

DECEMBER

25 CENTS
30c IN CANADA

POPULAR MECHANICS

MAGAZINE

...SO YOU CAN UNDER

REGD. TRADE MARK G.S. & B. LTD.



SEE
PAGE
880

Take a LOOK at the private life of Ethyl Gasoline

MOST regular gasoline has hysterics when you call on it for extra work. It literally blows up—wastes its power in harmful knock. But *Ethyl Gasoline* delivers power with a smoothly increasing pressure that makes your car run at its best.

Just recently a group of engineers played detective on gasoline. Through thick quartz glass windows they snooped into its private life. With special high-speed cameras, they took photographs of the actual combustion of motor fuels.

Look at the pictures below. On the left, a typical photograph of the antics of ordinary gasoline in a modern high compression engine. Compare it with the picture on the right. There's Ethyl Gasoline burning smoothly, steadily—producing *more* power and *less* wasteful, harmful heat.

Behind your wheel you *feel* this difference. Ethyl Gasoline gives you the utmost performance of your car over every inch that you drive. It protects your motor from wear-and-tear, from the waste of excessive choking in starting, and overheating on long runs. Ethyl Gasoline Corporation, New York City.



Ethyl fuel contains lead.

© R. G. C. 1932



Slow-motion movies of gasoline combustion



UNEVEN COMBUSTION of ordinary gasoline. Through a quartz window in the cylinder head of a modern high compression motor, Detroit engineers took this photograph of the uneven, wasteful explosion of ordinary gasoline. That white-hot vertical line shows the instant of *knock*.



SMOOTH COMBUSTION of Ethyl Gasoline. There's no trace of knock here. Note the even progress of the flame—the greater spread of power. Ethyl controls combustion; delivers *more* of its power to the pistons—leaving *less* waste heat. It brings out the best performance of *any* car.

Buy ETHYL GASOLINE

Copyrighted material

What is *Bi-Acoustic* Radio?



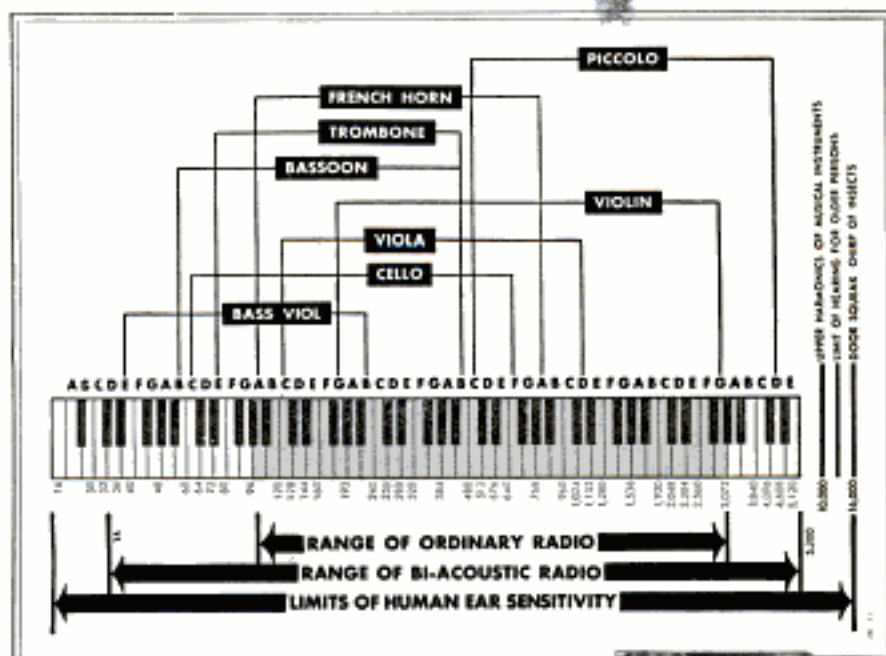
A simple technical explanation of this marvelous new RCA Victor Radio that gives 2 more octaves of music

A few weeks ago, RCA Victor introduced its latest, newest radio . . . the Bi-Acoustic. Thousands upon thousands who have heard it, marvel. This new radio has something others have always lacked. What is it?

It's the radio that adds two full octaves of music (amounting in the full orchestra to 266 extra musical tones) . . . in short, it is "Bi-Acoustic." We use the word "Acoustic" because this radio represents a tremendous advance in the perfection of tone quality, fidelity and frequency range, all of which are acoustical properties. We use the prefix "Bi" (the symbol for twofold), for in this new circuit there is twice the range, twice the reserve power, twice the tone quality.

Marked by 9 New Features

Nine sensational advancements make Bi-Acoustic Tone possible. Specifically, the new Bi-Acoustic radio incorporates the following features: (1) "B" Amplification increases fidelity, prevents amplifier "overspill." (2) Automatic Tone Compensation increases audibility, removes metallic harshness of sound at low volume levels. (3) Dual Automatic Volume Control reduces noise between stations, holds volume at the level you want—always. (4) Extended Musical Range makes possible the reproduction of two additional octaves, as shown in the above scale chart. You hear full, true notes you have never really heard before—piano notes, piccolo notes, saxophone notes. (5) Tone Equalizers prevent cabinet "boom." (6) An Improved Loud Speaker brings final reproduction still closer to the original performance. (7) New



This scale chart shows you exactly how much more music you get in a Bi-Acoustic Radio—in a full orchestra amounting to 266 extra musical tones

Type Radiotrons improve operating efficiency. (8) The new "Background" Noise Suppressor. (9) New Cabinetry, splendid in appearance, provides ample baffle area for the creation of the finest tone in radio.

You Hear ALL Tones

These features make possible the first radio to actually duplicate a broadcast—rather than merely approximate it. All in all, technically and acoustically, this new radio reaches the apex of performance.

Come in to any RCA Victor dealer, listen to, and examine the mechanics of this instrument. Put it to any test you want—it will win. There is no obligation, for whether you buy or not, we would like you to see and hear it. Frankly, we believe you will be amazed!



THE NEW R. 75 "BI-ACOUSTIC"—18-tube Super-heterodyne with "B" Amplification, Advanced Automatic Tone Compensator, Tone Equalizers, Dual Automatic Volume Control, Noise Suppressor, Micro Tone Control.

We have an interesting booklet telling in more detail the story of Bi-Acoustic Radio. We know you will enjoy reading it . . . so clip and mail the coupon NOW.

This One



Z9YS-S7F-SCDN

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

RCA Victor *Bi-Acoustic* Radio

2 MORE OCTAVES

RCA VICTOR RADIOS AND PHONOGRAPH COMBINATIONS, \$48.75 to \$310

When writing to advertisers please mention Popular Mechanics

Copyrighted material

He is calling You!



You are likely to think of the telephone from your individual point of view, as a convenience, as a necessity, as a means of transmitting to others your own thoughts and desires.

But your telephone is of equal importance to those who wish to get in touch with you. Right now as you are reading, someone, somewhere, may be calling you. It may be merely a friendly greeting . . . or news of importance to change the course of your life.

"Have dinner with us tomorrow." . . . The greater part of social goings and comings are maintained by telephone. "Come quickly! You are needed." . . . In crises and emergencies the telephone is indispensable. "That contract is entirely satisfactory." . . . Wheels of industry

move in direct response to messages received by telephone.

In a moment your telephone may ring. It may be a call from across the street, across the continent, across the sea. As you receive this message, of vital importance or mere daily detail, you share in the benefits of the great chain of communication which links up the activities of the world.



AMERICAN TELEPHONE AND
TELEGRAPH COMPANY

Popular Mechanics Magazine

200 E. Ontario Street, Chicago, U. S. A.

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

London: Messageries Hachette,
3 L. Belle Sauvage, Ludgate Hill, E. C. 4

Paris: Hachette & Co.,
111 Rue Reaumur

Melbourne: Gordon & Gotch
509-513 Little Collins St.

Vol. 58

December, 1932

No. 6

Special Features

What is the Lightest Metal?	874
T-6—The Latest Giant of the Sea	880
Woodcraft in the Woods	898
How to Become a Champion	906
Fire Detectives Make Ashes Talk	914
Spying on the Insect World	938
The Radio Doctor in the Arctic	944

Airplanes		
rubber on propellers to avert ice danger	949	
variable-pitch propeller controlled by pilot	951	
Alarms—robot phones for police when thieves enter	960	
Animals—the secrets of the lion men	926	
Archæology—rock forts found in far north	930	
Army, U. S.—two-man pursuit plane	941	
Atoms—splitting atoms with artificial radium rays	896	
Automobiles—auto sled has tractor drive	927	
Automobiles, Accessories		
clips for headlights show when bulb goes out	873	
number of miles per gallon told by meter	878	
parcel locker attaches under dash	895	
reflector for window held by vacuum cup	941	
remote-control oil-drain plugs	920	
screen for cowl ventilator keeps insects out	912	
stabilizer on steering gear cures driving troubles	888	
Automobiles, Lubricating—stainless grease stick for door	953	
Automobiles, Repairing—spray gun speeds up repairs	905	
Aviation		
pilots can ascend ten miles without danger of death	932	
"quick thinker" pilot's trick saves plane	950	
steam-heated plane wing to end air danger	959	
Bandage—elastic dressing for wound requires no fastening	895	
Barrels—makers exhibit skill at Leipzig fair	933	
Beacons—perils of the sky scanners	933	
Belts—belt built like cog prevents binding	885	
Bicycle—with stabilizers for land or water	878	
Boats and Boating—rocking on water in a rubber bubble boat	921	
Bottles—rubber wrench loosens caps of	931	
Buildings—junk used to build a castle	949	
Buoys—how ships at sea are safeguarded by	913	
Clocks—electric clock without dial or hands	913	
Cooling System—for rooms uses ice and electric fan	920	
Doorknob—rubber cover for, protects the walls	925	
Drawing		
combination chair and easel	925	
taught by radio with numbered chart	918	
Engraving—ink and colored powder imitate	953	
Eyeglasses—kept tight by plastic rivet	905	
Fabrics—creaseless cotton and silk	904	
Fire Alarm—handcuff on box stops false reports	912	
Fire Engine—has plow to clear away snow	903	
Fire Fighting		
asbestos shields guard firemen against heat	937	
firemen practice on eighty-five-foot ladder	910	
progress of fire fighting since revolution	894	
Fish and Fishing—essence of pearl	859	
fly-casting on land targets tests skill	903	
sea lions killed to save salmon	886	
Flashlight—without battery has generator	886	
Fossils—of four-legged fish found in Greenland	920	
Furniture—reversible tips for chair and table legs	889	
Heating and Ventilating		
oil for hot-air furnaces fed by gravity	932	
oil vaporizer for shops cuts heating cost	889	
Homes—high pressure to guard home from unwaashed air	948	
Hospital—for tiny ailments has pets as patients	943	
Hotel—built like a steamship	888	
House—built like elephant contains six rooms	873	
Household Devices	962	
Hurdle—horse operates own, with automatic barrier	928	
Lamps—light filaments one-tenth size of hair	889	
Latches—down-pull drive for, decreases vibration	943	
Lawnmower—and snowplow in one	965	
License Tags—auto, five numbers are too many in	912	
Lighthouse—India's constructed of steel	964	
Locks—the art of picking locks	890	
Lumber—mill waste is turned to rayon silk	926	
Machines—robot records lost time in production	932	

[Continued on Page 4]

ISSUED MONTHLY

SUBSCRIPTION

SINGLE COPY, 25 CENTS

In United States and its possessions, per year, postpaid \$2 50

To all other countries in the Postal Union 3.00

All subscriptions are discontinued at expiration. Please examine date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

Copyright, 1932, by Popular Mechanics Co.

Copyright in Australia. Copyright in France.

Recent changes in postal regulations make it necessary that subscribers advise us immediately of changes in address to eliminate delay and additional expense in delivery of magazines

Entered 929

Boat, automatic steering 860
Trunk drive speed on porloons 869

Copyrighted material

Spray gun 905 separate process 943
Machinery on Oregon

Pearl. mother of - Jacques 859
spray gun 905

[Contents—Continued]

Metals
 heaviest metal outweighs lightest fourteen times . . . 931
 powder metal squeezed into shape without heat . . . 935

Models
 model of steam fire engine . . . 879

Monument
 building world's largest stone monument . . . 919

Motor Bus
 "fish gills" for, keep out road dust . . . 897

Oil
 ocean being drilled for, from steel island . . . 936

Paints and Painting
 rust and fireproof coating for auto exhaust pipes . . . 903

Photography
 cold-storage photo plates make better pictures . . . 895

Piano
 color chart for keys latest teaching method . . . 957
 with twin keyboards used for radio . . . 886

Poultry
 expanding feeder for chicks . . . 897

Production
 rush job easy for engineer but not for rug maker . . . 964

Projector
 speech notes are projected as speaker writes . . . 927

Puzzles . . . 1024

Radio
 easy solutions for everyday radio problems . . . 971
 oldest and youngest radio "hams" . . . 970

Radio, Apparatus
 building a high-voltage d.c. test meter . . . 968
 ultra-short-wave set works at long distance . . . 960

Radio, Batteries
 filament supply for portable apparatus . . . 970

Radio, Broadcasting
 beautifying voices for tones of "Big Ben" broadcast by radio "search-light" . . . 965

Radio, Construction
 super-sensitive short-wave converter . . . 966

Radio, Parts
 storage rack for small parts . . . 972

Radio, Receivers
 auto receiver easily installed . . . 972
 portable set operated on either a.c. or d.c. . . 972

Radio, Repairing
 removing dust from receivers . . . 972

Radio, Tubes
 new tubes bring silent tones to life . . . 969

Railroads
 day and night train signals more visible in fog . . . 927

Refraction
 "heat waves" only light . . . 921

Roads
 one man to control traffic on super-road . . . 930

Roofs
 copper roof quickly aged with chemical bath . . . 878
 self-supporting steel roof made by welding . . . 942

Salvage
 treasure of sunken liner sought by divers . . . 911

Sculpture
 carving with dynamite on mountainside . . . 929

Searchlight
 three billion candlepower in sky-writing light . . . 879

Shoe Shining
 bootblack's shop on wheels . . . 935

Shovel, Power
 like octopus, handles scrap metal . . . 928

Signs
 portable neon sign operated from dry cells . . . 936

Seats
 rubber, with bumpers protect the ankles . . . 937

Stove
 pocket, to warm hands . . . 960

Swimming Pool
 artificial waves provide pool surf bathing . . . 952

Tackle Block
 self-locking, safeguards hoist load . . . 951

Tear-Gas Gun
 for wrist is fired by string . . . 931

Thimble
 has needle holder to aid in sewing . . . 935

Tools
 screwdriver with flashlight in handle . . . 910

Toys
 disassembler for toy railroad prevents collision . . . 889

Treasure Hunting
 the golden graves of Cocol . . . 954

Ventilator
 cleans air and fits any window . . . 936

Windmills
 old-time mills of Europe still useful . . . 961

Windows
 rubber grips panes in place of putty . . . 902

Work
 the right and wrong way of doing . . . 887

Envelopes
 file to hold prints and negatives made from . . . 987

Floors
 it's easy to fit new flooring . . . 976

Flowerpot
 cover, easily made . . . 982

Guitar
 small block aids in playing . . . 981

Handcar
 for the junior section crew . . . 995

Hat Rack
 wire, clips on shelf . . . 1004

Hose
 wire rack for drying over hot-air register . . . 1003

Hunting
 ducks retrieved with casting rod . . . 988

Insects
 eradicating ants with a sponge . . . 996

Jars
 glass containers hold small parts . . . 1003

Jewel Box
 novel, resembles pioneer cabin . . . 980

Jugs
 rocker support facilitates handling large . . . 990

Labels
 typing small gummed . . . 973

Level
 line, pill bottle used as . . . 981

Moth Balls
 warn when furnace water pan is empty . . . 998

Overshoes
 spiked, make effective ice creepers . . . 991

Photography
 vertical enlarger for home photographers . . . 973

Picture Hangers
 improvised from wire and tin . . . 998

Plaque
 locomotive, of brass cut on scrollsaw . . . 992

Polish
 for gold and silver articles . . . 989

Poultry
 an inexpensive poultry disinfectant . . . 1004

Pumps
 simple device for lifting pumps from well . . . 981

Punch Press
 long strips of work straightened by hand . . . 987

Pushcarts
 puncture-proof tires for . . . 998

Rifle
 alining telescope sight on . . . 991

Roofs
 roof for your home . . . 999

Ruling Pen
 double-line, improvised from cardboard box . . . 975
 glass cutter used as . . . 987

Sawdust
 crack filler made from . . . 988

Saws and Sawing
 flat-iron guide on rip saw . . . 994

Scraper
 keeps snow from blocking door in winter . . . 988

Ship Models
 Sovereign of the Seas, Part II . . . 983

Shoes
 shelf bracket holds wet shoes over hot-air register . . . 998

Sink
 tire pump clears drain . . . 982

Smokers' Accessories
 groove in pipe provides place to scratch matches . . . 981

Soap
 utilizing waste pieces of . . . 988

Stains
 simple methods of removing ordinary . . . 990

Tables
 nested tables improve the small apartment . . . 997

Telescope
 adjustable mounting . . . 989

Toys
 knockdown bridge for toy railroad . . . 991

Trowel
 improvised from auto pedal . . . 991

Truck
 improving latch handle on door of . . . 998

Watch
 extra hour hand eliminates confusion of day-light-saving time . . . 998

SHOP NOTES

Airplane
 spring tail skid substituted for shock cord on . . . 1022

Automobiles, Repairing
 portable setup for grinding brake drums without removing them . . . 1023
 silencing brake-lever rattle with rubber pad . . . 1015

Babbitt Ladle
 sheet-metal scum guard improves . . . 1012

Calking
 gun for applying compound . . . 1007

Coal Shovel
 extra handle improves . . . 1011

Drilling
 wooden sleeve strengthens small drill bits . . . 1015

Electric Lamps
 self-locking socket to keep tight . . . 1007

Elevator
 remote-control switch to operate car . . . 1012

Fence
 old tires fence garage runway . . . 1014

File
 hacksaw blades serve as substitute for . . . 1007

Gasoline Hose
 chamolix bag attached to nozzle filters gasoline . . . 1007

Gates
 safety latch for stock gates . . . 1012

Gold Washers
 increase prospectors' earnings . . . 1008

Golf Tees
 plug screw holes . . . 1011

Handle
 all-purpose, made from leather and strap iron . . . 1010

Hoist
 improvised from transmission has three speeds . . . 1022

Insulation
 suggested thicknesses for applying cork . . . 1022

Lathe
 tools and fittings for the model maker's lathe . . . 1013

Motor, Electric
 swinging arm supports utility . . . 1015

Nickelplating
 without electricity . . . 1011

Paper Hanging
 scale on smoothing brush saves time . . . 1023

Plating
 how to produce a steel-gray plate on brass . . . 1015

Reamer
 making worn reamer cut to size . . . 1007

Refrigerator
 electric, locating leaks in . . . 1011

Rivets
 improvised from copper wire . . . 1010

Saws and Sawing
 cut-off wheel saws metal quickly . . . 1005

Soap
 grease cup dispenses soap paste . . . 1014

Soldering
 bottle prevents rapid cooling of iron tool for radiator tubes . . . 1022

Transformers
 you can design and build . . . 1017

Vibration
 coil springs protect sensitive devices against . . . 1022

Wallboard
 erector places board against the ceiling . . . 1010

Welding
 sturdy rack for, equipped with pilot light . . . 1023

Telephone book records message 892

AMATEUR MECHANICS

Automobiles, Polishing
 polish to preserve the finish . . . 981

Automobiles, Radiator
 sign in, warns attendant of anti-freeze solution . . . 1004

Automobiles, Repairing
 an easy method of timing motors . . . 994
 cardboard on side of radiator improves heater . . . 975
 cotton repairs honeycomb radiator . . . 991
 making piston rings last longer . . . 1004
 method of fitting wristpins . . . 988
 waterproofing a cracked car top . . . 982

Automobiles, Tires
 simple trick to discourage theft . . . 988

Batteries
 water stream cleans corroded terminals . . . 990

Cement
 quick-setting, for metal, glass or wood . . . 982

Coils
 repairing a leaky hot-water coil . . . 987

Concrete
 molding forms nosing on concrete steps . . . 982

Copperplating
 without electricity . . . 975

Doorstop
 wooden puppy makes effective . . . 1003

Drawings
 adding depth to framed . . . 994

Drills
 extension drill improvised from pipe . . . 997

Wheel out of 1006

Help

... from
the most useful



set of books in the world!

IN these trying times, facts are perhaps more than ever essential to the needs of men, women and children—in business, at home, in government, in school.

You can get facts by asking the right person, if you can find the right person.

You can get them by searching diligently through a thousand books, by assembling and "digesting" a confusion of tens of thousands of words.

Or you can get them from the latest Fourteenth Edition of the new Britannica.

In its 24 volumes is a complete record of human knowledge. A few seconds bring you to facts that answer any conceivable question

of human interest—in business, finance, taxes, child care, literature, science, sports, gardening, etc., etc.

3,500 Noted Authorities

Furthermore, the new Britannica is not an "authorless" reference work. You know you can depend upon its information, because the Britannica carries the experience and knowledge of 3,500 of the world's leading authorities.

The list of contributors to the Britannica is the honor roll of world leadership. From Chief Justice Hughes to Ramsay MacDonald, from Sir Wilfred Grenfell to Bertrand Russell, from Pershing to Walter S. Gifford—they are all on the list of Britannica contributors.

Buy Now and Save Dollars

More than \$2,500,000 was spent on assembling the 35,000,000

words of information in the Britannica. More than \$500,000 went to prepare the 15,000 illustrations and 500 maps, many in color. In the Britannica and nowhere else you can buy all this, at an unusually low price.

How long the present low price can be continued, in the face of present conditions, we don't know. Shrewd men invest at once.

\$5 Down and \$5 a Month

If it is not convenient to pay cash in full, take advantage of our easy payment plan. As little as \$5 down and \$5 a month for a few months will bring the new Britannica to your home for immediate use and enjoyment. Mail coupon today for full details.

SEND TODAY FOR FREE BOOKLET—MAIL THE COUPON NOW

Owen D. Young

"Economics, politics and finance... correct information regarding them is essential... the new Britannica meets these needs."

Walter Dill Scott, President Northwestern University

"I believe there is not a better central source of authoritative information."

Send coupon today for new free booklet. Without cost or obligation you will

receive a new booklet that lists the Britannica's famous contributors, describes its contents, shows sample pages.



ENCYCLOPAEDIA BRITANNICA, INC.
342 Madison Avenue, New York City

2-P.M.-M-3

Please send me, by return mail, without obligation, your new illustrated booklet with color plates and maps from the latest Britannica, together with low price offer representing a saving of many dollars.

Name

Address

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

When writing to advertisers please mention Popular Mechanics

Copyrighted material



High School Course in Two Years!

You Want to Earn Big Money!

And you will not be satisfied unless you earn steady promotion. But are you prepared for the job ahead of you? Do you measure up to the standard that insures success? For a more responsible position a fairly good education is necessary. To write a sensible business letter, to prepare estimates, to figure cost and to compute interest, you must have a certain amount of preparation. All this you must be able to do before you will earn promotion. Many business houses hire no men whose general knowledge is not equal to a high school course. Why? Because big business refuses to burden itself with men who are barred from promotion by the lack of elementary education.

Can You Qualify for a Better Position

We have a plan whereby you can. We can give you a complete but simplified high school course in two years, giving you all the essentials that form the foundation of practical business. It will prepare you to hold your own where competition is keen and exacting. Do not doubt your ability, but make up your mind to it and you will soon have the requirements that will bring you success and big money. **YOU CAN DO IT.**

Let us show you how to get on the road to success. It will not cost you a single working hour. Write today. It costs you nothing but a stamp.

American School

Dept. H-947 Drexel Ave. and 58th St., Chicago

American School

Dept. H-947 Drexel Ave. and 58th St., Chicago

Send me full information on the subject checked and how you will help me win success.

- | | |
|-----------------------------|---------------------------|
|Architect |Business Law |
|Building Contractor |Lawyer |
|Automobile Engineer |Machine Shop Practice |
|Automobile Repairman |Mechanical Engineer |
|Civil Engineer |Shop Superintendent |
|Structural Engineer |Employment Manager |
|Business Manager |Steam Engineer |
|Cert. Public Accountant |Foremanship |
|Accountant and Auditor |Sanitary Engineer |
|Bookkeeper |Surveyor (& Mapping) |
|Draftsman and Designer |Telephone Engineer |
|Electrical Engineer |Telegraph Engineer |
|Electric Light & Power |High School Graduate |
|General Education |Wireless Radio |
|Vocational Guidance |Undecided |

Name.....

Address

When writing please mention Popular Mechanics

OPPORTUNITIES FOR MEN OF ALL AGES

N. Y. E. S. teaches **PRACTICAL ELECTRICITY** by its own distinctive method of

"Learn by Doing"

No previous preparation or electrical knowledge necessary. Every step is guided by expert instructors. Individual attention.

Day and evening classes open all year. Start any day.

SPECIAL COURSES IN AUTO MECHANICS AND AUTO ELECTRICITY

Write for **FREE Booklets.**
Visitors Welcome.

New York Electrical School

Established 1902 44 West 17th St., N. Y.

STICK 'EM UP!

Regardless of strength or size defend yourself and friends against any foul attack, from bullies or by gun, knife or club. Subdue with ease persons much stronger than yourself. A complete course on approved American Police Jiu-Jitsu by internationally known police instructor. 151 illustrations with detailed instructions pocket size. 13 knockout blows without using fists. Send One Dollar Full Price, or will send C. O. D.

S. J. JORGENSEN
781 Maritime Building Seattle, Washington

1000 POULTRY SECRETS

Our famous home-study Poultry Course teaches how to get more eggs, cut feed bills, avoid losses. Methods used by successful Poultry raisers the world over. **FREE Book** tells all about Course. Write today for your free copy. National Poultry Institute, Dept. 411-D, Washington, D. C.



LEARN TO SELL! STOP BEING A FAILURE

Now learn at home, secrets of successful salesmen today making \$4000 to \$10,000 a year. Free books "The Key to Master Salesmanship" and "Mistakes Commonly Made in Selling" tell all. Write for them today to National Salesmen's Training Association, Dept. W-105, 21 W. Elm St., Chicago, Ill.

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 contains 26 lessons and over 600 illustrations. All for Only...

\$2.85

Send name and address for free details.
RAYE BURNS SCHOOL, Dept. M-X, BOX 2194, Cleveland, Ohio

Promoted—when others were fired!

The Story of LaSalle Student Shaw



"Since the War I have been bookkeeper at \$35 a week. Married, with one baby girl, I found it harder every month to make ends meet. I was desperate!



"Last winter my wife brought me a LaSalle ad on Higher Accounting—showing how I could study in spare time for the job ahead. I investigated, and enrolled January 23. Just in time! For—



"Suddenly, orders came through to cut the force. I watched seven men in my department get the bad news and leave. Then the office boy tapped me, said I was 'next.' My heart sank as I followed him to the Front Office.



"Smiling, the boss handed me a letter. It was from LaSalle to him, announcing my enrollment and my good work on the first lesson. 'We are keeping you,' he said, 'because we like your spirit.'



"Naturally, I had more work to do, with the smaller force, but my training made it easier. I learned quickly, and when the Department Manager left, the boss moved me up.



"I have since been promoted twice, and now carry the title of Chief Accountant—at a salary several times greater. The future looks bright. If it had not been for LaSalle, I would be looking for a job right now."

BIGGER PAY FOR YOU— thru LaSalle Spare-Time Training

That's a story of what spare-time study has done for just one man. There are thousands of others like Shaw who found themselves through LaSalle. Now—how about yourself? Do you want a better position and higher pay?

You can win them, even today, if you can do the work. LaSalle experts will show you how, personally guide you step by step to success. Simply mark on the coupon the field you are interested in, and we will send you FREE, a valuable booklet about it, telling of opportunities open to you. No cost or obligation—and what you find out may put you on the road to success and financial independence.

The opportunity that is open today—right now—may not be here tomorrow. Don't put it off—but reach for your pencil, fill out, and mail today.

LASALLE EXTENSION UNIVERSITY Dept. 1264-RA

Please tell me how I can take full advantage—right now—of the opportunities in the business I am checking below. And send along your free booklet on that field.

- | | |
|---|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Railway Accounting |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Modern Salesmanship | <input type="checkbox"/> Personnel Management |
| <input type="checkbox"/> Paper Salesmen's Training | <input type="checkbox"/> Law: L.L. B. Degree |
| <input type="checkbox"/> Railway Station Management | <input type="checkbox"/> Commercial Law |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Office Management |
| <input type="checkbox"/> Higher Accountancy | <input type="checkbox"/> Chain Grocery Management |
| <input type="checkbox"/> Expert Bookkeeping | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Effective Speaking | <input type="checkbox"/> Foremanship |

Name.....

Address.....

Position.....

LASALLE

EXTENSION UNIVERSITY

MAKE YOUR OWN PROSPERITY through DRAFTING



Other DOBE TRAINED MEN have done it in Every Line of MANUFACTURING and BUILDING

Send the coupon for my PAY RAISING PLAN and "THE ONLY MAN WHO HAS A CHANCE"—The Vital Facts for every man who has to work for a living. Learn how you can quickly and easily prepare yourself at home for any of hundreds of GOOD PAY jobs through Drafting—the foundation of all progress and enterprise. Learn how thousands of others have done it. How you, too, can make your own better times—be more certain of employment—good wages—a bright and happy future—through preparation in Drafting.

Learn at Home From An Engineer

For more than 30 years, in good times and bad, I have helped men into GOOD PAYING POSITIONS as Chiefs, Superintendents, Foremen, Engineers, etc., by starting them in Drafting. Drafting means good pay and the open door to the BEST JOBS in Building, Engineering and Factory Production. The progress of the world depends on the Draftsman. That's the kind of OPPORTUNITY I offer you. If you have difficulties—if you are troubled because of small pay, or no job at all—if your future looks bad—INVESTIGATE! Find out what your chances are as a TRAINED and as an untrained man. Mail the coupon. I will send you two VITAL MESSAGES at once.

Act Now! It Costs Nothing to Get the Facts

Mailing the coupon will not obligate you in any way, yet it may be the turning point in your life. Send it at once for ALL THE FACTS, including my offer of a professional Draftsman's outfit and continuous help until you are all set on a PAYING JOB. No salesman will call on you to urge you in any way. Just send your name and address and decide for yourself. But DO IT NOW!



ENGINEER DOBE, 1951 Lawrence Avenue, Dept. 19, Chicago.
Send me particulars of your home training and the opportunities to which Drafting leads, including the two messages of Vital Facts.

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

When writing please mention Popular Mechanics

Play
GUITAR
Mandolin—Ukulele

this
FREE BOOK

shows the way to Popularity,
Pleasure, Increased Income.
Send for your copy now.

Gibson Inc.
503 Parsons Street, KALAMAZOO, MICH.

A MONEY MAKING
CARTOON COURSE \$1.00
BY THE FAMOUS CARTONIST
Nick Nichols POST PAID

Cartoon Instructor of Chicago Academy of Fine Arts
Art Director for Associated Editors' Newspaper Syndicate
Creator of Radio Comics—The Adventures of Peter Pen (the Bottle Imp)—Just Supposin'—Young Upstarts—Otto Watt—etc.

THIS PORTFOLIO CONTAINS—Twenty Lessons—Hundreds of Drawings—Tells You All My Secrets—How to Draw Funny Papers—Comic Strips—Pretty Girls—etc.
HOW and WHERE to MARKET YOUR DRAWINGS

Send \$1.00 To: STUDIO OF ARTS, 157 EAST ERIE ST., CHICAGO, ILL. Dept. 10

PHOTO-ENGRAVING LEARN IT AT HOME



We Furnish all equipment and materials including large photo-engraving camera complete with lamps, lens and screen. When you have finished the course you can establish a good paying independent business with the equipment furnished or work for others at a big salary. Photo Engraving offers greater opportunities today than any other industry. Every picture in this issue of Popular Mechanics was engraved by the process we teach you. Earn good money while learning. Write today for our new illustrated catalog which was engraved on equipment such as we furnish. You will not be obligated in any way by writing.

A copper plate to print above picture size 6 by 10 inches sells for \$25.37

Aurora School of Photo-Engraving, Box 1122, Aurora, Missouri



DRAW THE HUMAN FIGURE

Ability to portray the human figure pays better than any other kind of art work. Endless demand. Look in the magazines, newspapers and art galleries. Our new book, FIGURE DRAWING FROM LIFE by a new and simplified method shows the student how to draw the human figure correctly without a teacher. Large pages, 9 x 14, illustrated. Sent postpaid on receipt of \$1.00. Money back if not satisfied. Catalog of other books for artists FREE.

F. J. DRAKE & CO., Publishers
181 No. Michigan Blvd. Chicago, Ill.

RADIO-TELEVISION-TALKING PICTURES

Learn the easy way to get into a big pay job in sound engineering. All technical lessons prepared under direction of Dr. Leo DeForest, "Father of Radio." Motion picture films and projector help you. The quickest, best way to get a big pay job.

DEFOREST'S TRAINING, P-12, 1169 Center St., Chicago, Ill.

Learn
ADVERTISING
at Home

Greater opportunities now in advertising. Learn easily and quickly in spare time. Practical work. No text books. Old established school. Low tuition—Easy terms. Send for free booklet of interesting information.

Page-Davis School of Advertising
Dept. 1359, 3601 Mich. Ave., Chicago

MAKE YOUR VIOLIN

FOR \$9.95!

Expert Violin Maker furnishes everything needed—Complete Kit. Makes a Violin worth \$300. Success certain. Write—FREE CIRCULAR.

C. C. FRASER, 625 Stark, Saginaw, Mich.

Copyrighted material

MEN

THIS COUPON CAN
SOLVE THE
MENACING
PROBLEM OF
1933 FOR
YOU

INTERNATIONAL CORRESPONDENCE SCHOOLS
 "The Universal University"
 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:

BOX 5631-G, SCRANTON, PENNA.

- Architectural Draftsman
- Building Estimator
- Wood Millwright
- Concrete and Builder
- Structural Draftsman
- Electrical Engineer
- Electrical Wiring
- Welding Engineer
- Reading Shop Blueprint
- Business Management
- Office Management
- Personnel Management
- Traffic Management
- Accounting

- Telegraph Engineer
- Telephone Work
- Mechanical Engineer
- Patent Draftsman
- Patternmaker
- Toolmaker
- Bridge Engineer
- Tinsmith
- Gas Fitter and Builder
- Diesel Engines
- Automobile Mechanic

- Cost Accountant
- C. P. Accountant
- Bookkeeping
- Commercial Work
- Stenography
- French
- Advertising

- Name.....
- City.....
- State.....
- Age.....

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

- Flushing
- Sheet Metal Worker
- Steam Fitter
- Steam Engineer
- Civil Engineer
- Surveying and Mapping
- R. R. Locomotive
- R. R. Station Foreman
- R. R. Bridge and Building
- Foreman
- Locomotive Correspondent
- Geographical
- Complete Home Cards
- Civil Service Commercial
- Mail Carrier

- Business Correspondence
- Stenography
- Complete Home Cards
- Civil Service Commercial
- Mail Carrier

- Air Brakes
- Highway Engineering
- Coal Mining
- Boiler Making
- Textile Engineering
- Cotton Overseer or Roper
- Wood Manufacturing
- Agriculture
- Poultry Farming
- Machine Engineering

- Railway Mail Clerk
- High School Subjects
- College Preparatory
- Illustrating
- Lumber Dealer
- Carving

Address.....

Occupation.....

International Correspondence Schools Canada, Limited, Montreal, Canada

IF YOU'RE WORRIED ABOUT YOUR JOB, MONEY,
GETTING AHEAD—FOLLOW THE EXAMPLE OF OTHERS
WHO WORRIED, TOO, AND ARE NOW BUSINESS LEADERS
BECAUSE THEY MARKED AND MAILED THIS COUPON

When writing to advertisers please mention Popular Mechanics

Copyrighted material

PATENT

Your ideas

Small Ideas May Have Large Commercial Possibilities

If you hope to realize profits from your invention, you must protect it with a U. S. Government Patent. Otherwise you may find that all your time and labor have been lost, because it often happens that other inventors are working on the same idea. **IF YOU HAVE AN IDEA, TAKE STEPS TO GET A PATENT AT ONCE!** Your first step is to get my **FREE BOOK**. It tells you in simple, plain language just what you must do, how you must proceed in order to secure Patent protection.

I Serve You in Secrecy

You can communicate with me in perfect confidence. Any drawings, sketches or letters you send me will be kept in strong, steel, fireproof files, that are accessible only to authorized members of my staff. I have served inventors located in every state in the Union. My service is prompt, careful, efficient. Your first step—the move you should make today—is to **SEND THE COUPON FOR MY FREE BOOK.**



This **FREE**
Book shows how



"Record of Invention"

FREE If you act promptly I will send you this valuable Record of Invention blank absolutely **FREE**. It may help you to prove your right to your invention later on.

CLARENCE A. O'BRIEN

Registered Patent Attorney

WASHINGTON, D. C.

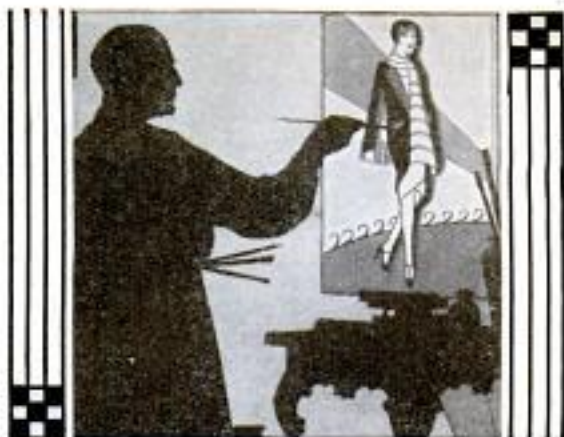
Clarence A. O'Brien, Registered Patent Attorney,
19-B, Adams Building,
Washington, D. C.

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name.....

Address.....

(IMPORTANT—Write or print plainly.)



ARTISTS EARN MORE

Through art training you may find the way to a large income. Many successful students of the Federal School of Illustrating are now earning from \$2500 to \$6000 a year and many are making even more. Through the Federal Course more than fifty famous artists—making big money themselves—give you their drawing secrets. In your spare time at home you may learn their methods of Illustrating, Cartooning, Lettering, Poster Designing, Window Card Illustrating, etc.

Learn to "mint" your art talent through Federal Training. Send us your name, age, occupation and address and we will send our Book, "A Road to Bigger Things," and Vocational Art Test without obligation.



FEDERAL SCHOOL of ILLUSTRATING

12132 Federal Schools Building
Minneapolis, : : Minnesota



Learn Public Speaking

At home—in spare time—20 minutes a day. Overcome "stage-fright," gain self-confidence, increase your salary, through ability to sway others by effective speech. Write now for free booklet, *How to Work Wonders With Words*.
NORTH AMERICAN INSTITUTE, Dept. 1359
3601 Michigan Avenue, Chicago, Illinois

LEARN WATCHMAKING AND ENGRAVING

BY OUR PROFIT-SHARING PLAN OUR GRADUATES SUCCEED

One of our Iowa students started in a very small way—now doing over \$20,000 a year. Another in Wisconsin, over \$10,000 the first year. Day or night classes. Call or write for **FREE BOOK**.

Chicago School of Watchmaking, Dept. 9101, 155 N. Clark St., CHICAGO

MAKE MORE MONEY IN— PHOTOGRAPHY

As a pastime or money making business, photography never fails. Learn quickly now in the privacy of your own home at low cost. Same practical, understandable training, given by same expert professional operators and instructors who handle personal attendance coaching in our completely equipped training studios. Only home-study training offering this advantage. Full or spare time. You may earn while learning. **FREE** placement service when qualified.
NEW YORK INSTITUTE OF PHOTOGRAPHY,
Dept. 49M, 10 West 33rd St., New York.

New York Institute of Photography,
10 West 33rd Street, Dept. 49M, New York.

Tell me, without cost or obligation how I may learn to make photography pay. **SEND FREE BOOKLET.** (No salesman will call.)

Still Photography (Commercial, News, Portrait) and Photo-Finishing.

Motion Picture Photography and Projection.

Name.....

Address.....



BROADCASTING
TELEVISION
TALKING PICTURES
WIRELESS OPERATING

WIN FAME and FORTUNE in RADIO!

Don't spend your life slaving away in some dull, hopeless job! Don't be satisfied to work for a mere \$20 or \$30 a week. Let me show you how to make MONEY in RADIO—THE FASTEST-GROWING, BIGGEST FIELD ON EARTH—where opportunities are many for the trained man.

JOBS LEADING TO SALARIES OF \$50 A WEEK AND UP!

Jobs as Designer, Inspector and Tester—as Radio Salesman and in Service and Installation work—as Operator or Manager of a Broadcasting Station—as Wireless Operator on a Ship or Airplane, or Sound Reproduction Operator—HUNDREDS of OPPORTUNITIES for fascinating, well-paid Jobs!

Ten Weeks of Shop Training AT COYNE IN CHICAGO

You are trained in all branches of Radio at Coyne—in 10 short, pleasant weeks—by actual work on actual Radio, Television and Sound Equipment. No useless theory. We give you the practical training you'll need.

All Practical Work at Coyne

Coyne is NOT a Correspondence School. We don't teach you from books. We train you on a great outlay of Radio, Television and Sound equipment—on scores of modern Radio Receivers, huge Broadcasting equipment, the very latest Television apparatus, Talking Picture and Sound Reproduction equipment, Code equipment, etc. You don't need advanced

education or previous experience. We give you—right here in the Coyne Shops—the actual practice and experience you'll need.

TELEVISION

Is Now Here

And TELEVISION is already here! Soon there'll be a demand for THOUSANDS of TELEVISION EXPERTS! The man who learns Television NOW can have a real future in this great new field. Get in on the ground-floor of this amazing new Radio development! Learn Television at COYNE on the very latest, newest Television equipment.

Talking Pictures A Great Field

Talking Pictures and Public Address Systems offer golden opportunities to the Trained Radio man. Here is a great new field of Radio that has just started to grow! Prepare NOW for these marvelous op-

portunities! Learn Radio Sound work at Coyne, on actual Talking Picture and Sound Reproduction equipment.

COYNE

Is 32 Years Old!

You get Free Employment Help as long as you live. And if you need part-time work while at school to help pay expenses we'll gladly do all we can to get it for you if you will tell us your problem. Coyne is 32 years old! Coyne training is tested—proven beyond all doubt. You can find out everything absolutely free. Just Mail Coupon for My Big Free Book, telling all about jobs—salaries—opportunities. Mail coupon now!

H. C. LEWIS, President
 Radio Division, Coyne Electrical School
 500 S. Paulina St., Dept. 92-3H, Chicago, Ill.
 Dear Mr. Lewis:
 Send me your Big Free Radio Book and all details of your Special Offer.

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

H. C. Lewis, Pres. Radio Division Founded 1899

Coyne Electrical School

500 S. Paulina St., Dept. 92-3H, Chicago, Ill.

When writing to advertisers please mention Popular Mechanics

Copyrighted material

NOW FIX ANY MAKE OF

AUTO**SIX BIG AUTO BOOKS ALL SHIPPED FREE**

on approval; whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new edition has been prepared by a large group of America's greatest automotive engineers.

Anybody who can read will understand them, for this great automobile encyclopedia is a veritable gold mine of valuable facts. Take advantage of this offer now; send in the coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay anything unless you decide to keep the books. Just tell us you want to see them and the full set of 6 great volumes, just off the press, will be sent to you! Read them, look them over and prove to your own satisfaction that one fact alone, which you will find in them, may save you an expensive repair, or help you to a better job.

**Aviation Motors
Free Wheeling
Synchro-Mesh
Outboard Motors
Motorcycles
Tractors
All Fully Covered**

Very Latest Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else can you get as complete and up-to-date information. Over a million dollars of resources have enabled us to give you the most authoritative books on the subject ever published. Everybody interested in automobiles in any way will welcome these books published by the world's largest publishers of Technical Cyclopedias (est. 1897) with agencies all over the world.

**Can You Fix It?**

Can you take out "play" in differential? Can you kill the "shimmy" in steering? Can you reset TIMING? Can you put your finger on engine trouble without guessing or tinkering? Can you pull the starter off and fix it? Can you adjust and repair transmission, engine, rear axle, bearings?

These Books Tell How

and tell you how to do any and every auto job right, the first time.

6 Big Volumes

Nearly 3,000 pages, over 2,000 illustrations, wiring diagrams, equipment charts, etc. De Luxe edition with gold-stamped flexible binding. Sent FREE for 10 days' use. If not wanted return express collect. If kept, send only \$2.00 after 10 days, then \$3.00 a month until special advertising price, \$24.80, is paid.

A Year's Consulting Membership FREE!

Privilege of consulting engineers of million-dollar American Technical Society on any automotive problem for one year without charge, if you mail coupon immediately.

SEND NO MONEY

American Technical Society, Dept. A-919,
Drexel Ave., at 58th St.,
Chicago, Illinois

I would like to see the brand new 6-volume edition of your automobile books but without any obligation to buy. I will pay the few cents delivery charge only and will examine the books and return them at your expense in 10 days unless I like them, in which case I will send you \$2.00 then and only \$3.00 per month until the special price of only \$24.80 is paid. You are to include free, consulting membership certificate in the American Technical Society. Send brand new edition.

Name.....
Street.....
City..... State.....
Employer's Name.....
Employer's Address.....

The coupon must be filled out in full. If not employed write us a letter explaining your work.

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

Play in Half Hour

After you get the four easy motions, you play harmonious chords with very little practice. No previous musical knowledge needed.

Easy Lessons

Even if you don't know one note from another, the 32 printed lessons and clear pictures make it easy to learn quickly. Pay as you play.

GIVEN when you enroll
—a sweet toned

HAWAIIAN GUITAR, Carrying Case and Playing Outfit—

WRITE AT ONCE for attractive offer and easy terms. You have everything to gain. A postcard will do. **ACT!**

Value \$18 to \$20
No extras—everything included

OTHER COURSES | Tenor Banjo, Violin, Tiple, Tenor Guitar, Ukulele, Banjo Ukulele. Under well known instructors.

FIRST HAWAIIAN CONSERVATORY of MUSIC, Inc.
9th Floor, Woolworth Bldg., Dept. 548 New York, N. Y.

Approved as a Correspondence School Under the Laws of the State of New York—Member National Home Study Council

**ELECTRICITY RADIO WELDING TELEVISION AUTOMOBILES**

No Finer Training Equipment Anywhere at Any Price. Improved Methods of Practical Instruction. Electric Arc and Oxy-Acetylene Welding, Armature Winding, Power Plants, Transformers, Motors, Generators, Batteries, Automobiles, Radio, Television and Sound Reproduction. **PREPARE FOR STEADY WORK AT GOOD PAY.**

Write for Information, Mentioning Course Desired.

COLEMAN ELECTRICAL SCHOOL, 1628 Main Street, KANSAS CITY, MO.

LEARN MECHANICAL DENTISTRY**Earn Big Money—Steady Work**

Prepare now for prosperity. Learn this money-making business in a few months in this **LARGEST, OLDEST, "Lab"** training center in New York. Day or Evening sessions. Big Demand. Practical Training. Individual Instruction.

Write NOW for free catalog P and reduced rate.

NEW YORK SCHOOL OF MECHANICAL DENTISTRY
125 West 31st Street New York

**VOICE****100% Improvement Guaranteed**

We build, strengthen the vocal organs—not with singing lessons—but by fundamentally sound and scientifically correct silent exercises... and absolutely guarantee to improve any singing or speaking voice at least 100%... Write for wonderful voice book—sent free. Learn WHY you can now have the voice you want. No literature sent to anyone under 17 years unless signed by parent.

PERFECT VOICE INSTITUTE, Studio 13-59
308 No. Michigan Ave., Chicago

**DENISON'S PLAYS**

Musical Comedies, Operettas, Vaudeville Acts, Minstrels, Comedy Songs, Make-up Goods.

57 YEARS OF HITS

Catalog Free

T.S. Denison & Co., 623 S. Wabash, Dept. 9, Chicago

How To Secure A Government Position

Why worry about strikes, layoffs, hard times? Train now for a Government job in the future! Increased salaries, steady work, travel, good pay. Open to citizens 18 to 50. Let me help you become a Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—or help you get into any other Government job you want. I was a Secretary Examiner of Civil Service Commission for 8 years. Have helped thousands.

Now FREE My 32-page book tells about the jobs open—and how I can help you get one. Send coupon for your copy TODAY.

A. R. Patterson, Civil Service Expert,
PATTERSON SCHOOL, 312 Wisner Bldg., Rochester, N. Y.

Please send me, without obligation, your free book "How to Secure a Government Position."

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



I was so lonely and friendless, a newcomer to town. Neighbors had made their polite calls, but I noticed they never came again.

The nights were so long and dull. My husband hid behind his paper, bored and unhappy. I was almost desperate myself.

One day I read how a lonely woman became popular by learning to play through the U. S. School Home Study Course. I sent for details.

When I found how simple this short-cut to music was I sent for the course. It was fun to learn. Before long I was playing tunes. But I didn't tell Bob.

Then came our party. When I sat down at the piano and played a gay, peppy tune, Bob was dumbfounded—but the party was "made."

Now we're invited everywhere. They call me "the life of the party" with my music. I'm so happy I learned this easy U. S. School way.

MUSIC - the Surest Path to Friends ... so easy to learn this short-cut way

NO longer need you envy people who play—who are always the center of attraction at parties—who make friends immediately wherever they go. Now this short-cut, newly perfected, home-study method can make YOU an accomplished musician. It can bring you the good times you've always longed for. It will lift you right out of the ranks of the "wallflowers" into the limelight of social popularity.

More than 600,000 men and women—boys and girls before you, have successfully learned to play their favorite instrument at home without a teacher the famous U. S. School of Music way.

Easy As A-B-C

This newly perfected "print-and-picture" method is literally as easy as A-B-C. The U. S. School simplified instructions, written by expert teachers, first tell you what to do. Then a picture shows you what to do. Then you do it yourself and hear it. No possibility of mistakes because the diagrams are right before you every step of the way.

And you learn so much more quickly by this modern, up-to-date method than was possible in the

old-fashioned, tiresome, scale-practicing way. Now you play real tunes almost from the start—by note. Every lesson is a fascinating game and you can actually hear yourself make progress. No teacher to fuss you. No wearying scales to plague you. No interference with business or pleasure, because you choose your own time at home.

New Joys For You

Just imagine yourself the center of a jolly, enthusiastic crowd, playing the season's latest song or dance hit. Or turning to the classics and re-creating the masterpieces of the world's greatest composers, making them live again with your own talent. Think of what it means to have the pleasures and the solace of music at your instant command, ready always to bring variation and color into your life.

As a musician, too, there should be many an opportunity to earn good money by your playing. Thousands of our pupils have done this and thus paid for their U. S. School course many times over. Many have organized their own orchestras and entered a profitable musical career.

Valuable Booklet and Demonstration Lesson Entirely Free

Prove to yourself without cost how easily and quickly you can learn to play. Send today for our booklet, "How You Can Master Music in Your Own Home." With it comes a Free Demonstration Lesson which shows graphically how simple this expert home instruction really is. You'll see how easily you can become an accomplished musician, as many thousands of others have. Instruments supplied if desired—cash or credit.

You owe it to yourself to get this valuable booklet and Demonstration Lesson at once. No obligation whatever on your part. Be sure to mail the coupon TODAY. U. S. School of Music, 712 Brunswick Bldg., New York City.

U. S. SCHOOL OF MUSIC
712 Brunswick Bldg., New York City

Please send me your free book, "How You Can Master Music in Your Own Home," with inspiring message by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

Have you
..... Instrument?.....
Name.....
Address.....
City..... State.....

PICK YOUR INSTRUMENT

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello
Hawaiian Steel Guitar	
Sight Singing	
Piano Accordion	
Italian and German Accordion	
Voice and Speech Culture	
Harmony and Composition	
Drums and Traps	
Automatic Finger Control	
Banjo (Plectrum, 5-String or Tenor)	
Juniors' Piano Course	

When writing to advertisers please mention Popular Mechanics



More Money

I show beginners how
-- experienced service men



Broadcasting Stations employ trained men for jobs paying up to \$5,000 a year.



Television—the coming field of many great opportunities—is covered by my course.



Spare time set servicing pays many N.R.I. men \$200 to \$1,000 a year. Full time men make as much as \$50, \$60, and \$75 a week.



Talking Movies—an invention made possible by Radio—employs many well trained Radio men for jobs paying as much as \$75 to \$200 a week.

My book, "Rich Rewards in Radio," gives you information on the opportunities in Radio and explains how I train you quickly to become a Radio Expert through my practical Home Study training. It is free. Clip and mail the coupon NOW. Radio's amazing growth has made hundreds of fine jobs which pay \$50, \$60, \$75, and \$100 a week. Many of these jobs may quickly lead to salaries as high as \$125, \$150, and \$200 a week.

Radio—the field with a future

Ever so often a new business is started. You have seen how the men who got into the automobile, motion picture, and other industries when they were started had the first chance at the big jobs—the \$5,000, \$10,000, and \$15,000 a year jobs. Radio offers the same chance that made men rich in those businesses. It has already made many independent—will make many more wealthy in the future. You will be kicking yourself if you pass up this once-in-a-lifetime opportunity.

Many Radio Experts make \$50 to \$100 a week

In a few years 300,000 jobs have been made by Radio's growth. Thousands more will be made by its future development. Men with the right training—the kind of training I will give you in the N.R.I. Course—have stepped into Radio at 2 and 3 times their former salaries. Experienced service men as well as beginners praise N.R.I. training for what it has done for them.

Many make \$5, \$10, \$15 a week extra in spare time almost at once

My Course is world-famous as the one "that pays for itself." The day you enroll I send you material, which you should master quickly, for doing 28 Radio jobs common in most every neighborhood. Throughout your Course I will show you how to do other repair and service jobs on the side for extra money. I will not only show you how to do the jobs, but how to get them. I'll give you the plans and ideas that have made \$200 to \$1,000 a year for N.R.I. men's spare time. G. W. Page, 110 Raleigh Apts., Nashville, Tenn., writes: "I made \$935 in my spare time while taking your Course."



Police Departments are finding Radio a great aid in their work. Many good jobs have been made in this new field.

Sample Lesson FREE

I'll send you a Free Lesson to prove that my Radio Course is easy, practical. That's how confident I am that I can train YOU at home in your spare time to become a Radio expert. Only my students could have this book in the past. I KNOW that when you see it, read it, examine it, you will be delighted with its clear, simple way of teaching Radio. I KNOW—because I have ALREADY trained thousands of men. Many of them with not even a grammar school education, and no Radio or electrical experience, have become Radio experts and earn two or three times their former pay. Mail the coupon now.



Some of the Jobs N. R. I. Trains Men For

Broadcast Engineer
Maintenance Man in Broadcasting Station
Installation Engineer of Broadcast Apparatus
Operator in Broadcast Station
Aircraft Radio Operator
Operator of Airway Beacons
Service Man on Sound Picture Apparatus
Operator of Sound Picture Apparatus
Ship Operator
Service Man on Public Address Systems
Installation Engineer on Public Address Systems
Sales Manager for Retail Stores
Service Manager for Retail Stores
Auto Radio Installation and Service Man
Television Broadcast Operator
Set Servicing Expert

Act! MAIL COUPON Today - - - Get The Facts About

for You in Radio

to get into Radio quickly
how to get better jobs-better pay

Here's Proof



**\$400
Each Month**

"I spent fifteen years travelling salesman and could see the opportunities in Radio. I've made more money than ever before. I have made more than \$400 each month and it really was your course that brought me to this." J. G. Dabbs, Radio Station KYA, San Francisco, Cal.



Radio Service Man Doubles Salary

"I spent 15 years selling and repairing, but felt I could do my memory. Upon completion, I was appointed Service Manager of Parks & Hall. I give N. R. I. full credit for my success—I immediately increased my earnings 100%." J. E. Maloney, 1511 Guilford Ave., Baltimore, Md.



From \$10 to \$50 a week in spare time

"Besides being employed by the Power & Light Company to locate Radio interference, I have a service business of my own that nets me from \$10 to \$50 a week in spare time. I owe all my success to the National Radio Institute, as I was only a common factory worker." H. L. Payne, 512 W. High Street, Piqua, Ohio.

Get ready for jobs like these

Broadcasting stations use engineers, operators, station managers and pay up to \$5,000 a year. Radio manufacturers employ testers, inspectors, foremen, engineers, service men, buyers, and managers for jobs paying up to \$5,000 a year. Radio dealers, jobbers (there are over 35,000) employ service men, salesmen, buyers, managers and pay up to \$100 a week. Talking pictures pay as much as \$75 to \$200 a week to men with Radio training. There are hundreds of opportunities to have a spare time or full time Radio business of your own. I'll show you how to start your own business on money made in spare time while learning. My book tells you of other opportunities.

You can learn at home in your spare time to be a Radio Expert

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively during your spare time. You don't have to be a high school or college graduate. My Course is written in a clear, interesting style that almost anyone can grasp. I give you practical experience under my 50-50 method of training—one-half from lesson books and one-half from practical experiments with equipment given without extra charge. It makes learning at home easy, fascinating, practical.

Learn the secrets of Short Wave, Television, Talking Pictures, Set Servicing, Broadcasting

I'll give you more training than you need to get a job—I'll give you your choice, and not charge you extra either, of my Advanced Courses on these subjects—(1) Television, (2) Set Servicing and Merchandising, (3) Sound Pictures and Public Address Systems, (4) Broadcasting, Commercial and Ship Radio Stations, (5) Aircraft Radio.

Your money back if not satisfied

I will give you an agreement in writing, legal and binding upon this Institute, to refund every penny of your money upon completing my Course if you are not satisfied with my Lessons and Instruction Service. The resources of the National Radio Institute, Pioneer and World's Largest Home-Study Radio School, stands behind this agreement.

Find out what Radio offers you. Get my book AT ONCE

One copy of my valuable 64-page book, "Rich Rewards in Radio," is free to any resident of the U. S. and Canada over 15 years old. It has started hundreds of men and young men on the road to better jobs and a bright future. It has shown hundreds of men who were in blind alley jobs, how to get into easier, more fascinating, better paying work. It tells you where the good Radio jobs are, what they pay, how you can quickly and easily fit yourself to be a Radio Expert. The Coupon will bring you a copy free. Send it at once. Your request does not obligate you in any way. ACT NOW.

J. E. SMITH, President
Dept. 2NP, National Radio Institute
Washington, D. C.

SPECIAL Radio Equipment for Broad Practical Experience Given Without Extra Charge

My course is not all theory. I'll show you how to use my special Radio Equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R.C.A., Victor, Majestic, and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, how to make them work when they are out of order. Training like this shows up in your pay envelope—when you graduate you have had training and experience—you're not simply looking for a job where you can get experience.



With N. R. I. equipment you learn to build and thoroughly understand set testing equipment—you can use N. R. I. equipment in your spare time service work for extra money.

I have doubled and tripled the salaries of many. Find out about this tested way to BIGGER PAY



Get a Job with a Future

FILL OUT AND MAIL THIS COUPON TODAY

Mr. J. E. Smith, President
National Radio Institute, Dept. 2NP
Washington, D. C.

I want to take advantage of your Special Offer. Send me your sample lesson and your free book about spare time and full time Radio opportunities and how I can train for them at home. This request does not obligate me.

NAME

ADDRESS

CITY.....STATE.....R

The Famous Course That Pays For Itself

U.S. GOVERNMENT JOBS

\$1260 to \$3400 a Year
PICK YOUR JOB
Men, Boys—18 to 50

These are steady positions. Strikes or politics will not affect them. Government employees get their pay for twelve full months every year. For the present year only, 30 days furlough is taken without pay.

\$1900 to \$2700 a Year

Railway Postal Clerks get \$1,900 the first year, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is quickly increased in normal years, the maximum being \$2,700 a year. (\$112.50 each pay day.)

Railway Postal Clerks



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 commence at \$1,700 a year and automatically increase \$100 a year to \$2,100 and \$2,300 in normal years.

Customs and Immigrant Inspector

Salary \$2,100 to \$3,300. Men 21 to 45. Work connected with examining immigrants and merchandise entering the country from foreign parts.

Is Your Job Steady?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. DO YOU GET \$1,900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET \$2,100 to \$2,700 A YEAR?

You Can Get Them

Experience is usually unnecessary and political influence is not permitted. Let us show you how.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment of three cents for a postage stamp may result in your getting a government job.

FRANKLIN INSTITUTE, Dept. D-174, Rochester, N. Y.

Rush to me entirely free of charge (1) a full description of the position checked below; (2) Free Copy of 32-page book, "How to Get a U. S. Government Job"; (3) A list of Post-depression U. S. Government Jobs; (4) Tell me how to get a Post-depression Government Job.

- | | |
|---|-------------------|
| <input type="checkbox"/> Railway Postal Clerk..... | (\$1,900-\$2,700) |
| <input type="checkbox"/> Post Office Clerk..... | (\$1,700-\$2,300) |
| <input type="checkbox"/> City Mail Carrier..... | (\$1,700-\$2,100) |
| <input type="checkbox"/> Rural Mail Carrier..... | (\$2,100-\$3,400) |
| <input type="checkbox"/> Government Clerk—File Clerk..... | (\$1,260-\$2,500) |
| <input type="checkbox"/> Inspector of Customs..... | (\$2,100-\$3,300) |
| <input type="checkbox"/> Immigrant Inspector..... | (\$2,100-\$3,000) |

Name.....

Address.....

Use This Coupon Before You Mislay It

When writing please mention Popular Mechanics

LEARN TO FLY



at LINCOLN

Internationally Known School

Get into aviation, the world's fastest growing industry with big pay and unlimited opportunities for promotion. The world-wide reputation of Lincoln's high class aviation training is your guarantee of success.

Want to go to a Foreign Country? We have 40 foreign representatives and students in 25 foreign countries and in every state in U. S. Big opportunities in foreign countries, especially Central and South America, and in U. S. One prominent South American air line now employing 90% American pilots and mechanics. Our Aviation courses taught in both English and Spanish. Both flying and ground school government approved. Write for catalog and complete details. State your age.

LINCOLN AIRPLANE & FLYING SCHOOL
 265B Aircraft Bldg. Lincoln, Nebr.

BE A RAILWAY TRAFFIC INSPECTOR



ACTIVE Men—19 to 55—needed for Railway and Bus Passenger Traffic Inspection work.

Fascinating, outdoor work; travel or stay near home; meet high officials. We'll train you in our few weeks' home-study course, and on completion will help place you at \$120 to \$150 per month up, plus expenses to start, or refund tuition. Costs little—terms easy. Many graduates now important executives. Write for Free Booklet and make your start NOW.

Splend' Opportunities For Trained Men

Standard Business Training Institute, Inc. 212, Buffalo, N. Y.

HOT PIANO Ultra-modern Piano

Jazz taught by mail. Note or ear. Easy rapid lessons for adult beginners. Also Self-instruction system for advanced pianists. Learn 358 Bass Styles, 976 Jazz Breaks, hundreds of Trick Endings, Hot Rhythms, Sock, Stomp and Dirt Effects; Symphonic and Wicked Harmony in latest Radio and Record Style. Write for Free Booklet.

WATERMAN PIANO SCHOOL, 1828 W. Adams St., Los Angeles, Calif.

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 as good or better than at a shop. You can earn money while learning and secure a well paying position or start in business after completing our course of instruction. Good watch repairers are always in demand and earn from \$50 to \$75 per week. For particulars apply to the **Wisconsin School of Watch Repairing** 524 E. Mason St., MILWAUKEE, WIS.

MAIL FOR FREE INFORMATION

BEDFORD

1115 Bedford Ave., Dept. PM-12
 Brooklyn, N. Y.

YMCA TRADE SCHOOL

Send me without obligation complete information on (check subjects).

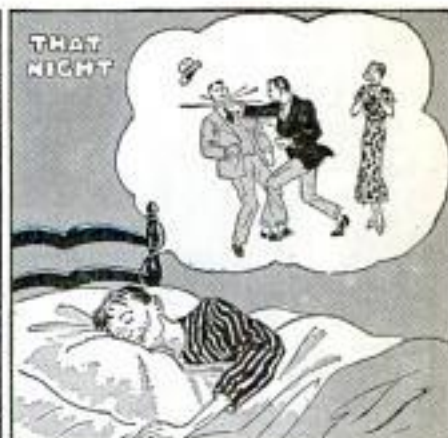
- | |
|---|
| <input type="checkbox"/> Caterpillar Tractor Mechanic |
| <input type="checkbox"/> Aviation Mechanic |
| <input type="checkbox"/> Machine Shop |
| <input type="checkbox"/> Welding |
| <input type="checkbox"/> Auto Mechanic |
| <input type="checkbox"/> Radio and Television Mechanic |
| <input type="checkbox"/> Talking Pictures—Double Western Electric Equipment |
| <input type="checkbox"/> Electrical |
| <input type="checkbox"/> Starting, Lighting, Ignition |
| <input type="checkbox"/> Window Dressing |
| <input type="checkbox"/> Commercial Art |
| <input type="checkbox"/> Sign Painting |
| <input type="checkbox"/> Architectural Drafting |
| <input type="checkbox"/> Mechanical Drafting |

Name.....

Street & No.....

Town..... State.....

THE BATTLE FOUGHT IN BED THAT MADE FRED A HE-MAN!



CHARLES ATLAS

The 97-lb. Weaking Who Became "The World's Most Perfectly Developed Man"

"I'll Give You PROOF in Just 7 Days That You Can Have a Body Like Mine!"

GET this straight, friend—I know what I'm talking about. In just 7 days I'll prove to YOU that I can make you a NEW MAN—a 100% HE-MAN, ready every minute for fun or for fight! My secret is *DYNAMIC TENSION*—the amazing discovery that developed me from a 97-lb. bag of bones into twice winning the free-for-all title of "World's Most Perfectly Developed Man." And, with it, I'll show you the way to a perfect body, glowing health, rippling muscles, giant power, and a fist that packs a genuine punch.

At my own risk, I'VE PROVE I can do it. I'll give you actual tape-measure evidence that I can add bulkness to your chest and shoulders, smashing power to your arms, surging strength and handsome proportions to every inch of your build. *WUKEE* pills, dieting, or apparatus that may strain your heart or other vital organs. I can make you the fellow that men respect and women admire, in just a few minutes a day. Mail response NOW for my illustrated book, "Everlasting Health and Strength." Tells all about *DYNAMIC TENSION*. Shows actual photos. It's a valuable book—and it's FREE. Send for your copy today. Address me personally, CHARLES ATLAS, Dept. 8-YY, 133 East 23rd St., New York City.

CHARLES ATLAS, Dept. 8-YY, 133 East 23rd Street, New York City

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 write or print plainly)

ADDRESS.....

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

© 1932, C. A. Ltd.



Come to Los Angeles

4 full courses

at price of single course



LEARN

TELEVISION-RADIO ELECTRICITY-TALKING PICTURES and BROADCASTING

A bargain offer! No longer is it necessary to pay several tuitions. Now, for the first time in history, National offers complete training in Radio, Electricity, Television, Talking Pictures and Broadcasting all at fee for one course. Unlimited training, enabling you to qualify for good jobs. We train you in four big pay trades; award you a life scholarship and help you to get a job that will start you on the road to BIG PAY and independence for the rest of your life. No dummy equipment. Individual, practical instruction. Right NOW, while jobs are almost impossible to "land" by the untrained man, you can get 27 training for the lowest tuition fee ever offered. This is a limited offer, but you must act NOW! Come to Los Angeles, the center of radio and electricity—and where the great American television laboratories are located—where hundreds of trained sound engineers and mechanics are employed in talking picture studios. Thousands of dollars invested in new training equipment, by National for you to work on.

Largest and Oldest Trade School in West

For 27 years National has successfully trained men by practical shop methods. Previous education unnecessary. More than 25,000 graduates.

Railroad Fare Allowed to L. A.
For a limited time we will allow coach railroad fare to Los Angeles from any point in the United States. This is deducted from tuition, so the trip costs you nothing.

FREE EMPLOYMENT SERVICE
Spare time jobs while at school. We help you get a job to pay living expenses while learning. Our unlimited employment service will help you get a JOB after you graduate. A few delightful months of training and you are qualified.

NATIONAL RADIO & ELECTRICAL SCHOOL

Including Television, Talking Pictures & Broadcasting
Dept. 124E, 4006 S. Figueroa, Los Angeles, Cal.

—MAIL THIS COUPON FOR FREE DETAILS—

This coupon will bring you our big, free training book if you are interested. It gives full details of the 4 big courses—radio, electrical, television, talking pictures and broadcasting; also details about railroad fare offer. Bargain offer, for limited time.

Name.....

Address.....

Town..... State.....

Save money by enrolling in National Now. For price of one course we now offer the four complete radio, electrical, television, talking picture and broadcasting courses. Four courses for price of one.



ELECTRICITY

Become an electrical expert. Complete electrical machinery and equipment for you to work on at National.



TELEVISION

The newest trade, with a tremendous future. Latest waxing disc equipment. National pioneers in this interesting work. Several thousand dollars' worth of new radio equipment for you to work with.



TALKING PICTURES
10,000 theatres equipped for sound. Good pay. National-trained men preferred in studios and theatres.

5,000 Samples FREE

to Introduce New Product SHOES RESOLED-9¢



Pat.
App.
For

Spreads On Like Butter
Wears Like Leather

Write today for your FREE SAMPLE of SAVASOLE on leather. Amazing new discovery makes old shoes wear like new for as low as 9¢ a pair. Applied in two minutes—no nails—no tools. Spreads on with old knife like butter on bread. Dries hard and smooth overnight. Gives months and months of wear.

AGENTS WANTED

Demonstrate SAVASOLE in your town and make up to \$42 a day. Tremendous market. Every home wants it. "Hard times" seller. Kinross of California made over \$40 in one day. No experience needed. If you want more money quickly with amazing sell—write today for facts and FREE SAMPLE of SAVASOLE on leather. Send no money. No obligation.

SAVASOLE CO. Dept. M-30
CINCINNATI, O.

Old
Shoes
Made
Like
New

FREE BARGAIN BOOKS

250,000 TITLES

Our 38th Annual 320 Page Bargain Catalog of Books of all Publishers covering all classes of Literature, Fiction, Juvenile, history, Scientific, etc. Illustrated, Indexed. Used by schools, colleges, libraries and thousands of individual customers. Write today for our new 1933 catalog. "Bargains in Books."

THE BOOK SUPPLY COMPANY, Dept. 82
564-566 West Monroe Street CHICAGO, ILLINOIS



Astrology

What do the Stars Predict for 1933?

Will it be a year of success? Would you like to know? Our special 15-page Astrological Reading gives predictions, month by month—with exact days, dates and happenings for 1933 based on your sign of the Zodiac. Consult it before making any change in home or business affairs, signing papers, love, marriage, seeking employment, rates in salary, speculation, travel, friends, enemies, health, accidents, busy days, etc. Send exact birthday with \$1.00 for reading.

Franklin Pub. Co., 800 N. Clark St., Dept. 1353, Chicago



NEW BOOK SENT FREE
SONG REQUIREMENTS
of
TALKING PICTURES
RADIO and RECORDS

SONG WRITERS

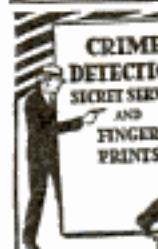
Don't fail to read "Song Requirements of Talking Pictures, Radio and Records" an explanatory, instructive book SENT FREE on request. New writers may mail song-poems for free examination. We revise, compose and arrange music, and secure copyrights, guaranteeing approval.

P. M. Newcomer Associates, 1674 Broadway, New York



"BECOME A LIGHTNING TRICK CARTOONIST"

Send \$1.00 for Laugh Producing Program of 23 Trick Drawings with Instructions. Catalog of Chalk Talk Supplies Free. BALDA ART SERVICE, Dept. 1, Oshkosh, Wis.



SECRET SERVICE BOOK FREE

For 20 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 20 days free reading. Send no
money. If you decide to keep it, then send only
\$1.00. If not, return it. WRITE TODAY. Not
sent to boys under 17 years of age.

T. G. Cooks, Book Dept. 13-59 1920 Sausyside Ave., Chicago

When writing please mention Popular Mechanics

New

[15 to 550 Meters]

16 TUBE

30
DAYS
FREE
TRIAL

ALL-WAVE RADIO Only

\$39.95

Completely
Assembled
with
Large
Dual
Speakers

WORLD WIDE RECEPTION may be yours when you own this sensational new Midwest 16-tube ALL-WAVE set with a tuning range of 15 to 550 meters. Hear standard U. S. broadcasts from coast to coast, listen to amateurs, police calls, airplane conversations, and, when conditions are favorable, short-wave broadcasts from England, Germany, France, Italy, South America, Australia, and other stations all over the world. You get the WHOLE WORLD OF RADIO when you get this new 16-tube Midwest—and you buy it at an amazingly low price direct from the big Midwest factory, on easy payments if you wish. No middlemen's profits to pay when you buy the Midwest way.

Don't be satisfied with less than a 16-tube Midwest ALL-WAVE set. A receiver covering only the regular broadcast waves is only half a set. Improvements in short-wave programs and receivers have made ordinary broadcast sets obsolete. The Midwest All-Wave gives you everything that's good in radio, both at

home and from abroad—and all in one single dial set with perfect tone and volume control and the marvelous new color-lite tuning and STAT-OMIT.

Don't buy any radio until you get the big new Midwest catalog. Just sign and mail the coupon or send your name and address on a postal—NOW!

Deal Direct with Factory!
SAVE UP TO 50%

Midwest sweeps aside the costly old-fashioned way of selling through distributors and dealers. You buy direct from the Midwest factory with just one small profit added. You save all of the middlemen's profits.

Investigate! Mail the coupon. Get the Midwest catalog. Learn the facts about Midwest 9, 12 and 16-tube ALL-WAVE sets—also Battery sets and amazing new Record-Changing Radio Phonograph. Learn about our sensationally low factory prices, easy payment plan and positive guarantee of satisfaction or money back. Get a bigger, better, more powerful, better toned radio—at a positive saving of 30% to 50%!

MIDWEST RADIO CORP.
Dept. 153 (Est. 1920) CINCINNATI, OHIO

ALL THE NEW
1933 FEATURES

Improved Super-Het. Circuit
Stat-Omit Tuning Silencer
Class "B" Amplification
Color-Lite Wave Band Selector
Acoustically Matched Dual Speakers
Full Band Automatic Volume Control
Dual Power. Two separate transformers
Dual Ratio Dial
One Complete Chassis
Complete Scientific Sintering
18 Tuned Circuits, 9 in cascade
15 to 550 Meter Tuning Range
Image Frequency Suppressor
Fractional Microvolt Sensitivity
Full-Floating Variable Condenser
Absolutely Faithful Tone Reproduction
Positive Tone Control
Thermal Safety Fuse
Duplex Duo-Diode Detection
New Type Tubes
Low Operating Cost

Read this Letter!

"During the past week I logged the following: FYA Pontoise, France; GBK Rugby, England; HVJ Vatican City, Italy; XDA Mexico City; VK2ME Sydney, Australia; VEGW Bowmanville, Canada; 12RO Rome, Italy; GSW Cholestad, England; CGA and VLEDE Drummondville, Canada. Also picked up many amateur and airport stations from all over United States. Numerous ship, shore and trans-atlantic phones from both sides and an Hawaiian Test Station came in clear and sharp. Several Spanish and German speaking stations have also been received but not yet identified. Have received every broadcast from FYA, morning and afternoon, for over a week with wonderful tone and volume. The Midwest set is certainly one to be proud of." — Wm. S. Teter, Winterpark, Florida.

TERMS
as low as
\$5 DOWN

RUSH THIS COUPON FOR
AMAZING FREE TRIAL OFFER
AND BIG BEAUTIFUL CATALOG

Midwest Radio Corp.,
Dept. 153,
Cincinnati, Ohio.

Without obligation on my part
send me four new 1933 catalog and
complete details of your liberal 30-
day free trial offer. This is NOT
an order.

User Agents
Easy EXTRA
MONEY! Check
here for
details.

Name
Address
Town
State



COMPLETE LINE OF
CONSOLES

The big new Midwest catalog shows gorgeous line of artistic consoles in the new six-leg designs. Mail the coupon now. Get all the facts.



Become an Expert Accountant

The Profession That Pays

The demand for skilled accountants—men who really know their business—is unceasing. Big corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, Organization, Management, Finance. Men who prove their qualifications in this important branch of business are rapidly promoted to responsible executive positions—given an opportunity to earn real salaries. The range is from \$3,000 to \$15,000 a year—even to higher income-figures.

Send for Free Book— "Accountancy, the Profession that Pays"

Why let the other fellow walk away with the better job, when right in your own home you can equip yourself for a splendid future in this profitable profession?

Preliminary knowledge of bookkeeping is unnecessary. Our free book on accountancy fully explains how we train you from the ground up, according to your individual needs. Low cost; easy terms.

The facts about the new LaSalle training in Accountancy and the opportunities in this highly profitable field are clearly outlined in a 64-page book which LaSalle will send you free.

The man in earnest to get ahead will find this coupon a most profitable aid to progress. If you have the urge and the will to increase your income, clip and mail the coupon NOW.

— — — Find Yourself Through LaSalle! — — —

LaSalle Extension University

The World's Largest Business Training Institution

Dept. 1264-HR Chicago

I would welcome details of your salary-increasing plan, together with copy of "Accountancy, the Profession that Pays," also a copy of "Ten Years' Promotion in One," all without obligation.

Higher Accountancy

Training for position as Auditor, Comptroller, Certified Public Accountant.

Other LaSalle Opportunities:

LaSalle opens the way to success in every important field of business. If interested in one of the fields below, check and mail.

- | | |
|--|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Law—Degree of LL.B. |
| <input type="checkbox"/> Modern Salesmanship | <input type="checkbox"/> Modern Business Correspondence |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Stenography—Stenotypy |
| <input type="checkbox"/> Railway Station Mgmt | <input type="checkbox"/> Expert Bookkeeping |
| <input type="checkbox"/> Railway Accounting | <input type="checkbox"/> C. P. A. Coaching |
| <input type="checkbox"/> Banking and Finance | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Commercial Law | <input type="checkbox"/> Commercial Spanish |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Effective Speaking |
| <input type="checkbox"/> Modern Foremanship | <input type="checkbox"/> Telegraphy |
| <input type="checkbox"/> Personnel Management | <input type="checkbox"/> Credit and Collection Correspondence |
| <input type="checkbox"/> Paper Salesman's Training | |

Name

Present Position

Address

When writing please mention Popular Mechanics

OWN A CARMEL POP CORN STORE



A Sensational New Business

Brings Startling Results

Make and sell in a store of your own the world's most delicious pop-corn confection—plump, tender, healthful pop-corn coated with flavory, tasty caramel candy. Made under special time-tested, secret formula—different from any other. More savory, more delicious, more sales compelling, more successful.

Start In Any Town

Big demand everywhere. Chance to open in many towns. Takes but little capital. Supplies plentiful and cheap. No experience needed. We make it easy to start. Supply equipment—help finance and locate you and furnish store plans. Proven successful, original formula. Teach process and furnish profit-making operating secrets.

FREE "Golden Kernels of Profit"

Free book brings all information and particulars. Shows how others are making big money and how you can do it. Shows how profits are made and gives you chance to get in a REAL business of your own—quickly, easily, while it's new and best. Write today. No obligation.



Long-Eakins Company (Originators)
1228 High Street Springfield, Ohio

RADIO NEEDS TRAINED MEN NOW!

Get into this interesting, money-making work. Broadcasting, ship's radio, aircraft, servicing jobs pay \$40-\$100 a week. Even more. Earn while learning at home. Book of Big Opportunities, Radio Facts, free. Write today.

RADIO & TELEVISION INSTITUTE, INC.

2130 Lawrence Ave.

Dept. 19, Chicago, U. S. A.

GOOD POSITIONS

Nation-wide opportunities for trained men in hotels, clubs, restaurants and institutions. Past experience proved unnecessary. Train at home in spare time. Hundreds of graduates put in touch with positions. Write for Free Book. **LEWIS HOTEL TRAINING SCHOOLS**, Room EW-366, Washington, D. C.

ELECTRICAL ENGINEERING

A CONCISE, comprehensive course for men of limited time, complete in one year. Mathematics, engineering drawing, shop-work. Students construct motors, install wiring, test electrical machinery. Modern buildings. 39 years' successful experience. Catalog on request.



**BLISS ELECTRICAL
SCHOOL**

122 Takoma Ave., Washington, D. C.

McSweeney's Easy Way to a New Job at Big Pay.



J. H. McSWEENEY

McSweeney Training makes you independent of hard times. There always is a demand for trained men. McSweeney teaches trades that never will be replaced by mechanical equipment. Easily and quickly you learn all about Automotive Mechanics and General Electricity. Never was opportunity greater for the man who knows how.

Eight to Twelve Weeks—Then a job that should pay from \$35 to \$70 a week, in the automotive or electrical field. Get out of the low-pay class before electricity takes your job.

No Books—No Lessons

In my shops we use tools instead of books. Students work on live equipment. Fifty thousand men can attest to the advantage of having my practical training.

Guarantee of Satisfaction

I agree to train you until you are permanently placed in a good job at good pay if you are over sixteen years of age.

Not a Correspondence Course—No Books—No Lessons

McSWEENEY SCHOOLS

ELECTRICAL
AUTOMOTIVE
DEPT. C-10-12 CLEVELAND, OHIO

ELECTRICITY | AUTOMOTIVE

Learn to control, master, and apply that magical juice which rules the universe. Be a McSweeney-Trained electrical man. Every motor propelled vehicle—automobile, truck, tractor—requires constant service. The fewer cars sold, the more service required.

Mail This Coupon for FREE Book

J. H. McSweeney, Pres.,
Dept. C-10-12—McSweeney Schools, 1815 E. 24th Street,
Cleveland, Ohio.

Without cost or obligation, send me your big FREE book and full details of your special tuition offer. (Check school interested in.) Electrical. Automotive.

Name.....

Street.....

Town..... State..... Age.....

Learn to Dance

You can learn all the modern dances—the latest Tango steps, the new Fox Trots, dreamy Waltzes, smart Collegiate Steps, and popular Society Steps at home, easily and quickly. New chart method makes dancing as simple as A-B-C. No music or partner required. Don't be a wallflower. Learn to dance. Complete course—285 pages, 54 illustrations, sent on 3 Days' Free Trial. Equals \$20.00 course. Send no money. Pay postage only \$1.98, plus postage upon arrival. Money back if not delighted. Catalog Free.



Franklin Pub. Co., 800 No. Clark St., Dept. 9441, Chicago

Operator No. 38



FOLLOW THIS MAN

Secret Service Operator No. 38 is on the job! Running down dangerous Counterfeit Gang. Tell-tale finger prints in murdered girl's room.

Free The Confidential Report Operator No. 38 made to his chief. Write for it. \$3000 a year and up

YOU can become a Finger Print Operator at home, in your spare time, at small cost. Write for confidential full report and details. Literature will NOT be sent to boys under 17 years of age.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave. Chicago, Ill.
Dept. 13-59

BASHFUL?

"Shame on You!" Are you nervous, embarrassed, or ill at ease? STOP being shy of strangers. Conquer bashfulness and the terrible fear of your superiors. Be cheerful and confident! Your faults easily overcome so you can enjoy life to the fullest. Send 25 cts. for my book, "Bashfulness," containing full particulars.
RICHARD BLACKSTONE, B-4712 Flatiron Bldg., N. Y. CITY

"The TRUTH about VOICE"

SENT FREE No Obligation to Buy

If you act quick!—we will send you postpaid—for 30 days free reading—New Voice Book disclosing starting FACTS that may save hundreds of dollars to every man or woman seeking a strong, rich voice for either singing or speaking. 30 days free reading—then send \$1. Otherwise, return it.
Prof. E. Feuchtinger 308 North Michigan Avenue Studio 13-59 Chicago, Ill.



When writing to advertisers please mention Popular Mechanics



BOOKS SENT FREE!

—ON APPROVAL—

5 Volumes Brand New Edition
Only 15 minutes a day with these WONDER BOOKS will 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.

Big Field Big Demand Big Pay
Competent draftsmen are urgently needed right now in all building and manufacturing firms at \$30.00 to \$100.00 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 FREE and see for yourself.

A year's reading membership in the American Technical Society now gives free 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. Real \$10 value, but free to you with these books.

AMERICAN TECHNICAL SOCIETY
Dept. D-919, Drexel at 58th St., Chicago, Ill.



American Technical Society, Dept. D-919, Drexel at 58th St., Chicago, Ill.
Send for 10 days' free use New 5 volume set of drafting. I will pay the few cents delivery charge. 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 \$12.00. The special introductory price, is paid. Send Brand New edition and include drawing instruments.

Name.....
Address.....
Employer's Name.....
Address.....

Go up, Young Man, GO UP!

The World's Greatest Opportunities are in



AVIATION

Get our part-time work Plan that helps pay your tuition



Joe D. Vail, veteran transport pilot and flying instructor

Here's your life-time opportunity—full flying courses, including transport. Ground training under government licensed mechanics—flying instruction by veteran transport pilot—at our big modern airport. You get thorough training and learn to fly in quickest time.

HOME TRAINING COURSE Prepares You for FLYING

If you are unable to come to our school at present for your flying training, we offer you our approved home training course—the most complete and thorough, we believe, ever offered.

FREE BOOK

Get all the facts! Big free book tells everything... how part-time work helps pay tuition... how home training course prepares you for flying. Don't put this ad aside before you mail the coupon.

Joe D. Vail, Pres., Dayton School of Aviation,
Dept. 1-P, Madison, Ind.
Also part-time work plan to help pay tuition. My age is.....
Name..... Address..... City..... State.....
 Private Pilot Transport Pilot
 Limited Commercial Home Training

CHEMISTRY



Complete, practical home-study courses prepared by some of the best-known chemists in this country, including ALLEN ROGERS, B.S., M.S., Ph.D.—Head of Department of Industrial Chemistry, Pratt Institute; L. M. TOLMAN, Ph.D.—Formerly Chief Chemist, Wilson & Co. Now Vice-president, United Chemical and Organic Products Co.; BRADLEY STROUGHTON, B.S.—Head of the Department of Metallurgy, Lehigh University, and OWEN L. SHINN, Ph.D.—Professor of Applied Chemistry, University of Pennsylvania.

Mail Coupon for Free Booklet

INTERNATIONAL SCHOOL OF CHEMISTRY
Associated with the International Correspondence Schools
Box 5633-G, Scranton, Penna.

Without cost or obligation, please send me full details of your home-study course in

- Analytical Chemistry Metallurgical Chemistry
 Chemical Engineering Short Chemistry Course
 Industrial Chemistry Pharmacy

Name.....

Address.....



FREE LESSON Home Art Craft



GOOD MONEY FOR SPARE TIME

A new easy way. Art novelties in big demand. Get free lesson and quickly learn to decorate Gifts, Bridge Prizes, Toys, etc. No Experience necessary. Anyone can succeed with simple "3-step" method and you earn as you learn. Everything furnished including supply of Novelties for you to decorate and Homecrafters Outfit.

NO CANVASSING

Just sit at home and make up to \$50 a week spare time or full. Write today for big illustrated book and FIRST LESSON FREE. Absolutely not one cent to pay. Lesson is free. Openings in every locality. Write quick.

FIRESIDE INDUSTRIES
Dept. 66-W, ADRIAN, MICH.

Be a DENTICIAN

LEARN AT HOME

To make Crowns, Plates, Bridgework, etc., for Dentists. Easy practical way to learn mechanical dentistry at home in spare time. Full equipment of tools and materials included with course FREE. Low tuition. Easy terms. Write for FREE BOOK about this money-making profession and our easy-to-learn homestudy course and special offer.



McCarrie School of Mechanical Dentistry

316 S. Wabash Avenue Dept. 6-811 Chicago, Ill.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Popular Mechanics Magazine, published monthly at Chicago, Ill., for October 1, 1933.

State of Illinois, County of Cook, ss.
Helfos me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, depose and say that he is the editor and publisher of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of the form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill., Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill., Managing Editor, L. R. Weber, 200 East Ontario St., Chicago, Ill., Business Manager, W. J. Kuecker, 200 East Ontario St., Chicago, Ill. Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Popular Mechanics Company, 200 East Ontario St., Chicago, Ill., L. B. Windsor, 200 East Ontario St., Chicago, Ill., H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINDSOR, Jr., Editor and Publisher. Sworn to and subscribed before me this 20th day of September, 1933. J. GRAHAM, Notary Public. My commission expires June 16, 1935.

NEW KIND of Lemon..Orange..Grapefruit JUICER

Hangs On Wall Just Turn Handle

Millions drinking fruit juices need revolutionary new Super-Juicer! Gets all juice from oranges, lemons, grapefruit instantly — no work, waste or worry! Just turn magic crank and fruits juice themselves. Strains all seeds, pulp and pith. Easy to clean. Can't rust. And amazingly low-priced! Agents make up to 4 profits on every call! Write at once for NO-RISK TEST OFFER and GUARANTEED Sales Plan!



AGENTS!
NO-RISK
TEST
OFFER

CENTRAL STATES MFG. CO., Dept. W-6076, 4500 Mary Ave., St. Louis, Mo.

Let me help you get in the Movies



Physical Culture Training won me the title "The World's Most Perfect Strong Man" and a contract in the Movies. I have been featured in over 100 pictures; trained many of the famous Hollywood Stars; and placed many of my students in Pictures and on the Stage. Now I'll help you through my home-study Physical Culture Course.

OPPORTUNITY FOR MOVIE CONTRACT

I'll not only give you a perfect physique and pack your body with all the strength and muscles it can stand, but I'll enter you in my Movie Contest, the winner of which will receive a Free Trip to Hollywood

and the Opportunity for a Movie Contract. If interested in a Movie career, I'll help you personally all I can.

DEVELOP A BODY LIKE MINE IN 90 DAYS

Put yourself in my hands for just 90 days, and I'll fill out your chest until the seams in your clothes rip apart—I'll put muscles on your arms and shoulders that will laugh at loads—I'll make a new man of you, a big, strong He-Man, with muscles of steel and the physique of a Greek God. Let me prove it! If over 16, write for my Free Illustrated Book, that tells all about my low-priced Course and famous Movie Contest. It costs nothing to investigate. Just write to JOE BONOMO, 298 Bonomo Bldg., HOLLYWOOD, CALIF.

TRI-STATE COLLEGE

DEGREE IN 2 YEARS



B.S. Degree in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering in 2 years. Those who lack high school may make up work. Living costs, tuition low. Students from all over the world.

Write for catalog

4122 College Avenue, Angola, Ind.

EASY WAY TO MAKE MONEY IN RADIO

Up to \$3 an hour easy in a short time. New training method and service equipment offer starts you earning quickly. Details of no-cost plan sent FREE. Write

Radio Training Association of America
Dept. PM12, 4513 Ravenswood Ave., Chicago, Illinois

STAMMERERS

Write for Free List of ethical schools that successfully correct all speech defects.

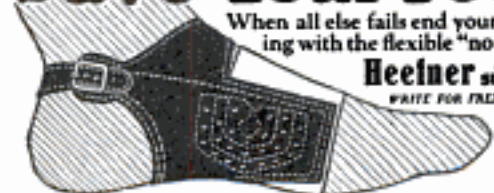
STAMMERERS' GUILD
38 Newbury St., Suite 400, Boston, Mass.

Save Your Feet

When all else fails end your suffering with the flexible "no metal"

Heelner ARCH SUPPORT

WRITE FOR FREE BOOKLET



HEELNER ARCH SUPPORT CO., 683 N. E. TAYLOR BUILDING, LOUISVILLE, KY.

