

SPECIAL PHOTOGRAPHY SECTION • PAGES 103 • 116

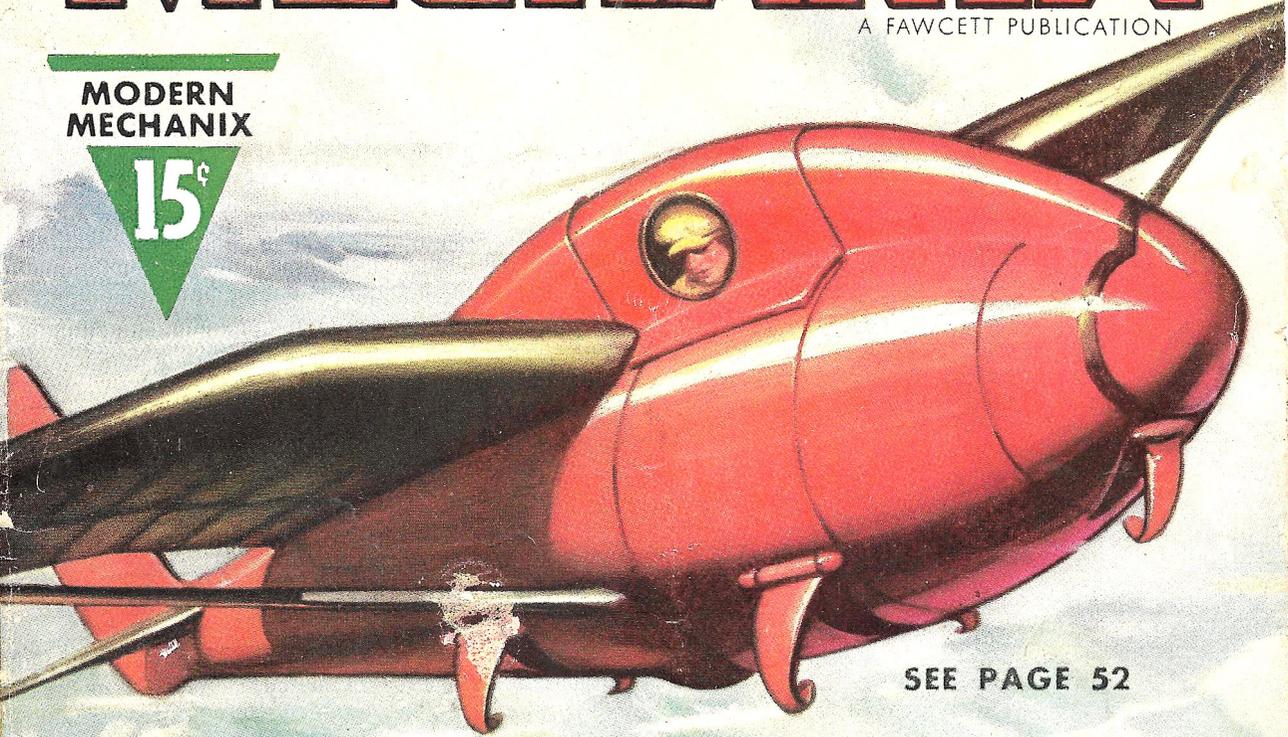
15
JANUARY

MODERN MECHANIX

A FAWCETT PUBLICATION

MODERN
MECHANIX

15¢



SEE PAGE 52



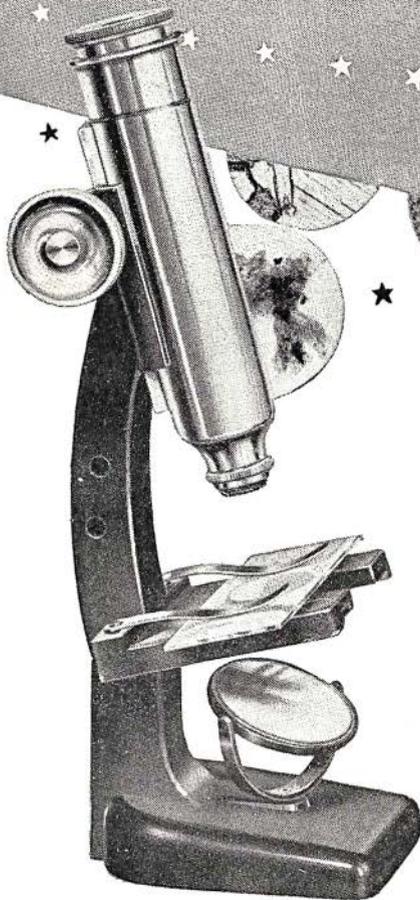
SCIENCE SAVES EYESIGHT

A MICROSCOPE

for Christmas

OPENS UP A LIFE-TIME

OF EXPLORATION



The nature and science enthusiast who finds a microscope among his Christmas gifts, stands on the threshold of a life-time of thrills and excitement. For there are worlds yet to be explored—worlds whose mysteries can be fathomed only through the magic of the microscope. The pleasures of microscopy start with the first view of the unseen world, and continue through the years, each new discovery a stimulus to further exploration. But be sure the microscope you buy is a *precision* instrument—one which will give you the sharp clarity that the scientist properly demands from his equipment.

Bausch & Lomb microscopes are *precision* instruments—built by the same skilled workmen who produce the famous Bausch & Lomb microscopes for medicine, science and research. Shown at left, Bausch & Lomb New Gem, 72 to 150 diameters, \$14.50. Also, Model R, 72 to 300 diameters, with 455-page book, "Adventures with the Microscope," \$21. Portable Microscope Laboratory, \$9.50. Micro-Projector, \$18.50. Professional microscope models, \$38 to \$774.50. *Write for interesting free literature.*

B A U S C H & L O M B

OPTICAL CO.

205 BAUSCH ST.

ROCHESTER, N. Y.

**What will you
be doing - ONE
YEAR FROM TODAY**



THREE hundred and sixty-five days from now—what?

Will you still be struggling along in the same old job at the same old salary—worried about the future—never able to make both ends meet?

One year from today will you still be putting off your start toward success—thrilled with ambition one moment and then cold the next—delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man—don't do it.

There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could advance.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, and, without cost or obligation, at least get the full story of what the I. C. S. can do for you.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 2324-N, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

- | | | |
|---|--|--|
| TECHNICAL AND INDUSTRIAL COURSES | | |
| <input type="checkbox"/> Architect | <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Boilermaker | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Air Conditioning |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Steam Electric Engineer |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> R. R. Locomotives |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Patternmaker | <input type="checkbox"/> R. R. Section Foreman |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Air Brakes <input type="checkbox"/> R. R. Signalmen |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Aviation Engines | <input type="checkbox"/> Highway Engineering |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Automobile Mechanic | <input type="checkbox"/> Civil Engineering |
| <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Surveying and Mapping |
| BUSINESS TRAINING COURSES | | |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Service Station Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> First Year College Subjects |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> French | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> C. F. Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Railway Mail Clerk |
| DOMESTIC SCIENCE COURSES | | |
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Millinery |
| <input type="checkbox"/> Professional Dressmaking and Designing | | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |
| <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Bridge and Building Foreman | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Pharmacy | <input type="checkbox"/> Coal Mining | <input type="checkbox"/> Mine Foreman <input type="checkbox"/> Fire Bosses |
| <input type="checkbox"/> Navigation | <input type="checkbox"/> Cotton Manufacturing | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Fruit Growing | <input type="checkbox"/> Poultry Farming |
| <input type="checkbox"/> Grade School Subjects | <input type="checkbox"/> High School Subjects | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Illustrating | <input type="checkbox"/> Cartooning | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |

Name..... Age..... Address.....

City..... State..... Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

PRICE
15 CENTS

SAME PRICE
IN CANADA

MODERN MECHANIX

January
1938

Volume XIX
Number 3

Circulation over 250,000

Copyright 1937 by Modern Mechanix Publishing Co.

SPECIAL FEATURES

Science Saves Eyesight - - - - - 35

By Donald G. Cooley

Radium From The Arctic - - - - - 42

By James Montanges

Guardians Of The Sea - - - - - 48

By Clifford Peters

Martin—"Early Bird" Of Aviation - - - - - 58

By Robert H. Rankin

The White House Talks To The World - - - - - 64

By James Nevin Miller

Stamps Of Many Nations Commemorate
Grafi Flights - - - - - 70

By Montgomery Mulford

How To Select A Shotgun - - - - - 80

By Robert Page Lincoln

Soap Box Derby Winner Receives College
Scholarship - - - - - 94

(Continued on page 10)

ALSO In This Issue

Modern Photography Section

- Winners Of Photo Awards - 103
- Photographic Monstrosities - 104
- Cabinet Speeds Quantity Film
and Print Drying - - - 105
- Making Photographs In Color 106
- Polaroid Glasses Make Glare-
less Pictures - - - - - 108
- A Clothespin Synchronizer - 110
- Two Practical Projects For
The Amateur Photographer 111
- Short Cuts For The Photo Fan 112
- Photography Handikinks - - 114

Each month MM offers cash awards for the best pictures sent in by amateur photo fans. For full details see page 103.

NEXT MONTH
In addition to many interesting and novel workshop projects that will provide ample outlet for your skill with tools, readers will find many general features of an interesting and informative nature.

Published monthly by Modern Mechanix Publishing Co., 11th St., & Broadway, Louisville, Ky., U. S. A. Business office, 22 West Putnam Ave., Greenwich, Conn. Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Editorial offices: 1501 Broadway, New York, N. Y. Not responsible for unsolicited manuscripts. In U. S. and Possessions and in Canada, 15c a copy; \$1.50 a year. Send subscriptions to Greenwich, Conn., address. Other Postal Unions, \$2.00 a year. East Indian Agent, P. C. Erance Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulation.
W.H. FAWCETT, Publisher RALPH DAIGH, Managing Editor ROBERT HERTZBERG, Editor AL ALLARD, Art Director
THOMAS A. BLANCHARD, JOHN L. SCHERER, CLIFFORD PETERS, Associate Editors
S. S. RABL, Naval Consultant

1939 1940 1941 1942 1943 1944 1945 1946 1947 1948



The leaders of the next ten years will largely be determined in the next ten months. Will you be one of them?

Will You Be Clerk or Manager Ten Years from Now?

SURELY, this could never happen to me," you say—"that I should be sitting at the same desk—be doing the same work—for ten straight years!"
But wait a minute—

Exactly that same thing has happened to thousands upon thousands of men. It has probably happened to men right in the company you now are working for. And—unless you fit yourself for a better job—there is a very good chance that it may happen to you!

Unthinkable? That's what J. N. Dixon of Columbus, Ohio, said to himself. Yet lack of training kept him slaving away at low wages for a long time.

TRIPLES INCOME

Here is Mr. Dixon's own story—"Just after I returned from the war, one of your representatives found me plugging away at a bookkeeper's job in Marietta, Ohio. He performed a real service and explained to me the need of further training, and induced me to take the LaSalle training in Higher Accountancy. After a few months of study, I secured a position with the Trust Department of a National Bank. This was the stepping stone I needed to various responsible positions including handling of receiverships and other important duties. That quickly boosted my income several hundred per cent."

ANOTHER AMAZING SUCCESS STORY

If you think Mr. Dixon's success story unusual, please read what J. H. Krouse of Memphis, Tennessee, says. "When I decided to take your training in Higher Accountancy, I was a clerk. Today I am Chief Consultant Accountant for the U. S. Engineer's Office in Memphis, Tenn. Whatever success or recognition I have had, I owe to your training. I have had no other specialized training along this line. Your method of teaching is not only instructive but highly engaging. I have observed other courses, but firmly believe LaSalle has the best to be had anywhere."

Another bit of proof is Mr. R. P. Barthalow's experience. Mr. Barthalow is Chief of the Sales Tax Section of the Tax Commission of Ohio. A department which handles over \$50,000,000 a year. Mr. Barthalow attributes much of his success to LaSalle training.

SEND FOR These Two Books and Start Toward Bigger Success

Need you hear more before you investigate the opportunities in Accountancy?

Or will you face the problem of your future NOW—and send to LaSalle and get further facts and particulars?

Without cost or obligation, the coupon will bring you two interesting books—one a 64-page book entitled, "Accountancy, the Profession that Pays"; the other "Ten Years' Promotion in One."

How about those next ten years—will you wait or will you START TODAY to realize the tremendous opportunities that lie ahead of you through sound and practical home-study business training?

Measure your grit and ambition by what you do with this coupon—NOW.

LASALLE EXTENSION

LASALLE EXTENSION

Dept. 3493-HR

CHICAGO

Opportunities in Accountancy—Check below and we will send you a copy of "Accountancy, the Profession that Pays," also copy of "Ten Years' Promotion in One," all without obligation.

Higher Accountancy: Leading to position as Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc.

Other LaSalle Opportunities: If more interested in one of the other fields of business indicated below, check that.

- Business Management
- Expert Bookkeeping
- C. F. A. Coaching
- Modern Salesmanship

- Traffic Management
- Law: Degree of LL. B.
- Industrial Management
- Modern Business Correspondence

- Stenotypy
- Business English
- Commercial Law
- Effective Speaking

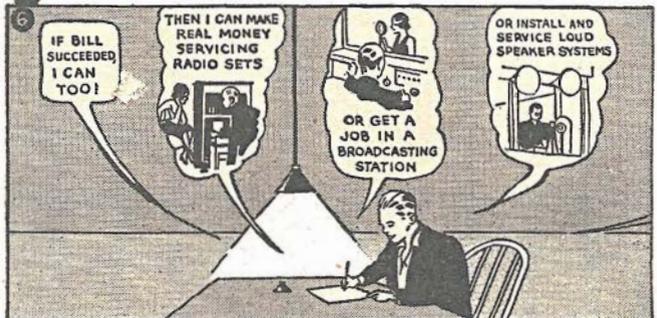


Name

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

When Answering Advertisements Please Mention March Modern Mechanix

HOW A "TIP" GOT TOM A GOOD JOB



J. E. Smith, President, National Radio Institute
Established 1914
He has directed the home study training of more men for the Radio Industry than any other man in America.

I will train YOU too at Home in Spare Time for Good Jobs in Radio

Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert.

Many Radio Experts Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Spare time Radio set servicing pays as much as \$200 to \$500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their statements. Mail the coupon.

There's a Real Future in Radio for Well Trained Men

Radio already gives good jobs to more than 300,000 people. In 1936, Radio enjoyed one of its most prosperous years. More than \$500,000,000 worth of sets, tubes and parts were sold—an increase of more than 60% over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets, and more than 4,000,000 autos are Radio equipped. Every year millions

HERE'S PROOF THAT MY TRAINING PAYS



\$80 Monthly in Spare Time

"I work on Radio part time, still holding my regular job. Since enrolling five years ago, I have averaged around \$80 every month." JOHN B. MORISSETTE, 309 Valley Street, Manchester, N. H.

Makes \$50 to \$60 a Week

"I am making between \$50 and \$60 a week after all expenses are paid and I am getting all the Radio work I can take care of, thanks to N. R. I." H. W. SPANGLER, 126½ S. Gay St., Knoxville, Tenn.



Operates Public Address System

"I have a position with the Los Angeles Civil Service, operating the Public Address System in the City Hall Council. My salary is \$170 a month." R. H. ROOD, R. 136, City Hall, Los Angeles, Calif.



Get Facts about THE TESTED



of these sets go out of date and are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred \$30, \$50, \$75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

Many Make \$5, \$10, \$15 a Week Extra In Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending Extra Money Job Sheets showing how to do Radio repair jobs. Throughout your training I send plans and ideas that made good spare time money for hundreds. I send Special Equipment to conduct experiments, build circuits, get practical experience. I GIVE YOU A COMPLETE, MODERN, PROFESSIONAL ALL WAVE, ALL PURPOSE RADIO SET SERVICING INSTRUMENT TO HELP SERVICE SETS QUICKER—SAVE TIME, MAKE MORE MONEY.

I Give You Practical Experience

My Course is not all book training. I send you special Radio equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus

for use in spare time work from this equipment. Read about this 50-50 method of training—how it makes learning at home interesting, quick, fascinating, practical. Mail coupon.

Money Back Agreement Protects You

I am sure I can train you successfully. I will agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny post card NOW!

**J. E. SMITH, President
Dept. 8AH
National Radio Institute
Washington, D. C.**



This Coupon is Good for One FREE Copy of My Book

**J. E. SMITH, President, Dept. 8AH
National Radio Institute, Washington, D. C.**

Dear Mr. Smith: Without obligating me, send "Rich Rewards Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME..... AGE.....

ADDRESS

CITY..... STATE.....

TO ★

INVENTORS

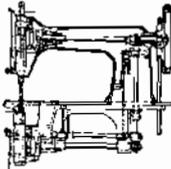
THIS is a message to inventors, for inventors, about inventors. If you yourself have an invention—even though it's only a crude idea in the back of your mind—**READ ON.** Read what other inventors have done—what steps they took—what steps you can take.

First remember this: that to be practical, useful, salable, and profitable, neither an invention nor the inventor need become famous. Most inventions and inventors are not. You know that Morse invented the telegraph; Edison the electric light; Bell the telephone. But who invented the eyelets in your shoes, the tips on the laces,

the hook where you hang your coat, the hundreds of things you use from early morning until you go to bed at night?

In fact, the benefits you derive from the inventor do not even stop at night. You brush your teeth with a patented brush; with paste or powder from a patented tube or container; you wash in a patented basin; bathe in a patented tub; go to bed on a patented mattress, which in turn rests on patented springs.

Yet there is—always will be—room for improvement, progress, INVENTION. And for more INVENTORS! Today's "pipe dream" may become tomorrow's necessity. Most of the things people used even five years ago have been changed, improved, by new inventions. That is because inventors have been busy. Maybe it will pay you to get busy, too. Who can tell?



Double Stitch Sewing Machine

The Double Stitch Sewing Machine shown in diagram form at the left, is one of the patented inventions of Miss Beulah Louise Henry, famous as the leading woman inventor and generally known as "Lady Edison." With more than fifty patents to her credit, "Lady Edison" is still going ahead. The Double Stitch

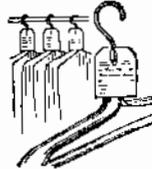
Sewing Machine shown here eliminates the bobbin, practically doubles speed of the average machine, permits use of smaller thread, and is less expensive to manufacture. Among her other inventions are a hair curler, vanity case, rubber sponge soap holder, dolls, toys and typewriter attachment.



Shaving Cream and Toothpaste Dispenser

Apparently Paul F. Roache, the inventor of this dispenser for shaving cream or toothpaste, was tired of having his shaving cream misplaced or of failing to find toothpaste ready for use at a busy moment. So he invented this dispenser to be attached to the wall of the bathroom. Patented certain features of same during 1937. The device first opens the collapsible tube and then discharges a desired

amount of paste and automatically closes the container when released. Handy, indeed, especially when you are in a hurry.



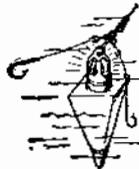
New Type Clothes Hanger

It is to be supposed that Richard D. Moore, who patented this new type clothes hanger in 1937, didn't like the ordinary wire or wooden hanger and decided to do something about it. So he developed and patented a new type hanger which can be made out of compressed paper and which also provides for an identification tag. The tag can be used for advertising purposes or for quickly locating a suit or dress of any patron in a dry cleaning establishment.



Lipstick Spreader and Remover

Another lady takes a hand at invention. Miss Esther M. Butschka patented this little device to be carried in a woman's purse. The container holds small absorbent pads, to be used in place of handkerchiefs or tissue paper, for spreading and removing lipstick. Remove lid of container. Push up the little feeder or knob at the bottom and up comes a pad. Lift off pad. Use it on the lips and then discard.



Illuminated Sinker

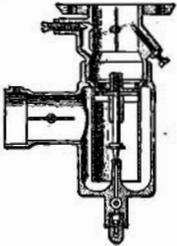
The fact that fish are attracted to light is no recent discovery. Illuminated fishing lures are not new. But James D. Watt decided he had a new and improved method of construction. The sinker contains a dry cell and small light bulb. When fish come "swarming" to the light, they're supposed to smell the bait and presto, they're hooked. There's just no telling where an inventor's mind will turn.

ABOUT INVENTORS



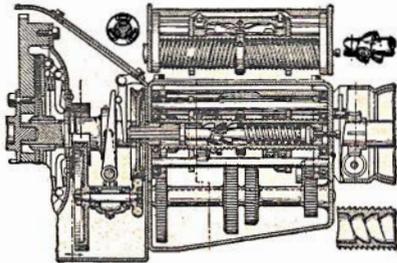
New Type Garter

Dr. Jeremiah Day, another inventor, believes in keeping his socks up evenly all around. The Y support for the garter attachment is designed to distribute pressure on the garter band evenly instead of at one or two points, thus preventing the sock from being up in front and down behind. The garter is also intended to insure greater comfort, and to prevent the possibility of interference with blood circulation. Why wear garters and then keep pulling up your socks?—so reasons this inventor.



Carburetor

Literally thousands of inventions relate to the operation of a gasoline motor. Here you see in phantom another idea for carburetor construction. The inventor's object is to provide a device to be employed either as an up-draft type or a down-draft carburetor and a means to simultaneously control the air and fuel in accordance with the increased or decreased speed of the motor. The inventor in this case is Eugene H. Rustin.



Automatic Transmission

And here we illustrate what is commonly known as a complicated invention. This cross section showing the multiplicity of gears, drives, levers and shafts, serves to give only a crude idea of the mechanism involved in George L. Brown's conception of an automatic transmission. In cases of this character, the patent application frequently taxes the skill and knowledge of the patent attorney to the utmost. The cross section shown here is but one of several views embodied in the actual patent itself, granted by the Patent Office in 1937. It is said that today's automobile embodies the work of thousands of inventors. Certain it is that because of the spirit of inventive progress, the world has traveled a long way from the stage coach stage.

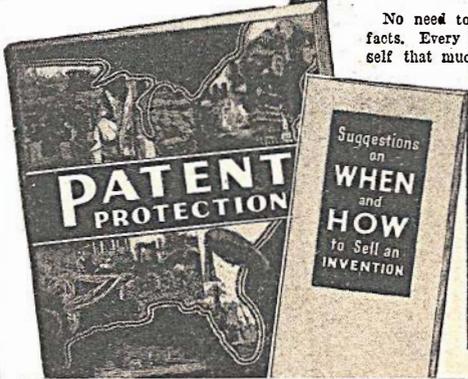
38 Years of Service To Inventors

It has been the privilege of this organization to serve inventors for 38 years. Today here in Washington we maintain a large staff of Registered Patent Attorneys, skilled draftsmen and experienced searchers to adequately represent our clients. Our fees are reasonable; deferred payments frequently arranged. If you have an invention, or have one in mind, your first step should be to secure information regarding Patent procedure. We have therefore in the booklets shown below, set forth many interesting facts and suggestions which other inventors have found helpful.

68 Pages Of Facts For Inventors

Send today for your copies of the two booklets "Patent Protection" and "When and How to Sell an Invention." These booklets will answer many questions regarding the simplest and most direct steps to take to apply for a U. S. Patent and likewise supply facts you should know before you attempt to sell or commercialize an invention. With the booklets comes an "Evidence of Invention" form on which you can quickly prepare a dated disclosure of your invention, a step which may prove valuable to you later on.

No need to delay. Know the facts. Every inventor owes himself that much. Sign and mail the coupon now.



Now Mail
Coupon
for these
FREE BOOKS

VICTOR J. EVANS & Co.

Registered Patent Attorneys

Main Office: 30-A, Victor Building, Washington, D.C.

Other Offices: 2610-B, Singer Bldg., New York
1445-B, Monahan Bldg., Chicago
1010-B, Hobart Bldg., San Francisco
405-B, Garfield Bldg., Los Angeles

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

Name

Street and No.

City or Town State

ELECTRICAL BOOKS
shipped
FREE

10
BIG BOOKS

Brand New Radio Section, Public Address Systems Covered

Here's great news for anybody interested in Electricity. BRAND NEW edition of Applied Electricity including Diesel Electric plants brought right down to date with every NEW Electrical subject fully covered. 10 big Volumes and all shipped FREE for examination.

For Beginners and Experts

Over 3000 pages—hundreds of illustrations—the most complete work of its kind ever published. Dynamos, motors, power stations, radios, television, everything electrical explained clearly so anyone can understand them.

BIG FIELD! Big Demand!

Big Pay! Men who understand electricity are urgently needed right now in thousands of industries. Autos, airplanes, machine shops—practically every industry depends on electricity and men who know this subject make big money. Pleasant, fascinating work, easy to learn and do learn quickly with these books. Send coupon for a set for FREE examination and see for yourself.

SEND NOW [A year's consulting membership in the American Technical Society now given to all readers of this famous Cyclopaedia of Electricity. Many say, "That's worth more than cost of books."]

AMERICAN TECHNICAL SOCIETY
 Dept. E1320, Drexel at 58th St. Chicago

American Technical Society, Dept. E1320, Drexel at 58th St., Chicago
 Send for 10 days' free use, BRAND NEW 10 volume set of Electrical Engineering. In return for mailing this coupon promptly, send certificate of membership in the American Technical Society entitling me to full consulting privilege for one year. I will pay the few cents delivery charges on the books. If I wish I may return them in 10 days and owe you nothing, but if I keep them I will send \$2.00 after 10 days, then \$3.00 a month until the total price of only \$29.80 is paid.

Name _____
 Address _____
 City _____ State _____
 Please attach letter stating age, occupation and name and address of employer and at least one business man as reference.

25¢



"Finest Book On Tools I've Ever Seen!"

Says one expert carpenter, "When I was young I hunted through every available book for information on tools. Just received your *Tool Guide*—wish something like it had been available then. It's the finest book on tools I've ever seen!"

Today, send a quarter for this big 32-page workbench handbook—contains hundreds of illustrations—tells how to adjust, sharpen and care for tools—and how to use them. Add a dime, if you wish, and get 16 complete plans—"Things To Make In Your Home Workshop." Send coin or stamps for one or both of these helpful, profusely illustrated books—NOW.

STANLEY TOOLS
 108 Elm Street New Britain, Conn.

SHORTER FEATURES

Army May Adopt Model Planes As Anti-Aircraft Targets - - - - - 45
 Auto Radio De Luxe - - - - - 51
 Rocket Flight—Dream Or Reality? - - - 56
 "Flivverplanes" Popularize Flying - - - 61

HOW-TO-BUILD FEATURES

An Antique Candle Bracket Of Hammered Brass - - - - - 71
 Unusual Holiday Decorations For The Home 72
 Make This Picturesque Christmas Tree Base 76
 Indoor Rifle Range For Sportsmen - - - 82
 Build A Model Ocean Airliner - - - - - 84
 Magic With Magnets - - - - - 88
 A Revolving Magazine Rack - - - - - 90
 A Novelty Vest Pocket Chess Board - - - 96

FOR THE WORKSHOP FAN

New Wrinkles For The Home Mechanic - 75
 Winter Sports Projects - - - - - 78
 Timely Household Short-Cuts - - - - - 79
 New Ideas For The Handy Man - - - - - 83
 Handikinks For The Shopman - - - - - 87
 Practical Workshop Kinks - - - - - 93
 Electrical Kinks For The Workshop - - - 102

NEW MECHANICAL INVENTIONS

Mt. Palomar Observatory Nears Completion 40
 Lights Reveal Motor Trouble - - - - - 41
 Device Reproduces Weather Within Metal Cabinet - - - - - 44
 Exhibit New X-Ray Machines - - - - - 44
 Scale Model Demonstrates New Type Fluoroscope - - - - - 47
 Machine Sells Train Tickets - - - - - 47
 Electrostatic Device Clears Air Of Smoke, Pollen - - - - - 54
 Machine Bends Pipe 180° - - - - - 54
 Brushes In Sorting Machine "Shave" Fuzz From Peaches - - - - - 57
 Surfboard Has Folding Fin - - - - - 57
 Bike-Boat Steers Like Auto - - - - - 68
 "Cockroaches" Clean Streets - - - - - 68

[Continued on page 12]

VACU-MATIC SCORES AGAIN!

BOB MCKENZIE
TRANSCONTINENTAL AUTOMOBILE CHAMPION
COAST TO COAST

WESTERN UNION
TIMED

NEW YORK
TO
LOS ANGELES
84 hrs. 45 min.

LOS ANGELES
TO
NEW YORK
97 hrs. 55 min.

CANADA
18,000 MILES
18 Days

LOS ANGELES
TO
NEW YORK
AND RETURN
121 hrs. 25 min.

WASHINGTON, D.C.
TO
MEXICO CITY
82 hrs. 37 min.

LOS ANGELES
TO
PHOENIX
6 hrs. 18 min.

MURDO BRIDGEMAN
1937 Buick Wildcat

LOS ANGELES
TO
KANSAS CITY, MO.
24 hrs. 37 min.

ALBANY, N.Y.
TO
GOVERN, N. C.
4 hrs. 31 min.

Vacu-matic Carburetor Co.
7617 W. State St.
Wauwatosa, Wisconsin

Dear Sirs:

Having just completed a new speed record between Los Angeles and Chicago, driving a 1936 Chevrolet equipped with a Vacu-matic carburetor control, I thought you might be interested in knowing some of the facts and the important part Vacu-matic played in the success of the run.

The distance covered was 2322 miles in thirty nine hours and forty-two minutes, officially timed by Western Union, which gave me an average speed of 59.7 M.P.H. based on elapsed time and with the Vacu-matic averaged 18 1/2 miles per gallon on gas-line.

Before leaving Los Angeles, we made several test runs both with and without the Vacu-matic, and the tests proved that Vacu-matic increased my gas mileage 3 1/2 miles per gallon at the driving speed of 60 M.P.H. and also very noticeable increase in both acceleration and power.

After this experience with Vacu-matic, you can depend that on my future speed runs across country that I will be depending on Vacu-matic to give me the same added performance it has proven on this last record breaking drive.

Yours very truly,
Bob McKenzie



Sets New Coast-to-Chicago Record

New Supercharge Principle SAVES GAS

MORE POWER - MORE SPEED
FASTER PICK-UP - NEW LIFE



ESTABLISHING new mileage records on cars in all sections of the country, the Vacu-matic again scores in a new speed record established by Bob McKenzie transcontinental automobile champion. Los Angeles to Chicago—2,322 miles in 39 hours and 42 minutes—driving 75 and 80 to maintain a speed average of 59.7 miles per hour! Here is speed—a grueling grind—where quick acceleration, greater top speed—and less stops for gasoline mean those precious moments saved that make new speed records possible. The same Vacu-matic that helped Bob McKenzie establish this speed record and gave him such fine gas savings is now available for all car owners. It is positively automatic—simple to install—inexpensive—and pays for itself many times over in gas savings.

Automatic - - Nothing Like It!

Vacu-matic is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Easily attached in ten minutes.

Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable territories now being assigned. Check and mail coupon.

The VACU-MATIC Co. Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC must prove itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up and more power, or it costs you nothing. "On my V-8 Ford it works miracles", says Ralph Fields. James Seeley—"On an International Truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas." A. V. Grove—"On the Buick it showed 5 miles more per gallon." F. S. Peck—"I average 22 miles per gal. on my Plymouth, an increase of 7 miles, for a saving of \$15.00 a month, or \$180.00 a year." Wm. Lyons—"Averaged 25 miles on a gal. with a Model A Ford at 40 miles per hour."

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY
7617-355 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

Name

Address

City State.....

Check here if interested in selling proposition.

Train for RADIO IN 12 WEEKS AT COYNE ON REAL EQUIPMENT

The great Coyne Shops in Chicago have a world-wide reputation for training ambitious fellows for their start in this well paid field in only 12 weeks. Then they help you by giving you life-time employment service. By my new plan YOU can take advan age of their wonderful method of learning-by-doing NOW.

SEND TODAY FOR DETAILS OF MY "PAY AFTER GRADUATION" PLAN

Get training in 90 days on Real Radio, Television and Talking Picture Equipment. Send the coupon today. If you are short of money I'll send you all details of my finance plan which tells how you can get training first and you won't have to start paying tuition until five months from the date you start school and then you'll have 18 months to complete your payments. Big Free illustrated Book telling all about COYNE and how many earn while learning, and training you can get without book study or useless theory.

A. C. Lewis



COYNE RADIO & ELECTRICAL SCHOOL

500 S. Paulina Street, Dept. 18-1H, Chicago, Illinois

MR. H. C. LEWIS, President

500 S. Paulina St., Dept. 18-1H, Chicago, Ill.

Send me the Big FREE Illustrated Book on RADIO, and details of your "Pay After Graduation" Plan.

Name

Address

State City



Be Your Own MUSIC Teacher

LEARN AT HOME by wonderful improved method. Simple as A-B-C—a child can learn it. Your lessons consist of real selections, instead of tiresome exercises. Each of these delightfully easy lessons adds a new "piece" to your list. You read real notes, too—no "numbers" or trick music. Method is so thorough that many of our 700,000 students are band and orchestra LEADERS.

Be Popular

Everything is in print and pictures. First you are told what to do. Then a picture shows you how. In a few short months you may become an excellent musician—the life of every party!

Free Book and Demonstration Lesson Write at once for our illustrated Free Book and Free Demonstration Lesson. Please mention your favorite instrument. No obligations. Instruments supplied when needed, cash or credit. (Fortieth Year—Est. 1898.)

U. S. SCHOOL OF MUSIC
2621 Brunswick Bldg., New York City, N. Y.

Pick Your Course
Piano Guitar
Violin Saxophone
Organ Mandolin
German Ukulele
Trombone Harp
Piccolo Clarinet
Flute "Cello"
Hawaiian Steel
Guitar
Trumpet
Piano Accordion
Italian and
German Accordion
Voice and Speech
Culture
Harmony and
Composition
Drums and Traps

RADIO

Auto Radio De Luxe	- - - - -	51
Microphone Aimed Like Gun	- - - - -	54
Radio Sparks	- - - - -	97
Complete Amateur Station Operates From Storage Battery	- - - - -	98
Condensers Improve Efficiency Of Volume Control	- - - - -	101
Reducing R. F. Oscillation	- - - - -	101

AUTOMOTIVE

Auto-Home Developed	- - - - -	40
Legless Youth Crossing U. S. In Motorized Trailer	- - - - -	46
Bus Serves As Diner-Home	- - - - -	52
Builds Midget Powered Bus	- - - - -	57
Device Speeds Tire Changes	- - - - -	69
Winter Aids For Motorists	- - - - -	92

AVIATION

Build Biggest Aero Propeller	- - - - -	44
Home-Built Plane Sets Mark	- - - - -	47
Glider Launched From Cradle Atop Auto!	- - - - -	52
New Zep Nears Completion	- - - - -	63
New Army Plane Designed To Fight Huge Bombers	- - - - -	67
Home-Built Plane Goes 40 Miles On Gallon Of Gas	- - - - -	68

DEPARTMENTS

Problems	- - - - -	18
Chips From The Editor's Workbench	- - - - -	28
Nic Sprank's Oddities	- - - - -	53
Crafts And Hobbies	- - - - -	71
New Ideas For Home And Shop	- - - - -	154

MISCELLANEOUS

New Synthetic Ice Invented	- - - - -	40
Dutch Test Double-Decker Streets	- - - - -	41
Cellophane Used For Sail	- - - - -	41
Models Show Cell Structure	- - - - -	41
Model Exhibit Thrills Scouts	- - - - -	46
Fancy Diver Uses Net "Pool"	- - - - -	46
Doll House Features Complete Interior Furnishings	- - - - -	55
Boys Build Passenger Train	- - - - -	55
New "Pup" Tent Developed	- - - - -	62
Rink Uses Nine Miles Of Pipe	- - - - -	62
Mariner Plans World Voyage In Small Catamaran	- - - - -	62
Early Franklin Generator Lights Modern Highway	- - - - -	63
Scouts Create Tree "Books"	- - - - -	63
Sailor Is Water Salesman	- - - - -	67
Lead Shields Protect Men Filming Radium Story	- - - - -	69
Model Vessel Aids Tourists	- - - - -	69

Become a Draftsman



Enjoy a Real Job in Industry

Steady Work

As nearly all manufacturing—construction—building starts on the drafting table, the draftsman is one of the first to be hired and one of the last to be laid off. It is his blueprints, his specifications, that give the last word in what the workmen are to do. No article—building or construction job is started before the plans drawn by the draftsman have been officially approved.

Good Pay

The draftsman has been called the Junior Engineer which title just about describes his work—position and pay. He combines his knowledge of principles, mechanism and construction details with the ability to draw and reproduce motions and methods on paper. On the average, his salary is considerably above the wages of the mechanic and, of course, less than that of the engineer.

Chance for Promotion

Working on plans, helping design new machines or new methods of construction, the draftsman is working directly with the important men of the organization. Consequently he knows what is being considered and planned. It may be the superintendent—the engineer—or even the prospective buyer with whom he consults. Because of these contacts, his experience and knowledge of the business in general he is in an excellent position to be promoted when next there is a good opening.

Young at 40

Athletes—farmers—and factory and shop workers who rely on muscle start growing old even before they reach 40 while office workers—executives—teachers—professional men, in fact, all kinds of brain-workers are just approaching their prime at 40 to 50. Training increases your value at once and continues to help boost your earning power as you mature and as you increase your experience and background for forming judgments of the firm's policies and methods.

Don't grow old at 40. Train now for the job you want at 50. Training helps you to be independent—self-supporting. It helps you to enjoy associations that are denied the untrained man. Training helps you to increase your earning power and by so doing to offer members of your family advantages far in excess of what you could give them as an untrained man. Train and enjoy **PROGRESS—CONTENTMENT—INDEPENDENCE.**

American School, Drexel at 58th, Chicago



Mail Coupon for 2 Lessons Free

American School, Dept. DD-128
Drexel Ave. at 58th St., Chicago

Without the slightest obligation, send 2 beginning Drafting Lessons and free Bulletin.

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

Address.....

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

2 Lessons Free

Test yourself — see how readily ★
you, too, can learn Drafting

This MACHINISTS' Home-Study Course



helps men get ahead

Newly assembled—specially priced—these five recent books give you the practical facts on modern machines, up-to-date methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency, with the new

Library of Modern Machine Shop Practice

5 volumes—2000 pages—1600 illustrations

(A combined home-study course and reference library)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It deals fully with lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, gear design and production, punch and die work, metal finishing, etc., etc. Plainly written—completely illustrated—this is the best kind of help to the machine-shop man who wants to advance himself.

No money down—special price—easy payments

FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y.

Send me for 10 days' free examination the Library of MODERN MACHINE SHOP PRACTICE. If satisfactory I will send \$1.50 in 10 days and \$3 monthly until the special price of \$16.50 is paid. If not wanted, will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

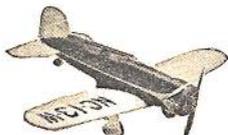
Name _____
 Address _____
 City and State _____
 Position _____
 Company _____ MMX-1-38

MEGOW MODELS

are "TOPS"
for



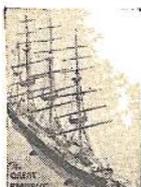
CHRISTMAS:



MISS STRATOSPHERE

Autographed kit of Clarence Chamberlain's high altitude ship, introducing new wood veneer construction. 60c plus 10c postage.

BUILD YOUR OWN SHIP MODELS



BOUNTY
 SETH PARKER
 SANTA MARIA
 QUEEN MARY
 and many others priced from 10c to \$6.00 for complete kit.

The GREAT REPUBLIC Clipper Ship shown here, \$1.25 plus 15c postage.

So easy to get . . . so exciting to build . . . so much fun to own! Either for yourself or as gifts, Megow model kits give you the greatest pleasure! Many new and sensational 30-inch wingspan flying models, also detail scale models and special models autographed by famous aviators have just been added, priced at only 50c and 60c!

Christmas Special!

Al Williams' GULFPAWK shown above. Model kit of famous Grumman, duplicating latest navy fighter—autographed by Maj. Williams. Send for it today, 50c plus 10c postage.

QUAKER FLASH, 67-inch wingspan gas-powered model with 3 1/4 in. rubber wheels for use with any model airplane motor. \$4.95 plus 30c postage.

See your dealer—or order direct. Send 5c postage for new 52-page catalog.

MEGOW'S
 Dept. MM, Howard & Oxford Sts., Phila., Pa.
 Also: 217 N. Desplaines St., Chicago, Ill.

Sensational BARGAINS

Guaranteed \$102.50 Model NOW Only \$44.90 Cash or on Easy Terms



SMALL CARRYING CHARGE

10 Day Trial No Money Down

Positively the greatest bargain ever offered. A genuine full sized \$102.50 office model re-finished Underwood No. 5 for only \$44.90 (cash) or on easy terms. Has up-to-date improvements including standard 4-row keyboard, backspacer, automatic ribbon reverse, shift-lock key, 2-color ribbon, etc. The perfect all purpose typewriter. Completely rebuilt and FULLY GUARANTEED.

Learn Touch Typewriting Complete (Home Study) Course of the famous Van Sant Speed Typewriting System—fully illustrated, easily learned given during this offer.

Money Back Guarantee Send coupon for 10-day trial—if you decide to keep it pay only \$3.00 a month until \$49.00 (term price) is paid. Limited offer—act at once.

INTERNATIONAL TYPEWRITER EXCHANGE
 231 West Monroe St., Chicago, Ill., Dept. 105
 Send Underwood No. 5 (P. O. E. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect. If I keep it I will pay \$3.00 a month until I have paid \$49.90 (term price) in full. For quick shipment give reference and occupation.

Name _____ Age _____
 Address _____
 Town _____ State _____

ANY PHOTO ENLARGED

Size 8 x 10 inches or smaller if desired. Same price for full length or bust form, groups, landscapes, pet animals, etc., or enlargements of any part of group picture. Safe return of original photo guaranteed.

47c
3 for \$1.00



SEND NO MONEY Just mail photo or snapshot (any size) and within a week you will receive your beautiful enlargement, guaranteed fadeless. Pay postman 47c plus postage—or send 49c with order and we pay postage. Buy 15x20-inch enlargement sent C. O. D. 78c plus postage or send 90c and we pay postage. Take advantage of this amazing offer now. Send your photos today. Specify size wanted.

STANDARD ART STUDIOS, 104 S. Jefferson St., Dep. 376-A, Chicago

Learn Profitable Profession in 90 days at Home



Salaries of Men and Women in the fascinating profession of Swedish Massage run as high as \$40 to \$70 per week but many prefer to open their own offices. Large incomes from Doctors, hospitals, sanitariums and private patients come to those who qualify through our training. Reducing alone offers rich rewards for specialists. Write for Anatomy Charts, sample lesson sheets and booklet—They're FREE.

THE College of Swedish Massage
 1601 Warren Blvd., Dept. 158, Chicago
 (Successor to National College of Massage)

Ob Last! A Wireless Pocket Tubeless Radio

WORLD'S SMALLEST REAL PERFORMING RADIO
 Amazing Midzot radio weighs only 3 Ozs. complete. Receives stations with clear beautiful tone. Very little static and interference. Nothing to adjust or cause trouble—should last for years. USES PATENTED FILLED RECTIFIER—ENTIRELY NEW DESIGN. MECHANICAL patent No. 2074887. Not to be confused with cheaply made imitations or UNLAWFUL COPIES. Music and programs come DIRECTLY FROM GRILL OF RADIO! New patented "Speakophone" gives more volume and stations! NOT A TOY! Tuning broadcast band. The newest radio sensation of the year. Absolutely complete with picture instructions for use in hotels, offices, boats, autos, bed, etc. TAKES ONLY A SECOND TO CONNECT—No hookup to any current or extra wires. SATISFIED OWNERS Report wonderful service in ALL PARTS OF THE WORLD. THESE ARE FACTS! Beautiful two color cabinets, six colors, or SEND ONLY \$1.00 and pay postman balance plus postage or send \$2.99 (Check M. O., Cash) and yours will be sent postpaid, GUARANTEED. ORDER NOW.

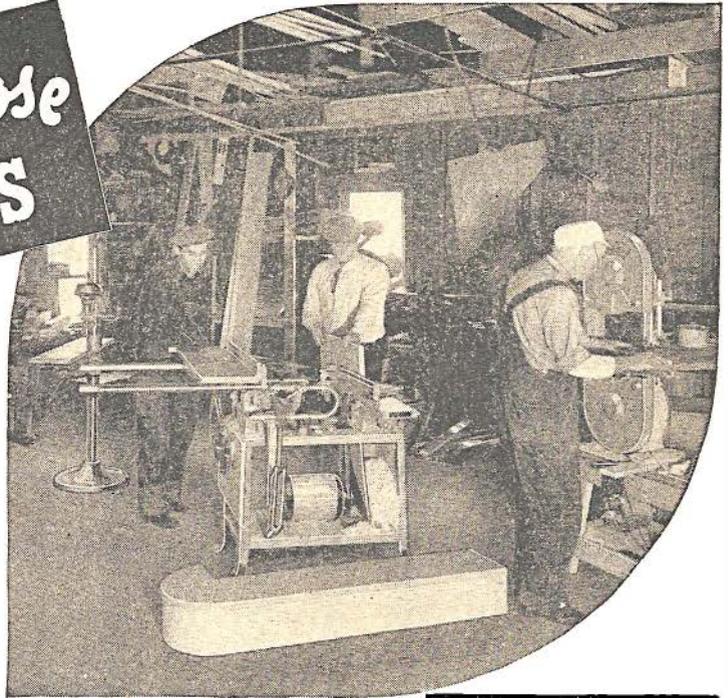
TINYTONE RADIO CORP., Dept. M-1, Kearney, Nebr.

SEND ONLY \$1.00

Two-Purpose TOOLS

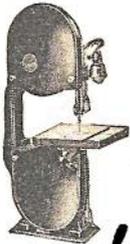
for Industrial and Home Shops

Modern low-cost motor-driven tools such as produced by Delta really possess more than double utility. They are designed and priced to be within the reach of the home shop. Yet they are engineered and built so well that industrial users everywhere welcome them as standard production equipment. For either purpose—home shop or industrial—Delta tools have *proven* in thousands of instances that they have what it takes to give long satisfactory service.



What Industrial Users Say

Just read the partial list of nationally known concerns using Delta tools. Add to these the thousands of professional cabinet shops, millwork shops, pattern shops, furniture factories, contractors using Delta Quality Tools. "The most useful tools in our shop" says one factory superintendent. "We are astonished at the machine value and precision you offer in your drill presses." "We are setting up complete production lines of your tools." "Our sample-making costs have been cut in half."—These are but a few of the thousands of favorable comments made on Delta tools—and they are saying it with repeat orders. The low cost of Delta "precision tools" spells economy and flexibility to the industrial user—skillful design and rugged construction mean greater satisfaction to the home shop owner. Send the coupon for the latest Delta catalog and check Delta values for yourself.



Send for Catalog

New Metal-cutting Band Saw

It takes the place of a power hacksaw in cutting off bars and shapes; it is used in the toolroom for sawing off tool, die and fixture stock; it will cut uniform strips from sheets; it saves hours of time in cutting templates and similar tools, and will cut almost any material, such as asbestos, mica, vulcanite, fiber, etc. Four low metal-cutting speeds and one high speed for wood sawing.

The 1938 Delta Catalog is the guide book to modern motor-driven tools. Send coupon for your copy—and the latest Delta Project Book No. 4—packed full of new and different things to make, with many photographs, working drawings, and complete instructions. Enclose 10c for Project Book. Catalog will be mailed postpaid.

DELTA MANUFACTURING COMPANY
600-634 E. Vienna Ave. Milwaukee, Wis.

Delta

QUALITY TOOLS

A Partial Roll Call

Below are listed a few of the thousands of industrial plants using Delta "Quality" Motor-Driven Tools.

The Owens-Illinois Glass Co.
Sikorsky Aircraft Corporation
General Electric Company
Underwood Elliott Fisher Co.
AC Spark Plug Company
Eastman Kodak Company
United States Bureau of Mines
Agfa Ansco
Frankford Arsenal
General Motors
Dodge Brothers
Hudson Motor
Chevrolet Motor Company
Fisher Body
Continental Motors
Packard Motor Car Co.
Chrysler Corporation
U. S. Rubber Products, Inc.
Fairbanks-Morse Company
Ramsey Accessories Mfg. Co.
Republic Steel Corporation
Graybar Electric Company
Truscon Steel Company
Firestone Tire & Rubber Co.
Mallinckrodt Chemical Co.
International Shoe Company
Caterpillar Tractor Company
The B. F. Goodrich Company
Goodyear Tire & Rubber Co.
Pittsburgh Plate Glass Co.
United Air Lines Trans. Corp.
Burd Piston Ring Company
Allis Chalmers Company
Kimberly-Clark Corporation

DELTA MANUFACTURING CO., Dept. M138
600-634 E. Vienna Ave., Milwaukee, Wis.

I enclose 10c (stamps or coin) for which please send me one copy of the new 1938 Book No. 4 of "Practical Delta Projects." Also place me on your mailing list to receive 1938 Delta catalog of quality motor-driven woodworking tools.

Name

Address

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

Check here if you are a Delta user now.

ARE YOU
ONE OF THESE
4 Types of

INVENTOR

1 IF YOU ARE THINKING OF INVENTION AS A CAREER

There are many people today who are making a good living from inventions. If you have inventive originality and the ability to recognize human needs, you should go far in the commercial world. If you are considering Invention as a career, write for our FREE BOOK at once.

2 IF YOU HAVE A MECHANICAL INVENTION

There is probably a bigger demand for mechanical inventions today than any other type. If your invention is of a mechanical nature, the first step is to have a search made at the U. S. Patent Office to ascertain that no one has gotten ahead of you. You will find this FIRST STEP fully covered in our FREE BOOK, "Patent Guide for the Inventor."

WHAT OUR PATENT SERVICE DOES

The first important step in securing a patent is to obtain the services of a Registered Patent Attorney. The U. S. Patent Office advises that you secure the aid of a Registered Patent Attorney to prepare your application and counsel you.

We have secured patents for inventors located in every state in the Union. Our organization is a large and efficient one. Our practice is confined entirely to Patents, Trade-Marks, and Copyrights. We have had years of experience in Patent Matters. When you place your invention in our hands, we are in position to proceed at once to secure protection for you.

Don't worry about finances. Our fees are very reasonable — we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office.

THE ANSWER TO YOUR QUESTION "HAVE I A SALABLE INVENTION?"

Some of the most successful commercial inventors — men who amassed large fortunes — reaped their rewards on simple everyday creations; the kind of things that make thousands ask themselves the question: "why didn't I think of that myself?" If you can beat the other fellow to the little gadgets always cropping up that make life more comfortable, easier, or exciting, you may succeed as a successful inventor. Are you convinced that you have "something?" Then don't flounder around trying to make up your mind to start; ascertain right now if you have hit upon an original idea by having us institute a Search of the U. S. Patent Office Records to determine if your invention has been anticipated.

IMPORTANCE OF ACTION

The greatest curse of the average inventor is delay in making practical use of his invention. The day-dreaming inventor may have wonderful ideas but unless he gets a Patent on his invention he is likely to remain a dreamer all his life.

Your invention of a practical article or an improvement upon an old one should be patented NOW. Frequently many of the thousands of applications filed in the U. S. Patent Office each year are for the same or almost the same invention. In such case, the burden of proof rests with the last applicant to file. Sometimes a delay of even a few days in filing the application means the total loss of the patent. LOSE NO TIME.

CLARENCE A. O'BRIEN & HYMAN BERMAN

3178 ADAMS BUILDING

Registered Patent Attorneys before U. S. Patent Office

WASHINGTON, D. C.

INVENTORS

3 IF YOU HAVE A NOVELTY INVENTION

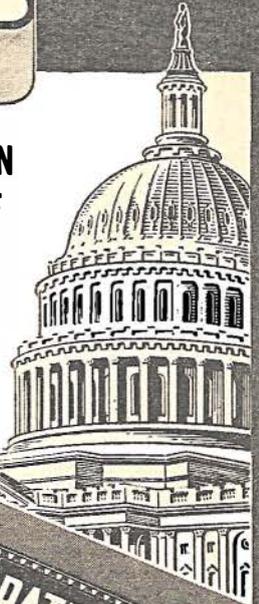
Go through the 10c stores and see the millions of articles offered for sale. The majority of these simple gadgets are patented, manufactured in big quantities at a substantial profit. If you have a novelty invention, get information on direct steps necessary to obtain Patent. Send for our FREE BOOK.

4 IF YOU HAVE A GENERAL UTILITY INVENTION

Have you an invention that makes home life easier and more attractive or serves a general purpose of utility? Some of the simplest inventions have found a quick market and earned immediate incomes for the inventor. Learn all about the possibilities of General Utility inventions. Write today for our FREE BOOK.

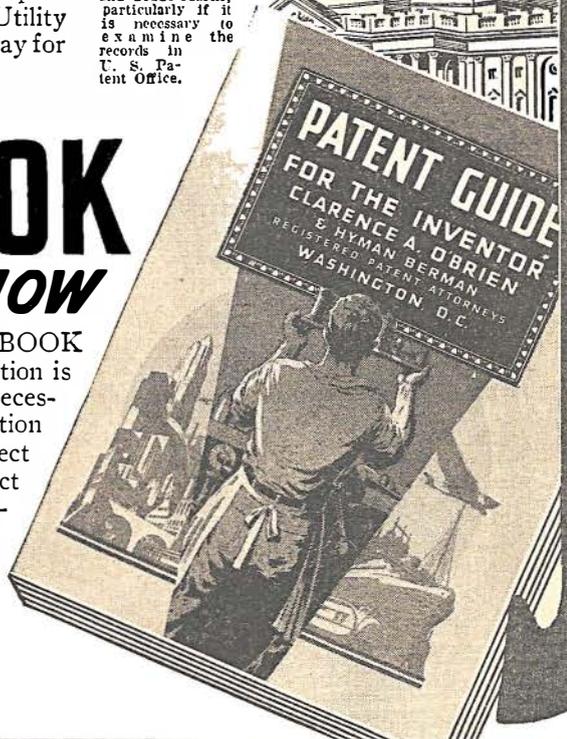
OUR OFFICES IN THE HEART OF THE NATION'S CAPITAL

Located in Washington, D. C., within a few blocks of the U. S. Patent Office, we are able to give you immediate advice and accurate, authentic information on all matters concerning Patents and Trade-Marks, particularly if it is necessary to examine the records in U. S. Patent Office.



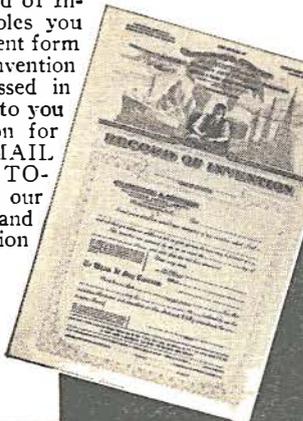
This FREE BOOK TELLS HOW

There are certain definite facts the inventor must know to Patent and market his invention. Our FREE BOOK gives complete information: How Patent Application is made, what kind of drawings and sketches are necessary, what papers must be filled out, the value of action in applying for patent, how the patent laws protect you, why it is necessary to secure patent to protect your inventions, etc. Don't be discouraged or disheartened about the future until you get our FREE BOOK and learn how other inventors succeeded despite lack of funds, remoteness from market, lack of mechanical skill, education, and other handicaps. Send coupon for this FREE BOOK today!



FREE RECORD OF INVENTION FORM

This FREE Record of Invention Form enables you to make in convenient form a sketch of your invention and have it witnessed in a manner of value to you should the occasion for evidence arise. MAIL THE COUPON TODAY and obtain our FREE BOOK and Record of Invention Form.



CLARENCE A. O'BRIEN & HYMAN BERMAN

3178 Adams Building
WASHINGTON, D. C.

REGISTERED PATENT ATTORNEYS
Before U.S. Patent Office

Please send me at once your Big FREE 48-Page Book, "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" form. This request does not obligate me.

NAME

ADDRESS

(Please write or print plainly)



Editor's Note: Your questions will be answered personally and free of charge by MM experts provided they do not require special research or involve trade secrets. Names and addresses of manufacturers of new products described in this issue can also be obtained free upon request. Enclose a self-addressed and stamped envelope for reply. Address: Problems Editor, Modern Mechanix Publishing Co., 1501 Broadway, New York City.

ELIMINATING HUM IN RECEIVER

I have just completed a two-tube radio receiver and have been unable to eliminate the hum. What do you think causes it? Could it be the power supply?—William Brown, Detroit, Mich.

Yes, it could be the power supply, but if you have at least eight microfarads of filter condenser and a choke coil for filtering, the trouble is probably elsewhere. If the set uses a center tapped filament transformer, be sure the center tap is connected to ground. If the transformer is not center tapped and you are using a center-tapped resistor, try substituting another resistor or check its resistance on an ohmmeter. Be sure the chassis and cabinet are grounded. If you are not using a metal cabinet, the set may not be sufficiently shielded. Ground all transformer and choke cases and cores.

BECOMING A RADIO AMATEUR

I would like to become a radio amateur. Does the license cost anything?—Jack Blanchard, Los Angeles, Calif.

The United States Federal Communications Commission will grant you an amateur operator's license at no cost. The only requirement for obtaining this license is that you pass an examination designed to test your technical fitness for it. We suggest you read the article "So You Want To Become a 'Ham'" in the November, 1937, issue of MODERN MECHANIX.

FROSTY APPEARING GLASS

How can I give a frosty appearance to window glass?—Frank Brown, Norfolk, Va.

Cover the glass with a mixture of

Magnesium sulphate.....	6 ounces
Dextrin	2 ounces
Water	20 ounces

When the solution dries, the magnesium sulphate crystallizes into fine needles.

LISTENING TO SHORT WAVES

I have a receiver which tunes only on the broadcast band. What can I do to hear short waves?—E. J. Lister, Miami, Fla.

You could build or buy a short-wave converter which would make your present receiver capable of bringing in the

stations you want to hear. However, you probably will get more service from a short-wave receiver designed for this purpose. You will find directions for building a receiver of this type in the December, 1937, issue of MODERN MECHANIX. A good short-wave receiver can be built as cheaply as a converter.

BLOWING FUSES

The fuses in my house circuit are always blowing out. Sometimes they last one or two days and other times, one or two weeks. Why should this happen?—William Ryan, Boston, Mass.

Probably the fuses are too small for the load on the line. When they last several weeks, it may be because the load has been just under their blowing point, and when one more appliance is connected, the load causes the fuse to blow. Before increasing the fuse size, you should have the wiring looked over by a competent electrician to be sure that a temporary short circuit is not causing the trouble.

REMOVING RUSTY SCREWS

I would like to remove some screws which have rusted in place. All attempts so far to get them out have ended in failure. How may I do it?—Walter Gustavson, Erie, Pa.

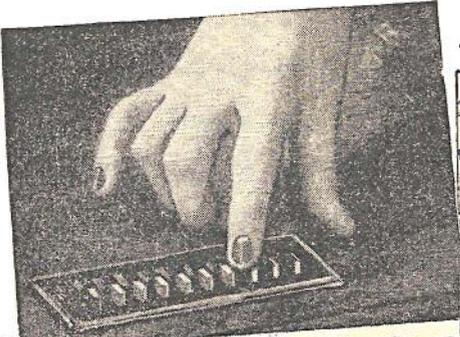
In almost every case, the following method will work. Place a small amount of light oil on the head of the screw and let it flow down into the threads. Heat a piece of iron, such as a poker, and touch it to the screw head. When the screw has become heated, it probably will come out easily. It is necessary to repeat the process for more stubborn cases.

REMOVING ALCOHOL STAINS

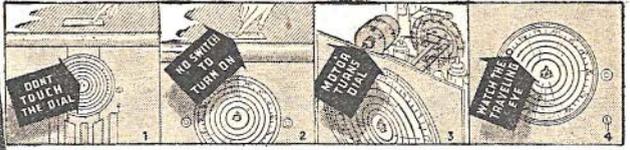
Recently I spilled some alcohol on a varnished table and large white stains appeared where it touched the surface. I have tried to remove them but so far nothing has been successful. What can I do to make these marks less apparent?—Robert Williams, Detroit, Mich.

Make a very thin paste of turpentine and pumice stone (000 grade), and with the fingers rub it over the stain. If progress is watched carefully, the stain will be removed and the surface will not be injured. Remember that if the alcohol has removed an appreciable amount of varnish, the only way to replace it is by refinishing the surface. However, this paste will usually remove the ugly stain so that casual inspection will not disclose the damage.

THIS 18-TUBE MOTORIZED MIDWEST TUNES YOUR STATIONS 2 to 5 times as fast!



JUST TOUCH ONE BUTTON... NO NEED TO TURN ANY CONTROLS—AN ELECTRIC MOTOR DOES EVERYTHING FOR YOU!



FLASH! Did you hear the good news?—Midwest scoops the radio world by giving you $\frac{1}{4}$ -second motorized touch-button tuning! Just touch a button on top of the radio... that's all... and **FLASH!**... your station comes in perfectly tuned in just $\frac{1}{3}$ (one-third) second... just like magic... at the exact center of resonance. (You can also tune by hand whenever you desire.) And, the radio is absolutely quiet BETWEEN stations!

The famous Midwest factory-to-you plan, proven by 18 years of success, is just as exciting. The big FREE catalog shows you how to buy handsome, newly styled, richly finished consoles at wholesale prices... to save up to 50%... to make your radio dollar go twice as far... to pay as little as 50 cents a week on the Midwest Easy Pay Plan... and secure 30 days FREE trial in your own home!

GLORIOUS NEW TONE AMAZES MUSICIANS

When you tune in a domestic or foreign program on this super 18-tube, 6-wave-band, 10,000-mile-range Motorized Midwest, you hear it with a new clarity, new depth and an intensity of feeling. Glorious, crystal-clear concert realism and brilliant foreign reception are now realities. Super power and 88 advanced features enable you to bring in weak distant foreign stations like "local". Now delight in American, Canadian, Police, Amateur, Airplane, Ship broadcasts... and finest Foreign programs.

FACTORY-TO-YOU SAVES 50%



18 TUBES ONLY \$39.95
6 BANDS
 (LESS TUBES)
NEW LOW BASE PRICE CHASSIS

30 DAYS FREE TRIAL

Act at once on this unusual factory-to-you offer. We send any Midwest radio you are interested in to your home. You use it 30 days, and compare it with other radios you have owned or heard... before you decide to keep it. You are triply protected with One-Year Warranty, Money-Back, and Foreign Reception Guarantees. **[SERVICE MEN: Join nation-wide Midwest Service organization. Write for free details.]**

TERMS AS LOW AS 50¢ A WEEK

PASTE COUPON ON IF POSTCARD... OR

Write Today!

MIDWEST RADIO CORPORATION
 Dept. KK-10 Cincinnati, O.
 Send me your new FREE catalog and complete details of your liberal 30-day FREE trial offer. (Special offer and prices prevail only when dealing direct with factory by mail.)

Name.....
 Address.....
 Town..... State.....
 User-Agents Make Easy Extra Money. Check Here for details.
 Check here for 1938 BATTERY catalog

MIDWEST *Factory-to-You* RADIOS

DEPT. KK-10 MIDWEST RADIO CORPORATION... CINCINNATI, OHIO, U.S.A.
Manufacturers of Quality Radios Since 1920



DRAFTING

BOOKS SENT FREE!

ON APPROVAL
5 VOLUMES BRAND NEW EDITION
 Only 15 minutes a day with these WONDER BOOKS can prepare you for a good drafting job in less than a year. Mechanical and architectural drafting from simple straight lines to important complex plans. *A step at a time!* Built especially for beginners, for men with only grammar schooling. Drafting room practice. **PLUS ENGINEERING**, made easy and clear. Includes complete course in blue-print reading.

For Beginners

Written, so you can understand every word, by 22 well known engineers and architects. DeLuxe flexible binding, nearly 2,000 pages, 1546 blueprints, charts and diagrams; prepares you for a good drafting job in mechanical or architectural lines. Sent for 10 days' free examination if you mail coupon immediately.

These Instruments Included



Big Field **Big Demand** **Big Pay**
 Competent draftsmen are urgently needed right now in all building and manufacturing lines at \$20.00 to \$75.00 a week. That's just the beginning—**FOR DRAFTSMEN HAVE THE BEST CHANCES FOR ADVANCEMENT.** Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for a set and see for yourself.

[A year's consulting membership in the American Technical Society now given to all readers of this famous cyclopedia of drafting. Many say that it is worth more than the cost of the books.]
 Complete set of drawing instruments if you send for these drafting books NOW. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. Retail \$10 value, but included with these books.

AMERICAN TECHNICAL SOCIETY
 Dept. D-1320, Drexel at 58th St., Chicago, Ill.

American Technical Society, Dept. D1320, Drexel at 58th St., Chicago, Ill.
 Send for 10 days' trial New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return books in 10 days and owe you nothing. But if I decide to keep them, I will send \$2.00 after 10 days, then only \$3.00 a month until \$24.00, the advertising price, is paid. Send latest edition and include drawing instruments and Membership Certificate.

Name _____
 Address _____
 Attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

Photography



for PLEASURE or PROFIT

Prepare for profitable business or fascinating hobby, at home under guidance of qualified instructors. No previous experience necessary, common school education sufficient. Many earn while learning. Our practical studio methods also qualify for well-paying positions upon graduation. Send coupon below at once for free booklet "Opportunities in Modern Photography", particulars and requirements.

AMERICAN SCHOOL OF PHOTOGRAPHY
 3601 Michigan Avenue Dept. 2051 Chicago, Illinois
 Send booklet, "Opportunities in Modern Photography", full particulars and requirements.

Name _____
 Address _____
 City _____ State _____

JIG SAW \$1.50



Including 12 assorted blades, Adapters, Illustrated Manual and Full Saw Guide formerly found on expensive machines only. All metal, 15" long, 8" high, 6 1/2" table. A swift and easy cutter—best ever made for the money.

FREE CATALOG

describing cash price contest and illustrating complete power tool line: Shaper, Circular Saw \$2.50; completely equipped Lathe, \$2 and \$4.95; Sander, \$1, etc. Order today or send card for Catalog.

J & H Metal Products Co. 8 Commercial St. Rochester, N. Y.

Free AIR CONDITIONING and Refrigeration



Trial Lesson

A fast growing field of opportunity. Trained men are needed. Learn the easy C.T.C. way.

AT HOME IN SPARE TIME AT LOW COST

Write today for FREE TRIAL LESSON
CHICAGO TECHNICAL COLLEGE
 A317 Tech. Bldg., 118 E. 26th St., Chicago, Illinois
 If you can go away to college to learn Air Conditioning, Engineering, Architecture, Drafting, Electricity or Radio, send for FREE Blue Book.

Learn Advertising at Home

Make money in advertising. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New, easy method. Nothing else like it. Send at once for free booklet—"Win Success in Advertising," and requirements. No obligation.

Page-Davis School of Advertising
 3601 Michigan Avenue, Dept. 2051, Chicago, Illinois, U. S. A.

RADIOS \$5.95

30 DAYS FREE TRIAL MONEY BACK GUARANTEE

6 tube sets \$7.80, 7 tube sets \$9.45, 8 tube \$11.50, 9 tube \$12.95. Write today for free catalogue of the most astounding values ever offered in the history of radio.

CHAS. HOODWIN CO., Dept. B 7
 4419 Broadway Chicago, Ill.

Correspondence Courses in RADIO and ELECTRICAL ENGINEERING

SPECIAL Only \$25

ELECTRICAL ENGINEERING Get good grasp of wide electrical field. Prepare yourself, at Low Cost, for secure future. Modern course. So simplified anyone can understand quickly.
RADIO ENGINEERING Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experimental kits furnished. Diploma given on completion. Tuition, ONLY \$25, either course. Deferred payment plan available.
FREE! Send name quick for free copies of school catalogs, student magazines, complete details. **SEND NOW.**
LINCOLN ENGINEERING SCHOOL, Box 931-57, Lincoln, Nebr.

CRIME DETECTION SECRET SERVICE AND FINGER PRINTS

SECRET SERVICE BOOK FREE

For 30 Days Reading
 No Money Down—Actual Crime Cases—
 If You Act Quick!—We will send you this stirring book on Crime Detection, Secret Service and Identification Work for 30 days free reading. Send no money. If you decide to keep it then send me only \$1.00. If not, return it. **WRITE TODAY.** Literature will be sent only to persons stating their age.

Cooke, Dept. 2351, 1920 Sunnyside Ave., Chicago, Ill.

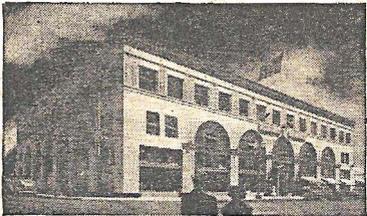
Start a POTATO CHIP BUSINESS

IN YOUR KITCHEN and MAKE MONEY!
 BUY potatoes for 2c a lb. Make sensational new "Greaseless" Potato Chips and sell for 35c a lb. Ideal business for men or women in spare or full time. Small investment buys complete equipment. No experience needed. I show you how to get stores to sell all you make; tell you how to make profit first day. All information, pictures, prices and terms sent free. Send a postal card for Free Facts on this big "Home Business" Opportunity.
G. H. HARDT, Dept. D-241, 325 West Huron St., Chicago, Ill.

**FOR MEN
WHO WANT
TO LEARN A
PROFITABLE
TRADE**



Complete DIESEL Training



HOME OF NATIONAL SCHOOLS

A million-dollar trade school, occupying its own modern three-story building, exclusively devoted to training ambitious men. Latest equipment; selected, experienced staff of engineers and instructors; practical, thorough training.

With all Types INTERNAL COMBUSTION ENGINES ELECTRIC POWER GENERATION, etc.

YOU MEN who are sincerely ambitious to make good in the Diesel and related industries, want to know the true facts—you want to know about employment opportunities and employment requirements. For 33 years, National Schools, a recognized leader in the field of trade education, has played a vital part in helping wide-awake men to qualify for success in industry. National Schools—a million-dollar trade school—will supply you with a sincere, honest statement of facts on what you should do to get into the profitable Diesel Industry. No exaggerations—no mis-statements.

YOU NEED REAL SHOP EXPERIENCE WITH TIME-TESTED TRAINING

Mail the coupon below. In the literature you will be sent, you will see exactly how other men like you are preparing themselves for success in National's modern training shops. You learn on the latest, finest equipment. You do real job work. You learn by time-tested, shop-practice methods. Your training is fascinating in every detail. You are taught how to make good, and helped to make good after you graduate. All of this and much more is clearly pictured for you in the Free Book of Facts we will send to you.

TRANSPORTATION ALLOWED TO LOS ANGELES

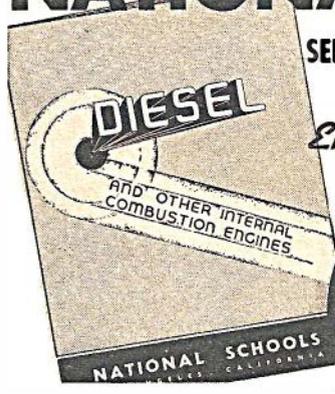
National Students are allowed coach railroad fare from any point in U. S. (Canadian students from nearest point of entry.) Student social life includes inspection trips, excursions, athletic activities, etc. Special doctor service. Personality coaching. Many students are helped with spare-time jobs to earn room and board while learning. (Canadians accepted.) Graduate employment cooperation.

