

February

25 Cents

Science and Invention

IN PICTURES

40
NON-TECHNICAL
RADIO
ARTICLES

DIAGNOSIS BY
RADIO

See Page 978



EXPERIMENTER PUBLISHING COMPANY, NEW YORK, PUBLISHERS OF
RADIO NEWS - SCIENCE & INVENTION - THE EXPERIMENTER - MOTOR CAMPER & TOURIST

Combines distance, selectivity, power, deep full tone, beauty and simplicity!

Looks like—and performs like—a \$200 radio set



BUILT TO GIVE LOUD SPEAKER ENTERTAINMENT FROM STATIONS THOUSANDS OF MILES DISTANT WHILE LOCAL STATIONS ARE BROADCASTING

"Coast to Coast" reception

verified by Miraco Users

NOTE! Do not judge Miraco sets by their prices. Enormous production makes them cost less. They are built by pioneer set makers—of highest grade parts. They embody improvements, refinement and features used in the most costly sets. Every Miraco user is an enthusiastic booster—these letters are typical of the many we receive.

Oklahoma Hears Europe

Nov. 27th was able to get two of the foreign stations on my Miraco, also Porto Rico and Guatemala, Mexico.—W. J. Lowe, Verdun, Okla.

Michigan Hears Germany

My Miraco is working fine. Nov. 28th I got 5NO, Newcastle, England, and LP, Berlin, Germany. Can you beat that record?—Thomas Walker Howell, Mich.

Pennsylvania Hears Paris

Believe Miraco the best distance-getter on the market for the price. Nov. 24th I picked up Paris, also Havana, Cuba, and San Juan, Porto Rico. Nov. 25th I picked up 5NO, Newcastle, England. Nov. 27th got 5NO and 2BD, Aberdeen, Scotland. Now have 98 other stations on my log to date, including KGO, Oakland, Calif.—Earl C. Way, Coleman, Pa.

Indiana Hears Europe Nightly

During the European test I had some foreign station every night on my Miraco. Nov. 22nd I also heard New York, Los Angeles, Canada, Texas and 31 others.—C. J. D. Rudolph, Evansville, Ind.

Kansas Hears Coast to Coast

Am using a Miraco and will let the following list of stations tell what I think of our sets. These are not all the stations I have tuned in as I do not "log" a station unless I hear it at least twice. The unrecorded stations include several in Canada, two in Mexico and one in Cuba. Expect to do better still: KHJ, KFI, Los Angeles; KGO, Oakland, Cal.; KPO, KVO, San Francisco; WBZ, Springfield, Mass.; WGY, Schenectady, N. Y.; WOO, Philadelphia; WSB, Atlanta, Ga.; KFDX, Shreveport, La.; WGA and WCAE, San Antonio, Tex.; WFAA and KFOP, Dallas, Tex.; WBAP, Ft. Worth, Texas; WWJ, Detroit, WMC, Memphis, Tenn.; WBAI and WLW, Cincinnati; WBT, Charlotte, N. C.; WGR, Buffalo; WBAF, Minneapolis; WCAE, Minn.; WAB, St. Louis; WCAW, Omaha; KOKA, Pittsburgh; WERH, KYW, WGN and WMAQ, Chicago; WTAS, Elgin, Ill., and twenty others in Missouri, Kansas, Iowa, Illinois, Minnesota, Nebraska and Oklahoma.—J. A. West, Augusta, Kansas.

Michigan Hears 180 Stations

Am sending list of stations I received on my Miraco in 3 weeks: KDKA, KDPW, KPCH, KEV, KFDA, KFDP, KFDD, KFHE, KFHL (Annetea), KOP, KOL, KRE, WAAD, WAAP, WABJ, WBAD, WBBA, WBZ, (Springfield, Mass.), WCAE, WCAL, WCAM, WCAP, WCAS, WCBP, WCE, WCK, WCN, WCK, WDAE, WDAF, WDAJ, WDAK, WGN, WGT, WDW, WEA, WEAL, WFAN, WEAQ, WFAA, (Dallas, Tex.), WFAF, WFAV, WFI, WGAN, WGAY, WGAZ, WGL, WGM, WGR, WHA, WGY, WHI, WHAR, WHAZ, WHK, WIP, WJAJ, WJAN, WJAR, WJAS, WERB, WFLA, WLW, WMAJ, WMAO, WMAQ, WMAH, WOC, WOO, (Philadelphia), WOR, WDAF, WPAZ, WPG, WPI, WQAJ, WSAI, WBY, WTAG, WTAB, WTG, WWJ, WTKA, WLAC, WHN, (New York City), WDL. This is all the list I have on hand. At the house I have 180 in all.—Howard L. Goodrich, Clinton, Mich.

costs only \$ **75**

The Marvelous MIRACO Ultra 5

[FIVE TUBE OUTFIT IN BEAUTIFUL SOLID MAHOGANY CASE]

Send coupon for SPECIAL OFFER!

Completely built, thoroughly tested and factory guaranteed by one of America's oldest and most reliable manufacturers of quality sets! Years of experience and quantity production explain its almost incredible price. Users, who have deluged us with commendations, say that friends who see and hear it are amazed that it sells for less than \$150 or \$200. Radio experts, who know good construction and quality parts, are equally astonished. You, too, will be delighted, thrilled, amazed with your big five-tube Miraco "Ultra 5" in its beautiful hand-rubbed solid mahogany cabinet! You'll be envied by radio friends who paid big prices for their outfits. Imagine getting all this for \$75—a beautiful sweet

toned "coast to coast loud speaker" set, composed of finest parts, housed in solid mahogany, equipped with the latest improvements, refinements and features found on costliest sets—and factory guaranteed! An instrument approved by radio's highest authorities! A set anyone can connect and operate. Even beginners learn quickly to cut through the "locals," get distant stations loud and clear, log stations and return to them at will. (Full directions with each set.) It is non-radiating, non-distorting, non-howling. Has cut-out switch—and a first stage phone jack for tuning—on Bakelite panel. All wiring concealed under Bakelite sub-base. Works on storage battery or dry cells. Literature describes other newest features.

Other Miraco Long Distance Sets \$14³⁵ up



Users tell us that Miraco Model R justly deserves its title, "Radio's finest low priced quality receiver." One tube acts as a tuned radio frequency amplifier and detector combined. A great distance getter. Easy to operate and log. Covers all wave lengths 150 to 625 meters. Like all Miraco sets, it operates on a storage battery or dry cells. Never such value before at only \$14.35

MIRACO RADIO GETS 'EM COAST TO COAST

This wonderful new Miraco Model R-3 is the three-tube, long distance, loud speaker set that has created such a sensation. Easy to tune and log. Covers wave lengths 150 to 625 meters. Detector acts also as a tuned radio frequency amplifier. 2 stages audio frequency amplification. Has no equal for simplicity, volume, range or clearness at anywhere near its price



Miraco R-3 only \$29.50

The famous Miraco Model MW four tube "coast to coast loud speaker" outfit which users all over the country report outperforms and outdistances much costlier sets. Comes in a solid mahogany cabinet. The improved 1925 model is equipped with cut-out switch, first stage phone jack for tuning (removing plug automatically switches program to loud speaker) and other latest features. Employs one stage of radio frequency amplification, detector and two stages of audio frequency amplification. Another unmatched Miraco value, \$54.50.

These Miraco sets are as easy as a phonograph to operate. Built throughout of highest grade parts. Full directions for connecting and operating supplied with each set. No experience necessary. The three and four tube sets have cut-out switch and first stage phone jack. Each set completely built, thoroughly tested and factory guaranteed.



All the Proof you want is waiting for You!

Reports from the many users in every state prove Miraco Tuned Radio Frequency Receivers—at rock bottom prices—have efficiency of sets costing up to three times as much. Remember that Miraco Sets are the product of a long established, reputable manufacturer—pioneer builders of sets. Send for further evidence that they are Radio's finest moderately priced receivers. All Miraco sets bear the endorsement of radio's highest authorities. Mail coupon now for latest bulletins and plenty of additional testimony from users leaving no doubt that "Miraco Radio Gets 'em Coast to Coast."

DEALERS! JOBBERS! Write for the new Miraco proposition. Nation-wide use and popularity of Miraco Sets, their amazingly low prices and our extensive advertising, makes them wanted everywhere. Send coupon.

AGENTS! The wonderful tone, volume and distance-getting ability of Miraco Sets makes them easy to sell. Send coupon for proposition; good territory open.

Send coupon for free bulletins or order direct from this ad

MIDWEST RADIO CORPORATION
Pioneer Builders of Sets
Cincinnati, Ohio

409 - T East Eighth Street

Send free literature, your SPECIAL OFFER and all particulars regarding Miraco Sets. () Jobber. () Dealer. () Agent. () User.

Name

Address

Learn Electricity

in Great Shops!



Not by Correspondence
All **PRACTICAL** Work at

COYNE



IN 12 WEEKS

Earn \$60 to \$200 a Week

Why work at dull uninteresting work, at low pay, with no future? In 12 weeks I will train you for a big pay job where you can command \$60 to \$200 a week as a COYNE TRAINED MASTER ELECTRICAL EXPERT or you can go in business for yourself with very small capital and make up to \$15,000 a year. Men trained as I train them are in demand everywhere. The great development of the Electrical industry makes the demand for trained men tremendous. Big opportunities and advancement for those who prepare now. The Coyne school was founded 26 years ago and my thousands of SUCCESSFUL GRADUATES are living proofs of what my training can do for ANY AMBITIOUS man. Many of these fellows will tell you in my big free book what Coyne has done for them.

Complete Electrical Training in 12 Weeks

I train you thoroughly on the greatest outlay of ACTUAL ELECTRICAL machinery ever assembled in any school. You work with your hands on all kinds of Electrical apparatus, door bells, house wiring, armatures, switchboards, dynamos, everything to make you an all around ELECTRICAL EXPERT. This REAL WORK with REAL tools, on REAL machinery trains you many times FASTER, many times MORE THOROUGH than trying to learn in the field or by books or lessons.

No Books—No Lessons—No Classes —You Do Actual Work!

I do not attempt to teach you by books or lessons. I train you to work with your head and hands on the same kind of Electrical Machinery used in power houses, industrial plants and on the outside, under actual working conditions, with instructors at your side. I have no classes, every student gets individual training.

Free Radio and Auto Course

For a short time only I am including ABSOLUTELY FREE my big new Radio Course and Auto, Truck and Tractor Electrical Course.

COYNE

Electrical School

1300-1310 W. Harrison St., Dept. 533-2 CHICAGO, ILL.

You Don't Need Education or Experience

You don't need a lot of schooling to master my course. You don't have to be a high school graduate or even a grammar school graduate. My method of instruction is clear and plain, and yet thorough, and if you can understand plain English I will make you an electrical expert even though you haven't a lot of education or any previous electrical experience.

Coyne Trains You For Life

You can get a free life scholarship which enables you to stay longer than the required time if you care to, or you may return at any time to take up new work I'm constantly adding to my school to make it the most modern at all times.

Earn While You Learn

My employment department will assist you to a part time job where you can make a good part of your living expenses while training, and they will assist you to get a BIG PAY job on graduation.



H. C. LEWIS, President

Get My Free Book

This big, handsome new book just off the press—size 12x15 in.—shows actual photographs of my big shops. Cost me a dollar to print, but it's yours FREE if you mail coupon. You owe it to yourself to get the facts.

H. C. LEWIS
President
COYNE
Electrical School
1300-10W. Harrison St.
Dept. 533-2
Chicago, Illinois

Dear Sir:—Please send me absolutely FREE your big new book and full particulars of your special offer and two courses FREE.

GET MY BIG FREE BOOK NOW!

Name.....

Address.....

Town.....

State.....

MAIL THIS COUPON NOW!

Science and Invention

FORMERLY
ELECTRICAL EXPERIMENTER

IN OUR NEXT ISSUE

Can a Perpetual Motion Machine Be Patented?

The laws of the Patent Office of the United States state that a perpetual motion machine when so called, cannot be patented unless accompanied by a working model. We will show how several inventors have gotten around this law by means of adroit descriptions of their machines. However, even with these patents in existence, our \$1000.00 prize offer still remains unclaimed to date.

What Do You Know About Sun Dials?

The past and present types of sun dials will be described by a well-known authority on "Time" who for several months past has contributed many interesting articles on that subject to this magazine. He will show how sun dials have been passed down through the centuries, changing very little in form and always remaining one of the simplest and most stable of time pieces.

Did You Ever See An Actor "Make Up"?

Simple as the art of "making up" may seem, still it is rather complicated in order to produce a satisfactory effect that is not too glaringly artificial. An authoritative article will deal with the various steps in the art of "making up," each step being fully illustrated and described.

Were You Ever Up In a Dirigible?

The fascinating subject of how dirigibles are steered and navigated will be dealt with by an expert on aeronautics. The illustrations will be complete and explicit and will show each and every little detail, all of which are so necessary in the safe navigation of a leviathan of the air such as the Shenandoah or the Los Angeles.

The above are just a few of the treats in store for our readers in the next issue. Hundreds of photographs and illustrations will also be published, accompanied by short, to the point descriptions.

HOW TO SUBSCRIBE FOR "SCIENCE AND INVENTION." Send your name, address and remittance to Experimenter Publishing Co., 53 Park Place, New York City. Checks and money orders should be made payable to Experimenter Publishing Co., Inc. Mention the name of the magazine you are ordering inasmuch as we also publish RADIO NEWS, THE EXPERIMENTER and MOTOR

SCIENCE AND INVENTION is published on the 25th of each month. There are 12 numbers per year. Subscription price is \$2.50 a year in U. S. and possessions. Canada and foreign countries \$3.00 a year. U. S. coin as well as U. S. stamps accepted (no foreign coin or stamps). Single copies, 25 cents each. A sample copy will be sent gratis on request. All communications and contributions to this journal should be addressed to Editor, SCIENCE AND

New York City
General Advertising Dept.
53 Park Place

Western Advertising Representatives
Floucau & McClure
720 Cass St., Chicago, Ill.

CAMPER & TOURIST. Subscriptions may be made in combination with the other publications just mentioned at special reduced club rates. Send postal for club rate card. Subscriptions start with the current issue unless otherwise ordered. ON EXPIRATION of your subscription we enclose a renewal blank in our last number to you, and notify you by mail. Then unless we receive your

INVENTION, 53 Park Place, New York City, N. Y. Unaccepted contributions cannot be returned unless full postage has been included. ALL accepted contributions are paid for on publication. SCIENCE AND INVENTION, Monthly. Application as second class matter made at New York, N. Y. with additional entry at Long Island City, N. Y. Post Office, under act of Congress of March 3, 1879, formerly entered at Jamaica, N. Y. Entered on

Pacific Coast Advertising Representatives
A. J. Norris Hill Co.
Hearst Bldg., San Francisco, Calif.

Kansas City Advertising Representatives
George F. Dillon
Republic Building, Kansas City, Mo.

Member Audit Bureau of Circulations
EDITORIAL & GENERAL OFFICES: 53 Park Place, New York City
Published by Experimenter Publishing Company, Inc.
(H. Gernsback, Pres.; S. Gernsback, Treas.; R. W. DeMott, Sec'y).
Publishers of SCIENCE & INVENTION, RADIO NEWS, THE EXPERIMENTER
and MOTOR CAMPER & TOURIST.

Contents for February

POPULAR ARTICLES

Editorial	973
By H. Gernsback.	
"Shipwrecked" On Stage	974
By A. P. Peck:	
Movie Film Duplicates Figures	975
By H. Winfield Secor.	
Viewing Mars From Mountain Top	976
Shooting the Air to Test Wind	976
By Ernest Brennecke.	
Automatic Railroad Crossing Gate	977
By J. W. Von Stein.	
If New York City's Water Supply	
Should Fall as Rain	977
By C. N. Holmes.	
The Radio Teledactyl	978
By H. Gernsback.	
Portable Electrocardiograph	979
Trick Sub-Sea Photography	980
By Edwin Shalbert.	
Social Life of the Ant	982
By Dr. Ernest Bader.	
Find the Hair—Find the Criminal	984
By Mel Wharton.	
Science in Pictures	985
The Living Death	986
By John Martin Leahy.	
"Death Ray" in Movies	988
Poison Gas Shells	989
By Lieut. Robert E. Sadler, U. S. A.	
Dr. Hackensaw's Secrets	990
By Clement Fezandic.	
Everyday Chemistry	992
By Raymond B. Wailes.	
Glands Assist Evolution	993
Safety Razor Blade Gives 400	
Shaves	993
Science of Christmas Toys	994
By Joseph H. Kraus.	
Stereoscopic Movies	996
Phosphorescence	997
By Raymond B. Wailes.	
Specialized Closets	998
By William M. Butterfield.	
Stunts for the Smoker	999
By Walter B. Gibson.	
How We Digest Food	1000
By Ismar Ginsberg, B. Sc. Chem. Eng.	
Magic for Everybody	1001
By Prof. Joseph Dunninger.	
Soap Doll Actor	1002
More Gamblers' Tricks Exposed	1003
By Mark Mellen.	

PRIZE CONTESTS

How-to-Make-It Department—	
\$30.00 in Prizes	1007
Scientific Humor—Prizes for Best	
Jokes	1021
Awards in \$1000 Monthly Contest	1024

AUTOMOBILES

Automatic Railroad Crossing Gate	977
English Tire	1002
Building an Auto Speedster	1004
By George Arthur Luers.	

ELECTRICITY

"Shipwrecked" on Stage	974
The Radio Teledactyl	978
Portable Electrocardiograph	979
Latest Patents	1020
Oracle	1022
Patent Advice	1034
Edited by, A. P. Peck.	

RADIO ARTICLES

The Radio Teledactyl	978
Radio Pictorial	1010
A New One—WGBS	1011
Photos Across the Atlantic	1012
By Leon L. Adelman.	
Broadcasting from the Clouds	1014
Capabilities of Your Receiving Set	1014
A 100-Foot Antenna Mast	1015
By Fred A. Parsons, 2ABM.	
A Low Loss Broadcast Receiver	1016
By Frank Frimmerman, 2FZ.	
Three Good Circuits	1017
Radio Oracle	1018

CONSTRUCTOR ARTICLES

How to Build an Auto Speedster	1004
By George Arthur Luers.	
An Emergency Foot Bridge	1006
Small Microscope From Glass	
Beads	1006

CHEMISTRY ARTICLES

Find the Hair—Find the Criminal	984
By Mel Wharton.	
Poison Gas Shells	989
By Lieut. Robert E. Sadler, U. S. A.	
Everyday Chemistry	992
By Raymond B. Wailes.	
Phosphorescence	997
How We Digest Food	1000
By Ismar Ginsberg, B. Sc.	
Wrinkles, Recipes and Formulas	1008

ASTRONOMY ARTICLES

Viewing Mars From Mountain Top	976
The Artificial Star	996

order and remittance before a renewal, delivery of the magazine is stopped. CHANGE OF ADDRESS: Notify us as far in advance as possible, giving your old address as well as the new one to which future magazines are to go. It takes several weeks to make an address change on our records.

Sept. 15, 1924, at Post Office, Atlanta, Ga., Chicago, Ill., Los Angeles, Cal., San Francisco, Cal. Title Registered at the Patent Office. Copyright, 1925, by E. P. Co., Inc., New York. The Contents of this Magazine are copyrighted and must not be reproduced without giving full credit to the publication. SCIENCE AND INVENTION is for sale at all newsstands in the United States and Canada; also at Brentano's, 37 Avenue de l'Opera, Paris. Member of the Audit Bureau of Circulations.

RADIO for Everybody

Complete Guide of the Parts of the Radio
All the Latest Information and Instructions Available

RANDOLPH RADIO CORP.
CHICAGO, ILL.

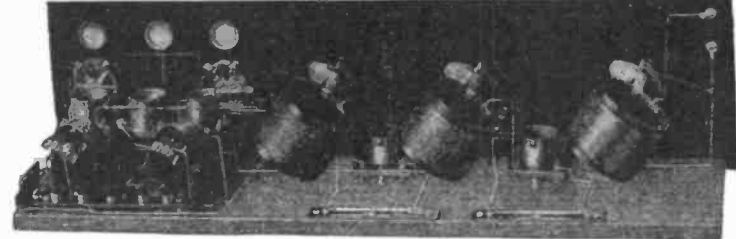
Satisfaction Guaranteed

Big Radio Book

Send For it At Once

Send For This Sensational Radio Bargain Book-FREE

Order Direct From This Page! Save About One-half! Compare our prices with others. Only highest grade nationally known GUARANTEED parts. OUR GUARANTEE PROTECTS YOU. Money cheerfully refunded if you are not satisfied. Be sure to write your order and state prices plainly. Send post office or express money order or bank draft for total amount to insure prompt shipment. **ALL PRICES ON THIS PAGE INCLUDE SHIPPING CHARGES RIGHT TO YOUR DOOR.** Refer to any bank or commercial agency regarding our reliability. If your favorite circuit is shown here, order direct from this ad. No skill required to build your own radio with Randolph parts. Panels are all drilled. Instructions are simple and complete. Everything comes ready to assemble. Order direct! All ship'g charges prepaid.



COMPLETE PARTS FOR 3 AND 5-TUBE NEUTRODYNE RECEIVING SET
Genuine Hazeltine Licensed Neutrodyne Parts Furnished.

1 7x24x1/4 Drilled Panel	4 Transformers	35 feet Hook-up Wire
2 Thordarson or Columbia Audio	7 Marked Binding Posts	1 Kit consisting of 3 Hazeltine Licensed Neutroformers & 2 Neutrodons
3 4" Bakelite Dials	1 Grid Leak and Condenser	1 Baseboard
2 Precision Jacks	5 Bakelite Sockets	2
1 Bakelite Rheostat, 30-ohm	1 .001 Condenser	
1 Bakelite Rheostat, 6-ohm	1 .006 Mica Condenser	
1 Bakelite Binding Post Strip		

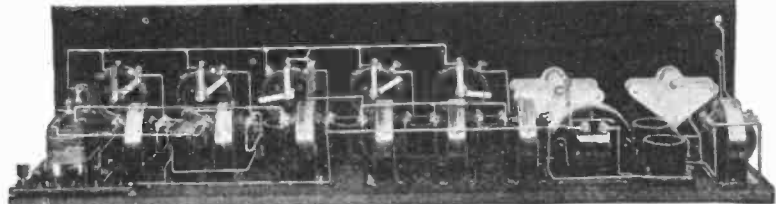
Complete blue-prints and working diagrams. **\$33.75**

COMPLETE PARTS FOR
ACME 1-Tube REFLEX... \$17.45
ACME 4-Tube REFLEX... \$39.85
with Genuine Acme parts as specified, drilled bakelite panel and full wiring diagram.

COMPLETE PARTS FOR
2-Tube Harkness Set
including Licensed Harkness Coils, Drilled Panel and wiring diagram. Easy to build. Wonderful results. **\$17.95**

OUR GUARANTEE
Every article exactly as represented. Every article is tested before shipping. Complete satisfaction guaranteed or money will be cheerfully refunded.

COMPLETE PARTS FOR BREMER TULLY 5-Tube Nameless Circuit
With Genuine Bremer-Tully Parts, including Drilled Bakelite Panel and Instructions.
Specially priced at **\$39.25**



COMPLETE PARTS FOR 8-TUBE SUPER-HETERODYNE

2 23-Plate Bremer-Tully or Duplex Low Loss Condensers.	2 Bakelite 6-ohm Rheostats	1 Multicord cable for connecting batteries
3 Remier or Columbia Intermediate Frequency Transformers.	1 Bakelite 30-ohm Rheostat	1 7x30x1/4 Drilled Bakelite Panel
1 Remier or Columbia Tuned Circuit Transformer	1 Bakelite Potentiometer, 400 ohms	1 Baseboard
1 Special Oscillator Coupler	1 Carter Double Circuit Jack	35 ft. Hook-up Wire
1 Midset Condenser	1 Dubilier 1 mfd. Condenser	2-4 in. Bakelite Dials
8 Bakelite Sockets	1 .006 Mica Condenser	2 4 1/2 volt C Batteries
2 Thordarson or Columbia A.F. Transformers	1 .0005 Mica Condenser and 2 megohm Grid Leak	
1 Connecticut Filament Switch	3 .0025 Mica Condensers	
	10 Binding Posts	
	1 .00025 Mica Condenser	
	1 Bakelite Terminal Strip for Binding Posts	

Complete wiring diagrams, base board layout, blue-prints and instructions. **\$59.75**

COMPLETE PARTS FOR Two Stage Amplifier
with Thordarson or Columbia Transformers; with drilled panel & wiring diagram **\$10.90**

COMPLETE PARTS FOR Ultra Audion
1000 Mile 1-Tube Set... **\$8.95**
with drilled panel and wiring diagram.

COMPLETE PARTS FOR Reinartz
1-Tube Reinartz Set... **\$10.45**
3-Tube Reinartz Set... **17.55**

Randolph Special Headphones
2200 Ohm... **\$2.45**
3000 Ohm... **2.95**



COMPLETE PARTS FOR 3-TUBE Cockaday Receiving Set

1 Cockaday Coil	1 Grid Leak and Mica Cond.
2 23-Plate Hy-Grade Cond.	7 Switch Points. 2 stops.
1 Bakelite Rheostat, 6 ohm.	1 Bakelite Binding Post Strip
2 Bakelite Rheostat, 30 ohm.	7 Binding Posts
3 Bakelite Sockets	1 7x21x1/4 in. Drilled Bakelite Panel
1 high ratio Columbia or Thordarson Transformer	3 Bezels
1 Single Circuit Jack	1 Baseboard
1 low ratio Columbia or Thordarson Transformer	1 switch lever
2 Double Circuit Jacks	24 ft. Hook-up Wire
2 3 in. Bakelite Dials.	

Complete blue-prints and wiring diagrams. **\$19.95**

1-Tube Set... **\$10.45**

Easy to Build Your Own Radio Set
All complete parts for sets on this page consist of standard advertised guaranteed parts and include drilled bakelite panels and wiring diagrams for easy set construction. Everything guaranteed on money-back basis. All transportation charges paid. **Don't forget!** Only genuine guaranteed parts used. Lack of space does not permit us to itemize individual parts, but you are fully protected by our money-back guarantee. Our Service Division is behind you.

FREE BIG MONEY SAVING RADIO CATALOG
containing a thousand bargains of everything on radio—parts, supplies, complete parts for sets, complete sets, etc., also a mine of very latest information on all different circuits, complete list of broadcasting stations, and other valuable, up-to-the-minute radio data. Send your name and address on a card or letter. We will send catalog free.

Free Service Department
Our radio engineers will help you solve all your radio problems, and furnish up-to-date information on set construction, operation and improvement. This service is free to our customers.

COMPLETE PARTS FOR 5-Tube Improved Cockaday Receiving Set
With Resistance Coupled Amplification
As designed by L. M. Cockaday. Including drilled panel and wiring diagram complete, ready to wire.
\$39.65

RANDOLPH RADIO CORPORATION
159 N. Union Ave. Dept. 338 Chicago, Illinois

SCIENCE and INVENTION READERS' BUREAU

Time and Postage Saver

IN every issue of SCIENCE and INVENTION you undoubtedly see numerous articles advertised about which you would like to have further information.

To sit down and write an individual letter to each of these respective concerns, regarding the article on which you desire information, would be quite a task.

As a special service to our readers, we will write the letters for you, thus saving your time and money.

Just write the names of the products about which you want information, and to avoid error the addresses of the manufacturers, on the coupon below and mail it to us.

If the advertiser requires any money or stamps to be sent to pay the mailing charges on his catalogue or descriptive literature, please be sure to enclose the correct amount with the coupon.

We will transmit to the various advertisers your request for information on their products.

This service will appear regularly every month on this same page in SCIENCE and INVENTION.

If there is any Manufacturer not advertising in this month's issue of SCIENCE and INVENTION from whom you would like to receive literature, write his name, address and the product in the special section of the coupon below.

TEAR ALONG THIS LINE

READERS' SERVICE BUREAU,

S&I 2-25

Experimenter Publishing Co., Inc., 53 Park Place, New York, N. Y.

Please advise the firms listed below that I would like to receive detailed information on their product as advertised in the issue of SCIENCE and INVENTION.

THIS FORM SHOULD NOT BE USED FOR TECHNICAL QUESTIONS

NAME	ADDRESS (Street—City—State)	List here specific article on which you wish literature.	If Catalogue of complete line is wanted, check in this column.
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

THIS FORM SHOULD NOT BE USED FOR TECHNICAL QUESTIONS

If you desire information from a manufacturer whose advertisement does not appear in this month's issue, use this space.

NAME	ADDRESS
.....
.....
.....

Your own name here.....

If you are a dealer check here.

Address.....

City..... State



G. Melrose now makes \$400 a month because S. & H. and Lincoln Tech. trained him right.

G. Fields jumped from \$35 a month to superintendent of a big electrical plant with 2 big salary increases to date.



Unholz and Farina, once common laborers, now have their own electrical company.

Only 20 Weeks Then You'll Be Ready for These Big ELECTRICAL JOBS

Just 20 weeks. Think of it. And yet in this short time you now can receive the amazing training of the S. & H. Engineering Company and Lincoln Institute of Technology and be ready to step into big jobs like Unholz and Farina, or G. Melrose, or G. Fields and hundreds of others. And yet this remarkable course takes only 30 minutes a day. No matter what your experience or education, this is an amazing opportunity for you.

S. & H. Fits You for Jobs Like These

Jobs like these above can be yours, so thorough is this training. After many years' study and experimental work there has been developed this remarkable way of teaching electricity right in your own home. This shop type home training is an exclusive copyrighted feature. You can get it nowhere else. And remember! You receive a diploma actually certified and endorsed by the Lincoln Institute of Technology. This is something you receive nowhere else. You not only get theoretical knowledge of electrical principles that is taught in technical universities, but you get the practice that a man gets only from doing practical work. This makes this amazing training the quickest and yet the simplest training in electricity ever devised.

And Electricity needs you. Right now hundreds of big pay jobs want men. But you must be trained right. The experts of this great institution know exactly what you need to fit you for these jobs. And you get it right in your own home, so simple and easy to grasp is this amazing training. You can soon be equipped to demand and get the high salaries this profession pays. All you need do is to take the first step.

Send for Big Book FREE

If you want to be an electrical expert send the coupon at once. All who send immediately will receive an amazing free offer of a complete outfit of electrical apparatus, instruments and appliances for experimental and practical home shop work. Also our big catalog gives you full information about this amazing rapid

and easy course. Learn what electricity holds for you. Find out what the S. & H. Training will do for you. Also about our big free Employment Bureau. But do not delay. Mail the coupon now.

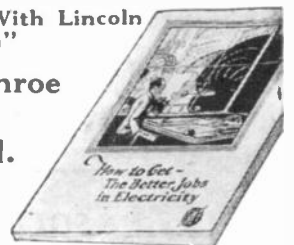
S. & H. ENGINEERING CO.

In Affiliation With Lincoln "Tech"

1422 W. Monroe Street

Chicago, Ill.

Dept. B-2



Chief Engineer,
S. & H. Engineering Co.,
1422 W. Monroe St., Dept. B-2,
Chicago, Ill.

Please send me catalog and full information about the remarkable S. & H. Course, your Free Outfit, your Employment Bureau, etc. This information is free and does not obligate me in any way whatsoever.

Name

Address

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

It's Summerland NOW below the Mason-Dixon Line.

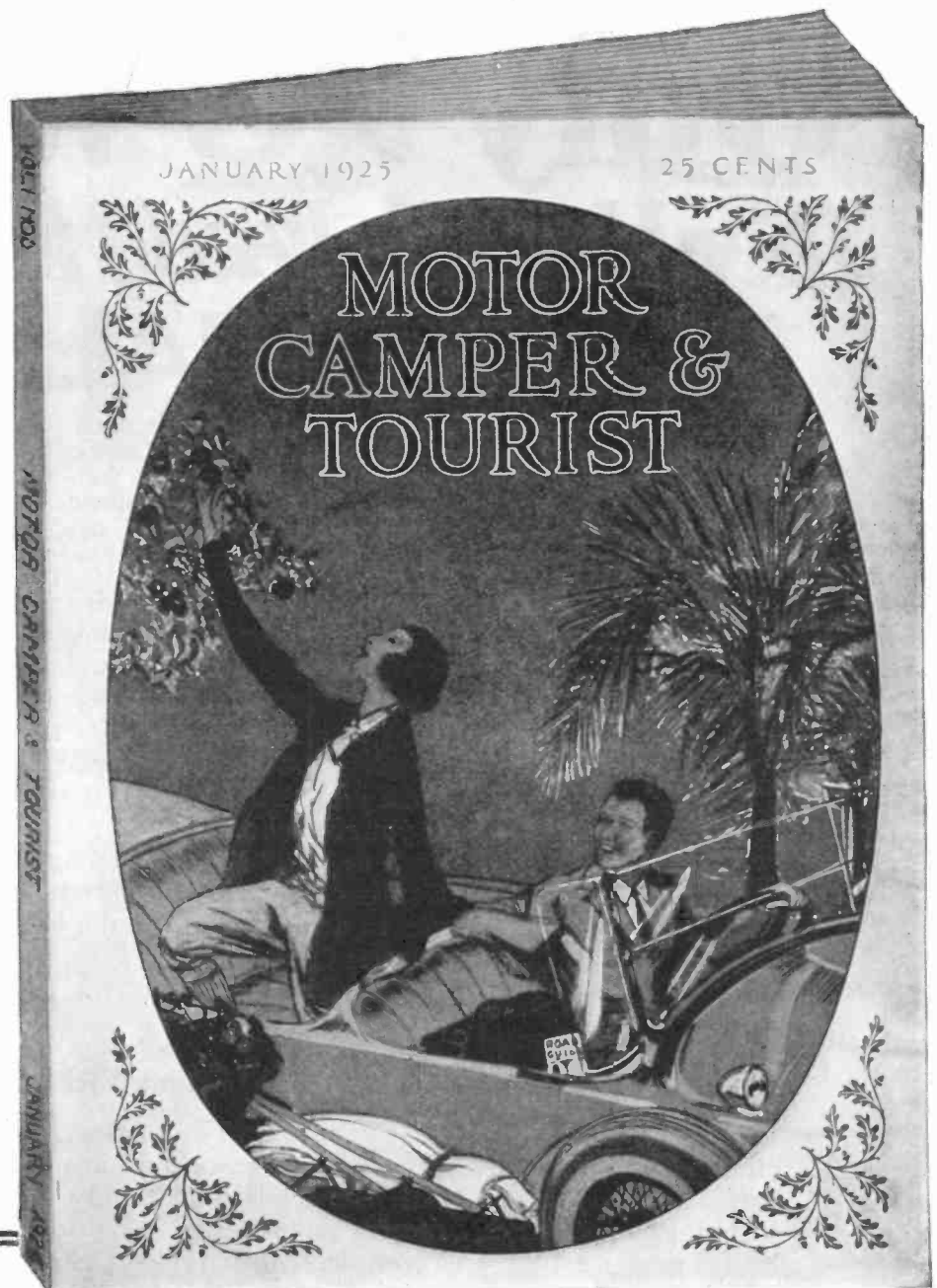


—and it's far easier and cheaper to get to the Summerland than most people think.

Those of you who store your car all winter and store yourselves in super-heated living rooms for six months are missing some mighty good times.

Get that car of yours out. Read **MOTOR CAMPER & TOURIST** and then write us for any further information and get your car moving toward the good old Southland.

You will enjoy every minute of the time and get a "kick" out of each and every day on the road. Don't forget to write us for any information you desire.



25^c

The Copy

SOLD

ON ALL NEWSSTANDS

Published by

The Experimenter Pub. Co., Inc., 53 Park Place, New York, N. Y.



The Quickest Way to Make BIG Money is to INVENT

Invention is the easiest way to earn a fortune. Almost overnight poor men have become wealthy through their ideas. Little things have brought their inventors millions of dollars. New book tells how 15 famous Inventors teach the secrets of successful Invention. Write for this book today—FREE!

THERE'S just one profession where everybody has an equal chance to become successful. That is Invention—the wonderful profession of opportunity and wealth. College man and immigrant; office manager and mechanic; from the King of England to a 17-year-old farmer's boy—men and women of every age, class and degree of education have won fame and prosperity through invention! Your chances to win success are as good as anybody's BECAUSE ANYBODY WHO THINKS CAN INVENT!

Even the greatest inventor of all agrees that men and women can be taught to become successful inventors. Read the words of Thomas A. Edison, the wizard of electricity: "Invention is a science and should be taught as a profession."

You can't doubt this great man's word. And your belief must be strengthened when you know what our greatest inventors were before they invented anything. Simon Lake was a schoolboy. Alexander Graham Bell was a teacher. Edison was a telegrapher. Gillette was a traveling salesman. Others were office clerks, mechanics, farmers, peddlers, housewives. Yet they all became inventors!

Invention Easy to Learn

There's nothing more needed to prove that you already have in you the ability to invent. Right now you possess ideas which can make you famous, bring you comfort and ease, earn for you prosperity undreamed of. All you need now to make your ideas worth big money is to develop your inventive ability, to train your mind to think *inventively*.

How can you do it? Learn the science of invention! And now, for the first time, you can actually learn invention—exactly as you learned to do your present work; exactly as others learned their jobs.

Fifteen Great Inventors Teach You Secrets of Successful Invention

Fifteen great inventors have joined together to tell ambitious men and women the secrets of successful invention; to train them in the habit of thought and action that will enable them to produce practical, money-making inventions.

No special knowledge of mechanics or science is necessary. No matter who you are or what you do, these fifteen famous inventors will take you from the ground up through the whole field of invention. They will tell you WHAT TO INVENT and HOW TO INVENT. They explain the four great steps of invention—how to originate ideas, how to develop ideas, how to protect ideas, how to exploit ideas. You learn how successful inventors work, the materials they use, where and how they get information, the short-cuts they practice.

But just as important as these things, you also learn how to sell your inventions, how to get royalties, how to get the most money for your ideas, how to protect yourself from the tricks through which thousands of inexperienced inventors have been defrauded of their rewards.

Just think of what you can get in this remarkable home-instruction in Inventive Science. Thousands of inventors before you have labored for years, have struggled through discouragement and failure, have wasted their savings just to learn the few simple, fun-

damental facts which are given you by 15 great inventors. Without effort, without discouragement, with the least use of time and money you can acquire through this absorbingly interesting home-course, all the secrets known and used by every successful inventor.

Everything Explained In New FREE BOOK

The Bureau of Inventive Science now offers you all the knowledge and experience which these fifteen inventors have put into their instruction. A wonderful book explaining this course will be sent to you free. Find out how you can learn the secrets of successful invention. Learn how you can become an inventor, how you can turn a simple idea into a fortune. Learn how 15 inventors teach you the Science of Invention in a remarkably short time right in your home. Get this great book now. It costs you nothing, so write for it today. The Bureau of Inventive Science is not connected with patent attorneys, promoters or manufacturers. Its only purpose is to teach ambitious, forward-looking men and women the facts that can help them make money as inventors. NOW—send the coupon.

Bureau of Inventive Science
Wisner Building
Dept. 72 Rochester, N. Y.

LITTLE IDEAS THAT MADE FORTUNES

How would you like to be the inventor of the Gillette Safety Razor, who makes TWO AND ONE-HALF MILLION DOLLARS a year? Wouldn't you gladly be the inventor of the snap fastener whose profits were so big that he paid an income tax of \$29,000? Wouldn't you willingly change places with the inventor of the President Sus-penders now worth \$5,000,000? Inventors have made thousands of dollars from such common things as the crimped hair-pie, the metal tip shoe-laces, the paper safety match, the ordinary wire paper clip.

Surely you have often had ideas for inventions just like these. It may be a new toy for your children. The man who invented the Kiddi-Kar made over \$5,000,000. It is reported. It may be a new kind of soap. B. T. Babbitt is worth millions of dollars today. Even so simple a thing as a common wooden wedge to stop the wobbling of tables, and chairs (which millions of people must have thought of) has brought the woman who DID something with her idea a respectable fortune.

Bureau of Inventive Science, Dept. 72,
 Wisner Building, Rochester, N. Y.

Please send me, without cost or obligation, your new book, "The Science of Invention," explaining how 15 famous inventors teach me at home the secrets of practical invention.

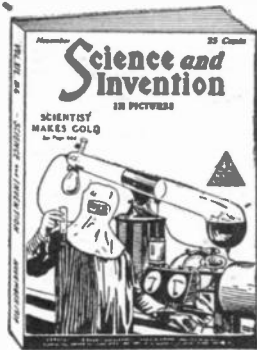
Name..... Age...
 Address
 City..... State.....

SPECIAL WINTER SUBSCRIPTION OFFER



RADIO'S LEADING MAGAZINE

Everything that is worthwhile in the radio industry appears in RADIO NEWS. The most popular new circuits are fully described and diagrammatically illustrated. The latest notes from the broadcast stations are commented upon. New radio equipment of every description is displayed together with reports of novel sets and unusually successful radio hook-ups. Every important advance in radio broadcast or reception in any part of the world is fully written up. In a word, RADIO NEWS covers everything big, active and worthwhile in the radio field.



PRACTICAL SCIENCE ILLUSTRATED

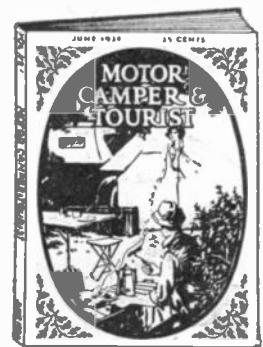
SCIENCE AND INVENTION is a sensation—the first scientific magazine in which the illustrations and captions tell a complete story. Explains and illustrates every latest development in the field of science, invention, mechanics, radio, in an entirely different and decidedly original way.

Published for the layman, in pictures so that every feature can be easily understood and quickly grasped. More interesting, twice as much editorial matter, more attractive than ever before.



EVERY DAY THE EXPERIMENTER FOR EVERYBODY

The EXPERIMENTER is probably the most novel magazine of its kind ever conceived. It is personally edited by H. Gernsback, who founded the old "Modern Electrics" as well as the "Electrical Experimenter," knows thoroughly what his readers want and have wanted for many years. The EXPERIMENTER covers electricity, chemistry, and radio, eclipsing the best that was in "Modern Electrics" and "Electrical Experimenter."



MOTORING WINTER, SUMMER, AUTUMN AND SPRING

This magazine is dedicated to the vast army of campers and tourists who want to know how and where to go. The interesting and instructive article, photos, and sketches each month will help you to decide correctly these most important points. It covers articles on almost every outdoor sport that can be indulged in while Motor Camping, such as when Mother, Dad, Sister and Brother and the kids swim, hunt, fish, golf, hike, snap photos, play tennis, climb mountains, listen in on their camp radio, and otherwise indulge in their innumerable pet hobbies.

This Book FREE With every Subscription
TO ANY ONE OF THESE FOUR PUBLICATION

Chock full of radio constructive and instructive articles from cover to cover. Sections include articles on Receiving Sets and Sundry Apparatus, Transmitters and Accessories, Radio Theory, Vacuum Tube Data, and Practical Hints for the Amateur. Serves as a ready reference and should find a place in the library of every amateur.



The "Radio News" Amateurs' Handibook contains 224 pages. It is a veritable modern textbook on radio. It is compiled by the most eminent radio experts. There are over 375 illustrations on complete mounted sets, circuit diagrams, graphs, photos of special parts, etc. The full size is 6 x 9 inches and it is bound with a beautiful color cover.

HOW YOU SAVE MONEY ON THIS OFFER

Regular Subscription Price.....	\$3.00	You Pay	\$2.50
Handibook (shown above)	1.00	(on this offer)	
TOTAL	\$4.00	YOU SAVE	\$1.50

TEAR OFF ON THIS LINE AND MAIL WITH CHECK OR MONEY ORDER

EXPERIMENTER PUBLISHING CO., INC., 53 Park Place, New York City.

Gentlemen:—I am enclosing \$2.50 for a special Winter subscription to RADIO NEWS SCIENCE & INVENTION The EXPERIMENTER MOTOR CAMPER & TOURIST It is understood that I will receive one RADIO News Amateurs' Handibook free of charge postpaid.

NAME

CITY

ADDRESS STATE



Herbert Dickerson, Warrenton, Va., makes \$7,500 a year



Automotive Electricity pays W. E. Pence, Albany, Oregon, over \$9,000 a year



J. R. Morgan, Columbus, Ohio, makes \$30 to \$50 a day in business for himself



Electrical Experts Are in Big Demand I Will Train You at Home To Fill a Big Pay Job

Electricity—the World's Big Pay Field

Electricity is the field of the greatest opportunities. In all other trades and professions competition is so keen from over-crowding that only the exceptional man can get to the top.

Not so in the Electrical line.

Here is a profession that is fairly bubbling with possibilities—with thousands of chances for wonderful success. We stand today on the very threshold of the real Electrical Age—an Age when everything now operated by steam or gas or horses, will be moved by Electricity. But it is an Age demanding specialists—trained men—Electrical Experts. Such men can easily earn from \$12 to \$30 a day.

Money is being poured into the Electrical Industry at the rate of a billion dollars a year. Think of it—a thousand million dollars a year for electrical expansion. This means—men—jobs—opportunities.

My big book the "Vital Facts" of the electrical industry and the wonderful opportunities that await "Cooke Trained Men" tells you all about this Big Pay Field.

Mail Coupon for the Free Vital FACTS

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 can make \$70 to \$200 a week—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.

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" 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 the most simple, thorough and successful in existence, 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.

FREE Electrical Working Outfit FREE

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. For this you need tools, and I give them to you absolutely free—a whole kit, a complete outfit, one that would cost you \$12 to \$15.

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.

Guarantee Backed by a Million Dollar Institution

Back of me in my guarantee, stands the Chicago Engineering Works, Inc., a million dollar institution, thus assuring to every student enrolled, not only a wonderful training in Electricity, but an unsurpassed Student Service as well.

It's this Service that makes "Cooke" training different from any other training. It's this Service, plus "Cooke" Training, that makes the "Cooke" Trained Man the "Big-Pay Man," everywhere.

Be a "Cooke" Trained Man and earn \$12 to \$30 a day—\$70 to \$200 a week—\$3,500 to \$10,000 a year.

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 Engineer

Chicago Engineering Works
2150 Lawrence Ave., Dept. 22 Chicago

Use this Free Outfit Coupon!

L. L. COOKE, The Man Who Makes "Big-Pay" Men
Dept. 22
2150 Lawrence Ave., Chicago

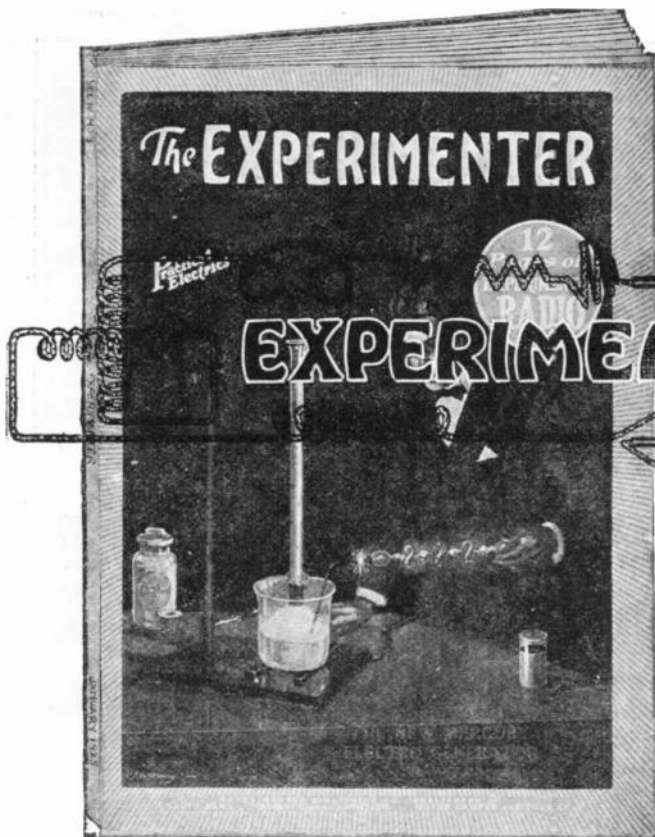
Dear Sir: Send at once, Sample Lessons, your Big Book, and full particulars of your Free Outfit and Home Study Course, also the Free Radio Course—all fully prepaid without obligation on my part.

Name

Address

Occupation

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



The EXPERIMENTER

an open sesame to the great undeveloped field of inventive opportunity

RADIO

has tremendous possibilities for every experimenter. In fact it has been only by constant inventing and research work on the part of many engineers and designers that radio broadcasting has come into existence. Opportunity knocks at everyone's door *today*—Radio has a hundred problems waiting for you to solve.

The EXPERIMENTER, the one and only magazine expressly for the person who experiments, carries each month many pages of radio that detail the major problems of the industry that are waiting to be solved. The EXPERIMENTER covers completely the field of radio from the standpoint of the development of the industry.

EXPERIMENTING as a PROFESSION

By HUGO GERNSBACK

The following extracts from Mr. Gernsback's editorial in the JANUARY issue of the *Experimenter* will give you an idea of the possibilities in store for the radio experimenter.

"Many of our readers experiment as a sort of hobby, for pleasure or instruction, but comparatively few realize that an experimenter may capitalize his work. Nevertheless, the writer is convinced of this, and he believes that he can readily show you that there is money in independent work of this character."

"In the radio business, particularly, there is today a vast field for experimental work. There is not a radio corporation worth its salt, that could not employ a few more radio investigators to develop a hook-up or a design, or what not."

"To make this clear, a large New York manufacturer of radio sets recently called upon the writer to furnish three experimental research men to perfect a certain set. These people had purchased a patent from an inventor who, however, did not know anything about the commercial work, nor could he make the set work where more than one tube was used. The one tube set worked very well, but the company wanted to produce a four tube set. Wouldn't the writer supply or suggest men to do the experimental work to develop such a set?"

SPECIAL FEATURE—JANUARY ISSUE

EXPERIMENTAL HARMONICS

By JOHN L. REINARTZ

John L. Reinartz, one of radio's greatest designers and experimenters has a live, up-to-the-minute article in the January issue of the EXPERIMENTER on his experiments with Harmonics. In a newsy, interesting way he describes his activities and the results of his test. They show how an experienced experimenter goes about his work.

0	0	0	0	0	0
The EXPERIMENTER Radio Data Sheets By John Harris		The EXPERIMENTER Radio Data Sheets By John Harris		The EXPERIMENTER Radio Data Sheets By John Harris	
WAVE LENGTH AND FREQUENCY <small>In a generally known fact the experimenter comes with an eye to radio communications travel through space with the same velocity as that with which ordinary light travels, viz., 186,000 miles per second, or 186,000,000 meters per second. When signals are reflected from an antenna, the phenomenon is similar to that of the "echo" in regular speech, which either is repeated or partly the radio waves of a frequency carried to the surface of the antenna. Thus, if the waves in the vacuum are considered as the waves of 1,000,000 cycles per second, the wave between these signals will be 17,000,000 cycles per second. If the radio waves are charged in different ways, they will arrive with other a signal, and to some extent in repeated waves. It is important that the experimenter be able to understand the wave length of the waves of the air, and the distance between the electrodes. The above data are very useful, and they should be a constant term in the experimenter's notebook.</small>		THE NATURE OF ELECTRICITY <small>Electricity was first discovered by the Greeks and has since the time that certain which called experimentally, named just as much less of course. It is the property was called electricity from the Greek word for amber, "Elektron".</small> <small>These substances can be classified by nature, as far as their own role or hard rubber, glass, etc. The property is not only supported by nature, but may be transferred from one body to another by mere contact. It has been found that if two similar bodies are charged in the same way, they will repel, when separated by space, will repel each other. If two similar bodies are charged in different ways, they will attract each other.</small> <small>The work in the use of two kinds of substances, and the experimenter should understand the nature of electricity. The law that follows from the above described substances is that bodies which are charged with equal and opposite, and bodies which are differently charged attract each other.</small> <small>A battery or storage charge may be placed upon the conductive body, and it will be found that when charge held in that order ordinary communication. The rate refers to a property of electricity, and in the bodies which are charged and repel by itself, the storage rate, and other charges attract each other.</small>		CONTENTS SECTION 1 ELECTRICAL AND RADIO THEORY SECTION 2 AMPLIFIERS SECTION 3 ELECTRON TUBES SECTION 4 GRID AND GRID AMPLIFIERS SECTION 5 CONDENSERS SECTION 6 RECEPTION AND TRANSMISSION SECTION 7 TRANSFORMERS SECTION 8 PUMPS, LIQUID RESISTORS SECTION 9 BATTERIES, CHARGERS SECTION 10 RADIO RECEIVERS SECTION 11 RADIO TRANSMITTERS SECTION 12 VISUAL CONDUCTORS SECTION 13 WIRELESS NATIONALS SECTION 14 RADIO TELEGRAPHY SECTION 15 MISCELLANEOUS	
<small>The EXPERIMENTER, January 1925</small>		<small>The EXPERIMENTER, January 1925</small>		<small>The EXPERIMENTER, January 1925</small>	

RADIO DATA SHEETS

The new radio data sheets of the EXPERIMENTER when completed will constitute a complete course on those important details of radio that every experimenter should have firmly fixed in his mind. They are practical guides to success in your Experiments. They can be removed from the book and kept on file for handy reference. Six sheets every month.

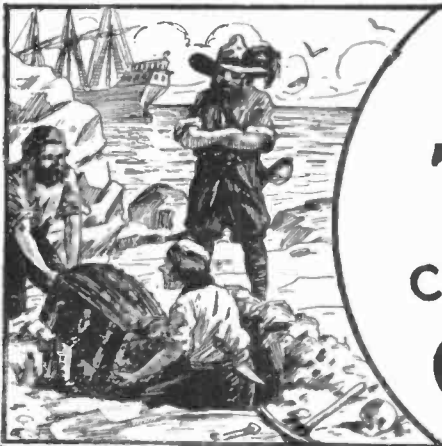
The EXPERIMENTER

Sold on all Newsstands—Ask Your Dealer

Published by

GERMOTT PUBLISHING CO., Inc.

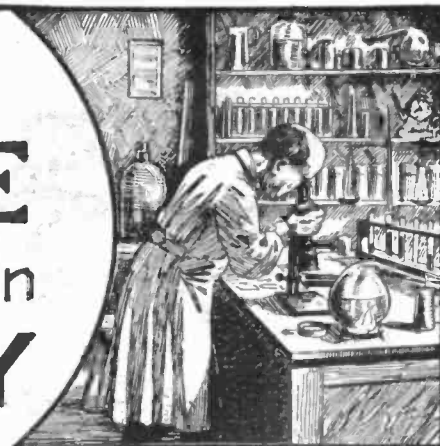
53 PARK PLACE, NEW YORK, N. Y.



BURIED TREASURE

can still be found in

CHEMISTRY



Good Chemists Command High Salaries

and you can make yourself independent for life by unearthing one of chemistry's yet undiscovered secrets.



T. O'CONOR SLOANE,
A.B., A.M., LL.D., Ph.D.
Noted Instructor, Lecturer and Author. Formerly Treasurer American Chemical Society and a practical chemist with many well known achievements to his credit. Not only has Dr. Sloane taught chemistry for years but he was for many years engaged in commercial chemistry work.

Do you remember how the tales of pirate gold used to fire your imagination and make you want to sail the uncharted seas in search of treasure and adventure? And then you would regret that such things were no longer done. But that is a mistake. They are done—today and everyday—not on desert islands, but in the chemical laboratories throughout your own country. Quietly, systematically, the chemist works. His work is difficult, but more adventurous than the blood-curdling deeds of the Spanish Main. Instead of meeting an early and violent death on some forgotten shore, he gathers wealth and honor through his invaluable contributions to humanity. Alfred Nobel, the Swedish chemist who invented dynamite, made so many millions that the income alone from his bequests provides five \$40,000 prizes every year for the advancement of science and peace. C. M. Hall, the chemist who discovered how to manufacture aluminum made millions through this discovery. F. G. Cottrell, who devised a valuable process for recovering the waste from flue gases, James Gayley, who showed how to save enormous losses in steel manufacture, L. H. Baekeland, who invented Bakelite—these are only a few of the men to whom fortunes have come through their chemical achievements.

What Some of Our Students Say of This Course:

I have not written since I received the big set. I can still say that it far exceeded my anticipations. Since I have been studying with your school I have been appointed chemist for the Scranton Coal Co. testing all the coal and ash by proximate analysis. The lessons are helping me wonderfully, and the interesting way in which they are written makes me wait patiently for each lesson.—**MORLAIS COUZENS.**

I wish to express my appreciation of your prompt reply to my letter and to the recommendation to the General Electric Co. I intend to start the student engineering course at the works. This is somewhat along electrical lines, but the fact that I had a recommendation from a reliable school no doubt had considerable influence in helping me to secure the job.—**H. VAN BENTHUYSEN.**

So far I've been more than pleased with your course and am still doing nicely. I hope to be your honor graduate this year.—**J. M. NORKUS, JR.**

I find your course excellent and your instruction, truthfully, the clearest and best assembled I have ever taken, and yours is the fifth one I've studied.—**JAMES J. KELLY.**

From the time I was having Chemistry it has never been thus explained to me as it is now. I am recommending you highly to my friends, and urging them to become members of such an organization.—**CHARLES BENJAMIN.**

I shall always recommend your school to my friends and let them know how simple your lessons are.—**C. J. AMDAHL.**

I am more than pleased. You dig right in from the start. I am so glad that I found you.—**A. A. CAMERON.**

I use your lessons constantly as I find it more thorough than most text books I can secure.—**WM. H. TIBBS.**

Thanking you for your lessons, which I find not only clear and concise, but wonderfully interesting. I am—**ROBT. H. TRAYLOR.**

I received employment in the Consolidated Gas. Co. I appreciate very much the good service of the school when a recommendation was asked for.—**JOS. DECKER.**



Experimental Equipment Furnished to Every Student

We give to every student without additional charge this chemical equipment, including forty-nine pieces of laboratory apparatus and supplies, and forty different chemicals and reagents. These comprise the apparatus and chemicals used for the experimental work of the course. The fitted heavy wooden box serves not only as a case for the outfit but also as a useful laboratory accessory for performing countless experiments.

Now Is the Time to Study Chemistry

Not only are there boundless opportunities for amassing wealth in Chemistry, but the profession affords congenial employment at good salaries to hundreds of thousands who merely follow out its present applications. These applications are innumerable, touching intimately every business and every product in the world. The work of the chemist can hardly be called work at all. It is the keenest and most enjoyable kind of pleasure. The days in a chemical laboratory are filled with thrilling and delightful experimentation, with the alluring prospect of a discovery that may spell Fortune always at hand to spur your enthusiasm.

You Can Learn at Home

To qualify for this remarkable calling requires elaborate specialized training. Formerly it was necessary to attend a university for several years to acquire that training, but thanks to our highly perfected and thorough system of instruction, you can now stay at home, keep your position, and let us educate you in Chemistry during your spare time. Even with only common schooling you can take our course and equip yourself for immediate practical work in a chemical laboratory. Dr. Sloane gives every one of his students the same careful, personal supervision that made him celebrated throughout his long career as a college professor. Your instruction from the very beginning is made interesting and practical, and we supply you with apparatus and chemicals for performing the fascinating analyses and experimental work that plays such a large part in our method of teaching, and you are awarded the Institute's official diploma after you have satisfactorily completed the course.

Easy Monthly Payments

You don't have to have even the small price of the course to start. You can pay for it in small monthly amounts—so small that you won't feel them. The cost of our course is very low, and includes everything, even the chemistry outfit—there are no extras to buy with our course. Our plan of monthly payments places a chemical education within the reach of everyone. Write us and let us explain our plan in full—give us the opportunity of showing you how you can qualify for a highly trained technical position without even giving up your present employment.

Special 30 Day Offer

Besides furnishing the student with his Experimental Equipment, we are making an additional special offer for a short while only. You owe it to yourself to find out about it. Write today for full information and free book "Opportunities for Chemists." Send the coupon right now while it is fresh in your mind. Or just write your name and address on a postal and mail it to us. But whatever you do, act today before this offer is withdrawn.

CHEMICAL INSTITUTE OF NEW YORK
Home Extension Division 2
66-S—West Broadway
New York City

Please send me at once, without any obligation on my part, your free Book "Opportunities for Chemists," and full particulars about the Experimental Equipment given to every student. Also please tell me about your plan of payment and your special 30 day offer.

CHEMICAL INSTITUTE OF NEW YORK, Inc.

Home Extension Division 2

66-S—WEST BROADWAY NEW YORK CITY

NAME

ADDRESS

CITY..... STATE.....
S. I., Feb. '25

DON'T WAIT—MAIL COUPON NOW!



Master Electricity By Actual Practice

The only way you can become an expert is by doing the very work under competent instructors, which you will be called upon to do later on. In other words, *learn by doing*. That is the method of the New York Electrical School.

Five minutes of actual practice properly directed is worth more to a man than years and years of book study. Indeed, Actual Practice is the only training of value, and graduates of New York Electrical School have proved themselves to be the only men that are fully qualified to satisfy EVERY demand of the Electrical Profession.

The Only Institution of the Kind in America

At this "Learn by Doing" School a man acquires the art of Electrical Drafting; the best business methods and experience in Electrical Contracting, together with the skill to install, operate and maintain all systems for producing, transmitting and using electricity. A school for Old and Young. Individual instruction.

Over 9,000 Graduates are Successful Men in the Electrical World

No previous knowledge of electricity, mechanics or mathematics is necessary to take this electrical course. You can begin the course now and by steady application prepare yourself in a short time. You will be taught by practical electrical experts with actual apparatus, under actual conditions.

The N. Y. E. S. gives a special Automobile Ignition Course as an advanced training for Auto Mechanics, Garage Men and Car Owners. The course covers completely all Systems of Ignition, Starters, Lighting and other electrical equipment on automobiles, motor boats, airplanes, etc.

Let us explain our complete courses to you in person. If you can't call, send now for 64-page book—it's FREE to you.

New York Electrical School

29 West 17th Street, New York

New York Electrical School
29 W. 17th St., New York, N. Y.

Please send FREE and without obligation to me your 64-page book.

..... NAME
 STREET
 CITY STATE

Science and Invention

H. GERNSBACK, EDITOR AND PUBLISHER
H. WINFIELD SECOR, ASSOCIATE EDITOR
T. O'CONOR SLOANE, Ph.D., ASSOCIATE EDITOR

Editorial and General Offices, - - - 53 Park Place, New York

"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact" - - - HUXLEY

Needed Inventions

By HUGO GERNSBACK

EVERY so often we run across some new little item that seems to be in everybody's household, or in everybody's possession, and often the inventor of the article has reaped a small fortune, and sometimes a big one, from the idea.

And ever so often, the writer receives requests from readers who wish to know on what they should try their inventive ingenuity, in order to devise something of use and merit.

There are, of course, many thousands of things that can be invented, by almost everyone, during the year. The difference between inventing an article and putting it on the market and selling it successfully is usually found in the practicability of the device and how much it is actually needed and wanted by people.

PENCIL ERASER. This is a good illustration of the above. Everybody makes mistakes, and everybody, therefore, needs an eraser badly. The man who invented the rubber eraser most assuredly was a genius of the first calibre. And while the rubber eraser still persists and will be used for many years

to come, we need today a different sort of an eraser, for several reasons. Where black lead is used, the rubber eraser is excellent, but we are now coming into an era of colored pencils, and we find that the rubber eraser no longer serves. Try to use the rubber eraser on colored pencil lines and you usually make a mess of it. Furthermore, the fountain pen is now used almost as much as, or perhaps more than, the pencil. No one has as yet succeeded in making a good and simple fountain pen or colored pencil eraser. What is needed is a simple chemical or mechanical eraser to cover these two crying needs.

UMBRELLA SUBSTITUTE. Before you leave your home in the morning, your daily paper assures you that it will be fair for the day. But when you come from lunch, you find that it is raining "cats and dogs." Of course, you have no umbrella, not having anticipated rain. So you stand under a doorway and wait for the rain to stop—which it may or may not do. So you skip through the rain and arrive at the office soaked to the skin. What is the remedy? There should be a simple, light contrivance that can be placed in the inside of every hat, or carried conveniently in the pocket. It can be made of oiled or prepared silk in such a manner that, when unfolded, it will cover one from head to foot. Being transparent, we can look through it and see where we are going. The article would have the shape of a huge rubber finger, such as you buy in drug stores, big enough to cover your hat and go down to the ankle. It would cover the arms as well. It should sell for about \$2, and need not weigh more than two ounces.

COLLAR PRESERVER. When your collars come back from the laundry, you feel, as a rule, like selling them to your hardware store, because the edges make excellent saws. A recent laboratory report shows that we do not *wear* out our collars. Instead, the laundry wears them out for us. It would seem that in up-turned or turn-downed collars the constant bending and unbending and running of the collar between hot laundering rollers breaks the fabric at the edges hence the saw edges. This is where our inventors should get busy. A reinforcement of some sort, in a different kind of material from linen, would, perhaps, solve the prob-

lem. The writer does not know whether silk was ever tried, but there must be some material that can be made to stand the wear; or perhaps an arrangement might be invented whereby a new edge could be inserted by the laundry people every time the collar is laundered; because we all know that it is not the entire collar that wears out, but only the edge. Hence, we have to throw away collars 99.5% in good condition, simply because a small fraction has worn out.

WINDOW CLOSER. Your wife and you take a stroll along the avenue, or you are visiting at your friends, when suddenly, for

no reason at all, it starts to rain. The lady of the house immediately gets a case of nerves, because she remembers that the parlor window has been left open, and, sure enough, the rain is coming from that side. The new sofa and the new rug will certainly be ruined. This happens to all of us, but so far no inventors have thought of and constructed a practical automatic window closer that shuts down immediately the rain starts falling.

To be sure, there have been patents of this kind galore, but somehow or other they could not have been very good, because the idea has never been adopted in practice. First, the article has to be cheap, so that anyone can install it for any window. Second, it must always be ready to act; and third, it must not take up a great deal of space. There have been proposed articles of this kind constructed with thin blotting paper or tissue paper, the idea being that as soon as the water softened these, a trip would immediately release and a weight would close the window. The trouble with some of these devices was that a strong wind would do the same thing. Here is a good item which, when worked out satisfactorily, should be used by every householder the world over.

BILL RENOVATOR. It costs the United States Treasury untold thousands to renovate our paper money bills every year. Most of the bills are really not so old that they could not be cleaned by some chemical or mechanical means, and every bank would welcome such a machine. You put the dirty, crumpled ten-dollar bill in one end, and out it comes, laundered, crisp and like new from the other. To be sure, there are some such machines in existence, but seemingly they have not been entirely successful, because as yet not every bank uses them. The machine the writer has in mind should be a simple affair that could be sold for less than \$50. It would contain a chemical tank in which the bill is soaked, then another cleansing tank through which it is run, finally to emerge, clean and dry, after being ironed out by two electrically-heated rollers. The whole machine need not be larger than a foot square and a foot high. There is a demand for such a machine.

ADVICE. The thing that the inventor should bear in mind when he becomes imbued with a new idea is that it is one thing to have a good idea, and quite another to patent that idea and make money out of it. Before spending hard-earned money on models and development of a given idea, the would-be inventor should first find out what has been accomplished in the same line before. The easiest way to do so is to get in touch with a good patent attorney who, for a small sum, will be glad to make a patent search among similar devices. This always saves money in the end.

I BELIEVE THAT:

To be a good inventor you must be an excellent observer.

I BELIEVE THAT:

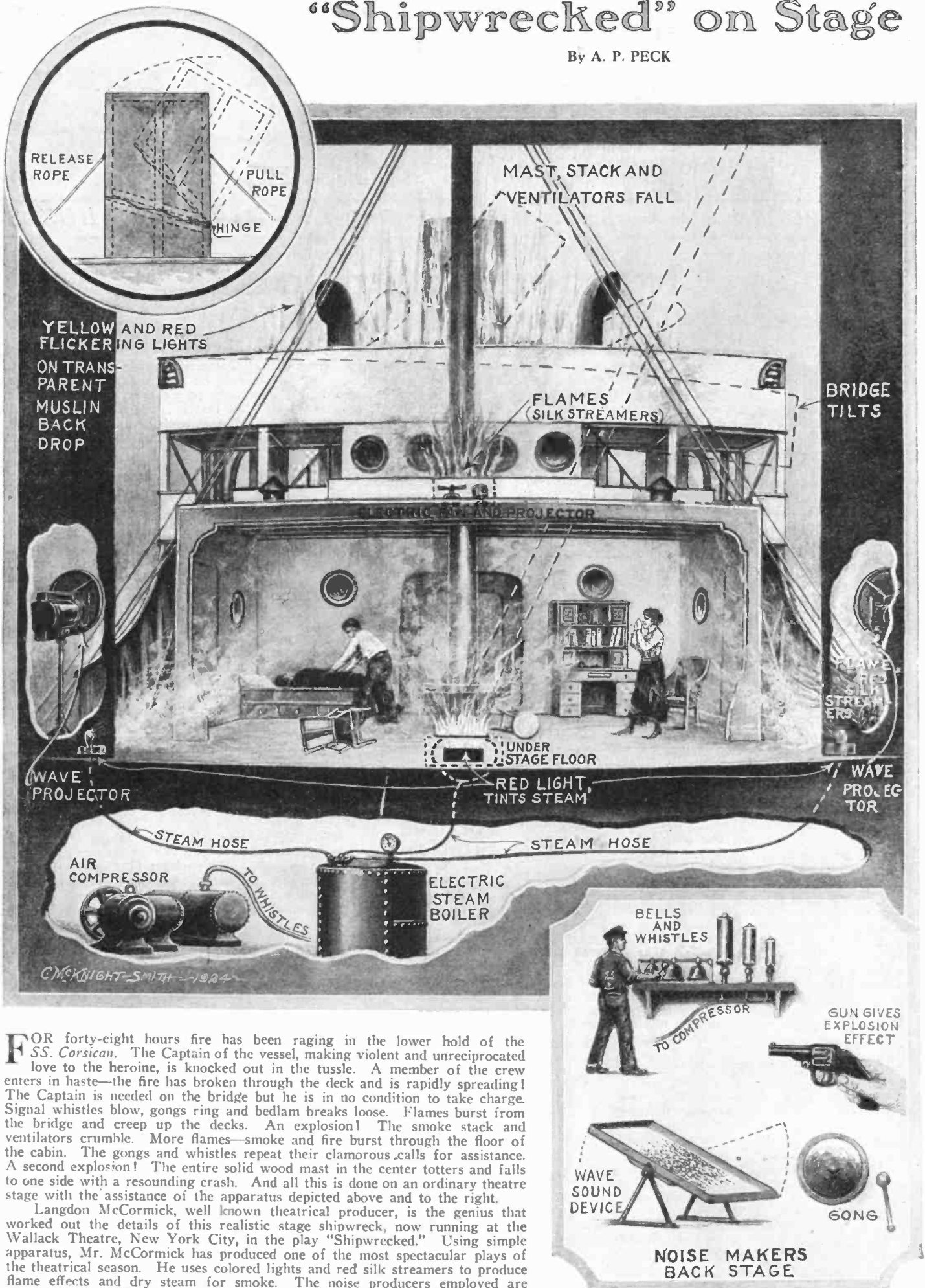
in time to come, inventing will be recognized as a regular profession.

THE GOLDEN AGE OF SCIENCE

is now symbolized by the golden cover of SCIENCE & INVENTION, LOOK FOR THE GOLD COVER every month!

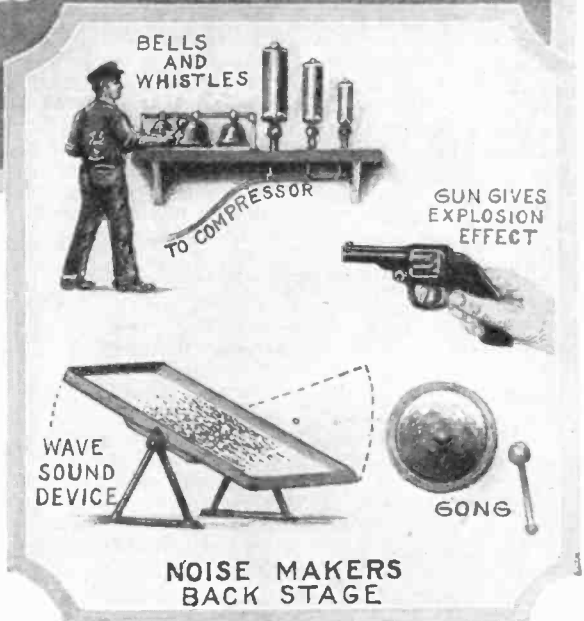
"Shipwrecked" on Stage

By A. P. PECK



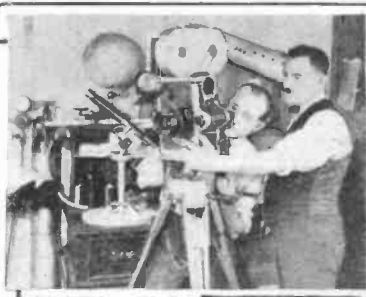
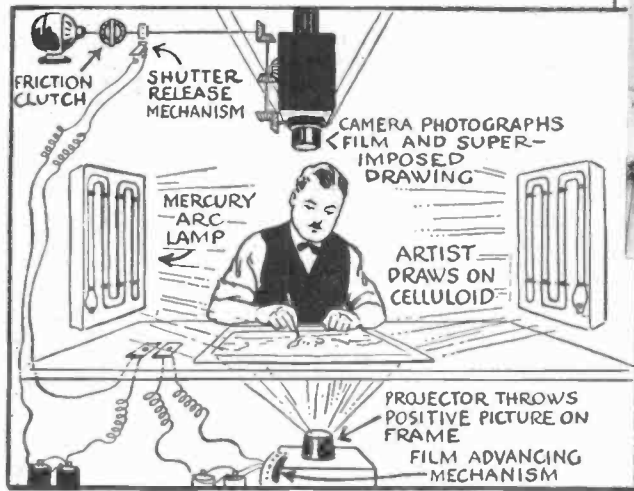
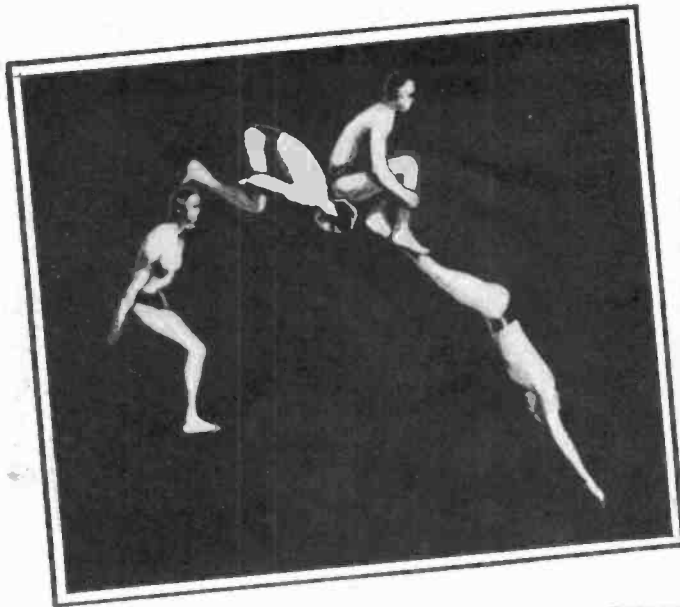
FOR forty-eight hours fire has been raging in the lower hold of the SS. Corsican. The Captain of the vessel, making violent and unreciprocated love to the heroine, is knocked out in the tussle. A member of the crew enters in haste—the fire has broken through the deck and is rapidly spreading! The Captain is needed on the bridge but he is in no condition to take charge. Signal whistles blow, gongs ring and bedlam breaks loose. Flames burst from the bridge and creep up the decks. An explosion! The smoke stack and ventilators crumble. More flames—smoke and fire burst through the floor of the cabin. The gongs and whistles repeat their clamorous calls for assistance. A second explosion! The entire solid wood mast in the center totters and falls to one side with a resounding crash. And all this is done on an ordinary theatre stage with the assistance of the apparatus depicted above and to the right.

Langdon McCormick, well known theatrical producer, is the genius that worked out the details of this realistic stage shipwreck, now running at the Wallack Theatre, New York City, in the play "Shipwrecked." Using simple apparatus, Mr. McCormick has produced one of the most spectacular plays of the theatrical season. He uses colored lights and red silk streamers to produce flame effects and dry steam for smoke. The noise producers employed are illustrated at the right



Movie Film Duplicates Figures

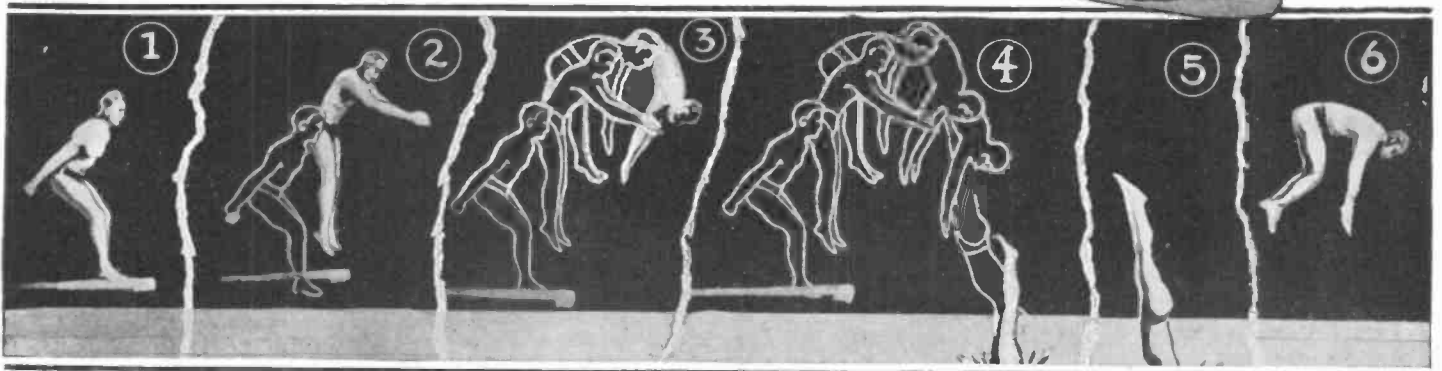
THE latest development in motion picture photography is the duplication of figures while the object is in motion, by means of either line drawings or photographs. At the left is an enlargement of a frame of the moving picture film. The man is seen to leave the spring board and go through the acrobatics of his dive. In mid-air, however, his figure remains impressed on the film, and as he passes from one movement to another, an impression of his previous positions is constantly maintained until the dive is over; these figures remaining in view for the sake of comparison instruct in the performance of the dive to a degree heretofore unexcelled. The photographic figures can be replaced by outline sketches, as illustrated elsewhere on this page. The process is a combination of the Novagraph or slow motion picture and Max Fleisher's cartoons. —H. Winfield Secor.



The diagram at the left illustrates how these pictures are made. A picture projected upwards from below enables the artist to properly make his line sketches. The camera photographs the drawing or image, or both.



The illustration above shows what a film looks like with a number of these images upon it. The mask is used for blocking out all of the film with the exception of that part upon which the photograph is to be impressed.

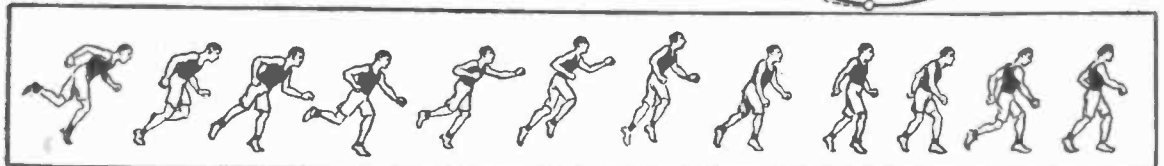


The above photographs are taken from another analysis film. In No. 1 the diver is just about to leave a spring board. As he reaches position No. 2, an outline figure remains at his first position. At any time the diver can be made to come back from Fig. 5 to 6, and continue the dive from that position.



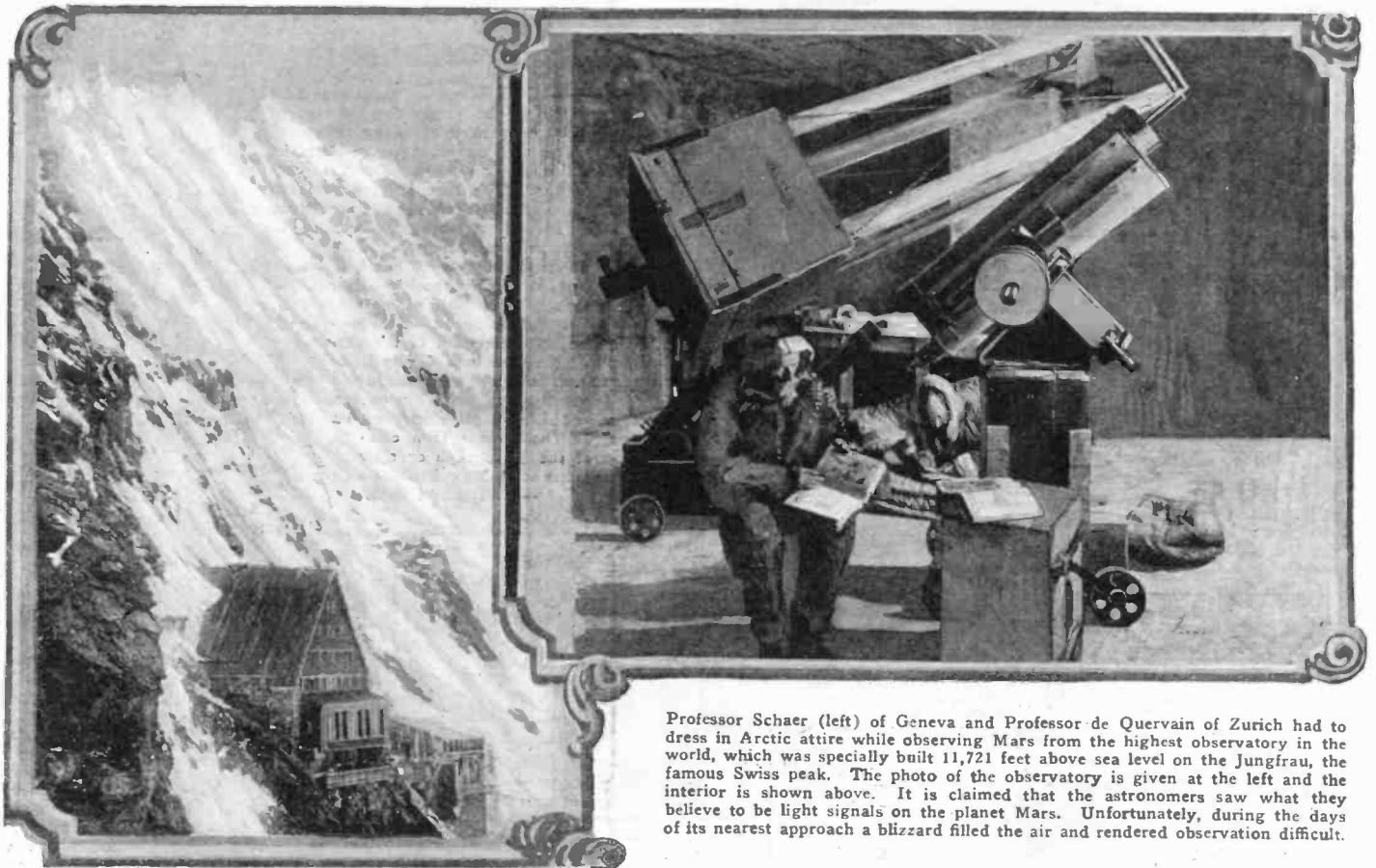
The system may be used to combine slow motion with a regulation speed movement. Let us assume that we have an individual making a broad jump as shown at the right. He runs at full speed to the taking-off place where his action gradually slows up until he is scarcely moving.

The action in the film may be repeated and reversed at any point as indicated above, where a dancer leaps into the air, crosses her legs, starts to descend, reverses her action to the former position, and repeats.



The best golfers teach that the upward stroke of the club should be the same as the downward stroke. A thin line which seems to leave the club as it moves indicates that the golfers do not practise what they preach.

