$3250.00 in Prizes

"There she blows!"
Why Auto Tires Wear Out
Harnessing Sea Temperatures
BOOMERANGS How to Make and Throw Them
1931 FEATURE RADIO VALUES LOWEST WHOLESALE PRICES

MODERN UP-TO-THE MINUTE RADIO AT TREMENDOUS PRICE REDUCTIONS

Now, as never before, are you able to buy real radio values at astounding low prices. Never before in our many years of experience in radio merchandising, have we been able to offer such real values—on such quality radio merchandise as you will find presented in this catalog. No matter what your radio requirements may be, you will find them offered in this large 168 page catalog in large variety. Dealers—set builders, and radio enthusiasts of every nature should have a copy of this remarkable catalog.

BUY NOW AND SAVE—PRICES ARE DOWN

If you have planned on buying a new radio set—or if you contemplate replacing your old receiver with one of the new screen grid types, send for this catalog immediately. It will show you the way to substantial savings. Prices are down to a new all time record. In the large assortment of receivers shown, you will find just what you have been looking for—sets, accessories, kits or parts at lowest prices.

EVERYTHING IN RADIO

NEW AUTO RADIO

Now, you can enjoy your favorite radio program as you drive. This new Roamer Auto radio blazes a new trail in its approach to perfection in circuit design. Music as You Drive

No need to miss your favorite program while you drive. Sporting events, news flashes, symphony, dance or opera—all are available to you with this new Roamer Auto Radio. Concealed installation with remote control. R. C. A. licensed chassis. Universal brackets simplify installation in any car. Its many special features make it an outstanding value.

168 PAGE CATALOG FREE!

WRITE FOR YOUR COPY TODAY

Write for your copy of this remarkable catalog today. See for yourself the unusual values that are offered. It lists over a thousand bargains, including such popular items as battery-operated receivers, super-batterydynes, remote control, electric time-switch receivers, phonograph-combinations, coin operated receivers, along with a remarkable variety of consoles, dynamic speakers, tubes, accessories, etc. No matter what your requirements may be in radio, you will find them listed in this catalog. Don’t delay. Clip the coupon and send for your copy today.

FREE CATALOG COUPON

Allied Radio Corporation
711 W. Lake St., Dept. D-4
Chicago

Gentlemen: Please send me your 168-page FREE radio book of bargains. It is understood there is no obligation for sending this catalog to me, neither will I be bothered by personal calls.

Name ____________________________

Address __________________________

www.americanradiohistory.com
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

O P P O R T U N I T Y IS KNOCKING AT YOUR DOOR

BIG MONEY STEADY JOBS OFFERED and the Definite Way to Get Them

Good Jobs at Good Pay! Steady, Interesting Work! Fine Profits for your Spare Hours! Big Money as Your Own Boss! That's the Opportunity for you in Radio right Now! Why? Because the great, fast-growing Radio industry has reached the stage where it must have many more trained men. Most of those now employed are untrained—they just "picked up" what they know about radio, and even many of them get good pay. But the Big Pay Steady jobs go to the Trained Men, and R.T.I. offers you the definite way to prepare for them. R.T.I. training is endorsed by Leading Radio Men and Radio Trade Associations.

R. T. I. TRAINS YOU AT HOME FOR THE BETTER PAID RADIO JOBS

Do you want to get into some branch of Radio where trained men can easily make $40 to $50 weekly—where some earn $75 to $100 per week—where trained experienced men are selected for executive positions paying up to $5,000 and $10,000 yearly and more? Then send for the R.T.I. Radio Opportunity Book. Find out how R.T.I. trains you at home for this well-paid work—you don't have to give up your present job—you learn quickly and thoroughly—just a little time needed at home—earn an extra $10 to $20 per week in spare hours while learning—Then step into radio and go steadily on up to the Big Money. No experience needed to start—R.T.I. starts you right.

LEARN TELEVISION—and Talking Pictures, TOO

Be prepared for Television! Learn Talking Picture Apparatus installation, adjustment, etc. Both of these great branches of Radio are included in the R.T.I. practical training.

LEARN FROM LEADERS

Why does the radio industry want men trained the R.T.I. way? Because you learn under experts—leading men in different branches of Radio—well known specialists of high standing.

FREE OPPORTUNITY BOOK

Remember, you need no experience to start in Radio—R.T.I. starts you right—and helps you on to success. The big R.T.I. Radio Opportunity Book explains everything. If you are interested, send for it now. Don't wait.

Use the coupon, or write, or telegraph to

RADIO AND TELEVISION INSTITUTE
Dept. 911, 4806 St. Anthony Court, Chicago, II.

RADIO & TELEVISION INSTITUTE
4806 St. Anthony Court, Chicago, Dept. 911

Send me Free and prepaid your BIG RADIO OPPORTUNITY 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________________________
**Take your pick of these fine Big Pay Radio Jobs**

YOU have seen how the men and young men who got into the automobile, motion picture and other industries when they started had the first chance at the key jobs—are now the $15,000, $10,000 and $15,000 a year men. Radio offers you the same chance that made men rich in those businesses. Its growth has already made men independent and will make many more wealthy in the future. Its amazing growth can put you ahead, too. Don't pass up this opportunity for a good job and future financial independence.

**Hundreds of $50 to $100 a Week Jobs Opening Every Year**

Radio needs more trained men badly. Why slave your life away for $25 to $40 a week in a no-future job when you can get ready in a short time for Radio where the good jobs pay $50, $60, $75 and $100 a week? And many of these jobs can quickly lead to $150 to $200 a week. Hundreds of fine jobs are opening every year for men with the right training— the kind of training I'll give you.

**I Am Doubling and Tripling Salaries**

Where you find big growth you always find many big opportunities. I am doubling and tripling the salaries of many men every year. After training with me only a short time they are able to make $1,000 to $3,000 a year more than they were getting before. Figure out for yourself what an increase like this would mean to you—the many things that mean so much in happiness and comfort that you could buy with an additional $1,000 to $3,000 a year.

**You Have Many Jobs to Choose From**

Broadcasting stations use engineers, operators, station managers. Radio manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers and managers. Shipping companies use hundreds of operators and give them world-wide travel with practically no expense and a good salary besides. There are hundreds of opportunities for you to have a spare time or full time Radio business of your own. I'll show you how to start one with practically no capital. My book tells you of other opportunities. Be sure to get it at once.
I will train you AT HOME free book gives facts and proof

I Will Train You at Home In Your Spare Time

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively during your spare time. You don’t have to be a high school graduate. My course is written in a clear, interesting style that most anyone can grasp. I will give you practical experience under my 30-50 method of training—one-half from lesson books and one-half from practical experiments. When you graduate you won’t have to take any kind of a job to get experience—you will be trained and experienced ready to take place beside men who have been in the field for years.

Television and Talking Pictures Included

My course not only gives you a thorough training in Radio—all you need to know to get and hold a good job—but also your choice, without extra charge, of any one of these special courses: Television, Aircraft Radio, Broadcasting, Commercial and Ship Radio Stations, Sound Pictures and Public Address Systems, and Advanced Radio Servicing and Merchandising. You won’t be a “one job” man when you finish my course. You’ll know how to handle a job in any one of Radio’s 20 different branches of opportunity.

J. E. Smith, President
NATIONAL RADIO INSTITUTE
WASHINGTON, D. C.

Salary Three Times Larger

"Before I completed your course I went to work for a Radio dealer. Now I am Assistant Service Manager of the Sparks-Withington Company. My salary is three times what it was before taking your course. I could not have obtained this position without it. I owe my success to N. R. I. training." H. A. Wilmoth, Sparks-Withington Co., Jackson, Mich.
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Editorial</strong></td>
<td>774</td>
</tr>
<tr>
<td>Music, Noise and Noise Abatement</td>
<td></td>
</tr>
<tr>
<td>Flights of Fancy Come True</td>
<td>776</td>
</tr>
<tr>
<td>&quot;There She Blows!&quot;</td>
<td>777</td>
</tr>
<tr>
<td>William M. Reddy tells some of the thrills and facts of the whaling industry</td>
<td></td>
</tr>
<tr>
<td>How Hot Are the Stars?</td>
<td>782</td>
</tr>
<tr>
<td>George F. Paul satisfries your curiosity</td>
<td></td>
</tr>
<tr>
<td>Electrocuting Plant Insect Pests</td>
<td>783</td>
</tr>
<tr>
<td>By Joseph Farrell</td>
<td></td>
</tr>
<tr>
<td>Harnessing Ocean Temperatures</td>
<td>784</td>
</tr>
<tr>
<td>A full account of Dr. Georges Claude's experiments in Cuba</td>
<td></td>
</tr>
<tr>
<td>Glowworms Light These Caves</td>
<td>786</td>
</tr>
<tr>
<td>Amazing, true—By Isabelle F. Story</td>
<td></td>
</tr>
<tr>
<td>How and Why Auto Tires Wear Out</td>
<td>787</td>
</tr>
<tr>
<td>If you own a car, don't miss this—By U. Vincent W. Heeke</td>
<td></td>
</tr>
<tr>
<td>Amazing Partnerships of Nature</td>
<td>788</td>
</tr>
<tr>
<td>An interesting tale—By Gaylord Johnson</td>
<td></td>
</tr>
<tr>
<td>How Science Saved Our Sugar Industry</td>
<td>789</td>
</tr>
<tr>
<td>H. L. Kaufmann explains how the U. S. government scientists turned ruin into prosperity</td>
<td></td>
</tr>
<tr>
<td>The Back Woods of Modern Russia</td>
<td>792</td>
</tr>
<tr>
<td>An astonishing tale of anachronisms—By Coula A. N. Mireafl and Murray Godwin</td>
<td></td>
</tr>
<tr>
<td>Mechanical Ears</td>
<td>794</td>
</tr>
<tr>
<td>Modern methods of extending the range of man's sense of hearing</td>
<td></td>
</tr>
<tr>
<td>Butterfly Wings Are Not Varicolored</td>
<td>796</td>
</tr>
<tr>
<td>Dr. E. Bade proves that seeing is not believing</td>
<td></td>
</tr>
<tr>
<td>He Can't Miss His Train</td>
<td>806</td>
</tr>
<tr>
<td>Austin C. Lescarboura describes an interesting model railway</td>
<td></td>
</tr>
<tr>
<td>He Rides a Hundred Hobbies</td>
<td>809</td>
</tr>
<tr>
<td>William T. Miller tells a fascinating tale of the hobbies of the millionaire Colonel Green</td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>In the Spotlight of Science</td>
<td>797</td>
</tr>
<tr>
<td>Eight pages of fascinating facts from here, there and everywhere</td>
<td></td>
</tr>
<tr>
<td>Would You Believe It?</td>
<td>810</td>
</tr>
<tr>
<td>You'll Have to Sprint to Get Your Share of That $3250.00</td>
<td>813</td>
</tr>
<tr>
<td>Final announcement of Our New Contest—Don't Miss It</td>
<td></td>
</tr>
<tr>
<td>The Oracle</td>
<td>820</td>
</tr>
<tr>
<td>Conducted by Seymour A. Davidson</td>
<td></td>
</tr>
<tr>
<td>The Safety Valve</td>
<td>826</td>
</tr>
<tr>
<td>Conducted by the Editor</td>
<td></td>
</tr>
<tr>
<td>Glider-Tap—the Latest Outdoor Sport</td>
<td>834</td>
</tr>
<tr>
<td>Doc Schumacher, originator of Outboard Polo, describes the first glider game</td>
<td></td>
</tr>
<tr>
<td>Scientific Book Reviews</td>
<td>845</td>
</tr>
<tr>
<td>Index to Advertisers</td>
<td>862</td>
</tr>
<tr>
<td>Unscrambling the Ether</td>
<td>790</td>
</tr>
<tr>
<td>A. Dunstable gives a simple explanation of the Stande Radiostat</td>
<td></td>
</tr>
<tr>
<td>Television in Germany Today</td>
<td>807</td>
</tr>
<tr>
<td>By Dr. Alfred Gradoe</td>
<td></td>
</tr>
<tr>
<td>What's New in Radio</td>
<td>825</td>
</tr>
<tr>
<td>Construction, Amusement, Experiment</td>
<td>791</td>
</tr>
<tr>
<td>How to Make and Throw Boomerangs</td>
<td></td>
</tr>
<tr>
<td>By William H. Van Stran</td>
<td></td>
</tr>
<tr>
<td>Spectacular Electrical Experiments</td>
<td>795</td>
</tr>
<tr>
<td>By John P. Morris</td>
<td></td>
</tr>
<tr>
<td>From Piano Stool to Book Table</td>
<td>805</td>
</tr>
<tr>
<td>By H. L. Weatherby, Director of Manual Training, Montgomery County Schools, Montgomery, Alabama</td>
<td></td>
</tr>
<tr>
<td>Model Guillotine Makes Useful Cigar Cutter</td>
<td>808</td>
</tr>
<tr>
<td>By Charles H. Alden</td>
<td></td>
</tr>
<tr>
<td>Magic</td>
<td>811</td>
</tr>
<tr>
<td>By Danninger</td>
<td></td>
</tr>
<tr>
<td>New Ideas for the Owner and Driver</td>
<td>812</td>
</tr>
<tr>
<td>By Arthur George, Consulting Engineer</td>
<td></td>
</tr>
<tr>
<td>Make Synthetic Dyes at Home</td>
<td>814</td>
</tr>
<tr>
<td>By Captain Robert E. Sutler, U. S. A.</td>
<td></td>
</tr>
<tr>
<td>Make Your Own Sunlamp</td>
<td>816</td>
</tr>
<tr>
<td>By John Steine</td>
<td></td>
</tr>
<tr>
<td>For the Home Machinist</td>
<td>817</td>
</tr>
<tr>
<td>By George A. Lears</td>
<td></td>
</tr>
<tr>
<td>Try These in Your Own Workshop</td>
<td>818</td>
</tr>
<tr>
<td>By Sam Loyd</td>
<td></td>
</tr>
<tr>
<td>Prize Puzzles to Polish Your Wits</td>
<td>819</td>
</tr>
<tr>
<td>By Sam Loyd</td>
<td></td>
</tr>
<tr>
<td>Making a Compact Oak Bedroom Suite</td>
<td>821</td>
</tr>
<tr>
<td>Part II—Bedroom and Tallboy Cabinets—By E. F. Lovett</td>
<td></td>
</tr>
<tr>
<td>Scientific Problems and Puzzles</td>
<td>822</td>
</tr>
<tr>
<td>By Ernst K. Chapin</td>
<td></td>
</tr>
<tr>
<td>Build This Bend Saw of Laminated Wood</td>
<td>823</td>
</tr>
<tr>
<td>By H. O. Harris</td>
<td></td>
</tr>
<tr>
<td>Wrinkles and Recipes</td>
<td>824</td>
</tr>
<tr>
<td>Drill Press From Bottle Capper</td>
<td>846</td>
</tr>
<tr>
<td>By Raymond B. Wiles</td>
<td></td>
</tr>
<tr>
<td><strong>Home Improvement</strong></td>
<td></td>
</tr>
<tr>
<td>Scientific Aids to Your Comfort</td>
<td>815</td>
</tr>
<tr>
<td>By Mary Jacobs</td>
<td></td>
</tr>
<tr>
<td>Science and Invention’s Service to Home Owners</td>
<td>859</td>
</tr>
<tr>
<td>For Inventors</td>
<td></td>
</tr>
<tr>
<td>Patent Advice</td>
<td>830</td>
</tr>
<tr>
<td>Conducted by Joseph H. Kraus</td>
<td></td>
</tr>
<tr>
<td>Yankee Brains at Work</td>
<td>832</td>
</tr>
</tbody>
</table>

25c a copy  $3.50 in Canada  $3.00 a year  $4.00 in Foreign Countries

Published Monthly by RADIO-SCIENCE PUBLICATIONS, Inc.  184-10 Jamaica Avenue, Jamaica, N. Y.

Publishers, B. A. MacKinnon and H. K. Fly; Editor, Joseph H. Kraus

Entered as second class matter at the Post Office at Jamaica, N. Y., under the act of March 3, 1879.

Title Registered at the U. S. Patent Office. The contents of this magazine must not be reproduced without giving full credit to the publication.

Copyright, 1931, by Radio-Science Publications, Inc. Editorial and Executive Offices, 381 Fourth Avenue, New York, N. Y.

All Rights Reserved.
BIG PAY JOBS
NOW OPEN
FOR EVERY RADIO
TRAINED MAN

Don't spend your life slaving away in some dull hopeless job! Don't be satisfied to work for a mere 25 or 30 a week. Let me show you how to quickly make BIG MONEY IN RADIO, the fastest, growing, biggest money-making game on earth.

THOUSANDS OF JOBS PAYING 6000 to 20000 A WEEK

LEARN WITHOUT LESSONS IN 60 DAYS.

Come to Coyne and learn the fascinating big pay game - NOT BY CORRESPONDENCE but on REAL Radio, Television and talking picture equipment. Real modern Radio receivers, ham radio, Broad-casting equipment and the very latest Television and talking picture and code practice equipment. We give you right here in THE COYNE SHOPS the actual experience you'll need to make you a money maker.

TELEVISION AND TALKING PICTURES

And now television is on the way. Soon there will be thousands of big pay jobs in this field. Get in on the ground floor. The fellow who learns television now can make a fortune.

GET THE FACTS FREE

Mail coupon for my big free book. It tells you all the facts. Tells you how you can LEARN WHILE EARN INC. FREE EMPLOYMENT SERVICE for life. MAIL COUPON FOR FREE BOOK AND GET FACTS

H. C. LEWIS, President
Radio Division, Coyne Electrical School
500 S. Paulina St., Dept. 11-SC, Chicago, Ill.

Send me your Big Free Radio Book and all details of your Special Introductory Offer. This does not obligate me in any way.

Name

Address

City

State
Music, Noise and Noise Abatement

J ust exactly what is noise, what is music, and where is the line of demarcation?

According to Webster, noise is sound of any sort whether loud or low, harsh, pleasant or melodious, specifically any sound that is without agreeable musical quality.

Music is a tone or tones having any or all of the features of rhythm, melody or consonance, or the science or art of pleasing, expressive or intelligible combination of tones.

Inasmuch as noise may be a melodious sound and music may likewise be a melodious sound, it would seem that the ear is both the presiding justice and the jury. Whether or not a succession of noises can be called music would depend on who you are, where you live and how your ear has been taught to discriminate and differentiate.

The average individual regards modern jazz as music. Jazz pleases the ear of the majority, even though the so-called music of major concert halls, purposely squeaked violins and pianos in syncopated minors, produces decidedly discordant notes easily discernible by the trained ear.

This same trained ear that considers white man's operas, fantasies, nocturnes, and sonatas, the symbolization of supreme harmony, would look upon the sounds made on various musical instruments of the savage as being extremely crude and unmusical. The savage in turn cannot appreciate our mode of musical expression and the sounds are unintelligible to him.

Let us take a piece of hardwood, an inch square and eight inches long, and drop it on the table or floor. It creates a noise. If we follow this with another smaller piece it also produces noise. Now drop the third yet smaller one—still some noise. Pick all three pieces up and drop them one after another in rapid succession and we will have music—a succession of sounds that please the ear. Several such pieces produce the drummer's musical blocks. Many of them properly cut and mounted give us the instrument known as the xylophone. We thus see that from a succession of noises we can produce music.

These facts concerning noise and its twin sister music could conceivably be applied to noise abatement, as we shall presently see.

Inventors have already perfected railroad track crossings that do not allow the wheels to bump on the cross rails. Street car rails have been welded together for the purpose of eliminating clicks. Solid rubber tires have been and can be applied to wagon wheels. Airplane silencers have been developed that are thoroughly practical, and Hiram Percy Maxim has developed a window ventilator that prevents much of the noise in the street from entering the building. Dr. J. F. Newsome, of Stanford University, developed a similar product more than three years ago. Noiseless typewriters are found in most offices, and many of the conference rooms of our large organizations, as well as the rooms which house the stenographic force, are now constructed with walls and ceilings which absorb sound. This is one form of noise abatement.

From another angle—automobile horns, once noisy, are now made to give forth musical sounds instead of the honk and squawk of the horns of the previous decade. Music, then, is another effort at noise abatement.

If steel-tired wagon wheels must run on cobblestone roads, why do not some inventors develop a frequency changer so that the noisy clatter would assume an aural presentation of a succession of sounds pleasing to the ear? If pneumatic riveting hammers cannot be replaced by activated hydrogen, or oxyacetylene welding, why do not some inventors develop frequency changers to endorse the tapping of the hammer with music-giving properties? If elevated structures, street car rails and railroad crossings are not provided with one or another of the many noise-eliminating devices that have been designed for this express purpose by the world's ever-budding inventors, why not make the necessary constitutional changes that will force the users of each noise-producing device to change its sound frequency?

Surely, the resultant discord would not be much worse than some modern jazz.

Here then is a chance for inventors to cover themselves with glory. They should devise systems for converting tumults into harmony, or develop devices which will produce sounds so related to the fundamental noise of the vehicle or conveyance, as to blend with this fundamental. The resultant sound could then be brought up above audibility; our ear would no longer be aware of the din.

At any rate, this presents an interesting thought. Inventors should do the rest.—Editor.
Amazingly Easy Way to get into ELECTRICITY

Don't spend your life waiting for $5 raises in a dull, hopeless job. Now ... and forever ... say good-by to 25 and 35 dollars a week. Let me show you how to qualify for jobs leading to salaries of $50, $60 and up, a week, in Electricity NOT by correspondence, but by an amazing way to teach, RIGHT HERE IN THE GREAT COYNE SHOPS. You become a practical expert in 90 days! Getting into Electricity is far easier than you imagine!

Learn Without Lessons in 90 DAYS By Actual Work — in the Great Shops of Coyne

Lack of experience — age, or advanced education bars no one. I don't care if you don't know an armature from an air brake — I don't expect you to! I don't care if you're 16 years old or 80. It makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have.

Railroad Fare Allowed

I will allow your railroad fare to Chicago, and if you should need part-time work I'll assist you to it. Then, in 12 brief weeks, in the great roaring shops of Coyne, I train you as you never dreamed you could be trained on a gigantic outlay of electrical apparatus ... costing hundreds of thousands of dollars ... real dynamos, engines, power plants, autos, switchboards, transmitting stations ... everything from doorbells to farm power and lighting ... full-sized ... in full operation every day!

No Books — No Printed Lessons

No books, no baffling charts ... all real actual work ... right here in the great Coyne school ... building real batteries ... winding real armatures, operating real motors, dynamos and generators, wiring houses, etc., etc. That's a glimpse of how we make you a master practical electrical engineer in 90 days, teaching you far more than the average ordinary electrical engineer ever knows and fitting you to step into jobs leading to big pay immediately after graduation. Here, in this world-famous Parent school — and nowhere else in the world — can you get this training!

Jobs-Pay-Future

Don't worry about a job, Coyne training settles the job question for life. Demand for Coyne men often exceeds the supply. Our employment bureau gives you a lifetime service. Two weeks after graduation, Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. We can point to Coyne men making up to $600 a month. $20 a week is only the beginning of your opportunity. You can go into radio, battery, or automotive electrical business for yourself and make up to $15,000 a year.

GET THE FACTS

Coyne is your one great chance to get into electricity. Every obstacle is removed. This school is 20 years old — Coyne training is tested — proven beyond all doubt — endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book of 150 photographs ... facts ... jobs ... salaries ... opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. So act at once. Just mail coupon.

Get This FREE Book

Mr. H. C. LEWIS, President
COYNE ELECTRICAL SCHOOL, Dept. 11-83
500 S. Paulina St., Chicago, Ill.

Dear Mr. Lewis:

Without obligation send me your big free catalog and all details of Railroad Fare to Chicago, Free Employment Service, Radio, Aviation, Electricity, and Automotive Courses, and how I can earn while learning.

Name: ________________________________
Address: ________________________________
City: __________________ State: __________

www.americanradiohistory.com
Flights of Fancy Come True

This remarkable photograph shows two of the latest and most amazing scientific achievements of our day, two Pitcairn-Cierva autogiros flying over the new Hudson River Bridge during a recent flight over New York in search of suitable landing places within the city itself. The revolving windmill foils permit these craft to ascend and descend almost vertically.
"There She Blows!"

For Hundreds of Years Man Has Hunted the Greatest of All Mammals, the Whale, the Various Products of Whose Carcase Provide a Golden Harvest for Those Who Are Willing to Experience the Thrills and Brave the Dangers so Vividly Described in This Article

By William M. Roddy

"HARD on the lee-beam, a whale; Thar she blows!" This shout of the look-out in the "crow's nest" is familiar to most everyone whether he knows anything about whales or not. And many are the stories about the pursuit and capture of this great monster of the sea—stories of hard-fought battles, of tremendous courage and of stirring adventure in far places.

Man has been hunting the whale for many centuries, even before the Pilgrim Fathers found the Indians engaged in this pastime on the coast of New England. Just who were the first people to kill and capture the whale is shrouded in the mists of antiquity—possibly they were an Oriental race. The first direct historical reference to whale hunting was made by the Norsemen in the tenth century. And though the whale dates back to Noah's time, and people are familiar, more or less, with the subject of whales, very few persons have ever seen one, and their conception of what it looks like was gained mostly from the story of Jonah and his encounter with the under-sea mammal.

Of recent years university heads, museums and biological societies have been making a concerted effort to study the life and habits of the whale; and as a result, while many important and interesting facts are known, there is much that is still held in the realm of romance and conjecture. The whale is the largest creature that lives or ever did live (the record specimen ever actually measured was 115 feet in length), yet one of the least known.

But this much of the whale's history is known definitely. Millions of years ago it was a land animal. At some time in the ancient past this huge monster gradually adapted itself to water for the purpose of obtaining food and of escaping dangers on land. As sea water is the whale's supporting medium and an animal's size is chiefly limited only by that medium, the whale has continued to increase in size through the thousands of years, until now it is the largest animal that lives or ever inhabited the earth. It has four-fifths of the earth's surface as a hunting ground, and the buoyancy of the water to support its body.

Due to the fact that the whale adapted itself to the water, where there was an almost unlimited supply of food and plenty of space to avoid its enemies, it has survived while the great mammals of that period, such as the mastodon and dinosaur, have become extinct.

The American people are in a position to acquire more concrete knowledge of the whale and the whaling industry than the citizens of any other nation, for the history and records of the industry are right at their front door, so to speak. From 1825 to 1860 was the "golden era" of whaling in America, and New Bedford, Mass., was then the whaling capital of the world. And it still has the finest museum of its kind to be found anywhere on earth.

But much new and important knowledge of the whale is being brought to light from time to time, additional valuable facts are being constantly gathered from the many sources, and carefully recorded by the newly formed American Society of Mammalogists, of which Dr. Henry Fairfield Osborn, President of the American Museum of Natural History, is a prominent member. Already we know the whale is a warm-blooded creature. It breathes air...
and gives birth to its young and
nurses them afterward for six or
seven months, and the mother's
milk is about the color and
consistency of ordinary
condensed milk. The baby
whale is from 15 to 25
feet at birth and grows
very rapidly the first
year; it more than
doubles its length by
the time it is weaned,
and at the age of two or
three years it is able to
bear young. After that
one can look at a whale
and say it is a young whale or an
old whale, but no one can
correctly state its age.

Capt. David G. Dedrick, former
Norwegian sailing master and now a
ranking officer of the Pacific Whaling
Company fleet of killer boats, laments
the fact that the romance
which he found in old time
whaling has largely dis-
appeared. He insists that
there is plenty of danger
even today, and he should
know because he has served
not only on modern steam
turbine-driven craft that
have the latest mechanical
equipment for handling of
the whale, but also on the
old-fashioned whaling ves-
sels which preceded the
modern whalers. Capt.
Dedrick was prevailed upon
to recount one of his expe-
riences with a monster—to
give his own version of one
of the occasions when he
was knocked out of a whale
boat and wounded. He has
lived through similar ex-
periences not once but doz-
en of times. This story
was culled from him with
difficulty, the sturdy captain
being very modest.

"Some years ago when I
was in command of an expedi-
tion in the Antarctic waters, I
took charge of one of the killer
boats, a vessel about 25 feet long
that was manned by a crew of
eight oarsmen, a helman and
myself as a harpooner. Each of
the eight oarsmen had an
oar apiece. We set out
for a day's work. Late that afternoon
we sighted a school of whales, a few points
off to starboard. We proceeded cautiously.
Caution is needed in approaching whales
because, despite their hulk, whales are very
delicately attuned and seem to sense the
presence of an enemy. Whales, as every
one knows, usually travel in a straight
line. So when you once get on their track
even though they might sound (a term re-
ferring to a whale going down to the bot-
tom) you can continue to row ahead know-
ing that you will again be on the whale's
trail when he reaches the surface.

"We finally came up in back of a large
beauty. I was standing on the platform of
the little whale boat with the harpoon
poised in my arm, my muscles taut, await-
ing the moment when I should thrust
the harpoon into the whale's body.

The oarsmen were pulling
slowly, methodically,
creating as little
noise as possible. We were gradu-
ally drawing up on the monster
to a point of better vantage.
I continued to repeat, in
time with the movements
of the oar, 'a little nearer
—a little nearer.' The
whale evidently sensed
danger. He started to
dive, but I was not anxi-
ous to let him get away
as easily as that. With all
the strength that I could
command, I drove the har-
poon forward, but it failed
to reach the life.' It failed to hit
the vital spot.

"When a harpooned whale does not
come to the surface spouting blood,
prepare for trouble.

"I knew that we were in for it. My
hand instinctively went to a knife that
a whaler always

A harpooned whale in the act of sound-
ring. This is where the thrill and danger
of whaling starts.
boat with you from the path to eternity. In this case, the knife did not do any good. I never had a chance to use it. The harpoon had entered several feet too far back of the shoulder to reach the heart. Infuriated, the whale tore off at express train speed, pulling our boat along so fast that it gave an imitation of a Gar Wood speedboat in an important race. Up one roller we went, down another, slapping the waves and spattering the spray for yards on each side, leaving a wake like a battleship—a terrific ocean sleigh-ride with a whale weighing 70 tons which had the ocean for a battle ground.

"A whale has the added advantage of being able to fight on the surface or transfer the action to the lower depths, the additional use of the flukes and flippers, the ability to hide from the enemy, and a tail weighing several tons composed of oily gristle as hard as a harbor wall which, when it spans an object, will render that object hors de combat be it a ship, whaleboat or man.

"Five or ten minutes later, (it seemed like hours rather than minutes) the line slacked. The monster had tired but was still at the bottom out of sight, his whereabouts unknown. We took up some of the slack but we got suspicious, the more slack we took in the more ominous the silence of the whale became. It was nerve-wracking. We did not mind battling the monster, but we would have liked to have seen him. We would have liked to have been prepared for whatever movement he might make next. We waited, carried on a whispered conversation, and moved our boat into what we hoped might be a position of advantage. When next we saw brother whale, he bellowed his battle cry.

"There was a ripple on the surface of the sea, followed by an undulating motion of our boat. Suddenly about 400 feet off our port bow, the gigantic monster 'breached.' That is something you very seldom see a whale do. 'Breaching' is the act of jumping from the sea 20 or more feet in the air and falling back on the surface flattened out. The sound made can be heard for miles, the water on each side of the whale cascades like Niagara Falls. This signal is thought to be the whale's warning to the family that trouble is abroad. At the same time, it was a signal to us of a coming onslaught. The cascades filled our boat with water.

"The gods favored us again, the mammal sounded. We bailed and bailed frantically, probably hurting as much of the water into our boat again as into the sea, in our anxiety to dump it overboard and then—that dread silence on the part of Mr. Whale which seemed to paralyze our muscles.

"When the boat had been made seaworthy, a glance at the white faces of the crew gave mute testimony of their trepidation. Again we hauled in the slack line, more of it than the last time. We knew the old boy was in our vicinity, fearfully close, but we did not expect him to be as close as he really was.

"All at once what seemed to be a floating island upheaved our boat. The air was the sea were in a turmoil. There was the crashing of splintered wood, the cries of sailors as they either leaped or were thrown overboard, and the swaying of the line as it swiped me a terrific broadside blow. The action of the whale had fouled this line and, being in the bow of the boat, I was caught in a bad position. The blow knocked me down and hurled me through the air and I hit the sea all sprawled out forty feet away. Only Providence prevented me from being cut in half by the line that had wrapped itself about my body. I do not to this day remember how I came out of that encounter alive.

"Three months later my broken leg and two fractured ribs had healed sufficiently to enable me to leave the hospital.
"Had I been able to cut that line, we would have saved our boat and I would have saved my ribs and legs. As it was, we lost the whale, harpoon and boat in this encounter with Moby Dick.

"Today, in the 20,000 ton steamer with all the comforts of home, with killer boats equipped with harpoon guns, much of the danger has been removed from whaling. In those days, the strength of a man's good right arm and an accurate plunge of the harpoon were the only things that stood between him and eternity."

Today whaling is carried out by fast little steamers, turbine driven and not motor driven as many believe, for a quiet approach to the whale is necessary. Water is an excellent conductor of sound and the whale has extraordinarily good hearing. Ordinary sounds of the sea do not disturb him, but the sound of a human voice, the "put, put" of a motor, or the clang of a hammer falling on the deck of a vessel, starts him for the bottom of the sea, in a panicly condition. These little steamers of one hundred or a hundred and fifty tons, each carry a harpoon gun in the bow. The harpoon, invented in 1867 by Sven Føyn, which is still in use today, weighs about one hundred and thirty-five pounds and consists of a tough steel shank about five feet in length, carrying four 12-inch bars hinged around the forward end tipped with a cast iron bomb loaded with black powder. The bomb is exploded inside the whale by a percussion cap timed to explode one second after striking, the barbs fly open in the cavity caused by explosion.

The cannon which fires this harpoon is mounted in the bow of the boat and has a range of forty to sixty yards. The adoption of this new method of whaling with its greater speed and less danger, coupled with the opening up in the Antarctic regions of the largest and richest whale fields ever discovered, marked the beginning of the modern era in the whaling industry. The Norwegians have had the Antarctic fields to themselves for several years, but now the rush is on and the American whalers are preparing to invade the fertile regions in force, as are the English, Japs, and other nations.

The old time American whaling vessels were from two hundred to five hundred tons, with four or five whale boats carried on deck, crews of about thirty men and the equipment for rendering the blubber was a brick furnace with a high chimney and huge copper cauldrons—all on the deck. It was a crude and cumbersome method as compared to the present system. The shore factories are passing, too, for it is no longer profitable to tow the catch thousands of miles to render the blubber and save the by-products. Now the modern up-to-date whaling fleet takes a huge floating factory along; a ship that is possibly of 25,000 tons, with a length of 500 or more feet. These factory ships are equipped with every conceivable mechanical and electrical device for handling whales speedily and economically. The
or the thickest part of the whale. There it is from 12 to eighteen inches thick.

The muscle meat immediately under the blubber is dark red and coarse of grain and lies under the blubber. It is as thick as the blubber and more, so some say. Under the meat is the bone structure and intestines. Whalers serve some of the meat on their ships in "meat-ball" form loaded with onions, etc. The meat is boiled and ground for meal. The best whale steaks come from under the eyes. West Indians, Norwegians and the Japanese eat whale meat extensively.

The blubber is yellowish white in color and is pure grease or oil. It is cut into chunks and put into vats and boiled; it has the consistency of rubber. When being boiled the oil is dark brown and thick and gives forth a disagreeable odor. The oil that comes from a sperm whale's head (dipped out with buckets) is white in color and not as thick as oil from blubber.

There is no refuse or cracklings to blubber itself but any cracklings that result from the rendering is from the skin, which goes into the pot with the blubber.

Whale oil is sold by the ton or ton and is worth, at the present time, about four cents a pound.

A bowhead whale (North Atlantic and North Pacific has been known to produce 300 barrels of oil, despite the fact that it is only 50 to 55 feet in length and one third of its body is head.

Originally, whales were hunted for oil and whale-bone only, but today the entire carcass of the whale is utilized as there is a market for every part of the body, just as there is for the hog.

A big factory ship operating today can easily handle 14 whales a day and in that case it ought to garner 1400 barrels of oil and several tons of whale meat and other salable by-products. The Antarctic whale is nearly twice as valuable as the California whale, for it produces a better grade of oil. Generally speaking the whale should produce about 100 barrels of oil and at the present market price it would be worth from 35c to 40c a gallon. This oil, like coconuut, sardine and other oils is away down in price, though there is a steady demand for it. It is the competition of other oils that holds the price down, and not because it has been supplanted by an oil of better or cheaper grade.

At no time since whale oil took its place among commercial commodities, has it had a more varied usage than at the present time; today it is being used in the manufacture of good soaps, paints, the dressing of leather, butter substitutes, the better grade of certain cosmetics; it is also extensively used in the tempering of steel and as a lubricant for all types of metals and machinery, and some European countries use it as edible oil. The oil of the sperm whale is classed as liquid wax rather than oil, and this is used in some of the more expensive cold creams.

