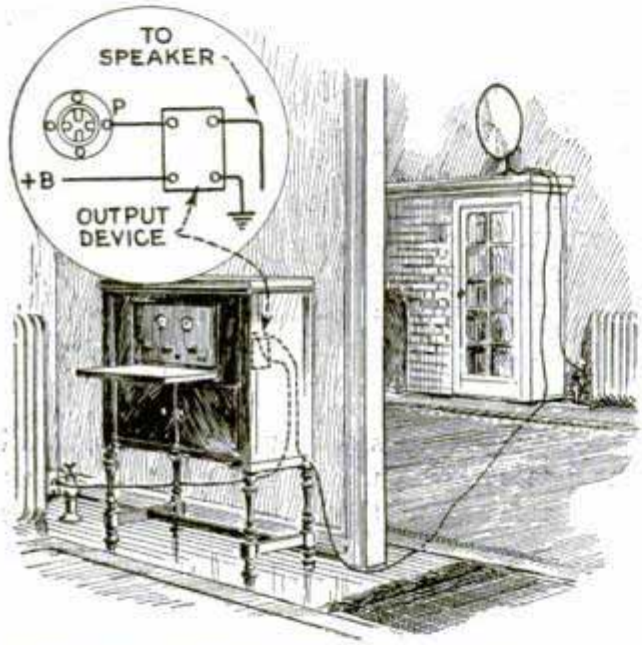
When testing and trouble shooting, the average amateur usually employs two lengths of wire with the insulation bared, and, while this serves the purpose, it is, at best, only a makeshift. The simple and efficient device shown in the sketch will enable one to do his own testing under safer conditions, as there is much less danger of short circuits. The two test rods required are made from lengths of ⅜-in. hard-rubber rod, 5 in. long, each rod having a ⅛-in. hole drilled lengthwise through it. One end of each rod is rounded as shown, and at the other end the hole is slightly enlarged. Two pieces of ⅛-in. copper or brass rod, 6 in. long, are pushed through the hard-rubber handles; the rods should fit tightly (a little glue on the rod before inserting will assure a solid fit) and the projecting ends of the rods are then filed or ground to points. Two flexible covered wires, about 3 or 4 ft. long, are soldered to the other ends of the brass or copper rods. The enlarged holes in the handles provide room for soldering, after which the holes are closed with sealing wax. The ends of the flexible leads terminate in standard horn plugs; these are inserted into single-circuit jacks, mounted in the side of the table. Either on the wall or on the test table, mount a socket for a 110-volt lamp. The lamp is wired in series with one side of the 110-volt line, and its glow will make a simple checking signal for continuity tests. For precision work, a meter may be used instead of the lamp, and in



Circuit Diagram Showing Lamp Connected in Series with 110-Volt Line; Details of Rubber-Insulated Test Rod; Left, Simpler Test Rod

this case it would be better to use a battery, instead of the 110-volt line. A simpler form of test rod is shown in the lower left-hand corner, spaghetti being used instead of the hard-rubber rod and two pieces of round busbar instead of the ⅛-in. rods. The flexible leads are then soldered to the upper ends of the rods and taped. These test rods may be used in the same manner as the other type, or may terminate in clips in the case of a 6-volt storage battery.—Herman R. Wallin, radio operator, Brooklyn, N. Y.

Simplified Connections for Portable Loud Speakers



Upper Left, Connections to and from the Output Device; Below, Sketch Showing External Connections

The common practice of moving loud speakers from room to room usually necessitates the use of long, expensive horn cords, which are also difficult to conceal. The diagram shows a simple and effective way to connect the speaker in a remote position, provided the set is of the modern type in which the speaker is coupled to the plate of the last tube through a condenser and choke-coil combination or an output transformer. It is only necessary to have one wire leading to the speaker, while the other connection may be made to a near-by water pipe, as close to the set as possible. The single lead to the speaker may be of small rubber-insulated wire, which is easy to conceal.—Bert E. Smith, engineer, Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y.

Homemade Relay for Trickle Charger

During some recent experiments, I hit upon a simple relay for automatically operating a trickle charger that can be made at very small cost, and may also be arranged to control the 110-volt a.c. supply to the B-eliminator if desired. The diagram practically tells the whole story. A 6-ohm doorbell buzzer is used for the relay to control the trickle charger as shown at the top, one magnet being shorted so as to make the total resistance of the buzzer 3 ohms. It is important that the leads from the magnet be insulated away from the frame, as in most cases the frame will be found grounded. When the contact is adjusted properly, the battery will be placed on charge when the switch on the radio set is off, and will stop charging when the set is on. In Fig. 1 the buzzer connections are changed so that the lower magnet is shorted out, and leads are shown from the buzzer contacts at front. In Fig. 2 the relay is connected to the charger and battery ready for operation. Any standard battery charger of the trickle or low-rate type may be used, but do not attempt to use the device on a charger of the mechanical type. If a B-eliminator is used, a few simple changes in the relay will provide an automatic cut-off for the eliminator as well as for the charger control. The diagram in Fig. 3 shows the relay controlling both the eliminator and charger.

A spring from a jack is soldered to the underside of the copper contact on the armature, and is arranged so that a connection is made when the armature is drawn toward the magnet. The armature is held when the set switch is turned on as shown in the diagram; by

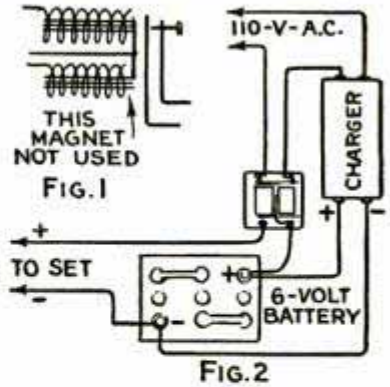


FIG. 2

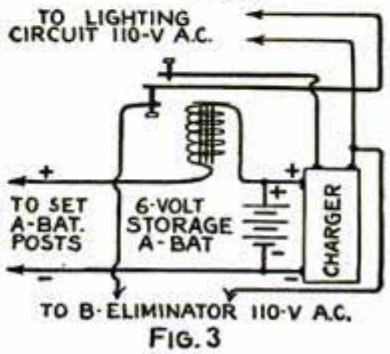
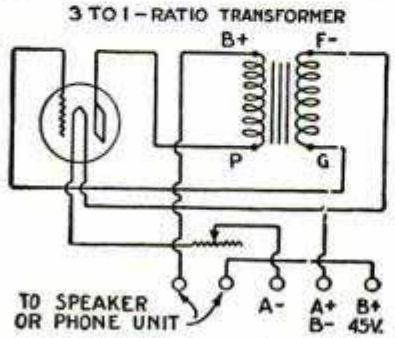


FIG. 3

tracing the leads it will be seen that the 110-volt a.c. supply is turned on the B-eliminator and cut off from the charger.—H. Lawrence Mills, chief engineer, Station WAMP, St. Paul, Minn.

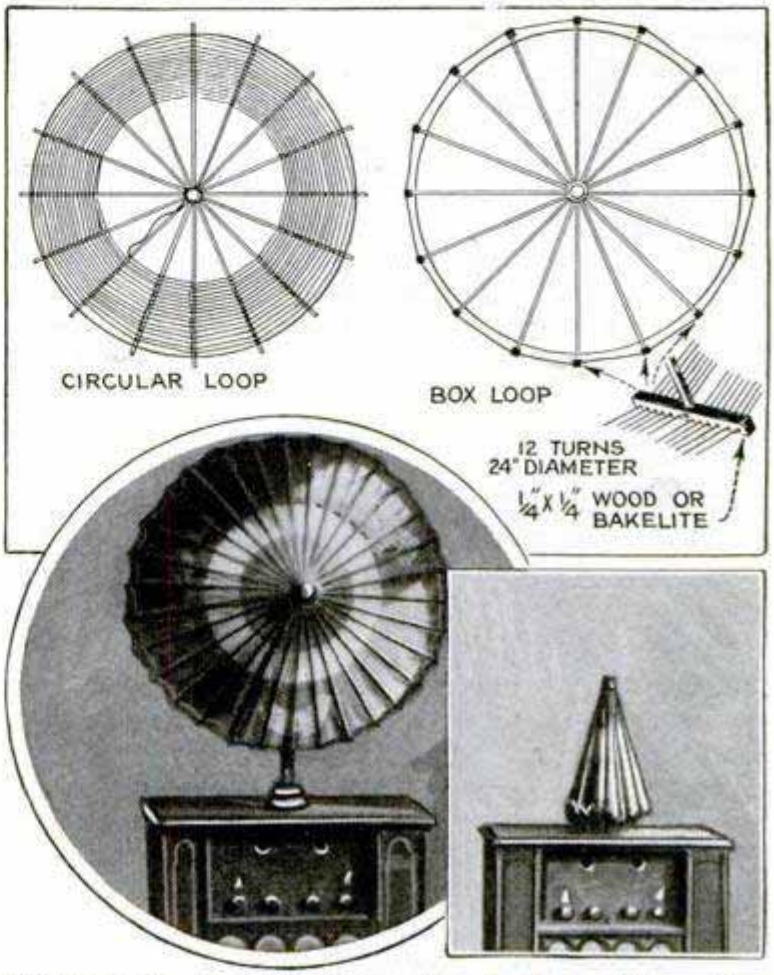
A Simple Tube Tester for Experimenters

The diagram of the tube tester shown in the accompanying sketch is self-explanatory and the tester costs but little to make, as most experimenters have the parts lying around. The parts required are: a standard tube socket, a 30-ohm rheostat, five binding posts and a 0 to 6 d.c. voltmeter, the latter being optional. The writer made up one of these testers in a cigar box, with a phone unit inclosed for portable use. To make a test, connect the batteries and place the tube in the socket. Adjust the rheostat to the normal operating brilliance of the tube. The voltmeter, of course, is the best means of checking this voltage. If no sound is heard in the phones, the tube is dead for all practical purposes. If a low clear note is heard, the tube will make a good oscillator. If a shrill, high note comes through, the tube needs rejuvenating. The lower the note heard in the headphones the better the tube; the higher the note the poorer the tube. To obtain matched tubes, select all tubes of the same note, and as low pitch as possible. This takes a little practice and a good ear but is not hard to do. If the tester does not respond as outlined above, it may be necessary to reverse the primary connections on the transformer. Service men and owners of sets requiring matched tubes will find this tester a great help and a real saving where work of this type is to be done.—Frank Nickel, Jr., second operator, Station WIP, Philadelphia.



Loop Built on Japanese Umbrella

A Japanese umbrella may be utilized for mounting a loop and makes an attractive ornament for the home. The one shown in the photos is equipped with a socket and lamp at the rear, which, when lighted by the house current, gives an unusually pleasant effect. The sketch at the right shows how crossarms are fastened to the ends of the ribs when a box-type loop is required. If a circular type is desired, the insulated loop wire is stitched on the inside of the frame, as shown at the left. Eighty-six feet of stranded loop wire should be used for sets employing a .0005-mfd. tuning condenser; the turns should be spaced about ¼ in. apart.—A. C. Schmidt, engineer, Weehawken Electric and Mfg. Co., Weehawken, N. J.

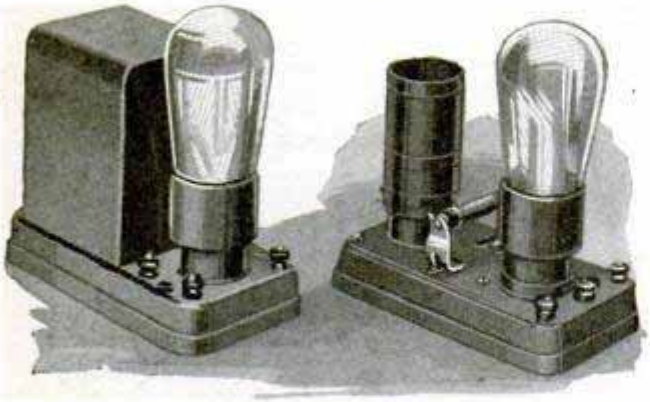


Wiring Details for Either Box or Circular Loop; Below, Completed Loop Open and Closed

¶Popular Mechanics radio department offers its information service free to all readers of our magazine. We will be glad to help you with your radio problems, and will promptly answer all inquiries.

Wired Radio Units

The manufacturer of the units shown in the photo describes them as "the sectional-bookcase idea applied to radio."

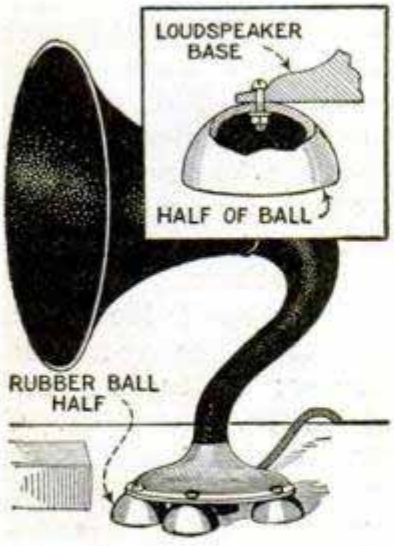


Left, Complete Audio-Amplifier Unit; Right, Complete Detector, Including the Gridleak

The radio builder simply hooks up various units to form the circuit desired, and the set is ready for operation. For example, if a five-tube tuned r.f. set is decided upon, the parts required will be two of the r.f. stages, detector stage and two a.f. amplifier stages. Each unit is made with two binding posts, and hooking them up is no more work than connecting a similar number of dry cells.

Rubber Feet for Loud Speakers

Many owners of receivers place their speakers on top of the radio cabinet, if space is scarce. This is not usually a good place for it, as the vibration from the speaker may be transmitted to the tubes, causing howls. If the horn or cone is cushioned at the base, however, this objection is overcome. Feet for the loud speaker, to minimize vibration, can be made from the halves of two hollow rubber balls as shown. The balls are cut in two with a sharp knife and three or four of the halves are fastened to the speaker base by means of small brass machine screws, as shown in the insert. The metal base is drilled to receive the screws.—Harry G. Schultz, Astoria, N. Y.

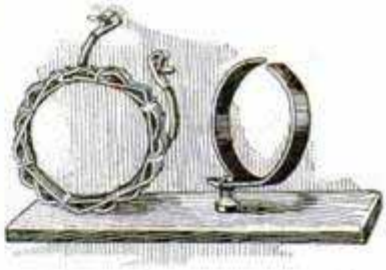


How to Prevent Tube Blowouts

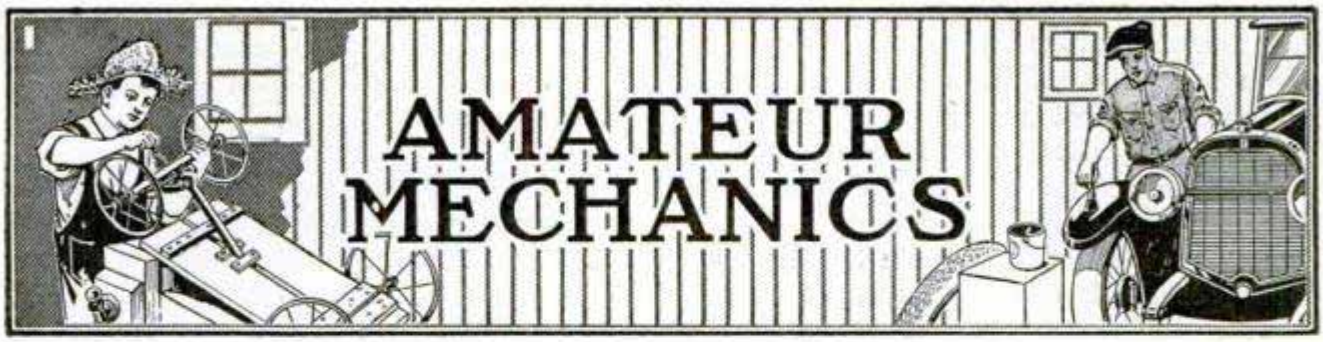
The most common cause of accidental burning out of tubes is letting the B-battery voltage get across the tube-filament terminals. When testing a new set it is an excellent idea to connect the 6-volt A-battery to the B-terminal plug in all the tubes and make sure that no filament lights. If a filament does light, it is an indication that the B-lines are crossed with the A-wiring somewhere in the set, and this fault must be located and remedied. If no filament lights, it is quite safe to connect the B-battery to its terminals.

Handy Mounting for Homemade Coils

A handy mounting for homemade coils of the honeycomb or basket-weave type is shown in the illustration. The supporting form is cut from a 3-in. fiber or bakelite tube as shown at the right; the ring is ½ in. wide and a mounting lug about 1½ in. long is left on one side. A section is cut out of the top, sufficiently wide so that, when the coil is pushed over the mounting, it will be held firmly. A hole is now drilled in the mounting lug, and a long wood screw run through this and into the baseboard, a half spool being used as a spacer. Two or more of these mountings may be used, and the coils turned in any desired relation to each other. The writer has found them very handy in experimental work, especially if the coil leads are provided with clips for quick changes.—Lloyd R. Dickens, Windsor, Ont., Canada.



¶C-batteries do not run down rapidly as they are not subject to drain; however, any dry cell has a limited shelf-life due to cell corrosion, and when the battery falls below its rated voltage it should be replaced with a new one.



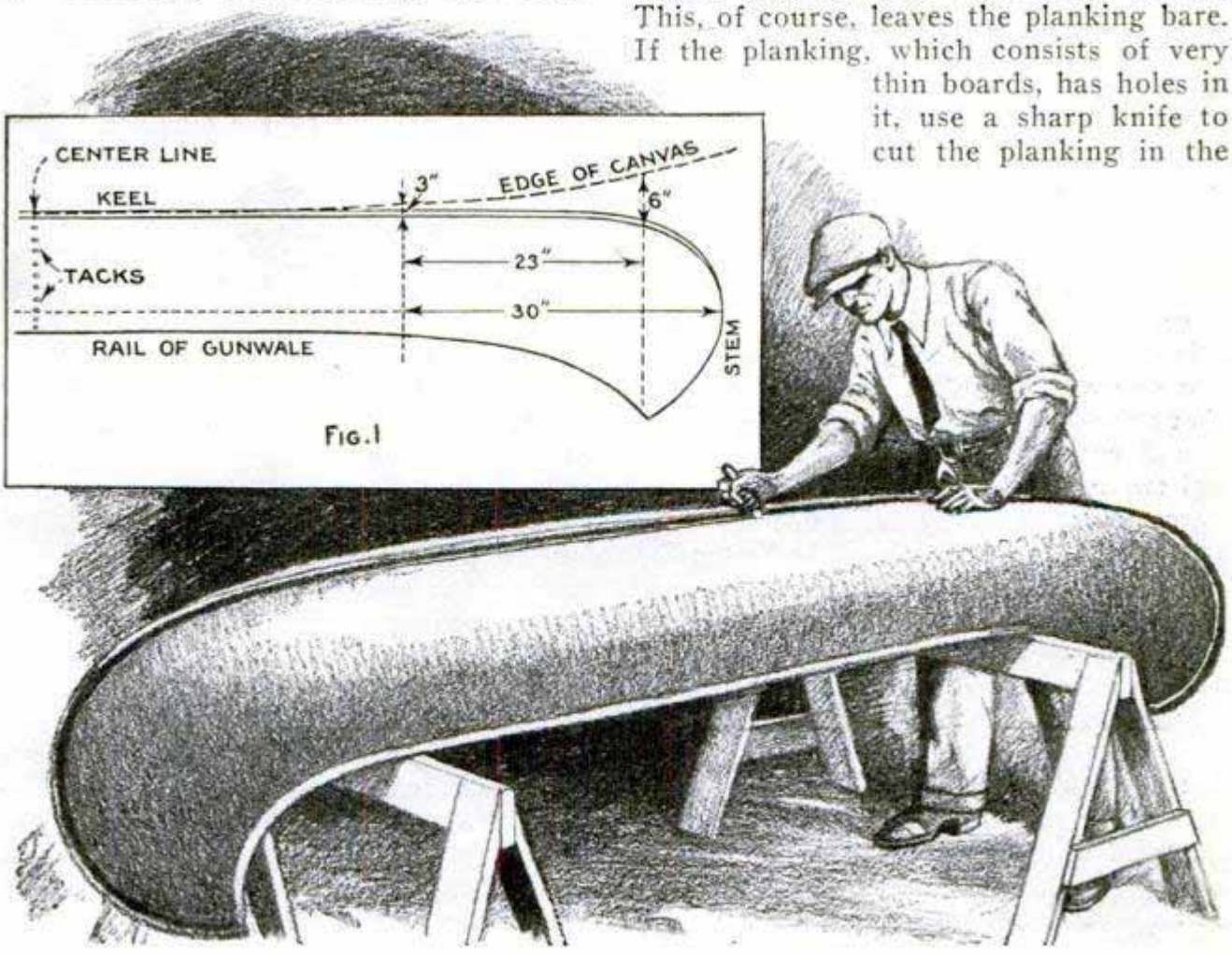
How to Recanvas a Canoe

By HENRY E. C. DITZEN

RECANVASING an old canoe is not as hard a task as is usually imagined. Having bought an old wreck of a canoe, I was told on all sides that it would be most difficult to recanvas it, and that the job would, as likely as not, be a failure. No literature could be found on the matter, consequently a method had to be "invented." The success of my procedure was so pronounced and the job so perfect, that it is described here for the benefit of others who may want to try their hand at it. There may be better ways but I have not learned of them. The canoe is an eighteen-footer, and the make is unknown, since the nameplate was gone. Different makes have somewhat different shapes and this must be borne in mind when these instructions are followed.

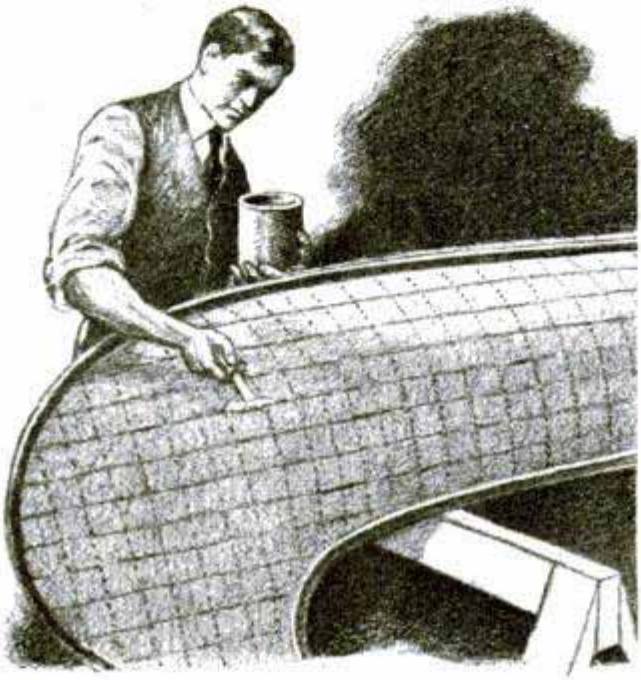
Place the canoe, bottom side up, on a pair of carpenters' horses. Take a sharp knife and cut the canvas along the keel and gunwale. Then remove the bang plate. The canvas is usually tacked to the bow and stern stems. Pull out these tacks; then remove the entire canvas. This, of course, leaves the planking bare. If the planking, which consists of very thin boards, has holes in it, use a sharp knife to cut the planking in the

FIG. 1



center of each of the ribs adjacent to the holes, and lift the piece or pieces out. Then take a piece of wood of the same thickness and cut a piece to fit the opening exactly. Nail this into place with tacks that do not quite go through the ribs, copper tacks being preferable. When you have patched each hole in this way, look the hull over carefully and see whether the planking fits together snugly.

The chances are that you will find many a crack. These should be filled carefully both from the outside and inside of the canoe. The joints of the patches should also be filled. For this purpose, make a sort of putty of whiting and the waterproof glue that you will use for attaching the canvas later on. This putty gets very hard in a short time. After it has set, use a file or sandpaper to cut down the rough surface of the filler. Get the surface quite smooth. When this is done, the canoe is ready for recanvasing.



It is generally neither necessary nor advisable to take the keel off. In fact, it would be more difficult, it would seem, to recanvas the whole canoe at once, while it is an easy matter to canvas one side of a canoe at a time. An 8-oz. canvas is about the best; this is not too heavy and it will withstand jabs from sharp rocks satisfactorily. If in a country where the waters have a sandy and not a rocky bottom, a lighter canvas will be better, for it will keep the weight of the canoe down. This is a matter of personal choice and does not, of course, affect the manner of putting it on.

It might be supposed that one edge of the canvas should be fastened in a straight line along the keel and the canvas then stretched over the gunwale. The writer has not found this to be the case, although it may work in some canoes. In the writer's case, it was found that the edge of the canvas extended beyond the keel at the ends in a large arc, as shown in Fig. 1. This is not stated as a guide for all cases, but merely as a warning not to try to make it run along the keel, unless by doing so the canvas will cover the hull with perfect smoothness.

Find the center of the canoe, between the extreme curves of the stems. Draw a line at this point perpendicular to the keel and outer rail of the gunwale. Take a piece of canvas, somewhat wider than the distance from keel to gunwale and several inches longer than the extreme length of the canoe along its bulge; find the center of the length and make a crease across the canvas at that point. Then roll back the ends toward the center, stopping several feet from the crease. Hold these rolls in place with paper clips or something else that will serve the purpose. Then tack the central line of the canvas to the central line of the canoe. Do not drive the tacks all the way in; drive them so that they can readily be removed, yet will stand some strain. The canvas should be tacked so that it extends almost to the bottom of the keel, that is, almost to the top of the keel as the canoe lies upside down. Unroll the canvas toward one end of the canoe for a distance of several feet. If assistance can be had, the assistant should hold the canvas while it is being laid in place. From the center line of tacks work the hand forward along the bulge, keeping an even tension on all the tacks. With one hand rub upward and forward from the bulge to the keel and with the other, forward and downward toward the gunwale. When the canvas is as smooth as it can be made, tack it temporarily along the keel and gunwale. Take a short stretch of a couple of feet at a time. Fig. 2 shows how it is to be done. When the end of the canoe is reached,

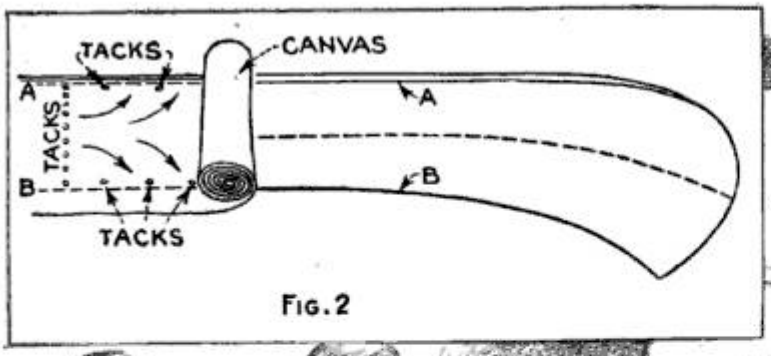
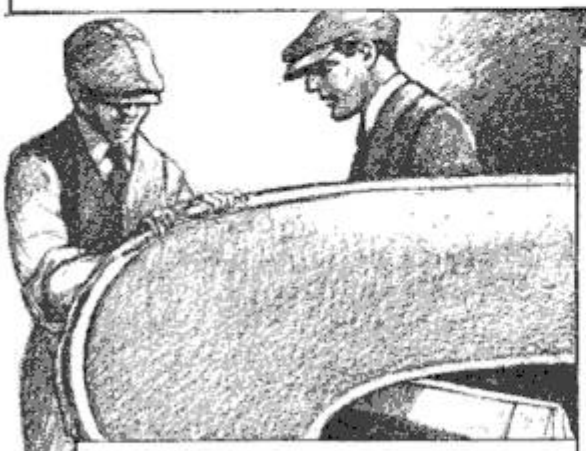


FIG. 2



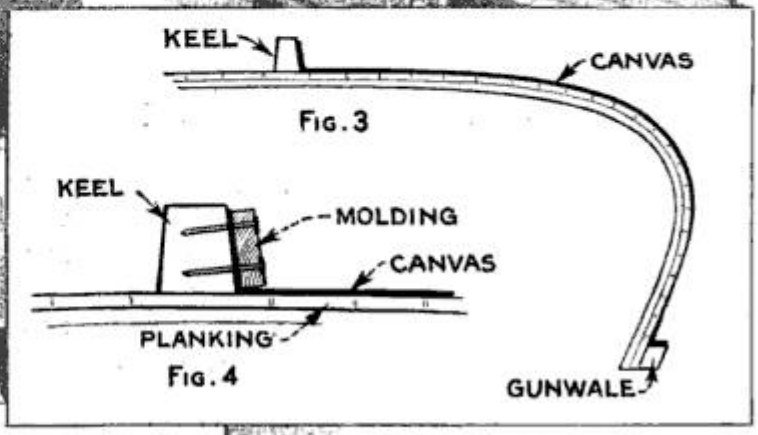


FIG. 3

FIG. 4

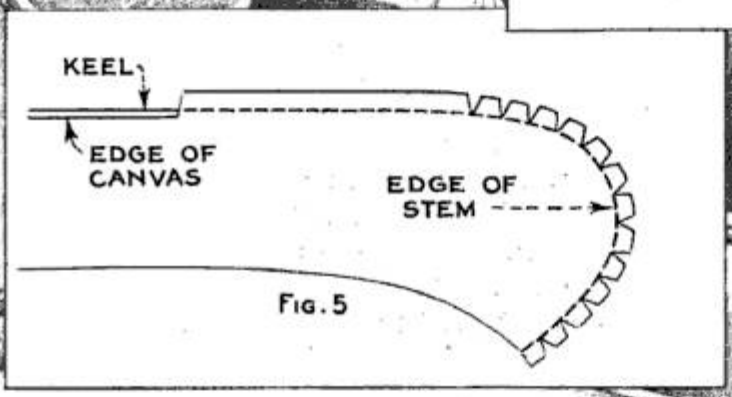
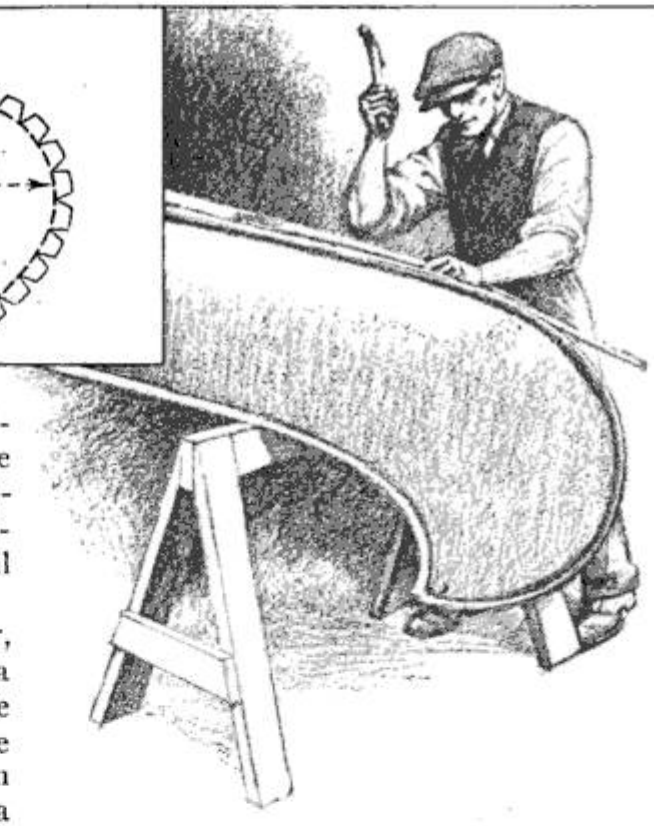


FIG. 5



look the whole over. It may not be entirely satisfactory. The canvas may bulge and pull here and there. If so, the temporary tacking may be taken out as necessary and the work gone over again until the canvas is as even as you can make it.

The canvas, when put on in this manner, in the writer's case had the shape of a large arc, and the curve was found to be as shown in Fig. 1. At the end of the bang plate, which was 30 in. back from the extreme front edge of the stem in a straight line, the canvas was found to extend 3 in. beyond the keel; 23 in. farther forward, it lapped 6 in. beyond the keel, while, in the middle of the canoe, it was slightly below the edge of the keel. These measurements must be regarded as merely illustrative. They will vary with different makes and different sizes of canoes. Even on the same canoe they are likely to vary on opposite ends and opposite sides. The fact is given, however, to show that one cannot tack the canvas straight along the keel and then stretch it over to the gunwale and expect it to be smooth. The canvas must be put on according to the curves of each canoe. You may not be able to get away from a very slight looseness along the gunwale but this will disappear when the canvas is glued on. This does not mean, however, that any folds are allowable.

When the canvas is in place, it should

be lightly tacked along the gunwale and keel and the curve of the stems. Then, with a soft lead pencil or marking crayon, run along the line of juncture between the keel and planking (A in Fig. 2), making a distinct mark; do the same along the juncture of the gunwale and the planking (B, Fig. 2) and along the edge of the stems. This is done so that, when the canvas is removed, it can be replaced exactly in its former position. All the tacks are now taken out, except those along the center line, and the canvas rolled back as it was when the work was first begun.

Before starting, the waterproof glue should have been made ready. You can buy waterproof glue or you can make it yourself. If you buy it, it will come rather expensive for a job like this, and glue that you waterproof yourself will answer the purpose perfectly well. A great many different estimates are given in regard to the quantity of glue necessary, some being very extravagant. Three pounds of glue have been found ample for an 18-ft. canoe, including the glue that was used to make the filling putty. It may be made all at once or half of it at a time. If your pot is not large enough, a pound at a time will do.

To make the glue, buy a good grade of ordinary carpenters' glue; put it into the pot (a double boiler is preferred so that the glue is not likely to burn) and cover it with just enough water to swell it without its losing shape. The exact quantity of water cannot be given since it varies with different grades of glue. A medium grade of hide glue will take about 2½ parts of water to 1 part of glue by weight. The length of time it takes to soak the glue also varies, but it is well to soak it overnight when it is to be used the next morning. When thus softened, linseed oil is added in the proportion of 1 part oil to 8 parts of glue (⅛ lb. of oil to 1 lb. of glue). Have plenty of water in the outer part of the double boiler, and then heat while stirring until the glue melts completely and is mixed with the oil thoroughly, when a gelatinous mass results. This done, it is well to add ½ oz. of nitric acid to every pound of glue. This will help to keep it liquid so that it spreads more easily and does not set too fast. This glue sticks firmly, and it is said that it neither absorbs water nor allows it to pass through. It has stood the test thus far in the writer's case.

When the canvas has been properly marked and rolled back as directed, place your glue pot in a convenient position. Apply the glue to the planking and not to the canvas, using a regular glue brush. The advice given is generally the other way, but the writer does not feel that this is better and he has certainly had wonderful results by putting the glue on the planking. The canvas having been rolled clear back to the center-line tacks, spread the glue thoroughly upon the planking for a distance of about 2 ft., rubbing it in well. Then, if an assistant can be had, it is well for him to hold the canvas a slight distance from the planking. Start at the center-line tacks and on the bulge and lightly run the hand up toward the keel, getting the pencil line back into its original position. Then run the hand lightly down to the gunwale and get that line back into its original position. In this way run first up and then down, until the lines are in place as far as the glue has been spread. The whole surface must then be gone over thoroughly so as to get out all bubbles and folds. The canvas must fit like a glove. The covering is then turned back again just a trifle from the edge of the glue, and a couple of feet more of the planking are covered with glue. The lines on the canvas are again placed into the original position and the canvas rubbed down smooth. This process is continued until the end of the canoe is reached. It is really surprising how easily the canvas will shape itself to the various curves. If the directions are followed carefully there is no reason why the finished job should not look as well as that turned out by a factory. Do not as yet attempt to glue the canvas over the edge of the stem.

After finishing this half of the side, remove the tacks on the center line and glue the canvas onto the other half out to the edge of the stem. When this is done, take a warm flatiron and run it back and forth over the canvas lightly so as to melt the glue into the canvas, being careful not to have the iron too hot or to soak the glue clear through the canvas. Then the job should be allowed to stand until

the glue has set well. A sharp knife is next taken and the canvas trimmed off close to the bottom of the keel and the outer edge of the gunwale rail. When the place is reached where the bang plate is to be attached, leave a flap, about 1 in. or so in width. V-shaped pieces are cut out of the flap, as in Fig. 5, along the curve of the stem so that it can be pasted smoothly to the front edge of the stem. Tacks are also driven in in order to hold the edge of the canvas firmly in place. When the glue has set thoroughly, the canvas is trimmed off close to the farther edge of the stem.

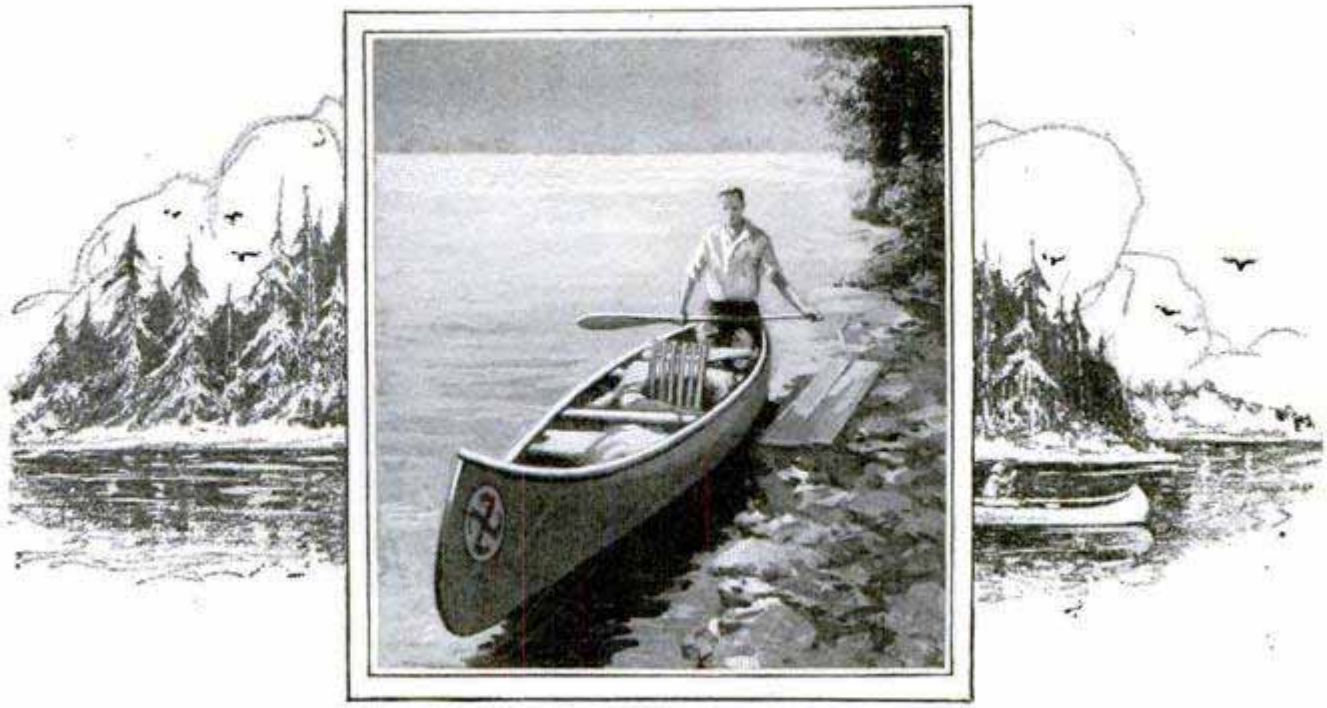
This completes one side of the canoe as far as gluing on the canvas is concerned. The canvas is then glued onto the other side. This is to be glued around the front edge of the stem also, making a double thickness of canvas on its outer edge as shown in Fig. 5.

The next step is to nail strips over the edges of the canvas to keep them from working loose. A thin narrow strip of molding, say a ⅝ by 3/16-in. window-screen molding, properly chamfered if necessary, is covered with some of the waterproof-glue putty, as is also the side of the keel, and the molding is then nailed in place with ¾-in. flat-head wire nails, or such other nails as may be suitable. (See Fig. 4.) This will pull the molding up tight and squeeze out the superfluous putty. The surplus is wiped off and the job left to dry.

The strips tacked against the rail by the writer consisted of "kite sticks" of the proper width. These doubtless cannot be had in every community. They are the long narrow strips that are cut off cigar-box wood while making boxes of different sizes. However, some other thin narrow strips probably can be found for this purpose. They are set in glue putty in the same manner as the molding strip was fastened along the keel.

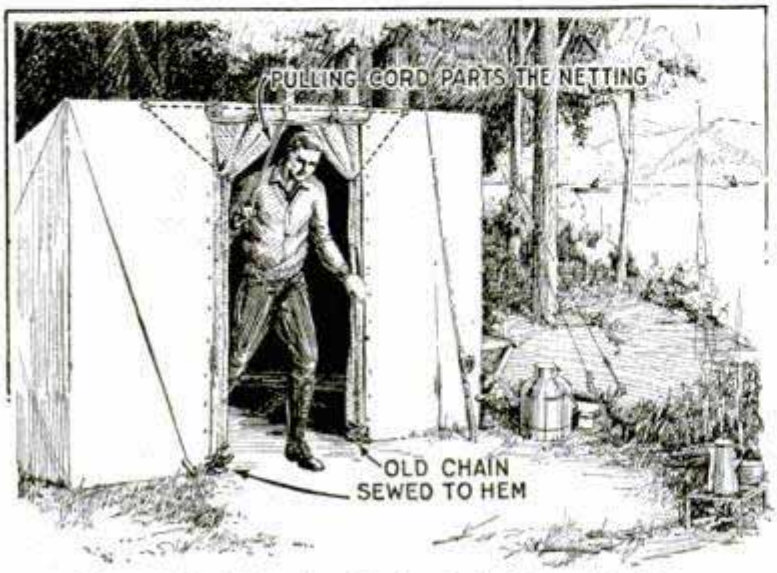
If the old bang plates are broken, new ones must be put on. The material can be bought in 10-ft. lengths. One piece is enough. It should be of ample width so that the holes drilled through it for the screws do not unduly weaken the plate. It is also advisable to put glue putty under the bang plates. The material is quite readily bent.

When the bang plates are on, the job is complete for filling and painting the canvas. This is outside the purpose of this article. There are different methods of treating the canvas. Some advise giving a first coat of shellac, but this is rather expensive. The writer gave a first coat of linseed oil and let that get bone-dry. This was followed with two coats of tinted white-lead paint. When thoroughly hard, this was sandpapered until smooth, and then a couple of coats of waterproof varnish were given. The author also added a swastika. The illustration below shows how the canoe looks at present.



Self-Closing Mosquito Netting for Tent Doorways

Mosquitoes, flies and other insects take much of the joy out of a camping trip. To prevent this annoyance as much as is possible, get some mosquito netting and suspend it in the entrance of the tent as shown in the drawing. If you have to brush it aside with the arm to pass through, the net is likely to cling to the clothing or catch on buttons or shoe hooks, causing it to tear. This can be overcome by sewing two pieces of old chain to the hem at the bottom of the netting. Two lengths of flexible cord, such as heavy linen fishline, are passed around the netting and through the eyelet holes in the tent wall, both cords terminating in a ring suspended from the center eyelet. Pulling the ring will part the netting so that one can enter without interference. When the ring is released, the weight of the chains in the hem will draw the netting together from top to bottom.

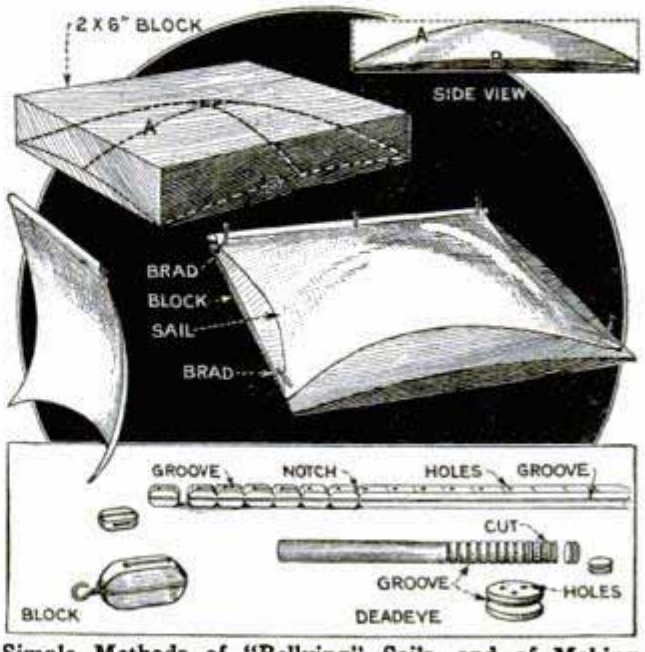


How to Use Mosquito Netting in the Door of a Tent

Making Sails, Blocks and Deadeyes for Model Ships

To make sails on model ships appear as if "bellied" by the wind, take a piece of 2-in. wood, the exact size depending on the size of the sail, and cut it down to form a pillow-shaped block, a little larger than the largest sail to be made. Cut the sail and hem it for the insertion of wire, then make up some thick starch and soak the sail thoroughly. Place it on the block and fasten with brads or pins. Lay the yard or spar on the top edge of the block and drive a brad in front of it at the center and one near each end. Catch hold of the bottom corners and pull the sail so that it is spread over the block without wrinkles. When thoroughly dry, give the sail two coats of white shellac, the second one being applied after the first has dried perfectly. Take the sail off the block and give the inside one similar coat. When dry, replace the sail on the block and leave it there for a day. The sail will then look weather-beaten. If you are building only one model, treat the largest sail first and then cut the block down to make it suitable for the smaller sails. The blocks may also be used, of course, for curving the triangular sails. If you are making several models, it is best to have a few blocks of different sizes.