When writing to advertisers please mention Popular Mechanics

Look
Fellers!

THIS POWERFUL
ELECTRIC
MOTOR
GIVEN
YOU!

With 12
Thrilling Issues



A MARVELOUS motor, made especially for us. You can do many astounding things with this four-terminal Erector Motor. Strongest, most powerful battery motor of its size made. Runs all toy models. With it you can make motor driven vehicles, and perform more than forty different experiments, all described in the big instruction book given FREE. Here are a few: How to Magnetize the Blade of Your Knife, How the Motor Moves, How to Make Rheostats, Make Colors Disappear, Buzz Saw, Song of the Siren, Whirling Dervish Disk. You may have this powerful motor and book FREE. Read Special Offer.

STORIES THAT PACK A PUNCH

The Open Road for Boys is a 50-page magazine, publishing sparkling stories of air adventure, sport stories, articles by famous coaches and star athletes; adventure stories of the barren wastes of the Arctic, of the wild jungles of the Tropics, of the battlefields of the World War, of the cow towns of the Old West, and of the mysterious lands of the Far East; business stories, school stories and many others. In addition four great serials each worth \$2.00 in book form. World wide correspondence club, stamps, OPEN ROAD PIONEER CLUB, best dope on hunting, fishing, camping. Contests galore, with plenty of prize money. Red blooded stories for red blooded boys.

SPECIAL OFFER

Regular yearly subscription price \$1.00. To make new friends we will send you next twelve fat issues for \$1.00 and send you also this wonderful, powerful motor and book FREE. Act quickly.

Mechanical Dept.
OPEN ROAD FOR BOYS,
130 Newbury St.,
Boston, Mass.

This offer good only
in the United States.

You bet I want that electric motor. Here's my dollar. Put me down for a year of The Open Road for Boys, and rush my motor and instruction book by return mail. I am waiting.

Name.....

Street.....

Town or City.....State.....

100% Satisfaction Guaranteed.

Here is a Fascinating New Hobby!

Learn to Mount

All Kinds of Birds and Animals

(Send the Coupon below for FREE BOOKLET)

This interesting and profitable hobby will bring you hours of delightful recreation

Taxidermy is FUN and you can now learn it at home — by mail

Mount Your Own Hunting Trophies

Send right now, Today, for full particulars as to how you can learn to become a Taxidermist—in your own home—using just your spare time.



TAXIDERMY CRAFT-WORK

You'll learn to make beautiful articles like those shown to the left Using Real Birds and Animals. The book-ends, pen-set, and reading-lamp illustrated here are only a few of the hundreds of Useful things you can make right at your own work-bench. These articles make unique decorations for your own home or den, and Sell Readily to others, particularly sportsmen, teachers, and outdoor lovers. Too, you can use the most common of specimens, such as squirrels, rabbits, owls, pigeons, and even frogs. You'll find this one of the most interesting and fascinating hobbies you have ever undertaken.

Save Those Beautiful Trophies

The next time you go hunting or fishing, don't throw away your finest specimens. Mount them exactly as they were when alive, and decorate your home or den with these beautiful trophies. A knowledge of Taxidermy will double your interest in your hunting trips. Whether it is a pheasant, duck, game-head or fish, we will show you how to re-create it exactly as it was when alive. All the secrets of

the professional Taxidermist are now revealed; you'll learn every branch of the work, including the Craft-work described above, the mounting of game birds and animals, fish, game-heads, common and domestic animals, collecting insects, and other interesting branches. Also, you'll learn to tan and dress skins, and make buckskin and leather.

\$25 TO \$50 A WEEK IN YOUR SPARE TIME

If you want to make more money in your spare time, or add to your present income, then investigate this uncrowded field. You can make good money, either by making and selling the craft-work pieces shown to the left, or by Mounting Game Specimens for Hunters and Fishermen. With shortened hunting seasons, and reduced bag-limits, the demand for Taxidermy work is increasing enormously. You can provide this service for sportsmen in your community, and easily make enough to pay for the instruction while you are learning. Then in your spare time you can make from \$25 to \$50 a week. As a full time business, profits of \$4000 a year are not unusual.

An Old Reliable School

Remember, this school has been in constant operation for 30 years, during which time we have graduated over 100,000 enthusiastic students. We teach just One Thing—Taxidermy. Our own Taxidermy shops have turned out jobs for some of the biggest museums in the world. Foreign governments and famous men have been our clients. We Know We Can Teach You to Become a Successful Taxidermy Artist. The work is highly interesting; it is Profitable. Make up your mind Right Now to investigate.

Read These Letters

Excerpts from a few recent students' letters
 "Since enrolling I have made over \$100. Your instructions are very clear." C. Williams (West Va.).
 "I mounted my first specimen within a week after receiving the first lesson." Ralph Hughes (Pa.).
 "Work is coming faster all the time. In my first year I cleared \$5000." J. S. Merry (N. Y.).
 "Thanks to your lessons, I now own my favorite trophies. The lessons are clear and I find Taxidermy interesting and profitable." Joseph Kawan (Calif.).

Send Coupon for FREE BOOK

**FREE
BOOK
COUPON**

Northwestern School of Taxidermy
3379 Elwood Bldg., Omaha, Neb.

Send me your free illustrated book, "How to Mount Game." Also tell me how I may learn this fascinating art easily and quickly by mail. No obligation.

Name.....

Age.....Address.....

Tear off and send the coupon to the left. We'll send you without any cost or obligation to you whatever, a large beautifully illustrated booklet, telling you more about this great hobby which is also a fun spare or full time business. The booklet has many fine game pictures, and tells full details of this old, reliable school for hunters, outdoor people and nature lovers. If you want this booklet **Send the Coupon Right Now.** (State your age.)

Northwestern School of Taxidermy
3379 Elwood Bldg., Omaha, Neb.

When writing to advertisers please mention Popular Mechanics



Classified Advertisements

WORLD'S BEST WANT AD MEDIUM

Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance
To be inserted under proper classification in January issue, copy should be in our office November 18th

ADVERTISING AGENCIES

ADVERTISE—Bargain value—24 words in 24 representative Sunday newspapers \$15; Free assistance with your ads, sales letters, literature. Helpful Ad-Guide showing best paying newspapers, magazines, rates, mailing lists, etc., free. Chicago Union Agency, Great Northern Bldg., Chicago.

INCH Display advertisement 50 magazines year \$24. Wood's Popular Services, Atlantic City, N. J.

ADVERTISE in rural weeklies. Lists free. Meyer Agency, 4112 Hartford, St. Louis, Missouri.

FREE—New 1932 Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

FOR ADVERTISERS

GET into advertising. Learn quickly at home. Experience unnecessary. New easy plan. No text books used. Practical work. Old established school. Send name and address for interesting free booklet. Page-Davis School of Advertising, Dept. 3439, 3601 Michigan, Chicago.

NEW List 500 cash remitters since Oct. 1st. Guaranteed. 50c. Herb's Print, Proctor, Minn.

INCH Display in 50 magazines \$2.50. Midwest Service, Bloomfield, Iowa.

ADVERTISING—20 words, 50 magazines, three insertions, \$1.20. Inch display, three months, \$6.00. Mailing Bureau, Lawndale, Calif.

ADVERTISE 53 Magazines, 3 months, \$6.00 inch. List, special offers, free. Evans King Co., Box 672P, Wilmington, Delaware.

COLLECTION LETTERS

250 ASSORTED Collection Letters, Reminders and Business Builders, \$1.00 postpaid. Maryland Specialty Co., 2712 Maryland Ave., Baltimore, Md.

MAILING LISTS

CHOICE List actual \$1 to \$10 mail order buyers, 100—\$1; 500—\$4; 1000—\$7.50 prepaid. National, Hunter, N. Y.

WASHINGTON, D. C. classified mailing lists, none better, 50c hundred. Moore Lists Co., 751-Quebec Pl. NW., Washington, D. C.

FREE Catalogue guaranteed mailing lists, lowest prices. Carl Torrey Company, Marblehead, Mass.

SALES PROMOTION

POWERFUL Sales messages prepared for penny postals, \$2 each. Submit data. Money back guarantee. Jed Scarborough, Maplewood, New Jersey.

EFFECTIVE Sales letters \$3.00. Adx \$1.00; 12, \$10.00. "Superad" Service, Box 250, Ithaca, N. Y.

INFORMATION

INFORMATION Any subject \$1.00. New York mailing address \$2.50 monthly. Representation of any business or individual. American, Room 1400, 79 Madison Ave., New York.

GRADUATE Engineers of established reputation offer complete consulting service for inventors. Midwest Engineers, Rockford, Illinois.

YOUR Dollars easy; know how? Plan 10c. "MooreMade." Lapeer, Mich.

MODEL Airplanes, Building and Flying—Joseph S. Ott, America's foremost model builder and designer teaches you how to build ships that fly. Very interesting and fascinating sport. 350 pages, 165 plans. Cloth. Price \$2.50. Purchase of book entitles you to membership in Junior Sky League of America. Postpaid upon receipt of price or C.O.D. anywhere in U. S. A. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

MAILING SERVICE

MAILERS. 100 Assorted commission circulars, 10c. Photocolor, 1680 Elmhurst, Detroit, Mich.

WRITERS SERVICE

WHY Don't your stories sell? There is urgent demand for new type of stories. My editorship in three major studios and 12 years active service means I can help you! Do write at once for my new booklet "Inside Facts about Talking Picture Stories!" It's free. Adeline M. Alvord, Dept. L, 215 Balme Studio Building, Hollywood, Calif.

STORY Ideas for talking pictures, magazines, accepted any form for revision, copyright and submission to markets. Established 1917. We know market requirements. Free booklet gives full particulars. Universal Scenario Company, 416 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

CARTOONING

AMATEUR Cartoonists: Sell your work. Write Smith's Service, PC1194, Wenatchee, Washington.

AUTOMOBILES

AUTOMOBILE Racing book. How to build dirt track racers championship racers, fast road cars. New, 10 chapters, 137 illustrations, track records, winning drivers, contest rules, speed, "revs," balance—Postpaid \$1.00. Ray Kuma, Dept. B, Madisonville, Cincinnati, Ohio.

AGENTS. New automobile invention. Generator remote control just out. University Electrical Engineering Company, Davis, California.

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58-S, Adams Building, Washington, D. C. See page 127A.

AUTOMOBILE SUPPLIES

SILVER White plating powder, plates iron, steel, nickel, copper and brass without electricity. Dispenses with polishing. Half pint can \$1.50 prepaid. Free particulars. Gunmetal Co., Ave. J, Decatur, Ill.

ONE Pint black Locomobile enamel makes old fenders like new. 50 cts. postpaid. Gallons \$1. Toolcrib Co., 100 Fox St., Bridgeport, Conn.

SAVE Money auto and truck repairs. Advise parts wanted. New rings 8 cents. Price list free. Century Parts Co., 1712 Lafayette Ave., St. Louis, Mo.

LUSTER Lacquer, automobile paste polish \$1.00 gallon. Renews, preserves, beautifies. Air Devices Division, Indianapolis.

AUTO SERVICE EQUIPMENT

BARGAINS—Compressors, 8-hour charger, test bench, also arc welder. Terms—30 day trial. Ken's Equipment Exchange, Box M-1223, Troy, Ohio.

MOTORCYCLES, BICYCLES AND SUPPLIES

MOTORCYCLES \$25 Up. Terms. Tires \$2.50. Engines for airplanes, ice sleds, boats, pumps, \$10 to \$75. Batteries, frames, forks, cylinders, belts, crankcases, handle bars, tanks, chains, \$1.50. Wheels for airplanes, boys' automobiles, motorcycles, \$1.00 up. Guaranteed bicycles, new, \$16.00. Motor bicycle \$55.00. Bike tires 80c. Save you dollars at Deninger Price Cutter, Rochester, N. Y. Send 25c for catalogue. Cheapest house in U. S. A.

HENDERSON, Excelsior, Harley, Indian, used parts, alloy pistons, catalogue and wings pin 10c. Ballak, 100 N. 12th, St. Louis, Mo.

USED Harley-Davidson motorcycles—many models, low prices. Parts, accessories, service. Send 6c for catalog. Knuth's, 2525 Fond du Lac Ave., Milwaukee, Wis. We sell everything for the motorcyclist.

USED Motorcycles and parts. Circulars 5c. Tower Cycle, 4163 Prairie, St. Louis, Missouri.

MOTORCYCLES—Direct to you at wholesale prices. Guaranteed Indians, Harleys, etc. Cash or easy terms. Send 10c today for latest Illustrated Bulletin "B." Crandall-Hicks Co., 780 Commonwealth Ave., Boston, Massachusetts.

REPAIR With good used parts, save 3/4 or more, state parts needed, no lists. J. B. Dahl, 3661 Archer Ave., Chicago, Ill.

SEND 15c For illustrated used Motorcycle catalog. Large stock. Bargains. Indian parts. Accessories. Indian Motorcycle Sales, Kansas City, Mo.

BATTERIES

GENUINE Edison storage batteries for lighting plants. Non-corrosive. Everlasting. Odorless. Notarized guarantees. Other sizes. Free literature. See Jay Battery Company, 82 Sterling Avenue, Yonkers, N. Y.

EDISON Lighting plant storage batteries. Non-acid, non-sulphating. Odorless. Guaranteed. 15 year life. Lowest prices. Lighting plant, motor bargains. Interesting literature. B. Hawley Smith, 22 Washington Ave., Danbury, Conn.

AVIATION

MEN Wanted for good positions as airplane mechanics and pilots after taking necessary training in government approved school. We qualify you for good positions paying \$150.00 to \$500.00. Lincoln Flying School, 2003 Aircraft Building, Lincoln, Nebraska.

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58-S, Adams Building, Washington, D. C. See page 127A.

CONVERT Your Ford motor for attaching propellers. Circulars and 5 photographs 50c. Heine Motor Works, Orwigsburg, Penna.

\$10.00 LEE "Whizit" flying suits \$4.95. Smokler, Department 13; 489 Fifth Ave., N. Y. C.

BE Prepared in aviation for the next boom. Write for new home study tuition offer. Major Robert Rockwell, Dayton, Ohio.

USED Airplanes, \$50 and up. Catalog 10c. Federal Equipment Co., Deer Park, Ohio.

BETTER Propellers, Harleys, \$4.50; Henderson, \$8.98; Pletenpol, \$9.98. Hibbs, Ft. Worth, Texas.

SPRUCE—Finished to size for airplanes, gliders, iceboats. Highest quality. Lowest prices. Mail sizes for quotation. Pike-Dial Lumber Co., 2257 Loomis, Chicago.

WRITE For free sample of balsa and price list. Aero Shop, 3950 Hurlbut Ave., Detroit, Mich.

BOATS, OUTBOARD MOTORS, ETC.

BOATS!!! Build your own boat now, taking advantage of your spare time and save two-thirds regular builders cost using our ready-cut semi-assembled materials. Cruisers, runabouts, outboards, sail and row. 38 designs as well as complete assortment fittings. Send 10c for catalog. Brooks Boat Co., Inc., Box K-20, Saginaw West Side, Michigan.

ICE-BOATS. Build the "Polar King" this winter. Handles like an automobile. Looks like an airplane. Faster than the wind. Write for prices on blueprints, knock-down kits, parts, etc. Mead Gliders, Dept. B-10, 12 South Market St., Chicago.

BRAND New Indian outboard motors half price—\$85. Few left. Crandall-Hicks Co., 780 Commonwealth Ave., Boston, Mass.

CARTOONING

BOOK, 1500 Cartoons—Limited supply last year books, priced \$1.00 plus postage. Splendid reference file for artists-students. Summers, 13500 Shaw, East Cleveland, Ohio.

ARCHERY

ARCHERY Tackle from the Ozarks where raw material is plentiful and woodcrafters exceptional. Send 4c today for catalog "H." Dealers—write for most attractive discounts and new sales plan. Outdoor Amusement Company, Clinton, Mo.

CHALK TALKS

LAUGH Producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

BOOKS AND PERIODICALS

RARE, Scarce, valuable, curious books. List for stamp. Nepeco, Roseland, Florida.

ALL Outdoors. The west's big outdoor sports magazine, for hunters, trappers, game breeders, fishermen, campers and all outdoor sports. One year—\$1.00. Special offer—six months 25c. Sample copy 10c. All Outdoors, 543 Douglas Bldg., Los Angeles, Calif.

CASH Paid for old books. Want list 10c (coin). Richard, 349 Summer St., New Bedford, Mass.

120 WAYS To make money \$1.00 postpaid. Literature for stamp. Willis, 644 - 13th, Tell City, Ind.

FOR BOYS AND GIRLS

EARN Spending money! Easy work after school! Wonderful prizes given, too. Nothing to buy! Wentworth Co., 177 Milk St., Boston, Mass.

HIGH School students. Spare time. Dignified, profitable. Write Hovis Company, B288, Ypsilanti, Mich.

EARN Christmas money. Order 50 sets Christmas seals. Sell 10c each. When sold return \$3.00, keeping \$2.00. StNicholas Seals, Dept. 43PM., Brooklyn, New York.

HARMONICA Instructor. (16 pages) 25c. Play in one hour. G. Elasa, Bowling Green, Ohio.

PICTURES AND POSTCARDS

CHRISTMAS Cards, 21 beautiful folders, parchments all different, satisfaction guaranteed. \$1.00 postpaid. Send currency. Flor-EI Studios, 304 Paul Brown Bldg., Dept. M-11, St. Louis, Mo.

CHRISTMAS Cards. Beautiful assortment, 25 cards and folders, with tissue lined envelopes. Exceptional value, special \$1.00. Mequon Drug Store, Thiensville, Wis.

JIG-SAW Puzzle blades 30c dozen. $\frac{1}{2}$ " basswood puzzle plywood, twelve square feet, \$1.00. Fifteen assorted pictures \$1.00 postpaid. Puzzle Picture People, Escanaba, Michigan.

GAMES, ENTERTAINMENTS AND PLAYS

PLAYS, Operettas, musical comedies and minstrel, comedy and talking songs, black-face skits, vaudeville acts, monologs, dialogues, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denton & Co., 623 So. Wabash, Dept. 11, Chicago.

MINSTREL Show—Complete \$1.00. Particulars free. Rialto Publishers, 1545 Broadway, New York.

MAGIC, TRICKS, BOOKS AND JOKER NOVELTIES

FREE Magic catalog with mystifying phantom vanishing card trick 10c. No practice required. Wizard Magic Co., Dept. 15-C, Box 1035, Station C, Los Angeles, California.

OPTICAL Novelties, puzzles, tricks, books. 25c brings six good samples. Spaulding Novelties, 3256 Evergreen, Chicago.

CURIOUS Books, unique novelties, magic photos, samples 10 cts. Randall, 124 E. 11th St., New York.

TRICK Catalogue, illustrated. 10c. Oaks Magical, Dept. 548, Oshkosh, Wis.

ELECTRIC Fun! 200 stunts, 110 volts, \$1. Cutting Sons, Campbell, Calif.

MAGIC Tricks, escape tricks, books, illusions, puzzles, etc., catalog 10c. Geo. Fenner, 2491 Jefferson, Louisville, Ky.

MAGIC Catalogue. Wonderful knockout cardtrick. Dinec. Singer, 533, Hancock, Wisconsin.

MAGIC Catalog 20c. Lynn, 103 Beach, Dept. 3, Jersey City, N. J.

SPHINX, Magicians' magazine, 35c. Large illustrated catalog of magic, 25c. Holden, 233 W. 42nd St., N. Y.

RADIO SETS AND SUPPLIES

POWER Transformers—Experimental and eliminator. Built to order. W. M. McCoy, Genoa, Ill.

SHORT Wave construction kits, sets, supplies. Wholesale catalog, 10c. Federal Radio & Telegraph Company, 4220 Clifford Road, Cincinnati.

SENSATIONAL New Melody King crystal radio set only \$1.00. Complete with phone and aerial \$2.75. Postpaid. Melomite, 7722 Fairmount Station, Kansas City, Missouri.

FIVE Short wave blueprints 25c (coin). Real DX results. Four tube AC midset kit \$8.95 complete. Super Engineering, 1313 - 40th St., Brooklyn, N. Y.

CRYSTAL Set works loudspeaker with our microphone button. \$1.00 including instructions. Ellis Laboratories, 713 Tuckerman, Washington, D. C.

MAKE Simple crystal radio. Melomite crystal with instructions, 25c. Melomite, 7722 Fairmount Station, Kansas City, Mo.

SENSATIONAL "Pocket radio," \$2.00. Catalogue, 10c. Nell Tasker, Shamokin, Pa.

GUARANTEED Microphone repairs—any make or model—24-hour service. Stretched diaphragm double-button repairs, \$7.50. Others, \$3.00. Single-button repairs, \$1.50. Write for 1933 catalog with diagrams. Universal Microphone Co., Ltd., Inglewood, California.

STAMP COLLECTING

APPROVAL Headquarters: Happy is the collector who owns a complete first issue of any country, but when that first issue is Azerbaijan, then, there is reason for real pride. This issue consisting of ten stamps, is beautifully printed showing multi-colored native views and is so scarce, that few collectors ever saw them. Although the catalogue value of this complete set is 63c, we offer it as a special bargain for only 10c to approval applicants. Money back if not satisfied. Globus Stamp Co., 208 - 4th Avenue, New York City.

STILL Biggest Dollar—1000 mixed U. S. containing over 100 different varieties for 75c; 1000 mixed foreign for 25c; 100 different British Colonies for 25c; 100 different French Colonies for 25c; 100 different Latin-Americans for 25c; 100 different stamps from 50 different countries for 15c; and 1000 hinges. All above for only \$1.00. Approval selection sent with each order. New England Stamp Co., Inc., Est. 1893, 52-P Bronnfield St., Boston, Mass.

APPROVALS to fit Scott's Junior Albums will be sent to serious collectors on application. New England Stamp Co., Boston, Mass.

OUR 3rd Edition 1932 U. S. price list is now ready. New England Stamp Co., Boston, Massachusetts.

FREE! Brunei (native scene), grotesque Afghanistan, Tanganyika, Grenada, weird Corea, Charkhari, Surinam, and scarce genuine Baden. These splendid stamps absolutely free to those requesting our famous approvals, and enclosing 3c postage. Viking Stamp Co., Sheepshead Bay Station, Brooklyn, N. Y.

FREE! Thrilling Jungledland packet! Includes Sudan, Abyssinia, Congo, Azerbaijan, bandits, explorers, jungle scenes, etc! Also lists, prize coupons, dandy approvals! Everything, 3c postage! Midwood Stampo, Midwood Station, Brooklyn, N. Y.

QUALITY Stamps on approval 1/2c up. Free premium. Kelgwin Stampo, Vineland, New Jersey.

SCARCE Airmail and triangle. Beautiful Uruguay "flying horse" airmail and scarce Guatemala triangle (smallest in the world) are included in our big packet of 60 different stamps from Alouites, Grand Liban, Venezuela, British and French Colonies, etc. All for 5c to approval applicants. Big illustrated lists free with each order. Write today! Mystic Stamp Co., (Dept. 80), Camden, New York.

FREE! 6 U. S. A. Commemoratives, 300 stamps, with year's subscription; 10c. "Stampist" Hyndman, Pennsylvania.

SOUTHERN Seas packet free to approval applicants. Edward Hammond, Auburndale, Massachusetts.

100 DIFFERENT Foreign stamps from 100 different foreign countries, including Africa, Asia, Australia, Europe, West Indies, etc., for only 20c. Free with each order, our pamphlet telling "How to Make a Stamp Collection Properly," together with our price list of albums, supplies and hundreds of bargains in sets, packets, etc. Queen City Stamp Co., Room 36, 604 Race St., Cincinnati, Ohio.

IMMENSE Triangle stamp! The largest in the world, an album giant (Spain 1930 Columbus commemorative) included in amazing packet of thirty-four scarce varieties from queer far-off lands; Reih, Kouang-Tcheou, Gwalior, etc. Absolutely no common European varieties to mar the high quality of this wonderful packet. Only 10c (coin) to approval applicants. Vogue Stamp Co., Dept. P3, Port Chester, N. Y.

1000 UNITED States—25c, 4000—\$1.00. Prepaid. Kilnestamp, Kent, Ohio.

STAMPS That interest us may interest you. Choice approval sheets on request only. Large illustrated price list free. Hatcher Stamp Co., Peoria, Ill.

FREE—Inini set (new country) to applicants for sets at 60% discount. Charles Cleveland, 806 North Humphrey Ave., Oak Park, Illinois.

WHOLESALE Catalog for dealers. Illustrated. Postage 5c. Frank Company, 4900 Chalmers, Baltimore, Md.

NAURU Ship stamp, scarce "dead-country" triangle, world's smallest parcel-post stamp, and 55 others from Tripoli, Eritrea, Libya, Natal, Inini, etc.—all for only 5c to approval applicants. Illustrated lists included. Universal Sales Co., Camden, N. Y.

UNITED States Olympic mixture; strong in commemoratives, airmails. Half pound 50c. Tandrum, 825 West 81st, Los Angeles.

SACRIFICE! Packet Abyssinia, packet triangles, also Zanzibar, Tanganyika, German Africa (yacht), United States \$2.00 stamp and others. All only 10c to approval applicants. Forest, 4709 Liberty Heights, Baltimore, Md.

"GARUDA"—Unique Siam airmail! You will be delighted with our big value packet containing smallest stamp, Haiti, Mauritius, Transvaal and 35 distant lands (no Europe.) 10c coin, 3c postage. Bargain Co., 277-P West 23rd, New York.

BELL Your approval, large membership, world-wide trial 10c. Edgar Snyder, 3 Churchhill, Youngstown, Ohio.

RUSSIA — 1905 Commemoratives — 15c. Koupal, 622 East 135, Bronx, New York.

SET Cataloguing 15c with approvals 3c only. Harvard Stamp Company, Box 74, Cambridge, Mass.

FREE! World's smallest stamp and watermark detector, —3c postage. Bargains in United States packets (all different stamps) 25—10c; 50—25c; 100—95c; 150—\$2.00. Tatham Stampo, West Springfield, Mass.

SOMETHING New—"Foreign Legion" packet, cataloguing \$3—for just two dimes. Bargain. Pleasant satisfaction assured. Safarid, 71-47 Manse, Forest Hills, L. I., New York.

PERFORATION Gauge free with approvals. B. C. Stamp Exchange, Rutland, Canada.

SEND 10 Cents—50 different postage stamps, in perfect condition, to approval applicants. Reference, please. Schefers Stamp Co., Ramsey, N. J.

RARE Sets free to approval applicants. Quality stamps! Akarben Stamp Co., 2929 N. 59 St., Omaha, Nebr.

ODD Names of 450 towns. 25c. Paul Wiard, 2320 Woodward Ave., Pittsburgh, 16, Pennsylvania.

2 STAMPS Cat. 90c and 45 others 5c to approval buyers. How to get a free album. Box 552, Glendale, Calif.

FREE! 57 Varieties unused stamps. Postage 3c. Good until Dec. 15th. Chas. Townsend, Akron, Ohio.

LITTLE Globe trotter pkt., 100 diff. 10c to approval applicants. Victor Stamps, Dept. B, Box 92, West Los Angeles, California.

SCARCE Belgian airmail, pocket album, commemorative set, 40 more stamps from South Sea Islands, Africa, Asia, Canada, South America, etc., for 5c to approval applicants. Glendale Stamp Co., 1342P Linden, Glendale, Calif.

FREE! \$2.00 packet, approval applicants. Enclose reference, 3c postage. Abrams, c/o Freeman Bldg., Atlantic City, N. J.

FREE—Interesting historical stamp booklet to approval applicants. Enclose postage and references. Hawes Stampo, Auburn-dale, Mass.

2000 U. S. Mission mixture stamps, only 25c. Skillman, Titusville, N. J.

EARN Cash, stamps, album. Sell my nickel stamps packets. Ellison, 2841 West 37th Street, Brooklyn, New York.

FREE! Menagerie. Big packet scarce bird and animal stamps only, from Nyassa, Gulana, Ecuador, Barbados, etc., including caribou, lion, wolf, tiger, kangaroo, leopard, camel, anti-eater, elk, eagle, emu, oxen, quetzal, springbok—also big price list—all free to approval applicants enclosing 5c for mailing expenses. Arlington Stamp Co., Box 81A, St. Johns Place, Brooklyn, N. Y.

50 DIFFERENT Stamps cataloging over \$1.00 only 10c to approval applicants. 20,000 different stamps of prices ranging from 1/4c up. All stamps guaranteed genuine and fine selection of U. S. revenues at 1c and up. Address F. G. Stein, Dept. 132, 7360 N. Seeley Ave., Chicago.

WONDERFUL Bargain! Paupa, German Newguinea, Spanish-Morocco, Abyssinia, Andora, Inini, Algeria, and multitude others. All only 10c to approval applicants. Liberty Stamps, Havana, Ill.

35 DIFFERENT United States \$1.10. Fred Onken, 639 79th Street, Brooklyn, New York.

ILLUSTRATED U. S. list, price 50c; large complete U. S. price list 1933 free. Stanley Gibbons, 832 Park Row, N. Y.

CAICOS Islands—Also early United States, Uganda, Lourenzmarques, Congo's Salvador, Monte Carlo, Prince Island, Canada, Ubangi—"Countries collectors haven't got"—Free for 5c postage. Hurry! For yours, now. Empire Stamp Company, Toronto, Canada.

ONLY 5c. 25 Different Japan and Siam to approval applicants. Lester White, West Newton, Mass.

25 FRENCH Colonial pictorials, 5c to approval applicants. John Mason, 200 West 93rd, New York.

ALMANACS, Rareties, 1787 to 1900. List for dime. Faye DeCamp, Camden, O.

SELL Your stamps! Highest prices paid. Write—Doak's, Fresno, Ohio.

500 DIFFERENT Stamps, 20c to approval applicants. R. Sherman, 47 Central Avenue, Hartsdale, N. Y.

COMMEMORATIVES Free! Magnificent packet, 2c postage. Approvals, Duneco, 4312P Madison, Gary, Indiana.

100 DIFFERENT For this Ad and 3c to approval applicants. Evanston Stamp Shop, 2412 Noyes, Evanston, Ill.

1000 U. S. STAMPS, 20c. Auburn Stamp Co., Syracuse, N. Y.

100 DIFFERENT To approval applicants—5c. American Stamp Company, 816 Chalmers Building, Syracuse, N. Y.

AZERBAIJAN Set free. 3c postage. Approvals, H. Rundell, Wadena, Iowa.

PENNY Approvals regardless of catalog. Send self-addressed stamped envelope. Hal Cole, 2320 Mar-Vista, Pasadena, Calif.

JUMBO Surprise mixture \$1.10 with approvals. Stevens Stamps, Walden, N. Y.

100 FOREIGN Stamps, including Persia, Togo, Venezuela, etc., 10 cents. Lufbery, Box 242, Higganum, Conn.

FRENCH And British Colonials. Approvals at real bargain prices. References. Paul Rogers, Tuscarawas, Ohio.

FREE Beautiful surprise premium to approval applicants. Rocky Mountain Stamp Co., Box 371, Colorado Springs, Colorado.

SCARCE Stamp from St. Helena, the lonely island where Napoleon died, included in our packet of 49 different stamps from Malay, Siam, Volta, Caledonia, British and French Colonies. Only 5c to approval applicants. Pioneer Stamp Co., Box 630M, Pasadena, California.

GRIQUALAND—West—Missing in most collections. A fine used Griqualand-West, and 50 good stamps only 5c to new approval applicants. Send today, and we'll include free a dandy set of N. Y. stock transfers! Viking Stamp Company, Sheephead Bay Station, Brooklyn, N. Y.

1000 DIFFERENT Stamps 10c—500, 35c—300, 20c—200, 10c—100, 5c. Also 5c and 10c packets. Ace Stamp Company, 2 East 23rd, New York.

50 DIFFERENT Stamps including beautiful Nyassa Triangle 10c to approval applicants. Wood Stamps, 2915 Stafford, Pittsburgh, Pa.

100 DIFFERENT British Colonies including scarce old New Brunswick, Newfoundland, Canada commemoratives 25c to approval applicants. Reid's, 162 Lauder Avenue, Toronto.

AITUTAKI, Fiji, Brunel, Airmail, Zanzibar, Tanganyika, Mauritius, Kenya, in packet 49 different "hard-to-get" stamps, 6c only to approval applicants. Kenwood Stamp Company, 325 Kenwood, Glendale, Calif.

BELGIUM—Tin hats—123-29 cat. 52c to approval applicants for 15c. Good stamps. Bargain prices. Kumbler, 229 Cherry, Lancaster, Ohio.

UNITED States commemoratives, packet 60 varieties, catalog \$3.50, net \$1.45; packet 75 varieties, catalog \$10.00, net \$3.95; packet 50 different postage only 45c; 100 different postage \$1. Betts, 17065 Valleyview, Cleveland, Ohio.

SURPRISE Packet Cuba, 10 cents. Dale, Box 714, Havana, Cuba.

SURPRISE Box about 3000 stamps \$3. Henry Kost, Liberty, N. Y.

UNITED States stamp packets. Fine variety and quality. 25 varieties, 20c; 50 varieties, 40c; 100 varieties, 80c. Best value obtainable. Remit in money order only. General approvals also. Pacific Stamp Exchange, 534 Douglas Building, Los Angeles, California.

FREE—Two diff. unused U. S. commemoratives with surprise packet 15c. only to collectors asking approvals. George Haba, Colfax Ave. E., Roselle Park, N. J.

SEND For Our Select Approvals. Select Stamp Service, Independence, Mo.

PROFITSHARING Coupons free with purchases. Premiums, lists, with approvals. French, 267 Herr, Harrisburg, Pa.

8 SCARCE Triangles, Philatelic magazine 10c. Gardner, 3220 Cuthbert, Baltimore, Maryland.

NEW Manchurian stamps. Send one dollar. Japan Stamp Company, Kobe, Japan.

FREE Foreign packet to approval applicants. Box 1305, Gary, Indiana.

8 ININI Different. Approval applicants. C. A. Leeson, 674 Yonge St., Toronto 5, Canada.

1000 UNIVERSAL Hinges 10c; lists free. Harvey Teeple, Decatur, Indiana.

FREE! Five beautiful large Morocco with one cent approvals. Amiel, 2984 Nostredam Ave., Brooklyn, N. Y.

FREE Packet Algeria, Newfoundland, China, Canada, etc., to approval applicants. Enclose postage. Geo. Flagg, 165 Tremont, Boston, Mass.

U. S. COMMEMORATIVES, Complete stock, mint and used. Ask for free price list. Uptown Stamp Co., 140-P West 42nd, New York.

HELPSOUTOFIT, 5000 Different 1c each regardless catalog value. References. Albanbook, Albany, N. Y.

1000 MIXED United States, 25c. Wilcox, 607 Bear, Syracuse, N. Y.

FREE! Fine set of three beautiful Spanish airmails, largest in the world, to approval applicants enclosing 3c postage. Whitney, Mayo Court, Leominster, Mass.

FREE: 70 Different stamps to approval applicants. John Cooley, Fishers Island, New York.

200 DIFFERENT Stamps, including triangle, airmail, etc., 10c. R. H. Carlton, Tujunga, Calif.

1000 ASSORTED U. S. stamps—25c, 100 U. S. commemoratives—25c. Midland Stamp, 100 Chester, Syracuse, New York.

55 SCARCE Abyssinia, South Russia, Mesopotamia, Eritrea, etc., 5c to approval applicants! Bamapo Stampo, Ramsey, N. J.

GUATEMALA Or Japanese packet 5c. Approval applicants. Knauel, Edwardsville, Illinois.

500 HINGES 5c. Stamp bargains and approvals sent. Harvey Teeple, Decatur, Ind.

LIBERIA, Hornbill, Bird Scott No. 192 cat. \$4 free with purchases from my big Liberia list. Fred Hoterberg, 4448 N. Ashland Ave., Chicago.

U. S. COMMEMORATIVES—12 All different, 10 used, 2 unused—all for 10c. Highlander Brothers, Orange, Va.

UNITED States mission 35c, foreign 75c, Canada 60c per lb. Post free to 3rd zone. Mission Co., 4512 North Racine, Chicago.

GRAVEYARD Mixture. Remains of collections and approvals, slightly damaged rare stamps, 100 for ten cents. Gasper, 1221 California, Cincinnati, Ohio.

FREE! 6 U. S. A. commemoratives, 156 stamps! 3c postage. Vanvoornia, Hyndman, Pennsylvania.

121 DIFFERENT United States 50c; 50 different United States Commemoratives 75c; 30 different 25c. C. Reitter, Box 718, Kansas City, Mo.

CANADA Conference 2 values free with 30 different Canada or 25 different airmails, either packet 15c; both for 25c. Lists free. Specials: 500 diff. 25c; 1000 diff. 75c; 2000 diff. \$2.00; approval selection with each order. Victoria Stamp Company, London 4, Canada.

NYASSA Triangle set (9 different) 10c only to reliable approval applicants. New Empire Stamp Co., 103A La Salle Str., New York.

1000 FOREIGN Mixed stamps 25c. Washington Bicentennial souvenir free. Le Roy Trading Co., Le Roy, N. Y.

READ This. Inini, Gwallor, Cyprus, French Colonials, 55 all different. Also stamp wallet, hinges. All 5c to approval applicants. United Pacific Philatelists, Dept. M, Box 25, Ventura, California.

FREE—25 British Colonies, Nyassaland, etc., to approval applicants. Send postage. Frank Ewing, Box 683, Cleveland, Ohio.

FREE! Loose leaf postage stamp album at rate of 8 pages each month given with subscription to monthly journal. Send 3c stamp for prospectus. United Stamp Co., Marquette Bldg., Chicago, Ill.

FREE—Five Siam to approval applicants. Bernard Karch, Middle River, Maryland.

FREE Dollar packet to one cent approval applicants. Harlan, 5397 S. Marshfield Ave., Chicago, Illinois.

PENNY Approvals, 5,000 Sudan, Congo, Nyassa, Liberia, etc. Also 15,000 averaging 15c. Philatelic Exchange, Huntington, W. Va.

44 DIFF. United States, including \$2 tax, 12c; 30 Canada 12c. Robert Haynes, Point Place, Toledo, Ohio.

40 DIFFERENT United States 12c. Approvals at 60% discount. Seidenberg, Baroda, Mich.

250 GOOD Mixed foreign stamps, 10c. 500 very finely mixed, 25c. Stanton, East-Lyme, Conn.

PENNY Approvals that satisfy. Neil Gronberg, Box 5441, Philadelphia, Pa.

CANADA 30 Varieties 15c; 20 Newfoundland 10c; 100 British Colonies 15c; all three 35c. 50 Canada 30c; 50 Newfoundland 95c. Approvals with each order. Westminster Stamp Company, London, 5060, Canada.

75% DISCOUNT Off Scotts many hard to get nineteenth century stamps. References please. Hubert Codwise, Garland St., Lynn, Mass.

WRITE Hippentiel, Russell Avenue, Bethlehem, Pennsylvania, for list of twenty covers for one dollar.

ANCHER'S \$44 Outfit—only 12c. Fine triangle stamp, set German stamps (pre-war) value millions dollars, perforation gauge and mm. scale, airmail set, interesting stamp smallest republic, newspaper set, packet good stamps Travancore, Malay, Dutch Indies, etc., fine pocket stock book. Entire outfit 12c to approval applicants. Ancher Stamp Company, Rutherford, N. J.

24 VARIETIES Cuban stamps, 10 cents. List of stamps free. Chambers Stamp Co., 111P Nassau, New York City, N. Y.

ONLY 5c. 33 Different stamps including scarce Latvian triangular airmail stamps, 10 airmail, 12 United States (early issues, commemoratives, etc.) and 10 Canada. Approvals and illustrated pricelist sent with each order. Curhan Stamp Company, Gloucester, Mass.

COLLECTORS! For exchanging stamps, illustrated postcards with 2600 collectors. Ask American booklet 162, Registre Echangeistes, 51 Passage Bureau, Paris, France.

U. S. 25 Diff. air mails, commemoratives, revenues; 10 South America; all 5c with approvals. Hudson & Co., Plainfield, N. J.

BRITISH Colonies; 50 different given approval applicants sending 3c postage. R. D. Davis, Silver Lake, Indiana.

301 DIFFERENT 10c To approval applicants only. Free list of bargain packets. Kansas City Stamp Co., Lee Bldg., Kansas City, Mo.

FREE!! 15 Pictorial stamps. Postage 3c. E. Roberts, 901 Fourth, Bay City, Mich.

STAMPS Sent on approval, at 50% discount. Fred Herzberg, 197 E. Grantley Ave., Elmhurst, Ill.

200 DIFFERENT 10c, 25 Japan 10c, 60% discount approvals. Covert Stamp, 39 State, Rochester, N. Y.

STAMPS Sent on approval at 70% discount. Reference required. Emory Benoit, Hanover, Pa.

UNITED States stamps on approval. Huber, 3531 Penn Ave. No., Minneapolis, Minnesota.

UNPICKED Stamps from foreign missions, \$1 per pound or 25c per sample thousand. Approvals sent unless forbidden. Elmer, 192A Washington Street, Boston.

105 (CHINA, Etc.) 2c. Album (500 illustrations) 3c. Bullard, 446 Tremont, Boston.

PACKET 52 Different from Alaouites, Lebanon, Slam, etc., also watermark detector and rare old Hawaiian stamp—all for only 5c to approval applicants. Highland Stamp Co., Newton Highlands, Mass.

BEST One cent approvals in America. F. Hand, 1117 So. 66th St., Philadelphia.

QUALITY Stamps on approval 4c up. Free premium. Kelwin Stampo, Vineland, New Jersey.

"ALTHOUGH My stock of stamps is adequate to take care of business for years to come, yet results were so far beyond my expectations that with the help I had, I was unable to take care of further new customers." Such are the reports received from advertisers using space under this classification. Your offer should be equally as well. For further information as to rates, closing dates, etc., write M. L. Rund, Manager, Classified Advertising, Popular Mechanics Magazine, 290 E. Ontario St., Chicago, Ill.

RARE COINS

GET Profit and pleasure in collecting old coins. Send for free 48-page illustrated coin catalog. You'll be delighted with it. Send for it now. It's free. B. Max Mehl, Numismatist, Mehl Bldg., Dept. P, Fort Worth, Texas. Largest rare coin firm in U. S.

FOREIGN 15c Silver coin, one piece Eskimo money and catalog 15c. Geo. Best, Cedar Rapids, Iowa.

OLD Money wanted. Will pay \$100.00 for 1894 dime, S. mint; \$50.00 for 1913 Liberty head nickel (not Buffalo). Big premiums paid for all rare coins. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. H, Ft. Worth, Tex.

OLD Coins for sale. Selling list and old coin 10c. Davis, Box 1791, Huntington, West Virginia.

CALIFORNIA Gold—Quarter size, 27c; 3/4 size 53c; 3c piece and catalog, 10c. Norman Shultz, Box 748, Salt Lake, Utah.

50 DIFFERENT Bills including four 1854 25c. 60 different 50c. Coin Exchange, Box 654, Kansas City, Mo.

16 DIFFERENT Coins, 25c; 30 diff., 50c; 60 diff., \$1.00. Bischoff, North Kansas City, Missouri.

UP TO \$10.00 each for certain Indian head pennies. Send dime for list of these wanted. Coin-Shep, D, Springfield, Mo.

WOODEN Nickel, 25c; Confederate ten dollar bill, 20c; coin book, 25c. Kohn-X-Change, PM-33-S Dearborn, Chicago.

FOREIGN Copper before 1800, 3 crisp notes and catalog 10c. M. Figg, Box 283, Cedar Rapids, Iowa.

SEND 10c For 5 different coins and catalog or 50c for 25 different. Troyer Coin Co., La Fontaine, Ind.

\$5 TO \$500 Each paid for old coins. Many very valuable. Keep all old money. Get posted. Send 10 cents for illustrated coin value book, 4x8. Guaranteed prices. We buy and sell. Coin Exchange, Box 5, Le Roy, N. Y.

UNITED STATES. Large cent, two-cent bronze, three-cent nickel and bargain list, 25c. Thirteen dates large cents, \$1.00. George Coffin, Greenwood Mountain, Maine.

7 DIFFERENT Coins, 11 bills and catalog, 25c. Creamer's, 1112 Somerset, Baltimore, Maryland.

CAMERAS AND PHOTO FINISHING

MAKE Your camera bring you an income instead of expense. Earn good money right where you live making photographs that will sell to magazines and newspapers. Tremendous demand. Fascinating, money-making spare time occupation, quickly learned at home through U. P. training in Journalistic Photography. Possible to earn training fee while learning. Write for free book today. Universal Photographers' Corporation, Dept. 6M, 10 West 33rd Street, New York.

WATCH Cameras, twenty exposures, every tick a picture. Wonderful Christmas present. Complete outfit—\$3.98 post paid. Send for economy list—cameras and supplies. Gennert, Inc., 29 W. 22nd St., New York, New York.

PHOTO Christmas cards made from your own negatives 10c each with envelopes. Beautifully mounted 5x7 enlargement 30c. One roll film developed 5c, prints 3c each. Young Photo Service, 405 Bertha St., Albany, N. Y.

YOUR Favorite negative enlarged to 8x10 and hand tinted, \$1.00. Lone Pine Studio, 7 Hazelwood, Waterville, Maine.

BARGAINS—1A Eastman Kodak Jr., RR lens \$6.75, 9x12cm. Voigtlander Vag. f:4.5 lens in Iboce shutter \$14.75, 3 1/4x4 1/4 Graflex Series B kodak, f:4.5 lens, \$48.75. These are just a few—hundreds of others listed in our bargain book. Write for your copy today free. Central Camera Co., Dept. PM12F, 230 South Wabash Avenue, Chicago Illinois.

16MM FILMS And equipment. Art reels our specialty. Lists. Lincoln Photo Service, 1136 Lincoln Avenue, Utica, New York.

CAMERA Bargains. Zeiss Maxilar slightly used 9x12 cm., F4.5 Tessar, latest model, \$37, was \$48, Graflex Mod. B, F4.5, almost new, \$58, was \$89. Graflex Mod. C. Cooke F2.5 lens, real barg. \$139, like new. Many other wonderful bargains in new catalog No. 138 just out. Free. Norman-Willetts Company, 318 W. Washington St., Chicago.

20 XMAS Cards from your negative \$1.00. Summers, Unionville, Mo.

25 PRINTS 30c. Film developed, 16 prints finished 25c. Box 5, Lemons, Mo.

PHOTOGRAPHIC Postcards made from your own negatives 40c dozen. Use them for Christmas cards. Your friends will appreciate them more than store cards. W. Minor, Fruita, Colorado.

25 REPRINTS 50c Coin. Hand-painted enlargement. Globe Service, 816 Hennepin, Minneapolis, Minnesota.

"FIRESIDE-GLO" And photo statuettes. Engel Photo Service, Strasburg, Illinois.

MAKE Money in photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 3431, 3601 Michigan Avenue, Chicago.

SPECIAL Trial offer: Developing any size roll 5 cents; prints 3 cents each. Beautiful 7 inch enlargement 20 cents. Send for special bargain list, Roanoke Photo Finishing Company, 209 Bell Avenue, Roanoke, Virginia.

HAVE You a camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, 17, Mass.

YOUR Favorite kodak picture enlarged, size 5x7, 10c. Three for quarter, coin. Send best negative (film) today. Address Darmer Photo Lab., 221 Securities Bldg., Des Moines, Iowa.

MOTION PICTURES AND SOUND EQUIPMENT

BASS, Camera Bargain Headquarters, offers 100-ft. capacity Peko automatic spring driven 16mm motion picture camera with f:3.5 lens and water-proof case, worth \$50.00, at \$22.50, with money back guarantee. Fresh Eastman film, 100 ft., panchromatic reversible, includes developing at \$1.80. Hundreds of other bargains listed in the great Bass Bargaingram No. 209. Copy on receipt of 5c in stamps. Bass Camera Company, 179 W. Madison Street, Chicago, Ill.

\$1.250 FOR Original photoplay story. Our sales department sold unknown author's first story for above amount. We revise copyright and submit to studios stories for talking pictures. Being located in the heart of motion picture industry we know production requirements. Established 1917. Free booklet. Universal Scenario Company, 206 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

TALKIE And movie producers are clamoring for new short story ideas, plots, etc. Perhaps you can write one that we can shape and sell for you. One writer (V.M.) received \$3,000. New York best market. Write now for free booklet, without obligation—How To Write For the Talkies! Daniel O'Malley Company Inc., Suite P, 1776 Broadway, New York.

ART Film 100 ft. 16mm \$3.00. Sound attachments, 400' reels 38c; humidors 45c; cement 20c. 30x40 crystal roller beaded screen \$4.86. Eastman splicing \$1.25. Free library membership. Lists. Mogull Bros., 1914-J Boston Road, N. Y. C.

MOVIE Camera bargains. Films, slightly used, B & H. F3.5, \$59.50 with case, was \$140. Keystone 16 mm, motor drive F3.5, like new, \$19.50, was \$35. Universal 35 mm, 200 ft., F3.5 lens, with tripod \$95, was \$500. Many others. Free bargain catalog No. 136 just out. Norman-Willetts Company, 318 W. Washington St., Chicago.

HOLIDAY Bargains. 35mm. and 16mm. odd reels, \$1.00 plus postage. Lists 3c. Hoffman Film Service, 57 Broad, Albany, New York.

WORLD'S Greatest "Passion Play" 16 MM. (new) 5 reels. Rent or purchase. Write Hemenway Film Co., 37 Church Street, Boston, Mass.

SOUND Reel with record, twelve dollars. One hundred foot comedies \$2.50. Motor driven Duograph projector \$17.50. Film for camera—Kin-O-Lux Sun Ray \$3, Eastman-Stewart Warner \$4.50. Milton Mendelwager, 192 Ave. B, Bayonne, N. J.

WESTERN Reels \$1.50, 500 feet \$1.00. Jersey Films, 2050 Chesterland, Lakewood, Ohio.

16MM MOVIE Equipment. Bargain lists free. Elder, Dept. A-12, Chelsea, Mass.

LEARN Theatre management at home. Unusual opportunities. Free catalog. Theatre Managers Institute, Elmira, New York.

16MM QRS Projector \$3.95. Popular Star films 35c up. Free bargain lists. Home Movies, Box 32, Easton, Pennsylvania.

16mm FILMS, 100 Feet, \$2.25. Send dime for big catalogue and usable souvenir films. Eastin Films, Galesburg, Ill.

TRADE AND TECHNICAL SCHOOLS

OWN Your own business! Learn shoe re-building, hat renovating, clothes pressing. Enormous profits. Catalogue free. Gustas, Inc., T-T W, Division, Chicago.

LEARN Watch repairing. Hiles School, 5320 Mission St., San Francisco.

MODEL Of Jimmy Doolittle's record-breaking transcontinental racing plane detailed in blueprint 8N827, for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

BUSINESS OPPORTUNITIES

PLASTEX Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. So material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. Big X-mas business starts this month. You are just in time. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

START In business in your own kitchen. Cake doughnuts—fastest selling food product. Baked by electricity—new kinds and flavors. No canvassing. Sell output to stores. Strictly cash year-round business. Big profits. Less than \$60 total investment. Free particulars. Ringer Co., 64 Main St., Minneapolis, Minn.

\$1.50 STARTS You. Brand new business. \$50.00 week up possible. Mr. Boyer, 3828 Arsenal, St. Louis, Mo.

BARGAINS—Paint spray outfit, gasoline engine drive. Teras—trial. Helmick Paint Spray Exchange, Box M-1222, Troy, Ohio.

"MAKE Big money!" Raising giant bullfrogs! (Your backyard.) We buy them, furnish breeders and instructions. American Bullfrog Industries, 100-P, Fremont, Ohio.

MAIL Order and light manufacturing business—500% profit selling typewriter ribbons. Patented machine makes best \$1.00 ribbon for 18c. Every office a repeating prospect, monthly. Send 50c for sample and complete mail order plan. Ribbon Ink Corporation, 360 N. Michigan, Chicago.

AUTO Door utility pocket-road map, pipes, cigarettes, etc., always in place. Sample 50 cents. The Furniture Studio, Wilmette, Illinois.

OPERATE Dignified business, assured profits. Guaranteed plans \$1.00. Money refunded if plans fail. Doctors' Protective Association, Fort Worth, Texas.

START 1933 Right! Making successful products from guaranteed formulas. No machinery needed. Profits great! Metallic cold solder; Water Wax; Plaidura; Polish-plaster; Oil-eater; Dry Anti-freeze; latest advertised specialties, all lines. Get my 36th unequalled free anniversary offer. Miller, Chemist, 1766BP, Tampa, Florida.

EARN Up to \$25 weekly or more growing mushrooms in your cellar or shed. Illustrated booklet free. American Mushroom Industries, Ltd., Dept. 381, Toronto, Ont.

SIGNS And showcards, paint them yourself with letter patterns. So simple a child can do it, just trace pattern and fill in. Write for free samples. John Bahn, A2129 Neva Ave., Chicago.

ARE You old at forty? See our advertisement on page 36A of this issue. The Electro Thermal Company, 2160 Morris Ave., Steubenville, Ohio.

"HOMEWORK" 24 Plans 50c. Homework Service, 243 Willard, Toledo, Ohio.

MAKE Artificial marble, colorful glossy tiles, no polishing; rather uncanny. Novelties, tabletops, bookends, floors, whetstones. Hard, inexpensive, fireproof, enamels wood. Secret cement methods. Amazing samples. 3c. John A. Pagn, 945 Grande Vista Drive, Los Angeles, Calif.

MAIL Order drug store. Let us supply your drug store wants. Meguon Drug Store, Thibaultville, Wis.

SUCCEED With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxly Company, Washington, D. C.

MANUFACTURE Chipped glass house numbers. Beveridge, 166-22 Locust, Jamaica, New York.

SEND Your name on post card. Receive three free books. Mail order business. 3c postage appreciated. Dolsen Herald, 36 Liberty St., Brooklyn, New York.

STEADY Income with "chain" of amusement and merchandise vending machines. Start small capital. Robbins Corp., DeKalb and Broadway, Brooklyn, New York.

EARN Upwards of \$20 weekly growing mushrooms, all fall and winter, in cellars or outbuildings. Ready market. Begin now. Illustrated booklet free. Established 25 years. Adams Mushroom Co., Dept. 147, Toronto 10, Canada.

"SCHEMER Magazine," Alliance, Ohio, pays 50% dividend. Copy and dollar dividend blank, only 10c.

"KEY To Business Opportunities," 36 page booklet free. General Service Bureau, Box 627, Buffalo, N. Y.

I MADE \$50.00 Weekly renewing colors in rugs, upholstery, etc. Free booklet explains. Alhambra Laboratories, Box 44, Alhambra, Calif.

CHEMICAL Expert furnishes manufacturing formulas with complete working directions. Reliable individual service. Charges reasonable. Dr. VanHeeden, 4721 Lakopark, Chicago.

NEW Plan sure fire by mail. Gets agents. They pile up profits. Details stamp, or plan \$1.00. John F. Coleman, Box 14-P, Smithboro, New York.

POPCORN Machines, all types, lowest prices. Northside Co., 2117 Harding, Des Moines, Iowa.

MANUFACTURE—Sell your own beverages, extracts, candles, soaps, perfumes, etc. Free booklet. Truway Laboratories, 1333 Walton St., Chicago.

AMATEUR Cartoonists: Sell your work. Write Smith's Service, PW1194, Wenatchee, Wash.

700 MONEY Making secrets will help you start a business of your own. Write Illinois Universal, 800 N. Central Ave., Chicago.

SELL By mail. Books, novelties, bargains! Large profits. Particulars free. R. Effen, 525 S. Dearborn, Chicago.

MIRBORS Resilvered at home. Costs near 5 cents per square foot; you charge 50 cents. Profitable business plating like new brass worn-off autoparts, reflectors, tableware, spoons, etc. Outfits furnished. Details free. Sprinkle, Plater, 127, Marion, Ind.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gummetal Co., Ave. N, Decatur, Ill.

FORMULAS—Our literature will surprise you. Belfort, 4042 N. Keeler, Chicago.

START Little business anywhere. Everything furnished. No canvassing. Maywood, PM.923 Broadway, New York.

WHOLESALE Directory 300,000 articles 10c. Other valuable information. Moran Company, Wareham, Massachusetts.

FREE Booklet describes 87 plans for making \$20-\$100 weekly in home or office business of your own. Elite Co., 214 Grand St., New York.

GRANDFATHER Clock case, colonial type, ideal for electric movement, described on blueprint SN 501 for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

CHEMICAL Expert will furnish formulas and trade secrets. All lines. Lists free. W. L. Cummings, Ph. D., 228 Gordon Ave., Syracuse, N. Y.

LEARN The collection business. Good income, quick results. Interesting booklet, "Skillful Collecting" free. National Collectors Assn., Long St., Newark, Ohio.

CHARTERS: Delaware; best, cheapest; free form. Colonial Charter Co., Wilmington, Del.

OPERATE Chain of vending and amusement machines. Be independent for life. Start small, grow big. P. Goodbody, 1828 East Main Street, Rochester, N. Y.

A BUSINESS Of your own making—Sparkling Glass Name and Number plates. Checkerboards, signs. Big book and sample free. E. Palmer, 540. Wooster, Ohio.

ARTIFICIAL Marble sanitary flooring. Instructions covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost. Ornamental casting, concrete plaster papier-mache decorations, garden furniture, statuary, flexible molds, particulars and illustrations free. Chris. Mahler, Elmont, N. Y.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950 W. Broad, Richmond, Va.

CHEMISTRY

SEND 25c For new illustrated chemical experiment book with 207 formulas and tests. Catalogue of apparatus and chemicals free. J. Winn, 124 West 23rd, New York City.

CHEMICAL Consultation. Analytical service. Formulas rectified. Processes developed. Submit your problem. C. Thaxly Co., Washington, D. C.

FOR Sale. Information, marvelous discovery. World wide market. Perpetual income. Viola DuFrene, Hamilton, Mont.

CHEMISTS: 1932 Bargain list covering 2000 laboratory items 10c. 288 page catalogue 50c. Laboratory Materials Co., 643 E. 71st St., Chicago, Ill.

JOIN—American Amateur Chemists Society Journal, particulars 10c. Lansing, Mich.

ANALYSIS. Chemical consultation, processes, manufacturing plans. Guaranteed formulas. Small investment. Write. Associated Chemists, Indianapolis, Indiana.

HANDBOOK For chemical experimenters. Hundreds of experiments, illustrated, 50c. Booklet of experiments 15c. 1932-33 chemical apparatus catalogue 10c. Lowest prices. General Chemical Co., Reading, Penna.

BOY Mechanic—Famous library of 4 volumes covers the building of everything a boy might want to make. A great boon to parents and teachers. Actually covers 4000 different articles. Each volume 460 pages, fully illustrated. Cloth. Price \$2.00 or set of 4 vols.—\$7.00 postpaid upon receipt of price or C.O.D. anywhere in the U. S. A. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

FORMULAS AND TRADE SECRETS

TRANSFERINE: Transfers pictures from papers to cloth, etc. Formula 50c. J. C. Howell, Arlington, Oregon.

GUARANTEED Automobile radiator antifreeze mixture. Formula \$1.00. Also cosmetic and pharmaceutical formulas. Cleveland Laboratories, 711 Cleveland Street, Brooklyn, N. Y.

FREE—1933 Formula catalog. Moneymakers. Western Chemical, Salem, Oregon.

SUPERIOR Formula: Complete manufacturing information for automobile batteries, particulars free. "Molab," 3222 Dickens, Chicago.

SUCCEED With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxly Company, Washington, D. C.

OWN A business—Make products with guaranteed formulas, trade secrets. Catalog free. Industrial Institute, A-12, 360 N. Michigan, Chicago.

TESTED Formulas. Newest, guaranteed. Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

FORMULAS. Business plans. Literature free. Belfort, 4042 N. Keeler, Chicago.

500 FORMULAS And big illustrated catalogue 25c. Ideal Book Shop, Park Ridge, Ill.

METALLIC Liquid solder formula \$3.00, guaranteed, made up samples 20c, write. Electro-Thermo Works, Peoria, Ill.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mullages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book pay \$5.50 and postal charges. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

"TESTING Precious metals with Touchstone"—practical booklet on buying old jewelry, dentures; detects platinum, palladium, gold, 50c. Jewelers Advice, 22 Albany, N. Y. City.

FORMULAS. All kinds. Guaranteed. Catalog free. Kemico, 31, Parkridge, Ill.

COOK'S Auto formulas. No guess work. Try samples finished products. Also chemicals, cans, containers for beginners. Geo. E. Cook, Box 281, Oyster Bay, N. Y.

1,000,000 FORMULAS. Industrial facts, tables, processes, rules, trade secrets, and calculations for all kinds of Trades and Businesses. Book—"Moore's Assistant"—1016 pages. Send postpaid for \$2.00. Ogilvie Publishing Co., 57 Rose St., Dept. 22, New York.

1100 SELECT Formulas, 26th anniversary offer, free materials for specialties worth \$47.00. Valuable selling systems, all free! Stamp brings amazing offer!! Miller, Chemist, 1706FP, Tampa, Florida.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W, Broad, Richmond, Va.

AGENTS WANTED

MAGIC Gas stove appliance. Cooks meals in half time at half cost. Pays for itself first 30 days. Actually puts money in pockets of purchaser. No sales resistance. 200% profit. Guaranteed. Agents—crew managers—write quick. A few choice territories still open. Economy Appliances, 1213 Van Buren, Dept. A-20, Chicago.

SELL Personal Christmas cards! 20 for \$1.25; your profit 60c. Sample box with your name 35c. Wentworth Co., 177 Milk St., Boston, Mass.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Permanent business. Neonite, Akron, Ohio.

BIG Profits selling household specialties. Write Novotny Products Co., Montgomery, Minnesota.

DISTRIBUTORS—Capable organizing women crews. No remarkable necessity. Women buy on sight. Sensational profits. No competition. Tekshon, Dept. K, 103 Park Ave., New York.

200% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. Sample 10c. New Method Co., Desk P.M.M-13, Bradford, Pa.

JUST Invented—New oil burner. Fits in any stove or furnace. Burns cheap oil. Fully guaranteed; 100% profit. Free sample offer. Protected territory. International Oil Heating Company, Dept. C-13, St. Louis, Mo.

NEW Rubber goods line. 47 revolutionary inventions. Homes, offices buy instantly. Agents cleaning up \$90 weekly. Outfit free. Kristee Mfg., Box 1442, Akron, Ohio.

100% PROFIT! Coal carburetor cuts coal bill 50%. Retail \$9.85, costs you \$4.85. Details free. Get your sample now and reserve territory. Franklin Stone Manufacturing Company, 40 Clinton Street, Newark, New Jersey.

AMAZING Liquid solder sticks tight to metals, leather, wood, pottery, etc. No heat, acid, skill needed. 200% profit to agents. Write Menzit Co., Dept. 248-A, Delphos, Ohio.

MYSTERY Cord set! Does entire ironing automatically. Prevents scorching. Saves electricity. For telephones also. Approved Good Housekeeping. 166% profit. Samples furnished. Neverknot, Dept. 12-A, 4503 Ravenswood, Chicago.

NEW Invention pays large daily profits; cleans, polishes instantly furniture, automobiles, glass, metal, without cloth or other polishes; light to carry, amazingly fast 25c seller; big reputer; write quick. I. D. Shef, Union City, N. J.

OUR Wonderful luminous crucifixes and religious statues still lead the parade for results. Shine brilliantly in the dark. Sell on first demonstration. W. G. Hannan Co., 2539 So. State St., Chicago.

AGENTS Wanted for patented ladies heel protector, auto or office use. Double your money. Send 25c for samples. Act now; secure territorial rights. Protekshu Manufacturing, Inc., Pacific Building, Oakland, California.

JUST Out—New automatic machine kills ice box "halitosis"! Actually "breathes" air—ends waste. Homes, stores buy on sight. Up to \$5 an hour. Amazing test offer. Write quick! St. Louis Mfg. Co., Dept. W-1, Carter & Warne Aves., St. Louis, Mo.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AMAZING Profits with "No Frost." Keeps auto windshields, show-windows, etc., absolutely clear of frost, mist, steam, rain, sleet and snow. Makes wonderful demonstration. Pocket package. Tremendous seller. Big profits. Investigate sure, Albert Mills, 1820 Monmouth, Cincinnati, Ohio.

DOUBLE-EYED Self-threading needle packages, size 3/9, blind people thread them. Samples, particulars, 25c. Agents wanted. Wm. Oglesby, Vandalia, Ill.

400% PROFIT Selling signs used everywhere. Largest selection, wonderful repeat business. \$1.00 worth samples, 25c; 50 signs \$1.00. 100 signs, \$5.00. P. Franklin Co., 3223 Third Ave., N. Y. C.

PURSE-LITE. Just out. Big 25c seller. L. Pries, Minneapolis, Minn.

DISTRIBUTORS And agents for Soderite, the original metal base fluid solder. No heat or acid. Solders almost everything. Small amount of cash. See full page advertisement Popular Mechanics Shop Notes, Fluid Solder Products Co., Van Wert, Ohio.

"SPARKLE Polish" repeats; profits big; sample free. J. Home, 3949 Metropolitan, Chicago.

HAN-DEE Cloth quickly polishes all metals. Representatives enthusiastic over easy sales—quick profits. Demonstrating sample free. Ruskin Company, 1501 Euclid, Cleveland.

A SELLING Miracle! Profits from the new Rite-Way line astound even seasoned veterans of selling. New plan solves problem of depression money-making. Write at once for full details. Rite-Way Products Co., Dept. W-146, 4367 Warne Ave., St. Louis, Missouri.

ENGRAVED Name plates, signs, number plates, desk plates, window signs, etc., profits large. Brett Bros., Winthrop, Mass.

MAKE Products yourself. Tested formulas—Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

NEW Invention. Attachment for electric bulb perfumes home. Novel. Fascinating. Everybody buys. Repeats. 25c brings outfit. Werner Mfg. Co., 125 Court St., Brooklyn, N. Y.

HOO-RAY Game. Hundreds can play. Brand new. For theatres, dances, parties, merchants advertising stunt, etc. Unusual opportunity salesmen. Hoo-Ray Game Co., 710 Cooper Bldg., Denver, Colo.

WHOLESALE Dealers' directory: 124 pages. Free circular. Maywood, 921 Broadway, New York.

NEON Tubes now available to experimenters and others. Straight two foot lengths. Red, blue, green. Set with transformer and everything to operate \$7.80. John Earley, 173 N. W. 16th St., Miami, Fla.

STIK Tite sole protectors. Guaranteed to outwear shoes. Wonder Products Company, 3335 Avalon, Los Angeles, Calif.

SUCCEED With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxly Company, Washington, D. C.

QUICK. Steady money introducing "Lend-a" Hand cleaner. New. Different. Removes grease, oil, stains; even printers' ink. Dandy to demonstrate. Over 100% profit. Constant repeater. Unique, self-selling plan builds business quickly. Details and sample free. Ivo-San Laboratory, 4612 St. Clair, Dept. L-55, Cleveland, O.

LAUGH At unemployment. Earn money home propositions. No canvassing. Hetzel, 802 Garden, Hartford, Conn.

AGENTS—Enormous profits selling new low priced gas saver, also hot water heater "Booster." Wallace, 2606 No. Hamlin, Chicago.

AGENTS Looking for a holiday special. Prairie State Specialty, 1822 Newport, Chicago.

IT'S New! Washes clothes spotlessly clean without rubbing. Every woman buys. 200% profit. Retail 25c. Big repeater. Sample free. Atlas, Chesterfield Station, Dept. M-20, Chicago.

GOOD Fountain pens. 18c up, samples 4 styles \$1. Hell, Desk B, Gaylord, Minn.

AGENTS. Earn big money selling our resurrection plants. Samples 25c postage. Desert Plant Co., Station A, Box 95, El Paso, Texas.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

300% PROFIT Selling mystery gas lighter. Retail 25c. Costs you \$1.00 dozen. Sample 10c. Square Deal Mfg., Desk PM-20, Bradford, Pa.

NEW. Profitable—Sell auto step mats. Quality rubber with owner's name molded white. Details free. Ebonite Products, Dept. M-40, 895 Main, Akron, Ohio.

SELL More goods! Engrave customer's signature or initials in gold on articles you sell. Free sample. Ideal, 489 Fifth Avenue, New York.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Permanent business. Neonite, Akron, Ohio.

START 1933 Right! Free valuable formula information for making best selling specialties. All lines. 300-750% more profit. See my advertisements—Business Opportunities—Formulas columns. Miller, Chemist, 1708AP, Tampa, Florida.

REPLATE Brass worn-off bath fixtures, reflectors, spoons, forks, etc., with pure silver. U-Kan-Plate polish, \$1. 8 ounce bottle. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Company, Philadelphia.

BUY Old auto inner tubes at one-half cent a pound and resell them at 90 cents a pound. Formula \$1.00. Mitchell Ames, Effingham, Illinois.

100% PROFIT In the Everlasting Match. No flint or friction. What makes it light? No wind can blow it out. Retail 50c. Sample and sales plan 25c. New Method Co., Desk PM-12, Bradford, Pa.

PENNY Each. Any size! Beautiful non-tarnishable gold window sign letters. New 6x9 catalogue. Amazing beautiful samples. Valuable working equipment free. Record-breaking offer. Atlas Sign Works, 7941 S. Halsted, Chicago.

FREE Catalogue new needle books, hosiery menders, self-threading needles; cost 1c up; world's fastest 25c sellers. Patsy Needle Company, Somerville, Mass.

RAINCOATS. Men, women, children, \$3.95. Outfit free. Goodyear Rainwear, 18 West 22nd, New York City.

CHRISTMAS Cards—Big values. 25 with name \$1.50. Box assortments 150% profit. Free offer. Graphical Printers, 5342 North Ave., Chicago.

MAKE Sell your own products. Formula catalog free. "Kemico," 32, Parkridge, Illinois.

AGENTS For Hanslick: Powdered hand-soap. Approved Good Housekeeping. Everybody a customer. Fine opportunity. Sample free. Solar Products, J-2144 So. Troy, Chicago.

MEN, Women—Sell new 10c steel wool brush. Sells itself. Big repeater. Money maker for distributors. Skourpak Corp., 1151 East 150th St., N. Y.

MYSTERIOUS Liquid: Solders, repairs, metal, wood, glass, without heat. Whirlwind seller. 150% profit. Bestever, 4317PM Irving Park, Chicago.

BIG Money steady. High grade coveralls, shopcoats, pants, shirts. Advertising on back. Fast sellers. Great demand. Prospects everywhere. Free outfit. Strong Mfg. Company, 911 West Jackson, Chicago.

SURE Fire Christmas seller! Every woman buys. \$10 a day easy. Write—get a real surprise. Mission Factory, P. 2328 Pico, Los Angeles.

BIG Profits taking orders, shirts, ties, underwear, dresses, hosiery, raincoats, sweaters, leathercoats, coveralls, pants. Outfit free! Nimrod Co., Dept. 8, 4922-28 Lincoln Ave., Chicago.

YOU Are wanted to resilver mirrors at home. Profitable business plating autoparts, tableware, etc. Write Sprinkle, Plater, 128, Marion, Ind.

POLMET Polishing cloth removes tarnish from all metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retail 25c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Massachusetts.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits, Emblem checks, check-fobs, name plates. Hart Mfg. Co., 363 Degraw St., Brooklyn, N. Y.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

WORK At home, easy handwork; pays well. Sun-Co, Box 175, Brockton, Mass.

FAST Mail seller—Free sample. Plans. Circulars furnished. Seewagon, 2328 West Pico, Los Angeles, Calif.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. \$1.45 profit every \$1.50 job. Free samples. "Balco," X-1043 Washington, Boston, Mass.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

NEW Discoveries. Washes clothes without rubbing. Whirlwind seller. Great repeater. Splendid profit. Sample free. Bosco, 4315P Irving Park, Chicago.

FREE "Booklet of money making opportunities," new ideas, original plans, money making secrets and other valuable information. None require peddling or outfits. Elite Co., 214 Grand St., New York.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

A BUSINESS Of your own—Making sparkling glass name and number plates, checkboard signs. Big book and sample free. E. Palmer, 512, Woster, Ohio.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Derstur, Ill.

AGENTS Everywhere making money with our line of kitchen specialties, demanded in all homes. Big earnings possible. Write today for details. P. Seed Filter Co., 333 Broadway, New York.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS—Opportunity to make money; book containing 87 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

SOMETHING The housewives want. A signed guarantee to save money and time in cooking. No competition. 400% profit. No license required. Station C, Box 25E, San Diego, Calif.

FLAVORING Extracts—Bottle yourself! Labels furnished. 600% profit! Whirlwind money-makers! Repeaters! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

SELL Men's neckwear—wonderful proposition. Astor M. 39 East 28th, N. Y.

\$10 DAILY Selling 21 assorted Christmas cards \$1; sample box 35c prepaid. Sunshine Card Co., 259 Broadway, New York.

GUARANTEED "Run-Proof" hosiery. Men's latest fancy hose—doz. \$1.10-\$1.50; ladies' fashioned hosiery—doz. \$1.75-\$2.65. Catalog free. Superior Hosiery Company, Dept. 34, New Haven, Conn.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, muckluge, anti-freeze solutions, battery solutions, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send no money. Just write a postal for "Henley's 20th Century Book of Formulas." Pay postman postage and \$1. Popular Mechanics Press, 200 E. Ontario St., Room 802, Chicago.

HIGH-GRADE SALESMEN WANTED

DON'T Be a job hunter—start your own business on our capital; no hard times, no lay-offs, always your own boss; hundreds average \$5,000 annual sales year after year; we supply stocks, equipment on credit, some 250 home necessities; selling experience unnecessary; wonderful opportunity to own pleasant, dignified profitable business backed by \$17,000,000 world-wide industry; for complete information write W. T. Rawleigh Co., L-U-PPM, Freeport, Ill.

SELL Stores or homes—Scissors sharpeners, gas lighters, razor blades, aspirin, breath gum, chewing laxative, adhesive tape, polish, handkerchiefs, polishing cloths, shoe laces, many others. Attractive displays. Catalog free. Superba Co., 8-303, Baltimore, Md.

WANTED—Salesman experienced in selling valve face grinding machines and kindred lines direct to the automotive and garage trade. Well-known automotive equipment manufacturer. In business for 25 years, has opening in choice exclusive territory, that offers excellent future for salesman who can qualify. Address Room 8, % Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

MAKE \$75.00 Week and repeats, selling factories, stores. Trade-marked protected liquid and bar belt dressing. Other products. Belt Grip Mfg. Co., Dept. A, Paterson, N. J.

OVERCOME Sales resistance by selling what people need and want. Razor blades are used everyday by everybody—women as well as men. Hospitals, institutions, undertakers and others are quantity users. Sell the blue steel Gillette type everyone wants. Small investment, exclusive territory, quick turnover, double your money. Milton Elias Company, 276 Schley Street, Newark N. J.

APLENTY New and different—fast selling 5c and 10c merchandise on attractive counter cards. 100% commission for you and dealers. Advertised by radio. No investment required. Catalog free. (Estab. 1921.) World's Products, 12810-C, Spencer, Indiana.

SELL Where there's money! Up to \$15 daily possible calling on merchants, professional men with lowest priced printing necessities. Sensational sellers. Steady repeats. 40% commission advanced. Elaborate outfit free. Northwestern, 631-DP Jackson, Chicago.

PUNCHBOARD Salesmen—Most gigantic line ever featured. Vending machines—all kinds. Make high as \$28.00 on single order. Repeat commissions. Beautiful colored catalog free. Lion Mfg., Dept. 56, 308 W. Erie, Chicago.

THE Brick with the kick! Best Xmas profits, sell genuine legal California wine bricks, grape bricks, beer bricks. Greatly reduced attractive prices. Vino Sano Co., Dept. 8-289, San Francisco, Calif.

SALESMEN: Everybody buys business stationery; highest quality \$2.80 thousand. Quick delivery. 40% com. Free cuts. Experience unnecessary. Big outfit free. Williams, Dept. 579, 2130 Gladys, Chicago.

NEW, Original, unique four and five color blotter cards—business cards—\$1.50 thousand with genuine leather card case. Big comm. Free cuts. Outfit free. Chicago Business Card, Dept. AB, Station D, Chicago.

MILLION Waiting locations. Coin tosser. Game of skill. Retail \$10, cost salesmen \$5. Sells on sight. A. J. Stephens Company, Kansas City, Mo.

SOMETHING NEW! Automatic juicer works like magic! Different—hangs on wall. Easy to clean. Strains seeds, pulp. Big demand—make up to \$17 daily. No-risk test offer. Write quick! Central States Mfg. Co., Dept. W-5136, 4500 Mary Ave., St. Louis, Mo.

SELL Our complete line of Christmas store decorations including our celebrated silk tissue streamers. Megaphone Novelties, Wade & Demman, Cincinnati, Ohio.

GALLOPING Ivories—New game thrills America. Absolutely legal. Every clear counter waiting. \$125.00-\$200.00 weekly. K&S, 4319 Ravenswood, Chicago.

SALESMEN—Sell wonderful line of calendars, novelties, signs and premiums. Every merchant, manufacturer prospect. Tremendous demand. We pay daily. Mail, repeat orders credited. Bonus, prizes. Write immediately. Harrison Co., Dept. F-1, Established 1892, Union City, Indiana.

POCKET Big profits daily! Sell new, modernistic all-steel electric sign. Flashes on—off. Priced surprisingly low. Every store sure prospect. Different trade name for each business. Get starting offer. World's Products, Dept. 12910-C, Spencer, Ind.

ATTENTION! Salesmen selling automotive dealers and garages. If you are looking for quality products to sell to your trade—real repeaters—write for complete details on these two necessities. Thunderbolt Manufacturing Co., Dept. PI, St. Louis, Mo.

SELL Exclusive combination suspender shirt. Four \$3.50. Advance commission \$1.00. Also made-to-measure line, outfit free. Menzin, 208 Greene Street, New York.

\$18 TO \$25 Daily; biggest selling line of men's suits. Meets present day conditions. Amazing values at \$11.95, \$14.50, \$16.95, \$18.95. Also raincoats, slickers, topcoats and boys' suits. Biggest commission paid in advance. Liberal bonus. Free outfit. State age and selling experience. "Jim" Foster, Inc., Dept. 212, 2250 South Spaulding Ave., Chicago.

SALESMEN-DISTRIBUTORS. New auto tire patch; guaranteed 10,000 miles. Repairs blowouts permanently. Sells garages, gas stations, tire shops. Salesmen's profit 100%. Up to 300% to dealers. Easy seller. Exclusive territory. Economy Rubber, 675 Burkhardt, Dayton, Ohio.

BUILD Up a business of your own, part or full time, selling nationally known automobile necessities. Quality products. Write today for territory and particulars. Tourist Pride Mfg. Company, E-12, Minneapolis, Minnesota.

SALESMEN—Sell Strickler's unusual collection stickers and business builders to business concerns and professional men. Copy-righted. Nationally advertised. Experience unnecessary. References required. Carl Strickler Co., 330-D Cavell Ave., Highland Park, Ill.

FINANCIAL Independence and income for life through constant, ever increasing repeat commissions without call-backs. The business made rich by the depression. Business and professional men buy on sight. 400% initial profit. Commonwealth Co., 508 S. Dearborn, Chicago.

BRAND New guaranteed business building plan for gasoline stations. Sweeping country. Inexpensive. Salesmen cleaning up. Big selling outfit free. Stimulators, Inc., 4311 Ravenswood, Chicago.

AUTO Seat covers, \$1.95. Amazing possibilities. Free outfit. Colorzone Co., Des Moines, Iowa.

BIG Profits in your own business. Sell replacement parts; armature rewinding, renewed vacuum cleaners at wholesale prices from catalog. Every home needs either repairs or renewed machine. Write quick for territory; free catalog and full information. Re-New Sweeper Co., 2264 Gratiot Ave., Detroit, Mich.

MAKE Up to \$150.00 per week! New legal punchboard plan. No investment to anyone. AJ Novelty Co., 161 Washington, Chicago.

WONDERFUL Opportunity. \$20.00 a day can be earned. No experience necessary. You can start at once. Showing the latest thing out. Self protection and home protection at cost. Ages 1 to 80. No insurance but provides benefits up to \$1000.00 natural or accidental death. \$20.00 per week if sick or injured. Address National Aid Society, Springfield, Ill.

SELL Punchboards direct to dealers from world's leading punchboard factory. Wholesale prices, enormous profits. Big commissions. Sales kit free. Harlich Co., 1407 Jackson, Chicago.

BIG Profits taking orders, shirts, ties, underwear, dresses, hosiery, raincoats, sweaters, leathercoats, coveralls, pants. Outfit free! Nimrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

SALESMEN—Four \$15.00 sales to stores net you \$40.00 daily. Savers Systems, Est. 1895, 2801-123 Sheffield Ave., Chicago, Ill.

EXPERIENCED Salesmen. Wonderful opportunity selling full line accident and health policies. Sell easy. Liberal commissions. Twenty-four-year-old legal reserve company. Write for special offer. Inter-State Business Men's Accident Co., Dept. 18, Des Moines, Iowa.

SALESMEN—Become independent. Own your business; experience unnecessary, selling our \$10,000 accidental death; \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited insurance department. Universal Policy, Dept. A, 716 Lefcourt Bldg., Newark, N. J.

GIVE Profits—Up to \$170 weekly. \$500,000 punchboard firm announces new no investment plan. Season starting. K&S, 4326 Ravenswood, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Fayer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

HELP WANTED

WANTED Factory representative. This is your opportunity. Wallenbeck & Moland Mfg. Co., 100 E. 4th St., Sandwich, Ill.

STOP Worrying about money! I'll start you with a regular weekly route supplying famous "Zanol" products to steady customers. Routes pay \$27.50 weekly up. Pay begins immediately. Write Albert Mills, Route Mgr., 1821 Monmouth, Cincinnati, O.

AGENTS—Masco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 204 Searle Bldg., Rochester, N. Y.

EDUCATIONAL AND INSTRUCTION

MEN—Women, 18 to 50, \$105.00 to \$250.00 month. Prepare immediately for steady for life. U. S. government jobs. Many post-depression vacancies. Common education. Experience unnecessary. List positions and full particulars free. Write today sure. Franklin Institute, Dept. D3, Rochester, New York.

SMALL Earnings while learning machinist trade, tool and die making, automatics. Practical shop work. Excellent opportunity for mechanically inclined young man. Day or evening instruction. Send for information. Allied Screw Machine Co., 524 Monroe St., Chicago, Illinois.

U. S. GOVERNMENT Positions, \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Paterson School, Rochester, N. Y.

EARN Big money making silk screen signs at home. We teach you, furnish complete equipment. Aurora Photo Engraving School, Aurora, Mo.

TAXIDERM Taught by professional. Free catalogue. M. Schmidt School Taxidermy, Memphis, Tenn.

GAIN Word mastery—speak effectively; write convincingly. Sure method. Particulars free. Kentco, 4924-S. Kolin, Chicago.

BECOME A landscape architect. Uncrowded profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 85 Plymouth Bldg., Des Moines, Ia.

BLUE Print reading—all trades. Columbian School, Drexel Building, Philadelphia.

CHALK-TALK Your way to popularity. Audiences at your feet if you learn how to entertain with a few simple pictures. Little artistic ability needed. "How to Chalk Talk" tells what to say and what to draw. Profusely illustrated. Make money giving chalk talks. Just order on a postal. Pay postman \$1.00 and postage when delivered. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

ELECTRIC REFRIGERATION

REFRIGERATION Compressors with fan pulley \$8.00, construction kits. Clow, 1944 Iglehart Ave., St. Paul, Minn.

NEW Complete refrigeration parts list free. B. & L. Engineering Co., 706 Bergen Ave., Jersey City, N. J.

SHORT STORIES

SELL Your stories. Stamp for details. Hoyer Service, 15483 Cuyler, Detroit.

SHORT Stories revised, typewritten and marketed. Details free. Hursh Service, Box P-1913, Harrisburg, Penna.

YOU Need a better grip on mathematics? Ask us to send you a copy of "Mathematics for the Practical Man," only \$1.50. By common sense methods it removes the mystery and difficulties so algebra and calculus are made simple. Assuming your knowledge is limited to arithmetic you quickly and easily gain a working knowledge of algebra, geometry, Trigonometry and calculus. Simply pay postman when he hands you the package. Address Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

TYPEWRITERS AND SUPPLIES

ADDING Machine \$10, typewriter \$8.50, multigraph printer \$22.50, duplicator \$20.00. 2 days trial. Money back guarantee. Pruitt, 190 North LaSalle, Chicago.

PRINTING, MULTIGRAPHING AND MIMEOGRAPHING

5000 LOTS—3½x6 Folders, \$9.50; envelope slips, \$4.00; imitation typewritten letters, \$11.50. All printing low prices. Samples. Goodprint, Harrisonburg, Va.

CUTS \$1.00—2x3 inches from drawings and photos. Joe Bek, 133 Gazette Ave., Lexington, Ky.

500 NOTEHEADS, \$1.00; 12 Christmas cards, 25c. Blackwood, Abilene, Texas.

5,000 LETTERHEADS \$3.00, other items in proportion. Quality printing. 3103 East 18th, Kansas City, Mo.

USED Type bargains, presses. Send stamp. Box 15, Cambridge, Mass.

TRIAL 250 Full-sized bond letterheads, envelopes, billheads or cards \$1.00 postpaid. Race Printers, Hudson, N. Y.

LETTERHEADS, Envelopes, \$2.50 for 500 each. Midwest Service, Bloomfield, Iowa.

200 ENVELOPES, Name, address, 60c postpaid. Mecklals', Pelican Lake, Wis.

250 (8 1/2 x 11) LETTERHEADS, 250 Envelopes printed \$1.50 postpaid. Universal Printing, Bay City, Michigan.

5000 PRINTED Envelopes \$4.75; letterheads \$7.45; multigraphed letters \$6.45. Sianco, 35 Alexander, Rochester, N. Y.

STATIONERY Printing, catalogs, circulars. Samples, Ruling, loose-leaf binders. Commercial Press, Batavia, Ohio.

250 BOND Letterheads, envelopes, billheads, cards, \$1.35 each. Economic Press, Leonia, N. J.

STATIONERY, Circulars, folders, New-magnetic-lowdown price-kit free for stamp. Pound-kit samples dime. Webb-Battlefield-Press, Gettysburg, Penna.

PRINTING OUTFITS AND SUPPLIES

ONE New font 6 point card gothic \$1.00. Postage paid. Other bargains in printers supplies. Catalogue sent free. Franks, 3354 Harrison St., Chicago, Ill.

PRINT Letterheads, envelopes, trademarks in gold and bronze colors with ordinary rubber stamp. Learn how. Guaranteed process 35c. Wizard Sales, 115 Gaskill, Alliance, O.

PRINT Your own circulars, envelopes, with home made press costing less than \$1.00. Illustrated instructions 10c. Carl Edquist, Odessa, Minn.

USED Press bargains. What size do you want? Send stamp for reply. Exchange, D-1, 489 E. Main, Meriden, Conn.

PRINT Your own cards, stationery, circulars, advertising etc. Save money. Easy rules furnished. Print for others, big profits. Junior press, \$5.99; job presses, \$11; power, \$149. Write for free catalog and full information. Kelsey Co., 8-11, Meriden, Conn.

PREUSED Printing presses and supplies. Lists 3c stamp. Popular Bargains, Richmond, Pa.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

GUMMED LABELS

BETTER Labels for less. Sample, Rex, 6618M Quimby, Cleveland, Ohio.

LABELS: Gummed and ungummed printed labels. Designers, manufacturers. Write us. Old Dominion Label Co., Bridgewater, Va.

1,000 PRINTED: Name, business, address 50c. JBS Company, Box 93, Holyoke, Mass.

DUPLICATORS AND DEVICES

"EXCELLOGRAPH" Rotary stencil duplicator \$39.00. "Two-Faced" film duplicator \$6.00. Booklet free. Pittsburgh Type-writer Supply, Dept. 601, Pittsburgh, Pa.

RUBBER STAMPS

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

NAME 15c; 2 Lines 25c; 3 lines 35c. Fehlberg, 921 Farnam, LaCrosse, Wis.

FOR HOMECRAFTSMEN

LEARN To wipe plumbers joint. Simplified instructions \$1.00. Box 103, Woodside, N. Y. C.

FOR SMOKERS

AUTOMATIC Cigarette machine \$1.85. Illustrated folder for stamp. A. C. Machine Wks., 1055 Sheridan Rd., Chicago.

SUBAC: The wonder smoking tobacco, blending Virginia grown Burley, Oronoko, Turkish, goldleaf. 3 pounds \$1 postpaid. Belmont-Williams, Chatham, Va.

OLD, Mild chewing or smoking tobacco: 5 lbs. \$9.99; 10—\$15.00. Quality guaranteed. Pipe free. Farmers Union, 368-N Mayfield, Kentucky.

FIELD GLASSES, TELESCOPES AND MICROSCOPES

BINOCULARS, Field glasses, telescopes—slightly used, \$1.75 up; 8x prism binoculars, \$11.00. All makes. DuMaurier, Busch, Lemaire, Colmont, Megaphos, etc., 3 to 24 power. World's largest assortment. Catalog free. DuMaurier Importers, Dept. 2012A, Elmira, N. Y.

MAKE Your own telescope described October Popular Mechanics, 4"—\$3.25, 6"—\$4.50. Catalog low priced binoculars, telescopes, microscopes 10c, refunded with order. Precision Optical Supply, 991 East 163 Street, New York.

STUDENT Microscope, Descriptive circular free. General Chemical Company, Reading, Penna.

GLASS Discs for telescope making, 3/4" x 8", 1" x 9", \$3.00 per pair. P. E. Myers, 3749 Albatross St., San Diego, Calif.

DIAMONDS, WATCHES AND JEWELRY

DIAMONDS, Railroad watches, radios. Bargains, Garnett Simms, Lake, New York.

RAZORS AND BLADES

SAFETY Razor blades sharpened. All makes, 1c each plus 3c postage. Write for free mailing bag. Chicago Sharpening Co., 1507 - 24th St., Des Moines, Iowa.

GUARANTEED New Gillette type blades \$4.00—1000. Bunch samples 25c coin. Willis, 644 - 13th, Tell City, Ind.

IT Pays: Safety razor blades honed and stropped. Single edge 2 1/2" and double edge 3c each. Also sharpen shears, knives, razors and clippers. Schweitzer Cutlery Co., 1034 W. Winnebago St., Milwaukee, Wis. Established 1874.

"HONE Handy" (copyrighted) renews dull blades, Price 25c. Harrington, 649 Second Ave., New York.

ANTIQUES, WAR RELICS AND INDIAN GOODS

ANTIQUES—Free priced list of hundreds of items; furniture, glass, china, hobbies, etc. Valuable priced list of 360 historical bottles, \$1.00. Katharine Willis, 234 North-ern Blvd., Flushing, New York.

INDIAN Relics, beadwork, coins, curios. Catalogue and arrowhead 8c. Vernon Lemley, Northbranch, Kansas.

NOVELTIES, CURIOS, ETC.

FAMILY Christmas gift box. Twenty imported novelties and useful articles. Something for every member of the family. Japanese crying doll, Lucky Elephant pin cushion, bridge-table ash-tray, toy diver, and many others! Many in gift boxes. Retail value \$2.00. Sent postpaid in U. S. for \$1.00. West of Mississippi river \$1.25. Gent (Beachland), Cleveland, Ohio, Member Chamber of Commerce.

MUSIC AND MUSICAL INSTRUMENTS

FORTUNES Being made from songs through talking pictures, radio, phonograph, music publishers. "Hit" writers revise, arrange, compose music to your lyrics. We submit to studios and other markets. Free reading. Send for booklet. Universal Song Service, 625 Meyer Bldg., Hollywood, Calif.