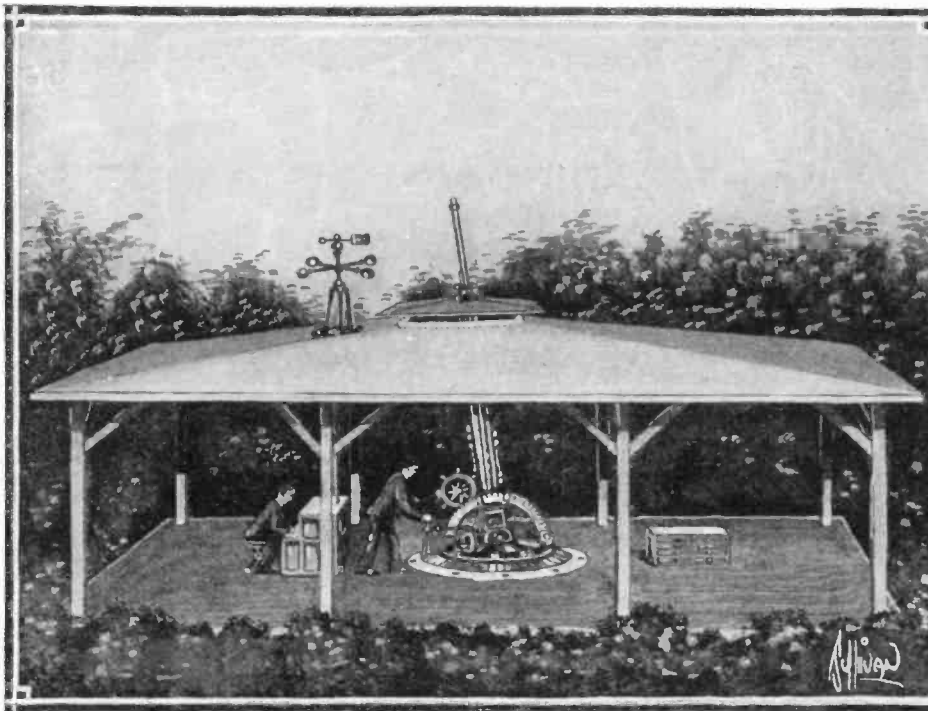
Viewing Mars from Mountain Top



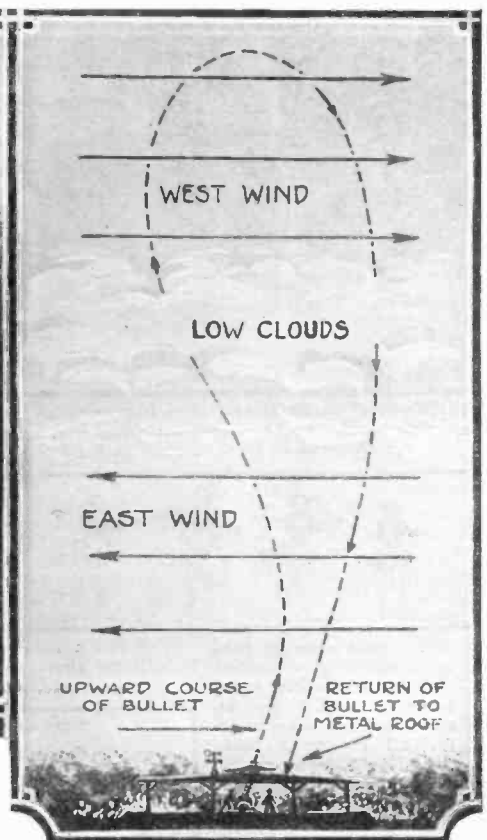
Professor Schaer (left) of Geneva and Professor de Quervain of Zurich had to dress in Arctic attire while observing Mars from the highest observatory in the world, which was specially built 11,721 feet above sea level on the Jungfrau, the famous Swiss peak. The photo of the observatory is given at the left and the interior is shown above. It is claimed that the astronomers saw what they believe to be light signals on the planet Mars. Unfortunately, during the days of its nearest approach a blizzard filled the air and rendered observation difficult.

Shooting the Air to Test Wind

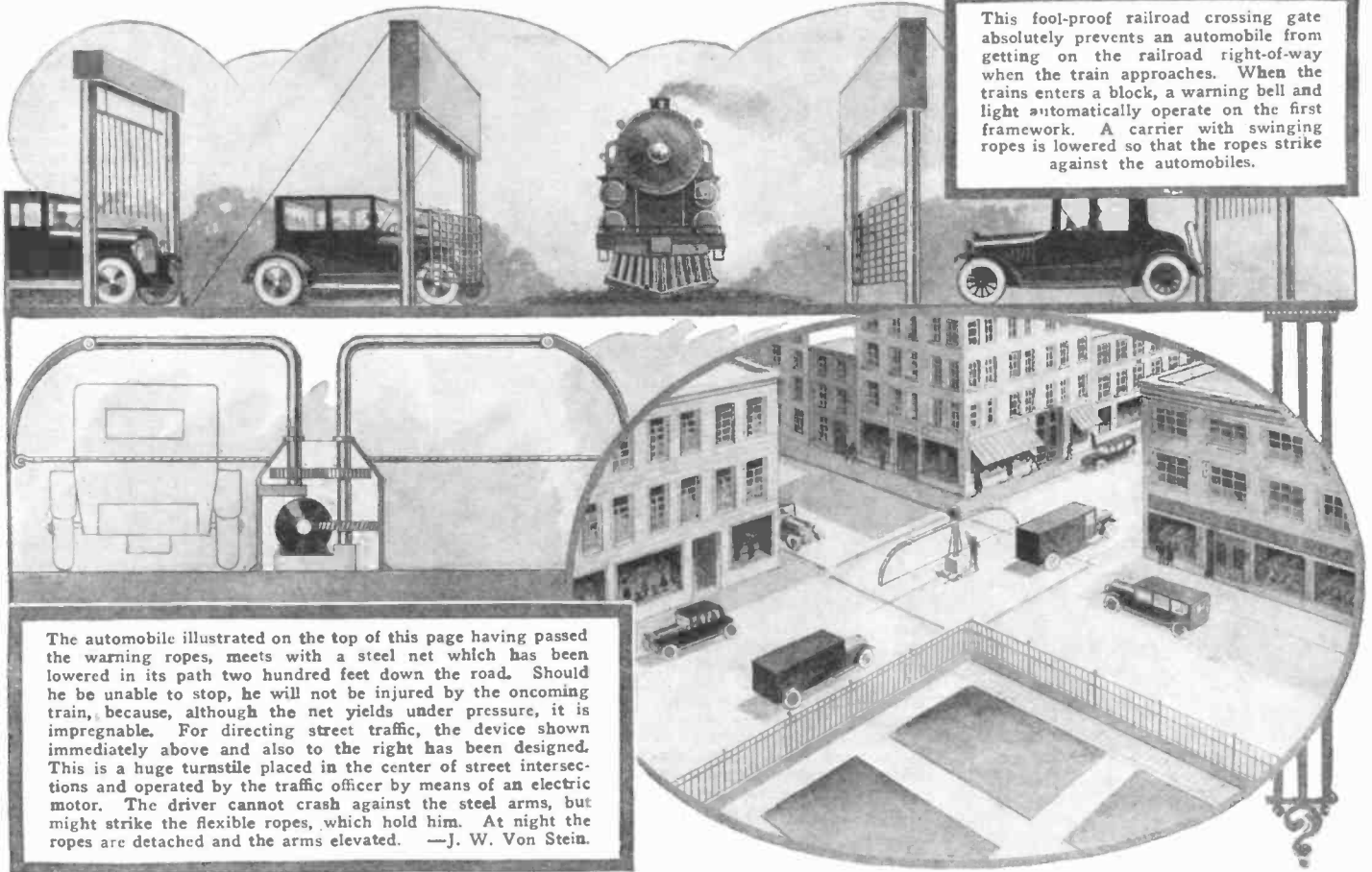
By ERNEST BRENNECKE



The British meteorological and aircraft stations have been equipped with a novel scientific gun, gun-mounting and gun-shed. When the clouds hang low in the sky, the winds above them may blow in opposite directions to those near the earth. For the protection of the airplane pilot, a bullet is fired into the air after the rifle has been properly set. The object is to cause the bullet to fall back upon the metal roof and the powder charges, weight of the bullet and angle of the gun are changed until it does so. By computation, the character of the wind is then determined.



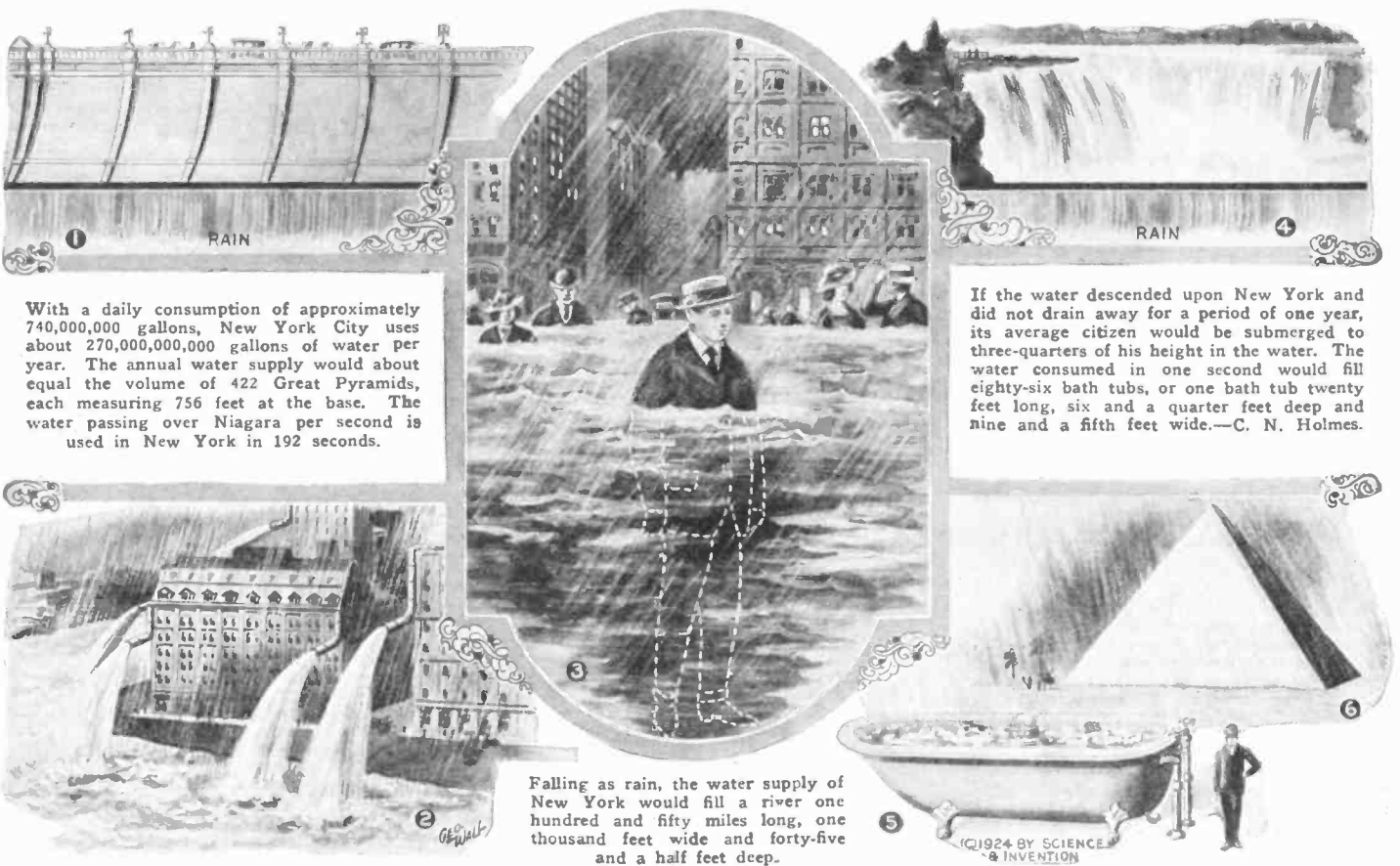
Automatic Railroad Crossing Gate



This fool-proof railroad crossing gate absolutely prevents an automobile from getting on the railroad right-of-way when the train approaches. When the train enters a block, a warning bell and light automatically operate on the first framework. A carrier with swinging ropes is lowered so that the ropes strike against the automobiles.

The automobile illustrated on the top of this page having passed the warning ropes, meets with a steel net which has been lowered in its path two hundred feet down the road. Should he be unable to stop, he will not be injured by the oncoming train, because, although the net yields under pressure, it is impregnable. For directing street traffic, the device shown immediately above and also to the right has been designed. This is a huge turnstile placed in the center of street intersections and operated by the traffic officer by means of an electric motor. The driver cannot crash against the steel arms, but might strike the flexible ropes, which hold him. At night the ropes are detached and the arms elevated. —J. W. Von Stein.

If N.Y. City's Water Supply Should Fall as Rain



With a daily consumption of approximately 740,000,000 gallons, New York City uses about 270,000,000,000 gallons of water per year. The annual water supply would about equal the volume of 422 Great Pyramids, each measuring 756 feet at the base. The water passing over Niagara per second is used in New York in 192 seconds.

If the water descended upon New York and did not drain away for a period of one year, its average citizen would be submerged to three-quarters of his height in the water. The water consumed in one second would fill eighty-six bath tubs, or one bath tub twenty feet long, six and a quarter feet deep and nine and a fifth feet wide.—C. N. Holmes.

Falling as rain, the water supply of New York would fill a river one hundred and fifty miles long, one thousand feet wide and forty-five and a half feet deep.

©1924 BY SCIENCE AND INVENTION

The Radio Teledactyl

By HUGO GERNSBACK

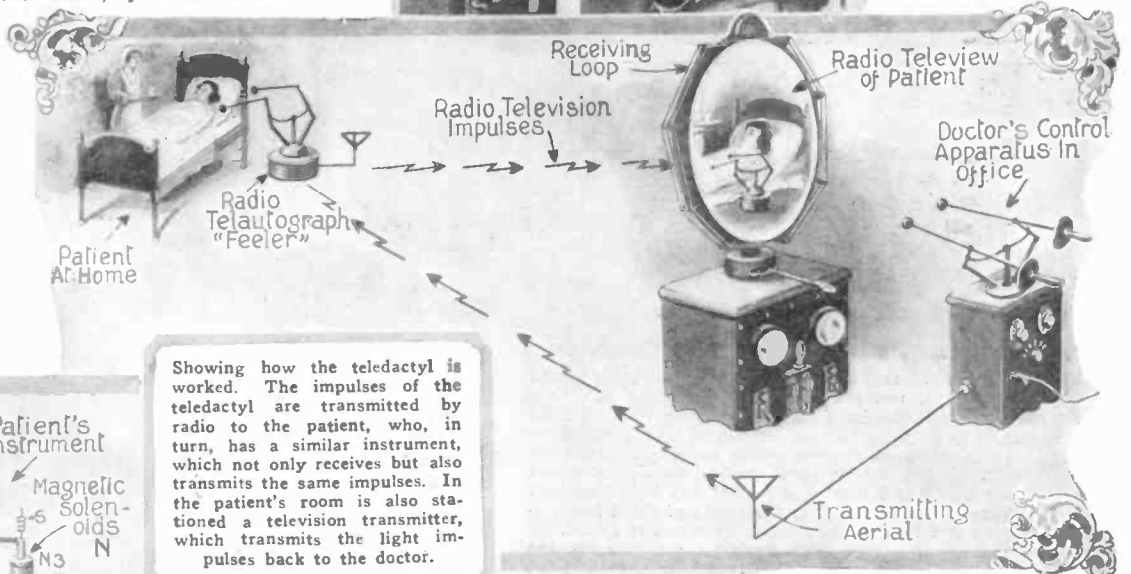
Member American Physical Society

1

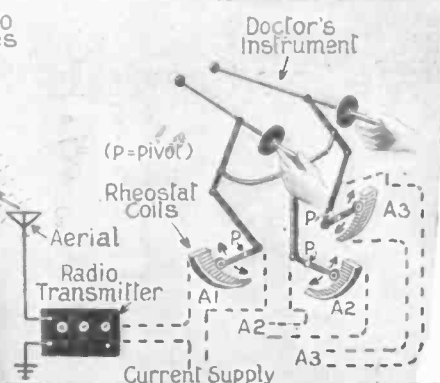
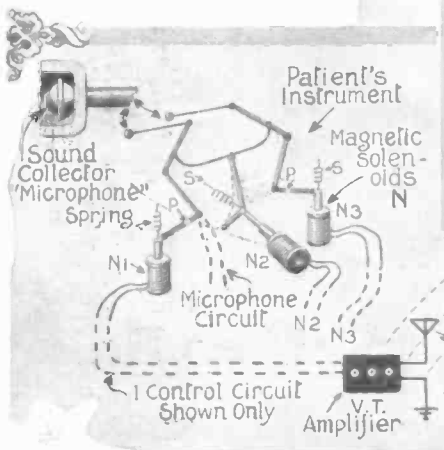
The Teledactyl (Tele, far; Dactyl, finger—from the Greek) is a future instrument by which it will be possible for us to "feel at a distance." This idea is not at all impossible, for the instrument can be built today with means available right now. It is simply the well known telautograph, translated into radio terms, with additional refinements. The doctor of the future, by means of this instrument, will be able to feel his patient, as it were, at a distance (see illustration to right). The doctor manipulates his controls, which are then manipulated at the patient's room in exactly the same manner. The doctor sees what is going on in the patient's room by means of a television screen. (See other captions on this page.)



Here we see the doctor of the future at work, feeling the distant patient's arm. Every move that the doctor makes with the controls is duplicated by radio at a distance. Whenever the patient's teledactyl meets with resistance, the doctor's distant controls meet with the same resistance. The distant controls are sensitive to sound and heat, all important to future diagnosis. The doctor sees what he is doing by means of the television screen in front of him.



Showing how the teledactyl is worked. The impulses of the teledactyl are transmitted by radio to the patient, who, in turn, has a similar instrument, which not only receives but also transmits the same impulses. In the patient's room is also stationed a television transmitter, which transmits the light impulses back to the doctor.



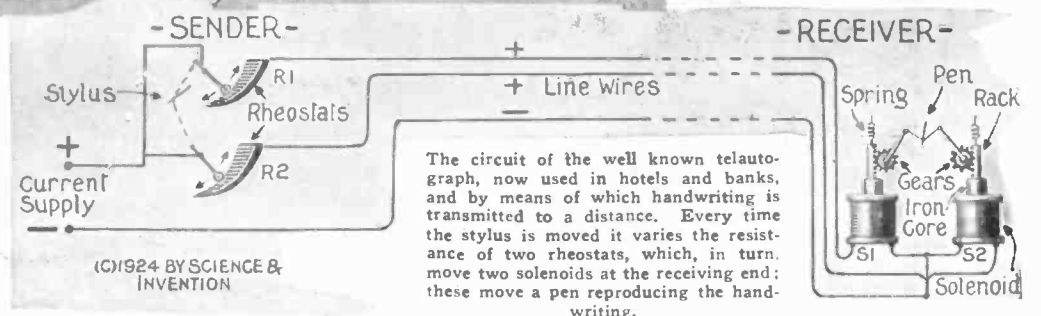
How the teledactyl operates: The teledactyl is but an improved telautograph; it works, however, in three planes, whereas the present day telautograph works in only two directions. The teledactyl is connected to a radio transmitter, which transmits the impulses; these then are received on the patient's instrument. These same impulses are then transmitted back to the doctor's instrument. The sound collector microphone is used so that the doctor at the other end can use his radio stethoscope and listen to the patient's heart-beats.

As our civilization progresses we find it more and more necessary to act at a distance. Instead of visiting our friends, we now telephone them. Instead of going to a concert, we listen to it by radio. Soon, by means of television, we can stay right at home and view a theatrical performance, hearing and seeing it. This, however, is far from sufficient. As we progress, we find our duties are multiplied and we have less and less time to transport our physical bodies in order to transact business, to amuse ourselves, and so on.

The busy doctor, fifty years hence, will not be able to visit his patients as he does now. It takes too much time, and he can only, at best, see a limited number today. Whereas the services of a really big doctor are so important that he should never have to leave his office; on the other hand, his patients cannot always come to him. This is where the teledactyl and diagnosis by radio comes in.

(Continued on page 1036)

Another application of the Teledactyl. Here we see the man of the future signing a check or document at a distance. By moving the control, it goes through exactly the same motions as he would in signing the document. He sees what he is doing by means of the radio television in front of him. The bank or other official holds the document in front of a receiving teledactyl, to which is attached a pen or other writing instrument. The document is thus signed.

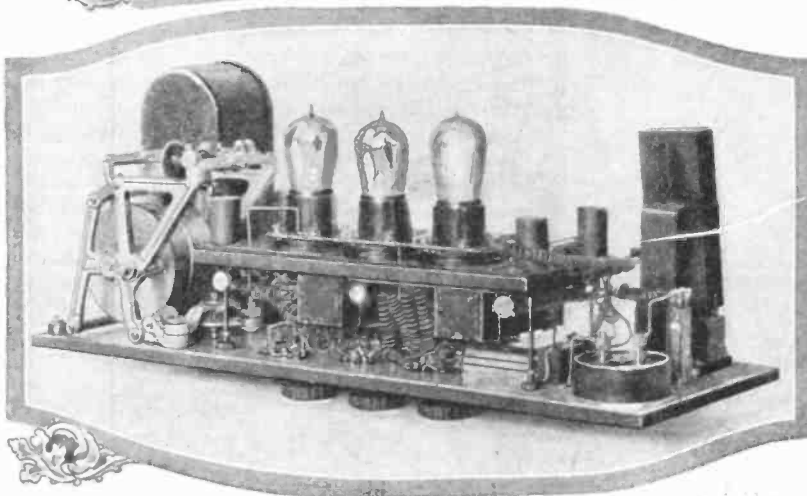
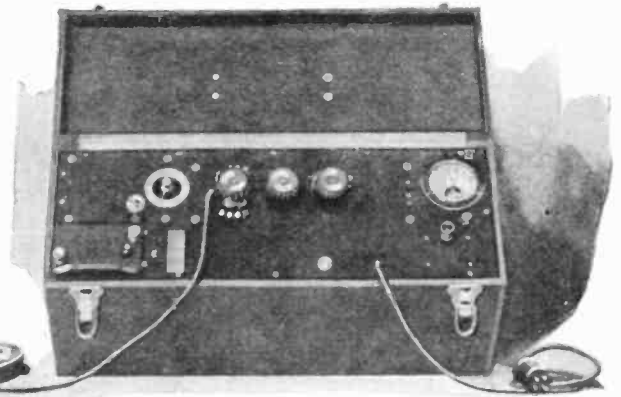


The circuit of the well known telautograph, now used in hotels and banks, and by means of which handwriting is transmitted to a distance. Every time the stylus is moved it varies the resistance of two rheostats, which, in turn, move two solenoids at the receiving end; these move a pen reproducing the handwriting.

Portable Electrocardiograph



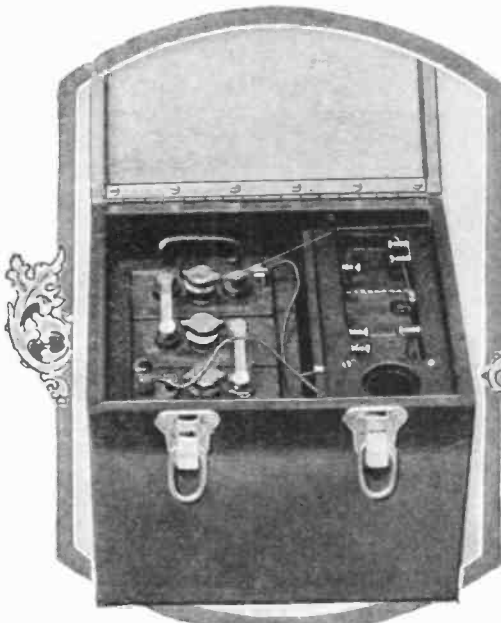
THE portable electrocardiograph recently demonstrated by the general engineering laboratory of the General Electric Co. is illustrated on this page. One of these devices could be used by the country physician in submitting a diagnosis by radio, in accordance with the apparatus depicted on the left hand page. The entire device weighs only 37 pounds and the power unit weighs 33 pounds. The apparatus open is shown at the right.



The photo above shows the portable electrocardiograph with the panel board inverted showing the vacuum tubes. In the old style cardiograph elaborate protection against vibration had to be made. Usually vibration-proof foundations were used for the mountings of these instruments. The fragile metal quartz thread used in the former apparatus is dispensed with in this construction.

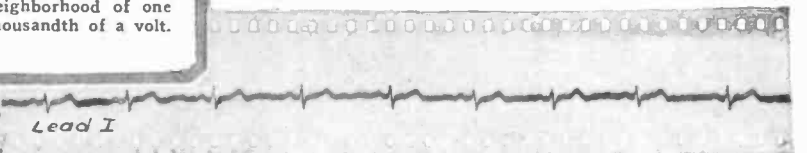


A patient having a cardiogram made is depicted in the above photo. Simple metal electrodes fastened to the arms and legs of the patient are used in place of the wet sponge electrodes formerly employed. The functioning of this instrument is not affected by skin resistance. The results could be transmitted by radio to a consulting physician, telephotographically.



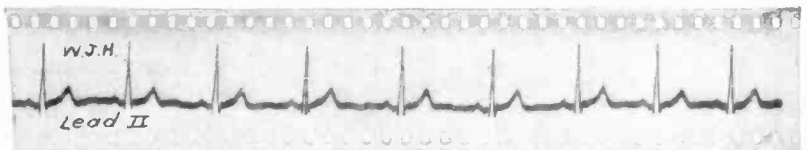
Contraction of the heart muscles is accompanied by or preceded by an electrical manifestation. This electrical change is amplified by vacuum tubes. The voltage before and after the heart beat is in the neighborhood of one one thousandth of a volt.

Lead I



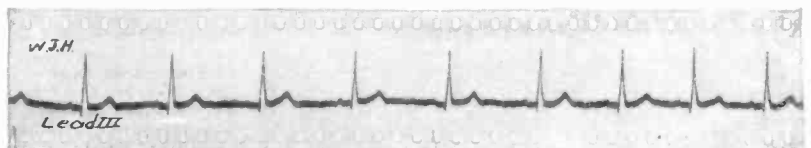
W.J.H.

Lead II



W.J.H.

Lead III



The power unit for the electrocardiograph is illustrated above. At the right are three typical cardiograms used for diagnosing different kinds of heart trouble taken with three different leads. They are caused by a spot of light acting on a moving film strip.

Trick Sub-Sea

By EDWIN

IN the Buster Keaton comedy "The Navigator," the star appears in a diving suit beneath the surface of the sea engaged in repairing a leak in the hold of a vessel which has run aground. Here he has an encounter with a swordfish and devilfish. Most of the views of his performance were actually secured at a depth of twenty feet on a small portion of the bottom of Lake Tahoe with apparatus like that illustrated on this page. In the story you behold a ship drifting out to sea with only two passengers on board, Keaton and his would-be wife. The ship runs aground off a cannibal island and springs a leak. It is at this time that Keaton dons a diving suit and goes over the side of the vessel while the girl mans the air pump. Meanwhile savages overrun the vessel, capture the girl and cut both lifelines and air hose.

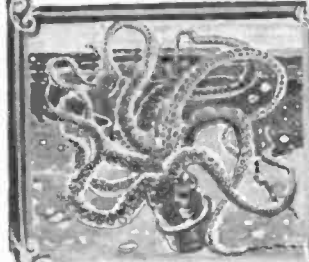
Keaton at the bottom of the sea is busy repairing the leak with a hammer and presumably wood plugs. While thus engaged a swordfish comes toward him followed immediately by another. He grasps the first one and using it as a weapon battles with the second, finally subduing it. When he realizes that his air hose has been cut, he turns off the valve at the top of his helmet and proceeds to walk toward shore. On the screen you behold him coming toward some rocks where the octopus is presumably hidden. As he approaches the rocks, a long black arm stretches forth and clasps the neck of the bronze helmet. The diver draws a knife from his belt, flourishes it above his head, and disappears behind the rocks as an inky black cloud floats upward. There are signs of a struggle and a momentary glimpse of the octopus, and then the diver emerges and continues on his way. The cost of the picture was considerably increased by the procuring of real undersea effects, but this helped to enhance the actuality of the scenes. The only scene taken in a tank in this picture was a close-up of a baby octopus with a five-foot tentacle spread.



The above photo is real undersea "shot" of Buster Keaton in a diving suit. The pail beside him is used for washing his hands. Sounds ridiculous doesn't it, but that is just why the picture is really funny. He uses a wooden mallet which floats away.

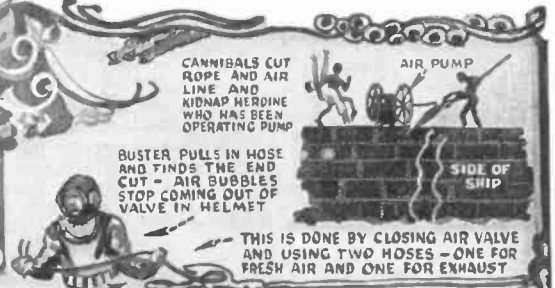


SET REPRESENTING SHIP'S STERN GROUNDED ON SAND BAR
ARTIFICIAL SWORDFISH OPERATED FROM ABOVE BY WIRES



SHOT OF REAL "BABY" OCTOPUS TAKEN IN TANK

The photo above shows Keaton holding a swordfish and ready to encounter another which begins to float toward him. This is a battle to the finish. It is a good thing that the swordfish were controlled from above by quite invisible wires. When the air hose is cut as illustrated at the right, one wonders how Keaton gets his air. A second air supply hose is coupled to the cut hose, and escaping air passes through another hose.

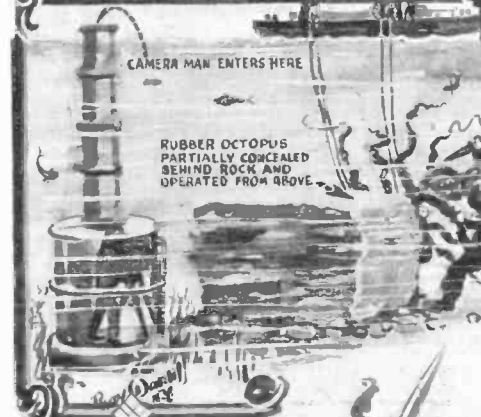


CANNIBALS CUT ROPE AND AIR LINE AND KIDNAP HEROINE WHO HAS BEEN OPERATING PUMP

AIR PUMP

BUSTER PULLS IN HOSE AND FINDS THE END CUT - AIR BUBBLES STOP COMING OUT OF VALVE IN HELMET

THIS IS DONE BY CLOSING AIR VALVE AND USING TWO HOSES - ONE FOR FRESH AIR AND ONE FOR EXHAUST



CAMERA MAN ENTERS HERE

RUBBER OCTOPUS PARTIALLY CONCEALED BEHIND ROCK AND OPERATED FROM ABOVE

PRESSING BULB FORCES LIQUID LAMP BLACK OUT OF OPENINGS IN BODY OF OCTOPUS

HOW BATTLE WITH OCTOPUS IS FILMED

CAMERA STOPPED TO PERMIT PLACING OF RUBBER ARM AROUND HIS NECK

ENTRANCE OF TWO HOSES CONCEALED IN TANGLE

TO PUMP

©1925 BY SCIENCE & INVENTION



AIR HOSE IS SUPPOSED TO BE CUT - REALLY IT IS CONCEALED BY WATER AND GOES BACK TO PUMP ON BEACH

In the octopus scene a "shot" of a real live octopus in a tank was taken. From this scene the scene was cut to the under water shot, where the diver battles with an octopus. This time, however, the octopus was artificial and was constructed of rubber. It was operated from the ship above. The inky cloud effect was produced by pressing a bulb that forced the liquid lamp black preparation through openings in the body of the octopus. While the rubber arm was being placed around the diver's neck, the camera was stopped. Photo above shows Keaton rescuing his lady-fair by coming up from the sea.



SUIT INFLATED

THE ESCAPE

Photography

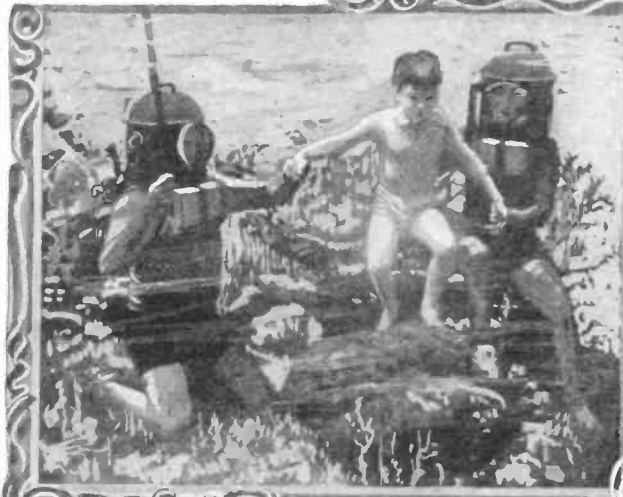
SCHALLERT

NOT all pictures are taken under water, but the most spectacular motion picture productions are taken on the actual settings as found in nature.

A place is usually selected where the foliage is plentiful, where sea ferns and coral abound. Often the motion-picture camera is lowered into the chamber which is to receive it and ground for hours, until the fish become accustomed to the noise and do not start away when the cameraman commences his grind. In "Water Babies" the undersea views were taken eleven miles off the coast of Florida in still water around coral reefs. Masses of coral may be seen in the photographs. The apparatus, by the aid of which the scenes were photographed, was fastened to the bottom with long steel clamps and the cameramen had to dive down and make their entrance through the open bottom of the tank before they could start work. The air pressure was sufficiently high so that the water would not rise more than half way to the top of the camera compartment, and fresh air was constantly supplied by air pumps. The tropical warmth of the ocean in this locality permitted the operators to remain under water for several hours at a time, and the boy, a stunt swimmer, could stay under water for about eighty seconds.



The boy stunt swimmer could by the proper manipulation of weights act as though he were walking around on the ground. He is shown above going through a veritable forest of sea weeds, and in the photo at the left we have further proof that the boy stunt swimmer is actually acting beneath the surface of the water, where the two divers are assisting him across rocky bottoms.

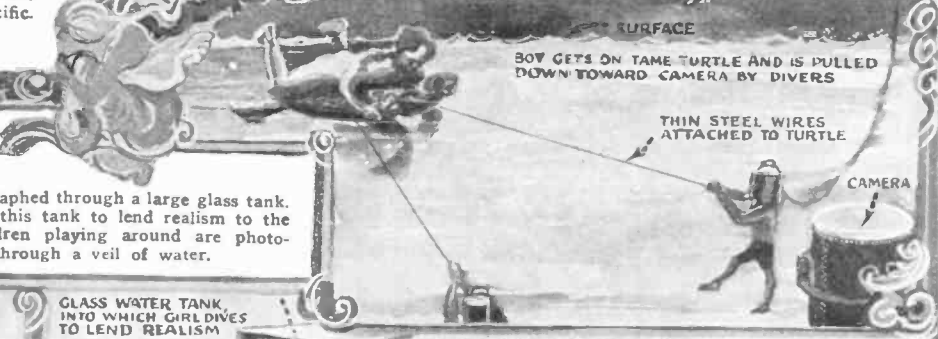


BOY GETS ON TAME TURTLE AND IS PULLED DOWN TOWARD CAMERA BY DIVERS

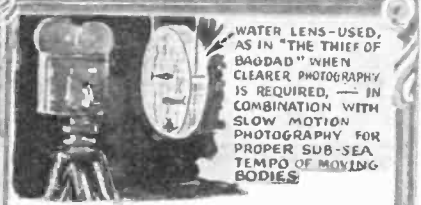
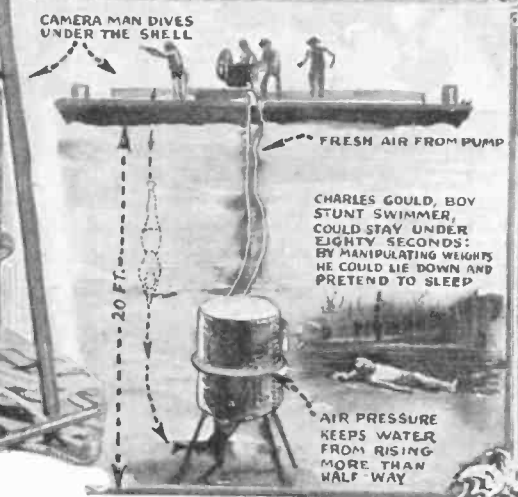
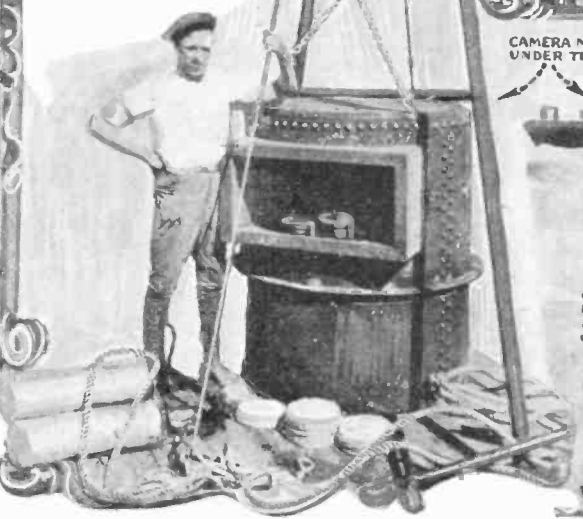


The photo at the left shows the boy stunt swimmer riding the back of a tame turtle. This turtle was controlled by two divers who held thin steel cables which were attached to the turtle. When it was desired to make the turtle submerge, the cables were pulled upon and the camera photographed the turtle swimming beneath the surface of the water from the bottom of the Pacific.

In some would-be under-sea motion pictures the scenes are photographed through a large glass tank. A girl dives into this tank to lend realism to the scene, while children playing around are photographed through a veil of water.



The photo here shows the chamber which was used in taking "Water Babies." The front of this chamber is fitted with a glass window through which the scenes are photographed. Air is pumped into the chamber.



Instead of employing a large glass tank into which a girl may dive and taking the photos through the tank, so that scenes placed in back of it may likewise be registered on the film, a much smaller tank is sometimes used. This is suspended immediately in front of the photographic camera and may have seaweed and fish in it. In combination with slow-motion photography, it gives the proper tempo at which bodies move beneath the surface of the sea.

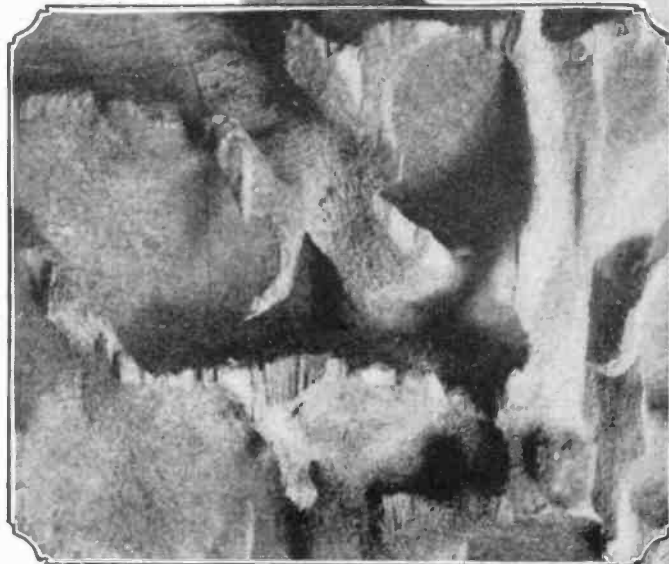
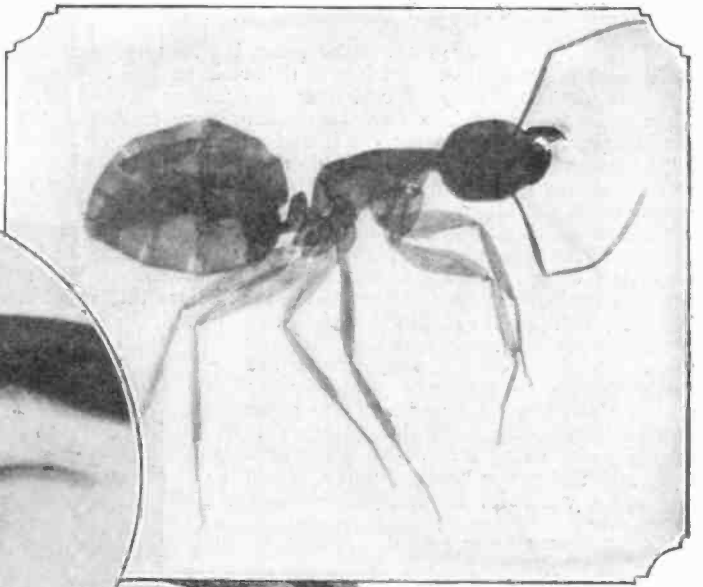
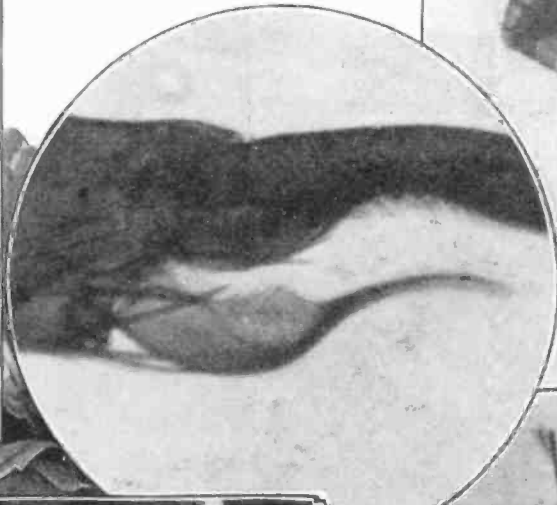
Social Life of the Ant

By DR. ERNEST BADE

Below—The worker of the red ant; at times such individuals may attain the age of 15 years in captivity, which is surely a sufficient lapse of time to be able to learn and utilize facts observed.

Right—The brain consists of only 1/300 part of the body; in man, the brain is 1/43 part of the body.

Below—The front leg of the ant is provided with an indentation and a brush to clean the feelers. The ant "clan" sees to the cleanliness of the individual as well as of the home.

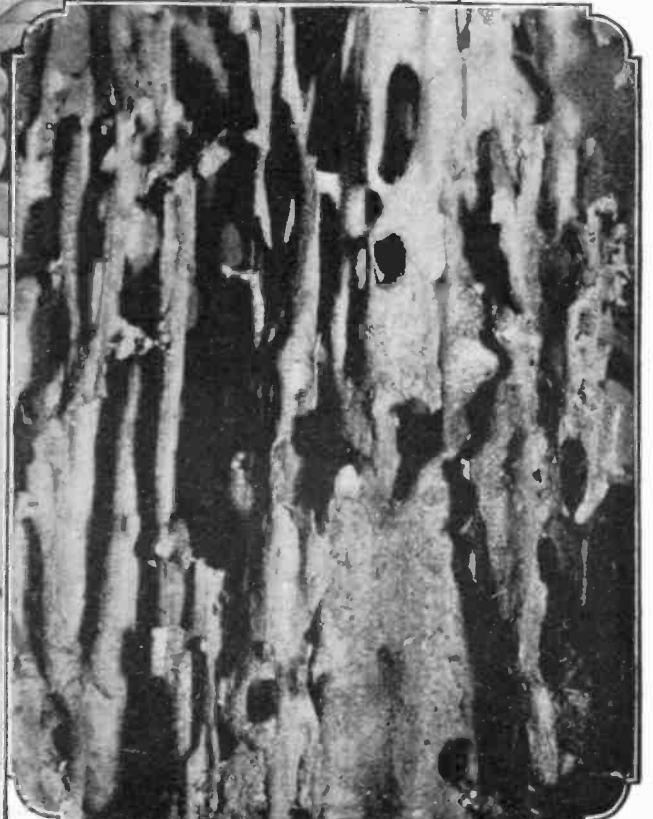
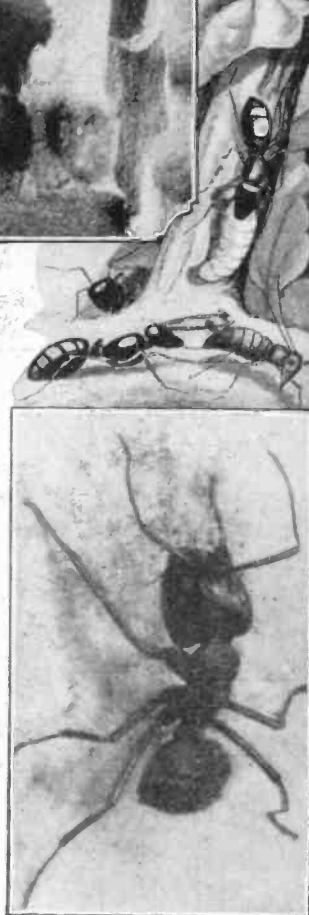


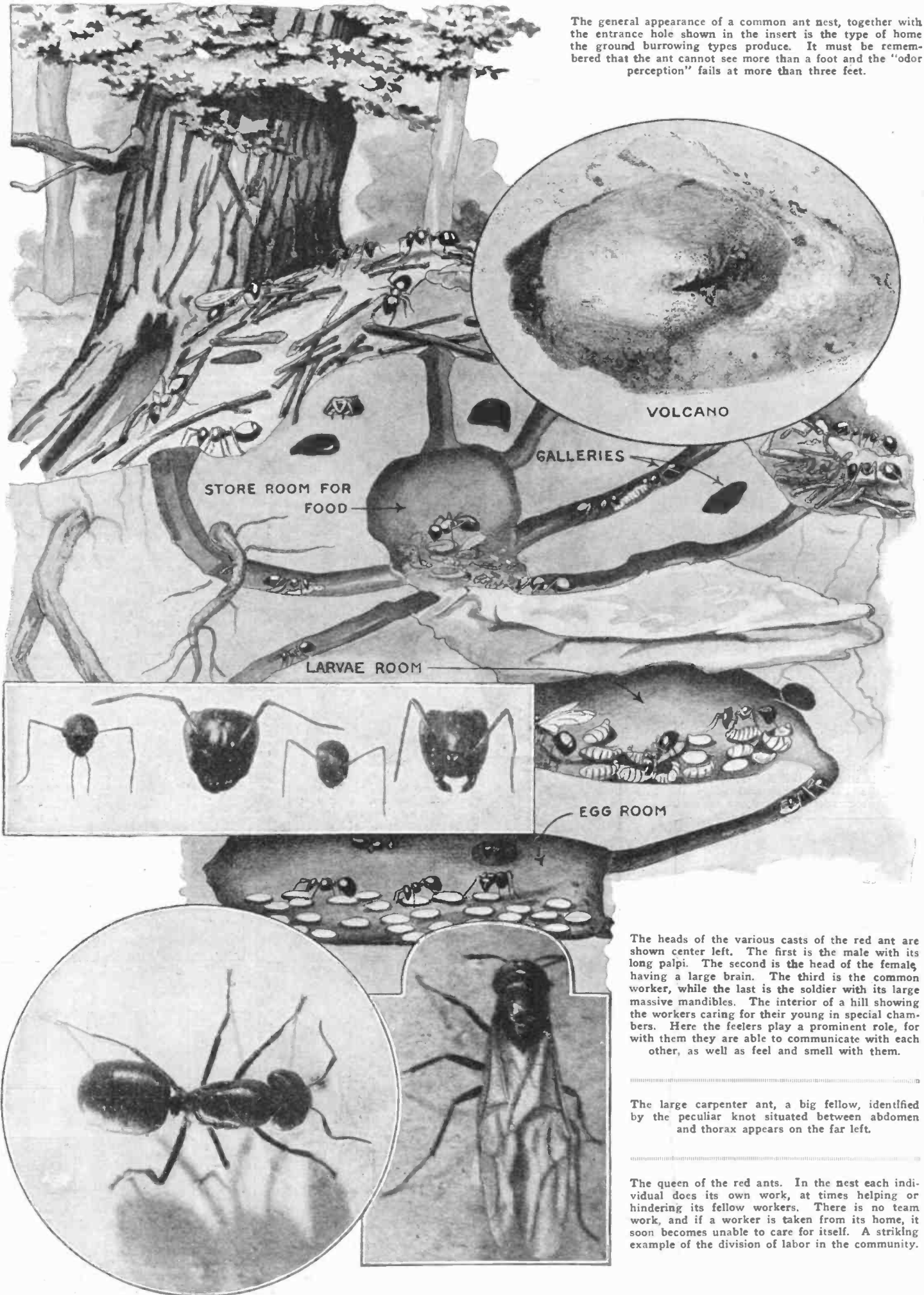
A Small Republic

THE male of the red ant, above to the right, is provided with wings. This form, as well as the female, are the only forms provided with them. The rest, the "state," is sexless and wingless. Above are the chambers of red ants eaten in wood. The workers are usually classed into groups. The smaller forms tend the young and keep the home in order. Similar individuals bring in food, others keep watch while still others are the protectors of the nest.

The soldier of the ant is the protector. This cast is characterized by exceptional size and possess extraordinarily large mandibles.

The burrows or paths of the red ant eaten out of the solid wood. In these nest building forms, each nest generally represents a state. But a nest may branch, and the branches formed may contain another community of the same form. Then these various branches are in friendly relation with the main nest, the entire network representing a "state." Example on right.





The general appearance of a common ant nest, together with the entrance hole shown in the insert is the type of home the ground burrowing types produce. It must be remembered that the ant cannot see more than a foot and the "odor perception" fails at more than three feet.

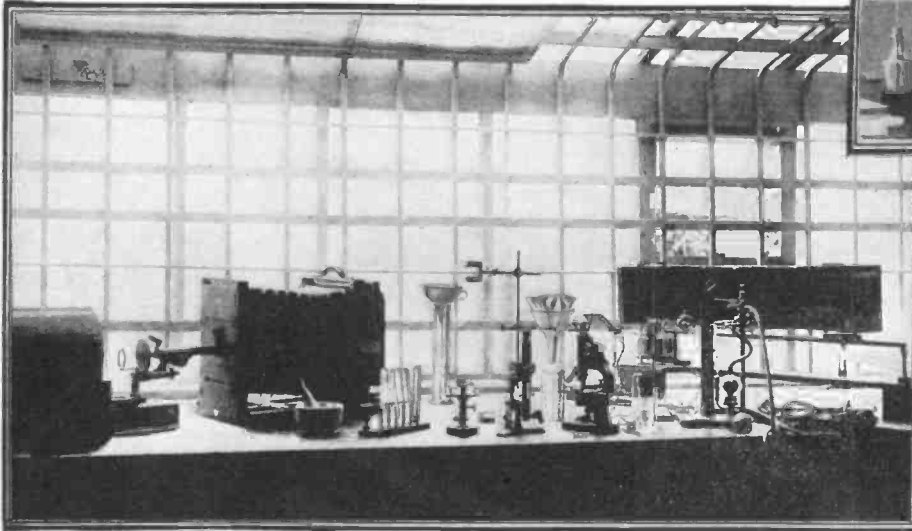
The heads of the various casts of the red ant are shown center left. The first is the male with its long palpi. The second is the head of the female, having a large brain. The third is the common worker, while the last is the soldier with its large massive mandibles. The interior of a hill showing the workers caring for their young in special chambers. Here the feelers play a prominent role, for with them they are able to communicate with each other, as well as feel and smell with them.

The large carpenter ant, a big fellow, identified by the peculiar knot situated between abdomen and thorax appears on the far left.

The queen of the red ants. In the nest each individual does its own work, at times helping or hindering its fellow workers. There is no team work, and if a worker is taken from its home, it soon becomes unable to care for itself. A striking example of the division of labor in the community.

Find the Hair-- Find the Criminal!

By MEL WHARTON



HAIR is the latest source of information to the modern scientific detectives. The Berkeley and Los Angeles Police Departments—the most scientific in the country—following the original investigations of Dr. Schneider, have investigated and annotated a large number of facts concerning the peculiarities of hair. From a little sliver of hair, half an inch long, the enterprising sleuths of the Los Angeles school can tell the nationality, the age, general condition of health, the comparative cleanliness or dirtiness, sex, color and weight of the individual from whom the hair originated. It is also possible to tell whether the hair is straight or curly, and whether the owner is a victim to the use of pomades or curling iron, and whether the hair itself was torn from the head or fell out. The extreme value of such information to the police is of course obvious.

In the sketches immediately below the magnification is about 500 diameters. Fig. 1. A tiny bit of human head hair showing an interrupted pith and numerous pigment granules. Fig. 2. Bit of armpit hair showing the abundant deposits of sebaceous matter. Fig. 3. Bit of pubic hair showing two extruded epithelial cells. Fig. 4. Basal portion of human head hair pulled out by force as indicated by the transversely torn follicle. Sebaceous deposit just above the skin surface line. The upper end has been recently cut by sharp shears. Fig. 5. The shrunken follicle indicates that the hair fell out. Sebaceous deposit much reduced. Fig. 6. Transverse section of a straight head hair. Outline circular with centric pith. Fig. 7. Transverse section of a curly head hair. Outline elliptical with eccentric pith. Fig. 8. Bit of beard shaving, two days' growth, cut by means of a dull safety razor. Fig. 9. Bit of body hair of Cinnamon bear. Fig. 10. Bit of deer hair showing the very characteristic cellular pith. The cortex is reduced to a minimum, being scarcely noticeable. Fig. 11. Hair of Alaskan ermine. Fig. 12. Hair of Rhesus monkey. This hair shows the general characteristics of human body hair. Fig. 13. Body hair of dog. Compare with hair of the coyote. Fig. 14. Bristle or hair of black caterpillar showing one prong or branch. Fig. 15. Bit of wool (sheep). There is no pith or medulla and there are no pigment granules. Fig. 16. Body hair of rabbit. Fig. 17. Body hair of Scotch mole. Fig. 18. Body hair of coyote. Resembles very closely the hair of the dog, somewhat coarser.

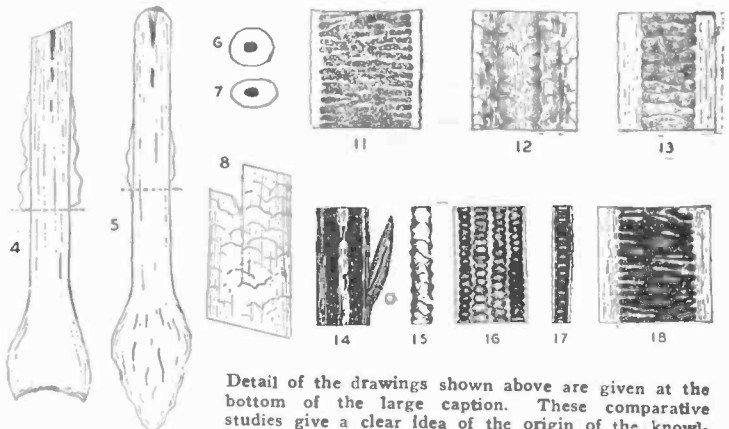
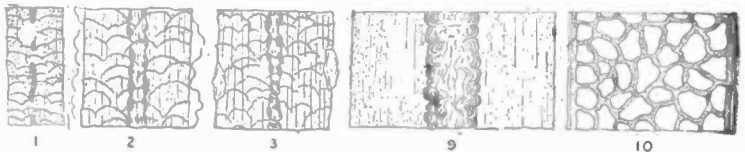


The photograph at the top of the page shows the interior of the laboratory of the Los Angeles Police Department where the hair observations and analyses are made.

The various heads shown here illustrate clearly the difference between the hair characteristics of different races and sub-races, which is the first broad analysis made.



The analysis not only tells race, but it also demonstrates the particular part of the body or head at which the hair originated, and whether the hair has been trimmed recently or not.

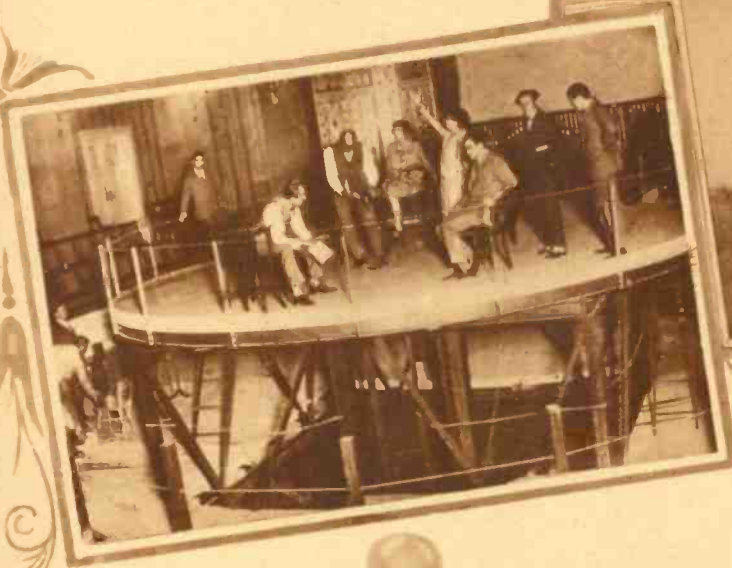


Detail of the drawings shown above are given at the bottom of the large caption. These comparative studies give a clear idea of the origin of the knowledge used by the department.

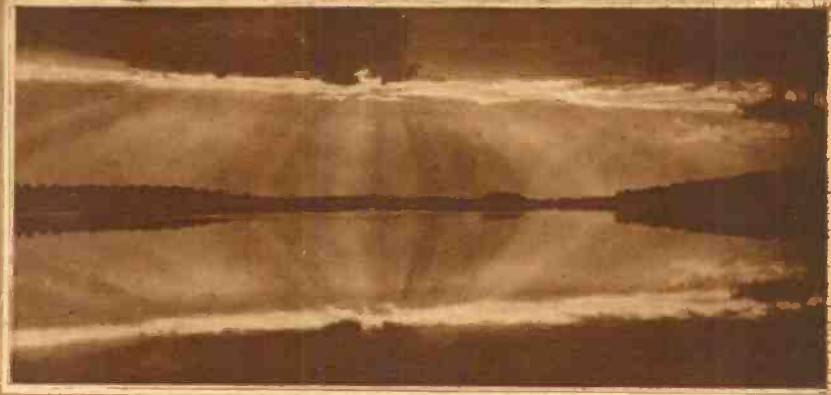
Science in Pictures

The News of the Month Briefly Reviewed

The versatile moving stage illustrated below has been designed by the sculptor Klesler and is in use in Vienna. It can be moved up and down and revolved as desired. Right: Robert V. Jaros of the University of Chicago with a model airplane constructed by him that stayed in the air for ten minutes, fourteen and two-tenths seconds, establishing a world's record.



Right: A novel aerial advertisement which for some time floated in the air 300 feet above Columbus Circle, New York City. It represents a well known make of balloon tire and in itself is 24 feet across. Made of very light balloon fabric, it contains 3000 cubic feet of hydrogen and is held in place by means of flexible steel cables. From the street, the cables were hardly visible and the tire appears to be suspended in the air without any support whatsoever. Needless to say, the advertisement created a considerable amount of interest.

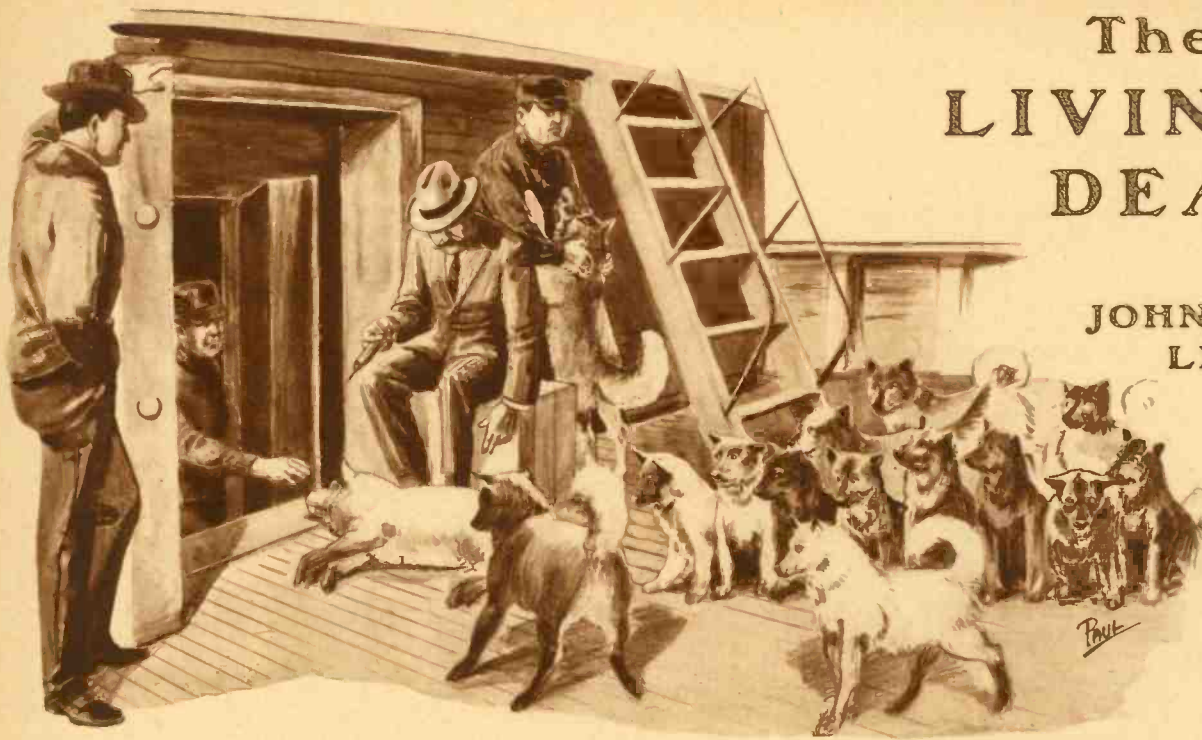


Above: Ornamental lamp posts made by Ray Lambert, Park Commissioner, San Antonio, Texas. Mr. Lambert uses discarded tin cans as the core of the lamp posts, covering these forms with concrete. Thus, ugly refuse is turned into a useful channel.

The above photograph by E. L. Braley is interesting in the extreme. It is seldom that one sees a photograph combining such a wonderful reflection with that atmospheric phenomenon known as "the sun drawing water."

The LIVING DEATH

By
JOHN MARTIN LEAHY



Frontenac stood at the entrance to the freezing-room and, as a dog was brought forward, he made an injection in the animal's neck.

SYNOPSIS

Captain Livingstone, an Antarctic explorer, calls into conference a famous scientist, Darwin Frontenac, who has distinguished himself in research work involving methods of inducing hibernation in mammals. In the presence of Mr. McQuestion, a reporter, Captain Livingstone recounts a weird tale of exploration and discoveries in the Antarctic. He tells how, with a well equipped ship and a hearty crew, he started for the South Pole and how, far south of the Antarctic circle, land was discovered. Leaving part of the crew at this point and travelling overland, the explorers found the air to become warmer and to their great astonishment they discovered a land, surrounded by high mountains, the temperature of the region being far above the freezing point and where palm trees and luxurious flowers flourished. During part of their exploration trip, a "Thing" unknown to them killed all of the explorers with the exception of Captain Livingstone and a man by the name of Hampden. Leaving this Garden of

Paradise, as this spot had been named at first, the two men travelled onward. Some distance further on they discovered a cave, the floor of which was covered with a thick coating of ice and encased in that ice they found the body of a beautiful young woman, clothed as only inhabitants of a tropical country would be. The Captain formed the opinion that this girl was not dead, but was in a state of suspended animation—in other words, neither living nor dead.

It was with this girl in his mind that the Captain approached Darwin Frontenac. His object was to induce the scientist to exercise his knowledge toward bringing this beautiful young girl back to life. After the facts stated above had been recounted to Frontenac and Mr. McQuestion, they agreed to go to the Antarctic regions and attempt to revive the girl if, to quote Frontenac: "...that 'Thing' in the Garden of Paradise doesn't get us within the reach of its claws."

The two resumed their seats.

"I found her," said the captain, "but I am a doomed man; I shall never see her again."

A strange look came over his visage. His lineaments moved in a wan, melancholy smile.

"I am getting up in years, and, if the truth must be told, I am, after all, something of a hardened old sinner, and yet—"

That smile slowly left his face, and for a time he was silent—a strange, rugged pitiable figure.

"And yet, gentlemen, sometimes I think that—yes, I sometimes think that I love that girl."

Darwin Frontenac's look was suddenly keen and questioning, then as suddenly was what it had been a moment before.

FIFTH INSTALLMENT CHAPTER XV

ANOTHER MONSTER—THE DOOR

CAPTAIN STANLEY LIVINGSTONE came to his feet and reached out his hand; Frontenac too arose and extended his own; and the captain pumphandled away at him in fine fashion.

"I knew, Mr. Frontenac, that you would do it!" he exclaimed, the puffed and livid features working with strong emotion. "I knew that you would awake my Sleeping Beauty!"

As for myself, my astonishment was very great. This was not like Darwin Frontenac. I had thought that he would give this matter—one of the strangest and wildest things, certainly, that had ever been presented to any man—long and careful attention. And now look! Frontenac had already answered—answered before the explorer had even finished his story!

"And you, Mr. McQuestion?" the captain said. "Are you going to go, too?"

"Really the thing is so unexpected, so strange. I must have time to think it over—that is, if Darwin wants an Icicle Mucky-muck like me along."

"You know nothing would please me more, old tillicum!"

"Well, I must think it over."

"Of course," the captain nodded. "Of course."



The figure, cut out of the living rock, was a colossal one, being thirty feet in height and fully fifty in width. It was perched upon a heap of (sculptured) human skulls, the wings were outspread as though it was about to launch itself down upon us.

"Yes, it is so," said the captain, burying his face in his hands. "I could never forget her. Call me an old fool—call me what you will! She was so sweet, so lovely there in her bed of crystal—a sight so sad that I wept to see her lying there. But I shall never see her again. My aneurism may burst at any moment."

Darwin Frontenac glanced in my direction. I saw in his eyes only wonder and awe.

The captain raised his head from his hands. That wan, sad smile—a thing I could never describe—passed over his features once more.

"An old fool's weakless, gentlemen," he said, giving a melancholy wave of his hand. "I don't know why I have told you this. Heaven knows, I never intended to tell it to any man. But what, after all, does it matter? I shall never see her again. But you will see her, Mr. Frontenac, and you, too, I fancy, Mr. McQuestion. Yes you will see her there in her tomb of ice—perhaps on a day see her smiles and hear her laughter. Perhaps you—both of you—will love her too.

"Poor little kid! as Hampden said. You will be good to her, Mr. Frontenac, I know. Yes, she will never regret that you awoke her, or you regret it, either. In a way, she will be your daughter, unless, that is—a thing which I think not unlikely—she becomes one even dearer still."

It was Frontenac now who smiled. He made no response, however.

"But," said the captain, "who can say what will be? All that is in the future.

"As for the expedition, today would have found us almost ready to put to sea—perhaps, indeed, actually under way—if it hadn't been for this hellish aneurism of mine. I had known for some time that there was something wrong. I thought, though, 'twas nothing serious and that it would pass away, as so many other things had done. But it did not pass away. It got worse instead of better. And so finally I went to a doctor. I demanded the truth; he gave it to me. I went to another and yet another; it was the same thing. It was quite a shock at first, gentlemen. For a time I tell you I felt mighty bad. But I brought my philosophy, such as it is, to bear upon the matter, and I soon resigned myself to my fate.

"But what to do about the expedition? Things were rapidly nearing completion. Nunatak—maybe you have heard of Nuna-



A few moments, and we had cleared the pier and were out in the stream.

tak in Alaska, Mr. McQuestion? His real name is an odd one truly—Louis Louisiana."

"Oh, yes."

"A fine man," said the captain. "They say that he is one of the best, perhaps the very best musher in all the Northland. He is as tall as a bean-pole, skinny as a poker, and one eye is black and the other is blue. Ever meet him up there?"

"No. I've seen many a man up North with one eye or both eyes black and blue, but I never saw a man, there or any other place, with one eye blue and the other black. I remember hearing of this Nunatak, though."

I turned to Frontenac. "Ever hear of a man with peepers like those before?"

"Oh, yes. Never saw such an one, though."

"As I was going to say," the explorer went on, "there was everything almost ready

and Nunatak on his way down from the North with the dogs—genuine Eskimo dogs, from the Tinnanannomook country—and now, like a bolt from out the blue, came this sentence of death!

"What was to be done? Should the *Multnomah* sail anyway—the expedition to go on under the second in command when the aneurism finished me? I didn't know what to do. And, while I was trying to decide, I read of your discovery, Mr. Frontenac, and I made up my mind to come to you and tell you what I had never told any man—the whole of my story. Thank God, I did come! I shudder to think, though, how near I was to backing out, for I was afraid you might regard it all as nothing but a fairy tale.

"I suppose, however, that the *Multnomah* will be ready to cast off by the time that you can get your affairs in shape. When I decided to come to you and tell you my story, the first thing I did (on the chance that you might believe me) was to draw up papers that would forestall any hitch or difficulty in case I should be bumped off before the expedition got away. There is no telling; I may live for months, and, again, I may go at any moment. However, I have fixed matters so that, if I die this minute, things can go on as smoothly as though nothing had happened.

"Your discovery, Mr. Frontenac, will make at least one change necessary: you will, I suppose, want a freezer on the *Multnomah*?"

"By all means."

"I didn't think that you would awake her down there."

"Of course not."

"That's what I thought. So there will have to be a freezing-room to bring her back in."

"Just so. And there are the dogs," Frontenac reminded him. "How many?"

"About one hundred."

"The freezer must be large enough to hold all those dogs, with some additional space. For we will *kill* them, pile them up in the freezer and thaw them out when we reach Summer Haven. That will be much better than having them crowded about the decks, to say nothing of the saving in food."

"By Joe!" the other exclaimed. "I never once thought of that."

"However," Frontenac said, "these details can be taken up later. I am anxious, Cap-

(Continued on page 1048)



There was a cry, and I looked up and saw Hampden make a wild effort to turn and save himself, the rear end of the sled tip up, and the sled slip forward and vanish, dragging the dogs down after it.

"Death Ray" in Movies

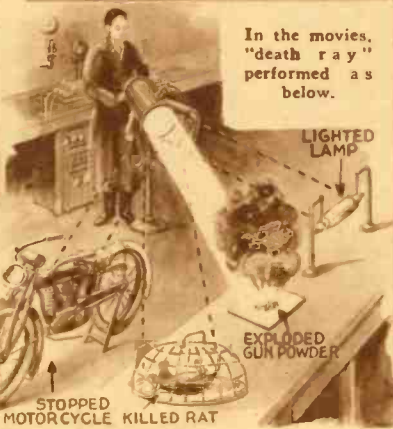
They Do It In the Movies!!



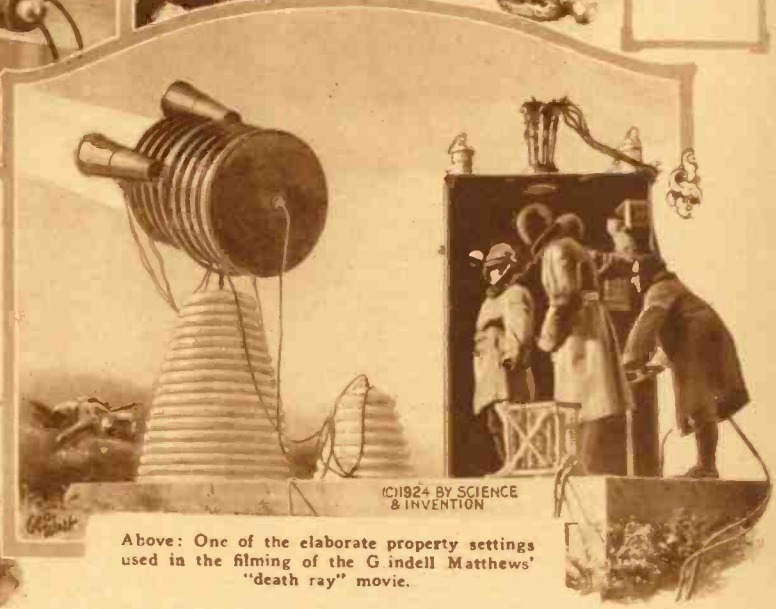
The inventor of the "death ray" recently staged a movie on that subject for Pathé.



Left: An action scene from the "death ray" movie.



In the movies, "death ray" performed as below.



©1924 BY SCIENCE & INVENTION

Above: One of the elaborate property settings used in the filming of the G indell Matthews' "death ray" movie.

Harmless X-Ray

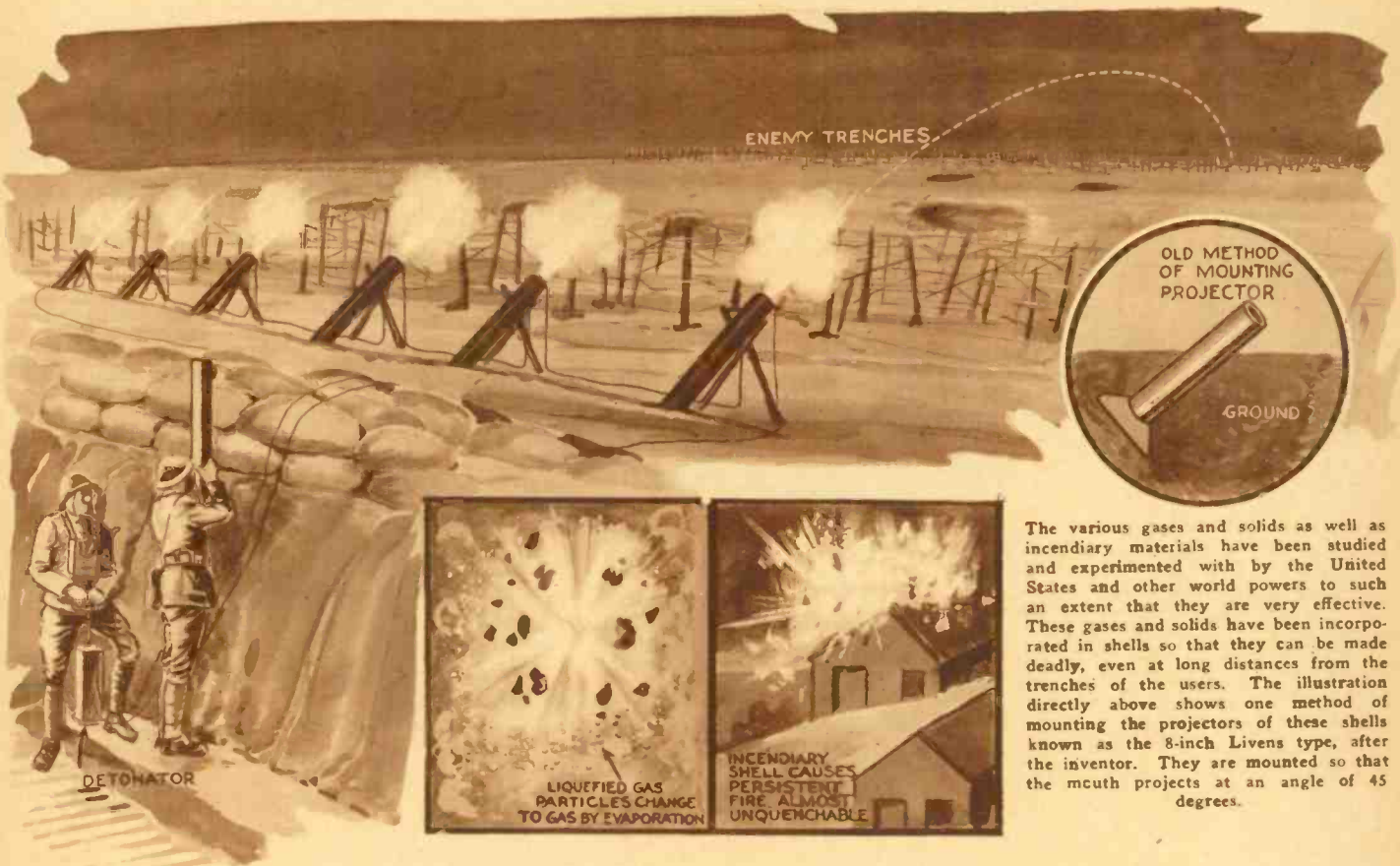
Diagram labels: CONTACT, 30,000 WATT LAMPS, SWITCH, BRILLIANT RED GLOW, LENS, LOWER HEMISPHERE OF EACH LAMP IS SILVERED REFLECTOR, CHEST UNDER ORDINARY X-RAY, CHEST UNDER COLD LIGHT.

©1924 BY SCIENCE AND INVENTION

The medical world has recently been startled by a statement to the effect that in France there is in use a device which gives the effect of an X-ray, yet employs none of those emanations that have been known by that title since their discovery by Roentgen. The device which gives this effect is illustrated at the left. It consists of a series of 30,000-watt lamps, half silvered, as shown, mounted on a rotating wheel and lighted at the instant that they pass a given point. At this point, the rays of the lamp are directed through a lens so that they give the effect shown. Each bulb is used for such a short space of time that, it is claimed, little, if any, heat reaches the patient. The light is, therefore, called cold and in the upper lefthand corner of our illustration is shown a comparison between a photo taken with ordinary X-rays and "cold light." The blood vessels and organs can be seen.

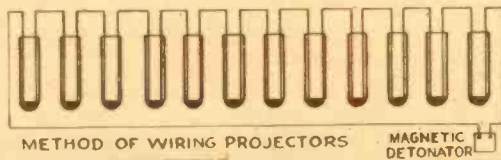
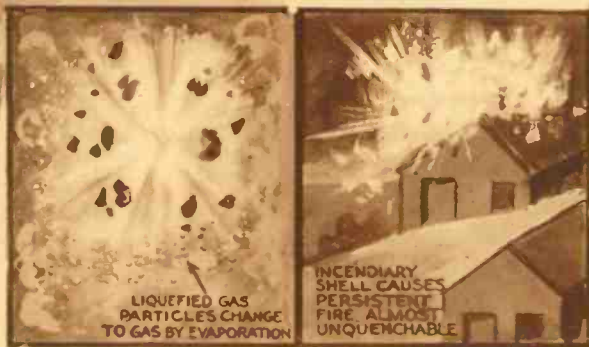
Poison Gas Shells

By LIEUT. ROBERT E. SADTLER, Chemical Warfare School, U. S. Army

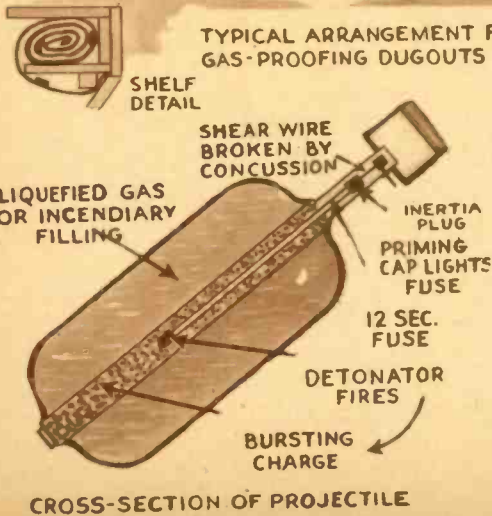
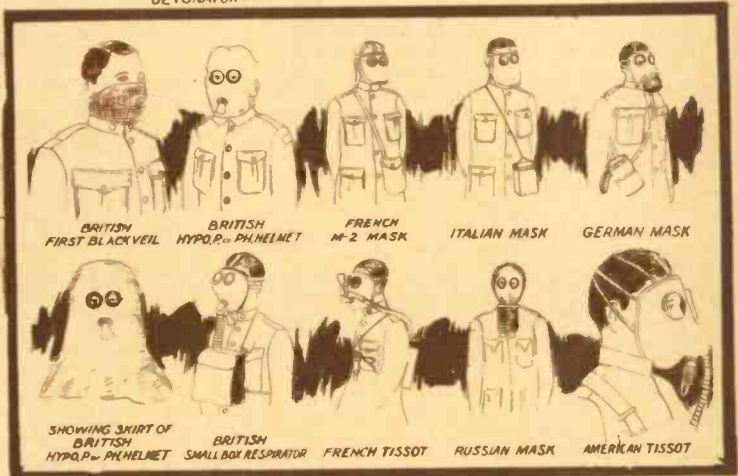
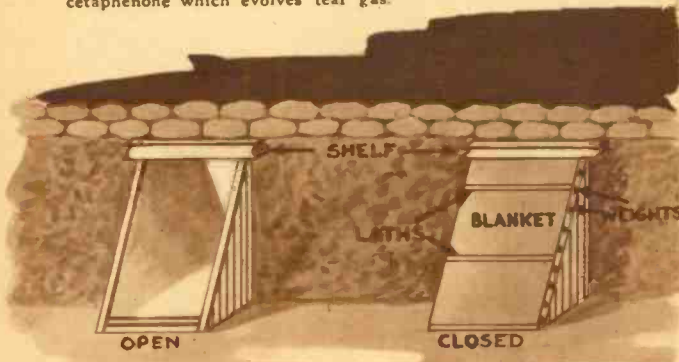


The various gases and solids as well as incendiary materials have been studied and experimented with by the United States and other world powers to such an extent that they are very effective. These gases and solids have been incorporated in shells so that they can be made deadly, even at long distances from the trenches of the users. The illustration directly above shows one method of mounting the projectors of these shells known as the 8-inch Livens type, after the inventor. They are mounted so that the mouth projects at an angle of 45 degrees.

The three most important gaseous chemical agents used in chemical warfare are mustard, phosgene, and chlorpicrin gases. Also there are three important solid materials used. They are diphenylchlorarsine used as a toxic smoke, diphenylaminechlorarsine for the same purpose and chloracetaphenone which evolves tear gas.



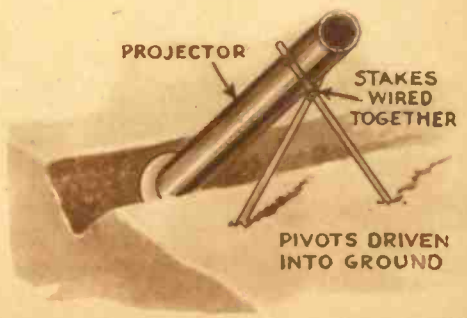
An entire battery of Livens projectors are wired together in series as shown at the left and are simultaneously detonated from a single point by means of a magnetic device. The insert above and to the left shows the effect of bursting gas and incendiary shells.



The illustration in the lower righthand corner shows an improved American method of mounting Livens projectors that is equally as effective as the old type, and can be placed in one-fifth the usual time.

Above and to the right are illustrations of various types of gas masks used in the World War. Note the variations in size and form.

At the left is shown one of the improved types of Livens gas shells as used in the projectors illustrated herewith. Note the simple, yet effective method of breaking the shell. Directly above the shell is shown a typical arrangement for gas-proofing dugouts. A blanket with laths nailed to it at intervals serves as an effective block to the gas when the edges are weighted down.



-AN AMERICAN METHOD OF EMPLACEMENT

Doctor Hackensaw's Secrets

By CLEMENT FEZANDIÉ

No. 36. The Mystery of the Z-Ray Spectacles.



"Good gracious!" cried Miggs, "I can see right through the wall into the office where the clerks are!" "Yes," assented Doctor Hackensaw dryly, "I sometimes look at them myself, and I must say I don't often see you working, Miggs—perhaps it's on account of some trouble with the spectacles."



raveling a most difficult case. But first let me ask you something. I am informed that Doctor Hackensaw has invented a wonderful pair of spectacles—X-ray spectacles, I believe they are called—by means of which the wearer can see right through people, or even see through the walls of a house what is going on inside. Is that true?"

"Yes, ma'am, only he calls them Z-ray spectacles, because it is not the X-ray that he uses."

"Have you ever worn the spectacles? Do you know how they work?"

"No, ma'am, but I heard the doctor say that they were so simple that anyone could use them."

"Do you think the doctor would lend you a pair for a few weeks. I don't want him to know that they are for me. You must ask them for yourself."

"I think I could get a pair," replied Miggs, non-committally.

"Very well. Now here's what I should like you to do, and remember, there is a handsome reward offered; in fact, I will give you one thousand dollars in case of success."

Miggs' eyes gleamed. "All right," said he, "I'll succeed! What is it you want me to do?"

The lady glanced at her watch. "It's a

IN Doctor Hackensaw's employ there was a bright boy of fifteen named Tintageles Smith. The name is pronounced Tin-taj-jill-leeze, but as most people would not take the trouble to pronounce it correctly, they called him "Miggs" for short.

One night Tintageles had an adventure. Doctor Hackensaw had given him a ticket for the theatre, and at the end of the performance the boy had started off to walk home, when a high-class automobile drew up to the sidewalk alongside of him, and a beautiful young lady in evening dress, and glittering with diamonds, leaned forth from the car and beckoned to him.