To make blocks, cut a strip of suitable stock, preferably boxwood, to the width and thickness of the size desired. Mark off the length of each block on the narrow side and drill a small hole about a third of the way back from the mark. Make a little notch on each line, top and bottom, and with the point of a knife cut a small groove from the hole to the notch. Also cut one along each side. With a sharp knife also slice each block off, cut-



Simple Methods of "Bellying" Sails, and of Making Blocks and Deadeyes

ting a little on each side. If strapped blocks are desired, take an "E" mandolin string and bind them as indicated in the detail. If a lathe is available it is also an easy matter to make deadeyes. Turn out a piece to the right size and cut notches half the width of the deadeye. Saw each one off, sandpaper and drill it.—Carroll MacT. Elder, Bradley, Ky.

Tool for Turning Hot Valve Wheels

The wheel of a valve connected to a cleaning tank was generally too hot to be touched with the bare hands. Some of the men used waste while others preferred inserting a screwdriver between the spokes to turn it around. To avoid these makeshift methods, I made a simple lever that has proved very handy. I doubled a length of 3/16-in. wire and drove the closed part into a file handle, while the other end was formed into a hook to fit on the valve stem and the tips then bent outward at right angles so as to engage the valve wheel as shown. In the drawing, the left-hand hook is engaged with the handle to open the valve. To close it the lever is reversed on the spindle and moved in the opposite direction. Hung on a nail close to the valve, this tool is always handy when the handle is too hot to be touched by the bare hands.—Harry Moore, Hamilton, Can.

Let Nature Be Your Painting Guide

Some painters use nature to guide them in arranging the color schemes for houses. Picking, for instance, a pansy, for the purpose, he uses its dominant color as a guide for the side wall, the next most prominent color for the corner boards, cornices, etc., and the high-colored tints for the panels, brackets, shingles, carvings, etc. Nature furnishes perfect harmonies in color and such a guide is easy to find, especially in summer.—L. B. Robbins, Harwich, Mass.

Growing Long and Tender Stalks of Rhubarb

To make rhubarb stalks grow long and tender, and practically without strings, is the ambition of many amateur gardeners. This may be done easily by the use of headless kegs or half barrels, as shown in the drawing. A keg is placed over each rhubarb plant as soon as the leaves are fairly well developed, and no further attention is necessary, except to water and cultivate it in the usual way. The plant, denied the full sunlight but supplied with plenty of nourishment for its growth, pushes rapidly upward and produces long bleached stalks which are more tender.

Inner-Tube Band on Broom Protects Furniture

Using a common house broom for sweeping under dressers, buffets, and other low pieces of furniture will cause damage to the varnished surfaces unless care is taken. To avoid this trouble, cut a wide rubber band, from a discarded inner tube, to the shape indicated. The tabs are perforated so that they can be slipped over the broom handle and the band is stretched down over the broom shoulder, where it will serve as a neat and effective buffer.

Fisherman's Watch and Cigarets Kept in Rubber Balloons to Keep Them Dry

Fisherman's Watch and Cigaret Protector

Fishermen, particularly in going for trout, often slip on a slimy rock and receive a thorough ducking. The mere ducking may be taken good-naturedly, but it is rather annoying to find one's expensive watch, tobacco or cigars hopelessly water-soaked. This trouble can be avoided by the use of toy balloons as covers for these articles. Just slip your watch or tobacco inside of the rubber sack and tie up the end. The thin rubber can be stretched taut over the face of the watch and this will be sufficiently transparent to read the dial. Cigarets can be carried in the same way.

Tanning Shoes without Dye

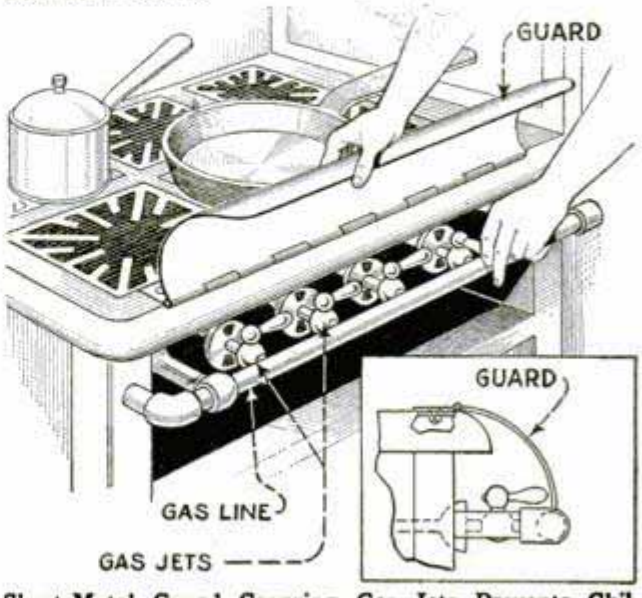
When white-kid shoes become dark and gray from much cleaning they can easily be tanned without dye. Take ten drops of tincture of saffron with three tablespoonfuls of olive oil. Rub this mixture into the leather with a piece of soft cloth, first making sure that you have cleaned the shoes as well as possible. One or two applications will do the tanning effectively. —L. H. Georger, Buffalo, N. Y.

Coloring Solder

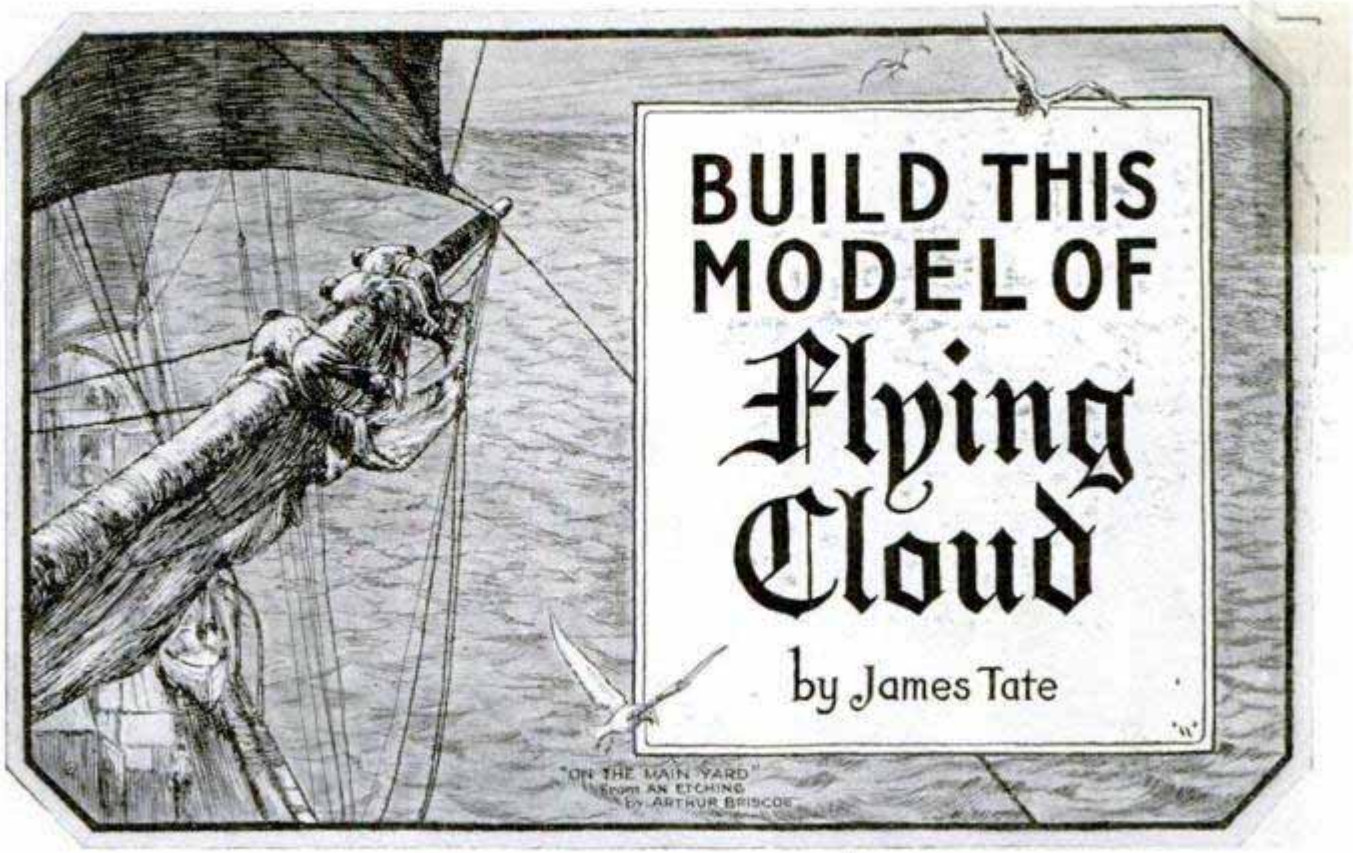
Better and more lasting jobs could be done on brass if the joints were made with solder, but the objection to its use is that it does not match in color. This can be overcome in the following way: Make a solution consisting of strong blue vitriol and water and apply this to the solder with a piece of iron wire. This will "copperize" the surface. Then mix some sulphate of zinc with strong blue vitriol and rub this over the copperized area with a piece of zinc. This mixture should be applied until the right color is obtained.

Metal Guard Keeps Children from Gas Jets

Every gas stove is a source of danger, especially where children are allowed to play in the kitchen. They may easily turn on the gas jets whether unwittingly or in mischief. This can be prevented by providing the sheet-metal guard shown in the illustration. It is made in two sections, which are hinged together, the narrow flat part being attached to the stove and the curved section arranged so that it drops over the handles of the gas jets, completely hiding them from view. The guard is raised when it is necessary to get at the jets, but the children, not seeing them, let them alone.—F. A. Inman, Grand Haven, Mich.



Sheet-Metal Guard Covering Gas Jets Prevents Children from Tampering with Them



BUILD THIS MODEL OF Flying Cloud

by James Tate

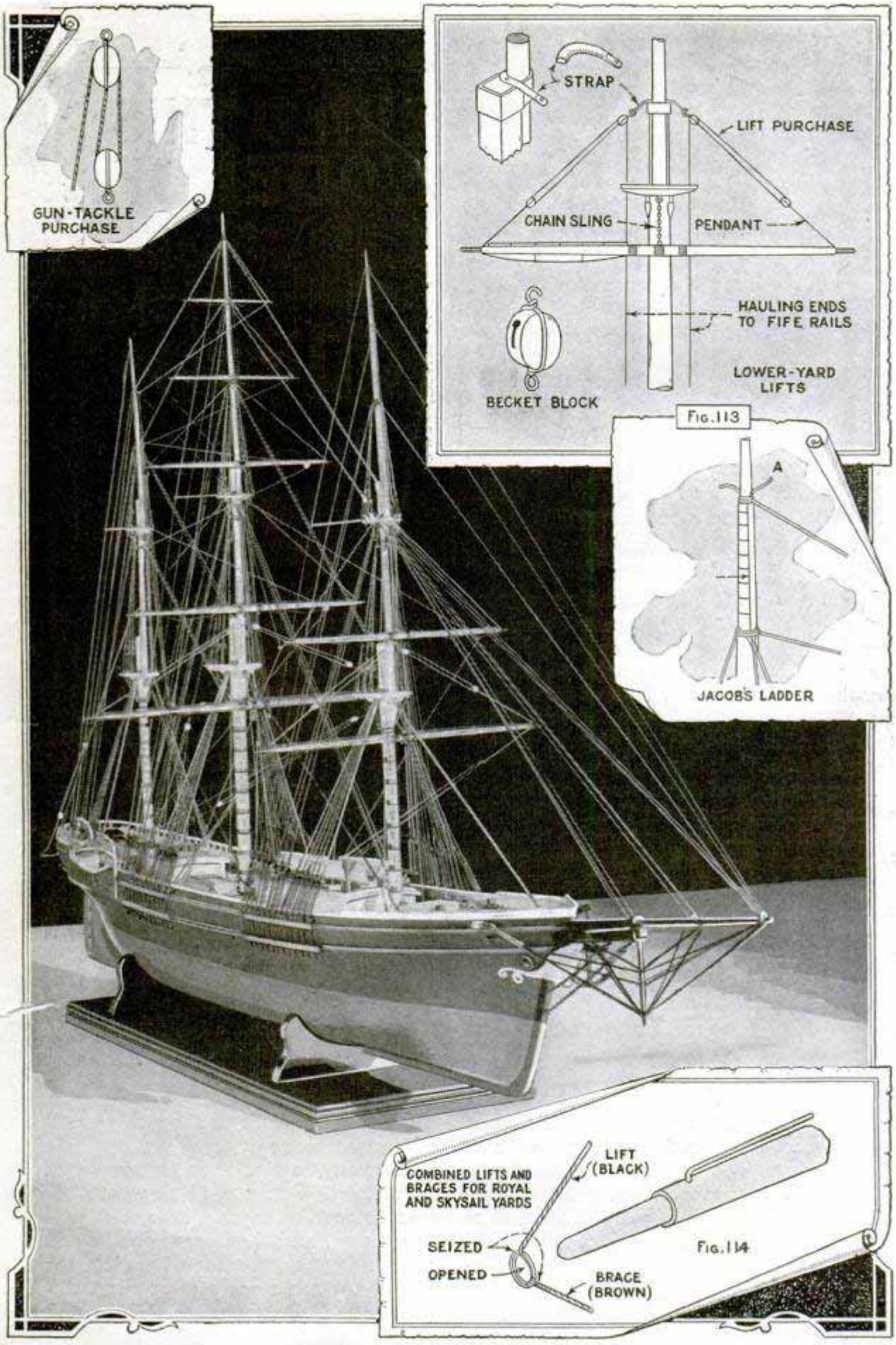
ONE more item of standing rigging should be added before tackling the running rigging—the "Jacob's ladders." These run from t'gallant masthead to royal masthead, on the after side of each royal mast. They are best made by stretching two parallel lengths of black button thread, about 3/16 in. apart, in some convenient manner, and then knotting No. 60 cotton ratlines across for the length of the individual masts. Leave long ends on the ladders, tuck these ends under the shrouds at the mastheads, as at A in Fig. 113, glue and cut off.

One mistake appeared in the yard dimensions given in Fig. 99, March number. The length of the mizzen lower yard should be 8 in. instead of 6 13/16 in. This yard is called the crossjack, usually abbreviated cro'jack.

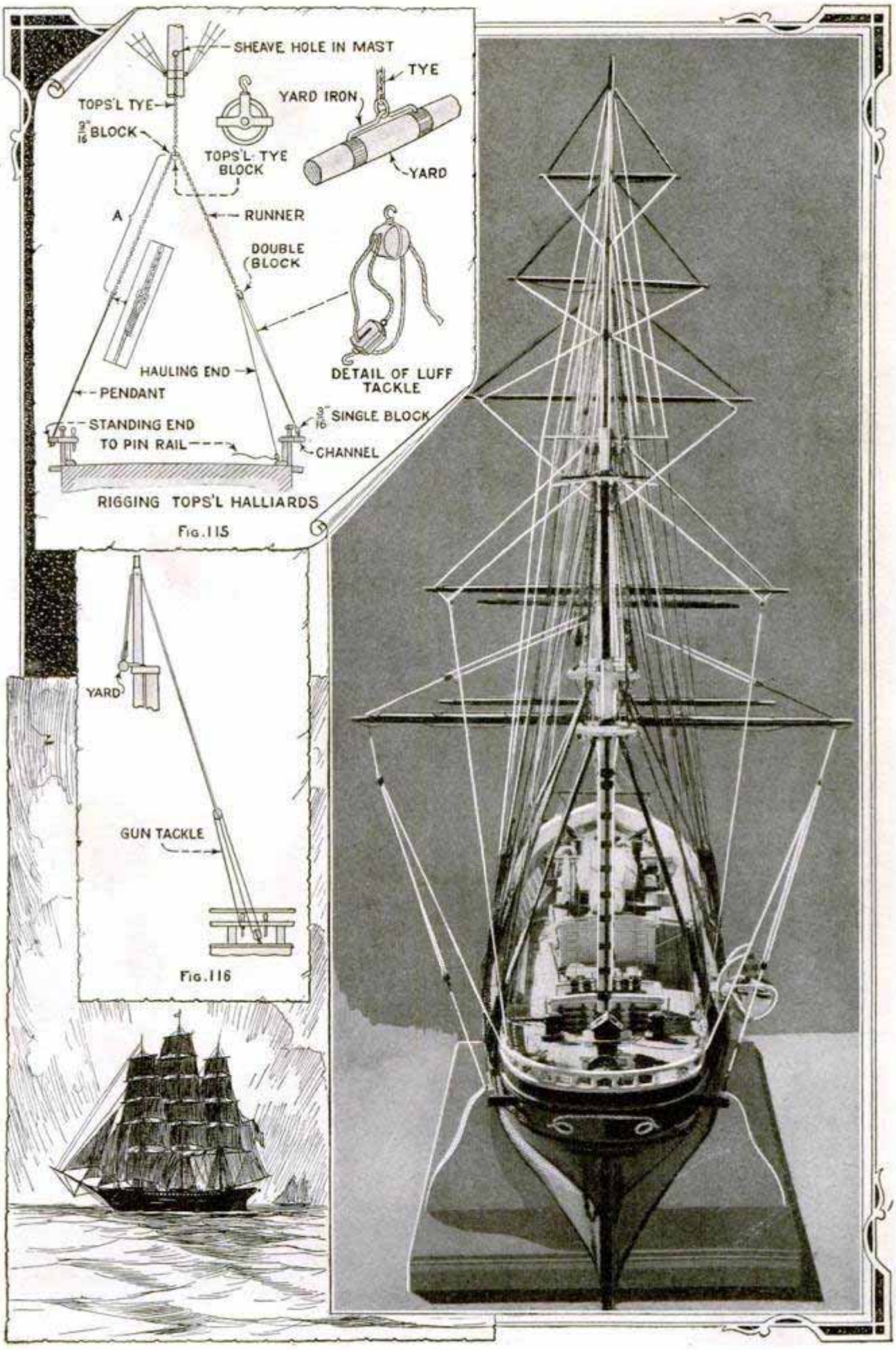
First sling the lower yards. A short piece of 22-link chain is fastened to the eye at the center of the yard and to one on the mast between the crosstrees. The yardarms are supported by the lifts shown in Fig. 113. The tackle used here is a gun-tackle purchase, and is shown in detail at the left. Use 3/16-in. blocks for lifts and braces on fore and main lower yards; 1/8-in. on mizzen. The pendants are of fine twisted wire, painted black. Note that the lift blocks at the masthead hook into a crescent-shaped strap, which is so bent as to bring the tackle well forward of the foremost topmast shrouds. This strap is half-round, filed from 1/16-in. wire.

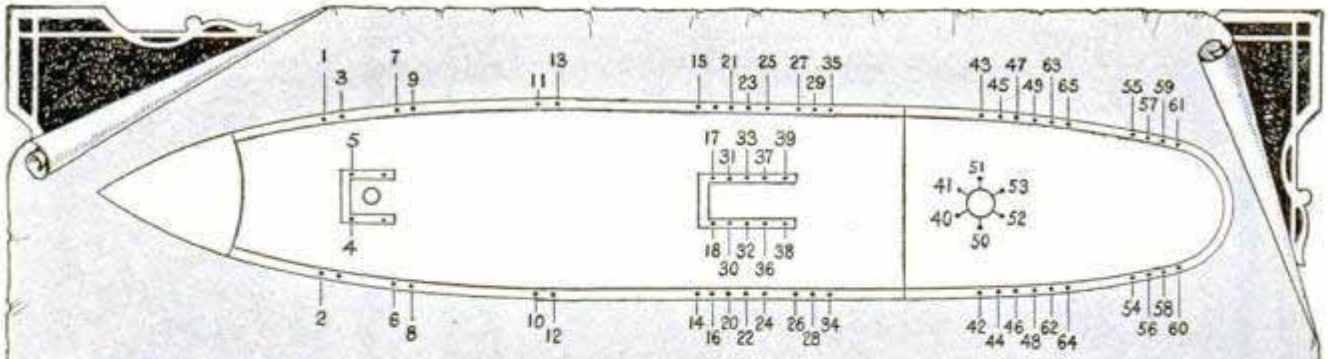
For the entire rigging ninety-six 1/8-in. single blocks are required, ten 1/8-in. double blocks and twenty-one 3/16-in. single blocks. For the standing rigging one hundred and forty-eight 3/16-in. deadeyes are necessary and sixty 1/8-in. deadeyes.

Pay close attention to Fig. 117. This shows the points where the end of each running line is belayed, or made fast. This is one of the important points about a correctly rigged model. One authority says: "The lead of running gear aloft may, and does, vary, but the lead on deck should be the same in every ship, so that a sailor may be able to go on any strange ship on the darkest night, and be able to lay his hand at once on any piece of running gear." Also, use common sense in rigging. It is difficult to show the exact lead of every line, so, if any question arises as to how any particular rope reeves through a block, for example, think what the gear was intended for, and how it must have been used, and then reeve the line in the way it would have been handiest for the men. When belaying gear, wind the line on the pin in a figure-of-eight, as shown at the left, Fig. 118, not as in the center.



Материал, защищенный авторским


SHEAVE HOLE IN MAST
TYE
YARD IRON
TOPS'L TYE
3/16" BLOCK
TOPS'L TYE BLOCK
YARD
A
RUNNER
DOUBLE BLOCK
DETAIL OF LUFF TACKLE
HAULING END
PENDANT
3/16" SINGLE BLOCK
STANDING END TO PIN RAIL
CHANNEL
RIGGING TOPS'L HALLIARDS
Fig. 115
YARD
GUN TACKLE
Fig. 116



1-OUTER-JIB HALLIARDS
2-INNER-JIB "
3-FORETOPMAST-STAYSAIL HALLIARDS
4, 5-FOREYARD LIFTS
6-FORETOPS'L HALLIARDS
7-FORET'GALLANT HALLIARDS
8-FORE-ROYAL "
9-FORE-SKYSAIL "
10, 11-FORE BRACES
12, 13-FORETOPS'L BRACES
14-MAIN T'GALLANT STAYSAIL-HALLIARDS
15- " TOPMAST STAYSAIL-HALLIARDS
16- " ROYAL STAYSAIL-HALLIARDS
17, 18-MAIN LIFTS
20, 21-FORE-T'GALLANT BRACES
22, 23-FORE-ROYAL BRACES
24, 25-FORE-SKYSAIL "
26-MAIN T'GALLANT HALLIARDS
27- " TOPS'L "
28- " SKYSAIL "
29- " ROYAL "
30, 31-MIZZEN-TOPS'L BRACES
32, 33-CRO'JACK "
34, 35-MIZZEN-T'GALLANT "
36, 37- " ROYAL "
38, 39-MIZZEN-SKYSAIL BRACES
40, 41-CRO'JACK LIFTS
42-MIZZEN-STAYSAIL HALLIARDS
43- " TOPMAST STAYSAIL HALLIARDS
44, 45-MAIN-T'GALLANT BRACES
46, 47- " ROYAL "
48, 49- " SKYSAIL "
50-SPANKER THROAT-HALLIARDS
51-SPANKER PEAK HALLIARDS
52, 53- " TOPPING LIFTS
54, 55-VANGS
56, 57-MAIN BRACES
58, 59-MAIN-TOPS'L BRACES
60, 61-SPANKER-BOOM SHEETS
62-MIZZEN-TOPS'L HALLIARDS
63- " T'GALLANT "
64- " ROYAL "
65- " SKYS'L "

Fig. 117

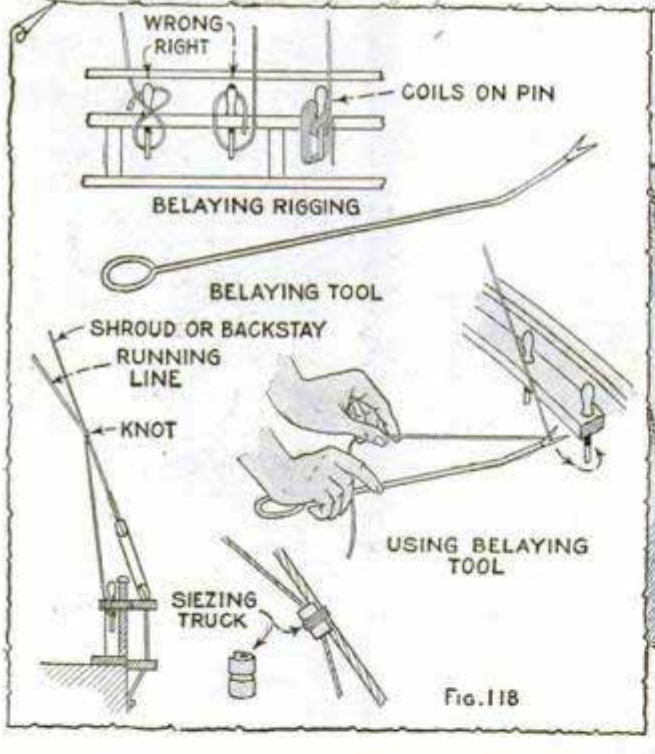
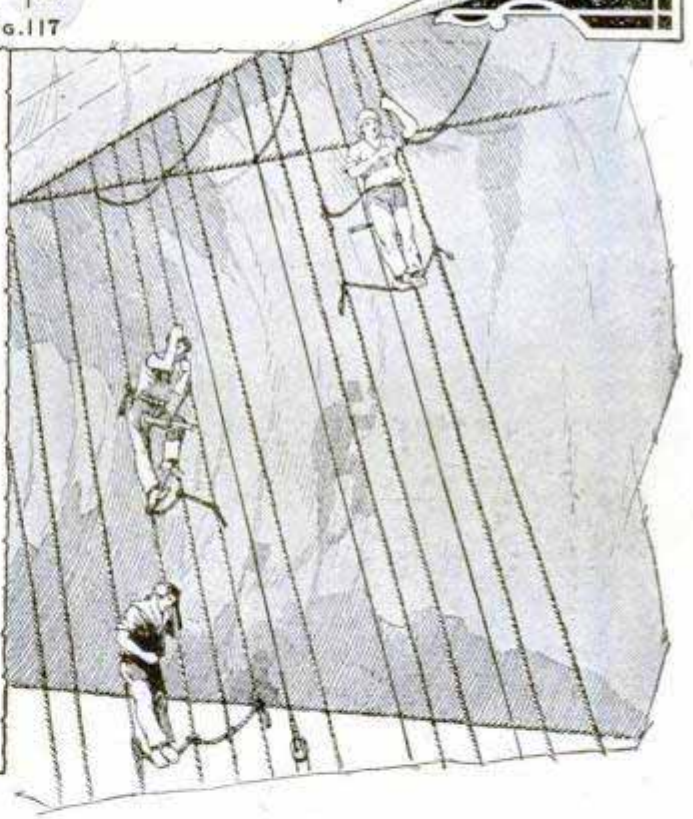


Fig. 118



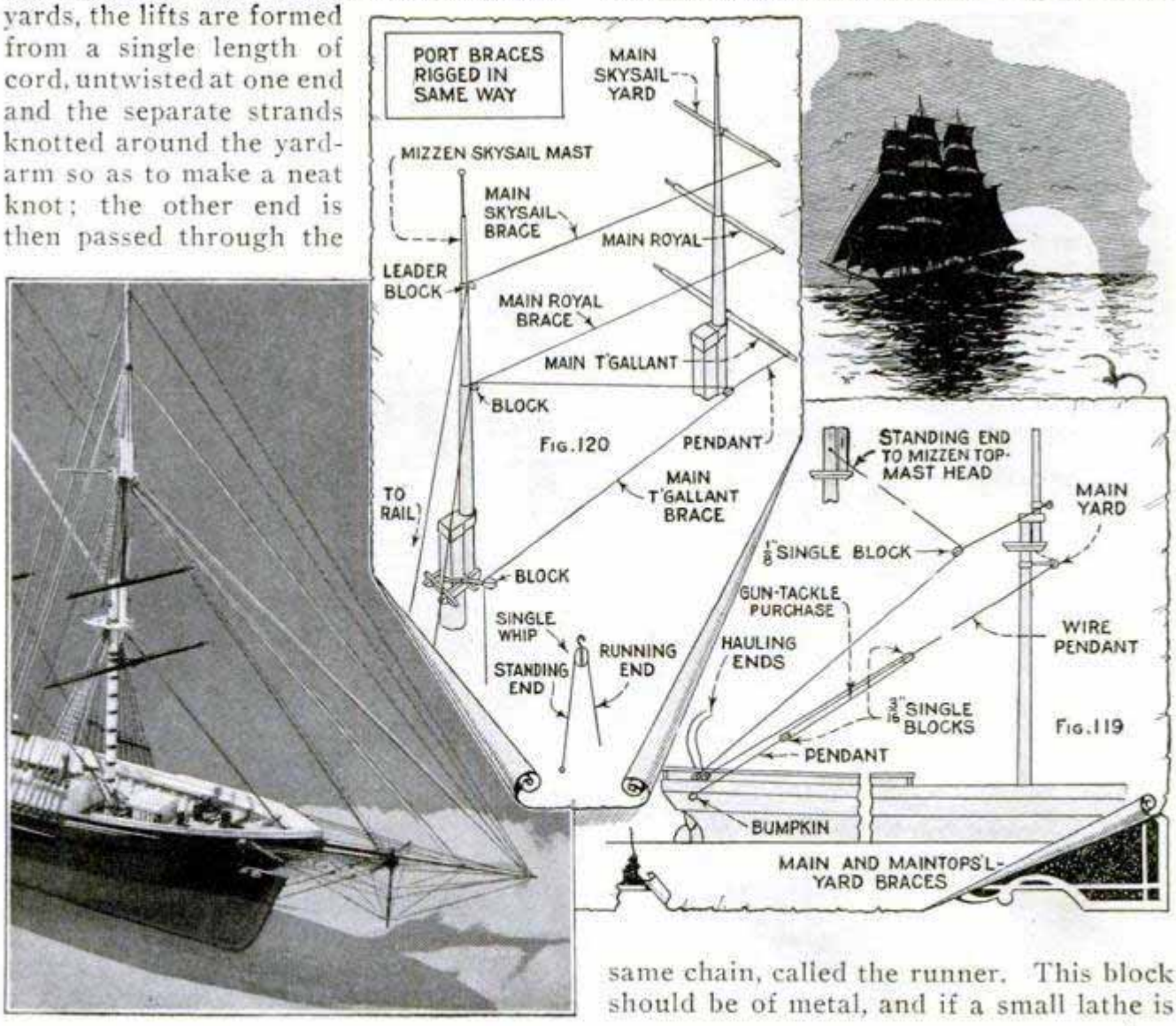
Make a simple wire belaying tool as shown in the same figure, and use it from the opposite side of the model for any particular line. Then the job of belaying will be found fairly easy. A drop of glue on the pin will keep the cord from coming off after belaying. The belaying pins can be obtained from model-supply houses for a few cents a dozen. Get sixty-four pins, ½ in. long, and cut them off to suit the monkey rail as needed. Ordinary pins, driven through holes in the rail, can be used if desired. The coils on the pins should be formed separately, by winding a few turns of line on a 5/16-in. dowel, afterward gluing the coil on the pin.

Use the lightest rigging cord for the rigging on the lower and topsail yards, and dye it light brown, as near the color of rope as you can. Don't leave the running gear white. As you go aloft, use smaller and smaller sizes of linen thread; say, No. 40 for the t'gallant rigging on fore and main, No. 70 for the royal yards and

No. 100 for the skysails. On the mizzen, where the yards are lighter, use No. 70 for t'gallant and No. 100 for royal and skysail yards. Do the same with the blocks. For the lower yards, use 3/16-in. blocks, 1/8-in. blocks for the topsail and t'gallant yards, and, where leader blocks are required for the t'gallant, royal and skysail braces, use either 1/8-in. blocks or the same blocks filed down to about 3/32 in. Keep everything in proportion to the decreasing size of masts and yards, as nothing looks worse than heavy, clumsy blocks on a light spar.

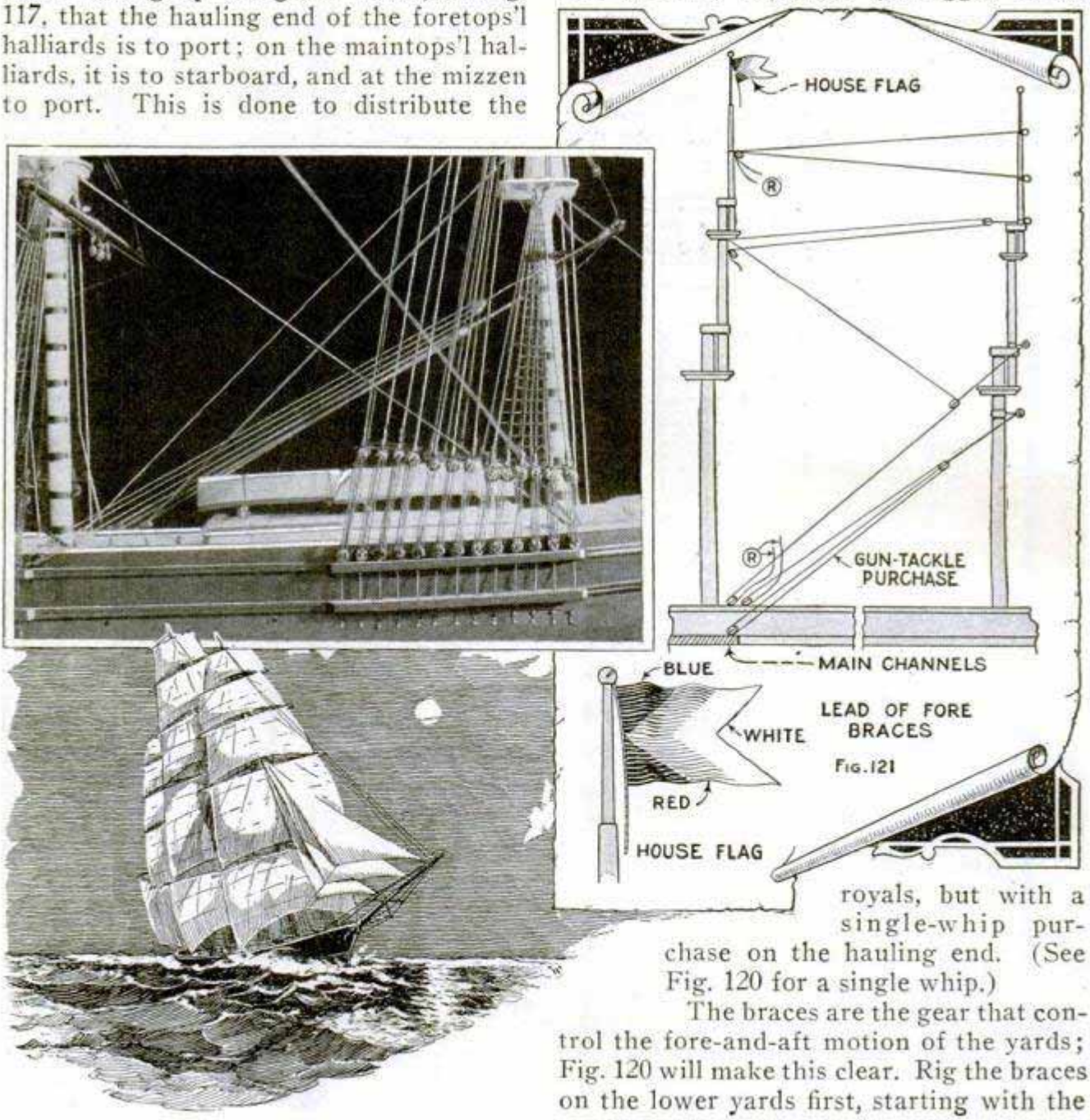
The lifts on the tops'l, t'gallant, royal and skysail yards have no purchases, but consist of single cords running from the slight shoulders on the yardarms up to the masthead, on each side. Keep these in proportion also, using the medium rigging cord for the fore and maintops'l yards, the fine cord for the t'gallants, and Nos. 70 and 100 linen thread for the royal and skysail yards. On tops'l and t'gallant yards, the lifts are formed from a single length of cord, untwisted at one end and the separate strands knotted around the yardarm so as to make a neat knot; the other end is then passed through the eyes of the shrouds at the masthead (using a needle if necessary), brought down to the other yardarm and knotted as on the other side. On skysails and royals, the neatest method is to use a thread long enough for both lifts and braces, opening the thread at the proper point, as shown in Fig. 114, seizing around the yardarm, passing the end through the shrouds at the masthead and opening and seizing to the other yardarm. Use the dyed thread for this, and, after all is in place, paint the lift portions black. All lifts are black, except, of course, the purchases on the lower yards.

The halliards are the tackles that are used to hoist the upper yards. All tops'l halliards are rigged as shown in Fig. 115, using 22-link chain, painted black, and the light rigging cord. The tye is the chain that goes through the mast sheave hole and is shackled to the yard iron. On the after end of the chain is hooked a 3/16-in. block drilled for another length of the



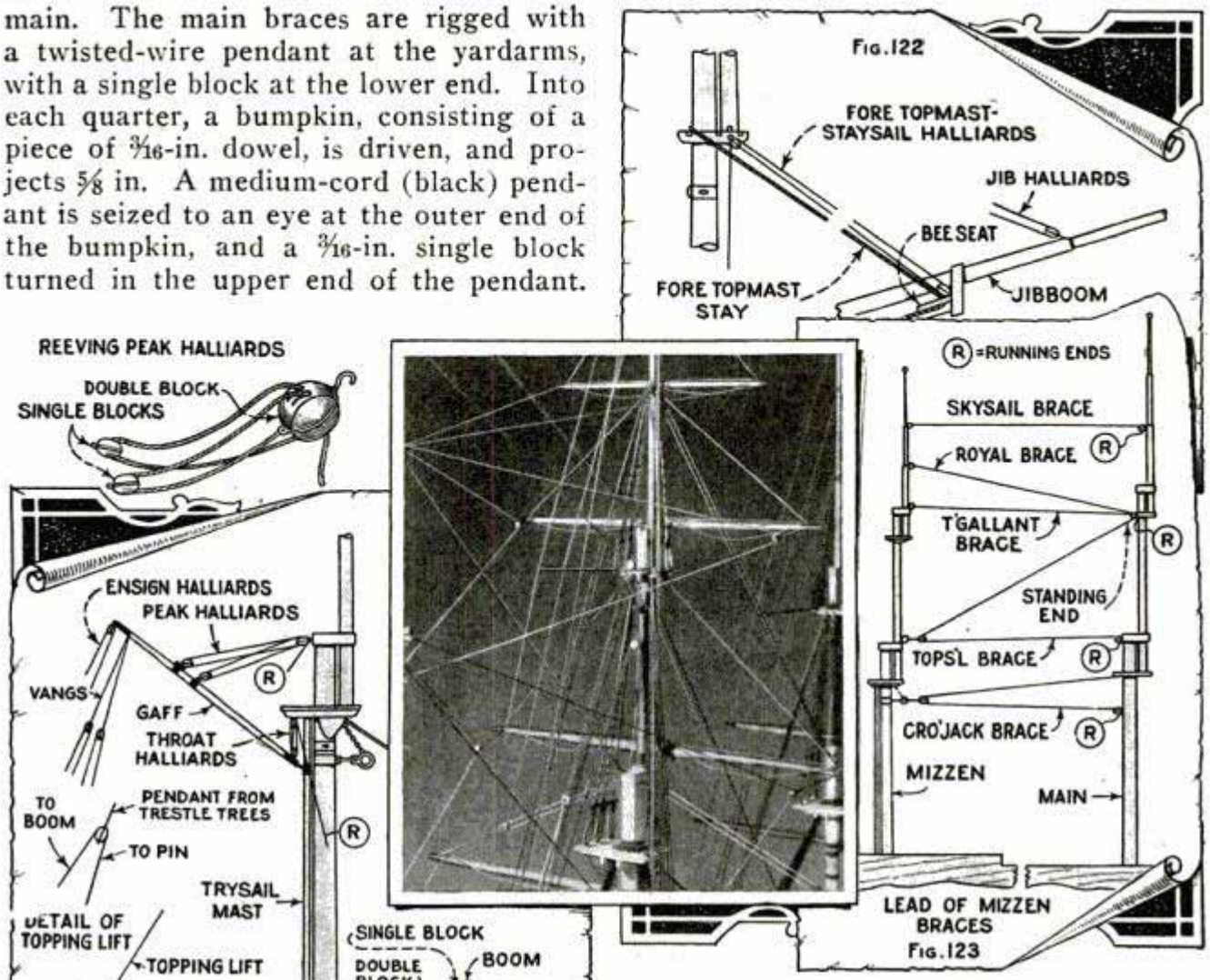
same chain, called the runner. This block should be of metal, and if a small lathe is

available, it can be made as indicated; it must not be over 3/16 in. in diameter. In the absence of a lathe, regular 3/16-in. blocks answer very well. To the channel on one side is fastened a length of black medium cord, the upper end being fastened to the runner as indicated. On the other end of the runner a 1/8-in. double block is hooked, through which the tackle is rove to a block in the opposite channel. This is a luff tackle. The hauling end is brought down through a single 1/8-in. block in the waterways and then up to the rail. In order to get lifts and halliards set up tight, it will be found necessary to run a small pin through the mast above each yard parrel, so as to keep the yard down when setting up the gear. Note, in Fig. 117, that the hauling end of the foretops'l halliards is to port; on the maintops'l halliards, it is to starboard, and at the mizzen to port. This is done to distribute the strains on the hull, and the same thing applies to all halliards, the foret'gallant halliards being to starboard, the main to port, etc. Lead the tops'l-halliard runners, tackle, etc., down in line with the topmast backstays, the t'gallant halliards in line with the t'gallant backstays, and similarly with royal and skysail halliards. T'gallant halliards on fore and main are rigged in exactly the same way as the topsail halliards, except that a gun-tackle purchase is used instead of a luff. Fore and main royal halliards are rigged as shown in Fig. 116, with a light-cord tye and a gun tackle. As the mizzen t'gallant yard is not any heavier than the main royal, rig it in the same way. Skysail halliards consist of a No. 40 thread tye, rigged as the royals, but with a single-whip purchase on the hauling end. (See Fig. 120 for a single whip.)



The braces are the gear that control the fore-and-aft motion of the yards; Fig. 120 will make this clear. Rig the braces on the lower yards first, starting with the

main. The main braces are rigged with a twisted-wire pendant at the yardarms, with a single block at the lower end. Into each quarter, a bumpkin, consisting of a piece of 3/16-in. dowel, is driven, and projects 5/8 in. A medium-cord (black) pendant is seized to an eye at the outer end of the bumpkin, and a 3/16-in. single block turned in the upper end of the pendant.



The hauling end of the tackle runs through a block under the monkey rail and up to the rail. (See Fig. 119.) Maintops'l braces are rigged as single whips with the standing end made fast at the mizzen-topmast head. Main-t'gallant braces are rigged in the same way (see Fig. 120), with the standing ends at the mizzen-t'gallant masthead, and the hauling ends led through blocks at the mizzen futtock band. Main royal and skysail braces are single lines led through 1/8 and 3/32-in. leader blocks at the mizzen-t'gallant and royal mastheads. The leader blocks can be hooked into the eyes of the stays.

Where the ends of running gear go down to the rail on a real ship, they are led through "seizing trucks," seized to the shrouds and backstays above the rail, as in Fig. 118. These trucks cannot easily be made small enough to look well on our model, so, after the lines have been made fast, draw them in to the nearest shroud or backstay with a black cotton thread on each, and knot the thread to the stay to represent the truck. Cut the ends off close, and keep the knots all in the same line, about 2 in. above the rail.

The lead of the fore braces is shown in Fig. 121. The fore brace has a gun-tackle purchase, the lower block being fastened on the forward end of the upper main channel, and the hauling end being brought in through a 1/8-in. leader block on the rail. Fore-tops'l braces come down in the same way, without the purchase. Fore-t'gallant, royal and skysail braces are led back to the main, as shown, the hauling ends coming down through the lubber's hole in the main top, then down the main shrouds to the rail. The mizzen braces are led forward to the main, as shown in Fig 123. The "R" marks on the drawings indicate the running or hauling ends of the gear. There are no pendants on the brace blocks on mizzen yards.

In making up the purchases, the standing end of the cords are made fast to a becket block, which is strapped as shown in Fig. 113. A neater way to attach the line to the block was shown in Fig. 94, March number. Drill under the strap of the block so as to make a small groove, slip the end of the line through the groove and knot to the strap.

The rigging of the foretopmast staysail and jib halliards is shown in Fig. 122, and the outer-jib halliards are the same. All are gun tackles, the lower block of the foretopmast-staysail halliard being hooked to an eyepin in the bee seat, and the lower blocks of the jib and outer-jib halliards being hooked to eyes on the jib-boom. All the other staysail halliards are rigged in exactly the same way. The staysails were the triangular sails that were set on the stays, as the name indicates, and the stays on which the halliards are to be rigged are indicated in Fig. 117.

No very detailed instructions are necessary for the rigging of the spanker boom and gaff since Fig. 124 shows this clearly. Note carefully how the peak halliards are rigged. The throat halliards are a luff tackle, and the spanker-boom sheets are luff tackles with the double blocks hooked to eyes in the quarterdeck waterways. Topping lifts are single whips; the vangs which steady the gaff, are also single whips, the blocks hanging from light-cord pendants, and the standing ends of the whips being knotted in small holes drilled through the lower rail. The block for the ensign halliards should be made as small as possible, and hooked to a small eyepin driven into the end of the gaff.

This completes the rigging, with the exception of the ensign and house flag. The ensign is a small American flag and can be obtained at almost any store that sells favors for parties. Don't get one that is too large in proportion to the model. The house flag will have to be made, preferably of white linen, and colored with "paintex" or similar dye colors. It should not be larger than ¾ by ½ in. over all. The masts are surmounted by small gilt balls, and holes for the house-flag halliards are drilled through the ball on the main. Belay the halliards to any convenient pin. Paint the skysail poles above the skysail masts white, go over all the paintwork and touch it up where necessary, then give a final glance "alow and aloft," to see that everything is "shipshape and Bristol fashion." Cut out the name given at the end of this article and glue it on the stern, then glue around it a scroll of heavy cord, painted white, and the model is finished.