National Training is so thorough and all-inclusive, that no ambitious man can afford to consider Diesel Training without first knowing all of the facts regarding the many advantages available to him as a National Student. INVESTIGATE.

PUBLIC SCHOOL SUPERINTENDENT PROFITS BY NATIONAL TRAINING
"I have attended two state universities and two state normal schools and I want you to know that I feel I have received more for my money at National than at any other school I have attended. One cannot be too high in praise of the instructors—of their determination to see that each student received complete instruction and thorough understanding of each assignment."
J. STOVER, JR.,
Sup't., Palouse Public Schools,
State of Washington.

NATIONAL SCHOOLS Los Angeles

SEND FOR YOUR COPY TODAY
—Real Facts on Diesel
Employment Requirements



Free
NEW BOOK
OF
TRAINING FACTS

Request for Free Book
NATIONAL SCHOOLS
(established 1905) Dept. MMA-1
4000 S. Figueroa St., Los Angeles
Please send me, without obligation, your FREE BOOK and information regarding Diesel Employment Opportunities and Requirements.

NAME _____
ADDRESS _____ AGE _____
CITY _____ STATE _____

AUDELS Carpenters and Builders Guides 4 vols. \$6



Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Woodworkers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill out and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, hungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint



THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail 3 Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will return \$1 in 7 days, and \$1 monthly until \$6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name.....
 Address.....
 Occupation.....
 Reference..... M. M.

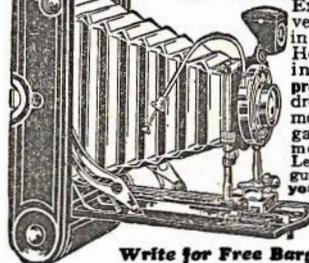
Nothing so **STRONG** as laminated construction

No other Padlocks but **Master** are laminated

For maximum protection against torpedoes and shells, the hulls of battleships are laminated. . . separate layers of steel welded to one another to form armor plate much stronger than one wall of steel could ever be.

Sold by dealers everywhere
Master Lock Co., Milwaukee
 World's Largest Exclusive Padlock Manufacturers
OVER 52,800,000 IN USE

CAMERA BOOK FREE!



Explains latest inventions, methods in photography and Home Movie Making, for fun and profits. Offers hundreds of amazing, money-saving Bargains in still and movie Cameras, Lenses, Films, etc. All guaranteed. We take your old Camera and equipment in trade! Satisfaction guaranteed! WRITE!

Write for Free Bargain Book!

CENTRAL Camera Co. (Est. 1899) 230 S. Wabash, Dept. J-1, Chicago

NEW! PLASTIC! ELASTIC!

● FLEX-O-FIX ● **MAKES! MENDES!**

A combination patch and cement. Applied direct from tube on rubber, leather, fabrics, etc.—dries tough, elastic, waterproof. Used by craftsmen, mechanics, home and auto owners, sportsmen, etc. **MAKES** mounds, washers, boots, etc. **MAKES** moulds, washers, packing, etc. . . **INSULATES** wires without use of tape. **WRITE NOW** for FREE BOOKLET showing hundreds of everyday uses. 10c, 25c, 60c sizes. Ask for Flex-O-Fix at hardware, auto supply, sporting goods, variety stores. If not available send money and your dealer's name to **FRUND PRODUCTS CO. DEPT. M-18, 43 E. OHIO, CHICAGO, ILL.**

EARN MONEY

Make Color-glazed Concrete Products

New, perfected low cost method. No molds, power or costly tools. You build your own equipment from plans we furnish. Experience not necessary to make color-glazed concrete garden pottery, statuary casting, giftware—in home or shop—to earn money. **MEN—Send 10c TODAY** for booklet, colorplate, details of this money making business. No obligation.

NATIONAL POTTERIES COMPANY
 Room 8, 13 W. 28th St.
 Minneapolis, Minn.

do-it-with-squabs

Supply low, demand and markets up. Write a post-card, get FREE **BYE-OPENING** Picture Book. Why breed for ordinary trade when these great luxury national markets are wide open for all the **SQUABS** you can ship, every day in the year? We give a large bonus in stock for promptness. Write today to **RICE FARM, 602 H St., Melrose, Mass.**

AVIATION APPRENTICES

BIG PAY GOOD FUTURE

If you are interested in working yourself into a highly paid position in Aviation under our Apprentice-Plan—Write, immediately, enclosing stamp—**MECHANIX UNIVERSAL AVIATION SERVICE CO.**

Strathmoor Station Dept. A Detroit, Mich.

WORLD'S GREATEST all around ELECTRIC TOOL

DRILLS GRINDS SHARPENS POLISHES CARVES SANDS SAWS

SENT ON 30 DAYS APPROVAL

The new **WHIZ ELECTRIC TOOL** is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drill through 1/4 inch iron plate in 45 seconds or engraves intricate designs on jewelry. Uses 50 different accessories, instantly interchangeable. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates tedious labor. **PERFORMS JOBS IMPOSSIBLE WITH OTHER TOOLS.** Plug into any socket AC or DC, 110 volts. Chuck 1/4" capacity. Ball bearing thrust. Powerful, triple geared motor. Ideal **XMAS GIFT.** **SEND NO MONEY.** Pay postman on delivery only \$6.95. Try 30 days at our risk. If not 100% satisfied your full money returned.

only \$6.95 Postpaid

FREE! Accessory outfit including set of drills, mounted 1 1/2" grinder, cutting wheels, sanding disc, mandrel, mounted brush, etc. **(REGULAR VALUE \$2.00)** **FREE** with each outfit ordered.

PARAMOUNT PRD., CO. Dept. 1-B 245 Broadway, New York



This man has routine job in shop. Would like to earn more money, advance to better job, but does nothing about it. Will be doing same work 20 years from now.

This man had job in shop. Wanted more pay and better job. Learned Practical Drafting at home from Engineer Dobe. Advanced steadily, increased his earnings considerably, became full-time draftsman.

Better JOBS Now



As industry revives, who is always needed first of all? The **DRAFTSMAN** who draws the plans. **AFTER** that the steel mills, lumber mills, brickyards and others start getting busy. Recovery in business and most industries now seems well on the way.

ENGINEER DOBE has taught drafting by mail to thousands of successful students, aged 16 to 18 to past 50. Established since 1900.

Government efforts to help are making things hum. In some factory towns a shortage of draftsmen appears at times. Many trained draftsmen will be needed on better jobs—at better pay and shorter hours. Who'll get those good jobs? Of course, the men who have prepared—so, prepare now!

Drafting Leads Most Industries
Ahead of most any other work is Drafting and Planning for mechanics, builders and factory to produce. It leads them all!

Here Is Your Opportunity!
Yes, here is an opportunity that's open to those who know how to grasp it:—At a few dollars a month, students get complete training in drafting by mail in surprisingly few months—Engineer Dobe teaches his students until thoroughly trained and until holding a good paying job. Trained Draftsmen enjoy good salaries. Unless you get a satisfactory job:—all your money back. That's Engineer Dobe's guarantee.

No Experience Required
With Engineer Dobe's method no previous experience is necessary. High School education not needed. Everything made plain. Practical work from the start until you're in position.

Time is money. Learn drafting in your spare time. It's high time now to prepare. Don't wait another day. Send coupon for Dobe's free book.

ENGINEER DOBE Div. 4731 Libertyville, Ill.

Start NOW Win PROMOTION—DRAFTING

If you're a mechanic, a knowledge of draftsmanship may make you a foreman or superintendent in short order. Get out of overalls and draw the pay of a boss. If you are a boss, learn draftsmanship, a foundation stone of many a line of business.

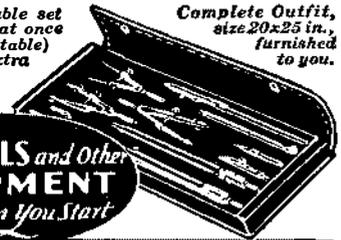
In every walk of life, practical training in draftsmanship will prove valuable. Even if you never accept a job as a draftsman, will you not be **money ahead** by taking Engineer Dobe's course?

You'll be amazed at the speed with which you can learn in your spare time by Engineer Dobe's Practical Method. Send coupon TODAY for free book entitled "Success in Draftsmanship".

All Working Tools Furnished

Here's a valuable set of tools—sent at once (also a drawing table)—all without extra charge the day you enroll.

Complete Outfit, size 20x25 in., furnished to you.



These TOOLS and Other EQUIPMENT Given When You Start

Free Book!

ENGINEER DOBE, Div. 4731 Libertyville, Ill.

Send me your free book "Successful Draftsmanship". Please explain how you assist your graduates to good positions as draftsmen.

Name

Address

Town

State..... Age

AUTO

BOOKS SENT FREE

on approval. Just mail the coupon and we'll send you a set of these remarkable auto books, just off the press. Whether you are a mechanic or helper, expert or apprentice, auto owner or driver, if you're interested in knowing all about automobile mechanics, take advantage of this FREE OFFER.

GET A BETTER JOB

A better job—in the gigantic auto industry. BIGGER PAY—a chance to go into business for yourself and get a share of the huge profits, are waiting for any man who even half tries to improve himself. Learn auto engineering with these wonder books a new way—without studying or memorizing. Simply use the JIFFY INDEX to look up the answer to any auto problem. Built by eleven of America's greatest automobile engineers, and written in simple language so you can understand it. Very newest cars, all covered.

FREE Privilege of consulting Automobile Engineers of American Technical Society for one year without cost if you mail coupon immediately

Books also include valuable articles on Service Shop Management.

AMERICAN TECHNICAL SOCIETY
Drexel Ave. & 58th St., Dept. A1320, Chicago, Ill.

I would like to see the new 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose to, I may return them express collect. If after 10 days use I prefer to keep them, I will send you \$2 and pay the balance at the rate of only \$3 a month, until \$24.80 is paid. Please include free consulting membership as per your offer above.

Name _____
Address _____
City _____ State _____
Attach letter stating age, occupation and name and address of employer and that of at least one business man as reference.

Air Become An Conditioning Engineer

Rich, fast-growing field for men thoroughly trained in design, manufacture, estimating and installing. In 1936, Air Conditioning did a 49 million dollar business—while in the first 3 months of '37 it skyrocketed to 50 million—14 TIMES as many installations as in 1933. FREE booklet on home study points out YOUR opportunities in Air Conditioning. Tells WHY this new industry promises steady work, good pay, promotion, and jobs where you are still young as 40. No obligation. Write TODAY.

American School, Dept. AC126, Drexel at 58th, Chicago

A billion dollar industry in the making!

NEW OLYMPIC \$4.95 INTRODUCED AT CANDID CAMERA

- For Fast Action Pictures.
- Made to Sell at a higher price.
- High Power Fully Corrected Achromatic Lens, adjustable diaphragm stops at F.8, F.11, F.16 and F.24.
- Speed Shutter
- Cable Release
- Telescopic View Finder
- Built in Tripod Socket
- Takes 16 Clear, Sharp pictures on economical No. 127 V.P. Film
- Takes Natural Color pictures as easily as Black and White

Order Now for special introductory Price of only \$4.95 Postpaid, C.O.D. if preferred, plus postage. • Genuine Leather Every Ready Carrying Case only \$1.50.

CANDID CAMERA SUPPLY CO. Dept. M.M.
303 West 42 Street, New York, N. Y.

ARREST HIM, OFFICER! I'LL HAVE COMPLETE FACTS ON THE OTHER FELLOW TONIGHT!



Secret Service Operator No. 88 is on the job... FOLLOW HIM through all the excitement of his chase after the counterfeit gang. Write NOW for

FREE Confidential Reports No. 38 Made to His Chief!

It may open your eyes to the great opportunity for YOU as a well paid Finger Print Expert. The kind of work you'd like, Excitement! Travel! Thrills! A REGULAR MONTHLY salary. REWARD MONEY! Graduates of this school HEAD 47% of all

Identification Bureaus in U. S. 1 Write for Free Reports, Finger Print Book, low prices. Easy Terms, Offer, if 17 or over. Literature will be sent only to persons stating their age.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 2351, Chicago, Ill.

Home Study

Home Study Courses leading to Degrees in Arts and Sciences; Philosophy; Education; Writing; Psychology; Chemistry; Theology; Law; Agriculture; Business; Accounting; Sales; Advertising; Public Speaking; Electrical, Civil, Mechanical, Diesel, Architectural, Aeronautical, Automobile, Drafting, Radio; Air Conditioning; Refrigeration and Chemical Engineering. A good, practical education is the greatest dividend paying investment one can possibly make. If you are willing and ambitious—if you have the "G. I. WILL" determination, we will show you the way to success. FREE 10-Day Examination of Course Selected.

McKINLEY-ROOSEVELT COLLEGE OF ARTS AND SCIENCES.
4223 Clarendon Ave., CHICAGO

CARTOON YOUR WAY TO SUCCESS!

DON'T COPY - LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course has 26 lessons and 600 illustrations. Send name and address for Free details. Only... **\$3.95**

RAYE BURNS SCHOOL, Dept. 30, Box 2194, Cleveland, Ohio

BIG MONEY BUILDING MEAD'S NEW Portable OUTBOARD BOAT!

Build this light, tough, durable, sporting, portable Outboard Ki-Yak! Take it anywhere by hand or car. Safe, leakproof, trouble-free. More speed per horsepower, more miles per gallon. MEAD'S perfected aluminum-ribbed, cut-to-fit Construction Kit guarantees successful assembly, quickly, easily. Rush done for MEAD GLIDERS, 15 S. Market, Dept. M-18, CHICAGO.

KNOCK-EM-COLD!

THE BIGGER THEY ARE, THE HARDER THEY FALL! LEARN JIU JITSU!

36 secret knock-out blows without fists by 15c world famous Police Jiu Jitsu instructor

A little jab with tip of fingers, or strike with edge of hand to right spot and tough guys go out like a light. Also many one fingered headlock breaks. Northwest "Mountain" Joe Jorgensen's system. G-men must be Jiu Jitsu experts. He has personally taught many in U.S. Army, Navy, Marines, National Guard, Coast Guard, Immigration, Border Patrol, Police, etc. and performed for the Movies. Whether you are young or old, man or woman, send now for new illustrated course. Full Price 1.5c Size or strength mean nothing. Fast no man, gun, knife, club.

S. J. JORGENSEN, 720 Maritime Bldg., Seattle, Wash.

EARN UP TO \$75 WEEKLY as a RADIO SERVICE EXPERT

Let R. T. A. Train You At Home

Write quick for this Free Book that tells you why R. T. A.'s Practical Home Training course offers the utmost in RADIO TRAINING including Television, Talking Pictures and Public Address Systems. Packed with startling facts and interesting illustrations, including our sensational Service Equipment Offer that helps you earn money almost at once. Radio progress is astounding the world. Heed the call of RADIO!

RADIO TRAINING ASS'N. OF AMERICA
Dept. MM-18, 4525 Ravenswood Ave., Chicago, Ill.

60 POWER TELESCOPE \$2.19

VARIABLE EYEPIECE, 20X-40X-60X

NEW! Three telescopes in one, 3 different magnifications. 20 power for ultra-bright images with 40 and 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc. 60 times as close.



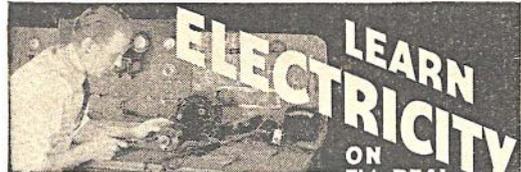
Compound 4 lens microscope. Most powerful made for anywhere near the money. Can be collapsed to less than a foot in length. Multiple lens system. 30 mm. objective, in heavy brass-mount. Directions included for using as a telescope. American made. We pay postage. Only \$2.19.

500 POWER MICROSCOPE \$3.95

NEW 500X SUPER-POWER BROWSCOPE

Ultra high power at low cost. 75X to 500 X in 5 steps. Each microscope is carefully tested to give clear images. All refinements including rack and pinion focusing, tilting stand, etc. 10 day money-back guarantee. Complete with prepared and plain slides and instruction booklet, only \$3.95 postpaid. **SPECIAL 1600X objective with high resolving power for above microscope giving it the amazingly high magnification of 1600 power. Only \$1.95.**

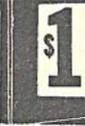
BROWSCOPE CO., Dept. 71, 234 Fifth Ave., New York, N. Y.



LEARN ELECTRICITY ON THIS REAL EQUIPMENT RIGHT IN YOUR OWN HOME

We supply you 20 separate outfits of Electrical Equipment and Apparatus at no extra cost to help you learn Practical Electricity in your own Home Shop. No previous experience or advanced education necessary. Lifetime Employment Service. Write for Big Free Electrical Book Today! No obligation. **ELECTRIC INSTITUTE, Dept. 48A, Hinsdale, Ill.**

Refrigeration

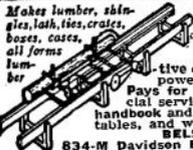


Text-Book for Home Study

This complete, up-to-the-minute, practical book will teach you quickly how to service all types of refrigerators. Page after page of useful, easy to understand facts. Refrigeration is the big money field and you can get into it after studying this text book. Size 8 1/2 x 11 in. Priced at only \$1.00, postpaid. Send for this book today. 3722 W. 13th St. Chicago, Ill.

SUPREME PUBLICATIONS

ONE-MAN SAWMILL



TURN TREE INTO MONEY WITH A BELSAW

Three capacities: 10, 14 and 20 feet. Accurate set works, positive dogs. Hand or power feed. Runs on low power—Many owners use old auto engine. Pays for itself quickly—Thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment. **BELSAW MACHINERY CO., Kansas City, Mo.**

FARM MODEL \$49.00

Which of These

Gov't Jobs



MEN-WOMEN
START \$1,260 to \$2,100 a YEAR
Liquor-Gauger
Stenographer
Meat Inspector
Custom House
Office Clerk—Typist
Accountant
File Clerk
Income Tax Auditor

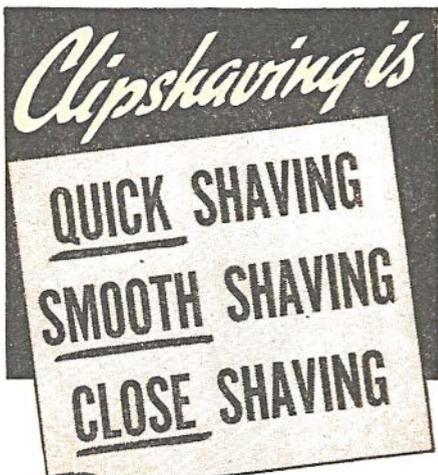
Do YOU Want?

No special education or experience usually required. Steady work. Short hours. Vacations. PENSIONS! Age 18 to 50. Extra Social Security Jobs expected soon. Send coupon for FREE Book. Tested Method will help you pass Civil Service Examination for earliest possible appointment.

FREE BOOK

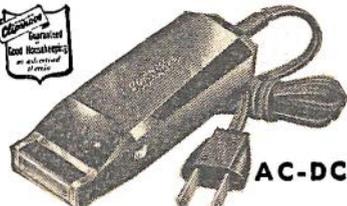
Arthur R. Patterson, (Former Govt. Examiner)
Principal, PATTERSON SCHOOL
431 Mercantile Building, Rochester, N.Y.
Send FREE Book, "How to Secure a Government Position."

Name _____
Address _____



Now you can shave as you please, when you please, where you please. No need to "get ready" with CLIPSHAVE, for you can shave anywhere on a second's notice. Just plug CLIPSHAVE in any AC or DC electric socket. No blades, no brush, no lather and no bother.

CLIPSHAVE'S V-shaped notches permit every type of hair to enter and be shaved off skin-close with amazing speed. The two outside shaving edges trim sideburns with hairline accuracy and give you double shaving action—in both directions. CLIPSHAVE is clog-proof, self-cleaning and fully guaranteed. It is as economical to operate as it is to buy.



AC-DC

THE PERFECT CHRISTMAS GIFT



If there is no dealer near you, write Clipshave, Inc., Dept. M, Port Chester, N. Y.

Price in Canada—\$11.50

Victor A. Smith, Ltd., Lumsden Bldg., Toronto

Listed in the U. S. by Underwriters Laboratories and approved for sale in Canada by the Hydro Electric Power Commission of Ontario, Pats. No. 2,077,867 and 2,078,896. Other patents pending

Inventors

TAKE THIS FIRST STEP TO
PROTECT YOUR INVENTION

Find Out Now If Your Invention Is Patentable

It is not necessary to make an expensive model or finished drawings. A description and sketch is all we need to help you. The important thing is to get started NOW, just as quickly and as economically as possible. But FIRST, send for our free Patent and Selling Guides. Know where you stand NOW in regard to Patent Protection.

Our Free Books Tell You What Every Inventor Wants to Know

They tell you why delay can prevent you from securing Patent Protection. How to avoid costly mistakes. How to get your invention saleable as quickly as possible. Whom to sell it to. How patent laws protect you. What a Patent costs. What kind of Patents are granted. The importance of secrecy in Patent matters. How a skilled Patent Attorney can secure you better Patent Protection. The difference between a good patent and a worthless one.

C. A. Snow's 62 Years of Experience Can Be of Real Value to You

We have served inventors in every state in the Union . . . in every field of invention. In fact, we have secured Patents for inventors in every civilized nation in the world. To help inventors get started without delay, we offer a convenient DEFERRED PAYMENT PLAN. By this plan, the cost of your patent is spread over several months.

Your Patent Application Personally Prepared By a U. S. Registered Patent Attorney

Every member of our firm is a U. S. Registered Patent Attorney. Therefore, your patent application will be carefully prepared IN STRICT CONFIDENCE by a skilled specialist. A specialist who will secure for you the broadest possible patent protection, because, as a member of our firm, he has a personal pride in your patent. Send for These FREE Patent Guides Today

Suggestions on how to
COMMERCIALIZE

HOW WE
PROTECT
YOU



C. A. SNOW & CO.

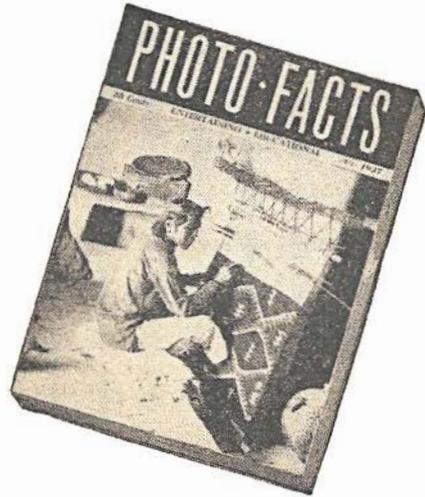
Registered Patent Attorneys Since 1875

3000 Snow Building, Washington, D. C.
Gentlemen: Send me your free handbooks for inventors by return mail. No obligation on my part.

NAME

ADDRESS

CITYSTATE.....



WHY ENVY OTHERS

their opportunity for travel, for education?

YOU, TOO

can have the cultural advantages of trips to far places, a true foundation of real knowledge you can use to get ahead, to win friends and develop your personality.

Read

PHOTO-FACTS

"The Pocketbook of Knowledge"

PHOTO-FACTS is a revolutionary new magazine designed to entertain and educate its readers. No matter if you quit school in the grades or high school, or are a University graduate, you will enjoy learning from PHOTO-FACTS.

Be Interesting Because You Are Informed

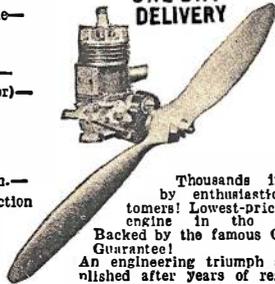
Don't miss the "Newsstand University" section. In it you will find a course "Develop Your Personality," as compiled from the works of Dale Carnegie. And a course on your money, how to make it, what to do with it, by Prof. Harold F. Clark of Columbia University and Dr. Carl Norcross.

NOW ON SALE AT ALL NEWSSTANDS

WHAT? A REAL GAS ENGINE FOR ONLY \$8.50

Yes!! A real gasoline engine that will provide thousands of hours of pleasure and instruction!! Just think of what you can do with one of these engines!! Fly a plane—install in a boat—power small tools—thousands of uses in work and play throughout the year!!

- 4 Port 2 Stroke Cycle—
- $\frac{3}{4}$ " Stroke—
- $\frac{1}{8}$ " Bore—
- 900-12,000 R.P.M.—
- Weight, 12 oz. (Motor)—
- Turns 14" Prop.
- 8" Pitch—
- Bearing Surface, $\frac{3}{8}$ " x $1\frac{1}{4}$ "—
- Crankshaft, $\frac{1}{8}$ " Diam.—
- Rotation, Either Direction



ONE DAY DELIVERY

Thousands in use by enthusiastic customers! Lowest-priced gas engine in the world! Backed by the famous G.H.Q. Guarantee! An engineering triumph accomplished after years of research.

FINISHED PARTS KIT \$8.50
 No Machining! Quickly Assembled!
FINISHED ASSEMBLED MOTOR—free flywheel \$12.50 } **POST PAID**

G. H. Q. MODEL AIRPLANE CO.

854A East 149 St. New York, N. Y.

Business Proposition Resilvering Mirrors,

REFINISHING PLATED Articles, Autoparts, reflectors, tableware. Making Chipped Glass Name Plates, Signs. Experience unnecessary. Write **SPRINKLE, Plater., 855, Marion, Indiana.**

PLASTEX

The Plastex Industry needs manufacturers on small scale and for big production of X-MAS TREE ORNAMENTS, Art Goods, Novelties, Souvenirs, etc.: in Plastex and Marble Imitation. Experience unnecessary. Equipment & simple instructions furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods for coming X-mas holidays. Ambitious men have chance for real prosperity. Our free book will interest and benefit you. **PLASTEX INDUSTRIES, Dept. 3, 1055 Washington Ave., New York.**

MAN IN EACH TOWN

To Plate Auto Prats

Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you IN GOOD PAYING BUSINESS. Write today for FREE particulars and proofs.

GUNMETAL CO.,

Ave. P. Decatur, Ill.

LEARN WATCH REPAIRING



AT HOME You can learn by our modern and original system of instruction every part of the Watch repairing Trade at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the

WISCONSIN SCHOOL OF WATCH REPAIRING
 524 E. Mason St., Dept. C, Milwaukee, Wis.

"SHOP PRACTICE & HOME STUDY-

brother, they go together!"

● "I work in the shop every day. And a couple of hours every evening, I study. Study what? I don't mind telling you—an I. C. S. Course! Take it from me, shop practice and home study go together. When you combine them you are headed toward more pay—provided you do the same thing I did by mailing a coupon like the one below."

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 2325-N, Scranton, Penna.

Without obligation, please send full particulars about the subject before which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|--|---|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Diesel Engines |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Aviation Eng. <input type="checkbox"/> Auto Mechanic |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Plumbing <input type="checkbox"/> Heating |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Refrigeration |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Steam Electric Engineer |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Civil Engineer <input type="checkbox"/> Highway Engineer |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Bridge Engineer |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Bridge and Building Foreman |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> R. R. Locomotives <input type="checkbox"/> Air Brakes |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> R. R. Section Foreman |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> R. R. Signalmen |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Coal Mining |
| <input type="checkbox"/> Foundry Practice | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Boilermaker | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Poultry Farming |

BUSINESS TRAINING COURSES

- | | |
|--|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> C.P. Accountancy | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Salesmanship <input type="checkbox"/> Advertising | <input type="checkbox"/> First Year College Subjects |
| <input type="checkbox"/> Service Station Salesmanship | <input type="checkbox"/> Illustrating <input type="checkbox"/> Spanish |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> Cartooning <input type="checkbox"/> French |

DOMESTIC SCIENCE COURSES

- | | |
|---|--|
| <input type="checkbox"/> Professional Dressmaking and Designing | <input type="checkbox"/> Millinery |
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Foods and Cookery |
| <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |

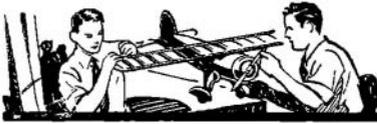
Name.....Age.....

Address.....

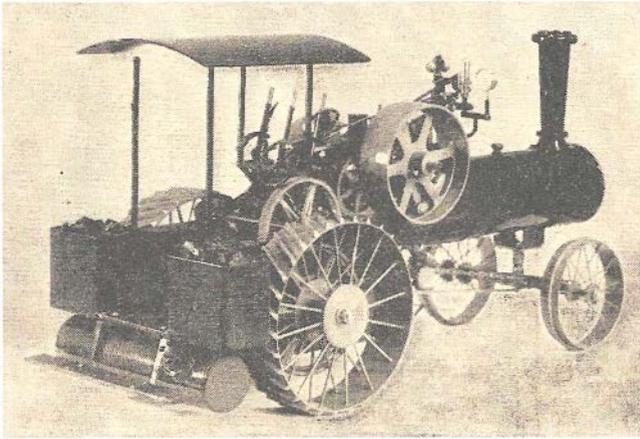
City.....State.....

Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



Chips from the



Evincing craftsmanship of highest quality, this model steam traction engine was constructed by Raymond Swanson. The whistle, steam gauge, governor, clutch, etc., actually work.

IT MAY be plenty cold outdoors, but judging from the amount of letters and photos received by the Workbench there is plenty of "heat", in the form of energy, being applied in thousands of home workshops maintained by MM readers. Keep up the good work, fellows, and don't stop sending in photos and details of your completed projects, as we are using as many as possible each month, awarding cash prizes for the photos used. Besides, you want to let other MM readers see the products of your craftsmanship, don't you?

* * *

Lloyd Moore, of Chariton, Iowa, was awarded this month's first prize of \$5 for a letter and photo concerning a very novel project. His letter reads as follows:

Dear Editor:

I am sending you a photo of a model steam traction engine built by Raymond Swanson, of Humeston, Iowa. It is a working model, steam power being generated in a boiler with 18 flues by means of an alcohol torch.

The model is built to a scale of one inch equals one foot. The whistle, steam gauge, governor, clutch, throttle and reverse are all complete, working just as they do on a real steam traction engine.

Swanson did all the work by hand, using a small jeweler's lathe and a few other small tools. Construction of the model required over a year, working about five hours per day, and the total outlay for materials was about three and a half dollars.

Lloyd Moore.

The more we study the photo of Swanson's model, the more we are impressed with the craftsmanship it represents.

From Emanuel Forte, of Orange, N. J., came a letter and a photo that won an award of \$3. He says:

Dear Editor:

Enclosed is a photo of my latest dirt track midget racer which is powered with a motorcycle engine. A multiple clutch and a three-speed transmission are used, enabling the car to attain a top speed of 82 m. p. h. The rear end is that of an old Model T Ford automobile.

I want to thank MM for numerous tips and kinks that helped me in constructing this racer. Shortly, I expect to build the Arlen Special racer that appeared in recent issues of your magazine.

Emanuel Forte.

Judging from the photo, Forte has turned out a very creditable job and we feel sure he will have no trouble in building the Arlen Special.

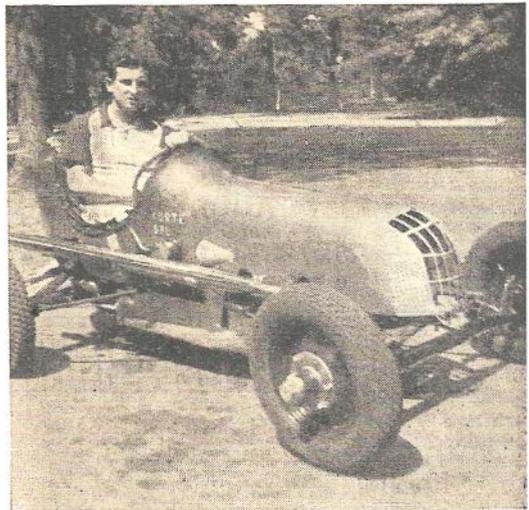
* * *

A prize of \$3 was awarded to Clarence Downton, of Saskatoon, Canada, for his letter which reads:

Dear Editor:

I am sending you a photo of a snowplane that a friend, Dave Mitchell, and myself built in our spare time. How do you like it?

We have used this machine for a lot of winter traveling and on several occasions the Mounted Police have made use of it. The snowplane has also aided me in my garage business, proving to be an excellent adver-



Powered by a motorcycle engine, this midget dirt track racer can travel 82 m.p.h. Builder Emanuel Forte is at the wheel.

Editor's Workbench



tisement. I buy MM every month and like it because it does not publish the same thing two or three times like some magazines do.

Clarence Downton.

We like the photo of the snowplane very much, Downton, and if the Mounted Police used it, well—it must have "the goods."

* * *

Another \$3 prize winner is Fred Kennedy, of Plant City, Florida, whose letter reads:

Dear Editor:

Enclosed is a photo of a tiny radio I constructed from plans that appeared in MM. I have added some features since the set was first constructed, among which are a band-spread tuner with a plug-in coil arrangement that provides range from 16-555 meters, and a one-tube amplifier.

I am 14 years old and get a lot of pleasure from short-wave radio, spending most of my evenings listening in. I wonder if you could give me any information on passing the amateur radio operator's examination?

Fred Kennedy.

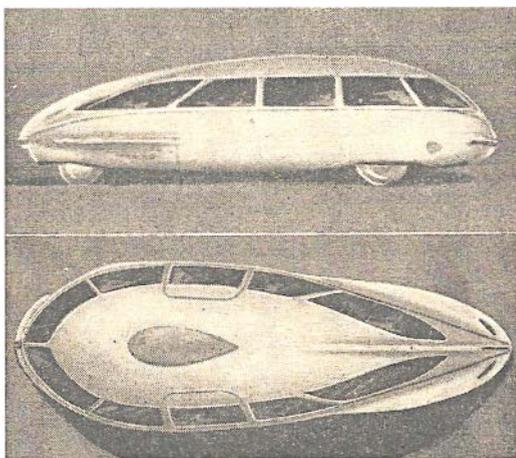
Reader Kennedy and many other MM short-wave fans will find the article—"So You Want To Become a 'Ham'"—which appeared in the November issue of MM, to be of great help relative to the securing of an amateur radio operator's license.

* * *

An award of \$3 was sent to Melvin C. Mawhinney, of Cecil, Pa., whose letter reads as follows:

Dear Editor:

I have spent much time during the past few years in developing a design for an ideal "future car" and am enclosing a photo of a wooden model "Dream Car"

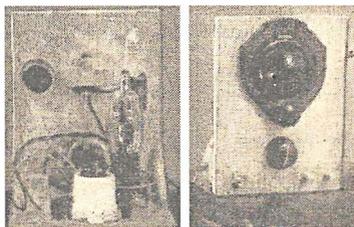


Shown in the above photos is a side and overhead view of Melvin C. Mawhinney's interesting model conception of ideal "car of the future." Note the perfect streamlining throughout.

that incorporates my design. I hope you will find it interesting enough to publish.

I hope to become a car designer some day and will soon have an interview with officials of an automobile company.

Melvin C. Mawhinney.



Fred Kennedy built this short-wave radio set from MM plans. The photos show back and front view of the set.

We certainly hope that reader Mawhinney will have a profitable interview with the auto manufacturer and wish to compliment him on the unusual design of his model.

* * *

MM has received word of the organizing of an amateur inventors club in Long Beach, Calif., the purpose of which is

to help amateurs protect and market their "brain children." Persons interested in the organization are invited to write to V. J. Schmidt, president of the club, at 3741 Gundry Ave., Long Beach, Calif.

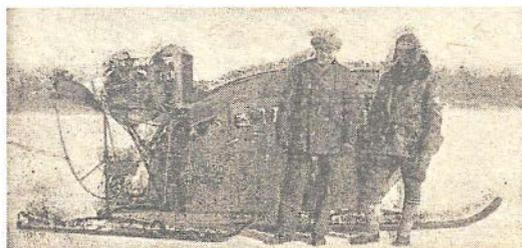
* * *

The snowsled season being at hand, many MM readers are enjoying themselves zipping over ice and snow in home-built power sleds constructed to MM plans. Lloyd Knoepke, of Helena, Mont., describes the snowsled he constructed in a letter which was awarded a \$3 prize. He writes:

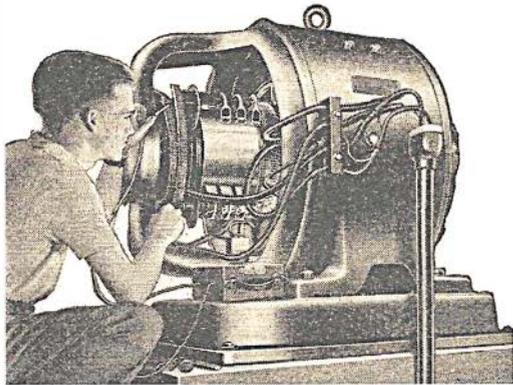
Dear Editor:

I am sending you a photo of my airsled. It is equipped with a four-cylinder motorcycle engine, weighs 210 pounds, and is 13 feet, 6 inches long.

[Continued on page 31]



Dave Mitchell and Clarence Downton, of Saskatoon, Canada, built this trim looking powered cabin snowplane. So well does it operate that the Mounted Police have used it occasionally.



AMAZINGLY EASY WAY TO GET INTO ELECTRICITY

Send Today for Details of My "PAY-AFTER-GRADUATION" PLAN

Don't spend your life never sure of a job. Let us prepare you for your start in a good paying field. Let us teach you how to prepare for positions that lead to good salaries in Electricity—NOT by correspondence, but by an amazing way we teach right here in the great Coyne Shops. You get a practical training in 90 days. Mail the coupon below. If you are short of money I'll send you all details of my "pay-after-graduation plan" where many get my training first and start paying for it 5 months after they start school and then have 18 months to complete their payments.

LEARN BY DOING—IN 90 DAYS BY ACTUAL WORK—IN COYNE SHOPS
I don't care if you don't know an armature from an air brake—I don't expect you to! Coyne training is practical "learn-by-doing" training. Don't let lack of money hold you back from getting all details of my amazing plan.

MANY EARN WHILE LEARNING
If you need part-time work to help pay your living expenses we will give you the help of our employment department to assist you to get a part time job, as we have thousands of others. We give you a 12 weeks practical training in the great roaring shops of Coyne... on one of the greatest outlays of electrical apparatus ever assembled... real dynamos, engines, power plants, autos, switch-boards, transmitting stations... Diesel Engines... Air Conditioning and Electric Refrigeration... everything from doorbells to farm power and lighting... full sized... in full operation every day!

DIESEL ENGINES AIR CONDITIONING ELECTRIC REFRIGERATION

Additional instruction included in these fast growing fields at no extra cost.

GET THE FACTS Coyne is your great chance to get into Electricity. This school is 38 years old—Coyne training is tested. You can find out everything absolutely free. Simply mail the coupon and let us send you the big, free Coyne book with photographs... facts... opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. No obligation to you. So act at once. Just mail coupon.

BIG FREE BOOK! Send for my big book containing photographs and telling the complete story—absolutely FREE.

H. C. Lewis



COYNE ELECTRICAL SCHOOL
500 S. PAULINA ST., Dept. 18-53, CHICAGO, ILL.

H. C. LEWIS, Pres., COYNE ELECTRICAL SCHOOL
Dept. 18-53, 500 S. Paulina St., Chicago, Ill.

Dear Mr. Lewis: Without obligation send me your big, free catalog with facts about Coyne Training and details of your "Pay-Tuition-After-Graduation" Plan.

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

Address.....

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

MOTO-SCOOT XMAS GIFT AT NEW LOW PRICE

Ideal as Xmas gift for man, girl, woman or boy. Easy to operate. Safe. Economical—120 miles to gallon. New low price plus many new features. Fun galore. Be first!

See your closest dealer or write to



\$89.00 and up
F. O. B. Factory

MOTO-SCOOT MFG., CO. Dept. MM1-219, S. Western Ave., Chicago, Ill.

HOW TO MAKE MONEY

Thousands of magazines and newspapers buy MILLIONS of photos from free-lance camera owners every year. We show you what to photograph, how to do it, where to sell for biggest profits. Learn at home, in spare time. You may pay for course in small monthly installments. No special camera needed. Write for FREE BOOK. UNIVERSAL PHOTOGRAPHERS, Inc., Studio 331, 10 West 33rd Street, New York City.

WITH YOUR CAMERA

PARKS AIR COLLEGE

PARKS AIRPORT EAST ST. LOUIS, ILL.

Offers you college education majoring in aviation

Four courses lead to B. S. degrees in Professional Flight, Aviation Operations, Aviation Mechanics, Aeronautical Engineering. 100 acre airport. 14 buildings, 33 in faculty, 302 enrolled for Fall term, 6,400,000 miles flight training. 1,562 planes. 538 engines repaired and rebuilt in shop. Graduates with all leading aviation companies. Dormitories, dining hall on field. Winter term Jan. 4th. Catalog. Write

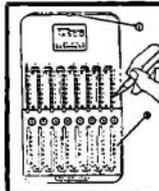
REGISTRAR, DEPT. MM-1
11th YEAR PARKS AIR COLLEGE, EAST ST. LOUIS, ILL.



Earn Cash at Home!

Raise giant patented mushrooms! We supply materials and instruct with pictures. Our 25 Coast-to-Coast branches buy all crops. Big FREE book, photos tell if your cellar, shed, barn, etc., suitable. Write today. (Established 1908.)

UNITED MUSHROOM COMPANY
3848 Lincoln Ave., Dept. 316, Chicago



Vest-Pocket Adding Machine

Sturdy Steel Construction. Adds, Subtracts, Multiplies. Divides. Capacity, 999,000.99. A real machine—guaranteed 5 years. On delivery, pay postman \$2.50 (plus few cents postage). (Foreign Countries send cash.) Your money back after 10 days trial if not satisfied. Thousands of satisfied users. Special Offer to agents.

2.50

Free Trial Send No Money

TAVELLA SALES CO.
17 W. Broadway, New York City

MAKE MONEY IN YOUR WORKSHOP
Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in FREE BLUEPRINT BOOKLET
MODERN MECHANIX PUBL. CO., Fawcett Bldg., Greenwich, Conn.

NOTHING TO SELL!

Be a BUYER for Me I furnish the MONEY

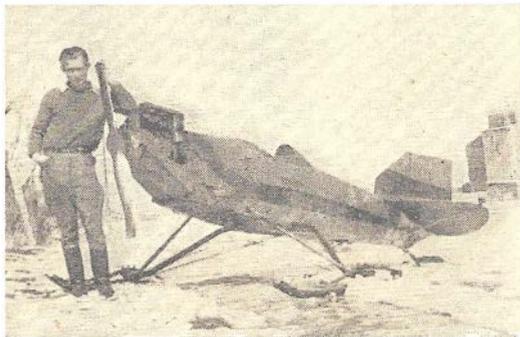
Steady Work—Big Pay Daily! Run this highly profitable business with my money. Operate from your home, office, or spare room—spare or full time. No experience. Full instructions furnished. Write for Money-Making details today!

PRUITT CO., 1212 Pruitt Bldg., Chicago, Ill.



Editor's Workbench Chips

[Continued from page 29]



Mounted on spring-set runners to insure easy riding over rough ice and powered by an old motorcycle engine, this air-sled carries builder Lloyd Knoepke one mile in 43 seconds.

I have made several types of snowsleds and find that this type gives the most thrills and speed. Springs on the runners insure easy riding over rough ice at all speeds. I have made a mile in 43 seconds with this sled.

Lloyd Knoepke.

Traveling a mile in 43 seconds is plenty of speed and Knoepke certainly must have thought his powered sled grew wings as it whizzed over the ice at that speed.

* * *

Apparently there is a growing interest in home-built aircraft, for we have been receiving more letters asking where parts, kits, and plans for building airplanes can be secured. We hope that all air minded readers read the article—"Are Home-Built Planes Safe?"—which appeared in the December issue of MM and that they will send in their ideas on the subject as well as photos of their home-built planes.

* * *

Another MM reader who wants to correspond with fellow hobbyists is Russell Coffin, of 14 Georgia Road, Thornton Heath, Surrey, England, whose letter reads:

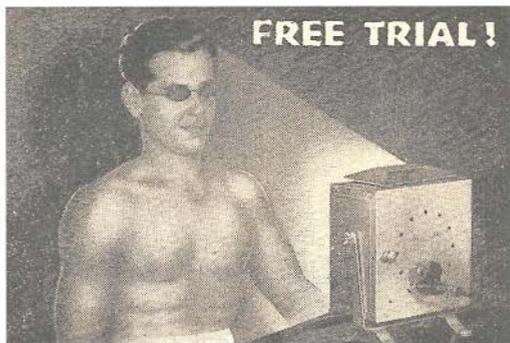
Dear Editor:

As a reader of MM for some time I am wondering if you could put me in touch with American boys of my own age (16) who would like to correspond about hobbies.

I am interested in model railways, traffic control, and firearms. I will answer letters from any boys who are interested in these subjects.

Russell Coffin.

We are sure that many American hobbyists will want to contact this enthusiastic young Englishman.



FREE TRIAL!

IMPROVES YOUR APPEARANCE 100%

Have that healthy **TAN**

... that Men and Women Admire!

IT'S the first impression that counts! Get that healthy, vital appearance that opens the door to success! Many a man has lost his big chance because his appearance didn't "click." Social as well as business success depends on your looks . . . and the pale, pasty-looking chap won't get to first base. Now a daily "sun bath" in the privacy of your own home, will keep you looking like a Million Dollars—and feeling as physically fit as you look!

LOOK SUCCESSFUL—BE SUCCESSFUL!

■ A good, healthy coat of tan has a surprising effect on your appearance. Salesmen find their sales actually increase after they have acquired a real bronze tan! And you will become more popular, for women, too, admire that healthy outdoor look!

IMPROVES HEALTH AS WELL AS APPEARANCE!

■ Frequent exposure to the ultra-violet rays of the sun tones up the entire system, stimulates the body into energy and vitality, increases gland activity, builds up resistance to colds . . . and aids in clearing up many skin diseases.

4 TIMES AS POWERFUL AS SUMMER SUN!

■ You know what a glorious tan your skin would acquire if you could spend an hour every noon sun-bathing. The Health Ray Sun Lamp has been tested by the well known Electrical Testing Laboratories of New York. Their report indicates that this Inexpensive Sun Lamp gives the same amount of beneficial ultra-violet rays in 15 minutes in your home that you would get in one hour's exposure to the mid-summer sun!

INEXPENSIVE HEALTH INSURANCE FOR EVERY MEMBER OF YOUR FAMILY



■ Build up resistance and vitality. Insure yourself against illness the sunshine way!



FULLY GUARANTEED! MAKE THIS FREE TEST!

Test this lamp . . . our expense NOW! Compact, easy to use, tested and approved . . . it is yours for 7 days FREE trial! This genuine carbon-arc lamp, fully guaranteed by The Health Ray Mfg. Co., Deep River, Conn., will be one of the greatest health investments, you ever made.

SEND FOR DETAILS OF OUR 7-DAY FREE TRIAL!

Let us mail you our FREE book containing valuable information on sunshine, complete details of the Health Ray Lamp and our 7-day trial offer.

OR

If You Want YOUR SUN LAMP AT ONCE . . .

Simply mail \$1 with the coupon. Use it for 7 days. Then either pay \$6.95 balance or return the lamp and get your dollar back.

\$1.00 DOWN PAYMENT BUYS IT!

HEALTH RAY MFG. CO., INC.
161 Elm Street, Deep River, Conn.
(Check below for free literature or Sun Lamp)

Send full details of FREE trial offer.
 Send Health Ray Lamp at once. I enclose \$1. In 7 days I will either pay \$6.95 or return the lamp and receive my dollar back.

Name -----
Please write Mr., Mrs., or Miss

Address -----

Copyright 1937 Health Ray Mfg. Co., Inc., Deep River, Conn.

Here's How WE MAKE BETTER BLADES!

● We use diamond-tested Swedish steel electrically treated to glass-cutting hardness. Shaving edges are the keenest ever produced—so marvelously finished that they are actually invisible.

The accompanying pictures tell only a part of the story. You would be amazed if you could see how Gillette maintains the highest precision standards known today.



● O. K.! Every Gillette Blade passes an individual examination by trained eyes before it's surgically sterilized and automatically wrapped.

Gillette Blades



● Test! After heat-treatment, the hardness of Gillette Swedish steel is checked by square-cut diamonds.



● Costly electric testing furnaces analyze Swedish steel to make sure it conforms to rigid Gillette standards.



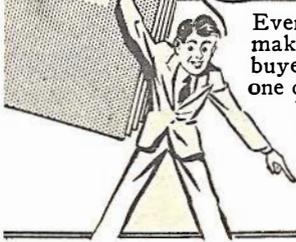
● Amazing electro-magnetic tester "sees" through steel—a relentless check to assure blade perfection!

CARTOONISTS

WRITE FOR FREE BOOK

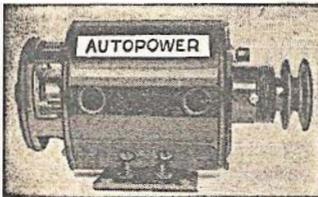
FREE WIN \$2500

HOW TO MAKE MONEY
WITH SIMPLE CARTOONS



Everyone who likes to draw should have this valuable book. Contains money-making tips, drawing instructions, ways of getting ideas, and list of cartoon buyers. Sent free. You also will be given the opportunity to win \$25.00 or one of 25 other cash prizes with a simple cartoon. Entry blank included with book. Big money in cartooning. We show you how to draw cartoons by the new Marionette Method. All particulars free. Send no money. Just send name on penny postcard. Hurry. Our supply of free books limited.

CARTOONISTS' EXCHANGE Dept. 351 Pleasant Hill, Ohio



TURN SCRAP INTO MONEY

AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. INSTRUCTIONS FOR BUILDING AN A C WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS. Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only \$1.00 postpaid.

S. W. BUNCAN, Publisher

412 S. Hoyne Ave., Chicago



TRY THIS for a Merry Christmas and **A HOBBY NEW YEAR!** **10-DAY money-back TRIAL**

ALL PURPOSE MOTO-TOOL

MODEL 1 \$9.85 Postpaid

Saves time and labor on all craft work

An attractive, appreciated gift for every craftsman who works at home, shop, school or profession. Grinds, drills, carves, polishes, etc., on all materials. Takes 10 seconds to do 10 minutes hand work. Absolutely safe—thousands in use. Weighs 6 oz., handles easily as a pencil. Powerful—about 25,000 r.p.m., AC or DC current. Chuck handles a large variety of tools.

NEW MODEL 2 MOTO TOOL
Faster—More Powerful

Designed for heavier shop work, this rugged machine is recommended where precision and accuracy are demanded. It has many refinements—unit finger grip—chuck lock—snap switch—air cleaner—better cooling—convenient hanger, etc. Weighs 13 oz., develops about 27,000 r.p.m. Price \$16.50, postpaid.

UNIVERSAL SHAPING TABLE STAND \$4.50 \$2.50 (stand extra)

20 pc. Craftsman's tool set, for either model \$5.75 Post-paid

Ask your dealer for a demonstration or order by mail on 10-day money-back trial. Send for FREE booklet.

DREMEL MFG. CO. 1025 CT Racine, Wisconsin

FREE ELECTRICITY FROM WIND POWER

For Lights, Power, Radio, from Auto Generators. New Copyright Book with over 100 Facts about Wind Chargers. Wind-Propellers—Generators—Plants—Batteries. Answers all questions you should know. Including plans for 6 or 32 V. Plant. Send 25c for plans, facts and catalog. AGENTS WANTED.

CURRIER MFG. CO. 407 Terminal, Minneapolis Minn.

WANTED — MEN

to cast Christmas Goods, 5 and 10c Novelties, Toy Autos, Ashtrays, etc. Can be done in any spare room, basement or garage and no experience necessary. A rare opportunity to devote spare or full time to profitable work. Write Dept. 2.

METAL CAST PRODUCTS CO. New York City
1696 Boston Road

MAKE MONEY IN YOUR WORKSHOP

Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in **FREE BLUEPRINT BOOKLET**

MODERN MECHANIX PUBL. CO., Fawcett Bldg., Greenwich, Conn.

PRINTING offers BIG PROFITS

Cards, Stationery, Circulars, etc. Easy rules. Sold direct from factory only. Does raised printing like engraving. Junior outfit \$8.85. Senior outfit \$12 and up. Do your Own Printing! Save Money. Pays for itself in short time. Write for full details.

THE KELSEY Company, P-9, MERIDEN, CONN.



High School Course at Home

Many Finish in 2 Years

You can complete this simplified High School Course as rapidly as your time and abilities permit. Equivalent to resident school work—prepares you for entrance to college. Standard H. S. texts supplied—Diploma. Credit for H. S. subjects already completed. Single subjects if desired. High School education is very important for advancement in business and industry and socially.

College Entrance

During the past 14 years, our High School graduates have been admitted to 531 different Universities, Colleges, Junior Colleges and Normal Schools—30% of them without entrance examination. Course also prepares for teachers' certificate and pre-professional examinations.

Business—Industry

To get and hold a good position in Business today you must be able to write clear, accurate letters and reports—do figuring involving Algebra and Geometry—talk intelligently on matters requiring a knowledge of Geography, History, and Economics.

In Industry—Mechanical and Engineering lines—you must have at least an elementary knowledge of Physics and Chemistry—be able to figure quickly and accurately—know something of Mechanical Drawing and blueprints—and be able to talk and write accurately and clearly on both your work and ordinary topics of conversation.

Our High School course meets the preparatory educational requirements for Business and Industry.

An Educational Institution

The American School was chartered in 1897 as an educational institution, not for profit—and is exempt from paying Federal income tax, like the best resident colleges and universities.

Don't Be Handicapped—Complete Your Training Now

Be a High School Graduate! Prepare yourself for promotion in Business and Industry—for the Professions, College Entrance and social success. No matter what line you may select, High School training will prove invaluable to you! Our moderate fees cover all instruction, standard textbooks and Diploma. Easy monthly terms. Get ahead in life. Start your training NOW!

Mail coupon for information about line that interests you
American School, Drexel at 58th, Chicago

American School, Dept. H-128, Drexel at 58th, Chicago

Tell me how to train for success in line checked. No obligation.

High School Course

<input type="checkbox"/> Accounting & Auditing	<input type="checkbox"/> Diesel Engineering
<input type="checkbox"/> Architecture & B'ldg	<input type="checkbox"/> Drafting & Design
<input type="checkbox"/> Automotive Eng'ring	<input type="checkbox"/> Liberal Arts
<input type="checkbox"/> Business Management	<input type="checkbox"/> Private Secretary
<input type="checkbox"/> Commercial Aeronautics	<input type="checkbox"/> Higher Ac't'g (C.P.A.)
<input type="checkbox"/> Electrical Engineering	<input type="checkbox"/> Highway Engin'g
<input type="checkbox"/> Electrical Refrigerat'n	<input type="checkbox"/> Mechanical Engin'g
<input type="checkbox"/> Air Conditioning	<input type="checkbox"/> Radio & Television
<input type="checkbox"/> Civil Engineering	<input type="checkbox"/> Steamship
<input type="checkbox"/> Complete Law	<input type="checkbox"/> Steam Engineering

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



Bread, Butter, and Jam for 13,000,000 People

ARE you one of these 13,000,000 people? Does the income which supports you come from making or selling automobiles, radios, electric refrigerators, or movie films? If so, you are one of them. You are one if that income comes from the rayon or aluminum industry, or any of the other industries which have grown up in a single generation.

Automobiles, radios, gasoline, aluminum—these and many other products exist today because industry sought new products and better ways of building old ones. And after unearthing these new products, industry developed them, found

ways to build them better, means to sell them at lower prices.

Today, these industries not only employ millions but—through demands for steel, coal, cotton, transportation—they help support millions more.

Some of the greatest advances in this work have been made through the use of electricity. Through it new products have been developed, and the efficiency of all industries has been increased. In most of these modern electrical developments, General Electric research and engineering have pioneered.

G-E research has saved the public from ten to one hundred dollars for every dollar it has earned for General Electric

GENERAL  **ELECTRIC**

LISTEN TO THE G-E HOUR OF CHARM, MONDAYS, 9:30 P.M., E.S.T., NBC RED NETWORK

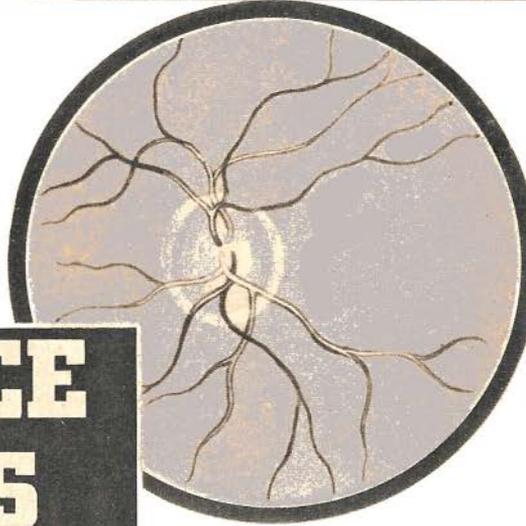
DOES it astonish you to be told that at this very moment, as you read these words, you are totally blind for a considerable part of the time it takes you to scan this sentence?

Science has proved that the human eye can see nothing while it is in motion. You read this line of type in four or five jumps, pausing at stopping-points to absorb a word or two, then passing on. As the eye moves from one fixation point to another you are quite blind, although you do not realize it because of the phenomenon of persistence of vision—the fortunate provision of nature which makes the movies possible.

For that matter, man is the only animal with an eye capable of reading or other close work. And there is only one tiny spot in the

SCIENCE SAVES EYESIGHT

by Donald G. Cooley



When the examiner looks inside the human eye with an ophthalmoscope, this is what he sees if the eye is normal. The branch-like members are blood vessels of the retina. The nerve fibers from the retina converge upon the optic disc (the circular, rimmed area) and pass through back of eye into skull as the optic nerve.



By means of the ophthalmoscope, which illuminates the eye by a beam of light, doctors are able to study the interior of the living eye (above). The condition of the retina of the eye is an index to many types of disease.

eye, called the macula, which can see things sharply. When you look at an object which you must see distinctly, you focus its light rays upon the macula. You can demonstrate this for yourself by focusing your vision on a word in the center of this line. It is clear and sharp. But the words on either side fade out to an indistinguishable gray blur.

The eye is such a complex precision instrument that in the entire human race there is probably no such thing as a physiologically perfect eye. Most eye defects are errors of refraction—some element of the eye is imperfectly shaped so that the organ cannot refract, or bend, the rays of light to focus them exactly on the retina. Years ago the old-time "eye doctor" used to prescribe spectacles in hit or miss fashion

by allowing his patient to try on various lenses from his sample case. When the customer found a lens which seemed to help him see better, the transaction was completed without any further tests. This "trial and error" method is part of the ancient history of the science of refraction. Today the refractionist uses delicate measuring devices which are among the most sensitive precision instruments known to any branch of science.

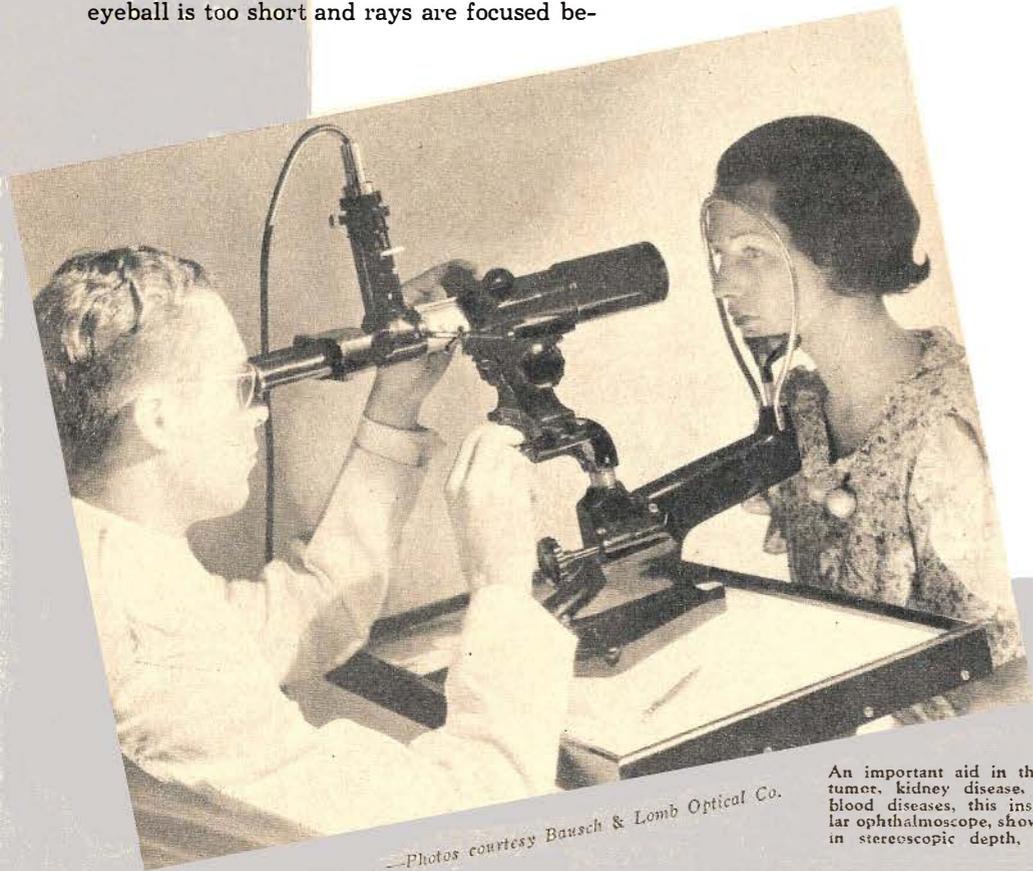
One such instrument, called Green's Refractor, is a complete optical miracle in itself. It is a complex instrument of dials, lenses and knobs which almost completely obscures the patient's face as he peers through it. To the uninitiated it looks like a monstrous mechanical mask suggestive of a Rube Goldberg invention. But this single mechanism is capable of making every examination required in refractive procedures.

To understand this major miracle, some comprehension of the most common refractive errors of the eye is necessary. Your own eye is practically certain to be near-sighted, far-sighted, or astigmatic, although very possibly to such a slight degree that no optical correction is necessary. Near-sightedness is generally the result of an eyeball which is too long; the lens focuses light rays in front of the retina instead of upon it. It is corrected by concave lenses. In far-sightedness, the eyeball is too short and rays are focused be-

hind the retina. The condition is corrected by convex lenses. Astigmatism results when the cornea—the transparent window at the very front of the eye—is curved unequally like the bulge of a teaspoon, instead of a mathematically correct spherical bulge. Compound lenses with unlike curves in different meridians compensate for this anomaly.

Sounds pretty complicated, doesn't it? Especially when you consider that two or more refractive deviations are usually found in the same eye. If you operate a camera, you know how critical a matter it is to focus your subject sharply. The slightest miscalculation gives a fuzzy negative. It's the same with the eye, except that spectacle lenses must be figured with infinitely greater precision. Many of the lenses used in refractive instruments are ground to an accuracy of a fraction of a wavelength of light—and if men were as wide as a wavelength of light, 3,000,000 of them could stand side by side on the edge of a foot rule.

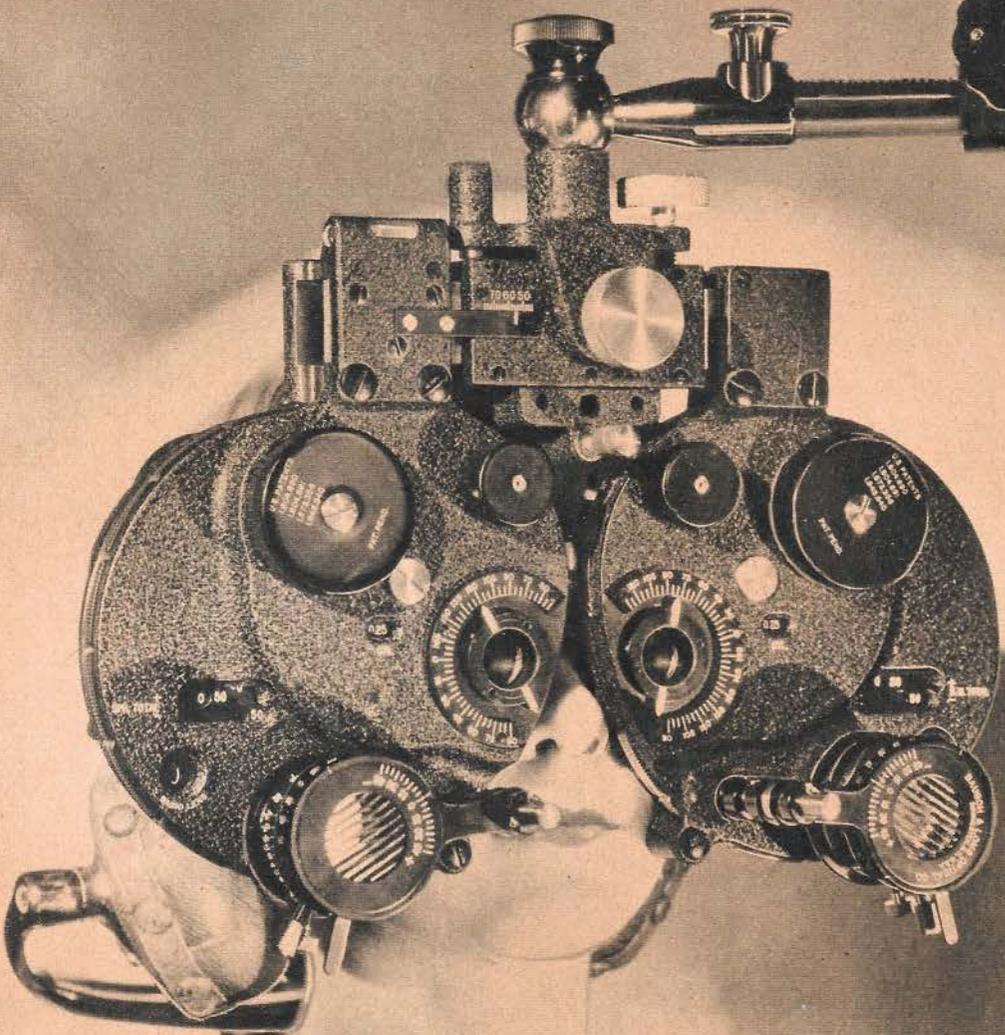
Astigmatism produces more discomfort than any other refractive shortcomings of the eye. If you are astigmatic, you are unable to see horizontal and vertical lines with equal sharpness at the same time. If the vertical mesh of a screen door is distinct, the horizontal lines are hazy. It used to be thought that



An important aid in the diagnosis of brain tumor, kidney disease, anemia and various blood diseases, this instrument, the binocular ophthalmoscope, shows the eye background in stereoscopic depth, magnified 16 times.

—Photos courtesy Bausch & Lomb Optical Co.

This is not a torture machine from
an ancient inquisition chamber—



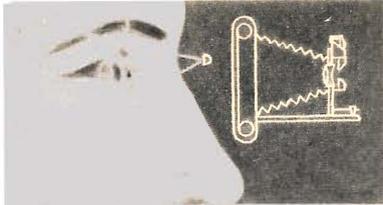
but a marvelously intricate optical instrument,
Green's Refractor, which is capable of measuring all
refractive errors of the human eye. It is one of
science's most valuable tools for saving eyesight.

the cause of astigmatism was a displacement or tilt of the crystalline lens of the eye. Now it is known that the general cause of astigmatism is a malformation of the cornea.

To measure the cornea curvature, the refractionist uses an instrument called the keratometer or ophthalmometer. It consists essentially of a target which is imaged on the cornea, and a telescope through which the examiner observes the image. The patient looks through an aperture in the center of the target and fixes his vision on an image of his own eye. Light is projected from the target to the patient's cornea; from there the light rays pass through a series of lenses to form a magnified image which the examiner measures. Readings on the dials of the ophthalmometer give the proper figures for the corrective lens needed by the patient.

Astigmatism is also measured subjectively by having the patient look at charts until a corrective lens is found which makes both the horizontal and vertical lines on the test card appear equally sharp.

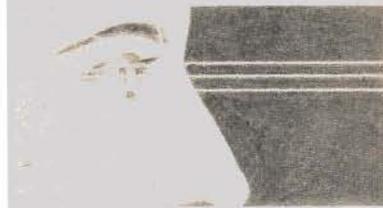
A trial frame, which is a spectacle frame in which test lenses can be placed and removed quickly, is also used in testing astigmatism, as well as nearsightedness and farsightedness. In Green's Refractor, mentioned above, trial lenses are not used. The operator obtains lens powers of different combinations by manipulating the proper dials of the instrument, and when he is through he simply reads the correct



Like a camera the eye has its (a) lens; (b) film, the retina; (c) diaphragm; and (d) shutter, the eyelid. The eye focuses by changing its lens shape.



When the eyeball is too short, or the front of the eye (the cornea) is not sufficiently curved, rays of light come to a focus behind the retina.



To correct this condition, a convex spectacle lens is worn before the farsighted eye to bring the light rays to a sharp focus on the retina.



If the eyeball is too long, or if the cornea is too strongly curved, images of distant objects are brought to focus in front of the retina.



Near-sightedness is corrected by a concave lens, which bends the light rays and brings them to a focus on the retina.



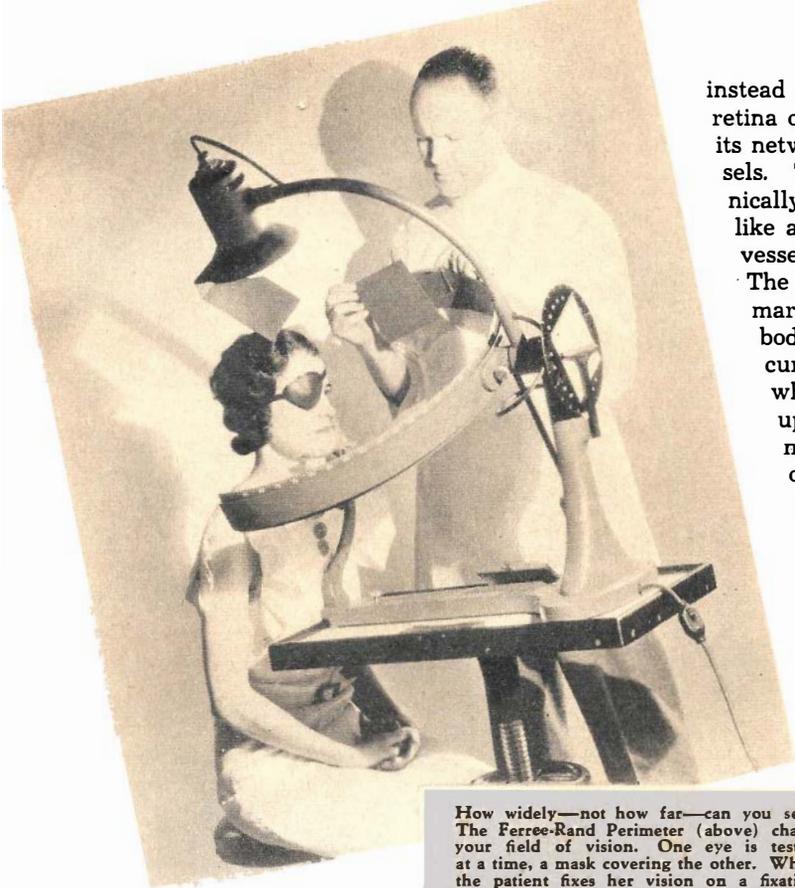
Astigmatism, the inability of the eye to see both horizontal and vertical lines with equal sharpness at the same time, is corrected by a cylindrical or toric lens.

prescription from the engraved figures which appear in windows alongside the dials.

