

October

25 Cents

Science and Invention

IN PICTURES



How to Use a

**GAS MASK
FOR DIVING**

See Page 550



40
NON-TECHNICAL
**RADIO
ARTICLES**

Answer this question for yourself today if you want to make big money in electricity

In all parts of this country there are electrical men who, for a few cents a day, have received information that has made a big change in their pay envelopes.

Some of them are holding down big jobs at big money. Many have advanced themselves to positions they thought they never would be able to get. Many more have been promoted to jobs that pay better. All of them are making more money than they ever made before.

Hundreds of these men have been good enough to say that without the Croft LIBRARY OF PRACTICAL ELECTRICITY they never would have gone ahead so quickly. They give the Library credit for bringing them a knowledge of practical electrical work that would have taken them years to get for themselves.

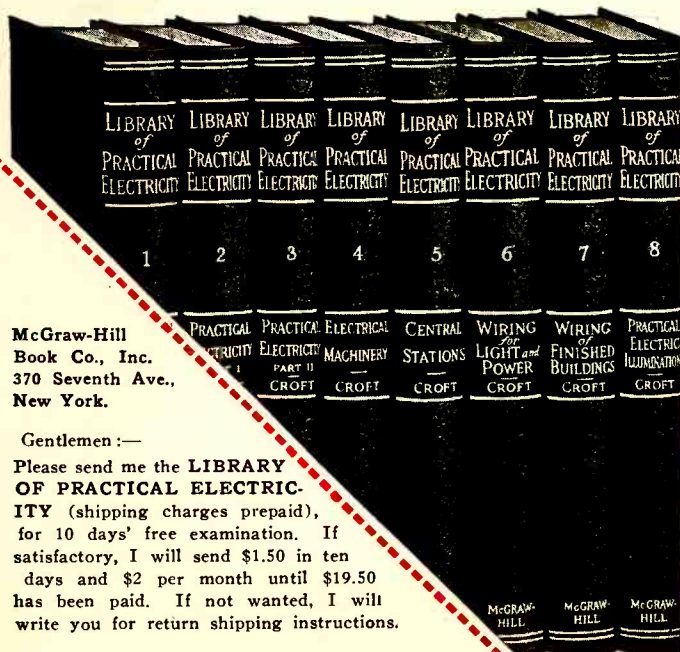
A quick and sure way to a bigger and better job

That's just what this Library does for the man who wants to advance himself. It goes into every side of electrical work and explains just what has to be done, and why, and how.

Instead of spending years in getting the necessary information through actual practice, these men make use of the experience of others—they get an expert knowledge of every angle of the electrical business from the Croft books—and in that way they are ready so much the sooner to handle the jobs that pay big money.

These eight books train you in electrical practice complete

There are two volumes on Practical Electricity which explain the fundamental facts and theories about modern electrical practice clearly and completely.



McGraw-Hill
Book Co., Inc.
370 Seventh Ave.,
New York.

Gentlemen:—

Please send me the LIBRARY OF PRACTICAL ELECTRICITY (shipping charges prepaid), for 10 days' free examination. If satisfactory, 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.

Name
Home Address
City and State.....
Firm or Employer.....
Occupation

Sci. & Inv. 10-1-24

There's a volume on Electrical Machinery in which you get the needed facts about the installation, operation, management, repair and selection of all electrical machinery used at the present time.

The book on Central Stations tells you all that you need to know about the generation, transmission and distribution of electrical energy. Every angle of the central station is taken up and made perfectly clear to you.

Wiring for Light and Power explains how to install electric wiring for all purposes so that it will be electrically safe and mechanically secure. Wiring of Finished Buildings takes up this special type of wiring so much in demand and shows you how to take advantage of this new opportunity for big money in electrical work.

Practical Electric Illumination describes every modern method of installing illuminating systems in stores, office or home. It explains interior and exterior illumination and shows you exactly what to do for every usual and unusual case.

And Practical Mathematics rounds it all out by making it easy for you to handle arithmetic, algebra, geometry and trigonometry in solving the problems that come up.

Free examination—no money down —small monthly payments

No man has to guess about the profit that he can get from this pay-raising set of electrical books. No man has to take our word for it.

Every man gets the library to examine first for ten days at our expense. He sees what the library is—reads up on some subjects that he wants to know more about—he judges for himself whether or not he ought to have the books. If he wants them, he sends us \$1.50 and arranges to pay the balance at the rate of \$2.00 a month. If he doesn't want them, he just sends them back—again, of course, at our expense.

Only a great set of books can be sold on this free examination plan. We could not afford to send out hundreds of these libraries unless they were really great, unless they were really helpful, unless they gave the ambitious electrical man just what he wants, just what he needs, just what he has to have.

Know electricity as experts know it —earn an expert's pay

The Croft LIBRARY OF PRACTICAL ELECTRICITY can help any man who wants to get ahead in electrical work. It gives not only the kind of help that makes things easier but also the kind of help that shows a man how to get and hold the jobs that pay big money.

Every man runs into responsibilities that make it necessary for him to have more money coming in each week. And for thousands of men the Croft LIBRARY OF PRACTICAL ELECTRICITY has been the sure way to promotion, to the big money that goes with promotion, and to the comfortable living that big money makes possible.

The right answer to this question is worth hundreds of dollars to you

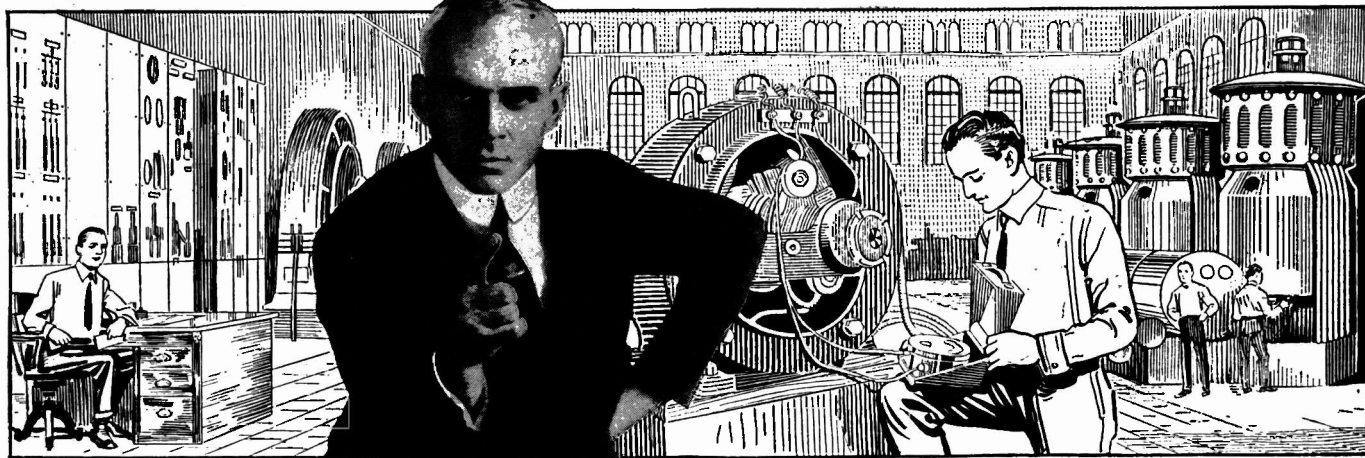
If the Croft LIBRARY OF PRACTICAL ELECTRICITY has helped thousands of men just like yourself—

If it costs you only a few cents a day to keep it—

If it costs you nothing at all to see it—

Isn't it something you certainly ought to look at?

Be up with the best of them. Answer that question with the coupon.



Electricity Needs You Now I Will Train You at Home

Stop right here. This is YOUR opportunity! Electricity is calling you, and the Electrical Business is in for a tremendous increase. But it needs more trained men—at big pay. By my Home Study Course in Practical Electricity I can train you for these positions.

EARN \$70 to \$200 A WEEK

You've always had a liking for Electricity and a hankering to do electrical jobs. Now is the time to develop that talent; there's big money in it. Even if you don't know anything at all about Electricity you can quickly grasp it by my up-to-date, practical method of teaching. You will find it intensely interesting and highly profitable. I've trained and started hundreds of men in the Electrical Business, men who have made big successes. YOU CAN ALSO.

Be a Big Paid Electrical Expert

What are you doing to prepare yourself for a real success? At the rate you are going where will you be in ten years from now? Have you the specialized training that will put you on the road to success? Have you ambition enough to prepare for success, and get it? You have the ambition and I will give you the training, so get busy. I am offering you success and all that goes with it. Will you take it? I'll make you an **ELECTRICAL EXPERT**. I will train you as you should be trained. I will give you the benefit of my advice, and 20 years of engineering experience and help you in every way to the biggest possible success.

EMPLOYERS

Use our free employment service when you want an ambitious, trained man for an important electrical job. Send for our book "Men"—the big story of selecting and training men.

**CHIEF ENGINEER
COOKE**

Chicago Engineering
Works

Dept. 27 2150 Lawrence Ave.
CHICAGO, ILL.

Dear Sir: You may send me entirely free and fully prepaid, a copy of your book, "How to Become an Electrical Expert," and particulars about your Home Study Course in Electricity.

Name

Address

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

Valuable Book Free

My Book, "How to Become an Electrical Expert," has started many a man on his way to fortune. I will send a copy free and prepaid to every person answering this advertisement!

Act Now! Good intentions never get you anywhere. It is action alone that counts. **NOW IS THE TIME TO ACT.**

L. L. COOKE, Chief Engineer

**CHICAGO
ENGINEERING
WORKS**

2150 LAWRENCE AVENUE
Dept. 27 CHICAGO, U. S. A.

FREE!

BIG ELECTRICAL OUTFIT

A fine outfit of Electrical Tools, Instruments, Materials, etc., absolutely FREE to every student. I will also send you FREE and fully Prepaid—Proof Lessons to show you how easily you can learn Electricity and enter this splendid profession by my new revised and original system of Training by Mail.

RADIO COURSE FREE

Special newly-written wireless course worth \$45.00 given away FREE.

Free Use of Laboratory

I have a large splendidly equipped Electrical Laboratory where you can come at any time for special instruction without charge. Several competent assistants—practical engineers—are in charge.

Earn Money While Learning

I give you something you can use now. Early in my Home Study Course I show you how to begin making money in Electricity, and help you get started. No need to wait until the whole course is completed. Hundreds of students have made several times the cost of their course in spare time while learning.

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

Science and Invention

FORMERLY
ELECTRICAL EXPERIMENTER

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 AND INVENTION, RADIO NEWS, PRACTICAL ELECTRICS and MOTOR CAMPER & TOURIST.

Table of Contents for October

POPULAR SCIENTIFIC ARTICLES

EDITORIAL.....	By H. Gernsback	547
THE PYRAMIDS TELL TIME.....	By L. B. Robbins	548
HUDSON RIVER TUNNELS MEET.....	By W. B. Arvin	549
WAR GAS MASKS AS DIVER'S HELMETS.....		550
	By Joseph H. Kraus	
THE SCIENCE OF ATHLETICS.....	By R. Leon Hall	551
UNIQUE CLOCKS.....	By Marshall Kelly	552
WHAT WOULD HAPPEN IF THE EARTH SLOWED DOWN.....	By Cleve Hallenbeck	553
THE LIVING DEATH.....	By J. Martin Leahy	554
DR. HACKENSAW'S SECRETS.....	By Clement Fezandie	556
SCIENTIFIC INNOVATIONS.....		558
OUR SUN IS A PYGMY.....	By Charles H. Howard	559
MAGIC FOR EVERYBODY.....	By Prof. Joseph Dunninger	560
MEDICAL SPECIALIST BROUGHT TO EVERY TOWN.....		561
INGENIOUS DRIVER'S TEST.....		561
	By William Middleton and J. G. Pratt	
CRACKING DAVY JONES' LOCKER.....	By H. W. Secor	562
GAMBLERS' TRICKS EXPOSED.....	By Mark Mellen	564
POISONS WE EAT EVERY DAY.....		565
THE HEAVENS IN OCTOBER.....		566
	By Isabel M. Lewis, M.A.	
CASEIN AND ITS USES.....	By Raymond B. Wailes	567
WATER TRANSPORTATION.....	By Jack Bront	568
SCIENTIFIC TUMBLER TRICKS.....	By Walter B. Gibson	570
CONCRETE BRIDGE HAS OSCILLATING PIERS.....		571
MAKING A KITCHEN CABINET.....		572
	By William Butterfield	
MACHINE PICTURES SOUND.....	By C. A. Oldroyd	573
STEREOSCOPIC PORTRAIT CAMERA.....		574
THE BODY AS AN AQUARIUM.....		575
SHADOWS THAT STAY.....		576
TENT FIRE-PLACE.....		577
WHERE IS THE MOON THE BIGGEST.....		578
ARE YOUR CLOTHES MADE OF GOOD MATERIAL?.....		579
	By Ismar Ginsberg, B.Sc., Chem. Eng.	
READERS' FORUM.....		508
DISAPPEARING SEARCHLIGHTS.....		581

PRIZE CONTESTS

AWARDS OF THE \$1000 MONTHLY PRIZES.....	602
HOW-TO-MAKE-IT DEPARTMENT—\$30.00 IN PRIZES.....	585
SCIENTIFIC HUMOR—PRIZES FOR BEST JOKES.....	597

AUTOMOBILES

VULCANIZER.....	585
INGENIOUS DRIVER'S TEST.....	561
HUDSON RIVER VEHICULAR TUNNEL.....	549

ELECTRICITY

ELECTRIC ANCHOR HOIST.....	569
NERVE ANALOGY.....	574
DISAPPEARING SEARCHLIGHTS.....	581
ELECTRIC SURFACER.....	577
LIE DETECTOR.....	568

RADIO ARTICLES

LOCATING ORE BY RADIO.....	587
RADIO NEWS HERE AND THERE.....	588
NEW YORK GETS NEW BROADCASTER.....	589
CRYSTODYNE.....	590
LADDER OF VIBRATIONS.....	591
COMPLETE DATA ON RADIO TUBES.....	591
THE SOLODYNE.....	592
THE JOLLIFE RECEIVER.....	593
UV-199 AUDIO FREQUENCY AMPLIFIER.....	593
RADIO ORACLE.....	594
COMPLETE LIST OF BROADCASTING STATIONS WITH POWER AND WAVE-LENGTH.....	625

CONSTRUCTOR ARTICLES

SWINGING BRIDGE.....	577
SIMPLE AND EFFICIENT MOTOR LAUNCH.....	582
PLASTER MASKS.....	583
COMPASS ATTACHMENT.....	583
ROCKING SHIP WINDOW DISPLAY.....	584
PHOTOGRAPHIC STUNTS.....	584
HOW-TO-MAKE-IT DEPARTMENT.....	585
WRINKLES, RECIPES AND FORMULAS.....	586

Edited by S. Gernsback

CHEMISTRY ARTICLES

POISONS WE EAT EVERY DAY.....	565
CASEIN AND ITS USES.....	567
ARE YOUR CLOTHES MADE OF GOOD MATERIAL?.....	579
SUN FLOWER USES.....	578

ASTRONOMY ARTICLES

THE PYRAMIDS TELL TIME.....	548	
OUR SUN IS A PYGMY!.....	559	
THE HEAVENS IN OCTOBER.....	566	
	By Isabel M. Lewis, M.A.	
WHEN IS THE MOON THE BIGGEST?.....	578	
	By C. A. Dahama	
MERCURY'S LANDSCAPE.....	581	

HOW TO SUBSCRIBE FOR "SCIENCE AND INVENTION." Send your name, address and remittance to Experimenter Publishing Co., 53 Park Place, New York. Mention the name of the magazine you are ordering. We also publish RADIO NEWS, PRACTICAL ELECTRICS and MOTOR CAMPER & TOURIST.
RATES AND TERMS. The subscription rate for SCIENCE AND INVENTION is \$2.50 per year (12 numbers). When remitting do so by check, money order or registered letter, if cash is enclosed. Avoid sending cash through the mail if

possible. Subscriptions for less than one year are not accepted. Subscriptions may be made in combination with RADIO NEWS, PRACTICAL ELECTRICS or MOTOR CAMPER & TOURIST with considerable saving. Send postal for special rates. Subscriptions start with the current issue, unless otherwise ordered.
POSTAGE. We prepay postage in all parts of the United States, Mexico and island possessions. For foreign or Canadian subscriptions we require 50 cents in addition to the subscription price for additional postage charges.

CHANGE OF ADDRESS. Notify us as far in advance as possible. It requires several weeks to make an address change on our records. Always write clearly, giving your old address as well as your new.
ON EXPIRATION of your subscription we enclose a renewal blank in our last number to you and notify you otherwise. Unless we receive your order for a renewal, with your remittance, we stop our delivery to you on expiration.
COMMUNICATION to us should always bear your full name, address and when possible the number which appears on your wrapper every month.

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. Checks and money orders should be drawn to order of EXPERIMENTER PUBLISHING CO., Inc. If you change your address notify us promptly, in order that copies are not miscarried or lost.

All communications and contributions to this journal should be addressed to Editor, SCIENCE AND 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. A special rate is paid for novel experiments; good photographs accompanying them are highly desirable. 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. Title Registered at the Patent Office. Copyright, 1924, 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.

New York City
General Advertising Dept.
53 Park Place

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

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.

RADIO Everybody

Complete Guide to the Art of Radio

RANDOLPH RADIO CORP.

Satisfaction Guaranteed

Send For This Sensational Radio Bargain Book-FREE

Big Radio Book

Send For it At Once

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 shipping charges prepaid.

OUR CATALOG IS FILLED WITH Bargains Like These

- CONDENSERS**
 23-plate plain Cond'n'r. \$1.29
 23-plate Vernier Cond'r. 2.59
- RHEOSTATS and POTENTIOMETERS**
 Bakelite Rheo's't, 6-ohm. .38
 Bakelite " 30-ohm. .59
 Bakelite Vernier Rheo's't. 1.15
 Bakelite Potentiometer, 200 ohm. .59
- TRANSFORMERS**
 Randolph Special, 6 to 1. 2.16; 3 1/2 to 1. 1.89
 Sinclair Special, 6 to 1. 2.55; 3 1/2 to 1. 2.24
- TUBE SOCKETS & DIALS**
 4" Hygrade Dial. .28
 Bakelite Socket. .28
 Weston Plug. .75
- VARIOMETERS**
 Moulded Variometer. 2.39
 Bakelite moulded. 3.45
- HEADPHONES**
 Randolph Special, 2200 ohms. 2.65
 Blue Bird Special. 3.95
- LOUD SPEAKERS**
 American Bell. 3.95
 With adjustable loud speaker unit. 6.95
- COUPLERS and COILS**
 180° Variocouplers. .95
 Reinartz Coils. 1.25
 Electric Soldering Iron. 1.29
 Cockaday Coil. 1.95
 Three-Circuit Tuner. 2.95
 Ambassador Coils. 2.95



COMPLETE PARTS FOR 3 AND 5-TUBE NEUTRODYNE RECEIVING SET
 Genuine Hazeltine Licensed Fada, Freed-Eiseman, or other Genuine Licensed Parts

1 7x28x3/4 Drilled Panel.	3 4" Bakelite Dials.	3 Filament Control Jacks.	1 Vernier Rheostat—30-ohm.	1 Plain Rheostat—6-ohm.	1 strip Bakelite, 6x1x3/4.
2 All American or Columbia Audio Transformers.	8 Binding Posts.	1 Grid Leak and Condenser.	2 Bakelite Sockets.	1 .001 Condenser.	1 Dubilier By-Pass Condenser.
3 4" Bakelite Dials.	3 Binding Posts.	1 Grid Leak and Condenser.	2 Bakelite Sockets.	2 Neutrodons.	3 Bezels.
3 Filament Control Jacks.	1 Wave Control Neutroformer.	2 R. P. Neutroformers.	1 Baseboard.	2 Neutrodons.	3 Bezels.
1 Vernier Rheostat—30-ohm.	1 Baseboard.	2 Neutrodons.	5-TUBE SET		
1 Plain Rheostat—6-ohm.	1 .001 Condenser.	1 Dubilier By-Pass Condenser.	3 Bezels.		
1 strip Bakelite, 6x1x3/4.	1 Dubilier By-Pass Condenser.	3 Bezels.			

Complete blue-prints and working diagrams and instructions.

PRICE—3-Tube Set, \$26.45

Complete Parts for Two-Stage Amplifier
 May Be Used In Connection With Any Receiving Set

1 7x9 or any standard Bakelite Panel.

1 Thordarson or Columbia High-ratio Transformer.

1 Thordarson or Columbia Low-ratio Transformer.

2 Bakelite Rheostats.

2 Bakelite Sockets.

2 2-circuit Jacks.

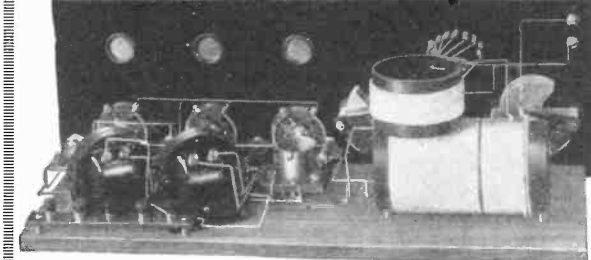
1 1-circuit Jack.

1 Baseboard.

9 Binding Posts.

\$10.90

Diagram and Instructions for wiring.



COMPLETE PARTS FOR 3-TUBE COCKADAY RECEIVING SET

1 Cockaday Coil.	2 Double Circuit Jacks.
2 23-plate Hy-Grade Cond.	2 3" Bakelite Dials.
1 Bakelite Rheostat, 30-ohm.	1 Grid Leak and Mica Cond.
1 Bakelite Rheostat, 6-ohm.	7 Switch Points, 2 stops.
3 Bakelite Sockets.	1 Bakelite Binding Post Strip.
1 high ratio Columbia or All-American Transformer.	8 Binding Posts.
1 Single Circuit Jack.	1 7x21x3/4 Drilled Bakelite Panel.
1 low ratio Columbia or All-American Transformer.	3 Bezels.
1 Baseboard.	
9 Binding Posts.	

Complete blue-prints and wiring diagrams.

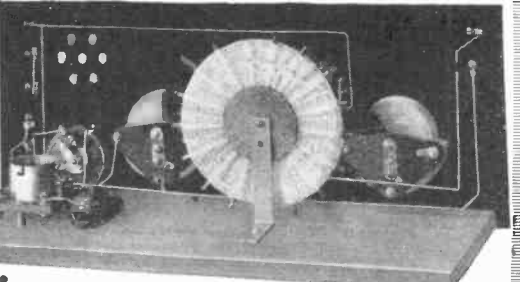
1-Tube Set. \$19.45

SUPER Heterodyne

Containing 3 Intermediate Frequency Transformers, Filter Transformer, Oscillator Coil and 2—1 M. F. Condensers.

\$19.75

with Audio frequency Trans. \$26.55



PARTS FOR REINARTZ RECEIVING SET

1 7x18 Bakelite Panel.	1 Genuine Reinartz Coil.
1 Vernier Bakelite Rheo.	2 doz. Switch Points and Stops.
1 Bakelite Socket.	3 Switch Levers.
1 23-plate Lo-loss Var. Cond.	25 feet Busbar Wire.
1 11-plate Lo-loss Var. Cond.	1 Freshman Grid Leak and Condenser.
2 Bakelite Dials.	1 Baseboard.
9 Binding Posts.	9 Binding Posts.

Blue-print and Complete Instructions.

3-Tube Set. \$17.55

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 ACME 4-TUBE REFLEX

3 Acme A-2 Transformers

1 Acme R-2 Transformer

1 Acme R-3 Transformer

1 Acme R-4 Transformer

4 Bakelite Tube Sockets

1 Duplex or Bremer-Tully Lo-loss 23-plate Condenser.

1 Frost Potentiometer-Rheostat.

1 .00025 Fixed Condenser with grid leak mounting.

1 .0025 Fixed Condenser.

2 .002 Fixed Condensers.

1 .005 Fixed Condenser.

1 RW Crystal Detector.

8 Binding Posts.

1 3" Bakelite Dial.

1 2-circuit Phone Jack.

1 length Spaghetti.

25' No. 14 Hook-up Wire.

1 50,000-ohm Grid Leak.

1 "C" Battery.

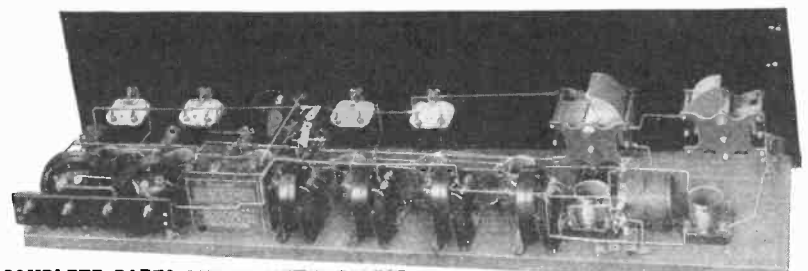
1 7x21x3/4 Bakelite Panel—drilled.

1 Baseboard.

Complete set blue-prints and instructions for wiring.

4-Tube Set \$39.85

1-Tube Set. \$17.45



COMPLETE PARTS SUPER-HETERODYNE FOR 8-TUBE

1 23-plate Lo-loss Vernier Bremer Tully or Duplex Condenser.	1 8x36x3/4 Dr'd. Bak. Pan.
1 23-plate Lo-loss Vernier Bremer-Tully or Duplex Condenser.	8 Bakelite Sockets.
1 400-ohm Frost Potentiometer.	7 Binding Posts.
2 6-ohm Rheostats.	1 Filter Transformer
2 30-ohm Bakelite Rheostats.	1 Oscillator Coupler.
1 .00025 Fixed Condenser.	1 "C" Battery.
4 .002 Condensers.	1 Battery Switch.
1 .006 Condenser.	
1 Bakelite Terminal Strip for Binding Posts.	
1 Multicolored Cable for connecting batteries.	

3 All-American or Columbia Long-wave Transformers.

2 All-American or Columbia Audio Transformers.

Instructions, blue-prints and complete layout.

\$59.75

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.

RANDOLPH RADIO CORPORATION
 159 N. Union Ave. Dept. 26 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,
Experimenter Publishing Co., Inc., 53 Park Place, New York, N. Y.

10-24

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.

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

NOTE—This Form Should Not Be Used For Technical Questions.

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

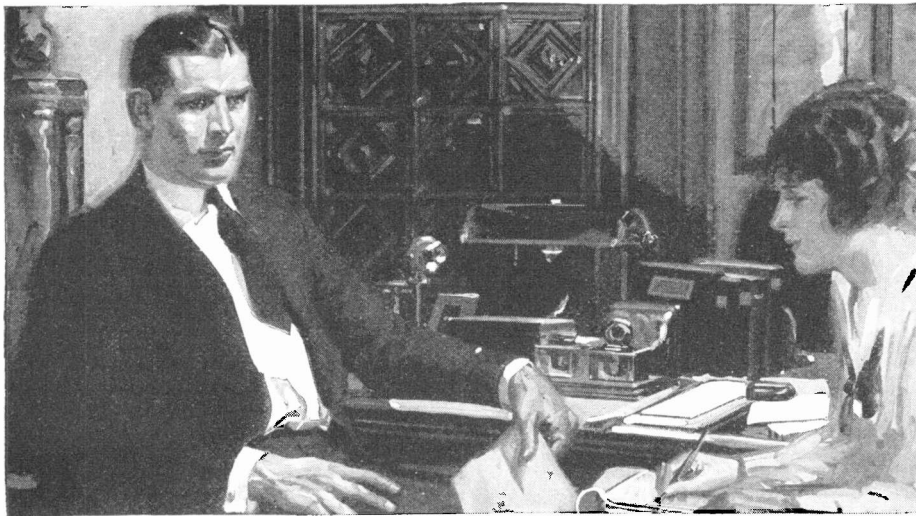
.....
.....
.....

Your own name here.....

If you are a dealer check here.

Address.....

City..... State



Making Successful Men by Home-Study Training

How can I make more money? How can I advance more rapidly in business? Literally millions of untrained men—yourself, perhaps, among them—are continually disturbed by those two questions.

“Be industrious; keep everlastingly at it”—that’s the way the writers of *copy-book maxims* would tell you to go about it. But honestly—are you fooled by that sort of talk? Why, you yourself know dozens of fellows who work just as hard as beavers, yet draw barely enough to keep them alive!

Argue it any way you like, it takes something beside mere *work* to push men ahead—it takes *specialized work*.

And to suggest, for a second, that an untrained man—no matter how hard he works—is going to be promoted to a highly specialized position—such as that of Auditor, or Traffic Manager, or Sales Executive, or Expert Correspondent, or Production Manager, or Legal Counsellor—without first *equipping* himself for that position, is as absurd as to intimate that the boatman in the park who has been on the job for twenty years is likely to be chosen captain of a trans-Atlantic liner!

* * *

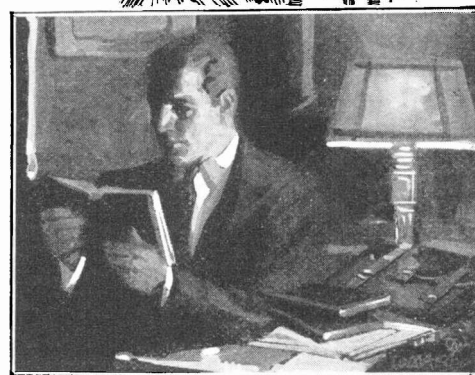
Recognizing these facts—and surely no one can dispute them—what is the wise thing to do to change one’s situation for the better?

Many a happy-go-lucky chap will tell you that all you need do is to keep your eyes open and promotion will take care of itself.

It will. *But, oh, how slowly!*

While one man is advancing by this tedious route from \$25-a-week to \$30-a-week to \$35-a-week, another chap, not a bit smarter than he, is climbing from \$15-a-week to \$30-a-week to \$50-a-week to \$100-a-week.

If you doubt it, look about you! Talk with the men still in their twenties and early thirties who are swinging \$5,000 jobs!



No—there’s more to advancement than merely “catching onto things.” TIME is the all-important factor—and that is the big reason why thousands of earnest men have refused to wait, but have turned instead to LaSalle Extension University and have shortened by many years their journey to success.

That they—in so doing—have acted to their own advantage is borne out by the fact that during only three months’ time as many as 1193 members reported definite advancement which they were frank to attribute to home-study training under the LaSalle Problem Method. The total salary-increases so reported amounted to \$1,248,526, an average increase per man of eighty-nine per cent.

* * *

Your future is, of course, your own problem—and no one can solve it but yourself. If you are content to drift, you will find plenty of company though little profit.

If, on the other hand, you are really in earnest when you say that you want to get ahead in business, you will find both companionship and gain in home-study training under the LaSalle Problem Method.

Below this text there’s a coupon—very similar to the one which has set many, many thousands on the path to success.

A good way to gauge your strength of purpose is—by what you do with that coupon—NOW.

LA SALLE EXTENSION UNIVERSITY

The Largest Business Training Institution in the World

LASALLE EXTENSION UNIVERSITY

Dept. 10384-R

Chicago, Illinois

Please send me catalog and full information regarding the course and service I have marked with an X below. Also a copy of your book, “Ten Years Promotion in One,” all without obligation to me.

- | | | | |
|--|---|---|---|
| <input type="checkbox"/> Business Management: Training for Official, Managerial, Sales and Departmental Executive positions. | <input type="checkbox"/> Traffic Management—Foreign and Domestic: Training for position as Railroad or Industrial Traffic Manager, Rate Expert, Freight Solicitor, etc. | <input type="checkbox"/> Industrial Management Efficiency: Training for positions in Works Management, Production Control, Industrial Engineering, etc. | <input type="checkbox"/> Business English: Training for Business Correspondents and Copy Writers. |
| <input type="checkbox"/> Modern Salesmanship: Training for position as Sales Executive, Salesman, Sales Coach or Trainer, Sales Promotion Manager, Manufacturer’s Agent, Solicitor, and all positions in retail, wholesale, or specialty selling. | <input type="checkbox"/> Railway Station Management: Training for position of Station Accountant, Cashier and Agent, Division Agent, etc. | <input type="checkbox"/> Personnel and Employment Management: Training in the position of Personnel Manager, Industrial Relations Manager, Employment Manager, and positions relating to Employee Service. | <input type="checkbox"/> Commercial Spanish: Training for position as Foreign Correspondent with Spanish-speaking countries. |
| <input type="checkbox"/> Higher Accountancy: Training for position as Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc. | <input type="checkbox"/> Banking and Finance: Training for executive positions in Banks and Financial Institutions. | <input type="checkbox"/> Modern Business Correspondence and Practice: Training for position as Sales or Collection Correspondent, Sales Promotion Manager, Mail Sales Manager, Secretary, etc. | <input type="checkbox"/> Effective Speaking: Training in the art of forceful, effective speech, for Ministers, Salesmen, Fraternal Leaders, Politicians, Clubmen, etc. |
| <input type="checkbox"/> Law: Training for Bar; LL. B. Degree. | <input type="checkbox"/> Modern Foremanship and Production Methods: Training for positions in Shop Management, such as that of Superintendent, General Foreman, Foreman, Sub-Foreman, etc. | <input type="checkbox"/> Expert Bookkeeping: Training for position as Head Bookkeeper. | <input type="checkbox"/> C. P. A. Coaching for Advanced Accountants. |

Name..... Present Position..... Address.....



"BUILD YOUR OWN" WITH "RASCO" PARTS!

Buy from the Oldest and Original Exclusive Radio Parts House in the United States

We pay ALL transportation charges in U. S. ALL GOODS SENT PREPAID IN 24 HOURS

Order direct from this page.

NEW AND EXCLUSIVE "RASCO" GOODS

Money refunded if goods do not satisfy

CRYSTODYNE

LICENSED TRADEMARK



\$1.75

6900

ZINCITE DETECTOR (PATENTS PENDING)

Here is a detector which has been especially developed by us for the new Crystodyne circuits. This detector while using the natural mineral zincite can be used with any other crystal as well. Several unique features are embodied in this detector. To begin with it is the only detector that has a sliding crystal cup with perfect contact arrangement and which cup not only slides but rotates with an eccentric motion. (Note slot A). By means of the small knob the cup slides easily so that any point of the crystal can be brought into contact. A new crystal can be inserted immediately by unscrewing the small knob. The contact plate which at the same time forms the cathode is made of spring steel. The combination of steel-zincite is the only one that was found practical for the Crystodyne oscillating crystal. Note the micrometric adjustment that can be made by means of the large knob bearing against the steel spring. This raises and lowers the steel point to the finest possible degree. The base is of bakelite, all parts nickel plated and polished.

"RASCO" Double Acting Snap Switch

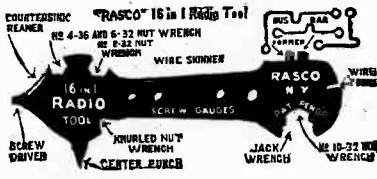
At last a REAL radio switch constructed for radio purposes, not just a battery switch that may be adapted for radio. THE RASCO switch is the only switch with a POSITIVE DOUBLE spring action. No more guess work if the circuit is open or closed. A push of the finger and the current is on. A slight pull and The Handle Snaps Back of its own accord. An internal coil spring pushes the handle back when a little pull is applied. This switch is intended as a battery switch to disconnect your "A" batteries. Only one hole to drill. No tools required to mount except your finger and thumb. Also this switch takes up a minimum of room, much less than other switches, the base of the switch measuring only 1 1/4 x 1/2". All metal parts nickel plated. A switch you will be proud to possess. No. 04850-RASCO Snap Switch, Each.....25c



4850

25c

16 in 1 Radio Tool 35c



Here it is! The radio tool that will bring happiness to all radio experimenters and constructors. Here is a tool that does 16 different things and does them well. A tool that does practically everything required in building your radio set. The tool is built of hardened steel, exactly as per illustration, highly finished. Here are some of the uses: 1. Screwdriver. 2. Center punch. 3. Countersink. 4. Bus bar wire bender. 5. Bus bar and wire bender for 8/32 screw. 6. Bus bar and wire bender for 6/32

screw. 7. Socket wrench for jacks. 8. Socket wrench for 4/86 nuts. 9. Socket wrench for 6/32 nuts. 10. Socket wrench for 8/32 nuts. 11. Wrench for knurled nuts. 12. Screw gauge for 4/36 screw. 13. Screw gauge for 6/32 screw. 14. Screw gauge for 8/32 screw. 15. Screw gauge for 10/32 screw. 16. Knife for wire skinning.

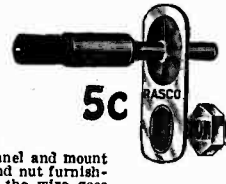
These are only the important uses of the tool, but many other uses will readily suggest themselves to every radio experimenter. You will wonder how you have gotten along before without the 16 in 1 radio tool. Get one of these happiness tools. You will never again be without it. Size 4 1/2 x 1 1/2 in.

No. 0-4800 RASCO 16 in 1 Radio Tool, each.....\$0.35

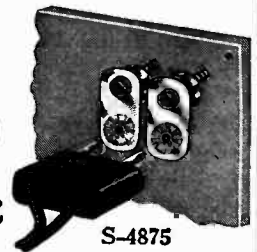
"RASCO" "Jiffy" Jacks and "Jiffy" Plugs

Again, Rasco leads with a small but important radio novelty. JIFFY JACKS are the simplest, and most efficient Cord Tip Jacks ever designed. Stamped from a single piece of metal they grip any style cord tip from any make phone or loud speaker. THE JIFFY JACKS take but a minimum of room. All you need do is to drill two small holes in your panel and mount the JIFFY JACK with screw and nut furnished. No soldering necessary as the wire goes right on the screw. X-ray view shows how two of the jacks are used in conjunction with our Jiffy cord plug. The jacks go on in back of panel, only screws show in front. JIFFY JACKS take practically no room when mounted and are made of best spring brass that will not heat out. Hundreds of other uses for our JIFFY JACKS. We will pay \$1.00 for every new use for JIFFY JACKS that is accepted by us.

JIFFY PLUGS are made of semi-hard rubber into which the tips of your phones or loud speaker are pushed. The cheapest and simplest plug ever designed. Its small size and neatness made it famous over-night. Size 1 in. long, 1/2 in. wide and 3/8 in. thick. No



5c



20c

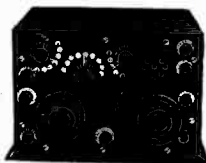
S-4875

tools required. Just wet the metal cord tips and push through openings. Plug can be used with any standard cord tip jack, but best with RASCO JIFFY JACK.

O-4875-Two Jiffy Jacks with nuts and screws and one Jiffy Cord Plug.....\$0.20
O-4870-One Jiffy Jack complete with nut and screw.....0.05
O-4871-Jiffy Jacks without nuts or screws, 10 for.....0.05
O-4860-Rasco Jiffy Plugs, each.....0.10

COMPLETE SET SALE AT REDUCED PRICES

Reinartz Receiver



Exactly as shown with mahogany cabinet, panel, all necessary instruments, binding posts and pattern for assembling. This set can be put together by anyone in a few hours.

09988 Reinartz Receiver.....\$13.50

Autoplex Circuit



Will bring broadcast on loud speaker on single tube. Complete as pictured here. All parts, including mahogany cabinet, panel, instruments, binding posts, etc. Can be put together in a few hours time.

09955 Autoplex outfit.....\$15.00

Wanted

This Company is always in the market for new ideas. Any small specialties in demand by the radio fan will be highly welcomed by us. Some of the articles shown on this page originated with our customers, whom we paid well for the ideas. Send your sketch or model addressed to Research Department, c/o this Company.

SPECIAL



Genuine RICO 2000 ohm double head set. Standard phone with 6-foot cord. Tripole type. Regular price, \$4.00. Our special price O-6060,

\$2.50



FREE

The big "Rasco" catalogue. Contains all arms strong circuits. Every up-to-date vacuum tube hook-up. Greatest little book printed. Free upon receipt of postal.

Moulded Variometer

Highly substantial instrument. Silk windings. 1/4" shaft. Flange B when placed into AB direction makes instrument panel mounting. 130 to 650 meters. Money back if this instrument is not all that we claim for it.

05350 Variometer \$3.00

FONEKUSHIONS

Made of sponge rubber. Make wearing your receivers a pleasure. Positive-ly exclude all noises and make reception a pleasure. Sponge rubber will last for years. Light as a feather.

03550 Fonekushions, set of two.....\$3.50

Straight Line Condenser

Simplest and most practical type of condenser.

04430 "Rico" Condenser .001 mfd. 48 plate capacity.....\$1.75
04230 .0005 mfd. 25 plate capacity.....\$1.75
04110 .00025 mfd. 11 plate capacity.....\$1.75
All types no dials \$1.50

Radio Frequency Transformers

Best Radio Frequency Transformer developed so far. Designed by R. E. Jacault, Associate Editor RADIO NEWS. Air core type. 200-600 meters.

02251 Medium Navy used. Save 50 per cent by size. 2 1/2 volt.....\$1.20
02800 Transformer, size 1 1/2"x2 1/2".....\$1.50

NEW!! Push Pull Transformer

for many new circuits. See any radio magazine. Made of best materials. Coils impregnated. Silicon steel laminations. Save 50 per cent by assembling yourself. Simple instructions furnished.

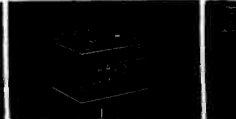
01159 Transformer, Ratio 6 1/2 to 1.....\$4.00

Dilectryte Panels

Highest dielectric strength as per Bureau of Standards.

07100 7x10x3-16".....\$.70
07120 7x12x3-16"......85
07140 7x14x3-16"......95
07180 7x18x3-16".....1.25
07210 7x21x3-16".....1.45
07240 7x24x3-16".....1.65

NEW THINGS FROM CATALOG No. 11 AT CUT PRICES



Dial Marker

The big little thing you have been waiting for. Just drill a hole in the panel and mount the marker above the dial. Nickel plated and polished.

07788 Dial Marker, each.....\$.05

Vacuum Tubes

Only best make tubes carried in stock. Any tube replaced if defective, providing filament lights.

0201A 5 v., .25 amp. \$2.50
0199 3 v., .06 amp. 2.50
012 1 1/2 v., .25 amp. 2.50

"Rico" (Adjustable) Loud-Speaker Phone

Has rubber gasket underneath diaphragm, making phone fully adjustable. Gives amazing results as loud-talker on 1 and 2 stages of amplification.

02525 Speaker with 5 ft. cord.....\$2.65

Cockaday Coil

Guaranteed best make. Three windings of No. 18 magnet wire. Has brass brackets for panel or base mounting. Guaranteed or money back.

02750 Cockaday coil \$1.50

Tapped "B" Batteries

We positively guarantee these batteries to be of long life. We carry only fresh stocks. All with taps.

02250 5m. 2 1/2 V., \$.85
02251 Medium Navy used. Save 50 per cent by size. 2 1/2 volt.....\$1.20
04500 Large size. 4 1/2 volt.....2.30

Audio Frequency Transformer

No better Transformer made. Highest class materials. Impregnated coils. Silicon steel stampings used. Save 50 per cent by assembling it yourself.

01100 Ratio 4 1/2-1 \$2.00
01150 Ratio 6 1/2-1 \$2.00

Sponge-Rubber Cushions

Get rid of tube noises due to vibration. Softest sponge rubber made. Size 2 1/4"x3", 3/8" thick.

08989 Sponge-rubber cushions, each.....\$.12

RADIO SPECIALTY CO., 100 Park Place, New York City

Factories: Brooklyn, N. Y. Elkridge, Md.



FREE! The Book That is Bringing Thousands Big Money in **ELECTRICITY!**

There is no field in the world that offers such great money making possibilities to trained men, as electricity. Thousands are qualifying the new way by actual S & H Shop Type training. A few weeks during spare time in your own home, then you are equipped to step right into jobs paying from \$50 to \$150 per week. Get this wonderful book which tells you just how you can do this. Sent free.

Train at Home for \$3,000 to \$10,000 Jobs

Don't stand back on account of education, experience, age, or location. No matter where you live, or what you are doing through my course you have the chance to become in a very short time a big pay "electrical expert."

Actual Shop Methods in Your Own Home

For I have devised a wonderful new system that gives you the benefit of actual shop experience in your own home. Never before has this been possible. But now, after finishing my training you will be at home in the biggest electrical plant, in a sub-station,

in a battery station, or with expert maintenance men, or on automobile and tractor starting, lighting and ignition work because you will have had actual experience, which means everything.

Backed by Lincoln Institute of Technology

This new system of teaching electricity has proved so successful that it has been highly recommended and endorsed by the great Lincoln Institute of Technology. When you enroll you know that you are backed by a great institution. You receive free, employment service and expert advisory service as long as you live.

Free Outfit

There is such a call for men now that we are giving free an electrical outfit for experimental and practical home use if you enroll now. Think what it will mean to leave forever the low pay rut to become a trained, efficient electrical technician, capable of managing and supervising ten or five hundred men on the biggest jobs; to travel, to be a man of influence—to have a salary of \$5,000 to \$10,000 per year. Find out

now how you can do this. You cannot afford to delay a day. Send right now for this wonderful free book that is pointing the way for thousands to big money in electricity. The coupon brings you this book entirely free, without obligation. Fill it out.

S & H ENGINEERING COMPANY

Affiliated with the Lincoln Institute of Technology
Dept. M2, 1422 W. Monroe St., Chicago, Ill.

FREE BOOK — — FREE OUTFIT COUPON

S & H Engineering Co.,
Division of Lincoln Institute of Technology,
Dept. M2, 1422 W. Monroe St.,
Chicago, Ill.

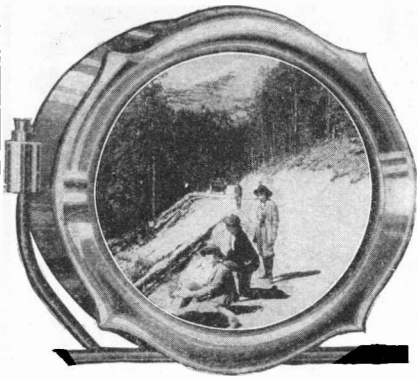
Please send me at once your big book "How to Get the Better Jobs in Electricity," and full particulars of your course in practical electricity, your free outfit and your free employment service offer. I am not obligated in any way.

Name

Address

City State.....

Give age if under 16



**Are You Within
the Headlight's
Beam?**

Motor Camper & Tourist

THE big, practical idea behind **MOTOR CAMPER & TOURIST** is to help everybody get the most from their motor trips, helping everybody to motor pleasantly, conveniently and comfortably and helping everybody to select the most favorable itinerary for their trip.

Each Month are published new, interesting routes, new motoring hints, new scenic points of interest and new ideas for motor campers new and old so that all can keep abreast of the progress of Motor Travelling.

MOTOR CAMPER & TOURIST is the beam of the headlight, illuminating the roadway of Motor travel everywhere. Get in the beam's light by sending in your subscription on the coupon below provided for that purpose inclosing \$2.50.

MOTOR CAMPER & TOURIST is edited by H. Gernsback, editor of *Radio News*, *Science and Invention* and *Practical Electrics*. The managing editor, Mr. John D. Long has camped up and down the highways and byways of the United States and is the Author of the book "Motor Camping," the authority on Motor Touring.

25c the copy
on all newsstands

SUBSCRIPTIONS
\$2.50 the Year

Germott Publishing Co.
INCORPORATED
53 Park Place, New York City

**RADIO
NEWS**



OCTOBER ISSUE Now On Sale

THE October issue of *Radio News* will be one of the greatest in its history. 192 pages of Radio. Every line, every page full to the brim with the latest and most active Radio information of the day.

The feature article on the intimate life and work of Dr. Lee DeForest, a radio man whose marvelous Radio work is like a story from the pages of fiction, will be of inestimable value to every reader.

And then there are articles on the very latest advances in Radio receiving and radio broadcasting as it is developed in every corner of the world.

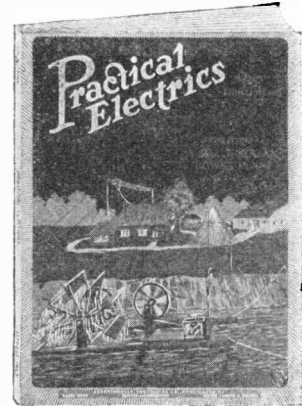
You can't be disappointed in *Radio News* it covers everything for the amateur and professional Radio Man.

25c the copy
on all newsstands

SUBSCRIPTIONS
\$2.50 the Year

Experimenter Pub. Co.
INCORPORATED
53 Park Place, New York City

Step Inside the Electrical Laboratories



THE Electrical Engineers who spend days and months in the great research laboratories of America discover many marvelous uses for that modern Wizard, "ELECTRICITY."

PRACTICAL ELECTRICS is the only magazine, written for the layman, that brings these wonderful developments of the laboratories direct to you. **PRACTICAL ELECTRICS** takes you into the laboratories with these men as they develop step by step the new and interesting things in Electricity. Everything in **PRACTICAL ELECTRICS** is written so that you can understand it easily. It is profusely illustrated with pictures and drawings.

You can obtain **PRACTICAL ELECTRICS** on all newsstands for 25c the copy. Or fill out the coupon below and mail it to us with \$2.50 and we will have it delivered to your door for twelve months.

Practical Electrics

is Sold on
**ALL
NEWSSTANDS**

25c the
copy

Published by
Germott Publishing Co.
INCORPORATED
53 Park Place, New York City

Great Inventors Now Teach You Secrets of Practical Inventions

How would you like to be the inventor of the tin cap that now corks millions of bottles—and who gets a royalty on every one? How much money would you have now if you had invented the simple idea of putting a rubber tip on pencils? The inventor of the Gillette Safety Razor is said to have made as high as \$2,500,000 a year! The inventor of the tiny snap fastener last year paid an income tax of \$29,000. The man who invented the Autographic Kodak sold his patent rights for \$500,000!

JUST a single idea can make you independently wealthy in a short time. Little things—like the crimped hairpin, the paper safety-match, the metal-tip shoelace—brought their inventors hundreds of thousands of dollars. Only recently *Success Magazine* told how one woman built up a splendid business from an invention based on a little wedge-shaped piece of wood!

Couldn't you develop an invention as simple as these? Haven't you some ideas—even now—for one of these little inventions which can pay you so much money?

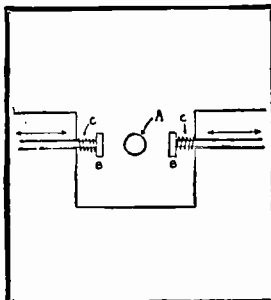
What Invention Is

After all, invention is nothing more than the science of "fixing things." And how many times a day you do "fix things." A leaky faucet, a rattling window, a broken strap—you fix hundreds of things just like these almost every day. You may not know it, but when you "fix things" you are using the principles upon which Inventive Science is based.

Prove it for yourself. Here is shown a very simple problem in invention. See how quickly you can solve it. What would you put on Shaft "A" to force members "B B" to move back? Think of something you know now which can give you the answer. If you have an ordinary electric light switch you will find it in a second.

Invention is not guesswork or blind luck—it is not a God-given faculty possessed by a few favored mortals. The truth is that invention is based upon exact laws which anyone can learn. It is merely a matter of first seeing something to be fixed and then of thinking of some principle which will fix it.

This test shows how easily you can develop your ability to invent.



Here is an interesting little problem and its solution will be found very simple, if we really think hard.

"A" is the end of a shaft. The two members "B B" are free to move in either direction indicated by the arrows. If they are pushed back, the springs "C C" will immediately pull them toward again. Our problem is to put some kind of an attachment on the revolving shaft "A" so that the members "B B" will be pushed back both at the same instant every time the shaft "A" makes a single revolution. The device on shaft "A" must also allow the two members "B B" to come forward once in every revolution. What would you suggest putting on the shaft "A"?

That's all. The whole thing rests on being able to think inventively. The simple problem shown here proves that when you think inventively the whole science of invention becomes as easy to learn as reading or writing.

Why More Inventions Are Needed Now

Hundreds of years ago, the world didn't need many new things. That is why few inventions were made each year. But now the world has more needs, more things to be "fixed." And that is why, in the United States alone, over 50,000 inventions are patented every year!

The world wants better and cheaper light and power. It wants an electric light that will be heatless. It wants new motors that will weigh less and produce more power. It wants faster and less costly aeroplanes, motor cars, steam engines. It wants new inventions which will make cooking and housework easier; that will save time and labor in the home, the farm, the factory and the office. It wants new ideas for toys and other amusements. It wants its present inventions to be developed so that they will work better and more economically.

Surely you have at least one idea for an invention—no matter what it is—no matter how great or how small—the world will pay handsomely for even the simplest idea. Every day you see things which can be improved or which must be "fixed." Every day you can get ideas for new inventions. It can be a new kind of mechanical toy, or some device which will make your wife's housework easier. It can even be something as simple as the common nutcracker. The man who invented the Kiddie-Kar, it is reported, made over \$5,000,000!

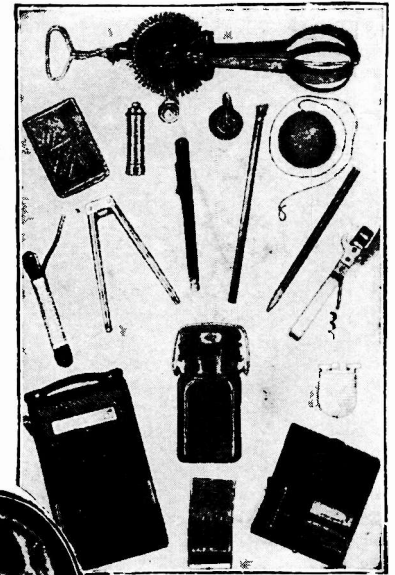
What Edison Says

Could you ask the advice of any greater authority than Thomas A. Edison? He says: "INVENTION IS A SCIENCE AND SHOULD BE TAUGHT AS A PROFESSION."

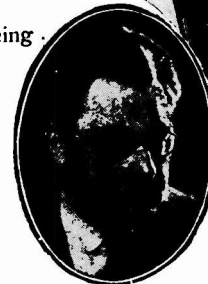
And now, for the first time, you can profit by Edison's advice. You can actually learn invention as a profession—exactly as other people are learning electricity, automobile mechanics, law, medicine, as a profession. The Bureau of Inventive Science offers you the first course in practical invention ever devised, it has written down the easy-to-learn principles of Inventive Science so everybody could read them and learn to use them. You want the ability to invent—NOW. All you need, to become successful is this easy, fascinating training which will develop your ability so it will be worth real money.

Learn Invention by Actual Practice at Home

Hitherto inventors had to work out the principles of invention alone. But at what a terrific price in long years of discouragement, lost time, wasted money! Now you can quickly learn, in your spare time at home, the secrets of invention which brought wealth and fame to Edison, Marconi and other great inventors.



Little inventions like these have brought fortunes to their inventors



Raymond F. Yates, who with fourteen other famous inventors now makes it easy for you to learn how to invent in your spare time at home.

Today fifteen famous inventors tell you WHAT TO INVENT and HOW TO INVENT. They tell you the secrets of invention which every successful inventor knows. They explain how to originate ideas, how to develop and perfect them, how to get patents. But they tell you even more: Thousands of inexperienced inventors have been defrauded of their rewards because they did not know how to protect their patent rights. This great course tells you everything you want to know—how to sell your invention, how to get royalties—how to get the most money for your ideas.

New FREE Book

The most fascinating part of this great new course is that it teaches invention by actual practice, right in your own home. With each lesson you are sent some problem in invention—just like the one you worked out here. This fascinating exercise in solving actual problems in invention, sharpens your instinct to fix things. Better than anything else, it gives you an unforgettable, instinctive habit of thinking inventively, which is worth more than you realize. In fact the lessons and exercises are so simple, so easy to understand, so interesting, that they seem more like a pleasant game than like instruction which can make you a successful inventor.

A wonderful new book, just printed, tells you more about the Bureau of Inventive Science and its simple new course in invention. It explains in detail just how this course develops your ability to invent. It tells you how great inventors work, how to develop your ideas, how to get a patent, how to protect your invention, the best way to sell your invention, how to convert a simple little idea into big money, how to learn all the secrets of successful invention. It costs nothing, so send the coupon at once. This Bureau is not connected with patent attorneys or manufacturers. Its only purpose is to teach you the principles of practical invention used by every successful inventor. Write for the FREE BOOK now.

BUREAU OF INVENTIVE SCIENCE

Dept. 710

Wisner Building, Rochester, N. Y.

BUREAU OF INVENTIVE SCIENCE

Dept. 710, Wisner Bldg., Rochester, N. Y.

Please send me your free book, "The Science of Invention."

Name Age.....

Address

City



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 8,000 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.

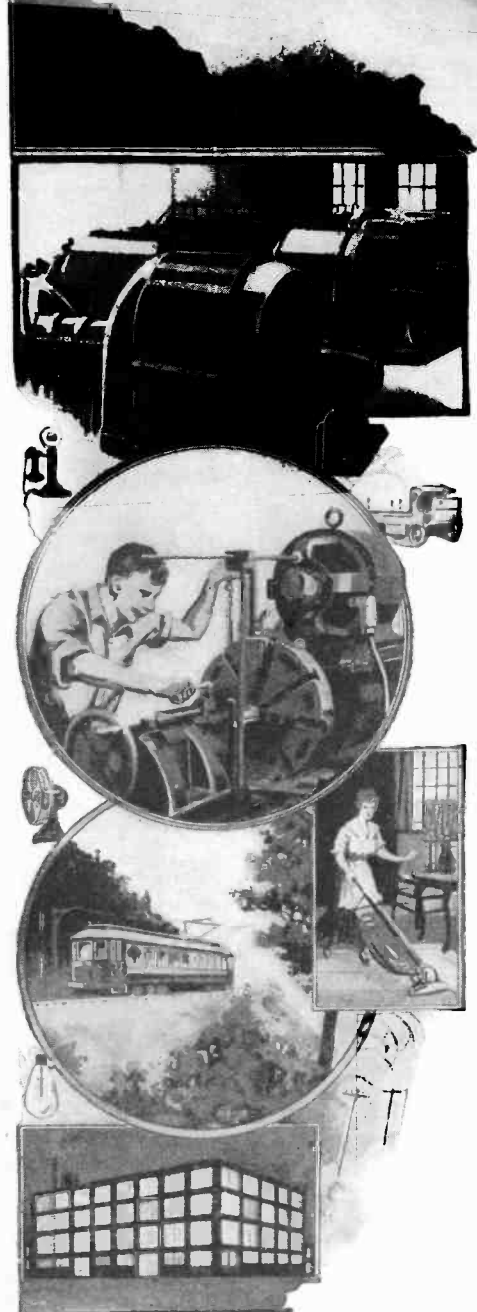
New York Electrical School

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

Radio and Life

By HUGO GERNSBACK

WHenever there is a heavy continuous rain-fall in the country almost any farmer that you meet will tell you that he blames it all on the radio. Whether there is a cyclone, long extended rain, or, for that matter, a long extended drought or an earthquake, radio is sure to be blamed for the result. Of course scientists scoff at any suggestion that radio can have any effect whatsoever on rain or drought, but it is also true that radio waves no doubt have **SOME** effect on our atmosphere, but this effect may be compared with an electric fan in the midst of a prairie. The fan will make **SOME** breeze and create **SOME** disturbance, but the effect ten or fifteen miles away from the fan will be practically nil. So with radio.

I BELIEVE

¶ **THAT** Success comes to those who **Think-Act**, rather than **Act-Think**.

The entire power that is actually sent out into space all over this globe does not amount to more than 5,000 kilowatts, in other words, a power that would light about 100,000 fifty watt incandescent lamps. If in the future this power should amount to a million kilowatts or over there is no telling but that this power might actually have a slight effect upon our atmosphere, but even then it could never be serious enough to interfere with rain or sun. The super-radio station of the future—when we will send power by radio—and which may radiate into space 500,000 kilowatts will be quite a different matter. Such a super-station would probably keep the immediate vicinity free from rains if sufficiently elevated. It has been shown recently that aviators using electrified sand were able to disperse clouds and actually cut huge holes into cloud banks by this means. It would seem that future radio power stations might clear the air of rain, sleet or snow for possibly a few miles around, but even such huge stations will probably not affect the rest of the atmosphere to any marked degree.

The writer has often been asked "What effect do radio waves have upon the human body?" It is a fact that as you are reading these lines radio waves are passing through your body from all sides. No matter where you are these days radio waves of various frequencies will actually pass through your entire body almost every second of the day. If you are in the open, such waves will surge more strongly through you than when you are in the city. When you are standing alone on a prairie, you will possibly receive the maximum effect of the waves. If you are in the city, surrounded by tall steel buildings, these

buildings, rather than your body, will absorb most of the radio waves and finally if you should place yourself into a hermetically sealed steel vault, no waves would pass through your body at all.

But what is the effect of these waves upon the human body? As far as we have been able to observe, directly and indirectly, the effect is practically nothing, or no more than the effect of sunlight on a pane of glass. There must be some effect, but it is very little—that is, with the power that is being employed by the radio stations at the present time; it is so weak that you must amplify it thousands of times in a receiving set in order to hear a single note. The human body itself as far as the radio wave is concerned is a conductor that conducts electric currents fairly well. If you live right underneath a powerful radio station there would undoubtedly be some effect on your body and this effect would be a beneficial one. It would possibly be of benefit to the human being, that is, if he is under the influence of the radio waves for twenty or thirty years. Under such influence then you would probably not be subjected to *arteriosclerosis* (hardening of the arteries). This is the most common pathological condition of man as he grows old.

I BELIEVE

¶ **THAT** fifty years hence, sunlight and ocean waves will supply the world's power.

It was discovered by d'Arsonval some years ago that high frequency currents actually had the effect of greatly reducing this ailment (by lowering the blood pressure). Of course there would only be this beneficial action if one were living very close to the transmitting station. One mile away from it there would be practically no effect.

About fifty or one hundred years from now with super-radio stations generating millions or billions of kilowatts, the situation will probably change. The beneficial action will then be felt by everyone no matter where located on this globe. Furthermore, the high frequency currents will have become sufficiently powerful to have a vitalizing effect on every human being. We will all be electrified then—in the full meaning of the term. Not only man, but plant life will also be greatly stimulated as recent high frequency experiments on plants have shown. Our crops and plants will grow probably two to ten times as quickly and the crops will be more productive under this electrification. The super radio power stations will then also locally control the weather. If rain is required in a rural section, its radio power station will shut down for one or two days during the week, to allow rain to fall.

I BELIEVE

¶ **THAT** near-facts are the greatest bane of humanity.

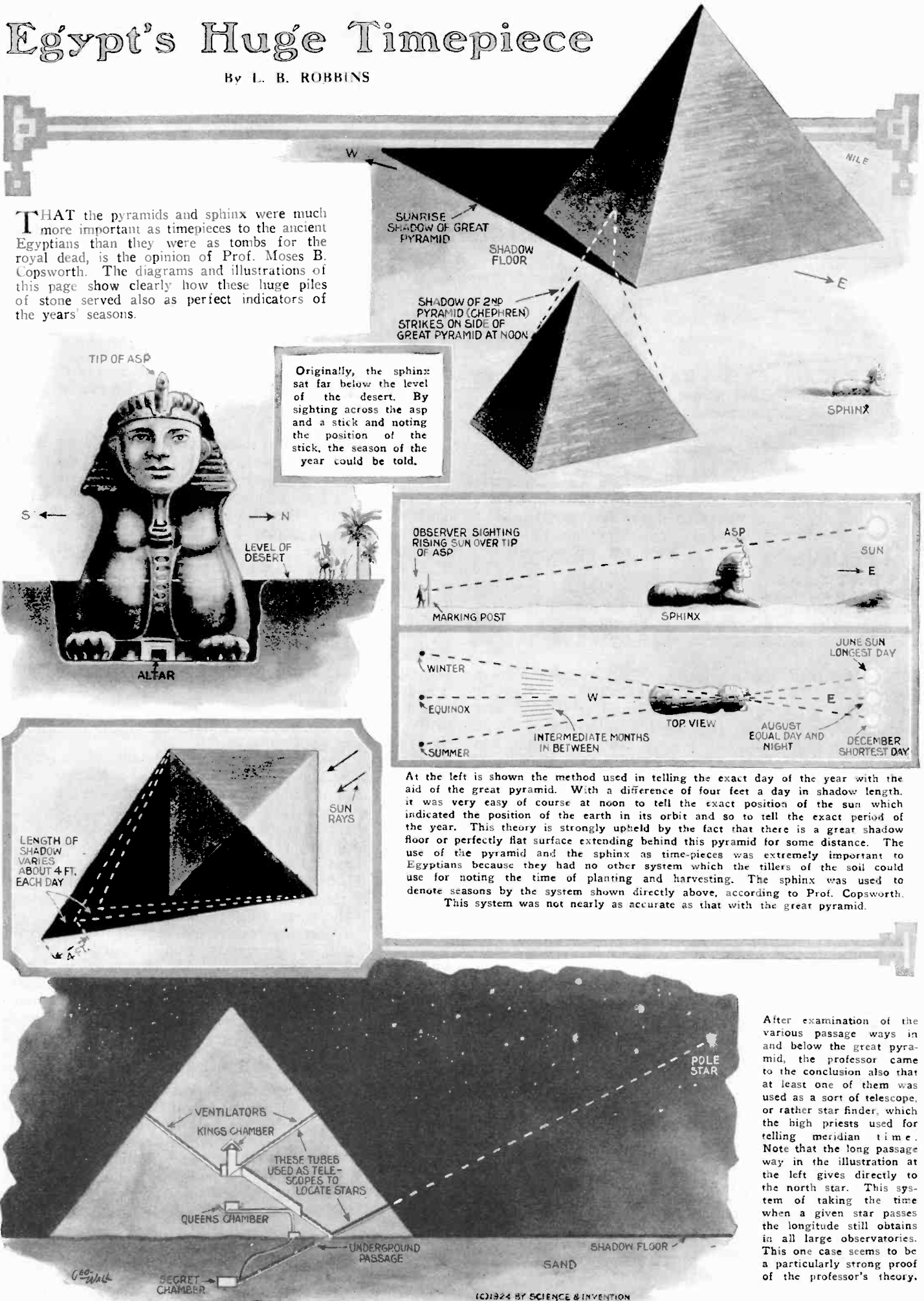
THE GOLDEN AGE OF SCIENCE

is now symbolized by the golden
color of **SCIENCE & INVENTION**.
LOOK FOR THE GOLD COVER every month!

Egypt's Huge Timepiece

By L. B. ROBBINS

THAT the pyramids and sphinx were much more important as timepieces to the ancient Egyptians than they were as tombs for the royal dead, is the opinion of Prof. Moses B. Copworth. The diagrams and illustrations of this page show clearly how these huge piles of stone served also as perfect indicators of the years' seasons.



Originally, the sphinx sat far below the level of the desert. By sighting across the asp and a stick and noting the position of the stick, the season of the year could be told.

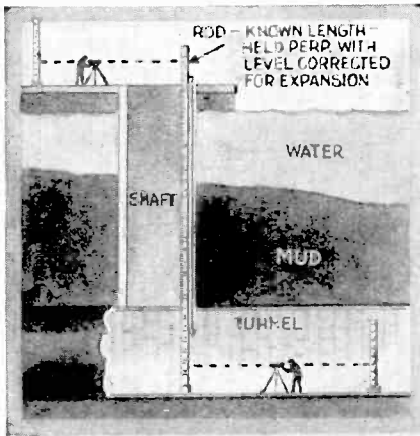
At the left is shown the method used in telling the exact day of the year with the aid of the great pyramid. With a difference of four feet a day in shadow length, it was very easy of course at noon to tell the exact position of the sun which indicated the position of the earth in its orbit and so to tell the exact period of the year. This theory is strongly upheld by the fact that there is a great shadow floor or perfectly flat surface extending behind this pyramid for some distance. The use of the pyramid and the sphinx as time-pieces was extremely important to Egyptians because they had no other system which the tillers of the soil could use for noting the time of planting and harvesting. The sphinx was used to denote seasons by the system shown directly above, according to Prof. Copworth. This system was not nearly as accurate as that with the great pyramid.

After examination of the various passage ways in and below the great pyramid, the professor came to the conclusion also that at least one of them was used as a sort of telescope, or rather star finder, which the high priests used for telling meridian time. Note that the long passage way in the illustration at the left gives directly to the north star. This system of taking the time when a given star passes the longitude still obtains in all large observatories. This one case seems to be a particularly strong proof of the professor's theory.

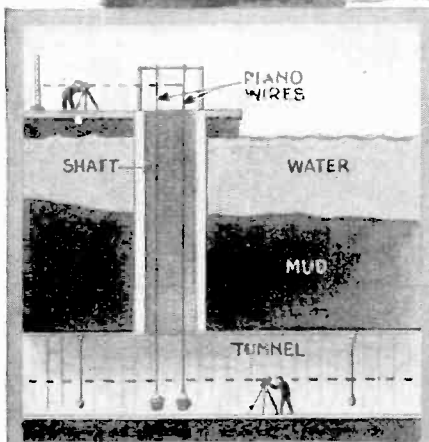
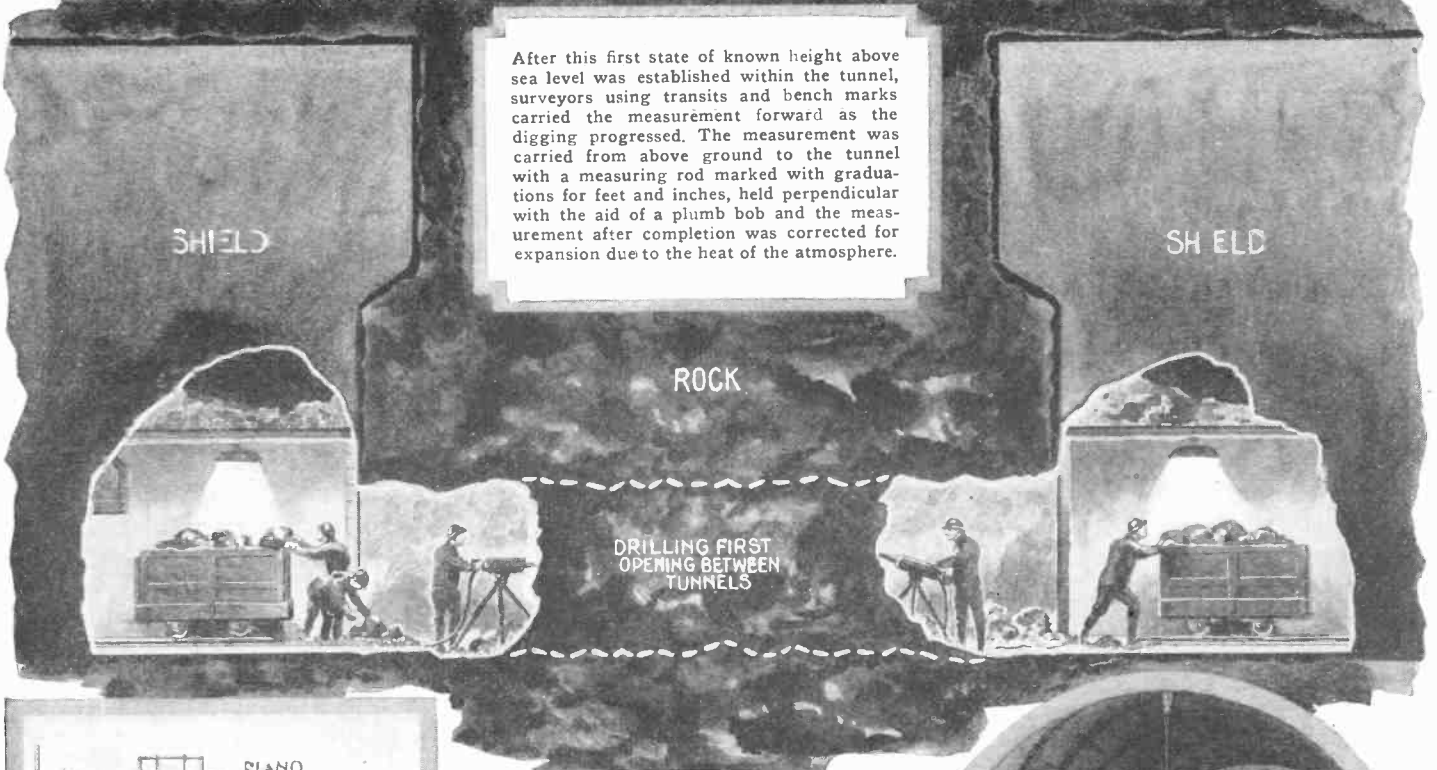
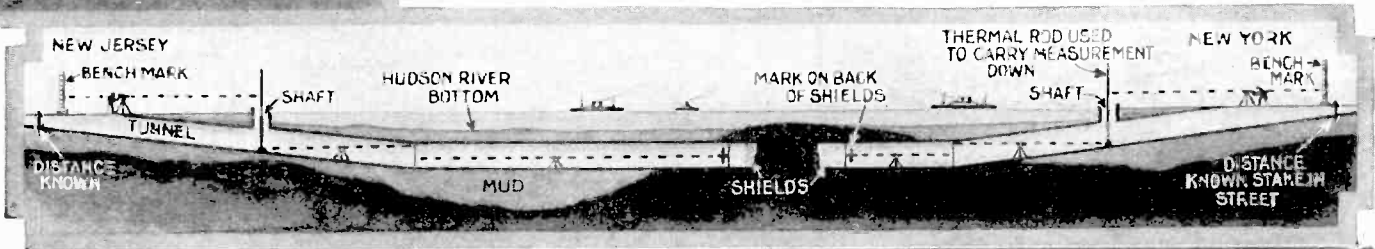
Hudson River Tunnels Meet

Giant Surveying Job Comes to Successful Conclusion

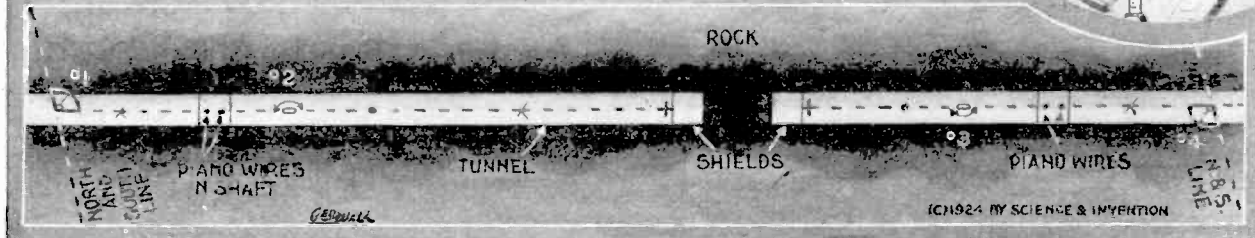
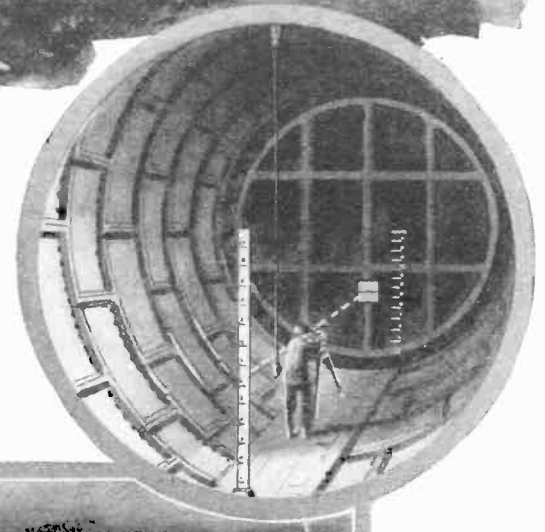
By W. B. ARVIN



THE two sections of the Hudson River Vehicular Tunnel, one being dug from New Jersey and the other from the New York side, meet in perfect union under the river, with a variation of only a few inches. This is indeed a feat of surveying since the base lines for both sides had to be taken from a longitude bearing, also the level or the vertical elevation of both shafts had to be maintained with the same accuracy as their lateral direction, else they would not meet. The sketch below shows the method used in running the level marks. A bench mark, or point of known height above mean sea level was set on both the New York and Jersey side. This mark was transferred to the tunnel as shown at the left.



Above is shown the way the tunnels meet. The forward line for one-half the tunnel was obtained by first taking a longitude observation, obtaining an absolute north and south line on both shores. Then two piano wires with weights attached were hung in this line down a shaft communicating with the tunnel proper. The surveyor below then set his transit in line with these two wires, so the same line, in effect, is used on both sides of the tunnel. At the right is shown the method used by surveyors in controlling the position of the head of the shield. Sighting from the plumb bob which denotes the line, the surveyor determines the direction of the shield, and with the level rod, its vertical location.



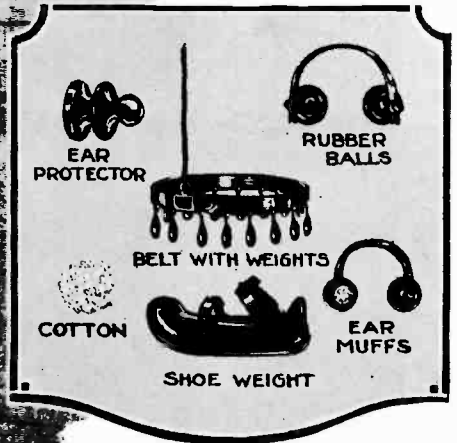
Gas Mask Makes Diver's Helmet

By JOSEPH H. KRAUS



Above is shown a close-up of the aquatic adaptation of the navy type gas mask. Air is seen escaping from the exhaust. The chemical tank may be filled with lead shot.

AT last a use has been found for discarded army and navy gas masks. Homer J. Smith suggests that they may be used as divers' helmets for the entertainment of swimmers and others who love athletic sports. A rubber garden hose with walls sufficiently thick to resist the water pressure is attached to the intake of the mask and is kept on the top of the water. Both the army and navy type of mask may be used in this manner. In both cases the air supply hose is attached to the helmet intake where it is removed from the chemical tank. With the aid of this mask and air hose, it is possible to make descents of 20 to 30 feet. Of course it will be necessary to carry weighted foot gear.



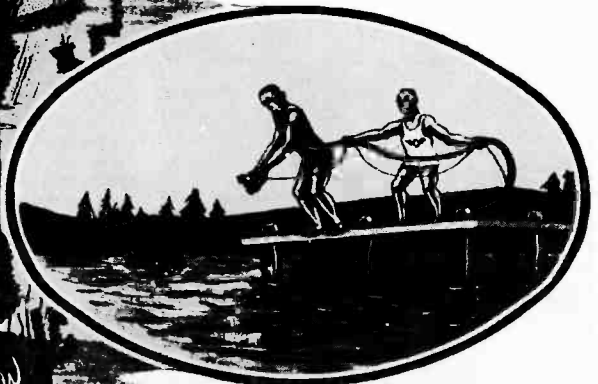
Above is illustrated some of the weight styles and ear protectors.



A diver equipped with gas mask, who has no assistants and fastens his air hose to a raft.



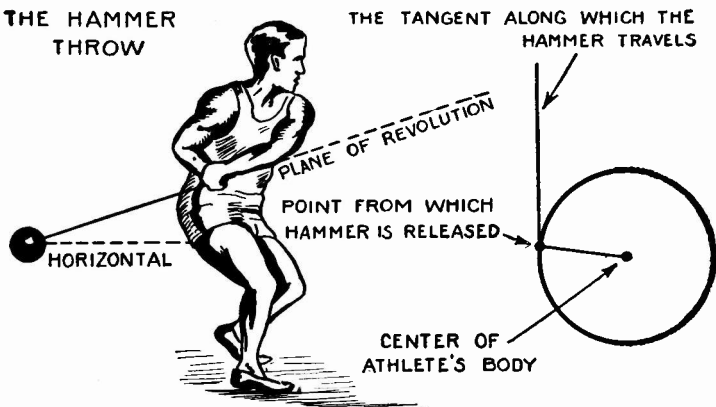
Actual photograph of a diver who was able to stay under water twenty minutes, using only an air hose.



For comparatively shallow water, a flat iron held in the hand will often prove sufficient weight to carry the diver down. As with the weight belt, a rope is attached to the iron so that when the diver comes to the surface, the weights may be hauled up.



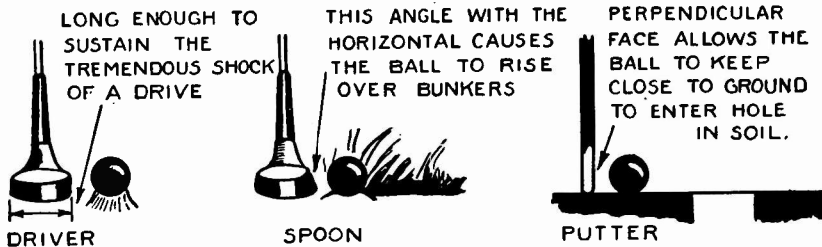
THE HAMMER THROW



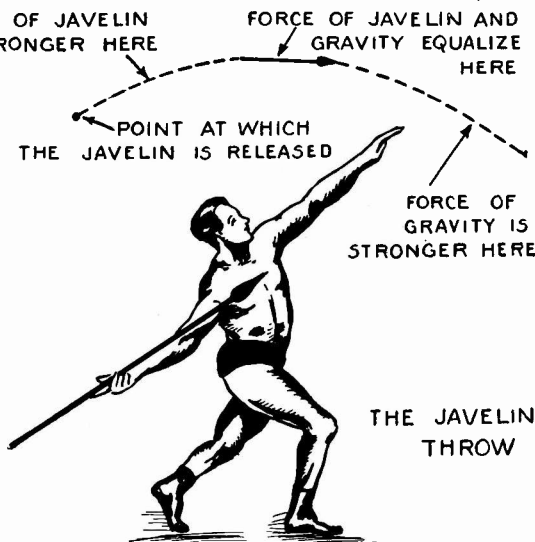
This illustration concerning the part science plays in athletics the hammer throw. It is entirely a problem in centrifugal force.

Science's Part in Athletics

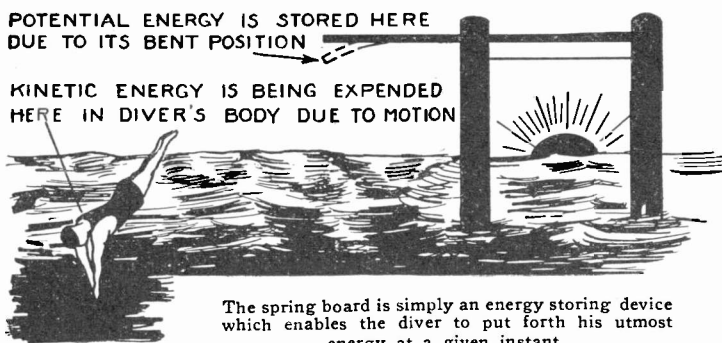
Some Scientific Points Not Often Considered



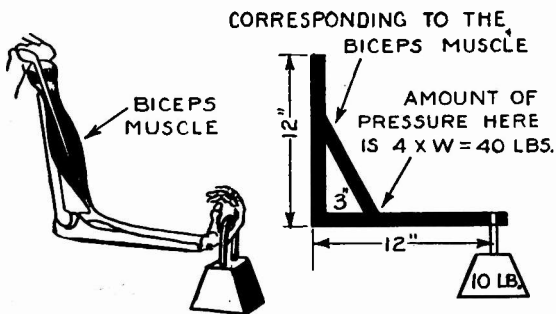
Golf clubs must be carefully designed, both in order to withstand the strain to which they are subjected, and to perform the particular drives and putts for which they are built. Particular attention must be paid to the angle at which the face of the club is cut.