"Jump in," she said; "I want to speak to you."

Tintageles turned around to see whom she was addressing, but there was no one else near.

"It's you I want," insisted the lady; "jump in!"

Our young hero was convinced that the lady was mistaking him for someone else, but he was always ready for an adventure, so he jumped in and took his seat beside his fair interlocutor.

"My name," said the lady, "is Miss Muriel Gold. You may possibly have read about me in the Society Notes of the papers. Your name, if I am not mistaken, is Tintageles Smith."

To say that Miggs was surprised to find that he was really the person wanted, and that the young lady even knew his name, would be to put the matter mildly. He was "flabbergasted," but he managed to answer:

"Yes, that's my name, but my friends all call me 'Miggs.'"

"Very well, Miggs," returned the young lady, smiling. "I understand that you work in Doctor Hackensaw's laboratory?"

"Yes, ma'am."

"And I am told that you have the makings of a fine detective in you?"

Tintageles blushed. This was taking him on his weakest side. From boyhood up he had hesitated as to whether he would be President of the United States or a detective, but finally the fascinations of a detec-



long story," she said, "and I haven't time to go into particulars tonight. But come to this spot tomorrow night at ten o'clock and bring the spectacles with you. I shall be here with the auto, and bring you home with me, and then I'll give you full details. *Au revoir* till then!"

CHAPTER II

"No, Miggs," said Doctor Hackensaw, "I can't lend you a pair of my magic spectacles: haven't made the invention public yet, because I don't dare to let these spectacles go out of my possession. I am afraid they might be used for mischievous purposes. But I have no objection to letting you look through them. Here is a pair. The spectacles, of course, fit over your eyes. As you see, the wires that connect with the ear-

tive's life carried the day. The lady's words accordingly touched him in a tender spot.

"I have so much faith in your abilities as a detective," continued the lady, "that I have decided to make use of you in un-



pieces that support the spectacles, pass down under the back of your coat and then through a hole in the pocket to the radium battery and audions which are contained in a small case that fits in your pocket. The adjusting screws are on the outside of this case. The large knob controls the distance to which the ray goes before it is reflected. Here, put the spectacles on your eyes, and the case in your pocket. Now take off your coat while I make the connections. All ready. Put on your coat again. Connect the spectacles with the wire and look at the wall."

"Good gracious!" cried Miggs. "I can see right through the wall into the office where the clerks are!"

"Yes," assented Doctor Hackensaw, dryly. "I sometimes look at them myself, and I must say I don't often see you working, Miggs. Perhaps it's on account of some trouble with the spectacles. Now, if you want to see what you look like, just turn the adjusting screw to the left, and look at yourself. You can get a pretty good view of your ribs, your heart, lungs, stomach and other organs. These spectacles are invaluable to a physician in diagnosing the condition of each organ of his patient. In fact, there are a thousand uses to which they may be put."

"What is the principle on which they work?" asked Tintageles.

"Their construction cost me many a sleepless night," replied the doctor. "Yet the problem seemed simple, since I had the

"My starting point was the discovery made by Frederick Laue in 1912, that X-rays could be reflected by special crystalline surfaces. In a mixed fascicle of X-rays of different wave-lengths, he found that the surface would reflect those rays whose wave-lengths correspond with its own molecular structure. So far, however, this discovery has only been used in an attempt to determine the real arrangement of atoms in space.

"Finding myself unable to make any headway with the X-rays, I turned my attention to some of the other rays. To begin with, Miggs, I must tell you that there are a large number of different kinds of rays. Radium, for instance, throws off three kinds of rays, known as the α (alpha), β (beta) and

"In my experiments I chanced to discover a new ray, which I called the Z-ray, and which, like ordinary light rays, and like the X-ray and the beta ray,



has a wide variation in wave-length.

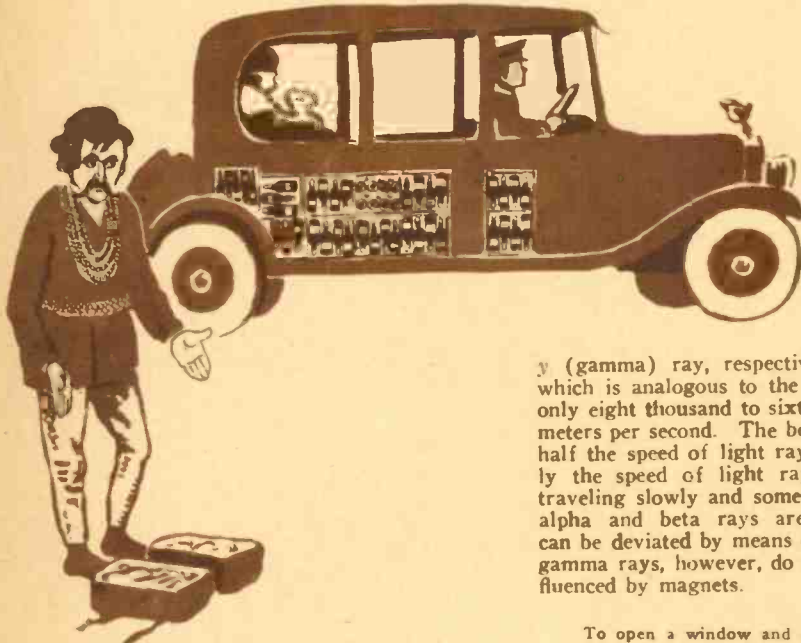
"My problem was to separate this ray into a number of homogeneous rays of a uniform wave-length. To accomplish this I used crystalline surfaces like those used by Laue. I found that the rays with different wave-lengths penetrated to different depths into the body viewed before the light was reflected. By using one length of wave I would get a reflection of a flat surface inside of the body—a sectional view. An adjusting screw enabled me to view a section at any desired depth in the body. A flexible diaphragm that can be made to assume any curvature at will, enables me to view a curved surface, such for example, as the outer surface of the heart instead of a plane section through the heart. With a very little practice anyone can adjust this diaphragm and the distance micrometer screw so as to see any portion of a man's organs that he wishes to examine. I have also a special attachment which enables me to read the letters in a man's pocket. Put on the spectacles again, Miggs, and see if you can read the address on the letter I have in my coat pocket."

Miggs adjusted the spectacles once more and then gave a cry of astonishment.

"Gee!" he exclaimed. "Why, I can look right into your insides. I can see your skeleton and your heart and stomach and everything! And all in natural colors—not in black and white like an X-ray picture. And I can see all you've got in your pockets, too. I can see the bills and coins in your pocket-book, and I can read what's on your railroad ticket. Say, doctor, can't you lend me a pair of these spectacles only for one week!"

"No, indeed," replied the doctor. "Think what harm might arise if a bad use were made of them. They would be invaluable

(Continued on page 1026)



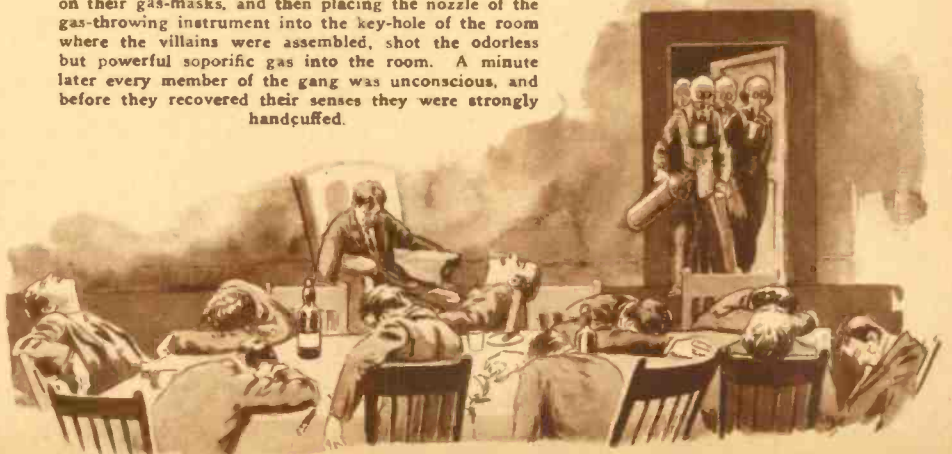
With the Z-ray spectacles our policemen would be able to detect weapons, bottles of Scotch, smuggled jewels, et cetera, hidden about the person or in automobiles, as the central illustration shows. Imagine how our bootleggers would scurry to cover if they knew our policemen were armed with these penetrating spectacles.

γ (gamma) ray, respectively. The X-ray, which is analogous to the alpha ray, travels only eight thousand to sixteen thousand kilometers per second. The beta rays vary from half the speed of light rays to approximately the speed of light rays, some particles traveling slowly and some fast, for both the alpha and beta rays are corpuscular and can be deviated by means of a magnet. The gamma rays, however, do not seem to be influenced by magnets.

penetrating X-ray to start with. But the progress of invention is always very slow. Man must have been familiar with his own shadow long before he noticed his reflection in a pool of water. And water was his only mirror until a few hundred years ago he succeeded in making metal mirrors and then glass mirrors. The use of lenses to refract light came long after the use of mirrors. Finally came the X-ray, which is still in its primitive stage—the stage in which it can merely throw a shadow. Attempts to reflect and refract these rays were only partially successful.

"Then I took the matter in hand. The analogy of the X-ray to the heat and light rays is so great that I knew there must be some way of utilizing them for the spectacles I dreamed of—spectacles that would enable us to look either through or into solid bodies at will.

To open a window and climb into the house was the work of an instant. Pep, Joe and the three men put on their gas-masks, and then placing the nozzle of the gas-throwing instrument into the key-hole of the room where the villains were assembled, shot the odorless but powerful soporific gas into the room. A minute later every member of the gang was unconscious, and before they recovered their senses they were strongly handcuffed.



Everyday Chemistry

By RAYMOND B. WAILES

WHY DO SO MANY MEDICINES CONTAIN ALCOHOL?



1 To dissolve some of the ingredients not soluble in water, not as a stimulant.

IS THE RING AROUND THE TUB DIRT?



2 No, not entirely. It is mainly a substance formed by soap and minerals.

THE RED SIGNAL LIGHT AND RADIO MOVIES ARE CLOSELY RELATED



3 Selenium tints glass red and is also the heart of television apparatus.



4 The glossy finish on high class sport cars is usually due to a paint containing non-explosive gun cotton.

ADD A POISON TO YOUR SALT



IODINE + SALT

PREVENTS THIS

5



GOITRE

Iodine in the proportion of .01% in salt prevents goitre and is harmless. Some manufacturers call this "Iodized Salt."

THE RED LIQUID IN THERMOMETERS IS NOT RED MERCURY, IS IT?



6 Metallic mercury is never any color but silvery. The red liquid is alcohol containing a red dye.

IS IT TRUE THAT THE HARDENING OF COPPER HAS BEEN "RE-DISCOVERED"?



COPPER KNIFE

7

Hardened copper is considered by metallurgists to be nothing but copper alloys. Aluminum bronze would be a more appropriate name.

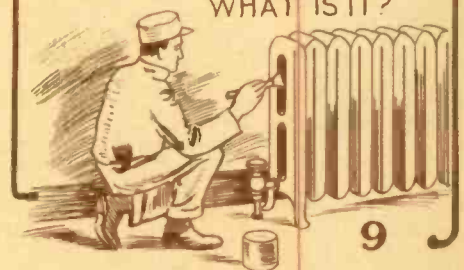
WHAT MAKES SOME SOAPS FLOAT?



8

Because of the fact that there are minute air bubbles in the soap, not because of any secret ingredient.

OF COURSE THE RADIATOR GILDING IS NOT GOLD, BUT WHAT IS IT?



9

The gold color is imparted by powdered brass or bronze. This can be proven by a flame test, which will show green.

IS CARBON MONOXIDE RESPONSIBLE FOR GAS ASPHYXIATIONS?



10

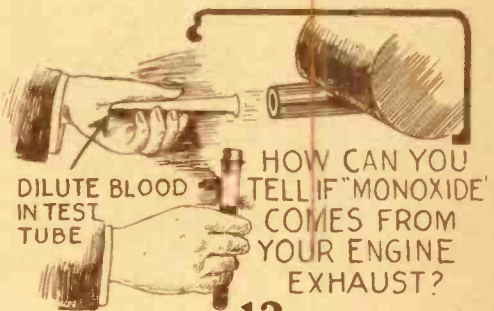
Only partly. Ethylene or "looney gas" plays a part. This gas gives illuminating gas its yellow color effect.

HOW ARE THE IRIDESCENT COLORS PRODUCED ON GLASSWARE?



11

By allowing the vapors of metal chlorides to play about the glass while it is heated.



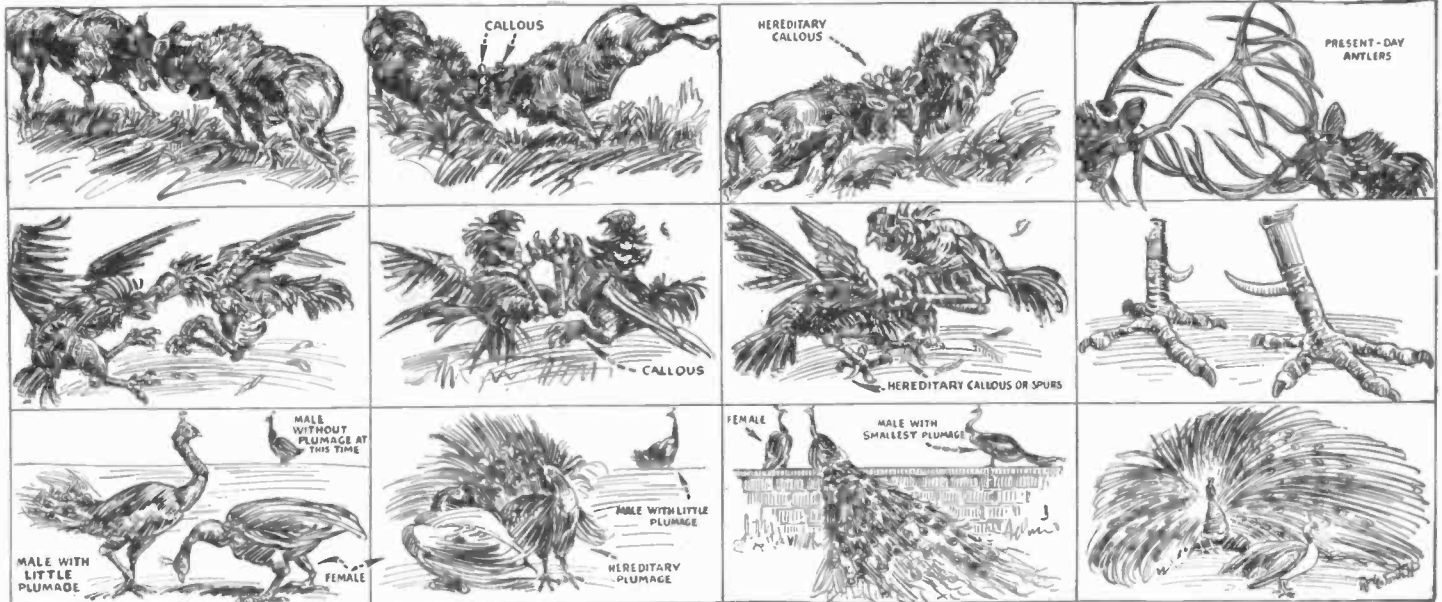
DILUTE BLOOD IN TEST TUBE

HOW CAN YOU TELL IF "MONOXIDE" COMES FROM YOUR ENGINE EXHAUST?

12

Diluted blood will turn pink when exposed to exhaust gas, if carbon monoxide is present.

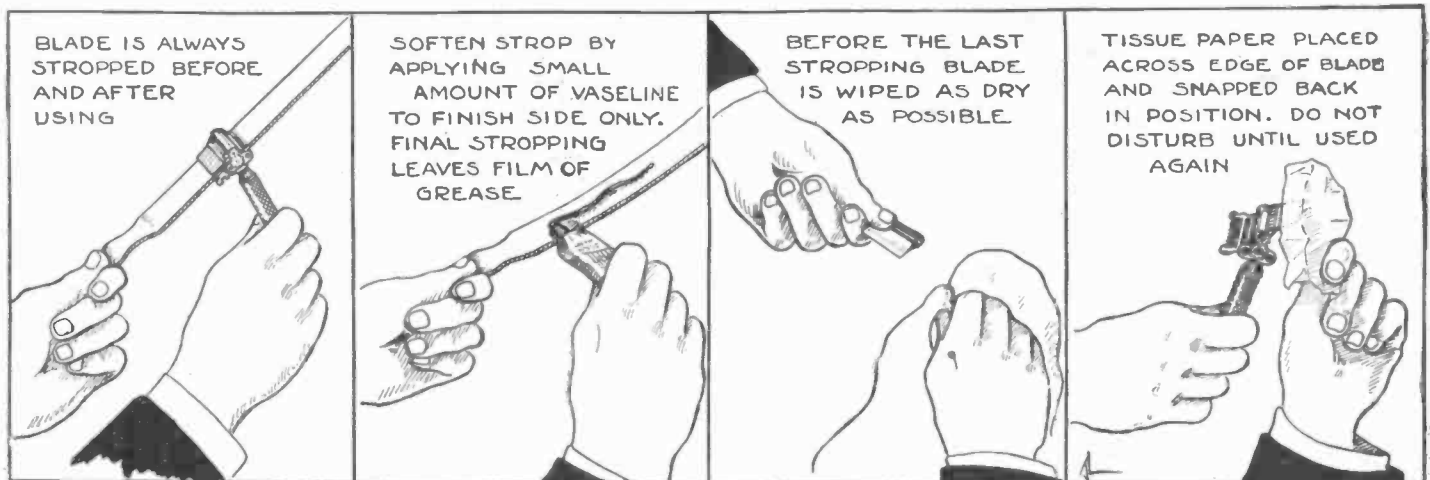
Glands Assist Evolution



That the endocrinal system which governs the growth of mammalian bodies will automatically adjust itself and the body to any set of circumstances over a number of generations, is clearly illustrated according to Dr. T. J. Cunningham in the case of the deer's antlers, the cock's spurs and the peacock's plumage.

In the case of the cock and deer, the bruises at the skull and feet cause certain impurities to be fed back into the blood, which cause the glands to construct a natural projection. In the case of the plumage of the peacock, it is a matter of natural selection.

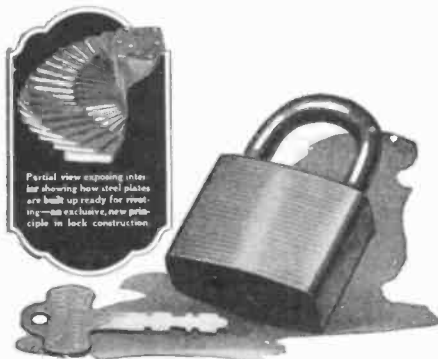
Safety Razor Blade Gives 400 Shaves



A year's shaves from one safety razor blade may be obtained if the blade is stropped both before and after shaving, and the blade kept covered with a

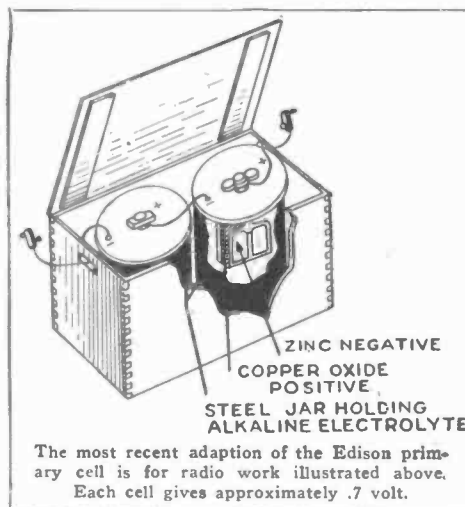
piece of tissue paper while not in use. The sketches above show clearly the necessary steps in the technique.—O. H. Knoon.

Strongest Lock



The strength of laminated construction is used to advantage in this latest design of padlock shown above. The body is constructed of laminated cold rolled steel sections and will withstand much more pressure before releasing than the ordinary type of padlock. Only one key works it.

Radio Battery



The most recent adaption of the Edison primary cell is for radio work illustrated above. Each cell gives approximately .7 volt.

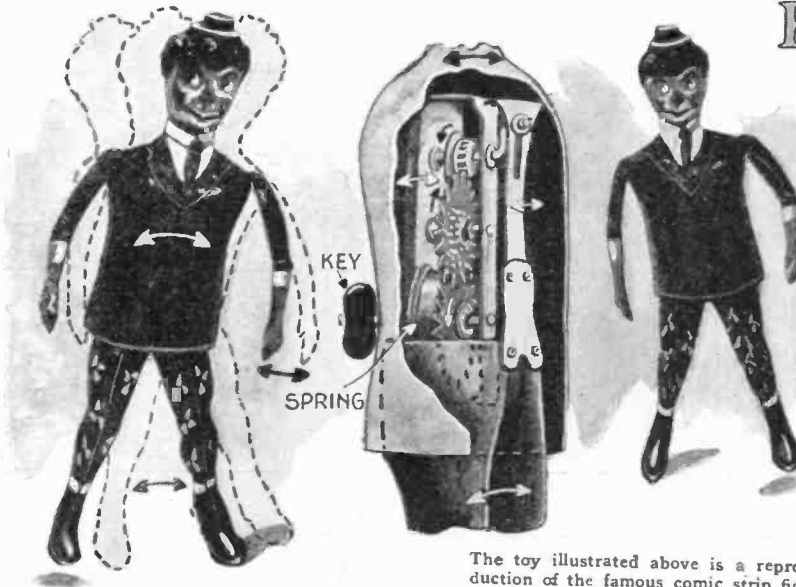
For Drafting



The instrument shown above, a combination tee square and protractor, will be found exceptionally useful to the draftsman.

Remarkable New

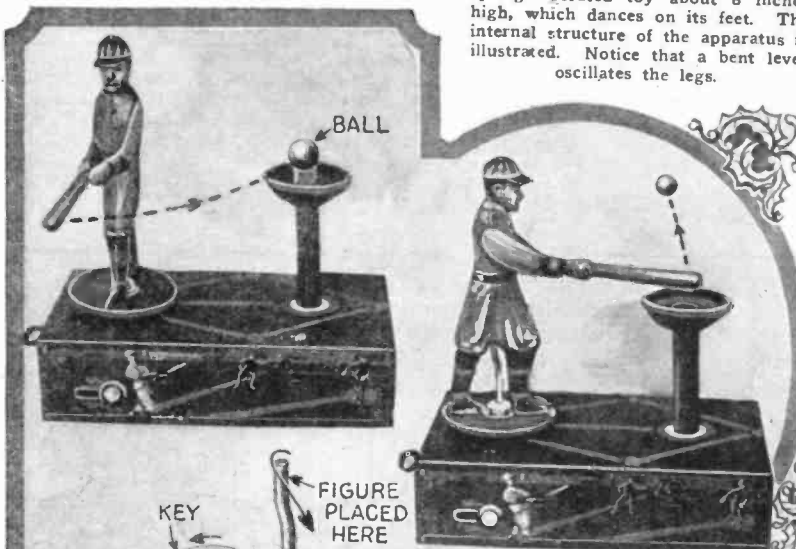
By JOSEPH H. KRAUS



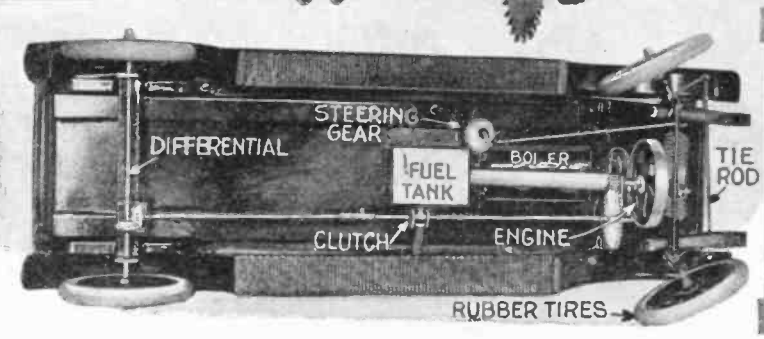
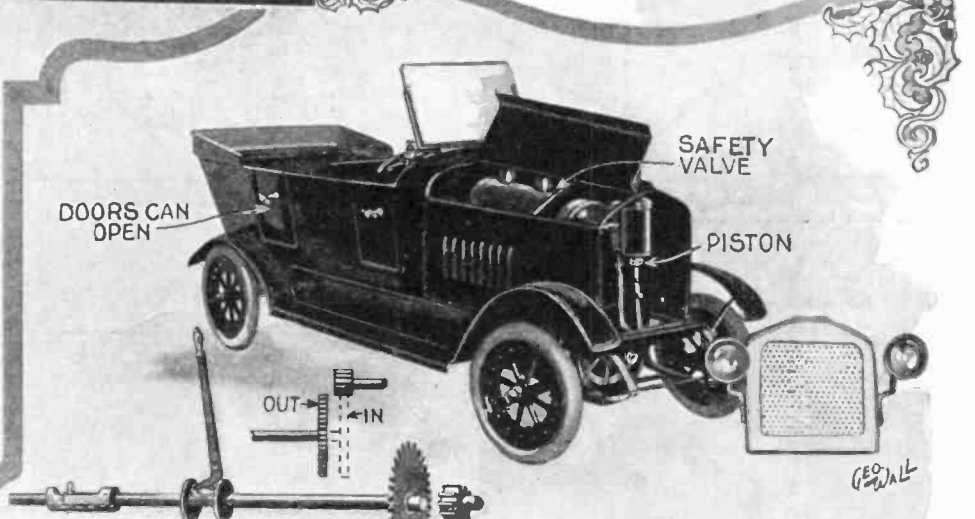
The toy illustrated above is a reproduction of the famous comic strip figure "Boob McNutt." It is a small spring operated toy about 8 inches high, which dances on its feet. The internal structure of the apparatus is illustrated. Notice that a bent lever oscillates the legs.



The face with the sparkling eyes is illustrated herewith. Like the other toys on this page, it is made of metal and beautifully colored. The eyes are of celluloid. The toy is operated by pulling the string, which rapidly revolves a pair of small metal wheels covered with emery. A small piece of pyrophoric metal bears on the emery wheel and produces a shower of sparks. The string is wound up automatically.



The toy above is a baseball player who realistically swings at a small wooden pellet and sends it out to quite a distance. The stand contains a number of balls and an automatically controlled ball raiser carries the balls upwardly in position to be struck by the player. As may be seen from the drawing of the mechanism, the toy is well constructed considering its retail price. The mechanism is simple and does not soon get out of order.



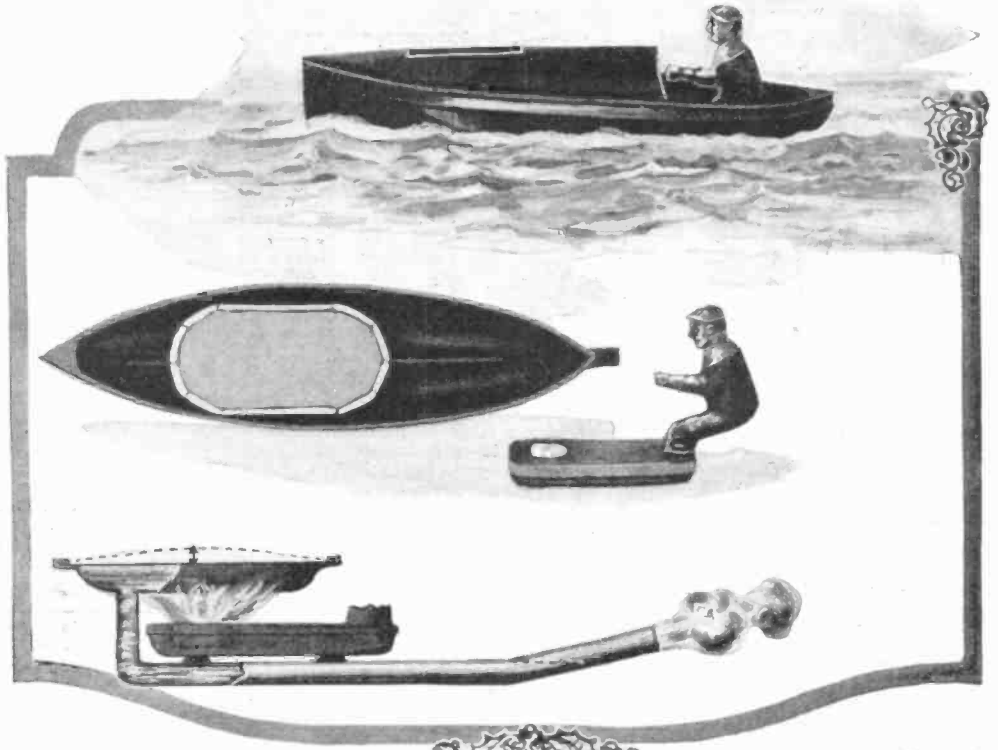
The photo above shows a toy steam-operated automobile with the radiator removed and the engine hood lifted to show the boiler. The automobile has a spare wheel and tire and is equipped with a clutch. It travels across the floor at a lively speed by its own motive power. Alcohol is used as fuel.

Mechanical Toys

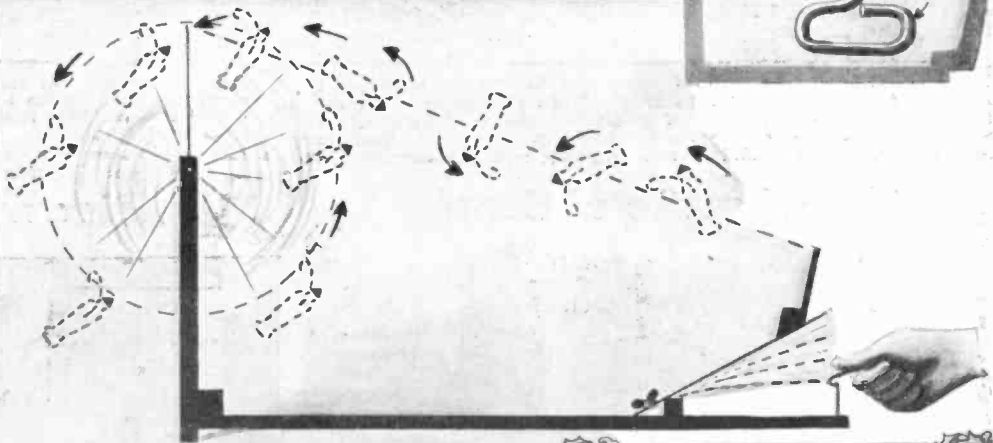
THE toys illustrated on this page are all well constructed and the majority of them very reasonably priced. We will be glad to send names of manufacturing concerns making the toys here illustrated as well as several other toys which we have tested but because of lack of space found it impossible to illustrate, to any who are interested. Simply send postal requesting this service.

The toy at the right is a mysterious power boat. It is operated by a small piece of solidified alcohol which is held in the base of the stand to which the figure is attached. This heats a small boiler-like compartment having thin metal diaphragm on top. Steam being produced in this boiler is driven out through a pipe beneath the water and its reaction upon the water propels the boat forward. Immediately cold water rushes in to take the place of the expelled steam. The boat then put-puts forward merrily and will continue to do so for hours without renewing the fuel supply. The sound it emits reminds one of a power boat.

The balking mule illustrated below is a very clever novelty simply constructed. The wheels of the toy are securely fastened to the axle, which is equipped with two gears. These gears mesh with a semi-circular gear which in turn is driven by a spring. The semi-circular gear causes the wheels of the cart to rotate first in one direction and then rapidly reverse and rotate in the opposite direction. The figure jumps up and down and the mule rocks back and forth. The device never repeats the same movement twice in succession. At times the mule will be lifted into the car and the cart will whirl around while in this position.



The toy illustrated herewith is made of wood and metal and differs in this respect from the other toys listed on these two pages which are made almost entirely of metal. At one end of a double trapeze a circus clown is found to be hanging. About two feet from the trapeze a spring board made of a piece of steel spring and a wooden seat is found. A second wooden figure is then mounted on the seat.



The seat of the spring board is pushed down until it engages in a small wire catch. When the catch is pressed down with the thumb, the seat is released and the figure is hurled upward into the air. Here it describes a complete turn and hooks itself on the top bar of the trapeze. The momentum imparted is transferred to the trapeze and both figures whirl around and around quite a few times before coming to a final rest. A thumb screw adjusts the tension of the spring board.

Stereoscopic Movies

HARD EDGE AT TOP BROKEN UP BY DRAPERIES, HUNG SEVERAL FEET IN FRONT OF SCREEN, THUS:

PLAN ADAPTED TO THEATRE WHERE IMAGES ARE PROJECTED FROM BEHIND SCREEN

SCREEN

DRAPERIES ARE ALSO HUNG DOWN EACH SIDE TO HELP BREAK THE UNNATURAL STRAIGHT LINE

BLACK VELVET CURTAINS

GAUZE DRAPERIES HUNG IN FRONT OF TOP AND SIDES

THE VIGNETTE OF SIDES IS FURTHER ACCOMPLISHED BY BEVELING THE END OF SCREEN OUTWARD TOWARD AUDIENCE AND TINTING THE BEVEL IRREGULARLY SO THAT IT MERGES INTO THE BLACK SIDE CURTAINS; THUS

WHITE SCREEN

4 FT.

AUDIENCE

ORNAMENTAL SHRUBS TO BREAK BOTTOM LINE

STAGE

GAUZE DRAPERIES HELPING TO BREAK TOP AND SIDE EDGES

SHADOW BOX DARKENED ON INSIDE

GROUND GLASS SCREEN

OPAQUE GLASS, IRREGULAR IN CONTOUR AND VARIED IN DENSITY

PROJECTOR

LOWER EDGE OF SCREEN BROKEN UP WITH SHRUBS

AUDIENCE

Giving moving pictures the illusion of solidity has been the dream of many an inventor, but unfortunately most of the pictures of this nature heretofore projected upon the screen entailed the necessity of additional expenditures for re-design in projection apparatus and further expenditures for some kind of viewing screen. In the system here illustrated, the same effect is psychologically produced by O. A. Owen. By taking away any vestige of a straight edge and draping sides top and bottom of the screen with irregular drapings, the result is more than surprising.

© 1924 BY SCIENCE AND INVENTION

Some Unsolved Riddles of Science

SOURCES

DIAGRAM OF A RIVER SYSTEM

GOLD WILL BE FOUND IN THE FORKS MARKED "X"

WEST **EAST**

NARROW VALLEY

GOLD HERE **NO GOLD HERE**

OCEAN **CLOUDS**

WEST **EAST**

NO GOLD HERE **GOLD HERE**

MOUNTAIN

OCEAN **CLOUDS**

OVERBURDENED CLOUDS

MASS OF FRESH WATER

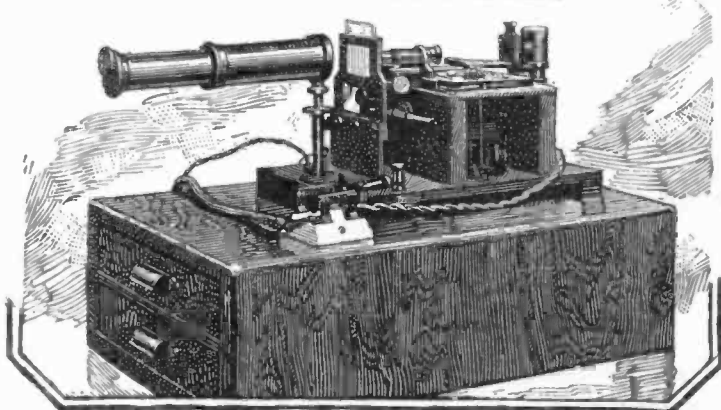
OCEAN

When gold is found near the head waters of a river system, it is almost invariably found in the right hand branch, if the observer stands at the source and looks down stream. Gold miners know that the spots where the sun shines before noon are always richest in this precious metal. This has been found true and verified in such a widely separated countries, as

England, America and Australia. Why? Water spouts are formed by centrifugal force. When a water spout occurs on the ocean, salt water is carried upward. Why is there a deluge of fresh water at the moment the spout breaks?

—O. Ivan Lee, B.Sc., F.M.S.A.

The Artificial Star

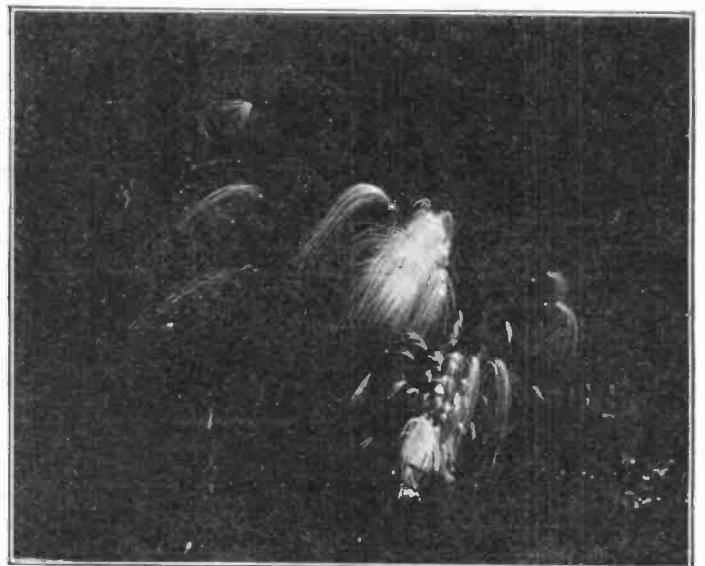


The instrument above is designed for eliminating the human equation of error in recording the passage of stars. In this machine an artificial star crosses a line, and the length of time required by the astronomer in reacting to the crossing is definitely determined. —Courtesy Elgin Watch Co.

Right: In photographing fireworks it is best to use red-sensitive plates. These must be developed in total darkness. Use a large aperture and open the shutter for the length of time desired to get complete picture.

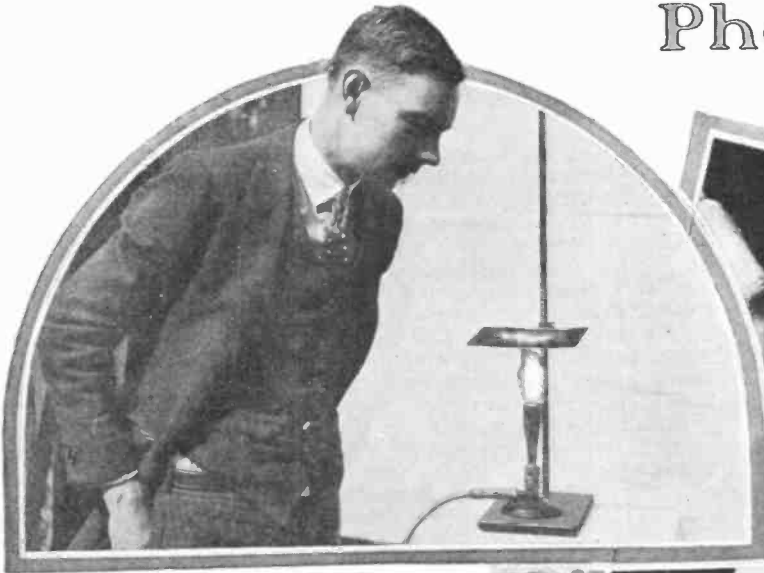
—J. M. Howard.

Fireworks Photo



Phosphorescence

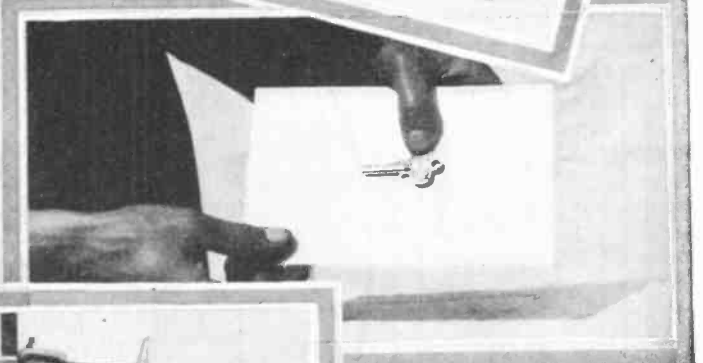
By RAYMOND B. WAILES.



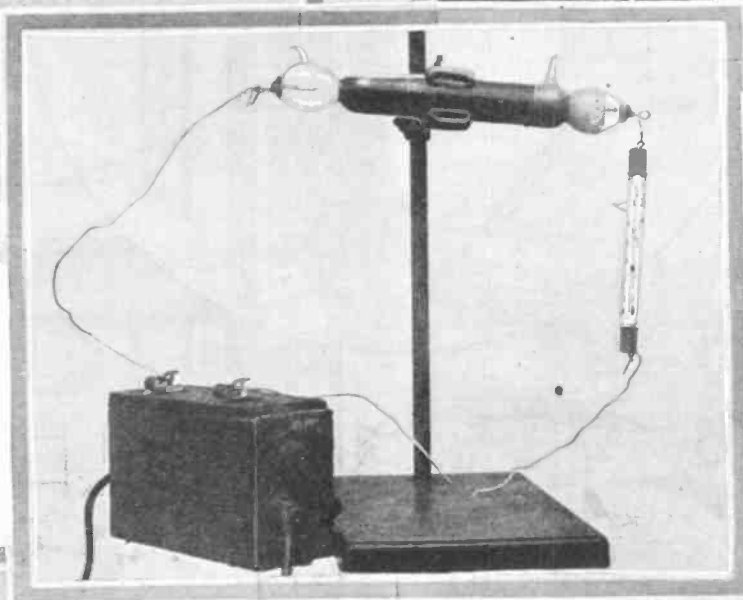
Little chips of fluor spar heated on an iron plate will shine like lightning bugs in a dark room. Paint a sun in a scene with luminous paint. In a dark room hold a lighted cigar or cigarette behind the sun. It will become luminous. Ice will make it disappear in the reverse way.



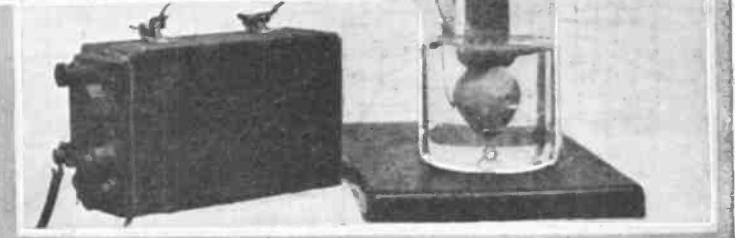
Hot water is lighter and floats upon cold water. A bit of paper coated with luminous paint will show this because the heat will cause the top part to glow. Below: A common medicine, salophen, will glow if rubbed between glass surfaces.



Coat a card with luminous paint and allow it to dry; then place an object upon it and expose the whole in sunlight. In the dark room the silhouette of the object will appear.



If one end of a Geissler tube is submerged in a solution of quinine to which a drop of storage battery acid has been added, it will glow with a beautiful blue. If a Geissler tube is spirally coated with luminous paint and operated in series with another tube, a fair imitation of a column of fire will be had.



Specialized Closets

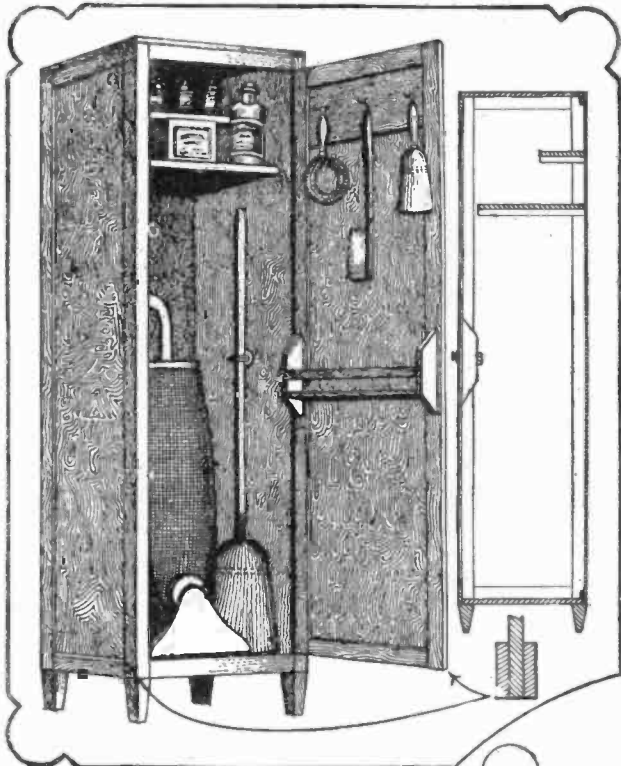
By W. M. BUTTERFIELD

THE first example shown is a closet large enough to hold the entire cleaning outfit of the household—vacuum cleaner, broom, mop, floorwax, furniture polish, etc. The closet has been designed for the kitchen, and is intended to occupy a space on one side of the kitchen cabinet, while another, of the same size and design, is planned for the other side to hold cooking utensils and for tinned food supplies. Panel board can be used in the construction of a closet of this kind for the back, the sides and the door.

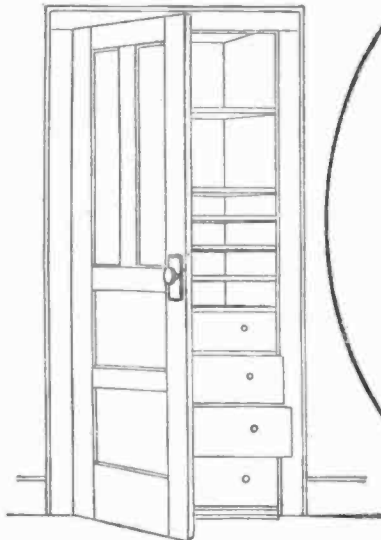
Another example shows a closet for the ironing boards as well as other implements used in ironing. One closet is for the kitchen sink outfit and is designed to occupy a space over the sink.

Every housewife wants a linen closet—many are willing to sacrifice one for clothes if they can only have one for linen. Answering this almost universal call of the housewife, we show a plan by which the sacrificed clothes closet can be converted into a bona-fide linen closet. In fact, this closet was designed for a storage place for linen, although it may have the outward appearance of the usual receptacle for clothes. A rather complicated design is shown in which dressing table and closets occupy one whole end of a bedroom. Specialization is shown here, also, for one closet is for outer garments, the other for under garments. There also are drawers for the usual dressing table supplies in the table and a box for shoes under the drawers. A neat bench is provided as part of this outfit. Mirrors are set in through sides above the table while an overhead electric fixture to supply illumination is installed.

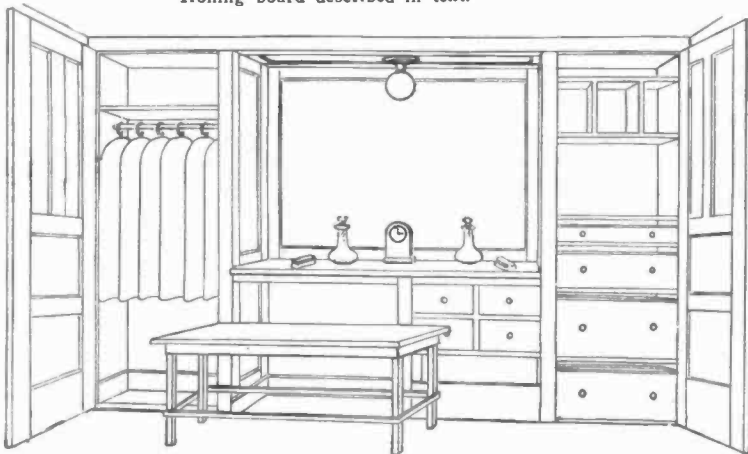
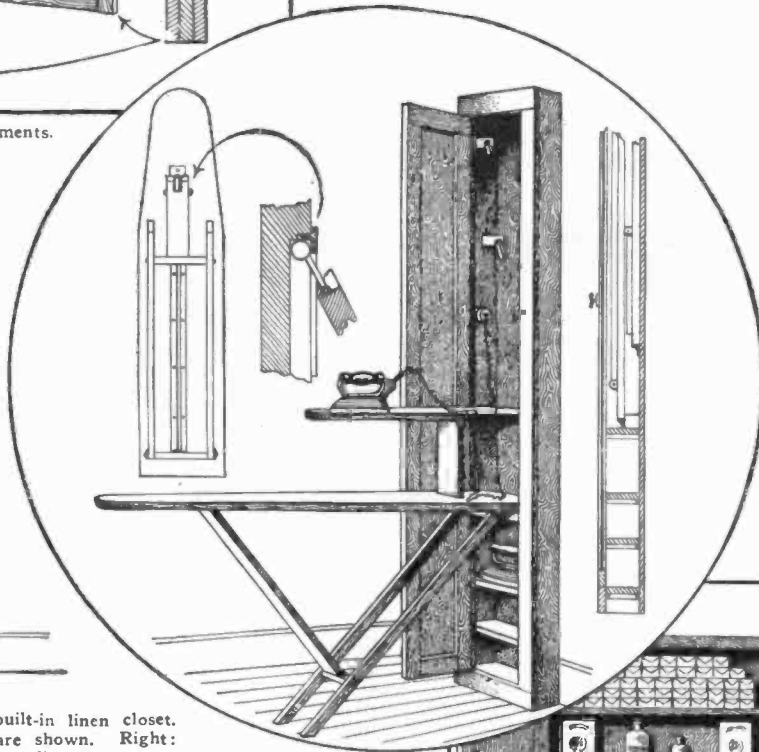
In constructing drawers or drawer-like trays, in closets, it is necessary to provide for space for drawpulls and for space at the door side to pull the drawer out past the door. We have shown a series of detailed sketches to illustrate the requirements and one method of procedure. In the ironing board details, we have shown the most practical device for supporting the board yet devised. It consists of two folding members, one hinged to the board, the other fastened to the board by means of a T-shaped metal piece sliding in a long metal-covered groove in the board. This works automatically.



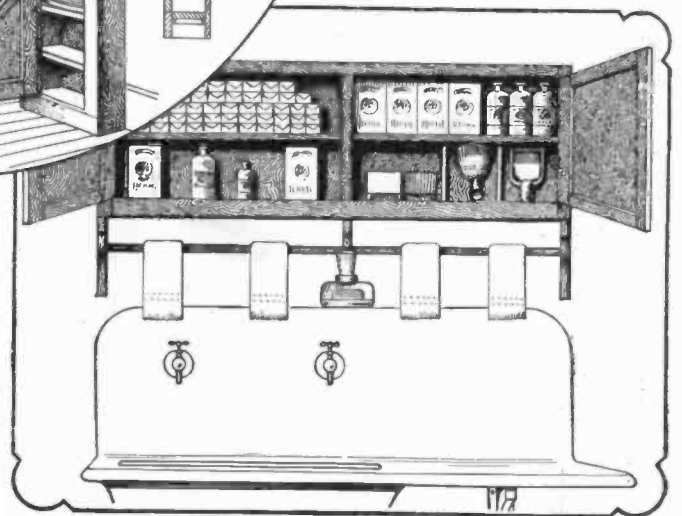
Above: Closet for cleaning implements.



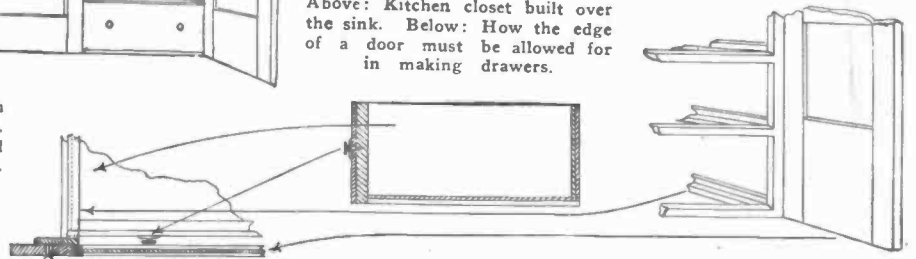
Above: View of a built-in linen closet. Drawers and shelves are shown. Right: Ironing board described in text.



The illustration above shows two built-in closets with a dressing table and drawers placed between them. All should be constructed of the same kind of wood and stained to match. A bench completes the set.



Above: Kitchen closet built over the sink. Below: How the edge of a door must be allowed for in making drawers.



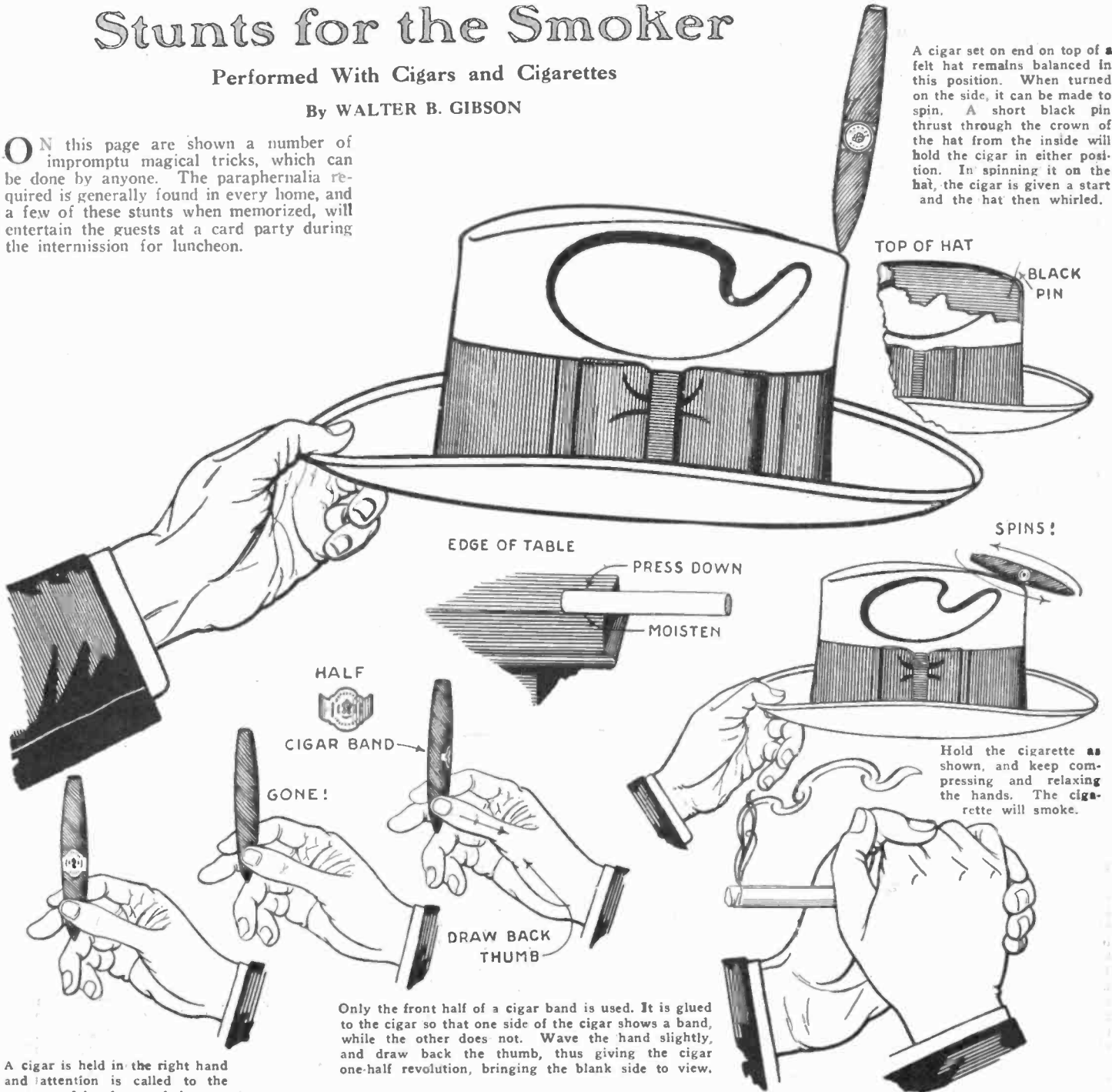
Stunts for the Smoker

Performed With Cigars and Cigarettes

By WALTER B. GIBSON

ON this page are shown a number of impromptu magical tricks, which can be done by anyone. The paraphernalia required is generally found in every home, and a few of these stunts when memorized, will entertain the guests at a card party during the intermission for luncheon.

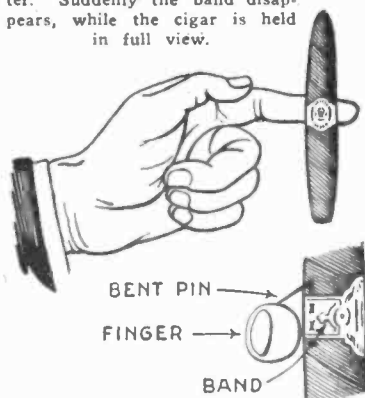
A cigar set on end on top of a felt hat remains balanced in this position. When turned on the side, it can be made to spin. A short black pin thrust through the crown of the hat from the inside will hold the cigar in either position. In spinning it on the hat, the cigar is given a start and the hat then whirled.



Hold the cigarette as shown, and keep compressing and relaxing the hands. The cigarette will smoke.

Only the front half of a cigar band is used. It is glued to the cigar so that one side of the cigar shows a band, while the other does not. Wave the hand slightly, and draw back the thumb, thus giving the cigar one-half revolution, bringing the blank side to view.

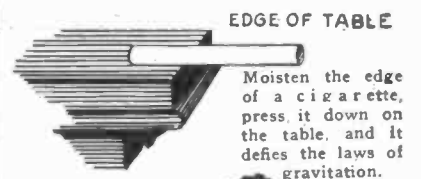
A cigar is held in the right hand and attention is called to the ornamental band around the center. Suddenly the band disappears, while the cigar is held in full view.



No magnetic power is required to make a full sized cigar adhere mysteriously to the tip of your forefinger. A bent pin pushed through the cigar band is responsible. The point of the pin rests on the tip of the finger. In passing the cigar for examination, the band is removed and thrown away, while the pin goes with it.



You need two cigarettes, one for yourself and one for a friend, but when you open your cigarette case you find it empty. Close the case. When reopening it slightly and reaching inside, you remove two cigarettes, much to the astonishment of your friend. These have been concealed under the clamps.

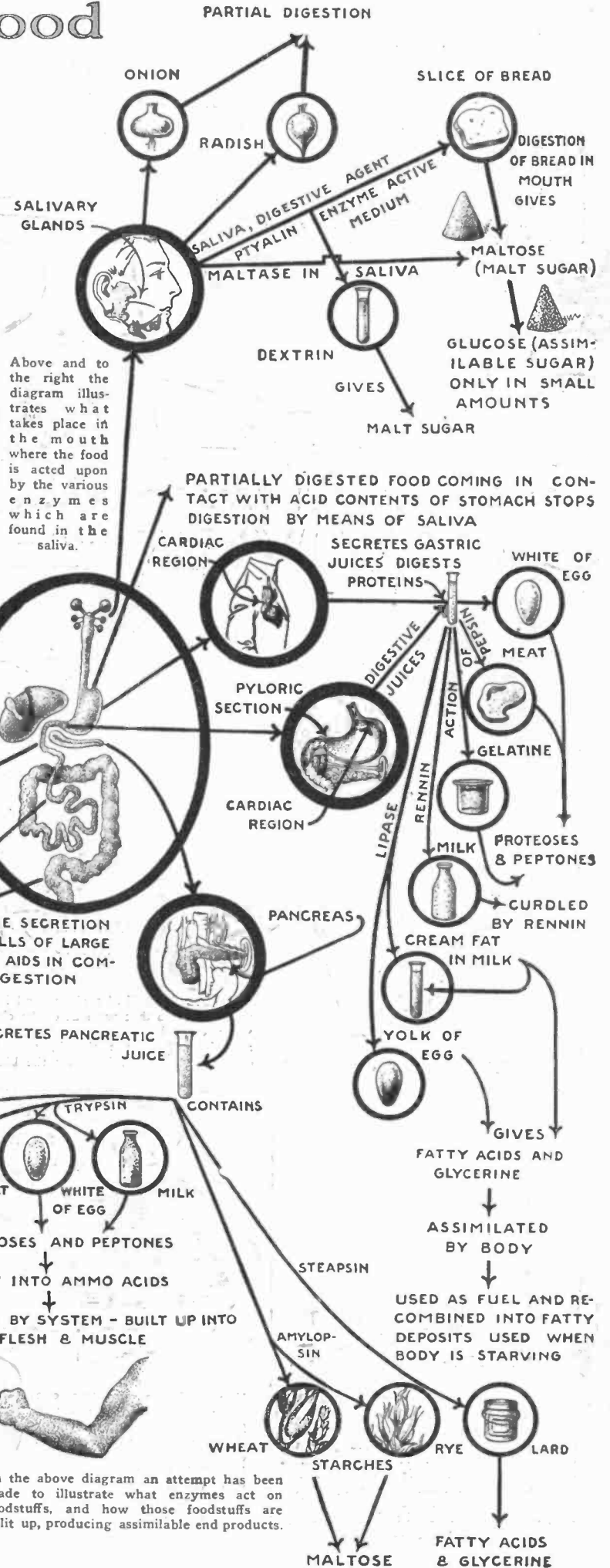


A cigarette is set on the edge of the table. A fountain pen previously rubbed on the coat is held beneath it and the cigarette topples from the table. Substitute a pencil for the pen, secretly blow upon the cigarette, and duplicate the effect.

How We Digest Food

By ISMAR GINSBERG,
B.Sc., Chem. Eng.

THE illustrations herewith show graphically what takes place during the process of digestion. Saliva contains an active digestive agent or enzyme called ptyalin which has the power to convert all starchy ingredients into maltose, a sugar. Maltase in saliva, another enzyme, acts on maltose, giving sugar. The food passing from the mouth to the cardiac or upper end of the stomach, encounters the secretion of two types of glands. The one type secretes pepsin, and the other hydrochloric acid. Here the action of ptyalin of the saliva is stopped due to the presence of the acid in the stomach, and the pepsin commences its action on the various foods indicated in the diagram and the other enzymes, lipase and rennin, act on the other ingredients of food, producing fatty acids and glycerine used by the body. Very little absorption of food takes place in the stomach. It has been definitely ascertained that most of the absorption of food occurs in the region of the small intestine. The action of the glands on foodstuffs is indicated in the diagram. The movement of the muscles in the stomach walls churns the food and eventually moves it out through the pylorus or that part of the stomach near its connection with the small intestine. The food in the form of liquid chyme is here acted on by the bile from the liver and gall bladder by the pancreatic juices or those juices which come from the gland known as the pancreas and by the intestinal juices. These juices are alkaline in nature, and they split up the proteins from meats, white of eggs, etc., into proteoses, peptones, polypeptides, and amino acids. The amino acids are in a form ready to be absorbed by the body. Other various enzymes taking part in the digestion are indicated.



Bile is a secretion of the liver. The secretion accumulates in the gall bladder during the time that digestion is not going on. Bile contains a weak ferment. Its uses in digestion are dependent on the peculiar action of the bile salts on the fermentative property of the pancreatic juice.

ENTEROKINASE

CONVERTS ENZYME IN PANCREATIC JUICE INTO ACTIVE TRYPSIN

The alkaline content of the intestine contains the enzymes trypsin, amylopsin, steapsin or lipase, and pancreatic rennin.

EREPSIN

CHEESE DIGESTED DIRECTLY

SUCRASE

SUGAR CHANGED INTO GLUCOSE

ABSORBED

USED AS FUEL IN MUSCULAR ACTION

COMPLETES DIGESTION OF MEATS AND OTHER PROTEINS

In the above diagram an attempt has been made to illustrate what enzymes act on foodstuffs, and how those foodstuffs are split up, producing assimilable end products.

Magic for Everybody

By PROF. JOSEPH DUNNINGER
NO. 23 OF A SERIES

The magician has an extra large billiard ball in his hand. He invisibly tosses this on to a stand. The construction of the stand demonstrates how the trick is performed. When the assistant releases the string the air bag inflates a small rubber balloon.

RED BALLOON
RUBBER TUBE IN STEM
AIR BAG
SPRING
STRING IN HAND OF ASSISTANT OFF STAGE
BALL PALMED
BALLOON INFLATED

Three cards are shown. They are placed face downward on the table. On turning them over the center card has changed to a blank. A corner of a card is cut off and glued to another so that it forms an envelope-like corner for the blank card.

SMALL PIECE PALMED
7
BLANK CARD
30
50
50

SPRING WHEELS
THIN THREAD
BALL FLOATS THRU SPACE!
ASSISTANT'S HAND
IN THE HANDS OF THE MAGICIAN

The magician holds a large magnet. His assistant walks off with a large ball and releases the ball in air, which floats toward the magnet. Actually the ball rolls along two thin threads.

WAND
HANDKERCHIEF
STRING TO FLOOR
IN HAND OF ASSISTANT OFF STAGE

The performer loads a handkerchief into a pistol. A wand is suspended in midair and the performer fires at the wand. The wand contains the handkerchief. An assistant pulls it into view.

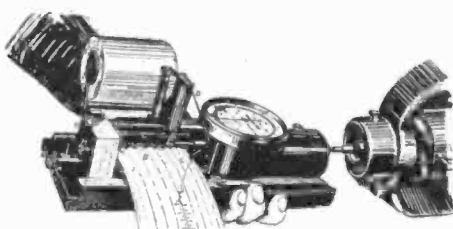
Soap Doll Actor



Here is a movie actor whose head is made of soap. In filming a recent fairy tale, the director came face to face with a very serious problem. He could find no actor of sufficiently grotesque face and form to act a certain part in the piece. As a result an ingenious art director hit upon the scheme of carving hobgoblin's head from a bar of soap, placing it on a small frame

as shown at the left, and dressing it up to imitate the character to be shown. The picture of the doll was filmed against a dark background. The other characters meeting the doll were also filmed against a black background. The two were made on separate negatives using only half the film. Both negatives are printed on same positive, giving a single picture.—L. J. Wilson.

Tachometer



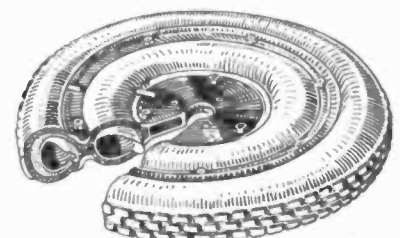
The tachometer shown in the above illustration records the speed of the machine being measured, showing variations in it.

For Walkers

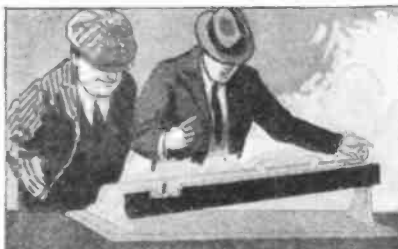


For night walking this device uses two electric bulbs in parabolic mirrors attached to eye glasses. (Author send address).

English Tire



The use of a dual air chamber in automobile tires allows a thicker tread and much easier riding.



The advertisement of the Tumble Bug reads: "Get the bug and get the jack. This is a two way store under control at all times." Pressure on a screw regulates the size of the slot, making it impossible for the bug to enter the lower end of the trough.



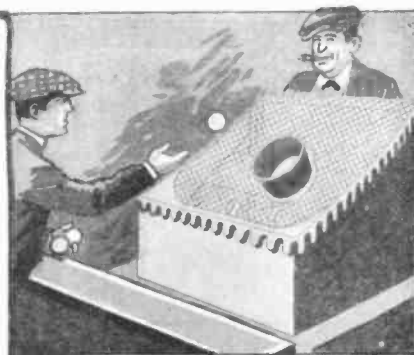
The advertisement of the Chinese Dice Box reads: "Shake the dice without removing the cover from the box and name the faces on the dice that are up." A dice box of this nature is well worth the price charged for it if you can induce anyone to bet with you. You always win. The dice can only turn over once for each shake of the box. In two shakes the faces on the bottom will be on top.

More Gambler's Tricks Exposed

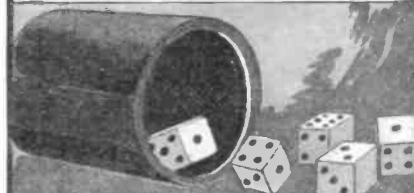
By MARK MELLEN

The Man Who Fooled P. T. Barnum

ON this page we show a number of mechanical devices and contraptions that are often used to fleece the would-be "wise guy." There are quite a few concerns manufacturing the devices shown here. For those in the "know," blueprints are supplied demonstrating how the devices work. The story about the Goddess of Chance which gives each and every player an equal opportunity of winning a large prize is pure bunk. One might just as well place the head and shoulders of a beautiful woman on a stand as illustrated below, and put the sack of easy money in her hand. Then as the crowds try to embrace her the crooks do their work by removing the gold from the pockets of the swelling crowd. Of course, the gambling devices illustrated are more legitimate. They are painless methods of extracting cash from the pockets. The gambler is not a philanthropist. No doubt he lets you win two or three or four times in succession, or he may even let you win for one or two days until you have imbibed the spirit of the thing, and then one day "luck" runs against you, and you lose a little more than you won. You try to recover the loss and continue to lose more. Then you become convinced that the Goddess of Chance never smiled at you and are about to forget the game forever when you make a "killing," and regularly thereafter you win once and lose a dozen or more times, so unless you know more about it than the other fellow, keep out of the game.



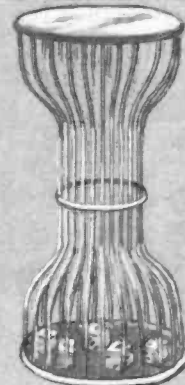
Pop in the bucket shown above is a direct descendant of the old Huckleby Buck family. It looks easy to win—and it is, when the operator wants you to win. The ad states that "the outfit can be regulated and demonstrated by the operator at all times." By tilting the bucket a little less, the operator can cause you to win or lose.



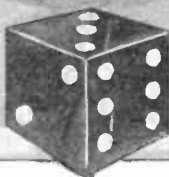
The trip dice box "trips" the dice as they are rolled out and causes them to turn over, thereby frustrating the efforts of anyone who may try to slide them out instead of rolling them. Suckers think the game must be on the level. They don't realize that the dice may be controlled after they leave the box.



If there is any doubt in your mind as to whether or not it is practical to control dice by means of an electric current, we advise that you look at the illustration below. The advertisement reads: "The electro-magnetic coil is placed in a wooden case 9 inches square, 2 inches deep, and is fitted with an extension cord and connecting plug which will fit any ordinary light socket. The magnet is controlled by an extra heavy switch and will pull through one inch of wood controlling a space 6 inches square."

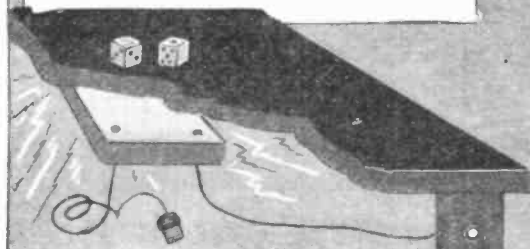


The hand cage illustrated above is generally used in playing hyronemous or hazard. It is seemingly impossible to manipulate the dice inasmuch as they are kept in the cage.



The platinum filled transparent dice illustrated above is used where suckers cannot be steered into an establishment containing a magnetically controlled dice table upon which the player has no chance. The dice here illustrated is loaded with platinum. Being so loaded the cheater brings his suckers to any place at all, and if they are willing to bet against him, he removes their surplus capital.

An electric control for the hand cage may be purchased for a mere addition of \$50.00. The dice in the cage are loaded with steel shavings and as usual the sucker has no chance. The rubber dice mat illustrated below is used to cheat the cops rather than the players. Elimination of noise prevents officers of the law making an arrest—or a collection.



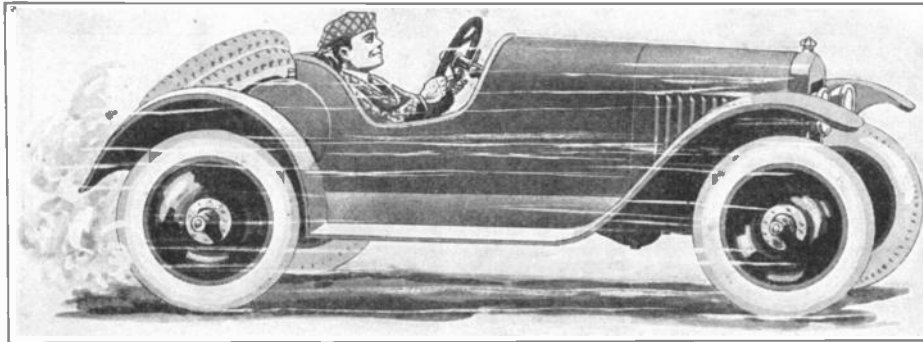


THE CONSTRUCTOR



Building a Motor Speedster

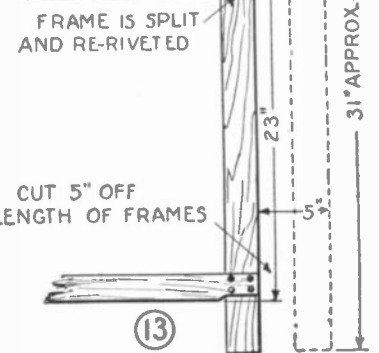
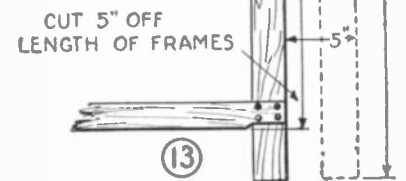
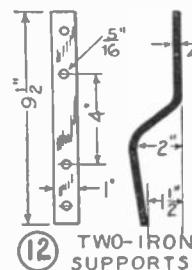
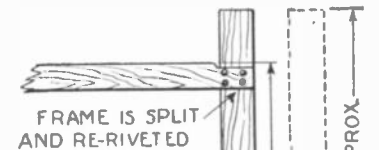
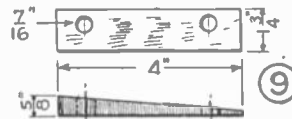
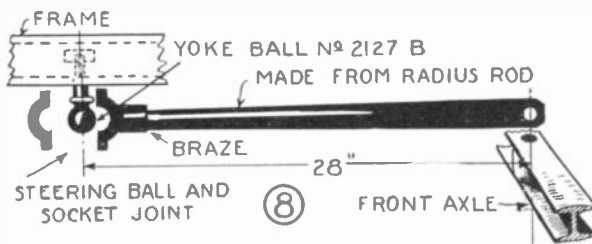
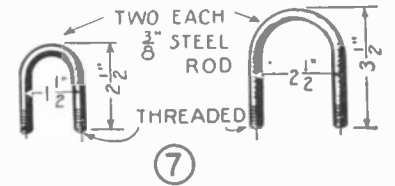
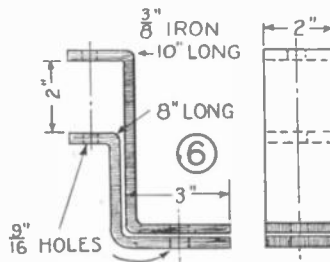
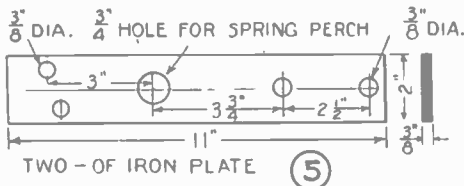
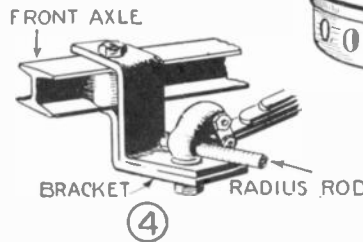
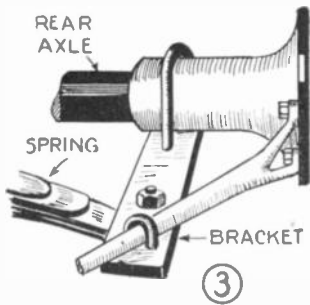
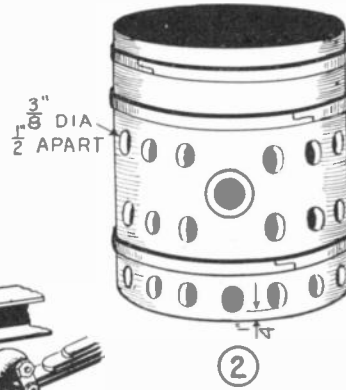
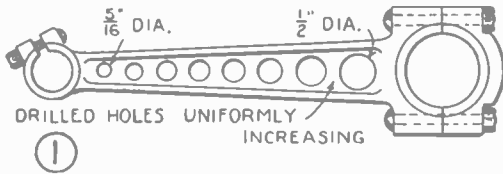
Specially Prepared by
GEORGE ARTHUR LUERS



WHO, with any sporting blood in their veins, can resist the lure of a snappy, low hung sport car? Probably every one of us has at some time or other had a burning desire to own and operate a car of this type. The cost of such an outfit, ready built, has deterred most of us from the realization of this dream. However, we are showing on this and the opposite page just how a fast auto speedster can be made from a Ford chassis and a few parts that an ordinary mechanic can make. A few inquiries in the proper direction will soon make evident the fact that a second-hand Ford chassis can be purchased very cheaply, sometimes as low as \$15.00.

The first operation is to place the engine and chassis in good mechanical condition. Clean it thoroughly and when finished, give it a coat of black enamel in order to preserve it. Before starting work on the body, the engine must be changed. The main idea is to reduce the weight of the reciprocating parts, namely, the piston and connecting rod. This can be done as shown in Figs. 1 and 2 herewith. It is advisable also to use two gaskets under the lower crank case cover, which increases the oil supply in the troughs.

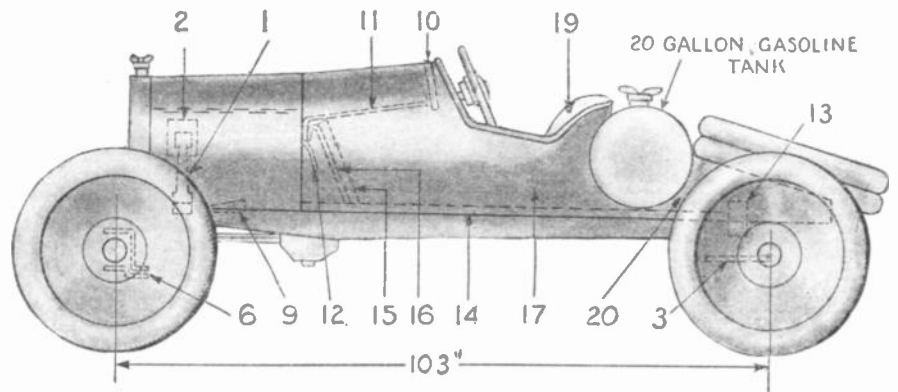
The next work is to undersling the chassis. Strap iron bent and drilled as shown is the only necessary material. The details for the front and rear axles are shown in Figs. 3 and 4, and the various parts in Figs. 5, 6 and 7. A brace which will make the front axle more rigid is shown in Fig. 8. In order to undersling the chassis, it is necessary to cut five inches off the frame, as shown in Fig. 13. The steering gear must be lowered. Use is made of a wedge, Fig. 9, and extension straps to the steering post flange, Fig. 12. An oak dashboard is to be made, Fig. 10, and placed in position with braces, Fig. 11.



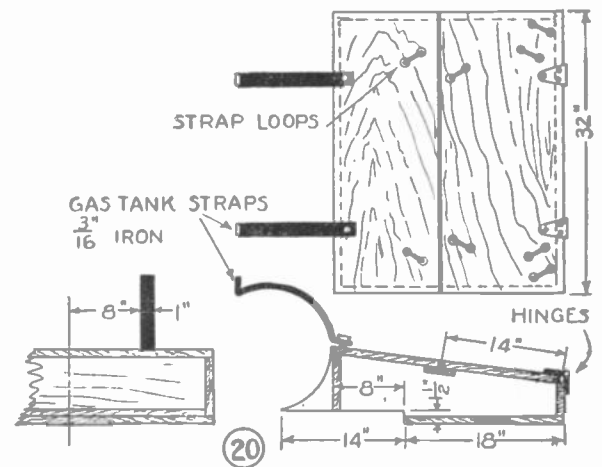
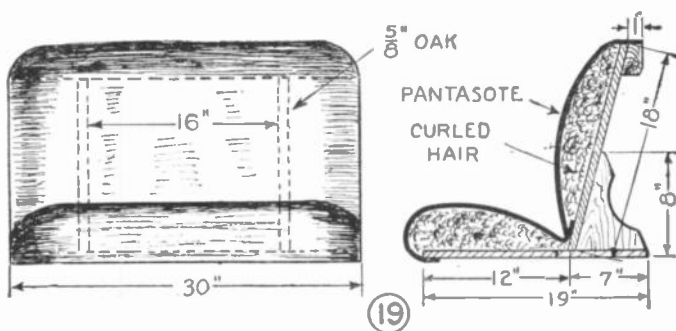
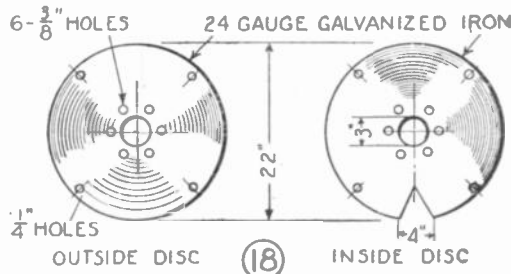
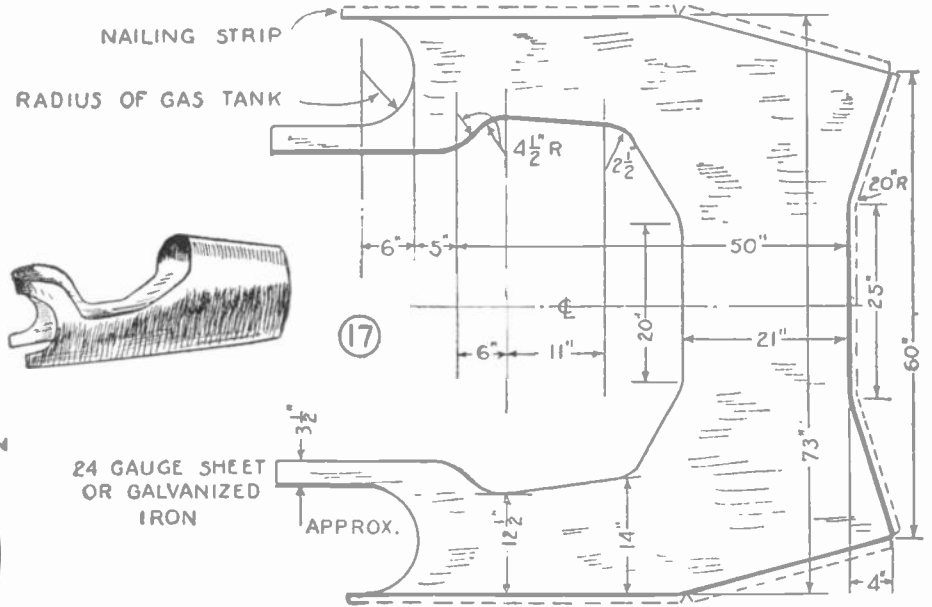
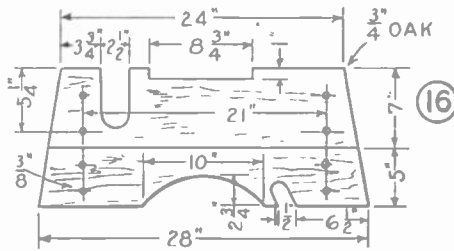
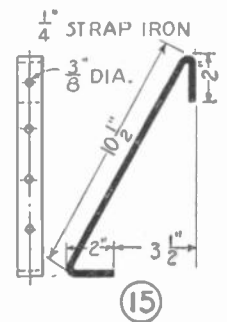
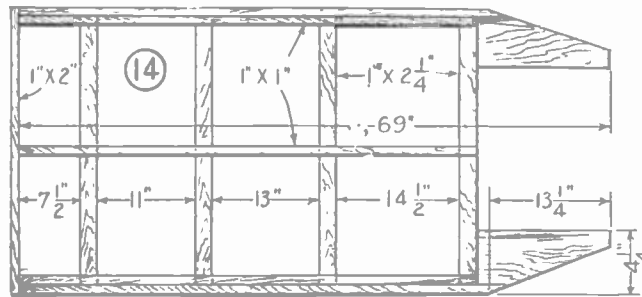
AFTER the engine and chassis changes, illustrated on the opposite page are completed, the body must next be built. All the details are given herewith. First, a frame is made up, Fig. 14, using screws for fastening together. Foot boards are shown in Fig. 16, which are to be fastened with braces made of strap iron as shown in Fig. 15. The body and the cowl are the next consideration. A pattern is given in Fig. 17, which should be reproduced in full size on a large sheet of paper. This pattern can then be placed over the metal to be used, and the latter carefully cut to the correct size. This casing is to be secured to the frame at the edges and to the dash by small large-head nails placed one inch apart. The metal may be cut in one piece as shown, or in several pieces, riveting together at the junctions. For appearance, it is desirable to bead the edge of the metal by turning it over a stiff wire. The details of the seat and upholstery are given in Fig. 19 and of the tool box and gasoline tank support in Fig. 20. Fig. 18 shows how disks for the wheel can be cut from galvanized iron.