For the purpose of the prize contest, the model will be without sails. Later we will have an article describing how to rig the sails on any clipper model, but the builder of this model will realize, after he has finished the rigging, that the addition of sails is a difficult and long job.

Next month we will describe the stand for the finished model and show how the photos for the contest should be taken.

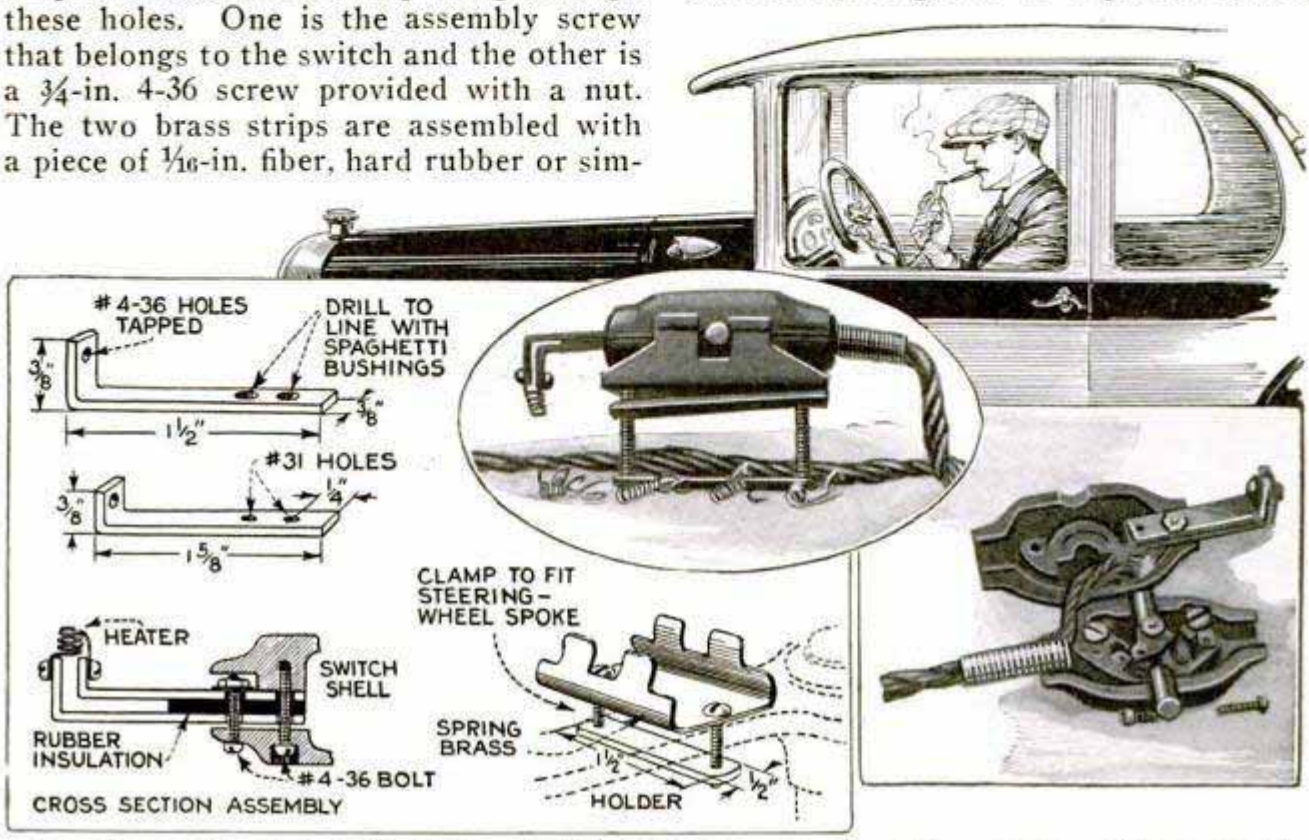
Homemade Cigar and Pipe Lighter for the Motor Car

Lighting matches while driving is not only inconvenient but involves certain danger, especially at night when the light temporarily blinds the driver. There are a number of electric cigar lighters on the market, but most of these are not suitable for lighting a pipe. Auto drivers who smoke a pipe will therefore appreciate the homemade electric lighter described in this article. It can be made by any motorist and its cost should be approximately one dollar.

A pendant switch used for 110-volt appliances is obtained and taken apart. One-half of the shell serves as a cover and the other contains the switch mechanism. Get a 6-in. strip of ⅜ by 1/16-in. brass and bend the two ends at right angles as shown in the lower left-hand detail. Holes are drilled and tapped in the bent ends for ⅛-in. 4-36 machine screws which are used to fasten the heating element. Hold the empty half of the shell in the hand so that the two raised portions around the screw holes point to the right. File or cut away the material around the upper hole down to the level of the flat portion. This will make room for the brass strips. Turn the shell over and carefully drill and tap

a hole with a No. 31 drill near the upper end, in the position indicated in the drawing. You now have two holes in line at one end of the shell. The brass strips should fit in the shell and are fastened to it by two machine screws passing through these holes. One is the assembly screw that belongs to the switch and the other is a ¾-in. 4-36 screw provided with a nut. The two brass strips are assembled with a piece of 1/16-in. fiber, hard rubber or similar insulating material between them. Shellacked cardboard may be used if nothing else is available. Place the strips in position and mark where they are to be drilled. Drill two holes with a No. 31 drill in the shorter piece, and with a No. 27 drill in the other piece, these holes being large enough to admit a little piece of spaghetti tubing. Also use an insulating washer between the nut and the upper strip. The tubing is necessary to prevent a short circuit. Connect one brass strip to the nearest terminal of the switch, by soldering a short length of insulated, stranded wire to the brass strip and fastening the other end under the screw of the switch terminal. Care must be taken to prevent a short circuit, which may occur if the insulation is scraped off too far. Next obtain a 5-ft. length of black flexible lampcord of small size, bare the ends, connect one to the other brass strip and the second to the remaining open terminal of the switch. A coil spring of the kind used on electric flatiron plugs can be used, if desired, to protect the lampcord from breaking easily where it enters the switch.

The heating element is made of No. 22 nichrome wire. A 5-in. length is wound on the tapering end of a pencil, leaving the ends straight to permit connecting the wire under the screws. The exact length of coil must be found by trial. It is convenient to hold the lighter with a spring clip on the steering wheel or it can be attached to the instrument board. This clip may be made of spring brass. The connecting wires, twisted together, are wound loosely around the steering post and are then brought down to the terminal block, if the car has one, one lead of the cord being connected to the battery terminal and the other to the ground. When in use, the lighter should glow a dull red. If it gets too hot, the resistance wire should be longer; if not hot enough the wire should be shorter.



Auto Owners Who Smoke While Driving Will Find This Homemade Pipe, Cigar and Cigaret Lighter Handy to Use; It Does Not Involve the Risk Arising from the Use of Matches

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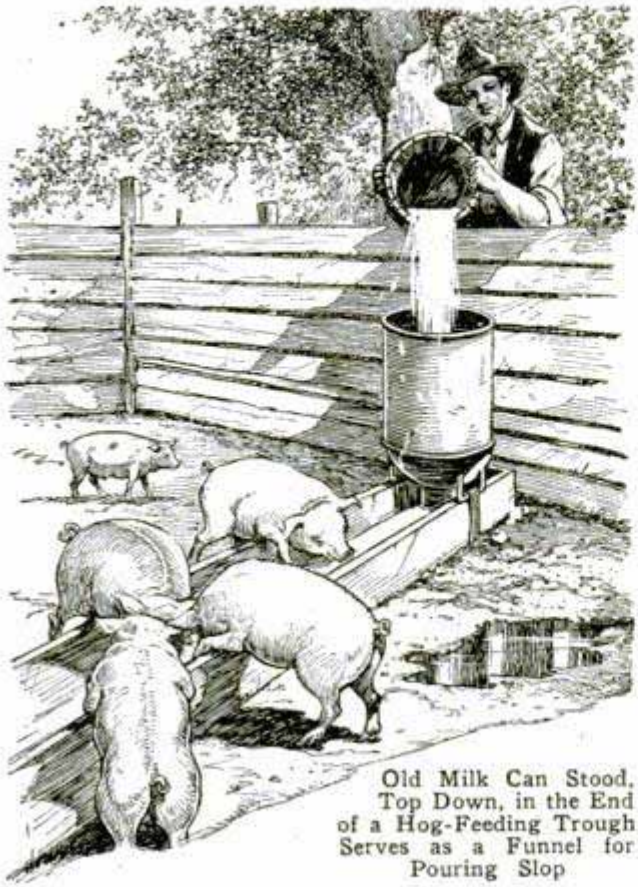
¶If veneer becomes loose at the edges, raise the section slightly with a thin knife blade and insert a flake or two of shellac under the veneer; then pass a warm iron over the spot. This will melt the shellac, holding the veneer securely.



Old Milk Can Stood, Top Down, in the End of a Hog-Feeding Trough Serves as a Funnel for Pouring Slop

"Funnel" for the Hog Slop Trough

A young farmer got tired of having his young hogs push the slop bucket out of his hands and spill the contents before he had a chance to get it into the trough, so he constructed the illustrated "funnel" from an old milk can. He first cut the bottom out and set the can, neck down, in one end of the trough next to the fence. The two handles just fitted on the edges of the trough and were bound to it with several strands of wire, holding the can securely. The slop is quickly spread from one end of the trough to the other end and all the hogs get an equal share. The amount of food saved pays well for the trouble of making the installation. —Frank Sargent, Holton, Kans.

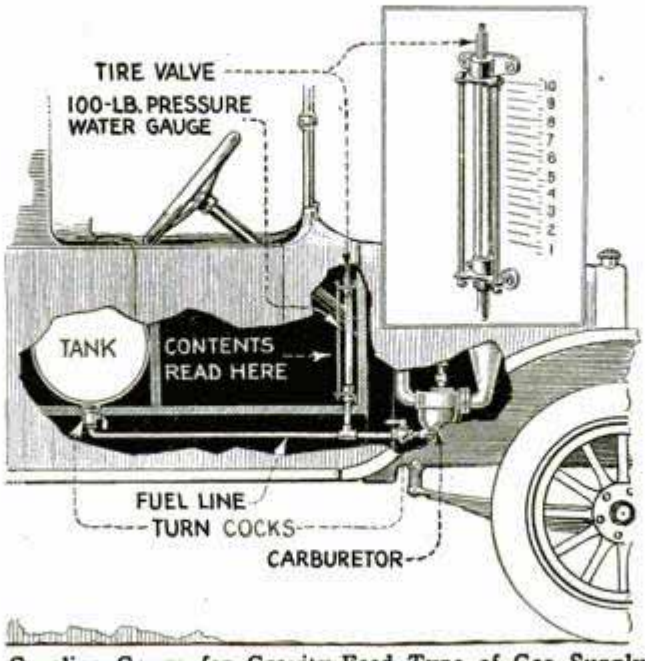
¶In nailing on light molding, first soak the material.

Hot Water from Outboard Motor

Finding innumerable uses for hot water while on outboard-motor boating trips, the writer decided to let the motor furnish it. A part of my boating equipment now consists of a towel, a washbasin and a cake of pumice soap. I also have a length of rubber tubing that fits over the end of the water-discharge pipe of the circulation system. If I get my hands soiled, I simply slip the rubber tube in place, fill the washbasin with hot water and have a comfortable wash. Under ordinary running conditions the water comes out of the motor at a temperature of about 115°, which is just right for washing one's hands.—John Edwin Hoag, Los Angeles.

Gauge and Clean-Out Pipe for Gravity Gas System

A number of automotive vehicles are fitted with gravity systems for fuel supply, particularly trucks and cars used for commercial purposes. The drawing shows an installation which provides the driver with a gas gauge on the instrument board, and a clean-out pipe to enable clearing the fuel line in case it is clogged. A T-fitting is inserted at the point indicated, and a 100-lb. pressure water gauge is attached here so that its bottom is level with that of the gasoline tank and the gas in both will reach the same height. Turn cocks are provided at the tank and at the carburetor. A tire valve is fitted to the top of the gauge, which is graduated in gallons by starting with an empty tank and adding one gallon at a time until the tank is full. A file can be used to make the marks on the gauge. To clean out the fuel line, attach the pump above the gauge and alternately open and close the turn cocks. The air pressure supplied will then force out the obstruction.



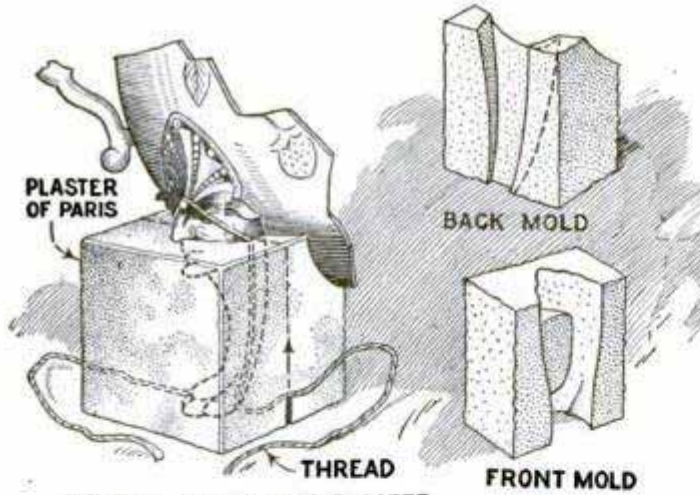
Gasoline Gauge for Gravity-Feed Type of Gas Supply Installed on Instrument Board

Repairing Broken Pewter

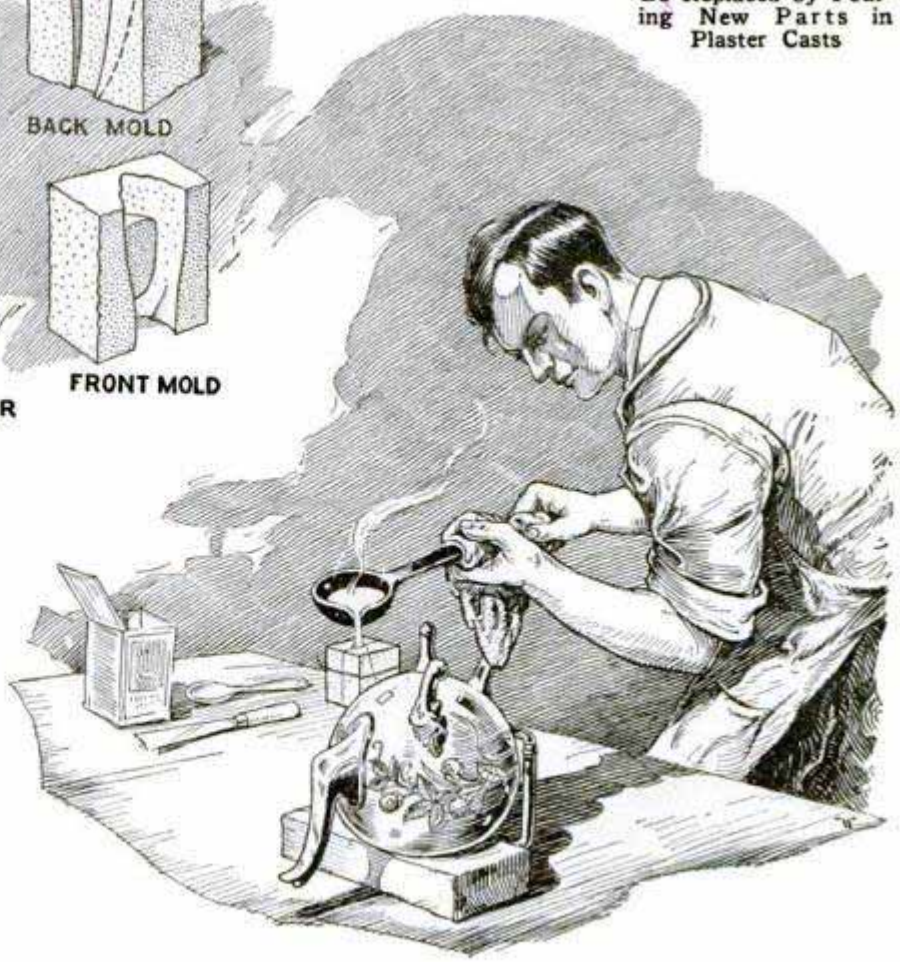
By DICK HUTCHINSON

COLLECTORS of old pewter find many pieces with a broken leg or otherwise damaged sufficiently to spoil a valued and desirable article. No matter how good a man may be at common soldering, the repair of pewter by this means is generally considered an impossible task, as pewter is one of the most fusible of metals.

A short time ago I picked up the teapot shown in the accompanying illustrations with one leg lost. After a little experimenting I made a new leg which, when finished, could not be distinguished from the others. I mixed up a small quantity of plaster of paris in cold water, and, after having drawn a linen thread over one of the good legs to divide the cast, I completely covered the leg, with the exception of a hole in the bottom, with about ½ in. of the plaster. After this had set just enough to hold together, I took hold of both ends of the linen thread and pulled it out through the plaster, cutting the cast in two. I allowed the cast to remain on the leg until it was thoroughly dry and hard, removed the two parts and then set them in place on the short piece that remained of the broken leg, fitting them snugly over this so that the new leg would be in the same position as the old one had been. I applied a thin coat of fresh plaster over the seams in the cast to hold them together, and in the proper position. When this had set thoroughly, I melted a small quantity of old pewter in a ladle and, turning the work upside down so that the hole in the bottom of the cast would come on top, I poured the molten pewter into the hole until the cast was full. The hot pewter melted a portion of the stub of the old leg, and that was just what I wanted, as the new and old pewter fused together nicely. As the whole was inclosed in the cast, the new leg was naturally set in the desired position. When the piece had cooled sufficiently, I removed the plaster cast and found that, with the exception of the seams where the cast came together, the work was entirely satisfactory. After smoothing these seams with a fine file and a piece of jewelers' emery paper, I lighted a match and held it



METHOD OF MAKING PLASTER OF PARIS CAST



Broken Parts of Pewter Teapots and Similar Pieces Can Readily Be Replaced by Pouring New Parts in Plaster Casts

under the new portion, allowing the smoke to blacken it slightly. I rubbed it up just enough to match the rest of the piece. This done, I applied a coat of transparent lacquer, and the teapot, equipped with a new leg, was as good as ever.

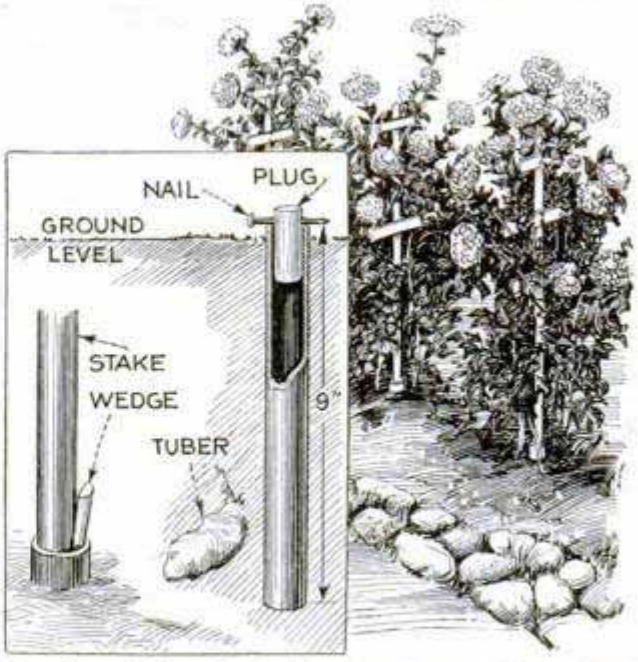
Two Samples of Broken Pewter Articles Which Were Mended by the Process Described

Other parts of pewter pieces can be renewed in a similar manner. If a portion of a cover has been broken off, use the remaining side with which to make the mold. If a section of the spout or handle is gone and there is nothing to model from, fill in the broken portion with plaster of paris, and work over the outside with a pocketknife after the plaster has set, until it conforms with the lines of the remaining section. Coat the outside of the built-up section with vaseline and proceed to make the cast as described above. Soak up the built-in plaster with hot water and dig it out with a pocketknife. In case of a broken spout, a core may be built up of dry plaster, incased in a cloth sack, and placed inside of the spout. When the work has cooled after pouring, cut a hole in the sack and sift the plaster out.

New Scheme for Dahlia Stakes

Among dahlia growers it is general practice to set the stakes, which later are to support the plants, at the time the tubers are planted. This practice prevents possible injury to them if the stakes are driven in after the plants have come up. While these bare wooden stakes, often standing 5 or 6 ft. high, do not make an inviting picture during the early weeks of growth, it does not matter so much in a garden where a special place is set aside for these flowers, and where the plot is not too conspicuous. But when, as in the case of the average home owner, the dahlias must be grown in a small yard, perhaps in front of the house, the presence of even a few bare stakes detracts from the general appearance.

One home owner overcame this objection in a novel way: Instead of driving the stakes into the ground when the tubers were planted, he buried a 10-in. length of 1-in. pipe in the ground, setting it vertically so that the top would be just above ground level. To prevent dirt and other material from getting into the pieces of pipe he stops them up with plugs made from old broom handles. A nail driven horizontally through the plug near the top prevents it from slipping down into the pipe. When the dahlia plants are tall enough to need support, the plugs are withdrawn, and the wooden stakes are inserted into the pipes. A couple of wooden wedges may be used to hold the stakes tightly. With this plan, it is not necessary to set out the stakes until the plants are 2 or 3 ft. high. It is even possible, if desired, to use short stakes at first and then longer ones as the

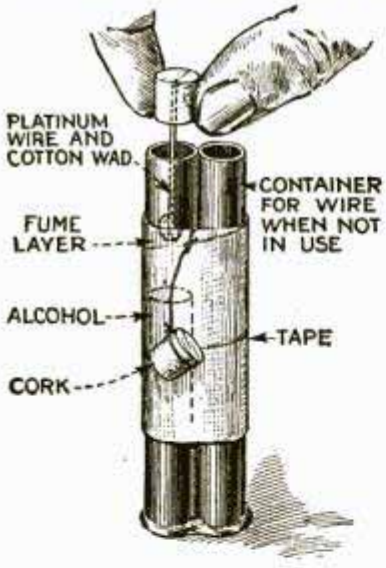


Lengths of Pipe Buried in the Ground Make Good Supports for Dahlia Props

plants grow higher. In either case the appearance of the front yard or flower bed is not marred by a group of unsightly props during the early part of the season. —Robert H. Moulton, Chicago, Ill.

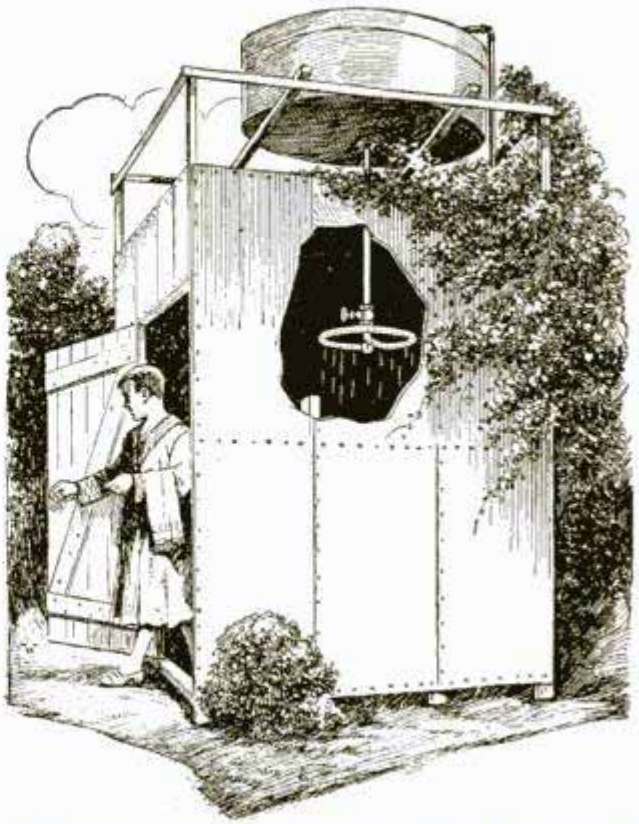
Homemade Cigaret Lighter

To make an efficient cigaret lighter like that shown in the drawing, get two brass or other metal tubes, each about 2 in. in height and ½ in. in diameter, and also a 1-in. piece of platinum wire from a chemical-supply house or jeweler. Insert the wire in the cork, that fits one of the metal tubes, and attach a small cotton wad securely to the other end of the wire. The second tube is about half filled with alcohol and is fitted with a cork to prevent evaporation. When a flame is desired, insert the cotton-wadded end of the platinum wire into this tube, not directly into the alcohol but only in the fumes above the liquid. The cotton wad will become lighted. To extinguish it return to the other tube and cork this as well as the alcohol tube. For greater convenience, the tubes should be bound together with adhesive tape, and they may be decorated if desired. The cost of this lighter will be only 25 or 50 cents — Philip C. Shera, Columbus, Ohio.



Green-Bronze Finish for Plaster Casts

Small plaster casts can be finished attractively by giving them a green-bronze finish. It is made as follows: Dissolve sal ammoniac, 1 oz., cream of tartar, 3 oz., and salt, 6 oz., in 1 pt. of water. Then dissolve copper nitrate, 2 oz., in an additional pint of hot water and mix the two solutions thoroughly. When the mixture is cool, apply it to the cast with a soft brush, putting on several coats where extra depth of color is desired.

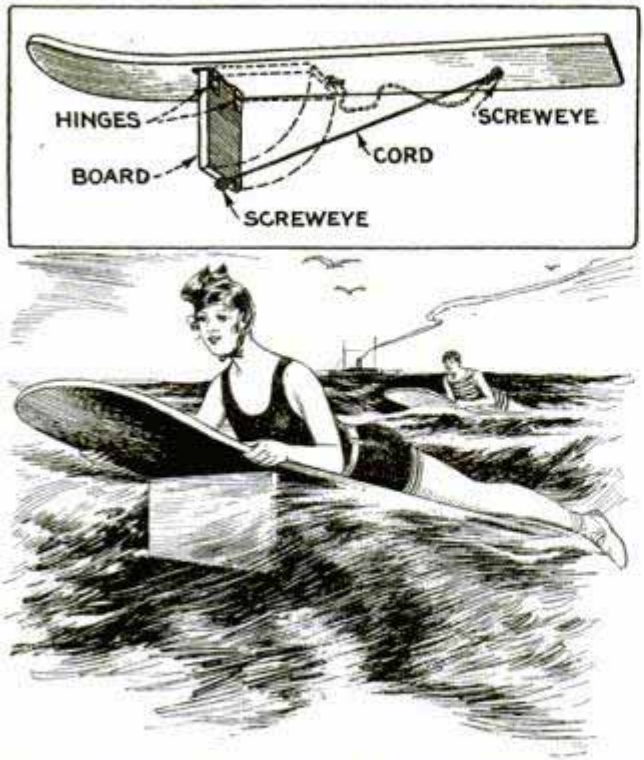


Homemade Shower Bathhouse for Farm Built of Old Lumber at Very Small Cost

Shower Bathhouse for the Farm

Shower-bath accommodations are usually missing on the farm. However, the shower house shown in the drawing is simple to make and will be appreciated by the men coming from the fields after a day's work. The water in the overhead tank is warmed by the sun's rays and much heat is also retained in the house itself as its sides and top are covered with sheet metal. In this particular case, the material for the frame was taken from an old mill tower, which had blown down. The posts are 10 ft. high and are 6 ft. apart, being set in the corners of a concrete floor. The sheet iron used for the walls can be obtained in 8-ft. lengths. Water is pumped into the tank by the windmill and a length of pipe runs down inside, terminating in a homemade sprinkler, which can be raised or lowered and has a shut-off valve. The device cost the owner only a few dollars, and he claims that it has more than paid for its cost in the convenience obtained.—Dale R. Van Horn, Lincoln, Nebr.

¶When a hot dish is set on ice to cool, place a fruit-jar rubber ring under it; then the dish will not slip.



Buoyancy of a Surfboard Can Be Increased by Extra Board Hinged to the Bottom

Improvement for the Surfboard

More pleasure can be had from a surfboard by attaching an extra board to the underside, as shown. This board is fastened on by means of hinges so that it will be forced back against the surfboard when it is being pushed out into the sea. When the user has waded out far enough to catch the crest of a wave, the board is turned around, the attachment drops down, and it will then catch part of the wave which carries the rider a long distance toward the shore. White pine should be used to make the board and two coats of shellac are applied to prevent the wood from becoming waterlogged. A strong cord connects the lower end of the attachment to the rear end of the surfboard. This provides extra support to the crossboard. A very stout person may increase the efficiency of the crossboard by making it wider than the surfboard. In use, it is, of course, necessary to observe care in order not to get one's fingers pinched between the two boards.

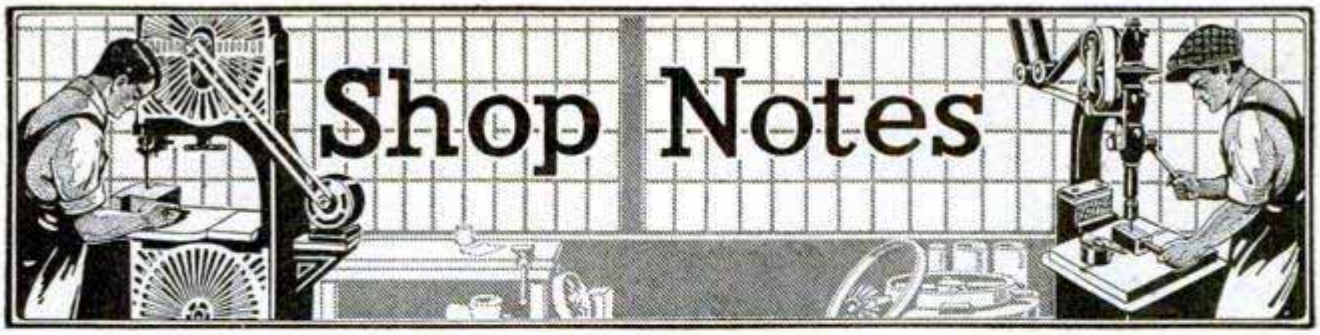
Cleaning Kerosene Range

Practically all kerosene-burning kitchen stoves feed the burners from one main pipe running the entire length of the stove. In time, the bottom of the fount holder becomes filled with dirt and water, which works its way down into the pipe and eventually clogs up the inlets to the burners. To clean the pipe and the minute outlet openings is usually a difficult task, but can be quickly and easily done with the aid of a good bicycle or auto pump. Remove the fount and the burners from the supply pipe. Also take the end plug off the same pipe. Place the nozzle of the pump over the several jet openings, one at a time, and force a stream of air through them. This will dislodge any particle in the jets and will blow it either out of the end of the main pipe or up into the fount basin, where it can be taken out. Repeating this by blowing from different jets will in a short time clean the piping of all refuse and water. Then replace the burners and the stove will operate normally

Hinged Board Protects Milk Bottles

To prevent dogs and cats from getting at the milk bottles, a simple cover can be made as shown in the drawing. It consists of a ¾-in. wooden board, hinged to the wall so that it will rest horizontally on the tops of quart-size bottles, and, when not in use, it can be swung to the position indicated by the dotted lines. The board also protects the milk bottles from being accidentally pushed over by baskets and boxes, or by persons walking past them.

Hinged Board Prevents Cats and Dogs from Licking Tops of Milk Bottles



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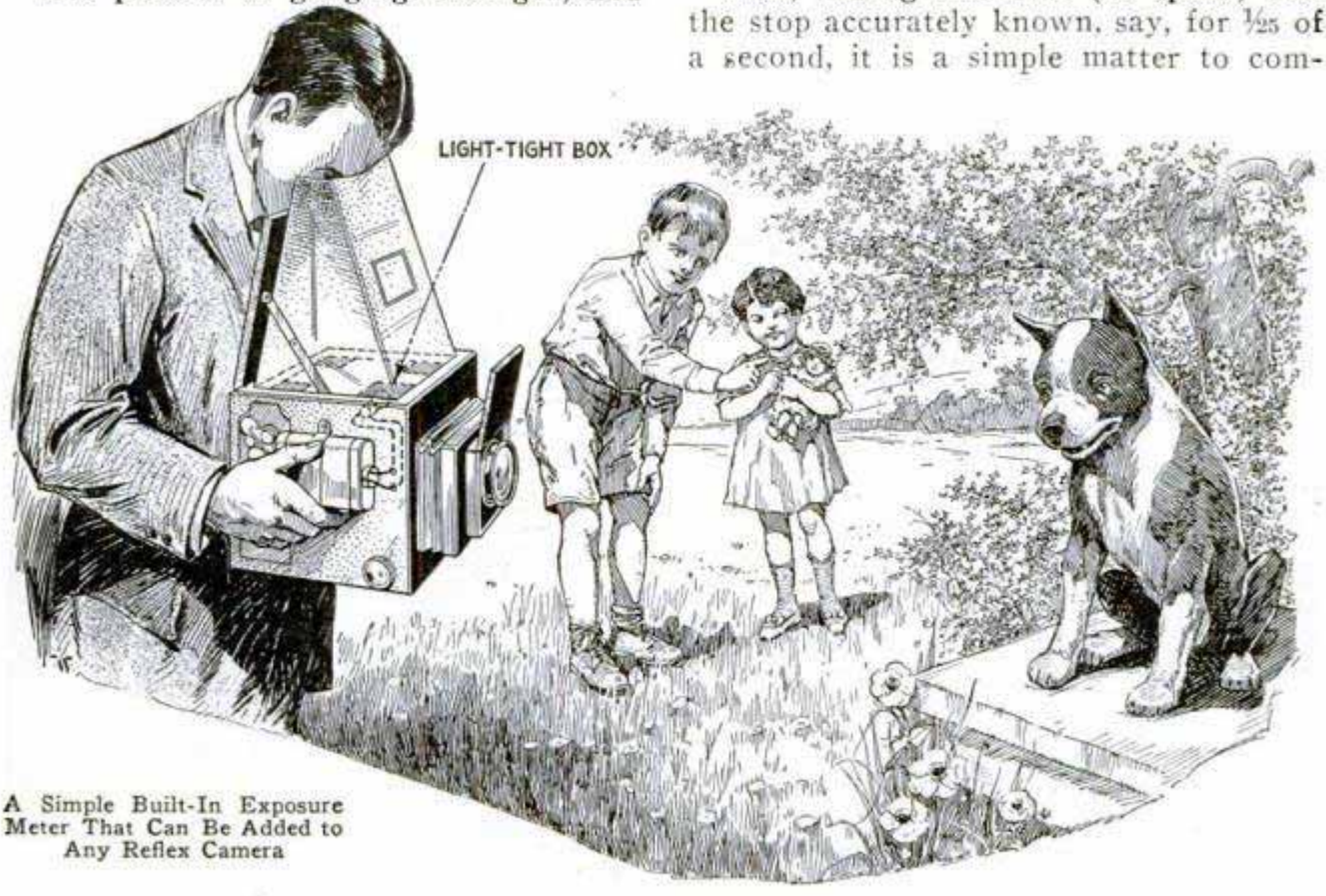
Exposure Meter for Reflex Cameras

By HERBERT J. SUMMERS

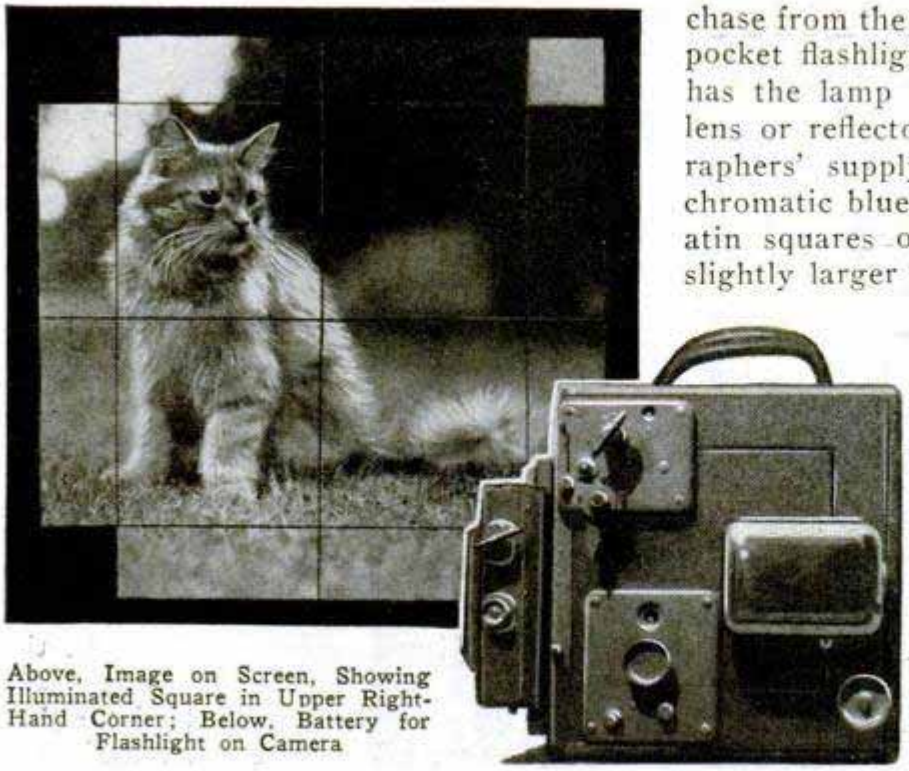
WITH small expense and a little time and ingenuity, a scientifically correct exposure meter, which is dependable, simple and almost instantaneous in operation, may be built into the ordinary reflex camera. It works on the photometer principle and depends on matching two fields of light to the same approximate intensity. One of these fields is the image on the ground-glass screen within the hood of the camera, and the other is the light from an ordinary pocket electric flashlight, the light being arranged to appear in a square in the upper right-hand corner of the ground glass.

The process of gauging the light, and hence the exposure, is this: Look in the hood at the image on the screen and press the button, illuminating a square in the upper right-hand corner of the screen. The image will be found to be either stronger or weaker than the illuminated square. Change the opening of the diaphragm until the two fields of light are approximately the same average intensity. Using, then, that particular diaphragm opening (or stop), the correct exposure will be a certain constant amount of time —say 1/25 second, which it is necessary to determine but once by experiment when your apparatus is first built.

Now, having the time (or speed) and the stop accurately known, say, for 1/25 of a second, it is a simple matter to com-



A Simple Built-In Exposure Meter That Can Be Added to Any Reflex Camera



Above, Image on Screen, Showing Illuminated Square in Upper Right-Hand Corner; Below, Battery for Flashlight on Camera

pute the speed for any other stop, or the stop for any other speed. Simply remember that an increase in the stop from one figure to the next, admitting more light, calls for one-half the speed. In short, every time the stop is changed from one figure to the next, the amount of light admitted to the film is either halved or doubled, according to whether the diaphragm is closed or opened. The speed must be halved or doubled accordingly.

In your apparatus, a correction must be made for the difference between the quality of the light as seen by the eye and the actinic light which is effective in making the picture. This is very nicely accomplished by means of monochromatic blue filters. The dark blue known as the "C4" passes a very high percentage of the actinic light of the ordinary film pack, roll film or orthochromatic plate or cut film. Viewing, then, the screen and the illuminated square through the blue filter, you are looking at the actinic light only, and the eye is prevented from being influenced by colors, and other light, such as red, which is not actinic. One of these filters may be permanently installed over the electrically illuminated square, and the other may be placed over the lens. The latter, however, must be removed from the lens before the exposure is actually being made.

For the construction of this meter, purchase from the hardware store a small, flat pocket flashlight, one of the type which has the lamp exposed and is without a lens or reflector. Then, from a photographers' supply dealer, obtain a monochromatic blue filter. These come in gelatin squares of various sizes. Get one slightly larger than is necessary to cover the lens of your camera, and mount it between two pieces of circular glass obtainable from the hardware store. This can be either fitted into the cell which holds your other filters, or some sort of holder can easily be improvised. The scraps from the corners of the blue square will suffice for the small illuminated field in the corner of the ground-glass screen. It will be noted from the photograph that the writer located the battery case on the side of his camera in such a way that the button was easily accessible to the right thumb. With some bits of fine insulated copper wire, make connections at the terminals of the flashlight where the lamp has been screwed out, and lead these wires through the case of the camera, through fine holes made with a pin, into the upper right-hand corner and on top of the ground-glass screen. There it is only necessary to construct some sort of box just large enough to house the lamp from the flashlight. A light-tight box can be built, of pasteboard and glue, around the lamp, just the same size as the black square in the corner of the finder used as an aid to framing the picture. Over the top of this box place one or two thicknesses of paper and the blue filter.

You are then ready to calibrate your meter, that is, to determine the time constant mentioned in an earlier paragraph. This can be done in two or three ways. Select a subject. Watch the blue fields of light as mentioned before and then with another (borrowed) meter, find out the time required for that particular stop. This is the quickest method. Another is to determine the stop again as above and then experiment on a few films exposing one at, say, 1/10 second, one at 1/25 second,

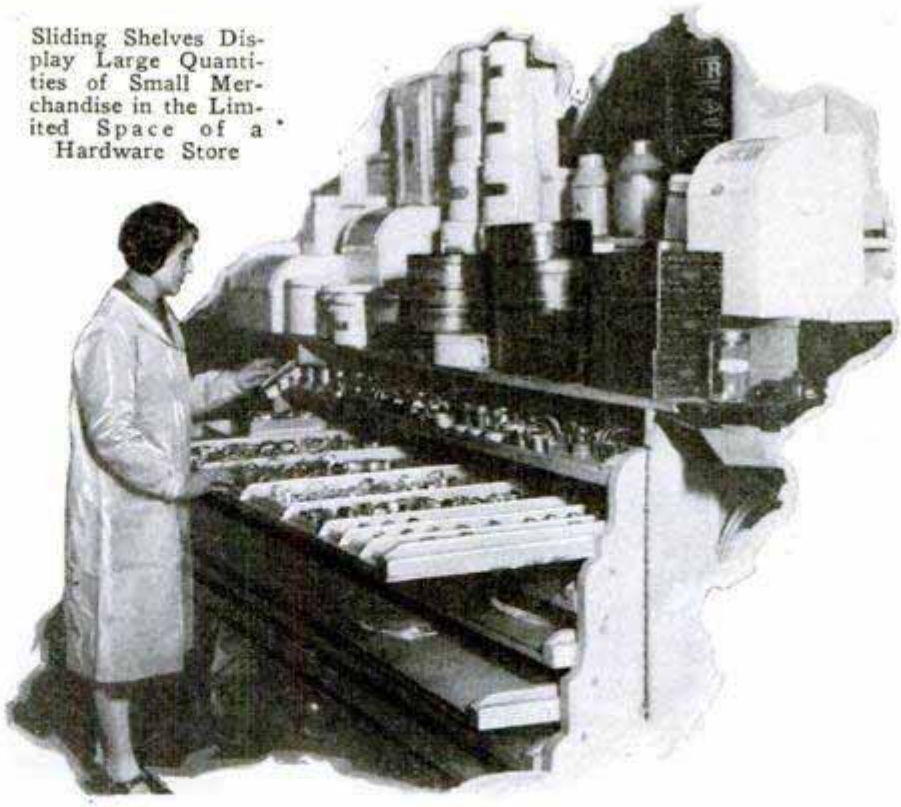
and one at 1/30 second. Then use the time constant which gives the best result. If it is found that, with an average picture, the stop comes out very small or very large, or perhaps the fields cannot be matched at all, take out some of the paper and filters (if more than one) in the illuminated square, or, if necessary, put in some more. It is best to have your time constant come out a relatively slow speed, say 1/10 to 1/20 second, so that in an average bright outdoor photograph, the stop will be small; then the meter will be fit for use in deep shadows, the limit being the dimmest picture you can take at that speed with your lens. Once this time constant is found, it will always be the same. Thus every time an exposure is calculated, you will use the stop found as told above, with this particular shutter speed. Then, if you wish to use another speed or stop opening, it may be computed as outlined.

The reason for the correct operation of this meter is fairly obvious. The square is always illuminated to the same intensity, and is constant within negligible limits. Hence, when the image on the ground-glass screen is matched with it in intensity, it, too, is always the same within the same negligible limits. With the same amount of light always admitted to the film, the shutter speed must necessarily be the same at all times. This shutter speed is the time constant determined at the outset.

It should be added here that the writer employed this meter for three months last summer making about 400 rather particular publicity photographs throughout Europe under all sorts of light conditions, and obtained excellent results. It might be thought that a battery would not be dependable, but it was found that, after the first day, it was so nearly constant that it was impossible to notice any change for nearly three months, until, by accident one day, a short circuit came somewhere in the system and the battery died. It cost 25 cents to replace. Of course, care should be taken and the current used only a short time while testing the light.

Sliding Shelves in Store Save Space

Homemade sliding shelves solve the problem of storing and displaying large stocks of small merchandise, such as kitchen utensils, enamel and china dinnerware, in a western store. Around the sides of the walls, large cases holding a great number of these sliding shelves have been built. There are from five to ten shelves in each case, and the depth of each shelf or tray varies with the type of merchandise for which it is designed. The shelves slide on steel rollers, which were taken from roller skates, four rollers being attached to each cleat on which the edges of the shelves rest. In use, a shelf can be pulled out from the wall so that the customer can inspect every piece of merchandise displayed. Additional shelves of the usual rigid type may be built above the cases if desired.—Miss Mary Gleeson, San Francisco, Calif.



Sliding Shelves Display Large Quantities of Small Merchandise in the Limited Space of a Hardware Store

¶Tin can be removed from tinplate scrap by boiling in caustic soda, and the tin in the solution deposited on a sheet-iron plate by electroplating.

Wrecking Car Has Motor-Driven Hoist

Instead of having a hand crank on this wrecking car to pull autos out of the ditch, a western garage man uses an old motor to do the work. The gear shift and clutch are retained so that the hoist can be driven at different speeds. A chain and sprocket are connected to the winch drum. This arrangement saves both time and labor. —Carlton Groat, The Dalles, Oreg.