SIX Hollywood songs 10c. Frank Little, 6035 Hollywood Blvd., Hollywood, Calif.

SONG Poems solicited—a different proposition. Richard Broughton, Sioux Falls, South Dakota.

SONG Writers. Send for our "Publishing Agreement." McKinley Music Printers, 1561 E. 55th St., Chicago.

TRUE Facts about songs: Particulars free. Get it before submitting your manuscript. Dearborn Music Company, 443 S. Dearborn, Chicago.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

SONGWRITERS! Poems, melodies, Astounding proposition. Hibbeler, D1, 2104 Keystone, Chicago.

DUO-FLEX Reeds clarinet and saxophones. See display ad page 126.

POEMS Wanted. Work guaranteed. We publish. Great Eastern Song Bureau, Dept. 27, Thomaston, Me.

SYSTEM Complete \$1.00. Address "Music Shorthand," Pismo Beach, California.

SEND Song poems, 30-50 plan. Indiana Song Bureau. (Brookside), Salem, Ind.

PATENT ATTORNEYS

PATENT Your invention: Send for free book, "How to Obtain a Patent," and "Record of Invention" blank. Consult us about how to protect your ideas. Reasonable charges. Deferred payments. Victor J. Evans & Co., 601-M Victor Bldg., Washington, D. C.

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58-S, Adams Building, Washington, D. C. See page 127A.

WHAT To Invent. List of wanted inventions sent free on request. Use our legal form for recording proof of invention. Write W. T. Greene, 946 Barrister Building, Washington, D. C.

INVENTORS May now market their new ideas before patenting. For information, write Chartered Institute, 554 Barrister Building, Washington, D. C.

INVENTORS: Send for booklet telling how to patent and sell your inventions at lowest cost. Ralph Burch, Patent Lawyer, 900 F St., Washington, D. C.

L. F. RANDOLPH, 302-B Victor Building, Washington, D. C. Low cost. Book and information free.

"INVENTOR'S Guide," valuable information free. Frank Ledermann, Registered Attorney-Engineer, 220 Broadway, New York.

PATENTS—Write for free information, How to Obtain a Patent and Record of Invention—or send drawing or model for examination. Miller & Miller, Patent Attorneys (former Patent Office Examiners), 1060-A Woodworth Building, New York; 673 Earle Building, Washington, D. C.

PATENTS. Send sketch or model for advice. Free book, "How to Obtain a Patent." Established thirty years. Highest references. Prompt service. Reasonable charges. Chandler & Chandler, 908 F Street, Washington, D. C.

ESTABLISHED 1864. Milo H. Sterens Company. Free booklet. Patents. Trade marks. Copyrights. Offices, Monadnock Block, Chicago; Barrister Bldg., Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

LANCASTER, Alwine & Bommel, Suite 411, 815 - 13th St., N. W., Washington, D. C. "Originators of the Form Evidence of Conception." Refers disclosing your invention to anyone send for blank form to be signed and witnessed. Form and patent information bulletin free.

PATENTS Procured; trade marks registered—preliminary advice furnished without charge. Booklet and form for disclosing idea free. Irving L. McCathran, 700A International Bldg., Washington, D. C.

FOR INVENTORS

MANUFACTURERS Will now buy inventions. Valuable information free. Crude ideas developed. Inventions patented, attorney's charge \$60.00. Practical sales help. Searches \$5.00. Trade-marks \$35.00 complete. Expert in difficult cases. J. J. O'Brien, Patent Attorney-Engineer, 103 West 42nd St., New York City. International Building, Washington, D. C.

"PRACTICAL Patent Law," 420-page book, saves inventors money and time. Shows what is patentable, how to protect your patents, relation of patents to prior patents, possibilities of infringement. Written so you can understand by noted patent authority. Save cost many times. Send only \$1.50; volume will be shipped on 5 days approval. If not satisfied, money will be refunded. Commerce Clearing House, Dept. 3379, 265 W. Monroe St., Chicago.

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58-S, Adams Building, Washington, D. C. See page 127A.

INVENTORS Magazine! Just what's needed! Hundreds inventions advertised, sale, wanted. Valuable trade information. Necessary, useful, interesting! Patent sales features! Recommended. Patent application department. Details; copy 20c. Year \$1.00. Manufacturers, inventors, communicate. "Inventive Age-Patent Market," 819-G, 80 Wall, New York.

MANUFACTURERS Everywhere seek new inventions to improve their product. List of wanted inventions sent free on request. Use our legal form for recording proof of invention. Write W. T. Greene, 914 Barrister Building, Washington, D. C.

TO Inventors: We are in the market to purchase a good patent, preferably in the automobile accessory line. Will purchase outright or on a royalty basis. Purchasing Agent, 241 Front St., New York, N. Y.

INVENTIONS Patented and financed. Whitman, 277 Park Avenue, New York.

WANTED, Inventions, anything, (stamp.) Wm. Robinson, Fond du Lac, Wis., Route 8.

INVENTOR Wants position, also, sell good patent. Full particulars will be received from Gabor Hacy, 4 Vilbur Str., So. Norwalk, Connecticut.

INVENTORS! Investigate our new, wonderful, copyrighting priority claim offer. Our Evidence of Invention form free with every magazine. Price of magazine 25 cents. No free magazines. Ideas Magazine, Box 27, Station C, Los Angeles, Calif. Established 1930.

HELPFUL Information for inventors wanting to realize on new ideas without patenting delay and expense. For particulars, write Chartered Institute, 553 Barrister Building, Washington, D. C.

GET Your own patents; legal blanks, complete instructions \$1. Cutting Sons, Campbell, Calif.

INVENTOR'S Universal Educator: contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1.00 postpaid in U. S. A. Address Dietrich Co., 692B Ouray Bldg., Washington, D. C.

BRASS Gears and model supplies. Send for catalog. The Pierce Model Works, Tinley Park, Ill.

INVENTORS—Cash in on your invention now! Don't delay the sale any longer! Send for a free copy of our specially prepared booklet, "Turn Your Patent into Money," today! It contains helpful information for all inventors. M. L. Hund, Mgr. Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

PATENTS FOR SALE

PATENTED. Sweater stretcher. Adjustable shapes and sizes. H. Cook, 1627 Butler St., Philadelphia, Pa.

INFLATABLE Shoe stretcher. Outright. Frank Sordellet, 5131 Darbytown Rd., Richmond, Va.

U. S. PATENT (Pending, serial 631,387) for sale. G. Stade, P. O. Box 1075, Victoria, B. C., Canada.

SIMPLIFYING Device for dial phones. Magnifies and lights dial. Patent for sale. A. G. Bradford, 203 No. Almont Dr., Beverly Hills, Calif.

OUTRIGHT Newly patented "Two-in-one chisel." Stanley Penkoski, 334 W. 29th St., New York, N. Y.

MANUFACTURERS Wanting profitable inventions, send stamp for new list 300 selected inventions. Chartered Institute, 553 Barrister Building, Washington, D. C.

ANTIGLARE Shield. Patent 1,790,965 for sale. Alvah L. Wyatt, Nora Springs, Iowa.

MANUFACTURERS Looking for new inventions should write W. T. Greene, 939 Barrister Building, Washington, D. C.

MODELS AND MODEL SUPPLIES

MODEL Parts headquarters, parts and blueprints for model ships, locomotives, stationary and marine engines. Gears, metals, any shapes or quantities. Machinery and tools for model building. The Chas. A. Strelinger Co., Detroit.

IN Canada model and homcraft supplies. Gauld & Catlin, 939 King East, Hamilton, Ontario.

LARGEST Assortment of model airplane and boat accessories in the world. Send 10c complete catalog. Selley Company, 1373B Gates Ave., Brooklyn, N. Y.

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58-S, Adams Building, Washington, D. C. See page 127A.

INVENTORS: Send us sketch or crude model of your idea. Crescent craftsmen will develop it into a practical working model. 30 years of successful experience and thousands of satisfied clients. Confidential services guaranteed. Bank references furnished. Free illustrated book: "Making Inventions Pay." Crescent Tool Co., Dept. 8-12, Cincinnati, Ohio.

PLANS For making artistic and comfortable dog houses. Send 25c for blueprint SN 826. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

POWER Models, gasoline, steam engines. Railway, steamship, boiler fittings, metals, model engineering materials in great variety. New 64 page catalog 35c. Charles Cole, Ventura, Calif.

PATENTS. Low cost. Book and information free. L. F. Randolph, 302-C Victor Building, Washington, D. C.

SEE Catalogue 10 for model engines, castings, supplies. Howards, 2117 No. Ashland Ave., Chicago, Ill.

"REAL" Motor, gasoline, for model airplanes, boats. $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{1}{2}$ " h.p., weight 1 lb., 3200 r.p.m. Catalog "Real Boats," motors, fittings, 25c coin. Loutrel, 96 McDonough St., Brooklyn, N. Y.

MODEL Steam and gasoline engines, catalog 15c. Anton Bohaboy, 212 Price St., Rahway, New Jersey.

WE Make working models for inventors and do experimental work and carry a complete stock of brass gears and model supplies. Send for catalog. The Pierce Model Works, Tinley Park, Ill.

FAMOUS Bailey Handbook—Prepares you to pass the examination for any grade of license for stationary, marine and Diesel engines, firemen and boiler inspector in any state of the Union or any province of Canada. Flexible cover. Handy pocket size. Pay postman \$2.00 plus postage when he hands you the package. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

MANUFACTURING

MAJESTIC'S Engineering department is devoted to improving your product without charge. Steady scientific progress of Majestic laboratories shows in the ever-increasing quality and scope of its products. Experienced craftsmen manufacture your models, dies, stampings, deep drawing, casting, screw machine and wire specialties very economically. Plating, enameling, assembling, boxing. Estimates promptly submitted. Free warehousing. Majestic Products Mfg. Co., Box 877, Chicago.

MANUFACTURING. Tools, dies, models, stampings. Low rates. Edw. Persberg, Northfield, Ohio.

ECONOMICAL Manufacturing from sheet, bar, wire or tubing. Models, dies, special machinery. Swanberg, 5124 N. Kildare Ave., Chicago.

MANUFACTURING. Models, dies, stampings, brasswork, moulds for castings, galvanizing. Circular free. Baums Metal Specialties, Kansas City, Mo.

METAL Articles developed and manufactured. Model making. Reasonable price and first class workmanship. W. F. Meyers Company, Bedford, Indiana.

WOODTURNING For amateurs. Excellent new instruction book just published for the amateur and home work shop owner. Contains all the needed information and is well illustrated yet published to sell at the low price of 25 cents postpaid. Send for your copy today. Mail remittance with your order. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

BLUEPRINTS

MAKE Your own blueprints by sunlight. No chemicals. Instructions free. Complete outfit nine by twelve inches blueprinting frame, test papers, twenty-five sheets sensitized paper, tracing paper. Postpaid two dollars. Cash or COD. Satisfaction guaranteed. Hatcheson Company, 36 Bromfield Street, Boston, Massachusetts.

WELDING AND SOLDERING

LEARN To wipe plumbers joint. Simplified instructions \$1.00. Box 198, Woodside, N. Y. C.

BARGAINS—Excellent reprocessed arc welders. Entirely rebuilt—guaranteed. Trial Terms. Write Ken's Service, Box M-1224, Troy, Ohio.

SHOP Notes for 1932. Get your copy now. Only a limited edition. Contains all the articles published in the Shop Notes department of Popular Mechanics Magazine during 1931. Send 50 cents. If you want the set of Shop Note books consisting of 7 volumes including the 1932 number and 6 others issued previously we will send them C. O. D. for \$3.50. Popular Mechanics Press, Room 805, 200 E. Ontario St., Chicago.

MACHINERY, TOOLS AND SUPPLIES

NEW 9" Atlas screw cutting bench lathe, \$79.00; 12" x 5" Shepard quick change lathe, \$125.00; 18" Parks woodworking band saw, \$35.00; 14" Barnes drill press, \$35.00; new $\frac{1}{2}$ " cap motor driven bench drill, \$39.00; No. 60 Heald cylinder grinder, \$375.00; air compressors; battery charger; etc. All types of machine tools. Write for catalog. Terms to suit. Cincinnati Machinery & Supply Co., 27 West 2nd St., Cincinnati, Ohio.

LATHE Bargains—Factory rebuilt and demonstrators. 9", 13", 16" swing screw cutting lathes. Also few used lathes in good condition, 90% new. Write South Bend Lathe Works, 253 Madison, South Bend, Indiana.

KELLOGG Air compressors, excellent condition, \$4.00. Taylor, 105 East 102nd Street, New York City.

MODERN Rebuilt machine tools of every description. Send for List No. 32. The Eastern Machinery Co., 3271 Spring Grove Ave., Cincinnati, Ohio.

FIVE Types of ornamental wood fences described on blueprint SN 640 for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

AIR Compressors—Portable, completely equipped, reconditioned. Driven by Harley-Davidson gas engine. Ideal for paint spraying, etc. Exceptional bargains. Limited number. Harley-Davidson Motor Co., Milwaukee, Wis.

WOOD Turning on the lathe. Both interesting and fascinating. Send for a copy of Milton & Wohlers Course in wood turning. It gives you quickly a complete mastery of this manual art. 200 pages. Cloth, 131 plates. Sent C. O. D. Pay postman price \$1.50 and small amount postage upon delivery. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

SUBSTANTIAL Savings—used arc welders, platers, compressors, paint sprays. Entirely rebuilt; guaranteed. Trial and terms. Write Ken's Equipment, Box M-1225, Troy, Ohio.

\$100.00 NEW Screw cutting lathe. Broumann, 3363 South Kinnickinnic Ave., Milwaukee.

\$100.00 SCREW Cutting lathes. Amphion, 305 - 21 St., Milwaukee, Wis.

START Business of your own, doing chromium, nickel, copper, silver plating. Also silvering mirrors. Big profits. Information free. Electro Platers Supply Co., 28 West Second St., Cincinnati, Ohio.

ELECTROPLATING—A practical, easily followed guide to electroplating including chromium, with a simple explanation of processes, including most recent developments. Price \$2.00. Sent postpaid upon receipt of price or C.O.D. anywhere in U. S. Popular Mechanics Press, Room 810, 200 E. Ontario St., Chicago.

ENGINES, MOTORS AND DYNAMOS

$\frac{1}{4}$ HORSE Alternating motors \$4.50. $\frac{1}{4}$ horse \$12.75. Generators and motors at half price. Electrical Surplus Co., 1885 Milwaukee Ave., Chicago.

REBUILT Motors, $\frac{1}{4}$ \$3.00, $\frac{1}{2}$ \$5.00. Niagara Pattern & Model Works, 1367 Niagara St., Buffalo, N. Y.

MODEL Of Wright "Whirlwind" 309 radial engine. Size 13x22 inches, lithographed in colors. By means of an ingenious arrangement of flaps, this model can be practically disassembled and put together again. Shows and names every part. Of great value to aviation students, mechanics and air-minded men and boys. Durable. Sent prepaid upon receipt of price, \$1.00. Popular Mechanics Press, Room 805, 200 E. Ontario St., Chicago.

1000 WATT Light plant \$125.00. Lightco, 660 Barry Ave., Chicago.

SMALL Step-down transformer for 110 volt a.c. has range from 2 to 22 volts. Blue-primed SN 819 on construction for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

GOVERNORS For all auto engines used for stationary or portable power. No cash down. Camde-Smith, 215 North Los Angeles Street, Los Angeles.

BRAND New 1/4 hp. ac. motors \$6.00. Many bargains in 32 volt machinery. Write for quantity prices. Queen City Electric, 1738 Grand Avenue, Chicago.

INVENTIONS—Have you conceived one? There is a long, winding road to travel before your vision of rewards can be realized. Send for the new book "Inventions and Patents, Their Development and Promotion" by an eminent authority. It is designed to guide the inventor on his way and help him avoid pitfalls. Will be sent C. O. D. Pay postman \$2.50 plus postage when he hands you the package. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

ELECTRICAL EXPERIMENTS

ELECTRICAL Experimenters salvage bargains. Nationally known apparatus. Two way telephone kits, complete, instructions, \$2.31. Magnetic kits, instructions, 49c. Hand driven a.c. generators, instructions, 91c. Electrical laboratory experimental kits, instructions, \$3.27. Special—Real microphones, 40c, postpaid. Engineering Service Company, 1718 South 14th Street, Lincoln, Nebraska.

ELECTRICAL Trouble shooting on the motor car and airplane. Don't trust to luck or guess work. Learn to make every motion count in testing and repairing. Send for our standard 493-page book for electricians and mechanics. 300 diagrams. Hundreds of practical tests. Pay postman \$4.00 plus postage when delivered. If outside U. S. remit when ordering. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

FARMS AND FARM LANDS

FREE Books on opportunities in Minnesota, North Dakota, Montana, Idaho, Washington, or Oregon. Complete information on climate, crops, location for farm or suburban tract for grain, livestock, dairying, fruit, poultry—a home, independence, plenty of food, clothing, continuous employment. No occupation offers more to industrious capable men. Write E. C. Leedy, Dept. 257, Great Northern Railway, St. Paul, Minn.

INDEPENDENCE, Security assured on North Dakota, Minnesota, Montana, Idaho, Washington, Oregon farms. Bargain prices. Easy terms. Descriptive literature, impartial advice. Mention state. J. W. Haw, 119 Northern Pacific Bldg., St. Paul, Minn.

LAKE-SIDE Florida farm 12 acres, oranges, good 7-room house, mile RR. village. \$1690 including 140 poultry, equipment; easy terms; picture pg. 37 big free illustrated catalog. Street Agency, 255-P Fourth Ave., N. Y. City.

FREE Homesteads—Some improved, forfeited; 18 states. Maps, "700 Facts," 40c. Hitchcock, Beth, Arkansas.

\$5 DOWN, \$5 Monthly, 20 acres in Missouri Ozarks, \$100. Fishing, hunting, trapping. Hubbard, 216 Grossman Bldg., Kansas City, Kansas.

SELL Your property quickly for cash, no matter where located. Don't pay big commission. Particulars free. Real Estate Salesmen Co., Desk B, Lincoln, Nebr.

861 PRACTICAL Ways to Reduce Farm Labor and Expense and Increase Income. One farmer writes he would not part with this information for \$100, if he could not duplicate it. Nothing experimental. These ideas have all been put to test and proven practical. Send today for a copy of our Handbook for Farmers and get ready to put these ideas into operation for your own benefit. Pay postman only 98 cents and the postage when he hands you the package Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

OLD GOLD WANTED

IMMEDIATE Cash for your discarded gold jewelry, watch cases, crowns, bridges, etc. Goods held ten days subject to your acceptance of remittance Old State Metal Co., Box 51, Shrewsbury, Mass.

WANTED—MISCELLANEOUS

MAIL Us your discarded jewelry, gold crowns and bridges, watches, diamonds, silver, platinum. Money promptly mailed. Goods returned if offer refused. United States Smelting Works (The Old Reliable) 39 So. State St., Dept. 71, Chicago.

MODEL Of ocean liner "Europa"—Size, unfolded, 10x13 in., lithographed in colors, shows and gives names of 173 different exterior and interior parts of this famous ship, the transatlantic record holder. This ingenious device gives one an idea of a great ship such as could be gained in no other way. Durable, securely packed. Send prepaid upon receipt of price \$1.00. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

OLD Envelopes, stamps, old-fashioned folded letters with stamps or postmarks on them that were used and mailed before 1880. Nationally known collector offers high prices for many kinds. If your old family letters, etc., have been saved, it may be much to your advantage to write at once for interesting information free of cost or obligation. R. V. Rice, 2652 Ashbury Ave., Evanston, Ill.

WANTED—Encyclopedia Britannica, fourteenth edition. Cheap. Harry Fesenfeld, Black Earth, Wisconsin.

OLD Books, stamps, wanted. Cash paid. Box 144, Lorain, Ohio.

OUTDOOR Sports for everyone—Enjoy them all year round with aid of book published by Popular Mechanics. This veritable encyclopedia not only furnishes hundreds of ideas for new and popular sports for every season of the year, but also gives complete instruction for making the necessary equipment at very small cost. 350 pages and 650 illustrations. Send today as book is full of thrills and excitement for winter sport enthusiasts. Mailed postpaid anywhere for \$2, or will be sent C. O. D. to any address in U. S. Simply pay postman when delivered. Popular Mechanics Press, Room 802, 200 East Ontario St., Chicago.

FOR SALE—MISCELLANEOUS

TRUNK Keys furnished by number. Quarter, Capital Lock Shop, Richmond, Va.

PLASTEX Statuettes, novelties. Catalog 5c. Demco, 114 Ford St., Providence, R. I.

MECHANICAL Models, new and novel. Everyone is familiar with the "anatomical chart" method of teaching the physiology of the human body. Popular Mechanics has developed similar accurate models in the mechanical field. Models now ready are Wright "Whirlwind" Airplane Engine, Ocean Liner "Europa" and Modern Passenger Locomotive. Every part clearly shown and the name given. Invaluable to students and all who are mechanically inclined. Price \$1.00 each. Sent postpaid anywhere upon receipt of price. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

RABBITS

GENUINE Angora wool rabbits. Reasonable. Sunnyside Fur Ranch, Vaughn, Mont.

RABBITS And supplies. Complete descriptive literature 10c. Fancy Corporation, X-30, Wallkill, New York.

POULTRY

POULTRY Tribune, America's leading poultry magazine. Explains methods used by successful poultrymen. One year 25 cents. Dept. C-93, Mount Morris, Ill.

MAKE Poultry Pay. Learn how to produce phenomenal layers by paying more attention to breeding of fowls. James Dryden, authority, tells how in his book, 416 pages. Over 300 illustrations. Price \$2.00. Sent postpaid upon receipt of price or C. O. D. anywhere in U. S. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

DOGS AND PETS

ST. BERNARD Puppies, beautiful Christmas gifts. Helvetia Kennels, 5345M McKenna, Montreal, Canada.

CHOW Chow puppies, broods, Champion pedigree. Gerald Reimers, Manning, Iowa.

FOR Sale, Minks, squirrels, raccoons, foxes, ferrets, muskrats, ginseng, rabbits, skunks, wolf pups, opossums. B. Tippman, Caledonia, Minn.

TROPICAL FISH

MAKE Money at home raising beautiful tropical aquarium fishes. Valuable information ten cents. Vineland Tropical Fish Hatchery, Vineland, New Jersey.

ROOTS AND HERBS

JUST Out! World's Greatest "Herbalist Almanac." Beautifully illustrated in natural colors. Contains over 500 old-fashioned herb medicine recipes and Indian secrets for home use. 10c (coin) postpaid. Worth dollars! Botanica, 145 W. 112th St., Chicago.

HERBS And health remedies for all ailments. Send 10c for 95-page herb book. Indian Herb Gardens, Centerville, Mich.

PERSONAL

10 YEAR Astrology reading \$1.00. Covers all personal affairs. Psychology reading included. Birthdate. National, Desk 104-K, Hunter, N. Y.

ARE You old at forty? See our advertisement on page 36A of this issue. The Electro Thermal Company, 2160 Morris Ave., Steubenville, Ohio.

PALMISTRY Unfailingly guides your destiny. Particulars? Chromant, 1537 West 7th, Los Angeles.

MAIL Order drug store. Let us supply your drug store wants. Mequon Drug Store, Tlensville, Wis.

BEST Books for \$1. Formerly \$2.50 to \$5. Get these best sellers you have wanted to read: Abraham Lincoln (The Prairie Years) by Abraham Lincoln by Kellogg, Henry the Eighth by Hackett, Napoleon by Ludwig, Meet General Grant by Woodward, Omnibus of Crime by Sayres, Vagabond Journey Around the World by Franck, Royal Road to Romance by Halliburton. Postpaid upon receipt of price or C.O.D. by mail anywhere in U. S. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

MISCELLANEOUS

YOU Are wanted to resilver mirrors at home. Profitable business plating autoparts, tableware, etc. Write Sprinkle Plater, 288, Marion, Indiana.

AMATEUR Artists. Earn money now! New simple course tells how. \$1.00 complete. Nichols, 5908 Kenmore, Chicago, Ill.

WATER Pumped without cost from spring, brook, artesian well. Free catalog. H. T. Olsen, 19 Park Row, New York.

COMPLETE Tattooing outfits, supplies, removers, free catalog. Chicago Tattoo Supply House, 434 South State, Chicago.

HOUSEHOLD Refrigeration. A complete treatise on the principles, types, construction and operation of both ice and mechanically cooled domestic refrigerators, and the use of ice and refrigeration in the home. 491 pages. Fully illustrated. Cloth. Price \$3.50. Sent postpaid upon receipt of price or C.O.D. anywhere in the U. S. Popular Mechanics Press, Room 810, 210 E. Ontario St., Chicago.

BIG MONEY growing mushrooms at home. Free book. Mushroom Association, 431-AA N. Clark, Chicago.

FREE Lists, Magazines, newspapers. Cumberland Publishing Company, Wallins Creek, Kentucky.

AMATEUR Drawings printed. Cash proposition! Write Fouts Service, Liverpool, Ill.

CUTS Anybody can make. Simple, cheap process \$1.25. Specimens, particulars for stamp. J. C. Day, Windfall, Ind.

LAWN Chair, southern style, fully covered on blueprint SN 529 for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

CAN You draw? Something different. Sample—particulars 10c. "Straley," 13 1/2 Main, Springfield, Ohio.

AMATEUR Cartoonist: Sell your work. Write Smith's Service, PX1194, Wenatchee, Wash.

TATTOOING Supplies, guaranteed remover. Illustrated list. "Waters," 965 Putnam, Detroit.

AMATEUR Cartoonists—Earn \$25.00 week, spare time, copying cartoons for advertisers. 3-M Syndicate, Argyle, Wis.

RAISE Jumbo bullfrogs—Investigate and help develop this new industry. Increased demand necessitates the raising of bullfrogs in many localities. Interesting book tells of the possibilities. Price \$1.00. Sent postpaid upon receipt of price or C.O.D. anywhere in U. S. Popular Mechanics Press, Room 810, 200 E. Ontario St., Chicago.

Free-MENTAL ANALYSIS



...reveals your hidden powers
—shows what is holding you
back—how to forge ahead!

Thousands have discovered amazing new powers to achieve with aid of this 68-page book, "Scientific Mind-Training." Makes a scientific check-up of your mental forces and handicaps—reveals unsuspected powers now dormant within you. Also gives complete outline of Pelman system for training ALL mental faculties. Make this SELF-revealing analysis—discover YOUR real powers! For free copy send postcard or tear out this notice, write your name, address in margin, mail AT ONCE to:

PELMAN INSTITUTE, (Suite 612) 271 North Ave., New Rochelle, N.Y.

Wrestling Book

Learn at Home

FREE



Be an expert wrestler. Learn at home by mail. The greatest wrestlers of all, Frank Gotch and Farmer Burns, both world's champions have prepared the most wonderful course of lessons ever written on Scientific Wrestling, Physical Culture, Self Defense and Jiu-Jitsu. Be strong, healthy, with an attractive body. Handle and control bigger and stronger men with ease. Get this Free Prospectus—32 pages—brimming with thrilling information—No Charge—merely send 2c to cover postage. Don't delay. Write Today for your copy. Make Your own.

FARMER BURNS SCHOOL, 3379 Courtney Bldg., Omaha, Neb.

LAW STUDY AT HOME

Legally trained men win high positions and big success in business and public life. Be independent. Greater opportunities now than ever before. Big corporations are headed by men with legal training. Earn \$5,000 to \$10,000 Annually.

We guide you step by step. You can train at home during spare time. Degree of LL. B. conferred. Successful graduates in every section of the United States. We furnish all text material, including fourteen-volume Law Library. Low cost, easy terms. Get our valuable 64-page "Law Guide" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept. 1264-L Chicago

The World's Largest Business Training Institution

Learn PHOTOGRAPHY at Home

Make money taking pictures. Photographs in big demand. Commercial Photography also pays big money. Learn quickly at home in spare time. No experience necessary. Write today for new free book, *Opportunities in Modern Photography*. American School of Photography, Dept. 1355, 3601 Michigan Ave., Chicago.

LEARN WATCHMAKING

and become independent. We help you secure a position. Easy to learn. Send for FREE CATALOG.

ST. LOUIS WATCHMAKING SCHOOL DEPT. 5 ST. LOUIS, MO.

Learn the NEW REFRIGERATION

Fastest growing industry of today. Low-priced home study course. Simple, understandable. No previous technical training required. Model furnished. Full details free.

Interstate Refrigeration School, Box 225, Ypsilanti, Mich.

Information on any book free. Write Popular Mechanics Press, Chicago, Ill.

Become an ENGINEER



Save time and money on your training. ELEC-TRICAL, MECHANICAL, CIVIL, ARCHITECTURAL. Opportunities to partly earn living expenses. Complete Junior Course in 9 months. B.S. Degree Course 3 years (27 mos.). Send for 80-PAGE "BLUE BOOK"—mailed FREE.

CHICAGO TECH COLLEGE
Dept. R 75, 118 East 26th St., Chicago, Ill.

It's the TRAINED MAN today WHO IS

"SITTING ON TOP OF THE WORLD"

Untrained "Jacks-of-all-trades" suffered through the Depression—they were fired when things started to get bad and, now that things are picking up, they're still out of work. While untrained men are still hopelessly job-hunting, trained men are making good money. They're "sitting on top of the world."

YOU CAN BE THERE, TOO - IF YOU'LL

LEARN ELECTRICITY

This greatest industrial field is constantly growing... needing more and more men who really "know their stuff"—who are experts! Heads of great concerns tell us that the first men they are adding for their expansion programs are trained men. If you are one of them you don't need to worry about the future. You're fitted for big-pay jobs always. And it isn't hard—nor does it take long—to get the necessary training.

SPEND ONLY 10 WEEKS IN THE GREAT COYNE SHOPS

Here you'll find a great institution—world-known and respected—equipped with everything to train you—great dynamos, motors and generators to operate; big telephone switchboards; mammoth electric signs; the latest models of electric refrigerators; air conditioning equipment; auto and airplane motors—all in a great five-story building occupied entirely by Coyne.

ALL PRACTICAL WORK

—not mere theory

The Coyne method of training puts you right at work building real batteries, winding armatures, wiring houses and doing actual jobs you will be called upon to do as a master electrician. No unnecessary theory or book work. Lack of experience or higher education is no barrier to success—all you need bring to Coyne is determination and average intelligence. The rest is up to you. Thousands of others have succeeded—so should you!

Many Earn as They Learn

Don't let money shortage scare you. We do everything to help make it easy for you to get Coyne training. Our efficient employment department helps secure spare-time jobs for many to earn their own way. Many make their living expenses while training here. If you too need this help, write and tell us your problems.

GET BIG FREE BOOK!

Tells all about Coyne training. Hundreds of illustrations of Coyne Shops. Points out opportunities in Radio-Television and Talking Pictures—tells how you can grasp them. Shows big money to be made in this great field. Get this Book—SEND THE COUPON AT ONCE!

COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 92-72 CHICAGO, ILL.

H. C. LEWIS, President.

Coyne Electrical School, Dept. 92-72.

500 S. Paulina St., Chicago, Ill.

Send me your FREE BOOK and tell me all about Coyne training and what it will do for me.

NAME.....

ADDRESS.....

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



"I will add **2 INCHES**
TO YOUR BICEPS
... or it won't cost you one cent!"

Signed: **GEORGE F. JOWETT**

TWO solid inches of tough, sinuous muscle added to your biceps ... or it won't cost you one penny! That's my unqualified guarantee!

If I hadn't accomplished this for thousands of others ... if I wasn't absolutely sure that I could do it for you ... I wouldn't dare make such a startling guarantee!

You will not only increase your biceps, but every part of your body will be developed proportionately ... I will add at least 3 inches to your chest ... I'll give you lithe, muscular legs that will be columns of power for speed and endurance ... I'll make your whole body vibrate with muscular energy, pep and health!

Take my full course and I will guarantee to add 3 inches to your chest and 2 inches to your biceps or it won't cost you one penny!

Try one of my test courses NOW ... prove to yourself that you too can get a sixteen inch bicep!

**Send for "Moulding a Mighty Arm"
A Complete Course for ONLY 25c**

It will be a revelation to you. You can't make a mistake. The guarantee of the strongest armed man in the world stands behind this course. I give you all the secrets of strength illustrated and explained as you like them. In 30 days you can get an unbreakable grip of steel and a Herculean arm. Mail your order now while you can still get this course at my introductory price of only 25c.

Try any one of my test courses listed below at 25c. Or, try all six of them for only \$1.00.

Rush the Coupon Today

Mail your order now and I will include a FREE COPY of "NERVES OF STEEL, MUSCLES LIKE IRON." It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the equal of theirs. Reach Out—Grasp This Special Offer.

**FREE BOOK WITH PHOTOS
OF FAMOUS STRONG MEN**



"Nerves of Steel,
Muscles Like Iron"
SENT FREE!

JOWETT INSTITUTE OF PHYSICAL CULTURE

Dept. 4Mb, 422 Poplar St., Scranton, Pa.

George F. Jowett: Send, by return mail, prepaid, the courses checked below for which I am enclosing.

- Moulding a Mighty Arm, 25c
- Moulding a Mighty Back, 25c
- Moulding a Mighty Grip, 25c
- Moulding a Mighty Chest, 25c
- Moulding Mighty Legs, 25c
- Strong Men Stunts Made Easy, 25c
- All 6 Books for \$1.00.

Name _____ Age _____

Address _____

FREE The Road to Understanding For Men Past 40



W. J. KIRK

WHY is 40 the "dread age" for many men? What is the "intimate" disorder that often robs them of vitality, vigor, joy of living? This daring free book answers these vital questions. Mail coupon for Free Copy.

WHY are many men past 40 suddenly afflicted with a dangerous ailment, that if neglected, may lead to wretched old age or perhaps grave surgery? The Free book answers this and other questions every man past 40 should know.

WHY do so many middle aged men suffer backache, leg and foot pains, sciatica, bladder trouble, night vision, chronic constipation and other so-called old-age ailments? Find the answer in the Free book.

HOW can one again frequently know the joy of living, get swift, lasting relief and feel 10 years younger in 7 days? Mail the coupon and learn how an amazing new drugless treatment is used, and endorsed by prominent specialists.



The Truth About Prostate Gland Trouble

Many men mistake these dangerous and distressing ailments for approaching old age and live lives of misery, when by simply re-stimulating a tiny gland—called the prostate—they might be enjoying youthful pep, vim, and health. Already 100,000 men have tested the merits of a new drugless method of gland stimulation perfected by a scientist with offices in Ohio, California and England. Now many physicians, specialists, hospitals and sanitariums use and endorse it, for prostate gland failure. It is not a medicine, drug, massage, diet, exercise or violet ray. Its relief is not only usually quick—but lasting. Many users say it cleared up their distressing symptoms and made them feel 10 years younger in 7 days. Now it will be sent to you on a guarantee that if it doesn't do the same for you, pay nothing. If you want to know the joy of living, mail the coupon for your Free copy of "Why Many Men Are Old at 40."

W. J. KIRK, President

THE ELECTRO THERMAL CO.

2160 Morris Ave.

STUEBENVILLE, OHIO

If you live West of the Rockies, address The Electro Thermal Co., 500 Wm. Fox Building, Dept. 21-P, Los Angeles, Calif.

W. J. KIRK, President
The Electro Thermal Co.,
2160 Morris Ave., Stuebenville, Ohio.

Send free copy of your daring book, "Why Many Men Are Old at 40." Also facts about your Free Trial.

Name

Address

City State

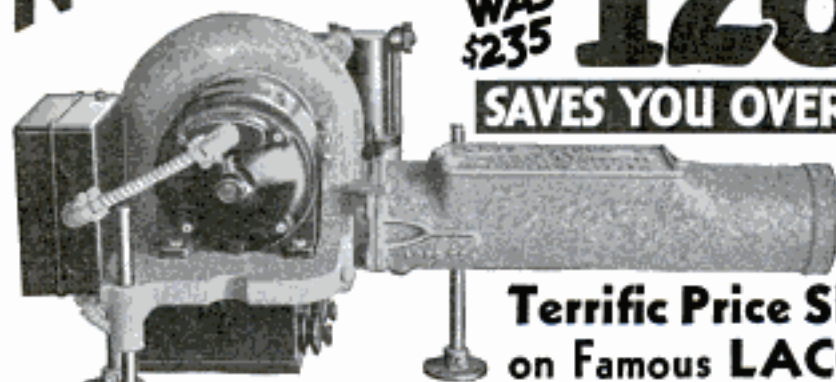
When writing please mention Popular Mechanics

Copyrighted material

NOW-Only \$126⁵⁰
 WAS \$235 Net Wholesale Price

SAVES YOU OVER \$100

OIL HEAT
 Cheaper than COAL!



Terrific Price Slash Gives Huge Saving on Famous LACO Atomizing Power Burner

26 Models and Sizes

Mineral Wick type, \$18.55. World's lowest priced Automatic oil burner. Thousands in use. Rolling like wild-fire. Guaranteed. Easiest to install. Ask about this.

Blue Flame Burner, Only \$28.00. For cook stoves, heating stoves, hamburger griddles. Operates on less than 1¢ an hour. Noiseless. Heavily built. Guaranteed.

Lowest priced quality oil burner. Mineral-wick principle. For stoves, Arcolas, small furnaces. Ample heat. Safe. Guaranteed. New styling, low as \$9.00.

SENSATIONAL ANNOUNCEMENT! Now... for *Half Price* you may enjoy the comfort and economy of Automatic Oil Heat... save heating drudgery and dirt!

World's greatest oil burner offered at Amazing New Low Price. Built and guaranteed 25 years by largest exclusive oil burner manufacturer. Wonder heater... operates for much less than coal... burns cheapest oils (and 24 West Coast Diesel oil.) Quiet. Clean. Safe.

BURNS OIL NEW WAY
 LACO's famous Quiet-tized Flame uses amazingly little fuel. Every particle of heat extracted from every drop of oil. Improved diffuser mixes oil and air thoroughly... creates a slow spiral floating flame in perfect suspension. Much more efficient than flame which shoots through furnace with a roar, wasting fuel up the chimney.

MANY NEW FEATURES

Fully automatic. Complete with thermostat and spark switch. Operates without attention. Maintains uniform temperature. Safest known. Carries Underwriters Lab. approval. Many exclusive improvements... powerful, new packing-less pump—radio-proof coil—indestructible all-brass tubing—new steel long-life electrodes. Only 1 moving part. Easy to install in any heating plant.

GUARANTEED FOR LIFETIME

If, in 25 years, burner fails to give perfect satisfaction due to defective manufacture, we protect you fully.

30 DAYS' FREE TRIAL

Try it. FREE, in your own home. You must be satisfied, or you need not keep burner.

WRITE! Send NOW for free booklet, complete list of New Low Net Wholesale Prices. Give size of home, type heating plant. **SEND TODAY!**

AGENTS, DEALERS

Send for details of **FREE BURNER OFFER!** Sensational Free Burner offer starts you out! Make \$500 to \$1000 a month without experience. Every home interested in guaranteed LACO at Amazing New Low Prices. 26 models and sizes suit every need. Valuable factory help given. **Start NOW.** Try a LACO in your own home, at our risk. **Send TODAY!**

LACO OIL BURNER CO.
 1122 Union St., Griswold, Iowa, U. S. A.



Minstrels

Unique First Parts for complete show with special songs and choruses. Make-up, Catalog free.

T. S. Denison & Co., 623 S. Wabash, Dept. 19 Chicago



Comedy Strips Plays

Jingles



PIN A DOLLAR BILL TO THIS ADVERTISEMENT

Big value! One Dollar will buy this genuine leather, gold corner pass case, holds 5 cards. (Emblem FREE). Name in gold 35¢ extra. Ask for Masonic Catalog showing many fine dollar items.

MASONIC MONITORS AND BOOKS
REDDING MASONIC SUPPLY CO.
 Dept. P. M. 200 Fifth Ave., New York

LEARN CARTOONING at Home—In Your Spare Time

The famous Picture Chart Method of teaching original drawing has opened the door of success for hundreds of beginners. Whether you think you have talent or not, send for sample chart to test your ability, and examples of the work of students earning from \$50 to \$300 per week. Please state your age.

THE LANDON SCHOOL
 1438 National Bldg. Cleveland, O.



Information on any book free. Write Popular Mechanics Press, Chicago, Ill.

ARE YOU READY FOR A BETTER JOB?

Success comes to those who know HOW and Why



ELECTRICITY

offers a field that will never be over-crowded. Interesting. Well-paid. Start at once to get practical working knowledge. Read a book a month.

BOOK-A-MONTH STUDY PLAN

The newest, easiest way to study. Everything simple and clear. Test questions easy to answer. Even poor students learn quickly.

AUDELS New Electric Library

makes electricity so easy as A B C for beginners; interesting as technical manuals can carry in pocket for spare-time reading and reference. Questions, answers, thousands of diagrams, calculations.

12 Vols. Large type. One per binding. Questions, diagrams, tables. 600 to 800 pages.

ONLY \$1.50 PER VOL.

THESE SUBJECTS—others—Dynamics, Armature Winding, D-C Motors, Maintenance, Tests, Batteries, Transformers, Condensers, A-C Motors, A-C Current, Meters, Power Stations, Wiring Diagrams, Electric Railways, Elevators, Auto and Aero Ignition, Radio, Telephones, Telegraph, Motion Pictures, Talkies, Refrigeration, X-Ray, Welding, Domestic and Farm Appliances. **FOR 6¢ A DAY** we help you overcome handicaps of education. What you start the Audel way you can finish.

—SEND COUPON—NO MONEY—

THEO. AUDEL & CO., 65 W. 23rd St., New York City

Mail Vol. I, Electric Library on 7 days' free trial. If O.K. I will remit \$1.50 otherwise I will return it. I also request you to mail one book each month on same terms. No obligation unless I am satisfied.

Name.....
 Address.....
 Occupation.....
 Employed by.....P.M.

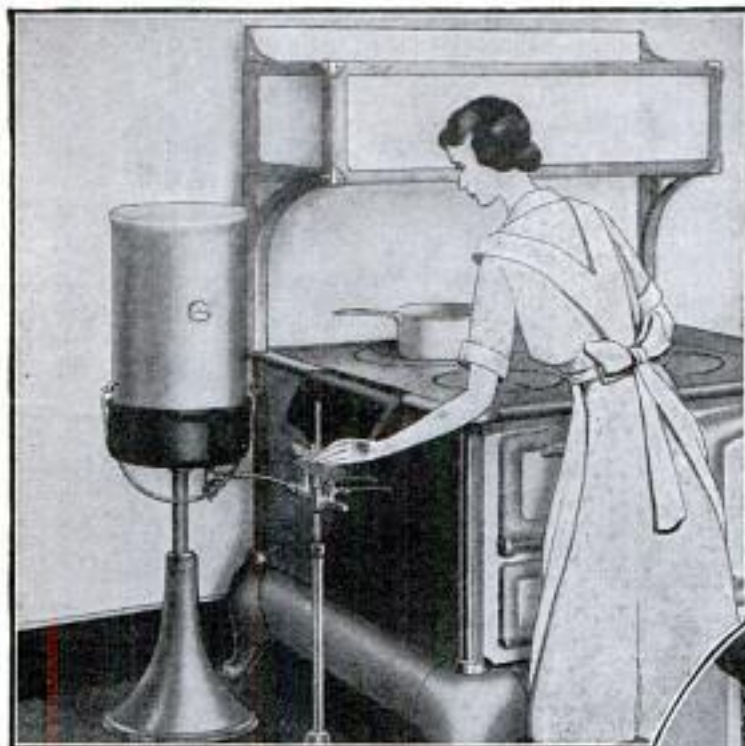
RAISE JUMBO BULLFROGS FOR PROFIT



Send for complete illustrated book fully explaining the industry and its possibilities. Price \$1.00 postpaid.

POPULAR MECHANICS PRESS
 Room P12, 200 E. Ontario St., Chicago, Illinois

Amazing New "Purple Blue" Flame Oil Burner Sweeping the Country



\$10 to \$15 A DAY
Plan and Free Burner
Offered to Agents,
Dealers & Distributors

This is a big oil burner year. There are 14,833,854 homes in the United States using coal or wood stoves. Oil is now more economical than coal. *People buy oil burners to save!* The demand is tremendous. We need hundreds of distributors *quick*. Agents are making big money. If \$250.00 a month or more interests you, write or wire for free burner and protected territory offer.

CHEAPER Heat Without COAL



"The gods what a seller!" says Raymond Sessel

Burning oil in stoves is a far cheaper method of cooking, baking and heating. Here's proof that people *spend money to save money*: During 1930 they purchased 76,096 oil burners for stoves and ranges and the demand grew so rapidly that in 1931 over 148,000 money saving oil burners were installed in stoves—an increase during depression times of 94.7 per cent!

BURNS 96% AIR
4% CHEAP OIL

Here's a remarkable oil burner of an entirely new "blue flame" type which gives twice the heat in your present stove or range — and costs less than coal! Simply sets in the fire box of any cook stove, range, heating stove or parlor circulator. Silently turns cheap oil into quick fire, much hotter than coal — and cheaper.

JUST TURN A VALVE AND COOK

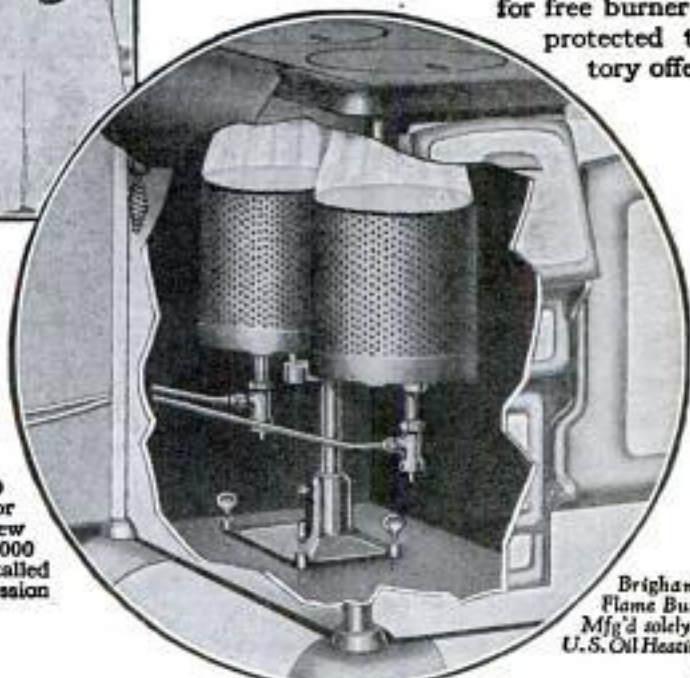
This amazing invention operates by a simple turn of a valve. Cooks, bakes, and heats with *uniform* heat. Starts instantly with a match. Burns, without waste, 96% air and 4% cheap oil. Most economical burner to install and operate. No smoke, soot, or odor. Absolutely safe. No gas or electricity necessary. Easily installed in few minutes by anyone without damage to stove. Guaranteed 10 years. Sold on absolute money-back guarantee. Gives universal satisfaction.

30 DAYS TRIAL IN YOUR HOME

Low introductory price and 30 day trial offer to first users in each locality. Write for free pamphlet on oil heating.

SPARE-TIME WORKERS WANTED

Men and women who have never sold anything in their lives before are meeting with marvelous success with this burner. It sells *easily* because it's so easy to prove by actual demonstration how the burner SAVES its own low cost over and over



Brigham Blue Flame Burners, Mfg'd solely by the U.S. Oil Heating Co.

again. And this year people are SPENDING to SAVE. Write immediately for free burner plan and protected territory offer that starts you in business for yourself.

U. S. OIL HEATING COMPANY

Mfrs. Brigham "Purple-Blue" Flame Oil Burner, Dept. 112, Third & Lynch Sts., St. Louis, Mo.

MAIL THIS COUPON TODAY

U. S. OIL HEATING CO.

3rd & Lynch Streets, Dept. 112, St. Louis, Mo.

I am interested in your amazing new "Purple-Blue" Flame Burner and ask you to mail free particulars at once. This does not obligate me in any way.

I AM INTERESTED IN MAKING MONEY.

Name

Address

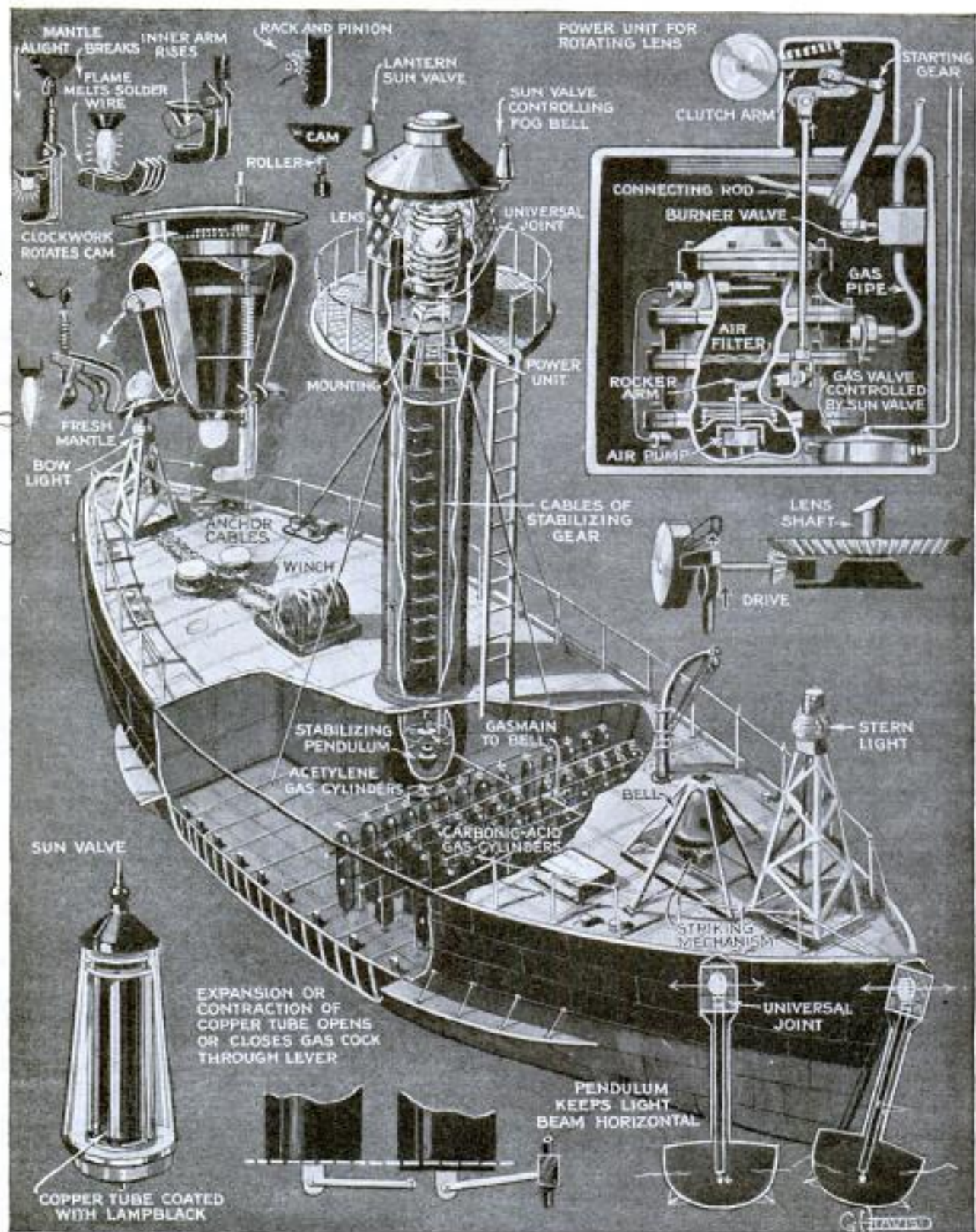
City State

When writing to advertisers please mention Popular Mechanics

Copyrighted material

B. 17 42 Built by Isaac Accumulator Co. Ltd
 Brentford, England
 No U.S. agent known
Crewless Lightship Is New 'Flying Dutchman'

Built by H. Davis' Limmers, Hellebode Road, Sweil, Surrey, England.



PROTECTING the world's shipping from hidden shoals, sandbanks and rocks, lightships without crews operate themselves for six months to a year. Automatic mechanism lights the lanterns at dusk, extinguishes them at dawn, rings

fog bells in murky weather and darkness and even replaces broken gas mantles in the 40,000-candlepower light. Carbonic-acid gas stored in the hull runs this mechanism and acetylene gas is the illuminating medium.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 58

DECEMBER, 1932

No. 6



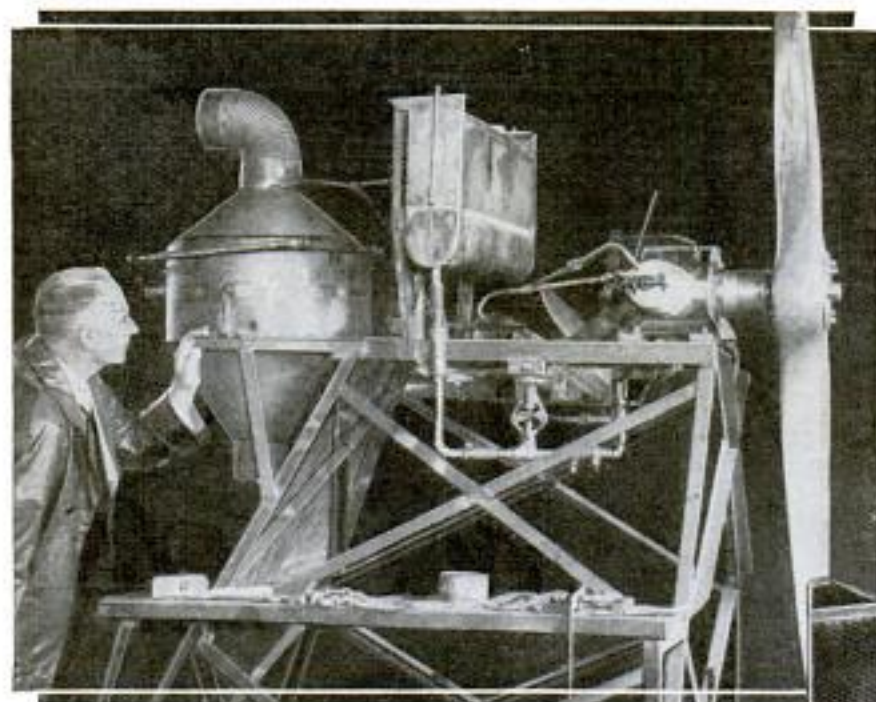
A STEAM power plant of unusual design will be used to drive a small airplane in a one-stop flight from Akron, Ohio, to Los Angeles. The engine, invented by Harold C. Johnston, has been given several hundred hours of testing. The plane in which the steam plant is being installed has been in service for two years, equipped with a sixty-five-horsepower

radial engine. The new steam plant consists of three main units—the oil-heated boiler, the two-cylinder engine and a condenser. The boiler weighs but sixty-five pounds and consists of a sheet-metal shell lined with coiled stainless-steel tubing. At the bottom is a burner using light furnace oil. Steam pressure can be built up to the required 1,600-pound point in about two

548 Cedar St. Akron, Ohio 857

Copyrighted material

B17 74



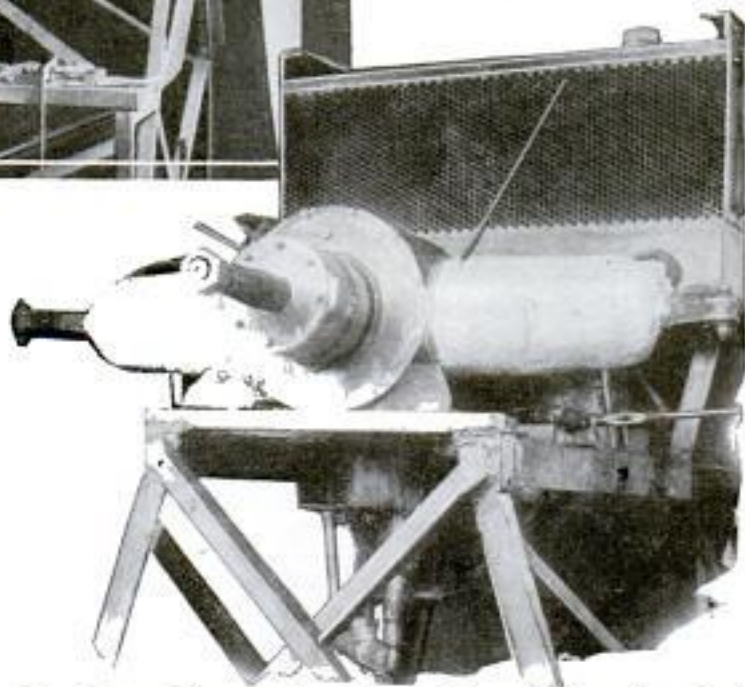
ute, so that the propeller speed can be kept down to the most efficient rate, with a probable reduction in propeller noise. It can be operated for days without stopping. Weight of the ninety-horsepower plant is 152 pounds. This gives a weight-per-horsepower of about 1.7 pounds.

In test-block operation, the steam engine produced only two noises of

minutes. Failure of the boiler would mean only the bursting of a steel tube so small that no damage would be done.

From the boiler the vapor passes into the cylinders through poppet valves similar to those used in gasoline engines. The engine of the power plant that is being installed in the plane develops ninety horsepower at the stated pressure. After steam has passed through the engine cylinders, it is liquefied in a condenser resembling a honeycomb-type automobile radiator. The water is then fed back into the boiler. One of the outstanding advantages claimed for steam plants, and borne out by tests with the new unit, is the greatly reduced operating cost as compared with a gasoline unit. A sixty-five-horsepower gasoline engine, using high-quality fuel at 30 cents a gallon and lubricating oil at \$1.35 a gallon, can be operated for an hour at a cost of about \$18, this estimate including depreciation, but not pilot's salary or other costs. The gasoline motor can be said to have a useful life of about 1,000 hours. It must operate at fairly high speed.

On the other hand, it has been found that the ninety-horsepower steam engine can be run at a cost of \$1.68 per hour. It delivers its maximum power at speeds between 900 and 1,400 revolutions per min-



Top, Power Plant on Test Stand; Below, Engine, Not Much Larger than Motorcycle's, Which Produces Ninety Horsepower

noticeable intensity—the swishing of the propeller through the air and a clicking sound resulting from the operation of a valve cam.

6995 Washington

**ELECTRIC EYE "CANDLES" EGGS
793 FASTER THAN EXPERTS**

Through adaptation of the "electric eye," or the photo-electric cell, an egg-candling machine has been developed which passes judgment more rapidly and accurately and with less breakage than the most expert human. It can classify as many as a hundred varying grades, and in competition with an experienced candler, passed several eggs which he had rejected as bad. When broken, however, the rejected eggs were found to be good.

Swena Appis, mail

*July 19 22
Electronics 10/26/32*

*Dr. W. Wheat
Ferris, St. Louis, Mo*

Commissioner Henry O'Malley B1971

Bureau of Fisheries

POPULAR MECHANICS

Washington, D.C.

859

FISH-SCALE ESSENCE YIELDS BIG PROFIT

B1780

Big profits are returned to fishermen and manufacturers by extraction of essence from fish scales. In 1928, a gross income of \$134,000 was received by fishermen for 2,344,000 pounds of fish scales, and the industry is growing. The manufacturers reap their profits from products in which this extract is essential. When incorporated properly with celluloid plastics, fish-scale essence produces finishes which have a luster like mother-of-pearl. Celluloid articles, inexpensive jewelry and metal ornaments are lacquered with such finishes. The essence also is being developed for decorative purposes, in interiors and exteriors and on the body work of automobiles, leather goods and furniture. Most of the essence produced in the United States comes from the river herring, the sea herring of the Atlantic and the California pilchard. The essence is made from the silvery substance deposited in the skin of the fish. When rubbed off the scales, freed of foreign matter and suspended in a suitable liquid, this substance constitutes pearl essence.

Dept. of Commerce Press mem.

Five Different Maneuvers Are Executed by This Electric Toy Truck Controlled by Push Button



East Moline, Ill. L. Mfg Co. Buddy

ROBOT TOY OBEYS COMMANDS AT TOUCH OF FINGER

Five human commands are obeyed by a toy electric dump truck to which a transformer and fifteen-foot cord are attached. Pressing a button on the transformer once, causes the wheels to swing slowly from side to side. When they are in the desired position, a second tap causes the vehicle to move forward, a third reverses the direction and a fourth tap on the button causes the truck to dump its load, while a fifth brings it back to neutral. Rapid taps bring different and desired action. In this way the truck can haul twelve pounds of sand, for example, back it up, dump it, straighten out and return for another load at the will of the operator.

PROTECTING GRILLE ROLLS UP LIKE WINDOW SHADE

B1747

Admitting light and air, yet impassable to trespassers, an all-metal grille operates on the principle of a window shade. Adapted to store windows, it permits the display of merchandise to be visible from the street, yet affords protection against "smash-and-grab" bandits. In homes, the grille allows full ventilation and, when in use, may be rolled up completely out of sight.



W. J. Harvey Sales Co. 740 N. Broadway

VOICES OF DEAD IN FILMS

Preserved on a phonograph record, the voice of the late President Woodrow Wilson will be used in a talking picture featuring leaders of the World War. The original record will be made a part of the sound track of the film.

Chas. B. Es. Shackwell 129 S. Rexford Drive Beverly Hills, Calif

Iron Works, Inc. 34th St (Marine) Long Island City N.Y.

031706

860

Stunt Man in Act of Dropping from Wing of Plane to Top of Speeding Auto; Note Unusual Device for Landing



Lake Calif
J. H. Pate
at Mirror Bay

duh
STUNT MAN HOPS FROM PLANE TO TOP OF SPEEDING AUTO

To prove that, in an emergency, a human being could be transferred from an airplane in flight to a speeding automobile, a movie-stunt man recently made the transfer. He dropped from the wing of the ship, flying a few feet above the ground, to the top of an automobile fitted with a frame above the top to receive him, and landed right side up without injury.

AUTOMATIC STEERER FOR BOAT RELIEVES THE HELMSMAN

Following a course set on the compass in a straight line, an automatic steering device relieves the helmsman or operator of yacht or motorboat. The compass acts as the brain and the device as the hand that turns the steering wheel. Only a lookout must be maintained to avoid collision with other vessels, driftwood and floating objects. The operator is left free to consult his chart, plot future courses, attend to the engine or do other work. He need give only slight attention to the steering, as this is being done more precisely than if he were devoting his entire time to the wheel. A change in course to pass around another boat requires no more effort than

031754

Automatic Compass Corp
11 W. 42 nd
New York

to turn the compass head slightly. It is even possible to guide the boat by remote control by means of an extension cable to some other part of the craft.

031713
CARD-TABLE LAMP HAS ASH AND GLASS TRAYS

Designed for the players' convenience, a new lamp bracket for the bridge table is provided with a tray large enough for two glasses, an ash receiver, and match and pencil holders. The bracket, attached to two opposite corners of the table, holds two lamps placed at a height that causes no eyestrain. Use of twenty-five-watt inside-frosted bulbs is recommended, because of economical operation. When the lamps are removed, with their stands, from the bracket, the bridge table may be folded. Installation of the lamps requires only a minute. Special shipping cartons in which the lamps are packed may be used for storing them.

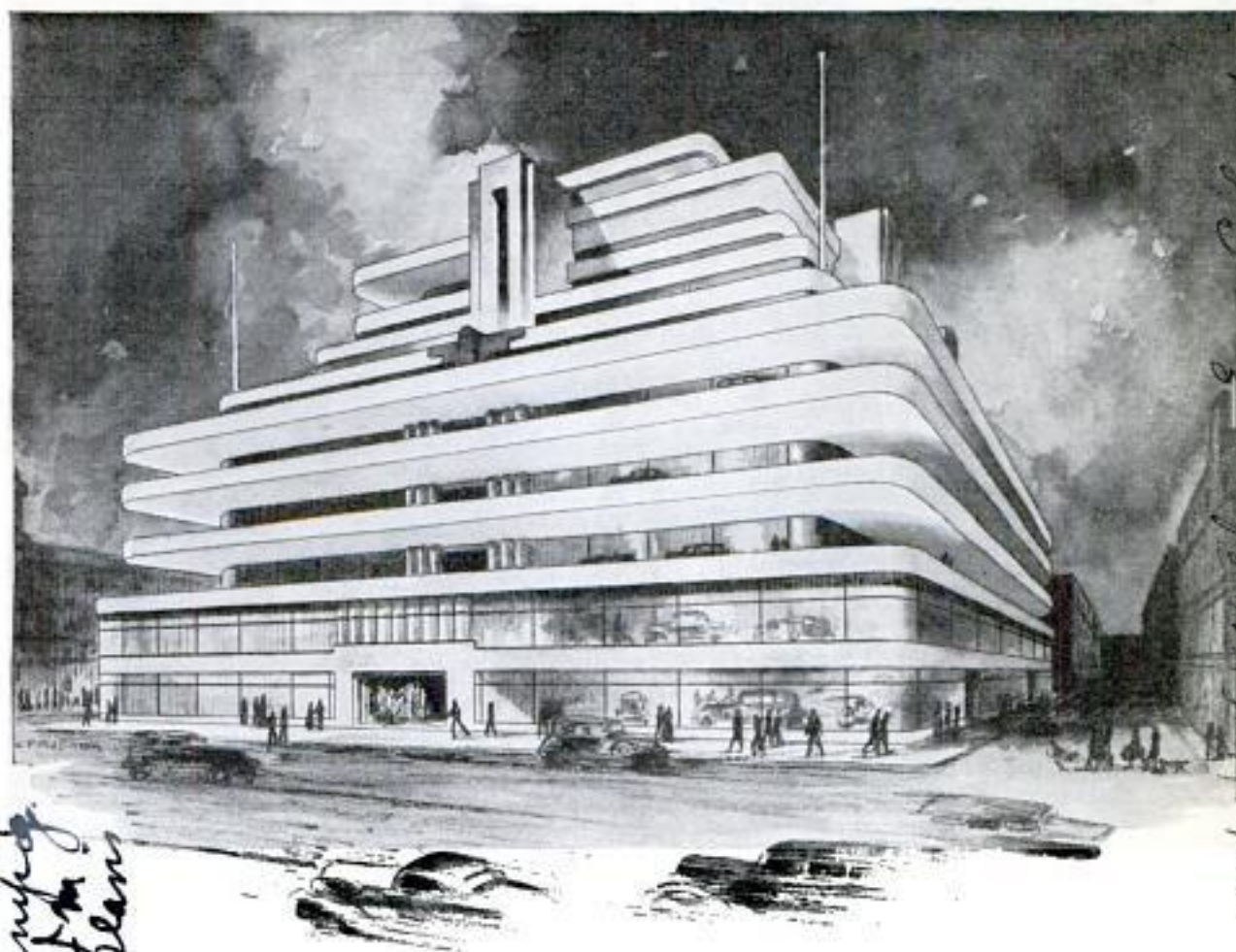
Sheldrake 8/00.



Trays on These Bridge-Table Lamps Provide Room for Matches, Glasses, Pencils and Ashes

Gerry N. Weber
Victrol
205 S. Herwin Ave.
material

Motor Center Circled by Covered Roadways



Comb. H. J. Williams Esq. Colomere
 29. Dean Road. Derby Heath
 W. London England

Refer to Industrial Development Board
 Life Bldg. Winnipeg
 608 Harbour Commission
 Toronto - Can.

West End

Auto-Parking Station in London Will Have Roadways around the Sides, as Shown; the Roads Are Built for Spring and Hill-Climbing Tests; Space for 5,500 Cars Will Be Provided

Every floor of a motor center proposed at London, will be accessible to motor cars by means of a series of covered roadways twenty feet wide connected by ramps. Facing the elevated highways will be automobile showrooms totaling one mile of frontage, while inside there will be space for approximately 5,000 parked cars. Portions of the road will serve as proving ground for hill-climbing ability and riding comfort. On the roof, it is planned to construct an airplane landing field.

richer in flavor. Frost seems to sweeten its flavor and freezing does not hurt it.

PLANTING TOOL HOLDS DIRT LEAVES CLEAN HOLE

031692

Florists and gardeners may save time and labor in the planting of bulbs or transplanting of seedlings by using a tool which bores a clean hole. When the tool is driven into the ground to the desired depth, squeezing the handle contracts the blades which grip the earth, and upon withdrawal,



leave a round hole with little tendency toward falling walls.

leave a round hole with little tendency toward falling walls.

BERRY COCKTAIL FOR HEALTH IS NOW PRESCRIBED

see letter 031756

Recommended as a before-breakfast beverage as well as basis for jellies and preserves, the wild mossberry of northern Manitoba, Canada, now is rising from obscurity to popularity. This bush fruit resembles a cranberry but is said to be

*done by Henry J. Russe
 Collinsville, Ill.
 (will be on market)*

*608 Harbour Commission
 Toronto - Can.*



These Formidable-Looking German Tanks Are Protected by Cardboard Only; Excellent for Peace-Time Tactics but Useless in War

club

TANKS "ARMORED" WITH PAPER USED BY GERMAN ARMY

Armored cars protected by "armor" in appearance only were used in the autumn maneuvers of the German army for want of something more effective. The treaty of Versailles limits the type of armament Germany can possess, and as a result the tanks were nothing more than cars covered with cardboard which would be of little use in actual warfare.

PESTS REMOVED FROM CATTLE BY VACUUM CLEANER

Removal of the ox warble and other parasites from cattle is made easy by a device employing the principle of the vacuum cleaner. The pest remover is built on



Vacuum-Cleaning of Cattle Has Been Adopted as Effective Means of Removing Pests; Several Operators Are Supplied Power by Portable Motor

an automobile trailer. In operation, the nozzle is placed over the pest on the animal's back, and air suction does the rest. A gasoline engine supplies power. Several lines of hose are connected to the device so that as many animals may be treated at the same time.

ASPHALT COAT SEALS PILING AGAINST SEA WATER

Impregnating concrete piling with an asphalt coating makes the concrete impervious to the action of sea water and permanently protects the steel reinforcement from rust and corrosion. Piles to be treated are first heated and subjected to a vacuum in order to remove existing moisture from the pores. Then liquid asphalt is applied at high temperature under pressure. The treatment thoroughly fills the pores of the concrete and covers the piling with a coat to the depth of about one-half inch. Tests have proved that even if the treated concrete is chipped by accident, the asphalt seal is effective enough to prevent entrance of moisture.

001701

001760

*Capt. Allen P Child
Box 4673, Kansas City
Mo.*

*Pan Pacific
Piling & Construction
Co. Los Angeles, Calif*

**SKIN OF FROGS AND KANGAROOS
MADE INTO LEATHER** B1720

In the search for leather for novelty goods, tanners are using not only the skins of many animals, but of fishes, reptiles and even birds. Included in the list are monkeys, frogs, snakes, kangaroos, crocodiles, alligators and ostriches. Skins of sharks, rays and seals are made into footwear, traveling bags, brief cases and novelty articles. Kangaroo and wallaby skins are used where a specially durable leather is required, while alligator and crocodile skins, long used in making luggage, now are employed by the shoe and pocketbook manufacturers. Shoes and pocketbooks are made of snake skin, trimmings for leather goods are made of the larger frog skins and ostrich skins are made into novelties of various kinds, while monkey skins have been used in a similar manner. By embossing methods, American tanners have been successful in imitating the grains of these skins.



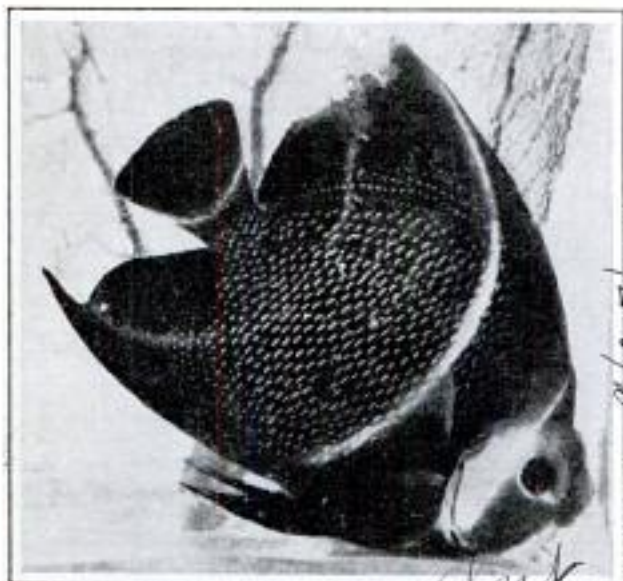
This Group of Students Received Only \$37.80 for \$50 in Experimental Play at a Slot Machine

**SLOT MACHINES PAY JACKPOTS
ONCE IN THOUSAND TIMES**

Chances of winning the jackpot by playing the ordinary slot machine found in stores and restaurants are about one in a thousand. This was the conclusion of students of New York University who took apart a typical machine and figured the chances of winning. They also found that \$50 invested in a slot machine set to pay in the customary manner would return no more than \$37.80.

**ANGEL FISH LIVE ONE MONTH
IN AQUARIUM PRISON** B1727

French angel fish, one of the most beautiful of deep-sea species and widely sought



Here Is an Angel Fish, a Deep-Sea Specimen That Survives Only Thirty Days in an Aquarium

for aquariums, can live but a month in captivity. Found in profusion just outside Morro castle, off Havana, they are one of the principal attractions of the Havana aquariums but, being so short-lived, must be constantly replaced.

**SECRET OF "STONE DOUGHNUTS"
IS FOUND IN NATURE** B1718

Oklahoma's "stone doughnuts" were formed by nature and not by Indians. These wheels of red sandstone, as large as dinner plates and with holes in the center, occur in considerable numbers near Geary. Samples of the stone rings recently were examined by a mineralogist for the Smithsonian Institution who determined that they were natural formations and owed their origin to sand deposited by whirling gusts of wind. The sand piled up, layer upon layer, and in time the grains were cemented together and compressed into sandstone masses. Then, weathering broke down the stone which tended to fall apart into circular layers, and wind-blown sand finished the product by wearing holes in the center. While the Indians did not make the rings, it is believed they placed some of them in piles to make altars of them.

Class in general science under Mr. E. E. Free

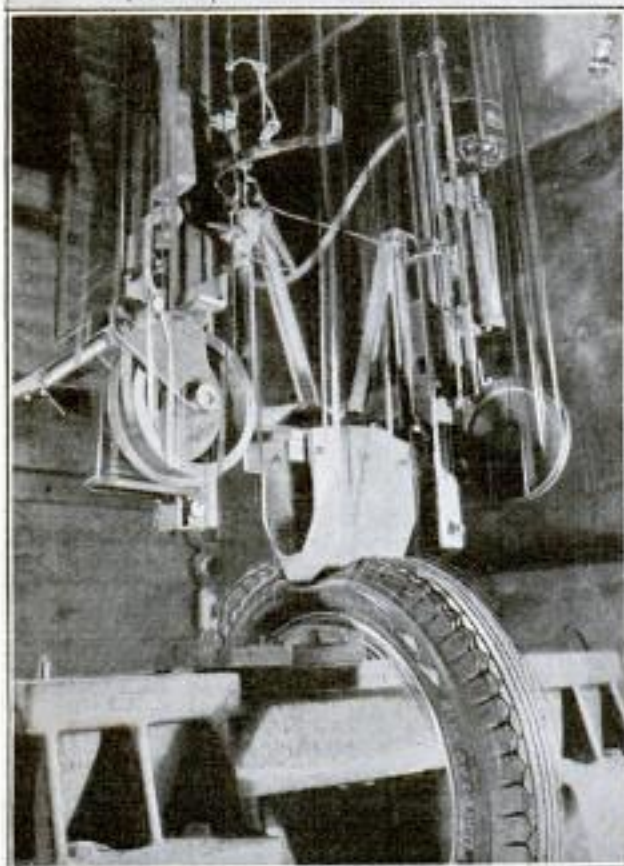
Source of 27/32

Washington D.C.

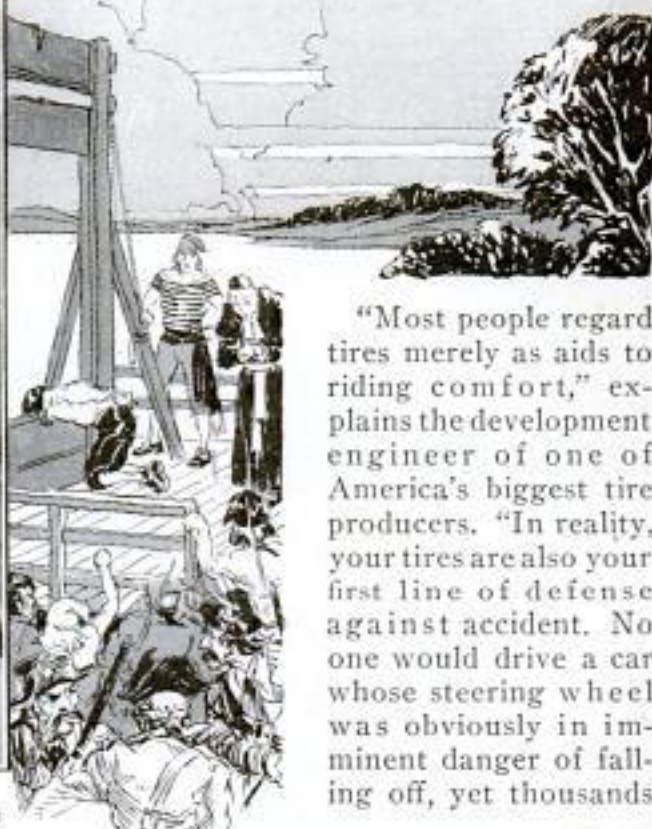
Dr. Irmari Michelson and Mr. W. J. Dishay

B1473 Cml. Walter E. Burton
1032 Florida Ave
Akron Ohio

when Death Rides



"Guillotine Test"; a Sharp Plunger Dropped on a Tire Determines Carcass Strength



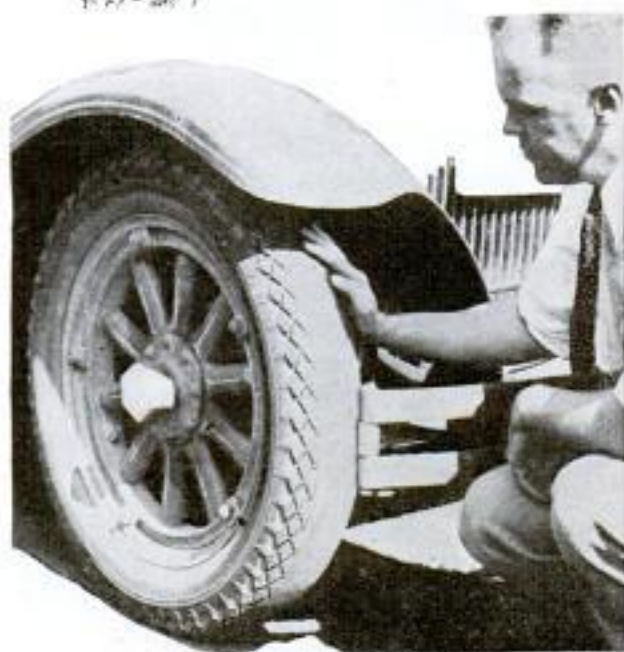
"Most people regard tires merely as aids to riding comfort," explains the development engineer of one of America's biggest tire producers. "In reality, your tires are also your first line of defense against accident. No one would drive a car whose steering wheel was obviously in imminent danger of falling off, yet thousands

By MORGAN W. GIBNEY

ARE you riding on rubber that makes your car a death trap?

A recent survey indicates that one car out of ten is being operated with one or more "shoes" which are unsafe—more than 2,000,000 cars traveling the highways of the nation which are a threat to their drivers and to other motorists.

The old adage, "a car is no safer than its tires," is especially true today. Speeds have mounted by leaps and bounds during the past few years. Nowadays even the cheapest cars can attain seventy miles per hour—and do. Mere mile-a-minute speed is no longer a thrill. Yet at sixty your car has the same capacity for inflicting damage as though it were diving off a ten-story building.



A "Bald-Headed" Tire, on Which the Center Tread Is Worn Off, Promotes Skidding

the Rubber



of motorists drive cars with front tires which are on the verge of blowout. After all, you really have three steering wheels; the wheel you hold in your hands and the two front wheels. If any one of them fails, you're in trouble—plenty of trouble.

"You may have the best brakes in the world, but brakes can only stop the wheels. It's up to the tires to stop the car. Your car rides on four points of contact, and your control over your car is no better than its road grip at those points.

"Shock-proof bodies and shatter-proof glass help to protect you after the accident, but good tires protect you by preventing accident. You may have low center of gravity and perfect balance in your automobile, but when you're rounding a turn on 'slick' wet pavement; it's up to the tires to grip the road and keep the car from skidding."

Some motorists drive their tires too far, through sheer neglect; others, because of false notions of economy. At Akron, the capital of the world, they will show you that the average modern tire costs about



B1473
866



Tire Injuries Are Not Always Apparent: This Casing Seems Good for Many More Miles, but When Torn Down, Reveals Serious Carcass Injuries

50 cents per 1,000 miles of safe operation. Driven beyond their limit of safety obviously becomes rather expensive

One puncture eats up the energy represented by driving 1,000 miles at constant danger.

Should a tire be discarded? How long is safe mileage? That depends on your driving, say the experts. Tire life depends not so much on the number of miles as the kind of driving.

Under normal conditions, your tires wear out as rapidly as at 14,000 safe miles. They last out after 14,000 miles on a hot-stone road at a temperature of 90 degrees.

could drive in a constant temperature of sixty degrees, your tires could last about twice as long as those driven in a constant

temperature of ninety degrees. If you underinflate or overinflate your tires, you shorten their life amazingly. If you like to step out at the traffic light with a burst of power, your tires pay for that thrill. And, of course, if you like to stand the old bus up on its nose when you put on the brakes, that costs miles too.

Let the tire itself tell you when it should be removed from active service, is the advice of those who know their tires. When the anti-skid tread is worn off, get rid of it. Don't wait for the rubber to wear down to the "breaker strip." When the tread is gone, most of the traction has gone with it. With the tread goes sixty per cent of the tire's resistance to bruising. However, if you have given the tire normal wear, the carcass probably has lost at least half of its original strength. Consider the punishment that tire takes in carrying your two-ton car around, flexing 4,000 or 5,000 times every mile, absorbing the terrific road shocks of fast driving. A bald-headed tire is an old tire, a thin tire, and the only safe place for it is the junk heap.

In some states, busses and other public vehicles are regularly inspected and forced to replace tires which have worn smooth. Safety commissions have recommended



Cross Section of "Retreaded Tire" Turned Out by Slipshod Methods May Look Serviceable...



but, in This Case, Vulcanizing Was Improper and the Tread Easily Separates from Body

that motor cars operating on unsafe "shoes" be barred from the highways. The next time you are searing along the highway and see another hard-driven car approaching, imagine what would happen if, suddenly, it leaped in front of you at the instant of passing—and you'll have little difficulty in realizing why the poorly shod car is becoming an outlaw.

Beware the man who offers to make your old tire "as good as new." In most cases, retreading is a poor substitute for a new tire. Indeed, the retreaded casing frequently is less safe than it was before.

In the research laboratory, tire engineers can show you the flaws in this sort of economy.

"Here is an answer to a retread gyp's prayer," explains the engineer, rolling out a used tire. "Except for its worn tread, it looks perfectly sound, inside and out. You can't see any carcass breaks and bruises; to the average motorist, it looks as though a new tread should double its life. But, to anyone who knows tires, it's a different story."

With a few deft movements, he strips away a portion of the tread and exposes a dangerously weakened point in the cord fabric.

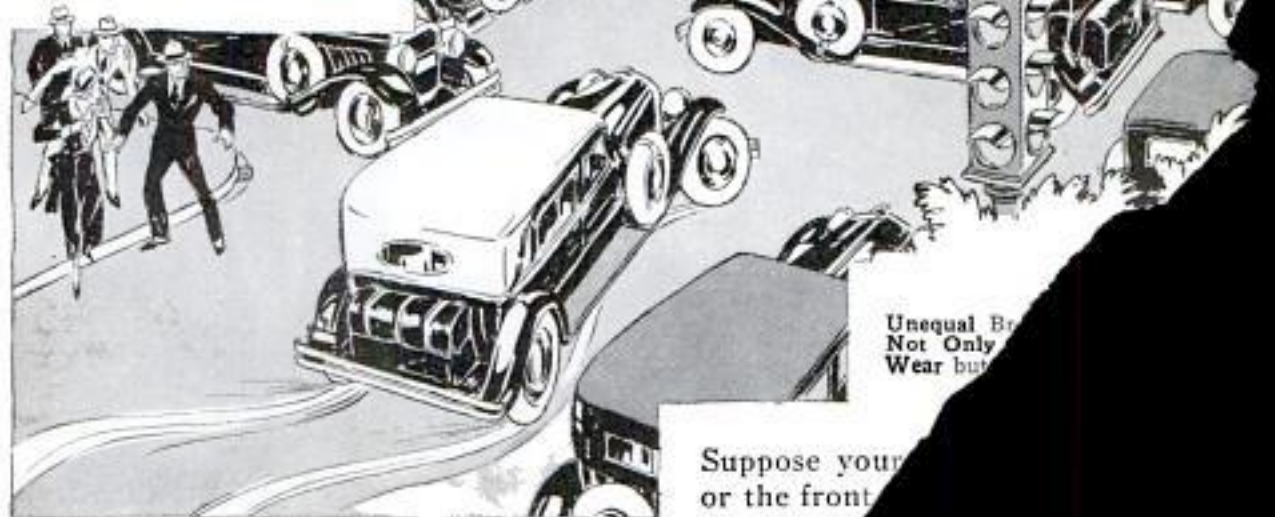
"Now, let some rule-of-thumb tire repairman slap a new tread over that weak spot. Then put the



Tires Worn Thin Are Very Susceptible to Punctures; This Casing Has Traveled 14,000 Miles



The Tread of a New Tire Is Heavy Enough to Withstand Tacks without Puncturing Tube



Unequal Braking
Not Only Causes
Wear but

tire on a front wheel and hit a sharp bump at high speed—and see where you land.

"Under certain conditions, however, a retread is really advisable and economical.

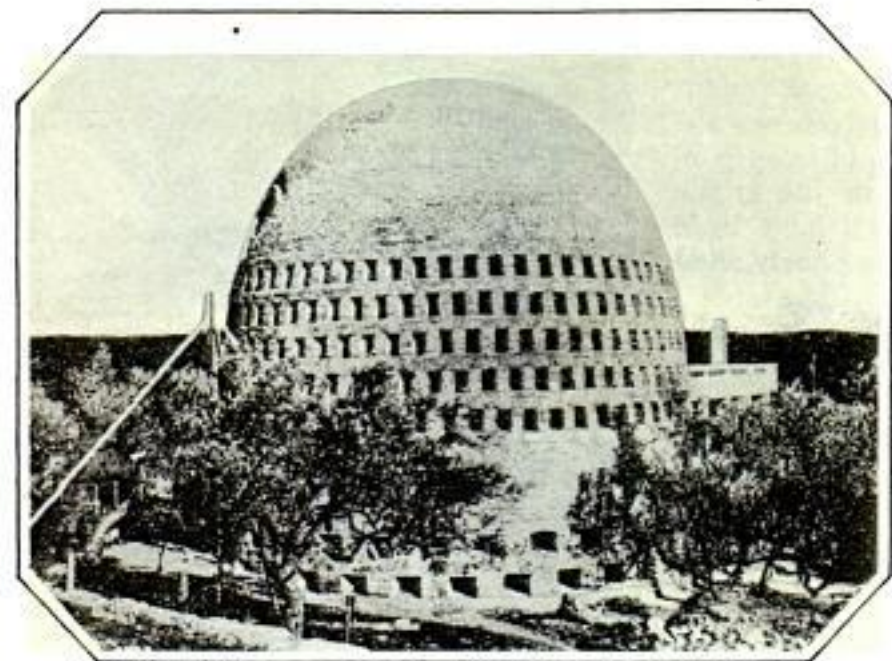
Suppose your car has 10,000 miles on the front tires and 20,000 on the rear. The rear tires are worn in. The front tires are good.

few thousand dollars. You may be able to get a proper retread for a few hundred dollars.

B1775
868

Le miroir du monde
9/24/32

France - en. Provence



This Odd-Looking Building Is a Well, Although It Is All Above Ground; Condensation Pulls Water from the Air

WELL LIKE GIGANTIC ANT HILL GATHERS WATER FROM AIR

Resembling a huge anthill, a tower has been erected in an arid section of southern France to become what has been termed an aerial water well. This section, which is devoted to horticulture, is almost rainless, but has hot days and cool nights and the air is well saturated with vapor. The tower is built with a number of slanting canals on the inside, some running upward from the lower rows of openings in the wall and others downward from the upper rows. The heated daylight air enters and rises through the former to the top where it is trapped in a central shaft. When the outside air is cooled at night, it sinks through the down-sloping canals to the central shaft, mingles with the trapped heated air there and forces out of the moisture, the result being collected in the shaft and used for irrigation. The tower is 600 feet high. The walls are 13 feet thick and are protected from radiation from the inside by the aerial well of water per surface.

a similar system built over 2,300 years ago, and if the present well proves satisfactory others are to be constructed in northern Africa where there are enormous losses of cattle through the lack of drinking water.

B1773

SLOT MACHINE SELLS TOWELS ON CREDIT

Paper towels are dispensed by a penny vending machine which collects from the customer after he has used the article, instead of before.

