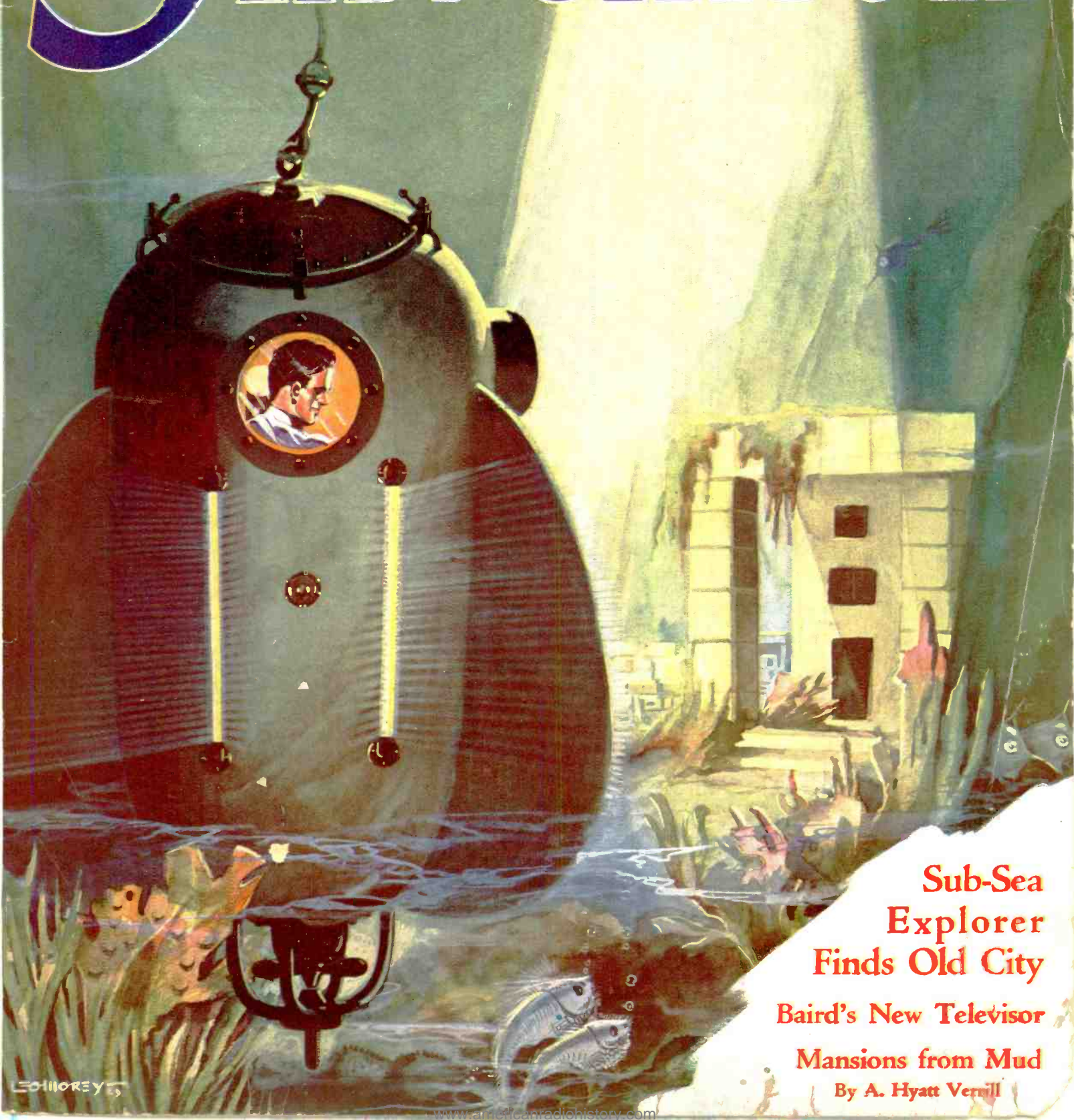


DECEMBER

25 CENTS

Science and Invention



**Sub-Sea
Explorer
Finds Old City**

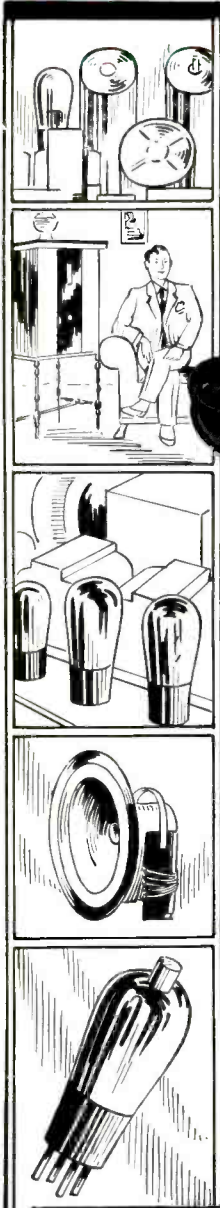
Baird's New Televisor

Mansions from Mud

By A. Hyatt Vernill

3450

SCREEN GRID CHASSIS



FREE
Radio Catalog



A POWERFUL super-sensitive A. C. receiver that answers today's demand for the ultra-modern in a high-grade screen grid receiver. It offers everything you look for that is modern in radio. Nothing has been overlooked to secure outstanding quality—advanced engineering features—or efficient performance.

It is establishing a new standard of perfection in radio design. Incorporating such advanced features as screen grid R. F., power detector, "245" push-pull power audio, dynamic tone quality plus practical scientifically shielded construction, it is blazing a new trail in perfection of circuit design. Its super power assures unusual distance range—its ultra-selectivity adapts it for use in the most congested broadcasting districts. Its remarkable tone quality and tremendous volume win for it the instant admiration of the radio purchaser.

Write Today for this new 196-page catalog full of all the latest in radio showing the new, humless, Screen Grid A. C. all-electric and battery operated sets. Beautiful consoles, dynamic speakers, accessories, parts, kits; in fact, everything in radio and all at rock-bottom wholesale prices. Hundreds of real radio bargains from a Radio House backed by over \$3,000,000 in resources. This book will save you money. Send for it now before you buy anything more in radio supplies!

Use the Coupon

Allied Radio Corporation,
Dept. D-3
711 W. Lake Street, Chicago, Ill.

Please send me your new 1930—196-page radio catalog—which we understand is to be absolutely free.

Name

Address

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

ALLIED RADIO CORPORATION

711 W. Lake St. Dept. D-3 Chicago, Ill.

FREE!



MEN! Here's the dope you've been looking for

HOW TO GET INTO THE RADIO BUSINESS-

J.E.S.

Many Earn \$50 to \$250 a Week in Work That is Almost Romance

If you're earning a penny less than \$50 a week, clip coupon now for FREE BOOK! New 64-page book pictures and tells all about the Radio business, hundreds of opportunities—in work that is almost romance! YOU can learn quickly and easily at home through my tested, proved methods to take advantage of these great opportunities! Why go along at \$25, \$35 or \$45 a week when you can pleasantly and in a short time learn how to hold the big-pay jobs?

Clip Coupon for Free Book

Don't envy the other fellow who's pulling down the big cash! My proven home-study training methods make it possible for you, too, to get ready for better jobs, to earn enough money so you can enjoy the good things of life. One of the most valuable books ever written on Radio tells how—interesting facts about this great field, and how I can prepare you in your spare time at home, to step into a big-pay Radio job. GET THIS BOOK. SEND COUPON TODAY.

J. E. SMITH, Pres.
National Radio Institute
Dept. 9-ZT
Washington, D. C.



I Have Trained Hundreds of Men at Home for Big Radio Jobs. My Book Proves I Can Do the Same for You.



J. E. Smith,
President,
National Radio
Institute
Dept. 9-ZT
Washington, D. C.

Dear Mr. Smith: Without obligating me in any way, send me your big FREE BOOK, "Rich Rewards in Radio," and all information about your practical, home study Radio Course.



I Give You 6 Big Outfits of Radio Parts

With them you can build 100 different circuits—learn the "how" and "why" of practically every type of Radio set made. This kind of training fits you to step into the good jobs—sends you out an experienced Radio expert. When you complete, my Employment Department will help you get a real big Radio job like Graduate Edward Stanko, now chief operator of Station WGR, or Frank M. Jones, 922 Guadalupe St., San Angelo, Texas, builder and operator of Station KGFI and manager of the best equipped Radio shop in the southwest, or help you start a Radio business of your own like Richard Butler, 1419 N. 17th St., Philadelphia, Pa., who made around \$500 a month—compared with a small salaried, no future job as a motorman when he enrolled.

My Radio Training is the Famous "Course That Pays for Itself"

Spare time earnings are easy in Radio almost from the time you enroll. G. W. Page, 1807 21st Ave. S., Nashville, Tenn., made \$935 in his spare time while taking this course. Al Johnson, 1409 Shelby St., Sandusky, Ohio, \$1,000 in four months, and he didn't know the difference between a condenser and a transformer when he enrolled. I'll give you a legal contract, backed by N. R. I., pioneer and largest home-study Radio school in the world to refund every penny of your money if you are not satisfied, upon completing, with the lessons and instructions received. Find out what Radio offers you—get the facts. Mail coupon—RIGHT NOW.

ACT NOW~COUPON BRINGS MY

FREE BOOK

Name..... Age.....
Address.....
Town..... State.....

UP-TO-THE-MINUTE ARTICLES *in this* Issue by WELL-KNOWN AUTHORS

General Science

Have You Musical Fingers?.....	676
Editorial	682
2,500 Feet Under the Sea.....	684
<i>By H. E. Serner</i>	
Mansions of Mud.....	686
<i>By A. Hyatt Verrill, famous Archeologist and Tropical Explorer</i>	
Ashes Removed by Vacuum.....	687
Newest Aviation Ideas.....	688
Gas-Electric Car Has No Gear Shift.....	690
This Car Pulls Instead of Pushes.....	690
Baird's Newest Televisor.....	691
<i>By H. Winfield Secor, E. E.</i>	
Measuring Heights and Depths With Sound.....	692
<i>By Botho Von Romer, German Correspondent</i>	
New York Plans New Tunnel.....	693
New Ways to Detect Icebergs.....	693
<i>By Dr. Howard T. Barnes, Department of Physics, McGill University</i>	
40,000 Horse-power From a Three-Foot Pipe.....	694
<i>By Charles W. Geiger</i>	
Six Miles a Minute!.....	694
Would You Believe It?.....	695
New Toys	696
<i>By Joseph H. Kraus</i>	
New York to Manilla by Air.....	699
You Can't Fool This Plane!.....	699
Some Recent Inventions Based Upon Modern Chemistry... 700	
When the Fates Fooled Harry Kellar.....	701
<i>By "Dunninger"</i>	
In the Scientific Spotlight.....	702
Super-Refined Oil.....	704
<i>By Alfred M. Caddell</i>	
Von Opel Makes First Rocket Plane Flight.....	705
Huge Circular Air Station for Kansas City.....	705
Amateur Talkie Equipment.....	706
What Oil Heat Offers.....	707
<i>By Harry F. Tapp</i>	
Motor Hints for Owner and Driver.....	708
<i>Conducted by George A. Luers</i>	
Latest Automobile Devices.....	709
Magic—A Monthly Feature.....	710
<i>By "Dunninger"</i>	
Can You Answer These Scientific Questions?.....	711
Cross-Number Puzzle—To Test Your Wits.....	715
What Our Readers Think.....	722
Scientific Humor	728
The Oracle	729
Latest Patents.....	730
Financial Article	764
<i>By Alfred M. Caddell</i>	

Patent Advice	742
<i>By Joseph H. Kraus</i>	

Aviation

Newest Aviation Ideas.....	688
Latest Aviation Toys for the Kiddies.....	696
Six Miles a Minute!.....	698
New York to Manilla by Air.....	699
You Can't Fool This Plane!.....	699
Von Opel Makes First Rocket Plane Flight.....	705
Huge Circular Air Station for Kansas City.....	705

Chemistry and Electricity

Baird's Newest Televisor.....	691
New Ways to Detect Icebergs.....	693
Electric Power From Water.....	694
Latest Electric Toys.....	696
Recent Chemical Discoveries.....	700
Super-Refined Oil	704
How to Make Rayon.....	714
Short-Cuts for the Young Chemist.....	714

Home Movies

Amateur Talkie Equipment.....	706
How to Develop Your Own "Home Movies".....	712
<i>By Don Bennett</i>	

Automotive

Gas-Electric Car Has No Gear Shift.....	690
This Car Pulls Instead of Pushes.....	690
Toy Racing Auto.....	696
Making Used Oil Better Than New.....	704
Motor Hints	708
Newest Auto Devices.....	709

Radio and Television

Baird's Newest Televisor.....	691
Remote Radio Control for the Amateur.....	724
Look In! R. C. A. is Televising.....	725
New Radio Devices.....	726
Radio Oracle	727

How to Make It

Christmas Gifts From the Home Wood Turner.....	713
<i>By H. L. Weatherby</i>	
How to Make Rayon.....	714
Hints for the Home Workshop.....	716
How-To-Make-It Department	718
Wrinkles and Recipes.....	720

NEXT MONTH *and* LATER

The City of Tomorrow Is Space Curved?

A highly interesting article treating in a popular manner the much discussed curved space of Professor Einstein, explained by Dr. Menzel.

How Useless Swamps Are Be- coming Airports

Plenty of Construction, How-To- Make-It Articles and Wrinkles

Record-Breaking Model Airplane

Making Silhouettes Without Scissors

Tricks With a Phonograph

WITH OUR AUTHORS

H. E. SERNER, author of "2500 Feet Under the Sea," is a mechanical engineer of many years experience and he has worked out many of the details and the general design of the sub-sea exploring tank used by Dr. Hartman. Dr. Hartman is also an engineer of many years' experience, particularly in the special field of sub-sea photography.

A. HYATT VERRILL, well-known archeologist and tropical explorer, makes annual pilgrimages to his favorite stamping ground—Peru. Mr. Verrill is the author of many extraordinary scientific fiction tales and has written a great deal concerning his interesting discoveries over a period of many years spent in Peru. Mr. Verrill is "full of his subject," and we are sure that our readers will be delighted with his "Mansions of Mud" article in this issue.

DUNNINGER, who writes on "How the Fates Fooled Harry Kellar" in this number, is a famous magician and mentalist of many years experience; he enjoys

the unusual distinction of numbering among his personal friends all of the leading magicians. His last story told how fate fooled Houdini.

DR. HOWARD T. BARNES, of McGill University, Montreal, is professor of physics at this famous institution, and he is particularly noted for his work in destroying huge ice jams in rivers by the use of thermit. He is the author of the book "Ice Engineering" and undoubtedly the greatest living authority on the problem of ice elimination.

RICHARD HOADLEY TINGLEY, who prepared the cross-number puzzle on which you will probably expend several hundred foot-pounds of mental energy, is a civil engineer by profession. In his later years he has been writing for a number of leading American magazines and newspapers. Mr. Tingley has prepared a great number of cross-word and cross-number puzzles, which are appearing in newspapers clear across the country. He possesses the happy faculty of not only making a puzzle interesting, but educational as well.



Are You Caught Behind the Bars of a "Small-Time" Job?

Why be satisfied with a "small-time" job at low pay? Why grind along at tiresome, uninteresting work with long hours and no future? Why take orders all your life from every Tom, Dick, and Harry who happens to be your boss? Right now—this very minute—you hold the key to REAL SUCCESS in your hand. Hundreds of other

men before you have read of COYNE just as you are doing now—and are making \$30—\$75—\$150 a week as a result. This is your BIG CHANCE to get friendly help and practical training that will enable you to climb out of the rut, and EARN REAL MONEY! Don't miss it! Today may be the big turning-point in your whole life!

LEARN ELECTRICITY Without Books or Correspondence IN 12 WEEKS

By Actual Work—in the Great Shops of Coyne

SOME kinds of jobs ought to be labeled with a big sign that says "Man-killer." They are either so heavy, dirty and hard that they sap a man's strength and keep him dog-tired all the time—or else they are so disagreeable, uninteresting and poorly paid that they kill his ambition in almost no time. And AMBITION is the most valuable thing a man can have!

Fascinating Work—Real Pay!

That's why so many men are turning to ELECTRICITY, which offers unlimited rewards and opportunities—with ordinary salaries of \$50—\$75 and up a week! Right now big electrical jobs are actually going begging! Electrical experts are in demand—and the need is growing every day! The situation is one that spells O-P-P-O-R-T-U-N-I-T-Y in letters a foot high for the man who is wide-awake enough to see it!

Learn Quickly

Let me make you a master electrician—the Coyne way. I've done it for thousands of others—farmers, laborers, factory men, and hundreds who haven't had more than 8th grade education! I can do it for you—and start you off on the road to independence and big earnings in just 90 days!

Not by Books

The secret of Coyne-training is that it is ALL PRACTICAL work. No books—no dry lessons—no useless theory. In the great shops of COYNE you learn the "ins and outs" of Electricity by actual work on real electrical equipment—the finest outlay in the country! And best of all—experts work right with you every step of the way, showing you all the electrical secrets that are essential to your success!

No Advanced Education or Experience Needed

With a personal, practical method like this, is it any wonder I say I can make any man into a master electrician in 12 happy weeks? You don't need a bit of previous experience or advanced education. Many of our most successful graduates are fellows who never went to high school and hated "book learning." The Coyne method is different!

Big Pay Jobs

are common in electricity. Our free employment bureau puts you in touch with openings to choose from. The following are only a few of the kind of positions you fit yourself for in the Great Shops of Coyne:

- Farm Lighting Experts \$60 to \$100 a Week
- Armature Expert \$50 to \$100 a Week
- Power House Operator \$50 to \$75 a Week
- Auto Electrician \$50 a Week and up
- Inventor - Unlimited Income
- Maintenance Engineer \$60 a Week and up
- Service Station Owner up to \$200 a Week
- Radio Expert, \$60 a Week and up
- Contractor, \$3,500 to \$15,000 a Year

Special Reduced Tuition Offer

NOW—For a short time I am making a Special 30th Anniversary Offer. You can now get a real money-making training at the lowest price.

Special Offer Now

Make up your mind today to get into one of these real-pay electrical jobs. If you act now—I'll pay your railroad fare to Chicago and give you these courses free! AVIATION ELECTRICITY, RADIO and AUTOMOTIVE ELECTRICITY! And besides that, I help you to a part-time job while learning! FREE employment service for life after graduation, too. We place dozens of men in wonderful jobs every week.

Send for FREE Book

Just give me a chance to tell you about the unlimited opportunity that awaits you. Let me send you this big book free, containing over 150 photographs and listing and telling you how you can qualify for the kind of jobs that lead to \$75 to \$200 a week. If you really want more money and a wonderful future, send for this book now! No obligation. Simply mail the coupon.

Mail This FREE BOOK Coupon To-day

COYNE ELECTRICAL SCHOOL

H. C. LEWIS, Dept. 99-27
500 South Paulina Street, Chicago, Ill.

Dear Mr. Lewis:—I want the facts, so without obligation, send me your free illustrated catalog and details of your R. R. fare.

Name.....

Address.....

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

COYNE ELECTRICAL SCHOOL

500S. Paulina St., Dept. 99-27 H. C. Lewis, Pres., Chicago

Have You "Musical Fingers"?

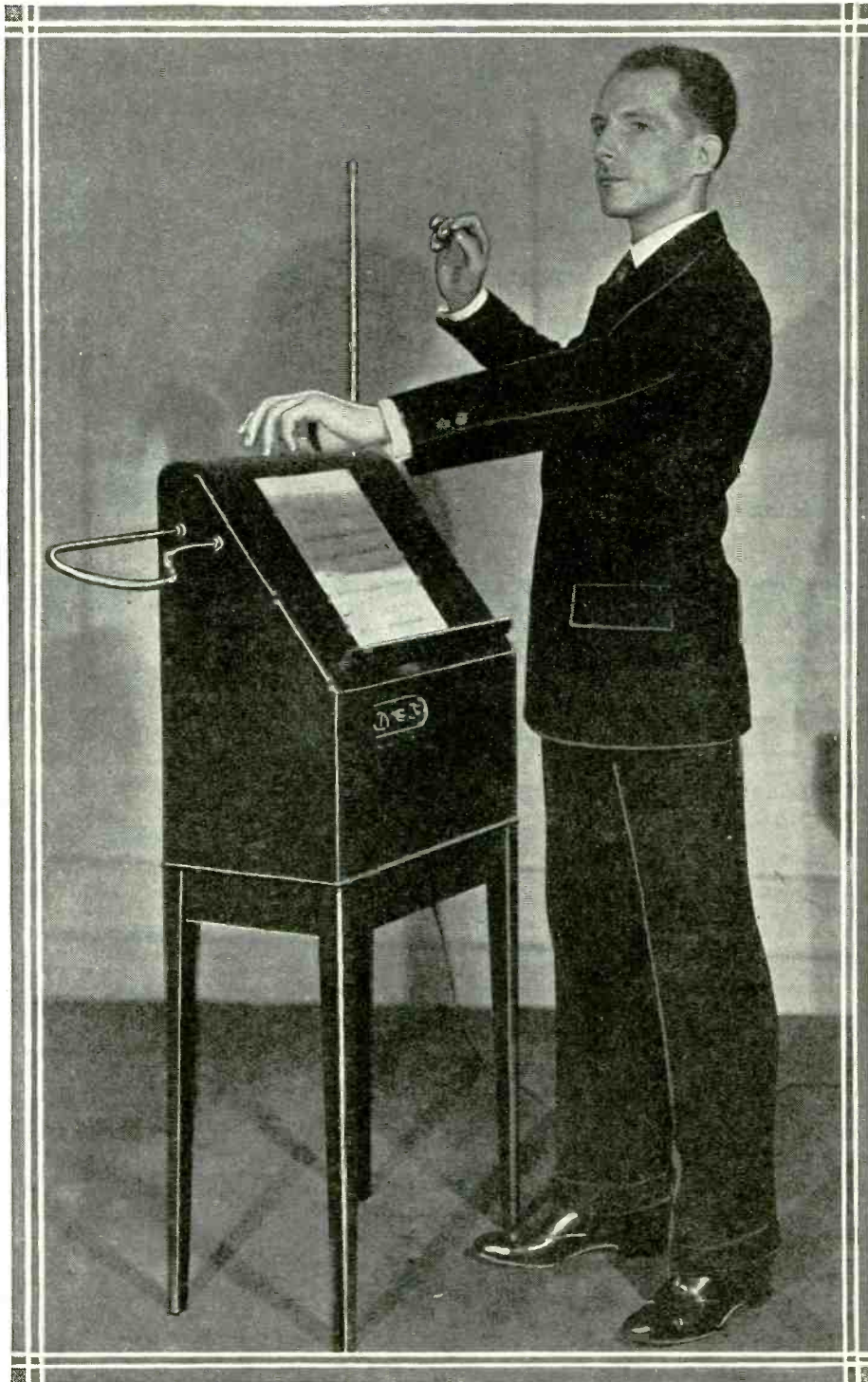


Photo courtesy Radio-Victor Corporation of America

Prof. Leon Theremin, the young Russian scientist, who showed us how to obtain musical notes and chords by a simple wave of the hand. It is claimed that anyone who can hum a tune can learn to play this "Theremin"—which is to be sold at a nominal price. Movements of the left hand with respect to the loop control the volume; moving the right hand toward or away from the vertical rod changes the pitch and tone. The sound-producing currents originate from two oscillating circuits, producing a beat frequency or note, which operates a loud speaker within the Theremin.

READY! A Completely New ENCYCLOPAEDIA BRITANNICA



This handsome bookcase table, made of genuine Brown Mahogany, is included with every set of the new Britannica.

Greatest Knowledge Book of All Times

HUMANIZED—"picturized"—recast from cover to cover—the first copies of the new 14th Edition of the Encyclopaedia Britannica are just off the printing presses!

Three years of intensive editorial work . . . an expenditure of more than \$2,000,000 before a single volume was printed . . . 15,000 superb illustrations . . . 3,500 world-famous contributors . . . that is the amazing story of the new Britannica!

An Encyclopaedia such as you have never seen before

Only the tremendous resources and prestige of the Britannica could have made possible an achievement like this. Now it is done, and the new Britannica instantly takes its place as *America's outstanding work of reference—the world's supreme court of scholarship.*

New in plan and purpose, this 14th Edition is doubly new in the important place it gives the knowledge of today. New discoveries in science, modern trends in art, revelations in history, up-to-the-minute technique in sports, handicrafts or manufacturing—all are brought into lucid relation with the time-tried learning of the past.

3,500 Famous Authorities

In this new Britannica the "how" is as important as the "why." Recognized leaders in every field of human activ-

An Amazing Work

35,000,000 Words

New from Cover to Cover

Cost More Than \$2,000,000

15,000 Illustrations Many in Color

Nearly 500,000 Index References

Remember—this is a new work! Only a small amount of text that could not be improved in any way is retained from previous editions.

ity tell not only *what* is done, but *how* to do it. From them you learn the everyday technique of work and sport as well as the profound opinions of science.

Business men reaching out for new markets—housewives faced with the practical problems of the home—all alike can find authoritative help in the new Britannica. For the general reader it is an alluring invitation to master any

phase or field of human knowledge.

Each feature in the physical make-up of the new Britannica is a triumph of printer's and binder's arts. The color illustrations alone mark it instantly as a super-encyclopaedia. Your whole family will share with you the pleasure of the new Britannica!

Extremely Low Price

Not for two generations has a completely new edition of the Britannica been offered at a price as low as this! Mass production on a scale never before possible gives you this set at a fraction of what it would otherwise cost.

Everywhere in America men and women are sending in their orders for the new Britannica. To own a set of the first printing on the present favorable terms you should act without delay! Easy payments, if desired. An initial payment of only \$5.00 brings the complete set and mahogany bookcase table to your home.

56-Page Booklet—FREE

It includes specimen pages, maps, color plates from the new Britannica. We will gladly send you your copy without the slightest obligation on your part. It gives full details of bindings, present low prices and easy payment offer. You owe it to yourself and to your family to be fully informed about the new Britannica.

Now—while you have this page at hand—tear out the coupon and send it in!

ENCYCLOPAEDIA BRITANNICA, Inc. S19-D2
342 Madison Avenue, New York City

Please send me by return mail, without any obligation on my part, your 56-page illustrated booklet describing the new Fourteenth Edition of the Britannica together with low price offer and easy terms of payment.

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

MAIL THIS COUPON TODAY

The
NEW
Remington
Portable
With Eight New Features

EIGHT years ago, the Remington Portable was launched—to revolutionize its field and become the world's largest seller.

It was the first portable typewriter with standard four-row keyboard. Big machine dependability, speed and quality of work. The famous Remington feather-finger touch. Every essential refinement found on a regular office typewriter—but only one-fourth the size and weight.

The public demanded nothing better. But for eight years, Remington engineers have been working to produce its successor—the perfect portable typewriter—the one you've wanted without knowing it!

Here it is . . . with

1. *A new streamline body*—added beauty and even greater strength.
2. *Type bars always in writing position*—no raising or lowering.
3. *Perfect visibility*—nothing between your eye and what you write—no shadow on your work at any time.
4. *A new carriage-return lever*—easier to operate.
5. *A new paper bail*—holds paper tight to extreme bottom of page.
6. *A new carriage lock*—protects machine from accident or misuse by others.
7. *A new margin release*—on the keyboard.
8. *Paragraph key*—brand new—makes neater work by indenting paragraphs uniformly—simple as a space bar, five times as fast—invaluable for tabulating.

Call nearest sales office for full particulars . . . Don't delay—REMINGTON RAND BUSINESS SERVICE, INC., Portable Typewriter Division, 374 Broadway, New York.



TYPEWRITING makes writing easy—REMINGTON makes typewriting easy

4 of the 40 Easy Ways to Make \$3⁰⁰ an Hour

In Your Spare Time in RADIO

Below
are a few of
the reports
from those now
cashing in on the
"40 Easy Ways"

THE four plans shown are but a sample of the many ways in which our members are making \$3.00 an hour upwards, spare time and full time, from the day they join the Association. If you want to get into Radio, have a business of your own, make \$50 to \$75 weekly in your spare time, investigate the opportunities offered the inexperienced, ambitious man by the Association.

Our Members Earning Thousands of Dollars Every Week

The Association assists men to cash in on Radio. It makes past experience unnecessary. As a member of the Association you are trained in a quick, easy, practical way to install, service, repair, build and rebuild sets—given sure-fire money-making plans developed by us—helped to secure a position by our Employment Department. You earn while you learn, while you prepare yourself for a big-pay Radio position.

The Association will enable you to buy parts at wholesale, start in business without capital, help you get your share of the \$600,000,000 spent annually for Radio. As a result of the Association, men all over the country are opening stores, increasing their pay, passing licensed operator examinations, landing big-pay positions with Radio makers.



Mail Coupon Today for the FREE HANDBOOK

It is not only chock-full of absorbing information about Radio, but it shows you how easily you can increase your income in your spare time. Mailing the coupon can mean \$50 to \$75 a week more for you.

Radio Training Association of America
4513 Ravenswood Avenue Dept. RN-12, Chicago, Illinois



Clears \$3,000.00 Frank J. Deutch, Pa.—"Since joining the Association I have cleared nearly \$3,000.00. It is almost impossible for a young fellow to fail, no matter how little education he has, if he will follow your easy ways of making money."

\$1,100.00 in 6 Weeks J. R. Allen, Calif.—"Have done over \$1,100.00 worth of business in the last 6 weeks. Next month I am going to open up a store of my own. I never knew that money could come so fast and easy."

\$25.00 a Week Spare Time N. J. Friedrich, N. Y.—"I have averaged \$25.00 a week for the last 7 months even though I am not a graduate but just learning."

Training Lands Him Job R. C. Kirk, N. C.—"Your training has been very valuable to me. I landed a job with the big department store out here a few weeks ago because I had my membership card with me. There were a large bunch of applications ahead of me."

ACT NOW If You Wish NO-COST Membership

For a limited time we will give to the ambitious man a No-Cost Membership which need not—should not—cost you a cent. For the sake of making more money now, and having a better position in the future, mail coupon below now. You'll always be glad you did.

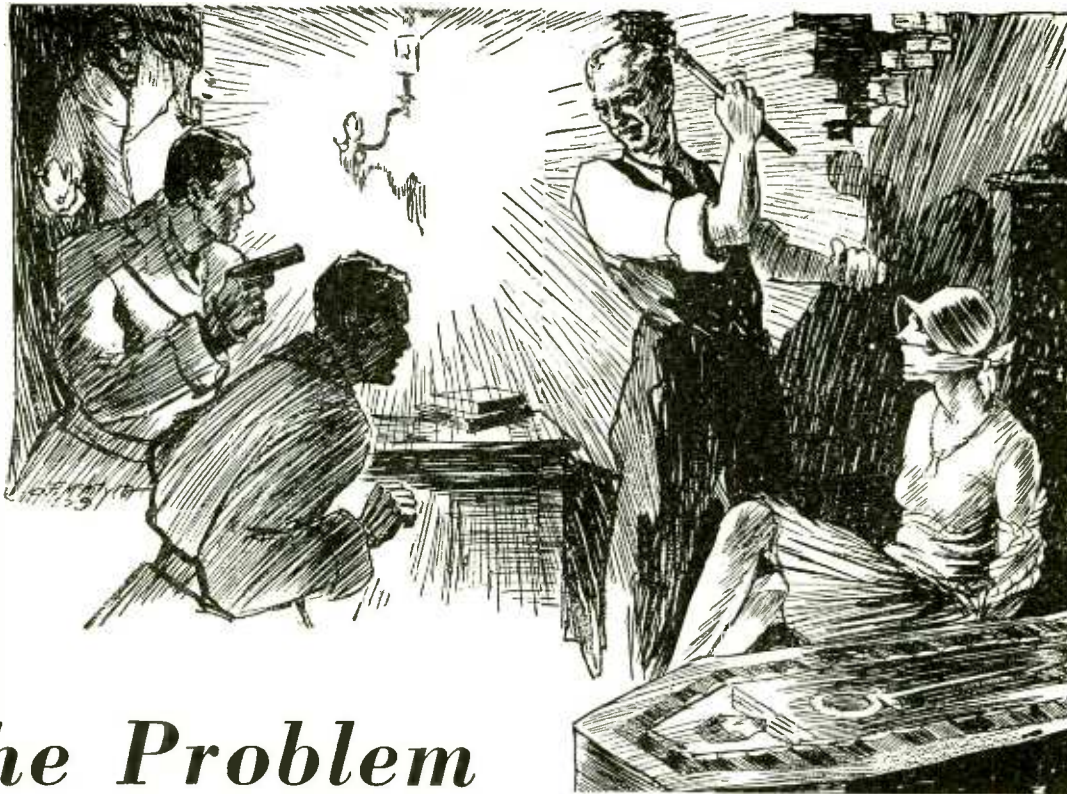
Radio Training Association of America
Dept. RN-12, 4513 Ravenswood Ave., Chicago, Ill.

Gentlemen: Please send me by return mail full details of your Special No-Cost Membership Plan, and also a copy of your Radio Handbook.

Name _____

Address _____

City _____ State _____



The Problem of the Twin Mummy Cases..

WHEN the rich and eccentric old Jonas Fielding was cruelly murdered in the secret vault underneath his smart Gramercy Park home, it wasn't a case of simple burglary. It was undoubtedly much more than that!

Why, for instance, did he tell his nephew, Philip Norris, whom he called suddenly on the phone shortly before his death, that he didn't expect to live much longer? Why did he term the simple looking empty Egyptian mummy case his "Treasure of Treasures"? Who were the hidden enemies he feared? Who was the beautiful girl whose portrait hid the entrance to old Fielding's secret vault?

How Would You Solve It?

Those are the questions that ran through Philip Norris' mind when he found himself suspected of the murder. Then Chance stepped in and gave him a clue, for he meets the girl of the portrait face to face, and she flees at sight of him!

What would you do if you were in Philip Norris' place? See if you can solve "The Gramercy Park Mystery" before he does.

• The Great Thinkers of the World Are Doing It Today

Every day more and more men are reading detective novels in their moments of relaxation. They find that it brings

them a fascinating, hair-raising story which takes their thoughts off business, but exercises and improves the reasoning power of their minds.

Formerly \$2, Now They Cost Only 25c

Complete Detective Novel Magazine is published to produce just such stories at the lowest possible cost. Each month it brings you the equivalent of a \$2 book-length novel complete in one issue for only 25c! The complete novel for December is "The Gramercy Park Mystery," by Marion Harvey, the beginning of which is described briefly above.

Get It from Your Newsdealer

Get a copy from your newsdealer today. Test your reasoning powers, and at the same time enjoy several evenings' reading pleasure.

Or, if your newsdealer is already sold out, send 25c in stamps or coin to Dept. 2412Y, Complete Detective Novel Magazine, 381 Fourth Avenue, New York, N. Y., and we will forward you "The Gramercy Park Mystery" postpaid by return mail.

A Complete
Novel
in Every
Issue

COMPLETE
**DETECTIVE
NOVEL**
MAGAZINE

Only
25c
at all
Newsstands

If YOU Were Down and Out



AND I agreed to start you in a big, new, money-making business of your own—RIGHT AT HOME IN YOUR SPARE TIME—a business in which I have helped other ambitious men and women double, triple and QUADRUPLE their earnings, would you jump at it? You BET YOU WOULD!

Well, you may not be down and out. But if you are earning A CENT LESS than \$100 a week—\$5,000 a year—here is your chance to break into real estate MY WAY—build a big-profit business of your own—and make MORE money than you ever made before. My free book tells the whole story. Get it now!

From Failure to Success

I like to get hold of the down-hearted—the discouraged—the “has beens” and the “also rans.” It gives me a big “kick”—a real thrill—every time I help a man or woman who felt they were failures. It’s easy enough to make successful men more successful. But give me the man who is struggling along—trying to make both ends meet—who has never had a real “look-in” on business success. The most fun I get out of life is turning such men into happy, contented, prosperous, independent business men. And I’m doing it right along! There’s E. G. Baum, past 50, lost his job as book-keeper, sick, discouraged, downhearted. I got Baum started and he cleaned up \$8,000.00 his first year. And J. M. Patterson. He’d just landed in Texas with a baby, a sick wife and only \$10.20 in his pocket. He started to use my Successful Real Estate System, and writes me that he will clean up \$20,000.00 in profits this year. Send for my free book. Learn how I am helping others—and how I can help you—win big business success.

New Lives for Old

I teach ambitious men and women my way of making big money in the Real Estate Business, without previous experience. I give them new lives for old. I transform them from low-salaried employees to successful employers—in business for themselves—independent—prosperous—contented—men and women from 21 to 79—from all walks of life—former mill-hands, clerks, railroad men, barbers, hotel employees, grocers, salesmen, bookkeepers, teachers, ministers, printers, musicians, insurance solicitors, etc., etc. Take “Bill” Dakin for example. He worked for fifty years in a New York steel plant. Never had any schooling to speak of. Never had any real-estate experience. Bill jumped at my offer. Writes me that last month he earned \$1,125 my way. Write for a free copy of my book today. Learn how wide-awake men and women are changing their jobs—trading old lives for new—with my System for Becoming a Real Estate Specialist. Address President, American Business Builders, Inc., Dept. M-15, 205 East 42 St., New York.

Mail Coupon



for **FREE** Book

Amazing Profits

\$17,000 IN ONE DEAL

Eugene Walfrath, formerly in the clothing business. Got my scientific System for making money in real estate. Cleaned up \$17,000 in one deal. Free book tells how he did it.

\$5,500 IN 1 WEEK

Evalynn Balster, Illinois widow, school teacher, three children to support, got my System, made \$5,500 in one week on her first real estate deal. Free book tells how!

\$8,500 IN 17 WEEKS

That’s the big money Chas. F. Worthen, Massachusetts, made with my successful Real Estate System. Free book tells you how I helped him to do it!

\$14,400 IN 6 MONTHS

That’s the fat profit H. G. Stewart, Maryland, made with my remarkable System for making big money in real estate. Stewart is a live wire. Are you? Get my free book and find out!

\$248 FIRST PROFIT

That’s the first pin-money Mrs. J. H. Hastings, Michigan, made with my System for Becoming a Real Estate Specialist. She has a fine business lined up. Free book tells how!

200% MORE MONEY

Alfred J. Bennett, Ford Salesman, was earning \$300 a month. Got my Real Estate System. Increased income 200%. Has well equipped office. Just bought new Chrysler Sedan. Free book tells how!

FREE

**“How to Become
A Real Estate
Specialist”**



Mail This
Coupon
Now!

Pres.
American
Business
Builders, Inc.
(Established 1917—
Capital \$500,000)

Dept. M-15

205 East 42 St., New York

Send me—without cost or obligation—
your free illustrated book “How to Become
a Real Estate Specialist.”

Name

(Please print or write plainly)

Address

City

State

Arthur H. Lynch, EDITORIAL DIRECTOR

H. WINFIELD SECOR, E.E.
Managing Editor

JOSEPH H. KRAUS
Field Editor

T. O'CONNOR SLOANE, Ph.D.
Associate Editor

ALFRED M. CADDELL
Financial Editor

AUGUSTUS POST
Aviation Editor

WILLIAM F. CROSBY
Marine Editor

Editorial

... THE TALKIES. One by one, and in large groups, the motion picture houses are going "talky." Within a few months we have witnessed a complete recasting of the motion picture industry. This upheaval has caused many stars to lose their brilliance and has made more lustrous some other lucky individuals who, up to now, never had a chance.

Most of us know little and care less about the mechanics of this change, but it is a most interesting story and is just another indication of the rapidity with which our business methods may be completely upset and rebuilt. New actors, new directors, new continuity writers, new camera men and new technique, are but a few of the changes the talkies have brought us.

From the standpoint of applied science, most of us can learn a great deal from the talkies. When the recording is done by an electrical reproducing method employing wax, great care must be taken in the preparation of the wax to hold what is termed "surplus noise" down to the lowest possible scale. Where the voice and music recording is made a part of the film, there is a great opportunity for chemists to exert their skill in the proper compounding of those chemicals which form the film emulsion, sensitive to the light ray, as well as in the production of the extremely delicate light-sensitive cells which are used in converting the rapidly changing sound frequencies into the light frequencies which are recorded on the film. One of the least understood among the electrical phenomena is high-frequency alternating current. This form of current is, to a large extent, the current used in the talkies. The intricate mechanisms providing synchronism between the electrical and mechanical units, which comprise the recording and reproducing units for the talkies, require an accuracy of manufacture usually confined to such skilled arts as watch manufacture.

The application of a great many of the fundamentals found in the commercial talkies has come directly from the large radio laboratories. This is indeed a fertile field for experimentation, and it is very likely that a great many home talking movie outfits will be used by many experimenters for the development of ideas which will further improve the commercial product.

In spite of the giant strides that have been made in the last year, there is still plenty of room for improvement in color motion picture photography,

recording equipment, and the proper application of all of these ideas to fit the particular acoustic properties of the theatres to the talking movie systems.

* * *

... SANE FLYING. The Department of Commerce insists that pilots engaged in regular passenger transport service shall pass a physical examination every six months. The wisdom of this ruling cannot be questioned. It means better flying by better men, and a very fine protective measure against any irregularities in the actual travel on air routes.

It is very gratifying to know that the Universal Air Lines believes so thoroughly in the fundamental idea, that arrangements are made for examination of every one of its pilots every two months. By this method the pilots are known to be in excellent condition, and just as soon as their record indicates a tendency toward staleness, they are given a rest. A few more intelligent steps of this nature will do much to reassure many of those who are still to become air-minded.

* * *

... THE ROCKET DRIVE. Fritz von Opel, in Germany, and Prof. Robert H. Goddard, in this country, have been devoting a great deal of time to the study of propelling vehicles by the explosion of rockets. The most recent, and perhaps most spectacular of these tests, was concluded by von Opel a short time ago. He drove a rocket propelled plane a mile and a quarter, at the rate of about 60 miles an hour. The plane he used was to a large extent an adaptation of one of the famous German gliders. This means of providing power for the movement of automobiles and airplanes would, it seems, be extremely expensive and inefficient, but the gentlemen whose energies are being turned in this direction believe that most of the present inefficiency may be eliminated, and that there is a real possibility of applying more highly developed devices of this kind successfully.

R. T. I. QUALIFIES YOU TO MAKE MONEY AND ITS SERVICE KEEPS YOU UP-TO-THE-MINUTE ON THE NEWEST DEVELOPMENTS IN RADIO, TELEVISION, AND TALKING PICTURES R. T. I.

*Easy to Get into
this **BIG**
Money Making
Work*

**\$60 to \$125⁰⁰
A WEEK
Radio
Operator**

**\$8 to \$15⁰⁰
A DAY
Servicing and
Repairing Radio Sets**

**\$5000⁰⁰ A YEAR
AND UP
Radio Engineer
for Broadcasting Station**

**\$85⁰⁰ A WEEK
Installing and
Repairing
Picture Equipment**

GOOD JOBS Right at Your Finger Tips
WHEN YOU ARE R.T.I. TRAINED IN
RADIO-TELEVISION ~ Talking Pictures

BIG PAY JOBS! SPARE TIME PROFITS! A FINE BUSINESS OF YOUR OWN! They're all open to you and other live wire men who answer the call of RADIO. The fastest growing industry in the world needs more trained men. And now come Television and Talking Movies—the magic sisters of Radio. Will you answer this call? Will you get ready for a big pay job NOW and step into a BIGGER ONE later on? You can do it EASILY now.

R. T. I. Home Training

Puts You In This Big Money Field

Radio alone, pays over 200 MILLION DOLLARS a year in wages in Broadcasting, Manufacturing, Sales, Service, Commercial Stations and on board the big sea going ships, and many more men are needed. Television and Talking Movies open up other vast fields of money-making opportunities for ambitious men. Get into this great business that is live, new and up-to-date, where thousands of trained men easily earn \$60 to \$100 a week—where \$10,000 a year jobs are plentiful for men with training plus experience.

Easy To Learn At Home—In Spare Time

Learning Radio the R. T. I. way with F. H. Schnell, the "Ace of Radio" behind you is EASY, INTERESTING, really FUN. Only a few spare hours are needed and lack of education or experience won't bother you a bit. We furnish all necessary testing and working apparatus and start you off on practical work you'll enjoy—you learn to do the jobs that pay real money and which are going begging now for want of competent men to fill them.

Amazingly Quick Results

You want to earn BIG MONEY, and you want some of it QUICK. R. T. I. "Three in One" Home Training—Radio-Television-Talking Movies—will give it to you, because it's easy, practical, and



FRED H. SCHNELL
Chief of R. T. I. Staff
Twenty years of Radio Experience. First to establish two-way amateur communication with Europe. Former Traffic Manager of American Radio Relay League. Lieut. Commander U.S.N.R. Inventor and Designer Radio Apparatus. Consultant Radio Engineer. Now in charge of R. T. I. Radio Training—and you will like his friendly manner of helping you realize your ambition.

is kept right up-to-date with last minute information. In a few weeks you can be doing actual Radio work, making enough EXTRA MONEY to more than pay for your training. In a few short months you can be all through—ready to step into a good paying job or start a business of your own. A BIG JOB—BIG MONEY—A BIG FUTURE. There is no other business in the world like it.

Investigate—Send For R. T. I. Book Now

Don't waste a minute. Find out what the great Radio Industry, which has grown faster than the Automobile and Motion Picture business, has to offer you. Find out what other men are earning. SEE HOW EASILY YOU CAN GET STARTED. Get the facts about Radio, Television and the Talking Pictures, first hand, in the big R. T. I. FREE BOOK. Learn what this R. T. I. "Three in One" Home Training can do for you. Mail the Coupon for FREE BOOK NOW.

**Radio & Television Institute
Dept. 91
4806 St. Anthony Court, Chicago**



**R.T.I. Training
Brings Big Jobs
Like These!**



Earned \$500 Extra Money in Two Months

Your radio course has enabled me to earn over \$500 in two months' spare time work. Understand that this is all spare time work, as I have a permanent position with my father in our store. I give you all the credit for the above and as I said before, I wish to finish the entire course as soon as I can.—Your student, J. NOFFSINGER
Greenville, Ky. R 1, Box 37.



Salary Raised 331-3% Since Enrolling

You may be interested to know that I am now Radio Service Manager for the H. N. Knight Supply Co. who are distributors for Eveready Radio Receivers in the State of Oklahoma, and Texas (Pawnee), with an increase in salary of about 331-3% since I enrolled with your school. Thanking you for your interest you have shown in me, and your wonderful course, I am, EARL F. GOSBON, 618 East 6th St., Oklahoma City, Okla.



Makes \$25 a Day

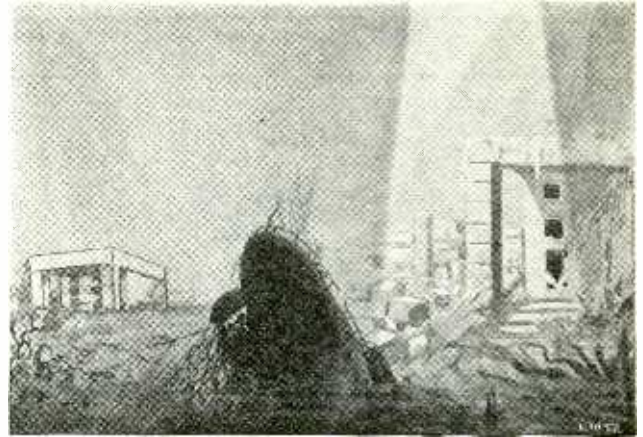
Haven't forgotten you. How could I when I make as high as \$25.00 per day and have made \$600.00 in two months from Radio work. That's not so bad when I'm only 19 and in a small town. I just looked over the catalog you sent me before I enrolled, and you did about all you said you would and about as much more.—ELOYN KNISMY,
R. F. D. 2, Box 51, St. Joe, Ind.

RADIO & TELEVISION INSTITUTE
Dept. 91, 4806 St. Anthony Court, Chicago
Send me Free and prepaid your BIG BOOK "Tune In On Big Pay" and full details of your three-in-one Home Training (without obligating me in any way).

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

R. T. I. TRAINS YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN

DR. HANS HARTMAN, the hero of our present story and the only man who ever descended to a depth of 2,500 feet beneath the surface of the sea, discovered the ruins of an ancient city at a depth of about 350 feet. Is it the lost Atlantis?



2,500 FEET UNDER *the*

American Scientist Breaks All Depth Sunken City in the Mediterranean.

An Interview with

Dr. Hans Hartman

By H. E. Serner

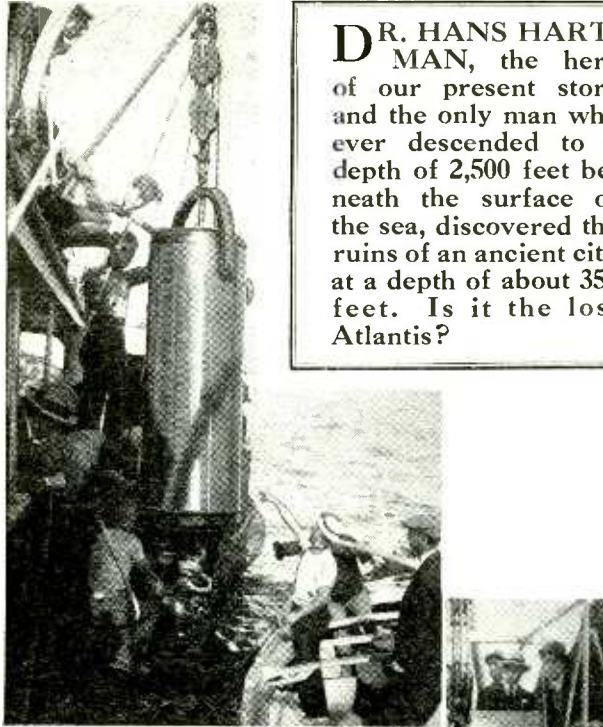
Consulting Engineer

COURAGEOUS men went to frozen poles, into tropical wilds and burning deserts in quest of knowledge. Others traced ancient culture, establishing piece by piece the earliest dawn of human civilization. The earth has now been explored and white spots on the maps have vanished.

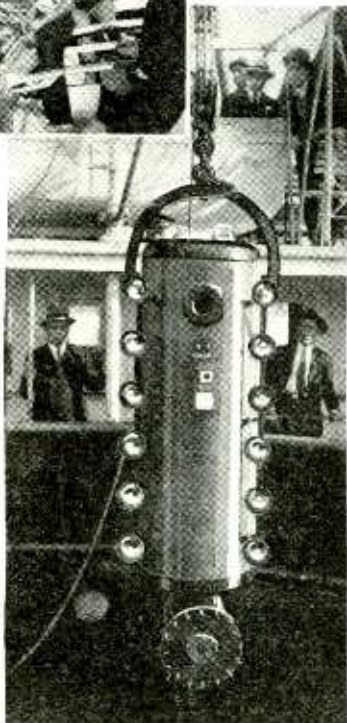
And yet—the greatest veil lingers—a veil covering the mysteries of more than two-thirds of the globe. The depths of the oceans are still unknown. True, they have been sounded, and fragile nets brought up a few of the smallest luminous denizens of that mysterious abyss, proving that life extends far down into the greatest depths, into eternal darkness and tremendous pressure.

According to science all life began in the water. From microscopic forms in the flat shelves of the ocean it grew to gigantic types, the Saurians who probably were wiped out by the first ice-age, after some had emerged and lived on land while others went deeper and deeper during untold generations to the ocean floor. Those great depths were not affected by the ice which may have enveloped our earth for ages to be counted perhaps by many thousands of years. Are their monstrous descendants still down there and have any higher forms of life been gradually born in that unknown abyss? We do not know!

What are the obstacles in the way of exploring the ocean depths? Only pressure and darkness! Can they be surmounted by modern engineering science? Three hundred years ago the diving bell with open bottom was invented and much later diving suits; both exposing their users to the pressure of the water. Since then almost no real progress can be recorded. A few pioneers tried at the risk of life and fortune, to descend deeper with devices they invented. But they seldom found moral support, or financial



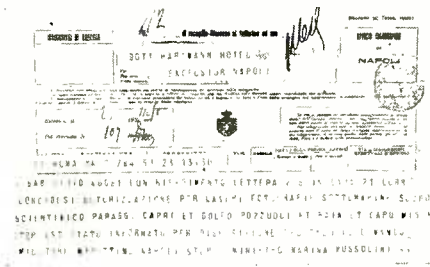
THE Harman deep-sea exploring bell, in which he was later submerged to great depths never before reached by man, is shown being hoisted overboard in the Mediterranean in the photo above. In the model of diving bell here shown, the "movie" camera was enclosed in a separate steel bell fitted with a quartz glass window, and attached to the bottom of the bell with a magnetic coupling; if the main bell became fouled, the operator could release it, causing the bell to rise.



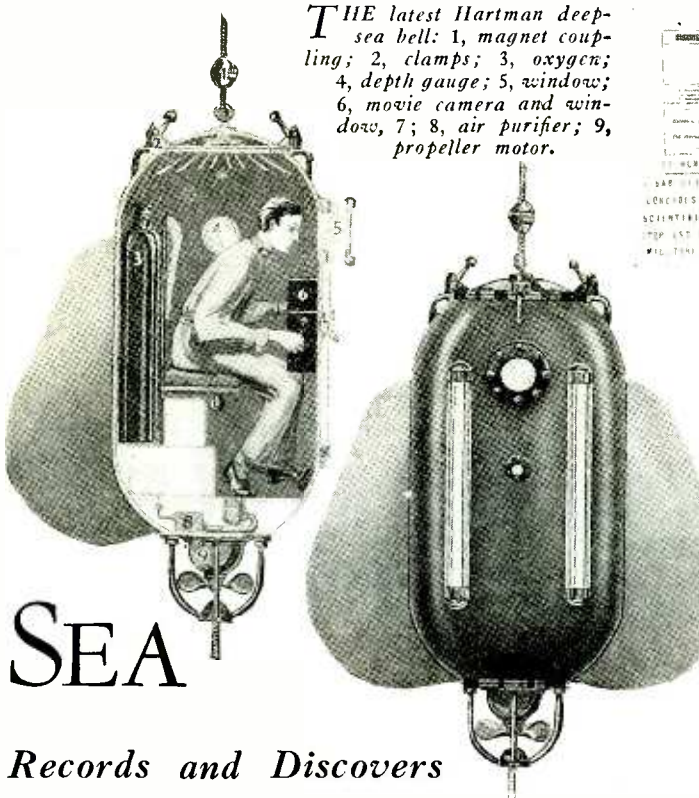
IN the photo above the special quartz high candle-power electric lamps are shown on either side of the diving bell. Dr. Hartman can be seen standing at the left of the diving bell in the photo above; while the photograph at the immediate left shows the diving bell being lowered into the waters of the Mediterranean. The top steel cover on the bell is bolted on, but in the newer design of bell quick-acting hand-screw clamps will be employed, the old design requiring too much time to open. In all such sub-sea work, it is imperative to be able to release the diver quickly in case he should collapse and have to be hauled to the surface.



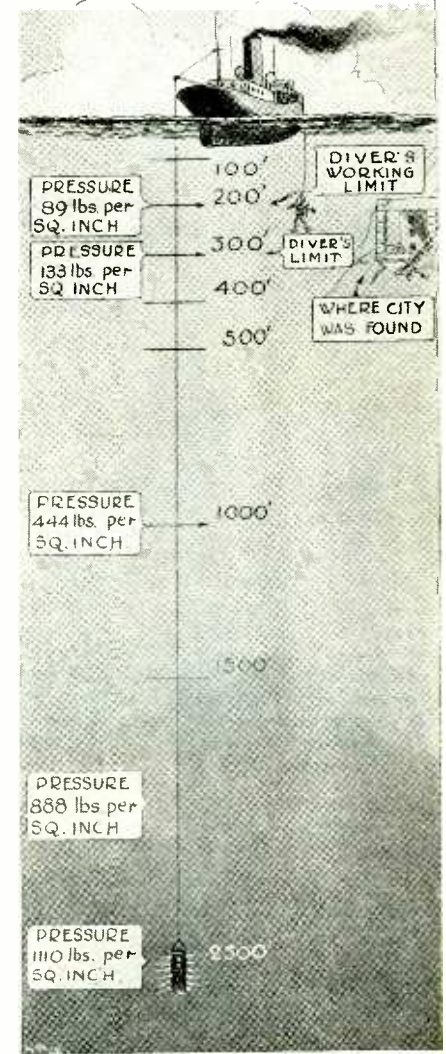
THE latest Hartman deep-sea bell: 1, magnet coupling; 2, clamps; 3, oxygen; 4, depth gauge; 5, window; 6, movie camera and window; 7; 8, air purifier; 9, propeller motor.



INTERESTING telegram received by Dr. Hartman from Mussolini appears at the left and reads as follows: Dr. Hartman, Hotel Excelsior, Naples, SS Roma: Referring to your letter of the 21 of the present month, we give you authorization for submarine photographic operations for scientific purposes at Capri and the Pozzuoli Gulf, and Baia and Cape Miseno. This is by arrangement from the military authorities in Naples. Marine Minister, Mussolini.



SOME idea of the remarkable depth obtained by Dr. Hartman in his Mediterranean sub-sea explorations with his Krupp built steel diving bell will be gained by looking at the picture at the right. Here we see that a diver reaches his limit at about 300 feet below the surface where the pressure is 133 lbs. per sq. inch.



SEA

Records and Discovers Is It the Lost Atlantis?

which were very dangerous due to many joints which afforded possible leakage of water. Others built hermetically closed diving chambers.

One of the later pioneers in this magnificent and virgin field is Dr. Hans Hartman, an electrical engineer of New York City, who has worked and dreamed all his life to penetrate the depths and illuminate and photograph the secrets of the sea. Already in the December number of 1916, this magazine described and illustrated his automatic deep sea camera, for which the U. S. Navy Department placed the *U. S. S. Vestal* at his disposal, to enable him to make tests and experiments. Dr. Hartman soon found that he needed a diving chamber, wherein he could accompany his camera down on its perilous way.

After several years of work following the close of the World War, Dr. Hartman had developed a deep sea diving cylinder, organized a small expedition to the Mediterranean sea, where he conducted, handicapped by limited finances, interesting research work in and around the Gulf of Naples, photographing submerged ancient ruins of Roman palaces, of the sunken city of Paleopolis and also the subaqueous arch which illuminates the famous Grotto of Capri. Premier Mussolini himself overruled obstacles made by local authorities in Naples, by telegraphing from Rome to Dr. Hartman his special permission. Europe became interested in the American submarine explorer's work. (Continued on page 738)

assistance. Some were ridiculed, others lost their lives. Some inventors constructed armored diving suits, others lost their lives. Some inventors constructed armored diving suits, others lost their lives. Some inventors constructed armored diving suits, others lost their lives.



The Man Who Found the Sunken Prehistoric City Off the Coast of Africa

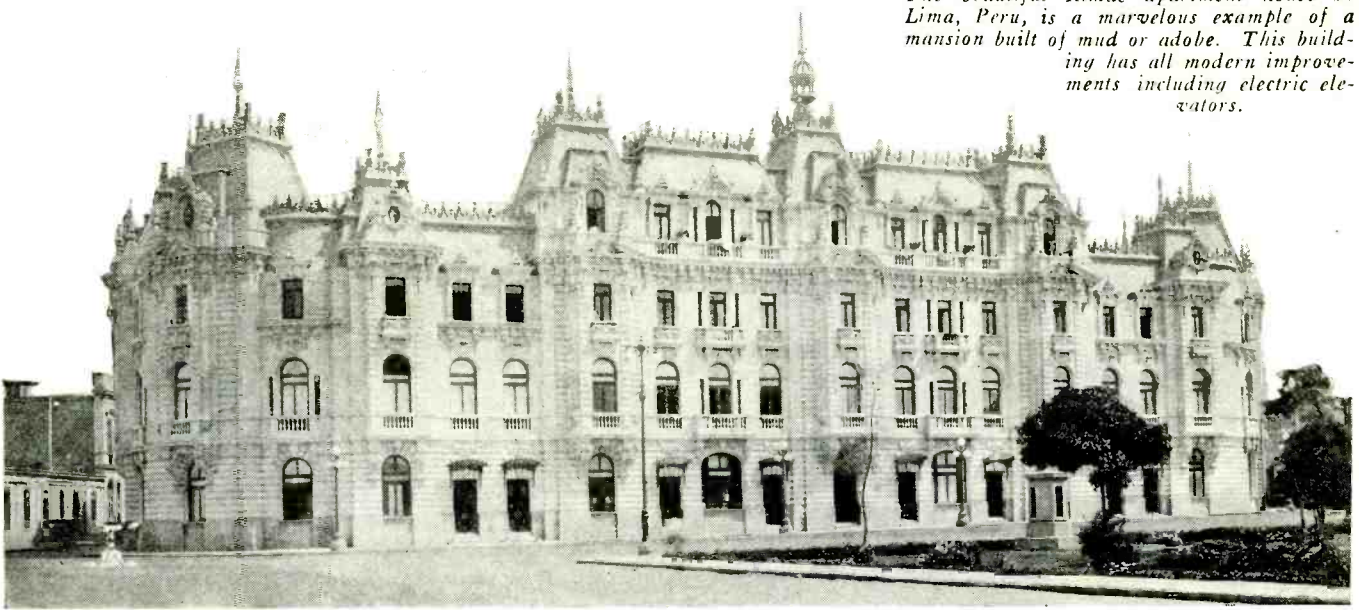
IN conjunction with his consulting engineer, Mr. H. E. Serner, the author of the accompanying article, Dr. Hartman designed the steel cylinder shown in the accompanying pictures. The editors have inspected the final construction blue-prints made by the famous Krupp steel experts in Germany, who built the seamless steel bell used in these remarkable explorations at great depths. The Krupp built steel bell was designed to stand a pressure of 2,500 pounds or a sub-sea depth of about 5,000 feet. Dr. Hartman descended to a depth of 2,500 feet. Dr. Hartman and his colleague, Mr. Serner, deserve the highest credit for their energy and courage.

Dr. Hans Hartman has just returned from Europe and this exclusive story tells of the wonderful discoveries he has made in the Mediterranean, off the coast of Sicily.



The map reproduced above shows the point between Sicily and the coast of Africa, where the prehistoric city was discovered.

The beautiful Rimac apartment house in Lima, Peru, is a marvelous example of a mansion built of mud or adobe. This building has all modern improvements including electric elevators.

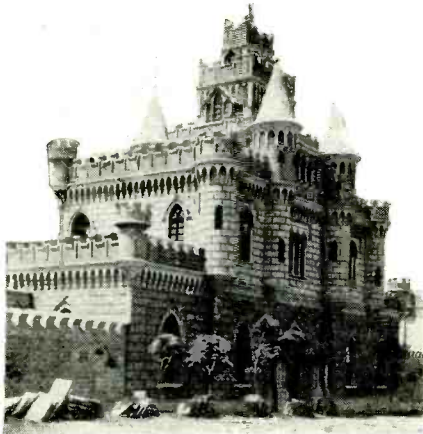


Mansions of Mud

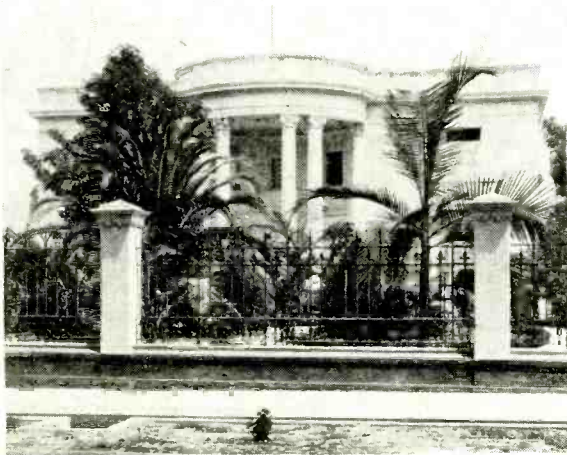
Would Be Washed Away in First Heavy Rain

By A. Hyatt Verrill

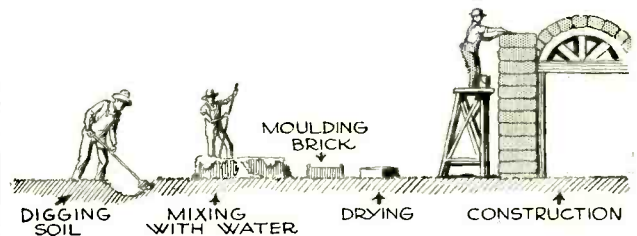
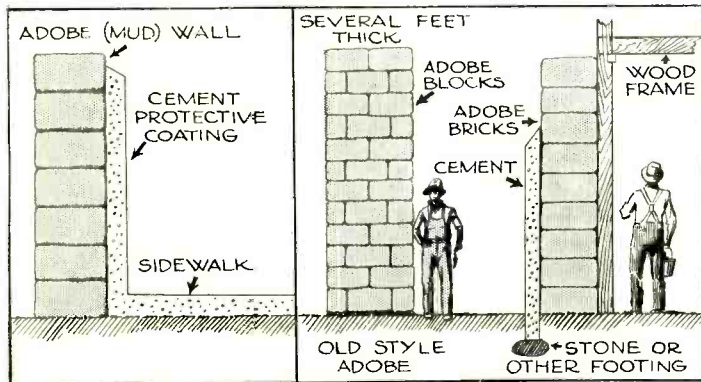
Famous Archeologist and Tropical Explorer



Above we see a glorious medieval castle in Peru, all built from mud or adobe. The method of making adobe construction is shown below. At right: Another handsome home of a wealthy Peruvian—and it's all made of mud!



THOUSANDS of years before Columbus the inhabitants of Peru built cities, palaces and temples of mud or adobe. In an almost rainless and treeless land it was the ideal material, and although deserted and exposed to the elements for countless centuries, the massive adobe walls, the immense temples and the houses of the people still remain almost intact and unaltered. The Spaniards were quick to profit by the experience of the people they conquered and destroyed and adopted adobe as the material for their own buildings. Practically every edifice of Spanish colonial times in Peru was constructed of mud, and churches, government buildings, palaces, cathedrals and forts were made of this humble material. These earlier mud buildings were constructed by the simple process of piling large adobe bricks or blocks one upon another to form the walls, and in order to support the weight of heavy timbers, floors and roofs, these walls were of necessity enormously thick and massive. Moreover, there was a limit to the height to which such walls could safely be carried. The weight of the adobe itself was enormous, and its resistance to a crushing strain is not very great, and as a result most of the earlier adobe buildings were low and seldom more than two stories in height. Occasionally, however, very imposing buildings were erected, and the great cathedral in Lima is (Continued on page 736)



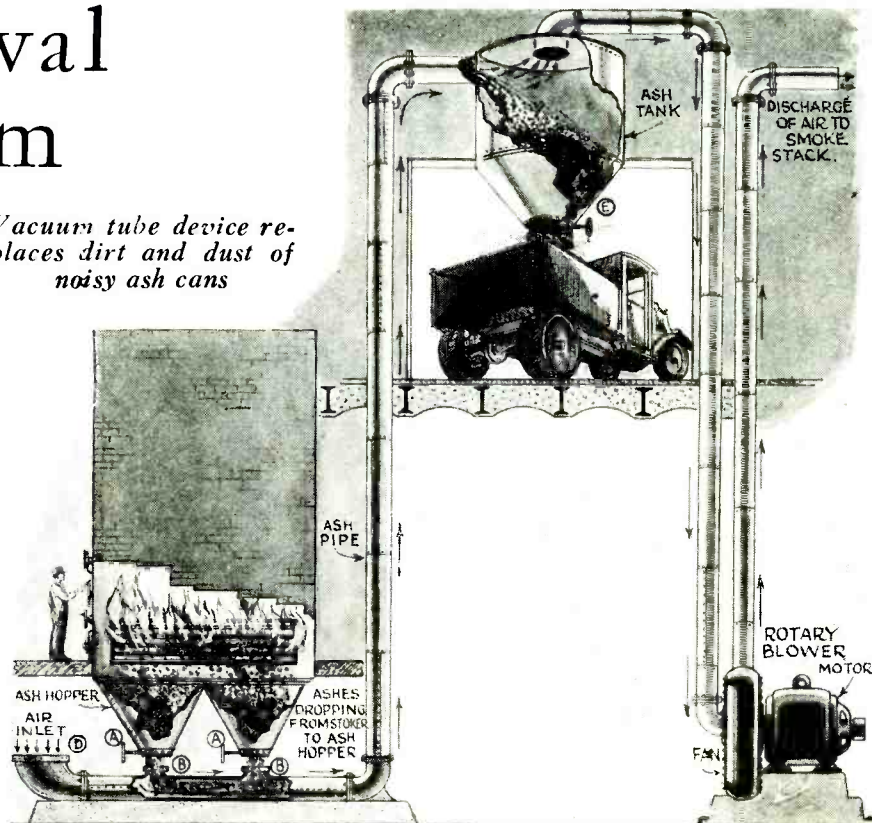
Beginning at the extreme left, the lower row of pictures show mud or adobe wall with a cement coating to protect it against rain spatter; comparison of old-style adobe wall with thinner new style, which utilizes a wood frame; and, above, various stages in adobe construction.

Ash Removal by Vacuum

ONE of the most novel and efficient means for the removal of ashes has recently been installed in the new mammoth New York Life Insurance Building.

The ash-removal plant operates in the following manner. The rotary blower motor, at the right, is started, and the air is allowed to filter in through the air inlet at the extreme left. This air is forced by the blower through the ash pipe and the ash tank to the smoke stack, where it is discharged to the outer atmosphere. The plug "B" is now removed from under the hopper to be emptied. Then a large square gate at "A," on the bottom of the hopper is opened and the ashes are fed into the ash pipe. The velocity of the air at points "B" and "D" is sufficient to carry the ashes up to the ash tank, one hundred feet higher. The ashes fall to the bottom of the tank while the air passes out as mentioned before. The ash man arrives, backs his truck under the tank, makes sure the blower is not working, and then proceeds to open gate "E." The ashes fall into his truck, and after it is loaded, he closes the gate and the tank is ready to receive more ashes.