In Japan and Norway, whale meat is used as food. Whale meat is also converted into meal after being cooked; fertilizer, cattle feed, chicken feed, and the bleaching of certain sugars from charcoal are made from the bones of whales. (Continued on page 838)
How Hot Are the Stars?

By George F. Paul

With the Thermocouple, Whose Essential Parts Weigh About as Much as One One-Thousandth Part of a Drop of Water, Astronomers Have Been Able to Measure the Heat Radiated by Stars and Ascertain the Temperature of the Planets

THINK of an instrument so sensitive that it can detect the exact heat of a candle 100 miles away, under the proper conditions. Such a device, the thermocouple, is now used at Mount Wilson Observatory to measure the heat of stars and planets.

With this instrument mounted upon the 100-inch telescope, the most powerful telescope yet constructed, investigators have accomplished the astonishing feat of measuring the heat radiation of a star of the thirteenth magnitude. Stars just visible to the naked eye are of the sixth magnitude; the faintest stars photographed with the 100-inch telescope at Mount Wilson are of the twenty-first magnitude. A star of the thirteenth magnitude is about 631 times fainter than the faintest star that most of us can see, yet this delicate instrument responds to the heat focused on it from such a star.

A star of the sixth magnitude, that is, one which can barely be seen, radiates upon the whole United States so much heat that the sun radiates upon one square yard of surface. The thermocouple shows that the increase in heat which this star occasions is one-half of one-millionth of a degree Fahrenheit, and that the electric current generated by it is about one-twenty-billionth of an amper. (The light in an ordinary incandescent house light is produced by a current flowing through it of from one-fourth to one amper.)

The current in the circuit connected to the thermocouple is due to the heat acting on the junction or junctions of dissimilar conductors. A current from an outside source passing through the junction in the same direction as that due to the heating of the junction, would operate to cool the thermocouple junction quite satisfactorily.

The extreme sensitiveness of the thermocouple is again illustrated in the case of the stars as they rise above the horizon. The higher they ascend the brighter they appear to grow, because the higher they rise the less of the earth's atmosphere their rays are obliged to penetrate, and consequently the less their rays are absorbed. With bright stars near the horizon the thermocouple can detect the change in brightness which takes place in one minute of time.

The principle of the thermocouple is simple. Two wires of different metals, iron and copper for instance, are welded together at their ends. The free ends are connected to the terminals of a highly sensitive galvanometer. The galvanometer thus forms part of a complete electric circuit. When the junction of the dissimilar metals is heated an electric current is set up. There are a number of thermo-electric junctions in the instrument.

Small thin metal plates are fused over the junctions of the wires and painted black. They absorb all the radiation from heavenly bodies and convert it into heat. The thermocouple is operated within a vacuum to reduce the loss of heat.

(Continued on page 883)
Electrocuting Plant Insect Pests

Plant Growth Is Tremendously Stimulated and Orchard Pests Are Being Eliminated at One-Tenth the Usual Cost, by Spraying with Electricity

By Joseph Farrell

Spraying crops with electricity to kill insects and stimulate plant growth is being demonstrated on a commercial scale in orchards and greenhouses in the northwestern fruit region. This unusual treatment rids orchards of pests at a cost of $6.30 an acre, compared to $63.00 per acre with the more cumbersome poison spray rig. The latter method frequently leaves a residue of lead arsenate on the fruit.

When I saw the apparatus in action, tests were being made in a 2 1/2-acre orchard near Wenatchee, Washington. The apparatus was a three-kilowatt high-tension high-frequency outfit (250,000 volts), attached to two feeders running along the sides of the orchard. Networks of two smaller model for greenhouse use. The Begonia plant on top of it, to the left, was grown naturally; the one to the right received electrical treatments.

To generate electricity, this three kilowatt 250,000 volt outfit is used. From it, two feeders carry the current along the sides of the orchard; it is distributed over the trees from a network of wires. The wires were spread over each row of trees. Bare tinned copper laterals were attached at intervals of 22 feet. Upon them the wires rested.

The orchard was divided into parts and each part was treated for a half hour every day. There were fewer aphids in the orchard than in adjoining lands and this was attributed to the fact that the apparatus killed all eggs and larvae (but not mature moths nor hard-shelled bugs); the area contained a smaller percentage of cull fruits; the leaves were large; there was a good growth of fruit spurs, and an especially good growth of grass. The apples on the trees have remained free from pests and worms and are much larger than fruit in adjoining orchards; the cover crop, alfalfa, is harder and larger than it ever was before.

According to Herbert S. Smith, the engineer in charge of the work, the operations are as follows:

"Electrical energy is put into the air under high voltages at high frequencies. This leaks off the wires, the wires acting as the antennae for the set. Because of the increased activity in the atmosphere, the oozes built up drive away the oxygen about the trees. Stimulation in the atmosphere makes the fruit larger and the trees clean from aphids and scale."

The network of wires does not discharge sparks; it resembles the radiating antennas of a powerful transmitting station. The electrical equipment resembles the now obsolete spark radio transmitter.

A greenhouse in the same district was wired and the machine used a few minutes each day. Tests were made with begonia plants, six of the plants being placed under the wire system of the house, and six placed outside the electrical spray area. In two weeks' time the six plants that had been especially treated were found to be much larger and harder than those grown under normal conditions.

Tomato plants in the greenhouse grew eight feet tall; turnips were harvested one month after planting and were found to be fully grown; another lot planted early in April was gathered less than six weeks later, and were twelve inches in circumference; beets planted and harvested at the same time as the turnips were eight to ten inches in circumference.

In the carnation room of the greenhouse, small (Continued on page 839)
Harnessing Ocean Temperatures

A Full Explanation of the Experiments Made by Drs. Georges Claude and P. Boucherot at Matanzas Bay, Cuba, to Generate Electrical Power by Turning to Account the Fact That There Is a Wide Difference of Temperature Between Water on the Surface and on the Floor of Tropical Oceans

The possibility of deriving cheap and unlimited power from the ocean has long attracted the attention of inventors and scientists. The most obvious method of harnessing the potential power of the ocean is to make use of the differences in level caused by the tides. Another suggested method is to make use of the energy expended by the waves in their ceaseless pounding of tropical beaches. Both of these ideas have been experimented with, and innumerable patents have been taken out for inventions designed to harness such power, but so far complete success has not been forthcoming.

There is, however, another and less obvious source of potential energy in the sea. The real source of this energy is not the sea itself but the sun, which is continually radiating enormous quantities of energy in the form of heat. We know, because we can feel it, that the sun heats up dry land during the day, and we know, also, because we can feel it, that the surface of the sea is heated as will. We know also, that earth and rocks heat up and cool down much more rapidly than...
Shown below is the mile long tube which extends down to the bottom of the ocean, which is nearly 2000 feet deep at this point. The accordion section enables the tube to bend easily over the cliff edge.

Above—Here is the large low pressure turbine with the dynamo coupled to it. Right—Dr. Georges Claude, already well-known as the inventor of Claude Neon Signs, processes for making synthetic ammonia, and methods of liquefying gases.

Left—This photo shows the well into which the great sea tube leads from the bottom of the bay, bringing up cold water which is used in the condenser. The joint here connects the well with the circulating pump.

Advantage of these facts has been taken by Drs. Georges Claude and P. Boucherot, of the French Academy of Science, in the development of their experimental power plant at Matanzas Bay, Cuba, with which a certain amount of success has recently been achieved. Briefly stated, the principle on which the Claude plant operates is as follows:

Warm surface water is fed to a "boiler" from which air is exhausted, with the result that steam at low pressure is evolved from the warm water. This low pressure steam is fed to a turbine and thence to a condenser, where it is cooled and liquefied again by contact with cold water drawn up from the ocean floor. The turbine is coupled to a dynamo which thus delivers power from the sea in the form of electrical energy.

What is perhaps not clear from the above brief explanation is how steam comes to be generated from water which is certainly not at a temperature which we associate with the boiling point of water, namely, 212° F. However, the temperature at which water (Continued on page 850)

Any experienced swimmer knows that if, during a hot summer, a sudden cold snap sets in for a day or two, the sea will still be warm enough to bathe in; in fact, a swimmer may often be warmer in the water than out of it.

The sea, therefore, acts as a vast storehouse for the heat radiated by the sun. But this heat is concentrated near the surface, which fact will also have been observed by experienced swimmers. Thus there exists a temperature gradient, or difference in temperature, between water at the surface of the ocean and water at or near the bottom, where the temperature is kept near freezing point by slow circulation from the poles. This difference in temperature is naturally greatest in the tropics.
Glowworms Light These Caves

Amazing as this may appear, the Editors have thoroughly checked up on the structure and habits of the particular species of glowworm which is responsible for the phenomenon. Authenticated descriptions of it are to be found in the records of the British Museum.

By Isabelle F. Story

WONDERFUL strides have been made in the technique of illuminating great caves by means of flood lighting and ingeniously placed electric lights of various types. New Zealand, however, claims the most uniquely lighted cave of all. It is the Glowworm Grotto, in the Waitomo Caves.

As the name indicates, the natural means of illumination in this limestone chamber is a little insect—or, to be exact, hundreds of thousands of them—of the glowworm species. The combined light from this host of living lamps shews a pale lustre on the snowy, slow-dripping stalactites, giving them an unearthly beauty.

All of the Waitomo Caves are entrancing, with their myriad of stalactites and stalagnites of lime and other unusual formations, their chambers studded with crystals, and their underground rivers, but all these features may be found elsewhere. The lighting of the Glowworm Grotto is unique.

The glowworm that gives its glory to this particular chamber does not resemble the ordinary glowworm of New Zealand or other parts of the world. It is a luminous, spiderlike creature, more closely related to the spider family, in fact, than to any worm species. Unlike many types of glowworms, it is carnivorous.

It is in the second, or larva, stage of life that these insects, known scientifically as Bolitophilus luminosa, do their bit to brighten their natural surroundings. The body of the larva or grub has a skin so transparent that it is possible to see all of its internal organs. It is a fragile little thing, slimy and grey in color. When full grown it has a segmented body, no legs, and a lamp carried inside the last segment.

The grub builds itself a silken sheath, placed horizontally on the ceiling of the cave and saturated with a slimy liquid. Inside this sheath or hammock it glides backwards and forwards.

Its carnivorous appetite, however, is the main cause of lighting the grotto. In order to satisfy it, the grub goes “fishing;” or, more accurately speaking, stays at home and with siren skill lures its prey.

This is done by means of spun silken threads, which are covered with little globules of mucus and allowed to hang down vertically from the horizontal sheath. These threads vary in size and number. Specimens have been seen up to two feet in length, and it has been estimated that some of the larvae have had as many as fifteen to twenty threads hanging from their silken hammocks.

Since the prey of this glowworm consists of tiny insect life, it is found only in places where there is an abundance of midges and the like. The Waitomo Caves are an ideal habitat, as through them flows a subterranean stream whose banks are infested with midge grubs which live on the organic matter in the rich mud. When the grubs are transformed into tiny midges and emerge from the water, they are attracted by the...
How and Why Auto Tires Wear Out

The design of a tire tread means more than an artistic expression or a handsome pattern. For it has much to do with its wear, along with wheel set, roads and other important factors, according to Government engineers who have been using a tire wear testing machine.

By Uthai Vincent Wilcox

TIRES do wear out. Why they wear out unevenly, become cupped, scuffed or otherwise damaged is a problem that concerns both the man who runs a car, the merchant and the manufacturer of tires.

Furthermore, when it is time to buy a new set of tires, what difference does it make whether the pattern of the tread is criss-cross, filled with buttons, longitudinal or some other combination? Very recently engineers and scientists of the Bureau of Standards, U.S. Department of Commerce, have investigated the wear of tires, particularly the wear on the tire treads. They have perfected unique machines that tell how and why various designs in tire treads wear faster than others. In such studies tire manufacturers have given every encouragement and cooperation.

A pneumatic tire is constructed with a thick layer of rubber around its outer circumference to act as a wearing surface. This is referred to as the tread, as distinguished from the body of the tire, which is designed to withstand air pressure. The ideal tread, in addition to giving tractive properties to the tire, should wear down uniformly, and at such a rate that it will last as long as the remainder.

W. L. Holt and C. M. Cook of the Bureau of Standards perfected an apparatus by means of which a tire can be pressed (Continued on page 848).
The Lion and the Lamb May Not Lie Down Together.... But a Small Bird Steps Calmly Into the Wide-Open Mouth of the Voracious Crocodile; the Tiny Pilot Fish Swims Within the Reach of the Huge Blood-thirsty Shark; the Female Bitterling Lays Her Eggs in the Gills of the Shellfish and the Hermit Crab Uses the Sea Anemone as a Protecting Roof

Amazing Partnerships

By Gaylord Johnson

ONE of the first world-tourists was Herodotus, the Robert Ripley of Greece. He loved to record "Believe It or Not" facts to drive the homefolks goggle-eyed with wonder. One of his best stories was that of the astonishing relationship which existed between the crocodile and the Egyptian plover. Globe-trotting Herodotus insisted that he had seen this bird step calmly into the wide open mouth of the crocodile and pick blood-sucking leeches from the big reptile's gums.

So that his audience could not miss his point, he explained that the crocodile was never in the habit of restraining his appetite when any other living things got within reach of his quick-snapping jaws. And then, to drive his point home with a punch, he told them the bird performed another friendly service for the crocodile; it emitted shrill cries to warn him of approaching danger. And believe it or not, science has not been able to invalidate Herodotus' claim in the two thousand years which have elapsed since he lived and told his tales. Students have found that Nature presents many amazing examples which may be conscious partnerships that are almost unbelievable or mere accidents.

Certain sponges have been found to play hosts to small crustaceans of the shrimp family. Mussels of the oyster tribe give shelter within their shells to tiny crabs who do a kind of housemaid service in return. Species of ants shelter and care for the green or black plant lice or aphids, in exchange for the privilege of milking them, like cows, of the sweet plant juice they have eaten. A tiny mite habitually lives on the dor beetle's armor and keeps it clean, with a continuous meal of dung for reward.

The team of shark, sucker shark, and pilot fish has been a source of wonder and amusement to sailors for centuries. Several pilot fish are sometimes seen swimming around a single shark, like motorcycle policemen escorting a municipal dignitary's automobile. And tiny sharks, called sucker sharks, attack themselves to the belly of the shark by means of a sucker-like muscular structure and hook a free ride.

Like the crocodile, the shark seems to restrain his blood-thirsty appetite and not regard his small associates as legitimate prey—while in return for this immunity the pilot fish is supposed to guide the shark to schools of mackerel and other fish entirely suitable for a shark's dinner. The pilot fish thus resembles the pointer dog of a human hunter. Of course, the pilot fish does not disdain any scraps that escape the shark's jaws, especially when it makes a meal of larger prey—such as a pearl-diving native. The pilot also secures considerable protection (through travelling in the shark's company) from being gobbled up himself by other large fish. It would seem from field and aquarium observation that the pilot fish is merely hanging around for food. It is quick enough to get out of the way of a hungry shark (Continued on page 854)
How Science Saved Our Sugar Industry

By H. L. Kauffman

In 1926, Louisiana's Historic Cane-Sugar Industry Appeared to be Doomed, Owing to Disease. Then Science Rushed in and Saved the Situation by Discovering Disease-Resisting Sugar Canes

Can you imagine yourself getting along without sugar? With no 5-cent candy bar to nibble on, no sugar for coffee or iced tea, no delicious chocolate carmelts or creams or other sweets? Not so pleasant to think about, is it? Nor would it be pleasant to our pocketbooks if we had to pay 25 cents for a candy bar which we now get for a nickel, or five dollars for the one-dollar box of chocolates which we now take to our wife or best girl!

But perhaps you recall how you disliked having your sugar ration cut down during those World War days of 1917-18. If so, then 'nough said!

Dr. Donald A. Laird, director of the psychological laboratory at Colgate University, has proved by actual tests that sugar in sufficient quantities is necessary to our endurance; in other words, that it gives us energy and stamina, and makes us alert and active.

The story of man's dependence on sweets, and by that we mean sugar, has already been told. This is the story of how science has saved the cane sugar industry for us in Louisiana, and before long will again fill Louisiana's "sugar bowl" to overflowing. And if you are like myself, one who enjoys sugar in your coffee, and a good chocolate caramel at almost any time, you'll appreciate what these government experts have done; for it means greater assurance to us that we're not going to have to pay, at least not within the immediate future, any excessive price for the sweets we like and need.

In 1911 Louisiana produced 352,874 tons of raw sugar; in 1926 production had fallen to the disheartening minimum of 47,000 tons—the lowest figure reached during the preceding half century. The situation at the close of 1926—the last season in which the State's production of sugar was made from certain long-used varieties of cane—was a desperate one and, to all appearances, Louisiana's historic cane-sugar industry was doomed. A particularly harmful plant disease, known as the mosaic disease, was rampant.

The situation was serious, affecting as it did the sugar-cane sections of Louisiana, Mississippi, Alabama, southwestern Georgia, and northwestern Florida. That the industry was not destroyed completely was only due to the activity of scientists in discovering that the malady was being spread by a tiny insect carrier; and after long search in foreign lands, the finding of strains of sugar cane especially resistant to the disease. Further research work also resulted in the development of other resistant strains by cultivation, and the production of canes that can reach their maturity within a wider climatic range than was possible with the kinds of canes formerly planted.

As far back as 1919 the government experts had been aware of circumstances that most of the sugar planters of Louisiana had overlooked. At that time Dr. W. E. Brandes, principal pathologist in charge of the office of sugar plants of the United States Department of Agriculture...
Unscrambling the Ether

By A. Dinsdale

The Latest Radio Wonder is a Superselective Receiver, Called by its British Inventor the Stenode Radiostat, which, While Giving Undistorted Reception, Will Even Produce Silent Places on Your Dial Between Stations

Those of our readers who are interested in radio matters have no doubt seen more or less vague references here and there to the Stenode Radiostat, a marvelous new British invention for which startling claims have been made. Those who regularly read our sister publication, Radio News, will have learned a little more about it in recent issues. At the time of writing there have just arrived in this country Dr. James Robinson, D.Sc., inventor of the new receiver, and Percy W. Harris, Chief Engineer of the British Radiostat Corporation, and well-known English radio editor and set designer. They have brought with them demonstration models of the Stenode which they immediately proceeded to demonstrate in Washington before members of the Federal Radio Commission, and engineers of the Navy and Army. From there they proceeded to the Chicago Radio Show.

The claims made for the Stenode Radiostat are that it gives a degree of selectivity never before dreamed of, and does so without cutting sidebands (to use a popular expression). The R.F. resonance curve of the receiver is only 100 cycles wide (See Fig. 3). This means that an unwanted station broadcasting on a frequency close to that of the desired station, would cause but little interference. As a matter of fact, the receivers brought over here will eliminate entirely stations only 5 Kc. removed from the desired station. There is absolutely no interference at all, either from a heterodyne beat note (caused by the two interfering carriers) or from cross-talk.

The significance of these claims is that there is no longer any necessity for spacing broadcasting stations 10 kilocycles apart. They can be crowded much closer together and, provided everybody uses Stenode Radiostat receivers, clear undistorted reception can be had from all stations without any interference. This means that we can build a lot more broadcasting stations, and do so without causing the Federal Radio Commission any sleepless nights. It also offers a solution to the difficulties of television experimenters who, as all the world knows, are being kept off the air because there is no room for the very wide frequency bands which they must broadcast. The amateur, whose narrow wavebands are so congested that he is being asked not to use phone, can equip himself with a Stenode and use phone to his heart's content. And finally the principles of the new invention can be adapted very advantageously to all other branches of electrical communication.

And what of the value of these claims? Well, through the courtesy of Dr. Robinson, I had an opportunity some months ago of handling a laboratory model of the receiver in London, and I found that all claims made for it were fully justified. Also, I have just had an opportunity of testing out one of the receivers right here in New York, and I can only say that I am amazed at the super-selectivity of the invention model of the receiver. And I know that all claims made for it were fully justified. Also, I have just had an opportunity of testing out one of the receivers right here in New York, and I can only say that I am amazed at the super-selectivity of the invention model of the receiver.
How to Make and Throw BOOMERANGS

By William H. Van Shrum of the Vaudeville Team of Van and Belle

WHAT does the word boomerang mean to you? Is it merely a dictionary term, quite useful in political oratory and conversation, or does it recall pictures of a half-naked, crouching savage, holding a long, narrow stick, tensely awaiting the instant when he will hurl his weapon and bring down a bird? Do you see in your mind’s eye a horde of brightly painted, gruesomely decorated tribesmen releasing a hail of flying, curving missiles almost impossible to dodge? Can you imagine them dancing around their campfire at night to the accompaniment of weird cries and shrill shouts exulting over the victims of their deadly boomerangs? Do you know that that weapon was merely a piece of curved wood which would travel in a circular path through the air and return to the thrower?

Originally boomerangs were the products of primitive man, notably the Australian aborigine. He used them both as a weapon of attack in open warfare and as a projectile to bring down small game and occasionally animals as large as deer. The deadly accuracy with which the natives hurled these weapons enabled them to protect their own lives and wrest a living from the forests.

The effectiveness of the boomerang can be attributed to the fact that it travels in a curve and is difficult to avoid even when noticed beforehand by the animal which it is intended to strike. The size and weight of the boomerangs which these warriors were accustomed to use is astonishing. A six-foot oak boomerang was not at all uncommon. These unusual weapons, however, are unwieldy and hard to control.

Today I use adaptations of these deadly weapons to entertain audiences. In my long career I have held audiences spellbound while I tossed whirling boomerangs all over the theatre; cut paper plates in the air with them; struck down Indian clubs placed in a line, one after another; and filled the air with whirling wings, which I caught in rapid succession.

With an understanding of the principles governing the flight of boomerangs, I am able to make them cut capers of which their native originators never dreamt.

Boomerangs, if properly handled, duplicate all the tricks performed by the stunt aviator. They will fly in wide or narrow circles, high in the air, or close to the ground, side-slip, fall away, loop-the-loop, follow a predetermined course and return to the spot from which they were thrown. Extraordinary as it may seem, you can make these spinning wings of inexpensive material, and a sharp jackknife is the only necessary tool.

The amazing flight of a boomerang which I saw when I was a small boy, about thirty years ago, so interested me that from that time on I have studied the art of making and throwing them. In fact, I can say that most of my life has been spent in studying the theoretical and practical aspects of the construction and flight of these spinning wings. After experiences lasting over a quarter of a century, I found that almost any kind of wood could be used. The heavier the wood, the further the boomerang will travel before it returns. Of course, greater strength and skill are required to throw a heavy boomerang than one constructed of light weight wood such as we will use.

After numerous trials with pine, oak, willow, bass and other woods, I came to the conclusion that balsa wood, procurable in various weights and grains, is best adapted to practically every type of boomerang. You can cut balsa very easily, and, unlike other woods, no finishing (such as sandpapering or planing) is necessary. Boomerangs made of balsa can be fashioned by the novice and do not require skill in handling. They are perfectly safe and with them the ordinary individual will find that he will soon be able to do the same tricks that the vaudeville artist includes in his act.

You can make the simplest boomerang from two long slabs of narrow wood, fastened in the form of a cross, by a rubber band at their midpoint. The long sides of these pieces are shaped so

(Continued on page 861)
**The Back Modern**

Priests Still Sacrifice Horses to Spirits: Animals ing Quarterly from One Village to Another Is the

By Count A. N. Mirzaoff

**A** LAND where man has been esteemed according to the number of livestock he can steal and hold, and one where each group has four villages, and moves from one to the next seasonally, making the complete round each year, were among those visited by the Lubinsky Expedition, which has just returned from North Central Asia and Siberia. The expedition turned east from the Volga, and followed the historic trail of the great migrations. It studied the conditions of life among the peoples of the vast steppes now included within the borders of the Kazak Republic and the Siberian area, and of the chill slopes of the Altai Mountains, where the tribal stronghold of the Oyrotos forms a self-governing territory. Of all the peoples visited, the Kazaks are, perhaps, the most interesting.

Turned back, at some time in the past, by the superior armament of Europe, they have remained at the stage in which the ancient Scythians were observed by the early Greeks. Only within the past few years have they begun to accept responsibility, learn industry and adapt themselves to settled social ways. The chief factor in changing their mode of life has been the recently completed “Turksib” railroads.

By occupation the Kazaks are herdsmen; their livestock including horses, cattle, camels, sheep and goats. It is horses, however, that they love best to raise and to acquire. The horse is not only transportation to them, but a source of milk and meat. And when

one says “milk,” one must take in a function not included in our own conception of milk—for the Kazaks make of mares’ milk a fermented drink of considerable alcoholic content—milk with a punch, which they keep on tap at all times. This drink, called “kiss-miss,” is the common intoxicating beverage of all horse nomads. In a fermented, but non-intoxicating state it appears in the Western World as a famous builder of health, fertility, and longevity.

In connection with the horse, one

must modify the meaning of the term “just,” as applied to the Kazaks. At least until lately it was their established practice, each fall, to engage in organized cattle and horse thieving raids, thus to increase their stock of both. (This custom still maintains with some groups.) To this type of raid they have given the name baranta—literally, to “make” or “lift” cattle; and with respect to this invasion of “property rights” (in our use of the term) the Kazaks up to now have been absolutely without moral or social qualms. Rather the opposite: He has been most honored who has been most successful at seizing and holding livestock which he has not bred or raised. This is part of the occupational ethics of every nomad herd- ing tribe, and settled folk who adopt roving ways easily take to it, as one sees by the most casual survey of the business of cattle rustling in our own Western states.

During the summer season the Kazaks live in transportable tent-like shelters closely resembling the
woods of Russia

and Human Beings Share Huts; and Movable-Style in North Central Asia and Siberia

and Murray Godwin

Mongolian yurts. They are circular in form, with walls of latticework and top of springly wooden strips, over all of which are stretched sections of felt made from wool and camel's hair. A hole at the summit permits smoke to escape and light to enter. The felt covering is necessary because of the chill of the night air even in the warmer seasons on the steppes.

For winter homes the Kazaks have permanent structures, rudely built of logs or slabs and clay or stone. Within these huts not only the human beings, but the less hardy animals of the herds spend the cooler seasons of the year.

Long coats stuffed with wool, trousers similarly made, high leather boots with heavy lining, and fur caps which expose only the face, compose the winter dress of the Kazak. Their summer dress is not much lighter. Milk and meat are their regular diet, together with a few simple additions like cakes made of flour and mutton fat. They are Mohammedans in religion, and until recently their women were treated as markedly inferior to the men of the tribe.

Under the former government the Kazaks were divided into tribal groups and assigned to certain grazing regions, the object being to keep them from coming together for possibly hostile resistance to the state. As citizens of an autonomous republic, they now have their own general assembly at the capital city, Alma Ata, near the southeastern border.

Touching the border of the Kazak Republic on the east is the Oyrot autonomous territory, in the foothills of the Altai range, which extends southwest into the land of the Mongols.

Like the Kazaks the Oyrots are horse nomads, but they are making increased efforts to cultivate the soil. They have wandered, in the past, many thousands of miles. Coming into Russia through the Caucasus about 1300 A.D. they roamed as far as Finland, where some of them remained. The rest returned eastward to their present home. Partially they came under Russian domination 200 years ago, but they have never been really conquered, and much of their region is unknown country. Its population is subject to sudden shifts. The present president of the area on one occasion discovered a village of 2,000 which had not been included in the government census. It had moved with normal disregard for boundaries from Mongolia into the Oyrot territory.

The Oyrots live in yurts in summer and log houses in winter. The yurts are of a different type than those of the Kazaks, however: straight saplings are leaned together, tepee-like. (Continued on page 863)

A favorite religious prescription among the Shamanists is sacrificing horses in an insanely brutal fashion. A totem pole, laden with the skin of a freshly killed horse.

The face of a god on a drum.

Canals are a rarity in these primitive regions. The natives employ a water carriage to bring their supply of water into the city from bordering rivers.

A Kirgoz milking his horse. A fermented drink of considerable alcoholic content is made from mare's milk.

"Only the doctor whom Lenin sends can help you." — the modern spirit. A sick man being treated by a Russian doctor.
Mechanical Ears

The Weird Contrivances Here Are Designed to Give Anti-Aircraft Defence Units All the Information They Require Concerning Approaching Aircraft

By Chester McDonald

IF you have ever observed a wild animal in his native haunt, you will undoubtedly have noticed that the slightest suspicion of a sound indicative of danger will cause the animal to suspend all other activities, raise his head and turn it in the general direction from which the sound came, and cock his ears. Nature provided him with long ears for just that purpose. He will then stand motionless until further sounds arrive either to reassure him or warn him of danger. Certain species of animals do one better. While they are feeding they will post a lookout in an advantageous position, usually on an eminence, and it is his duty to keep a sharp eye and a cocked ear for the first hint of danger, and give due warning to the rest of the herd.

Records show that the highest type of animal, man, behaved in an exactly similar manner during the earlier phases of his development. Even today, certain isolated tribes of so-called "savages" protect themselves by such methods.

But the range of man's unaided senses is strictly limited. Vision is limited by the condition of the atmosphere and the curvature of the earth. Hearing is limited by the intensity of the original sound, the density and movement of the medium, usually air, through which it has to travel and the number of reflecting, refracting or absorbing objects which may lie in the path of the sound waves. Most solids conduct sound waves better than gases; hence the practice of certain aborigines of placing an ear to the ground to catch the sound of an otherwise inaudible approaching enemy.

In these days of highly developed electrical communication, particularly the telephone and telegraph, we are apt to overlook the fact that these aids to long distance communication entail the installation of terminal equipment at the two communicating stations, and also of some special connecting link between them. Faced with the necessity of receiving intelligence from a distance greater than the range of our unaided senses, and under circumstances where it is either impossible to install equipment at one terminal and provide a connecting link, or where one party to the intercommunication does not desire to co-operate, the realization is immediately forced upon us that we are backward in the development of independent aids to our senses, independent, that is, so far as the other party is concerned.

Our only independent means of extending our vision is by means of a telescope or microscope. In the realm of sound, Nature did not provide us with long ears like those of the animal, or if she ever did, they have become attenuated during the process of evolution. In our efforts to catch fain sounds we instinctively imitate animals to the best of our ability by cupping a hand behind an ear. The mariner goes one step further and communicates over distances of several hundred yards by using a megaphone to concentrate and direct the sound waves issuing from his mouth and, at the receiving end, he amplifies incoming sounds by placing the mouth-piece of the megaphone to his ear and pointing the open end towards the source of the sound.

It was not until the World War that the acute necessity arose for us to reinforce these primitive methods still further, and under the stress of war a

A French officer supervising the observations being made with the aircraft detector unit shown at the bottom of this page.

This device, which was used by the French army during autumn manoeuvres near Lyons, locates planes, gives their flying speed, height, and distance away. As this photograph shows, it is easily manipulated by two men.

(Cover on page 853)
Spectacular Electrical Experiments

By John P. Morris

Many of the spectacular and mystifying effects which the magician produces on the stage can be duplicated by you in your own home. Very little equipment is necessary, contrary to general belief; and whatever material must be purchased can be bought reasonably. Usually the odds and ends found about the average experimenter's workshop will serve his purpose.

Some night, when you have a group of friends around, try frying eggs on ice. Or weld iron bars under water. Causing a ring to float around in the air, and lighting a lamp which has apparently no current source can be included in your repertoire. The only apparatus you may have to purchase for these four tricks is a second-hand transformer. It may be of the three-legged core type illustrated, in which case the primary coil can be wound on a form or spool, as indicated, and the secondary coil wound over the primary on the same spool, threading the sheet-iron laminations into either end of the spool until the core is entirely built up.

One trick you can try is frying eggs on ice. While this trick has never failed to excite the wonder of the audience, it is quite simple to build up the necessary apparatus: a powerful alternating current magnet is placed under the table, and the rapidly alternating magnetic lines of force emanating from the magnet, pass right through the ice and induce an alternating current of low voltage and high amperage in the copper skillet containing the eggs. The skillet obeys Joule's law, IR, heat is evolved and we have eggs fried without a stove.

The pan forms a secondary circuit of an A.C. transformer, the magnet under the table playing the role of core and primary winding. A copper pan will give the best results, as it offers the lowest electrical resistance and will allow the greatest current to flow in the pan.

The table containing the magnet may be covered with velvet or cloth. Its top can be a sheet of thin bakelite, or else the end of the magnet may be brought up as high as possible by cutting out part of the wood so as to nearly expose the magnet. It must be remembered that it takes power to force magnetic lines of force through space, and the shorter the gap in any case the stronger will be the effect produced in the secondary stage or circuit. Iron or any other metal should not be used in the construction of the table top, as we wish to conserve all our lines of magnetic force and concentrate them upon the object which forms the secondary circuit.

Best results will be obtained if the magnet has an iron core (laminated or built up of sheets bolted or clamped together at the ends) 15" x 20 x 2" in dimensions. The coil consists of eight layers, ten inches long of number ten B & S gauge D.C. magnet wire (with insulating fabric between the layers). Taps are connected to the sixth, seventh and eighth layers to provide adequate control of current consumption. The magnet connected to 110 volts, 60 cycle, A.C. circuit usually draws about 10 amperes. The core requires approximately 17 pounds of sheet iron and the coil about 20 pounds of magnet wire.

An interesting experiment demonstrates the reaction which occurs when an aluminum ring is held in the magnetic field of a powerful magnet. The ring may be made from a piece of wire joined together with a clamp, or the ends may be welded. Experimenting with various sizes will finally give you a ring which will yield the best results. As shown in our sketch, the wire is to be secured by three threads which are, to all practical purposes, invisible.

To light the mystic lamp, a secondary coil is constructed and placed in the hollow wood (Continued on page 847)
Butterfly Wings Are Not Varicolored

By Dr. E. Bade

In the depth of the ocean with its eternal light, only black and a few red creatures are found. And here red is equivalent to black, as it is invisible in the dark abyss. For light and color complement each other. Without light there is no color, and there are no gaily painted tints of nature. Even the small number of animals which live in caves below the surface of the earth where no ray of light penetrates are either dark or flesh-colored, since pigments can not be developed where there is no light. But where animals live in sunlight, gay colors are the rule.

Color is a normal product of the organism, a formation of the normal living body. Both color and markings are not the result of the haphazard working of nature, but depend upon a certain regularity.

By natural selection only those forms are retained which are not only adapted to but more or less protected by their surroundings in spite of vivid or glaring colors. Those forms which are not protected in color or markings which blend with their surroundings usually die. Another way of saying the same thing is that the animal must be adapted to its environment, if it is to live. Nature has been generous, indeed, in distributing colors to insects. Nowhere do we find the variety of color, glittering and sparkling of fiery tints as here. Color in butterflies is given by a fine dust scattered symmetrically upon the upper and lower surface of the butterfly wing. This dust resolves itself, under the microscope, into scale-like particles, arranged upon the transparent wing like the shingles on a roof. They are held quite loosely in place by means of little handles which fit into tiny sockets. It is these scales which give all color to the butterfly; the wing itself is as clear and transparent as glass.

The scales are hollow and filled with air and the pigment found within is only a yellowish brown mass. Gay colors are produced by interference and the breaking up of the light which is reflected as color. Each scale consists of layers, and the number of layers and their thickness give us the various color values. In addition, each particular scale is definitely marked and provided with wavy lines, protuberances and ornamentation which are clearly visible under a good microscope.

In this way, with the simplest of methods nature brings forth her exquisite colors in fiery and subdued tones.

It is quite easy to make prints of butterfly wings, whereby the gayly colored and minute scales are transferred in all their beauty to a piece of paper. No apparatus is required and no particular skill is demanded. All that is needed is a piece of thin wax paper.

Cut the wax paper just a little larger than the spread butterfly. Fold the paper in half, break off the upper and lower wing on one side of the butterfly and place between the folded wax paper. Place carefully in position. Cover with a strong and firm piece of paper and then rub this paper strongly and firmly with the rounded bowl of a spoon. Of course the paper must be rubbed immediately over the wings. This rubbing drives the scales into the wax of the wax paper, (Cont'd on page 853)
EVER since the termination of the war, Germany has been busy on reconstruction programmes, with special attention being given to the provision of modern housing facilities for her working classes. Many of these new settlements are vast in extent, daring in conception and models of comfort and convenience by comparison with the slums which formerly housed the working classes. The rents, designed for the workman’s pocket, are amazingly low for the facilities offered. Pictured above is Germany’s most modern settlement, called a Rundling, or round city, located in Leipzig-Loessnitz. The constituent blocks of flats are built concentrically in order to provide a maximum of light and air. The builder is Stadtbaurat (city architect) M. Ritter, of Leipzig, whose originality is deserving of favorable comment.

DEIGNED by Sir Dennistoun Burney, the brilliant designer of the British airship R-100 and the inventor of the Paravane minesweeping device used on all allied merchant ships during the war as a protection against mines, the Burney Streamline automobile is the most outstandingly original car that has appeared for years. Utilizing his wide airship experience, the designer equipped his new car with a seven-seater body streamlined like an airship. By this action alone it is said that the complete car, with seven passengers, will travel faster than with the stripped and unloaded chassis. The engine, having eight cylinders in line, develops 22 H.P., and the car will cruise at 70 M.P.H. and attain a maximum speed of 80 M.P.H.