Old Auto Engine on Wrecking Car Is Used to Operate the Hoist

Renewing Old Water Tanks

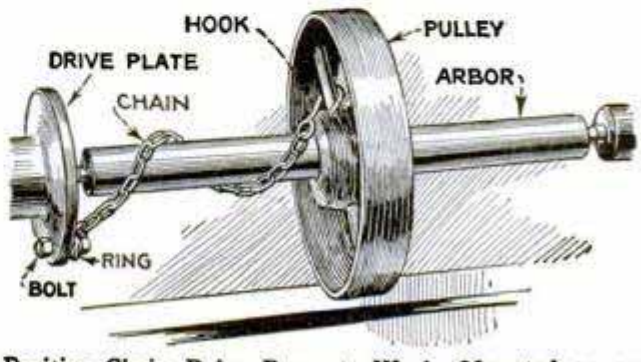
When a 15,000-gal. galvanized-iron cattle tank on a Texas ranch became old and leaky, it was repaired in a way that made it even better than a new one. The ranch was situated 80 miles from the nearest railroad station and about 3,000 ft. above sea level, so, when the tank began to rust, the manager of the ranch, if he had bought a new one, would have been faced with the problem of a long haul over a mountain road, 15 miles from the state highway, and the necessity of cutting down thousands of feet of mesquite, live-oak and cedar timber along the road to allow its passage. To avoid this and save time, the old tank was rejuvenated in this manner: It was first perforated until it looked like a huge piece of metal lath. Cement was then mixed and two layers applied to the tank, both inside and out. The result was a new and practically indestructible reinforced-cement tank, 4-in. thick. The work was repeated on other old tanks on the ranch, with the result that hundreds of dollars were saved, besides the delay and risk incidental to the transportation of new tanks by railroad, state highway and the roughest kind of mountain road.—Solon K. Stewart, San Antonio, Texas.

Mixture for Cleaning Hands

I have a cleaner for the hands, which has been found just as effective as soaps and cleaning compounds commonly used for this purpose. It does not require any rubbing and need only be applied like soap. The ingredients are obtainable in almost any drug store or paint store. Get 1 pt. of Turkish red oil, which is also called soluble oil, and ½ pt. of xylene, which is more commonly known as solvent naphtha. Mix the two thoroughly and apply to the hands. The compound is readily soluble in water.—Walter J. Stefaniak, Buffalo, N. Y.

Chain Provides Positive Arbor Drive

When turning pulleys of small bore on arbors, the work will sometimes slip under a cut. To avoid this, I tried a new device in the form of a chain with a ring at one end and a hook at the other. I clamped the ring to the driver plate and passed the hook around one of the arms of the pulley. This eliminated the slipping and made it unnecessary to drive the work very tightly on the arbor. This chain drive will be found handy also in cases where the work is too far away from the plate to allow the use of a bolt. The chain can be put on and taken off readily and is adjustable to different lengths.—Harry Moore, Hamilton, Can.



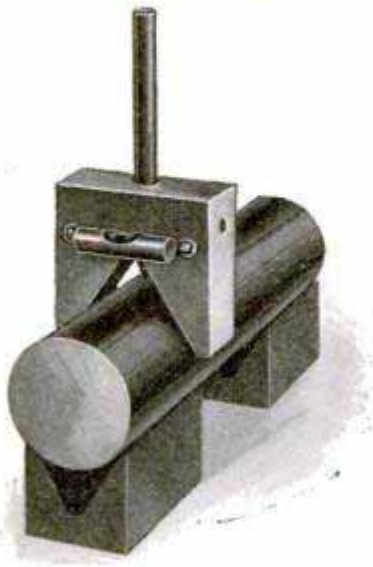
Positive Chain Drive Prevents Work, Mounted on an Arbor, from Slipping

Temperature in Developing Negatives

Many amateur photographers neglect the temperature factor when developing films or plates. This has much to do with success or failure. The best temperature is approximately 65° F. A difference of 15° usually spoils the negatives. At 50° the negatives invariably turn out weak and very flat; at 55° more strength will be evident but the image will still lack intensity, and at 60°, much longer development than normal will be required, and full intensity will still be lacking. At temperatures above 70° there is danger of the emulsion puckering away from the film base and also of too rapid development, causing "thick" negatives and chemical fog. So keep the temperature close to and slightly above 65°. Do not rely on the sensitivity of the fingers to tell the temperature of the solution, but use a thermometer, and take frequent readings, for this is the only reliable method.

Laying Out Keyways

The photo shows a tool that I have used for over ten years to lay out keyways and holes in long shafts. It consists of a V-block with a level and center punch, a small plunger, a small spring to bear against the plunger, and a headless set-screw, to increase or decrease the tension of the spring. The center punch is located in a hole drilled in the center of the block as shown. In use, the tool is set on the shaft, exactly level, and the punch is given a light blow. Without displacing the work, the tool is moved to another position to mark the shaft at a second point. After the tool has been set level, proceed as before, and you will be sure that the two punch marks are in line. —John Snitil, Cleveland, Ohio.



Newsboys' Change Holder Made from Cigar Box Saves Considerable Time

Newsboys' Change Holder

While waiting for a street car on a busy corner, the writer noticed a newsboy using a novel device for holding change in readiness for his customers. During rush hours, when he was very busy, this holder enabled him to make change quickly. The holder consisted of a cigar box in which a block of wood was fitted. A series of notches or recesses were cut in the upper side of the block, deep enough to hold three cent pieces. The other part of the box was used for loose change. When not engaged with customers, the boy filled notches with pennies. Customers handing him a five-cent piece for a newspaper, would immediately receive their change. —Leslie G. Roller, Cedar Rapids, Iowa.

How to Drive Nails to Avoid Splitting

When it is necessary to drive nails in places where there is danger of splitting, and a drill of the proper size is not at hand for starting a hole, simply file or grind the point of the nail to a chisel edge instead of the regular four-sided point, and drive the nail with the sharpened edge cutting across the grain of the wood. This practice will usually prevent splitting.

Conical Sheet-Metal Container for Tar, Which Facilitates Melting and Pouring It

Practical Container for Melting and Pouring Tar

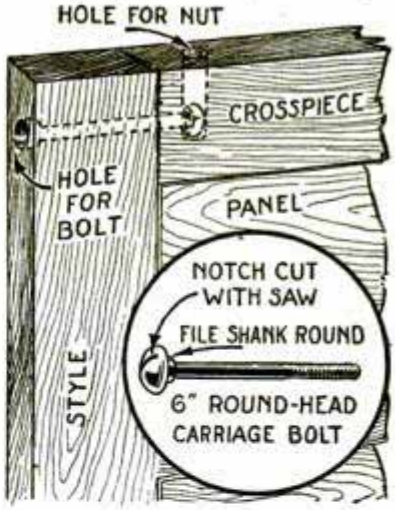
For melting and pouring tar in small quantities, the scooplike container illustrated will be found convenient. It is made of heavy tin or sheet iron, bent cone-shaped, riveted at the overlapping edges, and closed at the large end with a sheet-iron disk, riveted on. A hole is cut at the large end through which the cone is filled with pieces of tar; the small end is left open to permit the tar to flow out when melted. A wooden handle is attached to the wide end. In use, a plumbers' blow-torch is held so that the flame plays against the container, melting the tar and causing it to run out as indicated. The outfit can be moved about at will and the flow of tar can be directed with precision. The tar hardens after the flame is extinguished.

Machining Cold-Rolled Steel

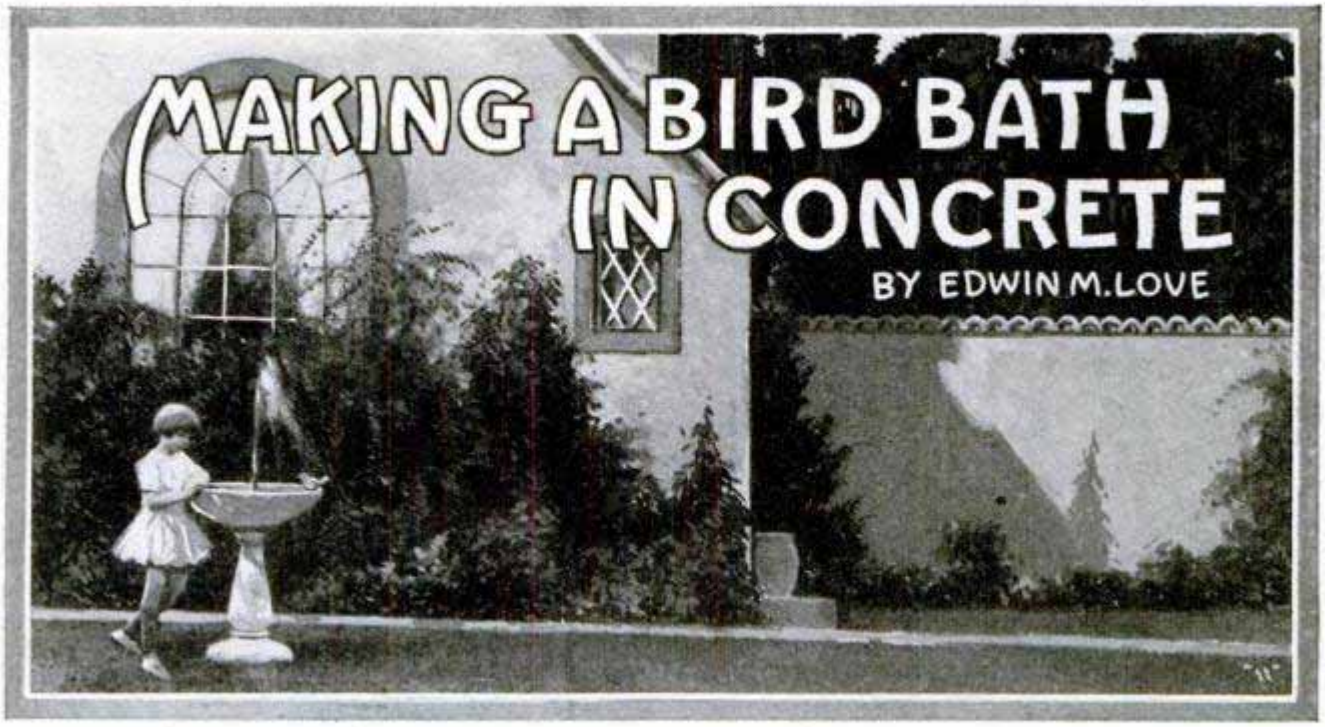
It will be found that, after machining, such as planing, milling or cutting a key-way in a bar of cold-rolled steel, the bar will spring to a considerable extent when released from the vise, owing to the relieving of the "rolling strains." This trouble can be largely overcome by first heating the bar to a dull red and then allowing it to cool in the air on grates off the floor and out of a draft.—Frank N. Coakley, Buffalo, N. Y.

How to Repair a Door with Bolts

To repair a door when the stile has worked loose from the crossboards is a task within the reach of the ordinary house owner who possesses a brace with a large and a small bit, a file, a wide-bladed screwdriver, a hacksaw and a 6-in. carriage bolt. First file off the shoulder of the bolt so that the shank is smooth clear up to the head. Cut a slot in the head so that the screwdriver will fit it. Take the door down and drill a hole, large enough to let the bolt head slip in and just deep enough to let it come below the surface of the wood. Using the small bit, continue the hole through the stile and about 2 in. into the crosspiece. It is best to drill this hole about 1½ or 2 in. below the corner of the door. Drill a second hole into the end of the door. This hole must meet the first one, about 1½ in. beyond the point where the stile is joined to the crosspiece. Slip the bolt into the hole and insert the nut as shown in the drawing. A little manipulation will be necessary to get the threads started. When this is accomplished, screw up the bolt with the screwdriver, and the door will be as good as ever. The entire job can be done in about half an hour. If the hole into which the nut was inserted is at the top of the door, it should be filled with a wooden plug or cork, which is tapped in tightly and cut off flush. If this is not convenient, pour the hole full of melted paraffin or sealing wax.—F. J. Ward, Ismay, Mont.



¶Do not connect belt ends with a metal fastener and allow the hooks to be poorly clinched; the hands of a worker may be cut when shifting the belt.



THE interesting bird bath described and illustrated in this article was turned from concrete, on a platform or wheel made of rough boards and rotated by hand, the concrete being built up on the wheel and the contour formed by turning the mass against a sheet-metal template, supported close to the side of the wheel. The same design would also serve for a fountain or a goldfish bowl, and the method of turning the column and base would work equally well for making a sundial or gazing-globe pedestal, or similar piece of concrete garden furniture.

Build the wheel or platform of rough 1-in. stock, in two layers, with the grain of one at right angles to that of the other. (See Fig. 1.) Nail the layers together well, scribe a circle, 28 in. in diameter, on the platform, and saw it to shape with a compass saw. Now bore a hole in the center, a driving fit for a 3-ft. length of ½-in. water pipe. Over the lower end of the pipe drive a length of 2 by 6-in. pine, which is to be tacked to the underside of the platform. Light hammer blows on this block will bring the pipe at right angles to the wheel, when the block can be nailed solidly in place, with the pipe projecting through the upper surface of the platform. The pipe should also project about 3 in. below the block.

Set in the ground a piece of 4 by 4-in. pine, with the end projecting 3 in. above the surface, and, centering on the end of the piece, bore a hole, ⅛ in. larger in diameter than the pipe, to serve as a socket for the projecting wheel pivot. Set the wheel in place on the 4 by 4-in. bearing, then drive a 1 by 3-in. stake into the ground close to its edge. The stake should be about 3½ ft. long and must be supported firmly. It can be braced to any convenient object near at hand, or, if this is not possible, to stakes driven into the ground behind it.

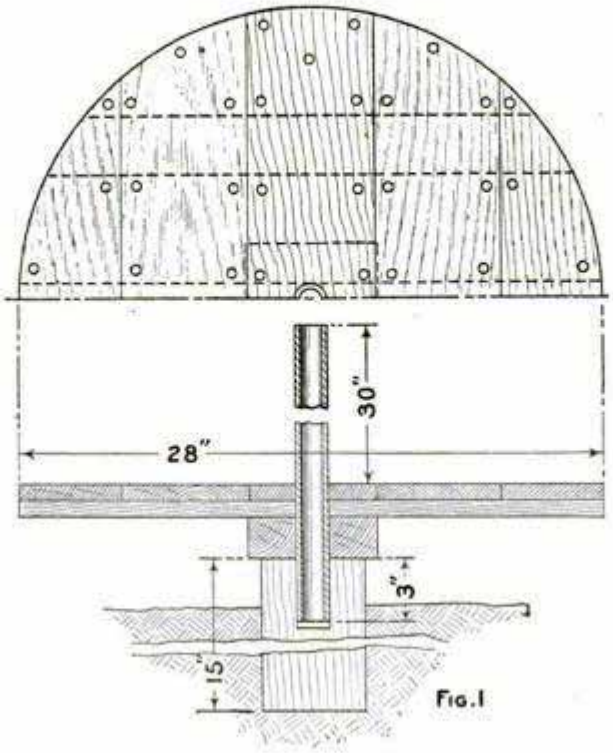


FIG. 1

The upper end of the pipe is then secured so that the platform will be level in every direction, by means of two braces

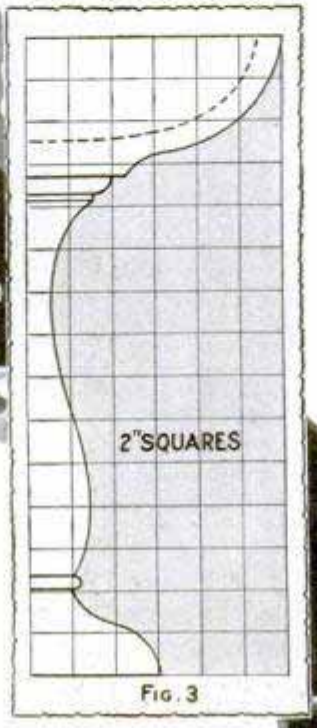


Fig. 3

bored to fit over it, and fastened to posts or stakes at the outer ends, or to the top of the long stake already in place. Rotate the platform. If the pipe does not turn with it, owing to loose fits in the wheel and block, make the necessary alterations so that the pipe will turn with the platform, for a stationary center will cause no end of trouble later, when the concrete is being shaped. At intervals of 60° around the circumference of the wheel drive short stakes as shown in Fig. 2, and nail guide cleats to them, projecting over the surface of the platform, to insure that the wheel will have a horizontal motion.

Make a paper pattern of the bird-bath profile given in Fig. 3. This is done by ruling the paper into 2-in. squares, locating a number of points on the profile in Fig. 3 with the dividers, and then marking similar points on the ruled paper, afterward drawing the profile through the points marked. Trace this on a sheet of tin or sheet iron, either with carbon paper or by cutting the paper pattern out first and then tracing along the edge. The template for the bottom may be cut separately, if desired. Cut the sheet-metal template out with tin snips and smooth with a file. Stiffen the iron with strips of wood nailed to both sides, as indicated in Fig. 2, then nail the template to the tall cleat at the side of the wheel at the proper distance from the center, allowing ¼ in. between the bottom of the template and the top of the wheel for clearance. The wheel is then ready for use.

Get some sand of the quality used for good concrete work and screen it through ⅛-in. mesh. A wheelbarrow makes a very convenient receptacle for the sand when screening, a hoe handle or similar tool being used under the screen as a roller, as in Fig. 4. On top of the platform, build a pile of moist sand and shape it to the contour

Fig. 2, Setting Up Template on Wheel; Fig. 4, Screening Sand for Concrete and Bowl Mold

of the inside of the bowl, as shown in Fig. 5 and the dotted lines in Fig. 3. Pat over the sand core a small quantity of cement, and allow this to harden.

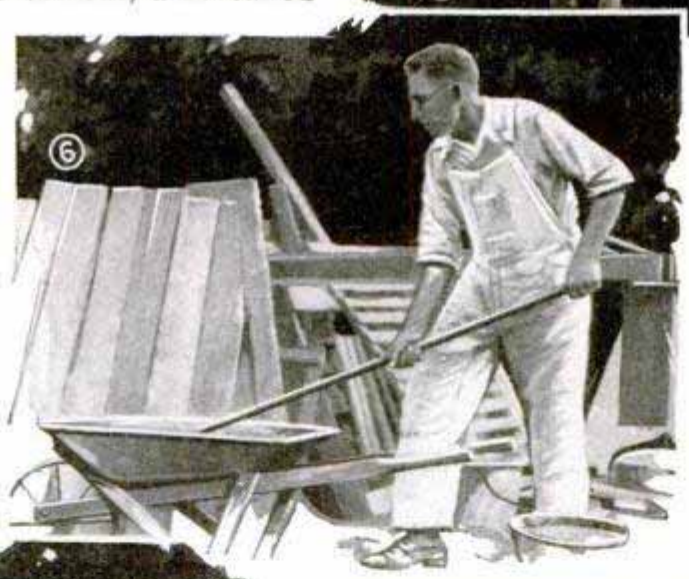
For turning the bowl, a fair quantity of concrete, mixed in the proportion of two parts sand to one of cement, may be stirred wet in the wheelbarrow, as indicated in Fig. 6, but for the column only a small quantity at a time should be wetted. The addition of a small quantity of slaked lime to the concrete makes it more plastic and easier to work. Now cover the sand with concrete, mixed wet enough to be handled easily but not sloppy, turning the platform slowly while doing so. The concrete, of course, settles outward, and consequently it must constantly be pressed upward with the hands until it has stiffened enough to hold together. A trowel, thrust between the tem-

plate and the bowl, helps in this operation. If trouble is encountered, due to the material breaking away from the mold during this process, keep the main body of the material back from the template about ¼ in., then, when this has set, plaster with thin concrete and turn against the metal. The hands, rubbed over the surface as in Fig. 7, will smooth the work very well.

The photo, Fig. 7, shows a part of the column being turned with the base, but the writer found it advisable to cut the column away, down to the molding under the bowl. The bowl, allowed to harden, was then removed from the platform and pipe, and the base and the whole column were turned together.

In order to do this, the template, of course, was removed from the stake and reset upside down, taking care to get it in the same relative position as before.

For the column, use a mixture of one part sand to one part cement, a so-called "rich" mixture. If, as the column is built up, nails are stuck freely into its surface, much of the falling away of the material will be avoided. A small trowel, held between the surface of the work and the template, will be found useful in smoothing the concrete. When the column is finished, stand it, upside down, on the bottom of the bowl and model out the swell at the top of the column to meet the molding. As the work is upside down, this, of course, means that the swell is at the bottom of the column while the modeling is being done. A scraper made from thin wood is useful in doing this work.



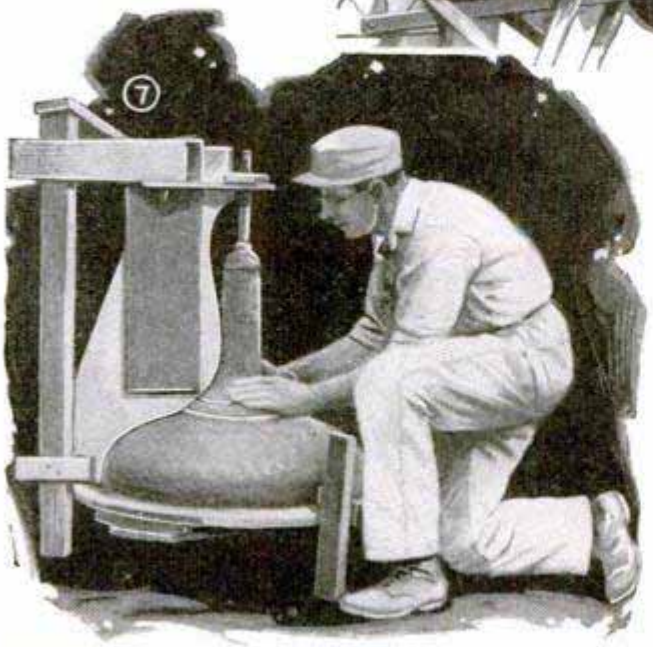


Fig 5, Shaping Bowl Mold; Fig 6, Mixing Concrete; Fig. 7, Smoothing Bowl Surface

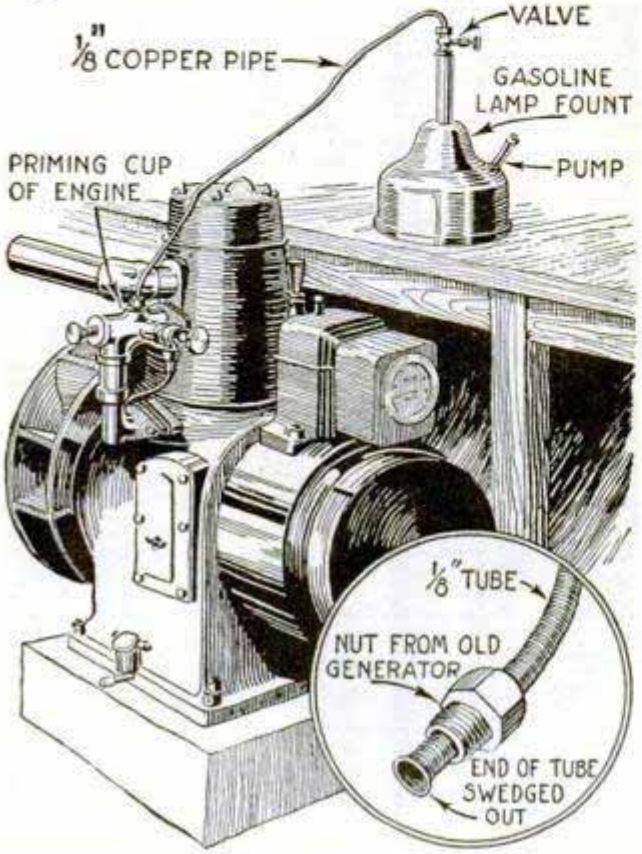
When the concrete has thoroughly hardened, the bird bath is ready to be set up. Smooth off the inside of the bowl and build up a more or less symmetrical mass of concrete around the projecting pipe, to hide it; this forms a small "island" in the center of the bowl. Lastly, round off the rough edge of the bowl with a rasp. The finished bath is shown in the headpiece of the article.

Driving Finished Work without Dogs

Some small pieces of finished work which it is not advisable to drive with a dog but on center of a lathe, can be driven to advantage by means of a length of belt lacing, passed around the work two or three times and tied securely. The free ends are passed through opposite slots in the faceplate and tied together. This will not mar the work or take up as much room as a dog driver.

Priming the Lighting-Plant Engine

The method of priming the farm-light engine shown in the drawing, while not



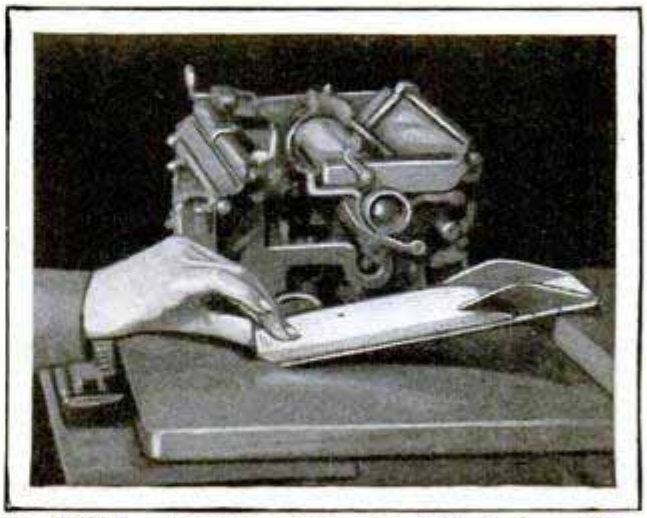
Gasoline-Lamp Fount Equipped with an Air Pump Can Be Used to Prime Gasoline Engine

automatic, keeps a large quantity of gasoline under pressure so that the engine can readily be primed by simply turning a valve, and thus avoids the trouble incident to the common method of priming.

The container consists of the fount and stem of a gasoline lamp, which is quite common in rural homes. The kind having an air pump built into the fount is the best for this purpose, but is not absolutely necessary. Remove the shade holder, air mixer and all the top parts until only the upright and valve are left. Locate the fount at any convenient point near the engine, either above or below it. Saw off the swedged end of a generator and remove the nut. Then arrange a suitable length of ⅛-in. copper pipe to reach from the lamp valve to a point just over the top of the engine priming cup. Place the generator nut on the tubing and swedge out the end of the latter with a blunt-nosed tool to resemble the generator end as much as possible. Insert the swedged end in the lamp and fasten it in place with the nut, just as though you were putting in a generator. Fill the fount with gasoline, see that the valve is closed, and pump up a good head of air pressure. See that all plugs and connections are air-tight. If this is not the case, smear the threads with soap before threading home. To prime the engine it is only necessary to turn the lamp valve. The air pressure in the fount will force gasoline through the tube to the priming cup. A few seconds only will be necessary for this and the valve can then be shut off. If the engine slows down on the first priming, the valve can just be cracked open and the gasoline allowed to drip into the cup until the engine picks up from its own fuel supply. A fount of gasoline should last for more than a month for priming purposes, and, if all connections are made air-tight, the pressure will hold for a week or ten days without pumping.—L. B. Robbins, Harwich, Mass.

Holder for Cards Aids Typist

A holder for cards that are to be picked up quickly for use in a typewriter or for other purposes can be made in a few minutes from the top or bottom and one of the sides of a cigar box. The angle for cutting the boards used as stops at the back of the holder may readily be determined by placing fifty or more cards in a pile with the ends overlapping each other. A small quantity of glue and two or three small nails will hold the stops securely.—Herbert C. Crocker, Edwardsville, Ill.



Card Holder, Made from Cigar-Box Wood, Saves Time for the Typist

¶When filing solder, a little machine oil will prevent the teeth of the file from clogging with the soft metal.

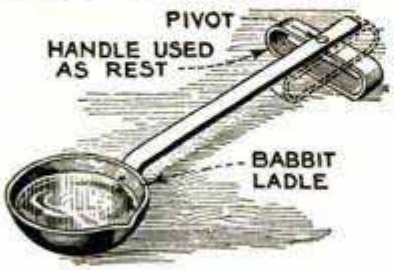
Wooden Structure, Made of Two-by-Four Framework and Ordinary Shiplap, Which Is Nailed on the Inside, Has Served as a Silo at a Fraction of the Building Expense

Cheap Homemade Silo

It was necessary to build a silo on our farm, but, as the cost was prohibitive to us, we decided to build a large bin or shed to hold the ensilage. It was made of 2 by 4-in. studs and rafters, while shiplap was used for the sides. Contrary to the usual procedure, however, we placed the studs on the outside. This method prevented the shiplap from loosening and perhaps coming off, owing to the weight and pressure of the contents, as would have been the case if it were nailed to the outside. Pegs were also driven into the ground and suitable bracing provided to prevent the bottom from spreading. In addition, a few braces were placed against the middle of the studs. In a silo of this kind it is necessary to pack the ensilage well, as the bin does not have the depth of a regular silo. The cost of this silo was only $47.50. If desired it can be dismantled and stored. —W. E. Smith, Thief River Falls, Minn.

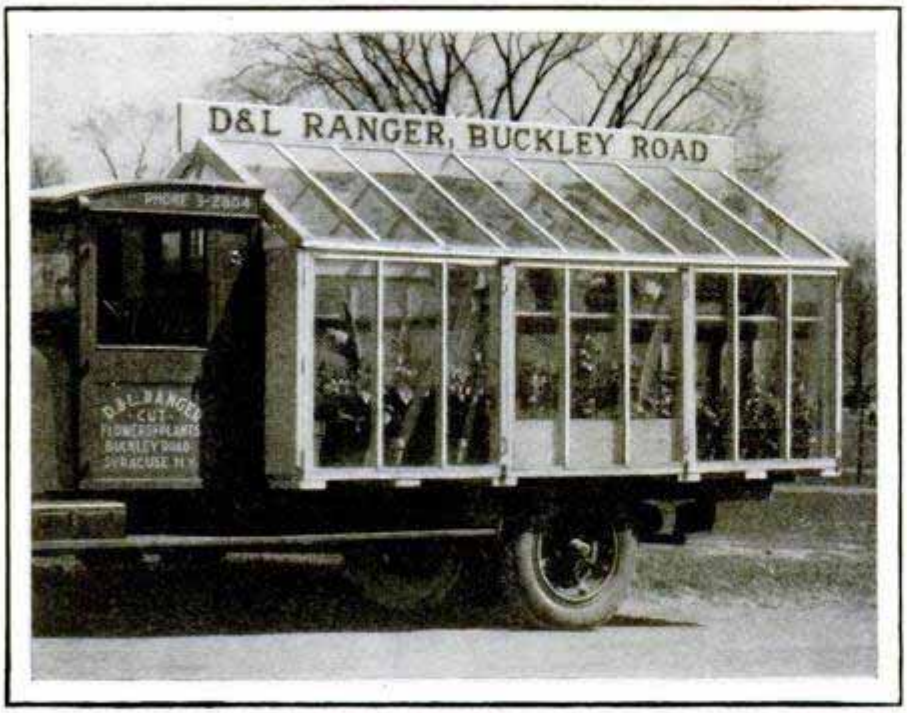
Handle Rest for Babbitt Ladle

It is often necessary to set a babbitt ladle down for a moment while resetting the work. The ordinary bowl-shaped ladle does not rest level unless it is packed up, but as babbitting always leaves little time to spare, I devised a rest to attach to the handle. I find this not only ideal for the purpose, but it also serves as an extra handle, allowing a firmer grip. The leveler consists of a piece of tubing, flattened to an oval shape and pivoted to the ladle handle with a rivet. When I am carrying the ladle or pouring the metal, the rest is in line with the handle, and if I want to set it down, I give the attachment a quarter turn to form a rest as shown in the drawing.—Harry Moore, Hamilton, Can.



Pumping Clean Water from a Cistern

Clean water may be drawn from a cistern in the following manner: Use a rubber hose instead of the lead pipe and attach a block of wood a little above the lower end to keep the end of the hose under water. The wood will float and keep the hose end just under the surface at any level of the water.



Auto Greenhouse Carries Flowers and Displays Them at the Same Time; the Outfit Did Much to Promote Sales

Flower Shop on Wheels

Considerable increase in the sale of flowers was experienced by an eastern florist, after he had made his delivery truck into a "flower shop" on wheels, as shown in the photograph. A large, sturdy truck was used for this purpose, and the framework of the shop was made of wood, especially braced to endure the jars of traveling. The top and sides were, of course, inclosed with glass. The truck facilitated moving the flowers from the greenhouse to the florist's shop.—H. L. Wheeler, Syracuse, N. Y.

Unwinding a Coil Spring

An old machinist saw one of the boys in the shop trying to straighten a coil spring with a screwdriver and a hammer on the bed of his lathe, so that he could rewind the wire to make a spring of smaller diameter than that of the original one. Telling the young fellow to "fetch the spring" over to his workbench, he took it and clamped one end in the vise, inserted an iron rod in the spring and then walked backward, unwinding the spring as he went, holding the rod at both ends. Although the wire was not made perfectly straight, it was in condition to be rewound. Besides the unhandiness of the method first employed, it was hard on the lathe. The bed of a lathe is not an anvil, and it should never be used for that purpose.

Emergency Router

On a repair job, a carpenter sometimes runs into work where he could use a router to advantage. Should he have none in his tool box, a router can easily be improvised by taking the plane bit out of a small wood plane and using a narrow chisel instead. Set the chisel edge to the right depth and tighten the wedge just as when adjusting a bit, and the router is ready. It takes only a few minutes to make the change, and this emergency tool will do better work than could be done by cutting the wood by the use of a chisel and mallet.

Cutting Wire Lath for Gables

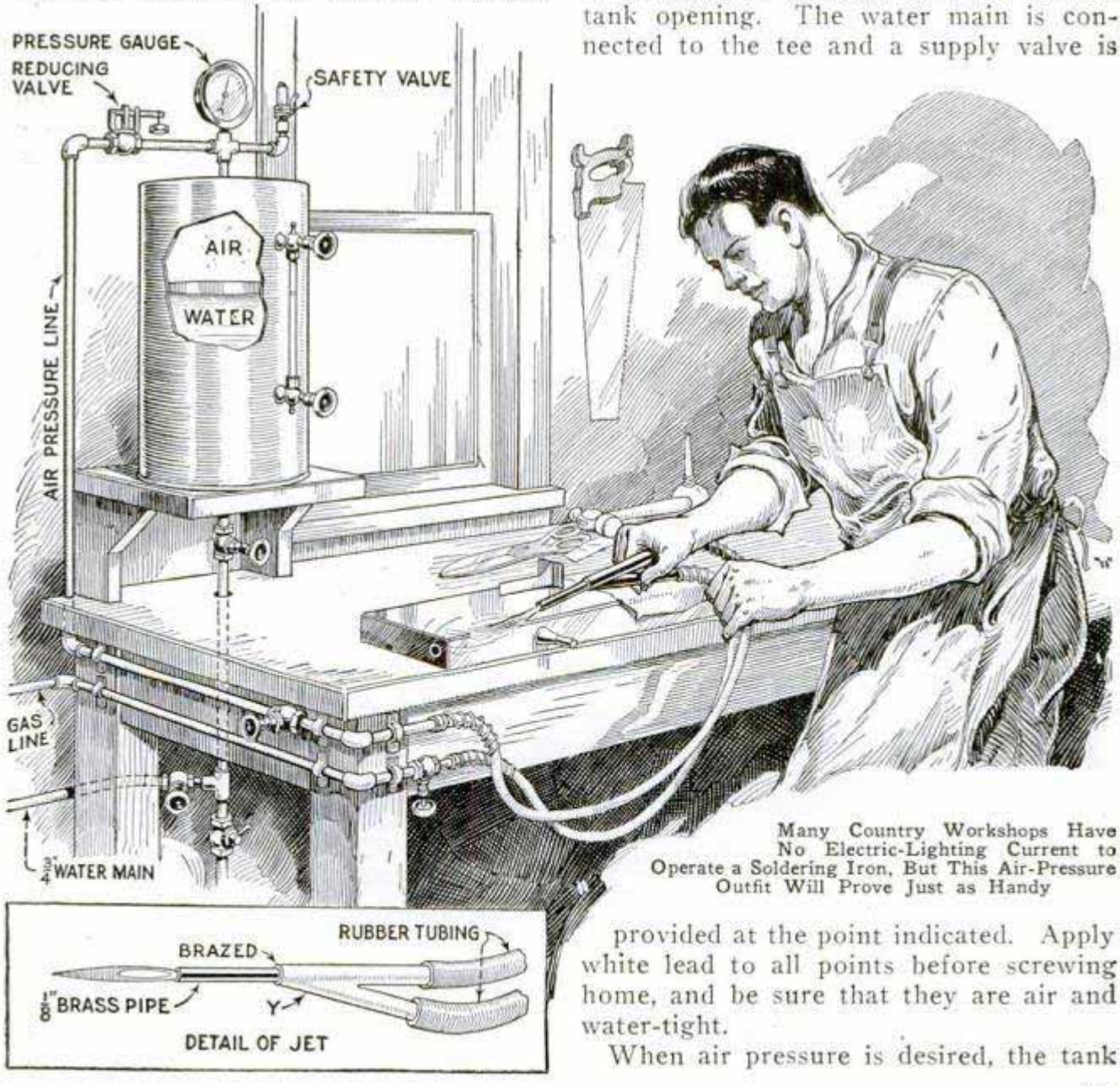
Much labor is encountered when wire-lathing gables, owing to the fact that the lath must be cut at an angle on both sides. If the cutting is done on the scaffold and full-length pieces of the lath are used, it is slow work and rather hard to handle. To avoid this difficulty, cut the pieces short as shown in the drawing, being careful that they are cut to conform to the inspectors' requirements. The pieces left over can be saved for use on the gable at the other end of the house, so that there will be no waste. The lath can be cut on the ground and brought up, and full pieces can be lapped onto the square ends of the angle-cut parts. Any further cutting will be straight across the pieces which is much easier.—Robert Page Lincoln, Minneapolis, Minn.

Pneumatic Soldering Plant for the Shop

By L. B. ROBBINS

MANY workshops are located in the country where electrical house-lighting current is not available and, for this reason, an electric soldering iron cannot be used. However, by utilizing the water system to compress the air, a serviceable soldering torch can be cheaply made, burning either commercial gas or gasoline. The air pressure can be regulated to suit various conditions, and a small or large flame can be produced. The torch will be suitable for large and small work, except where a flame cannot be handled safely.

The pressure tank may be an expansion tank of the kind found in hot-water systems. It should test to 75 lb., and is conveniently mounted on suitable wooden brackets or a shelf, near the workbench. The air line, consisting of pipe and a suitable length of armored-rubber hose, is provided with a safety valve, pressure gauge, pressure-reducing valve, and a shut-off valve, arranged as indicated in the drawing. The gas line is run to the same point on the bench as the air line, a shut-off valve and a length of armored-rubber hose being also provided in this line. The lengths of hose are connected to the soldering torch, which is made from a piece of ⅛-in. brass pipe brazed into the end of a brass "Y." A straight length of pipe, provided with a shut-off valve at one end, a cock at the other, and a tee cut in between, is screwed into the bottom tank opening. The water main is connected to the tee and a supply valve is provided at the point indicated. Apply white lead to all points before screwing home, and be sure that they are air and water-tight.



Many Country Workshops Have No Electric-Lighting Current to Operate a Soldering Iron, But This Air-Pressure Outfit Will Prove Just as Handy

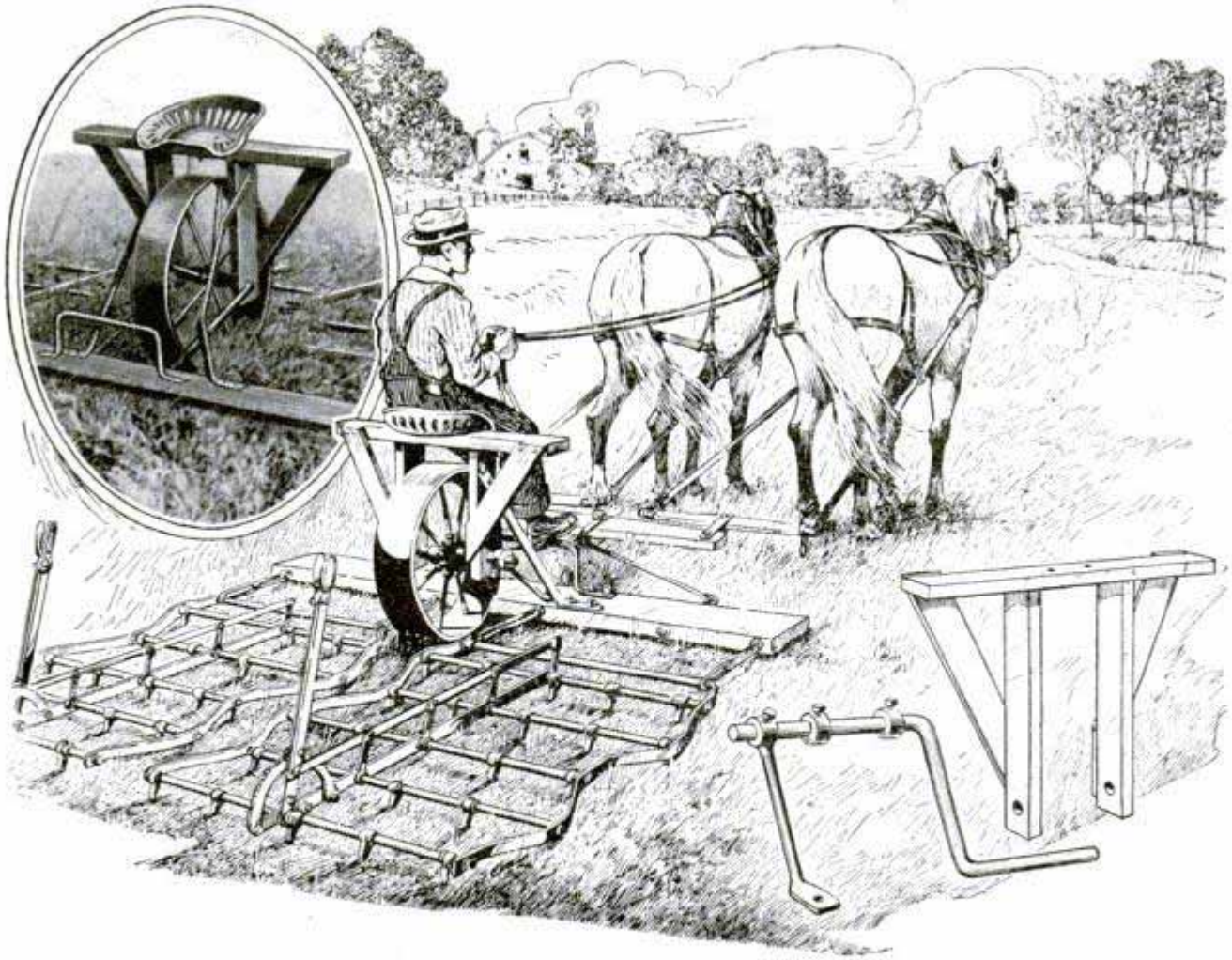
When air pressure is desired, the tank

must first be drained by opening both valve and cock in the drain line and closing the supply valve. Then close the cock and open the water-supply valve. As the tank fills with water, the air above the water level is compressed. If the tank is capable of safely holding 75 lb., you will have a good reserve. Do not allow the water level to rise above the water glass, as it may then get into the air line. The required air pressure can be obtained by adjusting the reducing valve on the air line. With sufficient water and pressure in the tank, the air can be drawn out as desired, by opening the air valve. When the air pressure in the tank drops too low for use, the tank must again be drained and refilled as before. One filling, however, at 60 lb., will provide air at 15 or 20-lb. working pressure for a long time. Be sure that the safety valve is set to open before dangerous pressure is reached. Suitable small soldering jets can be made from ⅛-in. brass pipe. A valve in each line will give positive pressure control at the jet and allow adjustment of the flame.

Where commercial gas cannot be obtained, gasoline will serve as fuel by utilizing an old gasoline lamp so common in thousands of homes. Simply connect the fuel opening of the jet to the lamp outlet pipe and inject the gasoline in the jet through the generator tip used in such lamps. By preheating the end of the jet and then turning on both the gasoline and a small quantity of air, a Bunsen flame will result when the jet is lighted, and the size of the flame and its intensity can be regulated by the valves.