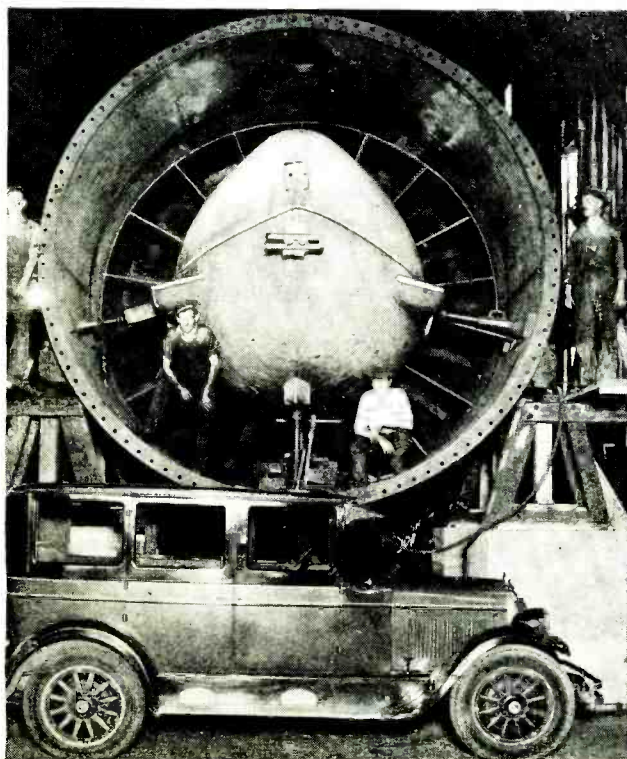
Vacuum tube device replaces dirt and dust of noisy ash cans



Above is a complete schematic diagram of the vacuum ash-remover. This drawing shows only two of the five boilers operated under this system. The hot ashes drop into the hopper and are conveyed up the ash-pipe.

Pumps to Empty Rain-Filled Streets

TO drain accumulated rain water from the streets of New Orleans, which is below sea level, that city has installed seven new mammoth pumps, with a capacity of 25,000 to 28,000 cubic feet of water per second.



One of the huge pumps, motored by General Electric, which will aid drainage of New Orleans streets.

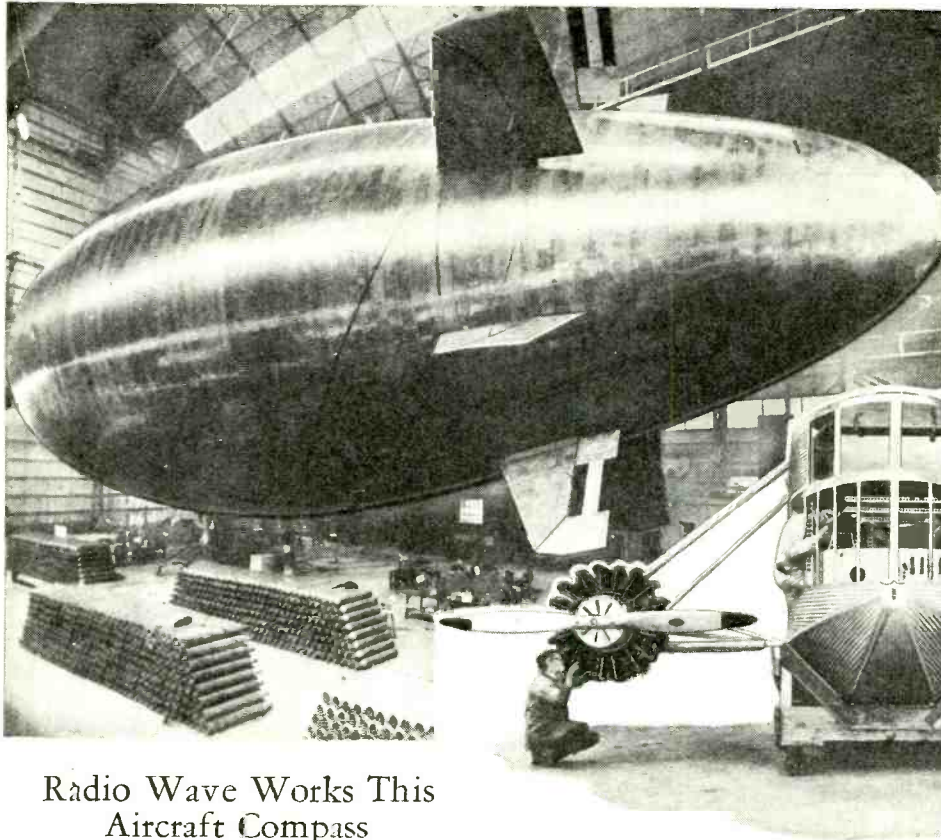
Model Plane Sets Endurance Record

NOT content with reading about endurance records for air-flights, the air-minded youth of the country set out to make juvenile history in the recent National Miniature Aircraft Tournament at Glendale, Cal. Boys of all ages, 250 in number, competed in this meet, with models of planes of standard design, to prove to the world that they were vitally interested in aviation. All the planes used were scale models of famous planes, ranging from copies of the well-known Curtiss-Hawk to the intricate Byrd-Fokker plane.



Above is John Bratten with the working model of his Curtiss-Hawk plane, which won first place.

The contest was won by Cecil Schwartz, who managed to keep his tiny plane in the air for a period of eight minutes and 44 seconds. This is really remarkable, when one considers that the only means of propulsion on these planes were spring motors and rubber bands. Compressed air engines should prove effective.



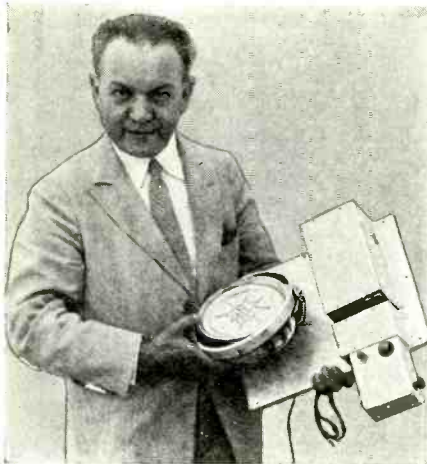
Newest

Uncle Sam's All-Metal Dirigible

THIS 200,000 cubic foot dirigible will be used exclusively in experimental work and for training purposes. It was designed and built by the Aircraft Development Corporation, a division of the Detroit Aircraft Corporation, at Detroit, Michigan. It is here shown in the

Radio Wave Works This Aircraft Compass

THIS photograph shows William Dubilier with the Eadon Automatic Direction Indicator. This device continues to point its needle in the direction of the broadcasting station to which it is tuned.



If the apparatus is set in a plane and the plane should hover above the broadcasting station, the needle will point directly down to the ground. This indicator has been sold to the government and will be available to foreign governments and private organizations. It will be of service in foggy weather and at night time to guide the aviator to land.

hangar in the process of construction, with the control car not yet in position. The gondola illustrated below has two Wright J-5 motors developing 440 horsepower. Observe the unique construction of the control fins.

Double Hull Seaplane

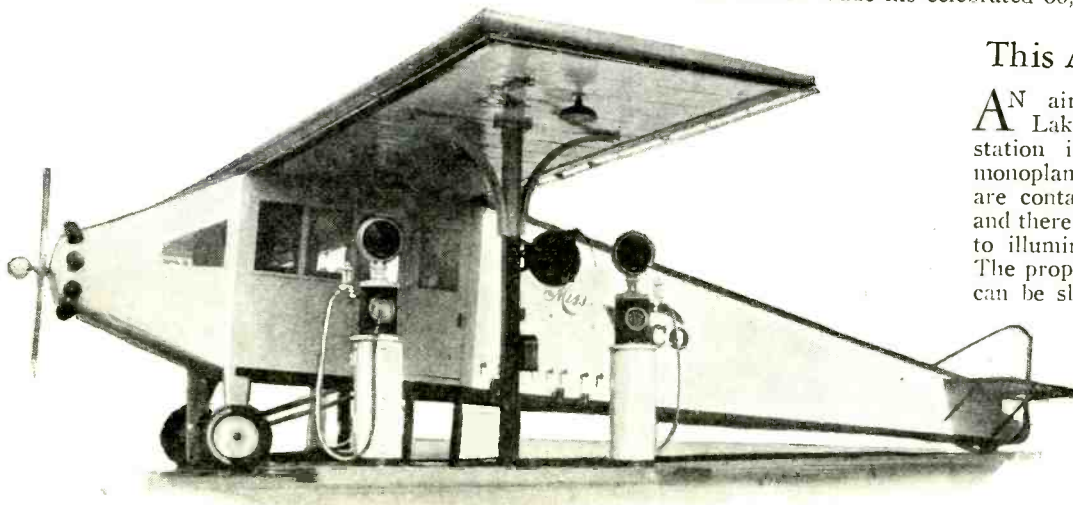


THE American Savoia-Marchetti double hull seaplane has two 500 horsepower motors in tandem. It will carry 14 passengers at a speed of 128 miles per hour, with a 5,500 pound load. This is the type of plane in which Commander de Pinedo made his celebrated 60,000 mile flight.

This Airplane Can't Fly

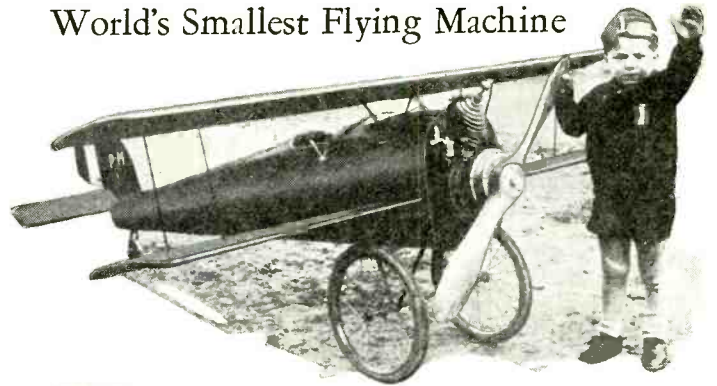
AN air-minded citizen in Salt Lake City built this gasoline station in the form of a large monoplane. Accessories and parts are contained within the structure and there are lights under the wings to illuminate the ground at night. The propeller in front of the plane can be slowly revolved by a small motor. On the side of the airplane fuselage one can see a group of spigots where oil is dispensed. The wing serves as an awning.

Photo Ewing Galloway



Aviation Ideas

World's Smallest Flying Machine

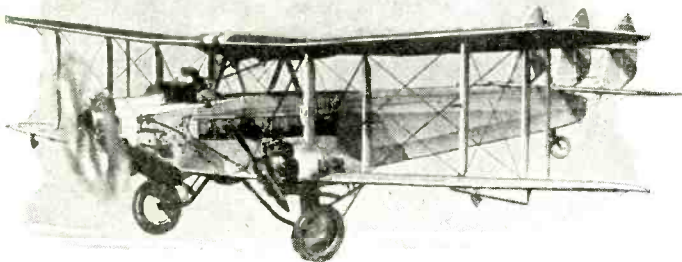


THIS biplane is powered by a one horsepower motor. Flight is very limited, lasting but a few yards, and the plane rises but a few feet in the air. It was built in Rome, Italy, for this child, who appears to be a flying enthusiast.



A Monoplane-Dirigible

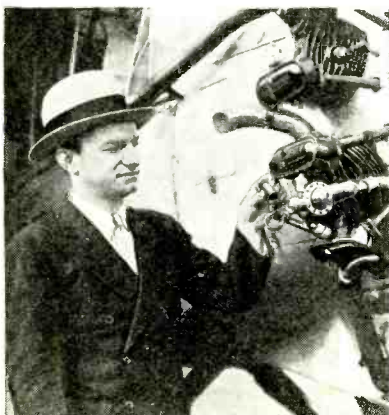
A REPLICA of a rigid metal-covered ship which Captain W. F. Cooper, of Hollywood, California, intends shall be 780 feet long. Seven motors are to be used to drive it, and its estimated load is 125 passengers and a crew of 25. The vessel will glide on water.



When One Motor Goes Dead

HERE is a striking photo of a three-motored De Havilland Hercules plane with three engines, totaling 1,500 horsepower, demonstrating its ability to fly on any two engines. This type of plane is used by the Western Australia airways on a portion of the route from London to India, and in particular on the section from Cairo to India. A performance of this nature makes a forced landing on the desert a remote possibility.

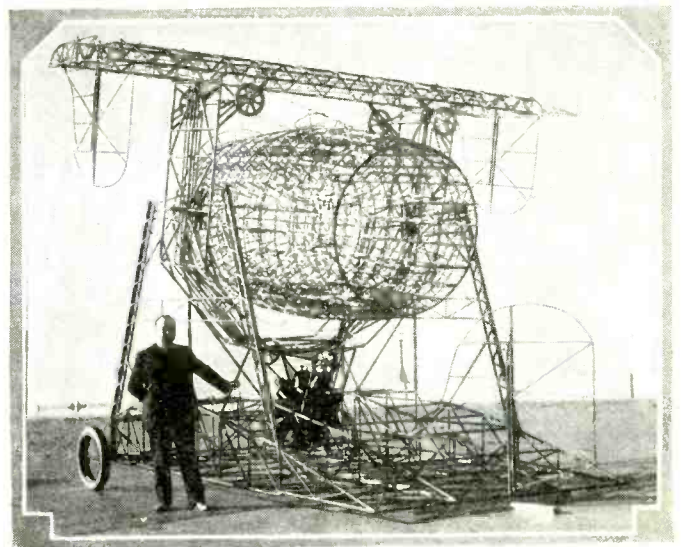
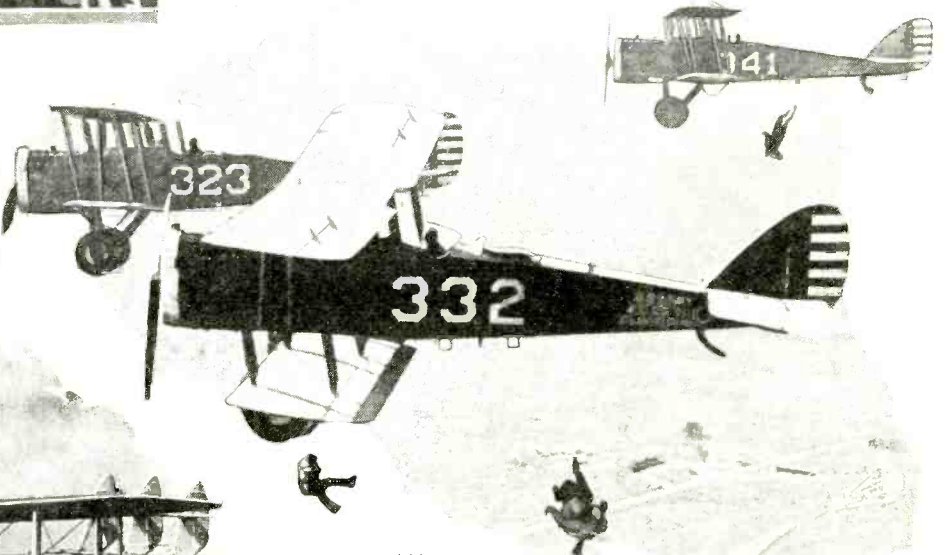
Shot-Gun Shell Starts Engine



CHARLES A. LEVINE is sponsoring a new type of starter for airplane engines which uses a half length 12 gauge shot-gun shell to supply the starting force. The starter weighs only 4 pounds and is screwed into the spark plug opening of a cylinder, after discharge the spark plug is replaced. The shell is inserted in the starter and fired. There is no noise when the shell is discharged.

Caterpillars Going Down!

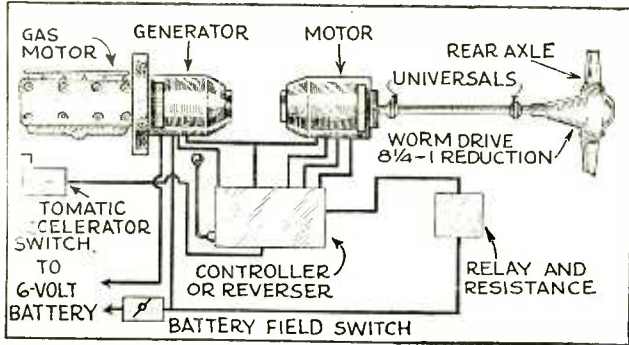
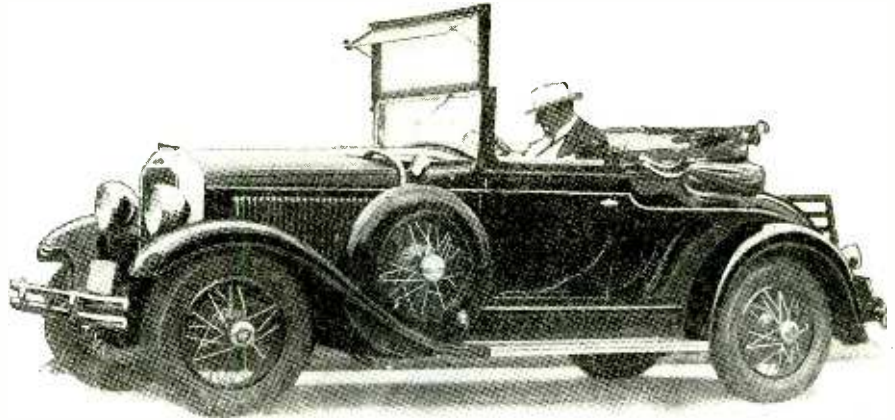
THESSE men are training for future membership in the Caterpillar Club, the organization of fliers whose lives have been saved by parachutes. Note that one of them is descending head first. The picture was taken at San Antonio, Texas.



Screws Its Way Through the Air

HERE is a skeleton frame-work of the Airworm, a new type of aircraft previously illustrated in this publication. The "barrel" turns and the large worm on the outside propels it. No extensive flights have been made with it.

Gas-Electric Auto Has No Gear Shift

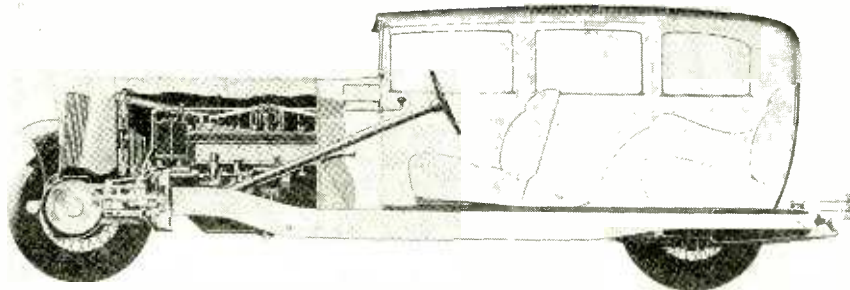


A NEW type of gas-electric automobile built in this country was recently purchased by Col. E. H. R. Green, son of the late Hetty Green, world's richest woman. This car, equipped with a new type drive, operates without a transmission, clutch pedal or gear shift. As shown in the diagram, a standard auto engine under the hood drives a generator. Current here produced operates a motor with shaft geared to the rear axle. The photograph shows Col. Green in the car. Note that the windshield is double, so that the owner can get into the car without stooping over. This Stearns-Knight car was built at the Rauch & Lang plant, in conjunction with the General Electric Company experts.

This Car Is Pulled Instead of Pushed

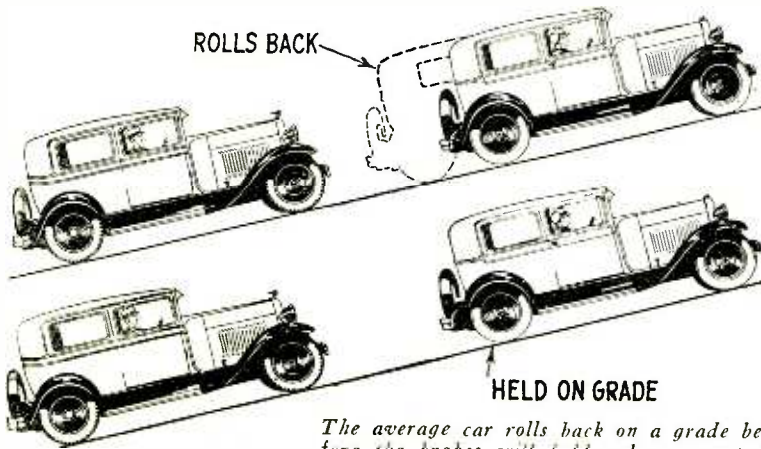
THE new automobiles are going to be front-wheel drive, if one can interpret the trend by examining the newest models made by leading manufacturers such as the Cord here shown. This pulling traction instead of a pushing effect provides many advantages. The driving force is always applied in

Front Wheel Drive Presents Many Advantages

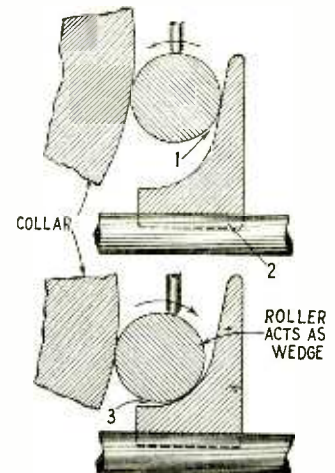


the same direction of motion. This reduces the likelihood of skidding. There is also a reduced thrust on front-wheel bearings. The body can be lowered, reducing wind resistance and providing greater roadability. The front wheel drive also lessens vibration because the long drive shaft has been eliminated.

No More Sliding Back on Hills



A NEW system, which can be applied to any car as an added unit or as an integral part of the transmission, prevents back rolling regardless of whether the shift lever is in neutral position or in any forward position. It is released when the lever is put in reverse. Diagram explains how it works. Collar is attached to drive shaft.



Baird's Newest Televisor

Designed to bring "Talking Movies" into your home

By H. Winfield Secor

VOICE and facial image were simultaneously flashed over the wires by means of the newest Baird experimental television system recently, in a demonstration to an audience of newspapermen given in New York City. The presentation was carried out under the direction (Continued on page 732)

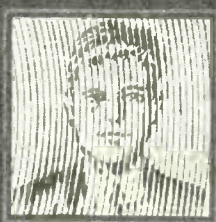
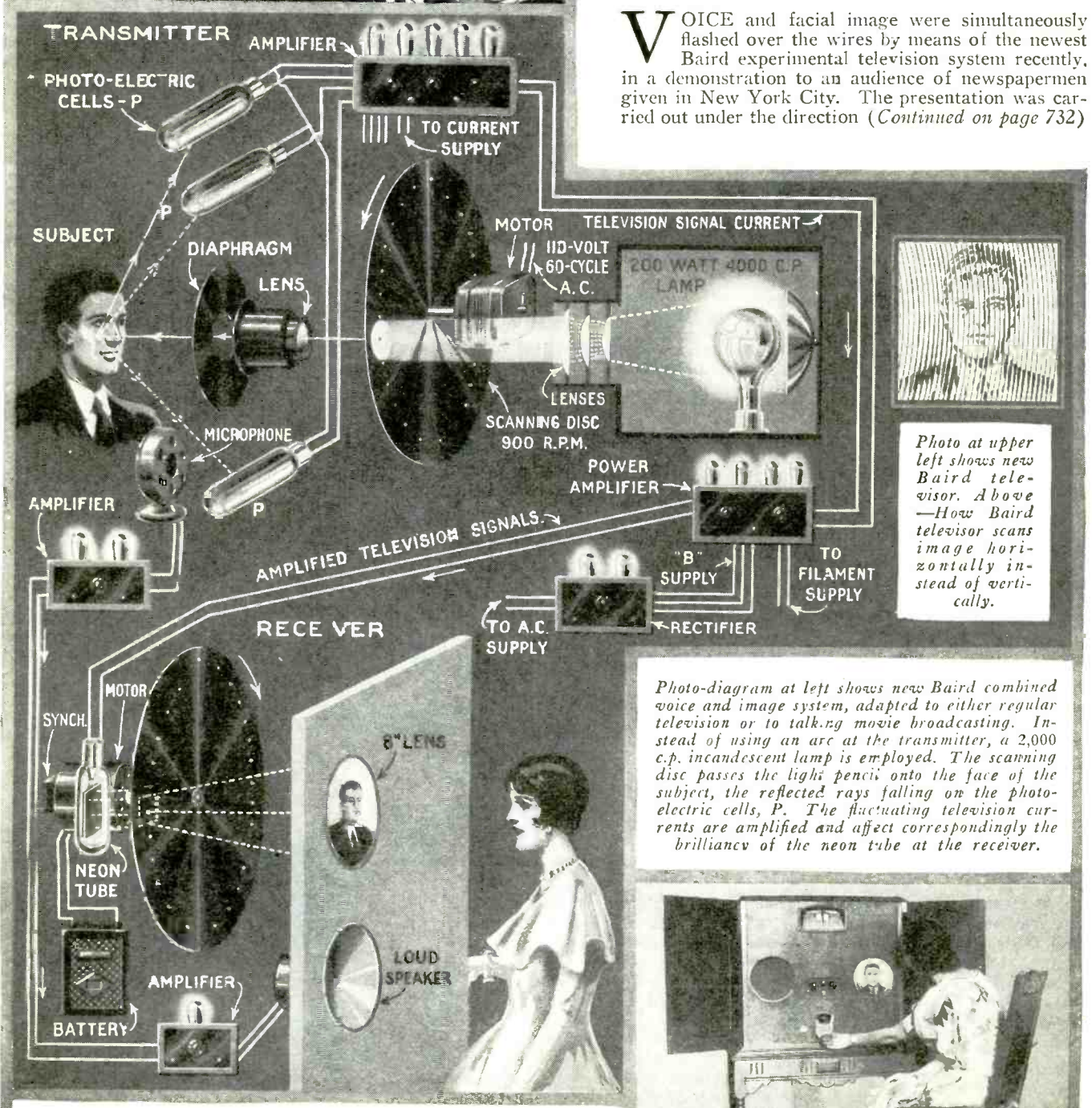
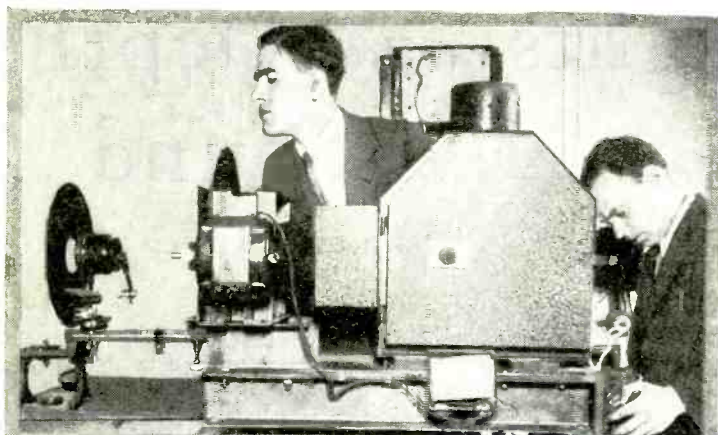
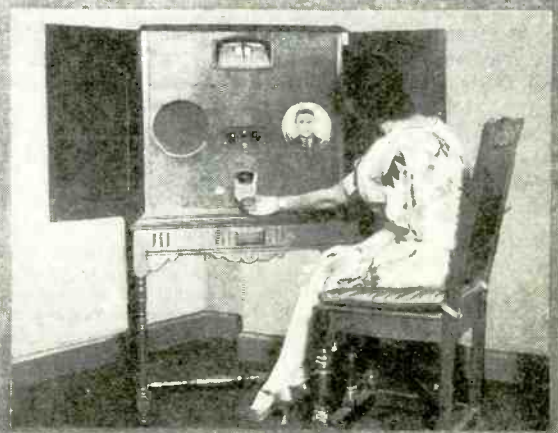


Photo at upper left shows new Baird televisor. Above — How Baird televisor scans image horizontally instead of vertically.

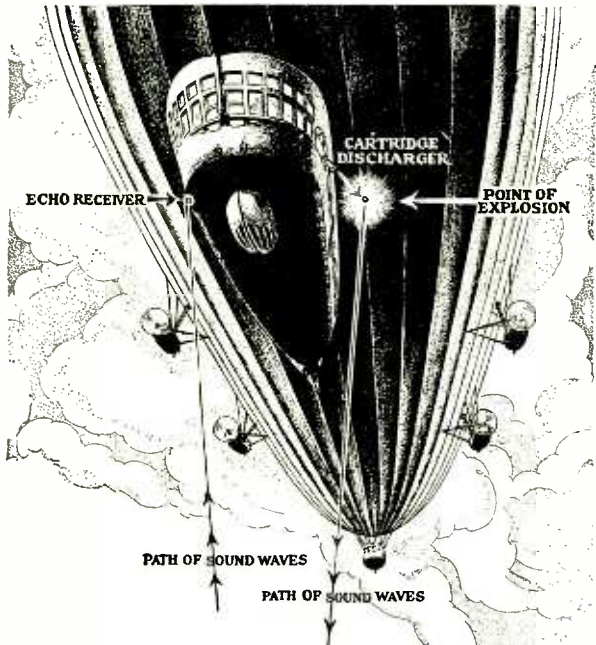
Photo-diagram at left shows new Baird combined voice and image system, adapted to either regular television or to talking movie broadcasting. Instead of using an arc at the transmitter, a 2,000 c.p. incandescent lamp is employed. The scanning disc passes the light pencils onto the face of the subject, the reflected rays falling on the photo-electric cells, P. The fluctuating television currents are amplified and affect correspondingly the brilliancy of the neon tube at the receiver.

Photo at right shows the Baird experimental television receiver for both voice and image. The loud speaker is at the left, while the lens and its television image are seen at the right. The observer is shown in the act of tuning in a station.



Measuring Heights and Depths with Sound

By Botho von Romer

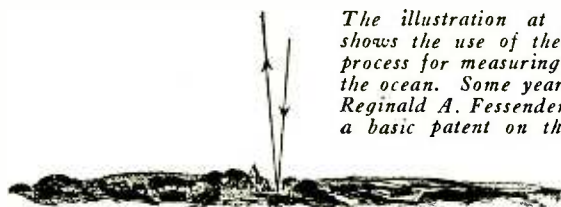


The above illustration shows how aircraft may determine their height above the ground by means of an echo measurement system. The sound reproducer is fastened to the fuselage from which the cartridge is discharged. The sound waves go to the surface of the earth, as shown below, and are reflected back to the craft.

FORMERLY the measuring of the depths of the sea was restricted to the seaman's lead with its measured rope or wire. In the most modern times an entirely new method for measuring depths has been developed. The system of echo measurement here described is that devised by the well-known physicist Behm, who, after lengthy research, has succeeded in bringing his experiments to a brilliant and successful conclusion. The illustration appearing here shows how the sounding process is used for measuring depths. The solution of the echo-sounding problem was obtained when Behm used the damping agency, which the hull of the ship provides, to prevent the echo receiver from being affected by the direct action of the sound signals when they are discharged on the other side of the ship.

On one side of the ship, by means of a cartridge, an explosion signal is given, through which agency it is quite possible to measure slight depths of the channel. After the cartridge is released, an explosion occurs when it has penetrated 3 to 6 feet below the surface of the water. The sound waves which are first received by the so-called discharge receiver go down through the water until they reach the bottom and are then reflected back to act upon the echo receiver.

By means of a time-measuring device, the interval from the starting of the sound waves, after the cartridge has exploded, until the sound wave is received by the echo receiver, can be measured accurately and produces a visible record. The exact time which has intervened can then be read off on a scale, which may either be used for depth measurements or for height measurements.



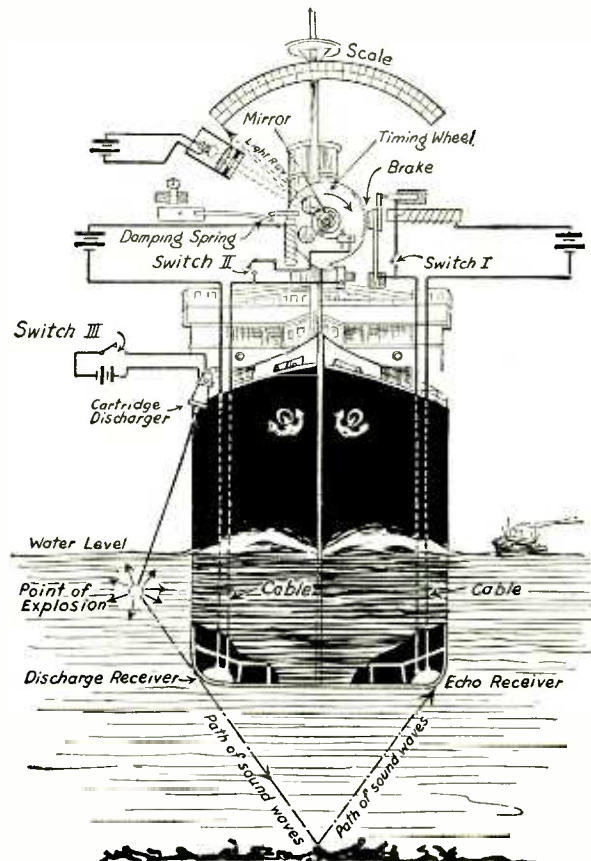
The illustration at the right shows the use of the sounding process for measuring depths in the ocean. Some years ago Dr. Reginald A. Fessenden obtained a basic patent on this system.

When the measuring system is to be used by a dirigible or airplane, the sound producer is fastened to the fuselage from which the cartridge is discharged. The point of explosion is thus clearly defined. The sound waves go down to the surface of the earth and are reflected back to the echo receiver. Behm has succeeded in measuring heights in airplanes using this method which gives an extraordinarily rapid estimation of the height of the elevation of the airplane or dirigible within an accuracy of about one foot.

Measuring by Radio

FOR the last five or six years the United States Coast and Geodetic Survey have employed a method called "Radio Acoustic Ranging." It is used to determine exactly the position of the survey ship during hazy or foggy weather or when the ship is out of sight of land. The purpose of the survey is to chart the coast lines at regular intervals out to a certain depth. In using the radio method there are two shore stations set out by the ship about 35 miles apart. Each of these is equipped with a radio transmitter, receiver and a three-stage bomb audio amplifier. About a thousand yards off shore is a box containing three hydrophones. At a given signal a bomb is dropped overboard from the ship and the exact time and log reading are taken at that instant.

In the ship's shack is a chronograph which records seconds with one pen and under-water sounds and radio signals with another pen. As the bomb explodes, the chronograph pen makes a dash on a tape. (Continued on page 757)





Gotham Plans New Tunnel

Above, diagram of the proposed tri-borough tunnel, showing various exits to New York's main traffic arteries. Left to right, cross-section of twin tunnels under East River.

NEW YORK has seen in the rapid growth of the automobile merely one more transportation problem. The task of keeping commercial and pleasure traffic moving has been the greatest dilemma the city fathers have been faced with in some time.

To aid in the solution of this commercial conundrum, a new tri-borough tunnel has been proposed, which will link the boroughs of Queens and Brooklyn with Manhattan. This tube will be similar in construction to the Holland Vehicular Tunnel, which connects New Jersey with New York, except that it will be larger and embody several improvements. One of these improvements is the proposed double-decked tube under Manhattan. It will consist of twin-tubes passing under the East River and having numerous exits in

all three boroughs. In Manhattan it will be connected with all the main arteries of traffic, passing up 38th Street to Lexington, Fourth and Fifth Avenues, and in Queens and Brooklyn it will have one main exit leading to a strategic point of distribution.

This tunnel, in spite of its high proposed cost (\$100,000,000), has been looked upon with much favor and with serious thought on account of the huge success of the Vehicular Tunnel under the Hudson River. Its capacity will be 4,000 vehicles per hour, which is 200 more than that of the Holland Tunnel. It will provide an easily accessible outlet for the large amount of traffic which daily plies between these home boroughs and the business borough of Manhattan.

New Ways to Detect Icebergs

By Dr. Howard T. Barnes

McGill University

I HAVE recently returned from an Iceberg Expedition, which was made for the express purpose of finding some method of detecting icebergs by means of illumination. As the use of searchlights has been abandoned, since the fog reflects back the light and blinds the eyes of those on the bridge, it was my hope to develop some powerful lights which could be thrown sufficiently far ahead of a ship, to enable the light to penetrate the fog and silhouette the iceberg. In case the fog was too dense, it was my intention to adapt a photo-electric cell sensitive to the infra-red rays; so that the shadow of the iceberg could be made audible, through one or two stages of amplification. We used parachute flares, but they do not seem practical, as they are too much at the mercy of the four winds of heaven. Fortunately

I was able to stumble upon a simple method of detecting icebergs by using a low-pitched submarine microphone, which gave loud and distinct sounds of the melting iceberg six miles away. Temperature changes are also noted in the water at considerable distances.

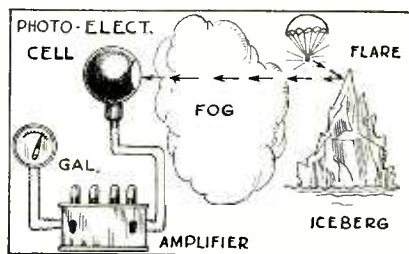
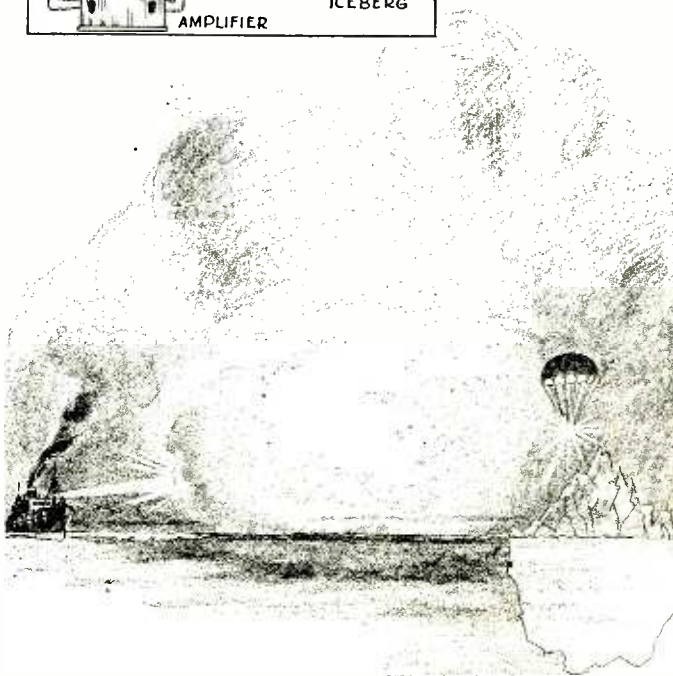
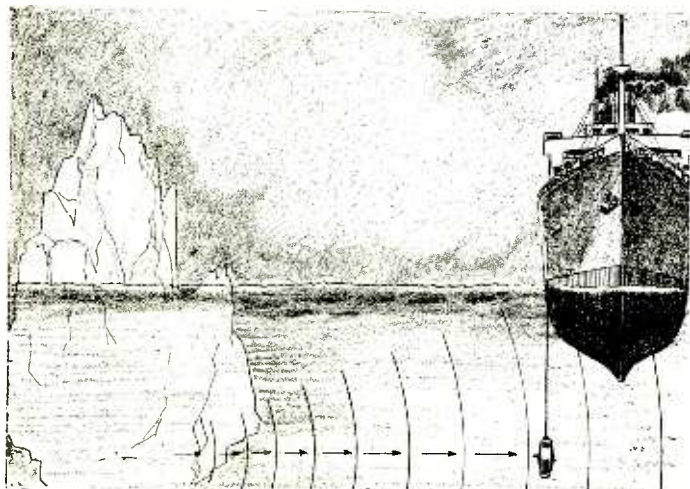


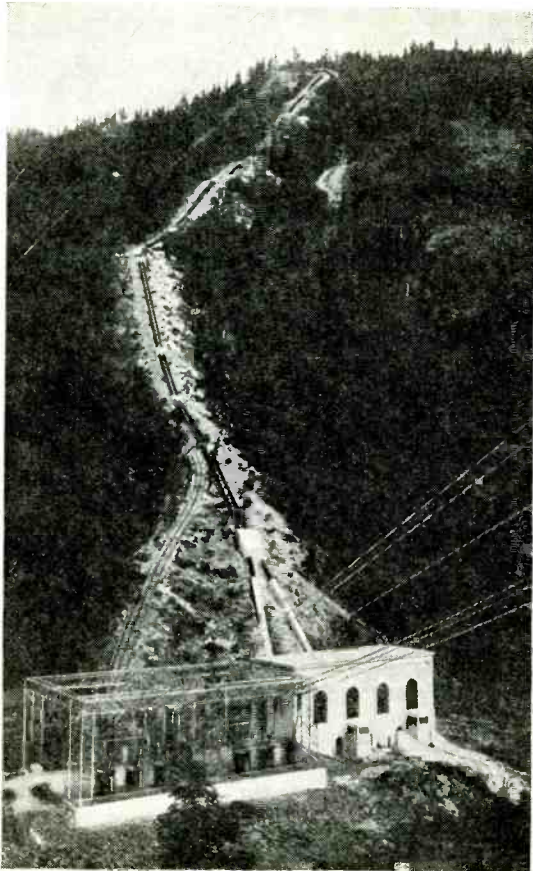
Diagram showing parachute flare and light effect on photo-electric cell.



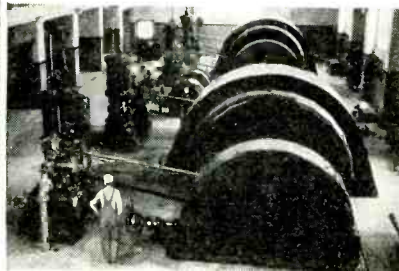
At left, submerged microphone which picked up sounds of melting iceberg six miles away.

40,000 Horse-Power From a 3-Foot Pipe

By Charles W. Geiger



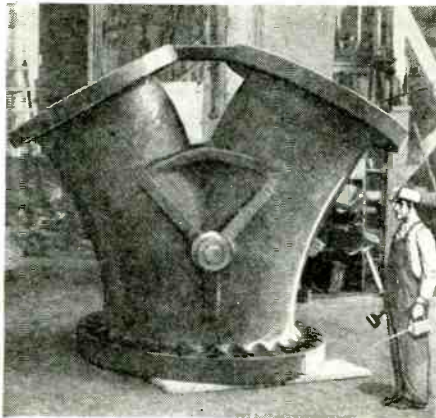
Above is shown a photo of the pipe line and power station. The photograph at the right shows two 40,000-H.P. Pelton double, overhung impulse turbines and one G. E. generator turbine, operating under a 2,350-foot effective head. Water-power plants of this type show an over-all efficiency about five times greater than plants using (coal) steam power.



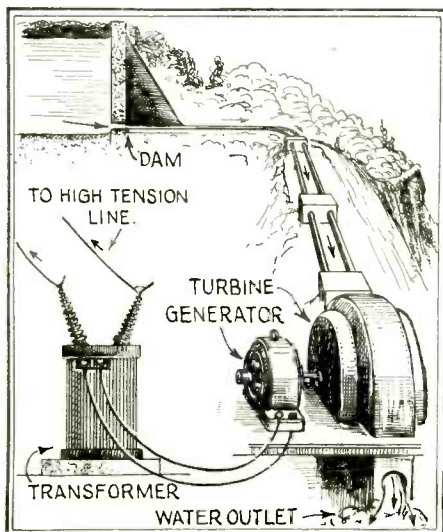
HIGH-HEAD water-driven electric power plants are no novelty on the Pacific Coast, and particularly in California, where the rapid fall of numerous mountain streams makes it possible to develop unusually high heads without long conduits. The Ducks Creek hydro-electric power plant of the Feather River Power Company, recently placed in operation in Plumas County, California, is designed to operate under a maximum static head of 2,562 feet, making this the highest head hydro-electric development in North America. How long this new plant will hold this record is a question, for the advance in hydro-electric development is so rapid that today's wonder may be tomorrow's commonplace.

An interesting feature of the Ducks Creek development is the system of remote indication and control which has been devised. By means of polarized relays, the opening and closing of the valves at the reservoirs and intakes to the tunnels are operated from the power house. Also, it is possible for the operator to select any one of ten valve positions at the main storage reservoir and upper diversion tunnel, or two positions at the intake to the lower tunnel. The operator can read from his operating board the position at which any valve is set. In addition to this, the water level at any moment in either of the reservoirs is indicated and also recorded in the power house. Through this system a flexibility of operation is attained which would otherwise be impossible.

The average slope for the 4,800-foot penstock is 30 degrees. The plant generates 40,000 horsepower. This is the highest head hydro-electric project in North America. Such high heads produce high pressures, necessitating the unique design of apparatus.

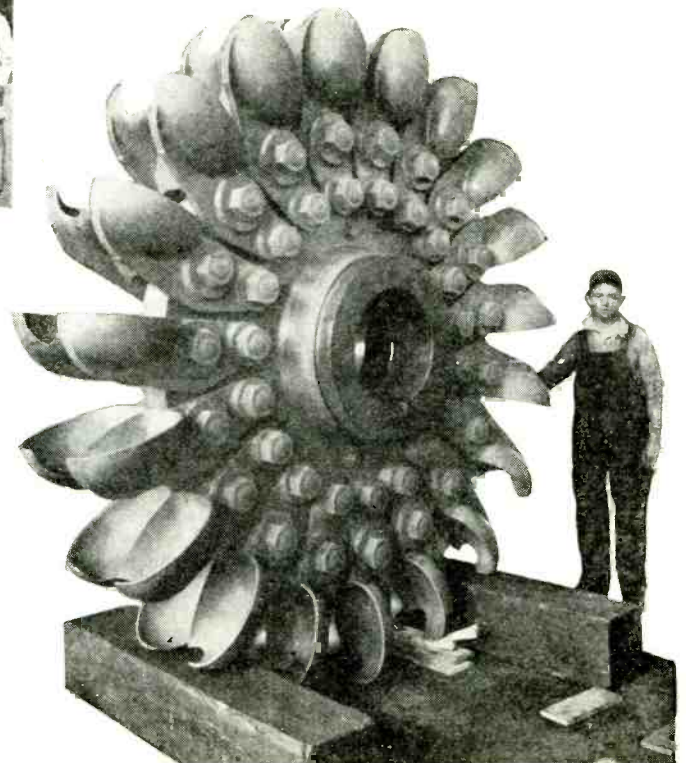


The "Y" pipe supplied for use where the two water penstocks branch out. There are two of these large pipes supplied for each of the turbines; note man.



At the right is shown the Pelton overhung impulse turbine wheel, built for operation under the highest head in America. This wheel is of unique construction and design.

Diagram showing how power is generated at a water-power electric plant. The water runs down the double penstock, drives the turbine and electric generator; transformer raises the voltage.



Would You Believe It?

Truths Stranger Than Fiction Are Here Photographically Presented



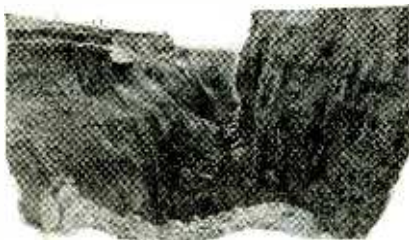
A Mysterious Head

AT first glance this might be the face of some unusual stage character with a very prominent chin. However, as you examine it closer, you wonder

what the two extensions in back of the head might be. There now, we have given the secret away. It is a head, but that of a male beetle with very unique horns. There is little reason for these horns, because the beetle is quite harmless. Like all other beetles, this one will fly against a light. Only the head alone has been photographed, the body having been blocked out by the artist.

Does Land Sink?

HERE is an actual photograph of what was once a perfectly level prairie. This began to sink, and within three days it dropped 75 feet, leaving sheer walls. The former level prairie



land, still unbroken, was at the bottom of the cavity. This event caused no small amount of excitement when the residents of Danvers, Montana, where this happened, learned of the fact. Geologists state that a "fault" probably existed at this point, or else the land dropped down into the bed of a subterranean river.

Dry "Whiskey" Has Strong Kick

A PLANT with a name like *Lophocereus Williamsii* might be responsible for anything. This plant is also

known under the name of Peyote, a species of cactus. Mexican Indians treat it and then chew it,

thereby getting a better jag than from the poorest grades of moonshine. Miss Mary



Jo Baird is seen holding samples of Peyote buttons.



Who Said "Pucker Your Lips"?

THE lips of this belle of the Sara people in Africa measure 6 inches in length. According to the people of this tribe, such distortion of the lips is a sign of beauty. Openings are cut in the upper and lower lip and pegs of wood inserted. These wooden pieces are repeatedly removed and larger ones substituted until this pelican-like mouth results.



Yes, Colored Girls Do Blush

THIS colored girl is a member of the "Hot Chocolate" Company and her blushes (the rush of blood to the face causes a minute rise in heat) are being detected by a heat-sensitive instrument held in the hand of Mr. E. E. Fairbanks, of the Museum of Peaceful Arts. This instrument measures very slight changes in temperature. The results disclosed that a white girl has better control over her blush and a colored girl at times will outblush the whitest girl in the land. Too bad the blushes can't be seen.

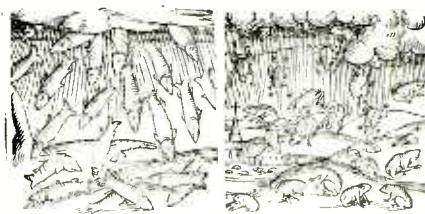
This Tiger Made of ??



MR. FIEVET is very good at stamping other things than his feet. As a matter of fact, he used over 50,000 stamps and took over 3,000 hours to complete this tiger head. Postage stamps of different countries were cut up and glued down to give this faithful reproduction of a tiger.

When It Rains Fish, Worms and Frogs

By Richard H. Tingley, C.E.



ALMOST any year one may read in the dailies that, somewhere in the world, frogs, toads, fishes, sea-turtles and the like have rained down from the clouds. Most people think such accounts are just newspaper yarns and

don't believe a word of it. I used to be that way myself until I saw it rain thousands of little perch and bullpouts at Providence, R. I., in 1900. Then I investigated and found at least two hundred accounts (*Continued on page 761*)

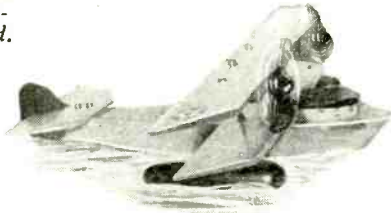


Dirigible Construction Set

THIS photograph shows a dirigible that has been constructed from small metal girders. These girders are all assembled by means of small bolts and after the framework has been completely built, the dirigible is covered with cloth. The gondolas are then added, the propellers fitted. By directing the air from a fan against this model, the propellers will be seen to whirl realistically. The model is more than four feet long.

Hydroplane

THE hydroplane below is constructed entirely of wood. Beneath the top wing there are two small spring motors which can be wound up with a key and which operate the propellers. The propellers will run several minutes with one winding. The device will not fly, but makes an entirely new water toy that will be well received.



Magical Outfit

MA^GIC appeals to the youngster just as it does to a person of maturer years. An enterprising American manufacturer has placed several magical kits on the market to meet the pocketbook of the everyday man. The tricks are well chosen and the set so arranged that no effect in outfit 1 is duplicated in set 2 or 3.

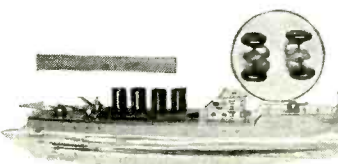


Dolly's Clothes Washer

ALTHOUGH this is a miniature clothes washer, it will act the same as large electric ones. A powerful spring motor drives the device and whirls the clothes-containing receptacle back and forth, lashing the water into foam and washing dolly's things. The wringer automatically applies itself to varying thicknesses of material run through it. The rollers are covered with the conventional rubber.

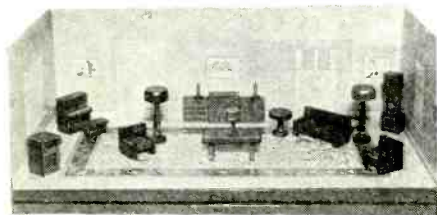
Destroyer

THE destroyer below is made of wood and equipped with turrets and guns. It is operated by a spring motor. As can be seen by comparison with the ruler, it is more than 2 feet long. Wheels are provided so that the toy does not lose its usefulness as an indoor or outdoor plaything.



Miniature Doll House

ALL of the furnishings in this living room suite are made entirely of wood. Each article is a replica of the full-size model. Some of the items are double-



faced, as for instance the radio cabinet in the left foreground which can be turned around so as to represent a phonograph. The child can get much amusement rearranging rooms. Other rooms are available.

Electric Auto

THE auto below is powered by an electric motor. It will travel against the fence, from which it receives its power, at a high rate of speed. The front wheels always have a tendency to turn the machine in towards the rails. The track can be changed in shape or form so as to produce breath-taking curves. The device is very well constructed and the track itself is made in but two sections so that it can be quickly taken apart.

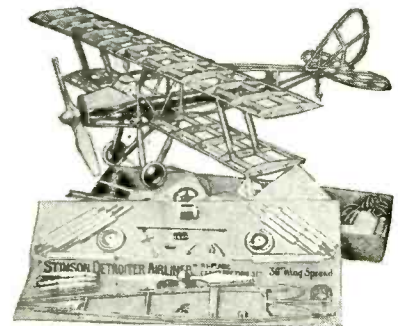


Lassoing Cows

IN the 50c game below, the object is to lasso the metal cows by pressing on a lever, causing the rider to toss a metal ring. The game seems quite easy, but you do not think so after you once try it.



Flying Airplane Model



THIS Stinson Detroit air liner can be built from model parts by the average boy. The plane has a wing spread of 36 inches, and when properly constructed, it will actually fly. Note the perfection of the skeleton construction indicated in the photograph.

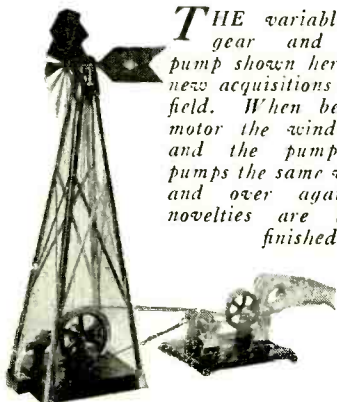
Skipping Game

THIS inexpensive item requires considerable skill for its proper manipulation. A marble is put in the socket at the top, the lever pressed down, and then released. The marble is supposed to hop from one opening into another.



Windmill Pump

THE variable speed gear and windmill pump shown here are two new acquisitions to the toy field. When belted to a motor the windmill turns and the pump actually pumps the same water over and over again. Both novelties are beautifully finished.



Names and addresses of manufacturers furnished upon request.

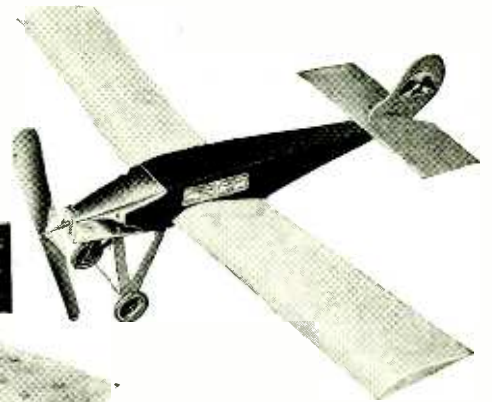
Saxophone

ANY child can play this saxophone. One does not however have to suppose that this instrument is of the ordinary wood variety. The construction here is beautifully nickel-plated and the bell is handsomely finished. There are enough keys present to enable one to play complete melodies and the reeds are of true tone.



Monoplane

THE illustration at the right shows a monoplane built of parts easily available on the market today. This monoplane has been noted for its long flights.



THE construction parts for making the airplane are shown at the left. This model is made largely of balsa wood, has indestructible landing gear, aluminum cowling and wheels. Of course it is inexpensive.

Toys
will
the Kiddies
Novelty and Uniqueness
average man's means

Sewing Machine

THE sewing machine below will do practically anything that mother's machine can do. As a matter of fact, mothers find it convenient to sew on it because it is so portable. The needle is protected to prevent injury.



The toy sewing machine here illustrated is operated in simple fashion by rotating the wheel at the right of the machine. A spool of thread is placed on top of the machine and the thread is then led through a tension device, thence through several guides down to the needle.

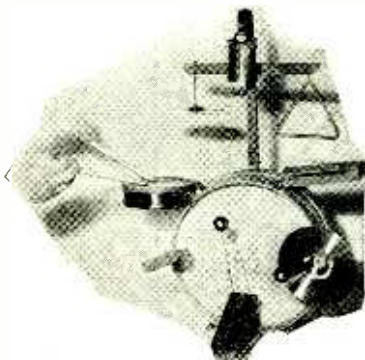
Electric Range



ONE of the best constructed, most reasonably priced electric ranges that will actually work, which the editors have ever seen. Compare size with plug in foreground.

Miniature Drum Set

THIS complete set of drums is bound to delight the youngster, but the racket will probably not please Dad if he is trying to take an afternoon nap. The bass-drum measures 11 inches in diameter.



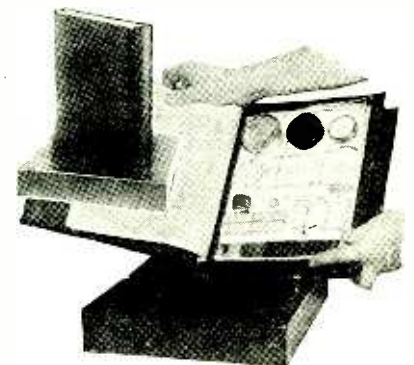
Model Architecture

IN new architectural construction sets, realistic reproductions of homes are



now possible with materials the same as used in actual building operations. All parts are cut to size and shape. The doors and windows are complete with frames, just like in real homes, and covering material such as stucco, etc., is furnished ready to apply in plastic form. Chimneys, driveways, sidewalks, shrubbery also come with the outfits.

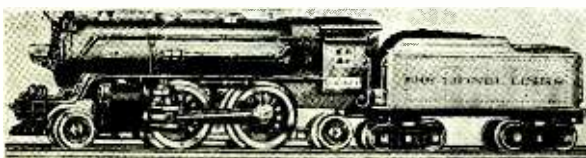
Telephone Book



THE story of the telephone is only a portion of this outfit gotten up in book form. The remainder consists of materials for building a telephone, even including the battery.

Electric Locomotive

THE locomotive shown in the photograph below is driven by a powerful electric motor. Nevertheless, the article faithfully reproduces some of our larger steam locomotives. Of course, the pistons move back and forth and the fittings are realistic throughout.



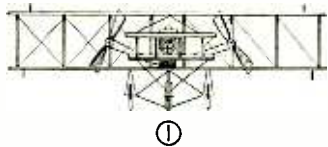
Pump Air Rifle

THIS air rifle shoots very accurately, and with good force, is a repeater and is operated in

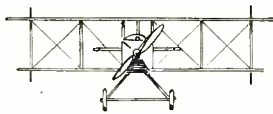


the usual pump fashion. No great pressure is required to set the gun, which is also equipped with a safety trigger.

EVOLUTION OF THE MODERN RACING PLANE



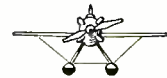
①



②



③



1929



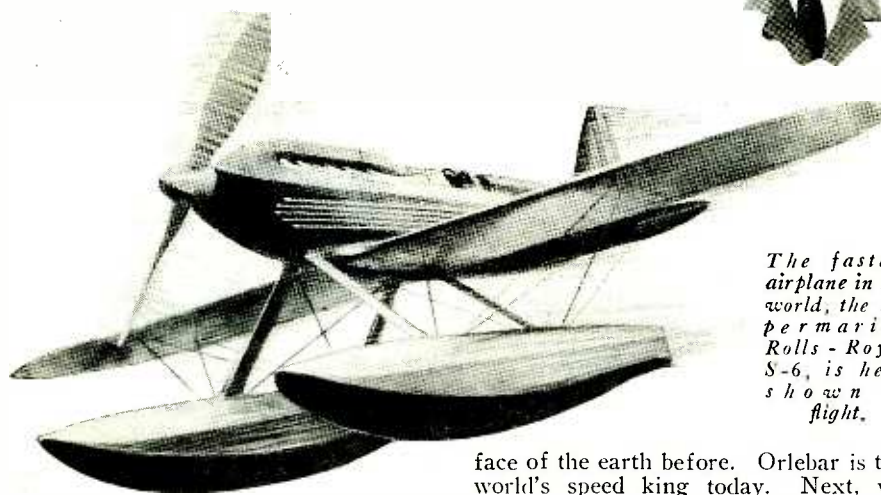
FUTURE

Six Miles A Minute!

Orlebar The Man Who Did It



The smiling face of Augustus H. Orlebar, who smashed all world speed records for any kind of craft when he flew his supermarine Rolls-Royce S-6 at an average speed of 357.7 miles per hour.

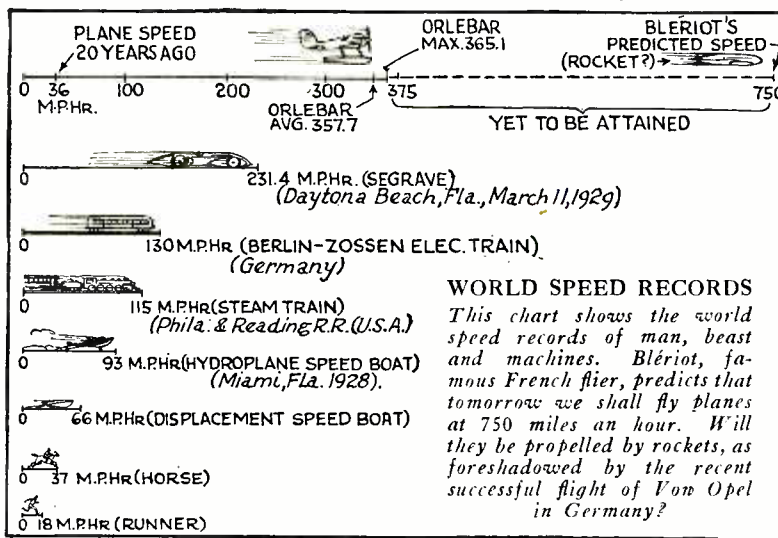


The fastest airplane in the world, the supermarine Rolls-Royce S-6, is here shown in flight.

SIX miles a minute—365 miles an hour—was the terrific pace set by Augustus Orlebar. British squadron leader, who took part in the flights for the famous Schneider trophy, off the coast of England recently. It took a man of iron nerve and resourcefulness, with years of flying training to his credit, to take a tricky little plane, like this extreme racing type that he used, into the air and fly faster than any human being ever passed over the sur-

face of the earth before. Orlebar is the world's speed king today. Next, we should salute the engineers who designed the plane made famous by Orlebar, the supermarine Rolls-Royce S-6. Orlebar established the world's supreme record for speed in a man-carrying ve-

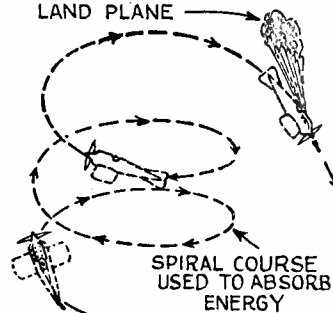
hicle on September 12th, when he made four flights over the 1.8-mile course at Calshot, England, his average speed being 357.7, this value being found by taking the average value of two flights with the wind and two flights against the wind. As will be seen from the picture of Orlebar's famous speed record holder, the plane is fitted with large pontoons, and it took off from the water and also landed on the water. Such planes as this have a landing speed in the neighborhood of 100 miles an hour, and it takes a super pilot to handle a plane at such speeds. In the diagram at the bottom of this page you will get a glimpse into what the future may hold for us, if we ever attain the 750 miles per hour speed, predicted by Louis Blériot, the first man to fly across the English Channel. Perhaps the racing planes of a few years hence will be propelled by rockets—who can say?



WORLD SPEED RECORDS

This chart shows the world speed records of man, beast and machines. Blériot, famous French fier, predicts that tomorrow we shall fly planes at 750 miles an hour. Will they be propelled by rockets, as foreshadowed by the recent successful flight of Von Opel in Germany?

PARACHUTE USED TO LAND PLANE



SPIRAL COURSE USED TO ABSORB ENERGY

MEASURED COURSE

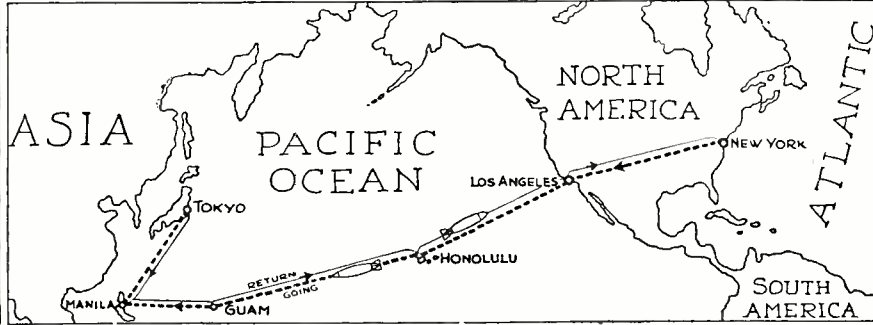
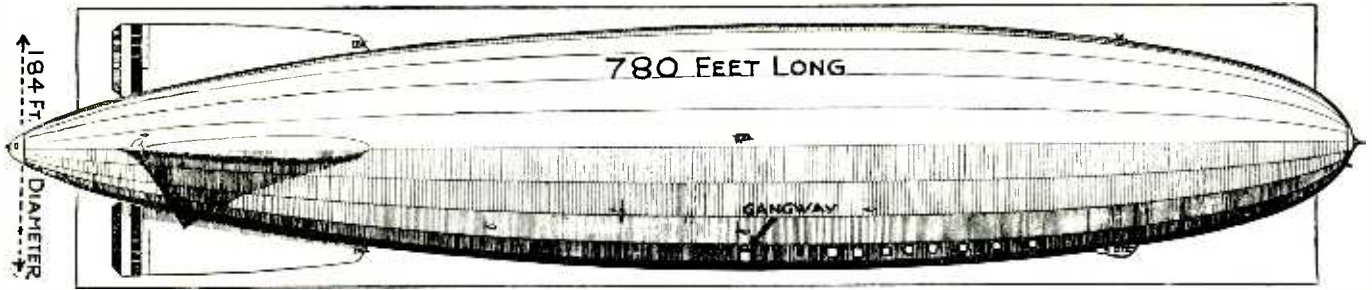
COURSE

STRAIGHTENS OUT FOR COURSE

DIVE TO GAIN VELOCITY

Blériot's formula for the 750-mile-an-hour plane of tomorrow: Shot from a catapult, the practically wingless plane flies across

the course and, by ascending in a spiral, the tremendous momentum is reduced, the plane and pilot landing with a huge parachute.



Paul W. Litchfield, president of the Goodyear Tire and Rubber Co., interested in Zeppelin trans-Pacific project.

New York-Manilla by Air

Plan Projected by Steamship and Zeppelin Company

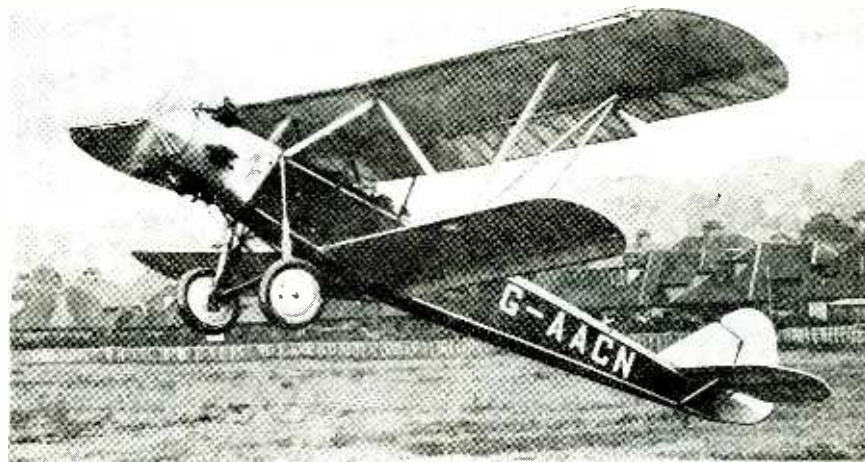
Commander Hunsaker, vice-president of the Goodyear-Zeppelin Corp., active in the proposed Zeppelin developments.

At the top of this page is a sketch of the proposed dirigible, 780 feet long and 184 feet in diameter, designed to carry eight motors and 100 passengers, which is planned by the Goodyear-Zeppelin Company to be built for the Dollar Steamship Company, to be used in service from

New York to the Orient. If the negotiations result in a satisfactory agreement between these two companies, the first service would probably be between San Francisco and Hawaii. Passengers, mail and light freight would be carried. The dirigible would be four times faster than a ship.

**CAN'T FOOL
THIS
PLANE!**

Wing Slots and
Flaps Permit
of Safety in
Unusual
Take-Offs

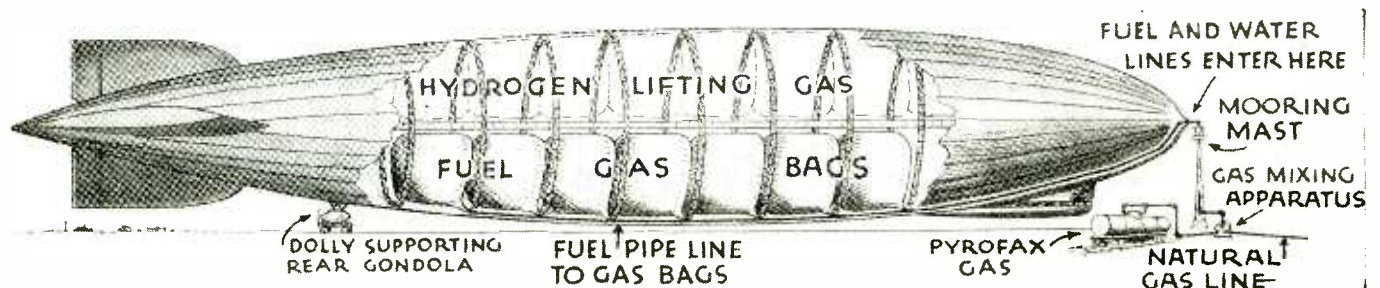


The powers of automatic interconnected wing slots and flaps are shown in this remarkable photograph. The machine here illustrated is the Handley-Page taking off in a perfectly normal manner but at a very acute angle. This machine is to compete for the Daniel Guggenheim Aircraft Safety prize. Tail spins are said to be impossible.

Fuel Gas Piped to Zeppelin Through Mast

THIS diagram shows how natural gas taken from a well was mixed with pyrofax gas to supply the fuel gas bags of the *Graf Zeppelin*. The mixed gases were led through a pipe in the mooring mast at Los Angeles and from there fed

to the fuel gas bags of the giant air liner. These fuel gas bags also serve to aid in the lift of the air liner. Water is piped to the air vessel in the same way. The use of gas fuel operates to secure an approximately constant weight.