Contrary to usual practice, the engine is fitted in the rear of the car, as a result of which rational manoeuvre it is said that the interior of the car is noiseless and free from the heat and smells of the engine. All the occupants of the car hear is a faint swish of air as the car travels along. All the passengers are carried well between the axles, thus ensuring a maximum of comfort. Considerable weight reduction, resulting in decreased tire wear, has been effected. The new car weighs only 4256 pounds, as compared with 6272 pounds for an orthodox car of similar passenger capacity. The body is low hung, there being no running board. This gives increased head room inside the car. Body squeaks and rattles have been eliminated by building the chassis and steel body frame in one unit, instead of, as is customary, building the body as a separate unit and afterwards fitting it to the chassis.

Separately fitted bodies tend to “work” in opposition to the chassis, with the result that squeaks and rattles very soon make their appearance. No such conditions can arise where the body and chassis are a single unit. The steel frame upon which the body is built also serves to strengthen the chassis, with the result that the chassis frames can be made of lighter material. Each wheel is separately sprung, giving as nearly perfect a springing system as it is possible to make, and one which remains perfect either at low speed or high speed. The shifting of the weight to the rear axle greatly reduces the possibility of front tire bursts. Possible disadvantages include vulnerability of the engine to rear-end collision.
Smokeless Anthracite from Bituminous Coal

A TECHNIQUE which duplicates in a few hours the process which requires millions of years in nature—the converting of bituminous coal into a high grade anthracite—has been perfected after eight years of intensive experimentation. It is the long-sought low-temperature carbonization process. In addition to producing smokeless fuel for domestic use at three dollars per ton less than mined anthracite, it yields large quantities of gas of a high heat value and two to three times the quantity of the by-product tar that would be realized from high temperature carbonization. The plant, which was opened recently at Chicago by Thomas Hitchcock, jr., and C. E. Bover, will help greatly toward the elimination of unnecessary smoke.

The first pile contains finished anthracite briquettes; the other, raw bituminous coal.

Artificial Climate Deceives Plants

EXPERIMENTS conducted by the United States Department of Agriculture reveal that some plants which normally flower in the fall, such as the late cosmos, will blossom in early summer if given proper treatment. Through the efforts of research workers at the Boyce-Thompson Institute, plants have been grown in an artificial climate with fair success. Electric lamps are used to simulate the various seasons; the plants are fooled, and bloom.

Model Apartments for Birds

THOUGH cold winter is coming, the songsters who make their homes about Lawrence, Kansas, do not allow the housing situation to worry them. Hundreds of bird houses furnished to suit the tastes of the most discriminating birds have been erected and distributed by their builder, F. L. Hunt, about the grounds which encircle his home. Though a piano tuner by profession, his pastime and hobby is playing architect and landlord to his feathered friends. They seem to appreciate Mr. Hunt’s consideration and, despite their popularity, there seems to be no danger that the rent will be raised!

Safety Chute Lessens Hospital Fire Hazard

THE Marlboro Hospital located in Marlboro, Mass., claims it has perfected a fire escape which provides a most expedient means of evacuating the hospital without discommoding the patients. It consists of a steel tube which leads from a hospital room to the street. The incapacitated are brought to this room (there is a different tube for each floor) and placed on mattresses, which are pushed into the tube. The glide through the tube furnishes a swift, sure, and comfortable means of exit.

The World’s Largest Camera

THE United States Geological Survey at Washington, D.C., is in possession of the biggest camera ever made. This gargantuan picture-taking machine weighs three and one-half tons, inclusive of associated equipment. With it, photographs covering an area of nine square feet can be taken. Not all of the gigantic machine appears in this illustration. The plates are loaded and inserted in another room. The apparatus is operated electrically through a remote controlled system. The camera is in constant service and the results achieved have proved highly satisfactory.

Television for Horse Race Fans

If the plans of Parisian television experts materialize, race track enthusiasts will be able to sip their drinks in their favorite boulevard cafés and see the horses, on which they have bet, tear down the home stretch to victory. All the thrills experienced by those attending the races will be theirs, for television screens are planned for the larger bars and cafés throughout Paris.
New Wind Tunnel for University of Detroit

The effect of a gale roaring along at a hundred miles per hour can be reproduced in the new convertible open or closed wind tunnel just built for the Aerodynamical laboratory for the University of Detroit. Apparatus of this sort effects a great saving in the cost of experimental work. It is not necessary to build a full size machine to test out a new theory or discover whether an improvement is practical. Airplane models whose wing span does not exceed a six feet length can be tested for air properties, as can miniature automobiles and other machines. The University of Detroit is one of the pioneer colleges to establish a regular course of study in aeronautical engineering.

Professor Altman testing the apparatus which produces a roaring hundred-mile-an-hour gale.

Sea Shell Glass Transmits Health Rays

A species of large sea shells found in abundance about the Philippine Islands have been discovered to be good transmitters of ultra-violet and infra-red rays. The large, thick shells, when set in leaded panels and properly laminated, afford sections about four inches square. They are being processed for use in bathrooms, sun porches and invalid rooms. The photograph shows the shells used for covering a baby’s cot—Lee McRae.

This Glider Wouldn’t Fly

The prospective pilot can learn to fly safely if he uses the new style ground glider invented by Paul Chamberlain, of Los Angeles, California. It is fastened atop a ten foot post with a ball-bearing top and has all the controls of the regulation sail plane. The beginner gets in and goes through all the operations necessary to start his glider; he remains on top of the pole. After familiarizing himself with the controls, the student is blindfolded, and his reactions to the wind on this test glider determine his advancement in glider flying. When he has progressed sufficiently, the young man is permitted to go up in another glider and really soar.

Tom Thumb Golf Successor

Now that Tom Thumb golf is on the wane, they found a new way to use miniature golf courses in the Western cities. Pool golf, as it is called, is all the rage now. It’s just another variation of the ancient Scottish pastime. The game is played the same as table pool, only a golf club is used instead of the cue. When the players get tired of their miniature golf, the holes can be closed up, and golf billiards played on the same green.

Enterprising owners of indoor and outdoor courses who realize that their success depends upon keeping one jump ahead of the public, are altering their links so that the followers of the latest fad will be able to play pool golf.

An Electric Parent

Father and mother can sleep in peace, certain that baby is not crying or has not fallen out of its crib, even though they’re sleeping in another room. Dr. E. S. Dorlington of the General Electric Company has rigged up a mechanical device to eliminate the sleep-walking scene so common when baby starts to cry. A telephone transmitter, used as a microphone, is connected by wire from baby’s crib to an amplifier and loud speaker located close to father’s ear. Baby’s first cry will awaken him.

The unsightly, weed-covered, empty lots that were transformed into attractive miniature golf links, are now being used for a new game. Here is Miss Betty Leight of Los Angeles playing pool golf.
Meet the Family Blimp

FIRST the enclosed cabin family airplane; now the small family blimp. This latest creation, the work of Capt. Anton Heinen, former executive of the Zeppelin Aircraft Company, Germany, takes the form of a 104-foot non-rigid dirigible powered by a 100 H.P. Brownbeck Tiger six-cylinder engine. Hydrogen is used for inflating the gas bag. The two vertical fins at the stern are the rudders, and the two horizontals the stabilizers and elevators. The gondola, of mahogany construction, seats four, including the pilot. Weighing about 1,800 pounds, the new air yacht can carry a pay load of 850 pounds, giving it a total lifting capacity of about 2,700 pounds. It is to be manufactured on a commercial scale in a plant built in Atlantic City, N. J., and will sell for less than $10,000. It is announced. The craft can be moored by one man and during a recent test was anchored in 46 seconds. According to Capt. Heinen the airship can be landed within the space of an acre, or less. Several test flights have been made which have proved that the new blimp has very easy maneuverability. On starting up the engine for a flight recently, however, an explosion occurred which slightly injured three of the crew and damaged the gondola. This explosion was said to have been due to over priming of the engine, made necessary by cold weather.

A Modern Rainmaker

SINCE it is the lot of the human race never to be satisfied, grumblers about the weather are to be found the world over. It's either too hot or it's too cold; it's too wet or it's too dry. And the man who is most concerned about the weather is perhaps the farmer; he has good reason to be. And did you ever meet one who was entirely satisfied? And so we have always had with us the medicine man, witch doctor, rainmaker—call him what you will, who, right down through the ages, has claimed, and in some cases really attempted, to be able to control our fickle weather. Up to the present, however, most of these efforts remind us of the story of King Canute ordering back the sea at Hastings. Our most modern rainmaker is Dr. G. A. T. M. Sykes, of New York City, who directs an organization which he calls the Weather Control Bureau. For the period of the Belmont Park Races this fall he guaranteed the Westchester Racing Association that no rain would fall during the meeting. For the first few days no rain fell and he collected $7,500 in fees, but on Futurity Day, the most important day of the meeting, rain did fall, and under the agreement Dr. Sykes forfeited $2,000. Nothing daunted, however, Dr. Sykes made arrangements to produce a rainstorm between 2:30 and 4:30 p.m. on a given day, just to show he could control the weather. The appointed day came and went, but no rain fell, in spite of the efforts of the rainmaker. Dr. Sykes' array of antiquated-looking radio equipment, does not impress us as providing an effective means of controlling the weather.

U. S. Submarine's Record Dive

THE new U. S. submarine, V-5, in her first official deep sea diving test off Boone Island, Me., established a record for the navy of 332 feet. The previous record was 300 feet. The V-5 was down for forty-five minutes, during which time tests were made of her pumps and machinery, which functioned perfectly. On board the submarine were Rear Admiral Phelps and seven officers of the industrial research department of the Portsmouth Navy Yard. Lieut. Commander John H. Brown was in command, with six officers and eighty men. The mine-sweeper Falcon accompanied the submarine and stood by during the dive. Ability to submerge to great depths enables a submarine to evade enemy anti-submarine measures, such as deep nets suspended from booms across narrow channels.
Where Tires Grow on Bushes

FOR twenty years or more, attempts have been made to produce rubber in the United States, thereby making this country independent of foreign interests which control the output of the world's rubber. The construction of a $150,000 plant near Salinas, California, 100 miles south of San Francisco, is the culmination of these attempts. Millions of guayule plants, imported from Mexico, and capable of yielding 1,000 pounds of rubber every four years, are now being grown successfully on a 25,000 acre tract at Salinas. With the successful solution of the problem of guayule plant culture, another giant industry is forecast for California. The final discovery of the treatment of the growing plant to cause the secretion of rubber was made by Dr. William B. McCallum, botanist of the American Rubber Producers, Inc., a subsidiary of the Intercontinental Rubber Company, and pioneer in the new California industry. Numerous experiments in various parts of the country had to be made to find the type of lands suitable for the growth of guayule plants. It has been found that the nurture of the shrub is all-important in causing the storing of rubber in the stalks. In order to extract this rubber, the entire shrub is crushed by machinery. The progress of this new industry will be watched with great interest.

Another Rocket Plane—American This Time

DURING the past few years we have grown accustomed to reading about various attempts to drive airplanes and surface vehicles by means of rockets. In almost every case, tales of these experiments have emanated from Germany. The factor which has lured inventors to this field is the possibility, by means of rockets, of obtaining enormous speeds, far in excess of anything now possible by means of internal combustion power units. Evidence that serious interest in the possibilities of rocket airplanes has spread to the United States is provided by this photograph, which shows Maurice Poirier, of Burbank, Cal. (standing), who invented and designed this queer looking contraption which he plans to test in the near future. Franklin L. Wallace (kneeling), a pioneer pilot, built the model which, if successful, will be followed by the construction of two full-sized two-passenger planes. The model has 39 rockets, 22 of which are stabilizers. Poirier claims the model will fly at a speed between 350 and 600 M.P.H., and land itself. On the rocket planes the inventor plans to install gasoline motors for take-off and landing purposes. In contradistinction to continental practice, all the rockets will be lighted at once. It will be worthwhile following the career of this plane.

Alaskan Volcano Packed in Ice

The idea of a volcano being packed in ice sounds so anomalous as to be almost incredible, yet two such volcanoes exist, according to the Rev. B. R. Hubbard, a Jesuit priest who has just returned from an exploration trip to Alaska. These volcanoes, both active, are Aniakchak and Veniaminoff, hitherto known only as locations on the map of the Alaskan peninsula, and not known to be active. Father Hubbard, in company with four Santa Clara University football men, chosen to stand hardship, packed more than 100 pounds each across Alaska and scaled the rim of Aniakchak first. The party then scaled Veniaminoff, inside the active crater of which they found a huge glacier, out of the centre of which rose a recently erupted cone.
Radioing Any Planet Thought Possible

According to Clyde Fitch, radio engineer, recent researches in infra-red radiation and short radio waves have indicated that communication with the various planets is theoretically possible. Ordinary radio waves can not be employed for this purpose, as the ionized air (the Kenelly-Heaviside layer), in the upper atmosphere, turns them back to the earth. "Radio waves only a few inches long," he said, "can now be generated, and these easily penetrate the Kenelly-Heaviside layer. The infra-red rays could also penetrate the atmosphere of the earth and other planets without scattering. The receiving apparatus for infra-red rays consists principally of a sensitive cell, so sensitive, in fact, that a match struck on the moon could be recorded on the earth."

The Wheat Market—Another Russian Upheaval

The world wheat market is being upset by the Union of the Soviet Republics. Producers there are underselling the United States and the other wheat countries by ten cents. When you consider that in three days the sale of wheat in the Chicago market amounted to $7,765,000 bushels you can understand that our Russian friends mean business. The cheapness of their products can be attributed partly to large scale production and partly to the fact that Russia is constantly importing the latest machinery. As you can see from the picture, both men and women and the machines, loading the sacks of wheat upon them.

The Zaeharingen, Germany's Radio Target Ship

Just as the practicability of substituting a robot for the pilot in an airplane was demonstrated a few months ago, we now have a radio-controlled steampship. The German Navy has recently equipped its S.S. Zaeharingen with an automatic radio controller. No longer is it necessary to anchor a ship, or tow it behind some speedy greyhound for Fritz to indulge in target practice. Now, though no human being is on board, the boat goes at is always under complete control. So efficient is the radio pilot that the boat can safely do twelve knots per hour, and can be stopped within a distance of eight hundred and fifty feet.

Speedy Life-Saving Motor Buoy

Looks like a cross between the sawed-off bow of a motor boat and a freak water sled, with two runners in lieu of a keel. It's the electric motor buoy invented and built by J. E. Haschke of Long Beach, California, for life-saving purposes. A propeller between the runners is driven by a small automobile starter motor, switched on and off by means of a button. The buoy only weighs seventy-five pounds and is supposed to be capable of towing the man, who hangs to a handle bar across the stern, through a raging sea at the speed of five hundred yards a minute. The life-saver clings to the handle by one arm; the other arm free so that at all times he may use it to grasp and hold on to the drowning person. The device should prove popular at beaches.

Eighty-Ton Giant Gear

Despite their size, the teeth of this giant eighty-ton gear have a tolerance of only one thousandth of an inch for accuracy. The gear was recently installed at the United States Aluminum Company, Pittsburgh, Pennsylvania, and is the product of the Falk Corporation's Milwaukee plant. It is surprising how accurate it is possible for a workman, living in the year 1930, to be. There are Johansson gauges which check four separate surfaces of an automobile counter shaft gear simultaneously. The dials indicate instantly the degree of error. There is one concern that holds its meter gauges to an accuracy of plus or minus four-millionths of an inch. A story descriptive of such precision instruments appeared in the July, 1930, issue of Science and Invention.

A Foolproof Plane

Heinrich Focko of Bremen, Germany, has just perfected what he contends is the world's safest airplane, claiming that it is foolproof against stalling and caparing during landings. The stabilizer and tail of this revolutionary craft have been removed. In order to prevent stalling, the front wing has been provided with quite a great angle of attack by placing a small wing and elevator in front of it. There are three wheels to the craft—one in front of the centre of gravity to prevent caparing. Brakes allow one to stop the plane within a short distance. The plane, which the constructor has named "The Duck," fitted with two Siemens motors, each rated at 100 horsepower, is said to possess great climbing power, and to be able to fly at the rate of ninety miles per hour. When in the air, it appears to be going backwards.
Ship-to-Shore Airmail Service

THE Europa is upholding her reputation. She is not contented with having established the world record of four days, seventeen hours and six minutes on her maiden voyage from Cherbourg, France, to Ambrose Lighthouse, off the Jersey Coast. She is saving half a day now in the delivery of mail.

Recently the Europa was equipped with a biplane, the Atlantic, which accompanies the giant steamer on all its trips. In order to improve on the existing system of landing mail, the Atlantic is catapulted from the ship, about a hundred kilometers, 62 miles, before the boat reaches the harbor. Perhaps the ship-to-shore service will soon be extended to expedite the landing of passengers to whom time is an important factor.

The Style in Light Aircraft

USING an old Indian motorcycle motor as an engine, Mr. Frank Burt, of Clementon, New Jersey, has introduced the latest in light aircraft—his rowboat plane. The photograph shows the designer and inventor in his craft, with the biplane named The Spirit of Clementon. Unlike the famous Spirit of St. Louis, on its initial tests this rowboat plane proved a disappointment, and refused to ascend into the air. It is reputed to attain a speed of thirty-five miles per hour over the surface of the water. It has a wing spread of twenty-one feet. Another one of the flying killers gone wrong.

Sunlight-Treated Bread and Cake

ULTRA-VIOLET rays for health... why not for furthering health, though indirectly, by making the quality of food better? At the Bakery Exhibition in London, one of the most popular booths proves to be the one where the use of ultra-violet ray for lightening and whitening bread and cake doughs was being demonstrated. All that is done, as you can see from the illustration, is to allow the artificial sunlight to pour down upon the uncovered batter for a definite time. As a matter of fact, artificially produced rays are being experimented with to produce a whole new series of health foods. So far tests have been very successful. Ultra-violet rays have the property of producing very necessary vitamins and are in themselves very germicidal.

Who Couldn't Keep Cool?

THOUGH it's a little late to think of sunparlors for those of us who live where fur coats and heavy clothes hold sway, we can think of next summer, or can imagine we're in Florida or California, when we look at this picture. The charming young lady examining the roof of this bungalow is Miss Mae Reid. The bungalow is on top of the Sherman Hotel, Chicago. It is equipped with a unique cooling system—sprays of cool water constantly flow over the skylight. Yes, it's leak-proof.

We don't know how practical this new way of lowering the temperature would prove for the usual home or apartment house... and incidentally, how expensive. Suppose you try it when the hot weather sets in.

Relics from 10,000 B. C.

AMERICAN archeologists excavating at Alisahr, Turkey, in the fifth attempt at solving the Hittite mystery, have unearthed remains of the Stone Age, and discovered relics of a settlement supposed to have existed at least 10,000 years before the birth of Christ. One on top of the other, ten layers portraying distinct periods of man's development have been dug up. Among the remains are the wooden roof of a dwelling occupied 12,000 years ago, valuable cuneiform tablets, fortresses, palaces, temples, jewelry, and the bones of the ancient peoples.

Should your recollection of the Hittites be hazy, they are the ancient Orientals who ruled over part of Asia Minor and Syria between 2000 and 1200 B. C. They were rivals of the old Egyptians.
Exploring Outer Space by Radio Beams

About two years ago a Danish experimenter named Hals began to observe radio echo signals which arrived much later than one-seventh of a second, the time taken for previously observed echo signals to travel completely round the world. Hals' first observations detected echoes which arrived several seconds after the original signal. Two Scandinavian scientists, Stormer and Pedersen, took serious notice of this discovery, and commenced investigations, with the result that eventually they were able to detect echoes arriving as much as twenty and thirty minutes after the original signal. These discoveries seemed to indicate clearly that, contrary to general belief, short waves do penetrate the Heaviside Layer and travel for millions of miles in a straight line into outer space until reflected back again to the earth by planets, or by other ionized layers far away in outer space. In the course of a recent address before the Italian Society for the Advancement of Science, Marchese Marconi (inset above, left) said that the waves are reflected by hands of ions outside the magnetic field of the earth, sometimes at a distance from the earth of 25,000,000 miles, and observations by Hals indicated distances up to 48,000,000 miles. The illustration shows, at left, the two kinds of waves we are familiar with, the ground wave, and the space wave which is reflected back to earth by the Heaviside Layer. At right is the new "celestial wave"—if we may call it so—which penetrates so far into outer space. Marconi suggests that further ultra-short wave development, plus ultra-sensitive modern receivers, may reveal to us further valuable information concerning our neighbors in the solar system.

Germans Use Duralumin Boats

From Gruenberg, Silesia, comes the news that the German army, in an effort to secure still greater mobility, has substituted a new type of boat for the usual heavy army pontoons or pontoon bridges. The new invention consists of a peculiarly constructed boat made of duralumin which can be folded up for easy transportation over land. It has accommodation for a dozen men, and is used for patrolling or crossing rivers.

British Flying Boats Cruise Baltic

The photograph shows one of Britain's flying boats, known as the Super-marine Southampton type, with Group Captain E. R. C. Nanson in command, about to take off from Calshot, near Southampton, England, on a cruise over the Baltic. This type of flying boat, which first appeared in 1925, is now the standard twin-engined reconnaissance flying boat of the Royal Air Force. Similar machines are in use by the Royal Australian Air Force, the Imperial Japanese Navy, and the Argentine Navy. During 1927-28, four metal-hulled "Southamptons" of the Far East Flight, R.A.F., proved their worth in a flight from Plymouth to Singapore, thence round the continent of Australia and back to Singapore, where they are now based. This cruise, which totalled 23,000 miles, was carried out to schedule without trouble of any kind. These twin-engined machines seat five, and are of the equal-wing, unstaggered biplane type. The normal structure of the wings is of wood covered with fabric, but metal wings have been produced which are approximately 200 pounds lighter than the wooden ones, with which they are interchangeable. Two 470 H.P. Napier "Lion" engines are fitted.

Above—Soldiers unfolding the new boat ready for launching. Right—Soldiers paddling the boat across a river.
From Piano Stool to Book Table

By H. L. Weatherby

Director of Manual Training,
Montgomery County Schools,
Montgomery, Alabama.

For the lazy person of literary tastes there is no article of furniture that will quite equal a revolving book table, or a drum table as it is usually termed. One can have a whole library at his finger tips, with a variety of reading to suit all moods and without rising from his chair. At the same time, if the reader be a smoker, he has a convenient place for cigarettes and ash tray on top of the table.

Tables of this type are also often used as convenient display places for the choice small vases and other articles of like nature around the home.

The table illustrated here was built from an old piano stool made in that style of our grandmothers' day, which is becoming so popular again. There are a great many of these old stools no doubt, similar in type, which have long since given way to the more modern piano bench; and which are probably lying about in attics and storerooms, of no further use to anyone. We suggest that you get the old revolving stool out, tear off the remnants of upholstery, clean off the old varnish and add the book compartments to the top and see what a truly useful and beautiful article of furniture will be the result of your labors.

Lacking the stool to begin with the craftsman can fashion the whole thing in his home work-shop and arrive at the same end, after a little more labor and time have been spent in construction.

Only very general dimensions are indicated on the drawings. It was felt by the writer that each individual would have to suit the construction to his own type of piano stool, and for that reason explicit directions could not be followed. A few general directions, however, will be offered.

After the old upholstery has been removed, clean up all varnished surfaces, using a good paint or varnish remover. It may be necessary to patch broken places with small pieces of veneer. Stick shellac may be purchased in dark colors, melted, and run into small cavities like sealing wax, and will be a very good patching agency. This is smoothed over after it hardens.

Construction of the book compartments will probably be the next step. The two tops are identical in shape and the edges may be shaped at the local mill, or simply rounded off by hand. The shape of these tops should probably conform to the general shape of the original rail, although in most cases they would look alright if made up square with rounded corners. The same is true of the upright pieces. These should probably be made solid, but they may be cut from soft wood and veneered as illustrated. For anyone who has never tried veneering, he will find the job an interesting one, and beautiful grain can best be secured in this manner. Veneer (Continued on page 844)
He Can't Miss His Train
Broker-Farmer Builds and Operates His Own Railway System for Pleasure and Profit
By Austin C. Lescarboura

The city dweller, accustomed to subways, elevated trains and street cars, is certain to miss his transportation facilities when transplanted to a many-aeraed farm. Distances are great and legs undeveloped. So it was with W. C. Gage, a New York City broker, who retired to his farm at Fishkill Village, N. Y., only to find that acres of land meant many miles of walking each day in the course of supervising, bringing in the vegetables and fruits, feeding the chickens, carting ashes away from the house and bringing them to hills on the property, and talking friends about the property. What to do?

Gage had travelled extensively. He had seen many things, among them ingenious home-made railways in Europe, built by farmers for the purpose of providing ready transportation in the absence of costly flivvers. And so he conceived the idea of a home-made railway for his farm. In a dozen years it has grown from a thing of utility to one of rare beauty, from an expense to a profitable investment. Originally intended for the routine of the farm, the railway has become a real attraction to many tourists. Like all good railroads, it handles both freight and passengers.

The Cecilwood Vest Pocket Railway boasts of two miles of track, winding through gardens and open country, passing through woods, running alongside a brook and swimming hole, crossing over bridges and trestles, and, generally, behaving like a real railroad. The track, built by Gage, consists of two-by-four timbers covered with strip iron and laid on old trolley line ties cut to half the usual length, making a most substantial track for the small flanged wheels of the rolling stock. The switches are of the simplest form, with the movable parts arranged to slide from one position to the other. Most of the switches are arranged on a concrete bed, with fixed parts moulded into place, and the sliding parts arranged for ready movement over very smooth concrete. Thus intricate metal or wood construction is avoided, and everything is kept strictly on the home-made basis. The railway includes such standard features as bridges and trestles, which are built of four-by-four timbers for short spans, and six-by-six timbers for long spans, giving ample strength for safety. (Continued on page 842)
Television in Germany Today

By Dr. Alfred Gradenzwitz

At the 1930 Berlin Radio Exhibition Television showed that certain advances have been made in its proper field during the past year. Progress in visual broadcasting has gone apace, some of the difficulties of radio transmission having now been overcome. The quality of images is now practically all that can be expected under the present regulations. In fact, no marked further progress can be expected before the advent of short-wave or, even better, ultra-short wave television broadcasts, enabling a relatively larger number of picture elements to be transmitted through the air.

The television exhibits were housed in a special section of one of the main halls, partitioned off by curtains to secure the semi-darkness suitable for the reception. The Reichspost-Zentralamt, of Research Department of the German Post Office, which is sponsoring television, had the Witzleben Television Transmitter to show, from which all German visual broadcasts for the last eighteen months or so have been emanating. Moreover, there was a light-spot scanner designed for the German Post Office by the Fernseh-A. G., which is the German subsidiary of the British Baird Television Company. While the Post Office television broadcasts so far have been limited to the transmission from simple films, actual television, i.e., the transmission of views of persons and of moving scenes, is now to be started.

A special feature of this light-spot transmitter was the use of a new type of photo-electric cell responding only to infra-red rays. A person seated in front of it is not inconvenienced by any dazzling light, all visible beams being eliminated by an infra-red filter, while the television studio can be illuminated by short-wave visible light. In fact, a person thus televised will be able, while seated in front of the photo-electric cell, to read a manuscript.

Another light-spot transmitter of similar design was exhibited by the Fernseh-A. G., in a transmitting booth of their own. It comprised a Nipkow disc with 67 holes, corresponding to 3350 picture elements, i.e., nearly three times the German standard figures. A "tele-talkie" film was demonstrated, showing the great improvement obtainable by the mutual assistance of speech and vision.

In the way of receivers, the Research Department had a Nipkow disc receiver as well as a mirror-drum receiver of their own to show, in addition to two projection receivers designed for them by the two German television companies. The Telehor, i.e., Mihaly, firm supplied a lens-disc screen receiver, while the Fernseh-A. G. supplied a small mirror-drum receiver.

In order to show the possibilities of television unhampered by the restrictions of present ether control, some independent television systems were provided—in addition to televisions designed for (Continued on page 857)
Model Guillotine Makes Useful Cigar Cutter

By Charles H. Alder

Anyone Possessing the Necessary Patience to Make Small Component Parts Can Easily Construct This Model With the Simplest of Tools. The Completed Model Makes an Attractive Desk Ornament and Is Utilitarian as Well

A FRENCH physician, Dr. Joseph Ignace Guillotin, born May 28th, 1738, died 1814, has always been credited with the invention of the guillotine, but Dr. Guillotin only supported its introduction into France. Its invention is ascribed to the Persians, and may date back to the 17th century.

It received the name of guillotine officially in memory of Dr. Guillotin's suggestion that such a machine be constructed and used throughout France as a new and uniform method of capital punishment. Ironically enough, Dr. Guillotin himself was a victim of the machine which bears his name.

The guillotine was first introduced during the French revolution, and its first victim is said to have been a highwayman. For a time its use was limited to people of noble birth, as it was considered the most agreeable method yet evolved for carrying out the death penalty.

A model guillotine, besides being an interesting thing to make, and a unique ornament when finished, can also be made to serve a useful purpose as a cigar cutter. The tools required are available to almost everyone. You need a back saw, a wood saw, a pocket knife, a small flat file, pliers, screw driver, ruler, hammer, small brush, hand drill, and an improvised mitre box.

The material required is four feet of

\[ \frac{3}{4} \text{" square white pine, bass wood, box wood, or any straight grained wood. This will make the upright stanchions, base, cross beam, and plank or table support. A cigar box lid or similar piece of wood \( \frac{3}{4} \text{"} \) thick will do admirably for the table, collar support, knife block and the cleat. An old ruler does very well for these parts. The base for the model measures \( 8\frac{5}{8} \times 6\frac{3}{4} \times \frac{3}{4} \text{"} \), and may be made of white pine, oak, or any other wood that will take a nice finish.

To make the stanchions there will be required eighteen inches of strip brass, \( \frac{3}{4} \times 1/16 \text{"} \). The hinges can also be made from this strip brass. The collar, shown at I, is made from sheet brass \( 1/16 \text{"} \) thick. Some round-head brass screws will be required, size \( 1/16 \) in diameter by \( \frac{3}{4} \text{"} \) long. A piece of lead \( 13/16 \times 1/2 \times 1/2 \text{"} \) will (Cont'd on p. 837)

These detail drawings give all necessary information for the construction of the component parts.
On the sand dunes, at South Dartmouth, Massachusetts, where Cape Cod begins, 250 acres overlooking Buzzard's Bay have been transformed into a veritable paradise for those who crave scientific research. Here Colonel E. H. R. Green rides his hobbies, and, aided by scores of eager helpers and associates, pursues interesting and novel experiments in aerodynamics, radio, television and radio movies, electricity, and photography, and carrying out his youthful desires.

As a boy, Edward Howland Robinson Green wanted to know "what made the wheels go round," but he placed the material necessity of achieving a success in life ahead. The son of Hetty Green, one of the shrewdest and most capable business women America has ever produced, Ned Green early proved himself capable of conquering his share of the world of business and finance. Meanwhile, his interest in mechanical development and technical research kept pace. He drove one of the first automobiles to be used in the State of Texas. He owned a railroad, and when he found that one of his employees, the movie pioneer, Lubin, was working with motion pictures, fell in wholeheartedly with the experiments which made early thrillers possible.

To aid him in scientific work, Colonel Green has constructed buildings and laboratories and filled them with the most up-to-date equipment.

One of the Green buildings is a powerful private radio station (WMAF). Here pioneer experiments in "land wire" transmission and re-broadcasting of programs were made. Community center amplifiers have been developed. A complete motorized radio receiving and amplifying apparatus is available for "field experiments."

A tract of marsh land of ample size has been filled and leveled to form an airport. Here, last summer, a commercial dirigible made meteorological experiments in connection with the Massachusetts Institute of Technology. In the bay nearby, a breakwater has been built to afford safe landing of seaplanes. Experiments are conducted with various radio devices to aid aviation. A laboratory for fog research has been built as well as a short-wave radio research station (W-IXV).

There is also a photographic laboratory. Work with telephoto lenses has been developed to the point of obtaining clear pictures of objects five and even ten miles distant.

Colonel Green, not satisfied with amassing mere millions, has converted 250 acres overlooking Buzzard's Bay into scientific laboratories and fields. Here he spends most of his time doing research work in any of his hundred hobbies — aerodynamics, radio, television, electricity, and photography.

One of the most interesting devices on the estate is Colonel Green's own electric automobile. This car is practically a mobile office; in addition to a compartment for note books and a folding table for writing facilities, it carries a radio receiver using a loop antenna on the rear of the car.

Colonel Green's hobbies are varied. He is a philatelist as well as a scientist and owns one of the most valuable stamp collections in the world. And the flowers and gardens which surround the Green mansion are as widely admired as are the results of his achievements in other fields. His estate exhibits only a part of what he has accomplished.

The steel radio towers rise 200 feet and provide for the use of transmitting and receiving antenna systems of various designs.

The main operating desk at Station WIXV controls six receiving sets for waves ranging from ten to 7,000 meters and four transmitters operating on ten, twenty, forty and eighty meters.
W HOLE mountainsides covering more than 100 square miles have been cut away to make stone faced terraces that provide flat land for the cultivation of rice. These terraces are outstanding examples of engineering feats of people who lived more than a thousand years ago. They belong to the Ifugaos, one of the hill tribes of Luzon, Philippine Islands.

The 1897 Auto

CH ARLES E. DURYEA, a pioneer in the American automotive field, is photographed here with the fourth Duryea design, which was recently placed on exhibition at the Museum of Peaceful Arts. This car designed in 1897 was built two years later. It has a three-cylinder engine which develops 35 horsepower when it runs at 3,000 revolutions per minute. The car had a planetary transmission and was capable of a speed of 30 miles an hour. In 1900, John Graver, of Pennsylvania, purchased the car. He used it for 10 years and then let it stand in the open for 20 more. Mr. Duryea bought it again and turned it over to the museum.

Would You Believe It?

W HAT seems to be the huge sea serpent in this rather striking view, is merely the bony skeleton of a huge Australian python. The leg-like structures are really the ribs.

Not a Freak of Nature

N ATIVES of La Mesa Angat on the island of Luzon, one of the Philippines claim that the modern saxophone was copied from the bamboo instruments of their forefathers. These musical constructions are still in use there.

The Forerunner of the Saxophone?

A NOTHER automobile of rare vintage is one that was purchased by Henry Ford, in Munich, Germany. It looks more like an ancient motorcycle than an auto. Nevertheless, the reports state that it is actually a model of an 1888 Benz, a product of Karl Benz. The automobile on display in the German Museum is supposed to be the first one built in Germany and dates back to the year 1885.

What Is It?

Y OU have undoubtedly produced this effect thousands of times but never realized it. The next time that you put a silver spoon in a tumbler of water observe the tiny air bubbles that arise from the spoon and gradually reach the surface of the water in the tumbler. This photograph was taken a moment after the spoon was dropped into the water.
The Vanishing Plate

A CHINA plate is shown to the audience and its substance and solidity is tested by striking it with a wand. Without any cumbersome moves, the plate is tightly wrapped in a sheet of newspaper. The wizard now tears the paper parcel into fragments. All traces of the plate have vanished.

Secret. Beneath the china plate is one of paper, which has been entirely covered with white enamel. In the act of picking the newspaper off the table, the genuine plate is secretly slid into a cloth-bag, the serviette, hung behind the table. It is the paper plate which is wrapped in the paper sheet.

Transformation Frame

A CARD is freely chosen from an unprepared pack that has been presented to a spectator, face down. With its face still down, the card is slid into the side of a small frame just large enough to hold it. The magician explains that this is done to prevent substitution. The frame is now turned over so that the audience can see the face of the card, which we will suppose is the trey of diamonds. The frame is now presented to some spectator to hold. With the back of the card toward him he is instructed to slowly withdraw the card. When he does so he finds that he has a king of diamonds instead.

Secret. The card which was originally placed in the frame, was the king of diamonds but when passed through the slit in the frame the edge of the card caught two small hooks which drew a cloth card into place, and covered the face of the originally chosen card.

The International Bullet

A LARGE metal gun-cartridge, 18 or 20 inches high is shown to the audience. The top portion of the bullet is merely a thin shell unquestionably empty and unprepared. The lower tubular section of the supposed implement of war is held up so that the audience can see through it. The magician puts the top on the cylinder, then reaching down into the bottom, he removes a large quantity of silk flags.

Secret. The trick can be found in the construction of the lower section of the bullet. This is really composed of two tubes, one within the other, the inner one being tapered slightly toward the bottom. When the tube is held up for examination, members of the audience cannot observe the taper. It is in this space between the two cylinders that the flags (which should be of thin China silk) are concealed.