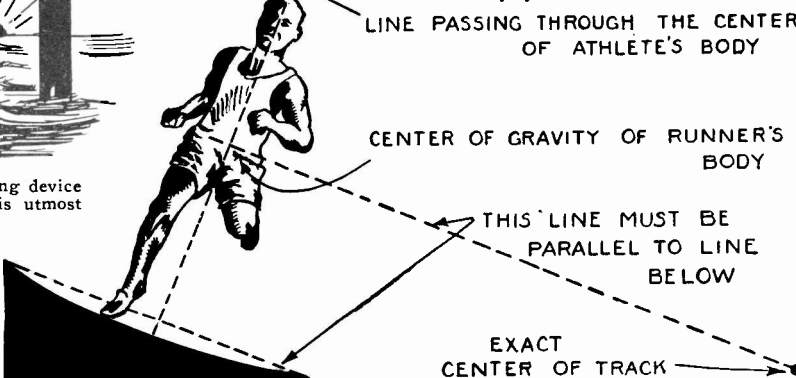
The javelin throw is a problem in projectile force. The tangent point at which the javelin leaves the player's hand is all important.



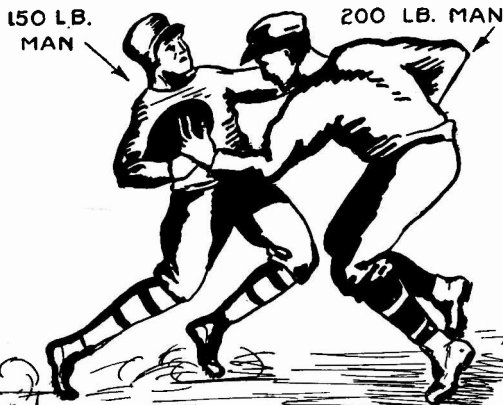
The spring board is simply an energy storing device which enables the diver to put forth his utmost energy at a given instant.



The biceps muscles operate the forearm lever-fashion, the mechanical counterpart of which is shown at the left side of the sketch. The weights and relations are shown.

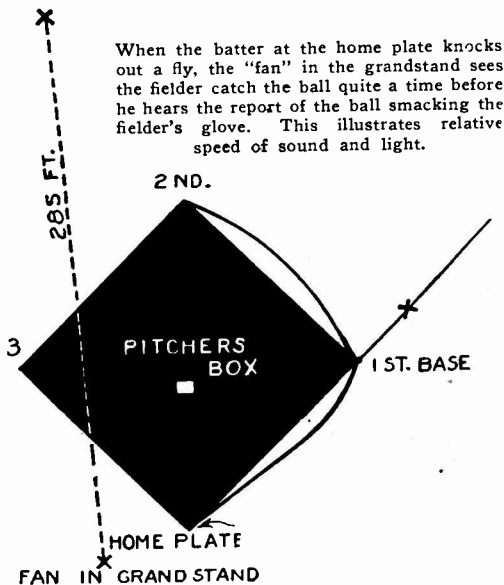


On interior tracks where the curves are rather short and centrifugal force exerts extreme influence on the runner, the track is banked or raised at an angle, as shown in the above illustration in order to counteract this force. The line perpendicular to the runner's body must intercept a line to the center of the track at a right angle, as shown.



A successful forward pass in a football game depends almost entirely upon the method used to throw the ball. The correct and incorrect way is illustrated just above. Also the heavier team has a decided advantage over the lighter team on account of the tractive force of the added weight. This is illustrated at the left.

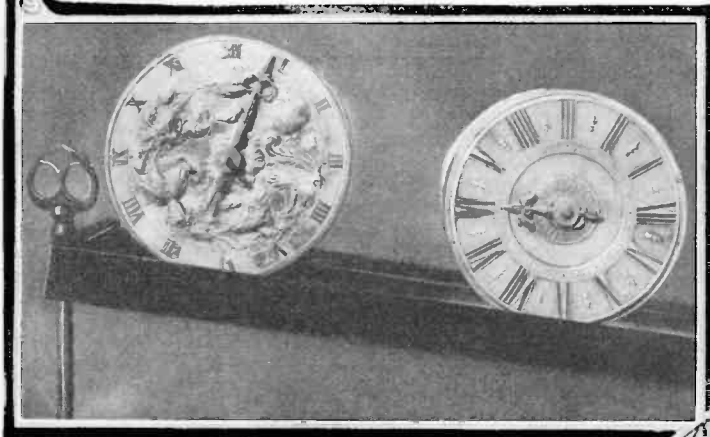
—R. Leon Hall, Reporter No. 10369.



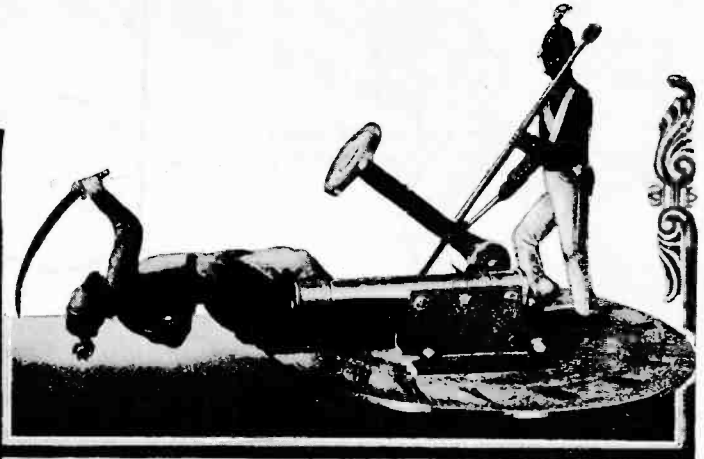
When the batter at the home plate knocks out a fly, the "fan" in the grandstand sees the fielder catch the ball quite a time before he hears the report of the ball smacking the fielder's glove. This illustrates relative speed of sound and light.

Unique Clocks

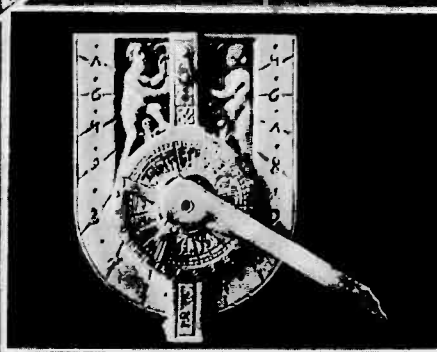
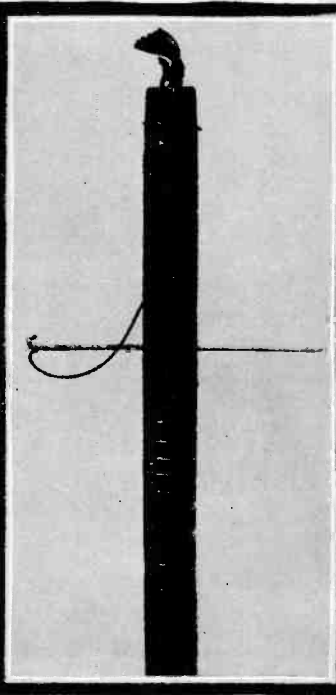
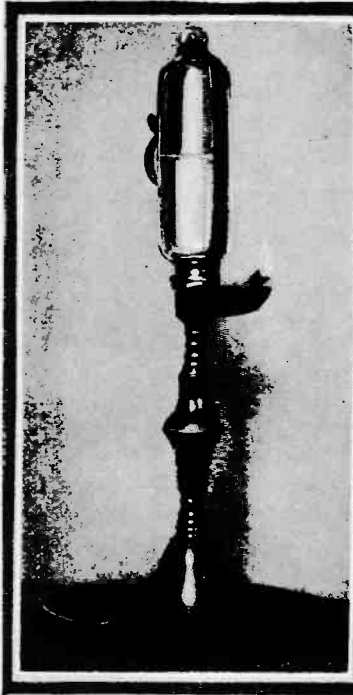
MARSHALL KELLY



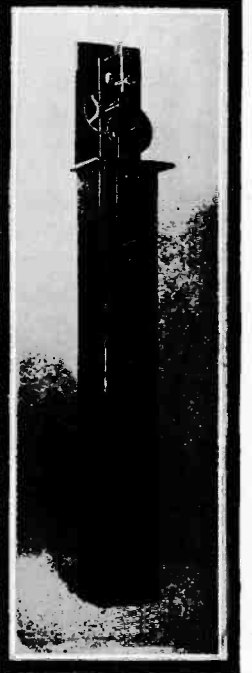
Louis XIV had a very novel clock which operated by rolling down an incline plane. Such a clock is shown in the above illustration. When the clock ran down, it was only necessary to set it at the top of the plane again.



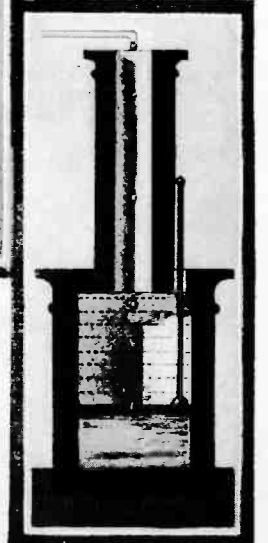
Maria Theresa had one of the most novel clocks the French court ever saw. It consisted of a sun dial with a small cannon which was fired on the hour. It was placed just under that famous lady's window.



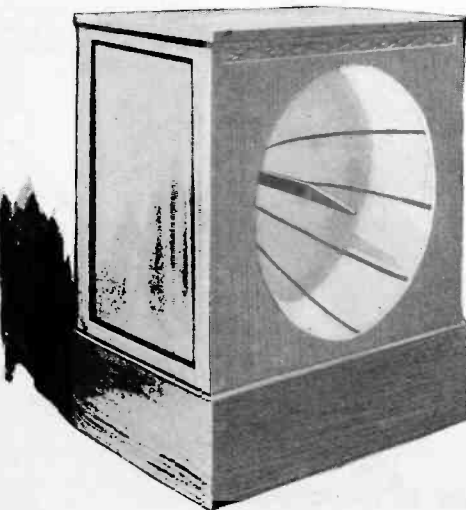
Above we have one of the early portable sun dials. It was adjusted for latitude. The gnomon which casts the shadow was collapsible.



A Gothic weight clock which marked the time by the descent of the weight down the scale, is shown above.



THE oil lamp of Mary Stewart marked time by the change in the position of the oil in the cylinder. A gauge was fixed alongside the cylinder so the time could be read directly. To the right of this novel timepiece is shown the Indian Pilgrim staff which told the time by the sun dial method. A peg was passed through the stick, and the location of the shadow marked the time. Directly above is shown a Japanese sand glass arrangement fixed so that one glass was continually marking the passage of the hours. The appliance which kept the time constantly was an improvement over the original hour glass idea, which necessitated turning every hour exactly as the last of the sand passed through the aperture in the glass. At the left is shown the bowl moon dial. The gnomon was of course arranged so that adjustment could be made for differences in latitude. It worked on exactly the same principle as the sun dial with the exception that the moon cast the shadow. At the right is shown possibly the oldest clock. Time was kept by the water dripping into the bath raising the indicator.

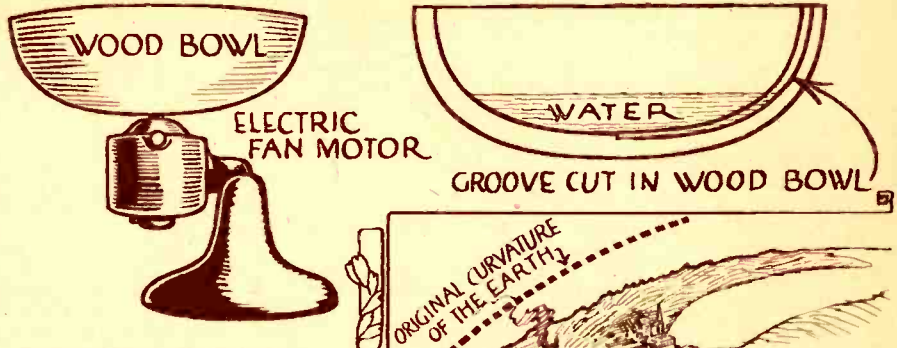


If the Earth Changed Speed

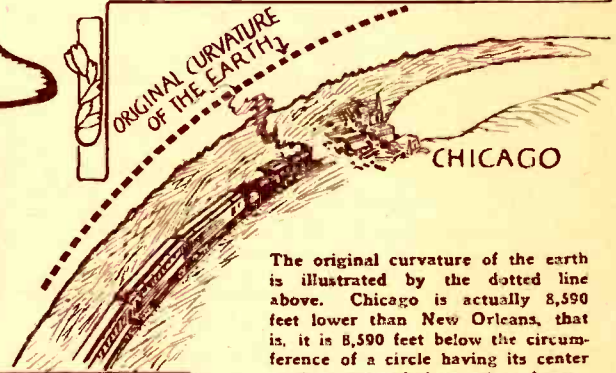
By CLEVE HALLENBECK



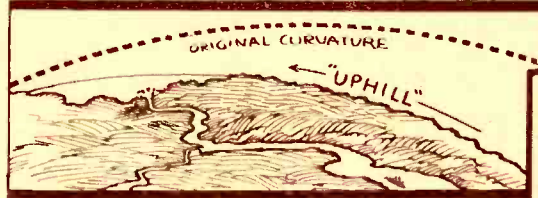
The dotted lines surrounding the sphere show, exaggerated of course, the flattening of the earth at the poles. This accounts, under the laws of gravitation, for making all lands from the equator to the North and South Poles have a trend "Down Hill."



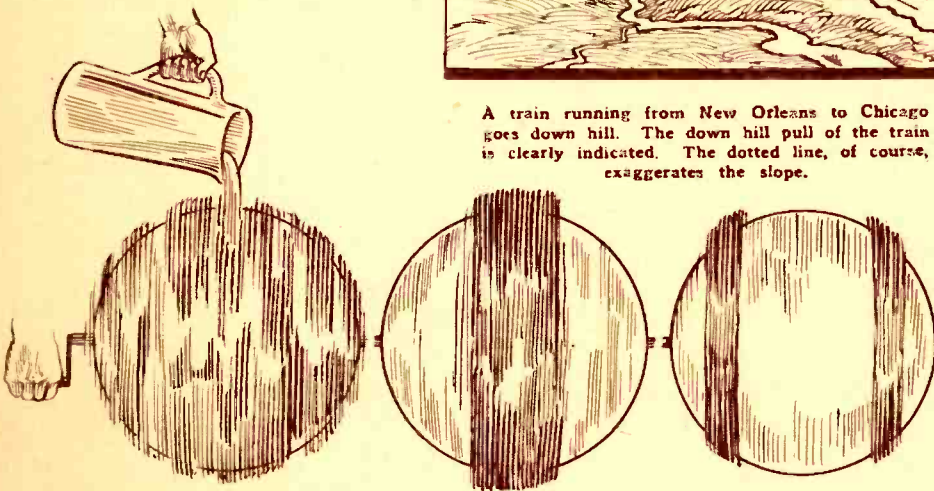
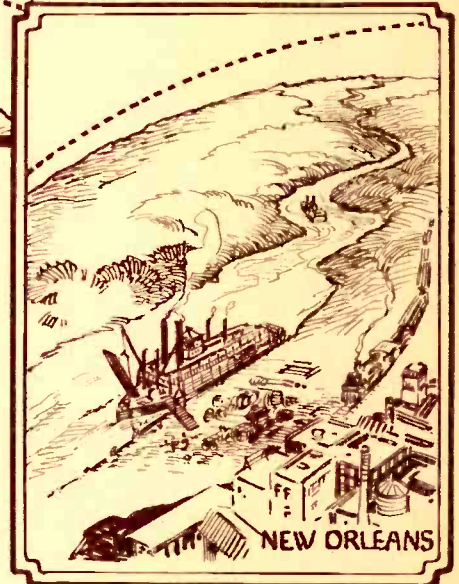
The experiment above showing the revolving grooved bowl, demonstrates how centrifugal force causes the Mississippi to flow up hill. The waters at the bottom of the bowl will rise up the sides as the bowl revolves and at a certain speed the water will flow up the groove and out of the bowl.



The original curvature of the earth is illustrated by the dotted line above. Chicago is actually 8,590 feet lower than New Orleans, that is, it is 8,590 feet below the circumference of a circle having its center at the center of the earth and passing through New Orleans.



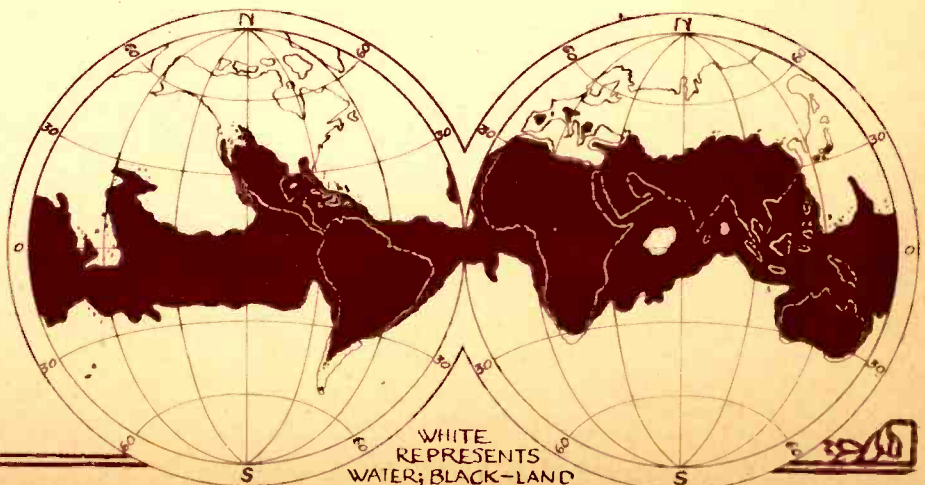
A train running from New Orleans to Chicago goes down hill. The down hill pull of the train is clearly indicated. The dotted line, of course, exaggerates the slope.



THE mouth of the Mississippi River is two miles higher than its beginning, in other words the water of the river flows uphill more than two miles in reaching the ocean. This state of affairs results from the flattening of the earth at the Poles, which process occurred at the formation of our planet. The Mississippi is able to make this rise and flow uphill because of centrifugal force. If the earth slowed its revolutionary movement only very slightly, the Mississippi would cease to flow altogether. If the rotation were to increase, on the other hand, the river's speed would also increase and the ocean would pile up at the equator as well. The old high school physics law that "water always seeks its own level" is only true when there is no force aside from gravitation acting upon the water. Were it not for this force we should have almost a perfect sphere on which to live because the waters of the oceans would flow to the cold regions until the present flattening of the globe at the poles was counteracted.

Centrifugal force is illustrated above. If a thick viscous fluid is poured on the revolving sphere, at a certain speed it will cover evenly the face of the sphere. At a faster speed it will gather at the equator and at a slower speed will flow towards the two polar regions.

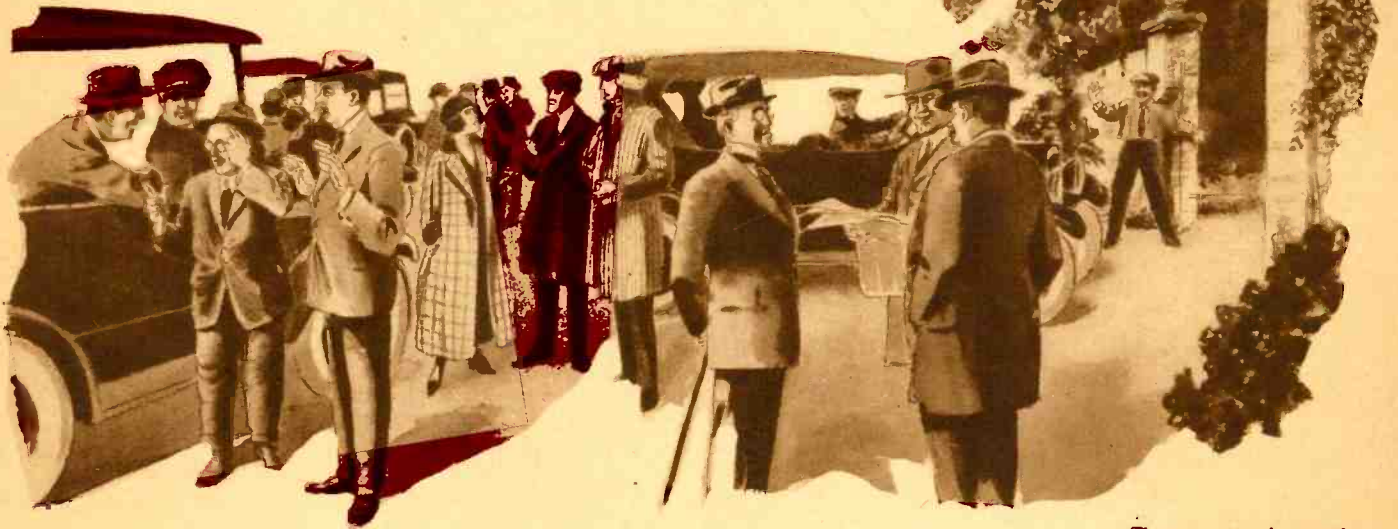
If the earth were to slow up its speed gradually, the waters of the oceans would pile up at the poles, leaving a belt of dry land on the shaded portion of the world map below.



WHITE REPRESENTS WATER; BLACK—LAND

The LIVING DEATH

By JOHN MARTIN LEAHY



There was a mob around Frontenac's gates.

"The true may sometimes not be probable. But science takes accounting of the truth, not of the probability."—Victor LaPorte.

CHAPTER I

THE DISCOVERY

WHAT I had read was surprising, simply amazing. And yet why should I be surprised at my surprise and amazement? For this was not the first time. Yes, more than once, arriving at Darwin Frontenac's home, I had been surprised, and once or twice shocked with an accompanying shudder. For some of the studies and experiments of my friend—a strange friend, but one as true as strange—were as unearthly as ever entered the mind of man.

I thought of some of these things; but never the faintest thought came, as I sent my automobile spinning along the smooth road, that this was the most momentous day ever to be known in all my life.

However, as I drove along, I was not a little puzzled. For, after all, what was I to make of those amazing stories in the newspapers? The first word of his discovery had been given to print (under somewhat unusual circumstances, it seemed) only a few days before; yet already the world was buzzing with interest and comment, from Seattle to London and Paris and even on to Shanghai.

Some of that comment makes curious reading now; but how was the world to know? No wonder there were "Doubting Thomases." The thing was too bizarre, too gruesome.

Why, even I, who knew the man and his work as, I felt sure, no other man knew, doubted.

"Yes," I thought, "this must be another of those wild newspaper yarns! It can not be otherwise. When did a reporter ever get a scientific story straight? That there was some foundation for the story—or, rather, stories—I did not doubt for one moment.

I had been away five months, and (if it had been any one else) I could have sworn that he was not even interested in such a thing on my departure, let alone experiment-

ing. And now this! Not the slightest mention of it had occurred in a single one of his letters.

The stories should be taken *cum grano salis*.

ments, and the summit of the gentle acclivity was reached, whence an extensive view meets the eye. There, stretching from south to north, glittered Puget Sound. A short distance before, the red roof of Frontenac's house came into view.

The road gave a sudden turn and I, a sudden exclamation. A few curious persons would have seemed no surprise, but what I saw certainly was. There must have been twenty cars parked along the fence, and all of two hundred people gathered at the house. Here and yon little crowds were clustered about some wisacre, and, as I rolled forward, I heard "bunk" and "faker" and sundry phrases and epithets no more complimentary than these.

And, there inside, puttering about the flowers and shrubs, was Blubs, the gardener and general handy man about the place. It was obvious, however, that the work engaging his hands was not taking his whole attention. Blubs, in reality, was on guard.

From the look he fixed on the car, I thought he was expecting some one. There was a sudden look of recognition, and the next instant he was moving toward the gate.

"Well, well," he said, as he swung the gate open, "if it isn't Mr. McQuestion back!"

"Not expecting me, eh, Blubs?"

"No," he answered. "I thought at first that it was—you see, I thought it was somebody else."

WELCOMED

My ring was answered by Frontenac himself. A look of surprise crossed his lean features and lighted up the somber gray of his eyes.

"Bond!" he exclaimed, and thrust out his hands and grasped me by the shoulders. "So it's you! When did you arrive?"

"You didn't know I'd returned?"

"Not until I opened the door and saw you here."

"I tried to get you on the phone. Sherrill answered, said you were expected back any moment, and he said that—"

"Oh, I see! And, when I did get back, Sherrill suddenly found so many matters on hand he forgot to tell me about it."

WITH this issue, we are beginning an important scientific fiction serial:

The LIVING DEATH

by John Martin Leahy

This is a gripping story of the South and the Antarctic. The prediction has often been made that somewhere in the Antarctic, a tropical plateau would be discovered which will be surrounded by ice on all sides. There is a good scientific reasoning for this and Mr. Leahy discusses it all, not only in masterful fiction, but with a masterful grasp of the scientific facts which he includes as well.

The footnotes found throughout the work are actual references to standard textbooks or lectures given by world famed authorities, or explorers.

This is a story that will grip you from start to finish. We warmly commend this serial to our readers.

—Editor.

If I had only known the truth—above all, what was to follow!

TO THE HOUSE

At length I left the main road, taking one that led off to the right. A few mo-

"Come in, Bond, come in!" he exclaimed with a sudden alteration of tone and manner. "You mustn't be surprised if things are a little upset about the place, though it would be rather difficult to say precisely why they should be so. Certainly I can't tell you. All this hullabaloo!"

He waved me into a chair and took another himself, crossing his legs and elbows resting on the arms of the chair, placed his chin on his long clasped fingers.

"Well, well, I'm certainly glad to see you again. Alaska seems to agree with you."

"And," I returned, "it seems you have been making a little Alaska of your own down here."

A smile touched his face.

"So you have been reading the papers?"

I nodded.

"And tell me this, have the papers got this business straight?"

"Not straight, of course, Bond; they never do get scientific things straight. Why, your reporter is a wonder if he knows that *Polaris* isn't *Archaeopteryx*!"

"What I mean," I told him, "is this: have you really done what these accounts say?"

"I have," said Frontenac, "and a few things beside which they know nothing about."

"You mean to tell me—Great Heaven, you mean to say that you can—?"

"Certainly I can! It was not my intention to have it made public so soon, however. This has—well, disarranged things a little. I'll have more sense next time. It was that old fuddlecap Professor Archimedes Bukink that gave the story away—the old rattlebrained bagpipe. Oh, well, it's all my own fault. I ought to have had more sense than to let him know of it."

AN ARRIVAL

"But look here——" I began.

"There," interrupted Frontenac, "there he is at last."

He was looking out the window, towards the gate, which Blubs had just opened and through which an automobile was moving.

"Who?"

The look he gave made me wonder.

"Stanley Livingstone," he said.

"Stanley Livingstone!"

"Yes, Captain Stanley Livingstone. There in the back seat."

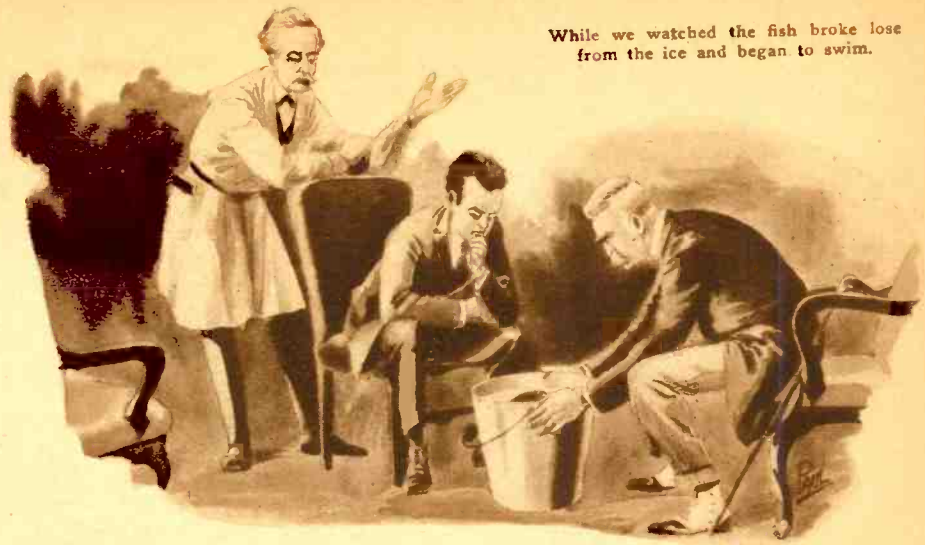
"That faker!" I exclaimed.

Frontenac held up a finger.

"Easy, Bond. Not so precipitate. Remember, even Newton and Columbus were fakers once."

"Shades of the great Munchausen!" I exclaimed. "Do you really believe in that man?"

"This is not the moment to say what I believe or do not believe. I have been waiting this visit with more interest than you can easily imagine. It has me guessing in more ways than one. Why is he coming—he of all men? What is this strange tale he has to tell me, and why has my discovery brought that man here?"



While we watched the fish broke loose from the ice and began to swim.

"You'll soon have the answer to that," I smiled. "But what is the Captain doing in Seattle?"

"Outfitting for another expedition."

"To the North Pole, this time?"

"No. To the Antarctic Continent again."

I understand, however, that his health has caused some hitch in the plans."

"Well," I observed, "here he comes! I want to meet the man, but don't worry; I'll soon excuse myself and leave you two to your mysterious confab."

"By no means, Bond!"

He placed a hand on my arm, and the seriousness of his manner astonished me.

"I want you to remain—well, as a witness, say. Something tells me the story will prove no common one."

And the next moment he was moving toward the door to receive the arrival.

CHAPTER II

CAPTAIN STANLEY LIVINGSTONE

THE meeting with Captain Stanley Livingstone left my thoughts in confusion.

This man I had set down as an unmitigated faker. Yet, as I saw his rugged, weather-beaten face, his clear blue eyes, doubts as to the correctness of my opinion arose. The impression produced upon me by the captain's personal appearance was very much in his favor.

This was not the face of a faker. And yet it was not pleasant to look upon. There was an unsightly puffiness about the features and a livid hue which stood out even through the tan. Captain Livingstone was a sick man. His troubled breathing, and the alacrity with which he sank into the chair pushed forward by Frontenac attested to his illness.

The captain lost little time in the small talk customary on such occasions.

"I have come to you, Mr. Frontenac," he said suddenly, "to tell you the strangest story one man ever told another. And, as

I am a living and honorable man (though dishonorable, or worse, in the eyes of the world) every syllable of it is true."

He paused, and for an instant his eyes rested on me with a look the meaning of which could not be mistaken.

THE CAPTAIN SPEAKS

"I assure you, Captain Livingstone," Frontenac said in reply to the look, "that I am very sensible of the honor thus accorded me. Also, I assure you that you may thoroughly rely on the discretion of my friend McQuestion here. Should there be anything in your story you wish held secret, you need have no fear of either of us betraying the trust."

The captain gave something like a bow. "I believe it," he said after a momentary pause, "and so I will tell you my story; tell you of the strangest, the most astounding scientific discovery ever made. The world sneered and jibed at what I did tell. So why should I have taken the trouble to bring out proof—even if I had not the horrible stares of the curious and the vile publicity she would have been subjected to."

Darwin Frontenac leaned forward.

"She?" he queried.

And I caught at the eagerness in his voice.

"Yes," said Captain Livingstone. "In a—a museum!"

He gave a fierce gesture. "Yes, that is what they would have done to her, that or something even worse—after all these thousands of years. I have been in something akin to despair ever since that awful day I found her. But now, Mr. Frontenac, your discovery changes everything. You are the one man in the world who can save her. And even you—no, I will not think that."

"Save her?" queried Darwin Frontenac.

"Yes, sir; save her."

"From what?"

"From eternal sleep—or one of the foulest of deaths."

"All this, Captain Livingstone, is something of a riddle to me."

"Yes, yes; but I will make all plain."

He was silent for a moment, then added: "As for me, gentlemen, I am finished—I am a doomed man."

His head sank forward, but the weakness was ephemeral; the next moment he raised his head and fixed his look once more on Frontenac.

"Aneurism of the aorta," he grunted.

That explained the puffiness and livid hue of his skin. Such a man, I knew, was not certain of his life from one minute to the next.

The explorer went on, "My days on this earth are numbered. Well, so be it."

(Continued on Page 602)



"It is the strangest story man ever heard," the captain was saying. "I come to you with it because you are the only one who can save her from everlasting sleep."



"And now there appeared on the screen a wonderful picture of a beautiful woman reclining in a sort of hammock; bare-legged and bare-armed like the

others, but considerably larger than her sisters. The far-famed Helen of Troy or even Venus in all their glory would have been put to utter shame."

Doctor Hackensaw's Secrets

By CLEMENT FEZANDIE

No. 33. The Secret of the Microscopic World

AUTHOR'S Note. This somewhat fantastic story of a microscopic world of men and women, is written for the purpose of giving in palatable form, some interesting and not commonly known facts in regard to bees, especially in regard to the manner in which the bees contrive to hatch out males or females at will. My facts are taken from some of the best authorities, and hence may be relied upon. As to my speculations concerning the formation of a class of human neuters in the not distant future—this is less a matter of theory than a matter of fact. Even at the present day families are very small and are continually growing smaller, while the number of bachelors and maids is increasing yearly, forming what is really a class of neuters in the human race.)

YOU'VE come just in time, Silas," said Doctor Hackensaw. "I've got something to show you, to-day, that is, in its way, more wonderful than anything you have yet seen—I myself would not believe it if I hadn't seen it with my own eyes. Truly Shakespeare was right when he said: 'There are more things in Heaven and Earth, Horatio, than are dreamt of in thy philosophy!'"

"Don't keep me on pins and needles, doctor. Tell me at once what this new wonder is that you're going to show me," said the reporter with a smile.

"Silas," continued the doctor impressively, "It's a common failing of mankind to believe that all the greatest discoveries have already been made. In the last hundred years we have seen all the marvels accomplished by steam, electricity, and radio-activity, yet still we doubt that the future has similar great surprises in store for us. Of course we are ready to admit if some of the planets, like Mars and Venus, may have new wonders to show us, but as to the earth itself we think we know it pretty well. As a matter of fact, we know very little about it—especially the microscopic

world. Well, Silas, I once showed you my super-microscope. Evidently discoveries of the greatest importance await us in the world of the infinitely small, and I spared neither time nor money in perfecting my instrument. I have made many discoveries in regard to the constitution of matter, the life histories of disease germs and other bacteria, and have solved a number of the

problems relating to life itself. But recently I had the good fortune of stumbling upon a microscopic world such as I had never dreamt of. Silas, if I were to tell you that I have found on a speck of earth no larger than the size of a pin-point, a world of microscopic men and women with their cities and farms, their commerce and industries, you would laugh at me and think I had lost my reason. But the fact remains that I have found just such a world. How I ever came to hit on it is a mystery, for there seems only one such world—I have searched the surrounding particles in vain for anything like it, though even if another existed, the chances are great that I could never find it—The search would be far more difficult than the traditional one of looking for a needle in a haystack. But this microscopic world seems unique."

Silas Rockett's incredulity showed on his face, but he was too polite to say what he thought.

"I see you don't believe me, Silas, and I don't blame you. I, myself, couldn't believe my own eyes when I found this microcosm,—excuse me, I mean this small world—in the field of my microscope. The thing, however, is not so impossible as it seems at first sight. You understand the laws of 'evolution' or 'the survival of the fittest,' as Herbert Spencer called it. As a rule, the large animal has an advantage over the small ones, and hence evolution is usually from the one-celled animal or plant to the larger mammals. But size is not always an advantage. The large animal requires more food, and is more readily found by his enemies. Natural selection has produced the microbe as well as the elephant and the whale. In fact, above a certain limit, size seems a decided disadvantage; for all the large ante-diluvian monsters have perished from the face of the earth. Such giants as the brontosaurus, the eighty-foot long diplodocus, and the hundred-foot long gigantosaurus have all vanished. They were too large, and could not compete with the smaller species—they succumbed in the battle of life



"Pegasus would have been treated royally had he had such a noble master. But horror of horrors! Another flesh eating dinosaur asleep in the forests was awakened by the tramp of the unicorn's hoofs, and with one pounce had knocked over the horse and seized the fair rider in his reptilian jaws."

because their enemies found them an easy prey.

"Now size is a very variable quality in animals, as we see in the dog and the horse. The former ranges in size from the toy dog you can hold in your hand, to the gigan-

The second room contained Microscope No. 2.

"You see," explained Doctor Hackensaw, "the great problem in obtaining successive enlargements is to find some means of illuminating each enlargement you obtain.—



"There amid a luxuriant tropical vegetation of palm-like cycads, tree ferns, and tropical cone-bearing trees, was an enormous brontosaurus quietly grazing. Much sooner would I have dared to face the terrors of Scylla and Charybdis than meet this carnivorous reptilian monster."

tic mastiffs. The horse varies from the small Shetland pony to the immense Percheron, and, in ancient times, horses existed that were no larger than small dogs. Similarly with plants. The scrub oak and the scrub pine are low forms closely related to the giant oaks and pines of our forests."

"That's true," assented Silas.

"Size is a mere matter of relativity," Einsteined the doctor. Nature can produce a minute insect as easily as an antediluvian monster. And as the small animal can more rapidly escape extinction, it is the most natural thing in the world that a race of men and women should have gradually become smaller and smaller until finally they attained microscopic size. In Africa there are tribes of dwarfs less than three feet high. Among the monkeys there are some very small species. Under certain conditions we can easily conceive how the microscopic world evolved. However, be the reason what it may, such a race of diminutive men and women exists, and I'm going to show it to you right now. You will be the first person besides myself who has seen it. Come with me to my 'microscope rooms'."

"Microscope rooms?" echoed Silas—"Have you more than one microscope?"

"Yes indeed. My super-microscope is in fact nothing but a combination of several microscopes, each one enlarging the image it receives and passing it on to the next. Here is Microscope No. 1," continued the doctor, opening the door that led to a peculiarly constructed room containing an immense instrument. The lenses were several feet in diameter and the instrument itself was some twenty feet high. All the adjustments had to be made by machinery. There appeared to be nothing on the object glass, but in reality there was an almost invisible speck of earth, illuminated by most powerful electric lights, whose beams, however, first passed through suitable solutions that filtered out the heat-rays that would otherwise have destroyed the microscopic world in an instant."

"That's a fine instrument," said Silas, "but it must have cost a pretty penny."

"It did, but it's worth every cent of it. And this is only one of the microscopes. Come now into the second room."

Otherwise the light soon becomes insufficient. To achieve this result, the images in my first microscope are photographed by a moving-picture camera which takes about a hundred snap-shots per second (developing the plate at the same time.) I study this film carefully and a special device enables me to pass the film through the second microscope in such a way that the particular spot I have chosen will be the one to be magnified as the film passes through. Of course, as you understand, there is not the slightest difficulty in illuminating the film or negative as highly as I wish. And the records being permanent I can go back at will and magnify other portions of the original film—As a rule, however, I magnify the central portion of the picture, as there is of course less distortion of the image by so doing—Each succeeding microscope merely repeats the process. It takes some one central spot on each of the image of the previous films, and enlarges this again—Finally, for convenience, the last negatives, which like the others are taken in natural colors by a process of my own, are projected on an ordinary movie-screen and give me a slow-up of the scene actually occurring in the microscopic world.

By means of audions and a loud speaker, I can at the same time hear the sounds made by the creatures, as you will perceive for yourself."

So saying, Doctor Hackensaw pressed a button, and the room was in total darkness. Instead of a sheet, the screen was a mirror, and as the projector began to automatically throw the images on the screen Silas beheld a vision that filled him with delight. It was a real city which was depicted here, with houses of magnificent architecture, but altogether different from our modern ugly buildings—They were more in the Oriental style of the Hindoos—The costumes, too, were different from ours, simple but very attractive, both men and women having bare arms and legs. They were very much like humans too, but more refined in features. And the figures spoke to each other, though Silas was unable to understand a word that they said.

"Why, they have a language of their own!" he cried.

"Yes," answered Doctor Hackensaw, triumphantly. "They speak the language from which our Sanskrit must have originally evolved, for it possesses many Sanskrit roots. Believe me, it was some job to understand their speech, but by catching the conversations on phonographic records and giving them to some of our best Sanskrit scholars to decipher, I have been enabled to understand what they say. And the fact that these men speak a Sanskrit language bears out my theory that these people are descended from normal-sized men and women."

"Then they are really men and women like us?" queried the reporter.

"Not exactly. Wait until you have seen the queen." And Doctor Hackensaw adjusted a few thumb-screws, bringing a different roll of film on the machine. And now there appeared on the screen a wonderful picture of a beautiful woman reclining in a sort of hammock; bare-legged and bare-armed like the others, but considerably larger than her sisters.

"Isn't she a beauty!" cried Doctor Hackensaw, enthusiastically—I call her Ionia because an ion is the smallest thing known—She is a dear girl, and I confess I have fallen in love with her."

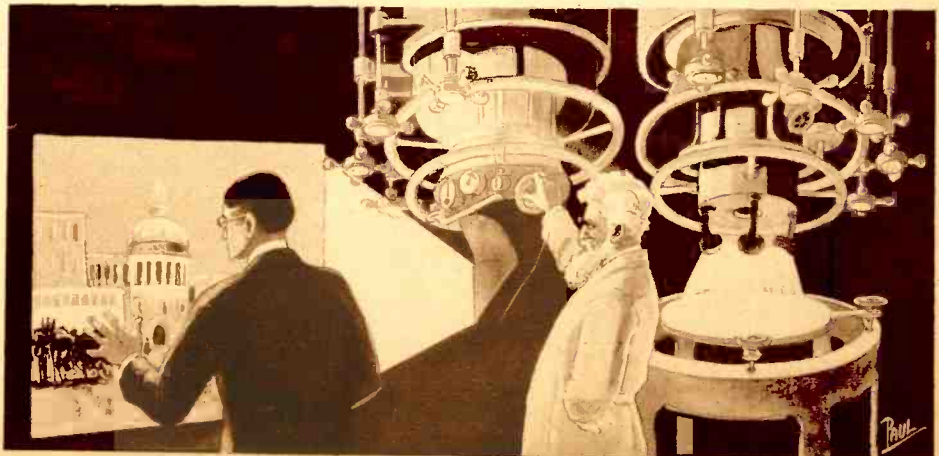
"But how is it that she is so much larger than the others?"

"I will tell you my explanation, Silas, and I think it is the true one. I believe Ionia is a queen in the same sense as the queen bee in a hive;—in a word that she is the mother of all her subjects."

"Good gracious!"

"To the large majority of people, Silas, the relation between the sexes is looked upon as something half way between a sin and a

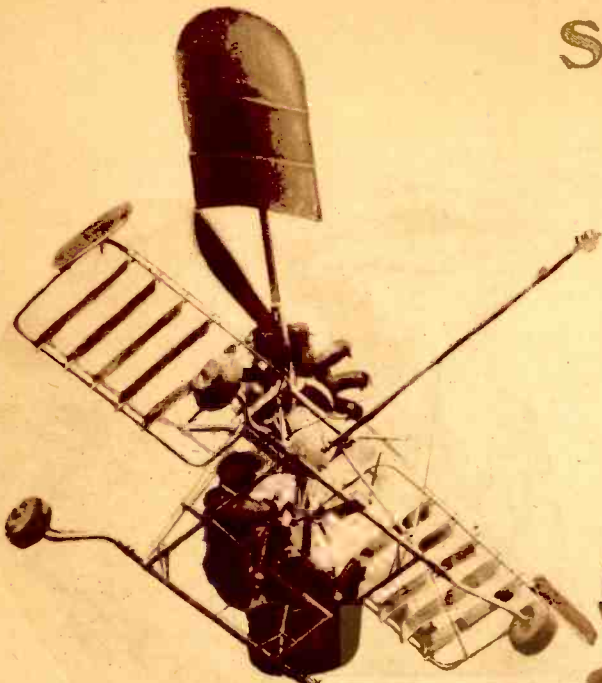
(Continued on page 620)



"—and as the projector began to automatically throw the images on the screen, Silas beheld a vision that filled him with delight. It was a real city which was depicted here, with houses of magnificent architecture but altogether different from our modern ugly buildings. They were more in the Oriental style of the Hindoos.—"

Scientific Innovations

Humorous and Peculiar Scientific Stunts



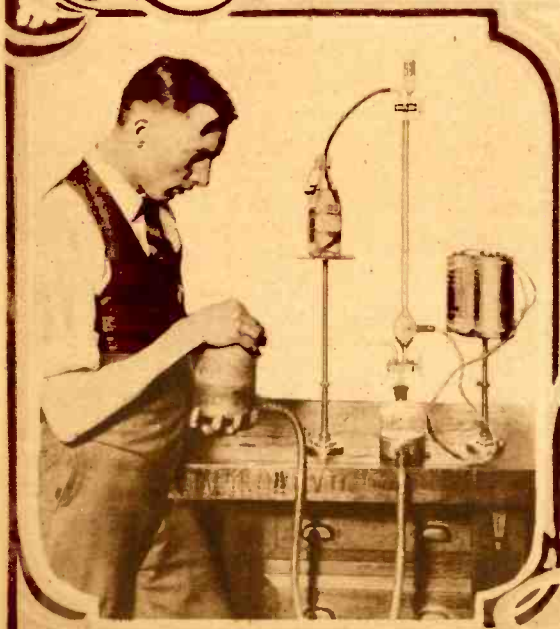
ANOTHER brave Helicopter experimenter met the end in Paris, which has befallen so many in recent years M. Doncharet, French air expert, and inventor of the helicopter, was acting as pilot. The machine rose only a few feet from the ground, when a sudden gust of wind capsized it. Neither the pilot or the machine were seriously injured. The aviator said that he would continue his work along the line looking for a solution of the problem. In the present instance a huge propeller acted as the lifting force.

We have wooden shoes, from Holland, grass shoes from China, carpet slippers from Turkey, and now the latest, none other than rubber shoes made from automobile tires. In the illustration at the right we see a gentleman using this latest method of beating the shoe profiteer at his own business. His shoes are made from segments of old tires.



Cooking on ice will at once appeal to the housewife as the very best method of preparing meals during the hot summer months. The kettle in the above photograph boils and boils, all the time setting on a cake of ice. The secret, however, is that the kettle contains not water but liquified oxygen at more than 300 degrees below zero. The cake of ice is truly a regular stove where liquid oxygen is concerned.

© Photograms, New York.



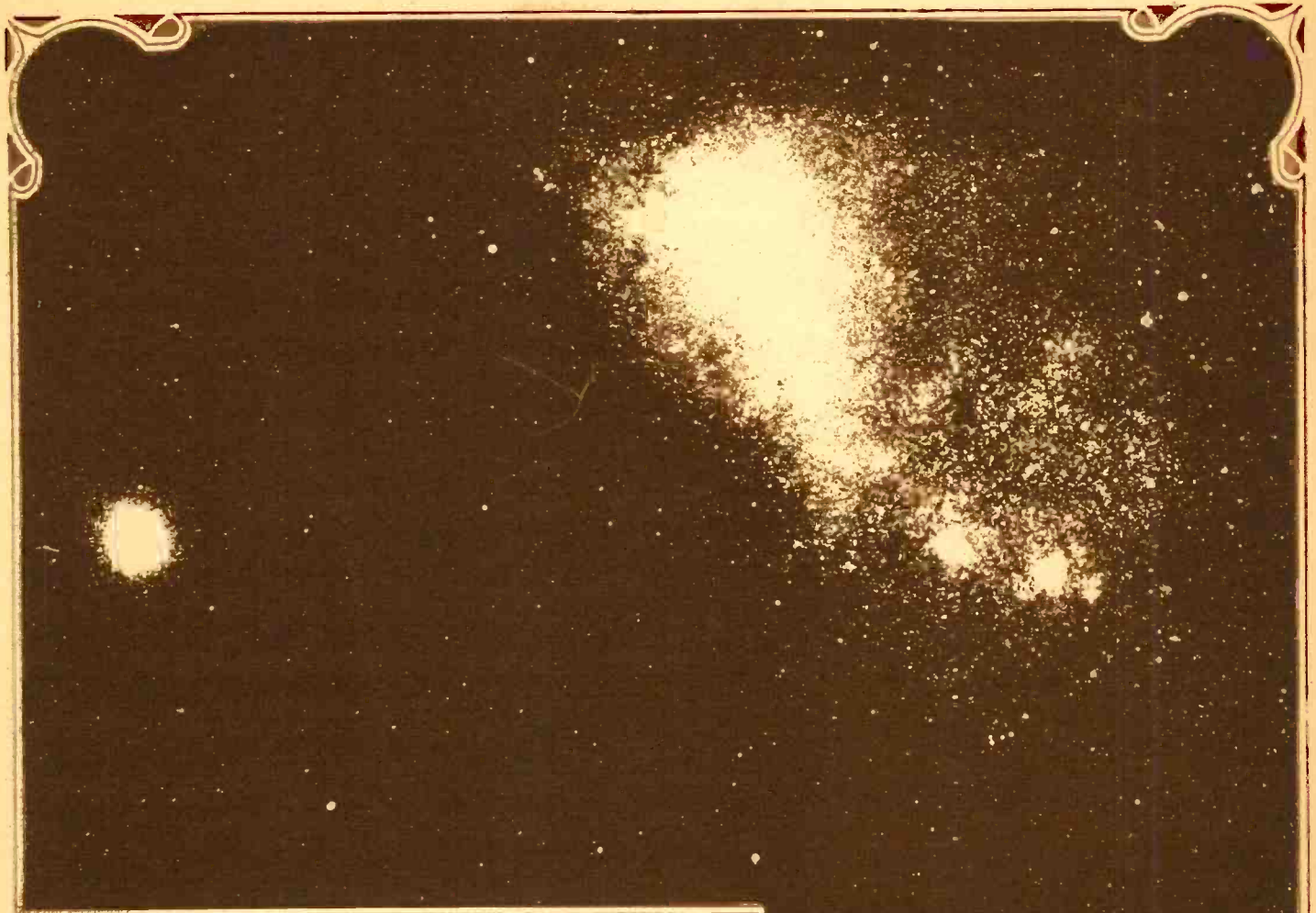
Probably the most ingenious and efficient tea-maker ever brought out is shown in the left illustration. It is the invention of Major Dopping Hepenstal. An alarm clock lifts a match from a container, strikes the match, holds it to the wick of a spirit lamp under the tea kettle and so starts things moving. When the tea comes to a boil, it is automatically poured into the pot.



Since the diplomats discovered a few months ago, that oil would probably win the next war, the Bureau of Standards, has taken extreme interest in it. Above is shown their latest device for prospecting. By testing the gases, found in spring waters, the Bureau can ascertain whether oil or gas is in evidence and how far it is distant from the source of water.

Our Sun Is a Pygmy

By CHARLES S. HOWARD, Ph.D.



The Small Magellanic Cloud is a group of stars and nebulae. It is not visible from the Northern Hemisphere and received its name from Magellan, the well-known explorer, who saw it on his visit to the southern part of the world. Astronomers at Harvard Observatory have measured its distance. It is 600,000,000,000,000,000 miles away, its light, traveling 186,000 miles a second, takes about 100,000 years to reach us.

SOME STARS IN THE CLOUD ARE AS MUCH BRIGHTER THAN OUR SUN AS AN ARCLIGHT IS BRIGHTER THAN A CANDLE FLAME

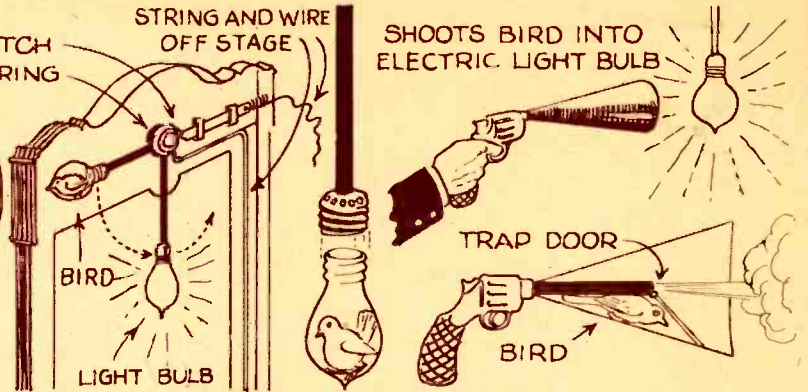
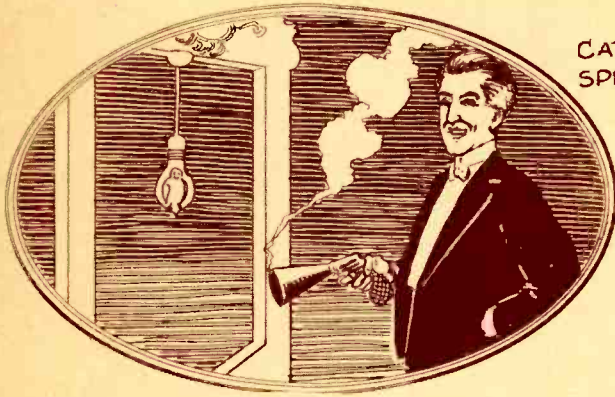
To gain some idea of the huge size of the object it might be said that light takes about 30,000 years to pass from one end to the other. If a star as bright as our own sun were in the Magellanic Cloud the largest telescope on earth would be unable to see it. All of the stars visible are hundreds and some of them thousands of times brighter than the sun. The very brightest stars ever found are some of these in the Cloud. They radiate about 50,000 times as much light as our sun. When Mt. Wilson measured the diameter of the star Betelgeuze a few years ago we thought we had reached the limit of largeness when it was found that it would about fit inside of the orbit of Mars. The largest Magellanic Cloud stars have diameters of the order of magnitude of the orbit of

Jupiter, about 900 million miles. It would take 30,000,000 suns to fill the volume occupied by the star Betelgeuze, but it would take thirty stars the size of Betelgeuze to equal one of these huge Magellanic Cloud stars.

Magic for Everybody

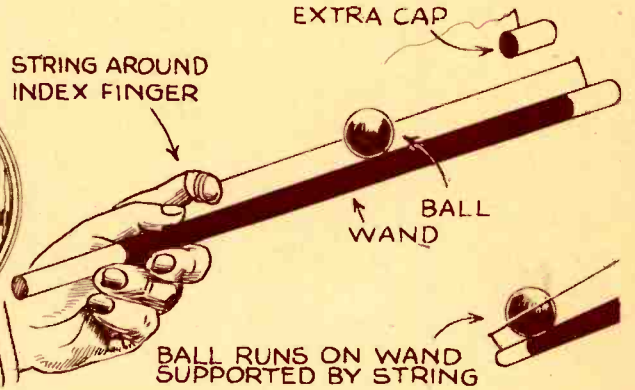
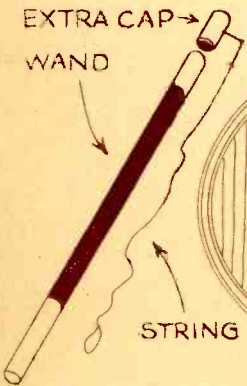
By Prof. JOSEPH DUNNINGER

NO 19 OF A SERIES



The magician places the bird in a prepared compartment in the pistol, fires at the bulb and behold, the bird is in the bulb. An assistant behind scene

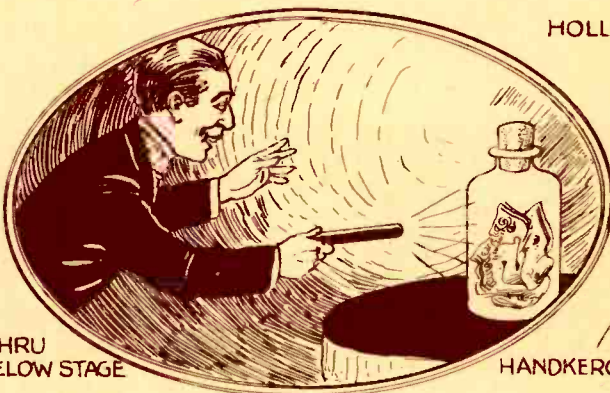
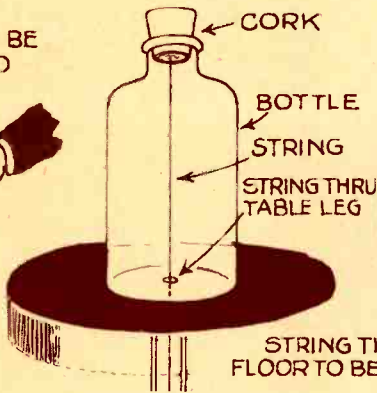
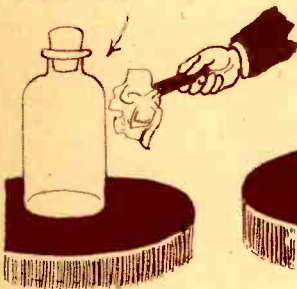
pulls a string which drops the bird into view with the device shown. The magician breaks the glass and the bird flies away.



The conjurer becomes a juggler, the billiard ball rolls up and down his wand. An extra cap with a string attached and a billiard ball balanced be-

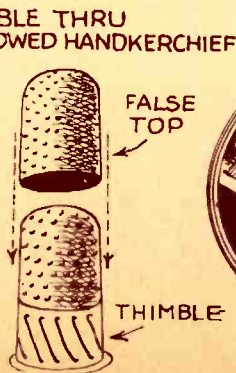
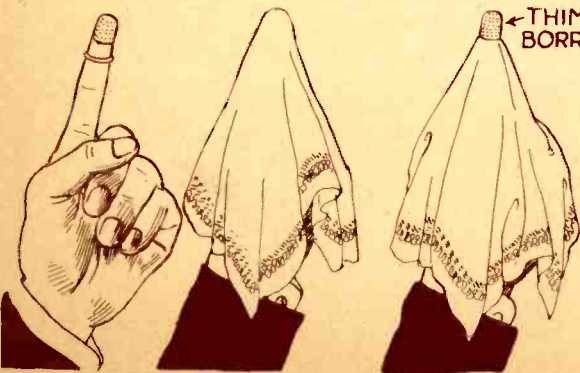
tween the string and wand make the stunt easy. The false tip of the wand is removed before passing it out for examination.

HANDKERCHIEF TO BE PUT INTO CORKED BOTTLE



A magician forces a handkerchief into the barrel of a gun, and fires with the barrel pointing toward the bottle resting on a table and lo, the hand-

kerchief is found in the corked bottle. The trick is explicable seeing the hollow cork holding a second handkerchief. The string passes to an assistant.

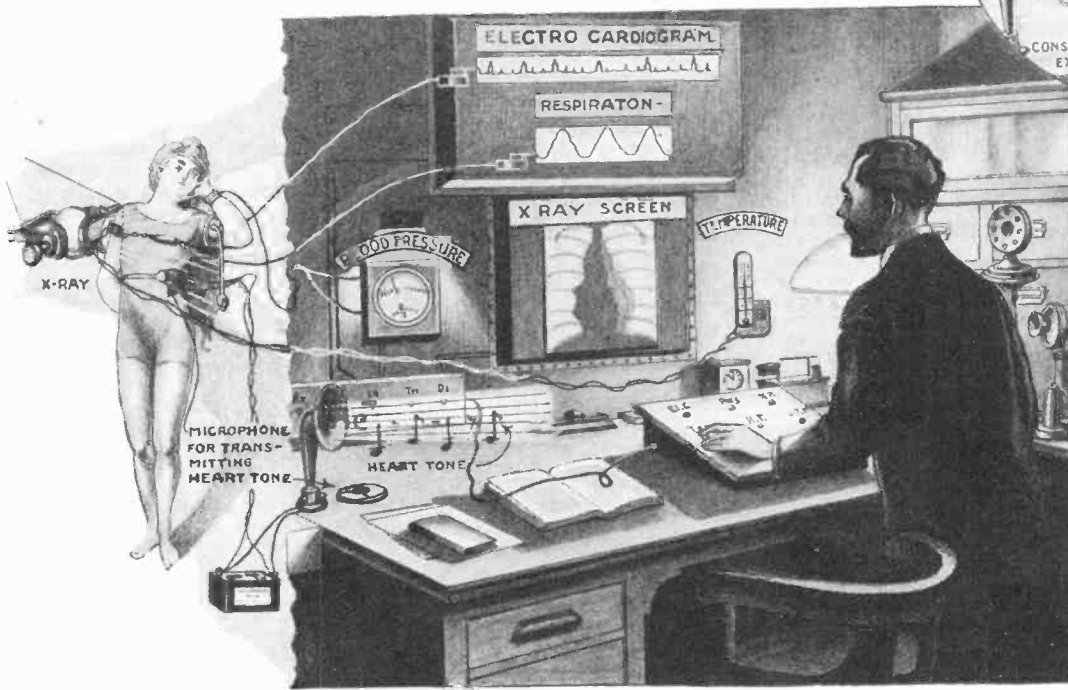


To pass a thimble through a handkerchief without making a hole in it is the magician's next stunt. However, it is quite simply performed if the thimble

is equipped with a duplicate top, such as the one shown in the above illustration. Dexterity is all the magician needs for performance.

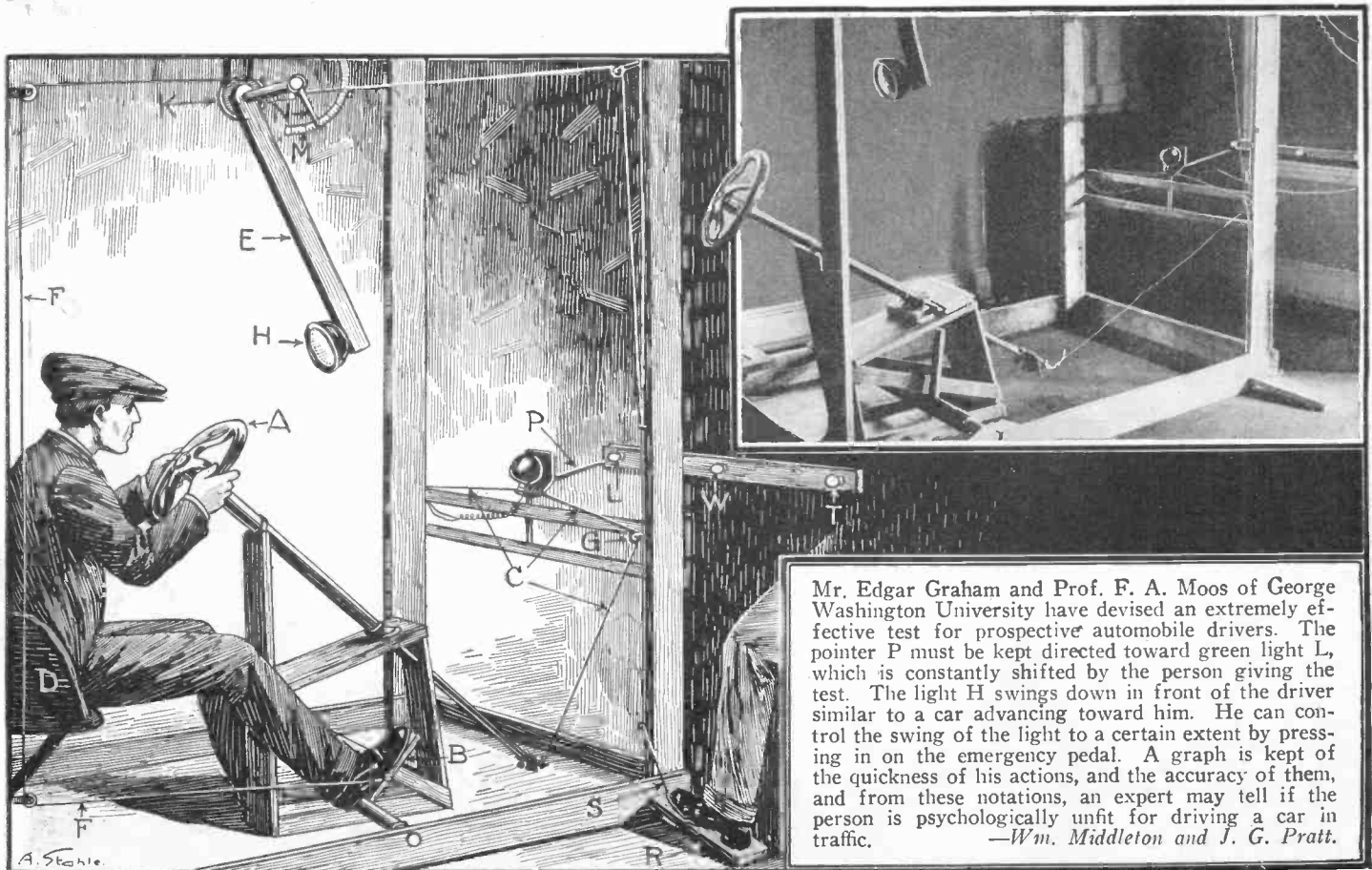
Specialist Brought To Every Town

Electric Transmitting Devices Carry Symptoms



WITH the aid of electrical indicating devices, it is easily possible to transmit the findings of any disease over wires from one place to another with almost absolute accuracy. The ideas necessary are shown in the illustration here with. A cardiograph is attached to the patient's two wrists and the variations in the current can be made to register in the distant specialist's office. Respiration pressure is transmitted through a carbon rheostat, the same as is the case with the blood pressure. The heart tone is transmitted by a radio microphone, temperature through a thermocouple. An X-ray of the infected member is transmitted by television.

Ingénious Driver's Test

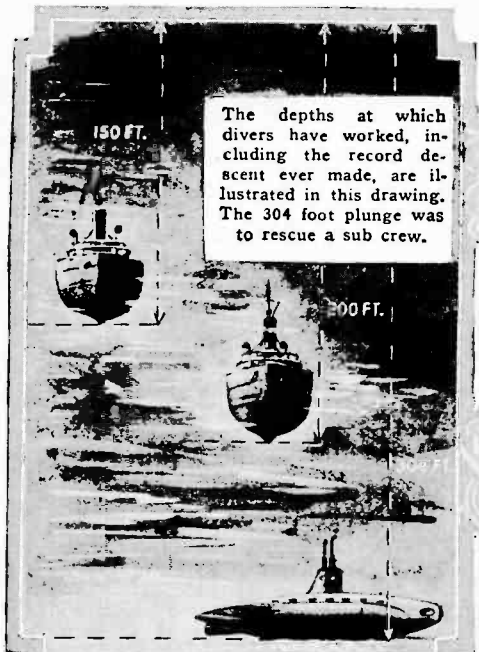


Mr. Edgar Graham and Prof. F. A. Moos of George Washington University have devised an extremely effective test for prospective automobile drivers. The pointer P must be kept directed toward green light L, which is constantly shifted by the person giving the test. The light H swings down in front of the driver similar to a car advancing toward him. He can control the swing of the light to a certain extent by pressing in on the emergency pedal. A graph is kept of the quickness of his actions, and the accuracy of them, and from these notations, an expert may tell if the person is psychologically unfit for driving a car in traffic.

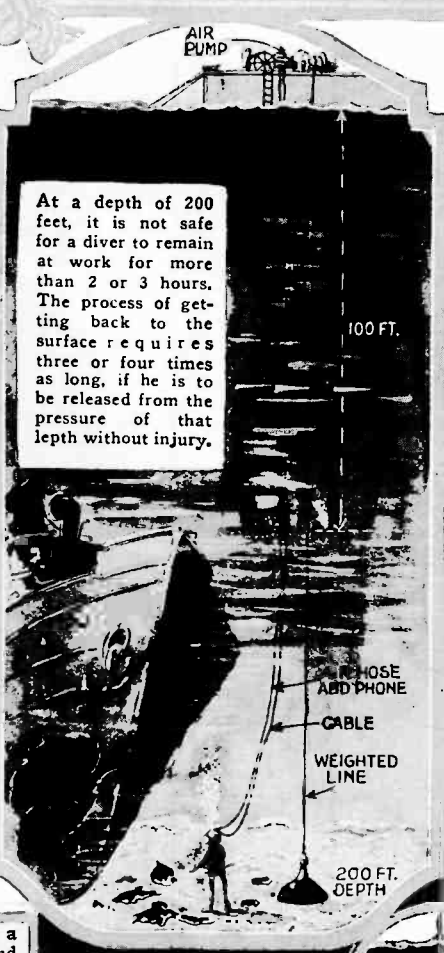
—Wm. Middleton and J. G. Pratt.

Cracking Davy

H. WINFIELD

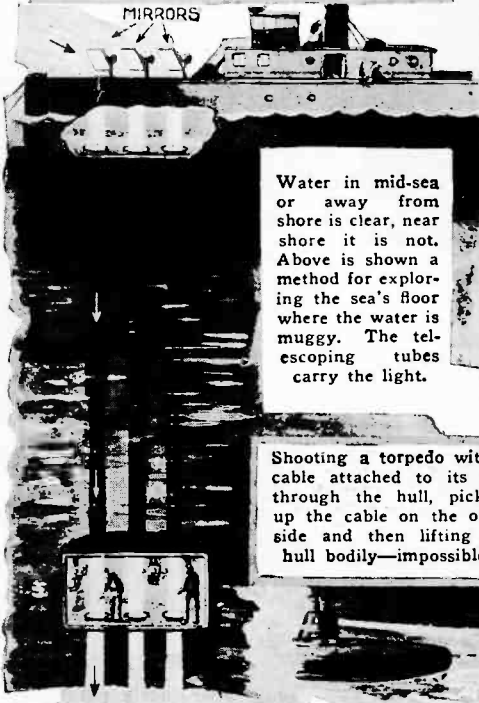


The depths at which divers have worked, including the record descent ever made, are illustrated in this drawing. The 304 foot plunge was to rescue a sub crew.



At a depth of 200 feet, it is not safe for a diver to remain at work for more than 2 or 3 hours. The process of getting back to the surface requires three or four times as long, if he is to be released from the pressure of that lepth without injury.

MILLIONS of dollars lie entombed at the bottom of the sea. The history of attempts to reclaim this huge fortune reads like the very best romance. Men have given their lives, gambled everything in attempts to recapture this lost wealth. On these two pages we show the principal methods that have been used or suggested during these latter more scientific days to salvage the treasures of the deep. Practically every branch of science has played its part in some one of these essays. Men have salvaged treasure in the face of almost insuperable odds and then failed on another such test which seemed on first observation to be simple enough. Some of the greatest feats of under-sea work, however, were accomplished for the sake of human life, particularly for rescuing men imprisoned in sunken submarines. There are thousands of patents covering salvage methods.



Water in mid-sea or away from shore is clear, near shore it is not. Above is shown a method for exploring the sea's floor where the water is muggy. The telescoping tubes carry the light.

Shooting a torpedo with a cable attached to its end through the hull, picking up the cable on the other side and then lifting the hull bodily—impossible!!



Where a wreck has lain long and has disintegrated, a sand dredge pouring into a strainer often retrieves much valuable debris from the site of the sunken ship.



One of the most marvelous salvage projects ever brought to a successful close is that illustrated at the right. First examination proved that the strong box of the ship was incased in a veritable steel wall of twisted beams and wrecked decks. It was only reached by placing a charge of explosive near it, the diver leaving while the charge exploded, then returning, and time after time repeating the same process, until finally the wreckage was sufficiently cleared away to give access to the strong box, when another charge of explosive opened it, making its treasure accessible to the salvagers.

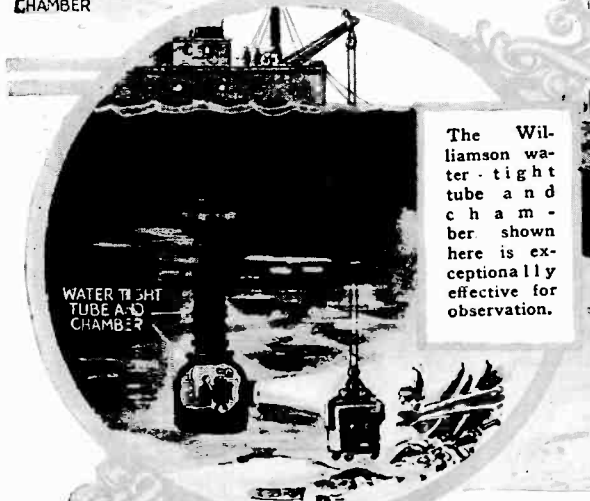


Jones' Locker

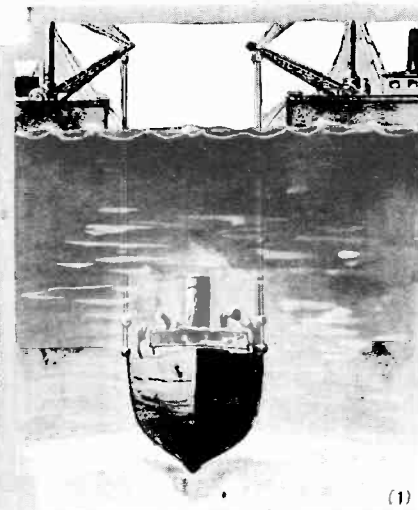
SECOR



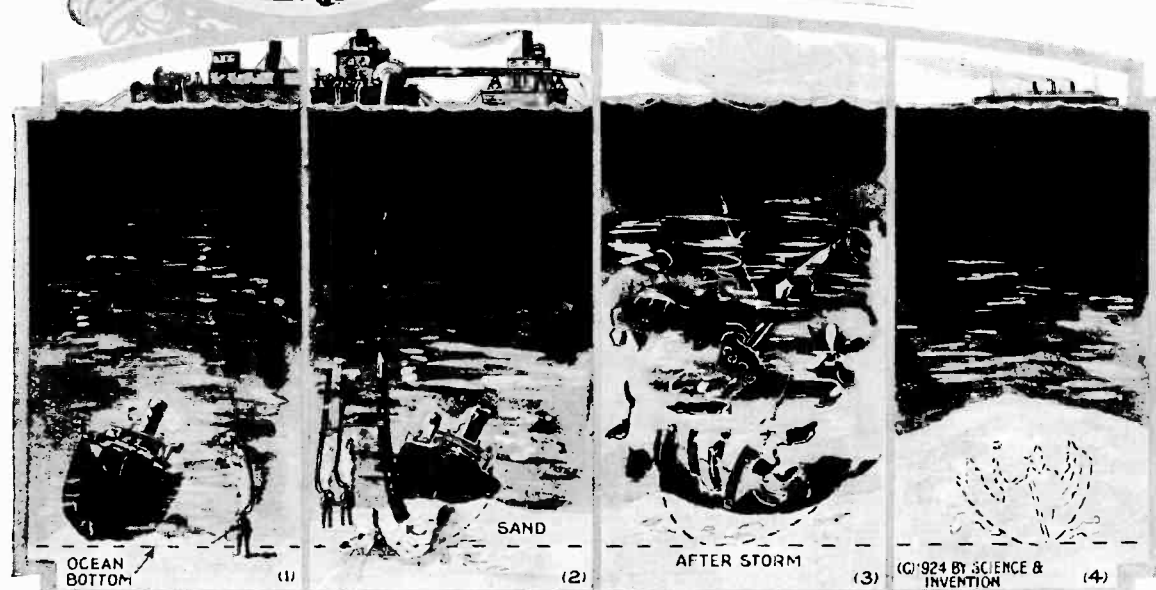
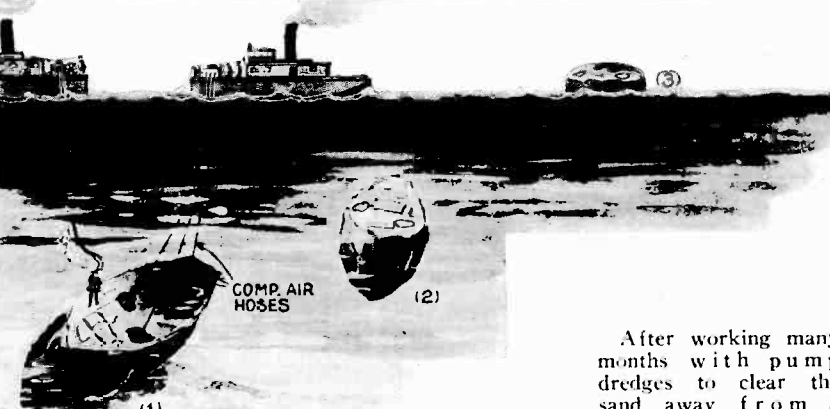
Another very effective method for salvage where the wreck is not too deep, is that shown above. A caisson or bell-like affair is let down near the outside of the sunken ship where the workmen make their first attack. This is Simon Lake's system.



The Williamson water-tight tube and chamber shown here is exceptionally effective for observation.



Many times a ship is broken in two when it hits the bottom of the sea. If such is not the case, however, cables may be let down and fixed to the side of the craft and it is raised by the aid of winches and hoists. This the English recently did.



After working many months with pump dredges to clear the sand away from a sunken vessel so that it might be salvaged, a storm came up forcing the salvagers to leave their work. When the weather cleared after a few months and the salvagers could resume their operations, it was found that the ship was broken into a thousand pieces and the remnant as before, covered with a ten foot layer of sand. Many thousands of dollars both in the original work, and in the second observation were entirely lost. Another method, however, more successful, is to make the hold of the ship tight and then fill it with compressed air, so raising it to the surface as shown above.

Gamblers' Tricks Exposed

By MARK MELLEN

The Man Who Fooled P. T. Barnum

SOME years ago I left a French port with a partner and of course night found us in the smoke room of the big liner, playing poker. There were two Frenchmen in the game who spoke only a few words of English—but they spoke another language which my confederate and I understood.

We had been playing but a few moments when one of the Frenchmen signaled he needed a spade to make a flush and quick as a flash the other Frenchie flashed back the O. K. The trick was turned neatly and when the first Frenchman threw his cards on the table, his partner spread the fifth spade. Of course, my partner and I said nothing. Wise people never holler—they drop out of the game, cheat the other sharks, or team up and all work together.

In this instance we did the latter. I shortly held four hearts and looked directly at the Frenchman. He looked at me for an instant and flashed the "go ahead" signal. I palmed the extra card and disposed of it in the deadwood and revealed a heart flush when my four cards were spread by the Frenchman and a fifth heart added.

We had found one language we could both understand.



It is first necessary for the sharps to signal among themselves in a poker game. The hand in the above circle shows one of the confederates signalling for a club. The second confederate, if he has the necessary card, gives his cigar an upward tilt, indicating that all is well. In this case the indication is to fill a flush or five cards of one suit. If a straight is needed by a similar system a card above or below the one desired is shown with the finger.



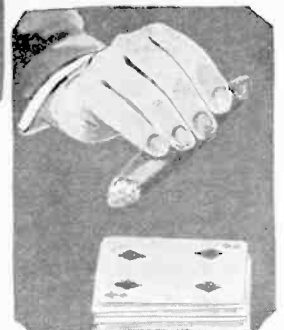
The same scheme is worked in stud poker. In such cases marked cards are used and the worker or man who reads the cards, signals his confederate what to do. The fingers on the card now reveal what the sucker has in the hole. One finger means ace, two fingers a king, etc. It is easily seen that this system allows the sharps to know exactly what an opponent has in the hole and consequently what his full hand contains.



After the signals have been passed across by means of the cards and fingers as in the circles at the top of the page, it is a comparatively easy matter of course to make a full hand with the aid of "spreading." If one player has a bob tailed flush, he asks his confederate for his missing card and the confederate signals yes with his cigars. The player with the flush lays his four cards on the table. The confederate takes the fifth card necessary to complete the hand, holds it back far in his palm, and then makes some such a remark as let's see them and at the same time fanning the cards out on the table and adding the fifth, thus completing the hand. I have met a great number of sharks who know how to collect the money with this method from the suckers, but I have never met one who knew how to keep it. Invariably the wise gent in one line is the fall guy in some other game.




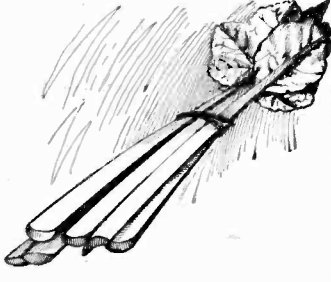
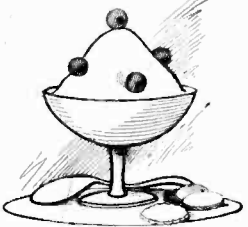
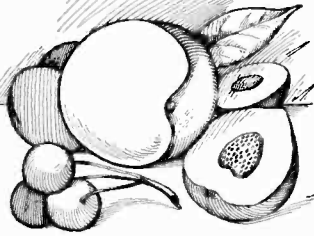




The above illustration shows the method used in palming the card to be spread in the confederate's hand. The extra card in the confederate's hand is passed into the dead wood.



In playing whist it is frequently a great aid to know what suit your partner would like to have you lead. This is easily arranged by unscrupulous sharps. The manner in which the cigar or cigarette is held conveys this information. In Figure 7 the signal, if used in a whist game, means "Lead a heart." The two fingers on the cigar give the "office." One finger over the cigar would "tip" your confederate to lead a spade. Three fingers over the cigar, as in Figure 8, reads to the experienced grafter, "Lead a club." And four fingers would be interpreted, "Lead a diamond." Figure 9 shows cigar held between index and second finger, with the burning end up. In a whist game this, in the land of graft, reads, "Take this trick regardless of rules as to high or low play."