How natural gas and pyrofax gas is mixed and piped through mast to dirigible.

Recent Inventions

Based on

Modern Chemistry

By Henry Townsend



Pocket Alcohol Tester

WITH this pocket testing outfit any liquid can be tested for the presence of wood alcohol and the percentage noted. An alcoholometer shows the percentage of wood alcohol present and "proof" may be obtained by multiplying the reading by two. When testing the liquid for the presence of wood alcohol, a pale pink color will be produced by a faint trace of this poisonous substance, and with increasing amounts the color deepens to a red-violet. Absolute absence of color after fifteen minutes proves that a liquid is free from wood alcohol.

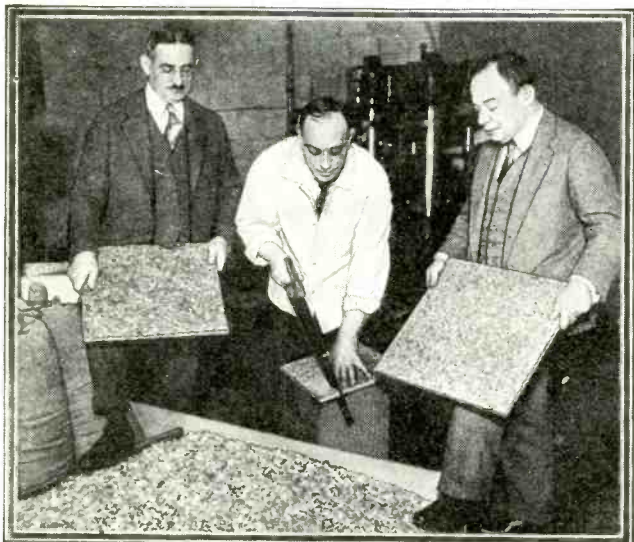
Lindbergh's Aeroplane Ice-box

AN aeroplane ice-box which was built for Colonel Charles Lindbergh is being demonstrated by the young lady. Dry ice, frozen carbon dioxide, is used for refrigeration. The refrigerator is made of balsa wood and weighs only 2 lbs. Ice-boxes of this type will soon be installed on passenger-carrying aircraft.

Balsa wood is of extreme lightness, yet it is a true wood of an exogenous tree. It has been used to construct boxes or retainers for ice-cream.



Lumber from Farm Wastes



Testing lumber fabricated from farm wastes.

MR. A. HAWERLANDER, a German chemist, with his associates, recently demonstrated a process by which farm waste, such as cornstalks, sugar cane, and shavings can be converted into lumber. The fabricated material possesses the characteristics of true wood and can be sawed, planed or nailed. 10,000,000 tons of cornstalks would make 9,000,000,000 sq. ft. of lumber.

Dry Ice Machine

DRY ice is made in the laboratory with the machine shown at the right. Carbon dioxide, which is a gas in its normal state, is solidified with this apparatus, thereby greatly reducing its temperature. Dry ice is so cold that it cannot be held in the hand without producing a severe burning feeling. It is called dry ice because it does not melt into a liquid but into a gas.

This new substance has many uses in the laboratory, as the actual temperature that can be obtained is much lower than that of ordinary ice. A machine of the type shown would therefore be useful in the laboratory, as it makes it no longer necessary to have complicated apparatus to experiment with the lower temperatures.



When the Fates Fooled HARRY KELLAR

Master Magician

How man who mystified thousands was fooled by a "ghost" that didn't materialize.

By Dunninger

THE theatre was filling rapidly. Beautiful women attired in evening gowns escorted by faultlessly groomed men were consulting programmes. Neatly uniformed ushers were leading late comers to their seats. The air was filled with rare perfumes emanating from silken-clad members of the fair sex, all alive to the possibilities of a new thrill. Groups were discussing the master of magic, Harry Kellar, whose yearly visit to that city always brought out theatre-goers who never were disappointed by the type of show this wizard presented.

The orchestra was tuning up. Talk ceased. All eyes from orchestra seats to top balcony were centered on the stage.

The overture was being played . . . a medley of weird oriental airs. . . .

With a crash the music stopped. The footlights threw fantastic shadows onto the main curtain, which hid the myster-

ies of the past and present from the world before the curtain.

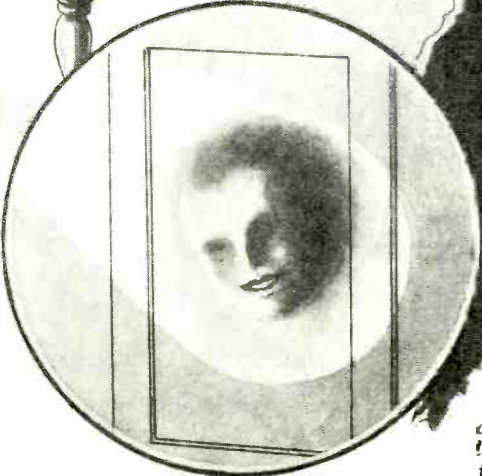
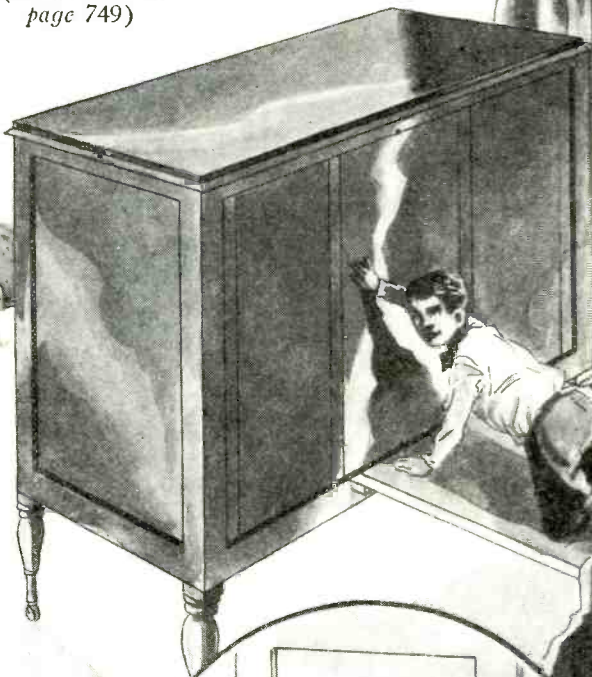
Slowly, majestically, the front curtain draped upward . . . the house was still . . . out onto the stage walked the Great and only Harry Kellar, the dean of magic, mystifier par-excellence.

A tremendous volume of applause greeted him.

Kellar gracefully bowed his silent thanks to their appreciative outburst . . . to him this was no new thing. In this manner he was greeted upon his entrance throughout the world, wherever he had appeared.

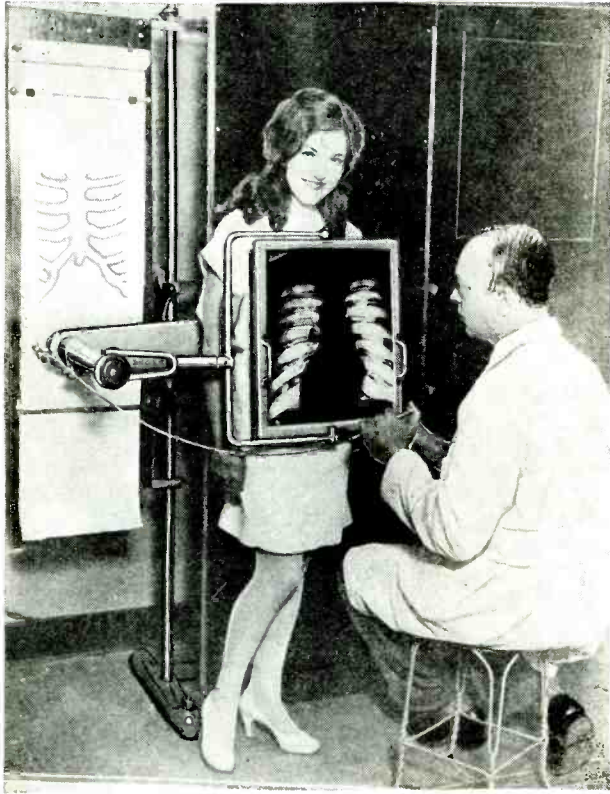
Enthralled, they sat watching every trick, deep in the mystification of this master's artistic efforts.

(Continued on page 749)



DUNNINGER, famous magician and mentalist, and a personal friend of Harry Kellar, tells here some of the most interesting incidents imaginable in Kellar's career. The public likes to be fooled, but sometimes the tables are turned on the magician—all by a stroke of Fate.

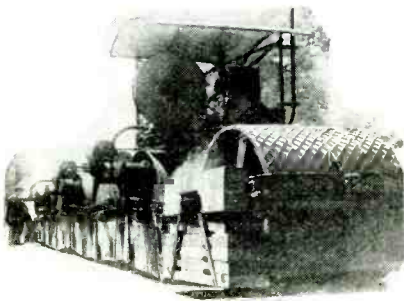
Harry Kellar, famous magician, had just announced to his audience that the ghost of "Katy King" would appear in the cabinet. But the "ghost" is locked out! Kellar's aid forgot to unlock the door.



This Machine Maps Your Ribs

IN the examinations of patients by means of X-ray, the physician often wants to record things that he sees and yet, for some reason or other, does not care to take X-ray photographs of the patient. A mechanism has been devised whereby the physician can, by merely tracing a pointer along the screen, reproduce on a chart against the wall every movement which the pointer makes. The chart can be filed for future reference or unusual features can be directly marked on it for further study.

Taking Skids Out of Streets



INSTEAD of blaming all skidding on the automobile, Berlin, Germany, prevents much of the skidding by running along asphalt streets with the machine here shown. This heats the asphalt and then the roller engraves a pattern in the street, producing a skid-proof surface.

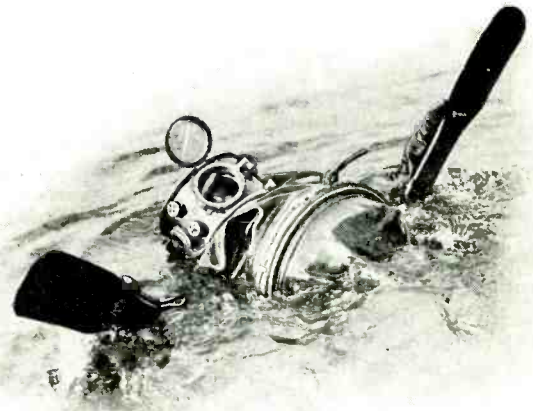
The increasing use of concrete surfacing of streets reduces the scope of work of this machine.

In the Scientific

Unusual Developments in

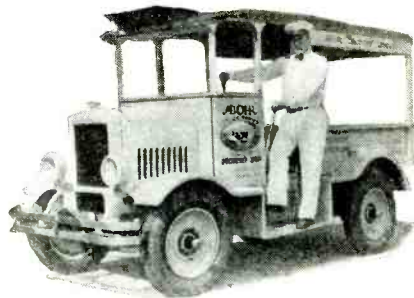
Air- and Water-Tight Life Suit

THE first demonstration of a life suit designed for shipwrecked victims was recently given in Germany. The paddles propel the victim. The lock at the waist separates the



two parts of the suit and makes it air- and water-tight. The window on the helmet is open for calm weather. A valve allows for breathing when this is closed.

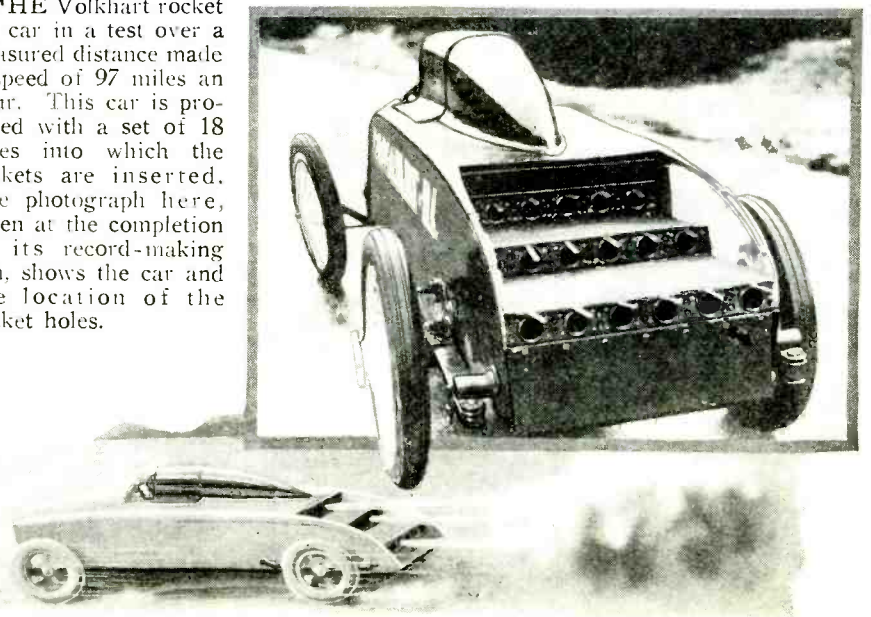
Controls Auto from Running Board



AN enterprising milk distributing organization produced an automobile which could be controlled from the running board. This saves the driver many steps and quite a considerable length of time, particularly when the run between deliveries is short as in neighboring houses. The auto is steered by a lever, and clutch and brake are located on either running board.

Ninety-seven Miles Per Hour in Rocket Car

THE Volkhart rocket car in a test over a measured distance made a speed of 97 miles an hour. This car is provided with a set of 18 holes into which the rockets are inserted. The photograph here, taken at the completion of its record-making run, shows the car and the location of the rocket holes.



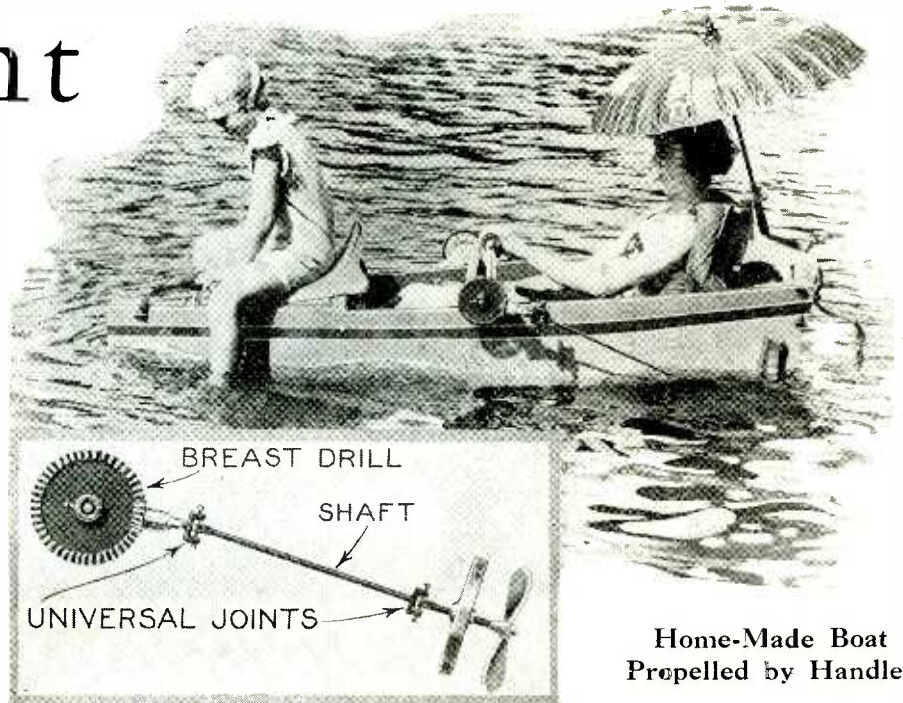
Spotlight

Different Parts of the World

World's Longest Kite



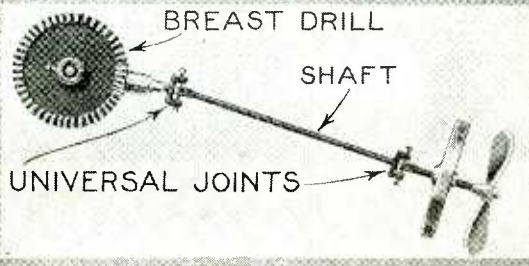
IN China kite flying is far more popular than in this country. Many attempts are made to produce kites of fantastic designs or exceptionally large kites or establishing some sort of record for such fliers. The kites are usually made of bamboo and Oriental silk and are grotesquely decorated. One of the largest kites that was ever built was recently sent up at the Exposition Park in Los Angeles. This kite was built by Lee Shaw and is in the form of a dragon 240 feet long. It is powerful enough to lift a man off his feet.



Home-Made Boat Propelled by Handles

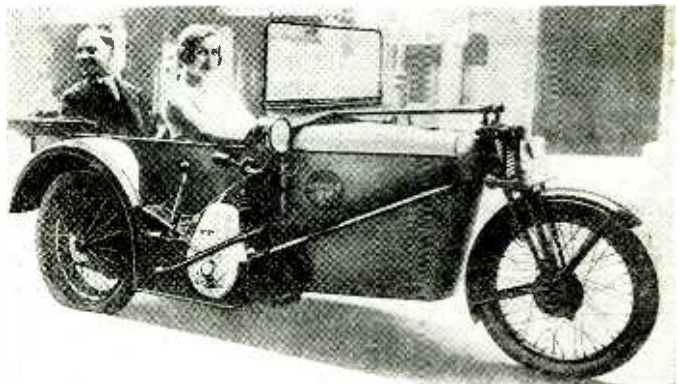
THE novel boat shown in the photograph here was demonstrated on a lake called the Aldershot Lido, because it is ideal for both boating and bathing. This lake is in England. For the benefit of those readers who might like to duplicate the novelty, an illustration showing

how two old breast drills can be pressed into service is found immediately under the photo. This boat requires no rudder, one propeller being speeded up slightly for the turn. Propellers and shafts are on either side of the boat as the photo shows.



This Auto Has Three Wheels Only!

CERTAIN laws in Germany make a three-wheel automobile very much to be desired, because no automobile license is required, and such a machine is exempt from the state automobile tax. Here is one that was recently put out by the Manos Auto Works in Germany. It will attain a speed of 25 miles an hour. Note the motor on the outside of the car and the rod for steering rising through a flap-covered opening beneath the windshield. Unfortunately a three-wheeled car upsets rather easily.

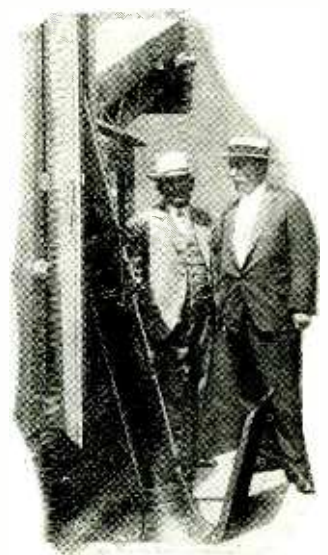


French Automobile for \$100.00

IN Paris, France, a car was recently exhibited that was hardly larger than a toy. This attracted a great deal of attention in the Paris Automobile Show. The automobile is powered with a 2½ horsepower motor. The wheels and tires are but little different from those found on a motorcycle. Their construction is lighter. To get into the car, one lifts the top, as shown, and steps inside. This auto can be purchased at a price of \$100.00 in France and will attain a speed of 20 miles per hour.

Dustless Removal of Ashes

THE new pneumatic conveyor shown in the photograph here sucks the ashes directly from the cellar and deposits them in a special car. This car then delivers the ashes to the dumping grounds. The conveyor was recently given a test in New York City before members of the Street Cleaning Department and the Fire Department. It aims to do away with unsightly ash-cans and eliminates dust.

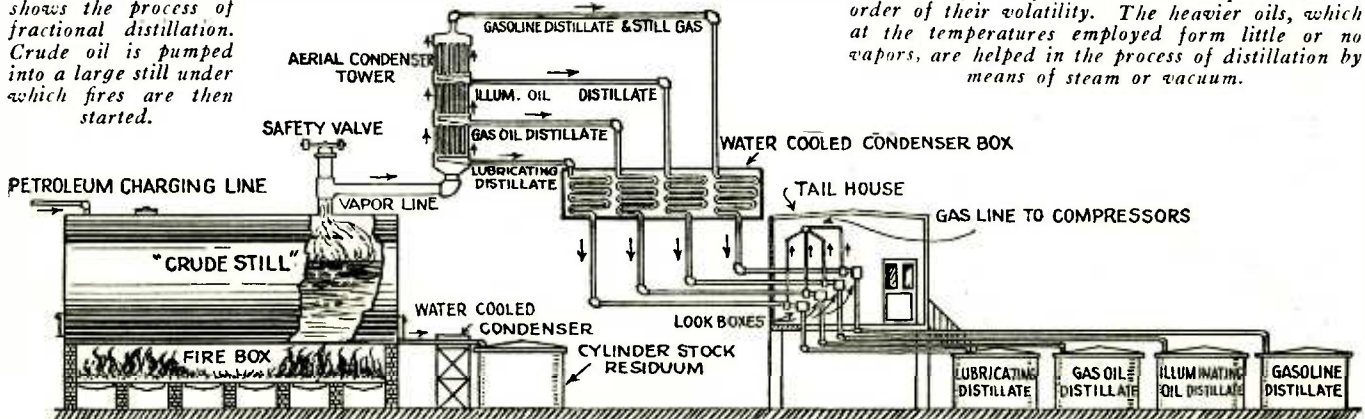


THE motoring world—and that includes practically everyone in the forty-eight states of the U. S. A. and a good share of the population of other countries—is gradually learning a lot about the stuff that permits motors to spin and wheels to go round. During these last few years lubrication engineers have been engaged in a splendid educational work, which has meant considerable money in the pocketbook and a great deal of motoring satisfaction to every motorist. And now with aviation and motor-boating stepping along pretty fast, he is a wise man who takes sufficient time to learn a few pointers about the stuff that can either crash him from the clouds, tie him up on a roadway, or, on the other hand, permit his motor to purr a pleasant "Home, Sweet Home."

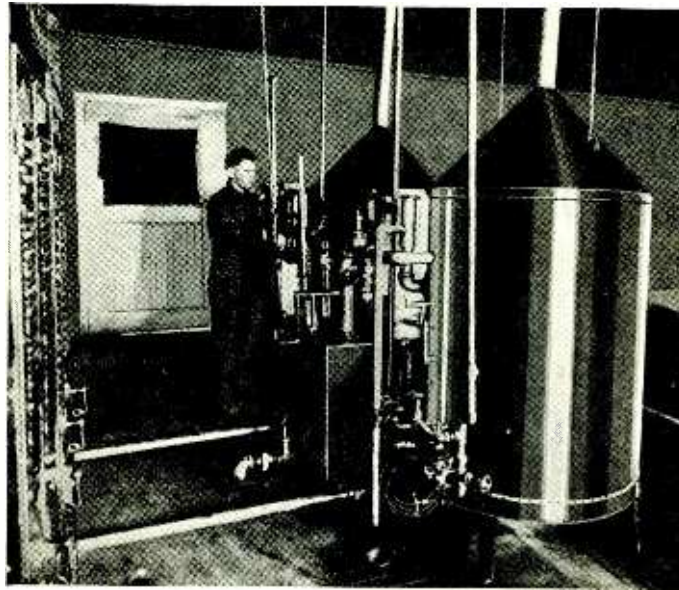
Not much of a popular nature has been written about oil. Most people simply regard it as slippery stuff and faithfully follow the recommendations of various oil companies to have their crankcases drained every 500 miles or so and refilled with new oil. If they are a little more careful than usual, they will request the grade of oil that the car manufacturer has specified, but, beyond that and beyond the distant landscape, lie the unknowing fields of innocent bliss. To most of them, oil is oil; to most garage men, oil is oil! But, to the dumb though sensitive motor, oil may be any one of a hundred things.

Compared to astronomy, chemistry, metallurgy and several other sciences that were handed down through the ages, the science involving petroleum is virtually an infant. Although petroleum had been observed seeping out of the ground for ages, even as recently as George Washington's time, it was regarded as something that merely spoiled good drinking water. In Pennsylvania the Indians collected small quantities of it and it was sold under the name of Seneca Oil for medicinal purposes. Then in 1859 Col. E. L. Drake drilled a well near Titusville, Pa., and following a blaze of excitement that developed, when the

The illustration below shows the process of fractional distillation. Crude oil is pumped into a large still under which fires are then started.



The light parts of the crude oil vaporize in the order of their volatility. The heavier oils, which at the temperatures employed form little or no vapors, are helped in the process of distillation by means of steam or vacuum.



The photograph at the left shows the oil-cleaning apparatus in the oil supply house at one of the government aviation fields.

Super-Refined Oil

Many Gallons of Lubricant Can Now Be Saved by Cleansing Old Oil

By Alfred M. Caddell

possibilities of oil struck the popular imagination, an era of industrial prosperity set in and is continuing up to the present days. For, contrary, to popular impression, the age of machinery did not develop the age of oil. Quite the reverse—lubricating oil made possible the development of machinery. Remove it from any machine or motor even for a few minutes' time and said machine or motor would speedily burn out its bearings or cease to move.

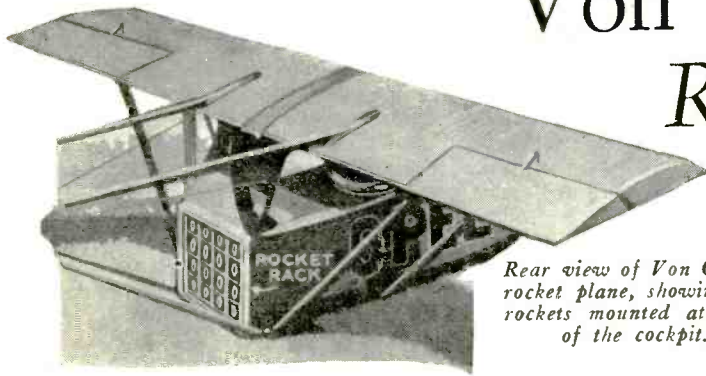
Crude petroleum is a highly complex mixture of compounds of hydrogen and carbon, running about 10 to 15 per cent. hydrogen and 80 to 85 per cent. carbon, the balance consisting principally of compounds of sulphur, oxygen, nitrogen and metallic salts.

Hundreds of different compositions, ranging between the extreme limits of gasoline on the light end and coke on the heavy, are separated from crude oil by distillation, after which these products are divided into many different grades, according to their physical and chemical characteristics and varying with the purpose for which they are to be used. Oil technicians, who necessarily must also be mechanical technicians, have spent their lifetime fitting lubricants to machines, in order that they may deliver a maximum of

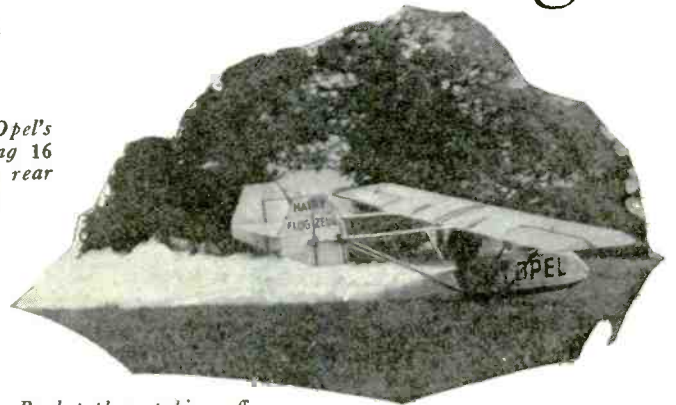
work. As a result, during recent years a vast oil technology has sprung up, the coming of the automobile contributing not a little intricacy to the problems of lubrication engineers.

How lubricating oils and fuels (gasoline, kerosene, etc.) are produced is of course beyond the scope of this article. Suffice it to say that the various groups and sub-groups are obtained through processes of fractional distillation. The crude oil is first pumped into the boiler of a large still, under which fires are started. Naturally, the light parts of the crude, like gasoline and kerosene, (Continued on page 745)

Von Opel Makes First Rocket Plane Flight



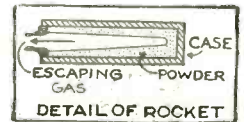
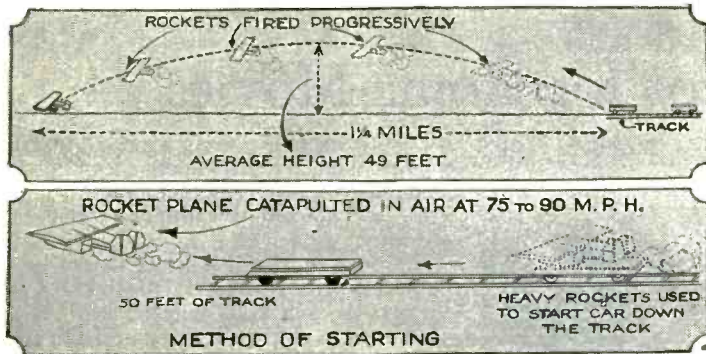
Rear view of Von Opel's rocket plane, showing 16 rockets mounted at rear of the cockpit.



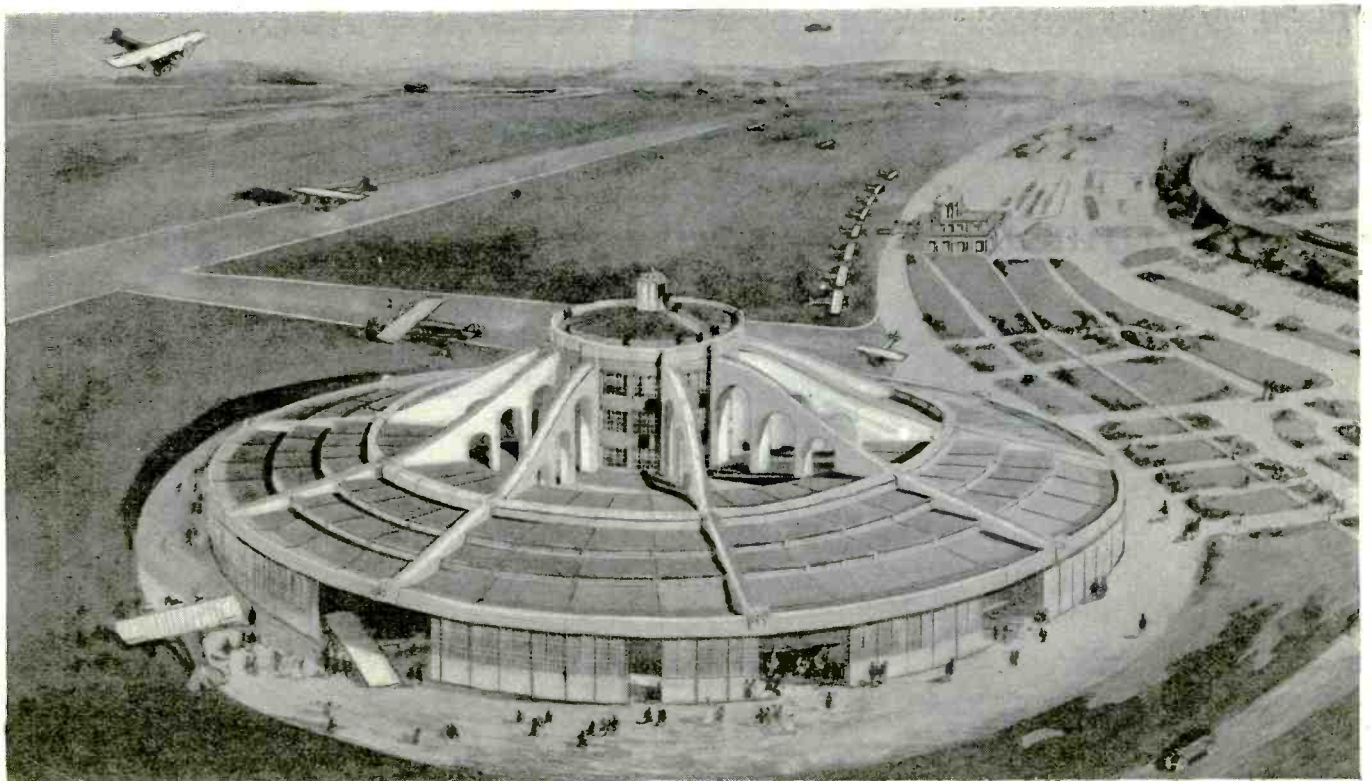
Rocket plane taking off.

FRITZ VON OPEL made the first successful rocket plane flight on September 30th at Frankfort, Germany. Von Opel was in the air for one thrilling minute and a quarter and covered a distance of a mile and one-quarter, at an average altitude of 49 feet. The drawing below shows how the rocket plane was catapulted into the air at a speed

of approximately 90 miles per hour. The rocket plane, which was really a combination of glider and engineless baby plane, weighed about 500 pounds with the pilot and the rockets on board. It rested on a wheeled carriage, which was hurled along a 50-foot length of track at tremendous speed by three powerful rockets weighing 10 pounds each and possessing a propulsion pressure equal to twice the weight of the loaded plane. The plane was catapulted into the air by the explosion of rockets fired by the pilot. The detail of one of the rockets is illustrated herewith, and they are ignited electrically one after the other by the pilot at his discretion.



A CIRCULAR AIR STATION for Kansas City

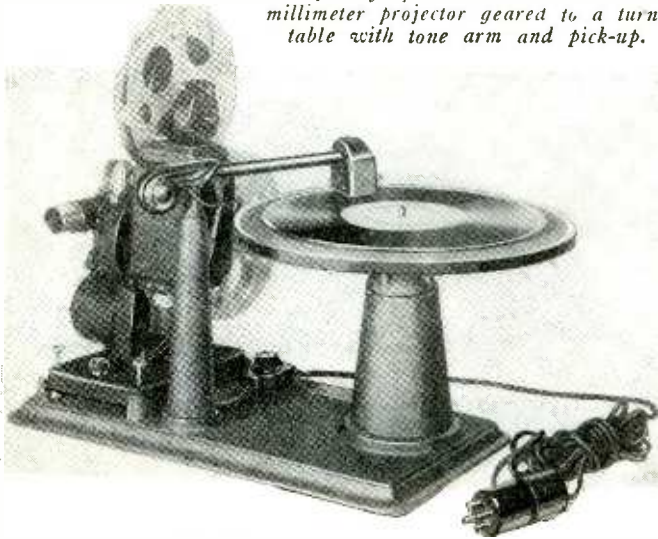


A VERY beautiful airport and a huge terminal station to house the largest airplanes has been designed for Kansas City, Mo., and is illustrated herewith. The circular terminal building will measure 450 feet in diameter on the

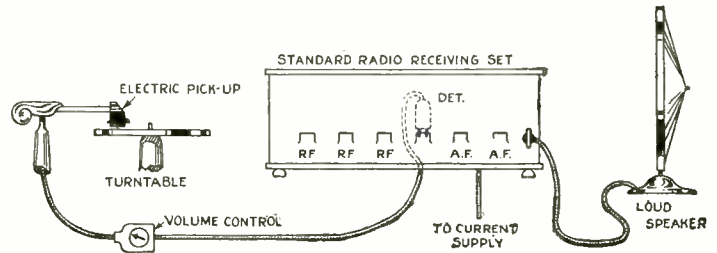
ground floor, and the building will cover an area of 159,000 square feet. Around the building will be a concrete taxi path 100 feet in width, so that planes landing on the field can taxi in and be housed in any part of the structure.

Amateur Talkie Equipment

The photograph below shows a new 16 millimeter projector geared to a turntable with tone arm and pick-up.



AMATEUR movie makers will be interested in a new home talking movie outfit which consists of a regular 16 mm. projector which is geared to a turn-table equipped with an electric pick-up. The latter connects to the audio amplifier in the radio set (a separate amplifier may be used) and a gear shafting synchronizes the action on the screen and the sound on the record. The drawing below shows how the record programs are reproduced through the radio receiver. Films or records can be run separately if desired. The operation is simple; it is simply necessary to thread the film through the projector, put the phonograph record on the disc, plug into the radio set and press a button.



New 16 mm. Projector for Home Movies

A NEW 16 mm. projector for home use was recently announced. This projector, while extremely low in cost, has many admirable features. It is made of die-cast aluminum, and is therefore very light in weight. While it is hand-driven, a motor can be added so that the machine can be entirely electrically operated. The motor possesses a unique feature, that of being controlled by an adjustable governor instead of a rheostat.

The optical system is very efficient and a specially designed bulb of the coiled type rated at fifty watts is used. At a distance of about twenty feet this gives a clear brilliant picture, about two and one-half by three feet. A quick threading gate and claw type intermittent movement, together with a single feed and take-up socket comprise the mechanism



for shifting the film with regularity.

The magazine arms have a capacity of one hundred feet, although auxiliary arms can be obtained of four hundred feet capacity.

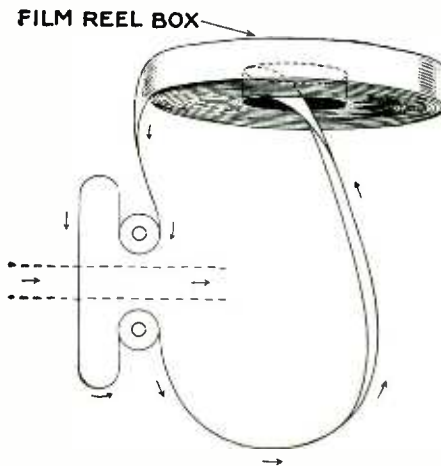
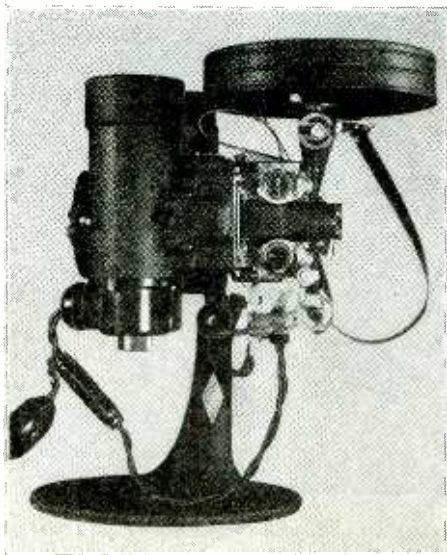
For use in rural districts where there is no electricity, a special lamp that consumes only six volts may be used, operated from a storage battery or from four dry cells.

The machine comes complete in a carrying case that contains space for the extra film.

The manufacturer expects to soon announce a low-priced sixteen millimeter camera in combination with this projector, thus opening the home movie hobby to many heretofore unable to enter it because of the high cost of equipment. The photograph shows a view of this low-priced projector.

Continuous 16 mm. Movies for Advertising

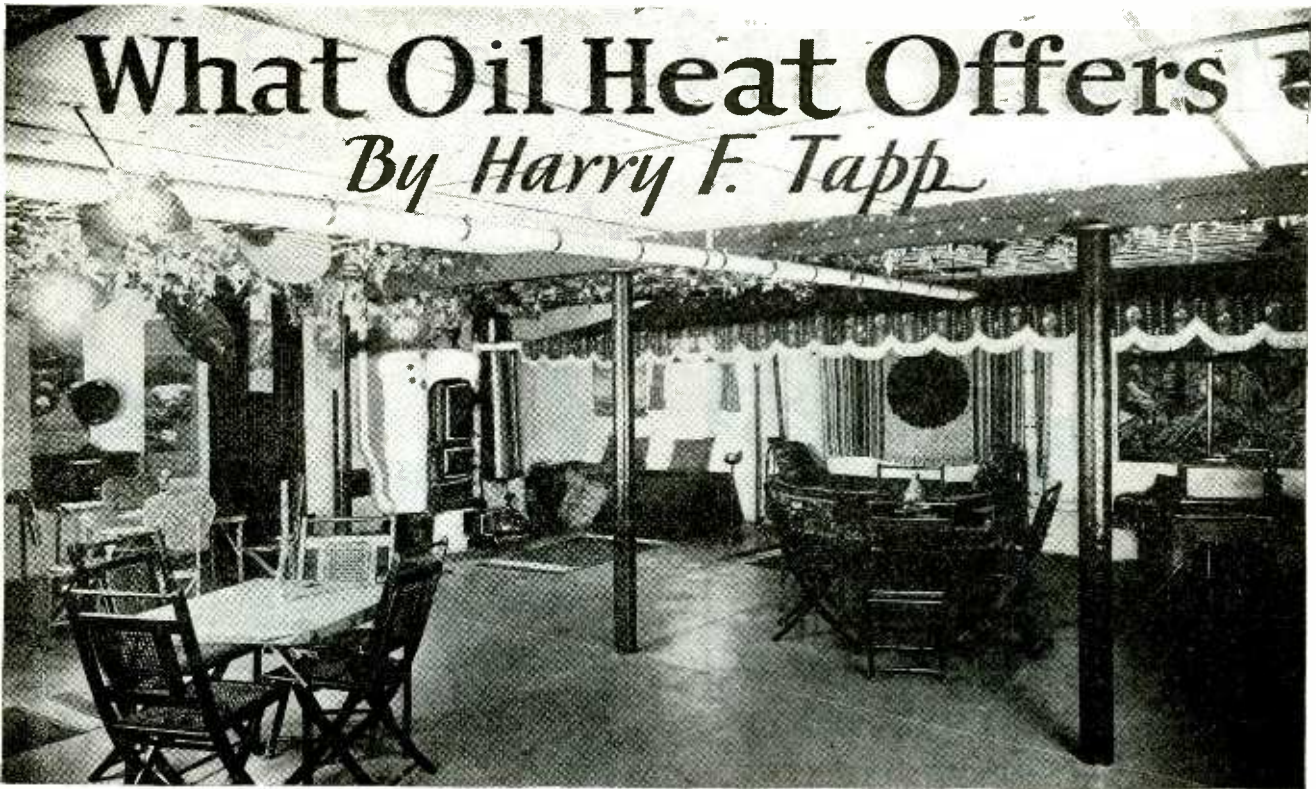
ONE of the larger amateur movie equipment manufacturers is now making a continuous projector attachment for use with their regular projectors, by means of which the same film is shown over and over again. The attachment consists of two major units which are slipped upon the projector. A drum at the top contains a continuous reel upon which the film is wound, and in place of the lower reel arm, a mer-



The continuous projector is shown in the photograph at the left. A drum at the top replaces the other reel arm, and houses the continuous reel containing the film, as shown in the above drawing.

cury switch is provided which automatically shuts off the current should the film break. The ends of the film are, of course, spliced together. In the drum the film rests on its edge and is kept moist by a humidifying device which is an important factor, especially when projection is continuous. All rollers over which the film passes are designed so that contact is made on the film edges and margins only. The film is never scratched.

Names and addresses of manufacturers on request.



What Oil Heat Offers

By Harry F. Tapp

Your basement may be used like this, when an oil burner is fitted to the boiler, seen in far corner.

THE user of oil-heating equipment adds to his life real liberty. He has been released from the traditional furnace chores and in the changing of a dull cellar filled with coal bins, ash cans and coal scuttles to a pleasant room, or rooms, free from dust and grime, there are infinite possibilities for the pursuit of happiness for all members of the household.

Once the basement has emerged from its primitive state you may decide to what use to put the space. If it is to be used as a children's play room—let them help work out the plan themselves. Most children like to draw or paint, and they should take great interest in drawing a frieze of animals walking to the ark, across a beaver-board wall space.

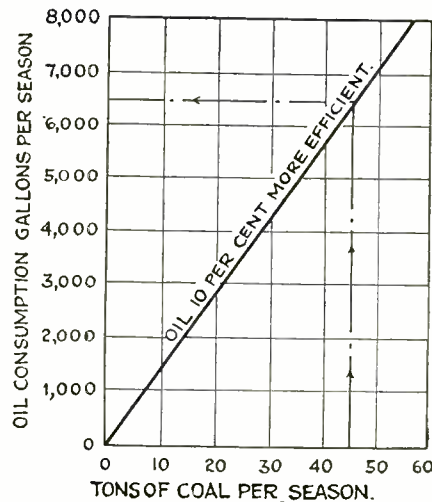
Older children would find it an ideal place to put the articles from their manual training classes, room for a permanent platform for the electric trains, always underfoot upstairs, or an unequalled opportunity for a real play house. An important point is that all well designed burners have all moving parts and adjustable features inclosed so that children playing in the vicinity are not able to tamper with the mechanism.

If the children's play room, assuming that your family includes the youngest generation, is incorporated in your upstairs floor plans, then why not fit up part of your basement as a gymnasium, with possibly a standing shower bath in one corner? This, too, would be the logical place for the scales and any heavy gym equipment which cannot always be installed with safety upstairs.

For a man who does his work at home a basement studio or workshop makes a secluded retreat from wailing infants, ringing doorbells, vacuum cleaners and other domestic activities.

HARRY F. TAPP, the engineer who prepared this series of articles on oil burners for residence heating, is one of the foremost experts on this subject. Mr. Tapp is the author of the "Handbook of Domestic Oil Heating." This is the second of a series of articles.

A division of space is, of course, possible, although if rooms are walled off the heating will usually have to be taken care of by extra radiation. A sewing



To compute cost of oil fuel per season, ascertain cost per gallon from local dealer and multiply this by number of gallons equivalent to your present coal consumption. If you burn 20 tons of coal, glance upward till diagonal line is met; look along horizontal line to left and we find 2,900, or roughly 3,000 gallons of oil.

room would be appreciated by the woman who makes her own clothes, with room for a cutting table, sewing machine and dress dummy. So much more work can be accomplished when one does not have to put everything away at meal time or at night, but can go back to work and find things as they were dropped.

And what a place for parties! All you need is the dance floor and a victrola, or run an extension loud speaker from your radio. You can be very Greenwich Village on almost nothing, with candles in bottles and all that sort of thing. We've even heard of people installing a miniature bar in their cellar. Of course that is optional, but it does add atmosphere. The saving on wear and tear on the living-room furniture is no mean item, as any hostess will testify. The "morning-after" duty—picking cigarette stubs and ashes from between the cushions and gathering in the stray glasses that will be left in the most unlikely places—loses half of its terrors when you know that, no matter what was spilled, or if a cigarette missed the ash tray, no one need worry.

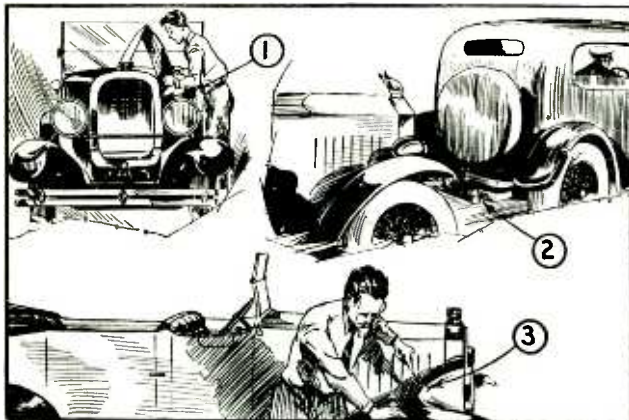
Many people utilize their new basement rooms as servant quarters or an emergency guest room. To quote one owner who found good use of this room: "If I hadn't been burning oil, it would have been necessary either to make an addition to the house or move into a larger place when my son and his wife came to live with us. The fact that the basement could be used made this expense unnecessary. I honestly believe, in estimating heating costs, a rental charge should be made against the coal bin."

Even if you don't go in for gymnastics or hilarious parties, if your children are grown up, (Continued on page 744)

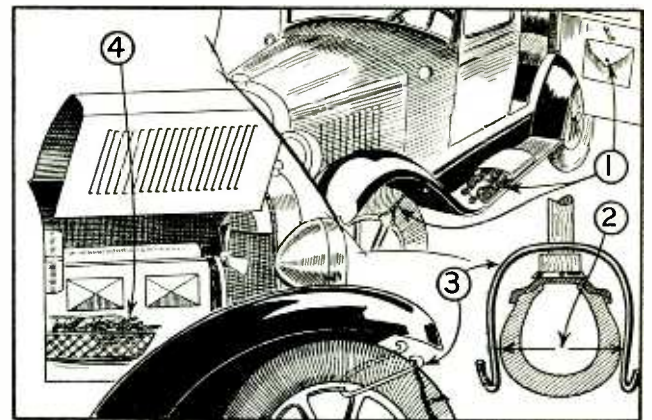
Motor Hints

For Car Owners and Drivers

Conducted
by
George A. Luers
Automotive Engineer



1—Hood scratching causes chromium break; 2—Bumper scraping helps ruin chromium; 3—Screw-driver nick does it too.



1—Door-pocket for snap-on chains; 2—Wire hook to fit snug; 3—Snap chain on, using hook; 4—Regular chains under hood.

Take Care of Your Chromium

FEW car owners are aware that chromium plating must be treated carefully. The layer of chromium is from .0002 to .0004 of an inch in thickness. Present methods do not permit of a heavier deposit. Where the plating is over brass, the film is easily worn through by abrasion. If over steel, the scratching of bumpers and engine hood edges will break off the chromium. Once broken, the rust and corrosion tends to cause peeling due to these scratches.

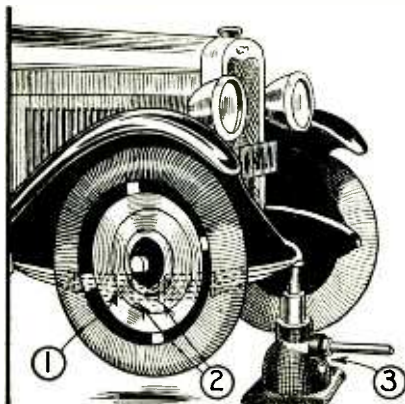
Another weakness of the thin plating is that the film, by reason of electrical deposition, is inclined toward being porous. If wet mud or dirt is allowed to remain on it, rusting of steel under it will occur.

Stop Springs Breaking

VIOLENT spring action, due to frozen roads, result in many broken springs.

A solution of beeswax in gasoline or of resin in turpentine is applied between the leaves of the spring.

The spring clips should then be made tight, the saddle bolts should be taken

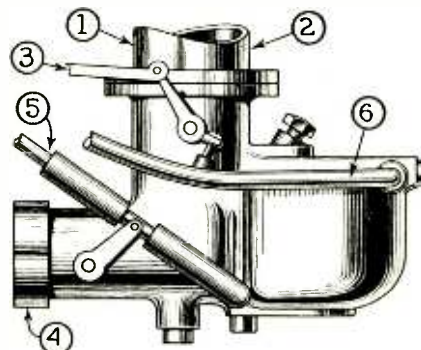


1—Solution is brushed on spring; 2—Then make clips tight; 3—Position of jack while treating springs.

up solid and the shackles should be adjusted so as to take outside play.

More Mileage with New Carburetor

NEWS is gradually getting around that the carburetor used on the Model "A" Ford is an effective gas saver for old model cars in cases where it can be attached. Recently two owners, one an Essex and another a Studebaker owner, applied these in place of the old equipment. A gain of fifteen



1 and 2—Intake manifold of engine; 3—Accelerator connection to dash; 4—Hot-air pipe can be used; 5—Dash choke control rod.

per cent or more in gasoline mileage resulted.

Carburetor flanges are now made uniform, except for diameters of intake manifold. The carburetor mentioned has a one-inch opening for the intake manifold. If an elbow fitting is required, it is possible to obtain a suitable part from one of the dealers in carburetors.

How to Handle Tire Chains

THE best chains for short trips or to pull the car out of snow are the quick snap-on chains, which encircle the tire and rim. Three of these for each rear wheel will pull the car out of a

tight place. Have a small waterproof container for these and they will stow in a side pocket, ready almost instantly.

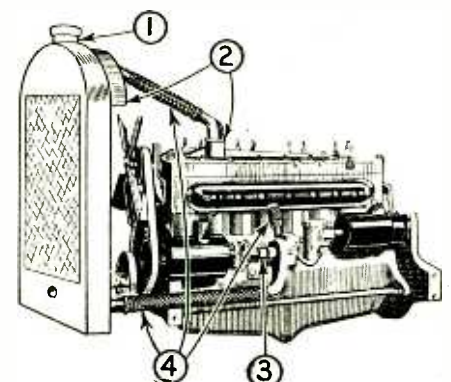
Regular duty tire chains are required for long trips through snow trails and in mountainous sections. A good way to place these on the wheels is to use a hook, made of quarter-inch wire, bent to the shape shown. Two of these are used so that both rear chains can be put on at one time. To put on the front chains, the car is driven backwards. Chains may be stowed in a wire basket under the engine hood.

Preparing the Radiator for Winter

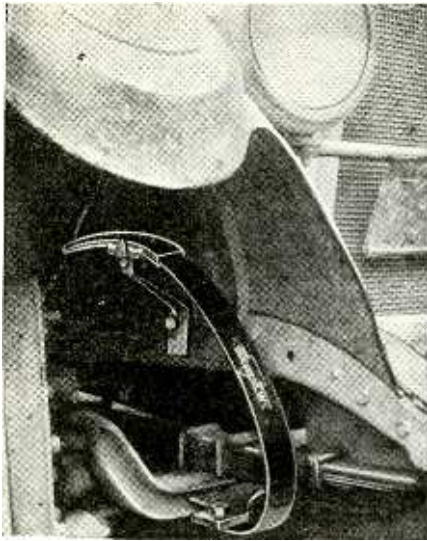
THE radiator should be prepared in advance for the anti-freeze mixture. Not alone should the radiator be flushed, but all weak spots should be made tight.

The procedure outlined below shows the main items which should be attended to.

If one-half pint of kerosene is poured into the radiator water, prior to this work, it will do much to clear out scale, kerosene being used for this purpose in water and steam boilers where it has proved effective.



1—Clear out scale; 2—Force iron cement into crevices; 3—Repack pump gland; 4—Inspect hose, tighten clips.



A Review of Some of the Latest Accessories Which Will Add to the Comfort and Pleasure of Motoring. A Two-Way Shock Absorber, an Oiler Which Effectively Lubricates the Combustion Chamber, and a Windshield Cigarette Lighter Are Shown

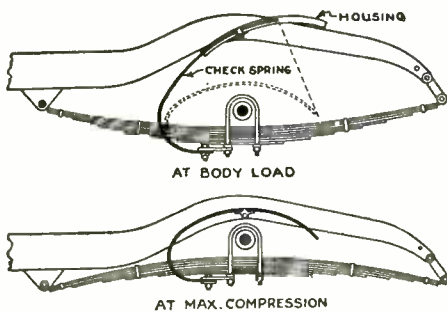
Bump Control for the Auto

Automobile Spring Control Insures Freedom from Jolts and Clatter

AN automobile spring control which eliminates to a great extent the shock felt when passing over bumps is shown in the illustration. It requires no lubrication and uses no fluid-filled chamber for checking the shock. The chassis springs can work both ways unresisted by friction within the desirable limits. It not only cushions part of the compression thrust but checks violent rebounds. The line drawing shows the bump-check spring which is inserted under the main spring. The compressed position of the spring is indicated by the dotted lines. When the main spring is compressed the check spring slides over a friction mat.

The spring control effectively resists the double throw of balloon tires and soft chassis springs and maintains a free center under any load. The device stabilizes steering by preventing side-sway and augments the natural straight-away characteristics of the steering system.

The above photograph shows the shock absorber installed on an automobile. The illustration at the right shows the check spring and main spring under static or body load and the position of the check spring under maximum compression of the main spring.



Cylinder Lubricator

THE life of the automobile engine can be lengthened and better performance obtained through the use of a combustion chamber lubricating appliance. The device introduces a special penetrating oil into the cylinder. It operates by vacuum to the intake manifold and thence to the cylinders, thoroughly lubricating the cylinder walls, the upper piston rings and valves. An oil container is provided which is bolted to the car in a suitable position. The oil flows from

Windshield Cigarette Lighter

Money from Auto Inventions

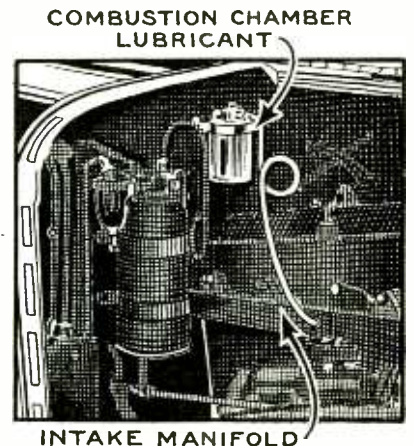
THERE is hardly a better field today than that of automobile appliances on which inventors can expend some of their ingenuity. The devices described here will give some idea of what other inventors have produced. There are still a surprisingly large number of automobile specialties which someone should invent.



The above photograph shows the automobile cigarette lighter in operation. The cover is pulled off to light the device.

the container through a metal tube to the intake manifold. Where the manifold has already been tapped, the lubricator can be attached in a few minutes. The oiler eliminates carbon troubles to a great extent.

Easier motor starting and quicker pick-up are assured by the proper lubrication of the cylinders. The oil reservoir carries enough oil to last for approximately 500 miles.



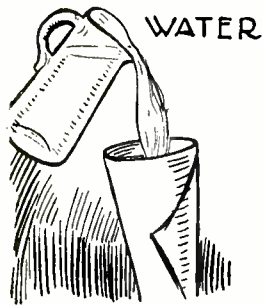
The above drawing shows the lubricating device attached to the car with connection made to the intake manifold. The photograph at the left shows the oil container, connecting tube and can of special penetrating oil.

FOR the motorist who smokes, the new cigarette lighter shown in the photograph will prove to be a valuable accessory. A rubber suction cup on the base allows it to be fastened to the windshield or windows of the car. When a light is required it is simply necessary to pull the top or cover of the lighter from the base. The wick and fuel are placed in the removable top and alloy in the base. A special spring contact brushes across the pyrophor when the top is removed.

Names of manufacturers supplied upon request



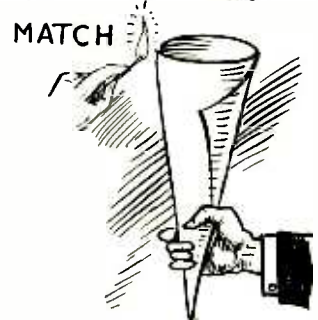
How the "Enchanted Cornucopia" trick is performed.



MAGIC

By *Humminger*

No. 76 of a Series



Allah's Candle

THIS magical device can easily be constructed by the reader. Effect: The magician exhibits what seems to be an unprepared tallow candle. He lights this—then with some patter (talk) about an Indian high priest who could light candles by power of will, he blows upon the candle and extinguishes it. A few passes and the candle re-lights—another pass and it goes out again. Secret: A wick saturated with benzine and operated by the slide pulls the flame in and out of the metal candle.



The Enchanted Cornucopia

THIS effect trick is illustrated at the top of the page. The magician first makes a cornucopia of paper. He then fills this paper cone with water from a pitcher. Putting the pitcher aside on the seat of a chair, he asks his assistant to light a match and set fire to the cone. This slowly burns until entirely transformed into ashes, which drop to the floor. The water has vanished. Explanation: The cornucopia, which can be rolled out of flash paper to produce a more spectacular effect or out of newspaper, is rolled up and then, while reaching for the pitcher of water, is passed behind the chair to pick up a celluloid cone hanging there. The water is now ostensibly poured into the paper, but actually into the celluloid cone. Another pass and the cone containing the water remains suspended on the back of the chair after which the paper is burned. With a little practice and misdirection, this trick can be presented so as to leave the audience quite bewildered. This and the Allah's candle trick are good foils for each other.

Ultra-Coin Trick

ONE of the greatest difficulties in the manipulation of coins is to handle them with that dexterity only possible by experts at sleight of hand. The novice or student often prefers short-cut methods because they have not the time to devote to hours of practice. A thimble, soldered to the center of the coin will prove of great advantage. With the coin palmed, the wizard has but to close his fingers, insert the middle finger into the mouth of the thimble and open his hand. The coin will be carried to the finger-tips in an expert-like move.



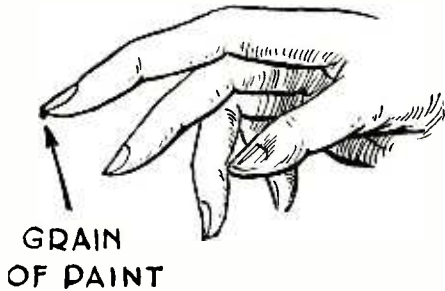


A mystic trick performed with a painter's palette containing assorted colors.

The Mystic Eye

THIS is a novel and effective thought-reading trick. A painter's palette, with a number of small squares of paints of assorted colors, is passed for inspection. A small nickel-plated box, slightly larger than the squares of paints, is likewise examined. As these articles are actually unprepared, rigid inspection is invited. During the wizard's absence from the room, one of the spectators is requested to place one of the paints into the box. Upon the magician's return, he is handed the box, which he holds behind his back in the one hand, while he raises his other hand to his head, to enact a picture of deep concentration. Shortly he calls the color of the paint concealed in the box.

Secret: In the act of holding the box behind his back, the wizard quickly opens it for a moment and secures a few grains of the paint beneath his finger-nail by scratching the nail across the surface of the square. In the act of raising his hand to his head, he thus has but to secretly observe the color beneath his nail.

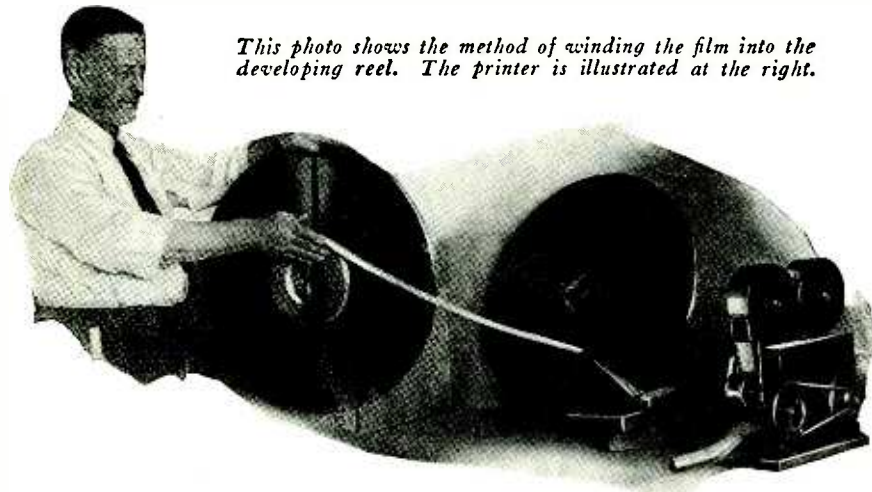


Above: How the magician gets a sample of the paint as he holds the box behind his back.

Can You Answer These Science Questions?

THE following questions on general science can be answered, if you have carefully read the articles appearing on the pages mentioned. Practically no one today considers himself well read unless he possesses a fair knowledge of scientific subjects. Here are the questions:

- 1—What is the water pressure in pounds per square inch at a 2500 foot depth below the surface of the sea? How far can a diver ordinarily descend into the sea? (See page 684.)
- 2—Where are palaces and apartment houses and other buildings constructed of mud, and what would happen to them if a heavy rain descended? (See page 686.)
- 3—How many engines can safely go dead on a tri-motor airplane? How can a shotgun shell start an airplane engine? (See page 689.)
- 4—How is the latest automobile device arranged to prevent a car sliding backward down a hill, when the brakes will not hold it? How are the rear wheels driven in the newest gas-electric automobile? (See page 690.)
- 5—Does the new Baird televisior use an arc or incandescent lamp at the transmitter? How is the voice transmitted in this television system? (See page 691.)
- 6—How can a dirigible ascertain its height above the ground by measuring the echo of a sound wave? (See page 692.)
- 7—If you were sailing in a ship at sea in a fog and you wanted to determine if icebergs were in the vicinity, what simple scientific test would you apply? (See page 693.)
- 8—Can you explain in a simple manner how high voltage electricity is developed from water stored up in mountain reservoirs? (See page 694.)
- 9—What is the fastest airplane speed? What is the fastest railroad train speed? How fast can a horse run? (See page 698.)
- 10—If you had to lift many tons of ashes one hundred feet each day, in a simple mechanical manner, without using elevators or dumbwaiters, how would you do it? (See page 687.)
- 11—How is gasoline obtained from crude oil? What other important products are obtained by the same process simultaneously? (See page 704.)
- 12—How did Fritz Von Opel launch his rocket plane into the air, and what was its initial speed? (See page 705.)
- 13—Can you compute quickly the approximate relative cost of burning fuel oil to heat your home through the winter, when you know how many tons of coal you burn per season? (See page 707.)
- 14—What special precautions should be taken in order to preserve the new chromium-plating on your automobile trimmings? (See page 708.)
- 15—How would you go about developing and printing your own "home movie" films? (See page 712.)
- 16—Do you know how to make rayon? (See page 714.)
- 17—What is meant by a "growler" for electrical testing purposes, and how is it used? (See page 717.)
- 18—Do you know what simple formula can be used to "brown" gun barrels? Do you know how to drill holes through glass? (See page 721.)
- 19—Without using any relays or magnets and provided with a switch and a fan motor, how would you rig up a simple remote control "station selector" for your radio set? (See page 724.)
- 20—Describe the Diesel engine cycle. How is a lady's head made to appear as if floating on swords by means of mirrors? How is a hail stone formed? (See page 729.)



This photo shows the method of winding the film into the developing reel. The printer is illustrated at the right.

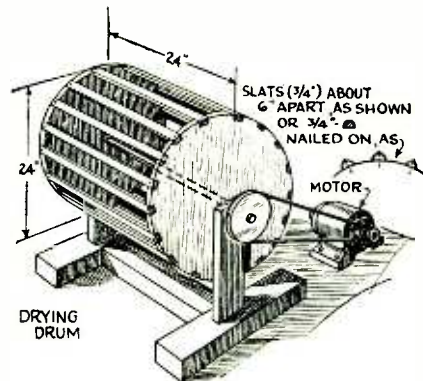


Fig. 7. Here is an illustration of a drying drum that the home movie enthusiast can make for his own use.

HOME MOVIES

How You Can Develop and Print Your Own Movies at Home

By Don Bennett

EVENTUALLY, every amateur movie maker feels the urge to try his hand at processing his own films. This is a laudable urge and one that deserves the utmost assistance from those in a position to help the amateur.

Professional laboratories are full of expensive equipment. Complex mechanisms are necessary for the processing of reversal film. And although the equipment needed for professional negative-positive work is not as elaborate or expensive, still it is beyond the reach of the average amateur. Our problem then is to find some means of placing in the hands of the user the most inexpensive equipment that we possibly can. The amateur must use small quantities of chemicals or the expense will be prohibitive (the commercial laboratories use forty gallons of developer in each tank). This requires the use of small tanks and smaller racks than the professional uses.

Figures 5 and 6 show two racks that can be easily made by anyone handy with tools. The easier one of the two only holds ten feet of film because of the spacing that is required between the pins. If this spacing were not there, there would be a possibility of the adjacent layers of film touching each other and preventing development of the image. The rack shown in Fig. 6 is more difficult to build but is more satisfactory and holds more film. It is made of brass or copper ribbon 1/32 inch thick by 1/2 inch wide. The ribbon is arranged in a spiral from the center, each layer of the strip being 1/4 inch from the next. At the center is a round piece 2 inches in diameter that serves as a well for pouring in the solution. The spiral is laid out as shown by the table in the illustration by cutting notches that gain 1/16 inch from the center on each arm. After the first mark has been



Photo by Herbert C. McKay
Fig. 3. This photo shows the Stineman 16 mm. printer in use. Note its small size.

laid out on each arm, it is only necessary to mark spaces a quarter of an inch apart until the end of the arm is reached. Involved calculation is unnecessary.

Four quadrants are cut out of brass so that they will fit into the spaces between the arms. The arms may be grooved to take these quadrants or they may be spot soldered to the stripping. These pieces form a bottom plate to prevent the film from sagging down below the strips and becoming tangled when the film stretches after being wet.

When the rack has been assembled, have the whole thing heavily nickel-plated or dip it in Probus paint (an acid-proof compound). This will prevent action of the chemicals on the strips and consequent spoiling of the developing solutions. The extreme diameter of this rack is twelve inches and it provides for a film capacity of almost seventy-five feet.

Three tanks must be made to hold the solutions for developing, fixing and washing the films. These tanks may be circular in shape, the inside diameter measuring twelve and a half inches; they are two inches deep. If desired,

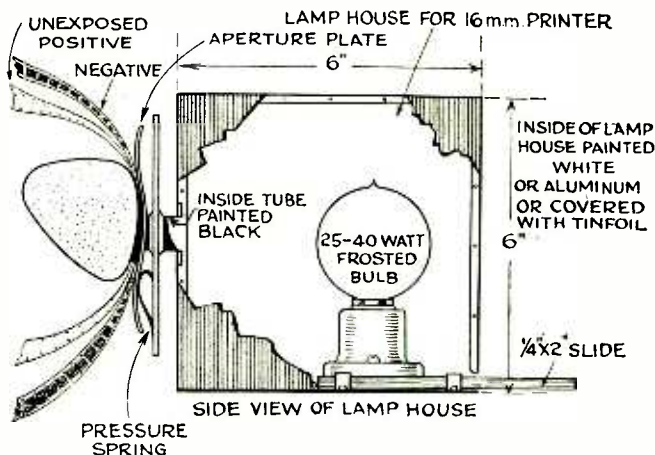


Fig. 2. Details for the making of a printer for 16 mm. film.

The tanks for the developing and fixing of the film are to be seen on the table top. This also illustrates the developing reel.



Photo by Herbert C. McKay

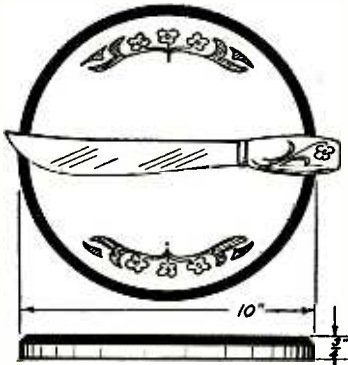
they can be made to nest, each tank of a different size, the smallest one twelve and a half, the next thirteen, and the last thirteen and a half. Then all three tanks and the rack can be stored together in a very small space. The tanks should likewise be nicked or painted with Probus.

For developing the negative the formula known as Number 16 is the best to use. This formula will be found at the end of the article, together with the formula for the positive and for the fixing bath. These are printed together so that they may be cut out and pasted in the scrap-book.