One other point that is desirable to observe in order to get the greatest speed out of this car is the muffler. It should be removed and the inside shelves taken out. This procedure will reduce the back pressure and increase the power of the engine.

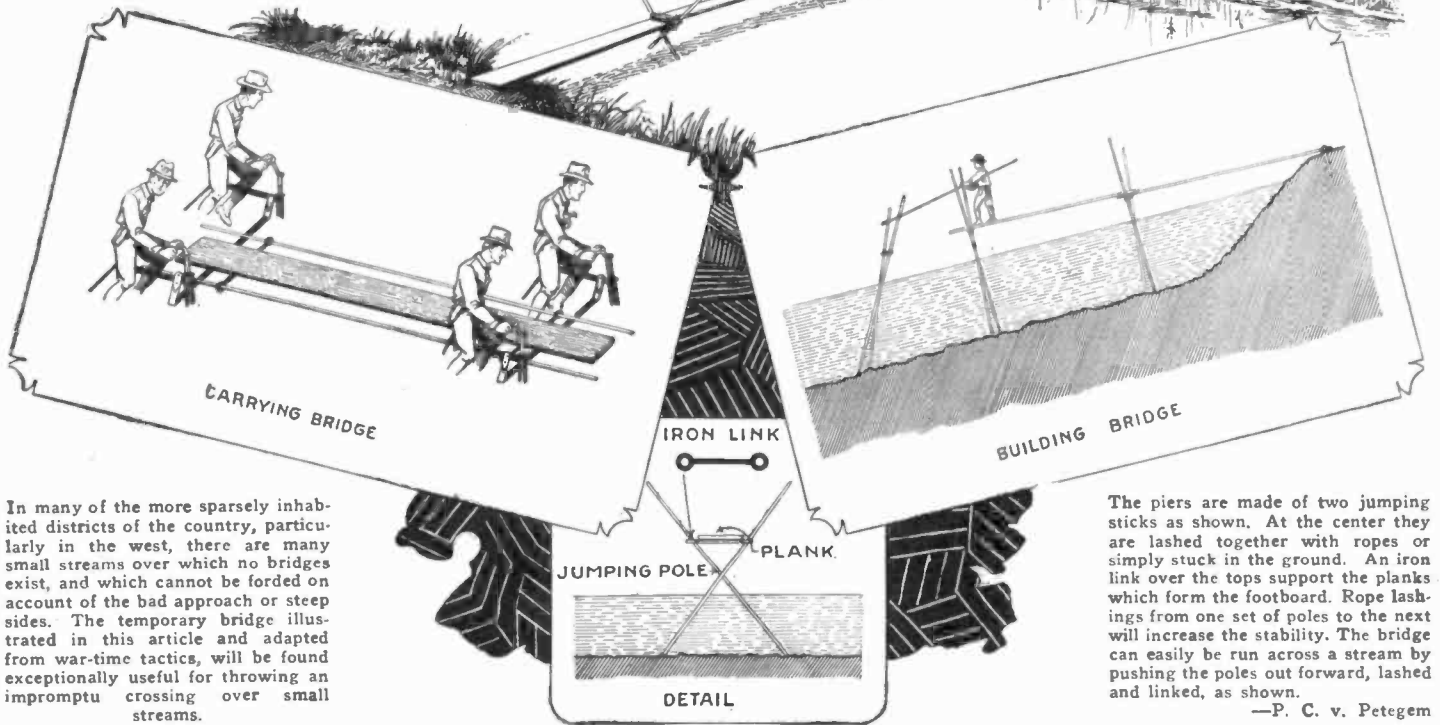
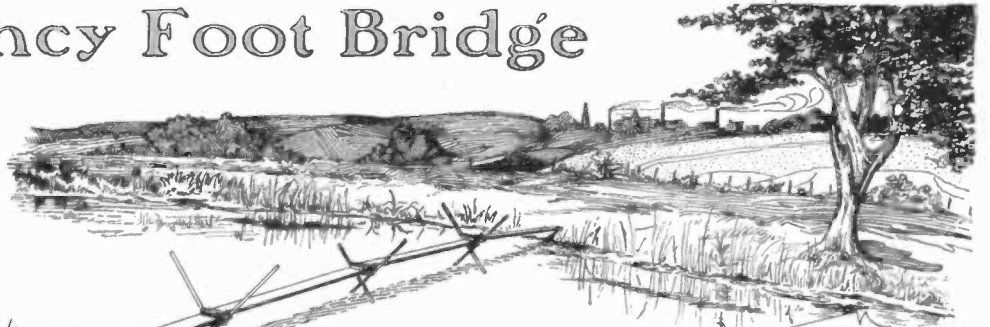
After the entire assembly is made, and a special twenty gallon, or the regular ten gallon tank, placed in position, the entire outfit should be carefully painted. First use a lead priming coat, sandpaper it and use one coat of color enamel. Rub this down with steel wool and apply a second coat, again rubbing this down with steel wool. One or two coats of varnish give an excellent finish. A white ivory body with black trimmings makes an excellent finish for this car.



The above illustration shows a complete assembly view of the motor speedster. All of the changes or new parts are numbered, the numbers corresponding with those given in the other illustrations. A sixteen valve engine head, sold on the market, will increase the power remarkably.



An Emergency Foot Bridge

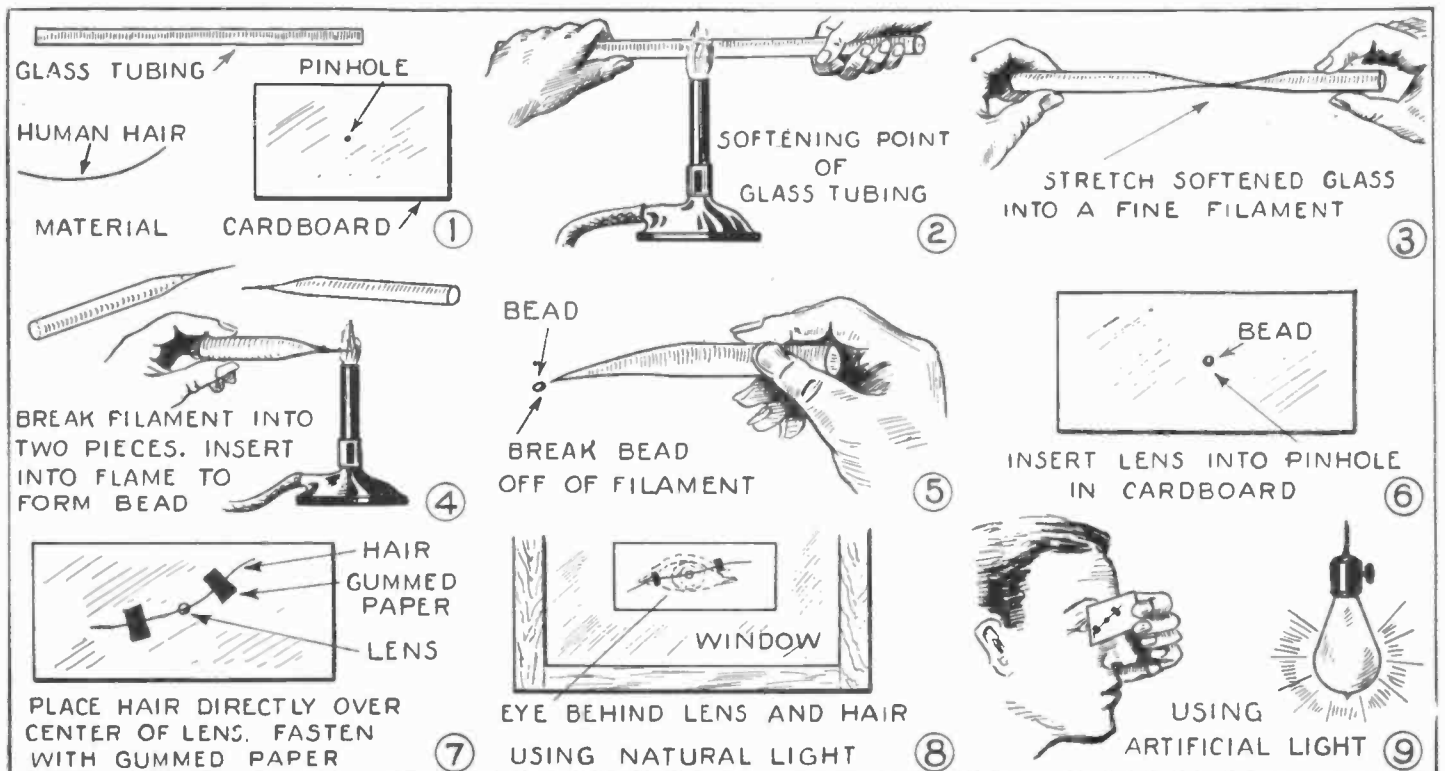


In many of the more sparsely inhabited districts of the country, particularly in the west, there are many small streams over which no bridges exist, and which cannot be forded on account of the bad approach or steep sides. The temporary bridge illustrated in this article and adapted from war-time tactics, will be found exceptionally useful for throwing an impromptu crossing over small streams.

The piers are made of two jumping sticks as shown. At the center they are lashed together with ropes or simply stuck in the ground. An iron link which forms the footboard. Rope lashings from one set of foot poles to the next will increase the stability. The bridge can easily be run across a stream by pushing the poles out forward, lashed and linked, as shown.

—P. C. v. Petegem

Small Microscope from Glass Beads



The lens for this miniature telescope is made by drawing out a glass rod over a flame. When the softened rod is stretched and broken in two, one of the fine ends is held in the flame again, so that a bead is formed. This bead is placed in a pin hole of the proper size in a sheet of cardboard. If a hair is placed across the top of the lens directly against it, as illustrated, the hair will

appear of about the diameter of a pencil. Several of the beads should be made, and the one being most free from bubbles, should be used. Selection is made by experiment. Since the lens has an extremely short focal length, it will be necessary to place the object directly on top of the lens and to hold the lens as close to the eye as possible.

—Edw. Kuwath, Jr.

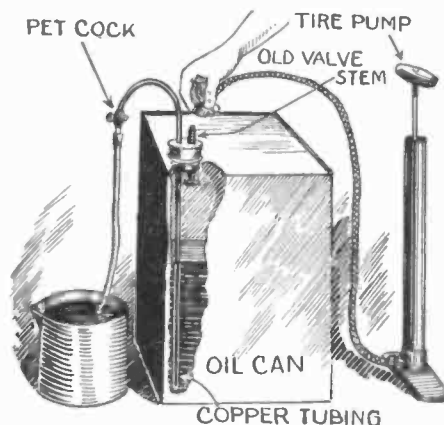


HOW-TO-MAKE-IT



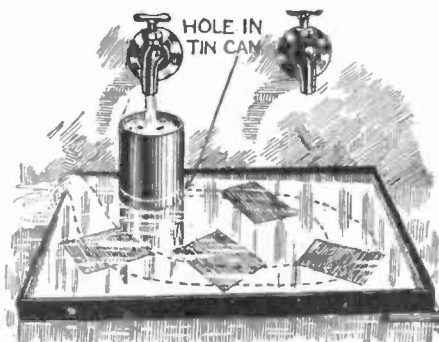
This department will award the following monthly prizes: First prize, \$15.00; second prize, \$10.00; third prize, \$5.00. The purpose of this department is to stimulate experimenters toward accomplishing new things with old apparatus or old material, and for the most useful, practical and original idea submitted to the Editors of this department a monthly series of prizes will be awarded. For the best idea submitted a prize of \$15.00 is awarded; for the second best idea a \$10.00 prize, and for the third best a prize of \$5.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings. Use only one side of sheet. Make sketches on separate sheets.

Liquid Dispenser FIRST PRIZE \$15



Liquids in large cans can be readily dispensed by using the system outlined above. Air pressure developed by the tire pump forces the liquid out. The flow may be stopped when desired by the pet cock. —L. J. Smith.

Print Washer SECOND PRIZE \$10



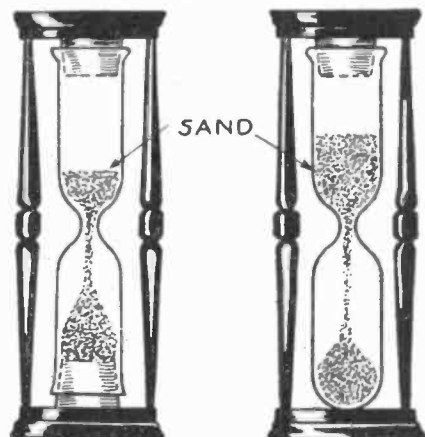
A very handy print washer for the amateur photographer can be made as shown above. A hole is punched near the bottom of the tin can which is then placed in the washing tray. Water is allowed to run into the can and to escape over one edge of the tray. The hole in the can creates a current of water that thoroughly washes the prints. —Author please send name.

Tire Tool THIRD PRIZE \$5



Rubber bands will repair bicycle tire punctures. Coat the bands with rubber cement, insert in hole, remove tool. Cut bands flush with tire when dry. —Milton White.

Time Glass



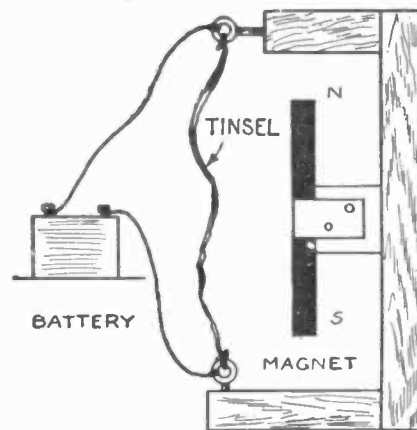
The time glass illustrated above will serve many purposes. It consists of either a glass tube or test tube, heated and drawn out as shown. The amount of sand is determined by experiment. —F. R. Newton.

Hammer Kink



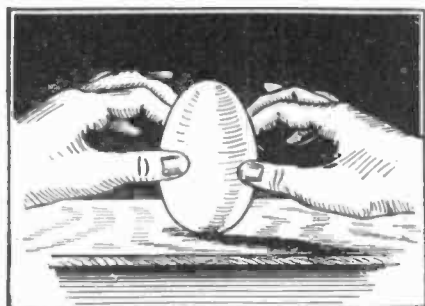
For driving nails in out of the way places, drill a hole in the hammer as shown above. The nail is held in position by a bit of beeswax. It can then be driven into the wood without the usual bruising of the fingers. When the nail is started, the hammer can readily be removed from it. —Florence E. Moore.

Magnetic Snake



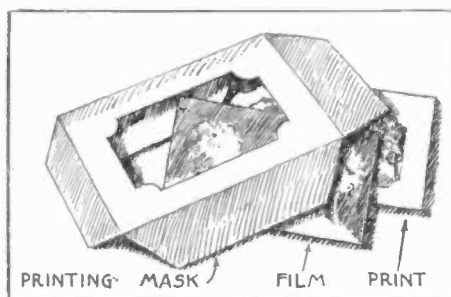
A piece of tinsel suspended as shown above will perform violent contortions when current is passed through it. Also try reversing the current. —S. Leonard Bastin.

Egg Trick



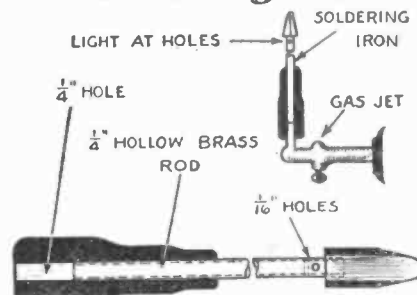
Hold an egg as shown above for a moment or two. The yolk will settle and with a little manipulation the egg will balance perfectly. —C. L. Walter.

Printing Mask

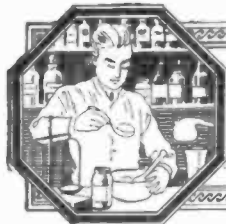


A satisfactory printing mask may be made from an envelope as shown above, cutting the face of the envelope to the desired shape. —A. P. D'Ambr.

Soldering Iron



A soldering iron made as shown above can be quickly and easily heated over a gas jet. The flame ascends through the brass rod. —George A. Coates.



WRINKLES

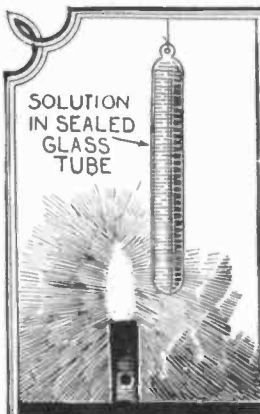
RECIPES & FORMULAS



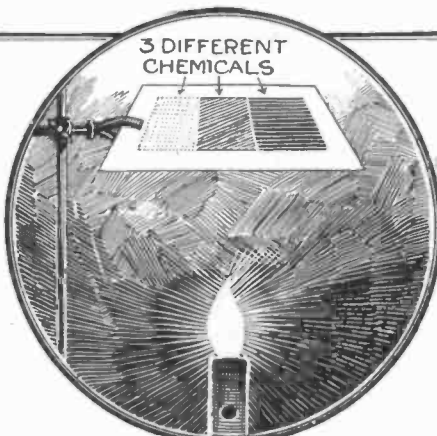
Edited by S. GERNSBACK

Novel Experiments with Heat

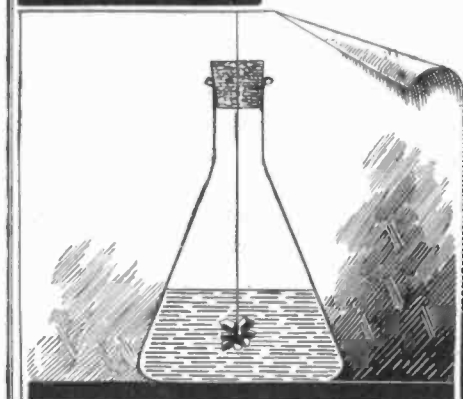
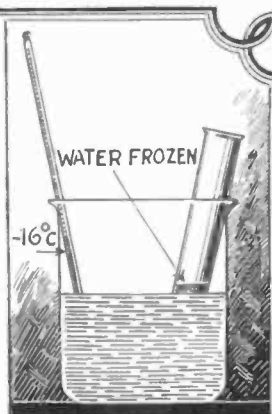
By EARLE R. CALEY, B. Sc.



A strong solution of cobalt chloride in alcohol when placed in a tightly stoppered bottle or a sealed tube, serves as a heat indicator. At ordinary temperatures the solution is pink, but upon being heated it passes through different shades of purple, until near the boiling point of water, it becomes blue.

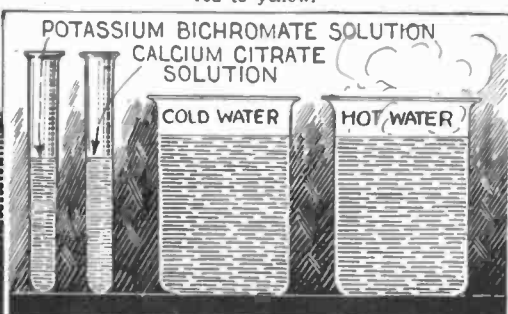


An interesting freezing experiment in freezing water may be performed by melting together six parts of tin, ten of lead, and eighteen of bismuth. Powder this alloy finely and pour it into a beaker containing eleven parts of mercury. The temperature of the mixture will drop to -16° Centigrade, and a thin walled test tube of water placed in the mixture will be frozen.



"Hypo" when melted in a flask which is then corked will remain liquid. However, if a wire holding a bit of hypo is introduced into the flask, beautiful crystals will form.

Cards coated with chemicals will change color when heated. Cobalt chloride changes from pink to blue, cobalt iodide from pink to green, mercuric iodide from red to yellow.



A cold saturated solution of calcium citrate will be precipitated by heat and potassium bichromate will be dissolved thereby. Put the substance in test tubes with beakers of water to give temperatures.



Place crystal of iodine in stoppered test tube. Heat produces intense violet colored vapor. Cooling reverses the phenomena, the color weakening.

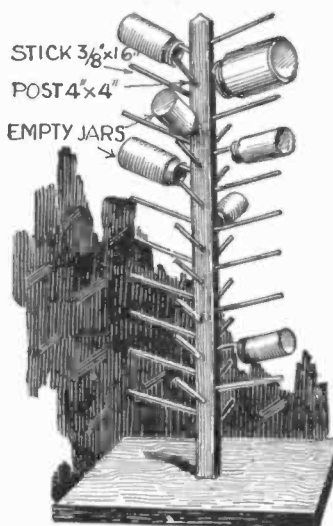
Paper Holder

CORNER OF OLD ENVELOPE



Corners clipped from used envelopes make splendid reinforcements for several sheets of paper clipped together as shown above. —S. Schlesinger.

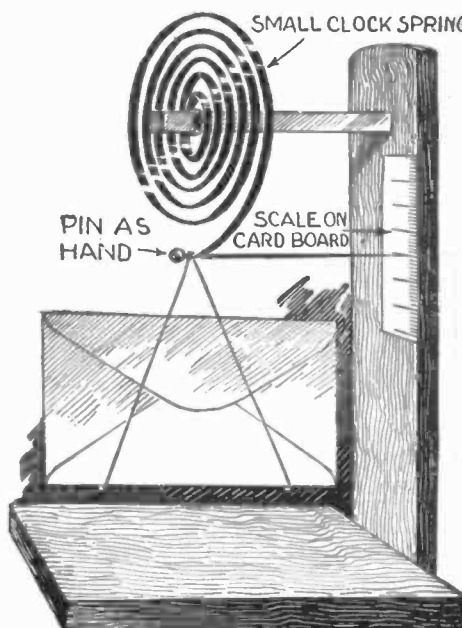
Jar Rack



A piece of lumber 4 x 4 in which dowels are placed as shown at the right makes an excellent rack for holding empty mason jars, so that they will be out of the way. —E. M. Quimby.

A small clock spring mounted as shown at the right when provided with a loop of wire for holding envelopes makes an excellent letter scale. (Author send name.)

Letter Scale



Readers Forum

THE INHABITANTS OF MARS

Editor, *Science and Invention*:

I am rather a "bug" on astronomy and that is the main reason I have many of your magazines saved up. I would like to know why scientists say that no people inhabit Mars. If the earth has inhabitants, why not Mars? Mars may be a dying planet but it still can have people on it. The gravity has nothing to do with it. The climate, most likely the people are built to endure. Dried out seas may be like very large canyons. When Mars was nearest us last, August 22nd, some scientists reported having heard queer sounds and had seen greenish-yellowish flashes. Other scientists scorned it. You must remember that the inhabitation idea is only a theory, not an actual proof. I believe an astronomer only knows what his telescope can show him. Is there any so powerful that it can detect people? Cameras only show blurs of Mars.

JESS WAY,
New York City.

(There is one group of scientists who believe in the inhabitation of Mars. This group was undoubtedly led by the famous, now dead, astronomers, Percival Lowell and G. B. Schiaparelli, and the other group does not believe in Mars' inhabitation. For the sake of balancing arguments, both in favor of Mars' inhabitation and against that view, we must first take into consideration the known facts concerning this much discussed planet. Mars is about one and one half times further from the sun than we on this earth are. Its orbit is very eccentric, and its distance from the sun varies as much as 26,000,000 miles. At its nearest approach to the sun, Mars is more than 128,000,000 miles from that luminary, and at its greatest distance 154,000,000 miles away. If we take the mean distance of Mars, we find that it would take light 12½ minutes to travel to the planet from the sun. This planet has a very light atmosphere, and consequently the heat which it obtains from the sun is not retained, and there must be extreme changes in temperature. Mars rotates on its axis in 24 hours, 27 minutes and 23 seconds. This makes a day on Mars approximately 40 minutes longer than our own day. Its axis is inclined to its orbit about 24 degrees and 50 minutes, which is a little more than the inclination of the earth's axis, which is 23 degrees and 27 minutes. Mars, therefore, has seasons which are very much like ours, but the seasons are slightly more marked and are nearly double the length of the terrestrial period, because it takes Mars nearly two of our years to make its journey once around the sun, which would be one year for Mars. Its seasons then are six months long, while ours are but three. As on the earth, there are torrid, temperate and frigid zones, and like the earth, it is furthest away from the sun; when there is summer in the northern hemisphere, the temperature on the planet is much warmer because of its proximity to the sun. The main surface of the planet is reddish yellow in color, and there are patches on it that are blue, grayish green or gray, or a combination thereof. Schiaparelli, the eminent Italian astronomer, pointed out that there were greenish streaks all directed to so-called seas. He called these streaks canals, which when properly translated means channels, but when it appeared in English publications, the translation was changed to canals. This immediately started the controversy over the inhabitation of Mars, because canals as we know them, are artificially produced, and if artificially produced, then intelligent beings must have built them. Another view entertained is that these so-called canals are vegetation canals.

The drawings of the canals were given in the December issue of *SCIENCE AND INVENTION* MAGAZINE, on page 771. Here twenty-two triangular canal terminals are shown, which were first observed at the Lowell Observatory at Flagstaff, Ariz., in the year 1894 and '95. On this map the light areas are continents and islands of white, red and yellow inorganic soil. The dark areas are dry sea beds and lake beds, and the vegetation canals are assumed to be rivulet valleys, all of which get their dark color from the residue, black organic soil of the planet, which shows more conspicuously when wetted seasonally with moisture from the polar caps. The dark triangular canal terminals shown at the seashore line, are now held to be dry organic black mud deltas, the last deltas made by once running rivers. That the last Martian sea wrote its history with deltas, drain swamps and valleys of dark soil is the assumption of Lowell and Schiaparelli. The same applies in the case of Lake Bonneville. The only difference is that the Martian drain swamps are dry, while those on Lake Bonneville are still in operation. It is probable that the only water which appears on Mars is that which is obtained from the polar caps. The few clouds which can be seen most of the time, may be due to water vapor, as the clouds we see ordinarily are, or they may even be dust clouds, but in either case, the planet would have to have air currents to move those clouds. Consequently one can reasonably assume that Mars has an atmosphere even though the atmosphere is scant. The famous polar caps are of uncertain origin. They appear in the winter season on the planet, and disappear in the

SCIENCE AND INVENTION desires to hear from its readers. It solicits comments of general scientific interest, and will appreciate opinions on science subjects. The arguments pro and con will be aired on this page. This magazine also relishes criticisms, and will present them in both palatable and unpalatable forms. So if you have anything to say, this is the place to say it in. Please limit your letters to 500 words and address your letters to Editor—The Readers Forum, c/o Science and Invention Magazine, 53 Park Place, New York City.

summer; so they are in some way dependent on the temperature in the polar regions. If they are hoar-frost or snow, they are condensations of water vapor, and when they disappear, there must be sufficient heat to melt them, but the normal temperature of an unprotected body at the distance of Mars from the sun is about 32 degrees below zero Fahrenheit, and since Mars cannot retain much heat because of its thin atmosphere, it could be assumed that the polar ice caps are not snow, but may be carbon dioxide deposits which condense into a white substance at a temperature of minus 109 degrees F. The mean temperature of the planet Mars is not assumed to be higher than 48 degrees F. This would make it difficult for vegetation to grow, unless that vegetation differs from vegetation as we know it on this planet.

The editors believe there are as many arguments in favor of the inhabitation of Mars as those against it. Scientists like to speculate and we see no reason why other planets should not be inhabited the same as ours. Should anything of a more definite nature be learned at any time, the readers of *SCIENCE AND INVENTION* MAGAZINE will be the first to get the information.

Summarizing, one may state that it is now believed that water and vegetation exist on Mars. Air is present, and perhaps some form of animal life exists there also, which if it progressed along the lines of evolution on this planet, must be considerably more intelligent than our own group of human beings.

The Experimenter

has come back! If you are one of the one hundred thousand readers of the old *ELECTRICAL EXPERIMENTER*, you will no doubt be glad to hear that the *EXPERIMENTER* is coming back **BIGGER AND BETTER THAN EVER**. *PRACTICAL ELECTRICS* has been changed into an entirely new kind of magazine entitled

The Experimenter

In this magazine which has been greatly enlarged in point of contents, illustrations and circulation, you will find the following new departments:

- Experimental Radio
- Experimental Chemistry

There is an entirely new treatment of radio containing experiments only. 90% of the magazine contains pure experiments written by the foremost authorities in their respective fields, also a monthly editorial by the writer.

A fine roto-gravure section is now added to brighten up the magazine. If you want experiments, this is your magazine.

Be sure to reserve a copy from your news-dealer before the issue is sold out. *THE EXPERIMENTER* will be on sale at all newsstands beginning January 20th, 1925.

Hugo Gernsback
Editor

As to seeing Martians through a telescope, this at present is impossible. An object to be seen on Mars must be at least 30 miles square.—Editor)

BOTH SCIENCE AND RELIGION

Editor, *Science and Invention*:

I have just read the letter by A. M. Riordan in the *Readers' Forum*, and would like to make a few comments.

In the first place Mr. Riordan does not understand evolution. That is obvious from the way he writes. Evolution does not conflict with the teachings of the Bible. God created man—but how? In one day, yes—but how long was that day? "A day is as a thousand years with the

Lord." Science says that life started with a single cell. If science is correct then that was God's way of creating. The Bible does not say how long each day of the six days required to create heaven and earth were. Why could not God have created everything in an instant? He chose the way we call evolution. That, man at one time looked more like an ape than like a man, is absolutely proven proof: The human skull used to be nearly flat across the top; man had a larger, flatter nose and a heavy set jaw, much like the ape of today. Man was covered with a coat of hair, and would be today if it were not for clothing. There are many other things that go to prove evolution. The kind of evolution that W. J. Bryan makes fun of has nothing to do with science, and never did have. Any broadminded person can see that evolution and the Bible agree with each other yet there are a few who do not want to understand, and will continue to think that evolution is "unprovable," etc., when a little thinking would set them right.

R. B. MEEKER,
Holland, Mich.

(This opinion on the part of another reader is likewise entertained by many evolutionists who can abide at once by the laws of Science and the Church at the same time. A radical, sane thinker is a worthy individual and a man who upholds his belief in the face of odds is doubly worthy. Those who profess to be scientists and then take a biased view of everything else, non-scientific, are not worthy of consideration and the same holds true for over-zealous religionists who can see nothing but from their own point of observation, and treat all others who do not agree with them as bigots. Fortunately, the world is made of a vast majority of the type of men similar to the writer of the above letter.)

It is good to remember that the other man is right part of the time. The rational individual will listen to and correct opinions if he knows a little more about the subject than the person with whom he is holding a conversation. He must, however, open his own mind to the logic and reasoning qualities of his opponent in a discussion and accept those parts of the arguments which best his own and overcome his objections.

Again we repeat as we have done so in past issues—"One does not have to overthrow the laws of state and religion to become a scientist"—the above letter confirms it again.—Editor.)

DOESN'T LIKE JOKE EDITOR

Editor, *Science and Invention*:

Some time ago I sent you a joke about a doodle bug. I have never heard any more about it. I think it's about time that you give us fellows that never had an education a chance. I can't see that it's necessary for a man to be a professor or a college teacher to win a prize. I think I can write as good a joke as any college professor and then some. I think it's all a swindle. Take the joke I saw in your magazine about radio sounding like a cook snoring. Now I know that no radio set ever sounded that way. I've asked lots of people who have radio sets if their sets ever sounded like a cook snoring, and they all said no. I don't understand how you publish such jokes when good jokes like mine you don't even look at.

N. COMPTON,
Greenville, Ohio.

(No doubt you feel peeved because we returned some of your jokes as unavailable. The reason for our rashness was that your jokes needed an explanation, in other words, they were very deep and the joke part could not be easily perceived; in fact in some of them one could not see the joke at all. Now if you will give us some really good jokes, we will be glad to publish them and pay you for the privilege at the same time. Don't worry about us not looking at jokes. We look at everything, and this answer proves that your jokes—alas—were also read personally by the writer. And believe us it is no joke to waste through 3,000 would-be jokes every month!—Editor.)

QUESTIONS JUDGES' OPINIONS

Editor, *Science and Invention*:

About eight months ago I sent in three articles to your magazine. They were returned to me marked "not of general interest." Imagine my surprise when on picking up the November number of *SCIENCE AND INVENTION* I found an article that was practically a duplicate of one of my articles which was returned to me with reason above marked. Evidently your idea of "general interest" has changed.

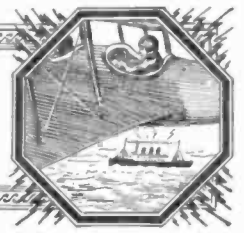
Your distinction in your Gold Cover Contest seems to be extremely fine. In the contest announcement you gave a square box covered with gold paper as a suggestion and give sixth prize to a round box; you suggested picture frames and give a prize to a picture frame which has a drawer for stamps as an addition. It seems to me that these prizes come under the list of those excluded in the prize announcement.

RICHARD WHITTINGTON,
Crawfordsville, Ind.

(Continued on page 1032)



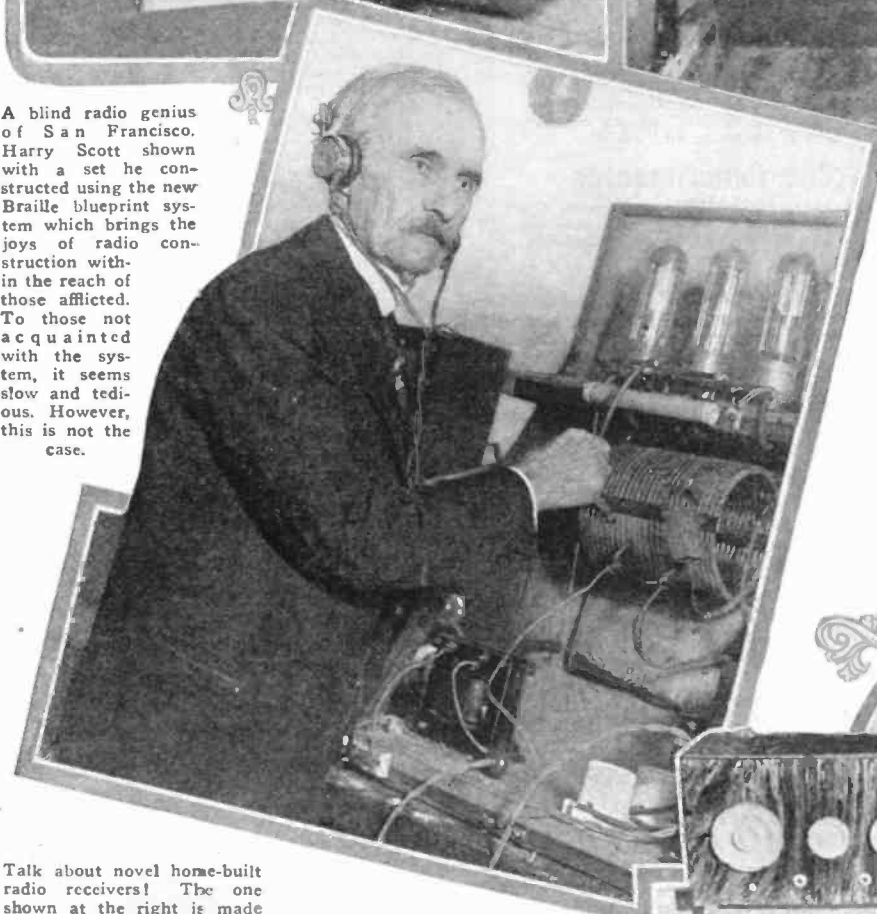
RADIO



Radio Pictorial

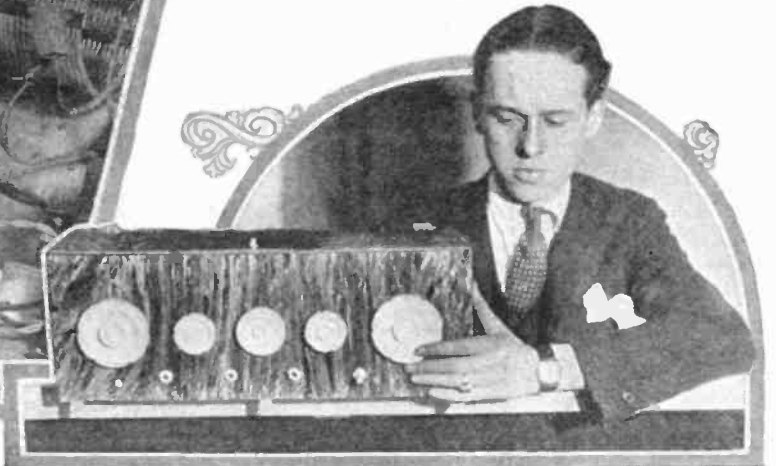


A blind radio genius of San Francisco, Harry Scott shown with a set he constructed using the new Braille blueprint system which brings the joys of radio construction within the reach of those afflicted. To those not acquainted with the system, it seems slow and tedious. However, this is not the case.



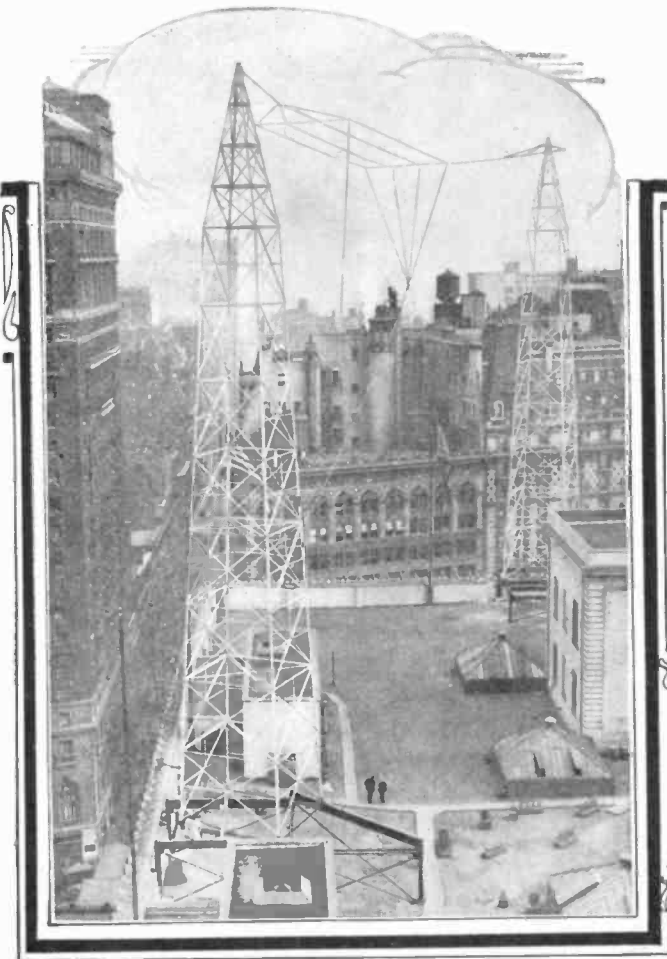
Above: The thriving little town of Larchmont, N. Y., now boasts of a very efficient and complete radio broadcasting set for the use of its Police Department. With a range of 600 miles, a law breaker will have to move quickly in order to escape capture. Left: Thanks to a decision handed down by the District Court of Appeals giving him credit for his invention, Dr. James Harris Rogers, famous radio inventor, has won an involved controversy between himself and the government. The aged inventor, famous the world o'er for the development of the underground antenna, is shown adjusting the submarine radio transmitter, used by the Navy during the war.

Talk about novel home-built radio receivers! The one shown at the right is made entirely from sour milk—a casein product. Coloring pigment of the desired tint is added before the milk hardens. In this way a beautiful effect is obtained.



A New One--WGBS

Splendid Addition to New York's Broadcasters.



High up above the street resting upon the roof of the Gimbel Brothers' store in New York City are two beautiful antenna masts supporting the large aerial from which the programs pass through space with the velocity of light.



Operating on 316 meters, the law demands that no deviation from the allotted wave-length be allowed. The engineer checks up the wave-length daily.



The interior of the beautiful studio where opportunities are afforded those with an ambition to perform before the microphone. The entire studio is glass-enclosed.



WGBS is the second radio broadcast station to be operated by the Gimbel Bros' Co. The other is the well-known WIP located at Philadelphia. Above are shown the licensed radio operators who listen in continuously during the broadcasting of programs. To the right, is another corner of the artistically designed station. One of the many novel features is that the station is operated entirely by storage batteries, thus eliminating the annoying hum usually accompanying the use of generators. In this way clearer programs are the result.



Trans-Atlantic Photo Radiograms

DETAILS OF HOW PHOTOS ARE NOW RADIOED BACK AND FORTH

By LEON L. ADELMAN

THE era of rapid transmission of pictures from country to country by means of radio is here. Across thousands of miles of space, hurdling oceans and continents alike, this agency we call Radio has been harnessed to carry the images of places and personages and happenings in one corner of the world to places and people in distant countries.

The full extent of this accomplishment cannot be foreseen at this time. But we believe it to be a great forward stride in radio science, and an important contribution toward "localizing" the news of the world.

As we study the forward marches of science, and their effect of steadily shrinking the world to what will ultimately become a single, big community of fellow humans, we must admit the growing necessity for the development of a universal language. Until this new process is worked out in its tedious way and accepted by the nations of the world, Photo-radiograms, which speak the truly universal language of pictures, will go far to bridge the gap that different latitudes and tongues have interposed between the peoples of this sphere on which we live.

There is an old Chinese proverb to the effect that "One picture is worth ten thousand words." This is as true today as the day it fell from the lips of the Chinese sage, for, since primitive man made his first crude drawing, pictures have been in constant use. So innate is our "picture sense," through centuries of cultivation, that one good picture may truly convey to us, at a glance, an idea or story that would require many words in the telling. It is not too much to suggest that the transmission of pictures across the world will play an important part in promoting world peace by making closer neighbors of peoples living on opposite sides of the earth. * * *—Statement by General James G. Harbord, President, Radio Corporation of America.

"Truly, a great achievement has been accomplished by the untiring efforts and perseverance of that small minority calling themselves Engineers and Scientists. One cannot begin to imagine against what great odds these promising results were obtained, but one can readily see that it was no small task to maintain absolute synchronism between apparatus 3000 miles apart."



THE TUBE WHICH SOLVES THE PROBLEM

Captain Richard H. Ranger, the developer of the system and the inventor of its unique features, is shown with the "electric eye," the tube which is responsible in a great measure for the successful operation of the apparatus. Not only photographs, but all kinds of printed matter such as newspapers, typewritten letters, and manuscripts are easily reproduced radioally.

9 MILE RECEIVING ANTENNA AT RIVERHEAD, L.I.

PORTRAIT RECEIVED FROM ENGLAND VIA RADIO

PORTRAIT RECEIVED BY MAIL

TAPE RECORDER TO CHECK SYNCHRONIZING

AMPLIFIER

SYNCHRONOUS MOTOR AND TUNING FORK

SYNCHRONIZING GEARS

RELAY

LAMP

LIGHT SHUTTER

LENS

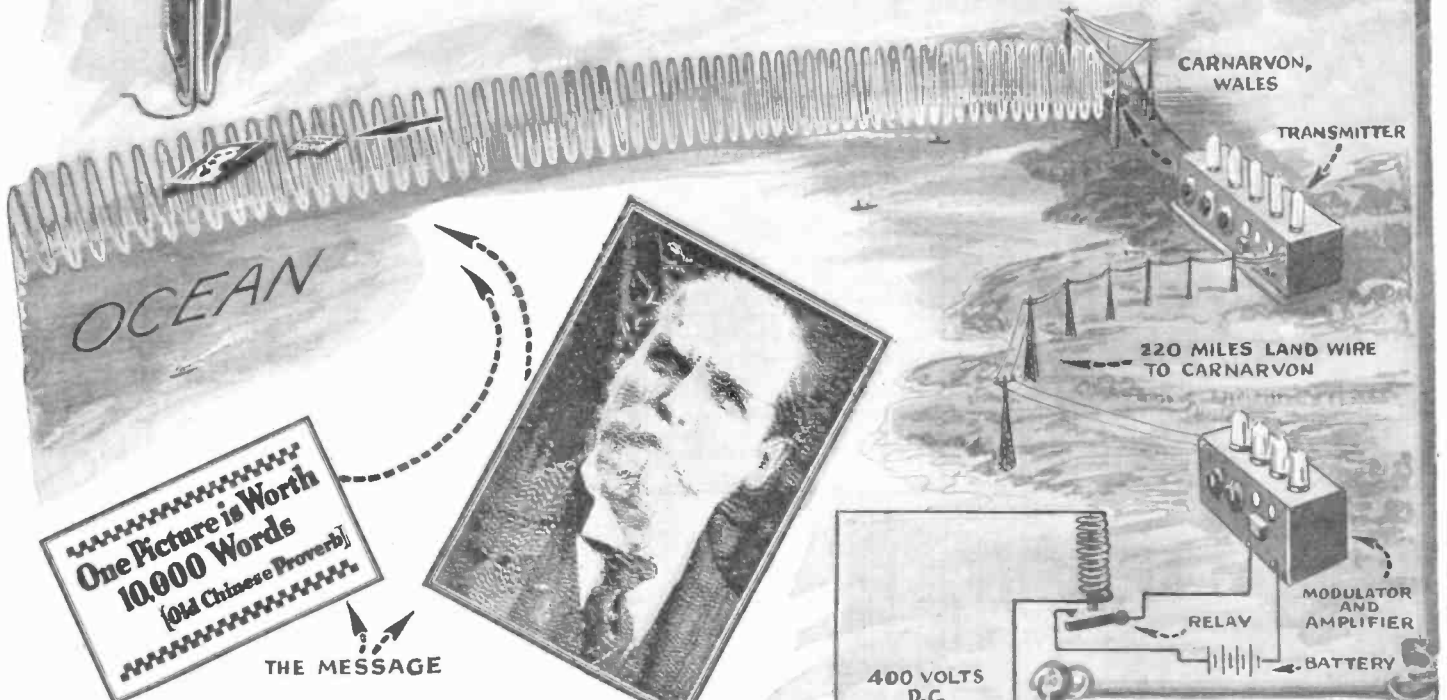
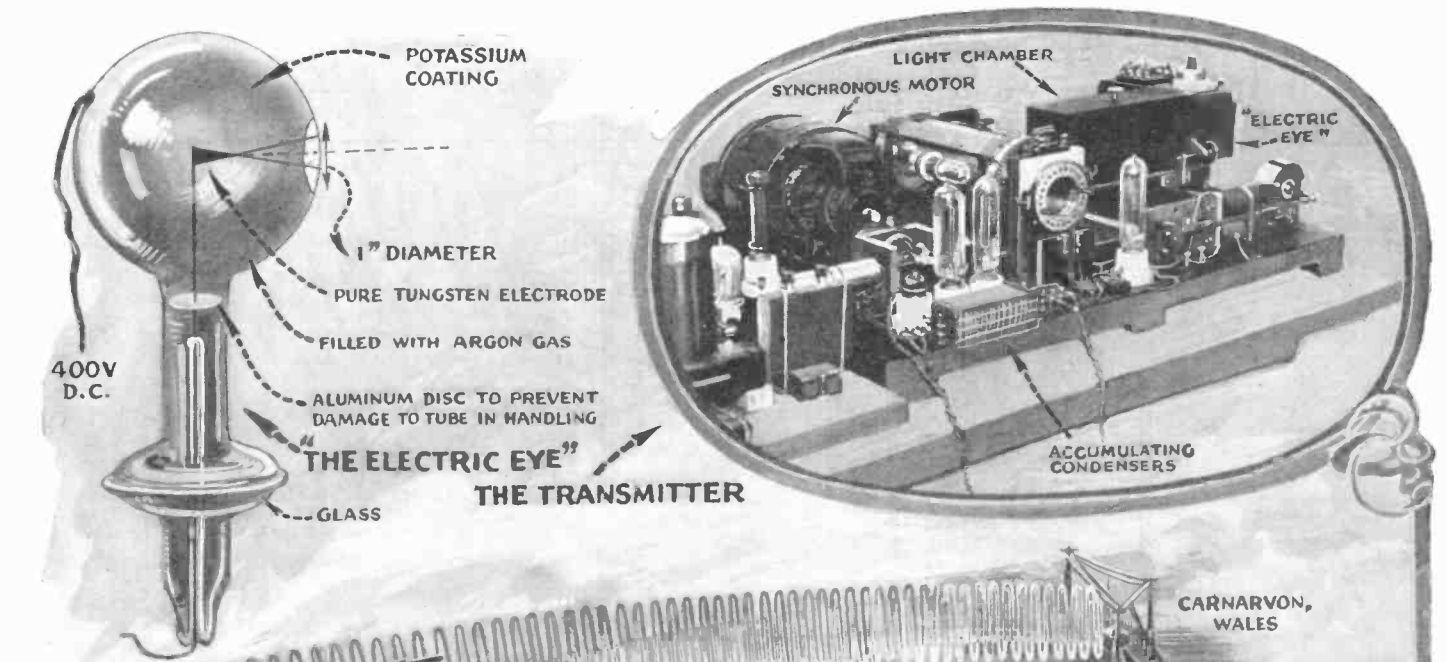
SENSITIVE FILM ON SYNCHRONIZED ROLLERS

PHOTOGRAPHIC REPRODUCTION

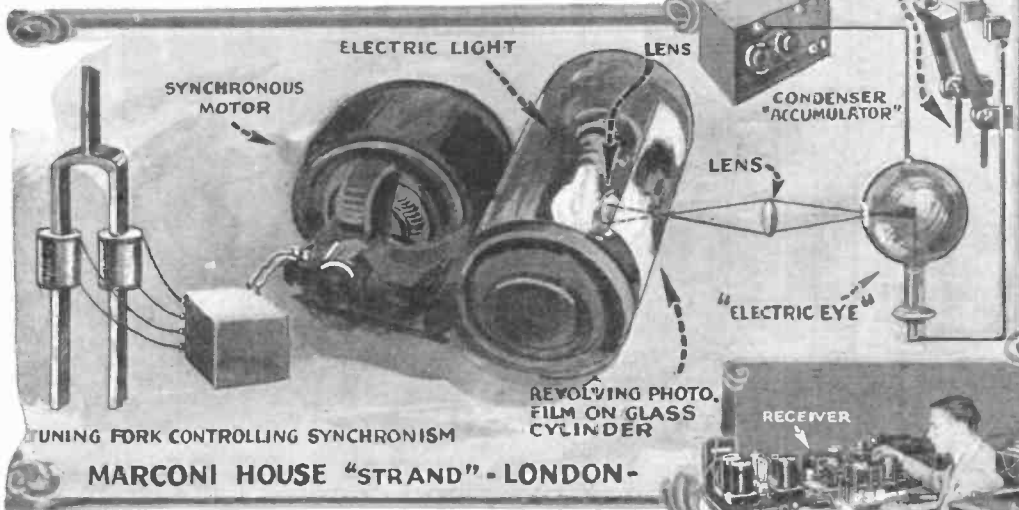
LINE DRAWING REPRODUCTION

By comparison between an original and transmitted photos, it is at once seen that the outline, the shading and tone effect is realistically portrayed. To the right is shown the photo as recorded on a tape recorder—a meaningless jumble—to check the synchronizing.

THE RECEIVER



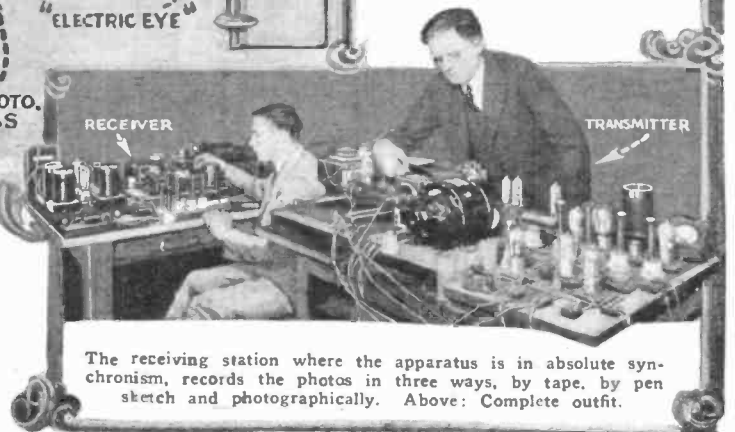
The "electric eye" shown at the top is a photo-electric cell whose electrical resistance varies in accordance with the amount of light falling upon it.



MARCONI HOUSE "STRAND" - LONDON -

Ordinarily, the current delivered by the "electric-eye" would be a pulsating current of varying intensity and would ultimately result in a much inferior picture. Thus, a condenser "accumulator," another development by Captain Ranger, is interposed and breaks up the light variations into a series of dots and dashes. This system of modulation is found to be excellent, and in conjunction with the necessary transmitting apparatus gives a much more clearly defined reproduction. 400 volts D.C. is required for the successful operation of the photo-electric cell. Note transmitted photos at upper left.

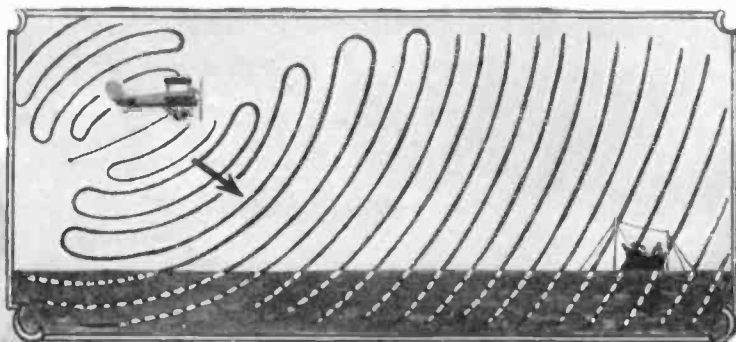
Immediately above is shown the glass cylinder on which is placed the picture to be transmitted. Within is an incandescent lamp, the light from which is focused in a minute beam onto the film. As the light and dark portions of the picture are traversed by the light beam, the intensity of the ray is changed. This ever changing beam after having passed through the film is again focused through another lens outside the cylinder onto the sensitive element of the photo-electric cell. This device transforms the light waves into electric impulses or waves which can be transmitted by radio, much the same as a regular dot and dash message.



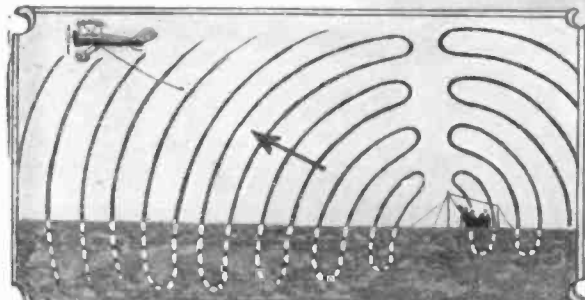
The receiving station where the apparatus is in absolute synchronism, records the photos in three ways, by tape, by pen sketch and photographically. Above: Complete outfit.

Broadcasting From the Clouds

Some New Developments by the Army



Advanced research work undertaken by the army's aviation officials shows great improvement in the transmission of radio messages from moving airplanes.

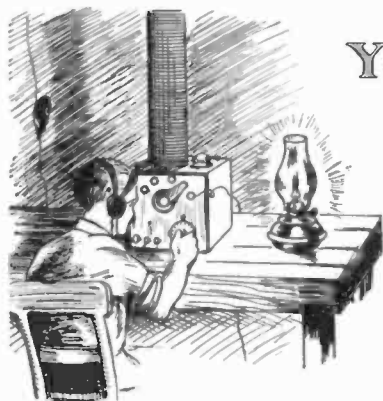


Quite recently it was demonstrated that the voice could be readily picked up by a receiving set on the ground, relayed over land line to the broadcast station from whence retransmission on a different wave-length took place. The army has been actively engaged in making thorough tests of the possibilities of radiophone communication between airplane mail carriers and the Post Office. At the present it has been found best to employ a single wire antenna of the trailing type as it was shown that the directional effects were desirable. Our artist has depicted the cross-section of the ether surrounding the transmission and receiving antennas, showing the electro-static field around them. The propagation of the waves show that they enter the earth's surface and as they attenuate, go further and further, until they become too weak to be amplified.



Capabilities of Your Receiving Set

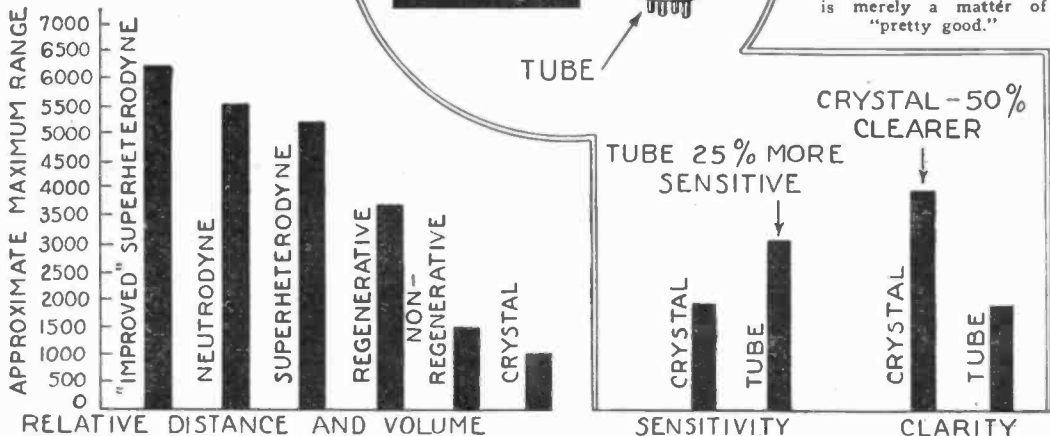
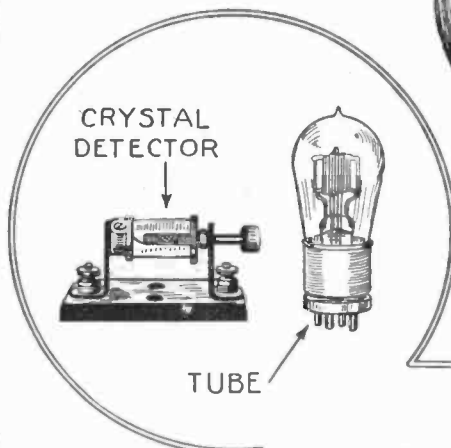
Which Do You Prefer—Distance, Volume or Clarity?



In the pioneer days of radio or wireless, as it was then called, a reception of a thousand or fifteen hundred miles was conceded a record.



Today, trans-continental or trans-oceanic reception is merely a matter of "pretty good."



Whether you as the owner of a receiving set and are proud of its performance, whether you are interested in knowing or not knowing about the intricacies of the circuit it employs, we are sure that the information contained graphically on this page will prove of more than passing interest to you. Radio, even at its present stage of development, has still many problems to be solved. Our tubes, although 25% more sensitive than the still popular crystal, are but 50% as clear. Our receiving sets with their multiplicity of dials and the complication therein arising when tuning in stations, will, in the course of a few years, be decidedly changed. Whether you are the owner of a crystal set or 17 tube set, you should be getting results comparable with this chart.

100 Ft. Antenna Mast

By FRED A. PARSONS, 2ABM

Constructional Details Which Will Enable One To Build Something Useful and Distinctive

HOW would you like to have a beautiful and artistically constructed antenna mast, gracefully reposing in your back yard? Of course you would, if the structure didn't entail too much labor, cost, space and trouble. This substantial mast is a creation you will always be proud of, a landmark which will attract wide attention and as an observation tower really worthwhile the time and trouble to build. Although provided with three mainstay guys, as a measure of safety, the tower has weathered several high gales with the guys cast off, without the semblance of a perceptible sway at the top. It is interesting to note that though entirely made of wood, the structure is as safe as a steel structure of the same type. It has been estimated that the static load on each leg is in the neighborhood of 400 pounds, or, fifty pounds per square inch of cross-section, a fraction of the compression limit of the wood used.

The foundation is the most important consideration and no trouble was too large to overcome, in accomplishing the desired result. For each leg of the tower, a hole six feet deep, three feet long and one foot wide was dug. A large steel plate to which was securely bolted two iron rods, was first put in. One ton of large stones was then thrown in on top and finally, after having placed the first sections of the legs in place, three-quarters of a ton of concrete were cast around them.

LIST OF MATERIALS

LUMBER

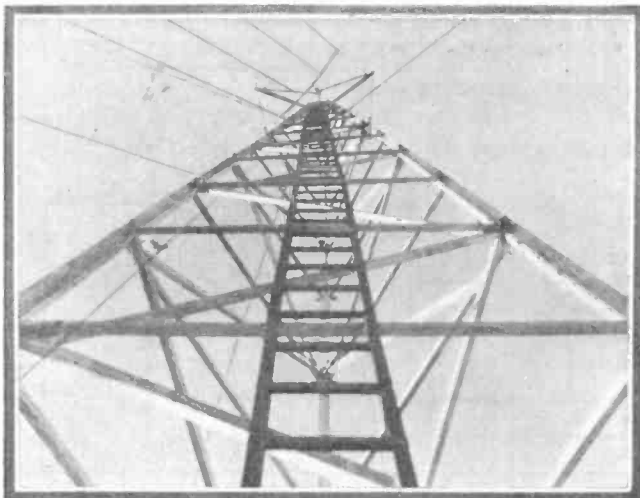
- 2 x 4 Legs—240 feet.
- 2 x 3 Bracing—900 feet.
- 1 x 4 Flanges for Legs—150 feet.
- 1 x 2 Steps for Ladder—100 feet.
- 3 x 4 Mast (1 piece)—31 feet.

FITTINGS

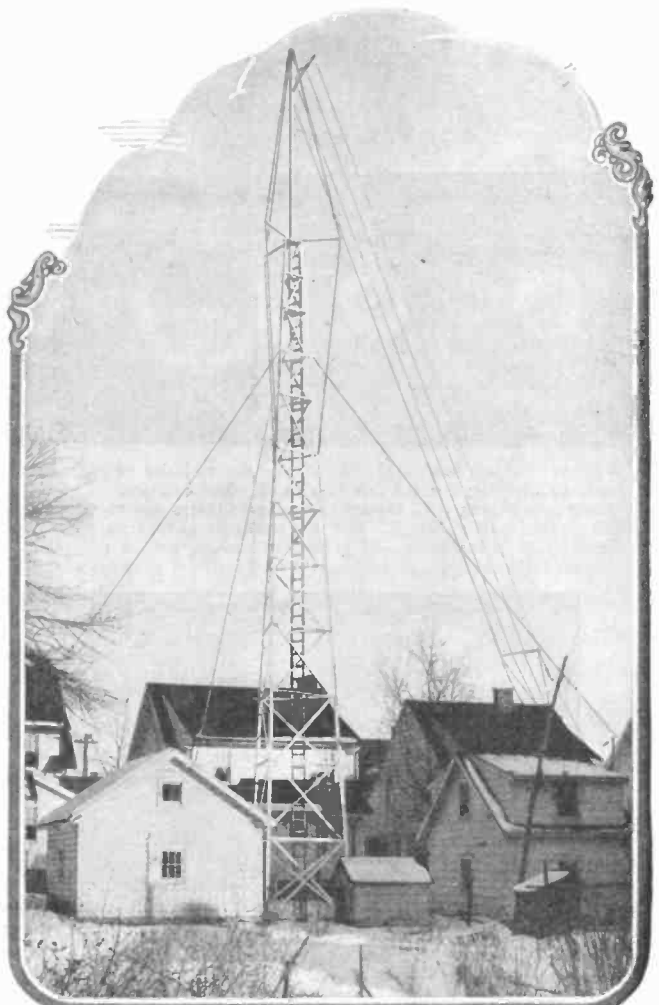
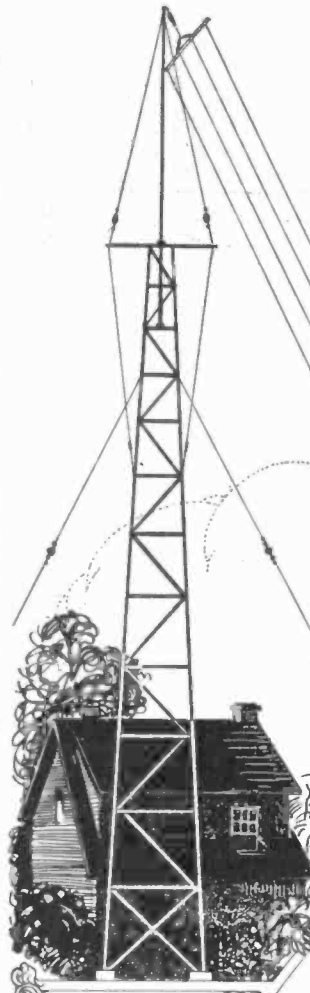
- 262 bolts and necessary washers.
- 82 galvanized brackets.
- 3 special angles, $\frac{1}{2}$ " x 2" x 2"—for guy wires.
- 300 feet $\frac{3}{4}$ " galvanized steel guy wire.
- 200 feet $\frac{1}{4}$ " galvanized steel guy wire.
- 52 galvanized guy wire clips.
- 12 large porcelain strain insulators.
- 3 $\frac{1}{2}$ " galvanized turnbuckles.
- 3 $\frac{3}{8}$ " galvanized turnbuckles.

FOUNDATION

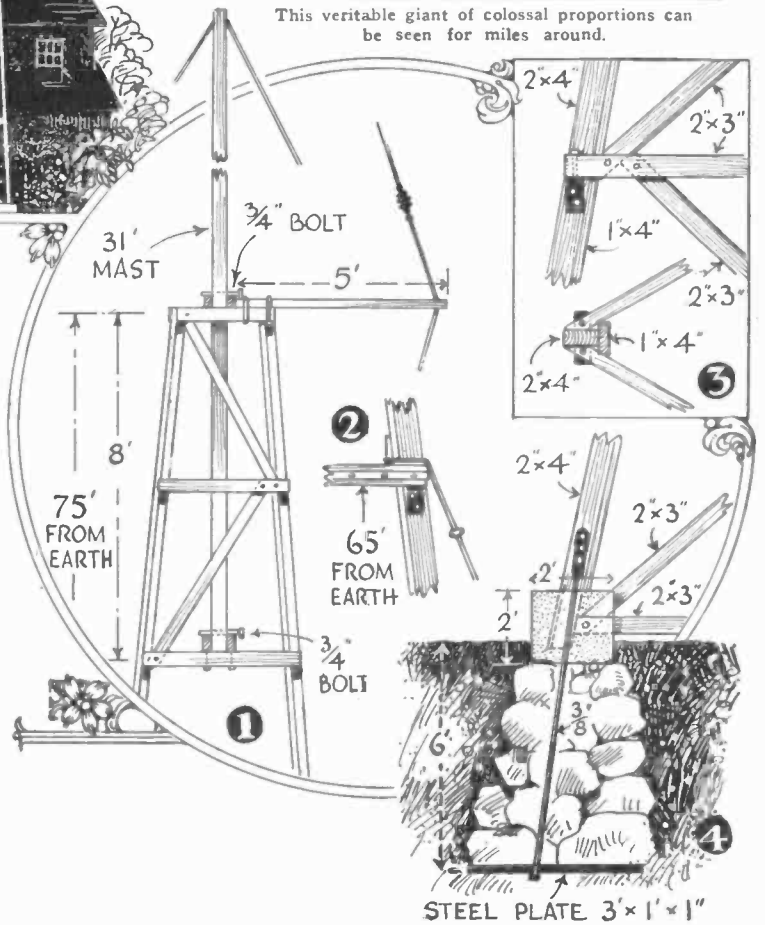
- 1 $\frac{1}{2}$ tons of concrete.
- 3 tons of stone.
- 3 steel plates, 1' x 3' x 1".



Looking upward before taking the dare to climb up to lofty heights. The ladder is perfectly safe, the rungs being sunk flush with the ladder legs and held to the structure by bolts fastened securely at frequent intervals. Note carefully the diagonal and horizontal bracing, each piece being rigidly bolted to the main framework so as to insure against longitudinal and lateral play.



This veritable giant of colossal proportions can be seen for miles around.

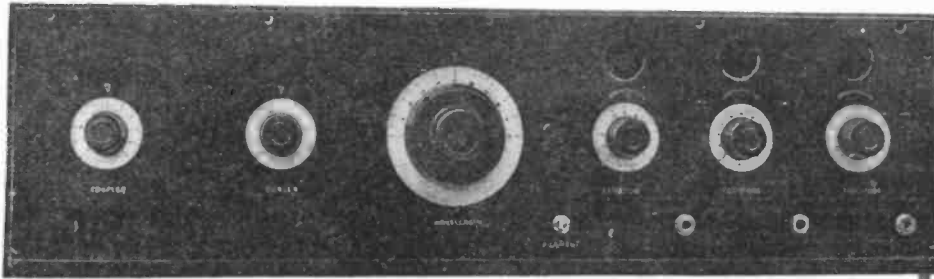


The first horizontal brace is placed at a height of seven feet, and the rest graduate down so that at the top, the uppermost two are but four feet apart. The three main guy wires are attached at a height of sixty-five feet. The antenna mast is also guyed by three out-riggers, each five feet long and bolted as shown in the sketch. Two king pins allow the lowering of the topmast for antenna repairs. The legs are 12 feet apart at the foundation.

A Low Loss Broadcast Receiver

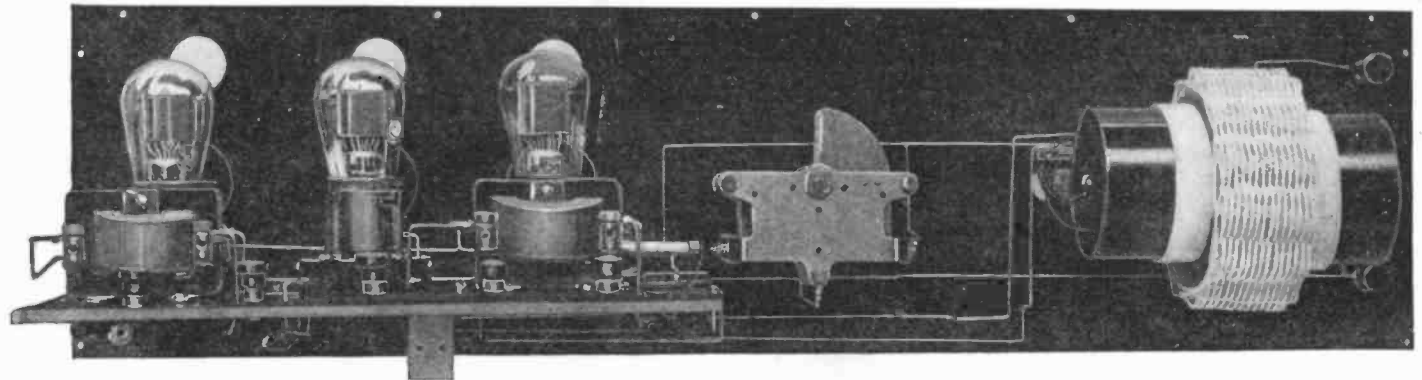
Refinements Which Bring in the "DX"

By FRANK FRIMERMAN, 2FZ



THE ideal three tube broadcast receiver should be easy to construct, should contain a minimum of apparatus, and should incorporate only materials of well known manufacture. Above all, its cost should be low, its operation should be simple and its prowess something to boast about. Now that the low loss idea has been brought to the fore—and indeed it is a step in the right direction—the very latest and endorsed principles of radio engineering have been made inherent in the construction of this broadcast masterpiece. With but one tuning control operating on a vernier dial, the set is truly an achievement worth while duplicating.

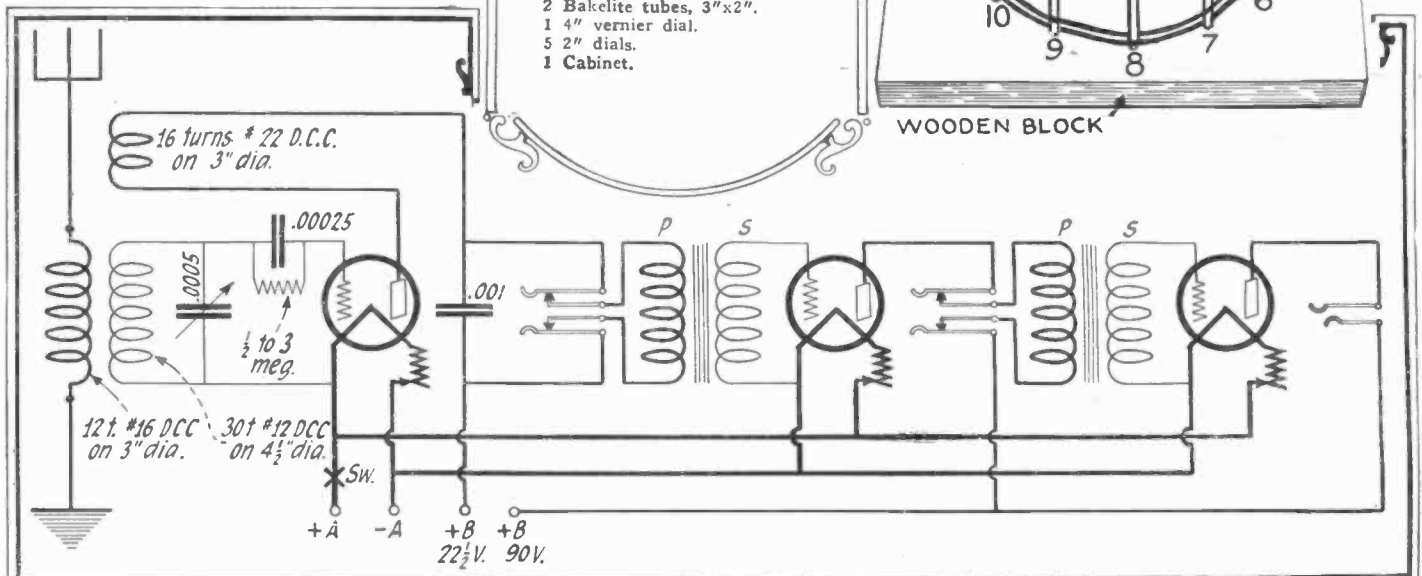
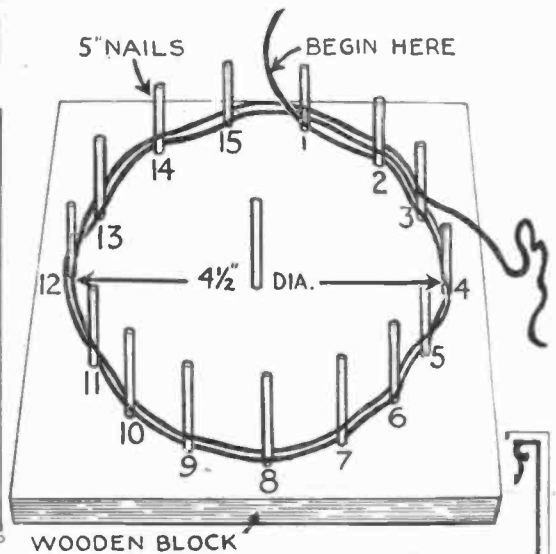
What is this low loss idea? Why have the majority of radio fans been so intensely interested lately in carrying out the low loss idea? The employment of low loss parts stipulates that all tuning inductances shall have a minimum of losses due to distributed capacity, insulation leakage and stray capacity effects. Nor are condensers, sockets, jacks and transformers immune from the primary consideration of perfect insulation, perfect contacts, and accurate mechanical and electrical design which has greatly enhanced the progress of radio during the last few years.



The most important parts are the tuning inductance and variable condenser. Of these, the condenser must be purchased. However, the inductance can readily be made by the enthusiastic fan with little trouble. One method of winding the coil is by first driving an odd number of nails—in this case fifteen—into a wooden block about six inches square. The diameter of the coil is 4½" and when completed contains 30 turns of No. 12 D. C. C. wire. The winding consists of leading or interlacing the wire between alternate nails on the form, remembering to wind the wire tightly. When the coil is finished, a piece of ordinary string is entwined between the windings, so as to hold them together—in other words, making the coil self-supporting. The primary consists of 12 turns of No. 16 D. C. C. wound on a bakelite tube 3 inches in diameter and 2 inches long. Upon a similar tube, 16 turns of No. 22 D. C. C. is wound, comprising the tickler. The secondary winding may be supported by two thin strips of bakelite, fastened to the panel in the conventional manner.

List of Parts

- 1 Bakelite panel, 7"x24".
- 1 Sub panel 10"x6".
- 1 23-plate low loss condenser.
- 3 6-ohm rheostats.
- 3 Good sockets.
- 2 4 to 1 audio transformers.
- 2 Double circuit jacks.
- 1 Single circuit jack.
- 1 Filament switch.
- 1 .00025 grid condenser.
- 1 .001 by-pass condenser.
- ½ lb. No. 16 D. C. C. wire.
- ½ lb. No. 22 D. C. C. wire.
- 1 lb. No. 12 D. C. C. wire.
- 1 Grid leak, ½ to 3 megohms.
- 6 Binding posts.
- 2 Bakelite tubes, 3"x2".
- 1 4" vernier dial.
- 5 2" dials.
- 1 Cabinet.

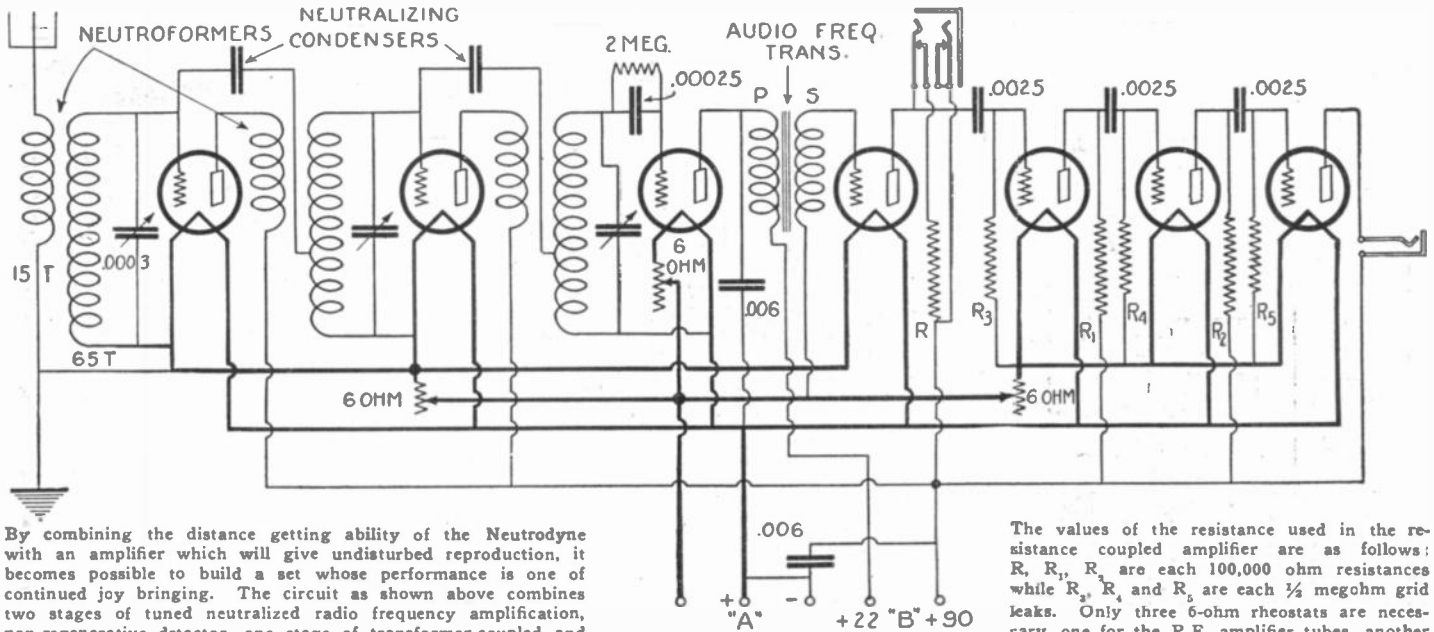


The regenerative circuit in all its glory, elevated to a higher plane by the introduction of low loss parts, still proves that it is the old stand-by, taking its place among the foremost receivers in the world.

Three Extra Good Circuits

A Seven Tube Neutrodyne Par Excellence.

By E. E. LAUFER, 2AQP

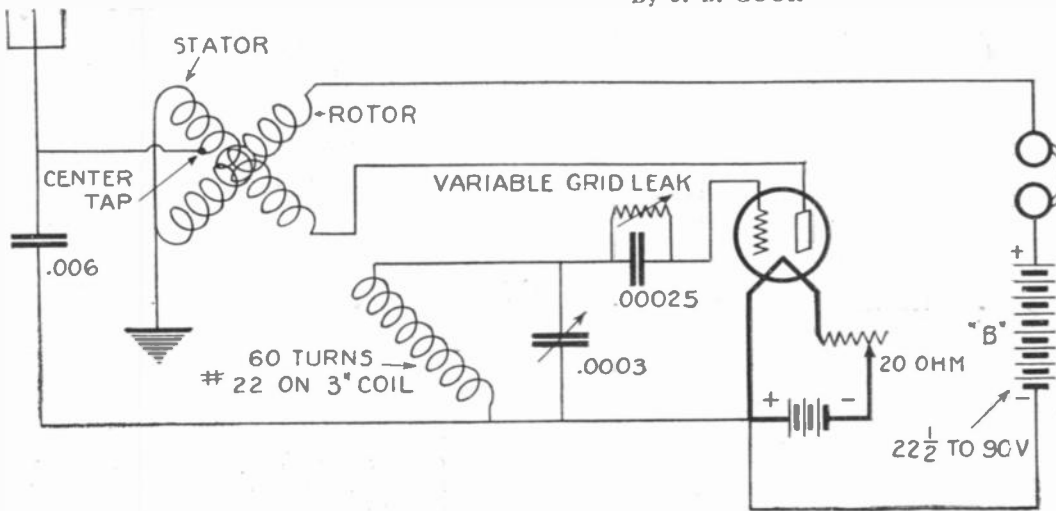


By combining the distance getting ability of the Neutrodyne with an amplifier which will give undisturbed reproduction, it becomes possible to build a set whose performance is one of continued joy bringing. The circuit as shown above combines two stages of tuned neutralized radio frequency amplification, non-regenerative detector, one stage of transformer-coupled and three stages of resistance-coupled audio frequency amplification.

The values of the resistance used in the resistance coupled amplifier are as follows: R_1, R_2, R_3 are each 100,000 ohm resistances while R_4, R_5 and R_6 are each $\frac{1}{2}$ megohm grid leaks. Only three 6-ohm rheostats are necessary, one for the R.F. amplifier tubes, another for the detector and a third for the A.F. amplifier.

A Superior One Tube Regenerator

By J. B. COOK

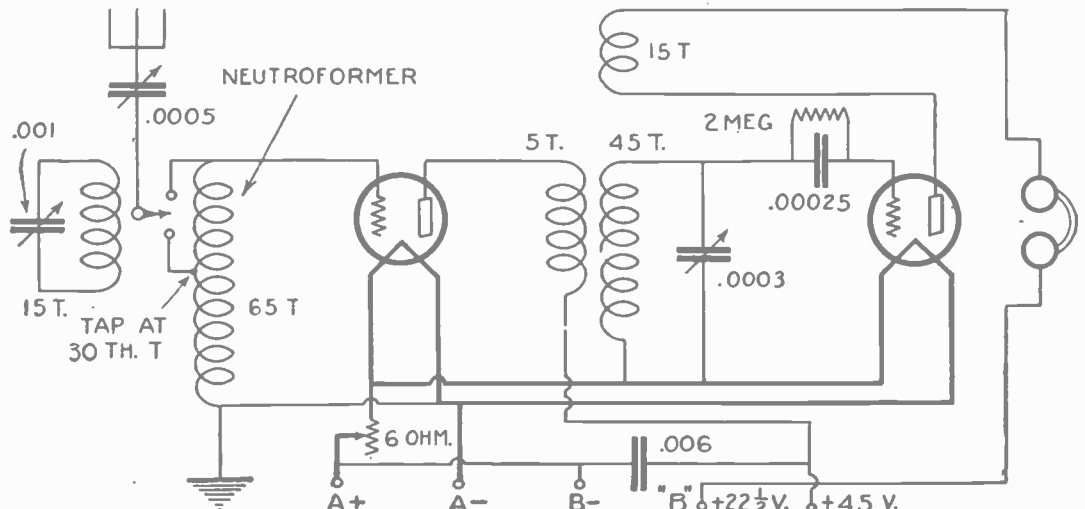


A single tube circuit which will very successfully operate a loud speaker on all local stations is shown in the diagram on the left. It is necessary to place a coil containing 60 turns of No. 22 D.C.C. wire in inductive relation to an ordinary variometer whose stator has a center tap taken off. By varying the "B" battery potential anywhere from $22\frac{1}{2}$ to 90 volts, it becomes possible to bring in the stations with maximum volume. In fact, it is possible to receive them with the "B" battery entirely disconnected from the circuit. For best results a variable grid leak is necessary, as well as a 20-ohm rheostat. It will be noted that the circuit has both inductive and capacitive feed-back, well nigh approaching the super-regenerative circuit and much easier to control. A dry cell tube can readily be used.