If an additional check on lens power is desired, the examiner may usher you to a seat alongside his Ferree-Rand Projector. This instrument, which is something like a specialized magic lantern, projects the symbols of a test chart on a screen. If you have ever stood in a thick forest at nightfall you know how darkness creeps up until you are finally unable to see anything at all. The point where you are just able to distinguish detail, before darkness blots everything out, is your threshold of vision. The eye is most sensitive to changes when working at this threshold.

Taking advantage of this principle, the operator of the projector dims the machine until you can just distinguish the test characters on the screen. Then, with his test lenses, he will strengthen or weaken your spectacle prescription very slightly. This tiny change in lens power will either improve your visual acuity considerably, or blur out detail entirely, thus enabling him to choose the proper lens for your eyes with extreme accuracy.

An instrument which the refractionist may use instead of the usual test cards hanging on a wall is the Clason Acuity Meter. This projects the familiar test symbols on a screen, varying their size rather than the strength of illumination. A sliding lever enables the operator to enlarge the symbols on the screen from invisibility to any desired size. The



How widely—not how far—can you see? The Ferree-Rand Perimeter (above) charts your field of vision. One eye is tested at a time, a mask covering the other. While the patient fixes her vision on a fixation point, the operator moves a test card along the semi-circular frame until it becomes visible to the patient, the point of visibility marking one limit of the visual field. The slit-lamp, or biomicroscope (below), enables a surgeon to determine just how deeply a foreign object, like a cinder, lies in the structure of the eye.

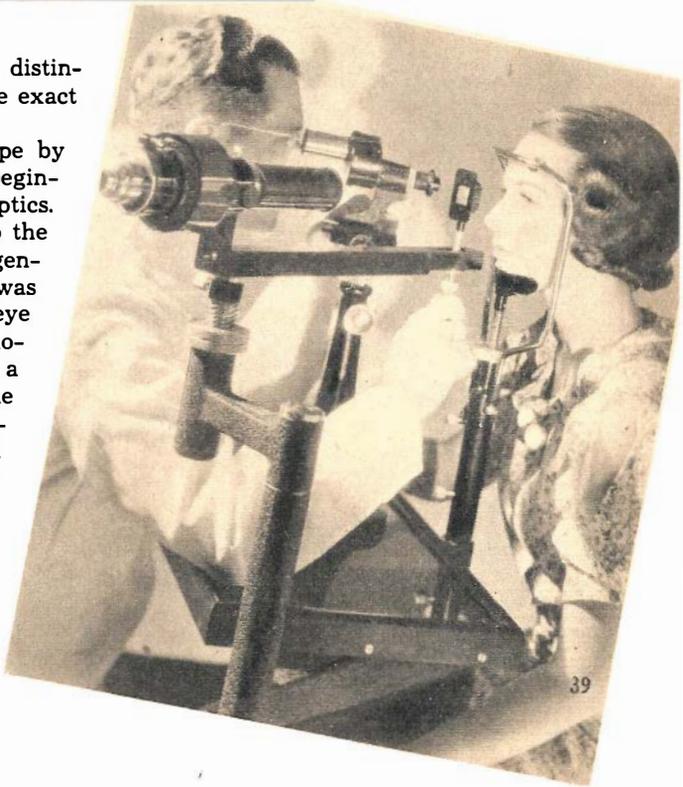
instead of black; what he sees is the retina or background of the eye with its network of nerves and blood vessels. The eye background is technically called the fundus and it looks like an orange disc, with red blood vessels. (See illustration, page 35) The retina is perhaps the most marvelous sense organ of the body. It is the light-sensitive curtain at the back of the eye which transmits images formed upon it to the brain via the optic nerve. Thinner than a sheet of onion-skin, microphotographs reveal that the retina consists of ten layers. The deepest layer is made up of rods and cones (so named from their appearance) which in some mysterious way seem responsible for the chemistry of vision. In each eye there are some 130,000,000 rods and cones—one for each man, woman and child in the United States.

Actually the retina is an extension of brain tissue. It is, in fact, the only spot in
[Continued on ' page 118]

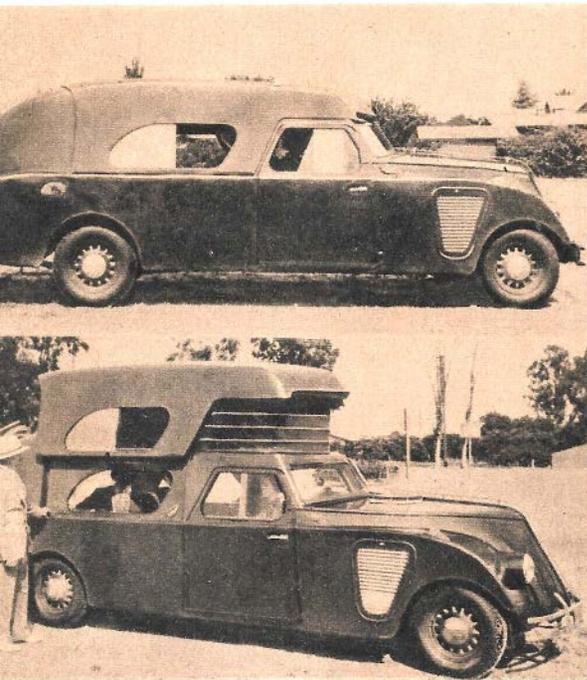
patient cannot memorize the symbols and give misleading answers, as sometimes happens when charts are used, for the examiner begins with symbols too small to be distinguished, and stops enlarging them at the exact point where the patient can read them.

The invention of the ophthalmoscope by Helmholtz in 1851 really marked the beginning of the science of physiological optics. Students had a'ways wanted to see into the interior of the living eye, but this was generally believed to be impossible as it was thought that all light shining into the eye was completely absorbed. The ophthalmoscope of Helmholtz proved that when a beam of light is projected into the eye, the deeper parts can be made visible if the examiner looks along the line of the beam.

Essentially, the ophthalmoscope is a hand instrument which generates light from a bulb in the handle and projects it from a mirror into the eye, the examiner peering through a pinhole behind the center of the mirror. To him the pupil then appears red



Auto-Home Developed



The roof of this streamlined auto (top) features a cleverly concealed magazine bed that furnishes the "bedroom" created when the roof is raised, as shown in lower photograph.

A STREAMLINED auto sedan that converts into a two-story dwelling with all the comforts of home has been developed by Arthur S. Thompson, a watchmaker in Ontario, California. The car is of standard width and has a wheel base of 138 inches, but the body design features a special roof that becomes a comfortable two-person bedroom when raised. A magazine-type bed is cleverly concealed in the roof when it is lowered for traveling.

The four upholstered chairs in the lower section of the novel auto can also be converted into a bed for two persons, thus providing the car with sleeping facilities for four. Fresh air is assured by a special ventilation system. The rear of the auto boasts a refrigerator, a sink with running water and space for supplies.

New Synthetic Ice Invented

A PATENT covering the manufacture of synthetic ice for use in skating rinks has been granted by the U. S. Patent Office to two Czechoslovakian inventors, E. Murmann and C. Prell. The "ice" features the use of naphthalene—main constituent of mothballs—and certain chemicals obtained from coal tar.

Literally a product of the chemist's test tube, the synthetic ice has the following advantages:

No water to freeze or melt. No elaborate refrigerator machinery with intricate coils or pipes is needed. Warm spells may come and go, but they will not melt the artificial ice, it is claimed by the inventors.

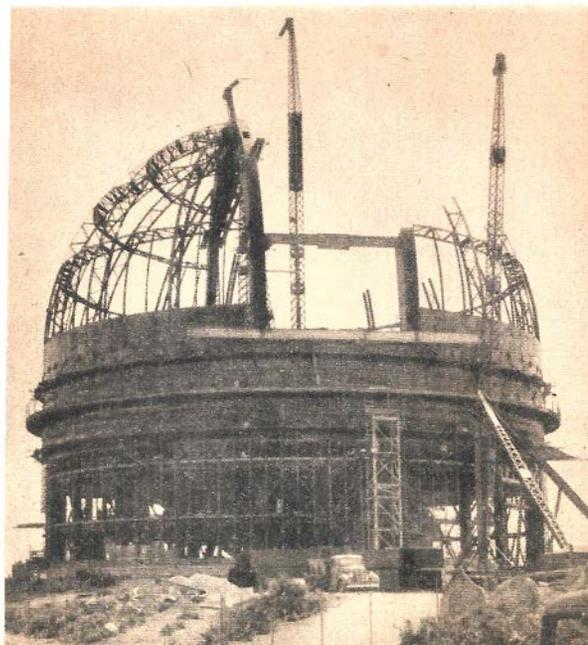
The chemical ingredients for making the ice are melted together with hard synthetic waxes, forming a fused mixture which may be poured in any desired thickness on the area which is to be converted into a skating rink. As the mass cools and hardens, the tar chemicals separate out as microscopically small crystals. These crystals keep the rink from cracking and forming fissures that would trip skaters. After the artificial ice has set, the surface is smoothed by scraping and ironing with hot irons.

Mt. Palomar Observatory Nears Completion

THE world's largest astronomical observatory is rapidly nearing completion atop Mt. Palomar in California. The steel beams constituting the framework of the 140-foot observatory dome, each of which weighs 10 tons, have been rigged into place by huge derricks and the dome will soon be covered with metal sheeting.

When completed, the observatory will feature a 200-inch telescope, the largest ever made. Mt. Palomar was chosen as the site for the giant telescope because of the superior visibility and freedom from fogs it provides.

Standing 138 feet high and 140 feet wide, this astronomical observatory atop Mt. Palomar, Calif., nears completion.

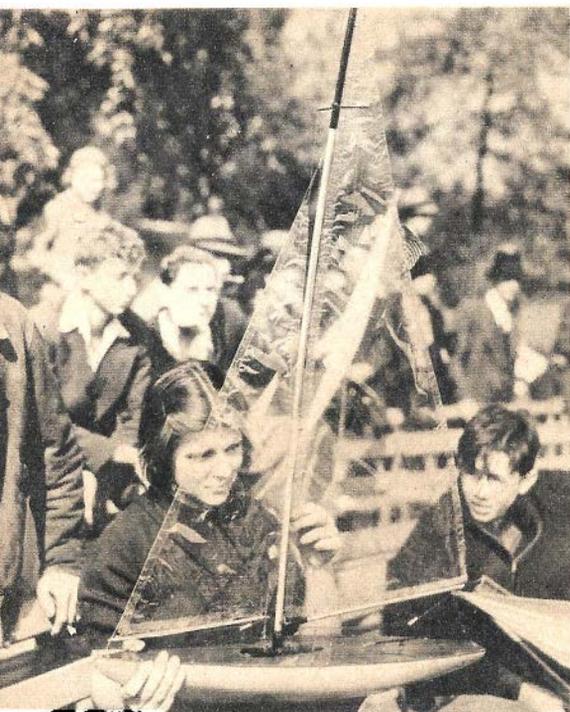


Dutch Test Double-Decker

CITY planners in Rotterdam, Holland, have achieved a workable solution for the problem of facilitating and protecting pedestrian traffic through the construction of double-decker streets. Developed as an experiment, the three miles of test streets have proved so practical and popular that city authorities are planning to construct more of them in the future.

The double-decker streets are two stories above ground level, being supported by attachment to apartment houses along the right-of-way. Bicycles, baby carriages and hand-pushed delivery carts are the only vehicles permitted to use the new streets, thus providing a safe "highway" for pedestrians and children. Pedestrians and vehicles are raised to the street level in small elevators.

Cellophane Used For Sail



Lola Barry, of Flushing, N. Y., displays scale model yacht she constructed. Craft is fitted with sails made of Cellophane.

ENTERED in a model yacht regatta staged in New York City recently, a boat constructed by Lola Barry, of Flushing, N. Y., featured sails made of Cellophane. The transparent material is said to be well adapted for model yacht use, providing sails that are lighter and stronger than those made from cloth or other fabrics.



Double-decker streets like this one are being tested in Rotterdam, Holland. Two stories above ground level, the novel streets are supported by attachment to nearby buildings.

Models Show Cell Structure

ARTIFICIAL models of living cell membranes are now being used by scientists to detect the facts of cell structure. The models are prepared by spreading simultaneously proteins in the form of egg albumin and fatty acids on water surfaces. The resultant film is then tested for strength, inhomogenities in the surface being detected and studied with an ultramicroscope.

Lights Reveal Motor Trouble

THE instrument panel of a motorcycle produced by a well-known manufacturer features red and green signal lights that serve to inform the driver whether or not the generator and the oil system are functioning properly. When the ignition switch is turned on the red light flashes to indicate improper oil pressure, remaining lit until pressure is normal. The green light remains lit until the generator charges properly. The lights, which are built-in as part of the classy instrument panel, flash brightly enough to attract the driver's attention even in daylight.



RADIUM



Since 1931 the mining camp at Great Bear Lake has grown from the few buildings shown above to a substantial community with a bank, stores, etc. The piled-up drums contain fuel for prospectors' planes, main transportation means.

On the shore of Great Bear Lake near the Arctic Circle, a load of pitchblende (right), the ore that contains radium, awaits shipment by plane and train to the refinery at Port Hope, Ontario, more than 3,000 miles away, where the mineral is chemically extracted from the ore in batteries of retorts (above). It requires 20 tons of chemicals and 6½ tons of pitchblende to yield one gram of radium valued at \$30,000!



WHEN prospector Gilbert LaBine flew over Great Bear Lake in northern Canada and saw strange dark seams in the rocky shore just below the Arctic Circle, he little realized that six years later he would produce the first ounce of North American mined radium, that his aerial view of rocky Great Bear Lake coast meant the breaking of the Belgian Congo radium monopoly with a resultant cutting of price from \$2,000,000 an ounce to \$840,000.

Today on the shores of remote Great Bear Lake there are many mining camps, some already in production, others in initial stages, and farther afield prospectors are still staking claims. A rush followed LaBine's discovery in 1930. He went in by plane and dog team

during the spring to explore the dark seams he had seen from the air. He battled the last of the Arctic blizzards, crossed treacherous spring ice on the 12,000 square mile lake, and made for the bay where he had seen the peculiar rock markings. There he found pitchblende, the ore which contains radium and its associated minerals, as well as silver, copper and some gold. But other metals were forgotten in the possibilities of radium, the little known mineral which sells by the gram, 28 grams making an ounce, the mineral which has been found to be one of the most likely cures for cancer, one of the scarcest and most valuable minerals on earth.

The assays proved the pitchblende was rich in radium, and extremely rich in silver.

From The Arctic

by James Montagnes



Frozen, or free of ice, Great Bear Lake (above) provides an excellent landing area for the planes of prospectors who work the valuable radium ore claims.



Stirring acids into pitchblende to start radium extracting process (above). Note the rubber gloves worn by the laboratory worker to avoid burns.



Left—Chemical extraction of the first ounce of radium from Great Bear Lake ore is eagerly watched by Gilbert LaBine (extreme left), discoverer of the mines, and a group of friends. Above—"Cooking" pitchblende with chemicals to extract radium used in cancer treatments.

LaBine, his brother, and several other prospectors staked five miles of Great Bear Lake shore. Their vein ran nearly all the way. And though they were a thousand miles from the nearest railway, though water transportation did not exist, though only planes or dog teams could get in, LaBine and his brother financed their find, started a rush.

They shipped out bags of the black ore, dangerous to handle because of the radium

content. By plane, by tractor and by scow, they hauled mining machinery from the nearest railway—more than one thousand miles away. At Port Hope, Ontario, they established a refinery and procured the best man available to extract the radium from the ore, Marcel Pochon, who had done work for the Canadian government's research laboratories. And while they tunneled on Great

[Continued on page 120]

Device Reproduces Weather Within Metal Cabinet

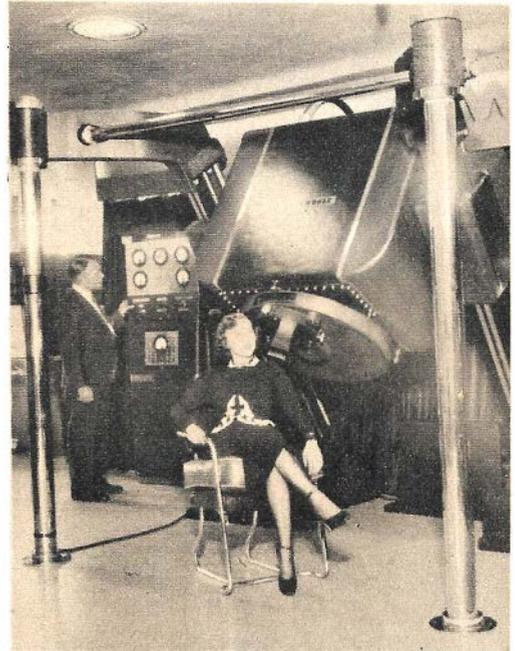


Designed for testing various materials, this "weatherometer" device can duplicate any weather condition such as rain, fog, desert heat, etc., by the mere turning of control knobs.

KNOwn as a "weatherometer," a newly invented device enables the operator to create any weather condition within the confines of a steel cabinet by merely turning a few knobs and switches. Electrically controlled, the weatherometer can quickly create a miniature San Francisco fog, a Kansas rainstorm, or the blistering heat of the Mojave desert for testing electrical insulation, durability of paint, etc.

The unusual device is mounted on a four-legged stand on the bottom part of which is mounted the control panel with its knobs, switches, and test meters. The upper part of the stand features the test cylinder chamber and a door that permits materials to be placed in the cylinder. A glass window in the door is used for observation.

Exhibit New X-ray Machines



This young lady is receiving shoulder treatment from a powerful 400,000-volt X-ray therapy machine which was exhibited at the Chicago National Convention of Radiologists.

Build Biggest Aero Propeller

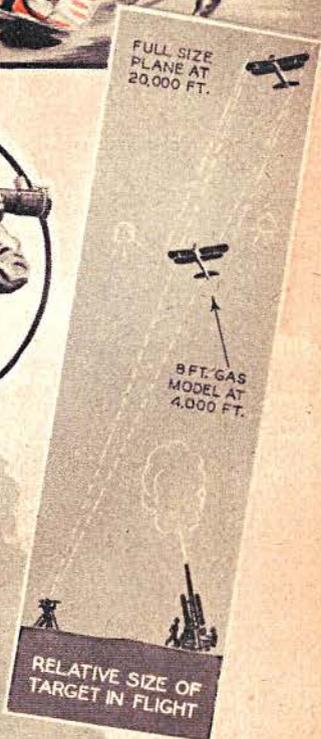
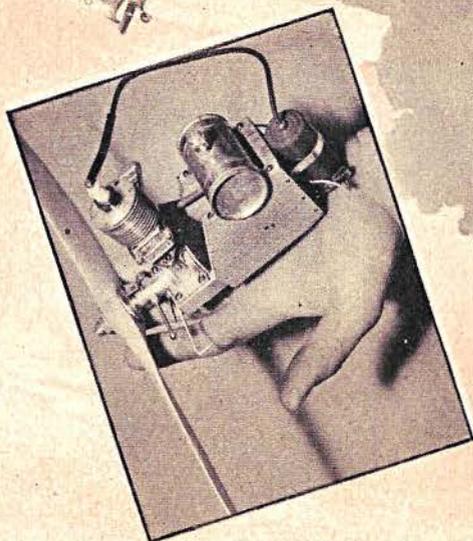
DESIGNED for use on engines of 1,700 horsepower, which are said to be in process of construction at this time, a huge three-bladed propeller built by the De Havilland Aircraft Co., of England, measures 14 feet, 6 inches in diameter. The propeller features controllable pitch and is claimed to be the largest of its type ever constructed, a chain hoist being needed to lift it.



The world's largest propeller dwarfs another of average size.

THE latest types of X-ray machines were placed on exhibition at the National Convention of Roentologists and Radiologists held in Chicago recently. Due to its massive size, a 400,000-volt X-ray therapy machine received the most attention from visitors.

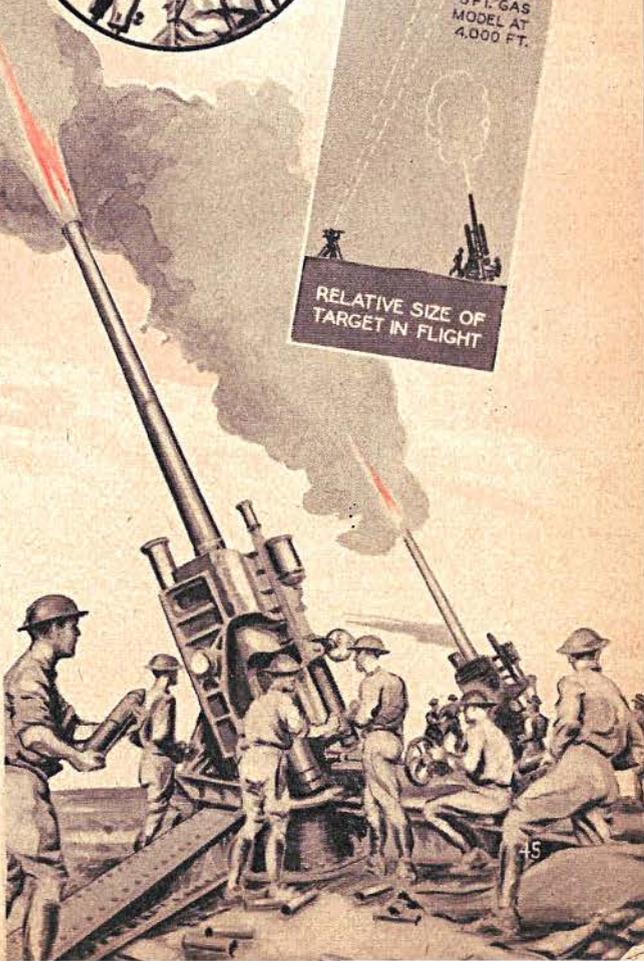
Army May Adopt Model Planes As Anti-Aircraft Targets



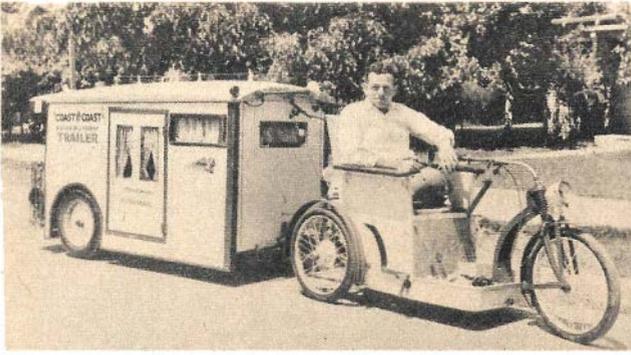
THE possibility of using highly efficient model airplanes as anti-aircraft targets is said to be under serious consideration by U. S. Army tacticians. Powered by compact one-fifth horsepower gasoline engines, the model airplanes easily attain an altitude of 4,000 feet, at which height they would present the same relative target as a real bomber at 20,000 feet.

The model planes to be used, if the plan is adopted by the Army, would be replicas of standard military aircraft and the possibility of controlling the models by radio is being considered. Photo shows a typical model plane gasoline engine.

January, 1938



Legless Youth Crossing U. S. In Motorized Trailer



Operating the engine by remote control from his special seat, Freddie Carson, a legless newsboy, is traveling from California to Florida in this motorized trailer at a speed of 30 m.p.h.

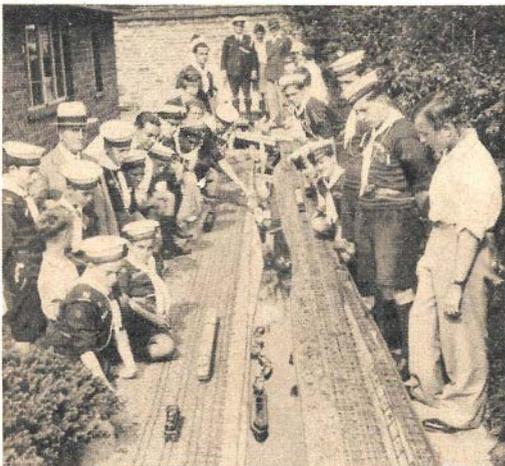
A NOVEL motorized trailer is being used by Freddie Carson, a legless newsboy of Santa Ana, Calif., to make a transcontinental trip to Florida. Although it is only seven feet long and four feet wide, the trailer boasts an electric radio, running water, a bed, and other conventional equipment found on large trailers.

Equipped with a one-horsepower engine, operated by remote control from the youthful driver's special chair, the trailer is said to attain a speed of 30 m.p.h. and run 120 miles on a gallon of gasoline. Carson expects to sell stories of his trip en route.

Model Exhibit Thrills Scouts

GIBRALTER Sea Scouts on a visit to London, England, paid a visit to the Ken View Model Railway Club located at Finchley, and were much intrigued by the club's model train and steamship exhibit. The club members, who make the models under the direction of Colonel G. Beach, an English army officer, range in age from 12 to 18 years.

The model exhibit, which is said to be one of the finest in England, consists of four lines of railroad tracks running along the edge of a miniature river confined between banks of concrete, sand and gravel. The model railroad features the latest types of streamlined engines and cars, while the "river" boasts replicas of well known Thames River boats.



This model train and boat exhibit, said to be one of the finest in England, proved to be a great attraction to a group of visiting Gibraltar Sea Scouts. The "river" is about 25 feet long.

Fancy Diver Uses Net "Pool"



Lack of a practice swimming pool does not deter Roy Fransen, English fancy diver, from keeping in training. A springboard and special net enable him to practice stunts in his garden.

SET up in the garden of his home at Kenton, England, a springboard and specially constructed net enable Roy Fransen, well known fancy diver, to keep in training for contests. The net features a square center of soft matting to prevent Fransen's arms or head becoming entangled in the webbing.

Scale Model Demonstrates New Type Fluoroscope

A ONE-SIXTH scale model of a new type biplane fluoroscope designed to eliminate bulky X-ray equipment was demonstrated at the International Congress of Radiologists in Chicago recently. The apparatus was designed and built by Dr. Edward Chamberlain and O. C. Hollstein, of Temple University Hospital, Philadelphia, Pa.

A full-size fluoroscope, built to the new design, will be entirely shock-proof and will feature X-ray tubes set at a greater distance from the screen to provide a sharper image. With the new device, it will not only be possible to quickly find the position of a foreign body in the lungs, but to also show how deeply it is lodged. Six years were spent in developing the new biplane fluoroscope.



O. C. Hollstein, research engineer, adjusts the screen of a model fluoroscope exhibited at a radiologists' convention in Chicago. The model's floor is cut away to show x-ray tube.

Machine Sells Train Tickets



Installed in a Swedish railway terminal, this machine not only issues train tickets and change upon insertion of coins in slots, but also snaps a photo of persons passing slugs.

A NEW device installed at the Stockholm (Sweden) Central Station issues train tickets upon insertion of coins within designated slots, providing exact change if too much money is inserted. An unusual feature of the machine is a built-in camera which automatically snaps a photo of any person who places a false coin in the slots, helping police to make a later arrest.

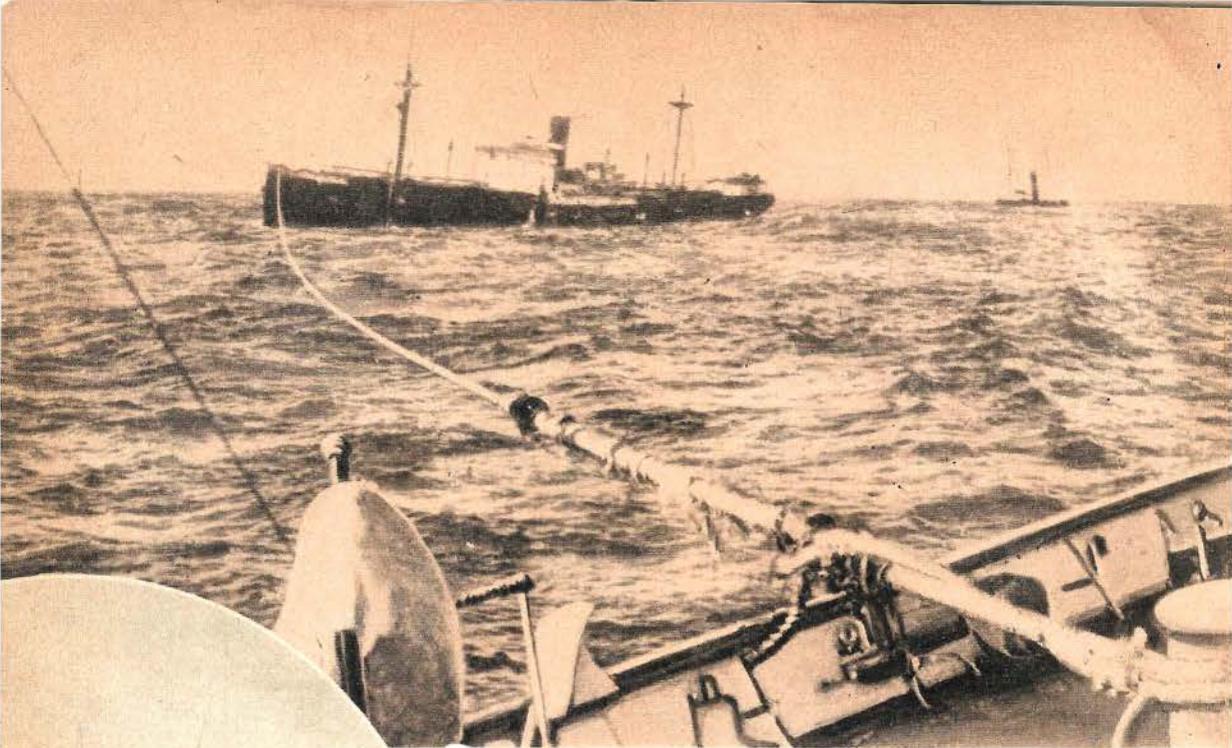
Home-Built Plane Sets Mark

PILOTING a home-built plane of his own design, S. J. Wittman, of Oshkosh, Wis., set a new record for light racing planes by speeding at 238.225 m.p.h. over a measured course. The tiny plane is powered by an inverted Curtiss D-12 engine of 420 horsepower.

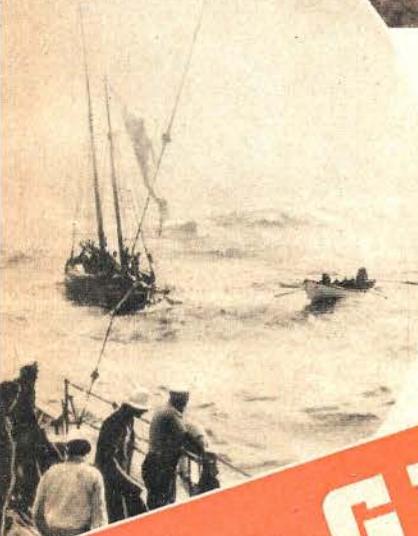
Wittman has made quite some money by entering his home-built plane in races held throughout the U. S. At the National Air Races in Cleveland, Ohio, he won \$2,500 by placing second in the Greve Trophy Race and another \$1,000 by placing fifth in the Thompson Trophy Race. In the Thompson event, Wittman was leading the field for ten laps, but was forced to slow up when his engine developed motor trouble. The speedy home-built plane is a stubby mid-wing type with a single-seat cockpit.



S. J. Wittman waves a greeting from the cockpit of his home-built racing plane with which he set a new light plane record.



Top—A Coast Guard vessel with a disabled ship in tow. Sometimes it is necessary for these cutters to tow a disabled craft hundreds of miles to a friendly port. Left—The white hull of a Coast Guard cutter is a pleasant sight to many a disabled boat.



Neither wind nor sea prevents the Coast Guard from proceeding to the rescue when an SOS is received.

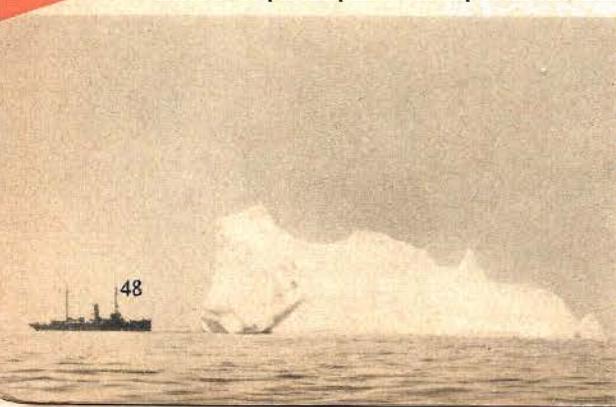
GUARDIANS

by
Clifford Peters

One of the most important duties of the Coast Guard is to keep ships warned of the location of icebergs. When the Titanic went down after striking one of these bergs, the Coast Guard went to work to prevent a recurrence of that tragedy. Their record is 100 per cent perfect—no ship or life lost since.

“ALWAYS Ready” is the motto of the United States Coast Guard. During every minute of the day, every day of the year, thousands of men and millions of dollars worth of equipment are ready to answer calls of distress from any ship at sea. No call goes unanswered. Ships or planes are under way within a few minutes after a call for help is heard or seen.

During each of the past sixteen years, nearly 4,000 lives have been saved by the Coast Guard, and more than 8,000 calls for assistance have been answered. The value of vessels assisted each year exceeds \$40,000,000. The Coast Guard was started as a law en-



forcement agency, but today its principal duty is the saving of life and property at sea and on the coast. For every dollar spent for Coast Guard operations, two dollars are returned in the form of property saved. This does not include the inestimable value of lives saved.

Organized August 4, 1790, the Coast Guard was first called the "Revenue Marine Service." It was started at the request of Alexander Hamilton, then Secretary of the Treasury, for the specific purpose of eliminating smuggling. Before the Revolutionary War, smuggling had been practiced as a means of side stepping the payments of unpopular duties imposed by a more unpopular King George.

Even after the war, these same smugglers and many new ones found it profitable to continue their activities under the new government. After a short time, Mr. Hamil-

ton found that the treasury was greatly in need of money and that one of its principal revenues, duty on imported merchandise, was not as great as he thought it should be.

Because appeals to the consciences of the smugglers were found to be useless, he went to Congress and requested funds with which to build ships. And that these ships would have more than a moral effect on the smugglers, he planned to mount guns on them, as many as fourteen, on each cutter.

In November of 1791, Hamilton's first cutters went into service. Within a short time, his opinions proved to be correct. Smuggling began to disappear and

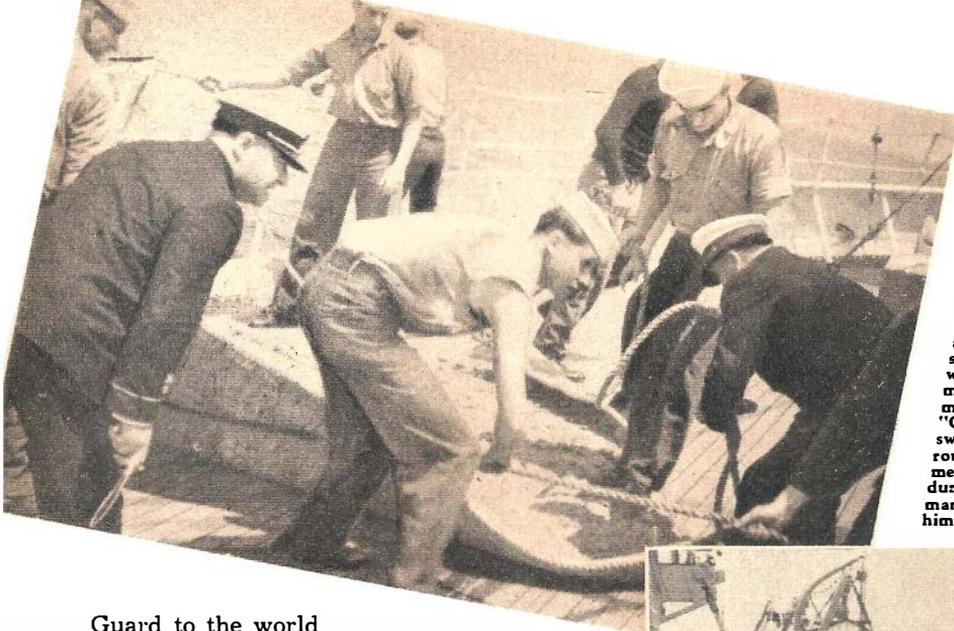
OF THE SEA



The Coast Guard Cutter Champlain. This vessel has participated in many thrilling marine rescues. Each Spring when the ice season starts, the Champlain goes off on ice patrol. Before the season is over, late in June, usually several ships have been towed into port and countless persons have been assisted in gaining shore.

The radio room on one of the Coast Guard cruising cutters. Here a continuous watch is maintained on the International distress frequency and the Coast Guard calling frequency. Several transmitters and receivers are ready for use twenty-four hours a day.





If a hole is stove into the hull because of a collision with another ship, immediate covering of that hole might mean the difference between life and death for many persons. The photograph shows a "collision mat" being prepared for use. With a rope at each corner it is lowered over the side and adjusted so that it covers as much of the hole as possible. While this mat may not keep a ship afloat indefinitely, it could slow up a large inrush of water long enough to permit more permanent repairs to be made. Below—When the "Champlain" is in warm waters, swimming is part of the day's routine. Because Coast Guardsmen may be forced overboard during rescue operations, each man must be able to take care of himself in, as well as on, water.



Guard to the world at large is the maintenance of the International Ice Patrol, which was instituted soon after the *Titanic* was lost.

Each spring when the ice starts to move southward from the Arctic regions, the Ice Patrol goes into operation. When the southernmost berg is sighted by a patrol ship, its position is broadcast. During daylight hours, the Coast Guard vessel continually searches for bergs, and each night it returns to the southernmost one and drifts with it until morning. This is repeated daily until the end of the ice season, when the bergs have been

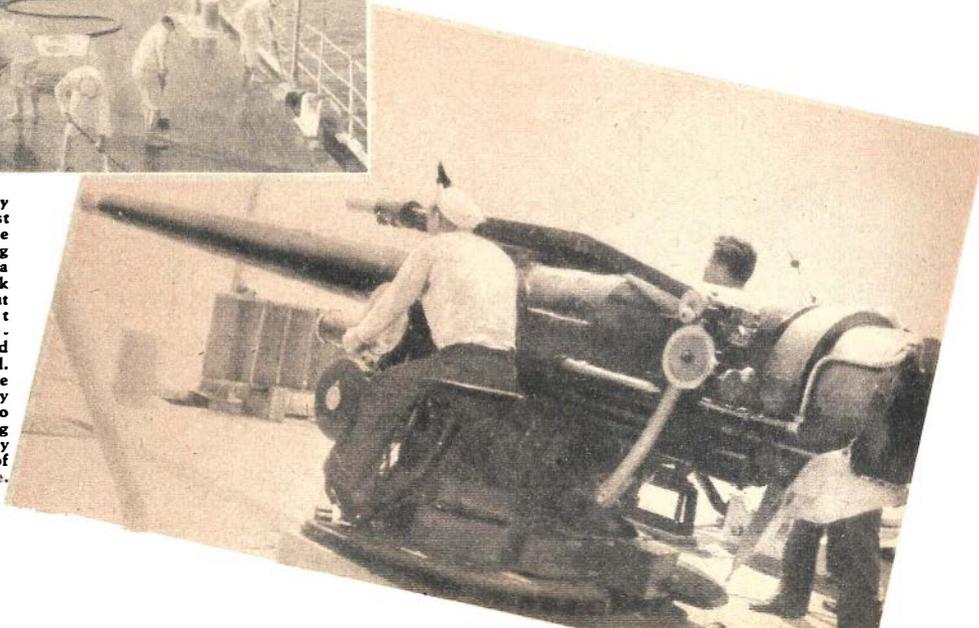
reduced in size by the warm water until they no longer are dangerous.

Contrary to the belief of many persons, there is no way to destroy these monsters of nature. Although attempts have been made to destroy them by shell fire and by dynamiting, both methods have been unsuccessful. The most effective weapon has been found to be a knowledge of their exact location.

[Continued on page 149]



It's not all play aboard a Coast Guard cutter. Here the crew is washing down the deck, a not unpleasant task on warm days, but not so pleasant when the thermometer has started its trek downward. Right—Because the Coast Guard may be called upon to aid in protecting our shores, gunnery practice is part of the daily routine.



Center — A gasoline-driven generator supplies power for the transmitters. The use of a generator effected a considerable weight reduction by eliminating storage batteries. Bottom—A trap door in roof of car affords the announcer an unobstructed view in all directions.

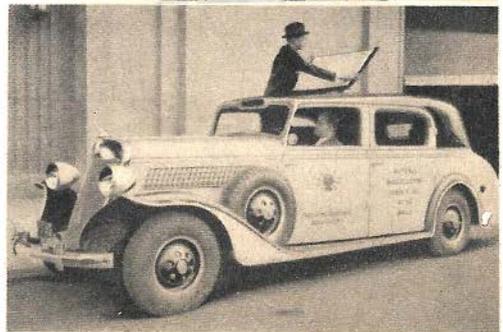
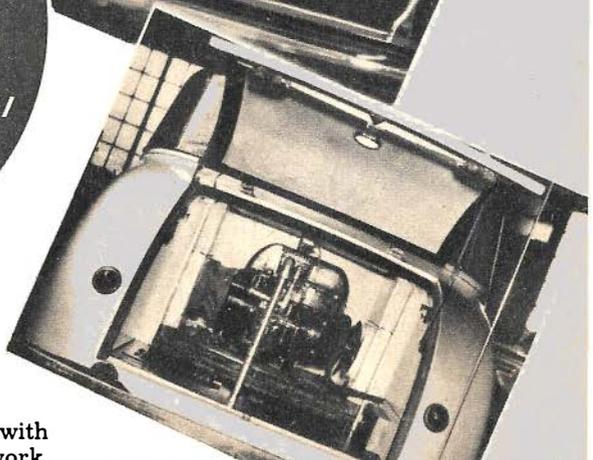
Below—The control panel is directly behind the front seat of the new NBC mobile transmitter car. The ultra-high frequency receiver and the speech amplifying equipment are contained in this cabinet. In the space usually occupied by the rear seat is the 50-watt intermediate frequency transmitter and the 40-watt ultra-high frequency transmitter.

**AUTO
RADIO
"DE LUXE"**

TO MEET the growing need for broadcasting from outside points, the National Broadcasting Company, of Chicago, Ill., has outfitted a new car with all necessary equipment for this type of work. The vehicle is capable of traveling from place to place at high speeds.

The equipment for this mobile unit consists of two transmitters, three receivers and a gasoline driven generator, all compactly mounted in a specially built touring sedan. Considerable weight reduction was achieved by discarding storage batteries and substituting the generator for the transmitters' power supply.

Immediately in back of the front seat is the control panel and console, which houses the ultra-high frequency receiver and the specially designed four-stage high gain audio amplifier. To the rear, in the space usually occupied by the back seat, is a large compartment containing a fifty-watt transmitter, used for stationary broadcasts. A forty-watt

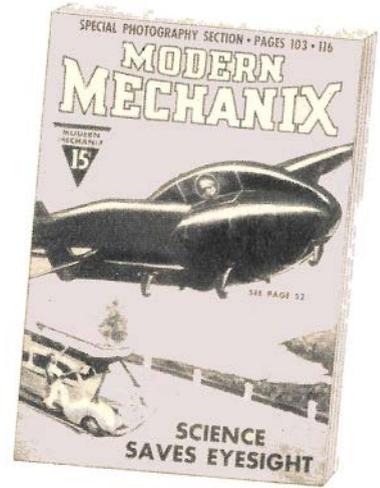


ultra-high frequency transmitter is used for mobile broadcasts. The mobile unit is so designed that one man can drive and broadcast at the same time.

Glider Launched From Cradle Atop Speeding Auto



A special track mounted atop a passenger auto enables Don Stevens to launch his glider without use of tow-lines or catapults. Glider leaves auto when sufficient speed is attained. Idea inspired MM cover reproduced at right.



A NEW method of launching a primary glider has been developed by Don Stevens, of Redondo Beach, Calif., in which the glider is carried on a specially constructed track mounted atop a passenger auto. The glider is held to the track until the auto has attained sufficient speed to create lift on the glider's wing, upon which it is released for free flight. The new launching method is said to be as practical in operation as the usual tow-line and catapult methods.

Stevens used a simple primary type glider to conduct his novel launching experiments, but glider pilots believe that secondary or soaring sailplanes would fare even better when launched by the new method due to

their superior lift qualities at various speeds. Only a short run of the car would be necessary

when launching a highly efficient sailplane.

On the cover of this issue, a *MODERN MECHANIX* artist has depicted the launching of an imaginary sailplane of highly streamlined design by the Stevens method. The hook-like objects protruding from the sides and nose of the sailplane are the means by which the glider would be held to the launching cradle atop the speeding auto until the pilot decided to release it. Once free of the launching cradle, the pilot would retract the hooks by a gear mechanism, cutting down wind resistance to an absolute minimum.

The editors would like to hear from glider enthusiasts who have tried other novel launching methods.

Converted Bus Serves As Mobile Lunchroom—Home



By converting this former passenger bus, the new owner established both a business and residence. Lower section serves as a lunch counter while upper is fitted as living quarters.

A FORMER Fifth Avenue (N. Y. City) bus has been converted into a perambulating lunch room and residence by its enterprising owner. Parked along the shore of Lake Copake in eastern New York, the lower section of the bus serves as a lunch room and counter for swimmers and fishermen, while the upper section is fitted out as living quarters for the proprietor.

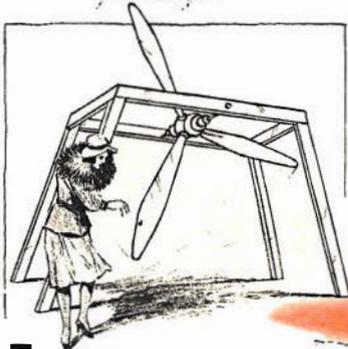
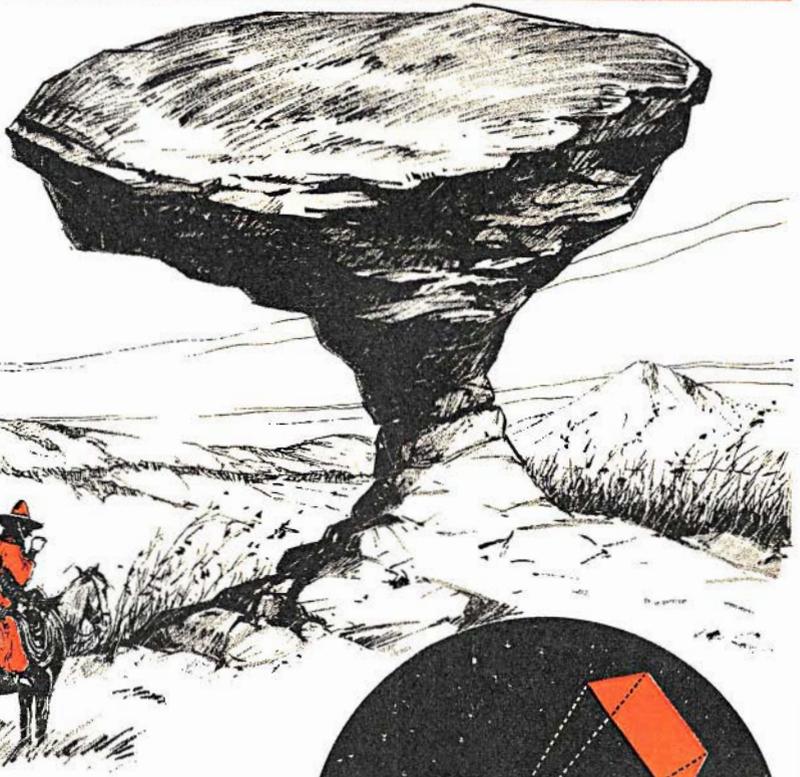
Addresses of manufacturers of products mentioned in MODERN MECHANIX can be obtained by sending a stamped, self-addressed envelope to the editors.

A 700-Ton Swaying Nut Cracker

NIC SPRANK OFFERS \$5.00 FOR BEST ODDITY

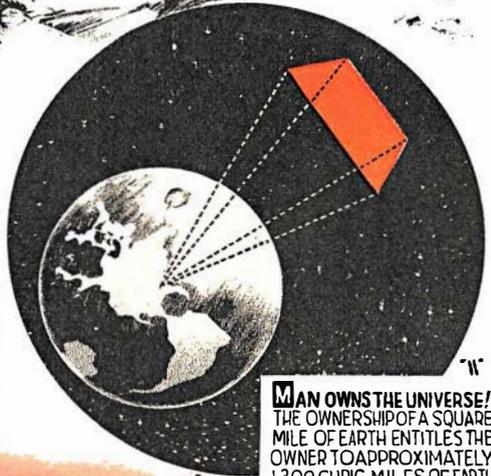
A 700-TON WALNUT CRACKER! A stone so perfectly balanced that when it sways in the wind it will crack a walnut. Can be seen in Argentina. - It weighs 700 tons and rocks with each puff of wind.

C.L. Brass, Clarksburg, W. Va.



GAS STATION OLDER THAN GASOLINE! - IN LAMAR, COLORADO. A GAS STATION HAS BEEN ERRECTED FROM PETRIIFIED WOOD, APPROXIMATELY 175 MILLION YEARS OLD. THIS "TIMBER" IS AS FIRE-PROOF AS STONE AND THE ROOF ALONE WEIGHS 90,000 POUNDS. -

*J.F. Dopak, Jr.
Chicago, Ill.*



MAN OWNS THE UNIVERSE! THE OWNERSHIP OF A SQUARE MILE OF EARTH ENTITLES THE OWNER TO APPROXIMATELY 1,300 CUBIC MILES OF EARTH 300 CUBIC MILES OF AIR, AND COUNTLESS MILLIONS OF STARS, COMETS, METEORS, AND AT TIMES EVEN THE SUN AND THE MOON - AND ALL BECAUSE OF A LAW WHICH STATES THAT "THE OWNERSHIP OF A TRACT OF OF LAND EXTENDS FROM THE CENTER OF THE EARTH TO THE ZENITH."

-Ed. Richlik, Cicero, Ill.

CHEWING GUM TURNS PROPELLER! - BECAUSE THE PROPELLERS OF THE GIANT AIRLINERS ARE BALANCED SO PERFECTLY, A PIECE OF CHEWING GUM PLACED ON THE TIP OF ONE OF THE BLADES, BECAUSE OF ITS WEIGHT, WILL CAUSE IT TO TURN. -

W. RICHARD, KANSAS CITY, KAN.



Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Modern Mechanix Publishing Company, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

Electrostatic Device Clears Air Of Smoke, Pollen

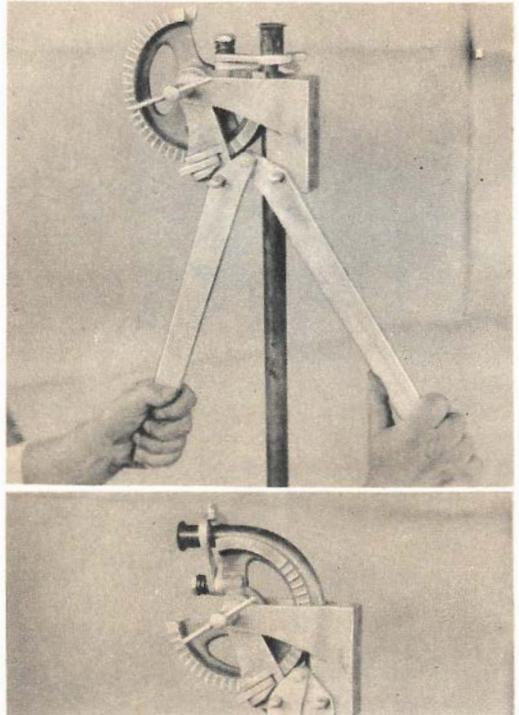


This electrostatic air cleaning machine removes dust, smoke and pollen from the air by ionizing particles and causing them to pass over grounded plates to which they cling. Young lady is shown testing the device with tobacco smoke.

DESIGNED for home or factory use, a compact electrostatic air cleaner device was recently placed on exhibition at a convention of iron and steel engineers held in Chicago, Ill. The new cleaner is said to remove dust, smoke, and pollen from the air more efficiently than ever before.

In operation the electrostatic cleaner forces the air through an ionizing screen and the solid particles in it, 90% of which would pass through the average filter, are electrically charged. The air is then passed over grounded plates, causing the dust and pollen particles to cling to them.

Machine Bends Pipe 180°



Bending pipe to any angle up to 180 degrees is easily accomplished with device shown at top. Lower—Pipe bent to shape.

Microphone Aimed Like Gun

A "MACHINE GUN" type of microphone that picks up a maximum of sound from the object or spot upon which it is focussed has been developed by a leading electrical equipment manufacturer. The device derives its name from the fact that it is mounted on a swivel joint atop a tripod and is aimed much in the manner of a machine gun.

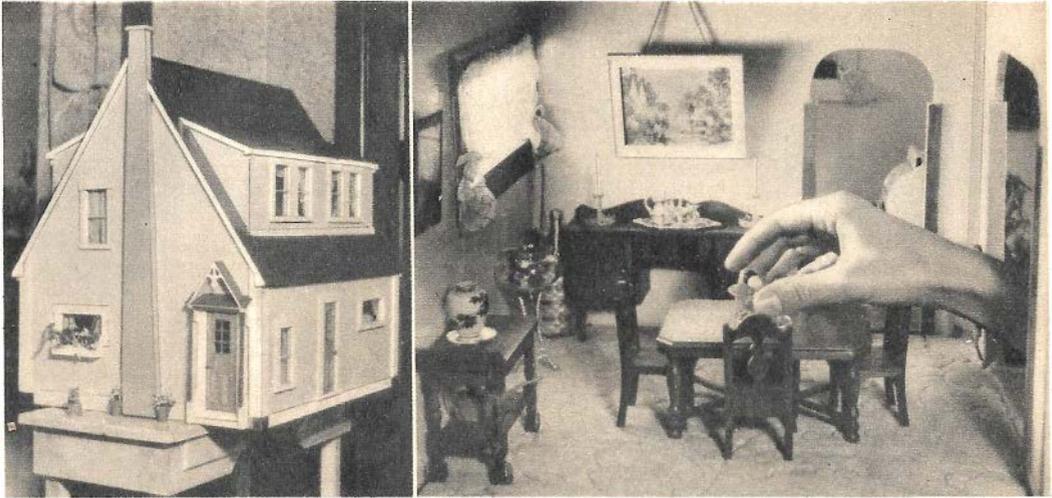
The novel microphone received an exacting field test when it was placed on a balcony of the Empire State building in New York during the American Legion Convention.



Aimed like a machine gun, this microphone was used to pick up band music during American Legion parade in New York.

REQUIRING very little physical effort, a new lever-operated machine quickly bends pipe, at any point along its length, to any desired angle up to 180 degrees. The bender is made in sizes accommodating pipe diameters of $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and one inch. Each movement of the machine's ratchet mechanism bends the pipe a fixed number of degrees, a long handle providing leverage.

Doll House Features Complete Interior Furnishings



If it were not for the builder's hand (right), one would believe the room to be that of a modern dwelling instead of an interior view of the beautiful doll house shown at left. The house walls can be removed to permit placing of furniture.

STANDING 31 inches high with a floor plan of 26 x 30 inches, a novel doll house constructed by a stenographer and her father as a hobby features all the furnishings and details found in the average real home. Lighting is supplied by small floor lamps connected to a transformer concealed in the tiny home's attic, the wiring being concealed by running it down a chimney and under the flooring of the furnished rooms.

The first floor of the doll house boasts a long living room with a fireplace, a reception hall with an open stairway at the end of the living room, a dining room and a kitchen. On the second floor are a master bedroom, a nursery, a bathroom and a hall with a rail that constitutes a balcony overlooking the miniature hall below.

The furnishings of the miniature dwelling are true to the best standards of interior decoration and are built to a perfect scale of the prototypes. Included in the furnishings are a grand piano, the top of which raises; a davenport, which can be divided into separate chairs; a refrigerator; a set of silverware; hand-made hooked rugs; monogrammed kitchen towels, etc.

The "family" occupying the doll house consists of a pin cushion doll serving as a mother; a father with his pipe in one hand; a little girl with her pet cat, and a baby in a tiny crib.

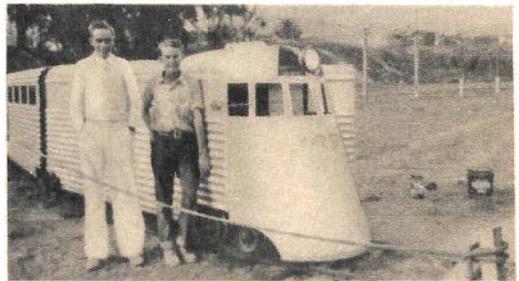
Most of the parts for the doll house were turned on a lathe. The door knobs were cast in bronze and the windows and door panes

were leaded in. The doors actually swing on hinges, but in order that one may see the insides of the house, the sides are removable in four complete sections.

Boys Build Passenger Train

USING salvaged mining equipment, Walter Osborn and Hugh Fife, of Bakersfield, Calif., constructed a miniature streamlined train 40 feet long, 5 feet high and 3 feet wide. Powered by a gasoline engine, the "Silver Streak," as the train is named, is capable of a 25 m.p.h. speed.

The novel train is equipped with air brakes, an air horn, a generator for electric lights and seats for 20 passengers. In spite of the saving through use of the salvaged mining parts, wheels, iron frames, etc., the home-built train and its 1,000-foot track cost \$1,000.

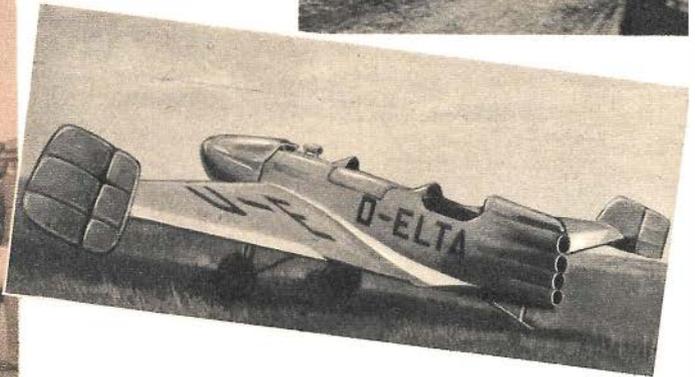


Walter Osborn and Hugh Fife devoted three years of spare time to building this 20-passenger streamlined "Silver Streak" train. Powered by a gasoline motor, the train travels 25 m.p.h.

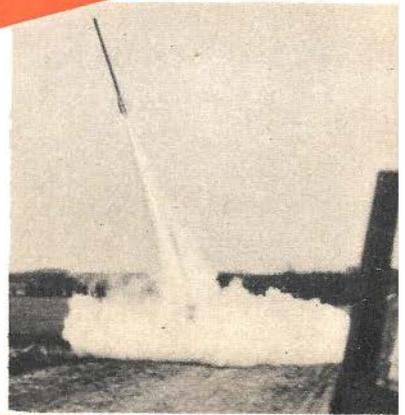
Prophetically depicting what future commercial rocket flight "space ships" will look like, a recent motion picture features scenes showing a passenger rocket taking off from a long runway (left) and another super-rocket ship being nosed out of its hangar (left center) in preparation for a trans-continental flight at speeds surpassing 1,000 miles per hour. Bona fide rocket experimenters, however, acknowledge that it will be a long time before passenger rockets will be practical.

ROCKET FLIGHT— Dream Or Reality?

In the photo at right, an experimental rocket is seen just at the moment of leaving the ground. Rockets do not have to be shot into the air in order to conduct tests, but are usually "launched" on a proving stand, special instruments indicating power, rate of climb, and other data.



Much in the manner of pioneer aircraft experimenters, groups of rocket fans are constantly seeking to improve rocket flight in an effort to hasten the day when commercial rocket travel will be practical. Left—German experimenters with a newly developed rocket. Above—Test plane fitted with a rocket motor at tail. Rocket motors have also been tested in boats and automobiles.



Brushes In Sorting Machine "Shave" Fuzz From Peaches

CUSTOMERS complaining about the fuzz on peaches he sold them caused William W. Heritage, of Richwood, N. J., to seek some means of removing the offending substance. The enterprising peach grower solved his problem by attaching a series of brushes to his sorting machine in such a manner that they strip or "shave" the fuzz from each peach as it is brought in contact with them. The residue is deposited in baskets at one side of the machine.

The peaches are shaved so finely that very little of the flesh is lost in the process. Housewives are said to favor the shaved peaches because the drudgery of peeling the fruit for desserts is eliminated.

Surfboard Has Folding Fin



Incoming waves strike the fin of this new type surfboard and propel it to shore at a fast speed. An air-tight compartment prevents surfboard from nose-diving, while a rudder guides it.

A NON-SINKABLE surfboard invented by William L. Wheeler, of Los Angeles, Calif., is fitted with an air-tight compartment at the nose, a folding fin, and a fixed rudder. The air-tight compartment prevents nose-diving in the surf when incoming waves strike the folding fin and help propel the board shoreward. The rudder serves to guide the novel surfboard in a straight path.

January, 1938



Peaches fed to a conveyor belt of this sorting machine (top) pass through a series of brushes that "shave" the fuzz off, after which peaches are selected for size and grade (bottom).

Builds Midget Powered Bus

USING old tins, scrap wood, saucepan lids and other junk, Ernie Johnstone, a bus driver in Brighton, England, spends his spare time building miniature buses. His latest model is powered by a motorcycle engine, is fully insured and licensed for operation on the highways. The tiny buses have made Johnstone very popular with local children.

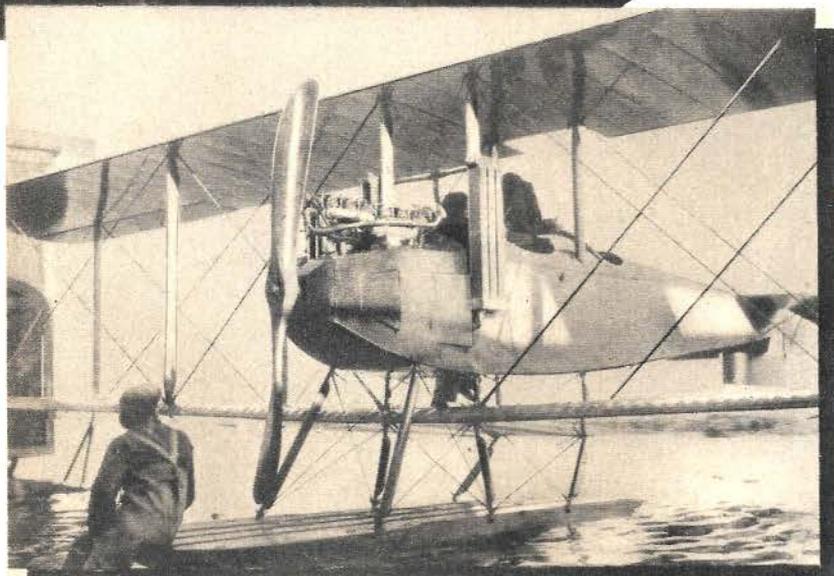


Ernie Johnstone, a Brighton, England, bus driver, takes two juvenile friends for a ride in the midget bus he constructed from junk. The vehicle is licensed for highway operation.

Martin —

by Robert H. Rankin

A self-taught designer-pilot whose planes have made history.



Glenn L. Martin, shown examining a model of his famous "China Clipper," was one of the first American pilots awarded an international license issued by the Federation Aeronautique Internationale, and is credited with being the third man in the world to build and successfully fly an airplane of his own design. An early Martin single-float seaplane is shown above. Contrast its size and construction with the world-famous, 130-foot span Martin "China Clipper" shown at right.

"Early Bird" of Aviation

THE name of Glenn L. Martin is one of the oldest, as well as one of the best known in the entire field of aviation, having been associated with aeronautics since the days of the "Early Bird" pioneers who followed fast in the footsteps of the Wright brothers. His bombing planes, with their high speed and wide cruising range, revolutionized theories of aerial bombardment, and his big "Clipper" flying boats have demonstrated the practicability of air transportation over the Pacific.

As a lad in Salina, Kansas, he evidenced a marked interest in mechanics and won a reputation for being able to repair anything from a bicycle to a threshing machine. A great reader, he eagerly followed the accounts of the glider experiments of Chanute and Lighthill. Experimenting first with large kites, then with gliders, Martin dreamed of the day when he would fly a powered craft.

In the meantime, he completed his public school education and went to Kansas Wesleyan College, where he studied for two years. His parents then moved from Salina to Santa Ana, California, and Glenn joined them, obtaining employment as a garage mechanic in his new home town.

At this time the newspapers of the country were hailing the Wright brothers and their new "flying machine" and when Martin read

of their success he decided that he would build a machine of his own. He hired an abandoned church to build it in and worked on the craft daily. Mrs. Martin had the greatest faith in her son and when it became too dark for him to see she would hold a lighted kerosene lamp for him so that he might continue his building far into the night.

After much hard work and an abundance of discouragement and criticism from fellow citizens, Martin finally completed his plane in 1909. Wheeling it out into the California sunshine, he was determined that he would make it fly or die in the attempt. He took his place at the controls and the propeller was spun by an obliging, if somewhat skeptical spectator. The coughing, spluttering 14 h.p. second-hand engine came to life and as the propeller bit into the air, the craft moved forward. Gaining speed rapidly, it lifted into the air and Martin became the third man in the world to build and successfully fly a heavier-than-air craft of his own invention and construction.

At once, he decided to enter the airplane manufacturing business and gathering seven ex-automobile mechanics about him, he established his factory in the abandoned church building. Harassed for



a time by poverty and forced to borrow and almost beg materials, Martin kept his plant running. During the warm summer months he took his old pusher biplane and barnstormed about the country to raise funds to carry on his work. Allowing nothing to discourage him, he kept his factory running full blast and by 1913 was recognized as one of the largest airplane builders in the world.

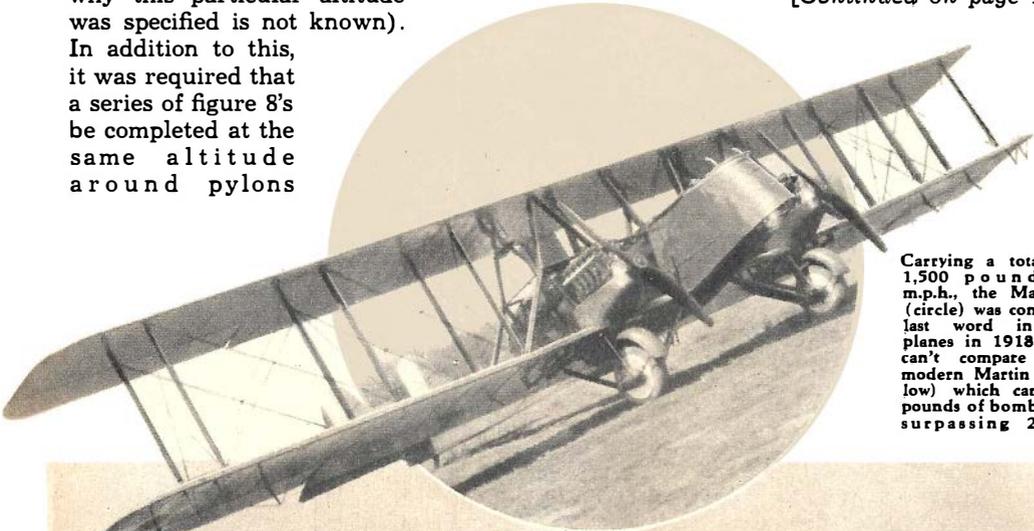
In the meantime he had advanced in flying skill and was awarded a medal for making a then amazing twenty-eight mile over water flight from the California mainland to Catalina Island. He became one of the first Americans to be given the international license of the Federation Aeronautique Internationale. In order to win this license or certificate it was necessary to make six complete circlings of the airdrome at an altitude of 163 feet and 5 inches (just why this particular altitude was specified is not known). In addition to this, it was required that a series of figure 8's be completed at the same altitude around pylons

which were spaced 500 feet apart. To wind up the qualifications, it was required that the candidate make a landing within 163 feet, 5 inches of a given mark. These requirements seem very easy today, but it required considerable skill to do them with the flying box kite planes of 1911.

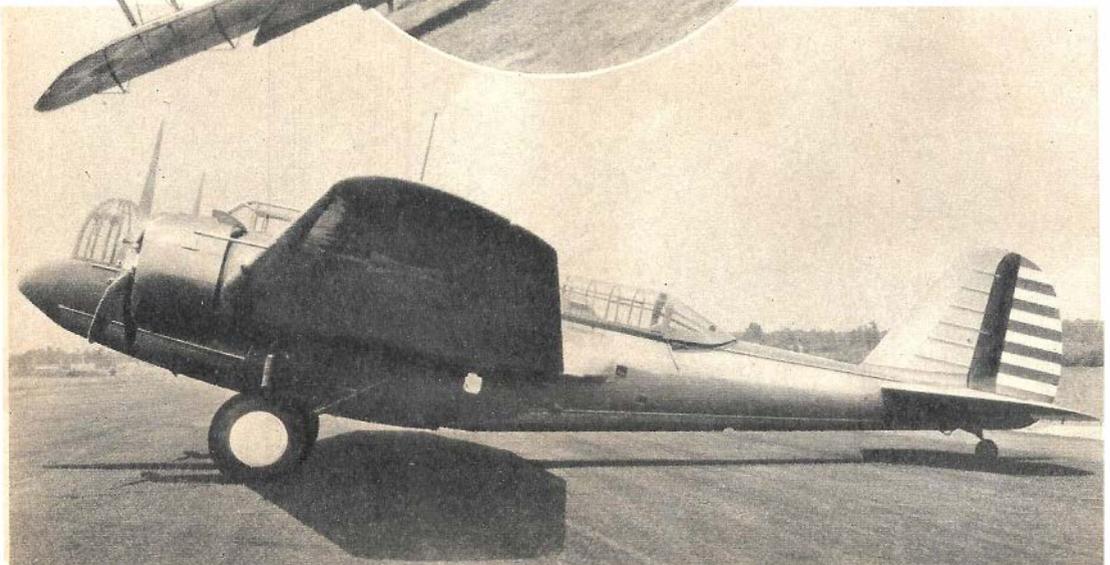
In addition to the Certificate of the F. A. I., Martin was awarded Expert Aviators Certificate No. 2 of the Aero Club of America.