It was found that most persons washed their hands first, then were forced to search through pockets with wet hands for a coin to obtain a towel from machines operated in the usual manner. So a towel dispenser was built on the theory that most people are honest, and contains a placard inviting the patron to use the towel first, and then hunt for



If Honesty Is Customer's Policy, This "Towel First, Then Pay" Device Will Make Money

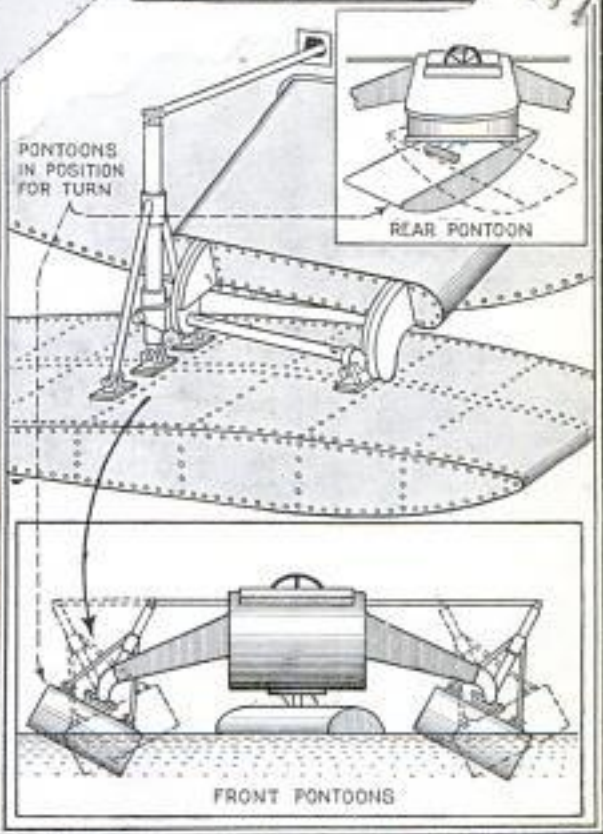
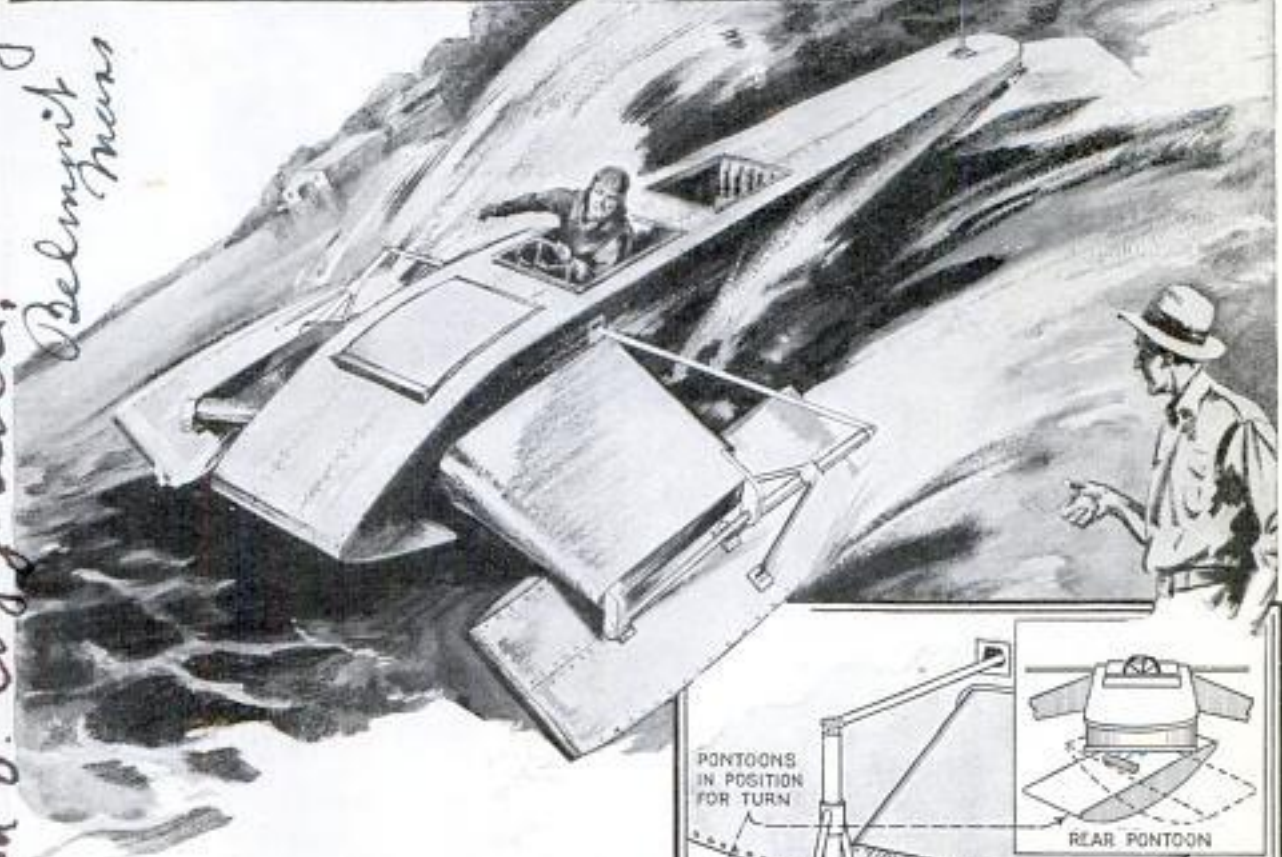
the coin to insert in the slot in payment of the service.

Paper Products Co.
323 W. Polk St.
Chicago

generally at cost of \$2.50 providing towel are purchased from company

Floats Act as Balloon Tires on Racing Boat

Cont. John F. Coggeswell, 16. Edgemoor Road
 Belmont Mass



Greater maneuverability, more speed from less power output and increased safety and riding comfort are promised in a "front-drive" speed boat suspended at three points on adjustable pontoons. In turning, a twist of the steering wheel tilts the two front pontoons, affording a banking action while the rear float pivots to act as a rudder. The outboard motor, mounted forward, pulls rather than pushes the craft and further increases steering response, enabling the boat to turn around practically within its own length. The body is connected with the pontoons through air-cylinder shock absorbers, giving, in effect, much the same suspension as a motor car on its wheels and contributing greatly to stability and riding comfort.

B/721

870

Standard Oil Company of New Jersey

J. J. Walker

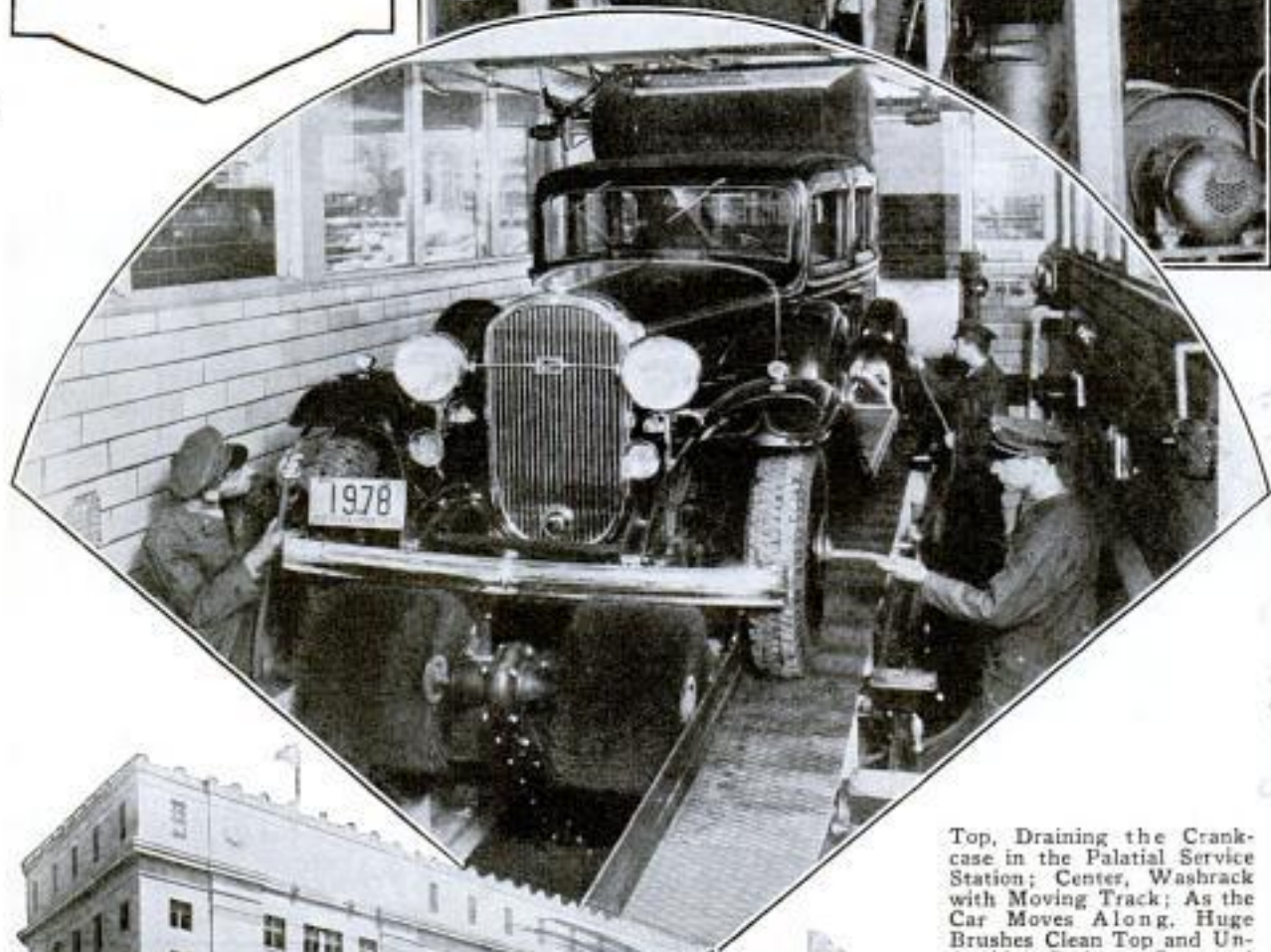
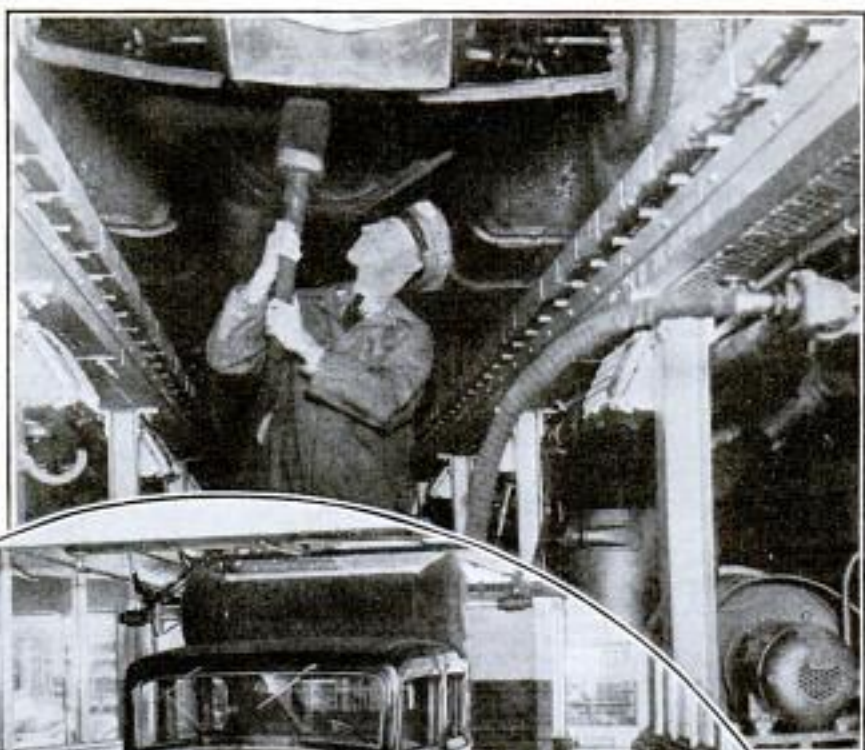
POPULAR MECHANICS

Washington, D. C.

Beauty and Efficiency Combined for Autoists

*Constitution Avenue
from 2nd to 3rd N.W.*

SAID to be the world's largest and most luxurious automobile-service station, this "Servicenter" recently was opened in Washington, D. C., within a block of the nation's capitol. Here, lowly flivver and aristocratic limousine get their "beauty treatments" in surroundings more suggestive of a pretentious hospital than a maintenance and repair shop for motor cars.



Top, Draining the Crankcase in the Palatial Service Station; Center, Washrack with Moving Track; As the Car Moves Along, Huge Brushes Clean Top and Underside; Below, General View of the "Servicenter," of Which the Service Station Occupies Top and Bottom Floors with Offices between Them



Dr. William D. Strong
Archaeologist

B1694

HUMAN JAW OF THE ICE AGE FOUND IN NEBRASKA

Men probably dwelt in America at least 15,000 years ago. This conclusion has been reached by the Smithsonian Institution as the result of the finding of a fragment of bone from a human jaw in deposits of earth apparently laid down when the last of the great glaciers receded from the United States, some 15,000 to 30,000 years ago. The fragment, along with crude bone and flint implements and broken bones of animals, perhaps eaten by the hunter whose jaw was unearthed, was found on Signal Butte in western Nebraska. This butte was famous as a signaling station in the days of Indian wars. The jawbone was in the lowest of four separate layers of relics, showing human beings lived there in four periods ranging from ancient times down almost to the present. Relics in the lowest layer seem to date from shortly after the close of the last ice age.

Cleveland Plain Dealer

B1766

Washington
22

Indianaapolis
Ohio



Top, Young Woman Holding Bar Which Presents a Streak of Light across Front or Rear of Vehicle; Bottom, Bar on Truck Shows Its Width at Night



TAIL-LIGHT BAR INDICATES FULL WIDTH OF CAR

Resembling a brightly glowing neon tube, a tail-light bar now is available which extends the full width of the car or truck on which it is installed and is plainly visible through fog or the glare of approaching headlights. Illumination is obtained from two standard tail-light bulbs inclosed in a tubular bar, fifty-four to ninety inches in length according to the width of the vehicle. Through a new application of reflection and refraction, this light is transformed into a brilliant streak, visible at greater distance than any signal light now in use. If one bulb burns out, the other is sufficient to maintain adequate illumination. If both burn out, a reflector disk in the center of the bar warns following traffic. In addition to the red warning light for the rear end of trucks, a green light bar may be mounted on the front end to warn oncoming traffic.

THREE RIDE THIS MOTORCYCLE WITH SIDECAR FOR TWO

Members of the Spanish civic guard are patrolling the roads of that country on three-passenger motorcycles. The vehicles are equipped with sidecars holding two persons sitting back-to-back, thus enabling a cruising squad to cover all angles of the road, one armed guard facing the rear while the other watches the front.

B1753

3242. Leesmore, Birmingham.



This Police-Patrol Motorcycle Has Sidecar for Two with Seat Arrangement as Shown

Made in England

More than 14,000,000 of the 29,904,000 families in the United States possessed their own homes when the last census was taken.

Bureau of Census, Washington, D. C.

329 W. Ohio St. Indianaapolis
Stresh G. Lite Corp.
General Motor Corp (Div. General Motor) Anderson, Ind.

B31759
872

Sound Communications Corp
11 W. 42nd St. New York

POPULAR MECHANICS

Recording Device at Right Picks Up Conversation without Any Connection to Telephone Line; Record Can Be Played Immediately



Harris Secretary Treasurer.

George

Am.

DISK LISTENS IN ON TELEPHONE AND RECORDS MESSAGES

Telephone messages can be picked up and recorded by a device that has no connection with the apparatus or wires of the telephone company. The record can be played back immediately. In a demonstration, Sidney Y. White used a rubber-wrapped air-core coil about the size of a baseball, placing it near a telephone box. Magnetic leakage from the telephone circuit was picked up by the coil and carried to a box of suitcase size which contained an amplifier and a recording device. The phone message, inscribed on an aluminum disk, can be reproduced immediately in earphones or through a loud speaker. Each side of a sixteen-inch disk takes down about twenty-five minutes of conversation. Mr. White also demonstrated a home set which would automatically take down three brief messages in the absence of someone to answer the telephone. The recording of programs direct from a radio receiver also is practical.

GOLD FOUND IN SKINS OF BEARS BROUGHT FROM ALASKA

Alaskan grizzly bears stick to the gold standard, or rather, the gold sticks to them. When a University of Michigan forestry professor went prospecting in bear skins brought from the Yukon, looking for new types of animal parasites, he found the expected fleas, and also unexpected flakes of gold scattered throughout

Prof. Elw. V. Baster, School of Forestry and Conservation

the fur. The skins were purchased from Indian hunters at Whitehorse, in the Yukon, and brought to the university for study. In hunting for parasites, the fur was carefully combed and the dust was then "panned" in a small dish with water, much as gold is treated by prospectors.

By this operation, the professor was pleased to find many types of insects, but, on looking more closely, he also saw yellow flakes which recalled the days when he had prospected for minerals. Examined under the microscope, the flakes were found to be gold, but hunting for it would scarcely pay, as there is very little of it. How the bears collected the flakes is a mystery. They may have caught bits of the metal in their claws while walking in stream beds, later transferring it to their hides while scratching.

BIRD BATH HAS FEEDING BOARD AROUND ITS EDGE

Serving a double purpose, an unusual bird bath made of concrete has a feeding board around the edge. The center is filled with water while the recess on the edge is for food.



Traylike Depression around Edge of Bird Bath Holds Food for Feathered Guests

Built by Nelson Edwards
111 W. Lexington St.
Baltimore Md.

in backyard at 3054 Arundel Ave Baltimore

Copyrighted material

B1634

Owner - James V. Lafferty

HOUSE BUILT LIKE ELEPHANT CONTAINS SIX ROOMS

Easily visible for a distance of eight miles, a six-room house shaped like a giant elephant attracts the attention of tourists at Margate City, N. J. The

Six-Room House Built to Resemble a Giant Elephant Carrying a Howdah; the Body Is Thirty-Eight Feet Long, and the Howdah Is Sixty-Five Feet above the Ground



Ent. J. J. Besch, Jr. are necessary 1500

structure represents "Jumbo" standing in a feeding position and contains six rooms furnished like a home. There are two spiral stairways, one in each hind leg, and the rooms are all on one level, occupying an area of eighteen feet square. On top is a howdah or observation tower, sixty-five feet above the ground. The body is thirty-eight feet long and eighty feet in circumference, the legs are twenty-two feet long, and the eyes, eighteen inches in diameter, are made of glass. The house contains twenty-two windows and 12,000 square feet of tin were required to cover the outside.

ly. If phosphorus is abundant, the liquid in the bottle turns dark blue. Varying degrees of phosphorus in the soil show up in colors from dark blue to colorless, the last revealing a soil equally bad for crops and for human food. Phosphorus is important in bone building.

B1599 CLIPS FOR AUTO LIGHTS SHOW WHEN BULB GOES OUT

Motorists driving at night often are unable to tell when a headlight fails and unwittingly drive with only one lamp. To keep them informed as to the condition of each light, a small double-slotted steel clip that fastens on the headlight rim is being offered. The clip projects just far enough to reflect a tiny spot of light from the lamp to which it is attached, so that the driver will know a bulb has failed when the reflection ceases.



which it is attached, so that the driver will know a bulb has failed when the reflection ceases.

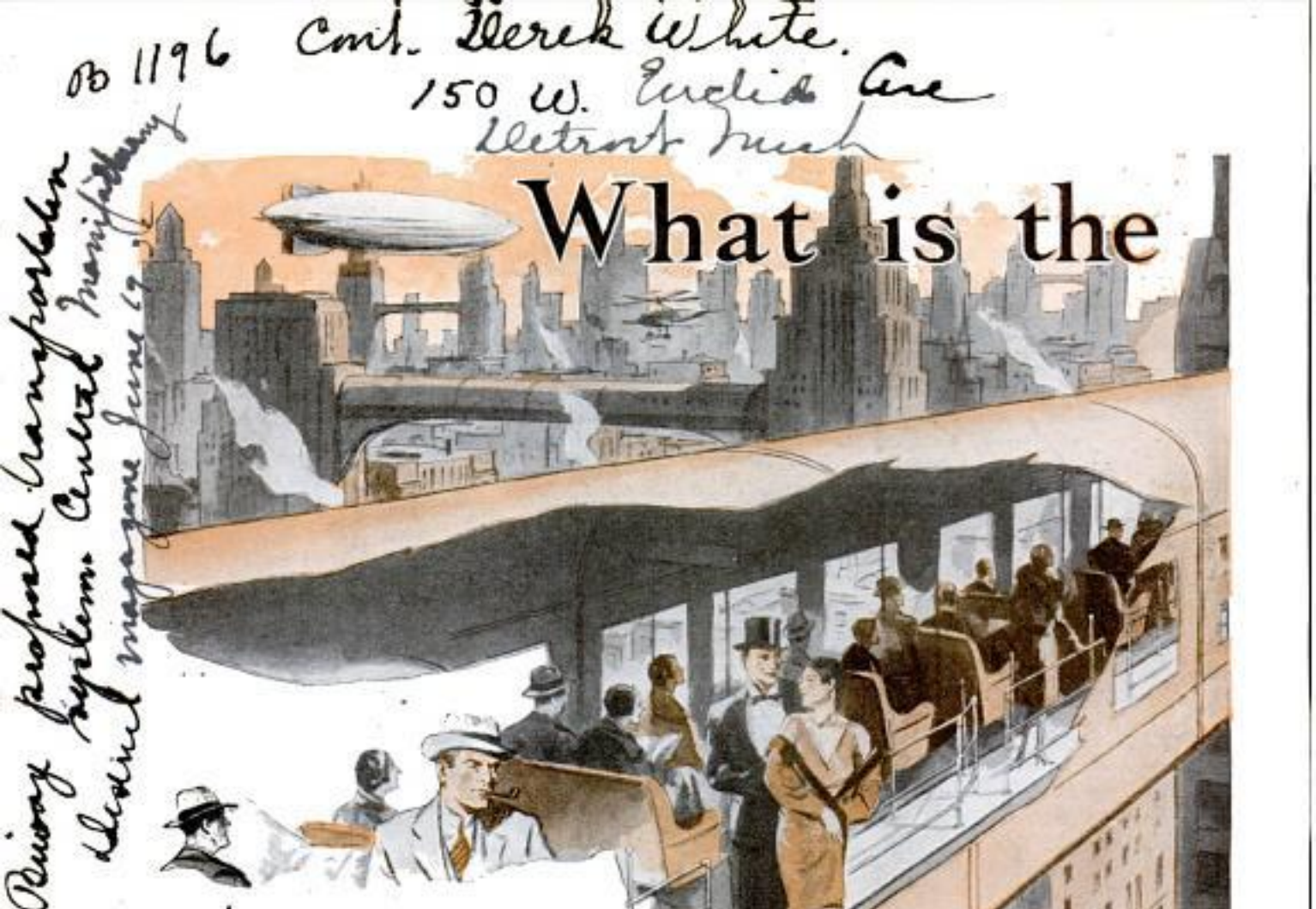
B1676 PLANT TEST FOR PHOSPHORUS REVEALS SOIL CONDITION

After years of guessing, the farmer now able to determine the amount of phosphorus in the soil by a simple method. From growing plants in the soil to be tested, about as many cuttings as would be used to make a cup of tea are sliced off and crushed slightly with the fingers to bring out the juice. Then the cuttings are placed in a bottle filled with a special chemical compound and shaken vigorously.

Purdue University West Lafayette, Ind

A. B. C. Mfg. Co Quincy, Ill.

by Expe ette con chl Change



Railway proposed transportation system. Central Manufacturing plant magazine June 1916

*Cont. Derek White.
150 W. Euclid Ave
Detroit Mich*

What is the

An Amazing Story of the Wonders Promised by the Dawning of the AGE of ALLOYS

By G. EDWARD PENDRAY

NINE persons out of ten, asked to name the lightest metal, will unhesitatingly say aluminum, but they will be wrong.

There are at least seven metallic elements lighter than aluminum. One of these, lithium, is so light that it weighs only half as much as water and floats like cork.

If the present era is one of iron and steel, the next certainly will be one of light alloys. It costs as much to haul a ton of vehicle as it does a ton of payload, whether the vehicle is an automobile, railway car, airplane or dirigible. And so, even the railroads are seeking ways of lightening rolling stock to cut expenses.

It costs \$300 per ton per year to haul an elevated railway car. Lightening a car a

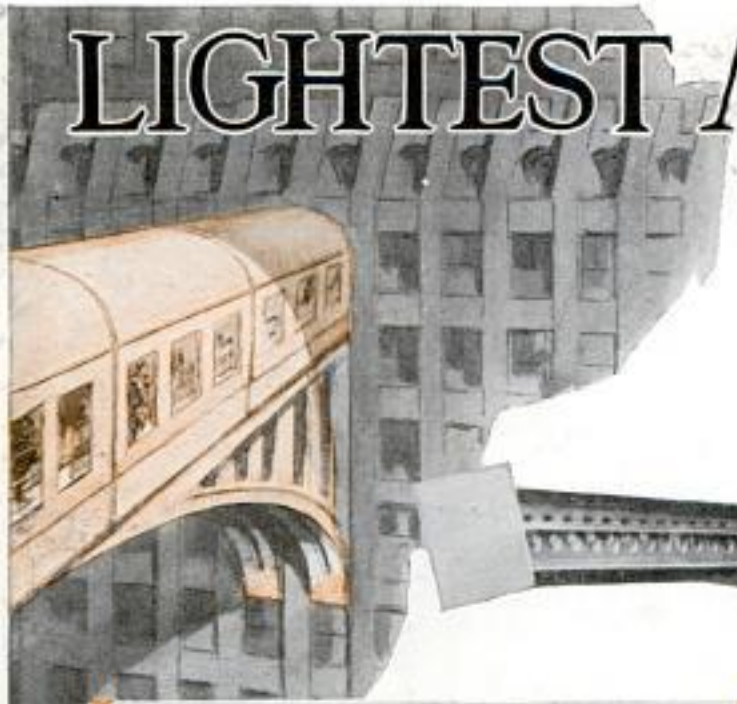
single ton or several tons is absolutely possible today, and a \$300 saving per car per year would run into millions of dollars, allowing reduction of rates, changing losses into profits and increasing the life of the equipment.

By constructing the wheels, fuel tanks, control parts and wing ribs of a lighter alloy, an airplane manufacturer saved 400 pounds in weight in a six-passenger ship, increasing his flight range 500 miles. By retaining the same flight range he can carry two extra passengers, and thus increase his revenue thirty-three and one-third per cent.

001196

LIGHTEST METAL ?

How Chemical Co
919 Jefferson
McClatchie, Wash



Top, Holding Aloft Two Ten-Foot Beams of Magnesium Alloy, Weighing Thirty Pounds Each; Above, Applying Aluminum Paint

lithium and the other extremely light metals seem considerably less fantastic and unattainable today than it might only a few years ago.

The seven metallic elements lighter than aluminum, in the order of increasing lightness, are strontium, beryllium, magnesium, calcium, sodium, potassium and lithium. Of these, the last three are lighter than water.

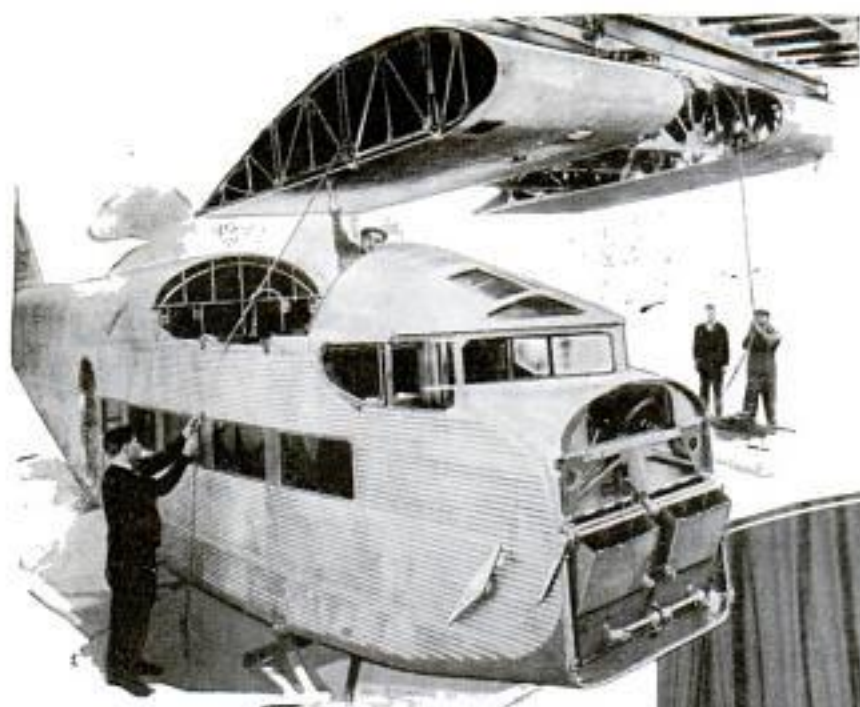
In the case of every one of these, the pure form is practically useless, because of lack of strength, rapid corrosion in air or water, low melting point, extreme softness, or other factors.

In spite of these obstacles, rapid progress is being made toward overcoming objections to the use of some of these metals in structural work. Magnesium alloys are now manufactured in commercial quantities.

The first answer of metallurgists to the demand for lightness was the development of aluminum and its alloys. From a rather expensive curiosity, this metal has within a few years become a structural material so common that it is now being used for the fabrication of objects all the way from kitchen utensils to flat cars. The success of these alloys makes the idea of using

Aluminum Company of America
2449 Olive Bldg, Pittsburgh Pa

1196
876



The Entire Skin and Main Structural Parts of This Airplane Are Made of Aluminum Alloy

is little used in its pure state, because of its low strength and lack of toughness. Small quantities of other metals, such as aluminum, manganese, copper, zinc, tin and cadmium are melted together with magnesium, and suitable alloys are produced, ranging from ninety-two to ninety-eight-per-cent magnesi

9/9 Jefferson Ave
Midland, Mich

ties both in this country and in Germany, being pumped in the form of brine from ordinary wells.

This is the only metal that is not mined and produced from ore. Its base is magnesium, and while magnesium itself has been known for more than a hundred years, it was not until recently that it became commercially available.

Magnesium is very little heavier than wood, yet has the strength of mild steel, and is the third most abundant structural metal in the world. This makes it seventy times as plentiful as nickel, 200 times as abundant as copper, and of all engineering metals, it is surpassed in quantity by two only—aluminum and iron.

Pumped through underground pipes into giant tanks, one of which has a capacity of 1,000,000 gallons, the solution is subjected to processes which remove the calcium chloride and bromide. The remaining magnesium chloride is dried, and the final operation consists in flowing it into large electrolytic cells, where it is melted with common salt under terrific heat. A powerful current is then shot through the bath and decomposes the magnesium chloride into chlorine gas, which is carried away, and magnesium metal that floats as a silvery layer and is immediately skimmed off and cast into ingots.

But magnesium, like nearly all metals



Lightweight Metal Chairs Constructed of Magnesium Alloy; Each Weighs Seven and One-Half Pounds

um, so all its characteristics, mainly lightness, are retained.

This new series of alloys is indicative of what industry is doing to develop new possibilities in structures. It indicates that old problems are being looked upon with new minds. The production of this light material has increased twenty times in the past few years and the cost has been reduced from \$5 a pound to thirty cents.

What does this mean to the world?

W. A. Mankey, eminent aeronautical and mechanical engineer, has estimated that needless weight in automobiles, airplanes and other means of transportation is costing the traveling public \$10,000,000 per year in tires, fuel, overhead and other operating expenses. Lessening the weight

9/9 Dow Chemical Co

Pittsburgh Pa

Aluminum Company
of America 2449 Alameda St

Law Chemical 877

919 Jefferson
Midland
Tex

of rotating and reciprocating parts of machinery gives increased speed and minimizes vibration and wear.

The advantage of light weight in portable tools is obvious. Tests have proved that reducing the weight of a riveting machine or portable drill reduced workman fatigue and gave increased output in proportion to the reduction.

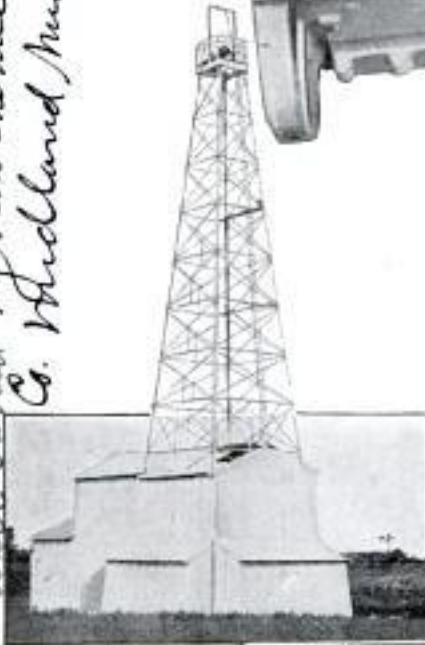
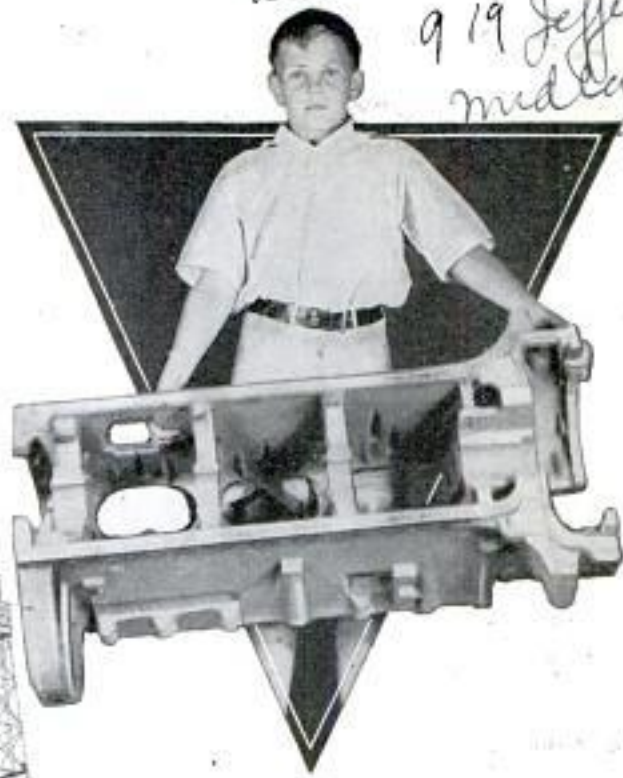
In the home, appliances to make the work of the housewife easier still can be improved. Vacuum cleaners, ironers, carpet sweepers, through lighter weight, would be more easily operated and require much less energy and time.

But how about the cost of attaining lightness? The savings in operating cost, and the advantage of longer life, will more than offset the additional cost of lighter metal in many products, and engineers are learning that weight does not mean strength.

The development of successful magnesium alloys is a first and important step in the harnessing of the seven light metals to structural use. The next most successful alloys to date are those of beryllium. These weigh a trifle more than magnesium, but have an advantage in the higher melting point of beryllium, which is nearly that of iron.

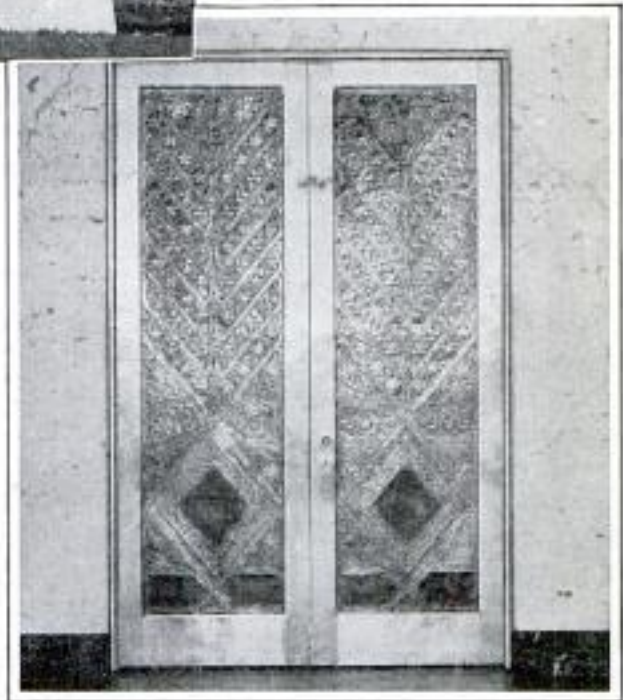
The principal disadvantage of beryllium alloys is the cost. The pure metal cannot now be obtained for much less than \$100 a pound, but by certain short-cuts in the process of manufacture when alloys are to be made, they can be bought at \$50 to \$60 a pound. This price is still much too high for general purposes, but the alloys will be used where lightness, high melting point and great strength are important enough to offset the cost.

The field of experimentation in alloys of these light metals is one that will become increasingly important. The development of aircraft and fast vehicles on land and water has stimulated it; the future construction of huge dirigibles and



perhaps of rocket ships will make an even greater demand.

Engineers are working, but the most radical improvements may come out of a great factory or laboratory—or out of a backyard shop.



Top, Magnesium-Alloy Crankcase; Center, Magnesium-Chloride Well; Below, Aluminum Elevator Doors

Well owned by Law Chemical Co. Midland, Tex

Paris, 20

Bicycle with Stabilizers for Travel on Land or Water; When Lowered, the Auxiliary Rollers Hold the Vehicle Steady in the Water

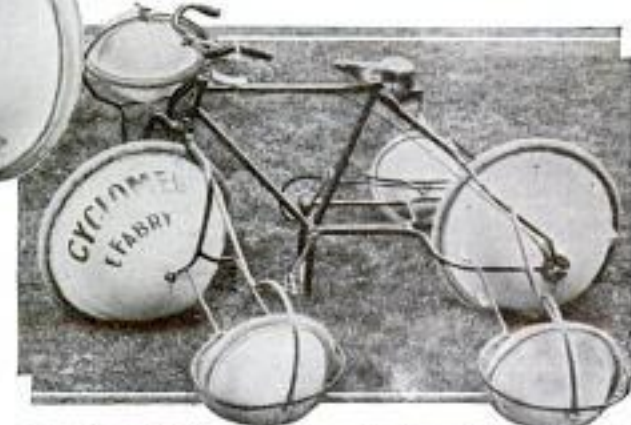


old roofs showed it consisted almost entirely of copper sulphate. Sulphur dioxide from burning coal provides the sulphur that reacts with the copper, but even in badly polluted industrial atmospheres from ten to fourteen years has been required to develop the coloring by natural weathering. Architects demanded a quicker method, and a ten-per-cent solution of ammonium sulphate was found to be an effective coloring chemical. In England, an electrolytic method is used that requires only fifteen minutes, after it was found that some ammonium-sul-

Establishments E. Fabry Paris (20) 5, Rue des Américains, France

Wide World BICYCLE ON DRUMS TRAVELS ON LAND OR WATER

At home on either land or water, a bicycle equipped with stabilizers has made its appearance in Paris. It is known as a "cyclomer" and has two large drum-shaped wheels to each of which are attached two smaller spheres which can be raised or lowered. When lowered the auxiliary rollers serve as stabilizers for water travel. On land the small spheres are raised and the vehicle travels like an ordinary bicycle.



phate solution treatments tended to break down under severe weather conditions.

NUMBER OF MILES PER GALLON TOLD BY AUTO METER

Motorists now can measure the exact mileage per gallon of gasoline their cars deliver at any speed with the aid of a motor-performance meter which attaches to the steering-wheel post. It is about the size of a volt meter and is electrically operated. An indicating hand swings from left to right, depending on speed, and by dividing the speedometer reading in miles per hour by the meter reading in gallons per hour, the miles per gallon figure is reached. For instance, if the meter points to four at a speed of forty miles an hour,



COPPER ROOF QUICKLY AGED WITH CHEMICAL BATH

Previously the green color that copper and its alloys assume after years of exposure to the weather had been considered as reliable an indication of its age as wrinkles and gray hair in a human being, but this is no longer true. Two metallurgists have worked out a method for the rapid development of patina on copper, and now a few sprayings with a chemical can turn the freshest copper roof or spire into one of venerable appearance within twenty-four hours. Discovery of the method was delayed because the patina had been considered to be a copper carbonate, while analysis of green coloring matter on

Waterbury, Conn

John B. Freeman, Jr. P. H. Kirby

A. S. A. Co. Elizabeth, N. J.

Accumulator ready about Aug. 15, 1903

©1393 Cmt. Ivar Isachsen
55 W. 86 St. New York



T-6

The Latest **GIANT**

By D. N. GLASS

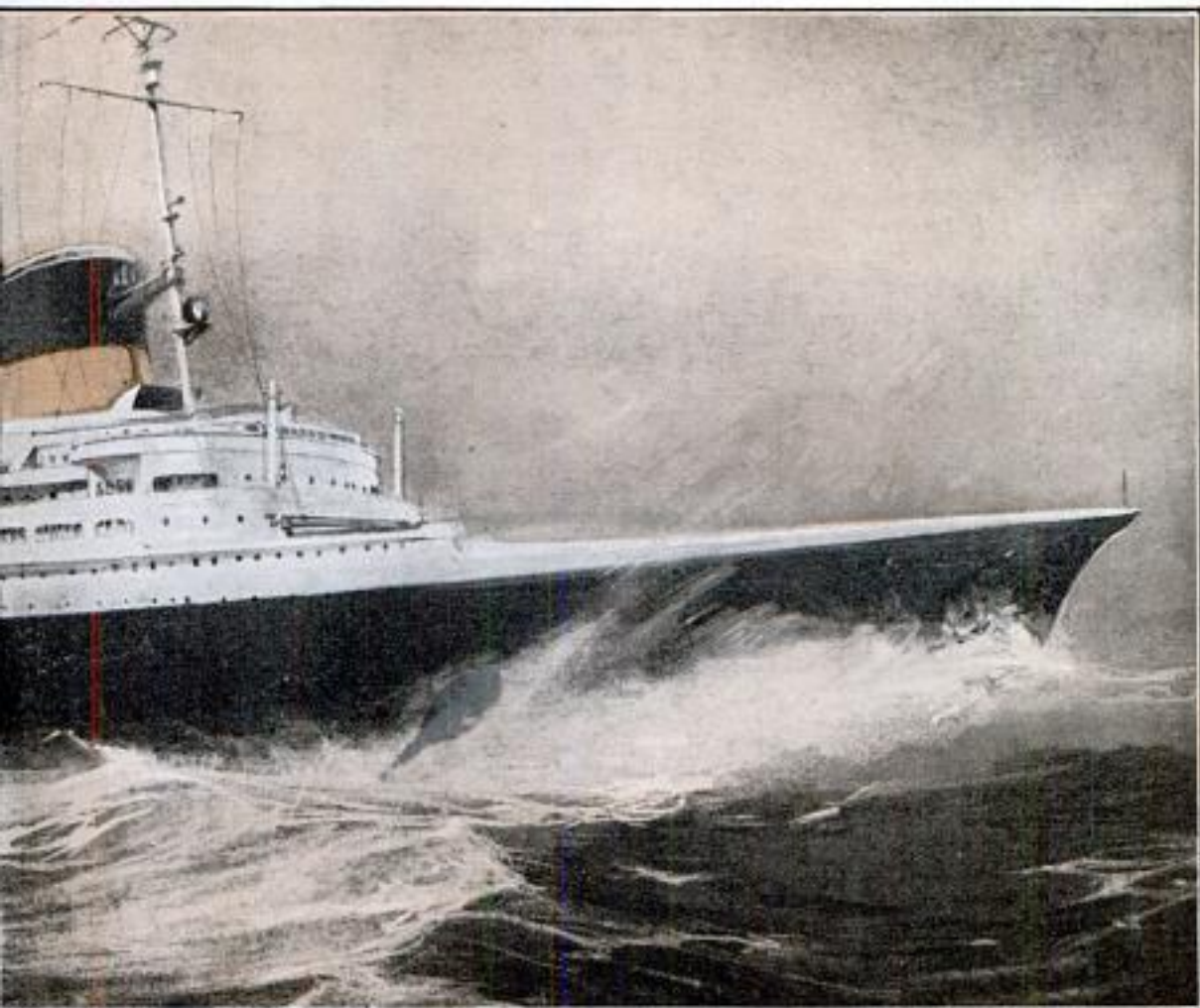
THE largest moving object on this planet has been launched into the sea. It bursts with strength, but responds to a man's touch; it looks colossal, but moves with the grace of a greyhound. It is a ship.

This ship is the answer to the demand for more speed, endurance, safety and comfort on the transatlantic boulevards. Her activities will be confined to one

ocean, where she will swim between two ports like a whale within a tank. To the west, the Panama canal shuts her out of the Pacific, and to the east, the Suez canal bars her from the Indian ocean. No such colossus was ever imagined by the engineers who designed these important sea links.

In order to visit the far east this new ship, tentatively called the "T-6," will have to go via the Arctic or Antarctic seas. And only New York and Havre will accommodate her with a berth and provisions.

The great "T-6," which will require about five years to build, is sponsored by



of the **SEA**

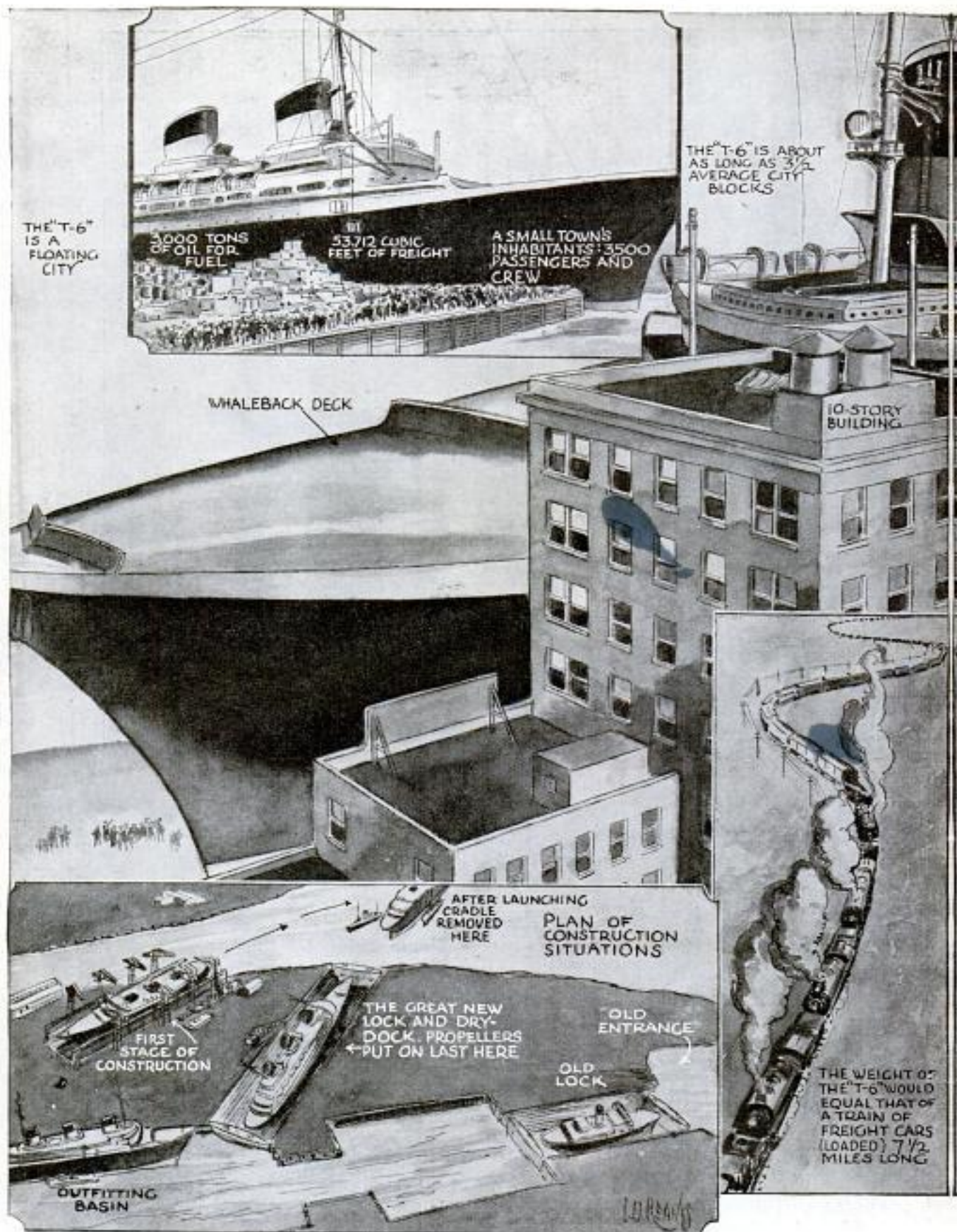
the French line and the French government. Dimensions alone do not make her a ship for history. But it is her size which allows the multiple wonders which form the "T-6." Her length over all is 1,014.6 feet; her beam, 117.81 feet. The ten decks between the engine room and sun deck are served by ten elevators, each with a capacity of thirty passengers. The four turbines will develop 160,000 horsepower, capable of driving forward the "T-6's" 75,000 tons at a speed of 34.54 miles per hour.

Not a piece of coal will be found on board. The power plant consists of four steam turbines coupled directly to gener-

ators which will supply electricity to four motors. Each turbine runs independently. All the ship's accessory machinery is electrified.

The "T-6's" staggering dimensions are made possible by an intensive application of the most modern practices in science and marine architecture. To wit, in planning the interior, her designers realized that no dining room worthy of such a ship could be built unless the funnels 'tween decks were removed from their traditional place. In order to have sweeping, unobstructed interiors, it was necessary to run the funnels up near the port and starboard sides of the ship, instead of through the ship's center line. By such ingenious planning, they achieved the largest room afloat, and what is probably one of the world's largest dining halls. It is three stories high from end to end and commands a clear view for 400 feet. Without the least crowding, the "T-6" could trans-

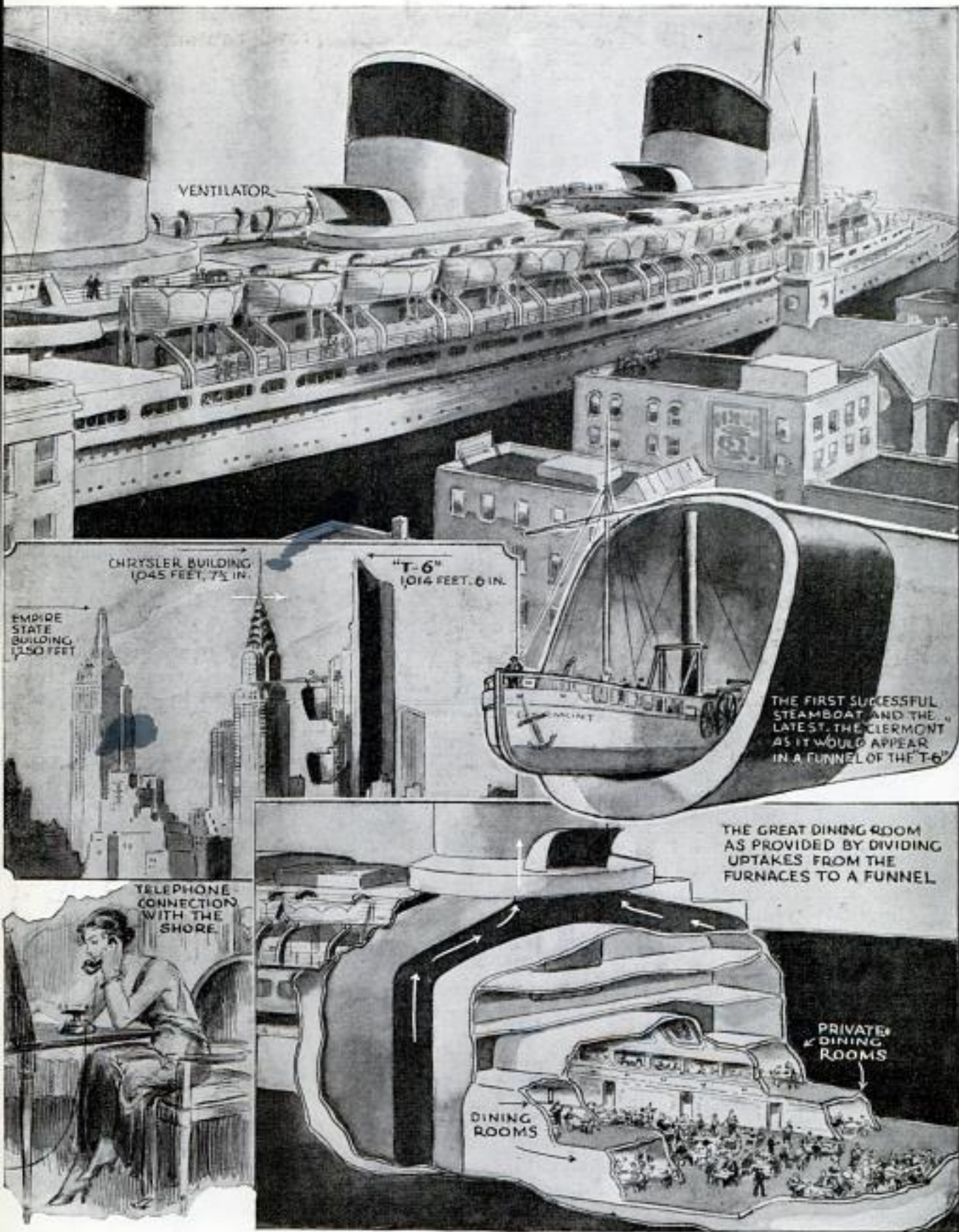
63 1393
882



port a city of 125,000 people across the Atlantic in fifty weeks. If stood on her end, she would soar above the Chrysler tower and dwarf the Woolworth building.

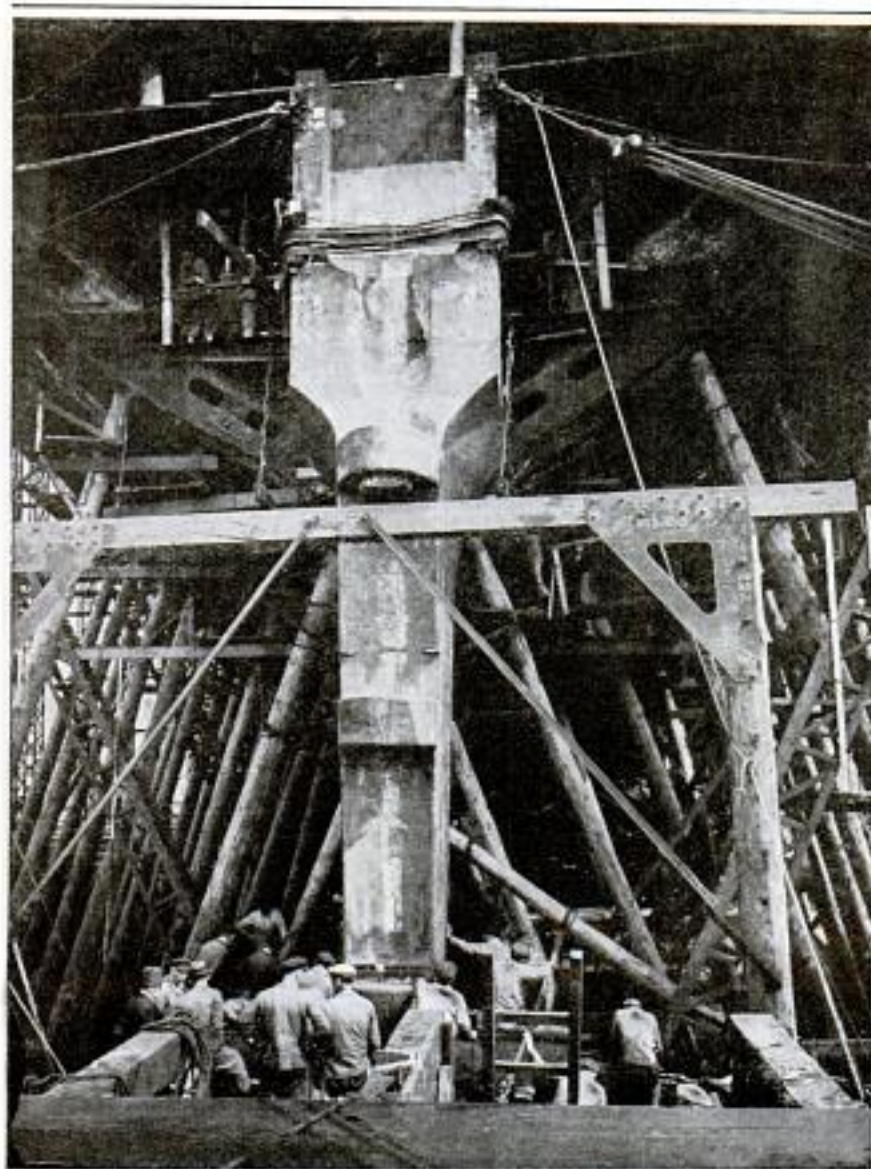
The "T-6" will carry enough oil and water in her double bottom to float a large Mississippi river passenger steamer.

The main dining room will accommo-



date 1,000 people at one sitting; the combined capacity of all her dining rooms is 2,300 people for one sitting. The kitchens will be equipped to serve 10,000 meals per

day and 40,000 to 50,000 meals on the average crossing. Four hundred waiters will operate out of the main kitchen at one time, and 165 chefs will prepare food for



data and public habits proves the practicability of a 75,000-ton ship, according to Pierre Malglaive, director of the French line, in charge of building the "T-6."

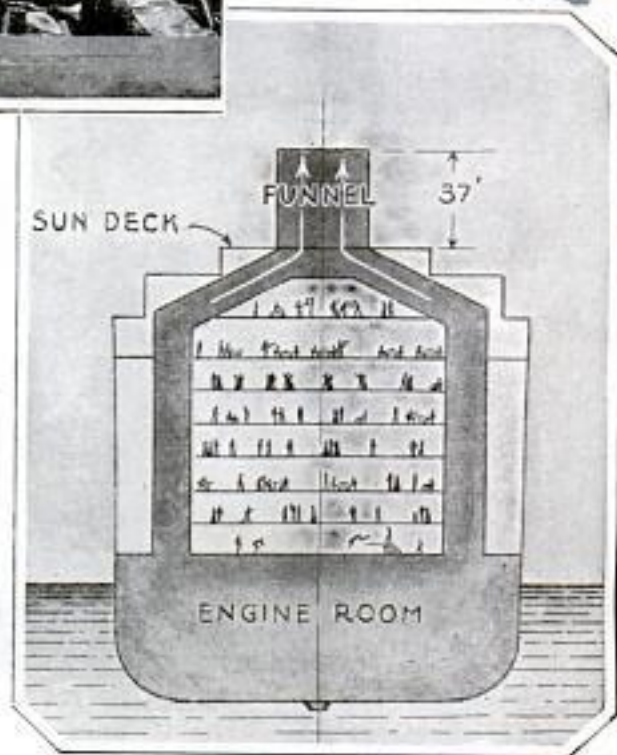
If Columbus in his flagship and the "T-6" had started across the Atlantic simultaneously, the latter would have arrived in America when Columbus had covered only 500 miles! The "T-6" could circumnavigate the globe at the equator in thirty days of running time. In a race around the equator between the Twentieth Century Limited and the "T-6," the famous train would beat the ship back to the home plate by only ten days.

The ship's bow presents a number of unique and promising characteristics. It is neither like the full bulbous bow on the "Bre-

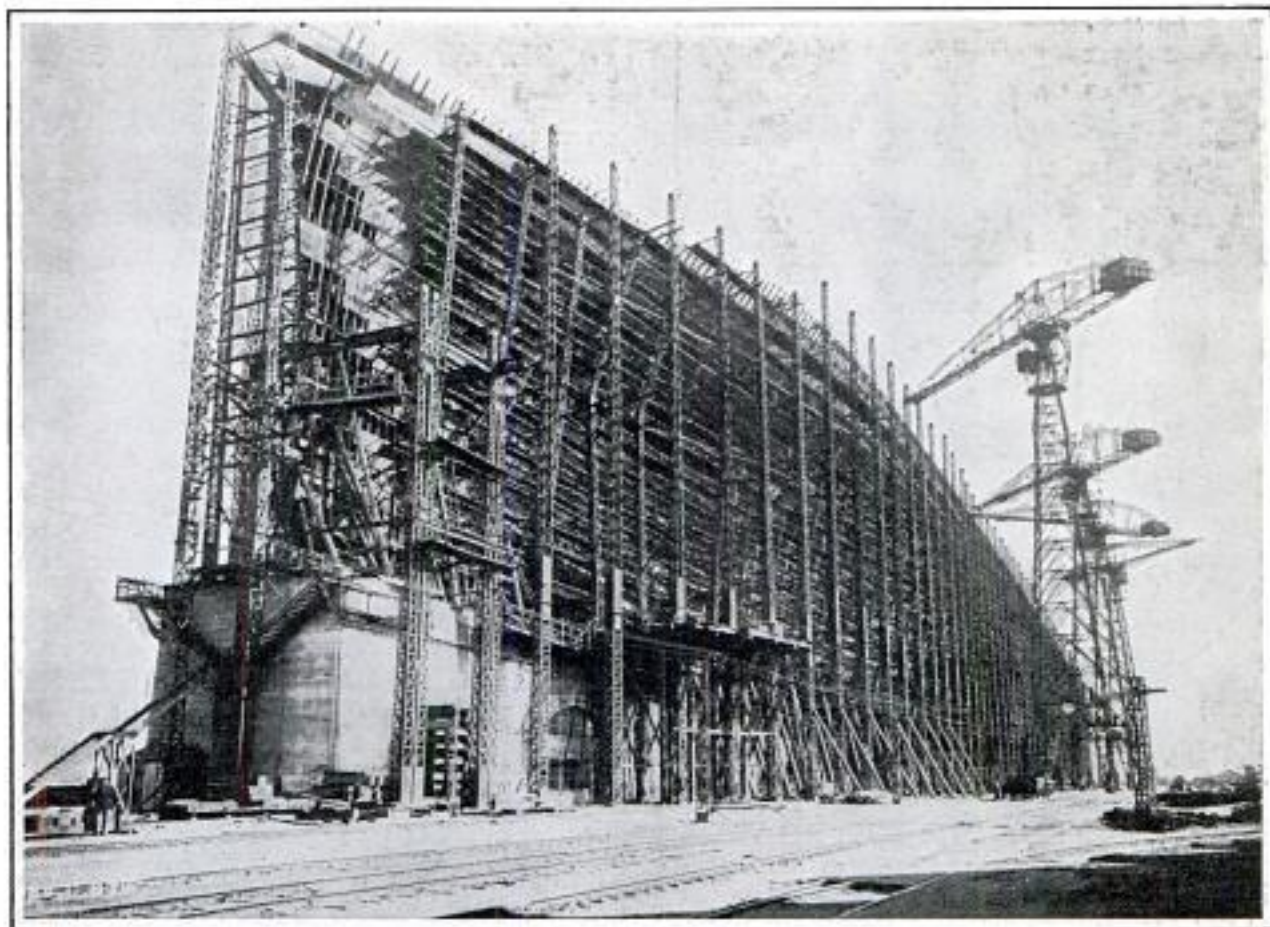
the 2,200-odd passengers. The crew of 1,000 will be served from a separate kitchen. About 60,000 pieces of chinaware and crockery will be necessary to serve passengers. For the dining service alone, 150,000 pieces of linen are necessary; for all services, the ship will need 400,000 pieces.

Robert Fulton's first steamship, the "Clermont," could easily fit inside one of the new ship's three funnels. Henrik Hudson's flagship, the "Half Moon," could fit into a small corner of the engine room.

The "T-6" does not represent an attempt to build a ship in order to establish or beat a record. The economics of shipping demand, first, that the ship pay back the \$28,000,000 cost of construction as well as provide for maintenance and a reasonable profit. A careful analysis of shipping



Above, Close-Up of the Huge Rudder Post; Below, Sectional View of the Ship; Note the Divided Uptake from Engine Room to Funnel



Hull of the "T-6" under construction; One of the Unusual Features Is the "Whaleback Bow" with a Curved Deck Designed to Throw Off the Crushing Weight of Water and Decrease Wind Resistance

men," nor like the old-fashioned knife-edge type, but is clipper-shaped with a very graceful semibulbous effect near the keel; it curves up into a rounded, streamlined rigid deck covering such as no ship is known to have.

Passenger recreation is provided for by numerous deck sports such as tennis, clay-pigeon shooting, and squash. Besides, there is a large swimming pool, a first-class gymnasium, a Punch and Judy show, and the first fixed theater ever built into an ocean vessel. This theater will have permanent seats accommodating 400 persons. The stage will be large enough for the production of full-length plays, musical revues, operettas and tableaux.

A new method of addressing audiences at sea will be found on the "T-6." By talking into a microphone in his cabin, the captain, or any other person, will be heard in all the public rooms. Concerts and radio talks picked out of the air can be re-broadcast likewise. In emergencies, the captain can talk directly into the ear of every person on board, even though the "T-6" is almost one-fifth of a mile long.

Passengers may speak with friends through an inter-cabin telephone system such as prevails in hotels on land. They will also carry on two-way conversations with phone subscribers in Europe or America—without leaving the confines of their respective cabins.

V-SHAPED BELT BUILT LIKE COG PREVENTS BINDING

B/656

Built like a cog, a V-shaped belt of fabric and rubber is obtainable for all types of shop equipment using a multiple belt drive. The cogs do not engage in use like regular gear teeth, but provide flexibility and prevent sidewise distortion which might tend to bind in the wedge-shaped grooves of the pulleys.



Dayton Rubber Mfg. Co.
Dayton, Ohio

B/605

made in Germany
maker unknown

Enl. James Montagna
608 Harbour Comm. Sec
Toronto, Ont.

886

POPULAR MECHANICS

Enl. Gardner F. Wilson
1035 Bay St.
Chicago

SEA LIONS KILLED TO PREVENT SLAUGHTER OF SALMON

More than 1,100 sea lions and pups paid the penalty of belonging to a too numerous race a few months ago when that number of animals were killed during the annual government hunt of lions off the coast of British Columbia. Too many sea lions play havoc with the salmon fisheries, so each year the excess animals are killed off. Despite the annual weeding out, the sea lions are still one of the greatest dangers faced by the salmon. They are very wild and difficult to reach on their lonely rookeries near the mouth of the Skeena river, and bad weather often hampers the summer hunting operations.

B/674

FLASHLIGHT WITH NO BATTERY HAS ITS OWN GENERATOR

Instead of a battery, a flashlight recently developed has a small and compact generator operated by a spring. Twisting the small end of the light winds the spring to operate the dynamo. A few turns assure constant light for a considerable length of time, and at the first signs of dimming a few more twists renew the brightness. The light may be focused with one hand, using the same button that turns it on and off. Each light is equipped with three lamps, the two spares resting in a space back of the reflector.

\$ 7.50



Flashlight without a Battery; Twisting Small End Winds a Spring Which Operates a Generator

Bat. Les Lite Corp.
414 Broadway
Albany, N.Y.

Probably Columbia Broadcasting System. 485 madison ave
New York



Piano with Two Keyboards, Two Sounding Boards and Two Sets of Strings Used in Radio Studio

PIANO WITH TWIN KEYBOARDS USED FOR RADIO

One radio-broadcasting company is using a piano with two keyboards that sounds like two instruments when played. Except for the double keyboard, the piano looks like any other instrument and is played by one person. It was made in Germany and has two sounding boards and two sets of strings.

COLDEST COLD EVER PRODUCED IS NEAR ABSOLUTE ZERO

Absolute zero, the completely cold point at which all temperature ceases and heat vanishes, is now only seven-tenths of a degree beyond the reach of man. Absolute zero is 273 degrees Centigrade below the freezing point of water, and Prof. W. H. Keesom, of Leiden University, in Holland, has succeeded in producing a temperature of minus 272.3 degrees. He obtained this low reading by keeping a small quantity of liquid helium stirred while producing a high vacuum over it with two powerful mercury pumps. This is one-tenth of a degree below the previous record, but when absolute zero is the goal, the last few tenths of degrees are like the last few hundred feet in scaling a mountain.

Science Service 9/14/32

14/34 - price does not answer letter

16/34 - price does not answer letter

Copyrighted material

How do *You* do it? *Push a Car* *Open a Window* *Lift a Wheelbarrow*

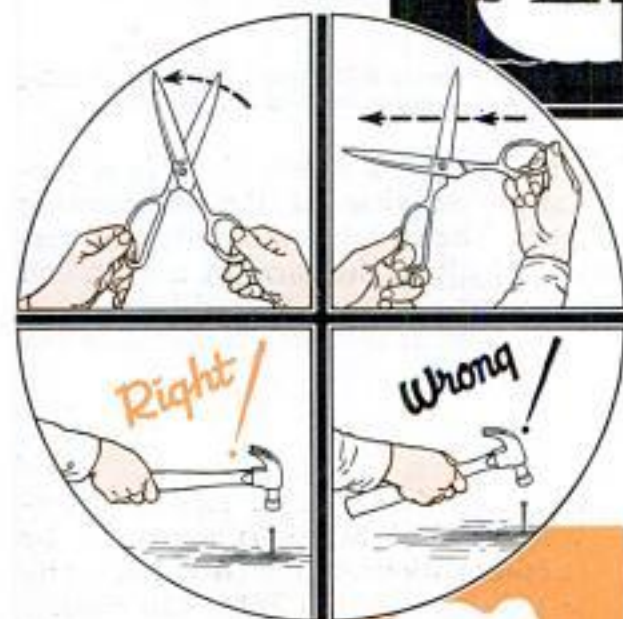
It's not a question of how much muscle you have. By no means—rather, the big thing is, how do you do it?

Here's a stalled car. Out you go for the big push. Do you go at the job as marked wrong—all abdominal and arm muscles? Or, do you work with the heavy back and leg muscles as pictured in the second sketch. You can push half again as much, and this with less strain, by using the latter method.

Maybe you own a boat. Compare the



accuracy, but half-way down the handle and you are exerting twice as much force to drive the nail.



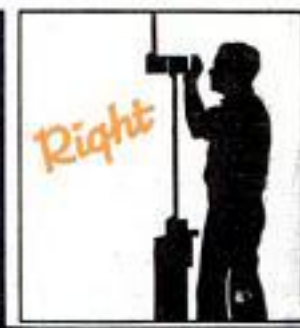
Everybody lifts. It may be the furnace ashes, or a clothes basket, or a wheelbarrow. The correct procedure is the same in every case: Squat, don't bend. Bending at the waist to pick up a weight puts a terrific strain on the pelvic bones and surrounding muscles; squatting, you put the load squarely up to the stronger leg and back muscles.

This simple thing of opening a jammed window. Don't try to lift it with the fore edge of your hands along the sash edge.

mechanical actions shown in the upper part of the circle and you can easily see that fending with the feet should be done as shown in the first right-hand sketch above and not in the scissorlike manner indicated in the second.

Leverage is a great thing. Most people realize that a little man on the end of a long lever can lift an enormous weight. Yet, give the average person a hammer and bang goes the idea of the lever. Choking a hammer may add a little to your

Get under it. Catch the sash on the heels of your hands and push. The action is entirely different—as different as right and wrong should be. Remember to get close to the weight.



*Lookout Point, Grand View
on route 30, near Logansport.*



Hotel and Restaurant Built Like a Steamship Standing on a Prominence in Allegheny Mountains

STEAMSHIP ON MOUNTAINSIDE IS ROADSIDE RESTAURANT

Motorists following the Lincoln highway through the Allegheny mountains east of Pittsburgh are amazed to find a "steamship" perched on the side of a moun-

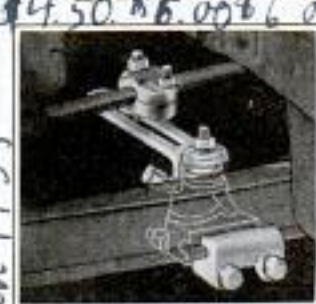
tain at one point where there is a particularly fine view of the surrounding country. The structure is a hotel and restaurant, built in the form of a boat, and stands at an elevation of 2,464 feet. From its deck, tourists look into three states and seven counties.

UNITED STATES IN THIRD PLACE IN MOTOR-SHIP NUMBERS

America has advanced to third place in the number of motor ships in operation since 1915, when not a single motor vessel was running under the Stars and Stripes. At the close of 1931, the United States was surpassed by only Great Britain and Norway in the number of such craft. This country had a total of eighty-four motor ships in operation with a gross tonnage of 544,673, Great Britain had 364 of 2,621,914 gross tons, and Norway 276 of 1,651,407 tons, out of a world total of 1,275 vessels with an aggregate gross tonnage of 8,510,634. While this country is third in number of motor vessels, it is surpassed in aggregate tonnage by the Netherlands with eighty-three vessels and a gross tonnage of 623,065. Sweden also has eighty-three such vessels, but with a lesser tonnage.

During the first half of this year, America built no new motor ships. In size of vessels, the United States is surpassed by eight other nations, this country having no vessels in the 15,000 to 30,000-ton class.

B1618 STABILIZER ON STEERING GEAR CURES DRIVING TROUBLES



Many of the automobile driver's steering troubles are eliminated by a stabilizer that holds the tie-rod at a uniform tension. It is said to stop wheel wobble, oscillation of steering wheel and shimmying, and to make all steering easier. It is installed by clamping on the front axle and to the tie-rod.

ble, oscillation of steering wheel and shimmying, and to make all steering easier. It is installed by clamping on the front axle and to the tie-rod.

U.S. Steady 9/16/31

U.S. Shipping Board Hoop Products Co 162 N. Franklin Chicago

Capt. Harry K. Hobart.

B1651

71 ~~Albany~~ ~~Hempstead~~ ~~St. Paul~~

POPULAR MECHANICS

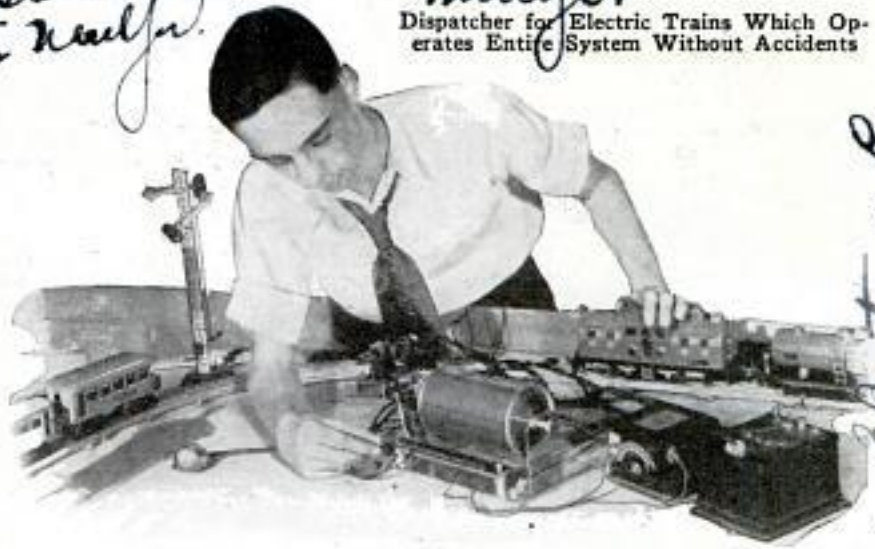
889

"midnight"

Dispatcher for Electric Trains Which Operates Entire System Without Accidents

ONE-TENTH SIZE OF HAIR

Diamond dies one-tenth the size of a man's hair are used in drawing the tiny filaments for the six-watt incandescent lamp. These dies, many of which are produced in Trevoux, France are made by boring tiny holes in rough-cut diamonds. In the making of filaments, the tungsten is drawn through ninety-five dies, each with a smaller hole, until the last is a mere speck. Enough filament wire for 666,666 lamps is drawn from a bar of tungsten three-eighths of an inch square and twenty-four inches long, weighing one and one-third pounds. So small are the die holes that as many as thirty attempts often are made before a good die results. A conical hole is drilled halfway through each side of the diamond and where they meet, the die is formed.



DISPATCHER FOR TOY RAILROAD PREVENTS COLLISIONS

When used with a toy electric-train layout, a miniature automatic dispatcher permits a boy to run from two to five trains over his system without collisions or other interference. The dispatcher also turns on lights at predetermined times, throws switches, sidetracks slow trains to give the right of way to faster ones and makes it possible to lay out a whole schedule of movement for trains, switches and accessories requiring six minutes to complete. The operator decides the maneuvers he wishes to accomplish, then cuts holes in a paper revolving drum, each hole representing one maneuver. If the holes are properly cut, the miniature railroad goes into operation when a switch is pressed.

Western Electric Co. Racine, Wis.

OIL VAPORIZER FOR SHOPS CUTS HEATING COSTS

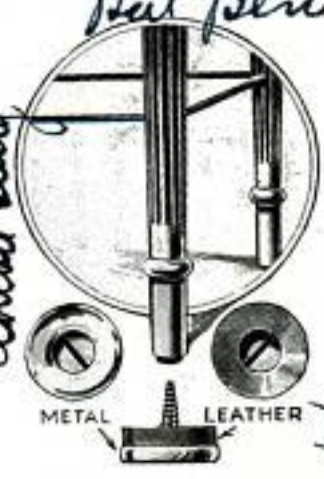


Low-cost oil now may be utilized as a practical substitute for gas in industrial heating by means of a vaporizer which atomizes the liquid fuel to a highly combustible mixture. A feature of

this vaporizer is its accurate and positive temperature control, making it adaptable to virtually all heating operations from kiln baking to high-speed-steel treatment. The unit is simple in design and construction, without working parts. Atomization is attained by subjecting the fuel oil to the heat of a pilot flame. Complete combustion prevents smoke, soot or odor, and blast noises are negligible owing to the low air pressure required for various heats

FURNITURE LEG TIPS REVERSE TO PROTECT FLOOR OR RUG

Reversible tips for the legs of chairs, tables and other furniture are available for the protection of floors and rugs. One side of the tip, which is attached to the end of each leg, is made of nickel-plated steel, while the other is of



leather impregnated with wax, which produces a resilient wearing surface.

Chicago - 6300 S. Halsted - Englewood

Railway Locomotive Co. 59 E. Van Buren

The rainiest time is late afternoon and early evening, weather reports show.

Scene Newsletter 8/2 7/32

P. H. Specialties 9084 Edgewood Station, Presidenc Rd

B 1449

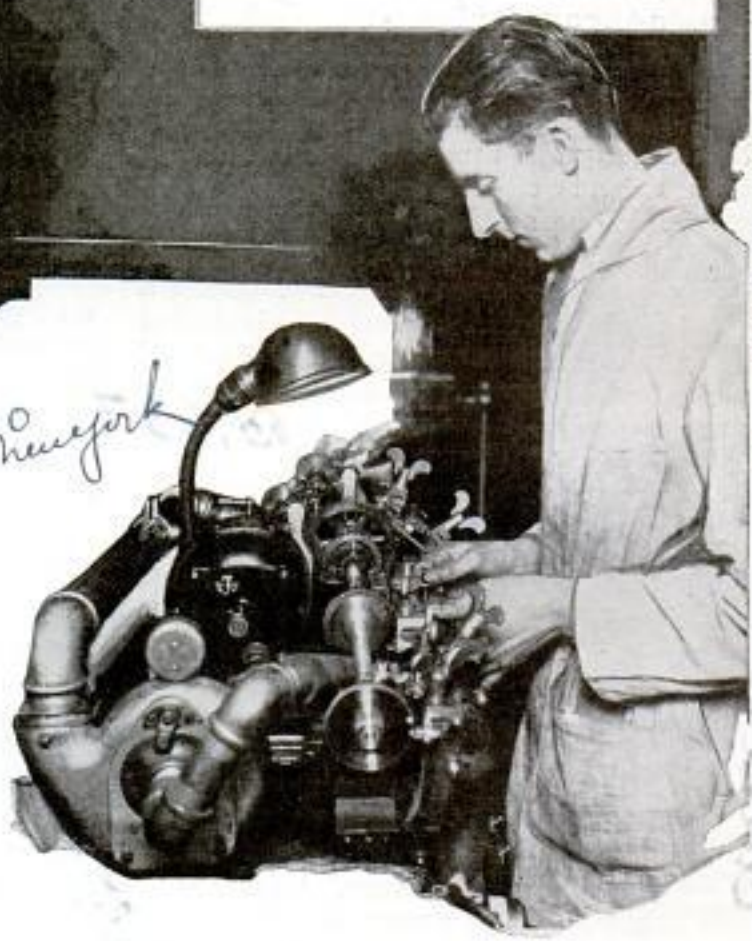
Harrison & Co
209 Centre
New York

Beissel Key Machine
Co 4/07 Park St
Detroit, Mich

The ART of



Left, the Locksmith Uses the Same Tools Employed by the Burglar in Conquering Combination Locks; Here an Expert Is Drilling a Hole in the Door of a Safe to Get at the Tumblers of Such a Lock. When He Reaches the Tumblers, Opening the Safe Door Is a Simple Task; Below, a Modern Key-Making Machine, a Far Cry from the Simple Equipment Carried by the Itinerant Locksmith of the Streets a Few Years Ago



By JACOB DESCHIN ^{15 60} *Desup Ave. New York*

WHETHER it be a call to recover property, save lives in a burning building or prevent a suicide, the expert locksmith accepts it as part of his daily round. Picking locks is his trade, and if now and then he picks up a little adventure on the side, why that's all to the good.

The term "locksmith" invariably suggests the itinerant maker of duplicate keys who patrols our streets in the company of the umbrella mender and the scissors grinder. How surprised, therefore, was the general public recently when an expert locksmith, Charles M. Courtney, president of the American Association of Master Locksmiths, was summoned to Europe to advise the salvagers of the gold bullion in the hulk of the sunken liner "Egypt" on how to open the safes without resorting to the torch. The locksmith was able to give the divers such exact instructions that the two remaining safes were opened as if the actual keys had been in hand.

While in Europe, Courtney unlocked a safe in a cellar of a former palace of the Hohenzollerns, in Kiel, Germany, which had not been opened since 1918. What lay inside that safe the locksmith never knew. And herein lies the peculiar irony of the locksmith's trade. His job is to pick the lock, but what lies behind the closed door remains to him, if the owner so wishes it, as much a secret as ever.

The locksmith is satisfied to let it go at that. He never lets curiosity get the bet-

530 - W. 125th St
New York

PICKING LOCKS

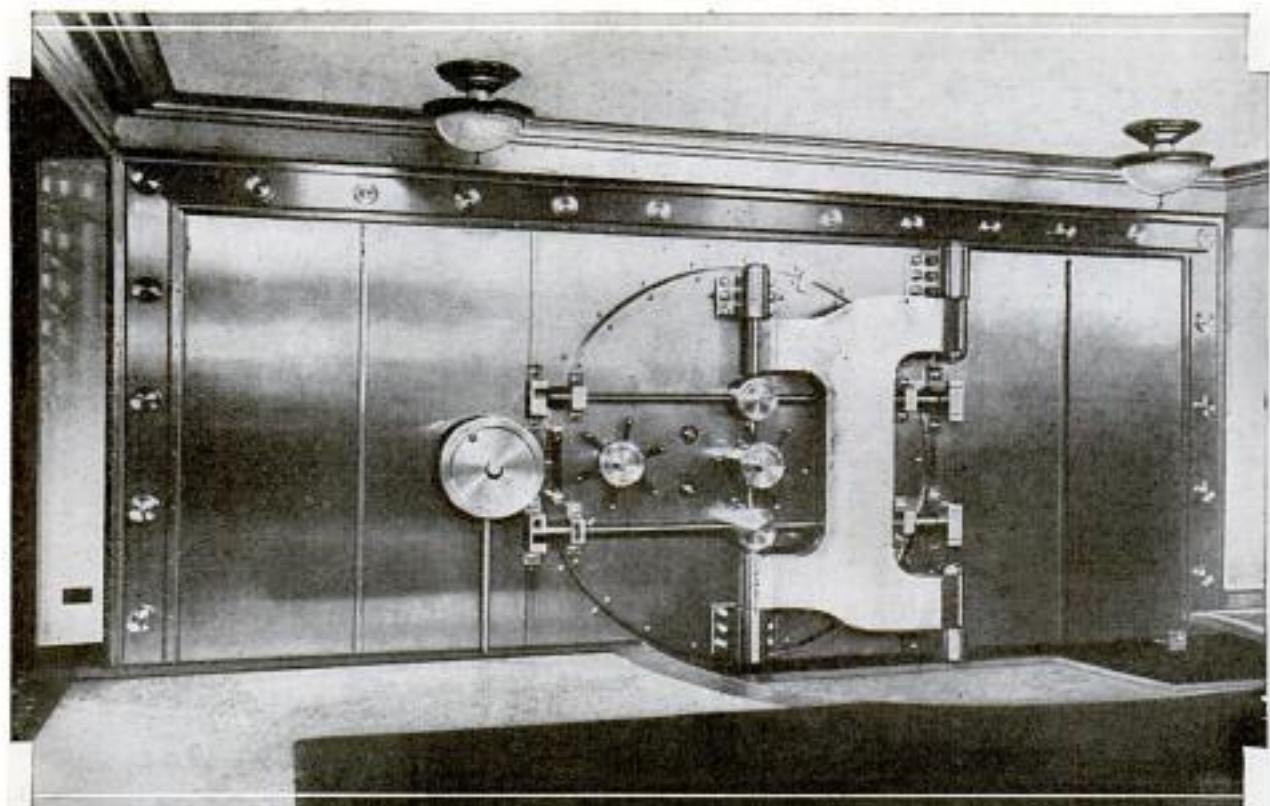


Top, Charles M. Courtney, Expert Locksmith, in His Workshop;
Below, Ornate Key of the Last Century

ter of him, for when it is considered how similar are the immediate objectives of the locksmith and the burglar, although their interests part beyond the actual opening of the lock, it can be seen how easily a locksmith may give his client a wrong impression as to his motive.

There are, however, unscrupulous locksmiths who will, for instance, keep a copy of a key when asked to make a duplicate or repair a lock. Illustrating this is the story of a locksmith with a shady sense of honor, who, upon being commissioned to make a duplicate key for a certain large office, made an additional one for himself, which he later used in entering the office on several occasions and rifling the desks.

The modern lock traces its lineage directly to the wooden lock and key of the Egyptians of 4,000 years ago, who devised a principle of security which is basically the same as that of the best locks of today. Essentially this consisted of a long wooden key, at one end of which were placed a number of iron pegs, these pegs being so arranged as to come in contact with corresponding loose pins in the casing of the lock. Upon insertion of the key, the pins were lifted by the pegs, thus permitting the free movement of the lock bolt. Since then it has been a matter of improvements in the methods of manufacture and in workmanship, but the basic principle has always been about the same. In the last century Linus Yale, Jr., adapting the pin-tumbler system of the Egyptians, gave the world a



Locksmiths Sometimes Are Called On to Open Huge Doors Such as This; Note the Giant Hinge on Which the Tremendous Weight of the Door Swings When the Combination Is Released

lock which could be opened with a flat, convenient key, in place of the round, heavy one in use up to that time.

The warded lock, comprising a plate with wards, or protuberances, which calls for a key that has been cut in such a way as to clear the wards, came into being in the Middle Ages. In 1778, a man named Barron combined the warded lock with the tumbler, this latter consisting of a notch in the bolt, into which a lever had to drop before the bolt could be drawn back by the key. This principle, improved upon by one inventor after another, finally brought us to the combination, keyless lock of today which is operated by means of a dial.

Locksmiths who have proved their ability and received some publicity on this account live always under the cloud of the danger of being shanghaied into the service of a gang of burglars. Constantly on their guard lest, by some ruse, they be made the innocent perpetrators of a robbery, they will never make a key from a wax impression or a drawing or a lock number, nor will they agree to pick a lock for a person unknown to them unless a recognized authority like a policeman is present.

There is, however, the story of a self-styled "minister," dressed in appropriate garb, who one day asked a locksmith to open the front door of his church as he had left the key at home. As the locksmith was picking the lock, he noticed that the minister suddenly took to his heels. Another minister had arrived on the scene—the real one this time—and the locksmith was left "holding the bag." He soon convinced the minister of his innocence.

Expert locksmiths are unanimously of the conviction that there never has existed any such romantic personage as a "Jimmy Valentine," that lovable crook of the imagination who sandpapered his fingers to make the tumblers drop and save the girl. In the first place, they say, nobody can solve the combination on a safe, and in the second place, the tumblers do not drop.

Some years ago a burglar picked the lock of the street door of an office building, climbed to the tenth floor, unobserved despite the presence of a watchman and scrubwomen, picked the locks of four doors leading into and between offices, worked the combinations on three different safes, and, to make matters complete,

picked the locks of several desks, his exploit netting him a total of \$200,000 in stocks, bonds and money. The public admiringly dubbed him a Jimmy Valentine in the flesh, but the experts among the locksmiths said he was a locksmith who had somehow learned the combinations of the safes.

Sometimes the locksmith risks his life in the pursuit of his trade. At Lafayette, Ind., some time ago, burglars had drilled a safe, inserted explosives, and lighted the fuse, but, contrary to reasonable expectations, no explosion resulted. Puzzled, they abandoned the task and departed, leaving a note warning all not to try to open the safe as there were dangerous explosives inside. The next morning an expert locksmith was called. First he made the explosive material inactive by admitting a chemical liquid through the hole made in the safe by the drill. Then, using a drill to line up the tumblers,



Above, Using Delicate Instruments to Pick Lock Inside a Safe; Left, Showing Mechanism of Yale Lock as Key Is Inserted



prematurely discovered, with the consequent flight of the thieves or immediate hiding or destruction of the sought-for evidence.

The expert locksmith, unless forced to do so, never breaks open a lock or uses violence. This is unprofessional, smacks of the cracksman's methods and causes damage. Tools are all-important. The

(Continued to page 121A)



he soon opened the door and disposed of the now lifeless explosives.

The locksmith is frequently called upon by the police to act with them in making a raid on a speakeasy or a gang of thieves. His job is to pick the lock on a back door or a loft door within a fraction of a minute, as the possibility is always imminent that they will be



B1685
894

Com. W. Henry Bolter, 1846
N. Bourne St

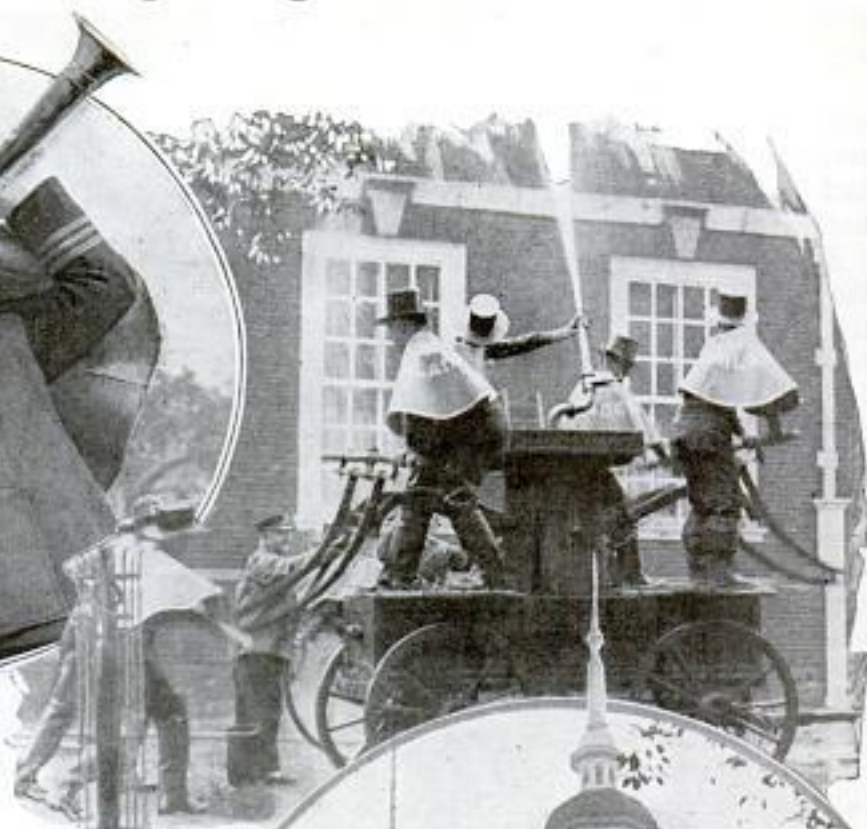
POPULAR MECHANICS

Phila

Progress of Fire Fighting Since Revolution



Above, Philadelphia Fire Chief in Colonial Costume and, at Right, Early Piece of Equipment before Independence Hall; Below, Water from Modern Apparatus Playing on the Building



Contrasting colonial fire-fighting methods with the modern way, the Philadelphia fire department recently "saved" Independence Hall in a demonstration of the progress that has been made since revolutionary days. Garbed as old-time volunteers, a company of firemen equipped with hand pumpers and other ancient apparatus responded to an alarm sounded by town criers with rattles. After they had shown how a blaze would have been extinguished at the birth of the republic, six pieces of modern equipment responded to an alarm and demonstrated how a blaze today would be handled. Independence Hall has long been under the special care of the fire department, and yearly drills are held so no time would be lost if fire ever threatened the structure.



for defrauding passengers who attempt to save money by sharing expenses of an auto journey to their destination. The methods used by irresponsible drivers are different from those of a reputable travel-booker agency and usually are easy to detect. The "wildcatter" ordinarily buys an old model of an expensive make of car for a small sum, sets up his own travel agency and solicits business. The unwary customer pays this agency a small sum for the booking and receives a receipt, but is required to surrender the receipt to the

"SHARE-EXPENSE" MOTOR TRIPS OFTEN FRAUDULENT

Recent police investigations in several cities have disclosed that the "share-expense" method of making automobile trips—once the device of thrifty motorists and travelers alike—has been developed by unscrupulous persons into a clever scheme

Los Angeles Times

9/25/02

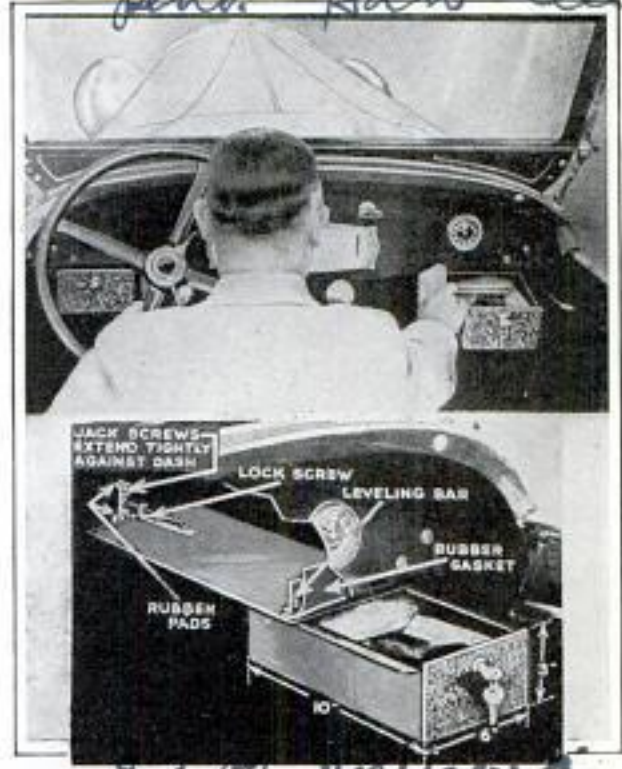
B1664 Peters & Russell

Springfield Ohio

PARCEL LOCKER FOR ALL CARS ATTACHES UNDER DASH

para. Jan Dec

driver and pay the balance of the sum agreed upon when it comes time to start. This procedure should serve as a warning to the passenger because it leaves him at the mercy of the driver. There is further evidence of dishonesty if the driver warns his passengers to inform any inquiring officials that they are merely friends and not passengers and are only sharing the expense of the journey. Often persons expecting to make a leisurely trip in an expensive car find themselves crowded into an ancient vehicle with six or seven others. Sometimes they pile out at a stop and return to find car, driver and their money gone. The use of an old car and a long trip without rest or sleep combine to cause accidents and here again the passengers are out of luck. They find the driver has no insurance and nothing on which to levy, even if they could prove they had paid for transportation. Another trick of the unscrupulous driver is to see that the car breaks down soon after starting and, on one pretext or another, to delay repairs until his fares seek other means of making the trip. They have no receipt for money paid and he refuses to refund.