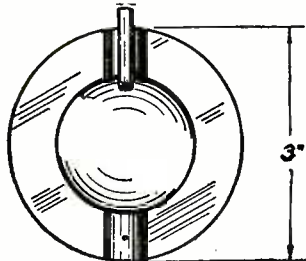
(Continued on page 758)

Christmas Gifts from the Home Wood Turner

By H. L. Weatherby



A handy cake bowl.

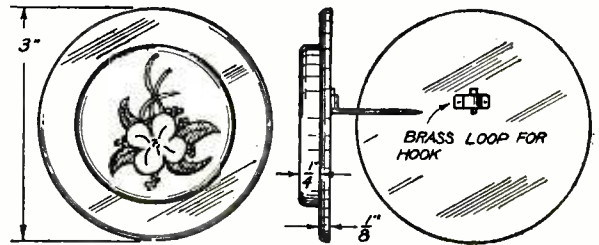
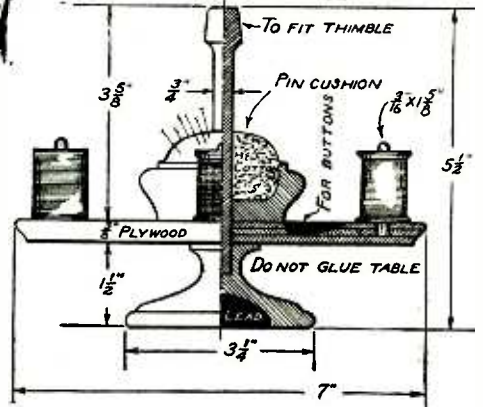


WITH the approach of Christmas and the making of gift lists, we are usually at a loss to know just what to give. Again, our pocket-books may not be able to stand the strain, and we dread to see the holiday season draw near. There are many useful novelties that can be made quickly and easily at home on the lathe by the wood-turner, and well-made and nicely finished articles made at home are the most acceptable of gifts. A few pleasant hours in the shop does the trick and, besides all of the fun and experience gained, the question of gifts may be solved in a large measure.

Most of the gifts illustrated will appeal to the feminine taste, even to the ash trays; however, they are all for the home and will prove to be very acceptable to all members of the family.

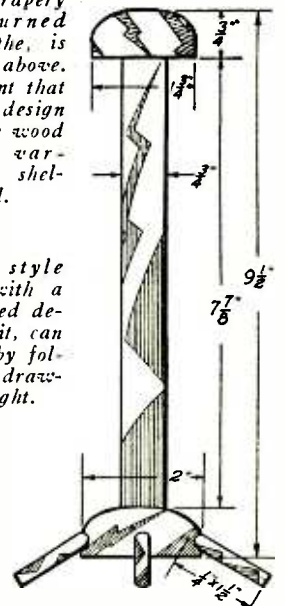
The Cake Board

ABOUT the easiest one of the group of articles illustrated is the cake board. It simply calls for the turning on a face plate of a flat, circular piece, with a bevel on the top side, careful smoothing up and decorating. The decorating may consist only of a two-color enamel combination on the edge and bevel, or in addition a spray of flowers may be painted on the top surface. A knife, that should go with it, to make the gift complete, should have the handle painted and decorated to match the board. It is quite likely that most housekeepers would prefer the top surface of the board simply sandpapered smooth and left free of decoration, so that the board could be thoroughly cleaned and scraped if desired. A close-grained, well-seasoned wood should be used and the size of the board, of course, is optional.



A neat drapery tie-back, turned in the lathe, is illustrated above. In the event that a transfer design is used, the wood should be varnished or shell-lacked.

A modern style hat-rack, with a gaily painted design upon it, can be turned by following the drawing at right.



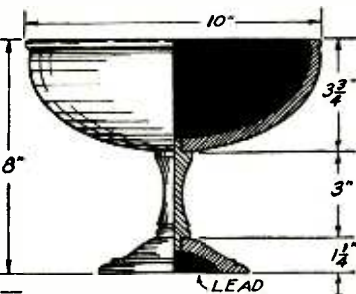
Drapery Tie-Back Ornaments

A SET of these ornaments will appeal particularly to the women. Most curtains and draperies are held back near the bottom with tie-back pieces, which usually loop over a hook placed in the casing. These disks, painted in gay colors to match the window hangings, will add very much to the appearance of the room. The turning is a simple matter, and the decoration may be done with transfer designs by those lacking artistic ability.

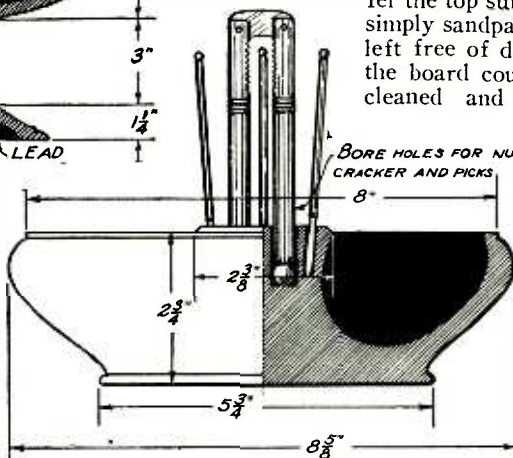
The construction of the loop which holds the hook is clearly shown. The shoulder of the hook, any number of which may be purchased (Continued on page 754)



Turned wood ash tray.



A turned wood fruit or nut bowl is shown above.



Nut bowl and holder for the cracker and picks turned from wood; mahogany or walnut makes a very pretty job. The finish may be rubbed varnish.



How to Make Rayon

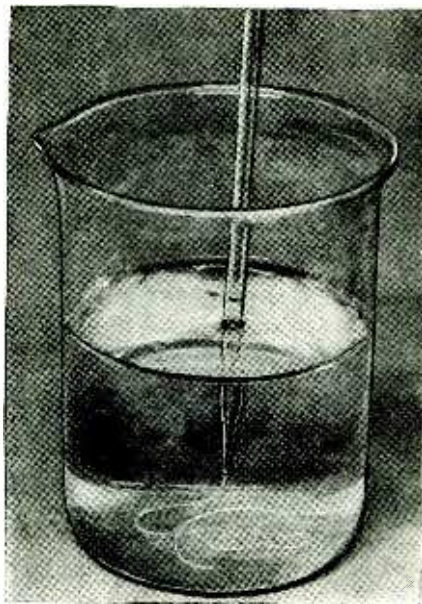
By Raymond B. Wailes

ONE would think that such a scientific and technically controlled process as the manufacture of artificial silk could not be duplicated by the amateur chemist in his little home laboratory, but quite the contrary, the actual manufacture of threads of this new industrial fibre is really possible as a laboratory demonstration.

Rayon, or artificial silk, can be made in the laboratory by dissolving purified or cleaned wood pulp or cotton in a solution of a copper salt and then squirting this chemical solution through holes into an acid or alkaline solution. This latter solution precipitates, as it were, threads of the artificial silk, which are then washed in water and dried. The drying often being done under tension.

Although the laboratory preparation of artificial silk, or rayon, will not yield fibres which may be woven into cloth, the process is easily carried out, and positive results are usually the outcome of even the most careless laboratory technique.

The first step in this beautiful experiment is to prepare a solution of cellulose (cotton or wood) in a copper salt solution. The copper solution is cupro-ammonium sulphate and can be easily made by dissolving copper hydroxide precipitate in very strong ammonium hydroxide, the stronger the better. The precipitate of copper hydroxide will immediately dissolve, forming a deep blue solution. This deep blue solution has the curious property of dissolving cellulose. Cot-



Blowing the cellulose solution through a small hole into a ten per cent. solution of sulphuric acid produces the rayon threads.



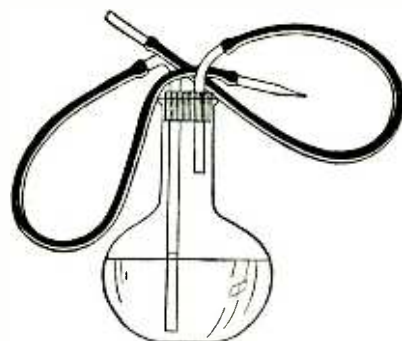
Filter paper dissolves in the copper salt solution.

ton, wood and paper are cellulose, and it will be found that if a sheet of filter paper is dipped into the solution, it will become pasty and disappear.

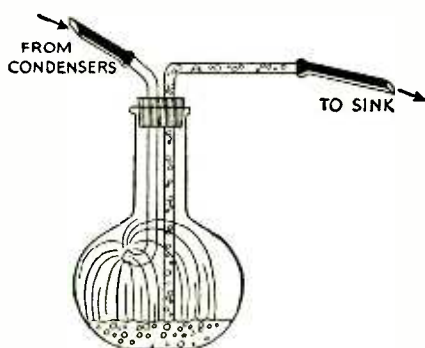
To squirt the threads, take an ordinary pipette and suck some of the cellulose solution up into it and thrust the tip of the pipette down into a weak sulphuric acid solution. Blow from the upper end of the pipette, and the cellulose solution will be squirted out through the hole in its tip and instantly be changed into artificial silk. The threads should be collected while moist, washed and dried.

Short-Cuts for the Young Chemist

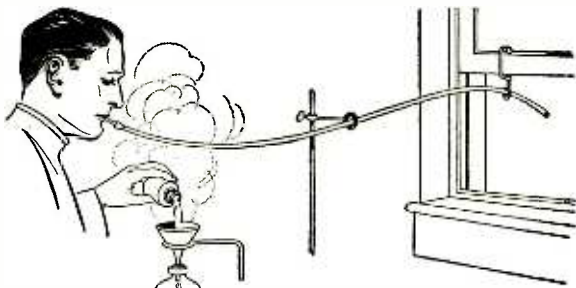
A WASH-BOTTLE that will stand on the table while in use, leaving both hands free, is



Improved wash-bottle.



Condenser flow indicator.



Breathing tube for use when working with chemicals that give off dangerous fumes.

obviously an advantage. Such a wash-bottle is shown in the diagram. The rubber tubing may be made any convenient length.

An indicator that will show when water is flowing through the condenser during a distillation may be made from a small flask, some rubber tubing, a rubber stopper, and some pieces of glass tubing.

Chemicals of the halogen group give off dangerous fumes in different combinations. It is, therefore, necessary for the chemist to have some means of getting fresh air. A glass mouthpiece and rubber tube extending outdoors will allow him to breathe fresh air.

Several small wash-bottles like the one shown will have many uses in the amateur chemist's laboratory. They are handy

and at the same time make it unnecessary to contaminate the regular wash-bottle containing distilled water.

Wash-bottle to use to avoid contaminating the regular wash-bottle.

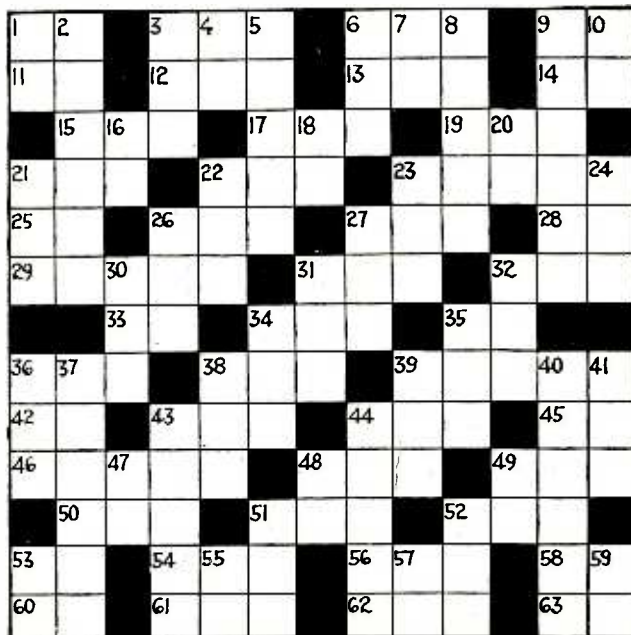


Making burette cleaners from glass tubing.

Test Your Mathematical Knowledge on this CROSS-NUMBER PUZZLE

By Richard Hoadley Tingley

JUST to start you off, we will give the answer to the first "across" line at 1; the answer is 33, twice the value of 1 pole, which is 16½ feet. Now proceed with the rest of the problems. Try to solve every one before turning to the answers on page 763.



ACROSS

1. Two poles.
3. Multiply the first of the "teen" numbers by seventy. Then subtract two.
6. Simple interest on \$100 at 5 per cent. for one month. In cents. Decimal point in front first figure.
9. The age at which a girl is said to be "sweet."
11. Maiden loved by Zeus who was turned into a heifer by the jealous Hera.
12. Add twenty to thirty two times the cube of three.
13. The 3rd, the 12th and the 22nd letters of the alphabet placed in a row.
14. The next to the last of the "teen" numbers.
15. Half of D.
17. Add four and eight tenths to one and six tenths times the Fahrenheit boiling pt. of water.
19. One less than M.
21. Three hundred dollars less than the monthly salary of a United States Cabinet officer.
22. Twenty-four divided by sixty four. Decimal point in front.
23. Ten times the date of the Norman Conquest, plus two thousand.
25. The number of degrees in a quadrant.
26. Add thirteen to the date of the Hegira.
27. One and eight one hundredths less than the square of the number of square feet in a square yard. Decimal point after the first figure.
28. The slang expression for a five-dollar bill and the chemical symbol for carbon placed one after the other.
29. Multiply the foot-minute pounds in a horsepower by 2.065234. Nearest whole number.
31. Divide MDCCCIX by three.
32. The abbreviation for the part of the country where the capital of the United States is situated.
33. Twenty-four thirty-seconds, expressed decimally.
34. The symbol in chess for castling on the queen's side.
35. Add four to the age of Benjamin Franklin when he died.
36. Six more than ten times an abbreviation for the Lehigh Valley (Railroad).
38. Nine hundred years before George Washington was born.
39. Sixty feet less than the height of the highest mountain peak in the world—Mt. Everest.
42. The number of rods in two furlongs.
43. Charlemagne was crowned King of the Franks and Emperor of the Romans eight years before this date.

DOWN

1. Add twelve to the last of the "teen" numbers.
2. Multiply the chemical symbol for didymum by 603.808. Nearest whole number. Capitalize last letter.
3. Twenty-four and a half times the number of perches in a furlong.
4. Divide six hundred and forty by eight thousand. Decimal in front.
5. Twenty-seven thirty-seconds expressed decimally.

6. Seventy less than one tenth of the number of square yards in an acre.
7. The number of men "on a dead man's chest."
8. Multiply the year in which Coolidge was elected President by 34.26351. Then subtract one. Nearest whole number.
9. Square three hundred and forty-five and add six hundred and sixty-five to it.
10. Four more than the square of the number of quarts in a peck.
16. The twelfth alphabet letter.
18. Ten less than President Hoover's age.
20. The number of ounces in eight Troy pounds.
21. One hundred years before the First Crusade started.
22. Interest on \$10 at 5 per cent. for eight months, in cents. Decimal point in front of last figure.
23. Pre-war value of a gold French franc. In cents. Decimal after second figure.
24. Five one hundredths. Decimal point in front. Add a zero at end.
26. Eleven hundred years before the "Deacon finished his one hoss shay."
27. Forty-two minutes is what part of a degree expressed in decimals? Decimal point in front. Suffix two zeros. CLXXVI.
31. The number of days from January 1st to August 25th of the year after. Not a leap year.
32. Add the number of rods in a furlong to the number of acres in a square mile.
34. Five per cent. interest on \$3.00 for three months in cents. Decimal point in front of last figure.
35. The B. C. date occurring four hundred and five years before the Battle of Marathon.
36. Eight more than the square of a couple of dozen.
37. Add the number of seconds in a degree to a half a million.
38. Ten times the boiling point of water by the Reaumur thermometer.
39. The number of days from January 1st to September 29th. Not in leap year.
40. Multiply 40.7409 by twenty thousand.
41. The chemical symbol for carbon and the twenty-fourth letter of the alphabet placed one after another.
43. Add 23138 to the number of inches in a mile.
44. Multiply 62.3118 by MDL.
47. The abbreviation for Long Island.
48. The twelfth letter, the twenty-fourth letter, and the personal pronoun first person singular placed in a row.
49. Thirteen less than six bits.
51. The square inches in a square foot.
52. One tenth of the abbreviation for the state of which Annapolis is the capital.
53. Four less than the chemical symbol for lithium. Capitalize last letter.
55. Fifteen and a third fathoms.
57. Three cubic yards in cubic feet.
59. Twelve more than the cube of three. (Answers appear on page 763)

Useful Ideas for the Home Scientist

Water-proofing Paper

DISSOLVE 8 ounces of alum and 3¾ ounces of white soap in 4 pints of water. In another vessel dissolve 2 ounces of gum arabic and 4 ounces of glue in 4 pints of water. Mix the two solutions and make the mixture hot. Immerse the paper in the mixture and then hang it up to dry or pass it between cylinders.

The alum, soap, glue and gum form a sort of artificial covering which protects the surface of the paper from the

action of water and, to a certain extent, from fire. This paper will be very good for packages which may be exposed to the inclemency of the weather.—*Eugene D. Yates.*

Iron Cement

THE following formula for cementing iron is very efficient and makes a strong, neat-looking joint.

Break up a pound of rolled sulphur and mix thoroughly with 1 pound of white lead, then add 3 ounces of borax and mix until you have a smooth mass.

Take the quantity needed for the job and moisten with sulphuric acid. Apply a thin layer to both surfaces and put under pressure as in a vise or clamps. Let stand 24 hours.—*Mark L. Gluckman.*

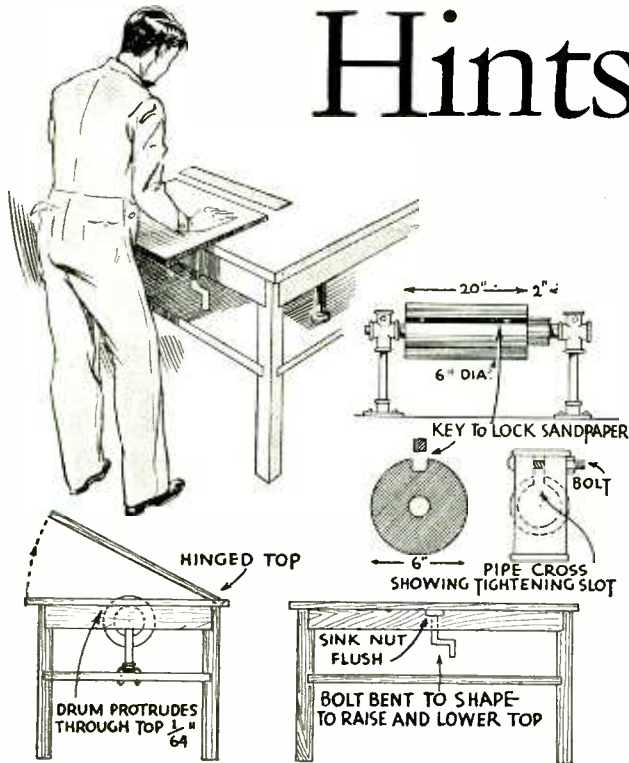
Dish Protection in Refrigerator

TAKE a piece of sheet rubber packing or stair tread about 4 x 4 inches. Punch holes through it any size or shape that may suit you. This is used under dishes that are set on the ice to prevent them sliding off.—*Mortimer M. Epstein.*

Hints for the Home

A Drum Sander from the Scrap Pile

First Prize \$10.00



This 18-inch drum sander will prove indispensable to the home mechanic.

TWO crosses, two nipples and two flanges are needed to make the bearings of this 18-inch drum sander. Before assembling the fittings plug the nipples where they enter the crosses. This will save babbitt. Assemble the fittings and tighten until they are of equal height. To babbitt within a reasonable degree of accuracy cut a crotch in two pieces of wood, trim to desired length and nail to a base. Heavy box paper clamped on each side of the crosses will prevent the babbitt from running out at the ends. Insert the shaft through the crosses, allowing the ends to rest in the crotch. Pour the babbitt, stopping it $\frac{1}{8}$ to $\frac{1}{4}$ " from the top of the crosses. This space serves as an oil cup. Remove the shaft and drill holes through the sides of the crosses for stove bolts. With a hack saw cut through the top part of the crosses and babbitt. Insert the stove bolts with nuts and you have an excellent spring bearing.

For the drum a 6 X 6 piece of redwood or soft pine may be used. Locate the center of the lumber and bore half way through from each end. If this is done by hand it will be found that there is a slight variation where the holes meet which will make the shaft fit tight.

Round one end of the drum for a belt and assemble parts on block A. Clamp to the bench and turn to desired diameter. The pulley is turned on one end of the drum. A one-quarter horse motor is sufficient power for slow work.—R. S. Glover.

Use Monkey Wrench as Seaming Tool

A MONKEY wrench will lock any sheet metal seam within its scope. To use it for this purpose, simply fold the metal to the desired width,

seam as the lock progresses. Lay the metal on something with a flat hard surface under seam, before starting to hammer.



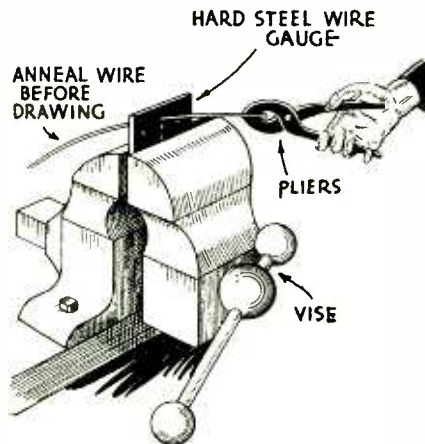
The drawing shows the four successive stages in making a lock joint between two pieces of sheet metal in the manner here described. First the edges of the two sheets are bent to the shapes shown at figure 2; next these two bent edges are interlocked as shown at figure 3. Finally the joint is locked as in figure 4, by simply holding the wrench over the ridge of metal formed by the juncture of the two folded bends, and repeatedly striking the wrench with a hammer as the man in the picture is shown doing.

then apply as shown. Adjust the wrench to the correct opening and tap with hammer as shown, moving along

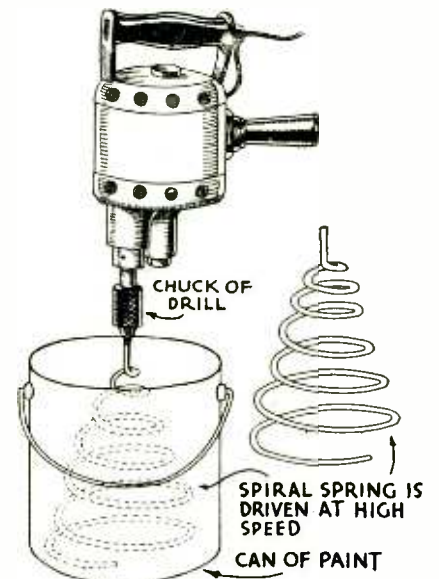
Reducing Size of Wire

WHEN small diameters of soft wire, such as soft iron, or spring wire of brass and german silver, are desired, anneal the wire by heating. Take an ordinary hard steel wire gauge and clamp it in a vise. Pass the end of the wire through, after filing slightly to reduce the end. With a pair of pliers, grip the end firmly and pull the wire through the gauge.

The wire may be reduced most any amount if the precaution is taken to anneal before each successive drawing. Try this novel means the next time you need a special piece of wire.—G. A. Luers.



Reducing diameters of small soft wire with steel gauge.



Paint mixing by means of motor-driven stirring rod.

Paint Mixing by Motor

THE writer recently saw a clever means for stirring paints and enamels, quickly, uniformly and less laboriously than that involving the use of a paddle.

A spiral-shaped spring was attached to a small electric drill and rotated by this means.

The operator had only to press the electric trigger of the drill and the improvised paint mixer went whirling around at high speed, mixing and smoothing out the paint without delay or exertion.

Such a spring for this use can be obtained from upholstered seats or is readily coiled from eighth-inch wire.—G. A. Luers.

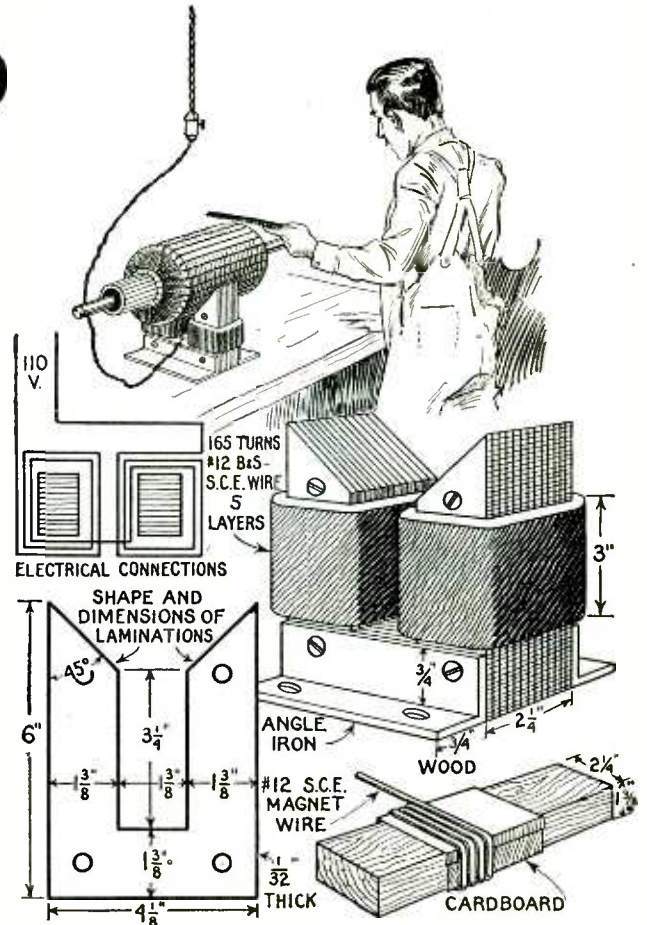
Workshop

Testing Motor Faults with "Growler"

THE growler herein described is a device for testing electric motor armatures for grounds, short and open-circuits. In this article a 110 volt A.C. growler will be considered; its principle is identical to that of the transformer. The windings on the armature become the transformer secondary, the iron armature core completing the magnetic circuit. Procure sufficient sheet iron about 1/32" thick, cut enough of these to the dimensions shown to make a thickness of 2 1/4". They are then clamped together in a vise and 4 holes drilled as shown. Cut and drill 2 pieces of angle iron and place these at the base of the assembled laminations and bolt them together. The two top holes are also bolted and the whole assembly is smoothed down with a file or emery wheel.

The coils consist of 5 layers (each layer containing 33 turns) of No. 14 B & S Gauge S. C. E. magnet wire, 165 turns for each coil, both being wound in the same direction and connected as indicated. They are then shellacked, taped and baked, and when thoroughly dried, placed on the core. The finishing ends should be flexible cord connected to an attachment plug.

Place the armature between the pole-pieces and insert cord plug in A.C. outlet. The armature is slowly revolved with one hand, while a small piece of steel (hacksaw blade) is held lightly on the top of the armature with the other. If there is a short-circuited coil, the blade will be strongly attracted to the slot carrying the defective coil, due to magnetic force caused by the induced current. The coil will also become noticeably hot. An open coil may be detected by shorting every pair of adjacent commutator segments. The bars that do not produce a spark have an open circuit. A grounded coil will produce a spark between the commutator and shaft when contact is made with a piece of wire.—Hugh Bureton.



Various motor armature faults can be located with this "growler."

Electric Glue-Pot

IN reading the August number I came across the pages devoted to Shop Mechanics and was very much interested in the other fellows' patience-savers, so I am submitting one of mine.

The heating problem of glue pots has been and is still the bug-a-boo for the back-yard cabinet maker. Before discovering the possibilities of a broken-down coffee percolator, I had depended



Remove handle of percolator and cut at dotted line; make glue pot with flat rim that extends over side of percolator.

\$10.00 MONTHLY FOR BEST HINT

SEND us a photograph or sketch of your own hint for the home workshop. \$10.00 is paid monthly for the best hint accepted and published. Others that we publish are paid for at regular rates. Here is a chance for you to win a prize for a useful workshop hint.

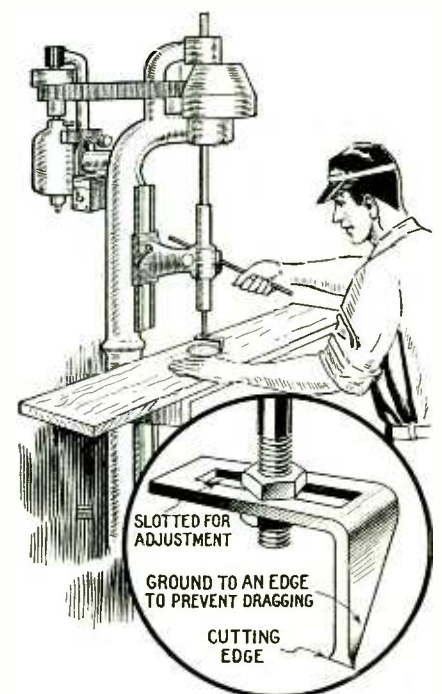
on either a coal oil stove or rushing back and forth between the shop and gas stove.

One day I noticed that our percolator was not in use and on inquiry I was told that it was battered and broken beyond further household use, so like a lot of other discarded things it found its way out to the shop.

Some time later while building a little furniture I had to use the glue pot. I was out of coal-oil, so was getting prepared for the kitchen parade, when I noticed the old percolator and an idea dawned. I filled it up with water and plugged it in and the experiment was more successful than I expected. Since then I have cut the percolator down and made a glue pot to fit it, and have sure enjoyed it.—A. L. Leonard.

Home-Made Circle Cutter

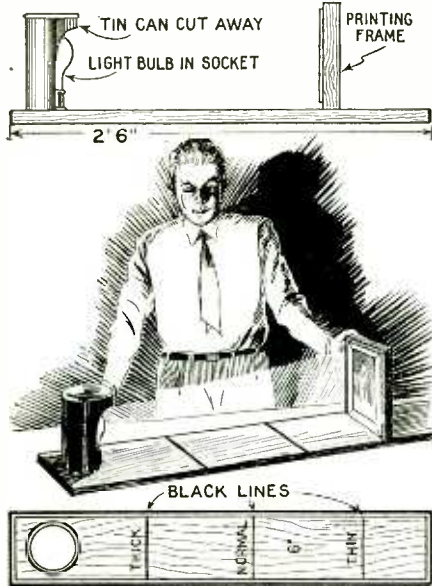
THIS home-made tool, used in connection with a drill-press, cuts neat holes up to eight inches in diameter in wood up to four inches thick. Bore a small hole for center and cut half way through from each side.—R. L. Allen.



A circle cutter is easily made after the simple manner here illustrated.

How-to-Make-It

Photo Print Guide



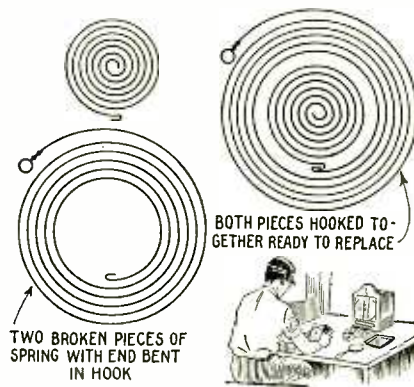
An easily made guide for making photo prints is illustrated above.

YOUR films can be roughly divided into three groups. Some are under-exposed. Others are over-exposed and, we hope, most of them are of normal density. This guide which will enable you to make the right exposure with only the clock to watch, consists of a single board 30 inches long and 6 inches wide, and a tin can. Cut one side of the can away as shown and set it up on the board at one end. Mount a light socket inside and run a cord from this to the outside, through a hole in the edge, so that it can be connected to a light plug in the house. Paint three lines evenly spaced. Mark the line closest to the can "Thick," the middle line "Normal" and the third "Thin," meaning — thick, normal and thin films. When you put a film in the printing frame note its

density. If it is thin, or under-exposed, then set on the third line and expose a uniform time of 10 seconds, or whatever time you have found to be the best with the bulb you are using. If the next film is thick, set the frame on the first line, and so on.—*D. R. Van Horn.*

Mending Broken Springs

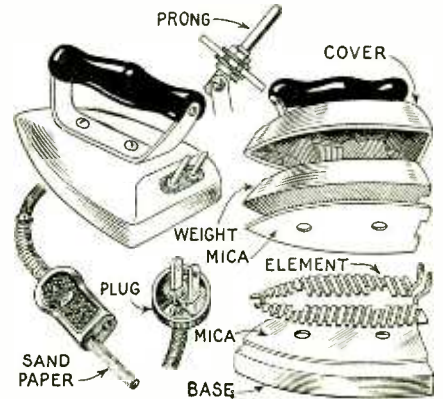
TO repair the spring, heat both ends in a clean flame till they are red, then bend both ends with pliers while red in a hook as shown, making them as flat as possible. Hook both together and replace.—*Donald Gilmour.*



The two pictures above show both inner and outer parts of a broken clock or other spring, with hooks bent on annealed ends before and after joining the hooks, thus making temporary repairs.

This method, though satisfactory, is not permanent, and may not work unless broken ends are very flat.

Repairing Electric Irons

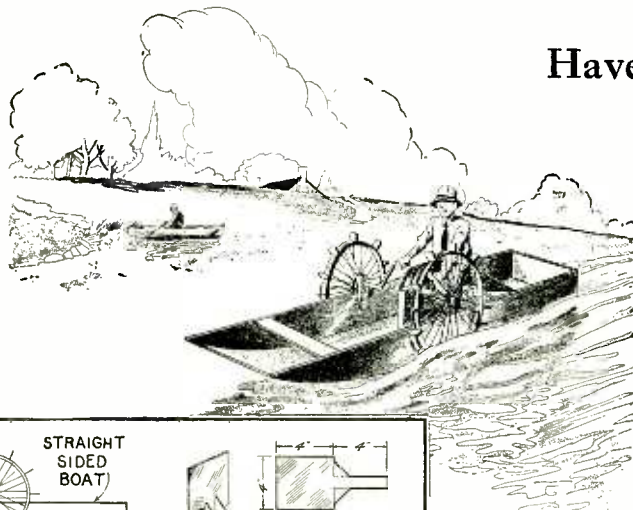


Various parts of an electric iron are shown clearly above.

ELECTRIC iron troubles can be placed in three classes: (1) Iron does not heat at all. (2) Blows fuses. (3) Iron does not heat to proper temperature. The first trouble is caused by a break in the circuit somewhere. The element may be burned out and in this case a new one must be installed. The connections where the element connects to the prongs may be broken or burned off, or the cord may have a break in it. Examine carefully the connections in the attaching plugs at the ends of the cord. On account of the high heat attained, these connections must be carefully watched and the plug re-set if they are found to be in bad condition.

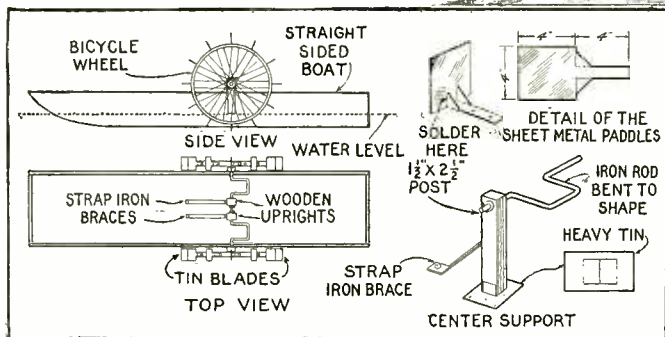
If the iron blows fuses, there is a short in the iron or cord. Sometimes the bare wires become twisted or otherwise come in contact with each other in the socket plug.

Have Sport With This Buck Boat



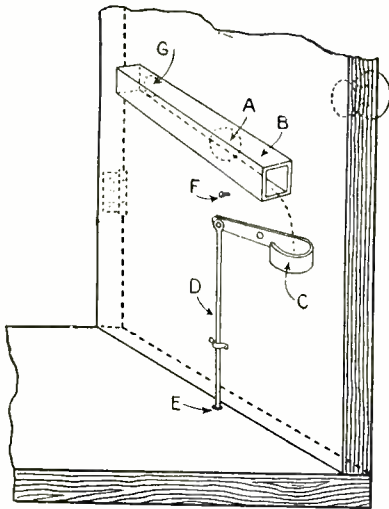
THE buck boat is a straight sided boat, preferably home-made and of a medium size with paddle wheels. These are turned with the hands and will send the craft at a good speed through the water. No rudder is needed, because all you have to do to turn the boat about is to stop turning one wheel while the other is kept turning. To speed up the turning process, one wheel can even be reversed. By reversing both wheels at the same time the boat can be brought quickly to a stop.

The mechanism is easily made. Two rods are required for the handles. These should be about 1/2 inch in diameter. One end is to be keyed or otherwise fastened into the hub of the bicycle wheel and then next in line is formed a crank as shown with about a 6-inch bend to give a 12-inch stroke. Each rod is nearly symmetrical except that the end projecting through the outside bearing is a little longer than the other and both rods must be shaped to fit the width of the (Continued on page 755)



This little buck boat is propelled by means of two paddle wheels, the wheels being operated independently, by means of cranks which are turned by hand. No rudder is necessary.

A Secret Lock

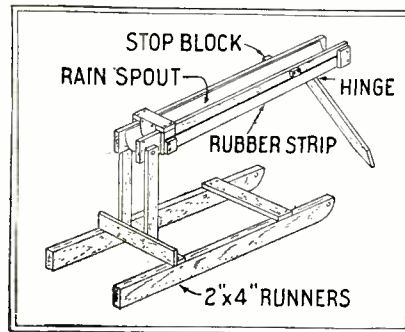


When a marble is pushed through a hole, G, into a tube, B, it runs down, and falling on lever, C, opens lock.

A VERY simple form of secret lock which hardly anyone will get wise to, is illustrated in the accompanying drawing. A simple pivoted lever and rod system, C, D, E, is employed and when a marble is pushed through the hole in the door, it falls down through the tube B, thence onto C and thus opens the lock.

Snow-Ball Catapult

FIRST lay out the runners and across their tops nail a couple of cleats for braces. Nail a third board on edge to the rear of the back cleat, and to this nail two uprights of the same length, about 5 inches apart. Fasten two boards to the tops of these, each 5 feet long, and between them fasten with brads, a section of rain gutter or strip of curved tin. A cleat nailed to the lower side of these at the front holds the hinge. To propel the ball, a special piece of stiff sheet iron is cut out, with its lower end rounded. The upper edge is nailed to a wooden slide to which side guide strips are nailed. Then on each side the rubber strips are fastened.—D. R. V.



A simple snow-ball catapult.

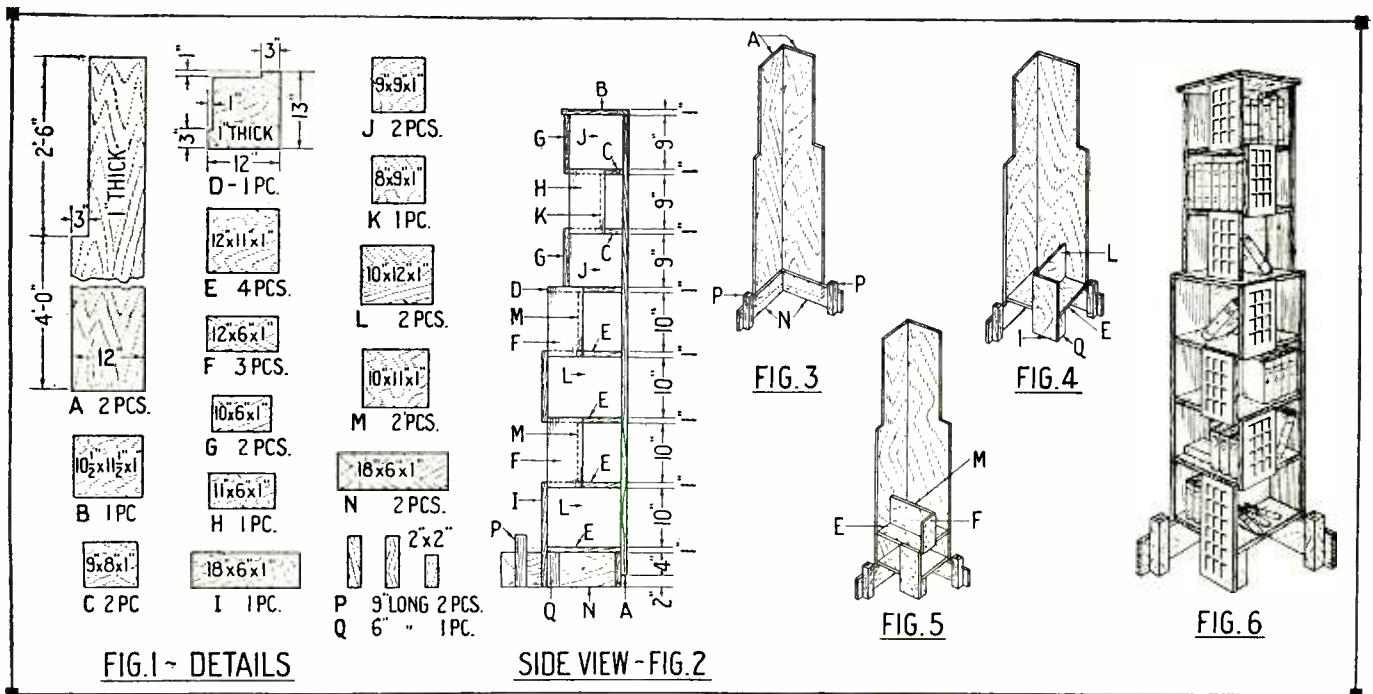
Car Polisher



Lamp wick rolled up in can makes a good car polisher.

COIL a length of ordinary cotton lamp wick into a roll that fits into a shallow metal can, such as a wax polish box, with half the width of the wick projecting from the can. This makes a pad that can be saturated with polish or liquid wax for readily repolishing the automobile. When not in use cover the can to keep out dust and prevent drying of the polish.—K. B. M.

How to Build a Skyscraper Bookcase



The dimensions of the various pieces of wood employed in building this skyscraper bookcase are clearly shown, as well as their assembly.

THIS bookcase has a shelf capacity of nine feet. If you make it yourself, from white pine, it will cost about \$4.00. Only forty feet of lumber are required, and 100 2-inch wood screws (40 round head), plus wood dye, white or orange shellac, and a little black paint.

Figure 1 shows dimensions of all wood pieces for a case 7 ft. high.

Caution: in making pieces "C" and "D," make one-half of each batch of pieces with the wood grain running in one direction and the other half with it in the opposite direction, the mechanical strength will rest entirely upon assembling the floors ("C," "D," or "E") such that the floor grain runs perpendicular to the upright partitions ("I" or "J").

The uprights "A" are screwed and glued together. Notice in Fig. 3 that the uprights "A" do not touch the floor—there is a clearance of 1 1/2 inch or so, indicated by the dotted lines. The sequence in building a story is, first lay the floor "C," "D," or "E"; second, put in the upright partitions "I," or "J"; and third, fasten the vertical truss "F," "G," or "H."—Eisten Moen.

WRINKLES



"Dropping" Bottles

HANDY dropping bottles can be made by inserting tubes through holes in corks. The glass tubes are drawn out in a flame to a fine point or nozzle. The opposite end dips into indicator solution, etc. In handling glass tubing in a flame, rotate the tubing and move it back and forth so as to evenly distribute the heat and thus prevent cracking.—*F. R. Moore.*

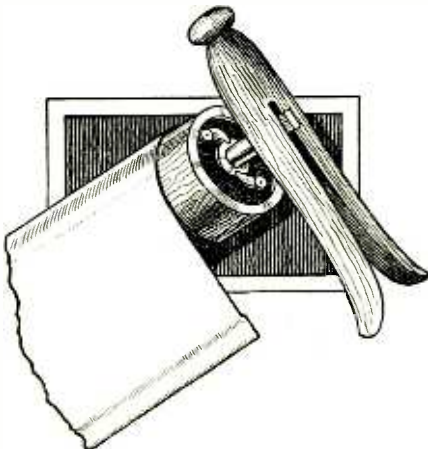
Tooth-Brush Holder



TOOTH BRUSHES may be kept clean by placing them in a test tube or vial. Tooth-brush holders of this type should have a ventilated cork or cover.—*Frank R. Moore.*

Wrench for Shade Rollers

WHEN the window-shade falls or is drawn so far that it locks, use a clothes pin as a wrench by inserting



How clothes pin serves as a wrench to adjust shade springs.

the flat projecting end of the shade roller in the groove of the pin. The shade is rewound and replaced without the necessity of first rolling up the shade, placing it in the lock, unrolling it and then rewinding. If the shade is locked by being drawn down too far, use clothes pin to move the spring slightly to permit loosening the ratchet.—*August Jeffers.*

Tin-Plating Iron

MANY a person has experienced great difficulty in making tin adhere to the surface of an iron object that was to be tin-plated. This condition can be satisfactorily remedied by the following process.

Clean off the iron surface first by pouring dilute sulphuric acid over it and washing it with plenty of water and then rubbing with sand until it is perfectly smooth and clean. When this operation has been concluded, apply a solution of chloride of zinc, the so-called soldering acid.

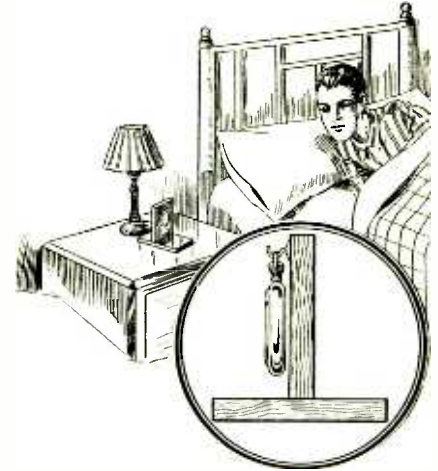
When an object, the surface of which has been prepared in the above manner is dipped into molten tin, the tin will adhere easily to all parts. This method is the best practical method for use in tin-plating iron that can be found for the amateur mechanic without expensive apparatus in his shop. The acid and zinc solution must be handled with care, especially the acid.—*Neil H. Tasker.*

A Cheap Generator Overhaul

WHEN sandpaper fails to liven the ammeter needle, it is usually necessary to have the commutator "turned down" on a lathe. But a lot of fellows like myself have no lathe and would like to fix it themselves. Here is what I did on a Ford. I disconnected the generator wires and removed the metal strap that keeps out dust and covers the commutator. Instead of using sandpaper, I inserted a file, just the width of the commutator, while the engine was throttled down to its lowest speed. The file must be kept on the commutator only and not on any engine or body parts. Commutators do not generally wear out of round, so if an even pressure is kept on the file an almost perfect job will result. When the commutator surface is bright and shiny all over stop filing and remove the generator from the car. Take generator apart and with a piece of hack saw blade undercut the mica insulation on the commutator very carefully. If installing new brushes, sandpaper them on the new surface and set them in the brush ring. Before assembling the generator all parts should be wiped clean from filings, gummy oil or dust that may be on any parts. Reassemble the generator and replace it on the case. Connect the battery terminal and then adjust the output with the third or small brush.—*Frank Placcan.*

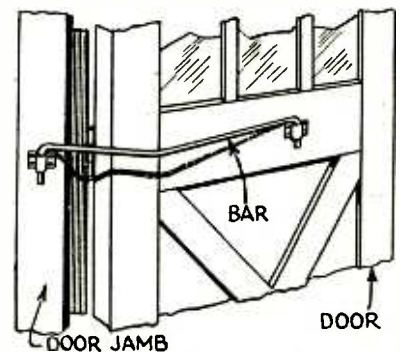
Watch Holder for Bedside

TWO pieces of wood placed at right angles, varnished and trimmed, makes a handy watch holder. The watch is held in a vertical position during the night, which is the best position for sat-



isfactory timekeeping. Another idea is to place a small flashlight bulb in front of the watch and a small battery back of the upright, together with a suitable push button or switch. This will provide a very convenient and useful time indicator in any bedroom.—*K. B. Murray.*

To Hold Garage Doors Open



A simple iron bar, bent to the shape shown, serves to hold garage doors open.

MANY a garage is built where it is inconvenient or impossible to plant posts to hold the door open. George Dolby of Saco, Maine, built such a garage, and here is how he solved the problem. He fastened a socket to each door and door jamb. Taking a three-foot iron bar, he had a hook formed on each end and the bar bent in the middle. When the doors are opened, the two iron bars are dropped in their sockets and George Dolby's "patent," as he laughingly calls it, holds the doors open against the strongest wind that blows.—*Edward Cloudman.*

and RECIPES



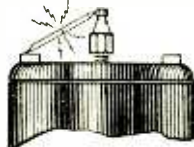
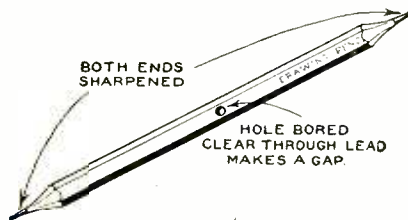
Shading Drawings Without a Pen

IN the making of ink drawings, it is sometimes desired that a portion be shaded, which is a tedious process with pen and india ink. Make a *dusting box* as illustrated, with a wire shelf near the bottom to support the drawing. In the box is placed a spoonful of black resin dust, made by coloring melted resin an intense black and pulverizing it when cool. The drawing should be covered with a (paper) cut-out mask, protecting all parts of the drawing that are not to be shaded.

Shake the resin in the box well and then insert the drawing on the wire shelf. In a few moments the exposed parts of the drawing will be covered with minute black dots of resin. When the shading thus obtained is sufficient, the drawing is removed from the box and gently heated, when the resin will melt and make the shading permanent. —K. B. Murray.

Spark Tester from Pencil

THE illustration below shows how to make an efficient spark plug tester. A hole is drilled exactly through the center of a pencil, giving two distinct electrodes; when the two pencil ends are touched to the engine frame and the spark terminal respectively, the spark jumps in the hole if the plug is O. K.



An easily made spark plug tester constructed from a lead pencil.

Drilling Holes Through Glass

TO drill glass, prepare a solution of camphor in turpentine and add some ether. While proportions are not very important, a good solution is made by taking spirits of turpentine, 1½ oz.; camphor, 1 oz., and ether, 3 drams. Break the tip from a three-cornered file so as to have a sharp and very hard point. Dip the tip of the file in the solution and give it a twisting motion on the glass where the hole is to be made. Use sufficient pressure to cut the glass, but do not break it. Practice will soon enable you to do the trick. Work on odd pieces of glass till you get experience. Be very careful when the tip of the file

\$5.00

will be paid each month for the best wrinkle or recipe submitted to the editors and which they accept and publish in these columns. All other ideas accepted and published in this department will be paid for at regular rates. Address your ideas to—Editor Wrinkles and Recipes.

is about to come through the glass. After the hole is made it can be enlarged to any size by a round file. Keep the glass constantly wet with the solution.—Charles McFarland.

A Solvent for Rust

IT is often very difficult and sometimes impossible to remove rust from articles made of iron. Those which are most thickly coated are most easily cleaned by being immersed in a solution, nearly saturated, of chloride of tin. The length of time they remain in this bath is determined by the thickness of the coating of rust. Generally 12 to 24 hours is long enough. The solution ought not to contain a great excess of acid, if the iron itself is not attacked. On taking them from the bath the articles are rinsed, first in water, then in ammonia, and quickly dried. The iron, when thus treated, has the appearance of dull silver. Polishing gives it its normal appearance.—Charles McFarland.

How to Put Brown Finish On Gun Barrels

A SIMPLE preparation for the browning of gun barrels may be made from tincture of iodine, diluted with one-half its bulk of water.—I'eron V. Johnson.

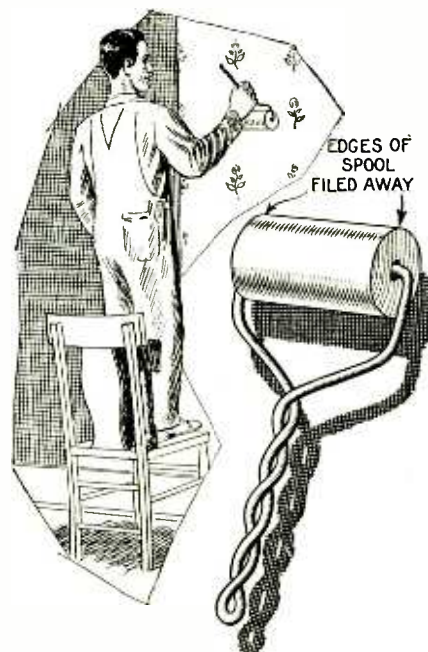


How to Wash Films

FILMS and plates can be washed entirely clean in a quarter of an hour by placing them in a trough made of a flat board with side pieces. Film in the strip can be pinned to the board at the upper end and the board suspended in the sink with the upper end at an angle under the faucet. This saves water, as but a small stream is necessary, and the method is twice as quick and certain as any other.—K. B. Murray.

Useful Wall-Paper Roller

A ROLLER such as used by paper hangers to level the wall paper from paste lumps, and to smooth the finished work, may be made by smoothing down the edges of a large spool with an emery wheel or file. The handle is made by twisting a piece of strong wire into the shape as shown in the illustration. The wire handle on a large syrup can will do.—Louis Andrews.



If you do any wall-papering, then you need this roller.

Readers' Opinions and Comments Will Be Welcomed by the Editors

What Our

Perpetual Motion Solved!



Editor, SCIENCE AND INVENTION:

In SCIENCE AND INVENTION MAGAZINE you offer to give \$5,000.00 for perpetual motion. This is what I call perpetual motion. Kindly send me the \$5,000.00. Here is my solution:

Electrons and atoms moving in a molecule are perpetual motion.

JOHN PICONI,
McKeesport, Pa.

(Unfortunately our contest calls for a demonstration of a working model of a perpetual motion machine. You cannot demonstrate electrons or atoms moving in a molecule. We can demonstrate the Brownian movement, which comes closer to a demonstration than your device, but this likewise is not a machine. We are acting in good faith. There is no catch to our proposition. We therefore anticipate that perpetual motion inventors will act accordingly.—EDITOR.)

Likes Chemistry

Editor, SCIENCE AND INVENTION:

I have been a reader of SCIENCE AND INVENTION for a year and a half and will keep on getting it until the last publication. Being an amateur chemist, I enjoy the chemical experiments. As soon as I receive it, I turn to the "contents" page and look for chemistry. I think Wailes is an excellent writer and knows his chemistry and physics. I especially enjoyed the "Absorption" and "Experiments with Acetic Acid" articles. The next thing I turn to is Scientific Humor, where I get a good laugh out of Sienty Simon. The jokes are well chosen, which makes them quite



enjoyable. I like to see fat people laugh, because there is so much of them to enjoy it. Hoping you are fat.

HERBERT F. WIESE,
1308 E. 141st St., East Cleveland, Ohio.

(Mr. Wiese hoped that we were fat because he included some jokes with his communication. If he ever saw the Joke Editor's face, he would wonder how a person so solemn and thin would ever sit in the chair of the Joke Editor. Perhaps some of the humor is so pathetic that it produces the lines of worry and care on this individual's smileless countenance.—EDITOR.)

Anti This and That

Editor, SCIENCE AND INVENTION:

Your utterly unjustified attack on alleged fraudulent curative devices has assumed the conditions of a childish fanaticism. You seem to have fallen in line with the despicable attitude of the present-day reformers: your crusade against the above-mentioned articles parallels that of the "Purity League," "Anti-Nicotine League" and countless other "Antis."

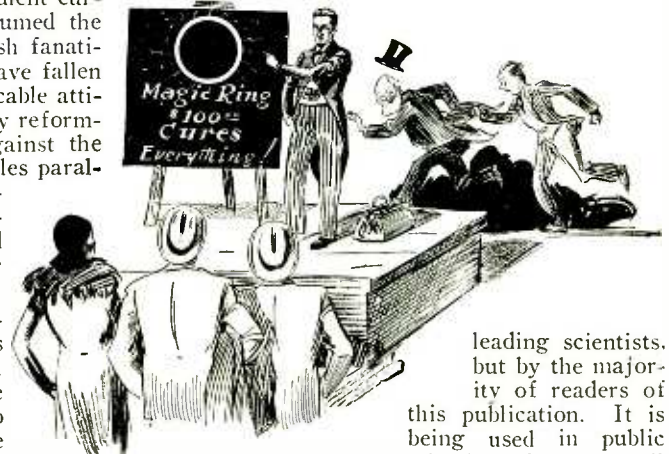
Such an attitude inevitably characterizes narrow-mindedness. Just why anyone should attempt to regulate or modify the life and actions of someone else is not discernible to one of the intellect. I am willing to admit that a vast number of the population of the country are incapable of governing themselves to best advantage, but to attempt to control them to the point where they may not even spend their money as they please is absurd. Admitting that the devices which you pronounce fraudulent are really so and have no actual curative power, still anyone who is sufficiently ignorant to succumb to the wild claims and advertising propaganda of the dispenser has a possibility of being benefited by sheer imagination.

While I am as firmly convinced as you of the uselessness of these products, I do not believe that one should be too hasty in condemning them. What harm is done by them, other than separating some illiterate and superstitious human of some of his worldly goods, which were the specific product of his choice not available, would be spent for something equally useless? But you, in your disbelief in the merit of these contrivances, must attempt to completely efface them, thereby helping to make the world safe for hypocrisy.

L. P. BERNARD,
Royersford, Pa.

(We do not presume to dictate to the entire populace of this country what they should do with their money. We feel, however, that the public is entitled to know the facts. When an advertiser deliberately misrepresents, when he makes misleading claims, when he garbles science so as to make it fit a distorted theory on the control of various diseases, when he makes a statement ostensibly scientific, but which is purely buncombe and piffle, it is time that some publication or some organization exhibit spirit enough and backbone enough to bring out the false claims and show them in their true light. We believe that pseudo-science is far worse than no science at all.

SCIENCE AND INVENTION MAGAZINE is an educational institution. It has been so characterized not only by the



leading scientists, but by the majority of readers of this publication. It is being used in public schools today, as well as in high schools, in

the science classrooms and for collateral reading.

Anyone of us "sufficiently ignorant" has a perfect right to get the facts. We strive merely to educate the public. We strive to bring forth the ridiculousness of misstatements found in advertising propaganda for systems supposedly based on scientific principles for the cure of illness and disease. Is the fact that a man is illiterate an excuse for separating him from his hard-earned cash? We will leave further comments upon this letter to any of our readers who may have been benefited or injured by our exposés.—EDITOR.)

Is a College Education Worth While?

Editor, SCIENCE AND INVENTION:

After spending thirteen years in college, the writer feels that he might make a few comments.

A number of years ago a young man came to me and said that he had only one year of high school, had been working for several years and wanted to return and, after graduation, take a college education. This would mean at least seven years to him. He was at the time receiving a salary from the rail-

Readers Think *Questions and Discussions of General Scientific Interest*

road of \$1,200 a year. This would mean a loss of some \$9,000 in salary, would cost him about \$5,000 plus a probable increase in wages and when he got out he probably would not get a salary equal to the loss of interest on this amount of money and the probable increase plus his present one. Eventually he would be the loser.

In many cases we find that men are the losers by a college education. In other cases, perhaps they are the gainers. A man in college loses personal contact with business men; he figures only in the classroom. He does gain many friendships. He can look at life from a different aspect. He can fit into different companies and his reading vision is enhanced. As an example, a young man once asked the dean of an

(There is no doubt but that if both apply themselves to the task equally well, the college-trained farmer is by far more successful than the individual who uses the cut-and-try method. The man who has the soil of his field analyzed to determine whether it needs more phosphate, more ammonia, or more lime automatically knows exactly what he should apply, instead of waiting for the crops to come up and answer his question. The man who knows to what truck his farm is best suited, never makes a mistake in cultivating plants which could not possibly grow on his land.

But how many college graduates keep up their friendships after they have secured their diplomas? The alumni of many colleges will show you that the percentage is extremely small.—EDITOR.)

Popular Magic



Editor, SCIENCE AND INVENTION:

I recently purchased your most wonderful magazine, "Popular Magic and Card Tricks No. 3," and have been more than pleased with its contents. The tricks explained are many of which the value alone would be worth more than what is asked for the book.

I am an amateur magician and I delight in collecting books, magazines, etc., on the art of magic. I have gotten most of my books for the sake of having them, but with your magazine it is different. I would like to ask you if you have volumes 1 and 2 of "Popular Magic" in stock.

JOSEPH S. COTTON,
Turner Falls, Mass.

(Unfortunately there are no copies available of volume 1 and volume 2, "Popular Magic," both by Dunninger.

It is likely that some of your magical friends would be willing to send you a copy should they happen to have two on hand. Should anyone have such numbers and should they care to dispose of them, we would be glad to forward the letters to Mr. Cotton.—EDITOR.)

(Cont'd on page 740)



Dog Days

Editor, SCIENCE AND INVENTION:

Will you kindly give me a general description of the term "Dog Days"?

When they appear? How long they last? Are they governed by the "Dog Star"? etc.

I might say that I have been a subscriber to SCIENCE AND INVENTION for a number of years and wouldn't be without it.

("Sirius," or the "Dog Star," is the largest and brightest of all stars and situated in the mouth of Canis Major. The ancients reckoned the "Dog Days," which are forty in number, as twenty before and twenty after the rising of this star. The rising of this star was supposed to presage extreme heat and the diseases incidental to this period. However, it was by mere accident that the rising of this star coincided with the hottest season of the year in the times and countries of these old astronomers. This star rises later and later every year because of precession and the time of its rising depends also on the latitude of the place. The time will come when the star will rise in the dead of the winter.—EDITOR.)

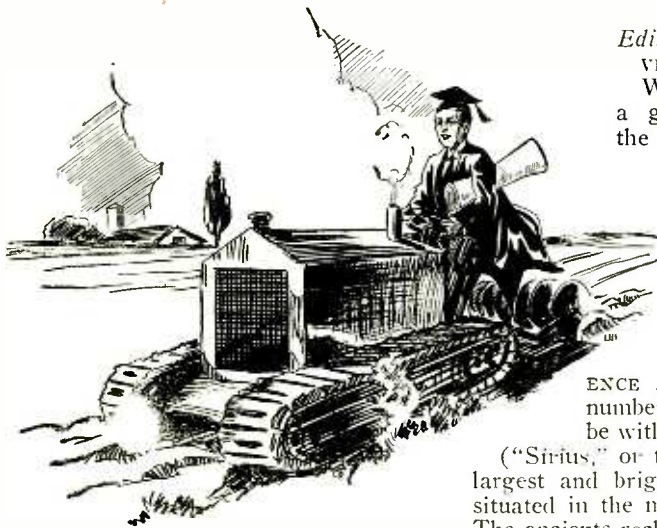
Nikola Tesla

Editor, SCIENCE AND INVENTION:

Some years ago you published a series of articles on the inventions of Nikola Tesla. Are copies containing this series of articles available, and what is Dr. Tesla doing at present?

S. W. HUNTER,
New York City.

(Back numbers containing the Tesla articles are not available but you can consult them at most public libraries. Dr. Tesla is occupied right along in the development and patenting of new electrical and mechanical inventions.—EDITOR.)



agricultural school, "If I go to college, do you think I can return to the farm and make more money?" The dean answered him, "I am afraid you can," and explained to him that if he took a course in college he would be able to return to the farm and do the work with ten times more interest because he would know why he was doing each operation. This statement may apply in all fields of work to a young man who can afford an education.

A college education does not entirely make a man, but it adds much to his capital.

The president of one of our universities said, "If you educate a crook, you put tools into his hands for his work, but if you educate an honest man you do the same."

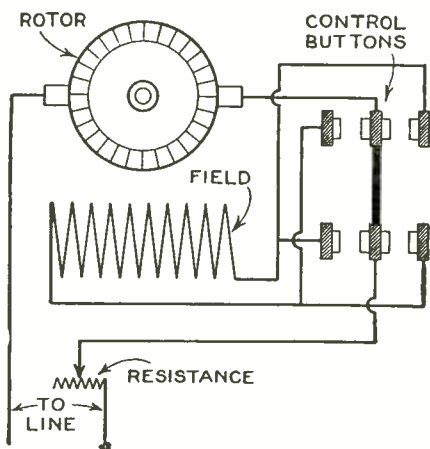
The days spent in acquiring a college education will never be forgotten, neither are the friendships made, and there are things that may not show themselves at once in dollars and cents that are of value and give pleasure in life. This everyone must consider in choosing a college education.

REED O. BRIGHAM, M.S., Ph.D., M.D.,
Toledo, Ohio.

Remote Control for the Amateur

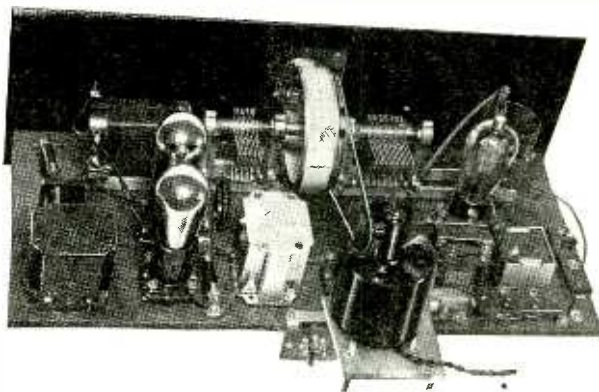
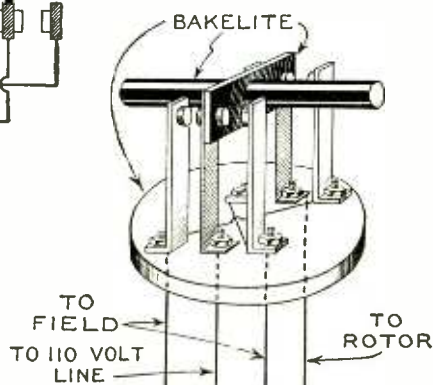
LIKE many new improvements which have come to radio during its infancy, the device for push-button selection is not of very much interest to the radio fan unless he can construct it himself. Here is one of the most simple push-button selectors we have seen yet.

The material necessary for building this set is a small oscillating fan motor, some bakelite or hard rubber rod $1\frac{1}{2}$ inches in diameter, a pulley belt, a variable resistance, one cable of four wires, and a long two-wire cable. Remove the blades and guard from oscillating fan, disconnect wires



Above is diagram showing circuit of motor in series. At left is diagram showing selection switch and hook-up for circuit.

from armature to field and solder on four long wires—two from the brushes and two from the field. Use the four screws that support guard to



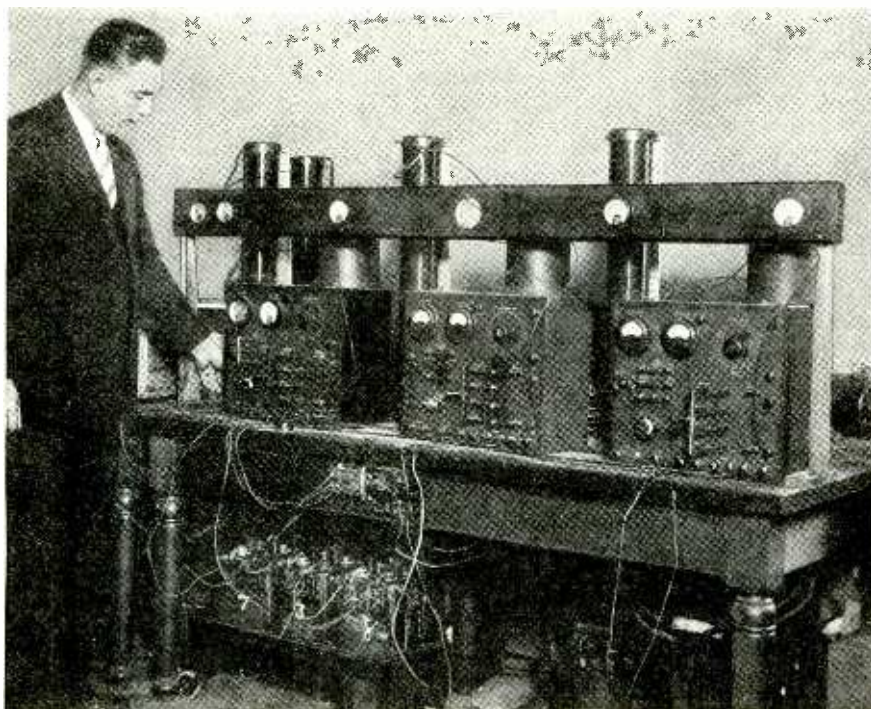
Above is rear view of set showing oscillating fan motor connected by pulley to drum of gang condenser.

place motor on. Next, make a groove around oscillating gear pulley. Put motor on back of the set and adjust the belt, made of cord or spring, from the pulley to the drum of the condenser gang. Then place variable resistance in series with the line. Now take the bakelite of $1\frac{1}{2}$ inches diameter and drill seven holes in it—six to secure the contacts and one hole in the center for fixing the bakelite rod to the base. Then affix a long two-wire cable to the main switch, using a pear push button to control it.

The four-wire cable should next be fixed, as shown in diagram, and led to an easy chair or any other place from which the operator desires to operate his selector.

This selector has proved very satisfactory in operation and has been practically trouble-proof. It is very simple in construction and can be made at home without any trouble. This has been hooked up on a 110-volt line; and if some resistance is not used, the motor will tend to overspeed. It is advisable in this case to use a power clarostat or its equivalent.—Carlos Frowein.

Now—Three Transmitters on One Aerial



©Harris and Ewing

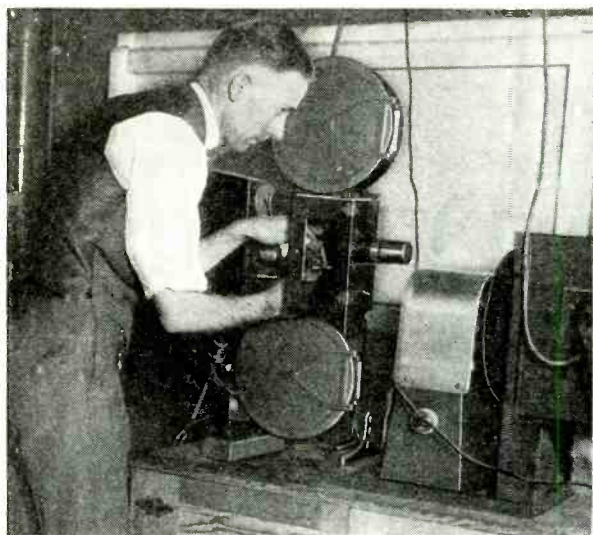
A scene in the laboratory at Washington, D. C., where three transmitters operate on one antenna.