Seat for the Harrow

A harrow having no seat can be provided with one as shown in the drawing. The seat support is made of 1 by 6-in. and 2 by 6-in. wood, securely nailed together as indicated in the lower right-hand detail. Two holes are drilled through the lower end of the 2 by 6-in. uprights to accommodate the axle of an old wheel,

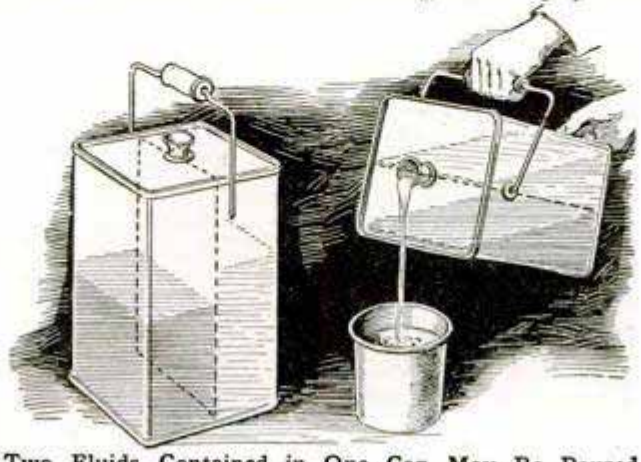


Seat for Harrow Enables the Driver to Work in Ease and Comfort; It Is Easily Improvised from Materials to Be Found on Farm Scrap Heap

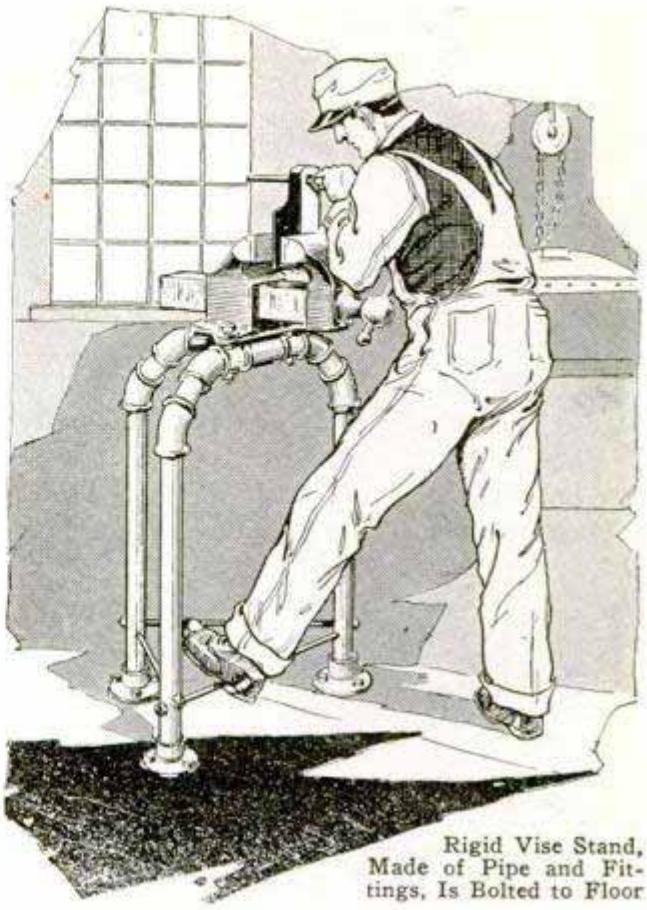
which can be taken from some discarded implement. Part of an old cultivator, with collars and a brace added as shown, is used as an axle for the wheel. It is securely fastened to a 2 by 6-in. "draw plank," which is attached to the front of the cultivator. Additional flat-iron braces are provided to hold the seat support rigidly to the draw plank, and a footrest, made of ½-in. iron rod and bent to the shape indicated, is also attached to the draw plank. An iron seat from a discarded implement is fastened to the support in the most convenient position for the driver. In use, the wheel rests on the ground, and when the horses are walking, the draw plank is raised from 2 to 4 in., while, at the standstill, it rests on the ground.—Willis Mehanna, Bussey, Iowa.

Pouring Two Liquids from a Single Spout

Two liquids of different strength are held in one can at the same time by a cleaning company that finds this method quickest and best to avoid mistakes. To outward appearances the can is much the same as an ordinary square 5-gal. oilcan with a spout in the center, and to anyone not in the secret it seems mysterious to see two different-colored liquids issuing from the same spout. The secret lies in a partition that divides the can in two halves. Anyone desiring to make a similar container can do so by taking a square can and providing a piece to fit in the center, leaving it projecting above the top a little. Next, two pieces are cut out for the top, each having half a hole in one side, and lastly a funnel spout is made and all the parts are soldered together. To pour either liquid, the can is held with the part containing that liquid on top. When filling the can a funnel is used to direct the liquid into the proper half and the can is never filled quite to the top. When the can is tipped to pour, the liquid in the lower half is below the spout and does not come out.



Two Fluids Contained in One Can May Be Poured Separately without Mixing

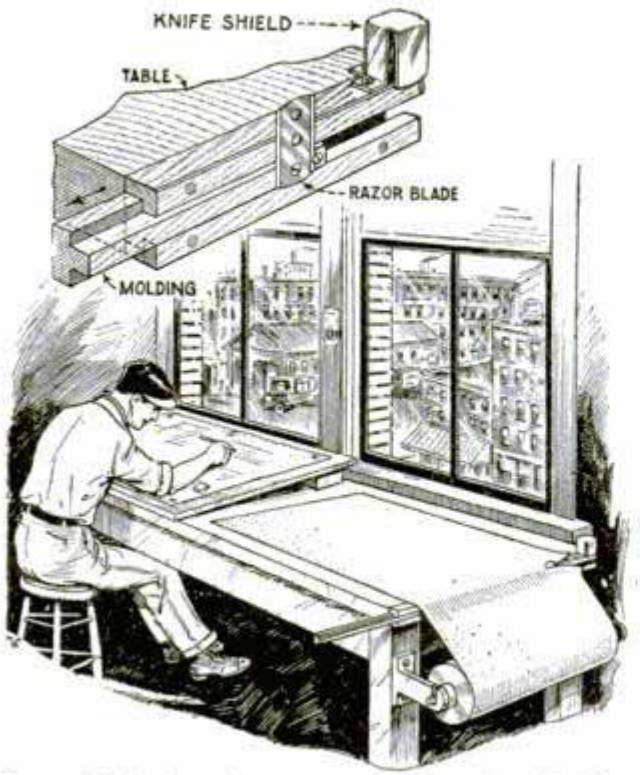


Rigid Vise Stand, Made of Pipe and Fittings, Is Bolted to Floor

Pipe Support for Heavy Vise

It is sometimes objectionable to support a heavy vise on the workbench as the vibration caused by its use may make it difficult for others to work at the bench. To overcome this trouble, a separate stand for the vise, made of pipe and fittings, was provided as shown. The stand has three legs, fitted with flanges, which are screwed or bolted to the floor. Additional strength is obtained by braces of ¼-in. iron rod. A number of elbows, couplings, nipples and a T-fitting are used to form the upper end of the stand, and the vise is bolted on top. When making the stand, start by fitting the top pieces together, then screw on the legs, brace them, and attach the flanges.

¶It is provoking to try opening a window at night for ventilation and find it frozen to the sill. This can be prevented by sprinkling a little salt on the sill every time the window is closed.



Razor Blade Attached to Simple Slide Cuts Drafting Paper Straight

Device for Cutting Drafting Paper Squarely and Quickly

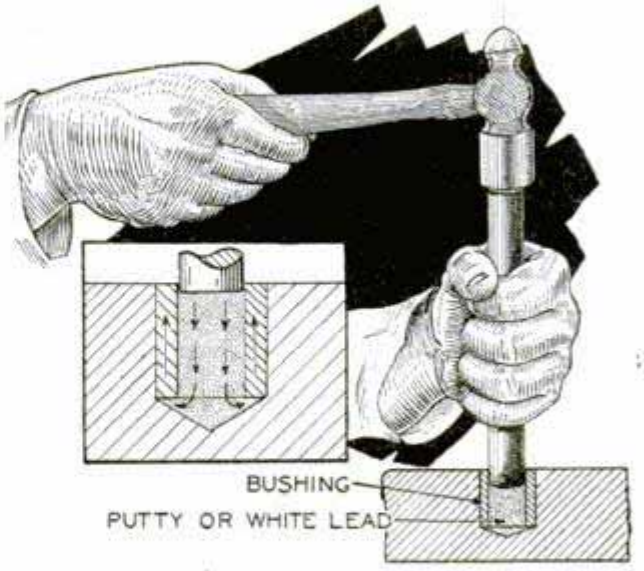
It is difficult to cut a piece of drafting paper from a roll squarely with a pen-knife or scissors, and many rough edges have to be removed, the total being quite considerable in a large drafting office. The trouble can be overcome by providing the cutting device shown in the drawing. Two lengths of ½ to ⅜-in. rabbeted mold are tacked to the end of the drafting table to which the roll of paper is attached. Another length of molding, rabbeted on both sides and fitting in the rabbets of the two other pieces, forms a slide. A safety-razor blade is screwed to the back end of the slide in the position indicated in the detail, so that it projects just above the surface of the table. The slide should be a little wider than the other two pieces so that it can be moved back and forth and the razor blade will not bind or cut the upper rabbeted piece. A length of drafting paper is drawn from the roll and cut squarely and rapidly by pulling out the slide which carries the blade. When not in use, the blade is pushed into a small sheet-metal guard in the shape of a box. This avoids the danger of cutting one's hands when unaware of the sharp blade. Additional precautions should be taken by setting the table on which the cutter is mounted, against the wall, as shown.—S. A. Marshall, Jr., Rome, Ga.

How to Harden Chalky Plaster Walls

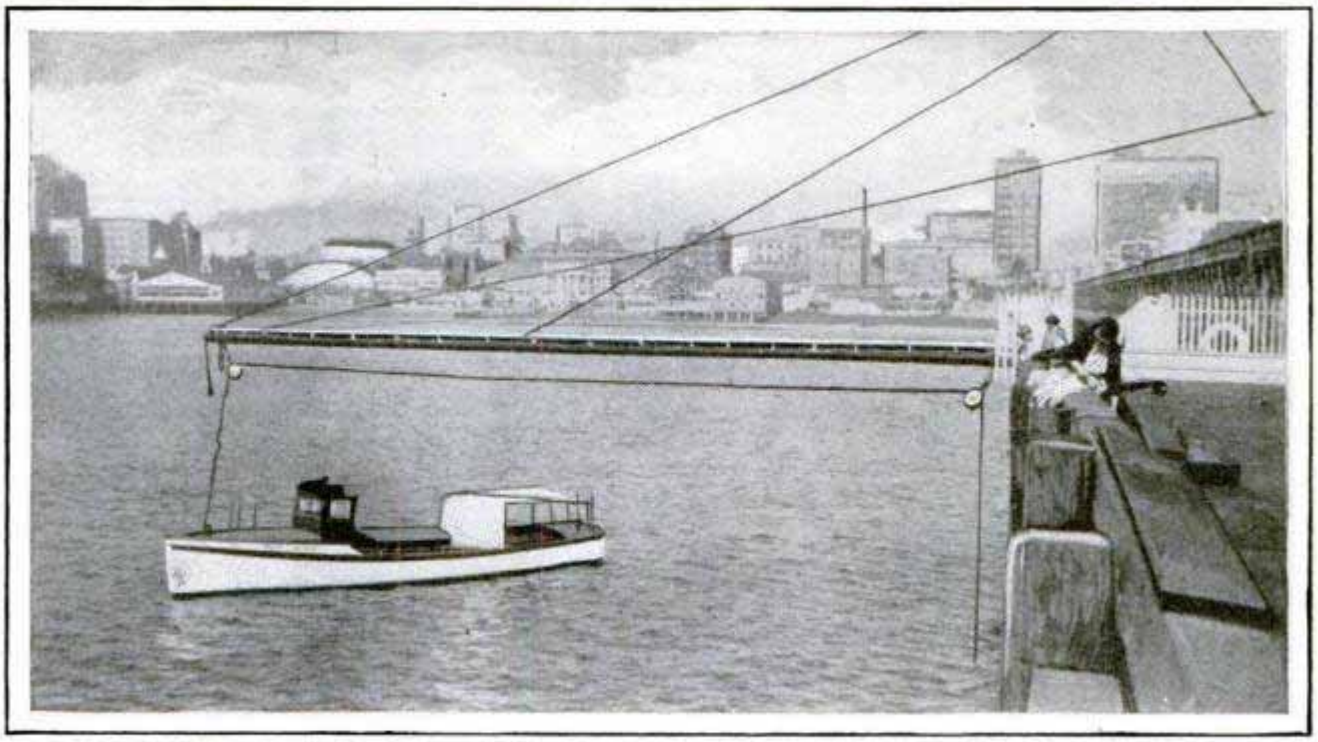
Plaster walls sometimes appear soft and chalky, which is not a good condition for the application of paint. In such cases it is, of course, necessary to harden the surface. A practical method of doing this is to dampen the wall with clean water, which is applied with a brush. When the wall has dried, the plaster will be hard. Although it may cause some delay in finishing the walls, the work is well worth while as the foundation of any painting job must be right if it is to be permanent.

Removing a Bushing

To remove a bushing in a hole that is not drilled through, is often a difficult task. A practical and novel method is to fill the hole with some plastic medium such as white lead or thin putty. A shaft, the diameter of which is just a fraction smaller than the inside diameter of the bushing, is held in a vertical position in the hole, as shown, and a sharp blow is directed on the top of the shaft. This will cause the plastic substance, under compression, to force the bushing out as illustrated in the insert. If the shaft is a good fit in the bushing, heavy oil may be used instead of the white lead or putty.—Joseph W. Kelly, Brooklyn, N. Y.



Easy Method of Forcing a Bushing Loose by Means of Putty or White Lead



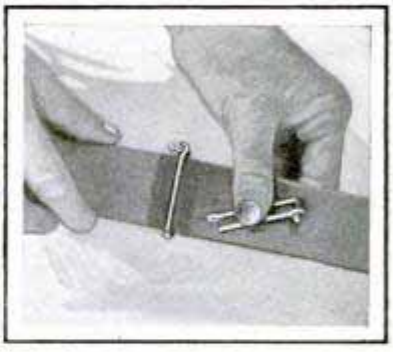
Practical Method of Mooring a Small Motorboat to a Dock in a Harbor Which Is Affected by Tide; a Walk Is Provided on the Boom, the Latter Being Securely Attached to the Dock and Braced by Guys

Mooring Motorboat to Dock

When a small boat is tied to a dock in a harbor affected by tide, the rope is tight when the tide is out, and loose when the tide is in. In the latter case the boat is free to drift around and bump against the dock, which is, of course, not desirable. This difficulty was overcome, in one instance, by using a large boom, extended horizontally from the dock as shown in the accompanying photo. Pulleys are attached, as indicated, to hold a rope, one end of which is tied to the bow of the boat and the other to a counterweight. In this way the boat is held securely and the rope is constantly under tension, no matter whether the tide is in or out. Being kept away from the dock, the boat will not be damaged by battering against it. A walk was provided on the boom by nailing crosspieces at right angles to its length and laying boards over them. The boom must, of course, be properly supported by guys.—Carlton Groat, Portland, Oreg.

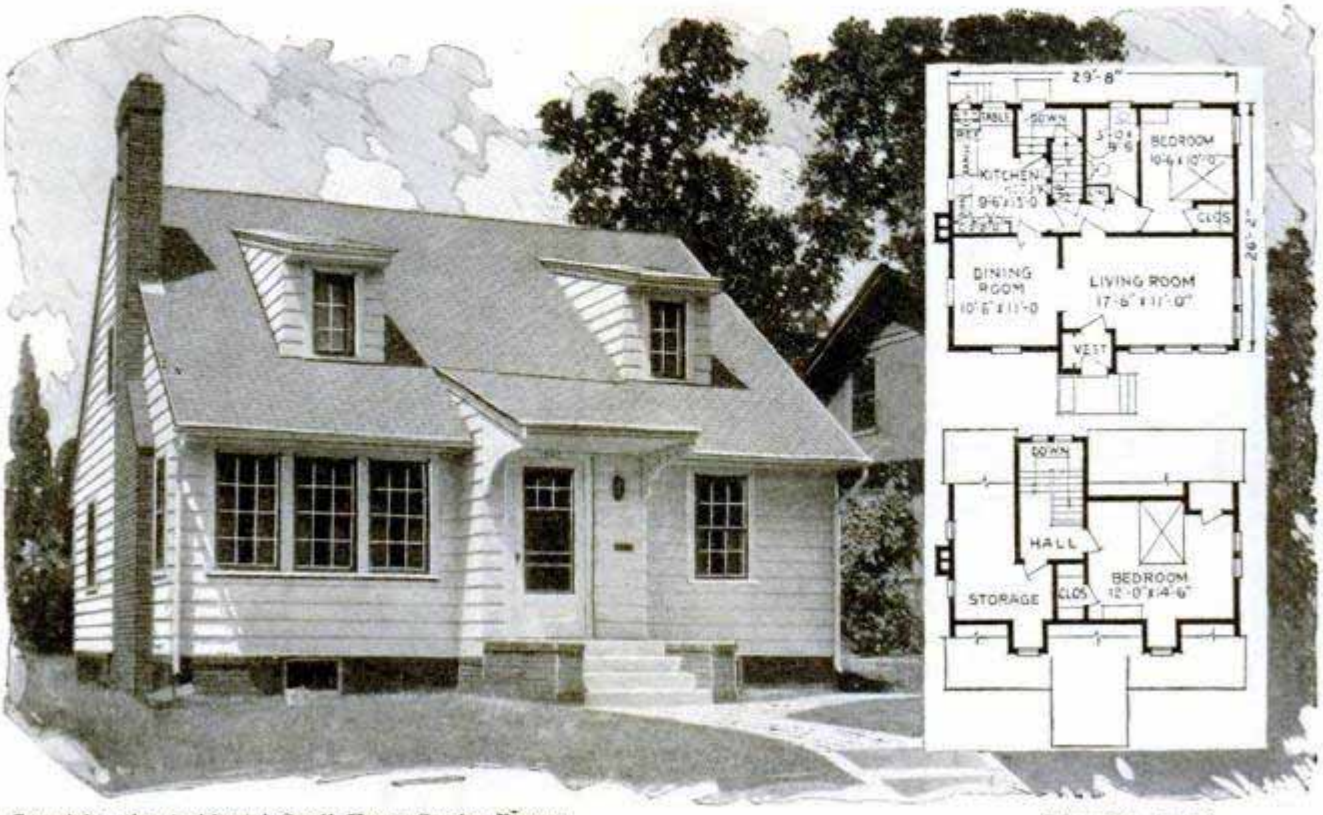
Doubling Length of Emery-Cloth Strips

When using strips of emery cloth torn from the usual 9 by 11-in. stock sheets, greater convenience can be obtained if the strips are joined together. This is particularly the case when circular pieces are being polished and the diameter of these leave but little of the cloth free for the fingers to grip. Two small cotter keys can be used, as shown in the photo, to hold two strips of emery cloth together firmly, without touching the surface over which the cloth is being passed. The legs of one key are bent back to an acute angle with the head. Between the legs of this key the two strips are forced, abrasive faces together. The short ends are then bent out, and the key ends locked with another but shorter cotter key. The latter fits in the troughlike groove formed by the faces of the short ends. The two strips of cloth can be gripped by the ends and vigorously pulled back and forth, the keys holding them securely together. The cotters can be removed from old strips of cloth and applied to new ones.—Frank W. Bentley, Jr., Missouri Valley, Iowa.



¶To refinish tops of automobiles, use brushing lacquer instead of auto-top dressing; the lacquer makes a much better dressing and will not crack or peel.

Is This Your Home?



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Plan No. 4A15

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the United States department of commerce. Blueprints, specification forms, and material lists for the house shown here may be obtained from The Architects' Small House Service Bureau for a small fee. If further information is desired, literature describing the plan service and publications of The Architects' Small House Service Bureau will be sent you upon request. A booklet entitled "50 Ways to Lower Home Building Costs," illustrated by ten Bureau homes actually lived in and showing how as much as $1,000 can be saved on a home, may be obtained for 20c.

THE external appearance of this house suggests the restfulness of the early homes in New Netherlands. It is individual in design and provides a suitable background for American home life.

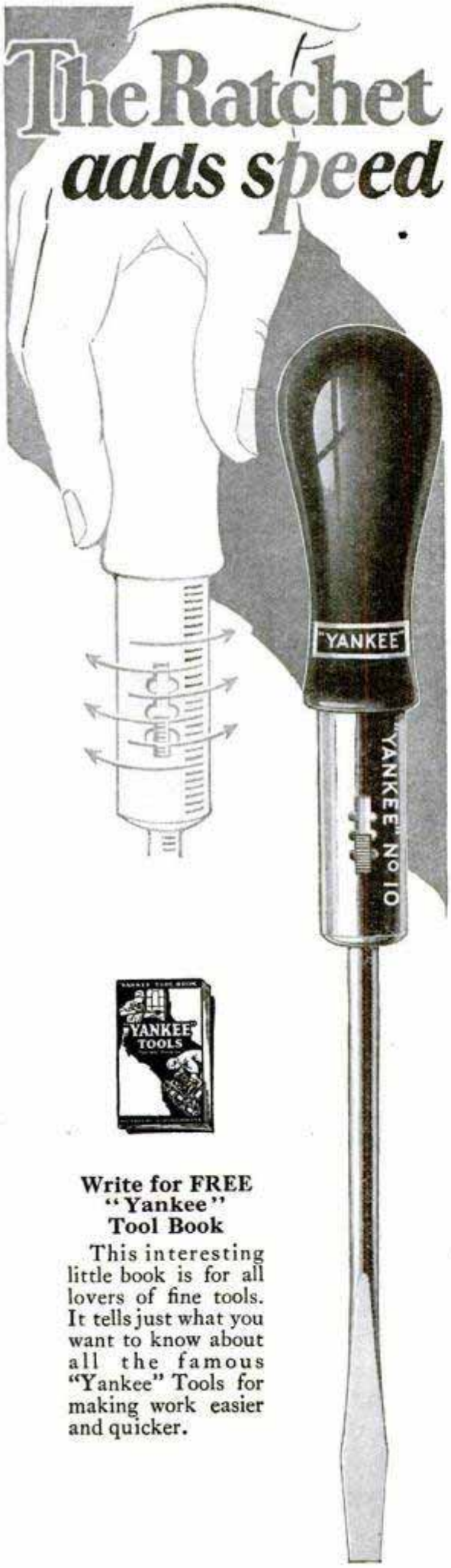
By grouping the windows in one corner of the living room, a sun-room effect is obtained. Another pleasing detail is the hooded entrance doorway with the handsome glazed door, which lights the vestibule. Besides providing space for a useful coat closet, the vestibule serves to shut off objectionable drafts from the living and dining rooms whenever desired.

French doors between the living and dining rooms permit these rooms to be thrown together to make practically one big room extending clear across the front of the house. On the other hand, by closing the doors, greater privacy can be given to the dining room.

The kitchen has been given careful thought. Observe how the designer has provided easy access from the kitchen to the dining room, front door and bedroom section of the house. Each step saved means economy in housework as well as giving the housewife time for other things. The ice box has an outside door for convenience in refilling it. There are a handy broom closet and built-in ironing board in the kitchen. The linen closet, which is also built in, is close to the bathroom. The downstairs bedroom has windows on two sides and a roomy closet.

Here is a compact plan which provides within small space a large amount of room and every comfort and convenience demanded by the average American family. The simplicity of the exterior, as well as of the layout, should insure low costs if this plan is adopted for your home.

The Ratchet adds speed



Write for FREE "Yankee" Tool Book

This interesting little book is for all lovers of fine tools. It tells just what you want to know about all the famous "Yankee" Tools for making work easier and quicker.

Try This "YANKEE" Way of Driving Screws

You just turn to and fro . . . . easy like . . . . without letting go of handle. A slick ratchet movement drives screw home. Right and Left Ratchet, and Rigid. Saves time and strength.

Ask your dealer to show you the "Yankee" Ratchet Screw-driver.

No. 10—With ratchet shifter moving lengthwise with tool. Eight sizes: 2 to 12-inch blades. 8-inch blade $1.20.

No. 11—Same as No. 10, except shifter moves across tool. 8-inch blade $1.20.

No. 15—With "Yankee" Thumb-turn on blade for starting wobbly screws with thumb and forefinger. Six blade lengths, 2 to 8-inch. All blades, 3/16 diameter. 8-inch blade 95 cents.

Some Other "Yankee" Tools

Plain Screw-drivers
Spiral Screw-drivers
Ratches Tap Wrenches
Ratchet Breast and Hand Drills
Ratchet Bit Braces
Automatic Feed
Bench Drills
Vises with Removable Base
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Dealers Everywhere Sell "Yankee" Tools

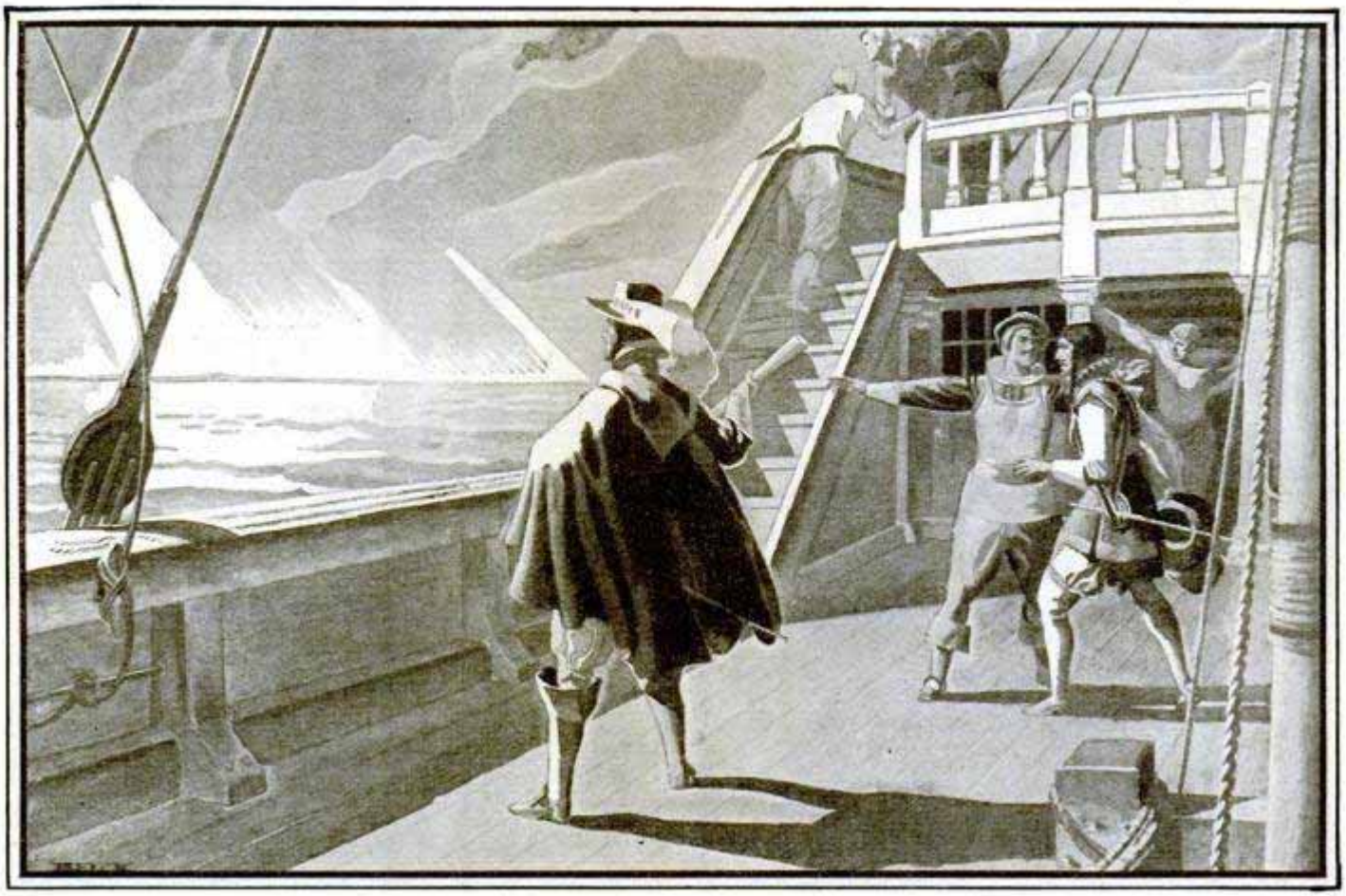
"Yankee" on the tool you buy means the utmost in quality, efficiency and durability.

Look for "YANKEE" on the tool —your protection against imitations

NORTH BROS. MFG. CO., Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics



Widening the Telephone Horizon

An Advertisement of the
American Telephone and Telegraph Company

IN THE memory of many now living, Alexander Graham Bell made the apparently rash prediction that the day would come when we could talk to other countries, even across wide expanses of water. That was shortly after the historic conversation between Boston and Cambridge, a distance of two miles.

Bell's vision was made a reality when in 1926 New York and London spoke together in two way conversation, and when in 1927 this service was opened to the public between any point in the U. S. A. and Great Britain. Since then, Mexico has been brought into speaking distance; important cities of continental Europe have come within the voice horizon of the United States.

Even more important, the Bell System in the United States now embraces 18,500,000 telephones—a growth for the past year of more than 750,000.

We may now converse with each other from practically any point in this country to any other, and may talk beyond our borders and across the sea. That is measurable progress in widening America's telephone horizon.

Your favorite gasoline + ETHYL =

Elimination of "knock"
More Power
Quicker Pick-up
Less Shifting
Cooler Engine

LEADING oil companies throughout the United States and Canada are offering gasoline in two forms. The first is straight motor gasoline. The second is motor gasoline to which has been added "ETHYL" fluid. This superior fuel is called Ethyl Gasoline.

"ETHYL" fluid, containing tetraethyl lead, controls the combustion rate of gasoline, thereby eliminating "knock" and giving added power for tough hills and heavy roads, quicker pick-up and all round better performance. As for high compression engines—they were made possible through Ethyl Gasoline!

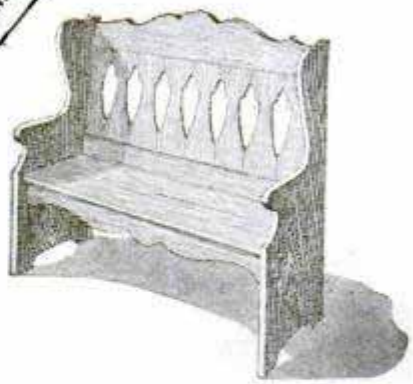
Drive to a pump which bears the "ETHYL" emblem, shown at the right. The price of Ethyl Gasoline will be merely the price of good motor gasoline, plus the few extra pennies the "ETHYL" ingredient costs.

ETHYL GASOLINE CORPORATION
25 Broadway, New York City 56 Church St., Toronto, Ont., Can.

ETHYL GASOLINE

Ethyl Gasoline is the "anti-knock" (high compression) fuel by which other gasolines are measured.

MAKE THEM YOURSELF



PLAN No. 19d PLAN No. 22d PLAN No. 21d

You, too, will say "I didn't think I could do it!"

STANLEY PLANS—*10c each*

AS Spring comes, the man with a knack with tools gets even more pleasure and profit from his hobby. Let us send you the Stanley Plans which show how to make articles like the above—a garden trellis, a garden seat, a 14-foot combination sail- and row-boat.

There are 25 different Stanley Plans. The list is shown in the center of this page. Each plan tells you just how to make the object, covering every step—how to select and cut the wood, how to assemble the job, how to sandpaper, paint and finish it.

To do your best work you need good tools—of course! Practically every carpenter uses Stanley Tools. Manual Training classes, too. Stanley makes the most complete line.

Buy your Stanley Plans from your hardware dealer. If he cannot supply you, write to us. Send 10c for each plan and ask for a free catalog of Stanley Tools. Address: The Stanley Works, New Britain, Conn.

Here is the complete list of the Stanley Plans No.

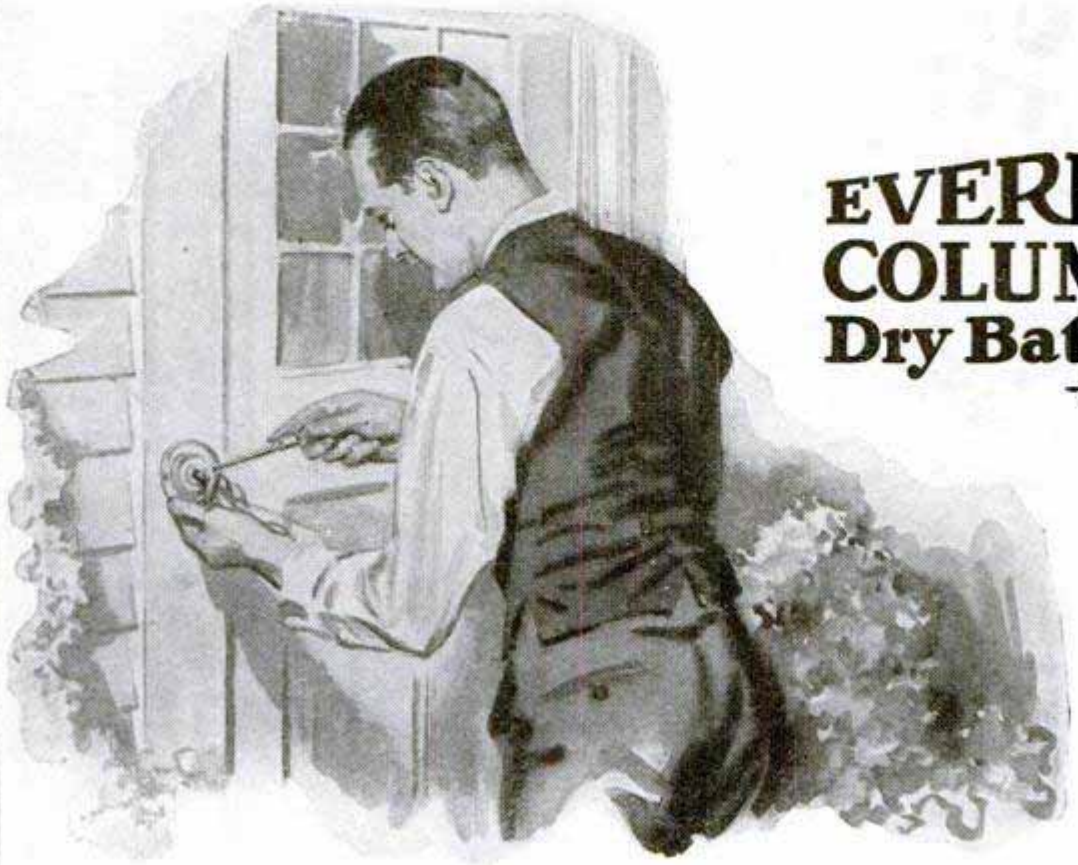
1d—Book Rack
2d—Candle Stick
3d—Pipe Rack
4d—Flower Box
5d—Table Lamp
6d—Toy Automobile
7d—Sconce
8d—Dinner Gong
9d—Bird Houses
10d—Dog House
11d—Book Stand
12d—Smoking Cabinet
13d—Kitchen Cabinet
14d—Sewing Cabinet
15d—Cedar Chest
16d—End Table
17d—Tea Wagon
18d—Model Sailboat
19d—Combination Sail- and Row-boat
20d—Combination Kitchen Seat and Step Ladder.
21d—Garden Seat
22d—Garden Trellises
70d—Small Tool Chest
71d—Large Tool Chest
72d—Work Bench

The best tools are the cheapest to use

Ask your hardware dealer

STANLEY TOOLS

The choice of most carpenters



EVEREADY COLUMBIA Dry Batteries

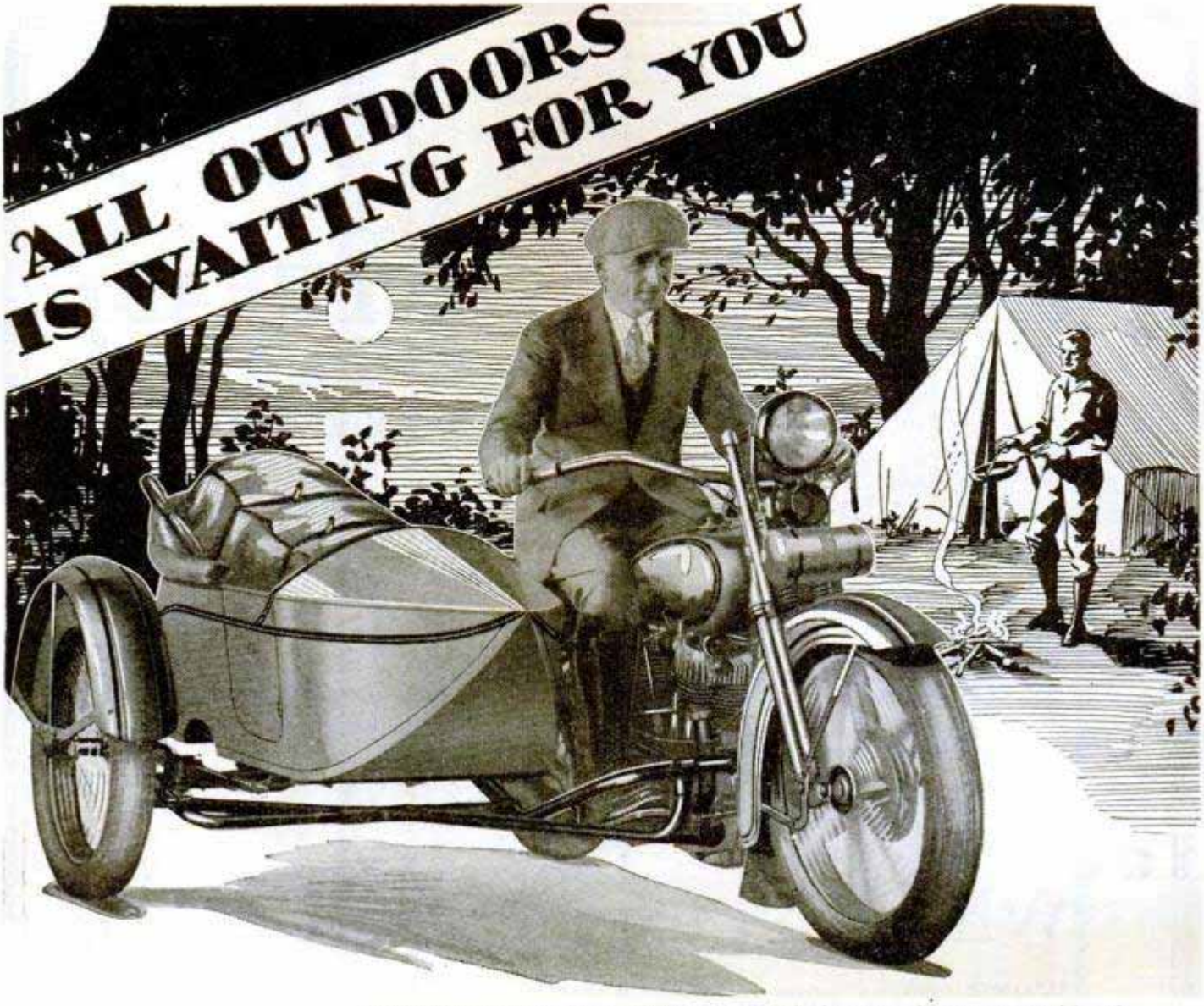
-they last longer

When you fix the doorbell

WHEN you fix your own or somebody else's doorbell or buzzer, put in Eveready Columbia Dry Batteries. They are the ones that last longer and, by their reliability, protect the operation of the things they operate. Electrical engineers, graduates of the big technical schools, know and use and recommend them. Big business houses that count the pennies, buy them. Take a tip from the engineers and the business men and you'll be protecting your own reputation as a fixer. Buy Eveready Columbias.

NATIONAL CARBON CO., INC.
New York UCC San Francisco
Unit of
Union Carbide and Carbon Corporation

FOR RADIO: The only way we can beat the Eveready Columbia is to make a special cell for one specific use. That's what we have done in the Eveready Dry Cell Radio "A," No. 7111. For use on dry cell tubes.



ISN'T there a restless, "Want-to-go" feeling tingling in your blood these days? Memories are carrying you back to that last vicious "strike" when the biggest one got away. He's still there — a year bigger — a year *hungrier*, and waiting for you!

Go there after him on a Harley-Davidson Twin. Crowd your vacation days and week-end trips with added hours of healthy, thrilling sport. Over any highway or trail this famous mount will carry you swiftly, safely and comfortably. Lots of room in the sidecar for a pal and your outfit!

You can easily afford the Harley-Davidson Twin. *Costs only 2c per mile* for gas, oil, tires — everything! Sold as low as $310 f. o. b. factory — on easy Pay-As-You-Ride terms.

See your dealer today. Send the coupon for catalog.

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Mail This Coupon.
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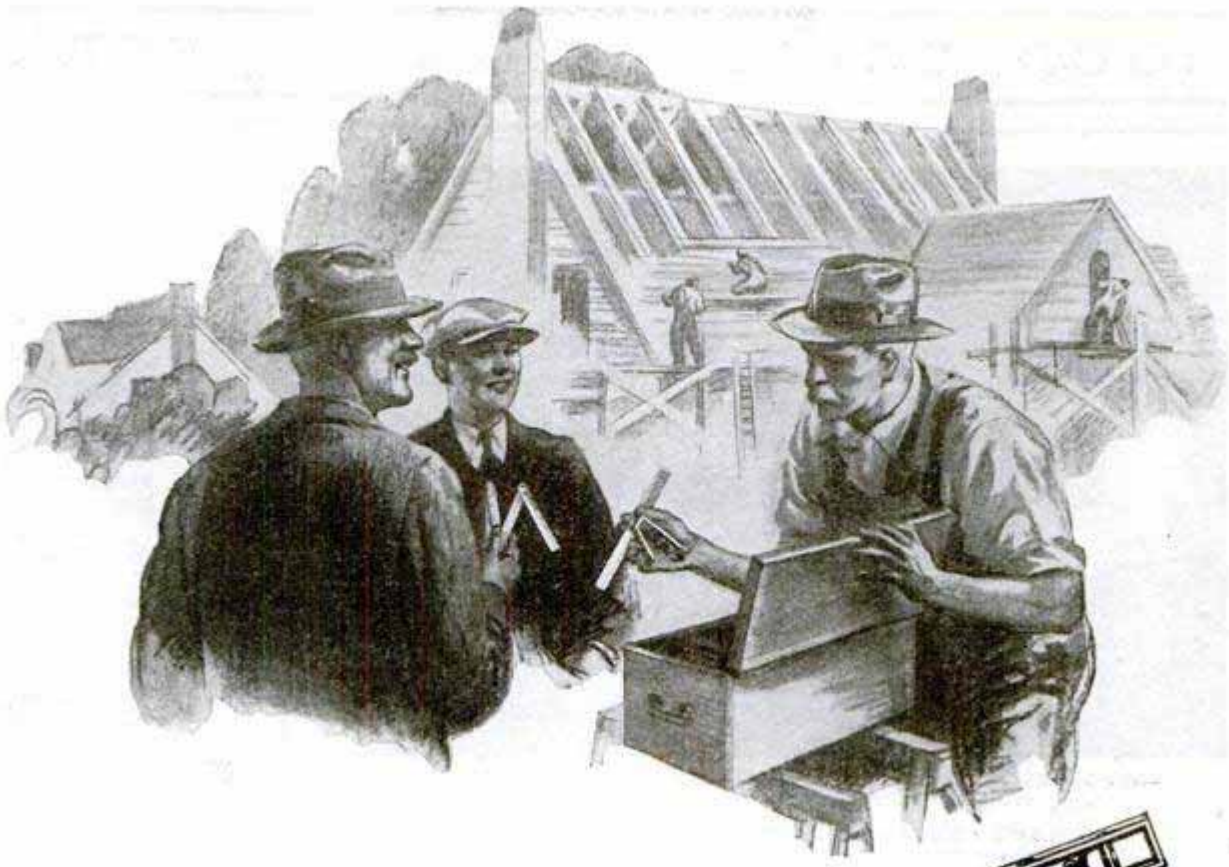
Motorcycles

The most powerful and economical motorcycle of its type ever built. Travels 80 miles per gallon of gas — one cent per mile pays all operating expenses. Costs only $235 f. o. b. factory, completely equipped.

The Single



He uses Starrett's too—!

Everywhere good, accurate work is done you'll find Starrett Tools helping to do it better, quicker, easier.

Every Starrett Tool has back of it all the skill and experience of the world's greatest toolmakers. Make sure of the quality of materials and workmanship, the lasting accuracy and resistance to wear that is in every tool bearing the Starrett name.

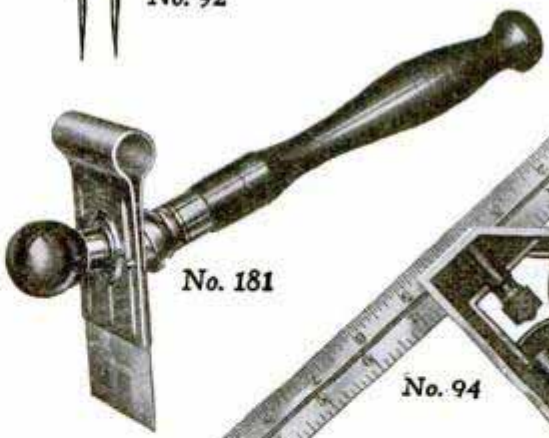
Here are a few of the 2500 or more fully illustrated and described in the Starrett Catalog — No. 132 Bench Level with double plumbs; No. 530 popular priced Steel Tape; No. 92 Dividers; No. 181 Floor Scraper; No. 94 Combination Square; No. 470 Stair Gage Fixtures.

Your tool dealer will gladly show you Starrett Tools. Write us for free Catalog No. 24 "AP".

No. 132

No. 530

No. 92



No. 181

No. 94

No. 470

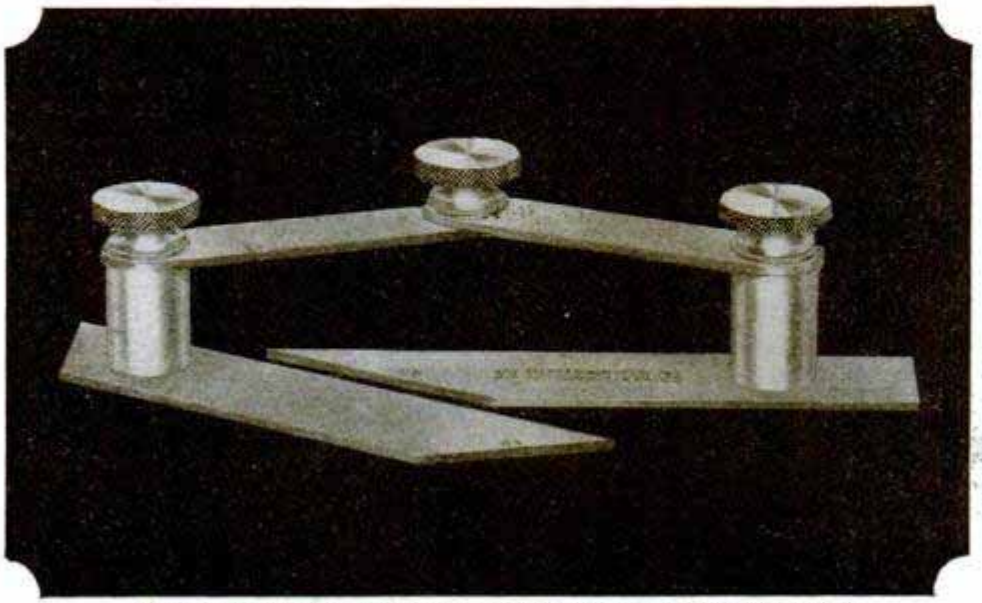
THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

Use Starrett Tools

1651

GOOD TOOLS DO GOOD WORK



Shown above is the new Improved Combination Bevel No. 502 with blades that can be set at any angle.