Patriotic Billiard Balls

THREE billiard balls, approximately 2 inches in diameter, are passed for inspection. They are perfectly round and seem to differ only in respect to color. The magician is securely blindfolded and then any one of the three colored balls is placed into his hand, held behind his back. Within a moment the magician calls the color of the ball he is holding. The trick is repeated as often as it may be desired and in any stage of the experiment the sphere may be examined.

Secret. The balls vary but slightly in size. This difference cannot be detected by the naked eye. The red ball is smallest, the white slightly larger and the blue the largest. Concealed beneath the magician's cloth is a round steel ring attached to a piece of elastic. When the magician receives a ball from a spectator, he tests it with a ring. If the ball passes through the ring it is red, if it fits snugly it is white. The blue ball does not pass through at all. When the steel ring is released it flies up beneath the coat. By applying several coats of enamel, the diameter of three balls of the same size can be varied sufficiently.

*No. 88 of a series of articles on magic appearing monthly.
New Ideas for the Owner and Driver

By Arthur George
Consulting Engineer

There are several improvements that every autoist would like to make in his car to enhance its appearance, to add to the comfort of its occupants, and to insure greater safety in its operation. Five suggestions which we have found practical and of which you can take advantage are detailed below.

Attach a slightly modified conventional type of parking light above the left side door, in such a manner as to cast a bright light downward. The red and white ends of the lamp are undisturbed, and the device serves the dual purpose of making hand signals visible and marking the car with a white light to the front and a red light to the rear for night parking.

Such a fixture can be put on the car by the mechanically inclined owner or any automobile mechanic.

As there is considerable vacant space under the hood, the owner who mounts a compact tool storage box similar to the one sketched saves himself the trouble of removing the rear seat to avail himself of the tools which he most frequently uses for minor repairs. The box is very easily built; two bolts hold it to the dashboard and the top is hinged and kept in place by hooks. This is a very convenient arrangement, as the implements and small spare parts are at all times easily accessible. Small metal compartments for these accessories make this a very valuable addition to any car.

Every driver, no matter how careful at some time or another is bound to dent the body of his car. This most discouraging damage can be readily repaired with a home-made tool consisting of a piece of pipe, a long bolt, and a nut. Quick repairs can be made, leaving the car body without visible evidence of the previous damage. A long pressure screw jack, as illustrated will frequently restore similar buckles to their original contour without spoiling the paint. This tool is also suitable for reshaping fenders which have become smashed in parking or by slight collisions. The screw and extension merely serve as means to apply force to the dented spot. To avoid bruising the metal, a padding of rags or wooden blocks should be interposed between the ends of the implement and the car body.

Another hint which we think will interest you is particularly timely—good for winter driving. A hand windshield wiper, fastened on the door frame just above the center of the glass, keeps snow and sleet from your left front window. With the movement of the hand, the glass can be cleared and approaching traffic observed although the window is closed. This adds to the safety of the driver and he is not inconvenienced by being forced to frequently open the window. Such a wiper can be readily (Continued on page 844)
You'll Have to Sprint to Get Your Share of that $3250.00

in Fine Tools and Shop Equipment

IF YOU HAD $50.00, or $200.00, or $400.00 to spend in equipping a home workshop, what tools and equipment would you buy?

SCIENCE AND INVENTION will award $3,250.00 in fine tools and home workshop equipment to the fifteen people who answer this question most effectively.

There are three points to consider—quality, completeness, amount of money allowed.

Your problem, in a nutshell, is to balance quality against completeness, and both of these points against the amount of money allowed. The fifteen prizes, totaling $3,250.00 in fine tools and workshop equipment, will go to the fifteen people who tell us how to get the most and best tools and equipment for the amounts of money named in the three price divisions. You may enter lists for any or all of the divisions.

Each winner in the contest will receive exactly the tools and equipment he has named in his winning selection. If, however, his winning selection duplicates tools or equipment he already owns, we shall be glad to substitute any others he may desire in their place, provided the cost is the same.

Thirty-five thousand hardware dealers have been informed about this Contest. They will be glad to cooperate with you in selecting your Ideal Home Workshop.

Important: Machine Tools, Motors, and Miscellaneous Working Equipment Will Be Considered in This Contest Where manufacturer furnishes consumers' discount prices, you may consider such quotations as list. Otherwise catalogue prices are list prices.

GET A REPRESENTATIVE GROUP of tool and equipment manufacturers' catalogues. Pick manufacturers who make tools and equipment of established quality.

Write down the names of the tools and equipment units you think would be ideal for the home workshop, in any or each of the three price classes named, together with the manufacturers' list prices. Try to make your assortment or assortments as complete as possible, within the money limit allowed. Enter lists for any or all of the divisions, as you please.

For each list write a letter of from 200 to 500 words telling plainly why you chose the tools you did. Send in the letter with the list. The letter will be considered by the committee in making the awards.

Winners in the Ideal Home Workshop Equipment Contest will be announced in the April, 1931, number of SCIENCE AND INVENTION.

We want all the data we can get on the ideal tools and equipment for the home workshop. To help you in making out your lists, we shall be glad to see that you are supplied with a representative group of manufacturers' catalogues. Drop us a line saying you wish to enter the contest. We'll do the rest.

Follow These Simple Instructions

A—List your ideal tools and equipment with manufacturers' names and list prices, keeping the total within the amount named in the division the list is intended for.

B—Write a letter of from 200 to 500 words explaining why you chose the tools and equipment you did.

Contest Closes December 24, 1930

THREE DIVISIONS—FIFTEEN PRIZES

5 at $50.00

In the First Division, you select the ideal tools and equipment you would buy if you had $50.00 to spend.

The prizes in this division will be five sets of tools and home workshop equipment, costing $50.00 per set at the manufacturers' list price. Tools and equipment will be exactly those selected by the winners.

5 at $200.00

In the Second Division you select the ideal tools and equipment you would buy if you had $200.00 to spend.

The prize in this division will be five sets of tools and home workshop equipment, costing $200.00 each at the manufacturers' list price. Tools and equipment will be exactly those selected by the winners.

5 at $400.00

In the Third Division, you select the ideal tools and equipment you would buy if you had $400.00 to spend.

The prizes in this division will be five sets of tools and home workshop equipment, costing $400.00 each at the manufacturers' list price. Tools and equipment will be exactly those selected by the winners.

Contest Rules

1. Entries must reach our office, 381 Fourth Avenue, not later than midnight, December 24, 1930.

2. Only one prize will be awarded to any winning contestant, but you may enter lists in any or all the divisions.

3. The contest is open and open to everyone. You need not be a reader of SCIENCE AND INVENTION to enter.

4. In case of ties, tying contestants will receive prices of identical worth according to the division involved.

5. Nestness of lists and pointedness of letters will count in the awards.

6. No employees of this magazine or members of their families are permitted to enter the contest.

7. The decision of the judges will be final.

8. The winning lists will be those in which completeness and quality are best combined, in the judgment of the committee, within the money limits of the divisions involved.
Make Synthetic Dyes at Home

Full Directions for Preparing Several Coloring Agents

By Captain Robert E. Sadler, U.S.A.

There are several dyes and colored organic compounds which may be easily prepared by the amateur chemist with chemicals that are readily available and at very low expense. They are:

Methyl Orange, Fuchsin, Aniline Red or Magenta, Indigo, Phenol, Fluorescein, Eosin.

Methyl orange is the salt of a sulfonic acid, and it is extensively employed in quantitative chemistry as an indicator. The aqueous solution has a red color when an acid is added, due to the formation of free sulfonic acid. The aqueous solution of the alkaline salt of sulfonic acid has a yellow color. These changes in color are utilized in the determination of the degree of acidity of alkalinity of solutions.

Sulphanilic acid is needed for this preparation, and in case of difficulty in obtaining it, use the following method: Pour 25 grams of aniline cautiously into 80 grams of concentrated sulphuric acid, keeping the receptacle cold during the mixing. Then heat the mixture to 180° C. to 190° C., for about 4 hours. If a small sample of the product is then dissolved in water and treated with an excess of sodium hydroxide solution, there should be no separation of aniline oil. Pour the entire cooled batch into cold water, and the sulphanilic acid will separate as a mass of gray crystals. Filter these

by suction, and wash with cold water while they are on the filter. Now dissolve them in as little boiling water as possible, shake with about 2 grams of powdered charcoal and filter. When the solution cools, the sulphanilic acid will crystallize out again, and can be left to dry.

To prepare methyl orange, make a solution containing 1 gram of sodium hydroxide in 10 cubic centimeters of water. In another small beaker, dissolve 1 gram of sulphanilic acid in 5 cubic centimeters of water and add 2½ cubic centimeters of the sodium hydroxide solution. Now place the beaker in ice and add a solution containing ½ cubic centimeter of concentrated hydrochloric acid in 2 cubic centimeters of water. The resulting solution should be reddish in color.

In a small beaker mix 0.74 grams or 20 drops of dimethyl aniline with about 13 drops of glacial acetic acid. Stir the solution prepared above constantly, and slowly add this solution. The thick, dark red mass which at once begins to separate is the dye—methyl orange. Now add the remainder of the sodium hydroxide solution and stir well. Filter this solution through two ordinary filter papers placed one upon the other in a glass funnel. The crude methyl orange prepared in this manner should now be recrystallized from 20 cubic centimeters of hot water. Then dry it on a filter paper. The methyl orange dye prepared in this manner will be in the form of leaflets having a golden luster.

Magenta may be utilized to dye animal fibers like wool or silk without the use of a mordant. It consists of a mixture of rosaniline and para-rosaniline hydrochlorides. It may be prepared by treating a mixture of three parts of aniline to one of toluidine with concentrated hydrochloric acid until a pasty mass results. Then add a little more aniline and an equal weight of nitrobenzene. While stirring the mass, it should be slowly heated to 190° C. when a small amount of iron fillings should be added. The water-soluble red magenta is formed in the solution as a red mass and the crystalline form may be obtained by slow crystallization.

The procedure followed (Continued on page 855)
Scientific Aids to Comfort

By Mary Jacobs

A Sunless Coat of Tan

MOST of us can no longer bask in the sun to acquire a fashionable coat of tan—and, incidentally, get the benefits of the health-giving ultra-violet beams radiated from the sky. Here's an artificial sunshine producer that will give us the same tonic and stimulating effect as Nature. This inexpensive, carbon-arc lamp is portable and can be put on the floor, on the table—in any position that you may desire for use. If it is your back that requires treatment, put it on a low table; if it's your throat, put it on your dresser. This lamp can be used safely. It shuts off automatically after four minutes.

Don't Burn Your Hands

HAVE you ever tried to lift sizzling doughnuts from a pot of steaming fat with a fork? To turn a roast of meat, or a potato, in the oven? If you have, it's a foregone conclusion you have not only succeeded in doing these things, but in simultaneously burning your hands and singeing your arms. Tongs of cold rolled steel, impervious to heat and cold, can be used to help you in cooking, baking, dyeing clothes and removing bottles from steaming pots. They come in three sizes, six inches, nine inches, and twelve inches, according to the purposes for which they are intended.

Potatoes That Peel Themselves

YOU no longer need a paring knife to peel potatoes—a tedious, messy job with one. Slip them on the spindle of this automatic peeler, release the cutter arm, and turn the handle. In a few seconds your potato will be pared evenly, for the ma-

chine is so adjusted that it will cut the same fine water-like strip from the entire surface, regardless of how irregularly shaped it may be. The device can also be used for making finely cut garnishes for salads, to cut carrot, beet and apple strings for decorations, and to peel turnips and other vegetables that are not very soft.

Much Needed Protection

AFTER the party is done and you return to the kitchen to wash dishes, on goes your apron. How often, after the dishes are washed, do you find that water has penetrated to your dress? Or that the spotless floor is all splashed up, in spite of your carefulness? By using a sink protector you can keep your dress fresh without benefit of an apron, and the floor dry. It is easily adjusted to any sized sink and can be pushed down into the sink when not in use.

Nested Glassware Sets

HERE'S a set of pyrex glass containers that serves three distinct purposes—you can cook your food in them, serve it from them, and store whatever is left over in the refrigerator. As they nest in one another, a minimum of space is required. The dishes come in graded sizes—small individual casseroles for storing butter and little left-overs; larger ones for cooking fruits and vegetables, and still larger containers for baking cakes and meats.

Eggs as Wanted

EGGS cooked just to your individual taste—soft, medium or hard—time and time again, without trouble. And all you have to do is to adjust the indicator at the top once, before putting them on to boil. When they are done they will rise out of the water and will not be spoiled.
Make Your Own
Sun Lamp

Here is a Roman Candle Type Arc Lamp That You Can Construct Cheaply. For Motion Pictures or Stills, for Preparing Small Blueprints or Acquiring a Coat of Tan This Home-Made Product Can Be Used Satisfactorily.

By John Steinke

Many arc lamps of various types have been placed on the market for sun tanning, as well as photographic work, some expensive, others, low priced. This lamp, however, can be made considerably cheaper than the least expensive and is as effective, besides presenting a finished appearance. It is efficient for taking motion pictures or still photography and for sun tanning. You can make small blueprints at night using this lamp.

Only a few simple operations are necessary to make the lamp as most parts are ready made. These are: hard asbestos board (or thin slate), a nine-inch aluminum mixing bowl, a one-quart saucepan, four thumb screws, resistance coil (can be taken from heater unit), asbestos covered wire, and a plug. A brass block 1/4" X 2" X 3 1/4"; brass strips, band iron for a stand, fixture pipe, and an inside iron base for a lamp. Bolts, fiber, and carbons. For tanning use Sunshine carbons. For photographic work, panchromatic photographic material, or white flame for other subjects and blueprinting.

The most work is on the carbon holding unit. Cut the brass bar (brass is much preferred to iron which will do), into lengths of 3/4 inch (two pieces), and one piece 1 3/8 inches. Drill 3/16" holes for bolting to the base board, and 5/16" holes for the carbons. Note that the holes for the thumb screws are on opposite sides, permitting easy adjustment of the screws. Drill and tap the thumb screw holes for whatever small size thumb screw you may have handy. Next prepare the base boards, and get the boards ready for holding the resistance.

Three boards, each 4 inches in dia-

Working plan of the assembled lamp: details of the resistance coil, a set of carbon blocks, and the front, middle, and back boards are also shown.

A close-up of the carbon holder unit. Note how the thumb screws are staggered. The round head bolt fitted with the washer is the three-inch bolt that holds the various units together.

The lamp ready for use. Note the neat and attractive appearance which gives a hint of its home-made origin.
EVERY workshop has a workbench. Its height, position and construction are quite important to the quality of the work you do. And in this work, you may have occasion to tap for special sizes of screws, and prepare dies. You frequently use chisels; in order to fit up parts, scrapers are in constant demand; and files of various types are in constant use. This month, a full description of these tools and the workbench are given, with hints for their use and care.

While the fitting of very large parts must obviously be done on the shop floor, the smaller parts to be fitted, assembled, or hand tooled, should be handled on the bench. It should be rigid, placed at the correct height for working comfortably, and provided with ample light.

For supporting a heavy vise or pipe grip, the post bench is one of the best types. Here, as illustrated in Fig. 1, a post is used as a stand for the bench. Two pieces of oak or other hard wood, held by long bolts, are used to span this post. A hard wood top an inch and a half or more in thickness is added above these beams.

If a portable bench is built, the leg and top supports should be made as shown in the sketch. The triple fastening at each leg joint which assures long life with maximum rigidity is quite essential. Bolts or screws are preferable for securing parts of the bench. It is a good idea to avoid nails wherever possible, for the same hammer blows that drive in your nails will loosen them.

One of the jobs that you can do on your workbench is tapping for special sizes or making up odd sized screws to fit into tapped holes. As the usual dies and taps cannot be had, it is extremely helpful to know how these tools are made.

The tap is made from drill rod, turned with the proper thread in the lathe. It is then fluted in the milling machine, the end is reduced to a tapering point and the starting threads are slightly backed off with the file. Tempering completes the tap. A special tap for clearing out old threads or undersized threads can be roughly and quickly made as per our illustration. The thread can be file cut, the metal can be cut away by grinding for half the diameter, and the tool, tempered. Of course you cannot expect a very neatly finished job with this hastily constructed tap.

Too often, the beginner or machine shop apprentice injures himself because the hammer misses completely or strikes the chisel he is using a glancing blow. Till practice enables the novice to handle a chisel safely he can slip a leather washer over the tool. It will serve as an excellent guard while he is (Continued on page 839)

Dyes, as you will see from Fig. 2, are readily fashioned from tool steel plates, slightly thicker than the diameter of the part to be threaded. The plate is first drilled then placed in the lathe and the correct thread chased in the plate. The hole is plugged and clearance holes are drilled at the sides of the threaded area. Part of the die thread must be cut away to allow for clearance when starting to cut the thread. A tapered reamer is necessary for this work. The die is now ready for tempering. If a number of special sizes are required, a single plate of tool steel should be fitted with several sizes of threads.

Fig. 3—The five general types of chisels. All should be adjusted to a 60° cutting angle for work.
Try These in Your Own Workshop

The Best Among Our Home Enthusiasts' Monthly Hints

For Cutting Circles from Wood

Holes from an inch to five inches and more, in diameter, can be cut from wood by using this simple device. It cuts out discs without pulverizing them, too. A punch guide, two cutting knives, set screws with which to fasten them, and a drill chuck are all the necessary equipment. Any blacksmith or iron worker will shape the sharp parts like auger knives for you, if you desire this work done by an expert.—E. Moen.

This idea can be applied to other angles frequently used.

To Set Your Rule at 45 Degrees

The 45-degree angle is the one used most often in planning work. Why not mark the measure on your folding rule so that you will be able to adjust it immediately at any time, to this angle? Using a known 45-degree angle, calibrate the rule by scribing a line on the brass hinge. It can be similarly marked for other angles.—R. Wailes.

Fitting a Soft Iron Bar

The next time you have occasion to fit a soft iron bar into a hole, proceed as follows: Drill a hole in the bar slightly smaller than its diameter. Then drop a ball bearing, which is larger than the diameter of this hole, into the hole into which you wish to insert the bar. As the soft iron is forced down into the hole, the hard ball bearing will spread it and hold the bar firmly in place.—George Max.

Using a Drill as a Planer or Gouge

Perhaps you do not use a planer or gouge often, so have not purchased them. Or perhaps they break in the middle of an operation. You may not realize it, but your drill is a good substitute for these tools. Merely support the work upon the tool rest of a wood-turning lathe, and allow the portion to be shaped or gouged to come in contact with the point of the drill. While the work will not be as perfect as with the correct tool, it will serve the purpose.—R. Wailes.

Bench Hook and Mitre Gauge Combined

A BENCH hook, similar to the one illustrated, enables you to cut work to size with a stiff hack saw on the workbench top. In addition, it can function as a mitre box. If it has no scale in front, paste or engrave one there. Then equip it with a left and a right 45-degree slot on the back cross member.—R. Wailes.

For Drilling Holes

Very often one wishes to drill a hole in a pipe or other round stock, but due to the curved surface, the drill slips and by the time it does catch there are several marks on the pipe. I find by cutting cross-lines (X) with a hack saw (not very deep), having the crossing right over the center of the hole to be drilled, I eliminate the hazard of slipping.—E. A. Scheffler.
Prize Puzzles to Polish Your Wits

By Stan Loyd

THE Puzzle King presents the thirteenth of a series of problems, the solving of which will show if your mathematical ability is bolstered up by logical reasoning. Prize winners of the October puzzles and solutions will be found on page 863.

TWENTY-FIVE DOLLARS IN PRIZES

A FIRST PRIZE of $10 will be awarded to the person sending correct answers to the two puzzles, accompanied by the best expressed analysis of the Expectations Problem.

A SECOND PRIZE of $5 will be awarded for the next best analysis and correct answers to the two puzzles.

TEN PRIZES of $1 each will be awarded to the ten persons who send the next best analysis of the Expectations Problem together with correct answers to the two puzzles.

Answers must be received not later than noon, January 15, addressed to "Puzzle Editor," SCIENCE AND INVENTION, 331 Fourth Avenue, New York City.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tying for any one of the prizes, will each receive the full amount of the prize tied for.

Dealing in Expectations or Exact Mathematics?

WHEN well-to-do John Robbins shuffled off this mortal coil, his blood relatives, whom he had snubbed impartially during his declining years, were left completely in the dark as to the old man's distribution of his possessions.

At a meeting of the natural heirs, before reading of the will, Robbins' two nephews and three nieces decided to do some dealing in their expectations. Their discussion led to the making of two separate bargains.

The nieces, Barbara, Celia and Dora, agreed to pool their prospective inheritances and each take one-third. Likewise, the nephews, Aaron and Edward, agreed to lump their portions and divide equally.

It transpired that all five had been generously remembered, although in somewhat varied degrees.

Peculiarly enough, the agreements entered into by the five heirs completely nullified the decedent's preferences, in that all five received like shares under the terms of their bargaining.

Incidentally, Uncle John left us a fair puzzle to remember him by.

To the information already set forth, let us supplement the following facts:

Had the provisions of the will been carried out, the combined shares of Aaron and Barbara would have amounted to $14,000. The shares of Barbara and Celia combined would have totaled $20,000. Celia and Dora together would have received $18,000, while Dora and Edward would have got $12,000.

There's enough data from which to reconstruct Uncle John's testamentary intentions. How much did he bequeath to Aaron, Barbara, Celia, Dora and Edward, respectively?

Rolling the Bones

AS the uninitiated soon learn when they venture to "roll the bones" with experienced "crap" shooters, the apparently simple game of chance is anything but a fair gamble. Leaving out of discussion the fellow who practices sleight-of-hand tricks and makes the cubes behave as he likes, there is yet the theory of chances involved in the game which makes it a "sure thing" for the adept when playing with the tyro.

The skilled player knows the exact mathematical chances for making the "crap" plays of 7 or 11, and is also posted on the exact odds for and against repeating the numbers thrown, (other than 2 or 12) which repeat constitutes a win.

These calculations are readily worked out by anyone versed in the elementary laws of chance, but the original game of craps, which came from India, is a more complicated problem, for the reason that three dice are thrown instead of two.

To consider only one feature of the old Hindu pastime, let us see who can figure out the chances for throwing three dice, in a single throw, so that they add up 7 or 11.
Meteorites

(2372) Mr. Andrew Perry, New Bedford, Mass., writes:

Question 1. Professor Laytins states in his article that the giant meteorite which fell near Grootfontein, in South-West Africa, has its thicker portion resting in a hollow formed in a bed of limestone. It is my belief that the limestone, which is softer than the hard rock which supports the other side of the meteor, sagged because of the weight of the meteor, and the meteor being in a molten state at the moment of impact, flowed into the depression.

Question 2. Isn't it possible that the earth's magnetic pole north pole acted upon the meteor as it approached the earth and turned its mass in a north and south direction?

Answer 1. Granting the possibility that this meteorite was able to make a dent in the rock upon which it fell, we must bear in mind that although a meteorite attains great heat during its approach to our world, it does not reach the earth in a molten state, and therefore would not flow into a form which the force of its impact would dig.

Answer 2. A meteorite moves at a tremendous speed. Its momentum is such that it is impossible for the relatively weak influence of the earth's magnetic force to deviate it from its course. Although a meteorite does not reach its melting point in its travel to the earth, the mass becomes red hot. A red-hot body cannot be magnetized and therefore any magnetic field through which the meteorite passes would not affect it. It is questionable if it had polarity.

An Acetylene Generator

(2373) Mr. John D. Walker, South Bend, Ind., writes:

Question 1. I would like to build an acetylene generator. The one I want to make must be simple, cheap and capable of being handled with safety. Can you furnish me with plans or a description which would enable me to assemble the unit which I require.

Answer 1. A very satisfactory generator can be made from two cans. The covers of both cans are removed and one of them is filled with water. The other can, which must be of such a diameter that it is able to slide easily in and out of the first can, is fitted with a plug bottom which can be unscrewed. A fine mesh screen cone is attached by its base to the bottom of the can so that it can be filled with carbide when the plug is taken out.

The two cans are now fitted together. The weight of the floating can forces it down until the carbide filled cone makes contact with the water. Acetylene gas is immediately generated and imparts buoyancy to the can, which rises so that the cone no longer touches the water, resulting in a cessation of the production of gas.

As gas is drawn from the generator, the cone again touches the water and the above described process repeats itself.

Should the acetylene be produced too quickly or in too large quantities, the excess gas will bubble out through the water between the two cans.

Can We Survive a Hard Fall?

(2374) Mr. Matthew Burns, Trenton, N. J., writes:

Question 1. My friend and I had an argument about how a man would be affected in a fall from a great height. I claim that the man would live until he struck the ground. My friend claims that inability to breathe while traveling at such a high rate of speed would cause the man to suffocate. Who was right?

Answer 1. Until recently the popular theory was that difficulty in breathing incurred in a long fall would kill a man before he made contact with the ground. However, daring aviators have disproved this theory by dropping far through space before opening their parachutes. We cite as an example the case of Harold Whitby, who traveled 4,000 feet before allowing his parachute to control his descent.

The Oracle is devoted to questions of general interest to our readers. Direct mail answers will be given at the rate of fifty cents per question.

Does the Piston Stop?

(2375) Mr. Clarence E. Walberg, Worcester, Mass., writes:

Question 1. I have been very much puzzled by the piston action in a motor-car engine. People whom I have queried have given me conflicting answers. Some say that the piston comes to a dead stop at the top of each stroke in changing direction. Others claim that the piston not only comes to a dead stop in reversing its direction, but that it also goes through a deceleration period in coming to a stop from the high speed at which it is traveling up the cylinder wall. Assuming that there is absolutely no play in the crankshaft or piston bearings, these being theoretically perfect, what actually happens?

Answer 1. As stated in your question, we shall assume in this discussion that the piston and crankshaft bearings are theoretically perfect, permitting absolutely no play.

The piston attains its greatest height or lowest depth in the cylinder when its position is such that the connecting rod is a continuation of a diameter of the circle, which is described by the movement of the crankshaft. We shall consider the first case.

This condition prevails only when the crankshaft is at point "A." A point by geometric definition possesses neither length, breadth nor thickness; it is merely a location. As the crankshaft is always in motion, every point on the circumference of the circle through which it passes is either approaching "A" or receding from "A" by definition.

(Continued on page 849)
Making a Compact Oak Bedroom Suite

Part II

Bedstead and Tallboy Cabinet

By J. E. Lovett

THE BEDSTEAD

To match the dressing table described last month, the bedstead illustrated here is allotted a width of 4 ft. 6 ins., the head and foot being 48 ins. and 28 ins. high, respectively. For a 3 ft. bedstead deduct 18 ins. in length from items C, D, E, F, G, H and I, and keep one set of facings to each panel.

As a guide to finish, the base (D) is intended for ebonizing, also the top panel facings; the rest of the bedstead might be of blue oak.

The head posts (A) and rails (C, E and F), together with the foot posts (B) and rails (C) should be of selected, straight-grained oak for first choice. Fig. 2 gives all the necessary sizes for shouldering the rails, and Fig. 4 shows three mortises on the inside edges of each of the head posts for the corresponding tenons of the head-rails. Between the two tenons on the bottom of the head posts and also on the edges of the rails, grooves to a depth of 3/4 in. must be worked for the bottom head panel (G)—this panel, of course, being clamped up with the rails.

The panels (H and I) Fig. 2, may be of faced plywood, and are simply paneled and glued to their respective frames. If, however, a thicker panel is desired, a suitable section is given in Fig. 5. This entails much more labor, but is recommended because of its strength.

To some readers, the space behind the oak plywood panel on the foot end may appear unsightly. To remedy this, a suitable wood moulding might be introduced; (or better still) an oak plywood panel might be used on both sides of the foot end frame. If the latter idea is adopted, a vertical rail, placed centrally between the foot posts and tenoned into the top and bottom rails, would be advisable.

As the base (D) is intended for ebonizing it might be of close-grained birch shaped as in Fig. 1 and stained and finally fixed by screwing up into the bottom rail (C).

The foot and head panels have as their decoration four sets of raised facings, grouped up to either side of the centre. All facings are allowed 3/8 in. of thickness. Those (J), next the panel, should be in white sycamore, while the top facings are in ebony or in birch ebonized. Glue to the panels and stop any pinholes. When polishing, use only white shellac on the facings,

THE TALLBOY CABINET

For modern use the bedroom tallboy, Fig. 6, stands about 4 ft. high. The drawers at the top are accommodating, while the enclosed cupboard below is intended for the week-end suit-case and a dressing press, or (alternatively) for millinery purposes, boots and shoes, etc.

CARCASE

The items required for the carcase are the ends (P), top (H), bottom (J), drawer rails (K), and division clamp (O). Fig. 8 gives a general survey of the constructional preparation for the separate pieces. The ends and top should be of quartered straight-grained oak, but plain oak will suffice for the bottom board. Select good, mild stuff for the drawer rails. Fig. 9 shows the development and finish of the mitre dovetail, which is the intended joint for top and ends. This is rather a tricky joint to cut and will require caution, both in marking and making to bring both dovetails up to a neat and effective mitre. As alternative joints, the double lap dovetail or tongue and groove would make an efficient substitute.

The ends (P) are clamped on the front edges to allow the drawer sides to stand clear. Work tongues on front edges of ends and groove the end clamps correspondingly.

In Fig. 8 are seen the rebates on the bottom edges of the ends for the carcase bottom. Rebates across the ends for the cupboard top (Q) must be worked 3/16 in. deep and to a width of 9/16 in. Groove the carcase top across the grain to a depth of 3/8 in. and width of 3/4 in. for the drawer division (N), and in line with (Continued on p. 858)
Scientific Problems and Puzzles

Resonance in Tuning Forks

Mount two similar tuning forks on suitable resonance boxes and place them a few feet apart. If one of the tuning forks is set vibrating for a moment and then stopped it will be noticed that the other fork is vibrating. Does the second fork receive its energy principally from the sound waves that strike the prongs of the fork or from the waves which enter the resonance box?

Where Will the Air Go?

The movements of air currents have engaged the attention of numerous scientists. Their studies have brought to light many heretofore unknown and interesting facts. In accordance with definite laws and the knowledge which modern science has given us, in what direction can we safely say air will blow if pushed south?

What a Gallon of Gasoline Will Do

Gasoline distributors are extolling the virtues of their products in nation-wide advertising campaigns. The thought has often been expressed that it is not the individual fuel, but the efficiency of the consuming motor which counts the most in deriving the greatest amount of work from gasoline. To illustrate our point: If automobiles were 100 per cent efficient, would a gallon of gasoline yield energy sufficient to lift four ten-ton trucks to the top of a mountain a thousand feet high?

Effect of Static Electricity on Water

Charge a rubber comb with static electricity by rubbing with a piece of wool or silk cloth and bring it near a dripping flow of water. The water drops will immediately coalesce to form a continuous jet. When the comb is removed the jet will again break up into separate and individual drops. Are you able to explain this phenomenon?

The Radiation Teeter-Toter

A simple teeter-toter is set up as indicated in our diagram. Bearing in mind that the bulb which occupies the higher position will always be shielded from the sun’s rays, can you explain the operation which enables this device to maintain motion as long as the sun shines upon it?

The Thrust of a Ladder Against the Ground

If a ladder leans against a smooth wall, do you think that the thrust of the ladder against the ground is equal to or more than the combined weight of the ladder and the load which it is carrying?
Build This Band Saw of Laminated Wood

By H. O. Harris

THOSE serious-minded individuals whose hobby takes them to the home workshop, will get a real thrill from constructing this useful and practical machine tool. The construction is fairly simple but must be accurate. The results are astounding and will save many calories.

The frame, in fact the entire machine, with the exception of bearings, shaft, tilting device and thrusts, is constructed of five ply fir, three-quarters of an inch thick. This material can be purchased at some lumber yards or cabinet works. One slab three by seven feet will be sufficient with plenty left over.

It is best to lay out the frame design on a piece of building paper according to the drawing, Fig. 1. Lay off three rectangles on the slab and mark the lines A, B, C, D, on opposite sides of the two outside pieces. Be sure they are correct, for you will need them later. Lay on the template, whose corresponding lines coincide with those on the slab. Mark the two outside pieces with the grain running up and down, while the middle piece is marked with the grain running crosswise.

Just a word about cutting, that is if you do it yourself. You may nail the three pieces together and have it cut; it will save some work but it is fun to do it yourself. The writer cut each piece separately on a jig saw. You can do it too.

With the band saw cut the lines 1-2, 3-4, and D-5; then with the jig cut the curve of the back, 6-7, and cut the curve running through 2 and 4. Save the material cut out as it is used for the wheels and table top. Doing the cutting in this manner will save considerable weight and the lumber is much easier and simpler to handle.

The two outside pieces are cut alike, while the inside will eventually have a slightly different measurement at two points. However, this need not prevent you from cutting all three pieces at once. After cutting, put all three pieces together, even up as much as possible and bolt firmly together, using quarter inch carriage bolts two and a half inches long, with washers. Clamp in the vice and with a spoke shave and plane even it up all the way around.

You now have three pieces of five ply wood, aggregating two and a quarter inches thick, and very strong. Now take apart, clamp the two outside pieces together and cut the adjustment slot in the base, using a fine hand saw. Cut the arc on the front as true as possible on the jig saw. Cut the slot, which is one inch narrower, on the middle piece. Turn a disk out of three-quarter inch ply wood whose radius is equal to that of the arc in the outside pieces, and cover the edge with sandpaper. The method of securing the ends of the sandpaper strips to the disk with slots and wedges is shown in the drawing Fig. 4. Sand out the two arcs to the correct dimensions, being careful to hold the work parallel to the revolving disk. You now have a perfect arc.

The finished band saw, with driving motor in position. Note the lamp to illuminate the table.

Cut three pieces of the ply wood, that will just fit across the slots, snugly but not tightly; they are of the length of the flange-diameter, which is three and a half inches. Clamp these together and bore a seven-eighths inch hole exactly in the center and also bore the same size hole in the top of the frame, to come vertically above the center of the slots, taking care to get both straight. These holes are for the bearings, upper and lower.

For the base, two pieces of ply wood five inches wide and fourteen inches long are cut, beveled all the way around, and screwed to the under side of the feet. Four angle or corner irons are bolted to the frame. The base is drilled and the whole bolted to a strong rigid bench.

Purchase four half-inch floor flanges and two half-inch brass nipples three and a half inches long. Have the threads on the nipples run down so they will screw into the flange side of the floor flange all the way through to a tight fit at the other end. The threads should be run down a good quarter of an inch further to a loose fit. This is important. Take the floor flange with the nipple screwed tight to your machine and have the nipple bored for a five-eighths inch shaft. Square off the flange and bore the outer rim.

This can all be machined with one chucking. Fourteen inches of shafting will be plenty, and this can be cut with a backsaw to the correct length as the two shafts are not of equal length.

The top bearing is slipped into (Cont'd on page 840)
Wrinkles and Recipes

To Replace Strong Coil Springs

By inserting two pieces of wire in the spring as shown and compressing in a vise, after which the wires are drawn tight and the ends of each twisted together, strong coil springs may be easily replaced. Then cutting the wires which compress the spring with a pair of wire cutters after the spring is in place, will complete the job.—Joseph D. Ambrose.

First Prize, $5.00

Two-Way Entrance

You can lock sliding doors on the inside and outside with paddlocks and enter from either side with the device illustrated, which is made of strap iron. It will also apply to doors that slide against a post or wall.—Dr. J. J. Edwards.

Water for the Laboratory

An electric soldering iron will be found useful in heating small quantities of water, but the point must be on watertight to protect the heating element.—Robert Hutish.

To Prevent Being Poisoned

Perhaps the following hint will prevent the accidental taking of poisons. Push several very small tacks through adhesive tape so that the points project from the dry side. The strips should then be placed around boxes or bottles containing poison. Anyone picking them up hurriedly will immediately realize, when he is pricked, that he is handling poison.—Jack Ridgeway.

Air for the Blowpipe

Dentists and mechanics often find it convenient to have air for their blowpipes, but do not have a small compressor for the amount of work. In this case a vacuum cleaner can be obtained from a second-hand store for a dollar or so which will serve the purpose. A connection can readily be made to put in the place of the dust bag attachment. This can be connected with the blowpipe by means of a piece of rubber tubing. It will also be convenient to have a switch at the motor and a resistance coil in the circuit could be used to control the amount of air.—Edward L. J. Prudhomme.

Open Fire Grate for Camping

An improvised open fire grate can be made by detaching the luggage "gate" from the running board of the automobile and placing it over two logs in the manner illustrated. A fire is kindled between these logs and an impromptu hot breakfast can be had on a chilly morning, with the aid of a frying pan and coffee pot. The motor tourist who has no room in his car for a camp stove will find this particularly helpful.—Lieutenant Buckley Barrett.

If Your Paint Brush Sheds

Varnish will hold the bristles in a paint brush that has a tendency to shed. With the bristles turned upward, pour a spoonful or two of clear varnish upon them. Keep the brush in this vertical position until the varnish dries, usually a day or two.—Mrs. H. E. Chrisman.