RECENTLY the U. S. Signal Corps radio engineers have developed an innovation in radio transmitting which is highly important and noteworthy. We all know of the unusual amount of trouble and interference caused by the neighbor's radio in the days of the old regenerative sets. This interference was due to a number of things—one of these was the aerial of the troublesome set. Now the Signal Corps experts claim to have perfected a system whereby three sets may transmit at the same time on the same aerial. Each transmitter uses a different wave-length without any interference from either of the other sets; they are shown at the left. The three transmitting sets are all lined up close together, yet there is no interference with the individual transmission of the respective messages.

The Signal Corps, under the direction of Major William Blair, is now working on a similar device for army receiving sets. One method of connecting more than one receiving set to the same antenna was illustrated and described in the November issue of this magazine.

Sends "Movies" by Radio

RADIO Television amateurs are now building apparatus to transmit motion pictures as well as receive them. J. F. Brott, a radio engineer of Seattle, Washington, has designed and built his own television transmitter and receiver. With this apparatus, Mr. Brott broadcasts motion pictures, which are regularly received by his neighbors.



J. F. Brott with his amateur motion-picture broadcaster.



The Brott amateur television receiver.

The transmitter, shown at the left, consists of a motion picture projector, modulator, and light-sensitive cells. The cable going to the ceiling runs to the radio transmitting station.

The box-like affair above contains the television receiver motor, scanning disk, and neon lamp. The image forms on a plate approximately one inch square.

Portable Televisor

A PORTABLE outfit for taking television pictures has been invented by Dénes von Mihaly, a radio engineer of Germany. The apparatus may be used to take motion pictures and transmit them via radio to various distances. Through the medium of this apparatus it is not necessary to have a huge permanent transmitting station; pictures can be transmitted from any spot desired.

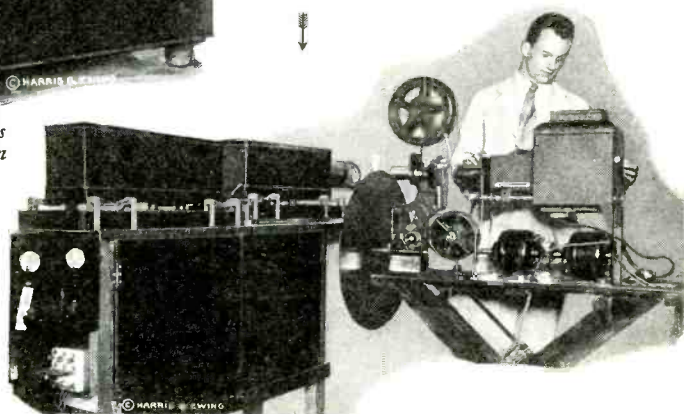
Such a development of television brings it into the realm of the news photographer. What seemed like a wild dream a short time ago is now a scientific possibility. We are now on the threshold of witnessing the latest news events at the same time that they happen. Directly we shall see athletic games and the like while they are going on.



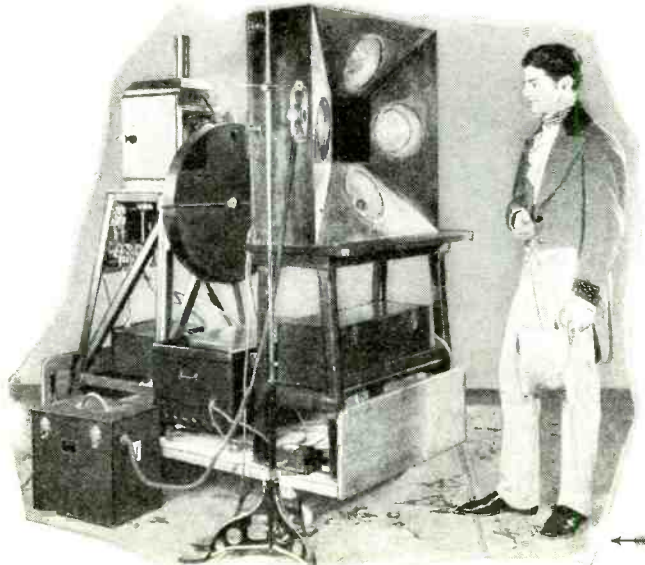
Dr. Mihaly with his portable television transmitter.

Jenkins Now Broadcasting Movies

MOTION pictures are now being broadcast nightly by short waves over a powerful radio station located ten miles outside of Washington, D. C., near Silver Springs, Md. These broadcasts are being made over the new television transmitting station of C. Francis Jenkins. This station is powerful enough to be capable of covering the Eastern United States with radio pictures.

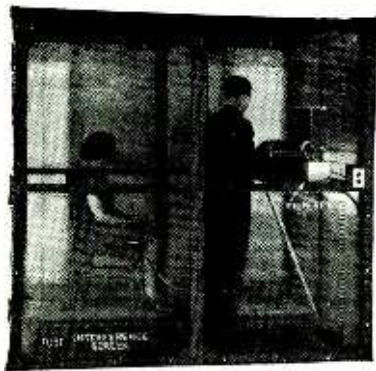


The Jenkins motion-picture projecting machine, scanning disk and radio amplifier. The radio transmitter is located in another room.



Look In! R. C. A. Is Televising

NIGHTLY broadcasts of motion pictures and still pictures are being sent over the R. C. A. experimental station W2XBS, located in New York City. These broadcasts are made on a frequency of 2,000 kilocycles, or 142.8 to 149.9 metres. The photograph at the left shows the television transmitting apparatus. Announcements of the station's call letters and other information are sent out like movie sub-titles. A card with the information to be broadcast, printed in large letters, is held before the televisor screen. Occasional attempts are made to broadcast pictures of people directly.



Interference Screen

A NEW screen cage for the use of dentists or other persons using electrical devices in the proximity of radio sets has been put on the market under the Tobe trade-mark. This screen cage is designed to protect electrical instruments from affecting radio receivers.

Screen Gridifier

HERE'S a really ingenious device manufactured by the Insuline Corp. of America. It's called a screen gridifier and enables any radio set owner, with a supply of 110 a.c., to enjoy the benefits of screen-grid tubes without any trouble. It is completely shielded, requires no wiring changes and will fit any standard UX four-prong and five-prong socket. With this device, the problem of using screen-grid tubes and being up to the minute is readily solved.



NEW RADIO DEVICES

New Filterettes



THESE filterettes are designed to act in conjunction with the screen cage shown above. The Tobe filterettes are plugged in series with the line. The manufacturers claim that the use of these two devices will eliminate all causes of electrical interference

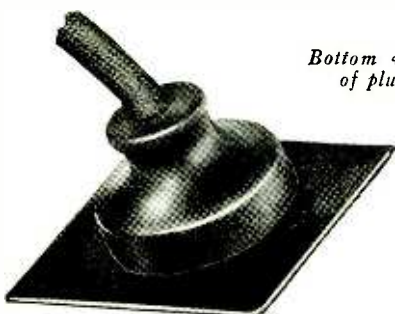
and distortion on radio sets, due to X-ray or other electrical machines in the immediate neighborhood.

The causes of distortion in a radio receiver may be due to numerous things. Here are a few ways of telling the reason for the distortion or any unusual noise in the set.

A universal type motor will cause either a high-pitched whine or singing tone. A rough buzzing tone is the result of disturbance from the ignition system of an oil-burner. The electric refrigerator causes an intermittent crackle in the set, sometimes being steady and coarse for several seconds. The easiest way to eliminate these various noises is to plug a filterette into the line.

Four-Pronged Plug

THIS plug is manufactured by the National Co. and is said to have better contact points than the ordinary



Bottom view of plug

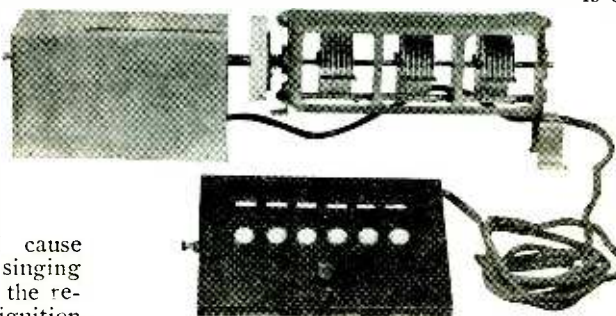
Shows plug fitting snugly into socket.

plug. It is of sturdy construction and the danger of breaking wires from binding posts is minimized.

It has a special thumb-shaped end; this prevents the usual wear and tear on the wire from pulling. The plug is especially adapted for connecting dynamic speakers and comes with 4 and 5 prongs.

Push-Button Selector

THE remote control device shown here is manufactured by the Motor-matic Radio Appliances and works on the principle of motor operation and magnetic control. It is available for any six stations on the dial drum, and



any number of remote control boards may be used. This selector is intended for standard sets and has the advantage that when the station has been tuned in, a light by the button flashes on.



Oxford dynamic with Kuprox rectifier.

Improved Dynamic Speaker

HERE is a dynamic speaker, the product of Oxford Radio Corp., which uses a Kuprox double rectifier. The cone has metallized cloth and the speaker is designed for 110 a.c. 60-cycle circuits.

Master Voltage Control

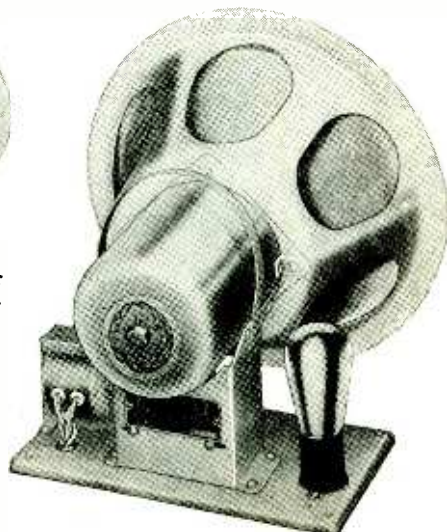
THIS is the product of the Master Engineering Co. and it is designed to prevent excess voltage reaching the set and burning out the a.c. tubes. It may be plugged into any wall or floor socket. The control has a scale of desired voltages on its side. One has merely to plug into the control and the necessary voltage is obtained.



A New Tube Speaker

BELOW is another Oxford dynamic speaker, using a 280-tube rectifier. It is designed to handle large volume and has a 12½-inch metallized cone.

Both of the speakers shown here are designed for auditorium use; other models are available for use on home sets; both are designed for 110 a.c. operation. The unique feature in both of these speakers is the special processed metallized cloth which is used. This cloth is impervious to all atmospheric changes.

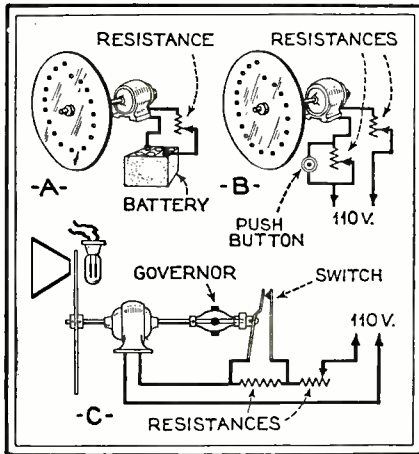


Television Speed Control

(737) Arthur Jones, Jersey City, N. J., inquires.

Q. 1. Sometime ago I saw an article giving several means of controlling television motors so that they could be easily synchronized. Will you please show the methods used?

A. 1. Several methods of keeping a television motor in synchronism are shown. The method shown in diagram A is probably the simplest and in some ways



Three ways in which to control the speed of television motors; "C" is automatic.

the most reliable. This is to use a twelve volt motor connected to a twelve volt storage battery with a controlling rheostat in series. The motor on such an arrangement will not vary in speed to any appreciable extent as the current supply from a storage battery, providing it is well charged and has sufficiently large capacity, is constant long enough to supply power for quite a series of pictures. Once the speed of the motor is adjusted, it will not vary for about one-half hour at a time.

This method is used in many television laboratories, chiefly because it is simple and reliable.

The method shown at B is for use with a motor connected to the regular lighting circuits. The current supply of such a circuit is not so constant as that from a storage battery, so that the speed of the motor will vary to a certain extent. The approximate speed is found by varying the large resistance. The resistance is then increased about one notch and the desired speed obtained by pushing the button. When the speed of the motor increases beyond the point of synchronization, the push button is released, throwing in the small resistance, which will slow the motor up to synchronization, and if it should become too slow it can easily be brought back to the proper speed by again pushing the button. This method will work satisfactorily if the line voltage is fairly constant.

The arrangement shown at C provides for automatic synchronization control. This arrangement is similar to the arrangement in B, except that the push button is replaced by the automatic switch and centrifugal governor. When the motor goes too fast the governor opens the switch, connecting the small resistance into the circuit. When the motor goes too slow, the resistance is automatically

RADIO ORACLE

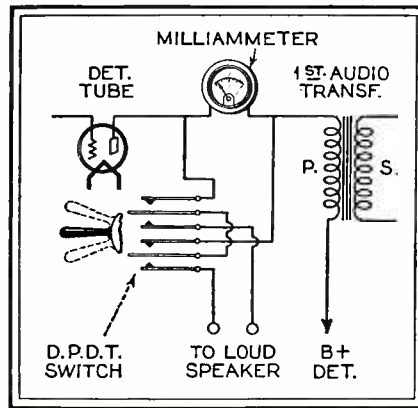
A Monthly Question and Answer Department

shunted out. This is a good arrangement but requires some manipulation before it can be made to operate smoothly and successfully; it will be necessary to do some careful experimenting with the governor and the small resistance, to find the proper size and adjustment of each.

Visual Tuning

(738) James Wailes, Freeport, Texas, writes:

Q. 1. I recently noticed an advertisement of a radio set having a so-called tuning meter. This was an ordinary meter on the panel of the set which showed when stations were tuned to their maximum point without depending on the loud speaker. Will you kindly show me the



How to connect a tuning meter. With switch down, meter is in circuit and speaker cut out; switch up, speaker is cut in.

wiring diagram of such an arrangement, and how it operates?

A. 1. A diagram of the automatic tuning meter is shown. When the switch is

in down position, the speaker is switched out of the circuit and the milliammeter thrown in. This makes it possible to tune in a station without the usual squawks and squeaks and to a definite maximum point of resonance. This will be indicated on the meter at the highest reading.

When the switch is in up position, the milliammeter is switched out of the circuit and the loud speaker goes into operation.

Such an arrangement is a definite improvement to any radio set. It eliminates guess work in tuning, and saves wear and tear on the nerves of the people listening to the programs. The device is particularly useful where a dynamic speaker, which handles a great deal of volume, is used.

Improving the Neutrodyne

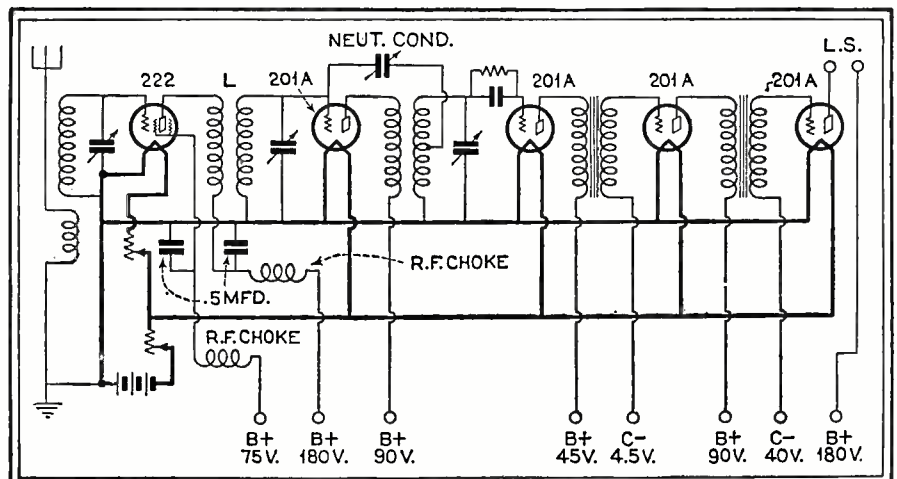
(739) Joseph Hanson, Gaston, Ill., asks:

Q. 1. I have a five-tube neutrodyne which I purchased several years ago when this type of set was considered the best obtainable. There are many sets now on the market much more sensitive than my set. However, it gives me quite satisfactory service, except that I should like to be able to improve the sensitivity. Would it be possible to convert this set to permit using screen grid tubes?

A. 1. In order to convert your set into a screen grid set, it would be necessary to rip out most of the apparatus in the set, change the coils, put everything in special shields, and incorporate a number of chokes and by-pass condensers. This would be a rather expensive proposition and in the end it would be easier to build a complete new receiver. You may improve your set, however, by adding one screen grid tube. It will only be necessary in this case to change coil "L" and add the usual choke coils and by-pass condensers. A complete diagram showing the changes necessary to add one stage of screen grid amplification to your neutrodyne is shown.

With your set rearranged in this manner it will be much more sensitive than originally.

We do not advise you to try to construct the coupler "L." This should be a standard screen grid coupler, as the regular neutrodyne transformers are not suitable for screen grid tubes.



This diagram will interest owners of neutrodynes and other sets, as it shows how to make the set more sensitive by adding a shield grid stage.

Scientific Humor

A Monthly Fun Page for Those Who Enjoy a Laugh

ALAS, TOO TRUE

A teacher was explaining to her class the meaning of the word bigamy."
 "It means having two wives at one time," she said. "Now tell me what word means having one wife?"
 A boy responded—"Monotony."
 —Albert DeLuca.

SHOULD HAVE BEEN A TIME EXPOSURE

DARING PHOTOGRAPHER — I was scaling the bluff attempting to get a close-up of the cliff bird's nest, when my suspender broke.
AWED LISTENER — And then...
DARING PHOTOGRAPHER — Why...er...
 an under exposure resulted.—Fred E. Erdos.



THE LOBSTER TEST

First Prize— \$3.00
 Mrs. HIGH—Now, Mary, when you bathe the baby be sure and test the water with the thermometer.



Mrs. HIGH (one hour later)—Did you use the thermometer?
 MARY—No, ma'am. I didn't need it. If the water's too hot, the baby turns red, and if it's too cold, she turns blue.
 —Earl Bennett.

A PANACEA

OLD LADY TO DRUGGIST (Angrily)—Well, sir, what can you mean? You sold me this thermometer with the instruction that I should keep it under my armpit for half a minute. I kept it there for half an hour and yet I was none the better."
 —Scarax Framrose Desai.

YEARS OF COLLEGE FOR THIS

CUSTOMER—Good heavens, Mr. Druggist, I'm poisoned! It must have been the sandwiches my wife gave me.
PHARMACIST—Yes, that's it. I tell you, you're taking a chance every time you eat a sandwich that isn't prepared by a registered pharmacist.—Miss Ursula Greenc.



NUTTIER BY THE 2ND

1st—That's a cuckoo clock.
 2nd—Yeh, I noticed it isn't right.
 Paul Kopetka.



AVIATORS—USE THIS!

AVIATOR — Wanta fly?
FLAPPER — O—oo yeth.
AVIATOR — I'll catch one for you.
 —Frank Gora.

IN THE ROUGH

It was a hot, sultry session in the courts and the judge was thinking other than judicial thoughts. Finally the lawyer said: "He claims his wife was intractable, your Honor, so he beat her into subjection with a golf club."
 "How many strokes?" asked the judge absently.
 —Mrs. H. E. Chrisman.

ALL jokes published here are paid for at a rate of \$1.00 each; \$3.00 is paid for the best joke submitted each month.
 Jokes must have a scientific strain and should be original.
 Write each joke on a separate sheet of paper and add your name and address to each.
 Unavailable material cannot be returned.

VERY ATTRACTIVE

The man with a lot of personal magnetism unfortunately walked through a hardware store.
 —Cletus Gardner.



LET GO THAT WHEEL!

The average woman's idea of intelligent driving is to stick a hand out each side so she can turn either way she wants to.
 —Annie Richard Taylor.

DARKENS SKINS

"Why do you leave your shoes in the sunlight?"
 "I am trying to make them tan."
 —Florence Harmon.

APPLY WITH GUN!

WIFE to Impatient Hubby—If you had a face like mine, what kind of powder would you use?
IMPATIENT HUBBY—Gunpowder.
 —Miss Shirley Clarke.

WE'VE SUCCEEDED!

"Science and Invention reminds me of a man with poor blood."
 "Why?"
 "Both are trying to work up a good circulation."
 —Earle Bennett.

SCIENTY SIMON SCIENTIST



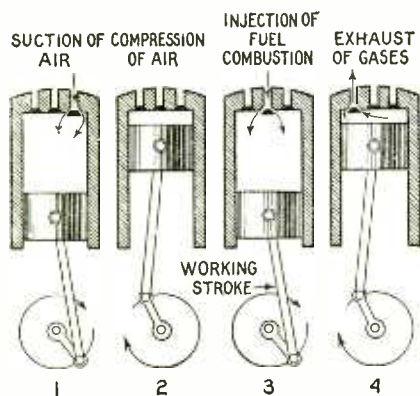
SCIENCE LESSON NO. 37
 THIS FAMOUS ROCK-SPLITTING STUNT, COMING FROM INDIA, INVOLVES NO TRICKERY, AND IS BASED ON A SOUND SCIENTIFIC PRINCIPLE. IT IS REALLY POSSIBLE TO CRACK A HEAVY BOULDER HELD AS SHOWN, WITH NO INJURY TO THE ONE HOLDING IT. THE REASON IS THAT THE GREATER INERTIA OF THE LARGE ROCK PREVENTS THE FULL SHOCK FROM BEING TRANSMITTED TO THE HEAD. WITH A SMALL STONE THERE IS NO SUCH PROTECTION.

A Monthly Scientific Question and Answer Page

The Operation of Diesel Engines

(2334) Joseph Smith, Philadelphia, Pa., writes:

Q. 1. Will you give a simple diagram of a Diesel engine, showing how it operates?



This diagram explains the operation of the Diesel engine. Air is first sucked into the cylinder, then compressed, which causes heating, after which the oil is sprayed in, combusts, producing the power stroke, and then exhausts.

A. 1. A schematic diagram of a simple Diesel engine is shown. Its construction is similar to a gasoline engine, except that there is no spark plug and the construction is heavier to permit a higher pressure to be used. Instead of sucking in its gasoline vapor, air is sucked into the cylinder and this is compressed. When air is compressed to a great degree, as in an engine of this type, the temperature rises to a great extent. Oil is then injected into the cylinder in a spray and the heat of the compressed air ignites the oil, causing combustion and forcing the piston down, as shown in position 3. The burned gases are exhausted on the upstroke and the cycle is repeated.

Decapitated Head Illusion

(2335) Howard Petersen, Quincy, Ill., writes:

Q. 1. I remember attending a fair once and seeing an arrangement of a woman's head resting on two swords placed across the arms of a chair. The head was alive, but there was no body attached to it. The result was weird. I should like to know how this was done and whether I could produce such an illusion.

A. 1. The illusion you refer to is called the "decapitated head illusion." The head is exhibited in a curtained recess and reposes upon two swords lying across the arms of a chair. The chair is upholstered in red plush and is placed close to a curtain at the back of the recess. At the back of the chair is an opening just below the level of the tops of the chair arms. This opening is not seen from the front, as it is concealed by a mirror that is placed between the arms of the chair at an angle of 45 deg. The ends of the mirror rest in folds of the fan-shaped upholstery on the inside of the chair arms. The lower edge of the mirror rests on the bottom of the chair and the upper edge is concealed by laying one of the swords on it, as may be seen in the illustrations. At the proper angle the bottom

The Oracle

of the chair is reflected in the mirror, giving the impression that one is looking at the back. The folds in the upholstery of the inside of the arms effectively conceal the right and left ends of the mirror. There is a hole in the red curtain, directly opposite the hole in the chair back, through which there passes a board, supported at one end by resting on the seat of the chair, and at the other end by a small box or any convenient article. The performer rests on this.

Formation of Hailstones

(2336) Henry Cowan, Miami, Fla., writes:

Q. 1. I should like to know how a hailstone is formed.

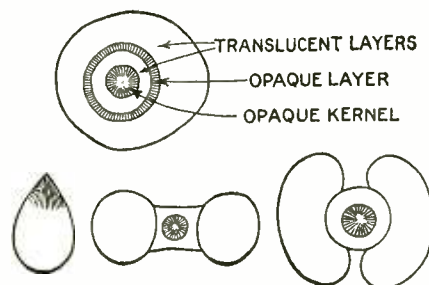
A. 1. Some recent scientific experiments by Dr. C. E. T. Brooks, Honorary Secretary of the Royal Meteorological Society of

Great Britain, definitely explains the process of the formation of a hailstone in *Discovery*:

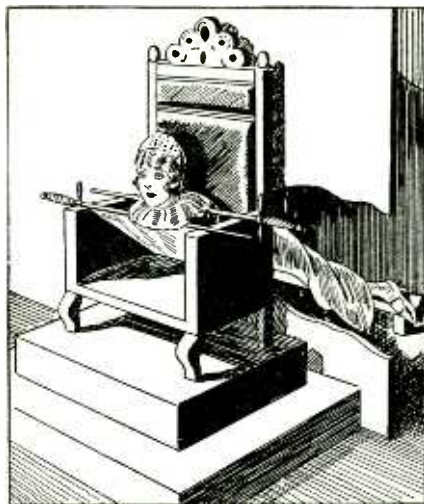
"It begins as a number of scattered molecules of water vapor in moist air near the ground, in the path of an advancing thunderstorm. When the air is drawn into the storm it rises, expands and is cooled by expansion until it becomes saturated. The water vapor condenses and forms drops, but these are small and are still blown upward, growing all the time. They pass into air below the freezing point and rise through a further height of five or ten thousand feet as super-cooled drops, until some of them freeze and form small particles of ice. At this level we have ice particles and super-cooled drops together and whenever an ice particle touches a super-cooled drop the latter freezes onto it. The incipient hailstone so formed, being now too heavy for the air current at that great height to sustain, begins to fall and on its downward path it meets and absorbs more of the super-cooled drops which are blown up against it. At the same time ice crystals are being deposited on it direct from the moist air and by these two processes it gradually becomes coated with a layer of opaque ice.

"On its downward path the hailstone meets with warmer and warmer drops, until it enters the level at which their temperature is just above 32 deg. F. Here it becomes coated with water which freezes more slowly and forms clearer ice. From this point the hailstone may continue its journey to the ground, arriving at a simple sphere of moderate size, consisting only of an opaque kernel and a single translucent layer; or it may be carried up again into colder levels and begin the process of formation afresh with a layer of opaque ice. Finally, however, it finds a way to the ground, either breaking through the upward current by the mere force of its weight, or else finding a way around the edge of the current to less disturbed air. It is possible that some hailstones freeze together during the formation of the outermost translucent layer, but it is hardly probable. The freezing together most likely takes place on the ground and accounts for many of the most sensational stories about hailstones ranging up to the size of a man's head, if not larger."

The diagram shows various types of hailstones, although the spherical form is the most usual.



This diagram explains various types of hailstones. The spherical shape is most common.



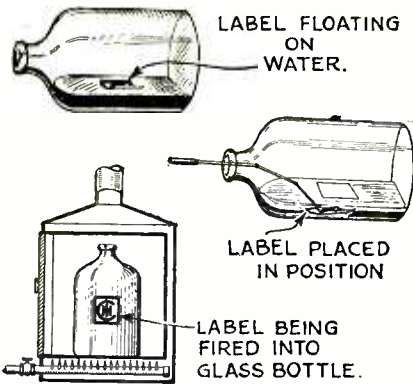
How the illusion known as the Decapitated Head is constructed. The mirror hides the body, as this diagram shows.

The "Oracle" is for the sole benefit of all scientific students. Question swill 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 50 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.

Latest Patents

Labeling Bottles



No. 1,725,199, issued to Antonius R. Kuhn and James J. Furlong. Decalcomanias when wet are easily injured. It therefore becomes difficult to place them on the inner surfaces of bottles where labels would be naturally protected. In this method the label is floated on water, and when the design is free, it is pushed down to adhere to the side of the bottle while the water is removed. After this the label is fired into the glass bottle by means of heat.

Milk-skimming Bottle



No. 1,722,396, issued to Winfield S. Reiber. With a milk bottle constructed with a division, as the illustration here shows, it is possible to separate the milk from the cream by merely tilting the bottle. For purposes of this illustration, the cream is shown being poured off in one position, but to prevent bubbling, the bottle is preferably turned around, so that opening is on top.

Dandelion Weeder



No. 1,725,191, issued to Thomas C. Holmes. This simple tool is small enough to be conveniently carried in the pocket. It has a bent handle to protect the user's knuckles and is employed for removing dandelions and similar weeds from the lawn.

Notice to Readers:

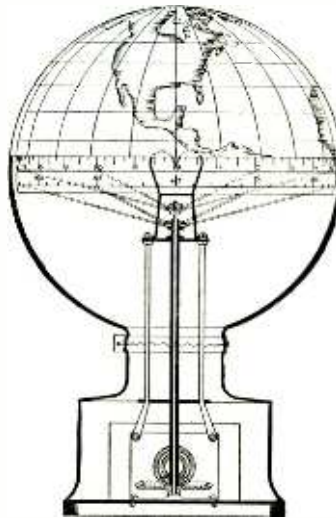
These illustrated and described devices have recently been issued patent protection but are not as yet, to our knowledge, available on the market. We regret to advise that it is impossible to supply the correct addresses of inventors of the devices to any of our readers, as the only records available are at the Patent Office at Washington, D. C., and give only the addresses of the inventors at the time of application for a patent some time ago.

Illuminated Pencil



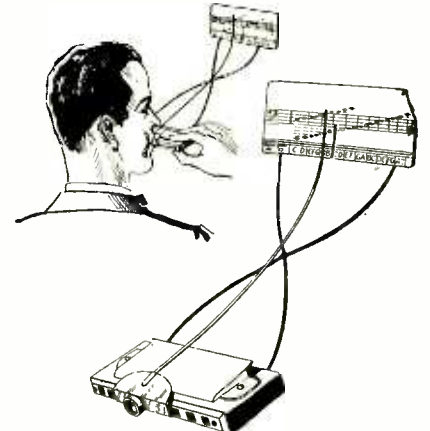
No. 1,722,238, issued to Albert Weber. The bulb containing the filament is provided with a central bore through which the lead is fed. The pencil itself contains the dry cell or battery.

World-time Clock



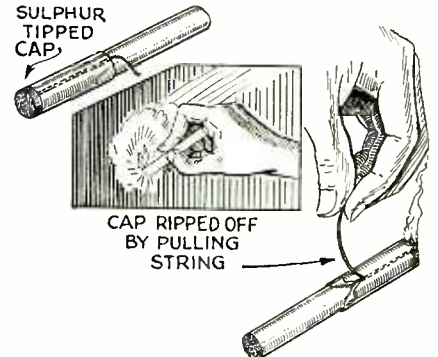
No. 1,720,902, issued to Elmer T. Isaacson. This unique clock has a stationary pointer and graduated horizontal dials which are moved by a clockwork mechanism. The time can be readily ascertained. The spherical representation of the earth's surface is associated with the clock in such a way that standard time, at any designated point on the surface, may be ascertained and the relative time at other points may be readily determined.

Easy-playing Harmonica



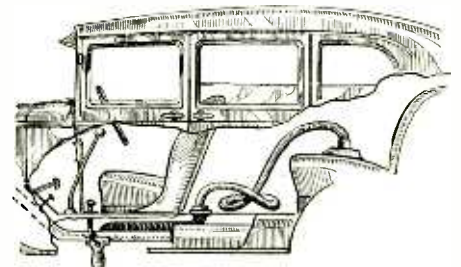
No. 1,722,852, issued to Frank Miller. By means of this attachment a harmonica may be played by amateurs in an easy and accurate manner. A bent wire rack holds the music and a slide fits over the reed openings and communicates with a piece of bent wire. By moving this slide-mouthpiece back and forth, the user can play any music arranged for the instrument. The design of the mouthpiece eliminates tonguing.

Self-lighting Cigarettes



No. 1,723,877, issued to Nicolai Mednikoff and Leo Liberthson. Attempts have been made to develop cigarettes with a striking compound on the end so that the cigarette need merely be rubbed against the side of the container to light it. Usually in striking such a cigarette against a prepared case, the paper of the cigarette is either ruptured or distorted. In this system a heavy paper wrapper surrounds the cigarette and this wrapper is removed by pulling on a string after the cigarette has been lighted.

Auto Vacuum Cleaner



No. 1,722,265, issued to Lester Filmore Beaulieu. In this invention the necessary vacuum has been obtained from the exhaust of the engine without the use of any fan or any mechanism driven by the exhaust. A simple trip in the base of the car directs the exhaust gases downward, which produces a partial vacuum in a branch passage.



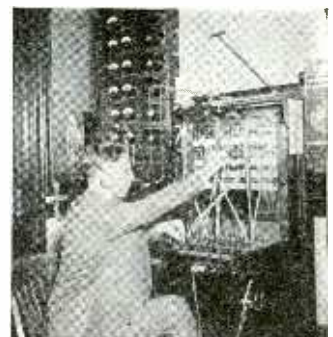
Radio Inspectors \$2000 to \$4500 a Year.



Radio Operators \$90 to \$200 a month (board free).



Broadcast Operators \$1800 to \$4800 a Year.



Radio Repair Mechanics \$1800 to \$4000 a Year.

Fill one of these BIG MONEY RADIO JOBS

SAY "Good Bye" to long hours and low-paid work. Pick yourself a big-money job in Radio! Hundreds of men just like you earn from \$2,000 to \$25,000 a year in this giant world-wide industry... It's the livest money-making business of today!

The Whole World is Calling for Trained Radio Men

Broadcasting stations and manufacturers all over the country are eagerly seeking trained men... Thousands of ships require experienced operators... and now comes nationwide radio telegraph service, telephony, television, photoradiograms!... Thousands of opportunities like this are waiting for you.

Easy to Learn at Home With This Magnificent Laboratory Outfit

There's no need for you to know a thing about Radio. The Radio Corporation of America sponsors this marvelous, simplified home-training course... by means of which you, too, can now prepare for success in every phase of Radio... You learn by actual experience with the remarkable outlay of apparatus given with this course... learn how to solve every Radio problem... such as repairing, installing and servicing fine sets. That's why you, too, can easily have the confidence and ability to hold a big-money Radio job.

Only Course Backed by Radio Corporation of America

The progress of Radio is measured by the accomplishments of the great engineers in the huge research laboratories of the Radio Corporation of America. This gigantic organization sets the standards for the entire industry... and sponsors every lesson in the course. That's why graduates of this school are always posted in newest up-to-the-minute developments in Radio. That's why they are always in big demand.

JOBS *many do it in 9 months!*

FREE BOOK SHOWS HOW!

Money Back if Not Satisfied

This marvelous home-laboratory training practically insures your success by preparing you thoroughly in every phase of Radio manufacturing, servicing, broadcasting, photoradiograms, television and airplane radio equipment. As a student you will receive an agreement signed by the president of this school assuring you of complete satisfaction upon completion of your training—or your money will be instantly refunded.

Read This Free Book

The young men in Radio today will be the industrial leaders of tomorrow... that's what happened in the automobile business... in aviation... and in every other essential industry... Get in on the ground floor and climb with this tremendous industry!

Free... everything you want to know about Radio... 50 fascinating pages... each one packed with pictures and descriptions about the brilliant opportunities in this fast-growing profession. See for yourself why R. I. A. training has placed thousands of men in well paid positions—usually from 3 to 10 days after graduation. Mail this coupon now and receive your Free Book.



RADIO INSTITUTE of AMERICA,
Dept. Ex-12, 326 Broadway, New York, N. Y.

Gentlemen: Please send me your FREE 50-page book which illustrates the brilliant opportunities in Radio and describes your laboratory-method of instruction at home.

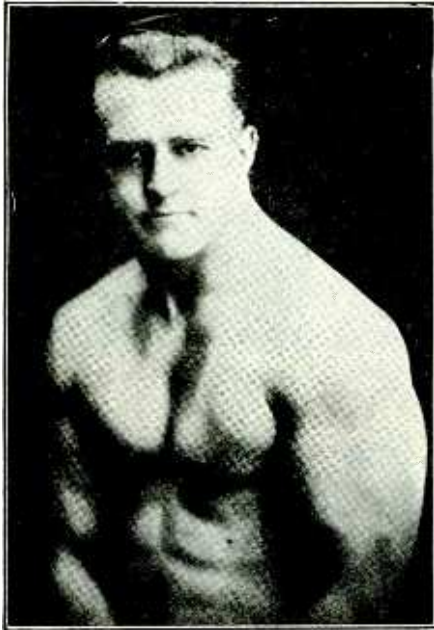
Name.....

Address.....

RADIO INSTITUTE OF AMERICA

SPONSORED BY





EARLE LIEDERMAN—The Muscle Builder
 Author of "Muscle Building," "Science of Wrestling,"
 "Secrets of Strength," "Here's Health," "Endurance," etc.

What Do Women Want Most?

Women want he-men for their husbands and sweethearts. None of this chorus-man stuff for the real girl. She wants to be proud of his physical make-up, proud of his figure in a bathing suit. She knows that it's the fellow that is full of pep and vitality that gets ahead in this world. He's got the physical backbone to back up the mental decisions he makes. He'll win out every time.

Look Yourself Over!

How do you shape up? Are you giving yourself a square deal? Have you got those big rolling muscles that mean health and strength inside and out? The vitality that gives you the ambition to win out at everything you start? Make that girl admire you first and foremost for a real he-man and the hardest part in winning her is over.

I Can Give It To You In 30 Days

In 30 days I can do you over so that she will hardly know you. I'll put a whole inch of solid muscle on each arm in 30 days, and two whole inches of rippling strength across your chest. I've done it for over a hundred thousand others, and I can do it for you. I don't care how weak and puny you are. I like to get them weak and puny, because it's the hopeless cases that I work with best. It gives me a lot of real joy just to see them develop and the surprised look in their eyes when they step before the mirror at the end of 30 days and see what a miracle I have worked for them.

You'll Be a He-Man From Now On!

And it's no temporary layer of muscle I put on you. It's there to stay! With those newly broadened shoulders; that perfect neck and great, manly chest, you can maintain your self-respect in any society. Every woman will know that you are what every man should be—a foreful, red-blooded he-man.

I want You For 90 Days

If at the end of 30 days you think you have improved, wait till you see yourself at the end of 90 days. Then the friends you thought were strong will seem like children by comparison. I'm not called the Muscle Builder for nothing. My system scientifically builds real muscle faster than you ever imagined.

Watch Them Turn Around

Notice how every woman prefers the fellow who carries himself with head up. Notice how the broad shouldered man always gets their eye. They want a dependable he-man when they make their choice—one who can protect them. And you can be that man. Remember, I not only promise it—I GUARANTEE IT.

Now don't put it off a minute. Get going to new happiness and real manhood today.

Send for my **Muscular Development** 64 Pages and New Book —IT'S FREE

It contains forty-eight full-page photographs of myself and some of the many prize winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. This book will prove an impetus and a real inspiration to you. 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 LIEDERMAN

Dept. 2712 305 Broadway, New York

EARLE LIEDERMAN
 Dept. 2712, 305 Broadway, New York City

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

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

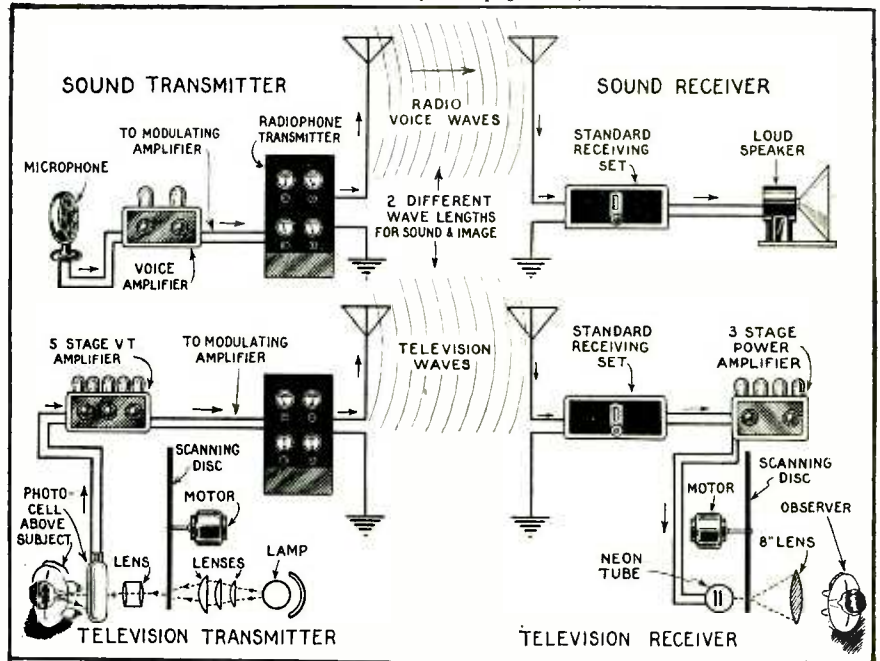
Street

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

Baird's Newest Televisor

By H. Winfield Secor

(Continued from page 691)



The diagram above shows schematically the radio circuits for transmission of the Baird television image as well as the voice; two different wavelengths are required, one for the voice and one for the television image.

of Captain W. J. Jarrard, who represents the Baird interests in America. This newest television and tele-talkie system has a number of interesting details. To begin with, the usual carbon arc lamp is done away with and a high candle-power incandescent lamp takes its place. A scanning disc is used, provided with 30 square holes and revolved at 900 revolutions per minute. An 8-inch diameter lens is used at the receiver to magnify the image and thus give greater pleasure to the observer, the usual image on most of the television machines being about one inch square. One of the principal ideas which the Baird experts have in mind for the application of this newest development in dual television and voice transmission and reception is for the broadcasting of talking movies.

At the transmitter, a powerful source of light, such as that obtained from a 2,000 watt, 4,000 candle-power concentrated filament lamp, is condensed through a specially designed triple lens arrangement as shown in the drawing, this powerful beam of light falling on the rear of the revolving scanning disc. This transmitter disc is revolved by a 110 volt, 60 cycle a. c. motor of the synchronous type. No extra synchronizing wavelengths or circuits are necessary with this improved television system, a special self-contained synchronizing or constant-speed attachment being fitted onto the scanning disc motor at the receiving station.

As each one of the minute square holes in the whirling disc at the transmitter passes across the beam of light, it causes a small pencil of light to pass out to the second lens system and diaphragm, and thence onto the face of the person, as shown in the picture. As the pencil of light from any given hole sweeps across the face in a vertical plane, the reflected pencil of light (whose angle is constantly varying, owing to the irregularities of the face for example) falls upon the photo-electric cells.

The Light-Sensitive Cells

THESE cells in the new Baird system are large affairs, about 3 in. × 12 in.,

and contain a single wire electrode passing along the center of the tube, the inner surface of the tube being coated with a chemical which is sensitive to light changes in such a manner as to cause a slight electric current to be produced when light falls upon it. The secret of these cells lies in the fact that the electric currents produced are proportional to the degree of light which falls upon them; the stronger the light, the stronger the current and vice versa. The very minute photo-electric cell currents are then passed into a five-stage amplifier, of the vacuum tube resistance coupled type, and the television image or signal currents are then passed over a wire circuit to a power amplifier at the receiving instrument, as shown in the diagram. If the television image current is to be transmitted by radio waves between two stations, the image current coming from the five-stage amplifier, is passed into the modulating amplifier of a regular radio transmitter of the vacuum tube type, such as used at present for broadcasting. The fluctuating ether waves whipped off from the transmitting aerial are intercepted at the receiving aerial, from whence they pass to a suitable tuning circuit; they are then amplified sufficiently to cause fluctuations in the neon tube placed behind the scanning disc, with its spiral of whirling holes, at the receiver.

Synchronizing System

ONE of the greatest bugaboos of all television systems lies in keeping the transmitter and receiver scanning disc rotating in exact synchronism or step. If the two discs do not rotate in exact step or synchronism, the image will be distorted. Instead of using a separate circuit or an additional, separate wavelength for carrying synchronizing currents to the receiver scanning disc motor, the Baird experts have devised a simple electro-mechanical arrangement, which is fitted into a small casing right onto the receiver motor. Once the picture is framed at the receiver, the machine does not have to be adjusted again. To frame the picture, the automatic syn-

(Continued on page 734)



The Man with the "Grasshopper Mind"

YOU know this man as well as you know YOURSELF. His mind nibbles at EVERYTHING and masters NOTHING.

At home in the evening he tunes in the radio—gets tired of it—then glances through a MAGAZINE—can't get interested. Finally, unable to CONCENTRATE on anything, he either goes to the MOVIES or FALLS ASLEEP in his chair.

At the OFFICE he always takes up the EASIEST thing first, puts it down when it gets HARD, and starts something else. JUMPS from ONE THING TO ANOTHER all the time!

There are thousands of these PEOPLE WITH GRASSHOPPER MINDS in the world. In fact they are the very people who do the world's MOST TIRESOME TASKS—and get but a PITTANCE for their work.

They do the world's CLERICAL WORK, and routine drudgery. Day after day, week after week, month after month, year after year—ENDLESSLY—they HANG ON to the jobs that are smallest-salaried, longest-houred, least interesting, and poorest-future!

If YOU have a "grasshopper mind" you know that this is TRUE. And you know WHY it is true. Even the BLAZING SUN can't burn a hole in a little piece of TISSUE PAPER unless its rays are focussed and concentrated ON ONE SPOT!

A BRAIN THAT BALKS at sticking to ONE THING FOR MORE THAN A FEW MINUTES surely cannot be depended upon to get you anywhere in your YEARS of life!

The TRAGEDY of it all is this: you know that RIGHT NOW you are merely jumping HERE AND THERE. Yet you also know that you have WITHIN YOU the intelligence, the earnestness, and the ability that can take you right to the high place you want to reach in life!

What is WRONG? WHAT'S holding you back?

Just one fact—one SCIENTIFIC fact. That is all. And when you know what it IS, then you can easily learn how to apply it; make it carry you STEADILY, POSITIVELY, AND DIRECTLY to prosperity and independence.

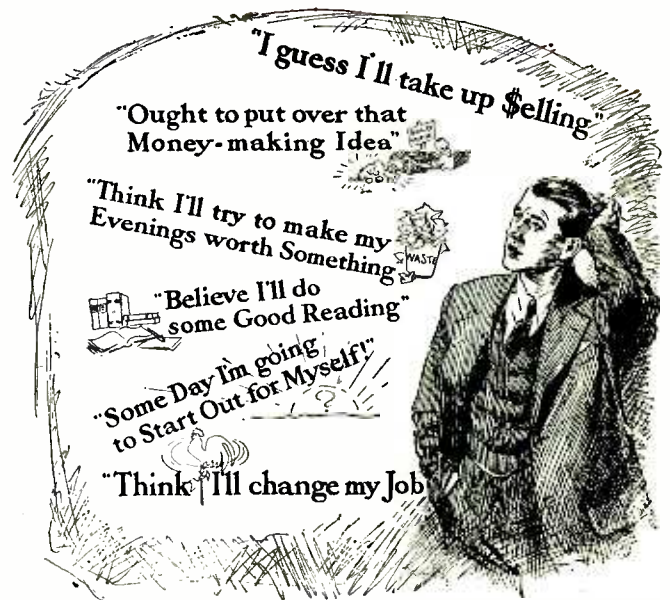
That fact is one which has been PROVEN and stated by the world's foremost scientists and psychologists. You are only ONE-TENTH as successful as you COULD be! Why? BECAUSE, as Science says, you are using only ONE-TENTH of your real BRAIN-POWER!

TEN per cent of his brain is all the AVERAGE person uses. He is paid for ONE-TENTH of what he really possesses because that is all he actually USES. The remainder lies dormant. The longer it is unused, the harder it becomes to use it. For the mind is like a muscle. It grows in power through exercise and use. It weakens and deteriorates with idleness.

What can you DO about it? That is the question you are asking yourself. Here is a suggestion.

Spend 2c for a postage stamp. Send in the coupon below for a copy of "Scientific Mind Training." There is no further obligation whatever. You need not spend another penny.

This little book will tell you the secret of self-confidence, of a strong will, of a powerful memory, of unflagging concentration. It tells you how to acquire directive powers, how to train your imagination (the greatest force in the world), how to make quick, accurate decisions, how to reason logically—in short, how to make



your brain an instrument of all-around POWER. It tells you how to banish the negative qualities like forgetfulness, brain fag, inertia, indecision, self-consciousness, lack of ideas, mind wandering, lack of system, procrastination, timidity.

Men like Judge Ben B. Lindsey, Sir Harry Lauder, Prince Charles of Sweden, Jerome K. Jerome, the famous novelist; Frank P. Walsh, Chairman of the National War Labor Board, and hundreds of others equally famous, praise the simple method of increasing brain power and thought power described in this free book. OVER 650,000 OTHERS PRAISE IT.

You have only TWO CENTS to lose by writing for your copy. You may GAIN thousands of dollars, peace of mind, happiness, independence!

Thousands who read this announcement will DO NOTHING about it. The effort and the will needed to send for this book—which is FREE—may be lacking. How can these people EVER gain what they hope for, crave for? They are the skeptics, the doubters, the "show me" wiseacres.

Other thousands will say, "I can lose only TWO CENTS. I may GAIN a great deal by reading 'Scientific Mind Training.' I will send for it NOW. It promises too much for me to RISK MISSING."

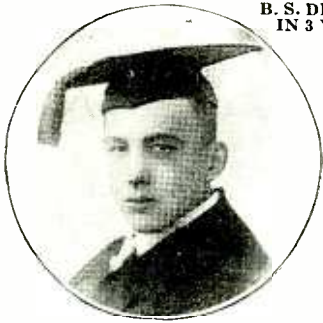
The thousands who are open minded—who are willing to learn something to their advantage—will ACT on their impulse to send the coupon. They will be better, stronger minded for having TAKEN SOME ACTION about their lives, even if they do nothing more than to READ a booklet about the inner workings of the mind. For your own sake—and for the sake of your loved ones, don't continue to GAMBLE that your future will be bright whether or not you DO anything about it! Mail the coupon today—NOW.

THE PELMAN INSTITUTE OF AMERICA
 Suite 3212, 71 West 45th Street, New York City
 Offices in London, Paris, Stockholm, Delhi,
 Durban and Melbourne

The Pelman Institute of America
 Suite 3212, 71 West 45th Street,
 New York City

Please send me without obligation your free booklet, "Scientific Mind Training." This does not place me under any obligation and no salesman is to call on me.

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



B. S. DEGREE
IN 3 YEARS

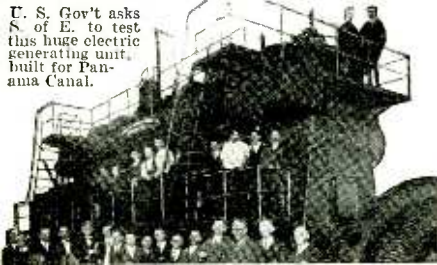
Learn Electrical Engineering

Radio, Television, Talking Movies, Power, Aviation—all of these great industries depend upon electrically trained men.

Here in the School of Engineering of Milwaukee, one of the foremost and best equipped electrical schools in America we are training young men in the various branches of electricity, in a thorough, complete, practical manner. **Jobs up to \$10,000.00 a year** are open to men of action who receive the highly specialized training given by this 26 year old school.

Complete, Practical Electrical Education

U. S. Gov't asks S. of E. to test this huge electric generating unit built for Panama Canal.



Complete courses in Electrical Engineering—A. C. & D. C. Armature Winding—Wiring & Testing—Commercial Electrical Engineering—Radio Technician—Automotive Electricity—Electrical Refrigeration.

EARN WHILE YOU LEARN

We help place students in part time jobs. Our close cooperation with several large Milwaukee industrial plants enables us to help ambitious students earn while learning. Tuition, board and room reasonable. Daily broadcasting. School orchestra. Fraternities. Station WISN is operated from this school.



Be a "Registered" Radio Technician in 90 Days

CLIP THE COUPON! State What Course Interests You

Classes are now organizing. Don't delay. Get into your chosen branch of electricity. Insure your future in the great field of unlimited earnings and opportunities. Send the coupon now!

SCHOOL OF ENGINEERING

of Milwaukee

Founded 1903 E. R. G. 1229 Milwaukee, Wis.

Without obligating me in any way please mail free illustrated book "Rise to Success Through Electricity," and particulars regarding the course I have marked with an X.

RESIDENT COURSES

- Electrical Engineering, B. S. Degree (3 Years).
- Commercial Electrical Engineering. (H. S. Graduates 1 year; others 1 1/2 years).
- Armature Winding.
- Light Motor Wiring and Testing.
- Electrical Refrigeration. Master Electrician.
- Radio Sales Service and Broadcasting.
- Home Laboratory Service. (Home Study Course).
- I am interested in your "Earn While You Learn" plan. Day Evening Classes.

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

Address.....

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

Education.....

Baird's Newest Televisor

(Continued from page 732)

chronizing device is disconnected for a fraction of a minute and then connected again. This is the same method as that used in synchronizing two alternating current dynamos, where no automatic synchronizing switches are used. The motor which revolves the scanning disc at the receiver in this newest system is a 12-volt d. c. machine, operated from a storage battery. It is well to mention in passing, that in many television laboratory experiments a motor of this type is used, operating from storage batteries, as it will maintain constant speed for a considerable length of time; corrections in speed being effected by means of a simple rheostat or variable resistance connected in series with the motor.

The reconstructed image of the person sitting before the television transmitter is built up by means of the whirling disc and its spiral of square holes mounted in front of the neon tube, and in this case the usual postage-stamp size image is enlarged many times, thanks to the use of an eight-inch lens.

How Voice is Transmitted

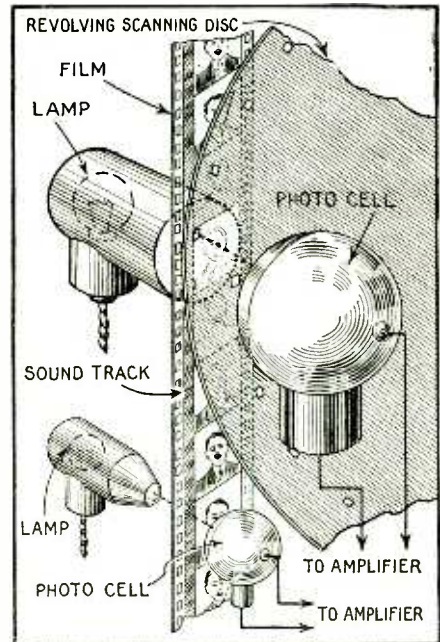
WHERE the voice is to be transmitted simultaneously with the television or motion picture image, a studio type microphone is employed in the manner shown in the large illustration. The fluctuating voice currents coming from the microphone, are passed through a voice amplifier at the transmitting station, and they are then passed over a two-wire metallic circuit to a power amplifier, and thence into a dynamic or any other loud speaker desired. Where the voice is to be transmitted by radio, it requires a separate wavelength and the voice currents, as they emerge from the voice amplifier, are passed into the modulating vacuum tube amplifier of the radio transmitting set. The voice is then carried by ether waves to the receiving aerial, where it is tuned in by the standard radio receiving set, and it may then be caused to reproduce the voice by means of the usual loud speaker.

To those uninitiated in the operation of television in general, it might be mentioned that with a 30 hole disc, each hole scans 1/30th of the image, which is made clear by looking at the small lined picture in the large illustration on the title page. Thus when the 30th hole has finally passed across the light beam and caused its ray of light to traverse the image, the entire image has been scanned or explored. It will be clear from the foregoing, that if we have a second revolving disc containing exactly the same number of holes placed in a spiral, placed before the neon tube at the receiver, at any given instant we will see a spot of light on the receiving lens, of corresponding strength to that received by the photo-electric cell at the transmitter. It is up to the television engineer then to cause his scanning light pencil not notice that such a step-by-step scanning process is going on. At the present time this effect is noticeable to quite a degree, principally for the reason that the image at the receiver seems to be built up of parallel light bands. It is the hope of television experts that they will be able to overcome this and produce a practically perfect image at the receiver.

Talking Movies by Radio Promised

EFFORTS have recently been made to experimentally transmit talking films

by television. One modern form of talking movies consists of an ordinary film, having printed along one side a ladder-like band of light and shade, representing the sound. This ladder-like band, as the film is projected, passes in front of a narrow ray of light, which is transmitted through the varying densities, and falls upon a photo-electric cell, setting up in the photo-electric cell an undulating electric current, which, after amplification operates a loud speaker, and reproduces the sound accompanying the visual projection of the film. In adapting this to television the visual effects are transmitted in the ordinary television manner—that is to say, by scanning the image at the transmitting end by means of a disc, perforated with a spiral series of holes; and at the receiving station using a similar disc, in conjunction with a neon lamp, to reconstruct the image. The sound effects are simply picked up from the marginal record on the film in the



In the Baird "Radio Talkies" scheme the disc scans the image where the film is stopped "intermittently," the picture image currents being picked up by the photo-electric cell and amplified. The second photo-electric cell picks up the fluctuations of the voice from the sound track on the film, through the medium of a light beam at a point where the film is traveling "continuously."

usual way, by means of a photo-electric cell, as used in the standard talking picture practice, and these sounds are broadcast simultaneously with the film picture image.

Tele-talkies as Baird calls them are sent out in a manner very similar to the transmission of television, and are received on the identical machine which receives television images. The standard films are used, but naturally subjects must be chosen suitable for transmission by television, such, for example, as head and shoulder representations. As in television, larger scenes, such a boxing matches, can be sent, but such transmissions are lacking in detail. The frequency band at present available for television is 9 kilocycles, which sets a limit to the amount of detail which can be transmitted, but as the art progresses there can be no doubt that larger wave bands will be set aside, and images of larger scope will be transmitted.

20 YEARS OF SHIRT-SLEEVE PRACTICE IN ELECTRICITY

Let This Library Guide You to Advancement and Better Pay

Free Trial

THIS is the electrical age, with unlimited opportunities for the man who has educated himself in the finer points of electrical practice. Fit yourself for a big-pay job by knowing electrical practice complete, including inside and outside work, central stations, and the whole subject.

Newly revised—up to the minute—the new Croft Library gives you the late, inside information that you need.

NEWLY REVISED UP TO THE MINUTE

7 Vols.—sent on Approval—Easy Terms

The Croft Library of PRACTICAL ELECTRICITY

The STANDARD Course

FOR HOME STUDY AND REFERENCE

The Croft Library is a complete electrical educator. It is founded on practice—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers.

A REFERENCE library and self-training course in eight volumes. 3,000 pages—2,100 illustrations. In these volumes Croft teaches you electrical practice complete. He takes you in quick, easy steps from the simplest principles to the complete and economical operation of a great central station. He tells you all that he has learned in twenty years of shirt-sleeve practice.

Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters and municipal requirements—illumination in its every phase—the latest and most improved methods of lighting—lamps and lighting effects, etc.—how to do a complete job, from estimating it to completion. Make no mistake about it—there are big jobs in electricity ready for you when you're ready for them. Thousands of men who have the Croft Library know that to be a fact. The Library itself, on a FREE TRIAL BASIS, will prove it to your own absolute satisfaction.

Know Electricity as the Experts Know It

With these books at his elbow a man can learn as much about electricity in six months—good practical “bread and butter” stuff—as he would ordinarily learn in a lifetime of practice.

NO MONEY DOWN—Small Monthly Payments



Fill in and mail the coupon attached and we will send you the entire set of eight volumes for ten days' Free Examination. We take all the risk—pay all charges. You assume no obligation—you pay nothing unless you decide to keep the books. Then \$1.50 in ten days and the balance at the rate of \$2.00 a month. Send the coupon NOW and see the books for yourself.



FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y.
Send me for 10 days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the special price of \$19.50 is paid. If not wanted, I will return the books at your expense. (To insure prompt shipment write plainly and fill in all lines.)

Name
Address
City and State
Position
Company S & I 12-29

Here is YOUR High School Education!

These fifteen wonderful books prepare you quickly at home for bigger pay, broader culture, social and business success. Every high school subject taught the modern, easy way — by fascinating "Question and Answer" method—English, French, Spanish, Latin; Ancient, Modern and American History; Literature, Biology, Physics, Algebra, Economics, Physiology, Geography, Spelling, Arithmetic and Grammar.



Fun to Learn This Easy, Inexpensive Way—at Home

Now you, too, may secure a high school Education and your *Certificate of Graduation*. How? So easy! Just a few minutes of interesting reading every day or so. No tedious study—no laborious lessons.

Fifteen expert instructors tell you everything you ought to know. They take you step by step through every subject. They put a Million Dollar High School in your home. Why handicap yourself when education is so easy and inexpensive to secure!

Bargain in Brain Power

Increase your earning power and improve your culture this delightful way. A few cents a day—a few moments of pleasant reading—and you, too, can gain the education that fits you for immediate advancement. These books are used in over 12,000 High Schools today; indorsed by educators everywhere! You owe it to yourself to qualify for your High School Certificate this simple, inexpensive way.

FREE Examination

Send no money in advance; pay nothing on delivery. Examine these 15 books FREE for 5 days. Then decide. Return them if you choose. Otherwise, send only \$1.85 first payment and \$2 monthly for 9 months—total only \$19.85. Send coupon below NOW. You take no risk. Remember—it pays to have a high school education!

High School Home-Study Bureau
Dept. 3799
31 Union Square, New York, N. Y.
Send Coupon

HIGH SCHOOL HOME STUDY BUREAU, Dept 3739
31 Union Square, New York, N. Y.

You may send me for FREE Examination the 15 Question and Answer Books containing the equivalent of a 4-year High School Education. Within 5 days I will either return the books or remit \$1.85 as first payment and then \$2 a month for nine months, a total of \$19.85. It is further understood that I may qualify for a High School Certificate of graduation. (Note: if you prefer to take advantage of the 10% cash discount, you may remit \$17.85 after free examination.)

Name
Address
Town State

Mansions of Mud

By A. Hyatt Verrill

(Continued from page 686)

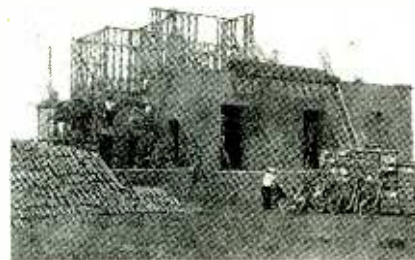


Very ancient building constructed of adobe.

the largest adobe building in the world.

For nearly five centuries adobe buildings were made in the same old way, exactly as they had been made by the Indians for thousands of years, but with the demands for modern dwellings and buildings the progressive Peruvians developed an entirely new method of mud-building construction, and today practically all the edifices made of this material are of reinforced adobe. Instead of erecting immense, thick walls of adobe bricks, the modern structure has a framework of light wood covered with a lathing of cane, metal lathes, wire-netting or light steel as a foundation for the mud bricks. By this method large, high and elaborate adobe buildings are erected, and when the outer surfaces have been covered with a stucco of plaster or a coating of sprayed cement, and have been painted and finished with ornamental plaster work, no one would dream that they were of adobe.

Such, for an example, is the magnificent Rimac apartment building which may aptly be called a "mud-flat" with its beautifully finished interior, its passenger elevators,



The new style adobe construction involves the use of a wooden frame, with the adobe blocks built around it.

and every up-to-date convenience. Palatial homes and mansions, office buildings, bungalows and Moorish palaces are all built of reinforced adobe, which in and about Lima still holds its own in competition with concrete, and one ambitious citizen even erected a medieval castle of mud.

Not only is adobe admirably adapted to Peru's climate; but it is the cheapest and the most abundant of building materials. One has only to mix some water with the soil, and presto! Your house lot becomes the source of material for building a house. But as a rule only the smaller houses are built from the mud on their own grounds. The adobe-brick industry is a very important one, and everywhere about Lima are

endless walls of the brown adobe bricks ready for use as occasion demands. And when a house is to be built the workmen move bag and baggage onto the property along with the mud bricks. A niche in the pile of adobes serves as their temporary home, and there they dwell together with their wives and innumerable children like modern cave-dwellers, until the last brick has been used and they move on to the next building-site. Sun, wind, time have little or no effect upon adobe buildings, and they will stand through an earthquake that will crumble and shatter concrete or even wooden houses. But rain is fatal to them. Ordinarily real rain is so rare on the coastal area of Peru that it may be said to be rainless. During the winter there is a misty drizzle, but occasionally heavy showers descend, and woe to the adobe buildings that are not prepared for the phenomenon. A few days of really hard rain would result in a large portion of Lima being reduced to its original mud, as was the case at Trujillo when, three years ago, a series of unprecedented rains fell



Preparing the adobe blocks.

on that city. Scores of houses and buildings, that had stood unaltered since the days of Pizarro, melted and crumbled to shapeless piles of mud, while scores more became unsafe and were abandoned. But the catastrophe proved a blessing in disguise. It was found that in nearly every case the damage was caused, not by the mud walls dissolving, but by the water spattering from the ground and striking the walls at their bases and thus undermining them. To prevent this a thin coating of cement is now superimposed on the walls of all adobe buildings. This reaches from the ground or a few inches beneath the surface to a height of several feet and effectively protects the soluble adobe from the spattering of any rain.

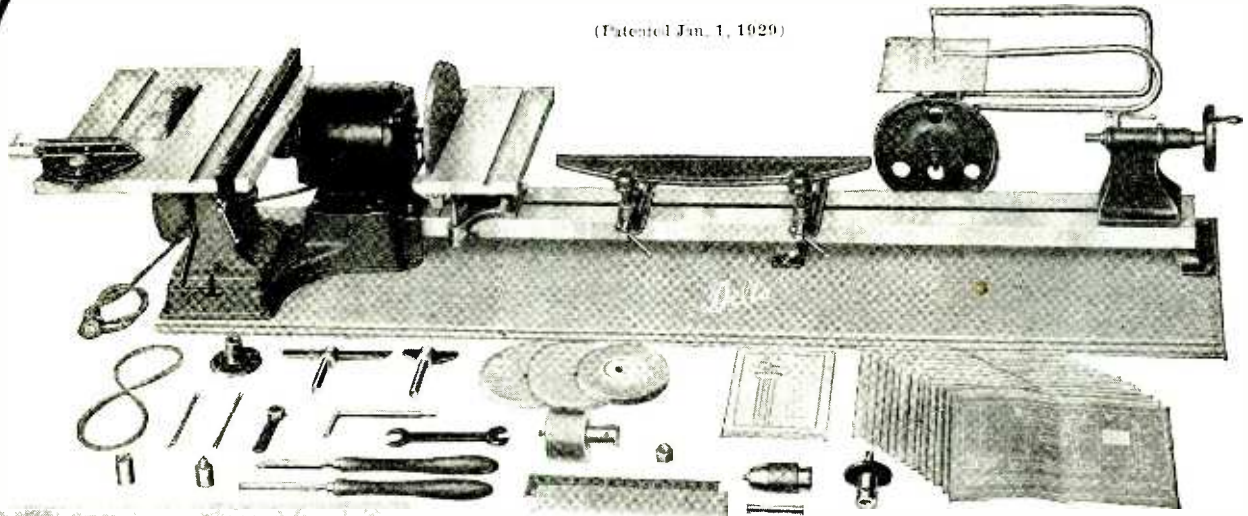
Truly, the Peruvians may be said to have glorified mud!



What happens when a heavy rain strikes an unprotected adobe building.

Announcing "Delta" Woodworking Units

(Patented Jan. 1, 1929)

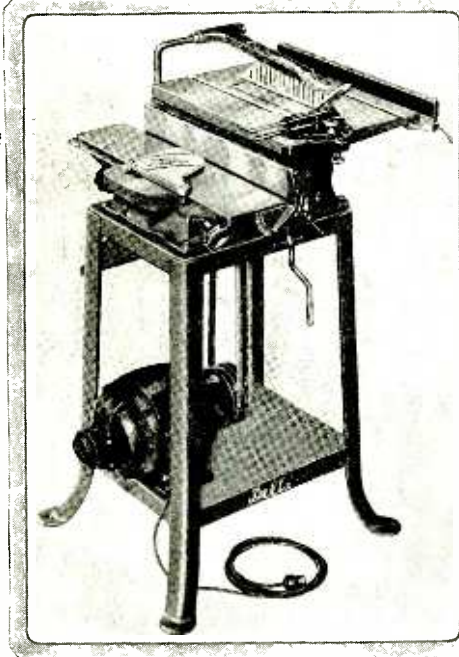


"Delta" Electric Handi-Shop

A complete Motorized Workshop for craftsmen, including all necessary equipment for Circular Sawing, Wood Turning, Scroll Sawing, Sanding, Drilling, Grinding and Buffing.

Practical Design — Dependable Quality — Plus Many Exclusive Features —

that's what you find in every woodworking unit bearing the Delta trademark. Craftsmen, artisans, farmers, mechanics—all who use wood in their daily labors or spare-time hobbies—are delighted with the sturdy construction, splendid efficiency, and moderate cost of Delta equipment. They appreciate keenly such exclusive constructional features as the Patented Tilting Tables, Automatically-oiled Bronze Bearings, Heavy U-Shaped Lathe Bed, Circular Saw Raising Lever in the Handi-Shop—the new Welded Steel Stands, Graduated Fence, Practical Rip Gauge, Graduated Miter Gauge, and the convenient arrangement, in the new Delta Jointer and Circular Saw Units, which can be used with your motor, if desired.

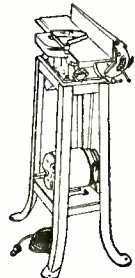


Combination 4-inch Jointer and 8-inch Circular Saw Unit

mounted conveniently on welded steel stand. Both machines can be used together or separately. Furnished with or without motor.

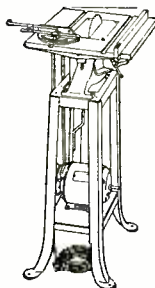
8-inch Circular Saw Unit

mounted separately on sturdy, welded steel stand. Furnished with or without motor.



4-inch Jointer Unit

of new, practical design. Mounted on stand. Furnished with or without motor.



10 Day Trial Easy Terms

For complete details and full description of the new 1930 Delta line, send coupon for FREE illustrated literature. Shows many items of interest to those who work with wood. You will learn, also, how you can try any Delta equipment for 10 days under actual working conditions at our risk. Choice of three convenient payment plans. Mail coupon TODAY!

DELTA SPECIALTY CO.