The posts give a clearance for straddling projections up to 7/8" high. Lines may be scribed or drawn the full length of blades and unobstructed vision is obtained at any setting.

Illustration about 1/2 actual size.

Any Angle — *Easily Quickly*

The New No. 502

for Mechanics — Draughtsmen Patternmakers — Toolmakers

Adding a new BROWN & SHARPE tool means providing new and better methods in mechanical work. Improved Combination Bevel No. 502 simplifies the operations of laying out and transferring angles.

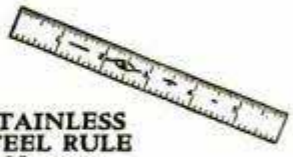
Special clamp nuts permit a uniform tension that holds blades firmly in any position—or they can be clamped securely if desired. Unobstructed view of blades at any setting is another feature this new tool gives you.

Have your dealer show you this new bevel. Add it to your equipment—you'll find its handiness a frequent help.

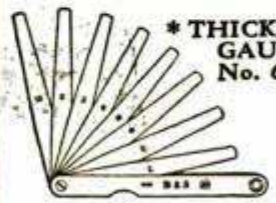
Get a copy of Brown & Sharpe Catalog No. 30 from your dealer. It lists over 5000 items, including 2300 machinists' tools. Dept. P. M., Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE TOOLS

* PLANER AND SHAPER GAUGE No. 265



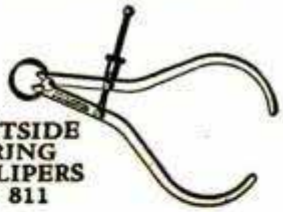
* STAINLESS STEEL RULE No. 350



* THICKNESS GAUGE No. 648

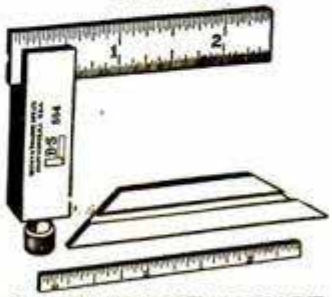
* DIE MAKERS' SQUARE No. 552

No. 438 * COMBINATION SET



* OUTSIDE SPRING CALIPERS No. 811

* SCREW PITCH GAUGE No. 630

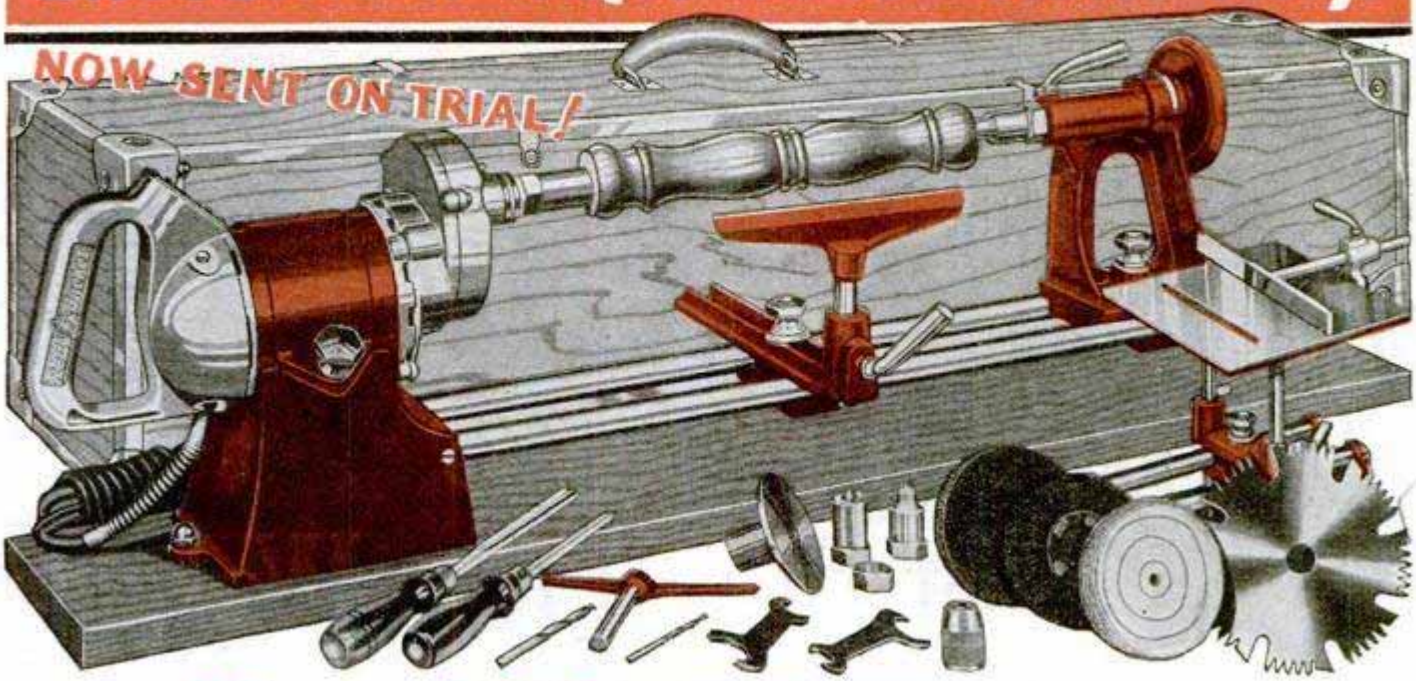


* ADJUSTABLE SQUARE No. 554

* *A description of this tool appears in Catalog No. 30*

"WORLD'S STANDARD OF ACCURACY"

The Modern Craftsman's Wonder Shop



New 1928 Red Jacket Assembly

Five Thousand Red Jacket Craftsmen have made a bargain possible for you

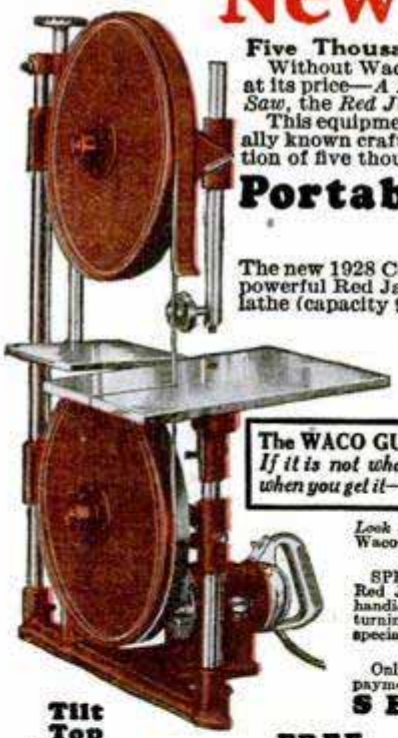
Without Waco sales volume, no manufacturer could give the equivalent of *"Waco Shop No. 12"* at its price—*A Red Jacket Master Drill*, the *Waco Craftsman's Lathe*, the *electric power tools*, the *Jig Saw*, the *Red Jacket Band Saw*, or the Crafts Courses.

This equipment was designed, tested, approved and is guaranteed by Wm. L. Aylward, a nationally known craftsman and manufacturer, who has developed his hobby into a co-operative association of five thousand craftsmen.

Portable—Interchangeable—Complete HOME WORK SHOP

The new 1928 Combination of Electric tools brings you a Red Jacket Band Saw and in addition the powerful Red Jacket Master Drill Motor with direct drive to the Waco Craftsman's wood turning lathe (capacity 9 in. x 38 in.); a bench saw that has depth and side gauges, scroll and jig saw; and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to any light socket and converts your work bench into a complete private tool and machine shop.

It is a complete chest full of electrically driven tools designed by a master for the private use of tool lovers and men who create, repair and appreciate handy tools at home.



The WACO GUARANTEE
If it is not what you want when you get it—send it back

It Is Easy to Do These Things

Write or send coupon at once for valuable information to all interested in beautiful handiwork. It is free. It tells you how easy it is to operate a Red Jacket set of tools and lists the advantages and privileges that are free to member craftsmen. Don't miss knowing all about Waco. It is free. You are invited.

Look out for imitations. There is only one Red Jacket—one Waco—one Wm. L. Aylward, Mastercraftsman.

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SPECIAL CRAFTS COURSE and blueprint service is free to Red Jacket Shop owners—all that there is to know about handicraft methods, raw materials, woods, carving, sawing, turning, designing, carpentering, decorating, is taught by special correspondence.

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Only $10.00 down. Liberal discounts for cash. Easy monthly payment plans. It is no hardship to own a Red Jacket.

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Send the coupon. You will be surprised with all it contains. Beautiful, Instructive, Fascinating, Interesting.

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FREE Blue Prints

The most elaborate and unusual drill motor ever designed as driving power.

This Headstock furnished where no electricity is available.

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542 N. Parkside Ave.,
Chicago

Manager, Dept. 105. Please send me all free information and literature on Red Jacket Assemblies.

Name.....

Address.....

The *Springy paws* of the Timber Wolf • •

"ONE morning I went out deer hunting. After I had been tracking the deer about a mile I noticed a bunch of other tracks. Coming over a hill I saw a wolf crouched in the snow. I shot and killed him. Instantly there was a furious noise—a cracking of brush—and the wolf pack broke.

"One turned and I got him too. Then the wolf pack returned keeping up a howling that made the woods echo. I beat a hasty retreat to a clearing, dragging my kill after me. Here I was safe from any of the pack springing upon me from the underbrush.

"When I got back to camp I was told by a nearby rancher that I had rid the country of two of the famous pack of timber wolves called the 'Forty Thieves' which had been robbing ranches in the district.

"Nature has given the timber wolf tough springy feet as well as strong muscular limbs. He is one of the swiftest animals in America. He has four toe pads and one heel pad of a rubbery-like substance. These were put there to protect the wolf's feet from the cactus-ridden prairies."

Trapper Evans

KEDS special models for boys give your feet much of the sure grip and spring of the timber wolf's paws.

The soles of Keds are tough and springy. Your feet grip surely without slipping and sliding.

Keds' uppers are light yet strong to protect your ankles against sudden twists and sprains. And the special Feltex innersole keeps your feet comfortable.

Write for our free booklet containing information on games, sports, camping, vacation suggestions and other interesting subjects. Dept. 2170, 1790 Broadway, New York City.

United States Rubber Company

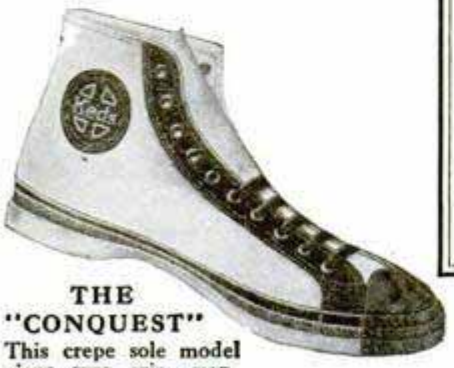
★ This account of the timber wolf by Trapper Evans is the first of a series of his experiences with wild animals of America printed for the first time by the makers of Keds.

To American Boys

An Offer of the Actual Footprints of the Timber Wolf

By special arrangement with Trapper Evans the makers of Keds are now able to offer you the actual tracks of many American wild animals imprinted in clay. Each one is an original, identical footprint—hardened in claylike material, mounted on felt. Write to Trapper Evans, care of Keds Outdoor Department, 1790 Broadway, New York City, enclosing 50c, and obtain a track of the timber wolf sent postpaid in U. S. and Canada.

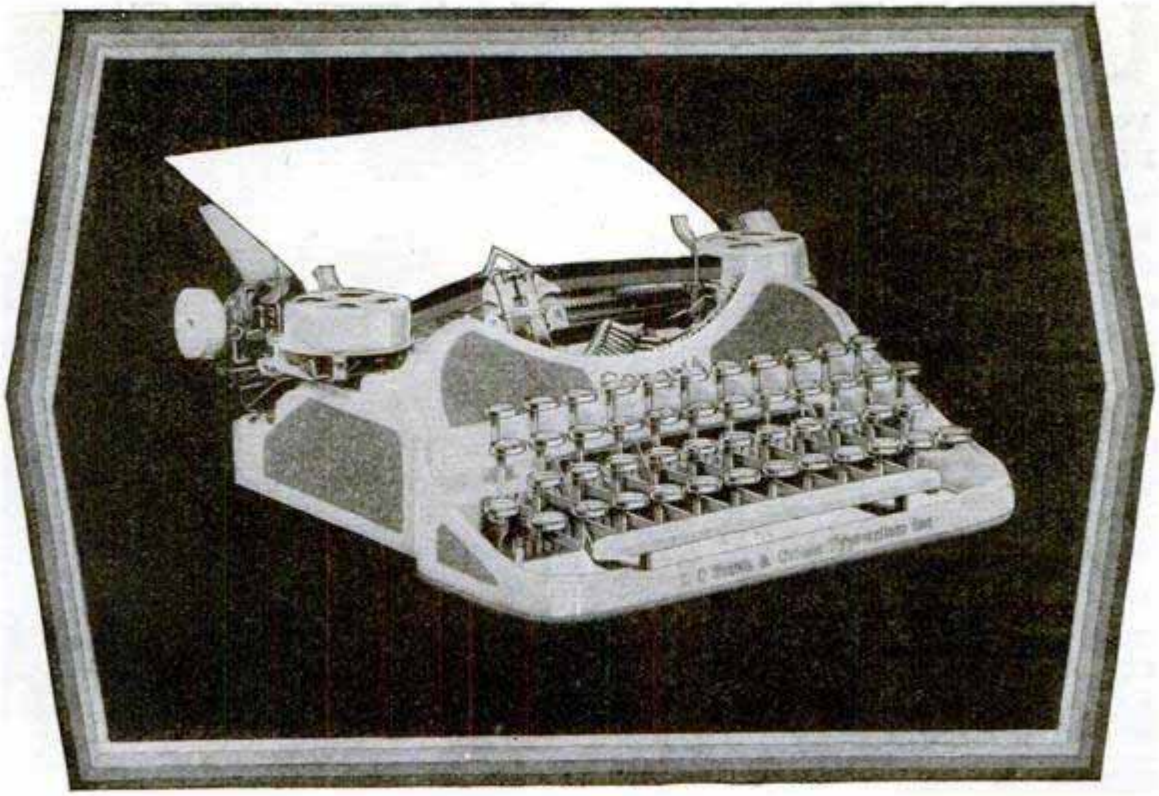
A complete list with prices of the wild animal tracks made by Trapper Evans will be mailed free on application.



THE "CONQUEST"
This crepe sole model gives sure grip—wonderful wear. White with black trim or brown with black trim.

Copyright, 1928, by United States Rubber Company

***They are* not Keds** *unless the* name *Keds is on the shoe*



Own this fine new Corona!

JUST a few monthly payments and this new Corona is yours! It's the latest and most improved Corona, with standard four-row keyboard, wide carriage, 12-yard two-color ribbon—every improvement modern skill can apply to a portable typewriter.

Corona is light—portable, yet it is unbelievably sturdy. The rigidly braced frame is of tough, light aluminum, the only material we have found to be light enough and strong enough for Corona.

You can have your choice of plain black or attractive colors.

Examine Corona in your own home

Our local representative will gladly leave a Corona at your home for you to examine at your leisure—no obligation. Mail the coupon now!

L C Smith & Corona Typewriters Inc 512 E. Washington St., Syracuse, N.Y.

Please send me your latest literature showing the new Duco finished Coronas in actual colors.

Name..... Address.....

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Precision
Popular Prices
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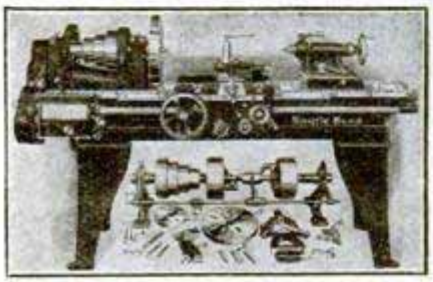
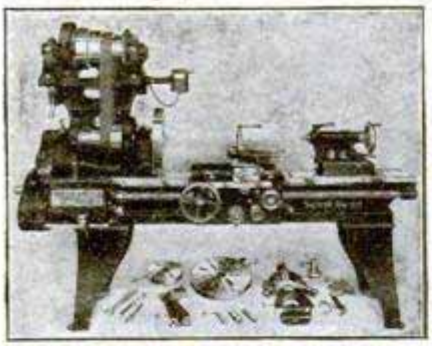
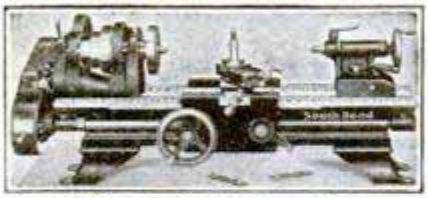
Easy Payment Terms



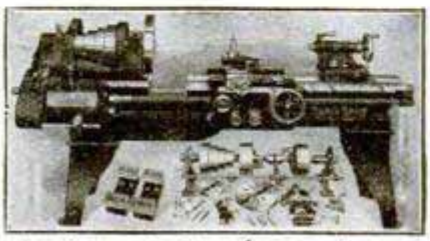
16"x 8' Quick Change Gear Lathe, Straight Bed..... $570
Described fully in Booklet No. 16



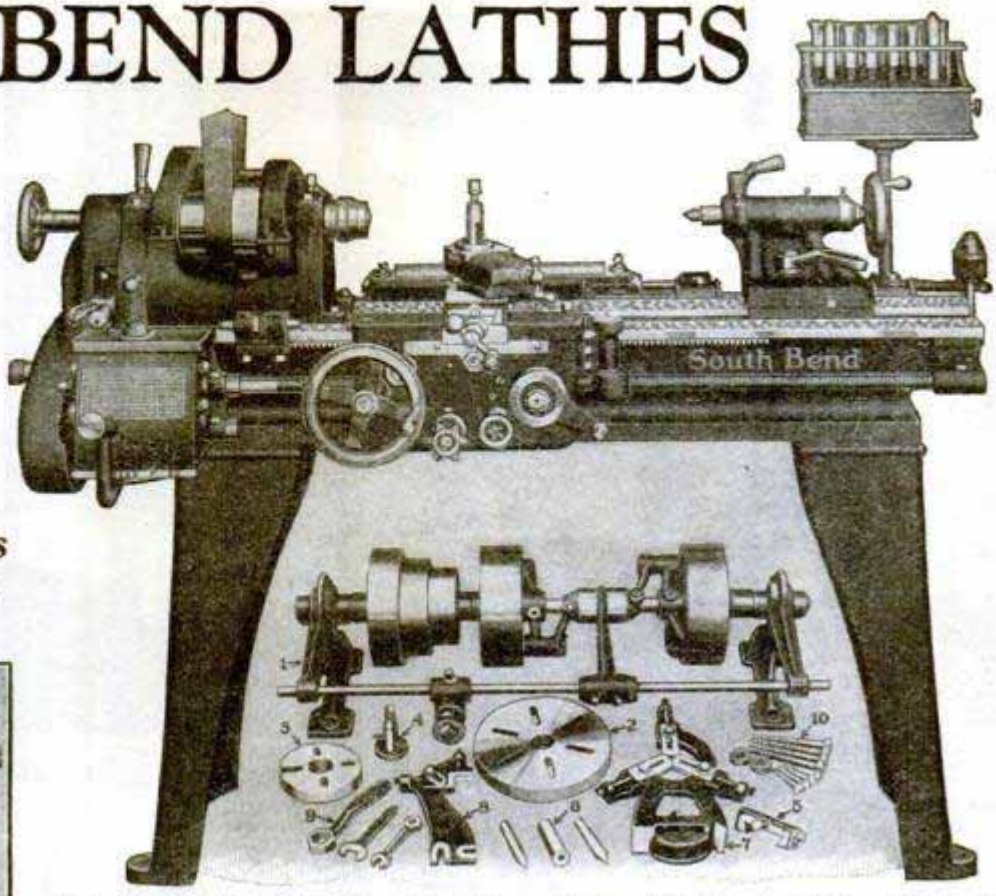
18"x 8' Quick Change Gear Motor Driven Lathe..... $908
Detailed specifications given in Special Booklet No. 18



9" x 2½' Junior Back Geared, Screw Cutting Bench Lathe... $150
Shown complete in Booklet 22K



16"x 6' Quick Change Gear Gap Bed Lathe..... $620
Shown complete in Booklet No. 16



11"x 4' New Model Precision Tool Room Lathe with Countershaft and Regular Equipment..... $335
One of the types illustrated in Special Booklet No. 11

Other Popular Selling Sizes

The Prices of Popular Selling Sizes with Countershaft and Equipment

Size of Lathe	Shipping Weight	Standard Change Gear	Quick Change Gear
9" x 3'	490 lbs.	$235.	$270.
11"x 4'	725 lbs.	$300.	$335.
13"x 5'	1110 lbs.	$352.	$402.
15"x 6'	1550 lbs.	$430.	$490.
16"x 6'	1875 lbs.	$480.	$540.
16"x 8'	2035 lbs.	$510.	$570.
18"x 10'	2840 lbs.	$685.	$750.

Easy Payment Plan—10 Months to Pay

Small down payment, balance in 10 equal monthly payments, or you can purchase through your nearest machinery dealer.

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Seven special descriptive booklets listed below illustrate, describe, and price 210 sizes and types of NEW MODEL South Bend Lathes. New General Catalog also illustrates and describes the complete line of New Model Lathes, Attachments, Chucks and Tools. Over 300 illustrations showing work the lathes will do.

Check off in the squares below, indicating the lathes in which you are interested. Cut out and mail to us with your name and address. Special booklets and Catalog No. 88 mailed free postpaid on request.

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- ☐ New General Catalog No. 88
- ☐ "How to Run a Lathe," price 25c
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ESTABLISHED 1906—OVER 38,000 LATHES IN USE

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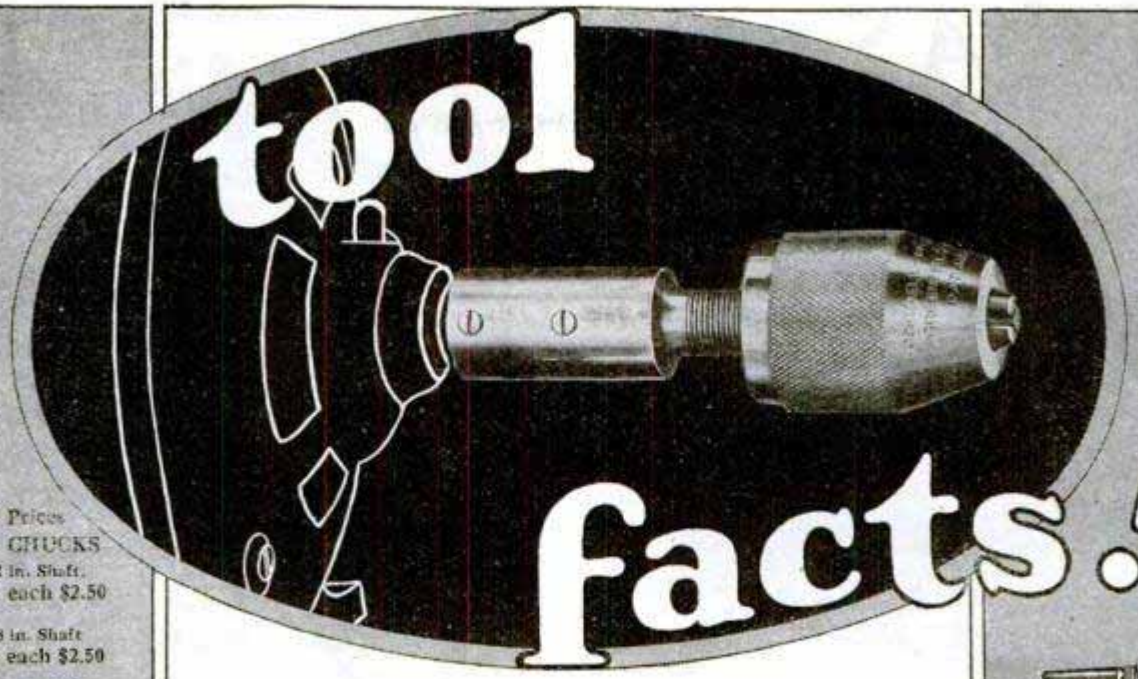
New York City Salesroom, 183 Centre Street



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DRILL CHUCKS
For 1/4 in. Shaft
No. 837, each $2.50

For 3/8 in. Shaft
No. 757, each $2.50

For 1/2 in. Shaft
No. 761, each $3.50

For 5/8 in. Shaft
No. 861, each $4.00

SAW ARBORS
For 1/4 in. Shaft
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The Mark of a Complete Line of Super-Performance Electric Drills

You Can Make a Machine Shop of Your Small Motor!

You can greatly expand its use, and much more easily do many of those odd jobs which you have heretofore found difficult.

Take drilling for instance. With a Drill Chuck, as illustrated above, and of the proper size to fit the shaft of your motor, you can convert it into a convenient and dependable bench drill.

The Combination Saw Arbor and Buffing Spindle provides a means of attaching a grinding wheel or saw as illustrated in Figure 1; wire brushes and buffing wheels may also be used with this attachment.

For polishing and buffing only. Buffing Spindles are provided, and may be used as illustrated in Figure 2.

With these attachments, much more rapid and accurate work can be done even by the amateur, and the skilled artisan finds he can do many jobs, with such combinations, as well as he can with much more complete and expensive equipment.

The attachments, of the proper size, are easily fitted to the motor shaft and secured by set screws provided. They are made with the care and precision characteristic of all Goodell-Pratt Tools, for years famous for uniformly high quality. Your local dealer probably has them in stock. If not, write us.

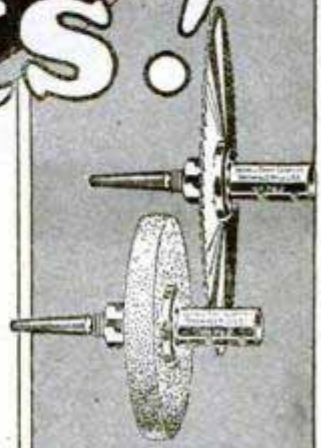

Figure 1
Showing the No. 762 Saw Arbor and Buffing Spindle equipped with a saw and with a grinding wheel.

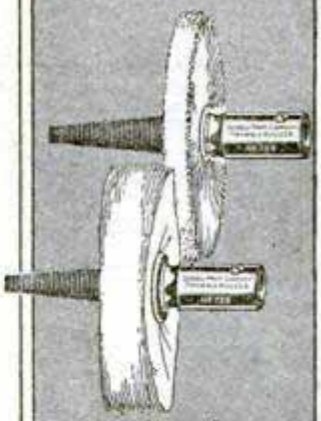

Figure 2
Showing the No. 759 Buffing Spindle equipped with a wire brush and a buffing wheel.

GOODELL-PRATT COMPANY *Toolsmiths* GREENFIELD, MASS. U.S.A.

GOODELL-PRATT

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AT LAST!

A Real Radiophone Transmitter —at a Reasonable Price!

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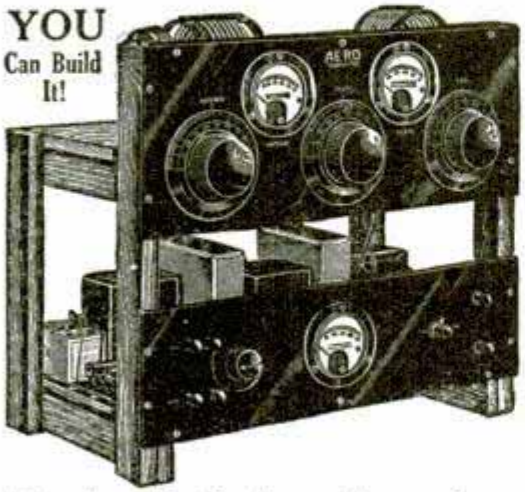

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—Ready to Plug Into Electric Light Socket

Here is a low power radiophone transmitter that every true radio fan will want to own. An extremely efficient circuit, designed by some of the best known parts manufacturers, that is producing wonderful records. Simple to operate, easy to build, its cost is no more than that of a good broadcast receiver!

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As installed at station 9DBM, Chicago, the results on 20 meters have been remarkably good. Reports varying from R-5 to R-7 have been regularly received from these typical stations: 1BBM, North Harwich, Mass.; 1ASF, Medford, Mass.; 1SW, Andover, Mass.; 2BSC, Glenhead, N. Y.; 3AKS, Philadelphia; 3CE, Baltimore; 4MI, Asheville, N. C.; and 8CVJ, Auburn, N. Y. Quality of speech has been reported to be very fine.

Adapted to code work, the Aero Radiophone Transmitter has produced outstanding results. From a location not of the best, all U. S. districts have been worked with CW on the 40 meter band, as well as NC5ZZ, Vancouver, B. C.

Employs Low Power

Surprisingly Long Range

Easy to Build

Easy to Operate

Outstanding Performance Assured By Carefully Selected Parts

Only the best quality parts have been incorporated into the Aero Radiophone Transmitter. Products of the following well-known manufacturers are specified exclusively:

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NOTE: ***The parts for the Aero Radiophone Transmitter are standard parts and are available at all dealers—when completed is ready to plug in to your electric light socket. All have been carefully chosen. Complete drilled and engraved foundation units are also available.***

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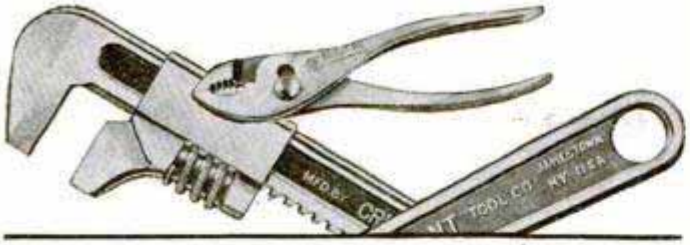

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Crescent-Smith and Hemenway tools represent the highest quality in workmanship and design. Every tool is sold with a guarantee of absolute satisfaction or your money back. You are the judge. Ask your hardware dealer for them by name.

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Wrenches	Chisels	Snips
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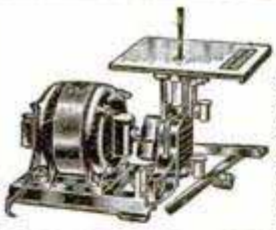

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MAY 6th to 12th

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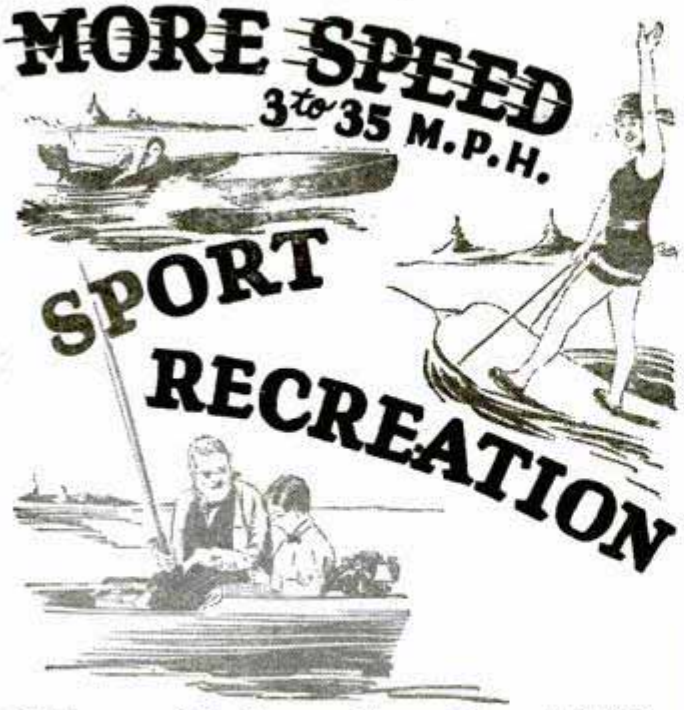

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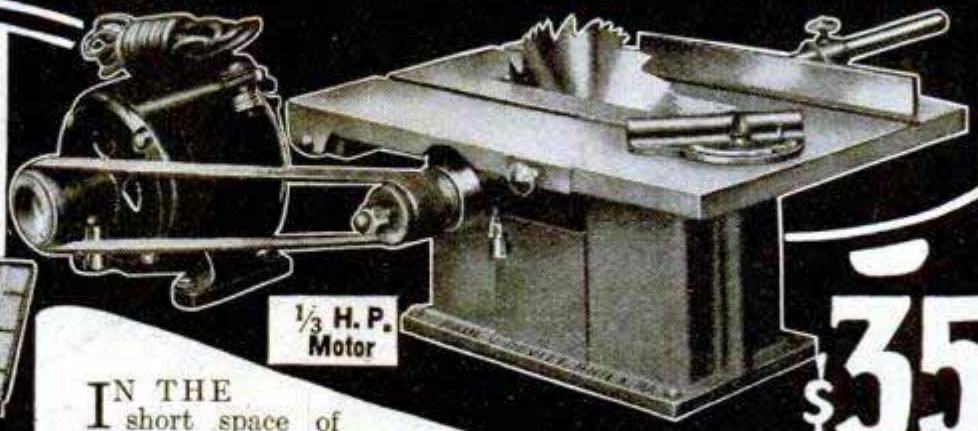
8,000 IN USE!

A SHOPFUL OF TOOLS WITHIN ARMS REACH!



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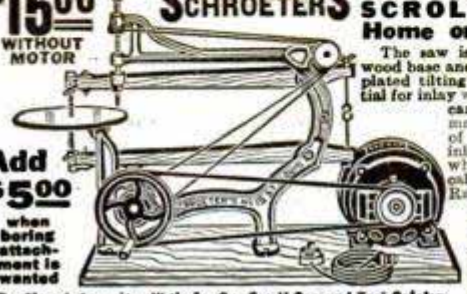

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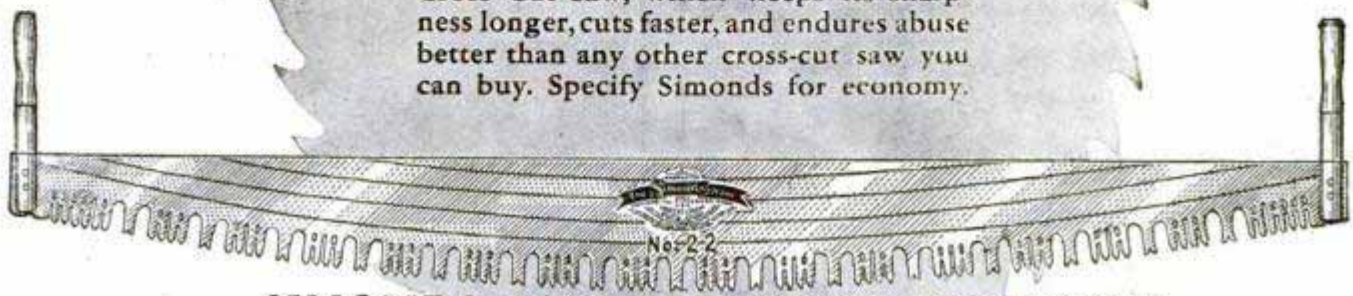

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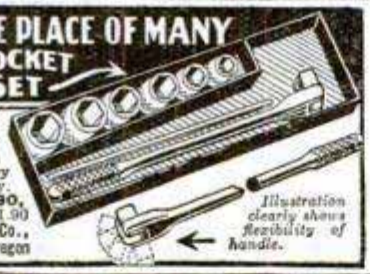

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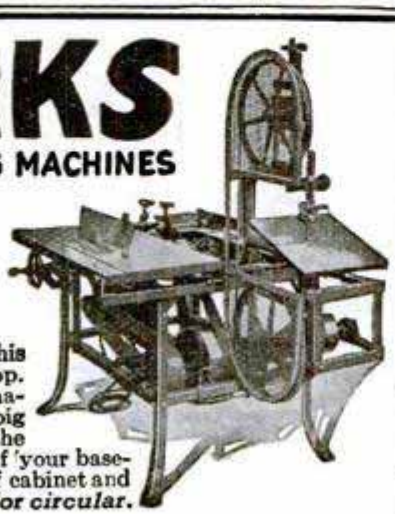
With Motor



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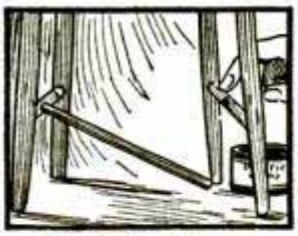

Fastening Loose Rungs

For Fixing Things

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Reg. U. S. Pat. Off.

Handles Like Putty — Hardens Into Wood

Filling Cracks and Holes

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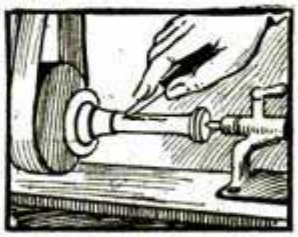
With Plastic Wood anyone—man or woman—can do many jobs around the house that formerly called for a carpenter or cabinet maker. It is as easy to handle as putty, but on exposure to the air hardens into solid wood, holds fast to wood, fabric, metal and plaster, and is waterproof, greaseproof and weatherproof. For use indoors or out. Send for folder of suggested uses.



Repairing Mistakes in Wood Working

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For loose tiles, cracked porcelain or enamel, use Plastic Wood White Waterproof Tile Cement, a special preparation for this particular need.

1 lb. can $1.00. ¼ lb. can 35 cents

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Renovating old Furniture

HOWARD JIFFY WINDOW CLOTHS for AUTO and HOUSE WINDOWS

The chemically treated cloth puts a brilliant polish on all glass without tiresome rubbing.

Price delivered.....$ .75

With Howard Dustless-Duster.....$1.00

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12-inch scale model of Lindbergh's Spirit of St. Louis. Very realistic. Rises from ground by own power. Flies 30 ft. or more. Easily built without tools. Construction set, with all parts and full directions, postpaid in U. S., only 50c (no stamps). Satisfaction or money back. Send today.

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$25 To $50 **Make $25 to $50 per day and be Your Own Boss!**

Per Day Drilling Wells!

Cash in on demand for good wells in every community! Any man with mechanical turn of mind can easily operate one of our drills, make big money, be independent, work the year 'round! A few hundred dollars starts you in this big paying business—pay balance out of earnings! Write for FREE CATALOG describing ARMSTRONG ALL STEEL WELL DRILLS—gasoline traction or non-traction models.

Write now—today—Armstrong Mfg. Co., 810 Chestnut St., Waterloo, Iowa.

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GENUINE GOLD LEAF LETTERS

S guaranteed to never tarnish. Anyone can put them on stores and office windows. Enormous demand, large profits. Paul Clark says: Smallest day $28.70. R. L. Reel made $920 in two months. Write today for free sample and liberal offer to general agents.

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New plan. No experience or capital needed. We furnish everything. Spare or full time. You can easily make

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AGENTS $7 A DAY SURE

AMAZING NEW APRON

NO STRINGS NO STRAPS

Just Out Not sold in stores. New PATENTED Apron without strings, straps, buttons, or hooks. Women grab it. Attractive cretonne patterns. Secret girdle holds it. Green made $26.25 in a day. Mrs. Bragg $16.80 in 2 hours. Big profits. Full or spare time. We deliver and collect. Get FREE SELLING OUTFIT OFFER. *WRITE TODAY SURE.*

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Makes Old Ford a Tractor

Now you can convert that old Ford car into a useful farm tractor without altering any Ford parts. We furnish the traction wheels, drive gears and auxiliary axle and mountings, ready to clamp on to the Ford frame. Pulls 16" plow.

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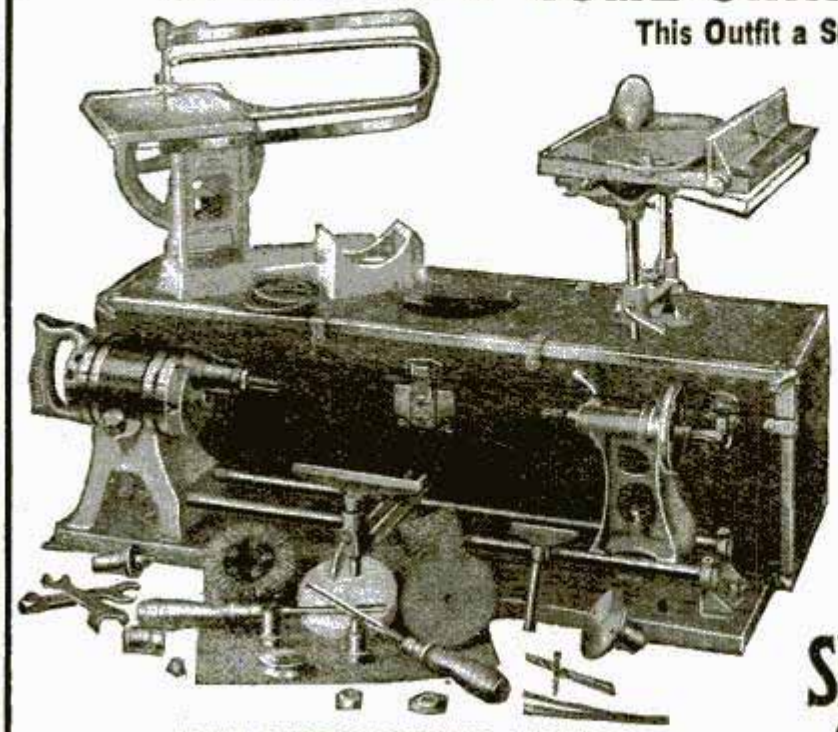
HOME MECHANICS MADE EASY WITH THE NEW "UP-TO-DATE HOME-CRAFTSMAN SHOP"



This Outfit a Superior Development Over All Others

The Up-to-Date Home Craftsman Shop can be used in any home lighting fixture, making of your old fashioned work bench a complete machine shop. Complete it is made up of a Super-Power Motor, a precision lathe (10" x 34"), featuring the bevel, a miter, side and depth gauges, a tilting table, jig-saw, and all accessories for buffing, grinding, cleaning and all portable or stationary drilling and sawing. This equipment will make you an advanced craftsman. Master mechanics have designed and skilled engineers have constructed this equipment which, after inspection, you will agree is the best of its kind. For those who build, invent, create and construct at home it is unexcelled.

OUR EDUCATIONAL AND BLUE PRINT DEPARTMENTS

Under personal supervision of Master Craftsman Eugene E. Maurey, offers special correspondence crafts course, giving in simple detail full information on home handicraft. Blue print service giving plans and details for making hundreds of pieces of wood handicraft included in this course FREE to our users.

GUARANTEE

After receipt of the Up-to-Date Home-Craftsman's Shop, if you are not satisfied, without question or delay every cent refunded and return express charges paid.

THE SUPER-POWER MOTOR

The drive power of our shop equipment is positively the latest development in electric drill motors. It produces ½ H.P. operating on 110, 220, or 32 volt currents either A.C. or D.C. and is guaranteed not to burn out or wear out in the ordinary use of home or factory. It drives the lathe, circular saw, jig saw, a 15" band saw, a 4" jointer with amazing power and durability. For further details on this Super-Power Motor and the perfected shop it operates, mail the coupon at right **TODAY.**

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MAIL THIS

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MANAGER, Dept. 8. Without any obligation, please send me full particulars about your shop, 10-day free trial, free blue prints, free crafts course, also, $10.00 down payment offer.

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Lead Burning Outfits	$18.00 up
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Superior Oxy-Acetylene Machine Co.
P. O. Box 285. Hamilton, Ohio

Foot Pains

stop in 10 minutes
or you pay nothing

Burning, aching feet — foot calluses, pains in toes, instep, ball or heel — dull ache in ankle, calf or knee—shooting pains, flattening and spreading of the feet, sagging arches —all now quickly ended.

SLIP on a new and amazing band. Within 10 minutes every trace of pain has vanished. Displaced bones are corrected—weakened muscles are supported whose weakened condition causes 94% of all foot troubles, medical authorities say. Wear stylish shoes again, walk and dance without a twinge.

No stiff props to further weaken the foot. This amazingly light band strengthens muscles naturally. Soon do without it—feet are well.

Test it 10 days. If not amazed and delighted your money returned. Go to druggist, shoe store or chiropodist. If they can't supply you use coupon below and pay postman. **Send for free book on foot and leg troubles.**

JUNG'S "The Original" **ARCH BRACES**

FREE if it fails

Jung Arch Brace Co.,
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Send 1 pair ☐ Wonder Style, $1. ☐ Miracle Style (extra wide for people weighing over 145 lbs.), $1.50.
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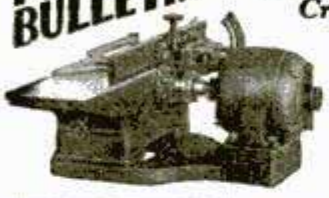
Shoe Size..... Shoe Width.....
Name .....
Address.....
City..... State.....

Canada: M. L. C. Bldg., Montreal. Add 25c to above prices

FREE BULLETIN



Big Profits with This *Crescent Bench Jointer*

You can turn out more work accurately and increase your profits with this convenient Crescent 6 inch bench jointer. Sturdy construction, ample capacity, operates from any lamp socket. Send today for FREE illustrated circulars describing all types of Crescent woodworking machinery.

The Crescent Machine Co.
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DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then **become a foot correctionist,** and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. *Address*

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Lathes $6.00 to $75.00. Largest line of small lathes in America. Send six cents for 32 page catalog of lathes, drill presses, bench saws, jig saws, band saws, etc.

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Diamond Jewelry—Special Values!

Newer styles, finer quality, bigger values. We import our Diamonds from Europe—that's why we can sell to you for less. Our rings are solid 18-k white gold, magnificently engraved, and set with gorgeous blue white Diamonds of exceptional beauty. Order now!