Installation of Safe-Deposit Drawer Which Is Adjustable to Fit Any Make of Car

Instrument-board locking compartments featured by many of the latest cars, now are available to all motorists as an easily attached accessory. Adjustable to fit any make of car, this safe-deposit drawer fits under the dash and has rubber pads to prevent squeaks and rattles. When the sliding drawer is locked, it is completely inclosed and the attaching fixtures are inaccessible, thus making it theft-proof.

B1669 ELASTIC DRESSING FOR WOUND REQUIRES NO FASTENING

Offering no interference with the movements of an injured member, an elastic dressing for wounds is being produced which requires no tying or pinning since it adheres to itself although it will not stick to skin, gauze or hair. Because it will stretch and is porous, it gives the wound an opportunity to "breathe" and thus aids in healing it.



ELASTIC DRESSING. Refer to Surgical Dressings, 65 Brookside Ave., Boston, Mass.

COLD-STORAGE PHOTO PLATES MAKE BETTER PICTURES

Like eggs and sausages, photographic plates are being kept in refrigerators to preserve their quality and uniformity. Tests have shown that this treatment applies particularly to plates intended for astronomical purposes, and several large observatories already have adopted the practice of keeping all unexposed plates on ice. The lower the temperature, the wly do changes in the emulsion e, and the result is that those kept more uniform in performance tes exposed to a variety of temperatures.

Recommended by Dr. C. E. K. Mees, Director

Jan 26, 1937

Laborgatory G. Rochester, Ny. Eastman Kodak Co.

me service 9/26/37

Co 461 W. Erie

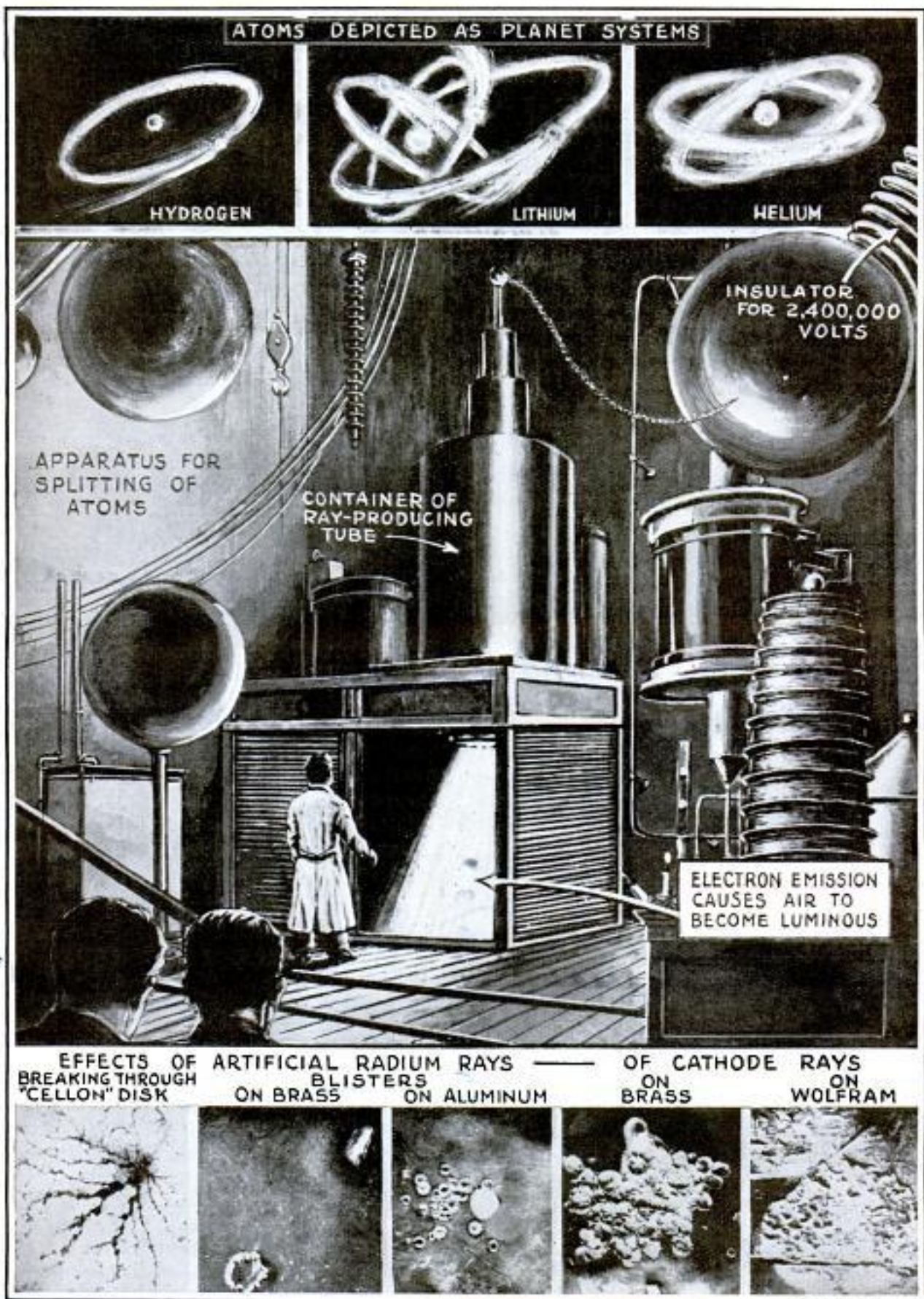
B/660

896

Emk. K. H. Runze, Heydstrasse 13
Berlin W. 10, Germany

POPULAR MECHANICS

Splitting Atoms with Artificial Radium Rays



see opposite

EFFECTS OF ARTIFICIAL RADIIUM RAYS — OF CATHODE RAYS
 BREAKING THROUGH "CELLON" DISK BLISTERS ON BRASS ON ALUMINUM ON BRASS ON WOLFRAM

Apparatus in Center Is Used by German Scientists to Split Atoms without Employing Radium by Shooting Helium or Hydrogen Electrons at Low Voltage against Material to Be Disintegrated

©K. H. Runze
 Heydstrasse 13,
 Berlin W. 10, Germany

Research Laboratory A. E. Es.
(General Electric Co.)

Chas. Wilkins

POPULAR MECHANICS

897

Aberschöneweide, Germany
ATOMS SPLIT IN VACUUM TUBE
WITH BOTTLED ENERGY

B31570

Two German scientists, Dr. Lange and Dr. Brach, have succeeded in splitting atoms by employing artificial radium rays. The procedure includes shooting helium or hydrogen electron streams of great velocity at comparatively low voltages against the material to be disintegrated. By this method they have disintegrated the elements lithium, beryllium, borium, sodium and aluminum, which have light atoms, and also lead, which is of high atomic weight. The energy of radium itself could not be used because enough of the element is not available, but its various rays, alpha, beta and gamma, were created artificially by sending an electric current of very small amperage through a vacuum tube containing helium or hydrogen gas, the electronic velocity being considerably increased by using voltages from 500,000 to 2,400,000. The same men previously attempted to collect atmospheric electricity of 8,000,000 to 10,000,000 volts with an installation extending between two peaks in the Alps, and at present another apparatus is being built which they hope will put at their disposal from 7,000,000 to 10,000,000 volts.

B/627

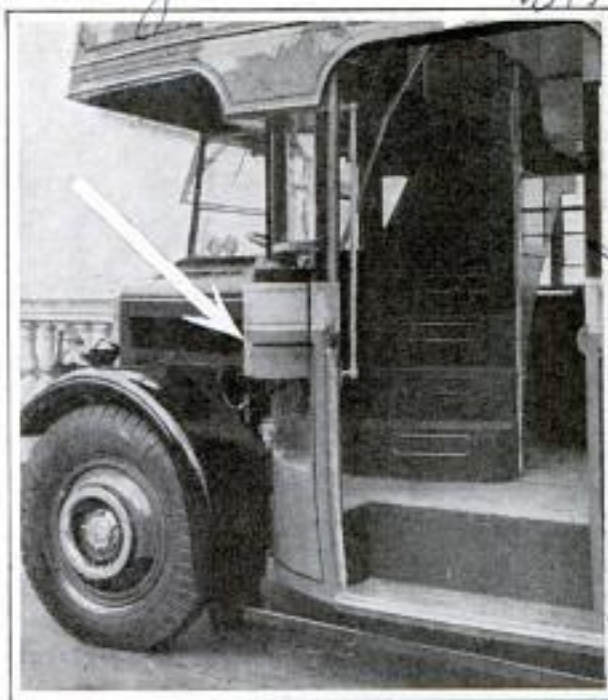
EXPANDING FEEDER FOR CHICKS GROWS TO FIT THE FLOCK

Telescoping feeders, which expand to twice the unit length to fit any-size flock of chickens or contract to suit any space in the poultry house, are now being offered. The legs are adjustable so the feeder adapts itself to an uneven floor. There is also a telescoping feeder for baby chicks which has legs to raise the feeder from the floor level to eight inches above it.



Telescoping Feeder for Chickens Can Be Expanded to Twice Its Length

Patd 7/29/32
Inventor
H. Parker,
c/o Swift Co.
Hiawatha, Kans.



Motor Coach with Rounded Front Corner, Which Deflects Air and Keeps Dust and Dirt Out of Bus

"FISH GILLS" FOR MOTOR COACH KEEP OUT ROAD DUST

Dust is stopped from blowing into a motor coach, or is sucked out if it does enter, by a method of construction suggested by the gills of the naturally streamlined fish. The gill effect is obtained by a rounded front corner on one side of the body which causes deflection of the air currents around the bus entrance at the front of the vehicle. Even when the sliding door is open, the dust is sucked out of, rather than drawn into, the coach.

SAFETY BELT FOR SWIMMERS FILLS ITSELF WITH GAS

B/640

Swimmers in Germany are wearing life belts which can be filled with gas in an instant in an emergency, but which are not in the way when unneeded. The belt consists of a closed tubular piece of cotton material which is fairly gas-tight when wet. Under ordinary conditions it hampers the swimmer no more than an ordinary belt would. If he gets into difficulties, he presses a lever which breaks a glass capsule filled with a carbonate compound which effervesces when wet, evolving carbon dioxide. This gas fills the belt and transforms it into an effective float to keep the wearer's head above water until help arrives.

Berlin inventor cannot locate maker

Short Bros. Scaplaney Works, England
U.S. agent
Rocheester, Kent.

B1468

points deep. Tribune Square Chicago



WOODCRAFT in the South



Left, Looking for Distinctive Landmark by Which to Locate Camp; Above, a Watch Can Be Used as a Compass in an Emergency

By **BOB BECKER**
Chicago Tribune

WOODCRAFT is simply the ability to read some of the guideposts of nature so that you can secure the maximum of comfort while close to nature.

Here are some of the most interesting tricks.

You are in the woods without a compass and the sun is obscured by the clouds. You think you can walk toward camp but you must have something to tell you which way north is in order to do it. Can you determine the points of the compass by looking at the moss on trees? Yes, you can.

First, remember that moss favors the side of a tree that retains moisture the longest.

So in finding your direction ignore leaning trees and the rough buttressed bases of big trees, because they usually grow moss all around their bases. Don't inspect



Can You Read These Tracks? One Bird Spends Most of Its Time off the Ground, the Other Does Not; Below, One of the Rabbits Was in a Hurry

trees which get no direct sunlight. Instead, pick trees which are isolated enough to get direct sunlight for a good portion

WOODS

of the day, because they have a chance to lose moisture; those which stand at the edge of a big tract of timber or in an opening, because these evaporate much of their moisture; smooth-barked rather than rough-barked trees, because on these there is usually a fairly even deposit of moisture all around, and this moisture will evaporate least from the north and northeast sides.

What's the result? Walking along checking the trees, the traveler trying to read the moss-compass signs may look at 100 or more trees and not take the evidence of more than ten or fifteen. This small number can

Below, Peeling Birch Bark—Ideal Material to Start a Fire in Any Weather



Moss on This Rough-Barked Tree Will Not Aid Lost Traveler Because It Grows All around the Trunk



give him the information he wants, namely, that trees with sufficient exposure re-

tain the most moisture on their north and northeast sides and on these moss will grow.

Starting a fire in the rain or wet woods is an important stunt and every novice should learn the trick. First, don't be in a hurry. Sometimes I have had to spend ten minutes looking for a suitable spot for the fire. What is a suitable spot? A big log or tree that has fallen but is not flat on the ground. Under such logs you'll find dry ground. Another ideal location is under shelving rocks or similar natural shelter. Sometimes I have had to take an ax and tear apart an old punky stump. It would be dry in the heart and here the blaze could be started.

The next question is fuel. That will vary in different places. Birch bark stands first. Gather all you can and shred it. In the pine country you can get



small pieces of "fat" pine and shave them down into thin slivers. Sometimes I have had to find an old leaning cedar and collect some of the dry bark from the underside.

Lacking any of these, take any softwood tree that has started to topple over and work on the under, dry side for bark and dry wood, using your belt knife. Sometimes I have had to work on the inside of a partly hollow and decaying tree to get enough dry stuff to start a blaze. Take it easy and have everything in your favor before a match is struck.

Incidentally, here is a tip on lighting matches when you have no dry spot to strike them. Put the head of the match between your teeth and then jerk it forward, quickly. It'll ignite.

Starting a fire without a match? In the north country the novice has no business leaving camp without his waterproof match box, small ax or knife and his compass. But often a hunter is caught without any of them. He is wet and cold. A fire is almost a necessity. But how can it be started without matches. This brings up

another woodcraft trick. If you have a shotgun and a few shells you can start a fire quite easily.

First, get everything ready for your blaze. Build up your fuel in wigwam shape, using thin, dry sticks. When you're ready, open a shotgun shell and pour out all except a few grains of the powder on the tinder. Tear a small piece of cotton cloth from your clothing and stuff it loosely into the nearly empty shell. Point the gun straight into the air and fire. The cloth wadding will come down near you, and it will be glowing so that, by blowing on it, you can humor it into a blaze. Drop it on your pile, and the fire is started.



Above, Following Blazed Trail; Below, Rubbing Bone against Tree to Imitate Moose Scraping Horns

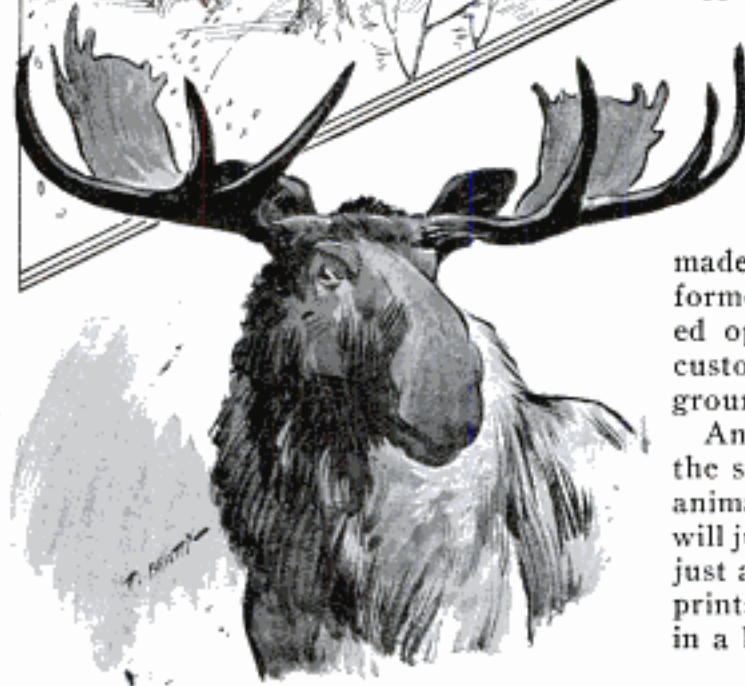
Although the city man may think of the north woods area as a trackless forest primeval without a single marker to help the novice woodsman, there are several kinds of "street signs" to be read if he knows how and where to look for them. This brings us to the subject of tree blazes.

A blaze is a durable and quite conspicuous cut on the bark of a tree. The first thing to remember about a tree blaze is that an experienced camper usually cuts one blaze on a trail that leads him away

from his permanent camp. Easy to remember this: A blaze—a way. On the other hand, two blazes means to camp: Two blazes—to camp. This doesn't hold true of trails blazed by trappers, but with the average sportsman, camper or woods traveler it does prevail. The novice should blaze his trails in the one-two manner.

Although learning woodcraft tricks is great sport in the woods during the summer, winter really brings the sport to its culmen. The reason is quite obvious: Snow in the woods is like a book on which all the animals and birds of the forest write their names and the record of their behavior. As illustrations of what winter woodcraft in the woods means and by way of showing how much fun it can be, consider the following problems:

There are tracks of birds in the snow. Can you tell if it is a ground



Above, Using Gun to Start a Fire; Left, Bull Moose with Spreading Horns Left Trail Because He Could Not Pass between the Two Trees

bird or one accustomed to spending its life in the trees?

A rabbit track is identified. Is he in a hurry or just loafing along?

What is the very small track that leads to and from an old bird's nest?

It is not so very difficult to tell the difference between a ground and tree bird after the two have made a record for you in the snow. The former walks with the two feet not planted opposite each other. The bird unaccustomed to spending much time on the ground naturally hops.

Any novice can identify a rabbit trail in the snow, but how can he learn what the animal is doing? A rabbit taking it easy will just hop along leaving four foot marks just a few inches apart. When these footprints are several feet apart Mr. Rabbit is in a hurry.

(Continued to page 140A)

B1659 Patent Electric Co

902

POPULAR MECHANICS

91. 7th Ave New York

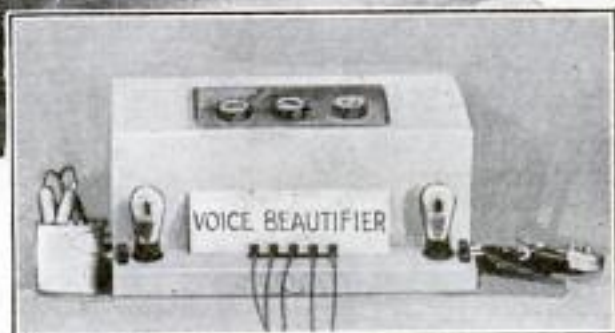
Beautifying Voices for Radio Broadcasting

Emb. Dewey Clay Foster, 233 W. 77th St New York



Above, Operating Sound Compensator to Correct Singer's Voice; Right, Instrument That Improves Voices

Persons speaking over the radio may now have their voices beautified without losing any pleasing natural characteristics by means of a special instrument known as a "compensator." Radio amplifier tubes are used in the apparatus, hooked up to feed into and be fed by special resonant and "rejector" circuits. The compensator is similar in appearance to a radio-receiving set without the cabinet and speaker, and by moving the dials one can reinforce or diminish the output in the lower or higher frequencies of the speaker's voice. Thus those having weak, harsh or raucous voices may have them retouched so that the maximum effectiveness for the ear is realized. Not only can a voice be made more attractive to listeners, but sometimes a convincing quality can be added by using filters to eliminate unwanted frequencies and compensators for building up the others. Each voice contains high and low frequencies, but some are more prominent than others, thus lending individuality to each voice. The compensator improves singing voices likewise and can make orchestral numbers more effective by providing greater richness of tone than could be heard in the same room with the orchestra. Heretofore it has been the aim of radio transmission to give as lifelike a



reproduction of the voice and music as possible, but now it has been found that the radio, and other electrically transmitted sound devices, are much kinder to some high-voiced individuals than to other deep-voiced persons. With the compensator, it is possible for the radio speaker to have a "prescription" or dial-setting table made out for his individual voice, so that it can be set at once to bring out the best qualities. It is also claimed that a speaker's voice could be made to sound in New England as though he had a Yankee twang, in the south as if he had a southern drawl, and in the west as though he spoke with the crisp accent common there.

RUBBER GRIPS WINDOW PANES IN PLACE OF PUTTY

B1642

Replacing putty, strips of rubber are being used to fasten panes of glass in windows. A steel rod imbedded in the strips gives rigidity. Small metal triangles hold the strips in place. Installation is said to be simple, and the strips may be used a second time if a window is broken.

U. S. Rubber Co.
2 Market St.
Passaic, N. J.

East River Mfg. Co.
South Whittley, Ind.

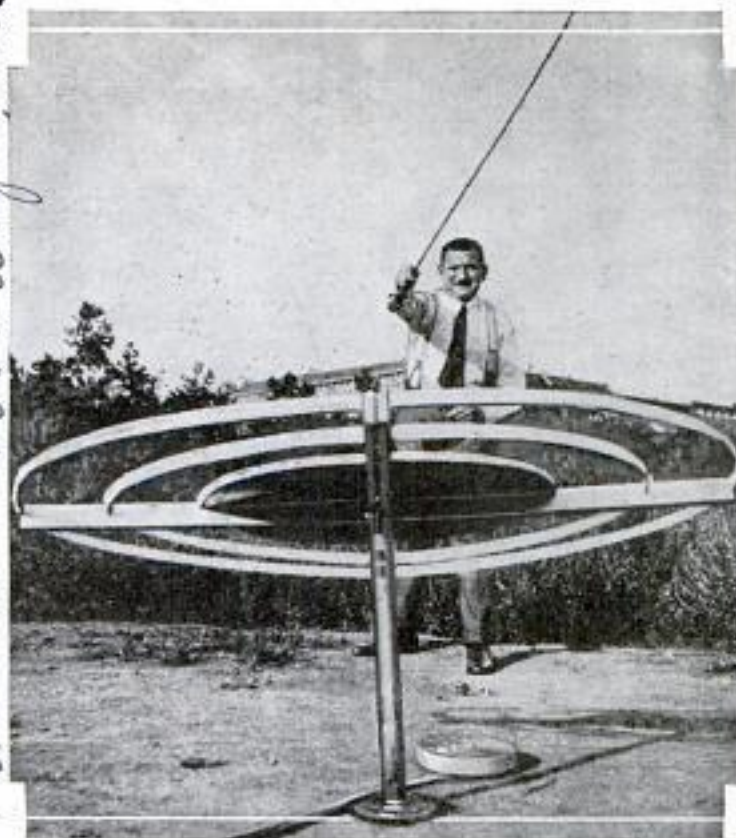
B1680

Protectocote
**RUST AND FIREPROOF
COATING FOR AUTO
EXHAUST PIPES**

Fire, water and rust-proof, a new liquid coating has been found adapted to use on automobile exhaust manifolds, pipes and mufflers, providing a protection heretofore believed impossible. The liquid, applied with brush or spray gun, dries into a hard coating that resists heat up to 3,300 degrees without chipping or flaking. After being brought to white heat, it returns to its original color. Usually, the exhaust system is left unpainted, but if painted, a week's operation of the car burns off all the finish, leaving manifold, exhaust pipes and muffler to rust. The new coating prevents this. The liquid also is useful on stoves, furnaces, radiators and other surfaces subject to high heat, and action of water and acid. Wall-board, or wood treated with the liquid, withstood, in tests, the heat of a blowtorch until the substances underneath the paint dissolved or disintegrated.

Dist. National Mill Supply Co.

Columba H. Ford Wayne, Ind.



Fisherman Making a Cast at Wheel-Like Target; Unusual Skill Is Necessary in Placing the Fly on the "Bull's-Eye"

**FLY-CASTING AT LAND TARGETS
TESTS FISHING SKILL**

By fly-casting at targets on dry land, perhaps miles from water, German sportsmen practice or test their skill in tournaments. These targets take various forms, but all test the long casting ability as well as the accuracy of the angler. One target is circular and mounted on a post. In the center is a solid disk at which the fly is aimed. Then there are rings around this disk with space between, providing a test of varying degrees of accuracy. Another target is a piece of cloth on which the bull's-eye and surrounding rings are painted. The cloth is stretched on the ground. Small lead disks of the approximate weight of the ordinary casting bait, are used instead of flies. Casts of 165 to 170 feet have been recorded in many of the tournaments.

Die Wache 9/10/32 p. 1119

3594
**FIRE TRUCK HAS SNOWPLOW
TO CLEAR AWAY DRIFTS**

Having chain and endless-tread wheels and a snowplow, a Vienna fire truck cuts its way through drifts to fires. It also clears a path through the snow for other trucks. The truck, with attached plow, was built especially for use in storms.

Austria



When Snow Is Deep, This Engine Plows Its Way to Scene of Fire in Vienna

Wide World

Our Bureau of Information is for your benefit. Use it as often as you please.

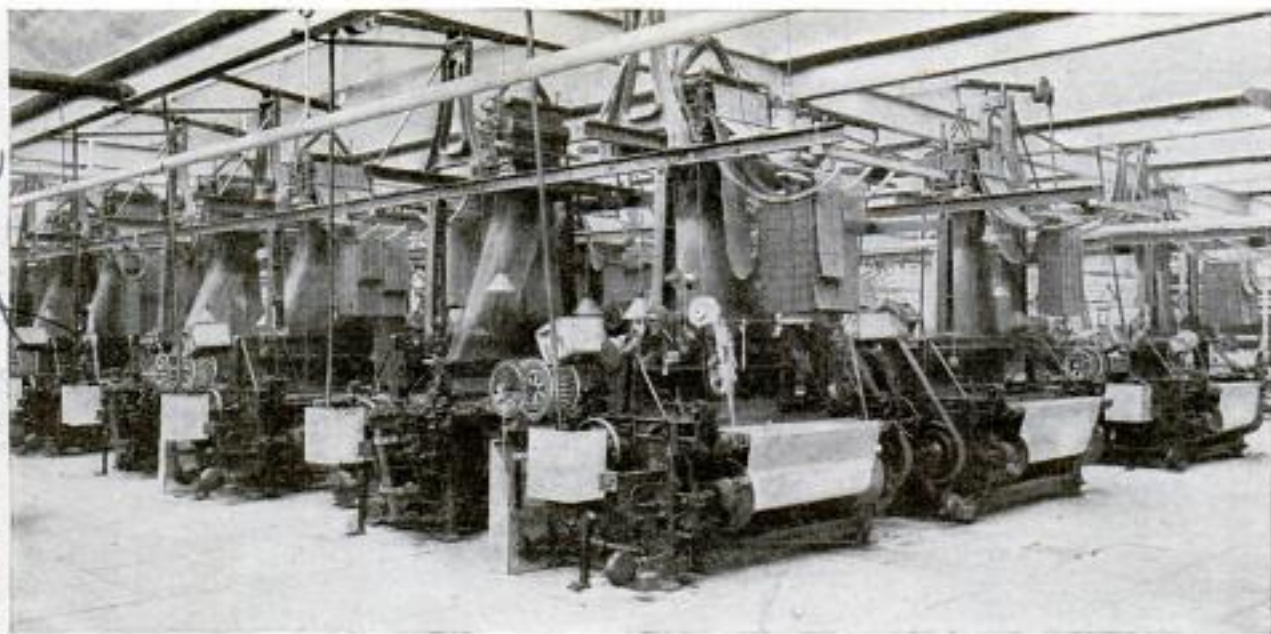
B1697

Postal, Broadhurst, Lee, Co. Ltd
Manchester, England
POPULAR MECHANICS

904

B1697

Creaseless Cotton and Silk Ends Long Search



Weaving Silk on Looms in a Manchester Mill; a Solution of Resin Is Added to the Fabric, Converting Cotton or Artificial Silk into a Material Which Will Not Crease

It has taken a band of scientists near Manchester, England, fourteen years' of researches and an expenditure of about \$350,000 to find a solution of the problem how to make artificial silk and cotton fabrics, which will not crease after wear, or rot after washing and cleaning, the latter defect being that of rayon. Dr. R. S. Willows was in charge of the work. Cotton lint, from which cotton yarn is spun, is made of thousands upon thousands of fine hairs, about one inch long, and a few ten-thousandths of an inch in diameter. Look at the dyed hairs under a microscope, and you will see that the color penetrates the whole of the hair, showing that it is not solid throughout, but simply spongy.

"What does this mean?" said Doctor Willows. "It means that the fabric as a whole is not springy and elastic, and that if you crease the material, the folds will not 'come out.' To get rid of the tendency to crease, one has to make each individual cotton fiber, or hair, elastic. This is the problem in a nutshell. When we began our researches, the only way to overcome the tendency to crease was to add twist to the yarn, but that addition increased the cost, and the resultant fabric, a kind of crepe, was still very far behind wool in non-creasing properties.

"Time after time," said Doctor Willows,

"we failed, but there is no problem in science and industry, which cannot be solved, given enough time, money and patience. Rubber is a substance which could be 'pumped' into the spongy silk and cotton hairs to make them elastic, but that is not a practical solution. We turned to the new school of chemists who have devised resins out of coal tar. Bakelite is one of them. Again we met failure, for we could not find the right sort of resin. At last, however, we succeeded and our process for making the 'total anti-crease solution,' as it is called, is to press the resin solution into the fabric and then convert it into an elastic resin by heating to a high temperature. This synthetic condensation product goes into the spongy cotton and silk hairs and filaments, just like a dye into cloth, and makes the fabric, either cotton or artificial silk, or rayon, like wool in not creasing. It also adds to the weight of the material, and, as it is cheaper than cotton, and the method of applying it is not expensive, it can be used for a variety of fabrics, including cotton, artificial silk, shoddy and linen.

"It is well known that when certain goods, made from artificial silk, are washed, they often prove to be rotten. This process prevents that danger, and is a final one, applied after the goods are bleached, dyed or printed."

similar product will be put on market in 1933
 by Parfisi Mills, 274 Church St New York

EXTREMES IN NATURE APPLIED TO NEEDS OF MANKIND

Extremes in nature, including all the things to which the superlative can be applied, not only stir the imagination but knowledge concerning them often aids in selecting the best materials to serve mankind in specific ways. Dr. B. S. Hopkins, of the University of Illinois, has compiled a list of some of these extremes, including the heaviest substance known, which is osmium, with a density varying from 21.3 to twenty-four. The lightest substance is hydrogen gas, unless we consider highly evacuated X-ray tubes containing streams of electrons, which are fragments of disrupted hydrogen atoms. The hardest material is the diamond, and the most ductile and malleable metal is gold. The highest temperatures sustained and measured with reasonable accuracy are in the neighborhood of 3,500 or 3,800 degrees Centigrade, and the most extreme cold ever recorded is the melting point of solid helium, 272.3 degrees Centigrade below zero which is within seven-tenths of a degree of absolute zero, the theoretical point where all heat vanishes. The most costly substance known to commerce is radium which sells at a price corresponding to more than \$2,000,000 per troy ounce.

Science Service 9/12/32



Filling in Dents in Auto Body with Metal Is Made Easy with New Spray Gun

METAL SPRAY GUN FOR AUTOS SPEEDS UP REPAIRS

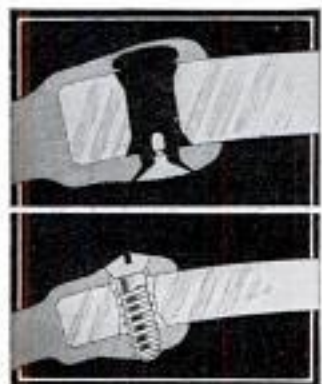
Speeding up repairs to auto body and fenders, a spray gun for applying metal has been devised. The gun, which sells at a low price, is practical for spraying solder filler on dents or wherever filler is required. As much as two pounds of metal per minute can be applied. The gun operates from an acetylene tank and compressed-air line and is portable. It is said to save forty per cent in time and labor, sixty per cent in acetylene and ten per cent in solder, while it eliminates heat warpage, acid corrosion, removal of upholstery and trim and the use of expensive body solders. The solder is applied cool, that is, the heat never exceeds 225 degrees Fahrenheit, which is not hot enough to damage metal joints or to warp thin panels.

"CELLULOID" FROM WOOD PULP

Highly resistant to water, a new material made from wood pulp is similar to celluloid, though much stronger in tests. The product is to be used in the manufacture of toys, buoys for fish nets and life belts and other things.

EYEGASSES ARE KEPT TIGHT BY PLASTIC RIVET

Replacing the screw for mounting rimless eyeglasses, a plastic rivet that seals the lens and strap into a unit has been introduced. The rivet is packed tight into the lens hole after being softened at a



temperature of 200 degrees. Then it hardens into a permanent mounting that eliminates much danger of lens breakage. Under old methods, the screw fits so poorly into the drilled lens that it either is too tight and cracks the lens or so loose the lens wobbles. A machine for installing the rivet does the job in less time than if a screw is used.

Bausch & Lomb Optical Co. Rochester, N.Y.

Pa
 Taken on by Metallurgical Syndicate
 Box 111, Long Island City, N.Y.

9/14/32
 To Dept. of Commerce

produced at Frederikstad Norway. reported by Trade Commissioner, Ludvig Carlsson
 1932. Norway

1459 Cmt. Boyden Sparks
199 Puritan Ave.
Forest Hills Gardens N.Y. New York

How to BECOME

*Brown's Physical Training Camp
Practical Learning in Sweden
New York*



By FORREST HILL

BILL BROWN, the trainer, has known more champions, I guess, than any man alive—champions of all kinds, fighters, wrestlers, runners, weight lifters, scullers, swimmers, jumpers, tennis players, golfers, jockeys and others.

In his lifetime he has trained many outstanding athletes; most of the good ones he has seen in action, and in his youth as a wrestler he went to the mat with some of the world's best. Bill Brown, if anyone does, knows what it takes to become a champion.

"Hey, Bill," I asked him recently, "what about Gene Tunney? He says in the story of his life that he just made up his mind he was going to be the heavyweight champion and then—well, he made good all right. How about it? Can anybody make himself a champion?"



Top, Champion Soccer Players from India Training for Match; Below, Akxel Garvinan, Swedish Decathlon Champion, on the Practice Field

"Well," said Bill, "I'll tell you..." But his answer took the best part of a week to deliver. Some of it I got while hiking beside him over the roads in the hills where long ago he established his training farm,

B 1459

a CHAMPION

at Garrison, in the South Highlands of the Hudson, opposite West Point Military Academy. An occasional young athlete is trained nowadays by Bill Brown, but most of those he trains are lawyers, statesmen, army officers, clergymen, merchants, journalists, actors and manufacturers. In training these men, and their sons, Bill Brown uses the same technique as if his charges were trying to become champions. He never, therefore, permits any of them to do too much.

"Many a champion has been pulled off his perch," Bill told me one morning on a hike, "because he left his fight out on the road. Road work should be regarded as of first importance in the conditioning of any man. We are all of us only as good as our legs. Yet road work can be overdone. With a sound heart, almost any man ought to be capable of six or eight miles of road



Top, Chuhei Nambu, Japanese Hop, Step and Jump Champion; Center, Georgia Coleman, Diving Champion; Below, Helene Madison, Swimmer

work. I don't mean running. For ordinary men trying to improve their condition, I mean walking uphill and down. For athletes, I mean walking with intervals of sprinting. In any kind of an athletic contest you need spurts of energy. So, when an athlete trains, he ought to vary his road work, walk fast, then run, slow down for a breather and then run again.

"You remember that legendary hero who began by lifting and carrying a calf? As it grew, his



strength increased, and when the calf had become a full-grown bull the man's strength was equal to the job. How many people, when they see Babe Ruth swat a ball over the fence, see as well the years of practice that gave him the timing sense that makes him the home-run king? How many, when they think of all the money Gene Tunney earned in the ring, think also of the hours of drudgery he had to devote to the task of making himself good enough to whip Jack Dempsey?

"You know why you get that road work every morning?" Bill asked. "For the same reason Tunney got it, and Dempsey and Jeffries and Corbett. Every time you go out on the road you increase your endurance. Each day we send you a little farther and you find yourself doing a longer hike more easily than you did a short one at the beginning of your training. The man who is conditioned with road work has a good foundation. His legs are right.

You've heard of glass jaws? It's nonsense. Generally it's a fighter's knees and not his jaw that crumple under a blow. When your legs refuse to work, you're out; so is a champ, even when his name is Dempsey."

At breakfast one morning, Bill commented on the Olympic contests then being held at Los Angeles.

"All those winners must have power to endure," he said. "Muscles, bones, nerves, heart, lungs—these are the things sports writers talk about and measure when they estimate the chances

Above, William Graber, of University of Southern California, Setting World's Record for Pole Vault; Below, William Carr of American Relay Team, Receiving Baton in Olympic-Game Event

of human contestants or race horses. But none of these is as important as quickness of reaction, that is speed—and the power to endure. And endurance is the stuff of which champions are made. It means more than muscle power. It means mental power—guts—gameness.

"The gamest man I have ever known is my best friend, George Bothner. Without a doubt Bothner is the gamest man who ever worked on a wrestling mat. You know he was for a long time lightweight champion of the world; but he would wrestle anyone. When he weighed around 130 pounds, he thought nothing of taking on men who weighed 225 or 250 pounds. He didn't know the meaning of the word quit. In 1906, Bothner



Above, Thomas Hampson, of Great Britain, Winning 800-Meter Race at Los Angeles Olympics; Left, American Horseman Practicing Jumps for Olympic Contests

leg. The pain was no doubt excruciating.

"'Nix!' said George.

"'Quit or I'll break your leg,' threatened Link.

"'Go ahead and break it!' Bothner was a champion all right. Shad Link bore down with all his might and the bones of Bothner's leg snapped. When he was unconscious, Link rolled him over on his back. But bones knit, and for many years thereafter Bothner continued to be the world's lightweight wrestling champion. His heart was right. On the other hand, there was George Hackenschmidt, the big Russian wrestler.

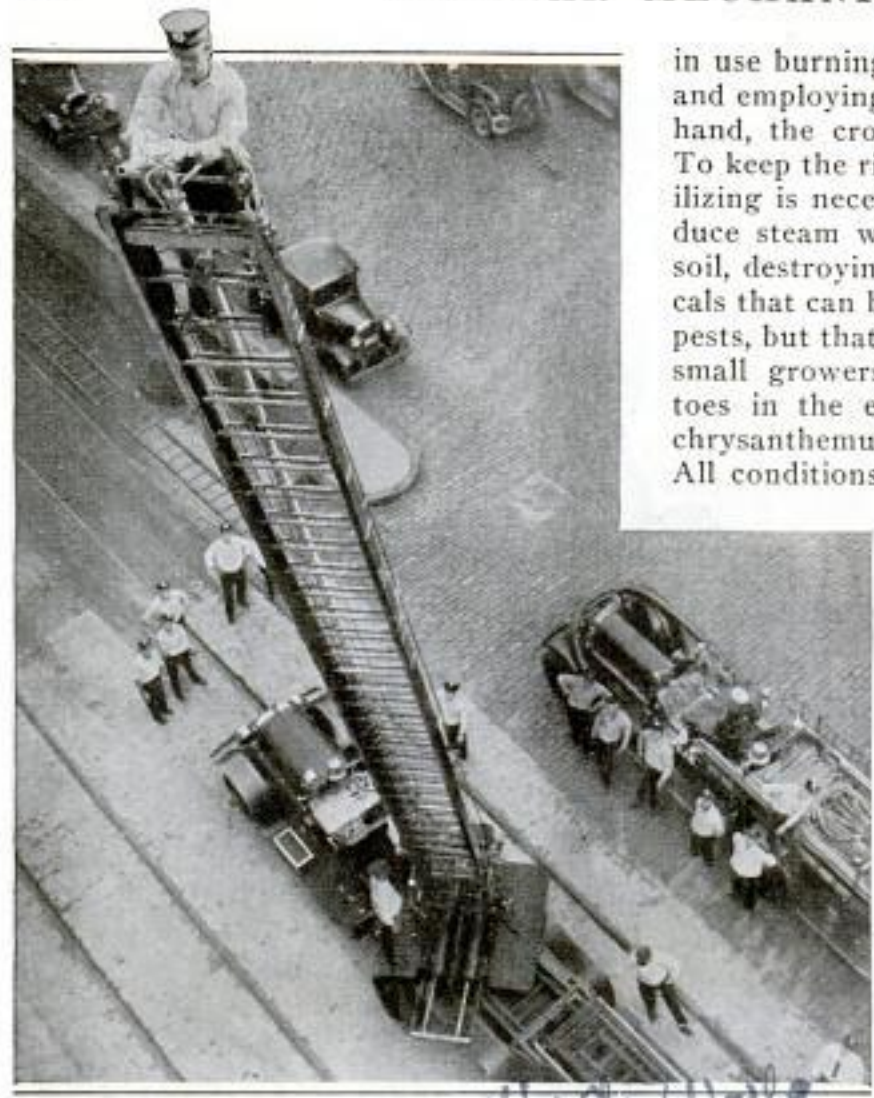
"When Hack first came to this country I trained him. Before that I had trained Tom Jenkins who was the heavyweight wrestling champion. When they met at

had himself matched out of his class with a fellow nearly twice his size named Shad Link. They wrestled at Atlantic City. The big fellow finally got a toe hold on Bothner.

"'Roll over,' commanded Link. He was exerting a terrific leverage on Bothner's

(Continued to page 136A)

B 1601



Fireman Is Shown Practicing Direction of the Nozzle from Top of Hose Ladder at a Height of About Eight Stories

FIREMEN PRACTICE ON LADDER EIGHTY-FIVE FEET TALL

Just to keep in practice, firemen of one large American city go to school, handling equipment used only in big fires and climbing tall ladders. One eighty-five-foot ladder carries hose and fireman high above the city streets to demonstrate what might be expected if a skyscraper caught fire.

CROPS PRODUCED UNDER GLASS ON THOUSANDS OF ACRES

Farming under glass is increasing so rapidly in England that more than 3,000 acres of land are said to be producing crops by artificial methods. The biggest crops are cauliflower, marrows, lettuce, potatoes, asparagus, carrots, beans, turnips, strawberries, tomatoes, cucumbers and grapes. Farming under glass is expensive, one firm with twenty-four acres

in use burning 4,500 tons of coal per year and employing 300 men. But on the other hand, the crops command higher prices. To keep the rich soil free from pests, sterilizing is necessary. Portable boilers produce steam which is forced through the soil, destroying insects. There are chemicals that can be mixed with the soil to kill pests, but that do not injure plants. Many small growers specialize growing tomatoes in the early part of the year and chrysanthemums for the winter market. All conditions of cultivation can be controlled by the glass-house farmer, temperature, moisture and fertilization being maintained at any desired level. England's investment in this method of farming is said to be close to \$40,000,000, while the wages paid exceed \$4,000,000.

controlled by the glass-house farmer, temperature, moisture and fertilization being maintained at any desired level. England's investment in this method of farming is said to be close to \$40,000,000, while the wages paid exceed \$4,000,000.

B 1605

FLASHLIGHT AIDS WORK WITH SCREWDRIVER

By building a flashlight into the handle of a screwdriver, a tool has been produced which enables the mechanic to use

both hands effectively when working in dark corners. The light is controlled by a button in the end of the handle and, when turned on, directly illuminates the screw head. The handle is of vulcanized rubber, and hence the tool is particularly adapted to electrical work.



Screwdriver with Flashlight in Handle to Illuminate Work; Button in Handle Controls Light

Burgess Battery Co
2 Deepark. *Copyright material*

St Louis, Mo.

B 1610

Answers 9/10/32

01573

see Jan 1931-92

Treasure of Sunken Liner Sought by Divers



Ward Liner

By Using a Special Diving Observation Chamber Accommodating Four Persons, Attempts Are Being Made to Recover \$4,000,000 in Gold and Silver Bullion from the Treasure Ship "Merida," Which for Thirteen Years Has Rested in 200-Feet-of Water Sixty Miles off the Virginia Capes; Above, at Left, a Deep-Sea Diver Entering the Observation Chamber, and at Right, Capt. Harry L. Bowdoin, Inventor of the Chamber, Aboard the Salvage Ship "Salvor," Holding a Piece of Deck Railing Covered with Barnacles and Other Deep-Sea Growths Which Was Brought by Grapnels from the "Merida"; Below, Right, Diving Chamber Being Lowered from the Ship

Whitestone, L. I. New York

Wide World

B1658 displayed at International Assoc.

912

POPULAR MECHANICS

Municipal Electricians Association in St. Louis

Hydrographic Office Secretary of Navy Washington etc

Cannot locate number mentioned



Fire Alarm with a Handcuff, Which Holds Person Turning in an Alarm Until Fire Department Arrives

HANDCUFF ON FIRE-ALARM BOX STOPS FALSE REPORTS

Fire-alarm boxes that handcuff all persons operating them have been tested as a means of preventing false alarms. A person turning in a report must insert an arm in the underside of the box and turn a key. This causes a cuff to clamp about the wrist as the alarm is relayed. Since the clamp can only be removed with a special key in possession of the firemen, the operator is securely held until the fire department reaches the box and releases him.

FIVE NUMBERS ARE TOO MANY IN AUTO-LICENSE TAGS

More than four figures on an automobile license plate make it impossible to catch the numbers of speeding cars. Dr. James L. Graham, of Lehigh University, reached this conclusion after conducting tests with an apparatus containing a reducing lens which changed the apparent distance, thus making it possible to test in the laboratory the ability to read tags rapidly fading into the distance. With three-number plates in black letters on a white ground, ninety-four per cent were seen correctly, but only nine per cent of seven-number tags were legible, and but sixty-four per cent of five-number plates could be read, although the speed used in the laboratory was only a third to a fifth of usual road speeds. Bright reflecting sur-

faces greatly reduced legibility, and color also was found to be important. When illuminated only by the tail light, blue on an orange background was found about thirty per cent better than the same colors reversed.

B1686 HOLE IN BOTTOM OF THE OCEAN NEARLY SEVEN MILES DEEP

Recent listing of the deepest "deeps" in the Atlantic and Pacific oceans shows the greatest known depth is in the latter—the Mindanao deep, 35,400 feet, near the Philippine islands. Other soundings of more than 30,000 feet have been made in several places in the western part of the north Pacific, and in the south Pacific, the deepest known point is Aldrich deep, 30,930 feet, north of New Zealand. The Atlantic cannot boast such depths. The deepest sounding known in the north Atlantic is Nares deep, about 27,972 feet, in West Indian waters. In the south Atlantic a sounding of 26,575 feet was recorded east of the southern tip of South America. The other oceans have much lesser depths, ranging from 14,000 to 22,000 feet.

B1698 SCREEN FOR AUTO VENTILATOR KEEPS BEES OUT OF CAR

To prevent the entrance of bees and other insects into an automobile through the cowl ventilator, a screen is being of-



Screen for Cowl Ventilator on Car Prevents Bees and Other Insects from Entering

ferred. It is installed simply by placing the unit in the opening and tightening one setscrew. Many insects, it has been found, are sucked into the car through the cowl opening, and bees in particular often cause accidents by distracting the attention of the driver.

Bethlehem, Pa

Science News Letter 9/24/32

Science News Letter 9/24/32

Jaynes & Johnson Inc. 2309 E. Jackson St. Copyrighted material

B1531

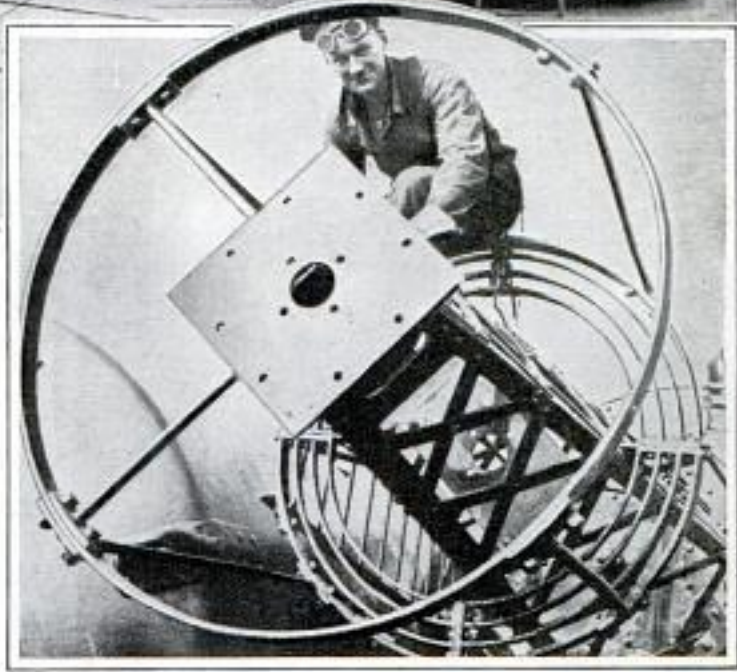
at Blackwall, East India, England 913

How Ships at Sea Are Safeguarded by Buoys



Wide World

Above, Types of British Buoys at the Repair Shop; Right, Overhauling Ten-Ton Buoy, One of Largest in Use



At present the United States lighthouse service maintains about 10,100 buoys as aids to navigation, although not all of them are stationed in the open sea. The average life of a metal buoy is twenty years, and a wooden one lasts five years but must be brought in frequently for repairs. The total number of aids to navigation maintained by the service on June 30, 1932, was 21,294, an increase of more than 1,000 since last year.

There are 1,607 airway beacons, and 129 radio ranges and radio marker beacons for airway use. The first airway beacon was established in 1927.

B1671

CLOCK WITH NO DIAL OR HANDS SHOWS HOUR AND MINUTE

Time reading has been so greatly simplified in an electric clock without dial or hands that any child who can distinguish figures can tell the correct time to a minute at a glance.



Instead of the usual dial and the hour and minute hands, there is a small slot in the front in which the figures representing the time appear like the mileage reading on the

speedometer of an automobile. The figures on the clock change every sixty seconds, and a glance at such a timepiece shows only the hour and minute at that particular moment. The cases are modernistic in design, the motors require no adjustments or oiling, and there are fewer mechanical parts than have previously been used for electric clocks.

SEALS HELP FIND OYSTER BEDS

Seals are to be used to locate oyster and lobster beds in James bay, the lower arm of Hudson bay. The plan of employing seals as oyster detectives was adopted after northern trappers had reported that seals caught in James bay often contain both lobsters and oysters. By following them, it is expected fishermen will find the beds without making a search of the entire bay.

B1699

(Montagne)

100-120 U. 60. 50. 25 cycle

Winwood Clock Co.
Winwood State Pa
Pittsburgh, Pa

Antaris government
copyrighted material

B3/653 Const. Thomas E. Stinson Jr.
145 S. Spring St
Los Angeles, Calif

FIRE DETECTIVES



Fire Detective Timing Candles of Different Thicknesses for Data to Break Down Alibis

TWO men in plain clothes prowled through the still smoking ruins of what an hour before had been a pretentious building. One of them stooped to pick up a piece of charred wood, while the other carefully transferred to a paper some fluffy ash which the wind already was scattering. These and other pieces of debris were collected and carried to a laboratory where trained members of the city's arson squad subjected them to a microscopic third degree. Late that same night, one of the investigators flew to a city 500 miles away where the owner of the building, on a pleasure trip, was preparing to return home.

"I've just heard about the fire," he exclaimed when the investigator introduced himself. "It's a mystery to me."



Two Photomicrographs of Charred Surface of Pine Plank Which Reveal Agent Used to Carry Flames



In the Upper Photograph, Linseed Oil Was Burned on the Pine, as Indicated by the Higher and More Uniform Ridges, and in the Lower, Kerosene Was Used to Spread the Flames

MAKE ASHES TALK

"How did it start?" he asked.

"You know, because you did it," was the reply.

"What do you mean?" demanded the owner. "That fire happened this morning and I've been out of town since yesterday afternoon."

"I'll tell you," replied the investigator. "This



Top, Comparing Photomicrographs of Rabbit and Fox Skins; Below, Candle Wick and Trail of Papers Which Convicted One Arsonist

morning you were out playing golf and at 11 o'clock you went to the clubhouse to make a phone call. You called your store, and as no one was there, you listened until the bell had rung fourteen times. Then you hung up and resumed your game.

"The bell clapper of the phone in your office was tied down with a weak string that you had learned would break on fourteen rings. Just before you hung up, the clapper broke loose and struck a nail that

discharged a blank cartridge that you had fastened in a wooden block. The flare from the cartridge ignited five gallons of gasoline in a glass bottle, the bottle broke under the heat, and the flaming gasoline spread over the floor and burned up your insured merchandise. Come along with me."

This really happened. Professional fire bugs and their amateur imitators have developed new and ingenious ways of creating fires in the last few years.

But members of an arson squad today can ransack the charred timbers of a fire and tell you if it is an arson case, the sex and nationality of the criminal, the method used to start the fire, and the minute of its inception.

Paul T. Wolfe, chief of the fire-investigation bureau in Los Angeles,





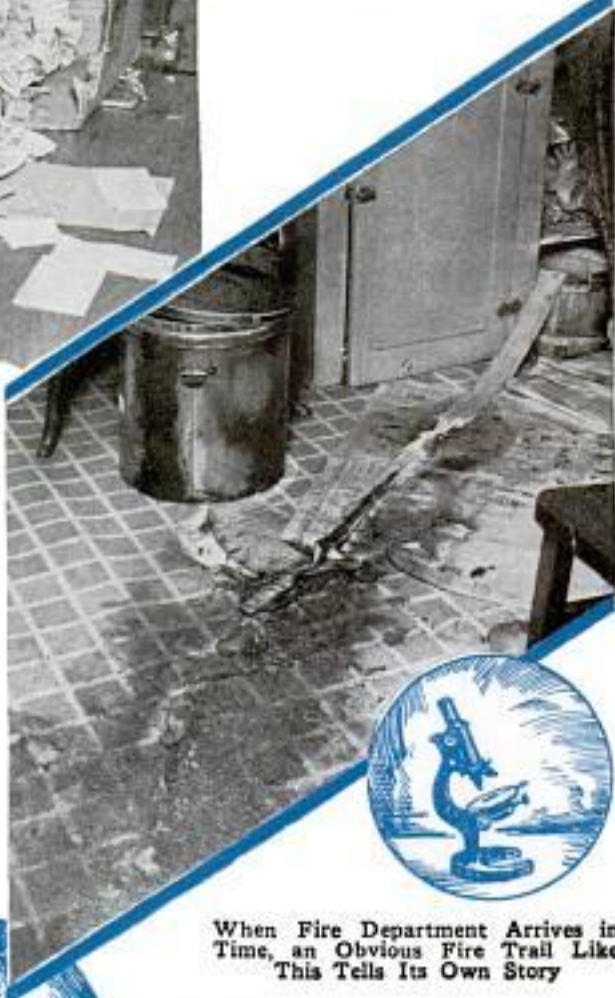
A Simple Candle Device for Starting a Fire That Was Found Before It Had Chance to Work

who is turning arson detection into an exact science, has some amazing cases in his records. "A few years ago," he says, "a man in New York started a fire in his Los Angeles office merely by calling his number on the long-distance phone. Only recently a fire occurred in a building ten months after the owner had locked it up and left for Europe. His timing device went off almost at the hour he had calculated. More recently still, a fire bug was able to burn down a house he had never been near simply by driving down the adjoining street."

Ten years ago, mechanical contrivances such as clock-works were frequently used to start fires, but the twisted bits of metal remaining were so hard to explain away, that incendiaries have adopted more subtle methods. Inflammable liquids,

gases, chemicals, and electricity, coupled with starting devices that practically disintegrate in the flames, are the latest tools of the professional "torch." The arson squad has only one weapon, the microscope, but this is proving to be more than a match for the criminal. The microscope is a practically infallible instrument of detection.

"I'll show you how easy



When Fire Department Arrives in Time, an Obvious Fire Trail Like This Tells Its Own Story



it is," says Mr. Wolfe. "When I go out to investigate a suspicious fire, I first locate the spot where the fire started. You can do this by tracing the cross checks on the burned wood. When wood burns normally, the





Investigators Examining a Collection of Various Devices for Getting a Fire under Way

cross checks on the charcoal have a definite size, but the checks are finer and closer together if some material that burns with a hotter flame than wood is present. We take a small piece of charcoal and make a photomicrograph of its surface. Then we compare this with photographs from the files and that tells us the material or liquid that set the wood on fire.

"Every combustible liquid leaves its own telltale marks on the wood. For example, if turpentine is burned on pine, the photomicrograph shows long rough ridges with cross cracks. If it was linseed oil, the ridges are higher and more uniform. A rough plane without cross cracks indicates that alcohol was used. If the plane

is smoother, but with cracks, kerosene was employed, and if the plane is smooth and with large cracks, then gasoline was the agent that carried the fire.

"A typical trick in the past was to carry heavy insurance on a stock of expensive goods," says Mr. Wolfe. "Then the fire bug would move the goods out, substitute shoddy material in their place, and start a fire. In that way he could obtain the insurance money and still own the goods. But that is no longer popular, even with fragile furs and feathers. The microscope enables us to differentiate between the burned hair and skin of an expensive fur and its charred counterfeit."

Newspaper stories that begin with the



B 1653

words, "A fire of unknown origin last night destroyed..." are now open to revision, Mr. Wolfe explained, as the exact cause of a blaze can always be learned. With the recent improvements in detection methods, fewer fires are ascribed to such causes as spontaneous combustion or electrical short circuits. Not even the common story of the iron left standing on the ironing board is readily accepted now, for an innocent fire from that cause usually will burn itself out with little damage. A hot iron will consume the cloth and wood beneath it, but the fire rarely spreads beyond the range of the iron's heat, and the iron will eventually eat its way through the board and fall on the floor, disconnecting the cord.

The whole art of arson detection is based on the fact that practically every material burns at a different temperature. A gaso-

line flame, for instance, burns at 1,500 degrees Fahrenheit, while burning sugar creates a temperature of only 700 degrees. Each individual flame temperature leaves different microscopic marks on burned wood and on the remains of other burned materials. With a knowledge of the temperature table, and of the effects that each temperature creates, an investigator can tell at a glance exactly what material started a fire.

This knowledge has given the arson squad a direct lead on the fire bugs who employ chemicals to start a fire or to spread the flames. Each chemical leaves its own characteristic mark long after the fire has been extinguished. Even when a gas is used, its identity may be determined.

As a result, eighty-five per cent of arson suspects in Los Angeles in the last few years have been convicted.

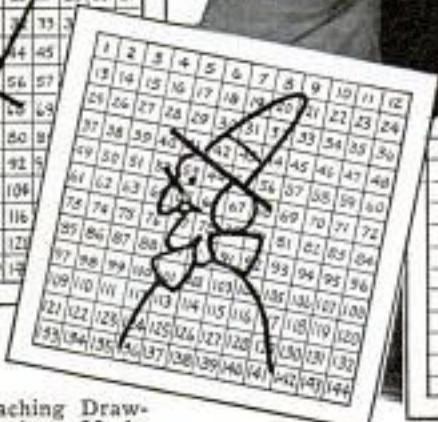
DRAWING IS TAUGHT BY RADIO WITH NUMBERED CHART

B 1675

Drawing can now be taught by radio with the aid of duplicate numbered charts, one used by the artist or cartoonist instructor and the others by pupils of the broadcast class. Each chart contains 144 numbered squares, and as the instructor draws a figure, he calls out the squares touched by his pencil or crayon. Pupils sitting at the radio with duplicate charts trace lines from

one number to another as they are announced in efforts to "copy" the work of the instructor. By such methods, caricatures, birds, animals, flags and other objects can be reproduced by the novice.

Talking Pencil



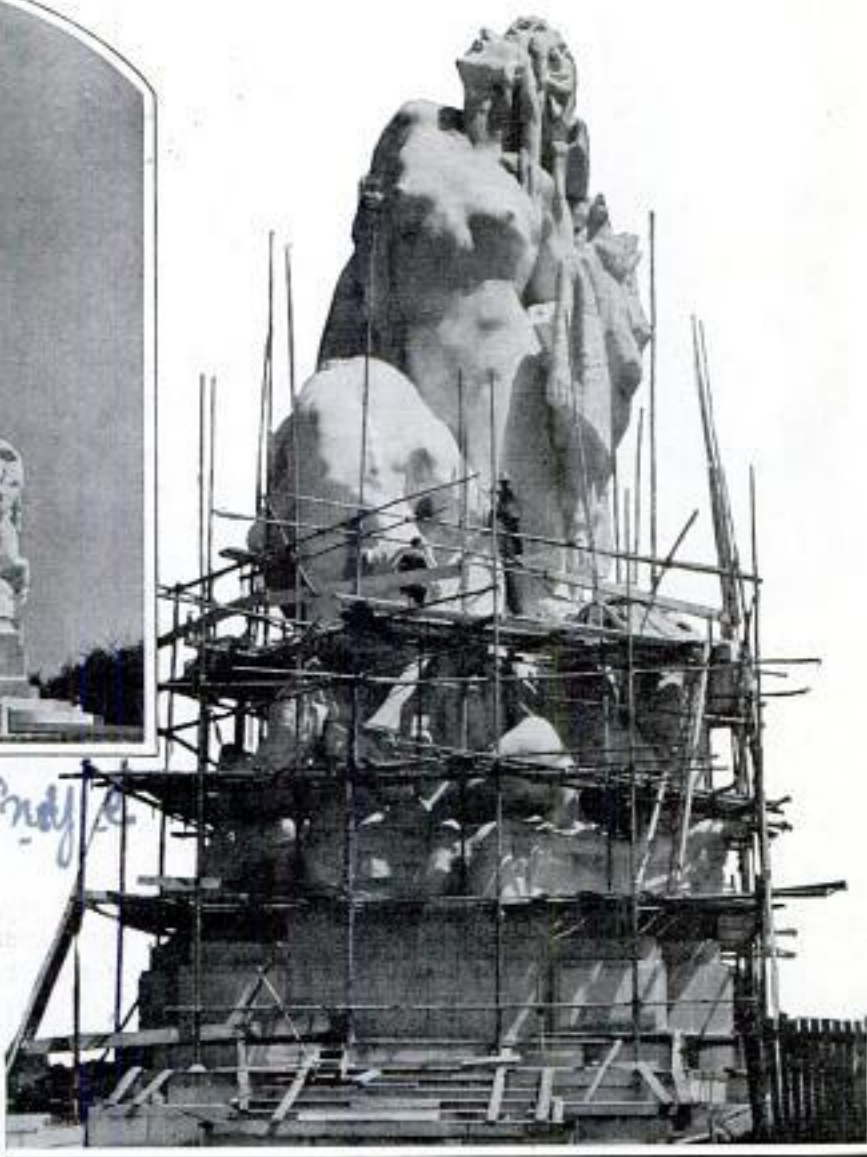
Charts Used in Teaching Drawing by Radio, the Students Marking In Lines between Numbers

Ed. Whitehall 6490. (ad March 23 209)
nick nichols, 157 E. Erie St. Chicago
Sept 30
 Copyrighted material

B 1689

Building World's Largest Stone Monument

More news same. 331 W. 14th Street



Commemorating the decisive battle of the Marne, the world's greatest monument of stone has been constructed and dedicated in France. It was designed by Frederick Mac Monnies and built by Edmondo Quattrocchi, both American sculptors. Exact reproduction of the models executed by Mac Monnies

Photo at Left Shows Completed Monument to the Battle of the Marne; Right, Workmen Placing Giant Blocks of Stone

was made possible by a machine invented by Quattrocchi and used for the first time in constructing this monument. The machine sets points from plaster models onto stone with great speed and accuracy, so

that blocks executed and carved in the studio fit closely when placed in position. The monument is seventy-five feet high, equal to a seven-story building, while the central figure is sixty feet tall.

FORTY-BILLION-VOLT ENERGY ESTIMATE FOR COSMIC RAY

That cosmic radiation bombards the earth with energies of forty billion volts is the latest estimate of Dr. Thomas H. Johnson, of the Franklin Institute, Swarthmore, Pa. This is about forty times the highest energies usually assigned to the cosmic ray. Doctor Johnson developed

the idea that the measured intensity of the radiation depends upon the particular kind of material through which the rays have just passed. This led to an estimate of the energy of each of the secondary radiations produced by one cosmic ray, or about 20,000,000,000 volts. Since these rays have passed through the atmosphere, dissipating energy as they traveled, he doubled this figure for rays entering it.

Assistant Director Bartol Research Foundation

More news same. 9/19/32

B 1593

Modern High
Race, Wis



Sectional Room Cooler Using Ice, Which Can Be Enlarged as Needed

COOLER FOR ROOMS USES ICE AND ELECTRIC FAN

Built on the same principle as a sectional bookcase, an air cooler for office, store or home is provided with one, two or three sections, and can be expanded as conditions require. Each section will hold seventy-five pounds of ice, and each is provided with handles inside to facilitate recharging with ice or removing water. A base supports the ice fan and catches the condensed moisture of cooling, while the turret top contains the power unit and blower, which may be turned to shoot the breeze in any desired direction. There is also a louvre for vertical control.

FOSSILS OF FOUR-LEGGED FISH FOUND IN GREENLAND

B 1667

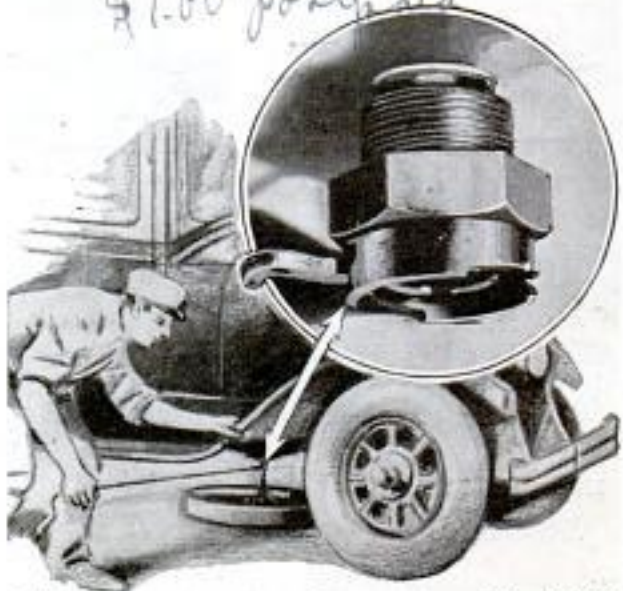
Fossils of "four-legged fish," regarded as the connecting link between water-dwelling and land-dwelling vertebrates, have been found in Greenland by Dr. Lauge Koch, Danish geologist. The fossils are among the exhibits with which Doctor Koch expects to reveal the complete scientific story of Greenland. The four-legged fish are known as Stegocephalians, not really fish but amphibians possessing a number of fishlike characteristics. They were the forerunners of the frog-toad-salamander family. There are, however, genuine fish that are four-legged,

that is, their fore and aft paired fins are modified in such a way that they can crawl as well as swim with them. Such fish are found as fossils among the earliest vertebrate-bearing rock strata, and two or three species of them still survive in the muddy rivers of the semiarid parts of Africa and Australia. These are known as lung fish, which get oxygen only by means of lungs or modified swim bladders. If kept under water for many hours, such a fish suffocates—literally drowns.

REMOTE-CONTROL DRAIN PLUGS MAKE OIL CHANGES EASY

B 1625

Crawling under an automobile to remove the drain plug when changing oil is unnecessary if the regular plug is replaced by one now offered that is opened and closed by remote control. The plug contains a valve under spring tension which is opened by a tug on a wire extending to any point conveniently in reach. A notched wire allows the operator to do other work while the car drains. The device is leak-proof and prevents forgetting to tighten the plug when the wire pull is released, as the action is automatic. As the plug closes, the torsional movement wipes the tapered seat, which prevents catching and retaining dirt in draining.



Oil-Drain Plug for Auto Operated by a Wire Which Opens a Valve Held under Spring Tension

Clearance is the same as for the original plug and the opening for draining is the same. There are six sizes to fit all makes of automobiles.

Copenhagen Denmark

Phone Service
9/19/32

at address Bail
Smith & Sons
Copyrighted material
Chicago

John Tiffany
Rocking on Water in a Rubber Bubble Boat

Resembling a flattened bubble or rubber drum, an inflated boat recently developed lends itself to many types of water sport. It is made in various forms, con-



410.00 & 20.00

Collapsible Rubber Boat Resembling an Inflated Auto Tube with a Double Cover; It Can Be Used as a Raft or Propelled by Rocking

sisting in its simplest form of a ring of stiff material covered on both sides with airtight balloon cloth, the result being much like an automobile tire fitted with a cover for both sides. One kind of stiffener is an aluminum-alloy ring with a U-shaped cross section, the concave side being outward. A rubber tube encircles the ring and, when inflated, flows out over the edges to provide a cushion. The whole is covered with a rubberized fabric laced in place and, finally, an outer covering of awning material. The two flat surfaces are held apart by air at low pressure. A collapsible boat has a stiffening ring of fabric-covered tubing that can be pumped to about fifty pounds' air pressure to make a rigid framework. Another type, intended for towing behind a motorboat, has a metal bottom, and a third, of all-metal construction, is for use on ice boats instead of regular runners so such craft can run both on ice and in water. For bathers, the inflated boats are superior to both blown-up inner tubes and swimming tubes, it is claimed, because a bather can

climb upon one of them and rest with his body entirely out of water. Such a craft can be used as a diving platform for shallow water also. While the boats can be propelled with a double-ended oar, they can also be "rocked" from place to place, the operator resting his knees near the edge so the opposite edge is tilted. A rocking motion then causes the boat to travel forward. They have also been used for tilting contests and as surf boards. The inflated tube and section between covers give double protection from sinking. When deflated, craft can be carried under the arm.

"HEAT WAVES" ONLY LIGHT *03/682*

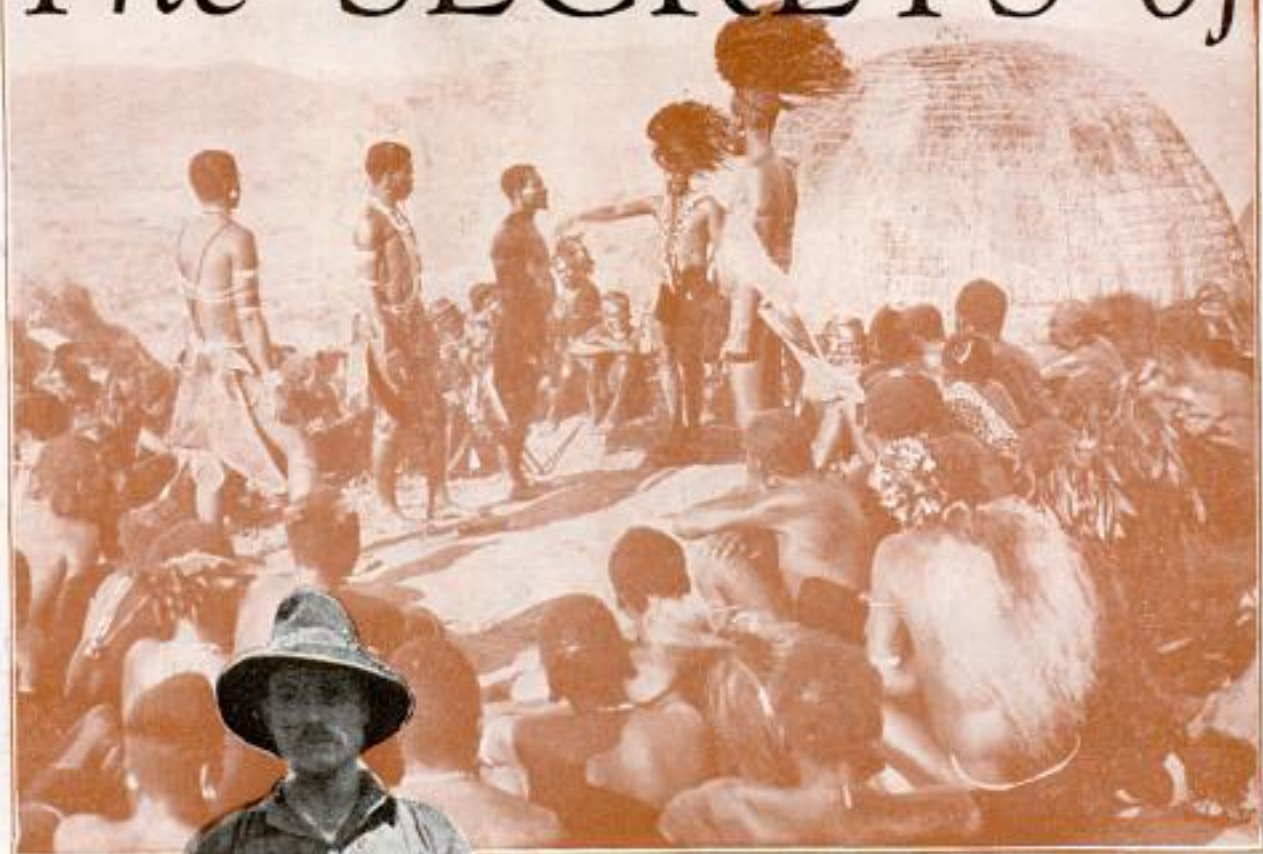
When wriggling waves are seen rising from a hot pavement in summer, the observer does not see heat radiating, as is generally believed. Instead he observes light refractions caused by currents of air of lighter density arising from the heated surface. The light waves are bent and the wriggling illusion results, just as a stick thrust into water appears bent. The twinkling of the stars and the mirage of the desert are other phenomena of refraction.

Wood impregnated with rubber is being used for some parts of violins.

Better Vision Institute
2058 42nd Copyrighted material

B3719 Cmt. 20, Clairouin
90, Rue de Turenelle,
Paris VII, France

The SECRETS of



By Attilio Gatti

LIONS were raging in the mountains of northern Zululand and fear spread in a paralyzing wave over the veldt. The Zulus gathered in the kraal of first one chief, then another, their worried gaze fastened on the emptying plain below, where zebras, gazelles and antelope moved southward in search of more plentiful pasturage and water.

In the kraals women and girls, old men and even children were silent with the fear of impending calamity. Each day the chief of each kraal gathered his family about him and, holding a calabash of water over his head, solemnly let it fall drop by drop on the parched ground. This, so the rain god, if absent-minded at the moment, might be left in no doubt of what was wanted.

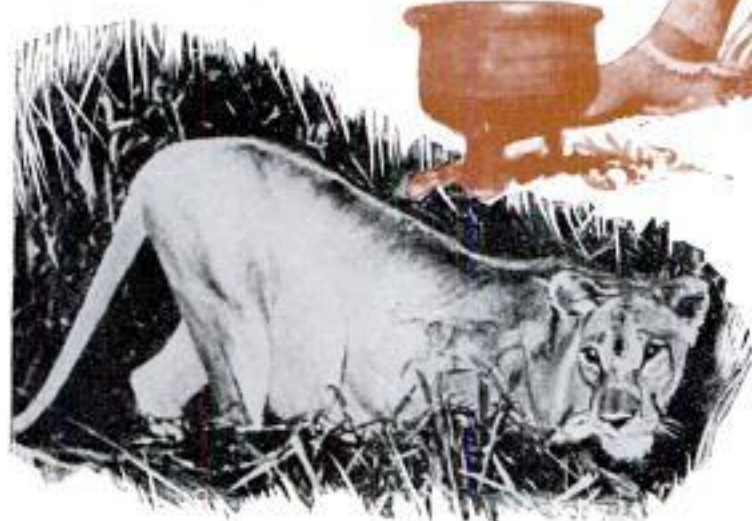
The Zulus did not fear the drouth itself because the mountains are rich in springs. But

Above, Tribe of Zulus, Most Courageous of African Natives, Engaged in One of Their Ceremonials; Below, the Author and Lion He Killed

the LION MEN

when the dry weather drives all game from the plains, the lion, having no more food, thinks of the taste of human blood. Then he becomes a terror, and there is no safety for women who work in the sweet-potato gardens, girls who go to the springs for water, boys who take the cattle to pasture, or old men and children who stray from their huts.

I was encamped on a hill with my native boys, the African kraals of the Zulus all about. The Zulus do not live in villages, but each family establishes its own settlement, or kraal, composed of clean and well-built huts placed in a circle around a fenced space in which the cattle are kept. The biggest hut is for the chief, each of the others being occupied by a wife and her children. A chief of-



Above, Native Zulu Warrior in One of His Tribal Ceremonies;
Below, Cats Like This Strike Terror to Zulu Hearts

a thick fence of thorn-covered branches, the women collected huge stores of sweet potatoes and meal, warriors sharpened spears and tested their shields. The cattle were pastured close to the inclosures so they might be driven in at the first alarm.

Then, one night, the tempest broke with a terrifying and majestic orchestral effect like a thousand thunderstorms. A long, far-away roar began the concert and was answered by ten, forty, a hundred challenges that seemed to fill all space. The lions were attacking in force. The first burst of noise was followed by a momentary silence even more terrifying. It was as if the beasts had held a preliminary roll call.

My native "boys"—some old enough to

ten has as many as ten wives and, next to his cattle, he cherishes his wives as evidence of his wealth and power, for he buys his wives at so many cows per wife, so each wife actually represents a certain number of cattle.

For days the Zulus, abandoned by their rain god, had been preparing to defend themselves. Old people and children built



Above, the Witch Doctor of a Zulu Tribe, Ready to Chase Lions or Bring Rain, Whichever Is Needed Most at the Moment; Below, Commander Gatti's Party Bogged Down in the Veldt

have been my grandfather—surrounded me with mouthings of devotion and reiterations that the white man and his gun would not let them perish. At the first sound, I had rushed from my quarters with my rifle, but was almost as much awed by the racket as my natives.

Suddenly the uncanny silence was punctuated by the "tam-ta-ta-tam-ta-ta" of a tom-tom. It was picked up at once by other drums and soon the beats seemed to be coming from everywhere. This was the

marvelous acoustic telegraph of the natives going into action. It is the best method of the Zulu for communicating messages over great distances and appears to be as rapid as our own telegraph.

Messages flew back and forth until suddenly all but one drum were stilled. This tom-tom, my boy said, beat out a message that the lions were attacking the kraal. The message was hardly relayed when word was passed that the attack had been repulsed. False alarms, requests to "stand by," and other messages, were followed by news of a second attack, this time aimed at the kraal of my friend, Chief Xipooso.

Drums repeated the message, but soon came the rhythmic beats informing us that this attack, likewise, had been repulsed. There is a belief among the Zulus that lions never attack the same kraal twice in the same night, so when the drums began their beat again, there was great excitement among my boys for they heard that

the beasts had massed about Xipooso's kraal for a second assault.

Then, as my boys interpreted the beating of twenty drums taking up the refrain, my blood ran cold at the message. "One lion jumped the fence, entered a hut, seized one of the chief's wives and, with another jump, took her over the fence," they translated. "The chief had only time to wound the lion with an arrow before it disappeared, clutching its prey in its jaws. The other lions have tasted human blood

B717

B7658, also in B
Anduaga, 80 Pine
New York City. 925

POPULAR MECHANICS

and are terrible. If help is not sent, tomorrow morning will find that Xipooso and all his wives and all his sons have been devoured."

I understood the situation probably was exaggerated, but it was nonetheless terrifying. The night was dark, the distance great and the way treacherous, but Xipooso had once saved my life. I decided to try to help him. "Tell him," I told my interpreter, "that we will arrive as soon as possible." Now our own drum called for silence, and soon it was hammering out its message to harassed Xipooso, the beats being passed along as the signals were given.

With my rifle in my hand, a bandoleer of cartridges about my waist and a focusing electric lamp attached to my forehead, I was ready to start. My gun bearer followed with a reserve rifle and ten picked boys carried torches. Running, stumbling and falling up and down those endless hills, we seemed to be struggling in a treadmill. We avoided the dangerous thickets as best we could, but twice the glare of my light reflected a pair of big phosphorescent eyes. Both times, with a roar, the lion disappeared before I could hypnotize him with the light long enough to take aim.

Little by little, we approached Xipooso's kraal, and the night was made hideous by human cries and shrieks, the roar of lions and the terrified bellowing of cattle. Evidently men, women and children were trying to make as much noise as possible to frighten the beasts away, but the lions were infuriated instead of scared. At last we arrived at the top of the hill overlooking the kraal, and a scene met our eyes which seemed to spell disaster.

The big fence of thorny branches about the inclosure had caught fire from brands thrown at the lions and was burning furiously. For the moment, the humans inside were safe because the lions feared the fire ring far more than the thorny fence, but when the fire died out, Xipooso, his wives and children were at the mercy of the jungle cats. I fired twice in the air, lighted my headlamp and dashed down the hill toward the inclosure, followed by my frightened boys. We saw no lions and were soon inside, my boys parting the

(Continued to page 116A)

Combination Chair and Easel That Can Be Carried under Arm When Folded

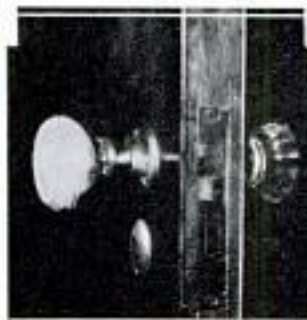


COMBINATION CHAIR AND EASEL IS CONVENIENT FOR ARTIST

Artists can now go on landscape-painting trips without loading themselves down with equipment by using a combination chair and easel which folds into such a compact unit that it can be carried under the arm. The various pins, grooves and notches make it easy to adjust the combination to the most convenient position for any sort of work, and the equipment is light in weight.

RUBBER COVER FOR DOORKNOBS PROTECTS THE WALLS

Rubber covers to fit any form of standard doorknobs are being provided to protect walls and also to guard glass knobs and others likely to be broken by contact with walls or furniture. Similar covers are made to fit the valve wheels on steam radiators to protect the hands when starting a sticking valve.



Dry ice is being used to shrink exhaust-valve seats into place in motor blocks.

General Motors Truck Co. General Motors Bldg. Detroit, Mich.

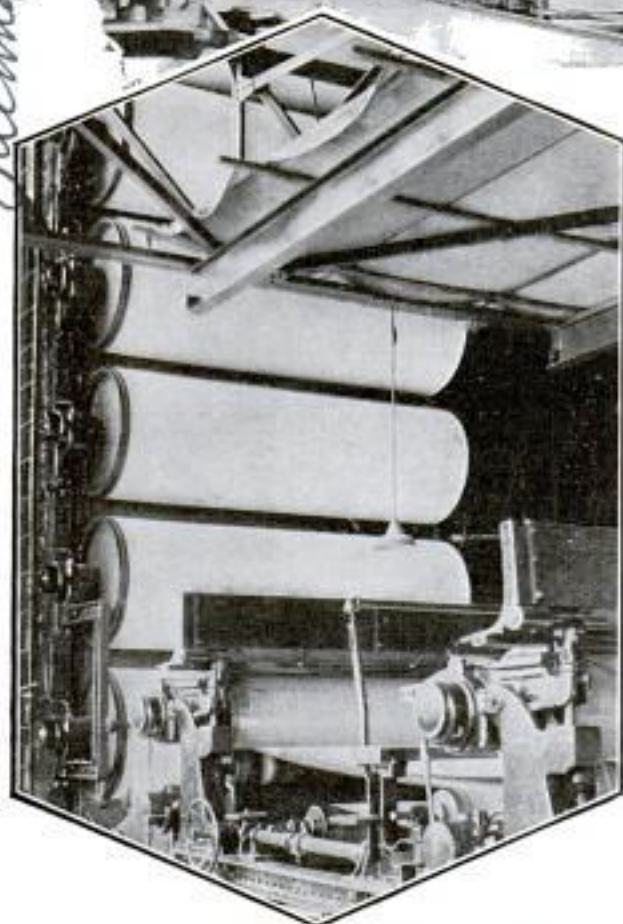
Woodward Stone

71 of new Photo

The Laurel Co. Springfield, N.J.

Lumber-Mill Waste Is Turned to Rayon Silk

Above, Wood Waste at a Lumber Mill; Below, the Same Waste Coming from a Machine as a Pulp Base to Be Converted into Rayon or Cellophane; in Circle, Bale of Rayon Pulp



process for converting hemlock wood waste, heretofore dumped into the boiler rooms of sawmills, into a soft, snow-white and fluffy pulp suitable for conversion into rayon and cellophane. Long research has produced a process that takes ordinary cull hemlock waste from the mills and changes it, by a cooking bleaching operation, into fibers softer and stronger than cotton, and today one paper plant on Puget Sound is running twenty-four hours a day, keeping 300 workers busy seven days per week, turning out bales of pulp for shipment by steamer to the Atlantic coast for making cellophane sheets and rayon thread. For years a third of America's most splendid timber was burned up as a total loss, but declining volume of lumber manufacture has set the industry to working out new uses for waste, at a saving often greater, per 1,000 feet of logs used, than the original cost of the timber

One of America's newest industries has proved a lifesaver for one Washington city, and efforts to find new uses for forest products have developed an ingenious

Cmd. Charles F. A. Martin 1110 Engel Sand Bank Rd
Tacoma Wash

Federal Railways
 Reported by Commercial
 Attache Charles E. Lyon

Mess Geiss I koverhe
 Bresden 927
 Germany

POPULAR MECHANICS

10/16/32
 SPEECH NOTES ARE PROJECTED AS SPEAKER WRITES

Dept. of Commerce 9/12/32

standing in the woods. It is a far cry from hemlock trees to silk stockings or sheets of cellophane, but the pure cellulose base made from wood waste for over a year has kept the plant going full speed.

DAY AND NIGHT TRAIN SIGNALS MORE VISIBLE IN FOG

Functioning on the brightest day or the darkest night, railroad signals three times more visible in fog than the common wing-and-disk type have been tested in Switzerland. The "luminous signals" are said to have the same appearance to trainmen day or night. The system operates without complicated mechanical installations. Even in the most brilliant sunshine, the signals are conspicuously visible. Two, four or more lights may be mounted on each signal, which is set at the level of the engineer's eyes to avoid confusion.

AUTO-SLED HAS TRACTOR DRIVE FOR SNOWY MAIL ROUTE

Two extra wheels and tractor drive, together with sled runners for the front axle, have solved the winter problems of an Iowa mail carrier. The equipment to convert his small car into an "auto-sled" now has been placed on the market. The runners are not placed under the front wheels, but are attached to the axle with the bottoms slightly higher than the position of the tire on the road. In deep snow, the runners carry part of the load, making it easier to drive in deep ruts. The extra wheels are attached to the front end of a special set of springs and the track is connected over the two tires.



Runners, Attached to Front Axle, and Two-Extra Wheels with Tractor Drive Convert This Car into an Auto Sled

Eschmobele Co.
 Alma, Wis.



Drawings and Notes Made by Lecturer Are Flashed on Screen as He Writes and Talks

Helping the speaker and lecturer to illustrate his talk, a new projector throws on the screen the handwriting and drawings of the speaker as he writes. It permits the illustrations to be presented without the aid of a second person and without the speaker being forced to turn his back to the audience to write on a blackboard. The speaker, as he faces his audience, writes in the usual manner on cellophane. His writing is projected onto the screen through an arrangement of lenses and an inclined mirror. As the writing surface is filled, it is turned to present a fresh space by means of a small knob without any interruption of the lecture. Or, if the speaker should desire, the notes and drawings may be placed on the cellophane before the speech and then flashed on the screen at the proper point in his talk. Lantern slides may be projected simply by laying them on the illuminated surface of the apparatus. The lecture room need not be completely darkened, since only the projection screen must be shielded from direct light.

Dried sweet milk is being used as a fish food to raise trout.

Esch Hatchery
 Madison, Wis.

Dr. Nath. Seeger's

1602

Automatic Barrier That Is Raised by the Animal as It Approaches Hurdle



HORSE OPERATES OWN HURDLE WITH AUTOMATIC BARRIER

Horse jumping is made safer for both the rider and the animal by using an automatic barrier that is raised into position by the horse itself as it approaches the hurdle. Formerly, in training horses to jump, human hands raised a pole just as the animal began its leap. Many horses balk at this method and refuse to leap when suddenly confronted with a higher barrier. With the automatic barrier, a thread is broken by the horse as it approaches and the pole is raised into position so quickly before the jump that the animal does not have time to refuse to take the leap. It follows, therefore, that the jump is made with proper posture and greater safety.

RAILROAD COVERED WITH GOLD LOST FROM CARS OF ORE

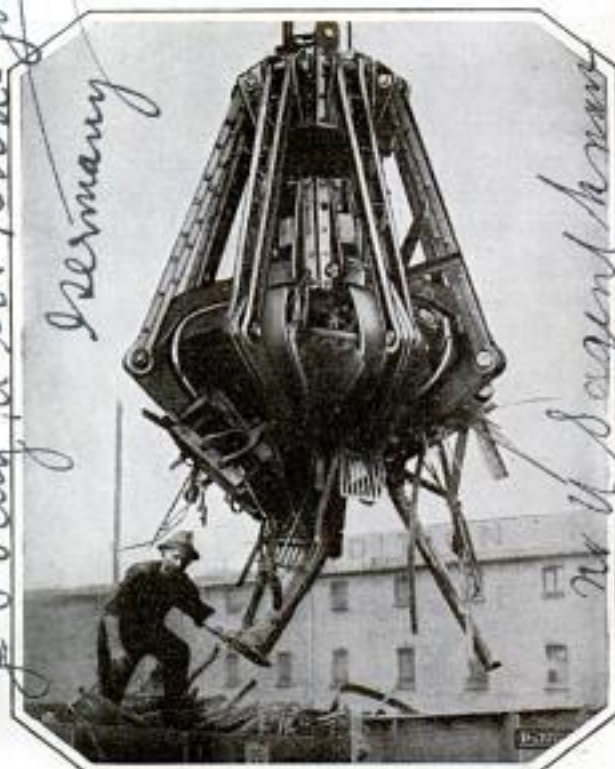
Less than half a mile of railroad track used by a western gold mine recently yielded over \$5,000 in pay dirt in one month after a weigh master noticed that the right of way was literally paved with gold. Before the ore was sent through the various processes, each car was weighed, and this was done by pushing it on the scales, then giving it a shove to send it coasting down the track to the mill. The

weigh master observed that each time a car was bumped in switching, a quantity of dust sifted out. A lease was obtained on the three-eighth-mile track and men began cleaning it up. Ore valued at \$175,000 a car has been shipped to this mill, and it has been estimated that the residue dump alone contains unclaimed gold worth \$3,000,000.