Division of
DELTA MANUFACTURING CO.
1661-67 Holton St. Milwaukee, Wis.
Dept. C-129

New "Delta" MOULDING CUTTER

Cuts Over 50 Moulding Shapes With Only 4 Sets of Blades

High speed blades produce over 10,000 cuts per minute at 3500 R.P.M. Blades require no individual adjustment. Quickly and easily locked in position. Special guide fence. Unusually low price.

DELTA SPECIALTY COMPANY, Dept. C-129
Division of "Delta Manufacturing Co."
1661-67 Holton St., Milwaukee, Wis.

Please send me FREE, illustrated literature describing 1930 model "Delta" Woodworking Units. Also details of 10 Day Trial Offer and Easy Payment Plans.

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

Add Five Inches To Your Chest!



CHARLES ATLAS—Holder of the title "The World's Most Perfectly Developed Man."

No other living man can claim this title. Yes, in less than three short months you can add layers of solid muscle, add five inches to your chest; a couple of more inches to your biceps; have a tremendous broad back; massive, powerful shoulders; wrists and fingers with a grip like steel, remarkable internal energy and vitality by my wonderful New System. You can attain the same results that I have by following the methods which enabled me to change from a weakling to America's Strongest Physical Director.

LOOK AT THESE PUPILS!



Anthony Sansone



Clevio Massimo

WHAT'S MY SECRET?

"Dynamic-Tension"! That's the ticket! The identical method thousands of other fellows are using to become marvelous physical specimens—my way. Quick, easy, natural. You simply utilize the DORMANT muscle power in your own God-given body—watch it increase and multiply EXTRA-FAST into real, solid, LIVE MUSCLE.

Here's convincing proof my pupils become tremendous, virile, Herculean Giants, even more muscular than some physical instructors. I GUARANTEE to give you marvelous quick-fighting muscles and develop your nerve, courage, confidence, and everlasting strength in record-smashing time.

FREE! "Everlasting Health and Strength"

My new book is packed with pictures of men whom I've taught. It will positively thrill and inspire you. It's the one Master Book of Health and Strength. Send for it today—NOW while this is before you.

CHARLES ATLAS

"The World's Most Perfectly Developed Man"
171 Madison Ave., Dept. 1712, New York City

— MAIL THIS NOW! —

CHARLES ATLAS,
171 Madison Ave., Dept. 1712, New York City.

Dear Sir: Please send me your new big free book: "EVERLASTING HEALTH AND STRENGTH." This places me under no obligation.

Name.....

Address.....

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

(Please print or write PLAINLY)

2500 Feet Under the Sea

By H. E. Serner

(Continued from page 685)

and many suggestions poured in on him. Prof. Maiuri, Director of the National Museum and of the excavation at Pompeii told Dr. Hartman that divers had seen near the Island of Rhodes, gold-glittering remnants of the fallen "Colossus of Rhodes," one of the seven wonders of antiquity, but at a depth which they cannot reach in ordinary diving suits; and he suggested that Dr. Hartman should not miss this wonderful opportunity during his next expedition to investigate and eventually recover so great a treasure.

The Mediterranean, the sea of the ancient world, has a strong appeal, and Dr. Hartman believes that civilization was born upon its now water-flooded bottom, when it still was a fertile, semi-tropical valley, contrasting beautifully with the dreary steppes which then covered Central Europe. The Mediterranean, being a sea of intense evaporation, receiving little water through streams and rivers, was separated from the Atlantic Ocean by a natural, rocky dam which stretched across the Strait of Gibraltar from Africa to Spain. The deep, warm valley probably contained two lakes, separated by higher land between Italy and Tunisia, both lakes being connected by a narrow channel as can be judged from soundings. Thus the fertile, semi-tropical valley presented the best conditions for human development. We find all ancient Western cultures around it. To the North the Neanderthal men roamed the bleak and cold steppes, while most of the Northern hemisphere was buried under hundreds of feet of ice; it was towards the end of the last glacial epoch.

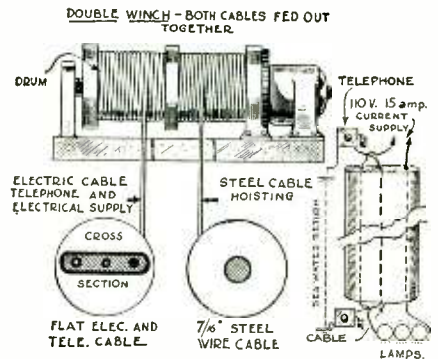
Then a great change occurred. The world-wide glaciers slowly melted, and the level of the oceans rose. The Atlantic began to spill over that low, rocky barrier at Gibraltar and finally broke it down, rushing its icy water in a terrific torrent into that beautiful, inhabited valley! This was probably the mightiest catastrophe which ever befell mankind. Was it the flood of the Bible? All ancient people around the Mediterranean preserved an old tradition telling of a tremendous, destructive flood, which happened in some prehistoric time. Only those inhabitants who were able to escape to the adjoining continents and to highest points, which remained as islands above the water, saved their lives. It was at about that time when the civilized Cro-Magnon race appeared in Southern Europe and Northern Africa and eliminated slowly the Neanderthals, who may have roamed in Europe for hundreds of thousands of years without any sign of progress.

The island of Malta bears innumerable mysterious, prehistoric cart-tracks which lately were photographed from airplanes and described by Prof. Zammit, the Director of the Museum at Malta in *Antiquity* March 1928 (London). They are worn so deep into the rocky ground, that they must have carried heavy loads perhaps for hundreds of years which were drawn by humans. It remains a matter for speculation to assume that a great population, marooned by the flood upon Malta, was struggling for a miserable, pitiable existence by dragging soil and water upon the high rocky flats, being unable to construct vessels to cross the suddenly formed Mediterranean Sea. Thus the place offers the most amazing and interesting field for submarine investigation and salvage work.

During his expedition Dr. Hartman found that additional improvements were required. A dangerous ballast weight,

which could be released from the diving chamber in case of emergency, had to be eliminated. Better submarine illuminators had to be constructed, and the apparatus had to be designed large enough to hold two persons. After four additional years of labor, and after spending the last winter on the Mediterranean to make further tests, Dr. Hartman has now perfected a deep sea diving chamber, wherein all the above changes and improvements have been incorporated, and which will be used for a new extensive investigation of the Mediterranean during the next spring and summer.

His new apparatus retains its buoyancy at all times, and can sink without additional weight or ballast. This had been declared by experts as impossible. Nothing can sink which is lighter than the water it displaces. Dr. Hartman however solved this problem in a most simple and ingenious way, by attaching to his diving chamber a small, electrically driven propeller, mounted on a vertical shaft, the propeller pulling the diving chamber down. Should the thin rubber covered cable break, through which current is sent down from a ship above, the propeller will stop and the entire apparatus will automatically



The diagram above shows the general arrangement of the flat telephone and electric light cable and also the 7/16ths inch steel wire cables, which were reeled out together in lowering the sub-sea diving bell.

rise to the surface by its own buoyancy. However as its speed would accelerate too fast, a battery can be used to operate the propeller, thereby slowing the speed down. In fact by means of this battery the diving chamber can operate below the water without any cable connection.

There remained the danger that, if a cable is used, which also provides telephone communication, it might break high above the diving apparatus, turning it upside down by its weight, and holding it down. Dr. Hartman invented a special connector, consisting of two iron shells, placed upon each other, forming an electromagnetic, egg-shaped connection, both halves being held together by magnetic force as long as an electric current passes through the cable. Should the line break the two halves fall apart and free the diving chamber from the weight of the cable. The new submarine illuminators consist of electric, luminous tubes, which are encased in strong outer glass tubes to withstand the great water pressure, and while only two are attached to the diving chamber, others can be lowered separately over any objects to be photographed. The men in the diving chamber direct the

(Continued on page 740)

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Heretofore, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, by the application of a white light, renders it perfectly visible in the dark. THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES. Quite simple to use. Anywhere you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by the push of a button or other plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Hobbies, etc. Small bottles, price 25c. Larger sizes, 50c and \$1 postpaid. JOHNSON SMITH & CO., Dept. 937 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better and quicker; saves more tobacco. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, works on 2 or 3. Made entirely of metal, nickel plated. 25c, 3 for 65c postpaid anywhere.

NOVELTY BADGES

2

Greatly popular. Making Permit 10c. Two very novel metal badges, nickel plated that you can give your fun out of all proportion to their trifling cost. 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

MIDGET BIBLE

GREAT CURIOSITY

Smallest Bible in the World. Size of a postage stamp. 200 Pages. Bound to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church, acquaintances, etc. PRICE 15c each, 3 for 40c, 12 for \$1.35, 100 for \$7.50. Also obtainable in Leather Binding, with gold edges. Price 50c each, 3 for \$1.25, \$4.50 per doz. Magnifying Glass for use with Midget Bible, 15c.

WONDERFUL X-RAY TUBE

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co., Dept. 937 Racine, Wis.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Price 50c, postpaid; 40 Bills 20c, 120 for 50c, or \$3.50 thousand postpaid.

MAGIC NOSE FLUTE

The Magic Nose Flute, or Hummatone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is as charming as it is surprising.

Every Boy His Own Toy Maker

Greatest boys' book written. Tells how to make a Pinhole Camera, a Canoe, model airplane, etc. Telephone, Boomerang, Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Boat, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 Illustrations. PRICE 10c postpaid.

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one crawls hatched itself into a snake several feet long, which you can watch about in a most interesting manner. Price per box, 10c postpaid, 3 for 25c.

The "Little Giant" Typewriter

A First Class Writing Machine For \$1.50

A perfect little typewriter for \$1.50. There are thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we cordially recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it and write as rapidly as they would with pen and ink. The letters of the alphabet are cut on to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best type written love letters, address envelopes, make out bills, and do almost any kind of work, not routine, of course, that a typewriter can do. We send a full type written and full printed instructions for using the machine. Price complete \$1.50 by mail postpaid to any address in the world.

MEXICAN JUMPING BEANS

Scientists are unable to give a reasonable explanation for what purpose nature created these curious Jumping Beans. They are found growing on small trees in the high mountainous regions of Mexico. The Beans Wiggle, Move, Jump, Flip Over, Etc. It is amazing to see them keep up this endless activity. Send for a few of these great curiosities. Simple Beans sent for 25c, 12 for 75c, or One Gross (144) for \$7.50 Postpaid. JOHNSON SMITH & CO., Dept. 937 RACINE, WIS.

Ad Luxe Edition of our new 1929 CATALOG mailed on receipt of 25c. Handsome binding. Over 600 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, not routine, curiosities, etc. unobtainable elsewhere. Remit by Stamps, Coin, Money Order, Check, etc. Unused U. S., Canadian and Foreign Stamps also accepted.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs. Special Offer 3 Blank Cartridge Pistol 100 Blank Cartridges 1 Bonus Catalog Only \$1.50

Well made and effective, modeled on latest type. It is a simple, reliable, and appears alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard 22 Cal. Blank Cartridge - obtainable everywhere. Special cash with order offer: Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new 550 page Bonus Catalog of latest novelties; all for ONLY \$1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holder (Carburetor) for pistol 50c. NO C.O.D. shipments. JOHNSON SMITH & COMPANY, Dept. 937 RACINE, WIS.

Throw Your Voice

Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

The VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. Never fails. A 16-Page Course on Ventriloquism and the Ventrilo. . . . 10 CENTS

LOOK 35c LOOK WONDERFUL INSTRUMENT

Nine separate articles in one. Odd, curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature, it is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a Pocket Mirror and a Laryngoscope - for examining eye, ear, nose and throat. It is worth all the cost to locate even one useful cinder in the eye. PRICE Only 35c or 3 for \$1.00 Postpaid. Stamps taken.

Watch Charm Pistol \$1.75

Exact reproduction of a real pistol; actually fires REAL BLANK CARTRIDGES of miniature size. Illustration is a actual size. 2 1/2 inches long, with ring at end for attachment to watch chain. Loads like a regular pistol. Pull the trigger and it goes off with a loud bang. Pistol is made of high grade steel, nickel plated, octagon barrel, handomely engraved handles, complete in box with cleaning rod. PRICE \$1.75. Not furnished with heart hands. JOHNSON SMITH & CO., Dept. 937 RACINE, WIS.

MICROPHONE TRANSMITTER BUTTON

You can easily make a highly sensitive detector-telephone by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a building and hear what is going on in each room. It is ultra-sensitive and is the greatest invention in microphone. You can mount the button almost anywhere - card board boxes, stove pipe, shelf calendar, on the wall behind a picture, etc. It is so light and small it cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be transmitted; often makes an old line "talk up" when nothing else will. The button may be used to renew telephone lines. Amplifies radio signals. Countless other similar uses will suggest themselves. Experimenters find the button useful for hundreds of experiments along the lines of telephony, amplifiers, loud speakers, etc. Many fascinating stunts may be devised, such as holding the button near a throat or chest to reproduce speech without sound waves. PRICE \$1.00. JOHNSON SMITH & CO., DEPT. 937 RACINE, WIS.

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment . . . \$1.00

Anyone Can Do Them

It is great fun mystifying your friends. Get this Conjuror's Cabinet and you will be the center of the fellow in your district. It contains the apparatus for 16 tricks - including: The VANISHING BALL AND VASE TRICK (a wooden ball placed in the audience and is found in someone's pocket); THE HUNDO'S MAGIC BOTTLE (can be made to change completely no less than five times); DISAPPEARING COIN TRICK (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); THE GLASS GLOBE TRICK (a coin is dropped into a glass of water and when the water is poured out the coin is found somewhere else); THE RUBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); THE DISAPPEARING HANDBLANKER (a handkerchief in the hands of a lady vanishes); THE WIZARD'S RING COIN TRICK; THE ENCHANTED BOTTLE TRICK (one but yourself is able to make it fly down); THE GREAT HAT AND DICE TRICK (a large top hat placed on a table, disappears and is found underneath yet no one has touched the hat), and last, but not least, the PHANTOM CARD TRICK, or two from five leaves untouched. Full instructions are sent for performing each trick. A deft touch, a few minutes of practice and a number of other feats and illusions are fully explained for which you can make or procure the necessary apparatus. Price complete \$1.00 postpaid.

ITCHING Powder

This is another good practical joke; the intense discomfort of your victims to everyone but themselves is thoroughly enjoyable. All that is necessary to start the ball rolling is to deposit a little of the powder on a person's hand and the powder can be relied upon to do the rest. The result is a vigorous scratch, then some more scratch, and still some more. Shipped by Express. Price 25c or 75c per dozen. Johnson Smith & Co., Dept. 937 Racine, Wis.

ANARCHIST BOMBS

One of these glass vials dropped in a room full of people will cause more consternation than a lumber-grenade. The bomb entirely disappears in a short time. 10c a Box, 3 Boxes necessary to start a dozen. Shipped by Express. JOHNSON SMITH & COMPANY

SNEEZING POWDER

Place a very small amount of this powder on the back of your hand and blow it into the room or car. Everyone in the room or car will begin to sneeze without knowing the reason why. It is most amazing to hear their remarks, as they never suspect the real source, but think they have caught it one from another. Between the laughing and sneezing you yourself will be having the time of your life. For parties, political meetings, car rides, or any place at all where there is a gathering of people. It is the greatest joke out. Price 10c, 3 for 25c, 75c per dozen. Shipped by Express. Johnson Smith & Co., Dept. 937 Racine, Wis.

COMICAL MOTTO RINGS

Lots of harmless fun and amusement wearing these rings. Made in platinum or gold, with a suitable motto, with wording on enamel, as illustrated. Price 25c ea. Postpaid. Johnson Smith & Co., Dept. 937 Racine, Wis.

DISSOLVING VIEWS

50c

You may have a lot of fun with this little snap-along. A regular starter. Made of tinny metal. Having a microscopic lens fitted inside. While the victim is absorbed in admiration of the pretty pictures, the button is turned and the interesting scene is brought into action, and the observer experiences a very great surprise. 50 cents each postpaid. JOHNSON SMITH & CO.

Lover's Knot or Friendship Ring

Made of 4 strands of genuine 14K gold filled wire, woven into the True Lover's Knot, symbolic of love or friendship. Very pretty, yet not showy. Each ring is made by hand by gold wire expert. It looks good and it is good. Price 50c Postpaid. Johnson Smith & Co.

Female SEX Indicator

25c

Hold the MAGIC INDICATOR over a man's hand, instantly it moves in a straight line, backward and forward. Hold it over a woman's hand and it describes a complete and continuous circle. The same action can be obtained over a child's hand by a man or woman, etc. It is fascinating, baffling. We have never been able to figure out how it is done, but we have never seen it fail. It is a marvelous and entertaining feat may be performed with the Sex Indicator, for example, similar results can be obtained with animals, cats, dogs, rabbits, over birds, chickens, etc. Also useful for determining the sex of chickens and birds, etc. In fact it is sold as a patented egg tester in Europe. Price 25c or 3 for 65c, postage prepaid. JOHNSON SMITH & CO.

25 CENTS BABY TANK

2 1/2 inches long

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down it will crawl along, overcoming all obstacles, in the same-like manner as the larger Tank that proved so deadly in the great war. This makes it go in somewhat of a mystery, for there is no mechanism to wind up, as usually understood with mechanical toys, yet this tank will keep plodding along for times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts, 25c prepaid.

WATCH CHARM

Exact reproduction of a real pistol; actually fires REAL BLANK CARTRIDGES of miniature size. Illustration is a actual size. 2 1/2 inches long, with ring at end for attachment to watch chain. Loads like a regular pistol. Pull the trigger and it goes off with a loud bang. Pistol is made of high grade steel, nickel plated, octagon barrel, handomely engraved handles, complete in box with cleaning rod. PRICE \$1.75. Not furnished with heart hands. JOHNSON SMITH & CO., Dept. 937 RACINE, WIS.

ITCHING Powder

This is another good practical joke; the intense discomfort of your victims to everyone but themselves is thoroughly enjoyable. All that is necessary to start the ball rolling is to deposit a little of the powder on a person's hand and the powder can be relied upon to do the rest. The result is a vigorous scratch, then some more scratch, and still some more. Shipped by Express. Price 25c or 75c per dozen. Johnson Smith & Co., Dept. 937 Racine, Wis.

ANARCHIST BOMBS

One of these glass vials dropped in a room full of people will cause more consternation than a lumber-grenade. The bomb entirely disappears in a short time. 10c a Box, 3 Boxes necessary to start a dozen. Shipped by Express. JOHNSON SMITH & COMPANY

SNEEZING POWDER

Place a very small amount of this powder on the back of your hand and blow it into the room or car. Everyone in the room or car will begin to sneeze without knowing the reason why. It is most amazing to hear their remarks, as they never suspect the real source, but think they have caught it one from another. Between the laughing and sneezing you yourself will be having the time of your life. For parties, political meetings, car rides, or any place at all where there is a gathering of people. It is the greatest joke out. Price 10c, 3 for 25c, 75c per dozen. Shipped by Express. Johnson Smith & Co., Dept. 937 Racine, Wis.

COMICAL MOTTO RINGS

Lots of harmless fun and amusement wearing these rings. Made in platinum or gold, with a suitable motto, with wording on enamel, as illustrated. Price 25c ea. Postpaid. Johnson Smith & Co., Dept. 937 Racine, Wis.

Rubber Chewing Gum

It is just like a regular package of chewing gum and looks so like a regular package of chewing gum that it fools every one. And no one suspects it is not genuine until they start to chew it. There is a world of fun in this rubber chewing gum. Write to the publisher. Price 10c Package, 3 for 25c; 12 for 75c, Postpaid. Stamps taken.

ADDRESS ORDERS FOR ALL GOODS ON THIS PAGE TO **JOHNSON SMITH & CO. DEPT. 937 Racine, Wis.**

2500 Feet Under the Sea

(Continued from page 738)

lowering and placing of these lights by telephone, so that only the desired objects are strongly illuminated, while the water between them and the camera remains comparatively dark. Thus a sharp photograph results at longer distance in clear waters, because otherwise, due to intense diffusion, the reflection upon the sensitized film is too strong, and the pictures would be blurred.

How Air Is Purified

THE film camera, especially built to take little space, can be operated by hand or electric motor, and take still as well as moving pictures. The air within the diving chamber is automatically supplied with oxygen from several cylinders of compressed gas, and the exhaled carbon dioxide is absorbed chemically in the lowest compartment, into which it is drawn by a small electric exhaust fan. This insures constant purification of all the air within the chamber. There is also a tubular electric heater below the seat, as the water in great depths is icy cold. A specially constructed pressure gauge indicates the depth. The diving chamber is provided with three external, vertical fins, to reduce rotation around the vertical axis, which is caused by the action of the propeller. Two propellers, turning in opposite direction, similar to those used on torpedoes, would eliminate such rotation; however, rotation at a very low speed is desired. Therefore a second propeller has not been found advisable.

The large port-hole which permits observation of the surroundings is closed watertight by a heavy quartz lens and special gaskets as also the opening for the camera below. The cable disconnecting device is arranged directly above the top of the chamber. This top is hermetically sealed by a cover which the pressure of the water tends to hold in place still more firmly. The propeller, if its action is reversed, can exert a strong lifting instead of downward pulling force. Dr. Hartman

has developed new salvaging devices, based on this principle; they consist of a globular shell containing powerful electric motors, driving two vertically mounted propellers. The apparatus is further provided with gripping means, capable of lifting large objects to bring them to the surface. The operation of those salvaging devices is directed by telephone from the diving chamber. The device may be used too for salvaging purposes in a limited way, as a gripping device can be attached to its lower end for handling smaller objects.

Dr. Hartman is now forming the first *Deep Sea Research Society* and hopes to be able to conduct scientific investigations every year in the Mediterranean, and to inaugurate with his submarine diving and salvaging apparatus a new era in real deep sea research, photography, archeology, and salvage and to bring to light sunken antique as well as more modern treasures, piercing the mystery of life at the bottom of the sea. If his ambitious plans mature, many surprising disclosures of the secrets of the ocean depths can be expected. One of the first objects to be explored and photographed is a sunken prehistoric city discovered by Dr. Hartman between Sicily and Tunisia, at a depth of about 360 feet. Its location, as shown on the small map, was ideal for a large ancient settlement, as there converged the cross-roads from Africa to Europe, and from the Western to the Eastern lake, and both existed before the Atlantic flooded the Mediterranean valley. And it remains open to speculation if this great sunken city is not the "Lost Atlantis" which Plato places as "beyond the pillars of Hercules" which may have marked the entrance to that waterway leading from the Eastern into the Western lake, and not the Strait of Gibraltar, which did not exist before that mighty catastrophe which transformed an ancient paradise into the Mediterranean Sea, as we know it today. Do the rolling blue waves of the Mediterranean hold the secret of the legendary "Atlantis"?

\$250.00 in Cash and Additional Prizes

Did you send in your solution of DUNNINGER'S AMAZING BUZZ-SAW ILLUSION?

If not, see September issue of this magazine. Contest closes Nov. 21, 1929. Address your solution to Joseph Dunninger, care Science & Invention.



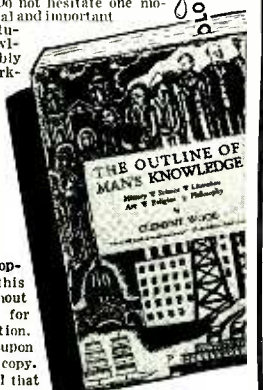
at last!

The Essence of a College Education SQUEEZED INTO ONE VOLUME

Now, at last, you can get all the essentials of a college education complete in one volume. If you have not had the time to go to college, and if you dislike grinding through tedious and uninteresting text books, then "The Outline of Man's Knowledge" by Clement Wood was written specially for you.

All Knowledge Now At Your Command!

Hailed by the critics as "a university in itself" and "better than a college education," this magnificent volume includes all the important facts of every branch of man's knowledge. This is an unusual opportunity that you really should not let go by. The characters and events of all history from the Stone Age to the World War will pass before your eyes in an endless dazzling array. You will become acquainted with all the important and interesting facts of Science, from Aristotle to Einstein. Here is a résumé of all the important literature of the world, and a fascinating discussion of all the Arts. The most important fundamentals of Religion are comprehensively reviewed, and all the great Philosophers from earliest times to James and Dewey are simply discussed. Do not hesitate one moment to send for this vital and important volume, for here you actually have all man's knowledge graphically and ably squeezed into one remarkable volume, definitely making a background that will broaden any man's mind.



738 Pages, Illustrations and decorative maps, 6 1/2 x 9 1/2, handsomely bound, titles stamped in gold, Chronology, Index, Reference Readings.

EXAMINE IT FREE!

Here is a remarkable opportunity to secure this all-inclusive book without any cost or obligation for a week's free examination. Send no money. The coupon will bring you your copy. If you are not convinced that this is the biggest value for the money that you have ever seen, send the book back and do not pay anything. This is your greatest opportunity for a finer education. MAIL NOW.

LEWIS COPELAND CO., Dept. 569
119 West 57th St., New York, N. Y.

Kindly send me THE OUTLINE OF MAN'S KNOWLEDGE, by Clement Wood, 700 pages, illustrated, handsomely bound. Within 7 days I will either return the book or remit \$1.50 as first payment and then \$2.00 per month for two months, a total of \$5.50. (Ten per cent discount for cash with order. Same return privilege.)

Name

Address

City State

(If outside Continental U. S., enclose \$5.50 with order.)

What Our Readers Think

(Continued from page 723)

S. and I. in Classroom

I like your simplified explanation of the fourth dimension and relativity. I use these articles in my physics classes. I cut out good articles and put them in folders and give them out for special reports. I would like to see articles put on consecutive pages so that they could more easily be put in folders for permanent filing. The short articles are not of much value to me as they do not tell enough to give us any definite knowledge. I would like to see more completely explained articles and less short subjects.

MARTIN L. RYERSON,
Science Teacher,
Roseville High School,
Roseville, Mich.

(Many colleges, high schools and even public schools are daily using magazines more and more for teaching science to their classrooms.)

We would like to hear from more of our readers on the subject of "Short vs. Long Articles."—EDITOR.)

Beg Pardon

Editor, SCIENCE AND INVENTION:
Please let me call your attention to a slight error in the October issue. You had four of my shorts in, but I note you credited one to Mr. L. B. Robbins.

It makes no difference to me whether my name or a credit line is given or not, as I am not a professional writer and am not after a name or reputation in the least. However, you know a fellow does not like to see a "Short" meeting editorial approval, and credited to someone else.

FRANK BENTLEY,
Missouri Valley, Iowa.

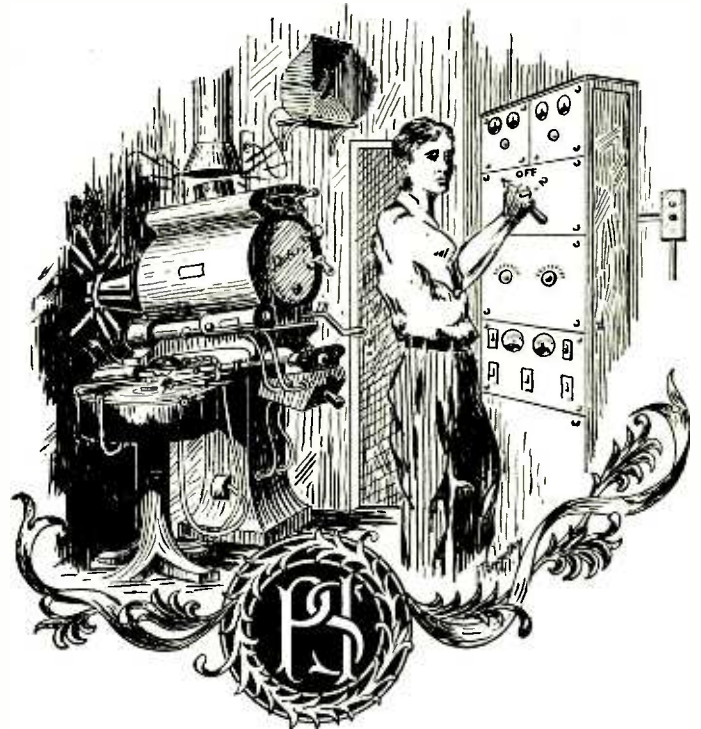
(We are glad to list this correction in these columns. The story mentioned in Mr. Bentley's article was titled "Match Box Used As Measuring Tool."—EDITOR.)

Thousands of Positions Open Right Now

at
Salaries Ranging

UP to \$200⁰⁰ per WEEK

for MOTION PICTURE SOUND Engineers



WE are in contact with chain theatres and manufacturers of Sound equipment who desire the services of competent sound men as engineers, projectionists, installation and service men. Our employment department will assist you in making a profitable connection free of charge.

GUARANTEE

Our guarantee insures you that if you enroll as one of our students and take advantage of the many opportunities that your membership entitles you to your increased income will pay the tuition of the course many times. We unconditionally guarantee that if for any reason you are dissatisfied (you being the judge) we will refund every cent you have paid.

Due to the fact that radio and sound are so closely allied, men with radio experience are the most adaptable.

POLICY

Our course on Sound Projection which is prepared by the most eminent authorities on Electrical Acoustics will qualify you for a Profession whose place in the engineering world is second to none. All of the available knowledge of the art and the underlying fundamental principles of sound is given to you in an everyday, plain-talk language, as well as two weeks' practical training in the operation, servicing and installation of Sound Equipment.

DEMAND

In the 20,000 theatres throughout the United States and Canada,

which now employ approximately 50,000 projectionists, it is estimated that a very small per cent of this number are qualified to fill the position as Sound operators. Many thousands of new men will have to be taken into this field as fast as the many thousand unwired theatres are wired for sound as the additions of sound doubles the number of operators required. This condition will create many thousands of positions at salaries up to \$200.00 per week.

The tuition for these courses is very reasonable and is payable in easy installments as you study. Also you have the added convenience of studying at home in your spare time. Fill out and mail the coupon below today for special scholarship proposition.

Mail Coupon for Free Information

PROJECTIONIST SOUND INSTITUTE

F. A. JEWELL, Gen. Mgr.

P. O. Box No. 28, Easton, Pa.

PROJECTIONIST SOUND INSTITUTE,
P. O. Box No. 28, Easton, Pa.

R. N.-12

Gentlemen:

Please send me, by return mail, full details of your Special Scholarship Proposition on Sound Projection.

Name.....

Address.....

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

PATENT ADVICE

CONDUCTED BY JOSEPH H. KRAUS

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.

INVENTORS

Protect Your Ideas

Send for our Guide Book, HOW TO GET YOUR PATENT, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description of your invention for INSPECTION and INSTRUCTIONS FREE. TERMS REASONABLE. BEST REFERENCES.

RANDOLPH & CO.

PATENT ATTORNEYS

Dept. 172, Washington, D. C.

Name.....

Street.....

City.....

\$165,000

REWARD for an IDEA

That sum was paid to the inventor of "Kiddie Kars." Here is a remarkable book which tells you what inventions are NEEDED in every field. Don't waste your ideas. Send today for

1000 NEEDED INVENTIONS

Prepared by Raymond F. Yates, famous inventor, former managing editor of Popular Science Monthly, who knows what manufacturers want. New, revised 1929 edition. This book may start you toward a fortune. Send no money. Just write a postcard. Pay mail man only \$1.50 plus postage when book arrives. Money back after 10 days if desired. Limited offer. Write now. (Get started in right direction. (Outside U. S. \$1.70 cash with order.)

BUREAU OF INVENTIVE SCIENCE
712 Wisner Bldg., Rochester, N. Y.

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., Washington, D. C. Estab. 1869

NEW YEAR - NEW IDEA

PATENT YOUR IDEAS

Call or send me a sketch of your invention. Phone LONgacre 3088

FREE Inventors Recording Blank

Confidential Advice

U. S. and Foreign Patents secured by

Z.H. POLACHEK Reg. Patent Attorney
Consult. Engineer

1234 Broadway, New York

PATENTS

WRITE FOR FREE INSTRUCTIONS

Send drawing or model for examination.

CARL MILLER, Patent Attorney

Former member Examining Corps, U. S. Patent Office

261 McGill Building, Washington, D. C.

INVENTORS' MODELS
Mechanical Specialists for over 20 years. Rendering Complete Service to the man with an Idea.
Labor Saving Machinery Designed & Built
Circular - References - Guarantee - Free
BERNARD & HELLER - 31 East 17th St. N.Y.C.

Motor-Driven Tooth Brush

(1196) George N. Buntin, Hermitage, Tenn., writes:—

Do you think it would be advisable to get a patent on a motor driven rotary tooth brush which can be operated from a light socket? A small light waterproof motor will be located in the handle of the brush. A rheostat switch combination operated by the thumb would regulate the speed and the brush itself could be easily



A motor-driven rotary tooth brush represents a good patentable idea.

removed so as to allow several persons to use the motor with their individual bristles.

A.—If you will refer back to your filed copies of SCIENCE AND INVENTION Magazine you will find that such an article has already been devised and has been exhibited on the market. We unfortunately have no record of the organization that was exploiting this suggestion, and consequently cannot give you their address.

We might suggest that you have a search made of the patent office records to determine whether or not this idea has been fully covered and also to what extent you can protect the issue. It is doubtful that a broad and basic patent would be allowed on such a suggestion.

Combination Motor and Iron

(1197) Mrs. T. C. Tucker, of Tampa, Fla., asks:—

Should I patent an idea of a combination sewing machine motor and electric iron. This is to be used in large ready-to-wear factories in their pressing room.

A.—We do not see how a combination of this nature could produce any results and would suggest that you send a further detailed description thereof and that you mention the exact purpose of the invention. The advantages of such an idea should be pointed out for a specific reply.

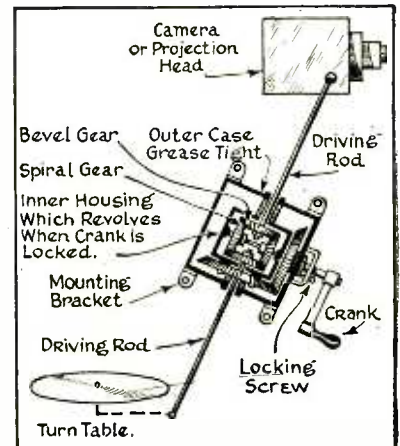
Talking Movies

(1198) Mr. W. M. Coates, of Meade, Kansas, writes:—

I have an idea for coupling a phonograph turntable to a motion picture camera. There is a drive shaft from the camera (or projector) of any suitable length which terminates in a small gear box. This shaft has a bevel gear which engages two differential gears in an inner housing, which in turn engage the bevel gear of another shaft which drives the turntable carrying the record. This inner case also has a gear encircling it, which in turn engages a pinion on a short shaft which projects from the case and has a small crank on its outer end and a lock ring, locking any position. In operation the driving rod drives the turn table through these differential gears at the same speed only in opposite directions. If the crank is turned by hand the driven shaft will slow down or speed up as the operator desires.

A.—Practically all cameras that are used for taking commercial photographs are now equipped with electrical motors, which operate both the camera and the turntable synchronously. In this way the recording laboratory can be very remote from the place where the photographs are taken. The only connection between the two points need be a pair of wires which can, if desired, be an ordinary telephone circuit.

Even in small home movie projectors a motor drive is employed and gear boxes have already been devised which will connect the projector with a turn table so that the two can be used simultaneously. We do not see anything odd or unusual in this design and cannot recommend further procedure.



Method of driving record turntable and movie camera by gears for taking "talkies."

At the right is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ.



All drawings and specifications are prepared under my personal supervision.

My Patent Law Offices
Just Across Street From U.S. Pat. Office



PATENTS

Protect Your Ideas

Take the First Step Today—Action Counts

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon below.

Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trademark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

Strict Secrecy Preserved—Write Me in Confidence

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now.

No Charge for Information On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will send you my "Record of Invention" form, on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

Clarence A. O'Brien

Registered Patent Attorney & Attorney-at-Law

Member of Bar of: Supreme Court of the United States; Court of Appeals, District of Columbia; Supreme Court, District of Columbia; United States Court of Claims.

PRACTICE CONFINED EXCLUSIVELY TO PATENTS, TRADEMARKS AND COPYRIGHTS

Inventors Write for these Free Books



Mail this Coupon NOW

CLARENCE A. O'BRIEN

Registered Patent Attorney and Attorney-at-Law

53-Y Security Savings & Commercial Bank Bldg. WASHINGTON, D. C.

—or— Suite 1106, Woolworth Bldg. NEW YORK CITY

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name

Address

(Important! Write plainly and address office nearest you)



Increase Your Pay

Are you sacrificing the best years of your life to a routine job, in the thought that you can advance only at the shuffling pace of the rank and file?

Thousands of men with no better start than you have doubled and tripled their incomes by home-study business training under the LaSalle Problem Method. During a period of only six months, 1,248 members of LaSalle Extension University reported definite salary-increases as a result of training under this remarkable method. **The average increase per man was 89 per cent.**

Send for This Book—It's Free

If "half as much again" would look good to you, check the training that interests you, sign and mail the coupon NOW. It will bring you full particulars, together with details of our **convenient-payment plan**; also your free copy of "Ten Years' Promotion in One." "Get this book," said a prominent Chicago executive, "even if you have to pay five dollars for it." We will send it free. Make your start toward that bigger job TODAY.

— Find Yourself Through LaSalle! —

LaSalle Extension University

The World's Largest Business Training Institution
Dept. 12384-R Chicago

Gentlemen: Send without obligation to me information regarding course indicated below:

- | | |
|--|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Commercial Law |
| <input type="checkbox"/> Modern Salesmanship | <input type="checkbox"/> Modern Business Correspondence |
| <input type="checkbox"/> Higher Accountancy | <input type="checkbox"/> Expert Bookkeeping |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> C. P. A. Coaching |
| <input type="checkbox"/> Railway Station Mgmt | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Railway Accounting | <input type="checkbox"/> Commercial Spanish |
| <input type="checkbox"/> Law—Degree of LL. B. | <input type="checkbox"/> Effective Speaking |
| <input type="checkbox"/> Modern Foremanship | <input type="checkbox"/> Stenotypy—Stenography |
| <input type="checkbox"/> Personnel Management | <input type="checkbox"/> Telegraphy |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Banking and Finance |
| <input type="checkbox"/> Banking and Finance | <input type="checkbox"/> Credit and Collection Correspondence |

Name

Present Position

Address

INVENTORS

We have been in business 30 years. If your invention or patent has merit, send details or model, or write for information. Complete facilities. References. Adam Fisher Mfg. Co., 205-D Enright, St. Louis, Mo.

PATENT YOUR INVENTIONS

EDWARD GOTTLIEB

Attorney in Patent Causes

5 Beekman Street

New York

Inventions Developed—Representative for Blair Tool and Machine Corp.

INVENTORS

May now arrange **PATENTS** to obtain and pay for them on the basis of **DEFERRED PAYMENTS**

INVENTORS SERVICE BUREAU

Dept. C, Union Trust Bldg., Washington, D. C.

Patents

Trade-Marks

EDWARD C. SASNETT

Registered Patent Attorney

(Ex-Principal Examiner U. S. Patent Office)

540 McGill Bldg. Washington, D. C.

Personal Service

What Oil Heat Offers

By Harry F. Tapp

(Continued from page 707)

your wife doesn't make her own clothes and your maid doesn't sleep in, you still should be interested in the effect that planning a house with an oil burner, or installing a house with an oil burner, or on the real estate value of your property. It is a well known fact that the real estate value of a house increases in proportion to its improvements and a good oil burner is a very tangible asset. How many people have you heard remark that the main reason they prefer an apartment to a house is to avoid playing nursemaid to a furnace? Such a person can soon be convinced that home owning may be accomplished painlessly and pleasantly if he buys a house that includes an oil burner.

If the man of the house is away from home frequently, his wife doesn't have the worry of keeping the home fires burning down stairs—the burner tends to that automatically and keeps the house at exactly the temperature indicated in the thermostat. A far more healthful arrangement than waiting until everyone starts to shiver, then stoking furiously and overheating the house.

This is especially true in the between season months such as April or October. Often then a fire in the morning would be welcome, but would become decidedly too warm in the middle of the day. Since these between season months comprise, roughly, half the heating season, it can readily be understood how much more of a saving in fuel cost can be accomplished in these months by taking the chill off the air in your house for an hour or so, night and morning and then having the burner shut off for the rest of the day, instead of keeping a furnace fire banked all day with the resulting waste of fuel.

All burners can be used for heating domestic hot water, if desired, by means of an indirect heater connected to the boiler and with controls mounted in connection with the storage tank which regulate the temperature of the water, just as the temperature of the house is regulated. This is most satisfactory with steam heat, but it also can be done with a hot water system. With warm air a separate unit must be used. There are several good automatic units on the market using oil fuel. The cost of heating water this way will be found quite economical when compared with other automatic heaters.

The demand for homes equipped with all the conveniences of life is steadily increasing. Women are no longer satisfied with homes that are not modern in every respect. They know what they want and if the house they are offered does not have what they want, they won't take it.

Homes that have automatic oil heat are cleaner and easier to keep in order and almost sell themselves. Oil heated homes always sell quicker, all other things being equal, than those that are not. Therefore, most far seeing builders are putting oil heating equipment into their new houses as an insurance against carrying the houses unsold over a period of time which would then mean a mark down on the price.

Watch for the next installment
in the
January Issue

Make Your VEST POCKET Bring You \$95 a Week

CARRY this amazing new adding machine in your vest pocket. Make \$3.00 an hour showing it to storekeepers, bookkeepers, professional men and others. Agents cleaning up with it is fast seller. Everyone who does any kind of figuring needs it and will buy on sight.

Complete Adding Machine Only \$2.95

VE-PO-AD duplicates work of large adding machines. Sells for only \$2.95. Adds, subtracts, multiplies—in a flash. Always accurate—no erasing out of order. Over 200,000 in use. You make 100% profit on every sale. Man! If you ever had a chance to CLEAN UP BIG MONEY—here it is!

Sample Ve-Po-Ad FREE

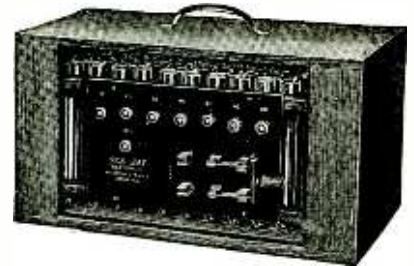
You don't need experience. Shapiro made \$175 his first week. Others make \$50 to \$100 a week regularly. You can sell as many as 8 Ve-Po-Ads an hour—over \$4.00 clear profit for you. Grasp this quickly! Write at once for full details of FREE Ve-Po-Ad offer and the MONEY-MAKING PLAN. Do it NOW.

C. M. CLEARY

303 W. Monroe St. Dept. 81-C Chicago, Ill.

"Dependable 'B' Battery Power"

Non-Destructive. Re-chargeable, Edison Element Batteries for Long and Short Wave Receivers. 100 volt, \$12.00; 140, \$17.00; 180, \$24.00. Prices include dry TRICKLE CHARGER. All batteries shipped dry with solution. Send no money, pay expressman. Also, "B" and "A" Battery Outfits operating from 32-volt systems.



Write for our interesting booklet. See Jay Battery Co., 911 Brook Ave., N. Y. C.

Real Gas Engine Flies Model Airplane 1 Mile

At last! A practical engine (not an experiment) has been perfected to fly model airplanes. Develops ½ h. p. Will also run small rowboat or light motor-cycle.

FREE Send at once for FREE illustrated Bulletin No. 46. Special discount to schools and model clubs. **Dynamic Mfg. Co., Monadnock Bldg., Dept. 103, Chicago.**



Electrical Engineering

Course for men of ambition and limited time. Over 5000 men trained. Condensed course in Theoretical and Practical Electrical Engineering including the closely related subjects of Mathematics and Mechanical Drawing. Students construct motors, install wiring, test electrical machinery. Course designed to be completed in one college year.

BLISS ELECTRICAL SCHOOL
Prepare for your profession in the most interesting city in the world. Catalog on request.
152 Takoma Ave., Washington, D. C.

MYSTERY GAS LIGHTER

JUST OUT, LIGHTS GAS INSTANTLY WITHOUT SPARKS OR FLAME - SELLS LIKE WILDFIRE WHEREVER GAS IS USED - RETAILS FOR 25¢

MAKE \$25. A DAY

PACKED ON INDIVIDUAL CARDS WITH INSTRUCTIONS. RUSH \$10.00 FOR GROSS or 10¢ FOR DOZ.

New Method Mfg. Co., Box 23-12, Bradford, Pa.

Super-Refined Oil

By Alfred M. Caddell

(Continued from page 704)

vaporize in the order of their volatility. Then heavier oils, which form practically no vapors at atmospheric pressure, are helped in the process of distillation by means of steam or vacuum. This separation of grades goes on and on until all but approximately 15 per cent. of the original crude has been distilled, the various oil vapors in the meantime passing through cooling tubes and condensing at their respective vapor-condensation points, after which the products are piped to various tanks.

But in the group distillates used for lubricants, as also in the group used as fuels, there lies a whole world of combinations. Here the lubrication engineer steps in and, having ascertained the properties of the various grades by chemical and physical tests, and knowing the mechanical work he has in hand, writes specifications for the job just as a doctor writes his well-known prescriptions to make the body function as perfectly as possible. Some of the finest science of the age has thus come into being and mechanical creations, such as the automobile, airplane, motor boat and other contrivances powered by internal combustion engines, not only were permitted to be born but have been nourished into gigantic enterprises by virtue of this science.

Of all mechanisms contrived by man, however, internal combustion engines are without doubt the most difficult to lubricate. The exposure of a large part of cylinder surfaces to high temperature, caused by the heat of explosion and burning of the gas and air mixture, calls for lubricants of the finest grades to (1) provide and maintain the necessary film of oil between the piston and cylinder surfaces and (2) be sufficiently refined so that the minimum of carbon and other deposits will result from the breaking down process due to the heat and action of the motor. Other factors, such as freedom from sulphur and similar impurities, are also to be taken into consideration.

To make available the right grade or specification of oil—in other words, to fill the mechanical and operating prescription properly—calls for the highest of technological skill and almost endless experimenting. The type of cooling system, the type of lubricating system and the rubbing speeds of the moving surfaces—all these with their endless variations form part of the data of the problem. Were the operating temperatures, contact surface speeds and lubricating systems the same for each motor—and most assuredly they are not—the problem of lubrication engineers would be greatly simplified. With gravity, flash and fire tests, pour-point test, viscosity, color (which indicates uniformity), acidity or alkalinity, tarry or suspended matter and emulsion factors to reconcile with specific jobs, the intricacy of the technology involved is fairly well indicated.

For instance, when William F. Parish, dean of the lubrication engineers, was made Chief of the Lubrication Division of our Air Service during the war—he had previously established lubrication standards for various governments and industries throughout the world, founded the lubrication divisions of some of our largest oil companies and done other work in this line—he set about the task of finding the most suitable lubricant to be used in the Liberty motors.

PATENTS TRADE-MARKS AND COPYRIGHTS



VICTOR BUILDING

Our New Building Nearly Opposite U. S. Patent Office Specially Erected by Us for Our Own Use

OUR OFFER: FOR THE PRODUCTION OF YOUR INVENTION

YOUR FIRST STEP—The inventor should write for our blank form, "RECORD OF INVENTION." Before disclosing your invention, a sketch and description should be made on our "Record of Invention Blank", signed, witnessed, then returned to us and we will place it in our fireproof secret files. **We will also give our opinion** as to whether the invention comes within the Patent Office definition of a patentable invention. This "Record of Invention" will serve as "proof of conception" until the case can be filed in the Patent Office. **There is no charge or obligation for this service.**

Write for Our Five Books Mailed Free to Inventors

Our Illustrated Guide Book

HOW TO OBTAIN A PATENT

Contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described.

OUR TRADE-MARK BOOK

Shows value and necessity of Trade-Mark Protection. Information regarding TRADE-MARKS AND UNFAIR COMPETITION IN TRADE.

OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries, and secure Foreign Patents in shortest time and at lowest cost.

PROGRESS OF INVENTION

Description of World's Most Pressing Problems by Leading Scientists and INVENTORS.

DELAYS ARE DANGEROUS IN PATENT MATTERS

TO AVOID DELAY: YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to save correspondence, secure protection and early filing date in Patent Office. You should send us a model, sketch or photograph with a description of your invention together with \$25.00 on account. We will make an examination of the U. S. Patent Office records and if it is Patentable we will prepare the official drawings immediately and forward them for approval. If the invention is not patentable we will return the fee less the cost of the examination.

PAYMENT OF FEES IN INSTALLMENTS

It is not necessary that the total cost of a patent be paid in one payment. We permit our clients to pay for their applications in three installments as the preparation of the application progresses in our office

ALL COMMUNICATIONS AND DATA STRICTLY CONFIDENTIAL. INTERFERENCE AND INFRINGEMENT SUITS PROSECUTED. Our Large, Comprehensive Organization has been

established for 30 years and offers Prompt, Efficient and Personal Service by experienced Patent Lawyers and Draftsmen. We shall be glad to have you consult us or to answer any questions in regard to Patents, Trademarks or Copyrights without charge.

Highest References—Prompt Service—Reasonable Terms

FREE
COUPON

WRITE TODAY
VICTOR J. EVANS & CO.

Registered Patent Attorneys: Established 1898
MAIN OFFICES: 715 Ninth St., Washington, D. C.

BRANCH OFFICES: 1007 Woolworth Bldg., New York City; 1640-42 Conway Bldg., Chicago, Ill.; 514 Empire Bldg., Pittsburgh, Pa.; 828 Fidelity Phila. Trust Bldg., Philadelphia, Pa.; 1010 Hobart Bldg., San Francisco, Calif.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name.....

Address.....



This Christmas Gift brings You Popularity

THOUSANDS will start toward musical success on Conns this Christmas. The one gift that brings you fun... popularity and endless chances to make extra money. Join a band or orchestra. It's easy. Anyone who can whistle a tune can learn quickly.



Easy to Play

Saxophone, Cornet, Clarinet, Trumpet, Trombone—any band or orchestra instrument you choose. Conn makes them all. And Conns are easiest of all to play. Choice of Sousa and the world's greatest artists. Especially recommended to beginners for quick progress. *Easiest* to blow, *Easiest* to finger. *Easiest* to play in perfect tune. The result of more than 50 years' experience and patented processes of manufacture exclusive with Conn—the world's largest maker.



FREE TRIAL, Easy Payments

Any Conn instrument sent for free trial in your own home. Easy payments if you wish.

Write for FREE BOOK

Write now for interesting booklet illustrating latest models in colors. Tells everything you want to know about your favorite instrument. Mention instrument.

C. G. CONN, Ltd., 1256 Conn Bldg. Elkhart, Indiana

CONN

WORLD'S LARGEST MANUFACTURERS of BAND INSTRUMENTS

C. G. Conn, Ltd., 1256 Conn Bldg., Elkhart, Ind. Gentlemen: Send free literature and details of trial offer on _____ (Instrument) Name _____ St. or R. F. D. _____ City _____ State, County _____

MAIL THIS COUPON

With a wealth of experience behind him but with a new motor and several new operating conditions, such as go with aviation, before him, he established an engine and oil laboratory testing program, and had no fewer than 4,662 analyses of oil made after many various kinds of oil had run in the engines under severe operating conditions. The stand-up and other qualities of the various oil compounds were tested with the engines on the block and in the air. Motors were taken apart to learn the operating effect under each oil at the end of the tests, Specification No. 3501 for Liberty aero-oil was chosen as the most suitable of the lot, and the prescription was forthwith transmitted to the various oil refiners to fill. Such is the care and the precision employed by men who know their oils and engines and who know the harm that will result from the use of improper oil or the good that will follow the use of proper oil.

Needless to say, therefore, that the operating success of the Liberty as well as other aero-motors, as far as lubrication was concerned, was highly successful be-

\$5,000 FOR PERPETUAL MOTION

The editors have received thousands of different designs of perpetual motion devices, and have received hundreds of circular letters soliciting finances for the building of perpetual motion machines.

The editors know that if they receive these letters, there are thousands of others in this country who get similar letters and who fall for the claims made in the numerous prospectuses giving the earning capacities of the various machines.

Most of the shares of stock for these perpetual motion machines are being sold at a rate of \$1.00 per share, although some inventors are trying to sell shares of stock at \$100.00 per share.

Therefore, the editors of this publication say, "Just come in and show us—merely SHOW us—a working model of a perpetual motion machine and we will give you \$5,000.00. But the machine must not be made to operate by tides, winds, waterpower, natural evaporation or humidity. It must be perpetual motion."

cause the lubricant had been properly standardized. But the wartime problem of supply and distribution—there were thirty army flying fields throughout the country and the forces in France to be served—brought about another development.

Mr. Parish, having gone into the technology of lubricants from the laboratory as well as operating standpoints, knew, among other things, that while lubricating oil did become contaminated through service, and while the lighter components of it could be and were broken down into vapors and carbon deposits, the true lubricant itself was not worn out! The contaminations consisted of gasoline, kerosene, dirt, metal particles and carbonaceous sludge. Therefore, thought he, if the used lubricating oil were put through a machine which separated the unwanted parts from the true lubricant, the lubricant could then be put back into service. Separating machines were thereupon devised and installed at the thirty flying fields, and during the last four months in which America was engaged in the war 109,560 gallons of lubricant were saved from what otherwise would have been discarded as waste. These

Save \$20.00 with this OFFER. Send no money!

GUARANTEE SATISFACTION OR MONEY BACK

Get Strong WITH These Improved Muscle Builders All for \$5.00

Why pay an extravagant price for strength—get all equipment you require and excellent course of instructions for only \$5.00. Develop muscles of a super-man. Get strong and amaze friends. We show how to easily master feats which now seem difficult—if you want physical culture for your health's sake, this equipment is just what you need. Save at least half. We furnish a ten cable chest expander adjustable to resistance up to 200 lbs. Made of new, live, extra strength, springy rubber to assure long wear and give resistance you need for real muscle development. You also get a pair of patented hand grips for developing powerful grip and forearm. We include wall exercising parts which permits you to develop your back, arms and legs—a real muscle necessity. Business men and athletes, too, first see in their legs. Develop leg muscles with foot strap which we furnish. This will give you speed and endurance—but that isn't all you get. In addition we include a specially written course which contains pictures and diagrams showing how to develop any part of your body so you quickly get on with these exercises and gain greatest advantage from their use. Act now!

SEND NO MONEY

All items pictured are included in this special offer. Sign name and address to coupon and rush to us. We send your ten cable chest developer, wall parts, a pair of hand grips, foot strap, and the course by return mail. Pay postman \$5.00, plus postage on arrival. (If you send check or money order in advance, we pay postage.)

GUARANTEE

All Crusader products are guaranteed to give entire satisfaction or money back.

Crusader Apparatus Co., Dept. 412, 44 Parker Ave., Maplewood, N. J.

I accept your offer. Send me everything described in your advertisement by return mail. I will pay postman \$5.00 plus postage on arrival. It is understood if I am not entirely satisfied after examination, I can return the goods and you will refund my money.

Name _____

Street _____

City _____ State _____

*Not—No C.O.D. orders to Foreign Countries or Canada.

U. S. Government Jobs!

\$1260 to \$3400

a Year

STEADY WORK

Vacation with full pay

MEN—BOYS

18 to 50

Coupon is Valuable. MAIL IT AT ONCE.

FRANKLIN INSTITUTE, Dept. D-182, Rochester, N. Y.

Rush to me **FREE OF CHARGE**, list of U. S. Government BIG PAY jobs now obtainable. Send me **FREE** 32-page book telling salaries, duties, hours, etc. Tell me how to get a position.

Name _____

Address _____

separating machines are still in use at the various government flying fields today, and their use is fast spreading throughout the automotive world.

But is this cleansed oil as good as fresh lubricating oil? The surprising thing about it—at least surprising until one analyzes the situation—is that if the output of these separating machines is under the control of skilled oil technicians, *the output is as good, if not superior, to the original oil!* Put back into a motor—after the necessary tests to learn its chemical and physical characteristics, and blending it to the proper viscosity and other standards, if need be—this oil, being carbon-free and less volatile, will produce the most satisfactory results. Exhaustive tests in airplane, motor-boat and motor-car engines have been made. During operation, motor action has been superb, and when engines thus lubricated have been taken down, after a 500-mile test, they have exhibited a remarkably clean and sweet-running condition with the oil, which again and again may be put through the separator, found to be heavy in body and very much less contaminated—in other words, through this super-refining process, a true or net lubricant has been produced.

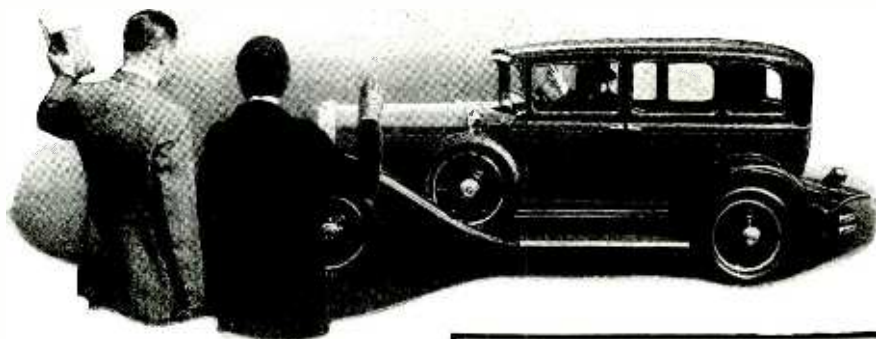
The reason for this is not hard to see, when one realizes, as of course the oil technicians do, that every finished oil put into the crankcase of a motor, is made up of a wide range of boiling points; various points representing the light oil, medium and up to the very heaviest cylinder stocks. Some of these fractions are naturally less stable than others. These are the parts that are destroyed quickest by the heat and action of the engine, and as a result of this destruction carbon is deposited on the metallic surfaces and becomes mixed with the oil itself.

Therefore this is where the beneficial effects of the heat and action of an internal combustion engine come in. The action which results in every particle of the oil coming into contact with the hot cylinder walls and piston heads enables the heat to break down the weaker components of the fresh oil, with the result that, while the oil does become contaminated, *it will become more refined* when the contaminations are removed. The greater the heat, the more thorough the refining job, the hot engine serving as a super-refining plant!

In fact, it has been said that in order to obtain the same grade or standard of lubricant that can be obtained from used motor oil, refiners would have to build very costly plants to duplicate the severe action of an internal combustion engine. And inasmuch as the carbon and weaker components would be broken down in such a process, the net result would be a reduced output by half, with the still further result that the cost of lubricating oil would rise to about \$5 a gallon—an almost prohibitive figure from the standpoint of the motoring public.

It is no surprise, therefore, to learn of separating machines being installed in various fleet-garages throughout the country, the worth of the super-refined lubricant having been so thoroughly demonstrated. But right here enters a factor of the utmost importance—though the machines are capable of doing a fairly satisfactory separating job, how is the average garage man going to know the quality of his output, technically and chemically? Is he capable of conducting emulsion tests, viscosity tests, flash point tests; of blending oils to obtain certain characteristics? It is hardly to be expected that he should know much more than that the output of his machine is oil. Under these prevailing circumstances, therefore, a real danger

Own a car your friends can admire



YOU needn't envy your friend's fine car — or be ashamed of your own—when you can buy a fine quality motor car for little money. Many good used cars have their original beauty, style and distinction, with thousands of unused miles. And you can buy a really fine used car for the price of a cheap new car.

By buying your used car under the terms of the famous Studebaker Pledge, you get positive satisfaction-insurance. The Pledge gives you five days driving trial with any used car you select. You get a 30-day guarantee on all Certified cars. And all prices are plainly marked —there are no code prices on a Pledge-backed used car.

Pledge to the Public on Used Car Sales

- 1 Every used car is conspicuously marked with its lowest price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.
- 2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.
- 3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

© 1927 The Studebaker Corporation of America

This free booklet, "How to Judge a Used Car," will teach you many fine points about used car buying. The Studebaker Pledge will thoroughly protect your motor car investment. Act now to give your family a better car—mail the coupon *today!*



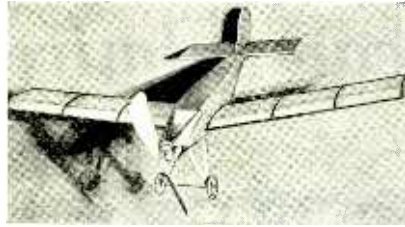
THE STUDEBAKER CORPORATION OF AMERICA
Dept. 1712, South Bend, Indiana
Please send me copy of "How to Judge a Used Car"

Name.....
Street.....
City..... State.....

STUDEBAKER

Builder of Champions

Get an IDEAL MODEL AIRPLANE for Christmas!



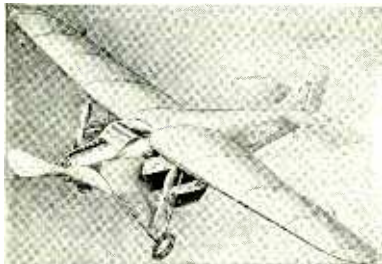
The IDEAL American Eagle

The Most Advanced Development in Flying Model Airplanes

Wing Span: 26 in. Weight: 3 3/4 oz.

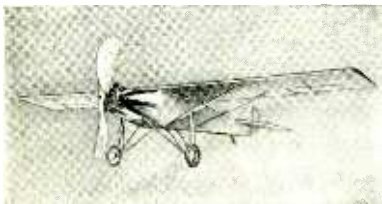
An entirely new, light-weight, fast-flying Model; distinctive appearance, realistic in flight, unique in construction details. Balsa wood fuselage, with specially designed aluminum bulkheads; built-up wings with ready-formed ribs; removable tail assembly. Finished in modern color decorations. Just the Model Airplane you have been wanting; simple in construction, and a reliable, fast flyer.

Construction Set: \$2.50
Assembled Model: \$5.00



The IDEAL FORD MONOPLANE

An accurate, 3-ft. Scale Model of this famous ship. All parts miniature duplicates of the original. Build it the IDEAL way; we guarantee it to fly when correctly constructed. Everything required in Complete Construction Outfit, including Plans and Instructions\$8.50



The IDEAL New York-Paris Monoplane

An exact Model reproduction of the most famous Airplane in the world—"Spirit of St. Louis." 3-ft. wing span, and a wonderful flyer. All parts and fittings are realistic and everything required to build the Model comes in Complete Construction Outfit...\$7.50
Fokker Monoplane: 3-ft. Model "North Pole" type. Complete Construction Outfit\$8.50
Cecil Peell Racing Airplane: 3 1/2 in. size. A Championship Winner. Complete Outfit\$3.75

Ask for IDEAL Model Airplanes at your local store. If unobtainable, send your order direct to us and delivery will be made at once.

64-page Catalogue Models, Parts, Supplies and Materials for Builders—5c

IDEAL AEROPLANE & SUPPLY CO., Inc.
Established in 1911—18 Years ago
22-24 W. 19th Street, New York City

confronts a motorist who pours an oil of unknown chemical and physical quality into his crankcase. He might be blessed with fool's luck and he might suffer the fate of fool's ignorance. So many factors enter into the science of lubrication that the field belongs entirely to the specialist.

The history of another industry yields a most striking parallel in this regard. Back in the early days of steel-making, Bessemer came upon a process by which he succeeded in making the finest kind of steel. His achievement was hailed by other steel and ironmakers and he sold licenses under his patent to them. But while they followed Bessemer's directions faithfully, they could not produce the steel that Bessemer could, and the inventor of the process felt obliged to buy back the licenses he had sold.

However, Bessemer was not discouraged by this setback. Far from it. He knew that he had and could always make good steel. Therefore, he reasoned, the trouble must lay in the iron which his licensees used.

Employing a chemist, he had this iron and also his own iron analyzed, and forthwith the reason for his licensees' failure came to light. Bessemer had unknowingly used an iron that contained only a small per cent. of phosphorous, while his licensees had used an iron high in phosphorous content. The small difference in the amount of this element's content made the difference between good, malleable steel and worthless, brittle steel!

But could Bessemer interest his former licensees in his process again? "Once bitten—twice shy" was their attitude until the very enormity of his success so overwhelmed them that they eventually repurchased licenses.

Maybe separated or super-refined lubricants will travel the same pathway of experience and maybe not. In the hands of skilled oil technicians, super-refined lubricants are known to possess exceptional merit. But in the hands of men who know little or nothing about this highly technical subject—well, the chances are that a motorist will first consider the life of his car.



"I EARNED \$75 LAST WEEK, FLO—and my banjo did it!"

"ISN'T it just great to make so much money—especially when the work is so fascinating and easy! I could kick myself that I didn't learn to play the banjo years ago. Then it looked so difficult to learn—but gee, you know how easy it was for me once I started!"

Banjo is the easiest and most enjoyable instrument to play. Our home study course is so simple, so completely explained that you will be able to play the most difficult pieces in almost no time—classical, jazz, "hot numbers."

There is always plenty of work for the banjo player—no orchestra or jazz band is complete without one. And the beauty of it is, you get paid for having a good time! Let us tell you without cost or obligation how you can quickly learn to play the banjo and earn big money—or win quick popularity. Write TODAY for details.

TENOR BANJO STUDIOS
Dept. C-401, 9th Floor, Woolworth Building, New York City

BE a FOOT SPECIALIST!



EARN BIG MONEY AS A FOOT SPECIALIST!

Learn PEDOPRACTIC—the new system of correcting foot disorders and deformities without medicine or surgery—that's making tremendous strides these days. It's a new uncrowded profession and offers amazing opportunities in an unlimited field. Dignified, interesting and profitable. No thinking man or woman will willingly neglect foot troubles when they produce so much discomfort and disability and can be so easily corrected.

LEARN QUICKLY AT HOME IN SPARE TIME!

With but ordinary education and leisure home study you can quickly qualify for this profession with its social, professional and financial advantages.

EARN WHILE YOU LEARN

The demand for your services will be so great that you can start in your own home and earn the cost of your training while you are studying the course. We teach you how to quickly "cash in" on your knowledge.

You can quickly build up a practice and have an office of your own. It's a wonderful opportunity so act quickly. Write today for full information about this wonderful new science. Do it now. No obligation.

AMERICAN COLLEGE
Chartered 1915 by the State of Illinois
Dept. P-12 54 W. Illinois St., Chicago

IMPORTANT TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers 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 reserving 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 AND INVENTION every month until I notify you otherwise, and greatly oblige,

Name.....

Address.....

Mac You Can Make It **24 PLANS 25¢**

Only 25c brings you these valuable plans, 24 separate sheets, with full particulars covering each operation. Collection includes Grandfather's Clock, Ship Model, Book Case, Table and many other useful and practical furniture objects, novelties and toys.

Experience the thrill of building something that will last a lifetime. Don't miss this opportunity. Plans easily worth \$2.50—but while this special offer lasts—only 25c—Send Now.

FREE Send for literature describing Mac—The Popular Mechanical Workshop—electrically operated, and details of our Free Trial Offer. Enables you to do all wood-working operations in one tenth the time.

WRITE TODAY

Midland Appliance Corporation
Dept. 1249 225 No. Michigan Ave., Chicago, Ill.

CLASS PINS 35¢

FREE CATALOG SHOWING 200 DESIGNS

EITHER DESIGN SHOWN. SILVER PLATE 35¢ EA. 12 OR MORE. \$3.50 DOZ.; STERLING SILVER OR GOLD PLATE. 50¢ EA. 12 OR MORE. \$5.00 DOZ.; 1 OR 2 COLORS ENAMEL, ANY 3 LETTERS AND DATE.

BASTIAN BROS. CO. 942 BASTIAN BLDG. ROCHESTER, N. Y.

When the Fates Fooled Harry Kellar

By Dunninger

(Continued from page 701)

The prosaic world with its weary round and monotonous sameness was forgotten, for Kellar's audiences were always transported upon a magic carpet into the land of perplexing mysteries.

No large cumbersome pieces of the old time magician were part of his paraphernalia; here was a wizard of a modern school . . . a master of enchantment . . . a prestidigitator de luxe . . . a modern day miracle man!

Kellar . . . a name to be conjured with! For he had earned the title of Master of the Magic Art, from not only enthusiastic audiences in all parts of the world, but from the magicians themselves, who worshipped this genial, ever-smiling and lovable Grand Old Man of Mystery.

Kellar toured the world several times and met with deserving success, but in the earlier days of his career, his lot in life wasn't exactly a path of roses. Fortune didn't smile down on this world's great mystifier, and shower a deluge of golden coins for his efforts.

His was the hard, uphill road . . . covered with obstacles and disappointments. Sometimes it seemed to this master of magic that the woes and cares of the world were upon his shoulders. But he smiled and kept going steadily forward to success and prosperity. This sturdy plodder who knew not the meaning of quitting, forged steadily onward, making magical history as he went along.

The little old, back room in the Martinka magic shop, which stood in Sixth Avenue, between 28th and 29th streets, years ago was the meeting place of magicians from all over the world. Kellar, whenever appearing or visiting in New York, used to make that memorable shop his headquarters, and many is the yarn that was spun there in what the magis call "those good old days."

Martinka's magic emporium was known the world over as the depot of magical supplies, including tricks, books and illusions. Managed and owned by Antonio and Francis Martinka, it was in this quaint shop, some of the greatest magical paraphernalia of the time was planned, built and sent out into the world to mystify and thrill audiences when presented by the leading wizards of the day, headed by the great and only Harry Kellar.

The Mystic Lobster

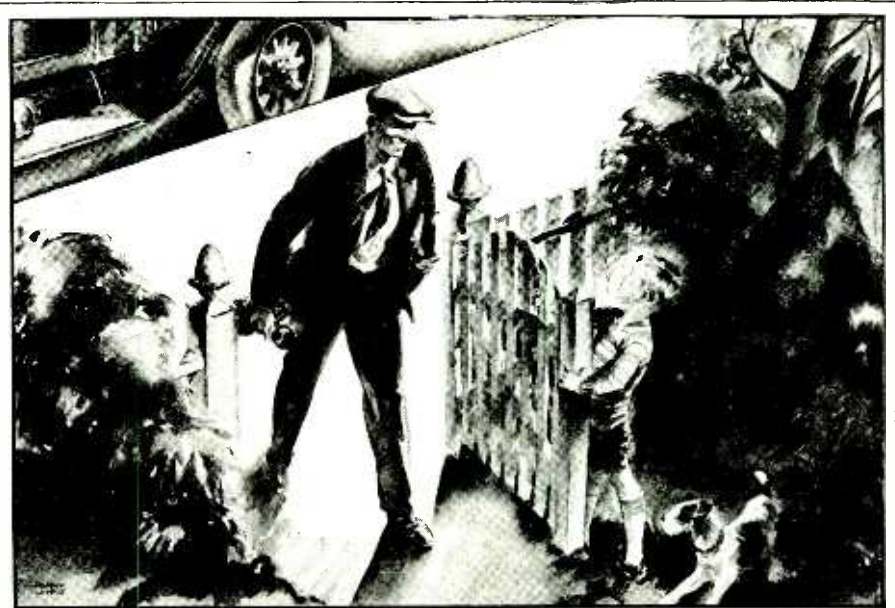
ONE of the stories told of Kellar was that one night after the performance he wandered into a restaurant, known throughout the city as the place that served the finest sea food obtainable, and picked himself a lobster which was in a show case that stood in the window.