A Special "DX" Circuit

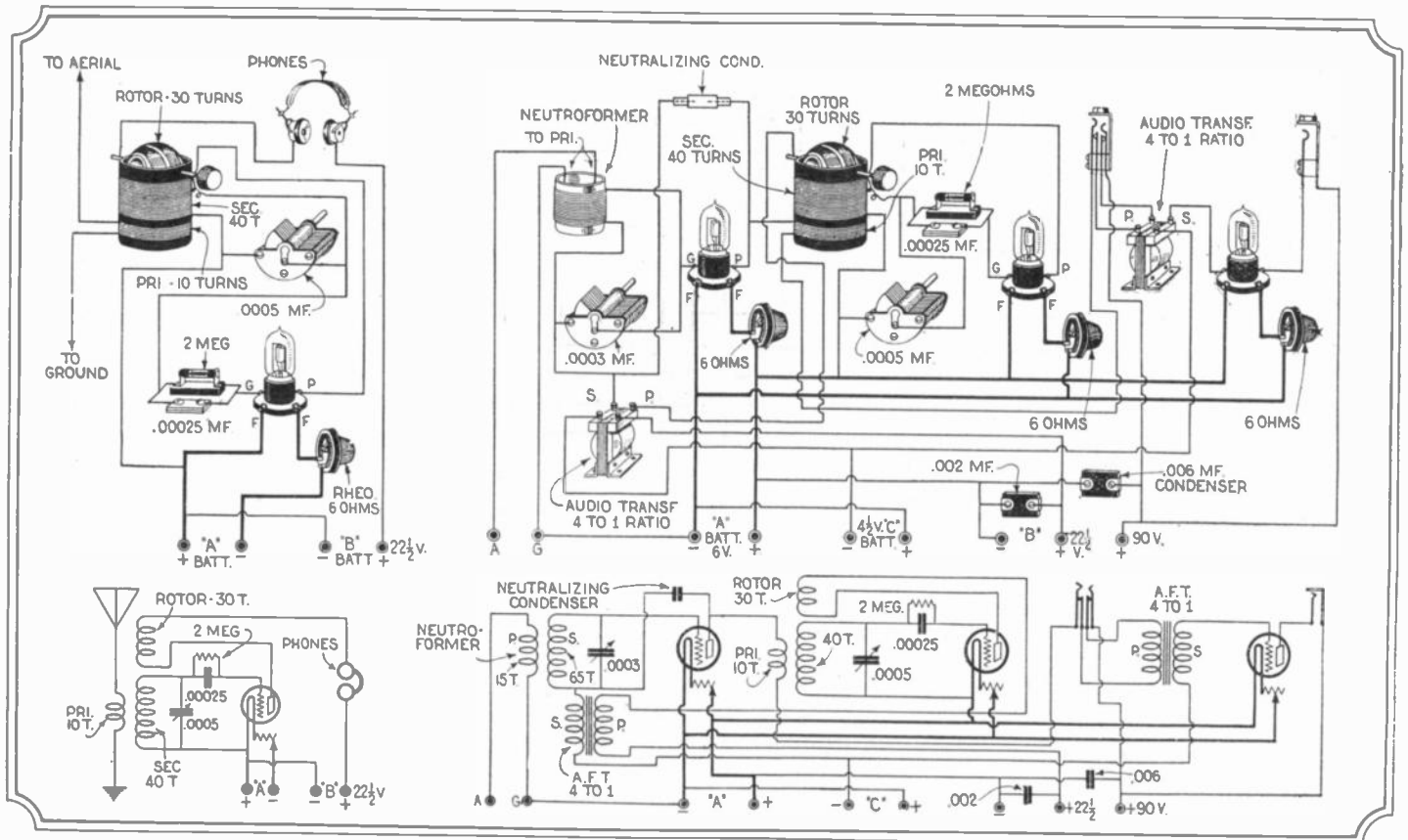
By MATTHIAS THURY, 2CT

Combining the advantages of one stage of radio frequency amplification with a regenerative detector, and utilizing the primary of the neutroformer in conjunction with a variable condenser as a wave-trap, it is possible to build a two tube set which, although not a bug-bear for volume, will bring in the distant stations without fail. A standard neutroformer is used for the R.F. amplifier, while an ordinary variocoupler re-wound to conform with the specifications given in the diagram serves its purpose well. Besides being absolutely free from undesirable radiating properties, the set is provided with a two contact switch which allows selectivity to be obtained as well as affording a reasonable change in wave-length adjustment. Though the set has a number of controls, from the standpoint of experimental design, it is really worth while building. One 6-ohm rheostat will be found to control the filaments of both tubes nicely. 201A tubes are to be recommended.



Radio Oracle

In this Department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this Department cannot be answered free. A charge of 25c. is made for all questions where a personal answer is desired.



The beginner's set is rapidly being improved by the addition of more tubes. If you want good results you should try this circuit.

IMPROVEMENTS

(329) Milton Stanley, Syracuse, New York, asks:

Q. 1. What is the best circuit to use in rewiring my single tube regenerative set into a three tube receiver?

A. 1. Instead of merely adding two stages of audio frequency amplification, the above circuit employing one stage of tuned R. F., regenerative detector, one reflexed and one straight audio frequency stages of amplification will be found to give excellent results.

RADIO PHOTOGRAPHY

(330) J. H. Merwin, San Jose, Calif., asks:

Q. 1. Kindly give a brief resumé of the experimentation in radio photography since its inception of the transmission of photos by telegraphy and radio?

A. 1. With the present great strides in the transmission of photos by telegraphy and radio, and the announcement by Col. Green of the transmission of moving pictures by radio over a distance of nearly a hundred feet, it will not be surprising if in the very near future we will be sitting in our homes and listening to what the world has to say besides seeing the greatest opera performances that it has to offer.

As early as 1856, Caselli sent various designs by telegraphy using for the transmitter a tin foil-covered cylinder on which the designs were drawn in insulating compound. A needle acting very much like the stylus

of a talking machine needle served the purpose of a contact pin, traveling over the surface of the revolving cylinder. Thus the circuit was made and broken as the lines passed under the contact pin, while at the receiving end, by an electro-chemical action, a cylinder which was exactly synchronized with the transmitter, reproduced the designs directly. The discovery of the effect of light on the electrical resistance of selenium became known in 1873 and shortly afterwards various schemes to substitute selenium for Caselli's process were tendered. The most noteworthy were those of Semloq and Perosino in 1878. After quite a long time, Korn in 1904, employing Semloq's plan with several modifications, put it into use and transmitted photographs several hundred miles from their destination. A negative of the picture was wound on a glass cylinder and a very narrow beam of light was used as a stylus passing through it. By reflection to a single selenium cell whose resistance varied according to the amount of light passing through the negative, the input current was modulated into the transmitting circuit. In the receiving station the current was passed through an evacuated tube which grew brighter or darker according to the pulsating incoming current. These variations in light were focused onto another cylinder covered with sensitized paper and of course after developing, reproduced the original picture in its entirety. By further experimentation, Korn was able to improve

slightly on his apparatus and in 1907 made several photographic transmissions from Paris to London.

Perhaps the most original scheme was that developed by Edouard Belin. His scheme resolved itself upon the fact of his discovery that bichromated gelatin becomes insoluble under strong light. Thus he wets a film of this gelatin and places it under the negative he exposes, whereupon the portions of the gelatin exposed to light swell up more or less in proportion to the intensity of exposure, while the protected parts remain flat. This forms a sort of relief map of the negative and is wound on a cylinder over which a stylus traces its path. A microphone is attached to this stylus and by its rising and falling, the resistance of the microphone is varied which in turn controls the intensity of the current passing through it. At the receiving station an oscillograph has its mirror deflected in proportion to the current received and a light beam is reflected thereby to another cylinder. This cylinder has a sensitized paper on it and thus, providing the receiving and sending stations are in exact synchronism, the picture will be reproduced faithfully. The hardest part of the transmission of photographs lies in the synchronizing methods employed.

More recent work has been done by Jenkins, Nakken, Col. Green and others who believe that the transmission of moving pictures by radio will shortly become an accomplished fact.

WANTED!!! RADIO ARTICLES

WE want descriptions of new radio ideas which you have worked out in practice. Take photographs of the important parts and make pencil or pen and ink sketches of the hook-ups or mechanical details, et cetera. We are particularly

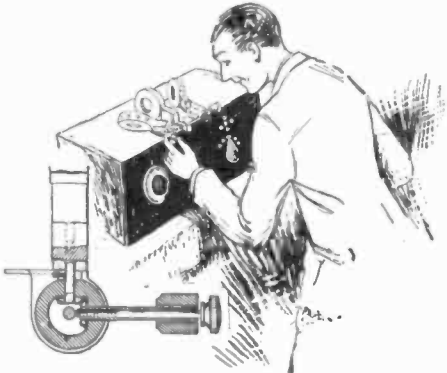
desirous of obtaining new hook-ups and descriptions of single tube sets, reflex and other types which have proven satisfactory. We like articles on new single tube receptors. We will pay good prices for your ideas. —Editor.



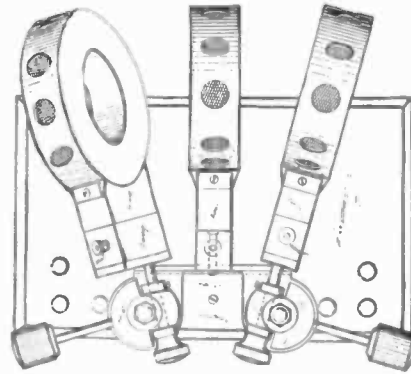
LATEST PATENTS



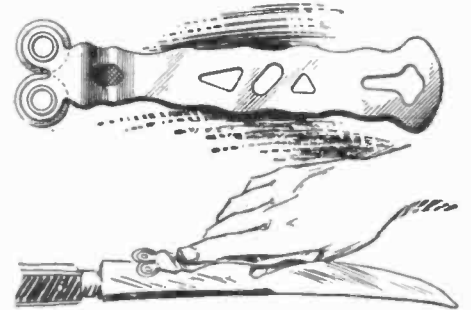
Honeycomb Coil Mounting



No 1,510,859, issued to L. G. Pacent relates to a new and interesting method of mounting honeycomb coils so that they may be used in a radio circuit. The illustrations above show the details of the coil mountings and also how the entire unit is to be mounted on the top of a radio set cabinet. With this new type of mounting, it is possible to turn either of the two movable coils so that they are in a different plane from the center stationary coil. A locking arrangement is also provided.



Knife Sharpener



No. 1,509,136, issued to Milton G. Goff describes an improved knife sharpener as illustrated above. The sharpener is drawn along the blade of the knife several times until the desired edge is produced.

Golf Accessory



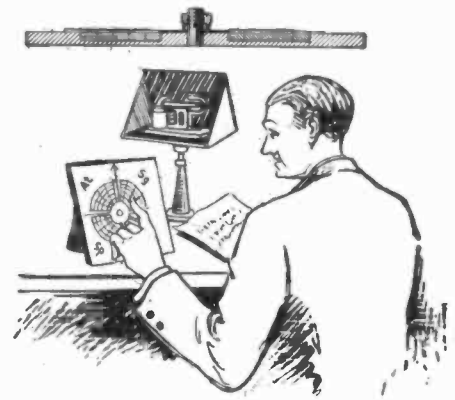
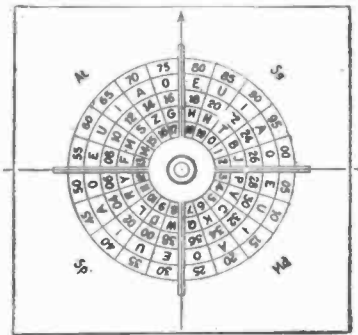
No. 1,509,302, issued to N. A. Larssen. In the game of golf, it is quite necessary that in order to make the best shots, the ball be placed on a suitable mound, known as a tee. The invention illustrated above, is for the purpose of forming these tees. Damp sand is compressed in the base of the device and then released as shown above. A perfect tee results.

WANTED

ARTICLES pertaining to automobiles such as handy kinks, roadside repairs and anything of interest to the man who drives a car. \$50.00 in prizes every month are offered by **MOTOR CAMPER AND TOURIST** for such articles. Get a copy at your newsstand and see what is wanted. If your newsdealer cannot supply you send for free sample copy to:

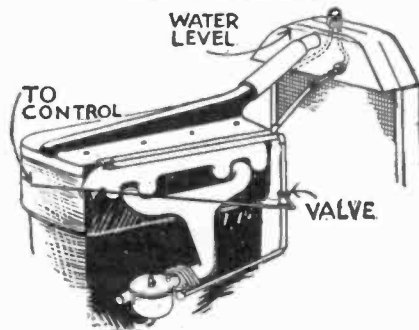
MOTOR CAMPER & TOURIST
53 Park Place,
New York City.

Code Device



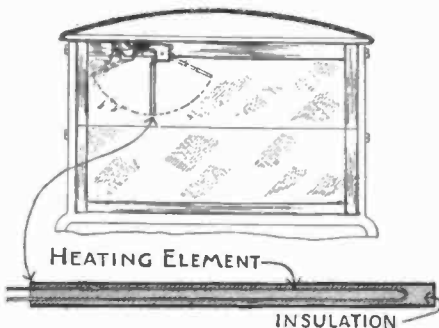
No. 1,509,929, issued to A. C. Caballero. A device for quickly and easily making up and decoding cryptographic messages. Circular in form, the device is readily manipulated.

Gas Saver



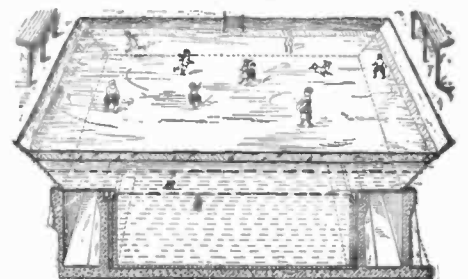
No. 1,510,151, issued to L. C. Moore describes a device for introducing moist, warm air into the intake manifold of a gasoline engine. This air is drawn from above the water level in the radiator.

Cleaner



No. 1,510,015, issued to C. L. Rayfield. Although the device illustrated at the left appears to be an ordinary windshield cleaner, it differs therefrom in that it contains a heating unit in the cleaner to assist in removing snow from the windshield.

Swimming Pool



This new patent relates to the protection of ceramic swimming pools during the winter. A larger pool is formed around and above the ceramic one, the banks being of sod. In cold weather, the pool is filled to several feet above the ceramic walls. Ice forms on the top, but the water cannot freeze as low as the ceramic surface. This pool may be used as a skating rink in winter as shown at the right.

Scientific Humor

HASN'T HYDROGEN HY DENSITY?

The class in college chemistry had been studying hydrogen. In the examination the question was asked, "What substance has the lowest density that you are acquainted with?" One paper read, "Water is the least dense substance that I am acquainted with; alcohol and ether are lighter, but I am not acquainted with these."—*Harry R. Lubcke.*

HE GOT HIS PHYSIQUES FROM THE POLICE GAZETTE



PHYSICS PROFESSOR: "Can anyone tell me the principles of the diving bell and for what purposes they are used?"

STUDENT: "Yes—Diving Belles are mostly used to get people to buy magazines, and

most of 'em ain't got any principles."—*Noel Compton.*

CALL FOR STATION KAT

LITTLE GIRL TO BROTHER: "Jimmy, what makes that whistle in our radio set?"

BROTHER, looking puzzled: "'Dunno. I heard Pop say he put up a 'cage' antenna, and mebbe a bird got caught in it."—*Harry Walters.*

OR AN INTERFERENCE ELIMINATOR

SHE: "What invention would mostly revolutionize kissing?"

HE: "An asbestos protector for moustaches."—*M. W. Harp, Reporter No. 13,578.*

THIS IS RELATIVELY IMPORTANT

FIRST SCIENTIST (viewing monkey in cage): "It is apparent to me—"

SECOND SCIENTIST: "Ah! Really, I did not know you claimed so close a relationship."—*Prospero Astrella.*

WE BET THE WATER TANK BURNED



CANADIAN: "I certainly do admire Uncle Sam's prohibition of officers."

YANK: "Why?"

CANADIAN: "Well, I cleaned my variable condenser with alcohol and I couldn't get any stations in

U. S. A. until it evaporated."—*Moe H. Friedman, Reporter No. 4880.*

THAT'S THE DOPE

FRIEND: "What a horrible noise comes from your radio set!"

RADIO FAN: "Well, I guess you would make just as bad a noise if you were coming out of the ether."—*Samuel Theodore Katz.*

WOULD THE CO HEAR HER?

MR. EDITOR: "Can you tell a phone from a wireless set?"—*J. C. Mello.*

HOW ABOUT THE NIGHT RATE?

BILL: "I missed my date because of a chemical."

WILL: "What do you mean?"

BILL: "I didn't get the nitrite."—*A. Daan-sen.*

First Prize \$3.00 METHUSELA USED AN ARC!

MRS. OLDEHAM: "Thank you so much for the wonderful birthday cake, dear, but tell me, what is the idea of the electric light bulb on it?"



MR. OLDEHAM: "It's forty candle-power, dearie."—*Paul S. Powers.*

SCIENTIFIC HUMOR AN HISTORIC DRIVE

Extract from St. Louis "Globe Democrat"—"His drive from the third tee went 125 years straight for the pin and dropped."—*W. O. Milligan.*

WE receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chance here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners. Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. We cannot return unaccepted jokes. Please do not enclose return postage.

All jokes published here are paid for at the rate of one dollar each, beside the first prize of three dollars for the best jokes submitted each month. In the event that two people send in the same joke so as to tie for the prize, then the sum of three dollars in cash will be paid to each one.

MAKES US FEEL LIKE 30c TO PRINT THIS

One day a professor was out hunting when quite unexpectedly a heavy rain storm came up. He crawled into a hollow log which kept the rain off very nicely. But the log became so water-soaked that it was impossible for him to squeeze out. He finally came to the conclusion that it was his fate to die there in that log, and he began to think of the many mean things he had committed, when suddenly he remembered that he had not renewed his subscription to "SCIENCE AND INVENTION." That made him feel so small that he was able to crawl out of the log without difficulty.—*Edward M. Carr, Reporter No. 10224.*

OSCILLATIONS OR OSCULATIONS?



MADGE: "How did you miss so much of the radio concert after staying home last night to listen in?"

MARJORIE: "Charlie called and there was too much interference."—*J. J. O'Connell.*

THIS SUIT NEEDED NO IRONING

CUSTOMER: "Say, this suit is rusty already and I bought it last week."

CLERK: "Didn't I tell you that it would wear like iron."—*J. C. Mello.*

ROASTING A FRESHMAN

PROFESSOR: "I'm getting some rare work from the new freshman."

ASSISTANT: "Rare?"

PROFESSOR: "Yes, not well done."—*Charles A. Hall.*

—OR SOME RAINMAKER, PFD.

WALL STREET LAMB: "Never again! I put money into a coal mine and it caught on fire. Then I tried an oil well and it was struck by lightning."

STOCK SALESMAN: "In that case, I have just what you need.



Our company is developing an asbestos property."—*J. J. O'Connell.*

AND THEN HE RECOVERED IN THE HOSPITAL

SHE (combing hair): "Look, my hair is full of electricity."

HE: "Why, of course, it's connected to a dry cell."

MORE HOLY THAN RIGHTEOUS

TEACHER: "What insect lives on the least food?"

BRIGHT STUDENT: "The moth; it eats holes."

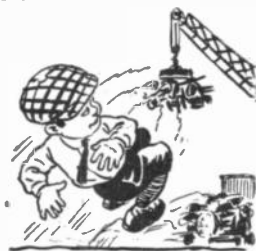
AND THE SWISS SCHWEITZER CHEESE?

PROF. (in history class): "It is an interesting fact in psychology of nations that when the Prussians commit suicide, they always use prussic acid."

INQUISITIVE FRESH.: "And then, do the French use Paris green?"—*A. Daansen.*

WELL IT HAD DRAWING POWERS

When Johnny was sent on errands, he often irritated his mother by lingering on the way to watch the magnetic crane lifting iron in the rolling mills, and one day she was punishing him when his father returned from work.



"What are you whipping him for?" asked Father.

"He's got too much iron in his blood," replied Mother.

"What!" exclaimed the astounded man.

"Yes, he just can't get away from that magnetic crane."—*H. P. Richards.*

IT HAPPENS TO ALL OF US

"What ails George anyway? He looks so sad and despondent."

"Oh! He thought he had picked up a new station way out west somewhere—but he suddenly discovered it was only the phonograph in the flat above."—*H. C. Newton.*

BUT HE DIDN'T TAKE 'EM

"TOURIST: "To what do you attribute your great age?"

OLDEST INHABITANT: "I don't know yet, there's several o' them patent medicine companies bargaining with me."—*James Wade.*

THE ORACLE

The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all but only matter of sufficient interest will be published. Rules under which questions will be answered:

1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.

3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this department cannot be answered by mail free of charge.

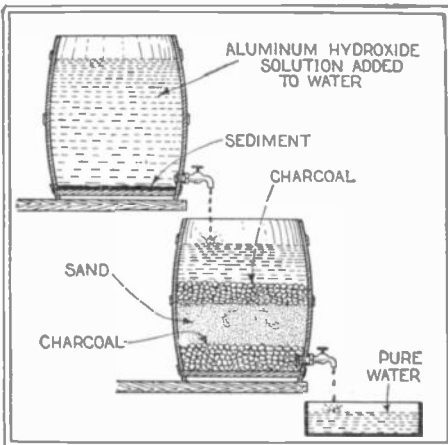
4. If a quick answer is desired by mail, a nominal charge of 25 cents is made for each question. If the questions entail considerable research work or intricate calculations a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

WATER FILTER

(1797) Roger V. Brink, San Antonio, Texas, asks:

Q. 1. How can I purify and filter water taken from a small brook?

A. 1. It is best first to purify and then filter the water. By means of precipitation with potassium aluminum sulphate alum, this can be readily accomplished. For every gallon of water, add two grams of alum, and allow the turbid mixture to stand over night. The clear water is then decanted or siphoned off, after which it is passed into a tank containing pulverized charcoal and layers of sand. Here any slight traces of chemicals are removed and the water is as fresh and clear as could be desired.



The purification of water is an absolute necessity and must be done in a thorough manner. No matter how dirty, water can always be made fit to drink.

BIRTH STONES

(1798) Robert L. Christman, Allentown, Penna., asks:

Q. 1. Will you kindly publish a list of the stones that are generally used as tokens of esteem, love and appreciation?

- A. 1. The desired list is given herewith.
- | | |
|-----------|--|
| Month | Stone |
| January | Garnet. |
| February | Amethyst, Hyacinth, Pearl. |
| March | Jasper, Bloodstone. |
| April | Diamond, Sapphire. |
| May | Emerald, Agate. |
| June | Cat's Eye, Turquoise, Agate. |
| July | Turquoise, Onyx. |
| August | Sardonyx, Carnelian, Moonstone, Topaz. |
| September | Chrysolite. |
| October | Beryl, Opal. |
| November | Topaz, Pearl. |
| December | Ruby, Bloodstone. |

SOAP SOLUTION

(1799) William A. Lathrop, Chatham, N. J., says he is experimenting with soap films and is desirous of obtaining a good soap solution for making these films. He asks:

Q. 1. Can you help me out?

A. 1. A very good soap solution would be composed of pure castile or palm-olive soap, 1 ounce, distilled water 8 ounces and pure glycerine, 4 ounces. The soap should be cut into thin shavings and be dissolved in distilled water. When thoroughly dissolved, add the glycerine and mix

well. The mixture is then allowed to stand over night and the clear portion of it at the bottom of the container is syphoned off and used. If a few drops of amyl acetate are poured on the surface of a vessel containing pure water, it will spread out. By using a wire bent into different forms, the thin film can be readily picked up and will cover the form completely, exhibiting brilliant hues. If celluloid is dissolved in the acetate, the film is made more durable and will last for quite a while.

PIPE THAWING TRANSFORMER

(1800) Milton Williamson, Buffalo, New York, desires data on a step-down transformer to be operated on 110 volt, 60 cycle A. C. supply for pipe thawing.

A. 1. The data given herewith can be used to construct a two K. W. transformer giving a

Interesting Articles to Appear In February Issue of "The Experimenter"

- The Tauleigne Microphone Amplifier.
- Lessons in Elementary Glass Blowing, By Earle R. Caley.
- Listening in for the Stars, By William Grunstein, E. E.
- Heating Metals Under Water, By R. A. Goepfrich.
- Ball Lightning.
- Galvani and His Work.
- A 13,000-Ampere Storage Battery.

secondary potential of about 12 volts and developing approximately 150 amperes. On the laminated sheet iron core, which should measure $17\frac{1}{2}$ " long x $18\frac{3}{4}$ " wide and having a cross section of $2\frac{1}{4}$ " x $2\frac{1}{4}$ ", is wound the primary winding consisting of 244 turns of No. 8 D.C.C. magnet wire. Care must be taken in using sufficient Empire cloth for complete insulation. The secondary winding is composed of two No. 3 wires, wound in parallel and consists of 32 turns. Extreme care should be taken in handling the output of the transformer.

WATER WHEELS

(1801) William Richards, Pasadena, Calif., asks:

Q. 1. Can you give some information as regards the efficiency of water wheels?

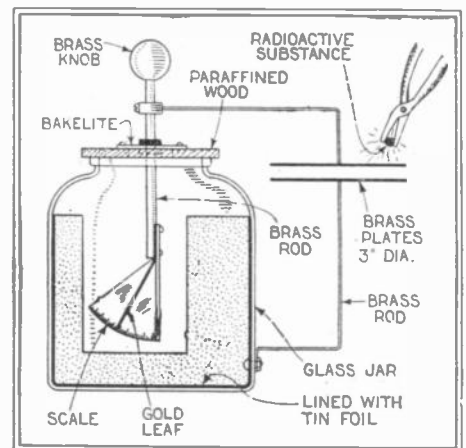
A. 1. There are three different methods used in the operation of water wheels, the types of which are as follows: The undershot, the breast-wheel and the overshot wheel. The undershot wheel is used mostly in the development of small power such as in small streams, brooks and slowly moving rivers and has the lowest efficiency of all. The breast-wheel is employed in some cases where a medium head of water is available, and where it is impractical to erect any

other type. The breast-wheel has a slight advantage over the undershot wheel. The overshot wheel is the most efficient and can stand high head pressure. Whereas in the undershot wheel, a very small portion of the buckets or vanes are in contact with the water and in the breast-wheel type, only about one-third of the wheel is in contact with the water, it is plainly ascertained that in the overshot type practically half of the wheel is constantly in use, thus giving much greater efficiency.

ELECTROSCOPE

(1802) James F. Dickson, New Orleans, La., asks:

Q. 1. Can you kindly give me the details con-



A sensitive device for detecting radio-active substances is an instrument known as an electro-scope. Its complete construction is detailed clearly above.

cerning the construction of a device used in detecting radio-activity?

A. 1. The electro-scope as used in the study of radio-activity and ionization is a very simple instrument to construct and if properly made will give very good results. By using an instrument such as described herewith, Mme. Curie was able to detect a particle of radium weighing but one-hundred millionth of the weight of a single red blood corpuscle. It was discovered by Faraday that due to electrostatic induction, the reading of any electro-scope could not be considered as absolute, unless it was enclosed in a grounded metallic container. To alleviate this, the container is lined with tinfoil on the inside. Glass is much preferred in building it, while a paraffined wooden top, having a bakelite center piece should be employed. A heavy brass rod, terminates at the top end in a brass ball and has affixed at the other end a brass plate and scale. A long and narrow strip of gold leaf is attached by means of a weak solution of gelatin in warm water, acting as the adhesive. Since the gold leaf cannot be touched by the hands, it is advisable to use a knife blade or soft brush or other available instrument to aid in fastening it.

COMPOSITION OF THE ATMOSPHERE

(1803) John B. Treyor, China Pond, Carmel, New York, asks:

Q. 1. Will you kindly tell me the composition by volume of the various constituents of the atmosphere?

FREE INFORMATION

If you want additional information concerning any of the subjects illustrated and described in this number of SCIENCE AND INVENTION we shall be glad to give you other data we have at our command. To make this work as easy as possible for our editors, please be brief. Write only on one side of the paper and state exactly in a few words just what it is you desire further information on. We have the original manuscripts and drawings of many of these articles in our files and can furnish such additional data in most cases. Please do not fail to send stamped and self-addressed envelope. Make all questions concise and specific.

Address all inquiries of this nature to INFORMATION EDITOR c/o Science and Invention, 53 Park Place, New York City.

A. 1. We are giving you the desired information below.

Nitrogen, 78.03%; Oxygen, 20.99%; Argon, 0.94%; Carbon Dioxide, 0.03%; Hydrogen, 0.01%; Neon, 0.0012%; Helium, 0.0004%.

Besides these, there are the various oxides of nitrogen, ozone, water vapor, dust, sulphur fumes, etc.

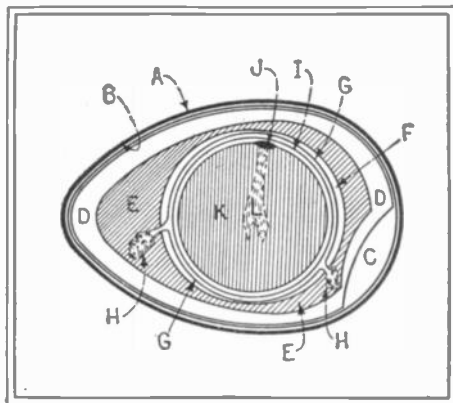
Q. 2. What is the weight of air?

A. 2. The weight of air is taken as 0.001293 grams per cubic centimeter.

THE EGG

(1804) Rupert Tucker, Jersey City, N. J., desires information concerning the structure of delectable hen fruit.

A. 1. With the daily enormous consumption of eggs through the entire world, it is truly re-



What an egg looks like when viewed sectionally. "A" is the shell; "B," double membrane of shell; "C," the air chamber; "D," the outer or fluid albuminous layer; "E," thick, middle albuminous layer; "F," inner albuminous layer; "G," membrane of the Chalaza; "H," the Chalaza; "I," Vitelline Membrane; "J," Germ; "K," Yolk; "L," Latebra. (After Macé.)

markable that we are able to have them strictly fresh on our table. Eggs contain a relatively large portion of proteids, and also mineral matter which latter goes to furnish the salts of the bones, especially calcium phosphate. The egg is one of the most concentrated forms of nutriment in that it furnishes also fat. Proteids serve as a fuel for the body and also provide nitrogen which is very much needed for growing children and in the case of old people to keep the body in repair. So-called egg substitutes have been placed on the market, but strange to say, although claims were presented that they contained all the ingredients of eggs, most of them fell far short. They are composed of other forms of protein matter, usually casein from milk, colored to resemble the egg in tint. Roughly speaking, the egg contains about 70 per cent. of water, 12 per cent. albumin and 12 per cent. fat. What is known as the white of the egg, or albumin, when separated from the yolk, membrane and shell, is a colorless, glary fluid, soluble in water. When the white of an egg is put into boiling water, it undergoes a remarkable change and enters a state of coagulation. In this state it is insoluble in water and opaque, forming a solid mass which however still contains a large proportion of water. It is probable that during coagulation, chemical as well as physical changes may have occurred. It is to this extent that the white of an egg is extremely unstable and of a complex nature, its fixed properties being so indefinite that it is hard to say whether it is a definite chemical compound. The egg albumin may be taken as the representative of a group of substances classified together as proteids or albuminoids. It contains five elements, namely, carbon, hydrogen, oxygen, nitrogen and sulphur. The last named element is the cause of the odor of decaying eggs.

The yolk of the egg is composed of albumin, fat and phosphorous bearing material known as lecithin. It is a well known fact that the yolk of an egg is a much richer food than the white and contains in addition to the nitrogenous element the fat and mineral bodies necessary to nutrition. Due to the porous nature of the shell, the contents within gradually grow less by evaporation and the egg loses weight. Again, air passes through the shell pores, carrying with it various microbes, thus resulting in ultimate decomposition and spoiling the egg. On the surface of the shell, however, there is a thin coat of mucilaginous matter which is easily washed off. As this coating tends to keep the pores closed, it is best for obvious reasons that eggs should not be washed.

Preservation of the egg can be accomplished by artificially coating with a thin coat of varnish, thus rendering it impervious to moisture and air. Water glass or sodium silicate is used to a great extent. However, when boiling eggs so treated, there is the disadvantage of having them break very easily.

Eggs can be tested in various ways, one of which is the salt water test. If perfectly fresh, the egg will sink to the bottom. If it remains immersed in the liquid, it is thought to be about three days old and if it rises to the surface and floats, it is safe to say that it is at least a week old. However, preserved eggs cannot be gauged by these means since it is useful only for eggs that have been kept in the air. The best test for examining eggs is candling, a process which consists of placing the egg between a source of bright light and the eye. When fresh, the egg will show a uniform rose colored tint without any dark spots whatsoever. To make sure that an egg is fresh, it is advisable to break it open and examine the contents as to its odor and taste. In cooking eggs, they should be placed in water about 175° F. in which they should be allowed to remain for ten minutes. As a result, the yolk will be found to be more coagulated than the white—the egg albumin beginning to coagulate at 134° F. and requiring some time to heat the egg throughout. Thus it is not best to actually boil eggs.

AERIAL NAVIGATION INSTRUMENTS

(1805) William J. Crane, Seattle, Wash., desires:

Q. 1. Kindly publish a list of the essential instruments and indicators used on airplanes and dirigibles and other aerial navigating ships.

A. 1. The most essential instruments for navigation in the air are, the compass which indicates the direction in which the air craft is pointing; the air speed indicator, giving the

IMPORTANT

TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers only with the actual number of copies for which they have orders. This makes it advisable to place an order with your newsdealer, asking him to reserve a copy for you every month. Otherwise he will not be able to supply your copy. For your convenience, we are appending herewith a blank which we ask you to be good enough to fill in and hand to your newsdealer. He will then be in a position to supply copies to you regularly every month. If you are interested in receiving your copy every month, do not fail to sign this blank. It costs you nothing to do so.

To _____ Newsdealer
Address _____

Please reserve for me _____ copies of
SCIENCE & INVENTION every month
until I notify you otherwise, and greatly oblige,

Name _____
Address _____

speed of the airship relative to the air; the altimeter, indicating height. Then there is a multiplicity of other instruments which give certain other necessary data and are known as follows: The turn indicator, to assist in flying through clouds; the aero-bearing plate, for fixing position and determining ground speed and drift (from which the wind velocity may be determined); a course-setting instrument by which the operation of course-setting, radius of action, interception, correction of wrong course or calculation of wind may be carried out. Precision thermometers, barometers, and hygrometers are also carried. In addition, a sextant is sometimes carried, but it is only effective for taking bearings to celestial bodies during an ocean passage or at night.

ASTRONOMY

(1806) Loren Lorensen, Brooklyn, New York, wants to know:

Q. 1. What is the force which holds the planets in their orbits? I understand that the sun has something to do with it, but do not understand what force counterbalances this attraction. What causes the planets to rotate on their axis, also why is it that the planets such as Jupiter and Saturn rotate on their axis many times faster than our earth? Kindly explain in full detail.

A. 1. We have referred your letter to Mrs. Isabel M. Lewis, M. A., of the United States Naval Observatory at Washington, D. C., who writes as follows:

"You ask what is the force which holds the planets in their orbits and what force counterbalances it. It is the gravitational attraction of the sun that holds the planets in their orbits. Every particle of matter in the universe attracts every other particle with a force that is directly proportional to the product of their masses and inversely proportional to the square of their distance apart. This is the universal law of gravitation discovered by Sir Isaac Newton. The law of gravitation for falling bodies at the surface

of the earth was known before the time of Newton, but he showed that the law of gravitation is *universal* and is the force that holds the heavenly bodies in their orbits. It is the tendency of every body to travel in a straight line if undisturbed by outside forces. The gravitational attraction of the sun is the force that keeps the planets from going off at a tangent to their orbits.

"The planets probably rotate on their axes because they received the rotational impulse at the time of their origin from the original solar mass. The earth, Mars, Jupiter and Saturn rotate on their axis from west to east, the direction of their revolution around the sun. There is some uncertainty as to the direction of rotation of the other planets because their surfaces cannot be seen well enough to determine the direction in which they rotate. Nearby bodies of large mass would have a very great effect on the direction of rotation of any member of the solar system. The moon, for example, always keeps the same face turned toward the earth. This peculiarity of rotation is probably due to the manner of its origin and nearness to the earth. We cannot say why Jupiter should rotate so much more rapidly than the earth, because we do not yet know how the planets originated. That is one of the problems the astronomers are still puzzling over.

"Jupiter and Saturn may, in a way, be considered to be semi-suns. Their densities do not differ greatly from that of the sun. They do not shine by their own light, however, and they give forth little if any heat. They are doubtless largely in a molten state. Jupiter may be partly in a molten state. Beyond a doubt, both of these bodies are surrounded by dense vapors. Their interiors may be very hot even if little or any heat escapes to outer space. The density of Saturn is less than that of water so it must be chiefly gaseous. Certainly neither of these bodies have solid surface crusts. There are certain definite facts known about these planets such as size, mass, density, rotational periods, presence of dense atmosphere, etc., but there are other facts that are not so well known and we can only speculate about these at present."

RELATIVITY

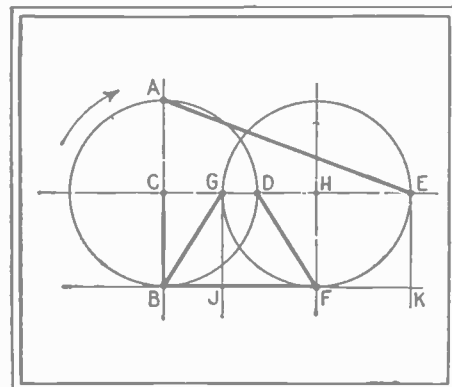
(1807) Charles C. Johnson, St. Louis, Mo., wants to know:

Q. 1. Is it true that the upper portion of a wheel travels faster than that part in contact with the ground?

A. 1. While it is true that the upper portion of a wheel has less resistance than the lower part in contact with the ground, due to the fact that there is such little compression in the members of the wheel and also that each point on the periphery of said wheel is fixed in relation with any other point and with the center, it remains clearly evident that one part cannot go faster, actually, than any other.

Let us refer to the diagram. We have here a wheel with center C. Suppose we move said wheel 1/4 of a turn and we will have as a result the wheel with its center now at H. B will have traversed the distance BG, while A, the distance AE; and D the distance DF. With relation to the earth, B will have moved the distance BK. Note the relative values of the distances BJ and BK that simply denote the relative speeds of both the lower and upper portions of the wheel. However, both the actual linear and angular velocities remain the same for A and B. Thus you can see that relatively, with relation to a fixed point on the earth, there is quite a large difference in the speed of different points on the periphery of the wheel, but actually each point has the same angular and linear velocity with respect to the center of rotation.

We assume a wheel to carry a vehicle. The velocity of its center will be equal to that of the vehicle. The tangential velocity of its high-



Does the top of a wheel really go faster than the bottom? Relatively, yes, but virtually it is foolish to conceive of such as an actuality. Note the diagram carefully.

est part will be twice the velocity of the center, while the part touching the ground will be stationary, but this relation only persists for an infinitely small space of time. The question is often propounded as a sort of catch.

Awards in \$1000 Monthly Contest

The Regular Departments Pay Prizes of Their Own. Authors on Contract Receive Their Own Rates; this, With Other Special Payments Makes the Total Paid for Articles in Excess of \$1500.00 Monthly.

FIRST PRIZE \$100.00

Trick Sub-Sea Photography, by Edwin Schallert.....980-981

SECOND PRIZE \$75.00

Social Life of the Ant, by Dr. Ernest Bade.....982-983

TWO PRIZES OF \$50.00 EACH

Find the Hair—Find the Criminal! by Mel Wharton..... 984
How to Build an Auto Speedster, by George A. Luers..... 1004

THREE PRIZES OF \$35.00 EACH

Poison Gas Shells, by Lieut. Robert E. Sadtler, U. S. Army.. 989
How We Digest Foods, by Ismar Ginsberg..... 1000
One Hundred Foot Aerial Tower, by Fred A. Parsons..... 1015

FIVE PRIZES OF \$25.00 EACH

Shooting the Air to Test Wind, by Ernest Brennecke..... 976
Automatic Railroad Crossing Gate, by J. W. Von Stein..... 977
Phosphorescence, by Raymond B. Wailes..... 997
Stunts for Smoker, by Walter B. Gibson..... 999
A Low-Loss Broadcast Receiver, by Frank Frimerman..... 1016

FIVE PRIZES OF \$20.00 EACH

If New York City's Water Supply Should Fall as Rain, by C. N. Holmes 977
Safety Razor Blade Gives 400 Shaves, by O. H. Knoon..... 993

Stereoscopic Movies, by O. A. Owen..... 996
Some Unsolved Riddles of Science, by O. Ivan Lee..... 996
Soap Doll Actor, by Latimer J. Wilson..... 1002

TEN PRIZES OF \$15.00 EACH

Fireworks Photo, by J. M. Howard..... 996
An Emergency Foot Bridge, by P. C. v. Petegem..... 1006
Small Microscope from Glass Beads, by Ed. Kuwath, Jr.... 1006
Time Glass, by F. R. Newton..... 1007
Magnetic Snake, by S. Leonard Bastin..... 1007
Egg Trick, by C. L. Walter..... 1007
Novel Experiments with Heat, by Earle R. Caley..... 1008
Hookup, by E. E. Laufer..... 1017
Hookup, by J. B. Cook 1017
Hookup, by Mathias Thury 1017

FIFTEEN PRIZES OF \$10.00 EACH

For Walkers (author send address) 1003
Hammer Kink, by Florence E. Moore..... 1007
Printing Mask, by A. P. D'Ambra..... 1007
Soldering Iron, by George A. Coates..... 1007
Paper Holder, by S. Schlesinger..... 1008
Jar Rack, by E. M. Quimby..... 1008
Letter Scale (author please send address)..... 1008
Poem—George Gray 1059

(No further Entries)

\$13,320.00 in Prizes Paid Last Year

WITH the December issue our \$12,000 a year prize contest came to a happy conclusion. Not only did we pay out \$12,000 in prizes as announced in our November, 1923 issue, but we did actually pay out in prizes alone, not less than \$13,320.00 to 1,112 winners. These prizes every month ranged from the first prize of \$100.00 down to the smallest prize winner of \$1.00 each.

Up to the time of going to press, SCIENCE & INVENTION had no less than 18,590 reporters scattered over every section of the globe. These reporter-contributors have sent in an avalanche of material, and their efforts have been fruitful in that they have won prizes.

SCIENCE & INVENTION aims to print the news first, if it is inter-

esting and to otherwise excel in the reporting of science and invention. Small wonder then that with the enthusiastic co-operation of our thousands of Reporter-Correspondents, SCIENCE & INVENTION today occupies an enviable position in the scientific press.

The \$12,000.00 prize arrangement has worked out so satisfactorily during the year just closed that we have decided to extend it for another year and we hope that our correspondents will be as successful in winning prizes for the coming year as they have been during the past one. We wish to thank all of our friends for their co-operation and wish them the best of luck for the coming year.

Note New Prize Schedule.

Here Is How You Can Get in the Contest:

\$12,000 or More in Gold

EVERY month SCIENCE AND INVENTION pays \$1,000 or more in gold in prizes. Every text article published will receive a prize—(most of the departments have awards of their own which they give every month). Ideas are what the Editors want. The ideas must be told simply, so that your mother or your sister can understand them—in pictures or sketches or both. But the idea must be new and must have something to do with science or invention.

The Editors want pictures and sketches—must have them—but what they want most

82 monthly prizes will be given as follows:

	FIRST PRIZE \$100.00
	SECOND PRIZE \$75.00
2	PRIZES OF \$50.00 each
3	“ “ 35.00 “
5	“ “ 25.00 “
5	“ “ 20.00 “
10	“ “ 15.00 “
15	“ “ 10.00 “
10	“ “ 5.00 “
15	“ “ 2.00 “
15	“ “ 1.00 “

\$12,000 or More in Gold

is IDEAS. These ideas will be handsomely paid for. We have published a pamphlet showing the rules of the contest which we shall be glad to send to anyone free on receipt of a postal card with your name and address. The pamphlet gives full details, the rules and how to submit articles. The magazine itself shows you what is wanted. Study it closely and submit your ideas.

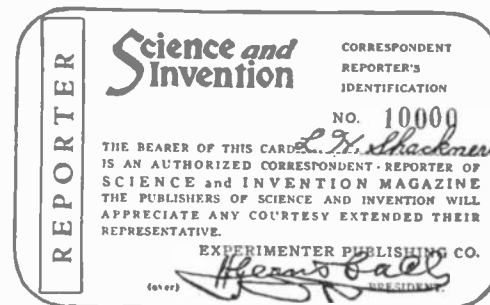
The closing date for all prize contributions is the 15th of the month preceding date of issue, i.e., the 15th of Feb. for the April issue, the 15th of March for the May issue, etc.

WILL YOU BE OUR REPORTER?

IN connection with our \$12,000 prize contest announced herewith, it goes without saying that you will have to do a little work in order to win a prize. The Editors do not wish to make it hard for you, quite the contrary. We want pictures and ideas and we cannot have too many of them.

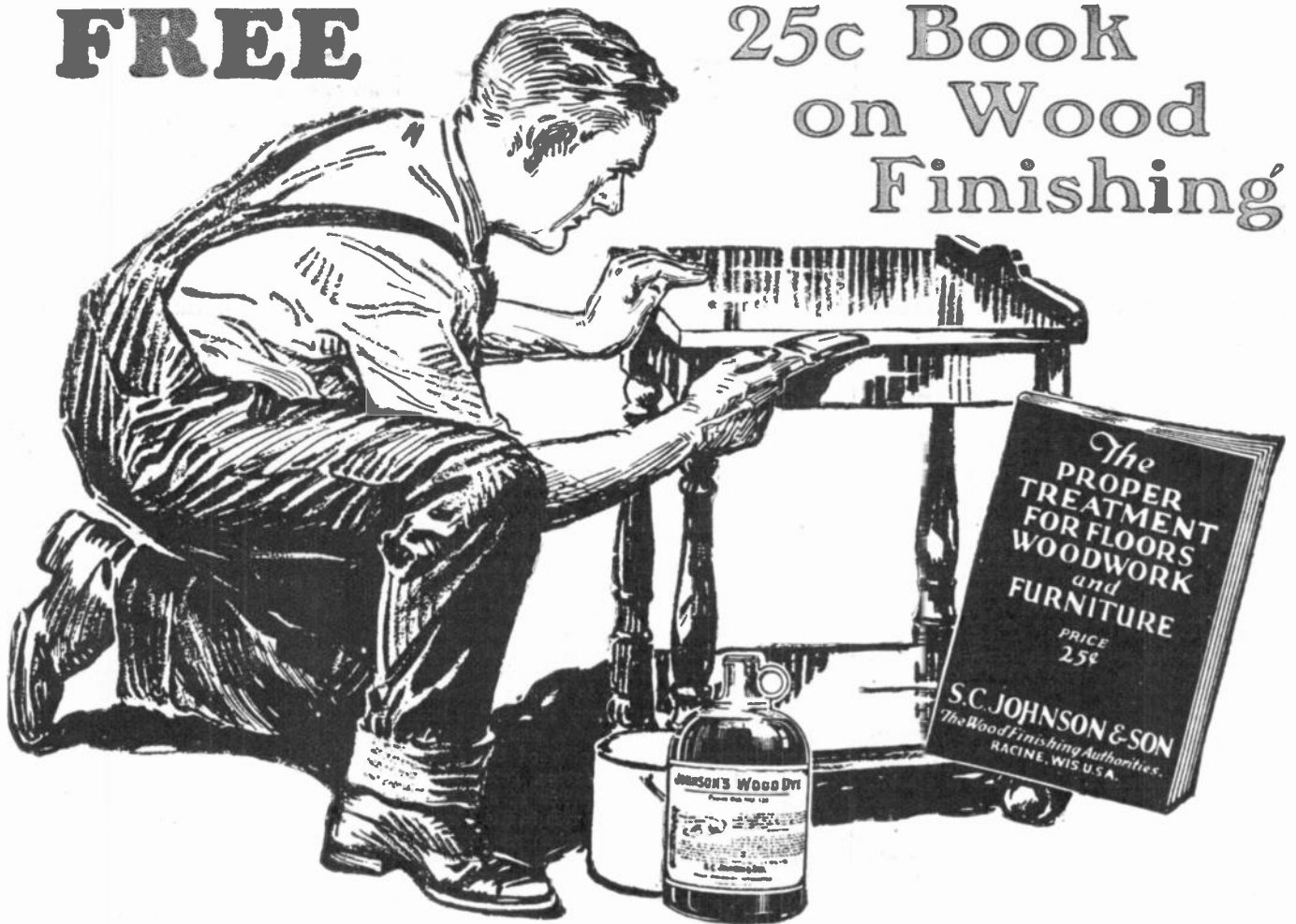
Herewith is reproduced our reporter's card. Up to now we have issued over 18,000 of these. Note in our awards how our reporters are winning prizes right along. We shall be glad to send the reporter's card free to anyone who makes an application for it. By means of this card you will be able to secure entry into industrial plants, business houses, motion picture studios, steamships, docks, public buildings, etc. This reporter's card will prove an open sesame to you in many instances. Every card is numbered and only one is given to a correspondent. A postal card from you and a request for this reporter's card is all that is necessary to obtain one. It will be sent to you by return mail. With it we will send you a pamphlet giving rules of the contest and how to proceed in order to get photographs, to send in sketches, and other information in order to obtain a valuable prize. Not only will this card help you to obtain material for this magazine, but it will train you to become a news gatherer, and will be the means of helping you to earn a good deal of money during your spare hours.

Address Field Editor. SCIENCE AND INVENTION, 53 Park Place, New York



FREE

**25c Book
on Wood
Finishing**



Our book gives complete instructions for finishing all wood—hard or soft—old or new. Tells how inexpensive soft woods may be finished so they are as beautiful and artistic as hard wood. Explains just what materials to use and how to apply them. This book is the work of experts—illustrated in color—gives covering capacities—includes color charts, etc. Use coupon below for a FREE copy.

JOHNSON'S WOOD DYE

(Penetrating)

Johnson's Wood Dye is very easy to apply. It dries in four hours and will not rub off or smudge—penetrates deeply, bringing out the beauty of the grain. Johnson's Wood Dye is made in 17 popular shades as follows:

- | | |
|------------------------|-----------------------|
| No. 128 Light Mahogany | No. 125 Mission Oak |
| No. 129 Dark Mahogany | No. 130 Weathered Oak |
| No. 127 Brown Mahogany | No. 110 Bog Oak |
| No. 329 Red Mahogany | No. 172 Flemish Oak |
| No. 120 Fumed Oak | No. 178 Brown Flemish |
| No. 123 Dark Oak | No. 131 Walnut |
| No. 126 Light Oak | No. 140 Early English |
| No. 124 Golden Oak | No. 180 Gray |
| No. 160 Brown Oak | |

All shades may be easily lightened, darkened or inter-mixed. Full directions on every label. Select the shade of Dye you want from the list above and order it from your dealer by name and number.

S. C. JOHNSON & SON, Racine, Wis., U. S. A.
"The Wood Finishing Authorities"

Johnson's Wood Dye is a dye in every sense of the word. It contains no finish whatsoever. Like most first class products it answers one purpose only—it dyes the wood—the finish must be applied over it. We recommend Johnson's Varnishes or Johnson's Polishing Wax.

Stores displaying the Johnson Service Department Sign carry a complete stock of Johnson's Artistic Wood Finishes and will be glad to show you finished wood panels—and answer questions on how to finish wood the proper way.



S. C. JOHNSON & SON, Dept. S.I. 2, RACINE, WIS.
"The Wood Finishing Authorities"
(Canadian Factory—Brantford)

Please send me free your Instruction Book on Home Beautifying and Wood Finishing. I enclose 10c to cover postage and wrapping.

MY DEALER IS.....

My Name.....

Address.....

City and State.....



Choose as Your Profession ELECTRICAL ENGINEERING

Electricity offers a brilliant future to the young man who is about to choose his career. Never before has there been such wonderful opportunity in this great field. Big paying positions in electrical work the world over are open to trained men—men who possess specialized, practical knowledge. Come to the School of Engineering of Milwaukee—the largest and best equipped electrical school in America. Here you are trained in both theory and practice by a faculty of experts. You learn in large, finely equipped laboratories. If you have 14 high school credits or equivalent, you can become an Electrical Engineer with a Bachelor of Science degree in 3 years. If you lack these credits they can be made up in our Institute of Electrotechnics in a short, intensive course.

Practical Electrical Education

Learn by the thorough approved scientific methods which our twenty years of specializing enable us to give you. In addition to Electrical Engineering, the following complete courses are given: A. C. and D. C. Armature Winding—Wiring and Testing—Practical Electricity—Drafting—Electrotechnics—Commercial Electrical Engineering—Auto Electrical Service Engineering and Automotive Electricity.

EARN WHILE YOU LEARN

You can earn money to help defray your expenses while learning. Our wonderful co-operative plan brings an Electrical Career within the reach of every ambitious man. Our Free Employment Department secures positions for those students who wish to earn part or all of their expenses. In addition, the Department will help you get a good position in the Electrical industry when your training is completed. Daily Broadcasting W.S.O.E.

New Term Opens February 16th

Big Book FREE

Mail the coupon today for our big new illustrated catalog. Mention the course that interests you most and we will send you special information. Read about the school that trains men for practical and quick success. See how easy it is for you to get the training that will enable you to step to a splendid position and a handsome income. Mail the coupon right NOW. No cost or obligation.

SCHOOL of ENGINEERING of Milwaukee

Dept. SI-225

415 Marshall St., Milwaukee, Wis.

SCHOOL OF ENGINEERING OF MILWAUKEE
Dept. SI-225, 415-17 Marshall Street,
Milwaukee, Wis.

Without obligating me in any way, please mail free 72-page illustrated book, "Electricity and the One Best Way to Learn It," and particulars regarding the course I have marked with an X.

- Electrical Engineering.
- Electrotechnics.
- Commercial Electrical Engineering.
- Automotive Electricity.
- Auto Electrical Service Engineering.
- Radio Sales and Service.
- A.C. and D.C. Armature Winding.
- Light, Motor Wiring and Testing.
- Practical Electricity.
- I am interested in your "Earn While You Learn" Plan.

Name..... Age.....
Address.....
City..... State.....
Education.....

Doctor Hackensaw's Secrets

By CLEMENT FEZANDIÉ
(Continued from page 991)

to a pick-pocket, for instance. He could see at a glance how much money each man was carrying in his pocket-book, and could know which ones were worth robbing.

The doctor remained obdurate, but alas, the locks in the office were of the most primitive kind. With the aid of a button-hook, Miggs was able to pick the lock of the closet, and that night at ten o'clock he was at the appointed trysting place, and a pair of the magic spectacles were in his pocket.

CHAPTER III

Miss Muriel Gold was the tool of a gang of professional yegg-men. Poor girl! She was not innately wicked, but she had succumbed to the wiles of a professional burglar, and after he had ruined her and taken her from her home, he had gradually forced her to help him and his pals in their nefarious schemes. The gang was well organized and very successful, with spies everywhere to report where good hauls were to be made.

One of these spies was in Doctor Hackensaw's employ. In some way this fellow had heard of the Z-ray spectacles, and the chief of the yegg-men, on learning of the existence of this wonderful device, resolved to obtain a pair of the spectacles at any cost. Evidently the simplest way was to use Muriel Gold as a lure, and she, much as she disliked the task, dared not refuse. She was wholly in the power of the gang. Hence, it was that she had waited for Miggs at the theatre, and hence it was that she met him the second time to bring him in her auto to one of the lairs of the gang.

Miggs did not have long to wait for her. Scarcely had he stationed himself in front of the theatre, when the young lady made her appearance in her auto.

"Have you got the spectacles, Miggs?" she asked eagerly.

For an answer, Miggs slapped his bulging pocket.

"Then jump in quickly and come to my house, and I will explain to you what I wish you to do. It will be the chance of your lifetime to make your name as a detective."

A half hour's ride brought the pair to a house in an unfrequented part of the city. Here the young lady descended, and, followed by Miggs, entered the house. Muriel conducted him into a parlor, and was delighted with the spectacles whose operation Miggs carefully explained to her.

"Now, Miggs," said the young lady. "I will explain what I wish you to do. But as I shall need you for a couple of weeks, you'd better write a word to Doctor Hackensaw to tell him you are called to the bedside of a dying relative in Chicago and that you will be gone for some time. Then we shall have lunch and you can start on your career as a detective immediately afterwards."

Miggs cheerfully wrote the letter, and then refreshments were served. But the drink served to our hero was drugged, and it was not long before he felt a drowsiness steal over him, and was soon sound asleep.

It was hours before he awoke again, and when he did he found himself a prisoner in a small but comfortable cell, but with iron bars on the windows. And the magic spectacles had disappeared!

CHAPTER IV

From that day on, New York city was startled by a series of astonishing safe-rob-

(Continued on page 1028)

Make BIG MONEY! IN RADIO

We Need Men—Can You Qualify?

Ozarka representatives make real money because they give real values and deliver a real service. For instance, there is a 4-tube Ozarka Instrument for loud speaker operation, giving wide range of reception at \$39.50. Our men demonstrate Ozarka Instruments and install.

The Instrument makes the sale easy by its performance. We train you to know radio and our methods, make you worthy to wear the Ozarka button as our accredited representative. Previous experience is not necessary. In fact we prefer to do our own educating. If you have a clean record, are industrious, and have saved up a little cash, here's a real opportunity, if you can qualify for an exclusive territory. We already have 2247 representatives. Territory going fast.

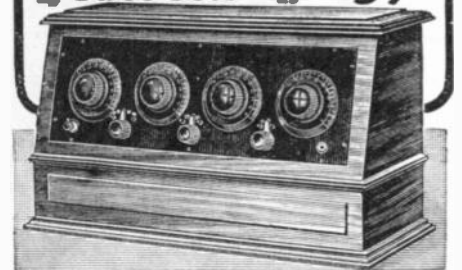


FREE, LARGE
Illustrated BOOK

WRITE Today for illustrated book No. 101 that gives the entire Ozarka Plan. Don't fail to give the name of your county.

OZARKA, Inc.
850 Washington Blvd.
CHICAGO

4 Tube Sets As Low \$39.50



Amateur Mechanics—Model
Makers—Students



WADE
BENCH-LATHE
Cap: 4" dia. x 12"
length. Slidestock has
travel entire length of
bed. Leadscrew inside
thread. Hollow spindle.
Turning, facng, bor-
ing, drilling, wind-
ing, thread-cutting.

Price \$28 F. O. B. New York. Free Circulars.
THE GEROLD COMPANY
Dept. S-6, 120 Liberty Street New York

HOME STUDY

Become More Efficient

through courses in Mathematics, History, English, Chemistry, Psychology, Education, Business and 35 other subjects which the University gives by mail. They command credit toward a Bachelor degree and may be begun at any time.

The University of Chicago
27 Ellis Hall Chicago, Ill.



Mailing Lists

Will help you increase sales. Send for FREE catalog giving contents and prices on thousands of classified names of your best prospective customers—National, State and Local—Individuals, Professions, Business Concerns.

99% Guaranteed
ROSS-Gould Co. 10th St. St. Louis

WHY NOT spend Spring, Summer and Fall gathering butterflies, insects? I buy hundreds of kinds for collections. Some worth \$1 to \$7 each. Simple outdoor work with my instructions, pictures, price-list. Send 10 cents (not stamps) for my illustrated Prospectus before sending butterflies. Mr. Sinclair Bx. 1424, Dept. 33. San Diego, Calif.



Inventors Protect your rights!
Recording Blank Free.
Consult me if you have an undeveloped invention or idea. Do not delay!
O. S. Leszay Registered Attorney and Engineer
15 Park Row, New York, N. Y.

Insure your copy reaching you each month. Subscribe to SCIENCE & INVENTION—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N. Y. C.



Dry "B" Batteries are an economical, dependable and convenient source of plate current!

No. 770, 45-volt extra large vertical. For heavy duty only. The ideal "B" Battery for use on multi-tube sets. Price \$4.75.

Scientists constantly improve battery quality

EVEREADY "B" Batteries today contain more electricity, more service, more satisfaction than ever before.

Processes evolved by the scientists of the Union Carbide and Carbon Research Laboratories, Inc., when put in effect in the Eveready factories, are responsible for this great accomplishment.

At the same time the factories have effected a still higher standard of workmanship. A system of inspection that is a marvel of efficiency was inaugurated. The results, gratifying beyond measure, were accomplished with a speed and completeness that have few parallels in industry.

The final tests showed more electricity, more battery service, greater Eveready satisfaction without increasing battery sizes and with a substantial reduction in price. "B" Battery operating costs, using the new Evereadys, in most cases show a reduction of at least one-half.

There is an Eveready Radio Battery for every radio use.

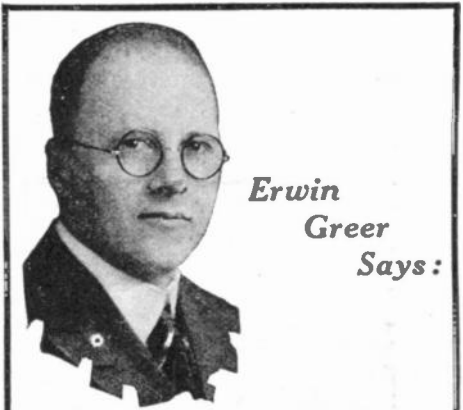
Insist on Eveready "B" Batteries.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
 Headquarters for Radio Battery Information
 New York San Francisco
 Canadian National Carbon Co., Limited, Toronto, Ontario

EVEREADY Radio Batteries

- they last longer

EVEREADY HOUR
 EVERY TUESDAY at 9 P. M.
 (Eastern Standard Time)
 Broadcast through a chain of prominent
 interconnected radio stations.



Erwin Greer Says:

"BE THE MAN Never Out of a Job"

"My Special Shop Training Prepares You for Steady Employment, or a Business of Your Own, Earning Big Money."

MEN WANTED

for jobs paying

\$50 to \$125 per week!

Thousands of high-pay automotive positions are open for men who have the training necessary to fill them. Hundreds of these jobs are offered by our Free Employment Bureau. YOU can have one of these big money jobs. Eight weeks of interesting training at Greer College will qualify you for big earnings. Then you are equipped for life.

GO IN BUSINESS FOR YOURSELF

Greer training equips you to own and run your own garage or repair shop. You can start with small capital (\$25 to \$50) and buy new equipment as your business grows. Thousands have started this way. We will teach you how.

EARN WHILE YOU LEARN

FREE EMPLOYMENT SERVICE

Our Free Employment Bureau will help you get an earn-while-you-learn job and place you when you graduate. Only a small payment down on selected course is necessary. Here in the big Greer shops you get actual work on 4, 6, 8 and 12 cylinder engines. Complete Greer Course includes Machine Shop Practice—Shop Management—Selling—Truck, Tractor and Automobile Repairing—Lighting—Starting—Vulcanizing—Storage Batteries—Driving—everything required to make you an all-around automobile expert.

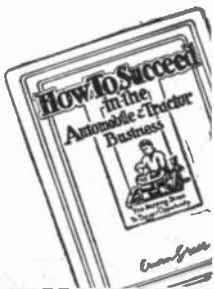
DAY AND EVENING CLASSES

Outside work need not interfere with instruction in the big Greer shops. You will find our training hours suited to your convenience.

MAIL THE COUPON

for **BIG FREE BOOK**, "How to Succeed in the Automobile and Tractor Business." We will also send Special Tuition offer and complete information about jobs.

Get this FREE BOOK



2024 S. Wabash Ave.

Dept. 3303

CHICAGO, ILL.

MAIL THIS COUPON

ERWIN GREER, President,
2024 S. Wabash Ave., Dept. 3303, Chicago, Ill.

Please send me FREE Book "How to Succeed in the Automobile and Tractor Business" and special training offer. This request does not obligate me in any way.

Name

Address

Doctor Hackensaw's Secrets

(Continued from page 1026)

beries. How the burglars obtained their information was a marvel, for their robberies were timed to occur on the very night when there happened to be important sums in the safes. It seemed certain that there must be collusion between the burglars and some trusted employes, but in many cases the employe had served faithfully for years. The thing was apparently inexplicable, yet the explanation was simple.

Muriel Gold could have thrown considerable light on the matter, for it was usually she who visited the different banks or business houses, and by means of the magic spectacles looked through the walls of the safes to see if they contained anything worth taking—she also, when visiting her friends in the fashionable world, looked through the spectacles into their bureau-drawers to see if there were any pearl necklaces or other jewels worth stealing. No hiding place was secure against her piercing eyes, and for many a rich haul was the gang indebted to these Z-ray spectacles.

Meanwhile Doctor Hackensaw had not missed the spectacles. He had received Miggs' note, so was not worried about the boy. But it so happened that the doctor was asked to rewrite a magazine article about the value of these new Z-ray spectacles.

He had accordingly begun by setting forth their value to the police. A detective equipped with these spectacles could spot at once a revolver in a man's hip-pocket, a razor concealed in his boot, or a set of burglar tools in his valise. They could look through the walls of a counterfeiter's den and see the men at work. They could secure evidence against gambling houses in the same way, and could detect loaded dice or faked roulette wheels at a glance. The smuggling of "hootch" would be a thing of the past when a single look through these spectacles would reveal its hiding place in an automobile or coffin.

Custom-house officials would no longer need to turn the contents of travelers' trunks topsy-turvy. A glance into the closed trunk through the Z-ray spectacles would reveal smuggled goods without trouble. Passengers would be saved the indignity of a personal search, as the spectacles would reveal at once any forbidden goods concealed on their persons. Prisoners could no longer hope to bring concealed files or saws with them into their cells.

To physicians the spectacles would be invaluable. It would enable them to watch the working of every organ inside their patients. The slightest derangement would be manifest. Chemists could detect adulterations in their drugs, and manufacturers detect flaws in their castings. Mechanics could perceive internal crystallizations in their machines at a glance. A chauffeur could locate his troubles without having to take his car apart. In a word the uses of these spectacles were manifold. There was scarcely a branch of art or science which they would not materially benefit.

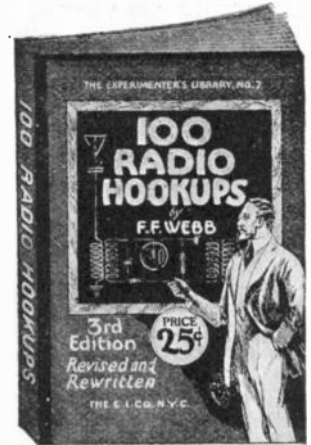
As he wrote, the doctor bethought him that he wished to locate some trouble he had with one of his new machines, so putting down his pen, he sought in his desk for the Z-ray spectacles he had shown Miggs. They were gone!

Instantly there flashed into his mind the boy's request for a loan of the spectacles. The inference was obvious. Miggs must have taken them without leave.

"What a lad!" exclaimed the doctor. "I'll bet he's up to some mischief!"

(Continued on page 1030)

100 Radio Hook-Ups



Revised Edition

16 PAGES ADDED

The most complete, practical and up-to-date radio hook-ups book obtainable. Just revised and brought up to the minute by one of the foremost radio engineers in the industry.

Contains only practical, efficient hook-ups, Crystal sets, one tube sets, reflex, regenerative, radio frequency, and super circuits.

Gives all important details of each circuit so that the constructor can build the set he desires.

All Orders Filled Within 24 Hours. You Can Obtain a Copy at All Reliable Radio and News Dealers.



Prepaid

THE E. I. COMPANY

Sole Distributors

THE CONSRAD COMPANY
233 Fulton St. New York City

CONSRAD

"RADIO'S FOREMOST PUBLISHERS"

Mason, Fenwick & Lawrence Trade Mark and Patent Lawyers

Washington, D. C. :: New York :: Chicago

Established over 60 years.

Write us.

References: National Confectioners' Association, Chicago; National Cannery's Association, Washington, D. C.; Life Savers, Inc., Port Chester, N. Y.; Bon Ami Co. and U. S. Cigar Co., New York City; Hershey Chocolate Co., Hershey, Pa.; Stephen F. Whitman & Son, Philadelphia, Pa., and many others.

Inventions protected. Trade marks registered.

RADIO ENCYCLOPEDIA

FREE! Thousands of radio bargains, standard sets, standard parts for sets, vacuum tubes, etc., at one-third less than regular prices, also latest information on all circuits, complete list of broadcasting stations and other valuable data. Send name and address, we'll send you 50c book FREE!

FREE SERVICE DEPARTMENT. Mr. Doctor of N.Y.C. Will help you solve your radio problems, and furnish up-to-date information on set construction, operation, improvement. This service FREE to our customers. Write today!

NORWALK RADIO CORP
Dept. 52A 66 READE ST., NEW YORK



Starrett

*Why are
Starrett Tools
Standard
in every Shop*



Fine Precision Tools—2200 from One

In something over forty years the Starrett Line has increased from a single tool, the famous Combination Square, to include over 2200 different Precision Tools, Hacksaws and Steel Tapes. Those years have seen the growth of a business that now requires the largest plant in the world devoted exclusively to the manufacture of fine mechanical tools.

From the first mechanics to whom Mr. L. S. Starrett sold his Improved Squares and Rules, the roll call of Starrett Users has grown year by year until today every country in the world which uses machinery and precision tools knows Starrett as the standard of accuracy.

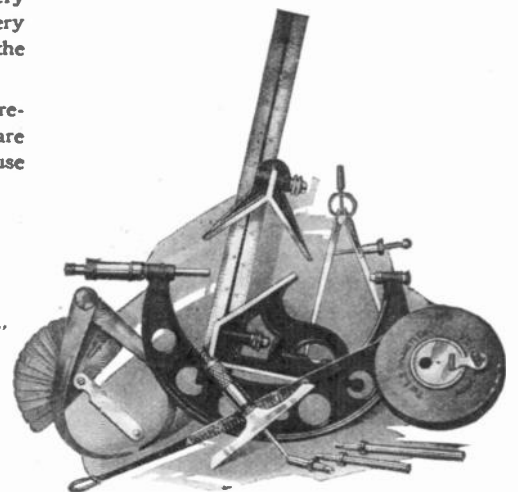
What is the cause of this world-wide preference for the Precision Tools that are made in Athol, Massachusetts? If you use Starrett Tools you know.

Shown in the group at the right are the following popular Starrett Tools: Micrometer Depth Gage No. 440, Improved Firm-Joint Calipers, No. 26, Fay Spring Dividers, No. 77, Quick Reading Steel Tape, No. 510 (with Leather Case and Patented Push Button Handle Opener), Micrometer No. 224 A (with interchangeable Anvils giving range of 2" to 6"), Combination Square No. 11, and Thickness Gage No. 72. Write for Catalog No. 23 "LE" for description of the complete Starrett Line.

THE L. S. STARRETT CO.

*World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
ATHOL, MASS.*

7441



WURLITZER

**Couldn't Play a Note—
Now Makes \$100⁰⁰
a week**

*"Bill Carola"
Landaus
Serenaders*



Read Bill Carola's story in his own words—
 "When I sent for your catalog, I wanted a Tenor Banjo, but I hesitated a long time as I didn't know a note of music. I finally decided to try it a week, as you offered, and at the end of that time I found I could pick a few notes. Then I started the correspondence course you furnished, and in seven months, even before the final payments on the Banjo were due, I had taken my place in a professional orchestra. Now I am making \$100 a week, three times what I made as a clerk. Two of my friends made money with their instruments after five months practice, one a drummer and the other a saxophonist, and neither could play a note when he started. I wish everybody knew how easy it is—anyone who can whistle a tune can learn to play a musical instrument."
Bill Carola

New Offer

**Learning to Play
Made Easy
FREE**

We now furnish with every instrument a Free Scholarship Certificate. This scholarship entitles you to free tuition in one of the foremost correspondence schools of music in the country. Whether you want to learn to play for profit or only for pleasure, this Free Scholarship will make it surprisingly easy for you.

**Free Trial
Easy Payments**

You may have any Wurlitzer instrument for a week's free trial in your own home. No obligation to buy. Payments are arranged in small monthly sums a few cents a day will pay for your instrument. Wurlitzer instruments are the result of 200 years' experience in musical instrument building. Famous for artistic quality, rich tone value and fine workmanship. Used in the finest bands and orchestras throughout the world.

Free Book

Illustrates and describes every known musical instrument—over 8000 articles. Special offers on complete outfits. Special prices direct to you. We also give you our Free Trial, Easy Payment plan and special Free Scholarship offer. No obligation.

Send Coupon Today



The Rudolph Wurlitzer Co., Dept. 1252
 117 E. 4th St., Cincinnati 329 So. Wabash Ave., Chicago
 120 W. 42nd St., New York 250 Stockton St., San Francisco

Send me your Free Book on Musical Instruments. Also your Free Trial, Easy Payment plan and Free Scholarship offer. No obligation.

Name _____
 Address _____
 City _____ State _____
 Instrument _____
 (State instrument in which you are interested)

Copyright 1924, The Rudolph Wurlitzer Co.

Dr. Hackensaw's Secrets

(Continued from page 1028)

And then sub-consciously there arose in his mind the series of safe-roberies that had taken place in the last two weeks, and the connection between the two events struck him forcibly.

"Some gang of burglars have got hold of the spectacles!" he cried. "That explains the whole thing! That explains how they are able to tell which safes contain money. I must get those spectacles back at any cost. Luckily I can locate them easily. There are no other Z-rays in existence but those that I have produced. My special detector can locate them if they're anywhere within a thousand miles of here. In five minutes I shall know exactly where they are!"

It was but a moment's work to switch on the detector, and after carefully insulating his other Z-ray spectacles, he watched the indicating compass needle as it swung quivering around on the dial.

"The needle points almost due North," he soliloquized, "and the strength of the Z-waves indicates a distance of about five miles. The spectacles must, at the present moment, be somewhere in Van Cortlandt."

"Pep," he called aloud. "Do you want a chance to distinguish yourself by catching a gang of burglars?"

Pepita Perkins stopped her type writing with a jerk. "What!" she cried aghast.

"If you want to make a little pocket money, Pep, there are big rewards offered for the capture of this gang of yeggmen, and the recovery of the stolen goods. I'll send "Spaghetti" Joe with you and two or three other stout men to help him, while you can go along with another pair of my magic spectacles, and boss the whole affair."

The preparations took but a very few minutes. "Spaghetti" Joe was a reformed safe breaker, whom Doctor Hackensaw had taken into his employ. A full set of burglar tools was put into an automobile, for it might be necessary to break into a house or open a safe, and Joe was the man who knew how to do it. The men were also provided with special gas throwers designed to throw a soporific gas that would overpower the burglars and render them incapable of resistance. The detector was also taken along to guide them to the exact spot.

The five miles to Van Cortlandt were covered in no time, and the automobile soon brought them near a lonely house not far from Van Cortlandt Park. Here they descended from the machine and circled around the house, and to their gratification the needle of the indicating compass turned so as to point always directly toward the house. There was no doubting the evidence! The Z-ray spectacles must be somewhere within that building.

Pep therefore took her second pair of spectacles out of its insulated case, and creeping quietly up to the house, peered through the walls. In one room she saw a dozen men smoking, drinking, and playing cards—evidently the gang. In another room, a beautiful young lady was lying on a couch reading. This was Muriel. In still another room was a boy, locked in and vainly seeking some means of escape. Pep's heart gave a jump as she recognized Miggs.

Without a word Pep handed the spectacles to "Spaghetti" Joe who had followed her.

"It's too dead easy!" cried Joe. "They're all bunched in one room and half-drunk. We can get them without any trouble."

To open a window and climb into the house was the work of an instant. Pep, Joe and the three men put on their gas-masks,

(Continued on page 1032)

Make Money Taking PICTURES



Tremendous, big-paying opportunities are open for ambitious men in Modern Photography. This is the picture age. Magazine and newspaper publishers buy thousands of photographs each year. Every manufacturer sends out high priced pictures of his products. Every home wants portraits. Photography is a business running into millions of dollars each year. And there is a great shortage of trained photographers.

Get \$100 for Flood Pictures
 "I took pictures of a flood and sold them for \$100. I have been able to buy my house and lot from the sale of pictures."
 C. M. Cole, Washington, \$97 in 2 Days!
 "I made \$285 in December. Went out two days last week on home portrait work and made \$97."
 A. G. Hughes, Kentucky.

Earn \$3,000 to \$10,000 a Year
 Hundreds of men are earning big money and establishing their own businesses. Even during spare time, while training, you can make \$75 a week easily—no matter where you live!

Amazing New Easy Method
 I show you at home, how to do the kind of work turned out by the big studios in New York and Chicago! I show you how to make big money within 30 days! C. M. Cole bought a home with money he had made when only half way through his training. So well do I know what I can do for you that I guarantee under bond to return every cent of your tuition if you are not thoroughly satisfied.

Professional View Camera FREE!



Write at once for Free Camera Offer—
 I give you, free, a splendid professional view camera. You will be astonished and delighted. This offer open for short time only—so act quick! No obligation.

INTERNATIONAL STUDIOS, Inc.
 Dept. 1422
 3601 Michigan Ave., Chicago, U.S.A.

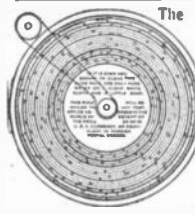
DON'T WEAR A TRUSS

BE COMFORTABLE—

Wear the Brooks Appliance, the modern scientific invention which gives truss sufferers immediate relief. It has no obnoxious springs or pads. Automatic Air Cushions bind and draw together the broken parts. No straps or plasters. Durable. Cheap. Sent on trial to prove its worth. Beware of imitations. Look for trade-mark bearing portrait and signature of C. E. Brooks which appears on every Appliance. None other genuine. Full information and booklet sent free in plain, sealed envelope.



BROOKS APPLIANCE CO., 172A State St., Marshall, Mich.



The Famous KON-VER-TER Slide Rule
 This rule instantly adds, subtracts, divides, multiplies, converts fractions or decimals of an inch. Gives sines, Co-sines, versed sines, co-versed sines, tangents, co-tangents, secants, co-secants of angles directly. Gives square roots, squares, cube roots, cubes and fifth roots and powers of all numbers. Logarithms, co-logarithms, anti-logarithms. Is in use throughout the world. About 6 inches in diameter. Is most complete rule of its kind ever made to sell at a popular price. 20 page book of instructions and box for each rule. DELUXE MODEL. White Ivory Celluloid, \$3.00 postpaid. We also handle other types of slide rules, engineering handbooks and equipment.

J. C. Hamilton, 7 Water St., Boston, Mass. Dept. B.

Automobile Makes 27 Miles On Air

An automobile goes 27 miles on air by using an automatic device which was installed in less than 5 minutes. The automobile was making 30 miles on a gallon of gasoline but after this remarkable invention was installed, it made better than 57. The inventor, Mr. J. A. Stransky, 145 Eleventh Street, Pukwana, South Dakota, wants agents and is willing to send a sample at his own risk. Write him today.—Adv't.

.38 Special
 Get this new guaranteed blue steel, side swing cylinder 6 shot revolver. Extra fine construction and finish. Accurate, hard hitting. .38 Special, and .32-20. **SEND NO MONEY.** Order now and on arrival, pay postman our special low price \$14.95 plus postage. Chicago Supply Co., 2459 Archer Av., Chgo.

ONLY \$14.95
ORDER NO. B-20726

Optical Plus

Wonderful, new device, guides your hand; corrects your writing in few days. Big improvement in three hours. No failures. Complete outline FREE. Write C. J. Osment, Dept. 44 St. Louis, Mo.

Write today for your **FREE** copy of—

Ward's New Radio Catalogue

THIS advertisement is published to tell you three things everyone interested in Radio *should know*.

That we believe Ward's is today the greatest Radio store in the world—that it is the real Headquarters for Radio.

Second, that at Ward's you can buy everything in Radio without paying the usual "Radio Profits."

Third, that this big 68 page book—a genuine reference book on Radio—is yours free for the asking.

Our Radio Experts

This Catalogue is a book gotten up by experts. It shows all the best hook-ups, everything in parts and com-

plete sets—so simple that you yourself can easily install them.

And it shows only tested and approved Radio equipment—selected by our Experts who are up-to-the-minute in Radio.

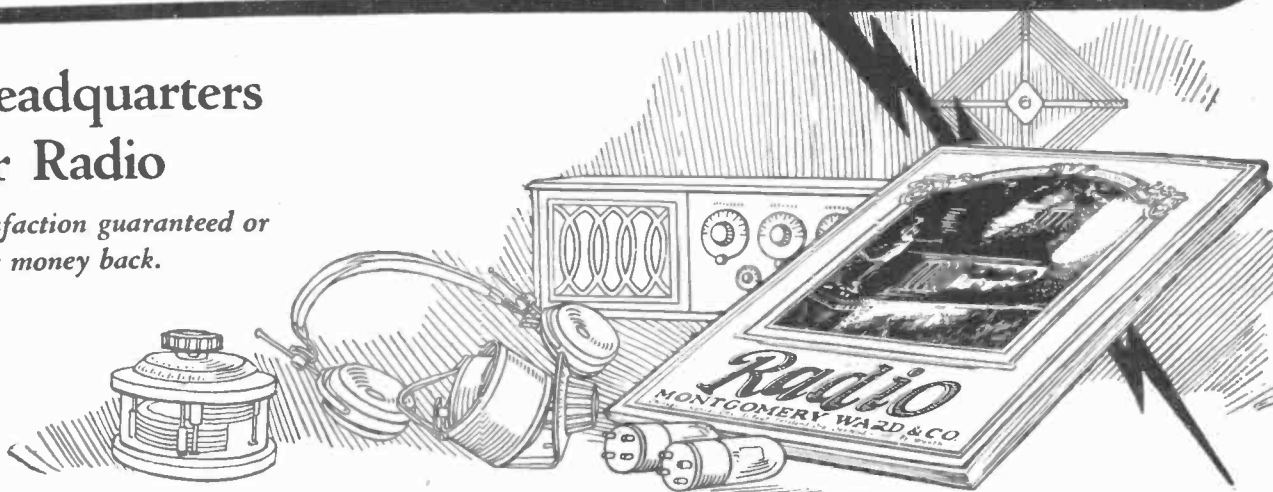
You can just as well have the benefit of our expert knowledge of Radio. Write for Ward's free 68 page Radio Catalogue and see the low prices.

Our 52 Year Old Policy

In buying Radio from Ward's you are buying from a house whose reliability is above question. For 52 years we have sold quality goods only. Address our house nearest you. Dept. No. 40-R

Headquarters for Radio

Satisfaction guaranteed or your money back.



ESTABLISHED 1872
Montgomery Ward & Co.

The Oldest Mail Order House is Today the Most Progressive

Chicago

Kansas City

St. Paul

Portland, Ore.

Oakland, Calif.

Fort Worth

ONLY \$3

**Brings You This
Genuine Underwood
Typewriter
on 10 Days' FREE TRIAL**

**A perfect machine,
complete in every
detail. Read all
about this great offer**



**Yes, We Will Positively
Ship You**

this splendid Underwood upon receipt of only \$3.00. This is by far the most liberal typewriter offer that has ever been made on no perfect a machine. Nearly two million Underwoods have been made and sold, proving conclusively that it is superior to all others in appearance, mechanical perfection and all-round excellence.

Ten Days' Free Trial

We want you to see for yourself that this is the typewriter you ought to have, and, therefore, we make our great free trial offer. You merely send us the three dollars deposit and we ship the machine for you to try for ten full days before you decide to keep it. If not satisfied, every penny of your money will be returned to you.