Incorporating his factory as the Glenn L. Martin Company, the young pilot-builder at first concentrated on producing planes for barnstormers and intrepid sportsmen. Moving his plant to Los Angeles, he built the first American training plane. In 1913 this trainer, which was known as the TT tractor, was adopted by the War Department as a standard training ship for the Army. In hydroplane form, the TT won the

[Continued on page 118]



Carrying a total load of 1,500 pounds at 118 m.p.h., the Martin MB-1 (circle) was considered the last word in bombing planes in 1918-22, but it can't compare with the modern Martin B-10 (below) which carries 4,000 pounds of bombs at speeds surpassing 200 m.p.h.



Thousands of aviation enthusiasts throughout the U. S. are receiving flying instruction in airplanes of the "flivverplane" class—planes equipped with motors of 40 horsepower or less. Right—Typical flying club group with a Taylor Cub airplane. Powered with a four-cylinder 40 h.p. engine, the Cub is one of the most popular airplanes in America. Selling for less than \$1,300, more than 1,375 Cubs have been sold in the last six years.



"FLIVVERPLANES" POPULARIZE FLYING

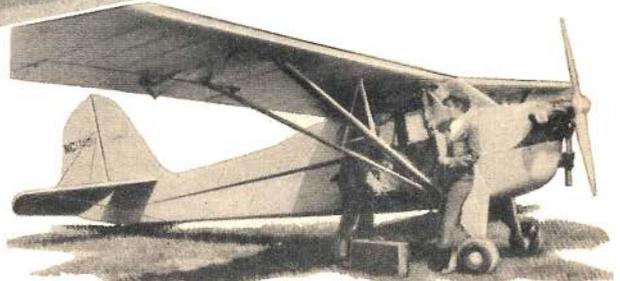


Possessing trim lines, the Rose "Parrakeet" biplane (circle) is a single-seater and especially adapted for flying by students who have soloed and desire to accumulate additional flying time needed to obtain a pilot license of higher grade.

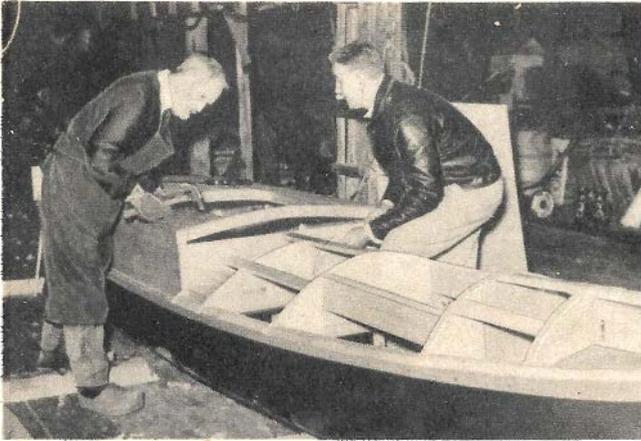


Increasing in popularity daily, the Taylorcraft (above) is one of the latest arrivals in the light plane field. The cabin features side-by-side seating and wheel-type controls in place of the conventional stick type. Prices of leading "flivver-planes" range from \$1,200 to \$1,800, with all models available on installment purchase plans featuring very liberal terms.

Powered by a 40 horsepower motor, the Welch sport monoplane shown above boasts a top speed of 96 m.p.h., yet lands at the low speed of 29 m.p.h. Operating cost is claimed to be about one cent per mile. Right—The Aeronca "K", latest of a long line of Aeronca planes that hold 19 out of 33 official world's records issued for planes of all categories. The model "K" cabin features side by side seating and space for several small suitcases as well, making it extremely popular with many sportsmen pilots.



Mariner Plans World Voyage In Small Catamaran



Captain William Salston (left) is assisted by Poultny Bigelow, a friend, as he constructs the canoe catamaran in which he plans to make his 31st round-the-world sailing trip.

A HOME-BUILT catamaran composed of three specially designed canoes will be the unusual means by which William Salston, a retired sea captain, hopes to make his thirty-first sailing trip around the world. The canoes are being built at Malden-On-The-Hudson, N. Y.

The center canoe of the catamaran will be 25 feet long and 41 inches wide, according to Captain Salston, and the two canoes on either side, serving as outriggers, will measure 16 feet in length and 36 inches in width. The sail for the craft will measure 350 square feet and a speed of 20 knots is expected of the craft when favored with a stiff breeze during the voyage. The canoes will be covered, providing dry storage space for food supplies and emergency sailing gear.

New "Pup" Tent Developed

A NEWLY developed "pup" tent is equipped with collapsible dural metal poles and can be folded into a compact roll that can easily be carried on the back. The tent weighs only six pounds but, despite its lightness, features conveniences such as a mosquito screen, zipper front, vents for air circulation and an attachment for suspending a small light inside.

Although small in size, the new tent is high enough at the peak to permit a man to dress inside and is tapered toward the back to give a streamline effect valuable in windy weather. The entire tent is made of a durable, rain-proof fabric and the floor is of the sewed-in type, serving to keep out crawling bugs, snakes and insects.

MAN-SIZED "PUP" TENT



Featuring collapsible poles, this "pup" tent can be rolled into a compact bundle for easy carrying. Floor is sewed-in.

Rink Uses 9 Miles Of Pipe



These workmen are placing packing over the nine miles of ammonia-filled piping used in making an English ice skating rink.

MORE than nine miles of ammonia-filled piping was required to convert a swimming pool in Wembley, England, into an indoor ice skating rink. The piping was placed on a wooden flooring supported by a steel scaffolding and covered with packing material to provide an even surface. Water was then allowed to flow over the piping until a depth of several inches was attained, after which freezing occurred.

Early Franklin Generator Lights Modern Highway

DURING recent ceremonies attending the renaming of one of Philadelphia's parkways as "The Benjamin Franklin Parkway," an electric generating machine constructed by the famous statesman was used, in conjunction with modern electrical equipment, to illuminate lights along the thoroughfare.

Turning a crank of Franklin's machine, Mayor S. Davis Wilson caused an early Edison generator to produce an electric current which gradually illuminated an early incandescent lamp. When the lamp produced a certain amount of light, it energized a photo-electric cell which operated a relay, sending a 60-cycle current over wires to light the numerous parkway lamps.

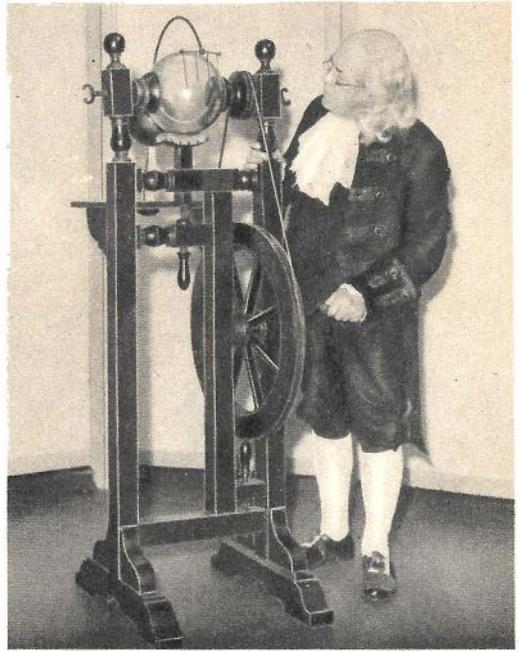
New Zep Nears Completion



Presenting the appearance of a huge spider web, the LZ-130 new German Zeppelin, nears completion at Friedrichshafen.

UNDAUNTED by the *Hindenburg* disaster, German engineers have nearly completed a sister ship of the ill-fated Zeppelin, the LZ-130, at Friedrichshafen, birthplace of all German airships. The entire framework of the new air monster has been completed and about three-quarters of the outer covering has been affixed. Non-inflammable helium gas will be used.

January, 1938



Impersonating Benjamin Franklin, William T. Innes, of Philadelphia, Pa., turns the crank of an electric generating machine built by the famous statesman. The machine was used during ceremonies at the naming of city's Benjamin Franklin Parkway.

Scouts Create Tree "Books"

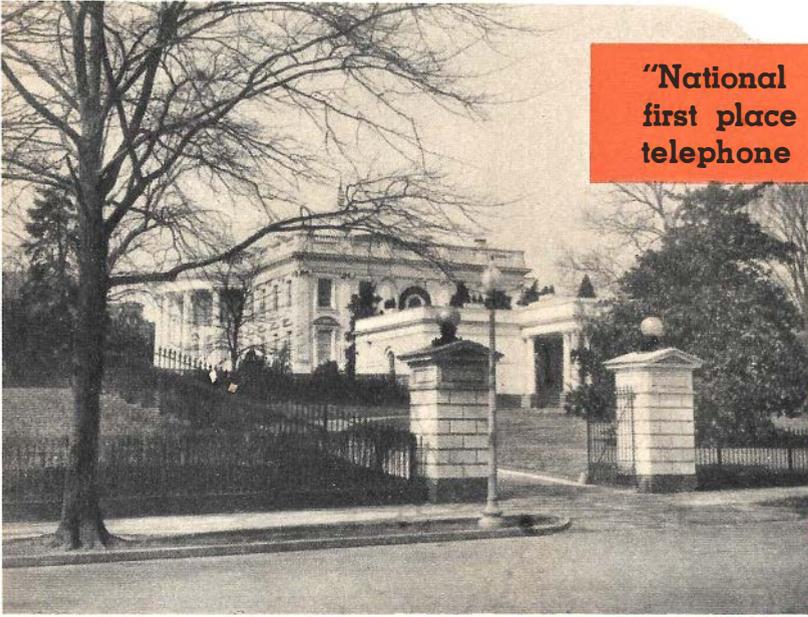
A NOVEL tree bark and wood sample "book" collection has been created by a group of Boy Scouts in Winston-Salem, N. C. Each of the "books" is made up of wood slabs and branches, serving as binders, secured from ninety different tree samples.

Neatly lettered labels, supplying the names of the trees from which the books are made, are glued in the position ordinarily occupied by a book title. Development of the novel books combined four hobbies—hiking, woodcraft, botany and woodworking.



Ninety different tree samples were used to make this novel "book" collection. Bark serves as bindings for the books.

The WHITE HOUSE



"National 1414" holds first place among U. S. telephone subscribers.

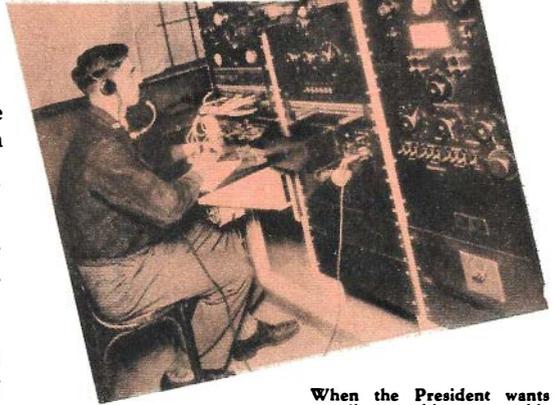
The White House must be capable of immediate contact with principal capitals of the world. A gigantic network of phones meets this important communication requirement.

by James Nevin Miller

WHAT might properly be called the "number one" telephone in the nation is listed in the Washington phone book as National 1414. This is the official home of Franklin D. Roosevelt. Better served is he by telephone than any other person in the world. Better by far than any President we've ever had.

At any moment, day or night, Mr. Roosevelt can select any one of 150 phones and talk with friends, official emissaries of our government, in fact, anybody in almost any nation in the world. Sixty different countries are now linked by telephone service. These countries have an aggregate of over thirty million telephones, according to official estimates, of which some eighteen million are on the North American continent and over ten million in Europe.

These figures seem rather bewildering when you realize that the White House staff and its equipment are exceedingly small. There are only five operators, all of them men except one, and a single switchboard. But it's a dandy—a three section PBX or private branch exchange. Usually three operators are on the job at one time. They work in shifts.



When the President wants to talk to a ship at sea, this operator connects the call to the desired vessel. The equipment is located at the Deal Beach, N. J., station of the Bell Telephone Laboratories.

The switchboard is located in the new executive offices on West Executive Avenue on the second or top floor. Mr. Roosevelt's private office is close by—on the first floor.

Through this board the Chief Executive and his office force have direct communication with all major government departments and the Capitol. There are also a good many private lines leading to the homes of close personal friends and administration advisers. The official residence has telephones in the study and most other rooms, including the

Talks to the WORLD



President Roosevelt in his study at the White House with his ever-ready telephone beside him. Above—Louise Hachmeister, nation's "number one" telephone operator. She is the only woman operator in Executive Mansion. Unlike some of his predecessors, President Roosevelt makes good use of the telephone. President Wilson disliked the service and would not permit the operator to ring his phone.

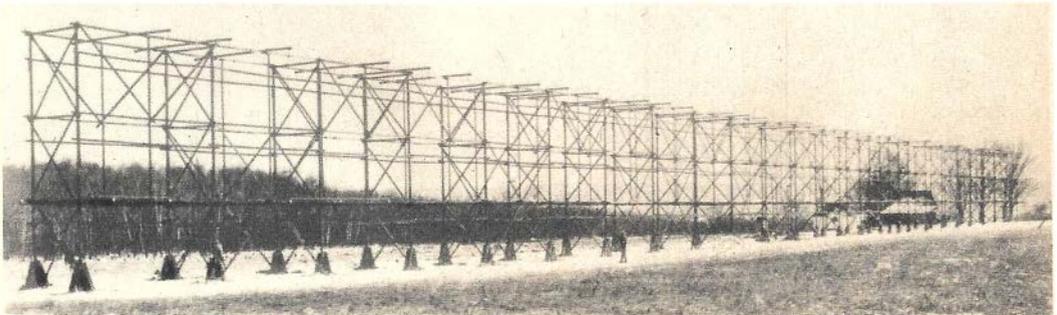
head usher's office at the private entrance.

At first thought you naturally wonder why so many phones are utilized in the White House. But the reason is obvious enough. In his work the President probably has more responsibilities than any other business executive in the world. The entire functioning of our government, except of Congress, is under his control. So he must be immediately

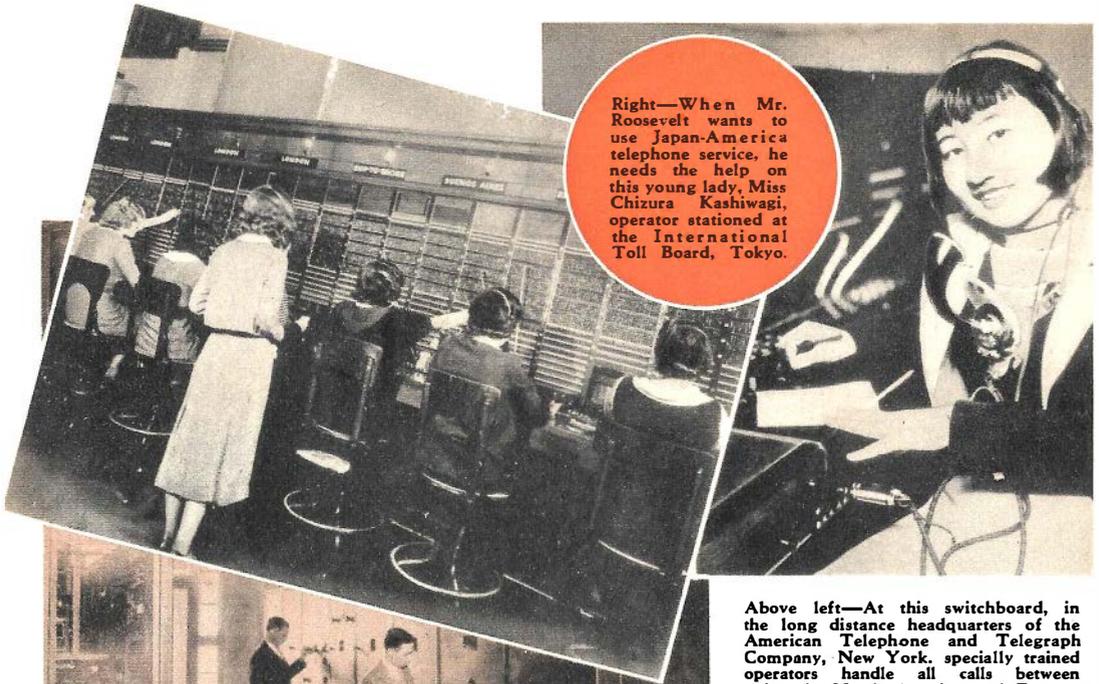
available every minute of every day in the year.

Operating the White House switchboard is a young woman whose ability to maneuver its cords and keys and use her head at the same time brought her to the personal attention of President Roosevelt and others in high command.

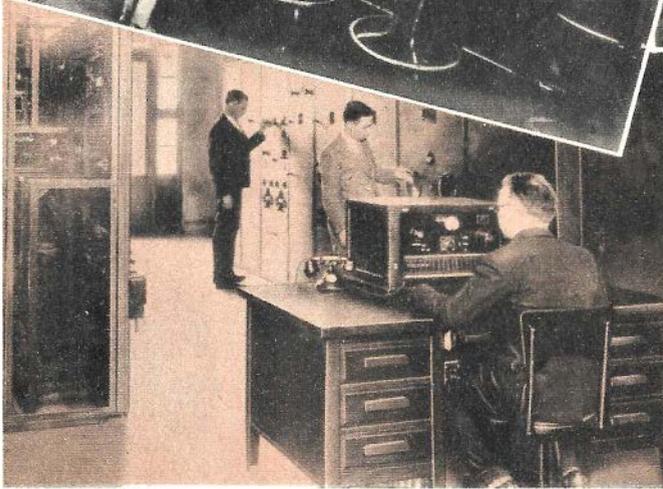
She is Louise Hachmeister, a dark-haired, square-jawed, smiling, super-operator who



Talking over seas today is a very simple matter for the White House. Here is shown the receiving antenna arrays used for trans-ocean communication. It is the short-wave radio telephone receiving center of the American Telephone and Telegraph Company, at Netcong, N. J. It is the portal of speech for some sixty countries.



Right—When Mr. Roosevelt wants to use Japan-America telephone service, he needs the help on this young lady, Miss Chizura Kashiwagi, operator stationed at the International Toll Board, Tokyo.



Above left—At this switchboard, in the long distance headquarters of the American Telephone and Telegraph Company, New York, specially trained operators handle all calls between points in North America and Europe, South America and the Far East.

These men can connect the President's voice with sixty nations. The man in the foreground is seated at the controls of one of the four radio transmitters. At the left is the power panel associated with these transmitters.

outside the United States proper, and route the call to Honolulu, via San Francisco.

Undoubtedly the high-ranking Navy officer could be reached directly or indirectly through the Pearl Harbor

served for fourteen years as a New York City "hello girl." Miss Hachmeister was assigned to the switchboard of the Roosevelt headquarters during his campaign, back in '32. So well did she do her work that the late Col. L. M. Howe, Mr. Roosevelt's confidential secretary, took her to the White House.

Should the President want to talk with the commander of the United States fleet, stationed temporarily, let us say, in Hawaii, he would simply pick up one of his many phones and say to Miss Hachmeister: "Get me Admiral Arthur J. Hepburn in Honolulu." First of all, America's number one "hello girl" would dial long distance and say: "The President wants Admiral Hepburn in Honolulu." Whereupon the long distance operator would call the Foreign Service switchboard in New York City, which handles all calls

Navy yard, so a connection would be established with the yard. In actual practice, if the Admiral were present there, the call would be completed within five to ten minutes! But if he happened to be on shipboard the local operator would call him by wireless telephone with a message something like this: "The President is calling. How soon can he be ashore?" Chances are that in such case the Admiral would reply: "In about fifteen minutes."

Of course, during the interim Mr. Roosevelt wouldn't have to keep his ear glued to the receiver. The phone folks would hold the line open while he attended to his other official duties. Then when the Admiral reached shore Miss Hachmeister would ring the President and the trans-Pacific conversation would begin.

[Continued on page 130]

New Army Plane Designed To Fight Huge Bombers



An artist's sketch of the XMF-1, a new type of pursuit plane developed for the U. S. Army Air Corps. Its twin pusher engines of 1,000 horsepower each are expected to drive it along at over 300 m.p.h. Full armament consists of six machine guns.

CARRYING a crew of five, six machine guns and bombs, a new type of pursuit plane has been developed for use by the U. S. Army Air Corps. The aircraft, believed to be the fastest military plane in the world, is a low-wing, all-metal monoplane powered by twin engines of 1,000 horsepower each. At present, performance and design figures are being withheld by the Air Corps.

The new aircraft was designed primarily for attack tactics against the "flying fortress" type of bombers being used generally by leading nations.

Departing radically from conventional pursuit plane design, the XMF-1, as the plane is officially designated, is a pusher type, the engines and propellers being at the rear of the wings.

Gunners are located in nacelles protruding from the wing section on each side of the fuselage of the new fighter. Complete interchangeability of crew is possible while in flight, a passageway connecting the outboard gunners' compartments with the main fuselage. Thus, the radio-operator or navigator can relieve the gunners if necessary. The placing of the wing gunners ahead of the engines makes it possible for them to exchange visual signals with the pilot during maneuvers. All compartments are heated and equipped with oxygen tanks, enabling the crew to work in comfort at altitudes up to 30,000 feet.

Although no such claims have been made officially, it is said that the new aircraft is capable of maintaining flight while using only one engine, increasing the plane's safety factor considerably.

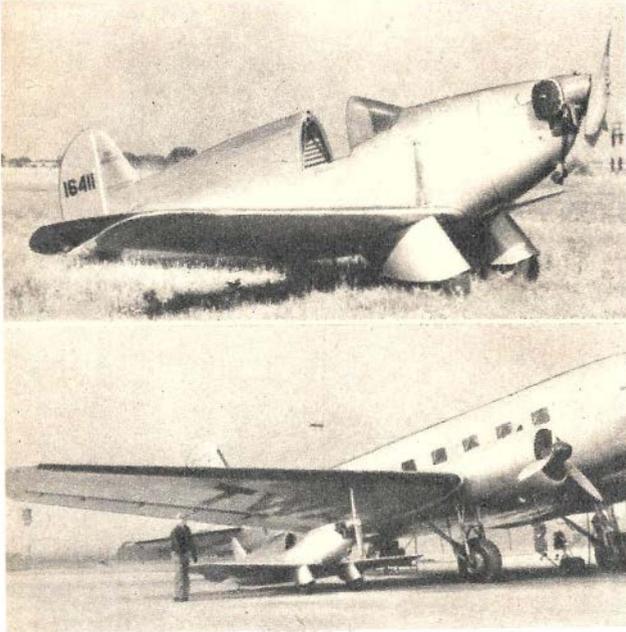
Sailor Is "Water Salesman"

NEAR the top of the list of unusual occupations is that of "Skipper" Joe Hanson, who makes his living by selling ordinary drinking water to yachts and pleasure boats passing along the East River in New York. Selling the water at one-half cent per gallon, Hanson services yachts owned by such prominent men as J. P. Morgan, Vincent Astor and Walter Chrysler.



Making a living by selling water to yachts passing along the East River in N. Y. City is the novel occupation of "Skipper" Joe Hanson. Note the flag sign atop the cabin of his launch.

Home-Built Plane Goes 40 Miles On Gallon Of Gas



Wayne Dalrymple's home-built plane is dwarfed when set beneath a transport plane's wing, but it speeds through the air at 120 m.p.h. Close-up view shows plane's trim lines.

SO SMALL that it easily stands beneath the low wing of a Douglas transport plane, a home-built airplane constructed by Wayne Dalrymple, an engineer for the Stearman Aircraft Co., of Wichita, Kansas, has proved its efficient design by winning races at local airports, traveling 120 m.p.h. Carrying one person, the plane averages 40 miles per gallon of gasoline and has a comfortable cruising range of 300 miles.

Powered by a 30-horsepower Aeronca engine, the tiny plane cruises at 100 m.p.h., lands at 46 m.p.h., and climbs 750 feet per minute. The wing of the home-built plane has a span of twenty feet, eight inches, and is of unique construction, having only one spar and featuring full cantilever bracing. Overall length is 14 feet.

Bike-Boat Steers Like Auto



Using a 16-inch propeller, this pedal-operated boat can attain a speed of 10 m.p.h. A comfortable seat and ease of propulsion enables operator to make long trips without fatigue.

"Cockroaches" Clean Streets

FEATURING light construction and pneumatic tires that enable them to be operated on sidewalks as well as roadways without damaging the concrete, a fleet of unusual looking street-sweepers has been ordered from a Cleveland, Ohio, manufacturer for use in South America. Because of their odd appearance, the South American purchasers have named the machines "La Cucaracha", which means "The Cockroach".



For street-sweeping purposes, South American officials ordered a fleet of machines like the one shown here. Oddly, each machine is named "La Cucaracha" (The Cockroach).

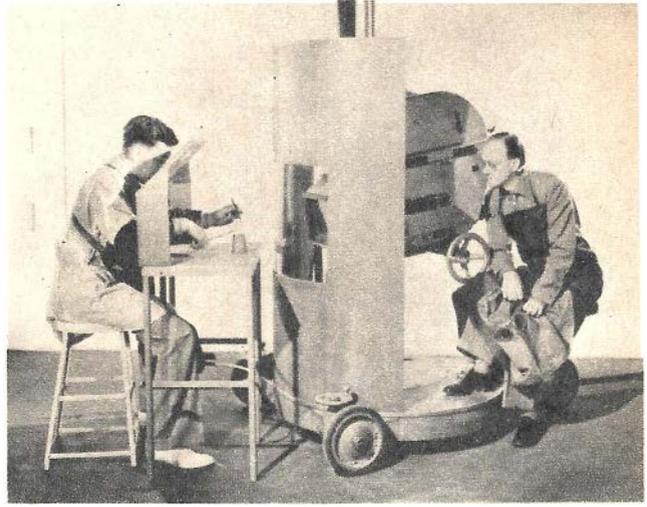
A NOVEL type of bicycle boat steered by an automobile-type steering wheel, has been developed at Lake Geneva, Wis. Its ease of propulsion is said to enable the operator to make long trips without fatigue.

The new craft consists of a specially designed deck platform mounted on twin floats. An adjustable seat serves to bring the operator's feet within comfortable reach of the pedals that motivate a 16-inch propeller attached to a drive-shaft housed beneath the deck between the twin floats.

Lead Shields Protect Men Filming Radium Story

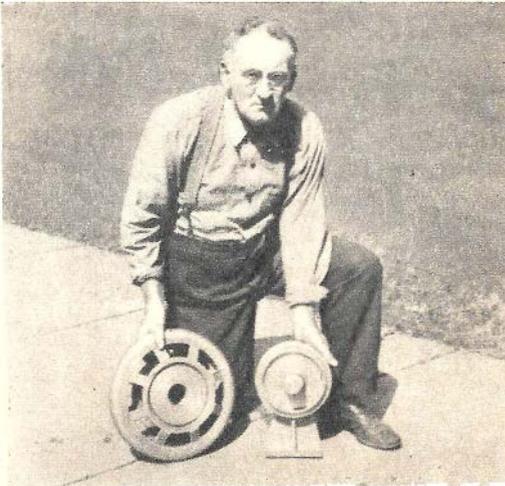
DURING the filming of a motion picture dramatizing the use of radium, elaborate precautions were observed to protect workers from the element's radiations. The cameraman operated behind a lead shield featuring a glass panel, while a workman who handled the radium used flexible gauntlets of fabricated lead and wool which were attached to a special observation shield of lead and glass.

Production was almost halted when the camera film became cloudy and diffused through exposure to the radium radiations but technicians were able to develop a film suitable for the job.



Seated behind a lead and glass screen, Pete Smith, popular movie commentator, checks camera angle while a technician handles radium behind a similar protective screen. Lead and wool gauntlets protect technician's hands from radiations.

Device Speeds Tire Changes



Daniel Slick exhibits the new auto wheel and axle he invented to facilitate tire changing. Wheel locks onto axle by means of four steel pins and can be removed in a few seconds.

ONE-MINUTE tire changes are said to be possible through use of a new auto wheel and axle device invented by Daniel Slick, of Superior, Wis. The wheel is quickly screwed onto the axle, using a three-quarter turn, and a knob on the outside of the wheel controls four steel pins that hold the wheel firmly on the axle. A safety lock on the knob provides an added protection against the wheel coming off while driving, but does not interfere with the speed or ease with which the wheel can be removed.

Model Vessel Aids Tourists

A ONE-THIRD scale model of the original *Mayflower* is being used as a novel information booth on the court house lawn in Plymouth, Mass. Seated on the deck of the ship in true Pilgrim costume, Miss Gladys Cobb supplies information to hundreds of visitors daily. Tourists from forty states have registered at the model ship.

The scale model vessel was built from plans of the original *Mayflower* and is built over the chassis of a truck so it can be wheeled around. Local residents claim the model is the most photographed ship in Massachusetts due to its historical significance.



Visitors from forty states have registered at this scale model *Mayflower* information booth located in Plymouth, Mass.

Stamps of Many Nations Commemorate Graf Flights

by
Montgomery Mulford

AFTER eight years of uninterrupted service, the great dirigible *Graf Zeppelin* ends her career. On June 8, 1937, the *Graf* returned to Frankfort to be decommissioned. Not being suited for helium, and Germany planning to use that gas in its Zeppelins, the *Graf* has ended its service. Its record is enviable.

A total of 590 flights was made by this tremendous ship of the air. The trips started in 1928, and until the *Graf* was flown back for the last time, it had alone made 143 sailings over oceans!

Any stamp collector can make an excellent stamp record of the *Graf*, since more countries have honored this airship than any other flying craft. Some representative stamps honoring and picturing the *Graf* are shown here. Its first flight was on the early morning of October 11, 1928, from Friedrichshaven, Germany. The day following, the *Graf* passed over Madeira, and two days later was floating over Bermuda. Thence she came to the United States, visiting the capital city, and coming to New York via Baltimore and Philadelphia, having flown 6,300 miles in 38 minutes over 111 hours.

That was the beginning of the fame of the *Graf Zeppelin*, which, to this year, has not decreased. Stamps honoring this dirigible are among the most popular air-issues. Some are comparatively scarce, too.

The last visit to the United States was made in 1933, for the Century of Progress Exposition held in Chicago. Today, many stamp collectors are completing albums of *Graf Zeppelin* airmail postage stamps and covers. A blank album devoted to this single ship of the air, properly mounted and annotated,

[Continued on page 124]



Pictured here are a few of the many stamps which have been issued by nations throughout the world to commemorate flights made by the historic *Graf Zeppelin*. Top to bottom are shown the commemorative issues of Paraguay, Liechtenstein, San Marino, Egypt, Italy, Cyrenaica, and Tripolitania.





RAFTS and HOBBIES

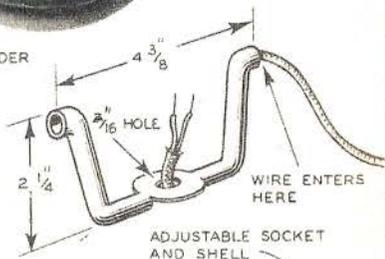
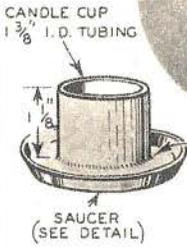
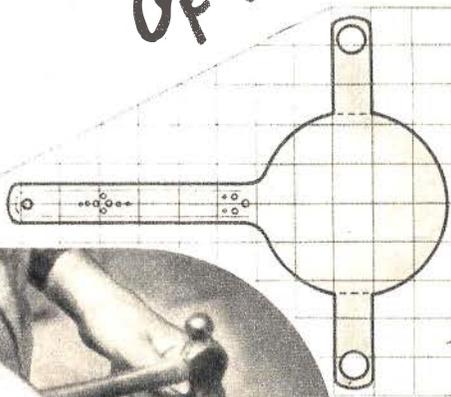
MADE TO HANG OVER HEAD OF BED OR BACK OF CHAIR

BEARINGS FOR SWING

HOLE FOR HANGING ON WALL

BRACKET SETS ON TABLE

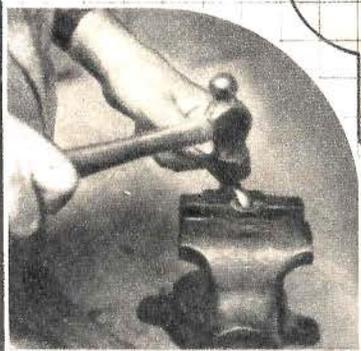
An Antique Candle Bracket Of Hammered Brass



The swing is formed from a 7-inch length of 1/8-inch brass tubing. Center portion of tube is split and hammered out flat.



Hung on a wall or placed on a table, this antique lamp always remains in upright position.



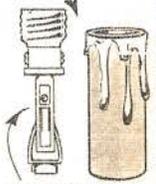
The tubing is bent to shape by inserting it in a length of pipe held in the vise jaws. Below—Hammering the saucer to shape.



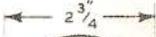
RADIATING the charm of the early Colonial period, this hammered brass candle bracket lends itself to many applications. The ingenious construction of the candle holder permits the light to be hung up on the wall or placed on a table. Regardless of the position in which it is used, the candle always remains in upright position. The candle bracket can be used as a bed, desk or utility lamp.

The base or bracket is laid out on 18 gauge soft sheet brass, and cut to shape with the tin shears. The circular portion is hammered into a saucer shape and the two side lugs are bent upright with a 1/16-inch hole drilled in the end of each as shown. A small hole is drilled in the end of the handle for

[Continued on page 140]



CUT HERE AND LET DOWN TO 3"





This outdoor illuminated decoration is built of wallboard. Colored Cellophane is attached behind the cutout greeting.



This brilliant outdoor decoration can be inexpensively constructed from wallboard, as described in the inset detail at left. The scenes are painted with showcard colors.

Unusual Holiday Decorations

IT IS perfectly easy to transform the home into a sparkling spectacle during the holiday season, using a few simple and inexpensive home-made devices which are lighted with electricity from the house circuit.

Among the materials that the home lighting display builder will find invaluable are crinkled aluminum foil, as a covering for lighted surfaces; composition or wall board, for making cutouts of scenes or words of holiday greeting; translucent fabrics, colored Cellophane, cel-o-glass, colored gelatin, or crepe paper to cover openings which are lighted from behind by one or more lamps; glass, plastics, festoons of colored lights, strings of tree lamps, laurel or evergreen roping and home-made candles or floodlights. These are used in building colored stars, multiplane scenes, in decorating trees or revealing, in a new beauty, the architectural element of the home with color and light.

At small expense the home may be made to sparkle inside and out with vari-colored lights and glowing displays in true holiday spirit in either a simple or brilliant array.

First, there is the ever-present evergreen

tree to decorate. The many new types of tree lamps make possible a variety of interesting decorative effects, including the electric candle—a small white candle with a tiny electric lamp whose filament sparkles with all the warmth of the old-fashioned taper; the luminous candle, made in series and in multiple types which glows from tip to base with cheery color and a multi-type pine-cone lamp.

The white or green tree, decorated with tinsels but no lamps can be made a beautiful spectacle by bathing the tree with floodlight. Two candles are constructed, and also a light-wooden frame, weighted at the base, covered with sheets of cardboard and painted red. Actual candle grease is used to form the drip on the sides. Three lamp sockets, equipped with inside frosted or colored lamps, are fastened to the frame work on the inside, as illustrated, and flame-shaped 25-watt flame tinted lamp located at the top. Placing the open side of the candle toward the tree floods it with light. If the tree is large, two candles, from different sides, may be used. Using different colors in each, interesting shadow and color effects are produced on the tree and



Housetop illuminated tree is formed with stringer lights. A 6- or 7-ft. vertical pole serves as support for the thin wires outlining tree.

Floodlights of various colors produce unusual decorative effects and may be effectively hidden in tree limbs so as not to be noticed. Details of the housetop illuminated tree are shown in inset. The reindeer and sleigh are of wallboard.

For The Home

by Earl W. Gage

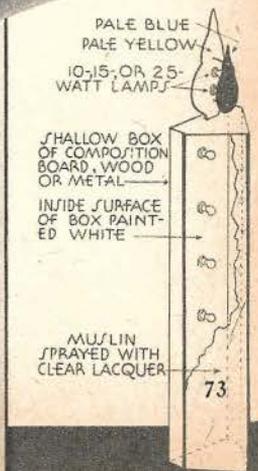
walls. A white tree covered with strings of silver foil, and floodlighted in blue from one side and amber from the other, provides a beautiful effect. The amber lamps should be half the wattage of the blue lamps.

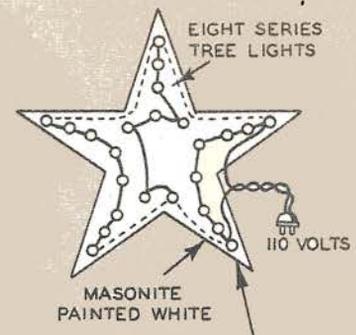
It is easy to build large candles on wooden frames, covered with translucent material. These may be built in half or full cylinders, each with a socket at the top and bottom for lamps and a small reflector which can be made out of sheet tin. The flame-shaped lamp and candle drippings at the top complete the illusion, while a Cellophane cover gives the shiny, frosty appearance. These candles can be used to create many interesting effects in the home, at the mantle, in the entrance hall, at windows or in combination with wreaths.

The cutout of a Christmas scene or a greeting, "Merry Christmas and Happy New Year," may be used indoors or out. It is possible to make cutout multiplanes from four or five pieces of wall board, shaped and colored differently, so as to produce a brilliant holiday scene. Cutouts may be used



Giant candles form a distinctive type of doorway decoration as the above photo shows. Construction of the candle is shown in the detail at right.





Large illuminated stars may be cut to shape on a jig saw. holes for inserting tree lights provided and sockets wired as shown in this detail.

DRILL HOLES JUST LARGE ENOUGH TO FIT LIGHT SOCKETS

indoors, fastened to the wall with a board framework supported by small braces. Colored lamps enhance the scene, the cords being concealed along the edge of the window or door. The board may be concealed by artificial snow.

Large luminous candles may be placed in dark corners, combined with a continuous garland of evergreen draped around the room at the ceiling. Or, they may be used for lighted decorations, such as cutout evergreen trees, made of two or more planes of cardboard. Colored lamps of 25 watts can be used to provide light, beauty and novelty. Paint the surfaces of the cardboard white, then apply clear shellac and dust with artificial snow.

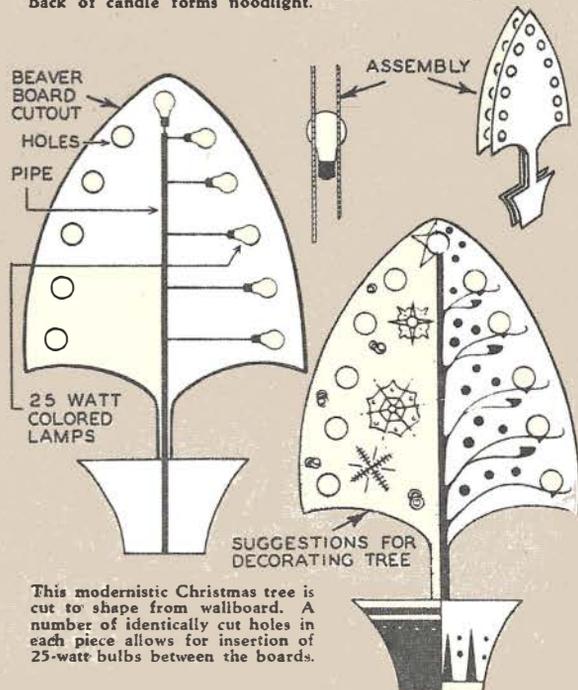
Christmas shields may be made to cover wall brackets, using cardboard and a pot of paste. The chandelier may be covered with a new dress for the holidays, using evergreen studded here and there with colored lamps of the series type. A special socket adapter permits use of the regular lamp with shade.

The living or dining room may easily be transformed into a "snow storm" scene. Stretch strong, white cords near the ceiling, from the four corners to the chandelier, or diagonally from corner to corner. Intermediate strings make the "storm" more dense. Suspend from the cords, at 6-inch intervals, "snow flakes" of small cotton puffs. The strings of puffs are suspended from white threads of varying lengths, as close together as possible. When illuminated, the cotton puffs give the effect of falling snow. Home-made spotlights may be made of coffee cans,

[Continued on page 124]



Giant tapers for flooding the indoor Christmas tree with light are easily built from cardboard. Back of candle forms floodlight.

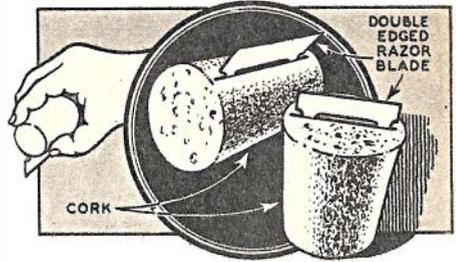


This modernistic Christmas tree is cut to shape from wallboard. A number of identically cut holes in each piece allows for insertion of 25-watt bulbs between the boards.

NEW WRINKLES FOR THE HOME MECHANIC

Corks Form Handy Blade Holders

OLD double-edged razor blades are very useful around the home workshop except for the fact that they are hazardous to handle. By inserting the blades in large corks this inconvenience can be overcome so that the sharp cutting edge of the blade may be used for all kinds of scraping work and for shaping model fittings.—H. Albert.

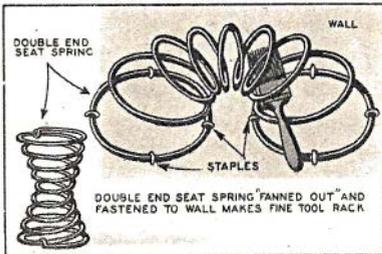
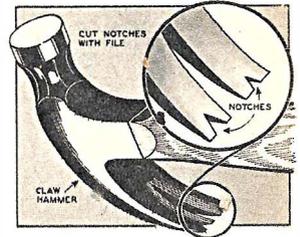


Vise Handle Made Pinch-Proof

A SHORT length of automobile radiator hose slipped over the head of the vise screw will prevent pinched fingers caused by the handle accidentally dropping down. Cut holes in each side of the hose, large enough to accommodate the handle and fit in place. Slit one hole so that the hose may be forced over the end of the handle.—P. Sley.

Notched Jaws Increase Use Of Hammer

THE usefulness of a claw hammer may be increased considerably by notching each claw so that the hammer may be used for pulling tacks and small finishing nails. Notching is accomplished through the use of a small three-cornered file. File the slots at an angle so that the resulting claws will firmly grip the nails.—P. E. Harvey.

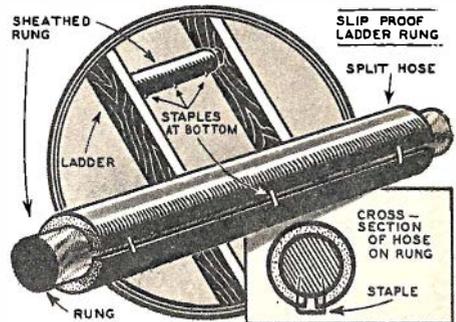


Seat Spring Serves As Brush Holder

OLD double-end seat springs, such as can be had for the asking at any auto graveyard, make convenient holders for paint brushes. Tack the spring to a block of wood with staples in the fan-shape shown in the accompanying illustration. Select a spring having a large number of coil turns, mounting the ends of the spring as closely together as possible.—Harvey Paisley.

Hose Increases Ladder's Safety

AS WORN rungs make ladder climbing treacherous, lengths of old hose cut up, slitted and secured to the rungs with staples will make the most dangerous ladder once more safe for climbing. Cut the hose up into lengths exactly identical to the inside width of the ladder so that the hose, when slipped over the rungs, will fit tightly. Drive the staples over the split section of the hose so that it holds both sides securely to the rung.—H. Edmont.



Make This Picturesque



Constructed of scrap lumber, burlap and plaster of Paris, this scenic base will enhance any Christmas tree. Left—Forming framework of the base involves only the use of a hammer and a saw.

After completing the lath frame of the base, arrange a large piece of burlap over it to determine the location of holes for two tunnel openings.



AN ARTISTIC base for a Christmas tree will add greatly to its beauty, and to the enjoyment of the tree which exemplifies the Yuletide in nearly every American home. Such a base, resembling snow covered mountains, can be made in a short time at little cost.

The stand can be made to any size desired. It need not be made of planed lumber; scraps can be used. A base 3 feet square is desirable because it does not extend past the limbs of the tree. Take a $\frac{3}{4}$ by 4 inch board and cut four pieces so that when nailed together they will form the desired outside dimensions of the base. If a 3 foot square frame is selected, cut two boards, 3 feet long and two boards 3 feet, $1\frac{1}{2}$ inches long, to allow for over-

lapping at ends so they can be nailed together.

Cut another piece of lumber 3 feet long and mount it 1 foot in from one side of the frame. Another piece 1 foot long is nailed to the outside board and the inside board to form a 1 foot square opening in one corner.

This is to act as a base for nailing in the tree holder.

The tree holder is made of the same size board. Four pieces, each 1 foot long, are nailed edge to edge to form a holder with an almost square opening. This is fastened with nails to the inside intersection of the two boards which form the square in one corner.

The shape the stand will take, when the outer covering is mounted, depends upon how the built-up boards are mounted. Pieces of laths are best for this. To build the slopes up to the tree holder, fasten laths from the outside board to the top of the holder, at the back and on the sides, as desired. A board placed from the front corner, where the tree holder is mounted, to the opposite corner formed by the long inside board, is the base for nailing the lath which continues up to the tree holder.

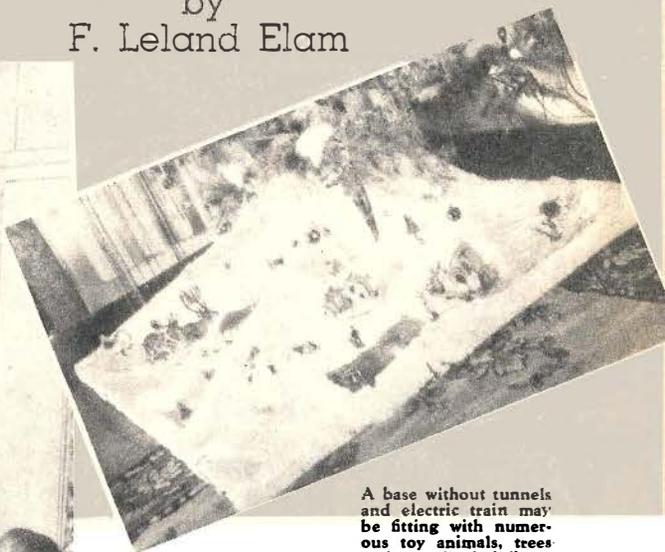
Other laths nailed from the outside board to the board mounted crosswise provide a flat surface in front of the tree mount. If additional slope is wanted toward the tree

Christmas Tree Base

by
F. Leland Elam



Tiny tots will thrill at the sight of a Christmas tree base such as this one. Construction is simple.



A base without tunnels and electric train may be fitting with numerous toy animals, trees and small buildings.

holder or the outside edges, laths can be nailed from a lower board to ones sloping toward the holder.

When the stand is completed, life can be added to it by installing a toy train track on it. It is desirable to have the track extend into tunnels on opposite sides of the stand. The tunnels must, of course, be mounted before the plaster covering is applied. Form the tunnels by folding a piece of tin to the desired size and shape. A flat bend at either end will provide an edge for nailing to the board, which is mounted crosswise. The track is not mounted until later.

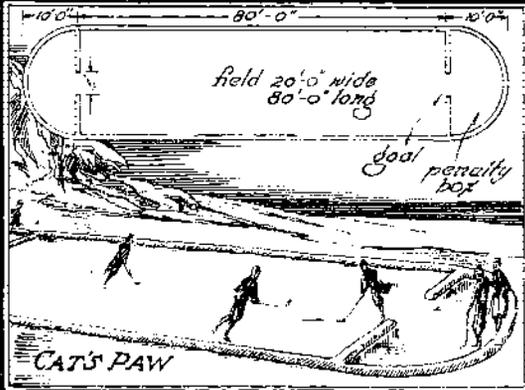
The next step is to take a piece of burlap, or sacks sewn together, and fit it to the stand. It should be large enough to allow for fitting into the design formed by
[Continued on
page 130]



After determining the tunnel openings, dip the burlap in plaster of Paris, arrange it on the framework and build up low places with hands full of plaster as shown at left.

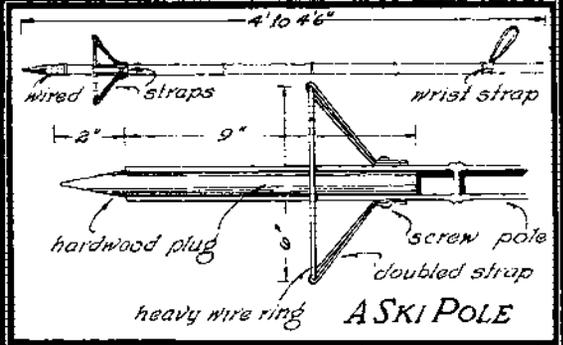
WINTER SPORTS PROJECTS

by G. Everett Van Horn

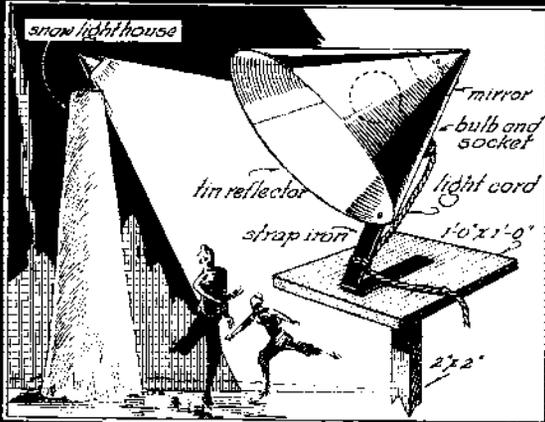


This game combines ice hockey and tag. The field is laid out to the dimensions shown. Any number of players can participate. The object of the sport is to drive the pucks into the opponent's goal to score 3 points. A player tagged by an opponent is retired from the game. Players may set a time limit for the game which is played in quarters.

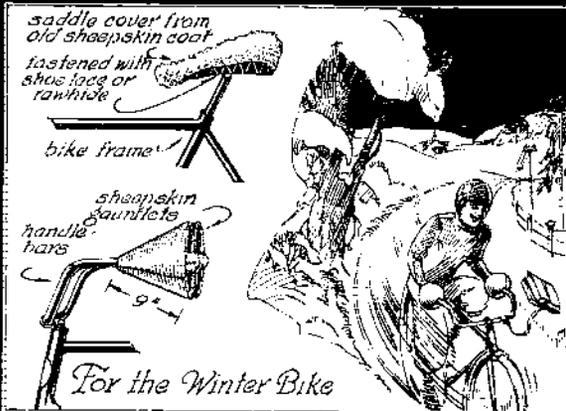
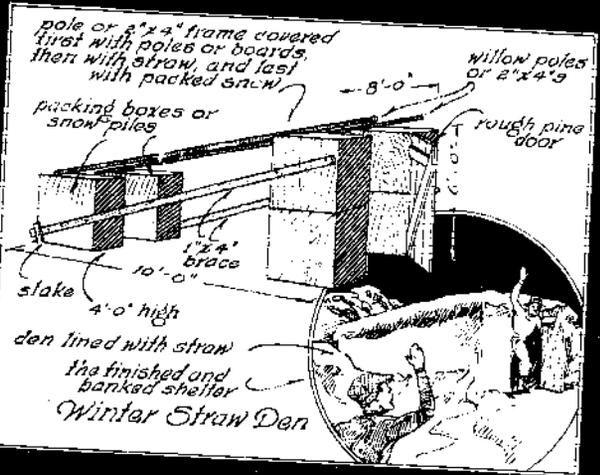
The ski pole (below) is made from a 1 1/2-in. by 4 1/2-in. bamboo pole. A pointed hardwood peg is driven in one end and secured with bale wire. The ring is formed to 6 in. diameter from heavier wire and attached to pole with leather straps. To facilitate carrying the pole, attach a wrist strap.



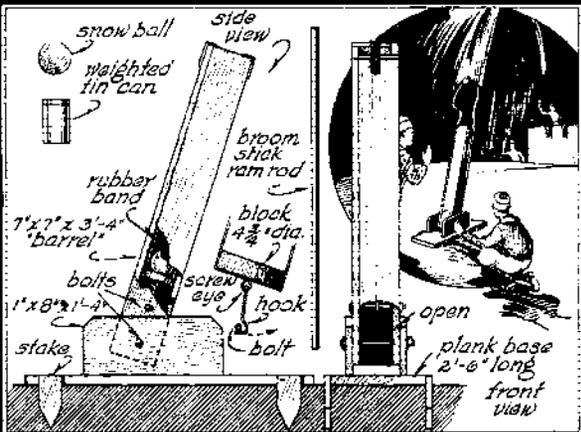
The straw and snow hut shown below will provide the ice fisherman with excellent protection against winter blasts. Packing boxes and willow poles form framework of hut. The frame is first covered with straw, followed with a packing of snow.



Night skaters will appreciate this snow tower floodlight. The tower is a tall mound of snow which has been well packed. The reflector is formed from bright tin and mounted on a wooden base. A pointed post supports it on the top of the snow mound.



The snowball mortar described below will provide youngsters with the necessary artillery for staging an exciting sham battle. The barrel is fitted with a rubber band catapult for firing the snowballs as indicated in details.



78 The winter cyclist will welcome these riding comforts, made from scrap pieces of sheep skin. Both gauntlets and saddle cover are cut to shape from burlap patterns. Stitch all seams with heavy waxed thread and secure saddle cover with laces.

Timely Household Short-Cuts



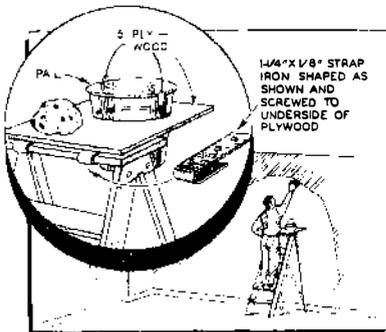
Ladder Moving Is Simplified

BOTH the handy man and housewife will appreciate this clever method of transporting a cumbersome step-ladder from one part of the home to the other. By fitting the front upright pieces of the ladder with a pair of furniture casters, the heaviest ladder can be rolled to the place where it is needed without the user exerting strenuous effort.

With the aid of a brace and a suitable bit, drill a hole at the bottom of each front upright for the casters. Make certain that the holes are low enough so that the ladder can be tilted to a convenient position for rolling.—A. Waychoff.

Pads Prevent Sticking Of Ice Trays

PRACTICALLY every owner of a mechanical refrigerator has at some time or other experienced difficulty in removing ice trays from the freezing chamber. This disagreeable annoyance can be overcome by cutting pads from an old inner tube to the exact size of the tray, and inserting them in the shelves of the freezing chamber. A slight tug will at once free the trays from the rubber pad, making their removal extremely simple.—A. H. Tempe.



Pail Holder Attaches To Ladder

A REMOVABLE pail holder that can be attached to any step-ladder is a device that every housewife will greatly appreciate. The holder is simply a piece of 5-ply veneer having a circular opening 1 inch smaller than the top diameter of the pail. A pair of strap iron brackets attached to the veneer panel. They permit the pail holder to be securely held to the top step of the ladder when in use.—F. Doughty.

Notched Brackets Balance Coal Hod

A COMMON fault of the ordinary coal hod is that its balance is usually disrupted when it is filled to the top with coal. To overcome this, remove the original bail brackets and replace them with a pair of notched brackets formed from 1-inch strap iron. Bend them to the shape shown in accompanying detail and bolt or rivet to the side of hod. With the improved brackets, it is a simple matter to balance the hod.—A. S. Wurz, Jr.





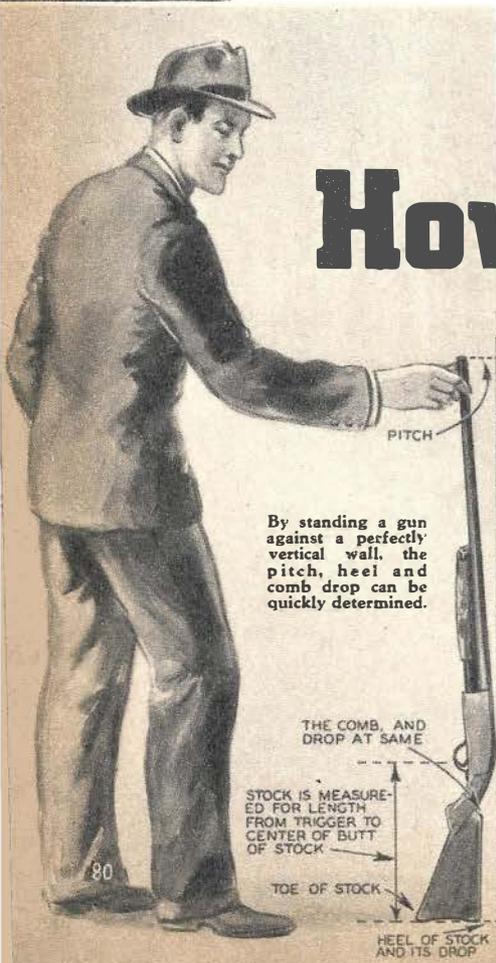
The short, chunky, deep-chested man should select a gun with a $13\frac{3}{4}$ -in. stock, having a heel drop of $2\frac{1}{4}$ -in.

THERE is a belief, sometimes expressed, to the effect that certain individuals are able to pick up most any sort of shotgun, light or heavy, any gauge, and with varied length of stock, drop at heel, comb and pitch of barrel, and do as excellent work with it as any other gun. It would be logical to demand proof when such assertions are made. So far, it has been impossible to find a shotgun devotee who has been able to prove the conclusions just stated. The fact remains that if one wants to get the most out of a shotgun, it must be more or less carefully fitted to his requirements, physical and otherwise, else the results from the use of the weapon will be questionable in the extreme.

Comparatively few shotgun users have ever taken serious note of just how the gun they are using measures up to demands. If they are consistently missing game, blame is placed on the shells, the barrel, or the make of the gun. Some other gun and shells, they feel, would change things completely. Probably in some instances the gun and shells may be at fault, but not always. There are other things that must be considered. The stock of the gun and the drop at heel and comb must be taken into consideration when purchasing a gun. Unless your gun fits you in every way you cannot expect to go out and do worthwhile shooting with it.

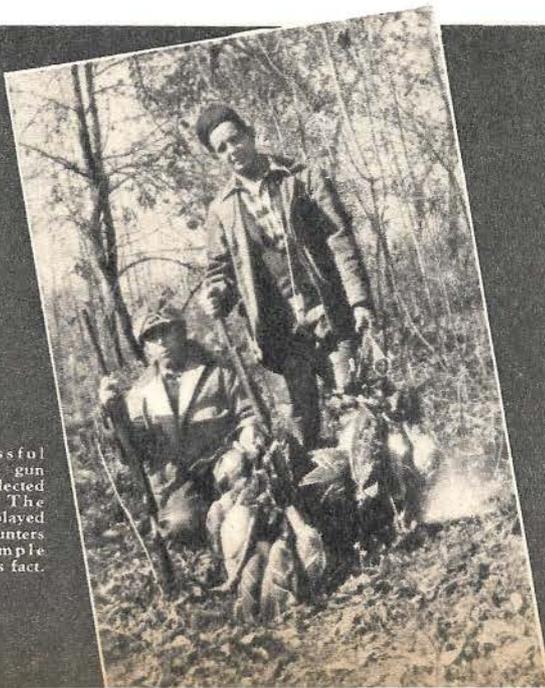
If all persons using a gun were built alike,

How To Select

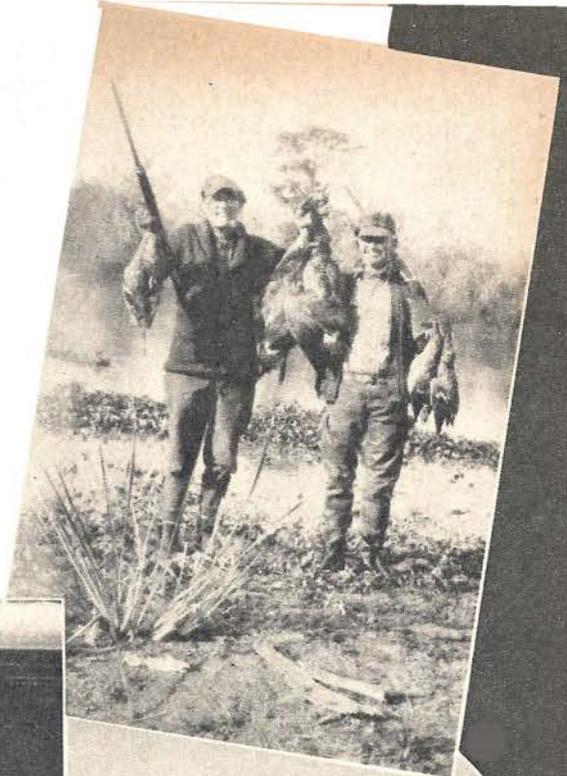


By standing a gun against a perfectly vertical wall, the pitch, heel and comb drop can be quickly determined.

For successful hunting a gun must be selected with care. The game displayed by these hunters provides ample proof of this fact.



guns could be made identical. But there are short men, tall, stout, medium and lean men; some with long arms and some with short arms. To believe that one certain cut of shotgun will do for all of these individuals is asking a great deal. Take the comb of the shotgun as an example. If the shotgun has a thick comb and the man shooting it is a person with jowls or outstanding cheeks, the tendency is invariably to throw the gun out of line, in which case the shot will go to the left. To bring the gun in line, such an individual must have a stock with a thin comb; in fact he may even have to have a special stock thinned down for him to suit his requirements before he will be able to do any



Because of increased muzzle blast heavy-load hunting guns require a longer barrel than guns of average load. Left—These upland hunters are equipped with guns having 28-inch barrels.

A Shotgun

by Robert Page Lincoln

Facts that every sportsman should know when he is buying a shotgun.



real shooting. On the other hand, if the shooter has a thin or sunken cheek the direct opposite will be the case if a thin comb is used. He will shoot to the right. To remedy the situation he must have a thick stock to keep the gun in line. It is strange how little attention is ever given this matter of the proper stock. It is an adequate explanation for much poor shooting.

Another qualification rarely considered in [Continued on page 120]

This hunter is using the popular pump-gun, which functions best with 28-inch barrel length.



THE construction of the range is very simple yet it serves the purpose for clubs whose members wish to improve their marksmanship and for training before the hunting season. The resounding ring of bullets striking the steel back plate or sides has been deadened by enclosing the steel plate with framework and leaving a space ten inches in width and seven feet in depth which is filled with sand. Another helpful feature is the indirect lighting system, all light being reflected from an overhead frame which can be lifted and moved to the desired distance from the targets so that no shadows or bright lights bother the one who is firing.

All the steel plate needed can be purchased from a scrap metal dealer or junk yard at a reasonable price. It need be no thicker than a quarter of an inch. The range may be painted either black or dark green. The latter color is recommended as more suitable because it is restful to the eyes. The reflecting tin can be obtained at a foundry at a slightly higher price or empty five gallon gasoline tins can be cut to the required size. Six, one hundred watt bulbs have been found to give more than ample illumination.

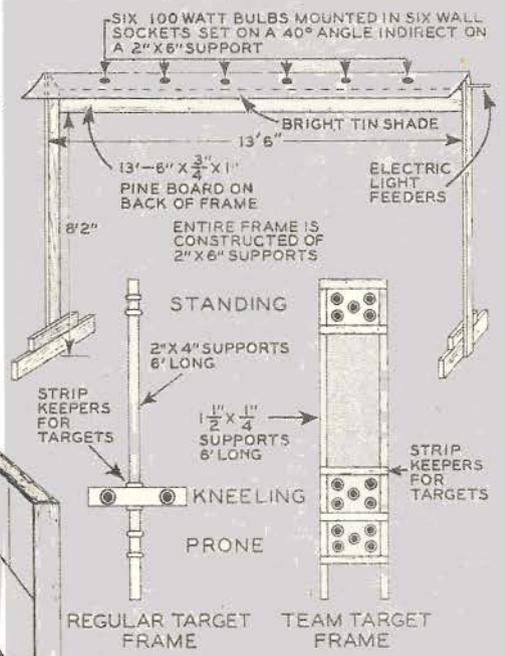
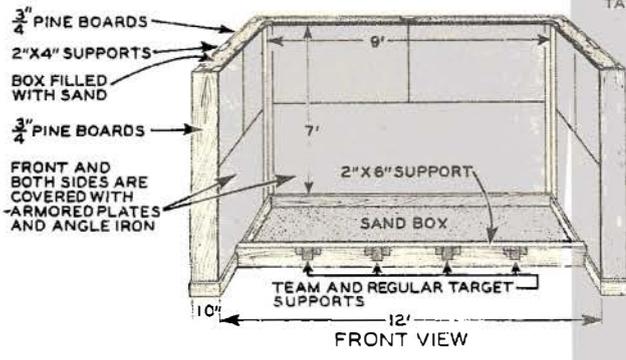
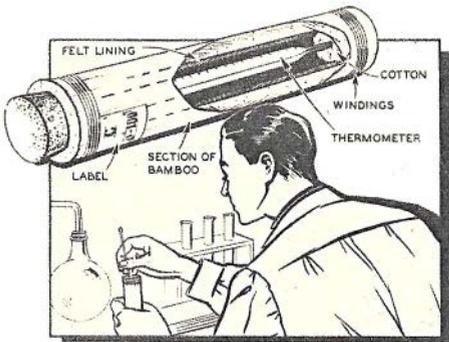
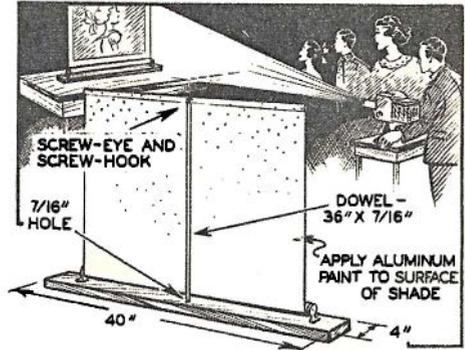


Photo shows the indoor range ready for use. Below are constructional details for builder. Six 100-watt bulbs were found to give ample illumination. Back and sides are designed to remove most of the noise caused by striking bullets.

New Ideas for the Handy Man

Window Shade For Movie Screen

A WINDOW shade that is no longer suitable for use in the home can be made into a handy collapsible home movie projection screen. A 35-inch shade is best suited for the purpose. Mount it on a 1 by 4 by 40-inch board with regular shade hooks. Drill a $\frac{7}{16}$ -inch hole in the exact center of the plank and insert a 36-inch dowel. A screw-hook is inserted in the end of the dowel for attaching the shade. Complete the screen by spraying it with aluminum bronze paint.—H. A. Bowman.



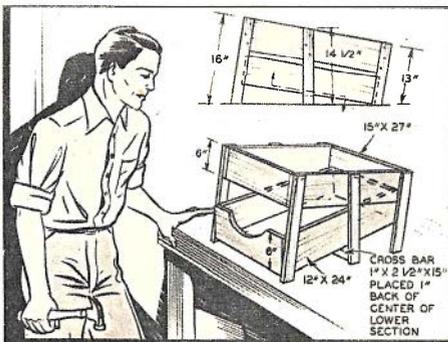
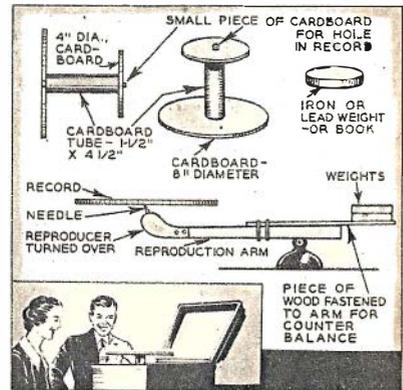
Delicate Thermometers Protected

DELICATE thermometers such as used for home medicinal or scientific purposes can be protected against accidental breakage by placing them in a rigid case when they are not being used. Such a case can be easily made from a length of bamboo cut off between the ribbed sections. Line the inside of the bamboo with cotton or felt padding and secure it with glue. Force a wad of cotton into the closed end of the tube and fit a cork into the opposite end to complete the case.—C. B. A. Kean.

"Scrambled Music" Is Novel Stunt

THIS clever stunt is certain to add new life to any party or family gathering. Simply by inverting the records and reproducer head of a phonograph it may be used for providing what might well be termed "scrambled music."

The record is placed on an elevated turntable made from a length of heavy mailing tube and cardboard to the dimensions indicated at right. Allow a short length of dowel to protrude from the top of the support so as to keep the record in its correct position.—P. R. Ronnie.



A Teeter Nest For Laying Hens

POULTRYMEN will find this mechanical hen's-nest capable of increasing egg production. The device works on a simple teeter board principle; when the hen enters, its weight causes the lower shelf to rise, closing the entrance. Assemble the nest from light stock salvaged from packing cases. The supports are attached to the upper frame and lower shelf hinged to cross bar.—T. V. Summers.



Facts About the "Caledonia"

In an effort to establish a trans-oceanic air service between England and the U. S., the "Caledonia", of Imperial Airways, made the first trip in 15 hours, 9 minutes. The return trip of 1,960 miles required only 12 hours, 5 minutes due to favorable winds. Before actual passenger flights are made, the "Caledonia" will be used to make several test crossings to check fuel consumption, meteorological and radio service.

This article tells you how to make a beautiful solid scale model of this new historic flying boat.

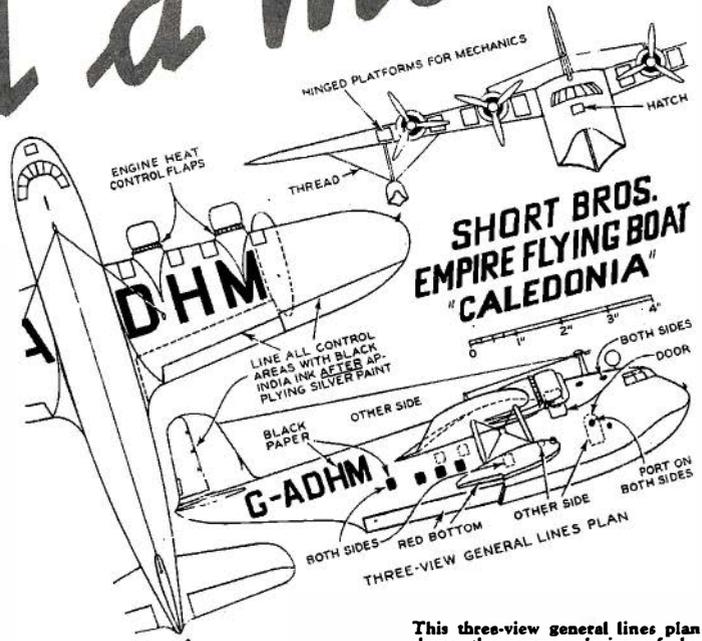
Build a Model

by Nick Limber

BBRITAIN'S new sky liners have spanned the great Atlantic and have landed well ahead in the race to establish a trans-oceanic air service. This magnificent fleet of flying boats has brought the Dominion of Canada closer to the mother land than ever before and is now to be the final link between the old and the new continents.