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Solid 14-k white gold case, 15 Jewels. $27.50. $2.75 down $2.75 a month

Satisfaction guaranteed, or money back. Goods sent for your free examination on request. Credit terms: Pay one-tenth down; balance weekly, semi-monthly, or monthly at your convenience. All goods delivered on first payment.

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Big 132-page book, illustrating our Diamonds, Watches, Jewelry, Silverware, and gift articles for all occasions, sent absolutely free. Write today.

"To Be Successful, Look Successful" —own and wear a genuine Diamond!

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Two exceptional values in men's Diamond rings. Each ring is solid 18-k white gold, hand carved and engraved, set with a magnificent blue white Diamond. Order yours today!

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Men's strap watch, nickel, cushion shape, 6-jewel, high-grade movement, $8.50 fine leather strap . . . . . .

19-Jewel Adjusted Waltham

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to represent us in your community, taking orders for the famous Buescher Saxophone and other musical instruments. The Buescher Saxophone is the easiest of all instruments to learn to play. Has many exclusive features; used by the greatest professionals. Easy terms of payment make them easy to sell. Every one is a prospect—young or old. Experience not necessary. We supply advertising material and help you get started. All or part time. Liberal commission. Write for information. (451)

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Mitten Dusters made from chemically treated yarn. Cleans, Dusts, Polishes; a triple service in a single operation. Retails for 50c, over 100% profit. Agents are cleaning up Big. Send for Big Brush Catalogue of 50 other fast selling Brushes and Brooms. Free Sample Case Outfit of Big Brush Assortment sent without deposit to responsible present or prospective Brush Salesman.

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$9.75

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Cards, Stationery, Circulars, Labels, paper, tags, menus, book etc. Save money and time, cut cost in half. Pays for itself in a short time. Sold direct from factory only. **Print for Others, Big Profits.** Complete Outfits, $8.85 up. Job Presses $11 up. Rotary $149. All easy, rules sent. Write catalog presses, type, paper, cards, ink etc.

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Now Making $50.00 to $100.00 and Up Per Week Selling Our GOLD LEAF SIGN LETTERS

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For store and office windows, board signs, trucks and glass signs. We also make to order script signs and business emblems singly or by the thousands. A permanent business. No capital or experience required. Big demand in every city. *Samples and Literature Free.*

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PLAYED WITH INTERCHANGEABLE ROLLS

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A GREAT little trouble-finder, a flashlight. Sends a bright beam right to the spot. Says "There it is," and "I'll help you fix it." Fine for examining complicated insides of anything mechanical too. A regular Sherlock Holmes for solving mysteries.

Remember, that in a flashlight, the *battery's* the thing—and Eveready's the battery. Eveready Batteries make an honest helper out of any flashlight. They put a flashlight right on the job with a beam of bright light when the switch clicks.

Get the flashlight habit when you work. Stick by Eveready Batteries because they stick by YOU.

Did You MAKE $25 TODAY?

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Easy to sell our quality line of barn and house **Paints, Varnishes, Stains, Brushes,** etc. Factory to user! Lowest prices—big commissions—easy sales! Paint salesmen make the big money—season just starting. Write quick for our wonderful new sales plan.

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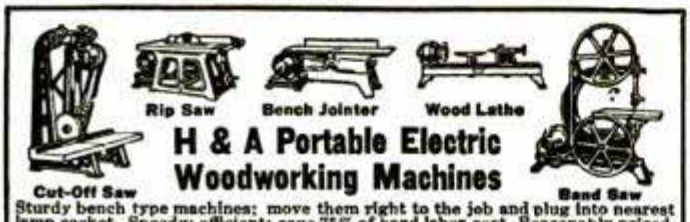

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Sturdy bench type machines; move them right to the job and plug into nearest lamp socket. Speedy; efficient; save 75% of hand labor cost. Reasonably priced. Fully guaranteed. Dealers in principal cities. Write for description and prices.

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To make a smooth, spotless, non-wearing, easily cleaned garage floor

A DIRTY garage floor is as bad an eyesore as a dirty car.

Ordinary concrete is porous. Oil sinks in and makes ugly spots, and appearance is also marred by the dust that grinds loose at dry places.

By mixing Smooth-On No. 7 into the top layer when laying the floor, you get a permanently smooth, dense, iron-hard, non-abrading, impervious surface that sheds water, absorbs no oil, is easy to keep spotless and stays spick and span. Adding the Smooth-On No. 7 to the concrete involves no special effort—merely spreading over while the top surface is soft, rubbing in with a float and finishing in the ordinary way with a steel trowel.

The extra cost for the Smooth-On for a single-car garage is about $9.50 and any one familiar with the working of concrete can do a perfect job.

Write for FREE BOOK

USE Smooth-On No. 7 also for waterproofing old, damp and leaky cellar walls and floors, boiler pits, stopping leakage from ponds, cisterns, troughs, etc. Can be applied easily like a paint and when so used is the only practical waterproofing material that can be applied **from the inside** and to **wet or dry** surface. On old concrete, and masonry surfaces, about 25 lb. of Smooth-On No. 7 are required for each 100 sq. ft. of surface covered, and no experience is necessary.

Get Smooth-On No. 7 in 5-lb. cans or 25, 50 or 100-lb. kegs. If your dealer will not supply you, write to us direct.

Do it with SMOOTH-ON

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Please send literature on Smooth-On No. 7.

Name.....

5-28 Address.....

$351.00 CLEARED IN ONE DAY

So writes W. H. Adams of Ohio. Letter from California man reports **$11275** sales in three months; New Jersey **$4000** profits in two months; Pa. **$3000** profits in four months. Ira Shook **$365** sales in one day. Bram bought one outfit April 5 and **7 more** by August. Iwata bought one outfit and **10 more** within a year. J. R. Bert says "only thing I ever bought that equaled advertisement." John Culp says: "Everything going lovely. Crispette wrappers all over town. It's a good old world after all." Kellog, **$700** ahead end of 2d week. Wholesale or retail. Big profits either way. No town too small. Business is pleasant, fascinating and dignified. You manufacture a food product.

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Furnish secret formulas, raw material and equipment. Little capital required; no experience needed.

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No limit to the sale of Crispettes. Everybody likes them. It's a delicious food confection. Write for facts about a business that will make you independent. Start now, in your own town.

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Send postal for illustrated book of facts. It contains enthusiastic letters from others—shows their places of business, tells how and when to start, and all information needed. Free. Write now!

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SAVE YOU MONEY

Edwards Metal roofing, shingles, Spanish tile, sidings, **ready-made garages and farm buildings,** are rust-proof, fire-proof, lightning-proof. Last three times as long as ordinary kind. Quality in every detail. Styles and types for every purpose. Easy and economical to apply. Lifetime satisfaction.

We are the world's largest manufacturers of sheet metal building materials. We control every operation from the raw metal to the finished product. You can buy from us at manufacturers' prices and save all intermediate profits. Write today for our Free Samples and prices. Ask for Roofing Book No. 150 or for Garage Book.

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One Year To Pay

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$2 Deposit—$1.25 a Week

Seven fine quality, genuine blue-white diamonds are set in a **SOLID PLATINUM** disk shaped like a solitaire. The diamond platinum cluster looks like $600 solitare and is set in the latest style, handsomely engraved 18 Karat solid white gold mounting. Two dark sapphires add to its attractiveness.

Guaranteed

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SEND NO MONEY After you get the ring, pay only $2.00 to the postman. If you keep it, pay only $1.25 a week for one whole year. **Don't bother writing a letter.** Just pin this ad to a piece of paper with your name and address.

Take 10 days to decide. If you are not satisfied that the ring is the biggest bargain you ever got, return it and **we will refund every cent you paid.** All credit dealings kept strictly confidential. **Money Back GUARANTEE**

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Write for Catalog It brings our large Jewelry Store right into your home. Tells how to buy diamonds like an expert. Gives information other jewelers dare not tell.

Our catalog gives you complete information about weights and grades of blue-white diamonds, starting at the remarkably low price of $197 per carat. **$197.00 A CARAT**

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From factory direct to you

Prices: $24.00 and up

Write for catalog L-1

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Class—Snap

Famous sure-fit *RED-I-KUT* life-size patterns and picture instructions show how you can easily convert your Ford into this **Fast, Saucy, Sport** Car as thousands have done with easily obtained materials. No need to lay up the car. Rear seat folds, making 4-passenger car. *Send 10c coin for actual body photo and new manual of other distinctive sport body patterns from $5.00 up—"RKO" Steel "Swing-Lo" irons, Tops and Windshields. ORDER RIGHT NOW.*

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SELL PIONEER $23.50 All Wool Tailoring

FULL OR PART TIME

MAKE $12.00 A DAY FROM START

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The most complete line ever offered, at real money-saving prices.

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Some all wood, others canvas covered. Light, swift, safe, strong and durable. Choice of many distinctive color combinations.

Motor Boats—

With or without **Engine.** For Lakes, Rivers, Shallow water and weeds.

CATALOG FREE — SAVE MONEY — ORDER BY MAIL

Please state the kind of boat you are interested in (30)

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(*Write to Either Place*)

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Used and rebuilt motorcycles $25 to $100, used bicycles $9.50, tandems $20. All machines fully guaranteed. New bicycles and motorcycles at factory prices, save dealers' profits. Motorcycle and automobile tires $3. Complete line frames, engines, supplies.

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Hendersons, Harley-Davidsons, Indians

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MAKE BIG MONEY—We supply stock and pay you following prices for all you raise: Belgian Hares $2 each—New Zealands $3 each—Chinchillas $4 each—Flemish Giants $5 each. 32-page illustrated book, catalog and contract, also copy of **Fur Farming** magazine, tells how to raise skunk, mink, fox, etc., for big profits, all for 10c. Address

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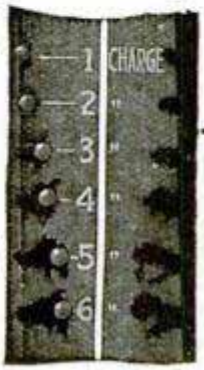

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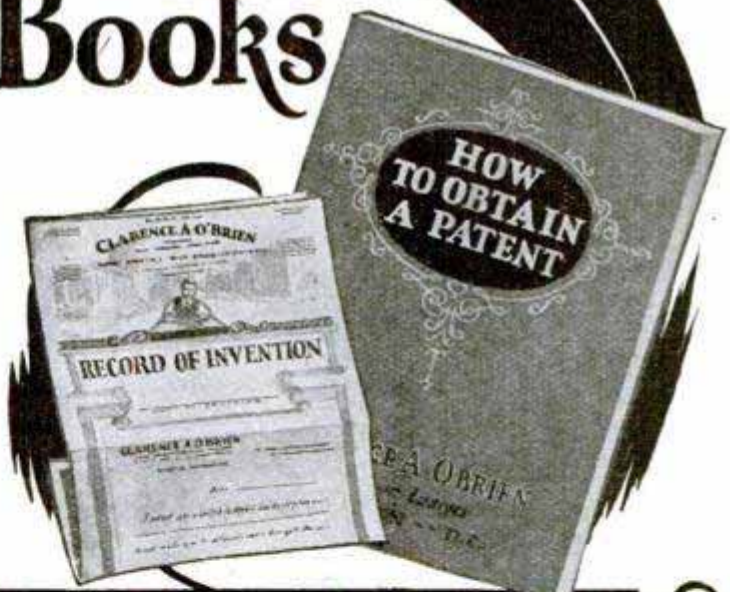

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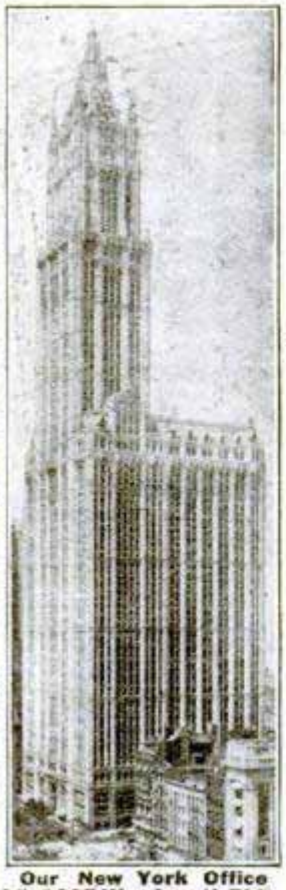

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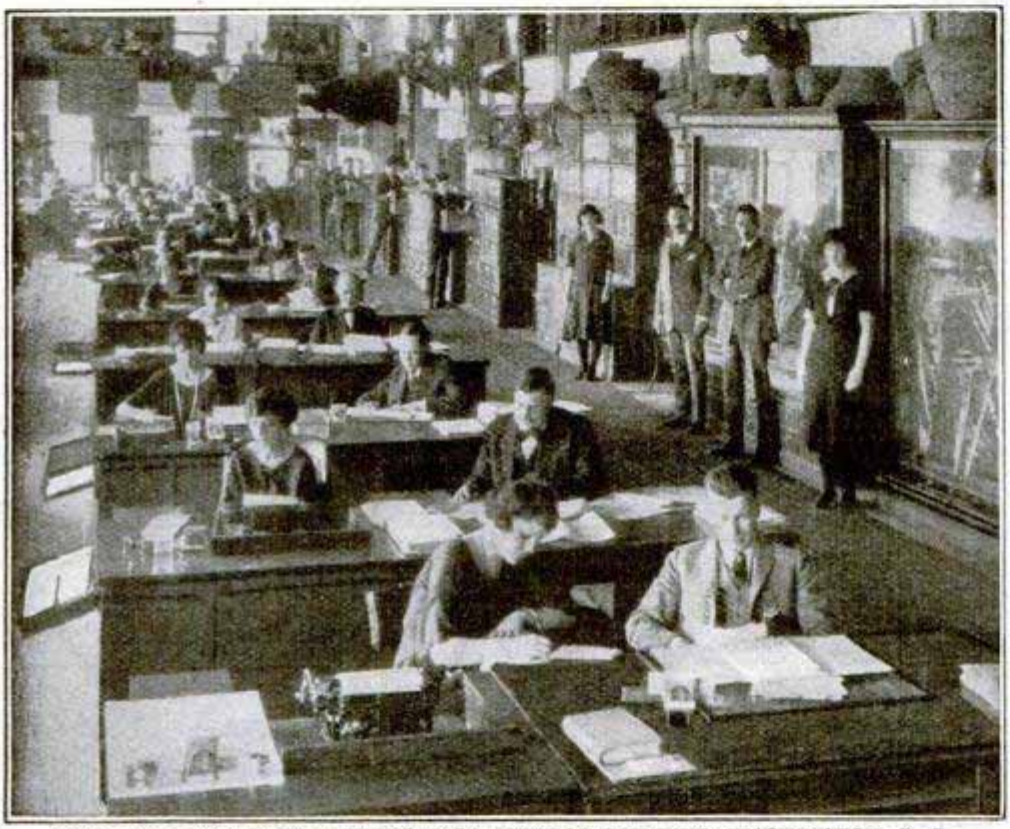

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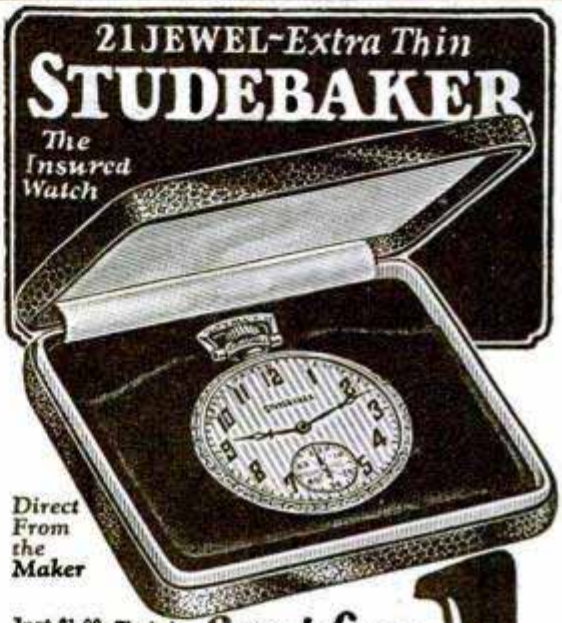

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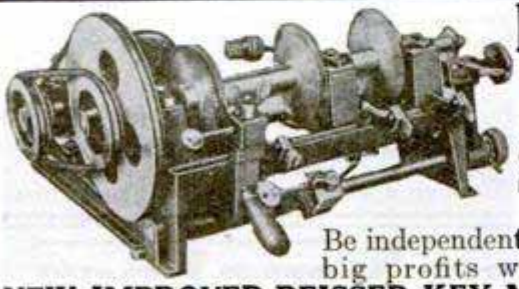

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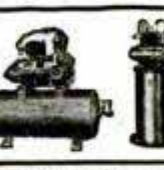

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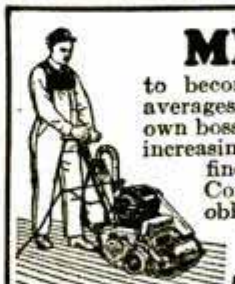

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(Planer attachment to fit on table top will smooth pieces up to 2 in. wide, $12.00 extra. Flexible Shaft Grinder attachment, $35.00 extra.)

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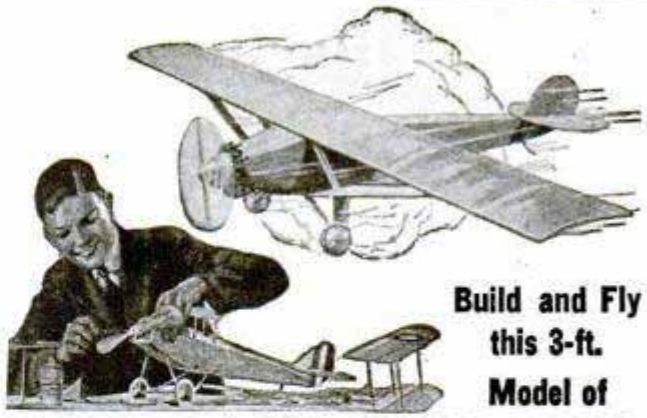

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Indicate size and model desired.

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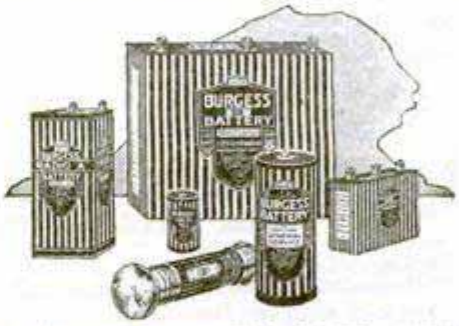

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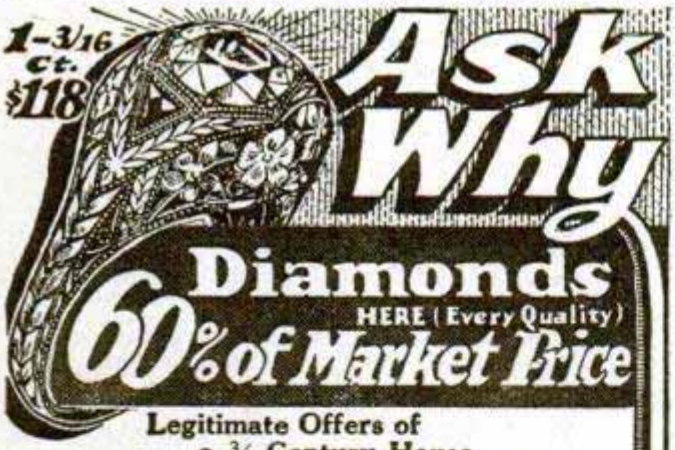

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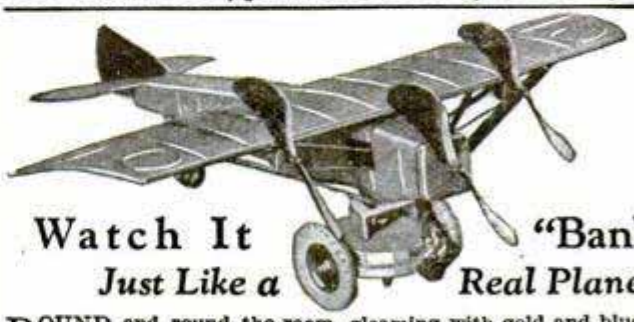

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The demand for this remarkable fountain pen is nation-wide. Newspapers daily tell stories about crooks who raise checks. Last year over $250,000,000 was stolen this way. This is the sales-getting story that will pay your $150.00 every week. Tell it to any man. Show the rotating wheel which absolutely protects every check. And the order is yours, with almost 100% clear profit in your pocket.

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A perfect writing instrument. Made of hard rubber, in all latest colors: Orange, Black, Mottled, and many others. Giant or medium size. 14 kt. gold point, iridium tipped—any style. 14 kt. gold band and pocket clip. New principle of filling pens—takes a second—no muss or fuss. Pliable rubber sac holds a generous quantity of ink. Throughout, the Security Pen is a mechanical masterpiece, a pen of beauty. Written 5-year guarantee comes with every pen.

DISTRIBUTORS: The Security Fountain Pen, featuring the patented Check-Protector, is one of the fastest sellers in America. Rich, unworked territories open. $300 a week for live distributors. Write!

FIVE EXCLUSIVE PATENTED FEATURES

Rush Coupon for FREE Offer

Every sincere man who mails coupon NOW will be made amazingly generous FREE PEN offer. Get this novel, check-protecting fountain pen FREE—and pocket $150.00 a week. Rush coupon now. No obligation.

Securograph!

We'll also tell you about SECUROGRAPH, the CHECK-PROTECTOR without the fountain pen. As well made as the pen. Pocket size. Price, $1.50. Big commission.

Security Pen Corp.
516 Fifth St. Mt. Carmel, Ill.

STRAIGHT-LINE

Security Pen Corp.,
516 Fifth St., Mt. Carmel, Ill.

Gentlemen:—Please send me Security Check-Protecting Pen selling plan—and FREE PEN offer.

Name.....

Street.....

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

☐ Check here for Distributor's Plan.

SQUAB BOOK FREE

Breed squabs and make money. Sold by millions at higher prices than chickens. Write at once for free 40-page book beautifully printed in colors telling how to do it. *You will be surprised.*

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Your Coat and Vest Can Be Matched with New Trousers

Get full wear out of that good coat and vest by buying **New Trousers to Match**

You save the cost of a new suit. Each pair tailored to your measure. Over 80,000 patterns to choose from. Mail vest or sample of your suit and we will submit sample of cloth for approval.

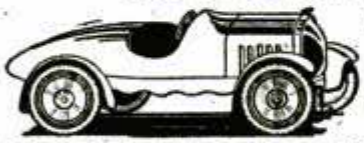
Enclose return postage if vest is sent.

We employ no agents.

ACME PANTS MATCHERS
Dept. BR-14, 20 W. Jackson, Chicago-76

Sport Bodies for Fords

AT FACTORY PRICES!



This Model in Grey Prime **$39.50**

Write for Booklet A-2 Showing Other Models

SPORT FACTORIES, AURORA, ILL.

Increase Your Profits

Better more dependable air service than the other fellow is the best business builder and advertisement your shop can have, if you sell to the car owner.

Only $12 Monthly

pays for the dependable HB Automatic Air Compressor that is making large profits for its users—priced $75 to $100 less than similar equipment. 30 days trial, in your shop on absolute money back guarantee. Write for details.

Hobart Bros. Co., Box M582, Troy, Ohio.

SHIP MODEL SUPPLIES

At prices you can really afford to pay. Send 25c (silver) for our Big illustrated catalog showing exhibition fittings for model Power boats and ancient historic vessels. Enlarged edition showing complete line now ready.

ROY HANCOCK
323 Douglas Ave., Portsmouth, Va.

START to PLAY Very First Day!

Pleasant, Easy Lessons Show You How!

Extra Money—Hosts of Friends—Loads of Fun Within Your Reach

HAPPY DAYS are in store for you if you will only act on this suggestion! Cheery evenings playing catchy music alone or with sweetheart, wife or sister; proud moments as *center of interest* at gatherings; nights of joy making **$5** to **$25** for work that is "play."

The Deagan Xylorimba is your opportunity! Wonderful for home, in demand at dances and entertainments, *yet easiest of all instruments to play*. No teacher necessary—you actually play simple melodies the very first day even if you cannot read a note of music right now!

Earns $60 a Week—Ralph Smith, Chicago, says: "Played 20 minutes at wedding. Received $20." L. E. Hallmann, Reading, Pa., writes: "Made $300 in 5 weeks, spare time. Had never played instrument before."

Send for Big Free Book! Our new book tells all about the delightful lessons furnished with each instrument, the five-day trial that removes risk, the wonderful Deagan easy-payment plan. No obligation—simply fill in and mail the coupon.

J. C. Deagan, Inc., Dept. B1455, 1770 Berteau Avenue, Chicago

Send me, without obligation, full details of Free Trial offer and easy-payment plan of the Deagan Xylorimba.

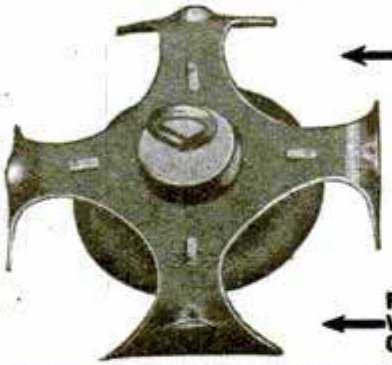
Name.....

Address.....

The Prim Vacuum Clip

"Holds Things Against Glass"

Patented Sept. 4, 1923.



The neatest and handiest way to place posters, announcements, advertisements, show cards, price cards, merchandise, etc., in windows, show cases, against mirrors, polished surfaces, etc., and takes the place of unsightly gummed stickers.

Used by merchants for a hundred convenient purposes around the store; newsdealers, music stores, window trimmers, advertising men, etc. Handy for motorist in holding road maps, matches, cigarettes, etc., against the windshield. Handy in the home for holding curtains, ice card, rent, and for sale signs in windows. Use 'em yourself and sell 'em to others.

PRICES:

Retail Price, 15c Each, $1.25 per Dozen: Wholesale price, $7.00 per 100. Jobbers, write for quantity prices.

AGENTS WANTED

PRIM MFG. AND SALES CO.

Manufacturers **SAGINAW, MICH.**

A BIG MACHINE at a LOW PRICE!

DOES 20 DISTINCT WOODWORKING OPERATIONS

ON EASY TERMS

FREE TRIAL

TURN YOUR HOBBY INTO INCOME!

No trick at all with this amazingly low price Woodworker, which you may try, and pay for, on terms, to turn idle hours into profit. Does 20 woodworking operations. Ideal size, capacity for shop, home or the job. Economical.

COMPLETELY EQUIPPED!

Comes complete with 8-in. Cross Cut, 8-in. Rip Saw; 12-in. Band Saw; Jointer, Lathe, Borer, Sander, Guides, Electric Motor. Investigate it!

FREE Working Drawings of 60 Items you can Make *with Saw*

SEND FOR FULL DETAILS! A. S. ALOE CO. 1832 Olive St., St. Louis, Mo.

Without obligation, send me details on the Woodworder, and the Free Trial and Easy Terms Plan.

NAME.....

ADDRESS.....

See Miles Away

Big 3½ Ft. Telescope

Lend wings to your eyes! People and objects miles away seem close. Wonder telescope brings new pleasures to home, farm, camp, travel, sport. Study the mysterious Sun spots; see Moon and Stars as never before. See people on the beach, on the mountains, etc.

FREE Yes, absolutely free! A handsome leatherette Carrying case and Shoulder Strap. Also Solar Eye Piece to view the sun—a special feature, found only on expensive instruments.

5 Sections 8 Power Lenses

Brass bound; measures 12 in. closed; powerful achromatic lenses protected by dust caps.

5 DAY TRIAL

Thousands Pleased

P. Brush wrote: "Watched submarines three miles off coast." C. Scribner: "See lighthouse 18 miles away." Mrs. Yarbrough: "Could tell color of aeroplane four miles away." S. M. Gearhart: "Can see men working seven miles away."

SEND NO MONEY

On delivery of Telescope, free Case, Strap and Eye Piece pay Postman only $1.85, plus postage (2 complete outfits $3.50), or send price with order and we'll pay postage. Satisfaction guaranteed or money refunded. Send today, entertain your friends! Be first.

FERRY & CO., Dept. 9776, Chicago, U. S. A.

"Interlox"

MASTER SLIDE RULE

Speeds up all measuring. Slides in and out—no folding. Direct-reading for instant **inside** measurements, as well as outside. Any length, 2 to 8 ft., 20c lineal ft. If not at dealers, sent postpaid.

MASTER RULE MFG. CO., 813 E. 136th Street, NEW YORK

Dealers and Agents: Write for attractive proposition.

TOOL CASES

for Machinists, Repairmen and Tool Makers. All metal, finished with quarter oak grain and brown crystallized enamel. Twenty styles. Ask for booklet.

The Yarder Manufacturing Co. TOLEDO, OHIO

Get This Motor Attachment!

Complete with drill chuck ONLY $2.75

Without drill chuck $1.75

Multiplies the Service of ALL Small Motors

Holds grinding and polishing wheels, wire brushes, drills, saws, etc. Quickly pays its small cost. In sizes to fit ¾, ⅜ and ⅜ inch shaft (state which). Complete, with drill chuck only $2.75. Without drill chuck $1.75. Send check or money order—we pay postage.

THE BARSTEEL PRODUCTS CO., 1111 Power Ave., Cleveland, Ohio

DIE CUT OVAL PRINTS

Something new for kodakers. Send negative with dime for sample and catalog of specialties for kodakers.

FRANK SCOBIE, 43-O; Sleepy Eye, Minn.

New Improved SPORS Fountain Pen. 60 Day Trial. Money back if not pleased

Agents' Sample 65c

Sells for $1.25. Writes like a $7 Pen

Make $10 Daily Easily

LADIES' OR MEN'S STYLE

Comes in Green Moiré or Blue Marble

Guaranteed 2 Years

Improved Point

Newest Invention. Rubber sponge keeps pencil moist. Writes like inked it touches paper

MADE $33 IN TWO DAYS

"Sold 44 pens Monday and Tuesday. Pens sell themselves. Rush 2 gross." Earnest Markle, Pa.

Write for FREE Wholesale Specialty Catalog

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LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES. Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, price 25c. Larger sizes, 50c and $1 postpaid. JOHNSON SMITH & CO. Dept. 823 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better and quicker; saves more than half. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. 25c, 3 for 65c postpaid anywhere.

GOOD LUCK RING

Very striking, quaint and uncommon. Silver finish; skull and crossbones design, two brilliant, flashing gems sparkle out of the eyes. Said to bring good luck. Only 25c ppd.

Exploding Cigarettes

JUST LIKE ORDINARY CIGARETTES. BUT SUCH REAL STARTLERS! The box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c box.

NOVELTY BADGES

Kissing Permit 10c *Garter Inspector 10c*

Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. Put up in boxes just like regular Safety Matches. As the victim tries to light one he gets quite a surprise.

Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

MIDGET BIBLE

GREAT CURIOSITY Smallest Bible in the World. Size of a postage stamp; 200 Pages. Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church acquaintances, etc. PRICE 15c each. 3 for 40c, 12 for $1.35, 100 for $7.50. Also obtainable in Leather Binding, with gold edges. Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible, 15c.

Rubber Chewing Gum

10c Pkge. 3 for 25c P.Pd.

It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one suspects it is not genuine until they start to chew it. There's a world of fun in this rubber chewing gum—5 sticks to the package. Price, 10c Pkge.; 3 for 25c; 12 for 75c postpaid.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.

Wonderful X-Ray Tube

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co.

Every Boy His Own Toy Maker

A great book for boys. It gives plain, practical instructions for making all manner of toys, machines and other articles, amusing and useful. Tells how to make a Steam Engine, a Photographic Camera, a Windmill, Microscope, Electrical Machine, Galvanic Battery, Electric Telegraph, Electrotyping Apparatus, Telephone, Kaleidoscope, Magic Lantern, Aeolian Harp; how to make Boats of all kinds, Kites, Balloons, Paper Toys, Masks, Card Racks, Wagons, Carts, Toy Houses, Bows and Arrows, Pop Guns, Slings, Fishing Tackle, Rabbit and Bird Traps, etc. 200 illustrations. PRICE 25c Postpaid. JOHNSON SMITH & CO.

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. Price, only 25c Postpaid. Johnson Smith & Co.

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most life-like manner. Price per box, 10c postpaid, 3 for 25c.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs

Well made and effective, modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridge — obtainable everywhere. Special cash with order offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new 550 page De Luxe Catalog of latest novelties; all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy Type) for pistol 50c. No C.O.D. shipments.

Special Offer
1 Blank Cartridge Pistol
100 Blank Cartridges
1 550-page Novelty Catalog
ONLY $1.50 The Lot
Shipped by Express Only
Cash With Order Only

THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it.

Never Fails. A 16 page course on ventriloquism, the Ventrilo, ALL FOR 10 CENTS

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment . . . $1.00

Anyone Can Do Them

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid.**

U. S. BABY TANK

It goes with real Yankee Pep—by its own power

25 Cents

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same lifelike manner as the larger Tanks that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run for toys. It will perform dozens of the most wonderful stunts; it will go backward or forward at will; 2½ inches long. Price only 25c prepaid. JOHNSON SMITH & CO.

Look 35¢ Look

Wonderful Instrument.

With Illustrated Directions.

3 for $1.00

Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngascope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00
JOHNSON SMITH & CO., DEPT. 823, RACINE, WIS.

JOHNSON SMITH & CO.

Dept. 823 RACINE, WIS.

A De Luxe Edition of our new 1928 CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind in existence. Nearly 500 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Stamps, Coin, Money Order, Check, etc. Unused U. S., Canadian and Foreign Stamps also accepted.

Save 1/3 to 1/2

Now You Can Buy Direct at Wholesale

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Do All Your Painting with DEC·O·LAC

Best Quality

Lacquer *in all colors*

30,000,000 Gallons used last Year

For Furniture, Floors and Automobiles. Dries in 30 minutes—hard-lasting finish. Wears 6 times longer than paint or varnish. Heatproof, Waterproof, Soap-proof and Wear-resisting. Automobile Manufacturers accept it as Permanent Finish for Autos. Will not crack or peel. Preserves the life and pattern of Linoleum and Floor Coverings. In colors or clear. Anyone can apply it, free of streaks or brush marks.

Special Offer
ONE GALLON ONLY $7.50
F. O. B. CHICAGO
Shipping wt. 12 lbs.

You Save $4.50

State whether for brush or spray machine

[*NOTE:* You have your choice of one color or four colors 1 qt. each]

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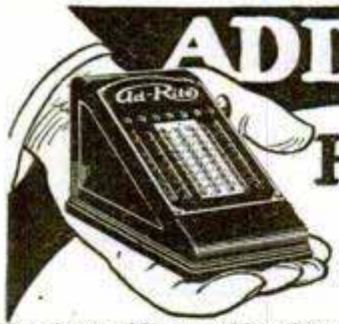
Made $1334 on $89.00 Investment Making Porch and Garden Furniture

Mr. Le Doux of Louisiana invested $89 in UTILITY Molds and in spare time cleared $1334. A New Jersey man made $2700 on a $97 investment. Others are enjoying a profitable business supplying the growing demand for permanent porch and garden furniture. Homes, estates, parks, cemeteries and public buildings want them. We show you simple, easy method of manufacturing and furnish the molds for making beautiful urns, vases, flower boxes, bird baths, sun dials, benches, etc. Send for catalog now. Get this extra income. Also ask for machinery catalog for making Block, Brick or Tile.

CONCRETE EQUIPMENT CO.
570 Ottawa Ave., Holland, Mich.

Send for Catalog

ADDS TO YOUR INCOME



Handing You Money

Here is an adding machine that sells so easily you'll say it's "like handing you money." You won't need any "sales talk"—just show it and it sells! A real adding machine—mechanically right—for only $10.

Every Store and Office Desk a Prospect

At this low price every business man, every clerk, can have one on his desk. No need for a whole office force to depend on one costly machine. Sell them an AD-RITE for every desk.

AD-RITE ADDS—SUBTRACTS—MULTIPLIES
Guaranteed for 5 Years

YOU CAN DO THIS
Scott, Iowa, 5 first day.
Barry, Ill., $50 first 2 days.
Degan, Ohio, $128 one week.

You don't have to be a "high power" salesman—you don't need any experience. AD-RITE makes you a one call man right off the bat. All you have to do is show it—work it—and state the price; they'll hand you a $10 bill and keep the AD-RITE.

Sells for Only $10 Not $150—nor even $25. Only $10—and it does the work! Quick CASH sales. Spot cash for you.

Tell me your offer to agents, and how I can get free AD-RITE sample machine.

Name.....

Address.....State.....

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Money-? Easy!!

SPEED WAY SHOP

Seven Complete Motor Driven Tools

Big, new metal and woodworking shop for mechanics, householders and "handy" men. Attaches to lamp socket.

Free Trial—$10 Down—Easy Payments

Every tool in the new, Super Speedway Shop is high grade, for regular work. A money maker for the small job man. Get full particulars. Write today.

Electro-Magnetic Tool Company, Department 2-M2
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Buy Direct from Swiss Importer and Save 50%

Written guarantee given with this 14-kt. solid gold effect watch, jewelled movement, tested, adjusted, accurate timekeeper, 25-year case, Waldemar knife, chain, also pistol-shape cigarette lighter. **Send no money.** Pay postman only $3.59 for all 4 articles. JENKINS, 521 Broadway, N.Y., Dept. 23M5

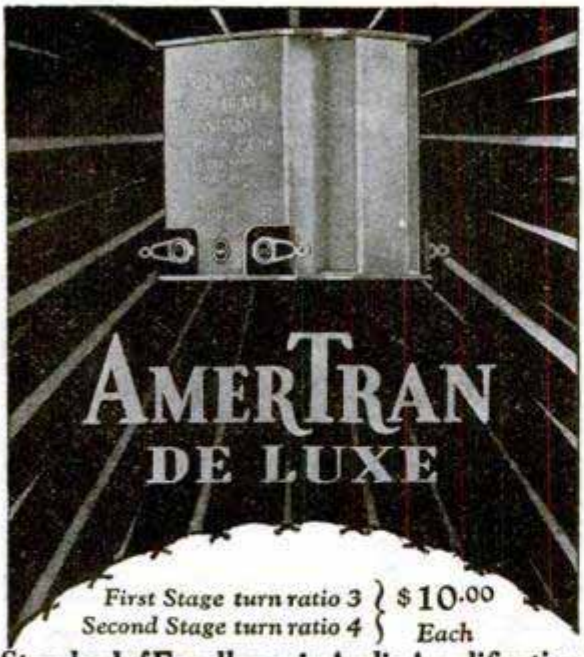
14 Karat Solid Gold Effect WATCH Knife and Chain and Cigarette Lighter Pistol $3.59

COOKS BY BURNING AIR

Does Away With COAL!

Converts any *ordinary stove into gas range.* Produces clean heat much *cheaper* and is far more *efficient* than coal. *Burns 96% air and 4% kerosene.* Installed in few minutes. Types for all heating purposes. Reliable distributor wanted.

GLORIA LIGHT CO., 111-5 N. May St., CHICAGO



First Stage turn ratio 3 } $10.00
Second Stage turn ratio 4 } *Each*

Standard of Excellence in Audio Amplification

AmerTran De Luxe Transformers are but two of more than 30 quality Radio Products bearing the name AmerTran, including power transformers, choke coils, push-pull systems and allied products. Each AmerTran device is designed for a specific use. Full and authoritative information will be given on any audio or power problem.

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Transformer Manufacturers for 28 Years
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Oh Boys! Great Fun with Model AIRPLANES

Actual Photo

The "SPIRIT of ST. LOUIS" MODEL
READY TO FLY—$5.00

Made to scale—22" high lift wings, metal propeller, powerful two bearing motor, shock absorber landing gear. Shipped ready to fly—guaranteed. Exceptional value—extra strong construction. Learn about aviation with these actual flying models.
Also Fokker—Fairchild and Seaplane models. Specify model when ordering. Cost only $5.00 postpaid in U. S. A.
Send ten cents (3 for 25c) for Racing Glider and complete catalog showing these real models of famous airplanes. Agents and dealers—write for discounts.

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DEPT. No. 1 NORTH HAVEN, CONN.

Read Your FUTURE in the STARS

New book, Wilde's Primer of Astrology, tells how to read the future by stars. Enables you to ascertain if your past performances have had the approval of the cosmic law—your future actions to be guided accordingly. Send $1.00 with name and address to
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Powerful 6-7 or 8 Tube Guaranteed RADIO

Radio's most amazing bargains, direct from big, reliable maker (8th successful year). All Electric or Battery sets. Consoles or table cabinets. Don't buy unless 30 days trial proves Miraco unbeatable at 2 to 4 times the price for selectivity, distance, volume and rich, Cathedral tone. Turn 1 dial for all stations. Completely assembled, fully guaranteed sets!

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Free literature, users' testimony and BIG SPECIAL OFFER
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Get Busy
Your Time is Worth

$25.00 a Day!

Collect It!

Don't sink your ambitions in any "one-horse" job—and that means any job that pays you less than *$25 per day*. Don't do it! We've got something better for you—a *real* opportunity.

$25 up to $75 a day! A business of your own! Complete independence! $65.00 starts you. Year around work. ALL these are yours when you put your ambitions to work in Clarke Floor-Craftsmanship.

It's not hard or tedious work—it's floor sanding and refinishing made easy—actually *pleasant*—by a wonderful machine that does it all. No training—no experience necessary, when you work with the Clarke Vacuum Portable Sander. It's almost as easy to operate as a vacuum cleaner.

Great Demand for Beautiful Floors

You work the year around—for every building and home in America needs the work of a Clarke Floor-Craftsman—not only once—but every few years. There's no overhead expense. *The $25 to $75 a day the CLARKE makes you is practically clear profit!*

There's nothing like it! It's your opportunity to turn your ambitions *quickly* into solid cash. The Clarke Vacuum Portable Sander made hundreds of thousands of dollars for men like yourself last year. Find out how *you* can get *your share* from now on. It's an interesting, thrilling story—all actual facts! The coupon will bring them to you. Mail it today!

CLARKE SANDING MACHINE CO.
Dept. P-5, 3831 Cortland St., Chicago, Ill.
For 11 years, Originators and Manufacturers of Portable Sanding Machines.

POWERFUL - FAST CUTTING
CLARKE
VACUUM PORTABLE SANDER

CLARKE SANDING MACHINE CO.,
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Gentlemen: Please send me the facts about CLARKE FLOOR-CRAFTSMANSHIP. No obligation to me.

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Address.....

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

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Pocket Ben

The new model Pocket Ben watch has won universal good will.

You'll find it as good looking as it is dependable. Millions of men carry it with pride and confidence.

Sold everywhere for $1.50.

Built by the makers of Big Ben and other Westclox

WESTERN CLOCK COMPANY
La Salle, Illinois

New Westclox Auto Clock

$2.50

Attractive, convenient, reliable. Fits any car. Quickly attached on dash or above wind-shield.

You Play tunes at once on a Conn

EASY playing features of the Conn saxophone give you quick mastery—you learn to play tunes at once. Entertain yourself and friends.

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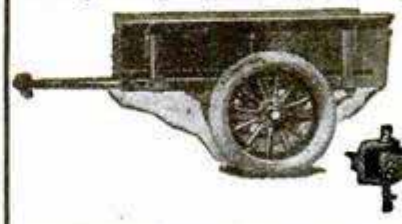

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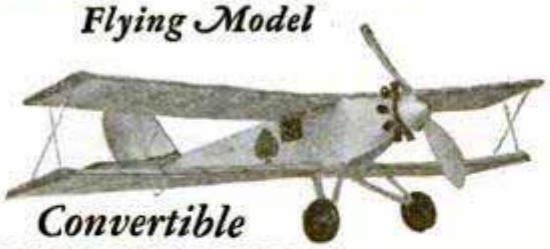

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Wing Spread 30 inches · Weight 3¼ ounces

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Cuts Wood, Steel, Brass, Bakelite

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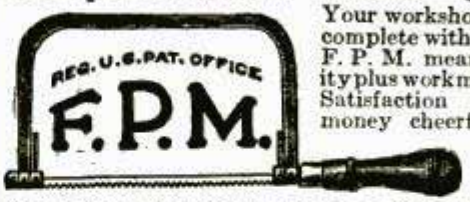

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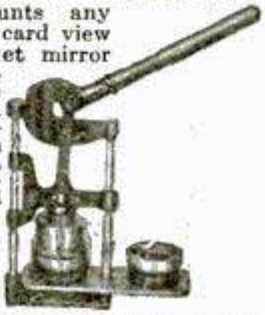

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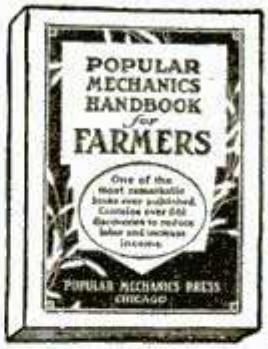
Chicago, Ill. Dept. 13

861 PRACTICAL IDEAS for REDUCING FARM LABOR and INCREASING INCOME



One farmer writes: "I would not take $100 for my copy if I could not secure another."

The Handbook for Farmers contains: 138 ideas for the farm shop, 35 on fencing, 98 on auto, truck and tractor, 61 on farm buildings, 36 on field machines, 48 on concrete work, 22 on orchard work, 23 on painting, 15 on live stock, 34 on poultry, 54 on garden work, 25 on electrical work, 22 on farm tools, 16 on hunting, fishing and trapping, 140 household helps.

394 HELPFUL KINKS to LIGHTEN the LABOR of the FARMER'S WIFE

The Handbook for Women contains: 83 kitchen and dining room helps, 17 on garden and flowers, 19 on sewing and mending, 37 on furniture, pictures and fixtures, 38 on laundry and cleaning, 32 on house cleaning, 12 on music, 14 on sleeping rooms, 11 on care of children, 16 on lights, 9 on photography, 14 on clothing and shoes, 23 on house temperatures, 12 on water and drains, 10 on insect pests, and 47 miscellaneous.