Poisons We Eat Every Day

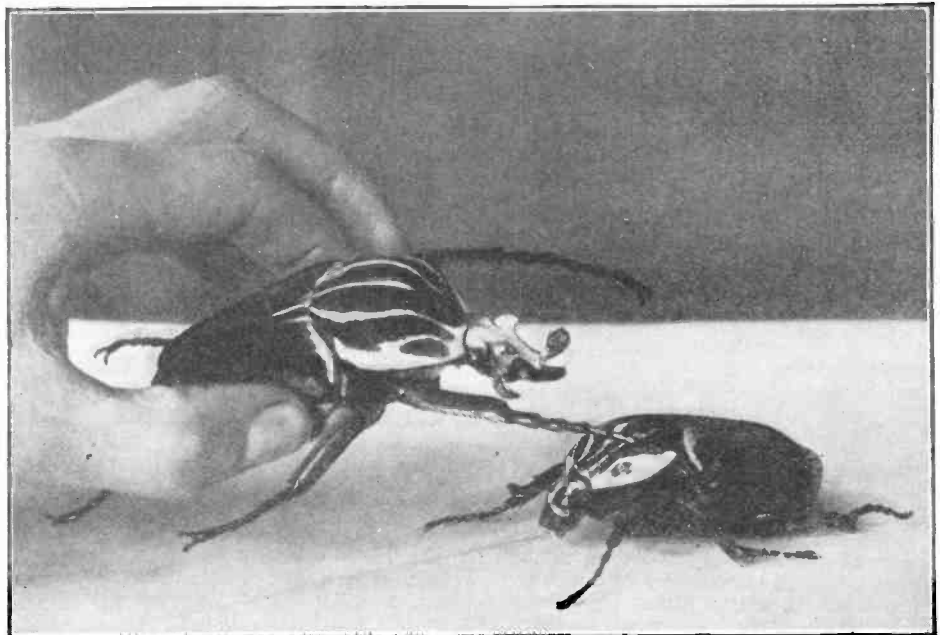
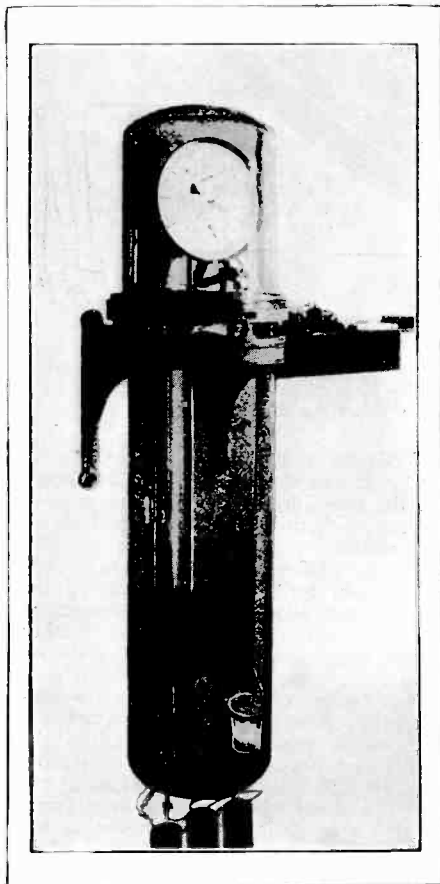
 <p>BURNING FATS PRODUCE IRRITATING AND POISONOUS ACRYLEIN VAPORS</p>	 <p>PIPERIDINE IN PEPPER SALT IS SODIUM CHLORIDE</p>	 <p>SALTPETRE IS USUALLY IN HAMS AND SALTED MEATS</p>	 <p>OXALIC ACID IS FOUND IN RHUBARB</p>
 <p>MARASCHINO CHERRIES CONTAIN BENZALDEHYDE AND A COAL-TAR COLORING</p>	 <p>AMYGDALIN PRESENT IN PEACH, CHERRY AND PLUM KERNELS, PRODUCES DEADLY PRUSSIC ACID WHEN CHEWED.</p>	 <p>ROTTEN EGGS OWE THEIR ODOR TO POISONOUS HYDROGEN SULPHIDE GAS</p>	 <p>WE COULD NOT LIVE IN AN ATMOSPHERE OF CARBON DIOXIDE GAS-THE FIZZLE IN THE SOFT DRINKS</p>

That we eat enough poison in a lifetime to deplete the ranks of an army may be seen by examining the above illustrations. The mere burning of fat in a frying pan produces a gas that is poisonous. In our two chief flavoring compounds, pepper and salt, there are two compounds that if used alone in any quantity would be deadly. In salted meats

and maraschino cherries there are substances used in their preparation that are hardly healthy. The toxic effect of peach and cherry pits is well known. In rhubarb there is oxalic acid. We could not live in an atmosphere of carbonic acid gas which is used in the bottling of soda water. —Raymond B. Wailes.

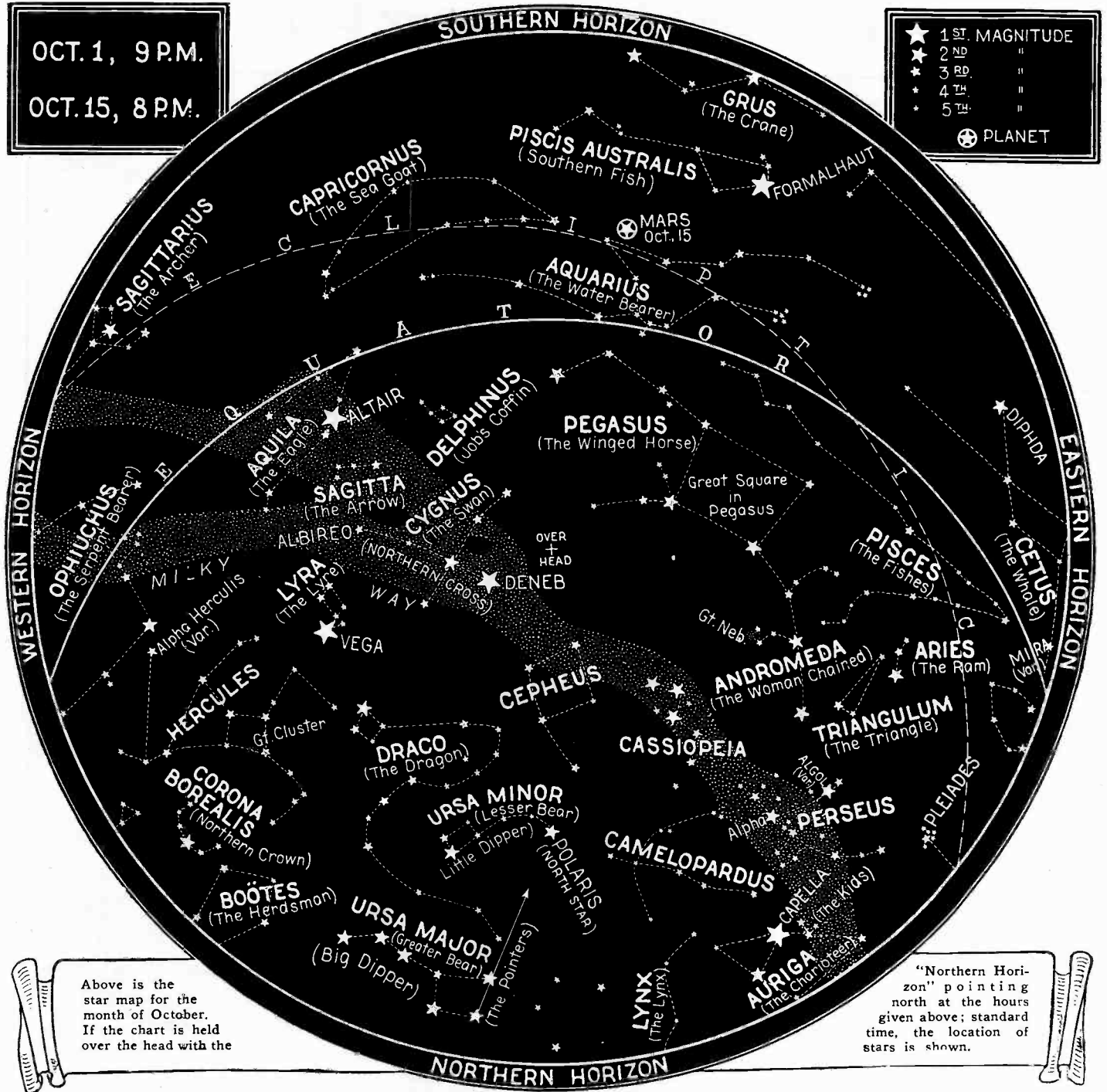
Precision

Beetles Pets of Scientist



An English scientist has two very singular pets. They are a pair of African Goliath beetles, one of the largest of the beetle species. In spite of their formidable size, which may be judged by comparing them with the hand that is holding one of them, they are quite tame and will come to their master's hand for bits of food. They are entirely harmless in spite of their appearance. —S. L. Bastin.

At the left is shown the precision clock at the Case School of Applied Science, Cleveland, Ohio. It is one of the most accurate clocks known, varying only a few thousandths of a second a day. The pendulum and rod are of Invar, an alloy whose coefficient of expansion approaches zero. The clock is kept in an airtight case and is regulated by the air pressure inside the case. —Dayton C. Miller.



The Heavens In October

By ISABEL M. LEWIS, M.A.
of the U. S. Naval Observatory

IN the south and southeastern part of the heavens this month we find that all of the constellations are in some way associated with water. In fact this part of the heavens was known to the Chaldeans, famous astronomers of antiquity, as The Sea. In classic times the winter solstice, which marks the most southern point in the sun's yearly circuit of the heavens was located in the constellation of Capricornus, The Sea-Goat, and the sun was in this constellation or in the constellation Aquarius, The Water-Bearer, next to it on the east, during the rainy season which probably accounts for the aquatic nature of these groups and others nearby. To the south of Aquarius is the Southern Fish Piscis Australis and to the east Pisces, The Fishes, with heads widely separated and tails bound together. Next to Pisces on the east

is the huge constellation of Cetus, The Whale. There are, then, three fishes, a whale, a water-bearer with his overbrimming urn pouring forth a stream of faint stars toward the southeastern horizon, and a sea-goat in this part of the heavens, a truly aquatic assemblage!

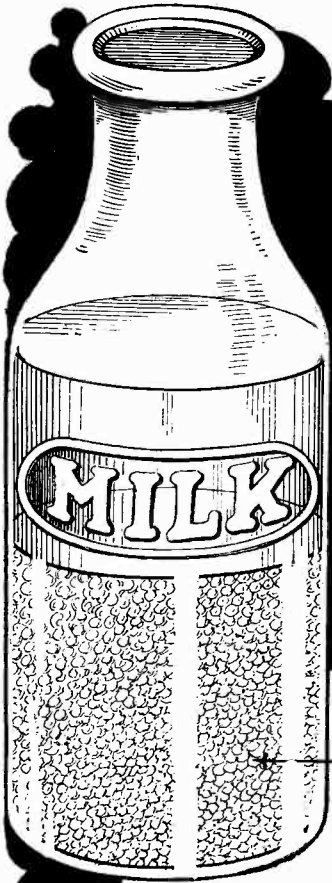
Were it not for the presence of the brilliant planet Mars in Aquarius at this time there would be but one bright star visible in the southeastern heavens this month. Fomalhaut, the white, first magnitude star in Piscis Australis, distant from the earth twenty-five light years or one hundred and fifty trillion miles, enjoys the distinction of being the farthest south of all the first

magnitude stars visible in the latitude of New York. In the latitude of Charleston, S. C. the magnificent Canopus also appears above the southern horizon for a brief period in the winter. Aside from Mars and this solitary star of first magnitude there is little to attract our attention in this part of the sky. The constellations that lie in southern skies in the belt of the zodiac on October evenings, Capricornus, Aquarius and Pisces, contain no conspicuous stars although they contain a number of third and fourth magnitude stars. Aquarius, the largest of the three groups, covers a large area in the south and southeast and can be identified by the presence in it of the planet Mars at the present time and by the little Y-shaped group of fourth magnitude stars representing the water-urn from which a stream of stars

(Continued on page 624)

Casein and Its Use

By RAYMOND B. WAILES



CASEIN, the wonder substance, is produced from milk, the cure-all. Skimmed milk is usually employed, and simply adding an acid such as vinegar, which is about 5 percent acetic acid, precipitates casein. This is also called "curd," and may form naturally even without the addition of the acetic acid. The curd is allowed to settle and is then filtered off. This curd when dried, is the commercial casein and is used in many different ways. In every day substances it is used directly. It forms the basis of many of the massage rolling creams, dissolved in borax or soda solution it yields a good paste, which is used for sizing or coating papers and is also employed in calico printing. It gives paper a high gloss. Combined with rosin and vegetable oils it forms excellent insulators. By using a filler and adding formaldehyde to the product, imitation ivory results. Articles from this product can be molded under pressure. These articles will include checkers, chessman, billiard balls, dominoes, toys, cigarette and cigar holders and vanity outfits. Many medicines or "toners" are composed almost entirely, if not entirely, of casein. If casein is dissolved in a thick hot solution of sodium phosphate and glycerine, it produces artistic bottle seals. If formaldehyde is sprayed upon them, the casein becomes very hard and water-proof. Equal parts of casein, borax and lime produce a porcelain cement if but a little water is added to make a paste of the substances. Electrolytically casein has been produced by placing carbon electrodes in milk. Due to impurities of the carbon, the product is inferior to that produced by the acid process.



CASEIN

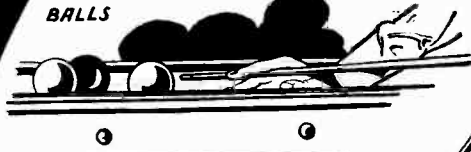
DOMINOES

CHESSMEN

CHECKERS



BILLIARD BALLS



CASEIN PAINTS WITHSTAND AGE



BOTTLE SEALS



PASTES, GLUES

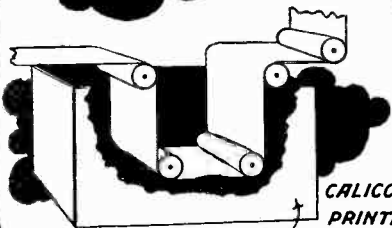


CARBON



POROUS JAR CONTAINING DILUTE MILK

ELECTROLYTIC CASEIN



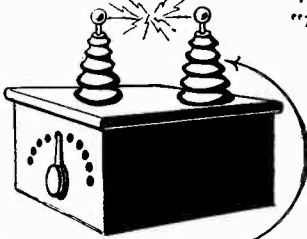
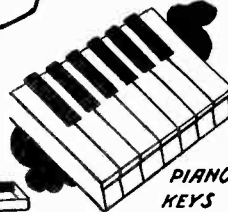
CALICO PRINTING

CASEIN-BORAX BATH

MEDICINES "TONERS"

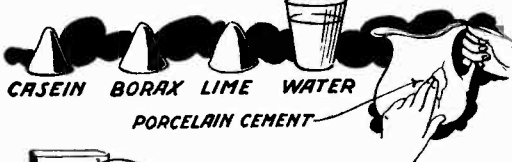


PIANO KEYS

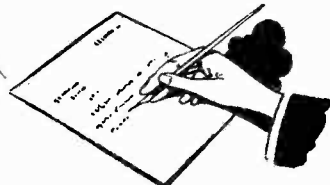


INSULATORS

CASEIN BORAX LIME WATER PORCELAIN CEMENT

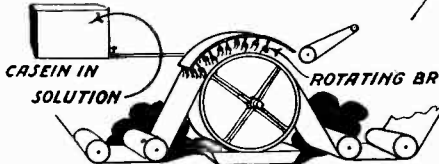


COATED PAPERS



CASEIN IN SOLUTION

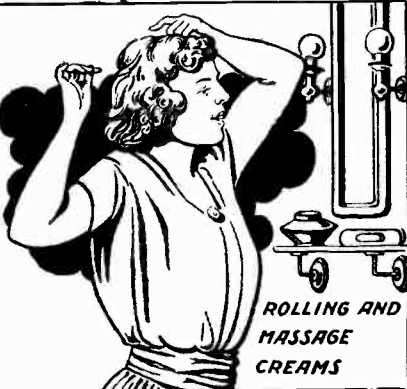
ROTATING BRUSHES



IF WALL PAPER IS TREATED AS SHOWN HERE, AND THEN SPRAYED WITH FORMALDEHYDE, THE PAPER CAN BE WASHED

"SYNTHETIC" MILK FROM CASEIN
 BAKING SODA 10 PTS CALCIUM CHLORIDE 2 PTS.
 CASEIN 75 " MILK SUGAR 6 PTS.
 BUTTER FAT 7 PTS.

CIGAR AND CIGARETTE HOLDERS



ROLLING AND MASSAGE CREAMS

Water Transportation

1 TON OR 33 BUSHELS OF GRAIN CARRIED 1 MILE BY 1 OUNCE OF COAL

COAL SIZE OF WALNUT

1 VESSEL CARRIES CROPS OF 250 FARMS OF 100 ACRES. HANDLED ABOARD OR OFF IN ONE DAY.

50 TON CROP OF 100 ACRE FARM HANDLED AT SHIPS TACKLES IN 6 MINUTES

1 TON OF GRAIN CARRIED 1 MILE FOR 1/5 OF A CENT FREIGHT CHARGES

Map labels: L. SUPERIOR, SAULT ST. MARIE, ST. LAWRENCE, L. HURON, DULUTH, CANAL, L. ONTARIO, NIAGARA FALLS, CLEVELAND, L. MICHIGAN, DETROIT, CHICAGO, L. ERIE.

Nowhere in the world may transportation be obtained as cheaply as upon our Great Lakes. Science and engineering have achieved one of their greatest victories in carrying products over these great bodies of water.

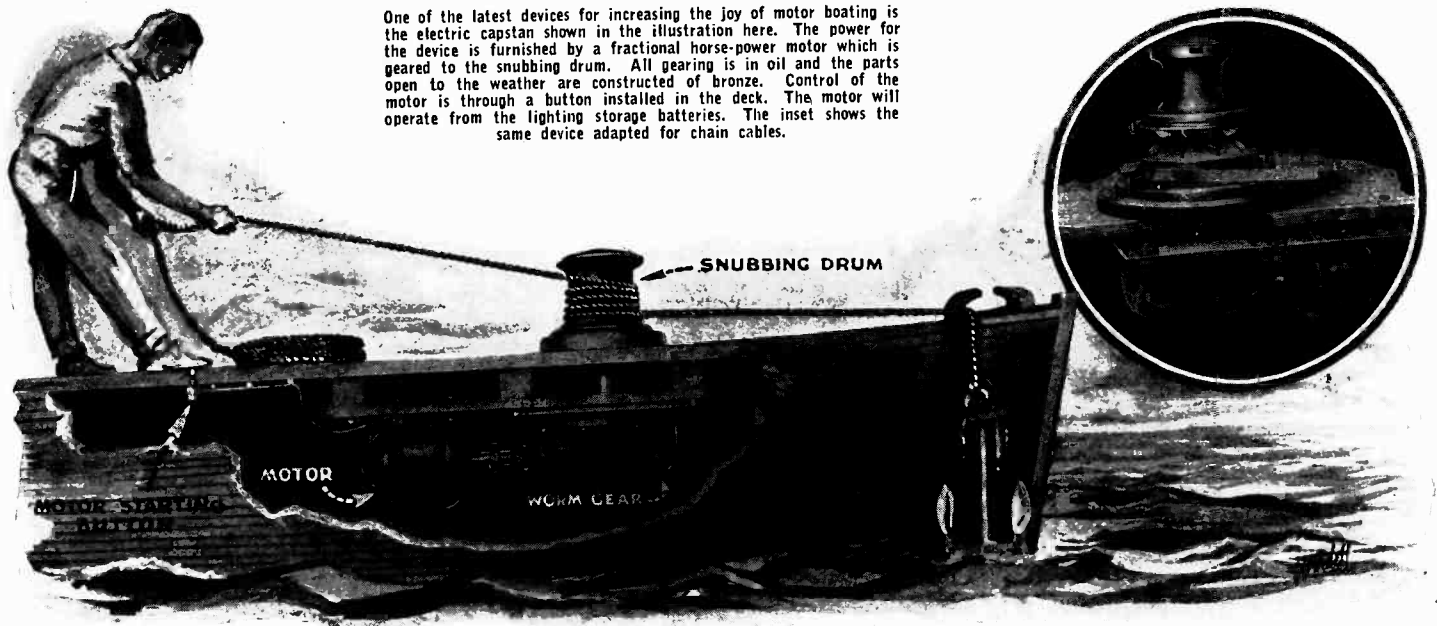
The amount of merchandise carried together with the time consumed in transportation, and some interesting figures of the cost of the process, are graphically shown in the above illustration. —Jack Bront.

The Lie Detector

The old days of the "third degree" in police investigations are on their way to the realm of history. The lie detector, shown above, by measuring with the aid of sensitive indicators on a graph chart, changes in the blood

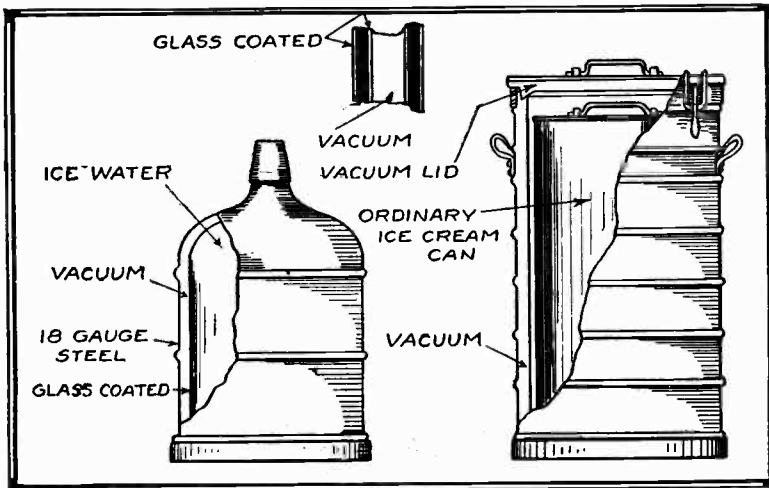
pressure and respiration rate, indicate when a suspect being questioned of is telling the truth or lying. Tubes convey variations in air pressure to sensitive diaphragms which actuate needles on graph chart recorder. —A. Sloan.

Electric Anchor Hoist

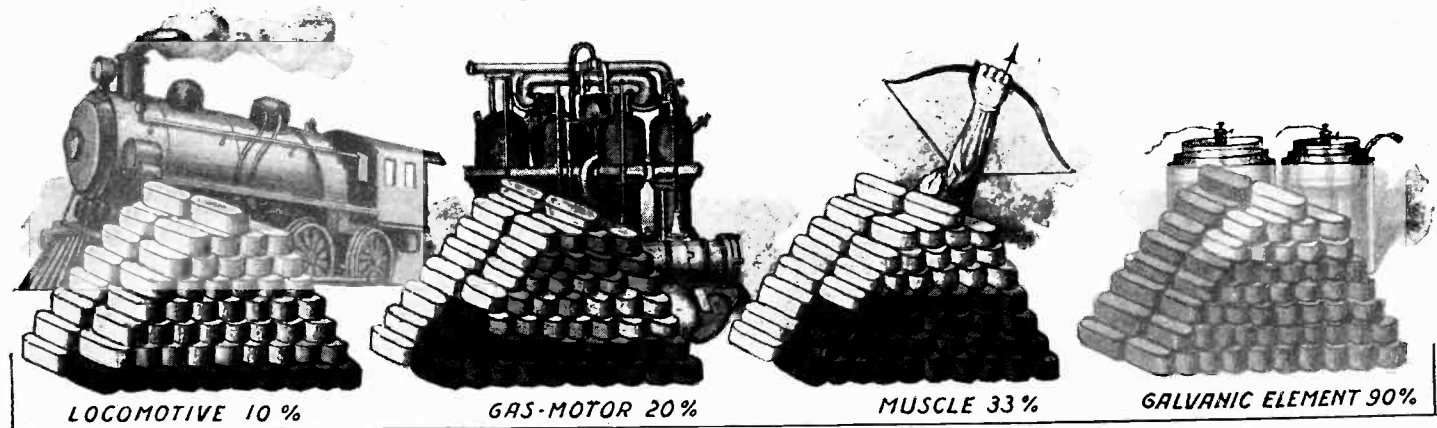


Vacuum Food Carriers

An application of the vacuum bottle for keeping foods at a certain temperature is shown here. These vessels will be found exceptionally handy by caterers in transporting foods and keeping them hot or cool over long intervals until they are served.



Comparative Efficiencies



Very enlightening are the comparative efficiencies of the various forms of prime movers shown above. From the total power producing fuel fed into the fire box of a locomotive only ten per cent of it is delivered as actual power at the periphery of the drivers. The internal combustion engine shows a bit better efficiency—twenty per cent of the fuel energy being actually transmuted into mechanical energy and delivered at the out-put

end of the crank shaft. Man, considered as a machine shows the next step in the efficient conversion of fuel into energy. His muscles will deliver about 33 per cent of the energy taken into his system. The most efficient of all the forms of energy converters is, however, the galvanic cell which transmutes 90 per cent. All efficiencies shown here are over-all, that is they show comparison from fuel to actual output.—From Kosmos.

Scientific Tumbler Tricks

By WALTER B. GIBSON



The problem in the trick shown at the left is to remove the top glass and drink the water in the bottom one without touching them with the hands. The top glass is removed with the chin as shown and the bottom one is tipped on the edge of the table with the teeth so that the water may be imbibed.



Blow through a glass of water? Impossible! Well, try it anyway. Set a lighted candle immediately behind a glass as shown and blow from the opposite side. The flame will be extinguished. The air currents join on the opposite side of the tumbler.

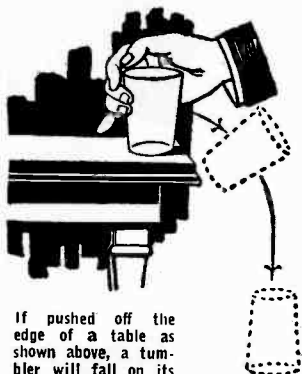


Ordinarily a sheet of writing paper supported at its ends would never support the weight of a tumbler. Corrugate it as shown above and no trouble will be experienced in making it support a glass.



MATCH STICK

Some little bit of dexterity is needed in the performance of this stunt. A full glass of water is balanced on edge on the tablecloth. The stunt is quite impossible to any but the experienced juggler unless the aid of the match stick beneath the table cloth is sought as shown in the above illustration. If this is used, however, a little practice and a steady nerve will enable anyone to perform it. The match may be placed and removed without the observers noting it.

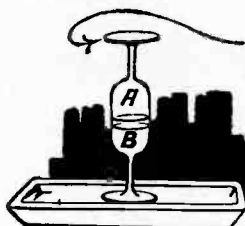


If pushed off the edge of a table as shown above, a tumbler will fall on its rim and the shock will not break it. This stunt should be practiced before public performance is attempted — and practiced over a pillow.

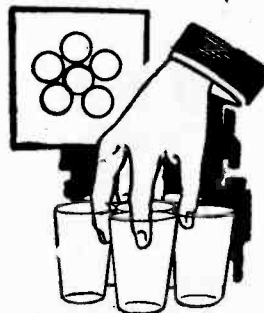
With the glasses placed as seen below, the bottom one filled with water, the question is to pour the water from B to A without handling the latter. Performance is accomplished by gripping A with the teeth and raising it to an upright position as shown and then pouring the liquid into it. Be careful of the added weight of the water, it may bring about disaster.



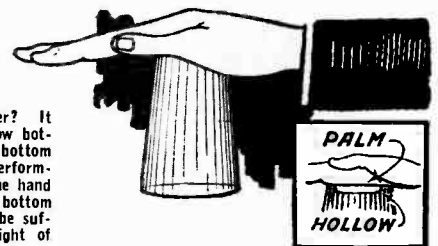
TAKE HOLD WITH TEETH HERE



In the above illustrated stunt the napkin may be pulled out from under the tumbler of water by giving it a sharp jerk. At the left below is shown the method of picking up six glasses at once. Each of the fingers holds an outside one while the inward pressure holds the center one.



Magnetize the bottom of a tumbler? It can be done if a glass with a hollow bottom is selected and the rim of the bottom is slightly dampened before the performance of the stunt. The palm of the hand is pressed down firmly upon the bottom and the slight vacuum formed will be sufficiently strong to support the weight of the glass.

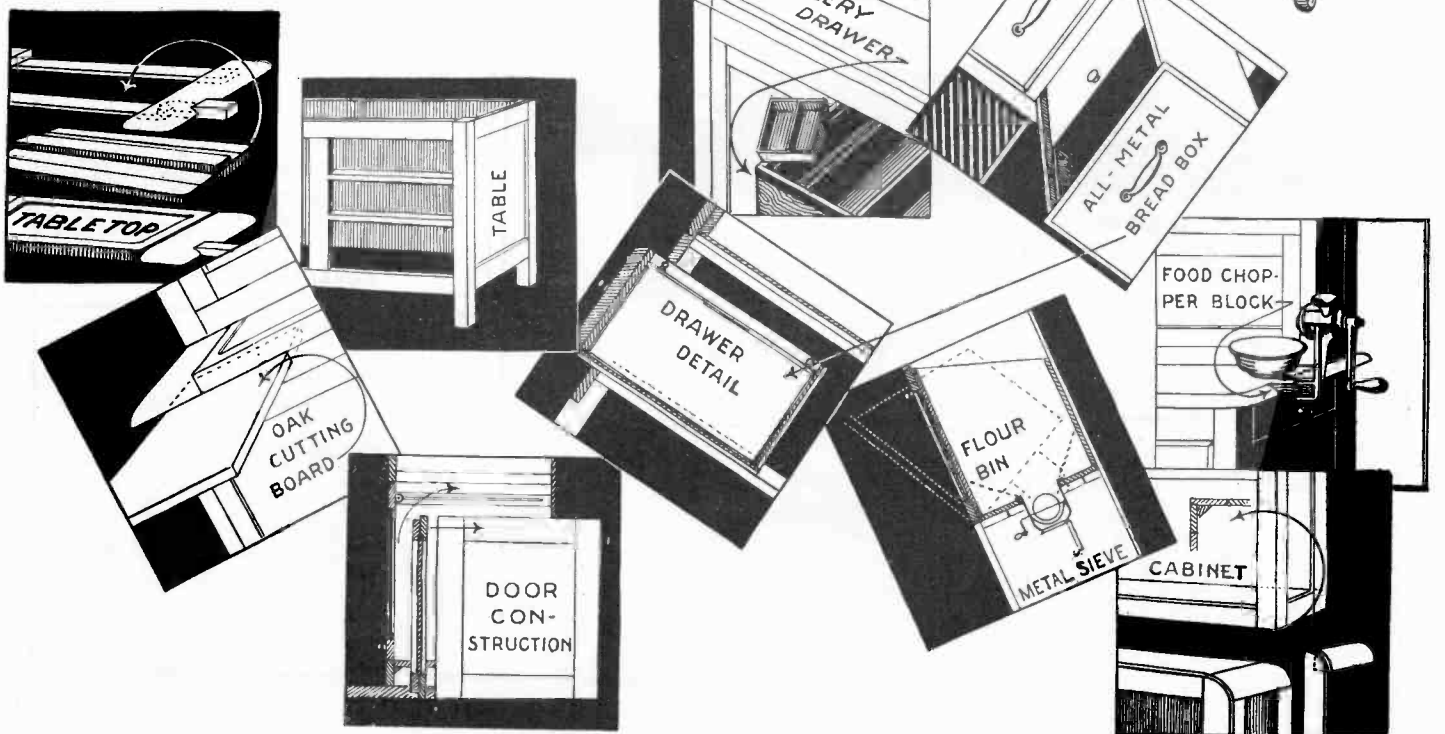
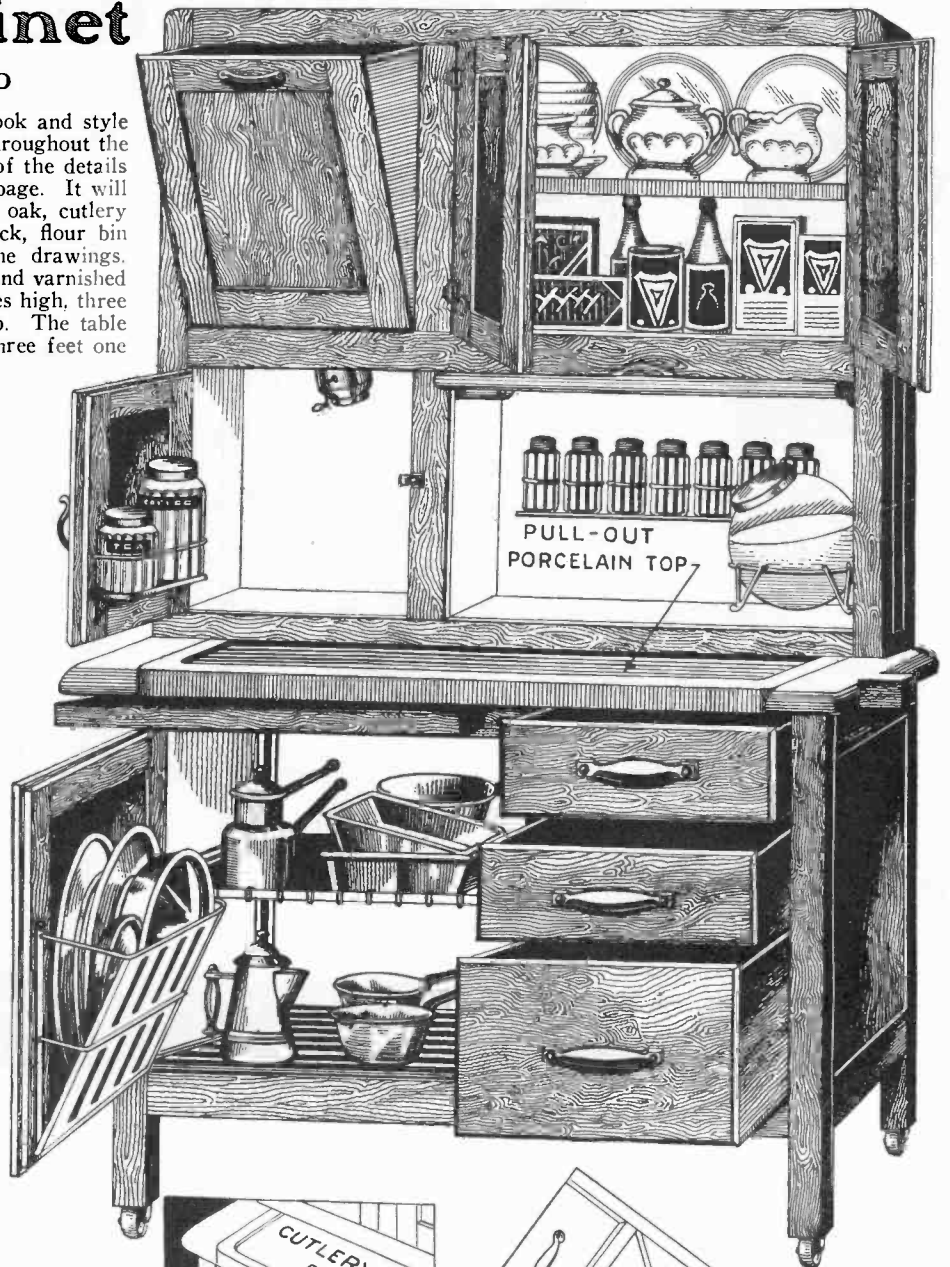


Kitchen Cabinet

By WILLIAM M. BUTTERFIELD

A KITCHEN cabinet that will have the look and style of nearly every cabinet sold anywhere throughout the country can be home built with the aid of the details and perspective drawings shown on this page. It will have a pull-out porcelain top, cutting board of oak, cutlery drawer, all metal bread box, flour bin and many other conveniences suggested by the drawings. The cabinet can be made of hard or soft wood and varnished or enameled. The cabinet is five feet eight inches high, three feet six inches wide and two feet one inch deep. The table is two feet seven inches high. The cabinet is three feet one inch in height. The cupboard and drawer spaces are made in proportions about as shown, no definite sizes are given.

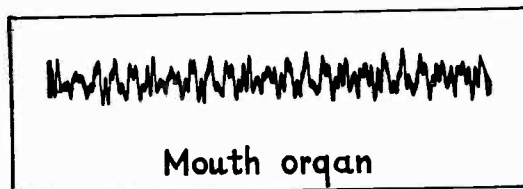
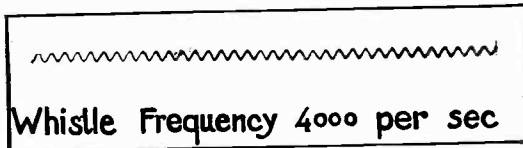
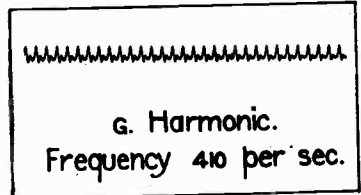
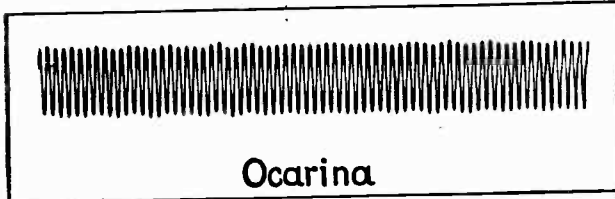
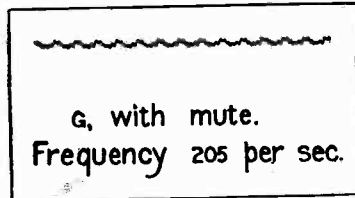
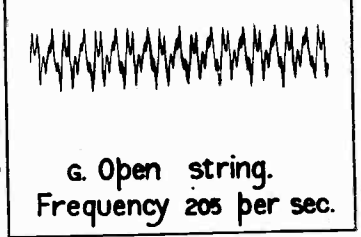
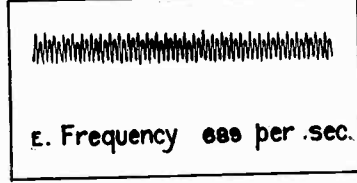
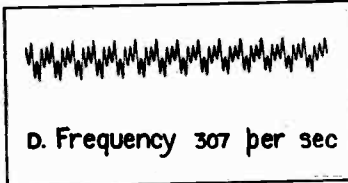
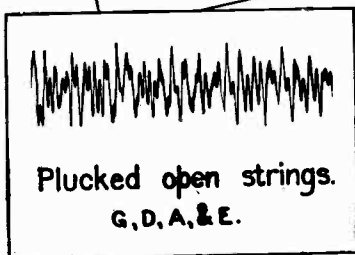
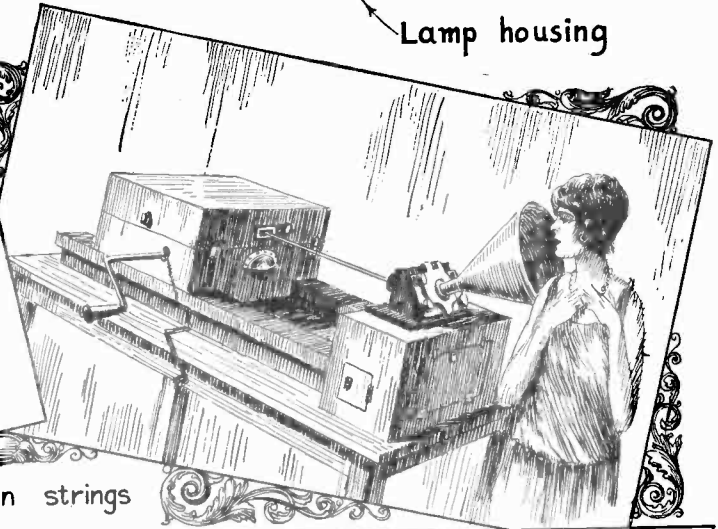
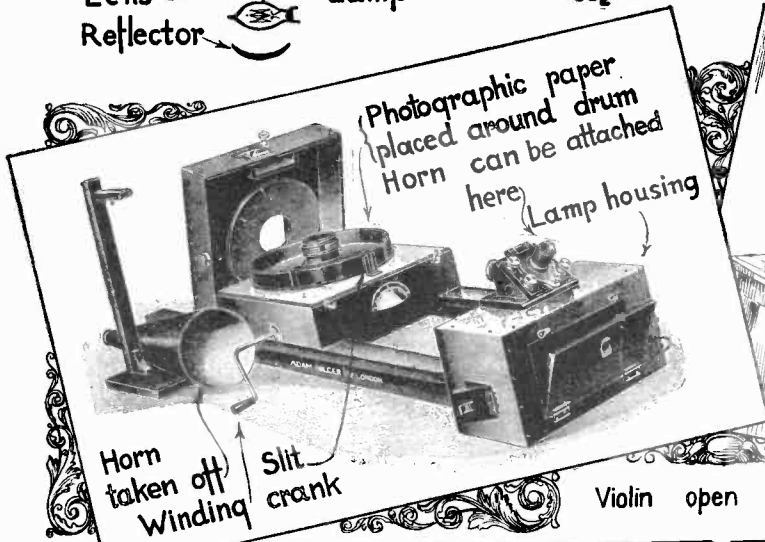
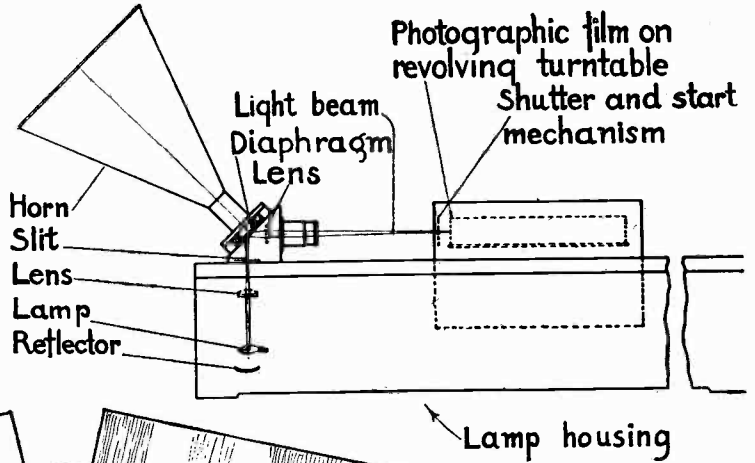
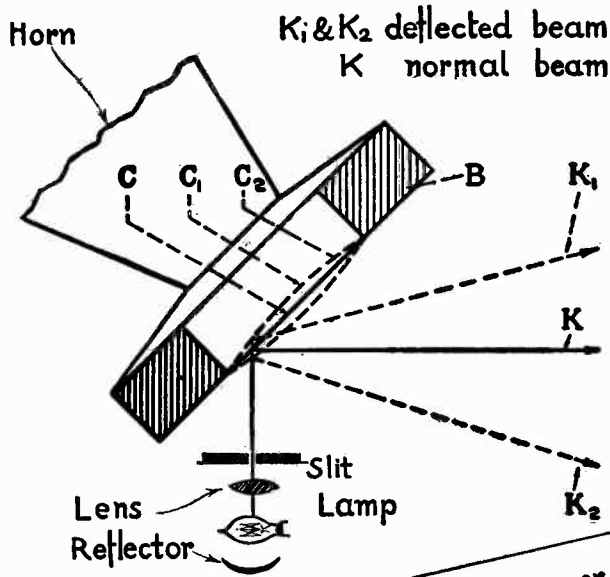
Porcelain fittings can be obtained in many colors and styles—their holding shelves or racks are of course made to fit the style selected. The sugar jar shown here is an improvised, glass aquarium with its holding rack, a metal top of convenient size is used to cover the jar. The metal shelf and trays for the utensil cupboard are made of copper and then enameled. The flour bin is made of wood with a common commercial metal sifter fitted in the bottom as shown in detail. The sifter will require an extra piece of metal soldered at the top to connect it to the bin, and a cap hinged at the bottom to close that opening when not in use. The bin and sifter should be so constructed that by tilting forward the bin can be removed from its cupboard like a drawer. The all metal bread box is an ordinary sliding top box placed in a drawer built to fit it. This box will probably determine the size of the drawers. One of the cupboard doors is made for convenience to open sectional-book-case-style by sliding vertically into a slot. The ordinary book case metal fittings are used to secure the door. The oak cutting board is attached to the cabinet in the manner employed with extension tables on an office desk. A block of hard wood (oak) is fitted in a groove with screws as shown to hold the food chopper when in use. Draw pulls, hinges and fastenings for the doors and castors are easily obtained from the large variety of such hardware on the market. In fact it is possible to obtain almost all the metal, glass or porcelain material used in the cabinet from regular commercial stocks.



New Machine Portrays Sound

Many Acoustic Studies Now Possible.

By C. A. OLDROYD

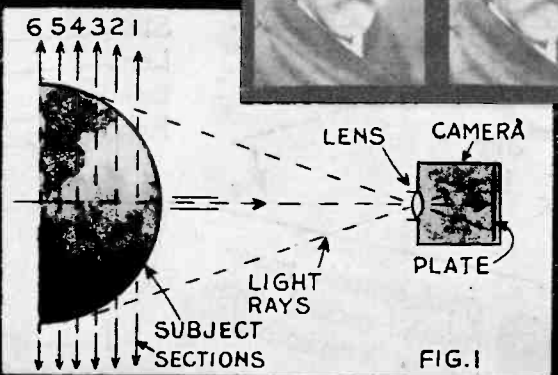
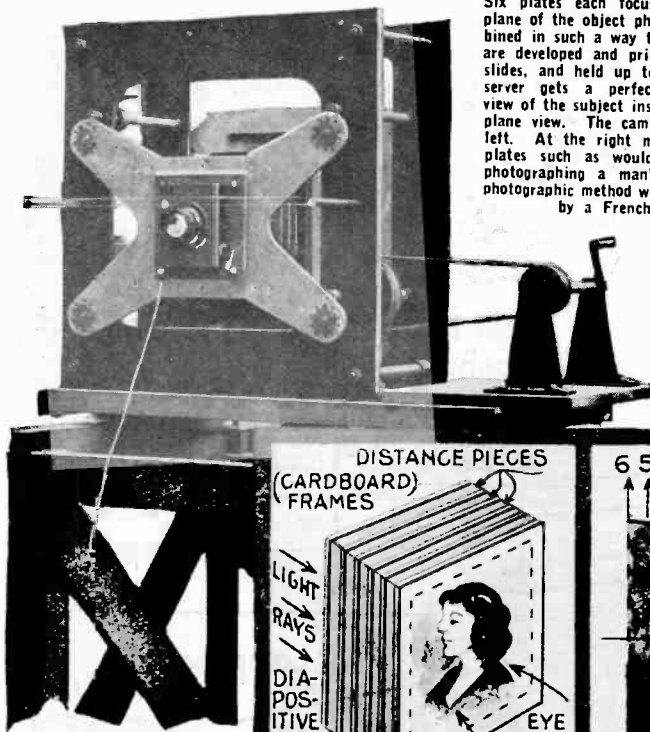


A STEP nearer perfect reproduction of sound by loud speakers and phonographs is made through a recent English invention which is illustrated on this page. It is called the Audio-meter and pictures sound in its most complicated forms, making possible comparison between original and reproduced sound for the minute study of scientists. Exterior views of the instrument and sketches showing its method of operation are seen at the top of the page. As shown, a beam of light from the lamp passes through a slit and falls upon a nickel or other metallic mirror attached to a highly resilient diaphragm C made of rubber or like material. The sound vibrates the diaphragm deflecting the light beam which is directed through lenses onto a photographic film.

AT K are shown the vibrating beams. The rotating drum carries a light-sensitized paper film past a slit through which the vibrating beam of light passes. Thus an extremely accurate picture of the vibrations appear when the film is developed. Some of these records of sounds for various instruments are shown at the bottom of the page. By making an original record with this machine and then allowing a reproducer (received radio signals actuating a loud speaker) to impinge upon the diaphragm, scientists and engineers may study closely from accurate records just what part of the musical vibrations are being dropped out in the process of transmission. Once the difficulties are made obvious, experience and knowledge will overcome them.

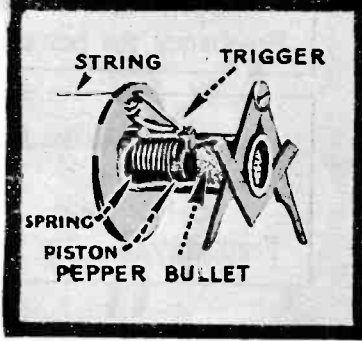
Stereoscopic Portrait Camera

Six plates each focussed on a different plane of the object photographed are combined in such a way that when the plates are developed and printed as positives on slides, and held up to the light, the observer gets a perfect three-dimensional view of the subject instead of the ordinary plane view. The camera is shown at the left. At the right may be seen the six plates such as would be the result of photographing a man's head. This new photographic method was recently developed by a French scientist.



At the immediate left is shown diagrammatically the method employed for obtaining the plastic effect. The first plate is sharply focussed on the first subject section; the second on the second, and so on. Each plate brings out sharply only one particular plane in the subject. At the extreme left is shown the method used for assembling. When the plates are arranged, registered and held up to the light, a perfect image appears.—C. A. Oldroyd

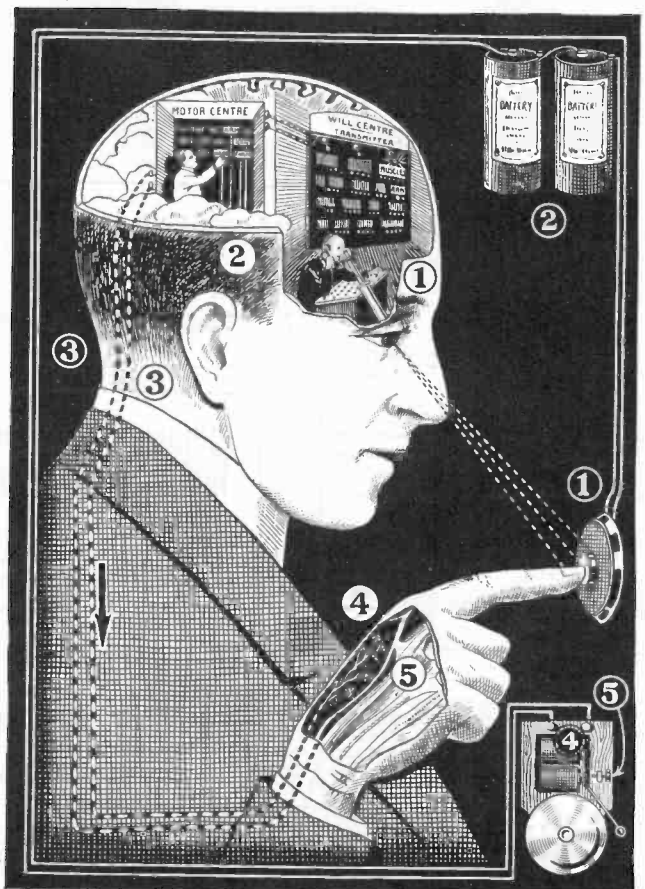
Pepper Gun



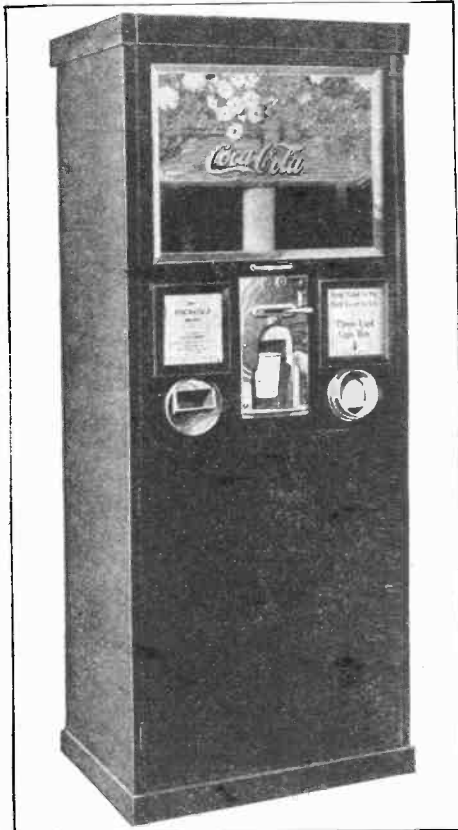
In these days of frequent hold-ups the little device illustrated above will find a happy reception with those who have to carry large sums of money, and who do not care to tote a gun. The device is extremely simple. Hiding behind an ordinary lodge emblem is a barrel which is loaded with red pepper, which may be fired into the eyes of an assailant by throwing up the hands. The pepper is ejected by means of a stout spring and plunger. Its presence is not noted ordinarily and the firing strings may be carried through the sleeves in such a way as to make no interference with the regular arm motions. Suggested by William Favini.

At the right is illustrated an extremely apt double analogy showing plainly the various functions of the nerves and brain in connection with a sight impression and a willed movement. The operator at the will center sees the push button on the wall "1" and gains a sense impression. A definite impression is transmitted to the motor center through the agency of the will. The motor center "2" corresponds to the battery "2" in the electric bell circuit, while the push button corresponds to the will center "1" since it controls the action of the remainder of the circuit. From the motor center the desire of the will is transmitted to the muscles of the hand over the motor nerve "3." These nerves terminate in motor nerve endings, "4", which translate the force of the will into action of the muscles "5." The two wires from the battery to the bell correspond to these motor nerves, carrying power from the battery which is under control of the push button. "5" represents the muscles actuated by nerve excitation, while "5" again represents the bell proper, actuated by the magnets.

Nerve Analogy

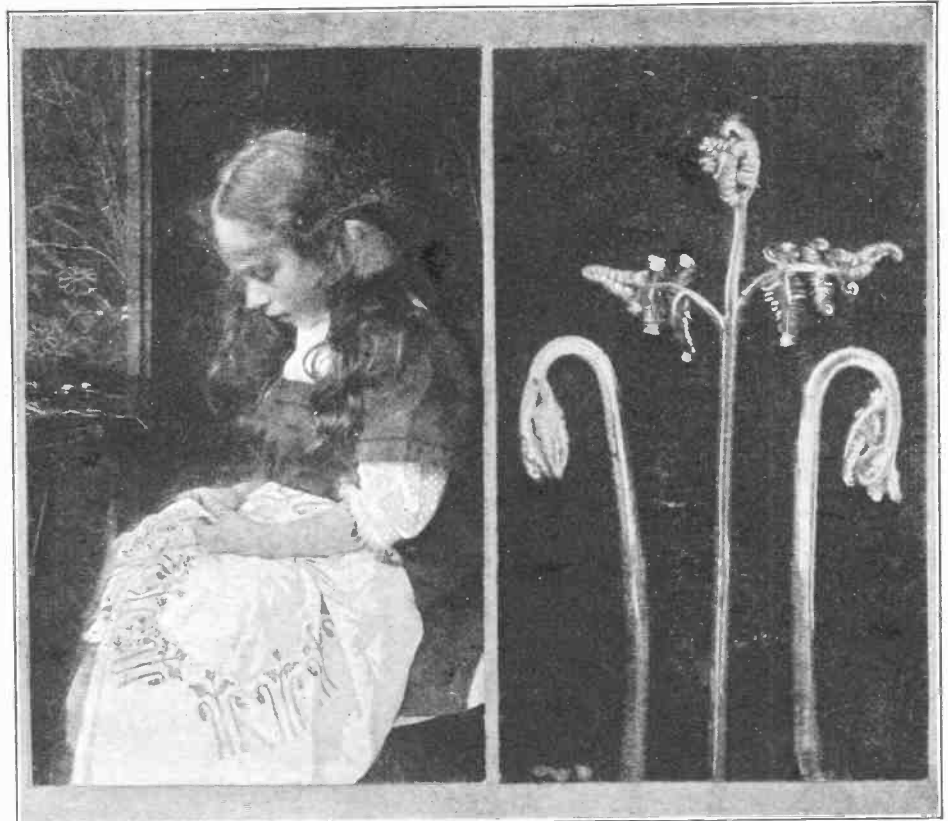


Drinks!



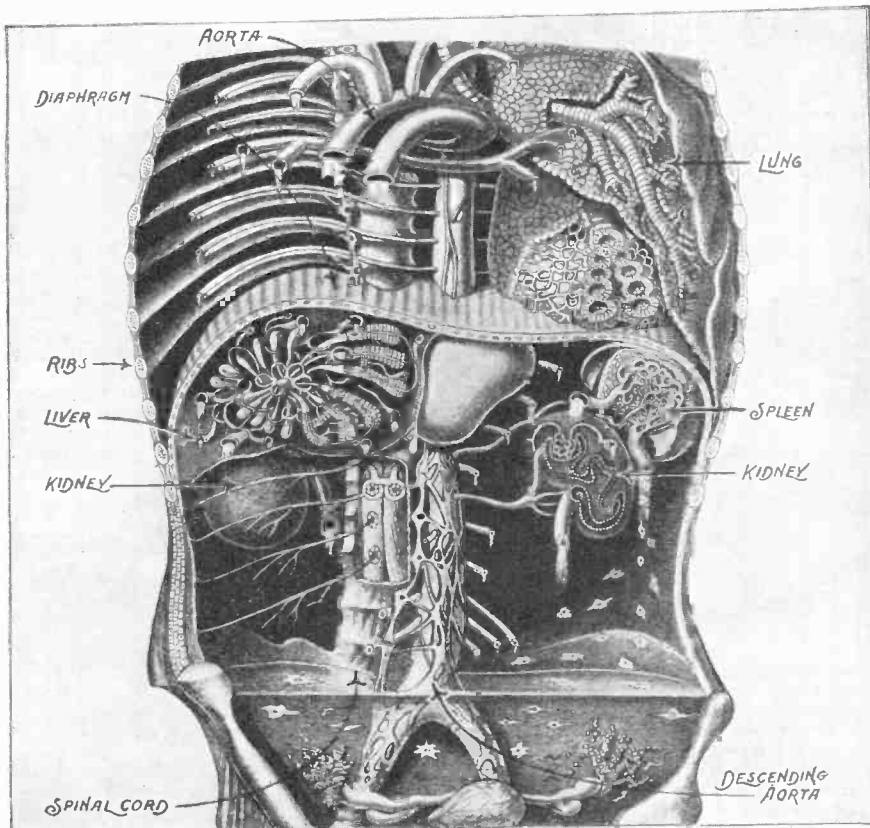
This is the latest in slot machines. If you are thirsty, simply put a nickel in the slot, turn the lever and wait for the results. A paper cup will fall in place, the syrup of the drink will run into it followed by carbonated water. A complete drink, and just as good as if the "soda squirt" had mixed it by hand.—Eric Dime.

Natural Designs from Ferns



Beautiful and not too complicated embroidery designs may be made from the natural forms of the shoots of tender plants as they appear in the early spring-time. This is a good English idea and is used quite extensively there. The young miss, in the picture, is shown putting the final touches to a piece of work, the design of which was taken from the broken fern. A photo of the original fern is shown at the right.—S. Leonard Bastin.

BODY AS AN AQUARIUM



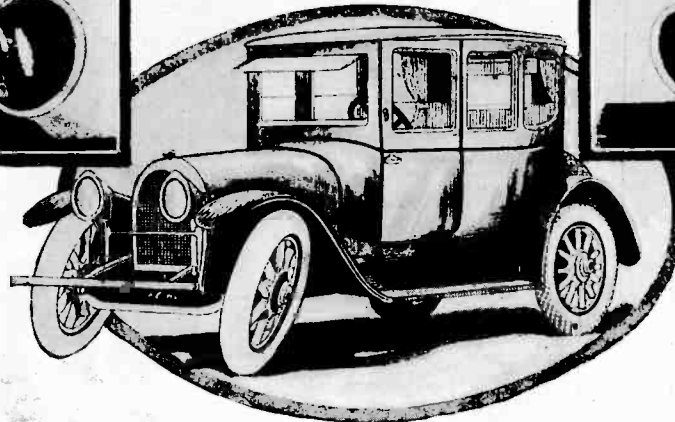
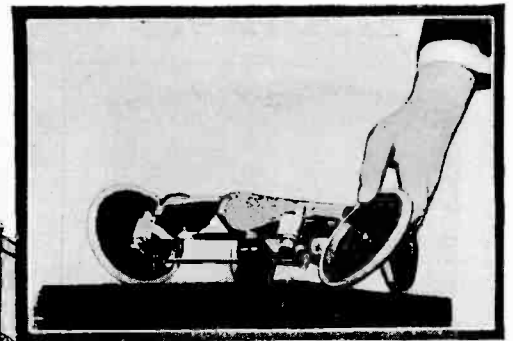
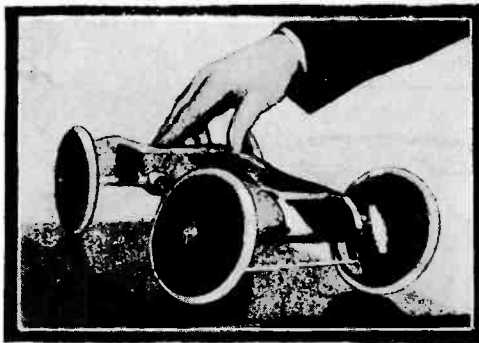
Through the arch of the great aorta (the heart removed) fifteen quarts of blood pass every minute. The lungs supply the blood with oxygen required for the birth of blood cells in the spleen. The kidney acts as a filter—the waste products pour through it.—Das Leben des Menschen.

BULLET-PROOF



In view of the severe duties falling on German police during the recent uprising and revolutions, the bullet-proof vest and helmet shown have been given them as a means of protection. They are made of small iron squares on the order of chain armor.—Dr. H. Becher.

Cutting Corners Easily



The speed at which automobiles are able to cut corners will be greatly increased by the use of a new device recently perfected by Wm. E. and Elmer T. Cox of San Francisco. By making a new steering knuckle, which tilts the front wheels in the direction of the turn, the centrifugal strain due to curve is greatly reduced. A model of the device is shown above and to the right.

An added advantage of this new steering device lies in the fact that the position of the front axle as regards height from the earth, remains always the same no matter whether the car is taking the turn, standing still, or running straight. The knuckles are made of such a size and strength as to withstand easily any strain which might be thrust upon them by the force of the car taking a sharp turn. —Charles W. Geiger.

Shadows that Stay



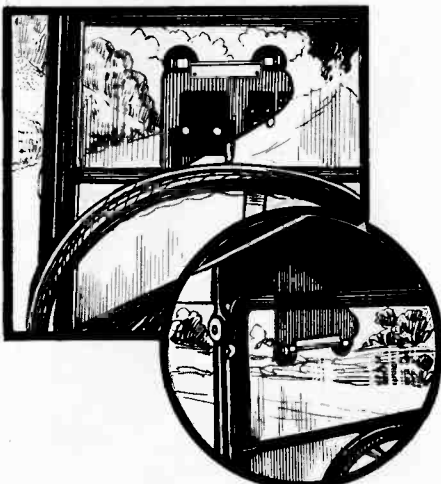
In parts of California where oil is stored in great pools, if you allow your shadow to be cast on one of these pools for a little time and then move away, the shadow will remain. The explanation is simple. The heat of the sun causes gas to rise in minute bubbles in the oil. The shadow cools a part of the surface, decreasing the gas formation, causing a difference in diffraction.

Brush



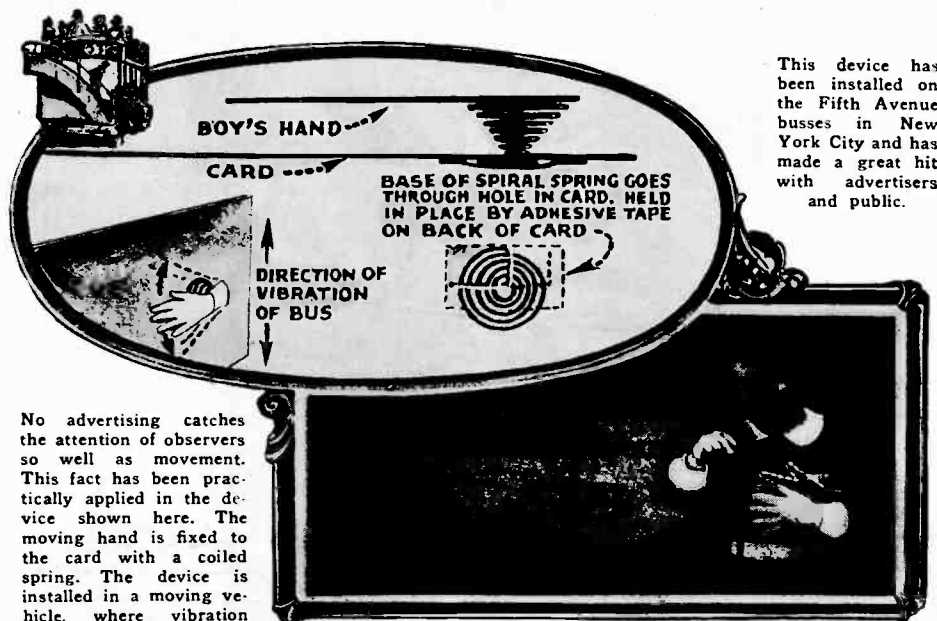
For cleaning clothing the brush illustrated above is exceptionally useful. The cleaning material or liquid soap is carried in the machine oil can, the spout of which feeds into the center of the brush bristles. The flow is forced by pressing the top of the oil can, thus squirting the mixture into the brush.

Eye Shade



For automobilists driving at night, the device illustrated above made of green celluloid, attached to the windshield with suction cups, will be found exceptionally advantageous when driving past glaring headlights. The driver can interpose this protector between his eyes and the lights by shifting his head a bit. —G. E. Manning.

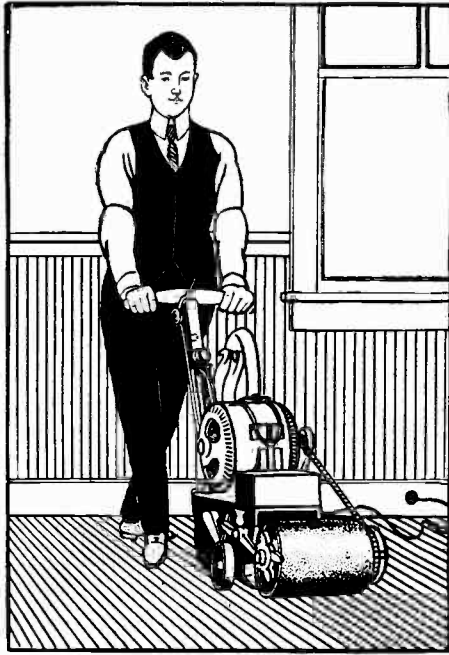
It Catches Attention!



This device has been installed on the Fifth Avenue busses in New York City and has made a great hit with advertisers and public.

No advertising catches the attention of observers so well as movement. This fact has been practically applied in the device shown here. The moving hand is fixed to the card with a coiled spring. The device is installed in a moving vehicle, where vibration causes the hand to shake.

Surfacer



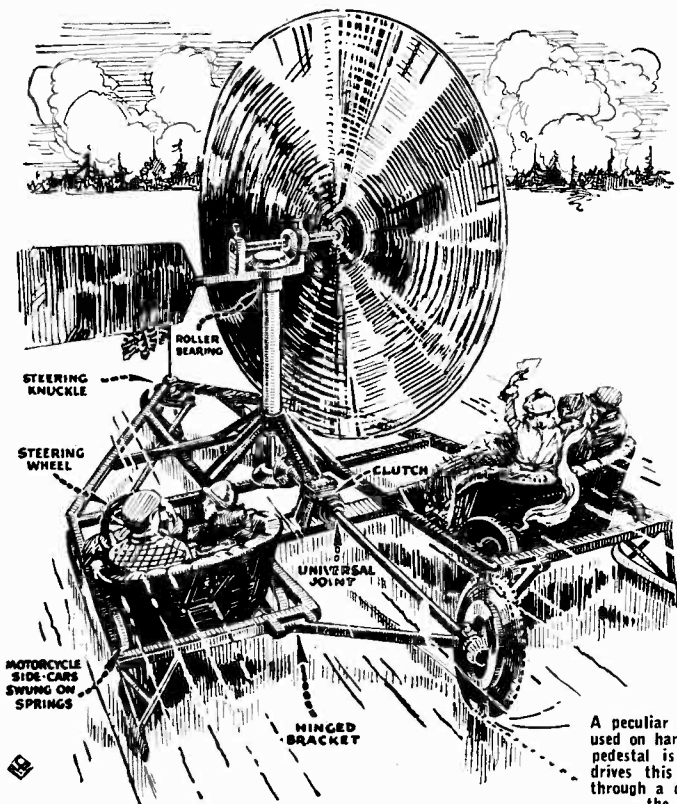
The illustration above shows a device for resurfacing old floors or putting a smooth finish upon newly-laid floors. The device is light enough to be operated by one man and runs from the ordinary house lighting circuit. A sufficiently powerful motor drives rollers, over which runs an endless belt of specially designed flexible material, the outer surface of which is coated with an abrasive. The results are said to be excellent and floors can be surfaced very quickly.

The tent illustrated at the right is designed for winter camping. One section of the tent is made of asbestos cloth and a second section is sewed in place as shown in the insert at the right. Smoke is carried up through this space as through a chimney. —George Arthur Luers.

Tent Fire-Place

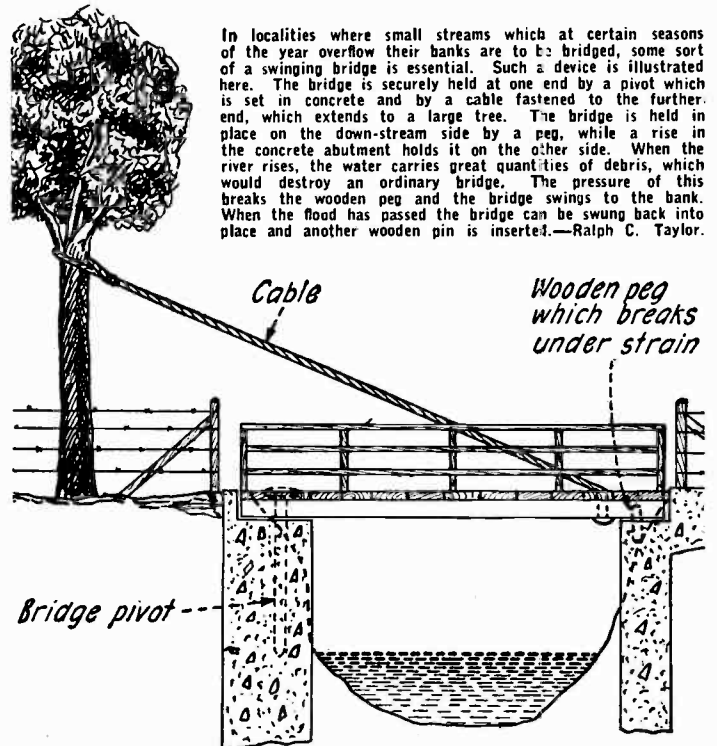


Wind Driven Sled



A peculiar type of pleasure sled for use preferably on ice, although it could probably be used on hard-packed snow, is shown at the left. A large windmill mounted on a revolving pedestal is geared to a toothed wheel located at the back of the vehicle. The wind drives this windmill and the power thus generated is delivered to the driving wheel through a clutch and universal joint. The vehicle is steered by means of one runner in the front, and the windmill always faces the wind, because of its rear vane.

Swinging Bridge



In localities where small streams which at certain seasons of the year overflow their banks are to be bridged, some sort of a swinging bridge is essential. Such a device is illustrated here. The bridge is securely held at one end by a pivot which is set in concrete and by a cable fastened to the further end, which extends to a large tree. The bridge is held in place on the down-stream side by a peg, while a rise in the concrete abutment holds it on the other side. When the river rises, the water carries great quantities of debris, which would destroy an ordinary bridge. The pressure of this breaks the wooden peg and the bridge swings to the bank. When the flood has passed the bridge can be swung back into place and another wooden pin is inserted.—Ralph C. Taylor.

When Is Moon Biggest?



The old argument concerning the apparent decrease in the size of the moon as it rises above the horizon, is settled here again.



The distance between the earth and the moon is shown above. The moon looks larger at the horizon because it is compared with terrestrial objects. A card held before the eyes to shut out near objects proves it.

©1924 BY SCIENCE & INVENTION



Another proof is to measure the angle of the moon with a pea when near the horizon and when high in the sky. Both measurements will be the same.



Above are shown methods of comparing the moon's size with objects on earth. The moon appears the size of an ordinary dinner plate at 100 feet from the observer or approximately the same size as a wash-tub at 300 feet.

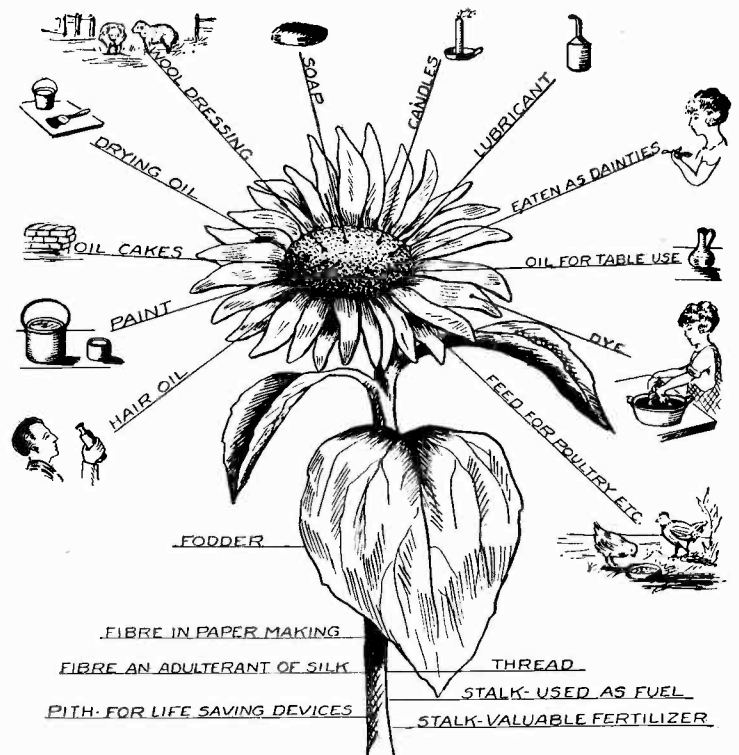
—C. T. Dahama, Ph.D.

Photographing Birds



The humming bird is the most difficult of all winged creatures to photograph. The photograph above was taken using a high-speed focal plane shutter camera, actuated by a string pulled at a good distance away from the camera. The shutter was working at one thousandth of a second. —Kenneth Smith.

Sun Flower Uses

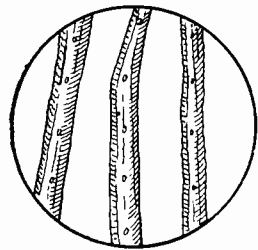
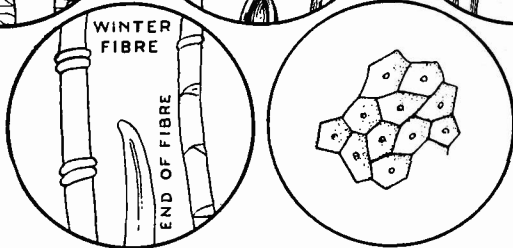
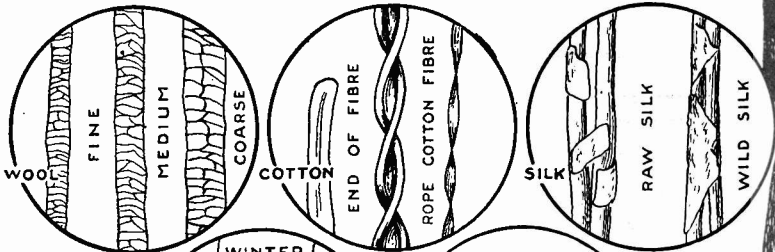
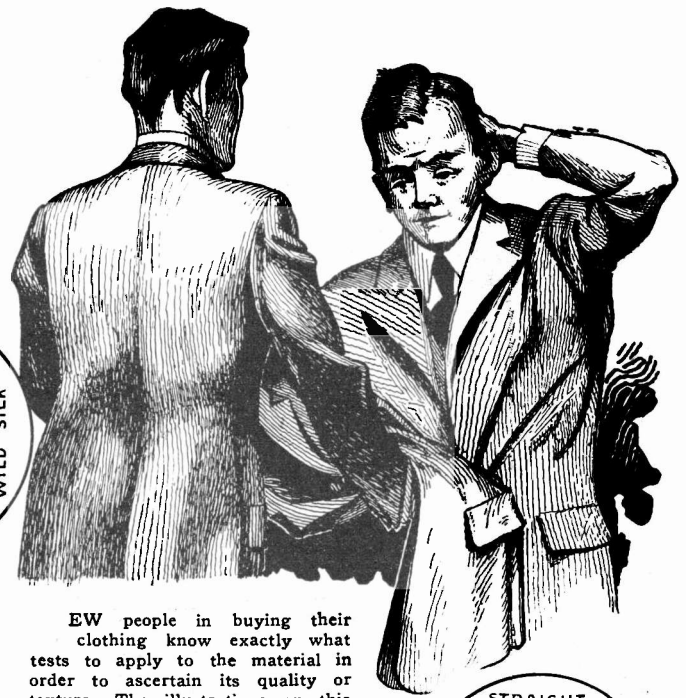


The wide and diversified uses to which products of the sun flower may be put are graphically shown in the above illustration, which needs very little explanation. Most of us are acquainted with the large grains of sun flower seed found in most commercially prepared chicken feeds. However, this is one of the smallest sun-flower by-products. —Bessie Statler.

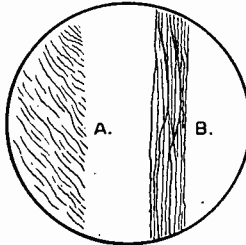
Are Your Clothes Made of Good Material?

Can You Recognize Cotton, Silk and Wool?

By ISMAR GINSBERG, BSc., Chem. Eng.

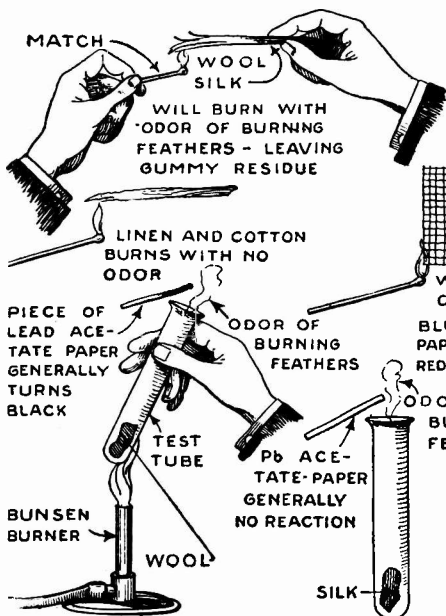
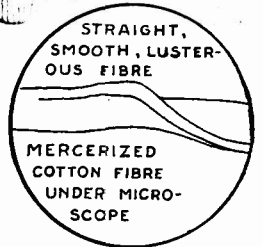


At the right "A" is a wool fibre "B" is worsted. The former is short, serrated, soft and fluffy, the latter is combed, having parallel smooth strands.



UNDER MICROSCOPE

EW people in buying their clothing know exactly what tests to apply to the material in order to ascertain its quality or texture. The illustrations on this page show graphically a number of tests, as well as several microscopic studies of various fibres used in the manufacture of clothing. Practically all wearing apparel—all cloth for that matter—is made from one of four chief substances, namely, wool, cotton, silk, flax or linen. A detailed study of these will give the reader a fair idea as to their properties. Aside from the regular cloths woven from each type there are on the market dozens of combinations of the originals, as well as numerous artificial weaves, made from chemically treated substances. In the circle above and to the right is shown a fibre of mercerized cotton as seen under the microscope.



WILL BURN WITH ODOR OF BURNING FEATHERS - LEAVING GUMMY RESIDUE

LINEN AND COTTON BURNS WITH NO ODOR

PIECE OF LEAD ACETATE PAPER GENERALLY TURNS BLACK

ODOR OF BURNING FEATHERS

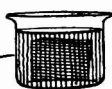
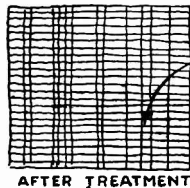
ODOR OF BURNING FEATHERS

COTTON

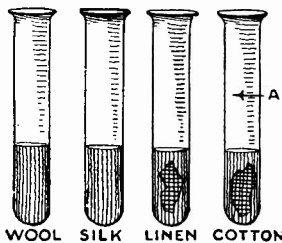
ODOR OF BURNING WOOD

WILL BURN IN DIRECTION OF COTTON

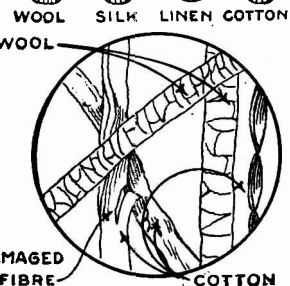
COTTON FIBRES VERTICAL WOOLEN FIBRES HORIZONTAL



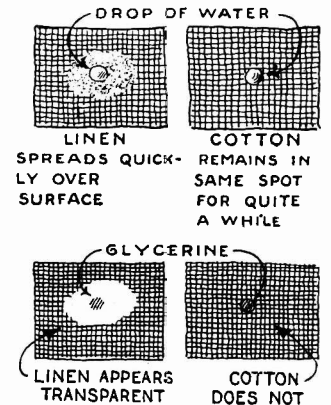
Linen and cotton burn with no odor. For testing a piece of wool cloth for cotton, boil it in a 5% solution of potash for fifteen minutes. The wool will be dissolved, leaving the cotton. For thin cloths, it is only necessary to hold a match to its edge. The cotton will burn quickly, while the wool burns slowly. Concentrated sulphuric acid will dissolve cotton quicker than linen.



ALKALIES STRONG ACID



DAMAGED FIBRE COTTON



LINEN SPREADS QUICKLY OVER SURFACE

COTTON REMAINS IN SAME SPOT FOR QUITE A WHILE

LINEN APPEARS TRANSPARENT

COTTON DOES NOT

Readers Forum

A FOOLISH ARTICLE

Editor, *Science and Invention*:

In a scientific magazine I read the following concerning Deep Sea Salvaging. The article was called "Can Deep Sea Salvaging Be Made Safe?"

"Thump, thump, thump!" The leaden feet of the diver clump on the deck of the salvage steamer. Ninety pounds of the heavy metal weigh down his body. It looks weird to see him try to lift the burden by moving his legs. One has the impression that the deck is a magnet and that the metal weights are not lead but iron or steel, pulled down by the attracting force. He slips into a suit of rubber, an iron cask fits over his head, over the gunwale he goes, ropes and tubes alone connecting him with the vessel. Without so much as a wave of his hand, he slips down into a salty sea, a lone pioneer to face the many dangers of the deep. His shoulders bob slightly for an instant, then vanish and all at once the top of his helmet is gone, too, and only a ripple shows where he has sunk. The diver is on his way to inspect a sunken vessel. A tube through which is pumped oxygen, and cords which support his weight and give him telephonic communication to those above are the slender strands upon which he depends for life and for aid in case he is in need of succor—"

In another part of the same article—"A break in his rubber suiting would drown him—"

And again—"The diver works in about two and a half atmospheres of pressure. A sudden drop, though even for only a few feet, and nose bleed may result. A further drop might bring the iron helmet down tight about his head. Men have died from just such an accident as this—"

And further on we read—"After an hour's toil he is brought again to the surface. He must rise very slowly. His blood and tissues are overcharged with nitrogen, due to his being under air pressure. Should he return to normal atmospheric conditions too quickly he would fall victim to that terrible malady known as the 'bends,' or caisson sickness—"

And at last this—"It takes about four hours to safely permit him to come back to normal atmospheric pressure—"

Is there any truth in these statements?