Equipped with the latest of scientific devices, these winged clippers represent a golden harvest after 34 years of aeronautical research and experimentation. They are a triumph of aeronautical skill.

Built for Imperial Airways by Short Bros. Ltd., the boats have a wing span of 114 feet and an overall length of 88½ feet. They are powered with four Pegasus engines, similar to that used in the altitude-record holding Bristol 138A, and maintain a maximum speed of 200 m.p.h., cruising at 165 m.p.h. They

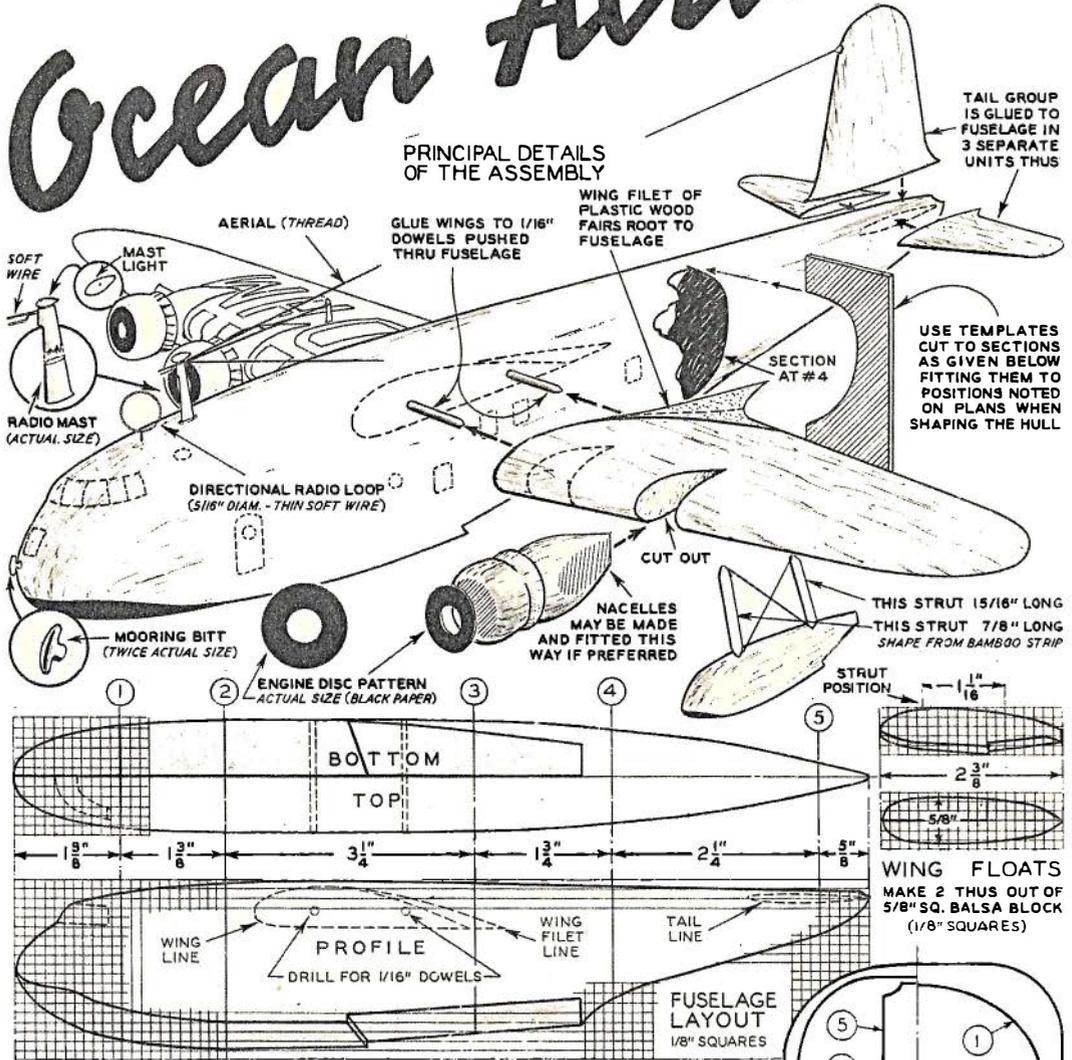


This three-view general lines plan shows the proper placing of details and the painting scheme. Body is finished in silver. Underside of the fuselage and the wing floats are lacquered in red.

are designed to accommodate 24 passengers as a day liner and 16 as a sleeper. Each ship is manned by a crew of 5, located in the upper deck of the two-deck hull. A promenade deck, salons, smoking lounge and model kitchen are located on the lower deck. Large windows, de luxe furnishings and a new technique in cabin design insure the passenger's maximum comfort and safety.

This solid scale model of the British "Caledonia" is an intriguing project for airplane enthusiasts.

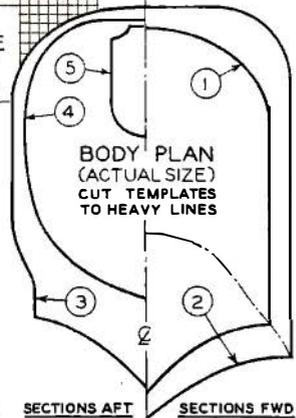
Ocean Airliner

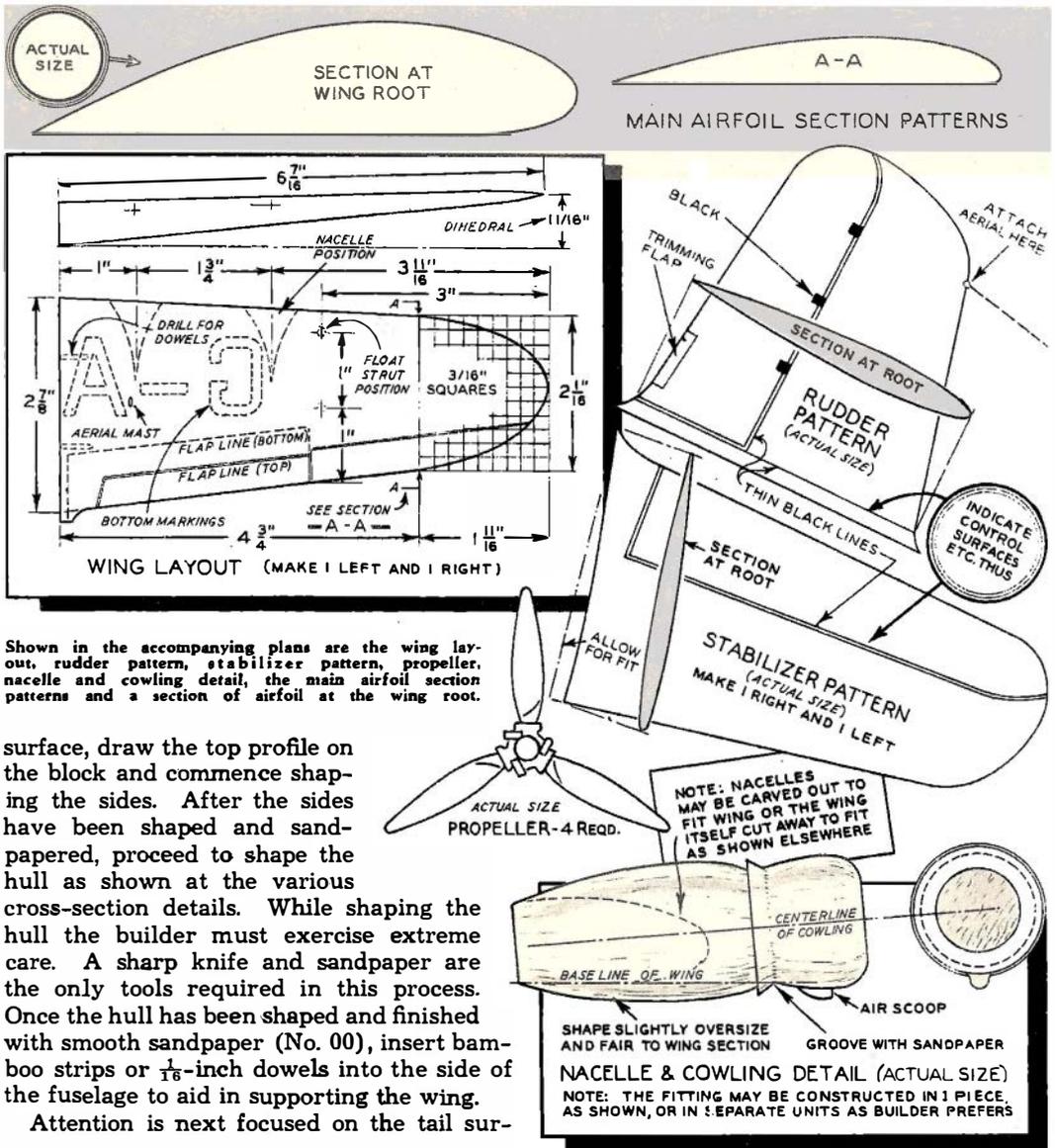


The model which is described here is the "Caledonia," the second to be constructed in a fleet of 29 ocean airlines.

Construction of the model begins with the fuselage, which is carved from a balsa block 1 1/4 by 2 1/4 by 1 5/8 inches. Draw the side view or profile of the hull on the block and then proceed to cut away the excess wood outside of the line. After this operation has been completed, sandpaper the newly cut

The main illustration, above, shows the "Caledonia" model in perspective. Accompanying details show the patterns for fuselage, wing floats in template form.





Shown in the accompanying plans are the wing layout, rudder pattern, stabilizer pattern, propeller, nacelle and cowling detail, the main airfoil section patterns and a section of airfoil at the wing root.

surface, draw the top profile on the block and commence shaping the sides. After the sides have been shaped and sanded, proceed to shape the hull as shown at the various cross-section details. While shaping the hull the builder must exercise extreme care. A sharp knife and sandpaper are the only tools required in this process. Once the hull has been shaped and finished with smooth sandpaper (No. 00), insert bamboo strips or $\frac{1}{16}$ -inch dowels into the side of the fuselage to aid in supporting the wing.

Attention is next focused on the tail sur-



Completed, the "Caledonia" luxury sky liner is an authentic reproduction of the ships flying the Atlantic ocean.

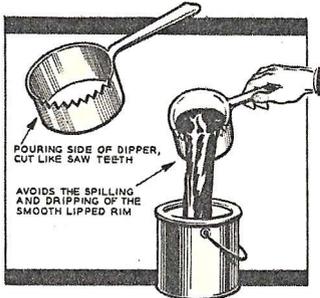
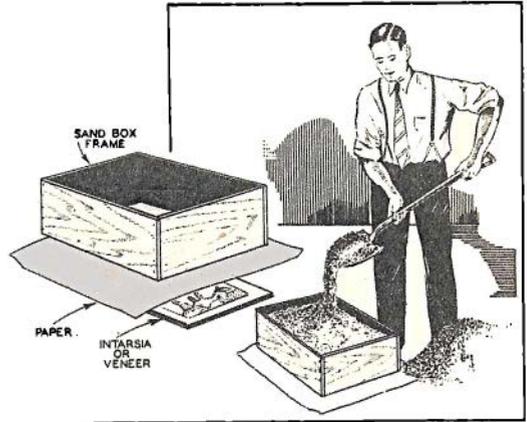
faces. Both the rudder and the elevators are cut from $\frac{1}{16}$ -inch sheet balsa. Streamline the assembly by first rounding the leading edges and then tapering the trailing edges. Finish with smooth sandpaper and cement to the fuselage, as shown in the diagram. Note that ambroid is used in all of the gluing operations as it is the quickest drying and best suited glue that can be used with balsa. Allow the assembly to dry in place, making certain that the rudder is vertical and the elevators horizontal.

With the completion of the tail unit, begin
 [Continued on page 126]

HANDIKINKS FOR THE SHOPMAN

Veneer Gluing Is Simplified

THE problem of obtaining even pressure when gluing veneer inlays and intarsia cut-outs always confronts the craftsman. To overcome this, lay the material to be glued flat on an even floor surface and cover with heavy wrapping paper. Place a wooden frame around it and pour in dry sand. Moist will not do. Tamp the sand down into the box to insure an even pressure over the entire glued area. Increasing the frame height will increase the potential pressure, but a frame eight to ten inches high will prove sufficient.—O. E. Olson.

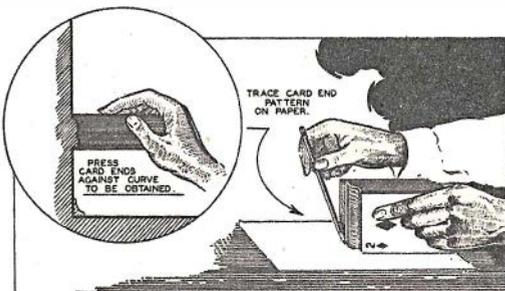
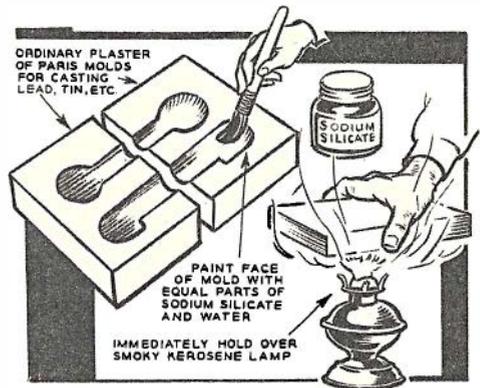


Toothed Ladle Aids In Dipping Paint

WHERE a dipper or ladle is used to convey paint, tar or other viscous liquids from one container to another, the use of a handy toothed ladle will prevent stringy drippings from forming. With the aid of a pair of tin snips, remove the rolled lip from the dipper then cut a series of vee-shaped notches along the edge to provide a saw tooth effect. The teeth will reduce the film area of the paint, actually cutting off the superfluous drippings.—A. H. Tempe.

Water Glass Aids Plaster Molds

DIFFICULTIES encountered in securing good castings from plaster of Paris molds can usually be attributed to the dampness of the plaster. A proven way to seal out moisture is through the application of a solution of one part water glass and one part water to the inner surfaces of the mold. Immediately after the solution has been applied, hold the molds over the smoking flame of a kerosene lamp. After a layer of soot has collected they are laid aside to dry before being placed into use.—A. Waychoff.



Cards Copy Unknown Curves

FITTINGS for curves, such as found on moldings and cornices, can be easily cut by determining their contour with a deck of cards. Stack up one or two decks of playing cards and press the ends over the molding in question. The cards will naturally follow the shape of the moldings so that the irregular hues may be traced with a pencil.

by Prof. Victor Lewitus

NEARLY everyone has either seen or heard about magnets, but very few people realize just how indispensable magnets of one form or another have become.

The Chinese people appear to have been the first to make use of the natural magnetic minerals which they found in certain regions, in great abundance. They discovered that the "lodestone," as it was called, was capable of attracting some things and not others.

As a result of these observations, man today has the advantages of the mariner's compass, the electric bell and buzzer, the magneto of automobiles, numerous railway signal devices, and many special surgical instruments. We must not forget to mention the telephone and the telegraph, nor should we forget that magnetism is the important factor in the production of electrical energy from the dynamo.

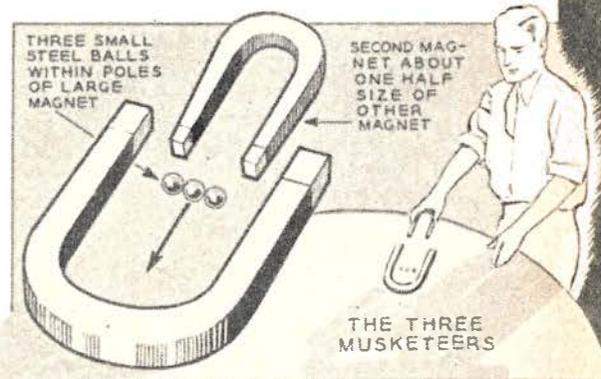
Our modern life is absolutely dependent upon the workings of magnetism. Without it we could not enjoy modern means of travel, be it on land or sea or far up in the clouds. Without it we could not communicate swiftly as we do from one end of the earth to the other. Without it we would be much discomforted.



WATER COMPASS—Into a small vial or glass tube, place a small nail with the head toward the bottom of the vial. Cork it up and place it in a tumbler or pan of water. As the vial floats it is free to move in any direction. Then bring the magnet close to the vial but not touching it, and notice how it follows the magnet around the edge of the pan.

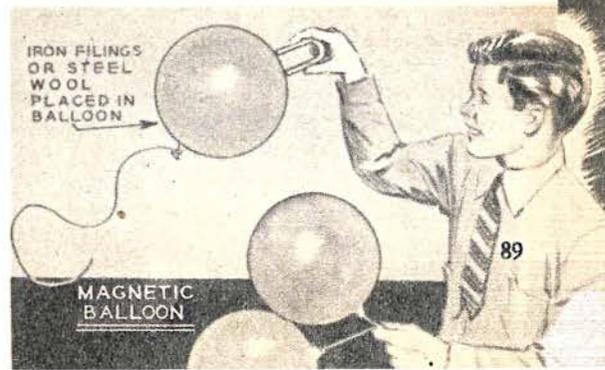


THE FEEDING CHICKEN—From a piece of stiff cardboard, cut the profile of a chicken, the size depending on the strength of the magnet to be used. To the side of the chicken that is away from the audience, attach a strong magnet by means of cord or thin wire. Place the magnet as close as possible to the mouth of the chicken without having it show. Using small ball bearings as feed, bend the chicken down close to the ground and notice how rapidly it "eats."



THE THREE MUSKETEERS—Between the poles of a large magnet, place three ball bearings. Be sure that they are touching each other, and are as close to the center as possible. Then bring a magnet about half the size of the larger one between the poles of the latter, and towards the ball bearings. As the magnet approaches the three ball bearings, they will move backwards.

MAGNET BALLOON—Into a dark colored balloon, place a few pinches of iron filings or a small piece of steel wool. Then inflate the balloon and tie the end with a piece of cord or rubber-band. Place it on the table or floor and bring a magnet closeby. The balloon will rise rapidly off the table or floor to meet the magnet.



A Revolving Magazine Rack



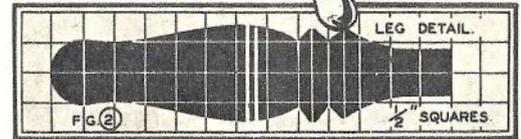
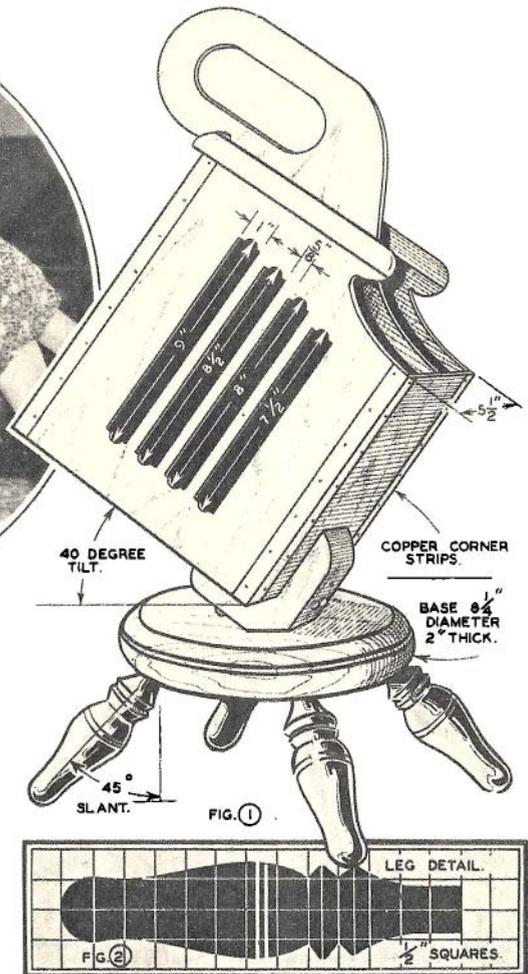
by O. E. Olson

HERE is a magazine rack that is as practical as it is novel. The box rotates freely on a sturdy pivot staff, making the magazines available from any angle. The pleasing Colonial design makes it a truly attractive piece.

Furniture woods characteristically Colonial, such as maple, walnut, cherry or birch, are the best to use. Start by laying out the box sides on $\frac{3}{8}$ " stock according to the graphed drawing, Fig. 4. It is likely that material will have to be glued up to obtain the desired width. The vertical design openings are started by boring a $\frac{5}{8}$ " hole at the top and bottom of each space, then cutting with a scroll-saw a sabre blade. The top edge is rabbeted $\frac{3}{8}$ " x $\frac{1}{8}$ ", to fit the slot in the quarter-round trim.

Next cut the back and front pieces $4\frac{3}{4}$ " in width, and rabbet same as the sides. The bottom board is cut from $\frac{1}{2}$ " stock. Assemble sides and bottom of box with wire brads. Then cut the quarter-round trim and rabbet as shown in Fig. 6. The back corners are mitered as shown in Fig. 7. The inside edge of trim should fit flush with inside of sides. Sand and glue pieces in place.

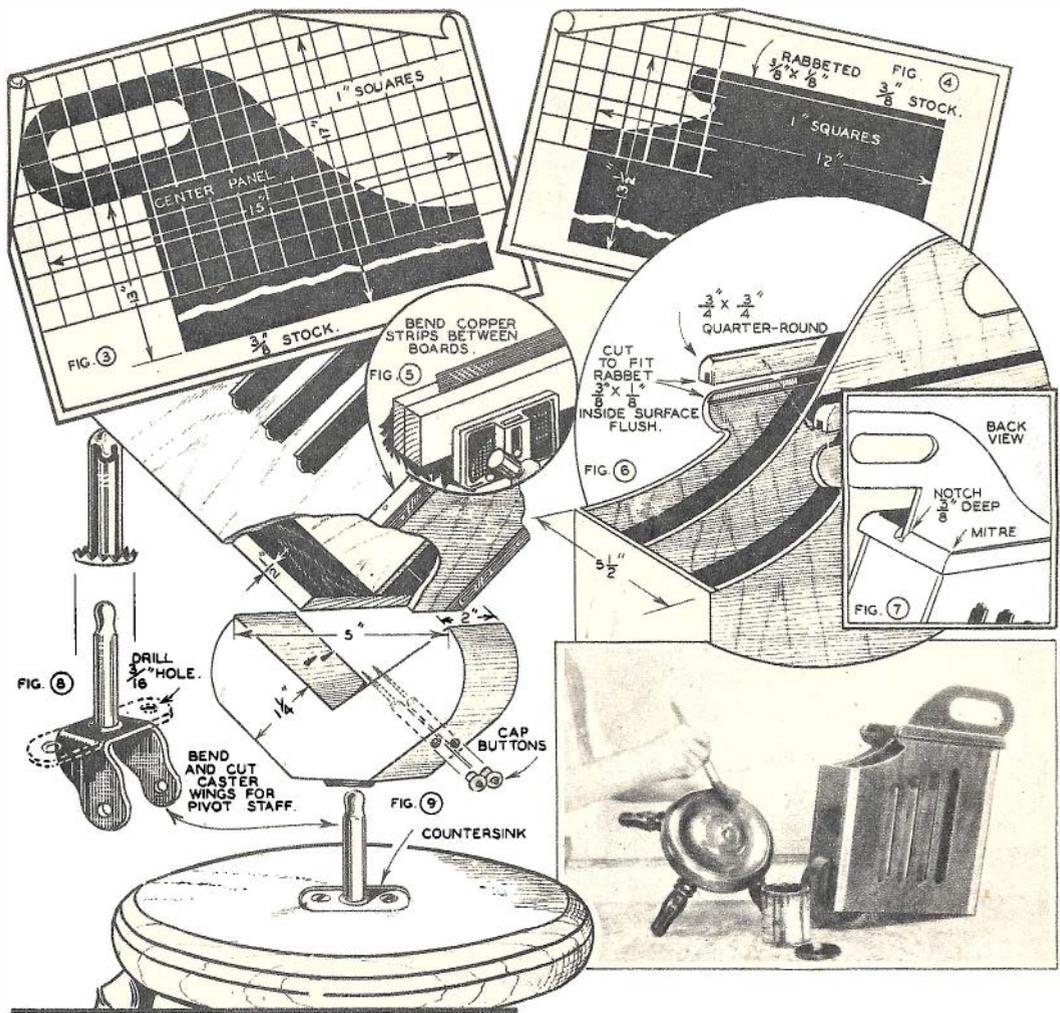
Layout and cut the center, or handle piece of glued stock, following the dimensions as



shown in Fig. 3. Sand well with fine sandpaper, and fit in place by notching trim as shown in Fig. 7. The front and back edges are held with $\frac{3}{4}$ " wire brads.

The angle block is cut as shown in Fig. 9, and is fastened to the box with hidden flat-head screws. The screws are set in $\frac{3}{8}$ " holes which act as deep countersinks. Cover these holes with button caps as shown in the drawing. These caps may be purchased ready to use or may be turned on a lathe. As the lower cut of the angle block determines the angle at which the box will stand, it should be checked carefully. The cut made should hold the box at an angle of forty degrees from level, as shown in Fig. 1.

Next, turn the cricket stool top from 2" stock, $8\frac{1}{4}$ " in diameter, the edge design of



which can be either plain or grooved. Sand on a lathe with fine sandpaper. Then turn the legs according to specifications of graphed layout, shown in Fig. 2. Two legs may be turned in a single piece on the lathe.

To insure a uniform slant of forty-five degrees of each leg from the top, it might be well to use a boring jig, made by boring a $\frac{3}{4}$ " hole of the desired slant in a piece of 2" waste stock, and clamping this piece in position to the turned top, as a guide.

Before gluing the legs in position, make and fasten the pivot staff to the top. To make this staff, bend and trim the wings of an ordinary grip-neck castor, as shown in Fig. 8, and bore two $\frac{3}{16}$ " holes in wings as shown. Slightly countersink the castor wings in cricket top and fasten with two 1" screws. Then bore a hole in the angle block to fit the clipsocket for castor staff. It is important

The builder will find his work simplified considerably if he carefully studies all the above details, making patterns full size before starting construction. This piece of furniture will be never-ending source of convenience to the user.

that this hole be at a right-angle to the base of the angle block. A flat, ball-bearing type castor can be used successfully, but requires somewhat different assembly.

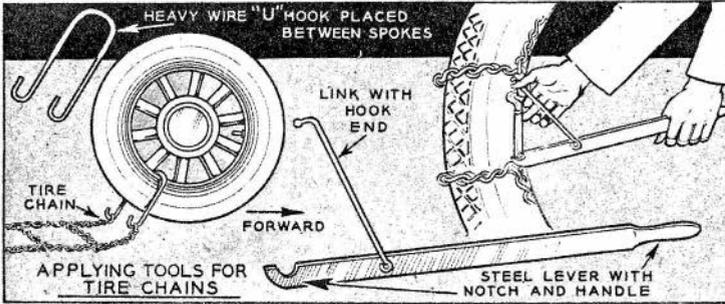
Finish before putting on the copper corner trims. Stain desired color, and apply a coat of white shellac. When this is dry, rub down with No. 00 steel wool, and follow with a coat of good furniture varnish. Let stand until thoroughly dry then rub again with steel wool. Apply a second coat of varnish, and when dry bring to a high lustre by rubbing with pumice and oil.

The copper corner strips add greatly to the appearance of the piece, and can be made by bending $1\frac{1}{4}$ "

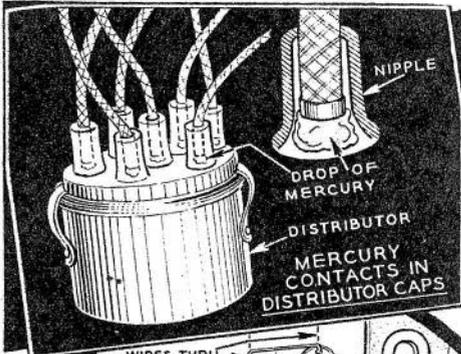
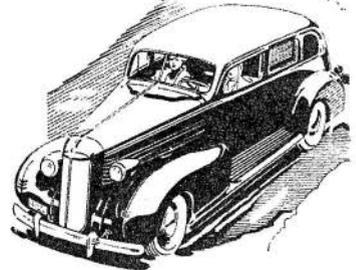
[Continued on page 140]

Timely auto tips that help to simplify cold-weather driving.

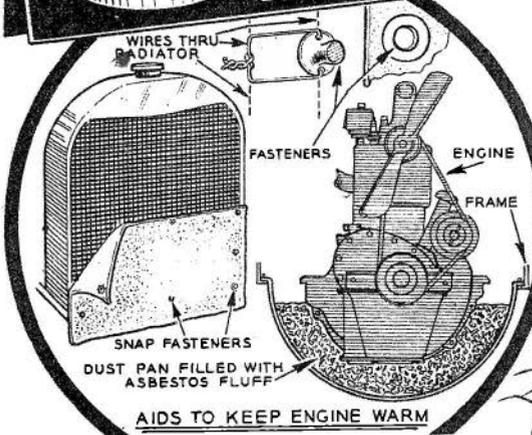
WINTER AIDS FOR MOTORISTS



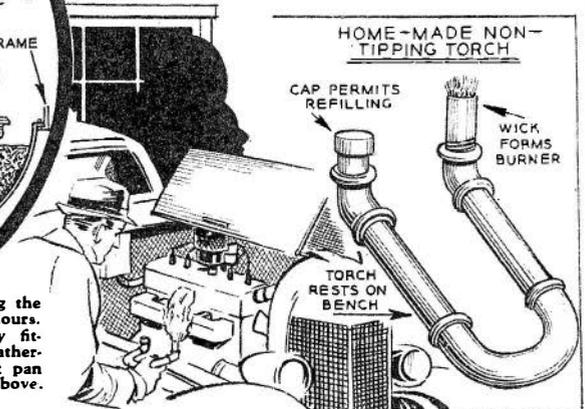
These simple tools permit the motorist to install tire chains in a fraction of the usual time. A hook formed from heavy iron wire is slipped between the wheel spokes, the chains attached to the ends and the car driven forward. The hook is then removed and the chains locked with the aid of the simple lever shown.



Left—To insure a hot spark it is vitally important that the ignition circuit be in perfect working order. After a car has been in use for some length of time the distributor cable plugs become faulty, resulting in the loss of spark. To overcome this, pour a few drops of mercury in each nipple and replace the high-tension cables.

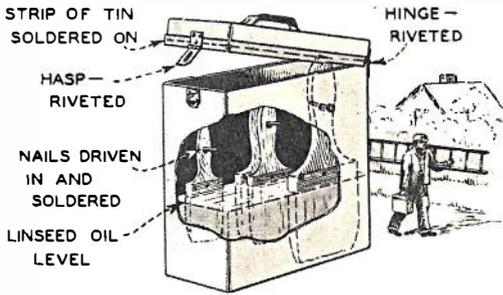


The blow torch illustrated below will find many practical uses around the garage and workshop. It is especially useful for heating the car manifold so as to permit quick starting in cold weather. The torch consists of scrap pipe and fittings connected as shown. Cotton wicking forms the burner. Alcohol or kerosene may be used for fueling torch.



Every motorist is troubled with the problem of keeping the motor warm when parking the car outdoors for several hours. Excellent insulation against cold can be provided by fitting the radiator with a cover made from felt-backed leatherette and filling the space between the engine and dust pan with asbestos steam pipe packing in manner outlined above.

PRACTICAL WORKSHOP KINKS

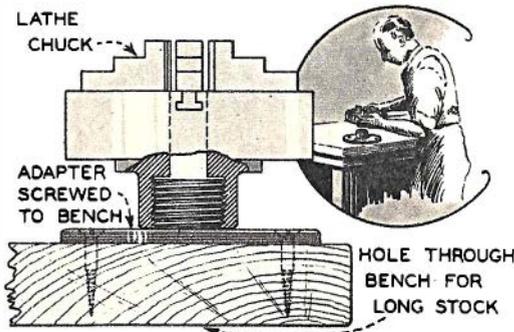
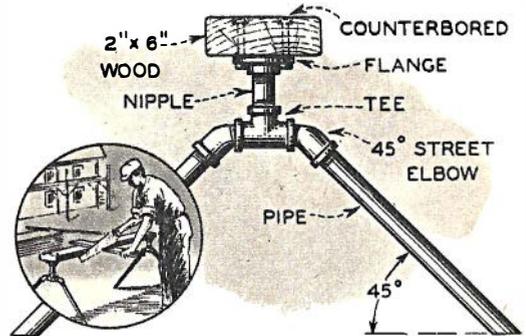


Handy Paint Brush Container

A ONE-GALLON varnish can makes a useful container for spare paint brushes. Cut off the top of the can and fit it with a hinge at one end. Solder a strip of tin around the end of the lid so that it overlaps on the can. Punch holes in the sides of the can at varying heights and solder nails in them to serve as brush hooks.—R. A. Kelly.

Shop Horses Made Of Pipe

A PAIR of heavy-duty shop horses that will find practical application about the shop can be formed from lengths of one-inch pipe and several fittings. Assemble the legs as shown in the accompanying illustration, sawing off the ends of the pipe at an angle of 45°. The counterboard is a length of 2 by 6 inch stock cut to the desired length and bolted to the flanges. The use of elbow fittings eliminates pipe bending.—W. C. Wilhite.



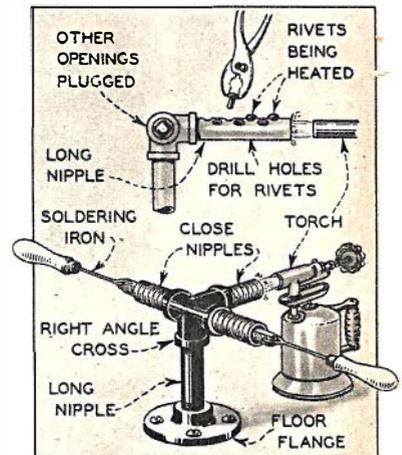
Chuck Forms Bench Vise

BY MEANS of a lathe chuck adapter bolted to one corner of the workbench, the regular lathe chuck can be employed as a vise for holding small metal turnings that require filing, sawing or threading. A hole drilled through the bench, directly underneath the adapter, permits working with long stock.—Homer West.

Blow Torch Soldering Iron Stand

A SOLDERING iron stand that derives its construction from pipe fittings, and heat from a blow torch, will insure the metal worker of a hot iron at all times. The stand is formed from a length of 1-inch pipe, floor flange, right angle cross and three pipe nipples. The supporting pipe is stuffed with asbestos wool so that heat does not penetrate to the workbench and the various fittings assembled in the manner shown.

A blow torch flame directed into the center nipple will distribute heat to the remaining nipples, which serve as holders for the soldering irons. The stand may be also used as a rivet heater by drilling holes for their accommodation in one of the nipples.—M. A. Hall.





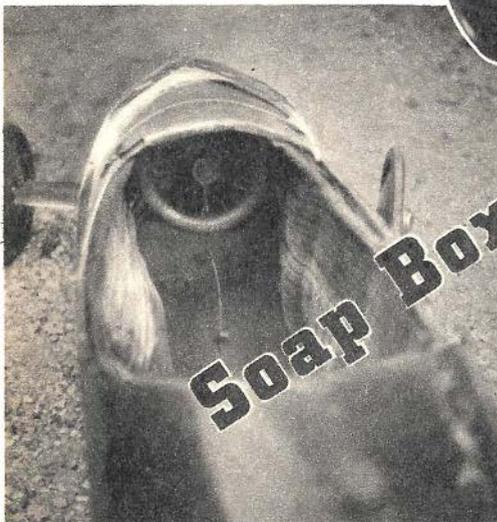
The soap box racer is equipped with a novel braking device. When depressed, the rear wheels are raised off the ground. The brake resembles the tail skid of an airplane.



The new Derby champion is congratulated by Felix Baron, of Chevrolet Motor Co., who presented him with the International Soap Box Trophy.



Robert Ballard, 1937 Soap Box Derby winner, and his car. The 12-year-old lad piloted his blue and white racer to All-American and International championships held at Akron, Ohio, on August 15, 1937.



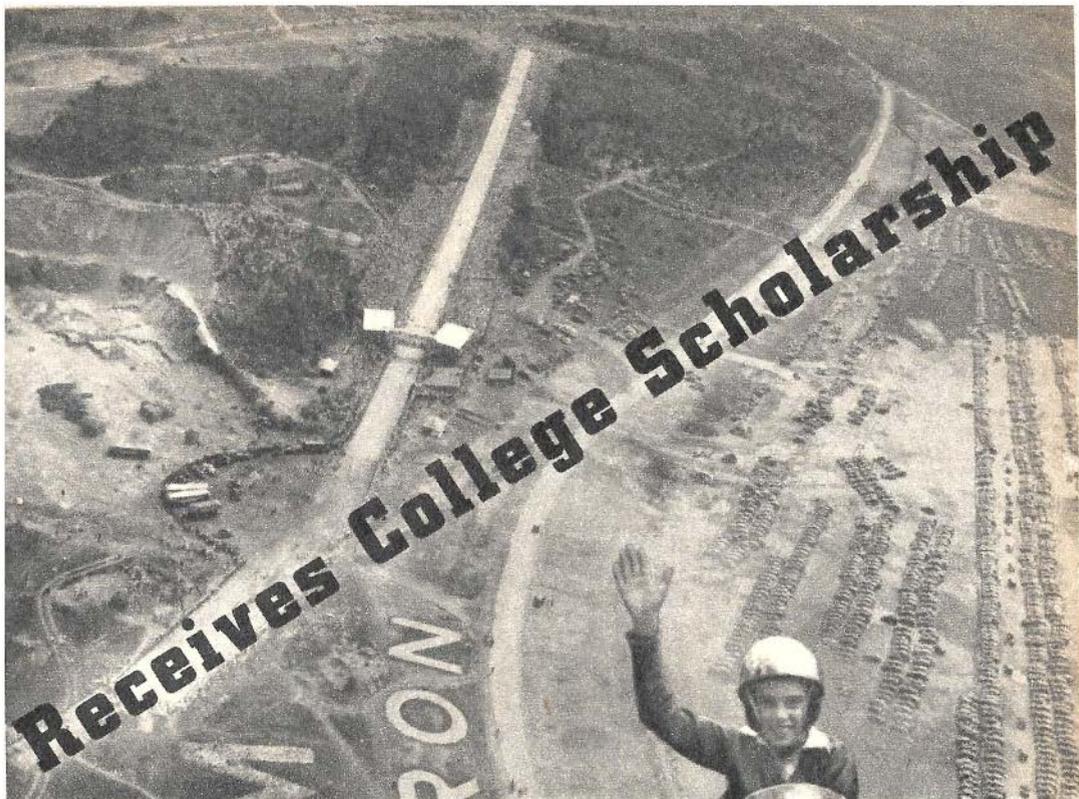
Looking into the cockpit. The brake pedal is located beneath the steering wheel. Pedal and brake are connected by a steel cable. Sides of cockpit are padded. Celluloid windshield rises above cowl.

Soap Box Derby Winner

by
Donald G.
Cooley

WHEN better soap box racers are built, young workshop fans like Robert Ballard will build them. Robert is the twelve-year-old youngster of White Plains, New York, who holds the title of world's champion soap box racing pilot—a soap box racer, of course, being a home-built, boy-size vehicle which uses gravity or human pushing power for a motor. Bobby won both the national and international championships a few weeks ago when his racer proved itself the fastest thing on wheels at the fourth running of the All-American Soap Box Derby at Akron, Ohio. His victory entitles him to a four-year

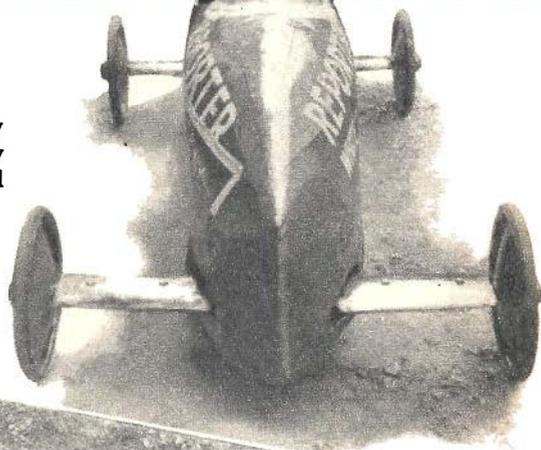
Modern Mechanic



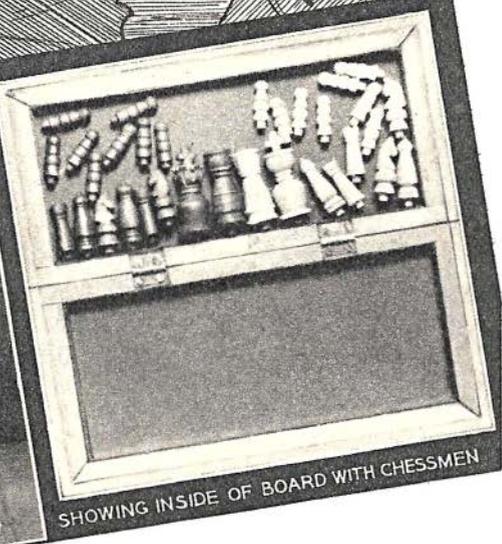
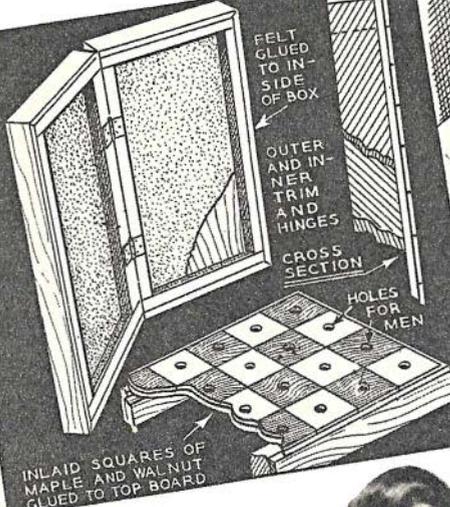
This aerial view of Derby Downs, near Akron, Ohio, shows the huge inclined track on which the soap box races were held. More than 100,000 spectators attended the meet, an annual junior sports event.

scholarship in any state college or university he may choose. He also won a silver trophy and a diamond-set gold medal. The mantel above the fireplace in his home is overflowing with trophies testifying to his skill as a designer of soap box racers.

[Continued on page 132]



This view of Bob Ballard's soap box racer provides a clear conception of the streamlined design of the body, the faired axles and the road-hugging qualities imparted by the underslung design and wide-spaced wheels. Left—This top view shows the cigar-shaped body with tapering nose and tail. The driver's seat is just wide enough to admit pilot.



SHOWING INSIDE OF BOARD WITH CHESSMEN

A NOVELTY VEST POCKET CHESS BOARD

THE veteran chess fan will derive much pleasure from this lilliputian version of the ancient but popular game of mental skill. Not only is this little board unique in size, but novel in construction as well, for its playing pieces are so made that they cannot accidentally shift position while in play. The board consists of a hinged maple box with

Designed by Seth and Boyd Pulley of Logan, Utah, this tiny chess board, measuring but $3\frac{1}{4}$ by 7 inches when closed, conveniently fits into the vestpocket. Playing pieces are lathe-turned so as to fit into holes drilled in the maple and walnut inlaid playing board.

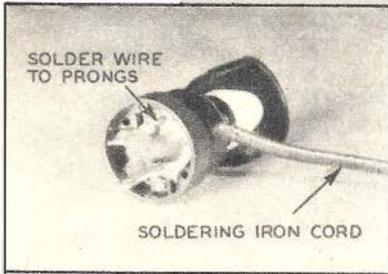
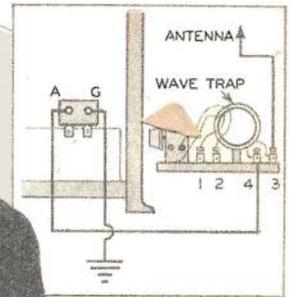
the checkers inlaid in walnut on the bottom and top.

Little explanation regarding the making of the box is necessary. Each half measures $3\frac{1}{4}$ by $\frac{1}{2}$ by 7 inches. The sides are made of $\frac{1}{2}$ by $\frac{3}{4}$ -inch lengths of maple plywood or solid stock about $\frac{1}{4}$ -inch thick. Blocks for the checker design are cut from walnut and maple veneer and attached with casein glue.

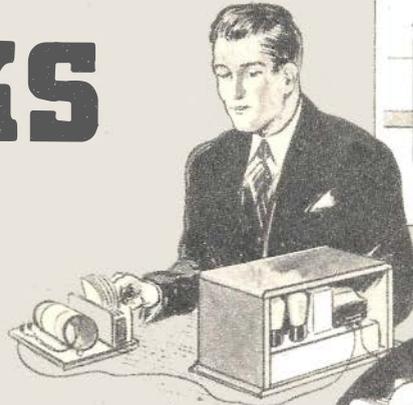
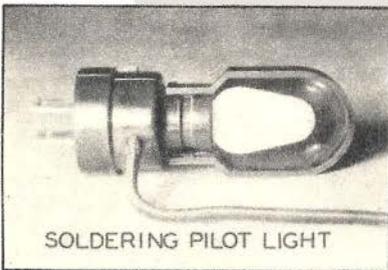
After the glue has set, carefully drill $\frac{1}{8}$ -inch holes in the exact center of each square for inserting the playing pieces. Drill the holes so that they pass through the blocks, but not through the maple stock underneath

[Continued on page 128]

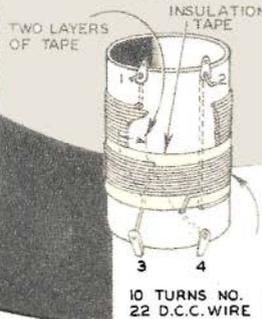
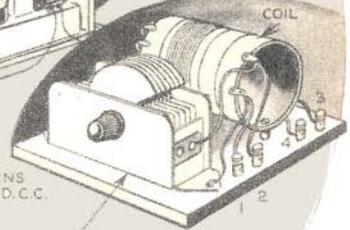
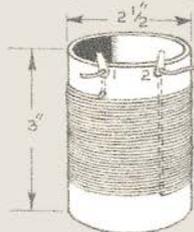
RADIO SPARKS



By replacing the regular soldering iron plug with a night lamp, as shown, unnecessary waste of current, when iron is not in use, will be avoided.



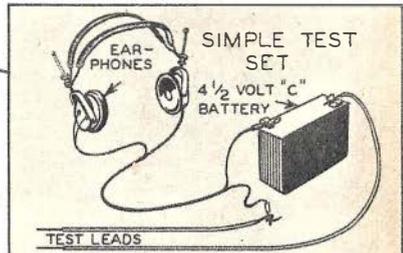
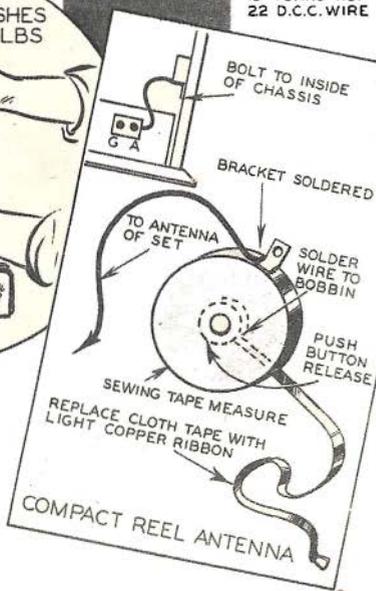
STATION SEPARATOR (WAVE TRAP)



On early receivers where it is difficult to separate local stations, a wave trap will often overcome interference. It consists of a .00035 mfd. variable condenser and home-made coil mounted on a wooden base. Wind the first coil with 75 turns of No. 22 d.c.c. wire on a 2 1/2 by 3-inch coil form. Connect the ends of this coil to the condenser and two terminals, labeling them 1 and 2. Over the end of the 75-turn coil wrap two layers of adhesive tape and on this, another winding of 10 turns. Connect the ends of this winding to terminals 3 and 4. To use the station separator, connect terminal 3 to antenna and 4 to antenna post of receiver. Adjust condenser until interference is overcome. If this does not work, connect antenna to terminal 2 and lead from antenna post on set to terminal 1.



Ordinary fingernail polishes may be used for tinting colored pilot bulbs used to identify wave bands in all-wave radio receivers.

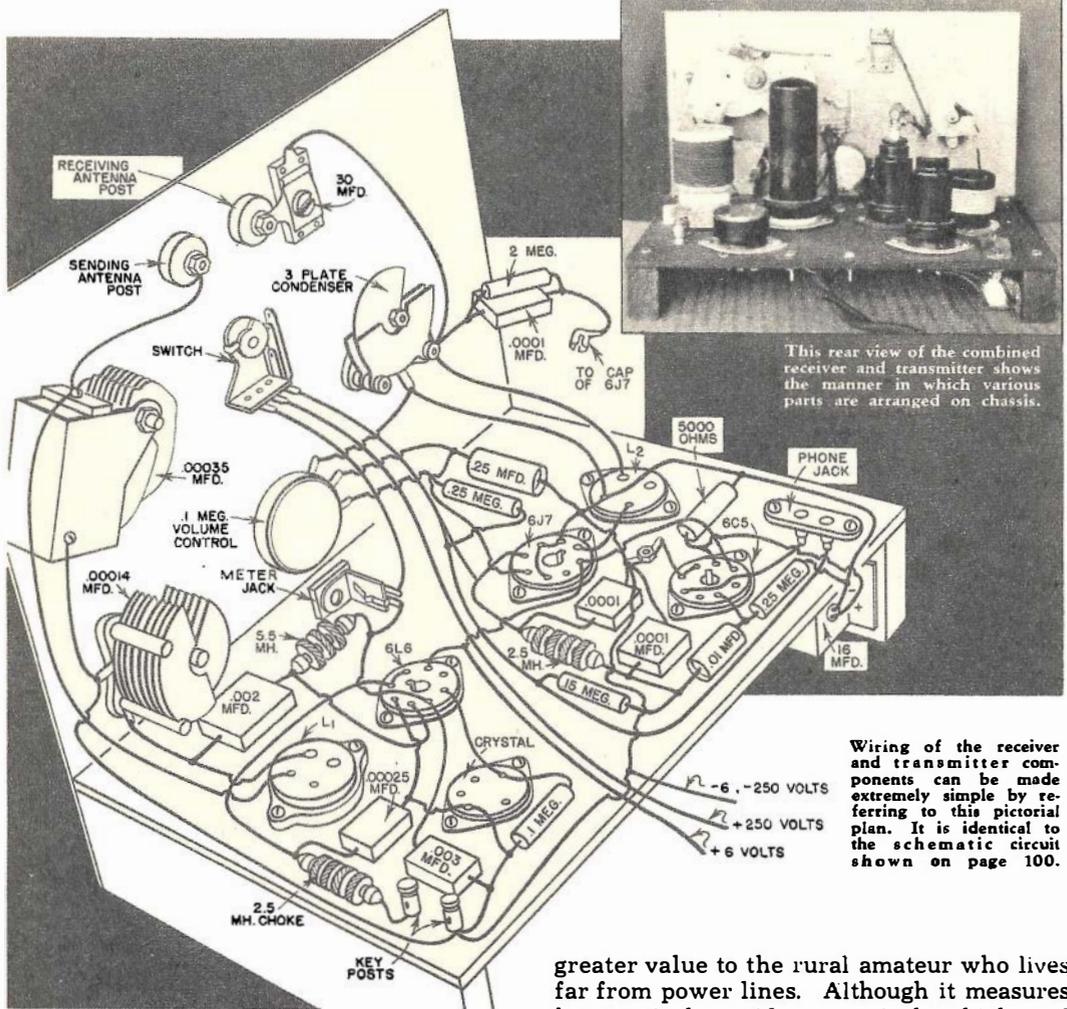


Here is a simple test set that will prove very useful. Touch the test leads to a suspected radio part; if no sound is heard, an open circuit exists; if a loud crash is heard, the circuit is closed.

Left—This compact reel-type antenna is especially useful for travelers. It is made by replacing the cloth tape of a sewing measure with a copper ribbon. The tape reel is connected to set as shown.

Complete Amateur Station

by Stanley Johnson



THE ability of simple short-wave sets to provide communication when all other means are wiped out has time and again proved of priceless value to isolated communities. Yet too often, emergency equipment independent of power lines is not built up until a sleet storm has left communication wires an icy tangle or flood water is beginning to trickle across the living room floor.

This receiving and transmitting unit—actually a complete amateur station—may be operated entirely from but a single storage battery, making it an ideal emergency-portable unit for any amateur and of even

greater value to the rural amateur who lives far from power lines. Although it measures but ten inches wide, seven inches high, and seven inches deep, it is capable of surprising output at low plate voltage. The unit shown in the photographs was used in the national amateur "Field Day Contest" last year, and during sixteen hours of operation allowed contact with 22 stations in a dozen states, including widely separated California, New York, Minnesota and Texas. Input to the transmitter was 10.5 watts, obtained from a small genemotor.

The unit uses three metal tubes, a 6L6, a 6J7, and a 6C5. The 6L6 serves as a crystal oscillator in a new transmitting circuit which allows clean keying on the fundamental frequency, good output when doubling, and

Operates From Storage Battery

simplified antenna matching—all with but two tuning condensers and a single coil. The 6J7 and the 6C5 provide for reception in an improved electron coupled detector—resistance coupled audio receiving circuit.

All of the tubes used are of the six-volt variety which may be lighted by a storage battery. The same battery can drive a 6-250 volt 50 milliamperer genemotor to supply the plate voltage. Five or six heavy duty "B" batteries may be substituted for the genemotor, but vibrator power supplies of the type used in automobile radios are not recommended because of poor regulation and the difficulty of filtering them enough to allow their use with short-wave receivers.

The use of a black crackle finished pressed wood material for the base panel makes the transmitter-receiver easy to build. Holes may be drilled with ordinary wood tools. Small wood cleats support the base panel in order to allow space underneath for the wiring and small parts. The front panel is a 7 x 10-inch sheet of a zinc alloy material similar in appearance to aluminum but cheaper and easier to work. All tuning controls—the "send-listen" switch which shifts the "B" voltage from the receiver to transmitter, the jack for the plate current milliammeter and the two antenna insulators—are all on the panel.

The receiver portion of the unit requires the most wiring so it is best to wire it first. All radio-frequency "grounds" are made to a group of soldering lugs between the two receiver tube sockets. Short leads and well-soldered connections are important. Looking at the set from the bottom, receiver wiring is separated from transmitter wiring by the four wire power cable.

The detector circuit of the receiver features an improved version of the electron coupled oscillator. Notice that the cathode "tickler" coil is wound in the opposite direction from the "grid" coil and unlike the older circuit, only the grid coil is tuned. A very small variable condenser, made by removing two plates from a five-plate midget variable,



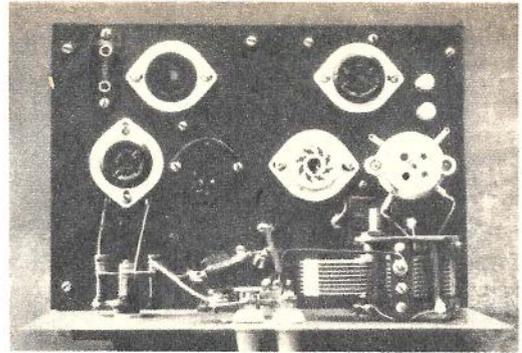
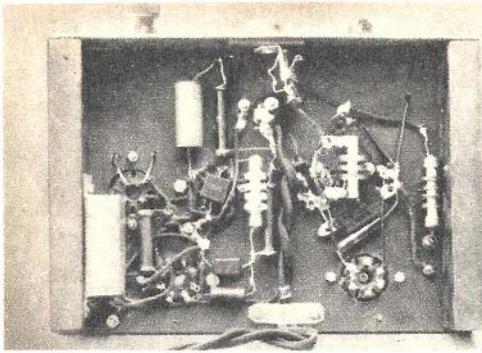
The unusual compactness of the combination transmitter and receiver permits it to be set up for emergency operation indoors or out.

is used for tuning in order to spread the amateur bands over a good portion of the dial. The builder must be careful in winding coils, however, or the narrow bands will be missed entirely. Some adjustment of the antenna coupling condenser may be necessary in order that the amateur bands fall in the center of the dial.

Once the receiver is completed and working properly, you are ready to begin on the transmitter. The circuit is one of the several new regenerative crystal circuits. Regeneration, obtained from the radio frequency choke and condenser in the cathode circuit, increases the output and allows keying of the transmitter at the crystal frequency under considerable antenna load. This particular method of securing regeneration is generally



When the set is not in operation, be sure the changeover switch is either in the off position or on "transmitter." When the switch is in "receiver" position, the potentiometer and dropping resistor are connected across the "B" battery.



The above photos show both top and bottom of the transmitter and receiver chassis. The chassis is constructed of Masonite for easy drilling. The panel is of aluminum or zinc alloy.

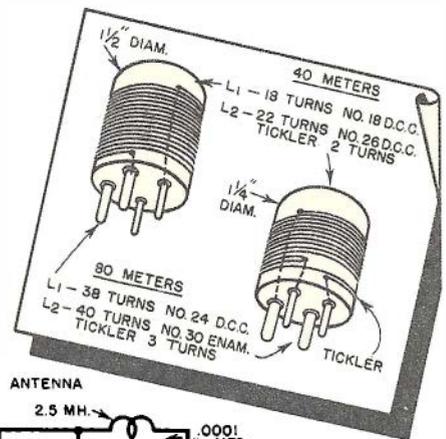
credited to Frank C. Jones, veteran short-wave experimenter. Thanks to the high mutual conductance of the 6L6, excellent output is obtained at twice the crystal frequency simply by tuning to the second harmonic.

Since the currents are heavier than in the receiver, number 14 enameled wire is used for the radio-frequency leads. As before, "grounds" are made to a single point, this time to the juncture of the two by-pass condensers. The jack for the plate current milliammeter must be insulated from the metal panel. Transmitter coils are wound on molded coil forms and tube and coil sockets are of similar high insulating material.

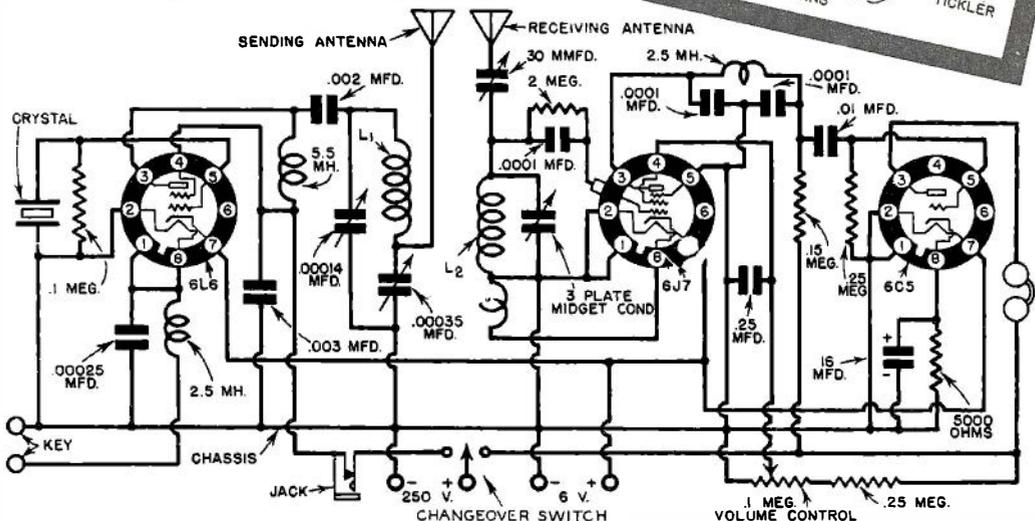
The crystal for the transmitter should be a high power "A-T" or "LD-2" cut. A good 80-meter crystal with a frequency between 3,500 and 3,650 kilocycles will allow operation on both 80 meters and 40 meters, although slightly more output is obtained with separate crystals for each band. The forty-meter band

gives good results on low power in the daytime, 80 meters being preferred for operation at night. An easily erected antenna for both bands is the "end fed Hertz," a single wire 133 feet long. The antenna condenser is adjusted for the desired antenna load and then resonance is restored by rotating the plate condenser. A six-volt dial light bulb,

[Continued on page 124]



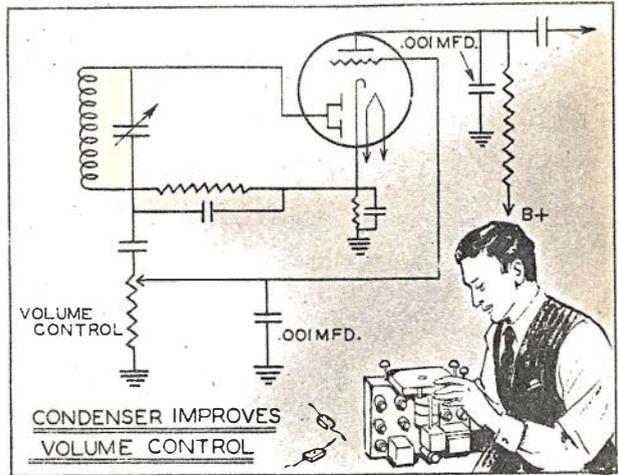
This schematic wiring plan corresponds with the pictorial plan on page 98. Coil data are at right.



Condensers Improve Efficiency Of Volume Control

IN MANY receivers employing a diode-triode type of second detector, the volume is not zero when the volume control is turned all the way down. This condition would be satisfactory were it not for the fact that the signal heard is usually badly distorted. The trouble is probably due to coupling between the diode plates and the plate of the tube, which are in the same envelope. Because of this coupling, r. f. energy gets into the plate of the tube and rectification takes place in the plate circuit—bad rectification at that. The remedy is to connect a .001 mfd. fixed condenser between plate of this tube and ground.

A similar, but more peculiar volume control action takes place in other cases. The volume is zero when the volume control is set at zero; but as it is increased slowly, the volume rises, falls sharply, and then rises again. In this instance, the trouble is due to coupling to the grid of the detector tube from the diode plates. The r. f. coupled to the plates is rectified by the grid; the audio coupled to the grid through the usual channel is out of phase with this spurious signal. The two are equal and opposite at a certain setting of the volume control. The remedy is to connect a .001 mfd. fixed condenser between grid and ground.



On some receivers the volume control, though fully retarded, fails to completely silence reception. The insertion of fixed condensers in the circuit as indicated above will eliminate this trouble in most cases.

Reducing R. F. Oscillation

RADIO-FREQUENCY oscillations are often traced to the audio-frequency end of the receiver, especially when high-sensitivity beam output tubes are used. In the event that the cause of a persistent oscillation proves elusive, try these simple remedies.

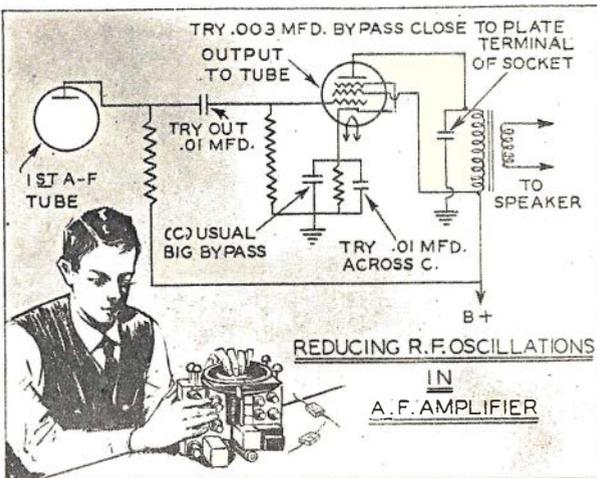
If the output tube is of the glass type, shield it and ground the shield solidly to the chassis.

Connect a small mica condenser (.01 mfd.) across the self-bias resistor. This condenser is in addition to the usual large by-pass (c.) ordinarily employed.

Connect a small mica condenser from the plate terminal of the output tube to chassis. This condenser should have a value of about .003 mfd. and be placed as close to the plate terminal of the socket as possible. An inch is a long distance here.

Try replacing the familiar coupling condenser with one of mica construction. Paper condensers sometimes leak (electrically), which may decrease the bias on the output tube to the point where ordinary preventive measures fail.

These ideas are illustrated schematically in the accompanying diagram so as to simplify repairs.

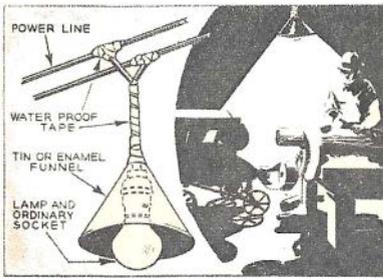
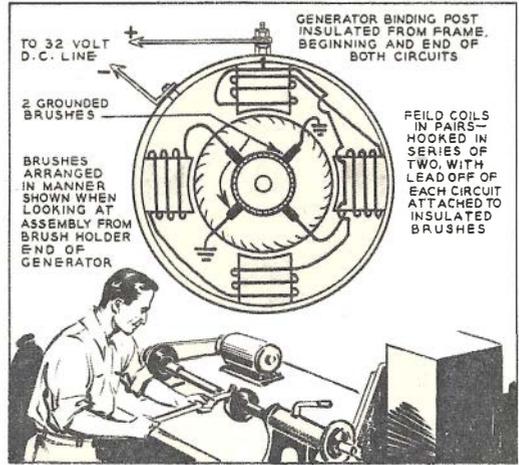


R. f. oscillation in the a. f. amplifier of a receiver may be reduced by the addition of fixed mica condensers in the circuit as shown. Make lead of .003 mfd. condenser to output plate as short as possible.

ELECTRICAL KINKS FOR THE WORKSHOP

Shop Motor From T Generator

A MODEL T Ford generator can be converted into a practical 32-volt d.c. motor for use on rural lighting systems. Remove the end of the generator housing and replace original brush holder with a four-brush holder taken from a model T starter motor. Secure the new brush holder to generator brush rack ring by threading it to take four small machine screws, first sawing ring in half with hack saw so that it can be inserted. Substitute carbon brushes with the copper type as used in the starter motor, then connect field coils in manner shown in diagram. H. E. Gruntmeir.

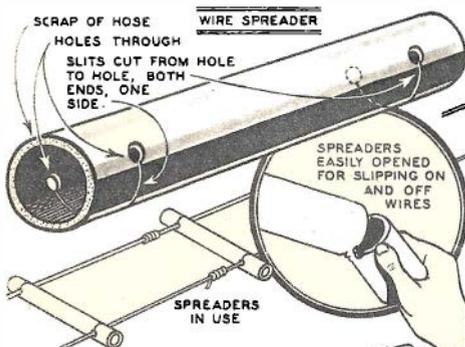
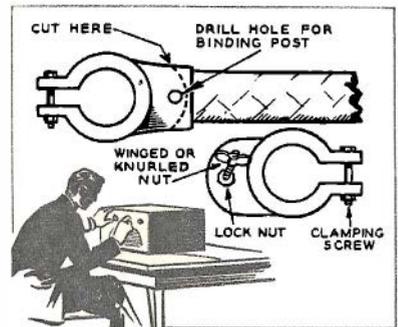


A Weatherproof Workshop Light

TO WATERPROOF an electric drop-light located in some damp part of the workshop will not only add life to the fixture and cord, but provide a safeguard against fire. Drop the leads from the power line through an inverted tin or enameled funnel and apply tape over both funnel spout and wires. The funnel not only prevents water from entering the lamp socket, but serves as an efficient shade and reflector.—A. C. Klust.

Auto Cable Used On Shop Battery

BATTERY post clamps, such as can be salvaged from old automobile battery cables, are of practical value to the electrical experimenter. Saw off the cable as close to the clamp as possible, then drill a hole through it for inserting a machine bolt. Fitted with a knurled or winged nut, the bolt serves as an excellent terminal for connecting leads from motors, welders and radios.—E. Z.



Hose Forms Wire Spreaders

SHORT lengths of rubber garden hose provide inexpensive spreaders for temporary electric lines such as strung up for outdoor celebrations and building operations. Cut the hose into 6-inch lengths and drill holes through the rubber about 1 inch from each end. With a sharp knife slot the hose so that the light line may be inserted in the spreader by bending it in manner shown.—A. W.

MODERN PHOTOGRAPHY

A Special Section of MODERN MECHANIX—Pages 103 to 116



FOURTH AWARD—Photographs such as this will substantiate the tallest of fisherman's stories. The large mouthed bass were posed in a toy boat. E. H. Cook of Ft. Wayne, Ind., took the photo with a 4x5 plate camera using a $\frac{1}{4}$ -sec. exposure and f:8 lens stop. His picture merited a \$5 fourth award.



SECOND AWARD—Table-top photography lends itself well to amusing subject matter. This china dog and cat, posing with a bantam camera, resulted in a photo of distinct novelty. Taken with a 4x5 Premo camera stopped to f:16 and 2 sec. exposure, it earns second award of \$10 for L. J. Jones, Reno, Nev.



FIFTH AWARD—This picture of a skyscraper cactus plant isn't an oddity of science, but a photo illusion. The camera, a 79c box type, was placed on ground near the plant. The man stood 60 ft. in the rear. The picture earned \$5 for A. J. Maus, Seattle, Wash.

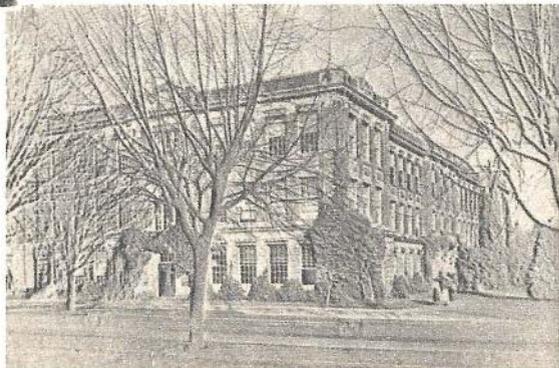


FIRST AWARD—Recipient of the \$15 award is Dr. W. D. Whiteside of Timson, Texas. His unusual composite picture consisted of two individual shots, taken with a Recomar 18, pasted together and then copied. The children were posed on a teeter board so as to obtain correct position on composite.

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay \$15 for the best picture received from readers, \$10 for the second choice, and \$5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Also your name and address. Wrap all prints carefully and include postage if you want them returned. Address all contributions to Photography Editor, MODERN MECHANIX, 1501 Broadway, New York, N. Y.

THIRD AWARD—Possessing a third dimension effect, this picture merited a \$5 award for Bill Staff, Aberdeen, Wash. It was produced by making a positive film of the original negative, placing both films together, shifting one slightly to the left, then printing.