Rebuilt Like New

Every Underwood we sell is rebuilt just like new. It is dismantled right to the very bottom, and remanufactured to make it just like a new typewriter, with new enamel, new pickel, new platen, new key rings, new type; complete, perfect typewriter, with two-color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, key shift lock, etc. Impossible to tell it from a brand new Underwood, either in appearance, durability or quality of work.

Easy Monthly Payments

Our easy monthly payment plan makes it possible for YOU to own this splendid machine without having to pay out any big sum of money. You will hardly know you are paying for it. REPAYMENT, you have the full use of the machine, just the same as though it was fully paid for.

Over 325,000 Sold

Over 325,000 people have purchased and been satisfied with our product. What better proof could anyone ask of the perfection of our typewriters and the integrity of this firm?

Your Money Back

Yes, you can have your money back if you want it. After you have examined the typewriter carefully, used it to write letters, if you decide for any reason whatever that you do not care for it, you may return it to us at our expense and every penny you have paid will be cheerfully and promptly refunded.

No Obligation on Your Part

When you send in the coupon for either further information about our great typewriter offer or for the typewriter itself on our free trial plan, you are under no obligation whatever until after you have tried it and have decided for yourself that you want to keep it.

**Write Now for Our Big
Typewriter Book**

telling all about our great big typewriter factory. In this book we illustrate and describe all of the various processes of re-enameling, re-pickeling and assembling this splendid Underwood. It tells in an interesting way how each part is examined and tested carefully and thoroughly to insure the finished machine being one you will be proud to own.

**Write Right Today
Use Coupon Below**

**SHIPMAN-WARD MFG. CO.
2162 Shipman Bldg., Chicago**

Send me your big bargain catalog and complete details of your surprising offer, without obligation on my part.

NAME
STREET
CITY..... STATE.....

**Doctor Hackensaw's
Secrets**

(Continued from page 1030)

and then placing the nozzle of the gas-throwing instrument into the key hole of the room where the villains were assembled, shot the odorless but powerful soporific gas into the room. A minute later every member of the gang was unconscious, and before they recovered their senses they were strongly handcuffed. One of the villains who was not in the room at the time, gave them a little trouble, but "Spaghetti" Joe dexterously tripped him up and held him while Pep adjusted the handcuffs. As for Muriel, she made no resistance.

Miggs was delighted at regaining his freedom, and taking the stolen spectacles, he and Pep explored the house thoroughly for the hidden booty. It was concealed in several ingenious hiding places, some in panels in the wall, others in secret recesses in chairs and cupboards, but the greater portion was buried under the ash heap in the cellar. There were watches and jewelry of all kinds, heaps of bank notes and negotiable securities. In all there were over five hundred thousand dollars worth of valuables that the thieves could have cashed.

No hiding place, however, was secure against the magic spectacles. The Z-rays penetrated through the walls or through the floor and revealed the treasure beneath.

It was more work to secure the valuables than to discover them, but at last all were loaded in the automobile and with the fettered burglars piled in, the car started on its homeward trip, but it was past midnight when Doctor Hackensaw's house was reached.

The burglars all received long terms of imprisonment, but Doctor Hackensaw would not allow Muriel to be even arrested. She was only a tool. The kind-hearted doctor gave her a position in his office, and she proved worthy of the trust he placed in her.

A handsome reward was paid for the recovery of the stolen property, and Pep was delighted by the receipt of two thousand dollars in cash and a beautiful pearl necklace as her share. Even Miggs received a thousand dollars and a fine gold watch.

But Doctor Hackensaw thereafter kept his Z-ray spectacles locked up in one of his strongest safes.

"Every great invention," said he, "is a power; and a power may be used either for good purposes or for bad ones. These magic spectacles are too dangerous to be put into the hands of the general public!"

Reader's Forum

(Continued from page 1009)

(Not knowing to which article you refer and not knowing the context of your original communication, we cannot comment on the first portion of your letter.

With regard to your second statement we have this to say: In all cases in awarding the prizes for the Gold Cover Contest, the distinction although apparently fine to the reader, was quite definite in the opinion of the judges, one of whom at least was partly responsible for the contest. This worthy gentleman found that the ideas to which prizes were awarded were different from those featured by us and there was no collusion whatever.—Editor.)

Dealers

Get this
**Free
Book**



The Guide of the
Radio Industry

Dealers Wanted

We want dealers in every locality to handle our line of goods

Our Proposition Means Money to You
Our prices save you money. The quality of our goods insures satisfied customers. Our fast service will help you do a large business on a small investment.

Send For Our Free Catalog
We supply you the finest line of merchandise—both sets and parts for building sets. Our dealers' information service will help you quickly build up a successful profitable business. Tell us what business you are doing and can do. We will help you. Act quick.

W. C. Braun Co.

32 So. Clinton St. Chicago, Ill.

PERSONAL STATIONERY
200 SHEETS and \$1.00
100 ENVELOPES \$1.00

Printed with your Name and Address

Clear, white bond paper, with envelopes to match. Your name and address printed in beautiful, rich blue ink, on both paper and envelopes, and sent to you postpaid for only \$1.00. (West of Mississippi river and outside of U. S. \$1.10.) If inconvenient to send the money, we will ship C.O.D. Money returned if you are not more than satisfied. Order today. Write name and address plainly.

AGENTS MAKE BIG MONEY taking orders for us. Write us today for our agent's proposition.

ELITE STATIONERY COMPANY

5030 Main Street Smethport, Pa.

LAW **STUDY AT HOME**
Become a lawyer. Legally trained men win the highest positions and biggest success in business and public life. Be independent. Greater opportunities now than ever before. Big corporations are headed by men with legal training. Earn \$5,000 to \$10,000 Annually. We guide you step by step. You can train at home during spare time. Degree of LL. B. conferred. LaSalle students practicing law in every state. We furnish all text material, including fourteen-volume Law Library. Low cost, easy terms. Get our valuable 100-page "Law Guide" and "Bridence" books free. Send for them NOW.
LaSalle Extension University, Dept. 2884-L Chicago
The World's Largest Business Training Institution

DEAFNESS IS MISERY
I know because I was Deaf and had Head Noises for over 30 years. My invisible Antiseptic Ear Drums restored my hearing and stopped Head Noises, and will do it for you. They are Tiny Megaphones. Cannot be seen when worn. Effective when Deafness is caused by Catarrh or by Perforated, Partially or Wholly Destroyed Natural Drums. Easy to put in, easy to take out. Are "Unseen Comforts." Inexpensive. Write for Booklet and my sworn statement of how I recovered my hearing.
A. O. LEONARD
Suite 369, 70 5th Avenue -- New York City

Wrestling Book FREE
Tells how to be a great athlete and successful wrestler—how to win. Starting secrets taught in wonderful lessons by world's champion Farmer Burns and Frank Gatch. Be stronger, healthy, athletic. Handle his men with ease. Learn self-defense. Be a leader. Men and boys, write for Free Book today. State your age.
Farmer Burns School, 1252 Railway Bldg., Omaha, Neb.

OWN THE WORLD'S BEST!

Sporting goods, binoculars, telescopes, body armor, ultra modern arms, etc. Catalog free. Pacific Arms Corp., San Francisco, Calif.

Build the Set you have dreamed of **TROPADYNE SUPERADIO OUTFIT**

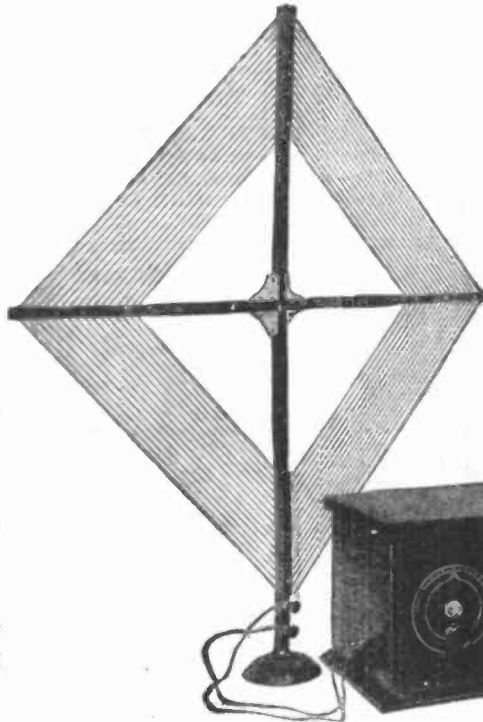
*Superior to
Super-Heterodyne*

THIS Superadio 6 Tube Set brings in Station KFKX (Hastings, Nebraska), 1200 miles, in New York City, clearly on a loud speaker, using only the small loop which comes with the outfit.

The outfit advertised here is complete, as listed below, everything needed is included, down to the last screw. The charts, blueprints, directions and photos furnished are so complete and explicit that anyone can build this set and have it working within a few hours. There is nothing additional to buy except the necessary batteries and tubes. Price includes mahogany cabinet and folding loop aerial.

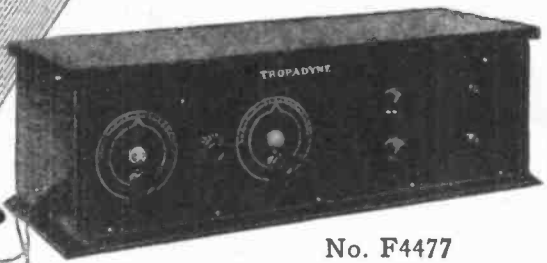
You can pay \$150 or more for an outfit, or \$200 or more for a set, but you cannot possibly buy a better set than this one.

Your Money Refunded if this set does not satisfy you in all respects—if after 5 days' fair trial you do not proclaim the TROPADYNE the best radio set you ever listened to.

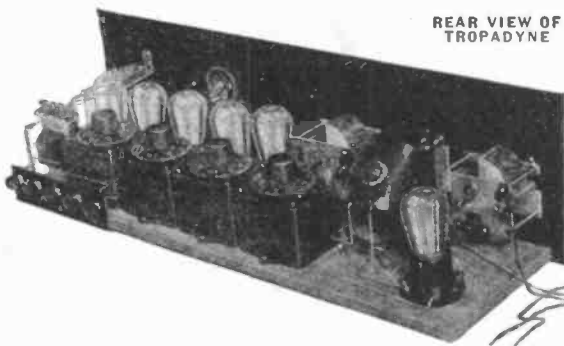


\$60⁵⁰

SEND NO MONEY



No. F4477



REAR VIEW OF TROPADYNE

Note These Important Features:

- DISTANCE, VOLUME AND TONE QUALITY** equal to any 8 tube set sold anywhere at any price.
- LOOP RECEPTION**—Outside aerial not to be used with this set—the complete loop is included in outfit.
- PERMANENT LOGGING OF STATIONS**—Follow chart furnished; there are only two tuning controls and you always find the same station at the same spots on the dials. Our log chart shows you at what point to find any station.
- MICROMETER VERNIER DIALS** giving you the full advantage of the exceptionally sharp tuning.
- OUTFIT IS ABSOLUTELY COMPLETE**—Drilled panel, Mahogany Cabinet and everything else needed, except tubes and batteries.
- ECONOMY and SIMPLICITY**—This is not a reflex, yet six tubes do the work for which other sets require eight to ten.

The Editor of the Radio News

In the August 1924 issue, said this about the Tropadyne: "Here is a remarkable receiver which we warmly recommend to our readers. It has several new and unusual features. In the first place only 6 tubes are used giving us much volume as the average 8 tube Heterodyne. The selectivity of this set is unusual. Unequalities of the intermediate transformers have now been done away with by tuning each transformer. After the transformer has been tuned, it can be left this way, no further tuning being necessary. "This system makes for maximum sharpness and maximum volume. Another outstanding point of superiority of the Tropadyne circuit is that it practically does not radiate, thereby not interfering with other nearby receiving stations. A saving of two tubes as well as an increase of selectivity is obtained with this new circuit."

Complete List of Parts:

4 RICO Tropafomers; 1 Standard Variocoupler; 2 Certified Low Loss 23-plate Condensers; 1 Calibrated Transformer; 2 Jacks; 3 Fixed Condensers; 6 Bakelite Sockets; 2 Vernier Dials; 1 Rheostat; 1 Potentiometer; 1 7x24 Panel; 1 7x24 Mahogany Cabinet and Baseboard; 40 ft. Bus Bar Wire; 1 Folding Loop Aerial; 1 Grid Leak and Mounting; Binding Posts; Flexible Wire; 1 Bakelite Binding Post Strip; 4 doz. Screws; Full Directions.

RADIO SPECIALTY COMPANY, 100 PARK PLACE, NEW YORK

Tropadyne Gets Europe!

"Received 2BD, Aberdeen, on November 25th. Results good, except noises. 11:30 to 11:40 talk, from 11:40 to 12:00 piano number. Piano number good, talk poor. Used Tropadyne Circuit."

J. ZIMMER, 157 James St., Newark, N. J.
The above has been verified by "Radio News"

SEE OUR 2-PAGE AD ON PAGES 1378 and 1379 RADIO NEWS

SEND NO MONEY

RADIO SPECIALTY CO., 100 Park Place, New York, N. Y.

Please send at once one complete Tropadyne Superadio Outfit as advertised in February Radio News. I will pay postman or expressman \$60.50 upon arrival.

NAME

STREET or R.F.D.

CITY STATE

U.S. PATENTS



SEND FOR THIS FORM

Don't Lose Your Rights

Before disclosing your invention to anyone send for blank form "Evidence of Conception" to be signed and witnessed. A sample form together with printed instructions will show you just how to work up your evidence and establish your rights before filing application for patent. As registered patent attorneys we represent hundreds of inventors all over the U. S. and Canada in the advancement of inventions. Our schedule of fees will be found reasonable. The form "Evidence of Conception" sample, instructions relating to obtaining of patent and schedule of fees sent upon request. Ask for them,—a post card will do.



Registered Patent Attorneys in U.S. and Canada
255 Ouray Bldg., Washington, D. C.
"Originators of form Evidence of Conception"

PATENTS

TO THE MAN WITH AN IDEA

I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition.

Send sketch, or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN, Patent Lawyer
164 Owen Building, Washington, D. C.
2276-B Woolworth Bldg., New York City

C. L. PARKER

Ex-Member Examining Corps, U. S. Patent Office
Attorney-at-Law and Solicitor of Patents

American and Foreign Patents secured. Searches made to determine patentability, validity and infringement.
Pamphlet of Instructions sent upon request
MCGILL BUILDING WASHINGTON, D. C.

INVENTORS PROTECT YOUR IDEAS

Send for our Guide Book, **HOW TO GET A PATENT**, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send

model or sketch and description of your invention for instructions. No charge for the above information.

Name

Street

City

RANDOLPH & CO.
Dept. 172, WASHINGTON, D. C.



Edited by
A. P. Peck

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail a nominal charge of \$1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

PRINTING TELEGRAPH

(869) R. H. Twyman, Rivesville, W. Va., states that he has developed principles whereby an attachment can be made to an ordinary telegraph circuit, which will cause the message to be typed in letters instead of symbols. He asks if this device would be patentable and whether it would be of any value.

A. There are several devices of this type, patented by various large electrical and telegraph companies. All of these are covered by very broad claims and we are of the opinion that it would be practically impossible for you to obtain a patent on such a device. Furthermore, you would have to work against these large companies whose unlimited resources would make such a procedure impracticable. As you do not send any details of your device, we cannot comment upon its practicability, but considering the points mentioned above, we would not advise you to attempt to obtain a patent.

OBTAINING A PATENT

(870) Pascal P. Pratt, Buffalo, New York, wants to know whether or not an individual can obtain a patent without the assistance of an attorney. He also asks what the usual charges for obtaining a patent are.

A. 1. Drawings and claims of an invention should preferably be drawn up by a patent attorney. The individual can do this himself, however, but it entails an expense greater than that which the patent attorneys charge. These drawings and claims are submitted to the Registrar of Patents, and the first Government fee of \$20.00 is charged, and the serial number is given, and when the patent has been granted, a second fee of \$20.00 is requested.

A search through the Patent Office records to establish a patent claim costs approximately \$10.00 and drawings made up by the draftsman will cost \$7.00 per page of illustration. The price for a patent varies when taken out by a regular attorney, and is approximately \$110.00 for a patent with one sheet of drawings, provided that no interference results. This is about the lowest cost at which a patent can be obtained, considering all costs and charges.

DOUBLE HACKSAW BLADE

(871) E. H. Price, Charlotte, N. C., submits a design of a hacksaw blade provided with teeth on both sides. He asks whether or not this idea can be patented.

A. 1. The idea of a hacksaw blade with teeth on both sides has been patented for some time.

SAFETY DEVICE

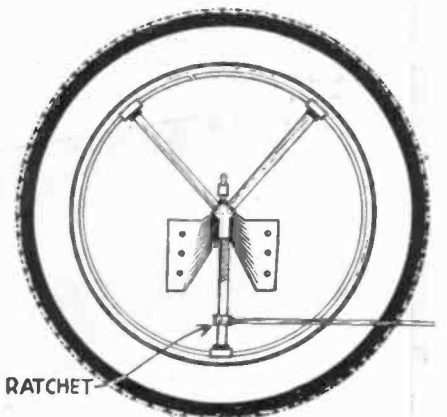
(872) L. Orman, Paterson, N. J., says that he has thought of a way whereby grade crossings on railroads can be made safe. He asks whether his idea is worth commercializing.

A. 1. At the present time it is almost impossible to place a railroad crossing safety device on the market, and unless you have plenty of available cash, we would not suggest that you patent the same. You might take up the matter with any of the railroad companies.

TIRE CARRIER AND RIM TOOL

(873) M. A. Chambers, Detroit, Mich., submits sketches and a description of a cleverly designed combination spare tire carrier and rim tool for use on automobiles which have split rims as part of their equipment. He asks our opinion on the device.

A. There seems to be several points of merit in your combination tire carrier and rim tool.



RATCHET

The tire rack and tool illustrated above possesses some novel points.

However, the average automobilist seldom if ever carries a device for splitting a rim. Usually one or two inflated spares are carried, which can be substituted when tires are punctured. The average automobilist will take punctured tires to a garage for repair. Therefore, garages are the places where rim tools are usually found. However, there seem to be enough good points about your combination to warrant your conducting a search through the patent files to determine whether or not the device can be patented. If you find it can be and you are willing to invest sufficient money in the project to obtain a patent, to manufacture the device and to advertise it extensively, we believe that you could make quite a good thing of it, if the combination is made to sell at a comparatively low price. Otherwise it would be well to forget the idea as practically every automobile is delivered to the purchaser equipped with a tire carrier. To use your combination it would be necessary to remove this and fasten on your device in place of it.

If you cannot finance the project yourself, there is a slight possibility that some manufacturer of automobile accessories would be interested. We would suggest a canvass of the various concerns in order to ascertain their viewpoint of the subject.

PATENTS

TRADE MARKS-COPYRIGHTS

PROTECT YOUR IDEAS

ANY NEW article, machine, design or improvement thereof, or any combination of parts or improvements in any known article which increases its efficiency or usefulness, may be patented, if it involves invention.

IF YOU HAVE ANY NEW IDEAS

which you feel are useful, practical and novel, take prompt action to protect your rights. If you have invented any new machine or new combination of parts or improvement, or any new design or process, SEND DRAWING, MODEL OR DESCRIPTION of it for information as to procedure to secure protection.



Drafting and Specification Room of Clarence A. O'Brien, Registered Patent Lawyer, Washington, D. C.

ALL COMMUNICATIONS are held in strict confidence. My personal, careful and thorough attention is given to each case. I offer you efficient, reliable and prompt service—based upon practical experience. Highest references. NO CHARGE FOR ABOVE INFORMATION.

WRITE TODAY FOR FREE BOOKS, "HOW TO OBTAIN A PATENT" and "INVENTION AND INDUSTRY" and blank form "RECORD OF INVENTION."

These books will give you valuable information, and they may save you much time and effort. Send for them, NOW. My practice is devoted exclusively to United States and Foreign Patents and Trade Marks. Write me freely, frankly and with full confidence; it is very probable that I can help you.

USE THE COUPON attached, and immediately upon its receipt I shall send you the form Record of Invention to be returned to me with drawing, description or model of your idea; promptly upon receiving your idea I shall write you as to procedure and costs.

CLARENCE A. O'BRIEN

REGISTERED PATENT LAWYER

Member of (COURT OF APPEALS, DISTRICT OF COLUMBIA, UNITED STATES COURT OF CLAIMS;
Bar of (SUPREME COURT OF UNITED STATES, SUPREME COURT, DISTRICT OF COLUMBIA
Practice Confined to Patents, Trade Marks and Copyrights

FREE COUPON

CLARENCE A. O'BRIEN, Registered Patent Lawyer

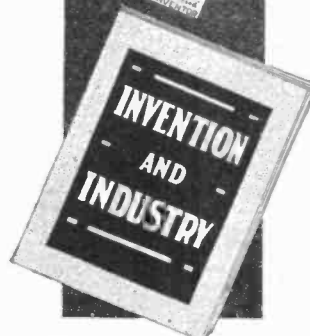
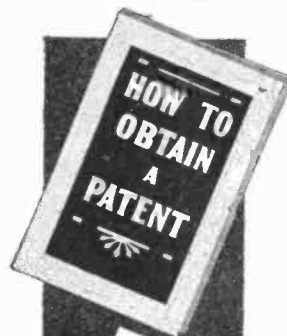
539B Security Savings and Commercial Bank Building Directly Across Street from Patent Office WASHINGTON, D. C.
Please send me your free books, "HOW TO OBTAIN A PATENT" and "INVENTION AND INDUSTRY" and blank form, "RECORD OF INVENTION," without any obligation on my part.

Name

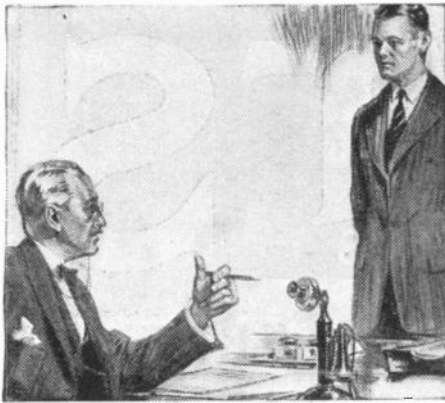
Address

IMPORTANT—WRITE OR PRINT NAME CLEARLY.

FREE



These books free



"So you want to get married, eh?"

"That's fine! I'm glad to hear it. But you know, Tom, just wanting to get married is not enough to justify an increase in salary."

"Don't depend on sentiment, or on any man's favor, to bring you the salary increases you need so badly. Study your work—learn to know more about it than the other men in your department—and you won't have to come to me for an increase in salary."

"Why don't you take up a home study course with the International Correspondence Schools? It's been the making of Joe Browning and Dick Roberts and some of the other men around here."

Employers in every line of business are begging for men with ambition, men who really want to get ahead in the world and are willing to prove it by training themselves to do some one thing well.

One hour a day, spent with the I. C. S. in the quiet of your own home, will prepare you for the position you want in the work you like best.

Yes, it will! Put it up to us to prove it. Mark and mail the coupon to-day.

INTERNATIONAL CORRESPONDENCE SCHOOLS Box 6193-D, Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject before which I have marked an X:

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

- | TECHNICAL AND INDUSTRIAL COURSES | |
|---|--|
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Architects' Blue Prints |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Architectural Draftsman |
| <input type="checkbox"/> Machine Shop Practices | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Airplane Engines |
| <input type="checkbox"/> Metallurgy <input type="checkbox"/> Mining | <input type="checkbox"/> Agriculture and Poultry |
| <input type="checkbox"/> Steam Engineering <input type="checkbox"/> Radio | <input type="checkbox"/> Mathematics |

Name.....
Street..... 3-6-24
Address.....
City..... State.....

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

PATENTS

BOOKLET FREE HIGHEST REFERENCES
PROMPTNESS ASSURED BEST RESULTS

Send drawing or model for examination
and report as to patentability

WATSON E. COLEMAN, Patent Lawyer
644 G Street, N. W., Washington, D. C.

PATENTS

Trade-Marks, Copyrights and Patent Litigation
Write for advice and instructions how to proceed,
costs etc

Hand Book with Illustrations of 100 Mechanical Move-
ments sent free on request.

ALBERT E. DIETERICH
Patent Lawyer and Solicitor
Successor to Fred G. Dieterich & Co.
602 OURAY BLDG. WASHINGTON, D. C.

Radio Teledactyl

By H. GERNSBACK
(Continued from page 978)

The technical end of the future invention has already been described by the writer above. In short, the new instrument is the human hand and arm projected into the distance. Such a mechanical hand at a distance can feel exactly the same as if the doctor was feeling the pulse of his patient in person. Using a television screen, the doctor manipulates his controls any way he chooses and the receiving teledactyl will faithfully reproduce the doctor's motions at the patient's bedside.

At the receiving end we have the feeling member, equipped with a sound collector or microphone, so that if the doctor chooses to place one of the controls over the patient's heart he can immediately hear amplified sounds of the heart-beats, the same as if he were at the patient's bedside. The writer may mention here that doctors have already listened to heart-beats of a patient a thousand miles away, located on a ship on the ocean, each heart-beat being transmitted faithfully by radio. But the future microphone does far more than this.

Doctors have come to know more and more that certain noises within arteries and muscles mean much if interpreted correctly. The supermicrophone of the future will, in a way, supplant the X-ray, because certain internal body sounds will mean certain things to our future physicians.

The patient's teledactyl control, aside from the microphone, will also have a very sensitive thermo-couple, by which a minute amount of heat can be measured. Very often, by means of such an instrument, so-called "hot boxes" can be located, which, particularly along the regions of the spine, greatly help in certain diagnoses. In other words, by means of a teledactyl "feeler," the microphone, and thermo-couple, a good doctor of the future can accurately diagnose a great variety of his patients' ailments.

The reader may ask the question here. "How does the patient get his teledactyl receiving instrument?" Again the answer is simple. The great doctor of the future will send his nurse to the patient with a small portable teledactyl, and the nurse will set up the instrument in front of the patient's bedside. The doctor and the machine do the rest. It is far better and cheaper for the doctor to send his nurse and save his time than to transport himself to the patient. In this way, the doctor will be able to treat four or five times as many patients as he could possibly do today. And, after all, if he is a really good doctor, he should have many patients.

It should be mentioned that the teledactyl will probably be used with very short wave-lengths, possibly not more than two or three meters. At this short wave-length we can operate hundreds and thousands of radio instruments without any interference from each other's. With the present wave-lengths of three or four hundred meters this could not be accomplished without chaos.

ANYWAY, THERE'S QUARTZ IN GLASS

The geology Professor of Doolittle University was hunting specimens of rock which he wanted to add to his collection of rare minerals. He had tramped all over the moonshine hills of Kentucky in search of them. On top of one hill he happened to come upon an old acquaintance.

"Glawd to see you old topehh," he said. "I have found ten of the rarest quartz—" "You lucky dog," said his friend, "I have hunted all day and I have only been able to find two half pints."—N Compton.

I WANT TO KNOW

The E. I. Co., publishes 15 complete, practical 64-page books, covering the care and operation on every part of your Radio sets, also special books on the latest receivers. They cover every important question a radio set user may ask and are written by radio's foremost authorities. Each book size 5½ by 7½ inches, fully illustrated, bound with handsome stiff covers printed in colors.

EACH
PRICE 25¢

Complete List of Books

- No. 1. Tips for the Radio Constructor.
- No. 2. How to Make a Practical Radio Receiver.
- No. 3. Radio Questions Answered.
- No. 4. Radio Frequency Amplification.
- No. 5. Loud Talkers and How to Build Them.
- No. 6. How to Tune Your Radio Set.
- No. 7. One Hundred Radio Hook-ups.
- No. 8. All About Radio Parts.
- No. 9. History and Operations of Vacuum Tubes.
- No. 10. The Neutrodyne and All About it.
- No. 11. How Radio is Received.
- No. 12. How to Locate Troubles in your Radio Set.
- No. 13. Reflex Radio Receivers.
- No. 14. The Super Heterodyne.

SOLD BY ALL RADIO AND NEWS DEALERS

The E. I. Company
Sole Distributors
THE CONSRAD COMPANY
233 Fulton St., New York City

PATENTS

Hand books on Patents, Trade Marks, etc., sent free. Our 78 years of experience, efficient service, and fair dealing assure fullest value and protection to the applicant. The Scientific American should be read by all inventors.

MUNN & CO.

618 Woolworth Building, New York

525 Scientific American Building, Washington, D. C.
414 Tower Bldg., Chicago, Ill.
367 Hobart Bldg., 582 Market St., San Francisco, Cal.
222 Van Nuys Building, Los Angeles, Cal.

PATENTS

As one of the oldest patent firms in America we give inventors at lowest consistent charge, a service noted for results, evidenced by many well known Patents of extraordinary value. Book, Patent-Sense, free. Lacey & Lacey, 644 F St., Wash., D. C. Estab. 1866.

INVENTORS!

Our facilities to assist you in securing patents, models, capital, etc., and our complete service to inventors will interest you.
INVENTORS INTERNATIONAL INSTITUTE
15 Park Row, New York

Insure your copy reaching you each month. Subscribe to **SCIENCE & INVENTION**—\$2.50 a year. Experimenter Publishing Co., 53 Park Pl., N. Y. C.

PATENTS TRADE-MARKS and COPYRIGHTS

**OUR OFFER: FOR THE PROTECTION
OF YOUR INVENTION**



VICTOR J. EVANS & CO.

PATENT
ATTORNEYS

779-9th ST.,
WASHINGTON, D. C.

Opposite
U. S. PATENT OFFICE

Have You an Idea?

YOUR FIRST STEP before disclosing an invention. The inventor should write for our blank form—

“Record of Invention”

This should be signed and witnessed and returned to us together with model or sketch and description of the invention for instructions. *No charge for the above information.*

Our Four Books Mailed Free to Inventors

How to Obtain a Patent

Our Illustrated Guide Book contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described, Articles on Assignment or SALE OF PATENTS, Patent Practice and Procedure, and Law Points for inventors.

Our Trade-Mark Book

Shows the value and necessity of Trade-Mark Protection and gives information regarding Trade-Marks and unfair competition in trade.

Our Foreign Book

We have Direct Agencies in all Foreign Countries. We secure Foreign Patents in shortest time and lowest cost.

Progress of Invention

Description of World's Most Pressing Problems by Leading Scientists and Inventors.

We Regard a Satisfied Client as our best advertisement, and will furnish to anyone, upon request, lists of clients in any state for whom we have secured patents. Highest References—Prompt Attention—Reasonable Terms

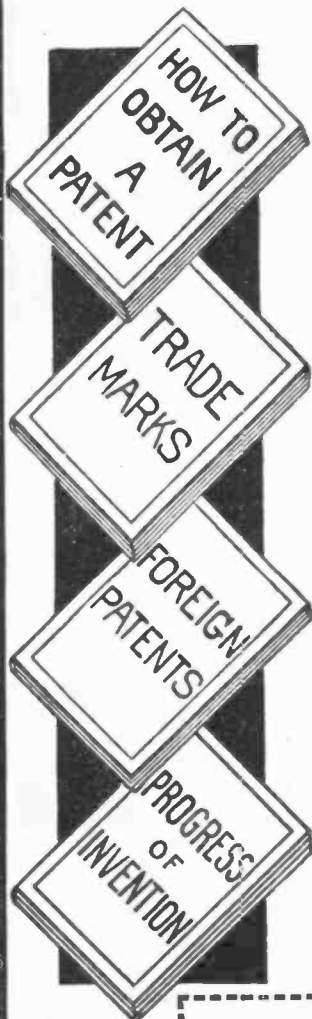
IMPORTANT

Do not submit your invention to anyone before you furnish proof that the invention is patentable or application has been filed. In order to have Your Case Made Special to Avoid Delay You Should Take the Precaution of Having Your Case Made Special in Our Office to Secure Protection, Save Correspondence and Secure Early Filing Date in Patent Office. To Secure Special Preparation of Your Case Send \$25.00 on Account With Model, Sketch and Description.

OUR ORGANIZATION OFFERS
PERSONAL SERVICES BY
EXPERIENCED PATENT SOLICITORS
AND DRAFTSMEN,
THE WHOLE BEING UNDER
THE GENERAL SUPERVISION OF
Mr. Victor J. Evans

Infringement
and
Interference
Suits Prosecuted

*All communications and data
strictly confidential*



**FREE
COUPON**

VICTOR J. EVANS & CO.

NEW YORK OFFICES
1007 Woolworth Bldg.
PITTSBURGH OFFICES
514 Empire Bldg.

PATENT ATTORNEYS
CHICAGO OFFICES
1114 Tacoma Bldg.

PHILADELPHIA OFFICES
714-715 Liberty Bldg.
SAN FRANCISCO OFFICES
Hobart Bldg.

MAIN OFFICES: 779 9th Street, N. W., WASHINGTON, D. C.

Gentlemen: Please send me Free of Charge your books as described on this page.

NAME

ADDRESS



Enter the Profession of

ELECTRICITY

Through This New Kind of Home Training System

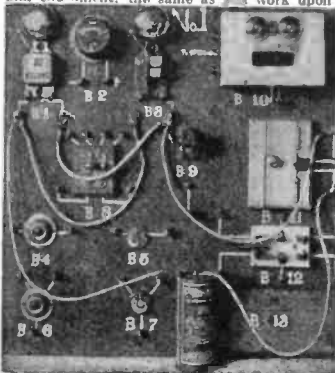
The great field of Electricity has never before needed so badly. Trained Men—men who are skilled in every department of this fascinating profession. The electrical industry is ready and glad to pay big salaries to the men who really know! Commercial Electrical Engineers, Master Electricians, Electrical Engineers, Automotive Electrical Experts, are needed everywhere, and they command handsome incomes. We will fit you for one of these splendid places quickly and thoroughly, right in your home, while you hold your present job.

Unlike All Other Schools

No other school furnishes its students with the elaborate Home Laboratory Units—actual working size instruments, chemicals and electrical equipment. This gives you actual practice, along with the theory, making you a skilled expert ready to take a big job. In addition, our official Broadcasting Station WSOE broadcasts educational lectures on Electricity, richly supplementing the studies and experiments of our home-study students.

FREE HOME LABORATORY OUTFIT COMPLETE

No models, or miniature parts, but actual size apparatus and equipment, the same as work upon when out in the field. Do not confuse these Laboratory Units with the models sometimes furnished by correspondence schools. They are sent to your home without cost to you, as a part of your course. It is only through the enthusiasm and cooperation of our myriad of students that we can go to this enormous expense. You will get complete details of this amazing plan when you write.



Satisfaction Guaranteed

Backed by This Great School

This marvelous training is backed by the largest and best equipped electrical school in America. The School of Engineering is endorsed and linked with some of the largest Commercial Concerns and Power Companies in the country, the employers of the Big Pay Men.

Catalog Sent FREE

Write quick, just mailing the coupon, for complete details and catalog. It will point the sure way to success.

Extension Division

SCHOOL of ENGINEERING of Milwaukee

Dept. SI-H225

415 Marshall St. Milwaukee, Wisc.

SCHOOL OF ENGINEERING OF MILWAUKEE, Dept. SI-H225, 415 Marshall St., Milwaukee, Wis.

Please send me your Free Catalog and details of your new home training system in Electricity.

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

Address

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

Radio Broadcast

REVISED AND CORRECTED TO DATE.
First Group of Figures Indicate the Power in Watts in the Antenna of the Transmitting Station. The Second Group Gives the Wave-Length.

Call Letters	Location and Name	Power & Wave Length
KDKA	East Pittsburgh, Pa., Westinghouse Electric & Mfg. Co.	1000—326
KDPM	Cleveland, Ohio, Westinghouse Electric & Mfg. Co.	500—270
KDPT	San Diego, Calif., Southern Electrical Co.	50—244
KDYL	Salt Lake City, Utah, Newhouse Hotel	100—360
KDYN	San Diego, Calif., Savoy Theatre	100—280
KDYQ	Portland, Ore., Oregon Institute of Technology	50—360
KDZB	Bakersfield, Calif., Frank E. Siefert	100—240
KDZE	Seattle, Wash., Rhodes Department Store	100—270
KDZR	Bellingham, Wash., Bellingham Publishing Co.	50—261
KFAD	Phoenix, Ariz., McArthur Bros. Mercantile Co.	100—360
KFAE	Pullman, Wash., State College of Washington	500—330
KFAF	Denver, Colo., Western Radio Corp.	500—278
KFAJ	Boulder, Colo., University of Colorado	100—261
KFAN	Moscow, Idaho, The Electric Shop	50—360
KFAR	Hollywood, Calif., Studio Lighting Service Co.	100—280
KFAU	Boise, Idaho, Independent School District of Boise City, Boise High School.	150—270
KFAW	Santa Ana, Calif., The Radio Den	10—280
KFAY	Medford, Ore., Virgin's Radio Service	50—283
KFBB	Havre, Mont., F. A. Buttrey & Co.	50—360
KFBC	San Diego, Calif., W. K. Azbill	5—278
KFBE	San Luis Obispo, Calif., Reuben H. Horn	50—242
KFBG	Tacoma, Wash., First Presbyterian Church	50—360
KFBK	Sacramento, Calif., Kimball-Upton Co.	100—283
KFBL	Everett, Wash., Leese Bros.	15—224
KFBS	Trinidad, Colo., Trinidad Gas & Electric Supply Co. and The Chronicle News.	10—280
KFBU	Laramie, Wyo., The Cathedral	50—283
KFCB	Phoenix, Ariz., Nielson Radio Supply Co.	10—238
KFCF	Walla Walla, Wash., Frank A. Moore	100—360
KFCL	Los Angeles, Calif., Leslie E. Rice, Los Angeles Union Stock Yards	500—236
KFCP	Ogden, Utah, Ralph W. Flygare	10—360
KFCV	Houston, Tex., Fred Mahaffey, Jr.	10—360
KFCY	Le Mars, Iowa, Western Union College	50—252
KFCZ	Omaha, Nebr., Omaha Central High School	50—258
KFDD	Boise, Idaho, St. Michaels Cathedral	10—252
KFDH	Tucson, Ariz., University of Arizona	50—268
KFDJ	Corvallis, Ore., Oregon Agricultural College	50—360
KFDL	Denver, Colo., Knight-Campbell Music Co.	5—226
KFDM	Beaumont, Tex., Magnolia Petroleum Co.	500—306
KFDX	Shreveport, La., First Baptist Church	100—360
KFDY	Brookings, S. Dak., South Dakota State College of Agriculture and Mechanic Arts	100—273
KFDZ	Minneapolis, Minn., Harry O. Iverson	5—231
KFEC	Portland, Ore., Meier & Frank Co.	50—248
KFEL	Denver, Colo., Winner Radio Corp.	50—254
KFEQ	Oak, Nebr., Scroggin & Co. Bank	100—268
KFER	Fort Dodge, Iowa, Auto Electric Service Co.	10—231
KFEX	Minneapolis, Minn., Augsburg Seminary	100—261
KFFB	Boise, Idaho, Jenkins Furniture Co.	10—240
KFFE	Pendleton, Ore., Eastern Oregon Radio Co.	10—360
KFFP	Moberly, Mo., First Baptist Church	50—266
KFFR	Sparks, Nev., Nevada State Journal	10—226



To Each Purchaser of a World Battery

A 24-Volt "B" Storage Battery positively given FREE with each purchase of a WORLD "A" Storage Battery. The WORLD Battery is famous for its guaranteed quality and service. Backed by years of Successful Manufacture and Thousands of Satisfied Users. You save 50%.

Prices That Save and Satisfy

Auto Batteries	Radio Batteries
6-Volt, 11 Plate \$12.25	6-Volt, 100 Amps. 12.50
6-Volt, 13 Plate 14.25	6-Volt, 120 Amps. 14.50
12-Volt, 7 Plate 17.00	6-Volt, 140 Amps. 16.00

Shipment Express C. O. D. subject to examination. 5 per cent discount for cash in full with order.

2-Yr. Guarantee Bond in Writing With Each World Storage Battery

proves satisfactory World performance. Mail this ad with your name and address—we will ship battery day order is received; and give you your choice of "B" Storage Battery or a handsome nickel finish Auto Spotlite. FREE. Write TODAY.

WORLD BATTERY COMPANY

1219 So. Wabash Ave. Dept. 19, CHICAGO, ILL.

This FREE "B" Storage Battery takes the place of dry cell "B" batteries. Can be recharged and will last indefinitely. To be sold retail for \$6.00. It is the only battery of its kind equipped with solid rubber case—and insurance against acid and leakage. Take advantage of this remarkable introductory offer NOW. (To those who prefer it, we will send FREE a handsome nickel finish Auto Spotlite, instead of the "B" Battery. Be sure to specify which is wanted.)

GIVEN FREE

To introduce this new and superior World "B" Storage Battery to the Public.



THE ANTENNAPHONE REPLACES THE AERIAL

SAFER than a troublesome outdoor aerial BETTER than an unsightly indoor aerial Easy to Install.—The telephone is not attached to, but merely placed upon the Antennaphone. Then connect the wire of the Antennaphone to the antenna post of your set (tube or crystal) and tune in. Increases Selectivity and Quality of Reception

Our Money Back Guarantee The Antennaphone will not interfere with the use of your telephone, and is guaranteed to work perfectly with any receiver (tube or crystal) or your dollar will be refunded. The Antennaphone, complete with insulated wire. Price..... \$1.00 Telephone can be any distance from radio.

AT YOUR DEALER Or Sent By Mail Upon Receipt of One Dollar Correspondence solicited from Radio Jobbers and Dealers THE ANTENNAPHONE CO. 90 WEST ST., NEW YORK CITY

Inventions Developed

If you have an undeveloped invention, consult us. We will prepare practical designs for you, also procure your patent rights. Write for FREE BOOKLET. Manufacturers Patent Co., Inc. 70 Wall St., New York

STAMMER NO MORE

Kill the fear of stammering. Re-education the key. The widely famed Hatfield Method fully outlined in an accurate, dependable, worthwhile book—"HOW TO STOP STAMMERING." 14 has inspired thousands. Free copy today. THE HATFIELD INSTITUTE, 109 N. Dearborn, Chicago, Ill.

Call Letters	Location and Name	Power & Wave Length
KFFV	Lamoni, Iowa, Graceland College	100-280
KFFY	Alexandria, La., Louisiana College	50-275
KFGC	Baton Rouge, La., Louisiana State University	100-254
KFGD	Chickasha, Okla., Oklahoma College for Women (J. A. Teeters)	50-252
KFGH	Stanford University, Calif., Leland Stanford Junior University	500-273
KFGL	Arlington, Ore., Snell & Irby	10-234
KFGQ	Boone, Iowa, Cray Hardware Co.	10-226
KFGX	Orange, Tex., First Presbyterian Church	500-250
KFGZ	Berrien Springs, Mich., Emmanuel Missionary College	500-286
KFHA	Gunnison, Colo., Western State College of Colorado	50-252
KFHJ	Santa Barbara, Calif., Fallon & Co.	100-360
KFHL	Oskaloosa, Iowa, Penn College	10-240
KFHR	Seattle, Wash., Star Electric & Radio Co.	100-263
KFI	Los Angeles, Calif., Earle C. Anthony (Inc.)	500-469
KFIF	Portland, Ore., Benson Polytechnic Institute	100-360
KFIO	Spokane, Wash., North Central High School	50-252
KFIQ	Yakima, Wash., First Methodist Church	50-242
KFIU	Juneau, Alaska, Alaska Electric Light & Power Co.	10-226
KFIX	Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints	250-268
KFIZ	Fond du Lac, Wis., Daily Commonwealth & Seifert Radio Corp.	100-273
KFJB	Marshalltown, Iowa, Marshall Electric Co.	10-248
KFJC	Seattle, Wash., Seattle Post Intelligence	100-270
KFJF	Oklahoma, Okla., National Radio Mfg. Co.	225-261
KFJL	Astoria, Ore., Liberty Theatre	10-252
KFJK	Bristow, Okla., Delano Radio & Electric Co.	100-233
KFJM	Grand Forks, N. Dak., University of North Dakota	100-280
KFJQ	Grand Forks, N. Dak., Electric Construction Co., Valley Radio Division	5-280
KFJR	Stevensville, Mont. (near), Ashlev C. Dixon & Son	5-258
KFJX	Cedar Falls, Iowa, Iowa State Teachers' College	50-280
KFJY	Fort Dodge, Iowa, Tunwall Radio Co.	50-246
KFJZ	Fort Worth, Tex., Texas National Guard, 112th Cavalry	20-254
KFKA	Greeley, Colo., Colorado State Teachers College	50-273
KFKB	Milford, Kans., Brinkley-Jones Hospital Assn.	500-286
KFKQ	Conway, Ark., Conway Radio Laboratories	100-250
KFKV	Butte, Mont., F. F. Gray	50-283
KFKX	Hastings, Neb., Westinghouse Electric & Mfg. Co.	1000-291
KFKZ	Colorado Springs, Colo., Nas-sour Bros. Radio Co.	10-234
KFLA	Butte, Mont., Ahner R. Willson	5-283
KFLB	Menominee, Mich., Signal Electric Mfg. Co.	50-248
KFLE	Denver, Colo., National Educational Service	25-268
KFLQ	Little Rock, Ark., Bizzell Radio Shop	20-261
KFLR	Albuquerque, N. Mex., University of New Mexico	100-254
KFLU	San Benito, Tex., San Benito Radio Corp.	15-236
KFLV	Rockford, Ill., Swedish Evangelical Mission Church	100-229
KFLW	Missoula, Mont., Missoula Electric Supply Co.	5-234
KFLX	Galveston, Tex., George R. Clough	10-240
KFLZ	Atlantic, Iowa, Atlantic Automobile Co.	100-273
KFMB	Little Rock, Ark., Christian Churches of Little Rock	—254
KFMQ	Fayetteville, Ark., University of Arkansas	100-263
KFMR	Sioux City, Iowa, Morningside College	10-261
KFMT	Minneapolis, Minn., George W. Young	100-231
KFMW	Houghton, Mich., M. G. Saterren	50-266
KFMX	Northfield, Minn., Carleton College	500-283
KFNF	Shenandoah, Iowa, Henry Field Seed Co.	500-266
KFNG	Coldwater, Miss., Wooten's Radio Shop	10-254
KFNL	Paso Robles, Calif., Radio Broadcast Assn.	10-240
KFNV	Santa Rosa, Calif., L. A. Drake	5-234
KFNY	Helena, Mont., Montana Phonograph Co.	5-261
KFNZ	Burlingame, Calif., Royal Radio Co.	10-231



If these books were \$25 each they would still be a good investment for you!



Eight times \$25 is \$200. Put \$200.00 in the bank at 4% interest and you get a little over \$8 a year interest.

Put only one-tenth of \$200.00 into the Croft books, together with a little spare-time study, and you should get back anywhere from ten to several hundred times \$8.

Practical Electricity

By TERRELL CROFT

8 volumes—300 pages—2,100 illustrations—flexible binding.

OPPORTUNITIES in the electrical field have always been abundant, but today there are more big-paying positions open than at any time in the history of electricity. New uses are being found for electricity every day, and the progress of the world more and more depends upon it. Terrell Croft is doing his share in teaching men the correct principles of electrical practice. He knows the game from experience. He has poured out all his secrets, all the short cuts, all the time savers, in language that anyone can easily grasp. Yet the text is so scientifically correct that thousands of the highest paid electrical engineers are using the books as a reference set.

Free Examination. No money down. Only \$2 a month.

The Sure Way to Bigger Pay

BIG salaries are paid in the electrical field for expert knowledge. The man who knows electricity in all its many phases—the man who has completely mastered the subject from A to Z—can pick his own job and name his own salary. Fit yourself for a bigger position by knowing electrical practice completely—inside and outside work—central stations, electric illumination and the whole subject. Croft will teach you. He will take you in quick, easy steps from the simplest principles to the complete and economical operation of a great central station. The Croft-trained man wins because he knows the "why" and "how" of modern electrical practice.

Practical Electricity Taught by an Expert

No course, no set of books, offers a quicker surer method of mastering electricity than the Croft Library. It is founded on practice—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed, pay-raising facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough that it is the daily guide of thousands of highly paid electrical workers and engineers.

Croft has been through the mill. His knowledge has been gained by shirt-sleeve contact with electrical problems. He has worked his way up from the bottom to the top—from apprentice lineman to electrical engineer for one of the great electrical companies. Now he heads his own consulting company, and his name is known in every corner of the electrical world. He is the one man above all others who can show you the way to permanent success.

FREE
WITH THE LIBRARY
If You Subscribe Now
Taylor's
TRANSFORMER
PRACTICE
TAKE ADVANTAGE
OF THIS GREAT
BARGAIN OFFER
Act Now!

Easy Payments Pay for these books as you go along. We have made the payments so low that any man can meet them. Only \$1.50 in ten days and the balance at the rate of \$2 a month for nine months. These are the lowest—the easiest—terms ever made on a high-grade electrical library. In addition, as soon as your first payment of \$1.50 is received, we will send you a copy of Taylor's Transformer Practice absolutely free.

JUST SEND THE COUPON We want you to send me the CROFT Library of Practical Electricity (shipping charges prepaid), for 10 volumes for ten days' free examination. If satisfied, I will send \$1.50 in ten days and \$2 per month until \$19.50 has been paid. If not wanted, I will write you for return shipping instructions. Upon receipt of my first payment of \$1.50 I am to receive a copy of Taylor's Transformer Practice free of charge. (Write plainly and fill in all lines.)

Send No Money—Just the Coupon

Name

Home Address

City and State

Company or Employer

Occupation

McGraw-Hill
Book Co., Inc.,
370 Seventh Ave.,
New York



"I'm Going to Make More Money!"

"I'm tired working for a small salary. I know I have just as good a head on me as Fred Moore and Bob Roberts, for we used to work side by side. But they've gone far ahead of me.

"Why? Because they saw the value of special training, and I didn't.

"But I know better now. If the International Correspondence Schools can raise the salaries of men like Fred Moore and Bob Roberts, they can raise mine, too!

"If they have helped others to advance, they can help me. To-day—right now—I'm going to send in this coupon and at least find out what the I. C. S. can do for me."

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6192-D Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject before which I have marked an X:

BUSINESS TRAINING COURSES

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

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|---|--|
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Architects' Blue Prints |
| <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Architectural Draftsman |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Chemistry & Pharmacy |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Airplane Engines |
| <input type="checkbox"/> Metallurgy | <input type="checkbox"/> Agriculture and Poultry |
| <input type="checkbox"/> Steam Engineering | <input type="checkbox"/> Radio |
| | <input type="checkbox"/> Mathematics |

Name.....
 Street..... 3-6-24
 Address.....
 City..... State.....

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

Electrical Engineering Course for men of ambition and limited time. Over 4000 men trained. Condensed course in Theoretical and Practical Electrical Engineering including the closely related subjects of Mathematics and Mechanical Drawing taught by experts. Students construct motors, install wiring, test electrical machinery. Course complete

In One Year

Established in 1893 Prepare for your profession in the most interesting city in the world. Free catalog.

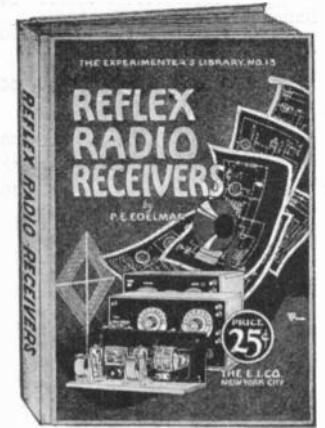
BLISS ELECTRICAL SCHOOL
 106 Takoma Ave., Washington, D. C.

Print Your Own

Cards, Stationery, Circulars, Paper, etc. Complete Outfits \$5.00 up. Have money Print for others, big profit. All easy, rules sent. Write for catalog presses type, paper etc. THE PRESS CO., E-47, Meriden, Conn.

Call Letters	Location and Name	Power & Wave Length
KFOA	Seattle, Wash., Rhodes Dept. Store	500-455
KFOC	Whittier, Calif., First Christian Church	100-236
KFOD	Wallace, Idaho, The Radio Shop	10-224
KFOF	Marshfield, Ore., Rohrer Electric Co.	10-240
KFOJ	Moberly, Mo., Moberly High School Radio Club	5-246
KFON	Long Beach, Calif., Echophone Radio Shop	100-234
KFOO	Salt Lake City, Utah, Latter Day Saints University	10-261
KFOR	David City, Nebr., David City Tire & Electric Co. (Howard A. Shuman)	20-226
KFOT	Wichita, Kans., College Hill Radio Club	50-231
KFOU	Richmond, Calif., Hommel Mfg. Co.	100-254
KFOX	Omaha, Nebr., Technical High School	100-248
KFOY	St. Paul, Minn., Beacon Radio Service	50-226
KFOZ	Fort Smith, Ark., Leon Hudson Real Estate Co.	20-233
KFPG	Los Angeles, Calif., Oliver S. Garretson	10-238
KFPH	Salt Lake City, Utah, Harold C. Mailander	50-242
KFPL	Dublin, Texas, C. C. Baxter	15-252
KFFM	Greenville, Texas, New Furniture Co.	10-242
KFPN	Jefferson City, Mo., Missouri National Guard, 70th Infantry Brigade	10-242
KFPO	Denver, Colo., Colorado National Guard, 45th Division Tank Co.	500-231
KFPP	Olympia, Wash., G. & G. Radio & Electric Shop	20-236
KFPR	Los Angeles, Calif., Los Angeles County Forestry Department	500-231
KFPT	Salt Lake City, Utah, Cope & Johnson	500-268
KFPV	San Francisco, Calif., Heintz & Kohlmoos	50-236
KFPW	Carterville, Mo., St. Johns Church	20-268
KFPX	Pine Bluff, Ark., First Presbyterian Church	100-242
KFPY	Spokane, Wash., Symons Investment Co.	100-283
KFQA	St. Louis, Mo., The Principia	50-261
KFQB	Fort Worth, Texas, Searchlight Publishing Co.	100-254
KFQC	Taft, Calif., Kidd Brothers Radio Shop	100-227
KFQD	Anchorage, Alaska, Chovin Supply Co.	100-280
KFQE	Colorado Springs, Colo., Dickenson-Henry Radio Laboratories	10-224
KFQF	Minneapolis, Minn., Donald A. Boul	10-224
KFQG	Los Angeles, Calif., Armory Exposition Park, Southern California Radio Assn.	100-226
KFQH	Hillsborough, Calif., Albert Sherman	50-231
KFQI	Culver City, Calif., Thomas H. Ince Corp.	100-234
KFQJ	Oklahoma, Okla., Harbour-Longmire Co.	50-236
KFQK	Fayette, Mo., Democrat Leader	10-236
KFQL	Muskogee, Okla., Oklahoma Free State Fair Assn.	20-252
KFQM	Austin, Texas, Texas Highway Bulletin	100-268
KFQN	Portland, Ore., Third Baptist Church	5-283
KFQO	Russell, Kans., Meier Radio Shop	10-261
KFQP	Iowa City, Iowa, George S. Carson, Jr.	10-224
KFQR	Oklahoma, Okla., Walter L. Ellis	50-250
KFQT	Denison, Texas, Texas National Guard, 36th Signal Company	10-252
KFQU	Holy City, Calif., W. Riker	100-234
KFQV	Omaha, Nebr., Omaha Grain Exchange	100-231
KFQW	North Bend, Wash., C. F. Kniernier Photo Radio & Electric Shop	50-248
KFQX	Seattle, Wash., Alfred M. Hubbard	500-233
KFQY	Belden, Nebr., Farmers State Bank	10-273
KFQZ	Hollywood, Calif., Taft Radio Co.	250-240
KFRB	Beeville, Tex., Hall Brothers	250-248
KFRF	San Francisco, Calif., Radioart Studio, Whitcomb Hotel	5-280
KFRG	Alexandria, La., W. R. Brown	10-242
KFRH	St. Louis, Mo., Cleveland High School	20-236
KFRH	Grafton, N. D., Martin L. Monson	10-268

Reflex Radio Receivers



WHAT REFLEX DO YOU PREFER?

The new 64-page book giving hookups galore on the finest low cost double duty-reflex circuits

Only the reflex can give the maximum results on a minimum number of tubes. It's the inherent principle of the reflex circuit that makes the tube do double duty. Therefore the reflex circuits are for the man who wants all the advantages of the high or low powered radic set at a low cost of construction and operation.

The new E. I. Company book gives complete details on the finest reflex circuits. It gives complete instructions on circuits galore. Contains 64 pages, bound by handsome heavy cover printed in two colors. Size is 5 1/2 by 7 1/2 inches.

SOLD BY ALL RELIABLE RADIO AND NEWS DEALERS

PRICE **25¢** Prepaid Book No. 13

PUBLISHED BY THE E. I. COMPANY
 The Consrad Company
 Sole Distributors
 233 Fulton St. New York City

Consrad

"RADIO'S FOREMOST PUBLISHERS"

Stop Snuffling



Get rid of nasty Catarrh. Stop sneezing, hawking, spitting and coughing. You weren't born with that disgusting disease. You acquired it because your Lungs, Liver, Bowels, Kidneys, and all other organs designed to eliminate waste matter are not functioning properly. Now your vitality is falling, your tongue is coated, your breath is foul and your Nose, Throat, Lungs and every part of your body are loaded with Catarrh poisons. Don't waste your time and money on dope and drugs, Sprays and washes, pills and powders. These can never help you. The only way to gain relief is to drive out the waste matter and build up your body—all of it—through Nature's Laws.

STRONGFORTISM—The New Science of Health Promotion will rebuild and restore every part of your body and aid Nature in forever banishing Catarrh and all other ailments. I guarantee it.

Mention the ailments on which you want special information and send with 10c for postage, etc., on my "Practical Talk on Catarrh," and my free book, "Promotion and Conservation of Health, Strength and Mental Energy."

STRONGFORT The Perfect Man **LIONEL STRONGFORT** NOW Physical and Health Specialist Dept. 17C9 Newark, New Jersey

Call Letters	Location and Name	Power & Wave Length
KFRI	Denver, Colo., Reynolds Radio Co. On moving train in Western Nebraska.	5—224
KFRJ	Conway, Ark., Guy Simmons, Jr.	10—250
KFRL	Grand Forks, N. D., Men's Club of First Presbyterian Church	10—240
KFRM	Fort Sill, Okla., Lieut. James P. Boland, U. S. A.	50—263
KFRN	Hanford, Calif., M. Laurence Short	5—224
KFRO	Fort Worth, Tex., Curtis Printing Co.	50—246
KFSG	Los Angeles, Calif., Echo Park Evangelistic Assn.	500—278
KFSY	Helena, Mont., Van Blaricom Co.	10—261
KGB	Tacoma, Wash., Tacoma Daily Ledger	50—252
KGG	Portland, Ore., Hallock & Watson Radio Service.	50—360
KGO	Oakland, Calif., General Electric Co.	1000—312
KGU	Honolulu, Hawaii, Marion A. Mulrony	500—360
KGW	Portland, Ore., Portland Morning Oregonian	500—492
KGY	Lacey, Wash., St. Martin's College	5—258
KHJ	Los Angeles, Calif., Times-Mirror Co.	500—395
KHQ	Seattle, Wash., Louis Wasmer (Excelsior Motorcycle & Bicycle Co.)	100—360
KJQ	Stockton, Calif., C. O. Gould.	5—273
KJR	Seattle, Wash., Northwest Radio Service Co.	50—283
KJS	Los Angeles, Calif., Bible Institute of Los Angeles.	750—360
KLS	Oakland, Calif., Warner Bros. Radio Supplies Co.	250—360
KLX	Oakland, Calif., Tribune Publishing Co.	500—509
FLZ	Denver, Colo., Reynolds Radio Co.	250—283
KMJ	Fresno, Calif., San Joaquin Light and Power Corp.	50—248
KMO	Tacoma, Wash., Love Electric Co.	10—360
KNT	Kukak Bay, Alaska, Walter Hemrich	100—263
KOB	State College, N. M., New Mexico College of Agriculture and Mechanic Arts.	500—360
KOP	Detroit, Mich., Detroit Police Department	500—286
KPO	San Francisco, Calif., Hale Bros.	500—423
KQP	Hood River, Ore., Apple City Radio Club	10—360
KQV	Pittsburgh, Pa., Doubleday-Hill Electric Co.	500—270
KQW	San Jose, Calif., Charles D. Herrold	50—360
KRE	Berkeley, Calif., Berkeley Daily Gazette	50—275
KSD	St. Louis, Mo., Post Dispatch.	500—546
KTW	Seattle, Wash., First Presbyterian Church	750—360
KFO	San Francisco, Calif., Examiner Printing Co.	150—360
KWG	Stockton, Calif., Portable Wireless Telephone Co.	50—360
KWH	Los Angeles, Calif., Los Angeles Examiner	250—360
KYQ	Honolulu, Hawaii, The Electric Shop	100—270
KYW	Chicago, Ill., Westinghouse Electric & Mfg. Co.	1000—536
KZM	Oakland, Calif., Preston D. Allen	100—360
WAAB	New Orleans, La., Valdemar Jensen	100—268
WAAC	New Orleans, La., Tulane University	400—360
WAAD	Cincinnati, Ohio, Ohio Mechanics Institute	25—360
WAAF	Chicago, Ill., Chicago Daily Drivers Journal	200—286
WAAM	Newark, N. J., I. R. Nelson Co.	250—263
WAAN	Columbia, Mo., University of Missouri	50—254
WAAW	Omaha, Neb., Omaha Grain Exchange	500—286
WABB	Harrisburg, Pa., Harrisburg Sporting Goods Co.	10—266
WABD	Dayton, Ohio, Parker High School	5—283
WABH	Sandusky, Ohio, Lake Shore Tire Co.	10—240
WABI	Bangor, Me., Bangor Railway & Electric Co.	100—240
WABL	Storrs, Conn., Connecticut Agricultural College	100—283
WABM	Saginaw, Mich., F. E. Doherty Automotive & Radio Equipment Co.	100—254
WABN	La Crosse, Wis., Ott Radio, Inc.	500—244
WABO	Rochester, N. Y., Lake Avenue Baptist Church (Hickson Electric Co.)	10—283



How big a field is DRAFTING?

A structure like the Temple Building, recently completed in Chicago, requires approximately 3000 mechanical drawings to guide its builders. Every floor, every girder, every stone must first be "laid out on paper." Every cottage and every skyscraper must be drawn... mechanically and to scale... before the builder can interpret the ideas of the architect... every country highway and city street, every engine and machine... wherever anything is built, there the draftsman is essential.

Send the Coupon

This Year, Thousands of Men Will Succeed in Drafting

—Will You Be One of Them?

FREE Trial Lesson Points the Way

TEN months from today you can be an expert draftsman. If you are making less than \$200 per month with limited prospect for advancement . . . these facts are addressed to you.

More than 50,000 draftsmen are needed every year. That is what makes drafting . . . when the man is properly trained . . . one of the surest and shortest roads to increased income. In a letter to Mr. Charles W. Morey, President of the Chicago Technical College, Mr. George W. Hand, Assistant to the President of the Chicago and Northwestern Railway, writes:

"Good draftsmen are hard to find and they experience no difficulty in obtaining remunerative employment."

Short Home-Study Course We have been teaching drafting for 21 years. Our instructors are practical engineers. They train you with practical jobs. Rates are low . . . payments easy. When you enroll, we include a \$25 "lifetime" drawing outfit.

The Trial Lesson Idea We send you without obligation a trial lesson in drafting. We want you to see what drafting is like . . . we want you to know our method of teaching by mail. Our course has been simplified and perfected through 21 years of teaching experience but we want you to judge for yourself whether you will like this fascinating, well-paid work.

40-page Book, free! We send you also a book of interesting facts on the field of drafting. This book gives you in complete outline our courses in structural, architectural, electrical and machine drafting. It introduces you to our instructors; tells you what prominent men say about drafting . . . where draftsmen are employed . . . and at what salaries . . . what a draftsman's opportunities are . . . it tells you how . . . and why . . . many of our students have increased their salaries even before finishing their courses.

Most men at the top in engineering started as draftsmen. Many of our students who learn drafting in spare time through Home-Study come to Chicago and secure positions at greatly increased salaries as draftsmen in engineering, construction, railroad, architectural firms, etc. Then . . . evenings in the college classroom . . . they continue their study of engineering or architecture. Many of them rise quickly to positions paying \$300, \$350, \$400 per month. Many enter their own business. Others become chief draftsmen and executives. The field of progress opened up to them in this way is really limitless.

Send Coupon Today

Thousands of men will succeed in drafting this year. Will you be one of them?



Chicago Technical College, founded in 1904, enrolls over 1000 men each year in resident day and evening courses.

Diplomas in engineering and architecture are granted at the end of two years. The Degree of B. S. is conferred at the end of three years in the day course. Short courses, also, in Drafting, Plan Reading, Estimating, etc.

From this famous College of Engineering come these Home - Study courses in Drafting.

Opportunities in Chicago

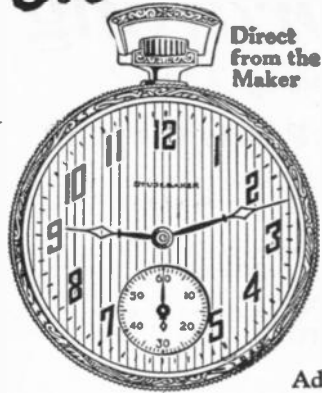
For those who can come to Chicago, there is a splendid opportunity to learn drafting while earning expenses in part-time positions. If interested, write for 52-page Blue Book.

Chicago TECHNICAL College

Chicago Tech Building, Dept. 245-B, 118 East 26th Street, Chicago

Chicago Technical College, Dept. 245-B, 118 East 26th Street, Chicago, Ill. Gentlemen: Send me, without cost or obligation, your Trial Lesson and your 40-page Booklet of Facts About Drafting.	TRIAL LESSON FREE	Name Address City State
--	--------------------------	--

On Credit!



Direct from the Maker



8

Adjustments

\$1 down!
—and direct from factory
Only \$1.00 down buys the famous Studebaker Insured Watch direct from the factory at the low factory price. Choice of 54 newest Art Beauty Cases, in white gold, green gold or yellow gold effects; 8 handsome dial designs. Mail coupon for beautiful Style Book in colors—Sent Free!

21 Jewel ~ Extra thin STUDEBAKER The Insured Watch

Has 21 Jewels—8 adjustments—and is insured for the lifetime of the owner. The masterpiece of timepieces at an amazingly low price.

Watch Chain FREE!

For a limited time we are offering a beautiful Watch Chain FREE. Write while offer lasts.

Mail Coupon for FREE Book

Mail coupon today for magnificent Studebaker Book of Advance Watch Styles. Find out how you can buy direct from the factory—save money and own one of the finest watches made. The Book shows 54 newest thin-model designs in Art Beauty Cases. Sent FREE!

STUDEBAKER WATCH CO.

Dept. H-97 South Bend, Indiana

Canadian Address: Windsor, Ontario

Ask for Ladies' Bracelet Watch Folder

Ask for Jewelry Folder

STUDEBAKER WATCH CO.
Dept. H-97 South Bend, Indiana
Please send me your Free Book of Advance Watch Styles and particulars of your \$1.00 down offer.
If you live in Canada send your inquiry to our Canadian office: Windsor, Ontario.

Name.....
Address.....
City..... State.....

Check here for Ladies Watch Folder Check here for Jewelry Folder

Magnified 225 Diameters

This is what the tip of a fly's leg is like when seen thru the



ULTRALENS MICROSCOPE

Any amateur can immediately start using his Ultralens to examine the edge of a razor, the mesh of a cotton shirt, the bacteria in dirty water. No technical training required, yet hundreds of scientists and teachers are using this instrument. Gives enormous magnification and perfect definition. Send \$7.50 for complete outfit. Send for descriptive literature.

\$7.50 for Complete Outfit Prepaid.

Scientific Apparatus Corp., Dept. 203, Milton, Pa.

Call Letters	Location and Name	Power & Wave Length
WABP	Dover, Ohio, Robert F. Weinig	200-266
WABQ	Haverford, Pa., Haverford College Radio Club	50-261
WABR	Toledo, Ohio, Scott High School	50-270
WABU	Camden, N. J., Victor Talking Machine Co.	50-226
WABW	Wooster, Ohio, College of Wooster	20-234
WABX	Mount Clemens, Mich. (near), Henry B. Joy	500-270
WABY	Philadelphia, Pa., John Magaldi, Jr.	50-242
WABZ	New Orleans, La., Coliseum Place Baptist Church	50-263
WAHG	Richmond Hill, N. Y., A. H. Grebe & Co.	500-316
WBAA	West Lafayette, Ind., Purdue University	250-283
WBAN	Paterson, N. J., Wireless Phone Corp.	100-244
WBAO	Decatur, Ill., James Millikin University	50-275
WBAP	Fort Worth, Texas, Wortham-Carter Publishing Co. (Star-Telegram)	1000-476
WBAV	Columbus, Ohio, Erner & Hopkins Co.	500-423
WBAX	Wilkes-Barre, Pa., John H. Stenger, Jr.	20-254
WBAY	New York, N. Y., Western Electric Co.	500-492
WBBA	Newark, Ohio, Plymouth Congregational Church	20-240
WBBD	Reading, Pa., Barbey Battery Service	50-234
WBBF	Atlanta, Ga., Georgia School of Technology	500-270
WBBG	Mattapoisett, Mass., Irving Vermilya	500-248
WBBH	Port Huron, Mich., J. Irving Bell	50-246
WBBL	Richmond, Va., Grace Covenant Church	5-283
WBBP	Petoskey, Mich., Petoskey High School	100-246
WBBR	Rossville, N. Y., Peoples Pulpit Assn.	500-273
WBBS	New Orleans, La., First Baptist Church	50-252
WBBT	Philadelphia, Pa., Lloyd Bros.	5-234
WBBU	Monmouth, Ill., Jenks Motor Sales Co.	10-224
WBBV	Johnstown, Pa., Johnstown Radio Co.	5-248
WBBW	Norfolk, Va., Ruffner Junior High School	50-222
WBBY	Charleston, S. C., Washington Light Infantry	10-268
WBBZ	Indianapolis, Ind., Noble B. Watson	50-227
WBL	Anthony, Kans., T & H Radio Co.	100-254
WBS	Newark, N. J., D. W. May, Inc.	50-360
WBT	Charlotte, N. C., Southern Radio Corp.	250-360
WBZ	Springfield, Mass., Westinghouse Electric & Mfg. Co.	1000-337
WCAD	Canton, N. Y., St. Lawrence University	250-280
WCAE	Pittsburgh, Pa., Kaufmann & Baer Co.	500-462
WCAG	New Orleans, La., Clyde R. Randall	50-268
WCAH	Columbus, Ohio, Entekin Electric Co.	100-286
WCAJ	University Place, Neb., Nebraska Wesleyan University	500-280
WCAK	Houston, Texas, Alfred P. Daniel	10-263
WCAL	Northfield, Minn., St. Olaf College	500-360
WCAO	Baltimore, Md., Sanders & Stayman Co.	50-275
WCAP	Washington, D. C., Chesapeake & Potomac Telephone Co.	500-469
WCAR	San Antonio, Texas, Southern Radio Corporation of Texas	100-360
WCAS	Minneapolis, Minn., William Hood Dunwoody Industrial Institute	100-280
WCAT	Rapid City, S. D., South Dakota State School of Mines	50-240
WCAU	Philadelphia, Pa., Durham & Co.	250-286
WCAV	Little Rock, Ark., J. C. Dice Electric Co.	10-360
WCAX	Burlington, Vt., University of Vermont	100-360
WCAY	Milwaukee, Wis., Hotel Antlers, Milwaukee Civic Broadcasting Assn.	250-266
WCBA	Allentown, Pa., Charles W. Heimbach	10-280

\$700 a week
from his own
Photograph Studio

"My income now averages from \$700 to \$1000 a week," writes Michael Gallo, who owns his own photographic studio on fashionable Fifth Avenue, New York. He adds, "My portrait studies bring me as much as \$250 a dozen." Hundreds of others are earning big money everywhere. Amazing growth of Professional Photography offers chance of a lifetime; high salaried position or your own business. \$20 to \$75 a week in spare time!

Learn at Home
No previous experience or special ability needed. New easy method makes you a Professional Photographer in spare hours at home. Famous experts of New York Institute of Photography train you by mail. All branches: Motion Picture, Portraiture, Commercial, News Photography. Earn while learning.

MOTION PICTURE CAMERA FREE
OR 5 x 7 VIEW
Your choice absolutely free. Motion Picture Camera takes real Motion Pictures on standard professional film used by all theatres—View Camera is latest professional model for all still photography; genuine anastigmat lens.

Write For Book. Handsome big new book explains wonderful opportunities: positions paying \$50 to \$250 a week, how to start your own business, how to earn money in spare time. Send postcard or letter today for FREE BOOK and free Camera offer.

NEW YORK INSTITUTE OF PHOTOGRAPHY
Dept. 822, 143 West 36th St. New York, N. Y.

YOU TOO CAN PLAY THE HAWAIIAN GUITAR
JUST AS THE HAWAIIANS DO!
PLAY ALL THE LATEST HITS

FREE! THIS \$15. HAWAIIAN GUITAR

ONLY 4 MOTIONS explain playing the fascinating Hawaiian Guitar. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Everything explained clearly. **PLAY IN HALF HOUR** After you get the 4 easy motions, you can play harmonious chords with very little practice. 40,000 students have learned to play in this easy, pleasant way.

EASY LESSONS
The 52 printed lessons with a great many pictures make it easy to learn quickly. You don't have to know how to read notes. No previous musical knowledge necessary. You learn to play any kind of music, and pay as you play.

FREE GUITAR
As a special offer to new students we give this full size, high grade instrument free of charge. It is sent at once without red tape or delay.

WRITE AT ONCE
Send your name at once and let us tell you all about the 52 easy lessons and the free guitar. You have everything you need. Don't put it off. A post card will do. Ask for new special offer and easy terms.

First Hawaiian Conservatory of Music, Inc.
233 Broadway (West 40th Bldg.) Dept. 48, New York, N. Y.

"LIGHTING FIXTURES"
READY TO HANG
Direct from manufacturer. Completely wired including glassware. Send for Catalogue No. 26 (Just off the Press)
Special Proposition to Dealers
ERIE FIXTURE SUPPLY CO.
Desk B Erie, Pa.

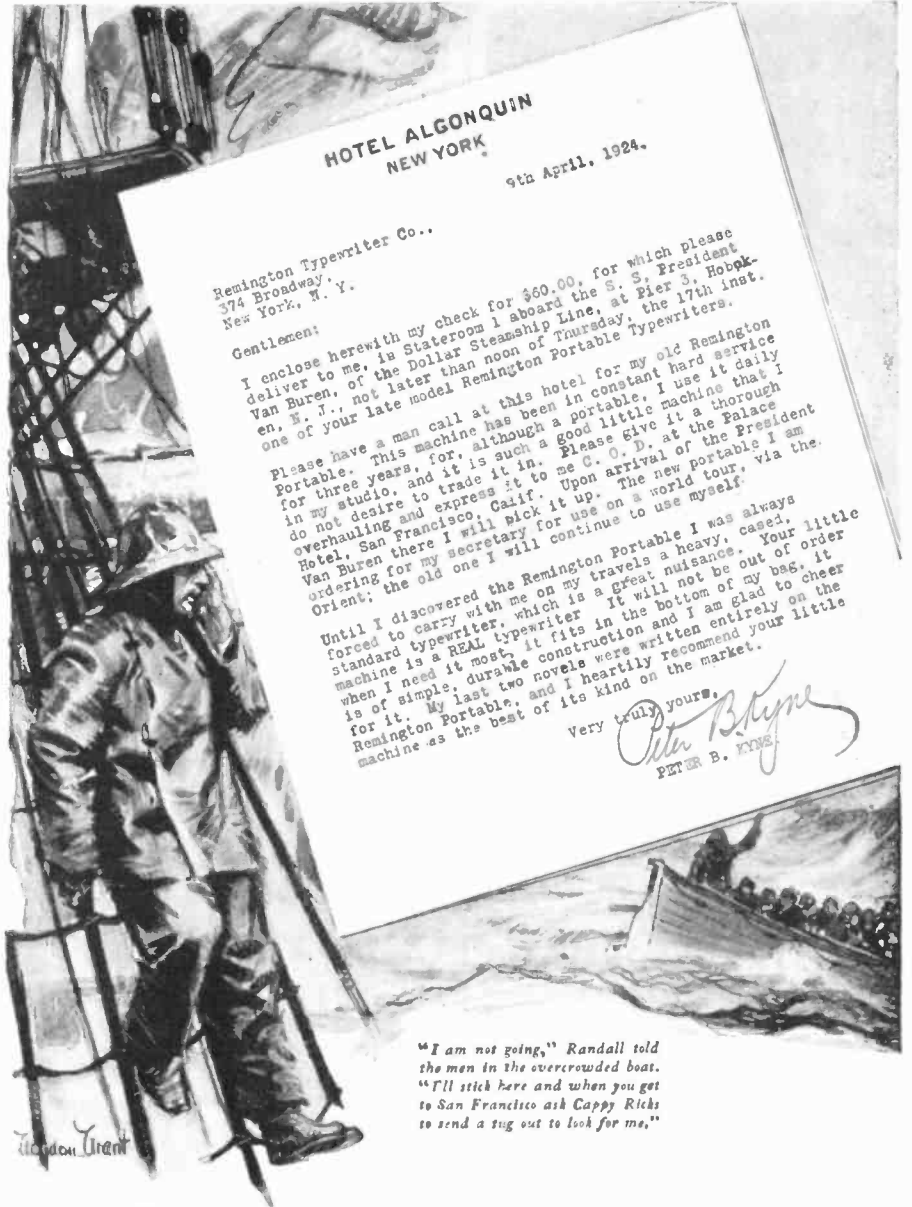
AGENTS 500% PROFIT GENUINE GOLD LEAF LETTERS

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. Reed made \$920 in two months. Write today for free sample and liberal offer to general agents.

METALLIC LETTER CO., 403 N. Clark Street, Chicago

"BOW LEGS and KNOCK-KNEES" UNSIGHTLY
Send for Booklet showing photos of men with and without the Perfect Leg Form
PERFECT SALES CO., Dept. 50
140 N. Mayfield Ave. Chicago, Ill.

Call Letters	Location and Name	Power & Wave Length
WCBC	Ann Arbor, Mich., University of Michigan	200-280
WCBD	Zion, Ill., Wilbur G. Voliva	500-345
WCBE	New Orleans, La., Uhalt Brothers Radio Co.	5-263
WCBG	Pascagoula, Miss. (portable), Howard S. Williams	10-268
WCBH	Oxford, Miss. (near), University of Mississippi	10-242
WCBI	Bemis, Tenn., Nicoll, Duncan & Rush	50-240
WCBJ	Jennings, La., J. C. Mans	10-244
WCBK	St. Petersburg, Fla., E. Richard Hall	500-266
WCBL	Houlton, Me., Northern Radio Mfg. Co.	50-280
WCBO	Memphis, Tenn., Radio Shop, Inc.	20-250
WCBQ	Nashville, Tenn., First Baptist Church	100-236
WCBR	Providence, R. I. (portable), Charles H. Messter	5-246
WCBT	Worcester, Mass., Clark University	250-238
WCBU	Arnold, Pa., Arnold Wireless Supply Co. (F. J. Ambrose)	50-254
WCBV	Tullahoma, Tenn., Tullahoma Radio Club	10-252
WCBW	Macon, Ga., George P. Rankin, Jr., and Mitland Solomon	10-226
WCBY	Buck Hill Falls, Pa., Forks Electrical Shop	10-268
WCBZ	Chicago Heights, Ill., Coppotelli Bros. Music House	50-248
WCCO	Minneapolis, Minn., Washburn-Crosby Co.	500-317
WCK	St. Louis, Mo., Stix-Baer & Fuller Dry Goods Co.	100-360
WCX	Detroit, Mich., Detroit Free Press	500-517
WDAE	Tampa, Fla., Tampa Daily Times	250-360
WDAF	Kansas City, Mo., Kansas City Star	500-411
WDAG	Amarilla, Texas, J. Laurance Martin	100-263
WDAH	El Paso, Texas, Trinity Methodist Church (South)	50-268
WDAR	Philadelphia, Pa., Lit Brothers	500-395
WDAS	Worcester, Mass., Sam Waite's Radio Shop	10-360
WDAU	New Bedford, Mass., Slocum & Kilburn	100-360
WDAY	Fargo, N. D., Radio Equipment Corporation	50-244
WDBB	Taunton, Mass., A. H. Waite & Co.	10-229
WDRC	Lancaster, Pa., Kirk, Johnson & Co.	50-258
WDBD	Martinsburg, W. Va., Herman E. Burns	5-268
WDBF	Youngstown, Ohio, Robert G. Phillips	50-246
WDBH	Worcester, Mass., C. T. Shear Co.	100-268
WDBI	St. Petersburg, Fla., Radio Specialty Co.	20-226
WDBJ	Roanoke, Va., Richardson-Wayland Electrical Corporation	50-229
WDBN	Bangor, Me., Maine Electric Light & Power Co.	5-252
WDBO	Winter Park, Fla., Rollins College	50-240
WDBP	Superior, Wis., Superior State Normal School	50-261
WDBQ	Salem, N. J., Morton Radio Supply Co.	10-234
WDBR	Boston, Mass., Tremont Temple Baptist Church	100-256
WDBS	Dayton, Ohio, S. M. K. Radio Corp.	5-283
WDBT	Hattiesburg, Miss., Taylor's Book Store	10-236
WDBW	Columbia, Tenn., The Radio Den	20-268
WDBX	New York, N. Y., Otto Baur	5-233
WDBY	Chicago, Ill., North Shore Congregational Church	500-258
WDBZ	Kingston, N. Y., Boy Scouts of America (Ulster County Council)	5-233
WDM	Washington, D. C., Church of the Covenant	50-234
WDZ	Tuscola, Ill., James L. Bush	10-278
WEAA	Flint, Mich., Police Building, Frank D. Fallain	50-280
WEAF	New York, N. Y., American Telep. & Teleg. Co.	500-492
WEAH	Wichita, Kans., Wichita Board of Trade	50-280
WEAI	Ithaca, N. Y., Cornell University	500-286
WEAJ	Vermilion, S. Dak., University of South Dakota	100-283
WEAM	North Plainfield, N. J., Borough of North Plainfield	150-286
WEAN	Providence, R. I., Shenard Co.	100-273
WEAO	Columbus, Ohio, Ohio State University	500-294
WEAP	Mobile, Ala., Mobile Radio Co.	100-360
WEAU	Sioux City, Iowa, Davidson Bros. Co.	100-275
WEAY	Houston, Tex., Iris Theatre	500-360
WEB	St. Louis, Mo., Benwood Co.	100-273
WEBA	Highland Park, N. J., The Electric Shop	15-233



**HOTEL ALGONQUIN
NEW YORK**
9th April, 1924.

Remington Typewriter Co.
374 Broadway,
New York, N. Y.

Gentlemen:
I enclose herewith my check for \$60.00, for which please deliver to me, in Stateroom 1 aboard the S. S. President Van Buren, of the Dollar Steamship Line, at Pier 3, Hoboken, N. J., not later than noon of Thursday, the 17th inst. one of your late model Remington Portable Typewriters.
Please have a man call at this hotel for my old Remington Portable. This machine has been in constant hard service for three years, for, although a portable, I use it daily in my studio, and it is such a good little machine that I do not desire to trade it in. Please give it a thorough overhauling and express it to me C. O. D. at the Palace Hotel, San Francisco, Calif. Upon arrival of the President Van Buren there I will pick it up. The new portable I am ordering for my secretary for use on a world tour, via the Orient; the old one I will continue to use myself.
Until I discovered the Remington Portable I was always forced to carry with me on my travels a heavy, cased, standard typewriter, which is a great nuisance. Your little machine is a REAL typewriter. It will not be out of order when I need it most, it fits in the bottom of my bag, it is of simple, durable construction and I am glad to cheer for it. My last two novels were written entirely on the Remington Portable, and I heartily recommend your little machine as the best of its kind on the market.

Very truly yours,
Peter B. Kyne
PETER B. KYNE

"I am not going," Randall told the men in the overcrowded boat.
"I'll stick here and when you get to San Francisco ask Cappy Rich; to send a tug out to look for me."

"IT'S A REAL TYPEWRITER"

The Remington Portable has won the endorsement of Peter B. Kyne, just as it has won the endorsement of prominent people the world over—by its outstanding superiority. Its success has been phenomenal.

Many present owners, like Mr. Kyne, have operated other typewriters. In the Remington Portable they have found a compact machine which meets every requirement, built to do beautiful work, and possessing every feature common to the big machine, even to the four-row standard keyboard.