J. B. Canton,
New York City.

(You have not given us the name of the publication in which the article on Deep Sea Diving appears. However, here are the facts!)

The writer states that the diver was working in two and one-half atmospheres of pressure. He did not for one moment realize that two atmospheres are no more than 40 feet. He did not know that divers, without the aid of diving suits, have descended more than 50 feet. The increase in pressure is .43 lbs. per sq. in. per foot increase in depth.

The author starts out with the diver "thumping" on the deck of the vessel, and then talks of him slipping into his rubber suit. Absurd, he must put the suit on first before he "thumps." He states that an iron cask fits over his head; there is no such thing. The helmet is made of copper. He likewise states that a ripple shows where he has sunk. It is not a ripple, it is a stream of bubbles.

Likewise, oxygen is not pumped through the tube, but ordinary air. He also states that a break in the rubber suit would drown him. Absolutely ridiculous. A break in the suit anywhere below the waist-line will not have any effect whatsoever, and in many places above the breast plate the break would have no effect.

The diver's suit hugs him just as closely as wet clothes stick to a person's body. Should anything happen to him, the pressure would not drown him. He could bob up to the surface very rapidly, bounce up out of the water and finally come to rest unless he became entangled with the wreck.

It is absurd to state that a drop of one or two feet, or ten feet, in two atmospheres or even 2½ atmospheres would cause a nose bleed. It is further absurd to state that the "iron" helmet would be brought down tight over his head as the "iron" helmet has a shoulder plate attached to it which prevents such accident. The helmet rests on the shoulders. Neither does he have to rise slowly from two atmospheres as stated, inasmuch as when a diver goes down to a "great" depth, he can only stay there one minute, that being the practical maximum of the ordinary diver (bathing costume).

The diver's blood and tissues are not overcharged with nitrogen at any time when working under two atmospheres, and neither is it probable that he will suffer from the bends. The writer has seen children eight years old subjected to the same atmospheric pressure, namely, two or three atmospheres.

Then the author of the article states that this malady (the "bends") formerly afflicted men who had to work under atmospheric pressure never using the word abnormal. Don't let anyone tell

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.

you that it required four hours to permit a man to come back to normal pressure, from a pressure of two atmospheres.

The whole article, wherever it may have been printed, must have been written by a writer of fiction who probably had read of divers, but never saw one. He is undoubtedly like the farmer who when he saw an airplane for the first time, exclaimed, "There ain't no such animal."—Editor.)

ANOTHER VICTIM

Editor, *Science and Invention*:

I have enjoyed your articles and pictures very much on crooked gambling, by Mr. Mark Mellen.

Here are two cards that I think must be marked. I lost a lot of money while this deck was used. I think they are marked, but I can't see how it is done.

You can see why I do not care to give my address, because I do not want the fellow to know I am on to him. But you could see if they are marked and you could publish them in your magazine showing the marks if any.

Thanking you for same in advance and repeating that I enjoy all the articles in your magazine, but especially those on gambling exposures.

A Regular Reader.

(Yes, your cards are marked. The markings are very well made, and are found in the flower parts of the back of the deck. Markings such as these are hard to discover. On the leaves in the upper left hand corner of the back of the card are red cross lines and straight lines indicating suits and value. We will be glad to give information of this nature to any of our readers desiring it. We respectfully request that they send us their name and address (which will be kept confidential) so that we may reply by mail directly instead of through the columns of this paper.—Editor.)

STUNG!

Editor, *Science and Invention*:

Can you tell me through your columns if this deck of cards is right or wrong?

Think I've been a sucker.

Bank Clerk.

(You have been. The cards are "trick" (?) cards marked when printed. Such markings are difficult to read and discover. You will notice that the plaid backs differ with regard to the size of a particular white space which can only be pointed out. We need the complete deck to give you the code.—Editor.)

MARKED CARDS

Editor, *Science and Invention*:

Your article in the June number of SCIENCE AND INVENTION about the marked cards and coins is very good.

Can you tell me if this card is marked?

If it is I will only be learning what I suspect now, so I will not give my name.

If any cards were marked it would be the ace, wouldn't it? If this card is marked, how and where are the markings? You can publish it in your magazine, but do not say who this letter comes from.

A Chicago Reader.

(The Ace is often not marked, but the card you sent was marked in red ink along the printed border. The mark can be seen at a distance of ten feet. In sending suspected cards, try to send as many as possible.—Editor.)

BRICKBATS AND BOUQUETS

Since you wish to know what your subscribers think of SCIENCE AND INVENTION in its new form I hasten to give you my opinion. First, let me say that your theory that many only look at the pictures is correct; in my case at least. Your captions are so long that they are really condensed articles. Yet you must be careful that in seeking brevity you do not sacrifice clearness. Moreover, your captions so nearly fall into the category of short articles that the use of capitals and bold-face

type, proper for short captions, seems forced and confusing. This confusion is further aggravated by the way you manhandle the captions to squeeze them into ill-shaped spaces.

On the whole, I am pleased with your new policy. But if you devote the magazine too largely to pictures, you will enable me to read it through too easily and thus give me the impression that it lacks "meat." If you retain your scientific fiction, jokes, regular departments (especially that of fiction and astronomy), and two or three other full-page articles, you will keep in your fold those of us who want to know that we have "got something." And let us hope that Mr. Chapin, who has been offering scientific puzzles, will not leave us.

With the sincerest of wishes for the success of the magazine.

F. H. Perrin,
West Medford, Mass.

QUESTIONING OUR POLICY

Editor, *Science and Invention*:

I note in your last month's edition you state there were no \$1.00 or \$2.00 prize entries and still my drawings were returned with a reason given (subject not likely to interest all readers). Probably what I mention here would interest the readers more.

There is a nigger in the wood pile and I believe I see him. What kind of a hand are you playing? Too bad some more of us were not born a Dr.—or a Prof.—so that we may have a chance for a prize in your so-called CONTEST in your magazine.

J. Kuhhorn,
New York City.

(It is not necessary to be either a doctor or a professor in order to win a prize in the contest conducted by SCIENCE AND INVENTION MAGAZINE. Inasmuch as you live in New York City, you can at any time come down to our offices and examine our records, and you will find that there are thousands of individuals in the United States who have won prizes, some of whom have not even had an ordinary public school education. The main idea is to get a popular practical suggestion, which would have a general appeal to our readers, and which is not copied from another magazine or book.)

Some of the writers for our magazine are paid for on a contract basis. Their names are generally familiar. Except for special articles written by these authors, their subjects are not eligible for awards in the prize contest.

When mention is made that there are no contestants for the \$1.00 or \$2.00 prizes, we mean just that. Every article in the magazine has had a prize awarded it, and we award prizes for every article found suitable for publication, with the exceptions noted in the paragraph above.

If you care to check through the magazine, you will find there are quite a few authors whose names are not listed in the award column and who have received no prize. Those authors are not eligible for prizes by reason of previous contracts.

We will be pleased to entertain you should you care to drop in on us any Saturday morning before 1:00 o'clock, or any afternoon before 5:30. We are always busy, but never too busy to see any of our friends and give whatever council we can to our reporters who are doing such excellent work in the field.—Editor.)

WHY?

Editor, *Science and Invention*:

Why do we follow a system which works some of us until we are too exhausted to enjoy life, starves others; produces idiots, crazy people, cripples and criminals of every description; piles up wealth for a few, who are unable to find time to put their wealth to proper use; yet it makes slaves of them who believe every word they hear uttered in regard to investments and ways of gaining wealth?

Why let out produce waste in field and forest, also goods decay in store houses, because many people do not know how to gain and reserve money enough, to supply their needs?

Why not distribute the labor of the community in a co-operative manner, giving each individual duties in comparison to their age and strength; both old and young finding life interesting and their duties pleasant responsibilities?

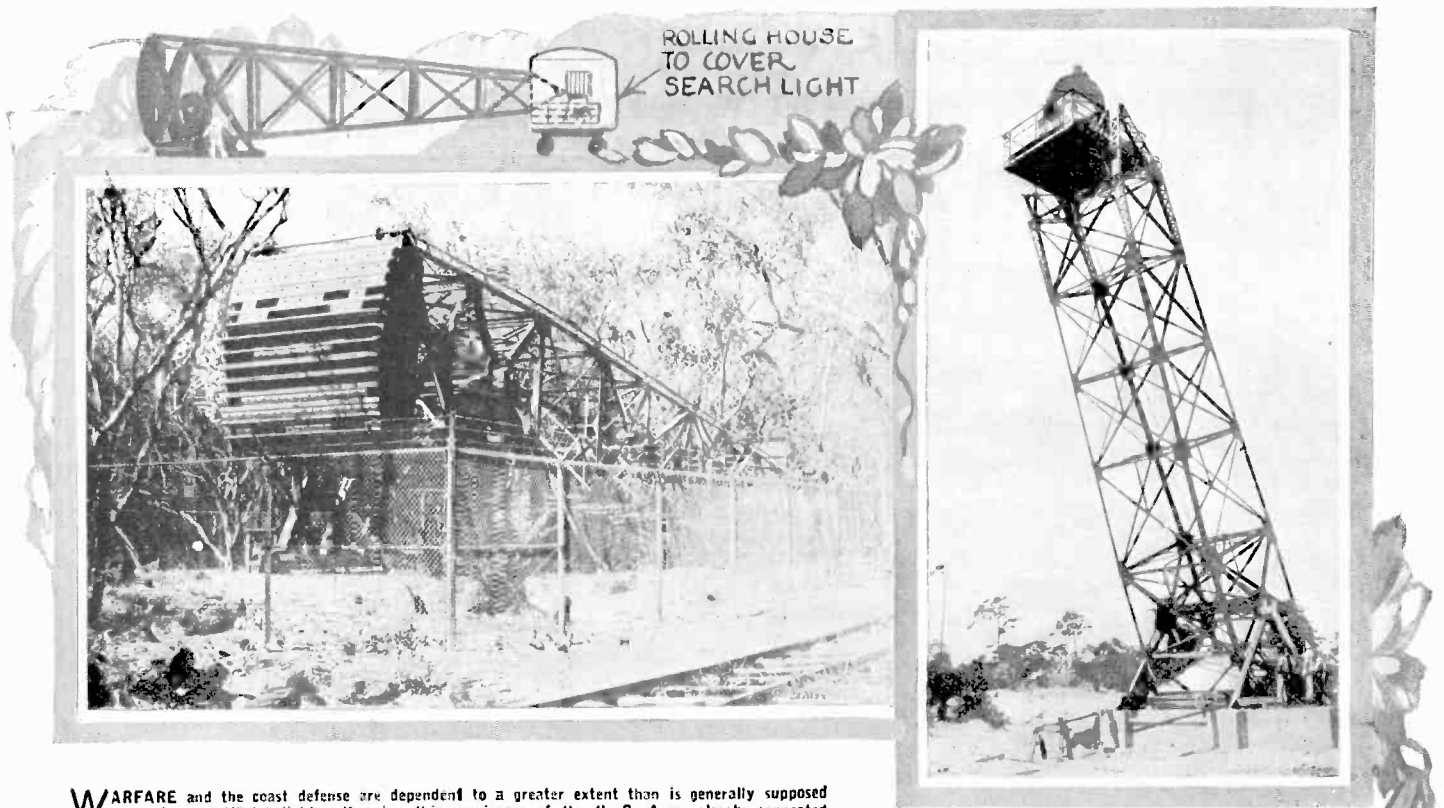
Why not plant our produce where nature can bring it forth in perfection, be it grain, fruit, forests, or animal life?

Why not have a system of gathering and distributing all produce from one community to another, that will eliminate waste, poverty and starvation?

Why build such cumbersome cities, shutting out pure air and light?

(Continued on page 609)

Disappearing Search-Lights



WARFARE and the coast defense are dependent to a greater extent than is generally supposed upon light—artificial light. Knowing this, engineers of the U. S. Army closely connected with coast artillery and other branches of the service where searchlights are imperative, have just developed the new method of mounting them shown in the above illustration. The light itself is mounted atop a swinging tower which may be lowered or raised by one man. Thus advantage is taken of the natural camouflage of brush and small hills where the light is installed. The ease of operation of the device is gained through a system of elaborate braking mechanisms.

The above photograph shows the tower with its light being raised to position. The height of the tower allows the beam from the light to pass over high intermediate obstacles. —George F. Paul.

Mercury's Creviced Landscape



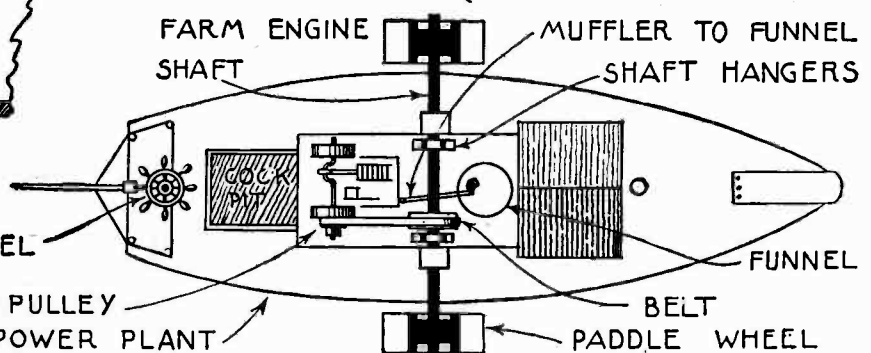
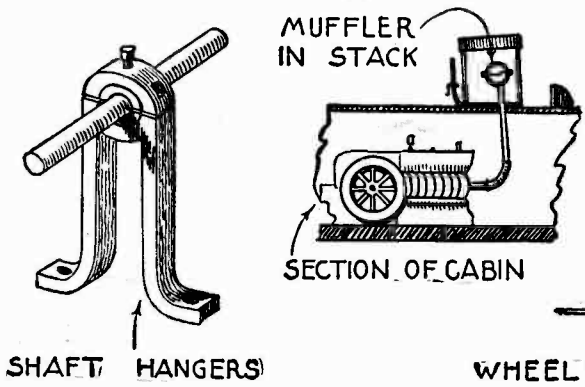
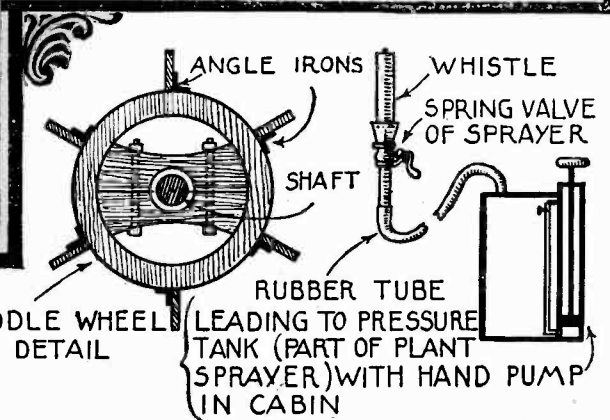
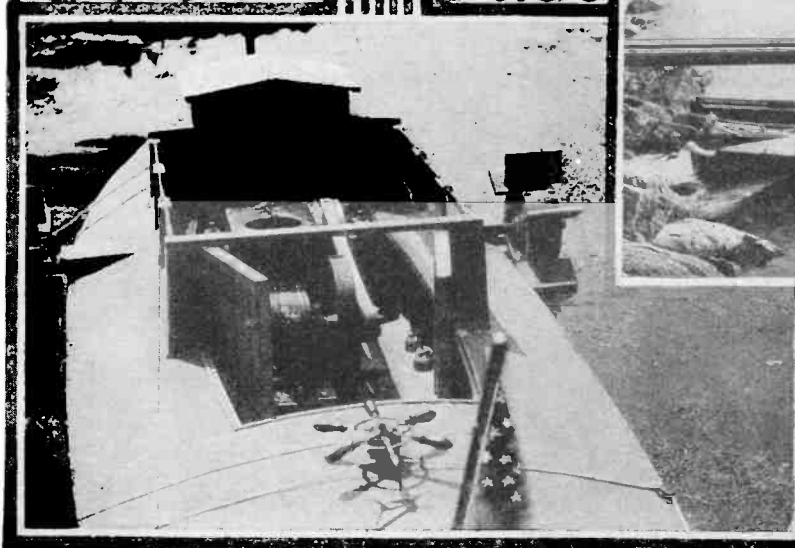
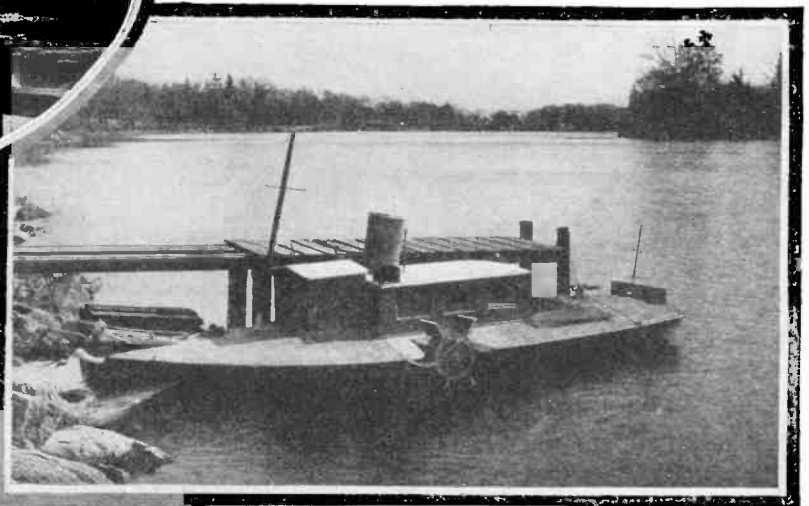
Upon the basis of wide and accurate observations of Mercury made by the late Prof. Lowell we give herewith an artist's conception of the surface of the planet. It is a burned

out world like the Moon. Note the huge cracks radiating from centers for hundreds of miles in all directions. Also the craters.

THE CONSTRUCTOR

Simple and Efficient Motor Launch

THE small motor launch shown on this page is so simply constructed that the prospective builder will have some work convincing himself that it is efficient. The hull of the boat can be of almost any approved model and is left entirely to the discretion of the builder. The power plant consists of a small farm engine belted to a cross-shaft to which are attached paddle wheels, one on either side of the boat, as shown in the photograph below. The exhaust of the engine is carried to a stack where the muffler is housed. The cockpit is just behind the engine. Trouble has not been taken to install water circulation for cooling since the type of engine to be used will under few circumstances run hot. The shaft hangers for supporting the paddle wheels may be found around almost any construction shop.



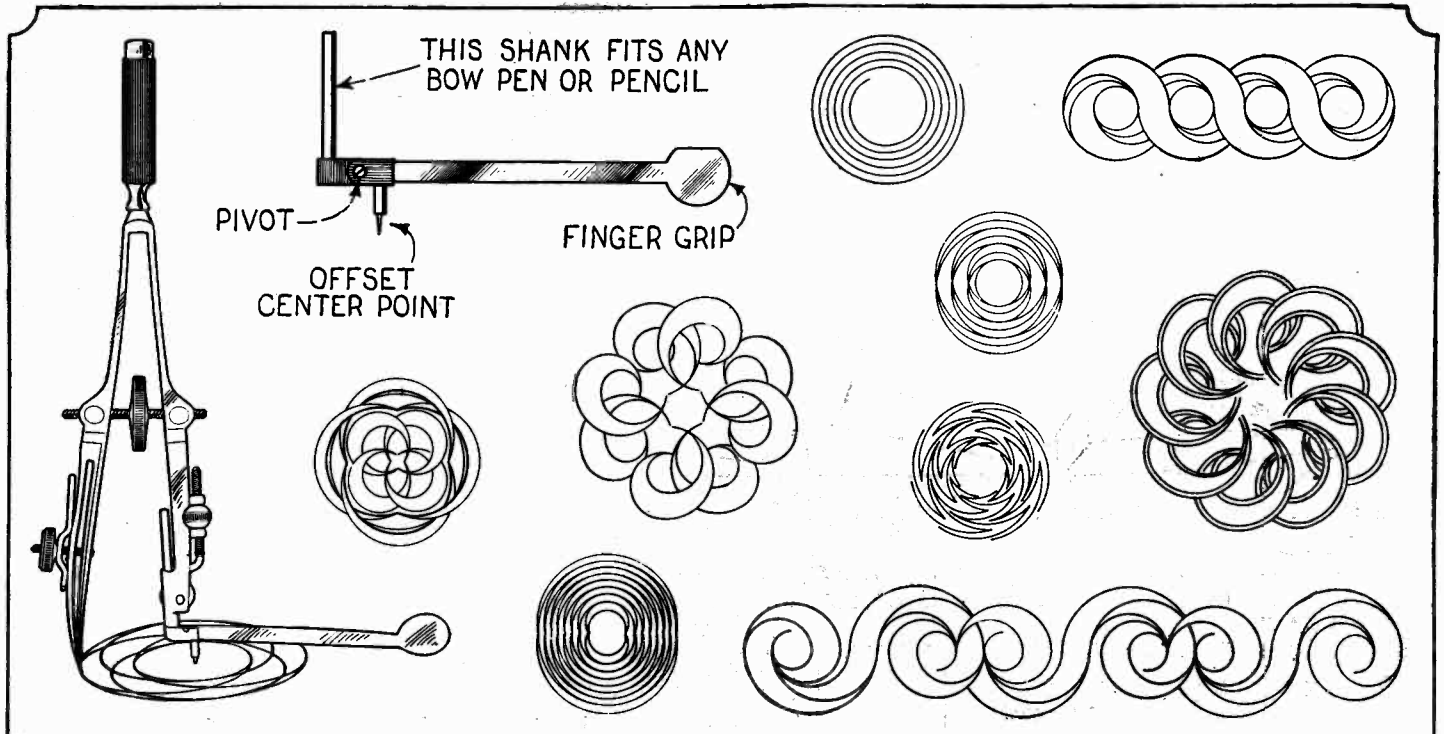
TOP ELEVATION SHOWING POWER PLANT

The plan view of the completed boat, as well as a number of hints for construction, are contained in the above sketches. As all boatmen know a whistle is a very necessary adjunct for signalling other craft. A cross-sectional view of the engine installed, the whistle and muffler together

with funnel are also shown. An exceptionally handy hint for a paddle wheel, a method for fastening it to the cross-shaft is given in the upper right of the sketch. The wheel is an ordinary belt pulley wheel, twelve inches in diameter.

—P. G. Howes.

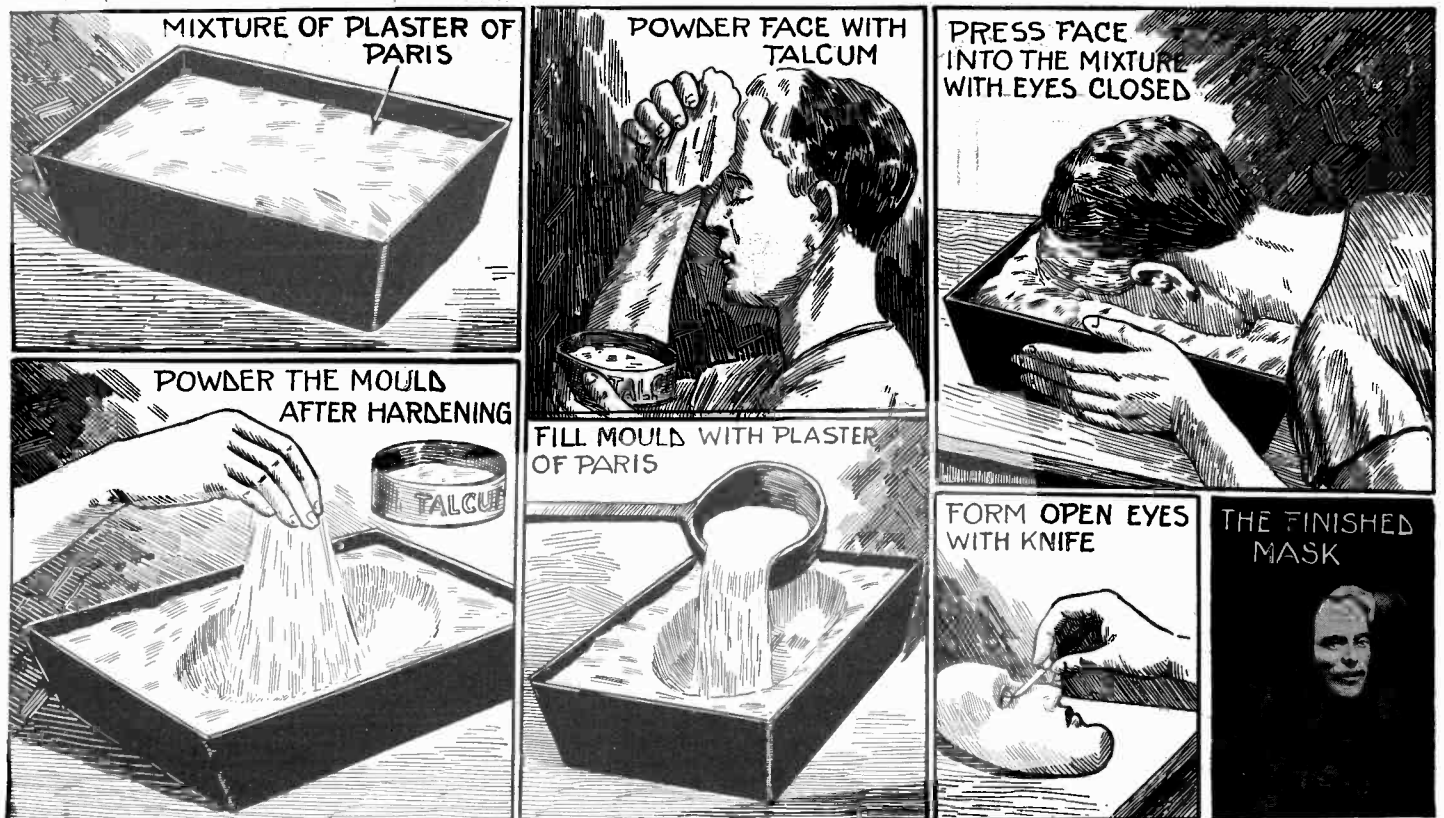
Compass Kink for Irregular Designs



Amateurs usually experience a great amount of trouble in producing special designs. The writer, finding several of these necessary, hit upon the scheme shown above for producing them with almost perfect symmetry. The regular center point of the compass is replaced by a movable off-center point attached to a finger grip, as shown in the illus-

tration. The shank of the attachment fits any bow pen or pencil. A little practice on the part of the operator and any of the figures shown above, as well as a large number of others, may be produced. If a true circle is desired, it is only necessary to let the finger grip rotate with the compass. —Justin Hurley.

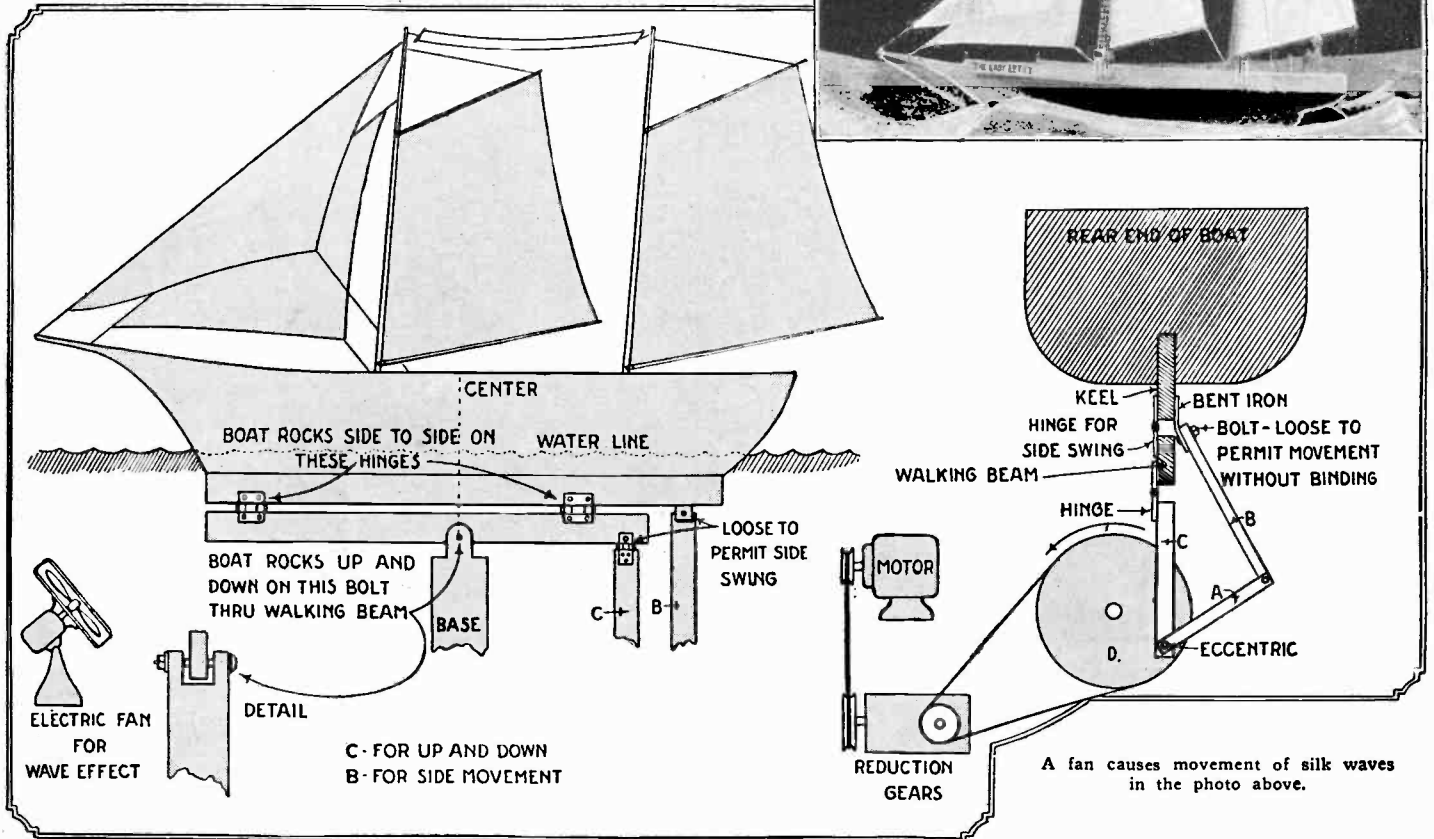
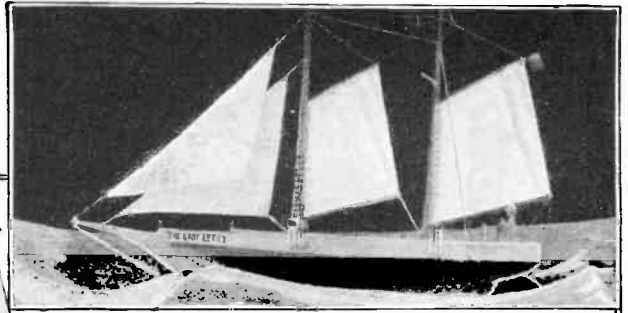
Plaster Masks Simply Made



Masks may be easily made at home, and if a little care is taken, there is no reason why they should not be fully as artistic as the professionally made articles. First make a mixture of plaster of Paris and water of the consistency of thin dough; then powder the face thickly with talcum. Press

the face into the plaster of Paris with the eyes closed. It will be necessary that the consistency of the plaster be proper, so that the features of the face will be retained. Then powder the mould and pour in the plaster for the cast. Form open eyes with a knife. —R. C. Leibe, Rep. No. 1876.

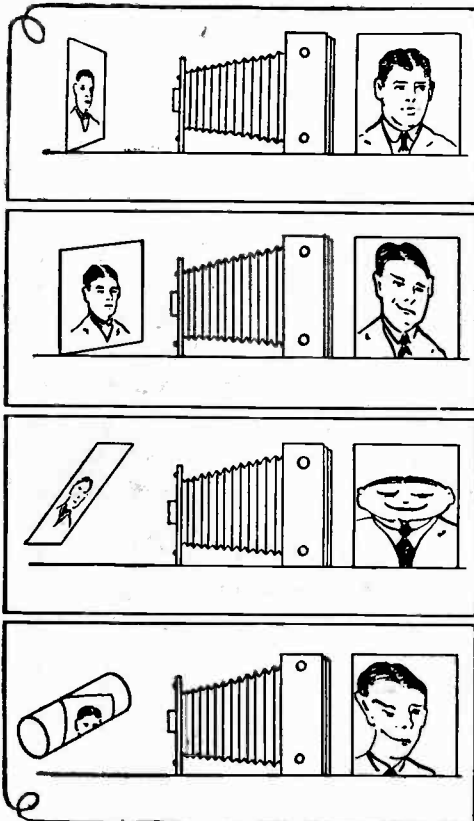
Rocking Ship Window Display



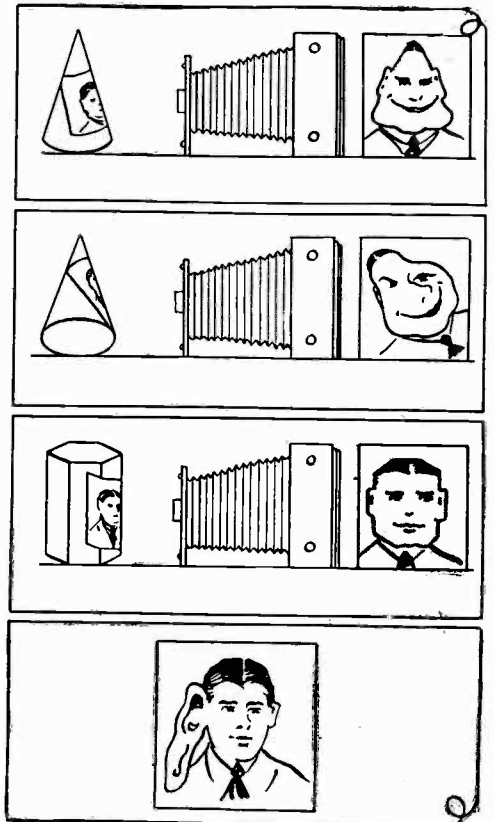
One of the most novel of recent devices used to call the attention of passers-by to window displays or other advertising is the rocking ship, which simulates almost perfectly its ocean-going prototype. The body and sails of the craft are of ordinary type and may be built to represent any

craft desired. By using the walking beam hinged to the keel, and supporting the beam on a rocker, as shown in the sketches, and connecting both the beam and the keel to a double eccentric, the boat may be rocked both longitudinally and laterally. —F. Malott.

Simply Performed Photographic Stunt



With an ordinary copying camera, advantage may be taken of certain photographic laws and exceedingly humorous photographs will result. Any number of effects may be obtained, and the few shown on this page illustrate simply the primary processes. If the photograph to be copied is set in a position at an angle with the plate upon which it is being copied, foreshortening of some part of the image will result. If the subject is rolled around a cylinder, or placed upon a cone or hexagon, still different reproductions occur. In the last sketch the plate being developed is taken from the fixing bath wet, a match is held under the image, and the gelatine allowed to run.—S. H. Samuels.



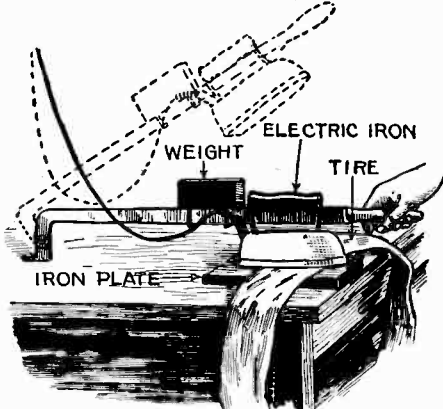


HOW-TO-MAKE-IT



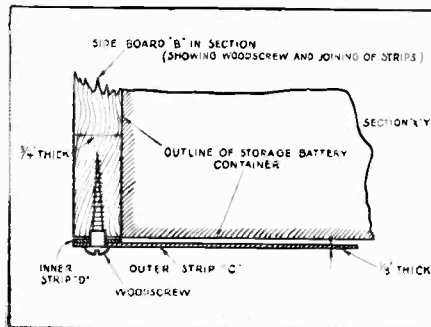
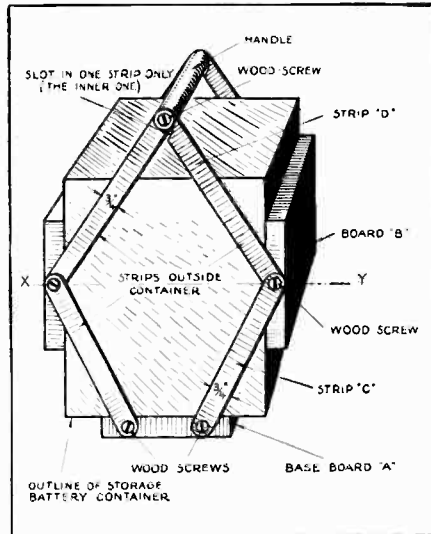
This department will award the following monthly prizes: First prize, \$15.00; second prize, \$10.00; third prize, \$5.00. The purpose of this department is to stimulate experimenters toward accomplishing new things with old apparatus or old material, and for the most useful, practical and original idea 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.

Vulcanizer FIRST PRIZE \$15.



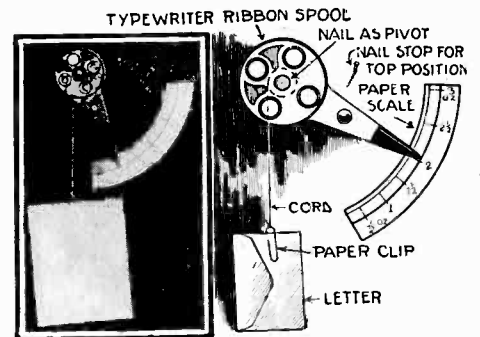
By attaching an electric iron to a weighted arm, as shown above, and fixing an iron plate beneath it, a vulcanizer results.
—W. B. Matthews.

Storage Battery Carrier SECOND PRIZE \$10



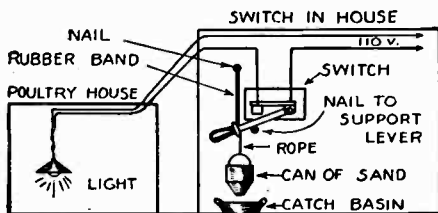
A few pieces of board, some thin iron strips and a piece of broom stick make a carrier for storage batteries.
—C. A. Oldroyd, Reporter No. 4433.

Postage Scales THIRD PRIZE \$5



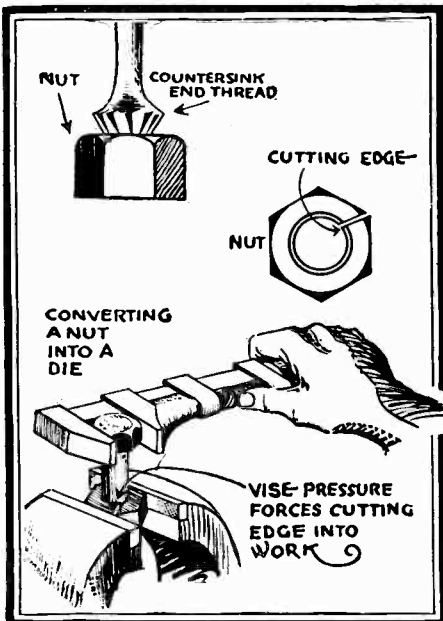
To an old typewriter ribbon wheel a weighted arm is attached, which passes over a scale, as shown. The string around the center of the spool attaches to the letter to be weighed.
—C. A. Oldroyd, Reporter No. 4433.

Electric Feeder



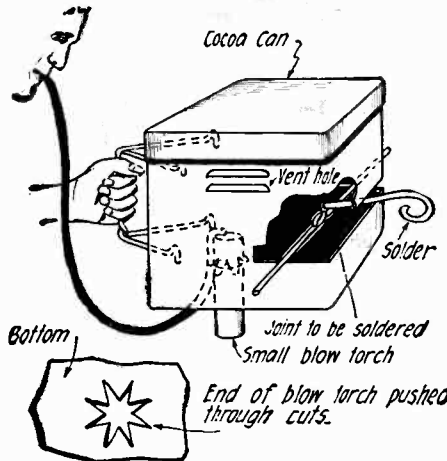
The sand drips out of the bucket attached to the switch just at the right time to allow the rubber band to close the switch, lighting the light or actuating a feeder in the poultry house.
—J. Stevenhagen.

Nut Die



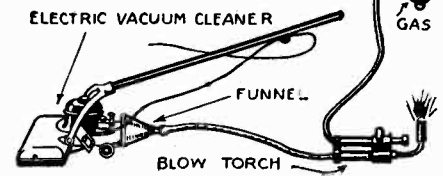
A nut die is made by slotting one side of the nut, counter-sinking it at one end and holding it in a vise, as shown.
—G. A. Luers.

Soldering Kink



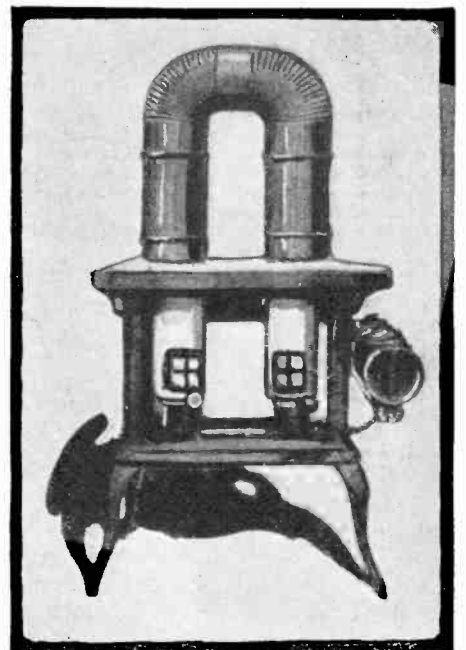
The cocoa can with handle and slit inside acts as a shield for doing out-door soldering work in the wind.
—Paul F. Bryant.

Blower



A blow torch using illuminating gas may be provided with air at pressure by using the back draught of a vacuum cleaner, as shown above.
—Alvin W. Hass.

Heater



Two joints and two elbows of stove pipe and a two burner oil stove combined as above form an efficient heater.
—Wm. L. Rankel.



WRINKLES

RECIPES & FORMULAS



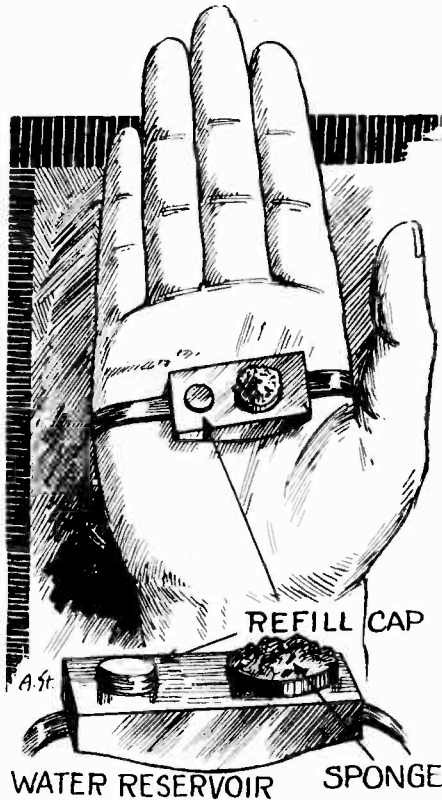
Edited by S. GERNSBACK

Handy Holder



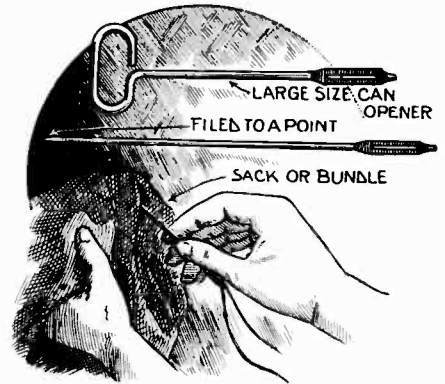
When replacing small screws in a clock or watch, if a strip of paper is used in which the screw is placed, the latter can be very readily replaced without loss of time.
—Gus Oline.

Speedy Moistener



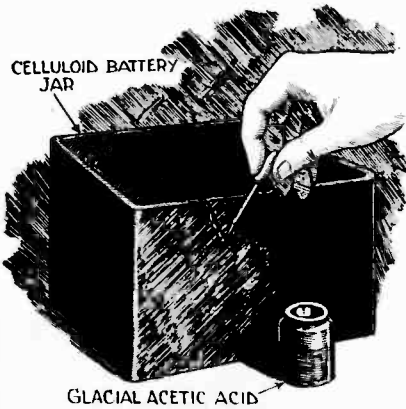
A very efficient finger moistener that fits in the palm is made from a piece of sponge or felt placed in a small water reservoir. This is attached to a small strap and finds itself readily available for immediate use.
—Martin Boris Beline.

Novel Needle



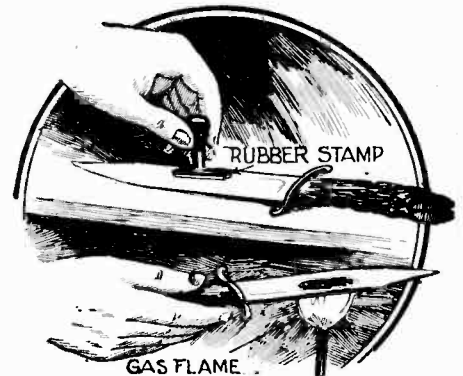
A large size can opener filed to a point makes a useful needle for sewing up sacks.
—Fred Ayres.

Celluloid Cement



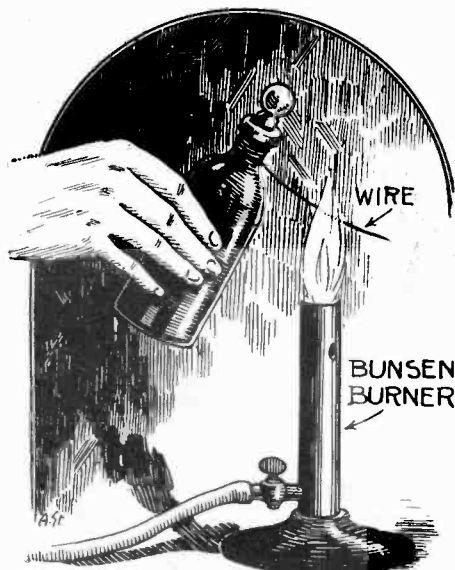
Broken celluloid jars can be mended by the following simple treatment. The surface is first cleaned by scraping and undiluted glacial acetic acid is applied with a fountain pen filler. After a minute or two, the ends of the fracture are pressed firmly together and left under pressure.
—G. Eric Jones.

Etching Steel



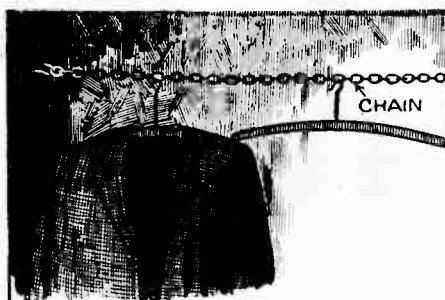
For successfully etching swords and knives, the following procedure is prescribed: Procure rubber stamp of name to be etched. Dissolve one quarter ounce shellac in one quart of alcohol and two ounces of dragon's blood in the same solution, filter. Use engraver's etching ink and stamp blade. Powder with dragon's blood and heat gently. Dip blade in solution made above and heat until enamel bakes evenly. Saturate piece of cotton with gasoline and rub over inked part. Suspend blade in a 40% solution of perchloride of iron and etch until desired depth is obtained. Lye is used to clean off the enamel.
—Frank J. McCarthy.

Stopper Remover



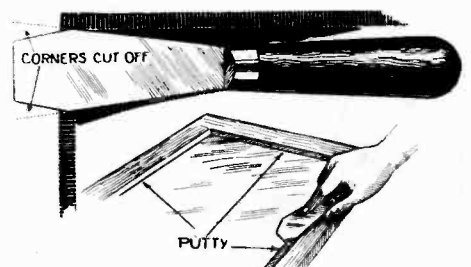
Obstinate stoppers can be removed quite easily by winding a few turns of copper wire around the neck of the bottle and heating the end in the flame of a bunsen burner.
—J. Schwarz.

Clothes Hanger



A very much better method of suspending clothes hangers is by the use of a length of chain stretched between the walls of the closet.
—Clifton Ask.

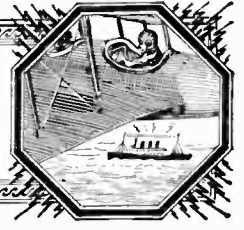
Putty Knife



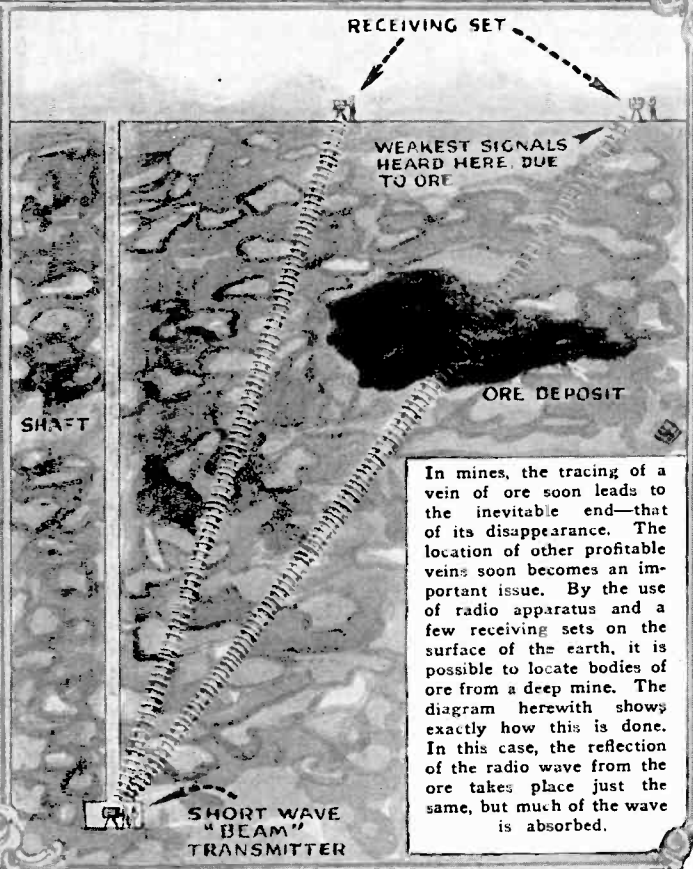
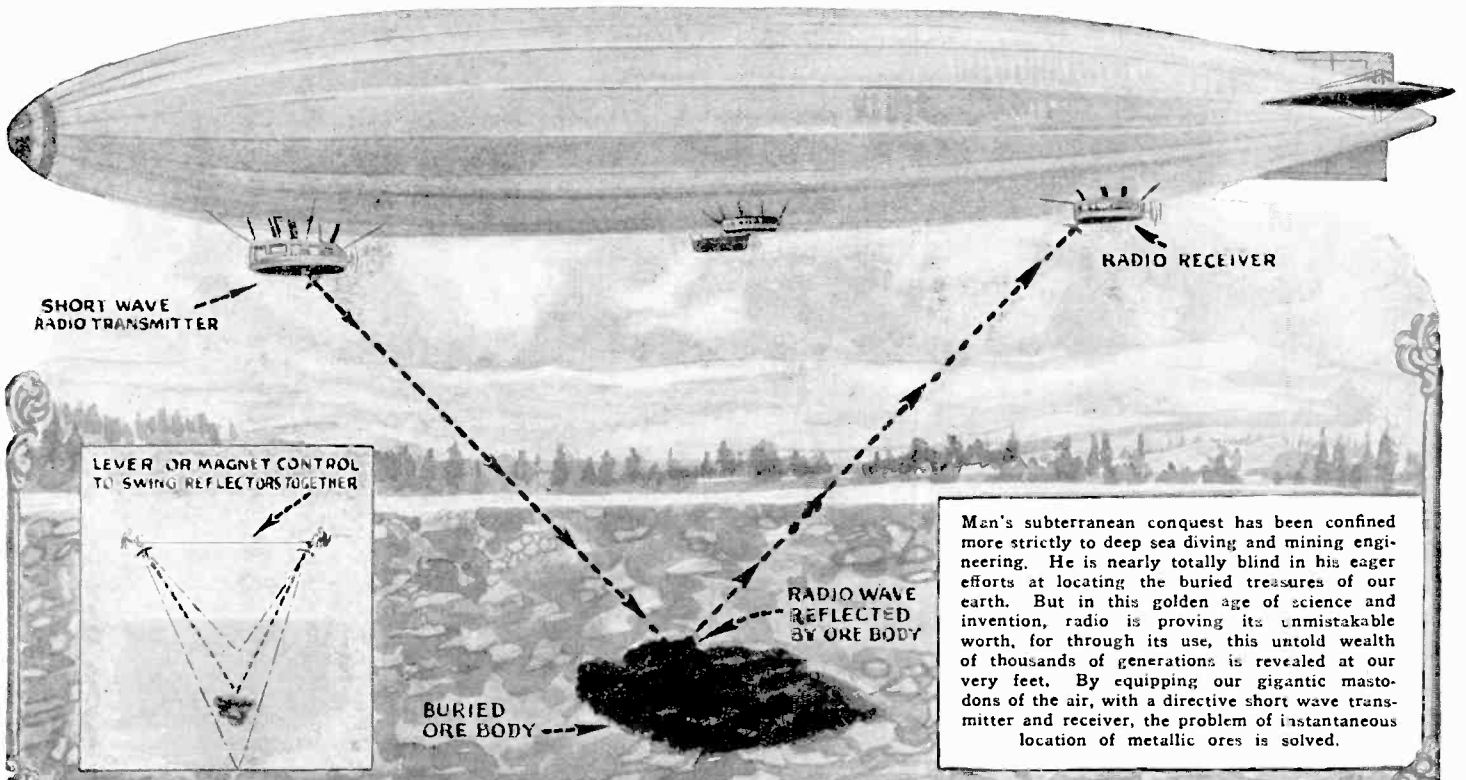
An improved putty knife can be made by cutting an ordinary putty knife as is shown in the diagram.
—Stanley P. Head.



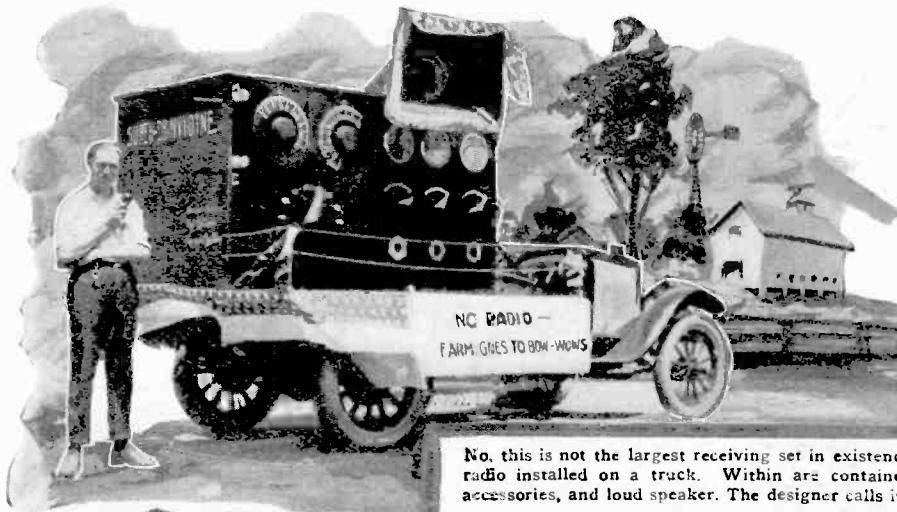
RADIO



Detecting Ore by Radio



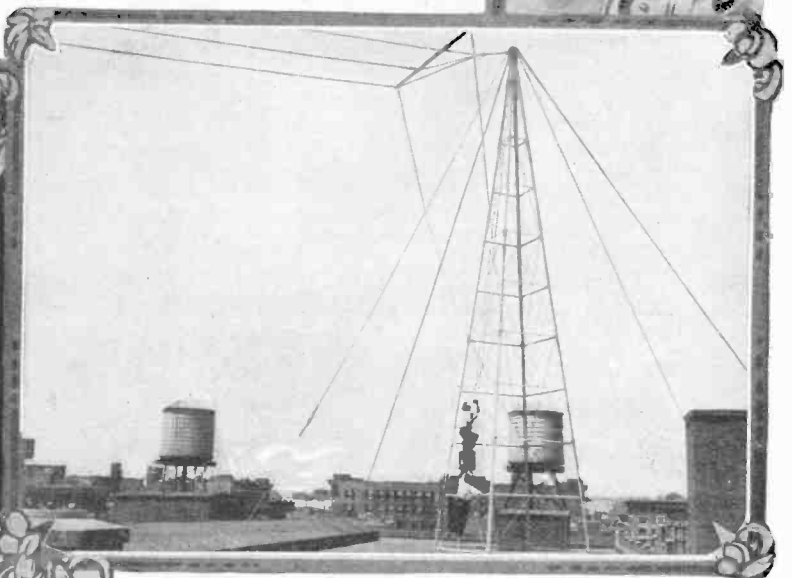
Radio News Here and There



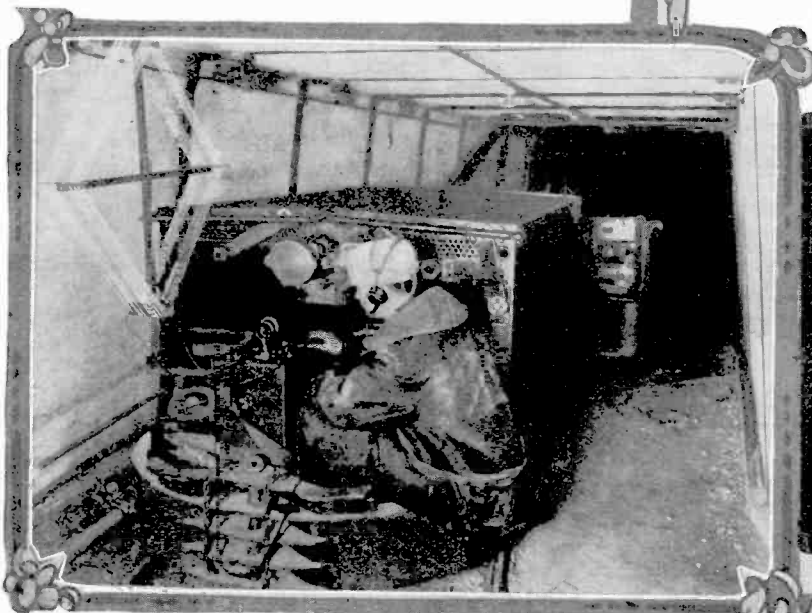
No, this is not the largest receiving set in existence, but merely a dummy radio installed on a truck. Within are contained a real receiving set, accessories, and loud speaker. The designer calls it the Super-Chevrodyne.



The popularity of radio broadcasting brings forth new stations every month. One of the latest is that of the Third Avenue Railway Co., New York City. The above photo shows a view of one of the twin transmitters. This station is noted for its neat layout and overall efficiency. The engineer is inspecting the 250-watt tubes which are responsible for present day broadcasting.



This shows one of the supporting masts of station WBJ of the Third Avenue Railway System, New York City. The construction of a station is not merely a haphazard arrangement of various tubes, sockets, transformers and condensers, but requires the most thorough knowledge of electrical and mechanical engineering. The present trend in the development of such stations is due to an ever-increasing demand for better programs, a cleaner air and a greater variety of good forms of entertainment.



The horrors of being buried alive hundreds of feet underground, where rock slides, explosions, floods and other mining disasters annually stamp out the lives of many daring workmen will be reduced as a consequence of the adaptation of wired wireless to the needs of our modern mining industries. Above photo shows a set installed by the Bureau of Mines.



Original ideas are always interesting. Here is one evolved by Alexander Carr, which is claimed to be quite an innovation. The idea is to incorporate a radio set in a trunk and then go off on a vacation without the slightest worry of missing one's "daily dozen" over the radio.

Another Broadcaster in New York



One of the most beautiful broadcasting stations in the country was recently opened at the Hotel Majestic in New York City. Above is shown the chief engineer handling the controls which start the set.



The pulsating heart of a radio station lies in its vacuum tubes. The photo shows the operators holding some of the giant vacuum tubes.

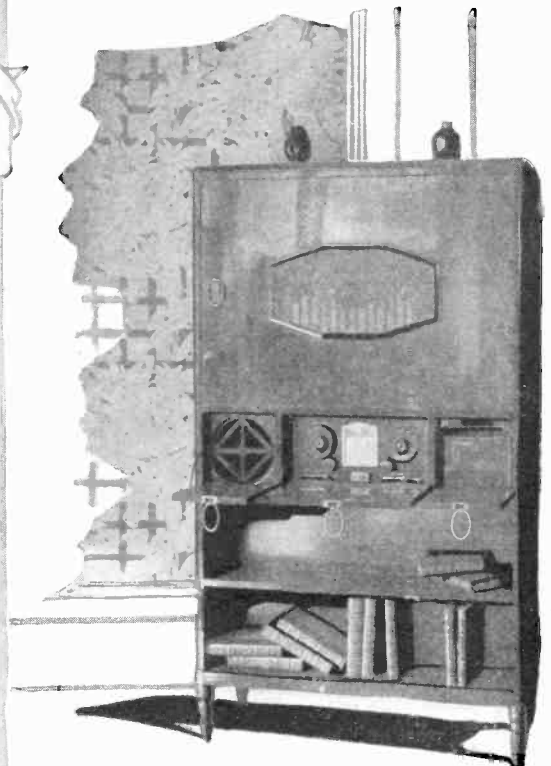


The law requires that each broadcasting station shall have an operator listening in for S.O.S. calls during the broadcasting periods.



This sumptuous scene is that of the interior of the Hotel Majestic's new studio. An unusual and outstanding feature of it is that all the microphones are concealed in the walls and when the speaker announces, it will not be directly into the microphone. This makes the artist feel more at ease and allows him to do his best.

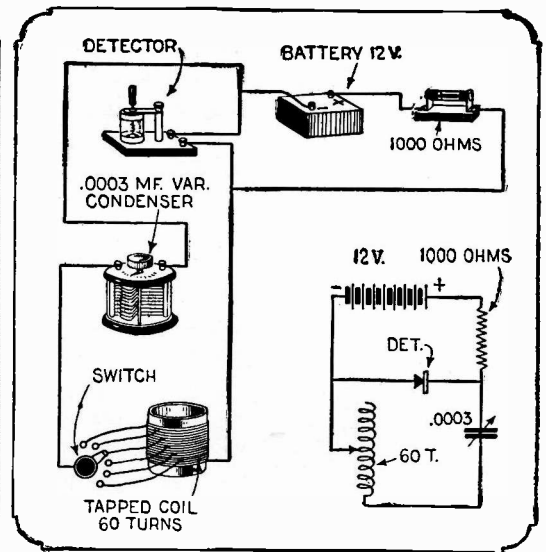
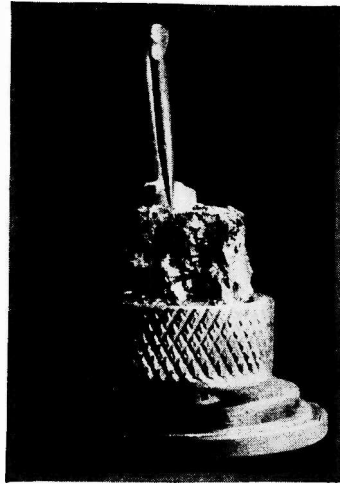
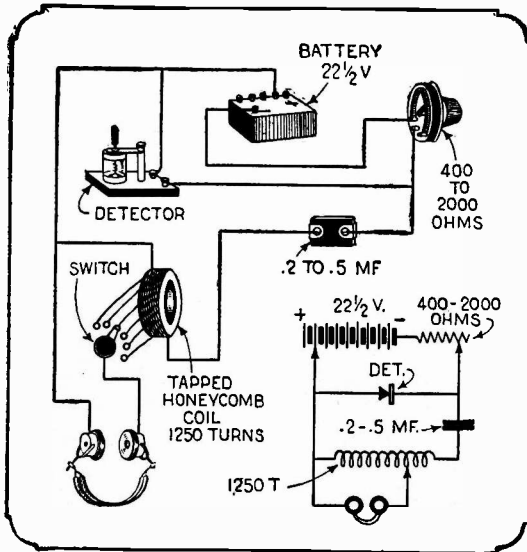
A French Set



The French manufacturers have not been waiting to see what America has to offer in the style of radio cabinets, but have been busy in turning out some beautiful work of their own. Entirely made of mahogany, the above combination of bookcase and receiving set is one of the latest pieces of attractive furniture being manufactured there.

The Crystodyne

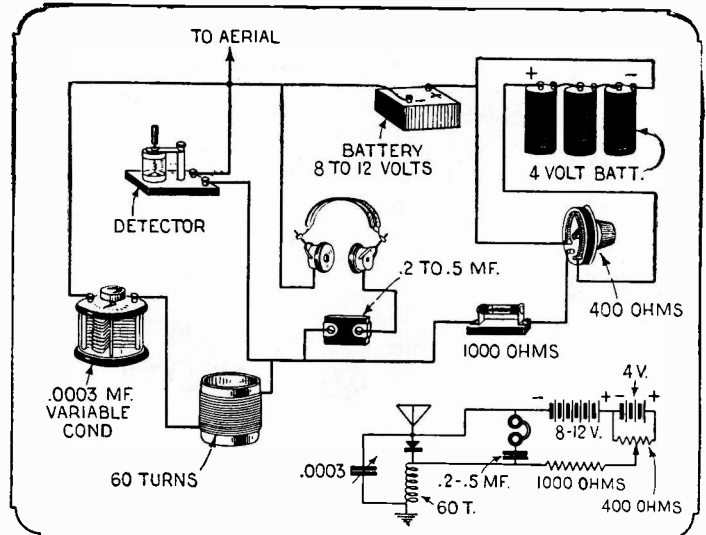
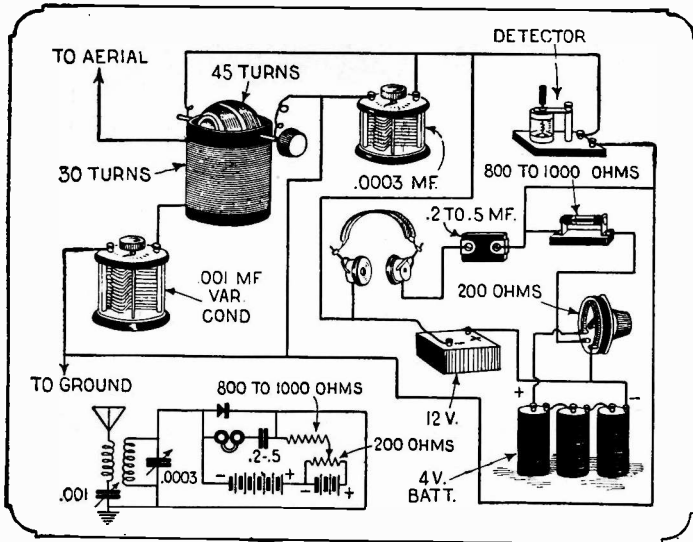
The Oscillating Crystal—A New Line of Interesting Research



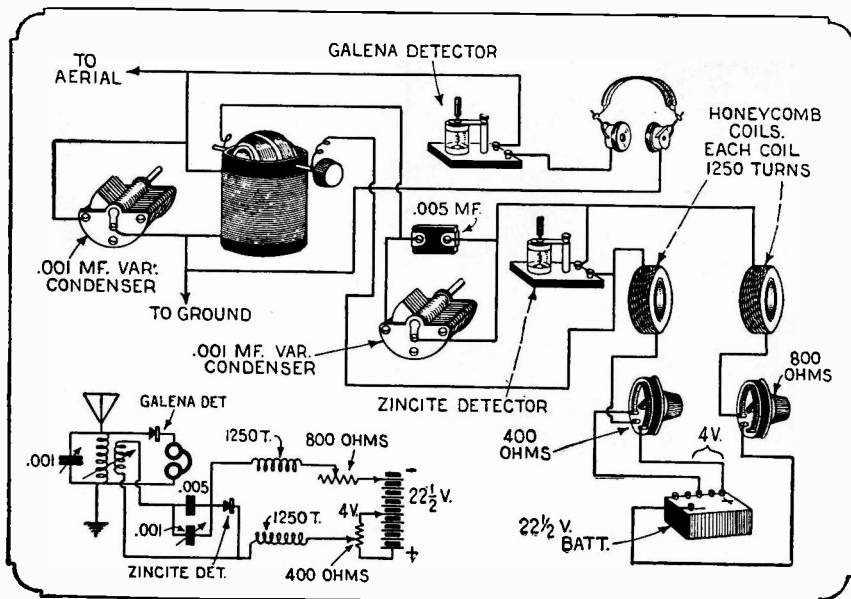
In the above diagram is shown an audio frequency oscillator using a crystal detector as the oscillator. Heretofore success was not attained using a crystal for the reason that the correct line of procedure was not followed out. It is now possible to obtain oscillations of a constant amplitude similar to those produced by the audion, the arc, or the high frequency alternator.

Imagine an ordinary crystal performing the many functions of our indispensable vacuum tubes! Yet this is a possibility. The crystal is now made to amplify and oscillate, besides detect. In other words, it is now doing what was thought impossible.

Not only will the crystal produce oscillations of an audible frequency, but can readily produce those of radio frequency. Every crystal will not oscillate, no matter what is done to it. Zincite especially, when fused with manganese dioxide has been found to give very best results. To find out whether the crystal is oscillating at radio frequency, a tube heterodyne is used.

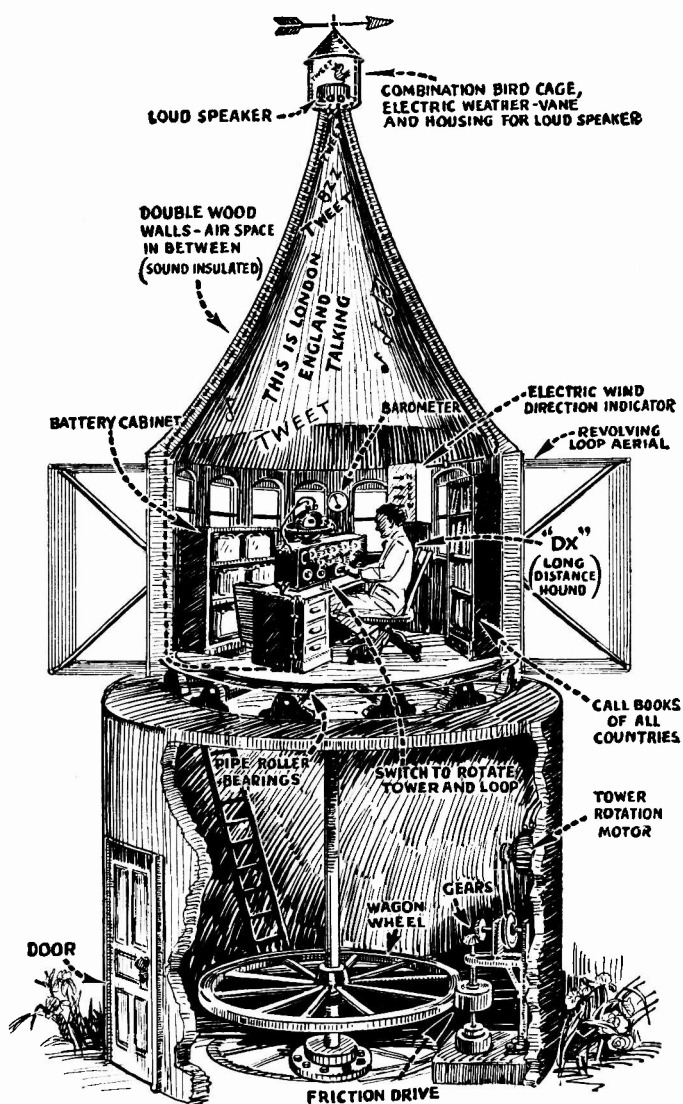


The reception of continuous waves on a crystal detector is now a possibility. With the circuits given herewith it has been found that a wave-length as low as 25 meters can be reached. This only goes to show the large oscillating range of the crystal. Perhaps a more efficient method in the reception of C. W. signals is that depicted by the circuit shown on the right. A radio frequency is generated by the oscillating crystal, while an ordinary galena rectifies the incoming wave. In this way the incoming signal is heterodyned and maximum signal strength is the result. The main difficulty in the reception of signals is that of keeping the steel contact on a sensitive spot, as a slight jar will knock the crystal out of adjustment.



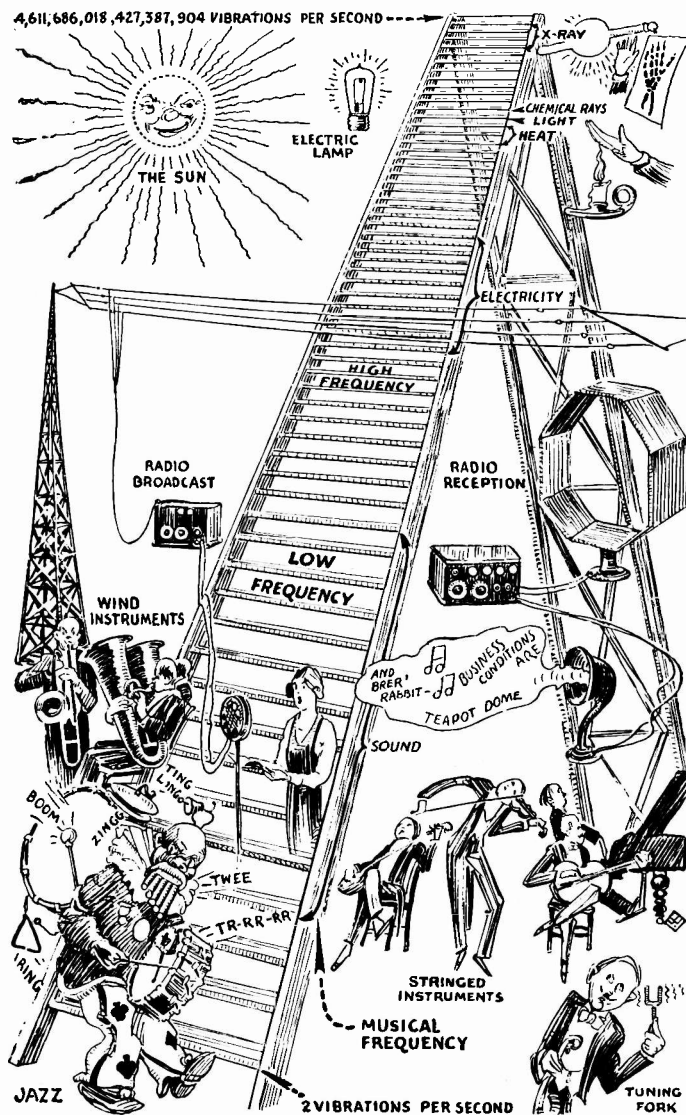
The above diagram shows the simplest circuit for receiving continuous wave telegraphy. A ground connection should be made between the inductance coil and the variable condenser. An inductively coupled circuit is more selective and can be seen in the diagram in the upper left. The possibility of having the oscillating crystal compete with the 3-element tube is rather slight, since the fact remains that it is a rather unstable device. As an experiment the reception of CW is decidedly interesting. Where the popularity of the oscillating crystal lies is undoubtedly in its properties as an audio frequency oscillator. Its intrinsic value in competition with the audion remains to be seen.

A Fan's Paradise



If a radio fan could build a radio receiving station to suit his own ideas, he would probably follow the above suggestions. The entire operating room may be revolved. This also revolves the loop aerial. Note the complete scientific and radio equipment as well as the built-in loud speaker. —W. E. Mayer.

Ladder of Vibrations



Each step of the ladder representing the table of vibrations indicates an octave. There are 62 octaves, the vibrations doubling for each step or octave. The actual figures of the first and last octave are shown. For the intermediate figures the reader is referred to the Oracle columns of the May, 1924, issue of SCIENCE AND INVENTION.

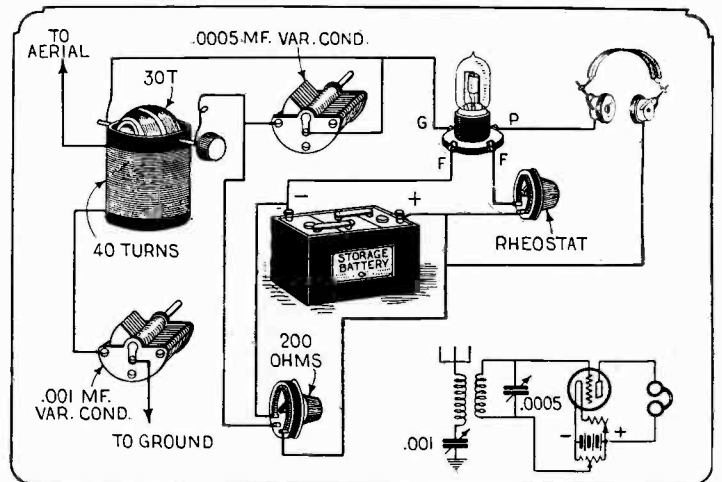
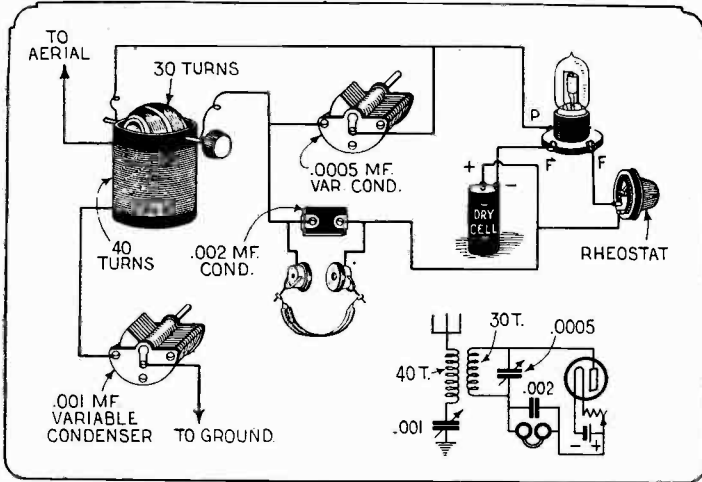
Complete Data on Radio Tubes

Different Types of Radio Tubes	Use	"A" Filament Terminal Voltage	"A" Filament Current in Amperes	Resistance of Rheostat in Ohms	"B" Plate Voltage		"C" Battery, Volts
					Detector	Amplifier	
UV-201-A	Detector or Amplifier	5	.25	15	48	48-96	0 to 6 Volts
C-301-A	Detector or Amplifier	5	.25	15	48	48-96	0 to 6 Volts
UV-201	Amplifier	5	1	6		48-96	0 to 4 Volts
C-301	Amplifier	5	1	6		48-96	0 to 4 Volts
UV-200	Detector	5	1	6	18-24		
C-300	Detector	5	1	6	18-24		
Sodion D-1	Detector	5	.25	15	24		
UV-199*	Detector or Amplifier	3	.06	30	40	48-80	0 to 6 Volts
C-299*	Detector or Amplifier	3	.06	30	40	48-80	0 to 6 Volts
WD-11	Detector or Amplifier	1.1	.25	6	40-48	48-72	0 to 4 Volts
WD-12	Detector or Amplifier	1.1	.25	6	40-48	48-72	0 to 4 Volts
DV-6-A	Detector or Amplifier	2.7	.30	6	24-48	48-200	0 to 6 Volts
216-A	Amplifier	6	1.35	10		96-120	6 to 10 Volts

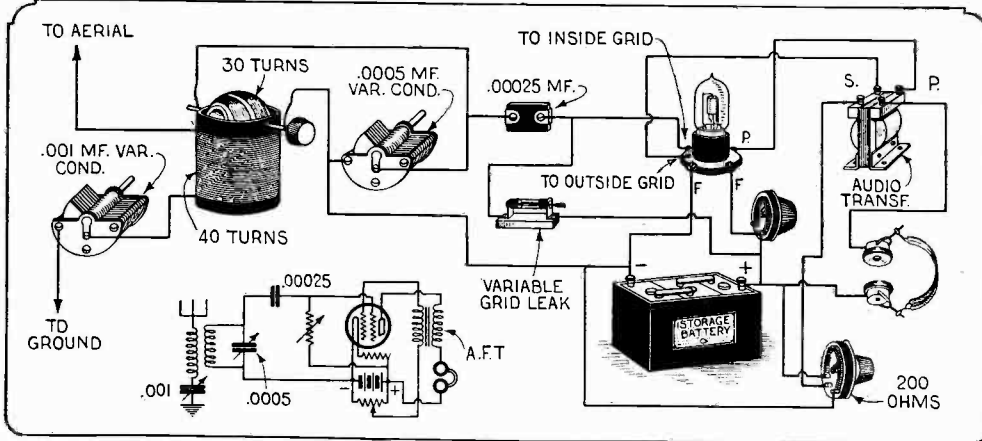
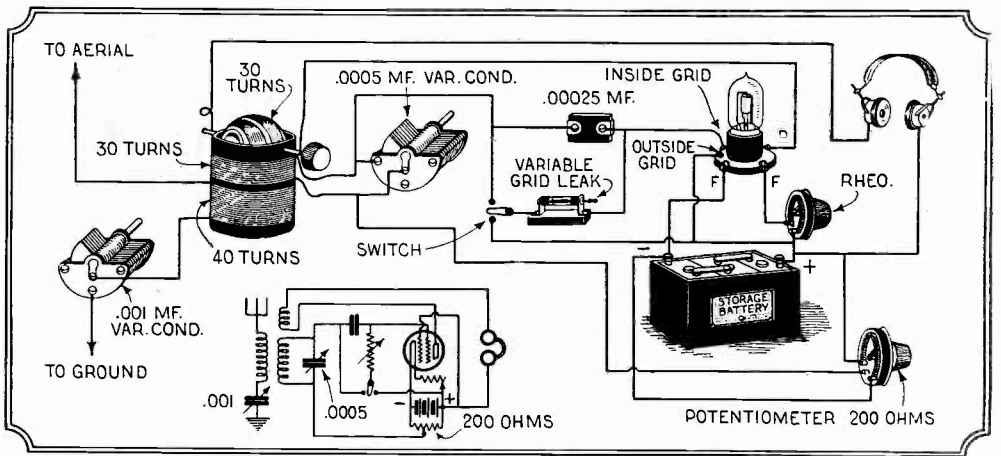
*To use these tubes on a 6 volt battery, use a 60 to 120 ohm rheostat.