$5.00 is paid each month for the best Wrinkle or Recipe accepted and published in these columns. All others are paid for at regular rates. Address: Editor, Wrinkles and Recipes.
What's New in Radio

Self-Tuning Device

A NEW and outstanding novelty is the recently introduced Lyric Radio. In the centre of this device is a watch, and around it are arranged 96 little levers which pull vertically out in ten graduated movements. Each lever corresponds to one fifteen-minute period of the day. Also mounted in the centre of the device is a tablet graduated in nine divisions, each one of which can be lettered by the user to correspond to his nine favorite stations. For example, WJZ is No. 7 on the tablet, and it is desired to hear that station's program between 6:15 and 7 p.m., the levers marked 6:15, 6:30, and 6:45 o'clock are pulled out to the graduation marked 7, but the set is not switched on. There is no need to worry further, or keep an eye on the clock. Promptly at 6:15 the radio set will be automatically switched on, and will remain on, tuned to WJZ, till seven o'clock. During the course of the program, further levers may be set for any of the other stations, at any other times, and as soon as one desired program terminates, the set will be automatically tuned to the next station. If it is desired to switch off the set at any predetermined time, the lever corresponding to that time is pulled out to the No. 10 graduation, and at the termination of the program at that time the set will be automatically switched off.

A Battery That Breathes

A NEW "breathing battery" which literally takes oxygen from the air as its source of long life and constantly sustained voltage has recently been placed on the market. The essential life-giving oxygen is drawn into the battery directly from the air instead of being supplied by oxygen bearing chemicals and minerals built in to the battery, as heretofore. With an unlimited supply of oxygen available, this new battery is said to have remarkably long life and, in contrast with other forms of batteries, maintains a practically constant voltage throughout its life without recharging. A special carbon electrode functions as the lungs of the battery, from which it gets its name "air cell." It will run a 7-tube receiver, using the new 2-volt tubes, for a year, if the set is used three hours a day.

A Portable Test Oscillator

THIS instrument should appeal particularly not only to the laboratory worker but also to the retail radio dealer and service man. In a readily portable form, this instrument combines a variable frequency R.F. oscillator with a range of 1,500 to 550 Kc., with fixed frequency oscillators of 175 and 180 Kc., with a vernier for the variations required for aligning the I.F. stages of superheterodines. It is equipped with an output meter for visually indicating resonance. It operates on 110 volts A.C. or 60 or 25 cycles, or 110 volts D.C. or external batteries for filament supply, and on one small "B" battery for plate supply. A compartment is provided for the "B" battery. The signal intensity may be varied over wide limits, and the instrument is completely shielded and mounted in a durable carrying case, complete with special leads and full instructions as to its operation.

Combination Set Analyzer and Tube Checker

ALSO of interest to the dealer and service man is the new Fliewelling combination analyzer and tube checker. This instrument combines in a single leather carrying case a complete set analyzer and A.C. tube checker. It will make a complete analysis of all circuit conditions existing in any radio receiver, or electrical apparatus within the limits of 800 volts A.C. or D.C., and current up to 100 milliampere. The instrument is manufactured for use on 60 cycle 110-115 volt A.C. circuits and can also be furnished for use on 25 cycle 110-115 volt and 60 cycle 220 volt A.C. circuits. A complete tube checker is included, together with a reference chart of tube ratings, engraved on the panel as an integral part of the instrument, thus permitting not only a complete analysis of the circuit of any receiver, but also an independent check on all its tubes. The instrument is operated by means of push buttons, and eleven meter ranges are available through the use of pin jacks for external testing. The whole instrument is fully protected by circuit arrangement so that no damage can result from incorrect operation, accidental or otherwise.

Automobile Radio Battery

WITH the ever-increasing popularity of radio on automobiles these days, it is perhaps not surprising that battery manufacturers are turning their attention to the production of special batteries for such use. The type illustrated here was used by the Byrd Antarctic Expedition. It is of the same construction as all Burgess batteries, with seamless zinc cans, paraffined containers, shock-proof and waterproof.

www.americanradiohistory.com
A Glider from Science and Invention Plans

I AM enclosing two views of a glider manufactured during past vacation season from specifications given in your August number, 1929, by George A. Gerber. It was built at an expense of $18.85, and we find the same very satisfactory, due to enlarging the wing spread to 14 feet, instead of 12 feet as shown on sketch.

I am a member of the local High School Glider Club, and have built a larger model than this one with the help of the other members. We thought you might be interested in knowing and seeing a view of the glider manufactured by myself without any help during the past vacation season, and wish you further success with your magazine, which I read from cover to cover, I am.

Herman G. Deluee, Jr., Lebanon, Pa.

(We certainly are glad to hear from you and appreciate the photographs which you so kindly forwarded.—EDITOR.)

One of the views of the glider Herman G. Deuer, Jr., built from our plans.

Even China Has Puzzle Fans

I DON'T know whether these solutions to your contest will come to you within the time limit. I find that I can solve practically every one of your puzzles, but there is not sufficient time for my letter to reach your office, and therefore I have to give you every chance to engage in these contests.

I don't think that you would care to exclude the right of entering contests to any of your readers who live outside of America. Is it not possible that the interim be prolonged?

S. K. Kuo,
Shanghai, China.

(Your letter arrived just one day late. An air-mail stamp would have carried it to its destination on time. We will try to arrange future contests so that these in favor of funds will have ample time to solve the problems and send in their replies. We thought that we had done so this time.—EDITOR.)

Now a Brickbat for the Family Doctor

PAGE 347 of Science and Invention, middle of column on the middle page, in an article entitled "A Bouquet for the Family Doctor" was read by me. After that I read the reply of the Editor. (This is in the August, 1930, issue.)

I don't think medicine has done any good to mankind. Not only do I think that way, but I am sure of it. Chemistry, natural and unnatural, furnishes the authoritative claim.

Your reply was, as I have sign, based on statistical figures, which, as any sensible man can clearly see, mean nothing at all. Factors or figures are only figures and no more, and statistics are an unreliable authority. Before statistics could be a true guide, the cause of things, conditions, environment, education, training and all that should be taken into consideration, and not only base your statistical figures as due to the introduction of the poisonous, filthy serums administered to the patients at a certain period. It is true that the people you mean may have been inoculated or poisoned, but their infections could not alone be considered as the foundation or main cause of the decrease of death, since the regular practice of injecting serums had been put into use sensibly or insensibly by medical devil quacks, that only could live by trying to make conditions worse.

Give me examples of the serumized people who possess the best health and clearest brains. None! I can give you thousands of examples of the non-serumized class who possess the healthiest babies and clearest brains and are the best citizens on earth you can find. To satisfy you let me give you one, just one only, Mr. Bernard Shaw. He even defied inheritance. What is he now? You know it. Write to him and you will be convinced. Then after all you will give up your claims for better conditions based on statistics, bunk all the time. Permit me for being so rough. But nature is rough. The truth is rough when once its course is violated. But its roughness is of the true kind. So no need for apology.

The truth about people going wrong, especially those under the sway of medical quacks, is that business, the need for gain money for food, is behind all their purposes, instead of sincerity and true service for the greatest good of all. Do away with doctors, they are all quacks. They get over their quickness only after resorting to natural means of prevention.

Of course, iodine and mercuric chloride are needed for minor cuts but they can be made by doctors. Your quacks will soon die.

N. Pascual,
Seattle, Wash.

(When two communities, practically adjacent, having substantially the same weather conditions, being peopled by the same class, and living under substantially the same environment, have different smallpox death rates, and when a singular death rate is found in those areas where vaccines are compulsory, the inference is obvious. When one town reduces its death rate while vaccinations are enforced, then suddenly decides to dispense with them and finds that the death rate again increases for the same diseases and upon returning to the compulsory treatment, discovers that the death rate is again decreased, the inference is also obvious.

The mere fact that one man or a dozen has lived to a ripe old age without employing one of the modern methods of maintaining health, is not an indication that the people of the entire country, under similar conditions and environment, would also live to a ripe old age. Nevertheless, the death rate among them is considerably higher than that in civilized communities where the population may be more dense and where accidental death is more frequent.—EDITOR.)

Pooh-Pooh

GLANCING through your current issue, I note on page 388 some illustrations and a brief note concerning the new Hudson Bridge, now in course of construction. The note states that the great span will be 3,500 feet long and "the greatest suspension bridge in the world." Splendid! But will it hold that honor long?

We of this coast and San Francisco, and the San Francisco Bay region think it will not. As witness the projected Golden Gate Bridge, whose plans—now finally apprproved —call for a span of 1,200 feet long, or 700 feet longer than the impressive span of the Hudson Bridge. I enclose a clipping from the San Francisco Chronicle giving some data on the Golden Gate Bridge. I feel sure that...
Comments Are Welcome. Please Address Them to Editor, Science and Invention

SCIENCE AND INVENTION, as well as its readers, will be interested in the figures there given, and in the fact that a favorable vote on the bond issue for building the bridge, to be held in the near future, is the only remaining obstacle to such building. The Bridge District which the directors designated has been created by law, the favorable report by engineers upon the borings for piers has been given; plans were finally approved by the War Department; and also by Bridge District Directors. There is strong public interest in the project, the need for which is great.

We on this coast sometimes feel that the East Coast does not always keep informed upon our doings even when they are of general interest. So, though only a layman in engineering matters, I take the liberty of writing the above, and to say that there seems good reason to believe that the bond issue referred to will be authorized and the work will proceed.

May I add that the San Francisco Bay Bridge District has another big bridge project viz., the Bridge to span San Francisco Bay from San Francisco to Oakland. It will be quite a different type of bridge—cantilever, I believe, much longer, with a number of spans, the longest two of which are to be 1700 feet each. As the entire bridge will be several miles long, and will join the East Bay region to San Francisco, the project is perhaps even larger than the Golden Gate Bridge. Taken together these projects should give the San Francisco Bay metropolitan area a conspicuous place in the engineering world; and they will minister to the needs of one of the world's greatest seaports, one with a bright future, as strategically the center and focus of this coast's growing trade on the Pacific, while becoming the bearer of an ever larger and larger share of the world's commerce.

Harlan Bailey, San Francisco, Cal.

(Back issues of SCIENCE AND INVENTION magazine have contained articles on the projected Golden Gate Bridge and also on the San Francisco Bay Bridge, from San Francisco to Oakland. The editors of this publication try to keep in touch with things that go on throughout the world. It is natural that a project of so many articles as either of these two would not pass unnoticed.—Editor.)

We'll Be Swell-Headed Soon

JUST a few words of praise for the SCIENCE AND INVENTION magazine. It is a wonderful makeup of news; a thoroughly enjoyable and interesting current of inventions, articles, and book reviews. Some magnetic book for the minds of both boys and old. I am spellbound when reading the different articles about science, the most wonderful thing in the world of culture and education. It certainly shows that the editor knows what he is putting in this magazine. I just happened to pick up a copy of this magazine at a leisure moment, and, after reading that issue, I have a hard time waiting for the postman to bring each month's issue. Here's wishing it many, many years of success.

Mary L. Flynn, Chicago, III.

(We hope that you will continue to enjoy SCIENCE AND INVENTION magazine for many years to come.—Editor.)

Air Stations on the Tops of Skyscrapers

As a constant reader and interested in the progress of your magazine, I thought that you might be interested in an idea which I think is the most practical way to solve the Airport Problem in large cities. It seems to me foolishness to build a large skyscraper only to adorn the city with its fineness and beauty; when it could also act as a huge column to support an overhead airframe. There is no doubt that more buildings such as the Empire State Building are in the future anticipation. Then why not locate them and design them to support huge trusses which, in turn, would support a large airframe? This would be an idea that would encourage it, because many fear to dive from 1000 feet altitudes to the ground. With the airport higher than a natural building obstruction, what need would there be to dive to earth to land?

The cost of such a project would be immense, but like the Holland Tunnel I think it would rapidly pay for itself.

Felix A. Wallace, Brooklyn, N. Y.

(Practically every architect foresees the possibility of erecting huge landing platforms on the top of some of our buildings. As a matter of fact, the "Empire State Building" in New York City will have a dirigible mooring mast at the top. It is not likely that future aircraft will require a long runway. It is very possible that sufficient landing place will be found in an area not greater than 50 feet square for the commercial aircraft of tomorrow. We, therefore, do not agree with our architects. While a landing platform on the top of an isolated building may be good practice, the top of the structure need not be built entirely free to the planet even 25 years hence. Nevertheless, such a project has been considerable interest to the editors of SCIENCE AND INVENTION and the readers of this publication have seen similar plans time and again.—Editor.)

America's Gliding Boat

BEING a constant reader of your magazine Science and Invention, I saw a small article in the October number, Vol. XVIII, No. 6, on page 512 regarding a new glider boat, as used in Germany, and would like to direct the reader's attention to the fact that this is strictly an American invention, designed and tested in Brooklyn, 1921-1926, by Col. Marcel de Princk, whom I used to work as a mechanic. He was formerly a German naval and aeronautical architect and glider pilot and constructor and is years ahead in naval aeronautical craft, and has spent a fortune in experimenting and testing his designs. With financial backing he will come out next Summer, and I am sure, will surprise many, so-called "speed kings." Several of his 20 to 60 I. F. machines have made 102-129 M.P.H. in secret tests in Gravesend Bay; and his Rigid Airships, models of which have been built are at least 20 years ahead of so-called "new improvements" in the Zeppelins built at Lakehurst, Akron or in Germany. His ships can never break. He also worked out air propeller-driven railroad trains for tremendous speeds, and as everything is perfected now, he will be ready by Spring to show his different craft in operation. He is well known in Washington, and among naval and aeronautical men.

Chas. Johnson, Brooklyn, N. Y.

Why Baldness?

THE Safety Valve of October, 1930, SCIENCE AND INVENTION contains an inquiry about growing hair. The answer refers to May, 1929, issue, in which a longer treatment of the subject appeared. In neither of these items was there any reference to a circumstance which gives the best explanation. Hair is never your next answer to a question. It follows:

Physical development of man, as relates to hair growth, is now undergoing a change. In past geological times hairs covered the entire body. Now hairs grow less abundantly, and what has grown, often falls out, leaving baldness in its place. That means that the human body is changing so that hair will not grow on it in future days. The present time is a time of change in the physical construction of man.

From the perpetual standard of hair

(Continued on page 859)
WHY NOT GRASP SUCCESS?

Study radio in your spare time at home

Are you satisfied with the position you now hold? Do you feel that you're worth more money? Are you pleased with yourself, your work, your associates... and your future? What does next year hold for you... and the year after that?

Are you content to merely plod along through the best years of your life... or do you want to get into far pleasanter work... meet more interesting people... and hold a well paid position?

The ambitious man ties his future to an industry that's developing rapidly... that's going up and up! Your life lies before you... will it be a losing game or a profitable adventure?... Will you GROW with a GROWING BUSINESS or will you waste your life and opportunities in an industry that is already fighting a losing battle?

If you are looking for a REAL opportunity... if you want to make the most of your life... to grasp the success that should be yours, then we say to you, "Study Radio."

Everyone knows that Radio is the fastest growing industry in the world today... countless opportunities are waiting for men who have the training and ability to grasp them. Where have you heard of any business that has developed as fast as this? Radio needs trained men and needs them NOW! Think of the future Radio offers you!

You can easily obtain the training you need under the direction of RCA Institutes, a division of Radio Corporation of America, which thoroughly trains men in every branch of radio and also assists them in obtaining employment. You learn radio by actual experience on the very latest types of radio equipment. You study under the direction of nationally known experts. You can learn all about radio servicing and selling, ship operating, shore station operating, radio telephony and telegraphy, and airplane radio equipment... also instruction in sound motion picture installation, maintenance and repair!

Study at Home in Your Spare Time

The RCA Institutes complete Home Laboratory Training Course gives you all you need to know about radio. The lessons are of absorbing interest... easy to learn. You rapidly progress, step by step... and you receive absolutely free the complete RCA Institutes Laboratory Equipment, a modern outfit of apparatus furnished to every student...enabling you to easily solve radio problems. This is the way for you to acquire, in your spare time, the commercial knowledge and ability that command good pay.

Home Training Course

By America's oldest and foremost Radio training organization

This home training course and free laboratory equipment are backed by more than 20 years' experience. A signed agreement by RCA Institutes assures you of absolute satisfaction... furthermore, if after taking this course you are not satisfied in every way, your money will promptly be returned to you.

Read this free book

Everything you want to know about Radio... Describes in detail the home training that has placed thousands of men in good paying positions. Forty fascinating pages of pictures and text all about radio.
READ HOW YOU CAN DO IT

Study radio in the finest equipped schools in America

In order to make it easy for you to study radio, RCA Institutes has opened six completely equipped schools throughout the country... at New York, Chicago, Boston, Baltimore, Philadelphia and Newark, N.J. Each of these six schools has the very latest word in radio equipment. They all offer exactly the same training in day or evening classes... you study under the personal direction of RCA experts. In this way you learn at the very heart of radio itself, because you study under the direction of RCA... the great corporation that sets the standards for the entire radio industry. The very progress of radio is measured by the achievements of the famous engineers in the great research laboratories of the Radio Corporation of America.

Only training course sponsored by Radio Corporation of America

Graduates of these schools are thoroughly posted in all the very latest developments, the newest inventions and greatest discoveries in radio, because they study in the finest equipped schools in America.

That's what RCA Institutes does for you... that's the kind of training you want... the practical, thorough knowledge that you need for success in radio.

Opportunities for Trained Men

Graduates frequently obtain positions shortly after graduation. Every graduate receives the thorough training that gives him the knowledge and the confidence to hold a good paying position.

Come in today... See for yourself!

Step into the nearest school and then you will know why it is that thousands of men have acquired the training that has enabled them to occupy well paid positions in radio. Meet the instructors, talk to the students, examine the equipment... convince yourself... See what radio can offer you, and what RCA Institutes can DO for you. We will be glad to meet you... glad to explain everything... to show you everything... without the slightest obligation on your part! Come in today and get a copy of our free book, or send for it by mail. See what our course has done for others and what it can do for you!

Send this coupon to the school most convenient for you to attend.

RCA INSTITUTES, INC.
A division of Radio Corporation of America

RCA Institutes, Inc., operates resident schools, giving day and evening classroom instruction in the following cities. Mail the coupon to or call at the institute most convenient to you.

222 North Broad Drive, Chicago
75 Varick Street, New York
899 Boylston Street, Boston
1211 Chestnut Street, Philadelphia
560 Broad Street, Newark, N.J.
1215 N. Charles Street, Baltimore

RCA INSTITUTES, Inc.
Dept. EX-1
Please send me catalog describing your resident school (classroom) instruction.

Name
Address

Occupation

www.americanradiohistory.com
PATENTS SECURED
TRADE-MARKS REGISTERED

High-class professional services for Inventors and Trademark users are necessary for Proper Protection. We offer you our best advice and terms. If you have an invention send us a model or sketch and description and we will give you our opinion whether your invention comes within the provisions of the Patent Laws. Our book "HOW TO GET YOUR PATENT" and Record of Invention Certificate sent on request. Delays are Dangerous in Patent Matters. We Assist Our Clients to Sell Their Patents TERMS REASONABLE. BEST REFERENCES.

RANDOLPH & CO.
PATENT ATTORNEYS
Dept. 172, Washington, D. C.

Ice Cream Freezer
(1246) H. M. Pitman, of Dallas, Texas, is very enthusiastic about a system for producing ice cream, which he intends to use with regular Frigidaire equipment. He sees no reason why he cannot get others to see the advantages and possibilities.

A. Ice cream stores have found many years ago that it pays to handle a better grade of cream. In New York, H. Breyer’s, Reid’s, Horton’s, and Anheuser-Bush are the outstanding “popular” ice creams. These manufacturers have spent countless sums of money in advertising. They are constantly developing new styles and new combinations, which the average man cannot possibly develop.

There are a great many small ice-cream stores (not including the chain stores), that manufacture their own products, and they have special cream freezers for that purpose. Unfortunately the quality is usually not there, and the same holds true for the ice-cream stores in your immediate neighborhood and in other parts of the United States. A bootlegger can make gun, rye or Jack, yet these products do not possess the quality of the pre-Vendeline liquid.

It is conceivable that if your device were placed on the market, it might meet with a small sale. You could not possibly get a basic patent on the situation, and hence, any other manufacturer desirous of placing a similar device on the market, could considerably lessen any cash returns that you might be able to develop.

Incidentally, motor-driven ice-cream freezers could be developed along Frigidaire lines, which would not necessitate a constant heating. For household refrigerators, your device is decidedly impractical, for a hole would have to be drilled in the top of the refrigerator to accommodate your ice-cream freezer. One can make ice cream in the ordinary Frigidaire without requiring the heating operation. We do not wonder that others have not looked upon this idea with any degree of enthusiasm. Our own suggestion would be to forget about it.

Automatic Automobile Brakes
(1247) Mr. Stanley Hearn, Camden, N. J., has designed an automobile bumper which applies the brakes the instant that the automobile strikes an object. He asks our opinion.

A. We do not believe that any auto-mobile bumper that is so arranged that it can apply the brakes at the moment the bumper strikes an object, is worthy of consideration. The time to apply brakes to the wheels of an automobile is before the bumper strikes an object and not at the instant of the impact. The momentum of any car is sufficient to cause it to drive forward for a considerable distance even if the brakes are slammed on. It is doubtful if the force of the impact would be reduced in the least. We would not suggest further procedure.

Airplane Speed Indicator
(1248) Walter J. Gazdzik, Philadelphia, Pa., asks whether or not a simple system has been developed whereby we can accurately give the aviator information as to the rate of speed his ship is traveling in land miles. He suggests a method of producing an instrument depending upon the ratio between air speed and engine speed to record land miles on a dial.

A. By subtracting the air speed in miles of an airplane from the wind velocity the aviator can only approximately determine his land speed. If he can make observations, then he can plot his speed with a fair degree of exactitude. However, there is no system known today which will enable an airplane pilot a true reading of land speed. Such a reading must be arrived at by calculation.

We believe that a patent on a device recording on a dial the land mile speed of a plane would be lucrative to the inventor. It is quite impossible to have an arrangement by which the air speed and the engine speed may be measured to give the ratio in land miles. The engine speed has very little to do with the speed of a plane. Variations in propeller pitch, variations in air density, variation or changes in wing structure due to snow, sleet and the like, and the necessity for attaining altitude all affect the land mile speed of a plane.

Suppose an airplane is flying against a cross wind of 30 miles an hour, a plane of slippage on the part of the plane. Because the plane is not flying directly into the wind or against it, his land mile speed would be nothing like any form of ratio between the two factors. With a cross wind of 30 miles an hour, a plane capable of traveling 50 miles an hour would only cover 40. Flying directly across the wind, a plane capable of going but 40 miles would cover 50 land miles in an hour.
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 located 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 trade-mark 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

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

Mail this Coupon Now

CLARENCE A. O'BRIEN
Registered Patent Attorney
53-C Security Savings & Commercial Bank Bldg., Washington, D. C. or
Suite 1106, Dept. D-7, 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 or print plainly, and address office nearest you)
INVENTORS FINANCE CORPORATION

Will assist you to obtain protection when, due to the lack of funds, you cannot file application for patent without long and dangerous delays.

UNION TRUST BUILDING
WASHINGTON, D. C.

Chicago representative—N. E. HEWITT
Room 1853, 111 West Washington Street

Write us immediately for free information regarding our time payment plan for the benefit of inventors.

MAIL THIS COUPON NOW

INVENTORS FINANCE CORPORATION
Dept. C, Union Trust Bldg., Washington, D. C.

Please send me particulars with reference to above plan and information about the way it is proceed.

Name

Address

City

PATENTS

BOOKLET FREE
HIGHEST REFERENCES
PROMPTNESS ASSURED
BEST RESULTS

Send drawing or model.

WATSON E. COLEMAN, Patent Lawyer
174 5th Street, N. W., Washington, D. C.

NEW YEAR - NEW IDEA
PATENT YOUR IDEAS

Call or send me a sketch of your invention. Phone Lido 3296 or write.

FREE Inventors' Recording Blank
Confidential Advice

U. S. and Foreign Patents secured by
Z. H. POLACHEK
Reg. Patent Attorney and Consultant, Engineer

1234 Broadway, New York

INVENTORS

who derive largest profits know and heed certain simple but vital facts before applying for patents.

Serene, given time, can fight free. Write

LACEY & LACEY

644 F ST., N. W., Dept. 15, WASHINGTON, D. C.

Established 1889

Figures Are Easy to Handle

Learn mathematics quickly! The expert in your class knows how to handle figures. Why not you? Achieve personal success and educate your mind if you have the book to guide you.

MATHEMATICS For the Practical Man

by GEORGE HOWE, N.E.

All mathematical problems clearly explained. Send ten years. Pay the postcard $1.25 give a few blank memories. Money back if not satisfied.

D. VAN NOSTRAND CO., 248 4th Ave., New York

Have a Good Time . . .
Make REAL Money . . .

Learn to play the Buescher, for social popularity, big pay, success. Live on the cream of life. Any Buescher quickly, easily mastered. Lessons given free with instrument. Join a band or orchestra in 90 days. Test yourself on a Buescher six days free.

BUESCHER BAND INSTRUMENT CO.

112 BUESCHER BLOCK
ELKHART, INDIANA

Yankee Brains at Work

Science and Invention

January, 1931

A Rudderless Ship

No. 1,744,848, issued to J. D. Russell

This invention provides a means of controlling the screw, not only as the propeller of a ship, but also as a dependable, efficient and easily controlled steering device which completely eliminates the rudder. The propeller is not mounted directly upon the propeller shaft. A universal joint is provided at the end of the main shaft. The other end of the universal joint is fitted to the auxiliary shaft to which the propeller is secured.

A rudder post is provided back of the propeller to which two stays are rigidly bolted. These are jointed to a sleeve which is mounted upon the shaft back of the propeller, which shaft extending back of the propeller is partly supported by this bearing or sleeve, so that it may slide longitudinally therein.

Moving of the tiller turns the propeller to the right or left and so gives the desired steering effect.

Remote Control

No. 1,773,973, issued to R. Edgar

The invention provides a means of operating a model ship from the shore by cords, which run from the boat to the manipulator, who is on land. By a system of pulleys, levers and compressible air bulbs within the hull the operator handling the cords can cause the ship to describe given paths, whistle, and raise or lower flags and sail from a distance.

Mechanical Flying Instructor

No. 1,773,936, issued to A. J. Bertram

The vertical and lateral controls are shown here.

A Pocket Projector

No. 1,774,097, issued to P. Hauser

CINEMATOGRAPH, whose outside dimensions are 2" x 4" x 1", is the subject of this patent. The apparatus is so constructed that it may be used in the dark as is the usual type of projector or in daylight when the moving pictures can be viewed by individuals sitting on a couch.

If it is desired to project the moving film upon a screen, an electric lamp of the flashlight type is incorporated in the device. For daylight use a simple microscope can be inserted in front of the lens. The microscope should be fitted with a large eyepiece, which will rest on the border of the eye socket, comfortably to the user.

This relates to a device which is expected to be of great help to those studying flying at home. The pupil's seat is so placed that manipulation of a lever located at the right side and off of a foot bar, corresponding to the "joy" stick and rudder bar of an airplane respectively, produce movements of the seat which simulate the positions which the pilot's body would assume in actual flight. Practice with this apparatus should insure to the user proper coordination of certain muscles necessary for perfect flight and develop a sense of equilibrium without the pupil ever entering the plane.

www.americanradiohistory.com
How Hot Are the Stars?

(Continued from page 782)

the star's heat. The instrument is attached to a telescope, which is trained upon the star to be examined. The star-rays fall upon a concave mirror and are focused upon a thermocouple junction.

The deflection of the galvanometer when a star is focused on the thermocouple is a measure of the heat received from the star. With this instrument it has been found that stellar temperatures range from 23,000° centigrade absolute (41,400° F.) for the very blue stars like Zeta Orionis, to 6,000° C. absolute (10,800° F.) for those like the sun, and 1,800° C. absolute (3,240° F.) for the very red long-period variable stars like O'Kane-Webb Ceti.

The coolest stars observed are very red and give little visual light in proportion to their heat.

The Moon Is Hot

The hottest stars do not necessarily give us the most heat. They radiate the most heat per unit of area, but a cooler star may be so much larger that its total radiation exceeds that of the hotter star. There are stars like the electric light—small, very hot and bright, with comparatively little heat outside the visual region; and there are stars like a stove—big, comparatively cool, and faint visually, but with an enormous amount of heat radiation, radiation which can be measured.

If the temperature of a star is known and the total amount of energy radiated from it can be obtained, its diameter may be calculated. If the distance to the star is known, the total radiation from it can be obtained from that falling on the mirror of the telescope.

The study of temperatures on the planets has revealed many strange facts. Mercury is certainly very hot and has little, if any atmosphere. The maximum temperature is about 800° F. Venus is covered with clouds and the radiation measured is from the high cloud surfaces and tells very little except by inference about the actual surface temperature. The temperature on Mars varies greatly with the season and the time of day, but it is somewhat like that on the earth.

The temperature of the moon has been a subject of investigation for seven years. The temperature at the point on the moon where the sun is directly overhead has been found to be 244° F. at the time of full moon and 149° F. at first and third quarters. Measurements made on the dark side of the moon gave 243° for its approximate temperature. During the lunar eclipse of June 14, 1927, the temperature fell from 156° to 179° F. during totality, or a fall of 335° F. During a solar eclipse on the earth there is a fall of about five degrees. This shows the effect of atmosphere. The moon has no atmosphere; the earth has.

PATENTS TRADE-MARKS AND COPYRIGHTS

OUR OFFER: FOR THE PROTECTION 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 Desirable Inventions and 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 SECRET AND CONFIDENTIAL; INTERFERENCE AND INFRINGEMENT Suits, PROSECUTIONS, Our Lawyers, and Representative Organization has been established for 25 years and offers Prompt, Efficient and Personal Service by experienced Patent Lawyers and Draftsmen. We will find out whether you have a patent, or whether patentable material has been disclosed to you, and instruct you to answer any questions in regard to Patents, Trademarks or Copyrights without charge.

WE ASSIST OUR CLIENTS TO SELL THEIR PATENTS

Highest References—Prompt Service—Reasonable Terms

WRITE TODAY

VICTOR J. EVANS & CO.

Registered Patent Attorneys. Established 1898

FREE COUPON

NAME: ____________________________
ADDRESS: _______________________

REMAIN A FIRM PARTNER IN BUSINESS

PATENTS TRADemarks and COPYRIGHTS

BUILDING Opposite U. S. Post Office. PATENT-TRADE MARK-TRADE-MARK BOOKS, PATENT APPLICATIONS, TRADE-MARK-TRADE-MARK AND COPYRIGHT APPLICATIONS.

JOE EVANS

PATENT-TRADE MARK-TRADE-MARK BOOKS, PATENT APPLICATIONS, TRADE-MARK-TRADE-MARK AND COPYRIGHT APPLICATIONS.

PHONE: _________________________

ATLANTA, CHICAGO, CLEVELAND, CINCINNATI, DETROIT, DALLAS, HOUSTON, MEMPHIS, WASHINGTON, NASHVILLE, TAMPA, BIRMINGHAM, SEATTLE, PHILADELPHIA, BOSTON, NEW YORK, LOS ANGELES, SAN FRANCISCO.

FREE COUPON

NAME: ____________________________
ADDRESS: _______________________

REMAIN A FIRM PARTNER IN BUSINESS

PATENTS TRADemarks and COPYRIGHTS

BUILDING Opposite U. S. Post Office. PATENT-TRADE MARK-TRADE-MARK BOOKS, PATENT APPLICATIONS, TRADE-MARK-TRADE-MARK AND COPYRIGHT APPLICATIONS.

JOE EVANS

PATENT-TRADE MARK-TRADE-MARK BOOKS, PATENT APPLICATIONS, TRADE-MARK-TRADE-MARK AND COPYRIGHT APPLICATIONS.

PHONE: _________________________

ATLANTA, CHICAGO, CLEVELAND, CINCINNATI, DETROIT, DALLAS, HOUSTON, MEMPHIS, WASHINGTON, NASHVILLE, TAMPA, BIRMINGHAM, SEATTLE, PHILADELPHIA, BOSTON, NEW YORK, LOS ANGELES, SAN FRANCISCO.

FREE COUPON

NAME: ____________________________
ADDRESS: _______________________

REMAIN A FIRM PARTNER IN BUSINESS

PATENTS TRADemarks and COPYRIGHTS

BUILDING Opposite U. S. Post Office. PATENT-TRADE MARK-TRADE-MARK BOOKS, PATENT APPLICATIONS, TRADE-MARK-TRADE-MARK AND COPYRIGHT APPLICATIONS.

JOE EVANS

PATENT-TRADE MARK-TRADE-MARK BOOKS, PATENT APPLICATIONS, TRADE-MARK-TRADE-MARK AND COPYRIGHT APPLICATIONS.

PHONE: _________________________

ATLANTA, CHICAGO, CLEVELAND, CINCINNATI, DETROIT, DALLAS, HOUSTON, MEMPHIS, WASHINGTON, NASHVILLE, TAMPA, BIRMINGHAM, SEATTLE, PHILADELPHIA, BOSTON, NEW YORK, LOS ANGELES, SAN FRANCISCO.
Glider-Tag—
the Latest Outdoor Sport

Doc Schnurmacher, Originator of Outboard Polo, Describes the First Glider Game

Here’s the glider soaring peacefully in the air, ready for the fun.

After he has mastered the primary types of land and water gliders, a real thrill—and a safe one, too, may be had by the glider pilot in a new game—"Glider-Tag." Here’s how we played it.

We hoisted a course of approximately four hundred yards square on Flushing Bay and then, armed with three bombs consisting of paper bags, each containing a pound of flour, our glider was launched at an altitude of about three hundred feet. Driving the car from which the glider had been launched, I shot forward onto the course while the glider tried to tag me. Bill Ziler was at the controls and Dick Pope, well-known aquaplane rider did the bomb throwing. The tagging process may be seen in the accompanying illustration.

According to the rules of the game which we evolved, the boat must stay within the bounded course while the bomb is being thrown. The boat may dodge, swerve, and double; but it must not leave the course.

After a few games of glider-tag it was demonstrated that the best way to plant a bomb was for the glider to sneak up behind the boat like an airplane riding the tail of another. In this position, which may be assumed by a glider pilot who has a few hours to his credit, an average of one direct hit in three at an altitude of about a hundred feet is attained.

The advantages of the game are three. In the first place it provides a source of competition between the glider and the boat or automobile that launches it. Secondly it provides problems in dexterity to the glider pilot. And last of all it makes for precision in dropping a bomb on a moving mark—possibly a war time use.

In this regard, we have launched a glider at an altitude of a thousand feet. With a gliding angle of twenty to one, it has flown well over three miles. The glider costs considerably less than a thousand dollars, and would provide an inexpensive and accurate means of exploding bombs on an enemy fleet or army from a nearby base. Being noiseless, it has a distinct advantage over the airplane for night work.

Right now, however, we’re concerned with peacetime pursuits, and that means glider-tag.

It is a good idea not to use flour for bombing purposes but to use a cheap talcum powder, or powdered chalk if you’re going to tag over the water. It explode just as satisfactorily and you won’t have to put in the hours I did cleaning up the boat and myself after the flour and spray had made a fine paste.
A SENSATION!

Because it has definitely set up extraordinary new standards of superlative performance, this amazing receiver has enjoyed a sensational reception this year. With 10-kilicycle or better station separation and a superb tone that beggars description, it brings new thrills to the man who knows radio.

It is entirely new—new in principle—new in operation. It employs the newly perfected Hopkins Band Rejector System. By this method, clipping stations apart on a hairline turn of the dial is accomplished without sacrifice of perfect tonal reproduction. The moment you tune and hear it, you sense the revolutionary difference between it and the fine radio of the open market. It is the set for those who are satisfied only with the best!

HFL MASTERTONE 10

A POWERFUL SUPER-HETERODYNE WITH THE HOPKINS BAND REJECTOR SYSTEM

Not just another super-heterodyne, but one wholly different. Aside from the exclusive use of the Hopkins circuit, it operates at a new frequency. Employs a new pre-selection system. New kind of R. F. amplification. With greatly improved sensitivity, providing an unhampered flow of every signal entirely through the circuit, the reception range is really astounding. Far away stations come in like locale! A rarity of reproduction that holds you spellbound!

Try It and See for Yourself

Bounding power that places at your whim the world of broadcast! Tone that in its sheer realism is awe-inspiring. Magic-like in its stark naturalness! Quick as a flash in tuning, it accepts

the chosen station to the exclusion of everything else in existence. You have never tuned a radio set like this before. You have missed something in radio in not doing so. Try it in your own home entirely at our risk. Give HFL the chance to prove these unusual claims without risk of a penny to yourself.

This Book Will Tell You

The coupon brings to you without cost a little Brochure describing in detail this wonder receiver. It tells its price. It tells you why this set performs so amazingly. It points to an easy way of its purchase. Mail the coupon today and soon begin to enjoy radio as you have never been able to do before.