1657

POWER SHOVEL LIKE OCTOPUS HANDLES SCRAP METAL

Built to operate something like an octopus, a large power gripper is being used in Germany to handle scrap metal, tangled wire and many other materials difficult to move otherwise. It has either six or eight long arms which extend outward from a central axis. When these arms are opened by powerful springs the shovel looks like six sections of an orange peel laid back so the fruit can be removed. This arrangement gives the gripper an extraordinary reach, and when the jaws close, they hold the load in a viselike grip. The gripper can handle 100 tons of ore an hour and has a capacity of two cubic yards. It can be suspended from a crane and is operated from a motor drive through a system of pulleys.



Power Shovel with Six Jaws for Handling Scrap Metal and Other Unwieldy Material

Mr. Paul B. Flynn Missouri
St. Louis, Mo.
1629
Mr. W. W. Garrett
1524 N. Lincoln St.
Colorado Springs

Polzig & Co. Köln, Germany

Golden Cycle Mill
Cripple Creek Colo.
Polzig & Co. Köln, Germany

1477

Cont. Walter E. Burton

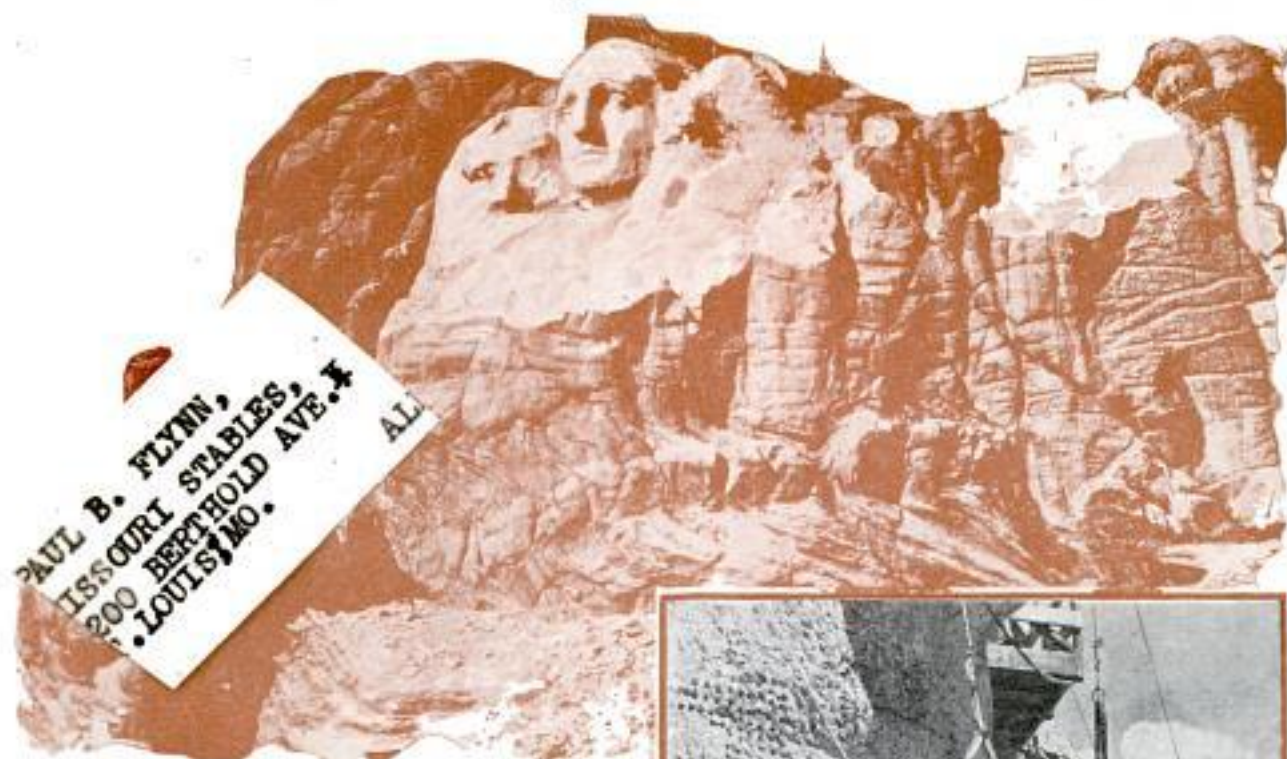
1027 Florida Ave

POPULAR MECHANICS

929

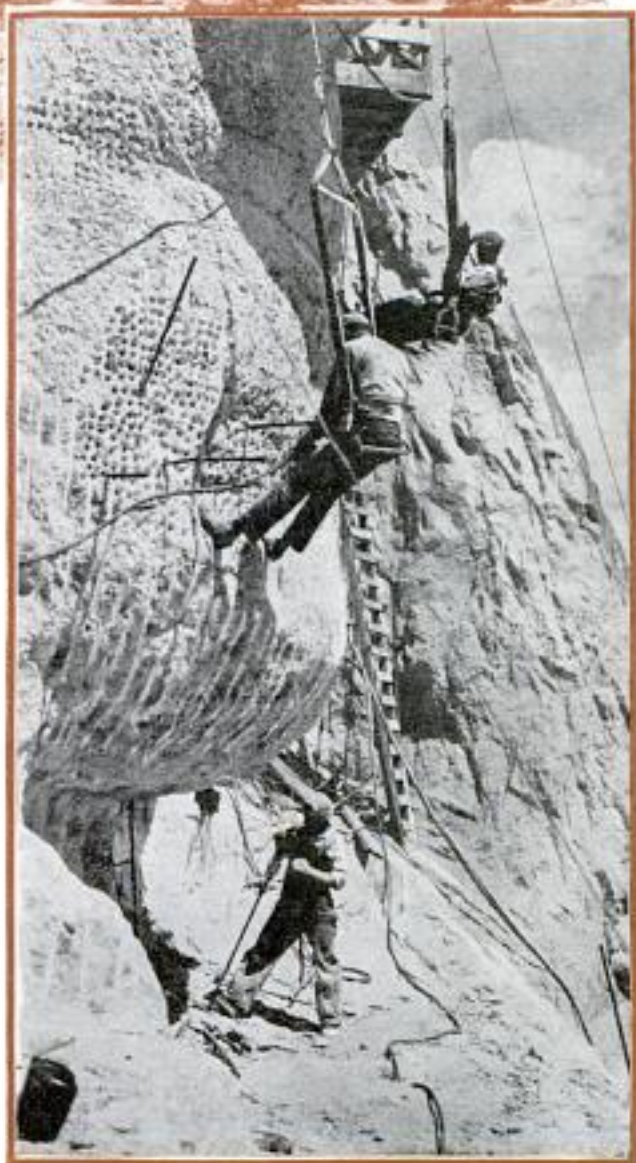
Abram Alts

Sculpturing with Dynamite on Mountainside



Top, General View of Memorial on Mt. Rushmore; Bottom, Close-Up of Mouth and Chin of Washington Head, Showing Holes for Light Blasts

Replacing the sculptor's chisel, dynamite is being used to blast the figures of men on mountainsides as everlasting memorials to the nation's leaders. On Mt. Rushmore, in South Dakota, the heads of Washington, Jefferson, Lincoln and Roosevelt are being carved in giant dimensions by explosives, while the figures of the South's leaders in the Civil War are taking shape on Stone Mountain, near Atlanta, Ga. Gutzon Borglum, famous sculptor, who is directing both jobs, has developed a technique of drilling and blasting to such a degree that he can shape a nose or chin on one of the giant heads to within an inch of the finished surface. Even lips, nostrils and eyebrows are fashioned with dynamite, while more delicate work is done by using only blasting caps. Fifteen men using explosives can accomplish in six weeks what it would take hundreds of men three years to do under old methods. The cost is estimated as one-sixth that of a few years ago. The work of carving with dynamite is not done haphazardly. First the area is measured, the features blocked out and the stone marked. High points, such as the end of a nose, a chin or cheeks, are located. Test holes are



drilled to a depth of three feet to reveal the nature of the rock.

see also Frontiers Nov. 1932.

001578 Cont. H. J. Williams, Esq.
930 Colombe, 29, Beau Road
POPULAR MECHANICS
Dexter Heath, Mr. Fudon Esq.

One Man to Control Traffic on Super-Road



Artist's Drawing of Control Station on Super-Highway in Europe Shows Toll Booth, Hotel and Shops; Note the Arrangement of Approach Roads Which May Be Closed with Iron Gates

One-man control of traffic is provided for a super-highway for automobiles between Evian, on the French shore of Lake Geneva, and Lyons, on the Rhone. The road, 143 miles long, will ascend from national highways by gradients. To avoid congestion and to prevent autos from cutting in on each other's route, access to the highway will be by four roads. Cars on each access route will run in one direction only, the one-way routes being separated so adjoining streams of traffic will flow in opposite directions. Down the middle of the road will run a paved way, under which light and power cables will be carried, and where the super-highway approaches a junction with the ordinary lower road, the central pavement will be widened to form foundation for a station to collect tolls from motorists using the special road and for a hotel and shops. One man at this central station can control traffic and can halt law violators or bandits by closing the access roads with grided doors. Stations along the highway will be in telephone communication with the cen-

tral station, and the road will be lighted. No curve will have a radius of less than 545 yards, nearly one-third of a mile, so autos may hold speeds of 100 miles per hour around the curves without danger of overturning. The road will have a lower layer of metal and rubble, then one of concrete and, finally, granite and other hard stones to withstand wear. Germany also is planning a special automobile highway from Hamburg to Basel to link up with the Italian road being built from Milan. Holland has in view a long auto road linking Amsterdam to Antwerp and Brussels, in Belgium, and thence to the new highway which France will build from Paris to the port cities on the English Channel. Spain plans a Madrid-Irun highway.

ROCK FORTS OF THE ANCIENTS FOUND IN FAR NORTH

Rock fortresses, used by people of the far north many centuries ago, have been found off the coast of Kodiak island, Alaska. Dr. Ales Hrdlicka, of the United

Science Service
9/15/32
reprinted material

00 1578.

POPULAR MECHANICS

States National Museum, discovered ruins of villages on the summits of high cliffs, almost inaccessible. To reach the top is a real "mountain-goat climb," and Doctor Hrdlicka could not carry even a spade or camera up the cliff that the ancients once climbed with all their supplies. Doctor Hrdlicka believes that the rock fortresses were selected as protection against enemies who might have sought to seize the cliff dwellers' collections of sea-otter skins. Among evidences of higher culture found by Doctor Hrdlicka on the island were beautifully shaped knives of slate, lamps made from rounded pieces of basalt and granite, carvings of fossil ivory with one well-executed portrait of a man, and picture writing on the rocks.

13/62

TEAR-GAS GUN FOR WRIST IS FIRED BY STRING

Only a flick of the finger is required to fire a small tear-gas gun that is worn on the wrist concealed by the coat sleeve. The weapon straps in place like a watch, and a small wire leads from the trigger to a ring on the middle finger. Simultaneous uplifting of the arm and crooking of the finger discharges the pistol, releasing enough gas to rout a gang of bandits. It is suited particularly for bank messengers or others facing the hazard of being held up.

Presto Tear Gas Gun Co.



Wentworth 1949

Tear-Gas Gun for Wrist Which Is Fired by Wire Leading from Trigger to Ring on Middle Finger

*Dr. Wm. Elmer Carlstrom
665 W 63rd
Chicago*



Comparing Weight of Young Woman with That of Osmium, Heaviest Metal, Magnesium, the Lightest, Gold, Lead and Water

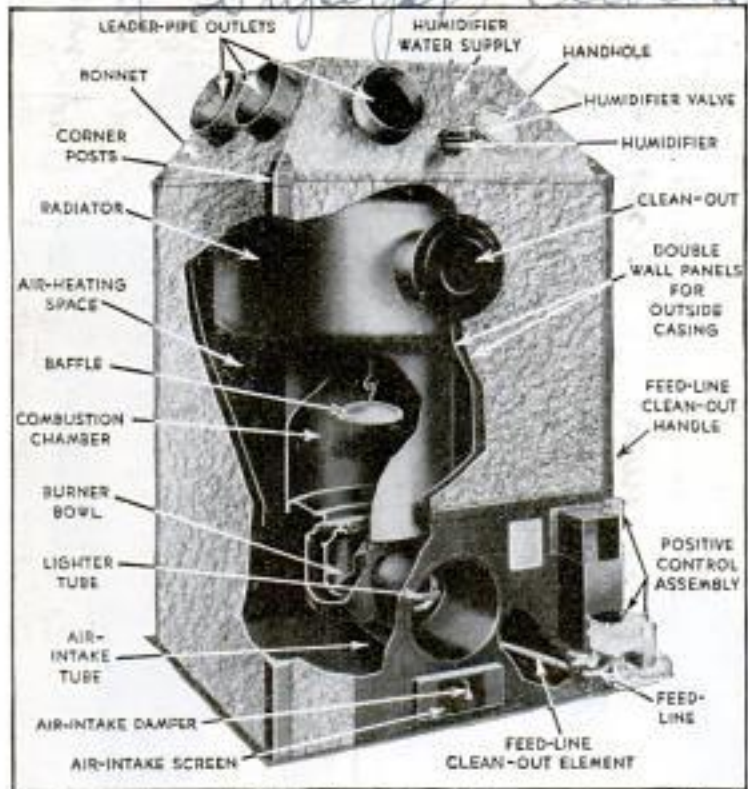
HEAVIEST METAL OUTWEIGHS LIGHTEST FOURTEEN TIMES

Osmium, the heaviest of commoner metals, outweighs magnesium, the lightest, by about fourteen times. A slab of osmium, one foot square and slightly more than one inch thick, weighs 135 pounds, the weight of a young woman who helped in recent tests on metals. A slab of magnesium one foot square must be approximately fourteen inches thick to weigh 135 pounds. Lead, regarded by most people as the heaviest metal, weighs only half as much as osmium, since a one-foot slab must be about two inches thick to weigh 135 pounds. A block of gold, one foot square, would have to be one and one-quarter inches thick to weigh as much as the young woman. By contrast, 135 pounds of water occupies two cubic feet.

*Aluminum Company of America
Chicago, Ill.
Belmont
Smelting & Refining Works
320 Belmont Ave
Brooklyn, N.Y.
Aluminum Co.
Academy of Natural Sciences
Philadelphia*

B1564 Perfection Store Co
7609 Piatte Ave

(Superior) Cleveland



Sectional Picture of Oil-Burning Hot-Air Furnace Showing Simple Operation; No Outside Power Is Necessary

OIL FOR HOT-AIR FURNACES IS FED BY GRAVITY

Automatic furnaces that burn oil have been produced for heating the home with warm air. No electricity or other outside power is necessary, the oil flowing from a storage tank into the burner bowl through a constant-level valve. To light the furnace, a crumpled newspaper is used, the burning paper vaporizing and igniting the oil. Draft control is so constructed that the heated combustion products pass directly into the chimney when the furnace is first lighted. After the chimney is heated to the right temperature, it produces the correct draft for perfect combustion. The direct opening from the combustion chamber to the chimney closes and the hot gases then pass through the radiator before reaching the chimney.

PILOTS CAN ASCEND TEN MILES WITHOUT DANGER OF DEATH

Airplane pilots could rise to altitudes of 50,000 feet, or nearly ten miles, without danger of death from such experiences, if the nitrogen gas in their bodies were expelled by breathing oxygen for an hour before such ascents. Sir Leonard Hill,

British physiologist, has reached this conclusion as the result of experiments on animals under low-pressure conditions. Previous tests in France had led to the opinion that 45,000 feet would be the limit that could be attained by a pilot even when oxygen-equipped, unless his body were inclosed in a pressure chamber to shield him from the effects of such great height.

B1665 "ROBOT" RECORDS LOST TIME IN PRODUCTION

Efficiency of production machinery and operators is constantly and accurately checked by a recording instrument which furnishes a visible chart of all idle time and the reason for interrupted production. This recorder is energized by the lighting circuit and may be adapted to virtually any type of production machine. Whenever the equipment is shut down for any reason—lack of stock, inspection, repair, tool grinding, set-up, etc.—the operator registers the cause by dialing the symbol, and the chart times the delay in minutes. During idle time, a red light flashes to



Recording Instrument Which Checks Idle Time for Any Machine and Reason for Non-Production

advise the foreman that production has stopped.

in nature of M. Marton & Linden W.C. Eng

Chronology and Natural Science

Chicago - 501 S. Dearborn

Science News Letter 9/24/32

Rich Eszaybar Electric Co 420 Lexington Ave New York

B1583 Cont. John L. Coonty
2910 Pennsylvania, D.C.

Washington, D.C.

PERILS of the SKY SCANNERS

HOW would you like to be marooned for long winter months on a mountain top with no one to keep you company save the howling wind and drifting snow?

How would you like to have your supplies, when your winter's cache had been depleted, brought you and flung at your door from the airways of the world?

How would you like to be let down the side of a precipice hundreds of feet by a rope until you could get a footing to ski off to the nearest village for medicine and help in case of sickness?



Top, Airway-Station Attendant Going down Mountain for Supplies; Below, Beacon Tower Whose Flashing Light Guides Pilot through the Night



Such is the life of Uncle Sam's keepers of mountain radio beacons who, high on lonely Sierra and Rocky mountain outposts, wage a constant battle with the elements and often, during the winter, find themselves shut off from civilization.

These stations, which might well be termed "lighthouses of the land," serve with their flashing lights the progress of hundreds of planes that beat nightly across the continent and up and down the west

B1583



coast. Their keepers must always be on the job.

At the Donner summit, California, airway weather-reporting and radio-range station, snow commonly lies at a depth of twenty feet, and sixty-five feet has been recorded. During the winter, therefore, these stations are snow-bound and accessible only from Norden, a rail station two miles distant, by skis or snowshoes up the steep slope of the mountain. Sometimes the keepers must go to Truckee, ten miles away, for supplies and medicine.

"At such times," says the station keeper, "we let ourselves down the mountainside by ropes until we come to a place where the snow lies sufficiently level to let us stand and walk. Then we begin our struggle for Truckee. Blinding glare and nasty spills mark our descent. Hours are spent scouting drifts, and care has to be taken not to start a slide. With wind velocities up to sixty-five miles an hour, one can realize the struggle to exhaustion that is often necessary to gain again our eerie castle."

The establishment of the Donner summit station presented as great difficulties as ever encountered by the keepers in going to and from it in the most terrific weather. Dog teams were necessary at times to transport the heavy steel for its construction. Steel masts were used owing to the presence of wood-destroying termites. Solid-rock surfaces made it nec-

essary to blast post holes for the radio masts. The houses were built on foundations laid above the rock surface as a protection against the deep snows.

Another instance of difficulties encountered in the establishment of airway beacons is that of the



Above, Donkeys Carrying Supplies to Mountain Airway Station; Below, Searching for Weather Data in the Sierras

light at Spencer, Idaho. It so happened that the site of the beacon lay some distance from the nearest available source of electric current. To supply this new station it was necessary for the engineering crew to lay a power line 6,700 feet. "No sooner had we set about this work," says the report of the engineer in charge, "than a heavy snowstorm set in, followed by hail and sleet. It looked as if the work would have to be suspended.

"We were undaunted, however, and pushed ahead with the work following the let-up of the sleet. Here we ran into a new problem. The sleet had coated the poles an inch or more in depth, making them extremely dangerous to handle. Pack animals became necessary to drag them to their places where, eventually, they were

031652.

set up. Then, as if to celebrate the occasion, the storm broke loose again, but the work continued, and within thirty days, the power line was in and the beacon lights flashing.

Airmen flying these western storm areas can depend at any time, day or night, upon these beacons. The keepers are always there, and a maintenance automobile visits them regularly, making its rounds regardless of the weather. The crew replaces lights, repairs equipment and checks over generally the condition of each station. These maintenance crews care for ten to twenty stations each, depending upon their distances apart.

Not infrequently missions of mercy are performed by these federal outposts. The most notable of these, perhaps, is that of the rescue mission to the Indian tribes in the vicinity of Winslow, Ariz. These tribes cut off from their homes by heavy snow, were facing starvation on a high, wind-swept mesa where they had gone to gather pinion nuts, their favorite food. During the time the planes were in the air, they were in touch with the nearest airway radio station.

On the daily log of this station, sandwiched between such entries as "All BCDS SKJS accomplished" (meaning all broadcast schedules accomplished); "No. 2 printer off; No. 1 printer on" (referring to the teletype writer machines over which weather information is sent and received) and "Time from NAA clock correct," came the messages that passed between the station and the airplanes that were delivering food to the stranded Indians.

BOOTBLACK'S SHOP ON WHEELS GOES TO THE CUSTOMERS

Shoe Support Attached to Rumble Seat of Auto to Transform Car into Shoe-Shining Parlor on Wheels



Carl Standen
Beverly Hills, Calif

When a California bootblack found business in his shoe-shining parlor falling off, he decided to take his business to his customers. By attaching a shoe support to the rumble seat of his automobile and loading the car with the various dyes, polishes and cleaning fluids, he evolved a shining parlor on wheels, then established a regular route through Beverly Hills. Instead of shining one pair of shoes for each customer, he sometimes obtains half a dozen pairs at one call.

POWDER METAL IS SQUEEZED INTO SHAPE WITHOUT HEAT

031623

High pressure is supplanting heat in the manufacture of alloys from powdered metals. Instead of being melted and poured into molds, metal can be shaped at low temperatures by this process. The manufacture of "oil-less bearings" and the fabrication of objects from all ordinary alloys, and from mixtures that cannot be poured from a melting pot because of the great difference in the melting points of the metals involved, are among some of the possibilities of powder metallurgy. Alloys are obtained under this process by mixing the powders of the various metals in the proportions desired. It is not necessary to consider the different melting points, the chemical reactions or the mixing ability of the materials. Then the metal powders are put through the presses, emerging as an object that looks like solid metal. The product is said to be strong.

THIMBLE HAS NEEDLE HOLDER TO AID IN SEWING



To aid in sewing, a thimble with a needle holder has been introduced in Berlin, Germany. The holder grips the needle and helps pull the thread through thick materials. It consists of a small clip which is attached to, or rather part of, one side of the thimble.

Wid World
as seen at Reichs
Inventoren Verein.
House of Technics.

Charles Hardy, Inc
4.15 Lexington Ave
New York

Parham Secman

Emb. Joseph W. Mountain, 2709 Alhambra Ave. Los Angeles, Calif. 9/21/37

B1654

magnetic near B
421 ~~Selma Ave~~
Los Angeles Calif

Com. Frank H Cross
Box 124, Bakersfield
Calif

936

POPULAR MECHANICS

Portable Neon Sign
Operated from Two or
Four Dry Cells Which
Will Run It Continu-
ously, Night and Day,
for Six Months

Santa Monica
California



production is obtained, the company expects to load ships from storage tanks at the well instead of through a pipe line to shore. To spud in an off-shore well, a surface casing, twelve to sixteen inches in diameter, is sunk into the bed of the ocean with a pile driver, the water removed from the pipe, and then drilling begins with regular rotary equipment and proceeds in the same manner as though the well were on shore.

VENTILATOR CLEANS AIR AND FITS ANY WINDOW

B1635

Portable and adjustable to any window, a new type of ventilator filters and washes the air before admitting it to the room. A flexible air shaft, attached to an adjustable steel window insert, is

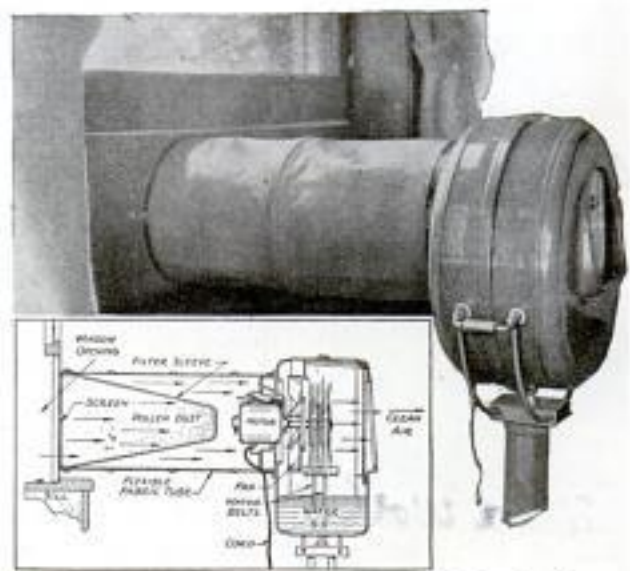
DRY CELLS OPERATE NEON SIGN AT LITTLE EXPENSE

Operating from two or four dry cells instead of the usual 110-volt lighting circuit, a portable neon sign, two by three feet in dimensions, is proving popular where electric current is not readily available. The self-contained flashing sign is used as a warning signal at railway and street crossings, and can likewise be employed by shops in advertising. The message may be changed quickly, and little current is required to operate it. The display carries three neon tubes and it is claimed one set of dry cells will run it continuously, night and day, for six months. Various colors and types of lettering are obtainable.

lined with a felt filter sleeve that removes ninety-seven per cent of the pollen from the air, besides the larger particles of dirt, dust and soot. Passed on to the washer, the air is cleansed by being forced four times through water and then is released into the room. Capable of washing and deodorizing 6,000 cubic feet of air each minute, the ventilator will refresh the air in an average-size room in twenty minutes. The machine's pollen-removing feature gives hay-fever and rose-cold sufferers considerable relief.

OCEAN BEING DRILLED FOR OIL FROM STEEL ISLAND

Off shore near Ventura, Calif., a steel island has been constructed in the ocean, and from a derrick mounted on it, a company is drilling in the sea for oil. Off-shore drilling for oil along the California coast heretofore has been made possible by the use of large steel and concrete piers, but the steel island does away with the piers entirely. All equipment, including boilers, is located on the island, and if



Filter and Cleaner Rapidly Refreshes Air in the Home; Drawing Shows How It Works

Com. Frank H Cross
Box 124
Bakersfield
Calif

Indian Petroleum &
Seacliff oil field

Swartzbaugh Mfg Co
1336 W. Bancroft
Toledo, Ohio

material

B1386

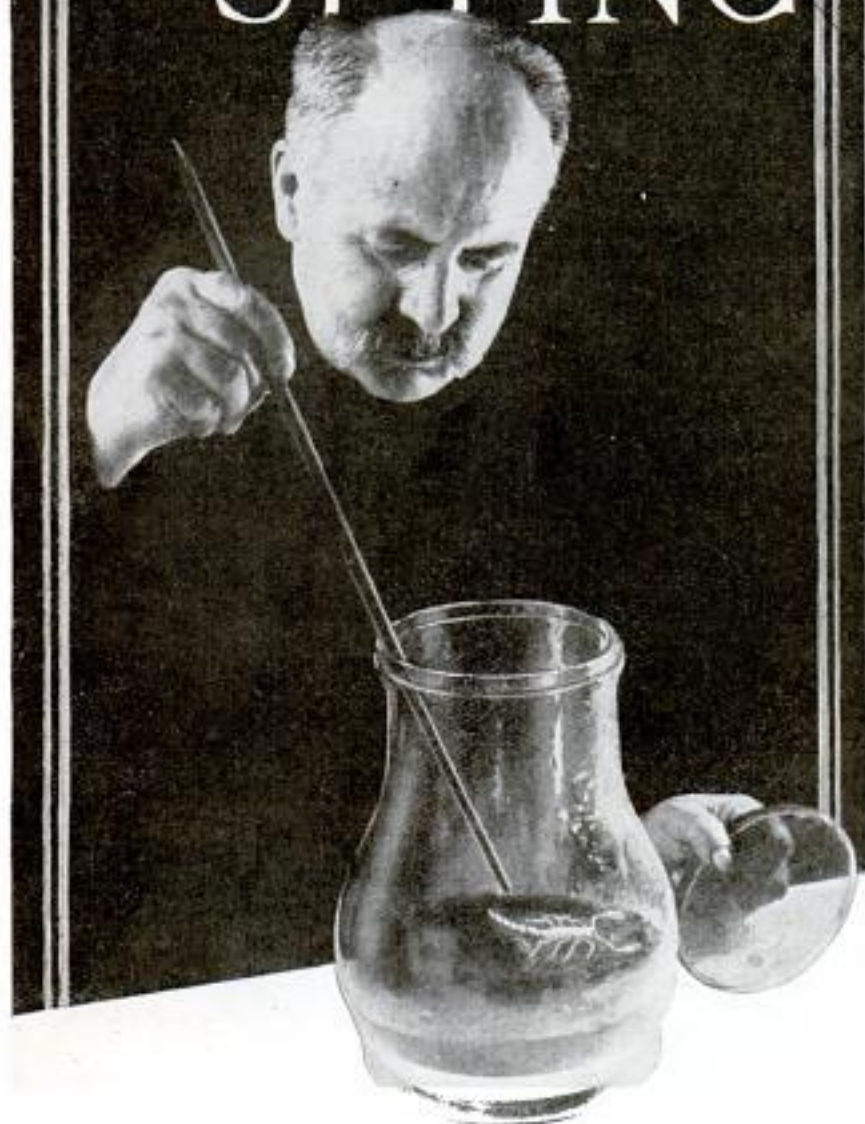
199 Puritan Ave
Forest Hills Garden
L. I. New York

SPYING

on the

By

BOYDEN SPARKES



Poisonous Scorpion in Its Glass Cage in the Insect Zoo Where Rare Specimens Gathered from All Parts of World Are on Exhibition

BUG hunters have just as many thrills in their lives as their fellow scientists who stalk head-hunters in New Guinea; who dig for fossilized remains of dinosaurs in Mongolia, or who try to find some fresh morsel of natural fact behind the ice barriers of the polar regions.

One big advantage of the bug hunter over those engaged in other branches of natural science is that, if circumstances compel, he can find material for a lifetime of study among the insect creatures of his back yard. Yet the bug hunters, too, go to the ends of the earth in pursuit of interesting specimens and facts about them.

So it was that Dr. Frank E. Lutz, curator of entomology at the American Muse-

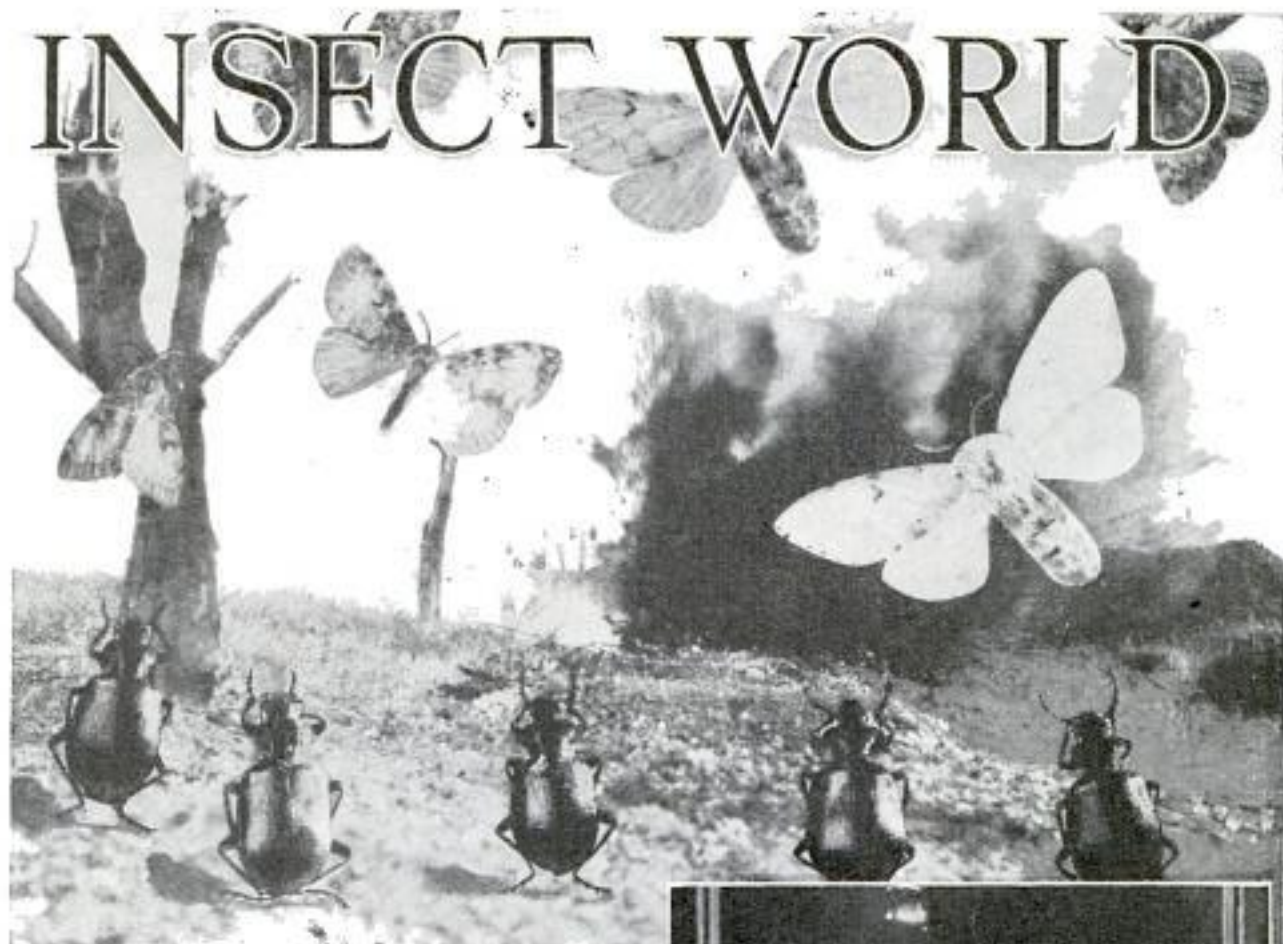
um of Natural History, went with an expedition of some of his associates to Barro Colorado island. In constructing the Panama canal, American engineers flung a dam across a tropical river. The waters of a new lake—Gatun—rose in the mountains, and one peak that had been undistinguished was engulfed until only its green top rose above the surface. This is Barro Colorado island.

It was a temporary nest or bivouac of army ants that held the attention of the entomologists. What they found was a fabric of living ants, their claws interlocked to form a curtainlike shelter for the queen and her brood. In defense of these, the soldiers are at all times ready to fight and die. Here is a loyalty untainted by individual cowardice, and it is in probing into such matters that entomologists find as much that is fascinating as Roy Chapman Andrews might in sorting through old bones in the dried-up swamps of the Gobi desert.

Army ants, as Dr. William Morton Wheeler has pointed out, correspond to the nomadic hunter stage of human development. They have no fixed abode. They are pure nomads and carnivorous; more or less constantly on the march, they ravage as they go. Their bivouac is a tent formed of the bodies of the living ants themselves. In the present instance, according to Herbert F. Schwarz, who accompanied Doctor Lutz to the island, the living curtain of ants was suspended from

New York City

INSECT WORLD



a tree trunk at a level only a few feet above the ground. The trunk was slightly in-sloping toward its base, thus forming a somewhat cavelike hollow, of which the ants had availed themselves. A liana that crossed the trunk near this point served as an additional support for this animated tapestry.

You might actually have thrust in a stick and tugged at this vital textile without ripping the almost clothlike shelter the ants had formed about that which was precious to them. Along the line of march of the ants there were here and there smaller clusters of the insects comparable in structure to the large nest, constituting possibly temporary caches. But to return to the main nest.

Doctor Lutz determined to take this curious fortress. The big catch, of course, is the queen and he got her along with most of her people. First he put down a barrage of kerosene. Beside him was a bucket of formaldehyde and he was armed with a long-handled shovel.

Then he reached for the nest with the blade of his shovel. A substantial part of



Top, Beetles Imported from Japan Routing Gypsy Moths; Below, Watching Honey Bees at Work

the army ants had been tossed, still clinging as a fabric, into the killing fluid before the insects could organize a defense. A few did climb the handle and bite Doctor



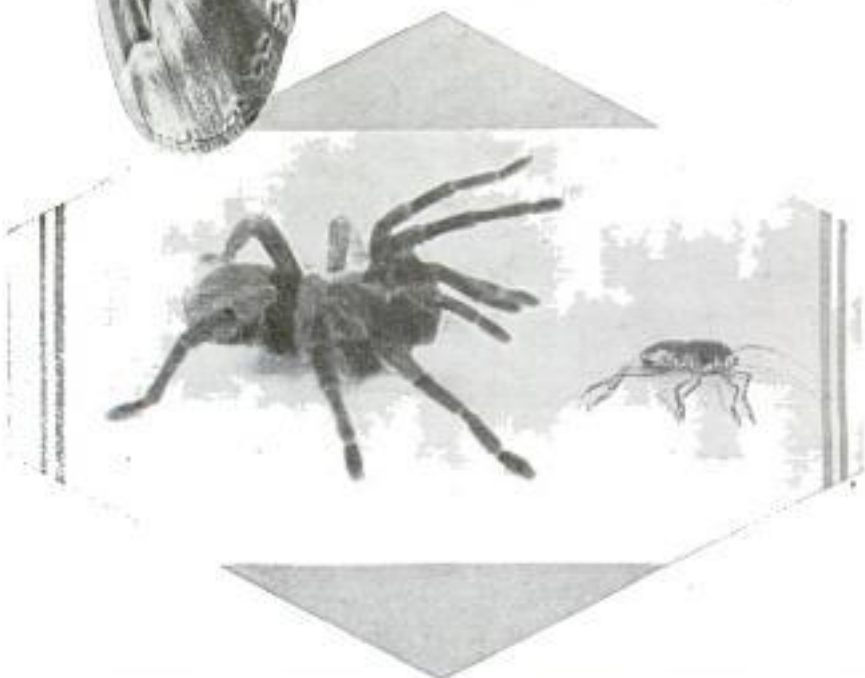
nowadays may press their noses close to a glass jar in which the single dreadful inhabitant is a hairy, black tarantula. An angry rattlesnake might be more easily avoided than the silent rush of this eight-legged, venomous giant of the spider family. Some of the largest specimens are found in tropical America, but these creatures are to be found also in Arizona, New

Lutz. But he did not cease his frantic shoveling until the inner defenses of the fortress had been laid bare and the queen was observed in efforts at escape. Quickly Doctor Lutz reached for her with his forceps and felt that with her capture he had acquired a valued specimen.

From times far in the past primitive peoples have used these army-ants' powerful jaws as surgical instruments. Instead of stitching a wound, it was their custom to draw the lips together and then, one by one, hold angry ants so that their closing mandibles would serve as stitches.

Elephants? Where the elephant hunter stalks his game in Africa there, too, must go the bug hunter who would capture the giants of beetle kind. As the smaller species, which any country boy knows as the tumble bug, center their existence around cows, so there are beetles of an appropriate size similarly linked to the destiny of elephants. *Megasoma Goliath* is of such proportions that Jack Dempsey could not conceal one in his closed hand.

Under the direction of Doctor Lutz, the American Museum of Natural History has established an insect zoo. Visitors there



Above, an Atlas Moth, One of the Largest of "Butterflies"; Below, Tarantula Pouncing on Cockroach

Mexico and Texas. Feeding time for the tarantula is as exciting a moment for the visitors to this zoo as similar occasions in the lion house, and he would be an unusual person who did not feel a shudder as a cockroach is dropped into the glass cavern of this evil thing.

"How many sorts of insects are there?" I asked Mr. Schwarz.

"No one knows the answer to that," he replied. "Certainly there are in excess of half a million known species. New species are constantly being added to the list. Obviously, then, there is plenty of work to be done by those of us who devote ourselves to the subject."

Plenty is the word; as a matter of fact,

(Continued to page 132A)

address unknown



clerk

Two-Man Pursuit Plane Recently Developed for the Army; It Is as Fast as a Single-Seater and Has the Added Advantage of a Gunner in the Back to Protect Craft from a Rear Attack

PURSUIT PLANE FOR TWO MEN DEVELOPED FOR ARMY

and delivered to the army, the first of several such craft to be added to its flying forces. The two-seater has all the speed of the single fighter with the added advantage of a gunner in the rear seat for protecting the area back of the pilot.

Although experts have always maintained such a ship was impossible, a two-man pursuit plane has recently been built

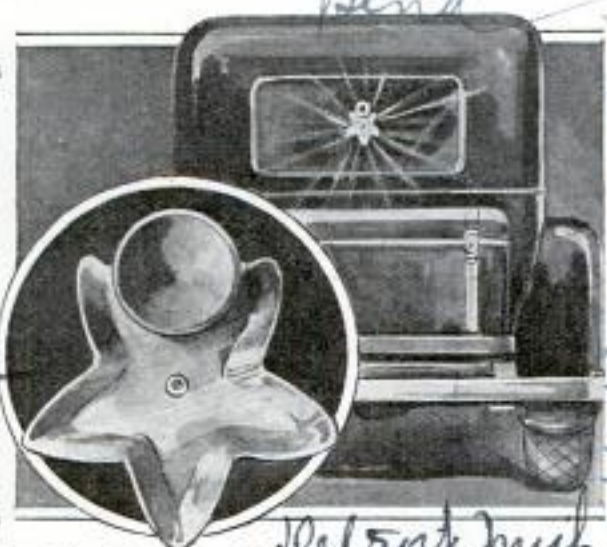
B:598

REFLECTOR FOR CAR WINDOW HELD BY VACUUM CUP

inside by a vacuum cup. In case the tail light fails, the reflector throws back a brilliant red light as it is struck by the beams from the headlights of a car in the rear. The reflectors are also used for side windows to warn drivers approaching from cross streets.

Added safety for motorists at night is provided by a star-shaped reflector for the rear window which is held in place on the

sample 10 cents



Star-Shaped Reflector for Rear Window of Auto; It Is Held in Position by a Rubber Vacuum Cup

COOLING MAIL TUBES SPEEDS UNDERGROUND DELIVERIES

B:1719

To prevent overheating from friction, a refrigerating system has been installed in the underground mail tubes of the Berlin post office. These tubes, operated by compressed air, are used in handling special-delivery mail, and it was found necessary to install the cooling system in the busy section connecting the post office with Templehof airport. Letters are dispatched from the main post office direct to the airport without stops en route by use of a system of switches which enables the substations to route mail past them.

Dept of Commerce 9/27/32

Delbert Mich

Jenkins Enterprises Co Berlin, Germany

12558

Pinehurst Ave

B 1691

Welding and erecting roof

J. R. Welding Co

POPULAR MECHANICS

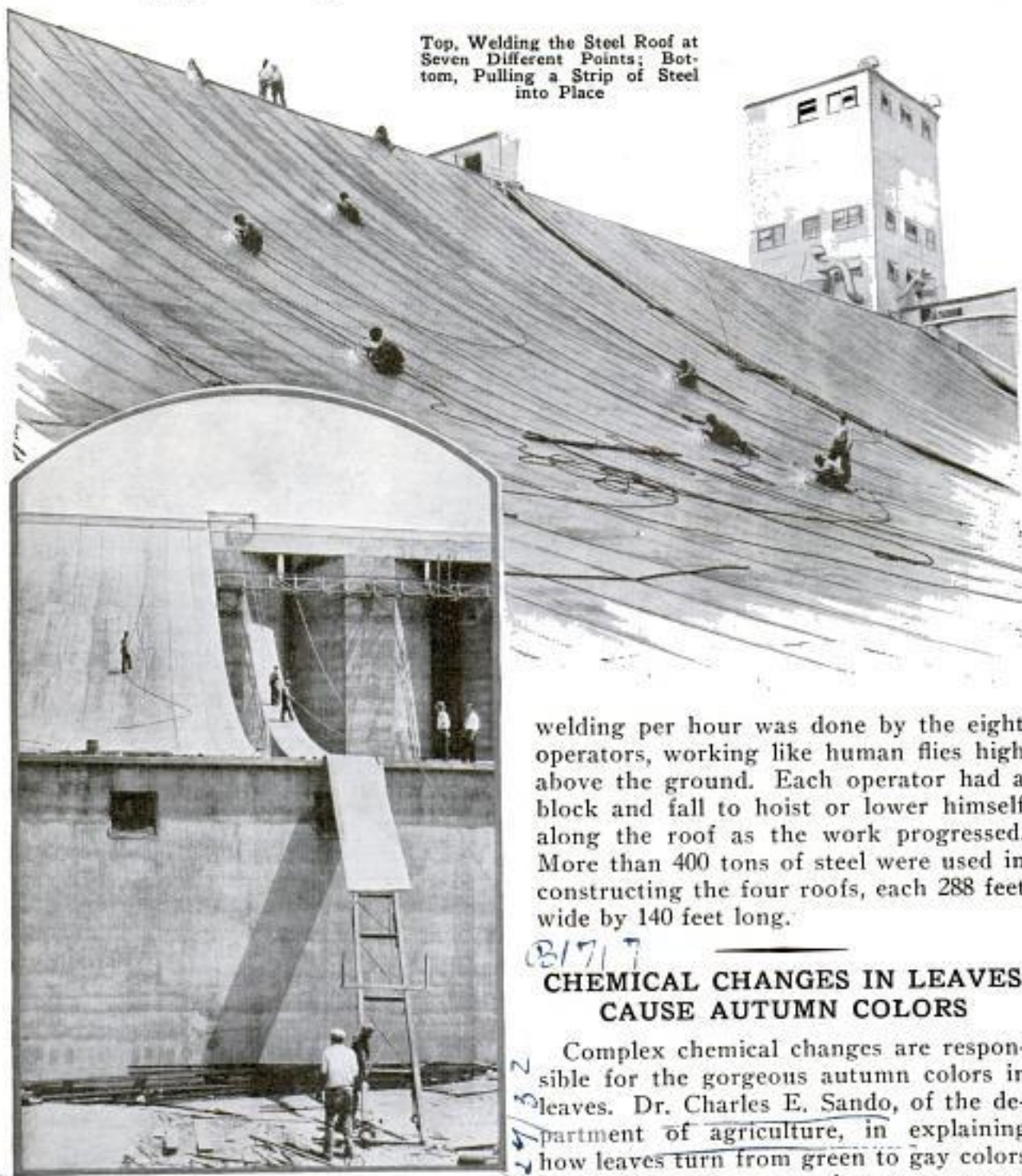
138 Centre Street New York

942

Self-Supporting Steel Roof Made by Welding

Erected by Lincoln Electric Co 13010 Cortz Road Cleveland Ohio

Top, Welding the Steel Roof at Seven Different Points; Bottom, Pulling a Strip of Steel into Place



welding per hour was done by the eight operators, working like human flies high above the ground. Each operator had a block and fall to hoist or lower himself along the roof as the work progressed. More than 400 tons of steel were used in constructing the four roofs, each 288 feet wide by 140 feet long.

B1717

CHEMICAL CHANGES IN LEAVES CAUSE AUTUMN COLORS

Complex chemical changes are responsible for the gorgeous autumn colors in leaves. Dr. Charles E. Sando, of the department of agriculture, in explaining how leaves turn from green to gay colors in the fall, points out that two general classes of chemical compounds, carotinoids and anthocyanins, help trees and plants dress up. Carotinoid pigments are present in all leaves but are masked most of the time by green coloring matter, chlorophyll, which is rapidly destroyed in the autumn, permitting the carotinoid yellow to be seen. If no other masking pigment is present, such leaves become pure yellow or orange, like tulip tree, willow and sassa-

Arc welding has made possible the first self-supporting steel roofs. No columns, stanchions or other supports were used, resulting in increased space in the four grain elevators on which the new roofs were laid at Albany, N. Y. Seventy-six sections of steel sheets, 140 feet long and fifty inches wide, were welded together to form a curving roof supported only at the top and bottom. Forty to fifty feet of

Built by New York port authorities for part of Albany

Science 9-27-32

Washington, D.C.

Copyrighted material

fras. The anthocyanins are dissolved in the cell sap and also are concealed by the chlorophyll, except in a few purple or bronze-leaved plants. When the chlorophyll is broken down, certain changes in the carbohydrate content of the leaves may cause an increase in the anthocyanins, resulting in strong reds and purples of sumac, blackberry, sweet gum and the oaks. Sometimes the two classes of pigments are found mixed in the same plant or tree, causing a gorgeous mottling of yellows and reds.

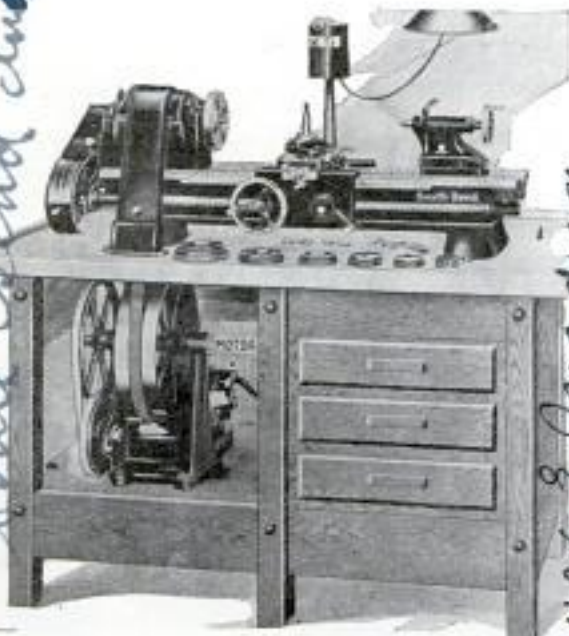
08/6/15

DOWN-PULL DRIVE FOR LATHES DECREASES VIBRATION

To provide greater steadiness and decrease noise, a small precision lathe with down-pull drive is being offered. It is driven by belt from a reversing motor mounted under the bench, directly beneath the headstock. Because of its compactness, convenience and safety, this tool is well adapted to the experimental, home or general repair shop. It is of the metal-cutting type but can also be used for turning wood, hard rubber and compositions owing to the wide range of spindle speeds provided by the back-geared headstock. There is an index plate which tells the operator at a glance the proper gearing necessary to obtain any desired power feed, and also shows the gearing for cutting various screw threads.

426 & Madison St
South Bend Ind

426 & Madison



Bench Lathe with Down-Pull Drive, Which Offers Greater Precision by Decreasing Vibration

South Bend Lathe Works.

05/6/81
HOSPITAL FOR TINY AILMENTS HAS PETS AS PATIENTS



Re me
Moss Monkey from South America Receiving a Pill in San Francisco Pet Hospital

Rare furred and feathered pets form the exclusive clientele of what is probably San Francisco's most unusual hospital. Here, birds and animals from all over the world receive clinical care to keep them fit in alien surroundings.

produced by John L. Sullivan

31731
FORTUNE WAITS FOR PROCESS OF SEPARATING METALS

Practical separation of mixed metals challenges the world's inventors and metallurgists. A fortune awaits the man who devises some machine or process for extracting the billions of dollars worth of rare minerals from that rich field in southern Oregon. Experts assert that this part of Oregon has more metals than any other district in the world, but they are so mixed that their full value cannot be extracted. Millions of dollars in placer gold have been taken from this area, but in addition, chrome-iron, platinum, palladium, iridium, osmium, ruthenium, tantalum, and many other rare minerals, that sell at \$19 to \$75 an ounce are present. But no practical method of separating the complex mixtures has been found.

Miss Jones
News Telegram
Portland Ore

☐ The ocean contains enough salts to cover the United States with a layer more than a mile and one-half deep.

Science News Letter

Copyrighted material
9/13/32

The RADIO DOCTOR

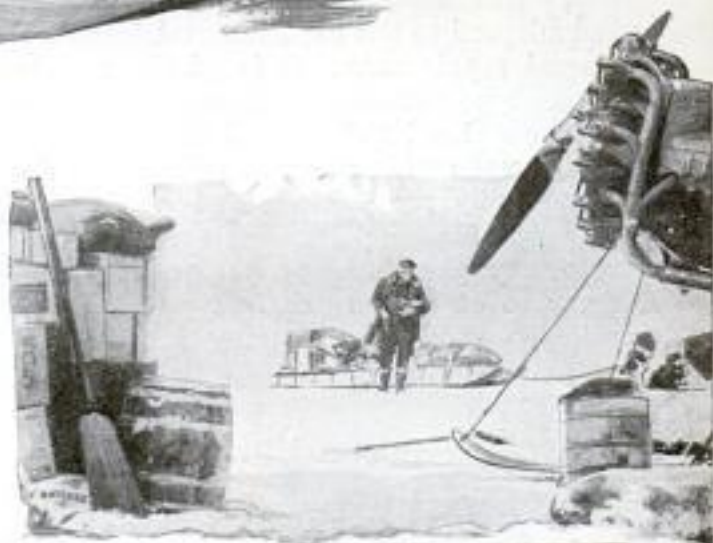


By JAMES MONTAGNES

IN the radio room of the Canadian government's department of marine, Ottawa, a message boomed out of the loud speaker. An operator decoded it on a typewriter, sent an answer, reached for his telephone, and called Dr. F. S. Parney. He repeated to the doctor the message he had just received. It had originated at the radio station at Cape Hope's Advance on the south shore of the Hudson straits, 1,200 miles north of Ottawa, over a desert region of rock and bush and unmapped lakes. The message asked for medical advice for a two-year-old Eskimo girl who was running a temperature.

The baby had a pain in the left side of the abdomen and had been given first aid. The doctor's reply by radio was to put the baby on a liquid diet for a few days. Five days later Doctor Parney was informed that the girl had fully recovered.

Doctor Parney is Canada's official long-distance doctor. His patients are as a rule anywhere from a thousand to two thousand miles distant. He diagnoses their ailments through the symptoms reported by short-wave radio from the distant Arctic. His instructions are winged back through the air, precise and detailed. To aid the



Top, Obtaining Medical Advice by Short-Wave Radio; Bottom, Arctic Plane with Engine Hangar That Provides Shelter for Nose Only

-Life-Saving in the Arctic



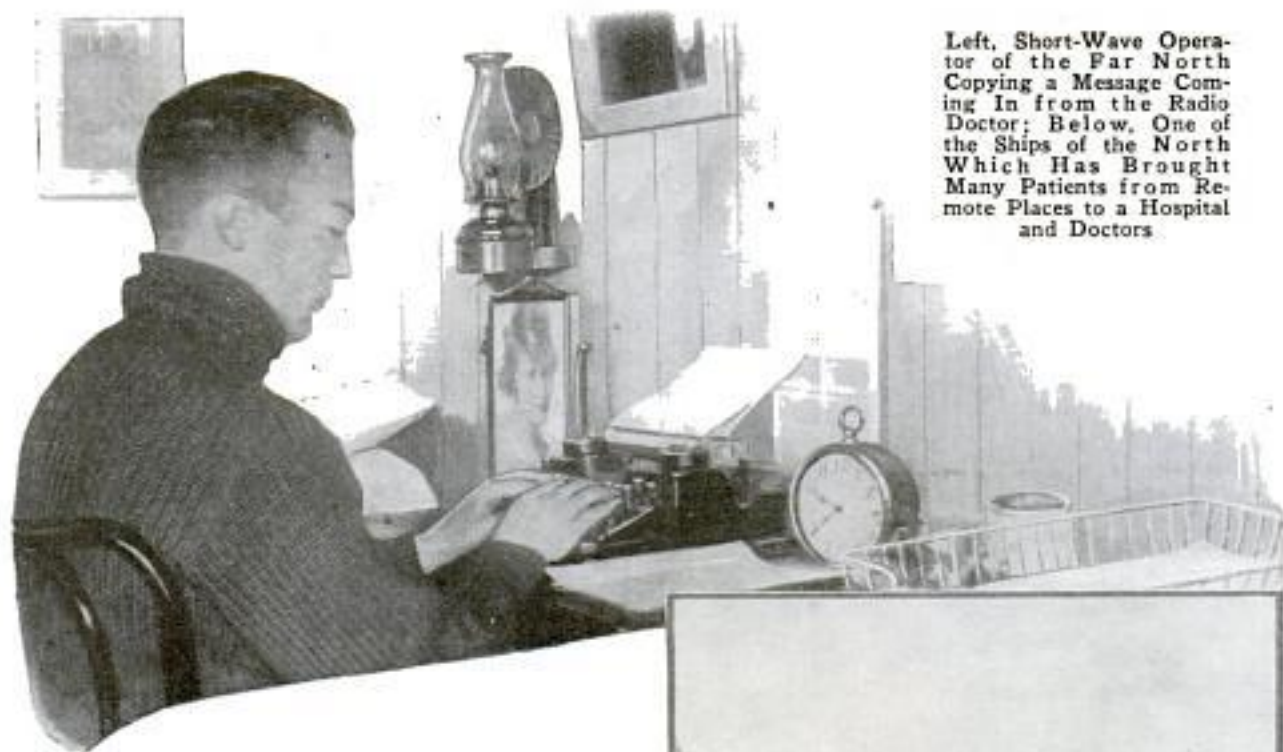
Above, Air-Ambulance Pilots Ready for Duty; Left, an Ambulance Plane of the Northland Refueling

Last winter a fishing boat's radio made contact with the Canadian government's station at Resolution island at the Atlantic entrance to Hudson straits. It flashed for advice for one of its sailors, who had been washed through a scupper door and had had half his scalp torn off and sustained a fracture. Resolution island called VAY, Cape Hope's Advance, on ship wavelength, and VAY relayed the message on the short waves to Ottawa, VAA. There Doctor Parney wrote out a very detailed message for the stitching of the sailor's scalp, and by way of VAA to VAY to Resolution island the message went, from where it was sent to the ship. A week later Doctor Parney was advised by radio that the fishing vessel had reached Reykjavik, Iceland, with the sick sailor still living and in the hospital there.

sick, the radio operators at Canada's northern stations are all equipped with a first-aid kit and a medical manual.

A trapper who had been wounded by one of his traps in the middle of winter, did not find his wound healing properly. He was sick, but harnessed his dogs and set out in the bitter cold to make the radio station at Cape Hope's Advance, fifty miles distant. Blood poisoning might set in, so he made the difficult trail to come staggering into the post. There the operators treated him, and summoned the radio doctor. The Ottawa physician advised an operation, and directed it by radio. The trapper recovered.

Two chains of radio stations are operated by the Canadian government in the northland, one along the Arctic coast and the other inland. From these stations come many calls in a year for medical aid, some requiring simple remedies, others operations. Experience has made the radio operators skilled in giving exact information over the air for the radio doctor. They have also learned to treat simple cases



Left, Short-Wave Operator of the Far North Copying a Message Coming In from the Radio Doctor; Below, One of the Ships of the North Which Has Brought Many Patients from Remote Places to a Hospital and Doctors

without assistance from Ottawa, and to do simple operations on instruction from the invisible physician.

To the most remote points in Canada, Doctor Parney is the only physician who can be reached. But to many other remote and isolated regions of the northland, medical aid can be speeded more directly. Doctors and nurses can reach northern posts quickly or patients can be brought to hospitals and doctors in short time. The radio doctor functions where no method of travel will bring medical aid in time.

Late at night, an Indian pulled a toboggan into a northern Quebec mining camp. His load was a man the Indian had found unconscious in the snow, his feet, hands and face frozen. The thermometer, when the man arrived, was fifty below zero. There was no doctor at the camp, no medical aid for miles. But an airplane was expected the next morning, and the man was made comfortable, till the drone of the big plane was heard above the blizzard which had started that morning.

The sick man was bundled into the cabin of the ship, an emergency gasoline cache serving to refuel the machine for its fight with the storm. Within an hour, the plane was off for the nearest rail point, 125 miles away. It was impossible to see twice the length of the plane, so thick was the snow. Below was bush, where a crash meant



isolation and possibly death from exposure. Landmarks were obliterated. Blind flying was the order of the day in this mountainous region. With but a gallon of gas left, the plane landed at its destination, where the patient was given immediate attention and put on a train for Quebec city.

Up in northern British Columbia, far beyond the railway, among high mountains, a man was seriously injured at a gold-mining camp by a premature explosion of blasting powder. It was hundreds of miles to the nearest town and medical

attention. A runner would have arrived too late. A radio transmitter was hastily rigged up, and put in working order by a radio amateur who happened to be at the camp. He made contact with Telegraph Creek, 280 miles distant. There a plane was requested and left for the camp. It was summer, but storms had been frequent, and now another came up after the pilot had left on the mercy flight. He was forced down in that wild bush country, but managed to take off again, to reach the camp in safety. There the injured man, his face and upper part of his body cut and burned, was put in the plane. The pilot headed for White Horse, Yukon territory, more than 300 miles distant. The flying ambulance encountered another storm, forcing the pilot to spend the night



anchored on a small unknown lake till the weather cleared. At White Horse, the patient was told he had a fighting chance to pull through.

Doctors and hospitals are few and far apart in the great northland. Distances are great and the weather is hard. Dog teams and canoes are slow means of travel where the lives of humans are at stake. To the subarctic and the arctic has come the fly-



Top, Typical Patients of the Radio Doctor; Center, an Isolated Canadian Radio Station; Left, a Northern Pilot in Flying Togs

ing ambulance, freighter of the air, recruited for mercy flights.

In an open two-seater plane, equipped with wheels and not skis, a pilot and mechanic set out one winter's day from Edmonton for Fort Vermilion, 400 miles north in the Peace river country of northern Alberta. A message had come from this pioneer farming settlement that an epidemic of diphtheria had broken out among the Indians. Carrying antitoxin serum, the plane battled extreme cold with its light engine for forty-eight hours and landed at



flights which consumed 128 flying hours. Gangrene poisoning is dangerous even with the best medical care. A trapper had been wounded in the jaw by the accidental discharge of a shotgun. This was 100 miles in the bush, and his companions brought him to the small post of Keg River in northern Alberta. Gangrene had already set in, the man's lower jaw and part of his tongue having been shot away. A runner made Peace river, the nearest settlement, in two days. A wire to McMurray air base, several hundred miles distant, started a plane at once for Keg River over unsettled bush. It took the pilot just seventy minutes to bring the patient to Peace river.

And so the radio and airplane are helping to save many lives in the Arctic.

HIGH PRESSURE TO GUARD HOME FROM UNWASHED AIR

High pressure will prevent dusty, untreated air from entering the home of the



Above, Radio Operators at One of Key Stations for Medical Aid; Below, Plane Which Saved a Patient Suffering from Appendicitis

Vermilion where the thermometer showed thirty-eight below zero.

The log of one of the largest airplane operators in Canada shows that the calls for plane-ambulance service are not only for trappers and miners. Included in this year's work of this company, was an Indian with lockjaw, a woman with a fractured leg, a nineteen-year-old girl seriously ill with tuberculosis, an Indian with a poisoned hand, an Indian woman who was so sick she had to be carried to the plane on a stretcher, a woman who tried to poison herself in a mining camp, and a man who had gone blind after an injury. This outfit last year made forty-five mercy

future. Donald R. Dohner, of the Westinghouse Electric and Manufacturing company, predicts that such a system will enable the human family to travel at a faster pace with greater efficiency and less fatigue. He says that future homes will be of welded steel construction, with aluminum roofs and well insulated walls and roof to keep out the winter's cold and the summer's heat. Central plants will heat or cool the home in addition to cleaning, conditioning and circulating the inside air. Less floor space will be necessary, says Mr. Dohner, pointing out that today's dining room, in use only a small part of the time, is particularly wasteful of space.

Chicago Post 10/1/32

Paul V. Alloughy

Director of
Engineering

*Carl Walker & F. Norton
1032 Florida Ave
St. Louis, Mo*

*B. F. Goodrich of B1728
Rubber Co
Akron, Ohio*

**RUBBER TO AVERT
ICE DANGER ON
AIR SCREWS**

By coating airplane propellers with rubber, engineers of one rubber company hope they have reduced one more aviation hazard. The "overshoes" consist of thin layers cemented to the metal or wood blades by a patented process. The rubber is treated with a lubricant which reduces adhesion between ice and rubber and prevents chilled vapor forming into thick ice on the blades. There is also a disk for the propeller hub to prevent uneven formation of ice about it. The shoes were tested in a refrigerated wind tunnel with satisfactory results, and are an outgrowth of the use of rubber on wings, rudders and stabilizers to prevent ice formation. It has been found that ice on blades without any protection usually breaks off in large chunks, throwing the propeller out of balance. The object of the coating is to cause the ice to break off in small pieces.



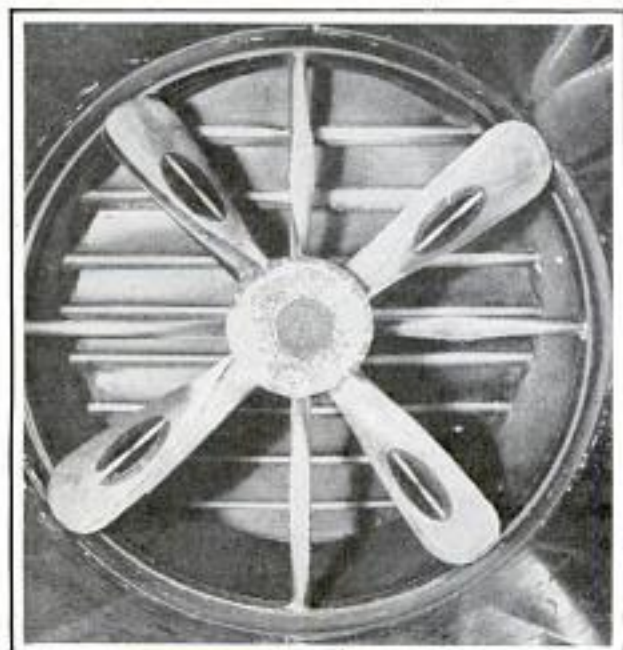
Discarded Materials, Picked Up on the Berlin Dump, Were Used by the Tender in Constructing This Unusual Building

**JUNK USED TO BUILD A CASTLE
ON THE RHINE**

Materials from the garbage piles of Berlin were used by the dump tender in the construction of an unusual building which is known as "The Castle on the Rhine." Nothing except junk was used by the castle's creator.

**BEWARE STRANGE BIRD PETS
WARNS HEALTH CHIEF**

Parrots, love birds, parakeets and other similar tropical feathered pets should be avoided unless accompanied by a certificate from a health officer declaring them free from parrot fever, according to Surgeon-General Hugh S. Cumming. Some of the breeding aviaries where birds of the parrot family are raised are infected, investigation has shown. Birds from these aviaries may transmit the disease to purchasers. Although interstate quarantine regulations have been amended to prohibit shipment of birds beyond the state limits of infected areas, "bootlegging" of the pets is anticipated. The surest protection against exposure is to strictly avoid contact with uncertified birds.

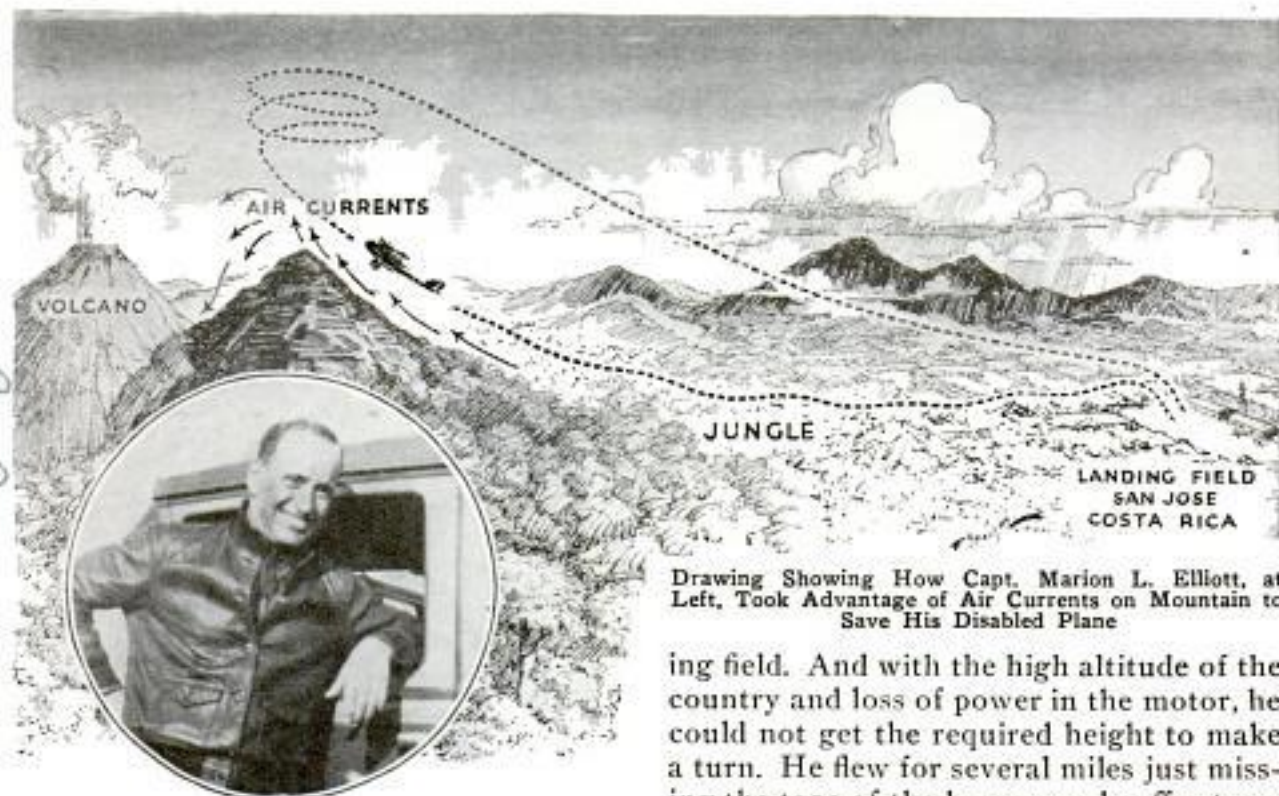


Testing Rubber-Coated Propeller in Wind Tunnel; Each Blade Has a Different Rubber Treatment

*B1796
9/29/32
Science Service inc*

*U.S. Public Health
Service, Washington, D.C.
Copyrighted material*

"Quick Thinker" Pilot's Trick Saves Plane



Drawing Showing How Capt. Marion L. Elliott, at Left, Took Advantage of Air Currents on Mountain to Save His Disabled Plane

The story of how a quick-thinking pursuit pilot saved a big multi-motored bombing plane by a thorough knowledge of air currents when one of its engines went bad over the jungles of Central America, has been brought to light with the return of the U. S. army personnel who recently delivered five airplanes to the Panama Canal Zone via Mexico and Central America. Three bombing planes and two amphibians, which composed the aerial fleet, flew without unusual incident through Mexico and Central American republics until Costa Rica was reached. The landing field at San Jose, the capital of Costa Rica, is narrow and at a high elevation. The field has been the nemesis of several army airplanes in the past, and it nearly proved the same for one of the bombing planes this trip. The mountains are close at hand and the thick jungle crowds the foothills. The last plane that took off on the recent flight, a bomber, threw a section of exhaust manifold from the left engine when about 100 feet in the air. The engine began sucking fresh air directly into the carburetor and flame from the exhaust played dangerously around the opening. A serious fire threatened. The pilot was not high enough to risk turning back to the land-

ing field. And with the high altitude of the country and loss of power in the motor, he could not get the required height to make a turn. He flew for several miles just missing the tops of the banana and coffee trees with the motors roaring out of synchronization. But the pilot knew he had to get some altitude and get back to the landing field. He had once been a pursuit man, or, as they are called in the military service, a "quick thinker," and had often performed unusual tricks with the little pursuit planes when flying across the Rocky mountains. One of the tricks was to nurse one of the little machines to the top of a mountain when the wind was coming from the right direction and take advantage of the air currents there to get additional altitude. He wondered if the same thing would work with the heavy bomber which he was now flying. There were plenty of mountains at hand for him to try his trick on. There was also a smoking volcano crater directly in the path he was flying. He knew that if he ever got into the hot sulphurous atmosphere of the volcano, he never could survive with his plane. So he deliberately swung the big wings around in a quarter turn and headed for the nearest mountain. He headed down wind. His speed increased to a great velocity and his wheels scraped the tops of the jungle. Some of the other planes which had been hovering above the crippled giant followed closely, and at least some of the pas-

Emb. Lieut. Corley McSarnient, Langley Field, Hampton, Va.

sengers expected to see the bomber strike headlong into the side of the mountain. But instead of striking the mountain, the wings began to creep upward in an uncanny manner. On and on up the mountainside went the plane until it reached the top. Here it shot upward like a game fish out of the water. And immediately the pilot began to swing it in short climbing circles directly above the crest. He had taken advantage of the air currents which rise along a mountainside and the ones which boil upward several hundred feet above mountain tops when the wind is right. When he had gained enough altitude, he made a beeline for the landing field.

B1646
RUBBER WRENCH LOOSENS CAP OF FRUIT JAR OR BOTTLE

Removing caps from fruit jars or bottles requires only a twist of the wrist with a handy kitchen aid which, in effect, is a rubber monkey wrench. It is only a ring of rubber with a corrugated inner surface for gripping the metal cap, but is highly efficient, since it cannot slip and a powerful leverage can be applied. It will also remove nuts if a grip can be obtained on them, and provided no greater force than

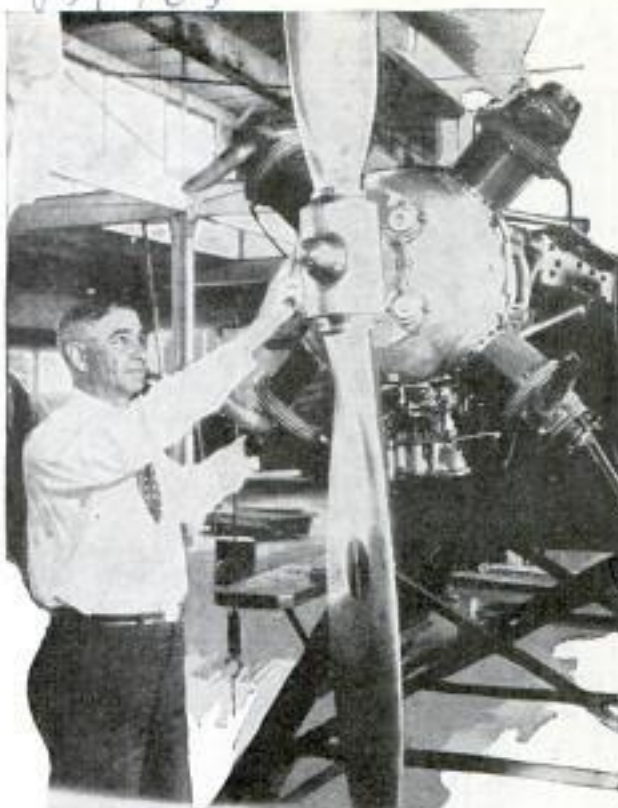


Rubber Wrench for Removing Screw Caps from Jars and Bottles with a Twist of the Wrist

is contained in the hand and arm is required to turn them.

B1744
SILENCER FOR ARTILLERY

Two Italian army officers have invented a silencer for artillery and naval guns which was tested recently. It is attached to the muzzle of a big gun and is said not only to repress the noise, but also to make the flame and smoke invisible.



Variable-Pitch Propeller Controlled by Pilot Gives Airplane Effect of a Gear Shift

W
"GEAR SHIFT" FOR AIRPLANES SEEN IN ADJUSTABLE PROP

Pitch of the propeller blades can be changed in flight by the pilot of a new type airplane. The effect is similar to that produced by the gear shift of an automobile. The propeller pitch is controlled through the center of the motor, which also is of new design, being built on the principle of an interchangeable power unit. The controllable-pitch propeller has been the goal of airplane engineers for thirty years.

B1738
SELF-LOCKING TACKLE BLOCK SAFEGUARDS HOIST LOAD

Back slipping of rope or cables during hoisting operations is prevented by a self-locking tackle block so constructed that the cable may move freely in one direction only. When load strain is reversed, the cable is firmly gripped by a lock actuated by the load itself. The lock may be disengaged instantly by means of a manual release. Breakage of the rope linkage also causes the lock to become effective, thus protecting the load and operator from injury.

Mr. Chad. F. Jensen
 3217-44th St.
 Astoria, Oregon

no street address available
Mr. H. O. McCullough
Berkeley, Calif.
Letter read

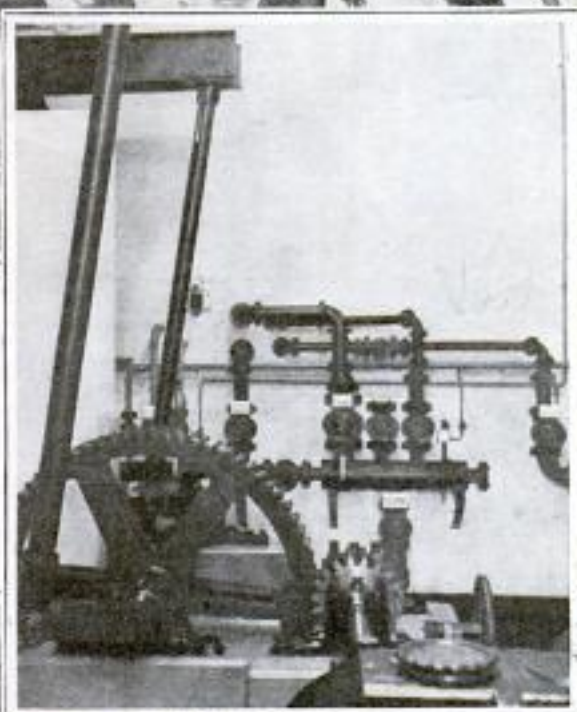
delivered to Tech

at naval station - P. O. G. noli

Copyrighted material

Artificial Waves Provide Pool Surf Bathing

CW. Franch Conly, 986 S. Penneylawn & Denver Col



EQUIPPED with a wave-producing machine, a swimming pool at Budapest, Hungary, offers surf bathing. Every half hour, great pistons are set in motion, creating artificial waves by means of compressed air. This is kept up for fifteen minutes, followed by a similar period of calm. Then the cycle starts again. The waves are as high as safety permits. The waters of the pool are radioactive, and the artificial surf bathing is said to be as healthful as that in the Adriatic, where Budapest swam until the map of Europe was remade after the world war, cutting off Austria, and with her Hungary, from the sea.



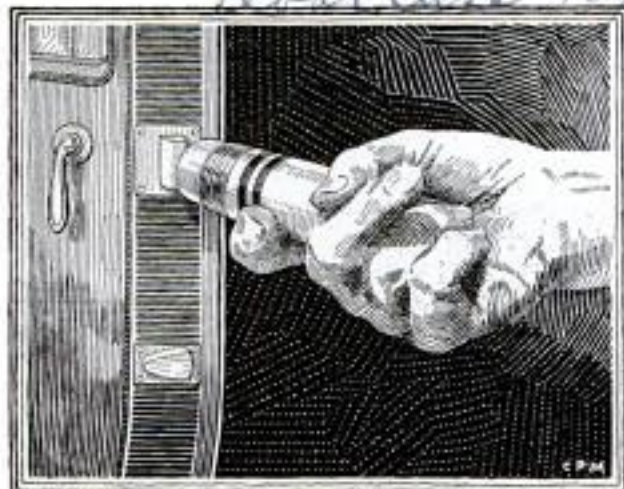
B1024
**SPECIAL INK AND COLORED DUST
IMITATE ENGRAVING**

Anyone can imitate engraving by using a new special ink and colored powder. The lettering or writing is done with an ordinary pen or artist's brush, the powder is dusted over the ink, and the two are fused by heating with an electric plate, alcohol lamp or gas flame. The process is simple and inexpensive. It also can be used with a rubber stamp and inking pad. Any well-sized paper for ordinary writing is suitable. The company making the ink and powder also has introduced machines that will turn out the imitation engraving at higher speed than is possible by hand. These machines do the printing, then pass the sheets through a compartment where the powder is applied and finally fuses ink and powder in a heating device.

*Script-A-Raise
Prac-way*

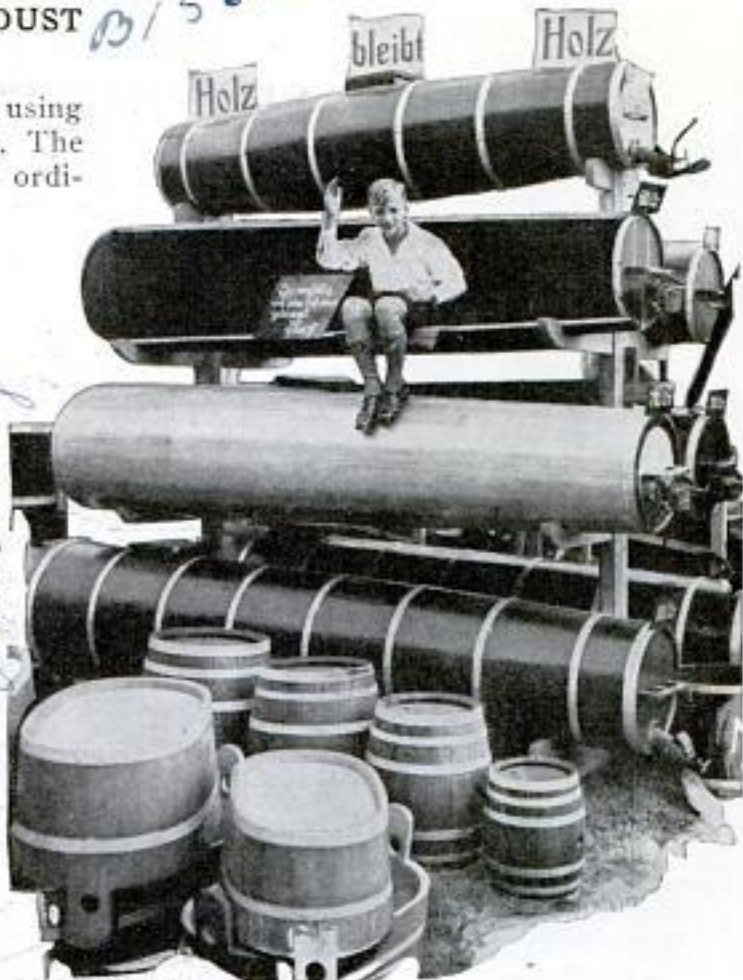
B1535
**GREASE STICK FOR AUTO
DOORS IS STAINLESS**

Made up in stick form so that it is easily applied, a colorless lubricant for lock tongues and dovetails of automobile doors adheres to the surface and will not rub off or spot the clothing. When used on hood lacings, it does away with the customary oily film and keeps the hood from sticking. Its qualities make the grease desirable also for easing doors, windows and drawers in homes and offices.



Grease Stick for Lubricating Auto Doors; It Will Not Spot or Stain Clothing

*American Grease Stick
Co. The Chicago Truck*



© New York Times
Part of a Barrel Display at the Leipzig Fair; It Included Everything from Kegs and Tubs to Huge Hogsheads

**BARREL MAKERS EXHIBIT SKILL
AT LEIPZIG FAIR**

Barrels in Europe are used for many purposes besides catching rain water and as containers for apples or potatoes, as was proved by a recent exhibit at the Leipzig autumn fair. The collection of barrels on display included everything from beer kegs, butter tubs and churns to the overgrown and elongated containers used in many industries.

B1574
OPPOSITE WINDS AID PLANES

Two planes in Pacific coast service recently passed each other in the opposite direction, both aided by tail winds of the same velocity and both traveling at the same speed. One ship was flying at 3,000 feet, with a north wind of forty miles per hour, and the other at 8,000 feet, with a south wind of identical velocity.

Our Bureau of Information is for your benefit; use it as often as you please.

*United Air Lines
you & I together are
Chicago*

B1372 Cmt. Iphigeneia Stejneger, Jr
145 S. Spring St
Los Angeles, Calif

The Golden GRAVES



Top, Treasure-Hunting Expedition at Anchor off an Island; Below, Radio Transmitter for Seeking Treasure and Metal Rods by Which Current Enters Earth; Left, Gold Beads and Indian God Recovered from a Tomb

CENTURIES ago an Indian race buried its tribal treasure in the forbidding Cocle mountains of Central America. Incantations were uttered to keep it hidden. Nature responded and the jungle covered the spot. Earthquakes and landslides changed the terrain as the years passed. The treasure was "lost," for the expeditions that searched for it returned home empty-handed.

Finally an engineer appeared. Across his shoulders were slung instruments more

magical than the charms of the early tribe. Slowly and carefully he explored the district, driving stakes into the ground, turning dials, and listening with his earphones. Eventually he said, "Dig here." The pick and shovel crew burrowed down and the treasure was brought to light.

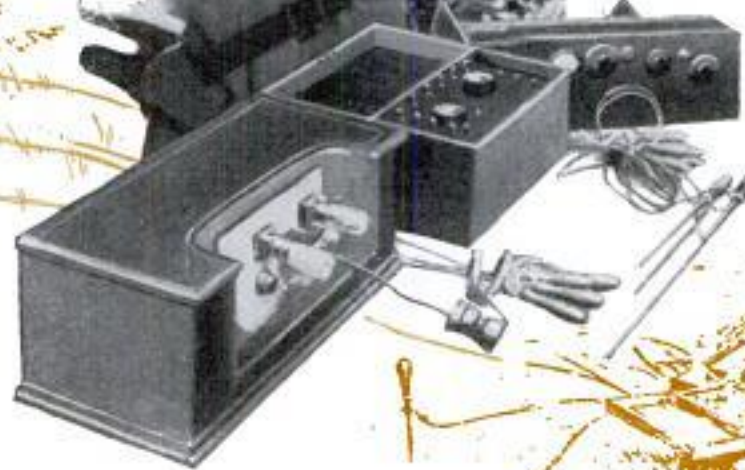
Uncanny as it seems, scientists can walk across country and tell you, "Dig here for mineral," or "Here is the place for an oil well." Their delicate instruments probe deep into the earth. With the aid of such

(Letter from Williams about Williams in Miscellaneous Feb) B1372

of COCLE



Above, Pieces of Pottery from a Tomb; Left, Lieut. Williams and Radio Receiver for Locating Lost or Buried Treasure



reveal their hiding places when his metal-detecting device is brought within range.

Panama has been the golden crossroad of the New World for hundreds of years. Ancient Indians buried their hoards in the vicinity. Spaniards who dealt in tons instead of ounces collected their cargoes there for transshipment to Spain. Returning '49ers from California tramped over the Cruces trail between the two oceans.

Much of the metal that crossed the isthmus is still there, having been buried in

instruments, Lieut. George Williams, who makes his headquarters in Panama, is turning the hunting of lost treasures into a steady business. He has unearthed hundreds of thousands of dollars' worth of valuables in the last six years. Gold and silver that have been sought for decades

haste against the attacks of pirates and highwaymen. It is estimated that \$5,000,000 worth alone was concealed in the old

at 1100x 327, Ancon Canal Zone 6/2/33

Machine taken over by W. Martin 717-3000 Air. U.S. 955

complicated in similar instrument to be built by. 9035 Service Blvd. Los Angeles. Calif.

Precise operation, user will require training. Several electrical parts about \$300.00

B1392



earthen jar crammed with money. In another spot he finds boxes of golden altar ornaments. Some of the public buildings of the old city are connected by underground tunnels, and in these Williams finds golden pitchers and bowls, drinking cups, sacred objects, and individual caches of gold and silver money. From one tunnel, filled with water, he fished up a solid-gold ball seven inches in di-



city of Panama in 1671 to hide it from the buccaneer Morgan. Lieutenant Williams has explored the ruins and is recovering chest after chest filled with doubloons and dollars. He is taking larger treasures from the ancient Indian graves. Even the Cruces trail is yielding its harvest of gold dust and minted slugs to his exacting search.

Williams had an audience of skeptics when he first tried out his machine. He was seeking a concession from the Panama government to search for treasure and offered to demonstrate his ability before a group of officials. He chose the ruins of a cathedral in old Panama as a likely place and set up his instruments. Treasure had been sought for years in the district and the officials scoffed at the suggestion that any remained. But the machine gave affirmative signals and a hole was dug. Within a few feet the treasure hunter uncovered a heavy chalice of solid gold.

Since then Williams has prowled back and forth through the ruins, earphones on his head. In one place he digs up an



Top, a Treasure-Hunting Boat and Its Crew; Below, Golden Ornaments Recovered from the Tombs of Cocolé

ameter surmounted by a cross. Although these finds are mounting up to an imposing total, Williams regards his treasure hunting in the civilized area as routine work. More interesting is the exploration of ancient Indian graves and temples to which his instruments lead him. Less than a hundred miles southwest of the Canal Zone are the Cocolé mountains, the former home of one of the few tribes that resisted the Spanish conquistadores. Here, for 2,000 years, the tribe panned gold from the streams and made it up into ornaments.

B 1372

Piano Kolorgraf, Suite
609 Woods Theatre Bldg
Chicago 957

POPULAR MECHANICS

But the tropic jungle, teeming with poisonous snakes and insects, is no place for white men. Only during a few weeks in the middle of the dry season can the jungle be entered. Every year Williams makes a hasty trip to Cocle, and his expedition returns each time laden with solid-gold treasure.

On his last trip Williams discovered a sacred mountain, the whole top of which is carved out by hand to form an underground temple. The slopes of the mountain contain countless tombs of ancient warriors, each skeleton resting on gold plates and surrounded by gold ornaments. In Williams' opinion, it will require years to excavate the graves and remove the treasure. Aside from the value of the precious metal that is recovered, the pottery objects are of high archæological value.

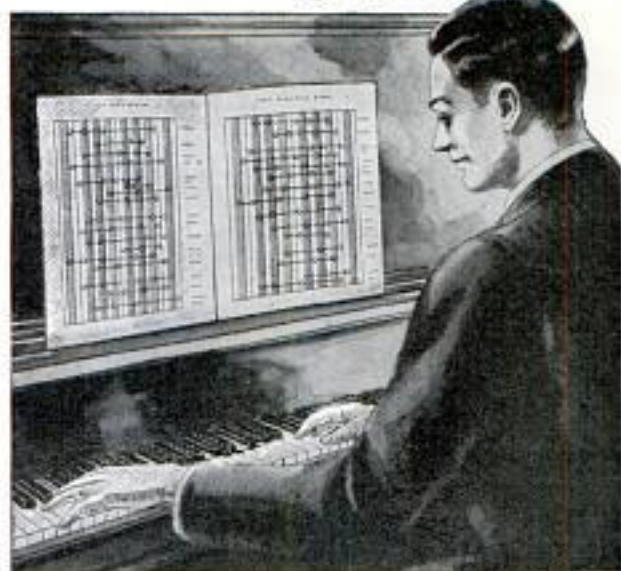
In reaching the sacred mountain, Williams sailed along the Gulf of Panama to Port Chame, where his boat was anchored. A steep climb along overgrown trails took his party to the Cocle region and the actual location of the mountain was found by interpreting native superstitions.

Whether the subterranean temple contains a huge hoard of treasure remains for future explorations to discover, as the lateness of the season prohibited Williams from making a complete search.

"The entrance to the temple was seen halfway up the mountain," says Williams, "but it was a long, dangerous climb as the rock footing crumbled. The entrance appeared to be a small room. It had a crack in one wall, and on squeezing through this, I stepped directly into a vast hall. The solid-rock walls had been cut perpendicularly. In some parts there were tables of rock, and seats and stools carved out by hand. Tall pots filled with white bones were along the walls. The columns were mostly thirty inches square, but some were cylindrical, so round they seemed to have been turned by machines. In the middle of the temple stands a vault of solid rock, the top covered with a pile of large stones."