The Solodyne

Circuits Which Eliminate "B" Batteries

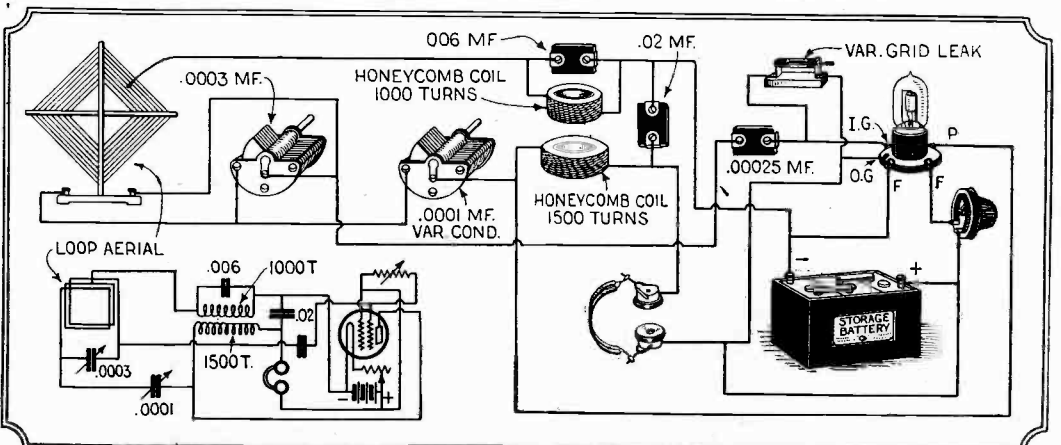


It all started when Thomas A. Edison announced the "Edison Effect"—the electronic migration from a heated filament to a cold plate. Fleming a short while later, applying this new principle evolved the now famous Fleming Valve. It was possible to receive intelligible radio signals with but one battery and be assured of more reliable communication than the crystal had afforded, and this, without the use of a "B" battery. Then came DeForest with his indispensable three element tube. Now comes a new development that vastly improves radio reception without the use of "B" batteries and incorporates a four element tube—the Solodyne. "What are its main advantages?" one may casually ask. By the elimination of the "B" battery, the burning-out of the filament of a tube becomes a thing of the past. Expensive transformers, phones, and fixed condensers are saved from the rather deleterious effects of burn-outs and blow-outs. Noise is practically done away with and reception is much more distinct.



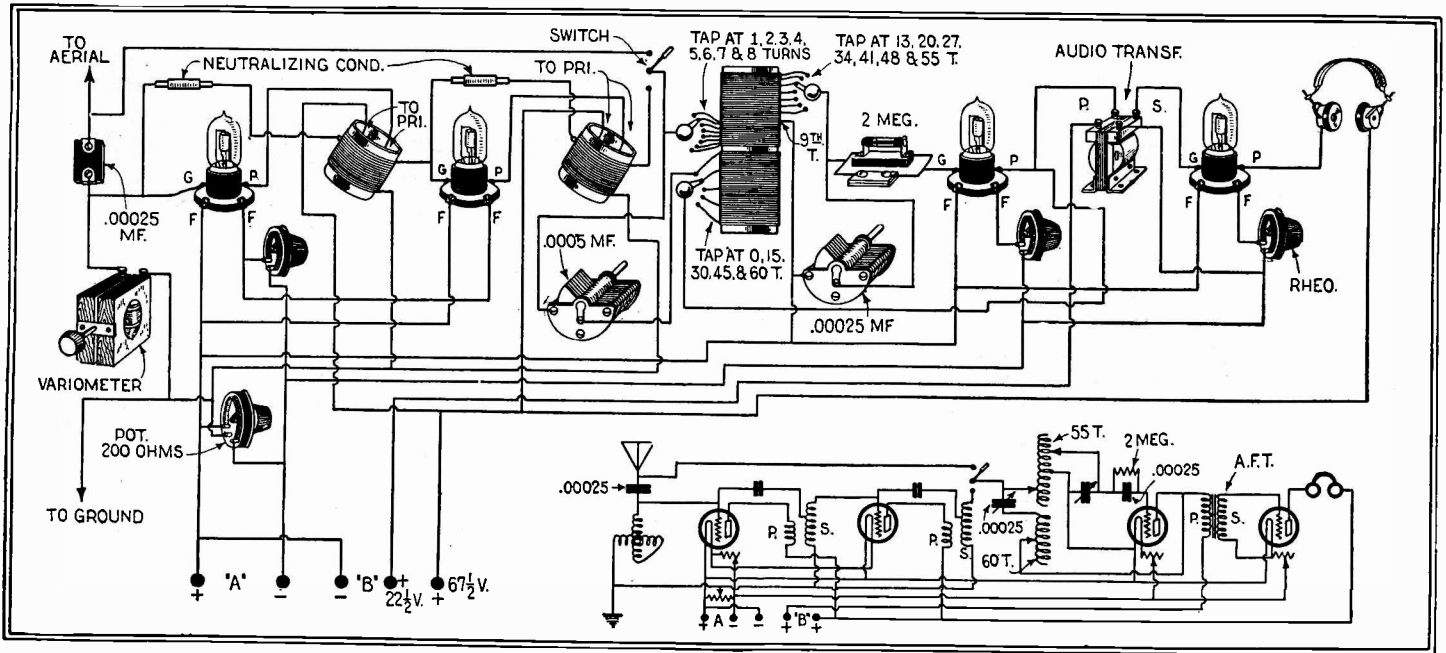
The theory of the circuit is best explained by referring to the above diagram. The antenna circuit is roughly tuned to the incoming oscillations, which are induced in the secondary circuit where the tuning is sharper. Now due to the electronic emission from the hot filament, there exists a small direct current in the plate circuit. The inner-grid,—the tube having two grids, one inside the other,—and the plate are both positively charged, being connected to the positive side of the "A" battery. The circuit is made regenerative by coupling the plate to the secondary in the usual manner. The fact that the inner-grid is made positive, reduces the internal resistance of the tube by acting in the manner of drawing more electrons away from the filament,—the heavier the flow of electrons, the greater the conductivity. At the same time, due to the feed-back action, this same grid has imposed upon it relatively high potential values and thus, incoming signals are produced with more volume.

The Solodyne requires the use of hard tubes, that is, tubes having a high degree of vacuum for the reason that the gases inside a soft tube, when hot, become ionized and spoil the action. The fact remains that all radio circuits would work much better if hard tubes were used entirely throughout, since many noises are the direct result from the internal reaction going on. Experimentation with these hook-ups prove that the Solodyne is the only reproducer of pure musical notes. Distortion is unknown and while signal strength is not as great as with circuits using "B" batteries, the increase in clarity more than offsets this. The diagram above shows a feed-back hook-up, using but one four-element tube, while that at the right, shows a form of super-regenerative receiver using a loop antenna which is tapped at the center. The Solodyne is a step in the right direction for musical quality.



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.



(Q 296) As is well known, the Reinartz circuit is one of the most efficient regenerative circuits in use. The problem of adding neutralized radio fre-

quency amplification to it has been met with fair success. This receiver will do remarkable long distance reception, but as a foreword, is very hard to control.

REINARTZ RADIO FREQUENCY

(296) Robert Hayden, Trenton, Mo., asks:

Q. 1. Kindly give me a diagram of a Reinartz circuit employing two stages of neutralized radio frequency amplification and one stage of audio frequency together with a list of all the necessary parts, and their values.

A. 1. The diagram you request is shown herewith.

BATTERY TROUBLE

(297) Chas. Weaver, Johnson City, N. Y., asks:

Q. 1. How may I test my set to find out whether or not the "B" battery circuit is correct, so that I will not burn out a tube?

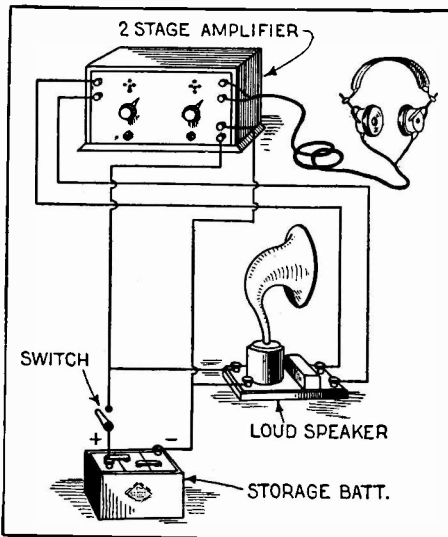
A. 1. The best method to use for the work you mention is to trace out your "B" battery circuit carefully and to make sure that it is not shorted across the filament. Another method is to connect up everything, including your "A" battery, but without the tube in the socket. Place a volt meter across the filament binding posts on the socket and note the reading. If it is higher than the reading of the "A" battery, then you may be sure that something is wrong and your circuit must be rechecked.

LOOP QUERY

(298) Roger Pryor, Union Hill, New Jersey, asks:

Q. 1. How can I make a loop to give me the best results on my Neutrodyne set?

A. 1. Twelve turns of No. 18 ordinary cotton covered paraffined bell wire, wound on a frame 3 feet square will answer. The turns should be spaced at least 1/4 of an inch



(Q. 299) A moveable Coil Loud Speaker lends itself very readily as a sensitive microphone and can be used to detect faint sounds many feet away.

apart, and the loop when shunted with a .0005 variable condenser will cover between 200 and 600 meters very efficiently.

DETECTAFONE

(299) Leonard Botwinick, Pasadena, Calif., asks:

Q. 1. Can you show me how to hook up a Magnavox loud speaker as a detectaphone?

A. 1. A two stage amplifier from any radio set is used, the input being directly

connected to the Magnavox. A pair of phones are connected to the output. With this system remarkable results are obtained, the device being very sensitive and faint sounds several hundred feet distant can readily be detected.

LIFE OF TUBES

(300) James R. Merton, Racine, Wis., asks:

Q. 1. Does reflexing shorten the life of tubes?

A. 1. The life of a tube depends only upon the way its filament is treated. For a 201A, whose filament voltage is 5 volts and whose filament consumption is .25 ampere to be operated at 6 volts with an insufficient rheostat control, the filament current will jump to .30 ampere. This increase of 20 per cent. in filament current lowers the life of the tube more than 80 per cent. In a reflex circuit or in any other circuit for that matter, a tube which performs a double function draws only on the "B" battery supply by its electronic emission. In an ordinary receiving set of three, four, or more tubes, the last tube must handle all the currents passed by the preceding tubes, and therefore causes a much greater drain on the "B" battery than the others, but the filament is in no way affected, except when the filament current is increased.

WAVE-TRAP

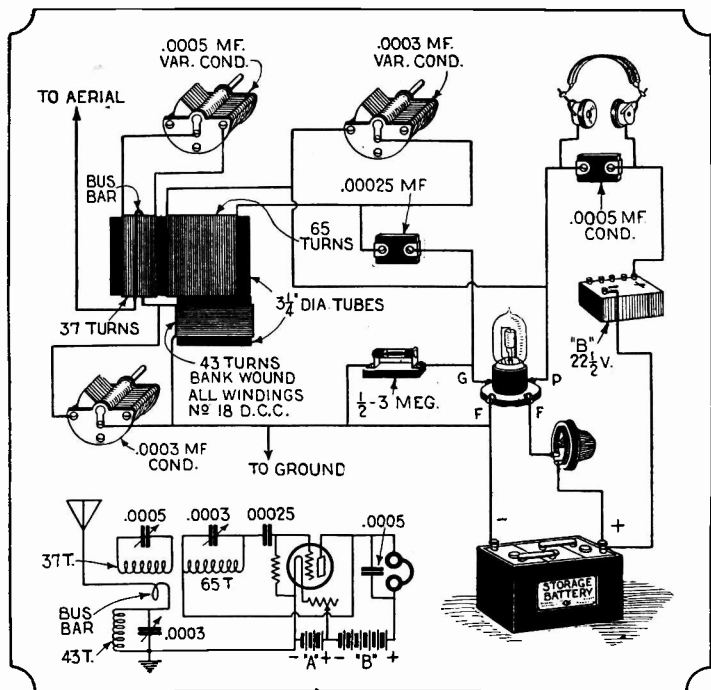
(301) F. E. Sturdevant, Columbus, Ohio, describes his receiving set and asks how he can place a wave-trap in the antenna circuit.

A. 1. Shunt an inductance coil of the required size across a variable condenser in series with the antenna.

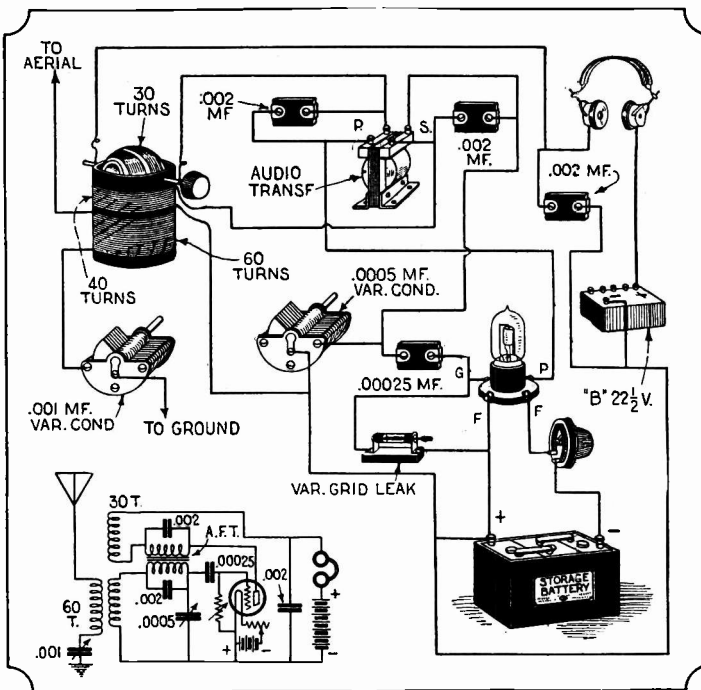
WANTED!!! RADIO ARTICLES

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.



(Q. 302) The use of taps is soon to become a thing of the past and will be classified as obsolete. To overcome the difficulties in their use, a variable condenser is shunted around the coil. This is the most efficient way of varying the wave-length.



(Q. 306) One tube can be very successfully used to function as a detector and audio frequency amplifier. However, the use of one tube as a radio frequency amplifier detector and audio amplifier has not been successfully solved. A detector tube acts as a radio frequency amplifier.

COCKADAY CIRCUIT

(302) Robert Lonergan, Wenatchee, Wash., asks:

Q. 1. Kindly publish the Cockaday circuit without the use of a tapped bank wound inductance coil. As I detest taps I would very much prefer the use of a condenser or other means of tuning it.

A. 1. The circuit you desire is shown in the drawing.

DIELECTRIC CONSTANT

(303) Arthur Mansfield, Rochester, New York, asks:

Q. 1. Kindly give me the reason why mica is used instead of paraffin paper in fixed condensers and also define dielectric constant?

A. 1. The dielectric constant of a substance is the ratio of the capacity of a condenser when its plates are separated by a substance, to its capacity when its plates are separated by air. Paraffin paper has a lower dielectric value than mica and is much inferior for the reason that it absorbs moisture more readily than mica, and cannot withstand potentials as high.

Mica has an average dielectric constant of 6. Due to the extreme thinness of the mica and this high dielectric constant, it is possible to obtain high capacities in small fixed condensers. Air is the unitary dielectric, but is used mostly for variable condensers. The closer the plates of a condenser are, the greater the capacity, hence if a fixed condenser of a known value were

put between the jaws of a vise and compressed, its capacity would rise above its rated one, but this condenser could not possibly withstand the voltage under which it was tested at first.

OSCILLATION

(304) S. B. Brown, Chicago, Ill., says that his set has suddenly stopped oscillating, not having done anything to it except to add a fresh set of "B" batteries. He asks:

Q. 1. I cannot see what has happened. Can you explain this?

A. 1. First see that there are no broken connections in the set. Check up on the storage battery to see whether it has not fallen too low. If lower than five volts, recharge immediately. The tubes may have been paralyzed by an excessively high plate-voltage. Disconnect the "B" battery and allow the filament to burn for half an hour at normal filament voltage. Tighten up feedback coupling. In many cases after a 10% reduction in the diameter of the filament due to volatilization, the efficiency of the tube falls off very appreciably and it becomes necessary to burn the filament more brightly.

TROUBLE IN CRYSTAL SET

(305) Bernard Dettling, Johnstown, Pa., says he has built the crystal set according to Fig. 2, page 54, of the May issue, but received no results with the same. He asks:

Q. 1. Can you help me out?
A. 1. The set described is the all around best crystal hook-up and you should have

no difficulty whatsoever in receiving signals. Perhaps your fixed condenser, which is shunted across the phones, is shorted. Remove it and try tuning slowly and readjusting the crystal detector. Be sure you have a good sensitive crystal. Make sure your variable condenser is not shorted; blow all the dust from all the plates and tighten up bearings. This circuit must work perfectly if these conditions are fulfilled.

SINGLE TUBE IN TRIPLE ROLE

(306) Norman Sigler, Syracuse, New York, asks:

Q. 1. Kindly give me a hook-up that employs one tube having the three functions of detection, regeneration and audio frequency amplifications.

A. 1. The circuit you desire is shown herewith.

RADIO TO AUDIO FREQUENCIES

(307) O. T. McIlvaine, Cleveland Hts., Ohio, asks:

Q. 1. In how many different ways can a radio frequency current be made audible and what are these means?

A. 1. There are several ways of rendering a radio frequency signal audible. Some are very good, others relatively poor. In the order of their respective sensitivity, they are:—the Audion, the Fleming valve, the crystal, the high frequency alternator (as a Heterodyne), the electrolytic, the tikker, the microphonic, the magnetic, and the coherer detectors.

200 ILLUSTRATIONS—100 ARTICLES

is the average of every issue of RADIO NEWS. We doubt if there is a radio magazine in print that can show the diversity of articles and illustrations that is found in this magazine.

But above all, it is the quality of the material that is of prime importance to the man interested in radio. RADIO NEWS appeals to all factions; the Scientist, the Amateur, the Experi-

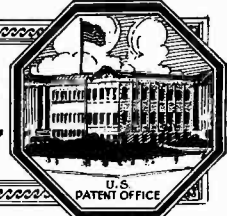
menter, the Broadcast Listener, and the Manufacturer. Each will find articles written especially for him. Every issue of RADIO NEWS is a radio education by itself. Sold on 35,000 newsstands in the United States and in every international book store in every civilized country the world over.

A LIST OF INTERESTING ARTICLES APPEARING IN THE OCTOBER ISSUE OF RADIO NEWS

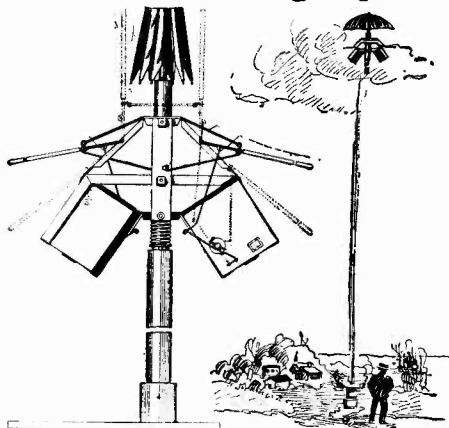
- Music From Your Lamp Socket. By R. D. Duncan
- The Biography of Lee DeForest. By W. B. Arvin
- Crystodyne Receivers and Amplifiers. By I. Podliasky
- Duet with Singers 3,000 Miles Apart to be Broadcast. By A. M. Jacobs
- Pilot Interviewed by Radio While Flying. By A. M. Jacobs
- Notes on the Super-Heterodyne. By Prof. Grover Ira Mitchell
- Reflex Radio Receivers In Theory and Practice, Part II. By John Scott-Taggart
- Non-Radiating Regenerative Receivers. By Clyde J. Fitch



LATEST PATENTS

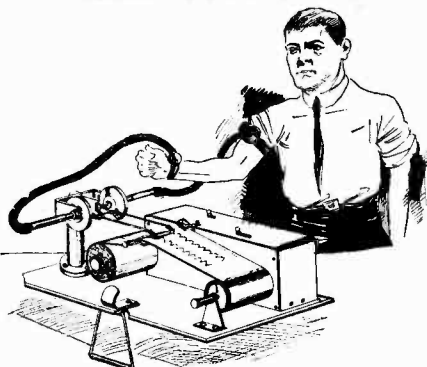


Aerial Photography



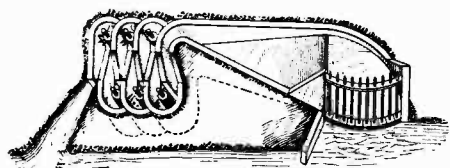
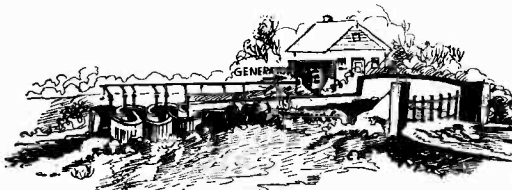
1,490,239, issued to Clifford B. Taylor. The parachute carrying the camera is shot into the air by means of a small cannon loaded with gun powder. At its extreme height the parachute opens and allows the camera slowly to descend. When the parachute opens it operates the shutters of the camera, thus taking the pictures.

Pulse Recorder



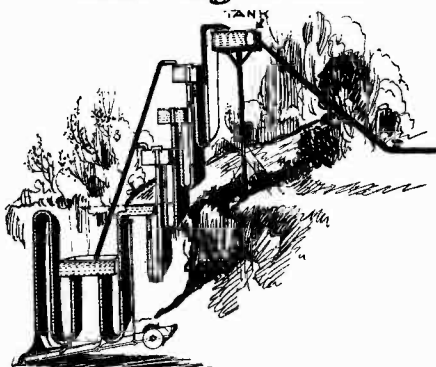
1,494,868, issued to Frank B. Sanborn. By communicating the differences in pressure of the veins and arteries to a tube and sensitive diaphragm to which a needle is attached, this device gives an accurate record of the circulatory condition of the individual under test.

Water Power



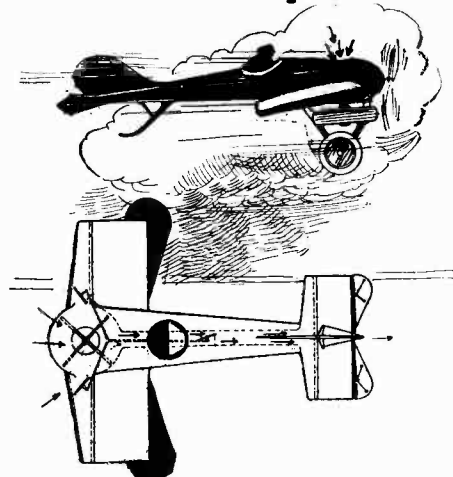
1,456,212, issued to James A. Bishop. By passing a stream of water through a number of baffles such as those shown in the above illustration and by placing a water wheel in the extremity of each baffle, a very efficient generator of power is obtained from the fall in the stream.

Raising Water



1,444,442, issued to Thomas Gaskell Allen. This system of raising water above its own level with the assistance of air pressure was described fully in *SCIENCE AND INVENTION* a few months ago. This is the patent covering the device then shown.

Aircraft Propulsion



1,491,954, issued to Leon H. Jacobs. Taking advantage of both helicopter and forward motion, this device sucks the air in at the nose of the plane, forces it through a channel, and out at the tail of the plane. A propeller is used to pull the air in and force it back, which, as in ordinary planes, pulls the machine forward.

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.

Blotting Device



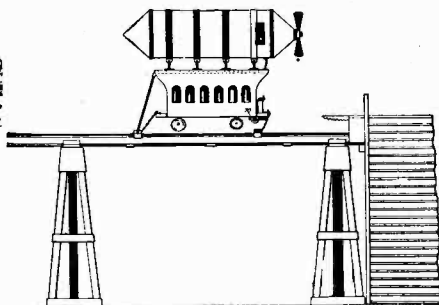
By placing a small blotting roller in a compartment attached to the top of a fountain pen, an extremely simple and handy kink has been devised. The blotting roller is renewable simply by removing it from the compartment at the top of the pen.

Car Washer



1,462,909, issued to Stanley F. Gulba. By placing a small turbine in a special nozzle and attaching the turbine to a rotary brush at the end of the nozzle, this patent fills a long felt want for garages. A stream of water uses its force to turn the cleaning brush and then flows on to the car body, acting as the washing substance, thus being used twice and making for efficiency.

Aerial Transport



1,468,507, issued to George F. Nilsson, Sr. This invention seeks to increase the speed of transportation by removing the wheel friction and rail friction and by making the transportation car a cross between the dirigible and an ordinary street car, the power is taken from the rails and propulsion is through an air propeller fixed in front of the gas bag. The gas bag contains hydrogen or helium.

Scientific Humor

SHIFTY GENTS

I'm careful in my dealings with elevator men. They are liable to take up, run you down, and let you out. They never move without pulling wires. You've got to be up and down with them. You give them the floor, and they tell you where to get off. You can't believe them; they never stay on the level, always shifting from one story to another. Sad but true!
—Myer Skolnick, Reporter. No. 13,440.

SHOULDN'T HAVE TAKEN HOLT

An electrical mechanic named Holt, Tried to tighten a lightning bolt. When he opened his eyes He said in surprise, "It must have been more than one volt!"
—C. A. Swoyer.



WHY HE WAS IN SO LATE

During a recent thunderstorm, Jones, a wireless fiend, went out into the dark and stormy night, lowered his aerial and carefully buried one end of it in the soil. Next morning, as he was going to town in his train, he told a fellow traveler what he had done. "But, weren't you afraid of the lightning striking you?" queried a rather incredulous listener. "No!" firmly replied Jones, "You see I had some silk pajamas on, and I read that silk is a good insulating covering."
—Ronald W. Etherington, Reporter No. 12,739.

REDUCTIO AD ABSURDUM

VERY STOUT CHEM. TEACHER: "Is carbon a good reducing agent?"
BRIGHT BOY: "I don't know, but you might try some."
—Robert Courath.

THE BED VIBRATED

MOTHER: "Willie, shut off that radio set and come to bed. That oscillation sets me crazy."
WILLIE: "Ma, I am in bed. That ain't the radio."
MOTHER: "What is it then?"
WILLIE: "That's our new cook snoring."
—Noel Compton.



"DRUG" OUT OF HIM

BOY (in a drug store): "I want a bar of Iron Soap."
CLERK (amusingly): "Maybe you mean Castile Soap?"
BOY: "Yes, that's what it is."
—Lester Kapala.

HOPE THE FUSES REFUSED TO SIZE-LE

FOREMAN: "The load is too heavy for the size fuses you are using."
BONEHEAD ELECTRICIAN: "But I don't see why the load should be heavy enough to blow the fuses. The blueprint says this is a light circuit."
—Fritz Vanderwerth.

First Prize \$3.00



A VERY MODERATE SIZED ANIMAL

PHOTOGRAPHER: "I am going to fire that new assistant."
WIFE: "Why?"
PHOTOGRAPHER: "I told him to order a thousand lbs. of hypo and he went down to the zoo and ordered a hippopotamus."
—J. C. Mello.

A SPIDER HAS NO ANTENNAE

A city lad spending a day on a farm saw a spider spinning a web between two weeds. "Hey, Pop", he yelled, "Come here and see this bug putting up a wireless."
—R. S. Barenther.

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.

SOME WHO SING IT TUNE IT OUT

Some citizens are now taking advantage of the fact that, when hearing our National Anthem over their radio, they can tune it out, rather than take the trouble to stand up.
—Charley Blood.

THE BOMBARDMENT OF THE ATOMS

The football team of Science College marched to the field amid the roar and din of the scientific school yell, "Up and Atom."
—Graham G. Berry.

POP TRIED TO STAY ON TOP

LITTLE BOY TO FATHER: "Pop, why do people call the shed on an automobile a top?"
Boy's father, after a moment's hesitation: "Well, Sonny, I suppose 'cause they go for a 'spin' in them."
—Harry Walters.



YOU'RE ON

The aviator's wife was taking her first trip with her husband in his airship. "Wait a minute, John", she said, "I'm afraid we will have to go down again."
"What's wrong?" asked John.
"I dropped one of my pearls and I think I can see it glistening on the ground."
"Keep your seat, dear," said the aviator, "that's Lake Huron."
—I. Weimert.

AND IODIDE OF POTASSIUM

DEAR EDITOR: "I always knew that a chrom-ate and a chlor-ate, but will you tell me this: Can a sulph-hide?"
—Milton Koenecke, Rep. No. 12,230.



A LEGAL LIGHT

PROF: "What's the moon?"
STUDENT: "It's a diffused head-light for lovers."
—J. C. Mello.

THE TEMPER IRONED-OUT

"What happened to your friend Steel?"
"Oh, Steel lost his temper and hit a Copper and Jidge Murphy gave him tin days."
—Charles R. Swift.

WIRELESS CLOTHES LINE

NEIGHBOR: "I see your wife hangs the wash on your aerial."
RADIO BUG: "Yes, very convenient. When it has been out long enough, the loud speaker started singing 'How Dry I am', and she takes it in."
—Sam Y. Caldwell.

THIS IS HOT

"Mazda, darling," he wrote, "be mine, Incandescent One! Watts life without you. Ohm is not ohm without the light of your presence. My heart is a transformer that steps up at every thought of you. I would insulate my head alongside your switch; the contact of your hand is like a live wire. Marry me, and let's have a little meter in our home."
—Wilbur H. Yost.

NOT EVEN A DOLLAR A YEAR MAN



A woman who had been married several times and who could not get along with her husbands wrote an article on "What Men Are Made Of."

"Man", she began, "is made of enough sugar to fill a teacup, enough lime to white-wash a small chicken coop, iron enough to make a small nail, phosphorus enough for a box of matches, postassium enough to fire a small cannon, fat enough to make six bars of soap and enough copper to rid a dog of fleas. All of this would cost 98 cents, which I think is a high price to pay for some men."
—Ned Guffey.

TAKES THE "FUSES" OUT OF "REFUSES"

HE (trying to start car): "This darned self-starter refuses to work. There is a short circuit somewhere."
SHE: "Well, why don't you lengthen it?"
—M. Kipp.



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.

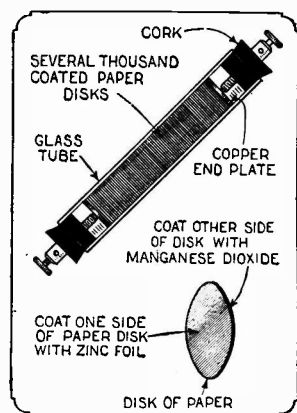
4. If a quick answer is desired by mail, a nominal charge of 25 cents is made for each question. If the questions entail considerable research work or intricate calculations a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

ZAMBONI'S DRY PILE

(1745) J. R. Crespo, Buenos Aires, Argentina, asks:

Q. 1. What is the so-called Zamboni dry pile and how is it made?

A. 1. This little device consists of a glass tube in which are placed several thousand paper disks which have one side coated with manganese dioxide and the other with zinc foil. In effect,



The accumulation of electricity either in the static or dynamic form has been attained in many different ways. The interesting and curious dry pile of Prof. Zamboni is one of the most interesting. It is in reality a voltaic cell having a high potential.

it is a miniature dry cell having a tremendous high internal resistance and an exceedingly great terminal voltage,—a good dry pile yielding sparks several inches long. A cell of this nature will last several years and much fun can be had with it.

MIRRORS AT STREET INTERSECTIONS

(1746) James Collins, Springvale, Mo., wants to know:

Q. 1. Why not put large mirrors on street corners so as to reflect another street and thus view the traffic?

A. 1. Although a good suggestion, we do not believe that this would work out very well. In the first place, the reflection from these mirrors, either of the sun's rays or automobile headlights, would render the device objectionable. Secondly, the initial cost, the upkeep, replacement and maintenance would be too high for the ordinary municipality.

FLY PAPER

(1747) A. D. Stanley, Greenville, Ala., wants to know:

Q. 1. Can you give me the formula for making a suitable sticky fly paper? Would I infringe on any patents by the manufacture of a different design from those on the market today?

A. 1. Providing of course your design for fly paper is entirely different from those on the market today, you will not infringe on any design patent. To make a good sticky fly paper requires the use of 8 parts of rosin, 4 parts of rapeseed oil, and 1 part of honey. The rosin and the oil are melted together and the honey then added.

Talking Dynamos

If you were standing before a dynamo in a power station and suddenly heard it talk, you no doubt would be greatly astonished. How dynamos and transformers can be made to talk opens up a new realm of experiment to electrical students; and not only does this represent an interesting and novel line of experiment, but owing to the manner of making the iron molecules talk without any diaphragms, a new field is opened up for research work on radio loud speakers and telephone apparatus in general. Don't miss this wonderful article by Eugene J. Dwyer in the October PRACTICAL ELECTRICS.

Other articles in October PRACTICAL ELECTRICS are:

Vacuum Tube Oscilloscope

By Charles D. Savage.

Electric Chimes—By Earle R. Caley, B.Sc.

Induction Motors By Harold Jackson.

Talking Transformers and Dynamos

By Eugene J. Dwyer.

Photo-Electric Cells. By H. Vigneron.

SIMPLE SHOCKING MACHINE

(1748) John Dowalo, Donora, Penna., asks:

Q. 1. Can you kindly inform me as to the simplest way in which a shocking machine can be made?

A. 1. Attach one wire to the vibrator terminal of an ordinary bell and another wire to one of the terminals, both about two or three feet long and connect a knife to the end of each wire to be used as shocking handles. By wetting the hands and grasping the knives when the bell is ringing, a distinct shock can be felt. This is the simplest arrangement for a shocking machine.

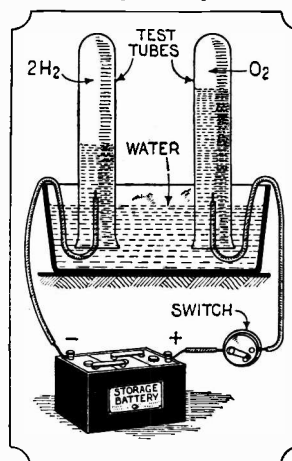
ELECTROLYSIS OF WATER

(1749) Harold Wris, Portland, Oregon, wants to know:

Q. 1. Is pure water a conductor of electricity? If so, kindly tell me how I can electrolyze it?

A. 1. While pure water appears not to conduct electricity, its resistance is greatly reduced by the addition of a few drops of sulphuric acid.

One of the commercial methods for obtaining oxygen and hydrogen in large quantities is by the electrolysis of water. The pure water is slightly acidulated by the addition of a small quantity of either sulphuric or hydrochloric acid. Platinum electrodes are used since they are not attacked by impurities or acids.



Two test tubes full of water are inverted into a receptacle containing water and the ends of two small platinum wire electrodes are inserted. By connecting a storage battery to the electrodes, the analysis of the water begins which breaks up into hydrogen and oxygen, twice as much hydrogen as oxygen being liberated. The chemical equation of this analysis is $2\text{H}_2\text{O}$ yields $2\text{H}_2 + \text{O}_2$.

ELECTRIC HEATER

(1750) Herman Forth, Brooklyn, New York, asks:

Q. 1. Can you give me any data on how to make a 2000 watt, 220 volt heater?

A. 1. For a 220 volt heater you should have No. 18 calido wire, which has a resistance of approximately .37 ohm per foot. At 220 volts, a 2000 watt heater will take 9 1/10th amperes or approximately 10 amperes, in which case R would be equal to 22 ohms. You will need, therefore, approximately 60 feet of No. 18 calido wire. Mica porcelain, plaster-of-Paris and sand can be used as the heat resistive insulators.

OUR \$12,000 PRIZE CONTEST

IT will be noted from recent issues and the present one that our prize contest has been a whale of a success. Over \$1,000 has been paid out this month for worth while contributions to SCIENCE AND INVENTION, either in pictures, suggestions, ideas or articles. We now have on our staff, close to 12,000 correspondent reporters who are scouting the world for

new material that can be written up for SCIENCE AND INVENTION. And the formula is simple—just keep your eyes open. Even if you were totally deaf or blind, you could still win a prize by simply using your head and sending us ideas of a scientific nature, or of a nature directly or indirectly attached to new inventions.

ARTICLES FOR NOVEMBER SCIENCE AND INVENTION

Early American Patents.

Details of the Radio Knife, Medicine's Latest Discovery.

Stereoscopic Photos and Vision Without a Stereoscope.

A Novel Third Degree Method.

By Andy Gilbert.

A Miniature Universe.

Homo Artificialis—Man with Artificial Organs.
By H. W. Secor and J. H. Kraus.

Poison War Gases Cure Ills.

Radio Frequency Coupled Amplifier.

Experiments with the Solodyne and How to Make Them.

The Good and Bad in Your Aerial.

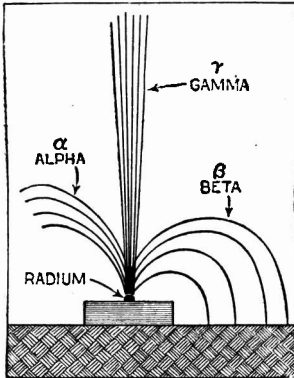
FREE INFORMATION

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 much 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.

RADIO-ACTIVITY

(1751) John Belmar, Racine, Wis., asks:
 Q. 1. Can you give me some information concerning radio-active materials?
 A. 1. Shortly after the discovery of X-rays by Roentgen, Becquerel noticed that certain fluorescent bodies emitted similar rays capable of penetrating opaque substances. In 1898, two years later, Mme. Curie succeeded in isolating the most radio-active material known, which she named radium. Thorium and uranium are other radio-active elements.



It is well known that radium emits three kinds of rays. These rays are not identical, but have different properties. They are called alpha, beta, and gamma rays. The diagram shows the action of the rays in the intense field of an electro-magnet.

Experimentation by Rutherford proved that radium emits three kinds of rays known respectively as alpha, beta and gamma. The alpha rays which are known to be atoms have small penetrating power, and when subjected to the action of a magnetizing force are deflected in a direction which shows them to be positively electrified. The beta rays are negatively electrified, have great penetrability and are similar in nature to cathode rays. The gamma rays are not deflected by a magnetic field, have very high penetrating powers and above all are ionizing. They have properties identical with Roentgen rays. Whereas the gamma rays travel with the speed of light, the beta rays travel as slow as 1/10th as fast and the alpha particles only 1/20th.

Radium, classified as an element, is itself a product of the degeneration of uranium and finally resolves itself into helium (given off as alpha particles) and an inactive product resembling lead. Being, as it is, that all the uranium of the world is breaking down from its very complex structure to the more basic and inactive forms of lead, we have no source from which we can draw. Of course, thousands of years will pass before all the radio-active elements disappear entirely. Pitchblende from which radium is obtained, is relatively cheap and many tons of it are required to produce a few milligrams of the wonder substance.

ELECTRIC SPOT WELDING

(1752) Peter Zasadny, Chicago, Ill., wants to know:
 Q. 1. Is it possible to weld two sheets of brass on an electric spot-welding machine and can it be successfully done?

A. 1. It is entirely possible to electric spot-weld two sheets of brass together. Electrical welding will accomplish what other means of welding cannot do. Almost any metal can be welded to any other kind; aluminum to soft iron, steel to zinc, etc. Electric spot-welding is one of the most successful, if not the most successful means of accomplishing a permanent joint between metals.

RELATIONSHIP OF INPUT TO OUTPUT

(1753) C. Price, Wichita, Kansas, asks:
 Q. 1. Will you please advise me what the proportionate or relative power of a solenoid is to the power required to energize the solenoid?
 A. 1. Of course, the power applied to a solenoid is equal to the power generated by one, minus leakage and frictional effects. It is always safe to figure 25% as a safety factor.

EVAPORATING WATER

(1754) Chas. Warner, Philadelphia, Pa., asks:
 Q. 1. Can you give me some methods of evaporating water chemically?
 A. 1. In order to evaporate water chemically, the means of accomplishing this are varied. You can use dry calcium chloride crystals which are hygroscopic and by their mere presence in an aqueous vapor atmosphere will absorb all the moisture. A shallow pan of concentrated sulphuric acid will also readily accomplish this. Heat is not necessary and the water, as you can readily see, will be evaporated at a very slow rate.

TESLA COIL QUERY

(1755) Robert Howorth, Englewood, New Jersey, asks:
 Q. 1. Will a Tesla coil operate if wound with a multi-layer winding?
 A. 1. No. It is very inadvisable to wind a Tesla coil with a multi-layer winding inasmuch as the voltage per turn is so excessively high that the insulation between turns is not sufficient to prevent break down and hence such a coil will not work efficiently. The winding convolutions should be spaced at least 1/32nd of an inch apart.

WHAT IS ELECTRICITY?

(1756) James Weston, Chicago, Ill., asks:
 Q. 1. Are there any institutions which would pay for the knowledge of knowing what electricity is? Have been working on the problem for many years and believe I have it solved.
 A. 1. Scientists ever since the discovery of loadstone have been trying to solve the problem of "What is electricity"? Although they haven't given up in the face of things, the problem is by far too complex to offer any substantial theory. Scientists all over the world today are hard at work on it. If you have any ideas concerning the nature of electricity, we would advise you to write to the nearest college or university and ask permission for the use of their laboratories to carry out your experiments. We know of no institutions that will pay for this knowledge, but we do know, however, that you will be more than amply reimbursed once this knowledge is gained.

REFRIGERATING MACHINE

(1757) Edward D. Stein, Bronx, New York, asks:
 Q. 1. Kindly explain the theory of operation of a simple refrigerating machine?
 A. 1. The principle of operation of a refrigerating machine for cold storage and ice making depends on the condensation and evaporation of ammonia.
 Ammonia gas is compressed by a pump A, and passed into a condenser, B, where a continuous stream of cold water removes the heat developed

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.

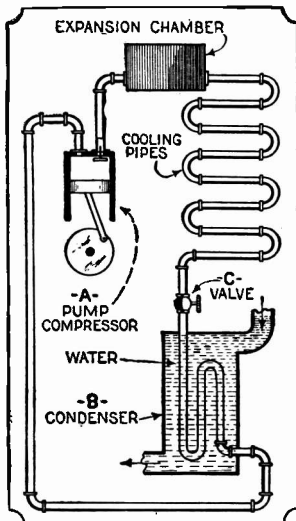
To Newsdealer
 Address

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

Name

Address

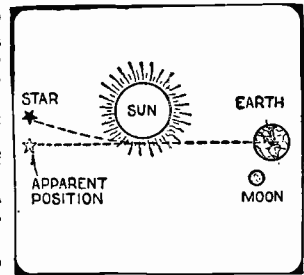
by the compression and condensation. In its liquid form, the ammonia is led through a pipe leading into the room to be cooled. Here it passes first through a valve, C, which has a very small opening. This holds the ammonia back, choking the flow and keeping it in a liquid state under pressure. Beyond this valve, the ammonia is free to evaporate rapidly and expand. This process takes up considerable heat and with a large cooling surface due to the long coils of pipes, large storage rooms are quickly chilled. The frost that coats the pipes is due to the condensation of moisture in the room. The pipes contain brine which does not freeze as water would at the temperature attained.



The refrigerating machines used for ice making on a large scale and for cooling rooms for cold storage, depend on the condensation and evaporation of ammonia. Salt water or brine is pumped through the pipes at the same time and thus prevents the water in the condenser from freezing. Very low temperatures have been attained with the use of these machines.

EINSTEIN'S THEORY

(1758) William J. Bentley, Rochester, New York, asks:
 Q. 1. Kindly summarize Einstein's theory?
 A. 1. In summing up Einstein's theory we find that it rests upon the following novel ideas, and combines them into a new conception of the universe:
 (1) There is nowhere any fixed standard by which the motion of anything can be measured. The theory of a stationary ether is put out of court.
 (2) The speed of light alone is independent of



A light beam from a star, according to Einstein followers, is bent as it passes the sun. This is one of the practical tests applied to the Einstein theory.

all other motions, and is the same for all observers, everywhere.
 (3) Time is not independent of space, or of motion. If two objects are in relative motion, both time and length, as observed from either object on the other vary with the ratio of their relative motion or speed, to the speed of light.

(4) Time plays the part of a fourth dimension, so combined with the ordinary dimensions of matter (length, breadth, and height or thickness) that together they make up a "continuum," or continuous, inseparable medium, called space-time.
 (5) Space-time is different in its structure from what we ordinarily think of as space, and ordinary geometry does not apply to it. It has an internal warp or curvature, which is greatest near massive (heavy) bodies.

(6) Gravitation (cause of the falling of bodies) is not due to an "attractive force" but is simply a natural consequence of the "curvature" of space-time.

(7) At least two important physical confirmations of the Einstein theory have been found:— First, the observed bending of light from stars passing close to the sun, which Einstein predicted as a result of the peculiar structure of space-time,—and second, the slow swinging round of the perihelion point of the planet Mercury, an effect that the Newtonian theory of gravitation did not satisfactorily explain.

MOTOR GENERATOR QUERY

(1759) James Murphy, Los Angeles, Calif., says he has a 110 volt 4 pole shunt wound D.C. motor, taking 10 amperes and running at 1200 R.P.M., and desires to rewind it to run at 220 volts so as to run it twice as fast. He asks:
 Q. 1. Can you give me any information on how to effect any changes?

A. 1. Since the speed is directly proportional to the voltage, the machine will run at 2400 R.P.M., and it will not be necessary to rewind the armature.

The field coils, however, being wound for 110 volts, will have to be rewound with the same weight of wire, which wire shall have one-half the cross-sectional area of the original wire, and thus have twice the number of turns.

Q. 2. Can this motor be used as a generator and at what speed should it be run in order to produce 220 volts, the resistance of the armature being 1 ohm and the current consumed by the shunt field when running as a motor being .5 of an ampere?

A. 2. Since in rewinding from 110 volts to 220 volts, you quadruple the resistance and at the same time increase the voltage to twice the original, the current in the shunt field becomes 1/2 the original value. Then use the following formula:

$$NG = NM \times \frac{(EG + IGR)}{(EM - IMR)}$$

Where

- NG = R.P.M. of generator.
- NM = R.P.M. of motor.
- EG = Terminal voltage of generator at full load.
- EM = Terminal voltage of motor at full load.
- IM = Armature current in generator.
- IG = Armature current in motor.
- R = Armature and brush contact resistance.
- R = 1 ohm.
- IM = $10 - .25 = 9.75$ amp.
- IG = $10 + .25 = 10.25$ amp.
- EG = 220 V.
- EM = 220 V.
- NM = 2400 R.P.M.
- NG = R.P.M. to be found.
- NG = 2616 R.P.M.

Thus it will be necessary to run the motor at 2616 R.P.M. to produce 10 amperes at 220 volts. A field rheostat in series with the fields is necessary to control the voltage at no load which is higher than 220 volts.

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

Egypt's Huge Time Piece, by L. B. Robbins 548

TWO PRIZES OF \$50.00 EACH

Casein and Its Use, by Raymond B. Wailes 567

Are Your Clothes Made of Good Material, by Ismar Ginsberg, B. Sc., Chem. Eng. 579

TEN PRIZES OF \$25.00 EACH

For Suggestion, War Gas Masks as Divers' Helmets, by H. J. Smith... 550

Science's Part in Athletics, by R. Leon Hall, Reporter No. 10369 551

Unique Clocks, by Marshall Kelly 552

If Earth Changed Speed, by Cleve Hallenbeck 553

Our Sun Is a Pygmy, by Charles H. Howard 559

Ingenious Driver's Test, by William Middleton and J. G. Pratt 561

Poisons We Eat Every Day, by Raymond B. Wailes 565

Machine Portrays Sound, by C. A. Oldroyd 573

When Is the Moon Biggest? by Charles T. Dahama, Ph. D. 578

Simple and Efficient Motor Launch, by P. G. Howes 582

FIVE PRIZES OF \$20.00 EACH

Water Transportation, by Jack Bront 568

Stereoscopic Portrait Camera, by C. A. Oldroyd 574

Disappearing Searchlights, by George F. Paul 581

Compass Kink for Irregular Designs, by Justin Hurley 583

Simply Performed Photographic Stunt, by S. H. Samuels 584

TEN PRIZES OF \$15.00 EACH

The Lie Detector, by C. A. Sloan 568

Machine Measures One Two Hundred Fifty Thousandth Inch, by S. R. Winters 571

Natural Designs From Ferns, by S. Leonard Bastin 575

Cutting Corners Easily, by Charles W. Geiger 576

Photographing Birds, by Kenneth Smith 578

Sun Flower Uses, by Miss Bessie Statler 578

Plaster Masks Simply Made, by R. C. Leibe, Reporter No. 1876... 583

Rocking Ship Window Display, by F. Malott 584

UV-199 Audio Frequency Amplifier, by Kenneth M. Swezey 593

A "DX" Loop Receiver, by Harold Jolliffe 593

TWENTY PRIZES OF \$10.00 EACH

Precision, by Dayton C. Miller 565

Beetles Pets of Scientists, by S. L. Bastin 565

Vacuum Food Carriers (Author please send address) 569

For Suggestion—Pepper Gun, by Walter Favini 574

Drinks, by Eric Dime 575

Bullet Proof, by Dr. H. Becher 575

Brush (Author please send address) 576

Shadows That Stick (Author please send address) 576

Eye Shade, by G. E. Manning 576

Tent Fire Place, by George Arthur Luers 577

Swinging Bridge, by Ralph C. Taylor 577

Speedy Moistener, by Martin Boris Beline 586

Novel Needle, by Fred Ayers 586

Clothes Hanger, by Clifton Ask 586

Etching Steel, by Frank J. McCarthy 586

A Fan's Paradise, by W. E. Mayer 591

Loud Speaker Horn (Author please send address) 615

Loud Speaker Volume Controller (Author please send address) 615

Transformer Shield, by Fred Ebel 616

Panel Support, by Joseph F. Odenbach, Reporter No. 10. 618

TEN PRIZES OF \$5.00 EACH

Nut Die, by G. A. Luers 585

Soldering Kink, by Paul F. Bryant 585

Heater, by Wm. L. Rankel 585

Celluloid Cement, by G. Eric Jones 586

Stopper Remover, by J. Schwartz 586

Putty Knife, by Stanley P. Head 586

Wire Guide, by Fred Smeltzer 610

Electrolytic Charger, by C. F. Tuma 618

Phone Block (Author please send address) 619

Storage "B" Battery, by E. J. Roy 619

TWENTY PRIZES OF \$2.00 EACH

Loud Speaker, by Philip Castanaro 610

Station Recorder, by Henson Lasher 610

Mystic Music, by Charles Rehm, Reporter No. 3932 616

Grid Leak, by A. W. Partington, Reporter No. 10316 616

Handy Tester (Author please send address) 617

Indicator, by Harold Menges 617

Lightning Arrester, by W. B. Fox 617

Neurodon, by William M. Hanneman 618

Variometer-Coupler, by Arthur A. Blumenfeld 619

Spiderweb Mounting, by T. Asplund 620

(No Further Entries)

TEN PRIZES \$1.00 EACH

(No Entries)

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

88 monthly prizes will be given as follows:

FIRST PRIZE \$100.00

2	PRIZES	of \$50.00 each
10	"	" 25.00 "
5	"	" 20.00 "
10	"	" 15.00 "
20	"	" 10.00 "
10	"	" 5.00 "
20	"	" 2.00 "
10	"	" 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 Oct. for the Dec. issue, the 15th of Nov. for the Jan. 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 13,000 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

REPORTER



SCIENCE and INVENTION

CORRESPONDENT
REPORTER'S
IDENTIFICATION

NO. 10000

L. H. Shackner

THE BEARER OF THIS CARD IS AN AUTHORIZED CORRESPONDENT-REPORTER OF SCIENCE and INVENTION MAGAZINE THE PUBLISHERS OF SCIENCE AND INVENTION WILL APPRECIATE ANY COURTESY EXTENDED THEIR REPRESENTATIVE.

EXPERIMENTER PUBLISHING CO.
Harold Ball
PRESIDENT



THIS BATTERY WILL MATERIALLY REDUCE YOUR OPERATING COSTS ON HEAVY CURRENT SETS

NEW!

Eveready Heavy Duty "B" Battery. 45 volts. Three Fahnestock Clips. Length, 8 3/8 inches; width, 4 3/8 inches; height, 7 3/8 inches; weight, 13 3/4 pounds.

New low price, \$4.75

New Heavy Duty 45-volt "B" Battery No. 770 Extra Large Cells— Extra Long Service

FOR maximum "B" Battery economy, use this *New Eveready Heavy Duty 45-volt "B" Battery*, in the following general cases:

- 1—On all receiving sets operating at 90 volts or more, having four tubes without a "C" Battery, and all sets having five or more tubes, with or without a "C" Battery.
- 2—On all power amplifiers.
- 3—On all sets that pull heavy currents from the "B" Battery.

Under the above conditions, the *New Eveready Heavy Duty 45-volt "B" Battery* will give much longer service than the 45-volt "B" Battery of usual size.

If your receiving equipment falls under any of the above classifications, you can make a big saving in "B" Battery costs by using this *New Eveready Heavy Duty 45-volt "B" Battery No. 770*. Buy it and you get the biggest battery value on the market to-day!

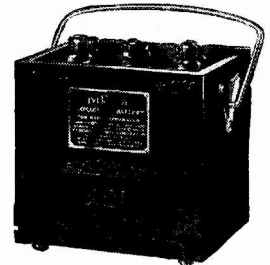
Manufactured and guaranteed by
NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery Information
New York—San Francisco
Canadian National Carbon Co., Limited, Toronto, Ontario

EVEREADY

Radio Batteries

—they last longer

No. 7111
Eveready Radio
"A" Dry Cell
Specially
manufactured for
use with dry cell
tubes



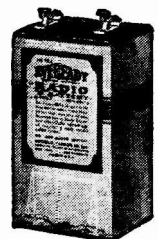
Eveready 6-volt Storage
"A" Battery

No. 766
Eveready "B"
22 1/2 volts. Six
Fahnestock Spring
Clip Connectors



No. 772
Vertical 45-volt, large
size "B" Battery

No. 771
Eveready "C" Battery
Clarifies tone and
prolongs "B" Battery
life



No. 764
Vertical 22 1/2-volt
"B" Battery



Thousands Can Draw CARTOONS Who Have Never Even Tried

Cartoonists earn from \$60 to far over \$300 a week. Why tie yourself to work that is drudgery when through a remarkable new method you can easily learn at home in spare time to draw cartoons that **SELL?**

MANY are earning pitifully small salaries who could make wonderful salaries in cartooning. Briggs, Fox, Fisher, Goldberg and other leading cartoonists *earn more than the President*. Yet a few years ago many of our most successful cartoonists never dreamed they could draw a cartoon!

The World's Easiest, Pleasantest and Best Paying Profession

Just watch a cartoonist work. A few little lines—a couple of simple curves—a splash of black here and there—and then you see a splendid cartoon before you. With a few strokes of his pen, he has taken some little incident of his day's experience—some humorous or sad scene he has witnessed—and produced a wonderful cartoon.

New Easy Way to Learn Cartooning

This fascinating ability to draw cartoons can now easily be yours—this ability which can mean so much real pleasure and profit to you. Through a wonderful new method you receive right at home through the mail a complete training in Cartoon Making, and *personal corrections on all of your work* from one of America's most prominent cartoonists!

With his help, you can in an *amazingly short time*, learn to draw the comic strips, humorous, political and animated cartoons which are in such big demand.

Learn More About Cartooning Send for FREE BOOK

Never have cartoons been so popular. Millions of dollars were spent last year on cartoons of all kinds—and every week newspapers increase the amount of cartoons used. Get full details on the amazing opportunities in this fast growing field of Cartooning and full information on this remarkable home study method. Mail coupon for **FREE BOOKLET** today.

WASHINGTON SCHOOL OF CARTOONING

Room 2610, 1113-15th St., N.W., Washington, D. C.

Washington School of Cartooning,
Room 2610, 1113-15th St., N.W.,
Washington, D. C.

Please send me without obligation your illustrated **FREE BOOKLET** on Cartooning and details of Free Offer.

Name

Write name plainly—State Mr., Mrs. or Miss

Address

City

State

If under 16 years, please state age

The Living Death

By JOHN MARTIN LEAHY

(Continued from page 555)

Glad have I lived, and I believe that I can, like Stevenson, gladly die. The only question is: what time remains to me? A day, a week, a month, six months? Who can tell?"

There was a pause. A moment, and a smile touched the captain's face.

"Well, what does it matter?" He made a gesture of resignation. "Life cannot be very rosy to a man who knows that any breath he draws may be his last. If I can only live to tell you my story! And I can avoid death with resignation when I have told you all if you will enter upon this undertaking."

"I must first," suggested Frontenac, "know what that undertaking is."

QUESTIONS

"A terrible one," Livingstone answered. "But, before entering upon my story, Mr. Frontenac, I am anxious to know if the version which we have of your discovery is correct."

Darwin Frontenac nodded.

"Yes; substantially it is correct—though the accounts are somewhat exaggerated."

"Then you really can bring an animal back to life?"

"Hardly that," Frontenac smiled. "It is not dead; the animal is merely in a state of suspended animation."

The captain looked puzzled.

"If an animal is frozen stiff, incased in a solid block of ice—is not dead, then what is it? Surely it is not living."

"No," said Darwin Frontenac.

"And it isn't dead?"

"Of course not."

"That," said the captain, "is just what poor Hampden said."

"The condition," I put in, "in which we find it in its block of ice must be one new to science."

"By no means, Bond," returned Frontenac. "If it were dead, life could not be restored. But life may be restored from suspended animation after many years—thousands of years."

"Thousands?" exclaimed the captain.

"Thousands, so I truly believe," Frontenac nodded.

"And if it were living?" I queried. "You say that it is neither alive nor dead."

"If it were living, we could kill it."

"Good Heaven, can't we do that?"

"No," said Frontenac, "in that state of suspended animation, remember. We kill it—if death results—not in its state of suspended animation, but in the *very act of restoring it to life*. What I am striving to express is this: What science calls suspended animation is neither life nor death."*

The captain and I looked at each other; the captain shook his head.

"That is what Hampden told me," he said. "I'm afraid, though, I do not grasp it."

"However," he added, "I can see there is a difference *if the animal is drugged* before it is frozen."

I thought a faint smile touched the corners of Frontenac's mouth, but he made no comment.

CHAPTER III

INCASED IN ICE

"That is what gives me hope," the captain added. "As I understand it, you

*"If, as seems certainly to be the case, the animal dies because in the very act of trying to restore it some inequality in the process is almost sure to determine a fatal issue, some vital center passing into the pectous state, the animal could not have been dead before restoration was attempted; for the dead cannot die again."—R. A. Proctor.

"DUB-EL SERVIS"

THE ORIGINAL INK-LEAD COMBINATION

The Double-Duty Instrument that combines a pen and a pencil for the one price

The most successful combination pen and pencil that you could use. Built solidly, no leaking, withstands roughest usage. A companion for you wherever you go. Perfected in every detail. Mechanically sound.

A splendid gift for your friends.

We will send you one made of Highly polished smooth black rubber. Highest grade gold filled trimmings. 14Kt. gold pen point. Pencil section and top of cap in COLORED ERONOID at FOUR DOLLARS by post.

DUB-EL SERVIS CORP.

130 W. 42nd Street
New York City

HEAT Without Coal

Amazing invention does away with coal or wood. The Instant-Gas Oil Burner sets in firebox of any stove or furnace; burns 96% air and 4% oil. Gives three times the heat of coal, and cheaper. Better cooking and baking.



Installed without damage to stove in five minutes—to furnace in an hour. Over 160,000 in use. Sold on money-back guarantee. Write today for 30 day free trial offer and Free Book, "Scientific Oil Burning." Mention whether for stove or furnace. AGENTS: We pay \$60 a week. Write for free sample offer. International Heating Co., Dept. 3-J, 117 So. 14th St., St. Louis, Mo.

Agents Wanted!

Salesmen—Distributors

to use and introduce attachment that makes Fords run on 34% air. THERMOSTAT on exhaust automatically turns down needle valve as engine warms, exactly as Ford Manual says do by hand.

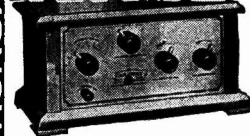
Blanche Auto Thermo

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 Blanche license. You can make Big Money selling this wonderful proven device. Experience not necessary. Blanche plan will start you without capital in a business of your own that makes you from \$250 to \$2,000 a month profit.

Write for free circulars Now!

A. C. Blanche & Co. 602 W. Lake Street
Dept. 521 Chicago

FARAWAY RADIO



\$2950
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 to \$150. Write for our money-saving plan and literature.

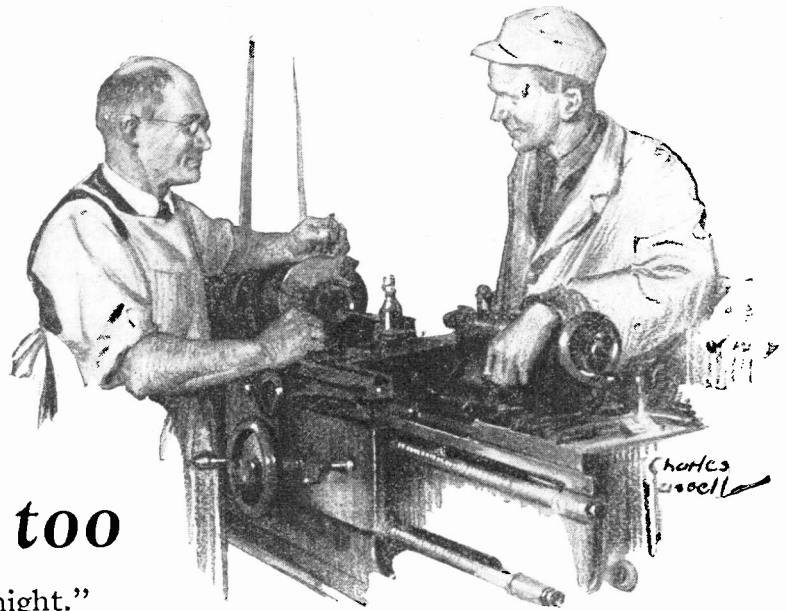
2-Tube Set \$29.50

4-Tube Set \$59.50

Dealers - Agents: Biggest possibilities you ever heard of. Write for plan and territory quickly.

THE FARAWAY RADIO CO., 657 W. THIRD ST., CINCINNATI, O.

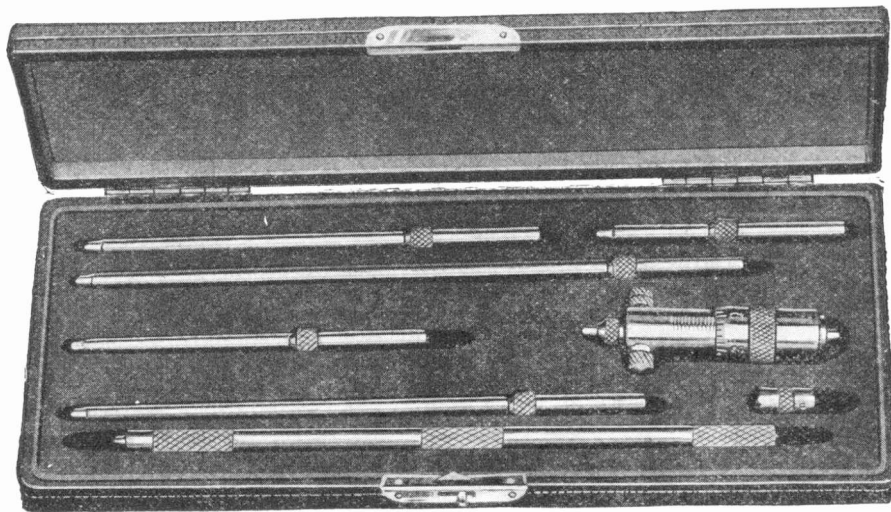
Insure your copy reaching you each month. Subscribe to Science and Invention—\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.



The Burglar was fussy, too

"I hear Bill got robbed last night."

"I'll say he did. He was supposed to go out on a job today and took his tools home to get an early start. Somebody busted into his place, found the kit bag and picked out all the Starretts. Bill's madder'n a wet hen, but he says you gotta hand it to the burglar, he certainly knows tools."



STARRETT INSIDE MICROMETER No. 124

One of the popular features of the Starrett Inside "Mike" is the positive method of setting. Each rod is fitted with a collar by which it can be instantly and accurately seated in the micrometer head. The auxiliary handle allows the tool to be used in places too small for the hand.

Over 2200 fine Precision Tools for Machinists, Apprentices, Auto-Mechanics, Carpenters and other tool users fully described (pictures, uses, prices, etc.) in the NEW Starrett Catalog. Get a free copy at any good hardware store or write us. Ask for No. 23 LE.



"The Starrett Book for Motor Machinists and Auto Repairmen." Got your copy yet? Only 75c at hardware stores. If dealer cannot supply you write us enclosing that amount.

THE L. S. STARRETT CO.

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



6582

Use Starrett Tools

Learn Electricity



Student winding a Stator in The Great School of **COYNE**

Earn \$200 to \$800 a month!

New Enlarged Course

I train you on everything from door-bells to power-plants—everything to make you a \$50 to \$200 a week **EXPERT**. You get complete **PRACTICAL** training in Circuits, House Wiring, D. C., A. C., Armature and Stator Winding, Drafting, Auto, Truck and Tractor Electricity, Battery Building, and Repairing, and Radio. Everything to make you a thoroughly trained, **BIG PAY**, Electrical **EXPERT**.

CHICAGO The Electrical Center of the World

The whole world of electricity is open to the **COYNE** trained Electrical Expert. Come to Chicago—the Electrical Center of the World. I pay your fare. Get your training at **COYNE**—the oldest, largest and best school of practical electricity in the country—endorsed by Electrical Industry. I do not offer a number of individual courses—I give you just one complete course so that you will be an **Electrical Expert** capable of commanding big pay. You can become an **Expert** and get big money in **ANY** branch of electricity if you come to **COYNE**.

Learn in 12 Weeks! NOT A CORRESPONDENCE SCHOOL

No books or useless theory. I train you on the greatest outfit of electrical apparatus of any institution in the country. I give you **FREE** complete Radio and Automobile courses. I also give you **FREE** a Life Membership which enables you to stay longer if you want or to come back at any time and take up any new work which is constantly being installed to keep my school the most modern at all times.

You Don't Need Education or Experience *COYNE* gives you education and experience by actual work—that's why you don't need education or experience to start with.

Earn While You Learn!

I help students to secure jobs to earn a good part of their living expenses while studying.

Send Coupon Now

Don't delay a minute—send that coupon **right now** for my big free catalog and full particulars of special offer. **ACT NOW!**

Free R. R. Fare to Chicago

Come to Chicago—the country's greatest summer resort city—and be ready for **BIG MONEY** in 12 weeks!



Endorsed by Electrical Industry

1300-1310 W. Harrison St., Dept. 533-7 Chicago

Coyne Electrical School, Dept. 533-7
1300-1310 W. Harrison St., Chicago

Mr. H. C. LEWIS, Pres. Dear Sir:—Please send me free your big new catalog and full particulars on free railroad fare offer and two free courses.

Name.....
Address.....

produce with some drug, a state of hibernation, so to speak, and maintain this condition by freezing; and that any time you wish restore the animal to normal activity and life."

Frontenac nodded. "That is just what I do. Suspending the vital processes is the easiest part of the matter. Some of the chemical agents capable of producing the semblance of death have long been known—mandragora and belladonna, for instance, and others of the Solanaceae. Dioscorides employed plants of this order, though it is uncertain whether he speaks of belladonna, mandragora or datura stramonium. Belladonna is, perhaps, the *strychnos manicos* of the ancients. The effects of all these agents are similar, though the dose must be varied to secure the same results.

"To these may be added amyl nitrite and chloral hydrate. The latter is very effective in suspending the vital functions.

"However, the agent employed in my work is none of these, but a discovery of my own. There are undoubtedly hundreds of such agents in organic chemistry and I have chanced upon one of them."

The captain leaned forward; eagerness marked his expression; also, I thought, there was something akin to fear in his look.

"If one of the old drugs has been used, belladonna, let us say, would that mean that the chance of a complete recovery would in any way be diminished?"

"No," Frontenac told him, "provided always, of course, that the drug was not administered in a quantity to prove fatal before the subject was frozen. My agent possesses some marked advantages, that is all: I can not say it adds to the certainty of the recovery."

THE EXPERIMENT

The captain settled back in his chair with an audible sigh of relief.

"I thank God for that," he said. "For then there is hope."

Frontenac waited, hoping, no doubt, that the other would go on; but the captain seemed to have fallen into a profound reverie.

So Frontenac continued: "To the general public I am a faker. It makes me a little sad, though, to hear what some men who ought to know better think of my work. They seem to be utterly ignorant of what has been done along this very line. The marvels of hibernation (and estivation) should have shown them the virtue of true scientific caution.

"In a state of complete hibernation, animals—mammals, remember—live for months without drawing a single breath. That respiration is completely suspended was proved long ago by Spallanzani: he left a marmot for four hours in carbonic acid gas, repeating the experiment with a bat as the subject. To a *breathing* mammal, it is scarcely necessary to remark, this gas proves almost instantly fatal. Also, as a further proof of the complete suspension of respiration, the oxygen was found unaffected after a bat had remained in a pneumatometer for ten hours.

"As for my own experiments, I will mention but one: I kept a bat for two whole months in a vacuum as perfect as could be made, and it still lived. A little vapor of ammonia brought him out of his long snooze as though nothing whatever had happened.

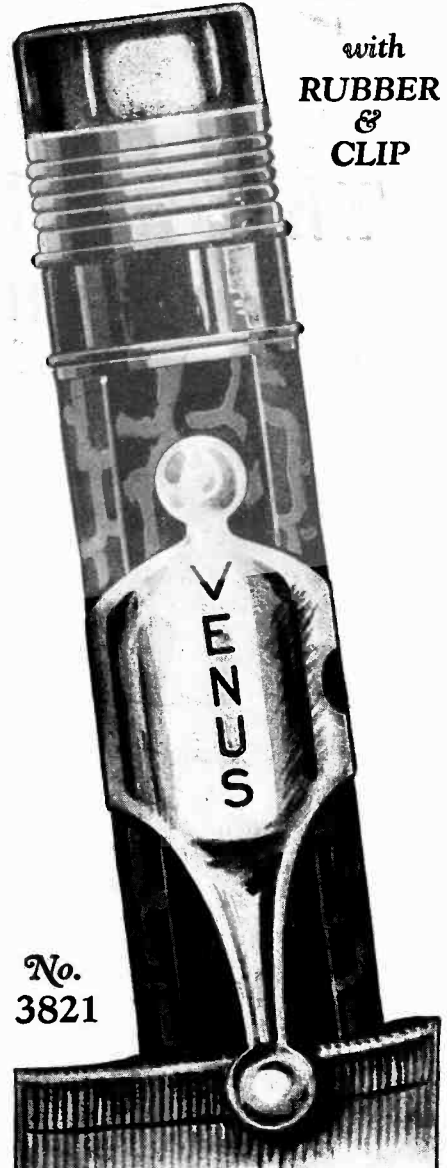
"However, the blood of an animal in a condition of complete torpor continues to circulate, though slowly; and this marks the great difference between hibernation and artificial suspension of vitality."

"I knew," said the captain, "that some strange things could be done with cold-blooded creatures; but I never dreamed such marvels were possible with warm-blooded mammals."

"One can do the same things to a warm-blooded animal as to one of cold blood

Something NEW! VENUS PENCIL

with RUBBER & CLIP



No. 3821

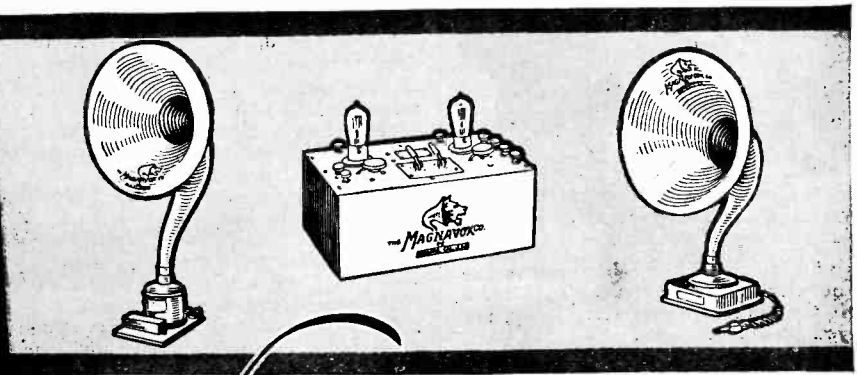
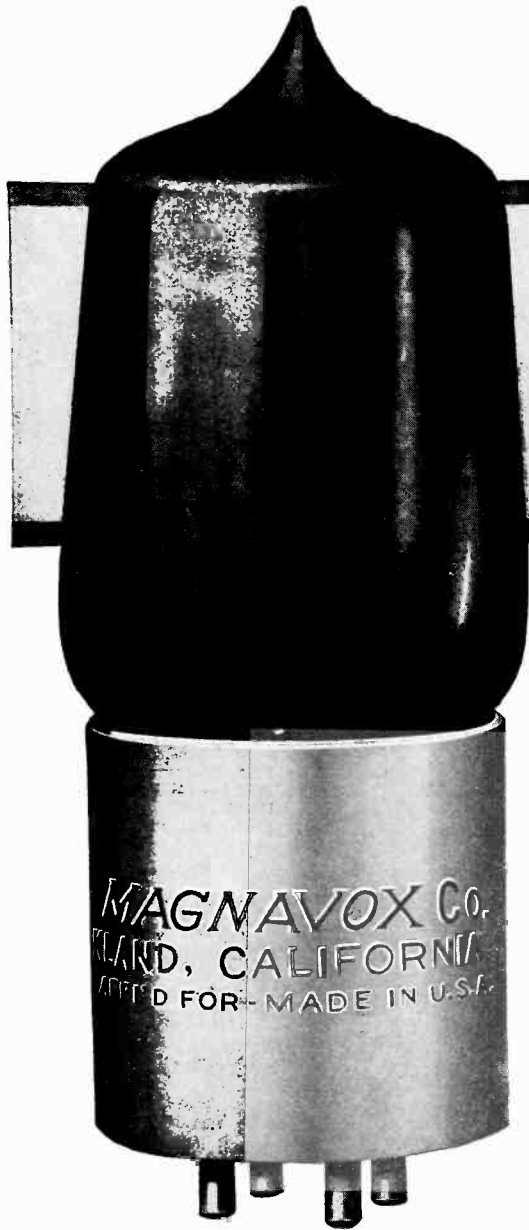
HERE is the famous **VENUS** Pencil made with rubber and clip; especially for your pocket. HB degree: just the right lead for general use.

VENUS—The largest selling quality pencil in the world—can be obtained at all dealers.

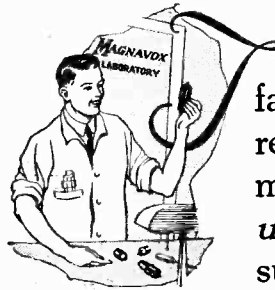
AMERICAN LEAD PENCIL CO.
203 Fifth Avenue, New York

Send 10c for a sample of **VENUS** No. 3821 and a **FREE VENUS ERASER**.

Name.....
Address.....



Now a MAGNAVOX Tube



THE engineers who developed the famous Magnavox line of radio reproducing and amplifying equipment have now produced a *vacuum tube* equally distinctive and successful in its own field.

One trial convinces the most exacting user that the Magnavox will replace ordinary tubes to great advantage in any receiving set.

\$5⁰⁰

MAGNAVOX RADIO VACUUM TUBE TYPE A is a storage battery tube for use as audio frequency and radio frequency amplifier in all standard circuits. Highly recommended also for detector use. This tube is not critical of adjustment either as to plate or filament. Filament consumption one quarter of an ampere.

The most notable feature of the new Magnavox Radio Tube consists in eliminating the grid.

Unlike the ordinary storage battery tube, Magnavox Tubes give the electrons an unobstructed passage between filament and plate, with the result that the Magnavox has less than one half the internal capacity of other tubes of similar type.

Magnavox Products

Reproducers of electro-dynamic and semi-dynamic type, for all vacuum tube receiving sets;
\$25.00 to \$50.00

Power Amplifiers for audio-frequency amplification, one, two, and three-stage;
\$27.50 to \$60.00

Combination Sets combining a Reproducer and Power Amplifier in one unit;
\$59.00, \$85.00

Vacuum Tubes: A storage battery tube of new and approved design for all standard circuits . . . \$5.00

Magnavox Radio Products are sold by reliable dealers everywhere. If unacquainted with the Magnavox store in your vicinity, write us for information.

The name Magnavox is your assurance of quality and efficiency

THE MAGNAVOX CO., OAKLAND, CALIF.
NEW YORK SAN FRANCISCO

Canadian Distributors: Perkins Electric Limited, Toronto, Montreal, Winnipeg



“What Do You Know?”

Never mind how *strong* you are. The boss is looking for *brains*, not *braawn*.

It's a fine thing to be healthy and hard as nails, but when the boss wants a man for a big job, the kind that pays real money, it's what you *know* that counts.

Right now employers everywhere are looking for men with special training—men who can do some one thing well.

How about *you*? Are you ready for one of these positions? Have you an expert knowledge of any kind of work?

If you haven't special training, *get it now!* You can do it—in spare time—through the International Correspondence Schools. Pick the position you want in the work you like best and the I. C. S. will give you the training you need right in your own home evenings—you need not lose a day or a dollar from your present occupation.

More than two million have prepared for success in the I. C. S. way. Surely, what so many have done, *you* can do. The first step is to find out how. Mark and mail this coupon.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6171-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"/> Illustrating |
| <input type="checkbox"/> French | |

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..... 3-6-24
Address.....
City..... State.....

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

Get Into the Auto Game

50 Days'

Earn Big Pay

training and you can qualify as expert mechanic.

Send for special tuition offer with railroad fare paid and board for 8 weeks' term free.

McSweeney Auto, Tractor School
Dept. 480 9th & Walnut, Cincinnati, O.
1815 E. 24th, Cleveland, O.

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.

if he only knows how," said Frontenac. "The thing is more difficult, that is all. At any rate, such is my belief. It is not impossible.

"It has long been known that fish can be restored to perfect life though completely frozen. Why, then, all this excitement of the public because I have succeeded in resuscitating a frozen mammal?"

"I had heard," said the captain, "that fish frozen in solid ice could be thawed out and brought back to life; but I confess I had some doubts as to the accuracy of the story—even though Hampden said it was so. I placed it in the same category as those stories of petrified men."

Darwin Frontenac arose. "Would you care to see it done?"

"Would I?" exclaimed Livingstone.

"I'll fetch a fish from the freezer," Frontenac said, "and show you."

He turned and left the room.

Livingstone gazed at me for some moments with a quizzical expression.

COMMERCIAL POSSIBILITIES

"No doubt, Mr. McQuestion, this is somewhat matter of fact to you; but to me it is very strange. And I assure you, sir, that I have seen some strange things in my day—as you will see when I tell my story."

"It is just as new and strange to me," I said. "And, you know, apart from its scientific interest and value, the discovery has great commercial possibilities."

"Oh," the captain nodded, "probably."

I wondered at the man's obtuseness.

"Great!" I ejaculated. "Why, the possibilities of this discovery are unlimited."

The captain looked at me questioningly.

"Probably. But—that is—well, in what way, Mr. McQuestion?"

"In what way? Why, for instance, if you want to ship livestock from the Western ranches to the great packing-houses, simply *kill* the animals and pack them in the freezing cars like so many hams or slabs of bacon, like so much cordwood. Think of the saving in fodder—to say nothing of the freight!"

"And here's another application. During the long winter months, what a saving for the farmer! The stock which eats but gives no value will be killed, piled in the freezer, save a winter's feed. Simple, isn't it?"

"Oh, yes. Undoubtedly, as you say, Mr. McQuestion, there are—well—ahum, great possibilities in that direction. But there are greater, more interesting, more wonderful possibilities elsewhere."

At this moment came the sound of foot-falls, and soon Frontenac entered—a pail, heavy with water, in one hand, a piece of ice in the other. The fish, a trout about seven inches in length, could be seen plainly encased in the ice, as though held in glass. The captain's hands trembled as he examined the little creature. He turned the ice this way and that and over and over.

"And, Mr. Frontenac," the captain exclaimed suddenly, his voice eager, his eyes wistful, "you can thaw him out, make him live once more?"

"Of course. That is what I am going to do now—though the fish is not dead, else it could not be done."

"And tell me," exclaimed the captain, his voice shaking a little, "could you restore a human being if frozen thus in solid ice?"

Frontenac scrutinized the captain closely for a moment, and asked "A human being?"

"A human being—yes."

"I believe," Frontenac told him, "I could."


"I know you can!" the explorer cried.

"Captain Livingstone, what do you mean?"

There was a brief silence. "It means that—well, you see—"

He raised a finger and pointed to the fish, resting again in Frontenac's hand. "I am as anxious to tell you what I found down there, Mr. Frontenac. But the fish. The story as soon as I see that trout swimming once more."

The Standard of Radio Receivers



The Neutrodyne Receiver

The astounding popularity of the Neutrodyne circuit is well deserved. When properly constructed the Neutrodyne can be guaranteed to give remarkable and consistent results at all times of the year and under the most trying conditions.

"Conrad" Pattern No. 7 shows you how to construct an authentic Neutrodyne circuit using the simplest and most direct method known. Pattern consists of full sized blueprints on a sheet 16" x 28" and a four-page instruction sheet for full details of construction. Enclosed in beautiful two-color folder 9" x 12".

AT ALL RELIABLE RADIO DEALERS
Or direct from us.

PRICE
50¢

Prepaid

Pattern

No. 7

The Conrad Co.
233 Fulton Street
New York City

Conspad

"RADIO'S FOREMOST PUBLISHERS"

Play Big Jazzy Sax At Once

No knowledge of music required. Play tunes right away on this big imported Jazzy Sax. Play by numbers instead of notes. Sweet, clear jazzy tone. Delightful harmony. Looks like regular Saxophone. 29-in. long. Made of metal, handsome polished finish.

A. H. King writes: "Use Jazzy Sax as lead instrument in 3-piece or 4-piece orchestra." V. Beatty: "Played Louis Cavallo of his band."

"Could play several old time tunes in an hour."

S. De Silva: "I bought one for my friend in India. It is wonderful."

Strong, serviceable and convenient. Sax Cartridges in 15. 40 Songs and full directions—all Free with purchase. If you order right away. Send today—surprise your friends. Be popular at dances, parties, everywhere. Everyone can play. Jazzy Sax arrives de-posit with postage. Carryng list and 40 Songs included. Satisfaction Guaranteed or money refunded. Clip this adv. Write today.