4 Radio Books at Magazine Prices

or FREE with RADIO NEWS!

NEW SHORT WAVE MANUAL

Experience the thrills of the Short Waves—of hearing Europe, Africa or Australia direct as clearly as native stations. This big book, replete with illustrations and How-to-Build diagrams and plans, crowded with 28 chapters by Lieut. Wenstrom, Marshall, Spangenberg and other foremost S-W authorities, represents the last word in authentic S-W data. The most complete up-to-the-minute short wave manual ever published. Brings you more information than books selling at ten times its price. Shipped, prepaid, to your home for only...

$0.50

RADIO AMATEURS' HANDBOOK

Sometimes called the Radio Amateurs' Bible. 30 profusely illustrated chapters bring you 10 How-to-Build articles, with complete instructions and diagrams; new radio wrinkles, DX hints, data on the new tubes, answers to AC problems, and helpful, money-saving ideas for the service man. 96 illustrated pages. Large 9 by 12-inch size. Beautiful colored covers. Shipped, prepaid, to your home for only...

$0.50

RADIO TROUBLE FINDER 

& SERVICE MANUAL

Ever have your radio reception fail or become distorted just when a big program was on and you wanted to hear every delicate inflection of tone distinctly? That's when this big, new book is worth its weight in gold. In simple words and easy-to-understand charts and pictures, it shows you how to find and correct any radio trouble quickly. Just the book you need for improving the reception of your set, or for starting a profitable repair business of your own. Shipped, prepaid, to your home for only...

$0.50

1001 RADIO QUESTIONS and

ANSWERS

If you own a radio, you need this book. Everything you want to know about radio is in it, from "How to Kill Outside Radio Noises," to a clear description of the newest tubes and how to use them. If you have a question on radio, here is your answer and a thousand more. 96 illustrated pages. Large 9 by 12-inch size. Beautiful colored covers. Shipped, prepaid, to your home for only...

$0.50

Radio-Science Publications, Inc. Dept. 2501, 381 Fourth Ave., New York, N. Y.

Clip and Mail TODAY!

FREE!

You may have any one of the above Radio Books ENTIRELY FREE with RADIO NEWS at a reduced price. To accept this offer check square below.

□ Ship me ENTIRELY FREE the Radio Book I have checked above and enter my subscription for the next eleven big issues of Radio News at the special price of only $2, which I enclose. (Regular newsstand price of Radio News $2.75.)
Agriculture had broadcast a warning that the mosaic disease (known in Porto Rico as the motting disease and in Java and Hawaii as the yellow stripe disease) threatened the sugar industry of the southern States.

The effect of the disease is to stunt the plant's growth, and this means smaller yields per acre. The virus of this wasting plant malady is carried by an insect, the corn aphid, and is also spread by man in moving diseased seed cane to unaffected areas in planting. It is impossible to treat the cane or the soil to cure the disease, or to prevent mosaic disease or prevent the spread of the trouble. The measures that scientists therefore had to take for its control and eradication were based on the destruction of the diseased plants, including the stubble, and the planting of healthy stalks only.

The search for resistant varieties of cane took government men to many foreign countries. But more about that later while we follow the first disease-resistant plant cane into being.

Several rows of cane are planted in a furrow to compensate for damage through disease and borers.

The original Louisiana sugar canes were characterized by their relatively high sugar content. On the slopes of the Himalayas flourished canes which, by a process of the survival of the fittest, have become able to resist disease and withstand considerable cold. Dr. Jan Kobus, in an experimental station in East Java maintained by the Dutch, crossed that tall Himalayan cane containing a nearly negligible amount of sugar with the high sugar-bearing cane of Louisiana, and obtained a cane that would resist the mosaic disease, and which was rich in sugar and more rugged than that formerly planted in Louisiana.

Thus came into being hybrids which are now known as the POJ varieties, and which are now helping to till Louisiana's "sugar bowl."

The canes imported from Java were planted under glass on the governmental experimental farm at Arlington, Va., and there propagated for observation by Dr. Jan Kobus. The variety designated as POJ 234 was tried out in the spring of 1922 on the Southdown Plantation in Louisiana. But investigators and research workers do not always—in fact, seldom—find things easy. And this work was no exception. Of the whole shipment of cane only twenty-one eyes succeeded in germinating, and then the cane borer got busy trying to destroy those! Enough survived, however, to show that the work was progressing in the right direction.

In 1923 the Department of Agriculture sent two more of Dr. Kobus' hybrids, POJ 36 and POJ 213, to the Southdown Plantation for a continuation of the experimental work, and by the end of 1924 there had been planted here four acres of POJ 234 variety and a short row each of POJ 36 and POJ 213. All three canes proved to be highly resistant to the mosaic disease, and they gave excellent yields while growing under the same conditions as neighboring canes of the old varieties, which were by that time almost completely incapable of producing stalks fit for seed purposes. Sugar cane is germinated from pieces of the fully developed cane, and about fifteen per cent of the crop is employed for this purpose.

New Life to Dying Crops

The majority of the sugar planters in Louisiana were decidedly skeptical of the claims made for the new canes, which were tested first and his associates. But the season of 1925. And then came the disastrous sugar cane crop of 1926, which proved to the planters that an urgent need existed for a change. Government agricultural experts, as the result of the co-operation of the Southdown Plantation and the American Sugar Cane League were able by this time to place the POJ varieties at the disposal of planters. In 1924, about one-fourth of the total acreage was planted in mosaic-resistant sugar cane, which resulted in the average yield for the crop harvested being raised to 13.4 tons per acre, as against 6.7 tons in the preceding year. In 1928 more than three-fourths of the cane planted was disease resisting, and the yields were amazing. From POJ 213 one planter obtained an average of 37 tons of cane per acre; and from POJ 36, another realized as much as 46 tons per acre!

The years 1929 and 1930 saw even further progress being made.

The U. S. Department of Agriculture is still searching, however, for hybrids that may prove to be even superior to the famous POJ varieties. In April, 1928, accompanied by Dr. Jakob Jesweit of Holland, and by a member of the Hawaiian Sugar Planters' Association. Dr. Beswick visited New Guinea, which is credited with being the original home of the sugar cane. There a search was made for wild varieties of sugar cane, and by penetrating 260 miles into the interior of that country a total of more than 150 new strains was obtained and brought back to Washington. After undergoing a full year's quarantine, in order to be sure that no disease might be introduced, these varieties are now being experimented with in the various government laboratories and experimental farms.

WANTED MEN

To Manufacture Metal Toys and Novelties

Big demand for the Soldiers, Animals, 5 and 10 cent Novelty, Snafly, etc., etc. This a fine line for those who desire to get into some new and active business. A small investment needed to start and we will help you get started. WE WOULD LIKE TO PAY THE COMPLETE OUTLAYS and start you in the very profitable and absolutely NO EX-PERIENCE and no special store equipment is needed. A chance of a lifetime for men with small capital to become independent. HURRY! RUSH IS ESSENTIAL, so if you mean seriously to try this then we suggest that you get all the information at once and act at once. Call or write us.

METAL CAST PRODUCTS CO.
B. B. 109 Union Bldg., New York City.

LEARN TO FLY!

Come to Washington—Center of Aviation. Nation's leading Flying Club, 750 members. Trainer, glider, monoplane instruction. Licensed pilots. See our free brochure. 10, 50, 100 full grades. 25 cents stamp for circular.

D. C. A. AIR LEGION
International Building Washington, D. C.

Learn Music at Home

Marvelous New Method

A Complete Conservatory Course on your favorite instrument, as you play it, with the notes and music of the time and correct notes necessary under old methods.

Let us prove to you that you can readily learn your favorite instrument in a short period of time and be a successful and professional musician. Music can be made as easy and interesting. Over 2,000,000 publications. No cost, no interest. Course in Piano, Violin, Mandolin, Cornet, Guitar, Trumpet, Saxophone, etc. Tenor Banjo, Accordion, Saxophone, Clarinet. Pianoforte instruction under artists. Satisfaction guaranteed. Full information. Free book of value. Just ask.

NATIONAL ACADEMY OF MUSIC

845 702 East 43rd Street, Chicago
A Model Guillotine
(Continued from page 808)

serve as a weight for the knife. For the rope a piece of twisted twine about 15" long should be cut and boiled in coffee to stain it the appropriate color. Some dark oak stain will be required to stain the woodwork.

For the knife itself, dig up an old or broken plane iron to be ground down to the correct size. The sharpest possible edge should be put on the knife to enable it to cut through cigar ends easily. To be historically accurate, the ground or inclined side of the knife edge should be toward the body of the victim, but as the victim in this case will be the cigar, it is better to so grind the knife that the inclined or ground edge is outward, towards the end of the cigar. This will permit the end of the cigar to be trimmed with a clean cut. At the expense of still further technical accuracy, an old safety razor blade can be utilized as the knife, and the size of the lead weight increased accordingly.

© Rafia until it digs up an old or broken plane iron to be ground down to the correct size. The sharpest possible edge should be put on the knife to enable it to cut through cigar ends easily. To be historically accurate, the ground or inclined side of the knife edge should be toward the body of the victim, but as the victim in this case will be the cigar, it is better to so grind the knife that the inclined or ground edge is outward, towards the end of the cigar. This will permit the end of the cigar to be trimmed with a clean cut. At the expense of still further technical accuracy, an old safety razor blade can be utilized as the knife, and the size of the lead weight increased accordingly.

---

### An Excellent Christmas Gift—Profitable Pastime

Realizing the demand for coach models, but that the prices charged by exclusive stores are too high for most people, we have made it possible for everyone to own one or more of these early conveyances which helped write the country's history.

We supply you with all the parts, cut to fit and ready to assemble, with a diagram and instruction sheet written so that anyone may easily follow. Each part is numbered and the corresponding numbers on the diagram show just where to place them. No tools are needed except a small tack hammer. Beside the illustration above we have parts for the following: Tally Ho, Devonport to London coach, Deadwood stage coach, Covered wagon... at $4.98 each (less horses). Horses $1.00 each with coach order.

**Guarantee:** If after assembling our coach model according to our instructions you are not satisfied, return it to us and we will immediately refund your money. You to be the sole judge.

**HISTORICAL COACH MODELS, INC., Dept. SI**

2206 FAIRMOUNT AVENUE

PHILADELPHIA, PA.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Print Your Own Signs and Show Cards**

We supply the materials necessary to make your own signs, advertising labels, paper, circlets, tags, etc. Send 25c for sample catalog showing work. Orders for small quantities accepted. We also supply signs for 3 to 5c each, 10c and 25c per hundred. We supply signs for 3 to 5c each, 10c and 25c per hundred. We supply signs for 3 to 5c each, 10c and 25c per hundred.

---

**LIFETIME GUARANTEED No. 1 Fountain Pen**

Sells for $1.25

Sends Only

"Write Like a $7 Pen." (Sent Post-Paid)

**AGENT'S CHANCE TO MAKE $10 to $20 A DAY**

SPORS IMPR., 1930 AGATE ST., LESUEUR CENTER, MINN.

---

**$100 Coach Model**

That Any School Boy Can Build in a Few Hours

For the prices of $4.98 each (less horses). Horses $1.00 each with coach order.

---

**Model of GEORGE WASHINGTON'S Private Coach**

*Model of George Washington's Private Coach*
Get Strong!
Eight Improved Muscle Builders
All for $3.75

Body master finds which one most easily
can improve the little figure of his or
her body. Supple and plump. All the
men and women, for all ages, have been
improved in appearance by this simple
method in 6 to 12 months. All technical
essentials included. School endorsed by
learned in electrical industry. You learn
all branches of electrification. Mission
Department. 1.00. Free employment service
Over 7,000 successful graduates, 2,121 to
this date. Write for our free illustrated
16-page catalog sent FREE. Write today.
NATIONAL ELECTRICAL SCHOOL
Dept. 10-B
4005 So. Figueroa, Los Angeles, Cal.

There She Blows!
(Continued from page 781)

In addition to all this, the baleen whale produces the whalebone that was once used extensively in ladies corsets, stays, buggies, and umbrellas; steel ribs replaced whalebone as stiffening in the latter article, and the thin steel stay took the place of the pliable little piece of whalebone that went into the torturing corset.

Whalebone is not part of the skeleton of a whale, as many think. It is a series of 300 or 400 horn plates, which grow from the palate of a baleen whale and hang down into the mouth. The plates are somewhat triangular in shape, the bases are rooted in the palate. Both apex and inner edge are frayed into horny shreds. The plates grow from parallel ridges on the palate, which are covered with long fibers (vascular papillae) like aconut fiber. It is fused together at the base to form the plates.

The whalebone is easily dislodged by steam, whalebone softens, and can be bent or moulded into shapes which it will retain if allowed to cool under pressure. The essential constituent of whalebone appears to be a form of keratin, the hardness being probably increased by the small proportion of phosphate of lime.

The Precious Ambergris and Its Uses

A Bowhead whale 50 to 55 feet in length has been known to produce 3500 pounds of black whalebone.

As one can see from the above list, the whale is a pretty diversified producer of trade articles, but there is still one product that he presents to mankind that is the most valuable of all, and so far as research goes, the whale is the only living thing that is an extremely rare article, known to commerce as Ambergris. Although 20,000 to 30,000 whales are being slaughtered yearly, very few of the mammals produce Ambergris, which comes from the sperm whale only. This great whale, with one-third of its body devoted to head, feeds on cuttlefish squid, octopus and other fish, some of which live on the sea bottom; it may have from forty to fifty-two teeth in its lower jaw, but sometimes there are six or eight pair of malformed ones.

Anyway, it is due to the sperm's teeth that mankind is indebted for the precious ambergris which has a value four times greater than gold, nor which spirited bidding is the rule when this sticky substance is put up for sale in the trade markets of the world. Its present value is between $75 and $85 an ounce.

The Sperm whale, having teeth, eats crustaceans, and like man in many cases, he fails to properly chew his food. As a result the bones and villanous poisons that infest the victims of his food supply, affect Mr. Whale's digestive apparatus and in time he develops a bad case of stomach trouble—in man it would be called Cholelith or gall stones; in whales it is called Cholesterol or Ambergris. Ambergris is nothing more or less than vomit from the interior of a sick whale.

Constantly Filling Mankind's Pocketbook

When first disgorged by the manual, it is of the consistency of wax. It is white, ash gray, yellow or black and often variegated, like a boy's pet agate marble; for a few days it floats a fatation or so under the surface of the sea, then the action of the water and air causes it to come to the top; the floating masses are sometimes from 60 to 200 pounds in weight and it has only a slight and not disagreeable odor. Nevertheless it is a great delicacy for the sea birds and every whale hunter is constantly on the lookout for a flock of oceas that seem to be drifting over some drifting object—it might be ambergris.

Ambergris is used for the most delicate and expensive perfumes, not as an odor itself, but as a fixing agent to retain permanently the other odors. A very slight quantity of ambergris added to a formula has the capacity of holding the odors so that as long as you have any of the perfume left it still retains its strength. The French use it also, in their finest "Bordeaux Rouge"—the red wine of Bordeaux, to hold the delicate bouquet in this rare vintage. But there are still other uses for ambergris; the medical profession utilizes it in the treatment of dyspeptic fevers, chronic catarrh and nervous diseases. So those of you who think the whale has been relegated to the past, take heed. The whale constitutes at the present time, as he has in the past, one of the world's most valuable natural resources. Few animals have contributed more to mankind's pocket-book than the whale—the biggest brain in the world.

It is hoped that the Mammalogists' Society will be successful in their efforts to preserve this rightiest of all creatures for posterity, for once the whale disappears from the face of the earth there will have passed the last of the great pre-historic monsters.
For the Home Machinist  
(Continued from page 817)

engaged in hand fitting, assembling, or metal removing operations.

There are five general types of chisels, all of which the average craftsman finds of use. The flat type of chisel serves for general purposes. Its cutting angle is about 60 degrees—the same angle can be used in working with the other four types. The face of this flat chisel is often bordered with round sides to prevent the ends breaking on hard steel. For brass and softer metals a chisel whose face is one inch wide is serviceable; for hard metals (as iron or steel) the cutting edge should be narrower.

The cape chisel is used for cutting grooves, such as hand-cut keyways. It can also be used to groove a surface before introducing the flat chisel. The round pointed grooving chisel fills in for chisel work wherever round corners are required. It serves chiefly for putting in oil ducts. The diamond point chisel cuts out corners, V-shaped grooves and irregularly outlined depressions. The side-cutting chisel cuts the sides of slots and recesses extending straight down into the work.

A scraper is generally necessary for fitting up parts. It is used mainly for trueing flat and curved surfaces after they have been milled, planed or shaped. In Fig. 4 you will see the triangular, hook and flat scrapers, which constitute the three usual forms.

Electrocuting Insects  
(Continued from page 783)

red spiders had been an uncontrollable pest. After three fifteen-minute treatments the spiders disappeared, and the plants grew more luxuriantly.

More elaborate experiments were conducted subsequently with small fruits and vegetables. Strawberries taken fresh from the patch, washed and placed in a glass jar and then sealed, kept fresh for many weeks after being treated but three minutes. As a matter of fact, one can of strawberries and one of peaches both canned in clear water and treated for one minute, were in perfect condition the following summer.

Pea plants of the same age. The one at the right has been subjected to 10 five-minute treatments.

Further experiments are being carried on. Should they prove as successful as those already attempted, it may prove possible to rid plants of all the pests that beset them, including the dread boll weevil.

Their words have wings as swift as light

An Advertisement of the American Telephone and Telegraph Company

WE live and work as no other people have ever done. Our activities are pitched to the swiftness of the instantaneous age.

Whatever happens, wherever it happens and however it may affect you, you may know it immediately over the wires or the channels of the air that carry men's words with the speed of light. Business and social life are free from the restrictions of time and distance—for practically any one, anywhere, may at any time speak with any one, anywhere else.

The widespread and co-ordinated interests of the nation depend upon an intercourse that less than sixty years ago was not possible in a single community. This is the task of the telephone wires and cables of the Bell Telephone System—to make a single community of our vast, busy continent wherein a man in Los Angeles may talk with another in Baltimore or a friend in Europe as readily as with his neighbor.

It is the work of the Bell Telephone System to enable friends, families and business associates to speak clearly and immediately with one another, wherever they may lie. Its service is as helpful and accessible on a village street as in the largest cities.

To match the growing sweep and complexity of life in this country, to prepare the way for new accomplishments, the Bell System is constantly adding to its equipment and bettering its service. To this end, its construction program for 1930 has been the largest in its history. This System at all times accepts its responsibility to forward the development and well-being of the nation.
**Boys Chemcraft**

Brings you real fun with the wonders of chemistry!

This is No. 2

$2.00

You can learn about science of chemistry and have a lot of fun in the same time—with a Chemcraft Outfit. Work all kinds of interesting, useful experiments and perform many amazing feats using this complete, accurate and economical chemistry set. It contains more than other similar sets, and is made of hard rubber and fine metal. Each piece is clearly marked. Chemcraft gives the most for the money—for you get Chemcraft.

Select Yours from These Fine Outfits

<table>
<thead>
<tr>
<th>No. 1</th>
<th>$1.50</th>
<th>No. 3 A</th>
<th>$3.50</th>
<th>No. 5</th>
<th>$4.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 2 A</td>
<td>$3.00</td>
<td>No. 6</td>
<td>$5.50</td>
<td>No. 25</td>
<td>Deluxe Chemical Laboratory—$25.00</td>
</tr>
</tbody>
</table>

Ask at your dealer for Chemcraft. Be sure to say Chemcraft on the box—then you will get the best chemical set possible.

Try Chemistry Out.

Get Chemcraft Junior Deluxe and create experiments you can do at home, and get them started for you in style and with safety. Make your own science museum, a science notebook, a microscope, and more, and keep your Chemcraft Junior Deluxe a lasting possession.

The Porter Chemical Company.

127 East Washington Street, Hagerstown, Md.

---

**PLASTEX**

The PLASTEX INDUSTRY Corp. manufacturers a small scale of equipment for the production of plastic products. It manufactures: Bunkers, etc. In Puerto Rico and the Virgin Islands. Complete and several distinct, specialized models are also available, from the smallest, simple models, to the most complete, specialized sets. All models made to order. For further information, contact us at the address below.

PLASTEX INDUSTRIES 3030 Washington Avenue, New York.

---

**BURN YOUR NAME ON TOOLS WITH THE ARKOGRAF**

Protect Your Tools From Theft. Write with electric pencil in any color of ink, red, blue, or green. Ink is permanent. No blueprints, no reproductions. Full guarantee.

Write for Free Sample. 11714 E. Clark St., Portland, Ore.

---

**GEARS**

In stock—immediate delivery. Gears, spur reducing, spur and pinions, shaft bearings, flexible coupling, pulleys, etc. A complete line is expected in our Chicago stock. Gears, spur reducing, spur and pinions, shaft bearings, flexible coupling, pulleys, etc. A complete line is expected in our Chicago stock.

---

**FREE Radio Bargain CATALOG**

and FREE RADIO GIFT


Genuine PILOT PRODUCTS

---

**Build This Band Saw of Laminated Wood**

(Continued from page 823)

the hole previously bored, the loose flange is screwed up tight, the holes are aligned, drilled and bolted securely with quarter-inch carriage bolts three and a half inches long. No washers are necessary, but put the rounded side of the nut against the flange. The same procedure is adopted for the lower bearing, but after it is bolted, take apart and cut the middle piece in two, about a third of the distance above the center and above the cross bolts, as indicated by dotted lines in Fig. 2. Countersink a quarter-inch hole for a carriage bolt at right angles in the bottom and inside the shaft hole. Insert a five-inch bolt, assemble and slip the whole into place, first drilling a hole through the base of the frame to accommodate the long bolt. To lower or raise this bearing it is merely necessary to loosen slightly the four flange bolts and tighten or loosen the adjusting bolt and screw the four bolts up tight. It will be necessary to keep your saw blade tight.

Drill an oiling hole 5/16" in diameter through the frame bearing at the top and below; drive a three-eighths piece of copper tubing almost to the shaft, letting it extend about an inch above the wood, stuff in a little waste to partly fill the tube, and oil with heavy oil. A grease cup may be used instead.

Three wheels are necessary, but the method of construction is the same, except that the driving wheel has no rim, unless you expect to use a flat belt. Secure three three-eighth inch floor flanges, have them bored to a driving fit on the shaft and face off the flange square with the hole and the outside. A hole is drilled in the hub of the flange and tapped for a set screw. Three pieces of fourteen gauge sheet iron two and a half inches square are bored to a tight fit on the shaft, and four screw holes are bored and countersunk.

The material saved from the center of the frame cut-out is used for the wheels. Mark off a twelve-inch circle on two pieces of ply wood and a six inch and a half inch circle on the other piece. Use another scrap for the small wheel, instead of the third square of ply wood, which you will need for the table. Cut out the circles to the line on the jig saw. Bore a 1 1/16" in diameter hole in the center of each disk and assemble on the shaft with the flanges on the outside. Screw the flange to the disk first, then adjust the square piece to the disk and shaft, getting it as true as possible and screw it to the disk. Do this with all three wheels.

Turn a hardwood shaft to a tight fit, put the small wheel on and true up in the lathe, cut the groove for the belt (sewing machine belting), sand and give a good coat of HOT linseed oil, rubbing off the excess. Take from the lathe, slip it on.

---

Fig. 1: Outline of the frame, showing measurements.

---

www.americanradiohistory.com
the steel shaft and put into the lower bearing, belt to the motor and you are ready to true up the large wheels. A quarter-inch piece of strap iron is bent as in Fig. 5 and clamped to the frame with a C-clamp. This makes a very satisfactory tool rest. Now with the aid of your motor true up the large disk to an outside diameter of eleven and seven-eighths inches. While the disk is still revolving, mark two circles on the face with a pencil, one one inch from the outside, the other three and a half inches from the outside. These circles are the rim and hub margins. Remove the wheel from the shaft, remove the square metal from the inside, and mark the spokes with a template made as in Fig. 6. Bore the holes in the disk at the junction of the spokes with the rim, and cut to the line with the jig saw. Do not remove the flange.

Rip a piece of straight-grained oak one and one-eighth inch wide, one-eighth inch thick and thirty-nine inches long. Turn HOT water into the bath tube and soak the strips for at least thirty minutes, and bend around the wheels using a C-clamp between each spoke. Let these dry thoroughly. Bevel to a feather edge one end of the oak strip, making the bevel at least three-quarters of an inch long. In gluing these strips to the wheels, start by clamping the bevel to the rim first and gradually work around the wheel, using plenty of clamps. At the end, the strip will extend over the bevel about an inch. See Fig. 7. Be sure and place a clamp over this joint. When the glue has set after standing overnight remove the clamps and cut the projecting edge flush with the outer edge of the wheel. Return to the lower bearing and true to twelve inches, sand, rounding off the spokes and all edges, give a good coat of HOT linseed oil and rub off the excess.

Drill a small hole through the upper shaft and drive in a pin, letting it extend at least one-eighth inch beyond each side of the shaft, cut a brass washer to fit the shaft and slip on. This keeps the upper wheel from running off.

---

FREE BOOKS OF BUSINESS HELPS

We publish over 50 Home Study Books, each a complete treatise of its subject. We have one or more for you.

- Commercial Art
- Lettering
- Advertising
- Sign Making
- Radio
- Aviation
- Painting
- Silk Screen Process
- Decoration
- Automobiles
- Battery Work
- Carpentry
- Building
- Contracting
- Sheet Metal Work

- Advertising
- Magnetics 30 Times
- Sign Making
- Automobiles
- Baterry Work
- Carpentry
- Building
- Contracting
- Sheet Metal Work

FREDERICK J. DRAKE & CO., Publishers
Room 510—179 N. Michigan Blvd., Chicago
Drake books are for sale in all book stores

---

New Units, New Features, New Improvements in Complete 1931 "Delta" Woodworking Line

No more hand labor—no more toil...when you use "Delta", motor-driven tools. Working with wood becomes a real pleasure with the help of these machines.

"Delta" Combination Jointer and Circular Saw. Can be operated separately or together—so interchangeable. Furnished with or without motor.

"Delta" Handi-Shop
A complete, compact, practical, motor-driven workshop—popularly priced. Includes equipment for wood turning, circular sawing, scroll sawing, boring, sanding, grinding, and buffing.

"Delta" Line-Shaft Shop
Includes 4-speed Lathe, Band Saw, Jointer, and Circular Saw. Operates with either gasoline or electric motor.

Practical, Motor-Driven Woodworking Equipment Now Within Reach of All

Now are available at astonishingly low price levels a complete series of compact, rugged woodworking machines incorporating numerous exclusive constructional features. Each unit embodies the practical, efficient design, the careful workmanship of the dependable quality of materials—for which the "Delta" trademark stands. This year there are many new units and features that will be of intense interest to all those who work with wood. All units now operate with either electric or gasoline motor power.

Woodworking—The Modern Way

Motor-driven tools save time and labor, and produce better work for artisans, farmers and mechanics. Up-to-date men everywhere are flocking to motor-driven woodworking equipment to eliminate tedious hand labor. And for full or spare-time work, "Delta" Units quickly pay for themselves.

10 Day Trial—Easy Terms

Send coupon today for free illustrated literature describing the new 1931 "Delta" line. Also details of 10-Day Trial Offer and Easy Payment Plan.

DELTA SPECIALITY COMPANY (Division of Delta Mfg. Co.)
1641-47 Holton Street
Milwaukee, Wisconsin, Dept. C 333

Gentlemen: Please send me FREE illustrated literature describing 1931 "Delta" line and details of 10-Day Trial Offer and Easy Payment Plan. (Check items of particular interest.)

Δ "Delta" Shop
Δ Jointer
Δ Circular Saw
Δ Handi-Shop
Δ Band Saw
Δ Routing Machine
Δ Moulding Cutter

Name
Address
Age

---

See the Craters in the Moon!

Astronomical and Terrestrial Telescope

Landscapes, Games, Ocean Scenes, Enlarged

30 Files

Tailor, 2 inches. Special finishing attention. For many years a top favorite for men and women alike. The one to have in every home. Beautifully packed in attractive box. Price $1.25...so low it cannot be beat.

Five Days' Free Trial

Bring only $1.00 down. Pay balance when next you visit. 100% satisfaction or money back. Price $1.25.

FREE CATALOG: Check the subjects in which you are interested and write today.

FREDERICK J. DRAKE & CO., Publishers
Room 510—179 N. Michigan Blvd., Chicago
Drake books are for sale in all book stores
Assemble the two wheels in their respective places, use a piece of linen tape for a "saw" and try it out! If your work has been accurate the wheels will run true and the "saw" will stay on the wheels.

Now for the table with its tilting device, guard, thrusts and cleaner.

The adjustable top thrust can be made in a number of ways, two of which are clearly shown in Fig. 9 and 10. The adjusting arm is made of three-quarter inch square maple, and by cutting a piece of the middle standard arm the maple will fit snugly, and with a couple of wing nuts it may be loosened or tightened for lowering or raising. The bottom thrust and cleaner are made as in Fig. 8. Soak the cleaner pieces in oil over night.

The guard is made of three-quarter inch material grooved to take the saw and secured to the frame with two wooden brackets.

The table is twelve inches square, or is can be made round, but if you make the table round first cut the grooves for the cut-off and the rip guide. The tilting metal disks are made of fourteen gauge cold rolled steel cut to the dimensions with a jig saw, bent at right angles and screwed to the half-circle wood pieces. These are shown in position in Fig. 3. Be sure and get the center lined to coincide. Now clamp these in place on the frame with a C-camp, find the center of the table and make a saw cut in it. Slip the wheels in place, put the saw on, tighten, and then slip the table on, getting it centered and square and then screw the bent edges of the tilting disks to it. Where the saw passes through the table it will be necessary to level the under side so the table will tilt without binding the saw. I found that by placing two layers of friction tape around both wheels the saw will ride much better. It will take a little time to line up the wheels in order to get the saw to ride properly.

The upper thrust is adjustable and is made as in Figs. 10, 11 and 12, or in any number of ways that can be devised to accomplish the same end. In case the saw is to be driven from a line shaft the drive wheel can be placed on the upper saw wheel shaft. The motor is fastened to an adjustable base with wing nuts so that the motor is broken and the lower wheel has to be raised the motor can be slipped a little closer to the saw. This feature is good, anyway, as it makes a convenient method of tightening the belt. The writer's saw travels about 600 R.P.M. and will saw six-inch material if taken slow. The writer has saws 82" in circumference, 3/4", 3/16" and 3/4" in width and 24 gauge. They cost about $1.50 apiece.

Fortunately, the trains are operated at speeds of not more than 15 miles per hour, which makes it possible to lighten up materially on the track.

Then there are round-tables for turning the locomotives around; sidings where they are shunted for loading and unloading of goods or passengers; a round house accommodating several locomotives; and a train shed alongside the house, near the highway, to pick up and discharge the travelers that come from far and wide to see them.

The rolling stock is unique in that it has the appearance of standard rolling equipment on a diminutive scale. Passenger coaches, freight cars, gondolas, flat cars and locomotives closely approximate the real thing in general appearance, on a greatly reduced scale, yet they are ingeniously designed to handle man-sized work. The passenger coaches are equipped with seats. Because of the reduced scale of the passenger coaches, the passengers must sit up with heads and shoulders above the roof. No harm is done here. The cars are narrow enough to carry passengers. The box cars are arranged with drop sides, so that they may be filled with tools, produce and feed, for carrying on the work of the farm.

The locomotives, of which there are several, are of the steam type in appearance only. Actually, these locomotives are gasoline inspection cars, such as used by railroads, but in disguise. The gasoline inspection cars are employed ordinarily by section gangs and foremen, in place of the conventional hand-cars. Gage has built locomotive bodies on the gasoline inspection cars. He has fashioned the boiler of sheet iron. The front is a large garbage can cover. The headlight is an automobile headlight. Some wood and more sheet iron form the cab, steam dome and tender. A few more pieces of iron strip go to make the cow-catcher or pilot. A dinner bell serves as the locomotive bell. An automobile horn serves as the whistle from a utility rather than from a decorative standpoint. The engineer sits on a seat which represents the tender or coal car, and works the controls within the cab. To start the locomotive, however, one side of the cab is swung open and a crank inserted in the engine flywheel to start things going.

All in all, it is lots of fun. The tiny trains chug along at eight to fifteen miles an hour over the couple of miles of track, sometimes carrying freight and at other times carrying merry visitors who come from far and wide to enjoy this home-made railway.

He Can't Miss His Train

(Continued from page 806)
Glowworms' Light
(Continued from page 786)
light of the glowworms, and their curiosity spells their doom.

Going to investigate this fascinating glow, they find it a delusion and a snare, for they become caught on the sticky threads and the glowworm has another full meal. Once they touch one of the threads, they are lost beyond all hope. There they stick, despite violent struggles. The vibrations caused by the struggle attract the attention of the glowworm, which if hungry immediately winds up the hanging thread. If the prey hangs in suspense until wanted.

In addition to obtaining the glowworms' food supply, their silken threads are also its body-guard. Exceedingly sensitive, the vibrations of sound caused by talking or other noises, are registered through the glowworm is warned of danger. It then, through some ingenious control method, is able to dim the light or to cut it off entirely.

Endless Illumination

The organ which emits the glowworms' light is a gelatinous and semi-transparent structure at the posterior extremity of the larva, capable of great diversity of form. Attempts by entomologists to solve the intricate problem have been in vain. All they have learned of the organ is that it is green in color and does not give off heat waves, all its energy being expended on light rays.

It may be, when scientists learn whether the composition of the light is chemical or otherwise, and the manner of its control, that a new era of illumination as wonderful as electricity will have arrived. It is interesting to speculate on the possibilities of such a "cold" light.

This glowworm goes through four stages of life—that of the egg, the larva, the pupa and the fly. The average life of the larva is several months. When it reaches its full size it reabsorbs all the hanging threads, leaves its silken hammock and, hanging down, changes from a grub to a pupa. For a few days it hangs thus, still luminous but taking no food, and then out of it emerges a dim, dark-winged fly, about twice as large as, and somewhat resembling a mosquito.

It shuns the daylight and so is seldom seen. It lays its eggs on the roof of the Grotto, the larvae are hatched, and the endless cycle of light goes on, providing endless illumination for the cave.

$21,000.00 for Spirits

For more than six years this publication has offered prizes totaling $21,000.00 for genuine demonstrations and proofs of spirit manifestations which we cannot duplicate by scientific and well-known means.

Up to the present time not one manifestation has been represented by even the greatest stretch of the imagination could be considered genuine.

How many more years must this prize be offered? Spiritualists, please answer!

The usual things

It is difficult to imagine the world today without some of the things that make our living in it so pleasant and comfortable. How naturally we lift the telephone receiver, step into an automobile, and look for the news of the world in the newspaper and magazine—every day of our lives.

Another of these usual, invaluable things, accepted as part of the routine of existence, is the guidance given by the advertisements in supplying our wants from day to day. We read them. They help us to save time and money. And our lives go on—more easily and more fully.

The advertisements suggest ways in which we can get things we want with the greatest possible satisfaction to ourselves. They tell us the advantages and comforts of which we would not otherwise have known. They help us to get down-to-the-dollar satisfaction. They assure us of proved values.
ALADDIN PORTABLE ELECTRO-PLATER

Instantly Applies Real Nickel
Also Electrically Plates Brass, Copper, Silver, Gold, Etc.
With the inexpensive ALADDIN OUTFIT you can easily nickel plate the nickel on your car and do a good job of it. The ALADDIN OUTFIT is also a time-saver.

Make Big Profits With the Aladdin
Whether you are interested in the ALADDIN for yourself or should you wish to go into business (putting real nickel on autos or doing metal plating in your neighborhood, or if you would like to act as an agent in your territory, write us immediately for free particulars.

P. J. F. BATENBURG CO.
Dept. 171
Racine, Wisconsin

A Book Table
(Continued from page 805)

may be purchased from any fine cabinet shop or furniture repair place. In patching old curved surfaces, or veneering new wood, similar to the uprights mentioned, one should have saved forms of the same shape for clamping. The photographs illustrate this clearly with regard to the uprights. The veneer should be thoroughly soaked and applied wet, or else it is likely to break on too sharp a curve.

After the veneer has been applied to both sides of the uprights, fit the cross pieces to them as indicated, and fasten the whole book-rack portion to the table top with screws from below. Fasten the upper top in place with dowels in the uprisings.

For the reader who plans to build his own table from the bottom up, we suggest a simple design be adopted for the pedestal, or that one be turned as illustrated, instead of making it of hexagonal shape. He may make it revolve by mounting it on a large dowel in the center of the pedestal, or by purchasing an old revolving screw from a junk yard.

Whether rebuilt from the piano stool or constructed to start from the framers, we feel sure that the results will more than justify the effort involved. A hand-natured durable varnish finish will put the final touches to a truly useful and ornamental article of furniture.

Your Order

Enclosed

Please send

35c

Bitte senden Sie

35 US-Cent

PER FROST

ALADDIN

Also Metal, With

Also metal, with

instantly and

instantly and

free particulars.

free particulars.