Why should you continue to write in the old-fashioned, slow, tedious, long-hand, when with a Remington Portable you can turn out a beautifully clear and legible printed page, with far less time and effort? It's time to buy a Remington Portable. Sold by all Remington branches, and over 5,000 dealers. Easy terms.

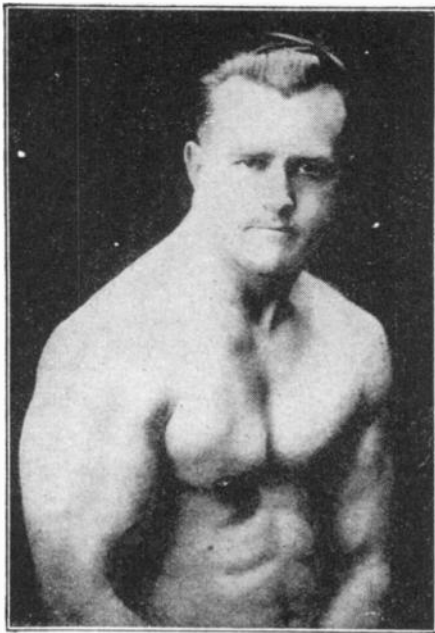
Illustrated "For You—For Everybody" will be sent upon request. Address Department 14.

REMINGTON TYPEWRITER COMPANY
374 Broadway, New York City
Remington Typewriter Company of Canada, Limited
Main Office, 68 King Street, West, Toronto



**REMINGTON
Portable Typewriter**

THE RECOGNIZED LEADER—IN SALES AND POPULARITY



EARLE E. LIEDERMAN
The Muscle Builder

A WART ON YOUR NOSE

would not be noticed nearly as much as a frail, weak body. Yet, if you had a wart on your nose, you would worry yourself sick—you would pay most any price to get rid of it. But what about that body of yours? What are you doing to make people admire and respect you? Wake up! Come to your senses! Don't you realize what a strong, robust body means to you? It makes no difference whether it be in the business or social world—everybody admires the strong, robust fellow—everyone despises the weakling.

I WILL TRANSFORM YOU

I make weak men strong. That's my job. That's why they call me "The Muscle Builder." I never fail. A bold statement, but true. I don't care how weak you are, I can do the trick. The weaker you are, the more noticeable the results. I've been doing this for so many years, it's easy now. I know how.

In just thirty days, I'm going to put one full inch on those arms of yours. Yes, and two inches on your chest. But that's nothing. I've only started. Now comes the real work. I'm going to broaden your shoulders and strengthen your back. I'm going to deepen your chest so that every breath will literally penetrate every cell of your lungs, feeding them with rich life-giving oxygen. You will feel the thrill of life glowing throughout your entire system. I'm going to tighten up those muscles in and around your heart, kidneys and stomach. I'm going to shoot a quiver up your spine so that you will stretch out your big brawny arms and shout for bigger and harder tasks to do. Nothing will seem impossible.

Sounds good, doesn't it? You can bet your Sunday socks it's good. It's wonderful. And the best of it is, I don't just promise you these things—I guarantee them. Do you doubt me? Come on then and make me prove it. That's what I like.

Are you ready? Atta boy! Let's go.

Send for my new 64-page book

"Muscular Development"

IT IS FREE!

It contains forty-three full page photographs of myself and some of the many prize-winning pupils I have trained. Many of these are leaders in their business professions today. I have not only given them a body to be proud of, but made them better doctors, lawyers, merchants, etc. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. All I ask is ten cents to cover the cost of wrapping and mailing and it is yours to keep. This will not obligate you at all, but for the sake of your future health and happiness, do not put it off. Send today—right now, before you turn this page.

EARLE E. LIEDERMAN

Dept. 202, 305 Broadway, New York City

Dear Sir:—I enclose herewith 10 cents for which you are to send me without obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

Name
Street
City State

Call Letters	Location and Name	Power & Wave Length
WEBC	Superior, Wis., Walter C. Bridges	10-242
WEBD	Anderson, Ind., Electrical Equipment & Service Co.	10-246
WEBE	Cambridge, Ohio, Roy W. Waller	10-248
WEBH	Chicago, Ill., Edgewater Beach Hotel Co.	1000-370
WEBI	Salisbury, Md., Walter Gibbons	15-242
WEBJ	New York, N. Y., Third Avenue Ry. Co.	500-273
WEBK	Grand Rapids, Mich., Grand Rapids Radio Co.	20-261
WEBL	United States, R. C. A.	100-226
WEBO	Hamilton, Ohio, Harry W. Fahrlander	5-250
WEBP	New Orleans, La., E. Budd Peddicord	50-280
WEBQ	Harrisburg, Ill., Tate Radio Co.	10-226
WEBR	Buffalo, N. Y., H. H. Howell	15-240
WEBT	Dayton, Ohio, Dayton Cooperative Industrial High School	5-270
WEBU	De Land, Fla., De Land Piano & Music Co.	5-258
WEBW	Beloit, Wis., Beloit College	500-283
WEBX	Nashville, Tenn., John E. Cain, Jr.	50-263
WEBY	Roslindale, Mass., Hobart Radio Co.	10-226
WEBZ	Savannah, Ga., Savannah Radio Corp.	5-280
WEEL	Boston, Mass., Edison Electric Illuminating Co. of Boston	500-303
WEV	Houston, Tex., Hurlburt-Still Electrical Co.	100-263
WEW	St. Louis, Mo., St. Louis University	100-280
WFAA	Dallas, Tex., Dallas News & Dallas Journal	500-476
WFAM	St. Cloud, Minn., Times Publishing Co.	10-273
WFAN	Hutchinson, Minn., Hutchinson Electric Service Co.	100-286
WFAV	Lincoln, Nebr., University of Nebraska	250-275
WFBB	Eureka, Ill., Eureka College	50-240
WFBG	Altoona, Pa., William F. Gable Co.	100-261
WFBH	New York, N. Y., Concourse Radio Corp.	500-273
WFBI	Camden, N. J., Galvin Radio Supply Co.	100-236
WFBJ	Collegeville, Minn., St. John's University	50-236
WFBK	Hanover, N. H., Dartmouth College	100-256
WFBM	Syracuse, N. Y., Onondaga Hotel	100-286
WFBN	Indianapolis, Ind., Merchants Heat & Light Co.	250-268
WFBQ	Bridgewater, Mass., Radio Sales & Service Co.	200-226
WFBQ	Raleigh, N. C., Wynne Radio Co.	50-252
WFBR	Baltimore, Md., Fifth Infantry, Maryland, N. G.	100-254
WFBT	Pitman, N. J., Gloucester County Civic League	50-231
WFBV	Boston, Mass., Commonwealth Radio Association	
WFI	Philadelphia, Pa., Strawbridge & Clothier	500-395
WGAL	Lancaster, Pa., Lancaster Electric Supply & Construction Co.	10-248
WGAN	Pensacola, Fla., Cecil E. Lloyd	50-360
WGAQ	Shreveport, La., Youree Hotel	150-252
WGAZ	South Bend, Ind., South Bend Tribune	250-275
WGBA	Baltimore, Md., Jones Electric & Radio Mfg. Co.	50-254
WGBS	New York, N. Y., Gimbel Brothers	1000-316
WGI	Medford Hillside, Mass., American Radio & Research Corp.	100-360
WGL	Philadelphia, Pa., Thomas F. J. Howlett	500-360
WGN	Chicago, Ill., The Tribune (Drake Hotel - Whitesone Co.)	1000-370
WGR	Buffalo, N. Y., Federal Teleg. Mfg. Co.	750-319
WGY	Schenectady, N. Y., General Electric Co.	1000-380
WHAA	Iowa City, Iowa, State University of Iowa	500-484
WHAD	Milwaukee, Wis., Marquette University	100-280
WHAG	Cincinnati, Ohio, University of Cincinnati	100-222
WHAM	Rochester, N. Y., University of Rochester	100-283
WHAR	Atlantic City, N. J., Seaside Hotel	100-275
WHAS	Louisville, Ky., Courier-Journal & Louisville Times	500-400

PRICES REDUCED

Only \$3 Down

A Year to Pay

Yes, lowest prices on UNDERWOOD, REMINGTON, L. C. SMITH, ROYAL, and all standard makes on easiest terms ever offered. Re-manufactured like new by the famous "Young Process."

10 Days' Trial—5 Years Guarantee

Our liberal "direct from factory plan" saves half. You actually use the typewriter 10 days without obligation to buy. Let us prove we have the greatest typewriter bargains ever offered. Big saving.

Big Illustrated Catalog Free

This interesting valuable book explains fully how "Young Process of Re-Manufacturing" guarantees you highest quality, perfect service and satisfaction.

YOUNG TYPEWRITER CO. Est. 1911

Send Coupon Now

Young Typewriter Co., Dept. 1163
654 W. Randolph St., Chicago

Send me Free book and Special Reduced Prices. This does not obligate me in any way.

Name.....
Address.....
City..... State.....

\$1

Postpaid with Instructions

SEND FOR YOUR FREE COPY

TESTED HOOK-UPS

SUBMITTED BY USERS OF OUR WONDERFUL TRANSMITTER BUTTON FOR LOUD SPEAKERS AMPLIFICATION EXPERIMENTS

K. ELECTRIC CO.

15 PARK ROW NEW YORK

FARAWAY RADIO

\$29.50

Gets stations Far and near Loud and Clear

FARAWAY Radio Sets are amazing values at bargain prices. Users get stations from New York to Frisco—loud and clear. Operate with either dry cells or storage batteries. Beautiful cabinet finished in mahogany with new platinum-finished panel. SATISFACTION GUARANTEED. Don't pay \$100 or \$150. Write for our money-saving plan and literature.

2-Tube Set - \$29.50
4-Tube Set - \$9.50

Dealers - Agents: Biggest possibilities you ever heard of. Write for plan and territory quickly.

THE FARAWAY RADIO CO., 657 W. THIRD ST., CINCINNATI, O.

MAKE MONEY SELL MADISON SHIRTS

Direct from our factory to wearers. Easily sold. Over one million satisfied wearers. No capital or experience required. Large steady income. Many earn \$100. to \$150. weekly. Territory now being allotted. Write For Free Samples.

MADISON MILLS MFRS., 5628'way, New York

Call Letters	Location and Name	Power & Wave Length
WHA V	Wilmington, Del., Wilmington Electrical Specialty Co.	100—503
WHA Z	Troy, N. Y., Rensselaer Polytechnic Institute	500—380
WHB	Kansas City, Mo., Sweeney School Co.	500—411
WHK	Cleveland, Ohio, Radiovox Co.	100—283
WHN	New York, N. Y., George Schubel	500—360
WHO	Des Moines, Iowa, Bankers Life Co.	500—526
WIAB	Rockford, Ill., Art. A. Johnson Garage	50—252
WIAC	Galveston, Tex., Galveston Tribune	100—360
WIAD	Philadelphia, Pa., Howard R. Miller	100—254
WIAK	Omaha, Nebr., Journal-Stockman Co.	250—278
WIK	McKeesport, Pa., K. & L. Electric Co.	100—234
WIP	Philadelphia, Pa., Gimbel Brothers	500—509
WJAB	Lincoln, Nebr., American Electric Co.	100—229
WJAD	Waco, Tex., Jackson's Radio Engineering Laboratories ..	150—360
WJAG	Norfolk, Nebr., Norfolk Daily News	250—283
WJAK	Greentown, Ind., Clifford L. White	30—254
WJAM	Cedar Rapids, Iowa, D. M. Perham	20—268
WJAN	Peoria, Ill., Peoria Star	100—280
WJAR	Providence, R. I., The Outlet Co.	500—360
WJAS	Pittsburgh, Pa., Pittsburgh Radio Supply House	500—286
WJAX	Cleveland, Ohio, Union Trust Co.	500—390
WJD	Granville, Ohio, Denison University	10—229
WJDD	Mooseheart, Ill., Supreme Lodge, Loyal Order of Moose	500—278
WJY	New York, N. Y., R. C. A.	750—405
WJZ	New York, N. Y., R. C. A.	500—455
WKAA	Cedar Rapids, Iowa, H. F. Paar	50—278
WKAD	East Providence, R. I., Charles Loeff (Crescent Park)	20—240
WKAF	Wichita Falls, Tex., W. S. Radio Supply Co.	100—360
WKAN	Montgomery, Ala., United Battery Service Co.	15—226
WKAP	Cranston, R. I., Dutee W. Flint	50—360
WKAQ	San Juan, P. R., Radio Corp. of Porto Rico	500—360
WKAR	East Lansing, Mich., Michigan Agricultural College	500—280
WKA V	Laconia, N. H., Laconia Radio Club	50—254
WKBF	Cranston, R. I., Dutee W. Flint	500—286
WKY	Oklahoma, Okla., WKY Radio Shop	100—360
WLAL	Tulsa, Okla., Naylor Electrical Co.	100—360
WLAP	Louisville, Ky., W. V. Jordan	20—286
WLAX	Greencastle, Ind., Greencastle Community Broadcasting Station	10—231
WLBL	Stevens Point, Wis., Wisconsin Department of Markets	500—278
WLS	Chicago, Ill., Sears, Roebuck & Co.	500—345
WLW	Cincinnati, Ohio, Crosley Radio Corp.	1000—423
WMAC	Cazenovia, N. Y., Clive B. Meredith	100—261
WMAF	Dartmouth, Mass., Round Hills Radio Corp.	100—500—360
WMAH	Lincoln, Nebr., General Supply Co.	100—254
WMAK	Lockport, N. Y., Norton Laboratories	500—273
WMAN	Columbus, Ohio, First Baptist Church	50—286
WMAQ	Chicago, Ill., Chicago Daily News	500—448
WMAV	Auburn, Ala., Alabama Polytechnic Institute	500—250
WMA Y	St. Louis, Mo., Kingshighway Presbyterian Church	100—280
WMAZ	Macon, Ga., Mercer University	100—261
WMC	Memphis, Tenn., "Commercial Appeal"	500—500
WMH	Cincinnati, Ohio, Ainsworth-Gates Radio Co.	750—309
WMU	Washington, D. C., Doubleday-Hill Electric Co.	100—261
WNAC	Boston, Mass., Shepard Stores	100—278
WNAD	Norman, Okla., University of Oklahoma	100—254
WNAL	Omaha, Nebr., Omaha Central High School	20—258
WNAP	Springfield, Ohio, Wittenberg College	100—275
WNAR	Butler, Mo., First Christian Church	20—231

Will you give me 6 Months to Increase YOUR PAY?

Your name on the coupon means "Yes"



No, I am not a wizard. I don't claim to have a "corner" on success, but here's a fact.

For fourteen years I have been helping men just like you to make more money, not just a few men here and there, but thousands of men.

Think these facts over—in just a few months time I boosted one man's pay from \$2.00 a day to over \$300 a month—another man makes as high as \$27.00 a day—another man, after securing my help, went into business for himself and, while he now hires his drafting done, he makes over \$50,000 a year.

\$275 Extra in Three Days

One man saw an ad like this—Sent in the coupon—Enrolled for the Columbia Course—and shortly after he received \$275 for one drawing that he made in his spare time in three days.

Do you make money like these men do? Does the money in your pay envelope get you the things you really want or just enough to make you wish you, too, could have the good things of life that other men have—money, independence, success, happiness?

MAKE \$50 TO \$100 A WEEK

Columbia will train you to be an expert Draftsman in your spare time at home by mail. There's a lot of room for you if you act now. This doesn't mean that you will be just an ordinary Draftsman, but a finished, Professional Draftsman, able to hold your place among the highest paid Draftsmen in the land.

PROMOTION IS QUICK

We'll qualify you for a high salaried position in the Drafting field and keep you in touch with openings for Draftsmen in the big machine shops, industrial plants and United States Government departments. Men who start as Draftsmen are often advanced to Chief Draftsmen, Chief Engineers, Production Managers, and so on. Many of my graduates are today holding such positions as a result of my help. These positions pay big money and lead on to executive positions of the highest type. Thousands of men have found Drafting to be the stepping stone to some of the biggest positions in American industry.

GET THE RIGHT TRAINING

I started this school years ago. Today it is a solidly established nationally known institution, with graduates all over the world. I stand personally in back of the Columbia School of Drafting and back of every promise, every statement we make.

You get the right training when you enroll at Columbia. You spend no time on long winded theories. You start on actual drawing work the day you receive your first lesson. You get right down to brass tacks and there is no lost motion, no waste of time or effort at any stage of the course. From the very beginning you can feel yourself making progress, the kind of progress that makes you confident of yourself and sure of your success.

YOU NEED NO PREVIOUS TRAINING

This course of mine is easy to understand and easy to follow. It is designed for men who must have the best and who must get the right training quickly, so as to be able to make more money as soon as possible. Many of my students are qualified, even before they complete the course. Many a man has increased his pay so soon after enrolling that his course has actually cost him nothing.

SUCCESS CALLS MEN OF ACTION ONLY

If you are a man of action—if you want success bad enough to reach out and grab it, clip the coupon now and show me that you are a man of action. Keep right on top of this opportunity to make real money. Don't go looking for a pair of scissors, tear the coupon off and mail it right away. Get started now.

What I Give You

Free Book. Send in the coupon today. I will immediately send you our book "Drafting—Your Success" which tells about Drafting and its opportunities and contains proof that I can raise your pay.

Free Subscription to Drafting Publication. "The Compass." I will give you free a subscription to our helpful, inspiring publication, "The Compass."

Practical Problems. You will be carefully coached in practical Drafting work.

I Help You Get A Job. I will help you get a position as a practical Draftsman and will give you real, personal help, such as I have given to thousands of others.

Personal Instruction and Supervision, throughout the Course. You will receive the personal instruction and help of Roy C. Clafin, President of the Columbia School of Drafting and a practical Draftsman of many years' experience.

Draftsman's Equipment. I will furnish you with a full set of first class drawing equipment and Drafting instruments, as shown in the picture below, when you enroll. You keep both sets on completing the course.

Consultation Privileges. You are free to write me at any time for personal advice and suggestions regarding your progress.

Diploma. The diploma I will give you on completing the course attests to your proficiency as a Draftsman. It is an entering wedge to success.

Advice Regarding Government Positions. The following are a few of the many positions open in the Government Departments from time to time. The salaries are starting salaries, subject to increase:

- Architectural Designer—\$4,000 a year.
- Chief Draftsman, Naval Aircraft Factory—\$15.04 a day.
- Aeronautical Draftsman, Field Service Navy Department—\$5.20 to \$12.50 a day.

We will advise you as to other government openings from time to time.

COLUMBIA SCHOOL OF DRAFTING

Roy C. Clafin, President
Dept. G-115, 14th and T Sts., N.W., Washington, D.C.

FREE BOOK COUPON

COLUMBIA SCHOOL OF DRAFTING
Dept. G-115, 14th and T Sts., N. W.,
Washington, D. C.

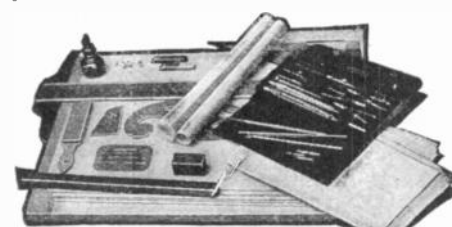
Please send me without charge your free illustrated book on Drafting, telling me how I can secure your help in securing a position as Draftsman. Also enter my name for free subscription to "The Compass."

Name

Address

City

State



FREE DRAFTING OUTFIT

We give you free with our course this professional Drafting outfit. It is yours to keep when you complete the course.



ON ONE TUBE

HIG FREE BOOKLET tells the story. California users of CROSS COUNTRY CIRCUIT hear Atlantic Coast, Canada, Cuba, Mexico and Hawaii. Atlantic Coast users hear England to California. Our new plan makes this set easiest and cheapest to build. One hour puts in operation. One tuning control. No soldering. Any novice can do it. **BIG BOOKLET FREE** or complete instructions for 25c stamps or coin. **VESCO RADIO CO.** Box 51-117 Oakland, Calif.

Agents Wanted!

Salesmen—Distributors

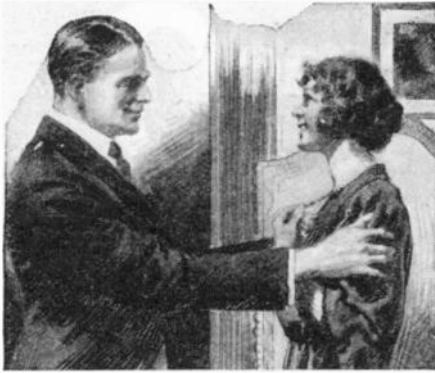
to use and introduce attachment that makes Fords run on 94% air. **THERMOSTAT** on exhaust automatically turns down needle valve as engine warms, exactly as Ford Manual says do by hand.

Blancke Auto Thermo

An Automatic Carburetor Control Makes Fords start easier winter or summer—saves half gas and oil—cuts repair bills one-half—reduces carbon formation one-half. Sells on sight to every Ford owner as easily as giving him a \$100 bill, because it saves \$100 every 10,000 miles. Cadillac now uses as standard equipment thermostatic carburetor control under Blancke license. You can make Big Money selling this wonderful proven device. Experience not necessary. Blancke plan will start you without capital in a business of your own that makes you from \$250 to \$3,000 a month profit.

Write for free circulars Now!

A.C. Blancke & Co. 602 W. Lake Street Dept. 921 Chicago



"Mary, I Owe It All to You"

"MR WILLIAMS called me into his office to-day and told me he was going to raise my salary \$50 a month.

"I am glad to give you this opportunity," he said, "for the best reason in the world. You deserve it.

"You may not know it, but I've been watching your work ever since the International Correspondence Schools wrote me that you had enrolled for a course of home study. Keep it up, young man, and you'll go far. I wish we had more men like you."

"And to think, Mary, I owe it all to you! I might still be drudging along in the same old job at the same old salary if you hadn't urged me to send in that I. C. S. coupon!"

How about you? Are you always going to work for a small salary? Are you going to waste your natural ability all your life? Or are you going to get ahead in a big way? It all depends on what you do with your spare time.

More than 180,000 men are getting ready for promotion right now in the I. C. S. way. Let us tell you what we are doing for them and what we can do for you.

Mail the Coupon To-day

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6194-D Scranton, Penna.

Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject before which I have marked an X:

BUSINESS TRAINING COURSES

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

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|---|--|
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Architects' Blue Prints |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Architectural Draftsman |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Airplane Engines |
| <input type="checkbox"/> Metallurgy <input type="checkbox"/> Mining | <input type="checkbox"/> Agriculture and Poultry |
| <input type="checkbox"/> Steam Engineering <input type="checkbox"/> Radio | <input type="checkbox"/> Mathematics |

Name.....
 Street.....
 Address.....
 City.....State.....

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

MAKE MONEY AT HOME

YOU can earn good money at home in your spare time making show cards for us. No canvassing or soliciting. We show you how by our new simple method. We supply both men and women with work at home, no matter where you live and pay you cash for all work completed each week. Full particulars and booklet free. Write today.

AMERICAN SHOW CARD SYSTEM, LTD.
 110 Adams Building Toronto, Canada

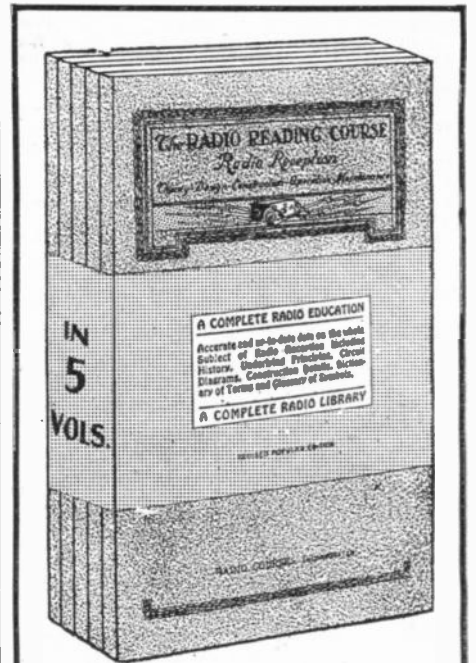
RADIO SETS — — AUTO BODIES

SEND FOR THE INTERNATIONAL CATALOG

Our net price list. Radio Sets; and auto bodies for Fords at Wholesale Prices. Save big money by buying Direct from Factory

International Body Works, 914 W. Ohio St., Dept. 4, Chicago, Ill.

Call Letters	Location and Name	Power & Wave Length
WNAT	Philadelphia, Pa., Lenning Brothers	100—250
WNAW	Fort Monroe, Va., Henry Kunzmann	5—360
WNAX	Yankton, S. Dak., Dakota Radio Apparatus Co.	100—244
WNJ	Newark, N. J., Radio Shop of Newark	100—233
WNYC	New York, N. Y., City of New York	1000—526
WOAC	Lima, Ohio, Page Organ Co.	50—266
WOAE	Fremont, Nebr., Midland College	15—280
WOAF	Tyler, Tex., Tyler Commercial College	10—360
WOAI	San Antonio, Tex., Southern Equipment Co.	500—385
WOAJ	Parsons, Kans., Ervins Electrical Co.	15—258
WOAN	Lawrenceburg, Tenn., James D. Vaughn	200—360
WOAR	Kenosha, Wis., Henry P. Lundsckow	50—229
WOAV	Erie, Pa., Pennsylvania National Guard, 112th Infantry	50—242
WOAW	Omaha, Nebr., Woodmen of the World	500—526
WOAX	Trenton, N. J., Franklyn J. Wolff	500—240
WOC	Davenport, Iowa, Palmer School of Chiropractic	500—484
WOI	Ames, Iowa, Iowa State College	500—360
WOO	Philadelphia, Pa., John Wana-maker	500—509
WOQ	Kansas City, Mo., Western Radio Co.	500—360
WOR	Newark, N. J., L. Bamberger & Co.	500—405
WOS	Jefferson City, Mo., Missouri State Marketing Bureau	500—441
WPAB	State College, Pa., Pennsylvania State College	500—283
WPAC	Okmulgee, Okla., Donaldson Radio Co.	100—360
WPAJ	New Haven, Conn., Doolittle Radio Corp.	100—268
WPAK	Agricultural College, N. Dak., North Dakota Agricultural College	50—283
WPAR	Beloit, Kans., Ward Battery & Radio Co.	10—236
WPAU	Moorehead, Minn., Concordia College	10—286
WPAZ	Charleston, W. Va., John R. Koch (Dr.)	10—273
WQAA	Parkesburg, Pa., Horace A. Beale, Jr.	500—360
WQAC	Amarillo, Tex., Gish Radio Service	100—234
WQAE	Springfield, Vt., Moore Radio News Station	50—275
WQAF	Sandusky, Ohio, Sandusky Register	5—240
WQAM	Miami, Fla., Electrical Equipment Co.	100—283
WQAN	Scranton, Pa., Scranton Times	100—280
WQAO	New York, N. Y., Calvary Baptist Church	100—360
WQAQ	Abilene, Tex., West Texas Radio Co. (Abilene Daily Reporter)	100—360
WQAS	Lowell, Mass., Prince-Walter Co.	100—266
WQAX	Peoria, Ill., Radio Equipment Co.	100—248
WQJ	Chicago, Ill., Calumet Rainbow Broadcasting Co.	500—448
WRAF	Laporte, Ind., The Radio Club	10—224
WRAL	St. Croix Falls, Wis., Northern States Power Co.	100—248
WRAM	Galesburg, Ill., Lombard College	100—244
WRAN	Waterloo, Iowa, Black Hawk Electrical Co.	10—236
WRAO	St. Louis, Mo., St. Louis Radio Service Co.	10—360
WRAV	Yellow Springs, Ohio, Antioch College	100—242
WRAW	Reading, Pa., Avenue Radio & Electric Shop	10—238
WRAX	Gloucester City, N. J., Flexon's Garage	100—268
WRBC	Valparaiso, Ind., Inmanuel Lutheran Church	500—278
WRC	Washington, D. C., Radio Corp. of America	500—469
WREO	Lansing, Mich., Reo Motor Car Co.	500—288
WRK	Hamilton, Ohio, Doron Bros. Electrical Co.	200—360
WRL	Schenectady, N. Y., Union College	500—360
WRM	Urbana, Ill., University of Illinois	500—273
WRR	Dallas, Tex., City of Dallas, Police and Fire Signal Department	30—360
WRW	Tarrytown, N. Y., Tarrytown Radio Research Laboratory	500—273



"Convincing Even to the Trained Engineer"

The above quotation of Prof. J. H. Morecroft of Columbia University is taken from his endorsement as printed in The Radio Reading Course, illustrating the authoritativeness of the data in this set of five books.

A Complete Radio Education

In The Radio Reading Course the amateur and experimenter will find a whole education. In the simplest but most complete and interesting manner you will find the fundamental principles representing the Cause behind the Effect. How often have you needed a sure knowledge of the Cause to help you correct a poor Effect or to get the good Effect you desired?

To Get These Books You Need

SEND NO MONEY

Send No Money—Just your name and address and we will forward the books to you upon receipt of which you pay the postman \$1.97 plus a few cents postage.

Sole Distributors

The
Conrad Company
 233 Fulton St., New York, N. Y.

Fords Get Double Mileage With New Invention

Simple Device Works Wonders

The most amazing and remarkable invention that has come to light in recent years has just been produced by Robert Martin of Chamberlain, S. D. Fords that were formerly making only 12 to 14 miles on a gallon of gas are now getting from 28 to 43 miles, by using this new attachment. This marvelous invention is a simple affair of aluminum and glass and can be installed by anyone in just a few minutes. In addition to increasing mileage, it filters every drop of gasoline fed to the cylinders and removes every particle of carbon at the same time. Mr. Martin guarantees it to increase mileage on any car and is willing to give one free to any person who will help him introduce it. Write Robert Martin, 800-24 Somers Bldg., Chamberlain, S. D., and ask for his free sample offer.

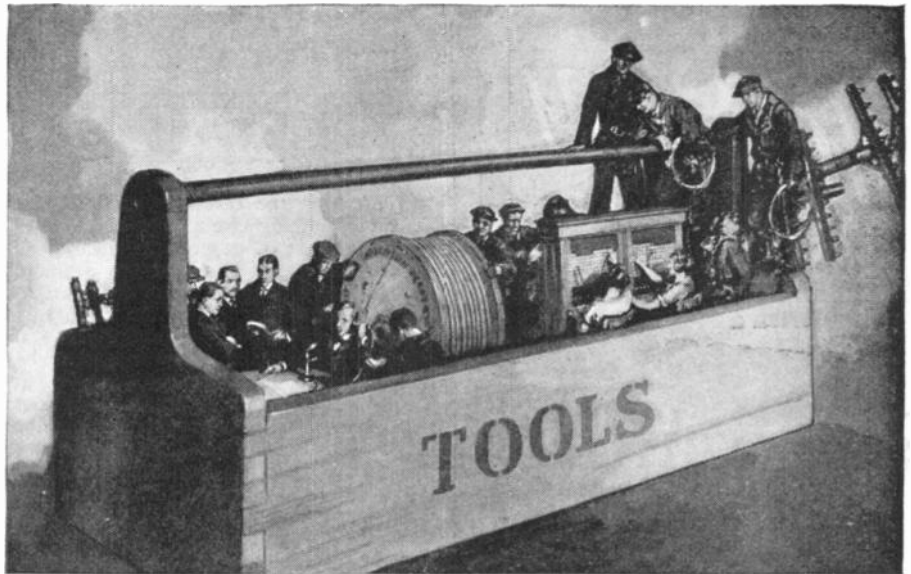
FREE

Fine Tone Musical Instruments

\$20

We have a wonderful new copyrighted system of teaching note music by mail. To first pupils in each locality we will give free a \$30 superb Violin, Tenor Banjo, Ukulele, Hawaiian-Guitar, Banjo, Mandolin, Banjo-Ukulele, Banjo-Mandolin, Cornet or Banjo-Guitar absolutely free. Also teach Piano and Organ. Very small charge for lessons only. Four lessons will teach you several pieces. Over 100,000 successful players. We guarantee success or no charge. Complete outfit free. Write today. Dept. 149. No obligation. Slingerland School of Music, 1815 Orchard St., Chicago, Ill.

Call Letters	Location and Name	Power & Wave Length
WSAC	Clemson College, S. C., Clemson Agricultural College ..	500—360
WSAD	Providence, R. I., J. A. Foster Co.	100—261
WSAI	Cincinnati, Ohio, United States Playing Card Co.	500—309
WSAJ	Grove City, Pa., Grove City College	250—258
WSAP	New York, N. Y., City Temple, Adventist Church....	250—263
WSAR	Fall River, Mass., Doughty & Welch Electrical Co.	100—254
WSAU	Chesham, N. H., Camp Marienfeld	10—229
WSAV	Houston, Tex., Clifford W. Vick Radio Construction Co.	100—360
WSAX	Chicago, Ill., Chicago Radio Lab.	20—268
WSAZ	Pomeroy, Ohio, Chase Electric Shop	50—258
WSB	Atlanta, Ga., Atlanta Journal.	500—429
WSL	Utica, N. Y., J. & M. Electric Co.	100—273
WSOE	Milwaukee, Wis., School of Engineering of Milwaukee..	100—246
WSY	Birmingham, Ala., Alabama Power Co.	500—360
WTAB	Fall River, Mass., Fall River Daily Herald Publishing Co.	100—266
WTAC	Johnstown, Pa., Penn. Traffic Co.	150—275
WTAF	New Orleans, La., Louis J. Gallo	10—268
WTAL	Toledo, Ohio, Toledo Radio & Electric Co.	10—252
WTAM	Cleveland, Ohio, Willard Storage Battery Co.	1000—390
WTAP	Cambridge, Ill., Cambridge Radio & Electric Co.	50—242
WTAQ	Osseo, Wis., S. H. Van Gorden & Son	100—254
WTAR	Norfolk, Va., Reliance Electric Co.	100—280
WTAS	Elgin, Ill. (near), Charles E. Erbstein	500—286
WTAT	Boston, Mass. (portable), Edison Electric Illuminating Co.	100—244
WTAU	Tecumseh, Nebr., Ruegg Battery & Electric Co.	10—242
WTAW	College Station, Tex., Agricultural & Mechanical College of Texas	250—280
WTAX	Streator, Ill., Williams Hardware Co.	50—231
WTAY	Oak Park, Ill., Oak Leaves Broadcasting Station	500—283
WTAZ	Lambertville, N. J., Thomas J. McGuire	15—261
WTG	Manhattan, Kans., Kansas State Agricultural College	50—273
WWAD	Philadelphia, Pa., Wright & Wright, Inc.	100—360
WWAE	Joliet, Ill., Lawrence J. Crowley (Alamo Ball Room) ..	500—242
WWAO	Houghton, Mich., Michigan College of Mines	250—244
WWI	Dearborn, Mich., Ford Motor Co.	250—273
WWJ	Detroit, Mich., Detroit News.	500—517
WWL	New Orleans, La., Loyola University	5—280



The tools of national service

The American people lead the world in the efficiency of industry. Who can say what part of their success is due to the superior implements they use. This much we know. They have the world's best telephone system as an instrument of communication, and they use it without parallel among the races of the earth. To this end our telephone service must be equipped with proper tools.

The tools of management. Bell System executives, rising from the ranks of those who know telephony, must share our responsibility to the public, most of whom are telephone users, shareholders or workers.

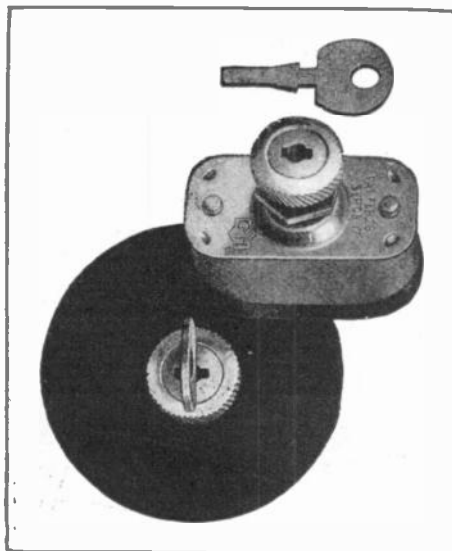
The tools of service. The national, two-billion-dollar Bell System, handling fifty-eight million telephone calls a day, must be enlarged and extended while in use.

The tools of forecast. We must continue to know the rapid and complex growth of communities and make provision in advance, so that the telephone will be ready when needed.

The tools of supply. The Western Electric Company, our manufacturing and purchasing department, its factories manned by 40,000 workers, assures us that extension of facilities need never be interrupted.

We must have the best tools of finance, of invention, of everything else, in order to continue serving the American people.

Radio Lock Switch



This key switch will enable the owner of a radio set to protect his tubes and batteries against theft or tampering with. The key can be carried on key chain. One hole mount.



AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

BELL SYSTEM

One Policy, One System, Universal Service

Music Lessons
WITH AN ACCREDITED SCHOOL
At Home

A Complete Conservatory Course By Mail Wonderful home study music lessons under great American and European teachers. Endorsed by Faderowski. Master teachers guide and coach you. Lessons a marvel of simplicity and completeness.
Any Instrument Write telling us course you are interested in—Piano, Harmony, Voice, Public School Music, Violin, Cornet, Mandolin, Guitar, Banjo, or Reed Organ—and we will send our Free Catalog with details of course you want. Send now.
UNIVERSITY EXTENSION CONSERVATORY
89 Stegel-Myers Bldg. Chicago, Illinois

Rejuvenation
by the famous author, W. J. Fielding. All the facts about the miracles of science in extending the span of life; stopping old age, rolling back the years to youthful physical and mental activity.
25c
LIMITED EDITION
Vest pocket size, flexible, real leather binding; an attractive gift volume; opening up new life vistas; explaining impartially and fully what gland transplantation does. Interests both men and women. Tells all you want to know about this fascinating and vital subject. The edition is limited—send 25 cents today in coin or stamps for prepaid copy.
BRINKLEY PRESS, Dept. 2 Milford, Kans.

Insure your copy reaching you each month. Subscribe to Science & Invention—\$2.50 a year. Experimenters Publishing Co., 53 Park Place, N. Y. C.

It's Easy TO MAKE MUSIC and FRIENDS

With a BUESCHER True Tone SAXOPHONE



Thousands of men and women, of all ages, have found a sweet-toned Buescher Saxophone an infallible key to social popularity. For home entertainment, for church, school or lodge affairs, the Saxophone is the most popular and adaptable instrument. Saxophone players enjoy, also, many opportunities of earning money.

It's Easy TO PLAY and to PAY

For a BUESCHER True Tone Saxophone

With the aid of the first three lessons, which are sent free (upon request) with each new Saxophone, the scale can be mastered in an hour; in a few weeks you can be playing popular music. You can even take a place in a band or orchestra within 90 days, if you so desire. 175



Free Trial - Easy Payments

You may order any Buescher Saxophone, Cornet, Trumpet, Trombone or any other Band or Orchestra Instrument and try it six days in your own home. Easy terms of payment may be arranged. Mention the instrument interested in and a complete catalog will be mailed to you free of charge.

Free!

This beautiful book shows how easy it is to learn to play a Buescher. In it you will find the first lesson chart. It shows all the different models and tells what each is used for.

BUESCHER BAND INSTRUMENT CO.
Everything in Band and Orchestra Instruments
717 Buescher Block Elkhart, Ind.

Buescher Band Instrument Co.
717 Buescher Block, Elkhart, Ind.
Gentlemen: Without obligation to me send your beautiful book "The Story of the Saxophone" described above. Check here
If you prefer literature describing other band or orchestra instruments, check below.
Cornet Trumpet Trombone Tuba
Mention Any Other
Write plainly, Name, Address, Town and State in Margin Below

The Living Death

By JOHN MARTIN LEAHY
(Continued from page 987)

tain, to hear the rest of your story. Did you find anything else at that cave or in it?"

"We did, in it, as you shall soon see.
"We had come prepared (so I thought) to explore it, and at least we started in. For the first few yards, the roof was so low that we could not go upright. Then suddenly the walls drew apart and the roof went sloping up to form a great vault. There was now no ice underfoot or anywhere. The place grew larger and larger as we advanced until at last, standing in the middle point, we could barely make out the wall on either side. It was a strange, weird scene, and it gave a man some solemn thoughts to be entering this place which human foot had never trod for so many thousands of centuries.

"I was carrying the light, and I had stopped and raised it high above my head in order to get a good look roundabout when a sharp exclamation broke from Hampden. I looked, and I think that I exclaimed, too. At any rate, I know I started and a strange feeling came over me. There, off to the right and some distance ahead, were two burning eyes, gleaming in the darkness with a greenish, hellish fire.

"Even as my look fell upon them, their dull fire faded; then suddenly they had vanished.

"The light!" said Hampden. "Raise the light again!"

"I did so, and there were the two eyes burning once more.

"Hampden laughed.
"Only the light shining on patches of mineral."

"Of course," I said, moving towards them. "At first I thought—but there can be no live thing in this place."

"Hardly," Hampden laughed.
"We had gone some distance when I stopped again.

"We had better be careful," I told him.
"I pointed back towards the entrance, or in that direction in which I thought the entrance ought to be, for we were now encompassed by pitchy darkness.

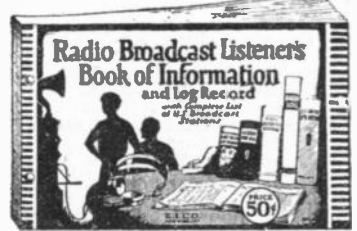
"We don't want to get lost in this hole."
"Hampden treated this suggestion lightly.
"Not much danger of that," he told me.
"But I was not so confident on that score.
"See," I remarked, "how the things send out arms in all directions."

"Some of these were so large that I didn't know whether we were following the main cavern or not. Hampden, though, said that there was no ground for uneasiness, and so we went on, slowly but steadily, deeper and deeper into this strange and awful place.

"The temperature of the cavern had risen in a remarkable manner, how much we had no means of knowing, for we had no thermometer with us.

"I clearly perceived that a thorough exploration of this great cavern was, at the present time, simply impossible; we had not come prepared for that. And what would a thorough exploration bring to light? A man could not even imagine that. The Antarctic had turned so many theories and beliefs upside down and inside out* that

* "The temperature of the sea-water is all the year round several degrees lower than the freezing point of fresh water, yet the growth of animal life is so vigorous that at moderate depths the entire bottom is covered and hidden under a dense carpet of rooted animals, and among these hunt and grub great numbers of active and predaceous fish and other locomotive animals. And all the time the temperature of their bodies is just about that of the water in which they live; that is to say, they are below freezing point, a temperature which has been supposed to be fatal to all life."—Antarctic Days, Murray and Marston.



THE LOG BOOK

You've Always Wanted

THE RADIO BROADCAST LISTENER'S BOOK OF INFORMATION AND LOG RECORD is not only a complete, practical book of those essential Radio facts that everyone who owns a radio should know, but it is also a handy log record for those who want to keep a record of the stations they receive.

The book is enclosed in a handsome two-color cover, bound in Loose-leaf fashion, so that new pages can be inserted if necessary. It contains 80 pages, each one containing information more valuable than the last.

The following is a brief summary of the information contained in this book:

Information for the Broadcast Listener:
Vacuum Tube Table: Meter wave lengths:
Radio Batteries: Wireless code chart:
Station Log Chart:

Complete List of Broadcast Stations of the United States, giving Power, wave length, and Time of Operation each day of the week.
Log Sheets for tabulating the dial settings of the stations you receive on your radio.

SOLD BY ALL RADIO AND NEWS DEALERS

PRICE 50¢ Paid Postage

Published by THE E. I. COMPANY

The Conrard Company

Sole Distributors
233 Fulton St. New York, N.Y.



12 Cells 24 Volts Solid Rubber Case

\$3.50 COD SPECIAL

INTRODUCTORY PRICE

For a limited time only, and to introduce this new and superior Storage "B" Radio Battery to the Public, we are selling it for \$3.50. Regular Retail Price is \$5.50. You save \$2.00 by ordering NOW. A finer battery cannot be built than the

World Storage "B" Battery (12 CELLS—24 VOLTS)

To ten million homes with Radio Sets—and to countless millions of prospective buyers—the World Storage "B" Battery brings a new conception of battery economy and performance. Here is a battery that pays for itself in a few weeks—will last for years and can be recharged at a negligible cost. And you save \$2.00 by ordering now.

A Superior Battery Equipped With

Has heavy duty 2 1/8 in. x 1 in. x 1 1/4 in. plates and plenty of acid circulation. Extra heavy glass jars allow ready observation of charge and prevent leakage and seepage of current. It holds its charge, while idle, at constant voltage. You will find this battery a boon to long distance reception. It does away with a great many noises so often blamed on "static." Mail your order today.

SEND NO MONEY

Just state number of batteries wanted and we will ship day order is received. EXTRA OFFER: 4 batteries in series (96 volts), \$13.00. Pay Expressman after examining battery, 5 per cent discount for cash in full with order. Send your order NOW and save \$2.00.

WORLD BATTERY COMPANY
Makers of the famous World Radio "A" Storage Battery
1219 S. Wabash Ave., Dept. 83 Chicago, Ill.

SAVE \$2.00 BY ORDERING NOW!

13 WEEKS FOR 15 CENTS

The Pathfinder

SHOWS THE WAY THROUGH THE JUNGLE OF EVENTS

You've heard your neighbor praise this wonderful weekly magazine that 3 million people read. Unbiased digest of national and world affairs. Check full of the kind of reading you want. Science, politics, travel, fun, question box, books, health, home, radio—entertainment and instruction for all. Send 15¢ (coins or stamps) today for this big paper on trial 13 weeks, or \$1 for 1 year (58 issues).

PATHFINDER, 566 Langdon St., Washington, D. C.

there was no telling what might be found here.

"Certainly I never imagined anything so strange as what we did find.

"The credit goes to Hampden, poor fellow. For I had come to a stop, my mind made up to turn back at that point.

"Just five hundred feet more," said Hampden.

"Not another inch," I told him.

"But Hampden was a persistent fellow, and the result was that he got his five hundred feet.

"One hundred and seventy paces," said I. 'Unless we find something then, not a foot farther. This place is like an oven.'

"One hundred and seventy," said Hampden. 'And here's the first.'

"I never saw longer paces in all my life. I believe Hampden's legs must have been made of rubber.

"At last came the hundred-and-seventieth stride—I believe Hampden had managed to make it eight hundred feet—and there we halted.

"Well," I queried, 'satisfied now? Here we are, and we have found nothing.'

"Hampden did not answer. I found his eyes fixed on a point ahead and at some distance above the cavern floor. I looked, too. I could see nothing but a black mass of wall, but that was because a moment before the light had shone in my eyes.

"Oh, Lord," exclaimed Hampden, 'look at that!'

"A form took shape up there on that black mass of wall—a figure vague, monstrous, horrible.

"For some moments we stood there staring. The light that struggled to it was so feeble, however, that we could not be sure just what that thing was which we saw.

"We moved slowly on towards it.

"A bat!" I exclaimed.

"No!" said Hampden, whose eyes were better than mine. 'A harpy!'

"I fetched up in my tracks, and a shiver went through me.

"Again!" Hampden cried.

"I wonder why a harpy," I said. 'That thing at first gave me the creeps.'

"A few moments, and we were within five or six yards of the wall. There we halted and stood gazing up at the sculptured monster. The figure, cut out of the living rock, was a colossal one, being thirty feet in height and fully fifty in width. It was perched upon a heap of (sculptured) human skulls, the wings were outspread as though it was about to launch itself down upon us, and the expression of the face (a face of striking but repellent beauty) was fierce and terrible beyond all description.

"What was that? I blinked and looked again. That carven horror up there above had held our look; we had seen nothing else. But now I saw it.

"There, right before our eyes, right under that carven monster, was—a door!"

CHAPTER XVI

DEATH TAKES HIM

"As we moved toward it, Hampden said:

"I see now what that harpy was for."

"I stopped and looked at him.

"What was it for?"

"To warn people to keep away—to keep out."

"I laughed.

"It probably worked in those old superstitious days; but it will take more than that harpy up there, horrible though it is, to keep me out."

"I think, though," said Hampden, 'that the door will.'

"And it did. The entrance we found about four feet in width by seven in height and closed by a mass of solid rock. That this stone was a door and not a sealing slab, we both believed. But how did it work?"

Learn Cartooning at Home

Earn \$100 a Week In This Fascinating Business

CASH in on the amazing ever-increasing popularity of cartoons! Thousands of cartoonists are needed to draw the vast number of political, religious, international, seasonal and human-interest cartoons. There is a crying demand too for men able to produce humorous cartoons, comic strips and sport cartoons. Advertising and animated cartooning offer two wonderful new and almost untouched fields. Never before have the opportunities in cartooning been so many or so varied. Never have cartoonists had such a wonderful chance to make big money. Now indeed is the time to study cartooning!

New Methods Make Cartooning Easy to Learn

Regardless of how little ability you have in drawing, you can now easily qualify for this attractive highly-paid business. Through a wonderful new method you can learn right at home in your spare time. Learning this way is more than easy—it is actually fascinating as a game.

advance through every branch of cartooning until almost before you realize it you are drawing cartoons that SELL. Many of our students have sold enough work while studying to pay for the course many times over.

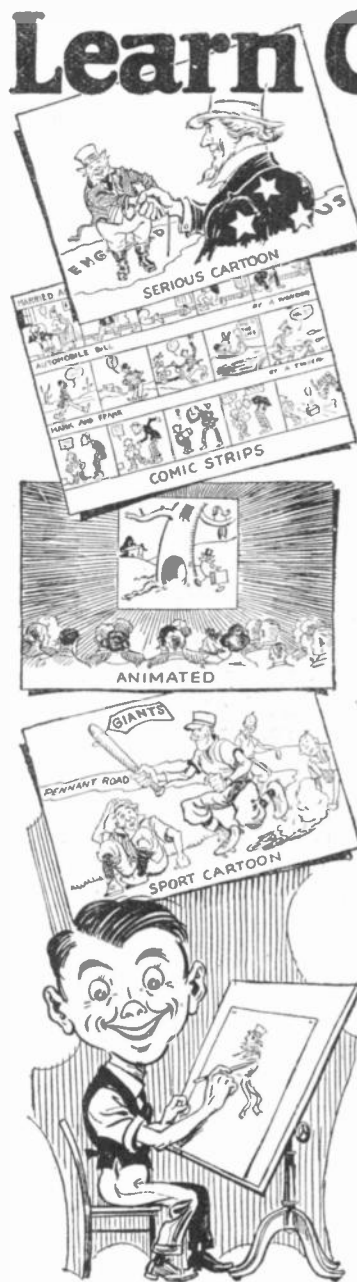
Just think of earning a splendid salary for such pleasant work. Successful cartoonists earn from \$3,000 to over \$100,000 a year. Yet enough cartoonists cannot be found to meet the tremendous demand. Right now there is a wonderful opportunity for you in this fast-growing uncrowded field.

Send for FREE BOOK

WASHINGTON SCHOOL OF CARTOONING
Room 262C, 1113-15th St., N.W., Washington, D. C.

Please send me without obligation your illustrated booklet on cartooning.

Name
(Print Name Plainly)
Address
City State
If under 16 years, please give age



Find out more about the wonderful opportunities open to you in this attractive field. Learn more about this easy home-study method of learning cartooning. A handsome booklet has just been prepared which is crammed full of interesting information about cartooning, and describes in detail this remarkable method. It will be sent to you without cost, without obligation. Mail coupon for it TODAY!

Washington School of Cartooning
Room 262C
1113-15th St., N. W., Washington, D. C.

No More Pumping Up Tires

An air-tight valve cap which prevents all loss of air in tires has been put on the market by F. C. Hughes. With this valve cap one inflation lasts the life of the tire and doubles tire mileage. Tested and approved by leading automobile manufacturers. We furnish proof of tests. Retail price \$1.25 for set of five. Great demand. Wonderful opportunity for agents. Write at once to Dept. 509.

F. C. HUGHES, 2512 W. Monroe St., Chicago, Ill.

The Traffic Cop of the Air

FERBEND Wave Trap

Add a Ferbend Wave Trap to your Radio Set and "Police" your reception. Regulate traffic. Guaranteed to tune out any interfering station. Widely imitated but never equalled. The original and only successful WAVE TRAP. Now in its third year. Sent Postpaid upon receipt of \$3.50 or C. O. D. plus postage. Send for Free Booklet FERBEND ELECTRIC CO. 31 E. So. Water St. Chicago

Insure your copy reaching you each month. Subscribe to Science and Invention—\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.



Men Needed in Electricity

NO PROFESSION offers greater opportunity to-day than Electricity. Salaries of \$12 to \$30 a day are not uncommon and the opportunity for advancement is unlimited.

As Forrest Crissey said recently in *The Saturday Evening Post*—"The demand for electrical work is increasing immensely and electrical contractors assert that the supply of electrical workers cannot overtake the demand for several years."

Now is the time to prepare for a good position in this profitable, interesting profession. You can study right at home in spare time through the International Correspondence Schools—just as so many other men have done. The I. C. S. Electrical Courses have been endorsed by Thomas A. Edison and Charles P. Steinmetz—the late electrical wizard of the General Electric Co.

Just mark and mail the coupon printed below and full information about Electrical Engineering, Electric Lighting, Electric Wiring, Electric Railways, Radio or any other work of your choice will come to you by return mail.

Mail the Coupon To-day

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6195-D, Scranton, Penna.

Explain, without obligating me, how I can qualify for the position, or in the subject, before which I mark X.

<input type="checkbox"/> ELECTRICAL ENGINEER	<input type="checkbox"/> CHEMICAL ENGINEER
<input type="checkbox"/> Electrician	<input type="checkbox"/> Pharmacy
<input type="checkbox"/> Electric Wiring	<input type="checkbox"/> SALESMANSHIP
<input type="checkbox"/> Electric Lighting	<input type="checkbox"/> ADVERTISING MAN
<input type="checkbox"/> Electric Car Running	<input type="checkbox"/> Window Trimmer
<input type="checkbox"/> Heavy Electric Traction	<input type="checkbox"/> Show Card and Sign Painter
<input type="checkbox"/> Electrical Draftsman	<input type="checkbox"/> RAILROAD POSITIONS
<input type="checkbox"/> Electric Machine Designer	<input type="checkbox"/> ILLUSTRATOR
<input type="checkbox"/> Telegraph Expert	<input type="checkbox"/> DESIGNER
<input type="checkbox"/> Practical Telephony	<input type="checkbox"/> BUSINESS MANAGEMENT
<input type="checkbox"/> MECHANICAL ENGINEER	<input type="checkbox"/> Private Secretary
<input type="checkbox"/> Mechanical Draftsman	<input type="checkbox"/> Business Correspondent
<input type="checkbox"/> Machine Shop Practice	<input type="checkbox"/> BOOKKEEPER
<input type="checkbox"/> Toolmaker	<input type="checkbox"/> Stenographer and Typist
<input type="checkbox"/> Gas Engineer	<input type="checkbox"/> Cert. Pub. Accountant
<input type="checkbox"/> CIVIL ENGINEER	<input type="checkbox"/> Traffic Management
<input type="checkbox"/> Surveying and Mapping	<input type="checkbox"/> Commercial Law
<input type="checkbox"/> Mining Engineer	<input type="checkbox"/> GOOD ENGLISH
<input type="checkbox"/> ARCHITECT	<input type="checkbox"/> STATIONARY ENGINEER
<input type="checkbox"/> Architectural Draftsman	<input type="checkbox"/> CIVIL SERVICE
<input type="checkbox"/> Architects' Blue Prints	<input type="checkbox"/> Railway Mail Clerk
<input type="checkbox"/> PLUMBING AND HEATING	<input type="checkbox"/> Textile Overseer or Supt.
<input type="checkbox"/> Sheet Metal Worker	<input type="checkbox"/> AGRICULTURE
<input type="checkbox"/> Navigator	<input type="checkbox"/> Veterinary Medicine <input type="checkbox"/> Spanish
	<input type="checkbox"/> Automobiles <input type="checkbox"/> RADIO

Name _____ Present Business _____ 4-30-24
Occupation _____ Address _____
Street _____
and No. _____
City _____ State _____

Canadians may send this coupon to International Correspondence Schools Canadian, Limited, Montreal, Canada

FREE RADIO CATALOG

Sent You Every Month

ALL the latest improved apparatus is listed in our monthly bulletin: "The American Radio Transmitter." If it's new we have it. **Lowest Prices in U. S.** Our prices to dealers are the lowest in the United States. All nationally advertised goods at discounts that make you real money. Dealers, get your name on our mailing list. Simply send name today for latest big monthly bulletin, showing 75 nationally advertised factory prices and 4,500 items. **AMERICAN RADIO TRANSmitters, INC.** P. O. Box 14th St. Dept. P, Kansas City, Mo.

We pushed and shoved and threw ourselves against it, but it never budged.

"A man might as well try to move Mount Rainier," Hampden said.

"And no doubt," I remarked, "a fellow could open it with a push of his little finger—if he only knew the secret."

"Of course," said Hampden, "but we don't know it."

"We might find the secret."

"We made a long and careful search all around, but at last we had to give it up in despair."

"What on earth," Hampden said, "is on the other side of that door?"

"That is a question I have asked myself a thousand times since. What secret has that harpy been guarding there in that awful darkness through all those ages. What will that man see who at last moves the stone slab and enters the passage? The answer I shall never know. But I believe, Mr. Frontenac, that on a day you will know it."

"And that is what we found, and we found nothing more, there in Sleeping Beauty's Cavern."

"Nothing daunted by this close call, for it really was that, Hampden was anxious to go in again; but I wouldn't hear of it."

"Why," Hampden cried, "there is no telling what else there is in that cave!"

"That is very true," I told him; "but what we want to do is not to run any risks but to get our story to the world."

"Hampden was terribly put out about it; but I remained firm and adamant."

"We were nearing Depot Number One when it happened. The sky was dark and gloomy, but Hampden and I were in gay spirits. Certainly the prospect seemed a bright one. A few days more, and we would be back at Summer Haven. And then it came, like a bolt from out the blue, and I was left all alone, a man shaken and wretched."

"Hampden was leading. The surface seemed almost level and firm as a floor, and we were swinging along at a smart pace. My look was not upon him at the instant it happened. There was a cry, and I looked up and saw Hampden make a wild effort to turn and save himself, the rear end of the sled tip up, and the sled slip forward and vanish, dragging the dogs down after it. For an instant I thought that Hampden had gone down, too. But no, there he was clinging to the edge of the crevasse and crying wildly for help."

"I rushed forward. I saw with horror that Hampden was slipping, that he was sinking lower and lower. The snow and ice that he was clinging to were giving way. Would the edge hold till I reached him? I got to within thirty feet of him, and then it broke. One loud, terrible cry was heard, then utter silence—or, if any other sound came up from that frightful place, I was not aware of it in the horror of that moment."

"I went to the edge and looked down—into an abyss that seemed fathomless, from which not the faintest sound came up."

"I cried out Hampden's name and cried it again and again, but never any answer came—never the faintest sound."

"How long I stayed there, I do not know. It is an awful feeling to have a man snatched from you like that—a feeling that I hope to God neither of you will ever know."

"At last, however, I left that cursed spot, and I did not make camp until I had reached the depot, nearly twenty miles distant from the scene of the tragedy."

"And that is why I have no photographs of the Gardens of Paradise or of Sleeping Beauty to show you. All had been on Hampden's sled, together with that piece which we had broken off the sculptured pillar, and now all were gone."

"There is little more to tell. It was awful

Why not YOU?

Isham Jones is one of the many popular stars who use and endorse the Conn saxophone.

Isham Jones, the famous soloist and orchestra leader, has made a fortune with his Conn saxophone. You can learn to play a Conn quickly and easily. Then great opportunities for pleasure and profit are open to you. Conn saxophones, used by the most famous stars, recognized as supreme in tone, tune and easy playing qualities, may be had on Free Trial; Easy Payment plan. Write for catalog and details.

C. G. CONN, Ltd., 256 Conn Bldg., Elkhart, Ind.

CONN BAND INSTRUMENTS

WORLD'S LARGEST MANUFACTURERS

BLANK CARTRIDGE PISTOL

Protection against Burglars, Thieves, & Dogs

PRICES 50c. \$1.00

Well made and effective model 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 Cartridges obtainable everywhere. Price 50c., Superior quality \$1.00 post-paid. Blank Cartridges, by express, 50c. post. 4.00.

JOHNSON SMITH & CO., Dept. 289 Racine, Wis.

I Guarantee You Can Play Any String Instrument in 1 Minute

Most remarkable music invention of the century. Any novice can now play any string instrument—INSTANTLY! A child can play without hesitation. No notes to learn—no ear for music needed. The only color system on the market, full protection by U. S. patents. Produced by a virtuoso by nationally known musicians.

Beautiful instrument given with each color-number course. Rich, mellow tone.

Money Back Guarantee Your money back if it fails. Get full details and Free Instrument offer. Write Today!

Schneider School of Music
238 Vermont St., Dept. U-2 Blue Island, Ill.

VALUE \$20.00 FREE!

HERE'S MORE MONEY for YOU

150 HOME STUDY BOOKS

Each of these sure pay-raising self-help books is a complete course of instruction. They cover Electricity, Automobile, Machine Shop, Carpentry, Painting, Engineering, Railroad, and twenty other trades. Full catalogue FREE. A postcard brings yours.

F. J. DRAKE & CO., PUBLISHERS
1009 Michigan Avenue Chicago

LATEST WHOLESALE RADIO CATALOG

FREE Simply send name TODAY for big 48-page catalog of latest radio goods at Wholesale. Live dealers and agents wanted.

STANDARD RADIO CO., 112 East 13th, Kansas City, Mo.

STAMMER

You can be quickly cured, if you

Send 10 cents for 288-page book on Stammering and Stuttering, "Its Cause and Cure." It tells how I cured myself after stammering 20 yrs. B. N. Bogue, 8113 Bogue Bldg., 1147 N. III. St., Indianapolis

making my way through that terrible loneliness, but there was one consolation: I would soon be home.

"It would be impossible to describe the joy that I felt when at last I gained the summit of the ridge to the north of Mount Theodore Roosevelt and Mount Woodrow Wilson and looked down on Summer Haven.

"There, far away, was the hut and the *Multnomah* moored in her little cove. For some time I stood there looking upon that strange and familiar scene. Everything was so peaceful, so dreamy and lovely. It was a joy to see the old place again, and yet I knew sorrow too as I stood there and gazed upon it, for, of the brave and loyal men who had gone with me into the Unknown, not a one was with me now.

"Many thoughts came to me as I stood there and not a few questions that I wished could be answered. Well, some of them would be answered when I reached the hut. So I spoke to the dogs, and once more we were in motion.

"I had got within a quarter of a mile of the hut before they discovered me. There was a great waving of arms and some cheering, and they started towards me.

"Where are the others?" was the first question they asked.

"I started to tell them. And now I saw for the first time that thing which was to embitter the rest of my days. Never could I forget that look which came to their faces when I mentioned the palm-trees. I had, of course, often wondered how my story would be received. I had never blinked the fact that there would be difficulties; but now, for the first time, I fully saw what really awaited me. The realization came with something like a shock. I had counted on the photographs removing any doubt that might linger. But there was not a single photograph to show them; all had been lost with poor Hampden.

"Not a word did I say about Sleeping Beauty, or the cave, or that mysterious door over which that carven horror holds its eternal vigil; but I did try to give them a plain, accurate, convincing account of all the rest. It was not long, though, before I saw clearly that the effort was useless. Instead of overcoming their incredulity, I was, it was very clear, only strengthening their conviction—formed at the very first—that what I had gone through had turned my brain.

"At length they began to *humor* me. That was too much and the bitterness of all, and I gave up in anger and fierce despair.

"The rest you know, or you can easily imagine it.

"And so now my story is done. What is to follow, no living man can say; and I shall never know it. But I do know that you will see wonderful things, and terrible ones too in all likelihood, before the word *finis* is written.

"I pray God to watch over you, Mr. Frontenac, and bring you safe through it all!"

CHAPTER XVII

THE "MULTNOMAH" SAILS

"Well, Bond," said Darwin Frontenac as we seated ourselves after seeing Captain Livingstone into his car, "what do you think of it?"

"No man ever told a stranger story—if, that is, what he told us is true."

"It is true, Bond."

"Do you mean to tell me you believe that that girl, incased in solid ice—if there is such a girl at all—is alive?"

"No."

"Then why—?"

"Just a moment," said Frontenac, uplifting a finger. "What I said was that I do not actually believe that she is alive. That, however, is not tantamount to saying that I believe she is dead. No man can say whether she is or is not. What I do be-

Earn \$50 to \$200 a Week in RADIO

You can! Hundreds of ambitious men are already earning thousands of dollars in this wonderful new industry—you, too, can get your share. Mail coupon below for Free Book which describes fully the amazing money-making opportunities in Radio and tells how YOU can earn from \$5000 to over \$10,000 a year.

The astounding growth of Radio has created thousands of big money opportunities. Millions of dollars were spent during the past year on Radio, and thousands of young men are needed right now to meet the ever-increasing demand of work.

Men are needed to build, sell and install Radio sets—to design, test, repair—as radio engineers and executives—as operators at land stations and on ships traveling the world over—as operators at the hundreds of broadcasting stations. And these are just a few of the wonderful opportunities.

Easy to Learn Radio at Home in Spare Time

No matter if you know nothing about Radio now, you can quickly become a radio expert, by our marvelous new method of practical instruction—instruction which includes all the material for building the latest up-to-date radio apparatus.

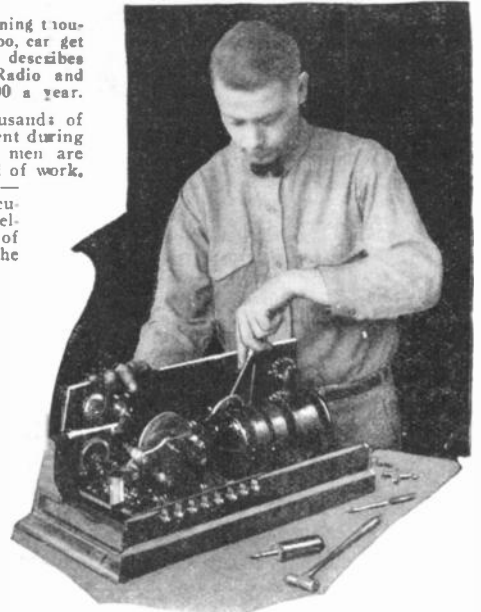
Scores of young men who have taken our course are already earning from \$75 to \$200 a week. Merle Wetzel of Chicago Heights, Ill., advanced from lineman to Radio Engineer, increasing his salary 100% even while taking our course! Emmet Welch, right after finishing his training, started earning \$300 a month and expenses. Another graduate is now an operator of a broadcasting station—PWX of Havana, Cuba, and earns \$250 a month. Still another graduate, only 16 years old, is averaging \$70 a week in a radio store.

Wonderful Opportunities

Hardly a week goes by without our receiving urgent calls for our graduates. "We need the services of a competent Radio Engineer." "We want men with executive ability in addition to radio knowledge to become our local managers." "We require the services of several resident demonstrators"—these are just a few small indications of the great variety of opportunities open to our graduates.

Take advantage of our practical training and the unusual conditions in Radio to step into a big paying position in this wonderful new field. Radio offers you more money than you probably ever dreamed possible—fascinating easy work—a chance to travel and see the world if you care to or to take any one of the many radio positions all around you at home. And Radio offers you a glorious future!

The National Radio Institute is one of America's Pioneer



Radio Schools—established in 1914. Our course is an absolutely complete one which qualifies for a government first-class commercial license. It gets you the bigger paying jobs in Radio.

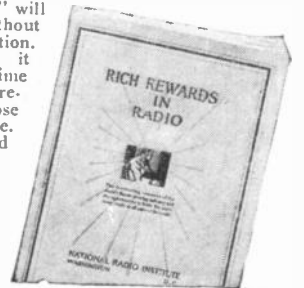
Send for FREE RADIO BOOK

Learn more about this tremendous new field and its remarkable opportunities. Learn how you can quickly become a radio expert and make big money in Radio.

We have just prepared a new 32-page booklet which gives a thorough outline of the field of Radio—and describes our amazing practical training in detail.

This Free Book, "Rich Rewards in Radio," will be sent to you without the slightest obligation. Mail coupon for it now! For a short time we are offering a reduced rate to those who enroll at once. Act promptly and save money.

National Radio Institute
Dept. 14DB
Washington, D. C.




NATIONAL RADIO INSTITUTE
Dept. 14-DB, Washington, D. C.

Please send me without the slightest obligation your Free Book, "Rich Rewards in Radio" and full details of your special Free Employment Service. Please write plainly.

Name..... Age.....
Address.....
City..... State.....


Pay Increases Over \$100 a Month



I am averaging a year where I am \$75 to \$150 a month more than I was making before enrolling with you. I would not consider \$10,000 too much for the course.

(Signed) A. N. Long,
Greensburg, Pa.

Doubles Salary



I can very easily make double the amount of money now than before I enrolled with you. Your course has benefited me approximately \$5,000 over and above what I would have earned had I not taken it.

(Signed) T. Winder,
Grand Junction, Colo.

FORDS—Start Easy at Zero

Nearly double mileage
50% More Power



The AIR FRICTION is the ONLY Carburetor which changes ordinary gasoline into powerful, super-heated DRY GAS VAPOR which burns up clean, prevents carbon and nearly doubles power and mileage. Leaves no unburned gasoline to run down into crankcase, destroy lubrication and grind out bearings. Motors live two to three times as long with Air Friction. Ford's guaranteed to make 34 miles to gallon. Other cars in proportion. Try Air Friction 30 days at our risk. Money back if you want it. Agents wanted. Write today.

AIR-FRICTION CARBURETOR COMPANY
1525 Raymond Building Dayton, Ohio, U. S. A.

ADULTS! SEX KNOWLEDGE BOOKS

Instructive, authoritative, profusely illustrated in natural colors, etc. The worth-while sort. Contains everything one should know both before and after marriage to enjoy health and happiness. Large Catalog, 1¢.

F. SMETANA & CO. OWosso, MICH.

GOLD PLATED AERIAL
WORKS WONDERS

Amazing new antenna The Goldenrod works wonders with any set. Clearer reception; more stations; greater volume; no "fading"; won't corrode, lasts lifetime. Used by Government, Ocean Liners, Broadcasting Stations.

NOW EVERYONE CAN HAVE IT

Solid Phosphor Bronze Wire, heavily plated with 18 kt. gold. Gold antenna long known to be best, but too costly. Now thru Goldenrod methods of manufacture, every set user can have one.

FREE illustrated folder giving complete details and proof of wonderful results from Goldenrod Aerial—"Best Because It's Gold Plated." Write quick and soon get new joys in radio reception!

IMP RADIO CORPORATION
Dept. 104 6 East Lake Street, CHICAGO

"BECOME A LIGHTNING TRICK CARTOONIST"



Make money chalk talking. Send \$1 for snappy program of trick drawings, with instructions by a professional cartoonist. Satisfaction guaranteed. Circular free. Balda Art Service, Dept. 4, Oshkosh, Wis.



What Other Typewriter Can Do These Things?

- Variable spacing.
- Interchangeable type styles.
- 17 different sizes and styles of print.
- Over fifty different languages.
- Automatic touch assuring uniform impression whether the key is pressed lightly or heavily.

The Typewriter of a Thousand Uses!

THE New Hammond will express your thoughts in many type sizes and styles—all instantly interchangeable on the same machine.

Languages of all nations are at the command of the Hammond user; two are in the machine at all times—changed by the twist of your thumb.

Condensed writing in one-third the usual space is made possible through Hammond miniature type and variable spacing.

THE NEW
Hammond
TYPEWRITER
VARIABLE SPACING
CHANGEABLE TYPE

is certain to fit your need. Write for new booklet describing how it accomplishes its wonders.

Hammond Typewriter Corp., 72 Brook Ave. at 132nd St., New York

lieve is simply this: that it is very probable indeed that the poor thing is not dead."

"And you believe that you can awake her?"

"I have every reason to feel confident that such will be the result—that is, supposing always that she be not dead."

"After all these thousands of years!" I exclaimed. "One hundred, two hundred, three hundred thousand years! But how do we know, after all, that she has been there for so many ages, that she has been lying there ever since the Great Cold fell?"

"We don't know it but I think we shall find Captain Livingstone's inferences fully justified. We know that thousands upon thousands of years have rolled over this old globe of ours since the snow and ice gathered about the Poles. We know that the climate there was a warm one in Miocene times; therefore the cold must have fallen in the Pliocene. That it came suddenly, instantaneously, as the captain (with the great Cuvier) believes it did, is a matter upon which one may be permitted to entertain some doubts. On the other hand, certain considerations incline me to the belief that the captain may be right. But the point is simply this: Sleeping Beauty could not have lived there after the land was mantled in snow and ice; ergo she must have been there when that awful curse fell upon the Antarctic."

"Unless," I proffered, "the Gardens of Paradise once extended much farther than they do today and some of the survivors of the awful cataclysm had sought a refuge there."

"I thought," said Frontenac, "that that would be your suggestion. I think it unlikely, though, that such was actually the case. I incline to the belief that, instead of being much larger, the Gardens of Paradise were at one time even of less extent than they are today. For the cold of the Antarctic, bitter though it is now, was once far more terrible."

"We must wait—wait until you awake the sleeper."

"Until I awake the sleeper!" he murmured.

He turned his face towards me, and never shall I forget that look which I saw upon it.

"Bond," said he, "I wonder, supposing that I do awake her—I wonder if she will thank me for it or live to curse both me and the hour."

I remained silent, wondering.

"But," he added, "we should regard the matter in its purely scientific aspect, and then we find it one of extraordinary interest, to say nothing of its possibilities. Sentiment is all very well in its place—as are thorns and roses."

"Why the gloomy thoughts?" I queried. "Why so suddenly look at the dark possibilities? Remember, you may awake for some man a sweetheart—perhaps, indeed, your own fond lover."

Frontenac smiled at that, and then he laughed a little.

"I always knew that you were a poetical son of a gun, Bond, where the ladies are concerned, but I never dreamed you had it so bad as that."

"Well, now," I replied, "looking at the matter in a sober light, what is there so terribly romantic, so terribly poetical, so awfully absurd in my suggestion? The girl is young; she is (if the captain's eye is to be trusted) a very lovely Sleeping Beauty indeed; and do you think for a moment that there will be no lover?"

"I think that the lover will come. Oh, I know that—just as well as I know that it won't be I."

"Oh, indeed! Just wait till you awake her, wait till you see her a living, breath-

"THE SAWING QUARTETTE"

Play a Saw

With Our Free Course of Instruction You Can
—Play in 3 Days—

We positively Guarantee that you can play our Musical Saw (using both bow and hammer) within three days by following our simple and easy Course of Instruction. The "Musical Saw" is the easiest to play musical instrument ever invented. No knowledge of music or note reading required.

If you have heard our Musical Saw in Vaudeville, over the Radio or from Victor Record 18787, Columbia Record 3757 or Vocalion Record 14766, you are familiar with the soft, mellow tones produced from our musical saws.

The "novelty" of producing such beautiful music from "a saw" makes this instrument "THE HIT" on any program entertainment.

Start A Saw Quartette in your Lodge, Legion Post or Club. A novelty organization of this kind will be the talk of the town. Put "pep" into your meetings, make it a feature advertising card at your entertainments, parties, etc.

Send No Money

Simply fill out the coupon and mail today. We send you the special tempered, tenor (solo) Musical Saw, Soft Hammer and complete Course of Instruction U.O.D. \$4.85 plus the postage. Try out the instrument for three days. If not satisfied with the tone or its easiness to play, return and we will refund your money. No strings to this offer. YOU ARE THE SOLE JUDGE. You will be the one to furnish the big surprise at your next Club or Lodge meeting. Then, start a Sawing Trio or Quartette. Complete information on this subject will be mailed to you with the instrument.

**MUSSEHL & WESTPHAL
FT. ATKINSON, WISCONSIN**

Start a Saw Club in Your Town

Now Only **\$4.85**

You may send me the Musical Saw, Soft Hammer and Free Course of Instruction. I will deposit with postman \$4.85 plus postage. If not entirely satisfied I will return the shipment within three days and you will refund my money.

Musseh & Westphal
719 W. Water St.
Ft. Atkinson, Wis.

Name.....
Address.....

The cost of our special "Saw Bow" is \$2.35 extra. check here if you wish Bow sent with instrument.

Insure your copy reaching you each month. Subscribe to Science & Invention—\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

ing woman in all the charm of her loveliness."

He smiled a little but made no response to this. What he said was:

"Do you know, Bond, what, in all the captain's strange story, gave me the greatest surprise?"

"The palm-trees?"

"The palm-trees? Fiddlesticks! Come again," said Frontenac. "And that reminds me: did you know that Nordenskjold thought he might find an oasis in the heart of Greenland?"

"I didn't know that."

"Well, he did."

"Did any scientist ever look for icebergs in the Sahara? But to come back. The severed head of Wilkie—and the mark of that enormous claw?"

"Once more," said Frontenac.

"Sleeping Beauty herself?"

"Not even Sleeping Beauty herself."

"What a queer way you have of looking at things! Then it must have been that mysterious door there in the cavern?"

"You're a mighty good guesser, Bond."

"What on earth was it?"

"His telling us that he had fallen in love with that girl!"

"A strange love certainly," I said.

He was silent for some moments, then asked:

"Going to go with me to get Sleeping Beauty, Bond?"

"I must think the thing over."

"Of course. But I fancy I know what your answer will be."

"This thing you're entering upon," I reminded him, "isn't going to be a honeymoon."

"I haven't forgotten that. A honeymoon is only the end of a dream, but this—this," said Darwin Frontenac, "is the find of a century. And the captain got only a glimpse, so to speak. There is no telling what other things may be down there."

"That is very true. I'm not particularly anxious, though, to get decapitated."

"The mystery," he smiled, "makes the adventure—well, piquant."

"Piquant? Heaven help us!"

"Well, 'tis so," said Frontenac. "And the risk gives it pep."

"Pep? I think you'll call it something else when that thing in the palm-trees starts work on your jugular."

He smiled faintly, but he made no response; a silence ensued.

Of course, he could get Sleeping Beauty without running that fearful risk; but I knew better than ever to make such a suggestion to Darwin Frontenac!

Why is danger, mystery the fascinating thing it so often is? I have often wondered about it but never have found any real explanation. It doesn't matter how terrible, how horrible it may be, there are always men simply *crazy* to go. Its subtle, fierce power enshadows the fascination even of woman: sweethearts, wives are left behind, and with glad hearts the men go forth, in their ears (and hearts) the sweet, terrible song of the siren.

Why do they go? I wish I knew!

And I ought to know, too, for (though there was neither sweetheart nor wife in my case) I am one of those fools myself!

The next day Frontenac and I, accompanied by Captain Livingstone, went to see the *Multnomah*. It was about half past nine when we arrived at Pier R, on the south side of which the famous ship was lying. A few moments, and we had issued from the warehouse and the whole of the vessel was in view. I say the whole of the vessel, but this (with the usual point of view in mind) is not strictly correct, for the tide was low, and we were looking not at the *Multnomah* but down upon her decks.

And the first thing that struck me was



Make dumb Loud Speakers talk!

Don't blame the circuit or yourself if only noise comes from your loud speaker. Hilco apparatus makes the dumbest loud speaker talk.

The Hilco Laboratories contain special equipment of marvelous accuracy for determining whether new circuits and apparatus developed by Hilco research engineers will give maximum satisfaction.

Ever striving for perfection, Hilco developed a new type of Fixed Condenser guaranteed accurate within 5% of rating; the famous 7-tube Super Hilco-Dyne Kit enabling anyone to construct at a moderate cost, radio's most superb receiver; the Hilco Lo-Loss Tuned Radio Frequency Kit and the Hilcoflex Kit, containing essential parts for building really

efficient 5 and 3 tube sets at little cost; the Hilco Multiformer perfecting the Reflex and Neutrodyne when used as replacement coils.

When you buy Hilco apparatus for improving your present receiver or the construction of a new one you are getting the latest in scientific radio apparatus that is distinctively different and superior in efficiency and appearance.

Literature describing Hilco products free—Blue Prints of circuits sent at actual mailing cost of 10c.

Ask Your Dealer

about Hilco Products, especially

- Super Hilco-Dyne Kit.....\$30.00
- Lo-Loss T.R.F. Hilco Kit.... 17.50
- Hilcoflex Kit 8.50
- Hilco Multiformer 2.25
- Hilco Fixed Condensers.
- Hilco Super Het replacement parts for perfecting Super Hets.

WRITE FOR DESCRIPTIVE MATTER

Please Address Dept. 16

A. E. HILL MFG. CO.
Atlanta Georgia



WANTED

RAILWAY POSTAL CLERKS

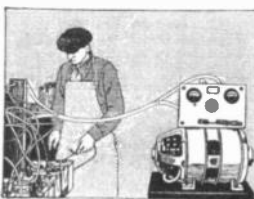
\$1600 to \$2300 Year

TRAVEL—See your country

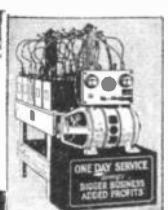
MEN—BOYS, 18 UP
SHOULD MAIL COUPON IMMEDIATELY
Steady work. No layoffs. Paid Vacations
Common Education Sufficient



FRANKLIN INSTITUTE,
Dept. W181, Rochester, N. Y.
Sirs: Send me without charge, (1) Sample Railway Postal Clerk Examination coaching lessons; (2) Schedule showing places of coming U. S. Government examinations; (3) List of many Government jobs now obtainable.
Name
Address



\$300 PROFIT Monthly from HB 8 Hr. Battery Charging
Add big battery charging profits to your income. Just \$35 cash puts this HB 8-Hour Constant Potential Battery Charging outfit in your shop—complete—all ready to set up and operate. Easy terms on balance. This HB is the lowest-priced complete outfit on the market. 30 days' trial on money-back guarantee. Ideal equipment for the small battery shop. No experience needed to install or operate. HB Users clear \$150 to \$300 monthly profits. Write for free bulletin No. 252.
HOBART BROS. COMPANY Box S-2 Troy, Ohio
Pays For Itself ~ Earns Big Profits



Into the attic

FEW youngsters to-day ever saw a horsehair sofa. They wouldn't know what to do with a fire taper, carpet stretcher, or coal-oil lamp. They couldn't braid rags into a rug, or wind yarn without tangling. But they know the how and why of typewriters, phonographs, telephones, automobiles; what happens when a push of the button gives light, or a kodak's flash fixes their image on paper.

Their education is as modern as the advertisements they see. They have no more use for the lamp and chimney of yesterday than you for the wick and tallow of the day before.

Advertisements induce such progress. They urge wide use that means improvement. They help you lift the out-of-date into the attic—rid you of the water buckets and soap kettles of slavery. They bring late improvements within your reach.

Read the advertisements regularly. Keep alert to the new.

*Without advertising, you would never
know a product's worth until
you had bought it*

DeForest
License



HONEYCOMB COILS

The Universal all-wave inductance. Back and front panel mountings. Send 25c for Super Het., R. F. and Honeycomb Coil Circuits and Complete Catalog.

Chas. A. Branston, Inc.
Dept. 4, 815 Main St.
Buffalo, N. Y.

Go Into Business for Yourself

Make storekeepers' profits without storekeepers' troubles or expenses. No investment necessary. We furnish everything and carry all stock for you. We have started hundreds of men who are now making \$4000 to \$10,000 a year. We can do the same for you. Write for facts at once. Address Dept. 561, GOODWEAR Chicago, Inc., West Adams St., at Peoria, Chicago.

Begin Today—Write for My FREE BOOK, I can make a good penman of you at home during spare time. Write for my FREE BOOK, "How to Become a Good Penman." It contains specimens and tells how others mastered penmanship by the Tamblin System. Your name will be elegantly written on a card if you enclose stamp to pay postage. Write today for book.

P.W. TAMBLIN, 424 High Bldg., Kansas City, U.S.A.

The Midget "Five-in-One" Slide Rule is a combination Mannheim, Polymetric, Log-Log, Binary, Add and Subtract Slide Rule. It will instantly add, subtract, multiply and divide any combination of whole numbers, fractions, mixed numbers and decimals. Gives every root and power, also Logs, Sines and Tangents. Made of aluminum with scales on white celluloid. Size 4 in. Approved and adopted by colleges. Price with Instructions \$1.50. Leather Case 50c extra. Sent C.O.D. if desired. Catalogue Free. GILSON SLIDE RULE CO., Niles, Mich.

(Patented 1-17-22)

that the *Multnomah* was one of the queerest-looking tubs that I had ever set eyes on. Yes, that is what she reminded me of at the first glance—a tub. This was due to her unusual beam—she was only three times as long as she was wide—and to her bow-like stern. The *Multnomah* was not built on the lines of a yacht but for service—the fierce buffets and dangers of the terrible Antarctic seas.