Ferry & Co., 630 W. Jackson Blvd., Dept. 8257, Chicago

TYPEWRITER PRICES REDUCED

Free Trial

ON ALL MAKES

Big bargains, easy payments on late model Underwoods, Royals, L. C. Smiths, Remingtons, etc.—perfect machines expertly remanufactured by the "Young Process" guaranteed like new for five years. Shipped direct from our factory to you at big saving. Our Big Illustrated Catalog sent free and without obligation to buy. Write for yours today.



Young Typewriter Co. Dept. 116-A
654 W. Randolph St., Chicago, Ill.

I Make the Best CHOCOLATE BARS

Mints and Chewing Gum. Be my agent. Everybody will buy from you. Write today. Free Samples. MILTON GORDON, 197 Jackson St., Cincinnati, Ohio

"That you will soon see, Captain. For I dare say you are not nearly so anxious to see this creature restored to life as I am to hear what you have to tell."

CHAPTER IV

THE CAPTAIN BEGINS HIS STORY

In silence Darwin Frontenac proceeded with his thawing. The captain and I sat watching.

More than once my look lingered on the explorer's face, held there by that strange, indescribable expression which had come over his weather-beaten features.

And, while watching, I kept wondering about the story the man was to tell us. Strange was this scene before me, Frontenac in the act of restoring to life a fish that had been incased in solid ice for months. I found myself growing impatient. The captain's story, I thought, would be of things even stranger than this experiment of Frontenac's.

I kept turning over in my mind the few words he had uttered, endeavoring to find some idea which would cast a bit of light on the forthcoming story.

Her. What had he meant by her? Who was she? What was she, where was she? A woman in the Antarctic? His words could mean nothing else. No woman had ever set foot on the Antarctic Continent, according to all accounts. And Frontenac to head an expedition to this land of snow and ice (and, if one could believe our captain, palm-trees) to save her! From what? From one of the foulest of deaths, the captain had said, or from sleep eternal.

THE FISH SWIMS

My musing was interrupted by an exclamation from the captain—a boyish exclamation of surprise and joy. The fish, now wholly free from its ice, was showing unmistakable signs of life. And the interval was not a very long one before he was swimming slowly around the pail as though nothing unusual had happened to him.

"Who would have believed it?" exclaimed Livingstone.

"I don't see what there is so very strange about it," Frontenac said. "In my mind, hibernation or estivation is more wonderful."

"Or," added the other, "the artificial suspension of vitality in warm-blooded creatures."

"Yes," nodded Frontenac; "or the artificial suspension of the vital functions—and their restoration."

"Of course," the captain added, "I realize that, in an ultimate sense, nothing can be any stranger than anything else. But it seems so to us, because, through our own ignorance or through the teachings of others, we come to believe things very possible are simply impossible. For instance, we are taught that life is a weak thing, whereas it seems no one knows how strong it really is."

"No one knows," said Frontenac, "or can know. And those who ought to know how wondrous and mysterious it is are the very ones we find so cocksure and dogmatic. For instance, these fellows declared life was utterly impossible in great depths of the sea. There was the frightful pressure; no living thing could stand it for an instant. And the total want of light; those depths are pitch black. And then came deep-sea dredging, and, to the amazement of the scientific know-it-alls, those deeps in which no creature could exist even for a single instant were found to be teeming with a myriad forms of life."

The captain nodded.

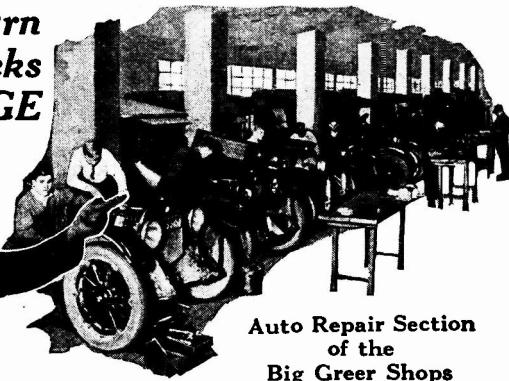
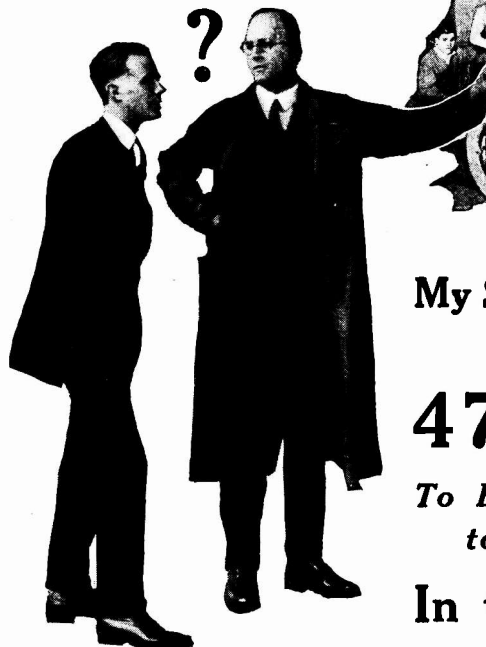
"Some of these scientific gentlemen are the very personification of cocksureness when, as a matter of fact, they haven't a single toe to stand on. I remember, for instance, how the great scientist Croll proved that there could be no elevated land in the Antarctic."

Frontenac nodded.

"Yes; I remember that, too. Had there been mountains, tablelands and so on, the

DO YOU Earn As Much

As These Men Will Earn After A Few Weeks At GREER COLLEGE



Auto Repair Section of the Big Greer Shops

My Shop-Training Methods Has Equipped

47,781 MEN

To Earn from \$35 Per Week to \$20,000 Per Year

In the Auto Business

Special Training Offer

Of the 47,781 men trained in my big Automobile shops, 30,245 are now in business for themselves. Some of these have tire repair shops, some operate battery stations, others own and operate garages, service stations, or sales agencies. All are independent, and earning more money than they had ever earned before taking the Greer Course. In 8 weeks my shop training prepares you to earn \$35 to \$100 per week, and more as you progress. The same future is yours if you will take it. Here is my special offer.

Free Tools—Free Radio Course

When you enroll I furnish you, free, a special kit of tools—23 pieces. For a limited time I will also give you a free RADIO COURSE in connection with your regular automobile subjects.

Jobs Guaranteed

Rates now reduced. I get you an earn-while-you-learn job immediately if you need assistance. Good-pay Auto jobs GUARANTEED after you are trained. My men are in demand. I can place every man who takes my shop course and takes advantage of the opportunity he is given to thoroughly learn the work.

I Pay Railroad Fare

This is a special offer to help you gain the training opportunity that will fit you for a lifetime of big and better earnings. Chicago is the place to train. Opportunities in Automobile work unlimited. Within ten blocks of Greer College are at least 40 large automobile sales agencies. Throughout the city are approximately 5000 garages and repair shops. We help you find a home. Get complete details and study them well before you start.

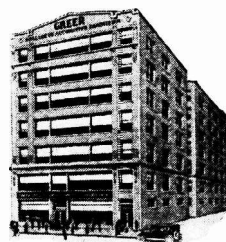
Mail Coupon for FREE AUTO BOOK

This request brings you my entire proposition and 66 large pages of valuable, illustrated, Auto training information. Mail the coupon to me TODAY!

GREER COLLEGE

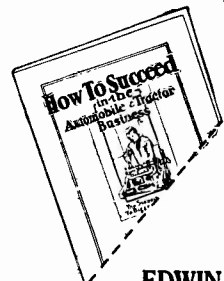
of Automotive Engineering

2024 S. Wabash Ave., Dept. 2403 Chicago, Ill.



This magnificent new seven story building is filled with repair shops and modern shop equipment entirely devoted to training Greer students.

Get This FREE BOOK



EDWIN GREER

President

2024 S. Wabash Ave., Dept. 2403 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

A LESSON ON CHIROPRACTIC

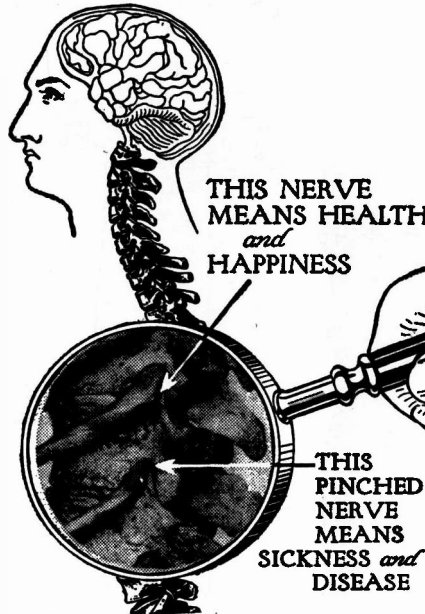
WHEN you wish your arm, hand, leg or any other part of the body to do something, a message is sent to that member over the nerves.

If the nerve over which the message travels is pinched, the message cannot get to the member to which it was directed; the member does not obey the mind, and it then is what we call diseased.

Chiropractic teaches that all the work that is done in the living body is done by an intelligent power within by means of functional impulses sent over the nerves, and that disease is the result of an interference with the normal transmission of these functional impulses over the nerves.

Chiropractic teaches that your arm or leg will obey the mind if the channel over which the moving or motor impulse is open and normal, but that if a segment of the spine becomes slightly misaligned and presses on the nerve, thereby stopping the motor impulse, the result is what is called paralysis.

The accompanying cut shows how the nerves, over which all functional impulses are sent, come out through the spinal windows between the vertebrae, and how a misaligned vertebra may press upon or impinge



the nerves, thus interfering with the flow of functional impulses, which causes dis-ease.

To adjust the vertebra to normal, thereby removing the cause of disease, is the work of the chiropractor.

Thousands have realized that paralysis is simply a lack of motor impulse to the affected part, when complete recovery followed the release of the prisoned functional impulse through the adjustment of the misaligned vertebra by a competent chiropractor.

Write for information regarding
Chiropractors or Schools
to the

**UNIVERSAL
CHIROPRACTORS'
ASSOCIATION**
DAVENPORT, IOWA
U. S. A.



**And Yet Some Say:
"I Don't Believe in Chiropractic"
What a Pity!**

The Hon. J. R. Morly, of Owatonna, Minn., under date of November 4th, 1922, says:

"In June, 1919, I met with a severe automobile accident which injured my spine. As a result of the injury I became paralyzed on the left side. My left hand and arm were practically dead and my left leg was so affected that I could only walk with someone to support the left side. My family and friends were much concerned and doubtful about my recovery. I immediately consulted a chiropractor, who advised me to have a spinograph taken. After this I commenced taking adjustments and have now regained the use of my left hand and can walk naturally. I would advise anyone suffering from similar trouble to consult a chiropractor."

bergs would have shown tilted and broken stratification, whereas the strata were always horizontal."

"Just so. And yet," said the captain, "when Roald Amundsen and his four companions raised the flag of Norway over the South Pole, they stood nearly two miles above the level of the sea."*

"A good lesson, that," nodded Darwin Frontenac, "in scientific caution."

"Our scientists certainly need it," said Livingstone. "Perhaps the bitterness I feel on this subject is not wholly warranted, but it was a scientist who first covered me with ridicule and—well, worse."

"But ridicule and worse are what the discoverer should be prepared to meet. There is an old saying that Truth finds foes where she makes none."

"But one doesn't expect to find foes in the very palace of Science herself."

"One should expect to find them there," Frontenac told him, "for your scientist, with all his learning, is but a man, a man with weaknesses and passions very like those of the butcher, the baker and the candlestick-maker."

"The scientist, Captain Livingstone, is often myopic or blind when the intelligent layman sees things very clearly. Have you forgotten Agassiz and evolution? That Francis Bacon rejected the Copernican system, as did the great Tycho Brahe, and Leibnitz the law of gravitation? That Darwin's name was rejected by the French Academy of Sciences, that those omniscient academicians suppressed Peyssonel because his observations showed coral not to be a plant but an animal? And, coming down to our own day, that scientists, showing about as much courtesy as we find in a political campaign, have for years declared the lines cobwebbing Mars are optical illusions."

"At the risk of offending you, Captain Livingstone," Frontenac finished, "I will say—" But Frontenac did not say it.

"Well, sir?" demanded the captain. He had straightened up in his chair and fixed his look on the other—the gray eyes flashing as though shooting tiny points of steel.

"I think, Captain Livingstone," continued Frontenac, "you have suffered your sensitiveness to get the better of your judgment. However, you stand in distinguished company, for Newton himself was by no means free of this weakness."

"The public heard about the palm-trees, though!" added Frontenac.

The captain laughed a sardonic, bitter laugh. "But there my story ended. Of course, in any event, it is only a question of time before others see what I saw and the world learns what I told was the truth. But what good will vindication do me when I am dead?"

A silence fell. It was broken by Frontenac, who arose and said:

"You will excuse me for a moment, Captain, while I return this trout to the freezer. Then your story."

"Are you going to freeze him again?" "Again," said Frontenac. "This will be the third time."

"However, Mr. Frontenac, I believe, after all, everything has been for the best. Yes, yes, for you are the only man in all the world that can save her."

"There it is again!" said Darwin Frontenac, sinking into his chair. "Save her?"

"Yes, Mr. Frontenac, save her! In other words, *awake* her!"

"And now, gentlemen," he added, "listen to the strangest tale that ever a man had to tell."

*"This is an awful place and terrible enough for us to have labored to it without the reward of priority."—Captain Scott's Journal.

(To be continued in next issue.)

Readers Forum

(Continued from page 580)

Why not plant forests in such a way as to eliminate vast storm centers?

Why try to subdue nature instead of working in harmony with her; many times we seem to have subdued her, having her saddled and bridled, sitting firmly in the seat, then at the first touch of the spur, she bucks us off into chaos and we sit up wondering why?

Elsie Brierheath,
Spokane, Washington.

(We could add a few more whys and produce a purely idealistic state where misery and want are lacking and health and harmony reign supreme. but why be dreamers of the ages to come when we can dream of the immediate future and its manifold improvements? If many of us would cut down on dreaming and add a little action, the race as a whole and humanity in general would improve. Dreams are necessary for advancement, but action is necessary to make them come true. Nevertheless this world is a good old world in spite of its wars and strife and it is getting better and better every day.—Editor.)

SPIRITUALISM

Editor, Science and Invention:

I have been trying and hoping to find out just what spiritualism is, or if it is true or not through SCIENCE AND INVENTION. This magazine started out to get the facts about this spiritualism and I have been watching for the outcome for some time, but they have never printed the facts as they were supposed to have. Some people claim they have been bought out. Has someone bought them out?

Tolbert Hamilton,
Detroit, Mich.

(Science and Invention brands as imposters any who claim that this magazine or its agents have "bought out" any persons laying claim to producing spiritual phenomenon.

The awards of \$11,000.00 paid wholly or in part for any or all phenomenon have not been paid because no one has come forward to prove the truth of the phenomenon. We are giving below the prize list of Mr. Joseph Rinn's \$10,000.00 challenge.

\$1000—To any person who will read what is on the pages of a book opened at random by me and placed open behind their back during the test.

\$1000—To any person who will produce a readable message of any sense on an ouija board, the letters of which have been transposed from their usual positions, and the performer to be blindfolded and his ears stuffed with cotton by me.

\$1000—To any person who will cause a message to appear on the inside of slates joined together and provided by me, which during the test are to remain beneath the bosom of my shirt. If removed for examination new slates to be provided by me for further tests.

\$1000—To any person who will prove telepathy or the power of two persons to communicate with each other by thought, after being blindfolded, their persons secured, and their ears and mouth filled with cotton by me.

\$1000—To any person who will accurately describe something definite going on at a distance in a place selected by me, or who will predict in advance an event or calamity of such a definite nature that it would be impossible for such person to have any controlling power over or previous knowledge of the same; or who will produce a picture on a negative supplied by me while the same is in a locked safe and in a room provided by me.

\$5000—To any person who after being searched and secured by me shall produce from their mouth or body what is called ectoplasm, and which shall shape itself into definite forms of hands or faces; or to any person who will proceed under scientific conditions laid down by me that the spirits of the dead can communicate with the living.

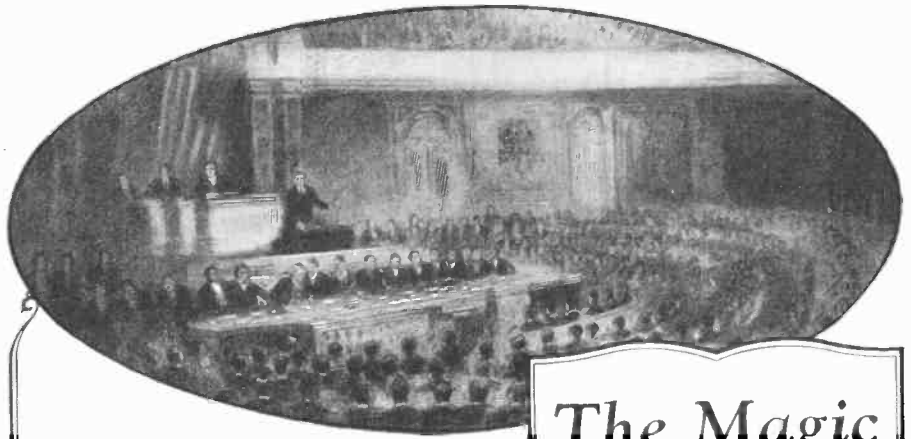
AN ADDITIONAL \$1000 ADDED BY SCIENCE AND INVENTION MAGAZINE as follows:

1.—The contestant must be a practising medium or spiritist, imputing supernatural or spiritistic claims to the manifestations to be presented. This offer is made as a test on spiritists directly. It does not include conjurers' tricks or optical illusions. Therefore, the performances of magicians, or of those not claiming spiritistic powers, cannot be considered, and such tricks will not be accepted as evidence, the contest being intended for practicing mediums only.

2.—Contestants must be willing to undergo tests on spiritistic phenomena or manifestations at the New York offices of SCIENCE AND INVENTION, at 53 Park Place.

3.—The same committee of investigators that witnesses the tests of the medium will also witness the tests which SCIENCE AND INVENTION will stage to duplicate the phenomena or manifestations in question.

(Continued on page 611)



Free—1924 Reference Atlas

You may have the 1924 edition of the "New Reference Atlas of the World" without a penny of cost. It contains 148 pages with 96 pages of maps, beautifully printed in colors, including all recent changes in the countries of the world, new census figures, parcel post guide. Bound handsomely; size 9 $\frac{5}{8}$ x 12 $\frac{1}{2}$ inches. This splendid Atlas is included free in our special offer to new subscribers for

WEBSTER'S NEW INTERNATIONAL DICTIONARY

The Merriam Webster

The "supreme authority"—a complete reference library in dictionary form—one big, convenient volume, the type matter of which is equivalent to a 15-volume encyclopedia.

Thousands of new words that have only recently come into use; 407,000 vocabulary terms; a biographical section giving information about 12,000 famous men and women; 32,000 geographical subjects; over 6,000 illustrations; answers all your questions about words, people, places and things. On approved orders this valuable work will be

Delivered for \$1.00

and the balance of the price may be paid in easy monthly payments. The Hon. Calvin Coolidge wrote: "Webster's New International Dictionary has been the official reference and authority in my office in Washington during my service as Vice President. It is a standard work and most useful to me." Send coupon for the free booklet, "The Magic of Words," and see why it will be most useful to you.



G. & C. MERRIAM COMPANY
Springfield Mass.

The Magic of Words

is working miracles of achievement every day. It enables one man to convince his business associates, another to win a case in court, another to play on the emotions of a great audience. Words rightly used are the *open sesame* to cultured society, to business success, to political power. You can use the magic of words in attaining your great ambition. You need only develop your mastery of expression by using the language power so fully offered to you in WEBSTER'S NEW INTERNATIONAL DICTIONARY.

Yours Free on Request

"The Magic of Words"

You may have this interesting, illustrated booklet free. You will enjoy its illuminating story and profit by its practical suggestions. It offers also full information about the highest authority of the English speaking world.

This Coupon
Brings Your
Copy, FREE



G. & C. Merriam Company,
Springfield, Mass.
Please send me, without cost or obligation, the illustrated booklet, "The Magic of Words" and full information on Webster's New International Dictionary and your special Free Atlas offer. Sci. & Inv. 10-24

Name _____

Street _____

City and State _____

This Man is Sure of His Job



HE saw the handwriting on the wall. Men in his department were being dropped right and left. He might have been the next to go but for a familiar coupon which he saw one day in a magazine. He marked it, and mailed it to Scranton.

Then one day his employer called him in.

"Young man," he said, "I have just received a letter from the International Correspondence Schools telling me you have enrolled and have received a mark of 93 for your first lesson.

"I don't mind saying that this letter has saved your job. I had you on the list of men to be dropped. But I'm going to keep you now. The man who thinks enough of his future to study his job is the kind of a man we want around here."

HOW about you? Are you sitting on the anxious bench wondering if you will be the next to go? Or are you training yourself so that you will not only be sure of your present job but will be ready for the job ahead?

No matter where you live, the I. C. S. will come to you. No matter how limited your previous education, the simply-written, wonderfully-illustrated I. C. S. textbooks make it easy to learn. No matter what career you may choose, some one of the 300 I. C. S. Courses will surely suit your needs.

This is all we ask: Without cost or obligation, put it up to us to prove how we can help you. Just mark and mail this coupon. Today is best.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6170-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"/> Illustrating |
| <input type="checkbox"/> French | |

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"/> Civil Engineer | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Metallurgy | <input type="checkbox"/> Airplane Engines |
| <input type="checkbox"/> Steam Engineering | <input type="checkbox"/> Agriculture and Poultry |
| <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

HERE'S REAL VALUE

With a Money-Back Guarantee

LONROP
Genuine French
8x32 Power Prism
BINOCULARS
Regular \$18.75
\$40 Value
Postpaid



Here's a perfect instrument, powerful and efficient for long range vision. Covered with black morocco. Price includes cowhide plush lined case and shoulder strap. Guaranteed to give satisfaction or money refunded. Send price with order or pay the postman.

B. MOGUL, Importer, 33 A. Union Sq., N. Y.

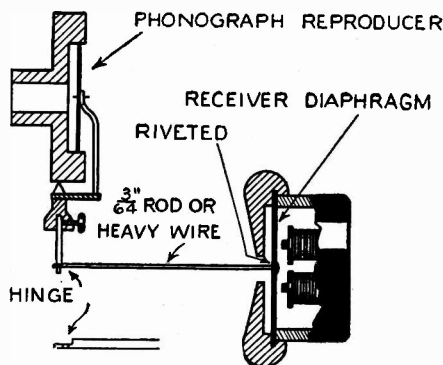
Insure your copy reaching you each month. Subscribe to Science and Invention—\$2.50 a year. Experimenter Publishing Co., 53 Park Place, N. Y. C.

RADIO WRINKLES

EDITED BY
LEON L. ADELMAN, 2AFS
Assoc. Mem. I. R. E.

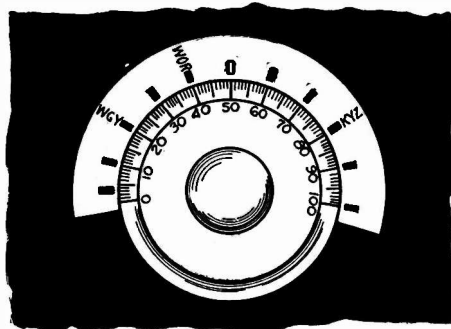
UNDER this heading we are going to publish items of interest to everyone who likes to build radio instruments. In order to continue this department it is necessary for our readers to tell us about their latest experiments. Write us a short description of some time- or money-saving kink you have discovered and send it to us along with a few sketches. Our regular prizes will be paid for this material. Be brief and try to put everything in the drawing. Don't be too elaborate. Address "RADIO WRINKLES" editor, care of Science and Invention.

LOUD SPEAKER



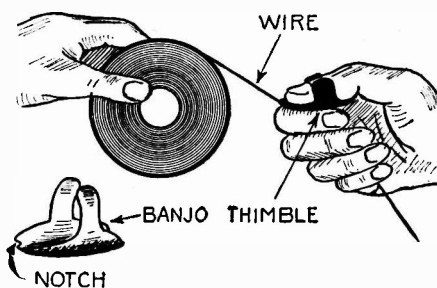
To use the phonograph reproducer as a loud speaker, a short length of aluminum wire is attached to it and fastened to the phone, as shown. Careful work brings good results. —Philip Castanaro.

STATION RECORDER



A semi-circular piece of white celluloid is cemented to the back of the dial and a hole is punched at the position where each station is heard. A white marker is pasted on the panel, to facilitate tuning. —Henson Lasher.

WIRE GUIDE



Whenever, it becomes necessary to wind wire for an inductance or other purpose, exasperation and loss of control can be avoided by using a banjo thimble. —Fred Smeltzer.

(Continued on page 615)

Blame yourself

If you are not making \$200 to \$450 a month 50 DAYS FROM NOW

If Eller, Ludlow, Duffy, Rockingham, and hundreds of other men are earning \$200 to \$1200 a month as automotive electrical experts WHY NOT YOU?

These men had only 50 days' training at AMBU ENGINEERING INSTITUTE—not a day more. Now they are money-makers. My free books tell all about how these men did it. No special education—no experience needed. Just the courage to enroll now. Special Home Study Course for those who can't come to Chicago. AMBU can refer you to numerous successful graduates. Only 50 days' training—practical training in big Ambu shops—only 20 men to each class. Send for free book today for all details.

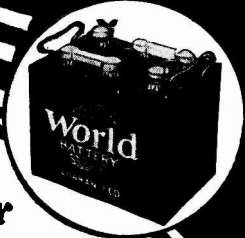
FREE A complete course on Radio, prepared by the Radio Board of Engineers of the American Bureau of Engineering—to the student who enrolls for the above course. Worth at least \$50—offer limited for short time—Free Book tells all. Send for it today!

AMBU ENGINEERING INSTITUTE
2632 Prairie Ave. Dept. 210 Chicago, Ill.

Send for this
FREE BOOK
To-Day!



FREE 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. 18.00

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. 18, 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.



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, 10c. F. SMETANA & CO. Saginaw, West Side, Mich.

4—Automatic writings will not be considered; such productions as these are considered sub-conscious phenomena.

5—Mediums must consent to present their offerings before the staff of SCIENCE AND INVENTION'S investigation experts, general press representatives, and also Joseph Dunninger.

6—It is understood that SCIENCE AND INVENTION need not necessarily expose the methods they employ in duplicating the phenomena or manifestations. If the effect produced by the presentation of SCIENCE AND INVENTION duplicates the tests submitted by the medium, this is to be accepted as a sufficient reproduction. The details or methods employed by SCIENCE AND INVENTION need not be exposed, as it is understood that SCIENCE AND INVENTION reproduces all manifestations in a scientific manner, minus the spirits.

7—An impartial committee will pass upon each test individually.

8—No exposes will be published in this magazine as to the methods employed by the practicing mediums contesting, as it is SCIENCE AND INVENTION'S desire to expose nothing other than fraud spirit medium methods, as well as self deceptions.

9—Methods employed by telepathists, mind readers, and mental artists, will not be accepted as evidence of spirit force.

10—Should preparation for duplicating a medium effect require a space of time for building or creating the necessary paraphernalia, such time as is necessary must be granted by the contestant.

11—This challenge expires on May 1st, 1924. In case of a tie, a duplicate prize will be awarded each contestant so tying.

12—In case the \$1,000.00 has not been awarded by May 1st, 1924, SCIENCE & INVENTION may, at its option, withdraw the offer of such prize.

13—In case a prize is awarded to any contestant, SCIENCE & INVENTION agrees to pay this amount in gold, within ten days after the findings of the disinterested committee.

We desire to impress upon the minds of our readers that it is not the desire of SCIENCE AND INVENTION to ridicule those who sincerely believe in so-called spiritistic manifestations. We desire to show that the communications and manifestations alleged by mediums and spiritists to emanate from the other world, prove nothing and can be duplicated by an accomplished magician. We hold that these manifestations are not sufficient to prove that the communications are supernatural or that the physical manifestations are the actions of the dead.

Up to this time there has not been any scientific basis to prove conclusively by scientific means that there is a communication between the deceased and the living. Whenever scientific proof is given that such communication exists, SCIENCE AND INVENTION will be the first to publish such a discovery.

SCIENCE & INVENTION extends the period of the contest for another year to May 1st, 1925, because the prize was not awarded to anyone on May 1st, 1924. There were but few competitors, each of whom were proved fraudulent.—Editor.)

A COMPLIMENT!

Editor, *Science and Invention*:

It was when I was in the fifth grade of grammar school that I spent my "Sunday money" for a copy of the "Electrical Experimenter." (The forerunner of SCIENCE AND INVENTION.—Ed.) At that time I had a laboratory that consisted of a hammer, a few cents worth of nails, some wire and some worn out dry cells. I saved my pennies to buy and make things that I read about in the "Electrical Experimenter." I have read every issue since.

The magazine was a wonder then and it is now. It would be a hard and expensive thing to try and suit everybody with one magazine.

My favorite writers are H. Gernsback, C. Fezandic, Ray Cummings, articles by J. H. Kraus. Dr. Ernest Bade's manuscripts are great. I think the How-To-Make-It and Wrinkles, Formulas, and Recipes Departments are just right the way you have them.

Photographs and drawings are great, but some of your articles should have more text.

George H. Boesken
Cleveland, Ohio.

(An increase of text will be presented in all articles needing it.—Editor.)

CORRECTION NOTICE

In the August number of SCIENCE AND INVENTION under the Scientific Problems and Puzzles, edited by Ernest K. Chapin, the answer given to problem No. 2 was given as 20 pounds. This error crept in due to an oversight. The correct answer is 15 pounds. We are thankful to our many readers who called our attention to this fact.



THE EXECUTIVE

Every executive is at some time called upon to make decisions which involve applied Chemistry. If he does not know Chemistry, he must rely entirely upon his factory chemists or high priced consultants. A knowledge of Chemistry, easily gained through our Course, would strengthen your position greatly and save you thousands of dollars.



THE BUSINESS MAN

Better buying and bigger sales are the rewards of the man who understands Chemistry. Manufacturers, buyers, salesmen, advertising men, cost accountants and clerks can all benefit by learning Chemistry. Our course teaches you in the shortest and most practical way.



THE PROFESSIONAL MAN

Every professional man needs a working knowledge of Chemistry whether he is practicing law, medicine, engineering, dentistry, or any other calling. Too often he finds this all important science was neglected in his earlier training. Our course removes the handicap. Most important, it gives you information in a form that can be readily used.



THE DAILY WORKER

Workers in any industry can raise their own wages by learning Chemistry, for every industry is based on Chemistry. Write and tell us what your work is and we will show you how Chemistry can fatten your pay envelope.

CHEMISTRY

Insures Your Climb to Success

No matter what your vocation you can increase your Proficiency and earn bigger pay by a thorough training in Chemistry

TO be successful today is to know Chemistry! Every line of business, every branch of industry depends upon Chemistry in some form. You may not realize it, but your own proficiency in whatever work you are doing would be increased by a knowledge of Chemistry. In many lines such knowledge is absolutely essential. In others it is a guarantee of promotion and more money.

It is no longer necessary to enter college in order to learn this fascinating science. Our Home Study Course trains you just as thoroughly, and with the same assurance of success, as those who took the longer way. And our methods are so simple that we can teach you no matter how little previous education you may have had. Many of our graduates now hold responsible positions or have materially increased their incomes from private enterprises as a result of taking our course. Hundreds of letters from students testifying to the benefits they have derived from our training are here for your inspection.

Remember that you do not need to study Chemistry with the idea of actually practicing as a chemist, although a great many of our students are taking our course with this object in view. If you want to know more about what Chemistry will do for you, if you want to know what our home study course offers, sign and mail the coupon today for FREE BOOK "Opportunities for Chemists."

DR. T. O'CONOR SLOANE Will Teach You Practical Chemistry In Your Own Home

The Chemical Institute of New York, of which Dr. T. O'Conor Sloane is Educational Director, was founded to fill the need of ambitious, far-sighted men who realize and recognize the splendid future Chemistry offers them, but who cannot spare either the time or the money to attend college. Dr. Sloane, a foremost authority on Chemistry, will teach you and will give you all the individual help you require. He will personally go over your papers, correct them, point out your faults and teach you in a practical and interesting way. No special education needed except the ability to read and write English. One student has characterized our lessons as "The course that takes the mystery out of Chemistry."

Easy Monthly Payments

You do not have to have even the small price of the course to start. You can pay for it in small monthly amounts—so moderate that you won't feel them. The cost is low, and includes everything, even the Laboratory Equipment—there are no extras to buy. Our plan of easy monthly payments places a chemical education within the reach of everyone.

Laboratory Equipment Given To Every Student Without Additional Charge

We give to every student without additional charge his 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.

Special 30-Day Offer

For a short period we are making a special offer that will be worth your while to take advantage of. Write for particulars, using the coupon below or simply a postal card. This will not obligate you in the least. Do not wait until tomorrow. Send the coupon now while you think of it.

The CHEMICAL INSTITUTE of New York, Inc.

Home Extension Division 10

66-S W. Broadway, New York City

Sign and Mail this Coupon for FREE BOOK

CHEMICAL INSTITUTE OF NEW YORK, Inc.
Home Extension Division 10
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 Laboratory Equipment furnished to every student. Also please tell me about your plan of payment and your special 30 day offer.

NAME

ADDRESS

CITY

STATE

S.&I.-10-24

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

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
Scientific American Building, Washington, D. C.
Tower Bldg. Chicago, Ill.
Hobart Bldg., 582 Market St., San Francisco, Cal.
Van Nuys Building, Los Angeles, Cal.

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.

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



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.

GLASS STEERING WHEEL

(827) Norman Vaness, Fort Wayne, Ind., requests our opinion of an automobile steering wheel made of pressed glass.

A. Our opinion of your "pressed" glass steering wheel is very poor indeed, and if you follow our suggestion you would forget about the idea immediately. What do you think would happen to that poor little steering wheel in the event of an accident? Not only would it cut the driver's hands immediately, but it might result in damage to other occupants of the machine.

COMMUTATORLESS D.C. GENERATORS

(828) Leo Vanderheyden, Buckingham, Iowa, asks if ideas can be sold. He also wants to know if he has invented a commutatorless D.C. generator and sends a diagram of the machine.

A. Ideas can be sold the same as patents, but the inventor has a certain amount of protection if he has a patent pending, which protection he does not hold if he merely sells his idea. In the latter case, one must deal with reliable concerns only. In the former, it does not make much difference, provided that your lawyer handles the sale of the patent. Contrary to your expectations you have not invented a commutatorless D.C. generator. The drawings of a type of generator similar to the one you submitted has been described time and time again, and although it gives a very low potential and direct current, and at the same time a very small amount of such current, it is quite impossible to increase the amount of current from such a device. If the machine is perfectly balanced and well designed, no direct current is produced. If there are faults in the iron and in the wiring, a very slight flow in either one direction or another is registered by a meter.

We do not advise applying for a patent on this system. It could not by any known means be employed in the elimination of static in radio receiving instruments.

SANDBLASTING GEARS

(829) Constantine H. Troy, of Elmira, N. Y., has solved a system for sandblasting gears which is, he believes, superior to the system now employed in the shop where he works. He asks our opinion.

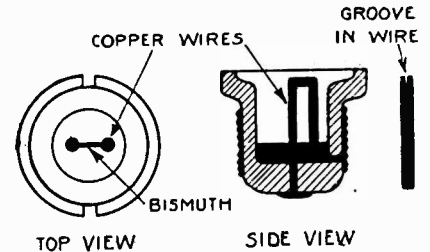
A. Your idea for sandblasting gears is fairly good, but it will cost a great deal of money to put it across. Why not enter into some sort of a contract with your firm to give you a certain percentage of the returns should your system prove

successful. The attempt is worth your while. Unfortunately, you can do very little with this idea if you merely secure a patent on the same. You will have to make a practical working model and give a positive demonstration of its superiority over other systems.

RENEWABLE FUSE

(830) Nick Raar, Grand Rapids, Mich., requests our opinion of a renewable fuse in which the link is clamped between spring clips.

A. We do not advise a patent on any renewable fuse, as the possibilities for the sale of the same are very slight unless you are in a position to manufacture and advertise the article.



A rather poor application of a renewable fuse.

Your fuse would not be passed by the Fire Underwriters, as the fuse link is not clamped in place, being merely held in position by means of poorly designed spring clips. You likewise show no protective covering for the fuse element.

It is not compulsory for an applicant securing a patent to have a model built, but a model gives the patent attorney a better conception of the device. You can take another fuse already found upon the market and convert it to your type for the purpose of supplying such a model.

SMOKING PIPE

(831) Paul W. Tietsche, Indianapolis, Ind., requests our opinion on a nicotine-absorbing pipe containing a blotting paper tube in the stem thereof.

A. With reference to the pipe which you have designed, we would advise that your idea, although at first glance seemingly fair, is really of no practical value because of the cost of manufacturing the same, and because of the uncleanness in effecting the cleaning operation. It must be quite evident to you that when this blotting paper in the pipe becomes wet, it will swell, constricting the area through which the smoke passes. Then, on attempting to remove the same, the blotting paper will be torn to shreds, unless some kind of a ram rod is employed for its removal; and every time it is removed and a new one inserted, difficulty will be had in placing the new blotting paper tube in the pipe, due to the fact that the interior of the tube into which it passes, will remain moist. Contrary to your expectations, this pipe will not absorb nicotine. It will merely prevent the saliva from the mouth and the moisture from the tobacco from passing back into the mouth. In curved stems it would be impossible to use your arrangement. One company sells pipes in which a small receptacle is placed immediately under the bowl. This receptacle is to hold the saliva and prevent particles of tobacco from filtering into the pipe stem. The pipe is quite effective and also cheap to manufacture.

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 and we will give our opinion as to its patentable nature.

Name

Street

City

RANDOLPH & CO.
Dept. 172, WASHINGTON, D. C.

PATENTS

TRADE MARKS · COPYRIGHTS

PROTECT YOUR IDEAS

ANY NEW article, machine, design or improvement thereof, or any new 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 of improvement, or any new design or process, SEND DRAWING, MODEL OR DESCRIPTION of it for information as to procedure to secure protection.

WRITE TODAY FOR BLANK FORM "RECORD OF INVENTION"

USE THE COUPON attached, and immediately upon its receipt I shall send you this form to be returned to me with drawing, description or model of your idea; promptly upon receiving your idea I shall write you fully as to procedure and costs.

NO CHARGE FOR THIS INFORMATION

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.

WRITE TODAY for free books "How to Obtain a Patent" and "Invention and Industry." These books will give you valuable information, and 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. Write TODAY.



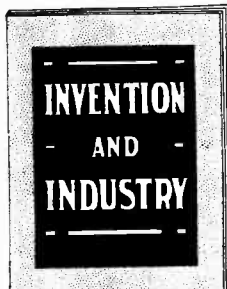
Drafting and Specification Room of Clarence A. O'Brien, Registered Patent Lawyer, Washington, D. C.

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

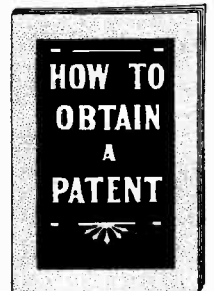


CLARENCE A. O'BRIEN, Registered Patent Lawyer, Washington, D. C.
537 Security Savings & Com'l Bk. Bldg., directly across street from U. S. Pat. Office.

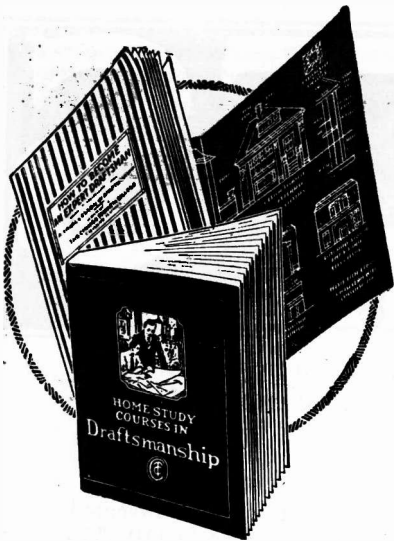
Please send me your free booklets "How to Obtain a Patent" and "Invention and Industry" and blank form "Record of Invention" without any obligation on my part.

Name

Address



IMPORTANT—WRITE OR PRINT NAME PLAINLY



FREE Trial Lesson DRAFTING

Mail the coupon and we will send you this Free Trial Lesson which will show you how well prepared you are to master Drafting. No obligation on your part, nothing to pay. While other schools ask you to enroll and pay a fee at once, we send this lesson first. Before you pay a cent or decide about enrolling test your ability and learn about the Chicago Tech. Method of teaching Drafting by mail.

Double your Earnings

Big concerns everywhere are seeking expert Draftsmen at top notch salaries. This is your chance to step ahead just as R. L. Cary did who reports 300% salary increase since training with Chicago Tech.; or as J. A. Da Costa did who was doing manual labor and rose to an executive position.

Train by Mail

By the Chicago Tech. Method you can become an expert Draftsman by home study. Practical men will give you the training that brings highest pay. No useless theories—you learn how to handle actual problems. Direct personal instruction. We furnish full size professional Drawing Outfit (retail price \$25) free or credit you on fees if you have one.

Send the Coupon

Ask now for the Trial Lesson. We will also send catalogs and full information about the Chicago Tech. Method. No obligation—no promise on your part. Send today.

CHICAGO TECHNICAL COLLEGE,
Dept. 1045, Chicago Tech. Bldg.,
118 East 26th Street, Chicago, Ill.

Without cost or obligation to me please send Free Trial Lesson in Drafting and other instructive matter about opportunities open for me in this line.

Write or Print Name Plainly

Name

Address

City

State

PRACTICAL ELECTRICAL EDUCATION

Learn by the thorough approved scientific methods which our nineteen years of specializing enable us to give you. A.C. and D.C. Armature Winding, Wiring and Testing, Practical Electricity, Drafting, Electrotechnics, Commercial Electrical Engineering, Electrical Engineering with B. S. Degree. "Earn While You Learn." Radio Broadcasting W. S. O. E. Every Day. Next term opens Sept. 29th. Write for 72-Page Illustrated Catalog. It's Free. Mention Age, Education and Course interested in.



SCHOOL of ENGINEERING of Milwaukee

415 Marshall St., Dept. S.1-1024B Milwaukee, Wis.

PATENTS Patent Litigation
Trade Marks
Copyrights

Handbook of Instructions, "How to Protect Inventions" Free on Request

R. H. FRAVEL, Patent Attorney
Formerly of the U. S. Patent Office Examining Corps
8503 McLaughlin Bldg. Washington, D. C.

AUTOMATIC ROAD MAP

(831) H. L. Triplett, New York City, submits a patent of an automatic road map to give exact locations of the car when on the road. The map is to be rolled on a spool and unrolls as the machine proceeds.

A. If your automatic road map for automobiles could be so arranged that an individual would take but one straight route to reach a certain town, the map would be of value. But what would happen if the individual came to a cross-road and decided to travel along that road, or what would occur if the individual came to a detour? You have evidently not taken this into consideration at all.

Then the difficulty would be to have a sufficient number of these spools to cover every road throughout the United States. This is, in our opinion, an almost impassable barrier. For this reason we do not believe that your invention would ever be of practical value. If a concern with large financial backing could develop a system of this kind, there is a possibility of obtaining limited profits.

HONEYCOMB COIL WINDER

(832) E. J. Tasset, Bellefont, Kansas, submitted a drawing of a honeycomb-coil former for winding coils at home. This system was good and he was so advised, but it was too expensive. He now sends a drawing of a substitute for the first one.

A. The difficulty with your coil winding machine at the present time is that it will not wind a honeycomb coil. It will merely wind a coil with an elliptical form. You will note that the ratchet arm moves back and forth at a fixed rate relative to the coil form-holders. This fixed speed will produce a bank coil, one turn lying on the other, and when the coil is finished and removed from the holder, the roll of wire will be in the shape of an ellipse. This system is far inferior to your previous one, even though it is considerably simpler.

We would suggest that in developing these systems, you build a small model out of cardboard or of small parts, in order to demonstrate to yourself the working of the devices.

FURNACE REGULATOR

(833) Constantine Troy, Elmira, N. Y., submits a drawing of a home furnace regulator, employing an odd type of thermostat, motor or solenoids and relays. He requests our opinion on the device.

A. Your suggestion for a furnace regulator is without a doubt of some value, but the value is so slight that we would hesitate at advising you to apply for a patent on the particular arrangement of the parts. Where perhaps one concern may be willing to install a regulator such as you describe, there are hundreds who would not do so, and we believe that you will be unable to successfully market this device.

Of course we can not claim to be infallible in our decisions, but previous experience has taught us that there is very little possibility of effecting a sale on a furnace regulator employing pyrometer principles. Regulators actuated by relays and either solenoids or motors are not suitable for home use. We do not suggest that you apply for a patent on this device.

NON-BREAKABLE GLASS

(834) Norman Van Ness, Fort Wayne, Ind., claims to have a formula for unbreakable glass made in part with transparent rubber. He asks if anything similar is on the market.

A. Unshatterable glass has been on the market for a great many years, and there are about twelve to fifteen concerns making the same today. This consists of two-ply glass with a layer of celluloid between, or in some cases of three-ply glass with two layers of celluloid between. The glass and celluloid are joined together under great pressure.

If you have a better formula for unbreakable glass, or if you have a formula for malleable glass, you may rest assured that it will be looked upon favorably.

COMBINATION AUTO GAUGE

(835) Henry Uzarantz, Rutherford, N. J., claims to have designed a simple and effective gasoline gauge which records the amount of gasoline in the tank and the amount of oil in the engine, and gives the number of miles per gallon at all times, as well as tells condition of radiator, water, etc. He asks our opinion of his system.

A. If your device does all you claim it will do and has no mechanical defects, applications for a patent would certainly be advisable. We believe, however, that you have only brought forth the interesting feature of your invention, not saying a word about the defects or the cost of manufacture.

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-S Woolworth Bldg., New York City

INVENTORS! Your Future

depends upon truthful and proper advice at the right time. Our facilities to assist you in securing patents, models, capital, etc., and our complete service to inventors will interest you.

Information upon request.

INVENTORS INTERNATIONAL INSTITUTE
15 Park Row, New York

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. 1888.

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 Movements sent free on request.

ALBERT E. DIETERICH
Patent Lawyer and Solicitor
Successor to Fred G. Dieterich & Co.
602 OURAY BLDG. WASHINGTON, D. C.

YOUR FUTURE

WHAT WILL IT BE?

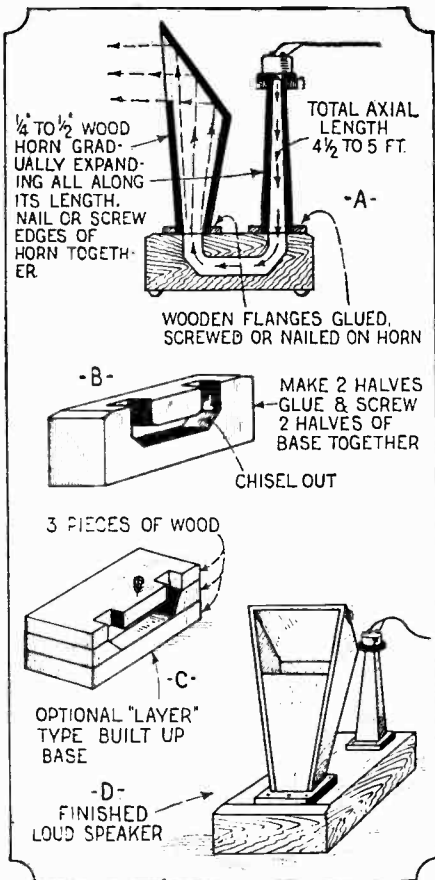
I can't foretell your future. But I can help you to big money and a bright future. How? With CRISP-ETTES. They've made the future rosy for others. Let them do it for you. A simple machine, secret formula, my advisory service and a little money all you need. Own a real business—one that will assure your future. Write for "Book of Facts."

H. W. EAKINS
1053 High St. Springfield, Ohio.



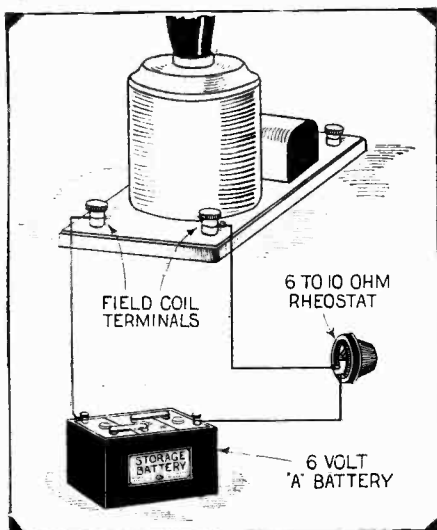
Inventors Protect your rights! Recording Blank Free. Consult me if you have an undeveloped invention or idea. Do not delay!
O. S. Leszay Registered Attorney and Engineer
15 Park Row, New York, N. Y.

LOUD SPEAKER HORN



Herewith is a sketch of a home-made loud talker built entirely of wood; the total length of the sound chamber along its axis is to be about five feet. Recent experiments in acoustics have shown that the amplifying horn should be four and a half to five feet to give best results. This design permits the using of this very desirable long amplifying chamber with a minimum of space requirement. A suitable clamping strap should be provided to fasten the loud speaker unit on the small end of the horn.

LOUD SPEAKER VOLUME CONTROLLER



The sound volume of any old type Magnavox or other similar loud speaker can easily be regulated by placing a rheostat in series with the field coil posts and the 6 volt "A" battery. The rheostat should have a resistance of at least six ohms and preferably ten ohms or more. This regulates the current in the field coils, and consequently their magnetic strength and the amount of motion of the moving coil for a given signal. With a rheostat of 10 ohms resistance, the 1 ampere field-current can be cut down to a minimum of .37 ampere.

—Harry R. Lubcke, Reporter No. 1015.

PATENTS TRADE-MARKS AND COPYRIGHTS

OUR OFFER: No Charge for Examination and Instructions

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 examination and 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

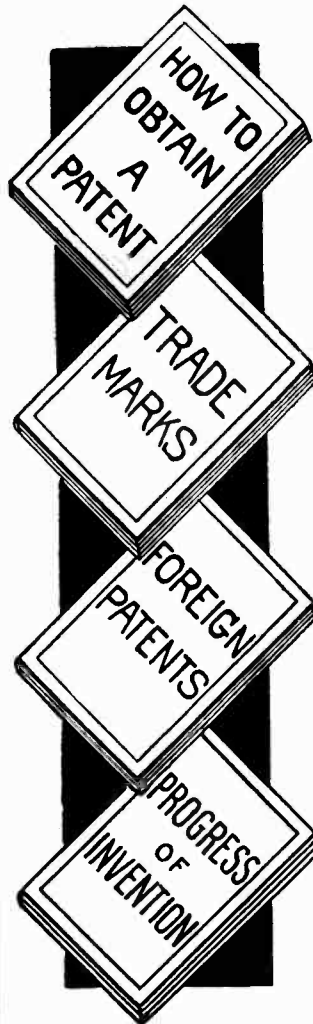
Shows the value and necessity of Trade-Mark Protection and gives information regarding *Trade-Marks and unfair competition in trade.*

Our Foreign Book

We have Direct Agencies in all Foreign Countries. We secure Foreign Patents in shortest time and lowest cost.

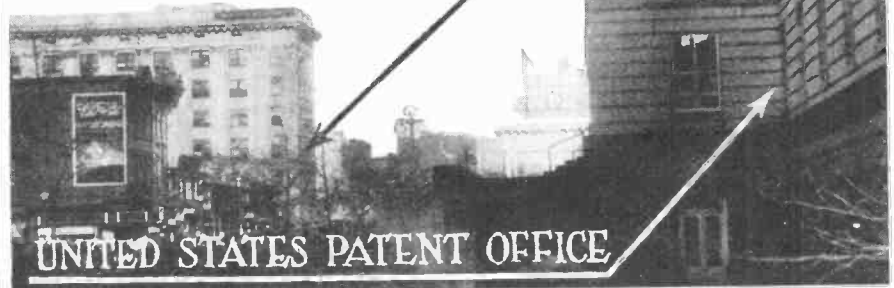
Progress of Invention

Description of World's Most Pressing Problems by Leading Scientists and Inventors.



VICTOR J. EVANS & Co.

VICTOR BUILDING. 779 - 9TH ST., N.W.



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. All communications strictly confidential.

Highest References—Prompt Attention—Reasonable Terms

WRITE TODAY

FREE COUPON

VICTOR J. EVANS & CO., Patent Attorneys

New York Offices Philadelphia Offices Pittsburgh Offices
 1007 Woolworth Bldg. 714-715 Liberty Bldg. 514 Empire Bldg.
 Chicago Offices, 1114 Tacoma Bldg. San Francisco Offices, Hobart Bldg.
Main Offices, 779 Ninth Street, Washington, D. C.

Gentlemen: Please send me **FREE OF CHARGE** your books as described above.

Name Address.....

TO COLOR WOOD ARTISTICALLY



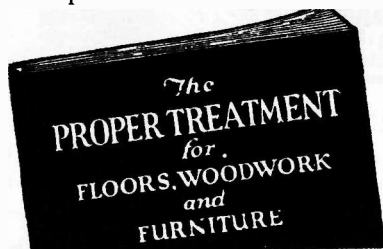
Small odd pieces of modern furniture add greatly to the attractiveness and convenience of every home. You, yourself, can easily make them for your family. There is no particular trick to constructing porch swings, tables, telephone sets, cabinets, etc. And the finishing of them is a very simple matter if Johnson's Artistic Wood Finishes are used. Our method involves practically no expense. All you need is a little time, a brush, and

JOHNSON'S WOOD DYE

Johnson's Wood Dye is very easy to apply—it goes on easily and quickly, without a lap or a streak. It penetrates deeply bringing out the beauty of the grain without raising it—dries in 4 hours and does not rub off or smudge. Made in fifteen beautiful shades.

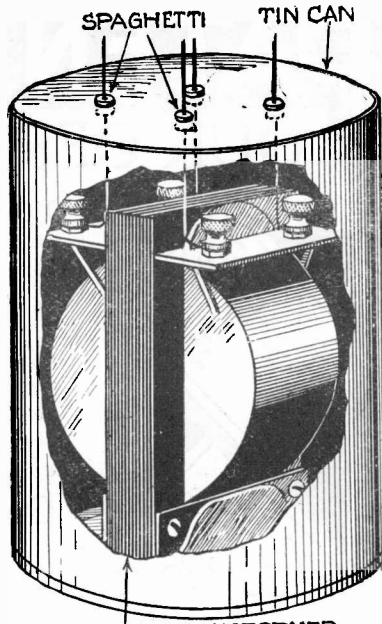
FREE—25c Book on Wood Finishing

This Book tells how to finish wood in artistic stained and enameled effects. Gives practical suggestions on making your home artistic, cheery and inviting. Tells just what materials to use and how to apply them. Includes color card—gives covering capacities, etc. Use coupon below.



S. C. JOHNSON & SON, Dept S 110, Racine, Wis. (Canadian Factory—Brantford)
 Please send me free and postpaid your Instruction Book on Home Beautifying and Wood Finishing.
 My Dealer Is.....
 MY NAME.....
 MY ADDRESS.....
 CITY & STATE.....

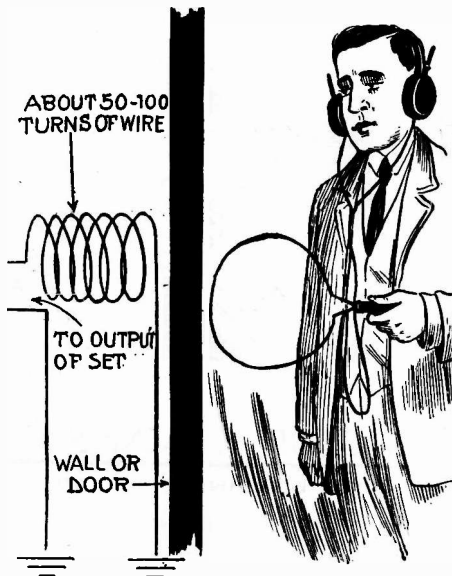
TRANSFORMER SHIELD



AMPLIFYING TRANSFORMER

To approach perfection in the assembly of a two step audio frequency amplifier requires that a minimum of interaction occurs between transformers. A tin can serves admirably for preventing interaction. —Fred Ebel.

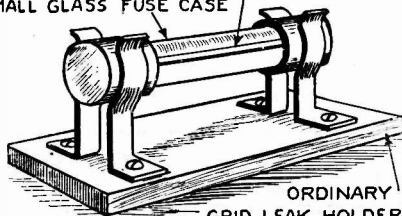
MYSTIC MUSIC



Loads of fun can be had by having several hidden coils of wire connected in series and placed about the house. The uninitiated betray great amazement when trying to find the source of music while exploring with a loop of wire connected to the phone terminals. —Charles Rehm, Reporter No. 3932.

GRID LEAK

PAPER WHICH HAS BEEN DIPPED IN PRINTER'S INK
 SMALL GLASS FUSE CASE



A very substantial fixed value grid leak is made by employing a burnt out fuse from your auto. A piece of paper 1/8 inch wide is dipped in India ink and allowed to dry thoroughly and then inserted.
 —A. W. Partington, Reporter No. 10316.

YOU CAN LEARN NEWSPAPER WORK

Experienced Editor Will Teach You How to Become a Reporter

FASCINATING WORK--GOOD PAY

Only a Few Months' Work Required To Qualify You for a Better Position

Regular reporters earn from \$40 to \$125 a week. Good deskmen on a daily paper are paid from \$60 to \$100 a week. A "Star" Reporter can command his own salary. Hundreds of ambitious men and women enhance their income materially by corresponding for newspapers or writing for magazines in their spare time.

We Will Teach You at Home

We can develop your talent for writing and lead you into this well paying profession. Our Practical Course in Journalism was personally prepared by Henry J. Brockmeyer, for 13 years on the Editorial Staff of the N. Y. Evening Post. Mr. Brockmeyer has trained hundreds of men and women, many of whom have, under his guidance, developed into front rank reporters.

Mr. Brockmeyer's course will teach you what it would take years of actual newspaper work to learn. It consists of six comprehensive lessons just brimful of everything a reporter must learn. The following are only a few of the subjects covered.

Starting in Journalism. What is a Newspaper? What is News? Start and Finish of a News Story. Technical Terms. The Type Point System. Styles of Type, Proof Reading. Capitalization and Punctuation. A Late Fire Bulletin. Court Stories. Libel Laws, Copyright. Hints to Reporters. Personal Conduct. Re-Writing and Condensing Stories. Paragraphs and Short Items. Good and Bad Styles. Broadening the Vocabulary. Aids to Good Style. Special Stories. Suggestions for Stories. Rhetoric. Preparing Your Story. Don'ts for Writers. Office Organization. Syndicated Matter. Business Office. Mechanical Department. Hints for Headline Writers. The Make-Up. The Country Correspondent, etc., etc.

Use Coupon—Save 50%

Although the price for the entire course is \$10, entitling the students to full consulting services directed by Mr. Brockmeyer personally, we will accept enrollments, if the coupon below is used before Nov. 20, at \$5—exactly half price.

Five Days' Trial

Just pin a check, money order or five dollar bill to the coupon below and mail. Then take five days after the course arrives to decide whether you want to keep it. If not, return it at our expense, and your money will be immediately refunded.

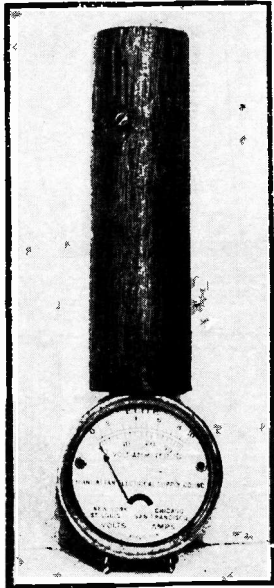
THE PRESS GUILD, Inc., 66-S West Broadway, N. Y.

THE PRESS GUILD, Inc. (Expires Nov. 20, 1924)
 66-S West Broadway, New York City.

Enclosed find \$5 for which you are to ship me at once, prepaid, Henry J. Brockmeyer's complete course in Practical Journalism with the distinct understanding that if I return the course in five days my full \$5 will be refunded and no questions asked.

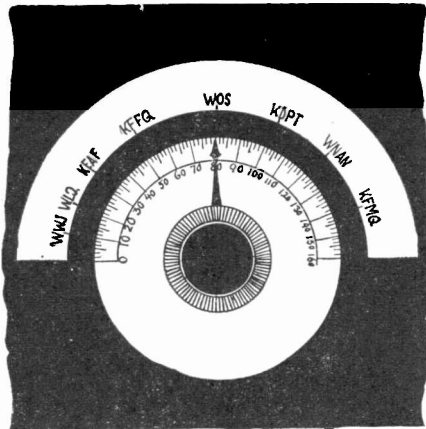
(Name)
 (Address)
 (City) (State)

HANDY TESTER



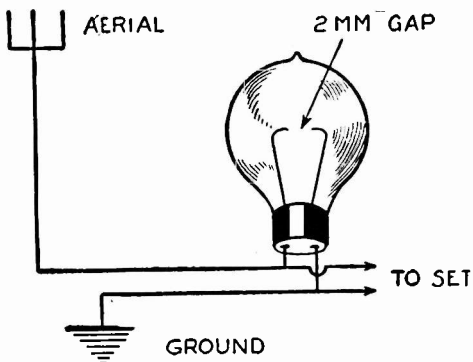
By providing a volt-ammeter with a wooden handle, an instrument already very convenient is made more so and is adaptable to a greater degree of usefulness. (Author please send name and address.—Ed.)

INDICATOR

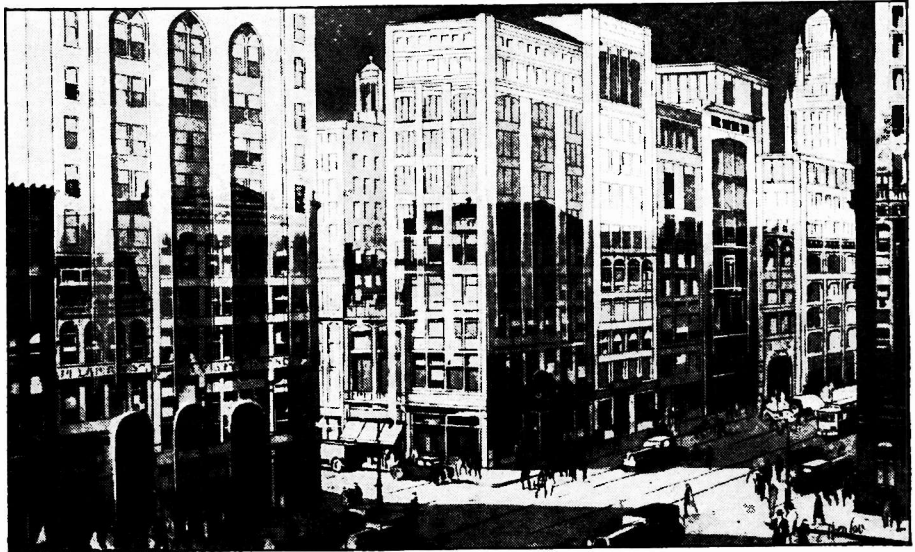


By pasting a piece of heavy white paper or celluloid as shown, another scheme for permanently recording stations is accomplished. A line acting as indicator is drawn in the middle of the dial and the name of the station heard is written on the white paper or celluloid. —Harold Menges.

LIGHTNING ARRESTER



As a means of safe-guarding a radio installation against lightning, a serviceable arrester is found in the use of a miniature burnt out auto or flashlight bulb. —W. B. Fox.



To-morrow's Telephones

So vital a factor has the telephone become in American life that the demand for it would undoubtedly grow even without increases in population. New businesses are founded; others expand. New homes are established in town and city, in suburban dwellings and apartment houses.

To meet the needs of America, to-day and to-morrow, with the best and cheapest telephone service, is the responsibility of the Bell System. The telephone will grow with the population and prosperity of the country, and the plans of to-day must anticipate the growth of to-morrow.

The service which is given to-day was anticipated and provision was made for it, long in advance. Money was provided, new developments were undertaken, construction work was carried through on a large scale. The Bell System, that is, the American Telephone and Telegraph Company and Associated Companies, has continuously met these requirements. It has enlisted the genius of technical development and the savings of investors for investment in plant construction.

Over 315,000 men and women are owners of the American Company's stock and over half a million are investors in the securities of the System. With a sound financial structure, a management which is reflected in a high quality of telephone service, the Bell System is enabled to serve the increasing requirements of the American public.



AMERICAN TELEPHONE AND TELEGRAPH COMPANY AND ASSOCIATED COMPANIES

BELL SYSTEM

One Policy, One System, Universal Service

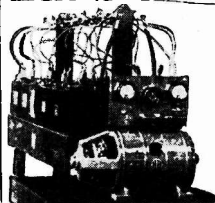
FREE with THIS BIG 3 FT. TELESCOPE

See people and objects miles away, on land or sea, as if they were close. Wonder Telescope gives new pleasures to home, farm, camp, travel, sport. See moon and stars as never before. Opens out over 3 feet long, in 5 sections; measures 12 inches closed. Brass bound; has powerful lenses. **Thousands pleased**—"Could tell color of aeroplane 4 miles away."—Mrs. Yarbrough. "Saw Provincetown Light, 23 miles away, as clear as if in front of me."—Clyde Scribner. "I have been watching submarines 5 miles off the coast."—A. C. Palmer. "Can see children playing in school yard 6 miles away."—P. H. Hennington. Read the numbers of freight cars mile away, see mountains on moon."—A. C. Palmer.

FREE handsome, sturdy 12 in. leatherette Carrying Case sent FREE with Wonder Telescope for short time. Clip This Ad

Because of fortunate purchase from large European maker we can give you a big bargain. Be first in your neighborhood; entertain your friends. **Send no money**; send only name and address for telescope and case by parcel post. On arrival deposit with Postman only \$1.85 plus a few pennies postage. Satisfaction guaranteed or money refunded. Order today while supply lasts.

FERRY & CO., 630 W. Jackson Blvd., Dept. 1257 Chicago, ILL.

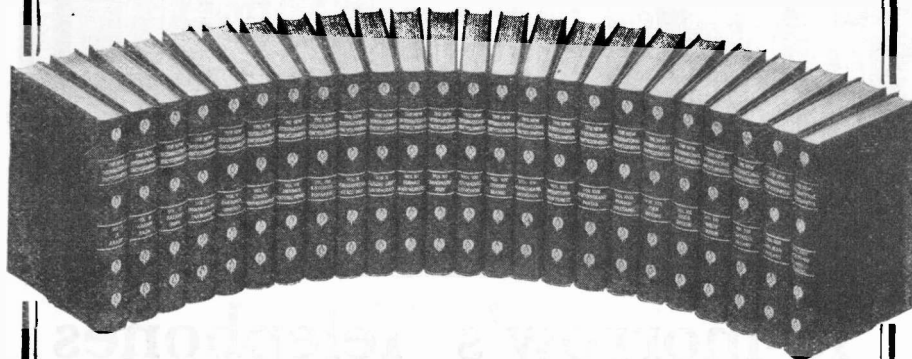


YOU CAN CLEAR \$150 to \$300 PROFIT EVERY MONTH WITH 8 HOUR BATTERY CHARGING

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 with bench, bus bars, resistance leads, connectors, cables, etc.—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. 90 days in which to exchange for larger HB. This is the ideal equipment for the small battery shop, or the shop that wants to get the big profits that battery charging pays. Push battery charging; increase your profits; beat competition. Write for free bulletin. **Hobart Bros. Company, Box S-10, Troy, Ohio**

\$35 PUTS THIS COMPLETE BATTERY CHARGING EQUIPMENT IN YOUR SHOP

The Publication of The
 New International Encyclopaedia Supplement
 Makes Available for You
 The Latest and Most Complete
 Reference Work in Existence



THE NEW INTERNATIONAL ENCYCLOPAEDIA

Complete with New Supplement

During the past ten years human life has been affected by more radical changes than in any other decade in history. For every man who knows the value of accurate up-to-date information there has been a definite need for a reliable source of all the new knowledge resulting from the significant events of this period. Now that need has been filled. America's greatest reference work has been brought right up to 1924 by the preparation of a splendid supplement. The editorial staff of The New International Encyclopaedia, aided by officials of the United States Government, Business and University authorities, and a large corps of other specialists has assembled this vast amount of vital information in a supplement that covers every subject within the scope of human thought and activity. The New International is the only thoroughly up-to-date encyclopaedia in existence, and an essential to every office or home where reliable facts are needed.

Write for Details of Special Offer

To put this one complete and reliable source of all the world's knowledge most easily at your service the publishers are presenting to new subscribers a most attractive special offer. Let us send you full information about it, without cost or obligation. Just send the coupon—now.

FREE—"The Man Who Knows"

This interesting and profusely illustrated little book contains a story that may have a definite bearing on your career. There is as well full information about The New International Encyclopaedia, how it has been developed, and what its value may be to you. The booklet is free—just send the coupon.

Dodd, Mead & Co., 413 Fourth Ave., New York
 Send me without cost or obligation a copy of "The Man Who Knows," and full information about The New International Encyclopaedia and your present special Supplement offer. (Se. & Inv. 10-24)

Name

Street Address.....

City and State.....

Dodd, Mead & Company, New York

Every Room an Outside Room

Hotel Gregorian

42 West 35th Street

Near 5th Ave.

NEW YORK CITY

A High-Class Fireproof Hotel in the Very Heart of the City. Close to All Department Stores and Theatres. Within a few minutes to Pennsylvania and Grand Central Terminals.

ROOMS WITH BATH FROM \$3.00 PER DAY
 FOR 2 PERSONS \$5.00 PER DAY
 SUITES \$6 PER DAY

Very Attractive Rates by Day, Week, Month or Season.
 Ownership Management Assuring Personal Attention.

DEALERS SAVE MONEY

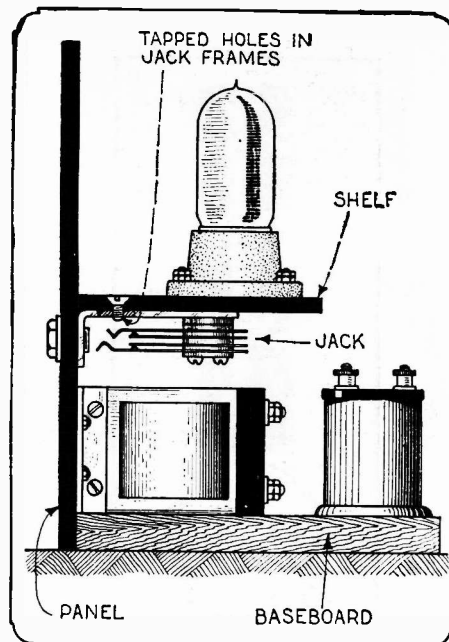
By Ordering from Our Bargain Catalog of Nationally Advertised Radio Goods, Write for It Today.

AMERICAN RADIO MFG. CO.
 Dept. F 6 WEST 14th ST. KANSAS CITY, MO.

RADIO Buyers' GUIDE

For Consumers Get it now—before you buy any set or parts to build one. Bargains in all kinds of complete Sets, Parts and Accessories (Will you be so kind as to add the name of one or more friends you believe will soon want radio goods? Thank you!)
FREE 100 Pages Just send your name.
 Liberty M. O. House, Dept. 165X 106 Liberty St., N.Y.

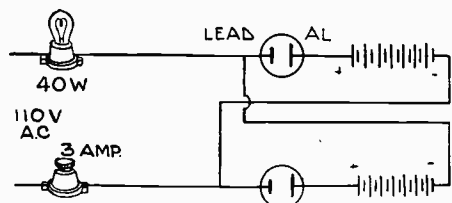
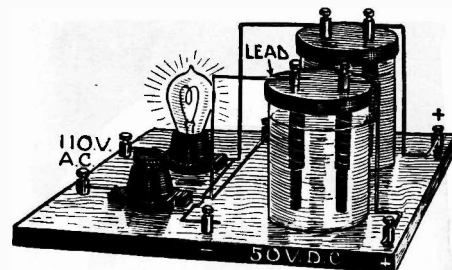
PANEL SUPPORT



Where compactness is desired and where space is at a premium advantage is taken of the mechanical features of the instruments. A series of two or three jacks will form a perfect support for a tube shelf, while a transformer obviates the necessity of extra brackets and expense.

—Joseph F. Odenbach, Reporter No. 10.

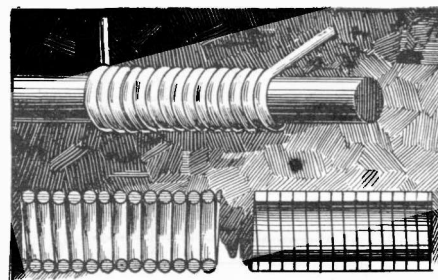
ELECTROLYTIC CHARGER



Two fruit jars containing a concentrated solution of borax, into which are immersed a lead and an aluminum rod, form an excellent B battery charger. After assembly, the plates are "formed" by connecting each set of terminals together and turning on the current for half an hour. Two sets of 22½ volt or 45 volt units can be charged at one time.

—C. F. Tuma.

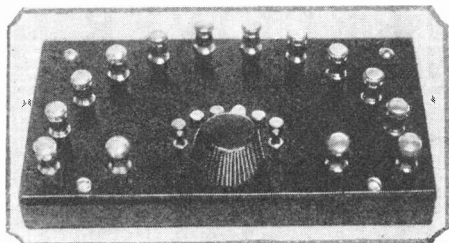
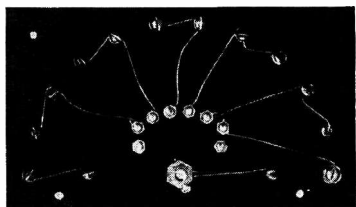
NEUTRODON



By winding a length of bus bar around a pencil and then filling in the interstices with solder, a real good sliding tube for a neutralizing condenser is made.

—William M. Hanneman.

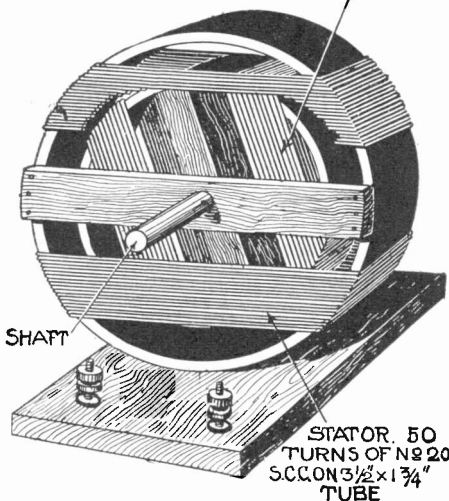
PHONE BLOCK



A piece of bakelite, 14 binding posts, a switch lever, 6 contact points and two switch stops when assembled as is shown, form a neat connection block. (Author kindly send name and address.—Ed.)

VARIOMETER-COUPLER

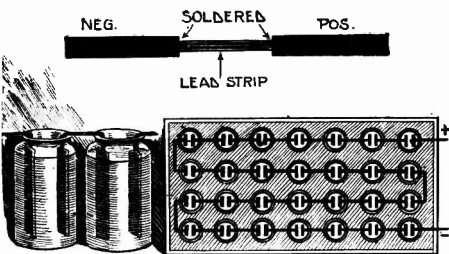
ROTOR, 60 TURNS OF NO. 20 S.C.C. ON A 3'-1/4" TUBE



For a cheap instrument the above is hard to beat. Cardboard or fibre tubes are wound with number 20 S.C.C. wire and connected either as a variometer or variocoupler, the whole being mounted on a wooden base. Flexible leads are used to connect the rotor.

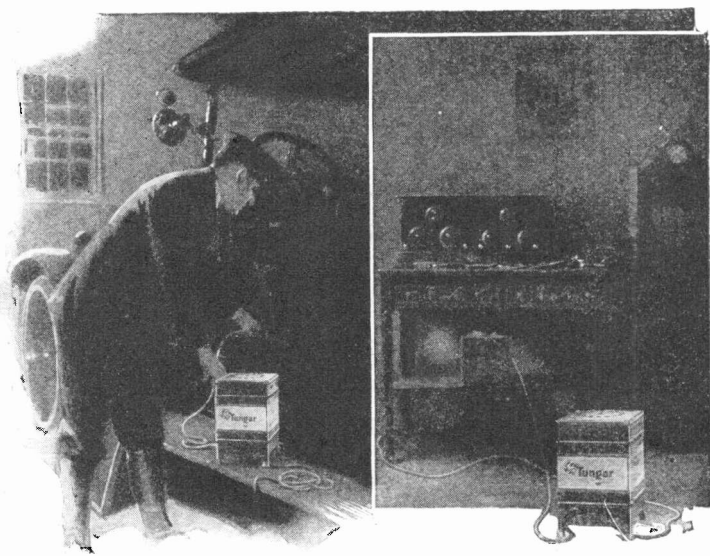
—Arthur A. Blumenfeld.

STORAGE B BATTERY



Using 44 small jars from a five and ten cent store, a 90 volt storage battery that will last a long time on one charge, can be made by cutting up a dozen each of positive and negative plates obtained at the battery station. These are soldered together with a strip of lead between them. The acid should be obtained at the same place and is known as 1200.

—E. J. Roy.



Charge 'em overnight

The handiest electric outlet at home is the place to recharge your radio or auto storage battery. All you need is a Tungar Battery Charger. It will "charge 'em overnight."

The Tungar for home use embodies the same safe principle as your garage man's larger Tungar.

With a completely wired home you attach Tungar anywhere without disturbing lamps.

Sold by Electrical, Auto-accessory and Radio dealers.



With Sprague BX Cable it is easy for your contractor to wire the garage for electricity. Then you take the **Tungar** to the motor car battery. How to plan complete wiring in your home told in the new fully illustrated book, "The Home of a Hundred Comforts"—the book that thousands have sent for. Write today for your free copy.

Address Section S1 to Merchandise Department General Electric Company Bridgeport, Conn.



GENERAL ELECTRIC

48-10

MODEL MAKERS—SCIENTIFIC EXPERIMENTERS—INVENTORS—STUDENTS

WADE BENCH LATHE

For METAL—WOOD—EBONITE: TURNING—BORING—DRILLING—FACING—THREAD CUTTING—WINDING. CAPACITY—4" dia. x 12" length. Lead screw protected inside bed. Slide-rest has a travel of entire length of bed and is fitted with cross feed.

STRONG—ACCURATE—QUIET—SIMPLE

A Real Machine Tool for the Home Work Bench at a Reasonable Price. Requires less space than a sewing machine and operates even more quietly.

Send for Latest Literature—Price \$25.00 F.O.B., N. Y.

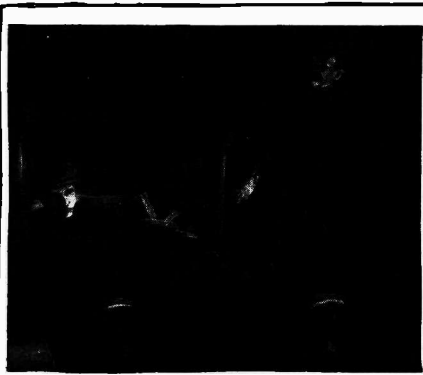
THE GEROLD COMPANY, 120 Liberty St., N. Y. City

Write FOR BOOK ABOUT Elto

3 H.P.—The Fastest "Light Twin"

Designed and Built by Ole Evinrude
Weights less than 17 lbs. per h. p.
Gives half more power, much more speed, yet easy to carry. Instant starting without spinning. Safe rudder steering. Trouble proof carburetor. Push button reverse, without danger of tipping boat. The ideal family motor. Fits carrying case without taking apart. Write for catalog.

ELTO OUTBOARD MOTOR COMPANY
Manufacturers' Home Bldg., Dept. 48 Milwaukee, Wis.



FREE

Actual Reports of Secret Service Operator 38

HERE is something money can't buy. More fascinating than detective stories. Confidential reports of a real operator—No. 38—to his Secret Service Bureau, headed by the most famous detective in America. Absolutely free. No cost. No obligations. Don't fail to send for them.

They may point the way to Big Money for you. See how the modern detective works. Read these inside stories of the solution of great mysteries. See what possibilities this most fascinating and eventful of all professions offers to you—and how you may fit yourself for it.

Be a Finger Print Expert

To command the highest fees, the Secret Service man must also be a Finger Print Expert. These reports show why. This profession may be easily learned at home, in your spare time. Wonderful opportunity in this UNCROWDED, PROFITABLE field.

Make \$5,000 to \$10,000 a Year

The unfilled demand for trained Finger Print men is increasing daily. Opportunity is waiting for you. No time to lose. Send today for these Reports, also our big Free book on Finger Prints. Gives all particulars and success stories of our graduates! Brilliant future ahead if you act now.

Special Offer Limited Time

Everyone getting these Free Reports will also receive my Special Offer of a Professional Finger Print Outfit, absolutely FREE. Made for a limited time only. Send coupon today—sure. Reports, Finger Print Book, and special outfit offer, all Free and Prepaid. Don't delay and perhaps forget. Do this right now.



← Also FREE

Send the coupon

UNIVERSITY OF APPLIED SCIENCE

1920 Sunnyside Ave., Dept. 94-27, Chicago, Ill.

T. G. COOKE, Pres. University of Applied Science
1920 Sunnyside Ave., Dept. 94-27, Chicago, Ill.

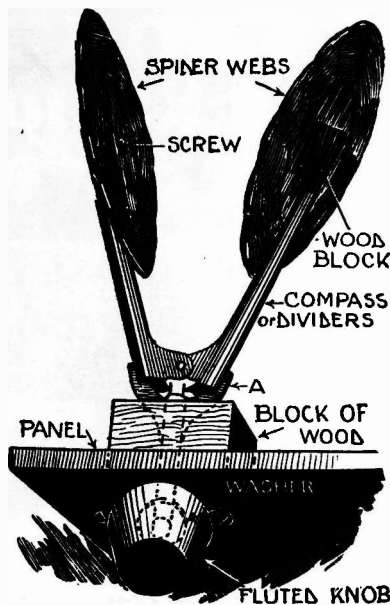
Dear Mr. Cooke: Please send me FREE and prepaid, Reports of Operator 38, your new illustrated book on Crime and Crime Detection and your Special Outfit Offer. It is fully understood I assume no obligation.

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

Address.....

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

SPIDER-WEB MOUNTING



A very good means of varying the coupling between two spiderweb coils is attained when using an ordinary cheap pair of dividers. Mount a small block of wood on the back of the panel and fasten the dividers to it. Flexible leads are attached to both coils.

—T. Asplund.