COLOR CHART FOR PIANO KEYS LATEST TEACHING METHOD

Teaching piano more rapidly by means of color charts is claimed for a new method called the "kolorgraf." The keys of the



Color Strip Is Used in a New Method of Teaching Student to Play the Piano

piano are identified by varicolored strips pasted on before the lessons begin. Five C-keys are included. Each note is identified on the piece of music by a ring upon the colored strip corresponding to that color key. A chord, of course, is merely a combination of the colored strips and is played by striking the same color combination on the keys. On the left side of each piece of music is the correct beat or time. By memorizing the colors of the keys and the chord combinations, the student learns more rapidly, possibly six months to a year faster than by ordinary methods, according to the kolorgraf makers. There are color markings for both hands, and they are presented on each sheet of music.

RUBBER SPATS WITH BUMPERS PROTECT THE ANKLES



German men are adopting spats made of rubber and equipped with bumpers. The ankle overshoes are made like cloth spats, except that they have a protruding section of rubber on each side.

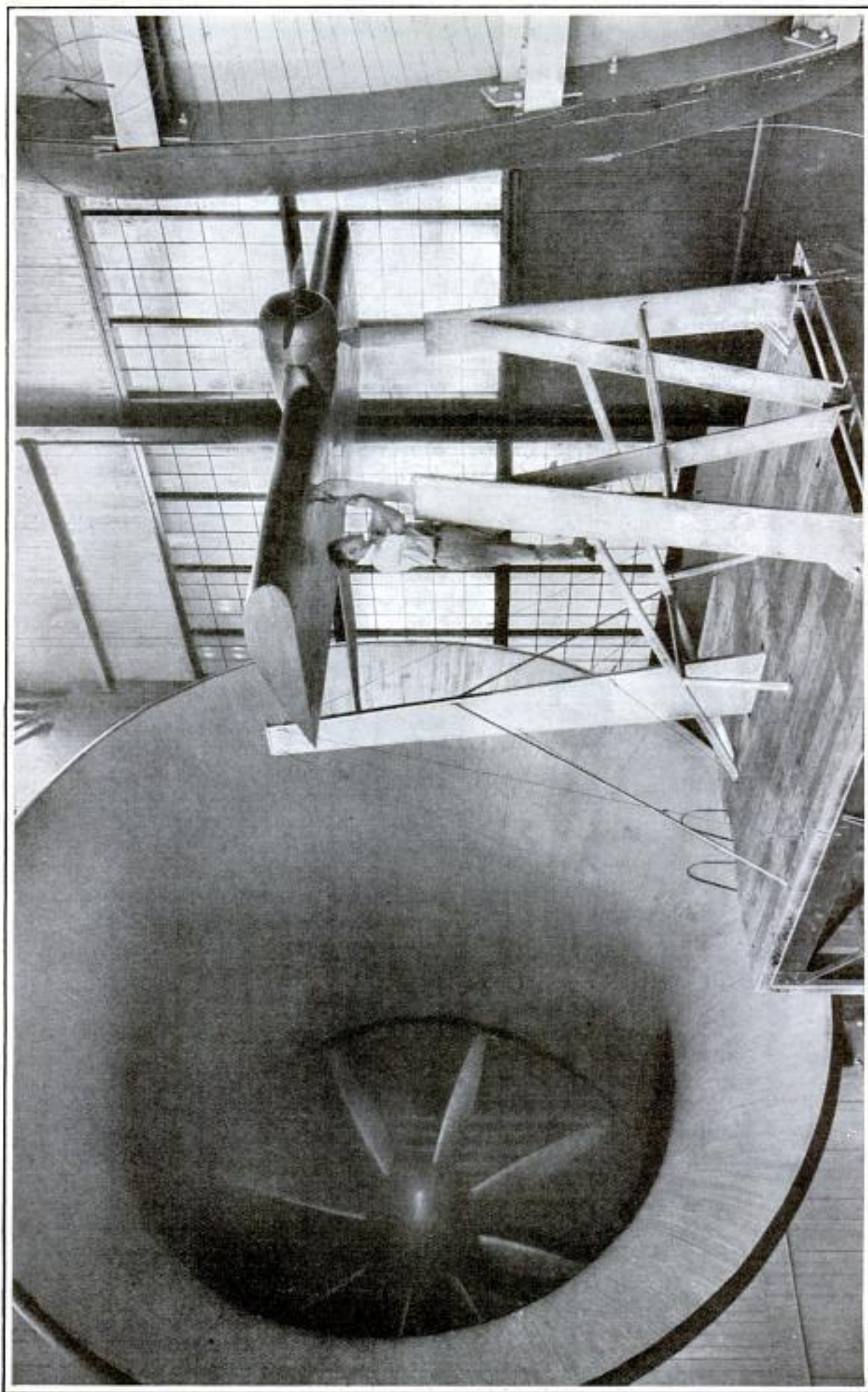
Caustic soda mixed with aluminum chips is used to thaw out frozen hydrants.

No further data

Copyrighted material

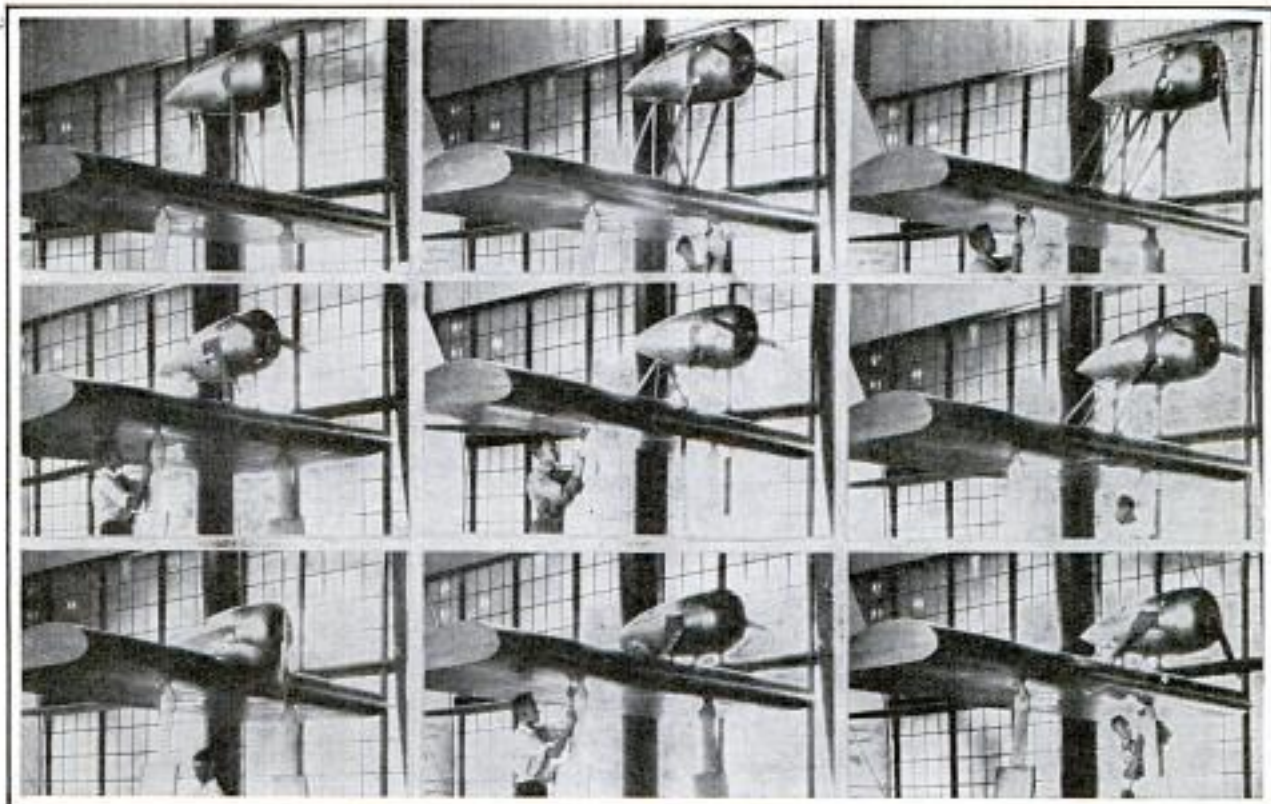
B. 500
employed at home
of technical staff
Mention Bremen, Berlin

1461



Set-Up for the Making of Tests to Determine Most Effective Position for Nacelles or "Power Eggs" Which House Engines of an Airplane

Steam-Heated Plane Wing to End Air Danger



Some of Positions Tested for Nacelles above the Wings; in General, It Was Found the Greatest Reduction in Drag Was Obtained by Fitting Nacelle Directly into the Wing Structure

A NEW factor—greater comfort for pilots and passengers—is being added to the basic research program of the National Advisory Committee for Aeronautics. Two other factors, increased safety in flight and reduced costs, remain, in that order, the primary objectives of its efforts.

There has been a series of tests aimed to increase the efficiency of multi-engined airplanes by reducing the wind resistance, or heavy drag, of the nacelles which house the engines attached to the wings. The results thus far obtained indicate that, if the engine is mounted a slight distance above the wing, the influence of its nacelle on the air flowing between it and the surface of the wing produces much greater drag than when it is placed higher; that, if it is hung below the wing, the drag is less than when it is in the other position and grows progressively less as the distance is increased; that, if the space between the nacelle and the wing surface is covered, it is even less, and that the greatest reduction in drag is obtained by fitting the nacelle directly into the wing structure.

Thus, it is explained, a way is indicated

to relieve the big airplane of considerable weight, and every pound that can be removed means greater efficiency and lower cost. At the same time, these results tend to add to the factor of safety by making it possible to build a greater reserve power into the plane without sacrificing the other vital factors.

Taking into account the lift, interference, and propulsive efficiency, the best location of the nacelle, with tractor propeller on a monoplane wing, for high speed and cruising, is with the thrust axis in line with the center line of the wing and with the propeller about twenty-five per cent of the chord ahead of the leading edge. The same location also appears to be the best in climb and landing, therefore excels in all conditions of flight.

Experiments also are being conducted in the use of steam heat for keeping ice from forming on the wings. The results are not as yet available, but the idea is interesting. As every student of aeronautics knows, ice picked up in flight distorts the wing curve, burdens the plane and forces a landing if the load becomes heavy enough.

Donald H. Wood, engineer

007571

marconi Wireless Telegraph Co Ltd

United Wireless Engineering Co 1940 E. 105th

960

POPULAR MECHANICS

marconi House, Strand

W.C. 21 London Eng

no U.S. agent known



ROBOT PHONES FOR POLICE WHEN THIEVES ENTER

When the holdup man commands "hands up" in an office equipped with a new robot alarm, he might as well have shouted "police." For this apparatus, set off by a secret control without any movement by the victim that is visible to the intruder, starts by dialing police headquarters on the telephone. A phonograph disk then is brought into play and repeats "police, attention, robbery" and gives the address. If the machine encounters a busy line, it continues to dial for six minutes.

POCKET STOVE TO WARM HANDS

Hands and pockets may be kept warm for twenty-four hours without refilling by a stove no larger than a cigaret case.

Equipment for Overcoming Curvature of Earth Is Used by Marconi in Successful Transmission by Ultra-Short-Wave Radio

ULTRA-SHORT-WAVE RADIO SET WORKS AT LONG DISTANCE

Operating on a wavelength of fifty-seven centimeters, or slightly more than one-half meter, ultra-short-wave radio equipment, designed by Marconi, has been tested successfully at a record distance of 168 miles. Both telegraph and telephone messages were transmitted. Heretofore radio transmission on such short wavelengths had not been possible beyond the optical range. The Marconi equipment proves it possible to overcome the obstacle represented by the curvature of the earth. Similar sets in the United States have been operated at horizon distances, or as far as the eye can see. Using the same equipment and a standard yacht telephone set, two-way telephone communication between the Marconi yacht and Rocca di Papa, near Rome, was maintained up to distances of eighty miles, while Morse messages were received at 150 miles.

Benzine is the fuel, an asbestos wick with a protecting metal grid being provided. It gives out 120 degrees of heat.



How Pocket Stove Is Lighted; It Is Safe for Carrying in Clothing on Winter Days

Abercrombie & Fitch
madison and material
45th New York City

Cleveland Plain Dealer

031631

03321

\$ 1.50

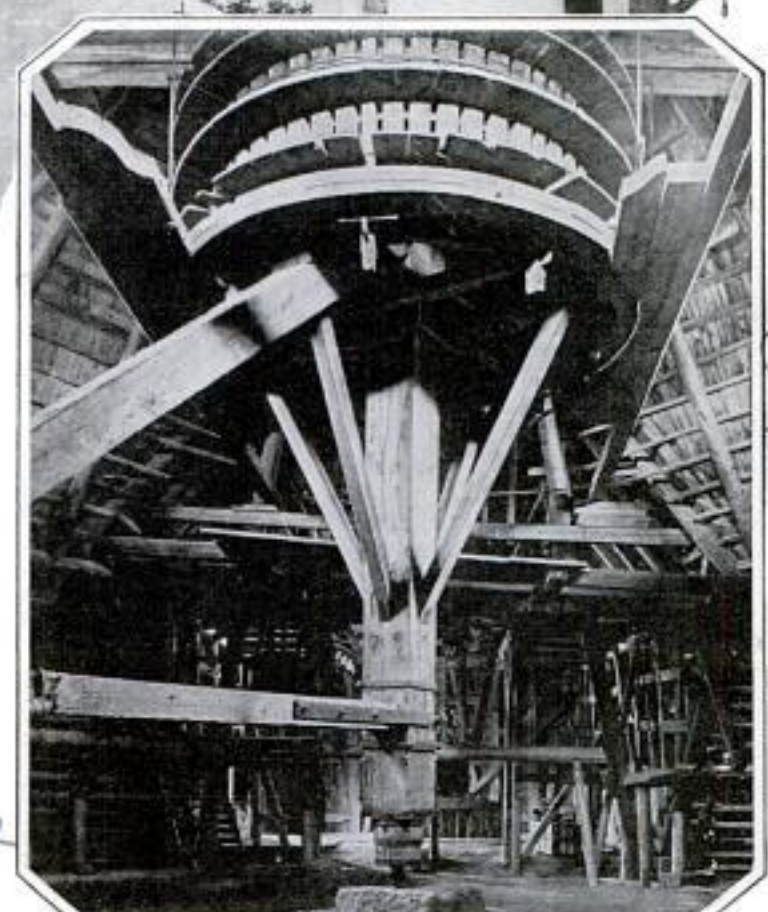
Always use finger

101586 from book "Technische Kulturdenkmal" 961

POPULAR MECHANICS
published by *Verlag* *Bruckmann*
München *Germany*

OLD-TIME MILLS OF EUROPE ARE STILL USEFUL

Europe's picturesque old mill wheels are still in use, serving modern nations in various ways. On the island of Mallorca, off the southeast coast of Spain, stands a row of windmills. Six-bladed



© Presse Photo
Top: Windmills on Mallorca Island with Blades Facing Different Directions; Bottom: Mill Wheel for Operating Mine Cage

ed wheels and thatched roofs make these mills unusual. In a silver mine at Johanngeorgenstadt is Germany's only horse-driven wheel for operating the cages that carry the workers to and from the various levels on the main shaft. The old wheel resembles the old-fashioned threshing-machine drive.

ANTS ARE ENEMIES OF HOUSE FLIES

House flies were so scarce in the lower Rio Grande valley in Texas this year, despite conditions favorable to their production, that health officials investigated and found ants were exterminating them. There are numerous varieties of ants in the region,

and it was discovered nearly all devour the larvæ of the flies and have become so proficient that there was a noticeable decrease in the number of flies.

Dr. J. H. Alsworth
Larvæ in city health office

Col. James H. Bagdady
General Delivery, Tampa
Oct 15

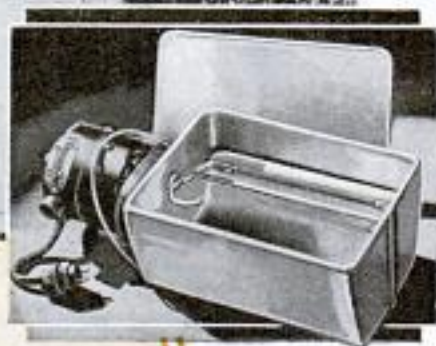
Making Home Tasks



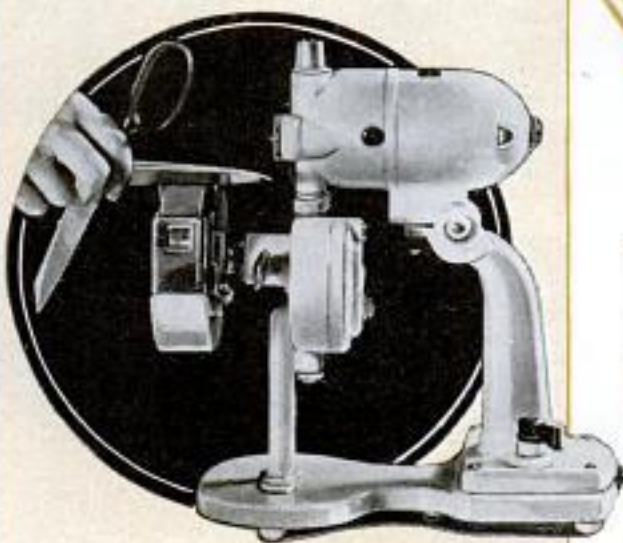
Above, Electric Ice-Cream Freezer with Motor-Driven Dasher That Operates Automatically in the Freezing Compartment of Any Electric Refrigerator; No Salt or Ice Is Needed



Aluminum Broiler Made in Two Sections to Provide a Drain for Fats and to Prevent the Flame Coming in Contact with Food; Handle Is Removable



Above, Electric Outlet with Triple Connections and Extension Cord; It Can Be Attached to Wall or Any Smooth Surface with Rubber Vacuum Cups



Left, Knife-Sharpening Attachment for a Kitchen Electric Motor; It Consists of a Stone in a Housing That Catches All Grit; Guide Holds Blade in Correct Position; Right, Modern Lighting Unit That Screws into Light Socket Like a Lamp Bulb



A Pleasure



Above, Handy Clip for Holding Cake Knife Which Can Be Attached to Any Table Knife; Below, Automatic Electric Light Which Can Be Attached to Door Casing of Any Refrigerator; It Switches On When the Door Is Opened



Right, Automatic Cradle Rocker Run by Electric Motor; the Crib Glides Back and Forth without Jolts or Jars; the Speed Can Be Regulated



Left, Swing Faucet and Spout Combination Covered with China to Match Color of Kitchen; There Are No Metal Parts to Keep Clean



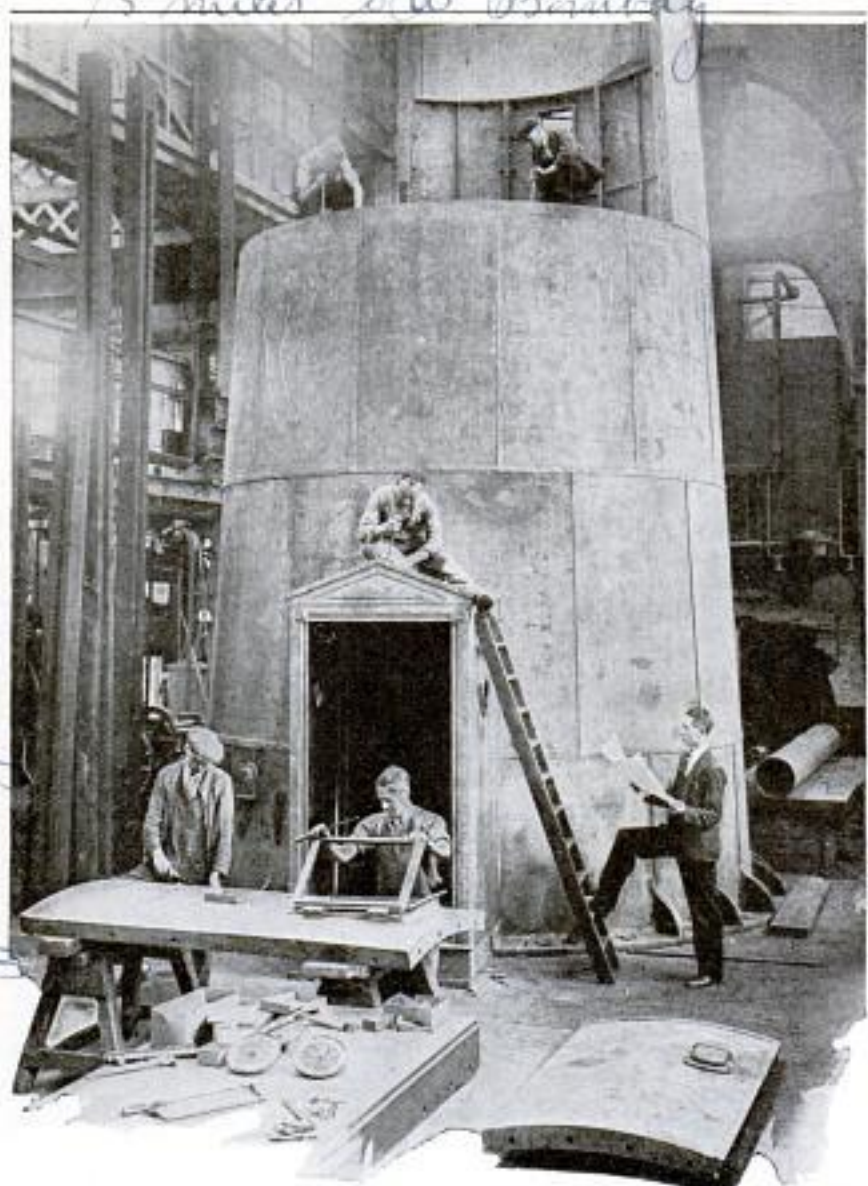
Left, Adjustable Grape-Fruit and Orange Peeler Which Removes the Meat Completely without Any of the White Skin or Bitter Part of the Rind; Right, Jar and Bottle Screw-Top Opener Which Adjusts Itself to Any-Size Cap; a Twist of the Handle Loosens the Cover



B1579

to be erected at Gungah
75 miles S.W. Bombay

Messrs. Chagnac & Smetheby
Staffs. England.



Here Is How India's 100-Ton Lighthouse Is Being Built in a British Factory; Note the Steel-Slab Construction

INDIA'S LIGHTHOUSE OF STEEL TO WEIGH HUNDRED TONS

Constructed of steel in a British factory, India's new lighthouse will weigh 100 tons and will throw a beam that will be visible for twenty-three miles in clear weather. The lighthouse will be erected at a point seventy-five miles south of Bombay. The light will equal 65,000 candlepower.

ACCIDENTS KILL MORE MALES THAN DOES DISEASE

Accidents kill more men and boys between the ages of five and forty-five than disease. Twice as many die of accident injuries as of tuberculosis, the next greatest single cause of death for this class. As

Illinois Health Department
State Dept. of Public Health,
Springfield Ill. 9/15/32

an example for the nation, the death statistics for Illinois in 1930 are quoted. These figures show that one-fourth of all deaths of men and boys would be prevented by elimination of accidental and homicidal mortality. In Illinois, in that year, there were 2,755 accident and homicidal deaths, as compared with 11,035 deaths from all causes. Only one-sixth as many girls and women in this age group die in accidents, but tuberculosis causes more deaths. The 1930 figures show that in accidental deaths, automobiles are first, drownings second, falls third, and railroads fourth, for the same age class.

B1611

RUSH JOB EASY FOR ENGINEER BUT NOT FOR RUG MAKER

Modern methods have speeded up production so much that rush jobs are easy for the engineer, but not for the carpet maker. At one plant, a forty-horsepower boiler ordered at seven o'clock in

the morning was on the way to its destination at three that afternoon, being completed in less than eight hours. On the other hand, a hand-made carpet ordered by a London club required four months of labor by thirteen workers. The carpet is sixty-two feet long, thirty-five feet wide and contains nearly 10,000,000 tufts of wool, each of which had to be separately tied to the flax threads forming the foundation. In contrast, a court dress was produced for an American woman in England in twenty-four hours. It was of white chiffon, with hand-painted water lilies and a moss-green border. Hand-made clothing is becoming more and more a luxury, for over ninety per cent of men wear ready-made garments. One Leeds, Eng-

considers 9/10/32

B1580 marconiphone Co
 210 Tottenham
 Court Road, London W1

land, firm has an output of two men's suits per minute during each working hour, while American manufacturers have similar high-speed methods. Turning to bigger things, the engineer usually requires two years to construct a large steamship, but a 5,500-ton steamer was built in seven months. In completing 104 engines in twenty-six working days, the Baldwin locomotive works set what is regarded as a record for engine building.

LAWNMOWER AND SNOWPLOW IN ONE B270

Equipped in winter with a pusher for sweeping snow, power lawnmowers did double duty in Denver parks. The drivewheels were filled with lead and spiked with three-eighth-inch bolts to solve the traction problem. It is possible to handle packed snow two inches deep with the power pushers, and also shavings left on the ice by skaters.

Wesley C. B. Mark, Park Dept Denver, Col.



Instead of Being Stored in Winter, This Lawn Mower Pushes a Small Snowplow in Denver

Jacobsen Mfg Co
 Racine, Wis



Radio "Searchlight" Trained on "Big Ben," London's Famous Clock, to Gather Sound for Broadcasting as the Hours Are Struck

TONES OF "BIG BEN" BROADCAST BY RADIO "SEARCHLIGHT"

"Big Ben," London's famous clock, now booms the hours over the radio. A microphone has been placed in the clock tower, and a powerful searchlight-pattern loud speaker has been trained on the clock to gather the sound as the hours are struck. In this manner it is possible for all Europe to set its watches by Big Ben.

SOLDER FOR STAINLESS STEEL SPEEDS UP WORK B1616

Soldering of stainless-steel joints in a practical manner can be done in one-half to one-fourth the usual time with a new flux. In addition, it gives a greater strength of 2,000 pounds more per square inch and stays liquid in the joint more readily. No special tools are necessary, the flux being brushed on and the heat applied in the ordinary way. Excess flux is removed to prevent dulling the finish, and the joint is polished with a special compound made for that purpose.

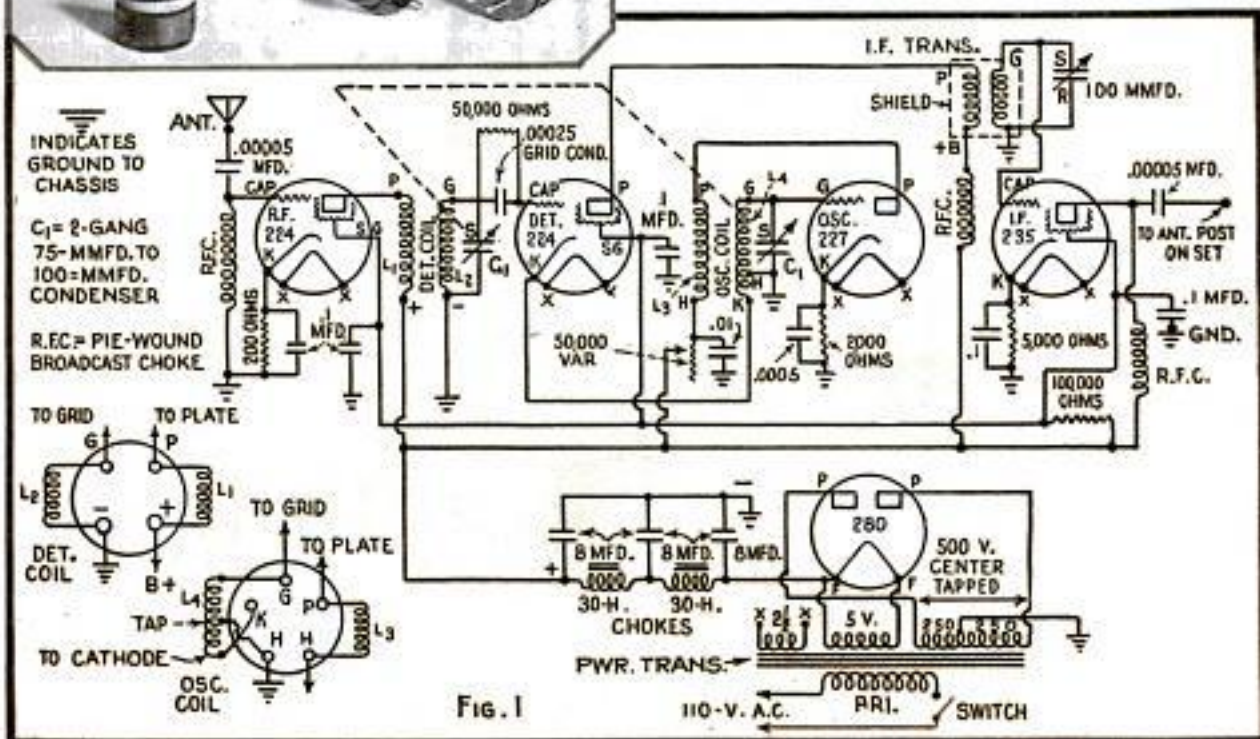
L. O. Allen Co
 6719 Perry Ave
 Chicago



IMPROVED sensitive out of any

THIS super-sensitive short-wave converter is an improved model of the "Magic Box" described in the October, 1931, issue. It is self-powered and many of the same parts can be used. A careful survey of the results obtained with short-wave converters during the past year shows that most of the broadcast receivers, while highly satisfactory for broadcast reception, lack sufficient r.f. sensitivity to give best results when used with an ordinary 2 or 3-tube converter.

The addition of an intermediate-frequency stage in the present converter, which can be tuned to the same frequency as the broadcast receiver, adds the necessary r.f. sensitivity lacking in many broadcast sets. There are no additional controls to manipulate, as once a setting of the broadcast receiver has been selected, the intermediate stage is tuned to resonance and left there. To obtain all the

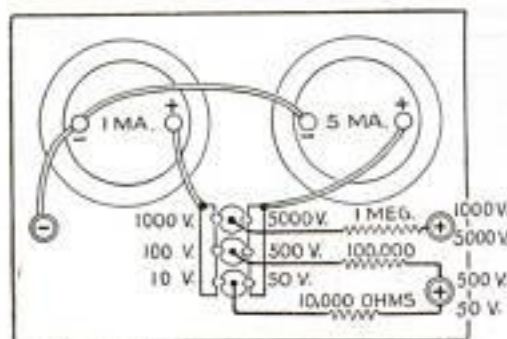


Building a High-Voltage D.C. Test Meter

This homemade instrument will give accurate voltage readings throughout the entire range useful to experimenters and radio workers. Such instruments have been quite expensive in the past but the parts are now within pocketbook



range of amateurs and service men. Good accurate resistors are necessary as multipliers, and several suitable makes are available. The instrument has two separate meters with different scale readings. These are inexpensive d.c. milliammeters and are rated from zero to one mil and from zero to five mils, respectively. With 1-meg. resistance in series, the one-mil meter will indicate 1,000 volts over the full scale. One meg means 1,000,000 ohms, and this resistor, in series with the five-mil meter, will indicate 5,000 volts over the full scale. It must handle about 25 watts, while most of the small resistors available will not take care of more than from 1 to 3 watts. So, it will be necessary to build up the 1,000,000-ohm resistance by connecting ten 100,000-ohm resistors in series.



The wattage then becomes 2.5 on each resistor. Types of this rating are standard. If the builder does not require a reading of over 1,000 volts, the problem is very simple. With the one-mil meter the resistance can be a single 1-meg. of the 1-watt type. In this instrument, however, there is a simple plug arrangement for changing the value of resistance, in series with either meter, to obtain a number of different full-scale readings. With 100,000 ohms in series with the 1-mil meter, maximum deflection is indicated with 100 volts. With the same resistor in series with the 5-mil meter, 500 volts will cause full-scale deflection. The 100,000-ohm resistor must be a 2.5-watt type for the 5-mil meter. A third resistance of 10,000 ohms is used for the lowest range on the meters. With this value, 10 volts is full-scale reading for the 1-mil meter and 50 is maximum for the 5-mil meter. The change-over switch may be an ordinary one with taps, or three single-pole, double-throw switches. The meters and switch are mounted on a bakelite panel, and the binding posts carefully marked. The wiring diagram is very simple, the rear-view photo below indicating the method of mounting the various resistance units that go to make up the series values specified.—Edwin C. Ewing, Jr., Chicago.

R.A. Radiotron Club
Harrison, N.J.

New Tubes BRING SILENT TONES to Life

CAPABLE of reproducing the full tonal range of the many instruments that compose a great symphony orchestra, new types of tubes make modern receivers real musical instruments. Up to the present time, 266 tones by actual count have been missing. A number of these, together with the instruments that produce them, are indicated in the column at the right. Receivers a few months older than those recently introduced employed tubes of limited frequency range that were not capable of reproducing these particular tones. The results obtained have been a fair imitation of the real music but discriminating music lovers were not satisfied. Now for the first time it is possible to obtain from the loud speaker, the rich full-bodied tone that heretofore had only been heard in an orchestra seat.

The new tubes provide greater sensitivity and selectivity as well as better tone quality. They are quieter in operation and have extraordinary reserve power. They will greatly improve short-wave operation, which has been seriously hampered by inefficient tubes. The new sets employing these tubes require smaller power transformers and chassis. Volume control has been improved and the cost of operation greatly reduced. These tubes are not interchangeable with any previous types.

The tube the man is holding in his hand in the central photo, is known as the C-57. It is a triple-grid amplifier with a dome-shaped bulb and is designed for greater strength and stability, lower wattage and quick heating. It is adaptable to special detector and oscillator design and is especially recommended for short-wave operation.

The first tube below at the left, in the same photo, is known as the C-56. This is an amplifier of smaller size and has less tendency toward microphonic noises than previous types. It has higher amplification possibilities than the well-known 27-type by 50 per cent. The next tube at the right is the CX-82, a mercury-vapor rectifier possessing a higher voltage output with better regulation than older types. It has enabled the set manufacturer



(Continued to page
128A)



Right, Henry L. Carter, Jr., Youngest Amateur Radio Operator; Above, Dr. George W. Kirk, Oldest Licensed Amateur

Oldest and Youngest Radio "Hams"

Youngest of all the world's licensed radio amateurs is ten-year-old Henry L. Carter, Jr., of Rochester, N. Y., who operates station W8FTB, according to the American Radio Relay league. Henry is a good operator and has a large number of verification cards from other amateurs throughout the United States. The oldest licensed amateur radio operator is Dr. George W. Kirk, who at eighty-one taps away at the key of station W8ARJ at his home in Curdice, Ohio. Many young ladies, known as "YL's," and "OW's" if married, are also prominent in the amateur list. The title of youngest wireless YL belongs to thirteen-year-old Josephine Rohas, station W8EKM, Kenmore, N. Y.

Filament Supply for Portable Apparatus

Flashlight batteries make an excellent filament supply for portable receivers, oscillators and similar test apparatus that must be compact for practical purposes. It is not generally known that the standard three-cell flashlight bulb draws a comparatively high current—approximately .290 amp. This is slightly in excess of $\frac{1}{4}$

amp. for the tiny dry-cell battery designed for it. Thus it may be readily seen that four of the popular type-230 vacuum tubes, connected with filaments in parallel, will draw but .240 amp. of current from the flashlight dry-cell battery. These tubes make fine detectors, amplifiers and oscillators and take as little power as possible consistent with satisfactory operating performance. As the flashlight batteries are designed for intermittent service, the best results will be obtained when not more than two of the type-230 tubes are used. As the tubes require 2 volts for the filaments, and the flashlight-cell unit delivers



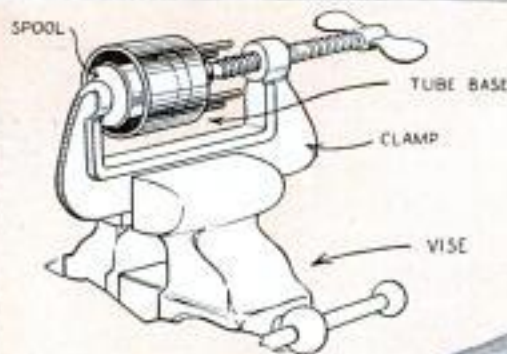
3.8 volts, it will be necessary to use a 40-ohm rheostat to regulate the filament supply for one 230 tube or a 20-ohm rheostat where two tubes are used in parallel. The rheostat is connected in series with one of the filament leads. The B-battery supply, required for the operation of portable apparatus, may be obtained from the small B-batteries commonly used for C-bias in battery receivers.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are always available without charge.

Easy Solutions for Everyday Radio Problems

*Bud Radio, Inc.
928 E 55th St
Cleveland, Ohio*

*Crystal Info Co.
285 N. 6th St
Brooklyn
Emp. Lite Electric Co.
200 Murray St
Brooklyn*



Tube-Base Coil Forms Are Easily Mounted for Drilling by Means of a Spool and C-Clamp Held in a Vise



Above, a Simple Method of Mounting Coils Wound on Bakelite or Cardboard Tubing; the Mounting Strip May Be Fastened to the Form with Thumb-tacks or Wood Screws



Improved Center-Tapping Resistance Has Movable Center Contact for Accurate Hum Balance in A.C. Receivers; Useful Wherever Resistor Requiring Occasional Adjustment Is Specified

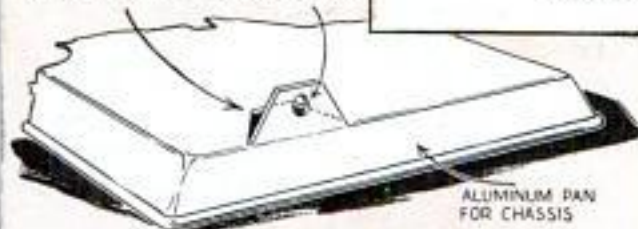


Short-Wave Converter, for Listening In on Police Calls, Will Operate with Any A.C. Receiver and Tune from 80 to 200 Meters

Below, This A-Eliminator Adapts 32-Volt Current for Operating Sets with the New Tubes



HOLE FOR MOUNTING - VOLUME CONTROL
TAB SAWED OUT AND LIFTED UP



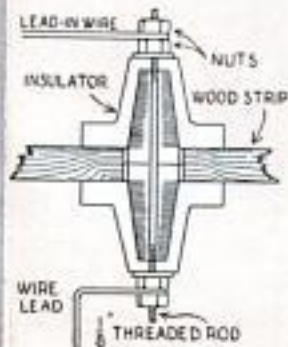
Tabs May Be Cut and Raised, as Shown for Mounting Variable Parts on Aluminum Cakepan Chassis Commonly Used for Modern Sets



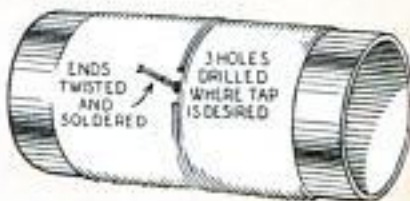
WIRE THRUST THROUGH HOLES IN TUBE TO SECURE WINDING



Upper Left, Coil and Condenser Units from Old Neutrodyne Receivers Make Excellent Wave Traps; Below, an Easy Method of Center-Tapping Coils; the Two Wires Come Up through the Middle Hole, and the Ends Are Twisted for the Tap; the Sketch Above Shows Holes Drilled for Anchoring the Terminals



Price Tags to Identify Leads; Left, Window-Sash Lead-In Insulators from Old Ford Magnetos



Chicago



Compact Auto Receiver and Three Methods of Installing It in Car

Auto Receiver Easily Installed

This small auto receiver is compact enough for easy installation in either of the three positions shown. The upper photo shows the receiver mounted on top of the speaker, directly back of the driver's seat, by means of brackets. The usual under-dash installation is illustrated in the center photo. As the receiver controls are on top and easily reached, the set may be placed directly on the floor between the driver and passenger, as shown below. This six-tube superheterodyne set includes screen-grid tubes, new type 6-volt heater tubes, which decrease A-battery drain, and a full-floating moving-coil dynamic speaker. The B-batteries may be housed under the front seat or sunk in the floor.

Removing Dust from Receivers

One of the handiest tools for the experimenter, or radio-service man, is a blower for removing dust from receivers. A large auto-tire pump will do for the purpose if fitted with a suitable length of rubber tubing. A nozzle may be made from copper tubing, flattened at the end to distribute the air. With this blower it is easy to clean all parts of the set, especially between the plates of the variable condensers where dust accumulation is a common cause of poor reception.—Don Russell, Joplin, Mo.

Storage Rack for Small Parts

Screw-top pickle bottles, or small glass preserving jars, are fine for storing machine screws, nuts and other small parts, such as fixed condensers, resistors, binding posts, soldering lugs and tag ends of wire solder. The bottles may be labeled and placed in a rack at the rear of the radio bench. The parts are thus kept separated and in plain view.

Set Operates on Either A.C. or D.C.

For individual room use in hotels, homes, offices or studios where a small receiver for local programs is required, this portable set may be operated from any 110-volt supply regardless of the type of current available. It will operate on either a 25 or 60-cycle a.c. supply as well as d.c. without alteration. A carrying case in red or black is available, and the total weight of the set is but 6½ pounds.

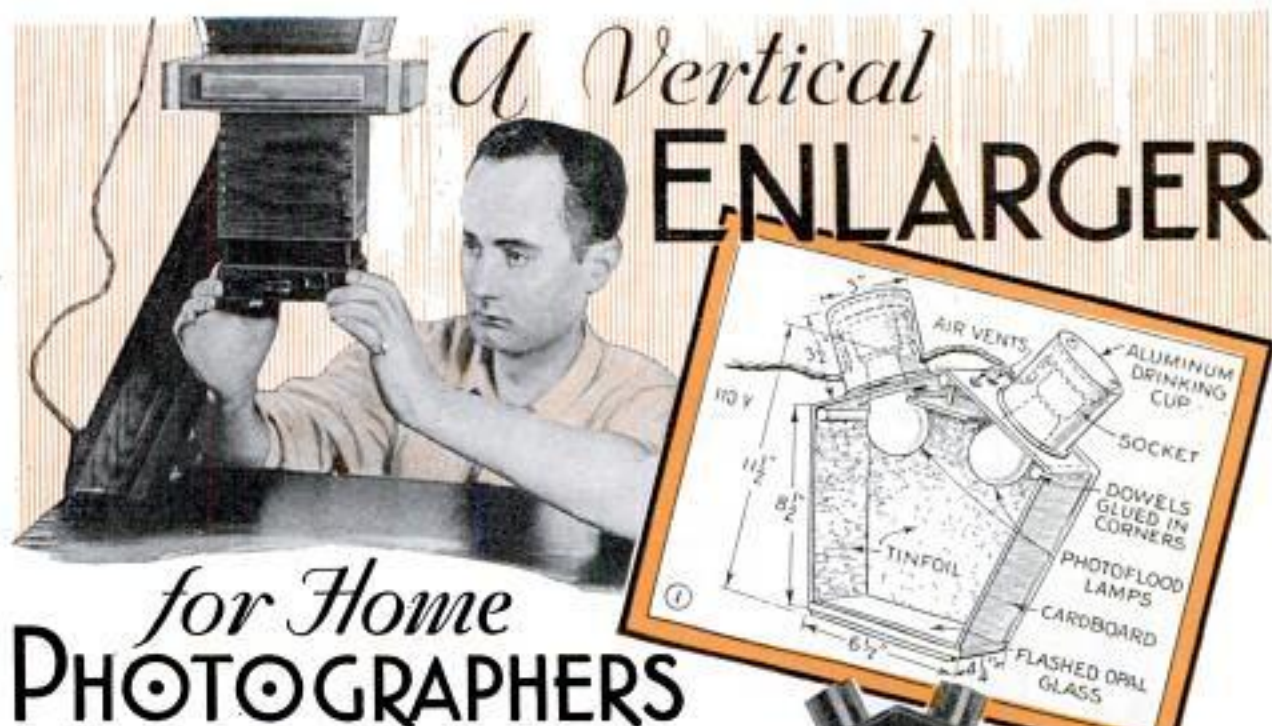


For further information on any radio construction article write to the radio department; this service is free.

Crosley Radio Corp. 1329 Ardenway, Cincinnati, Ohio



AMATEUR MECHANICS



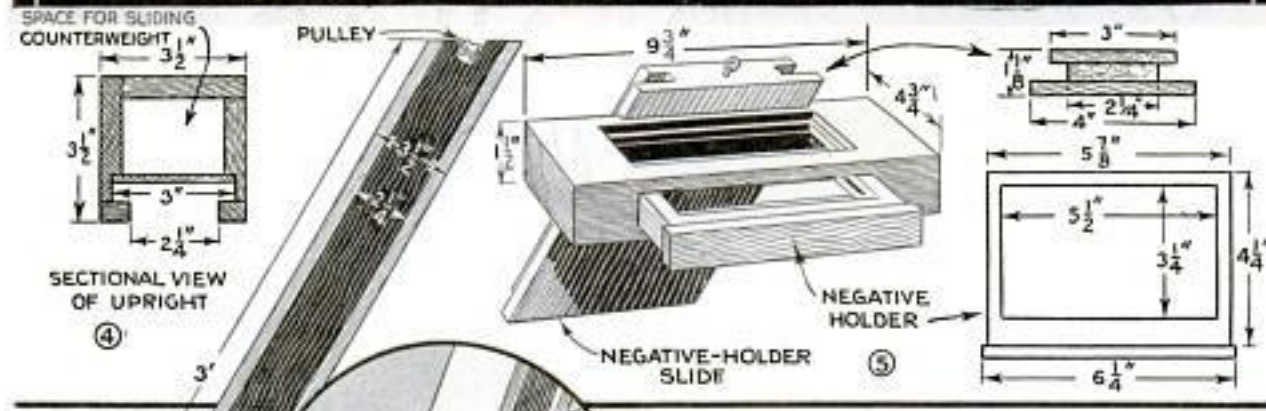
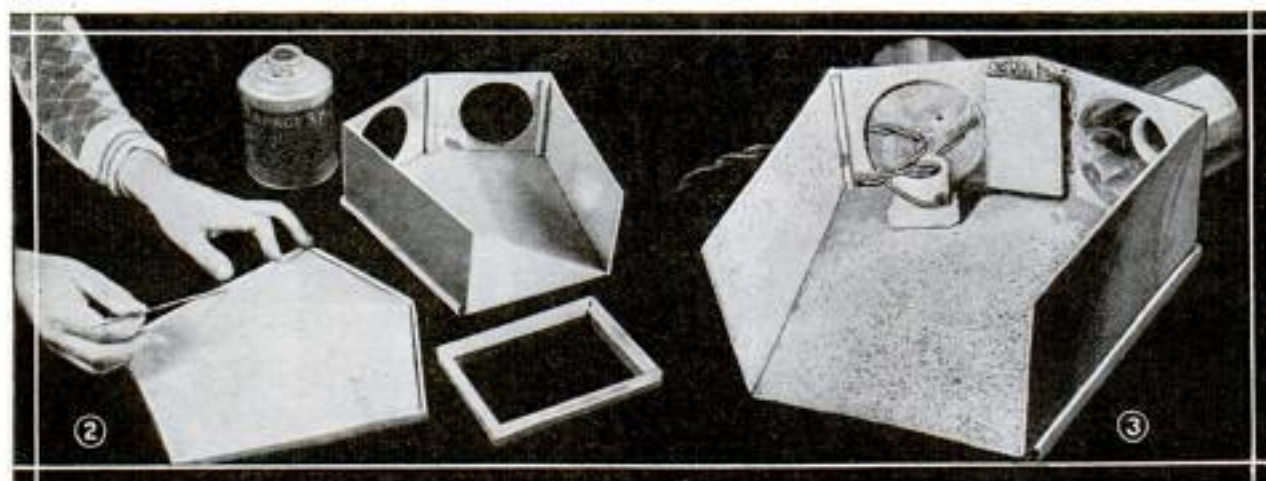
WITH this vertical outfit, costing less than a dollar to build, you can produce enlargements that are just as good as those made on a regular commercial machine. No special lenses are required. The framework consists of an upright, set at an angle, a camera holder and a lamp house.

To make the upright, use three lengths of yellow pine as shown in Fig. 4. A mortise to provide a track for the slide is cut the full length of two pieces. For strength, join these with the popular box joint to form a three-sided box. A length of three-ply veneer is then glued into the slide track. The ends are cut off at an angle as indicated, and the bottom is plugged with a block that fits tightly.

The camera holder, in which the negative box slides, is shown in Fig. 5, and consists of two pieces of veneer, with the opening in one larger than in the other, to provide a ledge to hold two pieces of glass. It is securely glued and doweled



to a slide which fits nicely in the track of the upright. All of the above parts are given a coat of shellac, sanded, and sur-



drilled in each weight. A sufficient number are strung on a heavy cord, passed over the pulley on the upright and tied to a screw eye on the slide. A hole is drilled in the base of the upright immediately above the plug at the lower end, to enable one to anchor it to a table with a metal clamp.

Any small folding camera may be quickly fastened to the holder. Remove the back and snap it in place with heavy flat rubber bands. In using a box camera, lay aside the outside part and provide a veneer box around that part in which the lenses are fitted. The box is in turn attached to a frame that can be snapped to the camera holder. With cameras of odd design, the reader can easily make a suitable connecting attachment. In use, the camera is shifted up or down until a picture of the desired size is projected on a piece of cardboard laid on the table. Then focus is obtained by moving the bellows, in case you are using a folding camera, or by adjusting the camera, if you have one of the box type in the veneer case, the latter being a rather tight fit to permit such adjustment. Turn off the light, exchange the cardboard on the table for bromide paper and

faces exposed to the enlarging light are coated with dead-black wallboard paint.

The lamp house is designed to utilize the illuminating power of the lights to the utmost. Heavy cardboard is glued inside of a wood frame, as shown in Figs. 1, 2 and 3. Both sides are made fireproof by coating with water glass, which is also used to attach sheets of crinkled tinfoil. The lamp sockets are bolted inside of aluminum drinking cups, 3 in. in diameter. Flashed opal glass is used to diffuse the light evenly. If this glass is not available, two pieces of plain glass, with a sheet of 16-lb. bond typewriter paper between them, may be substituted. Lamp house and camera holder are counterbalanced by a sliding weight inside the upright. Linotype metal is cast in shallow boxes treated with water glass, and a hole is

538 S. Clark or Pajit mania
Chicago

J. House Glass Co

make the exposure. Leave the camera shutter open at all times, exposing only by means of the light switch to eliminate any possible vibration. A good way to mask the space around the negatives is to apply adhesive tape to the edges of the glass in the holder.

Extensive testing of this enlarger has been made and it was found entirely satisfactory. The specifications are correct for any box camera, and for folding cameras up to postcard size. Larger sizes will require a higher upright because of the longer focus of the lens used with them.

Copperplating without Electricity

A thin coating of copper may be plated onto iron or steel objects by simply immersing the work, for a few seconds, in a solution made by dissolving copper sulphate, $1\frac{1}{2}$ oz., in 1 gal. of water. When the copper sulphate has dissolved, add commercial sulphuric acid, 1 fluid oz., pouring the acid into the solution slowly to avoid spattering. Before immersing the work in this solution, it should be thoroughly cleaned by boiling it for a few minutes in a strong lye solution. When clean, rinse and dip into the copper solution. While a plate made in this way is thin, it is suitable for a variety of ornamental purposes.

Typing Small Gummed Labels



Small labels may be typed near the bottom edge by using the method indicated. A sheet of paper is folded at the edges to fit over the ends of the label. By placing the sheet in the typewriter in the usual way, the folded edges hold the label as it is run through the machine.

☛ A knife blade whetted on a strip of No. 90 emery cloth will cut soft materials such as felt, leather and soft rubber more effectively than one that has been honed to a smooth fine edge.



Emergency Double-Line Ruling Pen Made by Inserting Ordinary Ruling Pens in Side of Box

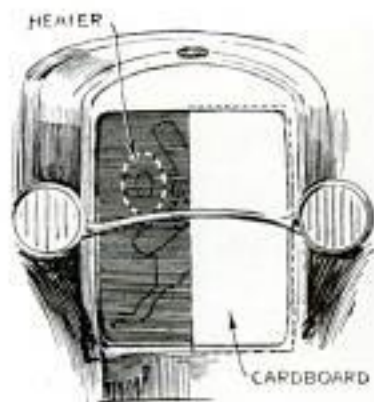
Double-Line Ruling Pen Improved from Cardboard Box

For emergency use, a double-line ruling pen can be improvised from a small cardboard box and two ruling pens. Holes are punched through opposite sides of the box to take the pens as shown. If lines of various spacings are to be ruled, it will be necessary to make a box for each one.

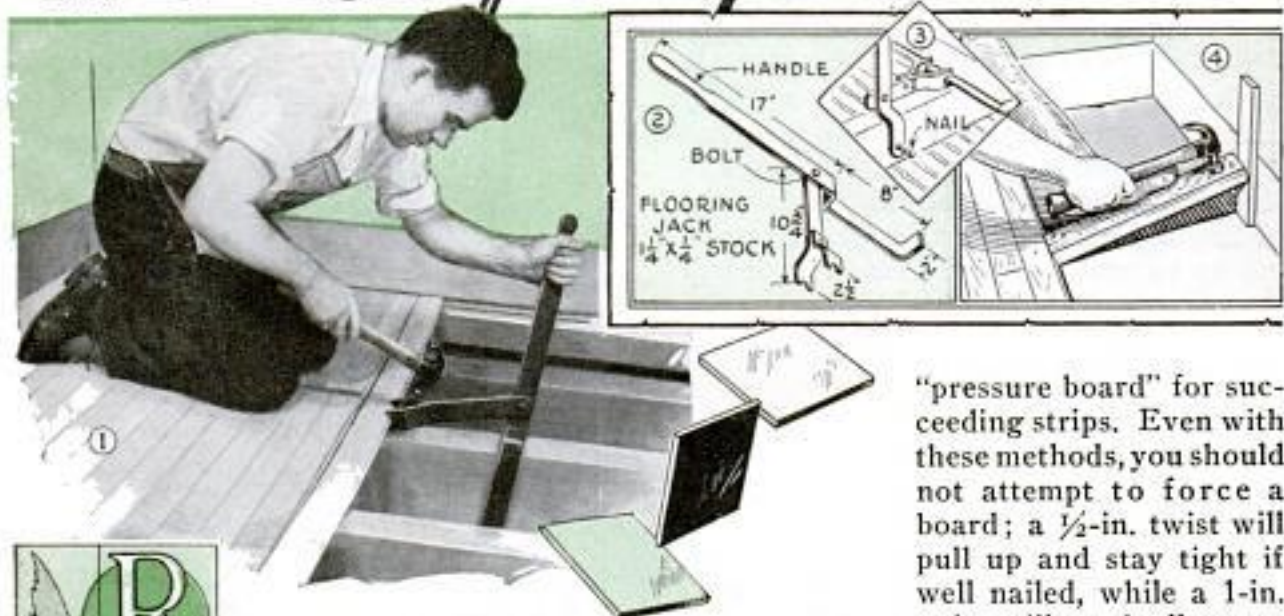
Cardboard on Side of Radiator Improves Heater

When attached to the side of a radiator opposite the exhaust heater, a piece of cardboard will not interfere with the efficiency of the heater, as is often the case when it is placed across the bottom.

If it is necessary to cover still more of the radiator to maintain the proper motor heat, be sure to leave an opening just in front of the air intake of the heater.



It's Easy to fit NEW



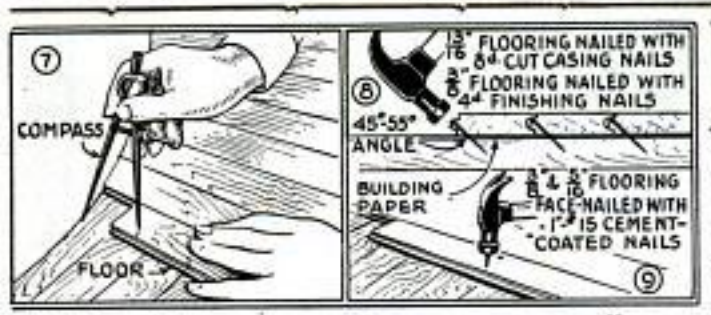
REFLOORING offers considerable scope to the home craftsman, with as many as a dozen easily worked materials to select from. No special skill is required to lay wood flooring beyond the ability to hit a nail squarely on the head. It may be nailed directly to and across the beams over the subflooring, or laid over old floors or matched subfloors.

Each of these methods has several things in common as regards the manner of fitting, one of the most important features being the proper handling of warped boards. Care should be taken to prevent this. The flooring should not be delivered until the last minute, and no deliveries should be made when rain is falling. No storage place other than a warm, dry room should be considered. In spite of all these precautions, some boards will warp. To fit them properly, use the simple flooring jack shown in Figs. 1 and 2. If the hooked arm will not fit around the beam, use the nailing method indicated in Fig. 3. When the joists are not accessible, the simple method shown in Fig. 4 can be used to good advantage, gradually shortening the

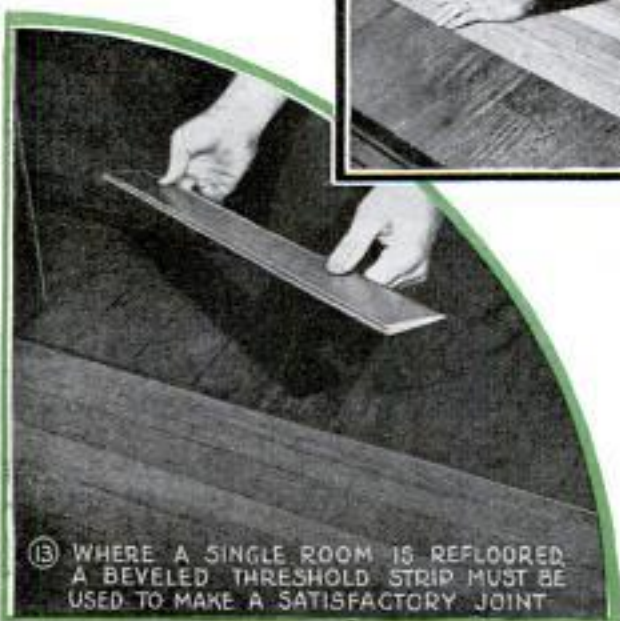
"pressure board" for succeeding strips. Even with these methods, you should not attempt to force a board; a 1/2-in. twist will pull up and stay tight if well nailed, while a 1-in. twist will gradually open up again after being laid tight. Use the short lengths and warped pieces in closets and out-of-the-way places, reserving long straight boards for doorways, exposed surfaces and large areas. If the warp is in the joist, it can be taken out by nailing a piece of 2 by 4-in. stock across the beams. This will hold a slight twist in place where the individual boards would be insufficient to bring the beams level. In a solid unit, of course, the flooring will hold the level surface after the cross timber has been removed.



FLOORING



Where $1\frac{3}{16}$ -in. flooring is applied directly to the beams, it is always necessary to remove the old flooring. This is done as shown in Fig. 10, after first removing the base shoe and possibly the baseboard and door trim. The new flooring is applied in the conventional manner, using eight-penny cut casing nails. Each strip is nailed at every beam, driving the nails home at a 45° to 55° angle as in Fig. 5. With some types of tongue-and-groove flooring, the nails can be hammered in their full length without danger of marring the edge of the wood; with other types, the final $\frac{1}{8}$ -in. portion must be driven home with a nail set.



1 3/16" FLOORING USED DIRECTLY ON BEAMS OR OVER ROUGH SUBFLOORING

3/8" FLOORING USED OVER OLD FLOORS OR MATCHED SUBFLOORS

1 3/16" FLOORING USED ONLY WHEN SUBFLOORS ARE HEAVY AND WELL-MATCHED

Hardwood flooring of $1\frac{3}{16}$ -in. thickness is usually tongued-and-grooved all around. For this reason, the end cut from one strip should always be used in starting the

next, leaving the grooved end in place for the succeeding board. Joints may occur anywhere, provided two side-by-side strips do not join directly in line. The important point here is that you need not butt the stock directly over a beam, since a joint between two beams will be held solidly by the tongued portion of adjacent boards.

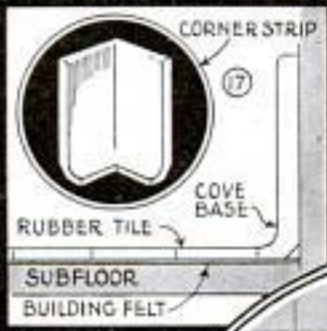
Fig. 11 shows the best type of common floor, $1\frac{3}{16}$ -in. hardwood, being applied over diagonal subflooring. The procedure in cutting, fitting and nailing is much the same here, with the exception that a layer of waterproof building paper is laid between the two courses. For second-story work, a layer of building felt should be added for insulation, but not on the first floor because of its absorbent quality. For

American Tile & Rubber
Brenton, N.J.



pansion. The opening, of course, is covered by the base shoe. Visible butting joints, such as around a bathtub or curved stair riser, should be a tight fit. A simple method of determining the proper curve is indicated in Fig. 7, the board being slipped into place and the arc scribed with a compass.

Rubber tile is a comparatively new flooring medium which is especially suited for the bathroom, sunroom or kitchen. In its simplest form, the individual tiles are laid in a square-block pattern, as in Fig. 14. Much of the success of such a floor depends on the under surface. This should be as level as possible, clean and dry. Over the floor, a layer of 1½-lb. building felt should be tacked or cemented, butting all joints and covering the area carefully to within ¼ in. of the edges. The tiles should be laid in a waterproof cement provided for this purpose. A tight bond is established by going over the finished floor with a weighted roller or with a common rolling pin, plus pressure, as shown in



best results, nail onto and also between the beams, drawing lines on the building paper to show where the joists are located.

Reflooring directly over old floors is increasing in popularity because of its simplicity. This is especially true where ready-finished flooring is used. The first step in this work has to do with the old floor. It must be as nearly level as possible, and all projecting boards should be planed or nailed down, as shown in Fig. 6. After that, remove the base shoe or quarter-round molding on the baseboard, the building paper and building felt, and lay the new flooring. This will be standard ⅜-in. stock, tongued-and-grooved in as many as a dozen different ways as featured by different manufacturers. The ends of the boards are usually not grooved, but are simply butted tightly together. Use four-penny finishing nails, blind-nailing in the same manner as described for the thicker flooring, Fig. 8. Where a single room is being refloored, it is necessary to bevel a strip, as shown in Fig. 13, in order to make a suitable threshold strip. As there is no final edge on this piece, it must be face-nailed, using 1-in. No. 15 cement-coated nails, as shown in Fig. 12. The nails should be set and the holes filled with wood filler to match the wood. The flooring should not be laid tightly against the baseboard, but a clearance of about ⅛ in. is left for ex-



Fig. 15. Besides the square 6-in. blocks, rubber tile is supplied in a wide variety of shapes and colors, with plain-colored strips for border effects. These strips can be cut with a roofing or linoleum knife, as in Fig. 16, or with a fine circular saw. A sanitary cove base, with molded corner strips, as in Fig. 17, is often used in connection with the flooring in

ways show the board lines and eventually the board itself as the linoleum cracks and chips away. The only correct way is to see that the floor is as smooth as possible. Building felt, of a good weight, should always be used under the finished floor. This may be tacked or cemented down as



20 WHEN LINOLEUM IS CEMENTED IN PLACE, SAND BAGS OR OTHER WEIGHTS ARE LAID OVER SEAMS UNTIL CEMENT IS DRY



23 INSETS TO REPLACE WORN SPOTS



suits the job. Best results are obtained by cementing the linoleum to the felt base, covering the whole surface. The seams, at any rate, should be properly coated with waterproof cement, as in Fig. 19. The manner of edging the linoleum against the baseboard is also important. It should never be a tight fit, but should clear the wall by at least $\frac{1}{4}$ in. When applying the base shoe over the edge, do not nail it tightly onto the linoleum, but slip a strip of light cardboard under the wood and then nail to the baseboard, as shown in Fig. 22, and not to the floor. Laid in this manner, the linoleum has room to expand without humping. Linoleum should not be tacked. If you must fasten it by nailing, use $\frac{3}{4}$ -in. No. 18 wire brads, driving these in until the heads are just lost in the

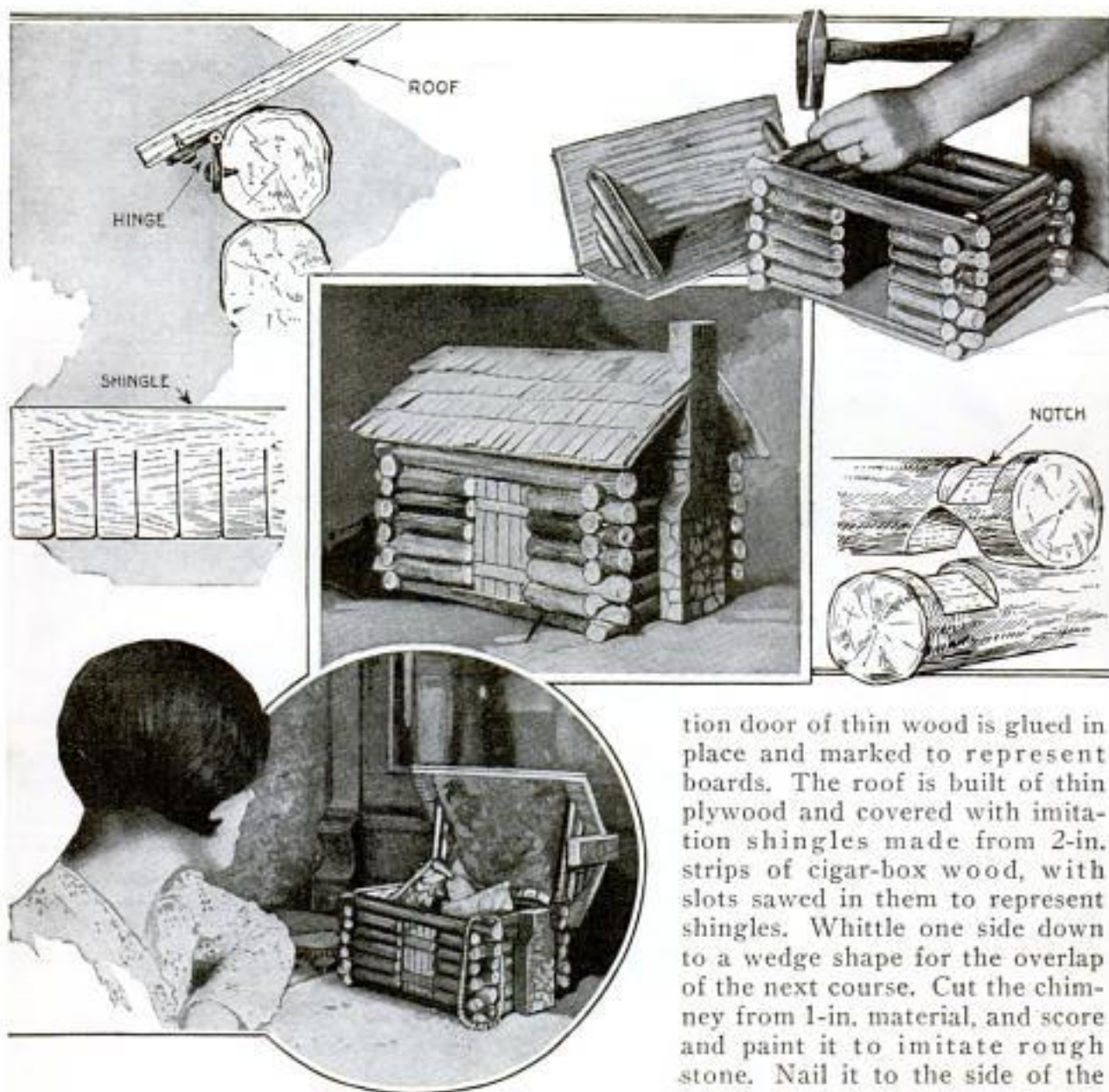
(Continued to page 121A)

order to secure a neater job. Fig. 18 shows the tiles being laid in a diagonal block, using a 6-in. border and a starting course of triangular pieces. Notice here how each block is more or less pushed into place so that a small portion of the cement is carried forward between the seams. Cement projecting above the blocks should be promptly wiped off with a rag soaked in alcohol.

Linoleum floors are often laid improperly, the commonest fault being the lack of the right under flooring. The best grades of linoleum laid over rough wood will al-

Sealer (Congoleum hair sealer)
Kearny, N.J.

Novel Jewel Box Resembles Pioneer Cabin



Resembling an old-fashioned log cabin, this jewel box is made from small green twigs, about $\frac{3}{4}$ or 1 in. thick, with the bark left on. Cut twelve pieces, 11 in. long, for the sides and an equal number, 8 in. long, for the ends, while varying sizes are used for the gables. The pieces for the sides and ends are notched deeply enough for the logs to fit closely together when fitted. The height of the sides, when assembled, should be about 6 in. The twigs are assembled by nailing them with lath nails, each to the one below it. Avoid nailing near the corners, or the pieces may split. The doorway is 2 in. wide, leaving the top and bottom logs intact. An imita-

tion door of thin wood is glued in place and marked to represent boards. The roof is built of thin plywood and covered with imitation shingles made from 2-in. strips of cigar-box wood, with slots sawed in them to represent shingles. Whittle one side down to a wedge shape for the overlap of the next course. Cut the chimney from 1-in. material, and score and paint it to imitate rough stone. Nail it to the side of the cabin and cut it in two, so that the upper half will rise with the roof when the box is opened. Hinges complete the assembly. Wood filler is used to calk the cracks. A lining for the inside of the box can be made of cardboard which may be covered with fancy cloth. No paint or varnish should be used for the walls, but the roof, door and log ends should be stained to represent weathered wood.—Paul Hadley, Piggott, Ark.

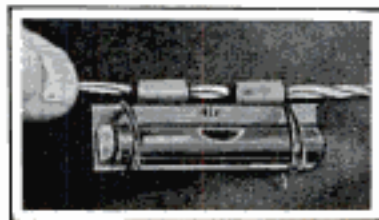
☛ Cardboard boxes and paper bags can be waterproofed by painting them with a dilute solution of casein glue; when the glue has dried, paint the surface with formaldehyde.

A Polish to Preserve the Finish on Your Car

The owner who spends many hours polishing the surface of his car will appreciate this formula for a polish that requires no rubbing. Mix clear spar varnish, $\frac{1}{2}$ pt., in high-test gasoline, $1\frac{1}{2}$ pt., and to this add turpentine, 2 oz., and raw linseed oil, 1 oz. After the car has been washed and dried, apply the polish with a pad of cheesecloth, keeping the pad saturated so that the polish almost flows onto the surface of the car, but do not rub it in. Apply the polish quickly and do not go over the same area after the polish begins to dry. It dries completely in a couple of hours, depending on weather conditions. After the polish has dried, wash with cold water to harden and set the varnish, and then dry off with a chamois.

Pill Bottle Used as Line Level

A simple level for determining the true horizontal position of a wall chalk line can be made from a small pill bottle attached to one-half of a common butt hinge. The bottle is first filled with liquid, allowing space for a small air bubble, and then tightly corked, after which it is wired to the hinge, parallel to the lower edge. The line is threaded through the pinholes

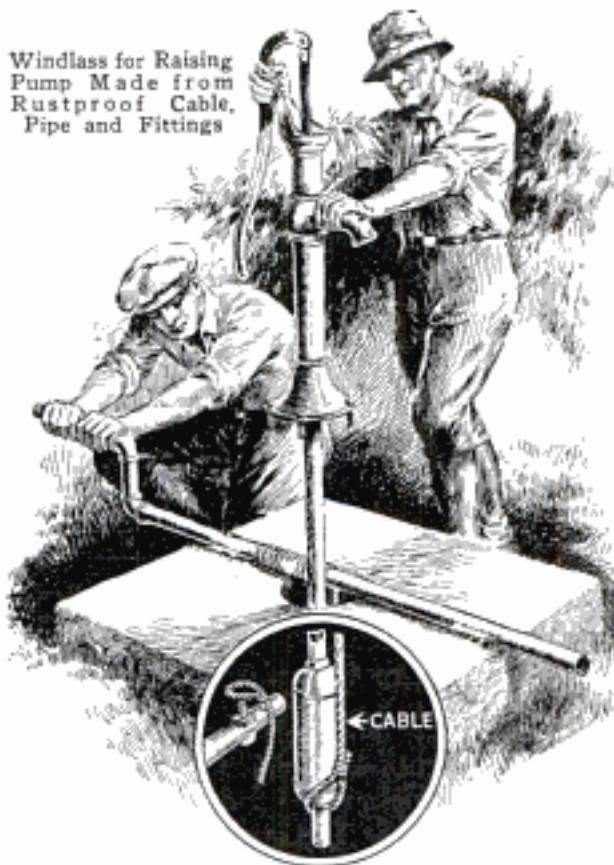


of the hinge, which permits it to be moved in either direction. Marking the exact center of the hinge on the top edge will aid in determining when the air bubble indicates levelness.

Small Block Aids in Playing Guitar

Guitar players often break the E-string by using it as a rest for supporting their fingers in strengthening the base notes. To avoid this, they will find the following method helpful. Glue a block, $\frac{1}{2}$ in. square and 2 in. long, to the guitar 3 in. from the bridge, and just beside the E-string. It will then take but little practice to become accustomed to pulling on the block instead of the string.—Geo. Maxwell, Kimmswick, Mo.

Windlass for Raising
Pump Made from
Rustproof Cable,
Pipe and Fittings



Simple Device for Lifting Pumps Made from Pipe and Fittings

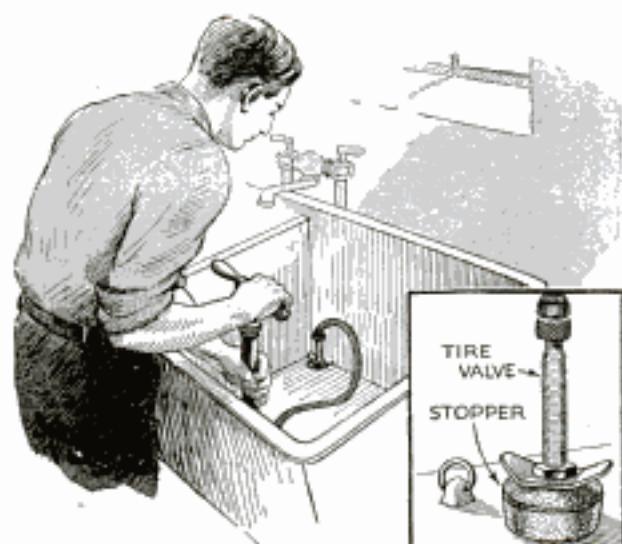
As pumps must be lifted from a well frequently for making repairs, this ever-ready lifting device will be found handy. It consists of a long crank, assembled from pipe and fittings, and a length of rustproof cable. When the pump is taken out, one end of the cable is looped around the pipe below the cylinder and the other end anchored to the platform. When the pump is to be lifted the next time, the cable is simply wound on the crank.

Groove in Smoking Pipe Provides Place to Scratch Matches

By filing a small groove on your pipe as shown, you will always have a convenient place for scratching matches. The groove, which



is just wide enough to receive the head of a match, is started with a three-cornered file and finished with a round one. It is then lined with emery cloth.

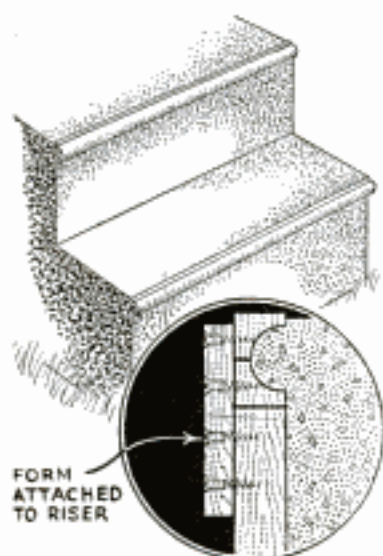


Tire Valve in Sink Stopper Allows Air to Be Forced into Waste Pipe

Tire Pump Clears Sink Drain

By fastening a valve from an old inner tube to the rubber stopper in a sink, the drain can be cleared by forcing air into it with a tire pump. The part that holds the ring on the stopper is cut off and a hole is drilled through its center to take the valve. When the altered stopper is put in the sink and held firmly, air can be pumped into the pipe to force out accumulations that clog it.—Ray J. Marran, Kansas City, Mo.

Quarter-Round Molding Forms Nosing on Concrete Steps



Two lengths of quarter-round molding, nailed together to form a semicircle, and screwed to the forms by means of a cleat, as shown in the detail, make good forms for nosings on concrete steps. After the forms are removed, any ridges, caused by the cement leaking through the cracks between the molding strips, can be chipped off or dressed down with a file.

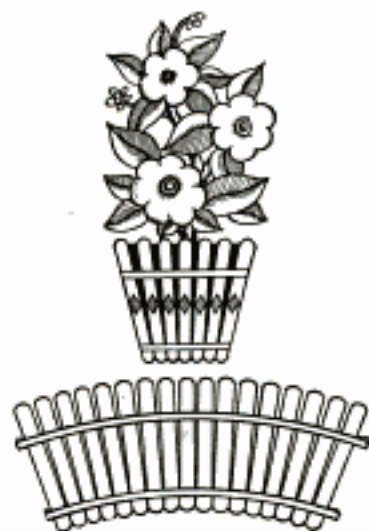
Two lengths of quarter-round molding, nailed together to form a semicircle, and screwed to the forms by means of a cleat, as shown in the detail, make good forms for nosings on concrete steps. After the forms are removed, any ridges, caused by the cement leaking through the cracks between the molding strips, can be chipped off or dressed down with a file.

A Strong Quick-Setting Cement

A quick-setting cement for metal, glass or wood may be made by mixing dry white lead with thick orange shellac to form a heavy paste. The lead should be worked into the shellac with a putty knife and a piece of plate glass may be used as a mixing table. This cement will set in a short time, and will be hard enough to be carved, filed and sandpapered. If colored cement is desired, add a suitable quantity of dry color, or color the shellac with spirit stain or aniline dye before adding the white lead.

Easily Made Flowerpot Cover

Here is a flowerpot cover that can be folded up and put away when not in use. It consists of wooden tongue depressors, obtainable at any drug store, held in position with strips of adhesive tape as indicated. The lower strip should be about $\frac{3}{4}$ in. from the bottom and the upper one about $1\frac{1}{2}$ in. from the top. Two more strips are placed in the same position inside of the cover, and the ends are joined to the ends of the strips on the opposite side. Any kind of narrow strips, cut from thin stock, may be used instead of the depressors.



Waterproofing a Cracked Car Top

When I found the top of my car cracked so badly that it seemed almost beyond repair, I coated it with roofing paint, which filled the cracks and made it waterproof. Before using, the paint should be thoroughly warmed so it will flow into the smaller cracks. Apply as many coats of paint as necessary to fill the cracks and leave a smooth surface, allowing each coat to dry before applying the next one.—Eugene Allford, Decatur, Ala.

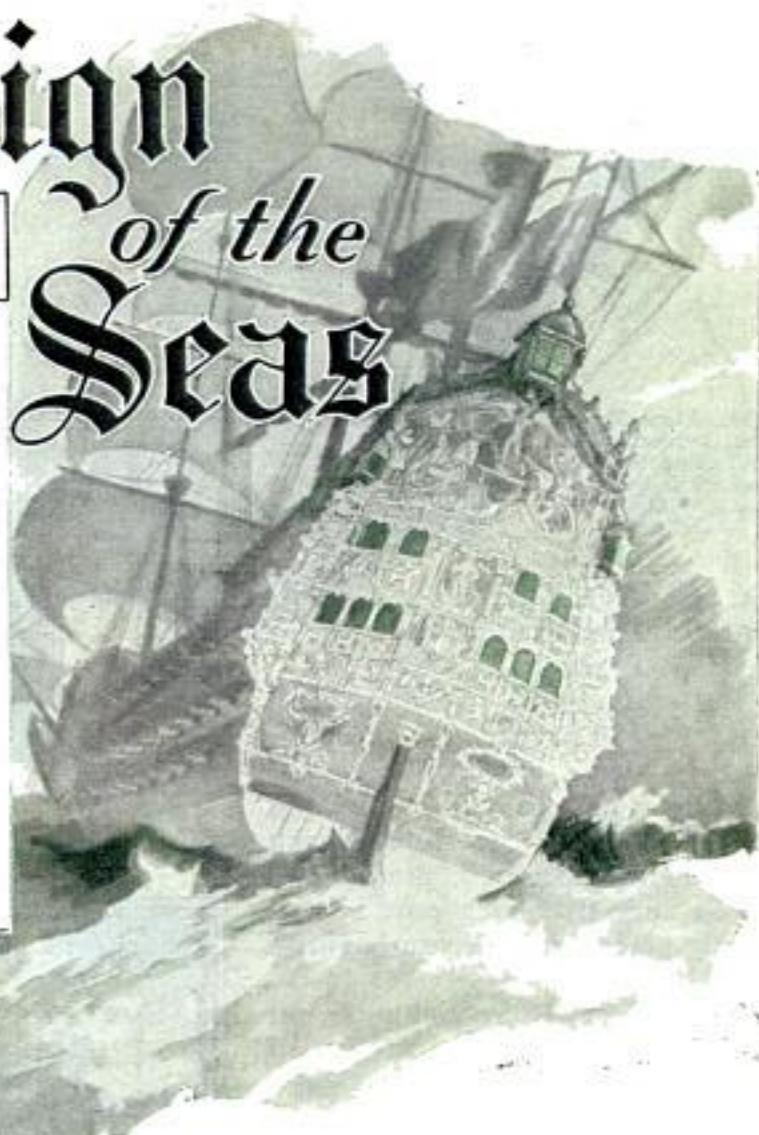
Sovereign of the Seas

By HAROLD T. BODKIN

Charter President of the Ship Model Club of Chicago

PART II—The Rudder, Quarter Galleries and Gunports

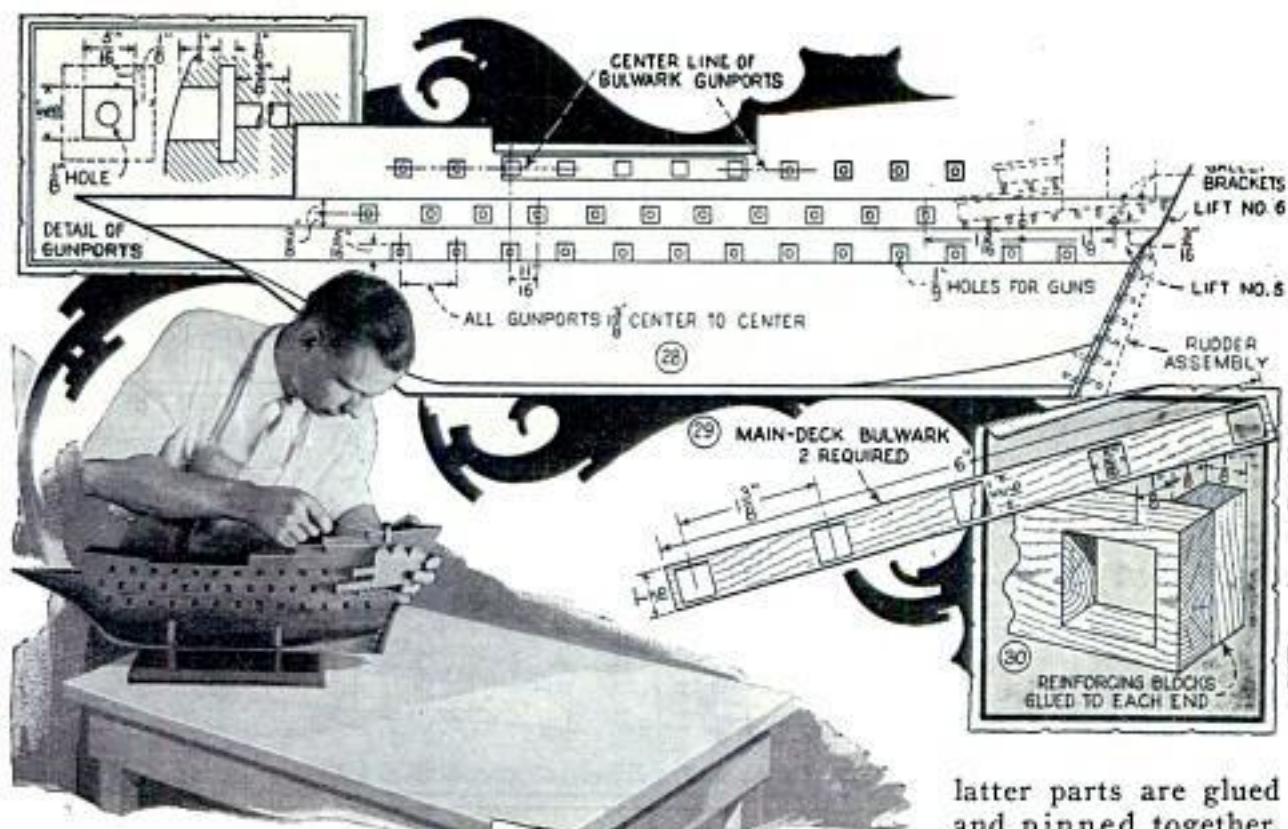
AFTER carving the hull to shape as covered in the November issue of *Popular Mechanics*, you will need two main-deck bulwarks to build up the ship's sides just below the spar deck. The bulwarks are simply two strips of white pine, each 6 by $\frac{7}{8}$ by $\frac{1}{8}$ in. in size, as shown in Figs. 29 and 30. Into each of these pieces cut five gunports, $\frac{5}{16}$ in. square, beginning with the center



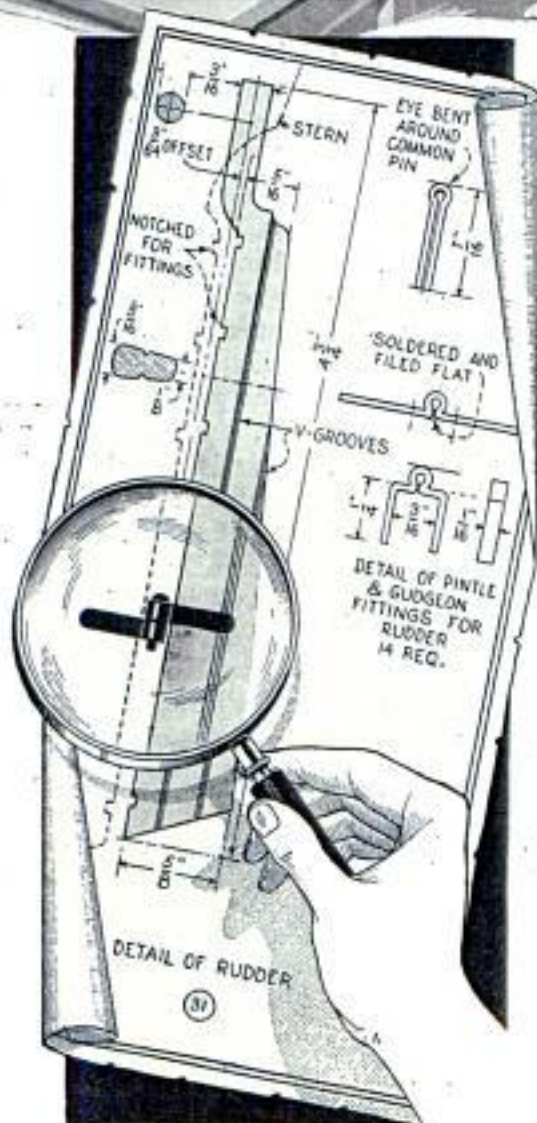
gunport and locating two more ports on either side. All of the ports should be located so that they come exactly $1\frac{3}{8}$ in. center to center. This done, mix a little casein glue, and with it attach to each bulwark two $\frac{1}{8}$ -in. square reinforcing pieces of wood, flush with each end, top and bottom as in Fig. 30. When dry, glue the bulwarks in place as shown on the general assembly, Fig. 28. The reinforcing pieces should be inboard, of course, and the outside of the bulwarks should be flush with the ship's side at the main deck level. Sandpaper the juncture of the bulwarks and the hull side so that the hull curve will flow smoothly into the bulwark face.

Now, we again take to carving. Beginning with the top row of gunports, draw pencil squares, $\frac{5}{16}$ in. on a side, to define the gunports to be cut next. The top line of ports is on the horizontal center line of the bulwark gunports. In the next row below, the gunports are centered along

POPULAR MECHANIC



block between two smaller ones. On one set, glue the cut-away block to the right of the center block; on the other set, glue the corresponding block to the left of the center. The gallery rails, rail tops and decks are made as shown in the quarter-gallery details. Cut the stern angle and the bottom angle in each set of blocks. Then, mortise shallow channels in the inner side of each cut-away and middle block, to receive the parts of the gallery decks that continue aft on their inner sides. You can buy fine pins, called "lills," at your stationery or department store, which provide excellent fastenings for all small parts on the ship, including the decks and rails of the quarter galleries. These



latter parts are glued and pinned together.

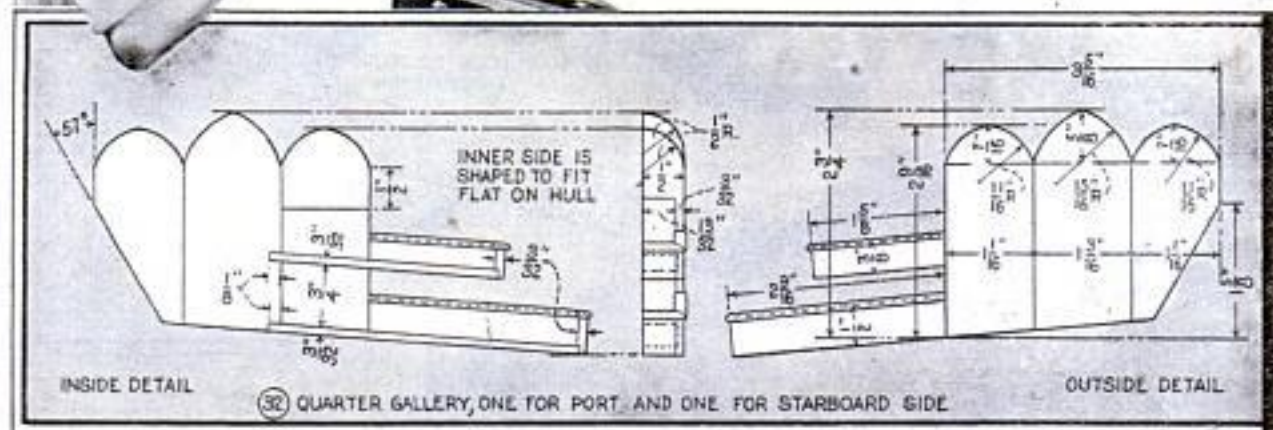
Drive the lill pins partly into the wood, cut off the heads and drive in flush with a light ball-peen hammer. This will produce another smaller head on the pin, which is sufficient to grip the wood securely.

When you have completed the quarter gallery assemblies—one right and one left—you will have to fit the inboard side of each to the curve of the hull and upper works. Do this with a jackknife or chisel and finish with sandpaper. If the galleries are correctly fitted, they should butt flush against the hull at all points of contact. The general assembly drawing, Fig. 28, shows where the galleries are attached to the ship. The best way to do this is to apply glue to all contact surfaces, clamp galleries, one at a time, in position and make the initial fastening



31, is full size, and, to get the proper offset for the rounded section at the top, trace the outline first on tissue paper and then onto the wood, following the same method you did when laying out the hull lifts.

The aft side of the rudder is cut down to $\frac{1}{8}$ in. thick; the top, just under the rounded section, is $\frac{7}{16}$ in. wide from the forward edge, and the bottom measures $\frac{5}{8}$ in. wide from the same edge. Two shal-



with $\frac{1}{16}$ -in. wood dowels, driven through holes that go through the two solid gallery blocks and into the hull on each side. After this, you can use lills to secure the decks and rails where they meet the hull.