A gangplank was out—up, rather—and in a few minutes we were on the deck. There we met the first mate—Mr. Ben Rainier, a man of powerful physique and a visage so grim that it would have been repellant but for the strange intellectual cast of some of the features.

"Well, Mr. Rainier," said the captain, "I have good news for you: the expedition is now a sure thing."

"I am glad to hear that, Captain Livingstone," said the mate, not the slightest change of expression, however, on his face. "I felt all the time that those doctors—"

"It isn't *that*," the captain told him. "The doctors knew. I am doomed. Mr. Frontenac takes command of the expedition. I go along, of course—until you dump me over the side with a sack of coal at my feet."

"This is sad news, Captain Livingstone," said the mate, still not the faintest change on that strange visage. "This is indeed sad news. Perhaps, however, things are not so bad as they seem; perhaps, after all, those doctors—"

The captain gave a melancholy wave of the hand.

"It wouldn't do me or anybody else any good to blink, Mr. Rainier," he said. "A man should never blink facts, no matter how disagreeable the facts may be. If he does, he is liable to get a wallop right between the eyes during one of the blinks."

"That is true," said Mr. Ben Rainier.

"No, I have had my day; and, now that I am finished, I am not going to shed any tears over my end. Instead of weeping over the inevitable, I thank God that my work—and work that I could never dream of doing myself—is to be carried on by Mr. Frontenac."

The mate turned his impassive visage towards my companion.

"This is sad news and glad news," he said. "The glad news is that our commander is to be Mr. Frontenac."

For my part, I couldn't help wondering if the mate really was glad.

"We of the Northwest," he added, "are proud of you, Mr. Frontenac—proud of your fame and that we are your neighbors, so to speak."

"Just wait till the expedition returns!" said the captain. "Great though Mr. Frontenac's fame is now—well, wait till *then*! Your pride will know no bounds. My one great regret in all this business is that I shall not be here to share that pride."

Then it was, for the first time, that I thought I saw a change in that visage of Mr. Ben Rainier; I thought that a questioning look came into those yellow eyes of his, but even of this I could not be sure.

He remained silent, thinking no doubt that the captain would explain.

What the captain said was:

"Well, gentlemen, I will show you over the ship."

The *Multnomah* was a three-masted fore-and-aft, with two square topsails on the foremast; her length one hundred and thirty-two feet over all, on the water-line one hundred and fifteen. Her beam, for a vessel of that length, was a most unusual one, being no less than thirty-eight feet and ten inches. She had a depth of eighteen and, when heavily laden, a draught of fifteen feet and a displacement of nine hundred tons. The sail area was about two thousand three hundred and eight square yards, and she had, for auxiliary power, a two hundred and twenty-five horse-power Diesel engine. By means of this motor, the *Multnomah*, when

Play a SAX!

Have Fun



Nothing will bring you so many friends or make you so popular as being able to play a saxophone. The new York Saxophone is easier to finger, easier to blow.

6 DAYS FREE TRIAL

With our free lessons you can be playing popular tunes in a short time. You can get this wonderful instrument, with its superb tone and perfect workmanship on six days' free trial in your own home.

Then if you decide to keep it you can take ten months to pay. Write at once for free saxophone booklet. Other York Band Instruments sent on the same easy terms. Free literature upon request.

J. W. YORK & SONS
Dept. 1825-B Grand Rapids, Mich.



heavily laden, could move through the water at the rate of some five or six knots per hour. This was no great speed, truly, but it was a great thing for all that.

It is strange the way we sometimes arrive at momentous decisions—some of the circumstances that influence us being so subtle as to baffle analysis. In my case, when I stepped onto the *Multnomah's* deck, I was, as regards this strange quest, uncertainty itself. Long before we left the ship, however, my mind was made up. I would go. I would go and see Sleeping Beauty in her bed of ice, see that mysterious door over which the great harpy held guard and enter the wonderful, the awful Gardens of Paradise.

Why this sudden dissipation of all doubt and uncertainty? Why this sudden, irrevocable decision, the consequences of which no man could even imagine? I did not know. I am not sure that I know now.

However, I said nothing about this at the time; indeed, it was not till the day following that I told Darwin Frontenac.

He gripped my hand, and his gray eyes gleamed in a way that thrilled me.

"I knew all the time, Bond, old *tillicum*," he said, "that you would go! I can't tell you how glad I am to learn that at last you know it yourself."

"When do we start?"

"The captain tells me that we ought to get away within the month. The *Multnomah* could sail before that, as soon as the freezer"—this was to be built in the fore-hold—"is done if it wasn't for the delayed arrival of some of the supplies, due, of course, to the hitch in his plans."

"Well," I said, "a week would give me plenty of time to get my affairs straightened out."

"A week?"

Frontenac gave a sound like a groan.

"A month will be none too long for me."

Swiftly now days followed on the heels of days.

Great had been the interest excited by Frontenac's discovery; and, when the big headlines informed the world that he was to head an expedition to the Antarctic, that interest became a very great interest indeed. And, in addition to its enhancement, there was that element of mystery about the whole enterprise.

What had Captain Stanley Livingstone told Darwin Frontenac? That was the question which was being asked everywhere. Of course, but three men knew—the captain, Frontenac and myself.

And that was our secret.

So the interviewers, in despair, left us and hid themselves to Professor Archimedes Bukink—who, it probably will be remembered, was the man that had really set this whole thing going.

The professor was wholly in the dark. He did not despair, however, but brought reason to bear upon the matter; in other words, he proceeded "with the greatest diffidence, in view of the great paucity of data," to propound an hypothesis. This celebrated hypothesis of Archimedes Bukink was, 'tis true, rather vague, but, like quite a few things that are vague, it had not a little truth in it.

It was something like this:

Imprimis, the professor wished it clearly understood that the matter was an utter mystery to him. In the second place, he had nothing substantial whatever on which to bottom a single conjecture. Nevertheless, he did conjecture, though, of course, "with the greatest diffidence." And his conjecture was that it, the great mystery it, was in some way connected, though in *what* way he had not the slightest conception, with Darwin Frontenac's amazing discoveries in suspended animation.

Frontenac, the newspaper lowered in his hands, looked at me, and there was a faint smile in his eyes, a smile of amusement and of anger that smoldered.

(Continued on page 1057)



Make Big Money as a Radio Expert

\$3,000 to \$10,000 a year

Yes—\$3,000 to \$10,000 a year! These are the opportunities. The chance of a lifetime. Investigate! Look into the amazing possibilities of Radio. Become the Radio expert in your neighborhood. The Radio Association of America now makes it easy for you to train for a big job, or to go into business for yourself. If you want to get away from poor pay and jobs with no future, here's your big opportunity.

We want ambitious men everywhere—to learn Radio operation, construction, installation, repairing and selling. Be our representative in your neighborhood. Find out how you can qualify in a few short months, and receive our marvelous 1000 Mile Radio Outfit FREE as part of your training.

Train at Home—In Three Months

Find out how, in your spare time at home, by mail, without giving up your present position or losing a dollar of pay, you can become a Radio Expert in a few short months. No previous experience necessary. The possibilities for big salaries or to go in for yourself are unlimited. In no other line have ambitious, wide-awake men the chance that Radio offers. You can now train under one of America's leading Radio authorities. Read Mr. A. G. Mohaupt's offer to train you personally in everything about Radio. By enrolling with us now, you get the benefit of the direct personal guidance of this well-known expert.



A. G. MOHAUPT

"I pledge my personal attention to every member enrolling in our Association at this time. Your individual problems and questions will be answered by me, and I will work with you at every stage of the course, guiding you till fully trained, including Government examinations for Operator's license."

A. G. MOHAUPT

Mr. Mohaupt, head of Radio Association of America, is a Graduate Electrical Engineer, University of Wisconsin; former Radio Instructor for the U. S. Government; author of "Practice and Theory of Modern Radio."

Free 1000-Mile Radio Outfit

Mail the coupon now for all the facts and free information. Let us prove to you that Radio is easier to learn and offers bigger money than any other business or profession that you can get into. Don't wait. Act while our FREE Offer of a 1000-mile receiving outfit is still in effect.

RADIO ASSOCIATION OF AMERICA
4513 Ravenswood Ave., Dept. 62 Chicago

Please send me details regarding your Expert Home-Training Plan and offer to representatives, also your offer of a 1000-mile Radio Set FREE.

Name.....

Address.....

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

EVERYTHING IN RADIO

Standard Prices — Shipping Prepaid

- ANY RECEIVING SET
- ANY SET OF PARTS
- ANY ARTICLE OR PART
- ANY HOOK-UP

Give full details. Say exactly what you want. We will send anything C. O. D. We are your servants.

If you are not certain what you want, give full details and results you wish and we will send the cheapest part, set of parts or receiving set for best results.

Prices lowest. No order too small or too large.

MAIL ORDER ONLY

ALL RADIO

417 North Clark St., Chicago, Ill.

MECHANICS' HANDBOOK

330 PAGES



HANDIEST book of its kind ever written. Prepared by experts under the direction of the International Correspondence Schools. Note this partial list of subjects:

- Hydro-mechanics; Strength of Materials; Boiler Design; Care and Inspection of Boilers; Horsepower of Boilers; Chimneys; Exhaust Heating; Machine Design; Horsepower of Engines; Boilers and Pumps; The Slide Valve; Belt Pulleys; Rope Belting; Cylinders and Steam Chests; Electricity; Currents; Wiring; Dynamos and Motors; Batteries; Compass Surveying; Curves; Leveling; Etc.

Just fill out and mail the coupon with a dollar bill, and this 330-page I. C. S. Mechanics' Handbook will be sent to you by return mail.

Only \$1

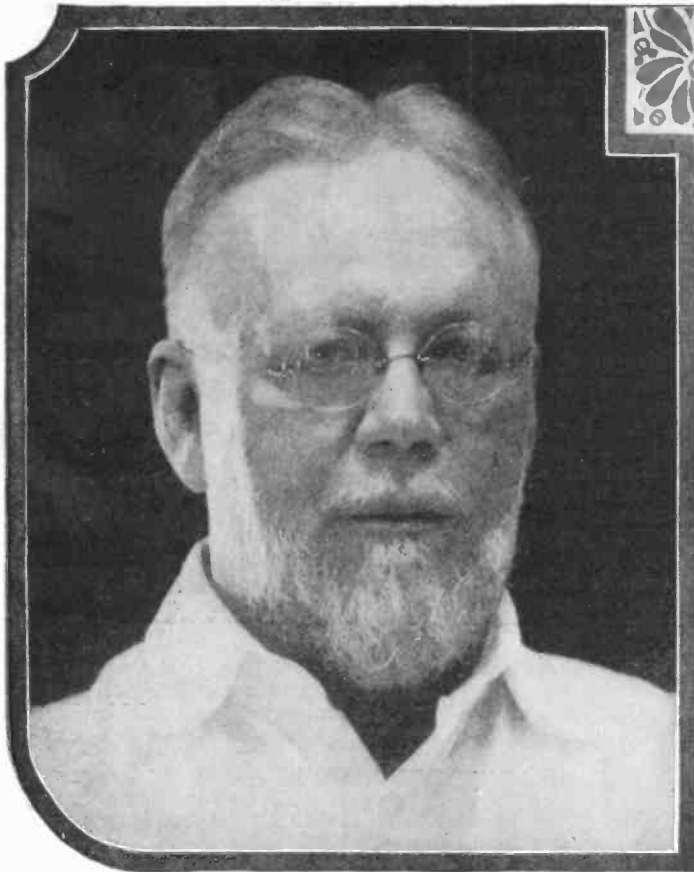
TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6198-D, Scranton, Penna.

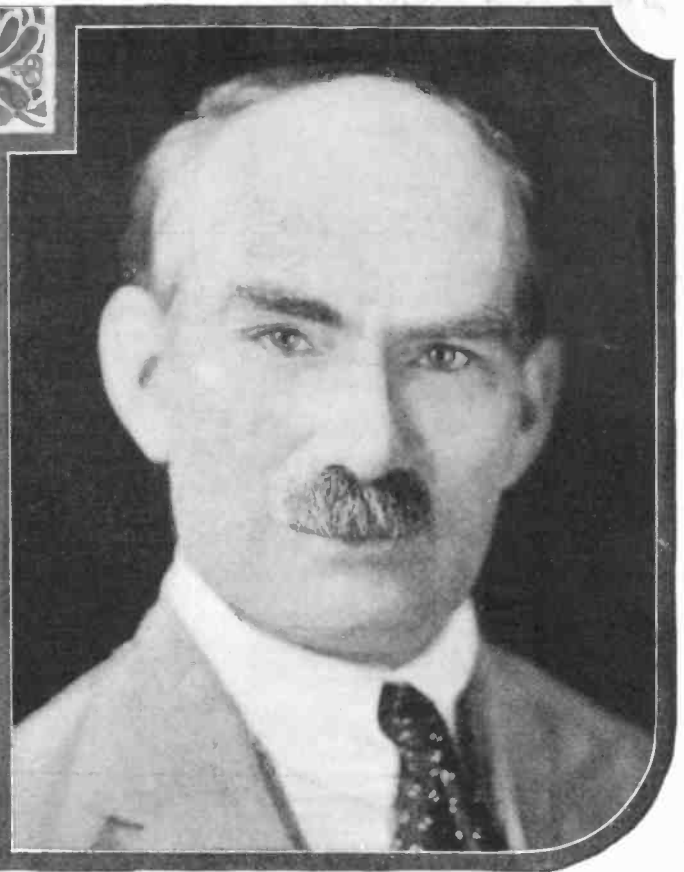
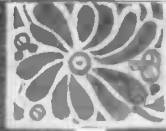
I enclose One Dollar. Please send me—post-paid—the 330-page I. C. S. Mechanics' Handbook. It is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

Name.....

Address.....



Professor Reginald A. Fessenden



Dr. Lee DeForest, Ph. D.

Learn From These Great Radio Inventors

Study the great Stories of how they developed Step by Step, in their laboratories and at home, their great inventions that are now the very foundations of Radio

There is only one way in which you can learn how to go about inventing. There is only one path to follow, one method that brings success.

The lives of the greatest, most prolific, master inventors are a sure, safe guide to your realization of success in this great field.

The lives of Radio's two greatest men, Dr. Lee DeForest and Professor Reginald A. Fessenden, constitute a complete course in practical inventing for anyone. The complete stories of these men now running in RADIO NEWS tells just how they struggled, how they worked in developing their great inventions.

Dr. Lee DeForest invented the modern vacuum tube, that marvelous instrument that makes powerful radio reception and transmission possible. He is also the inventor of the radio receiving system of regeneration that is used in thousands of radio receiving sets today.

Professor Reginald A. Fessenden is that great inventor who developed the modern radio telephone. His early experiments in the sending of the human voice without the aid of wires are an inspiration to every inventor young or old.

HERE IS YOUR OPPORTUNITY TO FIND OUT HOW OTHERS HAVE SUCCEEDED IN THE FIELDS OF INVENTING.

THE COMPLETE STORIES OF THESE TWO GREAT INVENTORS ARE NOW RUNNING MONTHLY IN "RADIO NEWS."

RADIO NEWS

ON ALL NEWSSTANDS :: 25c THE COPY

Published by The Experimenter Publishing Co., Inc., 53 Park Place, New York, N. Y.



How This Man Won Success As an Electrical Expert

General Manager of his company at 28 years of age! His own boss—owns his home—married and happy and prosperous—that's the remarkable success achieved by Wallace H. Rohrshneider, now General Manager, Secretary and Treasurer of the Hustisford Light, Power and Manufacturing Company of Hustisford, Wisconsin.

Mr. Rohrshneider got his start toward his quick and brilliant success at School of Engineering of Milwaukee. There he received the practical, intensive and specialized training that enabled him to make good in a big way.

Why Don't You Get Into This Big Pay Field?

The same kind of training that put Mr. Rohrshneider into the ranks of the highly-paid Electrical Specialists will qualify you for brilliant success in this fascinating field of unlimited opportunities. Come to America's Greatest Institution of Electrical Education. Learn by actual practice in our big laboratories with their magnificent equipment, including motors, dynamos, switchboards, ignition and lighting systems, etc. Recognized experts give you personal instruction every step of the way.

Earn Your Way Through This Great College

You can earn money to help defray your expenses while you are learning. Our wonderful co-operative plan brings an Electrical Career within the reach of every ambitious man. Our Free Employment Department secures positions for those students who wish to earn part of their expenses. In addition, the Department will help you get a good position in the Electrical Industry when your training is completed.

Big Book FREE—Mail the coupon today for our big new illustrated catalog. Check the course that interests you most and we will send you special information. Read about the School that trains men for practical and quick success. See how easy it is for you to get the training that will enable you to step to a splendid position and a handsome income. Mail the coupon right NOW. No cost or obligation.

SCHOOL of ENGINEERING of Milwaukee

Dept. S.&I.-225A, 415 Marshall St., Milwaukee, Wis.

MAIL COUPON NOW

SCHOOL OF ENGINEERING OF MILWAUKEE

Dept. S.&I.-225A, 415 Marshall St., Milwaukee, Wis.

Please send me without any cost or obligation, full particulars of the electrical course I have checked and your big Free Book telling about your institution and how it will fit me for a big position in the electrical field. Also tell me about your Earn-While-You-Learn plan.

(Check courses interested in, and be sure to give your education.)

—School of Practical Electricity—6 months or 1 year course. Complete general course, covering entire electrical field.
—Institute of Electrotechnics—12 to 30 months' course. Practical electrical training combined with thorough Academic education.

—College of Electrical Engineering—3 years' course. Regular collegiate work granting B. S. Degree. 14 High School units or diploma from our Institute of Electrotechnics required for entrance.

—Commercial Electrical Engineering—1 year course. Thousands of Trained Men wanted in this new profession. 14 High School units or diploma from our Institute of Electrotechnics required for entrance.

—School of Automotive Electricity

—Auto Electrical Service Engineering—1 year course.

—Automotive Electricity—3 to 6 months.

—Radio Sales and Service.

—A.C. and D.C. Armature Winding and Motor Generator Course—3 to 6 months' course. Brief, but intensely practical, leading to well-paying positions.

—Electrical Home-Service Training with laboratory facilities, for those who cannot come to Milwaukee.

Name

Street

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

Age..... Education.....

The Living Death

(Continued from page 1055)

"The confounded bag-pipe on two legs!" he exclaimed. "Can you imagine how so shrewd a fellow as Bukink sometimes shows himself to be, can be such a colossal, unmitigated, infernal fool?"

I couldn't.

"But," I queried, "what does it matter? He can never guess the truth."

"I wasn't thinking of that," said Frontenac.

Swiftly the days passed, and nearer and nearer drew the day of sailing. Once we motored up into the mountains to see the dogs. The captain had sent the animals to a high altitude, nearly five thousand feet, to save them as much as possible from the summer weather. Up there we met Mr. Louis Louisiana, known as Nunatak—he with the one eye blue and the other eye black.

It was about a week before the *Multnomah* sailed that I got (after a manner of speaking) the surprise of my life.

"It has been my opinion all along," Darwin Frontenac told me, "that the expedition ought to have a scientist along—to study things geological and biological."

"And so," said I, wondering at that pause of his, "you have got a biologist and a geologist?"

"No. I have been more fortunate: I have got a biologist and geologist."

"Oh! Killing two birds with one stone. And the accomplished gentleman is who?"

"Professor Archimedes Bukink."

"What?"

"Just so," smiled Frontenac.

"But—that is, I thought—great Jupiter Ammon, after all the things you've said, after all the names you have called that man! You said he was a fool, an ass, a nincompoop, a bonehead, a fuddle-cap—"

"I did. I said he was all that and more, and I say it again."

"And yet—"

"And yet," said Frontenac, "Archimedes Bukink is anything but a fool when it comes to geology and biology."

"But the man's utter lack of discretion?"

"I haven't forgotten that, Bond. We must guard against it, that is all. We mustn't let the old calloph know things—things, that is, that we don't want advertised from the house-tops."

"Well, what on earth will it be next? But isn't Bukink getting up in years?"

"He's far from senile yet. No his years won't matter. He'll encounter no hardship, anyway; his habit will be Summer Haven. And, besides (though, of course, a man doesn't want cripples along in an enterprise like this) I incline to the captain's belief that, when it comes to these things, the wonders of youth have been not a little exaggerated."

"It may be so. I hope your choice will not turn out a bad one."

"Furthermore, Bond, I am really greatly indebted to Granny Bukink—though I would never, never tell him so."

"Indebted?"

"Just so. For look you! Had it not been for Archimedes, I should, in all likelihood, never have heard the captain's story!"

"And, in all probability," I could not help saying to myself, "we'll wish, every one of us, before this wild business is ended, that you never had!"

On the fourteenth day of the month (September) Nunatak arrived with the dogs. The next day the animals—splendid creatures, every one of them—were killed and piled up in the freezer, to be thawed out and resuscitated on our arrival at Summer Haven.

There were one hundred dogs—one hundred and two, to be precise—but the killing was not a long affair. Frontenac stood at the entrance to the freezing-room and, as a

(Continued on page 1059)



Aviation Brings Quick Success

TO young men of daring no other field of work offers such a fascination, such high pay, nor such opportunities for quick success as the field of Aviation. As yet, aviation is practically in its infancy. But now is the time to get in.

Amazing Opportunities in Airplane Industries

In the automobile industry and in the moving picture business hundreds of men got rich by getting in at the start. They made their success before others woke up. Today, these lines offer no greater opportunities than a hundred and one others. BUT AVIATION IS NEW. Get in while the opportunities are big. All over the country there will be a clamor for trained men. It will not be a question of pay but of getting capable men.

Become an Aviation Expert \$50 to \$100 per Week

The study of aviation is almost as fascinating as the actual work. Every lesson is full of interest. That is why it is easy to learn aviation. You do not have to make yourself study—it is like reading an interesting book that tells you things you have always wanted to know. Only one hour each evening will give you the basic training in a surprisingly short time.

One student, S. F. McNaughton, Chicago, says: "Your lessons are like a romance, and what is more, after one reading, the student gets a thorough understanding. One never tires of reading them." James Powers, Pa., another student, says, "I am indeed surprised that such a valuable course can be had from such practical men for so little cost."

Fascinating—Daring—Big Paying

Prepare Now for One of These Positions

Aeronautical Instructor \$50 to \$150 per week

Aeronautical Engineer \$100 to \$300 per week

Aeronautical Contractor

Enormous profits

Aeroplane Repairman \$60 to \$75 per week

Aeroplane Mechanician \$40 to \$60 per week

Aeroplane Inspector \$50 to \$75 per week

Aeroplane Salesman \$5000 per year and up

Aeroplane Assembler \$40 to \$65 per week

Aeroplane Builder \$75 to \$200 per week

Personal Instruction

by Experienced Men
Men who have had actual experience give you personal attention. They select the lessons, lectures, blueprints and bulletins. They tell you things that are essential in everyday practice. Each lesson is easy to read and understand.

Get Big FREE Book—Now

Send coupon below for New Book, just out, "Opportunities in the Airplane Industry." It is interesting and instructive. It will show you many things you never knew before about aviation. We have but a limited supply of these books—send the coupon before they are all gone.

American School of Aviation
3601 Michigan Ave., Dept. 14-22 Chicago, Ill.

American School of Aviation
3601 Michigan Ave., Dept. 14-22 Chicago, Ill.
Without any obligation, send me your Free Book, "Opportunities in the Airplane Industry", also information about your course in Practical Aeronautics.

Name.....
Street.....
City..... State.....

The Radio Union



The Radio Purchaser and Radio Dealer in an Association for Mutual Benefit

Under the auspices of "Radio News," the World's Leading Radio Magazine, an association has been formed, having for its object, the bringing together of consumer and merchant, in a way that will permit every radio owner to save money on his purchases.

The Radio Union is a mutual benefit association of radio stores and radio enthusiasts. Every member store agrees to give a discount on every sale made to individual members. The member stores will benefit because our members will patronize those stores at which they obtain a discount on their purchases—the individual members benefit because they will save money on every radio purchase, and eventually on purchases made for all other necessities, such as groceries, clothing, jewelry, automobile supplies, drugs, furniture, etc., etc.

Every live radio dealer has been invited to join The Radio Union, and contracts stipulating the discounts that will be allowed on member's purchases are pouring in from every city in this country. Eventually invitations will be sent to stores selling all classes of merchandise, in your town, so that very shortly you can make large savings, not only on your radio purchases, but on everything else you or your family buy. The list of membership stores will be sent to every enrolled member.

The dues for membership will be \$5.00, entitling you to life membership, guaranteeing you against any further dues or assessments, and entitling you to a discount on every purchase you or any of your immediate family make in a membership store.

We want 50,000 Charter members. To these first we offer a membership at only \$2.00—a saving of \$3.00. Remember this is the only cost—there are no dues or assessments that you will ever have to pay. All you must do to obtain your discounts from member stores is to send us once a month, or oftener if you wish, the bills or sales slips for purchases made from member stores. These bills will be verified by the stores from which the goods were purchased and they will remit the discounts to us. These savings we forward to you after deducting a small charge for our operating expenses and overhead.

You have everything to gain by becoming a member in this Radio Union and can save \$3.00 by joining now as a charter member. A single purchase will more than make up the small fee of \$2.00 which you pay to join the Association.

DO IT TODAY

Remember the regular Membership fee will be \$5.00 hereafter.

Fill out the application blank, and mail it today with your remittance.

Officers and Directors

The personnel of the Officers and Directors of The Radio Union is quite sufficient to guarantee the success of the new association. The Officers and Directors are Messrs. Hugo and Sidney Gernsback and Mr. R. W. DeMott, the owners of the Experimenter Publishing Company, the publishers of Radio News, Science & Invention, The Experimenter, and Motor Camper & Tourist. These great magazines, with their tremendous circulation, at the disposal of The Radio Union, assures an overwhelming success to the new organization.

APPLICATION FOR MEMBERSHIP

THE RADIO UNION, INC., 53 Park Place, New York City, N. Y.

Gentlemen—Enclosed you will find Two Dollars (\$2.00) for charter Membership fee in The Radio Union, Inc. I understand this payment entitles me to a Life Membership and to a discount on every purchase I make in a membership store, list of which you will forward.

NAME STREET
TOWN STATE

The Living Death

(Continued from page 1057)

dog was brought forward, he made an injection in the animal's neck. On the instant, down it dropped, as though a bullet had gone crashing into its brain. Without more ado, the animal was lifted up and taken inside, and another dog was brought forward. And so it went, almost with the regularity of clock-work. Dog after dog received his injection—the fluid used was a vivid scarlet—down he dropped, to all appearances as dead as a doornail, was piled up in the refrigerator, and another followed.

It was a strange sight—a terrible thing to see. It gave Nunatak quite a turn, especially when he went into the freezing-room after the *killings* was over and saw the frozen bodies piled up one on top of another, the eyes fixed in a glassy, horrible stare.

"The poor brutes!" said Nunatak, unable to keep the tears from those strange eyes of his. "You've fixed them now!"

"They're all right," Frontenac assured him. "They are only sleeping, so to speak. And they'll be fixed so that the pitching of the ship, however violent, cannot budge them."

"Sleepin'!" echoed the musher. "Yes, they're sleepin'—sleepin' the sleep that we'll all find ourselves in some day. Sleepin'! Yes, they're sleepin'. They're dead, that's what they are, every one of them, dead as so many pickled mackerel, as you'll find when you try to wake them up. I guess I know a dead dog when I see one!"

"Lord help us!" he added. "What is this here old world of ours comin' to, anyway?"

The next day, at ten minutes to five in the afternoon, the last line was cast off, and the *Multnomah* began to back out into the fairway. A great crowd had gathered, and we certainly received a rousing send-off. Even the face of Captain Livingstone lighted up. This, however, was but for a few moments. A black cloud suddenly cast its shadow across his features.

A few moments, and we had cleared the pier and were out in the stream. The engine was reversed; the *Multnomah* lost sternway, stood still for a few seconds, then began to move forward. The ship's head swung away, over until we had the West Point light a point or two on our starboard bow, when the helmsman steadied the wheel and held her there.

We were off—off at last on our strange quest! How strange that quest really was, only three men knew—*thought* they knew.

Sunrise found us off the Dungeness light, with all canvas set (save the square fore-topsails) and the wind on our starboard beam. The motor was still going, however, for the wind was a light one. But, as the day advanced, it increased to a fresh breeze, when the engine was stopped and we went along under canvas alone, the ship slowly rising and falling now to the long swells coming in from the sea.

(To be continued)

MODERN ASTRONOMY

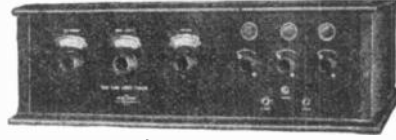
Astronomy is 'lderful,
And interesting 2.
The earth 3volves around the sun
Which makes a year 4 you.

The moon is dead and can't re5
By law of Phy6 great,
It's 7, where the stars above,
Do nightly scintill8.

If watchful Providence be9,
With good in10tions fraught,
Did not keep its grand design
We should come to 0.

GEO. GRAY.

Have You Heard THE RADIO SHACK New Shacton Low Loss 3 Circuit Receiver?



The
Supreme Achievement
with
VISIDIALS

Send for our Catalog

A SLIGHT turn of the Visidial, then—music, lectures and entertainment of all sorts from all parts of the country. These long, cold winter evenings hold many a surprise for the owners of the new "SHACTON."

For design, construction, performance and ease of operation the SHACTON is the most remarkable achievement in present day radio. The most important feature and without a doubt the cause of SHACTON'S success lies in the fact that Low Loss instruments of the highest grade are used throughout the entire circuit. Equipped with VISIDIALS—dials behind the panel, enabling fine, sharp tuning without vernier. The Visidial adds to the appearance and improves the performance to a surprising extent. Something new, something better.

PRICE
\$29³⁹

STANDARD PARTS with VISIDIALS

- 1 7x18 Drilled Radion Mahogany Panel, Engraved in Gold.
 - 1 Brunswick Low Loss 3-Circuit Tuning Coil.
 - 1 Genuine Brunswick Low Loss Condenser.
 - 1 Brunswick Triploid Mounting Socket and Binding Post Strip.
 - 2 Brunswick Cast Foundation Brackets.
 - 2 Brunswick Jacks with Gold-Plated Fronts; 1 for phones, 1 for Loud Speaker.
 - 1 Freshman Mica Grid Condenser.
 - 1 Standard Glass-Enclosed Grid Leak.
 - 2 30-Ohm Shacton Bakelite Rheostats with Gold-Plated Indicators.
 - 2 Molded Mahogany Dials grained to match panel.
 - 5 Lengths Professional Bus-Bar.
 - 1 Special Blue Print for this circuit. Not an ordinary hook-up but a clear picture form that a child can understand and make.
 - 2 Premier Hegehog Transformers.
- ALL ASSEMBLED READY TO WIRE
THE RADIO SHACK
55 Vesey Street, New York City

ACCESSORIES

- Everything needed to operate after building is listed here—
- 3 Type 291A Tested Tubes \$10.35
 - 1 60-Ampere Hour Storage Battery 11.25
 - 2 45-Volt Extra Large Enco "B" Batteries 6.50
 - 1 Pr. 3000-Ohm Head Phones and Cord 3.75
 - 1 Antenna Equipment 1.50
 - 1 Phone Plug, Double70
 - COMPLETE OUTFIT \$34.05

Parts also sold separately

CABINET FREE

Order Set and Accessory Outfit both together, and we will send Fine Mahogany Finish Cabinet FREE!

MAIL COUPON TODAY

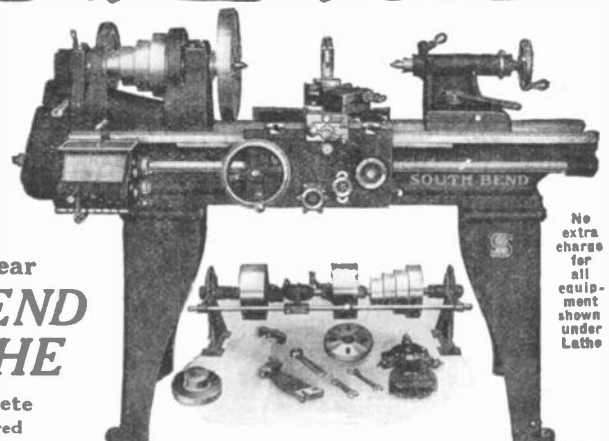
THE RADIO SHACK, Dept. B-19
55 Vesey St., New York, N. Y.

Please send me the "Shacton" outfit I have marked. When it arrives I will pay the postman the amount. If I am not satisfied I will return it in 5 days, and you agree to refund my money instantly. Mark choice in square.

- (A) Complete Building Kit. \$29.39
- (B) Operating Outfit. \$34.05

Name
Address
City State

Own a Lathe of Your Own



This 13" x 5'
Quick Change Gear
SOUTH BEND
SCREW
CUTTING LATHE

Only \$354 Complete
Easy Payments If Desired

This unusual offer comes to you from one of America's largest exclusive builders of Screw Cutting Lathes, established 18 years. More than 31,000 of our Lathes in use. For example, in plants of 2 largest Steel Companies, in 8 largest Auto Factories, in 5 largest Railroad Shops, in world's largest Sewing Machine Factory, in 2 largest Fire Arms Factories, by largest Oil Company, and by the U. S. Government, etc.

Choice of 96 Styles

In All Sizes From Small Bench Lathe to Largest Factory Lathe
You get our latest, finest Lathes, embodying 32 major improvements made in the last two years. You get our signed guarantee on every Lathe and 30-day trial offer right in your own shop. You take no risk. WRITE FOR FREE CATALOG showing pictures of all our Lathes. Compare our prices with what others ask. Note our liberal guarantee and 30-day trial offer. Send for Free Catalog today.

SOUTH BEND LATHE WORKS, 395 East Madison Street, South Bend, Ind., U. S. A.

No extra charge for all equipment shown under Lathe

Opportunity Ad-lets

YOU will find many remarkable opportunities and real bargains in these columns. It will pay you to read and investigate the offerings made every month by reliable firms, dealers and amateurs from all over the country. No matter what you may be seeking, whether supplies, automobile accessories, the opportunity to make money, or anything else, you will find listed here the best and most attractive specials of the month.

Advertisements in this section twelve cents a word for each insertion. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisement for less than 10 words accepted. Ten per cent. discount for 6 issues, 20 per cent. discount for 12 issues. Objectionable or misleading advertisements not accepted. Advertisements for the April issue must reach us not later than February 10th.

The Circulation of Science and Invention is over 150,000 and climbing every month

EXPERIMENTER PUBLISHING CO., INC., 53 Park Place, New York City, N. Y.

Advertising Agencies

Inch Display 100 magazines three \$8. Beck, 5411 Alaska, St. Louis.

Agents Wanted

Agents—Best seller; Jem Rubber Repair for tires and tubes; supercedes vulcanization at a saving of over 800 per cent; put it on cold. It vulcanizes itself in two minutes and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Dept. 601, Philadelphia, Pa.

Agents—Write for Free Samples. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Mills, 564 Broadway, New York.

Big money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co. Dept. 71, East Orange, N. J.

Make \$25 to \$50 week representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 27, Philadelphia, Pa.

Only one sale a day means \$200 per month. Five sales, \$1,000 per month. Marvelous new adding machine. Retail \$15. Work equals \$350 machine. Adds, subtracts, multiplies, divides automatically. Speedy, accurate, durable, handsome. Five-year guarantee. Offices, stores, factories, garages buy one to dozen. A fortune for live agents. Write quick for protected territory and free trial offer. Lightning Calculator Co., Dept. W., Grand Rapids, Mich.

Earn big money fast applying gold initials to autos. Every owner buys—\$1.35 profit on \$1.50 sale—particulars and samples free. Write quick. Lithogram Co., Dept. 19, East Orange, N. J.

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

\$60—\$200 a week. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 441 B., North Clark, Chicago.

Agents—Make \$25.00-\$100.00 weekly selling Comet Sprayers and Autowashers to farmers and Autoists. All brass. Throws continuous stream. Established 30 years. Particulars free. Rustler Co., Johnstown, Ohio, box C17.

\$25.00 a day easy! Best line of brushes on the market. 90 varieties, including famous Auto Fountain Washer. Excellent territory available. Write immediately. Philadelphia Brush Co., Dept. 28, Vineland, N. J.

District Managers Wanted—Appoint Local Agents for us in your locality. No canvassing or delivering. \$100.00 weekly easily made. Commissions advanced. Bob Russell, Z 2307 Archer, Chicago, Ill.

Write and learn how to start profitable business without capital or experience. Silvering mirrors, refinishing auto headlights, tableware plating. Outfit furnished. International Laboratories, Dept. 25, 309 Fifth Ave., New York.

Agents—Be independent, make big profit with our soap, toilet articles and household necessities. Get free sample case offer. Ho-Ro. Co., 2719 Dodier St., St. Louis, Mo.

Make \$17 Day.—Finest extracts, food products, toilet preparations, household necessities. Credit; sample case free. Write for amazing offer. Perkins Products, B-30, Hastings, Nebr.

At Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds jewelry world and deceives experts! Beautiful Sample Case Free! \$100 weekly! Write Quick! Rajah Diamond Co., Dept. F45, Salisbury, N. C.

Wonderful invention eliminates needles for phonographs. Preserves records. Abolishes scratching. Day's supply in pocket. \$20 daily. Sample on approval if requested. Everlyap, Desk H2, McClurg Bldg., Chicago.

Agents—Something New—Wonderful invention. Ford Owners wild over it—Distributors profit 300%—thirty day trial offer. Write A. Z. Super, 1304—Fondulac, Milwaukee, Wis.

Agents—\$15 a day. Easy, Quick sales. Free auto. Big weekly bonus. \$1.50 premium free to every customer. Simply show our beautiful, 7-piece, solid aluminum handle cutlery set. Appeals instantly. We deliver and collect. Pay daily. New Era Mfg. Co., 803 Madison St., Dept. 88D, Chicago.

Agents Wanted (Continued)

\$360.00 a month to distribute everyday household necessities in rural and small town districts. No money needed. Million dollar firm behind it. Write for particulars and state territory desired. B. U. Johnson, 611 W. Lake, Chicago.

\$10 daily silvering mirrors, plating and refinishing lamps, reflectors, autos, beds, chandeliers by new method. Outfits furnished. Write Gunmettal Co., Ave. D, Decatur, Ill.

Make from \$12.00 to \$50.00 a day handling quick selling auto specialty; part or full time; 300 per cent profit. Every auto owner buys on sight. Users say doubles mileage on gas, banishes carbon, increases power on hills. Attached or detached by anyone to any make car in five minutes. Exclusive protected territory. Write quick. Western Specialty Co., 2024 Locotah Bldg., Sioux Falls, S. Dak.

Earn money at home. Addressing, mailing circulars. Experience unnecessary. No selling. We pay weekly. York Supply Co., Dept. 120, 309 Fifth Ave., New York.

Start Mail Order Business. Watch Yourself Grow. Cost 5c. Sell by Mail for \$1. Particulars free. Tick, 3538 Arkansas St., Oakland, Calif.

Succeed with your own products—Formulas, Processes, Trade-Secrets. Modern master methods. Catalog Free. D. Thaxly Co., Washington, D. C.

Agents—200 per cent Profit, Wonderful Little Article. Something new; sells like wildfire. Carry in pocket. Write at once for free sample. Albert Mills, Manager, 2360 American Building, Cincinnati, Ohio.

\$100 Weekly—Pleasant work; appointing local agents to introduce Mother Hubbard Foods; no canvassing; no delivering; no money invested. Adam Inthout, 556 Congress, Chicago.

Live wire salesmen to join our prosperous sales force. Earn \$75 to \$125 weekly from the start—selling the biggest and fastest selling tailoring line. Set your own profit on each sale, 300 all-wool fabrics retailing from \$22.50 to \$45.00. Satisfaction guaranteed. Experience helpful but not necessary—we teach you. Write for big line today. Ambitious men can become District Managers. Address Sales Manager, R. H. Hart, Box 483, Chicago, Illinois.

You wish a big income? Your fault if you don't make a fortune. Write to Lucky Spencer for information. 4201 South Main St., Los Angeles, Calif.

New Improved Automatic Ad-Stamper just out. Salesmen and sideline men be wise and get in line. Automatic Ad Stamper, Joplin, Mo.

Agents—Sell two shirts for price of one. Walton Duplex shirts are reversible. Make \$15-\$25 daily. We deliver, collect. Write for "Your Opportunity." Walton-Duplex Co., 129 Brooks Bldg., Chicago.

Clothing Sensation! New line of men's clothing. Allwool suits, all at one low price of \$23.50. Nothing higher. We pay biggest commissions cash with order, supply finest selling outfit and give powerful co-operation. 3 to 6 orders a day gives you income of \$60.00 to \$125.00 a week. Experience isn't necessary. If you're honest, earnest and willing to work we'll train you. Address Dept. 280, William C. Bartlett, Inc., 850 W. Adams St., Chicago.

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

Manufacture Potato Chips. Big Profits. Start in own kitchen. We furnish sacks. Formula, manufacturing instructions, sales plan. E. Allen, 5945 Chicago Ave., Chicago.

American Made Toys

Opportunity to start Manufacturing Metal Toys and Novelties. No experience necessary. Enormous demand exceeds supply. We furnish, at cost, casting forms for production and buy entire output, also place yearly contract orders. Casting forms made to order. Catalog, advice and information free. Metal Cast Products Co., 1896 Boston Road, New York.

Battle Photos and War Relics

For Dens: Relics Collected from Europe's Battlefields. Firearms, medals, helmets, etc. Illustrated catalogues and sample War photographs 25c. Lieut. Welsh, 2117 Regent Place, Brooklyn, N. Y.

Books

Free—Upon request will send you my literature illustrating the following books. Astrology, Character, Clairvoyance, Concentration, Healing, Hypnotism, Magnetism, Mediumship, Personal Magnetism, Personality, Physiology, Salesmanship, Seership, Success, Sex, Will, Yoga Philosophy, Gazing Crystals, etc. A. W. Martens, E. E. 6, Burlington, Iowa.

Books (Continued)

Nature's Finer Forces. Marvelous Scientific Disclosures; Lights; Colors; Tones; Vibrations; Odic-Auras; Cold-lights; Radio; Inventions; 270 pages, \$3.00. Satisfaction Guaranteed; Circulars Free. E. J. Stevens, Publisher, 242 Powell, San Francisco, Calif.

Color Science and Rhythms nearly hundred pages. Starting Revelations. Illustrated. Leatherette binding \$2. Paper \$1.50. Doctor Stevens, 242 Powell Street, San Francisco, California.

Business Opportunities

Dollars yearly in your backyard. No mushroom dope. Particulars free. Metz, 313 East 89th, New York.

You can have a business-profession of your own and earn big income in service fees. A new system of foot correction; readily learned by anyone at home in a few weeks. Easy terms for training, openings everywhere with all the trade you can attend to. No capital required or goods to buy, no agency or soliciting. Address Stephenson Laboratory, 18 Back Bay, Boston, Mass.

Stop Plodding! Be Successful. Operate a Tire Repair Shop. Make big profits in any locality. We teach you and furnish complete equipments \$100 up. Book of Opportunity free. Haywood's, 1312 South Oakley Avenue, Chicago.

Get Money in your mail. "Lambert's Mail Order Secrets" contains successful methods never before published. Particulars free. Leon Lambert, 670-D Kaufman Bldg., Wichita, Kansas.

Money making books, formulas, plans, etc. Write for circulars. Morris Specialty Co., 2007 Park Ave., St. Louis, Mo.

Formulas. New, Different. Make your own extracts, flavors, syrups, beverages, etc. Name-address brings valuable information free. Merlden Co., 3522 M. White Bldg., Seattle, Wash.

Earn \$25 weekly, spare time, writing for newspapers, magazines. Experience unnecessary. Copyright book free. Press Syndicate, 987, St. Louis, Mo.

Make Money with your camera. Lancaster-P, Box 436, Los Angeles, California.

Unlimited possibilities, making toys and novelties at home or on a large scale. Particulars free. New Specialty Co., 448 E. 79th St., New York.

50 Successful Mail-order enterprises and 450 practical formulas in book form for 50 cents. Pentland-Service Co., Norwalk, Conn.

Free Instructive Book. Start little mail order business; home employment evenings. Outfit furnished. Pier, 867 Cortland Street, N. Y.

Chemistry

Learn Chemistry at Home. Dr. T. O'Connor Sloane noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 971 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Correspondence Courses

Used correspondence courses of all schools sold, rented and exchanged. List free. (Courses bought.) Lee Mountain, East Chattanooga, Tenn.

Electrical

Meters \$2.98, twentieth horsepower 115 volt alternating, direct current. Order now. Pay postman. Perry Trading Co., Dept. 1, 815 Lake, Racine, Wis.

For Advertisers

24 words—355 Rural Weeklies \$14.20. Ad-Meyer, 4113 St. Hartford, St. Louis, Mo.

For Inventors

We Develop Your Ideas into commercial shape for presentation to purchasers making working models, drawings, experiments or tests. Courtesy, efficiency, secrecy and ample equipment; 30 years' experience. Ducon-Rich Engineering Co., 504 Pacific Mutual Bldg., Los Angeles, Cal.

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars (Copyrighted). Write W. T. Greene, 808 Jenifer Bldg., Washington, D. C.

Your Chemical problems solved and working process furnished for Five Dollars. Write me. W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

For Inventors (Continued)

Patents and pending patents. Sold promptly. Write American Patents Corporation, Barrister Building, Washington, D. C.

Market your own invention. Booklet free. Chartered Association of American Inventors, 635 F Street, Washington, D. C.

Formulas

Money-making Books, Plans, Formulas. Catalogue Free. Ideal Book Shop, 5501-E, North Robey, Chicago.

What do you want to manufacture? \$2 will bring guaranteed formula for any product, complete instructions. Consulting Chemists Bureau, Box 1709, Boston, Mass.

For Sale

Super Heterodyne, manufactured by Experimenters' Information Company. The Halls Royce set. There is no better set than this on the market. Fully assembled and wired by the Company in expensive mahogany cabinet, bakelite panel, ready to operate. Due to death of owner, outfit must be sold. Set takes 8 tubes. Size of outfit is 40" by 39" by 10". Set originally cost owner \$200. No reasonable offer refused. Box No. 200, Science & Invention.

For the Photographer

Have you a Camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, 17, Mass.

Games and Entertainment

Tricks, Puzzles, Jokes, Magical Apparatus, Plays, Stage Supplies. Mind-Reading Acts and Sensational Escapes. Send 10c for 160-page illustrated 1922 professional catalogue. Oaks Magical Co., Dept. 549, Oshkosh, Wis.

Health

Free—Stop using tobacco. We will give free information how to conquer habit easily and permanently. Results guaranteed. Anti-Tobacco League Box M, Omaha, Neb.

Help Wanted

Detectives Needed Everywhere. Work home or travel. Experience unnecessary. Write, George Wagner, former Government Detective, 1968 Broadway, N. Y.

Silvering Mirrors, French plate. Easily learned, immense profits. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

All men, women, boys, girls, 17 to 65, willing to accept Government positions, \$17-\$250, traveling or stationary, write Mr. Ozment, 293 St. Louis, Mo., immediately.

Detectives Earn Big Money. Travel. Excellent opportunity. Great demand everywhere. Experience unnecessary. Particulars free. Write, American Detective System, 1974 Broadway, N. Y.

Earn \$1.20 an hour cutting blanks at home; anywhere; spare time. Men only. Send addressed reply envelope. Goodyear Sy., 147 W. 23d St., New York.

Men to Build Radio Sets in spare time. Leon Lambert, 670-II Kaufman Bldg., Wichita, Kansas.

Become a Landscape Architect. Uncrowded profession of wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Write for book. American Landscape School, 66-E, Newark, New York.

Be a Detective—Exceptional opportunity; earn big money. Travel. Big rewards. Established 1909. Particulars free. Write C. T. Ludwig, 1417H Westover Bldg., Kansas City, Mo.

Earn \$25 weekly, spare time, writing for newspapers, magazines. Experience unnecessary. Copyright book free. Press Syndicate, 886, St. Louis, Mo.

Get Posted—Good prices paid for butterflies, insects. See Sinclair display advertisement page 1026.

Money Silvering Mirrors, Autolight, Radiators, tableware. Methods Free. Write Sprinkle, Plater, 953, Marion, Indiana.

Make money at home writing Showcards. We instruct and provide work. Kwik Showcard, 61-J Bond, Toronto, Canada.

\$133.00-\$192.00 month. Government Railway Postal Clerks. Men, 18 up. Steady. Common education sufficient. Candidates coached. Particulars free. Write immediately. Franklin Institute, Dept. W23, Rochester, N. Y.

Firemen, Brakemen, Baggage-men, Sleeping car, train porters (colored) \$140-\$300. Experience unnecessary. 897 Railway Bureau, East St. Louis, Ill.

Insects Wanted

Get Posted—Good prices paid for butterflies, insects. See Sinclair display advertisement page 1026.

Instruction

Learn Chemistry at Home. Dr. T. O'Connor Bloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 871 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Instruction (Continued)

Correspondence Courses sold complete; one-third usual prices because slightly used; easy terms; money back guarantee. All schools and subjects. Write for special Free catalog. Courses bought for cash. Economy Educator Service, H202, West 49th St., New York.

Be a Laboratory Expert. Earn \$300 to \$500 monthly. Study Microbiology, Sanitation, Day, Evening Classes. Diplomas, Degrees Granted. Free 71 Piece Outfit to Students. Write for Free Prospectus Today. International College of Microbiology, 2124 Lincoln Ave., Chicago.

Arthel Shorthand learned in four evenings. Full course seven dollars. Used everywhere. Sent on approval. Particulars, Hollerfreund's Institute, Desk X., Stratford, Ontario, Canada.

Correspondence Courses—All schools sold complete at lowest prices. Easy terms, money-back guarantee. Courses bought for cash. Catalog Free. Mention Subject. Economy Educator Service, 412-H Sansome, San Francisco.

Inventions for Sale

Invention for sale. Traffic congestion eliminator. Autos, Trolleys, 107 Station A, Boston.

Languages

World-Romie System, Masterkey to All Languages. Primers, \$1.94; Chinese, French, Spanish. Pronunciation-Tables, 30c. Dictionaries, \$1.98. Languages, 8 West 40th, New York.

Machinery and Tools

Concrete Building Block Machines and Molds. Catalogue free. Concrete Machine Co., 305 South Third St., St. Louis, Mo.

Manufacturing

To order: Metal articles, simple, or complicated machinery. Models, tools, patterns. Experimenting. Parma Engineering Works, Brooklyn Station, Cleveland, Ohio.

Miscellaneous

Hindu Psychology, Yogi, Personal Magnetism. The Secret Sciences, Books and Courses. Large illustrated Private Catalogue, with "How Realize Any Desire," 25c. Adaros, 116 South Michigan, Chicago.

Beautiful registered bull pups cheap. Bulldogs, 501 Rockwood, Dallas, Texas.

Cigar Smokers' Factory to Smoker System Saves you half; write for particulars and special offer. Montrose Cigar Factory, 4004 Montrose Ave., Chicago, Ill., Dept. B.

Get Posted—Good prices paid for butterflies, insects. See Sinclair display advertisement page 1026.

Combination Ivory opera-glass, microscope, compass and mirror, 60c postpaid. Elanore Sales Co., 621 S. Warren St., Trenton, N. J.

Artificial Marble, sanitary flooring instructions, ornamental castine, concrete, plaster, papier-mache, decoration garden furniture, 15 years instructing the public, particulars and 200 illustrations free. C. Mahler, Huntington, N. Y.

For Lowest prices on models and machine work, write. Louis Uhler, 543 Napoleon, Detroit, Mich.

Motorcycles—Bicycles

Don't buy a Bicycle Motor Attachment until you get our catalogue and prices. Shaw Mfg. Co., Dept. 6, Gatesburg, Kansas.

Musical Instruments

Viollins—Deep, Mellow, Soulful—on easy credit terms. High grade, wonderful instruments of my own make. Development of many years' experience. Write for book. Gustav A. Henning, 2424 Gaylord St., Denver, Colo.

Novelties

Magie goods, cards, books, novelties, tricks. Catalogue free. Clifford Fennar, 2401 Jefferson, Louisville, Ky.

Patent Attorneys

Patents. Send for free booklet. Highest references. Best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 644 G Street, N. W., Washington, D. C.

Get your own patents. Application blanks, complete instructions \$1. Cutting Bros., Campbell, Calif.

Inventors write me about patents. My fees payable monthly. Booklet free. Frank Fuller, Washington, D. C.

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars (Copyrighted 1923). Write W. T. Greene, 809 Jenifer Bldg., Washington, D. C.

"Inventor's Adviser," the valuable Patentbook with 139 Mechanical movements and illustrations, sent free upon request. M. I. Labiner, Patent Attorney, 3 Park Row, New York.

M. P. Laughlin, Patents. Engineer-Attorney, 47 West 42nd Street, New York.

Patents—Write for our Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for Examination and Instructions. No charge for the above information. See advertisement on page 1937. Victor J. Erans & Co., 191 Ninth, Washington, D. C.

Patent Attorneys (Continued)

Inventors: Send sketch or model for free opinion concerning patentable nature and exact cost of patent. Book "How to Obtain a Patent," sent free. Tells what every inventor should know. Established twenty-eight years. Highest references. Prompt service. Reasonable charges. Chandiee & Chandiee, 476 Seventh, Washington, D. C.

Patents. Write for my free Guide Books "How to Obtain a Patent" and "Invention and Industry" and "Record of Invention" blank before disclosing inventions. Send model or sketch of your invention for instructions. Promptness assured. No charge for above information. Clarence A. O'Brien, Registered Patent Lawyer, 929 Security Bank Building, directly across street from Patent Office, Washington, D. C. See page 1035.

Patents Procured; Trade Marks Registered—A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 130 Owen Bldg., Washington, D. C., or 2278-T Woolworth Bldg., New York.

Monroe Miller, Ouray Bldg., Washington, D. C. Patent Attorney; Mechanical, Electrical Expert. Free Blue Book gives candid advice.

Inventors—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information free. Lancaster and Allwine, Registered Patent Attorneys in United States and Canada, 242 Ouray Bldg., Washington, D. C.

The Patents. Impartial advice to Inventors and Manufacturers. Mailed on request. Anderson & Son, Patent and Trade Mark Lawyers, Established 1865. 637 F St., Washington, D. C.

Millions spent annually for ideas. Hundreds now wanted! Patent yours and profit. Write today for free book—tells how to protect yourself, how to invent, ideas wanted, how we help you sell, etc. American Industries, Inc., 212 Krege Bldg., Washington, D. C.

Lacey Patent-Sense. "The book the inventor keeps." Free. See page 1036.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Ledermann, Registered Attorney and Engineer, 15-B Park Row, New York.

Herbert Jenner, Patent Attorney and Mechanical Expert, 606 F Street, Washington, D. C. I report if patent obtainable and exact cost. Send for circular.

Patents—Our book "How to Obtain a Patent" sent free upon request. Contains full information about patents, trade-marks and designs. If you will send us a sketch of your invention we will promptly make search of the Patent Office records and advise you as to patentability, our charge for the service being \$5.00. Prompt, efficient service with moderate charges. Over twenty years' experience. Bank and commercial references. Talbert & Talbert, Registered Patent Lawyers, 553 McGill Bldg., Washington, D. C.

Stronger patents for less money. Booklet Free. Chartered Association of American Inventors, 635 F Street, Washington, D. C.

Patents

M. P. Laughlin, Patents. Engineer-Attorney, 47 West 42nd Street, New York.

Inventions commercialized. Patented or unpatented. Write Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Personal

Exchange interesting letters with friends in Mexico and Central America. Information free. Box 1647, New Orleans, La.

Free to Men or Women—Information of a scientific nature that has brought physical vigor and happiness to thousands. No charge; no obligation. Write Fair Sales Co., Dept. 246-1, Colorado Springs, Colo.

Lonely Hearts—Exchange letters; make interesting new friends through our romantic club. Write Eva Moore, Box 908, Jacksonville, Florida.

Get acquainted. Make new friends. Exchange Letters. Enclose stamped envelope for plan. The Lilly Club, Station H, Cleveland, Ohio.

Lonely—Join our Club. Make friends everywhere. Particulars free. Write Mrs. Mathews, Box 28, Oakland, Calif.

Phonographic Supplies

Build Your Phonograph. Spring Motors, Electric Motors, Tonearms, Amplifiers, Accessories. Latest Equipment also in Radio Mechanism and Cabinets. Catalog mailed for ten cents. Hoosier Mfg. & Supply Co., Baldwin Block, Indianapolis, Ind.

Photo Finishing

Trial Offer. Any size Kodak film developed 5c. Prints 3c each. Trial 5x7 enlargement beautifully mounted 25c. Young Photo Service, 404 Bertha St., Albany, N. Y.

Photoplays, Stories, Etc.

\$ \$ \$ For Ideas. Photoplay Plots Accepted any form; revised, critiqued, copyrighted, marketed. Advice from Universal Scenario Corporation, 223 Security Bldg., Santa Monica & Western, Hollywood, California.

Photoplay Idea—Original, for sale. Lucual Atencio, P. O. Box 3814, Station D, Philadelphia, Pa.

How to Get a Position with the U. S. Government

Thousands of appointments are made yearly. Good salaries—short hours—liberal vacations (as much as 30 days in some branches of the service). Positions open now in Washington and in other cities.

"Pull" and influence unnecessary. Common school education sufficient as groundwork for most positions. The International Correspondence Schools will prepare you right at home to pass your Civil Service examination with a high mark.

Mail the coupon today for 48-page Free Civil Service booklet.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6197-D, Scranton, Penna.

Without cost or obligation, please send me a copy of your 48-page CIVIL SERVICE BOOKLET, which tells how I can secure a good-paying position with the U. S. Government.

Name.....
Address.....



Hotels Start You With Salaries up to \$3500 a Year — with your living

Hotels, restaurants, clubs, apartments, everywhere need trained men and women—salaries to start up to \$3,500 a year with your living. Over 70,000 high-class positions paying up to \$10,000 a year are open every year in the hotels of the United States. Today this is the FIRST INDUSTRY IN AMERICA with over \$992,391,963 in new hotels being built in 1924—exceeding by \$200,000,000 the next largest industry. These new hotels, restaurants, etc., will need over 60,000 trained men and women.

You can have one of these high-class big-pay positions, with luxurious meals and apartment and fascinating work. No previous experience necessary. The Lewis Schools guarantee to give you the valuable knowledge that it has taken some of the most successful hotel men years to obtain—men who are now making \$5,000 to \$50,000 a year. We train you by mail in your spare time at home with the Lewis Simplified Study Plan, and we put you in touch with big opportunities. Our students employed, our methods endorsed by leading hotel men everywhere. Send today for Free Book. "YOUR BIG OPPORTUNITY," showing how we can train you for one of these splendid positions in 20 weeks or less, and explaining our Money-Back Guarantee.

LEWIS HOTEL TRAINING SCHOOLS
Room M-3488 Washington, D. C.

FREE BOOK COUPON
LEWIS HOTEL TRAINING SCHOOLS,
Room M-3488, Washington, D. C.
Send me without obligation the Free Book, "YOUR BIG OPPORTUNITY."
Name.....
Address.....
City..... State.....

NEW KIND OF TRUSS

Now you can throw away forever steel bands, chafing leg straps and other heavy makeshift devices. For a well-known American scientist has found a new easy way to support ruptures assisted by means of a wonderful little invention weighing less than 1/25 of an ounce. Not only do you do away with the objectionable pressure and tight strapping, but you eliminate the "coming down" of rupture—when running, straining, exercising, sneezing, etc.—which too frequently leads to strangulation, a real danger. The success of this wonderful device that it is being offered to ruptured people on an absolute guarantee of satisfaction or no cost. Drop a postcard or letter requesting free literature to NEW SCIENCE INSTITUTE, 450 1/2 Clay St., Searsville, Ohio

PIMPLES

Your Skin Can Be Quickly Cleared of Pimples, Blackheads, Acne Eruptions on the face or body, Barbers Itch, Eczema, Enlarged Pores and Oily or Shiny Skin. Write today for my FREE BOOKLET, "A CLEAR-TONE SKIN,"—telling how I cured myself after being afflicted 15 years. E.S. GIVENS, 163 Chemical Bldg., Kansas City, Mo.

Radio

Build Your Radio. Complete line of radio equipment. Money saving prices. Complete sets or units ready for assembly. Send ten cents for catalog. Hoosier Manufacturing & Supply Co., 310 Baldwin Block, Indianapolis, Indiana.

Attention! 50 Vacuum Tube Hook-Ups. The greatest collection of Vacuum Tube Circuits ever brought under two covers at such insignificant cost. These diagrams will be found in the great "Rasco" catalogue which contains raw materials and parts in a greater profusion than any other catalogue. 15c in stamps or coin will bring the catalogue to you. Radio Specialty Company, 100 Park Place, New York City.

Boys, don't overlook this! The "Rasco" Baby Detector. Greatest detector ever brought out with molded base. Fully adjustable. See former advertisements in this publication or our catalogue. Detector with Galena Crystal complete, 50c; the same Detector with Radiocite Crystal, 75c, prepaid. Send for yours today. Radio Specialty Co., 100 Park Place, New York City.

Send me your burned out or broken Power tubes—50 watts or over. Will pay liberally. W. Baker, 36 W. 20th St., New York City.

Have your broken and burned out power tubes repaired, 50 watts or over. Send them to us for Repair. Charges reasonable. Wm. Baker, 36 W. 20th St., New York City.

2650 Miles Distance with one tube. Any Novice understands our Simplified Instructions. Big Free booklet tells the story. Vesco Radio Co., Box SC-117, Oakland, Calif.

Salesmen Wanted

A Salesman wanted in every town or city within 25 miles of a broadcasting station to sell Radiogem, the complete radio receiving set that retails for \$2.50. With Radiogem there is nothing else to buy—the outfit includes the Radiogem receiving apparatus, 1,000-ohm phone, and aerial outfit. The cheapest radio outfit on the market—yet as practical as the most expensive. Big money to the right men. Send \$2.00 for sample outfit. The Radiogem Corp., 66R West Broadway, N. Y. City.

Distributors: Wonderful Pricing System for all Stores. Absolute protection. Immediate sales! Tremendous Earnings! Millen Mfg. Co., Dept. JF, 100 Boylston, Boston, Mass.

Distributors—Screw-holding Screw Driver. Handiest Tool ever invented. Unlimited Market. Tremendous demand! Big repeat earnings! Write Coburn Tool, 738M, Boylston, Boston, Mass.

Stamps and Coins

California Gold, quarter size, 27c; half-dollar size, 53c. Columbian nickel and catalogue, 10c. Norman Shultz, Box 146, Colorado Spring, Colo.

Stamps 100 All Different 3 cents. S. I. Quaker Stamp Company, Toledo, O.

158 Genuine Foreign Stamps, Mexico War Issues, Venezuela, Salvador and India Service, Guatemala, China, etc., only 5c. Finest approval sheets 50 to 60%. Agents Wanted. Big 72-p. Lists Free. We buy stamps. Established 20 years. Hussman Stamp Co., Dept. 156, St. Louis, Mo.

You'll get profit and pleasure collecting old coins. Send 10c for genuine old coin and large coin catalog. This is just a get-acquainted offer. Send today. You'll be delighted with it. B. Max Mehl, Numismatist, Dept. N, Mehl Building, Fort Worth, Texas. Largest Coin Firm in U. S.

Danzig Free—Nice Set Danzig Stamps with Biggest Catalogues Issued, 2c postage. Midland Stamp Co., Station E12, Toronto, Canada.

Stamps Free—Variety Packet, Foreign Stamps with Catalogue—2c postage. Gray Stamp Company, Station E5, Toronto, Canada.

Typewriters

Typewriters, all standard makes, \$10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Exchange, 121 N. Francisco Ave., Chicago.

Wanted

Detectives Earn Big Money. Work home or travel. Experience unnecessary. Write, George Wagner former Government Detective, 1968 Broadway, N. Y.

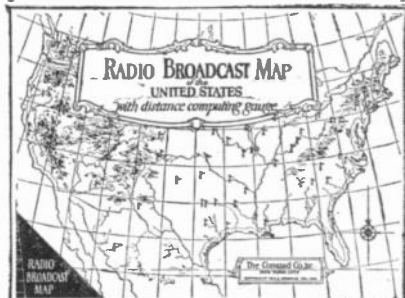
Young Men—Turn Your Spare Time Into Money!

Earn big profits, prizes and awards selling RADIO NEWS, SCIENCE & INVENTION, THE EXPERIMENTER, and MOTOR CAMPER & TOURIST in your neighborhood. We train you as our salesman and pay you liberally for your time. Write at once and we will help you get started.

M. BRIDWELL.

THE EXPERIMENTER PUBLISHING CO.
53 Park Place New York, N. Y.

Here's a PERMANENT Broadcast Station MAP



Complete Map Mounted on Heavy Cloth with Special Distance Finder Attached

The Conrad Radio Map is different from all other maps in that it is printed on CLOTH. With proper care will last a lifetime.

The Map measures 17x22" and contains a special distance-computing gauge of our own design which enables one to determine the distance in miles between any broadcast station and his receiving set at a glance.

Another special feature of this map is a novel Finder device for locating a broadcast station in quick time.

A complete list of broadcast stations are given on a separate sheet which can be fastened to the map by ordinary paper fasteners.

The map furnished in two colors with the sheet of broadcast stations, enclosed in a two-color heavy manila envelope 9 1/2 x 12 inches.

PRICE

50c

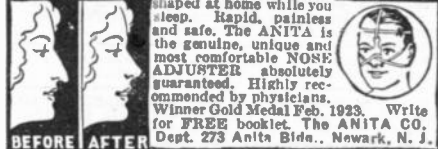
SOLD BY ALL RADIO AND NEWS DEALERS

Published by

The Conrad Company

233 Fulton Street, New York, N. Y.

A PERFECT NOSE



shaped at home while you sleep. Rapid, painless and safe. The ANITA is the genuine, unique and most comfortable NOSE ADJUSTER absolutely guaranteed. Highly recommended by physicians. Winner Gold Medal Feb. 1923. Write for FREE booklet. The ANITA CO., Dept. 273 Anita Bldg., Newark, N. J.

\$20 A DAY EASY

That's the average of our men selling exclusive patterns. "BUILT ON HONOR TO HONOR THEIR MAKER!" Direct from our large, airy mills to wearers. Out of ordinary rations. Tremendous demand. Big repeat business. We deliver for you. Not sold in stores. No capital or experience required. Write J. W. HEITJAN, Gen. Mgr., CHICAGO SHIRT COMPANY 118 Chicago Shirt Bldg., Chicago, Ill.

Straightens Shoulders —Increases Pep

THE NATURAL BODY BRACE—Corrects stooping shoulders, straightens the back, gives the lungs chance for normal expansion, induces proper breathing. Brings restful relief, comfort, energy, and pep. For men and women.

Costs nothing to try it
Write for 30 days free trial offer and free book.
NATURAL BODY BRACE CO.
Howard C. Rash, Ft. 286 Rash Bldg., Salina, Kansas

A Chemistry Laboratory for \$7.00

Think of it, fellows! Here is a *real* chemistry outfit with regular chemical apparatus that performs those fascinating, actual chemical experiments. This outfit is not a toy, put up merely to amuse, but a practical laboratory set, with all the chemicals, apparatus and reagents necessary to perform real work and to teach the beginner all the secrets of inorganic chemistry.

DESCRIPTION OF THE OUTFIT

The outfit consists of 44 Chemicals and Reagents all C. P. put up in appropriate wooden boxes, glass bottles, and hermetically closed jars. The acids are put up in glass bottles with ground-in glass stoppers, and there is a sufficient quantity of chemicals supplied (mostly one to two ounces) to make dozens of experiments with each.

The apparatus furnished are all of the best obtainable make and of standard laboratory size and shape.

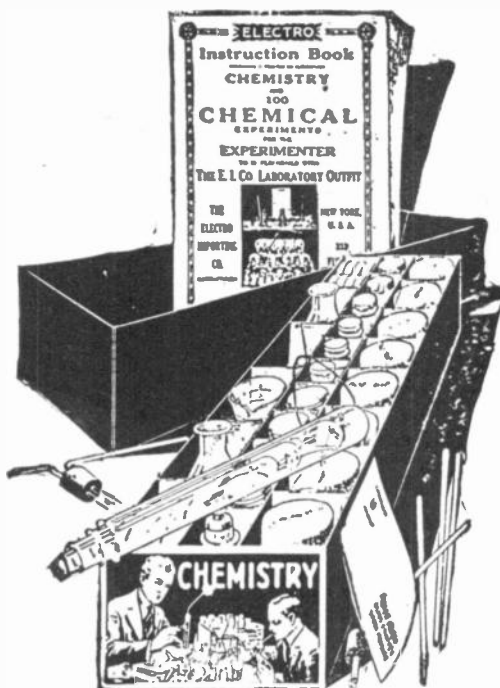
The *Instruction Book* is a *real Chemistry Course for the Beginner*. Some of the Contents are: *Division of Matter*: This is a Treatise on Elementary Chemistry and deals with the theory of the Elements, Molecules and Atoms, etc. *Chemical Nomenclature*: This explains in simple language the derivation of the chemical names of the elements and their compounds. There is a chapter on *Laboratory Operations*; *Glass Working*; *First Aid*; *Fire Extinguishers*; *Experimenters' Aphorisms*, etc.

A good part of the book is devoted to Weights and Measures. The Metric System, The English System and the U. S. System are fully explained.

The following tables are furnished: Symbols and Atomic Weights of the Elements; Measures of Weights, Volume, Capacity and Length; per cent solutions; Conversion of Measure expressed in parts; poisons and their antidotes; technical and common name of chemical substances; formulas for cleaning various substances, etc., etc.

Among the 100 Experiments are:

How to make chemical tricks; How to make invisible and magic inks; How to test flour; How to test soil; How to make chlorine gas and smoke (German War Gas); How to bleach cloth and flowers; How to produce Oxygen and Hydrogen; How to make chemical colors; How to test Acids and Alkalies and hundreds of interesting hints and formulas.



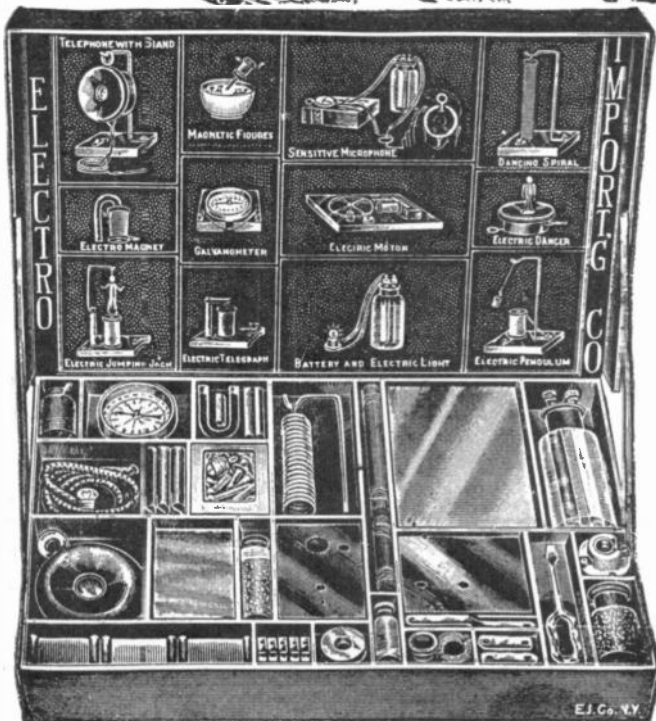
Complete, \$7.00 Sh. Wght., 10 lbs. (Shipped by Express only)
 (We guarantee shipment within 24 hours after your order is received)



\$7.00



Every Fellow Wants the
BOY'S ELECTRIC TOYS



The Boy's Electric Toys contains: Enough material to make and complete over twenty-five different electrical apparatus without any other tools except a screw-driver furnished with the outfit. Student's chronic plunge battery, compass-galvanometer, solenoid, telephone receiver, electric lamp, etc. Enough various parts, wire, etc., are furnished to make the following apparatus:

Electromagnet, electric cannon, magnetic pictures, dancing spiral, electric hammer, galvanometer, voltmeter, hook for telephone receiver, condenser, sensitive microphone, short distance wireless telephone, test storage battery, shocking coil, complete telegraph set, electric riveting machine, electric buzzer, dancing fishes, singing telephones, mysterious dancing man, electric jumping jack, magnetic geometric figures, rheostat, erratic pendulum, electric butterfly, thermo-electric motor, visual telegraph, etc., etc.

With the instruction book we furnish one hundred experiments that can be made with this outfit, nearly all of these being illustrated with superb illustrations. No other materials, goods or supplies are necessary.

The outfit contains 114 separate pieces of material and 24 pieces of finished articles ready to use at once.

The size over all of the outfit is 14 x 9 x 2 3/4. Shipping weight 8 pounds. "The Boy's Electric Toys" outfit as described, \$7.00. Immediate shipment.

SEND NO MONEY

We have so much confidence in these sets that we desire to ship either one to you by express C.O.D. with the privilege of inspection. In other words, we ship on approval. It does not cost you one cent to take a good look at whichever outfit you want, and see if it comes up to your expectations. If it does, pay the express man \$7.00, plus express charges. If not, you need not accept it, and we will pay the return charges as well.

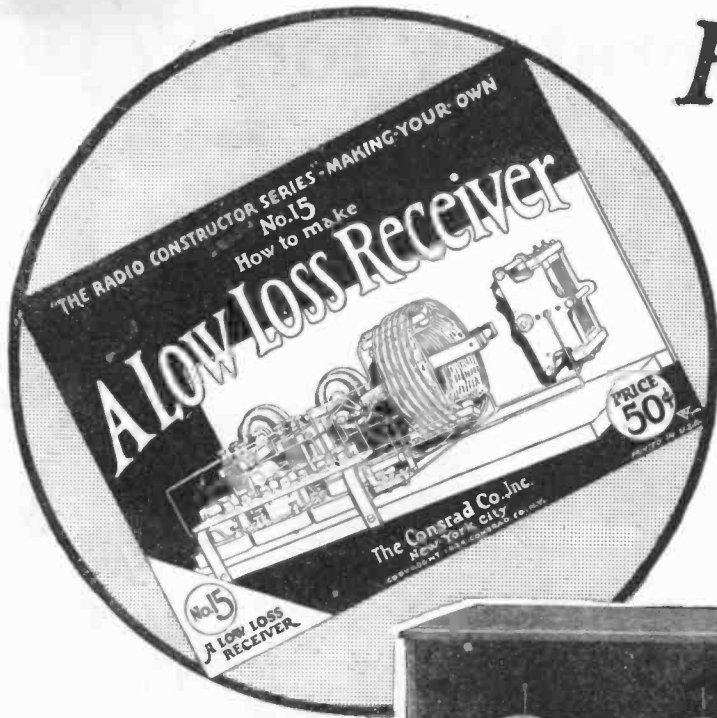
ELECTRO IMPORTING CO., 233 Fulton St., New York City

ELECTRO IMPORTING CO.,
 233 Fulton St., New York
 Please send me by express THE
 CHEMICAL LABORATORY. If
 I don't like it I need not accept it.
 If I want it I only pay \$7.00 plus
 the few cents express charge.

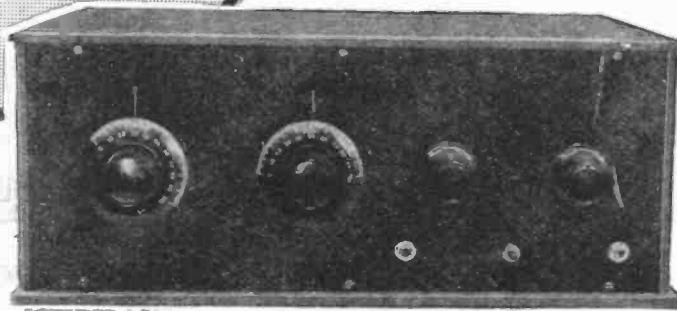
S&I-2-25

ELECTRO IMPORTING CO.,
 233 Fulton St., New York
 Please send me by express THE
 BOY'S ELECTRIC TOYS. If I
 don't like it I need not accept it.
 If I want it I only pay \$7.00 plus
 the few cents express charge.

S&I-2-25



Price 50c Each



Here's a New Pattern!

HOW TO MAKE A

Low Loss RECEIVER

Build Your Own "LOW LOSS" Receiver with this New Pattern

Last year everyone was building Power sets, larger and larger grew the already complicated receivers. When more volume or greater distance was desired more tubes were added. Everyone overlooked that vital factor of high efficiency, namely LOW LOSS. It is the high efficiency of the LOW LOSS Receiver that gets the distance, produces clarity and insures ample volume.

Conrad has just published a New Pattern. A standard, high efficiency LOW LOSS receiver that embodies every notable modern advance along that line. This new pattern is the most complete, most practical and most easily understood pattern

ever published. It contains two full size blueprints, size 14 by 19 inches, giving wiring diagram and panel layout and a complete 16 page instruction booklet. The entire pattern is enclosed in a heavy, two color manila folder size 9 by 12 inches.

The blueprint of the wiring diagram incorporates a unique new idea of inestimable value to the user. The wiring of each circuit is printed in a different color, thus: GREEN for the aerial circuit, YELLOW for the low potential or ground, RED for plate and "B" Battery and WHITE for the grid circuit. Altogether the user of this pattern has every modern aid that has been designed for the building of sets from blueprints.

CONSRAD PATTERNS—HOW TO BUILD

Pattern No. 1—Short Wave Regenerative Receiver

Especially designed, single circuit receiver pattern that incorporates all those refinements that give such remarkable results. Pattern contains 2 blueprints, size 16" by 22" and a five page instruction book.

Pattern No. 2—One and Two Stage Amplifiers

Everyone likes to add some amplification to his set at some time or other. This remarkable pattern gives full details with blueprints of circuits, etc.

Pattern No. 3—A Radiophone Crystal Set

The crystal set complete. With patterns, blueprint, instruction folder containing illustrations and full details.

Pattern No. 4—A Reinartz Receiver

One of Radio's most popular hook-ups, noted for its distance getting capacity and simplicity of construction.

Pattern contains 2 full size blueprints 16" by 22" and a complete illustrated catalogue.

Pattern No. 5—A Reflex Receiver

Here is a reflex receiver anyone can build, details are reduced to a minimum. Pattern contains the usual full size blueprints and four page instruction booklet.

Pattern No. 6—A Cockaday Receiver

The four circuit tuner, with the perfect regeneration control on all wave lengths, that gets those consistent results. Pattern contains 2 full size blueprints and complete booklet of instructions.

Pattern No. 7—A Neutrodyne Receiver

The five tube Neutrodyne—one of radio's greatest circuits. This pattern contains a complete diagram of the wiring diagram and one of the panel layout together with a four page instruction booklet.

Pattern No. 9—The S.T.100 Receiver

This circuit spread like wildfire abroad. Those in the United States who have tried it have obtained astonishing results. The pattern contains every essential to the complete construction of the outfit.

Pattern No. 10—The Ultradyne Receiver

The ultimate in Super-6 tube circuits. It engages the "Modulation System," a very valuable asset to the high-power set. Pattern contains a four page booklet and one extra large blueprint containing wiring diagram, coil windings, panel layout, etc.

Pattern No. 11—The Five Tube Cockaday

The modern, successful Cockaday with the push-pull system of amplification. Exceptionally fine for long distance reception. Contains the usual large size blueprints of wiring, panel layout, etc.

Pattern No. 12—A Portable Receiver

There are ten thousand uses for a good portable receiver. Conrad has developed a low cost highly efficient receiver for general use. Pattern is of standard size and is complete in every respect so that the user will have no difficulty in constructing this set.

Pattern No. 13—A Harkness Receiver

One of the latest and finest of the Conrad Patterns. The modern, popular Harkness. Each pattern contains full size blueprints of wiring diagram, panel layout and a special complete instruction booklet for use.

Pattern No. 14—The Super-Heterodyne Receiver

The greatest of Radio Patterns giving complete blueprints and a beautiful 16 page instruction book on just how to construct the genuine Super-Heterodyne.

PRICE \$1.00

All Patterns—50c. Each—Sold By All Radio and News Dealers

The Conrad Company, 233 Fulton St., New York City

Conrad

RADIO'S FOREMOST PUBLISHERS—Everything in Books, Patterns and Diagrams

Let These Guides

Solve Your Problems



Electricity at your finger ends

HAWKINS ELECTRICAL GUIDES IN TEN VOLUMES

3500 PAGES
4700 PICTURES

\$1 A VOLUME
\$1 A MONTH

SEND NO MONEY—SEND ONLY THIS COUPON

Know the facts in Electricity. They mean more money and better position for you. Hawkins Guides tell you all you need to know about Electricity. Every important electrical subject covered so you can understand it. Easy to study and apply. A complete, practical working course, in 10 volumes. Books are pocket size; flexible covers. Order a set today to look over.

LEARN ALL ABOUT

Magnetism—Induction—Experiments—Dynamos—Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distribution Systems—Wiring—Wiring Diagrams—Sign Flashers—Storage Batteries—Principles of Alternating Currents and Alternators—Alternating Current Motors—Transformers—Converters—Rectifiers—Alternating Current Systems—Circuit Breakers—Measuring Instruments—Switchboards—Wiring—Power Stations—Installing—Telephone—Telegraph—Wireless—Bells—Lighting—Railways. Also many Modern Practical Applications of Electricity and Ready Reference Index of the ten numbers.

SHIPPED FREE

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Send Coupon now—today—and get this great help library and see if it is not worth \$100 to you—you pay \$1.00 a month for ten months or return it.

THEO. AUDEL & CO.,
72 Fifth Ave., New York City

Please submit me for free examination, HAWKINS ELECTRICAL GUIDE (Price \$1 a number). Ship at once prepaid, the 10 numbers. If satisfactory, I agree to send you \$1 within seven days and to further mail you \$1 each month until paid.

Name

Occupation

Employed by

Home Address

Reference

Not a Toy

Not a Fad—A Proven Scientific Instrument



Health-Vigor-Success-

By means of **Marvelous-VIOLET RAYS**

Use it Yourself at Home

FREE BOOK

We offer FREE this wonderful book describing the marvelous, strange new force, Violet Rays. Explains in simple words and pictures how Violet Rays revitalizes every cell and works apparent miracles in helping to overcome pain and sickness.

Practicing physicians and plain home folks explain in this book how Violet Rays has made them well, strong and happy. 60 pages, illustrated with actual photographs, scientific charts and diagrams. It's FREE.

A Proven Aid To BEAUTY

Brings natural, magnetic beauty of health, no dieting, exercises or drugs. Home treatments save money.

Acts Instantly—No Delay, No Waiting

Violet Rays work at once, you feel results immediately. "Violet Rays is the finest thing I ever used to relieve congestion in any part of the body, and to relieve pain. Treat-

ments are so pleasant that all my patients like it," writes Dr. Duncan, Kewanee, Ill. You can use it at home and get equally good results yourself.

The New Way—No Medicines

Acts without drugs or medicine, it's scientific, goes after the cause, that's why it gets results. Note the list of ailments Violet Rays treats successfully, and many others. Success in Business and Social affairs depends on health, it is in your easy reach.

Check Your Allment Below for Free Advice

Here is a partial list of ailments successfully treated with Violet Rays:

Catarrh	Eye Disease	Nervousness	Sore Throat
Chilblains	Falling Hair	Neuralgia	Sprains
Colds	Hay Fever	Neuritis	Tonsilitis
Constipation	Headache	Paralysis	Whooping Cough
Deafness	Goitre	Piles	Asthma
Earache	Insomnia	Rheumatism	
Eczema	Lumbago	Skin Diseases	

Send FOR NEW FREE BOOK

REVEALS MARVELOUS SCIENTIFIC METHODS

Explains how Nikola Tesla discovered Violet Rays, how it works, why it heals. Tells what doctors and plain folks accomplish in conquering pain, disease and nervous troubles. Shows charts of human body, explains where pains start, how to banish them. Offered FREE for a limited time only, to introduce Violet Rays.

Liberal Pay To Representatives

Men and women, without experience, earn liberal profits in spare time showing Violet Rays to neighbors. Proves results first demonstration, sells on sight. Wholesale price and permanent territory to representatives.

VI-REX ELECTRIC CO., 326 WEST MADISON ST. DEPT. 402 CHICAGO

Please send me without any cost or obligation your free book describing your VI-REX Violet Ray Outfits, and details of your free trial offer.

Name

Address

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