Doctor Hackensaw's Secrets

By CLEMENT FEZANDIE

(Continued from page 557)

joke. They do not realize that the evolution of sex is one of the most marvelous achievements of nature; that it is sex which has produced the higher animals and raised man to his present supreme position. It is sex that laid the base for social life and made civilization possible. The primitive animals and plants that possess no sex have been left far behind in the race. And yet, strange to say, there now seems to be a reaction. Among the highly socialized communities of animals, such as the ants and the bees, there has been evolved a sexless form, neuters or workers as they are called. The ants show a transition stage. There are a number of males and females in the ant-hill, but the majority are neuters, either workers or soldiers. In the bees, there is only one real female in the hive,—the queen; the workers are undeveloped females. The drones or males are kept on tolerance and killed off at the approach of winter. Only one drone is really necessary, but it is desirable to keep a number, so that when the queen leaves the hive seeking a lover, she shall not have far to travel before she finds him. Only one drone out of the thousands in the hive is made happy, and he pays for the privilege with his life, for he dies in the act of mating.

"Now I am convinced that in this microscopic world we have before us, the conditions are very much the same as with bees. I am convinced these smaller undeveloped women are really neuters, and that the queen is the only true female. In fact, if I am not mistaken, she lays eggs like a bee instead of bringing forth her young alive. It must be so, for as you will see, her house contains cells of two sizes exactly as is the case with bees."

"Do bees make cells of two different sizes?"

"Yes, the drone cells and the worker cells. In fact they make a third and still larger size when they want a new queen. The bees are ahead of us in one way, they have the power of determining which of



A PORTABLE RECEIVER

The Latest Development in Radio Receivers

The Portable Radio Receiver offers a keener enjoyment of Radio than any other type of Receiver on the market. The Portable Receiver, as the name implies, can be moved from room to room in your home as best suits your convenience. It can be placed in your Automobile and taken on week-end trips or it can be easily transported to the house of a friend on special occasions. The Portable offers so many interesting applications that no home is complete without one.

"Consrad" pattern No. 12 "How to Build a Portable Receiver" shows you how to construct a highly efficient Portable by the simplest and most direct method known. A complete set of full-sized blueprint patterns are furnished consisting of two sheets 15" x 18" and another 15" x 18" together with a four-page instruction sheet that details all operations in the building of this set. All blueprints are drawn full size so that no extra measurements of any kind are necessary.

SOLD BY ALL RELIABLE RADIO DEALERS Or Direct From Us.

"BUILD YOUR OWN"

PRICE **50¢** Prepaid Pattern No. 12

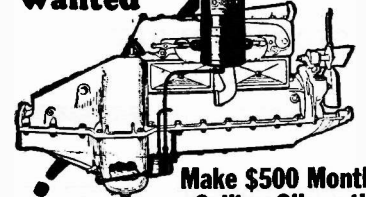
The Consrad Company

233 Fulton Street
New York City

Consrad

"RADIO'S FOREMOST PUBLISHERS"

AGENTS wanted



Make \$500 Monthly Selling Oilomatik

Sales remarkably easy with this amazing new oil regulator for Ford cars and trucks. Over 25,000 now giving Ford owners perfect satisfaction. Our men averaging over \$500 monthly. Oilomatik maintains a constant oil level in the Ford motor crank case and automatically blows horn when oil is low. Saves 25 per cent—50 per cent in oil consumption. Sells like lightning. No limit to your earning power. Big profit on every sale. SPECIAL PROPOSITION now available to hustlers. Write quick!

AUTO PRODUCTS SALES CO., Dept. 11
341 E. Ohio St., Chicago, Ill.

OILOMATIK

their young shall be males and which shall be females."

"Is it possible?"

"The fact is undeniable and for years the true explanation eluded our entomologists. But at last the solution has been found."

"What is the explanation?"

"It was a pretty problem," continued the doctor. "Of course it has long been known that the workers constructed two sizes of cells, and that the eggs laid in the large cells always hatched out as drones, while the eggs in the small cells hatched out as workers. But there seemed three possible explanations: First—The queen bee might possess the power of laying a male or female egg at will, and was always careful to lay a male egg in a drone-cell, and a female egg in a worker-cell. Second—The queen might know in some way whether her next egg was to be male or female, and so be able to lay it in the right cell. Third—The eggs might all be alike, but the sex be determined by the food furnished by the workers to the growing larvae. As a matter of fact, none of these three theories was the correct one, though the true explanation was only discovered comparatively recently, by careful observations under the microscope."

"And what is the secret?"

"Simply this. The queen bee has in her abdomen what is known as a sperm-sac. During her wedding-flight, this sack is filled full of sperm by the drone, who then dies. The queen-bee then returns to the hive with this small sackfull of sperm, and this must serve her afterwards to fertilize her eggs during the remainder of her life—that is to say for several years."

"But that doesn't explain the sex of the young."

"Yes, it does. When the queen lays an egg in a small cell, that is to say a worker cell, the tip of her abdomen is compressed, and a drop of sperm is forced out of the sperm-sac and fertilizes the egg. When, on the other hand, the queen lays an egg in a large cell,—a drone-cell,—her abdomen is not compressed and the egg laid is unfertilized. The fertilized eggs produce females, the unfertilized eggs always produce males. This explains, too, how it is that when, as occasionally happens, a worker-bee develops sufficiently to lay eggs, these produce drones, since the eggs have not been fertilized."

"But doctor, do you mean to tell me that you consider it an advantage for ants and bees to have a sex of neuters?"

"Not only is it advantageous for ants and bees Silas, but it seems to be advantageous for mankind as well. We, too, live in large social communities, and we, too, are rapidly evolving a race of neuters. You will hear a great deal of bosh about 'race-suicide.' As a matter of fact, evolution, as a rule, is inevitably accompanied by a diminution in the birth-rate. Animals or plants low in the scale produce eggs or seeds in countless numbers. A cherry tree will produce about a million cherries during its life-time, each capable of growing into a new tree. A salmon, likewise will lay a million eggs, each of which could produce a salmon—Competition kills off all but one of the offspring on an average, so that the total number of cherry trees or salmon remains about the same. Among the higher animals there are fewer births but also fewer deaths—in other words there is less waste. You have heard of the law of Malthus, the law that led Darwin to his theory of Natural Selection. According to Malthus, population in a new country doubles every sixteen years, hence, unless there were some natural check, there would soon be no room for the new men and women. But, as population increases, the birth-rate diminishes, until, as in France, a point is reached where the birth-rate and death-rate become equal, and

I Can Qualify You as a Radio Expert in a Few Months!

Learn at Home Earn \$2500 to \$10,000 a Year

Merle Wetzel, one of my students, reports that he is now making three times what he did before becoming a radio expert. Emmett Welch writes that after finishing my training, he made \$300 a month and all expenses. George Jones says: "To your course I credit my present position as manager of this Radio Department." Another graduate is now an operator of a broadcasting station, PWN of Havana, Cuba, and earns \$250 a month. Still another graduate, only 16 years old, is averaging \$70 a week in a radio store. Hundreds of other former students enthusiastically tell of their successes as radio experts! The field of Radio today is a real treasure house of wonderful opportunities. It offers rewards beyond your fondest dreams! Mail coupon today for my Free Book just out—which explains in detail the amazing opportunities in this World's Fastest Growing Industry.

E. R. HAAS
Director, National Radio Institute.





Hundreds of Big Paying Positions Waiting

Do you want to earn far more money than you ever dreamed possible? Do you want to be your own boss?—to have a profitable business of your own? Do you want to travel the whole world over—and make big money while doing so?

Radio offers you all of these opportunities—and more! Radio, the new infant industry; Radio, growing with leaps and bounds; Radio, the field of endeavor with the most promising future of all!

Hardly a week goes by without our receiving 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.

Our course is the only absolutely complete one now being offered which qualifies for a government first class commercial license. It gets you the bigger paying jobs in Radio.

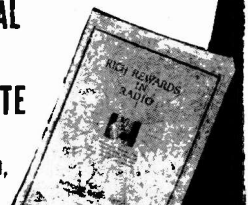
This Wonderful FREE BOOK Has Shown Thousands The Way To Bigger Money

This Free Book has opened the eyes of thousands to the glorious opportunities in Radio. Never in all history has an industry jumped into prominence so rapidly! Millions of dollars now spent yearly on Radio. Hundreds of big money positions have been created almost overnight. Thousands of men trained in Radio are needed. If you are ambitious—if you are looking for a field which offers big money, fascinating work, advancement, and a real future, send for this Free Book. It costs you nothing. You obligate yourself in no way. Yet this book can easily mean all the difference between the work you are doing now and wonderful success!

For a short time we are offering a reduced rate to those who enroll now. Act promptly and save money.

Before you forget—mail the coupon NOW!

NATIONAL RADIO INSTITUTE
Dept. 14-KA
Washington, D. C.



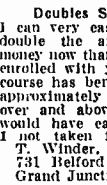
E. R. HAAS, NATIONAL RADIO INSTITUTE,
Dept. 14-KA, Washington, D. C.

Without obligation on my part, please send me the free book "Rich Rewards in Radio," with full details as to how I can quickly train for the position of "Certified Radiotelegraphist" in my spare hours at home. Also tell me how your free Employment Service will help me secure a good paying position, and about your special short-time offer. Please write plainly.

Name _____
Street _____
City _____, State _____



Pay Increases Over \$100 a month
I am averaging anywhere from \$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. Lang,
120 No. Main St.,
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 \$3,000 over and above what I would have earned had I not taken it.
P. Winder,
731 Belford Ave.,
Grand Junction, Colo.



From \$15 to \$80 a Week
Before I enrolled with you I was making \$15 a week on a farm. Now, I earn from \$2,080 to \$4,320 a year, and the work is a hundred times easier than before. Since graduating a little over a year ago, I have earned almost \$4,000 and I believe the course will be worth at least \$100,000 to me.
(signed)
Geo. A. Adams,
Route 1, Box 10,
Tamaqua, Pa.

Be An Auto Expert

Learn the Simplex Way!

Let us prepare you at home to become an Auto Expert

Write for SPECIAL OFFER

SIMPLEX AUTO SCHOOL

2016-2024 W. Van Buren St.
Chicago, Ill.

Save \$38.80

Take advantage of the great saving we offer on the genuine, world-famous, ball-bearing, long-wearing L. C. Smith Typewriter. Late model machines, standard size, up-to-date in every way, at remarkably low prices.

TEN DAYS' FREE TRIAL
Test it thoroughly—no obligation.

SEND NO MONEY
A YEAR TO PAY EASY TERMS
Guaranteed Five Years

We do the most perfect and highest class job of rebuilding known to the typewriter industry. Our machines do perfect work and last for years and years. Just like new. The L. C. Smith is the easiest machine to operate and you can easily type your own letters. Complete lessons on typewriting, also our 5 Year Guarantee with every machine. **FREE**—Send today for Free Booklet of Valuable Typewriter Information, Big Catalog and our Special Offer.

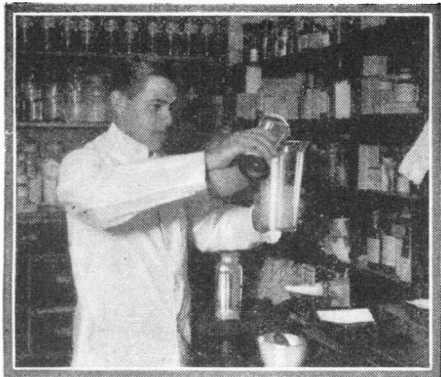
SMITH TYPEWRITER SALES CO.
303-360 East Grand Avenue Chicago, Illinois

"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.

Print Your Own

Cards, circulars, labels, book, paper, Press \$12. Larger \$35. Job press \$150. Save money. Print for others, big profit. All easy, rules sent. Write factory for press catalog, TYP. cards, etc. THE PRESS CO., D-47 Meriden, Conn.



An Easy Way to Learn PHARMACY AT HOME

Graduate pharmacists are always in demand. The work is interesting and pleasant and salaries are good. Many young men open drug stores of their own and become independent.

There's an easy way to learn pharmacy right in your own home in spare time, without losing a day or a dollar from your present work.

The International Correspondence Schools course in Pharmacy supplies the knowledge which it will be necessary for you to have in order that you may pass your State Board Examination.

Just mark and mail the coupon printed below to the International Correspondence Schools, Box 6168-D, Scranton, Pa., and full particulars about the Pharmacy Course or any other work of your choice will come speeding to you by return mail.

----- TEAR OUT HERE -----

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6168-D, Scranton, Penna.

Without cost or obligation on my part, please send me full particulars about the subject before which I have marked an X in the list below:—

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|--|--|
| <input type="checkbox"/> PHARMACY | <input type="checkbox"/> Civil Engineer |
| <input type="checkbox"/> Chemistry | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Automobile Work | <input type="checkbox"/> Mine Foreman or Engineer |
| <input type="checkbox"/> Agriculture and Poultry | <input type="checkbox"/> Steam Engineering |
| <input type="checkbox"/> Mathematics | <input type="checkbox"/> Gas Engine Operating |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Airplane Engines <input type="checkbox"/> Radio |
| <input type="checkbox"/> Electrician | <input type="checkbox"/> Architect |
| <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 |

BUSINESS TRAINING COURSES

- | | |
|---|---|
| <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Business Management |
| <input type="checkbox"/> Advertising | <input type="checkbox"/> Industrial Management |
| <input type="checkbox"/> Better Letters | <input type="checkbox"/> Personnel Organization |
| <input type="checkbox"/> Foreign Trade | <input type="checkbox"/> Traffic Management |
| <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> Business Law |
| <input type="checkbox"/> Business English | <input type="checkbox"/> Banking and Banking Law |
| <input type="checkbox"/> Civil Service | <input type="checkbox"/> Accountancy (including C.P.A.) |
| <input type="checkbox"/> Railway Mail Clerk | <input type="checkbox"/> Nicholson Cost Accounting |
| <input type="checkbox"/> Common School Subjects | <input type="checkbox"/> Bookkeeping |
| <input type="checkbox"/> High School Subjects | <input type="checkbox"/> Private Secretary |
| <input type="checkbox"/> Illustrating | <input type="checkbox"/> Business Spanish <input type="checkbox"/> French |

Name.....
Street Address.....
City..... State.....
Occupation.....

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

Are YOU missing this fun?

The Conn Saxophone, easiest of all wind instruments to play because of its exclusive features, opens great opportunities for pleasure and profit to you. Write for details of Free Trial; Easy Payment plan on any Conn instrument. Used by world-famous artists; Conns cost no more than others.
C. G. Conn, Ltd., 1056 Conn Bldg., Elkhart, Ind.



CONN
BAND INSTRUMENTS
WORLD'S LARGEST MANUFACTURERS

Print Your Own
Cards, circulars, labels, book, paper. Press \$12. Larger \$35. Job press \$150. Save money. Print for others, big profit. All easy, rules sent. Write factory for press catalog, TYPE, cards, etc. THE PRESS CO., D-72 Meriden, Conn.

population remains stationary. Many men and women marry late or never marry at all, and the couples produce few children or are even completely sterile. In a word man too, has already evolved a third sex—a sex of neuters.

"But all this is beside the point. Here are these microscopic men and women with neuters distinct in appearance from either males or females. Here, too are the cells in which the young grow from the egg. Watch! Here are some nurses attending to a baby that has just emerged from his cell. We're in luck, because the number of births is very few, these people seeming to have a life as long as our own. Hence only a small annual birth-rate is required to keep up the population."

"You say these beings have a spoken language?"

"Yes, and in that too, they differ from bees."

"How do you know that bees haven't a spoken language?"

"Pierre Huber proved that by a clever and conclusive experiment. You are perhaps aware that bees have only one queen in a hive. If anything happens to her, however, they at once set to work hatching a new one from a worker egg. The way they do this is to make one large cell so as to give the larva plenty of space in which to develop completely. Huber took advantage of this fact. He opened a hive of bees and placed a fine-meshed wire netting down the centre, thus confining half the bees on one side of the hive, and half on the other.

"Instantly the whole hive was in commotion; but after a few minutes everything returned to its normal condition. The bees on the side where there was no queen had evidently learned in some way from their friends that the queen was safe.

"Then Pierre Huber opened the hive again and placed a second netting alongside the first, parallel to it, but an inch away. If the bees communicated with each other by sounds, a distance of an inch should be no obstacle. If, however, they communicated by touching each other, the partition would prevent them from giving their friends news that the queen was safe.

"The experiment proved the correctness of the theory. The same commotion as before started in the hive. But on the side where the queen was, the disturbance soon subsided as the bees learned that the queen was safe. On the other side of the hive, however, the news was not received, for these bees at once set about rearing a new queen. Hence it was evident that the language of bees is one of touch and not of sound."

"You say you can understand the speech of your microscopic men and women? What do they speak about?"

"They seem to be very primitive. Their language is simple, like that of a savage, and their sentences are short consisting of only a few words. They seem to have no art, literature or science, and their industries are undeveloped. Their houses are transparent being made of a sort of wax-like substance. They make their own clothing but it consists of the skins of animals and is little more than a breech-cloth. They feed on flesh and on vegetables and also prepare a kind of honey which they store up. They make a cordage of vegetable fibres, as you will see if you carefully examine the hammock in which Ionia is lying. They even have horses or shall I call them unicorns? See! There is a neuter riding one now! Notice how the horn of the unicorn is gracefully twisted. Evidently this animal evolved from the dwarf horses of ancient times."

"Have these creatures no weapons?"

"Yes, they have bows, arrows and lances. Wait till I turn the film and you can see a mammoth hunt. There! See how these tiny creatures, with their primitive weapons, bravely attack this monster, which though



A Reflex Receiver

The Double-Duty Radio Receiver

One of the most simple Radio Sets on the market with a reflex circuit that doubles the value of the single tube. Is highly efficient so its size the construction of which costs very little. It is one of the most practical sets for the man who wants a simple, inexpensive receiver that requires no special knowledge to operate and can be repaired and kept in order by anyone.

"Conrad" pattern No. 5, "How to Build a Reflex Receiver," gives complete instructions for building this Reflex. Pattern contains full set blueprints consisting of two sheets 14" x 16" drawn full size so that no extra measurements are necessary, together with four page instruction sheet with full details of construction operations.

AT ALL RELIABLE RADIO DEALERS

Or Direct From Us

"Build Your Own"

PRICE
50¢

Prepaid
Pattern
No. 5

The Conrad Company

233 Fulton Street
New York City

Conrad

"RADIO'S FOREMOST PUBLISHERS"

MAKE MONEY AT HOME

You can earn good money at home in your spare time making show cards. No canvassing or soliciting. We show you how, supply both men and women work at home no matter where you live and pay you cash each week.

AMERICAN SHOW CARD SYSTEM, LTD.
110 Adams Building Toronto, Canada

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., 562 B'way, New York

Wrestling Book FREE

Be an expert wrestler. Learn at home by mail. Wonderful lessons prepared by world's champions Farmer Burns and Frank Gotch. Free book tells you how. Secures holds, blocks and tricks revealed. Don't delay. Be strong, healthy. Handle big men with ease. Write for free book. State age. Farmer Burns School, 1287 Railway Bldg. Omaha, Neb.

microscopic to us, is gigantic to them. See how the unicorns help in the attack. It is really a wonderful sight!"

"Do these creatures use fire?"

"Not to my knowledge. They seem to have stood still at their primitive age while we were making progress. I can only explain it on the theory that their small size gave them immunity from their enemies and made it easier for them to procure food. It is the struggle for existence that produces progress and evolution. Where there are no competitors to fight against, the life of ease renders people indolent, and retrogression sets in. These people in their microscopic world seem to have few enemies—and yet . . ." Doctor Hackenshaw paused.

"And yet?" repeated Silas, interrogatively, seeing that the doctor was holding something back.

"And yet there is one part of their country which they seem to shun, and with good reason, for it seems to contain monsters of the most frightful kind—microscopic to us, of course, but gigantic to these little people. You will understand better, however, if I change the film."

Silas waited impatiently while the doctor, consulting a memorandum he had made, carefully turned several micrometer screens on his instruments. Even then he was obliged to use a finder, similar to the finders used with large telescopes, before he could find the exact spot he was seeking. "There, Silas," said he, "now look!"

The reporter gazed in surprise. There, amid a luxuriant tropical vegetation of palm-like cycads, tree-ferns and tropical cone-bearing trees, there was an enormous brontosaurus quietly grazing if we may use the word "grazing" where no grass or flowering plant grew.

"You see, Silas," explained Doctor Hackenshaw, "we have before us a Mesozoic landscape with its Mesozoic animals and plants. Grasses and flowers were unknown at that period of the world's history, and the reptiles were the highest animals evolved. In some way the creatures have survived in this reduced form, but have not progressed. But look, quick! See that ugly carnivorous dinosaur! That's a tyrannosaurus I'll bet! What a frightful monster! See him pounce on the brontosaurus, though the latter is many times his size! Now he's sucking its life-blood! Whew! I can't stand this, I must turn the instrument in some other direction—I want another look at Ionia."

Again the doctor shifted the thumb screw, and had soon brought the beautiful queen again upon the screen. But now she was out for a gallop on her unicorn through the shady woods. But horror of horror! Another flesh eating dinosaur asleep in the forest was awakened by the tramp of the unicorn's hoofs, and with one pounce had knocked over the horse and seized the fair rider in his reptilian jaws.

"Quick, doctor, quick, for mercy's sake, save her!" cried Silas.

"But what can I do, I'm perfectly helpless!" cried the doctor. "I can no more interfere than I could if this were taking place on the moon!"

And then an idea came to him. By an ingenious arrangement the last microscope and the first one were in the same room, side by side. This was for the purpose of enabling the doctor to shift the object glass at will. There happened to be a small bottle of sulphuric acid on a table. Seizing this, the doctor quickly poured some of the powerful acid into the object glasses. Instantly the whole picture vanished—woods, city reptiles and Ionia with them. To the people on the microscopic world it was as if some cataclysm had suddenly blotted them out of existence.

"I'm sorry I had to do it, Silas," re-



Ward's Radio Catalogue

Write for your FREE copy

We want you to have a copy of Ward's new Radio Catalogue.

You will find it a storehouse of information—a dependable guide to the newest and most important radio developments.

It shows all improved parts and diagrams of the best hook-ups for the man or boy to build his own set, as well as the very best ready-built sets at surprisingly low prices.

Montgomery Ward & Co. are Headquarters for everything in Radio. And this Catalogue

shows complete—everything in Radio equipment. Remember we sell only standard goods—direct to you by mail, and without the usual Radio profits.

For 52 years, "Satisfaction guaranteed or your money back," has stood behind every Ward sale. At Ward's, quality is never sacrificed to make a low price.

Write for your copy of this 68-page Radio Catalogue. See for yourself the low prices. You may as well profit by the savings it offers. Address our house nearest you: Dept. 40-R

ESTABLISHED 1872 Montgomery Ward & Co.

The Oldest Mail Order House is Today the Most Progressive
Chicago Kansas City St. Paul Portland, Ore. Oakland, Calif. Ft. Worth

High School Course in Two Years

Lack of High School training bars you from a successful business career. This simplified and complete High School Course—specially prepared for home study by leading professors—meets all requirements for entrance to college and the leading professions.

30 Other Courses No matter what your business inclinations may be, you can't hope to succeed without specialized training. Let us give you the practical training you need. Check and mail Coupon for Free Bulletin.

American School
Drexel Ave. and 58th St.
Dept. H 726, Chicago

© A. S. 1924

Money Back When You Finish If Not Satisfied

American School, Dept. H 726 Drexel Ave. and 58th St., Chicago
Send me full information on the subject checked and how you will help me win success.

.....Architect	.....Business Law
.....Building Contractor	.....Lawyer
.....Automobile Engineer	.....Mach. Shop Practice
.....Auto Repairman	.....Mechanical Engineer
.....Civil Engineer	.....Shop Superintendent
.....Structural Engineer	.....Employment Manager
.....Business Manager	.....Steam Engineer
.....Cert. Pub. Accountant	.....Foremanship
.....Accountant & Auditor	.....Sanitary Engineer
.....Bookkeeper	.....Surveyor & Mapping
.....Draftsman & Designer	.....Tel. & Tel. Engineer
.....Electrical Engineer	.....High School Graduate
.....General Education	.....Wireless Radio
.....Personal Analysis	.....Undecided

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 \$992,394,968 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 SCHOOL
Room C-3488 Washington, D. C.

----- FREE BOOK COUPON -----
LEWIS HOTEL TRAINING SCHOOLS,
Room C-3488, Washington, D. C.
Send me without obligation the Free Book, "YOUR BIG OPPORTUNITY."
Address.....
City..... State.....

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.

Your "Greater Self" never Sleeps



DID you ever feel that you were being directed, at a crucial moment, in an important task, or when making a momentous decision, by some intelligence and power vastly greater than yourself?

Did your heart ever grow sick of the daily grind and the dull drab prospect of all the days and years ahead? And then did you experience an inspiring flash of thought, amounting almost to whispered words, that a higher, nobler and happier life was possible to you—that it was within your power to make your life anything you wanted it to be?

If either of these experiences ever came to you, did you wonder whence the inspiration came? It was your Greater Self whispering to you, and urging you on to become and achieve the things you wanted to become and achieve. You actually have a Greater Self. It occupies four-fifths of your brain. It never sleeps. It built your body from the beginning, and still sustains, repairs and renews it. It is your God-Mind. It is timeless, and changeless, and

deathless, and abundantly able to give you every desire of your heart.

Judge Daniel A. Simmons, the well-known jurist and Practical Psychologist, has written a personal manuscript message entitled "Realization," which has introduced a great many men and women to their Greater Selves, and since that introduction they have healed themselves of stubborn diseases, come into possession of the things they desired, succeeded abundantly in business and professional life, attained love and happiness, and come into a calm peacefulness of mind which passes understanding. We will be glad to send you a copy of "REALIZATION" fully post-paid and

Absolutely Free of Charge

if you will merely fill out and mail to us the coupon at the bottom of this column.

**THE REALIZATION SYSTEM
JACKSONVILLE, FLORIDA**

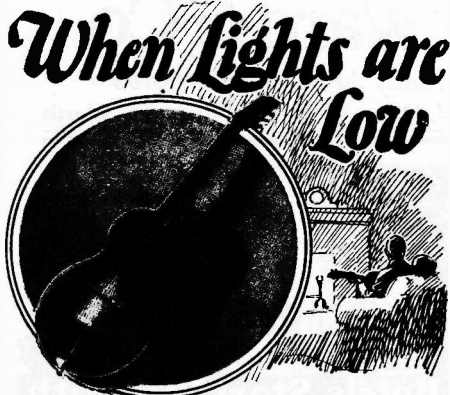
THE REALIZATION SYSTEM,
Law Exchange Building,
Jacksonville, Fla.

I accept your offer to send me free and post-paid a copy of your personal manuscript entitled "Realization," with the understanding that I thus incur no obligation of any kind whatsoever.

Name

Street or RFD

City State.....S.-I.10-24



WHEN the time, the place and the mood suggest music, bring out the Gibson. There's fascination in this music—the sweet strains of the guitar accompanying voices or blending with other instruments—that warms the heart, brings cheer and joy. Best of all, with a Gibson string instrument you learn to play easily and quickly, the kind of music you like best. Send for details of Free Trial! Easy Payments on any Gibson guitar, mandolin or banjo. Gibsons are recognized as supreme in tone and easy playing qualities.



Carson Gibson, Victor guitar soloist, uses a Gibson. Hear the sweet yet powerful Gibson tone on his records.

GIBSON, Inc.
1010 Parsons St., Kalamazoo, Mich.

Gibson

STRINGED INSTRUMENTS
World's Leading Manufacturers

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 used in 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 to gain. 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 (Woolworth Bldg. Dept. 40) New York, N. Y.

Special courses on Violin, Tenor-Banjo, Banjo-Ukulele and Ukulele

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.

LAW STUDY AT HOME

Become a lawyer. Legally trained men win high positions and big success in business and public life. Greater opportunities now than ever before. Be independent—be a leader. Lawyers earn \$3,000 to \$10,000 annually.

We guide you step by step. You can train at home during spare time. Let us send you records and letters from LaSalle students admitted to the bar in various states. Degree of LL. B. conferred. Thousands of successful students enrolled. Low cost, easy terms. We furnish all text material, including fourteen-volume Law Library. Get our valuable 120-page "Law Guide" and "Evidence" books FREE. Send them NOW.

LaSalle Extension University, Dept. 10384-L Chicago

marked Doctor Hackensaw, almost sobbing, "but I couldn't stand by and see Ionia torn to pieces by that cruel monster. It's a pity to have had to destroy this whole world of interesting creatures, but curiously enough I had no power to change anything in their world without destroying it completely. It is much the same in our human world. One man has very little power in improving it, but his powers of destruction are practically unlimited!"

The Heavens In October

By ISABEL M. LEWIS, M. A.

(Continued from page 566)

flows toward the south and southeast, as mentioned already.

In the northeast this month appear the constellations representing the royal group, Cepheus, king of Ethiopia, his beautiful queen Cassiopeia, and Andromeda their daughter who was chained to the rocks to be devoured by the huge sea-monster Cetus, now rising above the eastern horizon. Perseus, the hero, who came to the rescue of the maiden on his winged horse Pegasus, will be found next to Andromeda on the northeast and directly in the path of the Milky Way. In his hand he holds, as the legend tells us, the head of the snake-headed Gorgon, Medusa in which appears Algol, the variable star that represents the baleful, winking eye of the demon. Every third day this star drops suddenly from the second to the third magnitude and recovers its former brightness within a period of a few hours. This is caused by the periodic eclipse of the brighter star by a dark companion in close and rapid revolution around it.

Alpha, the brightest star in Perseus, is in the midst of a brilliant field of stars in the Milky Way that is one of the finest in the heavens to view with a field glass or small telescope.

Not far away in Andromeda, about fifteen degrees due south of the star Alpha in Cassiopeia, which follows next after the leader or most westerly of the stars in the west, we find one of the most interesting objects in the heavens, the Great Andromeda Nebula. Even without the aid of the telescope we will be able to detect this object as a faint, luminous cloud. It covers an area over three times as great as that covered by the full moon and as it is at least more distant than the nearest stars the actual size of this object must be tremendous. Some believe that it represents an external universe on a scale comparable to our Milky Way system of stars which contains hundreds of millions of stars and many great gaseous nebulas. If so, its distance must be reckoned in hundreds of thousands of light years.

It is hardly safe to venture, at present, an estimate of the distance of the Great Andromeda nebula, for astronomers are not agreed either as to the nature of this interesting object or as to its distance. According to an estimate recently made by the English mathematician and astronomer, Jeans, it is at a distance of approximately 4,000 light years. Various estimates of its distance range from a few hundred light years to over a million. It is the largest and brightest of the spiral nebulae that have been the subject of so much discussion in recent years, and it is known to be approaching the earth at a velocity of 200 miles per second. There is also evidence that it is rotating. Many of us are doubtless already familiar with this beautiful object through the photographs of it that have been taken with the Mt. Wilson 100-inch reflector and other great telescopes.

Next to Andromeda on the southwest is one of the most conspicuous configurations

in the heavens, as familiar to seasoned stargazers as the Big Dipper or the W of Cassiopeia. This is the Great Square in Pegasus, with the star Alpha in Andromeda marking its northeastern corner. We always associate this group of four stars in the form of a huge, nearly perfect square with the month of October and take it as one of the signs that the fall is here. Another sign of fall is the appearance of the beautiful Fomalhaut from the southland over in the southeastern part of the sky.

This month we will look in vain for our friends of the past summer, the planets Jupiter and Saturn, which are now too close to the sun to be seen. Venus passed long ago to the morning sky where she now greets the early riser in all her splendor. Mars alone remains of all the bright planets visible in the evening hours and Mars is now speeding away from the earth and rapidly losing the unusual glory and brilliancy that marked its close approach to the earth in August and made it for a time the most interesting object in the heavens. On the fifteenth of this month its distance from the earth has increased to nearly fifty-one million miles as compared with a distance of less than thirty-five million miles at opposition in August.

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	Name	Location	Power & Wave Length
KDKA	Westinghouse Electric & Mfg. Co.	East Pittsburgh, Pa.	1000—326
KDPM	Westinghouse Electric & Mfg. Co.	Cleveland, Ohio	500—270
KDPT	Southern Electrical Co.	San Diego, Calif.	50—244
KDYL	Newhouse Hotel	Salt Lake City, Utah	100—360
KDYM	Savoy Theatre	San Diego, Cal.	100—280
KDYQ	Oregon Institute of Technology	Portland, Ore.	50—360
KDZB	Frank E. Siefert	Bakersfield, Calif.	100—240
KDZE	Rhodes Department Store	Seattle, Wash.	100—270
KDZR	Bellingham Publishing Co.	Bellingham, Wash.	50—261
KFAD	McArthur Bros. Mercantile Co.	Phoenix, Ariz.	100—360
KFAE	State College of Washington	Pullman, Wash.	500—330
KFAF	Western Radio Corporation	Denver, Colo.	500—278
KFAJ	University of Colorado	Boulder, Colo.	100—360
KFAR	Studio Lighting Service Co.	(O. K. Olsen), Hollywood, Calif.	200—280
KFAU	Independent School District of Boise City	Boise High School, Boise, Idaho	150—270
KFAW	The Radio Den	(W. B. Ashford), Santa Ana, Calif.	10—280
KFAY	Virgin's Radio Service	(W. J. Virgin), Medford, Ore.	50—283
KFBB	F. A. Buttrey & Co.	Havre, Mont.	50—360
KFBC	W. K. Azbill	San Diego, Calif.	5—278
KFBE	Reuben H. Horn	San Luis Obispo, Calif.	50—242
KFBG	First Presbyterian Church	Tacoma, Wash.	50—360
KFBK	Kimball-Upson Co.	Sacramento, Calif.	100—283
KFBL	Leese Bros.	Everett, Wash.	15—224
KFBS	Trinidad Gas & Electric Supply Co.	and Chronicle News, Trinidad, Colo.	10—280
KFBU	The Cathedral	(Bishop N. S. Thomas), Laramie, Wyo.	50—283
KFCB	Nielsen Radio Supply Co.	Phoenix, Ariz.	10—238
KFCF	Frank A. Moore	Walla Walla, Wash.	100—360
KFCL	Leslie E. Rice	Los Angeles Union Stock Yards, Los Angeles, Calif.	500—236
KFCP	Ralph W. Flygare	Ogden, Utah	10—360
KFCV	Fred Mahaffey, Jr.	Houston, Texas	10—360
KFCZ	Omaha Central High School	Omaha, Neb.	50—258
KFDD	St. Michaels Cathedral	Boise, Idaho	10—252
KFDH	University of Arizona	Tucson, Ariz.	50—268

Will She Say "Yes" — the Second Time?

WHEN the last strains of the music have faded away—when the dance is over—you thank your partner and she smiles back at you. But is her smile forced—did she really enjoy the dance? Will she say "yes" when you ask for the second dance?

Does any girl want to dance with a clumsy, awkward leader? Does she want to stumble along with a partner who is constantly falling out of step?

Why Good Dancers Are Popular

If you long to be popular, admired, envied—actually sought after—learn to be a good dancer. You can do it—right in your own home—with neither music nor partner. All you need is Arthur Murray's wonderful, new home-lessons in dancing. And no matter how little you know about it now—with these remarkable, simplified Print-and-Picture instructions, you can master any of the newest and most popular steps in a few hours. Why you'll be amazed to see how quickly you will be able to waltz, fox-trot, one-step, lead or follow with perfect ease and confidence.

Many of the foremost society leaders of America and Europe have chosen Arthur Murray as their dancing instructor. He is recognized as the most prominent dancing authority in this country.



Arthur Murray, Studio 278
290 Broadway, New York

Five Dancing Lessons FREE


Over 200,000 men and women have already learned to dance through Arthur Murray's astonishing methods—and so sure is he of their starting, quick results that he is willing, for a limited time only, to send *Five Lessons Free* to everyone who returns the coupon. Enclose 25c (stamps or coin) to pay the cost of postage, printing, etc., and the five lessons will be promptly mailed to you. There's no obligation whatever. So act now. Arthur Murray, Studio 278, 290 Broadway, New York City.

To prove that I can learn to dance at home in one evening you may send me the FIVE FREE LESSONS, which are: (1) The Secret of Leading; (2) How to Follow Successfully; (3) How to Gain Confidence; (4) A Fascinating Fox Trot Step; (5) A Lesson in Waltzing. I enclose 25c to pay for the postage, printing, etc.

Name

Address

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




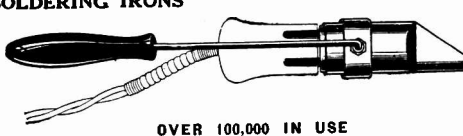
Free Handsome genuine leather Carrying Case and shoulder strap with a limited number of **8X Powerful Prism Binoculars**

Special offer on 8 Power Binoculars. Latest improved Prism Lenses. Powerful, clear vision, sturdy; finest product of famous Paris house of Huet-Flammerion. Individual eye adjustment. Latest model, not a "war glass". Regular price, \$40.00. Will last a lifetime.

Send No Money Not a penny with your order. On arrival pay Postman our bargain price of \$19.75 plus a few cents postage. Three day's trial. Guaranteed absolutely satisfactory or money back. We are responsible; our guarantee protects you. Send today.

Ferry & Company, 630 W. Jackson Blvd. Dept. 8257 Chicago Ill.

ELECTRIC SOLDERING IRONS

OVER 100,000 IN USE

For continuous work. Solderette Senior is recommended. Most simple construction of all large irons. Heating element of Nichrome wire, easily renewable. Made with the grip that a real mechanic demands. Solderette Senior comes packed single iron in carton, with cord and plug complete as illustrated, for only \$3.00

It's what the whole radio world has been looking for and wanting—a real, practical electric soldering iron at a reasonable price.

At \$1.50 complete with handle, Solderette is the biggest value ever offered in a soldering iron.

THE BEEHLER CO., 1439 North 13th Street, St. Louis, Mo.

"THERE'S MONEY IN IT"

LEARN TELEGRAPHY AT HOME

MORSE AND WIRELESS

TEACH YOURSELF in half usual time, at trifling cost, with the wonderful Automatic Transmitter THE OMNIGRAPH. Sends unlimited Morse or Continental messages, at any speed, just as an expert operator would. Adopted by U. S. Government and leading Universities, Colleges and Telegraph Schools. 3 styles. Catalog free.

If you own a Radio Phone Set and don't know the Code, you are missing most of the fun.

OMNIGRAPH MFG., CO. 22 Hudson St., NEW YORK





Always
Good Music
When Two
BUESCHERS
Get Together

Talk about fun! And good music! There is always plenty of both when two Buescher Saxophones get together.

The Saxophone is the ideal instrument for home entertainment. If you like good music—if you want to be popular—if you want to make your home the center of attraction, you must have a Buescher Saxophone.

Easy to Play
Easy to Pay

With the aid of the first three lessons, which are sent (upon request) without charge 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 your place in a band or orchestra within 90 days, if you so desire.

No other instrument has ever won such universal popularity in so short a time because no other instrument has that rich, appealing tone and is productive of so many surprising orchestral effects.

Free Saxophone Book

Just send coupon or a post card for your copy. Mention the instrument in which you are interested and complete catalog will be mailed. (107)

BUESCHER BAND INSTRUMENT CO.
Everything in Band and Orchestra Instruments
 193 Buescher Block, Elkhart, Ind.

.....
 Buescher Band Instrument Co.
 193 Buescher Block, Elkhart, Ind.
 Gentlemen:
 I am interested in the instrument checked below:
 Saxophone.....Cornet.....Trombone.....Trumpet.....
 (Mention any other instrument interested in)
 Name.....
 Street Address.....
 Town.....State.....

Call Letters	Name	Location	Power & Wave Length	
KFDJ	Oregon Agricultural College,	Corvallis, Ore.	50-360	
KFDX	First Baptist Church, Shreve-	port, La.	100-360	
KFDY	South Dakota State College of	Agriculture and Mechanic	150-360	
KFDZ	Harry O. Iverson, Minneapolis,	Minn.	5-231	
KFEC	Meier & Frank Co., Portland,	Ore.	50-248	
KFEL	Winner Radio Corp., Denver,	Colo.	50-254	
KFEQ	J. L. Scroggin, Oak, Neb.	100-268		
KFER	Auto Electric Service Co., Fort	Dodge, Iowa	10-231	
KFEV	Felix-Thompson Radio Shop,	Casper, Wyo.	50-263	
KFEX	Augsburg Seminary, Minneapo-	lis, Minn.	100-261	
KFEY	Bunker Hill & Sullivan Mining	and Concentrating Co., Kel-	logg, Idaho	10-360
KFFB	Jenkins Furniture Co., Boise,	Idaho	10-240	
KFFE	Eastern Oregon Radio Co., Pen-	dleton, Ore.	10-360	
KFFP	First Baptist Church, Moberly,	Mo.	50-266	
KFFR	Nevada State Journal (Jim	Kirk), Sparks, Nev.	10-226	
FFV	Graceland College, Lamoni, Iowa	100-280		
KFFX	McGraw Co., Omaha, Neb.	100-278		
KFFY	Pincus & Murphey Music	House, Alexandria, La.	50-275	
KFGC	Louisiana State University, Bat-	ton Rouge, La.	100-254	
KFGD	Chickasha Radio & Electric Co.,	Chickasha, Okla.	200-248	
KFGH	Leland Stanford University (P.	O.), Stanford Univ., Calif.	273-360	
KFGL	Snell and Irvy, Arlington, Ore.	10-234		
KFGQ	Crary Hardware Co., Boone,	Iowa	10-226	
KFGX	First Presbyterian Church,	Orange, Texas	500-250	
KFGZ	Emmanuel Missionary College,	Berrien Springs, Mich.	500-286	
KFHA	Western State College of Colo-	rado, Gunnison, Colo.	50-252	
KFHD	Utz Electric Shop Co., St.	Joseph, Mo.	100-226	
KFHH	Ambrose A. McCue, Neah Bay,	Wash.	50-261	
KFHJ	Fallon & Co., Santa Barbara,	Calif.	100-360	
KFHR	Star Electric & Radio Co., Seat-	tle, Wash.	50-283	
KFI	Earle C. Anthony, Inc., Los	Angeles, Calif.	500-469	
KFID	Ross Arbuckle's Garage, Iola,	Kan.	30-246	
KFIF	Benson Polytechnic Institute,	Portland, Ore.	100-360	
KFIL	Windisch Electric Farm Equip-	ment Co., Louisburg, Kan.	50-234	
KFIO	North Central High School,	Spokane, Wash.	50-252	
KFIQ	First Methodist Church, Ya-	kima, Wash.	50-242	
KFIU	Alaska Elec. Light & Power Co.,	Juneau, Alaska	10-226	
KFIX	Reorganized Church of Jesus	Christ of Latter Day Saints,	Independence, Mo.	250-240
KFIZ	Daily Commonwealth and Oscar	A. Huelsman, Fond du Lac,	Wis.	100-273
KFJB	Marshall Electric Co., Mar-	shalltown, Iowa	10-248	
KFJC	Seattle Post Intelligencer, Seat-	tle, Wash.	100-270	
KFJF	National Radio Mfg. Co., Okla-	homa City, Okla.	20-252	
KFJI	Liberty Theatre (E. E. Marsh),	Astoria, Ore.	10-252	
KFJK	Delano Radio & Electric Co.,	Bristow, Okla.	100-233	
KFJL	Hardsag Mfg. Co., Ottumwa,	Iowa	10-242	
KFJM	University of North Dakota,	Grand Forks, N. D.	100-280	
KFJQ	Electric Construction Co., Val-	ley Radio Division, Grand	Forks, N. D.	5-280
KFJR	Ashley C. Dixon & Son, Stev-	ensville, Mont. (near)	5-253	
KFJX	Iowa State Teachers College,	Cedar Falls, Iowa	50-280	
KFJY	Tunwall Radio Co., Fort Dodge,	Iowa	50-246	
KFJZ	Texas National Guard, 12th	Cavalry, Fort Worth, Texas.	20-254	
KFKA	Colorado State Teachers Col-	lege, Greeley, Colo.	50-273	
KFKB	Brinkley-Jones Hospital Assoc-	iation, Milford, Kan.	500-286	
KFKQ	Conway Radio Laboratories (Ben	H. Woodruff,) Conway, Ark	100-250	
KFKV	F. F. Gray, Butte, Mont.	50-283		
KFKX	Westinghouse Electric & Mfg.	Co., Hastings, Neb.	1000-286	
KFKZ	Nassau Bros. Radio Co., Colo-	rado Springs, Colo.	10-234	

Personal Stationery

200 SHEETS and 100 ENVELOPES Printed with your Name and Address

\$1.00

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 Denver and outside of U. S. \$1.10). If inconvenient to send the money, we will ship C. O. D.

Write name and address plainly.

Money returned if you are not more than satisfied. Order today!

Elite Stationery Company
 5030 Main Street
 Smethport, Pa.

SEND FOR THE INTERNATIONAL CATALOG Our net price list. Full line of auto bodies and accessories for Fords at Wholesale Prices. Save big money on bodies by buying Direct from Factory.

FOR FORD—Prices from \$27.85 up. Factory to consumer direct—Pay only One Profit

International Body Works, 914 W. Ohio St., Dept. 4, Chicago, Ill.

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.

"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.

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.



B. S. DEGREE IN 3 YEARS

Come to School of Engineering of Milwaukee. 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.

A Complete, Practical Electrical Education

Learn by the thorough approved scientific methods which our nineteen 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—Automotive Electrical 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. The new Students' Loan Fund offers financial aid to worthy men.

New Term Opens Sept. 29th

Mail the coupon today for our big new illustrated catalog. Mention **FREE** 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. 1024, 415 Marshall St., Milwaukee, Wis.

School of Engineering of Milwaukee
Dept. S. & I. 1024, 415 Marshall St., Milwaukee, Wis.

Please send me your free illustrated catalog; also details of your "Earn While You Learn" plan.

Name

Address

Town State

Age Education

Course Wanted



\$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

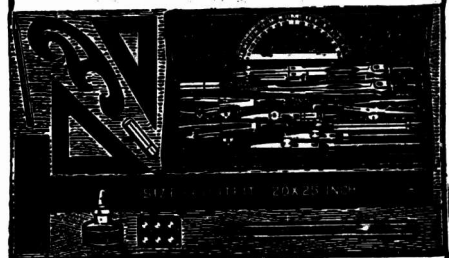
NEW YORK

Call Letters	Name	Location	Power & Wave Length
KFLA	Abner R. Willson,	Butte, Mont.	5-283
KFLB	Signal Electric Mfg. Co.,	Menominee, Mich.	50-248
KFLD	Paul E. Greenlaw,	Franklinton, La.	10-234
KFLE	National Educational Service,	Denver, Colo.	25-268
KFLQ	Bizzell Radio Shop,	Little Rock, Ark.	20-261
KFLR	University of New Mexico,	Albuquerque, N. M.	100-254
KFLU	Rio Grande Radio Supply House,	San Benito, Texas.	100-236
KFLV	A. T. Frykman,	Rockford, Ill.	100-229
KFLW	Missoula Electric Supply Co.,	Missoula, Mont.	5-234
KFLX	George R. Clough,	Galveston, Texas	10-240
KFLZ	Atlantic Automobile Co.,	Atlantic, Iowa	100-273
KFMB	Christian Churches of Little Rock,	Little Rock, Ark.	10-254
KFMQ	University of Arkansas,	Fayetteville, Ark.	100-263
KFMR	Morningside College,	Sioux City, Iowa	10-261
KFMT	George W. Young,	Minneapolis, Minn.	5-231
KFMW	M. G. Sateren,	Houghton, Mich.	50-266
KFMX	Carleton College,	Northfield, Minn.	500-283
KFNF	Henry Field Seed Co.,	Shenandoah, Iowa	500-266
KFNG	Wooten's Radio Shop,	Coldwater, Miss.	10-254
KFNJ	Warrensburg Electric Shop,	Warrensburg, Mo.	50-234
KFNL	Radio Broadcast Association,	Paso Robles, Calif.	10-240
KFNV	L. A. Drake,	Santa Rosa, Calif.	5-234
KFNY	Montana Phonograph Co.,	Helena, Mont.	5-261
KFNZ	Royal Radio Co.,	Burlingame, Calif.	10-231
KFOA	Rhodes Dept. Store,	Seattle, Wash.	500-455
KFOC	First Christian Church,	Whittier, Calif.	100-236
KFOD	The Radio Shop,	Wallace, Idaho	10-224
KFOJ	Moberly High School Radio Club,	Moberly, Mo.	5-246
KFOL	Leslie M. Schafbuch,	Marengo, Iowa	10-234
KFON	Echophone Radio Shop,	Long Beach, Calif.	100-234
KFOO	Latter Day Saints University,	Salt Lake City, Utah.	10-261
KFOQ	Ora W. Chancellow,	Galveston, Texas	50-240
KFOR	David City Tire & Electric Co.,	David City, Neb.	20-226
KFOT	College Hill Radio Club,	Wichita, Kan.	50-231
KFOU	Mommel Manufacturing Co.,	Richmond, Calif.	100-254
KFOX	Technical High School (Board of Education),	Omaha, Neb.	100-248
KFOY	Beacon Radio Service,	St. Paul, Minn.	50-226
KFOZ	Leon Hudson Real Estate Co.,	Fort Smith, Ark.	20-233
KFPB	Edwin J. Brown,	Seattle, Wash.	15-224
KFPG	Garretson & Dennis,	Los Angeles, Calif.	100-238
KFPH	Howard C. Mailander,	Salt Lake City, Utah	50-242
KFPL	C. C. Baxter,	Dublin, Texas.	15-242
KFPN	Missouri National Guard, Headquarters Company,	70th Infantry Brigade, Jefferson City, Mo.	10-242
KFPM	New Furniture Co.,	Greenville, Texas	10-242
KFPO	Colorado National Guard, Forty-fifth Division Tank Co.,	Denver, Colo.	500-231
KFPF	G. & G. Radio & Electric Shop,	Olympia, Wash.	20-236
KFPR	Los Angeles County Forestry Department,	Los Angeles, Cal.	500-231
KFPS	Carter A. Ross Motor Service Co.,	Casper, Wyo.	10-242
KFPT	Cane & Johnson,	Salt Lake City, Utah	500-268
KFPV	Heintz & Kohlmoos,	San Francisco, Calif.	50-236
KFPW	St. Johns Church,	Cartersville, Mo.	10-268
KFPX	First Presbyterian Church,	Pine Bluff, Ark.	100-242
KFPY	Symons Investment Co.,	Spokane, Wash.	100-283
KFQA	The Principia,	St. Louis, Mo.	50-261
KFQB	Searchlight Publishing Co.,	Fort Worth, Texas	100-254
KFQC	Kidd Brothers Radio Shop,	Taft, Calif.	100-227
KFQD	Chovin Supply Co.,	Anchorage, Alaska	100-280
KFQE	Dickenson-Henry Radio Laboratories,	Colorado Springs, Colo.	5-224
KFQF	Donald A. Boulton,	Minneapolis, Minn.	10-224

\$90 Drafting Course Free

There is such an urgent demand for practical, trained Draftsmen that I am making this special offer in order to enable deserving, ambitious and bright men to get into this line of work. I will teach you to become a Draftsman and Designer, until you are drawing a salary up to \$250 a month. You need not pay me for my personal instruction or for the complete set of instruments.

FREE Drafting Outfit!



These are regular working instruments, the kind I use myself. I give them free to you if you enroll at once. Send the Free Coupon Today!

Salaries up to \$250 and \$300 a Month

Positions paying up to \$250 and \$300 per month, which ought to be filled by skilled draftsmen are vacant everywhere. There are in every part of this country ambitious men, who with practical training and personal assistance, will be qualified to fill these positions. Mr. Dobe guarantees to train you UNTIL placed in a permanent position at a salary up to \$250 and \$300 per month.

Earn While Learning

You can be earning a handsome income while learning at home. This is a special offer I am making. Absolutely no obligations of any kind in sending coupon. But you must write at once, as I limit the number of my students.

I Guarantee
To instruct you until competent and in a permanent paying position at a regular Draftsman's salary of at least \$250 per month and guarantee to furnish you free complete Draftsman's working outfit at once from the start.

Mail Coupon

at once for my book—"Successful Draftsmanship," also list of open positions and for the free offer to be earning good money at once while learning at home. This offer is limited and in order to benefit thereby—act at once.

Chief Draftsman Dobe
1951 Lawrence Ave., Div. 14-27 Chicago, Ill.

Free Course Offer Coupon

Chief Draftsman Dobe
1951 Lawrence Ave., Div. 14-27 Chicago
Without any obligation to me please mail your book, "Successful Draftsmanship" and full particulars of your liberal "Personal Instruction" offer to a few students. It is understood I am obligated in no way whatever.

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

Address.....



Do you want to be a Surveyor?

ARE you fond of outdoor work? Would you like to become a Civil Engineer? Then take up Surveying. It is a profession that not only pays big salaries itself, but it is the stepping stone to something even better. Probably 99 out of every 100 Civil Engineers were Surveyors first.

Fill out the coupon below and let us tell you how you can prepare for success in Surveying, Engineering, Drafting, Chemistry, etc., through spare-time study at home with the I. C. S.

INTERNATIONAL CORRESPONDENCE SCHOOLS

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..... 3-6-24
 Address.....
 City..... State.....

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



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.

F. W. Tاملین, 424 High Bldg., Kansas City, U. S. A.

RADIO TUBES REPAIRED

Like **\$2.50** and new **\$5.00** guaranteed ALL TYPES

Mail in your burnt-out or broken tubes. Satisfaction guaranteed. Prompt service on mail orders. OHIO RADIO SALES, Dept. S 723 ROSE BLDG. CLEVELAND, OHIO Dealers: Write for our proposition.

Earn extra money full or part time selling 175 popular household articles and food products to friends and neighbors. Experience unnecessary. Outfit and instructions free. Wonderful plan. Investigate!

HEALTH-O PRODUCTS CO. Cincinnati, Ohio

145 Duane St., Cincinnati, Ohio

Call Letters	Name	Location	Power & Wave Length
KFQG	Southern California Radio Association, Los Angeles, Calif., Armory, Exposition Park	Los Angeles, Calif.	100—226
KFQH	Albert Sherman, Hillsborough, Calif.	Hillsborough, Calif.	50—231
KFQI	Thomas H. Ince Corp., Culver City, Calif.	Culver City, Calif.	100—234
KFQJ	Harbour-Longmire Co., Okla-homa, Okla.	Harbour, Okla.	50—236
KFQK	Democrat Leader, Fayette, Mo.	Fayette, Mo.	10—236
KFQL	Oklahoma Free State Fair Association, Muskogee, Okla.	Muskogee, Okla.	10—252
KFQM	Texas Highway Bulletin, Austin, Texas	Austin, Texas	100—268
KFQN	Third Baptist Church, Portland, Oregon	Portland, Ore.	5—283
KFQO	Meier Radio Shop, Russell, Kansas	Russell, Kan.	10—261
KFQP	George S. Carson, Jr., Iowa City, Iowa	Iowa City, Iowa	10—224
KFQR	Walter L. Ellis, Oklahoma, Okla.	Oklahoma, Okla.	10—250
KFQS	Dickenson-Henry Radio Labs., Manitou, Colo.	Manitou, Colo.	10—246
KFQT	Texas National Guard, Thirty-sixth Signal Co., Denison, Texas	Denison, Texas	10—252
KFQU	W. Riker, Holy City, Calif.	Holy City, Calif.	100—234
KFQV	Omaha Grain Exchange, Omaha, Neb.	Omaha, Neb.	100—231
KFQW	C. F. Knerim Photo Radio & Electric Shop, North Bend, Wash.	North Bend, Wash.	50—248
KFQX	Alfred M. Hubbard, Seattle, Wash.	Seattle, Wash.	250—233
KFSG	Echo Park Evangelistic Association, Los Angeles, Calif.	Los Angeles, Calif.	500—278
KGB	Tacoma Daily Ledger, Tacoma, Wash.	Tacoma, Wash.	50—252
KGG	Hallock & Watson Radio Service, Portland, Ore.	Portland, Ore.	50—360
KGO	General Electric Co., Oakland, Calif.	Oakland, Calif.	1000—312
KGU	Marion A. Mulrony, Honolulu, Hawaii	Honolulu, Hawaii	500—360
KGW	Portland Morning Oregonian, Portland, Ore.	Portland, Ore.	500—492
KGY	St. Martins College, Lacey, Wash.	Lacey, Wash.	5—258
KHJ	Times Mirror Co., Los Angeles, Calif.	Los Angeles, Calif.	500—395
KHJ	Central Wasmer, Seattle, Wash.	Seattle, Wash.	100—360
KJFU	Louis Power Co., Kearney, Neb.	Kearney, Neb.	10—234
KJO	C. O. Gould, Stockton, Calif.	Stockton, Calif.	5—273
KJR	Northwest Radio Service, Seattle, Wash.	Seattle, Wash.	100—270
KJS	Bible Institute of Los Angeles, Los Angeles, Calif.	Los Angeles, Calif.	750—360
KLS	Warner Bros. Radio Supplies Co., Oakland, Calif.	Oakland, Calif.	250—360
KLX	Tribune Publishing Co., Oakland, Calif.	Oakland, Calif.	250—509
KLZ	Reynolds Radio Co., Denver, Colo.	Denver, Colo.	500—283
KMJ	San Joaquin Lt. & Power Corp., Fresno, Calif.	Fresno, Calif.	50—248
KMO	Love Electric Co., Tacoma, Wash.	Tacoma, Wash.	10—360
KNT	Walter Hemrich, Kukak Bay, Alaska	Kukak Bay, Alaska	100—263
KNX	Electric Lighting Supply Co., Los Angeles, Calif.	Los Angeles, Calif.	100—360
KOB	New Mexico College of Agriculture and Mechanic Arts, State College, N. M.	State College, N. M.	500—360
KOP	Detroit Police Dept., Detroit, Mich.	Detroit, Mich.	500—286
KPO	Hale Bros., San Francisco, Cal.	San Francisco, Cal.	500—423
KQP	Apple City Radio Club, Hood River, Ore.	Hood River, Ore.	10—360
KQV	Doubleday Hill Electric Co., Pittsburgh, Pa.	Pittsburgh, Pa.	500—270
KQW	Chas. D. Herrold, San Jose, Calif.	San Jose, Calif.	50—360
KRE	Berkeley Daily Gazette, Berkeley, Calif.	Berkeley, Calif.	50—275
KSD	Post Dispatch (Pulitzer Pub. Co.), St. Louis, Mo.	St. Louis, Mo.	500—546
KTW	First Presbyterian Church, Seattle, Wash.	Seattle, Wash.	750—360
KUO	Examiner Printing Co., San Francisco, Calif.	San Francisco, Calif.	150—360
KUY	Coast Radio Co., El Monte, Calif.	El Monte, Calif.	50—256
KWG	Portable Wireless Telephone Co., Stockton, Calif.	Stockton, Calif.	50—360
KWH	Los Angeles Examiner, Los Angeles, Calif.	Los Angeles, Calif.	250—360
KYO	Electric Shop, Honolulu, Hawaii	Honolulu, Hawaii	100—270
KYW	Westinghouse Electric & Mfg. Co., Chicago, Ill.	Chicago, Ill.	1000—536
KZM	Preston D. Allen, Oakland, Calif.	Oakland, Calif.	100—360
WAAB	Valdemar Jensen, New Orleans, La.	New Orleans, La.	100—268
WAAC	Tulane University, New Orleans, La.	New Orleans, La.	400—360
WAAD	Ohio Mechanics Institute, Cincinnati, Ohio	Cincinnati, Ohio	25—360
WAAF	Chicago Daily Drovers Journal, Chicago, Ill.	Chicago, Ill.	200—286
WAAM	I. R. Nelson Co., Newark, N. J.	Newark, N. J.	250—263
WAAN	University of Missouri, Columbia, Mo.	Columbia, Mo.	50—254



MIRACO GETS 'EM FROM COAST TO COAST

LIST PRICE ONLY \$29.95

Beats radio sets costing \$50 to \$60 more!

"Have received more stations with my Miraco than I ever received with any other set costing \$50 or \$60 more," reports F. J. Brink, Grove, Okla. "More than pleased with my Miraco—have 125 stations on my log to date."—C. Gilland, Franklin, Texas. "Best set I have ever used. Have heard London and California."—C. A. Henry, Yernbank Village, N. Y. "When you can't get a program with the Miraco you need not try any other set. Am getting all over U. S. with mine."—J. C. Brown, Albertville, Ala.

COAST TO COAST RECEPTION
verified by Miraco users

<p>ILLINOIS HEARS N. Y. AND CALIFORNIA "Believe Miraco best on market. Have heard stations all over U. S. Also Cuba. Hear N. Y. and Cal. most every night."—Mrs. F. K. Probst, Pawnee, Ill.</p> <p>NORTH DAKOTA HEARS CALIFORNIA "Miraco has been working fine. Have heard from coast to coast. Also many stations in Canada, Hawaii and Cuba."—J. G. Anderson, Turtle Lake, N. D.</p>	<p>MINNESOTA HEARS TEXAS "Using my Miraco, got reception from coast to coast, Calgary, Canada, Houston and Dallas, Tex."—J. S. Esquelet, Coakso, Minn.</p> <p>OHIO HEARS PORTLAND, ORE. "Miraco works fine. Just heard Atlanta, New York City, Liverpool, Tampa, Fort Worth, Dallas and Portland, Ore. Guess that's more enough, isn't it?"—T. B. Mann, Ashland, Ohio.</p>
--	--

Reports like these from users in every state prove Miraco Tuned Radio Frequency Receivers—at rock bottom prices—have efficiency of sets costing three times as much. Two-tube guaranteed outfit, solid mahogany cabinet, list price \$29.95. Four-tube guaranteed loud speaker outfit, list price \$54.95. Order direct or

Radio's Finest
Lowest
Sets

Send Coupon
for latest bulletin and special offer. It will interest you!

DEALERS AGENTS
The Miraco proposition is a winner. Write.

THE MIDWEST RADIO COMPANY
809 Main Street, Cincinnati, Ohio

Interested in Miraco () as a dealer () as an agent () as a user.

Name.....
Address.....

MORE PROFITS

To Dealers Who Buy Nationally Advertised Radio Goods from Our Bargain Catalog! Write for It Today!

AMERICAN RADIO CO.

DEPT. 6 WEST 14TH ST. KANSAS CITY, MO.



YOU Are Wanted For A Better Job—

and we will help you get it thru our employment Bureau. Thousands of positions are open. Make \$50 to \$100 weekly. We guarantee to train you for best paying positions in spare time at home by mail. Just as soon as you qualify for one of the high-salaried positions we keep you in touch with openings. Promotion is quick. You are wanted right now to fill one of the many openings as

CHIEF DRAFTSMAN, CHIEF ENGINEER, PRODUCTION MANAGER, Etc.

You start right in at actual drawing with the first lesson. No books are used throughout the course. You need no previous training. Course is easy to understand—easy to follow. Tear off the coupon and mail it now.

HERE ARE SOME POSITIONS OPEN FREQUENTLY TO YOU

- The U. S. Government needs Draftsmen.
 - Architectural Designer.....\$4,000
 - Chief Draftsman, Naval Aircraft Factory.....\$15.04 per day
 - Aero. Draftsman, Field Service, Navy Dept.....\$5.20 to \$12 daily
- Mail the COUPON for Free Book explaining our method of training, and facts you want.

COLUMBIA SCHOOL OF DRAFTING
Roy C. Claflin, Pres. Washington, D. C.

FREE BOOK COUPON

COLUMBIA SCHOOL OF DRAFTING,
Dept. J-24, 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 complete Home Study Course and your help in securing a position as Draftsman.

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



The
**HARKNESS
RECEIVER**

*A Two Tube
Reflex that
is both simple
and Inexpensive*

The Harkness, since its inception, has always been one of the most popular radio receivers for the reason that it fills a very definite place in the field of radio sets. The Harkness is the supremely ideal set for those, and only those, men who want a sturdy, reliable instrument for loud speaker that will consistently give fine reception on local broadcast and which will entail practically no upkeep of any kind.

"Conrad" Pattern No. 11, "How to Build the Harkness Receiver," shows you how to construct this receiver using the simplest and most direct method known. A complete set of full-sized blueprint patterns is furnished consisting of sheets and a four page instruction sheet that gives all detailed information on construction operations and other special instructions. Comes enclosed in a handsome two-color printed heavy envelope size 9"x12".

AT ALL RELIABLE RADIO DEALERS

Or direct from us.

PRICE
50¢ Prepaid
Pattern
No. 11

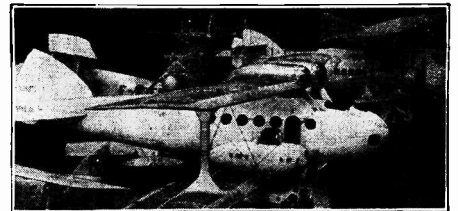
Conrad

"RADIO'S FOREMOST PUBLISHERS"

The Conrad Co.

233 Fulton Street
New York City

Call Letters	Name	Location	Power & Wave Length
WAAW	Omaha Grain Exchange,	Omaha, Neb.	500-286
WABB	Harrisburg Sporting Goods Co.,	Harrisburg, Pa.	10-266
WABD	Parker High School,	Dayton, Ohio	5-283
WABE	Young Men's Christian Association,	Washington, D. C.	100-283
WABH	Lake Shore Tire Co.,	Sandusky, Ohio	10-240
WABI	Bangor Railway & Electric Co.,	Bangor, Maine	100-240
WABL	Connecticut Agricultural College,	Storrs, Conn.	100-283
WABM	F. E. Doherty Automotive & Radio Equipment Co.,	Saginaw, Mich.	100-254 500-244
WABN	Ott Radio, Inc.,	LaCrosse, Wis.	10-283
WABO	Lake Ave. Baptist Church,	Rochester, N. Y.	100-266
WABP	Robert F. Weinig,	Dover, Ohio	50-261
WABQ	Haverford College Radio Club,	Haverford, Pa.	50-270 100-252
WABR	Scott High School,	Toledo, Ohio	50-270
WABT	Holiday-Hall,	Washington, Pa.	100-252
WABU	Victor Talking Machine Co.,	Camden, N. J.	50-226
WABW	College of Wooster,	Wooster, Ohio	20-234
WABX	Henry B. Joy,	Mount Clemens, Mich. (near)	500-270
WABY	John Magaldi, Jr.,	Philadelphia, Pa.	50-242
WABZ	Coliseum Place Baptist Church,	New Orleans, La.	50-263
WBAA	Purdue University,	West Lafayette, Ind.	250-283
WBAH	The Dayton Co.,	Minneapolis, Minn.	1000-417
WBAN	Wireless Phone Corporation,	Paterson, N. J.	100-244
WBAO	James Millikin University,	Decatur, Ill.	50-360
WBAP	Wortham-Carter Publishing Co. (Star-Telegram),	Fort Worth, Texas	750-476
WBAV	Erner & Hopkins Co.,	Columbus, Ohio	500-423
WBAX	John H. Stenger, Jr.,	Wilkes-Barre, Pa.	20-360 500-492
WBAY	The Western Electric Co.,	N. Y.	500-492
WBBA	Newark Radio Laboratories,	Newark, Ohio	10-240
WBBD	Barbey Battery Service,	Reading, Pa.	50-234
WBBG	Irving Vermilya,	Mattapoisett, Mass.	500-248
WBBH	J. Irving Bell,	Port Huron, Mich.	50-246
WBBL	Grace Covenant Church,	Richmond, Va.	5-283
WBBM	Frank Atlas Produce Co.,	Lincoln, Ill.	200-226 10-275
WBBN	A. B. Blake,	Wilmington, N. C.	100-246
WBBP	Petoskey High School,	Petoskey, Mich.	100-246
WBBR	Peoples Pulpit Association,	Rossville, N. Y.	500-273
WBBT	Lloyd Brothers,	Philadelphia, Pa.	5-234
WBBU	Jenks Motor Sales Co.,	Monmouth, Ill.	10-224
WBBV	Johnstown Radio Co.,	Johnstown, Pa.	5-248
WBBW	Ruffner Junior High School,	Norfolk, Va.	50-222
WBBY	Washington Light Infantry,	Charleston, S. C.	10-268
WBBZ	Noble B. Watson,	Indianapolis, Ind.	50-227
WBL	T. & H. Radio Co.,	Anthony, Kansas	100-254
WBS	D. W. May (Inc.),	Newark, N. J.	50-360
WBT	Southern Radio Corp.,	Charlotte, N. C.	250-360
WBZ	Westinghouse Electric & Mfg. Co.,	Springfield, Mass.	1000-337
WCAD	St. Lawrence University,	Canton, N. Y.	250-280
WCAE	Kaufman & Baer Co.,	Pittsburgh, Pa.	500-462
WCAG	Clyde R. Randall,	New Orleans, La.	100-268
WCAH	Entrekin Electric Co.,	Columbus, Ohio	100-286
WCAJ	Nebraska Wesleyan University,	University Place, Neb.	500-283
WCAK	Alfred P. Daniel, Asst. Division Mgr.,	A. R. R. L., Houston, Texas	10-263
WCAL	St. Olaf College,	Northfield, Minn.	500-360
WCAO	The Sanders and Stayman Co.,	Baltimore, Md.	50-360
WCAP	Chesapeake & Potomac Telephone Co.,	Washington, D. C.	500-469
WCAR	Southern Radio Corp. of Texas,	San Antonio, Texas	100-360
WCAS	Wm. Hood Dunwoody Industrial Institute,	Minneapolis, Minn.	100-280
WCAT	South Dakota State School of Mines,	Rapid City, S. D.	50-240



**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 \$60 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. 14-27 Chicago, Ill.

American School of Aviation
3601 Michigan Ave., Dept. 14-27 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.....



"This Man Gets the Job"

"I am giving it to him because I know he will make good. He isn't as old as some of you other fellows, but he's years ahead of you in knowledge and training.

"I wasn't particularly interested in him until I found out that he was studying with the International Correspondence Schools in his spare time. That's the kind of man we want around here.

"While you frittered away your time, this man was getting ready for a bigger job. And to-day he has his reward.

"I tell you, gentlemen, you cannot succeed to-day without special training. The best reference you can have with any employer is an I. C. S. diploma. It will get you farther than pull or luck. It enables you to get a job—to hold that job after you get it—to move upward to the job ahead."

HOW much longer are you going to wait before taking the step that will bring you advancement and more money?

It takes only a moment to tear out and mail that I. C. S. coupon. Only a moment! But it is the most important thing you can do to-day.

Right now is the time to take your pencil and make that first move toward success.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 6172-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..... 3-6-24
Address.....
City..... State.....

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

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 only 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, 1165 Eleventh Street, Pukwana, South Dakota, wants agents and is willing to send a sample at his own risk. Write him today.—Adv.

Let Us Help You

If you have invented any new metal automobile accessory and don't know what to do with it, get in touch with us. We can help you solve your development and marketing problems. Write today naming item.

THE METAL SPECIALTY CO.
1533 W. 6th St. Cincinnati, O.

Call Letters	Name	Location	Power & Wave Length
WCAU	Durham & Co.,	Philadelphia, Pa.	250—286
WCAV	J. C. Dice Electric Co.,	Little Rock, Ark.	10—360
WCAX	University of Vermont,	Burlington, Vt.	50—360
WCAY	Milwaukee Civic Broadcasting Station,	Milwaukee, Wis., Hotel Antlers	250—266
WCAZ	Carthage College,	Carthage, Ill.	50—246
WCBA	Charles W. Humbach,	Allentown, Pa.	10—280
WCBC	University of Michigan,	Ann Arbor, Mich.	200—280
WCBD	Wilbur G. Voliva,	Zion, Ill.	500—345
WCBE	Uhalt Radio Co.,	New Orleans, La.	5—263
WCBF	Paul J. Miller,	Pittsburgh, Pa.	50—236
WCBG	Howard S. Williams,	Pascagoula, Miss. (portable)	10—268
WCBH	University of Mississippi,	Oxford, Miss. (near)	10—242
WCBJ	Nicoll, Duncan & Rush,	Bemis, Tenn.	50—240
WCBK	J. C. Mans, Jennings,	La.	10—244
WCBK	E. Richard Hall,	St. Petersburg, Fla.	500—266
WCBL	Northern Radio Mfg. Co.,	Houlton, Me.	50—280
WCBM	Charles Schwarz,	Baltimore, Md.	50—229
WCBN	James P. Boland, Lieutenant,	U. S. A., 3d F. A., Fort Benjamin Harrison, Ind.	50—266
WCBO	Radio Shop (Inc.),	Memphis, Tenn.	20—250
WCBQ	First Baptist Church,	Nashville, Tenn.	100—236
WCBR	Charles H. Messter,	Providence, R. I. (portable)	5—246
WCBT	Clark University,	Worcester, Mass.	250—238
WCBU	Arnold Wireless Supply Co.,	Arnold, Pa.	50—254
WCBV	Tallahoma Radio Club,	Tallahoma, Tenn.	10—252
WCBW	George P. Rankin, Jr., and Maitland Solomon,	Macon, Ga.	10—226
WCBX	Radio Shop of Newark (Herman Lubinsky),	Newark, N. J.	100—233
WCBY	Forks Electrical Shop,	Back Hill Falls, Pa.	10—268
WCBZ	Coppotelli Brothers Music House,	Chicago Heights, Ill.	50—248
WCK	Stix Baer & Fuller Dry Goods Co.,	St. Louis, Mo.	100—360
WCX	The Detroit Free Press,	Detroit, Mich.	500—517
WDAE	Tampa Daily Times,	Tampa, Fla.	250—360
WDAF	Kansas City Star,	Kansas City, Mo.	500—411
WDAG	J. Laurance Martin,	Amarillo, Texas	100—263
WDAH	Trinity Methodist Church (South),	El Paso, Texas.	50—268
WDAK	The Courant,	Hartford, Conn.	100—261
WDAR	Lit Bros.,	Philadelphia, Pa.	500—395
WDAS	Sam Waite's Radio Shop,	Worcester, Mass.	10—360
WDAU	Slocum & Kilburn,	New Bedford, Mass.	100—360
WDAY	Radio Equipment Corp.,	Fargo, N. D.	50—244
WDBA	Fred Ray,	Columbus, Ga.	20—236
WDBB	A. H. Waite & Co.,	Taunton, Mass.	10—229
WDBC	Kirk Johnson & Co.,	Lancaster, Pa.	50—258
WDBD	Herman E. Burns,	Martinsburg, W. Va.	5—268
WDBE	Gilham-Schoen Electric Co.,	Atlanta, Ga.	10—252
WDBF	Robert G. Phillips,	Youngstown, Ohio	50—246
WDBH	C. T. Sherer Co.,	Worcester, Mass.	100—268
WDBI	Radio Specialty Co.,	St. Petersburg, Fla.	10—226
WDBJ	Richardson-Wayland Electrical Corp.,	Roanoke, Va.	20—229
WDBK	M. F. Bros. Furniture, Hardware & Radio Co.,	Cleveland Ohio	100—248
WDBN	Maine Electric Light & Power Co.,	Bangor, Me.	5—252
WDBO	Rollins College,	Winter Park, Fla.	50—240
WDBP	Superior State Normal School,	Superior, Wis.	50—261
WDBQ	Morton Radio Supply Co.,	Salem, N. J.	10—234
WDBR	Tremont Temple Baptist Church,	Boston, Mass.	100—256
WDBS	S. M. K. Radio Corp.,	Dayton, Ohio	5—283
WDBT	Taylor's Book Store,	Hattiesburg, Miss.	10—236
WDBU	Somerset Radio Co.,	Skowhegan, Me.	10—258
WDBV	Strand Theater,	Fort Wayne, Ind.	100—258
WDBW	The Radio Den,	Columbia, Tenn.	20—268

Be a Radio Expert

EARN \$3000 to \$9000 a Year

Enter fast growing radio field, thousands of big pay jobs waiting for you. U. S. Gov't., Steamships, R. R.'s, Corporations eagerly seek Radio trained men. Advancement rapid, earn from \$3000 to \$9000 yearly.



Prepare for Big Pay in Spare Time

My reputation as Radio Engineer and instructor insures you complete, speedy success, at home in spare time; earn while you learn. I make you expert in radio designing, building, repairing and operating and teach you only practical "inside" dope. You quickly complete my course and step out into Big Pay. No experience required.

FREE RADIO 1000 MILE TUBE SET

For a short time I will give tube radio set in handsome cabinet to men who enroll now, absolutely FREE. Send at once for my FREE wonder-book of inside Radio "dope."



A. G. MOHAUPT, Radio Engineer. RADIO ASS'N OF AMERICA 4513 Ravenswood Avenue, Dept. 610, CHICAGO

Dear Sir: Send me your FREE Radio Book and your limited plan without cost or obligation.

Name.....
Address..... City.....

Make \$100 Weekly—sell RADIO

Demonstrate once—results mean sure sale. Coast to Coast, lowest prices, attractive four tube instrument \$39.50. Big commission to you. Exclusive territory to proven salesman. Territory going fast, write or wire today. Don't fail to give name of your county.



OZARKA, INC.
618 Washington Blvd., Chicago, Ill.
\$39.50

Big Profit

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

WRITE JOKES

EARN FROM \$50 TO \$150 PER WEEK writing jokes, epigrams and humorous stories for publications. Tremendous demand for material. Our short course in Humor Writing teaches you to write humorous material that sells. Learn in your spare time—earn in your spare time. Complete marketing plan and markets furnished. Write today for full particulars AMERICAN INSTITUTE OF HUMOR Office E, 319 Marion Bldg., Cleveland, O.

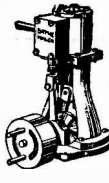


B-METAL

For total purity use B-METAL Crystals. Ask your dealer to order them.
B-METAL REFINING CO. 11th floor 525 Woodward Ave. Detroit, Mich.

MODEL SLICE VALVE MARINE ENGINE

1/2" bore, \$12.75, or 3/8" bore, \$15.75
You will probably wish to make your own model boat hull, but what about your power unit? We are builders of working model engines and boilers of many types. We can supply you with a power unit that will meet the requirements of your particular model boat. Boiler, Ship and Naval fittings. Special work. Large illustrated catalogue, 20c.
BATHE MFG. CO. Dept. 2, 5214 Woodland Ave., Phila., Pa.

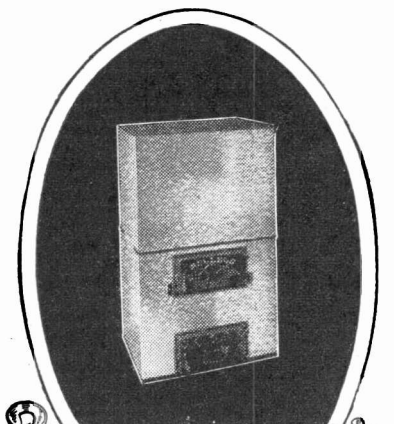


2½ Tons Heats 5 Rooms!

"There is no heater to compare with the Bulldog. I burned 2½ tons of coal last winter and heated five rooms and bath."
—Walter Geary, Gloucester, Mass.

That's what the Bulldog does with coal! Here's what it does with about the lowest grade fuel you can think of!

"I can run my Bulldog furnace steady for fourteen days in normal weather conditions on the actual cost of fifty cents." So writes F. R. Redetzke, of Cleveland, North Dakota, and he adds: "Hard to believe, is it? That's what some of my neighbors thought until I showed them! We have an unlimited amount of grain screenings in this country. That's the fuel I am using."



BULLDOG PIPELESS FURNACE

Comes Completely Erected!
Fits Any Height of Basement
Goes Through Any Door
You Install It Yourself!

If you are even thinking of a pipeless furnace, or any furnace, write for our free catalog. The Bulldog is one furnace you MUST investigate. Comes completely erected, fits any height of basement, goes through any door, and you install it yourself! A really extraordinary development in heating.

No Money Down!

The Bulldog is sent you for free inspection. Then, if satisfied, you make only small monthly payments, at our amazingly low price! Factory connections in both East and West. We ship from nearest point. Don't consider buying any furnace until you find out about the Bulldog. Write at once for our special offer and our free catalog, together with the wonderful record of Bulldog success. Get ready for winter NOW! Mail this coupon TODAY!

Babson Bros.

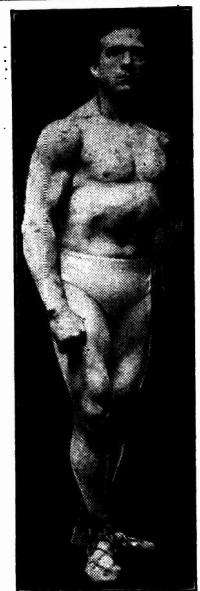
19th & California Ave., Dept. 14-27 Chicago
Without obligating me in any way please send me your free catalog and special offer on the Bulldog Pipeless Furnace.
Print name and address plainly.