Telling the manager he wanted that lobster prepared for him, he sat down and looked over his newspaper. After a while the lobster was brought to him and the manager, who knew Kellar well, stepped over to the table and asked him how he liked it.

"That isn't the same lobster I fished out of the window," replied Kellar, in anger.

"What?" questioned the manager, "You mean to say that the lobster before you is not the same?"

"That's just what I did say," yelled Kellar, "And I'm right. I am surprised that you allow such substitution to take place in here, a place noted for its efficient service and—"



800,000 ADDITIONAL TELEPHONES ARE GOING INTO USE THIS YEAR

A million and a half dollars a day

An Advertisement of the
American Telephone and Telegraph Company

MORE than 200 new Bell telephone buildings are going up this year in the United States, 800,000 additional telephones are going into use and new switchboards to care for 3,000,000 additional calls a day. Thousands of miles of new cable, millions of miles of wire, new carrier systems, vacuum tubes and loading coils.

These are a few of the things in the 1929 construction and improvement program of the Bell System which will cost more than 550 million dollars—a million and a half a day.

Telephone growth is essential to the new American civilization of better opportunity for the average man. The Bell System employs

more than 400,000 workers, is owned by 450,000 stockholders and serves the people of the nation.

Every day the Bell System is extending its lines to more people, increasing the speed and accuracy of its service, giving greater comfort and convenience in telephone use. All of this is done that each individual may get the most from this means of all inclusive and instantaneous communication and that the nation may be one neighborhood.

This is part of the telephone ideal that anyone, anywhere, shall be able to talk quickly and at reasonable cost with anyone, anywhere else. There is no standing still in the Bell System.



MECHANICAL ENGINEERING

Learn at home

MECHANICAL Engineering embraces the design, construction and operation of machines and machine tools. It is a profession which offers almost unlimited opportunities to men who combine mechanical ability with technical training.

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

These courses are complete, up-to-date and especially arranged to meet the needs of the student who studies at home. They are particularly helpful because they are written by well-known mechanical engineers.

INTERNATIONAL SCHOOL OF ENGINEERING

Division of the
International Correspondence Schools
Dept. 6203-F, Scranton, Penna.

Without cost or obligation, please send me full details of your home-study course in
MECHANICAL ENGINEERING

Name.....

Address.....

Mail the Coupon for Free Booklet

FREE RADIO BOOK

Little Salesman
Dealers Confidential Net Price List
RADIO
New England Mills Company
251-53 S. WASHINGTON BLVD. CHICAGO, ILL.

Send for it TODAY!

DEALERS, SET BUILDERS, AGENTS, RADIO SERVICE & REPAIR MEN.

NEW ENGLAND MILLS offers everything in radio at Wholesale Prices that spell real savings! That's what you will find in this great catalog just off the press, featuring Radio's newest creations in sets, kits, parts and supplies. Everything in our catalog is backed by the guarantee of this old, stable concern and its vast resources, accumulated through 17 years of faithful service to its customers.

Radio Dealers Save Money
on complete radio sets of every description, dynamic and magnetic speakers, A. C. and all other types of tubes, eliminators, batteries, radio cabinets—in fact everything required by dealers for resale or servicing. Buy right, sell right and make money.

Set Builders and Repair Men
Earn big money by rebuilding and modernizing old sets. Catalog contains everything required for this work; also the latest nationally renowned kits—knocked down or completely assembled chassis ready to install in table or console cabinets, all at wholesale prices.

A. C. Electric Radios
Large selections of the finest A. C. Electric, 6, 7, 8 and 9 tube chassis and complete sets obtainable at the amazingly low prices we quote. Every modern radio improvement is embodied in these marvelous electric radios. Backed by guarantee of satisfaction of this 17 year old institution.

Battery Sets for Unwired Homes
Rural communities with homes not wired for electric radios offer a good market for battery sets, repairs and replacements. We have a large stock of batteries, eliminators, speakers, tubes, transformers, coils, and all kinds of accessories for battery sets. Best known, nationally advertised goods, such as Cunningham, Sonatron and Arcturus tubes, Burgess batteries, Jewel instruments, Belden Products, Utah, Temple, Farrand and other popular dynamic and magnetic speakers.

Send for Free Book—NOW!
Radio dealers, agents, set builders, service men, etc., cannot afford to be without the New England Mills catalog. We maintain a complete radio service department, supervised by expert radio engineers who will help you with all your radio problems. All goods catalogued are stocked for immediate shipment. Write for this book today. It's FREE! Send request on business stationery. Catalog also contains complete line of tires, tubes, auto supplies, electrical and sporting goods.

NEW ENGLAND MILLS CO.
851 Washington Blvd. Dept. 13 Chicago, Ill.

Learn to PAINT SIGNS and SHOW CARDS

We quickly teach you by mail, or at school, in spare time. Enormous demand. Big future. Interesting work. Oldest and foremost school.

EARN \$50 TO \$200 WEEKLY

Otto Wiegand, Md., home-study graduate, made \$12,000 from his business in one year. John Fasson, N. Y., gets \$25 for a show card. Crawford, B. C., writes: "Earned \$200 while taking course." Write for complete information.

DETROIT SCHOOL OF LETTERING
179 Stimson Ave. Est. 1899 DETROIT, MICH.

Book on Law Free

Write today for this new book. It tells you how a law training will shorten your road to success. It also carries a vital and inspiring message to every ambitious man. Find out about the opportunities that await the law trained man. Find out how you can learn law right in your own home. No obligations. The book is absolutely FREE.

Write Today—now—while low tuition fee is in force.

American Correspondence School of Law
3601 Michigan Ave. Dept. 1429, 2 Chicago, Ill.

"Wait a moment, Mr. Kellar," begged the manager, "Tell me how you know the difference between lobsters?"

"Come on out to the kitchen first," proposed the master magician.

So out into the kitchen they went, and upon inquiry the chef admitted that the lobster just served wasn't the one selected, and brought in by the waiter, that the manager had given him. The excuse was that the other one also being fresh and nearer to the chef's hand went into the process of preparation.

Leaving the kitchen the manager asked Kellar how he happened to know there was a difference, as both lobsters were of the same size, to which the wizard replied, "The lobster I picked had one of the teeth in the right claw broken." Which shows what sharp eyesight Kellar had and what a close observer of details he was.

Kellar enjoyed taking long walks. He used to amuse himself by picking out as many objects that came within his range of vision as he could. During his promenades he used to go over in his mind, different tricks and illusions he wanted to build at some future time. Kellar was democratic to his fingertips. Although his banners and lithographs shrieked his fame, he remained the lovable, gruff at times, friend of everybody. To know Kellar was to love him. Naturally he made enemies too. What famous personage doesn't? But even his jealous rivals had to one and all admit that Kellar stood for all that was straight, staunch and true... a real man among men and a master among magicians.

How I Fooled Kellar

MANY the time he unfolded the tale of his earlier struggles when he had to escape from a hotel by hoisting his trunk through a window to a friend who stood below. That was in his younger days when the zest for adventure and the love of magic led him into tight places, from which he always somehow managed to escape.



You can easily do this trick as explained in the text, yet it completely fooled Kellar.

One afternoon in the old Martinka magic shop, I attained the distinction of mystifying Harry Kellar. I was standing in front of the iron grating, on the right coming into the shop from the street, looking over a book of magic. Kellar was standing a few feet away, talking to Tony Martinka. Finally Kellar called to me to watch a new *sleight* he had figured out. Kellar vanished a handkerchief and later made it appear from his right hand trouser pocket. "Now loan me that silk and I'll show you one." I promised, silently praying that the fates would not desert me before so critical a spectator.

Kellar handed over the red silk handkerchief he had just been manipulating. I carefully rolled it up—held it in my closed fist, and asked the dean to blow

MAKE GOOD RECEPTION EASY



Thousands of users marvel at the difference in reception with a Townsend "B" Power Unit. Full, sweet tone, clarity, volume and greater distance are among the many advantages reported daily.

ONLY \$6.85 COMPLETE

TOWNSEND "B" POWER UNIT

Hooked up in a few minutes; just plug into the light socket and forget it. Delivers up to 100 volts on any set—D.C. or A.C.—any cycle.

Approved and passed by the rigid laboratory tests of "Popular Radio" and "Radio News."

Over 150,000 Now in Use!

There's no longer any reason for putting up with the expense and undependable performance of "B" Batteries—when you can own a good "B" Power Unit for \$6.85. Over 150,000 Townsend "B" Power Units now in use—a substantial proof of satisfaction.

Send Only \$1.00

Send name and address with only \$1.00. On arrival of Townsend Power Unit pay postman \$5.85 plus postage. Try out ten days, then, if it fails to do everything we say, return it and money paid us will be refunded. Make a REAL receiver of your set.

"Results Equal to 180 Volt Power Unit!"

I have used my Eliminator for a year and it is giving just as good service now as the time I bought it. I am using it on a Splitdorf 8 tube set that calls for 180 volts, and I noticed no difference when I connected the set to a 180 volt M—"B" Eliminator than when I used your 90 volt one.

Harry Metz,
Ben Avon,
Pittsburgh, Pa.

Send for Literature

TOWNSEND LABORATORIES

725 Townsend St. Chicago, Ill.

BE A RAILWAY TRAFFIC INSPECTOR

Earn up to \$250 monthly, expenses paid

Most interesting work with many opportunities for advancement. Meet big railway officials; travel or remain near home; pleasant outdoor work. We assist you to a position at \$125 to \$150 per month, expenses paid, after 3 months spare time home instruction, or money refunded. You take no risk. **ACT NOW!** Write for free booklet giving full details. Don't delay!

STANDARD BUSINESS TRAINING INSTITUTE
Div. 27, Buffalo, N. Y.

LEARN CARTOONING

At Home—in Your Spare Time

The famous Picture Chart Method of teaching original drawing has opened the door of success for hundreds of beginners. Whether you think you have talent or not, send for sample chart to test your ability, and examples of the work of students earning from \$50 to \$300 per week. Please state your age.

THE LANDON SCHOOL
1460 National Bldg., Cleveland, O.



CHEMISTS

Catalog illustrating 2500 Chemist's Supplies, 5,000 Chemicals, Minerals, Drugs, etc., and listing 1,000 scientific books sent for 50c. Glass Still as illustrated. Capacity of flask 1 qt. Complete \$8.

LABORATORY MATERIALS CO.
635 East 71st St. Chicago, U.S.A.

H.B. PAINT SPRAY
DOES THE WORK OF FIVE MEN

Paint Spraying Brings Quick, Easy Profits—H.B. does work of 5 brush painters. Paints autos, furniture, homes, at lowest prices, with big profits for you. Pays for itself—or 1/2 \$20 monthly. Easy lowest terms brings it. Practically no investment. 30 days trial. Write for valuable bulletins.

Hobart Brothers Co.,
Box S1291, Troy, Ohio.

EASY TERMS. 30 DAYS TRIAL. QUICKLY PAYS FOR ITSELF.

To be sure of getting your copy each month, subscribe to Science and Invention, \$2.50 year.

EXPERIMENTER PUBLICATIONS, Inc.,
381 Fourth Avenue, New York City.

upon it. This done, I allowed my hand, held about two feet from Kellar's face, to slowly open. The handkerchief was gone! I nervously laughed, but Kellar stood there blinking his eyes, completely mystified. "Well," shouted Kellar, "Where is the handkerchief?" "Gone," I replied.

Kellar began looking around, then started to search thru my pockets and sieves. He was really completely mystified for the time being. And it goes without saying, I was more than delighted. I had fooled Kellar, the greatest magician of them all.

Now, I will have to let you, dear reader, into the secret of the trick, so you will follow clearly what happened later. The trick consists of rolling a handkerchief into a ball, and holding it in the palm of your hand. The hand is closed and a throwing motion is made, and at the count of "three," the handkerchief is thrown over the head of the victim. This move, the eye of the spectator is unable to follow. It's simple and an excellent trick and can fool the cleverest if he isn't in on the secret. Well, Dean Kellar wasn't, so he looked all around the place, and couldn't find the missing handkerchief. Now the thing that happened was, when I threw the handkerchief over Kellar's head, the silk supposed to fall behind the spectator's back, had landed on top of the master magician's black felt hat, and remained there. I decided to wait for an opportune moment to reach onto the hat and get rid of the handkerchief . . . so the trick would not have to be exposed. But that was not to be.

Kellar suddenly looked at his watch and made some remark about having an appointment, left the store hurriedly with me trailing in his wake. Disliking the fact that I would have to give the stunt away which had fooled the master magi, I continued to follow, hoping the wind would blow the handkerchief off the hat, but such was not to be the case. A number of people passing by, looked at Kellar and laughed. Several stood right in his path and burst into a spasm of laughter when he reached them. And all the time Kellar was growing more and more indignant and embarrassed, as he was wondering what the people were laughing at. Finally after looking himself over as well as he could, the professor took off his hat and there was the red handkerchief waving merrily in the breeze. Watching Kellar taking the silk from his hat, I spied him looking around suspiciously—assured that he had not seen me I took to my heels.

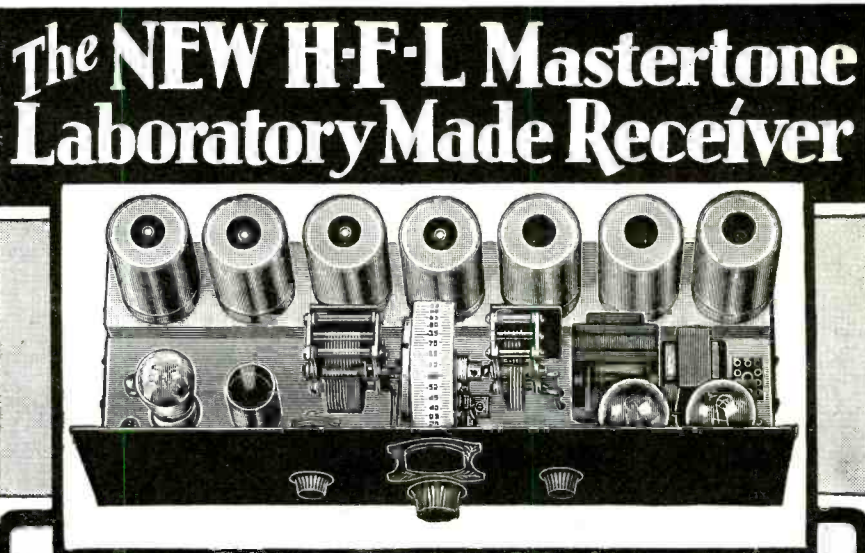
Laugh and the world laughs with you, believed Kellar, but there were moments when the laughs failed to arrive.

Assistants are a source of worry to magicians. It is far easier to find a clever magician than it is a good intelligent assistant.

One of the most competent and trustworthy of magician's assistants was Fritz Bucka, who travelled the world over with Kellar, and whom the dean of wonder-workers swore by and also at many times. Kellar trusted Fritz as he did himself, and Bucka was devoted to the grand old man of magic.

The Ghost That Didn't Appear

DURING the performance of the Kellar show, more than twenty years ago, the feature trick was the spirit cabinet in which the magician conjured up the ghost of the famous *Katy King*. This was a startling illusion of the spiritualistic type, and one that thrilled and mystified, in the years that followed, millions of lovers of mystery and spirit phenomena.



Completely Built and Assembled by H-F-L Engineers—Shipped ready to Operate

All metal completely shielded chassis: 7" x 21" x 7½". Fits nearly all consoles. 11 tubes operating at peak efficiency [5-224; 3-227; 2-245; 1-280.] Single dial positive one-spot tuning; Humless AC Operation; Uses 5 Screen-Grid tubes, 5 Tuned R. F. Circuits; High Power Screen-Grid detector, with 175 volts impressed on plate; Automatic line voltage control inbuilt holds voltage against fluctuating; 100-Volt DC Dynamic field supply incorporated; 3 stage Phonographic amplifier; Finest quality precision made parts.

Amazing Power

Startling realism! Unfailing accuracy! Its great power and sweet tone awe and thrill, setting new standards of performance achieved by H. F. L. engineers after two years of tireless research and tests under all conditions.

Keenest Sensitivity

Unlike any ever known! Gets distant stations clearly, sharply, distinctly with only wire screen or metal plate aerial built in cabinet.

Highly Developed Circuit

Intermediate employs 4 screen-grid tubes with 5 tuned filter circuits, easily adjustable to peak of tuned frequency. Positive 10 Kilocycle selectivity. Most highly engineered receiver ever built.

The New Audio System

Uniform amplification over entire musical scale. Operates with dynamic, magnetic or horn speakers without a bit of hum.

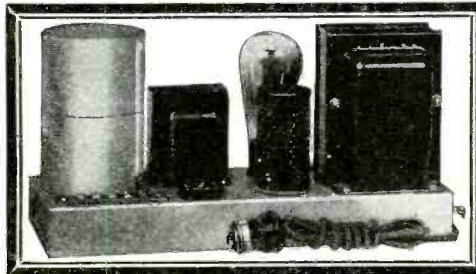
The H-F-L Power Master

Not an ordinary power pack, but a specially developed unit of the Mastertone, built separately to simplify installation. Has oversized transformer, full wave type 280 rectifier tube.

Built by Hand—Yet Low in Price—

Quality—not quantity—the H-F-L Mastertone standard. One demonstration will convince you that its master receiver of all times. Fully guaranteed.

Write today for complete description and price.



HIGH FREQUENCY LABORATORIES
28 North Sheldon St. Dept. 21 Chicago, Ill.

NEW MONEY MAKING OPPORTUNITIES Write!

A Surprise That Means Money To everyone who writes for our new Four-in-One Line. New shirts, new ties, new underwear. Free kit. Vanderbilt Mills. Dept. 134T, 29 W. 32 St., N. Y. C.

Candies, Home Made. Make Big Money. Few dollars starts you. We teach making and selling. Free catalogue. Capital Candy School, Dept. AX-3043, Washington, D. C.

Agents earn big money taking orders beautiful Dress Goods, Silks, Wash Fabrics, Hosiery, Fancy Goods. 1000 samples furnished. National Importing Co., Dept. Y-39, 573 Broadway, N. Y.

A Plying Position Open to Reps. of character. Take orders Shoes-Hosiery direct to wearer. Good Income. Permanent Book "Getting Ahead" Free. Tanners Shoe Mfg. Co. 21412 C St. Boston.

A Business of Your Own, Bankrupt and Bargain Sales. Big Profits. We start you, furnish everything. Distributors, Dept. 279, 429 W. Superior, Chicago.

Salesmen, This Advt. Worth \$100 weekly to you. Newest and liveliest all year seller. 20 million people and all dealers will buy on sight. Dept. 702-T. Lyco Co. 702 E. 40th St. Chicago.

Without one cent investment make \$65.00 every week selling finest work pants made. Every man buys 3 pair for \$3.50. Outfit Free. Dept. L.C.S. 12. Longwear, 489 Broome St., New York.

\$35-\$50 Weekly year round. Call on our customers and build your own local business. No money or experience needed. We furnish everything. Powers Shirt Co., 20 Lake, Waterloo, Iowa.

We Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 670, St. Louis, Mo.

Hotels Need Trained Executives— Nationwide demand for trained men and women; past experience unnecessary. We train you by mail and put you in touch with big opportunities. Write at once for particulars.

Lewis Hotel Training Schools, Room B5-W637, Washington, D. C.

Men or women. Sell foot specialties. Complete line. Big demand. Strictly legitimate. Dignified. Make good living. Have enviable business of your own. Write at once Healthopedic Co., 210 St. Clair Ave., N. W., Cleveland, Ohio.

Big Money Daily, Selling Shirts, Pants, O'alls, Sweaters, Leather Coats, Lumberjacks, Underwear, Hosiery, Play suits! Outfit Free. Nimrod Co., Dept. 85, 4922-28 Lincoln Ave., Chicago.

Get your groceries at wholesale and make \$15 profit a day as my local rep. Pleasant, interest. work. No experience required. Particulars free. Albert Mills, 3959 Monmouth, Cincinnati, Ohio.

MOLDING A MIGHTY CHEST



Get a 46 Inch Chest
Complete Course on Chest Building
ONLY 25c

Learn the real secret of powerful chest building. Know all about the muscles that lift, widen and deepen the chest and broaden the shoulders. Practice the specialized exercises which will make YOUR chest massive and powerful. The greatest analysis of vital, vigorous chest development ever written. Learn the Hindoo religious system of exercises that makes their wrestlers and strong men invincible. A Hindoo strong man and wrestler threw Zybyso in two seconds. Many other methods unknown to the American body builder, are explained. Complete with illustrations. You can build for yourself a Herculean chest. The author, George F. Jowett, built his chest from 32 inches of weakness to 48 inches of colossal muscular strength. Develop your chest with straps of big steel muscle. Fill it full of vital strength energy.

WORTH ITS WEIGHT IN GOLD—GET IT TODAY

To each purchaser will be given a COPY of **THE THRILL OF BEING STRONG**—a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the equal of theirs.

REACH OUT—GRASP THIS SPECIAL OFFER

Jowett Institute of Physical Culture

422 Poplar Street, Dept. 302, Scranton, Penna.

Dear Mr. Jowett: I am enclosing 25c. Please send me the course "MOLDING A MIGHTY CHEST" and a copy of "THE THRILL OF BEING STRONG."

Name

Address

REFLECTING
TELESCOPES
SUPPLIES
ERNEST W. BLANDIN
1207 Columbia Terrace, Peoria, Ill.

ANY BOOK IN PRINT
Delivered at your door. We pay the postage. Standard authors, fine editions, new books, all at biggest savings. Be sure to send postcard for Clarkson's catalog.
FREE Write for our great book catalog. This catalog is a short course in literature and is so used by some of America's leading universities; 300,000 book lovers buy from it. Free if you write now.
CLARKSON PUBLISHING CO.,
1151 CLARKSON BLDG., CHICAGO, ILL.

How to Write
I can make a good penman of you at home during your spare time. Write for my **FREE BOOK, "HOW TO BECOME A GOOD PENMAN."** Your name elegantly written on a card if you enclose a stamp. Write today.
F.W. TAMBLYN, 424 Ridge Bldg., Kansas City, Mo.

The actor portraying the role of the ghost of Katy King entered the cabinet, unseen by the audience, through a door at the back. Fixed to this door was a special lock, the key of which Bucka, as the chief assistant of the Kellar show, had in his keeping at all times. The door between performances was locked to prevent prying eyes seeking to find that which they should not see.

On this particular night of the show, Kellar dramatically worked up the spirit materialization, and in his inimitable manner, announced the entrance into the cabinet of Katy King's ghostly spirit.

Once, twice, three times—the master announced the arrival of the spirit, *but no spirit!* What had happened? Kellar didn't know. Neither did any of the other assistants. Passing from that trick with an appropriate remark about the spirits holding a convention elsewhere that evening, he quickly went into another effect.

Bringing the next illusion to a fitting and sensational climax Kellar, bowing gracefully to the applauding audience, was as angry as a hornet.

His marvelous acting ability and showmanship hid his real feelings from even the members of the company, until the curtain fell on that act.

Kellar, who had worked himself into a frenzy, was beside himself with rage. Loudly he called for Bucka. "What is it you want, Mr. Kellar?" asked the quiet-going Fritz. "Want!" screamed Kellar. "Want! You're fired! You're through!" Then he curbed his anger and continued on with the show. Between tricks he took back all that he had said in anger to Fritz, and wound up by saying, "Remember Fritz, don't let that happen again! See that the ghost gets into the cabinet hereafter."

Years rolled on. The ghost of *Katy King* appeared at every show.

Some twenty-three years afterward, Kellar continued to present the *Katy King* spirit materializing cabinet séance. It still was a big feature with his show. And, maybe this time it was a prank of the spirits, for one night history repeated itself . . . the spirit of poor old *Katy King* couldn't make its entrance into the cabinet.

Again the door to the cabinet was locked!

Fritz was busy rebuilding some stuff for the show and forgot to unlock the door.

This time Kellar didn't grow angry but after the curtain went down, the master magician called his trusty assistant aside, placed his hands on Bucka's shoulders, looked him in the eye and in a pained voice said, "Fritz . . . I am ashamed of you! The same mistake twice in twenty-three years!"

The Greatest Illusion of Them All!

SHORTLY after the above episode took place, Kellar arrived in New York and was royally entertained by members of the craft. One morning several magicians dashed into the magic shop rendezvous of Clyde Powers and each one displayed a circular announcing that at twelve o'clock that night a certain wonder-worker would present, at the corner of Broadway and Forty-Second street, in the middle of the street, the master illusion in which a woman would be levitated into mid air, and remain so, for a certain length of time.

Soon others of the magic clan arrived, each one with a similar circular. Much excitement and comment galore. Into the store walked Kellar. Some of the wizards showed him the circular. His face grew

CHEMISTRY

Complete, practical home-study courses prepared by some of the best-known chemists in this country, including ALLEN ROGERS, B.S., M.S., Ph.D.—Head of Department of Industrial Chemistry, Pratt Institute; L. M. TOLMAN, Ph.D., Vice-president, United Chemical and Organic Products Co.; BRADLEY STOUGHTON, B.S.—Head of the Department of Metallurgy, Lehigh University, and OWEN L. SHINN, Ph.D.—Professor of Applied Chemistry, University of Pennsylvania.

Mail Coupon for Free Booklet

INTERNATIONAL SCHOOL OF CHEMISTRY
Division of the
International Correspondence Schools
Box 6204-F, Scranton, Penna.

Without cost or obligation, please send me full details of your home-study course in

Analytical Chemistry Metallurgical Chemistry
 Chemical Engineering Short Chemistry Course
 Industrial Chemistry Pharmacy

Name

Address

Choice of 1200 Newest RADIO VALUES

SEND for our 1930 catalog. Filled with amazing values in screen grid radios, push pull audio, consoles, kits, parts. All standard makes and guaranteed merchandise.

FREE

WESTERN RADIO MFG. CO.
1228 W. LAKE ST. CHICAGO ILL.

GEARS

In stock—immediate delivery Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue-prints and inquiries.

Write for Catalog No. 40
Chicago Stock Gear Works
769-773 W. Jackson Blvd., Chicago, Ill.

AVIATION Information FREE

Send us your name and address for full information regarding the Aviation and Airplane business. Find out about the many great opportunities now open and how we prepare you at home, during spare time, to qualify. Our new book "Opportunities in the Airplane Industry" also sent free if you answer at once.

AMERICAN SCHOOL OF AVIATION
Dept. 1429 3601 Michigan Ave. CHICAGO

JENKINS Watch-Lighter \$4.97

Guaranteed 6 Jewel watch and new design elegant cigarette lighter in one. Watch is of excellent Swiss make, tested and adjusted. Two years' written guarantee. Radium dial—tells time in dark. Lighter is of sturdy construction and can be opened with one hand. Gives instant flame. Large fluid capacity. Easily re-assembly. Elegant covered case. **SEND NO MONEY.** Pay on delivery \$4.97 plus postage. Satisfaction guaranteed. **JENKINS, 623 Broadway, New York, Dept. 12-A-65.**

Gasoline Engines, Steam Engines, Motors, Dyna-Motors, Lathes, Drills, Gears, Books, Blueprints, Pulleys, Hangers, Bench Saws, Display Tables, Model Makers' Materials and Supplies.

Catalog sent postpaid 20c, refunded first order
HOWARD ENGINE & MFG. CO.
2415 N. Ashland Ave. CHICAGO, ILL.

SQUAB BOOK FREE

Breed squabs and make money. Sold by millions. Write at once for free 48-page book beautifully printed in colors telling how to do it. **YOU will be surprised.** **PLYMOUTH ROCK SQUAB CO.**
506 H St., Melrose Highlands, Mass.

purple with rage. And no wonder, for the levitation mystery was his original illusion, and one that had met with sensational success, wherever the master illusionist had presented it.

Telephones became busy, and the news of the proposed open air mystery show was told and retold. The mysterious illusionist, whoever he was, for none of the conjurers knew him, was at least assured of a large audience for his midnight performance, at the busiest corner in the world.

Three hours or so before the scheduled time, the magician enthusiasts began to arrive. I was there, too, and accompanying me was Kellar, La Vellma, Rush Ling Toy, Leon Caesar, and many other mystics who were interested in this unique demonstration.

The time dragged slowly. Minutes passed into hours, and the hours seemed unusually long. More than five hundred people, many drawn by the sight of the magic



Finally the hour of twelve arrived . . . and passed.

crowd, stood around thinking that something had happened . . . just what, they knew not. Several of the more talkative magicians informed those who asked what was about to take place.

Finally the hour of twelve arrived . . . and passed.

Nothing happened. Disappointment was written all over the strained, expectant faces of the magic fans.

Suddenly, someone hit the nail on the head as he asked, "What date is it?" "March 31st," replied another.

"It's after midnight . . . this is April 1st, isn't it?" queried the fellow.

"April fool!" yelled one of the crowd.

A roar went up from the crowd . . . seemed as if a million throats had shouted in unison.

We couldn't resist laughing at the way we were all taken in by the cleverly planned hoax.

The tricksters had been tricked.

Another article by Dunninger relating how another famous magician was fooled, will appear in an early number.



Station WISN operates from S. of E. Also amateur Station W9SO.

OSCAR WERWATH
Electrical Engineer
Pioneer in Electrical Training for 25 years.

NOW I will train YOU for BIG PAY in ELECTRICITY

RIGHT IN YOUR OWN HOME!
Just As I Have Trained Over 25,000 Graduates In My Great ELECTRICAL SCHOOL!

BIG HOME LABORATORY Without Extra Cost



Full-sized laboratory equipment (Not toys) that you can't duplicate for \$60.

SPECIAL PATENTED Laboratory Equipment

that cannot be secured elsewhere. Makes fascinating sport of laboratory experiments. Amazingly easy to use.



LEARN BY DOING



Work on actual motor, switchboard, circuits, and full-sized electrical equipment. Get Training that is PRACTICAL.

NOW, through my Extension Division, I will train you for advancement and MORE PAY in Electricity without your leaving your home! You will get the same course, the same methods, the same faculty of skilled engineers that have made The School of Engineering internationally famous. Behind your training will be an institution specializing in Electricity—a fully established college, recognized by the U. S. Gov't. Thousands of S. of E. graduates now employed in important positions with largest concerns in the country.

ELECTRICALLY TRAINED MEN Earn \$3,000 to \$10,000 a Year

In Radio, Television, Aviation, Automotives, Refrigeration, Moving Pictures, Super-Power, Lighting—Electricity is the key. Big manufacturers are pleading for men trained in Practical Electricity. Salaries of \$3,000 to \$10,000 a year now are common. Here is a vast field for you, with unlimited opportunities. Now is the time. Start on the road of Electrical Training that leads to bigger pay—bigger opportunities—and SUCCESS!

EARN AS YOU LEARN

Cash in on your Electrical Training while you're learning. Many students report increased earnings, advancement, even while studying. Train in your spare time at home. Employment Service renders FREE aid for life. Lifetime Consultation Service. Many exclusive features available nowhere else. Mail the coupon today for full particulars.

FREE!

Send Coupon TODAY for illustrated Catalog—"Practical Electricity—the Key to Success"—and full details of Extension Division Training.

MAIL COUPON NOW!

Extension Division, Dept. 23
SCHOOL OF ENGINEERING
Milwaukee, Wisconsin

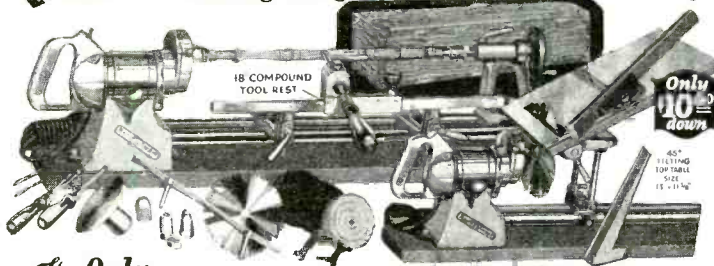
Please send me without obligation FREE illustrated catalog, "Practical Electricity—the Key to Success," and details of Extension Division training.

Name _____
Address _____

EXTENSION DIVISION
SCHOOL OF ENGINEERING
Dept. 23 Milwaukee, Wis.

The New 1930 Waco Red Jacket INVITES YOU TO BE A REAL CRAFTSMAN

Enjoy the thrill of your new skill in making things this modern motorized way!



Above—45° Tilt Top Table Band Saw
Below—Powerful Portable Master Drill Motor

The Only Complete Interchangeable Power Shop - Improved Features - Exclusive Advantages

Now you can do the things you have long wanted to — at home in your own modern motorized workshop — with this new, improved Waco Red Jacket Wonder-Shop. No other compares with it in complete, interchangeable, power features, efficiency, exclusive advantages and quality.

Join the Happy Family of Waco Wonder-Shop Workers
Wm. L. Aylward, Waco's president and nationally known craftsman, has developed his own life-time hobby into a cooperative association of thousands of amateur and professional craftsmen. He invites you to join. He will instruct, guide and help you.

The new 1930 Red Jacket Combination brings you the powerful Red Jacket Master Drill Motor, Wood Turning Lathe (capacity 9" x 36"), Compound and 18" Rests, Tilt-Top Mitre Saw, Sander Disk, Scroll and Jig Saw, Hand Saw, and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to light socket. Converts your work bench into a complete private tool and machine shop. Add new special equipment any time as desired.

Avoid Imitations! Waco Red Jacket is the pioneer—foremost in the field—sold only direct from the factory; not through stores.

Professional Quality and Efficiency. The choice of professional as well as home craftsmen. Red Jacket Shops are making money for their owners all over the country. You can be one of the Red Jacket Guild chain and market your products if you want under our new plan.

TODAY! Send This Coupon for Interesting Facts FREE!

Detailed descriptions and specifications. You will be surprised and fascinated by the possibilities afforded. Just see what you can make and do. Fill in and MAIL TODAY.

WACO TOOL WORKS, Inc.
5216 W. Kinzie Street, Chicago, Ill.
Manager, Dept. 212. Please send me all free information and literature on Red Jacket Assemblies and FREE Services.

Name _____
Address _____
City and State _____

Make It Yourself!



Special Craft Course FREE

All there is to know about handicraft methods, raw materials, carving, turning, sawing, designing, etc., etc., is taught you by correspondence FREE.

FREE Blue Prints

The Waco Guarantee
If it is not what you want when you get it—send it back.

You Can Buy NOW on Easy Terms.

Only \$10 down. Easy monthly payments. Liberal discount for cash. No hardship to own a Waco Red Jacket.

WIN \$1000 CASH

ANY NAME THIS

This Offer Open to Every Reader of this Announcement

Have you sent a name? If not, do so at once. It makes no difference who you are or where you live we want you to send us a name for this new and unusual shampoo. Whoever sends the most suitable name will win the one thousand dollars—nothing else to do. **Just write or print the name on any kind of paper—neatness don't count.**

NOTHING TO BUY — NOTHING TO SELL

You can use a coined word or a word made by combining two or more words, such as "Sungleam," "Youthglow," etc., or any other name you think of. Your name might suggest the handy new container, our latest sanitary tube from which the Shampoo is simply squeezed out, thus eliminating waste and trouble caused by the old-fashioned liquid soap in bottles. There

is nothing to buy or sell—simply the person sending the most suitable name will receive \$1,000 cash prize, or if prompt \$1,100 in all.

Any Name May Win

No matter how simple you think your suggestion is you cannot afford to neglect sending it at once. Any name may win.

Win this \$1000 cash prize by a few moments' thought. How can you earn this amount of money easier or more quickly? Remember, there is no obligation! The person submitting the winning name will have nothing else to do to win the \$1000 and the extra \$100, if prompt. In choosing a name bear in mind this shampoo is marvelous for cleansing the hair and scalp. It is designed to bring out the beauty, lustre and natural gloss of the hair. Remember, too, how handy the new sanitary tube is for traveling, no bottle to leak or spill, no cake of soap to lie around and collect germs. The only thing necessary to win is to send the name we choose as the best and most suitable for this shampoo. Only one name will be accepted from each contestant. This unusual offer is only one of a number of offers embraced in our novel distribution plan of ultra toilet goods, whereby those taking part may win any one of a hundred other prizes, the highest of which is \$8,000.00 cash. By participating in our distribution plan the winner of the \$1,100.00 cash prize may win an additional \$8,000.00, making a total of \$9,100.00. Everyone sending a name, regardless of whether it wins or not, will be given the same opportunity to win the \$8,000.00 or one of the other 100 cash prizes. **Get busy with your suggestion at once—do not delay!**



\$100 EXTRA FOR PROMPTNESS

To get quick action we are going to pay the winner an extra \$100.00 for promptness, or \$1,100.00 in all—so send your suggestion AT ONCE!

CONTEST RULES

This contest is open to everyone except members of this firm, its employees and relatives. Each contestant may send only one name. Sending two or more names will cause all names submitted by that person to be thrown out. Contest closes April 30, 1930. Duplicate prizes will be given in case of ties. To win the promptness prize of \$100 extra, the winning name suggested must be mailed within three days after our announcement is read.

PARIS AMERICAN PHARMACAL CO.,
911 McCune Bldg., Des Moines, Iowa.

Enclosed with this coupon on separate sheet is my suggestion for a name.

Date this announcement was read.....

Date my suggestion is mailed.....

Name.....

Address.....

NOTE: Being prompt qualifies you for the extra \$100.00 as outlined in this announcement.

Christmas Gifts from the Home Wood Turner

By H. L. Weatherby

(Continued from page 713)

at the five-and-ten-cent store, should be filed or hammered flat, front and back, to keep the ornament from turning. Painting should be done with bright lacquers or enamels, and in case a transfer design is used a coat of varnish should cover it.

Hat Rack

HAT RACKS similar to the one illustrated are right popular now, and anyone with any turning ability will be able to turn this simple article. It should be gaily painted and zigzag modernistic stripes can be added to further the decorative idea. The feet are made by hand and glued in the holes bored for them.

Ash Trays

A SET of ash trays for bridge tables will make an acceptable present. This job calls for face plate chuck turning which has been explained before. It would be well to turn the bottoms of the entire set first, and then make a chuck to fit this bottom and turn the top or inside. The semi-circular grooves can be easily cut with a sharp half-inch bit by placing the lips of two of the turned trays together and boring in the crack. Short pieces of half-inch brass tubing split lengthwise and filed to fit should be tacked into these grooves. A Chinese red or jade green enamel will be the most satisfactory colors to use.

Fruit and Nut Bowls

THE fruit bowl is turned and built up in three sections. The center or upright is simple turning with a tenon on each end to glue into the base and bowl. The bowl will call for a large piece of wood mounted to the face plate, hollowed out and rounded off in one operation, or the hollowing out may be done and then the piece turned around and chucked for the rounding off process. In either case, due to the size of the piece, difficulty may be experienced.

The base has a hollowed out place in the bottom into which melted lead should be poured on completion, to keep the bowl from being top heavy.

The finish should probably be mahogany or walnut with a rubbed varnish finish. After gluing the parts together, a piece of felt glued to the base will complete the job.

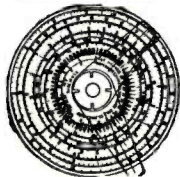
The Sewing Stand

THE sewing stand will be a very useful present to mother, wife, or sweetheart, and may bring results in darned socks and sewed-on buttons.

It has a place for the thimble, a pin-cushion, button tray, and rods for spools of thread. The table must not be glued, in order to allow it to revolve freely, and it should be made from a piece of plywood to prevent its warping.

The rods are made from 3/16 inch dowels, or they may be planed by hand from hardwood squares and driven through a 3/16 inch hole to round them up. Great care must be taken to set them square, in gluing.

The construction of the post and base need no explanation. The base should be loaded as with the fruit bowl. The pin cushion hollow is packed with cotton and a piece of cloth is tacked over the top to form a cover. The finish may either be stain and varnish or painted.



THE MIDGET SLIDE RULE

Instantly adds, subtracts, multiplies, divides, solves proportion, gives all roots and powers. Logarithms, Sines, Cosines, Tangents, Cotangents, etc. Also gives decimal equivalents, lettered and numbered drill and tap sizes.

The Engine-divided scales are on whitefinished aluminum and are grease and water-proof. Diameter 4". Price with Instruction Book, \$1.50. Pocket Carrying Case, 50c extra. Cash or C.O.D. Catalogue free. Your money back if you are not satisfied. **GILSON SLIDE RULE COMPANY, V. Stuart, Florida** (SLIDE RULE MAKERS SINCE 1915)

NEW SCIENTIFIC WONDER



10c 3-25c **BIG FUN BOYS** You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. **FREE—PKG. RADIO PICTURE FILMS.** Takes pictures without camera. "You'll like 'em." 1 pkg. ea. 25c order. **MARVEL MFG. CO., Dept. 83, NEW HAVEN, Conn.**

TRAVEL FOR "UNCLE SAM"

Railway Postal Clerks



Steady Work — No Layoffs — Paid Vacations
Many Other Government Jobs Obtainable
MEN — BOYS 18 to 50

\$158 to \$225 a Month

MAIL COUPON BEFORE YOU LOSE IT

FRANKLIN INSTITUTE, Dept. C-177
Rochester, N. Y.

Sirs: Rush to me without charge—copy of 32-page book, "How to Get U. S. Government Jobs," with list of positions obtainable and full particulars telling how to get a position.

Name

Address

Have Sport With This Buck Boat

(Continued from page 718)

boat being used. The inside end of each rod passes through the 1 1/2 by 2 1/2 inch upright and a pin put through a hole to hold it in place. These uprights are fastened to the bottom of the boat by a sheet iron collar cut and bent as shown at the right and the upturned portions are tacked to the post while the flat piece is tacked to the boat bottom. A strap iron brace is also provided for the front side, to set at an angle, the top being fastened with a lag screw and the lower end with a screw which is too short to pass through the boat bottom. This is, briefly, the manner of making the apparatus. Now for the details.

The two bicycle wheels should have the rims, spokes and hubs in good shape. If the rim is a bit wobbly straighten it by tightening some of the spokes. Then give the rim, if it is wood, two liberal coats of paint and let dry.

Twenty-four paddles will be needed for the two wheels. Each one is cut from a sheet of rather heavy galvanized iron 4 inches wide and 8 inches long. The paddle itself is 4 inches square and a 1/4 inch wide projection extends for another 4 inches with two triangular pieces left when the cutting is done for braces. These are bent on the dotted lines up to right angles when the paddle has also been bent to shape and are soldered in place as indicated. These braces will give the paddles much greater strength. The narrow tongue is provided with two small holes for screws.

Space off each rim into 12 equal parts and then fasten the paddles in place with two wood screws. By pounding these tongues with a round headed hammer you can get them to lie quite snugly in the concave side of the rim. You can cut small notches in the bottom edge of each paddle for the edges of the rim if they will not fit tight enough otherwise. This done, apply paint or varnish to the edges of the tongue to keep out water from underneath. This would cause warping of the wood possibly, and perhaps rusting of the metal.

With the two wheels finished, fit the upright supports on the sides of the boat, about 2/5 of the distance back from the front end. These should be 1 inch thick, 2 1/2 inches wide and high enough to bring the lower edges of the wheel rims about 4 inches under the water line when the boat is in use. In doing this the paddles themselves will extend two or three inches below the bottom of the boat.

Now bore one hole through the top of each piece just large enough for the rod. If you have access to a junk pile find, if possible, a short piece of iron or brass pipe which has an inside diameter large enough for the rod to fit through it. If you can find such a pipe, bore the hole through the upright big enough for this pipe. Cut off a piece long enough to extend through it, then drive it to a fit. This will make an excellent bearing and the friction will be kept down. With the wood bearing even when the wood is well soaked with oil, water getting on it will possibly cause swelling and hard turning.

This pipe bearing idea can also be used with the upright bearings in the middle of the boat. Be sure the four bearings are in line and all exactly the same height. Insert the rods now and make sure that they turn easily. Nail or screw the uprights to the side of the boat. Place a washer between the pin and the inside upright bearing when assembling. Then

FREE

Get two wonderful books by mailing coupon below.

You get these Genuine High Quality, Imported Drawing Instruments, 14 Other Tools and a Drafting Table—all included in my Home Training Course.

These Two Books—
Mail Coupon!

Yes, Absolutely
FREE



2 Books FREE



Just Send the Coupon Below!

Jobs for Draftsmen in Great Industries—Learn At Home

Automobiles—Electricity—Motor Buses—Aviation—Building Construction.

There are jobs for Draftsmen in all of these Industries and in hundreds of others.

Aviation is expanding to enormous proportions.

Electricity is getting bigger every day.

Motor Bus building is becoming a leading world industry.

Building of stores, homes, factories and office buildings is going on all the time.

No structure can be erected without plans drawn by a draftsman. No machinery can be built without plans drawn by a draftsman.

I train you at home, in Drafting. Keep the job you have now while learning drafting.

I will train you in drafting right where you are in your spare time. I have trained men

who are making from \$3,500.00 to \$9,000.00 a year. There is a big future for draftsmen because you plan and supervise the work of others, or you go into business for yourself. Get started now toward a better position, paying a good, straight salary, the year around. Comfortable surroundings. Inside work.

Earn As You Learn

I tell you how to start earning extra money a few weeks after beginning my training.

Employment Service

After training you I help you to get a job without charging you a cent for this service. Employers of Draftsmen come to me for men because they know that Dobe Trained Men make good as they have learned drafting by actually doing the work themselves, in a practical way. Employers know they are not taking chances on men trained by me.

If You Earn Less Than \$70.00 a Week Ask for My 2 FREE Books



Mail this coupon, at once. Get "My Pay Raising Plan" and "Successful Draftsmanship". Both of them point the way to Success. You owe it to yourself to find out what a big opportunity there is in practically all industries, for Draftsmen. These two books are Free. They come to you post paid. Mail the Coupon for them TODAY.

ENGINEER DOBE

1951 Lawrence Ave., Div 14-29, Chicago

FREE BOOK COUPON

ENGINEER DOBE

1951 Lawrence Ave., Div. 14-29, Chicago

Send me free of all cost your book, "Successful Draftsmanship", also plan to earn money while learning and proof of big money paying positions. Also your new book "My Pay-Raising Plan."

Name

Address

Post Office State

\$5,000.00 Worth of Prizes



I am going to give away, absolutely free, an 8 cyl. Studebaker Sedan to someone who answers this ad. It will be delivered thru the nearest Studebaker dealer, or winner may have its full value in cash, \$2,250.00. This offer is open to anyone in the U. S. outside of Chicago, and is backed by a Big Reliable Company, which has already given away thousands of dollars in cash and prizes to advertise its business.

Solve This Puzzle

There are many objects in the picture of the circus to the left. See if you can find 5 that start with the letter "C." When you do this, write them on a piece of paper together with your name and address and send it to me right away.

\$550.00 Given for Promptness

I am also giving away a Chevrolet Sedan; Victrola; Shetland Pony; Seven Tube Radio; Gold Watches and many other valuable prizes and Hundreds of Dollars in Cash, including \$550.00 for promptness. First prize winner will receive the Studebaker Sedan and \$550.00 cash, or \$2,800.00 cash. In case of ties duplicate prizes will be awarded. Find 5 objects in the picture above starting with the letter "C" and send them to me right away with your name and address plainly written and I will send you full particulars. \$5,000.00 worth of prizes. Everybody rewarded.
L. E. WILFERD, Mgr. Dept. 3799 315 South Peoria Street, Chicago, Illinois

\$150 to \$300 Monthly Profit—30-Day Trial

Easy Terms

Pays for Itself Without Expense to You



HB 8-Hour Battery Charger insures big year round profits. Charges batteries in 1/3 the time required by others. Starts you in best paying business in automobile field. Requires no special expense, uses small space. 30-Day Trial at our risk under absolute money back guarantee. Write today without obligation to Hobart Brothers Co., Box S-129, Troy, Ohio.

ELECTRICAL ENGINEERING

BOOKS SENT FREE

New Edition Containing 100 Pages on
A-C RADIO!

8 FLEXIBLE MAROON VOLUMES

4300 pages, 3200 illustrations, deluxe gold stamped binding. Index in each book, general index in Vol. 8. Covers every subject in Electricity—Light, Power, Transmission, Generators, Motors, Switchboards, Radio, Telephone House Wiring, Railways, etc.

We're glad to send a set to your home to examine and use as your own for 15 days—to show you that here is the most up-to-date and complete work on Electricity ever published. Written by CROCKER of Columbia U.—MILLIKAN of Calif. "Tech."—HARRISON of General Electric and 26 other noted Electrical Engineers. Starts off with elementary Electricity in simple, non-technical language for the beginner and includes every Engineering branch for use of experts on the job.

Complete Electrical Reading Course

Electricity, the biggest industry in the world, continues to grow the most rapidly. And it offers better jobs, bigger salaries and a brighter future than any other field. Every dollar, every hour invested in learning Electricity will come back to you a thousand-fold. Learn in spare time with these books at one-fifth the cost of trade courses. Outline for organized study, quiz-questions and a year's free consulting membership in the American Technical Society included without extra cost, if you mail coupon immediately.

Look it up!

Thousands of these sets are used as R. F. F. E. N. C. E. books by men employed in electrical, building construction and allied lines. The JEFFY INDEX puts the answers to 20,000 questions right at your finger tips.

AMERICAN TECHNICAL SOCIETY
Dept. E-925
Drexel Ave. & 58th St., Chicago



American Technical Society
Dept. E-925 Drexel Ave. & 58th St., Chicago

Please send for 15 days' free trial 8-volume set of Electrical Engineering just off the press, subject to return, if I wish to. (I pay the few cents express charges on receipt of books, you pay express if returned.) If I decide to keep them, I will pay \$2.00 after 15 days trial, then \$3.00 a month until \$34.80, special advertising price, is paid, after which books become my property. Year's Consulting Membership to be included free.

Name.....
Address.....
Employed by.....
Employer's Address.....



Magnified 225 Diameters

This is what the tip of a fly's leg is like when seen through the

Ultralens Microscope

At last a high powered microscope is within the means of all who wish to study, observe and experiment with the vast world of minute objects invisible to the naked eye. Such fun it is, as well as educational. No technical training required, yet hundreds of scientists and teachers are using this instrument. Gives enormous magnification and perfect definition. Send \$5.00 for complete outfit. Send for descriptive literature.

\$5.00 for Complete Outfit Prepaid

ROAT & LOHMAN, Dept. 203, Milton, Pennsylvania

SPRUCE STRIPS

All sizes and quantities
Perfect size and finish
Write us and save
AIRPLANE SPRUCE CO.
4046 N. Keystone Ave., Chicago, Ill.

put one wheel over each outer rod end and fasten in place. This can be done by drilling a hole through both wheel hub and rod, or by slightly deforming the rod at this point and filling the hub around the rod with melted babbitt. Be sure the wheel will turn true when the rod is revolved. In bending the rods to shape the sharp right angle bends can be better formed if the rod is heated at these points to a cherry red. Care must be taken to keep the rod perfectly round at least at the portions which are to pass through the bearings.

For greatest comfort there should be room between the boat bottom and the arms at the down stroke for the user's legs to pass under. A seat, built at a comfortable distance behind the rods will in some cases prove satisfactory; on others the operator will prefer to sit flat upon the boat bottom, or stand upon his knees. There is still plenty of room ahead of the mechanism for one or possibly two people and three wide boards set upon cleats nailed to the boat's sides can very easily be put in.

Several washers placed between the wheel hubs and the sides of the boat will prevent rubbing of the paddles although if the outside uprights are quite thick, this will not be necessary.

If the water in which you are to use the boat is quite deep and of uniform depth without any hidden obstructions, you can easily add to the side and area of the paddles by soldering a 4 by 6 inch extension to each one. This will cause the wheels to turn harder, but will give considerable more "push" to the boat.

This same plan can be used with almost any boat but the home-made kind with straight sides will lend itself best to this arrangement. On the side of the boat near the front, letter on, with paint of a contrasty color, some suitable name. Then look forward to a lot of pleasant hours using it. It is an exceptionally good boat to fish in because you do not need to worry about the paddles floating off.—Dale R. Van Horn.

In RADIO NEWS for December, 1929

THE NEW VOICE OF EDUCATION—How modern speech amplifier apparatus is being used in one of the new high schools, and what such installations mean in a money-making way for radio servicemen.

A SOCKET POWER RECEIVER FOR DIRECT CURRENT DISTRICTS—Complete circuit and constructional detail of a receiver designed by David Grimes and intended for batteryless operation where the line supply is d.c.

A UNIVERSAL METER—Circuit and construction details of a testing meter for the experimenter and radio serviceman.

HAMS TAKE WINGS—Ralph P. Worden tells how the Cleveland Wireless Association maintained constant contact over the air meet race course with the judges' stand.

WHEN CAMERA MEETS "MIKE"—Carl Dreher discusses the intricacies of radio and sound technique in connection with the production of talking movies.

FOR THE HOME SET BUILDER—Circuit and constructional details of three of the most advanced a.c. operated broadcast receivers.

Make Big Money Learn Autos



AT HOME!

IF YOU'RE earning a cent less than \$60 a week, send for my Free Auto Book. See how you can get complete instruction at home, covering every branch of Auto work. Learn how you can prepare for the big opportunities—jobs paying up to \$5,000 a year. Clip coupon for full particulars.

Earn up to \$100 a Week

Whether you're an experienced auto man or not—if you've just had common schooling, find out about this new easy, practical "Job-Way" Training. Reach out my employment department helps you get the good jobs. Learn how you can make real money in spare time without giving up your present position. Get all these facts by simply mailing coupon—now.

AVIATION COURSE also included FREE OF Extra Charge

Auto Book Free

MAIL THIS FOR FREE BOOK

Send at once, your FREE Book "Auto Facts." Also full particulars of "Job-Way" Training, and AVIATION COURSE Offer. No obligation on my part.

Name.....
Address.....
Age..... Occupation.....

HOW TO OBTAIN A Better Looking Nose! Improve your personal appearance



My new Model 25 Nose Shaper is designed to improve the shape of the nose by remoulding the cartilage and flesh parts, safely and painlessly. This is accomplished thru the very fine and precise adjustments which only my patented Model 25 possesses. Results are lasting. Can be worn at night, or during the day. Money refunded if not satisfied after thirty days' trial. Write for free booklet to

M. TRILEY
Pioneer Nose Shaping Specialist
Dept. 77 Binghamton, N. Y.

DEAFNESS IS MISERY

Multitudes of persons with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they Use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.



A. O. LEONARD, Inc., Suite 685, 70 5th Ave., New York

I CHALLENGE

you that I will teach you, by mail, in one lesson, the simplest, shortest method. Not telepathy. You can read one's mind to a dot, by only looking in the eyes of Partner, chum, sweetheart, etc. All for \$1.00. Praised by New York, Boston, Montreal Police chiefs; colleges; Thurston; Blackstone, etc. If fake, let them arrest me.

A. HONIGMAN, Dept. 35

Sta. E. P. O. B. 85 Montreal, Can.



This BOOK 10¢

Amaze and Mystify Your Friends!

Earn money at Clubs and Parties. No skill required. It's easy. "The Book of 1000 Wonders" tells how and teaches you many startling tricks of Magic. Also contains a complete catalog. Send 10c. today.

LYLE DOUGLAS

Station A-3 Dallas, Texas

\$4.99 22 Cal. Blank Automatic

WITH You need no license or permit to own this 6 shot Automatic. Use for fun or CART-self-defense. Keeps away RIDGEstraps, frightens thieves, scares away dogs—A real home protector. Foolproof friends. Same as an expensive automatic in construction, finish, appearance, durability; automatic magazine loading and ejection of cartridges, instant and powerful report. Guaranteed absolutely safe. Send no money. Pay on delivery \$4.99 plus shipping charges, 100 cartridges. **JENNINS, 683 Broadway, New York, Dept. 12-J-65**



Measuring Heights and Depths with Sound

By Botho Von Romer

(Continued from page 692)

Seconds are recorded by another pen. After the bomb explodes, the ship operator informs the two stations by radio and they switch on their amplifiers in order to receive the sound impulse from the bomb. The amplifiers are used to step up the sound of the bomb received by the hydrophones to such a volume as to trip a relay and start an automatic key. The shore operator throws over a switch and three telegraphic dashes are sent back to the ship. Both shore stations must be tuned to the same frequency, so that the ship's receiver can hear them without changing the dial setting.

These three radio dashes from each shore station are recorded on the chronograph tape and the exact time is noted. As sound travels under water with a speed of about 1,477 meters per second, the distance to both stations is found and the exact position of the ship can be located on the chart.

Model Blueprints

Correct—Easy to Follow

- 1-2 Horizontal Steam Engine details.....set \$1.00
- 3-4 Boiler construction for aboveset \$1.00
- 5 880 Ton Bark..... 50c
- 6-7 Twin Cylinder Steam Engine and Boiler.set \$1.00
- 8-9 Gasoline Fired Locomotiveset \$2.00
- 10-11 U. S. S. Constitution, "Old Ironsides"...set \$1.00
- 12 13th Century Man-of-War 50c
- 13-14 Chinese Junk.....set 50c
- 15-16 Electrically driven Automobileset \$1.00
- 17 Roman Ballista..... 50c
- 18-19 Simple Steam Engine, set 50c
- 20-21 How to Build a Reflecting Telescope... \$1.00
- 22 "Santa Maria," complete 50c
- 23-24 Model U. S. S. Portsmouthset \$1.00
- 25 Building a Model Tugboat 50c
- 26 Twin Cylinder Marine Engine 50c
- 27-31 U. S. S. Truxton..... \$2.00
- 32 Sopwith Biplane..... 50c
- 33 Speed Boat..... 50c
- 34 Airplane Engine..... 50c
- 35-36 Motor Winch..... 75c
- 37-38 Vertical Steam Engine \$1.00
- 39 Cannon 50c
- 40 Steam Roller..... 50c
- 41 Prairie Schooner..... 50c
- Lincoln Sport Biplane (man-carrying) \$6.75
- Gerber Monoplane (man-carrying) \$1.00

Send Orders to

BLUEPRINT DEPARTMENT
SCIENCE AND INVENTION
381 Fourth Avenue
New York City

Campbell's Infra-Red Ray Lamp

Relieves Pain Quickly



**Write for
Factory
Price**

**30 Days
Home
Trial**

Relieve That Troublesome Ailment

Write at once and let me tell you how to relieve that troublesome ailment with Infra-Red treatments in your own home. The Campbell Infra-Red Ray Lamp throws out mild beams of Infra-Red Rays which penetrate deeply into the tissues and bring a soothing *internal heat*—best, because it works where the congestion is, and restores active blood circulation. Medical authorities say most ailments are due to congestion—relieve the congestion and you relieve the ailment because nature itself does the healing through active, normal blood circulation.

Why Suffer Needless Pain?

Are you troubled with Sinus Irritation, Sore Throat, Neuralgia, Bronchitis, Rheumatism, Neuritis, Lumbago, Tonsilitis, Catarrh, Ear Trouble, Gall Bladder trouble or similar ailments? Just let me send you this wonderful lamp on approval. Use thirty days according to directions and see if it does not bring you wonderful results.

Harmless You or anyone in your home can use the lamp on instant notice. It is on an adjustable stand—easily carried to any room—easily placed in any position. Leading health authorities recommend it. Letters from satisfied users everywhere tell of wonderful results. Just a few treatments will surprise you. First cost only cost. Connect with any electric light socket.

Easy Payments Shipped by parcel post or express direct to you from factory at lowest cost. Don't delay—if you or some friend have some troublesome ailment. Write and let me send it at once.

Get Our Book On Infra-Red Rays

This book quotes leading medical authorities and hundreds of users. Mention your ailment when writing and we will send you free valuable suggestions on how to treat it with Infra-Red Rays. Thirty day trial period.

WILLIAM CAMPBELL CO. Dept. 1050 ALLIANCE, OHIO

Win \$3,500 OR BUICK SEDAN and \$1,500 Extra Cash in Our Great New Advertising Campaign

Santa Claus is a jolly fellow who makes millions happy. But good old St. Nick was never as generous as we are in this great new advertising campaign. In the past we gave thousands of dollars in awards. F. Sieglinger won \$3,000, Edna Ziler won \$1,975, Tillie Bohle won \$1,500 and many others. Now better than ever. Enter now and

Find the Real Santa Claus

Look sharp. Can you find the real Santa? The pictures all look exactly alike, but only 11 are the same—one is different. He is the real Santa Claus. Maybe the difference is in the face, or cap or tassel. Sharp eyes will find him. Can you? Write the number on postal card or letter and mail to me today.

25 Grand Prizes
\$5,000 Given



L. M. STONE, Mgr., 844 W. Adams St., Dept. 110, CHICAGO

\$1,500 Extra Cash is For Promptness

If you are prompt and win First Prize I will give you \$1,500 as extra prize just for promptness.

Send No Money

Nothing to buy now or later. Doesn't cost a penny to win. You may be the next one.

Mail Answer Now

Promptness pays extra cash. You can share in this great advertising cash distribution. All who take an active part are sure to be rewarded. Some one wins \$3,500 First Prize Money—Why Not You? Duplicate prizes in case of final ties. If you want to win write at once for information. You have nothing to lose.



How to Learn AVIATION AT HOME

MAIL THE COUPON



Next to actual practical work in ships, the new Extension Course now being offered by Universal Aviation Schools is the best possible initial aviation training you can secure. The knowledge and experience of trained men now instructing in the world's largest system of aviation schools has been combined in the preparation of this course. Entire cost of course credited if Universal Flying Course is taken later. Get the facts. Learn how you can master aviation theory at home. Clip the coupon, fill in and mail.

UNIVERSAL AVIATION SCHOOLS
 Division of The Aviation Corporation
 1158 Boatmen's Bank Building, St. Louis, Mo.
 Please send literature describing Universal Aviation School's Extension Home Study Course.

Name _____ Age _____
 Address _____
 City _____ State _____

SEND FOR THIS FREE BOOK OF SELF HELPS

New practical working methods for Aviators, Radio Men, Inventors, Engineers, Mechanics, Automobile and Battery Men, Electricians, Contractors, Carpenters, Painters, Decorators, Artists, Advertisers and other technical men. Over 200 books covering practically all kinds of mechanical work. Write for your free copy today.

FREDERICK J. DRAKE & CO., Publishers
 510-179 No. Michigan Blvd., Chicago

Does YOUR Job Pay \$50 Every Week?

As a *Railway Postal Clerk* you can average \$53 a week the year 'round. I help you get the job if you are a citizen—18 to 50. Steady work, pleasant, travel, vacation and sick leave with pay, regular advancement.

Send for My FREE BOOK

Tells how I help you get this and other Civil Service Jobs: Post Office, Custom House, Internal Revenue, or Panama Canal Clerk; City or Rural Carrier, etc. For years I was Secretary-Examiner of Civil Service Commission; have helped thousands. SEND TODAY for my FREE 32-page book.

ARTHUR R. PATTERSON
 Civil Service Expert
 Patterson School
 9012 Wisner Bldg., Rochester, N. Y.

Print Your Own

Cards, Stationery, Advertising, Labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. Junior Press \$5.90, Job Press, \$11, Rotary \$149. Do popular raised printing like engraving with any of our presses. Print for Others, Big Profits. Pays for itself in a short time. Easy rules sent. Send for catalog of presses, outfits, and all details. The Kelsey Co., B-47, Meriden, Conn.



WOOD OF ALL KINDS

Samples of 33 rare woods \$2.00. 20 cabinet and 20 inlay \$1.75, or your choice \$1.00. Sets labeled and postpaid. Send for Price list.

CRAFTSMAN WOOD SERVICE
 T-715 E. 62nd St. CHICAGO

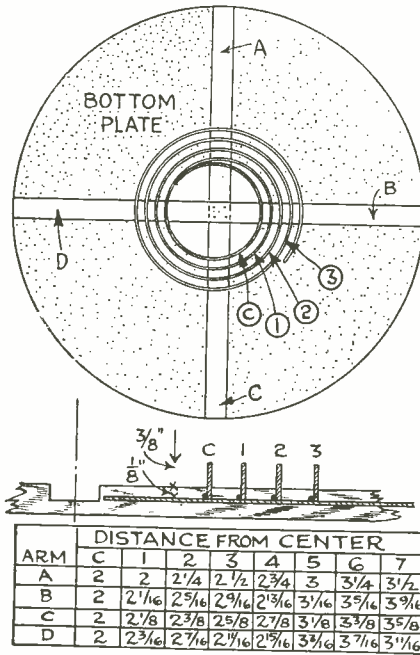
Home Movies

By Don Bennett

(Continued from page 712)

Developing the Movie Film

ABOUT a half gallon of solution is sufficient for filling the tank with developer, and after the rack has been filled with film, starting from the inside, the rack is placed in the tank and the de-



Details of film rack. Fig. 7.

veloper poured in the center hole. Normally exposed film will develop in from five to seven minutes at 65 degrees Fahrenheit.

All the operations of loading, developing and fixing must be carried out in the dark room under a safelight. A twenty-five watt ruby bulb is satisfactory if used not closer than six feet from the film. A safelight of the No. 2 type is satisfactory and can be used close to the film. (Use No. 3 for panchromatic negative). When the film has developed sufficiently (until the black parts show through the back of the film) lift the rack out of the tank and transfer it to a second tank, which contains water with two ounces of 28 per cent acetic acid added. This is the *short-stop*. Leave it in this tank for a minute or so and transfer it to the fixing bath where it should stay until all the yellow color has been fixed out. After three or four minutes in the fixing bath, a dim white light may be switched on so that the film may be inspected. Twenty minutes in the fixing bath is usually sufficient but if the bath is weak let the film remain until thoroughly fixed. It is then removed to another tank where the film is thoroughly washed. A short hose attached to the faucet is placed in the center hole so that no strong current of water strikes the emulsion of the film. An hour's washing is usually necessary. After the first ten minutes, empty the water from the tank and fill it up again. Repeat this procedure every ten minutes until the hour is up. Lack of proper washing will cause the film to stain and appear dirty, in time bleaching away all the image.

PIN A ONE DOLLAR BILL

to this ad and mail to the I. A. ARMS CO., E. 6th & Euclid, Cleveland, O.

You will receive by return mail the most remarkable 1930 strap watch. Test it—wear it for a whole week—if pleased with it send a dollar weekly until the "Direct by Mail" price of eleven dollars is paid. Otherwise return dial and get your dollar back. White rolled gold plate case, platinum finished—newest radium dial—ruby and sapphire shockproof movement that will get you there on time. New type adjustable link band. Stylish for both men and women. Just attach a dollar to this ad with your name and address. You will receive the most beautiful strap watch you ever saw by return mail.



TYPEWRITER NOW 1/2 PRICE

All Standard Makes (Also Portables)

Your choice of the World's best typewriters—Underwood, Remington, Royal—full size, late model, completely rebuilt and refinished brand new. Prices below half. Sold on Easy Terms.

FREE TRIAL

SEND NO MONEY! Just send your name and address and we will mail you our complete *Free Catalog* prepaid, fully describing and showing actual photographs of each beautiful machine in full colors. Tells every detail of our direct-to-you small payment plan. Write now for tremendous savings. No obligation whatever. Amazing values—Act quick. (Free Office Supplies with each Typewriter).

International Typewriter Exchange
 231 W. Monroe St. Dept. 1217 Chicago, Illinois

Build This Model Airplane YOURSELF



EXACT REPLICA 3-ft. model
BELLANCA "Columbia"

FULL SIZE PLAN WITH INSTRUCTIONS
 Complete Materials for Assembly. Guaranteed to Fly.

Send for your copy of our 56-page booklet describing 24 flying models and complete line of parts for model builders. This booklet is mailed to you upon receipt of 19c.

Your dealer can supply you, if not order direct.

U. S. MODEL AIRCRAFT CORP.
 397 Bridge St. Dept. A Brooklyn, N. Y.

LEARN TO Mount Birds

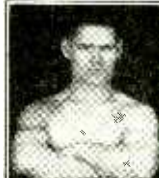


We teach you At Home by Mail to mount Birds, Animals, Heads, Tax Furs and Make Rugs. Be a taxidermy artist. Easily, quickly learned by men, women and boys. Tremendously interesting and fascinating. Decorate home and den with beautiful art. *Make Big Profits from Spare Time Selling Specimens and Mounting for Others.*

Free Book—Yes absolutely Free—beautiful book telling all about how to learn taxidermy. Send Today. You will be delighted. Don't Delay!

Northwestern School of Taxidermy 3799 Elwood Bldg. OMAHA, NEB.

I Positively Guarantee



to increase your arms one-half inch in size, chest one full inch, strength 25%, health, 100% in one week's time, by following my instructions and using my exerciser 10 minutes mornings and at night. Send \$1 for complete course and exerciser. Satisfaction guaranteed or \$1 refunded.

J. A. DRYER
 Box 1850-L Chicago, Ill.

Airplane Blueprints

Lincoln Sport Plane, \$6.75
 Gerber Monoplane, \$1.00

SCIENCE & INVENTION
 381 Fourth Ave., N. Y. C.

Drying the Film

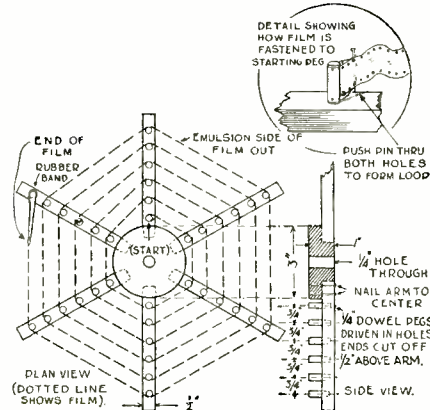
AFTER the film has been washed it must be dried and the handiest way to do this is on a circular drying rack such as the one shown in figure 7. This drum consists of two circular ends 24 inches in diameter with half-round slats placed at about six-inch intervals around the edge. A shaft through the center supports it and it is revolved at a high rate of speed by a motor. On good days films will dry in an hour's time, less if placed in a draft.