WINNERS
OF THIS
MONTH'S
PHOTO
AWARDS
OFFERED
BY
MODERN
MECHANIX



The distorted image reflected by the convex surface of a silver spoon can be photographed in the manner shown to produce the monstrosity effects.

Photographic Monstrosities



These pictures show a few of many effects obtained by photographing images reflected by curved surfaces.

by Paul Hadley

FREAKISH photographs, in which the image of a person's head or body appears hideously distorted, are frequently seen in picture exhibitions and in advertising. These always attract the eye, but the amateur picture-maker generally considers the making of these photographic "monstrosities" as beyond his ability.

However, a glance at the accompanying illustrations will show that one need not be an expert photographer or have special equipment in order to get really astonishing results. An ordinary plate camera, with ground glass back and a long bellows to permit focusing within six

[Continued on page 124]

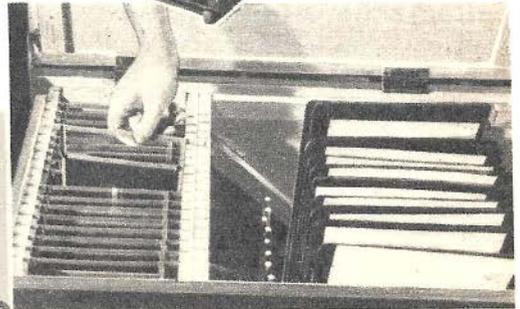
Cabinet Speeds Quantity Film and Print Drying

ONE of the chief annoyances of the average photographer is slow drying of films and prints when he is in a hurry for them. Although many large studios and news photo concerns are equipped with large automatic dryers, the average photographer cannot afford such a luxury.

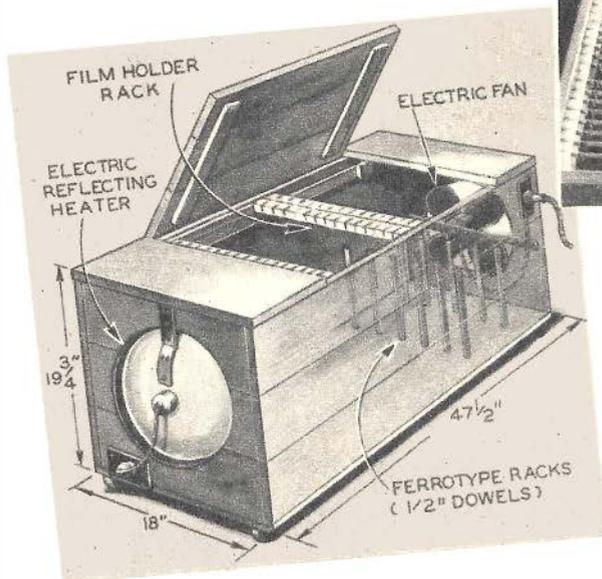
The dryer described here was designed by Robert Raines, a New York photographer, and can be constructed at a cost of only a few dollars. Where a smaller dryer is desired, dimensions can be altered accordingly.

The drying cabinet, constructed of 1-inch pine or $\frac{1}{2}$ -inch plywood stock, measures $47\frac{1}{2}$ inches long, $19\frac{3}{4}$ inches high and 18 inches wide. A reflecting type electric heater is mounted in one end of the cabinet with angle brackets. In the opposite end, an electric fan is mounted over a circular opening with the blades blowing the air outward. The fan, mounted in this manner, acts as an exhaust and distributes the heat evenly through the cabinet.

The inside construction of the box is simple. Four rows of dowels are inserted in holes



The inside of the cabinet is arranged to take both cut film holders and ferrotype plates. It accomplishes both drying operations at one time.

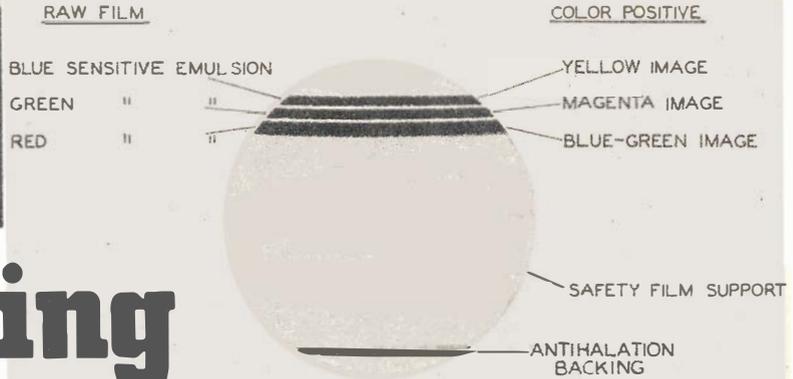


This phantom detail of the cabinet film and print dryer shows the placement of the electric heater and electric fan. Dimensions may be altered to suit individual needs.

drilled in the bottom of the cabinet to act as ferrotype racks. Four strips of $\frac{3}{4}$ -inch stock, mounted across the top of the opposite end of the cabinet, serve as racks for the film holders, accommodating as many as fifty-four 4 by 5-inch films. On damp days, the cabinet will handle a complete drying operation in 15 minutes if the heater and the fan are operated at full capacity. The finished dryer is mounted on casters.

This greatly magnified cross-section view of Kodachrome film shows the three separated layers of color-sensitive emulsions. By means of an extremely complex developing system the respective emulsions are converted into dyed images, one above the other, as listed on the right. The original film thus be-

KODACHROME FILM



Making

comes a colored positive transparency which is best seen by projection on a screen. At present Kodachrome is available only for 35 mm still cameras.

Photographs

ALTHOUGH color photography for the amateur has been possible for many years, it is only recently that advantage has been taken of the several processes available. Advertisers have been conscious of the attention-getting value of color for some time; magazine editors have lately begun to use full-color photographs as cover illustrations and have been paying enormous sums of money (\$500 to \$1,000) for good "shots." Perhaps this increasing use of color photography in the graphic arts is what has focused the attention of the amateur on the fact that he, too, may take pictures in color.

The amateur may make two kinds of colored photographs: transparencies and prints on paper. A transparency is a film or plate which is exposed in a camera and then processed to give the colors of the original subject. It is like a lantern slide in that it is a positive and it is transparent. It must be viewed by holding it up to a source of light or projected upon a screen in a lantern. It is like a motion picture positive except that it is in color and does not show motion. When one uses Kodachrome or Dufaycolor or one of the several color plates, he has, after processing, the original film or plate on which the exposure was made.

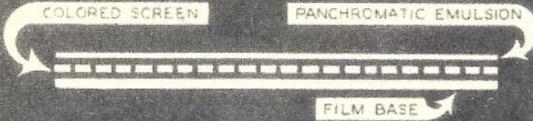
While it is perfectly easy to make good transparencies, it is still very difficult to make prints. Many amateurs are doing it, however. First it is necessary to make three ex-

posures of the object on three films through three different filters. These are called separation negatives. Positives are made from each negative. These positives may be on other film or on special paper, and each must then be dyed, toned, or pigmented. The dyes or pigments used must be exactly related to the colors of the filters through which the negatives were made. The positives must be superimposed on one another in exact register. This means that the camera must not move during the negative-making process. For correct color balance in the final print, it is imperative that the three negatives be correctly exposed and developed. One cannot shoot with the abandon possible in making black and white prints.

Transparencies can be made almost as easily as shooting off black and white film, and they are marvelously beautiful to look at. They are so beautiful that many amateurs have foresworn black and white photography completely, have bought themselves a good projector and, instead of passing black and white prints among their friends to look at, entertain them with natural size images of their vacation spots, their babies, their pets or their hobbies, thrown on a screen.

Still photographers are therefore following the trend of movie makers. So beautiful are the color movies, and because of color so full of apparent depth—a sort of third dimen-

CROSS SECTION OF DUFAYCOLOR FILM

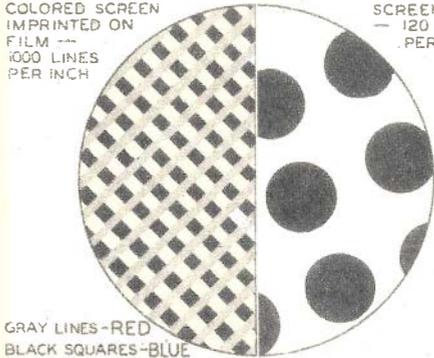


Dufaycolor film is placed in the camera with its back toward the lens, so that the light must pass through the colored screen before it strikes the emulsion.

Easy to "shoot", color films open new opportunities for camera fans.

In COLOR

MAGNIFIED VIEW OF COLORED SCREEN IMPRINTED ON FILM --- 1000 LINES PER INCH



GRAY LINES-RED
BLACK SQUARES-BLUE
WHITE SQUARES-GREEN

DUFAYCOLOR FILM

The screen pattern of Dufaycolor film consists of a patchwork of red, blue and green lines, so fine that there are 1,000 to the inch. They are imprinted on the film base by precision machines, and then covered over by a panchromatic emulsion, on which the image is actually recorded. A common 120-line halftone printing screen is shown for size comparison.

sion—that those who can afford it take nothing but color. Sales of color film have gone up over two thousand per cent in the last year!

There are several forms of color film available for the amateur. Dufaycolor has been available for several years both in cut film and in roll film for practically all cameras. Agfacolor plates have been on the market for years. Recently Eastman made available to owners of 35-mm still cameras its beautiful Kodachrome, which has done more to con-

A small, simple projector provides the best means of showing color pictures. The images can be thrown up to large size on any white surface, and are spectacularly beautiful.



by Keith Henney

vert movie makers to color than any other factor.

All one has to do is load his camera, or his plate holders, with these materials and shoot it off—taking care that he observes the fact that these sensitive materials must be carefully exposed. They do not have the latitude of black and white; they must be correctly exposed if true color values are desired. One cannot go barging about shooting right and left with color! The amateur must know what he is doing.

Dufaycolor is an additive process in which true color values are secured by the light passing through an enormous number of minute colored filters embedded in the support on which the sensitive silver emulsion is placed. Dufaycolor can be processed at home, is good fun and not difficult. Anyone who develops his own black and white films can handle Dufaycolor, provided he is willing and capable of working in absolute darkness during the early part of the developing process. In this, Dufaycolor does not differ from the use of any highly sensitive panchromatic film. It must be developed by time and temperature and not by inspection—unless the materials are desensitized before development. Dufaycolor, however, will

[Continued on page 133]

Polaroid Glasses Make

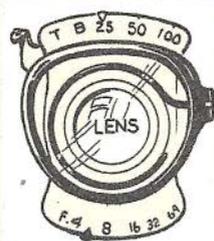
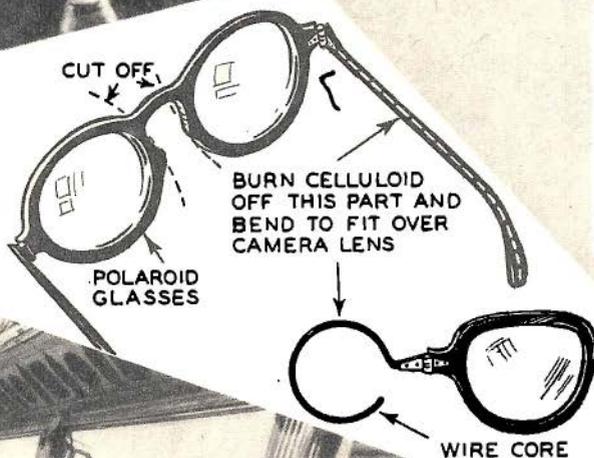


POLAROID glasses, which cost only \$3.75 as compared with regular Polaroid photographic screens costing from \$12.00 to \$27.00, provide an inexpensive means for experimenting with polarized-light photography.

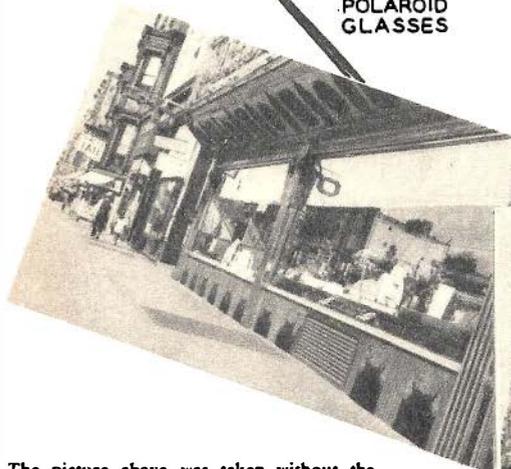
These glasses, now generally available at optical stores, are designed to eliminate or reduce objectionable and blinding sun or headlight glare. With them, it is possible to see through and beyond a transparent glass surface or body of clear water without the glare or reflections ordinarily seen on the same surfaces. In the case of opaque reflective surfaces, objects placed on them will not show reflections when viewed through the Polaroid glasses.

Used on a camera, these glasses can eliminate unwanted glare and reflections from horizontal surfaces when held against the

Polaroid spectacles can be made into permanent lens filters by cutting away the nose piece and heating and bending the temple pieces to form lens clip as shown.



When attached to the camera lens, the Polaroid screen should be in either perfectly vertical or horizontal position.



The picture above was taken without the Polaroid filter. Note street reflection in store window. Right—Same scene taken with filter, but minus extraneous reflections and glare.

Glareless Pictures

by
Andrew
Vena

camera lens in a horizontal position. Vertical reflections, of course, require that the glasses be held over the camera lens in a vertical position.

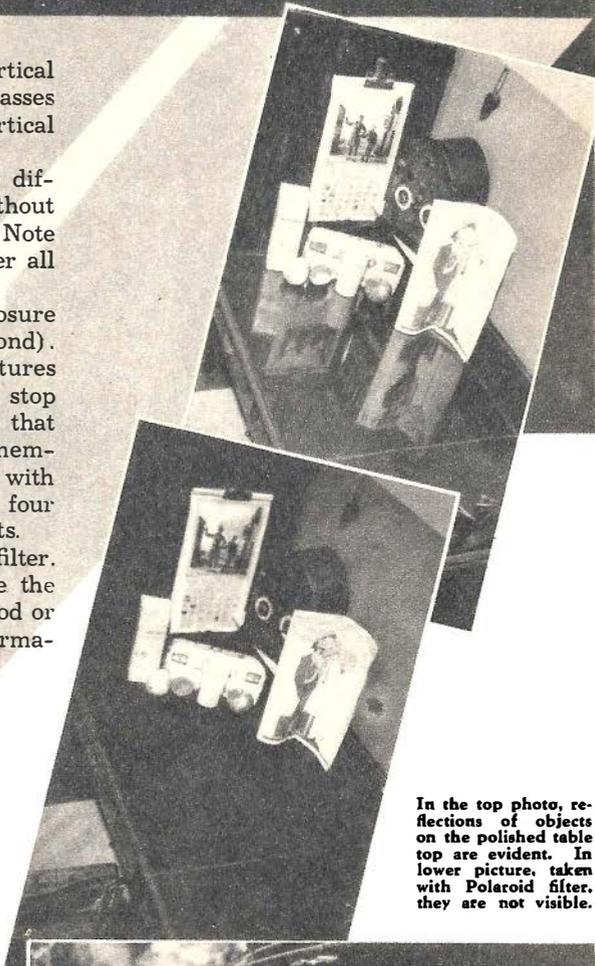
The accompanying photographs show different scenes, each taken twice; first without the Polaroid filter and then with it. Note that in the pictures taken with the filter all objectionable reflections are absent.

The illumination and the time of exposure were the same for each picture (1/25 second). A lens stop of $f. 6.3$ was used for all pictures taken with the Polaroid filter. A lens stop of $f. 16$ was used in taking the pictures that did not use the filter. It should be remembered that in all instances pictures taken with the filter should have a stop opening of four times that required for normal snapshots.

In taking pictures with the Polaroid filter, the glasses may simply be held before the lens, if the camera is mounted on a tripod or other stationary support. If a more permanent filter adapter is desired, the spectacles may be cut in half and the temple pieces bent to form a clip for attaching to the lens housing in the manner shown in the accompanying illustrations. A single pair of Polaroid spectacles will thus make two inexpensive filters.

The amateur photographer should exercise care in using the filter so that when attached to the camera it is in either a perfectly vertical or horizontal position. If mounted at any other angle no light will pass through the filter or else it will not

[Continued on page 122]



In the top photo, reflections of objects on the polished table top are evident. In lower picture, taken with Polaroid filter, they are not visible.



The effectiveness of the Polaroid spectacles in eliminating reflections and glare from snapshot pictures is made evident in these pictures. The picture at left was taken without the filter. The photo above, using the filter, shows no reflections. Always remember that the Polaroid filter must be mounted over the camera lens in a perfectly vertical or horizontal position. Otherwise, no image will be visible on negative when developed.

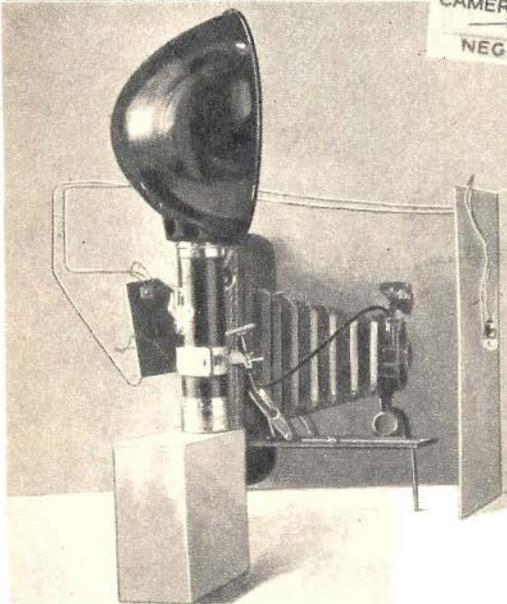
A Clothespin Synchronizer

ALL amateur photographers will welcome this homemade device because it provides for independence of light conditions at all times.

Get an ordinary flash reflector, the 98 cent variety, complete with fiber case and battery. By constructing a synchronizer to work in conjunction with the reflector battery switch and camera shutter, it will open many new ways to make story-telling and human-interest shots. The accompanying illustrations show how this inexpensive synchronizer is made from a spring clothespin and a few incidental parts.

[Continued on page 128]

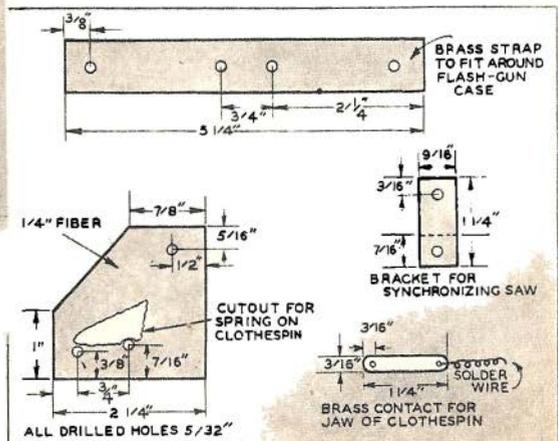
by Dr. C. W. Clifford



To adjust synchronizer, set shutter at 1/25 second, remove camera back and wire flashlight bulb to gun. Place bulb behind a cardboard shield, provided with a small hole, in direct line with camera lens. Adjust contact screw until light shows through back of camera when clothespin is depressed. When adjusted, lock set-screw.



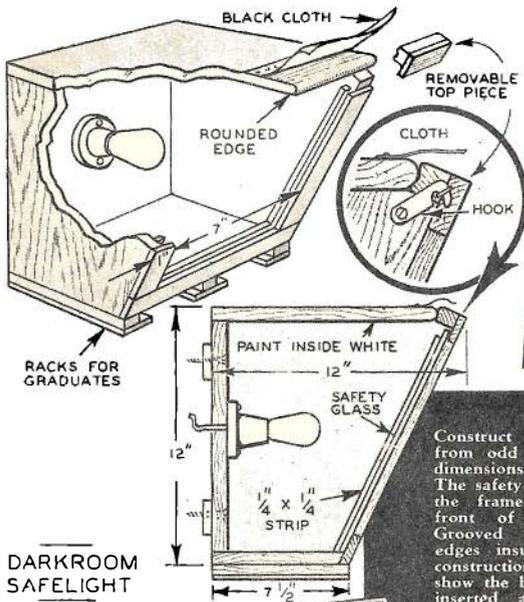
Clamped to the fiber case of a flash gun, this simple synchronizer insures correct timing of shutter and bulb. The cable release to the camera shutter inserts in a slot cut in the open end of the clothespin. When compressed, the clothespin trips the camera shutter and at the same time closes flash gun circuit, firing bulb. Below—Patterns show size of parts.



Two Practical Projects For The Amateur Photographer

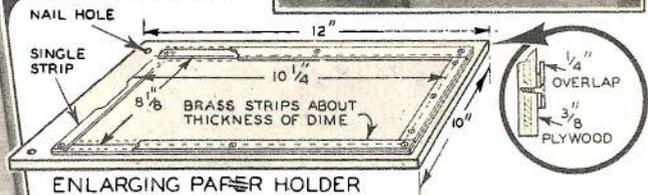
A HANDY DARKROOM SAFELIGHT

This convenient safelight is made so that the safety glass can be removed and full illumination attained when not developing. It consists of a box having a sloping front fitted with guides for inserting the safety glass. When in place, a strip fits over the glass and books securely in place. Grooved and rounded edges with a strip of black cloth glued over the top joint insure a light-tight housing. The inside of the safelight is painted white, after which it is fitted with a cleat type socket for a 25-watt bulb. Racks fitted to the bottom of the light provide convenient storage for graduates.



DARKROOM SAFELIGHT

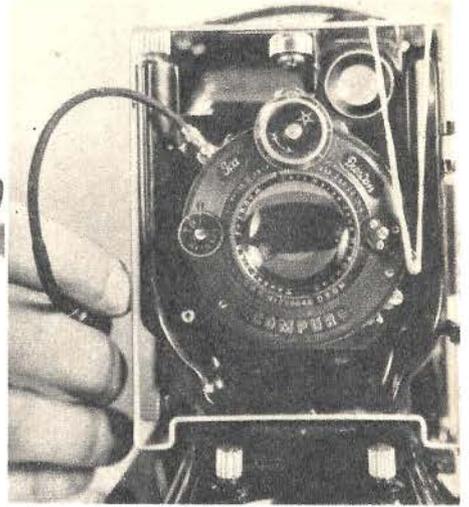
Construct the safelight from odd stock to the dimensions shown above. The safety glass fits into the frame attached to front of light box. Grooved and rounded edges insure light-tight construction. The photos show the box with glass inserted and removed. Below—Strips of 1/32-inch brass attached to a plywood panel makes a convenient holder for enlarging paper. The dimensions may be altered to suit photographer's individual needs.



ENLARGING PAPER HOLDER

A very satisfactory holder for enlarging paper can be made from a plywood panel and brass strips in the manner illustrated. While the original was designed for 8 by 10-inch sheets, the dimensions may be altered to suit. The brass strips are about the thickness of a dime and are screwed securely to the plywood. Holes at the top of the board are for slipping over nails on the wall of the enlarging room (if a horizontal enlarger is used). The overlap of the upper brass strips determine width of border around the print.

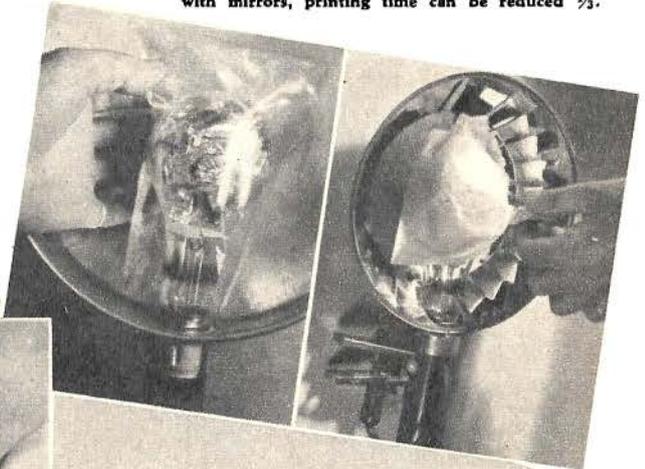
SHORT-CUTS FOR



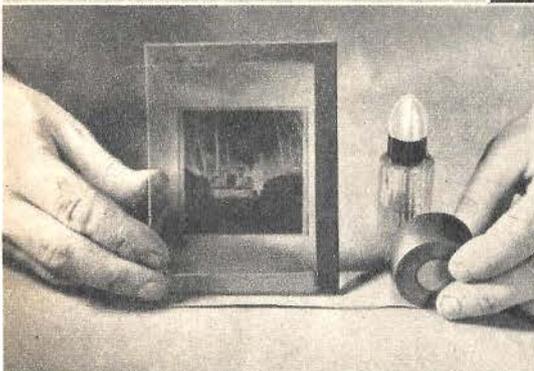
Where it is desired to stop motion, the normal maximum shutter speed of any good camera can be increased from $1\frac{1}{2}$ to 2 times by use of a rubber band. Loop band over the setting lever and attach the other end to wire finder in manner shown. Upper left—By lining inside of enlarger lamphouse with mirrors, printing time can be reduced $\frac{1}{2}$.



Most useful accessories for weighing up photographic chemicals are these inexpensive paper pastry cups. Due to their crinkled shape, they will hold several ounces of sulphite or carbonate without spilling. The cups insure chemical cleanliness in the darkroom.



Infrequently a photoflash bulb will burst when it is ignited, due to atmospheric changes or variations in the amount of gas in the bulb. As a safeguard, slip a Cellophane bag over the bulb as shown at left. Right—A piece of tissue paper wrapped around a photoflash bulb makes an ideal diffuser.



Scratched miniature-camera negatives may be enlarged without marks showing by applying a thin coating of Canadian balsam over negative and sandwiching it between two sheets of glass. Bind the edges of the glass with photographic tape.

THE PHOTO FAN

by Kenneth Murray



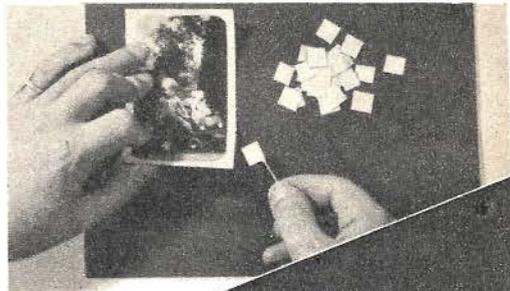
This useful handle-grip accessory will greatly simplify picture taking. It is made from an old soldering iron handle, fitted with a bolt of the correct size to fit into the tripod socket on camera.



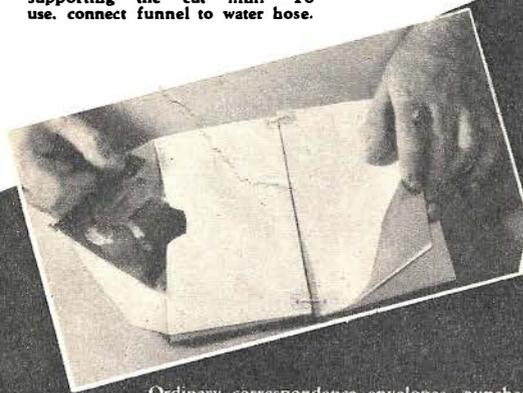
As white ink and pencil do not lend themselves well for titling snapshots in the photo album, adhesive titles are to be desired. These are made by typing the data on a sheet of adhesive or gummed paper and mounting under pictures.



Films may be washed in $\frac{1}{4}$ the usual time with this funnel kink. Flatten a 3-in. diameter aluminum funnel, punch a small hole in the side and insert a push-pin for supporting the cut film. To use, connect funnel to water hose.



Gummed wafers for mounting prints in the photo album can be made by dipping thin sheets of paper in a thick solution of gum arabic and water. After allowing the sheets to dry, cut out wafers to the desired size.



Ordinary correspondence envelopes, punched and tied together as shown, make excellent files for negatives. Strips of adhesive tape provide reinforcement for the punched holes.

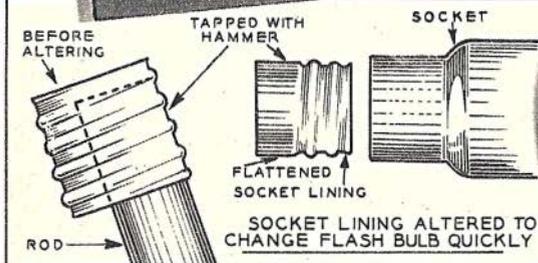


Gummed ring binder reinforcements permit a number of prints to be mounted on a single page of the photo album in file card fashion.

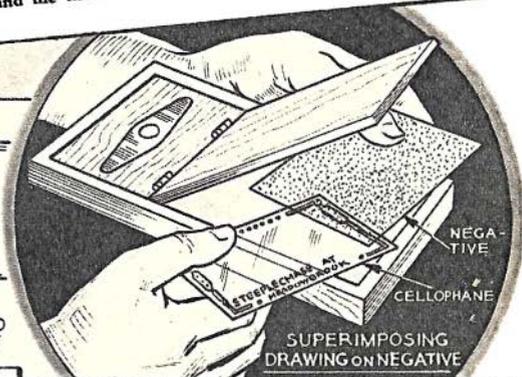
PHOTOGRAPHY HANDIKINKS



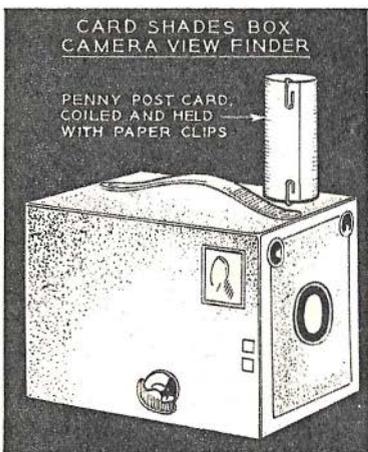
The original greeting card pictured at left consists of several individual snapshots, all in correct proportion, pasted up on heavy cardboard and photographed with a copying lens attachment. The message at the bottom was lettered on white tissue and the tissue attached to negative before prints were made.



Photographers shooting pictures at night with photoflash bulbs can speed up insertion and removal of bulbs from the "gun" by flattening the threaded socket as shown here. Remove the threaded shell from socket case and hammer out all but 3 or 4 threads. The arrangement permits removal of bulbs instantly.

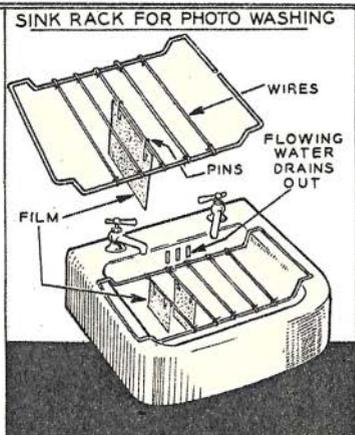


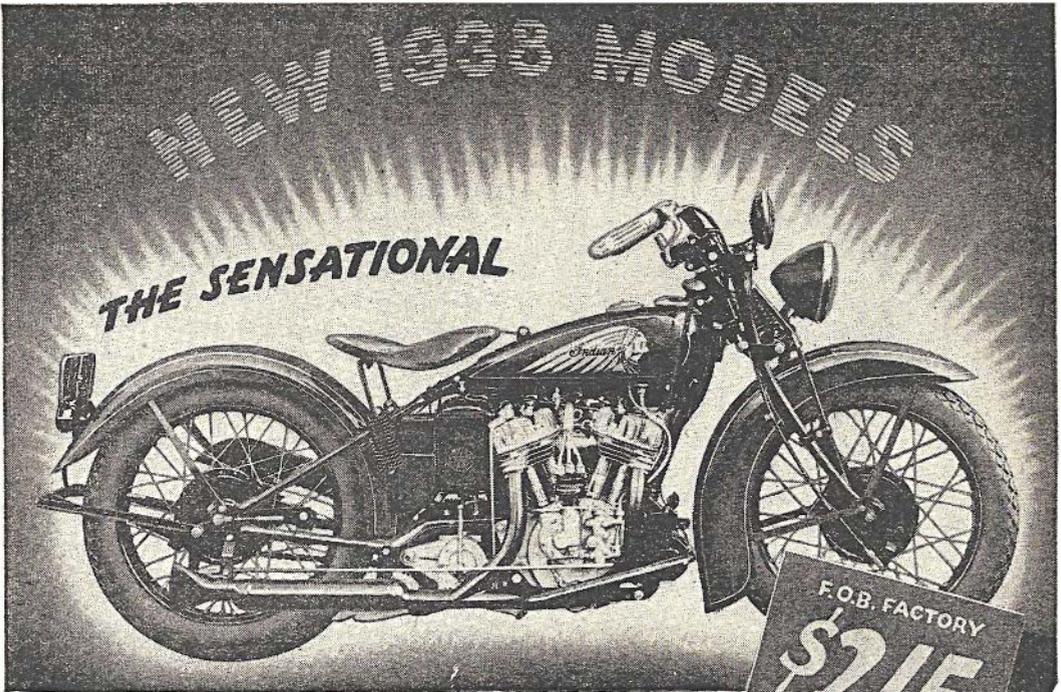
This stunt permits decorative borders or titles to be added to any negative without actually marking up the negative itself. Merely trace border and title on a piece of cellophane and place over negative before printing.



On bright, sunny days, when it is almost impossible to see objects through the view finder of a box camera, the simple shield shown at left is recommended. It is nothing more than an ordinary postal card rolled into a cylinder and secured at each end with several paper clips.

The handy negative washing rack shown at right is well adapted for the amateur photographer's use. Formed from stiff wire, it fits over the bathroom wash bowl and provides a quick, clean method for removing developing chemicals from films. They are suspended on racks with small safety pins or clips.





THE SENSATIONAL

F.O.B. FACTORY
\$215.
 FULLY
 EQUIPPED

Indian JUNIOR SCOUT

THE TWIN CYLINDER MOTORCYCLE MARVEL

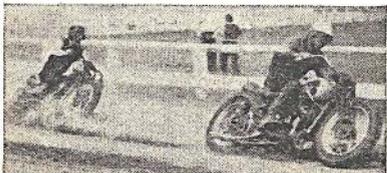
THE NEW 1938 INDIANS ARE READY to flash you over the open road to fun and adventure! New Indian triumphs, all of them—great motorcycles built as only Indian can build them.

Heading the parade is the new Indian Junior Scout—the greatest twin cylinder “buy” in all motorcycle-dom! It’s a great machine—an engineering marvel easy to handle, easy to start, with plenty of power and pep to flash you along with the leaders. And it costs so little to run—you’ll get 70 miles to the gallon easily!

NOW OWN AN INDIAN ON EASY PAYMENTS

The Junior Scout is still the lowest priced “twin” in America! So why wait? Visit your Indian dealer today and let him tell you how easy it is to own any Indian model on easy payments.

BOY—HOW THEY TRAVEL!



Don't forget
 our great
FREE OFFER



Get this fine RIDER'S HELMET and INDIAN PIN absolutely FREE when you place your order.

MAIL COUPON TODAY!

INDIAN MOTORCYCLE CO., Springfield, Mass.

Please send me at once, without obligation, your illustrated Folder showing the new 1938 Indian Motorcycles, and CERTIFICATE OF VALUE entitling me to FREE RIDER'S HELMET and INDIAN PIN, as illustrated, when I place my order. **MMF**

Name.....

Address.....

Please be sure to check your age group:

14-19 years 20-30 years 31 years and up Under 16 years

INDIAN MOTORCYCLE CO., Springfield, Mass.

Photo Puzzlers

TAKING "MOONLIGHT" PICTURES IN DAYTIME

From time to time you have published prize winning pictures showing moonlight scenes which were actually taken during the daytime. I would appreciate more detailed information as to how I could take similar snapshots.—Ray Robbins, Houston, Texas.

There are two methods whereby moonlight effects can be obtained with daylight exposures. One consists of simply underexposing the negative so as to eliminate shadow detail and make the print quite dark. Usually, pictures made in this manner are convincing only if the "moon" (in reality the sun) is included. The sun should be partially hidden behind clouds when making pictures of this kind. When the sun can be seen through the clouds without discomfort to the eyes, the conditions are good for such pictures.

The second method, which is of more general application, requires the use of a deep red filter over the camera lens. A Wratten filter No. 72 is suggested. The camera should be loaded with panchromatic film and the shutter speed advanced so as to partially underexpose the picture.

CAUSE FOR NEGATIVES PARTIALLY REVERSING

In developing a roll of film recently, I discovered that one of the exposures showed a partial positive image much like the images found on movie films. Was there something wrong with the film or did I err in the processing operation?—Dudley Willard, Milwaukee, Wis.

Considerable overexposure is sometimes the cause for the partial reversal of an image from a negative to a positive. More frequently it is caused by the film being exposed to light during the developing operation. When this occurs it is advisable to check the safelight for leaks, or look for cracks in the darkroom through which outside light may be entering.

Often reversals are caused by the safelight being placed too near the developing operation. Keep it a safe distance away from where you are working. Another, but uncommon, cause for films reversing is the presence of hypo in the developing solution. To avoid this, wash all trays well before and after using. If you will abide by the rules mentioned, future reversals will not be probable.

GREENISH-WHITE DEPOSIT COLLECTS ON FILMS

A number of my negatives show a greenish-blue deposit on the surface which does not seem to wash off. Can you tell me the cause of this and how it may be removed?—Edward Frankle, Flint, Mich.

The deposit on your negatives consists of aluminum sulphite and is caused by failure to keep the films moving after they were placed in the fixing bath. Usually the deposit can be removed by going over the negatives with a moistened viscose sponge or wet absorbent cotton before they have had a chance to dry. Once the films have dried the deposit can only be removed by treating them with a 1 percent solution of sodium carbonate at 80° F. To prevent damage from softening the emulsion, the films should first be hardened with a 10 percent formalin solution.

OBTAINING GOOD BLACK TONES ON PRINTS

I have experienced some difficulty in obtaining good black tones on my prints. Probably the trouble is due to my lack of knowledge in developing the printing paper, therefore suggestions would be appreciated.—Carl Doar, Portsmouth, Va.

In order that good dark tones are obtained on prints it is advisable to follow out the exact developing formula recommended by the manufacturer, using only the quantity of bromide necessary to keep the margins of the print clear. The temperature of the developing solution should be 70° F. Expose the print so that it will develop out in from 1 to 1½ minutes. Good results can only be had by complete developing, using, of course, fresh chemicals. A frequent unrecognized source of poor tones on developing-out-paper is contamination of the developer with hypo. A very small trace of hypo in the developer is sufficient to effect the color of the print, making it impossible to produce rich black tones.

PREVIEW of

Miniature Kodaks

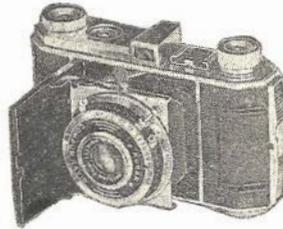
KODAK DUO SIX-20, SERIES II (right) New, improved—the "miniature" that takes album-size pictures (1½x2¼). Kodak Anastigmat f.3.5 lens; 1/500-second Compur-Rapid shutter. Shutter release on camera body. Bracket for range finder. Single-finger bed release. Die-cast metal body. Price remains

\$5750



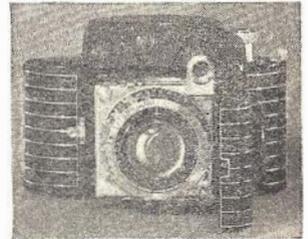
KODAK BANTAM

SPECIAL (below) Performs brilliantly under all conditions. Lens, Kodak Anastigmat EKTAR f.2.0. 1/500 Compur-Rapid shutter. Coupled range finder, military-type, split-field. Negatives are needle-sharp, yield superb enlargements. Also makes full-color transparencies on Kodachrome Film. Price **\$110**



KODAK RETINA

(above) Lens, Kodak Anastigmat EKTAR f.3.5. 1/500 Compur-Rapid shutter. For black-and-white pictures: Kodak "SS," Panatomic, Super X; Infra-Red Film. For full-color transparencies: Kodachrome Film. (Negatives approximately 1 x 1½ inches.) Film-measuring device. Exposure counter. Price **\$5750**



KODACHROME FILM FOR FULL-COLOR "STILLS"

Load with Kodachrome and get full-color transparencies to be viewed as they are, or mounted for large-size projection. Easy as black-and-white. No. K928 or K828A (8 exp.) for Kodak Bantam Special, \$1.35; No. K135 or K135A (18 exp.) for Kodak Retina and similar cameras, \$2.50. Prices include processing.

Brownies from \$1; Kodaks from \$5. See them at your dealer's . . . Eastman Kodak Company, Rochester, N. Y. ONLY EASTMAN MAKES THE KODAK

your Kodak dealer's Christmas suggestions...

Precision Kodaks

Ciné-Kodaks



KODAK SENIOR SIX-20 (f.4.5)

Kodak Anastigmat f.4.5 lens; 1/200 Kodamatic shutter. Body shutter release minimizes camera movement. Optical, direct-view finder helps you get the picture when it's exactly right. 2¼x3¼-inch pictures. Price **\$2950**



KODAK RECOMAR 18

Kodak Anastigmat f.4.5 lens, 1/250-second Compur shutter. Built-in self timer. Double-extension bellows and bed. Ground-glass focusing back. Utilizes the almost limitless emulsions available in film packs, cut film and plates. Pictures, 2¼ x 3¼ inches. Price **\$54**

KODACHROME FILM FOR FULL-COLOR MOVIES

Loaded with Kodachrome Film, all Ciné-Kodaks make gorgeous full-color movies. They are easy to make as black-and-white. No extra equipment; the color is in the film. Here are beauty and realism impossible to describe. The projection of Kodachrome is thoroughly trouble-free. You can splice color sequences right in with black-and-white. See a Kodachrome reel at your dealer's. 16 mm. cameras load with 100-foot rolls at \$9, 50-foot rolls at \$4.75, 50-foot magazines at \$5. Rolls for Ciné-Kodak Eight cost \$3.75. Prices include processing.

CINÉ-KODAK EIGHT

(right) Movies at only "10 cents a shot." Ciné-Kodak Eight makes it possible. A roll of Ciné-Kodak Eight Panchromatic Film costs you only \$2.25, finished, ready to show. Good for from 20 to 30 black-and-white movie "shots," each of newsreel length. Price **\$3450**



CINÉ-KODAK "E"

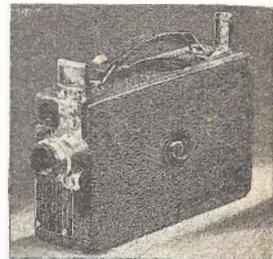
(left) An Eastman 16 mm. movie camera at the lowest price ever. Kodak Anastigmat f.3.5 lens. Fixed focus. Triple-speed device. Simplified gate enormously facilitates loading. Takes all 50- or 100-foot 16 mm. Ciné-Kodak Films. Price, \$48.50.



\$4850

CINÉ-KODAK "K"

(right) World's most widely used 16 mm. home movie camera. Makes clear, brilliant movies at the touch of a lever. Performs beautifully for the beginner, and as his skill increases, responds to every exacting demand. Loads with full 100 feet of 16 mm. film. With f.1.9 lens. **\$8850**



Including carrying case, \$100.



\$125

MAGAZINE CINÉ-KODAK

(left) Loads in three seconds. You don't touch the film at all—it comes in a magazine. Just slip the magazine into place, close the camera cover and you're ready to shoot. To switch from one film to another, you merely take out a partly used magazine, slip in one of the others. Effortless loading is only one of the six new features in this remarkable pocket-size movie camera. Equipped with fast f.1.9 lens, \$125; including combination carrying case, \$137.50.

Martin—"Early Bird" Aviator

[Continued from page 60]

Curtiss Marine Trophy for covering the greatest number of miles in a single day of flying.

During the same year the U. S. Army held its first bomb-dropping experiments, using Martin planes, and with the prospect of future government orders, Martin quit building planes for private use and concentrated on the production of military types.

In 1929 the Martin concern was moved to a superb new plant at Middle River, Baltimore, Maryland. Located on a 1,234 acre tract and employing some 1,200 men, it is rated as one of the largest privately-owned aircraft factories in the world.

It was at this new plant in 1932 that the famous Martin B-10 and B-12 bi-motor monoplane bombers were developed for the Army. These bombers completely changed bombardment aviation, in addition to upsetting international air-fleet balance and revising pursuit aviation tactics.

For his work in developing these bombers, Martin was awarded the Collier Trophy for 1933. (Martin "Clipper" planes helped Pan American Airways earn the 1936 Collier Trophy.) This trophy, which is ranked as perhaps the greatest in aeronautical science, is awarded annually for the greatest achievement in American aviation as demonstrated in actual practice during the year. Under the trusteeship of the National Aeronautical Association, the trophy has been awarded to other great aviation leaders in this country such as Wright, Curtiss, Sperry, Burgess, Hoffman, Reed, Lawrence and Douglas.

In addition to the planes mentioned, Martin has built many other types, outstanding among which are his famous dive bombers BM-1 and BM-2, which were developed for the Navy for aircraft-carrier work. His torpedo planes T4M-1, XT5M-1 and XT6M-1 are very important Navy service types. For the Navy Martin has also been particularly successful in developing big patrol craft for long-distance, non-stop flying. Perhaps the best known of his patrol boats are the PM-1 and PM-2, both twin-engine biplane types, and the P3M-1 and XP2M-1 monoplane boats. These last two craft are tri-motor jobs. At the present writing, Martin is engineering a new trans-ocean transport flying boat which will be considerably larger than the present "Clippers."

The new Martin Clipper will be designed to carry 285% more pay load than the China Clipper, although its gross weight will be only 19% greater and its wing span 21% greater. To be known as the Model 156, the new giant flying boat will have a faster take-off due to the use of a new low drag-high lift device developed by Martin. Now rapidly nearing completion, the Model 156 will be another tremendous step in the conquest of the oceans by air.

Glenn L. Martin has won for himself a great

[Continued on page 120]

Science Saves Eyesight

[Continued from page 39]

the body where the living brain may be observed. This fact makes it of vital importance in diagnosing many other diseases than those of the eye. A brain tumor, for instance, often betrays its presence through the condition of veins and arteries of the retina. Kidney disease, anemia, certain stages of diabetes and many other diseases leave important symptoms in the retina. Such is the vital organ whose examination the ophthalmoscope made possible.

In the past two decades the binocular ophthalmoscope has partially replaced the older hand type. The retina area can be observed in three dimensions by the binocular instrument, which does not differ in fundamental principle. Instead of a flat view of the fundus, the binocular instrument obtains a picture with depth, magnified some 16 times, enabling the topography of the retina to be studied.

Similar in appearance to the hand ophthalmoscope is the retinoscope, a device which enables refractive lenses to be prescribed without the co-operation of the patient. It is often used in prescribing lenses for children or for illiterates who cannot read the alphabet on test cards. Babies as young as ten months have been fitted accurately with glasses—so accurately that the infants cry for them if mother neglects to put them on.

Optical principles on which the retinoscope is based are extremely complicated, but in practice the examiner determines the strength of corrective lens which is needed by throwing a narrow beam of light into the eye from the retinoscope and observing the direction of movement of the light spot and its accompanying shadows as the light beam is moved across the eye.

Your eye has several fields of vision, one for each primary color. Certain nerves are sensitive to blue, red, and green light respectively. Out of these three primaries all sensations of color are derived. All three primaries in combination give white, their total absence, black, and yellow and purple and other hues are merely combinations of the primaries in varying proportions. This fact is the basis of all systems of color photography.

"Visual fields" do not refer to depth of vision, or acuity, but to absolute area. If your eye is average, the widest color field is for blue, then red, with green the smallest. In certain eye diseases, such as glaucoma, the visual fields are important guides to diagnosis. One instrument for measuring these fields is the Ferree-Rand Perimeter. The patient sits with his face on a chin rest, one eye masked, and focuses on a fixation point while the examiner moves a test object along a semi-circular frame. The point at which the object can be distinguished as to color marks one boundary of the visual field for that hue.

Another instrument serving a similar purpose is the Stereo-Campimeter. In this device the patient looks through binocular lenses at a stage,

[Continued on page 132]

THE GREATEST
POWER ON
EARTH !



The Magic of Mind

THE STRANGE POWERS of mind were known to the ancients. From every land they trekked to the caves of the oracle. In her presence they were imbued with the mysterious faculty of foresight. She brushed from their mental vision, fear and misgivings. Deep within their consciousness she implanted illuminating ideas with which they went forth to accomplish the seeming miracles history records. Were these geniuses of the ancient world, Pericles, Socrates, Alexander the Great, merely deluded, cast under a fantastic spell, or can the human mind truly assert an influence over things and conditions? Is there a wealth of infinite knowledge just beyond the border of our daily thoughts which can be aroused and commanded at will?

It is time you realized that the rites, rituals and practices of the ancients were not superstitions, but subterfuges to conceal the marvelous workings of natural law from those who would have misused them. Telepathy, projection of thought, the materializing of ideas into helpful realities, are no longer thought by intelligent persons to be impossible practices, but instead, *demonstrable sciences*, by which a greater life of happiness may be had.

Dr. J. B. Rhine, foremost psychologist and university instructor, says of his experiments with thought transference and the powers of mind—"The successes were much too numerous to be merely

lucky hits and one can see no way for guessing to have accounted for the results." *Have you that open-minded attitude of today which warrants a clear, positive revelation of the facts of mind which intolerance and bigotry have suppressed for years? Advance with the times; learn the truth about your inherited powers.*

Let this free book explain

The Rosicrucians (NOT a religious organization) have been leaders in introducing the ancient wisdom of mental phenomena. Established throughout the world for centuries, they have for ages expounded these truths to those thinking men and women who sought to make the utmost of their natural faculties. Use the coupon below—avail yourself of a pleasing book of interesting information which explains how you may acquire this most unusual and helpful knowledge.

The ROSICRUCIANS (AMORC)

USE THIS COUPON

Scribe R.L.T.
The Rosicrucians, AMORC,
San Jose, California.

I am sincerely interested in knowing more about this unseen, vital power which can be used in acquiring the fullness and happiness of life. Please send me, without cost, the book, "THE SECRET HERITAGE," which tells me how to receive this information.

Name _____

Address _____

State _____

How To Select A Shotgun Martin—"Early Bird" Aviator

[Continued from page 81]

selecting a shotgun is the length of the stock itself. How often we find a short-armed man shooting a shotgun with a stock too long for him, or a long-armed man with a stock too short! Unless one is acquainted with this need of the right length of stock on the shotgun, he will be utterly in the dark as to what hinders him in his shooting. When the stock on the gun is absolutely right, one is able to swing the gun to shoulder instantly, assume position with it and fire. If one has to feel around to adjust the gun to his shoulder, there is something missing in the arrangement.

Length of gun-stock is measured from the center of the gun-butt to the trigger. If the gun is a double-barrel, with double trigger, then the measurements are reckoned from the forward trigger. Probably 50% of all shotgun users would do well with a stock measuring 14 inches in length. Others who are fairly tall, and with a good reach, may take a stock that ranges from 13¼ to 14½ inches in length. Large men, having long arms, may require a stock ranging from 14¾ to 15 inches in length. The demonstration guns in use in gun stores are valuable in assuring the purchaser of getting the correct stock length and correct drop at heel and comb. These guns, however, are valuable only if the shooter throws the gun into position each time in the same identical manner as the last, that is, with cheek to comb and butt to shoulder. If the shooter has acquired this knack and does not handle the gun differently each time, he can easily determine which gun suits his needs best.

Where a gunstock needs to be lengthened, it is possible to gain the required length simply by adding recoil pads, either the ventilated rubber type or the sponge rubber variety in the shape of a leather guard that slips down over the gun butt and laces under the gunstock. While recoil pads are most valuable on duck and goose guns, where muzzle blast is most pronounced, still it will be found that any shotgun outfitted with a pad gives one the maximum of comfort, aside, of course, from the fact that it also extends the stock to the desired length.

Assuming that most shooters are about 5 feet 8 inches in height, it will be found that best shooting can be obtained with a gunstock 14¾ inches in length with the drop at heel being 2½ inches and at comb, 1½ inches. For a chunky-built, deep-chested short fellow, the drop of the stock at heel should be about 2¼ inches and the stock about 13¾ inches. The tendency of the upland hunter is more and more toward the gun with a uniformly straight stock. He is likely to find a gun with a drop of 2 inches at heel and 1½ inches at comb ideal. A six-foot man, or taller, will find a gun that has a stock of 14¾ inches with a 2¾-inch drop at the heel ideally suited for him. Shotguns for goose and water-

[Continued on page 129]

[Continued from page 118]

and lasting place in aviation. He is one of the very few pioneers who still head the companies which they founded. In addition to his other honors, he is a Fellow of the Royal Aeronautical Society of England and a member of the National Aeronautical Association, having served as governor of Ohio and Maryland for the latter organization. He is also a member of that famous fraternity, the Early Birds, as well as of the Institute of Aeronautical Sciences. In 1931 he delivered the Wright Memorial Lecture to the Royal Aeronautical Society in London. The right to deliver this lecture is an honor accorded only once each year to one of aviation's leaders.

[Editor's Note: The present generation of hopeful inventors will find real inspiration and encouragement in the life stories of men who are now famous in the world of science. MODERN MECHANIX has been running a special series of these articles, which should be read by every man who has ideas and expects to capitalize on them sooner or later. The October, 1937, issue had a history of Donald Douglas, the plane builder; the September issue, William Dubilier, noted radio-electrical inventor; the August issue, Colin Fink, famous physicist; the July issue, Carleton Ellis, renowned chemist.

Readers who missed any of these issues can obtain back copies directly from the Circulation Department of MODERN MECHANIX, Fawcett Building, Greenwich, Conn., at the regular price of 15 cents each.]

Radium From The Arctic

[Continued from page 43]

Bear Lake, dug deep under the Arctic lake, built cabins, bunkhouses, power stations, mine railways, and imported thousands of tons of mining machinery, a system was being worked out by Pochon to get the radium out of the ore in the cheapest way possible. They even went so far as to meet competition from the Belgian Congo by flying their ore to the railroad, one thousand miles away.

Chemical processes were developed, safety standards for handling the ray-emanating mineral were established, and month by month, the production men became more efficient, cut down costs. Towards the end of 1936, after three years of work, they finished producing the first ounce of Arctic radium, and by that time had production costs down so fine that the radium is now selling at the refinery in platinum and lead needles and cases at \$30,000 a gram. (It takes 20 tons of chemicals to procure a single gram of radium from 6½ tons of pitchblende.)

Silicosis, a lung disease contracted in dusty occupations, is called the greatest single occupational hazard in this country.

*Each tin
proves it
over and
over again..*



Better



Smoking



Tobacco

*..and here's
WHY*

- aged-in-wood
Burley tobacco*
- extra good taste*
- for pipe or
cigarette*

*2 full ounces
in every tin*

Copyright 1938, LIGGETT & MYERS TOBACCO CO.

When Answering Advertisements Please Mention January Modern Mechanix

Prepare for Good Paying Jobs Like these

IN ELECTRIC REFRIGERATION and AIR CONDITIONING

UNMARRIED SERVICE MAN experienced in development, design and application of household electric refrigerating units. Must know proper refrigerating methods. Must be thoroughly experienced in details of construction of motor-compressor refrigerating units. **Salary, contract, and Air Conditioning and Refrigeration.**

ENGINEER—Experience in development, design and application of household electric refrigerating units. Must know proper refrigerating methods. Must be thoroughly experienced in details of construction of motor-compressor refrigerating units. **Salary, contract, and Air Conditioning and Refrigeration.**

DESIGNER—Engineer with thorough experience in domestic cabinet design and on domestic compressor development—A real opportunity in an active government organization. **GEORGE M. VEIT** Park P. O. Box

ENGINEER—Experience in repairs of all types of temperature controls. State age give full details of experience. **Box Air Conditioning and Refrigeration**

WANTED: Service man for Norge and Frigidaire refrigerators and other electrical appliances. Must be sober and permanent position. **Chicago**

SHOP FOREMAN WANTED. Large and well established independent service company in Midwest is in need of a shop foreman with thorough knowledge of household and methods of shop repairs. Must have initiative and leadership ability and be able to plan, direct and control shop activities of twenty shop men. Machine's knowledge essential. An excellent opportunity and good salary with rapidly growing concern. **Box 82, Chicago**



FREE BOOK
Tells How to Earn Up to
\$30-\$50
WEEKLY

Electric Refrigeration and Air Conditioning are the fastest growing industries in America today. **RIGHT NOW** there are new jobs for thousands of **TRAINED** men. Ads like these—appearing in daily newspapers and trade magazines—offer big-pay opportunities—up to \$30 to \$50 a week and more. Many jobs pay \$5,000 and even \$10,000 a year.

Here is a condition that spells **O-P-P-O-R-T-U-N-I-T-Y** in great, big capital letters for the ambitious man who is seriously thinking about his future. Are you? If you—prepare for your opportunity in Electric Refrigeration and Air Conditioning at home in spare time by U. E. I.'s low-cost, easy-pay plan. Learn **EVERYTHING**—Engineering, Estimating, Installation, and Servicing under a highly successful system that has brought outstanding results for the past 10 years. Then get practical experience in one of our large, completely equipped laboratories where you will learn by doing.

Let us help you to a **Better Job and Bigger Pay**, as we have helped hundreds of others. U. E. I. trained men are now employed by the leading manufacturers and distributors and service organizations throughout the United States, Canada and elsewhere. U. E. I. Employment Service is offered you **FREE** of extra cost. Mail the coupon for Book of Facts about your opportunity.

UTILITIES ENGINEERING INSTITUTE

Established 1927

400-410 N. Wells St., Dept. 218, Chicago, Ill.

Utilities Engineering Institute, Dept. 218
400-410 N. Wells St., Chicago, Ill.

Please send me your Free Book telling about MY opportunity in Air Conditioning and Electric Refrigeration. I have marked the one that interests me most.

Air Conditioning Electric Refrigeration

Name

Address

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

Photographic Monstrosities

[Continued from page 104]

or eight inches from the subject, was used in making the "monstrosities."

Probably everyone has noticed the peculiarly distorted effects seen when looking at the reflections in the curved, polished surface of an automobile headlight, lamp reflector or similar object. What can be seen can be photographed, so by setting up a camera so as to bring it within close focus of one of these surfaces, surprising pictures will result.

In making the photos shown in this article, the photographer used the rounded bowl surface of a brightly polished silver spoon. The spoon, as can be seen in the explanatory photo, was held steadily in place on the table by forcing the handle into a slot cut in a small cardboard box.

The subject, seated in a chair, placed her face within an inch or two of the spoon's surface so as to produce a greatly distorted reflection in the convex bottom. The camera was placed so that this reflection was greatly distorted by the convex bottom.

The camera was arranged so that this reflection could be photographed without the subject being included in the picture. This required the camera being placed close to the spoon so that the distorted reflection covered nearly all of the ground glass focusing screen. While artificial lighting was used to obtain the brilliant effects shown, natural daylight, from a window, can be used with equal results. To improve results, a black background should be placed behind the subject to ward off extraneous light.

After taking the pictures, best effects will be obtained by enlarging the images so that the edges of the spoon are excluded from the prints. This will give them a puzzling effect, making it difficult for anyone to guess how they were made.

Other curved surfaces can be used to produce photo "monstrosities." The outside of highly polished auto headlights and the mirrored balls such as used for lawn decorations both yield unusual effects. In all cases, the subject must be very close to the reflecting surface for greatest distortion and the camera placed so as to eliminate the image of the subject itself.

Polaroid Glass Clears Pictures

[Continued from page 109]

serve its intended purpose. Two scratch marks on the lens housing will serve as true positions at which the filter should be used. It is also important that the camera be held approximately true in relation to the surface from which the glare or reflections are to be eliminated.

Study the scene to be photographed and observe lighting, glare and reflections by looking through the Polaroid screen before placing it over the camera lens. Doing this will insure the best angle and position for securing a satisfactory exposure.

\$200 My First Week



... Now in my OWN Business.

Would you, too, like to own a business where you could take in \$200 your first week as did L. A. Eagles in Madison, Wisconsin?

We want a reputable, honest man in each county. This man need not have any special experience or more than ordinary ability, but he must be honest and courteous.

Such a man we will start in business for himself. You can make far above average profits in the rug-cleaning business—a high-grade business all your own. Many earn \$125 to \$200 per week—some considerably more.

NO SHOP NECESSARY

The rug-washer finishes rugs like new on the customer's floor. Anyone can run it. Electricity does the work. A quick, thorough and highly-efficient method that restores the natural beauty of floor coverings.

There are hundreds of customers—in your vicinity and nearby towns. The business grows steadily. Simply clean a few rugs or carpets. These customers tell others and also give you their future work. Soon you will have a prosperous year-around business. Send coupon for booklet explaining everything.

"Profits Pay for Home"

Harry Hill built and paid for a home from rug-washer profits. His first day's business was \$36. Another man writes, "Made \$70 in 13 hours." A. L. Miller says, "Have had rug-washer 6 years—have earned as high as \$92 a day." M. O. Malmin earned 3 times the cost of his machine the first two months. You, too, can enjoy a large income.

VON SCHRADER MFG. CO., 201 PL., RACINE, WIS.

Free Book!
MAIL COUPON now

VON SCHRADER MFG. CO.
201 Pl., Racine, Wis.

Send at once (no obligation) your free booklet illustrating rug-washer and telling how I can own my own permanent business; how I can earn large profits at prices below other methods; how I can become financially independent in a short time; and how I can pay on easy terms.

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

"Never a Complaint"

C. J. White says: "\$100 business in six days—never a complaint." That is the nicest part of this business—every customer is more than satisfied. Stains and blotches disappear and vivid colorings and freshness in faded floor coverings come back.

EVERY MACHINE GUARANTEED

You take no risk. These machines have been manufactured since 1918 and are used by the United States Government and by Statler and other leading hotels. They are fully GUARANTEED.

EASY TERMS

The complete equipment is inexpensive. A reasonable down payment brings everything to you and the balance is paid monthly. From the start, you have your own business—one that is profitable and of which you can be proud.



Make Money In Your Workshop — Free Blueprint Booklet

More than 125 plans are listed in the new MM Blueprint Booklet for building your own radio, boats, model railway, electric refrigerator, model planes and scores of other projects. Send stamped-addressed envelope for free copy.

Modern Mechanix Publishing Co.,

Fawcett Bldg., Greenwich, Conn.



NEW BOOK CRAFTSMEN SHOULD HAVE 100 PAGES—NO. 10—MAKE BEAUTIFUL FURNITURE

10c
Rebated on
First
Order

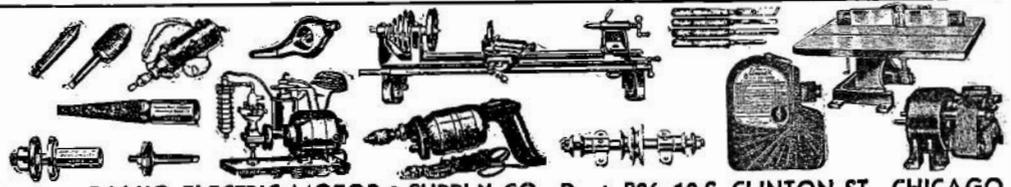
at a fraction of store cost. 14 pages of lumber with prices. Veneers and plywoods of all woods cut in usable sizes without waste. USE THE CRAFTSMAN new process of inlaying, using our new process ART INLAY GLUE, needing no clamps for the finest work. Hard-to-find rare grains for all woods, including foreign—special hard-to-find hardware, mouldings, turned legs, etc. Lists and illustrates 76 blueprints of scroll patterns, inlay table tops—Kits for inlaid art boxes, plaques, trays, book ends, etc., that anyone can make—22 pages in color. VENETIAN BLINDS for one-third of usual price. All material requiring only a saw, screw driver, a tack hammer and paint to assemble.

CRAFTSMAN WOOD SERVICE CO.

2731 MARY STREET

CHICAGO

FREE



SEND FOR YOUR 80-PAGE CATALOG BALKO ELECTRIC MOTOR & SUPPLY CO., Dept. B26, 10 S. CLINTON ST., CHICAGO



Pyroil won't actually make your car fly. But it does add a thrill to automobile performance that's sensational! As one user of Pyroil says, "My engine sounds as though it is running on velvet!"

Ask your service station attendant to add 15 cents worth of Pyroil to the gas tank of your car every 200 to 250 miles. Also, add a dime's worth each time a quart of oil goes into the crankcase. Then, enjoy new pep, power, smoothness!

New cars need Pyroil from the start. It safeguards all engine parts against excessive wear. Against corrosion (acid attack). Against carbon, gum and sludge accumulations. Older cars get these same benefits—plus marvelous stepped up performance.

In cold weather, Pyroil gives you LUBRICATION at the first turn of the engine—stays on the cold metal when regular lubrication drains away!

Try Pyroil today! Mail coupon for interesting facts. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 61, Pyroil Bldg., La Crosse, Wisconsin, U. S. A.



**SIMPLY
ADD TO
GAS & OIL**

DISTRIBUTORS:

Check and mail coupon for facts of our unusual Sales Opportunity for you. Start now!

PYROIL COMPANY
61 Pyroil Bldg., LaCrosse, Wis., U.S.A.

Please send complete Pyroil facts.
 Also send details of your plan for Distributors.

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

Commemorating Graf Flights

[Continued from page 70]

would become a most fascinating book, and be very historical. Few countries honor the creations and inventions of any other land, but the instance of the *Graf Zeppelin* is an exception to the rule. Even our own country has pictured this dirigible on air-stamps. Italy and its colonies have issued a series for the *Graf*. Paraguay has both overprinted stamps as well as regular issues for this airship.

The album devoted to "Graf Stamps" might be arranged by countries, Germany leading, with a second section following devoted to covers from the *Graf*. The pages of such an album, being blank, could be easily annotated. Brief remarks about the stamps showing the *Graf*, year of issue and extent of flight which resulted in their being issued, would be welcomed information. Those collectors interested in aviation and air-stamps will find the field captivating.

Holiday Decorations In Home

[Continued from page 74]

or similar covers with shiny surfaces, and lighted by natural or colored lamps. Locate these above the line of vision, from the four corners of the room, with a different color in each corner. Flashers, such as used on the tree, enhance the effect. Indirect lamps may also be used effectively. Socket adapters are used for colored or natural lamps. Color may be had without changing the floor lamp, by placing colored celoglass screens over the top of the shade.

None of the decoration schemes described involves any great expense. Variations from the original designs can be used if they better suit into the decorative arrangement of the particular home in or about which they are to be used. Careful study of the homes pictured in the accompanying illustrations will provide the craftsman with numerous ideas.

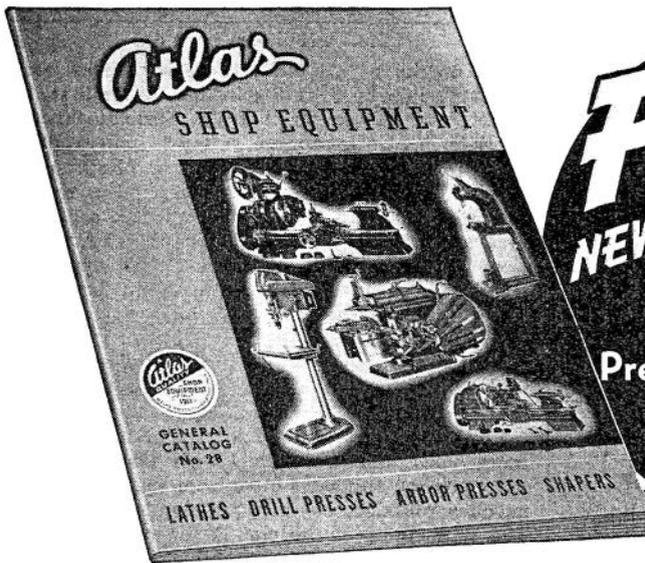
Station Operates By Battery

[Continued from page 100]

is adjusted for the desired antenna load and then resonance is restored by rotating the plate condenser. A six-volt dial light bulb, soldered to a small loop of wire, is a useful tuning aid.

With the circuit as shown 275 volts is the maximum safe plate and screen voltage. By adding a tapped voltage divider to keep the screen voltage at 275 volts, however, plate voltage may be raised to 375 volts, with a considerable increase in output.

French gardeners are using poison gas to destroy certain plant diseases in hothouses.



FREE!
NEW 1938 Atlas CATALOG
 ... Presenting
 The Finest Modern
 Precision Machine Tools
 You've Ever Seen!
WRITE TODAY

See the sensational new Atlas machine tools—the new small metal lathe, the amazing new bench shaper! See all the latest lathes and drill press attachments for special operations. Every man who has a workshop or hopes to have one this year should have this interesting catalog.

ATLAS PRESS COMPANY

152 N. Pitcher St., Kalamazoo, Mich.

FACTORY DISPLAYS AT

CHICAGO—35 E. Wacker at Wabash

NEW YORK—130 W. 42nd St.

PHILADELPHIA—113 N. Third St.



ATLAS PRESS CO., 152 N. Pitcher St., Kalamazoo, Mich.

Kindly send me your 1938 Catalog. I am interested in New Small Lathe Metal Lathes Arbor Presses New Shaper Drill Presses Wood Lathes.

Name

Address

City and State

LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS

Can You Equal This Home for 895

Shipped Direct from Our Mill



Save 30% to 40% on Your New Home..

WE PAY FREIGHT

Don't pay several hundred dollars more than necessary when you build a home! Buy it direct from our mill at our low factory price. We ship you the materials—lumber cut-to-fit, ready to erect. Paint, glass, hardware, nails, etc., all included in the price—no extra charges. We pay the freight. Plans furnished—also complete building instructions. No wonder our customers write us that we saved them 30% to 40%, compared with builder's prices. Easy terms—monthly payments.

Send for **FREE BOOK** of Liberty Homes

Handsome Big CATALOGUE FREE

Pictures wonderful homes in colors at money-saving prices. Designs to suit everyone.

Write for your catalog today
LEWIS MANUFACTURING CO.
 Dept. 6881 Bay City, Michigan

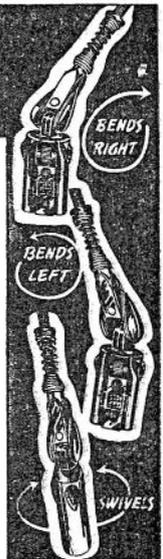
NEW! DIFFERENT
Wrist Action
CORD SET
MONEY MAKER

Women ARE GOING WILD ABOUT THIS WRIST ACTION CORD:

Here is no ordinary new product. This new Wrist-Action Plug is one of the most remarkable new devices ever offered in the Direct Selling Field! You never saw anything like it. Housewives are fascinated—held spellbound by the instant demonstration you can give with this new electric iron cord that swings freely in any direction. Ends kinking and twisting—prevents broken wires, burned fuses. Swivel action plug spins round and round—swings from side to side—keeps cord out of the way—no wonder housewives say, "Just what I want," as soon as they lay eyes on it!

FREE Sales are instant—sure! Nothink like it ever before. Here is the self selling big money maker you can clean up with. Get the story at once. Learn how you can **GET YOUR DEMONSTRATOR FREE.** All territories wide open. Write immediately for sensational money making plan.