Name _____
Address _____

Call Letters	Name	Location	Power & Wave Length
WDBX	Otto Baur, New York, N. Y.	New York, N. Y.	5—233
WDBY	North Shore Congregational Church, Chicago, Ill.	Chicago, Ill.	500—258
WDBZ	Boy Scouts of America, Ulster County Council, Kingston, N. Y.	Kingston, N. Y.	5—233
WDM	The Church of the Covenant, Washington, D. C.	Washington, D. C.	50—234
WDZ	J. L. Bush, Tuscola, Ill.	Tuscola, Ill.	10—278
WEAA	Frank D. Fallain, Police Building, Flint, Mich.	Flint, Mich.	10—280
WEAF	American Telephone & Telegraph Co., New York, N. Y.	New York, N. Y.	1000—492
WEAH	Wichita Board of Trade, Wichita, Kan.	Wichita, Kan.	50—280
WEAI	Cornell University, Ithaca, N.Y.	Ithaca, N.Y.	500—286
WEAJ	University of South Dakota, Vermillion, S. D.	Vermillion, S. D.	100—283
WEAM	Borough of North Plainfield (W. Gibson Buttfield), North Plainfield, N. J.	North Plainfield, N. J.	150—286
WEAN	Shepard Co., Providence, R. I.	Providence, R. I.	100—273
WEAO	The Ohio State University, Columbus, Ohio	Columbus, Ohio	500—360
WEAP	Mobile Radio Co., Mobile, Ala.	Mobile, Ala.	100—360
WEAR	Evening News Publishing Co., Baltimore, Md.	Baltimore, Md.	50—261
WEAU	Davidson Bros. Company, Sioux City, Iowa	Sioux City, Iowa	100—275
WEAY	Will Horwitz, Jr., Houston, Texas	Houston, Texas	500—360
WEB	Benwood Co., St. Louis, Mo.	St. Louis, Mo.	500—273
WEBA	The Electric Shop, Highland Park, N. J.	Highland Park, N. J.	15—233
WEBC	Walter C. Bridges, Superior, Wis.	Superior, Wis.	10—242
WEBD	Electrical Equipment Service Co., Anderson, Ind.	Anderson, Ind.	10—246
WEBE	Roy W. Waller, Cambridge, Ohio	Cambridge, Ohio	10—248
WEBI	Walter Gibbons, Salisbury, Md.	Salisbury, Md.	15—242
WEBJ	Third Ave. Ry. Co., New York, N. Y.	New York, N. Y.	500—273
WEBH	Edgewater Beach Hotel Co., Chicago, Ill.	Chicago, Ill.	1000—378
WEBP	E. Budd Peddicord, New Orleans, La.	New Orleans, La.	50—280
WEV	Hurlburt-Still Electrical Co., Houston, Texas	Houston, Texas	100—263
WEW	St. Louis University, St. Louis, Mo.	St. Louis, Mo.	100—280
WFAA	The Dallas News, The Dallas Journal, Dallas, Texas.	Dallas, Texas	500—476
WFAE	Carl F. Woese, Syracuse, N. Y.	Syracuse, N. Y.	100—234
WFAH	Electric Supply Co., Port Arthur, Texas	Port Arthur, Texas	150—236
WFAM	Times Publishing Co., St. Cloud, Minn.	St. Cloud, Minn.	10—273
WFAN	Hutchinson Electric Service Co., Hutchinson, Minn.	Hutchinson, Minn.	100—360
WFAV	University of Nebraska, Dept. E. E., Lincoln, Neb.	Lincoln, Neb.	250—275
WFBB	Eureka College, Eureka, Ill.	Eureka, Ill.	50—240
WFBC	William F. Gable Co., Altoona, Pa.	Altoona, Pa.	100—261
WFBH	Concourse Radio Corp., New York, N. Y.	New York, N. Y.	500—273
WFBV	Ainsworth-Gates Radio Co., Cincinnati, Ohio	Cincinnati, Ohio	750—309
WFI	Strawbridge & Clothier, Philadelphia, Pa.	Philadelphia, Pa.	500—395
WGAL	Lancaster Elec. Supply & Const. Co., Lancaster, Pa.	Lancaster, Pa.	10—248
WGAN	Cecil E. Lloyd, Pensacola, Fla.	Pensacola, Fla.	50—360
WGAQ	Yourcee Hotel, Shreveport, La.	Shreveport, La.	150—252
WGAZ	The South Bend Tribune, South Bend, Ind.	South Bend, Ind.	250—360
WGI	American Radio & Research Corp., Medford Hillside, Mass.	Medford Hillside, Mass.	100—360
WGL	Thomas F. J. Howlette, Philadelphia, Pa.	Philadelphia, Pa.	500—360
WGN	The Tribune (Drake Hotel-Whitestone Co.), Chicago, Ill.	Chicago, Ill.	1000—370
WGR	Federal Telephone and Telegraph Co., Buffalo, N. Y.	Buffalo, N. Y.	750—319
WGY	General Electric Co., Schenectady, N. Y.	Schenectady, N. Y.	1000—380
WHA	University of Wisconsin, Madison, Wis.	Madison, Wis.	500—360
WHAA	State University of Iowa, Iowa City, Iowa	Iowa City, Iowa	100—484
WHAD	Marquette University, Milwaukee, Wis.	Milwaukee, Wis.	100—280
WHAG	University of Cincinnati, Cincinnati, Ohio	Cincinnati, Ohio	100—222
WHAH	Hafer Supply Co., Joplin, Mo.	Joplin, Mo.	250—283
WHAK	Roberts Hdwe. Co., Clarksburg, W. Va.	Clarksburg, W. Va.	15—258
WHAM	University of Rochester (Eastman School of Music), Rochester, N. Y.	Rochester, N. Y.	100—283
WHAR	Seaside House, Atlantic City, N. J.	Atlantic City, N. J.	100—275
WHAS	Courier-Journal and Louisville Times, Louisville, Ky.	Louisville, Ky.	500—400
WHAV	Wilmington Electrical Specialty Co., Inc., Wilmington, Del.	Wilmington, Del.	50—360
WHAZ	Rensselaer Polytechnic Institute, Troy, N. Y.	Troy, N. Y.	500—380
WHB	Sweeney School Co., Kansas City, Mo.	Kansas City, Mo.	500—411
WHK	Radiovox Co. (Warren R. Cox), Cleveland, Ohio	Cleveland, Ohio	100—360

Restore YOUR Pep and Power!

Resist the forces that are sapping your vital powers. Banish the weaknesses that make your life a wretched failure. Stop experimenting with dope and drugs and foolish fads. Shake off Catarrh, Constipation, Indigestion, Dyspepsia, Bad Blood, Rupture, Nervousness, Youthful Errors, Vital Depletion, Impotency and other results of neglect and abuse (see Consultation Coupon).



STRONGFORT
The Perfect Man

Don't be a Chronic Weaking

You know that life isn't worth living without the ability, power, virility of vital, healthy manhood. You know that you can never be a 100% Man again until you regain the vital force that you have lost thru overwork, worry, excesses and abuse of Nature's immutable laws. Dope and Drugs, Pills and Powders can never help you. Such methods are the refuge of a weakling who hasn't the sand to acknowledge his errors and get a new start in life. There is only one way that you can escape the misery of mental and physical weakness and that is: through strict adherence to Mother Nature's Laws. She will not fail you if you sincerely want to regain your falling vitality and be a red-blooded man, with pep and power to measure up to real manhood.

Build Up Your Body and Brain

Banish Your Ailments. You can be Healthy, Virile and Successful—you can free yourself of the weaknesses and defects that rob you of the Joys of Life; and that sooner or later will cause you to lose your self-respect, your friends and your position. You can build yourself up—develop your muscles—clear your befuddled brain—strengthen and correct every organ and function and get a new start in life, if you will.

STRONGFORTISM

The New Science of Health Promotion
Do not confuse this Science of Nature with ordinary so-called physical culture or gymnastic courses. Strongfortism contains all that is embodied in preliminary methods and, in addition, brings you the scientific applications that will rid you of such ailments as Nervousness, Rupture, Constipation, Bad Blood, Rheumatism, Catarrh, Indigestion, Dyspepsia, Bad Habits and the numerous other results of breaking Nature's Laws. You will be revived, restored, rejuvenated—made over into a new being; and you will experience an inflow of vital force that will surprise and please you—renew your flagging powers and Manhood and place you on the Straight Road to Health, Happiness and a Successful Life.

Send For My New Free Book

"DO IT WITH MUSCLE" my newest book, is a helpful, plainly worded true story of how I became the PHYSICALLY PERFECT MAN and attained worldwide professional eminence, prosperity and family happiness; how thousands of my pupils have achieved shining lives through the conquest of constipation, world weariness, fear, debility and the ugly horde of physical, mental and sexual disorders resulting from ignorance, neglect and folly. Lavishly illustrated with scores of superb camera studies of myself and pupils.

Just check the subjects on the Free Consultation Coupon on which you want special confidential information and send with 10c to help pay postage, etc. I'll do the rest. Send for my new free book **Right Now—TODAY.**

LIONEL STRONGFORT

Physical and Health Specialist over 25 years
Dept. 1604 Newark, N. J.

FREE CONSULTATION COUPON

Mr. Lionel Strongfort, Dept. 1604, Newark, N. J.—Send me FREE my private copy of "DO IT WITH MUSCLE," for which I enclose one dime (10c) towards mailing expense. I have marked (X) before the subject in which I am interested.

..Colds	..Increased Height	..Impotency
..Catarrh	..Pimples	..Falling Hair
..Hay Fever	..Blackheads	..Weak Eyes
..Obesity	..Short Wind	..Gastritis
..Headache	..Flat Foot	..Heart Weakness
..Thinness	..Stomach Disorders	..Poor Circulation
..Rupture	..Constipation	..Skin Disorders
..Lumbago	..Neuritis	..Dependancy
..Neuralgia	..Torpid Liver	..Round Shoulders
..Flat Chest	..Indigestion	..Lung Troubles
..Deformity (Describe)	..Nervousness	..Stomach Disorders
..Insemlia	..Poor Memory	..Shoulders
..Manhood Restored	..Rheumatism	..Muscular Development
..Female Disorders	..Diabetes	..Great Strength
..Successful Marriage	..Prostate Troubles	..Weaknesses
	..Youthful Errors	..Neurasthenia
	..Vital Losses	

Name _____
Age _____ Occupation _____
Street _____
City _____ State _____

If you have taken my "Regular" or "Advanced" Courses, kindly indicate same by making a cross in box for this purpose below.

I have taken your "Regular" Course ()
I have taken your "Advanced" Course ()
Have you received my book, "Prevention and Conservation of Health, Strength and Mental Energy?"
When _____

Before You Build that Radio Set—

Everybody wants to get the most from the Radio Set he Builds or owns. There is a certain pleasing satisfaction when broadcast is received clearly and with great volume at all times. To assist Radio Set builders who want to get complete satisfaction from their receivers at all times CONSRAD has compiled some very valuable data. Data that will help in many ways and in many places.



PACKET E

Radio Amateurs Practical Design Data

A complete simplified, practical compilation of the following: Measurement Charts, Special Hartley and Navy Circuits for Receiving Sets, Five Watt Transmitter, Reinartz Tuner, 15 Watt C.W. Transmitter, Wavelengths of Inductance Coils, Two Special Tables of Oscillation, and Chart of Antenna Characteristics. Contained in a handsome folder size 9x12.

PRICE50c



PATTERN No. 2

Detector and Amplifier Units

An interesting, valuable method of construction showing clearly and simply how to make efficient Vacuum Tube Detector and Amplifier Units to be used with any type of receiver. Folder contains two four-page instruction sheets and three blueprints 11"x16" covering every detail in the making of Detector and Amplifier Units.

PRICE50c Prepaid



PACKET C

All About Aerials

The Aerial is a very vital part of any radio receiver and to know which are the most efficient for the various types of receivers is a great help to any constructor. The CONSRAD folder on aerials is complete, giving diagrams and illustrations of the various types of aerials, their value and their application.

PRICE50c Prepaid



PACKET A

Radio Broadcast Map

Completeness is the predominant feature of the CONSRAD broadcast map. Not only does it show the accurate location of broadcast stations in the United States, but it is arranged so that you can accurately measure the distance of any station from your home. It is printed on cloth so that you can tack it on the wall and keep it in sight at all times. It will not tear under usage and remains ready for use at all times.

PRICE50c Prepaid

Build Your New Receiver Via "Consrad"

Your pick of Radio books, patterns or diagrams on more than 150 of the Practical Radio Receivers in use today, compiled by the foremost radio authorities in the country and every one authentic, complete and practical—also books and literature on the care and operation of every part of your Radio Set.

AT ALL RELIABLE RADIO DEALERS

The Consrad Company

233 Fulton Street

New York City

"RADIO'S FOREMOST PUBLISHERS"

Consrad

Call Letters	Name	Location	Power & Wave Length
WHN	George Schubel, Loew's State Theatre Bldg.,	New York, N. Y.	
WHIO	Bankers Life Co.,	Des Moines, Iowa	500—368
WIAB	Art A. Johnson's Garage,	Rockford, Ill.	50—252
WIAC	Galveston Tribune,	Galveston, Texas	100—360
WIAD	Howard R. Miller,	Philadelphia, Pa.	100—254
WIAK	Journal-Stockman Co.,	Omaha, Neb.	250—278
WIAQ	Chronicle Publishing Co.,	Marion, Ind.	10—226
WIAS	Home Electric Co.,	Burlington, Iowa	100—283
WIK	K & L Electric Co.,	McKeesport, Pa.	100—234
WIL	Continental Electrical Supply Co.,	Washington, D. C.	5—360
WIP	Gimbel Bros.,	Philadelphia, Pa.	500—509
WJAB	American Electric Co.,	Lincoln, Neb.	100—229
WJAD	Jackson's Radio Engineering Laboratories,	Waco, Texas.	150—360
WJAG	The Norfolk Daily News,	Norfolk, Neb.	250—283
WJAK	Clifford L. White,	Greentown, Ind.	30—254
WJAM	D. M. Perham,	Cedar Rapids, Iowa	20—268
WJAN	Peoria Star,	Peoria, Ill.	100—280
WJAR	The Outlet Co. (J. Samuels & Bro.),	Providence, R. I.	500—360
WJAS	Pittsburgh Radio Supply Co.,	Pittsburgh, Pa.	250—286
WJAX	Union Trust Co.,	Cleveland, Ohio	500—390
WJAZ	Chicago Radio Laboratory,	Chicago, Ill.	20—268
WJD	Denison University,	Granville, Ohio	10—229
WJY	R. C. A.,	New York, N. Y.	500—405
WJZ	R. C. A.,	New York, N. Y.	500—455
WKAA	H. F. Paar,	Cedar Rapids, Iowa	50—278
WKAD	Charles Loeff (Crescent Park),	East Providence, R. I.	20—240
WKAF	W. S. Radio Supply Co.,	Wichita Falls, Texas.	100—360
WKAN	United Battery Service Co.,	Montgomery, Ala.	15—226
WKAP	Dutee W. Flint,	Cranston, R. I.	50—360
WKAQ	Radio Corp. of Porto Rico,	San Juan, Porto Rico	100—360
WKAR	Michigan Agriculture College,	East Lansing, Mich.	500—280
WKAU	Laconia Radio Club,	Laconia, N. H.	50—254
WKBF	Dutee W. Flint,	Cranston, R. I.	500—286
WKY	W. K. Y. Radio Shop,	Oklahoma City, Okla.	100—360
WLAG	Cutting & Washington Radio Corp.,	Minneapolis, Minn.	500—417
WLAH	Samuel Woodworth,	Syracuse, N. Y.	100—234
WLAL	Naylor Electrical Co. (Sim Naylor),	Tulsa, Okla.	100—360
WLAP	W. V. Jordan,	Louisville, Ky.	20—286
WLAQ	Arthur E. Schilling,	Kalamazoo, Mich.	20—283
WLAW	Police Dept.,	New York, N. Y.	500—360
WLAX	Putnam Electric Co.,	Greencastle, Ind.	10—231
WLB	University of Minnesota,	Minneapolis, Minn.	5—360
WLBL	Wisconsin Department of Markets,	Stevens Point, Wis.	500—278
WLS	Sears, Roebuck & Co.,	Chicago, Ill.	500—345
WLW	Crosley Radio Corp.,	Cincinnati, Ohio	500—423
WMAC	Clive B. Meredith,	Cazenovia, N. Y.	100—261
WMAF	Round Hills Radio Corp.,	Dartmouth, Mass.	100—500—360
WMAH	General Supply Co.,	Lincoln, Neb.	100—254
WMAK	Norton Laboratories,	Lockport, N. Y.	500—273
WMAL	Trenton Hardware Co.,	Trenton, N. J.	50—256
WMAN	First Baptist Church,	Columbus, Ohio	10—286
WMAQ	Chicago Daily News,	Chicago, Ill.	500—448
WMAV	Alabama Polytechnic Inst.,	Auburn, Ala.	500—250
WMAY	Kingshighway Presbyterian Church,	St. Louis, Mo.	100—280
WMAZ	Mercer University,	Macon, Ga.	100—261
WMC	Commercial,	Memphis, Tenn.	500—500
WMU	Doubleday-Hill Electric Co.,	Washington, D. C.	100—261
WNAC	Shepard Stores,	Boston, Mass.	100—278
WNAD	University of Oklahoma,	Norman, Okla.	50—360
WNAL	Omaha Central High School,	Omaha, Nebr.	20—258
WNAP	Wittenberg College,	Springfield, Ohio	100—275
WNAR	First Christian Church,	Butler, Mo.	20—231
WNAT	Lennig Bros. Co. (Fred Lennig),	Philadelphia, Pa.	100—360

"ULTRA" Radio Reception



THE ULTRADYNE

The Ultradyne is the "Ultra," the finest in High Powered, 8-Tube Radio Receivers. It is designed by Robert E. Lucault, of the Staff of "Radio News," using the famous system of Modulation. It is one of the most consistent Receivers in getting signals from coast to coast. You can build your own ULTRADYNE at home, using the CONSRAD Pattern No. 10. This pattern contains a simple 4-page pamphlet of instruction that anyone can follow, and an extra large blueprint, 30" x 18", showing the complete wiring diagram and panel layout. The entire pattern is enclosed in a handsome 9 x 12 inches two color folder.

PRICE 50¢ Prepaid Pattern No. 10
From your Dealer or Direct from

Consrad Company Inc.
233 Fulton Street
New York City

Consrad

\$20 A Day
for Dental Laboratory EXPERTS!

Enormous demand right now for McCarrie-trained Dental Laboratory EXPERTS at \$65 to \$150 a week! Only profession that's not over-crowded—only kind of professional work that you can master in a few months!

70,000 Dentists Need Laboratories

At Chicago and Detroit I direct the largest Dental Laboratory Schools in the world. Personal, individual instruction. Learn by doing actual Dental Laboratory jobs. I prepare you quick for Expert's pay averaging \$3 per hour. No classes, no textbooks here.

\$50.00 Outfit FREE!

If you write at once! For a limited time I will give every student a complete \$50 outfit of tools, materials and supplies. Write for free offer today.

Open a Laboratory

of your own. Little capital needed when you are McCarrie trained. My instruction includes Laboratory management, \$15,000 a year profits made easily by Dental Laboratories.



I Will Make You a Dental Laboratory Expert in 4 to 6 months.

FREE R. R. Fare to Chicago or Detroit for a limited time. GET MY OFFER QUICK!

Big, New Book FREE!

Tells you all about the surprising opportunities waiting for you when you are a McCarrie-trained Dental Laboratory Expert. Explains my rapid, practical method of training you for big-pay positions or to open your own laboratory. Contains my free offers of R. R. fare and \$50 outfit. Write me personally right away!



H. A. McCARRIE, Director
McCarrie School of Mechanical Dentistry
1338 S. Michigan Ave., Chicago
Dept. 303-J.

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.

Call Letters	Name	Location	Power & Wave Length
WNAW	Henry Kunzman,	Fort Monroe, Va.	5—360
WNAX	Dakota Radio Apparatus Co.,	Yankton, S. D.	100—244
WNYC	City of New York,	New York, N. Y.	1000—526
WOAC	Page Organ Co. (H. P. Mouse),	Lima, Ohio	50—266
WOAE	Midland College,	Fremont, Neb.	15—280
WOAF	Tyler Commercial College,	Tyler, Texas	10—360
WOAG	Apollo Theatre (Belvidere Amusement Co.),	Belvidere, Ill.	100—273
WOAH	Palmetto Radio Corp.,	Charleston, S. C.	10—360
WOAI	Southern Equipment Co.,	San Antonio, Texas	500—385
WOAN	Vaughn Conservatory of Music,	Lawrenceburg, Tenn.	200—360
WOAO	Lyradion Mfg. Co.,	Mishawaka, Ind.	50—360
WOAT	Boyd M. Hamp,	Wilmington, Del.	100—360
WOAV	2nd Battalion, 112th Inf.,	P. N. G., Erie, Pa.	50—242
WOAW	Woodmen of the World,	Omaha, Neb.	500—526
WOAX	Franklyn J. Wolff (Monument Pottery Co.),	Trenton, N. J.	500—240
WOC	The Palmer School of Chiropractic,	Davenport, Iowa	500—484
WOI	Iowa State College,	Ames, Iowa	500—360
WOO	John Wanamaker,	Phila., Pa.	500—509
WOQ	Western Radio Co.,	Kansas City, Mo.	500—360
WOR	L. Bamberger & Co.,	Newark, N. J.	500—405
WOS	Missouri State Marketing Bureau,	Jefferson City, Mo.	500—441
WPAB	Pennsylvania State College,	State College, Pa.	500—283
WPAC	Donaldson Radio Co.,	Okmulgee, Okla.	100—360
WPAJ	Doolittle Radio Corp.,	New Haven, Conn.	100—268
WPAK	North Dakota Agricultural College,	Agricultural College, N. D.	50—283
WPAL	Avery & Loeb Electric Co.,	Columbus, Ohio	500—286
WPAM	Auerbach & Guettel,	Topeka, Kan.	100—275
WPAR	Ward Battery & Radio Co.,	Beloit, Kan.	10—236
WPAU	Concordia College,	Moorhead, Minn.	10—286
WPAZ	Dr. John R. Koch,	Charleston, W. Va.	10—273
WQAA	Horace A. Beale, Jr.,	Parkersburg, Pa.	500—360
WQAC	E. B. Gish,	Amarillo, Texas	100—234
WQAE	Moore Radio News Station,	Springfield, Vt.	50—275
WQAF	Sandusky Register,	Sandusky, Ohio	5—240
WQAI	Coles County Telephone & Telegraph Co.,	Mattoon, Ill.	10—258
WQAM	Electrical Equipment Co.,	Miami, Fla.	100—283
WQAN	Scranton Times,	Scranton, Pa.	50—280
WQAO	Calvary Baptist Church,	New York, N. Y.	100—360
WQAP	West Texas Radio Co. (Abilene Daily Reporter),	Abilene, Tex.	100—360
WQAS	Prince-Walter Co.,	Lowell, Mass.	100—266
WQAX	Radio Equipment Co.,	Peoria, Ill.	100—248
WQJ	Calumet Baking Powder Co.,	Chicago, Ill.	500—448
WRAF	The Radio Club (Inc.),	Laporte, Ind.	10—224
WRAL	Northern States Power Co.,	St. Croix Falls, Wis.	100—248
WRAM	Lombard College,	Galesburg, Ill.	100—244
WRAN	Black Hawk Electrical Co.,	Waterloo, Iowa	10—236
WRAO	St. Louis Radio Service Co.,	St. Louis, Mo.	10—360
WRAV	Antioch College,	Yellow Springs, Ohio	100—242
WRAW	Avenue Radio Shop,	Reading, Pa.	10—238
WRAX	Flexons Garage,	Gloucester City, N. J.	100—268
WRBC	Immanuel Lutheran Church,	Valparaiso, Ind.	500—278
WRC	Radio Corp. of America,	Washington, D. C.	500—469
WRK	Doron Bros. Elec. Co.,	Hamilton, Ohio	200—360
WRL	Union College,	Schenectady, N. Y.	500—360
WRM	University of Illinois,	Urbana, Ill.	500—360
WRR	City of Dallas Police and Fire Signal Dept.,	Dallas, Texas	30—360
WRW	Tarrytown Radio Research Laboratory (Koenig Bros.),	Tarrytown, N. Y.	500—273
WSAB	South East Missouri State Teachers College,	Cape Girardeau, Mo.	100—360
WSAC	Clemson Agricultural College,	Clemson College, S. C.	500—360
WSAD	J. A. Foster Co.,	Providence, R. I.	100—261



\$1000 REWARD For the Capture of This Man

CONVICT 6138, escaped from the State Penitentiary; Name, Charles Condray; age 37; Height, 5 ft. 8 in. Weight 141 pounds; Hair, light brown; Eyes, gray.

Easy enough to identify him from his photograph and this description, you may say—but, Condray took the name of "Brown", dyed his hair, darkened his skin, grew a mustache, put on weight and walked with a stoop.

Yet, he was captured and identified so positively that he knew the game was up and returned to the penitentiary without extradition. How was it accomplished? Easy enough for the Finger Print Expert. They are the specialists, the leaders, the cream of detectives. Every day's paper tells their wonderful exploits in solving mysterious crimes and convicting dangerous criminals.

More Trained Men Needed

The demand for trained men by governments, states, cities, detective agencies, corporations, and private bureaus is becoming greater every day. Here is a real opportunity for YOU. Can you imagine a more fascinating line of work than this? Often life and death depend on finger print evidence—and big rewards go to the expert. Many experts earn regularly from \$3,000 to \$10,000 per year.

Learn at Home in Spare Time

And now you can learn the secrets of this science at home in your spare time. Any man with common school education and average ability can become a Finger Print Detective in surprisingly short time.

Free Course in Secret Service

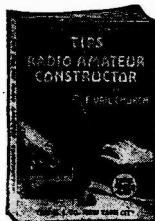
For a limited time we are making a special offer of a Professional Finger Print Outfit, absolutely Free, and Free Course in Secret Service Intelligence. Mastery of these two kindred professions will open a brilliant career for you.

Write quickly for fully illustrated free book on Finger Prints which explains this wonderful training in detail. Don't wait until this offer has expired—mail the coupon now. You may never see this announcement again! You assume no obligation—you have everything to gain and nothing to lose. Write at once—address

University of Applied Science
Dept. 14-27 1920 Sunnyside Ave. Chicago, Ill.

UNIVERSITY OF APPLIED SCIENCE
Dept. 14-27 1920 Sunnyside Ave., Chicago, Ill.
Gentlemen—Without any obligation whatsoever, send me your new, fully illustrated, FREE book on Finger Prints and your offer of a FREE course in Secret Service Intelligence and the Free Professional Finger Print Outfit.

Name _____
Address _____
Age _____



Book No. 1

Many men fail in building their Radio sets because of some trivial error that could easily have been corrected before it was too late. The E. I. Company has compiled a book that will help you avoid all the common pitfalls while building your Radio sets.

PRICE 25c



Book No. 2

The man who wants to build only those PRACTICAL Radio Sets that are guaranteed to give good results when properly constructed will need this book. Gives the principal successful hookups of practical Radio Construction.

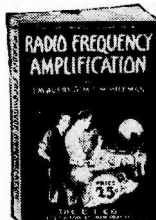
PRICE 25c



Book No. 3

Question No. 1—What is Radio? This is the nature of the questions that this book answers. Then it answers questions on all the principal parts of a Radio Receiver. It is a handy book to keep in your radio file.

PRICE 25c



Book No. 4

Distance lends enchantment—and its Radio Frequency Amplification that brings in the distance on your Radio Receiver. If you contemplate adding any Radio Frequency to your set you will want this book at your side.

PRICE 25c

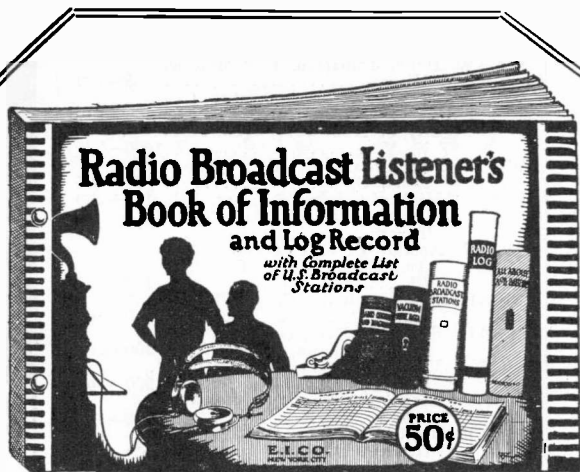


Book No. 6

Don't struggle in the dark, looking for stations—here is an inexpensive book that gives you detailed instructions on just how to handle your Radio set. You will be surprised at the increased results that can be obtained through proper tuning.

PRICE 25c

The complete set of E. I. Company Books shown on this page make up a library that covers practically every important detail of Radio Receiving Sets. The low cost of the complete set as compared with the amount of valuable information contained in it is the Reason why many Radio Set builders have a complete library at home that is constantly referred to. Size of each book is 7 1/2 inches by 5 1/4 inches, contains 52 pages and printed with a handsome two-color cover. You can obtain these books separately or all together from your Radio Dealer or by writing to us direct enclosing the price of each book.



One Radio Book Everybody Needs

The Instant Reference book giving essential Radio Information, List of Broadcast Stations, Log Record, Etc.

No Radio Book on the market today is just like this new book of the E. I. Company. It 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.

This book is the most valuable record ever prepared for the Radio Set owner.

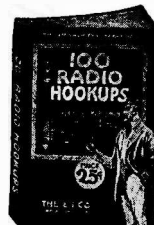
Copies can be obtained from your Radio Dealer or direct from us on receipt of 50c.

Postage **Paid**



Can you imagine a better book for your work bench? Gives diagrams, hookups, and details on Radio Hookups galore. One of the most complete hookup books published. Authentic, and up-to-date in every respect.

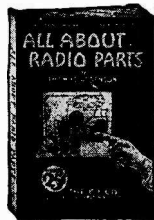
PRICE 25c



Book No. 7

Everyone who constructs a radio set should know, before he starts, the simple fundamentals of the various parts that go to make up the set. The E. I. Company has set these forth in a compact little book that is valuable at all times.

PRICE 25c



Book No. 8

The Vacuum Tube is a marvelous piece of apparatus. A short study of it as given in this book gives you the principal on which every Vacuum Tube Radio Receiver operates.

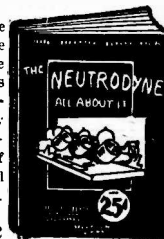
PRICE 25c



Book No. 9

Everybody knows the famous Neutrodyne hookup. One of the finest Radio Receivers in use today. This 52-page E. I. Company book gives an explanation of every detail of the Neutrodyne and how it all works.

PRICE 25c



Book No. 10

Anyone with this handy book as a guide can repair and keep in order his own radio set. Covers every detail of the modern radio sets and tells how to locate and repair any trouble.

PRICE 25c



Book No. 12

E. I. Company

233 FULTON STREET

Consrad Company

Selling Agents
NEW YORK CITY



A Five Tube Cockaday Receiver

A Brilliant Radio Achievement

The owners of the new "Five Tube Cockaday" have no further desire in respect to a radio receiver. They receive local and long distant broadcast at all times in the year. They have an instrument that is reliable, has little to get out of order, is extremely selective and presents a handsome appearance in any home. The New Cockaday is a receiver that compares favorably with the finest on the market, not only in practical operation but also in appearance.

"Conrad" Pattern No. 11, "How to Build a Five Tube Cockaday," shows you how to construct the original, Authentic Five Tube Cockaday Receiver using the simplest and most direct method known. A complete set of Blueprint Patterns consisting of a full sized sheet 19"x28" is furnished together with a four page instruction sheet giving details of all construction operations and any special information. Everything is drawn full size so that no extra measurements of any kind are necessary. Comes complete in handsome two-color folder, size 9x12 inches.

SOLD BY ALL RADIO DEALERS

Or direct from us.

PRICE **50¢** Prepaid Pattern No. 11

Conrad

"RADIO'S FOREMOST PUBLISHERS"

The Conrad Co.
233 Fulton Street
New York City

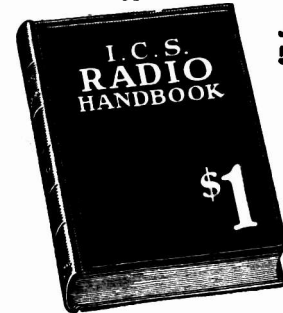
Call Letters	Name	Location	Power & Wave Length
WSAI	United States Playing Cards Co., Cincinnati, Ohio	Cincinnati, Ohio	500-309
WSAJ	Grove City College, Grove City, Pa.	Grove City, Pa.	250-360
WSAN	Allentown Radio Club, Allentown, Pa.	Allentown, Pa.	10-229
WSAP	Seventh Day Adventist Church, New York, N. Y.	New York, N. Y.	250-263
WSAR	Doughty & Welch Elec. Co., Fall River, Mass.	Fall River, Mass.	100-254
WSAU	Camp Marienfeld, Chesham, N. H.	Chesham, N. H.	10-229
WSAV	Clifford W. Vick Radio Construction Co., Houston, Texas	Houston, Texas	100-360
WSAY	Irving Austin (Port Chester Chamber of Commerce), Port Chester, N. Y.	Port Chester, N. Y.	100-233
WSAZ	Chase Electric Shop, Pomeroy, Ohio	Pomeroy, Ohio	50-258 500-429
WSB	Atlanta Journal, Atlanta, Ga.	Atlanta, Ga.	50-258
WSL	J. & M. Electric Co., Utica, N. Y.	Utica, N. Y.	10-273
WSOE	School of Engineering of Milwaukee, Wis.	Milwaukee, Wis.	100-246
WSY	Alabama Power Co., Birmingham, Ala.	Birmingham, Ala.	500-360
WTAB	Fall River Daily Herald Pub. Co., Fall River, Mass.	Fall River, Mass.	100-266
WTAC	Penn. Traffic Co., Johnstown, Pa.	Johnstown, Pa.	150-275
WTAF	Louis J. Gallo, New Orleans, La.	New Orleans, La.	10-268
WTAG	Kern Music Co., Providence, R. I.	Providence, R. I.	10-258 10-236
WTAJ	The Radio Shop, Portland, Me.	Portland, Me.	10-236
WTAL	Toledo Radio & Elec. Co., Toledo, Ohio	Toledo, Ohio	10-252
WTAM	Willard Storage Battery Co., Cleveland, Ohio	Cleveland, Ohio	1000-390
WTAP	Cambridge Radio & Elec. Co., Cambridge, Ill.	Cambridge, Ill.	50-242
WTAQ	S. H. Van Gorden & Son, Osseo, Wis.	Osseo, Wis.	100-254
WTAR	Reliance Elec. Co., Norfolk, Va.	Norfolk, Va.	100-280
WTAS	Charles E. Erbstein, Elgin, Ill. (near)	Elgin, Ill.	500-286
WTAT	Edison Electric Illuminating Co., Boston, Mass. (portable)	Boston, Mass.	100-244
WTAU	Reugg Battery and Electric Co., Tecumseh, Neb.	Tecumseh, Neb.	10-242
WTAW	Agricultural & Mechanical College, College Station, Texas	College Station, Texas	250-280
WTAX	Williams Hardware Co., Streator, Ill.	Streator, Ill.	50-231
WTAY	Oak Leaves Broadcasting Station, Oak Park, Ill.	Oak Park, Ill.	500-283
WTAZ	Thomas J. McGuire, Lambertville, N. J.	Lambertville, N. J.	15-283
WTG	Kansas State Agricultural College, Manhattan, Kan.	Manhattan, Kan.	50-273
WTL	H. G. Saal Co., Chicago, Ill., Webster Hall	Chicago, Ill.	10-268
WWAB	Hoenig, Swern & Co. (John Rasmussen), Trenton, N. J.	Trenton, N. J.	10-226
WWAD	Wright & Wright, Inc., Philadelphia, Pa.	Philadelphia, Pa.	100-360 500-227
WWAE	L. J. Crowley, Joliet, Ill.	Joliet, Ill.	500-227
WWAO	Michigan College of Mines, Houghton, Mich.	Houghton, Mich.	250-244
WWI	Ford Motor Co., Dearborn, Mich.	Dearborn, Mich.	250-273
WWJ	Detroit News (Evening News), Detroit, Mich.	Detroit, Mich.	500-517
WWL	Loyola University, New Orleans, La.	New Orleans, La.	5-280

CANADIAN STATIONS

CFAC	The Calgary Herald, Calgary, Alta.	430
CFCA	Star Publishing & Printing Co., Toronto, Ont.	400
CFCF	Marconi Wireless Telegraph Co. of Canada, Montreal, Que., Canada	440
CFCH	Abitibi Power & Paper Co., Iroquois Falls, Ont.	400
CFCJ	La Cle. de L'Evenement, Quebec, P. Q.	410
CFCK	Radio Supply Co., Ltd., Edmonton, Alta.	410
CFCL	Centennial Methodist Church, Victoria, B. C.	400
CFCN	W. W. Grant Radio, Ltd., Calgary, Alta.	440
CFCO	Semmelhaack-Dickson, Ltd., Bellevue, Que.	450
CFCQ	Radio Specialties, Ltd., Vancouver, B. C.	450
CFCR	Laurentide Air Service, Ltd., Sudbury, Ont.	410
CFCW	The Radio Shop, London, Ont.	420
CFDC	Sparks Co., Nanaimo, B. C.	430
CFDQ	The Electric Shop, Ltd., Saskatoon, Sask.	400
CFRC	Queens University, Kingston, Ont.	450
CFUC	University of Montreal, Montreal, Que.	400
CFXC	Westminster Trust Co., New Westminster, B. C.	440
CHAC	Radio Engineers, Halifax, N. S.	400
CHBC	The Albertan Publishing Co., Calgary, Alta.	410
CHCB	Marconi Wireless Telegraph Co. of Canada, Ltd., Toronto, Ont.	440

Every Question ANSWERED for only \$1

At last you have under one cover a Complete Radio Handbook



JUST OUT 514 PAGES

Compiled by HARRY F. DART, E.E.

Formerly with the Western Electric Co., and U. S. Army Instructor of Radio. Technically edited by F. H. Doane.

40,000 ALREADY SOLD

NO more need you turn from book to book, hoping to find what you want. It is all here, in 514 pages crammed full of every possible radio detail. Written in plain language, by engineers for laymen. Clears up the mysteries, tells you what you want to know. A complete index puts everything within your reach in a few seconds.

IT EXPLAINS: Electrical terms and circuits, antennas, batteries, generators and motors, electron (vacuum) tubes, every receiving hook-up, radio and audio frequency amplification, broadcast and commercial transmitters and receivers, super-regeneration, codes, license rules. Many other features.

Under one cover. Yes, it is all in one volume of 514 pages of clear type with hundreds of diagrams and illustrations. Takes the place of eleven or more specialized texts, each costing from two to ten times the dollar you pay for this single book. Belongs in every radio-equipped home, on every amateur's table.

Send \$1 to-day and get this 514-page I. C. S. Radio Handbook—the biggest value in radio to-day. Money back if not satisfied.

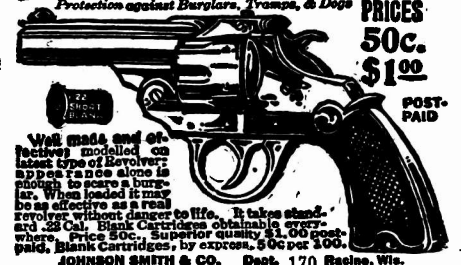
TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6173-D, Scranton, Penna.

I enclose One Dollar. Please send me—post-paid—the 514-page I. C. S. Radio 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.....

BLANK CARTRIDGE PISTOL



Protection against Burglars, Tramps, & Dogs

PRICES 50c. \$1.00

POST-PAID

Well made and effective, modeled 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 .38 Cal. Blank Cartridges obtainable everywhere. Price 50c. Superior quality \$1.00 post-paid. Blank Cartridges, by express, 50c per 100.

JOHNSON SMITH & CO. Dept. 170 Racine, Wis.

ELECTRICITY LEARN AT HOME

Send for catalog which tells how Burgess Home Training enables men and boys to get good jobs and keep them.

BURGESS ELECTRICAL SCHOOL
Dept. 10, 745 East 42nd Street Chicago

USE "RAGEMCO" TOOLS TO BUILD BETTER RADIO SETS



DS-701 RADIO TOOL SET

This is the handiest set of tools ever made for Radio Work by the makers of the famous "YANKEE" Tools. It contains the following: 1 Ratchet Screw-driver, 6 1/4 in. long, holding all attachments; 1 Blade, 5/16 x 3/16; 1 Blade, 3/2 x 1/2; 1 Blade, 2 1/2 x 1/4; 1 Countersink; 2 Socket Wrenches for all small nuts; 1 Reamer to enlarge holes in panel from 1/4 x 1/2; 1 Wrench, one end 5/16" square or hex. for jack, other 1/2" hex. etc.

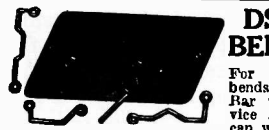
Price per set\$3.00



DS-303 HAND DRILL

The hardwood handle is hollow to store drills. Iron frame, nickel-plated parts, ball bearing three jawed chuck holding and centering accurately round shank drills from 0 to 3/16. Length of drill, 12 inches.

Price\$2.25



DS-203 WIRE BENDING TOOL

For making eyes, loops, bends, and offsets on Bus Bar wire. With this device any Radio Constructor can wire his set to compare favorably with any factory made set. Easier to use and more accurate than pliers. Full directions in box. Made of heavy steel, blued and finished.

Price\$1.00

DS-402 CIRCLE CUTTER

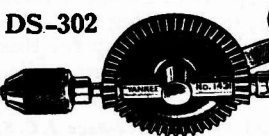


Especially designed for the Radio Constructor. Made of the finest material and equipped with the highest grade high steel cutting bits. It does three things at once. It drills its own pilot, cuts out plug and puts bead or scroll around the hole in one operation. Cuts holes 3/4 to 4 in. in diameter.

Price\$3.00

CB 401. Same tool but smaller and not fitted with bead or scroll in one operation.

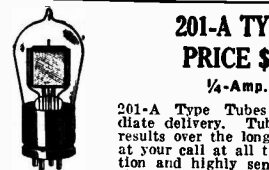
Price\$2.00



DS-302 HAND DRILL

Especially designed for Radio Work by the makers of the famous "Yankee" Tools. A beautiful balanced, small, powerful drill, with 4 to 1 ratio of gears for speed. Special chuck 9/32" capacity, to take largest drill, mostly furnished with drill or tool sets. Length over all, 9 1/2 in. Weight 1 1/2 lbs.

Price\$2.75



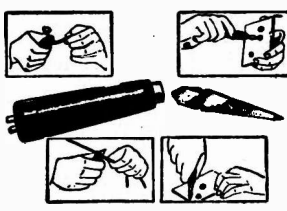
201-A TYPE TUBES PRICE \$3.45 Each

1/4-Amp., 5-6 Volts

201-A Type Tubes in stock for immediate delivery. Tubes that give the best results over the longest period of time and at your call at all times. Quiet in operation and highly sensitive. Note our special low price.

Order by order numbers. Remit by check, money order, stamps or cash. All goods are shipped free of transportation charges to all parts of U. S. and possessions same day as order is received, not satisfied, money will be refunded upon return of goods.

The Radiogem Corp.
66-S-West B'way, N. Y. City



DS-702 RADIO HANDI-TOOL

Bends Bus Bar or wire strips and scrapes wire, bores and reams holes, etc. Tool consists of 4" black japanned handle, to which is attached wire bending device, with nicked ferrule and 3" long two sided reamer.

Price\$0.50



DS-703 TOOL CHEST

Set consists of "LOCK-GRIP" master handle, 5" long, black Rubberoid finish with steel chuck, nickel plated, buffed and with the following 9 tools: Saw, bradawl, large screwdriver, file, scratch awl, gimlet, reamer, chisel, small screwdriver. Each tool of fine steel, drop forged, tempered, hardened, and nicely finished. Set comes in leatheroid box with tray.

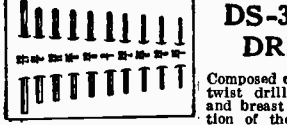
Price\$1.85



DS-304 SCREW STARTER and DRIVER

Holds any screw by its slot with a firm grip, makes it easy to place and start screws in difficult places. Just the tool for the Radio Constructor. All parts heavily nicked and polished.

Price\$1.00



DS-305 RADIO DRILL SET

Composed of 10 straight shank twist drills, fitting all hand and breast drills. The selection of these drills has been especially made for Radio Constructors and consists of the following sizes: 1-16, 5-64, 3-32, 7-64, 1/8, 9-64, 5-32, 11-64, 3-16, 17-64. Drills are mounted on white Holland Linen with sizes clearly marked.

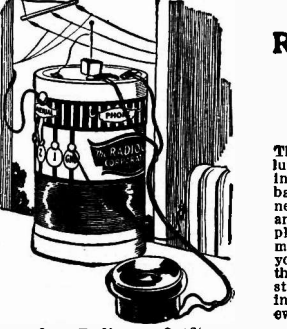
Price\$1.25



DS-800 ELECTRIC SOLDERING IRON

A perfect tool for Radio Work. Operates either on 110-volt A.C. or D.C. The heat element is of Nichrome, which prevents overheating and assures the desired even temperature. Size of Iron, 10 1/2 in. long. A 4-foot cord and plug is furnished.

Price\$2.00



THE RADIOGEM Complete Radio Receiving Outfit

\$2.50

This outfit is absolutely complete. Nothing more to buy—no batteries or tubes needed—no upkeep of any kind. The simplest radio outfit made—you build it yourself. So simple that anyone can construct it. Complete instruction book with every outfit.

Complete Radiogem Outfit\$2.50
The Radiogem only 1.00
The Gemphone only 1.80
Aerial Outfit only50

WE CARRY A COMPLETE LIST OF RADIO TOOLS. NO MATTER WHAT YOU WANT WE HAVE IT IN STOCK. WRITE FOR OUR COMPLETE TOOL LIST.

HANDS UP!

Protect yourself against hold-up, rowdies, etc. with this clever cigarette case of light weight metal. Looks exactly like the real thing! Pull the trigger, back flies the lid showing your cigarettes. Lots of fun scaring your friends, and a great protector. Sold exclusively by us. **PAY POST-MAN \$1.75 on delivery plus postage.** Money back if not satisfied. Pat. Pending

Pathfinder Co., Dep. HA3B, 534 6th Ave., N.Y.

The Midget "FIVE-IN-ONE" Slide Rule a combination Mannheim Log-Log, Add and Subtract, Polymetric and Binary Slide Rule. Will instantly add, subtract, multiply and divide any combination involving whole numbers, fractions, decimals and mixed numbers. Gives every root and power of every quantity. Graduations printed on metal coated with white celluloid and are grease and waterproof. While the most versatile calculator ever invented, operation is simple and easily understood. Diameter 4". Price with 16-page instruction Book, \$1.50. Leatherette carrying case 50c extra. Catalog free. Your money back if you are not satisfied.

GILSON SLIDE RULE COMPANY, NILES, MICH.

Call Letters	Name	Location	Power & Wave Length
CHCD	Canadian Wireless & Elec. Co.,	Quebec, Que.	410
CHCE	Western Canada Radio Supply,	Victoria, B. C.	400
CHCL	The Vancouver Merchants Exchange, Ltd.,	Vancouver, B. C.	440
CHCM	Riley & McCormack, Ltd.,	Calgary, Alta.	440
CHCS	The Hamilton Spectator,	Hamilton, Ont.	410
CHYC	Northern Electric Co., Ltd.,	Montreal, Que.	341
CJCA	The Edmonton Journal, Ltd.,	Edmonton, Alta.	450
CJCM	J. L. Phillippe Landry, Mont	Joli, Que.	400
CJGC	London Free Press Printing Co.,	London, Ont.	430
CJCD	The T. Eaton Co., Ltd.,	Toronto, Ont.	410
CJCE	Sprott-Shaw Radio Co.,	Vancouver, B. C.	420
CJCI	Maritime Radio Corp., Ltd.,	St. John, N. B.	400
CJCN	Simons Agnew & Co.,	Toronto, Ont.	410
CJCX	Percival W. Shackleton, Oids,	Alta.	400
CJSC	The Evening Telegram,	Toronto, Ont.	430
CKAC	La Presse Publishing Co., Ltd.,	Montreal, P. Q.	425
CKCD	Vancouver Daily Province,	Vancouver, B. C.	410
CKCE	Canadian Indp. Telephone Co.,	Toronto, Ont.	450
CKCH	Canadian National Railways,	Ottawa, Ont.	435
CKCK	Leader Publishing Co., Ltd.,	Regina, Sask.	420
CKOC	Wentworth Radio Supply Co.,	Radio Assn., Ottawa, Ont.	400
CKCX	P. Burns & Co., Ltd.,	Calgary, Alta.	440
CKOC	Wentworth Radio Supply Co.,	Hamilton, Ont.	410
CKY	Manitoba Telephone System,	Winnipeg, Man.	450
CKYC	V. W. Odum,	Vancouver, B. C.	400

BRITISH STATIONS

2LO	London	365
5IT	Birmingham	475
5WA	Cardiff	350
6BM	Bournemouth	385
2ZY	Manchester	375
5NO	Newcastle	400
5SC	Glasgow	420
2BD	Aberdeen	495
6SL	Sheffield (relay station)	303

FRENCH STATIONS

YN	Lyon	740
FL	Paris (Eiffel Tower)	2600
8AJ	Paris	1780
ESP	Paris	450

CUBAN STATIONS

PWX	Cuban Telephone Co., Havana	400
2DW	Pedro Zayas, Havana	300
2AB	Alberto S. de Bustamante, Havana	240
2OK	Mario Garcia Velez, Havana	360
2BY	Frederick W. Borton, Havana	260
2CX	Frederick W. Borton, Havana	320
2EV	Westinghouse Elec. Co., Havana	220
2TW	Roberto E. Ramirez, Havana	230
2HC	Heraldo de Cuba, Havana	275
2LC	Luis Casas, Havana	250
2KD	E. Sanchez de Fuentes, Havana	350
2MN	Fausto Simon, Havana	270
2MG	Manuel G. Salas, Havana	280
2JO	Raúl Pérez Falcón, Havana	150
2KP	Alvaro Daza	200
2HS	Julio Power, Havana	180
2PK	George A. Lindeauoc, Cotorro, Cuba	195
2OL	Oscar Collado, Havana	290
2WV	Amadeo Sáenz, Havana	210
3EV	Leopoldo V. Figueroa, Colón	360
6KW	Frank H. Jones, Tuinucú	340
6KJ	Frank H. Jones, Tuinucú	275
6CX	Antonio T. Figueroa, Cienfuegos	170
6DW	Eduardo Terry, Cienfuegos	225
6BY	José Ganduxe, Cienfuegos	300
6AZ	Valentin Ulivarri, Cienfuegos	200
6EV	José Alvarez, Caibarién	225
7AZ	Pedro Noguera, Camaguey	225
7BY	Salvador Rionda, Camaguey	350
8AZ	Alfredo Brooks, Santiago de Cuba	240
8BY	Alberto Ravelo, Santiago de Cuba	250
8FU	Andrés Vinnét, Santiago de Cuba	225
8DW	Pedro C. Anduz, Santiago de Cuba	275
8EV	Eduardo Mateos, Santiago de Cuba	180
8GT	Juan F. Chibas, Santiago de Cuba	260

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 December issue must reach us not later than October 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.

Agents Wanted

Agents—Best seller: Jem Rubber Repair for tires and tubes; superceded 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.

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.

We start you without a dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 232, St. Louis.

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.

We want Salesmen and Agents, either whole or side line, to sell our low priced radio books to the trade. Excellent proposition for live wires. The E. I. Company, Publishers, 233 Fulton Street, New York City.

Earn \$10 daily silvering mirrors, plating and refinishing metalware, chandeliers, bedsteads, headlights. Outfits furnished. N. Deete Laboratories, 1139 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.

Big money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50, make \$1.44. 10 orders daily easy. Samples and information free. World Monogram Co., Dept. 32, Newark, N. J.

Rummage sales make \$50.00 daily. Offer wonderful values. We start you. "Wholesale Distributors." Dept. 32, 609 Division Street, Chicago.

Best proposition in the Specialty Field. Perry Lykoll Paintings, Photo Medallions, and Novelties have no equal. Every interview means a sale. 600% profit. Write for details. Perry Photo Novelty Corporation, Sect. S17, 360 Lowery, New York.

Men's Shirts. Easy to sell. Big demand everywhere. Make \$15.00 daily. Undersell stores. Complete lines. Exclusive patterns. Free samples. Chicago Shirt Manufacturers, 229 W. Van Buren, Factory 212, Chicago.

Big Money selling New Household cleaner. Washes and dries windows. Sweeps, scrubs, mops. Complete outfit less than brooms. Over 100 per cent profit. Harper Brush Works, 152 3rd St., Fairfield, Iowa.

\$10 daily silvering mirrors, plating and refinishing lamps, reflectors, autos, beds, chandeliers by new method. Outfits furnished. Write Gunmetal Co., Ave. D, Decatur, Ill.

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.

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. Rusler Co., Johnstown, Ohio, Box C47.

Succeed With Your Own Products—Formulas, Processes, Different, Dependable, Profitable. Catalog Free. D. Thaxly Co., Washington, D. C.

Agents—Pick up \$5.40 for few minutes work. Then, if you like, become "regular" representative making \$10-\$15 daily. Write quick for particulars. Pitkin Company, 691 Pitkin Building, Newark, New York.

\$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. 26, Vineland, N. J.

\$100 Every Week. Let me prove you can make it. Remarkable proposition—investigate immediately. Albert Mills, Mgr., 2007 American Bldg., Cincinnati, O.

Easy Money applying monograms on automobiles, gold initials simply transferred from paper, no experience needed. Takes 5 minutes, make \$1.50, cost 5c. Sample Free. "Ralco," 325B Harrison Ave., Boston, Mass.

Agents—Get our free sample case offer. Build your own pleasant profitable business. Be your own boss. Ho-Ro-Co household necessities sell, repeat quickly. Ho-Ro-Co., 2719 Dodder, St. Louis.

Agents Coining Money: \$1.40 profit on every \$1.50 sale. Monogramming Automobiles. Free Samples: Worcester Monogram Co., Worcester, Mass.

Agents Wanted (Continued)

Agents Wanted Full or Part Time to sell on liberal commission new Thermostatic Automatic Carburetor control Attachments for Ford cars. Increases mileage 100%. No holes to drill. Attached in 2 minutes. Does automatically exactly what Ford Manual instructs driver do by hand. Cadillac now using Thermostatic Carburetor Control under Blanche license. Write at once. A. C. Blanche & Co., Dept. 351-E, 602 W. Lake St., 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., 1696 Boston Road, New York.

Battle Photos and War Relics

For Dens: Relics Collected from Europe's Battlefields. Firearms, medals, helmets, etc. Illustrated catalogue and sample War photographs 25c. Lieut. Welsh, 2117 Regent Place, Brooklyn, N. Y.

Books

Perpetual Motion, by Percy Veranee. A history of the efforts to discover same from earliest days to the present, together with a scientific discussion regarding the possibility of its ultimate achievement. Profusely illustrated. 357 pages. Price postpaid, \$2.00. The Enlightenment Specialty Co., 305 Fourth St., Edwardsville, Ill.

"Nature's Finer Forces," Vibrations; Lights; Color-tones; Electromagnets; Odicures; Radio; Coldlights; Inventions; Wonderful Opportunities; Fifty Lessons; Marvelous Cures; Illustrated 270 pages. \$2.00. DeLuxe \$3.00. Stevens Research Laboratories, 242 Powell, San Francisco.

Hypnotism. Astounds, controls. Wants gratified. Disease eliminated. 25 Easy Lessons \$1.00 "Mindreading" (Any distance) wonderful. Success guaranteed. 60c "How to Win in Business Love and Society" 400 pages \$3.00. Catalog free. Science Institute, SE 1014 Belmont, Chicago.

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, Yogi Philosophy, Gazing Crystals, etc. A. W. Martens, E. E. 6, Burlington, Iowa.

Popular Books, 10c each. Magic tricks, Card tricks, Coin tricks, Boxing, Hypnotism, Ventriloquism. Clifford Fenner, 2401 Jefferson, Louisville, Ky.

Master Key, Creative Personality, Power of Will, 410 pages each, all three \$5.00. Bargain Catalog 4c. Phipps, 1014 Belmont, Chicago.

Business Opportunities

If you have adaptability to selling specialties, exclusive territory is available on the Hush-A-Phone. This device is generally recognized by the largest concerns in the country as superior to a phone booth for voice privacy, office quiet, and telephoning in noisy places. Over a thousand banks have adopted it. It is without competition. Energetic men can make a life occupation of selling the Hush-A-Phone in their section. Office appliance, and telephone men particularly adapted. Write for proposition. Hush-A-Phone Corp., Room 1311, 19 Madison Avenue, New York City.

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.

Free Advice. How to be Successful in Real Estate, particulars. Macdonald Cooperative Realty, San Diego.

Establish Yourself—at Home—As a Photographic Expert. Make \$75 a week while learning. Write at once for Temporary offer. International Studios, Dept. 11-26, 3601 Michigan Ave., Chicago.

Start a paying business at home or small office anywhere. Soliciting unnecessary. \$50.00 weekly easy. Begin in spare time. Free Folder, Downs Co., 2327 Myrtle, St. Paul, Minn.

Patent applications filed with drawing \$20; deferred \$15; strongest claims; priority rights guarded. Inventor's Service, 11 Broadway, N. Y.

Notice. Easy money for you. Go in business. Learn how. Write Box 238, Warrenton, N. Carolina.

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 611 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Chemical Experimenters! Amateurs, Students— Send 25c for next six issues "Popular Chemistry." The Wright Laboratory, Dept. Az, Caldwell, New Jersey.

Correspondence Courses

Used correspondence courses of all schools sold, rented and exchanged. List free. (Courses bought.) Lee Mountain, East Chattanooga, Tenn.

Used correspondence courses bought and sold. Bargain catalogue 1,000 courses free. Students' Exchange, Dept. 4, 47 West 42nd St., New York.

District Representatives Wanted

Money-making opportunity selling Radiolite system of charging batteries. Sells to battery stations, garages, auto-owners. Write for information and free demonstration offer. Radiolite Co., Dept. N., St. Paul, Minn.

Esperanto

The International Radio and Business Language. Complete Textbook and 1800 Word Dictionary for \$1.00. Your money returned if you are not satisfied. W. A. Buchheim, Bookseller, 1435 Race Street, Denver, Colorado.

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. Duocron-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.

Cashing in—If you have a practical, useful invention to sell (patented or pending), write us promptly. American Patents Corporation, Barrister Building, Washington, D. C.

Inventors—Experimenters. Don't discard good ideas. Mechanical, electrical problems solved \$2.50 each. Experimenters supplied. Chas. Martin, B.S., 190-80 St. B'klyn, N. Y.

Formulas

Money-making Books, Plans, Formulas. Catalogue Free. Ideal Book Shop, 5501-E, North Robey, Chicago.

For Sale

For Sale or Trade. Concrete Culvert. Particulars on request. Smith Caldwell, Castague, Mont.

For Sale—Patent on alarm clock. Variable sound. Jack Moore, 131 Circle Drive, Wichita, Kansas.

For Sale—Hotel Training Course, 14 volumes. Show Card Writing Course, 5' x 6' flag. Mark Kistler, Hamburg, R4, Pa.

For Sale. Gas Mixer and Atomizer for automobiles and all gas engines. Sells at \$1.00. Saves its cost every day. Inventor too poor to promote. C. E. Reyburn, 251 East Main, Peru, Indiana.

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 to men—Information of a scientific nature that has brought physical vigor and happiness to thousands. No charge; no obligation. Enclose stamp for reply. C. I. Wood & Co., Colorado Springs, Colorado.

Booklets on healing. Particulars for stamp. Arthur Stevens, Watseon, O.

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

We want Salesmen and Agents, either whole or side line to sell our low priced radio books to the trade. Excellent proposition for live wires. The E. I. Company, Publishers, 238 Fulton Street, New York-City.

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.

Earn \$25 Weekly, spare time, writing for newspapers, magazines. Experience unnecessary; details free. Press Syndicate, 986 St. Louis, Mo.

All men, women, boys, girls, 17 to 65, willing to accept Government positions, \$117-\$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—Age 18-40, wanting Ry. Station-Office positions, \$115-\$250 month, free transportation, experience unnecessary. Write Baker, Supt. 47 Wainwright, St. Louis.

Salesmen—Earn \$50, weekly selling custom-made shirts at ready-made shirt prices. 100 latest patterns, price \$2.95 up. Shirts individually cut. Unconditional guarantee. Custom Blit Shirt Company, 538 Broadway, N. Y.

Firmen, Brakemen, Baggage-men, Sleeping car, Train porters—(colored), \$140-\$200. Experience unnecessary. 897 Railway Bureau, East St. Louis, Ill.

Men—Women 18 up. Get U. S. Government Life Positions. \$95 to \$192 month. Steady work. No layoffs. Paid vacation. Work pleasant. Short hours. Pull unnecessary. Candidates coached. Common education sufficient. Full particulars free. Write immediately. Franklin Institute, Dept. P 23, Rochester, N. Y.

Men to Build Radio sets for me in spare time. Leon Lambert, 555-H Kaufman Bldg., Wichita, Kansas.

Instruction

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 611 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

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.

Arthel Shorthand learned in four evenings. Full course seven dollars. Used everywhere. Sent on approval. Particulars, Hollefreund's Institute, Desk X, Stratford, Ontario, Canada.

Machinery and Tools

Concrete Building Block Machines and Molds. Catalogue free. Concrete Machine Co., 305 South Third St., St. Louis, Mo.

Vulcanizers, tools, materials, supplies, tires, tubes direct from factory. Miller-Anderson Rubber Works, Anderson, Ind. Dept. S.I.-4.

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.

Camera -I- Hospital: Expert Repairing a specialty: Send your broken camera. Turner, 1679 Avenue A, New York.

Wanted—Inventors' Experimental work, wood, metal patterns, Machine work, rubber mill under one roof. Send drawings. Miller-Anderson Rubber Works, Anderson, Indiana, Dept. S.I.4.

Developing ideas and manufacturing our specialty. Absolute satisfaction, 33 years' experience, write us. The Eagle Way & Stop Signal Co., 2016 Elm St., Cincinnati, Ohio, Dept. A.

Miscellaneous (Continued)

16-page price list for chemists and experimenters. George Ott, 1218 Chestnut, Reading, Pa.

Old style watchtower meters, still running good. Check full of coils, magnets, binding posts, jewel bearings, brass screws, etc. Dials make good revolution counters. Mount relays, switches, alarms, instruments, etc. in base. Immediate shipment, \$3.25 prepaid. Cecil Ostermeier, 1510 South Douglas, Springfield, Illinois.

Honest co-operation in quickly selling any good invention. The Murray Co., Box 12, Pasadena, Cal.

Wanted—Disinfectant vaporizer small portable. David Molofsky, Vineland, N. J.

Artificial Marble, sanitary flooring instructions, ornamental casting, concrete, plaster, papier-mache, decoration garden furniture, 15 years instructing the public, particulars and 200 illustrations free. C. Mahler, Huntington, N. Y.

Models and Model Supplies

Models, Dies, Metal Stampings, Light Manufacturing. Modern Shop, Reasonable Prices. Osborne Register Company, Pearl at Elm, Cincinnati.

Motorcycles—Bicycles

Don't buy a Bicycle Motor Attachment until you get our catalogue and prices. Shaw Mfg. Co., Dept. 6, Galesburg, Kansas.

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.

Lacey Patent-Sense. "The book the inventor keeps." Free. See page 614.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Lederhann, Registered Attorney and Engineer, 15-E Park Row, New York.

Herbert Jenner, Patent Attorney and Mechanical Expert, 624 P Street, Washington, D. C. I report if patent obtainable and exact cost. Send for circular.

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 615. Victor J. Evans & Co., 194 Ninth, Washington, D. C.

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. Chandee & Chandee, 478 Seventh, Washington, D. C.

Patents Preserved, 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 R. Owen, 150 Owen Bldg., Washington, D. C., or 2278-T Woolworth Bldg., New York.

Monroe Miller O'urray 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 Alvine, Registered Patent Attorneys in United States and Canada, 242 O'urray Bldg., Washington, D. C.

Millions spent annually for ideas! Hundreds now wanted! Patent yours and profit! Write today for free books—tell how to protect yourself, how to invent, ideas wanted, how we help you sell, etc. American Industries, Inc., 212 Kresge 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.

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, 927 Security Bank Building, directly across street from Patent Office, Washington, D. C. See page 613.

Patents

M. P. Laughlin, Patents. Engineer-Attorney, 47 West 42nd Street, New York.

Inventions commercialized. Patented or unpatented. Write Adam Fisher Mfg. Co., 278, St. Louis, Mo.

Personal

Exchange interesting letters with new friends. Write Dolly Gray Club, Box 186K, Denver, Colorado. Stamp appreciated.

Exchange Cheery Letters with new friends. Write Betty Lee, Inc., Box 820, City Hall Station, New York City. Stamp appreciated.

Lonely—Join our club, make friends everywhere. Particulars Free. Write Frances Mathews, Box 26, Oakland, Calif.

Personal (Continued)

Ladies beauty cream. Rolling massage cream. Orange vanishing cream. Theatrical cold cream. All four 10c. Wm. Rodgers, 839 Oak, Cincinnati.

Phonographic Supplies

Build Your Phonograph. Quality phonographs Famous Serenade Motors. Also original Perfection Motors. Electric Motors, tonearms, reproducers, amplifiers, case material, accessories. Free blueprints and building instructions. Big saving. Wonderful results. Prompt delivery. Catalogue mailed for ten cents. Hoosier Mfg. & Supply Company, 321 Baldwin Block, Indianapolis, Indiana.

Photoplays, Stories, Etc.

Big money writing photoplays, stories, poems, songs. Send for free copy America's greatest magazine for writers. Tells you how to write and sell. Writer's Digest, 637 Butler Bldg., Cincinnati, Ohio.

\$\$\$ For Ideas. Photoplay Plots Accepted any form; revised, criticized, copyrighted, marketed. Advice free. Universal Scenario Corporation, 223 Security Bldg., Santa Monica & Western, Hollywood, California.

Printing

Hammermill Bond. 100 letterheads, 100 envelopes, 50 notecards, \$1.00. Samples Free. Opportunity Publishers, Dunkirk, N. Y.

Radio

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 material 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.

Teaches you the code within two hours or money refunded. Rito Code chart \$1. Complete. John Percival, 1411 N. Nevada, Colorado Springs, Colo.

The How and Why of Radio Apparatus, by H. W. Secor, E. E. This newest book on radio matters fulfills a distinct gap in wireless literature in that, while the treatment is made as understandable and as free from mathematics as possible, it at the same time incorporates a wealth of technique and instruction for the Radio Amateur—the Radio Operator—the installation and designing Expert—as well as teachers and students of the subject in general. A very broad field has been covered by the author, at the same time giving a great deal of information not found in other text books. If you are engaged in any branch of the Radio or allied arts at all you will surely need this latest contribution to radio literature, which is destined to be found on every radio man's book shelf before long. A glance at the following list of chapters gives but a very scant idea of the extensive and useful radio knowledge provided in its text. The Induction Coil; The Alternating Current Transformer; Radio Transmitting Condensers; The Spark Gaps; Radio-Transmitting Inductances; Radio Receiving Tuners; Radio Construction of a Direct Reading Wave-Meter and Decimeter; Antenna Construction; The Calculation and Measurement of Inductances; Appendix containing very useful tables, covering all subjects treated in this very unusual book. This newest of Radio Works, cloth bound in Vellum de Luxe, Gold Stamped and Hand Sewed, has 160 pages. Size of book, 6x9 inches. The How and Why of Radio Apparatus, Postpaid, \$1.75. Experimenter Publishing Co., Book Dept., 53 Park Place, New York City.

How to Make Radio Frequency Amplifiers. This book is for the more advanced amateur, showing the construction of the Radio Frequency Amplifying Transformer and giving complete constructional data. It shows the application of Radio Frequency to amplifying units that the amateur may already possess and gives 15 hook-ups showing practically every use Radio Frequency Amplifying Transformers can be put to. 32 pages, 15 illustrations; bound in beautiful two-color cover. Prepaid 25c. The E. I. Company, 233 Fulton St., New York City.

Experimental Electricity Course in 20 Lessons. By E. Gernsback and H. W. Secor, E. E. A course of the theory and practice of Electricity for the Experimenter. Every phase of experiments in electricity is treated comprehensively in plain English. New experiments are described and explained and nearly every application of Electricity in modern life is given. 160 pages—400 illustrations. Flexible cloth cover, 75c, postpaid. Stiff cloth cover, \$1.25 postpaid. Experimenter Publishing Co., Book Dept., 53 Park Place, New York City.

Salesmen Wanted

A Salesmen 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., 68R West Broadway, N. Y. City.

Tailoring Salesmen \$150.00 weekly. Liberal Bonus and large commission selling \$45.00 All-Wool suits: \$32.50. Union made to order by oldest tailors on earth. Satisfaction guaranteed. Experience unnecessary. Write today for free outfit, exclusive territory. Wilson Tailoring Co., 940 W. Jackson, Chicago.

Agents—Quality Shoes, quick sellers. Big commissions. Immediate returns! Independent business! Repeat orders. Experience unnecessary. Write full particulars. Tanners Shoe 2045C St., Boston.

Salesmen—Put gold initials on automobiles, trunks, etc. You charge \$1.50—make \$1.45. Every car owner a prospect. Pay for your outfit the first job. Outfit \$2.00, your profit \$36. Southern Monogram & Metallic Letter Co., Georgetown, Texas.

\$10,000 a Year In Commercial Photography



Magazines, newspapers, manufacturers, spend millions every year on commercial photographs. The man or woman who knows Modern Photography has an unlimited opportunity for success in this fascinating and big paying profession. During your spare time alone, you can make \$75 a week from commercial photographs or portraits. You can do modern professional work from the start and charge the same prices that other high grade photographers do. Guarantee to return every cent of your tuition if you are not absolutely satisfied.

This picture was made for a catalog of Bathing Suits. Thousands of manufacturers now use photographs to sell their merchandise.

Learn at Home

No previous experience is necessary. You can make big money in your spare time while you are learning. Last Christmas, E. D. Blunt got more than the entire cost of the course for one family portrait group. You can do this, too! If you are ambitious, there is a tremendous opportunity for you in Modern Photography.

FREE I give every student a wonderful, big, Professional Camera FREE. This wonderful offer is open for a limited time only. So write for information right away. Today!

International Studios, Inc.
3601 Michigan Ave.
Dept. 14-27 Chicago, U. S. A.

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 15c (coin or stamps) today for this big paper on trial 13 weeks, or \$1 for a year (52 issues).

PATHFINDER, 586 Langdon Sta., Washington, D. C.

Art and Life

The PICTURE MAGAZINE Art, Nature, The Body Beautiful, Mind Intellectual, Soul Intuition, Animals, Birds, Art Prints. Cash contests and lessons. Criticisms, cartoons and comics. Proclaims The Invisible Brotherhood. Can't describe—you must see it. Send NOW, only \$1 for 5 mo. trial sub. O. K. or refund. No free samples.

ART and LIFE, Dept. 933 Kalamazoo, Mich.

SEXUAL KNOWLEDGE

320 Pages ILLUSTRATED Cloth
By Winfield Scott Hall, M.D., Ph.D.

SEX FACTS MADE PLAIN

What every young man and Every young woman should know
What every young husband and Every young wife should know
What every parent should know

Table contents and commendations on request.

Postpaid, Mailed in plain wrapper.
AMERICAN PUB. CO., 1045 Winston Bldg., Philadelphia

A PERFECT NOSE

shaped at home while you sleep. Rapid, painless and safe. The ANITA is the genuine, unique and most comfortable. NO STRAP. ADJUSTER absolutely guaranteed. Highly recommended by physicians. Winner Gold Medal Feb. 1923. Write for FREE booklet, THE ANITA CO., Dept. 973, Anita Bldg., Newark, N. J.

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 **FREE BOOKLET** "A CLEAR-TONE SKIN"—telling how I cured myself after being afflicted 15 years.

E. S. GIVENS, 168 Chemical Bldg., Kansas City, Mo.

Short Stories, Manuscripts Wanted

Earn \$25 Weekly Spare Time writing for newspapers, magazines. Experience unnecessary; details free. Press Syndicate, 987 St. Louis, Mo.

Stories, Poems, Descriptive Articles, Plays, etc., are wanted for publication. Submit Mss. or write Literary Bureau, 165 Hannibal, Mo.

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., Dent. 156, St. Louis, Mo.

Stamps Free—Variety Packet, Foreign Stamps with Catalogue—2c postage. Gray Stamp Company, Station E5, Toronto, Canada.

Technical Schools

Chicago Technical College offers short, intensely practical courses in Drafting and Engineering—civil, mechanical, electrical, structural—Architecture, Building Construction, Plan Reading, etc. Courses fitted to your needs. No time wasted. Instructors are experts. Graduates in demand at big salaries. Opportunities for part-time work while studying. Day and evening classes, 21st year. Enter any time. No special preliminary training required. Low tuition—easy terms. Write for 52-page illustrated Blue Book, describing opportunities open to our graduates. Chicago Technical College, 24 Chicago Tech. Building, Chicago.

Trade Schools

\$10 to \$20 per day. Practical courses in Sign—Pictorial—Auto Painting—Decorating—Graining—Marbling, Paperhanging—Low Cost—Catalog Free. Chicago Painting School, 132 W. Austin Ave., Chicago, Ill.

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. Particulars free. American Detective System, 1974 Broadway, N. Y.


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, Pt. 286 Rash Bldg., Selma, Kansas



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. Ozment, Dept. 44 St. Louis, Mo.

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." It has inspired thousands. Free copy today.

THE HATFIELD INSTITUTE, 109 N. Dearborn, Chicago, Ill.

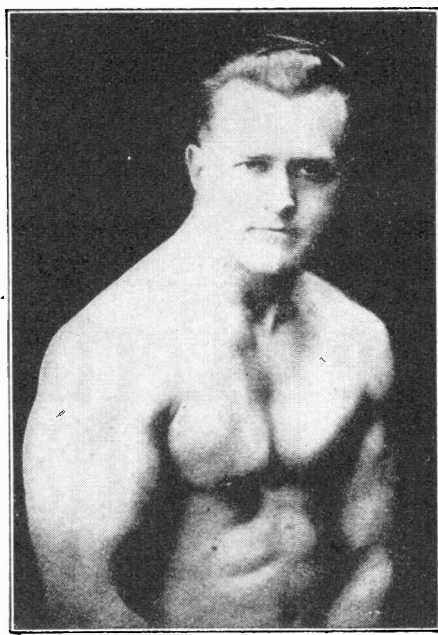
WHY NOT IMPROVE YOUR PERSONAL APPEARANCE?

Send for booklet showing photos of Men with and without the (PERFECT LEG FORMS) for BOW LEGS and KNOCK-KNEES. Also BRACES, for children for PERMANENT CURE. Perfect Sales Co., 140 N. Mayfield Ave., Chicago, Ill. Dept. 50

You can be quickly cured, if you

STAMMER

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. Bogus, 8109 Bogue Bldg., 1147 N. Ill. St., Indianapolis



EARLE E. LIEDERMAN
The Musculo Builder

How Strong Are You?

Can you do these things?

Lift 200 lbs. or more overhead with one arm; Bend and break a horse-shoe; Tear two decks of playing cards; Bend spikes; Chin yourself with one hand.

Can you do any of them? I can and many of my pupils can. It is remarkable the things a man really can do if he will make up his mind to be strong. It is natural for the human body to be strong. It is unnatural to be weak. I have taken men who were ridiculed because of their frail make-up and developed them into the strongest men of their locality.

I want you for 90 days

These are the days that call for speed. It once took four weeks to cross the ocean—now it takes less than one. In olden days it took years to develop a strong, healthy body. I can completely transform you in 90 days. Yes, make a complete change in your entire physical make-up. In 30 days I guarantee to increase your biceps one full inch. I also guarantee to increase your chest two inches. But I don't stop till you're a finished athlete—a real strong man. I will broaden your shoulders, deepen your chest, strengthen your neck. I will give you the arms and legs of a Hercules. I will put an armor plate of muscle over your entire body. But with it comes the strong, powerful lungs which enrich the blood, putting new life into your entire body. You will be bubbling over with strength, pep and vitality.

A Doctor who takes his own Medicine

Many say that any form of exercise is good, but this is not true. I have seen men working in the factories and mills who literally killed themselves with exercise. They ruined their hearts or other vital organs, ruptured themselves or killed off what little vitality they possessed. I was a frail weakling myself in search of health and strength. I spent years in study and research, analyzing my own defects to find what I needed. After many experiments, I discovered a secret of progressive exercising. I increased my arms over six and a half inches, my neck three inches and other parts of my body in proportion. I decided to become a public benefactor, and impart this knowledge to others. Physicians and the highest authorities on physical culture have tested my system and pronounced it to be the surest means of acquiring perfect manhood. Do you crave a strong, well proportioned body and the abundance of health that goes with it? If so, spend a pleasant half hour in learning how to attain it. The knowledge is yours for the asking.

Send for my new 64-page book "MUSCULAR DEVELOPMENT" IT IS FREE

It will show you what I have done for others and what I guarantee to do for you. It contains forty-three full page photographs of myself and some of my many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Just look at them 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 10 cents to cover the cost of wrapping and mailing. 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. 210, 305 Broadway, New York City

EARLE E. LIEDERMAN
Dept. 210, 305 Broadway, New York City

Dear Sir, I enclose herewith 10c for which you are to send me, without obligation on my part whatever, a copy of your latest book "Muscular Development."

Name

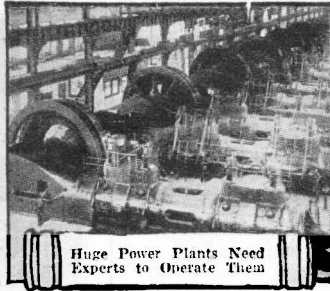
Street

City State

(Please write or print plainly)



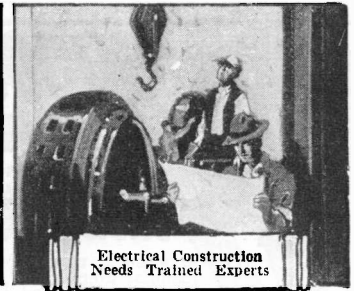
Public Buildings Are Big Users of Electricity



Huge Power Plants Need Experts to Operate Them



Hydro-Electric Plants Being Built Everywhere



Electrical Construction Needs Trained Experts

Be a Certificated Electrical Expert Earn \$3500 to \$10000 a Year In This Big Pay Field

TRAINED "Electrical Experts" are in great demand at the highest salaries, and the opportunities for advancement and a big success in this line are the greatest ever known.

"Electrical Experts" earn \$70 to \$200 a week. Fit yourself for one of these big paying positions. Big jobs everywhere are waiting for trained men to fill them.



Electrified Railways Offer a Big Field

It is the most simple, thorough, and successful Electrical Course 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.

I Give You a Real Training

As Chief Engineer of the Chicago Engineering Works, I know exactly the kind of training a man needs to get the best positions at the highest salaries. Hundreds of my students are now earning \$3,500 to \$10,000 a year. Many are successful ELECTRICAL CONTRACTORS. Every branch of Electricity is open to you when you have finished my course. My experience as a practical engineer and my most unusual course makes this possible. I even have special lessons for those who want to go into business for themselves.

ments absolutely FREE. I also furnish them with all supplies, including examination paper, and many other things that other schools don't furnish. You do PRACTICAL work—AT HOME with this Outfit. You start right in after the first few lessons to WORK AT YOUR PROFESSION in a practical way.

You Owe Yourself the Best Why Not Get It?

To make yourself the big success you want to be—to get the big money and make a name for yourself—you need the best training you can get. Get it right here—Now—Where results are guaranteed.

Learn at Home to Earn \$12.00 to \$30 a Day

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" ordinary Electricians—to boss Big Jobs—the jobs that pay. You, too, can learn to fill one of these jobs—spare time only is needed. Be an "Electrical Expert"—Earn \$70 to \$200 a week.

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. If you can read and write English, my course will make you a big success.

Some Features of My Course That Make SUCCESS Certain

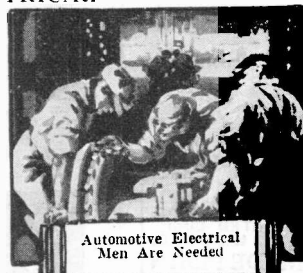
Home Study Training Revolutionized

1. Practical Money-Making Instruction—no useless, high-sounding theory.
2. Free Electrical Outfit—Finest outfit ever sent out for home experiment and practical use.
3. Free Employment Service. (Helps you get a good job.)
4. Free Consulting Service. (No chance to get stuck on anything, while studying or afterward.)
5. Free Engineering Magazine.
6. Free use of my Electrical Laboratory.
7. Extra Courses Free—Radio—Electrical Drafting.
8. Spare Time Work—Special earn-while-you-learn lessons.
9. Reduced prices on all Electrical Supplies.
10. Cash Refund Guarantee Bond.

These features are all explained in my big Free Book.

I give each student Outfit of Electrical Tools, Materials and Measuring Instru-

Get Started Now—Mail Coupon



Automotive Electrical Men Are Needed

I want to send you the "Vital Facts" of the Electrical Industry, including my electrical Book, Proof Lessons, and a sample of my guarantee bond all FREE. These cost you nothing and you'll enjoy them. Make the start today for a bright future in Electricity. Send in the coupon—NOW.

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.

FREE—Electrical Working Outfit—FREE

L. L. COOKE, Chief Engineer
Chicago Engineering Works
Dept. 527
2150 Lawrence Ave., Chicago, Ill.

L. L. COOKE, Chief Engineer Chicago Engineering Works.

Dept. 527, 2150 Lawrence Ave., Chicago, Ill.

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

Name

Address

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

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—Dynamometers—Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamometers—Electrical Instrument Testing—Practical Management of Dynamometers 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

S. I. October



\$3 **And it's yours**

DOWN

The Greatest Typewriter Bargain Ever Offered

Right now we are making you the greatest typewriter offer you ever dreamed of—an eye opener. This wonderful standard Shipman-Ward Rebuilt Underwood only \$3.00 down. Ten days' free trial and the easiest monthly payments, shipped direct to you from our big factory.

Ten Days' Free Trial

Yes, only \$3.00 down puts this genuine late model Shipman-Ward Rebuilt Underwood in your home. You can try it, test it, and then decide. See for yourself how new it is, how it writes. You must be satisfied. Your \$3.00 unconditionally returned if at the end of ten days you are not satisfied. The entire transaction will not cost you one cent.

Easy Monthly Payments

Little more than rental. Balance of payments so small you will hardly notice them, while you enjoy the use of this wonderful machine. You don't have to scrimp and save to pay cash. All at a big saving to you.

Five Year Written Guarantee

With every typewriter we give a written guarantee. These machines are rebuilt like new by the famous SHIPMAN-WARD PROCESS. Equipped

with late improvements. You can't tell them from a new machine. The world's standard typewriter, the same models as sold by the Underwood Typewriter Company today, at a big saving to you. Act Now! Get this splendid offer and save money.

Free Book of Facts

Write for this free book of facts explaining Shipman-Ward's wonderful system of rebuilding typewriters. We show you exactly how it's done. How you are able to buy them. Complete and valuable information about the typewriter industry, both instructive and educational.

ACT NOW! Mail this coupon today.

Free with Every Typewriter

A complete course in touch typewriting. You don't have to know how to operate a typewriter. You can learn to operate this machine in one day. We also give free a waterproof cover and all tools that come with a typewriter.

From Factory to You

These machines are shipped direct from our factory—the largest typewriter rebuilding plant in the world. They are rebuilt by the famous SHIPMAN-WARD PROCESS. Developed through 30 years in the typewriter business. Through our money saving methods of rebuilding and elimination of a large expensive sales force we are able to make this wonderful money saving offer to you. **ACT TODAY**, take advantage of it and you will save money.



All Shipments made direct to you from our modern factory—the largest typewriter rebuilding plant in the world.

FREE BOOK COUPON

Shipman-Ward Mfg. Co.

2167 Shipman Bldg.

Montrose and Ravenswood Aves., Chicago

Send by return mail your wonderful offer of Shipman-Ward Standard Rebuilt Underwood, also your Free book of facts. (This is not an order and does not obligate me in any way.)

Name.....

Street or R. F. D. No.....

Post Office..... State.....

SHIPMAN-WARD MFG. CO.

2167 Shipman Bldg., Chicago, Ill.

Montrose and Ravenswood Ave.