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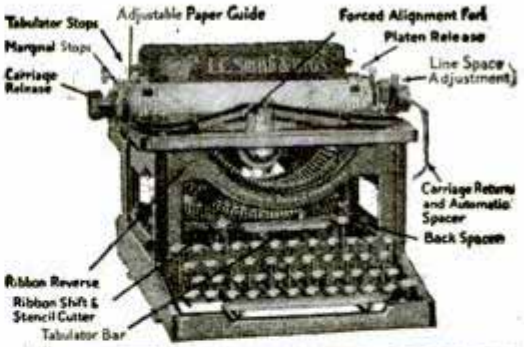

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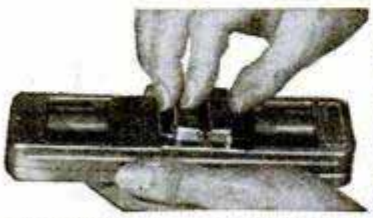

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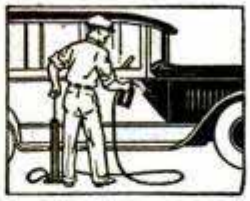

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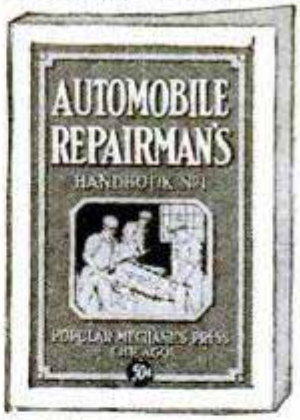
Time, Labor and Money Saving Ideas for Auto Repairmen



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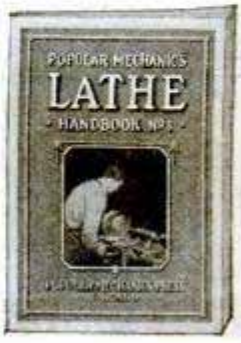

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Dept. 805-G, Chicago, Ill.

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Address.....

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

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Year.....No. of cylinders.....

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It Outgrips a 40-POUND Bench Vise—The "handgrip" of a tiny rubber band holds the Hardest-to-hold thing known against a 300-Pound Pull!

This is an Automatic LOCK-Grip Ratchet WRENCH—Speed VISE—Parallel PLIERS, and more; with a 1-Ton, 10-to-1, POWER-Gear!

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MAKE $20 DAILY SUPPLYING DEMAND

Right now we have exclusive territory open everywhere that holds big money making possibilities.

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New, sanitary, electric, complete Red Hot kitchen soon to be announced. Get advance details. Very small investment starts you on the road to independence. Write at once to—

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MADE $1200.00 NET PROFIT IN 90 DAYS

You Can Do It Too FREE Book Tells How-

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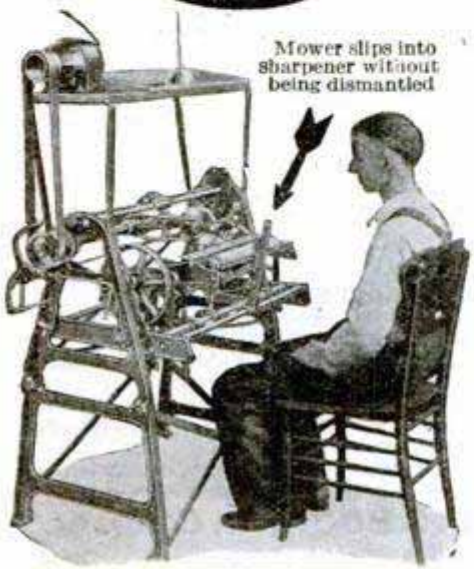
Here's Your Chance!

The big opportunity you've always wanted—to make extra money, BIG MONEY, in your spare time, at home. W. T. Moore, Twin Falls, Idaho, made a net profit of $1200 in 90 days. You can do it too—turn every spare hour into $4 to $6 profit with the

IDEAL LAWN MOWER SHARPENER

You, too, can make yourself independent, build a permanent, honorable, big-paying business with this "Ideal" Grinder—a wonderfully simple machine that sharpens all makes of lawn mowers perfectly, scientifically, without taking the mowers apart. Just pick up the mower, set it in the "Ideal," make a few simple adjustments and proceed to sharpen. In 15 minutes the mower is ready for the lawn, and you have made $1.50 to $2.00—depending on the charge you fix.



Mower slips into sharpener without being dismantled

Man, It's Amazing How Easy it is to make big money with the "Ideal." Anyone can do it! H. J. Nulick, El Dorado, Kans., turned his grinder business over to his 14 year old son.

Hundreds of Dull Mowers in your locality are waiting to be sharpened. No town too small. R. S. Newcomer, Vinton, Ia., writes: "People come for miles around and other towns to get their mowers ground." Your customers stay with you, too. The "Ideal" sharpens mowers to razor edge. Owners are delighted; tell their friends; your business grows by leaps and bounds.

$2100 Last Season
W. F. Kendt, Buffalo, writes: "I sharpened 994 lawn mowers last season and the receipts were nearly $2100—not bad for a side line."

You Make Money Right Away Geo. E. Kearney, Stillwater, Minn., writes: "We set the machine up 2 weeks ago Friday; since that time have sharpened 102 mowers." That's close to $200 in Kearney's pocket for 2 weeks' work!

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Our FREE BOOK, "Let George Say It," contains proof of what we say. Send today for it.

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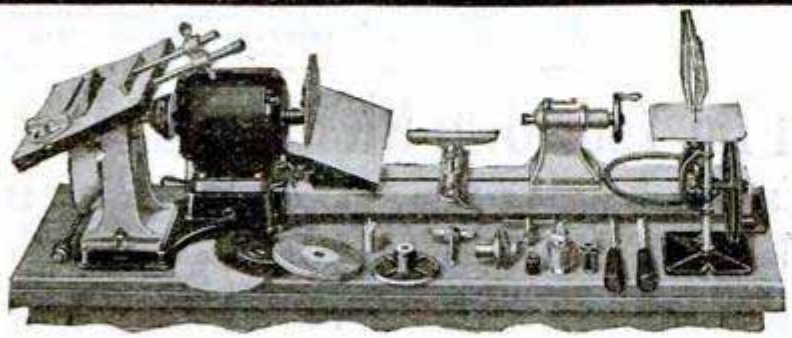

It's easy to gratify your ambition to make beautiful things with this big, husky, practical workshop and its many carefully-designed accessories—every one over-size—every one a nationally-known product. Scientifically designed and carefully built of the finest materials, there is no other workshop that offers so much actual machine-value per dollar.

Send for our big, illustrated color folder. Learn why the DELTA HANDI-SHOP is so much more practical and efficient—why as many as three tools are always ready for work at one time. Learn the decided advantages of the two-shaft motor and the many other novel and exclusive Delta features.

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Protect the cushions of your car from dust, dirt and wear. Doubles their life. Increases trade-in value. Keep car looking fresh and new inside.

Quality seat covers made of heavy, reversible, special quality, long wear seat cover material with dust-resisting surface. Washes beautifully.

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Best made, perfect fitting. Cover cushions completely, without wrinkles.

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SEND NO MONEY! Just mail name, address, state make, year, and model of car and color of cover wanted. Pay postman above price, plus a few cents delivery charges. If not all you expected return them and we will refund your money.

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C-A ADJUSTABLE BEARING corrects and prevents end-play without removing motor. Eliminates many troubles. Easy to install—simply drop pan. For Fords, **$3.75**; for Chevrolets, **$4.25.** Ask your dealer or sent prepaid by

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LATE MODEL WITH 1 BLADE or 4 Razors and 4 Blades for $1.00.

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This marvelous Invention enables anyone to NICKEL-PLATE anything—anywhere; in the Home, Garage, Office, Store or Shop—in fact, you can do all the NICKEL-PLATING on any automobile with the ALADDIN ELECTRO PORTABLE OUTFIT in a very short time—without removing any of the parts. This interests every auto owner (and others) because you can **SEE THE NICKEL FLOW** NOW take the Plater to the job instead of taking the job to the Plater. This offers wonderful ECONOMY to users and BIG MONEY-MAKING possibilities to AGENTS. Be the first in your locality. *WRITE FOR FREE BOOKLET.*

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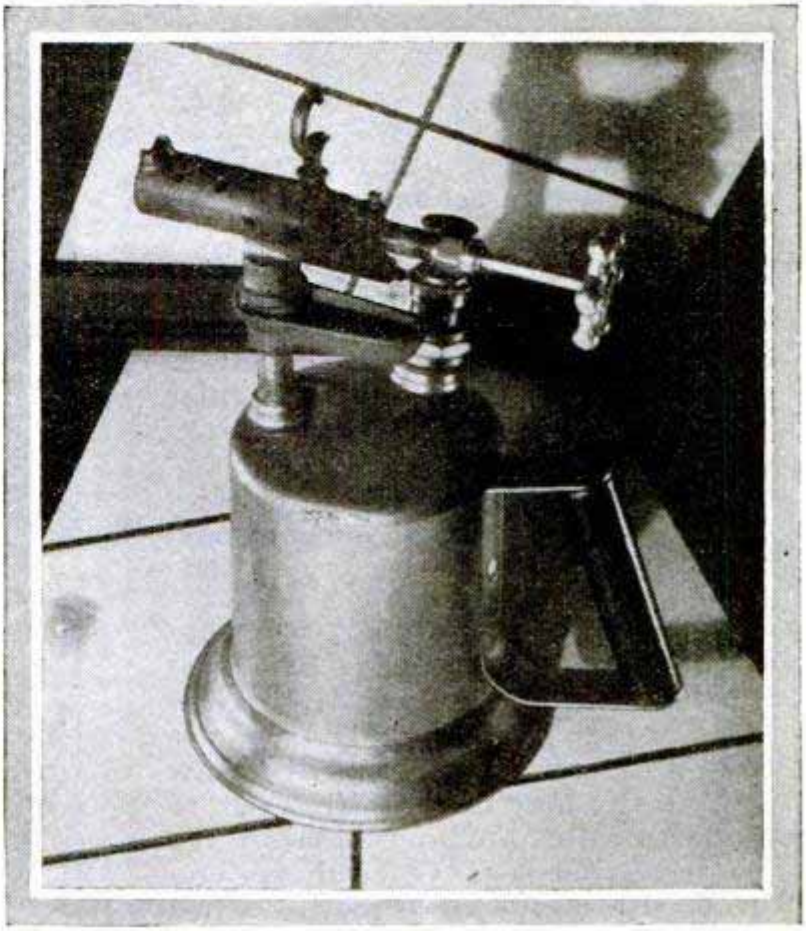
C & L 158

This blow-torch is especially made and priced for the man who likes to do odd jobs around the house, or to tinker with mechanical things. It will last a lifetime if it is not abused. The usual retail price is about five dollars. Most hardware, electrical and automobile accessory stores have it or can get it for you quickly. Look for the red handle.



When you plank down your money for a blow-torch . . .

You'd be surprised what a lot of things there are inside of a blow-torch. When you buy one you have to take those insides pretty much for granted—the outside won't tell you a thing. Yet the insides of blow-torches differ considerably, making one work better and last longer than another.

If you'll take a look, next time you're buying one, and make sure the name Clayton & Lambert is on it, you can be mighty certain you're getting the torch that will do the job you want it to do, will keep on doing it in fine style, and that the price represents the best blow-torch value your money can buy.

And here's why. We've been making blow-torches for forty-odd years. Our first one was a good one. But that just made us want to make a better one—and that's the way we've felt about it all these years. As a result, we've developed a list of improvements as long as your arm, and we hold patents on them.

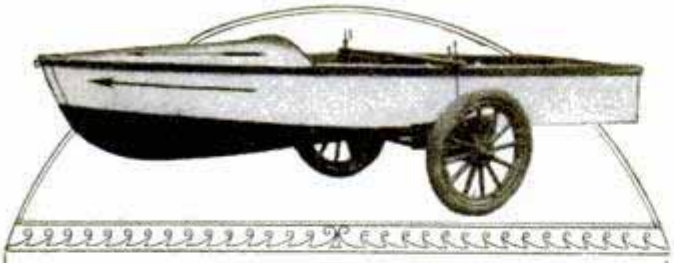
Those are real improvements. So real that the better performance of Clayton & Lambert blow-torches has made us the largest manufacturer of blow-torches in the world, with volume production that permits giving better quality at any given price and in every wanted type and size.

So when you plank down your money for a blow-torch—make sure the name Clayton & Lambert is on it.

CLAYTON & LAMBERT

MANUFACTURING CO.

DETROIT, MICHIGAN



HAVE you seen these "boats on wheels"? Before summer is over, you will probably see many of them for Mullins has made the Portable Boat popular by means of the Mullins Boat Conveyor.

No longer are you compelled to use your boat on one particular body of water. Load up your camp equipment and take your boat where you will. New reaches of sparkling lake and river are yours to explore.

This simple, ridiculously inexpensive conveyor removes the last obstacle to boat ownership. Now your garage may be your boathouse too, and your Seahawk will follow you to the lake or river or seashore at forty miles an hour if you want to drive that fast. Once there, you back the conveyor into the water and your Seahawk floats free. It's as simple as that.

And since there's no longer any excuse for doing without a boat, send at once for the new four color "Book of Boats" that Mullins has prepared for you. Get the dope on the fifteen new models—and the conveyor. Write today.

Please send me your 1928 "Book of Boats" that gives all the dope.

Name.....

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MULLINS

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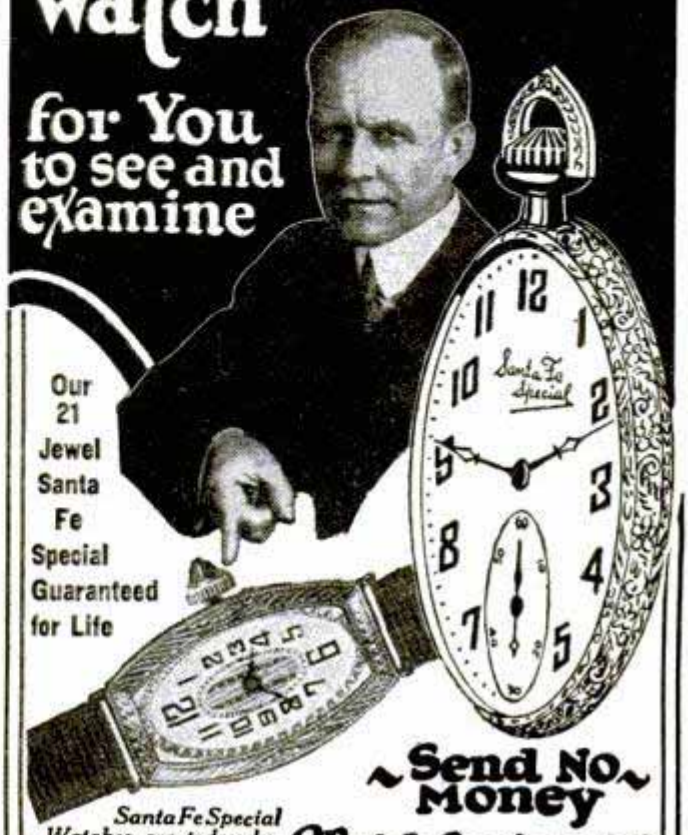

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Santa Fe Special Watches are today being shipped to every civilized country in the world, and are probably the best and most favorably known watch in both Army and Navy.

In addition to our NEW LOW PRICE, I will send for your approval one of these Standard Watches, guaranteed for a lifetime of satisfactory service, not only by the Santa Fe Watch Company, but by the Great Illinois Watch Factory. So accurate, Government officials carry them; so perfect and beautiful, jewelers say they are worth 1-3 to 1-2 more than we ask for them. I will send you one to see WITHOUT ONE PENNY DOWN—allow you to wear it 30 days FREE—then sell it to you on easy payments.

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Please send prepaid and without obligation your Watch Book Free, explaining your "No Money Down" Offer on the Santa Fe Special Watch.

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No Tire Compares With DICKINSON

Our Salesmen Agents are "Cleaning Up" —*the Chance of a Lifetime!*

Selling the tire that went at the rate of 230 miles per hour in the recent Florida races.

Our Salesmen-AGENTS are "cleaning up" on DICKINSON CORD TIRES, for they solve the biggest replacement-cost of every car owner. Unbelievable as it may seem, no other tire begins to compare with this, "The World's Perfect Tire"—*for Strength—for Speed—for Service.*

No wonder that every car owner is a willing buyer. Sales are made quick and profits are large. You don't have to be an extraordinary Salesman to make $40 a day. Through our National Advertising you have an established business ready and waiting for you right in your own locality. This is the chance of a lifetime to get into business for yourself. Immediate big money and future income assured from repeat orders. No investment. We start you—FREE.

The Dickinson Cord Tire is a tire for the classes—those who want only the best. Costs user nothing, as saving in gas ranges from 10% to 17%. It has no competition. Absolutely new and embodies correct motor-traction principles *never before applied.* Every Dickinson Cord Tire is made on the Dickinson Automatic Tire Building Machine, of which we are the *exclusive users.* From core to tread it is built with automatic precision. There are no "slip-ups," no hand mistakes, and no guesswork flaws. Every Tire Perfect and a Racing Tire. "Stone bruise" is impossible. "Blowouts" are back numbers. 100% pure "live" rubber, cabled-cord construction, precise alignment and scientific accuracy make it "The World's Perfect Tire" for *Longest Life—Greatest Comfort* and *Strictest Economy.* Guaranteed for one year against all road-hazards regardless of mileage.

Write today for Information about Exclusive Representation in Territory still open. Dept. 59.

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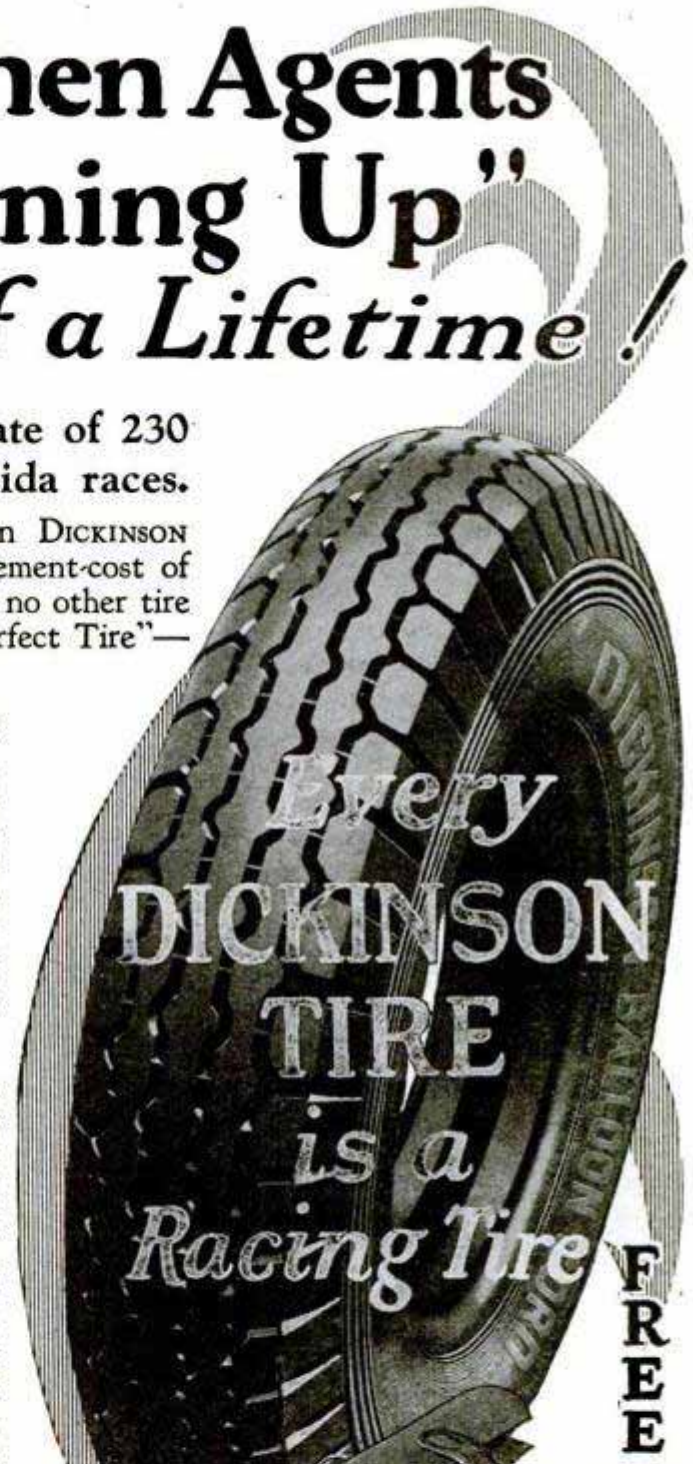
Pottstown, Pa. *Address Nearest Branch* **Chicago, Ill.**



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This case, $40 a Day PROFIT . . .

This case makes the sales, sets you up in a lifetime business and makes you independent. Show the quality of a *Dickinson Cord Tire* and the prospect sells himself. Sales easy. Satisfaction brings automatic re-orders. First applicants receive preference for Exclusive Territory. No investment. Write now. Dept. 59.

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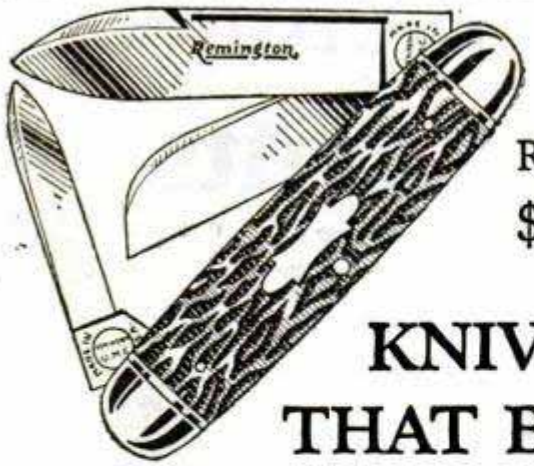

R4223
$1.50

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Remington steel is hardened and tempered by a special process, to produce blades with keen, uniform, and lasting cutting edges. Every blade is hand-honed at the factory. When you buy your Remington every blade will bite, and you can keep a biting edge on Remington blades.

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Originators of Kleanbore Ammunition

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CASH REGISTERS SERVICE MACHINES

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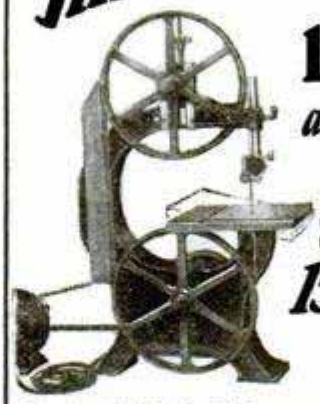
THIS amazing New!
12" Band Saw
and S&B *Wonder* Scroll Saw
Sent to You on *15 days approval*



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It is easy to make the devices described above because there are 317 helpful illustrations. The articles are clear enough for boys, yet interesting enough for any man.

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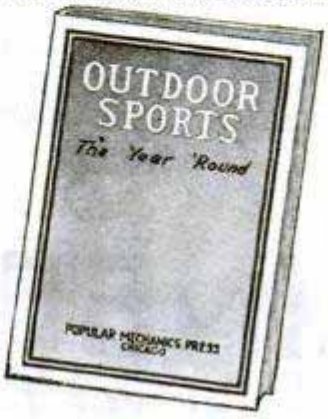

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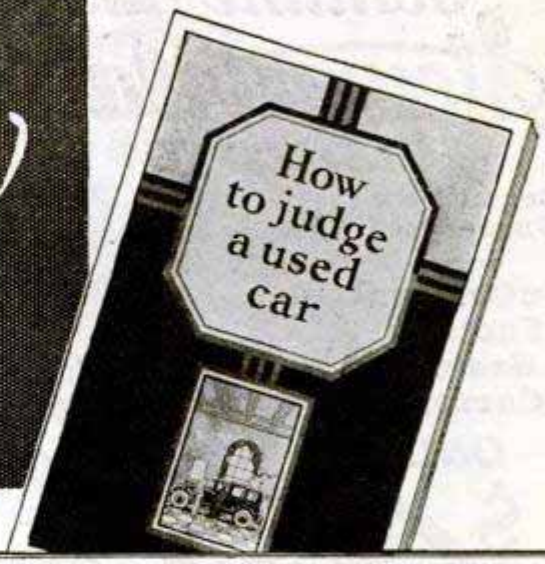

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Please send me my copy of your valuable free booklet, "How to Judge a Used Car."

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Brand New Guaranteed

In Original Factory Sealed Cartons

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Gives You All These Features

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Perfect scale accuracy—every tone **always** full, clear and true.

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Buescher Band Instrument Co.
2536 Buescher Block, Elkhart, Indiana

Silk Hose 5c a Pair

An astonishing new discovery called Duro-Silk now allows any woman to make any silk stocking "Run Proof," wear twice as long and never fade. Duro-Silk gives any woman who uses it **a pair of silk hose for 5c.** In a recent test, a chiffon silk hose, treated with Duro-Silk, was drawn over finger nails 5,573 times without a break or run. The originators want agents who can make from $75 to $200 per week, and will send sample to introduce. Write

CURTAN MFG. CO., Dept. 805-G, 154 E. Erie St., CHICAGO

DEAFNESS IS MISERY

Multitudes of persons with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Antiseptic Ear Drums. Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are Unseen Comforts and inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

A. O. LEONARD, Inc., Suite 699, 70 5th Ave., New York

Boice Leads *in Saw Values*

Compare the two Boice bench machines illustrated here with similar saws for size, capacity and price. Only enlarged production facilities and big demand for Boice products could permit such prices for this high quality.

Universal Handisaw

Table 15" x 17" tilts 45 degrees. Elevates for grooving. Swings 9" saw, cuts 2½" stock. Insert takes dado head 6" x 1", cope heads and 8" sand disc. Guides always remain parallel to saw regardless of elevation or tilt of table. No other saw of equal cost has this feature. Sold with or without motor and base.

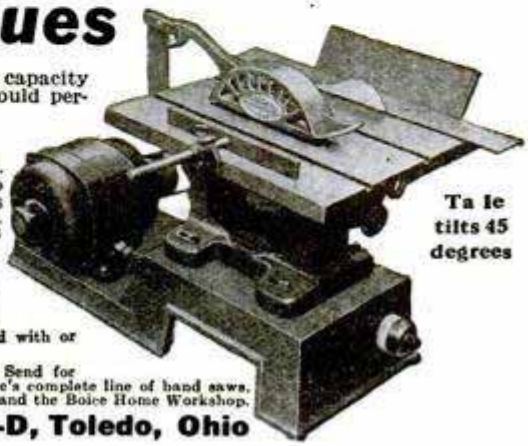


Table tilts 45 degrees

Universal Jig Saw

$12.00 *as illustrated*

Table 8 in. dia. tilts 45 degrees both ways. Saw-to-frame 10 in. Vertical stroke 1½ in. Uses blades 1-8 in. to 3-8 in. wide. Bronze bearings. Speed 800 to 950 R.P.M. Height 14 in. Sold with or without motor and belt.

All Boice machines driven from light socket. Send for new catalog "B" describing and illustrating Boice's complete line of hand saws, circular saws, jig saws, mortisers, jointers, lathes and the Boice Home Workshop.

W. B. & J. E. BOICE, Dept. P. M. 5-D, Toledo, Ohio

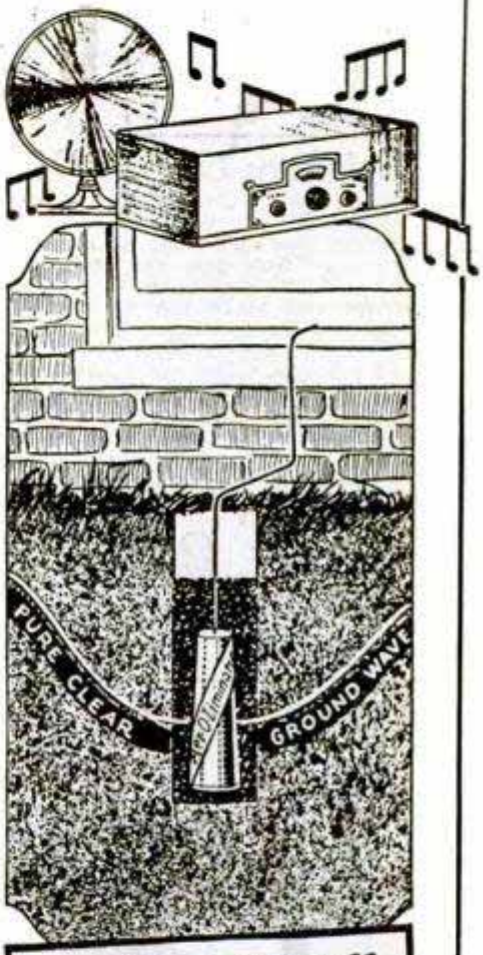
Amazing New Ground Antenna

Gets Everything But Static!

Brings in Far Away Stations Loud and Clear Regardless of Static Conditions

Fans everywhere are replacing their troublesome and static gathering up-in-the-air aerials with the marvelous new GROUND ANTENNA—Aer-O-Liminator. Radio engineers and hundreds of users testify that Aer-O-Liminator gets better long distance reception, almost unbelievable freedom from outside noises, far greater selectivity and marvelously true, clear sweet tone quality.

John E. Christenson, radio engineer, Chicago, writes: "I have tested and thoroughly approve the Aer-O-Liminator. I find it increases selectivity and volume without distortion, practically eliminates static, gives good clear tones, both on local and distant stations. I would recommend the use of the Aer-O-Liminator to every radio owner to get the best reception from his set."



FREE TRIAL Make This Thrilling Test at Our Risk!

Install an Aer-O-Liminator (Ground Antenna). Leave your old overhead aerial up. Try out on a night when static is bad. If you do not get a wonderful improvement in freedom from static, greater selectivity and clear sweet tone without interfering noises, if you can't get good reception on stations that are drowned out by static on your old aerial, you need not pay us a red cent for this test. Send coupon at once for scientific explanation of Aer-O-Liminator (Ground Antenna), proof of performance and our conclusive iron-bound guarantee and remarkable Free Trial Offer—Mail Coupon TODAY!

Easy to Install

Just dig a small hole about 6 inches in diameter and drop Aer-O-Liminator into it.

Aer-O-Liminator (Ground Antenna)

CURTAN MFG. CO.
154 E. Erie St., Dept. 805-G
CHICAGO
ILL.

Having your Antenna in the ground does away with the Lightning Hazard.
Aer-O-Liminator is Endorsed by foremost Engineers and Dealers.

Curtan Mfg. Co., 154 E. Erie St., Dept. 805-G, Chicago, Ill.
Please send me at once complete description of Aer-O-Liminator with details of guarantee, Scientific Proof and FREE TRIAL OFFER.

Name .....
Address .....
City ..... State .....

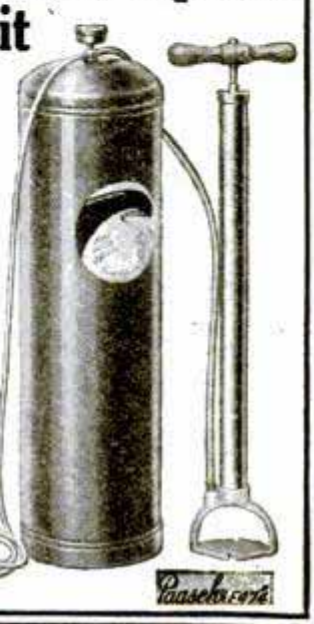
Use This Coupon

Now! HOUSEHOLD LACQUERING UNIT
You can easily dress up Your own Furniture, Screens, etc.

ONLY $15.00

FREE FREE
15-foot roll of Paasche Masking Tape with each Unit. Used for clean-cut color edges, shielding and stenciling.

It's Amazing how easy you can now paint with this Outfit



Brighten Up The Home
Until now the home owner had to be content with the old-style slow hand brush, with its unsightly laps and brush marks and uneven coverage. Now you can spray lacquers, paints, varnishes, enamels, shellacs and bronzes and make the work easier, look better and finished much faster. Now you can brighten up the home with your choice color schemes. This outfit has been tested and approved for home use and is the latest product of the world's largest manufacturer of airbrush equipment.

Paint Your Own Auto
With this unit you can obtain beautiful results, always smooth and uniform—secure any shade—spray intricate pieces as easily as flat surfaces—produce rich blends—veiling effects, and any finish, and as an aid in antiqueing furniture, this unit has no equal. Also don't overlook your auto—now you can keep it bright and new looking. Manual training classes of high schools everywhere find this an inexpensive unit and valuable in teaching this finishing method. Now do it better with a Paasche Spray Outfit.

THIS UNIT CONSISTS OF
One Paasche J. D. Hand Pump, Tank with Gauge.
½ Pint Glass Jar, Fittings and 8 foot Hose.

Patented

Paasche Airbrush Co.
J. A. PAASCHE, President
1949 Diversey Pkwy., CHICAGO, ILLS.

Also Large Power Outfits for Commercial Use.
Write for FREE FOLDER

Yes You Too . .

will make more money using the TAKE-ABOUT. Makes sanding faster and smoother, operates from lamp socket. It is the only belt sander and only weighs 14 lbs.

TAKE-ABOUT Sander

Does the work five times as fast and great for those hard to sand places such as floor edges and stairs. Also for bench work, furniture, in short wherever hand sanding is required. Many other features fully explained in illustrated literature.

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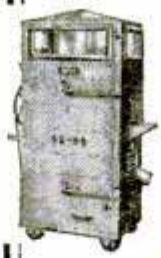
Take-About $85.00
Super Take-About $125.00

Write to
Porter-Cable Machine Co.
1704-10 N. Salina St., Syracuse, N.Y.

Why work for the other fellow—

START IN BUSINESS FOR YOURSELF!



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Knife and Chain

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For a short time only—to make you acquainted with the wonderful NEW Burlington Watch—we will send FREE, with any men's watch, a beautiful knife and chain; with any ladies' watch, an exquisite watch bracelet. Moreover, we will give you 30 days' trial—and a year to pay!—at our rock-bottom, direct to you price, saving you from 25% to 40%. (*Just compare our watches and prices with those of your local jewelers.*) This is unquestionably the most remarkable offer ever made on a superb quality watch. Write before this offer is withdrawn!

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Don't think of buying ANY watch until you see the NEW Burlington Book. It is sent free, and shows in colors, all the latest, most exquisite designs. The Burlington, always a masterpiece, *is now better than ever!* 21 Ruby and Sapphire jewels; adjusted to the Second, to Temperature, to Isochronism, to Positions; 25 Year Gold Strata Case. In the New Burlington Book you will find every kind of model—such as the New Burlington Bulldog, for rough service, the New Lady Burlington, new strap watches for men—in fact *a watch for everyone!*

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NEW Wrist Watches for Men!

Don't fail to see our NEW models. They are "the last word!"

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With these wrist watches we send FREE the New Trifold 14-Karat Gold-filled Wrist Band. Write!

Think of it! You can use any Burlington watch for 30 days just as if it were your own; then if not *delighted!*—send it back at our expense. If you keep it you have a year to pay! And, in addition, you get a Beautiful *Gift!*

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Burlington Watch Co., Dept. 13-55
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Please send me (without obligation and prepaid) your new free book on watches, with full explanation of your Free Gift, 30 Days' Trial offer on the New Burlington Watch.

Name ----------

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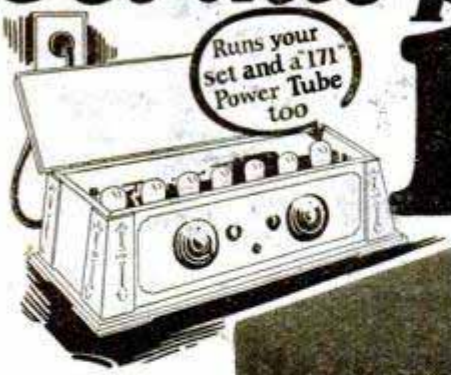
Get this powerful 180 Volt "B"

OPERATES from 110 Volt 60 cy. CURRENT



Delivers 180 VOLTS from 85 MIL. TUBE

Because of its very low price, don't confuse the PEERLESS with Eliminators which deliver only 90 or 100 volts. Also, don't confuse it with chemical type Eliminators. The PEERLESS uses the standard 85 milliampere gas-filled Raytheon or Q. R. S. rectifying tube. It is dry. No water, no acids to add. Requires no attention whatever. Delivers pure, hum-free "B" current of 22½—45—90—135 and 180 volts. Out-put Voltage taps are fixed. No adjustments. Will run any set. Will operate *any* power tube requiring no more than 180 volts. Will not "motor-boat" on superheterodyne receivers. Operates resistance-coupled audio amplifiers, when other "B" Eliminators fail. In every sense of the word, the PEERLESS provides the finest kind of "B" Eliminator performance—at only $12.45. Why pay more?

Only $12.45

Direct from Factory to you

Now—you can buy as good a "B" Eliminator as is possible to build—at a price that won't cramp your purse. Now—you can enjoy the thrill of louder, clearer, better reception that a good "B" Eliminator affords. And you buy the PEERLESS without risk of any kind, for it is backed with a

2 Year Guarantee

This astounding offer is without a precedent. Never before has such a value been offered. A "180" volt "B"—a "B" that will run your set and a power tube too—and guaranteed for two long years—at the ridiculously low price of only $12.45.

30 DAY TRIAL

Read all about this great new, better, tube type "B" Eliminator in the left column of this page. Then order it at once. Hook the PEERLESS up to your set. Compare the reception you get to that which you got before, or to that which you can get from any other "B" Eliminator. Put the PEERLESS to every test you can. Make it drive a "171" power tube, if that's the tube you use in your set. Enjoy this "B" for 30 days. Then—send it back, if you think that any other "B"—at any price is as good. We'll refund your money instantly.

$1 BRINGS YOU The PEERLESS TO TEST AT OUR RISK

Send only $1. A dollar bill will do. We'll ship the PEERLESS "B" Eliminator at once. Pay the expressman $11.45 plus small express charges. Remember—you order the PEERLESS entirely at our risk. It is yours to test for 30 days. You get your money back promptly if within that time for any reason whatever, you don't want to keep the PEERLESS. Order now. Fill in the coupon and mail today.

TUBE FREE IF YOU ORDER NOW

This is the first announcement of this new, super-powered, better quality guaranteed "B" Eliminator. Its regular price is $12.45 without the rectifying tube. But, as a special introductory offer to get thousands of these units out on sets, we will include, for a limited time only, a genuine $4.50 Q. R. S. 85 Mil. Tube free with your order. Think of it! A 180 Volt "B"—a 2 year guarantee—the privilege of trying it 30 days at our risk—and a $4.50 tube free—all for $12.45. Mail coupon now.

PEERLESS MFG. CO.

3985 Cottage Grove Ave. **Chicago, Ill.**

Mail Now!

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I enclose $1. Send me the 2 YEAR GUARANTEED PEERLESS "B" Eliminator and free 85 Mil. tube for 30 days trial. I agree to pay expressman $11.45 plus express charges.

Name.....
Street.....
Town.....State.....

Just A Twist Of The Wrist

Banishes Old-Style Can Openers to the Scrap Heap and

BRINGS AGENTS $6 to $8 IN AN HOUR

WOMEN universally detest the old-style can opener. Yet in every home in the land cans are being opened with it, often several times a day. Imagine how thankfully they welcome this new method—this automatic way of doing their most distasteful job. With the Speedo can opening machine you just put the can in the machine, turn the handle, and almost instantly the job is done.

End This Waste and Danger

You undoubtedly know what a nasty, dangerous job it is to open cans with the old-fashioned can opener. You have to hack your way along slowly—ripping a jagged furrow around the edge. Next thing you know, the can opener slips. Good night! You've torn a hole in your finger. As liable as not it will get infected and stay sore a long time. Perhaps even your life will be endangered from blood poisoning!

You may be lucky enough to get the can open without cutting yourself. But there's still the fact to consider that the ragged edge of tin left around the top makes it almost impossible to pour out all of the food. Yet now, all this trouble, waste and danger is ended. No wonder salesmen everywhere are finding this invention a truly revolutionary money maker!

A "Million Dollar" Can Opening Machine

The Speedo holds the can—opens it—flips up the lid so you can grab it—and gives you back the can without a drop spilled, without any rough edges to snag your fingers—all in a couple of seconds! It's so easy even a 10-year old child can do it in perfect safety! No wonder women—and men, too—simply go wild over it! No wonder Speedo salesmen often sell to every house in the block and make up to $10 an hour.

Generous Free Test Offer

Frankly, men, I realize that the profit possibilities of this proposition as outlined briefly here may seem almost incredible to you. So I've worked out a plan by which you can examine the invention and test its profit without risking one penny.

Get my free test offer while the territory you want is still open—I'll hold it for you while you make the test. I'll send you all the facts about $75 to $150 a week. I'll also tell you about another fast selling item that brings you two profits on every call. All you risk is a 2c stamp—so grab your pencil and shoot me the coupon right now.

SPEEDO
PATENTED HOUSEHOLD SPECIALTIES

CENTRAL STATES MFG. CO., Dept. E-701
4500 Mary Ave. Est. Over 20 years. **ST. LOUIS, MO.**

Central States Mfg. Co.,
4500 Mary Ave., Dept. E-701,
St. Louis, Mo.

Yes, rush me the facts and details of your FREE OFFER.

Name.....

Address.....

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

READ!

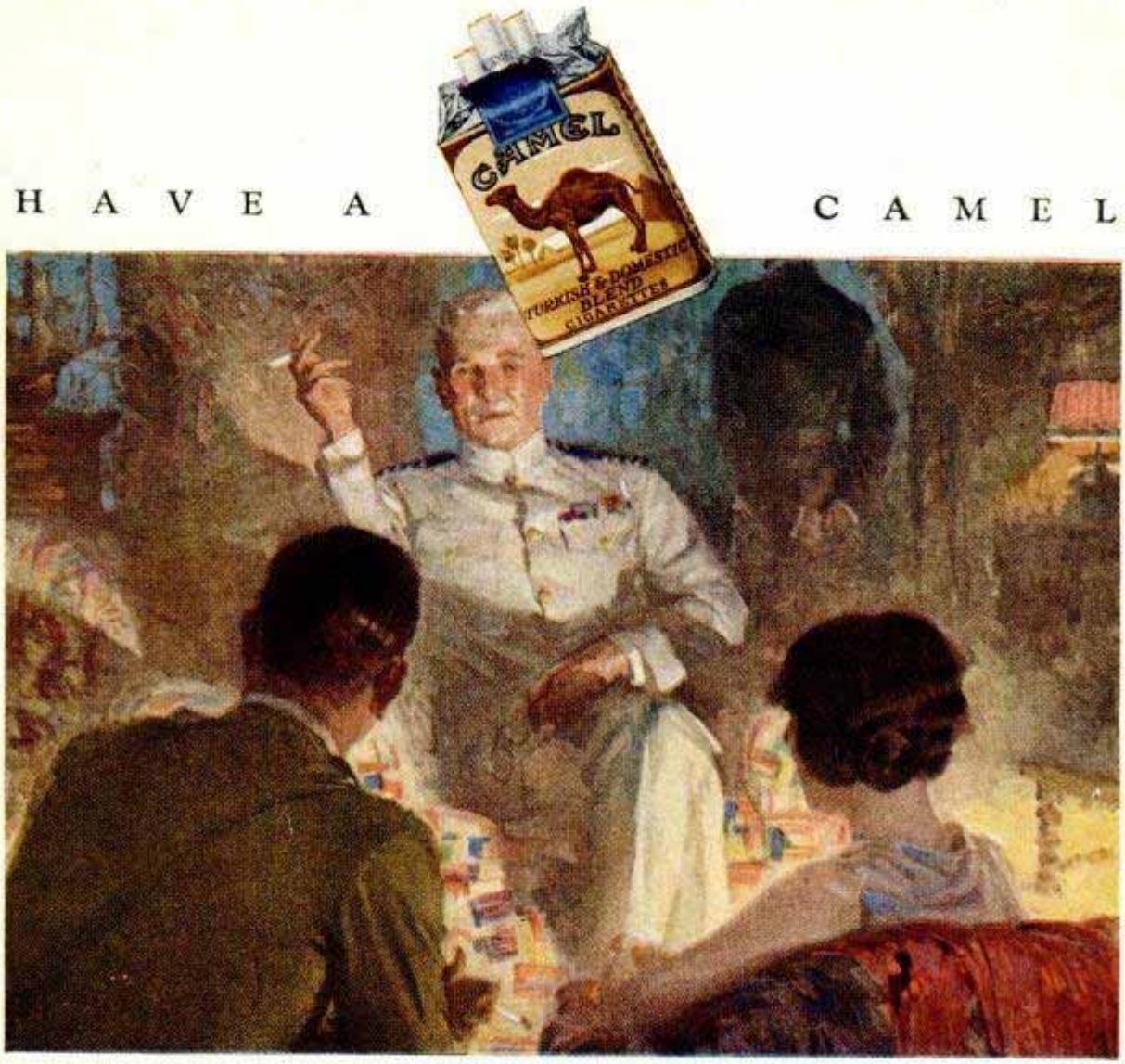
$265 In a Week

"Here is my record for first 30 days with Speedo: June 13, 60 Speedos; June 20, 84 Speedos, June 30, 192 Speedos; July 6, 288 Speedos. Speedo sells to 9 out of 10 prospects." M. Ornoff, Va.

J. J. Corwin, Ariz., says "Send more order books. I sold first 14 orders in 2 hours."

A. Piotraschke, Mich., writes, "Send order book and folders—only worked 3 hours and got 9 orders." Barb, W. Va., says, "Was only out a few evenings and got 20 orders."

H A V E A



C A M E L

The cigarette that's liked for itself

It is sheer enjoyment of smoking that has made Camel the most popular cigarette of all time. Nothing takes the place of fragrant, mellow tobaccos.

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