No-Tro Electric Appliance Corporation
 820 W. Erie St. Dept. M-1 Chicago, Ill.



ALLIED *presents* RADIO'S NEWEST FEATURES AT LOWEST PRICES IN 61 NEW KNIGHT RADIOS



KNIGHT 11-TUBE
Push-Button Tuning—
All-wave

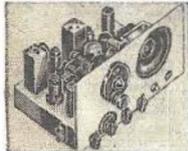
KNIGHT 6-TUBE
Push-Button Tuning—
3 Bands

ALLIED leads again in value with 1938 Knights combining radio's newest features at sensational low prices. Advanced R. C. A. and Hazeltine licensed circuits, with Electric Push-Button Tuning, Slide-Rule Select-O-Matic Dials, Electric Eye, Full Voice speakers, A. F. C.—world-wide range—all these at prices that challenge the industry. 5 to 16 tubes for AC, AC-DC, 6 volt, 32 volt, battery and auto. Radio's greatest values! Choose from 61 Knight models in ALLIED's great Catalog—send coupon.

EVERYTHING IN RADIO AT LOWEST PRICES

Dealers! Service Men! Sound Specialists! Amateur-Experimenters! Get ALLIED's 1938 Catalog. Everything you need at lowest prices—over 12,000 Parts, Kits, Sound, Amateur, Test Equipment, books, tools, tool-kits—every radio requirement. Complete stocks, fastest service, lowest prices—saves you time and money at ALLIED. Send coupon today for Free 1938 Catalog—radio's complete supply guide!

KITS—All types, for any set in any Radio publication. Write for Free Parts Lists.



ALLIED RADIO CORPORATION
Dept. 6-A8, 833 W. Jackson Blvd.,
Chicago, Ill.

- Send your Free 1938 Catalog.
 Send Free Parts Lists for
-
Name
Address
City..... State.....

Build A Model Ocean Airliner

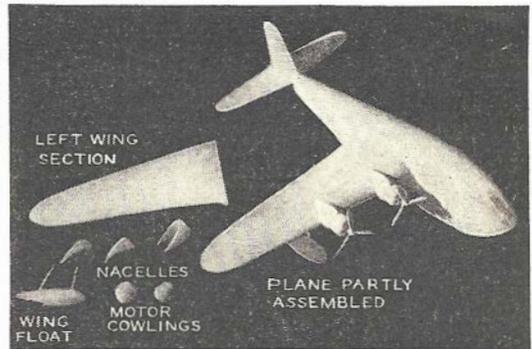
[Continued from page 86]

work on the wing. Make it in two pieces, each measuring $\frac{3}{8}$ by 3 by $6\frac{1}{4}$ inches. Note that the stock is slightly larger than the completed panel so as to insure maximum safety in construction and a better fit between wing root and hull. After the wing has been shaped and tapered as shown in the top and front views, refer to the sectional diagrams and commence to shape the airfoil section. With the aid of a sharp knife cut away the surplus balsa and with sandpaper, finish off the panel to give it the desired airfoil.

When both panels have been completed make the four engine nacelles. These are of soft balsa with the construction method similar to that of the fuselage.

The nacelles are carved from a $\frac{3}{4}$ -inch square nave block and are each $1\frac{1}{4}$ inches in length. After the top and sides have been shaped and the nacelles rounded, cut out the slot for the wing. The true shape of the slot is shown at sections G-G and F-F in the accompanying details. Should the builder experience difficulty in carving out the slot, it is advisable to slice the nacelle horizontally and thus carve the slot in each half separately. After this operation has been completed the two halves are cemented together and the nacelle secured to the wing.

While the nacelles are drying to the wing,



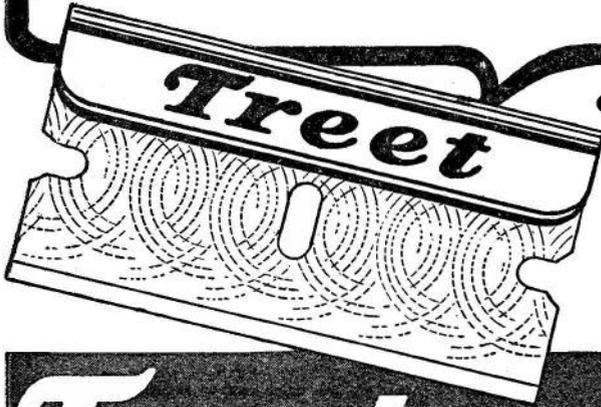
proceed to construct the cowlings. Each cowling is carved from a $\frac{3}{4}$ -inch square nave block, $\frac{5}{8}$ -inch long. They must be shaped as shown in the drawings and grooves cut to indicate the engine cooling flaps. After completion, the cowlings are cemented to the nacelles and allowed to dry.

The wing panels are now cemented to the hull and the roots filleted with plastic wood. Make certain that the same amount of dihedral has been given to each wing panel and that each is in line. Allowing the fillet and the cement to harden, continue on to the wing floats.

Each float is carved from a $\frac{5}{8}$ -inch square nave block of balsa, $2\frac{3}{8}$ inches long. Upon completion of the floats, make the struts that are to connect

[Continued on page 151]

"OH BOY-AM I KEEN!"



• It costs only a dime to discover a world of shaving comfort! Ask for Treet Blades and let their super-keen edges rid you of shaving troubles! 4 for 10¢.

Treet Safety Razor Corp., Newark, N. J.

Treet BLADES
FIT GEM AND EVER-READY RAZORS

**4
FOR
10¢**

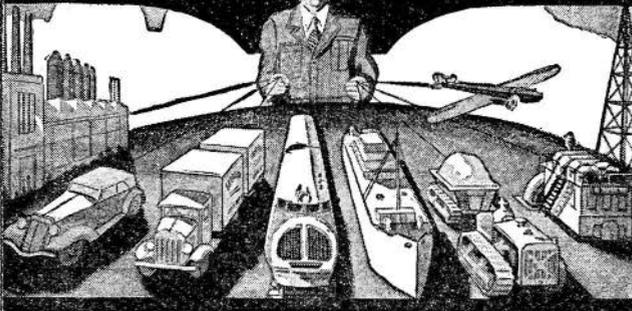
Make Money In Your Workshop — Free Blueprint Booklet

More than 125 plans are listed in the new MM Blueprint Booklet for building your own radio, boats, model railway, electric refrigerator, model planes and scores of other projects. Send stamped-addressed envelope for free copy.

Modern Mechanix Publishing Co.,

Fawcett Bldg., Greenwich, Conn.

The Diesel Engineer



Is Your Job Safe?

Just as the gasoline engine changed the jobs of thousands who depended on horse-drawn vehicles for their living—so now the Diesel engine is fast invading both the power and transportation fields, and threatening the present jobs of thousands.

What This Field Offers You

Diesel engines are replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, aircraft, tractors, dredges, pumps, etc.—opening up well-paid jobs for Diesel-trained men. You get all the latest Diesel developments in our course. Special diagrams for quick understanding of this new power.

2 Diesel Lessons Free

Men Over 18—Under 40

In your own home, learn about Diesel

This opportunity is NOT open to boys under 18 or men over 40. But if you are WITHIN these ages, you owe it to yourself to investigate this opportunity of acquainting yourself with Diesel—the new, fast-growing field.

No experience necessary. At our expense, see how plain every point is made—how thoroughly you grasp it—how greatly you will enjoy the work. If you are over 18 and under 40, send postcard, state age, and get 2 beginning lessons FREE. No obligation. This may be the turning point in your life, so write TODAY!

AMERICAN SCHOOL, Dept. D 128, Drexel Avenue at 58th Street, Chicago, Illinois

Test Yourself for a Good Pay Job—Steady Work



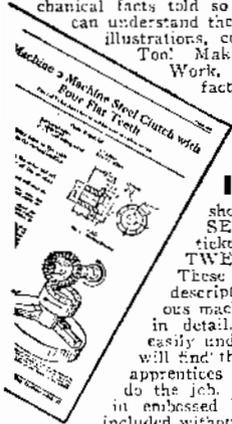
MECHANICAL ENGINEERING

● Manufacturers everywhere are frantically calling for **MORE SKILLED MEN**. Tool makers, milling machine, grinder, planer, shaper, operators, all are in demand. Here is a chance for you to profit by these opportunities. You can't become a tool maker or a skilled machinist in a month but **HERE IS A PLAN WHICH WILL TEACH YOU HOW TO SET UP ALMOST ANY MACHINE JOB, IN TEN OR FIFTEEN MINUTES.**

Pays Big NOW!

These Books All Shipped **FREE**

for examination. Don't miss this chance to qualify for promotion, don't put off for one minute this Big Opportunity which is yours almost for the asking. Seven Big Books entitled Modern Shop Practice, chockful of important mechanical facts told so simply and clearly that anyone can understand them. Over 2600 pages, nearly 2700 illustrations, cover each subject fully, including Tool Making, Pattern Making, Foundry Work, Mechanical Drawing, Forging, in fact, almost anything you need to know.



Over Seven Hundred Job Ticket Sheets

Included In addition to the seven big books shown above, we include **OVER SEVEN HUNDRED** sheets of job tickets, prepared at a cost of **TWENTY THOUSAND DOLLARS**. These show by actual illustration and description how to lay out work for various machines. Individual jobs are shown in detail, so clearly that anyone should easily understand them. Skilled machinists will find them of great value and with them, apprentices and helpers can quickly learn to do the job. These sheets, handsomely bound in embossed leatherette loose leaf binder, are included without one penny of extra cost.

Money Makers

These job tickets and the books offer a practical method for learning machine shop work by a study of actual jobs and thus simplify and shorten your training period. They alone should be worth more than the price of the books. They should prepare you quickly for a raise.

This is a reproduction of one of three job ticket pages showing how to mill flat teeth in a plain surface. In these pages are listed the tools required and a complete description of each of the seven operations.

Take Advantage of This Opportunity

NOW Get these books and job tickets free for examination. Send the coupon. When the books arrive show them to your foreman or superintendent if you want to. Look them over—pick them in every way and we are sure you will agree that they offer you an exceptional opportunity to get a better job with more pay, **QUICKLY!**

Endorsed by Factory Superintendents and Managers.

AMERICAN TECHNICAL SOCIETY
Drexel at 58th Street Chicago, Illinois Dept. M1320

Use This Coupon for Books and Job Tickets

American Technical Society, Drexel at 58th Street Dept. M1320, Chicago, Illinois. You may send me the 7 Big New Books entitled Modern Shop Practice, for **FREE EXAMINATION**. I will pay the few cents delivery charges only. I am to have the privilege of ten days' free examination, after which I will send you only \$2 then \$3 each month until the total price of \$20.80 is paid, otherwise I will return the books in ten days and owe you nothing. Because I send now you agree to include, without one penny of extra charge, the 700 Job Ticket Sheets in a handsome binder and also a membership certificate (good for one year) in the American Technical Society, which entitles me to full consulting privileges with your experts.

Name.....

Address.....

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

Please attach a letter stating age, occupation, employer's name and address and that of at least one business man as reference.

A Clothespin Synchronizer

[Continued from page 110]

A piece of fiber, 2¼ by 2¼ inches, is shaped as shown, and the parts mounted on it. Bore two holes in the clothespin for mounting it to the fiber board, fastening it with ⅛-inch machine screws. These same screws are also used to hold the metal clamp which fits around the battery case.

In one end of the clothespin, make a hole and slot large enough for the plunger of the camera shutter cable release. A flat piece of metal is attached to the top of the clothespin with a small screw to form part of the timing mechanism contact.

A piece of copper or brass, ⅝ by 1¼ inches, is drilled and bent L-shaped to hold the adjusting screw. A nut is soldered to this bracket to accommodate the contact adjustment screw. Once adjusted, the screw is locked in position with an additional nut. The adjustment screw must be set so as to make contact with the metal piece on the top of the clothespin just as the shutter is opened by the cable release.

Solder one end of a length of No. 22 gauge insulated copper wire to the metal strip on the top of the clothespin and the other end to the screw cap on the bottom of the flashlight case. Then solder similar wire to the brass or copper L-shaped bracket to which is fitted the screw adjustment. The opposite end of this wire passes through a hole drilled in the fiber flash case and is soldered to the shell of the flash bulb socket. Although this arrangement wires around the flash case switch, it does not render it useless. As both clothespin contact and flash-case switch are wired in parallel, either can be used independently to fire the flash bulb.

To synchronize the clothespin switch, proceed as follows: Remove the back of the camera, temporarily connect a small flashlight bulb to the gun and place it behind a cardboard shield provided with a small hole to align with the center of the lens. Screw in the synchronizer bolt until light is seen through the back of the camera when the shutter opens. Use a shutter speed of 1/25 second. Once the correct adjustment has been determined, lock the adjustable contact screw in place.

Vest Pocket Chess Board

[Continued from page 96]

constituting the top and bottom of the box.

The playing pieces, which are made next, consist of two sets, one turned from walnut and the other from maple.

For each set eight Pawns, two Horses, two Bishops, one King, one Queen, and two Castles will be required. Turn the playing pieces so that they correspond in design with the conventional types and allow a short stem to remain on the bottom of each piece so that they can be inserted in the holes drilled in the checkered board.

How To Select A Shotgun

[Continued from page 120]

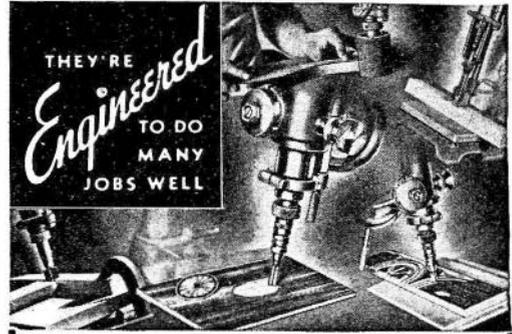
fowl shooting in general can be uniformly selected with a drop at heel of $2\frac{1}{2}$ inches and with drop at comb of $1\frac{1}{2}$ inches. These specifications will take care of most hunters who go into the field. It should always be remembered that if there is too much drop in the stock there will be an inevitable tendency to shoot low. By the same token, the straighter the stock, the higher the gun will shoot. It is the consensus of opinion among shotgun authorities that the straighter stock is the best for all-around shooting, especially upland shooting, where the game is almost always taken on the rise upward. If the gun, by reason of its straight stock, naturally shoots high, there is no need for raising the gun very much in order to cover the rise in heading off the bird with the shot pattern.

The pitch of a shotgun has been described variously as "the divergence of the barrels from a right angle with the butt plate" or "the angle of the butt in relation to the line of sight over the barrels or rib." There are those who discount the value of pitch in a shotgun, but it is generally recognized as one of the essentials.

The method of assuring yourself as to the pitch, heel and comb drop can easily be determined by standing the gun up against a perfectly straight wall, being sure at the same time that the floor is likewise perfectly level. The heel and toe of the butt of the gun should rest flat on the floor, after which the gun is pushed forward until the top of the breech rests against the wall. The distance, between the heel of the stock and the wall, is then reckoned; also the distance between the comb and the wall and the distance from the muzzle to the wall. While the depth of the drop at heel and comb has been covered, the pitch is still to be considered. Pitch, so far as a gun used on waterfowl is concerned, should be approximately $2\frac{1}{4}$ to $2\frac{1}{2}$ inches. On the other hand the pitch for an upland gun, best on quail, pheasants and grouse would range from $1\frac{3}{4}$ to 2 inches.

While the drop at the heel and comb of the gunstock have much to do with the effectiveness of the shotgun, in the field, there is also need of considering the length of the gun barrel. Mention is made of this because it is one question that is invariably asked by the amateur. It seems that there is a misconception cleaved to by most beginners which has for its theme the theory that the longer the barrel of the shotgun the more effective it is. The fact of the matter is that the long barrel is no more effective, nor harder hitting, than the short barrel. Whether it is a 26-inch barrel or a 30-inch barrel, neither length can claim much preference over the other. The only difference here would be in shooting heavy loads, when the shorter barrel would of course produce a more excessive recoil. This muzzle blast is counteracted by the use of a longer barrel.

[Continued on page 137]



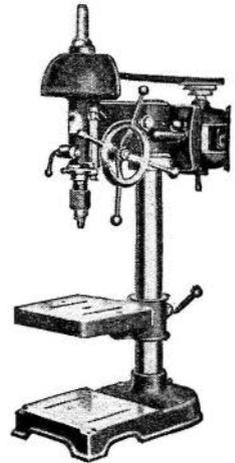
DRIVER DRILL PRESSES

Heavy or light, accurate or rough drilling are done equally well on a Driver Drill Press. In addition, these versatile tools will handle many routing, shaping, dovetailing, mortising and carving jobs.

Unusual rigidity, machining to close limits, maximum capacity and minimum vibration mark the lowest-priced Driver Drill Press as well as the finest. See these tools at your Driver dealer's, or write for the new 1938 catalog.

DRIVER D925 DRILL PRESS

\$39.95 Less Motor (shown right). Used by many industrial shops for steady production. 6-spline spindle cuts vibration. 4 precision ball bearings. Pilot wheel feed, Jacobs ($0''$ to $\frac{1}{2}''$) key chuck. $10'' \times 9''$ tilting table. 4" spindle travel. Chuck to table, 12", to base, $17\frac{1}{2}''$, to column, $7\frac{1}{2}''$. These, and its many other features, have never before been combined in any other drill press, regardless of price. See this tool.



DRIVER D710 DRILL PRESS

\$29.95 (Not illustrated) Intermediate capacity, for all-around home workshop use. Ball bearings. Jacobs chuck. A well engineered tool built for many years of versatile, dependable service.

DRIVER D570 DRILL PRESS

\$19.25 (Not illustrated) For the craftsman seeking maximum value at low price. Rigid cast frame. 24" high overall. 7" chuck to table. Unmatched at its price.

Look up your Driver dealer—see how much these tools offer at the price! Walker-Turner Co., Inc., 518 South Ave., Plainfield, N. J.

DRIVER Engineered POWER TOOLS

Do you like RADIO? Does the future of TELEVISION Interest You?



Send for your FREE COPY of this book of FACTS

Full of Instructive Information on Employment
Opportunities and Requirements

You men who are sincerely ambitious to make good in radio and related industries will want a copy of this new book about employment opportunities and requirements. Written in plain, understandable language with no exaggerations and no mis-statements, this free book gives you facts you want to know about these profitable trades. 95 illustrations. Major subjects include Television Theory and Construction, Pick-up Systems, Amplifiers, Transmitters, Receivers, Cathode Tubes, Sound-Recording on disc, Loud Speakers, Talking Picture Projection and Radio Communication.

NATIONAL SCHOOLS is the oldest trade institution in the West. Established in 1905. Occupies its own modern three-story building, exclusively devoted to training ambitious men. Latest equipment. Selected, experienced staff of engineers and instructors. Many students can earn room and board while learning. National students are allowed coach railroad fare from any point in the United States.

NATIONAL SCHOOLS Los Angeles

Request for FREE BOOK of Details

NATIONAL SCHOOLS

Dept. MNR-1 4000 So. Figueroa Street, Los Angeles, Calif.

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

Make This Xmas Tree Base

[Continued from page 77]

the laths and extend over the outside boards, folding underneath about 1 inch. After fitting the burlap, cut small holes at the location of the tunnel openings. Do not as yet cut them to exact size because when applying the plaster saturated burlap it may not come just as planned.

Proceed by mixing water and casting plaster (plaster of Paris) in a bucket until it is thick. Dip the burlap into the plaster until the pores are filled. Take it out immediately and place it on the stand, forming it to the shape desired. Fold the burlap over the outer boards and tuck under edges. Work quickly because the plaster dries fast. It takes only about ten minutes for it to dry so hard that it cannot be worked.

With a pair of sharp scissors or a knife, trim the burlap to make the tunnel openings, allowing a half inch for folding to the inside. Next place the track in position. The plaster will hold it down. Cut a hole at the opening of the tree holder and tuck the edge of the burlap inside.

More can be added to the set-up by placing a piece of green pebbled art glass at any desired place. This will give the appearance of a miniature lake.

A coating of the plaster must now be placed over the entire surface of the stand, building it up to cover any burlap surface still appearing and to hold the track and glass in place firmly.

The stand is now completed except for decoration, which you can add to give it increased beauty and life. Novelty and five and ten cent stores stock a variety of sizes of miniature Christmas trees. These range in size from one to several inches high and are covered with a substance that resembles snow. A number of these trees in varying sizes can be stuck into the plaster, to add to the decoration of the base.

Miniature people and houses can be obtained and placed near the lake edge or on the "mountain" slopes. Small animals such as deer also add to the appearance of the stand.

This Christmas tree stand can be used for many years if properly stored between seasons. Paper wrapped around it will protect it from dust. If it should become dusty, brush the dust off and apply a coat of whitewash to restore it to its original condition.

White House Talks To World

[Continued from page 56]

Should the President phone Europe, the call, after passing through the trans-Atlantic terminal at New York, would travel over the long-wave radio telephone circuit across the Atlantic or over three short-wave channels that were put in operation in 1928 and 1929. The terminals are at New York and London, whence connections are made respectively to the Bell system network and to the telephone systems of the various Continental countries.

INVENTORS PATENT YOUR IDEAS SEND FOR FREE BOOK



HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form

CARL MILLER

REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

3503 Woolworth Bldg., Dept. 18B, New York City
MILLER BUILDING, Dept. 18B, WASHINGTON, D. C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME

ADDRESS

NEED MONEY?

Write for free booklet describing "107 Plans for Operating a Successful Business of Your Own". Make from \$20 to \$100 a week starting in spare time at home. No peddling or house-to-house selling. Booklet sent free, and without obligation. Write for your copy today.

ELITE PUBLISHING CO.

Dept. G 214 Grand St. New York, N. Y. **FREE BOOK**

NO JOKE TO BE DEAF

—Every deaf person knows that—
Mr. Way made himself hear his watch tick after being deaf for twenty-five years with his Artificial Ear Drums. He wore them day and night. They stopped his head noises. They are invisible and comfortable, no wires or batteries. Write for THE STORY. Also booklet on Deafness.

Artificial Ear Drums
THE WAY COMPANY
741 McKechey Bldg. Detroit, Michigan

RADIOS..SAVE UP TO 50%

DEAL DIRECT...FACTORY PRICES! Move into wireless from AC, DC, A.I. Wave, mechanical, motor, automatic, vacuum tube radios. Features that operate like city radial. Send postcard for NEW bargain catalog FREE. 30 DAY TRIAL plan and agent-user proposition. COLLENTONE RADIO CO. DEPT. G1, DEARBORN, MICHIGAN

Free Catalog

30 DAY TRIAL \$6.98 UP

MAKE MONEY IN YOUR WORKSHOP

Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in FREE BLUEPRINT BOOKLET

MODERN MECHANIX PUBL. CO., Fawcett Bldg., Greenwich, Conn.

ELECTRICAL ENGINEERING

For those who can't afford the time and expense of a 4-year college course, Bliss offers a condensed ONE YEAR residence training, combining practical theory and practice. 4th year. CATALOG ON REQUEST.



BLISS ELECTRICAL SCHOOL
381 Takoma Ave., Washington, D. C.

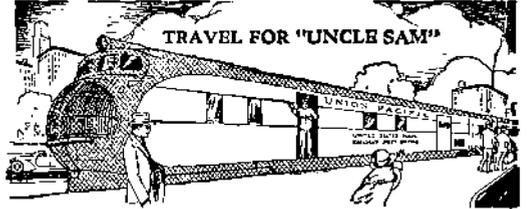
WORK FOR THE



GOVERNMENT START

\$1260 to \$2100 a Year
MANY 1938
Appointments Expected
Railway Postal clerk

Railway Postal Clerks get \$1,900 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,450. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.)



3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100 and \$2,300.

Customs Inspector

Salary \$2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign parts covering boats, trains, roads, automobiles, etc.

File Clerk—Clerk

Open to Men—Women 18 to 50. Entrance salary \$1,260—\$1,440 Year. Appointments as File Clerks and Clerks in the Departments at Washington, D. C., are made from this examination.

Many Other Positions

Many other positions are obtainable. Those wishing these positions should qualify at once.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. K262, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "HOW TO GET A U. S. GOVERNMENT JOB"; with (3) List of U. S. Government Jobs; (4) Tell me what to do to qualify for a U. S. Government Job.

Name

Address

Use This Coupon Before You Mislay It. Write or Print Plainly.

ONCE IS ENOUGH

It's some trouble to get set to do a gluing job—so—why not use a glue that really sticks permanently?

CASCO — that's the glue!

It's different, it sets *chemically*...like concrete...moisture, heat and hard use do not affect it.

EASY TO USE—Casco comes in convenient dry powder form—mixed in cold water in a moment—no cooking.

NO WASTE—You mix it as needed—always fresh and up to the full strength.

ECONOMICAL—A pound of Casco glue powder makes 1½ quarts of liquid glue—half the cost of most glues.

CONVENIENT—Comes in handy 10c and 25c packages, also in ½ lb., 1 lb., 5 and 10 lb. sizes at your Hardware, Paint and Lumber Dealers.

Preferred by homecrafters for all wood gluing...Casco is also the ideal easy-to-use glue for all household jobs. Makes *permanent* repairs on furniture, linoleum, piano keys, umbrella handles, books, luggage—everything that's "glue-able."



FREE BOOK SHOWS HOW!

32 pages—50 illustrations—full of gluing and repair information. Just ask for "Free Gluing Guide" on a penny post card.

CASEIN COMPANY OF AMERICA, INC.
Dept. M.M.138 350 Madison Avenue New York, N.Y.

**AT LAST
A LOW-
PRICED
MOTOR
SCOOTER**



A streamlined beauty—carries 300 pounds—speeds up to 45 miles an hour—climbs steep hills.

Easy to Run—Simple to Operate

Economy—130 miles per gallon of gas. Governor controlled. Full price of \$69 includes everything: Goodyear pneumatic 12-inch tires, roller bearing wheels, Seiss horn, plated handlebars, rubber grips, welded steering fork, foot proof clutch, etc. etc.—no extras required. And powered by a husky four-cycle, one horsepower, heavy duty gas engine, magneto equipped. Send 10c for illustrated circular—Dealers Write on Letterhead.

G. H. Q. MOTORS

854 A East 149 St.

New York, N. Y.

Soap Box Winner Gets Award

[Continued from page 95]

Don't think that a soap box racer can't burn up the track! Bobby set a record for the 1,175-foot Akron course by covering it in the breeze-scorching time of 29.28 seconds! His car has been paced by a motorcycle policeman at 52 miles an hour. A racer has to be sturdily designed to take the gaff.

Participants in future soap box derbies, which are sponsored annually by the Chevrolet Motor Company in conjunction with local newspapers, can pick up a few pointers on speed design by studying the photographs of Bobby's prize-winning racer which he posed especially for MODERN MECHANIX.

Science Saves Eyesight

[Continued from page 118]

upon which test objects are manipulated to chart the fields. By the substitution of twin photographs, exactly like those used in the old parlor stereoscope, patients with squints or improperly cooperating eye muscles are aided to overcome their trouble. This is called fusion training. In squints, one eye usually does most of the work. The binocular design of the Stereo-Campimeter forces both eyes to work together and muscles are trained to proper functioning.

One of the most extraordinary instruments used by eye physicians is the slit-lamp. In effect, this marvelous machine uses a thin beam of light to slice out a section of the eye and place it upon a microscope slide for thorough examination, just as a surgeon would perform the operation with a knife. Actually it is purely an optical phenomenon.

If a cinder becomes imbedded in your eye, or if you have a beginning cataract in the crystalline lens of your eye, the slit-lamp enables the physician to determine the exact depth at which the lesion exists. The instrument consists of a powerful light source which throws a narrow beam of light to the desired layer of the eye, and this is examined from an oblique angle with a binocular microscope. With magnifications up to 50X, the cornea, as an example, appears stereoscopically to have a depth of approximately half an inch and the depth of objects or natural structures can easily be determined.

A new German method of rust-proofing iron and steel uses a spray gun to apply a phosphate solution.

It has been found that ultra-violet rays aggravate the skin eruptions in smallpox.

The apparatus for weighing the earth at the National Bureau of Standards in Washington is so sensitive that an automobile parked outside the building will affect it.

Making Photographs In Color

[Continued from page 107]

process your films for you if you wish, and the charges are not high.

Kodachrome is a subtractive process in which colors are obtained by a very complicated mechanism. The amateur, however, is more interested in how to use these materials than in the theory upon which they are based. Kodachrome is available, now, only in 35 mm roll film for Leica, Contax, Retina, Bantam, Argus, and similar cameras. Larger sizes will undoubtedly be on the market before long. Kodachrome must be returned to Eastman for processing, which is included in the price of the film, resembling movie film in this respect.

Individual frames of Kodachrome and Dufay-color films may be mounted between glass plates and thereby protected against finger prints, dust, etc. In this form it is easy to project them.

Color films are somewhat slower than fast panchromatic black and white materials, Dufaycolor can be exposed correctly using a Weston speed of 8 or a Scheiner rating of 18; Kodachrome will turn out beautifully if a basic exposure of $f/6.3$ and $1/60$ second in bright sunlight is used. The following table has been worked out for Kodachrome:

Basic stop on full cloudy day	= $f/1.9$
Basic stop on bright day	= $f/3.5$
Basic stop on hazy sunny day	= $f/5.6$
Basic stop on bright sunny day	= $f/6.3$

Using these stop openings:

1. For light subjects, close diaphragm $\frac{1}{2}$ stop.
2. For dark subjects, open diaphragm $\frac{1}{2}$ stop.
3. For extreme distance close diaphragm $\frac{1}{2}$ stop.
4. For closeups, open diaphragm $\frac{1}{2}$ stop.

Two types of Kodachrome are available, regular film for outdoor use and Kodachrome A for use with incandescent lights. Regular film may be used at night with photoflood lights provided the proper filter is used. On the other hand the Kodachrome A may be used outdoors if a special filter is used. If the amateur desires to use but one type of film, he should use Kodachrome A and buy the filter which enables him to use this material in daylight. In this manner he will not lose the indoor speed caused by using a filter with Regular, and the sunlight speed of the A variety is sufficient.

When taking color photographs, it is wise to remember that what makes the picture beautiful, or worth taking at all, is color. There is no use shooting up expensive film at deep black shadows. The amateur wants color—and at some periods of the year it is surprising how difficult it is to find good outdoor color. The illumination should be flat, that is, the amateur should obey the old formula that says, "stand with your back to the sun." If the foreground is very dark with shadow, it will detract from the beauty of your picture. If a still-life set-up is not fully illumi-

[Continued on page 137]

NOW—A 7-Inch Genuine BLACK & DECKER ELECTRIC SANDER



THE NEW 7-INCH JUNIOR SANDER saves hours of slow, hard work with sandpaper, emery, files, etc. Makes quick work of such jobs as cleaning and smoothing wood or metal surfaces; removing paint and rust; grinding and smoothing welds and casting ridges; rubbing down new lacquer with felt rubbing pad; polishing metal, etc. Universal motor operates on A. C. or D. C. A great tool. A great value. Only \$39.50.

LOW-PRICED B. & D. DRILLS, TOO

$\frac{1}{2}$ -INCH JUNIOR DRILL: (Illustrated). Drives twist drills for drilling up to $\frac{1}{2}$ " holes in steel; augers for drilling up to 1" holes in wood. Also drives Black & Decker Hole Saws for cutting clean, round holes from $\frac{3}{4}$ " to $3\frac{1}{2}$ " diameter in any material a hacksaw will cut. Universal motor. Only \$35.00.



$\frac{1}{4}$ -INCH JUNIOR DRILL: Drives twist drills for drilling up to $\frac{1}{4}$ " holes in metal; augers for drilling up to $\frac{1}{2}$ " holes in wood. Also drives light wheels for grinding, buffing, polishing, etc. Universal motor. ONLY \$19.95.

MAIL THE COUPON TODAY for complete information and name of nearest dealer where you can see the Junior Sander, Drills and other Black & Decker Tools.

BLACK & DECKER

World's Largest Manufacturer of
PORTABLE ELECTRIC TOOLS

MAIL THIS COUPON NOW

The Black & Decker Mfg. Co.,
701 Pennsylvania Ave., Towson, Md.

Please send me Free Literature describing new low-priced Black & Decker Tools and the address of my nearest B. & D. dealer.

Name

Occupation

Address

City State

I WANT MEN

for **TEA AND COFFEE ROUTES**
PAYING UP TO \$60.00 IN A WEEK

Million dollar company, distributing over 250 nationally known food products and home necessities through Route Dealers only, needs more men at once. Your complete equipment will be sent on trial without money risk to you. Routes pay up to \$60.00 in a week for full time, or \$35.00 on part time. Ford Sedans or \$500.00 Cash Bonus given to producers. Once started, we finance you. Apply at once for Route in your locality. Send postcard or coupon below. Details free; no obligation. Albert Mills, 4909 Monmouth, Cincinnati, Ohio.

GIVEN! NEW FORD SEDAN..OR \$500.00 CASH as a bonus

APPLICATION FOR ROUTE

ALBERT MILLS
 4909 Monmouth Ave., Cincinnati, Ohio
 Rush me free facts on Tea and Coffee Route Plan, paying up to \$60.00 in a week. Also tell me more about the new Ford Sedans or \$500.00 Cash Bonus given to your producers.
 Name
 Address
 (Please print or write plainly)

You are invited to Come to **LINCOLN** for Complete Training for a **GOOD PAY JOB** in **AVIATION**

Learn Aviation at Lincoln. Prepare Yourself now for a Big Pay Job in Aviation. Airline Pilots earn up to \$700 a month; Mechanics up to \$200 a month. Lincoln Government Approved Flight and Mechanics Training prepares you for your Government License. 14 MODERN TRAINING PLANES. 12 shops and laboratories. Lincoln graduates in demand. We assist graduates in locating positions. Write today.
LINCOLN AIRPLANE & FLYING SCHOOL
 409-G Aircraft Bldg., Lincoln, Nebr.

Christmas for CRAFTSMEN



\$1. POST PAID

272 PAGES - 325 ILLUSTRATIONS
 LEATHERETTE COVER - WIRE-O-BINDING

It shows real thoughtfulness to give this new up-to-date Atlas Lathe Manual to your "craftsmen" friends. Pictures clearly all metal and wood operations—gives latest technical data for machining new metal alloys, plastics, etc. Each manual comes in individual box with Christmas wrap and card, postpaid for \$1. We'll do the mailing if you wish. Please print names. Order now for prompt delivery.

ATLAS PRESS COMPANY
 152 N. Pletcher St., Kalamazoo, Mich.

AUTO-MECHANICS & WELDERS

Auto Mechanics and Welders are in big demand. Complete courses in arc and acetylene welding, metal finishing, body and fender bumping, spray painting. Special low rates. Write today.
MICHIGAN TRADE SCHOOL
 3763 Woodward Ave., Detroit, Mich.

Write for **FREE CIRCULAR**

LETTERING ARTISTS MAKE Big MONEY



BE A SUCCESS—LEARN SHOW CARD PROFESSION "THE ACME STUDIO WAY"—Spend 2 full weeks our Big Chicago Studios—finish training spare time at Home. Hundreds taught this way now receive Big Pay. Free Employment service. Positions waiting. Earn while learning. EZ low terms within reach of all. **MONEY BACK GUARANTEE—NO RISK PROVED PLAN.** Name, address and present occupation brings **FREE ABILITY TEST AND BOOKLET.**

ACME STUDIOS, Dept. MM-1, 24 W. Hubbard St., Chicago, Ill.

WHY RENT A BOAT? MAKE YOUR OWN

Even a child can build at least one of the many boats that are described in the big new 148-page book, **HOW TO BUILD 20 BOATS.** Send 50c for your copy, now.

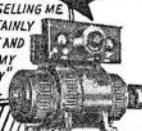
MODERN MECHANIX PUBLISHING CO.
 Fawcett Bldg. Greenwich, Conn.

"I WANT TO TAKE THIS OPPORTUNITY TO THANK YOU FOR DOING ME A FAVOR BY SELLING ME MY HOBART WELDER. I CERTAINLY AM WELL PLEASSED WITH IT AND IT HAS HELPED ME BUILD MY BUSINESS MORE THAN I CAN SAY"
 DANBURY, CONN.

SIMPLIFIED ARC WELDING BRINGS BIG PROFITS EVERY MONTH

New low prices make this profitable welding service available to everyone. Opens doors to big pay jobs that carry real profit. Hobart welders are easier to operate, faster, guaranteed to bring you quality welding business. Extra profits will pay for welder without expense to you.

NO INVESTMENT TERMS—PROFITS PAY FOR IT
 Extra earnings and savings possible with Hobart Welders make it easy to own without expense. Write for details.
HOBART BROS., Box SM-18, TROY, OHIO




FREE RADIO CATALOG

ASTOUNDING VALUES IN LAFAYETTE RADIOS LIKE THIS 6 TUBE, 2 BAND A.C.



The coupon below has brought new radio thrills to thousands. Mail it today for your **FREE** copy of the big 1938 180 page Wholesale Radio catalog containing the full line of Lafayette Radios. Illustrated is Model D-35—featuring sensational tuning "eye" which gets stations with pin-point accuracy plus tone that is unequalled. Designed with rounded walnut front and modernistic dial. One of 70 outstanding LAFAYETTE Radios described in the catalog. **30 DAY FREE TRIAL—Easy Time Payments. Send the Coupon NOW.**

FREE XMAS CATALOG

Get this Special 40 page Xmas catalog! Nationally advertised electric trains, toys, home appliances, etc. Gifts for every member of the family. **IT'S FREE.** COMPLETE

WHOLESALE RADIO SERVICE CO. INC.
 NEW YORK, N. Y. • CHICAGO, ILL. • ATLANTA, GA.
 100 S. SIXTH AVE. N. W. 901 W. JACKSON BLVD. 430 W. PEACHTREE ST. N. W.
 BOSTON, MASS. • BRONX, N. Y. • NEWARK, N. J. • JAMAICA, L. I.

WHOLESALE RADIO SERVICE CO., INC.
 100 SIXTH AVENUE, NEW YORK, N. Y.

Rush FREE 1938 Catalog No. 69-22A8 **TWO**
 Rush FREE XMAS Catalog No. 70-22A8 **GREAT**

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

FREE CATALOGS

PASTE COUPON ON PENNY POST CARD

STUDY ENGINEERING AT HOME

BIG STEADY JOBS—BIG PAY for skilled Engineers. Courses prepared by 84 Noted Engineers and Professors. Degrees conferred in Electrical, Mechanical, Diesel, Civil, Automotive, Aeronautical, Radio, Architectural, Drafting and Civilian Engineering. Become a Real Engineer. A good, practical education is the greatest dividend paying investment one can possibly make. If you are willing and ambitious—if you have the "it will" determination—we will show you the way to success. Only Standard Text-Books used. **FREE 10-Day Examination of Course Selected.**

McKINLEY COLLEGE OF ENGINEERING, CHICAGO
 4222 Clarendon Ave.,

BE A PASSENGER Traffic Inspector

Trained Men Needed Now—Positions Ready

Railway and Bus Lines are constantly asking for our trained graduates. Our short, home-study course quickly qualifies you, and upon completion we place you at up to \$135 per month, plus expenses, to start, or refund tuition. Active Men—19 to 50—eligible. Write for the interesting story of **TRAFFIC INSPECTION.**

STANDARD BUSINESS TRAINING INSTITUTE, Dept. 6101, Buffalo, N. Y.

DRAW-O-MATIC A BETTER DRAWING BOARD

NEW MODEL WITH TRANSPARENT TRIANGLES AND STRAIGHT-EDGE ATTACHED. SELF-ALIGNING, SLIDING PARALLEL BAR. A Professional Board at a reasonable price. Eliminates old-fashioned T square. Thousands in use by Draftsmen, Artists, Engineers, Students, Architects, Estimators and Designers. **BUILT TO A STANDARD OF QUALITY.** Board of hard composition; stays flat. No thumb tacks necessary. **FOOL-PROOF mechanism.** Rubber feet prevent slipping and marring. Plated metal supports. Bar slides easily and accurately. A **SELF-CONTAINED UNIT EASY TO CARRY.** Light in weight. Triangles held by spring clip on back. **ENABLES ANY ONE TO DRAW WITH ACCURACY AND SPEED.** **PRICES START AT \$1.50. THREE HANDY SIZES—12 in. x 16 in., 16 in. x 20 in., 20 in. x 25 in.** A real Xmas gift. Send for Free Circular. Agents Wanted. **Rollin Products Co., Dept. MX6, 212 W. Hubbard St., Chicago, Illinois.**

"GIVE ME YOUR MEASURE AND I'LL PROVE IN THE FIRST 7 DAYS YOU CAN HAVE A BODY LIKE MINE!"



No other Physical Instructor in the World has ever DARED make such an offer!

I'LL give you **PROOF** in 7 days that I can turn you, too, into a man of might and muscle. Right in the first week you will see and feel the improvements! Then I continue to rebuild, renew and "overhaul" your body. Soon you are the proud owner of a powerful build like mine. People will notice the ruddy glow of health in your face, the sparkle in your clear eyes, the breadth of your shoulders. You will be the fellow who will walk off with the prettiest girl and the best job. Mail coupon below for a **FREE** copy of my new book. It reveals the secrets that changed me from a 97-pound weakling into a husky who won the title of "The World's Most Perfectly Developed Man."

Are you underweight? I'll add pounds where needed! Are you fat in spots? I'll pare you down to fighting trim!

And I'll also give you rugged health that banishes constipation, pimples, skin blotches and similar conditions that rob you of the good things of life!

I haven't any need for contractions that may strain your heart and other vital organs. I don't dose you or doctor you. **Dynamic Tension** is all I need. It's the natural, tested method for developing real men inside and out.

48-Page Book FREE

Tells all about my method and what it has done to make **big-muscled** men out of run-down specimens. Shows, from actual photos, how I develop my pupils to my own perfectly balanced proportions. My system can do the same for you too. Don't keep on being only half the man you CAN be! Put your name and address on the coupon, or a postcard, and mail it today. **CHARLES ATLAS, Dept. 61, 115 East 23rd Street, New York, N. Y.**

CHARLES ATLAS, Dept. 61
115 East 23rd Street, New York, N. Y.

I want the Proof that Your system of **Dynamic Tension** will make a new man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

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

Actual photo showing how CHARLES ATLAS looks TODAY



Big Silver Cup Being Given Away

This valuable solid sterling silver cup stands about 14 inches high. I will award it to my pupil who makes the most improvement within the next 3 months. Therefore, no matter what your measurements may be now, you have an equal chance to win this cup—with YOUR name engraved on it!

LEARN TO FLY!

This book will teach you how...

YOUR WINGS is a complete flying course between book covers, by the world famous War ace and commercial aviator, Assen Jordanoff. It contains everything you need to know to become a pilot, from basic principles of aviation, airplanes, motors, instruments, etc., to advanced aerobatics and "blind" flying. It not only tells you in words what you must know to fly a plane, but its 425 illustrations show you graphically how to do it. It has taught over 15,000 men and women how to fly within a year.



EXAMINE THIS BOOK FREE

YOUR WINGS is a big book of 281 pages, size 7½"x10", with hundreds of illustrations, cloth bound. Order your copy today. Send no money! We guarantee your satisfaction. Simply tear out, sign and mail the coupon below. When **YOUR WINGS** arrives, examine it for five days. If you are in any way dissatisfied with it, you may return it to us and it will cost you nothing.

Mail This Coupon TODAY

To: Funk & Wagnalls Company
 Dept. 1781, 354 Fourth Ave., New York, N. Y.
 Send me **YOUR WINGS**, by Assen Jordanoff. When book is delivered, I will deposit with the postman only \$2.50, plus the few cents postage. I understand that I may return the book within five days for full refund, if I am not satisfied.

Name _____
 Address _____
 City and State _____

Give Helpful Books for Xmas!

RADIO ELECTRICITY
 Books At Sensationally LOW PRICES

LATEST technical information by nationally known authorities. Crystal clear. Profusely illustrated. Most outstanding book value in America!

- Build Exp. Labz. Work Bench... 20¢
- Exper. With 110-V Electrical Arcs 23¢
- Motor Transformer Exper. 29¢
- Radio Experimental Manual... 30¢
- Electrical Experiment Manual... 35¢
- Starting An Electric Repair Shop... 35¢
- Elec.-Radio Dictionary, condensed electrical education, 676 terms, 217 illus., 48¢
- Fault Location, Adjustment and Alignment of Radio Electronic Apparatus... 65¢
- Characteristics and trouble analysis of Radio Apparatus. You need this book... 75¢
- Radio Servicing Instruments. Two vol. 322 illus., Circuits, data, operating instr. Both for... 95¢
- Short Course in Mathematics. Two vol. fractions to logarithms, clear, complete. Both for \$1.05
- Short Course in Electricity and Radio. Two vol. 332 illus., Newest, most complete. Both for \$1.45
- Complete Radio-Electrical Library, all 15 books, fine Xmas gift, postpaid, only \$3.98

20¢ TO 70¢

MAILED POSTPAID!
 Send cash, check or stamps. Or, books mailed C.O.D. Order NOW or send card for Free Folder describing full line of Low Priced Books!

ELECTRONIC PUB. CO., Box 323-M Lincoln, Nebr.

NEW BENJAMIN AIR PISTOLS

Powerful—Accurate—Economical—Practical—Adjustable Shooting Force—Amazing Maximum Velocity—cal. 177 or 22 and BB—For Target and Small Game—the only Genuine Compressed Air Pistol for Shooting BB on the market—Single Shot with Bolt Action—Hammer Fire—Hair Trigger—Safety Price \$7.50. Holster \$2.00. Also 177 and 22 Single Shot Air Rifles \$7.50.—Single Shot BB Air Rifle \$6.00.—22 Shot BB Repeater Air Rifle \$7.50.—at Dealer or Direct—No license required—Safe for indoor use. FULL DETAILS—TARGETS—FREE—WRITE TODAY, Benjamin Air Rifle Co., 531 Marion St. St. Louis, Mo.

\$7.50

Cheaper HEAT Without COAL



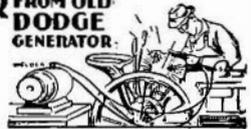
New Invention Fits Any Stove or Range 30 Days Free Trial

Remarkable invention burns 98% air, 4% of a cheap variety of oil obtainable everywhere. Does away with coal, wood, ashes, dirt and drudgery. Clean, silent, quick, like gas heat. 3 times hotter than coal and cheaper. Temperature controlled. No more getting up on bitter cold, wintry mornings. Many auto-

matic features. No gas or electricity needed. Safe as any ordinary kitchen range. Easy to install—no damage to stove—simply sits in firebox of any stove, range, heater or furnace. Costs just a few cents a day to operate. TRY 30 DAYS AT OUR RISK. Low introductory price and 30-day trial. Write for FREE CATALOG. AGENTS and spare time workers: Oil heat saves money this year; people buy to save. Write for Free burner offer that starts you in business for yourself. Act NOW! Listed as approved by Nat'l Board of Fire Underwriters. BRIGHAM OIL BURNER CO., 2923-A, Clark Ave., St. Louis, Mo.

BUILD ARC WELDER FROM OLD DODGE GENERATOR

35c brings complete plans for building economical and efficient 75 to 125 amp. arc welder and 1938 catalog listing over 500 welding and windcharger electrical items. Over 50 other generator changes into motors, generators, grinders, drill press and electric fence for operating on 6, 12, 32 or 110 volts.



LEJAY MFG. CO.

314 LeJay Bldg.,

Minneapolis, Minn.

60 ART LESSONS

Become Talented Artist with Big Income

This thorough course by Alexander Murray, famous Art School instructor, makes it easy to learn a lot in spare time. Teaches commercial art, cartooning, lettering, anatomy, perspective, adv. layout, etc. without bother or expense of corresponding. You get all 60 lessons at once—no waiting for next lesson. Over \$15 instruction illustrations, 125 pages of drawing paper FREE if you order from this ad. Send only \$1.95 for Complete Course postpaid—or pay postman plus postage (U. S. A. only). MONEY BACK if not delighted after inspecting.

EDUCATIONAL SUPPLY CO. Dept. A338-A Racine, Wis.

Only 95¢ POST PAID COURSE COMPLETE

INVENTORS BE SUCCESSFUL

Read Invention & Finance—it's your chance to make money. Two year subscription \$1.00 entered upon promise to pay on receipt of first copy. Place your order by cutting out and mailing this advertisement.

INVENTION & FINANCE MAGAZINE

80-H WALL ST., NEW YORK, N. Y.

BIG Free BOOK ON CRIME CASES

Fascinating book on scientifically solved true crime cases sent absolutely free to those over 17. Also tells how to get into Scientific Crime Detection. Home Study. New opportunities. Try. Steady Employment. Experience not necessary. Very easy terms.

SCIENTIFIC CRIME DETECTION INSTITUTE OF AMERICA, INC.

C & O Bldg. Dept. 10A9, Huntington, West Virginia J. T. Burdette, Pres.

GOVT. JOBS

Thousands of openings yearly. Men-women, age 18-50. Start \$105-\$175 month. Get ready now for next entrance test. Get our new plan—mailed FREE. Write,

INSTRUCTION SERVICE, Dept. 233. St. Louis, Mo.

How To Select A Shotgun

[Continued from page 129]

Thus for a waterfowl gun a repeater should have a 28-inch barrel, while a double barrel gun for the same sort of shooting would manage best with 30-inch barrels. So far as an upland gun is concerned, it is a toss-up between the 26-inch and the 28-inch barrels. Many prefer a short barrel in upland shooting, where much hiking is necessary, in that there is just that much less steel to lug around.

There seems to be a disposition on the part of some shotgun users to favor a full pistol grip on their guns. Whatever value they have in a more secure hold on the gun is lost by the fact that one is hindered in handling effectively a two-trigger double-barrel gun. For a gun of this sort, the plain grip is much to be desired, although it is to be admitted that where a single trigger is concerned and there is no need for movement of the hand, the full pistol grip is valuable.

Another introduction of value to the amateur is the use of two ivory beads, one in its usual position near the tip of the muzzle, the other set about 18 inches forward from it on the barrel. While a shotgun is never sighted like a rifle, still in throwing the gun up the eyes instinctively line up along the barrel. The eyes therefore will grasp two beads more easily than just one. At the same time, they will instantly show whether or not you are actually holding the gun straight or shooting to right or left, as the case may be. This will surely be the case if the stock is too thick or too thin, as was previously explained. The use of ivory beads on a gun is very effective when shooting in the shadowed confines of woods, in the half light of morning or late afternoon, and on overcast days.

Some shooters find it difficult to operate the two triggers of the double barrel shotgun, the impulse being to use one trigger and one barrel only, the ability to quickly shift from the one trigger to the other being hard to acquire. In this case some consideration should be given the selection of a one-trigger gun. There are two types, the selective and non-selective. Both are worthy of serious study when making a purchase.

Making Photographs In Color

[Continued from page 133]

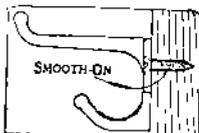
nated, if it has deep dark shadows in it, it will not be so beautiful. The fact is that a dark corner is, by contrast, more attention-getting than the color; and therefore the eye travels away from the color and toward the unsightly black shadow.

Contrast in a picture is obtained by proper placement and usage of color. One will soon become extremely color conscious after making color photographs. He will learn what color combinations are harmonious, and which are bad.

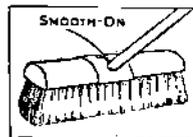
[Continued on page 151]

FASTENING SHELVES to MASONRY WALLS

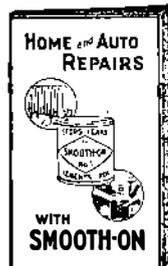
Cut holes into the masonry with cold chisel, insert bolts with heads in to form studs, and tamp remaining open spaces full of Smooth-On No. 1. Let the Smooth-On harden, then slip the brackets, cleats or uprights over the studs and fasten with nuts and washers. Use this method to anchor cellar shelves, partitions, wall cabinets, etc. Makes a strong, permanently tight connection that meets every need.



Tightening loose wood screws



Tightening loose handles



Write for FREE BOOK



SMOOTH-ON No. 1 stops leaks of water, steam, oil, gas and smoke. Makes a pressure-tight seal at joints, cracks and breaks in pipes, boilers, radiators, tanks, ovens, hot-air and smoke ducts, pails, etc. Tightens loose handles on tools, cutlery, push brooms, umbrellas. Makes stripped nuts, bolts and screws hold. Tightens loose locks, hinges, casters, hooks, stems, chair arms and legs, posts set in metal or concrete, etc. Stops leaks in automobile radiators, hose connections, cracked water jackets and gear cases, oil and gasoline lines, keeps nuts, lubricator connections, hub caps and wood screws from coming loose, makes headlight and dash supports tight and proof against rattle. Applied cold, holds in any metal, concrete, masonry, tile or wood, and makes a repair that is as efficient as the original construction.

Home and car owners find uses for Smooth-On every month in the year and save from 50 cents to many dollars on each application. Making these emergency and routine repairs yourself avoids expense and delays for professional fixers and is easy if you follow instructions in the Smooth-On Repair Book which will be mailed on request. Be ready the instant trouble shows up by keeping a can of Smooth-On in your repair kit and the booklet handy for quick reference.

Get the booklet from us and Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. tins from any hardware store.

Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 69,
574 Communipaw Ave., Jersey City, N. J.

Please send the free Smooth-On Repair Book.

Name

Address

1-38

There's MONEY IN ARC WELDING!



"No more tiresome work for me. I get a real thrill out of being an arc welder—and don't forget it, I'm getting more money than I ever earned on hit or miss jobs."

You, too, can become part of this great new industry! There's almost no limit to what welders can accomplish—they cut manufacturing costs way down. Because they know the "How and Why" of Welding, Metallurgy, Drawing, Blue-print Reading, Set-up Work and Fabrication.

No wonder manufacturers all over the country are demanding practically trained School of Engineering Welding Operators, Welding Technicians, and Welding Engineers!

Don't be content with ordinary work at low pay—when in a short time you can become a thoroughly Trained Specialist in Welding.

MILWAUKEE SCHOOL of ENGINEERING

Institute of Electrotechnics

138 MM Broadway & E. State, Milwaukee, Wis.

Send Free Booklet "The Dawn of Gigantic Industry and its Outstanding Opportunity." Also tell me how I can become an Arc Welding Operator in 3 months

Gas Welding Operator (6 weeks) -----
 Welding Technician (6 months) -----
 Welding Engineer (1 Year) -----
 Send details of Student Loan Plan ----- Earn Part Expense Plan -----

Name ----- Age -----
 City ----- State -----
 (If interested in other courses check here. Refrigeration and Air Conditioning Technician (3 Mo.) ----- Radio and Television Service Man (6 Mo.) ----- Commercial Radio Engineer (1 Yr.) ----- Electrical Engineer B. S. Degree (4 Yrs.) -----

"It's fun—and, boy, am I proud of my cruiser!"



Say enthusiastic model boat builders

Complete 18" Plans in Color 35¢

Make every step easy and full of fun. You'll thrill to see your seaworthy dream boat come true. Send 35¢ (stamps or coin) today.

SEATTLE MODEL BOAT CO.

Dept. D, Box 333, Seattle, Wash.

NEW TYPE CHEAP OIL BURNER

Sweeping the Country!!

COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace—HOTTER—CHEAPER—No Dirt or Ashes—Twice the Heat Quick at SMALLER COST.



COOK and HEAT for LESS

Amazing oil burner burns cheap oil a new way, without pre-generating or clogging up; quick intense heat at TURN OF VALVE.

AGENTS Salesmen BIG MONEY

Slips into ANY STOVE RANGE or FURNACE.

SENT ON TRIAL. Prove it cuts fuel bills, pays for itself quickly by what it saves. Order FREE SAMPLE TO AGENTS. Write quick, be first to learn how to end drudgery, dirt and ashes of coal and wood and make big money, spare or full time—mail in postcard today.

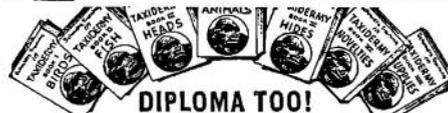
UNITED FACTORIES, A-500 Factory Building, Kansas City, Mo.

Mount Birds

ANIMALS—FISH—TAN HIDES!

Here's FUN and PROFIT—you start mounting first day! Fully illustrated, simple, COMPLETE COURSE covers every branch of Taxidermy. Thousands have easily mastered Taxidermy. You can, too! Learn modern methods.

COMPLETE 62 Easy Lessons, with 89 pictures 7 Great Books, cover 218 subjects



DIPLOMA TOO!

\$1 FOR ALL

SEND NO MONEY—HURRY!—Just pay postman \$1 plus few cents postage or send only \$1 now and we pay postage MONEY BACK if not 100% satisfied. You'll be amazed at this amazing bargain. Be quick—send today!

Schmidt School of Taxidermy, Dept. 111, Memphis, Tenn.

BUCHSTEIN'S FIBRE LIMB

is soothing to your stump—strong, cool, neat, light. Guaranteed 5 years. Easy payments. Send for Catalog today.



Also fibre arms, and braces for all deformities.

I. Buchstein Co. 610 3rd Ave. S. Minneapolis Minnesota

WILL YOU WEAR THIS SUIT

and Make up to \$12 in a Day!

Let me send you this fine all-wool tailored suit FREE OF COST. Just follow my easy plan and show the suit to your friends. Make up to \$12 in a day easily. No experience—no canvassing necessary. Send for samples—FREE OF COST. Write today for FREE details, ACTUAL SAMPLES and "sure-fire" money getting plans. Send no money. H. J. Collins, Progress Tailoring Co., Dept. A-137, 500 S. Throop St., Chicago, Ill.

Midget BATTERY

Portable Radio

WORLD'S SMALLEST RADIOS
 Just a handful—Wt. only 2 lbs.—Size 3 1/2x5 1/2—4 tube performance! Midget BUILT IN LOUDSPEAKER and AERIAL—Requires no ground—Hi-efficiency circuit and quality parts. Has Broadcast, short wave and foreign bands! Simple to operate—durable—trouble free. Ideal Radio for Office, Apts., Bedrooms, College, Camps, Trailers, Tourists, etc. Battery model has batteries inside case for use on farms, boats, autos, etc. Electric model uses 110 A. C. D. C. Either model kit or parts for \$8.49—Wired and checked \$9c extra or \$8.99 complete ready to listen! Beautiful brookproof cabinets, State Color. SEND ONLY \$1 and pay postman balance on delivery. (Batteries for battery model \$1.25 extra.) Free catalogue listing 100 other radios at factory price. Order now! Guaranteed. TINYTONE RADIO CO. M-1 KEARNEY, NEBRASKA

I'LL SAY IT'S EASY!

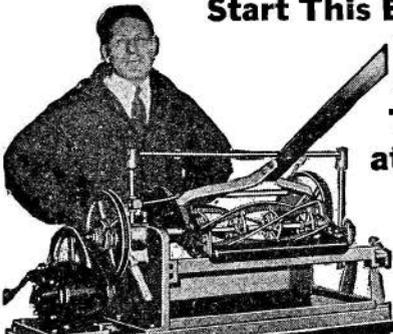
You'll learn more quickly and easily to play a P-A Sax, Trumpet, Clarinet, or Trombone, because P-As are easier to blow and have such beautiful tone. Strongest factory guarantee. Moderate prices. Home trial. Easy terms. See your music dealer or write for beautiful free book. 1295



PAN-AMERICAN 130 P-A Bldg., Elkhart, Ind.

Start This Business

in Your Spare Time at Home.



This Is the Way To Make MONEY!

That is what hundreds are saying about the Foley Electrakeen Lawn Mower Sharpener business. J. LeVert, N. Y., made up to \$104.50 a week clear profit last season. J. V. Anderson, Texas, reports increasing business for each of last 3 years.

No Canvassing Necessary Free plan tells you how to start. The Foley Electrakeen Lawn Mower Sharpener turns out perfect and easily, no experience needed. Simply put the mower in the machine and turn on the power. Uses same system as lawn mower factories. Sharpens all sizes and types in 15 or 20 minutes. You get \$1.00 or more for each job.

Special Offer: Attachment for grinding axes, hatches, knives, etc., included FREE with Foley Lawn Mower Sharpener on our Special Offer, brings you business the year around. Best season just ahead. Send postcard today—no salesman will call.

FOLEY MFG. CO. 108-B Foley Bldg., 11 Main St. N. E. Minneapolis, Minn.

We also make the FOLEY Automatic SAWFILER Files band, band, circular saws. Saves expense—does perfect work. Used by over 3000 repair shops.

BIG MONEY from POULTRY



I show you how to greatly increase profits, start your own business, or secure a good job in a big poultry plant. I train you at home in spare time quickly. Show your very latest methods. Give you facts worth money to yourself or employer. Men and women in small towns or suburbs will be particularly interested because latest scientific methods mean unusual profits for them. My home-study course used by thousands. 32-page book. "How to Raise Poultry for Profit" comes to you FREE. Mail coupon today.

SCIENTIFIC POULTRY RAISING

HARRY M. LAMON, Pres., National Poultry Institute, Dept. 137-C, Adams St., N. Y.

Please send me your FREE Book about poultry raising, and facts about your Course.
 Name _____
 Address _____
 City (R.F.D.) _____ State _____

IDEAL XMAS GIFT!

MAKE HUNDREDS OF FASCINATING

Radio-Electrical EXPERIMENTS

25-PIECE KIT! Genuine Commercial Apparatus—Not Toys! Dozens Experiments—Wire up thief-detector, extension phone, electric welder, radio code set, electro-plating, arc furnace, circuit tester, rectifier, 110-volt motor, arc light 4,000-ft. range, secret service phone, generate sun tan health rays, make electric stove, etc. Contains 110-volt A.C. motor, microphone, transformer, polarized test receiver, arc carbons, electro magnet, test compass, plating chemicals, condenser, 110-volt inductances, magnet, anodes, test socket, 110-volt power reducer, test records, clips, etc. Our kits used by leading schools!

6 BOOKS Free with kit! Instruction manuals, Theory of Electricity, Radio, Full plans for Exp. Bench, etc.

SAVE 60%—Send only \$3.99 for complete kit and books (actual value over \$10.) Or, sent C.O.D. Shipped same day order received. No stamp brings Bargain Catalog. **ELECTRICAL SALVAGE CO.,** Box 524-58, Lincoln, Nebr.

Only **\$3.99**
6 Books FREE

LEARN TO DRAW AT HOME!

IT'S FUN TO LEARN THIS WAY-AT HOME - IN YOUR SPARE TIME



LEARN TO BE AN ARTIST and become your "own boss." There's a big future in this fascinating, profitable field for men and women who are well-trained Artists. You can learn at home in your spare time this helpful, practical way.

COMMERCIAL ART CARTOONING AND DESIGN All in ONE Practical Course

For 23 years our method of instruction has proven successful. Today it is even more complete and strictly up-to-date. You start by drawing straight lines, and in advancing from lesson to lesson your drawings are given the correction and criticism of an experienced Art instructor. A few pleasant hours a week should give you the ability to earn good money later on.

ENJOY THE BETTER THINGS IN LIFE

Set A Goal For Yourself



GET MARRIED OWN YOUR HOME TRAVEL

Many of our graduates are enjoying a "new life" thanks to W. S. A. training. Margaret Kessel of New York earned \$125 in one week doing free lance Artwork. Mr. L. Raymond of Florida says, "Course paid for before completed." There's a future waiting for YOU!—and sending for our FREE BOOK will help toward your career as a successful Artist.

ARTIST OUTFITS GIVEN!



Two full-sized Outfits given with the course. Including everything you need to get started—drawing board, pens, brushes, paints, paper, etc. Mail coupon today for complete details.



FREE BOOK shows how

WASHINGTON SCHOOL OF ART Est. 1914
 Studio 201E, 1115—15th Street, N. W.
 Washington, D. C.

Yes! I am interested in learning to draw, please send me a FREE copy of your Book, "Art for Pleasure and Profit."

Name Age.....
 Address
 City State.....
 (No salesman will call)

Crafts And Hobbies

[Continued from page 71]

hanging on the wall. Decorate if desired, then bend to shape.

Set a 7-inch length of 1/8-inch brass tubing on end in a sand box, pour full of molten lead and let cool. The bending of the tubing is done in a vise by letting the tubing down into a larger tube, and bending over sharply. This casing helps to hold the smaller tubing round as is illustrated in one of the photographs.

Cut the bottom of the tube open, split it in the center, spread out to make a seat for the candle saucer and drill a 7/16-inch hole in the center. Heat, and run the lead out of one side of the swing. Leave the other side full for balance then adjust the two ends of the swing in the lug holes on the base so that it will swing freely.

Cut out a disk of the sheet brass for the small saucer, and hammer into shape, using the riveting hammer to form a sharp corner at the bottom. Saw off a 1 1/2-inch length of 1 3/8-inch I. D. (inside diameter) brass tubing, hammer, and solder into the saucer for the cup.

Secure an adjustable candle socket and cut off enough of the slide to bring the piece down to 3 inches high over all. Set this in the cup and clamp down tight with a fixture bushing. Cut off enough of the bottom of the shell so that when it is fitted over the socket it will be of the same height.

Run the wires in through the hollow end of the tubing swing and attach wires to the socket. Wiring in this way does not interfere with the freedom of the swing. Screw in a flame bulb in the socket and the lamp is ready for service by plugging into any outlet.

The lamp may be polished and lacquered, or left in the natural antique brass finish which has been brought out in the process of annealing the pieces.

The dimensions in the details must be followed strictly. A taller candle socket, a heavier light bulb, or a shallower swing will throw the piece off balance so that it will not swing upright.

A Revolving Magazine Rack

[Continued from page 91]

shown in Fig. 5. Place a board over the copper when pounding to prevent hammer marks. Fasten copper in place with short escutcheon pins spaced about two inches apart. To facilitate mounting, punch all escutcheon pin holes in the copper before placing it on the box. It is well to polish the strips with steel wool or metal polish and apply a coat of clear lacquer to prevent tarnishing.

Although a hurricane may be blowing 200 miles an hour, there is a calm area in the center, usually about ten miles across.

The New Simplified 40 Volt Arc Welding



Earns \$150 to \$300 Extra Profit Monthly Pays for itself

... WITHOUT COST TO YOU
Hobart pays its own way out of profits in a short time, without a cent of cost to you. The Hobart payment plan is the most liberal offer ever made.

START BIG PAYING BUSINESS
"Simplified" 40 VOLT ARC WELDING

New low prices on modern 40 Volt "Simplified" Arc Welders make this big pay business available to shops that never before could afford it. It opens the doors to the bigger profit jobs. The new Hobart is easier to operate, much faster. This is today's opportunity. Don't miss it.

Build Your Own
Portable Welder with Hobart Generator unit and auto engine or chassis. Lets you operate any place, especially on the profitable outside jobs. Easily saves you \$300 to \$500.

Portable Electric
New low cost on small sizes as well as large. The most profitable arc welder your shop can own. Welds faster, better, easier, saves current.

Easy to Operate
Hobart Welders have "Simplified" operation. This means faster welding—with the right current for every job. Hobart is simplified, so any of your men can weld easily and successfully. The mystery and uncertainty of obtaining correct welding current settings are removed.

60% Extra Capacity
Over old style 25 Volt Welders—necessary for welding with the new coated rods. Automatic reaction lets you handle light welding work without losing the arc. Users don't understand how they got along with the old style welders after using this new Hobart.

Remote Control
at no extra cost with Hobart. Think of being able to control your welder from any working point. Saves time, temper, and eliminates the need for a helper on overhead or concealed work.

"Pays-For-Itself" Terms
Extra earnings and savings make it easy for you to own a Hobart without expense to you. You can even rent a new Hobart—and later purchase it without loss of rent. Check Rental Purchase Plan.

GET THIS VALUABLE MANUAL
Sent Free if you will tell us the welder you plan doing.

30 DAYS TRIAL at Our Risk
Mail Coupon for further Details

HOBART BROS.,
Box FM181, Troy, Ohio

Tell me more about—
() Building My Own Portable () Complete Gas Welder () Engine Drive Welder () Electric Drive Welder () 30 Days' Trial—Easy Terms
() Rental Plan Privilege of Purchase
() Send FREE Manual on Welding. Attached letter tells about the work we want to do.

Name.....
Address.....
Interested in 30 DAYS' TRIAL EASY TERMS

HOBART ONE OF THE WORLD'S LARGEST BUILDERS OF ARC WELDERS

FUN and PROFIT

CRAFTSMAN OUTFITS

Get these fascinating big sets. Learn skilled craft work. Make money selling finished products.

• HAMMERED BRASS
Plywood plaques and non-tarnishable jeweler's metals, with patterns, hammer, tools, full equipment for "raised metal work." Complete set making Pair of Bookends and 5 Plaques, \$2.00.

• SOLDIER CASTING
Large 3 figure mould, clamps, handles, supply of lead, paints, brushes, electric ladle for making any number of big lead soldiers. Complete \$2.00.
At your dealers' or send money order to

RAPAPORT BROS.
717 W. OHIO ST., CHICAGO

FREE 40 PAGE BOOK

MICKEY MOUSE OSWALD RABBIT DONALD DUCK

and other library subjects

8MM ——— 16MM

Send for Complete Catalog

HOLLYWOOD FILM ENTERPRISES, INC.
6060 Sunset Blvd.
Hollywood, Calif.

REAL JOBS OPEN

Auto, Diesel, Aviation Mechanics—Body, Fender repair, Painting, Welding. Learn with a few weeks practical training. Write for FREE BOOK, low tuition rate, and course interested in.

McSWEENEY SCHOOLS, Dept. 11-49
Detroit, Mich., or Kansas City, Mo.



Want to be an EXPERT PHOTOGRAPHER?

Write for booklet about N.Y.I. method of individual training. Commercial, News, Portrait, Advertising, Candid and Motion Picture photography. Big money-making opportunities! Fascinating hobby. Personal Attendance and Home Study courses. 28th year.

New York Institute of Photography
10 West 33 St., (Dept. 153) New York City



ELECTRICAL KIT ONLY \$1.69

Fun! Educational! Build your own welding arc! Weld iron, brass, bluet glass, metal. Make arc light, 1-mile range. Arc furnace. Ultra violet sun-tan rays. Dozens of other interesting experiments. Works from house light current. (List \$4.75.) Yours now for only \$1.69. ORDER TODAY!

COMPLETE with carbons, resistor compensator, cord, plug, special goggles, Instruction Book, etc.

ELECTRICAL SALVAGE CO., Lincoln, Nebr.

Box 524-L

Automobile Racing Book (Fourth Edition)

Nine chapters, 66 illustrations of dirt, midjet, and championship cars and drivers. How to build cars and bodies; 14 plates working drawings. Ford V-8 front drive racer illustrated and described. Book answers questions on speeding up cars, balance, speed revs., rules, specifications, track records, etc. Postpaid \$1.00; C. O. D. \$1.15. Order NOW!



RAY F. KUNS, Dept. AA-1
Madisonville, Cincinnati, Ohio

FREE! LABORATORY APPARATUS BIOLOGICAL SUPPLIES MICROSCOPES TELESCOPES CHEMICALS

New complete 32 page catalog lists hundreds of items of interest to amateur and professional experimenters. Save Money—Buy Direct. Send now! It's FREE and crammed full of bargains and valuable information.