After the negative has been developed, it is necessary for us to make a positive print. In order to do this we must hold the negative and the positive film in contact while a light is exposed to the film. Film finishing laboratories have special printers which do this thoroughly but they are expensive machines and we must improvise one that will do the work sufficiently well for our purpose.

How to Make a Positive Printer

FIG. 1 shows an amateur projector converted for this purpose. The conversion does not affect its use as a projector nor is it a complicated job. As you can see from the illustration, an extra reel arm has been added in front of the regular arm. This is simply a strip of wood or metal having at its upper end a shaft which supports a hundred foot reel. On this reel is placed the negative while the unexposed positive stock is placed on the regular reel arm. A C-clamp holds the strip in the desired position. The projector is threaded in the usual way except that two films are threaded instead of one, the positive away from the lamphouse and the negative between the positive and the light. The regular lamphouse and lamp are removed. The negative and positive are so placed that the emulsion side of each is in contact. The cover of the gear box is removed so that the film may be inspected as it passes through.

The lens is removed from the projector and in its place is inserted the tube of the lamphouse. (Fig. 2). This tube presses firmly against the aperture plate so that no light leaks out to fog the film and with this point in mind, we paint the inside of the tube dead black. As you can see from the photograph (Fig. 1) and the drawing (Fig. 2). The lamp is placed on a sliding base. This is so that the amount of light reaching the film can be varied to suit the density of the negative. (Light density varies as the squares of the distance from the source). When the light is against the tube it is at its strongest in relation to the film, when the stick is pulled back all the way, the smallest



Simplest form of film rack for developing process. Fig. 6.

Be The Man Behind The Camera

**BIG PAY
FASCINATING
WORK**

\$60 to \$250 and more a week—that's the salary of a motion picture cameraman, the most fascinating job in the world. Play a major part in the production of the great movies that thrill the country.

Trained cameramen are in great demand—not a foot of film can be made without them. One of these enjoyable, lucrative positions, a position that offers big pay and future unlimited, can be yours—easily—quickly!

Easily Learned This New Way

Now, right at home in your spare time, you can quickly qualify for a well-paid position as a skilled Motion Picture Cameraman. You learn everything there is to know about motion picture photography—from short newsreels to great feature pictures. In an amazingly short time you will find yourself ready to step into a high-salaried position—capable of going out "on location" and taking every kind of moving picture.



Send for Big Free Book

Write today for your copy of our FREE book, which gives full particulars about the ever-growing field of motion picture photography — shows how you can quickly qualify for a well-paid position.

N. Y. Institute of Photography
Dept. D-1812, 2 West 33rd St.
New York City

Please send me your FREE Book, "The Modern Art of Photography," and details as to how I can qualify as Motion Picture Cameraman.

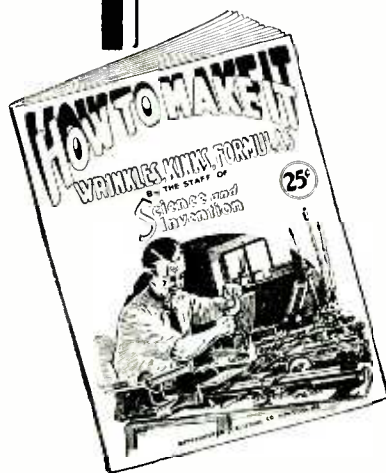
Name

Address

City

YOUR SUCCESS COUPON

"How to Make It"



For the Man Who Likes to Build Things Himself

SO often a little knowledge will do the trick—and here's the book that will tell you how to do it.

"How to Make It" is a veritable treasure-house of information for the man who has the urge to learn to do things for himself. In it you will find full instructions for making over a hundred helpful and unusual things. For example, it includes full details for making all kinds of furniture, fireplaces, and lamps. Also the making of a telescope; for building a model tug-boat, a deaf-phone that is of real benefit, a small lathe, a telegraphone, an enlarging machine, and numerous other articles that bring joy to many families.

A copy of "How to Make It" costs only a quarter. Simply clip and mail the coupon below with 25c in stamps or coin to the Experimenter Publications, Inc., 381 Fourth Avenue, New York, N. Y.

Clip and Mail Coupon

EXPERIMENTER PUBLICATIONS, INC.
Dept. 2512H, 381 Fourth Avenue, New York

Gentlemen:
I enclose 25c, for which please send me your book, "How to Make It."

Name

Address

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

**ONLY
25c
COMPLETE**

START TO PLAY VERY FIRST DAY



A Lifetime of Rich Wholesome Joy

UNTIL you learn to play, you have no idea of the rich joy, the vibrant fun, the big money that lie in the creation of music. And until you actually try out the Deagan Xylorimba in your own home, you have no idea how easy this fascinating instrument is to play!

Just think! No tiresome practice. No finger or lip exercises. No teacher. On the first day you play simple melodies. Soon you thrill friends and family with snappy fox trots, dreamy waltzes. Before you realize it, you are ready to appear in public. Xylorimbists are always in demand. The pep of any party, the spice of any band or orchestra. \$5 to \$25 for a night of "play!"


BIG BOOK FREE—Deagan Xylorimbis are sold on a 5-day FREE TRIAL basis. Models to suit every pocketbook. Surprisingly easy terms. You owe it to yourself to write today for the BIG FREE BOOK. No cost or obligation. Simply fill in and mail the coupon.

J. C. Deagan, Inc., Dept. 1569, 1770 Berseau Ave., Chicago
Please send me full details of the Five-Day Trial offer and easy payment plan of the Deagan Xylorimba.

Name _____

Address _____

AC. RADIO
6 TUBES
SCREEN GRID
\$24.00



AGENTS WANTED At last, long distance "AC," screen grid radio at price all can pay. Wonderful tone—volume to operate dynamic speaker. All ready to plug in electric light socket and operate. Sell Elgins—keep your job but add

\$60 A WEEK PROFIT to your present income in spare time—evenings. A demonstration means a quick sale. Replaces battery radio. Exclusive territory worth fortune to right man—but act quick to get contract as choice territory going fast. Write or wire immediately. Don't fail to give name of your county.

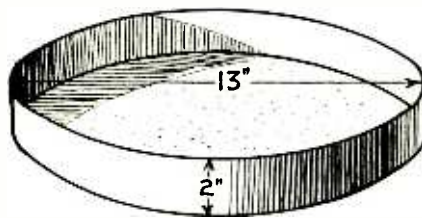
ELGIN RADIO CO., 4983 N. Crawford Ave., Chicago

30 DAYS TO TRY FREE *Ranger* **RADIO**
—10 Months to Pay
SAVE \$25 to \$100

All Electric with Dynamic Speaker Screen Grid Tubes

The Ranger is fast becoming the most favorably known radio now leading the field, as its predecessor, the Ranger Bicycle, has for 30 years. The Screen Grid Tube Ranger Nautrodyns (with 9 tubes) with No. 245 Tubes in "Push-Pull" is made under patents of R. C. A. Ranger assures you of selective reception from near and distant stations. You may now own one of these distinctive Rangers with Dynamic Speaker in a Deluxe Console by paying as low as \$10.00 down and balance in 10 months. Table models as low as \$40.00. Rangers come all ready to use—simply insert tubes and plug into your electric light socket—no more trouble than to connect an electric floor lamp.

Mead Write for catalog and marvelous new introductory offer—easy terms
Cycle Co., Dept. Y-173, Chicago

DEVELOPING TANK FOR FILMS

Fig. 5.

of light reaches the film and therefore the exposure is less. The placing of the light for each scene must be determined by experiment. The simplest way is to make a test strip a foot or so in length, develop and fix it and then regulate your light to give you better results. With experience you will be able to judge the negative density and the strength of light to use in almost every case. You will notice that only one take-up reel is provided. The positive film is run onto this and the negative is allowed to run into a basket on the floor, to be reeled up later at your convenience.

Developing the Positive Film

THE positive is developed in the same way as the negative except that a different formula is used. With both positive and negative you must remember to wipe off the back of the film after it has dried but while it is still on the drying drum, by applying a chamois dipped in alcohol to the back of the film as you rotate the drum by hand. This is essential, as otherwise "drying marks" will remain on the film and spoil the picture on the screen.

Figures three and four show a printer and nesting tanks that may be purchased. Any dealer can get these for you. Likewise your regular dealer can get the raw positive stock and the chemicals for you. The No. 16 developer can be purchased ready-mixed, requiring only the addition of the proper amount of water.

There are many tricks that can be done with the printer, you can reserve action, print upside down, double and triple print, make duplicates of your films and many other tricks that will be apparent to anyone. To print reverse action it is necessary to move the lamphouse around to where the regular lamphouse is placed so that the shutter will cut off the light. Place the negative on the upper reel and the positive on the lower. Put the crank on the projector and practice turning one frame at a time at a regular speed. Then thread the projector through the gate only, don't use the feed sprocket. Expose the first frame of film by quickly turning the crank. With the shutter closed (the light may be switched off each time) move the negative *down* one frame and the positive *up* one frame. Repeat this until the end of the scene is reached. It is tedious work but the good things don't come easily!

Comic Effects by Trick Printing

A COMIC effect can be obtained by making a stop motion of a person. This is done by printing a scene in the usual way but with the use of the crank, so that all exposure will be the same and suddenly stopping the negative while allowing the positive to run on. To do this, just advance the positive film by hand and re-threading each time while the same negative frame stays in the gate for a while. If this is done for twenty frames, then the negative allowed to go on for ten



Dex Hamlin fights alone—

WHEN Dexter Hamlin signed on as ordinary seaman with an Amazon tramp steamer between college years, he little dreamed that the adventure he craved would almost prove his undoing.

It all started when the bos'n picked on his undersized pal, Dex, of course, had to fight it out, and then jump ship. That jump took him straight into the Brazilian jungle and a two-year jail sentence in the filthy rubber camps. How Dex rebelled and fought alone against the fiendish cruelty of the half-breed rubber king is but one of the dozen stirring tales of strange adventure in foreign lands appearing in December Brief Stories.

Meet, too, the soldier who, single-handed, started one of the biggest battles in the World War. (A true story.) Meet Steve Gawne, Texas Gunman, who brings his talents to the South Seas, dealing death and sorrow to his evil foes. Meet Jim Tipton, officer of the American Navy, who engages in an International brawl so powerful that he even loses his ship in battle!

The Big New Brief Stories brings you life in the raw. Its stories of heroes, born to do or die, will hold you breathless until you've read the very last page. Get the December Number of the New Brief Stories on the newsstand today. It costs only 25c everywhere. If your newsdealer is already sold out, we will be glad to send you a copy postpaid as long as they last. Simply enclose 25c in stamps or coin and mail it to Brief Stories, Dept. 2512-O, 381 Fourth Avenue, New York.

Read Them in
Brief Stories

MODEL BUILDERS

MAKE AND FLY THIS
NEW
Big Mocar



TREMENDOUS VALUE
\$3.50
Post Paid

Aluminum Construction
30" Wing Spread
18" Fuselage
1 1/2" Aluminum Ball-Bearing Propeller

**A Great Construction Outfit
A Sweet Flying Job**

Boys—Never in your life have you seen such a wonderful buy as this Big Mocar aluminum construction model plane! Just think—a real aluminum construction outfit—with 2 1/2 ft. wing spread and 18 in. fuselage—and how it does fly! Many special features, cambered wing construction, the big 1 1/2 in. ball-bearing propeller, with a powerful long-running motor that carries this plane soaring and zooming, won't break up even after many flights. It is a real scale model—great fun to make—wonderful to fly. It will be your pride and joy. And you can fly it, too. It is made to stand the shocks. The Big Mocar construction outfit M-200 is complete with full instructions, mounted on board with all parts marked for easy assembly, rubber-tired wheels, covering material, cement and colors. Pliers only tool necessary. Don't let a day pass without sending for this. You won't be disappointed. It's the greatest value and finest flying model ever offered at a popular price. It's yours for only \$3.50 post-paid. Model M made up ready to fly \$5.00 postpaid. Catalog showing many model planes from 75c to \$5.00 (slider given with catalog) 10c. Clarence Chamberlain says: "I like the Big Mocar. It is very light and very strong—a great flyer."

**The American Model Aircraft Co.
Dept. S-12 New Haven, Conn.**




You, too! Join The Band and Orchestra



Moderately Priced.
Factory Guaranteed. Easy to Blow.
True Tones. Accurate. Write today
for the Pan American
FREE TRIAL
offer and Easy
Payment Plan.

FUN—instruction—
chance to earn
extra money. You can
before Xmas with a
Pan American Saxo-
phone, Clarinet,
Trumpet—or any
other instrument.

For complete information write to
Pan-American Band Instrument & Case Co.
1204 Pan American Bldg.
Elkhart, Dept. 3205, Indiana

BIG-PAY JOBS in ELECTRICITY

**\$60⁰⁰
to
\$150⁰⁰
WEEKLY**

Amazing new method. Trains you quicker and better. Motion Pictures in your own home make every point clear. Genuine DeVry motion picture projector at no extra cost. Thousands of feet of film furnished. We pledge to give you training and employment service necessary to secure a better job at bigger pay or refund money. Get full facts. No obligation. Write quick while offer lasts.

**Motion Pictures
Train You QUICK**

National School of Visual Education, Dept. 12-NA
537 S. Dearborn St., Chicago, Ill.

Send book, "The Film Way to Bigger Pay," with facts about this new, easier way to master electricity.

Name Age
St. or R. F. D.
City
State

MAIL THIS COUPON NOW!

frames, when another stop is made, the effect on the screen is quite comic.

Double printing is simply the placing of two negatives in the printer with a single piece of positive. More light must be used than with a single negative. Action titles can be made in this way by negative of a scene. A trick "Talkie" superimposing a title negative over a scene could be made by having two characters talk dialogue, and over their heads have the words appear. All this involves the making of the negative titles, so that they will locate over the head of the character who is speaking the lines and then double printing.

Caution

When threading the projector for printing leave plenty of loop in both positive and negative and have the loops of different lengths.

Wash the backs of all films before removing from the rack with alcohol.

Always work in a dark room with the proper safelight.

Use pure chemicals in the exact proportions given in the formulae.

Don't keep developer. It is no good after standing.

Hypo may be reinforced by the addition of more hypo and a small amount of alum.

Developer Formulas for Use With 16 Millimeter Film

(Note—While this formula is excellent for both positive and negative films, separate solution should be employed, that is, use one batch of solution for negative and another batch for positive.)

Water	1 gallon
Metol	18 grains
Sodium Sulfite (Anhydrous)	5 ounces, 130 grains
Hydrochinon	350 grains
Sodium Carbonate (Anhydrous)	2 1/2 ounces
Potassium Bromide.....	50 grains
Citric Acid.....	40 grains
Potassium Metabisulfate.....	87 grains

Mix in order named, dissolving each chemical thoroughly before adding next one.

Develop 7 minutes at 65 degrees Fahrenheit.

FIXING BATH

Hypo (Sodium Thiosulfate)	3 pounds 6 ounces
Water	1 gallon
Bisulfite Lye (Saturated solution)24 ounces (fluid)

Dissolve hypo in hot water. When thoroughly dissolved add Bisulfite Lye. Fix film in this bath until clear of yellow color. (20 minutes). Wash thoroughly for one hour in six changes of water.

When It Rains Fish, Worms and Frogs

(Continued from page 695)

of such showers, covering a period of many centuries and vouched for by scientific and other journals. Here are a few:

In 1804 the French Academy reported a rain of frogs and toads near Amiens, France, in immense numbers "covering the roads so that the diligence passed over, killing many."

In "Athenaeum," July 17th, 1841, there is an account of a thunderstorm at Derby,

BRAND NEW GENUINE Model 3 CORONA

LOWEST PRICE EVER OFFERED



2.00 DOWN
BALANCE EASY TERMS

HERE'S your chance to own that brand new Genuine Model 3 Corona you've wanted—on the easiest terms ever offered—at LOWEST PRICE ever offered! Complete in every detail; back spacer, etc., MANUFACTURER'S GUARANTEE. Recognized the world over as the finest, strongest, sturdiest, portable built. Only a limited number of these splendid machines available. To get one, you must act now!

**Yours for 10 Days FREE—
Send No Money**

Experience the joy this personal writing portable typewriter can give you! Use it 10 days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office desk, home, traveling. Small, compact, light, convenient. Don't send out letters, reports, bills in poor handwriting when you can have this Corona at such a low price or on such easy terms. Remember these are brand new machines right out of the Corona factory.

**Carrying Case Included
Special Xmas Package**

Leatheroid carrying case, oiler, instructions free on this offer. Send no money—just the coupon. Without delay or red tape we will send you the Corona. Try it 10 days. If you decide to keep it, send us only \$2—then \$5 a month until our special price of \$39.50 is paid. Now is the time to buy. This offer may never be repeated. Mail coupon now.

MONEY SAVED By Using This Coupon

**Smith Typewriter Sales Corp.
(Corona Division)
469 E. Ohio St., Chicago, Dept. C-91**

Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit \$2 with express agent. If I keep machine, I'll send you \$3 a month until the \$37.90 balance of \$39.90 price is paid; the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repackage and return to express agent, who will return me \$2. You are to give your standard guarantee.

Name

Address

Employed by

Earn More Money as Traffic Manager

Are you anxious to earn real money—\$3,000, \$5,000, \$7,500, \$10,000 a year, and even better? Then become an efficient Traffic Manager. Learn in your spare time to do quickly, accurately and scientifically what the untrained traffic man can do only slowly and with many blunders—learn the whys and wherefores of routes, classifications, rates, procedure before the I. C. C., these and many another accomplishment that marks the difference between the plugger and the specialist. Find out today about LaSalle home-study training in Traffic Management—how it won for Walter Baker the chairmanship of the traffic group of the Retail Trade Board of Boston; how it enabled John R. Meeks, of Sheffield, Ala., to increase his income more than 500 per cent; how it helped Samuel Moss, Jr., bill clerk at \$65 a month, to organize an independent traffic bureau yielding him better than \$10,000 a year. Low cost; easy terms. Send for 64-page book, "Opportunities in Traffic Management." It's FREE.

LaSalle Extension University, Dept. 12384-T, Chicago

EXCELLO Radio Consoles



Model R61

A beautiful Walnut Cabinet with sliding doors of matched Butt Walnut and selected Japanese Ash sidepanel overlays. Accommodates Buckingham, Crosley, Atwater Kent, Fada, Sparton and all standard receivers. Ample space for Receiver, Speaker, etc.

Write today for Free illustrated folder of all new styles, including Phono-Radio Combination Consoles.

EXCELLO PRODUCTS CORPORATION
4832 West 16th St., Cicero, Illinois

So Easy Play Before Xmas!

YOU can play a Pan American Trombone, Saxophone, Trumpet or any instrument with a few lessons, because Pan American Band Instruments are noted for easy blowing qualities, true tones and accuracy.



Moderately Priced. No hardship to pay for Pan-American. Can be purchased on easy payment plan after FREE TRIAL. Only complete line of nationally advertised, moderately priced FACTORY GUARANTEED instruments made. Universally approved by teachers and bandmasters.

For free trial offer, write

Pan-American Band Instrument & Case Co.
1204 Pan American Bldg.
Elkhart, Dept. 1205, Indiana

TRANSFORMERS

FOR RADIO POWER SUPPLY

A-B-C Power for all receivers. Primary 105 to 115 volts
50 or 60 cycles Secondaries—2½ volts, 9 amperes—2½ volts, 3 amperes—5 volts center-tapped, 4 amperes—300 volts each side of center-tap, 125 milliamperes. All lugs mounted on bakelite, concealed inside case, completely shielded. Mounting for sub-panel or regular. Price \$11.90. Write for our literature. Dealers get in now.

JEFFRIES TRANSFORMER CO.
7427 Alameda Blvd. Los Angeles, California

NEW! FREE CATALOG! DESIGNS

CLASS PINS

SOMETHING DIFFERENT! PIN COMPLETE WITH SEPARATE DATE GUARD & CHAIN 2 COLORS LESS! STERLING SILVER \$1.35 (2oz) \$1.20 (1oz) SILVER PLATE .75 MORE! .65

METAL ARTS CO., Inc. 950 Portland Ave. Rochester, N.Y.

England, that brought down "hundreds of small fish and frogs"—"from one-half an inch to an inch long."

In "Annals and Magazine of Natural History," January, 1929, Dr. E. W. Gudger tells of a downpour of menhaden or shiners that fell on the deck of a fishing boat in Vermilion Bay, Louisiana, in 1911.

Frogs fell to earth at Ithaca, New York, in 1901, and at Spokane, Washington, in 1904, in such numbers as to impede railroad traffic by rendering the rails slippery.

At Santa Isabel, Mexico, on the authority of the Mexican Minister of Agriculture, salt water fish fell from the clouds in 1925. This town is two hundred and fifty miles from salt water.

In 1901 live pollywogs fell on Fourth Avenue, New York City, as told in the *New York World* by William Foulke, then treasurer of the American Bible Society.

At Iron Hill, Maryland, in 1900, the rain brought down small frogs, earthworms and sea turtles. In 1857 Montreal was visited with a rain of little lizards; and jelly fish "about the size of a shilling, spattered" as they fell on the streets of Bath, England.

At Danville, Virginia, in June, 1926, local and other newspapers were full of accounts of a rain of immense numbers of little fish.

The popular and most plausible theory is that these creatures are sucked up by some passing whirlwind, carried about by the winds, and deposited to earth, often at some distant place. Opinions differ, however, as to whether the animals themselves are taken aloft, alive and matured, or whether it is the spawn that is so sucked up and hatched out in the clouds.

Although hundreds of reliable people have seen the down-coming phenomena, nobody has yet seen the creatures on the way up.

In AMAZING STORIES

For December

VAMPIRES OF THE DESERT, by A. Hyatt Verrill. After a rainfall, a good part of the arid deserts of Chile, Peru and Bolivia are covered with abundant vegetation. Suppose some change occurred in the ocean currents to give greater rainfall in those regions. Is it beyond the realm of possibility to say that the almost fossil seeds of prehistoric plants might come to life again? At any rate, it is a clever idea, ingeniously built up into a scientific story of Verrill's highest order.

A BABY ON NEPTUNE, by Clare Winger Harris and Miles J. Breuer, M. D. Any piece of fiction collaborated on by these two favorite authors ought to be good. It is. When Hertz got a little spark from a distant electric discharge through a stone wall, it was a triumph. Now we hear, without much comment, that a set made by one of the Edison students caught Byrd in the Antarctic. Is it such a far step to radio to another planet? These authors' conception of life on another planet is different than anything else we have ever read about. It is well worth a studied reading.

THE SECRET KINGDOM, by Allen S. and Otis Adelbert Kline. (A Serial in 3 parts.) Part III. A good number of things left unexplained in the preceding instalments are aptly taken care of in this one, and many new discoveries are made. The hero goes through a series of very thrilling adventures—thrilling to him in retrospect only. The reader follows with breathless pace.

And several other stories of unusual merit

The EAGLET Only \$1.00



20" Wing Spread
Very Light and Very Strong

BOYS A real sensation The newest development in AVIATION. A Genuine Duration Scale Model "THE EAGLET"

Specifications: Built up model-wood frame. 20 inch wing spread. Fuselage 14 inches. WEIGHTS ONLY SEVEN-EIGHTHS OF AN OUNCE. This remarkable light weight has never before been achieved in any commercially built scale model of this size. Practically CRASH PROOF and has flying qualities galore. The record to date is 92 SECONDS. You will get new thrills with this newest and finest type model plane. Wonderful results indoors as well as outdoors. Such a light weight, long flying, real scale model will be a revelation to you.

"Win Five Dollars in Gold"

We are offering semi-monthly prizes of five dollars in gold to the boy or girl who sends in the best flight record obtained with this model. Full instructions and prize entry blanks are included with every Eagle model. Get yours now. Send cash, check or money order. No stamps or C. O. D. The price is low—order your model now and compete for the prize awards. CONSTRUCTION SET—Complete with all parts, plans, instructions and prize entry blanks. Postage free. \$1.00.

Homor Milo of Graniteville, Mass., won last month's prize with flight of 400 feet distance and 92 seconds duration. Can you beat it?



EAGLE MODEL AIRPLANE CO.

Dept. G-12 NORTH-HAVEN-CONN

Stop Using A Truss

STUART'S ADHESIF PLAPAO-PADS are entirely different—being mechanico-chemico applicators—made self-adhesive purposely to keep the muscle-tonic called "Plapao" continuously applied to the affected parts, and to minimize danger of slipping and painful friction. The fabric is soft as velvet, and being adhesive



Awarded Gold Medal success—without delay

clings closely to the body without straps, buckles or springs. Easy to apply, comfortable, inexpensive.



Awarded Grand Prix

For almost a quarter century stacks of sworn testimonials from many different countries report success—without delay Grand Prix from work. The epidermatic absorption of Plapao and the utilization of "plaster therapy" tend toward a natural process of recovery, after which no further use for a truss.

Test of factor "PLAPAO" sent FREE Mail Coupon below TODAY—

Plapao Laboratories, Inc.

393 Stuart Bldg., St. Louis, Mo.

Gentlemen: Send me a Free Trial Plapao and 48-page book on Rupture. No charge for this now or later.

Name.....

Address.....

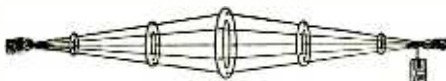


CORRECT Your NOSE

Improve your appearance with the ANITA Nose Adjuster. Shapes flesh and cartilage—quickly, safely and painlessly, while you sleep. Results are lasting. Doctors praise it. 68,000 users. Write for 30-Day Trial Offer and FREE BOOKLET.

ANITA INSTITUTE, N-73 Anita Bldg., Newark, N. J.

LIFE-TIME DX AERIAL



Guaranteed Double Volume and Sharper Tuning

Description of Lifetime DX Aerial No. 30—LENGTH 30 FEET:

Assembled ready to string up. Brings in volume of 150-ft. aerial but retains the selectivity of a 30-ft. aerial. Rings are heavy gauge solid zinc. Duplicates in design and non-corrosive materials the aerials used by most of largest Broadcasting Stations. Design permits using this powerful aerial in 30-ft. space (preferably outside). Sharpens tuning of any receiving set because of short length but has enormous pick-up because 150 ft. of No. 12 enamelled wire is used. Made for owners of fine radio sets who want great volume on distance without destroying sharp tuning. (Also used by many owners of short-wave outfits.) "Makes a good radio set better."

PRICE, \$10.00

No. 60—LENGTH 60 FEET:

Assembled—ready to string up. "Big Boy" size. (Same description as above except that 300 ft. of wire is used, making this the most efficient and powerful aerial possible to manufacture.)

PRICE, \$12.50

Manufactured by

THOROLA RADIO PRODUCTS,

1014 So. Michigan Avenue Chicago, Illinois

Be a Money Maker



C. W. Van De Mark
Better known as "Van," the Man Who Pays Men's Bills. He has shown thousands of men and women the easy way to have money. He promises to do the same for you—Write him today.

I'LL SHOW YOU HOW

I want a good honest man or woman, all or part time, to look after my established business in your locality. Take a few orders from list of established customers; things people eat and use every day. Let me help pay your bills and free you from money worries as I have for thousands of others.

NO MONEY OR EXPERIENCE NEEDED

I will make you my business Partner and give you half of all the money we take in. SEND NO MONEY! I furnish everything you need to start at once. Business already established; people waiting for you to call.

I Guarantee You Income of \$3.00 An Hour

You take no chances—I give you an absolute assurance of \$3 an hour just for following a few, simple, easy instructions. Over 20,000 men and women now my partners earning as high as \$150 in a single week! Write at once. I'll show you how to be a Money Maker this easy way.



I OFFER YOU CHRYSLER COACH

A brand new Chrysler Coach without cost for every one of my partners who follow my instructions. It is yours to keep for business and pleasure. Write me at once.

Send for Sample Food Products
Sample outfit includes \$18 worth high grade food products. Your groceries at wholesale for life. Send at once for details of this amazing opportunity with assured income. Write or wire Mr. Van, President.

THE HEALTH O QUALITY PRODUCTS CO.
Dept. 5023-PP Cincinnati, Ohio.
© 1929 by C. W. V. D. M.

LEARN TELEGRAPHY WITH TELEPLEX

Be an expert Morse or Continental code operator! BIG PAY—TRAVEL FUN ADVENTURE. After a few short weeks of practical study with Teleplex you will be an expert operator. This amazing instrument teaches you right in your own home. Works like a phonograph. No knowledge needed—beginners learn at once! NOT A SCHOOL. Free 10 days' trial. Write for FREE booklet M-11.



TELEPLEX CO., 72 Cortlandt Street, New York City

Solution of Cross-Number Puzzle

(Continued from page 715)

3	3		9	0	8		4	1	6		1	6
1	0		8	8	4		1	5	5		1	8
	2	5	0		3	4	4		9	9		
9	5	0		3	7	5		1	2	6	6	0
9	0		6	3	5		7	9	2		9	5
6	8	1	5	3		6	0	3		6	0	0
		7	5		0	0		8	8			
5	5	6		8	3	2		2	9	0	8	1
8	0		8	0	8		9	7	5		1	1
4	3	5	6	0		6	6	2		6	4	0
	6	1	4		1	1	5		1	2	8	
4	0		9	9	4		8	8	5		1	3
7	0		8	2	4		3	1	0		8	9

Sport Plane Blueprints Available at Nominal Cost

- Complete Set of Blueprints of Lincoln Sport Plane, \$6.75.
- Gerber Monoplane—set of Blueprints, \$1.00.

Send Orders to Blueprint Dept. SCIENCE AND INVENTION
381 Fourth Avenue New York City

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Science and Invention, published monthly at Jamaica, N. Y., for October 1, 1929.

State of NEW YORK } ss.
County of NEW YORK }

Before me, a notary in and for the State and County aforesaid, personally appeared Arthur H. Lynch who, having been duly sworn according to law, deposes and says that he is the Editor of Science and Invention, and that the following is, to the best of his knowledge and belief, a true statement of ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24th, 1912, embodied in Section 443, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Experimenter Publications, Inc., 381 Fourth Ave., New York City; Editor, Arthur H. Lynch, 381 Fourth Ave., New York City; Managing Editor, H. Winfield Secor, 381 Fourth Ave., New York City; Business Manager, H. K. Fly, 381 Fourth Ave., New York City. 2. That the owner is: Experimenter Publications, Inc., 381 Fourth Ave., New York City, B. A. Mackinnon, H. K. Fly. 3. That the known bondholders, mortgages and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.) Signed, Arthur H. Lynch, Editor. Sworn to and subscribed before me this 24th day of September, 1929. (Seal) Joseph H. Kraus, Notary Public, City of New York. (My commission expires March 30, 1931.)

Over the Mountains from Los Angeles 559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES TO THE GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone. K. J. Tulp writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5-10 miles to the gallon." P. P. Goerzen writes: "34 6-10 miles with the Whirlwind, or a gain of 21 miles to the gallon." R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to gallon and 25% in speed."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks.

FITS ALL CARS In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It is actually less work than changing your oil, or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISRIBUTORS WANTED
Free Sample and \$100.00 a Week Offer

Whirlwind men are making big profits supplying this fast selling device that car owners cannot do without. Good territory is still open. Free sample offer and full particulars sent on request. Just check the coupon.

GUARANTEE No matter what kind of a car you have—no matter how big a gas eater it is—The Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE TRIAL COUPON
WHIRLWIND MFG. CO.
533 A Third St., Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and free trial offer. This does not obligate me in any way whatsoever.

Name.....
Address.....
City.....
State.....
Check here if you are interested in full or part time salesmen positions

Free Book Quick Way into AVIATION

"Ill Train You AT HOME"
Rush coupon for details of quickest, easiest, least expensive way to get into Aviation—to qualify for one of hundreds of Aviation jobs paying \$300 to \$400 monthly. No experience or education needed. Employment help free. Lifetime service. Money-back agreement. Let Major Rockwell train you and your future in Aviation is assured.

Mail Coupon for FREE BOOK
Make your Aviation dreams come true! Be pilot, mechanic, etc., in few months. My book tells how. Sent ABSOLUTELY FREE if you're over 18 and act at once. Read this great book and learn how quickly and easily you can land one of the big pay jobs in Aviation. Rush coupon!
Major R. L. Rockwell
Dayton School of Aviation
Desk S-20, Dayton, Ohio

Major R. L. Rockwell
Dayton School of Aviation
Desk S-20, Dayton, Ohio.
Dear Major: Rush my copy of FREE BOOK on amazing, easy way to get into Aviation. I am not obligated.
Name.....
Address.....
Town..... State..... Age.....

Start with WIRING

...the first step toward a good job in ELECTRICITY

The sensible way to "break into" Electricity is to learn WIRING. Then the doors of opportunity in the world's most prosperous industry are open to you—
The new idea is to first learn how to wire bells, annunciators, alarms—how to wire homes and stores and factories for light and power—how to estimate the cost—
—then cash in on the training, before tackling the next branch. You will be surprised how quickly you can learn WIRING, at home in your spare time, by our JOB-ticket method of practical experience—
—takes only a few months—costs only a very few dollars. (Now, there is no longer any need to take a "Complete Course" costing hundreds of dollars, requiring years of time.)

Start with WIRING but don't stop when you're an Electrician. From time to time you can learn motors and generators, electrical drafting, power station equipment, radio, or other advanced subjects. Plan to learn one thing at a time and to advance one step at a time, until you're at the top of this money-making business. If you are interested in getting into Electricity—right, send for Free "Unit Plan" book.



American School
Dept. E-974, Drexel Ave. at 58th St., Chicago

American School, Dept. E-974, Drexel Ave. at 58th St., Chicago
Please send free Unit Plan Book, and tell me all about WIRING and other low-cost, quick Electrical Units of home training.

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

ORDER NOW—
Three New Books on Models
Model Airplanes and Flying Boats
ABC of Model Airplanes
Manual of Model Airplanes
Written by noted authority on Model Airplanes
SAL MESSINA
Originator, formerly owner and editor of Model Airplane News
Each book taken up on different subject Very Fully Illustrated
\$1.00 each, three for \$2.50
64 Pages of Model Airplanes, parts, materials, flights, sketches, illustrations, new models, Lockheed, Sikorsky Amphibian, Loening, Dornier Super Wal, Supermarine Napier and many other models.
MODEL AIRPLANE BOOK PUBLISHERS
29 East Avenue, West Haven, Conn.
Price List of Parts, Books, Blueprints, 5c

I'LL PAY YOU \$20 A DAY
To Show My Mystery Lighter to Men. What Makes It Light? All Guaranteed. Sample With Sales Plan 25c. Sample Gold or Silver Plated, \$1.00. Agents write for proposition.
NEW METHOD MFG. CO.
Desk S.I. 12 Bradford, Pa.

MARVELOUS NEW PATENTED SCREW-HOLDING SCREW DRIVER
Non-magnetic. Holds screws tight! Removes them INSTANTLY from inaccessible places. Factories, radio, electricians, machinists, etc., buy on sight! Indispensable. Price \$1.50 only. (Sent postpaid receipt money order.)
DISTRIBUTORS: Genuine opportunity earn big money. Exclusive territory. Write or wire quick for full details.
JEFFY-TITE MFG. CO., 1298 Water St. Boston, Mass.

The Why of an Investment Trust

By Alfred M. Caddell, *Financial Editor*

YOU have often heard that this is an age of specialization; that the affairs of life have become so complicated that unless one specializes in this activity or that he will not ring up a high score.

Translated into terms of investments, this means that unless he knows his subject backward and forward and is capable of viewing the investment situation with a clear perspective, he is not going to make himself as much income as his money, properly applied, is capable of making for him.

The wise investment of money is one of the most difficult tasks confronting the modern business man, principally because it involves laboriously accumulated savings. Moreover, investments cannot simply be made and forgotten; they must be watched with unflinching vigilance and appraised and re-appraised with the growth of time. To be able to do that intelligently requires more than ordinary investment knowledge.

Until recent years we did not have in the United States any outstanding institutions whose sole business was the management of investment funds by giving thereto the same intelligent study found in our other arts and sciences and professions. Each of us went on our own individual way, selecting investments calculated to increase our private fortunes. But most of us, it may be more or less safely said, couldn't devote enough time to this important undertaking to make any huge success of it.

But, as with most everything else, scientific efficiency, either personal or otherwise, must always rise to the top.

The Investment Trust type of company came into being as a natural sequence of the growing interest in investments—a management institution to take care of the requirements of many investors, large and small. This type of institution had its origin in England where it has flourished successfully for many years. Lately, it acquired a foothold in the United States and its expansion has been so rapid that today investment trusts number more than 450, about half of which sprang into being during the past year.

The capital of an investment trust is obtained by the sale of securities to the public. With this money the officers of the trust purchase or sell stocks or bonds, underwrite security issues and otherwise engage in a broad financial practice even to the extent of loaning out money on call. Most of the trusts safeguard their investments by investing not more than five per cent of their capital funds in any one security. A good deal of their safety consequently lies in diversity of holdings, for with anything like conservative and intelligent management the law of averages is bound to work in their favor—if one investment doesn't pay out so well, it should, by reason of wide diversity, be counterbalanced by an investment that yields a very good income.

Naturally, the reputed super-knowledge of investment trust management lies in the scientific attention that they give to their business. There are few investment trusts worthy of the name who do not maintain a staff of financial experts constantly employed—statisticians, economists, financial observers and such like, who keep a weather eye on the economic affairs of the world and a practical ear to the ground of things financial, so that the net result is knowledge upon which the executive management may wisely act.

Not all corporations operating as investment trusts—in America the law re-

Learn AVIATION WHERE LINDBERGH STARTED!

BIG PAY for Ground Men and Pilots

Aviation is growing faster than ever. There's a tremendous demand for Pilots, Ground Men and airplane welders. Get into this Big Paying Industry! Come to the Lincoln Airplane and Flying School—where Lindbergh learned—and get complete, thorough training that assures success.

Practical Instruction

In our Ground School we teach you to build and repair actual planes and overhaul all popular types of aero engines. In our flying school we train you for a private pilot's, industrial pilot's, limited commercial pilot's or transport pilot's license. Also complete practical training in airplane welding. All equipment, planes and instructors carry the Department of Commerce license. Come to Lincoln—NOW.

Send for FREE BOOK
Gives full information about cost of training courses offered, etc. Write if interested. Be sure to state your age.

Lincoln Airplane School
WHERE LINDBERGH LEARNED
226 Aircraft Bldg. Lincoln, Nebr.

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian Instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

Play in Half Hour
After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed.

Easy Lessons
Even if you don't know one note from another, the 52 printed lessons and clear pictures make it easy to learn quickly. Pay as you play.

GIVEN when you enroll
—a sweet toned HAWAIIAN GUITAR, Carrying Case and Playing Outfit

WRITE AT ONCE for attractive offer and easy terms. A postcard will do. ACT!
Value \$18 to \$20
No extras—everything included
OTHER COURSES: Tenor Banjo, Violin, Triple, Tenor Guitar, Ukulele, Slide, Ukulele. Under well-known instructors.
FIRST HAWAIIAN CONSERVATORY OF MUSIC, Inc.
9th Floor, Woodworth Bldg., Dept. 240 New York, N. Y.
Approved as a Correspondence School Under the Laws of the State of New York—Member National Home Study Council.

RADIO BARGAINS!

Brand New 7 tubes A. C. sets \$36.75 guaranteed. Used radios as low as \$9.90.
Power transformers and chokes; No. 1003 Sec. 600 V. 7 1/2 V. C. T. to first choke, 7 1/2 V. C. T., 2.5 V. C. T. to case 1 1/2 V. 3 chokes. For one 281, one 250, one 227, four 226\$5.00
Complete list upon request. **CHAS. HOODWIN CO., 4240 Lincoln Ave., Dept. N-3, CHICAGO.**
DEALERS IN BANKRUPT RADIO STOCKS

WADE BENCH LATHE

Cap: 4" dia. x 12" length. Slidest has travel entire length of bed. Lead-screw inside bed. Hollow spindle. Turning, facing, boring, drilling, winding, thread-cutting. No. 1 Lathe, plain headstock \$40.00. No. 2 Lathe, back-geared headstock \$68.00. Either lathe, 4"x18" \$7.00 extra. Complete line of accessories at equally low prices. Catalog sent free. **THE GEROLD COMPANY**
Dept. S-23 120 Liberty Street New York

A Bargain at \$4.69

Genuine Imported French Binoculars—Never before offered at our special price. Powerful lenses. Magnifies vision many times. Solid metal, elegantly finished. Complete with carrying case and genuine leather straps. Ideal for gifts. A real buy at our special price of \$4.69. Worth more. Send no money. Pay on delivery \$4.69 and postage. **JENKINS, Dept. 12-U-65, 685 Broadway, N. Y.**

\$175.00
KOLSTER DYNAMIC
REPRODUCER

Combined with
210 Power Amplifier and
"B" Supply Unit

FOR \$49.50
(with-out tubes)



Height 42"
Width 25 1/2"
Depth 19"

Model K-5

This famous genuine Kolster K-5, AC Electro-Dynamic Reproducer is complete with a 210 Power Amplifier and "B" Supply Unit all self-contained on a steel frame. This real fine meshed rucked Unit weighs 45 lbs. without the Cabinet. The Cabinet itself is Penell-Striped Walnut, beautifully designed with Cathedral grille.

If desired, the 210 Power Amplifier will also supply 22, 67 and 90 volts "B" current, sufficient for any set using up to 8 tubes. An automatic voltage regulator tube, UX-874, maintains the "B" voltage silent and steady.

This Electro-Dynamic Reproducer can be used with any battery or AC set, replacing the last audio stage, or be used with all tubes of the set. Wherever used it will bring out every shading and range of tone; every note is reproduced with utmost faithfulness, pure and undistorted. It will modernize any radio receiver.

Uses 1—UX-210, 2—UX-281 and 1—UX-874 tubes. A 20-ft. cable is included with each instrument. Operates direct from 50-60 cycle, 110-120 volt AC current.

Brand new in original factory cases and guaranteed. Every Reproducer is serial-numbered and has factory guarantee tag enclosed.

AMERICAN SALES COMPANY
19-21 Warren St. New York City

250 POWER MICROSCOPE
MADE IN U.S.A. **\$16.50**

Educational, entertaining, this fine microscope helps all to know life that can't be seen with unaided eye. Tiny insects look like monsters. Plant and mineral life reveal new wonders in form and color. Used by students, dentists, physicians, scientists—in home, office, school and laboratory. Precise optical qualities.

Magnifies 100 to 250 times. Tilting stand, fine finish, nickel trim, push-lined case, prepared slide, instructions. At your dealer or direct postpaid. Money back guarantee. Other models \$2.50 to \$8.50.



Catalog Free
Wollensak Optical Company
878 Hudson Ave. Rochester, N. Y.

WANTED MEN

To Manufacture Metal Toys and Novelties

Big demand for Toy Soldiers, Animals, 5 and 10¢ Store Novelties, Ashtrays, etc. We cooperate in selling goods you make, also buy them from you. Small investment needed to start and we help you build up. WE FURNISH COMPLETE OUTFITS and start you in well paying business. Absolutely NO EXPERIENCE and no special place needed. A chance of a lifetime for man with small capital. CHRISTMAS RUSH is now starting, so if you mean strictly business write AT ONCE for full information.
METAL CAST PRODUCTS COMPANY
DEPT. E 1696 Boston Road New York City

Learn Photography at HOME

Make money taking pictures. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free book, Opportunities in Modern Photography, and full particulars.
AMERICAN SCHOOL OF PHOTOGRAPHY
Dept. 1429, 3601 Michigan Ave. Chicago, U. S. A.

quires that such companies must incorporate—are worthy of public confidence, however. There are too many loopholes in the present laws which defects allow unscrupulous persons to engage in a blanket sort of investment—in some cases, sheer speculative—businesses, thus jeopardizing the funds entrusted to them by the public. Safeguards, such as are thrown around savings banks, life insurance companies and others, may probably come into being to prevent possible abuses of such funds. As with everything else, an investor must use proper discretion and discriminate most intelligently between the responsibility of one investment trust and another. There are plenty of good ones to choose among and unless all signs fail investment trusts are destined to play even a larger part in our investment world than they have up to the present.

For one thing, this type of institution when ably managed can do much to stabilize the market prices of securities. More and more bears are finding it difficult to raid the market in the hope of driving down prices to levels at which they would prove to be bargains. The recent buying on the part of investment trusts did much to bring back security prices from the low of last May. There are any number of instances on record where this type of institution now holds securities which were purchased 50 or 100 points lower than their present values. And what is more, owing to the large sources of capital at their command, investment trusts have been able to purchase what are ordinarily regarded as rich men's stocks—the securities that yield not only dividends but melons in the form of stock dividends. And as a general rule, investment trusts of this type are holding such stocks for future appreciation.

Questions and Answers

Conducted by Alfred M. Caddell
Financial Editor

Question—Can you tell me anything about the possibilities of Phillips Petroleum? I have been holding 100 shares for two years, same having cost me ten points higher than the present market price. L. L. F., Bayside, L. I.

Answer—I would not regard Phillips Petroleum as a risk, and would suggest holding it, believing that it will come back and show you a profit over dividends. The wrong time to sell any stock is when it is down, unless all signs point to a complete abandonment of an industry. This is far from the case with oil. Phillips estimates a satisfactory increase in net for the third quarter of 1929, and earnings for 1929 may confidently be expected to surpass those of 1928.

Question—I am worried about my holdings in General Motors, which I bought at 80. Should I sell at the present market or hold in hopes of recovery to that point? F. P. B., Lancaster, Pa.

Answer—I'd hold General Motors, particularly if you own it outright. At the present writing the stock is about 28 points from its 1929 high, but in so progressive a leader as General Motors one can say that it is only taking a much-needed rest and that it will wake up with new energy as soon as credit conditions become easier. General Motors is in so many industries—automotive, aviation, iceless refrigeration, etc.—that its potential earning power is increasing rapidly.

Question—What do you think of Andes Copper? I have been disappointed in the action of copper stocks. H. R. A., Springfield, Ohio.

Answer—The trouble with the coppers is principally due to influences other than the intrinsic merit of these stocks. Copper companies began to show up good in earnings rather late, and inasmuch as much money was tied up in other securities coppers could not be taken care of. Andes Copper is a subsidiary of Anaconda Copper, one of the best in the copper group, and Andes will undoubtedly reflect its present earnings and possibilities in a much more satisfactory way at an early date.

Information on securities will be furnished readers of *Science and Invention* free of charge by mail and through these columns. A 2-cent stamped, self-addressed envelope should be included in your letter. Address your inquiries to The Financial Editor, *Science and Invention*, 381 Fourth Avenue, New York City.

This is FIGHTING Talk



If YOU'RE a quitter you won't read far in this advertisement. If you're not—if you have the courage to face facts—you want to know who is responsible for your not getting ahead faster. It's YOU. The man who won't be licked can't be licked. If you're a drifter you'll always wish for success but never do anything about it. The earth is cluttered with that kind.

If you're a fighter you will do something about it. You'll get the special training that fits you for advancement, and you'll go on to a bigger job and better pay.

In spare time, right at home, you can get the training you need through the home-study courses of the International Correspondence Schools. Thousands of other men have lifted themselves out of the rut and into well-paid, responsible positions by I. C. S. study. Are they better men than you?

The time for action is this minute. Find out about this practical educational method that lets you learn while you earn. Check the subjects that interest you in the coupon below and mail it today. It doesn't obligate you in any way to ask for full particulars, but that one simple act may be the means of making your entire life happier and more successful. **Do it now!**

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 6202-F, Scranton, Penna.

Without cost or obligation on my part, please send me a copy of your 48-page booklet, "Who Wins and Why," and tell me how I can qualify for the position, or in the subject, before which I have marked an X:

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|--|--|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Aviation Engines |
| <input type="checkbox"/> Building Foreman | <input type="checkbox"/> Barber and Steam Fitter |
| <input type="checkbox"/> Concrete Builder | <input type="checkbox"/> Plumbing Inspector |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Foreman Plumber |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Heating and Ventilation |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Sheet-Metal Worker |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Electrical Contractor | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Electric Wiring | <input type="checkbox"/> Refrigeration Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> R. R. Positions |
| <input type="checkbox"/> Electric Car Running | <input type="checkbox"/> Highway Engineer |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Coal Mining Engineer |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Assayer |
| <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Iron and Steel Worker |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Textile Overseer or Supt. |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Poultry Farming |
| | <input type="checkbox"/> Mathematics |

BUSINESS TRAINING COURSES

- | | |
|--|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Show Card and Sign |
| <input type="checkbox"/> Personnel Management | <input type="checkbox"/> Lettering |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Accounting and C. P. A. | <input type="checkbox"/> English |
| <input type="checkbox"/> Coaching | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Spanish | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Advertising | <input type="checkbox"/> Lumber Dealer |

Name.....
Street.....
Address.....
City..... State.....
Occupation.....
If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

Choice of 1200 Newest RADIO VALUES

SEND for our 1930 catalog. Filled with amazing values in screen grid radios, push pull audio, consoles, kits, parts. All standard makes and guaranteed merchandise. **FREE**

WESTERN RADIO MFG. CO.
231 W. LAKE ST. CHICAGO ILL.

Read Classified Advertising—It Pays!!!

Advertisements in this section fifteen cents a word for each insertion. Name and address must be included at this rate. Cash should accompany all advertisements unless placed by an accredited advertising agency. Not less than 10 words accepted. Objectionable or misleading advertisements not accepted. Advertisements for these columns should reach us not later than 1st of 2nd month preceding issue.

Classified Advertising Manager—Experimenter Publications, Inc., 381 Fourth Avenue, New York City

Advertising

Get into Advertising. Learn quickly at home. Experience unnecessary. New, easy plan. No text-books used. Practical work. Old established school. Send name and address for interesting free booklet. Page-Davis School of Advertising, Dept. 533-A, 3601 Michigan, Chicago.

Agents Wanted

Strange new electric iron cord! Prevents scorching. Saves electricity. Cannot kink or snarl. Used on telephones also. \$25 daily. Samples FREE. "Neverknot," Dept. 12-K, 4503 Ravenswood, Chicago.

Phonograph Needle plays 50,000 records. \$2.50—profit \$1.25. Excellent sideline. Smit, 3605-K, Kingsbridge Ave., New York.

Agents—Show My Signs. Sell like blazes! Every merchant buys. Something new. Splendid opportunity. Sample sign, particulars 2c. Thomas Lawrie, 2066 East 23rd, Brooklyn.

IF AMBITIOUS TO SUCCEED with your own products—send for Free Booklet—"Keystone of Success" in Specialty Manufacturing. A new way to get started—on a liberal plan—under actual, successful, experienced guidance—appeals instantly to anyone seeking financial independence. E. Ruskin Company, 1501 Euclid Avenue, Cleveland.

\$2.45—Raincoats all Colors. Trenchcoats, Tweeds, Alligators, Leatherettes. Sample Coat and bonus to workers. Beautiful Outfit Free. Bradley, Dept. AD-12, 230 S. Wells, Chicago.

Free Booklet describes 67 plans for making \$20—\$100 weekly, home, office. Your own business. Elite Co., Dept. B, 84 Elizabeth Street, N. Y.

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

Agents—I'll pay \$19 daily to wear men's fine felt hats and show friends. Smartest styles. Latest shades. \$2 to \$5 saving on every hat. Samples FREE. Taylor Hat and Cap Mfrs. Dept. TC-390, Cincinnati, Ohio.

\$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.

Women go wild over gorgeously beautiful Rayon Silk Bedspreads! Original! Different! New Everywhere! Wildfire Seller! Gorgeously full-size swatches FREE! BAKER COMPANY, Salisbury, N. C.

IF YOU WANT TO MAKE \$100, \$500, or \$1,000, just send me your name. Wonderful new proposition. No capital needed. Particulars free. Albert Mills, 3972 Monmouth, Cincinnati, O.

You Are Wanted to resilver mirrors at home. Immense profits plating autoparts, tableware, etc. Write Sprinkle, Plater, 955, Marion, Indiana.

Make your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1975 W. Broad, Richmond, Va.

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.

Agents Wanted—Nationally known Chemist will show you how to make a highly specialized product in big demand today. Free information. J. C. Herstein, 46 Grand Ave., Grand Rapids, Mich.

500 Formulas and Big Illustrated Catalog 25c. Ideal Book Shop, Park Ridge, Ill.

\$10 daily silvering mirrors, plating and refinishing lamps, reflectors, autos, beds, chandeliers by new method. Outfits furnished. Write Gunmetal Co., Ave. D, Decatur, Ill.

400% PROFIT SELLING IMPORTED and American Novelties. A \$5.00 investment will earn \$180.00. Valuable and useful samples. Complete information 25c silver. NORTHWESTERN CO., 543-Y North Ashland, Chicago.

Big Money applying Gold Initials on Automobiles. Easiest thing today. No experience needed. \$1.45 profit every \$1.50 job. Free Sample. "Italo," R1043 Washington. Boston, Mass.

Don't sell for others—Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable book free. National Scientific Laboratories, 1975 Broad, Richmond, Virginia.

Gold Leaf Window Letters and Sign Signs; no experience; 500% profit; samples free. Consolidated, 69-R, West Van Buren, Chicago.

\$12.00 Daily Showing New Tablecloth. Looks like Linen. Wash like oilcloth. No laundering. Sample free. Bestever, 651 Irving Park Station, Chicago.

Airplanes—Aviation

Boys Fly—Our Baby R. O. G. Kit 35c. Endurance Tractor 50c. Endurance Pusher 50c. Send no stamps. Price list 5c. W. & J. Aeroplane Shop, 200 Maple St., Wyandotte, Mich.

Build your own Ice Sled. Conversion parts for Motorcycle motors, for Indians, Harleys and Hendersons. Send 10c for list. Heine Motor Works, Orwigsburg, Pa.

Heath Propellers for ice sleds, snow sleighs, boats or airplanes, give more real "push" for less money than any other form of drive because each propeller is individually designed by America's oldest aeronautical engineers to "fit" the particular requirements of each customer. 4c in stamps brings propeller catalogue giving prices on aerial transmission and propellers. Heath Airplane Co., Chicago, Ill.

Biggest, Best Catalog Model Airplanes, Parts, Supplies; 5c postpaid. Ideal Company, 23 West 18th Street, New York.

SIMPLEX AIR MODEL CO., Auburn, Mass. Model Airplane supplies, gas engines, wing sections, gliders, books on model building, glider construction and aerodynamics. Send 5c for catalogue.

Model Airplane Supply, Send 5c for 32-page catalog. Curtis Hawk const. set \$3.00. Blueprint only 50c. National Model Aircraft and Supply Co., 29 North Ave., New Rochelle, N. Y., Dept. S.

Mounted Propeller, 12 inch, and circulars on 3 foot model aeroplane, 10c. Aero Shop, 3050 Huribut Ave., Detroit, Mich.

Aluminum

Aluminum for radio and general purposes. Exact sizes. Drilling, Tapping, Irie Specialty, 1737 East 4th, Brooklyn, N. Y.

Building Material

Concrete Building Block Machines and Molds. Catalogue free. Concrete Machine Co., 5 First St., St. Louis, Mo.

Business Opportunities

Free Book. Start little mail order business. Hadvil, 5A-74 Cortlandt Street, New York.

BIG MONEY AWAITS YOU HERE. 250 Signs and Pictures an hour without press, type or machinery. Samples and particulars 10c. Straco, 1015 Mulberry, Springfield, Ohio.

Make your own electric Vibrators, Reducers and Exercisers. We furnish all parts at wholesale prices, wheels, bases, pulleys, stands, and vibrating belts. Send for circular. University Floor Machine Co., P. O. Box 68, Cambridge, A. Mass.

Nationally known Chemist will start you in highly specialized money-making business. Free information. J. C. Herstein, 46 Grand Ave., Grand Rapids, Mich.

Funds for expanding your business or starting new one. We specialize in helping you; show you how. Interesting details free. Write, George H. Cole, Pres., Tower Bldg., Syracuse, N. Y.

Sell by Mail!—Books, Novelties, Bargains! Large Profits! Particulars Free. E—Elfeo, 525 South Dearborn, Chicago.

Cameras and Photography Supplies

Make money in Photography. Learn quickly at home. Spare or full time. New Plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 5332, 3601 Michigan Ave., Chicago.

Chalk Talks

Laugh-Producing Program, \$1.00 Catalog 10c. Balda Art Service, Dept. 4, Oshkosh, Wis.

Chemistry

Chemical Experimenters—100 different chemicals of highest quality. Sufficient quantities for host of experiments. Apparatus to perform experiments included. Price \$5.00. 50 pieces of High Grade Apparatus, price \$7.00. Interesting to High School, College Students and Home Laboratories. Send Money (order for your outfit) now to Pines Chemical Co., 1524 St. Marks Ave., Brooklyn, N. Y.

Your Chemical problems solved and working processes furnished for Five Dollars. Write me, W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

Complete Chemical Laboratory Equipment for Experimenters. Circular Free. Experimental Service Laboratory, Hoosick Falls, N. Y.

Correspondence Courses

Used correspondence school courses sold on repurchase basis. Also rented and exchanged. Money-back guarantee. Catalog free. (Courses bought). Lee Mountain, Pisgah, Alabama.

Detective

Detectives. Work home or travel. Experience unnecessary. Particulars free. Write, George Wagner, 2190 Broadway, New York.

For Boys and Girls

BOYS, GIRLS Earn Christmas Money! Order 50 sets St. Nicholas Christmas Seals. Sell for 10c set. When sold return \$3.00, keeping \$2.00. No Work—Just Fun. St. Nicholas Seal Co., Dept. 47-S.L., Brooklyn, N. Y.

For Inventors

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars. (Copyrighted.) Write W. T. Greene, 908 Barrister Bldg., Washington, D. C.

If you have a good patent or pending patent for sale, write promptly. American Patents Corporation, Barrister Building, Washington, D. C.

Inventors. Use our special service for presenting your invention or patent to manufacturers. Adam Fisher Mfg. Co., 205-A Enright, St. Louis, Mo.

Blanking and forming dies. Light stamping. Machine work. B. L. Nortved, Mitchell, So. Dakota.

FREE BOOKLET ON PATENTING New inventions. Sterling Buck, S-629 Washington, D. C.

Formulas

Any Formula, 50c. Catalogue Free. Bernard Wells, Dept. 406, 852 George, Chicago.

Self-Shaving Cream without Razor. Formula 25c. "ERIEE" WAUKEGAN, ILLINOIS.

Formulas, processes, all lines; chemical problems solved. Individual service. Modcrato charges. Lex Clure, Industrial Chemist, Crawfordsville, Ind.

Help Wanted—Instruction

MEN 18-35. Railway Postal Clerks. \$158.00-\$225.00 month. Steady. Examinations coming. Common education sufficient. Full particulars free. Write immediately. Franklin Institute, Dept. D-15, Rochester, N. Y.

Be a Detective—Biggest paying work everywhere. Write National Headquarters, 169 East 83rd, New York.

Firemen, Brakemen, Baggage-men (white or colored), Sleeping Car, Train Porters (colored), \$150-\$250 monthly. Experience unnecessary. \$97 Railway Bureau, East St. Louis, Ill.

BE AN INVESTIGATOR. Make secret investigations, work home territory. If you have natural ability and a desire for the work, experience is unnecessary. Write today for particulars. Northern Detective & Identification Bureau, Dept. D, Traverse City, Michigan.

THE Boulder Dam. Eight years' work. Latest information regarding conditions, employment, concessions, etc., sent by return mail for \$1.00. Money back if dissatisfied. P. Roberts Service Bureau, Box 1051, Denver, Colo.

MAKE BIG PROFIT SILVERING MIRRORS. Easily learned patented process. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

I Catch from 45 to 60 foxes in from 4 to 5 weeks' time. Can teach any reader of this magazine how to get them. Write for particulars. W. A. Hadley, Stanstead, Que.

Wanted Immediately. Men-Women, 18-55, qualify for permanent Government Positions. \$105-\$250 month; experience not required; vacation with pay; common education many needed soon. Write, Instruction Bureau, 293, St. Louis, Mo., quickly.

MEN, 18-35. Railway Postal Clerks. \$158.00 month. Examinations coming. 25 coached free. Franklin Institute, Dept. D-4, Rochester, N. Y.

How to Entertain

Plays, Musical comedies and revues, minstrels, comedy and talking songs, black-face skit, vaudeville acts, monologs, dialogues, recitation, entertainments, juvenile plays and songs, musical readings, make-up goods. Catalog free. T. S. Denison & Co., 623 So. Wabash, Dept. 99, Chicago.

Inventions Wanted

Inventions Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Magic and Games

Magic Catalog 20c. Lynn's, 105 Beach, Dept. 6, Jersey City, N. J.

MAGICAL EFFECTS that are different. Illusion blueprints, secrets. Professional catalogue 10c. Herbert, 1705-A East Seventh, Brooklyn, N. Y.

Miscellaneous

The Heath Super Parasol, America's Most Popular Sport plane won 1st and 2nd place at the National Air Races. For 4 years Heath Planes have defeated all others in their class at the National Races. For 21 years Heath design and experience have proved superior. Fly a Heath Super Parasol from our Airport at \$975 or build it yourself for \$199. 10c in coin or stamps brings large illustrated booklet. Heath Airplane Co., Dept. S-12, Chicago, Ill.

Gears and Model Supplies of every description. Catalog 10 cents. Experimenters Supply House, Box 10, Station Y, New York City.

Gigantic Mail; send me 25c (coin or stamps) for one pound of mail. Ted Armour, 136 East 28th St., New York.

Music and Musical Instruments

SONGWRITERS: Submit your songs or complete songs. Quick decision on availability for publication—unacceptable manuscript returned. Chester E. Escher, Music Publisher, 125 W. 45th St., New York City.

Patents

Inventions Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Everything in RADIO! at *Lowest* WHOLESALE PRICES

Get this... CATALOG



This big book of 148-pages—rich from cover to cover with radio bargains—is yours for the asking. It contains all the latest radio devices and improvements—sets, accessories, parts and kits—profusely illustrated. No radio need is overlooked. Everything in this big book is available at wholesale prices, and many items are spotlighted as Specials at truly astounding reductions. To be without this book is to miss your greatest buying opportunity in radio. Every page points the way to money-saving. Never before have such startling values been offered—made possible by our tremendous buying power and low cost of operation. Quick deliveries and expert cooperation assured to all our clients. A trial order will make you a regular customer, just as it has thousands of our pleased customers.

Clip the Catalog Coupon, and mail it today!

New SCREEN-GRID Models

Marvelous offerings in new, Humless, Screen Grid A. C. all-electric and battery operated sets; a wide range of beautiful consoles, from the small table model types to the most ornate and artistic of radio furniture; dynamic speakers of tremendous volume and richest tone; accessories, parts and kits in wide variety—in fact, everything that is standard, as well as everything that is new, in Radio. Get this book today!

Price-Saving COUPON

Chicago Salvage Stock Store
Dept. 128
509 So. State St., Chicago, Ill.

Kindly send me (free of charge and postpaid)
your new 148-page Book of Radio Bargains.

Name.....

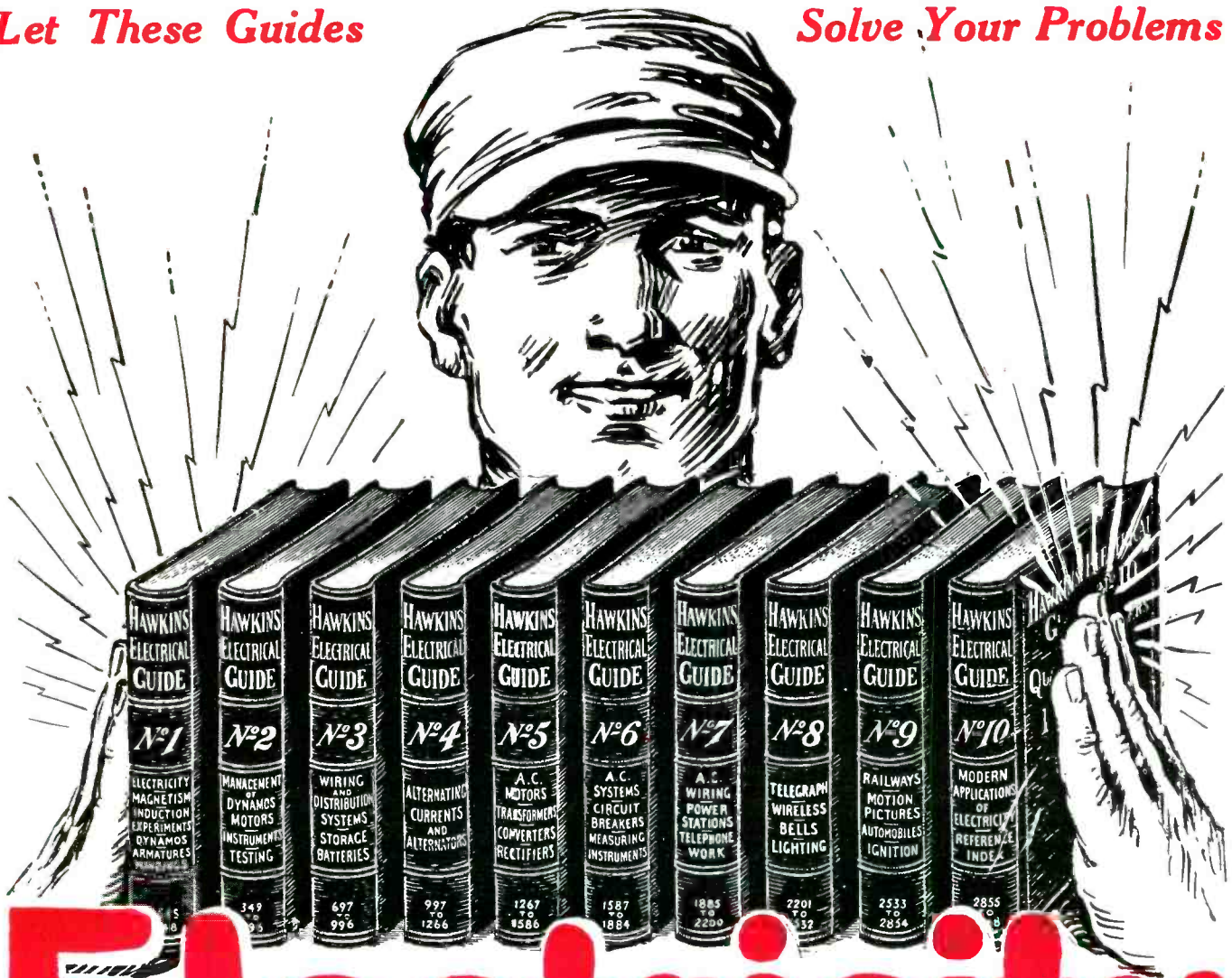
Address.....

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

CHICAGO SALVAGE STOCK STORE
World's Largest Radio Store
509 So. State St. Dept. 128 Chicago, Ill.

Let These Guides

Solve Your Problems



Electricity at your finger ends

HAWKINS ELECTRICAL GUIDES IN TEN VOLUMES

**3500 PAGES
4700 PICTURES**

**\$1 A VOLUME
\$1 A MONTH**

SEND NO MONEY—SEND ONLY THIS COUPON

Know the facts in Electricity. They mean more money and better position for you. Hawkins Guides tell you all you need to know about Electricity. Every important electrical subject covered so you can understand it. Easy to study and apply. A complete, practical working course, in 10 volumes. Books are pocket size; flexible covers. Order a set today to look over.

LEARN ALL ABOUT

Magnetism—Induction—Experiments—Dynamos—Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distribution Systems—Wiring—Wiring Diagrams—Sign Flashers—Storage Batteries—Principles of Alternating Currents and Alternators—Alternating Current Motors—Transformers—Converters—Rectifiers—Alternating Current Systems—Circuit Breakers—Measuring Instruments—Switchboards—Wiring—Power Stations—Installing—Telephone—Telegraph—Wireless—Bells—Lighting—Railways. Also many Modern Practical Applications of Electricity and Ready Reference Index of the ten numbers.

SHIPPED FREE

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Send Coupon now—today—and get this great help library and see if it is not worth \$100 to you—you pay \$1.00 a month for ten months or return it.

THEO. AUDEL & CO.

65 West 23rd Street, 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.....

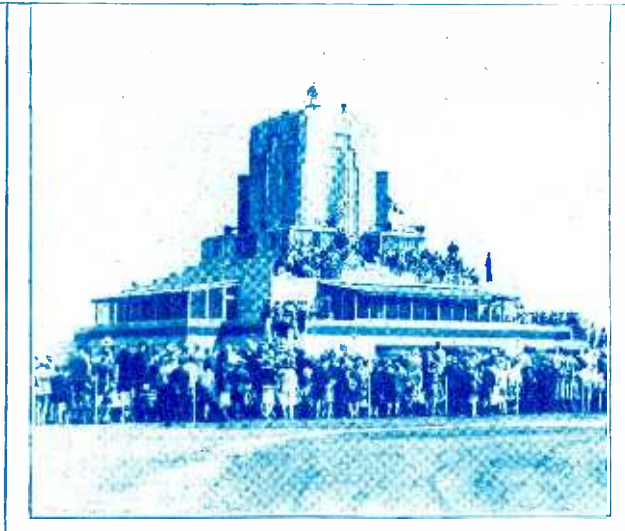
Occupation.....

Employed by.....

Home Address.....

Reference.....

S. I. DEC.



Club House, and Air Depot,
Sky Harbor, Chicago

FLY AT SKY HARBOR



Steel and Concrete Hangar, Sky Harbor, Chicago

NOW is the time to get into aviation—learn to fly at Sky Harbor, the finest flying field in the Middle West. Training on latest type training planes with air cooled motors similar to those used in the Army. Advanced training on Fokker and Trimotored Ford. We fly at Sky Harbor all winter.

Complete mechanic's courses covering every phase of aerodynamics taught at our big down town building—six floors of equipment—the finest ground school in the Middle West. Training given on latest types of motors, including whirlwind and other air cooled radials. Welding, navigation, meteorology, construction, and motors are included. Mail the coupon today for complete information. Be sure to investigate Sky Harbor before you pick your flying school.



Sky Harbor Flying School—Six Floors of Equipment

SKY HARBOR FLYING SCHOOL

DEPT. S. I

1801 S. MICHIGAN AVENUE

CHICAGO

SKY HARBOR, DEPT. S. I
1801 S. MICHIGAN AVE., CHICAGO, ILL.

Please send me complete information on the course checked below:

Private Pilot's Course. Limited Commercial Pilot's Course.
 Transport Pilot's Course. Welding Course.
 Complete Airplane Mechanic's Course.

NAME

ADDRESS

TOWN..... STATE