Agents Wanted

Anti-Mist

Guarantee Clear Vision

You can easily build a big money-making business of your own using Anti-Mist. Sells to auto supply stores, saloons, drugstores, cigar stores, grocers, haltide and street car companies. Anti-Mist makes glass rainproof and waterproof. Single orders guaranteed in all weather. Money back guarantee if it fails.

$50 to $100 WEEKLY

Others are doing it. Write for a copy of our large Anti-Mist recapit at 25c per set of 4, earth 1.00 for 8 or more.

GASTON MFG. CO.
Dept. 853-A, 4214 Lincolns Ave., Chicago, III.

Matty & Co., 615 Pender St. W., Vancouver, B. C.

NEW SCIENTIFIC WONDER

"X-RAY" CURIO

10c

3-25c

BIG FUN

BOYS

You will wonder at the vivid appearance of any object. See things in Finish.

RADIO PICTURE FILMS Take pictures without camera. "You'll like 'em." 1 pkg., ea. 25c order.

WAVE MFG. CO., Dept. 83, NEW HAVEN, Conn.

One Positively Guarantee

to increase your arms one-half inch in size, over one full inch, strength 25%, health 100% in one week. Use the time following my instructions and using my exercise chart beginning mornings and at night. Send $1 for complete course and exercises. Refund guaranteed or $1 refunded.

Fred J. A. DRAYER
Box 1850-L, Chicago, Ill.

Now It's Easy to WIN at BRIDGE

Surprise your friends! Get the habit of winning! Let Wilbur C. Whitehead, world-famous authority, show you his short-cut picture method to complete mastery of this fascinating game—both Auction and Contract.

Within a week you will be able to pit your wits against the best of players—and WIN! By using hundreds of pictures of hands to bid and play, with solutions and analyses, he makes the game you once thought difficult surprisingly simple. By his easily grasped picture method, anyone can master the finest art of forking, placing the lead and dozens of other clever plays. Printed in two colors with hearts and diamonds shown in red throughout. Worth much more than any $2.50 book on the same subject. Shipped to you, prepaid, complete, for only

50c

Simply write your address in margin below and mail 50c in check, coin or stamps to—

MACKINNON-FLY PUBLICATIONS, INC.
Dept. 858, 381 Fourth Ave., New York, N.Y.

The first thing about this book which strikes the eye before it is even opened is the claim made on the jacket by the author that he is the inventor of the wireless telephone. The present reviewer has been closely associated with all branches of radio communication for twenty years and thought he knew of all the important personalities who have contributed to the art in one form or another, but never has he heard of the name of A. Frederick Collins in connection with the wireless telephone. Still, that may be his ignorance; we live and learn.

The reviewer's next reaction, on looking over the book, is one of sympathy for friend Rowe. He certainly undertook a pretty thankless task when he agreed to edit this book, with the sort of asser
tion that he has acquired himself with honor. But it is a pity he did not allow the book to be buried decently instead of collaborating in its resurrection.

First published in 1922, this handbook has long outlived its period of useful existence. There are other works of reference available, notably the A.R.R.L. Handbook, which satisfy all requirements, and do so much better. The logical place for Chapter IV, "Electricity Simply Explained," is at the beginning of the book. Instead we find Chapter I devoted to "How to Begin Radio," which, incidentally, describes the slider timers, crystal detectors and induction coil transmitters we used twenty years ago. Much of later chapters is also devoted to this and other similarly antiquated junk which is now to be found only in museums and in the historical sections of radio exhibitions. Later sections of the book, apparently the work of Rowe, give some useful up-to-date information, however, and at the end there is a glossary of terms, miscellaneous information, insurance requirements, and details of radio laws and regulations.

AUTOBIOGRAPHICAL AND OTHER WRITINGS, by Alan A. Campbell Swinton. 181 pages, 17 illustrations. Published by Longmans, Green & Co. Price 10 shillings and sixpence, $2.50.

On the flyleaf of this book appears the quotation: "Let us now praise famous men and our fathers that begat us." The author thereupon opens his work with an essay "Memoirs." He attempts a history of wireless, which he traces back to the twelfth century. None of it is of the slightest interest to anyone outside of his immediate family circle. The rest of the book is devoted to meandering and musty recollections of electrical and other scientific happenings and personalities during the past forty years, none of which appears to have much value.

The author's claim to fame is of somewhat dubious extent. He claims to have been the first to suggest the use of load-carrying wire for wiring signal on board ship. He also possessed some reputation, during his younger days, as one of the earliest investigators in the field of cathode and X-rays. In 1911 he made the suggestion that television might be accomplished by the use of cathode rays at both the transmitting and receiving ends of the system, but never did any actual work on the idea. Of recent years he has written much concerning the impossibility of achieving television by present mechanical methods and advocating the use of cathode rays as the only possible solution to the problem in question. However, shortly before his death, which occurred in February, 1930, he witnessed a demonstration of the Baird system, and admitted in a letter to the London Times that Baird had succeeded by mechanical methods in producing recognizably images.

No doubt an interesting book for those who enjoy reading out-of-date reminiscences.


With each day a new theory is announced, another physical law is discovered, examination of photographic plates reveals a heretofore unseen star, a baffling piece of electronic apparatus is invented, intricate hypotheses advanced, new ologies, religions and systems of education come into being. The vast array of idea and thought material, is not, after all, completely supersede what was basic yesterday, bewilders and perplexes the average individual.

Messrs. Saidla and Gibbs have collected a select group of essays written by men, each high in his field. They have judiciously picked works, which, although specific in themselves, serve to answer various general questions. Are we discovering facts too quickly for us to absorb them? Is the order being discarded before the new is understood? How practical are Scientists? What relation does Science bear to our History and our methods of life? Will Science ever supplant Religion? Is specialization a factor for good? Are subject types which are directly or indirectly discussed.

The essays are not only educational and cultural but make very interesting reading. The introduction which precedes each article proves very helpful and provides sufficient background to permit the uninitiated to read the monographs with an understanding of the subject to be discussed. Eminent authorities who have contributed include Bertrand Russell, John Tyndall, Thomas Huxley, R. A. Millikan,
Michael Pupin, J. S. Haldane and others. The compilers made a serious mistake in their selection of a name for the book. The heading Science and the Scientific Mind frightens you away—who would think that entertaining matter would be contained in a volume bearing such a grave and impressive title?

SEVEN IRON MEN, by Paul de Kruif, Published by Harcourt, Brace & Company, New York, Pages, XIV; 241. Price, $3.00.

Paul de Kruif has written a stirring biography of the Merritt clan. Graphically he has described their unflagging efforts in pursuit of the elusive iron ore which they were so sure would some day be found in the Lake Superior Region. Chapter after chapter is devoted to the innumerable unsuccessful trips which various members of the family made into the wilds, dominated by that inborn urge to find iron, buoyed up through every disaster and hardship by their implicit confidence in their ultimate success.

Finally the Merritts announce the discovery of iron ore. The family own large blocks of land and commence mining operations. An eight million dollar offer is made for their vast holding and is scornfully rejected. Capital is interested, allied enterprises develop railroads are built and scavenging companies organized. The astute capitalists enter into partnership with these hardy pioneers. A handful of closely related men have opened up a wilderness to civilization and given a supply of cheap iron ore to the nation. The financial panic of '93 and '94 follows and when business stability is again established the Merritts are stripped of all their holdings and the monied interests are in control.

Mr. de Kruif writes that it is an un-toward tragedy that has left those responsible for the development of this section penniless. However, the writer cannot help feeling that it was inevitable. The Merritts were pioneers, not business men. Those very characteristics which spelled success for them as woodsmen and explorers caused their downfall when they attempted to deal with financial jugglers. Good lumbermen, they did not understand tricky business, and double dealing; did not even know that sharp practices existed, accepted every man's word as his bond, thought every one as honest as themselves.

Reviewed books can be secured from the publishers or directly from our Service Department.

Drill Press from Bottle Capper
By Raymond B. Wailes

THERE is a bottle-capper that makes an ideal feeding mechanism for a drill press. Using two polishing heads or a lathe head stock and a polishing head with the converted bottle-capper, a drill press can be rigged up very easily. Certain brands of polishing heads and lathe heads are now selling for a dollar, thus making it possible to have a drill press for the home workshop for less than five dollars.

The illustration shows how the head stock or the polishing heads are mounted to an upright wood panel which in turn is fixed to the heavy wooden base board by means of a shelf bracket. The two pulleys on the polishing heads are idlers, and are kept on the shaft by means of pins thrust through holes drilled through the shaft. Stock pulleys are used. The drill head is a lathe headstock, or, if desired, a polishing head, with one end of its shaft threaded to take the chuck.

The feeding table is made of a bottle-capper with the movable head inverted upon the rack-upright. The lower part of the rack-upright is cut off, bent at right angles and drilled so that it can be fastened to the table by means of screws. An additional bracket which gives extreme rigidity to the drill table is also added, and this is in the form of an L-shaped piece of metal, screwed to the panel and bolted to the rack.

The drilling table is a square or circle of wood in the center of which is mounted a wooden disc to slip into the crownhead of the capper. The soft rubber ring should be removed from the crownhead. A hole or two drilled through the crownhead will receive small screws which pass into the wooden disc of the drill table, thus holding the table securely to the feeding handle. In operation, the table is placed upon the table and the table fed by lifting upward on the capper handle.

Renovates Paint Brushes

BoRE a hole in the end of the brush handle and suspend by a wire in a mixture consisting of one part of kerosene. The brush should not touch the bottom of the liquid container.

If the brush is not to be used soon, clean out with kerosene, gasoline or turpentine, and wash with soap or gold dust and warm water. Rinse soap out of brush and work lubricating oil into the bristles. Then wrap brush in paper until you need it.

—Frank Hall.
Spectacular Electrical Experiments  
(Continued from page 795)

The amateur showman can give a striking demonstration by welding iron under water. With the use of a 1 K.W. welding transformer which delivers about 100 amperes at 10 volts, bars about 3/4 inch in diameter may be welded to flat strips of equivalent cross section. Clean the bars thoroughly of all oxide scale before attempting the experiment. The transformer is connected to the metal to be welded through rubber-covered copper cables, of the full current-carrying capacity of the wire used in the secondary coil of the transformer. Insert the rods in a jar of pure distilled water, and allow the ends to rust; they will become white hot and fuse together. When they have joined, the operator who should wear smoked glasses and asbestos gloves to add to the atmosphere of mystery, should lift the welded rods from the water and display them to the audience.

The welding transformer of 1 K.W. rating is made as follows: The core is of laminated sheet iron, 15 X 8/4 inches over-all size. About five layers of insulating cloth or tape must be wrapped about each long leg. The primary winding consists of four layers of No. 10 B.S. gauge D.C.C. magnet wire wound over a length of 10 inches of the core leg. Insulating cloth is placed between the layers. The third and fourth layers may be tapped. Eleven and a half pounds of magnet wire yielding approximately 344 turns which is wound about one of the longer legs should prove sufficient.

The secondary, which is wound on the other long leg of the core, comprises 31 turns of No. 6 B. & S. gauge D.C.C. wire or four No. 6 B. & S. gauge wires connected in parallel. Tape or impregnated fabric must be used as an insulator.

A more spectacular performance can be made if a 1 K.W. transformer, built to the following specifications, is used. The core measures 18 X 9/4 inches over all. Cross-section of each leg is a square 2 1/2 X 2 1/2 inches. The iron will weigh about 73 pounds.

If connected to a 110-volt 60-cycle A.C. circuit, the primary coil must contain about 19 pounds of No. 6 B. & S. triple cotton-covered wire or an equal amount of No. 9, two strands of which are wound together and connected in parallel. The primary draws approximately 27.3 amperes and the coil is composed of 196 turns in three layers, each 12 inches long. (These dimensions apply to No. 6 wire.) In order to obtain 10 volts A.C. 60 cycle, the secondary requires about 20 pounds of copper wire (or bar) having a cross-section of 288-750 circular miles. This cross-section area can be supplied by winding on 11 No. 6's, 4 No. 1's, or 5 No. 2's (all B. & S. gauge) in parallel.

You get PROOF the first 7 Days I can make this NEW MAN of YOU

(Continued)

Charles Atlas

"World's Most Perfectly Developed Man"

I'VE helped thousands of men—young and old—underweight and overweight—wrestlings and even "strong men" and other physical educators who wanted my new Muscle Power. Now I'll show you my quick, sure way to recondition a new body and make a "new man" of yourself.

Spend just a few minutes a day in your own home, doing what I tell you, without tricky apparatus, starving or gaining, using only my natural methods of Dynamic-Tension—in ONE WEEK you begin to SEE, and FEEL the difference in your bodily condition and physical appearance.

And my methods will dig down into your system, banishing such ailments as constipation, pimples, skin blotches and the ailments that do you out of the good things and good times of life. Your new health, pep and vigour will show even in your eyes, your hair, and the way you carry yourself. If you're timid and bashful, you lose all—that you have a new more forceful personality—you become a NEW MAN!

Gamble a 2c Stamp

It's a shame if you are being held back by a shabby, weak, body—now that you can so easily and quickly make this new man of yourself. Do what my thousands of other people did—send for a free copy of my 48-page book, "Eternasting Health and Strength." Learn how I built myself up from a weak, no-muscle, always-ill "rust" to make me THE World's Most Perfectly Developed Man. Send 2c to mail my coupon—to learn how YOU too can win the largest prize in life—abandon, healthy, husky body. Address CHARLES ATLAS (Dept. 17-A), 133 East 23rd Street, New York City.

Charles Atlas (Dept. 17-A), 133 East 23rd Street, New York City.

I want you to see the Dynamic-Tension will make a New Man of me—give me a healthy, husky body and big muscle development. Address CHARLES ATLAS (Dept. 17-A), 133 East 23rd Street, New York City, "Eternasting Health and Strength" and special "Proof-in-7-Days" offer.

Name.
Address.
City and State. (Please print or write plainly.)

www.americanradiohistory.com
How and Why Automobile Tires Wear Out

(Continued from page 787)

against and rolled along a heavy glass plate, through which the tread movement can be observed. A loading device permits the tire to be pressed against the plate glass and varying degrees of pressure can be controlled. The plate glass is ruled and etched in one inch squares as reference lines. By noting successive positions of any particular point on the tire with respect to a reference point on the glass the movement of the tread-rubber can be studied.

For accurate study these engineers coat the glass with some such liquid as soap solution or glycerin, and take photographs. For plotting their data a microscope is mounted about six feet away and observations are made through it.

"Observations of several tires showed that different parts of the tread have characteristic movements," Mr. Holt explained. "For instance, the central part of a tire usually shows straight-line movements opposite to the direction of travel of the tire, while other parts have movements with some component of motion in the same direction as that in which the tire traveled."

For detailed study Engineers Holt and Cook use artificial, smooth plates coated with melted paraffin wax. The wax is sprinkled with grains of carbondurum. Then, when a tire under load conditions is rolled over the plates the carbondurum is moved by the treads and their paths on the waxed plate. These waxed plates are slipped between the tire and the plate glass.

With such equipment various tires have been tested at varying speeds for two hours an hour to thirty miles an hour. It was found that the scratches in the center of the tread increase in length as the tractive effort is increased, which is what might be expected. Mr. Holt explained that the circumferential movement of points in the intermediate portions of the tread are increased while circumferential movements of the outer portions of the tread are decreased. The large movement, however, toward and away from the center does not change appreciably with a change in tractive effort.

In detail the government engineers found that the greatest tread movements occur under low pressures or high axle loads. All movements are more pronounced in balloon tires, which are inclined to wear faster and less uniformly than the treads of high-pressure tires.

"The common practice of cambering and toeing in of the front wheels of an automobile doubtless influences the tread wear. The results of these tests indicate that the movement of a tread may be affected by the direction of rotation, particularly in the case of a non-symmetrical design. It was noted that with some tires the tread movement is excessive at certain points, particularly at the ends or edges of non-skid buttons. From an observation of the way in which a button comes in contact with and leaves the ground, it would seem desirable to design the buttons so that the edges would be approximately parallel to the periphery of the area of the tire contact. This would tend to make the path of the button quickly change from a piece of glass to a contact quickly after once touching." It was noted that it would be a good thing if motorists would occasionally change the direction of the rotation of their tires while in service. This would probably give a few more miles of wear.

"A considerable part of the tread wear," said Mr. Holt, "may be caused by the slipping of portions of the tire over the surface of the road in changing from the normal to the deflected condition and vice versa. This might be termed a scuffing action. It is recognized that a tire seldom rolls over a surface which is as smooth as a waxed plate and that the tread movement on a rough surface may be different from that which takes place on a smooth surface. Nevertheless there will be the same tendency to slip on an outline to a rough surface as on a smooth one, and the tread movement on different surfaces will simply vary in degree, depending upon the amount of friction. The investigators wanted to understand that factors other than scuffing were always responsible for tire and tread wear, such as poor breaking, bouncing, side skidding and various difficulties of that sort; but the study made had to do with treads under normal conditions and not with other factors which were already well understood.

"From general observation of tires in service it is thought that in most cases scuffing is the most important, or at least an important factor in producing wear," Mr. Holt stated. "It was noted in several tires that there is a tendency for the tread to slip non-symmetrically even though the tread design is symmetrical. A close examination and adjustment of the testing apparatus may reveal this result of some nonuniformity in the tire itself."

The conclusions of these engineers indicate that tread movement is probably a fundamental factor in determining tire wear and that when tires are made so as to prevent scuffing and twisting movements the tires on the average motor car will last longer and go farther.
Make Your Own Sunlamp (Continued from page 816)

Now test it out so it can be permanently mounted on the lamp. Carbons come in 12" lengths, so break them in half and put the pieces in the four holes. The unit illustrated was planned for 8 mm. size. They should parallel each other, when tightened in the units. If they don't, put thin pieces of metal under the outer blocks until they line up properly at about 3/16" apart. Now take your resistance wire from a heater coil, hook one end to a long bolt, and the other to one end of the supply cord. The other end of the supply cord is hooked to the other bolt.

A lighter is necessary for the lamp. It is made by putting two short pieces of carbon into a length of rubber hose (so the whole can readily be held in the hand), and manipulated so the two carbons touch the ends of the two pairs of carbons projecting from the holder unit. It would be wise to make a little test block so the lamp can blow fuses without blowing the main fuse. Experience with various lengths of resistance wire until you secure the proper amount of coil to give a bright steady light, and yet not blow a ten ampere fuse. When it is working, tighten all bolts so they will be permanent.

Slip the resistance unit in place over the long bolts (now getting short) and bolt down. On the bolt that does not go through the brass strip, put on two washers and another nut, to hold one end of the supply cord. The lamp is now practically complete. The cover over the unit is not necessary, but it does add a lot to the appearance of the lamp, as well as protect the unit. Take the handle off the saucepan, and cut to fit around the lamp iron support. Punch three holes near the rim to fasten to the mixing bowl. For ventilation, punch a series of holes around the outside, one in the bottom of the pan, and put a rubber insulating double washers, so one end of the feed wire can be held between them. Into the single hole opposite the double holes put a bolt to help hold the resistance in place.

The Oracle (Continued from page 820)

The question which you raised is usually the stimulus for a lengthy and wordy argument. It can be compared to the old story of which came first— the hen or the egg. The conclusion that can be reached concerning the priority claims of our favorite breakfast food and its maternal parent are just as definite as any statement that might be made in answer to your query.
Harnessing Ocean Temperatures
(Continued from page 785)

will boil can be varied considerably, depending upon the pressure of the atmosphere above the water. The figure of 212° F. is the boiling point of water only when the atmospheric pressure over the water is such that the barometer reads 30", which is the standard reading at sea level during fine weather. If we climb a 7,000 foot mountain on an equally fine day we will find that at the summit the barometer will read approximately 22", and water will boil there at a temperature of only 197° F.

The surface temperature of the sea in the tropics varies from 75° to 85° F., and does not vary all the year around more than four or five degrees at any given place. It is clear therefore that if the pressure of the air over the water is reduced sufficiently (i.e., if a vacuum pump is attached to the boiler) water at this temperature will boil and give off steam. This steam, of course, is so far below atmospheric pressure that the turbine also must be kept in a vacuum before the steam can do any useful work, i.e., drive the turbine.

At first glance it would appear that more power would be required to drive the air pump than would be generated by the turbo-electric machinery. It is at this point that we must study the function of the condenser.

The duty of a condenser is, as its name implies, to condense steam back again into water. It consists essentially of a boiler-like container through which flows a constant stream of cold water. Hot steam striking the cold water immediately condenses and falls to the bottom of the container, with the cooling of water being drawn up and allowed to flow through the cooling tubes of the condenser.

This long pipe, being perhaps the most spectacular part of the Claude apparatus, has received considerable publicity in the newspapers. It is made of corrugated sheet iron, 0.75" thick. It measures over six feet in diameter, and is 2,000 metres, or over a mile long. The pipe was built up on land, then launched, supported by steel floats. The first two attempts to perform the difficult operation of sinking the tube met with failure, but the third attempt succeeded. The distance of the end of the pipe from shore is about 1,600 yards. The lower end of the pipe is at a depth of nearly 2,000 feet below the surface. At this depth the temperature of the water is 50.9°.

Sweeping Ocean Currents

Careful surveys had, of course, to be made of the sea bottom before the pipe was sunk, the chief obstacle to be avoided being ocean currents which might sweep the pipe away. From the shore line out to a depth of 82 feet the pipe is buried in a trench, cemented over to protect it against the action of the waves, and the pipe is "lagged" or wrapped with heat-insulating material so that the cold water will be heated on its journey upwards by the warmer water of the upper layer outside the pipe. The pipe was made of so large a diameter in order that the water in it should not be heated appreciably by friction against the sides.

One difficulty anticipated by Professor Claude was the formation of foam or large bubbles in the boiler and condenser due to the presence in the warm sea water of a considerable amount of air and other gases. Obviously, if the water in the boiler is aerated, as soon as the air pump gets to work to try and produce a vacuum the effect of its efforts will be impaired by the effervescence, in bubble form, of air from the water. Similarly, the vacuum in the condenser would be destroyed. This difficulty has been largely overcome by the installation, between the warm water intake and the boiler, and between the cold water intake and the condenser of purifiers, or de-gassing tanks.

There are several ways in which occluded or dissolved gas may be removed from water. The most effective method, which removes all gases, is to draw them out of the water by applying a moderate degree of vacuum. This involves the application of power, but since a very high degree of vacuum is unnecessary, not much power is required. It is this method which Prof. Claude has adopted.

We are now in a position to summarize the entire Claude process.

Warm surface water from the sea flows into a pit, where it passes into the de-gassing tank by means of a circulating pump. This water, after having been de-gassed, is fed to the boiler. Initially, an air pump is used to evacuate the air in the boiler so that steam is
evaporated from the warm sea water in other words, the water boils. But when evaporation takes place, the remaining body of water is cooled. It is therefore necessary, after a certain degree of cooling has taken place, to remove the water and replace it with fresh warm water. In practice this is a continuous process, warm water entering the boiler near the top, as illustrated in the drawing, and, after cooling by evaporation, leaving at the bottom. The ejected water is returned to the sea by any convenient route.

The steam evaporated from the warm water, after driving the turbine is, as we have already seen, condensed back into water, which water is allowed to run off into the sea. Cold water for the condenser is forced up gradually into a pit by deep sea pressure, and is drawn up from the pit by a circulating pump. After passing through a degassing tank and the condenser, the cold water is also allowed to run off into the sea.

The apparatus which Prof. Claude is using in Cuba was first tested out at Ougree, in Belgium, where, with a difference in temperature between the warm and cold waters of about 38° F., heat was being developed to the extent of 60 kw. at a line at 6,000 R.P.M. In Cuba, with a temperature difference of only 18° F., approximately, he has succeeded in generating sufficient power to light forty 500 watt lamps, or 2,000 kw. The real source of energy is thus seen to be the temperature gradient between the warm and cold waters, and the efficiency of the plant increases as the square of the difference of temperature. The deeper the cold water pipe is sunk the colder is the water which can be drawn up from the ocean floor.

Although Professor Claude's experiments have to this extent proved the correctness of his theoretical premises, he admits that more power is at present required to run his auxiliary machinery, such as pumps, than he can obtain from his turbo-generator. In defense of this circumstance, however, he stresses the fact that his equipment is in the nature of a laboratory setup, and that the various units are purposely out of proportion to enable him to carry out various experiments. He proposes to abandon the present plant as soon as he has completed his experiments, and build a new and much higher power plant which will, he says, definitely deliver a surplus of power on a scale sufficiently great to make the venture a commercial proposition. This projected plant, to be located at Santiago de Cuba, is expected to deliver a power of 25,000 kw., at an installation cost of $60 per kilowatt.

The cold water exhaust from the condenser may possibly provide what may be termed a valuable byproduct, in that it might easily be used for refrigeration purposes to cool, by more or less natural means, tropical buildings in the vicinity of such a sea power plant. The occupants of such buildings might thus be visualized as "turning on the cold," just as we in northern climes turn on the steam heat in winter.

A 400-Ton Pipe!

During the course of a lecture before the American Society of Mechanical Engineers, recently, Professor Claude gave the following figures. The weight of the cold water pipe is 400 tons, and only one tenth of the water it brings to the surface is actually needed for cooling purposes; if the diameter of the warm water pipe was reduced accordingly to one tenth of its present size, difficulties would be encountered owing to friction and heating of the water on its way up. The volume of both warm and cold water flowing into the boiler and condenser respectively is 200 litres, or approximately 52 gallons per second. "The loss of head in the pipe," said Professor Claude, "and the excess of density of the column of cold water for one metre of the temperature difference of half a metre in the tube, caused in the pit a three-metre depression, which shows how small is the work to bring up cold water, although some arbiters assumed that the tremendous work required to pump cold water condemns the process."

This means that, on starting to pump from the cold water pit, the water level in the pit will fall nine feet and remain there, owing to deep sea pressure forcing cold water slowly up into it.

As is customary in such cases, Professor Claude's pioneer ideas have met with a considerable amount of adverse criticism. Indeed, as one British technical journal of high standing put it a few years ago: "If it were not for the unimpeachable standing of the promoters and their splendid record, we might with some justice have condemned the efforts of the most honest man! Referring to his difficulties, he said that "obstination is the best policy for an inventor."

Professor Claude is responsible for the formation of several new industries. His investigations of rare gases, for example, resulted in the invention and perfection of the neon glow tube signs which we are so accustomed. He also developed the use of acetone as a solvent for acetylene, processes for liquefying air and other gases, and for the fixation of nitrogen. His researches also resulted in the setting up of an important industry for the manufacture of synthetic ammonia. - A. D.
**Answers to Scientific Problems and Puzzles on Page 822**

**Resonance in Tuning Forks**

T HAT a tuning fork picks up more sound energy through its box than it does from the sound that strikes its prongs can be demonstrated by removing the fork from its box and trying the experiment. In this case the tuning fork so removed must be remounted until in unison with the transmitting fork as the resonance box on which it is mounted has a very appreciable affect on the frequency of the fork. Under this condition the receiving fork will still fail to vibrate as vigorously when removed from its box as when properly mounted. In fact it is rather difficult to get it to vibrate at all unless mounted. We thus force believed that the top of the resonance box receiving the sound energy imparts its energy to the stem of the fork and this in turn to the prongs. Is it not strange that the stem, which is jiggling back and forth with a longitudinal motion, can set the prongs vibrating back and forth with a transverse motion?

**Where Will the Air Go?**

AIR that is pushed south is pushed from a latitude that is moving more slowly eastward with the earth's rotation than is the latitude toward which the air is blowing. On this account air that is moving toward the equator tends to lag behind the surface toward which it was originally pushed. That is, it drifts to the west.

These statements are true only for the northern hemisphere. In the southern hemisphere, air that is pushed south blows southeast, for it starts moving more rapidly eastward than the ground to the southward which it is directed. Thus it tends to gain on the region to the south and hence drift somewhat eastward.

**Energy of Gasoline**

A POUND of gasoline has about 20,250 B.T.U. of heat energy and each B.T.U. has an equivalent of 778 foot-lbs. of mechanical energy. Then since a gallon of gasoline weighs about 5.856 lbs. we find by multiplying these numbers together that a gallon of gasoline has 88,000,000 foot-lbs. of energy. Now it takes 2000 ft-lbs. to raise a ton one foot, so it takes 40,000 times as much to raise 40 tons a thousand feet or 80,000,000 foot-lbs. Thus a gallon of gasoline has not only enough energy to raise four ten-ton trucks to the top of a mountain a thousand feet high but has about 8,000,000 foot-lbs. to spare.

**Effect of Static Electricity on Water**

A CHARGED body, such as a rubber comb, when brought near a falling stream of water will draw the drops of water together by an action that is called "induction." According to the electron theory of this action the comb has an excess of electrons and hence is negatively charged. These electrons repel similar charges in each water drop to the side of the drop farthest from the comb. This leaves the nearer side of each drop positively charged and the farther side negatively charged. Any two drops that happen to be near each other will now have opposite charges on the surfaces closest together. Since opposite charges attract, the drops will be drawn together to form a more continuous stream.

**The Radiation Teeter-toter**

IN this teeter-toter it will be noticed that the lower bulb is exposed to the sun's rays while the upper bulb is shielded by the screen. The lower bulb then gets warmer than the upper bulb can, the air inside expands and forces the water in the joining tube to the other side. As a result the system rocks over into the alternate position and the oscillation in the reverse sense is soon repeated.

**Water Pipe Elocution**

WHEN water flowing in a pipe is suddenly stopped by the closing of a faucet its inertia tends to make it keep on going. The result is a violent jarring or hammering sound in the pipe. This hammering may continue for some time but some part of the air enclosed in the air inside expands and forces the water in the joining tube to the other side. As a result the system rocks over into the alternate position and the oscillation in the reverse sense is soon repeated.

**In Radio News for January, 1931**

Zeb Burch describes the South American flight of the "Good-will Pilot Radio" plane. This is the first instalment of three. The operation of the Stenope Radio-stat is explained in detail by Dr. James Robinson, its inventor. A. Dinsdale "debugs" television in an interesting historical subject of the and an estimate of its future. A three-page article, with about thirty pictures, describing the new midget receivers and discussing their place in the field.

The Air Cell—a presentation of something new in radio, a battery that provides "light socket operation" for those beyond the power lines. This battery breathes air and uses ordinary drinking water. It is employed with the new 2-volt tubes.

Carl Butman discusses the Federal Radio Licensing Requirements.

Don Bennett writes for the benefit of the newcomers in radio in telling how to build an amateur transceiver.

"Radio Rides the Airways"—an article on the communications system of the T. A. T. Mail Line.

"Europe Puts the Pentode to Work"—by L. Elden Smith.

The usual departments, including a new comment by George F. Eishen ing, entitled "In the Radio News Laboratory."
new science known as sound-ranging came into being, having as its objective the detection and location of the origin of sounds emanating from enemy artillery, submarines and aircraft.

All the armies engaged in the struggle camouflaged their artillery so as to make it invisible to enemy reconnaissance airplanes, or indistinguishable from the surrounding landscape, so that it became necessary to devise methods of locating the guns by the noise they made. This was achieved by placing a microphone at the small end of a megaphone or trumpet and moving the trumpet about until the sound was loudest, indicating that the microphone was pointed in the general direction of the offending guns. A second similar arrangement, placed some distance away along the front line trenches, gave a second directional indication, and the two bearings, plotted on a map, indicated the position of the enemy battery, which could then be shelled until it was silenced. Another method, which indicated the distance of the guns, consisted of using two microphones, one above ground and the other buried. The ground between a better transmitter of sound waves than the air, the buried microphone picked up the sounds of the submarine's engines and propellers. Hydrophones were also used on board ships. By making observations simultaneously from several widely separated points, the approximate position of the submarine could be determined by triangulation. Once roughly located, a surface craft, equipped with a hydrophone, would cruise round the approximate position until it arrived as nearly directly over the submarine as possible, when it would proceed to release depth charges, while dashing round in an ever-widening circle about the position. Towards the end of the war, very few German sub-

series of trumpets which can be directed to any part of the sky, but the weird-looking French device illustrated on page 794 operates purely mechanically. The firing of the horns or horns is so mounted that the operators can swing them, as a unit, to any point of the compass, and to any angle of elevation, so that the entire sky can be covered. Each opening of the honeycomb structure is the wide end of a horn, the narrow end of which is connected to a tube. All the tubes from each unit are coupled to large horns and these, in turn, all terminate in two stethoscope arrangements which terminate at the ears of the two listening operators. By means of devices like these, the faint sounds of approaching aircraft can be picked up long before they would otherwise be audible. And, further, these sounds can be made to tell their own story and divulge the location of the aircraft, their flying speed, height and distance away.

Butterfly Wings

(Continued from page 796)

and here they will remain firmly imbedded.

One pair of wings can be used to give a print of two pairs of wings. One side will give the upper surface of the wings, the other the under surface. In this way we have prints of the butterfly wing showing us both the upper and under surfaces. A number of such prints mounted on white cardboard in an album gives an excellent collection of butterflies, which remains immune to insect and fungus attack. They will remain perfect, for the paraffin used in the wax paper is sterile and is a preservative.
The clam that raises the fish's children.

and seems to serve no other purpose.

Yet some naturalists, believing that the shark is quite capable of finding his own food, think that the pilot-fish's share in the partnership is exclusively food-finding, and that he also performs some service as yet unobserved. Even if this turns out to be the case, the association must have proved highly satisfactory to both parties, for it has been observed and written about for centuries.

At first glance it would seem that there could be no way for a clam or oyster to cooperate with a fish—yet one of the most remarkable partnerships in Nature exists between the large mussels of lakes and streams and the fish called the Bitter Carp or Bitterling. Their association is in force only during the breeding season. At this time the female Bitterling develops a long orange-red egg-laying tube. It looks much like a worm almost as long as she is.

It is thought that the mussels use this tube as a service to the fish, since the mussel is her home and the eggs are deposited into the shell every time the mussel is penetrated. As the clutch is laid and the mussel finally leaves the young, again the tube is thrust out. The experiments conducted by Mrs. Missel showed that the mussel would not accept the eggs in any other way.

In the Second Year the Bitterling matures and the female returns to the mussel bed. She is then able to lay thousands of eggs in the mussel shell. The mussel takes in the eggs and eventually secretes a shell around them.

The mussel then starts to grow and the fish assisting the mussel by providing a home for the young ones. The mussel in turn becomes the home for the young fish. The mussel is thus able to grow larger and larger shells.

Wise Hermit Crab!

You would naturally expect any creature who is forced to find new unoccupied lodgings of the right size every few months to be of very alert and reasoning mentality—and, as a matter of fact, naturalists who have observed hermit crabs in aquariums have a high estimate of their intelligence and resourcefulness.

This is nowhere better seen than in the clever arrangement which the hermit crabs have made with those strange animals that look like flowers—the anemones.

The hermit crab was not satisfied with finding a mere empty shell for protection; he desired to further fortify himself by the addition of a valuable security against being eaten—a guarantee against becoming the victim of some hungry fish.

The crab noticed that the anemone is let severely alone. Practically no creature tries to make a meal of it. This immunity is partly due to the fact that this strange flower-like animal is provided with stinging threads which can be shot out and will penetrate the scales of small fish and kill them. Then again, larger fish, finding the anemone undesirable because of a slimy, highly objectionable secretion from its skin.

Our clever hermit knows that a big fish's palate teeth are strong enough to crush his shell if the fish really wants a meal of crab—but he also knows that the fish will pass him up if it cannot secure him without getting a distasteful secretion from the shell. So the crab joined forces with the anemone. Now, in exchange for his roof service, the anemone gets, free carriage to better feeding grounds with a share of the crab's food.

There are many illustrations in botany of plants that have taken particular care to insure that ants shall feel at home on their stems and leaves. Why?

The Prince of Space, by Jack William-
by the amateur chemist in the preparation of indigo requires greater care than he has ordinarily to exercise to insure success. Treat aniline with a concentrated solution of monochloracetic acid until a solid mass is formed. Then heat this mass gently with sodium amide (prepared by passing absolutely dry ammonia gas over fused sodium metal which must be protected from the air) until the color base of indigo, indoxyl is formed. This undergoes rapid oxidation to form indigo.

Phenol, commonly known as carbolic acid, a powerful disinfectant, may readily be prepared from aniline, one of the great bases of a family of dyes. Place about 50 cubic centimeters of water in a large beaker and with constant stirring add 11 cubic centimeters of concentrated sulphuric acid; continue the stirring and add 10½ cubic centimeters of aniline. Place the beaker in a freezing solution and continue to stir until a white solid separates out. Then cool the solution to the freezing point and cautiously add 8 grams of powdered sodium nitrite. In order to keep the temperature at 0° C. or below, add more ice from time to time. In order to neutralize the excess of nitrous acid formed in this reaction, it is necessary to add 2 grams of urea. Continue the stirring operation for about 15 minutes. To distill over the phenol, allow the cold solution to drop slowly from a dropping funnel into a boiling solution of 200 cubic centimeters of a 10% solution of sodium bicarbonate and 10 cubic centimeters of concentrated sulphuric acid in a 1000 cubic centimeters distilling flask. The mixture should be kept at the boiling point until about 250 cubic centimeters of the distillate has been collected. Diazobenzene sulphate is formed. The phenol may be recovered from the above distillate by saturating it with salt and recovering it with ether. Allow the solution to stand over fused sodium sulphate for a sufficient period, then allow the ether to evaporate and distil the phenol from a small flask.