J. H. WINN MFG. CO., Dept. 201, 124 W. 23d St., New York



MAKE MORE MONEY

GET AHEAD FASTER!



“Take advantage of this free offer. Send the coupon right now. I got a big raise—just while trying out a Royal. I sent my ideas in to the boss—typed.”

START NOW!



Own a ROYAL PORTABLE ON YOUR OWN TERMS!

You've ideas—ideas that are worth real money to you. Don't waste them . . . Present them *right* to the *right* people—worked out in your spare time—*typewritten*. Easy! Even if you've never thought of typing—if you own a *Royal Portable*! For Royals are scientifically designed for *everyone* to use. With full-sized standard keyboard and such genuine office typewriter features as Royal's famous Touch Control, Finger Comfort Keys, Complete Dust Protection and many others to make writing easier!

Only a few cents a day

Get the facts! Try the Royal Portable in your own home *free*! And remember you can own a Royal on your own terms . . . cash, or only a few cents a day.

FREE! Carrying Case and Instant Typing Chart



Handsomeness triple-purpose convertible Carrying Case; also a *free* Instant Typing Chart. Latest invention—it shows you, at a glance, how to type *right*.

ROYAL TYPEWRITER COMPANY Inc.
Dept. A-71, 2 Park Avenue, New York City, N. Y.

Please tell me how I can own—for only a few cents a day—a latest model, factory-new Royal Portable—complete with *free* Carrying Case and Instant Typing Chart.

Name _____

Street _____

City _____ State _____

I already own a _____ Typewriter.

Serial No. _____ Tell me how much you will allow on it as CASH payment on a new Royal Portable.



Know Electricity as Experts Know It—and Get an Expert's Pay!

Recovery has begun! The months ahead are charged with significance and expectation. What will you do to get the jump on the other fellow?

Thousands of men have used

The Croft Library of Practical Electricity

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 50,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems, electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' Free Examination. We take all the risk—you assume no obligation. If you decide to keep the books, send \$1.50 in ten days and the balance at the rate of \$2.00 a month. Send the coupon NOW and see the books for yourself.

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., 330 W. 42nd St., New York
Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the price of \$19.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name _____
Home Address _____
City and State _____
Position _____
Name of Company _____ MMX-1-38

EASY

SOPRANI AMPLIPHONIC Simplifies Playing

● Lighter, easier to play, less bellowsing, plus more beautiful tone and volume,—that's how Soprani's exclusive Ampliphonic feature has simplified this accordion. Assures rapid progress. Home trial. Easy terms. See your music dealer or send for beautiful free book. Write today.



SOPRANI, INC. Dept. 134, 630 S. Wabash Ave. Chicago, Illinois



Learn Public Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence, and increase their earning power, through ability to sway others by effective speech. Write for free booklet, *How to Work Wonders With Words* and requirements.
NORTH AMERICAN INSTITUTE, Dept. 2051
3601 Michigan Avenue Chicago, Illinois

RADIO

ENGINEERING, broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly. Engineering course of nine months' duration, equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free.
DODGE'S INSTITUTE, Fern Street, Valparaiso, Indiana

EARN MONEY Make Wind Electric Plants

WE SHOW YOU HOW! Simplified plans generator light buildings, play radio, operate washing machine and other motors. Sell friends and neighbors. Dime brings complete plans, and valuable parts catalog.

LEJAY MFG. CO.
414 LeJay Bldg. Minneapolis, Minn.

NEW ^{ELECTRIC} "POWERED SCOOTER" \$69.50 and up

Goes 5 miles for 1c. No gasoline, oil, noise, or bother to start! Instant action—anyone can ride it—even a 6 year old child the **FIRST TRIAL**. 100 speeds—perfect control—brakes, lights, horn etc. **PLENTY OF POWER!** Hi-speed model goes 35 m.p.h.—any speed available! Entirely self-contained power unit and charger. Simply plug into light socket (patented). Unusual range—Heavy duty tires and spring frame give smoothest ride! **ULTRA STREAMLINED**—available with air/o parcel carrier. Write for literature on complete line including gas models. **EXCLUSIVE DEALERS WANTED.**
MIDGET MOTORS CORP. Dept. M-1 Kearney, Nebr.



SAVE UP TO 70% ON FUEL COSTS!

Convert your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 5.
HARRINGTON COMPANY
201-204 Manchester Bldg. Portland, Oregon

I'M READY TO USE... INSTANTLY

LEPAGE'S strength LIQUID GLUE

You get the same uniform strength in bottle, tube or can of LePage's—standard throughout the world.
The economical fixer.

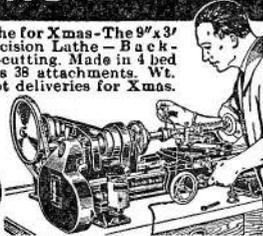
AN IDEAL GIFT FOR XMAS 9-INCH WORKSHOP SOUTH BEND LATHE

New Low Terms
ONLY \$6²⁰
A MONTH
Ask for FREE Catalog

Give him a lathe for Xmas—The 9" x 3' Workshop Precision Lathe—Back-Gear, screw-cutting. Made in 4 bed lengths. Takes 38 attachments. Wt. 320 lbs. Prompt deliveries for Xmas.

Write for Catalog
15-Y

\$90
LESS MOTOR
DRIVE



SOUTH BEND LATHE WORKS
255 E. MADISON ST., SOUTH BEND, IND., U. S. A.



GET HEP TO FUN!

Don't be lonely! Make 1938 your big fun year. Pal with right guys. Join your local motorcycle club. Go places and do things with the bunch! See your Harley-Davidson dealer—he'll tell you how to join. Send for full particulars of the new 1938 models. HARLEY-DAVIDSON MOTOR CO., Dept. MM, Milwaukee, Wis.

HARLEY-DAVIDSON
Motorcycles

Press Cards

For the Free Lance Reporter or Photographer.....25c
An indispensable aid for writing that story, or shooting those pix.
We are in the market for interesting photographs . . . Send stamped envelope for information.

GENERAL NEWS

Box 25 Dept. K West Farms Station, N. Y.

EARN EXTRA MONEY MOUNT BIRDS & ANIMALS FOR PLEASURE & PROFIT

Send Today for FREE BOOK chock full of items and fully illustrated showing a complete Line of GLASS EYES—FURRIERS and TAXIDERMISTS SUPPLIES.
LEARN TAXIDERMISTRY THE SCHOEPPER METHOD—Complete course, best method known—EASY—SIMPLE. Get into this rapidly growing business. Write today. Send 50c and pay postman balance on arrival. Price \$1. G. SCHOEPPER, 134 West 32nd St. (Dept. M-1) New York City

PANDICULATE FOR HEALTH

BE WELL,
STRONG,
YOUTHFUL



Enjoy the vigor that comes from relieving pressure on spinal nerves. 15 glorious minutes on Pandiculator gives pep like full gymnasium workout. Hundreds of hospitals, sanitariums and doctors use this great spinal corrective appliance. Send for FREE PANDICULATOR CO. 416 Newman Stern Bldg., Cleveland, O.

CANDID BARGAINS
NEW and USED
CAMERAS
AND ACCESSORIES
Write To DAY

BRING YOUR PHOTOGRAPHIC EQUIPMENT UP-TO-DATE .-. ECONOMICALLY

What do you need? Tell us what you have in detail, we will write and quote you our special prices. A complete Stock of Cameras, Projectors, Enlargers, Accessories and Dark Room Supplies at Attractive Prices.

NEW YORK CAMERA EXCHANGE

109 FULTON ST. (Dept. M-1) NEW YORK

CAMERA EXCHANGE ORIGINATORS

SINCE 1890

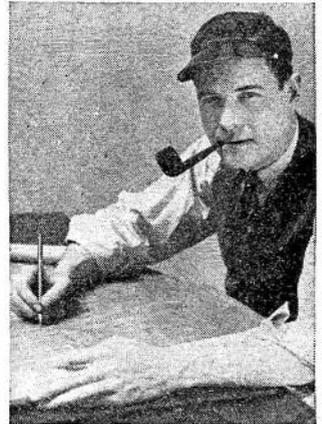
Here I Am At WORK Making GOOD MONEY

Free TRIAL LESSON in DRAFTING

Yes, this free lesson proved that drafting is easy, mighty interesting work . . . proved beyond a doubt that Drafting by the fascinating

C. T. C. method can be mastered easily AT HOME in SPARE TIME.

So I enrolled. Today I know my job is secure. For draftsmen are always needed in construction, manufacturing and industry . . . and in those new Diesel and Air Conditioning plants. Draftsmen can't be replaced with machines! Mail the coupon TODAY for FREE TRIAL LESSON. Drafting will take care of you TOMORROW.



YOU GET THIS COMPLETE DRAWING OUTFIT

without a penny extra. These are quality instruments—the kind that professional draftsmen use. With them you can put your ideas on paper quickly and with accuracy. With this outfit and C. T. C. training, you're all set to master draftsmanship in months—not years—at home, and you can use these very same instruments some day soon in a good paying job as Draftsman.

LEARN AT HOME IN SPARE TIME

A few hours of pleasant home study every week—that's all! No interference with your present job. You train yourself step by step. This tested method—developed over 35 years of C. T. C. progress—will fit you for a job in months—a job we'll help you get.

Get this: Terms are low. You can't honestly say, "I can't afford it." There isn't a reason why you shouldn't mail us the coupon today. When you get your FREE TRIAL LESSON, you'll say, "I never knew learning could be so easy and enjoyable."



CHICAGO TECHNICAL COLLEGE

A263 Tech Bldg., 118 E. 26th Street, Chicago, Illinois
Please send me FREE Trial Lesson in DRAFTING and show me how I can prepare for a good position in spare time AT HOME.

Name..... Age.....
Address.....
P. O. State.....

Classified Advertisements

Rate for classified ads, 18c per word (include name, address and all numbers), per insertion. Minimum 10 words. Cash must accompany order and be received in this office December 1st for the February issue (on sale December 28th). Address Classified Mgr., Modern Mechanix Hobbies & Inventions, 1501 Broadway, New York City.

A. C. GENERATOR

PRACTICAL changes for automobile generators. See our advertisement at bottom of page 32. Autopower.

ADVERTISING AGENCIES

ADVERTISE: Get mail-order business, agents. Free assistance. Free Ad-Guide of newspaper, magazine, circulations, rates, mailing-lists. Chicago Advertising Agency, 22 West Jackson, Chicago.

ADVERTISE: 24 words in 250 newspapers \$10. Lists Free. Advertising Service Bureau, 4515-B Cottage Grove, Chicago.

24 WORDS 40 newspapers \$2.00. Goodall Advertising Agency, 742 Market Street, San Francisco.

FREE NEW advertisers rate guide. Brown Advertising Agency, 140 South Dearborn, Chicago.

AGENTS WANTED

AGENTS: Smash go prices! Santos Coffee 12c lb. 4-oz. Vanilla 8½c. Razor Blades 10 for 8½c. 100 Sticks Chewing Gum 12c. 150 other bargains. Premiums. Experience Unnecessary. Carnation Co., MN, St. Louis, Mo.

I'LL GIVE YOU groceries at wholesale besides splendid opportunity to make up to \$45.00 in a week. Brand new Ford Sedan given as bonus. Details free. Albert Mills, 8826 Monmouth, Cincinnati, Ohio.

SELL New and Used Clothing! Over 100% profit. Selling experience unnecessary. We start you furnishing everything. Catalogue free. Acme Merchandise, AD-1219 So. Jefferson, Chicago.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory. Chemists, CE-1142 Sunnyside, Chicago.

GOLD Reflecting Window Sign Letters. Penny Each. Large Sizes. Easily Applied. New Styles. Absolutely Beautiful. Free Samples. Atlas Sign Works, 7941G Halsted, Chicago, Ill.

LARGE Profits in your own business. Sell new and used clothing, bankrupt stock. Experience unnecessary. Everything furnished. Details free. Publix, 558-FS Roosevelt, Chicago.

MAGIC Clothes Brush. Revolutionary invention. "Erases" dirt like magic. Saves drycleaning. Sensational seller. Samples sent on trial. Rush name. Kristee, 128, Akron, Ohio.

1000 BARGAINS. Drygoods, Notions, Drug Sundries, Specialties, Novelties. Agents under-sell stores. Free catalog. Jobbers, Dept. 2598A, 930 W. Roosevelt, Chicago.

BIG Money Applying Initials on Automobiles; \$1.45 profit on each sale. Write for particulars and free samples. American Monogram Co., Dept. 11, Dunellen, New Jersey.

BUSINESS Proposition Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 850, Marion, Indiana.

CASH IN with Rotex Embossing Ink. Novelty Xmas repeat item. Sample, details, Free. Rotex, 257mm North Washington, Tiffin, Ohio.

SIGN Letters for Store and Office Windows; 500% profit. Free Samples. Metallic Co., 448 N. Clark, Chicago.

AFTERNOONS Free! \$340 no-home! No canvassing. Expect surprise! Folio-T, Sta. D. Los Angeles.

MEXICAN Curios, Novelties. Free Samples. Marquez, Apartado 1176-M, Mexico City.

AIR CONDITIONING

BUILD Your Own Air-Conditioning Outfit This Winter! Make your own "mountain air"—for Home, Store, Office or Workshop! Live in new world of year-around health and pep! Parts and materials picked up at small cost. Complete, Diagrammed Directions, Blueprints, make construction simple and easy. Worth full cost, educationally alone—offers good income opportunity. Written Money-Back Guarantee. Send \$1.00 (or pay Postman \$1.15). Servatex Company, 870-MM Madison Building, Milwaukee, Wisconsin.

AUTOMOBILES

ECONOMY! Performance! Mileage! Semi-diesel conversions for gasoline motors, \$5.00 up. Manufacturer's written guarantee. Learn basic facts from free literature. Houston & Logan Conversions, 1719 Addison, Berkeley, California.

AVIATION

GET INTO AVIATION. Air transport pilots get up to \$7,000 per year; mechanics, \$2,500. Learn at this Government approved school. Write for complete information. State age. Lincoln Flying School, 4002 Aircraft Bldg., Lincoln, Nebr.

AEROPLANES. New Production, \$98.00. Easy payments. Propellers for aeroplanes, boats, sleds, wind-driven generators, \$2.50 up. Send 25c for more information. Universal Aircraft Co., Fort Worth, Texas.

SUCCEED in Aviation. Learn blue print reading and sheet-metal layout. Home study. Low cost. Free placement. Craft School, Box 687, Santa Monica, California.

INEXPERIENCED workers, apply for aviation jobs now. Full salary while learning. Details for stamp. Airpymment, Box 553, West Los Angeles, California.

AIRPLANES \$50 Up. Terms. Trades. Motors, crackups, salvage. Complete directory 25c. Used Aircraft Directory, Athens, Ohio.

AMBITIOUS Young Men interested in entering Aviation as Apprentices, see ad on page 22.

BLUEPRINTS

METAL TUBE Midget Radio, the last word in compact radio receivers. You can construct this set even though your knowledge of radio is limited by following the large pictorial blueprints available, from Modern Mechanix Publ. Co., Greenwich, Conn., at 50c postpaid.

BOATS

ICEBOAT parts \$24.75. Skate sails \$7 up. Try-Sail Company, Patterson, New York.

BOOKS & PERIODICALS

SPORTSMEN'S MANUAL—The outdoors man's guide containing scores of practical articles by America's leading outdoor writers, covering every phase of fishing, hunting, camping, and trapping. This book, edited by Robert Page Lincoln, will make that next vacation a dozen times more enjoyable. Price 50c at your newsstand, or order directly from Modern Mechanix Publishing Co., Fawcett Bldg., Greenwich, Conn.

MONEY Making Ideas of successful business men compiled in 2 volumes. Complete \$1. Neopolitan Publishers, Velva, N. Dakota.

RARE Antique Books. History, travel, religion. Many two hundred years old. Ten cents stamps for list, Friday A. Sreator, Illinois.

SCRAPBOOKS of Famous People, 101 pictures in each 25¢. Dan Freeson, Box 173, Kingsburg, Calif.

BOOKS That Pay. Descriptive literature free. Julius, Amarillo 17, Texas.

BUSINESS OPPORTUNITIES

PLASTEX Industry needs manufacturers on small scale and for big production of X-mas Tree Ornaments, Art Goods and Novelties in Plastex and Marble imitation. Cheaply and easily made in our guaranteed rubber moulds. We cooperate in selling goods. You are just in time for big Christmas season now starting. Interesting booklet mailed Free. Plastex Industries, Dept. R, 1085 Washington Ave., New York.

FASCINATING business. Repair, adjust typewriters, adding machines. Learn easily at home from factory expert. Earn up to \$15.00 daily. Complete instructions covering all makes \$3.00 postpaid or sent C.O.D. Adding Machine Equipment Service, 3601 Michigan, Dept. 2041, Chicago.

WE START you in business, furnishing Outfits and Instructions, operating "Specialty Candy Factory" home. Men and women, earn \$25.00 up to \$60.00 weekly, all or spare time. (Our 29th year.) Booklet Free. W. Hillyer Ragsdale, Inc., Drawer 110, East Orange, N. J.

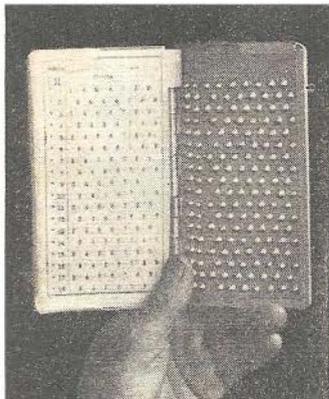
OPPORTUNITY for man to get into something for himself—be own boss. No soliciting. Start with as little as \$75.00—a tried and proven money-maker. No previous experience required. Write H. H. Wing, Box R, Central Station, Toledo, Ohio.

MAN in Each Town to Plate Auto Parts, Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you in Good Paying Business. Free particulars and proofs. Gunmetal Co., Ave. A, Decatur, Illinois.

MUSHROOMS: Grown At Home with newly patented Tobacco Stem Spawm. Good market all year. Book, Pictures Free. Tells all about this profitable business. Write Home Growers Service, Box 62, Dept. G, West Chester, Penn.

COLOR Concrete Surface with chemical solutions. Beautiful pottery without moulds. Garden wishing wells. Glazing concrete. Sample 10c. Hollywood CementCraft, 8528 Wonderland, Hollywood, California.

Metal Scoreboard Aids Golfers



A new golf score device (above) consists of a hinged, dished case having pointed conical elevations stamped within. Each elevation coincides with, and is directly under, printed figures on a cardboard scorecard which is inserted in the case. Applying finger pressure over the required number on the scorecard results in a permanent puncture of the number, affording a means of quickly tallying the total score upon completion of the game.

FREE circulars describing hundreds of money-making opportunities by mail. Newest methods. Pleasant surprise. Write Now. Progress Publishing Company, 2513B N. 9th Street, Milwaukee, Wisconsin.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

LEARN Marbleizing; with snow-white composition imitates marble perfectly. Learn mold making. Equals rubber. No heat required. Free Samples. Cowell Institute, Grayling, Michigan.

AFTERNOONS free for outdoors, movies, \$340 month, home. Unique plan. No canvassing. Prepare for surprise. Folio-S, Station D, Los Angeles.

OPENING FOR representative—National Agricultural House. We teach you without cost. Send stamp. Box 373, Cedar Rapids, Iowa. Dept. A.

IF YOU have some spare room where you can do light work, see our offer on page 33. Metal Cast Products Co., 1696 Boston Road, New York City.

SUCCESS With Your Products. Make-Sell Them. Formulas. Processes. Accurate analyses. Catalog free. A. Thaxly Co., Washington, D. C.

DIME brings copy 52 page magazine. Profitable plans, tips, formulas, home work offers. "Buckeye Buzzer," 257mm North Washington, Tiffin, Ohio.

BUILD Your Own Oil Burner, Plans \$3.00, Plans and Parts Kit \$19.95. 20% with order. Burner Co., 7 East 73rd Street, Cincinnati, Ohio.

OPERATE a Collection Agency Business from home or office. Quickly learned. Big income. Write, Cole Associates, Syracuse, N. Y. ,

FREE LITERATURE describes hundreds plans for making money locally or by mail. Gilbert Supply, 1107-M Broadway, New York.

SEND for Free literature describing hundreds spare or full time money making plans. Thayer Company, Dept. M1, Gassaway, W. Va.

"SUCCESS Beacon" 52 pages! Money-making schemes, ideas, plans. Dime. Jay, Publishers, 6034-S Kenwood, Chicago.

AGENTS—To mail our literature. Good profits. Home business. M. Maywood, 149 Fifth Ave., New York.

START Home Business. Make \$20-\$100 weekly. Free Booklet tells how. Century, 1261-M Broadway, New York.

SELL by Mail! Books, Novelties! Bargains! Big profits! Particulars Free! H. Elfco, 438 North Wells, Chicago.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-N Service, Argyle, Wisconsin.

OPPORTUNITIES! Latest Money Makers! Write! Monogram, 24 Calendar, East Providence, R. I.

RECAST old Batteries into new. Latest achievements. Battery Laboratories, St. Paul, Minn.

WHERE TO BUY at lowest wholesale prices. Information free. Yorena, Box A-312, Bayonne, N. J.

HANDY MEN—Establish profitable Neighborhood "Fix-It" Shop. Stafford, Makanda, Illinois.

CAMERAS & PHOTO SUPPLIES

MAKE money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 2049, Chicago.

INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. A, 10 West 33rd St., New York.

MOVIE Films. Develop yourself. Guaranteed Instruction Course and formulas, \$1.00 complete. Sample chemicals 15c. Lake Camera Exchange, 202, Gary, Indiana.

DUPONT Superior Panchrographic 35 millimeter film, 25 ft. \$1.00. Optical Laboratories, Larchmont, N. Y.

CARNIVAL GAMES

AND Merry-Go-Rounds earn Big Money—Outfits supplied. Catalog 10c. "MooreMade," Lapeer, Mich.

CARTOONING & COMMERCIAL ART

ART Magazine. Helps you sketch human figure, paint, model, carve, cartoon, sell drawings, exhibit, form clubs. Regular 25c copy for 10c while samples last. Art Headquarters, 18 E. 48, New York City.

AMATEUR Cartoonists. Advertisers publish your work. We help you succeed without investment. Complete information 50c coin. Carey's Advertising Service, Weimar, Texas.

CHALK TALKS

LAUGH Producing Program, \$1.00. Catalog 10c. Balda Art Service, Dept. 65, Oshkosh, Wis.

CHARTERS

DELAWARE Charters: Complete incorporating and organizing service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

Compact Auto Heater Burns Gasoline



Entirely independent of the motor cooling system, the automobile heater shown above burns gasoline in a patented sealed metal chamber. The fuel is drawn in through a line tapped to the carburetor of the auto and, when mixed with air in a special venturi, burns as an extremely hot gas. The gas is ignited by turning on an electric heating element, which automatically shuts off in about 90 seconds.

CHEMISTRY

BLACK Light Experimental Kit (Argon U. V. Lamp, 5 fluorescent specimens) \$1.00. Radium Spintharoscope—\$2.00. Slide Rules, Standard Type, 5 scale, 8 inches—30c. All prices prepaid. Catalog 10c—free with order. Laboratory Specialties Co., 130 S. Wabash St., Wabash, Indiana.

CORRESPONDENCE COURSES

500,000 USED Technical and business books. Sold, rented, exchanged. All subjects. Satisfaction guaranteed. Cash paid for used books. Complete details and illustrated bargain catalog free. Send name. Nelson Co., 3225 Manhattan Bldg., Chicago.

DETECTIVES

DETECTIVES. Make Secret Investigations. Experience unnecessary. Detective Particulars free. Write, George Wagner, 2640-V Broadway, N. Y.

EDUCATIONAL & INSTRUCTION

MEN Wanted—Learn Tool & Die Making. Automatic Screw Mach. Machinist Trade. Big Demand. Actual Experience. Expert Supervision. Write for Free Book "M". Allied Screw Machine Co., Inc., School Div., 603-9 Lake St., Chicago.

WANTED Immediately, Men-Women, age 18-50, qualify for Government Positions. Commence \$105-\$175 month. Common education sufficient. Valuable information free. Write, Instruction Service, 234, St. Louis, Mo.

1938 GOVERNMENT Jobs. Start \$105-\$175 month. Dependable. Men-women. Prepare immediately for next examinations. List positions, Free. Write today. Franklin Institute, Dept. L59, Rochester, N. Y.

LEARN connecting light switches for house-wiring. 64 diagrams, \$1.00. Electric Maintenance Service, Box 7608, Kansas City, Mo.

Christmas Novelties Made of Cellophane



For trimming holiday gift packages and Christmas trees, these ready-made ornaments fashioned from drinking straws of "Cellophane" cellulose film give a colorful touch and are equipped with hooks for fastening. The tree illustrated has foliage of blue straws combined with bits of white slit film.

ELECTRICAL EXPERIMENTS

ELECTRICAL KIT, \$1.69! Make arc light mile range. Arc furnace. Melt glass, metal. Weld iron, brass. Sun-tan rays. Dozens others. Complete with goggles, instructions. Works from house light current. Electrical Salvage Co., Box 524-L, Lincoln, Neb.

ELECTRICAL SUPPLIES

HUNDREDS of new, unusual, hard-to-get electrical items, replacement parts and supplies. Send for free wholesale Catalog. Autopower, 412 South Hoyne Ave., Chicago.

EMPLOYMENT SERVICE

EMPLOYMENT Guidance. Booklet. Successful Job Hunting. 25c coin. Employment Counsellors, Box 1283B, Milwaukee, Wisconsin.

ENGINES, MOTORS, ETC.

WINDING Data, 225 motors, single and three phase. Price \$1.00. Motor Data Service, Box 7631, Kansas City, Mo.

FOR INVENTORS

PATENT YOUR IDEA. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-seven years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 42-A Victor Building, Washington, D. C.

INVENTORS—Time counts in applying for patents. Don't risk delay in patenting your invention. Send sketch or model for instructions or write for new 48-page Free booklet "Patent Guide for the Inventor". No charge for preliminary information. Prompt, careful, efficient service. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 28-P Adams Building, Washington, D. C.

BUYERS located saleable patented, unpatented inventions. If will sell, reply immediately. No triflers. Booklet on request. Positive results. Invention Reporter, 11236 S. Fairfield, Chicago.

WE SUCCESSFULLY SELL inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney. L. F. Randolph, Dept. 341, Washington, D. C.

INVENTORS—We will make your model or special-machinery. Free estimates. Box 328, Ottawa, Canada.

FORMULAS, PLANS, ETC.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

SUCCEED With Your Products. Make-Sell Them. Formulas. Processes. Accurate analyses. Catalog free. A. Thaxly Co., Washington, D. C.

CONSULTATION, Analysis, Chemical Supplies, Formulas. Master's Degree. AlChem Laboratory, Box 72, Bloomington, Illinois.

FORMULAS—Latest money makers. Literature free. D-Belfort, 4042 N. Keeler, Chicago.

3000 MONEY Making Formulas. \$1.00 Postpaid. Davis, 504 San Antonio, Austin, Texas.

FORMULAS—All kinds. Guaranteed. Catalog Free. Kemico, 67, Parkridge, Illinois.

HOME CRAFTSMEN

6 FULL-SIZED lawn ornament patterns 10¢. 6 full-sized silhouette patterns 10¢. 7 full-sized novelty patterns 10¢. Modern Woodcraft, Saginaw, Michigan.

HYPNOTISM

HYPNOTISM. Complete 20 Method Course 25c. Lonk Institute Hypnotism, D-1313, Palatine, Illinois.

INVENTIONS

APC Patenting Plan: Saves all patenting expense except first government fee. Maximum protection. Booklet free. American Patents Corporation, Dept. 5-E, Washington, D. C.

INVENTIONS—Patented, Unpatented. Bought outright, royalty. Write Arellano-Power Company, 1 North La Salle St., Chicago, Illinois.

INVENTIONS WANTED

SELL Your Invention, patented, unpatented, quickly, satisfactorily. Copyrighted free book tells how. Write Invention Reporter, Dept. 36, 11236 So. Fairfield, Chicago.

SMALL inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. S. Hull, L-7829 Euclid Avenue, Cleveland, Ohio.

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

MACHINERY, TOOLS AND SUPPLIES

FREE—Bargain Catalog, handy electrical tools, drills, motors, machinery, accessories; for mechanics, craftsmen. Paramount Products, 245B Broadway, New York.

DRILL Press, Gear Feed, From connecting rods. No lathe work. Instructions \$1.00. Mitkos, 8802 Case Drive, St. Louis, Mo.

Tiny Christmas Tree Brightens Home

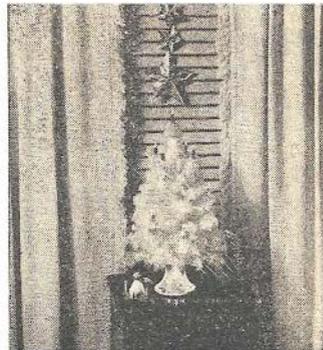


Table-size Christmas trees made of slit "Cellophane" cellulose film give the effect of burning candles, the light passing through glass tubes from an electric bulb in the wooden base. The trees, which come also with miniature bulbs, are in white and vivid colors with contrasting decorations.

MAGIC TRICKS & NOVELTIES

BE A MAGICIAN. Large professional magic catalog of latest tricks—25c. Cash paid for complete Tarbell Magic Courses. Write Ireland Magic Factory, 109 N. Dearborn, Chicago.

WE SUPPLY every noted magician. Large Professional catalog 25c. Holden, 222 West 42nd St., New York.

LEARN To Entertain With Magic. Catalog 10c coin. Gem, D-14, Wollaston, Mass.

MALE HELP WANTED

LOCAL AGENTS Wanted to Wear and demonstrate Free Suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples Free. H. J. Graves, Pres., 1300 Harrison, Dept. A-819, Chicago.

MALE—INSTRUCTION

DETECTIVES. Work home or travel. Experience unnecessary. Write, American Detective Institute, 2640-T Broadway, N. Y.

MIDGET AUTOMOBILES

BUILD a Midget Miller Racer. Complete plans for constructing this authentic midget automobile appear in the new 1938 edition of How-To-Build-It along with many other interesting home and workshop plans. Send 50c for this 148-page book to Modern Mechanix Publ. Co., Greenwich, Conn.

MISCELLANEOUS

BURGLAR Alarms equipment and supplies. Ideal Alarm Co., Danville, Ill.

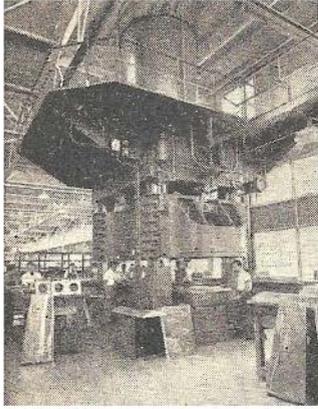
MODEL ENGINES

LOCOMOTIVE Electric. Steam. Gas engines. Castings. Supplies. 25c Latest Catalogue. Usual refund. Emco, J-2417 N. Ashland, Chicago.

MODEL RAILROADING

BUILD a Model Railroad in 00 gauge (3/4 inch between rails). A complete catalogue of parts, construction kits, and completed units, One Dime. Nason Railways, P. O. Box 9, Mt. Vernon, N. Y., Dept. 1X.

Aircraft Plant Uses Huge Hydraulic Press



Featuring a pressure capacity of 5,000 tons, the world's largest self-contained hydraulic press (above) has been installed at the Douglas Aircraft plant in Santa Monica, Calif. The gigantic press is said to accomplish several thousand production operations in the shaping and forming of special parts that are used in building Douglas planes.

MODEL Railroad Supplies "O" Gauge ($\frac{1}{8}$ " scale— $1\frac{1}{2}$ " between rails) Freight Car Body Kits \$1.00, Illustrated Catalog 10c. Westbrook Co., Hasbrouck Heights, New Jersey.

BUILD a Model Railroad! Send 10c for new 24 page 1938 catalog. Railroad Models, kits, track, signals. Model Railroad Shop, Dept. MM, Dunellen, New Jersey.

MODELS & MODEL SUPPLIES

YOUR Ideas developed into practical working model. 30 years successful experience; thousands satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32 page book "Making Inventions Pay." Crescent Tool Company, Dept. T. Cincinnati, Ohio.

ENGINE Catalog 20c. Particulars free. Evraymesco, 28 N. Clinton, Chicago.

MOTION PICTURE & SOUND EQUIPMENT

LEARN Motion Picture Theatre Business. Home-Study Training: Management, Advertising, Projection. Free Catalog, Theatre Institute, 345 Washington St., Elmira, N. Y.

16-35 M.M. Silent Films. Bargain list 3c. Bedner, 5300 S. Talman, Chicago.

MOTORCYCLES

RECONDITIONED Motorcycles. New—used parts for all makes. Authorized Harley-Davidson Dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

SEND 15c for illustrated used Motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

OFFICE EQUIPMENT

TYPEWRITERS, multigraphs, addressing machines, adders, dictaphones, duplicators, sealers, folders. Save half, write Pruitt, 553 Pruitt Bldg., Chicago.

OLD GOLD WANTED

CASH for old gold, teeth, watches, jewelry. 100% full cash value mailed day shipment received. Satisfaction guaranteed or articles cheerfully returned. Information free, or ship today. Chicago Gold Smelting Company, 300-C Champlain Bldg., Chicago.

OLD MONEY WANTED

\$5.00 to \$500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 18, Le Roy, N. Y.

OUTBOARD MOTORS

BUILD electric outboard motor from automobile generator. Operates with car battery. Complete plans and catalog 10c. LeJay Mfg., 514 Lake, Minneapolis, Minn.

PATENT ATTORNEYS

PATENT YOUR IDEA. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-seven years' experience. Avoid risk of delay. Address Victor J. Evans & Co., Registered Patent Attorneys, 41-A, Victor Building, Washington, D. C.

INVENTORS—Time counts in applying for patents. Don't risk delay in patenting your invention. Send sketch or model for instructions or write for new 48-page Free booklet "Patent Guide for the Inventor". No charge for preliminary information. Prompt, careful, efficient service. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 28-P Adams Building, Washington, D. C.

PATENT Your Invention with this responsible firm of Registered Patent Attorneys. Deferred payment plan. Over 62 years' experience. Write for two free books and "Certification of Invention." C. A. Snow & Co., New Patents Division, Snow Building, Washington, D. C.

"**INVENTOR'S** Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention". Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

HAVE YOU a sound, practical invention for sale, patented or unpatented. If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

PATENTS

INVENTORS—Time counts in applying for patents. Don't risk delay in patenting your invention. Send sketch or model for instructions or write for new 48-page Free booklet "Patent Guide for the Inventor". No charge for preliminary information. Prompt, careful, efficient service. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 28-P Adams Building, Washington, D. C.

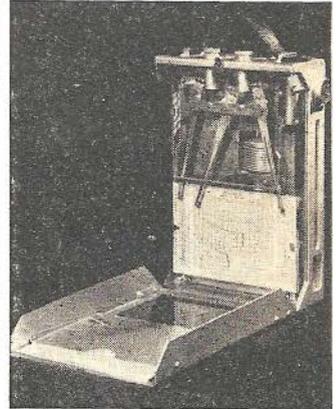
PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

GET Your Own Patents. Legal blanks, complete instructions \$1. Cudding Sons, Campbell, California.

PATENTS WANTED

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

Planes Carry Flight Analyzer Devices



Flight analyzer devices that provide constant automatic records of such flight conditions as altitude, rate of climb and descent, use of automatic (gyro) pilots, smoothness of air conditions, and other important features of the performance of an airplane have been installed on each of United Air Lines fleet of 60 transport planes. The analyzers are each housed in compact duraluminum containers as shown in above photo.

PERSONAL

SHOOTING High in this Game of Life? Interested in Greater Personal Power? Write today! Johnston, 257-F North Washington, Tiffin, Ohio.

PHOTO DEVELOPING

FINER Finishing. Rolls developed and printed, with One Colored enlargement, or two professional enlargements. All for 25c (coin). Genuine, Nationally Known, Moentone Superior Quality. Moen Photo Service, La Crosse, Wis.

AT LAST! All your prints in natural color. Amazingly beautiful. Roll developed, 8 natural color prints, 25c. Reprints, 3c. Fast service. Natural Color Photo, C-39, Janesville, Wis.

35MM MINIATURE Film, 36 exposure, expertly developed fine grain, $3\frac{1}{2} \times 5$ prints, 1 5x7 enlargement, only \$2. Richard McMurtry, Carthage, Mo.

ROLLS DEVELOPED—Two Beautiful Double Weight Professional Enlargements, 8 Never Fade Prints, 25c. Century Photo Service, LaCrosse, Wis.

ROLLS DEVELOPED—25c coin. Two 5x7 Double Weight Professional Enlargements, 8 gloss prints. Club Photo Service, LaCrosse, Wis.

I, ARJARGRAPH Reprints: Five (5x7 Enlargements) 25c. Cardinal Photo, Summit, N. J.

POULTRY

BIG MONEY in poultry this year. Read Poultry Tribune, the big monthly magazine that tells how leading poultry raisers make money. The only poultry magazine operating its own experimental farm. Five years \$1.00, one year trial 25c. Poultry Tribune, Dept. C-92, Mount Morris, Ill.

Milk Can Dome Makes Pouring Easier



Designed to make it easier to pour milk from large sealed cans, the milk can attachment shown above consists of a metal dome featuring a movable handle that operates in a slot in the dome. The handle actuates the punch that pierces the can, making it possible to pour the milk from the can through a small spout fitted in the dome.

PRINTING EQUIPMENT

6x9 PRESS, \$5.00. Bargain lists free. Novelty Shop, Downsville, Louisiana.

PRINTING, MIMEOGRAPHY

PRINT your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit, \$8.85; job presses, \$11 up. Details free. Kelsey Co., B-57, Meriden, Conn.

MIMEOGRAPHY: 1,000 copies, 300 words or less \$2.95. Superior Press, 829 No. 4th St., Shelboyan, Wis.

125 LETTERHEADS 8½x11 and 125 envelopes, \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

QUALITY Printing. Lowest Prices. Samples. Tucker Agency, Box 63, Indianapolis.

BUSINESS Cards, Tickets, 69c 1000. Canary Press, East Moline, Ill.

RADIOS & SUPPLIES

FARM-CITY radios \$7.95 complete. Save half. Agents free offer amazing prices windchargers, power plants, accessories. Marco, 1250 McGee, Kansas City, Mo.

NEWEST radio, electrical books, 20c to \$1.00. Amazing values. Catalog free. Electronic Publishing Co., Box 323-N, Lincoln, Nebr.

RADIO & TELEGRAPHY

RADIO BUILDERS' MANUAL—A book of radio set building plans and kinks for the home experimenter. Everything from a crystal set to a powerful 6-tube auto radio is included. Price 50 cents—order directly from Modern Mechanix Publishing Co., Fawcett Bldg., Greenwich, Conn.

RADIO Engineering, broadcasting, aviation and police radio, Servicing, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso, Ind.

SALESMEN WANTED

GOLD Reflecting Window Sign Letters. Penny Each. Large Sizes. Easily Applied. New Styles. Absolutely Beautiful. Free Samples. Atlas Sign Works, 7941G Halsted, Chicago, Ill.

TOOL Salesmen; sell new inexpensive electrical trouble shooter. Every repairman buys on demonstration. Many making \$75 weekly as side line. Factory, 2812 Gilham, Kansas City, Mo.

WANTED County Distributors. Excellent opportunity for earnings. Nationally advertised product. Large company. Dept. 252 Fyr-Fyter Company, Dayton, Ohio.

SELL grooved felt back changeable signs with double prong celluloid letters to all stores. Big commissions. T. Pricing Press, 124 White St., New York.

SPECTROSCOPES

SPECTROSCOPE with book of 120 experiments, \$2.50. Cudding Sons, Campbell, California.

TATTOOING SUPPLIES

TATTOOING Outfits, Supplies—Catalogue. Guaranteed Remover. "Waters," M-965 Putnam, Detroit.

TAXIDERMY SUPPLIES

TAXIDERMY—Send today for Free Catalog showing guaranteed taxidermy supplies. Glass Eyes, Shields, Panels, Head Forms, etc. Taxidermic Mfg. Co., Dept. 6-B, Memphis, Tenn.

TELESCOPES, MICROSCOPES, ETC.

TELESCOPES, Microscopes, Binoculars. Lowest prices. Optical catalog free. Brownson Company, 234 Fifth Avenue, New York.

TELESCOPES, Microscopes, Binoculars, Mineralogy, Chemistry. Catalog free. Teeko, Evanston, Illinois.

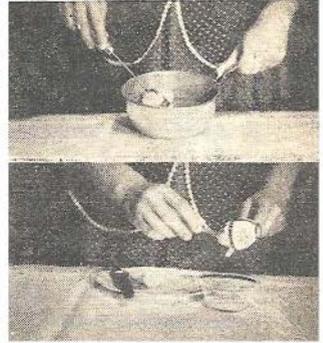
BUILD Reflecting telescopes; catalog free. Instructions 10c. Optical Laboratories, Larchmont, N. Y.

Vibrating Razor Is Wound Like Clock



Wound up like a clock, the non-electric vibrating razor shown above is said to produce a clean, quick shave. Any type of standard two-edged blade can be used, the razor head being easily detached for the insertion of new blades and for cleaning.

Egg Holder Prevents Burning of Fingers



A new egg holder enables the user to remove any size egg from boiling water without burning the fingers. Top photo shows the holder clamped over an egg in boiling water. Lower photo shows how the egg is held while the shell is broken and the contents easily removed.

VENTRILOQUISM

LEARN Ventriiloquist Art, Easy. Low cost. Free details. Apex, 221 E. 31, New York.

VIOLET RAY LAMP

ULTRA Violet-Infra Red. Dual Ray Health Lamp. Two separate units in one. Promotes Sun Tan—Vitamin "D." Automatic control. AC-DC current. \$3.90 Postpaid. Details Free. Beyer Mfg. Co., 4515-M Cottage Grove, Chicago.

WELDING

DODGE Arc-Welder. Build your own 40 volts, 25-200 amperes, direct current from old Northeast Dodge 12 volt automobile generators. 120 amperes from one generator, using ½ inch electrodes. 200 amperes, ⅜ electrodes from two generators, etc. Low cost and upkeep. Results guaranteed. Certified Instructive Plans \$1.00. COD. \$1.12. Air mail 12c extra. Welders Club of America, B-3432 Merchandise Mart, Chicago.

SOMETHING NEW—110 Volt Electric Brazing Torch. Produces a 3-inch flame similar to an acetylene welder. Requires no gas or upkeep. Ready to use at the turn of a switch. Will last for years. Complete with all accessories—\$12.50. Dept. C, Apollo Mfg. Co., 319 Union Ave., Memphis, Tennessee.

"MAKE Band Saw from old Auto Parts"; "How to make 15-100 ampere A. C. Arc Welder"; "How to build a real lathe". Complete drawings, plans, constructional details, 20c each. All three for 50c. Federal, Box 344, Dept. 23, Indianapolis, Ind.

WIND ELECTRIC PLANTS

BUILD wind light plant. We show you how. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 414 Lake, Minneapolis, Minn.

GENERATOR Propellers, expertly designed at factory prices. Universal Aircraft Co., Fort Worth, Texas.

Guardians Of The Sea

[Continued from page 50]

That this service is worthwhile is shown by the fact that not a single life or vessel has been lost because of bergs since the patrol started. The expense of this service is shared by the nations whose ships benefit by the work. Each country pays its part according to the number of vessels it has in the affected area.

To maintain the slogan "Always Ready," Coast Guardsmen undergo countless hours or rigorous training and drilling. Every day of the year, Coast Guard vessels are patrolling our coasts. Other vessels are in port prepared for tasks necessary to protect life and property afloat.

To get first-hand knowledge of how this important branch of the service goes about its daily routine, the writer obtained permission to accompany the Coast Guard Cutter *Champlain* on one of its regular patrols.

Measuring 250 feet long, with a forty-five foot beam and a sixteen-foot draft, the *Champlain* carried approximately 100 men, commanded by Lieutenant Philip A. Short. A five-inch gun is mounted forward and a similar gun is mounted aft. Two six-pounders also are mounted forward.

Usually stationed in the New York Division, the *Champlain*, each spring takes part in the International Ice Patrol.

Soon after the ship left the harbor, the "Call to Stations" order was given. Before going aboard ship we had wondered what kept officers and crew busy all day. The first afternoon out we found that we had not counted on the never-ending drills.

After "Call to Stations," the fire drill signal was sounded. In what seemed to be but an instant, streams of water fed by high-pressure pumps were shooting from several nozzles.

The signal for "Collision Drill" quickly followed. A large mat approximately eight feet square was brought out on deck to a point near where a hole was supposed to have resulted from a mythical collision. Ropes were fastened to each corner of the mat, and two of them were passed under the ship and up on deck at the other side. The mat was lowered quickly to a position necessary for covering the "hole."

Activity aboard ship is continuous throughout the twenty-four hours of the day, and therefore one does not recognize any marked distinction between the hours of daylight and darkness. Three

[Continued on page 153]

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordan, North Borneo, Malchukuo, Sudan, Macao, Iraq, Charkhari, French and British Colonies, including natives, beasts, ships, etc., all for 3c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87-Z (G. P. O.), Brooklyn, N. Y.

BHOPAL—India's Only Triangle! Beautiful, giant, bicolored; now obsolete! With Colossal Tru-Value Packet, including thirty attractive pictorials, Commemoratives, Airmails—10c, with Double Premium Approvals. Inquire regarding Free Airmail Collection. Tru-Value Stamps, Box M1412, Hartford (1), Connecticut.

STAMP CATALOGUE FREE—Special Gift Edition—Giant forty-page quarterly listing Albums, Supplies, Coronations, British Colonials, Canadians, United States, sets and Airmails. Illustrations galore! Empire Stampco., Dept. MM., Toronto, Canada.

LIBERIA Jubilee Set—Complete! Beautiful bicolored landscape commemoratives, cataloging 30c. Plus thirty attractive pictorials—10c with low-priced approvals. Economy stamps, Box M1543, Hartford (5), Connecticut.

UNITED STATES Approvals Only. Send post card for selection of U. S. Stamps on approval: 19th Century, Commemoratives, Air Mails, Revenues. John C. Daub, Dept. A, Wabash Bldg., Pittsburgh, Pa.

DIAMOND Airpost Commemorative Issue Complete, Proletariat Portraits Complete, Dragon Stamp, with 117 additional, cataloging \$3.00, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

LARGE Spanish ship stamp, Azerbaijan Camerons, Chad, Dahomey, Gabon, Ubang in packet of 57 stamps. All for 5 cts. with approvals. Swedell, 3129 Garfield Ave., Minneapolis, Minn.

THREE Costa Rica Diamond Mint Air Mail, 100 different foreign from many countries, one dime to applicants for our foreign approvals. Globe Packet, Westwood, New Jersey.

FREE—Rare Diamond Shaped Airmails provided you purchase at least 25c from our double premium approvals. Progress Stamp Service, Kirkland, Washington.

GIGANTIC Bhopal Triangle, Turks Caicos, \$5 U. S., Caymans, genuine Baden. Everything 3c with approvals. Viking, 1MM Hanson Place, Brooklyn, N. Y.

CORONATIONS—mint and used, including Tru-Value Packet—thirty attractive pictorials, including giant bicolored Liberia bird and animal new triangle—10c, with Double Premium Approvals. Inquire regarding Free Airmail Collection. Tru-Value Stamps, Box M1412, Hartford (2), Connecticut.

MONTHLY Stamp Magazine, 6 months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

UNITED STATES—45 different 10c. Free 25 different with approvals. Enclose 3c. Sidenburg, Baroda, Mich.

JUBILEES! 10 different used 10c. Specialty Import Service, 2308 Harvey, Berwyn, Ill.

FREE!!! Coronation Set. Postage 3c. Roberts, 9014 Fourth, Baycity, Michigan.

COINS

\$5.00 TO \$500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

COINS, Beadwork, Indian Relics, Minerals, Books, Curios, Stamps. Catalogue, 5c. Indian Museum, Northbranch, Kansas.

CALIFORNIA gold quarter size 27c. 3/4 size 53c. Large Illustrated Catalogue 10c. Norman Shultz, Salt Lake, Utah.

INDIAN CURIOS

INDIAN CURIOS. 100 good ancient Arrowheads \$3.00. Tomahawk Head 50c. Illustrated catalog 5c. H. Daniel, Hot Springs, Arkansas.

INDIAN RELICS

12 **ARROWHEAD, Spearhead, Wampum, Gempoint 99c—20,000 Bargains, Photolist 10c.** Museum, Rutland, Illinois.

ANTIQUE FIREARMS

BLUNDERBUSSES, Matchlocks, Flintlocks, Duelling Pistols. 87 Bargains. Photolist 10c. Museum, Rutland, Illinois.

Build A Model Ocean Airliner

[Continued from page 126]

them to the wing. These are made of bamboo strips of $\frac{7}{8}$ and $\frac{1}{16}$ inch lengths, respectively, cemented to the floats but not attached to the wing until the ship has been painted. Other details such as radio mast, directional radio loop, and aerial must not be put on the plane until it has been painted and ready for a coat of clear lacquer.

Once the cemented parts of the model have dried, and the air scoops have been glued beneath each cowling, proceed to paint the model. With the exception of the red bottom on the hull and the wing floats, the model is painted silver. After the first coat has been applied attach the wing floats in position. Several additional coats of paint are then applied, making certain that the ship has been sandpapered between coats. After applying the fourth coat, the windows, lettering and engine discs are cut from black paper and glued to the model. Builders will find that mucilage must be used in this operation as ambroid will dissolve the paint and ruin the finish.

Radio mast and directional loop are bent from soft wire. These and other details may now be placed on the model.

Control surfaces such as the ailerons and rudder are indicated by thin black lines. These may be drawn with India ink, using a ruling pen and a triangle as aids. India ink is also used when drawing in the engine cooling flaps on the cowlings.

After all the details have been added and the paint completely dry, finish the model with a coat of clear lacquer. Ready-made metal propellers are added to the ship with pins, and with the drying of the lacquer an authentic model of Britain's history-making sky liner will result.

Making Photographs In Color

[Continued from page 137]

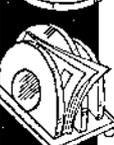
Dufaycolor is processed as follows: The film is first developed in a metol-hydroquinone formula supplied by the manufacturer. Then this developed film is bleached; exposed to light; developed again to reduce the remaining silver, and then it is fixed.

Prints can be made from both Kodachrome and Dufaycolor. The amateur can do it, but it is a long, complex process and full of difficulty. Furthermore, it is very expensive. Current prices for prints are about \$10 for a full color print 8 x 10 inches, and less, of course, for small sizes. It is a fact, however, that size lends a great deal to color. It is for this reason that the projected images are so beautiful. A small color print is not much more beautiful than a black and white—but an 8 x 10 gains depth tremendously and makes one very much dissatisfied with black and white photography.

Big Profits!

IN NEW PROFESSION

Start Earning At Home



No soliciting! No canvassing! We show you how to make big money decorating fast-selling Giftwares. We start you with the big \$10 Artist's Outfit shown above. We supply you with \$150 worth of Giftwares free of extra charge and show you how to dispose of them without leaving your home. We give you 29 Tested Plans for making money. One Fireside Member says, "I made \$100 on furniture in one week." Another writes, "My sales were \$500 for 5 weeks. This is my first year." R. M. P., of Ill., says, "I did \$3,500 worth of business last year and over \$12,000 this year." D. W., New Mexico, reports, "I would not take \$1000 for my Course."

No Experience Needed

You too may have a splendid income opportunity with Fireside. No tiresome study. No learn by doing. No artistic ability necessary. Our easy 3-Step Method makes the work easy to learn and easy to do and fits you to make good money practically from the start.

Quick Sales in Your Home

No need to leave the house to dispose of everything you make. Our new automatic salesman does all the selling for you. Designed to quickly find cash buyers for all the Giftwares you can turn out.

No Cost Plan

Send coupon for details of new plan that pays for your Fireside Course besides putting big cash profits in your pocket. Mail coupon now while openings for new members are still being offered.

FIRESIDE INDUSTRIES
Dept. 142-A
Adrian, Mich.

Fireside Industries

Dept. 142-A, Adrian, Mich.
Send me FREE Book on Home Decorating for a big steady income. Also details of plan that will pay for my Course and give me big profits besides.

FREE!
Book on decorating at home for big money. Tells how to get big amounts of beautiful Giftwares free with no charge.

NAME.....
ADDRESS.....
CITY..... STATE.....

CHEAP FARM POWER

PULLFORD
MAKES ANY FORD CAR
INTO A TRACTOR

POWERFUL . . .
ECONOMICAL

Plows 5 acres a day.
Discs, cultivates,
harvests. Does the work of 3 or 4 horses, faster and better. The PULLFORD unit is quickly attached to Model T or A Ford. It's simple, strong, built to last. Use your old Ford or buy one cheap, and get the advantages of power farming.

WRITE for FREE Catalog Pictures, letters from users, details and LOW PRICES. **FACTORY**

PULLFORD CO., 3058 Cherry St., Quincy, Ill.

New 9" x 3' Genuine SOUTH BEND WORKSHOP LATHE

TERMS AS LOW AS \$6 A MONTH

\$90.00

Less Motor Drive
AN IDEAL XMAS GIFT

Immediate
Deliveries

No. 415-YA, 9 1/4" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, 3/4 H.P. Reversing Motor, Switch and Adjustable Belt Tension Countershaft .. **\$122.00**

(\$15.00 down, \$6.00 a month for 18 months.)



A Back-Geared Screw-Cutting Precision Lathe
Weight 320 lbs.

THE new 9-inch Workshop Precision Lathe is a back-geared. Screw Cutting Lathe, and has the same workmanship and materials as our larger, more expensive models.

It is designed to handle the finest, most accurate jobs in manufacturing—in the tool room, in home workshops and automotive machine shops. This lathe at \$90 and up represents the greatest value we have ever offered in 31 years of fine lathe building.

Features include Twin Gear Reverse to lead screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed to Carriage, Precision Lead Screw for Cutting screw threads from 4 to 40 per inch, 3/4-inch hole through spindle taking collets up to 1/2-inch capacity. Takes 38 attachments

Lathes Stocked in Principal Cities

Chicago, Ill.—C. B. Burns Mchry. Co., 541 W. Wash. Blvd.
New York, N. Y.—A. C. Colby Mchry. Co., 183 Centre St.
Philadelphia, Pa.—W. B. Rapp Mchry., 132 No. Third St.
Los Angeles, Cal.—Eccles & Davies Mchry., 1910 Santa Fe
Detroit, Michigan—Lee Mchry. Co., 6318 E. Jefferson Ave.
Milwaukee, Wisconsin—Voell Mchry. Co., 1533 No. 16th St.
Boston, Mass.—The MacKenzie Mchry. Co., 36 Oliver St.
Cleveland, O.—Reynolds Mchry. Co., 2034 E. 22nd Street.

for milling, grinding, draw-in Collet chuck work, and many other lathe operations. In 3', 3 1/2', 4', and 4 1/2' bed lengths.

Write for information on this lathe and larger sizes in motor drive and countershaft drive. Get the bulletins we offer—with instruction about Manufacturing work, Automotive jobs, Home shop projects, etc. Use coupon below,

**5 OTHER SIZES: 9", 11", 13", 15" and 16" SWING
IN ALL BED LENGTHS—PRICED \$102 to \$1500.**

Lathe shown below is No. 117-C, 16" x 6' Quick Change Gear Underneath Belt Motor Driven Lathe with 1 H.P. motor. Complete as shown, Wt. 2300 lbs. **\$969**

(\$97 down, \$43.50 monthly for 22 months.)

Write FOR THESE BOOKS

"How to Run a Lathe" has 160 pages with over 300 illustrations of work on a lathe. Over 1,500,000 copies sold. 25c each. Catalog No. 15-Y describes and prices the 9" Workshop Lathe in 8 drives and 4 bed lengths. Copy sent free, postpaid.

South Bend Lathe Works

263 E. Madison St., So. Bend, Ind., U.S.A.

South Bend Lathe Works,
263 E. Madison St., South Bend, Ind., U. S. A.

Please send me the following:

- No. 33LB "How to Run a Lathe," 25c
 N 15Y 9" Workshop Catalog, Free
 Easy Payment Purchase Plan

Class of Work

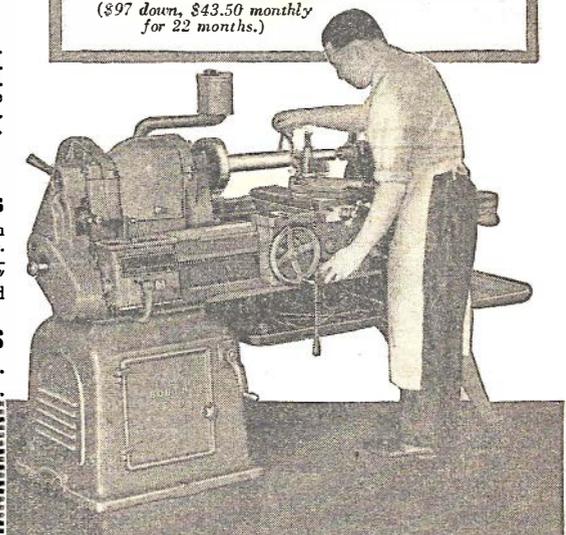
Name

Address

City

State

SOUTH BEND Precision LATHES



Guardians Of The Sea

[Continued from page 149]

o'clock in the morning finds just as much activity in some parts of the vessel as at three o'clock in the afternoon.

While we were in Chesapeake Bay we received an SOS from the *Sangate Castle*, 785 miles east of Chesapeake Lightship. Although we did not start for her because other ships close by were on their way, we were astounded at the speed with which a distress call is handled.

When an SOS is sent out, probably in no other place does it receive such prompt attention as from the Coast Guard. The radio operator on watch presses a button which sounds an alarm in the radio men's quarters. One operator rushes to the radio shack and assists the operator on watch. Another operator goes to the bridge and operates the direction finder. Within less time than it takes to describe it, he has turned on the receiver, tuned in the station sending out the SOS, and has obtained a bearing on the helpless vessel. In the meantime a messenger has notified the officer of the deck that a distress call has been received. Within a minute, the Coast Guard is ready to proceed to the rescue.

That no SOS will go unheeded, a twenty-four hour watch is maintained on the international distress, 500 kilocycles, and the Coast Guard calling frequency on short waves. One operator listens in at all times on both frequencies. This is accomplished by the "split phone" method. Wearing a standard headset consisting of two phones, the operator has one connected to a receiver tuned to the international distress frequency, and the other to a set tuned to the Coast Guard calling frequency.

To facilitate getting under way immediately after an SOS is received, steam at operating pressure is maintained at all times. Turbines are turning over and all that is required for full speed ahead is the placing of the throttle at the correct position.

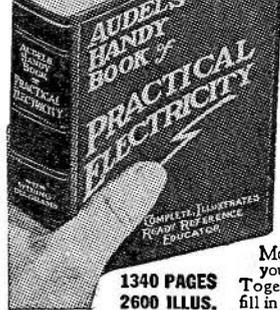
Because most SOS calls are received in stormy weather, Coast Guard vessels must be capable of operating in the heaviest seas. A hurricane may have disabled a large freighter and she is in danger of going down unless help arrives soon. If the message is received by the Coast Guard, the captain of the disabled vessel may be sure that assistance is on the way.

Last fall, during a trip down the coast in a hurricane, the *Champlain* leaned fifty-four degrees to starboard. The reader who finds this surprising will be even more surprised to know that she could have leaned considerably more. Even if she had leaned until the top of her 135-foot mast was in the water, she would have come back just as surely as she did from fifty-four degrees. Because Coast Guard vessels can take it and Coast Guardsmen can take those vessels where they are needed, the sea is not quite as dangerous as it would be without them.

KEY TO A PRACTICAL UNDERSTANDING OF ELECTRICITY

\$1 PER MO.

4 AUDELS HANDY BOOK OF ELECTRICITY
HANDY SIZE
 For Engineers, Electricians, Students and all interested in Electricity. A quick, simplified, ready reference, giving complete instructions and practical information. Easy to understand. A reliable authority and a handy helper that answers your questions.



INSIDE TRADE INFORMATION ON
 The Rules and Laws of Electricity—Maintenance of Machinery—A.C. and D.C. Motors—Armature Winding and Repair—Wiring Diagrams—House Lighting—Power Wiring—Cable Splicing—Meters—Batteries—Transformers—Elevators—Electric Cranes—Railways—Bells—Sign Flashers—Telephone—Ignition—Radio Principles—Refrigeration—Air Conditioning—Oil Burners—Air Compressors—Welding, and many Modern Applications explained so you can understand.

1340 PAGES 2600 ILLUS. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

THEO. AUDEL & CO., 49 West 23rd Street, New York
 Please send me "Auodels Handy Book of Practical Electricity" for free examination. If satisfactory, I will send you \$1 in 7 days, then \$1 monthly until \$4 is paid. Otherwise I will return it.

Name _____
 Address _____
 Occupation _____
 Reference _____ M. M.

READ FOR PROFIT!



HANDEE

Tool of 100 Uses

A NIFTY GIFT For Boys from 7 to 70

A whole shop full of tools in one—for work on all metals, alloys, bone, resins, plastics, glass, stone, wood, etc. Uses 200 different accessories to grind, drill, cut, carve, sand, saw, engrave, sharpen, clean, polish, etc. Saves hours of tedious hand work. Plugs in any socket AC or DC, 110 volts.

STANDARD MODEL
 A sturdy little helpmate. Weighs 1 pound. 13,000 r.p.m. \$10.75 postpaid, 3 Accessories Free.

DE LUXE MODEL
 Fastest, most powerful tool of its type and weight. 12 ounces. 25,000 r.p.m. \$18.50 postpaid, 6 Accessories Free.

GET A DEMONSTRATION
 at your Hardware, Department or Tool Dealer or order either Model on 10-Days, Money-Back Trial, Catalog Free.

CRAFTSMAN'S PROJECT BOOK
 Easy working plans for making many interesting and unusual projects, 25c stamps or coin.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. H, Chicago, Ill.

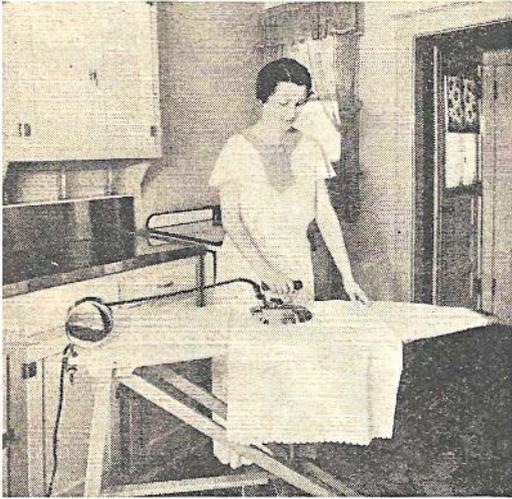
\$10.75 Model Project Book Send C. O. D.
 Send Catalog De Luxe Model

Name _____
 Address _____

MMI-1



New Ideas for Home & Shop



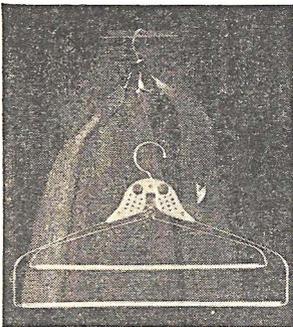
Keeping the electric cord taut at all times, a new spring reel prevents the cord from tangling, twisting or soiling the clothes by coming in contact with the material being ironed.

A **pneumatic tire spreader** automatically opens tire for inspection, and weighs but four pounds. Can be used wherever air pressure is available.

Beaver boards made in curves and colors. This material gives new opportunities to build more attractive rooms.

A **water circulator** which speeds up circulation in hot water heating systems in winter.

A **high tensile strength solder** and all-metal flux for low temperature soldering of such metals as aluminum, cast iron, die-cast metal, stainless steel, monel and other metals.

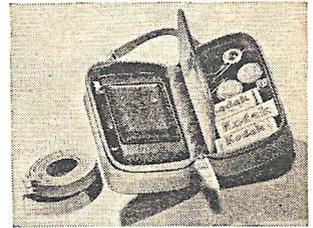


This space-saving coat hanger is so constructed that two garments may be hung from it at same time.

A **caulking compound** which can be applied with either a tool or gun. For narrow openings around doors or windows, the gun method may be used. When larger quantities are required, a putty knife should be used.

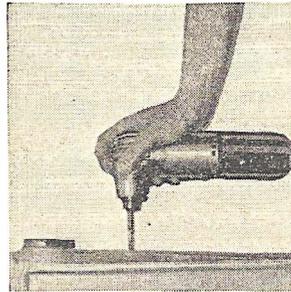
An **aluminum**

paint designed for metallic surfaces subject to high temperatures. It will stand 1,000 degrees F., and best results are obtained when the temperatures do not drop below 450 degrees F.



This sturdy book-style case will carry a camera and any small supplies. Accessories cannot fall out.

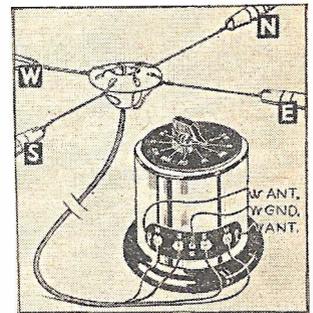
A **hydromatic gun** which opens clogged pipes, toilets, sinks floor or roof drains, drinking fountains, gas lines, oil lines, water pipes and supply pipes. Portable and hand operated, it can be used by anyone.



This light-weight drill combines ample power with ability to work around corners. Fits hand snugly.

An **electrode holder** for arc welding combines light weight with maximum conductivity. Has a current carrying capacity of 200 amperes and handles rods of $\frac{1}{8}$ to $\frac{3}{16}$ inch in diameter. The insulation of the handle is thoroughly ventilated.

A **fuse plug** designed to protect electrical tools, refrigerators, vacuum cleaners, washing machines and other electrical equipment from damage caused by overloads, low voltage, short circuits or locking. It gives double service as an attachment plug and as a circuit interrupter.



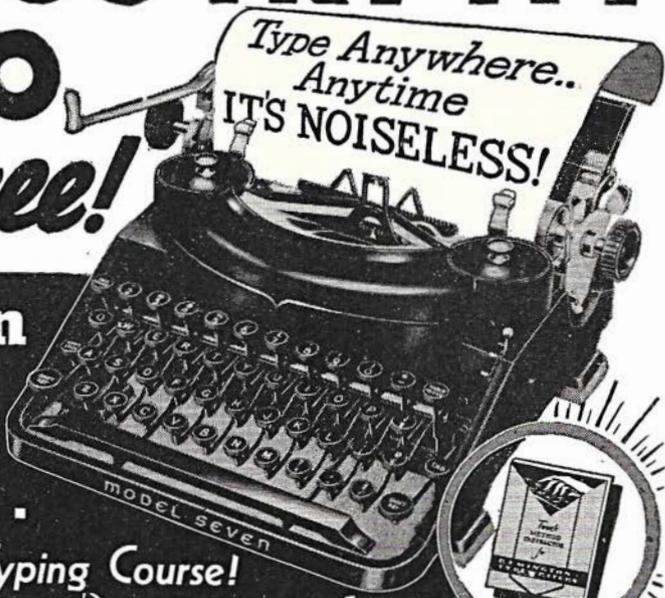
A four-direction receiving antenna includes a switching arrangement for selecting any of the antennas.

An **all-purpose chain wrench** with a capacity of from $1\frac{1}{2}$ to $4\frac{1}{2}$ inches.

WILL YOU TRY IT? ..FOR 10 DAYS *free!*

**Remington
Noiseless
Portable...**

Including Simplified Typing Course!



Try This New Remington Noiseless For Ten Full Days

See how useful it is for *all* your family. Use it—test it. Then—and *then only*—decide if you want to keep it. If you don't, *return at our expense* and the entire trial doesn't cost you a penny. Imagine! 10 days trial *absolutely free!*

It pays to own a typewriter! Educators report *14% higher school marks* for students who *typewrite!* Every parent should learn how a Remington can help children to get *better school ratings.* And, besides, how it will help the *parents themselves* in everyday activities... for business reports, memos, personal letters, applications, contest entries, etc.

By dealing with Remington Rand (world's largest manufacturers of portables) you're sure to get a *brand new model* with all the latest features of expensive office machines. Standard keyboard, full size carriage width, automatic ribbon reverse, composition keys, handset tabulator. But the *biggest* is "WHISPER-TYPING"—the new *noiseless* way to *type anywhere, anytime* without making a sound.

ACCEPT THIS SPECIAL OFFER NOW!

Here is your opportunity to get a *brand new* Remington Noiseless Portable for *only 10c a day.* You can have a typewriter *all your own*—Special Carrying Case... Complete Typing Course plus 10 Days Free Trial *right at home!* But you must act **NOW**, while these low prices and special terms are in effect. Rush the coupon for complete facts!

REMINGTON RAND INC., Dept. 141-1
BUFFALO, N. Y.

**PAY 10¢
A DAY!**

Yes, 10¢ a day is all it costs to own a new Remington Noiseless Portable, complete with Special Carrying Case and FREE Self Instructor Typing Course. Lowest terms ever offered. Now it's easy for everyone to afford a personal typewriter!

Mail Coupon Now!

free

Anyone Can Learn To Typewrite By Using This Simple Method

Don't worry if you lack typing experience. Anyone can learn to typewrite with this simple Home Instruction Course.

Follow the "touch method" used by experts. Even if after the trial you decide *not* to keep your Remington, this complete course remains your property absolutely free! But we're confident you won't easily part with this sturdy portable. It will be so handy for mother's letters and dad's business reports—for legal documents, stories, plays—for opening up chances to make extra money!

Take it with you everywhere in the *Cushioned Carrying Case* that's so roomy it can actually be used as an overnight bag! Don't fail to investigate this offer now—MAIL COUPON TODAY!

**REMINGTON RAND Inc., Dept. 141-1
BUFFALO, N. Y.**

Tell me how I can get a Remington Noiseless Portable for 10 Days Trial... *free!* Also send facts about Free Typing Course and 10c-a-Day Plan. *This is not an order.*

NAME.....
ADDRESS.....
TOWN.....STATE.....



Joan Crawford

takes time out from her part in M-G-M's "Mannequin" to play the part of Mrs. Santa Claus...Joan Crawford has smoked Luckies for eight years, has been kind enough to tell us: "They always stay on good terms with my throat."

TobaccoLand's Finest Gift

When you offer friends the welcome gift of cigarettes, remember two facts:

1. Among independent tobacco men, Luckies have twice as many exclusive smokers as all other brands combined.
2. Luckies not only offer you the finest tobacco but also the throat protection of the process "It's Toasted".

With men who know tobacco best...

It's Luckies 2 to 1