Phenol has a boiling point of 183° C. If the phenol obtained is colored, re-distil carefully.

The preparation of the dye, fluorescein, requires considerable time and skill. Grind 22 grams of resorcinol with 15 grams of phenyl anhydride and heat on an oil bath to 180° C. As soon as the mass is thoroughly fused, 7 grams of powdered anhydrous zinc chloride are added with constant stirring. The temperature is gradually increased to 210° C., until the liquid has become a solid. The mass is then cooled, powdered, and boiled with dilute hydrochloric acid to dissolve the zinc oxide first formed. Collect the fluorescein on filter paper and wash with water until the washings give no test for acid; then dry.

Fifteen grams of fluorescein should be added to 60 grams of alcohol and then 11 cubic centimeters of bromine added drop by drop. In this reaction the fluorescein first becomes soluble, and then precipitated in the form of brick-red leaflets. The mixture should be allowed to stand for one hour after all the bromine has been added; then filter, and dry the residue at 110° C. By this process, the most important salt of fluorescein, is produced. This is the dye commonly used in red ink.

The Hand That Encircles The World

There's Romance In Architecture

The man who loves the code is for touch with the world. Enroll in Technical and Industrial Correspondence Schools and soon you will be an expert operator. Write for Free Booklet, "The Master Teacher." GUARANTEED To Teach You. Write for Folder "E-19.

TELEPLEX CO. 36 Cortlandt St. New York

If you reside in Canada, send this coupon to the International Correspondence Schools, Limited, Montreal, Canada.
Unscrambling the Ether

(Continued from page 790)

The effect of what is now known as the Robinson system of radio direction finding. This system permitted, for the first time, the installation of a direction finding receiver on the airplane itself, thus obviating the necessity for the planes to transmit while their bearings were taken by separated ground stations, which could only handle one plane at a time. All the Allies, including the United States, installed the system on their war planes.

Dr. Robinson has several other important inventions to his credit, particularly inventions in connection with radio direction finding work, but I have not space to describe them here.

The end of the war found Dr. Robinson head of all wireless research and development at the British Air Ministry, and in this capacity he sat on many national and international committees which had to deal, amongst other things, with the allocation of wavelengths. It was during the course of this work that the overcrowded condition of the ether was driven home to him.

It was not until 1927, however, that he determined to tackle the overcrowding of the ether and, as a result of long study and field work, he decided to apply the principles to reception from existing stations.

So far, in radio communication, the only characteristic of a quartz crystal which has received considerable attention is its ability to act as a very practical constant frequency oscillator. The fact that its resonance curve is exceedingly sharp has not been widely applied. What Dr. Robinson has done in the Stenode Radiostat, therefore, is to include in a more or less standard receiver a quartz crystal oscillator circuit, the sharp resonance curve of which acts as a sort of narrow bottle neck through which incoming signals, at radio frequency, must pass. The width of this bottle neck in electrical terms is, as already mentioned, not more than about 100 cycles. The circuit diagram of the crystal circuit is given in Fig. 1, from which it will be seen that the crystal is placed in one leg of a Wheatstone bridge circuit, the condenser C1 being adjusted to balance the capacity of the crystal in its holder.

An immediate objection to the use of a quartz crystal resonator in a receiver is that its frequency cannot be varied, i.e., tuning from station to station cannot be effected. Some form of frequency changer is therefore necessary, and in the Stenode this takes the form of a superheterodyne. The inductance L in Fig. 1 is coupled to the output circuit of the last intermediate stage, and the output of the crystal circuit goes to the grid of the second detector.

![Fig. 2](image)

![Fig. 3](image)

![Fig. 4](image)

![Fig. 5](image)

![Fig. 6](image)

![Fig. 7](image)

![Fig. 8](image)

![Fig. 9](image)

![Fig. 10](image)
Now we come to the part which radio men find hardest to understand. Why is it that such a highly selective receiver does not cut sidebands and produce a clean broadcast signal?

To increase the selectivity of an ordinary receiver (i.e., narrow its resonance curve) it is necessary to reduce the damping of the circuit. The resonance curve of a cleaned broadcast receiver is as shown in Fig. 2, while that of a highly selective receiver of low damping is as shown in Fig. 3. If a momentary impulse is applied to a circuit having the response curve of Fig. 2, the current will gradually build up to a maximum value as shown in Fig. 4. When the impulse ceases, the current will fall to zero practically instantly. In contrast to this, if an impulse is applied to a circuit of low damping, the current will build up more rapidly, and to a higher maximum, as shown in Fig. 5 and when the impulse ceases the current will persist, i.e., the circuit will oscillate.

Referring to Fig. 6, rapidly succeeding impulses, P, Q, R, S, will produce in a highly damped receiver a current response curve as shown at a, while the current response curve of a lightly damped receiver will be as shown at b. In the former case, the highly damped broadcast receivers we are accustomed to visualizing the fluctuations of the incoming radio wave, due to modulation, which may be anything up to 100%.

In the latter case, the circuit of zero damping the current will persist, i.e., the circuit will oscillate.

Thus, the principle of the Stenode's operation. By the time the carrier wave reaches the second detector the degree of modulation is reduced to something like 10 to 15%. This process greatly attenuates the higher audio frequencies by comparison with the lower audio frequencies, so that the curve of the input current to the A.F. amplifier is similar to curve a in Fig. 10. By so designing the A.F. amplifier that it will produce a curve similar to curve b, all A.F. frequencies are amplified uniformly, so that the characteristic curve of the output current to the loud speaker is similar to curve c.

Television in Germany Today

(Continued from page 807)

receiving the official experimental broadcasts, Telekor, for instance, has a complete tele-cinema installation for a higher number of pictures, and the Fernseh-A. G., a "tele-talicie" installation for the standard number of picture elements (1200), but a higher number of pictures (25 as against the normal 12½). The Telekor people now use a new synchronising method, similar to the phonic wheel synchroniser used by Baird and Jenkins, which eliminates any fluctuation of pictures, thus securing a satisfactory long-distance reception throughout the range of the transmitter. Another novelty of theirs which is destined to revolutionise the business end is a new image adjuster, which enables images to be adjusted to their proper phase by a swift and simple manipulation. It is significant of the cooperative spirit now prevailing in the field, that the same constructors should design their receivers with a view to the rapid exchange of discs when changing over from German to English television broadcasts.

Both English and German transmitters use a 30-hole disc, but the former uses vertical scanning with a picture ratio of 7 to 3, while the latter uses horizontal scanning with a picture ratio of 3 to 4. A change of receiver discs and an alteration of the position of the necks are more essential.

Another exhibit of the Telekor Company was a screen receiver for projection on a frosted glass plate of images measuring 6X8 inches. Finally, the great improvement obtainable by an increase in the number of picture elements was illustrated by two receivers comprising 42-hole discs, instead of the standard number (30). These, of course, were connected by wire to the firm's own transmitter, any wireless broadcasts on this enlarged wave-band being for the time being, out of the question.

Apart from their standard receivers, the Fernseh-A. G. also showed a mirror-drum receiver synchronised by the same method and with the same amount of energy as a Nipkow disc 12 inches in diameter. This receiver is to be used for small screen television. A standard Baird Television was likewise on show, but on account of differences in standards, it could not be demonstrated in actual operation. Kits of branded parts for television fans were shown by both firms. So far, however, no apparatus is actually on sale in Germany. The Telefunken Company did not demonstrate Dr. Karolits' apparatus at the 1930 exhibition.

Now, consider curve b in Fig. 6 for a moment. In a circuit containing zero damping and zero resistance, it is obvious that the current shown by curve b is on the way to building up to infinity. If we could flatten it out at a given current level—put a ceiling on it, as shown in Fig. 8, we should then change the appearance of the Fig. 7 curves to something like Fig. 9. What may be termed the "working portion" of the curve, which contains the modulation which we are interested in, is now reduced proportionately as indicated at Fig. 8. In other words, we have demonstrated the wave considerably, and the manner in which it was done was to boost up considerably the C.W. component of the wave, while keeping the modulation component at the same unamplified level. To extract from the carrier wave the intelligence which we desire, i.e., speech and music, all we have to do is skim the cream off the milk, as it were. By doing so, we remove, by means of the detector tube, the working part a in Fig. 9, and in doing so we never approach the zero line Z.

To increase the selectivity of the modern Baird Televisor we are accustomed to visualizing the fluctuations of the incoming radio wave, due to modulation, which may be anything up to 100%. In other words, the circuit of zero damping the current will persist, i.e., the circuit will oscillate.

Thus, the principle of the Stenode's operation. By the time the carrier wave reaches the second detector the degree of modulation is reduced to something like 10 to 15%. This process greatly attenuates the higher audio frequencies by comparison with the lower audio frequencies, so that the curve of the input current to the A.F. amplifier is similar to curve a in Fig. 10. By so designing the A.F. amplifier that it will produce a curve similar to curve b, all A.F. frequencies are amplified uniformly, so that the characteristic curve of the output current to the loud speaker is similar to curve c.
Sunshine is HEALTH

And daily sun baths are the chamelion form of health insurance. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

$15

PALM BEACH SUN LAMPS

Recommended by leading physicians everywhere. Use a Palm Beach Sun Lamp and sport a coat of tan all winter. Send for free booklet, "Sunshine is Health." Mail orders sent direct to us will be filled promptly. Lamps sold on absolute guarantee of satisfaction or your money back.

KEENE CHEMICAL COMPANY, INC.
Dept. 8, 308 East 23rd Street, New York City

Compact Bedroom Suite

(Continued from page 821)

this groove at the front cut a mortise 3/4 in. deep for the division clamp. (See also Fig. 10).

Groove the back edge of carcass top visions and shelf into their respective grooves, completes the finished carcass. The drawers are now to be considered.

DRAWERS

The drawer fronts should consist of quartered oak, care being taken to select dry timber. Groove the drawer fronts on the inside faces for the drawer bottoms, and fit slips to the sides. Rebate the bottoms on three edges to fit the fronts and slips, push in from the back, and slot-screw up into the backs to allow for shrinking. For fitting to the carcass, the drawer fronts and sides are allowed 3/16 in. wider than the finished sizes in Fig. 7. Small stops are fitted to the drawer rails behind the fronts.

The door construction is quite simple.

Stiles and rails should be of quartered oak, whilst the panels of oak-faced plywood should show a quartered grain on the edges. An alternative door section is given in Fig. 11, introducing a solid panel.

Fig. 11 gives a general idea of the door construction.

Rebate the left hand meeting stile and work a bead and rebate on the right hand meeting stile. Haunch-tenon the rails into the stiles to form two frames. Clean up the oak-sided panels, glue and pin on top of the frame, afterwards filling the pin holes with dark wax stopping. The under facings (A9) are intended to be of white sycamore, whilst the top facings (A10) are of ebony. Glue and

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions Used in Playing this fascinating Instrument. Our new Hawaiian Instruc tion Pictures show how. Everything explained clearly.

Play in Half Hour


GIVEN

Hawaiian Guitar, Carrying Case and Playing Outfit

Value $20 to $25


FIG 3-FRAMING JOINTS  FIG 4-POST AND RAILS  FIG 5-ALTERNATIVE PANEL

Various constructive details of the bedstead, showing how joints are made.

to a width of 3 3/2 in. and a depth of 5/16 in. for the back. Groove across the bottom board for the divisions (R) and stop 2 3/4 in. from the front edge as shown in Fig. 8. Vertically in line with these grooves work two more in the cupboard top (similar in size) for the divisions. Groove out the vertical divisions for the shelf (S) to a depth of 3/16 in. These divisions and shelf are the only interior fittings.

Work grooves on the inside edges of drawer rails (K) for the drawerboards, and 3/16 in. tenons each end to fit corresponding mortises in the end clamps (I). Cut a mortise in the top drawer rail 3/16 in. deep for the tenon of the division clamp (O), the mortise to come vertically in line with the one already cut in the top. (See Fig. 10.)

Shape up and ebonize the blocks (A) and slot screw these to the carcass bottom. Fit the drawer runners next. Cut a tenon 3/4 in. long to enter drawer rail at front.

Groove the runner (M) 1/4 in. for the drawer division (N) as in Fig. 10, and also cut a tenon 1 1/2 in. long at front to fit the groove in the drawer rail (K). Guides are necessitated by the cramped carcass ends and should be pinned on.

Fit drawer runners above the cupboard top (Q) 3/4 in. oak ply back, screwed in position after slipping the drawerboards and...

Good exposure is greatly needed. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

Approved 9th Floor, Woolworth Bldg., Dept. 240.

Good exposure is greatly needed. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

Approved 9th Floor, Woolworth Bldg., Dept. 240.

Good exposure is greatly needed. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

Approved 9th Floor, Woolworth Bldg., Dept. 240.

Good exposure is greatly needed. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

Approved 9th Floor, Woolworth Bldg., Dept. 240.

Good exposure is greatly needed. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

Approved 9th Floor, Woolworth Bldg., Dept. 240.

Good exposure is greatly needed. They revitalize, discourage infection, and keep you up to par. Five-minute exposure is equivalent to one hour of midsummer sunshine. Good for every member of the family, but particularly for the children.

Approved 9th Floor, Woolworth Bldg., Dept. 240.
pin to panels, using white polish, so as to keep the facings their natural color. A doctor, who is glued and pinned to the drawer rail (K). Clean down the job with fine No. 2 glasspaper for polishing to the blue oak shade.

The following brasswork may be used: Pair 2 in. brass nuts with screws; two bullet catches for doors; one pair small barrel bolts for doors.

**Cutting List for Bedstead and Tallboy**

<table>
<thead>
<tr>
<th>Long</th>
<th>Width</th>
<th>Thick</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>Blocks</td>
<td>1</td>
</tr>
<tr>
<td>B-2</td>
<td>Head post</td>
<td>2</td>
</tr>
<tr>
<td>B-2</td>
<td>Foot panel</td>
<td>2</td>
</tr>
<tr>
<td>B-3</td>
<td>Rails</td>
<td>4</td>
</tr>
<tr>
<td>D-1</td>
<td>Rails</td>
<td>4</td>
</tr>
<tr>
<td>D-1</td>
<td>Rails</td>
<td>4</td>
</tr>
<tr>
<td>E-1</td>
<td>Head rail</td>
<td>4</td>
</tr>
<tr>
<td>F-1</td>
<td>Head rail</td>
<td>4</td>
</tr>
<tr>
<td>G-1</td>
<td>Panel</td>
<td>4</td>
</tr>
<tr>
<td>H-1</td>
<td>Head panels</td>
<td>6</td>
</tr>
<tr>
<td>I-1</td>
<td>Head panels</td>
<td>6</td>
</tr>
<tr>
<td>J-1</td>
<td>Furniture</td>
<td>6</td>
</tr>
<tr>
<td>K-1</td>
<td>Furniture</td>
<td>0</td>
</tr>
</tbody>
</table>

All sizes are net; thus allowance must be made for planing, etc.

**The Safety Valve**

(Continued from page 827)

preservation it means this: Men tend naturally to become bald. An elderly man with plenty of hair is unnatural. Outside causes such as hair bands against the head, do not cause baldness, though they may hasten the appearance of it. Likewise, hair-growth lotions can at best only check the course of natural evolution. New hair grows on bald areas only where the bald man is a kind of throwback from the path of evolution.

The above explanation may not be true, but it has the support of sufficient circumstantial evidence to make a half-cred case that he is the suffering advance agent, or the glorious primary manifestation, of the evolving new hairless era.

A. J. RANTALA,
Toronto, Ont., Can.

(Please in the years to come man will lose his hair. Not only his hair but his teeth may ultimately disappear as a rule of the day when food was chewed. Then again perhaps in this evolutionary department, future man will dispose of his clothes, hereafter to develop his hair again, as clothing is reduced in weight and garments assume a transparent condition. The fact remains that present man was not intended to be bald—EDITOR.)

**SCIENCE AND INVENTION’S Service to Home Owners and Prospective Home Owners**

*NOTE TO READERS AND MANUFACTURERS*

Whether your interest lies in materials and equipment for building a new home, or in modernizing your present one, or getting new utensils for it, you will find the following list of subjects very helpful; for each subject we have several booklets. These are not just catalogues. Many contain full data on installing and using the products described. SCIENCE AND INVENTION provides them as a service to readers and will add to them from month to month as new booklets are received. To obtain booklets on any subject or subjects listed below, simply use the coupon at the foot of the list, and order by number of subject.

So as to make this list as complete as possible, SCIENCE AND INVENTION invites manufacturers to submit copies of their booklets or other literature. No obligation is involved. Simply address the materials to SCIENCE AND INVENTION, 381 Fourth Avenue, New York City, with a brief note authorizing inclusion of your booklets in future lists.

1. **Insulation**
2. **Incorporators**
3. **Surface Materials and Finishes**
4. **Furniture**
5. **Hardware**
6. **Bathrooms and Bathroom Accessories**
7. **Lumber**
8. **Heating and Ventilating**
9. **Windows, Screens, Doors**
10. **Home Building Materials**
11. **Electric Wiring, Utensils and Appliances**

**Cutting List for Tallboy**

<table>
<thead>
<tr>
<th>Long</th>
<th>Width</th>
<th>Thick</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>Blocks</td>
<td>1</td>
</tr>
<tr>
<td>B-2</td>
<td>Drawer fronts</td>
<td>1</td>
</tr>
<tr>
<td>C-1</td>
<td>Drawer front</td>
<td>1</td>
</tr>
<tr>
<td>D-1</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>E-2</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>F-1</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>G-1</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>H-1</td>
<td>Top</td>
<td>1</td>
</tr>
<tr>
<td>I-1</td>
<td>End clamps</td>
<td>3</td>
</tr>
<tr>
<td>J-1</td>
<td>Bottom</td>
<td>2</td>
</tr>
<tr>
<td>K-1</td>
<td>Drawer rails</td>
<td>2</td>
</tr>
<tr>
<td>L-1</td>
<td>Drawer runners</td>
<td>1</td>
</tr>
<tr>
<td>M-1</td>
<td>Mid</td>
<td>1</td>
</tr>
<tr>
<td>N-1</td>
<td>Division</td>
<td>1</td>
</tr>
<tr>
<td>O-1</td>
<td>Division</td>
<td>1</td>
</tr>
<tr>
<td>P-2</td>
<td>Outer ends</td>
<td>3</td>
</tr>
<tr>
<td>Q-1</td>
<td>Cupboard top</td>
<td>3</td>
</tr>
<tr>
<td>R-1</td>
<td>Drawers</td>
<td>3</td>
</tr>
<tr>
<td>S-1</td>
<td>Staff</td>
<td>1</td>
</tr>
<tr>
<td>T-1</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>U-2</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>V-2</td>
<td>Drawer sides</td>
<td>2</td>
</tr>
<tr>
<td>W-2</td>
<td>Drawer backs</td>
<td>1</td>
</tr>
<tr>
<td>X-1</td>
<td>Drawer back</td>
<td>2</td>
</tr>
<tr>
<td>Y-1</td>
<td>Drawer back</td>
<td>1</td>
</tr>
<tr>
<td>Z-2</td>
<td>Drawer bottoms</td>
<td>2</td>
</tr>
<tr>
<td>A2-1</td>
<td>Drawer bottoms</td>
<td>2</td>
</tr>
<tr>
<td>A4-1</td>
<td>Drawer bottoms</td>
<td>2</td>
</tr>
<tr>
<td>A6-1</td>
<td>Drawer runners</td>
<td>1</td>
</tr>
<tr>
<td>A8-1</td>
<td>Drawer runners</td>
<td>1</td>
</tr>
<tr>
<td>A10-2</td>
<td>Door facing</td>
<td>0</td>
</tr>
</tbody>
</table>

Sizes generally are net.

**Excello Products Corporation**

4332 West 16th St., Cicero, Illinois

**Easy, Quick Way To Get Into**

**Radio**

"I Will Train You At HOME!" Major Rockwell

Learn to Earn $300 to $400 a Month

My new, practical Home Study Course offers you the quick way to add to your earnings, increasing your income as you study the fundamentals. So enroll in the course, we will send you the first two of the series of twelve monthly lessons. We are so confident you will find the lessons valuable that we give you a full refund if you are not satisfied. The course includes instruction in all phases of the radio business. Your materials are sent to you in registered mail. You risk nothing. If you are not satisfied after examining our course, tell us so. Take the first step by mailing coupon NOW for our big FREE Book Offer.

**MAJOR R. L. ROCKWELL**

Dayton School of Aviation
Dayton, Ohio

**Dayton School of Aviation**

Desk M-20, Dayton, Ohio

Mail Coupon For Book Offer FREE!
Advertisements in this section fifteen cents a word for each insertion. Address Radio-Science Publications, Inc., 381 Fourth Ave., New York City.
How to Make and Throw Boomerangers
(Continued from page 791)

that each has a leading or blunt edge and a trailing or tapered edge. Bear in mind that the part of the blade opposite the leading edge is always a trailing edge. The leading edge extends to the midpoint of each wood strip and then a trailing edge is cut along the same on the opposite half. This is so that the leading edge is always presented to the air. For best results, boomerangs have either a flat or hollow bottom, and the top of the blade is arched to present an airfoil surface, such as is found in an airplane wing.

After you have cut your wood to the size and shape desired, hold it with the curved side down over a gas or alcohol flame. As the wood is heated, bend both ends downward, raising the center, to form the dihedral angle. At the same time, twist the wrists so that your left hand moves away from your body and your right towards it, thus imparting a slight twist to the stick. When you look down at the blade you will see a slight right-hand twist, similar to that presented by a drill or corkscrew.

When your boomerang is assembled it will look like a four-bladed airplane propeller, except that its pitch or lengthwise twist is not so great, and that the blades are not flat, but have an upward bend from the midpoint to form dihedral angles. The smaller the dihedral, the higher the boomerang will fly. A large dihedral angle keeps the boomerang close to the ground. The sharper the twist, the smaller the arc in which the boomerang will fly. The less twist, the greater the circle which will be described by the boomerang.

The cross boomerang, shaped like a bird's forefinger, with the curved side inwards. Also move the arm straight from the shoulder, but you can toss in any direction between the hours of twelve and six o'clock through three o'clock.

All boomerangs are adaptations of the basic one which I have described in detail. I have included the two working drawings of the triangular and turkey boomerangs, so that you can readily see that they are merely more complex forms of the original two-piece cross boomerang. From the photographs you will observe that there is no end to the variety of shapes which a boomerang may assume. Just use your ingenuity to create new types. One of the most interesting boomerangs that I ever built I called the Spinning Wing. This is an ordinary straight piece of wood about one-quarter inch thick by 2½ feet long. The curve of the top surface is identical on both sides of the center, the bottom is flat. When it is thrown straight forward and a slight twist is given laterally to the stick, it buzzes around in the air and returns to your hands. Boomerangs can also be made with the ends so curved that a cross-section through the blade will show a perfect curve instead of an airfoil surface. This is particularly true of the parrot type, in which three straight sticks produce a six-spoke boomerang; a bolt through the center keeps the blades in place.

Again I want to tell you that you should not imagine that there are such things as set designs for constructing boomerangs. Try anything that you think will work. Remember that no two boomerangs will behave exactly alike. Each one will differ in some slight way from the next.

MEN WANTED
20 to 35 years old
(Radio)
(First Lesson Free!)

Broadcasting
Television
"Talkies"
Manufacturing
Service
Sales
Auto-Radio
Aviation

See how easy to learn
See how quickly you can get ready for well-paid positions in fastest growing, most prosperous industry.

Big demand right now from employers for broadcast operators, testers, inspectors, service-men, designers, installers, and "trouble-shooters".

$40 to $75 a week — and more!

Wish free radio lesson we'll send you our amazing combined training and employment agreement — good for help in securing a beginner's job when you're only half way through. Guarantee you help in finding a position, satisfactory in salary, after you finish, or money refunded.

A World of Opportunities to Choose From

Rockefeller is building a $500,000,000.00 "radio center" in New York. 20,000 movie theaters have gone "talkie". Auto-radio is selling like wild-fire. Midget sets are selling at rate of 10,000 a day! Aviation, television, servicing, sales—all these mean highly paid jobs and plenty of them. All you need to get one is the kind of training we give you, backed by a real placement service.

Lesson FREE!

Mail Coupon
for free radio lesson and book of thrilling facts about this wonder-industry and how to "break in."

American School
Dept. R-79, Drexel Ave. & 58th St., Chicago

THE AMERICAN SCHOOL
Dept. R-79, Drexel Ave. & 58th St., Chicago
Please send without cost or obligation, free radio lesson and job ticket and radio bulletin.

Name
Age
St. No.

City State

Specialize complete Tools, Dies, Special
Manufacture, Machinery

ATLAS INDICATOR WORKS
825 W. Washington Blvd.
CHICAGO, ILL.
Telephone: Harrison 5777—1100

Moulds as low as $1.50 each.

Take Your Own Lead Soldiers, Indians, Hunters, Wild and Farm Animals


W. E. SCHWARTZ, 212-132nd St., Brooklyn, N. Y.
INDEX TO ADVERTISERS

A
Alexander Hamilton Institute 834
Allied Radio Corp. Inside Front Cover
American Correspondence School of Law 844
American School 861
American School of Aviation 850
American School of Photography 839
American Telephone & Telegraph Co. 839
Anita Institute 844
Archgoth Pen Co. 849
Atlas, Charles 861
Atlas Indicating Works 861
Automatic Water Filter Co. Back Cover

B
Bustian Bros. Co. 842
Batesburg, P. J. F., Co. 844
Bernard & Heller 836
Bierhauer, C. F. 846
Blais Electrical School 831
Bogue, Benjamin N. 850
Brooks Appliance Co. 845
Buescher Band 832

C
Carter Prod. Corp. 858
Centre Publishing Co. 856
Chicago Gear Works 840
Chicago Salvage Stock Store 864
Classified Advertising 860
Cowan, Watson E. 832
Columbus "Tech" 854
Coyne, C. G., Ltd. 842
Coyne Electrical School 773-775

D
D. C. Air Legion 836
Dayton School of Aviation 859
Deagan, J. C., Inc. 862
Delta Specialty Company 841
Detroit School of Lettering 837
Dohe, Engineer 843
Drake, Frederick J. & Co. 841
Dyer, Prof. J. A. 844

E
e Evans, Victor J., & Co. 833
Essex Prod. Corp. 859

F
First Hawaiian Conservatory of Music 838
Fisher, Adam Mfg. Co. 830
Franklin Institute 838
G
Gaston Mfg. Co. 844
Geratner, H. & Sons 854
Greene, W. T. 830

H
High Frequency Laboratories 835
Historical Coach Models, Inc. 837
Hollin, Chas. Co. 848

I
Ideal Aeroplane & Supply Co. 863
Institute of Applied Science 853
International Correspondence Schools 855-863
International Mill & Timber Co. 852
International Typography Exchange 858
Inventors Finance Corp. 832

K
Keely Institute 856
Keese Chemical Corp. 858
Kelsey Company 837
Kirk, W. J. 846

L
Laboratory Materials 846
Lacey & Lacey 832
Lambert Co. 838
Lanmode Corp. 846
Landcaster, Allwine & Rommel 830
London School 850
LaSalle Extension University 839-848-857
Leonard, A. O. 848
Lincoln Airplane & Flying School 849

M
McGraw-Hill Book Co., Inc. 845
Marcel Mfg. Co. 844
Metal Arts Co. 850
Metal Cast Products 826
Miller & Miller 830
Miniature Ship Models, Inc. 850
Muscle Power Company 838

N
National Academy of Music 836
National Electrical School 828
National Radio Institute 770-771
New Method Mfg. Co. 834-838

O
O'Brien, Clarence A. 831

P
Pan American Band Instrument and Case. 857
Plastex Industries 840
Pulaceti, Z. H. 832
Porter Chemical Co. 840

R
R. C. A. Institute 828-829
Radio International Guild 844
Radio & Television Institute 769
Randolph & Co. 830
Roll-O Specialty Co. 841
Royal Sales Co. 846

S
Schiecke, H. C. 830
Slavin Institute 836
Sports Importing Co. 837
Stahl's Outdoor Enterprise Co. 846
Strongfort Institute 826
Superior Match Plants 852

T
Tamblyn, F. W. 834
Thaddeus System, Inc. 846
Teleplex Co. 855
Thaxley D., Co. 842
Twentieth Century Mail Order Corp. 810

V
Van Nistram, D. 832-830

W
Wagner, George Steve 838
Walker Turner Co., Inc. 852

Y
York Tire & Rubber Co. 844

SEND ORDERS TO
Blueprint Department
Science and Invention
381 FOURTH AVENUE
NEW YORK CITY

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)
Answers and Prize Awards in October Puzzle Contest

First Prize, of $10, is awarded to: Earle Mountain, 255 Brow Street, East Providence, R. I.

Second Prize, of $5, is awarded to: Francis Fechner, 32 West Broadway, Salt Lake City, Utah.

The ten winners of one dollar each, are awarded to the following:

Edward Schnitker, 517 South Ave., Toledo, O.
Howard Cadwallader, 133 Mayland St., Germantown, Philadelphia, Pa.
William Wegscheider, 1268 Goodrich Ave., St. Paul, Minn.
Dr. H. S. Herman, 1458 Madison Ave., N. Y. City.
P. M. Ginnings, 414 Northridge St., Greensboro, N. C.
W. C. Anderson, c/o Carrier 36, Waco, Texas.
Vincent Fernandez, 6119 Selma Ave., Hollywood, Cal.
O. Thomas, 4743 West Lake St., Chicago, Ill.

"Heard on Main Street"

PERKINS first asked $15 for his watch, and Jones countered with an offer of $8. Then Perkins offered to knock off one-third, coming down to $10. Jones increased his offer by 12½ per cent., to $9 which left them one dollar apart.

Solving the problem algebraically, we call Perkins' first asking price, X dollars, and Jones' first offer X minus 7 dollars.

Perkins came down to 2/3 X dollars, and Jones went up 9/8 times X minus 7 dollars. At this time there existed one dollar difference, so we have the equation:

\[
\frac{2}{3} X - 9/8 (X - 7) = 1 \quad \text{and} \quad X = \$15
\]

5 lands on 16; 10 jumps 7; 11 jumps 8; 12 jumps 9; 18 jumps 14; 19 jumps 15; 20 jumps 16; 25 jumps 22; 26 jumps 23; 27 jumps 24. We now have ten checkers on the board and the one numbered 3 can remove the other nine and land on 22. The sequence is susceptible of variation.

The Backwoods of Russia

(Continued from page 793)

fashion, and covered with birch bark; then another layer of poles is added, and so on. It is worth remarking here that in many other respects, such as in features, religious equipment, and dress the Oyrots remind one of the hunting Indians of northwest North America. Each Oyrot group has four villages, and moves every three months, transporting their houses, and making the complete round each year. The religion of the Oyrots is known as Shamanism, widely practiced in the Siberian area, with a local variation known as Burkanism, (or Birchanism). Good and evil deities are recognized— their names are Ulgan and Erilk respectively—and dealings with them are carried on through Shaman priests, whose methods and ceremonial devices are much like those of Indian medicine men. For the wealthier adherents the favorite religious prescription of the priests is horse sacrifice, which consists in slaughtering the animal—or several of them—in an insanely brutal way and then, for the poorer Oyrots, the priests recommend sacrifices of milk, fruit, or butter.

Within the past few years the power of the priests has begun to wane. The biggest factor in their decreased importance was the introduction of electric lights in Uala, the Oyrot capital. Wise old men at first poohpoohed the story of the mysterious new lighting method, but curiosity provoked investigation, and in a few visitors came hurrying back from Uala to demand that the Shaman priests match the magic of the new government. That was an order a trifle too large for the priests.
OUR NEW 1931 CATALOG—JUST OUT!
RADIO BARGAIN FLASHES
FROM THE WORLD'S LARGEST RADIO STORE

New A-C Screen Grid & D-C Battery Receivers
Phono Combinations
Dynamic Speakers
SUPER HETERODYNES
AUTO-MANTLE AND ELECTRIC CLOCK SETS

Buy Now
and Save

Prices offered in this catalog are so remarkably low that it will pay you to buy now even for future needs.

Modern UP-TO-THE-MINUTE Radio at Lowest Wholesale Prices...

All the very latest improvements in radio equipment. Large assortment of Screen Grid Sets, D C Battery Sets, Phono-Combinations, Dynamic Speakers, New Mantel Sets, Beautiful Consoles, Slot Machine Sets, Electric Clock Sets, Superheterodynes, New Accessories, Tubes—Parts.

Radio prices have hit bottom—Get your share of the bargains

Never Before
Such Values—
Send for Catalog—It’s FREE

You will find in this book just what you are looking for and all at prices that will greatly astonish you. Because we are the world’s largest radio store, we are able to buy and sell in such large quantities that we can make marvelous savings.

WE HANDLE EVERYTHING IN RADIO

Our immense stock is complete with practically everything of the latest in radio. Quick deliveries and real cooperation are assured you on all of your orders.

Fill Out Coupon and Mail Today

CHICAGO SALVAGE STOCK STORE
509 So. State St.
CHICAGO, ILL.
Dept. 517

www.americanradiohistory.com
The Most Interesting Evening I Ever Spent

Up till 9 o'clock the party was a complete flop. Nobody seemed to be able to get things going. Then Tom walked in. Tom's a live wire, if there ever was one.

He said he'd heard about a one man show anyone could perform with the help of a book he knew about. He had sent for that book, and said he was going to put on the show.

We thought he was joking, and laughed at him, but he sat us all down in the living room, got out a pack of old playing cards, and started to do things that made our eyes pop out of our heads.

For over 2 hours he made those playing cards almost talk. What he could do with those cards just didn't seem human. After it was all over, the gang all crowded around shaking his hand, and patting him on the back. The girls all said, "Oh, Tom! You're wonderful!" It was by far the most interesting evening I had ever spent.

I asked him how he learned it all, for I knew he didn't know a single thing about card tricks a week before. For answer he pulled out a shiny new quarter, and said that one just like it had taught him every trick he had showed us.

And it was a fact! Tom had simply enclosed a quarter with the coupon below, and gotten Walter Gibson's Famous Book of Popular Card Tricks by return mail. You, too, can entertain yourself and your friends with the 101 card tricks it teaches. No sleight of hand is necessary—no hard work to learn. Simply read the book carefully and you can do every trick in it.

And it costs only 25c! Send for it today. The demand is great, and we only have a few hundred on hand.

Simply
Clip
And
Mail
The
Coupon

RADIO-SCIENCE PUBLICATIONS, Inc.
Dept. 2501, 381 Fourth Ave., New York, N.Y.

I enclose 25c. (in stamps or coin) in full payment for Walter Gibson's Book of Popular Card Tricks, which, it is understood will be sent me by return mail.

Name

Street & No.

City...... State...
Turning on water faucets pours Money into your hands

Why drink dirty, germ laden water?

Here, at last, is an amazing water filter that attaches to the faucet and removes instantly the germ laden dirt from drinking water. Housewives everywhere want this Filter the minute they see it. It is a health protection that is needed and should be in every home.

Scientists have proven that water filtration prevents such diseases as Erysipelas, Septicaemia and Diarrhea, and actually lowers the death rate from Typhoid Fever. It is a proven fact that in many communities the water that comes from the drinking faucet is laden with disease germs.

Why continue to take chances with disease and death—why be subjected to danger and possible sickness by drinking raw, unfiltered water?

Dirty drinking water is a thing of the past the minute an Automatic Water Filter is installed. Saves buying expensive spring water. Now clear, clean water is within the reach of all.

Sample Free to Workers

We have arranged a plan that makes it possible for agents to start immediately making big money with the Automatic Water Filter. Good paying territory is open. Our plan enables those who are really interested to obtain their sample for nothing. Mail coupon today for Free Offer Plan.

Agents

If you are earning less than $3.00 an hour and would like to make up to $100 a week and even more, clip and mail the coupon today. The Automatic Water Filter offers quick sales and big profits. Every housewife in your territory is waiting for this health protector.

Guarantee

It makes no difference where you live, or what kind of drinking water you have, the Automatic Water Filter will remove dirt and filth from it. We guarantee it to purify water, remove and filth, protect against contamination and deliver pure crystal clear, sparkling water, or the trial cost you nothing.

MAIL THIS COUPON TODAY

Automatic Water Filter Co.,
Dept.114
2621 N. 3rd St., Milwaukee, Wisc.

Gentlemen—you may send me full particulars of your free offer and big money-making proposition.

Name ________________________________
Address ________________________________
City ___________________________ State ________________