You can make the gallery brackets while the glue on the two assemblies dries. It will save time if you form these as molding strips from $\frac{3}{16}$ by $\frac{1}{2}$ -in. square white pine. Make lengthwise cuts and sandpaper the curved edges of the sticks as shown in the detailed drawing of the gallery brackets, Fig. 27. Then cut $\frac{1}{8}$ -in. sections from the molding to make the individual brackets. After cutting, carefully sandpaper off any fuzzy edges left by the saw on the brackets, as this will detract from their appearance when on the ship. Twenty-six brackets will be required, three to be equally spaced on the underside of each gallery deck, and ten spaced out under the lower gallery deck. It will be necessary to change the right angle of the backs of the brackets so that they will fit snugly against both deck and hull. However, this angle depends upon the exact shape to which you have carved your hull, and so cannot be determined here. Attach the brackets with lills and glue.

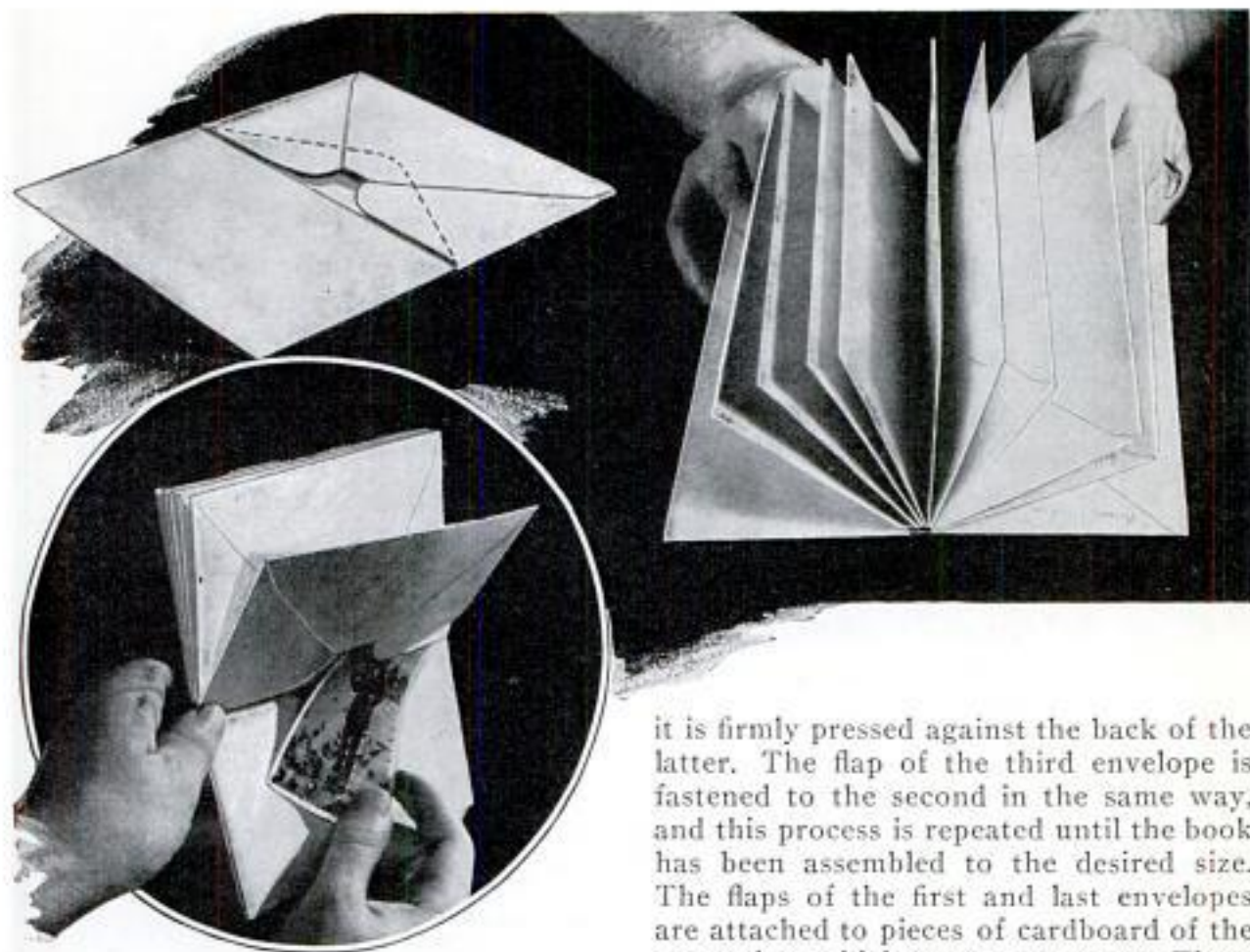
Make the rudder, as a single piece, from a good, clear strip of white pine, 5 by 1 by $\frac{3}{16}$ in. in size. The rudder drawing, Fig.

low V-cuts are made parallel to the forward edge from the bottom of the piece to represent planking. Seven notches, $\frac{1}{16}$ in. wide and $\frac{1}{32}$ in. deep, are cut into the forward edge, as shown in the same detail, to receive the pintle and gudgeon or hinge fittings, which attach the rudder to the ship. Similar notches are cut into the sternpost, but are staggered below those of the rudder when it is in position. Check the position carefully with the drawing before cutting the notches. When the rudder is attached, the bottom edge must be cut as a continuation of the straight line of the keel. Don't trim this until you have actually hung the rudder, for you may have to make some adjustments—up and down—to get the rudder in the position that looks best to you.

Pintle and gudgeon fittings are next. A flat cigaret tin will provide metal of suitable thickness from which they can be cut. From this, cut 14 strips, each $\frac{1}{16}$ in. wide and 2 in. long. Bend these in the middle and, using a common pin, form the eye at the upper end of each by putting the pin in the angle and pressing the metal together with a pair of pliers, just under the pin. Further development of these fittings is shown in the details of Fig. 31. Insert a pin in each eye of seven fittings only and

(Continued to page 131A)

Envelope Book Holds Prints and Negatives



For keeping your prints and negatives together compactly, a simple file can be made from a number of envelopes. The flaps of the envelopes are first turned back, the gummed edge is moistened, and it is then inserted into the next envelope where

it is firmly pressed against the back of the latter. The flap of the third envelope is fastened to the second in the same way, and this process is repeated until the book has been assembled to the desired size. The flaps of the first and last envelopes are attached to pieces of cardboard of the same size, which serve as covers. There is, of course, no limit to the size of books that can be built up in this way, either in the number of envelopes employed or in the size of the envelopes. With rubber bands snapped around the file, there will be no risk of losing any prints.

Repairing a Leaky Hot-Water Coil

A temporary repair for a small hole in a copper hot-water coil can be made by driving a steel carpet tack, or a small nail, into the opening. As copper is softer than steel, it will spread and fit snugly around the tack.—S. E. Schofield, Indianapolis.

Long Strips of Punch-Press Work Straightened by Hand

Punch-press operators can straighten strips of light sheet metal that have become bent on the press, by merely taking them at one end, individually, and slapping them against a flat surface, such as that of an I-beam. If one blow does not

suffice, grasp the strip by the other end and strike again.

Glass Cutter Used as Ruling Pen



be used as a rotary ruling pen. The sharp edge of the wheel is inked by the cotton, and makes a neat line on the paper.

By filling the small cavity just above the wheel of an ordinary glass cutter with cotton and saturating this with ink, the tool can



Sheet-Metal Scraper Prevents Accumulation and Packing of Snow in Front of Door

Scraper Keeps Snow from Blocking Door in Winter

Bent at right angles and screwed to the bottom of a door as indicated, a strip of sheet metal will scrape snow away when the door is opened. The scraper should extend just a trifle below the bottom of the door so that enough snow will be removed to assure sufficient clearance. Besides preventing the snow from becoming packed so the door cannot be opened, the scraper also keeps water from running down the outside of the door and freezing under it.

Method of Fitting Wristpins

Although considerable information on the proper clearances for fitting wristpins is available, the following method has been found a safe way of doing the job. Fit the pin just tight enough to hold the weight of the connecting rod when the piston is held in the position shown, but not so tight that it will stick when the piston is given a slight jerk.



A Simple Method of Determining When a Wristpin Is Correctly Fitted

Simple Trick to Discourage Theft of Auto Tires

An auto owner who had several tires stolen from the wheels of his car used the following idea to discourage the thieves. When new tires were put on the wheels a 1-in. strip of canvas, about 8 in. long, was allowed to project between the tire and the rim of each wheel to imitate a blow-out patch, leading the thieves to believe that the tires were in poor condition. A little mud smeared over the tires will help increase the deception.

Crack Filler Made from Sawdust

When working with any kind of wood, run some of the sawdust through a fine colander or sieve and mix it with enough white shellac to form a paste, which will make a crack filler the same color as the wood. The filler is quick-drying and, when smoothed down with fine sandpaper, will hardly be noticeable.—Paul D. Miller, Topeka, Ind.

Utilizing Waste Pieces of Soap

Scraps of toilet soap can be utilized by slipping them into a slit cut in the center of a rubber bath sponge. This arrangement also makes better lather than is obtained by rubbing the soap on the sponge. All that is necessary to remove the soap is to squeeze the sponge.

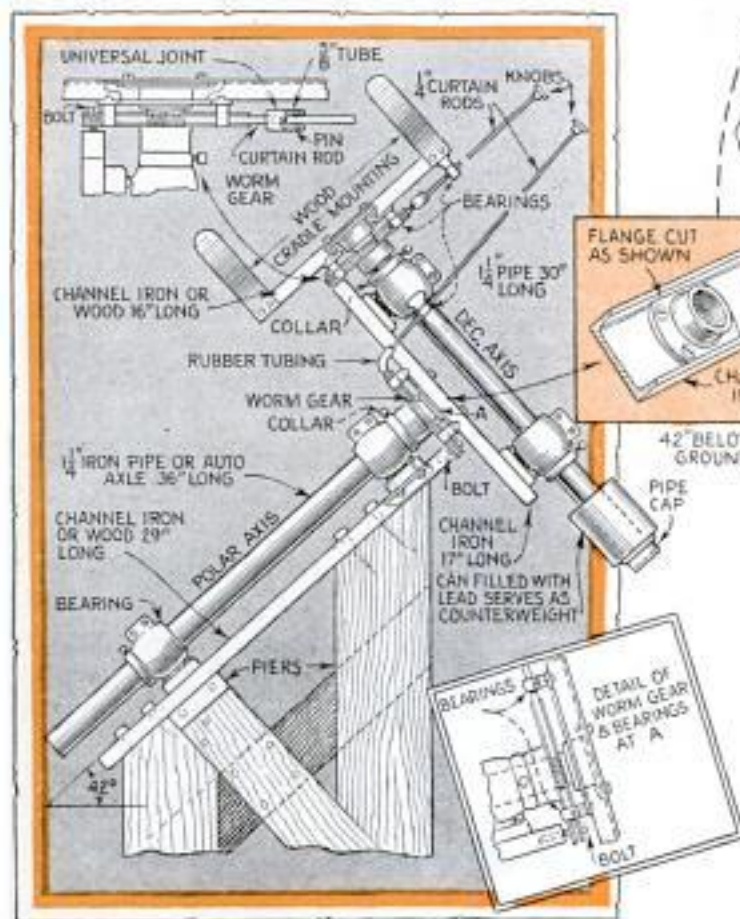


Ducks Retrieved with Casting Rod

When shooting wild ducks, a casting rod will be found handy for retrieving them. About 50 ft. of line is used on the reel in connection with a wood casting bait of the floating type. When a duck is shot and drifts in close enough to the boat, cast out over it and reel in.—I. H. Motes, Chicago.

Adjustable TELESCOPE MOUNTING

HERE are two forms of telescope mountings that can be made by any home craftsman. The first, shown on the left, is the simpler of the two, as it has no worm-gear control, but is moved about in two directions manually. It consists of a pier built up of 4 by 6-in. uprights, tied with 2 by 4-in. stock, and is set into the ground about 42 in., where a crosspiece forms a secure anchor. The tops of the piers are cut off at a 42° angle and a piece of channel iron or wood is attached with



This addition consists of 1/4-in. curtain rods held in bearings and fitted with worm gears that mesh with gears slipped over the ends of each axis but not fastened to the latter. The gear on each axis is fastened rigidly to the axis support, directly underneath as indicated, so that it will not turn. This arrangement permits the worm to work around the gear, rotating the part directly above the gear and also the axis to which this part is attached.—Geo. H. Olewin, Chicago.

Polish for Gold and Silver Articles

A good polish for gold, brass, nickel and silver is made by mixing kerosene with finely powdered crocus to form a creamy paste. Apply the paste with a soft cloth, and finish the polishing with a clean flannel.

lagscrews. This base carries two bearings for the polar axis, which is a length of 1 1/4-in. pipe. A pipe flange is screwed to the upper end and two collars hold it in place. The declination axis and its mounting are made in the same way, the only difference being the addition of a lead-filled can at the lower end, which serves as a counterweight, and a wooden cradle at the upper end to hold the telescope. The right-hand detail shows the same type of mounting to which worm gears have been added.



Pouring Contents from Large Jug Made Easy with the Use of This Rocker Support

Rocker Support on Large Jugs Facilitates Handling

When pouring the contents from a large jug, it is much easier to handle if the illustrated rocker support is provided. The rocker may be made from either heavy galvanized wire or a small iron rod. The method of attachment is clearly shown in the upper detail.—Fred W. Schneider, Towaco, N. J.

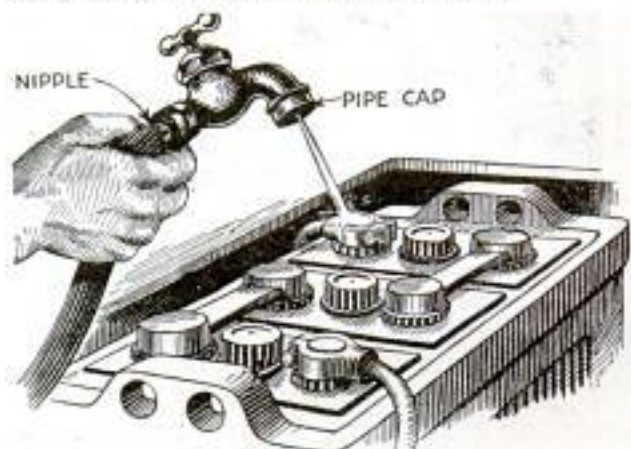
Simple Methods of Removing Ordinary Stains

Here are a few simple methods of removing ordinary stains that are often a problem in the average household. A new appearance can be given to a straw hat by cleaning it with a solution of sodium bisulphite, 4 parts, tartaric acid, 2 parts, and borax, 2 parts. Add water and apply the solution to the hat with an old toothbrush, wipe with a moist, warm cloth and set it aside to dry. The whites of two or three eggs beaten and rubbed over leather chairs with a flannel cloth will remove finger marks from the leather. If it is black, a little lampblack added to the eggs will help. Grease spots can often be removed from cloth by placing a blotter under it and then pressing with a hot iron. This softens the grease and the blotter absorbs it. A piece of ice wrapped in a cloth and rubbed over chewing gum on a garment

will harden the gum so that it can be broken up and brushed off. Stains caused from varnish or cooking fats can usually be removed with benzine. Clothes stained with indelible ink should be soaked in a strong solution of salt water and then washed in household ammonia. Iodine stains will come out if soaked overnight in a heavy solution of starch and water and then washed in the usual way. These stains should be removed as soon as possible as they tend to ruin the material. If you have a gold ring which has been stained with iodine, try immersing it in a solution of sodium bisulphite for about 15 minutes. Rust spots on household utensils will come off when soaked over night in a solution made by dissolving ammonia citrate, 1 teaspoonful, in half a glass of water. Tarnished silverware may be cleaned by boiling it in a clean aluminum pan filled with a solution of baking soda, 1 teaspoonful, and salt, 1 teaspoonful, to each quart of water used. It is important that each piece of the silverware touch the pan. Leather bags can be cleaned with a cloth dipped in a solution of sal-ammonia and water.

Forceful Water Stream Cleans Corroded Battery Terminals

Directed onto the corroded parts, a fine stream of water, under pressure, will quickly clean storage batteries. A hose and faucet, on which is screwed a pipe cap with a small hole drilled in its center, is used to direct the water as shown.



Small Stream Directed on Terminals Quickly Removes Corrosion from Storage Batteries

When tossing a flashlight to a companion, be sure to light it; there is then less chance of breaking the filament.

Alining Telescope Sight on Rifle

The following method of alining a telescope sight on a rifle will be found accurate, and may be used on any rifle where you can sight through the bore of the barrel: First put the gun in a rigid support, and then set up a regulation target or a piece of white paper, with a large "X" drawn on it, at a distance of about 150 yd. from the gun. Place the target so that, when you look through the barrel, it will be in the center of the bore. It will be noticed that the eye will tend to center itself in the opening of the bore. Now adjust the telescope to center on the target. When this is done, the target will appear in the dead center of both the telescope and the barrel of the gun. A slight error may result in elevation if a low-power gun is used, but in a high-power rifle this is negligible.

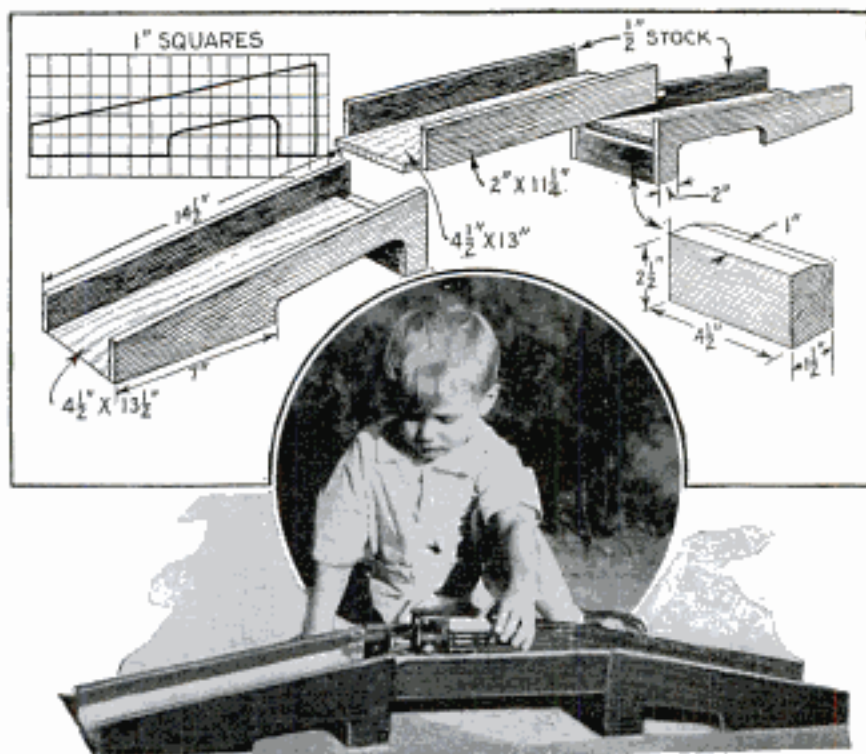
Trowel Improved from Auto Pedal



A pedal from an old model-T Ford will be found useful as a trowel for doing concrete patchwork. It is strong enough to press the cement into small crevices, the rounded face of the pedal enabling smooth working of the cement without streaking. It is especially handy when you are working in close quarters.

Cotton Repairs Honeycomb Radiator

Small leaks in a honeycomb radiator can be temporarily repaired by tamping a piece of cotton tightly into the hole against the leak. The sediment in the radiator will settle in the cotton, and this will soon seal the hole.—Dick Hutchinson, Ithaca, N. Y.



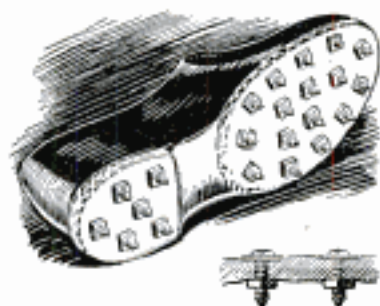
This Toy Railroad Bridge Is 40 Inches Long and Is Built in Three Sections for Ease in Storing

A Knockdown Bridge for Junior's Toy Railroad

Made in three sections, this wooden bridge is an inexpensive addition to any boy's toy railroad kit. It is made from $\frac{1}{2}$ -in. stock, except the two blocks which support the ramps. One edge of each block is beveled to fit flush against the floor of the ramps, while the ends of the center section rest on the remaining flat surface. The lower ends of the ramp boards are also beveled so that the upper surface comes flush with the floor.

Spiked Overshoes Make Effective Ice Creepers

Heavy rubbers or overshoes with sharpened stovebolts, fastened through holes punched in the soles and heels, make good ice creepers. A washer is placed under the head and nut of each bolt to prevent the bolt from digging its way through the rubber.—D. S. Jenkins, Xenia, Ohio.



LOCOMOTIVE PLAQUE



By FLOYD M. MIX

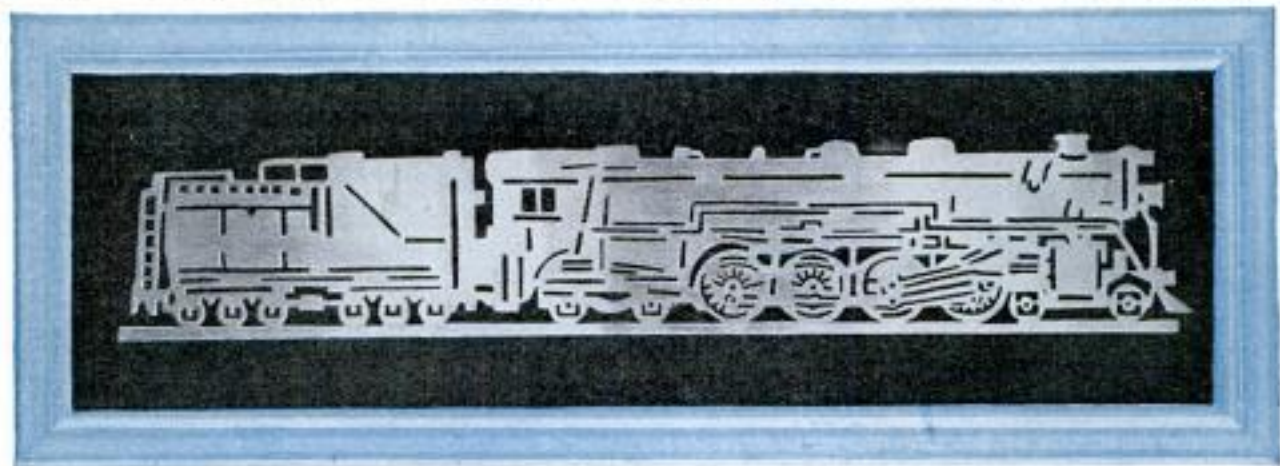
MOUNTED on a dull-black background, this brass locomotive plaque makes a pleasing addition to your living-room wall. It is cut from a piece of $\frac{1}{16}$ -in. sheet brass, 4 by 19 in. in dimensions. The first step is to make a pattern on a piece of heavy manila wrapping paper, which is done by ruling off the sheet in 1-in. squares and then drawing in the design freehand, or in case you wish to enlarge the design mechanically, this can be readily done by using a pantograph. The sheet is fastened to the brass with rubber cement. It is a good idea to coat the paper with shellac after it has been cemented to the brass, as this will prevent dirt from obliterating the fine lines of the design. As this is a scroll-saw project, it will be necessary to drill one or more holes through each portion of the design that is to be cut out, the holes being large enough to admit the



blades. If possible, use a motor-driven saw, which will enable you to do the work in a fraction of the time it would take if done by hand. Metal-cutting blades for a scroll-saw can be purchased at almost any hardware store.

After the sawing is completed, the rough edges are smoothed down with files. A set of die-makers' files is handiest for this purpose. The flat surface to be exposed

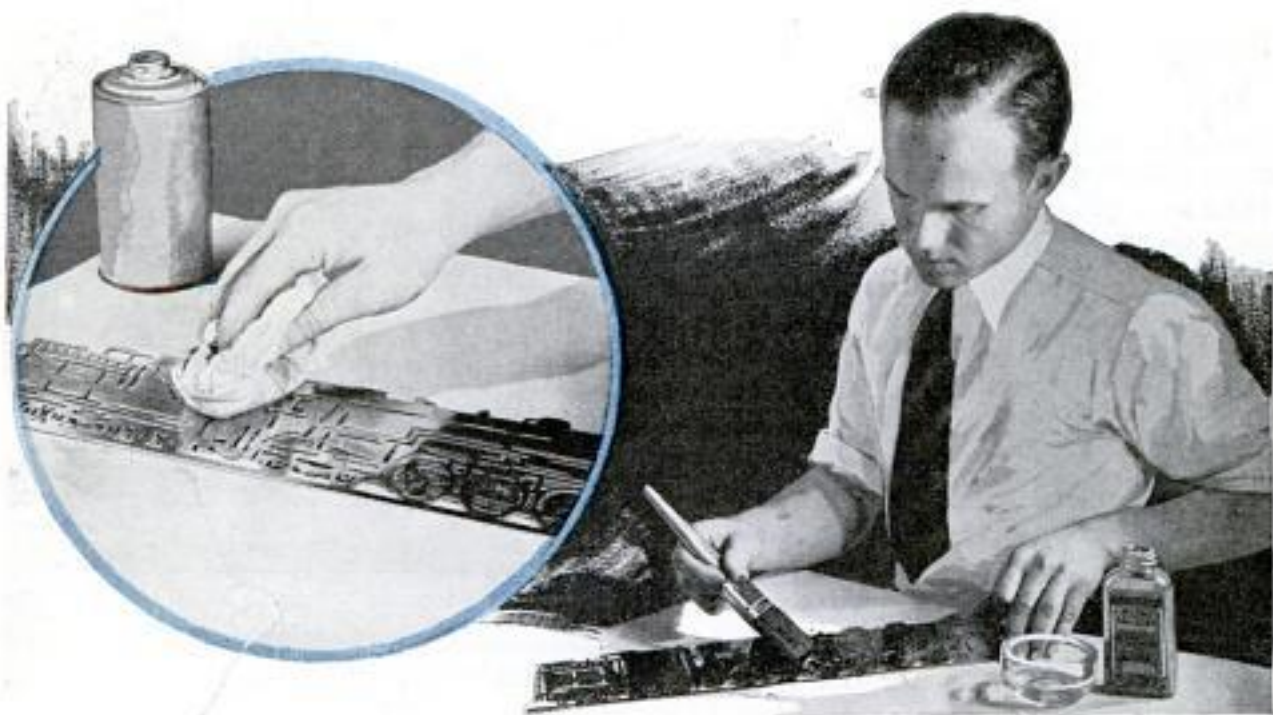
of Brass Cut on Scrollsaw



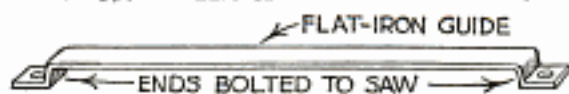
is then given a high luster. This may be done by first polishing with several grades of emery cloth held on a thick felt or cork pad or a felt-covered block. Use progressively finer emery cloth until all scratches are removed. The final operation may be done on a buffing wheel, using jewelers' rouge. If none is available, you can resort to fine rottenstone and oil. After the rubbing, solder two flat-head brass machine screws to the rear side to project through the backing, which is made later. Apply brass polish to remove all stains and bring out a bright finish, after which a fine badger or camel's-hair brush is used to apply an even coat of transparent metal lacquer.

Be sure all stains and discoloration are removed from the brass before the lacquer is put on.

Mounting the plaque is next. You can use a piece of $\frac{1}{4}$ -in. plywood, given several coats of dull-black paint or lacquer, or, if you wish, a covering of black velvet. Another suggestion is to get a piece of bakelite or hard rubber brought to a dull finish by rubbing with fine steel wool. The mounting is then set in a suitable frame. The two machine screws on the plaque project through the mounting and nuts are turned on to hold the assembly together, the screws and nuts being invisible from the front.



Flat-Iron Guide on Ripsaw Helps in Cutting Uniform Strips



Wooden Strips of Uniform Size Are Quickly Cut by Using Guide on Side of Ripsaw

On a job that required a number of wooden strips of uniform thickness, a flat-iron guide was bolted on the side of a ripsaw to eliminate the need of marking off each strip on the stock. The ends of the guide were bent as shown in the detail to provide the proper clearance. The guide also helps keep the saw in a straight line while ripping the strips.

An Easy Method of Timing Motors

Here's an easy and accurate method of timing an auto motor. Remove the valve-cover plates and spark plug number one. Take a length of wire with which you can feel the movement of the piston through the spark-plug hole and then have someone crank the motor slowly so you can watch the movement of the valves. When the exhaust valve, which is the first one on most motors, just closes and the intake valve, which is the second one, commences to open, piston number one should be on top dead center, or not more than $\frac{1}{8}$ in. on the downward stroke. If the motor is out of time, remove the radiator and timing-case cover and the timing chain, which permits the cam and crankshafts to move independently. Next place the piston on top dead center and turn the cam-shaft

gear until the first exhaust valve opens and closes, and with the next valve, which is the intake valve, just beginning to open, put on the chain. With the piston and valves in this position, the motor will be timed correctly. If the adjustment on the chain is at the limit and cannot be taken up any more, a link may be taken out if possible, and if not, the chain will have to be replaced. If the cam shaft is gear-driven, the gears are marked with a center punch so they can be correctly meshed. A good way to determine the correct ignition timing of a motor, is to crank it and watch the opening of the last exhaust valve. When it just closes, piston number one will be on top dead center and is ready to fire. Remove the distributor cap or cover, and with the spark retarded, the points should be ready to break for piston number one. If you find them otherwise, loosen the distributor and move it to its correct position.

Adding Depth to Framed Drawings

Painted on the back of the glass, a silhouetted foreground will add depth to a framed picture of a distant scene. The frame should be made so that there will be about $\frac{1}{4}$ in. space between the glass



Silhouetted Foreground Painted on Glass of Frame Adds Depth to Prints of Distant Scenes

and the print, and should be hung flat against the wall.



HANDCAR

for the *Junior Section Crew*

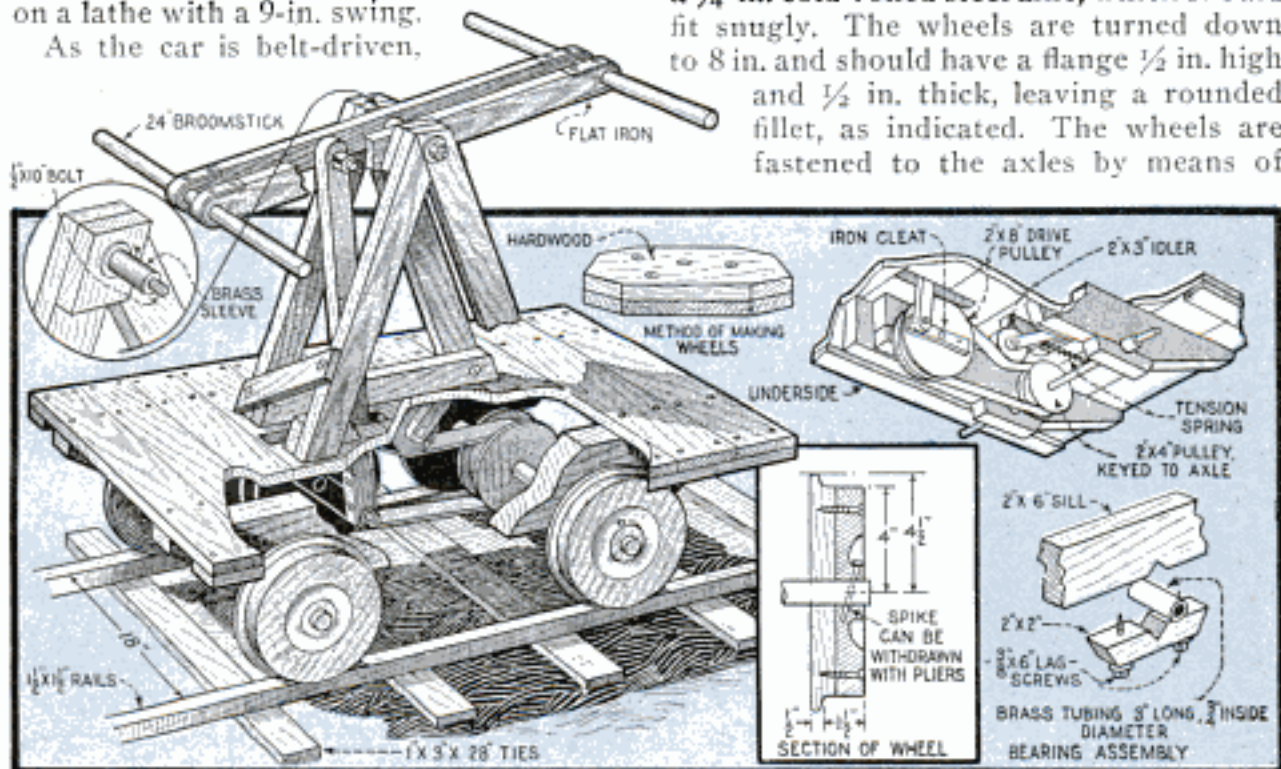
by
BOB HARDY

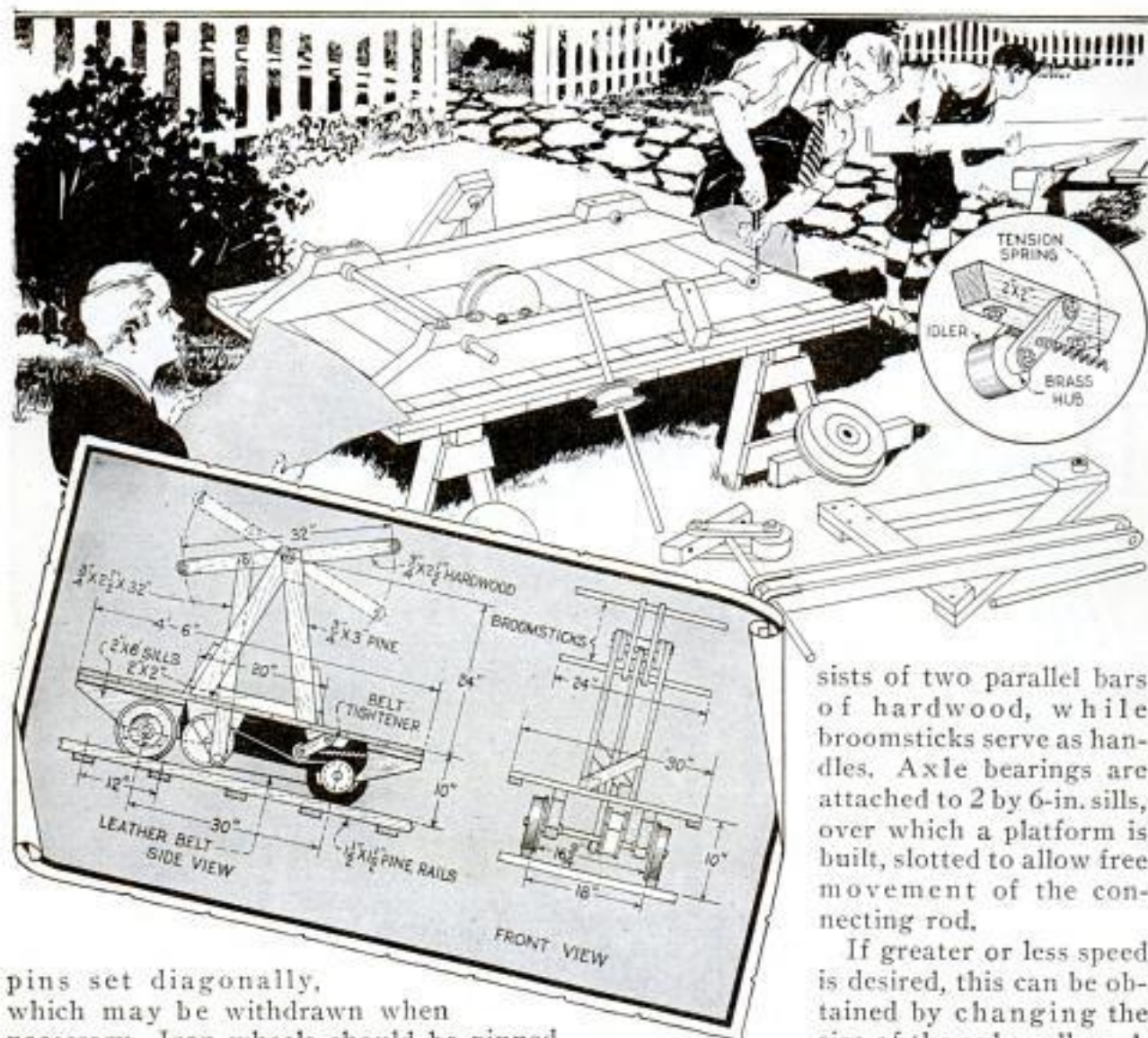
TRAVELING on wooden rails laid along the backyard fence or across a vacant lot, this miniature handcar provides a lot of fun and plenty of exercise for the young crew.

The most important item in its construction is the flanged wheels required. Iron ones may be obtained in junk yards, or you can make them from two pieces of hardwood glued and screwed together with the grain at right angles, and turned on a lathe with a 9-in. swing.

As the car is belt-driven,

it is quiet, and there is no danger of getting one's fingers pinched, as in a gear drive. Also, it is light enough to be lifted off the track. The hub is drilled for a $\frac{3}{4}$ -in. cold-rolled steel axle, which should fit snugly. The wheels are turned down to 8 in. and should have a flange $\frac{1}{2}$ in. high and $\frac{1}{2}$ in. thick, leaving a rounded fillet, as indicated. The wheels are fastened to the axles by means of





pins set diagonally, which may be withdrawn when necessary. Iron wheels should be pinned or keyed to the shaft.

The driving mechanism is geared up by providing an 8-in. drive pulley and a 4-in. axle pulley. Both pulleys are 2 in. thick, are made in the same way as the wheels, and should be recessed for a 1½-in. belt. The idler pulley is 3 in. in diameter and is held against the belt by means of a tension coil attached to the swinging bracket. The drive pulley is pinned to its shaft, which turns in a bearing of brass tubing, 5 in. long. A cotter pin and washer keep the shaft from slipping out of the bearing. The crankpin is simply a bolt through the pulley and also through a reinforcing bar of iron, screwed to the pulley. For the connecting rod, a piece of hardwood is used, 30 in. between centers. Each bearing of the rod is bushed with a length of brass tubing to fit the bolt, while the ends of the wood are reinforced with strap iron screwed in place. The walking beam con-

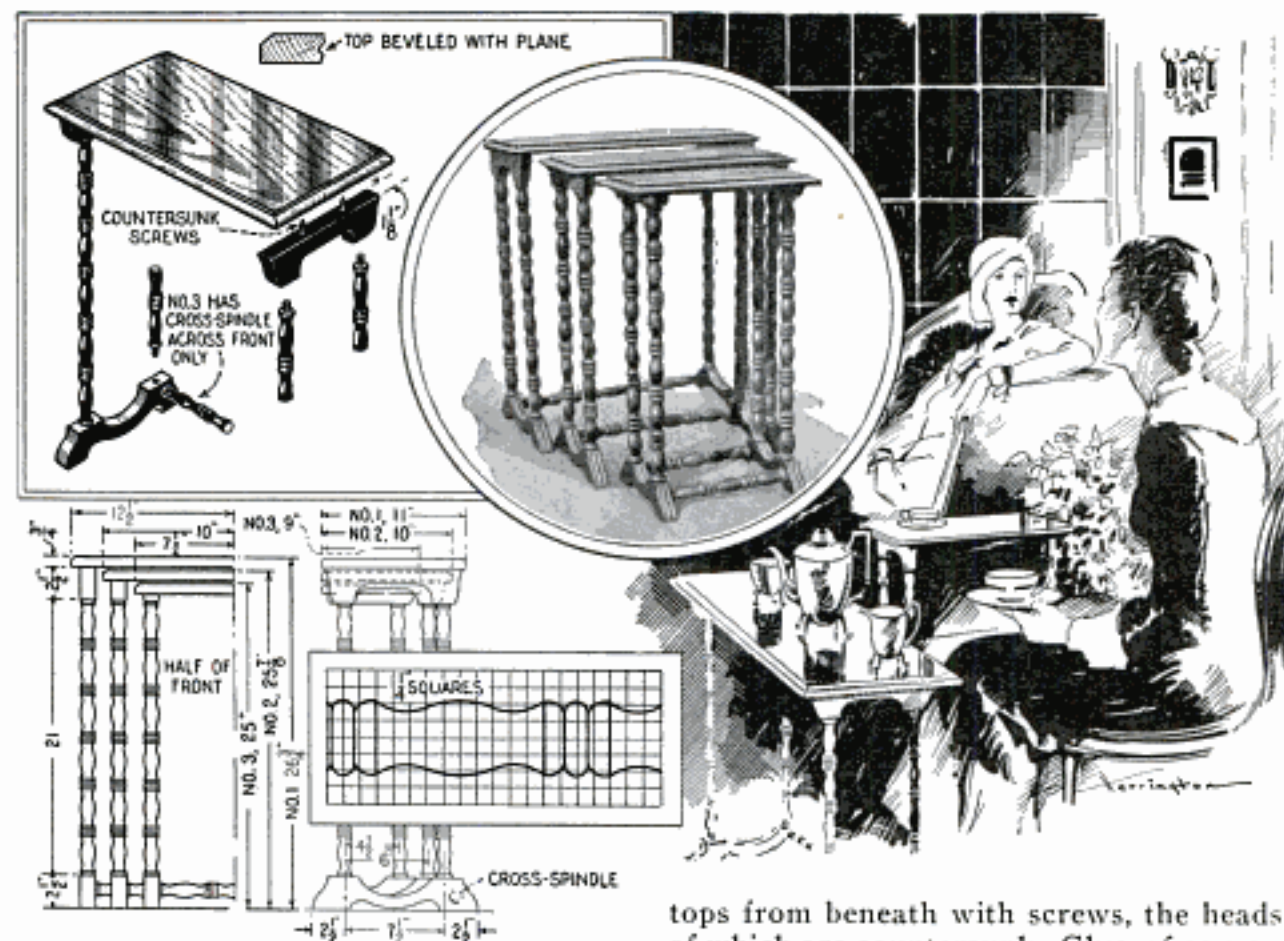
sists of two parallel bars of hardwood, while broomsticks serve as handles. Axle bearings are attached to 2 by 6-in. sills, over which a platform is built, slotted to allow free movement of the connecting rod.

If greater or less speed is desired, this can be obtained by changing the size of the axle pulley. A larger pulley will require less effort on the part of the crew and will develop less speed, and vice versa. If iron wheels are used, a strip of flat iron, screwed to the wood rail, will greatly increase its efficiency and, of course, minimize wear. Curves in the track can be made by using thinner rails than those specified for the straight stretches, and bending them to a long radius.

Eradicating Ants with a Sponge

To eradicate ants, thoroughly moisten a sponge, ordinary or rubber, with sweetened water and put it where the ants run. They will enter the sponge to get at the sweet water, but it is almost impossible for them to get out of the small passages. The ants are killed and removed from the sponge by immersing and squeezing it in hot water.

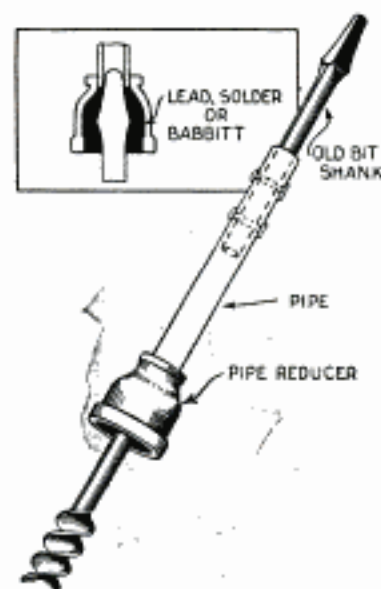
Nested Tables Improve the Small Apartment



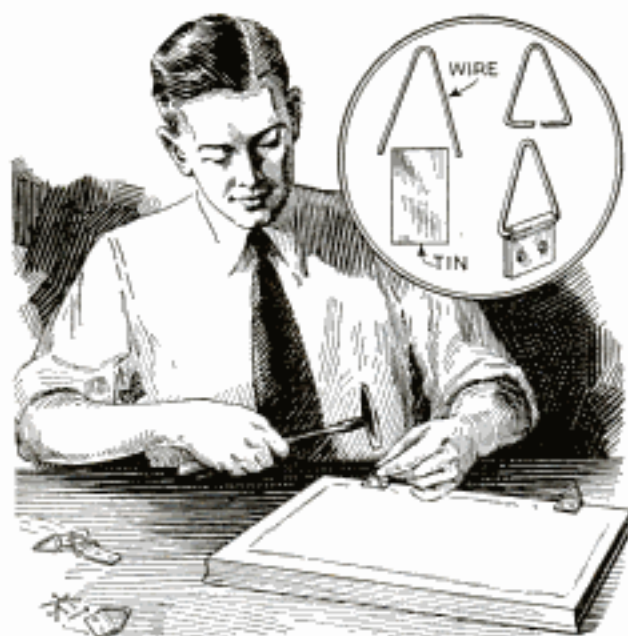
This set of three nested tables is a great convenience where space is limited. As the spindles are of uniform design and size, they can be turned easily on a lathe, while the curved pieces can be cut with a coping saw, if no scroll or bandsaw is available. The maximum finished diameter of the spindles is $1\frac{1}{4}$ in., so they should be turned from rough pieces, $1\frac{1}{2}$ in. square by about 24 in. long. The finished length is only 21 in., but allowance should be made for a dowel on each end, about 1 in. long and turned down to $\frac{3}{4}$ or $\frac{5}{8}$ in. The table tops are in 9, 10 and 11-in. widths, and should be made up of narrower sizes glued together and sandpapered smooth. The edge of each top can be molded on a shaper, or may be simply beveled with a plane. On tables Nos. 1 and 2, the curved underpieces in which the spindles are set, are similar in shape, except that No. 2 is shorter than No. 1, but the underpiece of table No. 3 is a mere cleat. The curved feet of all three tables are alike in design except that they are of different lengths. The underpieces are fastened to the table

tops from beneath with screws, the heads of which are countersunk. Glue, of course, is used on all joints.

Extension Drill Quickly Improved from Pipe



If an extension drill is not available when needed, one can be quickly improvised from a length of pipe, a reducer and an old auger shank. Rivet the shank into one end of pipe and screw the reducer on the other end. Then put the shank of the auger into the reducer and pour melted lead or babbitt around it, making sure that the shank is centered.



Strong Picture Hangers Can Be Made from Wire and Hinges of Tin

Neat Picture Hangers Improvised from Wire and Tin

Attractive picture hangers can be made from short pieces of wire and tin. The wire is bent into a triangular shape and the tin is doubled over the ends of the wire as indicated.—Henry Rabacher, Mt. Vernon, N. Y.

Moth Balls Warn When Furnace Water Pan Is Empty

Placed in a water pan on a furnace, a naphthaline moth ball will give warning when the pan is empty by filling the house with its odor. The naphthaline in the ball is not soluble in water, and for this reason no odor will be noticeable as long as the ball is covered with water.—Emil F. Lange, Lincoln, Nebr.

Improving Latch Handle on Door of Truck



Truck drivers, who have trouble in gripping the handle on the door latch, will find that a rubber crutch tip on the handle provides a better hold.

The tip will not interfere with the operation of the glass in the door, and it is especially handy when heavy gloves are worn.

Puncture-Proof Tires for Pushcarts

To make solid pushcart and trailer tires for occasional use, get a wooden pole the same size as the inside diameter of the tire. Saw this into sections, about 3 in. in length, and place them end to end inside of the casing, which is then placed on the rim in the usual way. This improvised "tube" will be fairly smooth-running and will last the life of the tire.—A. B. Bates, Los Altos, Calif.

Shelf Bracket Holds Wet Shoes over Hot-Air Register

A good holder for drying wet shoes above a hot-air register can be made from a shelf bracket and three pieces of 1 by 2-in. wood, joined at right angles as shown. In use, the base is set at one corner of the register, and the shoe is placed over the end of the bracket. Do not let the shoe get hot as this most likely will cause the leather to crack.



Extra Hour Hand Eliminates Confusion of Daylight-Saving Time

A jeweler had a customer who was confused by daylight-saving and standard time, and solved the latter's difficulty by adding one hour hand to his watch. The hand in the advanced position was marked with a "D" for daylight-saving time, while the other was marked with an "S" for standard time.

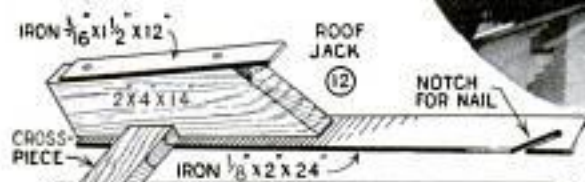
☐ Holes can be drilled through almost any number of sheets of paper at one time if the paper is tightly clamped between two boards, and the drill run through both boards and paper.



will need $11\frac{1}{2}$ "squares" of roofing, the square being a unit of 100 sq. ft. Pick a good grade of roofing. Cut-out roll roofing, as shown in Fig. 1, makes an inexpensive covering which is quite practical. Other types in strip, individual and patented shingles usually cost more, but give greater protection and are obtainable in a wider variety of patterns and colors.

First of all, the old wood shingles must be given the "once over." Warped slabs should be split with a hatchet and securely nailed to the lath, as in Fig. 4, using 12-gauge roofing nails. Gutter fastenings

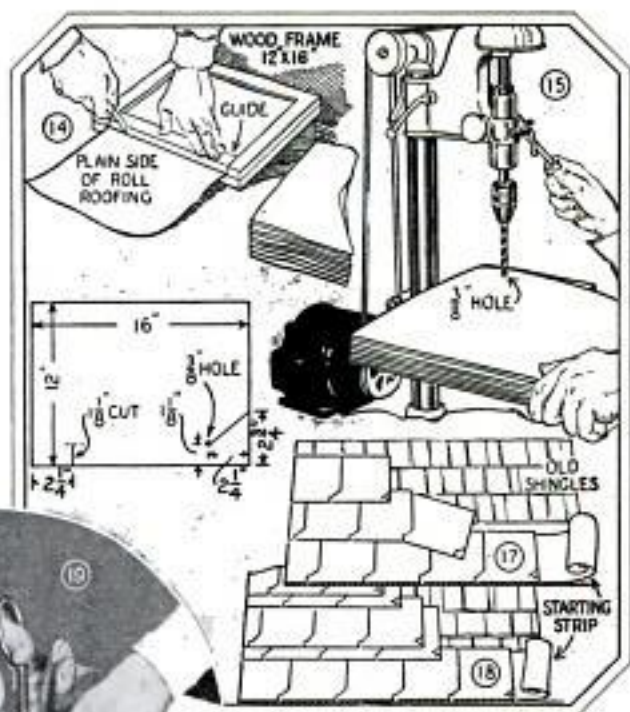
eaves where the dormer roof would overlap the main roof, 1 sq. ft. of roofing being added for every running foot of hip or valley. Working in this manner, the most irregular roofs can be quickly and easily figured. The rule applies whether the house be four-gabled, three-gabled, gable, hip or dormer hip. Imagining your calculations run 1,150 sq. ft. of roof, you



should be checked and repaired if necessary. Loose brickwork should be pointed up. The roofing job proper commences with the fitting of the metal edge strips, as shown in Fig. 5. These measure about 3 by 1 in. and are of light galvanized sheet iron. Their purpose is to give a finished edge over the old wood shingles. They are not absolutely necessary, but are invariably used in better-class work. Over the metal edge strip, and projecting just a bit beyond the eaves, is fitted the starting strip, as shown in Fig. 6. This is usually roll roofing, regardless of what the finishing shingle is like, and it should be of a

width equal to the depth of the shingles selected. No. 12-gauge 1½-in. galvanized roofing nails should be used for fastenings. These can be inserted anywhere, as the combined thickness of the old shingle roof and the new covering will never be less than ¾ inch.

If you are using cut-out roll roofing as a finish, the job proceeds as shown in Fig. 7, the first strip being placed directly over the starting strip, with each succeeding strip laid so as to expose the proper part of the strip immediately under it. Instructions on this are usually stamped on each

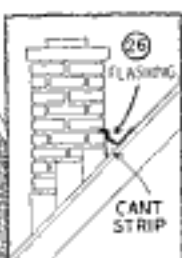
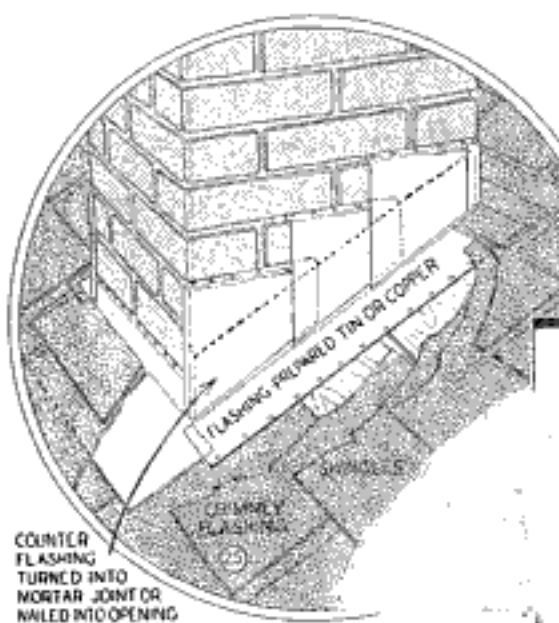


straightedge, as shown in Fig. 10, allowing about 3 in. on either side of the joint. Fig. 12 gives the necessary details of a simple roof jack which you will find quite necessary before you are finished. This is used as shown in Fig. 13, one jack being attached at each end of any suitable length of 2 by 4-in. stock. Each jack is held by a nail, which is hammered down when the jack is moved.



roll. Working up to the final strip on, say, a porch roof, fit the free end of the strip neatly under the siding, as shown in Fig. 8. Plastic roof cement may be used, but it is not necessary. Ridges and hips should be finished with individual strips measuring about 8 by 12 in., as shown in Fig. 9, although one continuous strip can be used where expense is an item. If there is a valley in any part of the roof surface, this should be covered first. Use a continuous strip, not less than 16 in. wide, fitting this in place as shown in Fig. 11. The roofing—roll or shingle—is brought to a rough fit at the valley and later trimmed with a

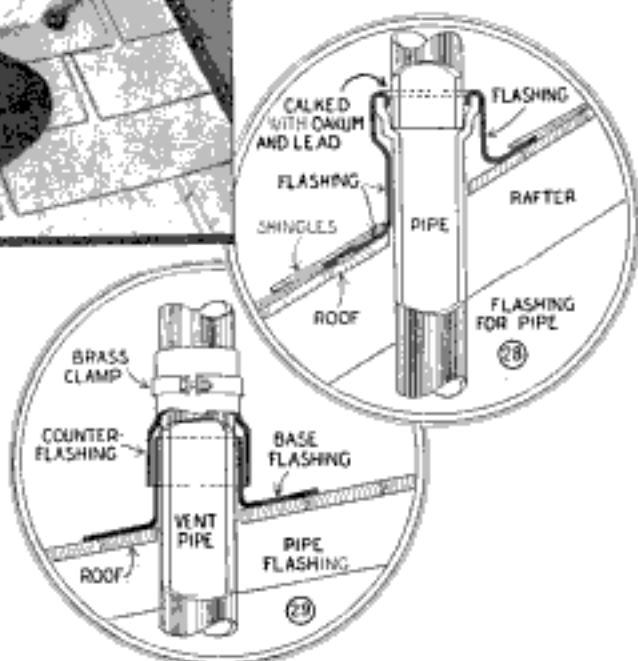




Would you like to make your own asphalt shingles? Figs. 14 to 19 inclusive show how this can be done. Take roll roofing, 32 in. wide, and split it down the center to obtain two strips 16 in. wide. Each strip is readily cut into large individual shingles by using the simple box frame shown. You will find that knives and tin snips do better on this job if dipped occasionally in kerosene. If you care to go a step farther, you can make a lock-type of shingle, as indicated in Figs. 15 and 19. Fig. 17 gives one method of laying a shingle of this type, the exposure being 10 in. to the weather. Notice how the one fault of roll roofing—exposed nailing—is eliminated by covering each nail head with the locking flap. Double coverage can be obtained by laying the shingles 5 in. to the weather in this fashion or by using the ribbon course of 10 and 3-in. exposures shown in Fig. 18. A simple lock shingle like this can be laid in many different ways. Used without the lock, these large shingles can be laid up either vertically or horizontally with a 5-in. exposure and $\frac{3}{4}$ -in. channels, as shown in Fig. 20. Notice, in Figs. 21 and 22, how each succeeding course is stepped up and nailed to form a watertight joint against brickwork and abutting siding.

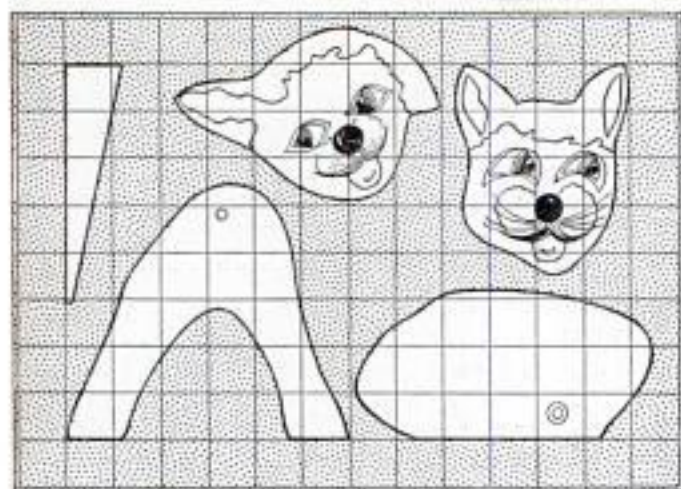
A little jig which comes in handy in laying many types of shingling is shown in Fig. 23. With the metal straps hooked over the previous course, you can't go wrong in allowing the exact amount of exposure, and at the same time you keep

each course perfectly straight from end to end. Another useful bit of roofing equipment is shown in Fig. 24: a triangular support of wood held to the roof by two nails projecting slightly from the underside of the base piece. If your choice of roofing material runs to rigid asbestos or composition shingles, it will be necessary to flash all joints with metal instead of following the simpler method possible with asphalt roofing. The necessary details on this work are shown in Figs. 25 to 29. The procedure is much the same as pre-



viously described with the exception that flashing tin or 16-oz. copper is used. Chimneys should be flashed and counterflashed for best results, as in Fig. 25, with the counterflashing either turned into the mortar seam or nailed well inside the joint. A cant strip of wood stock is sometimes fitted at the upper side of the chimney, as in Fig. 26, in order to break what would be otherwise an exceedingly sharp angle. On abutting sidewalls, metal flashing is laid up with every course of shingles, as in Fig. 27, fastening the metal securely to the siding. Vent pipes can be treated as in Figs. 28 and 29, the latter showing the usual procedure in treating a pipe which projects without break above the roof.

Wooden Puppy Makes Effective Doorstop



Interesting doorstops, made from four pieces of wood to represent puppies and kittens, can be built up in a short time and, incidentally, are excellent novelties, the profits of which will repay you well for the time spent in making them. The upper detail shows the shapes to which these pieces are cut from 1-in. stock. Screws are used to assemble the pieces, the head being held by one

screw so that it can be tilted at any desired degree. The tail is a narrow wedge which fits under the door and holds it. This piece is glued and screwed to the body so that it will not be likely to come apart. After sandpapering the edges and surfaces smooth, a coat of shellac is applied to fill the wood, after which the head and feet are painted on as shown. Almost any scrap lumber can be used for making these stops, and the work can be done with a hand or a power-driven scroll-saw.—Henry Kramer, Chicago.

Glass Containers Hold Small Parts

Instead of keeping nails, screws and small parts in metal or wooden boxes, put them in small glass jars fitted with tight covers. If they are set on a shelf, a glance will tell you where to find the article you want, and what things you are running short of. The tight-fitting covers prevent moisture from entering the jar and keep the articles from rusting.

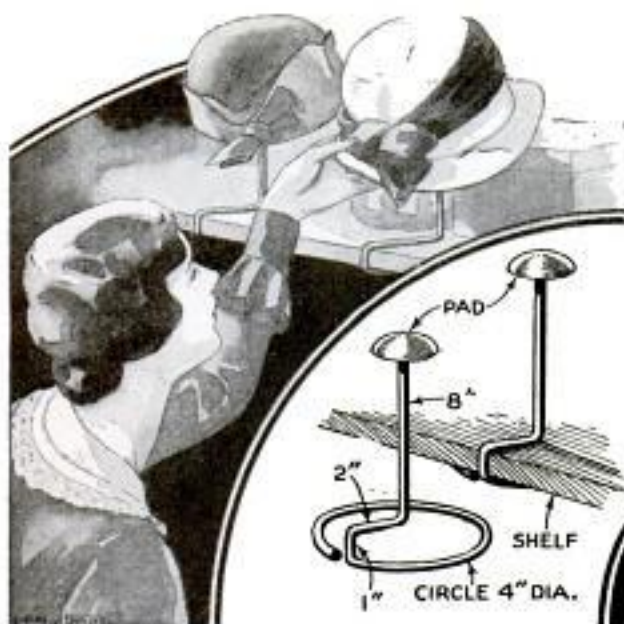
Wire Rack for Drying Hose over Hot-Air Register

By using two wire clothes hangers, you can make a handy rack for drying hose



over a hot-air register. One hanger is bent to form a base, while the hook on the other is straightened out and bent at right angles to fit in a metal sleeve slipped over the twisted ends of the base. When not in use, the rack is easily dismantled and stored.

over a hot-air register. One hanger is bent to form a base, while the hook on the other is straightened out and bent at right angles to fit in a metal sleeve slipped over the twisted ends of the



Wire Rack Clamps over Closet Shelf and Keeps Hat from Being Crushed

Wire Hat Rack Clips on Shelf

When slipped over the edge of a closet shelf, this wire rack provides a place to hang your hat so that it will keep its shape and not be crushed by other clothes. One end of a length of heavy wire, such as can be obtained from wire clothes hangers, is formed into a 4-in. loop and then bent to fit snugly over the edge of a shelf as shown in the detail. A disk of wood can be shaped to form the pad at the top of the rack,

Making Piston Rings Last Longer

When the rings on an aluminum-alloy piston get loose, they can be made to fit snugly again



which the punch is set in the center of the space between the grooves and tapped with a hammer. Care should be taken not

to get the punch too close to the edge. After the width of the grooves has been reduced uniformly, take one ring at a time and roll it around the groove to see if it fits snugly. If it wedges, dress off the sides of the groove with a flat file until the ring turns without noticeable sideplay. When a job of this kind is done, it is best to use light expanders behind the rings to prevent piston slap. While this suggestion is not offered as a substitute for re-boring and fitting new pistons, it has been known to give thousands of miles of satisfactory performance at small cost.

to get the punch too close to the edge. After the width of the grooves has been reduced uniformly, take one ring at a time and roll it around the groove to see if it fits snugly. If it wedges, dress off the sides of the groove with a flat file until the ring turns without noticeable sideplay. When a job of this kind is done, it is best to use light expanders behind the rings to prevent piston slap. While this suggestion is not offered as a substitute for re-boring and fitting new pistons, it has been known to give thousands of miles of satisfactory performance at small cost.

Sign in Radiator Warns Attendant of Anti-Freeze Solution

In order to prevent filling-station attendants from adding water to the anti-freeze solution in my radiator, I put a warning sign directly under the cap. The lettering is stamped on a brass disk, which is held in place with a piece of wire, one end being soldered to the disk and the other bent so that it fits into the top of the overflow pipe. The lettering should be filled with a good heat-resisting enamel.—W. C. Wilhite, Hornsby, Ill.



WIRE FITS IN OVERFLOW PIPE

An Inexpensive Poultry Disinfectant

The experimental farm of the Canadian government has developed an effective disinfectant for poultry house and equipment that can be made at a small cost. Dissolve concentrated lye, $\frac{3}{4}$ lb., in as small a quantity of water as possible, and then slowly add raw linseed oil, $\frac{1}{2}$ qt., stirring until the mixture is the consistency of liquid soap. To this, add a gallon of commercial creosol, stirring until the fluid takes a clear, dark-brown color. This mixture should be made up several hours before it is used, so that the lye will have time to cool. For a spraying solution, use a half cupful of the disinfectant to each gallon of water.

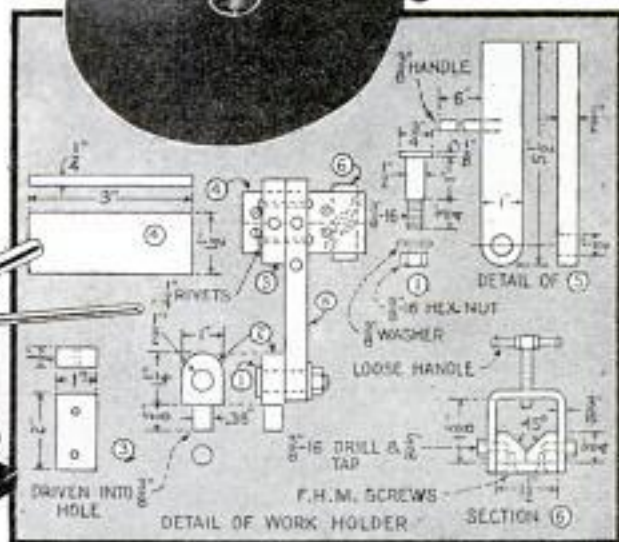
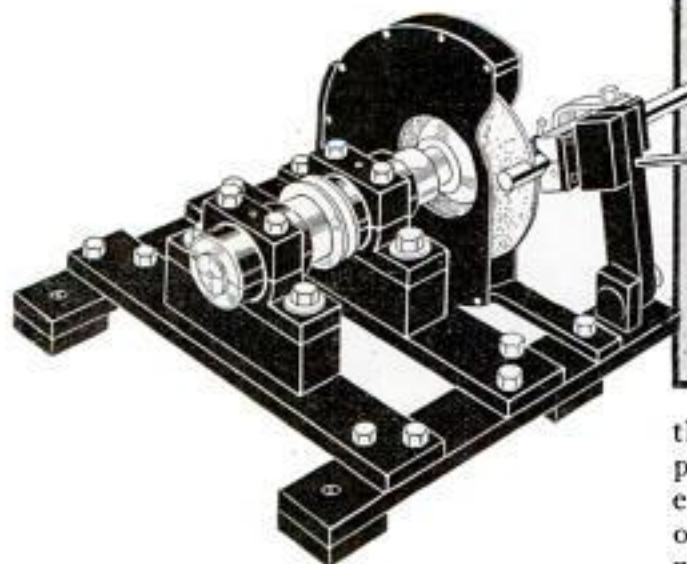


High-Speed CUT-OFF WHEEL Saws Metal Quickly

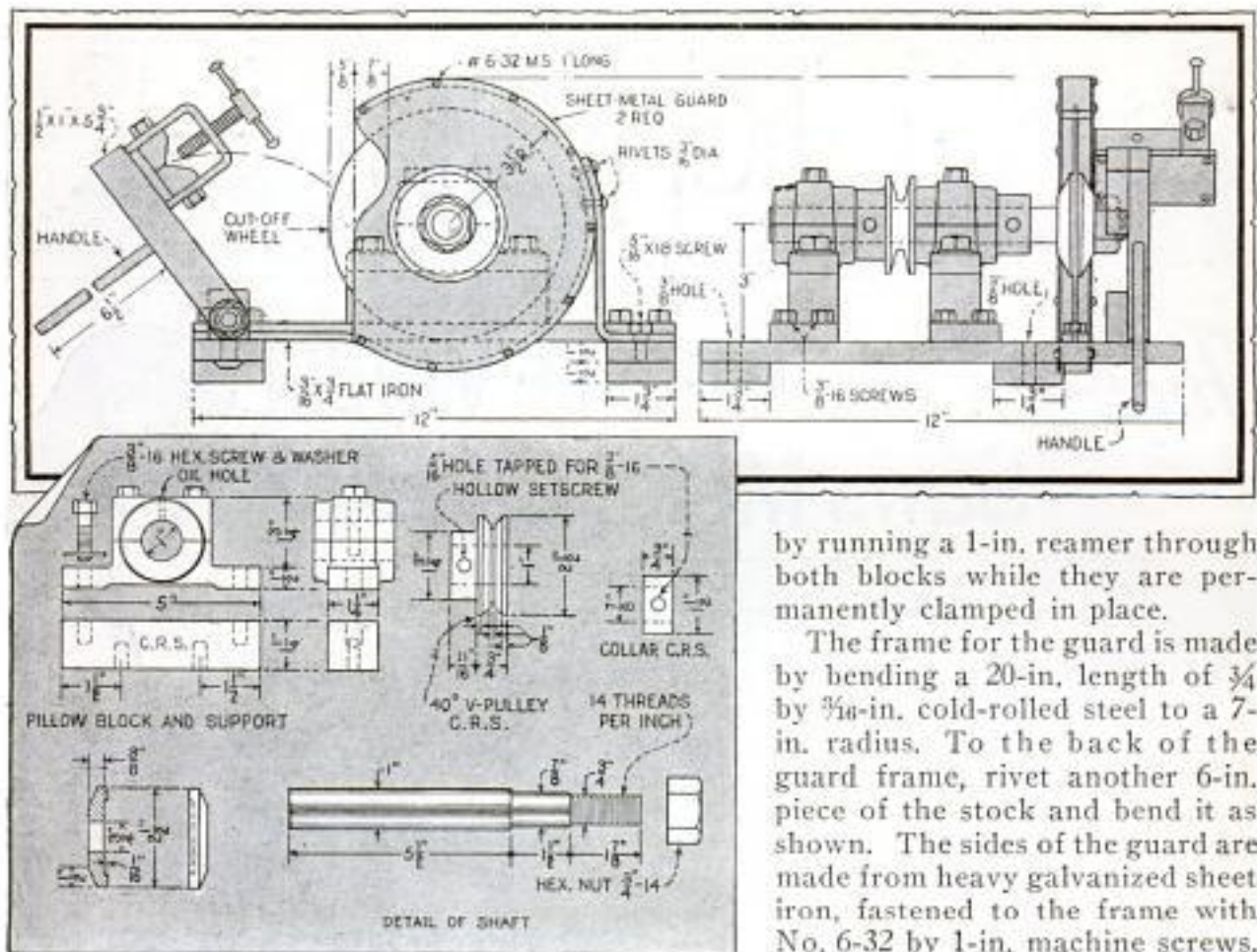
By Randolph E. Craig

WITH this new type of inexpensive high-speed abrasive cut-off machine, it takes only a few seconds to do many jobs which by old methods would require from five minutes to half an hour. You can quickly cut either round or irregular-shaped pieces of steel, brass, bakelite or fiber, or even the hardest tool steel, to exact dimensions and so smooth that filing is unnecessary. Washers and disks may be made quickly and accurately by simply sawing off lengths of either metal or bakelite rod or tubing. The machine will cut slots or grooves much faster and better than can be done with a hacksaw.

The shaft is made first, from a piece of 1 1/8-in. cold-rolled steel, 8 3/4 in. long. The threads on its end should be cut on the lathe to insure an accurate fit. To turn



the pulley, drill a 1-in. hole centrally in a piece of cold-rolled steel, 2 3/4 in. in diameter and 1 3/4 in. wide. This piece is driven into a tapered arbor and turned to the dimensions shown. A setscrew, preferably



of the hollow type, is used to hold the pulley in place on the shaft, and a collar is necessary to prevent end play. The flanges may be purchased at small cost or can be turned to size. The pillow blocks are either made or purchased. They are mounted on pieces of $1\frac{1}{4}$ by $1\frac{1}{4}$ by 5-in. cold-rolled steel to raise them to the correct height. The base is constructed from $1\frac{3}{4}$ by 1-in. cold-rolled steel. To assure perfect alignment of the pillow blocks, install the shaft with its pulley and collar and set the unit in place on the base. The blocks are clamped to the base and the shaft tested for alignment. With the assembly clamped in position, carefully mark the blocks where the screw holes are to be drilled. Draw up the screws and adjust the blocks so that the shaft turns as freely as possible. Next, drill holes through the cross and the pillow-block supports, the latter holes being tapped. The unit now can be permanently assembled. It may be necessary to place a thin sheet of paper under the edge of one or both of the pillow blocks to allow the shaft to turn freely. If the shaft fits too tightly, it can be freed

by running a 1-in. reamer through both blocks while they are permanently clamped in place.

The frame for the guard is made by bending a 20-in. length of $\frac{3}{4}$ by $\frac{3}{16}$ -in. cold-rolled steel to a 7-in. radius. To the back of the guard frame, rivet another 6-in. piece of the stock and bend it as shown. The sides of the guard are made from heavy galvanized sheet iron, fastened to the frame with No. 6-32 by 1-in. machine screws.

The front edge of the guard is shaped so that it serves as a stop for the movable work holder. The latter, in which the work is clamped, must be rigid and absolutely free from play.

When the machine has been completely assembled, it should be driven with a motor at low speed and with plenty of oil until the bearings are well limbered up. The cutting disk is a 6-in. diameter, $\frac{3}{16}$ -in. thick bakelite-bonded cut-off wheel. When purchasing wheels, be sure to specify a $\frac{3}{4}$ -in. hole. In order to drive the wheel at the proper speed, the motor will have to be fitted with a large pulley. If your motor runs at 1,750 r.p.m., place an 8-in. V-pulley on its shaft and belt this to the cut-off machine. With a 3,500-r.p.m. motor, use a 4-in. pulley. This will drive the machine at approximately 6,370 r.p.m., which is satisfactory for this size of wheel. A $\frac{1}{4}$ -hp. motor will cut iron and steel rod up to $\frac{1}{2}$ in. in diameter quite readily, and will rapidly cut up to $\frac{3}{4}$ -in. brass. A $\frac{1}{3}$ or a $\frac{1}{2}$ -hp. motor, coupled to the machine with a heavy V-belt, will enable you to cut 1-in. stock. When using the machine, clamp the work rigidly in place and stand at one

Norton Co. Worcester, Mass
Carborundum Co. Niagara Falls
New York

side while cutting. Wheels are likely to break after considerable use. The parts will fly straight out from the opening, however, and, with ordinary precautions, there is no danger.

Hacksaw Blades Serve as Substitute for Rasps and Files

A good substitute for a file or rasp can be made by fastening together a number of hacksaw blades of the same size, slipping a bolt through the hole at each end. By using blades with different sizes of teeth the coarseness or fineness can be varied. If the direction of the teeth is alternated when putting the blades together, the file will cut when pulled in either direction.

Self-Locking Socket to Keep Electric Lamps Tight

Electric lamps that have a tendency to work loose in their sockets can be kept tight as follows: Remove the outer shell of the socket, and, with a pair of tin snips, make a V-shaped cut, $\frac{1}{8}$ in. wide and $\frac{1}{2}$ in. long, in the threaded part of the socket;



then bend in the shell on one side of the cut as shown. The bent edge bears against the metal part of the lamp and prevents it from loosening. This method will be found especially handy on machinery or in shops.

Making Worn Reamer Cut to Size

When a tap or reamer becomes slightly worn and cuts undersize, fill the grooves or flutes with yarn, cotton string or candle wicking. The material should first be moistened with water so it will pack in the grooves and stay in place. The tool can be made to cut oversize in the same manner.



Calking Compound Forced into Cracks around Door with Gun Improvised from Paper Cone

Gun for Applying Calking Compound

For applying calking compound around door and window casings, a pressure gun may be quickly improvised by fashioning a cone from heavy manila wrapping paper. After filling the cone, it is squeezed to force the compound out the small end and into the cracks around the casing.—R. H. Townsley, Chicago.

Chamois Bag on Hose Nozzle Filters Gasoline at Station

Attached to the nozzle of a gasoline hose, a chamois bag will filter gasoline so that it is free of water and sediment when it enters the tank. Filling-station operators will find this precaution appreciated by their customers, especially in cold weather when water in the gasoline may freeze and cause trouble.—H. C. Thomas, Royal Oak, Michigan.



GOLD WASHERS



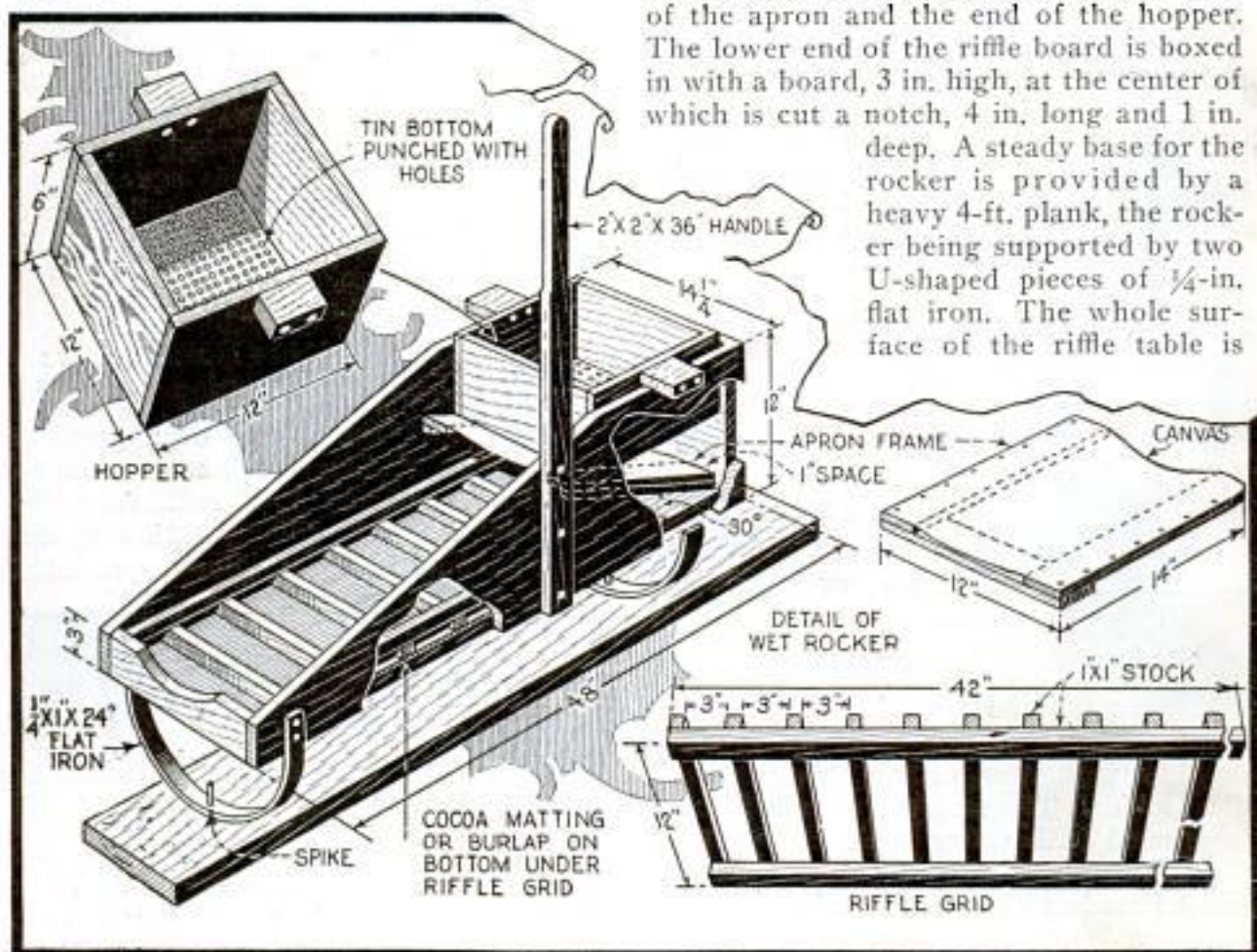
MILLIONS of dollars worth of gold dust and nuggets are recovered annually from river sands and dry washes by prospectors who have little equipment

besides the gold pan. One man with a pan can sift through $\frac{1}{2}$ cu. yd. of material a day, but by building a simple gold-washing machine, he may increase his production four or five times.

There are two types of washers. One is a wet rocker, used when water is available, and the other is a dry washer, where water supply is lacking. In both machines, the dirt is cascaded down an inclined plane. The gold, being heavy, sifts to the bottom and is caught behind riffles, while the lighter matter passes over the riffles and falls out.

The wet rocker consists of a riffle board with sides and a back built up to support a hopper, which has a tin bottom perforated with $\frac{1}{2}$ -in. holes spaced 1 in. apart. A canvas apron is tacked to a frame laid on the cleats, which are set at a 30° angle. A 1-in. slot is left between the lower end of the apron and the end of the hopper. The lower end of the riffle board is boxed in with a board, 3 in. high, at the center of which is cut a notch, 4 in. long and 1 in.


deep. A steady base for the rocker is provided by a heavy 4-ft. plank, the rocker being supported by two U-shaped pieces of $\frac{1}{4}$ -in. flat iron. The whole surface of the riffle table is



10555 Holman Ave
Los Angeles Calif

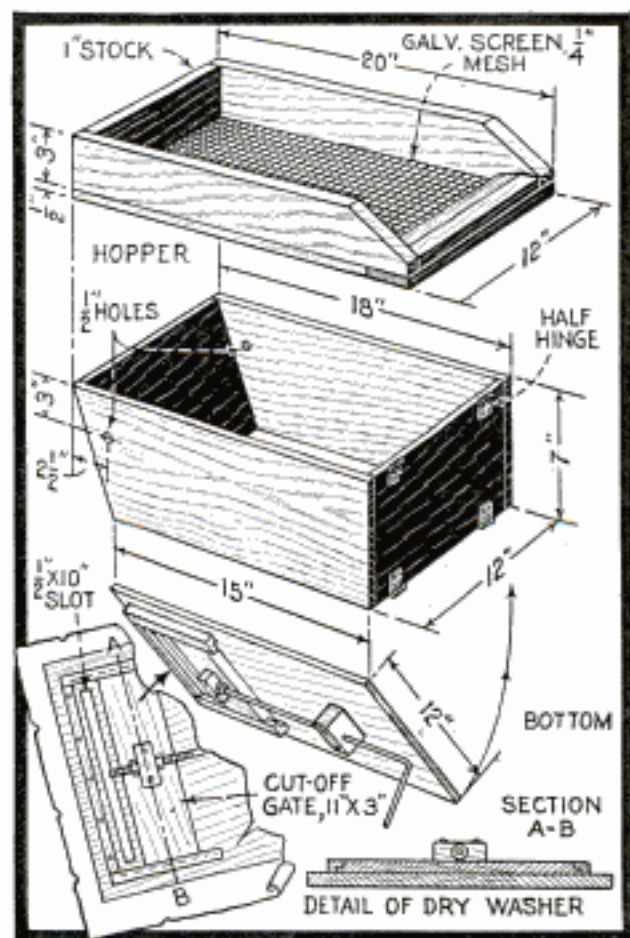
increase Prospectors' Earnings

By
THOMAS E STIMSON

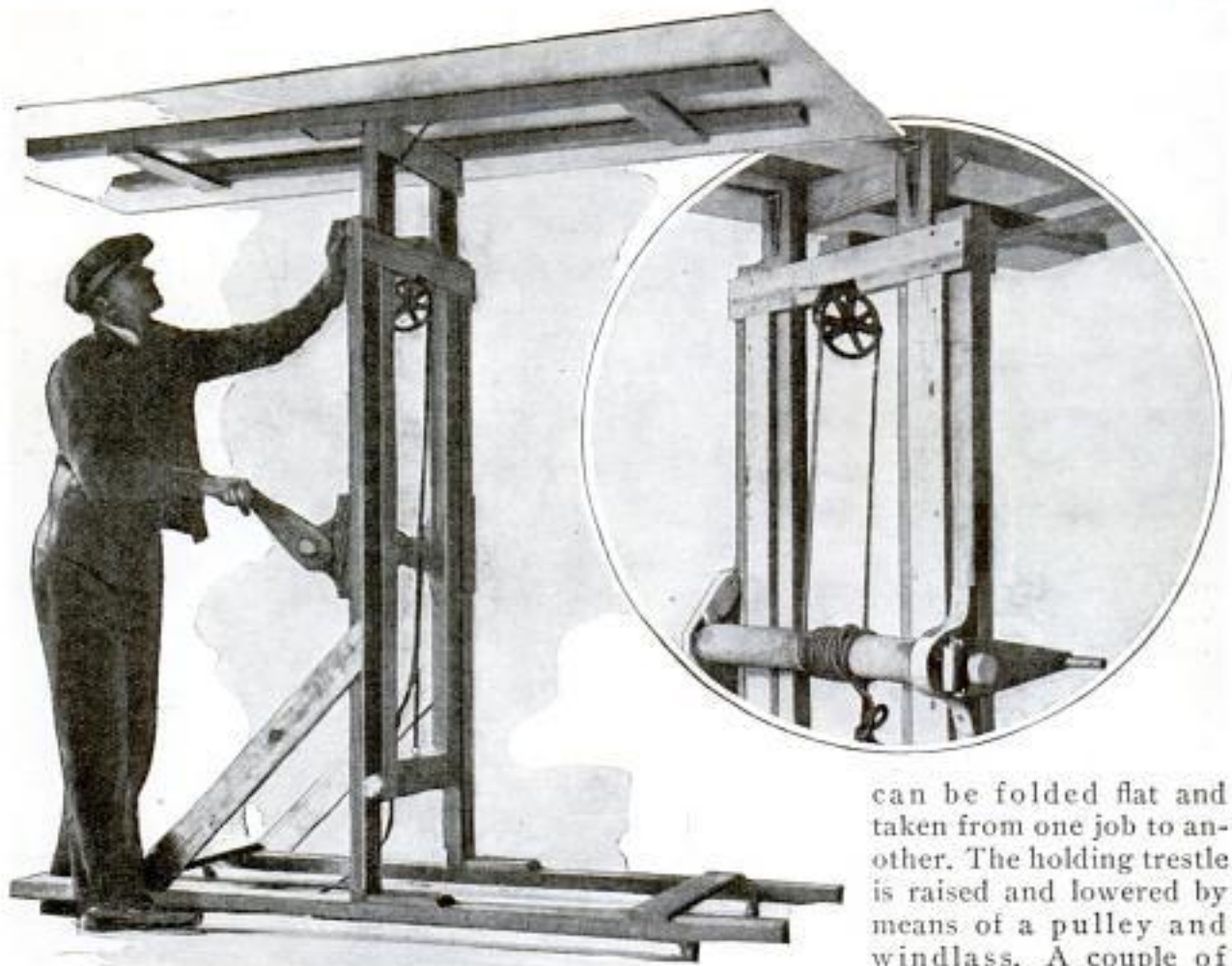


covered with a sheet of cocoa matting, canvas or a blanket, on top of which there are a number of cross riffles. The riffle grid is removable. In use, the hopper end of the plank is propped up about 2 in. with rocks, to slant the riffle board. The hopper is then half filled with the gold-bearing material and water is poured on. When all the fine material has passed through the holes in the bottom of the hopper, the latter is lifted out and the large gravel and stones are emptied. To make a "clean-up," the riffle bars are removed and the cocoa matting or canvas is carefully lifted out and washed in a tub of water. The gold and other particles that have been caught on the cloth fall to the bottom of the tub, and this concentrate is further reduced by panning. The wet rocker must be adjusted for each kind of material to insure full

(Continued to page 118A)



Erector Places Wallboard Against the Ceiling



Raising and holding heavy wallboard in place on a ceiling while nailing it, is an easy task with this scaffolding which was made and used by C. R. Lane, of Guilford, Conn. It is set on casters so that it can be run around a room in any position, and

can be folded flat and taken from one job to another. The holding trestle is raised and lowered by means of a pulley and windlass. A couple of turns is enough to lower it to the loading position at the height of a man's head. The platform is then raised to the ceiling where it holds the board while the carriage is moved easily on its casters until the board is placed in position for nailing.—H. Ros-siter Snyder, Guilford, Conn.

An All-Purpose Carrying Handle Made from Leather and Strap Iron

For carrying objects, such as batteries, heavy cases and metal parts, or for lifting cylinder heads, a good handle can be made by riveting pieces of strap iron to the ends of a



leather strap. A large hole is drilled in each piece of the iron, which also has a hook bent on the end. In this way, the handle can be anchored under bolts or hooked under projecting parts.—Ted Berg, Chicago.

Rivets Improvised from Copper Wire

For emergency use, rivets can be made from short pieces of copper wire by hammering a head on each end. If plain wire is not available, wire used in electrical work can be substituted by removing the insulation.

Nickelplating without Electricity

A thin but durable nickelplate can be put on brass and copper objects by boiling them in a solution made by dissolving ammonium chloride, 8½ oz., and nickel-ammonium sulphate, 8½ oz., in 1 qt. of water. The solution should be boiled in an aluminum pan. An even plate will be produced if the articles are kept in motion, but in contact with the pan during the plating process. Brass or copper is readily cleaned for plating by washing it in gasoline, to remove the grease, and then immersing it in a bright dip made by mixing nitric acid, 1 lb., with an equal volume of water. To this cautiously add sulphuric acid, 2 oz., and two teaspoonfuls of ordinary table salt. This acid solution should be kept in a stone jar. After dipping the work, rinse it in running water, and it is ready for the nickelplate. This process is convenient and effective for small articles. If 2 oz. of strong ammonia are added to the plating solution, it will plate articles of iron and steel.

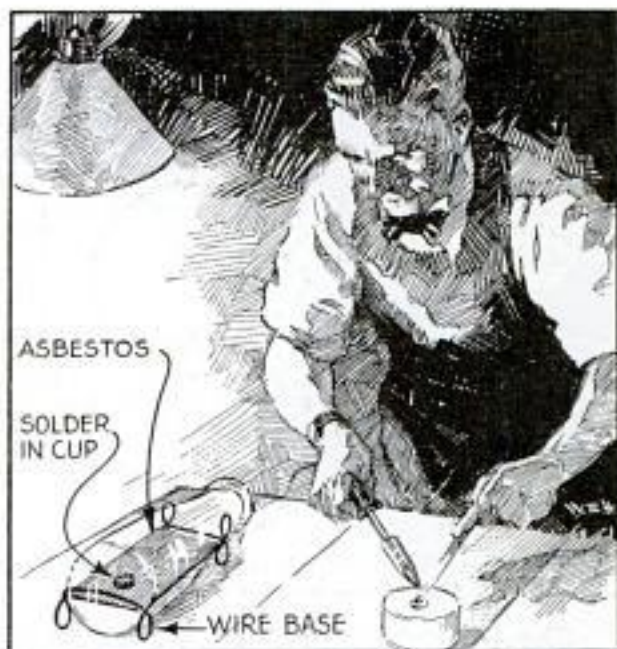
Extra Handle Improves Coal Shovel



Fastened to the handle of a coal shovel as indicated, an extra handle will be found restful to the hands and wrists, besides making it easier to lift the scoop. A bolt inserted into a hole drilled through the shank holds it in place.

Locating Leaks in Electric Refrigerators

Leaks in electric refrigerators, that use ammonia gas, can be located with sulphur. Roll powdered sulphur in a piece of paper similar to a cigaret, light it and pass it around under the valves and fittings. Sulphur fumes, uniting with ammonia fumes, produce a dense white cloud similar to smoke. If the refrigerant is sulphur-dioxide gas, the same result will be obtained by passing an uncorked bottle of common household ammonia around the fittings.—B. E. Wilder, Chicago.



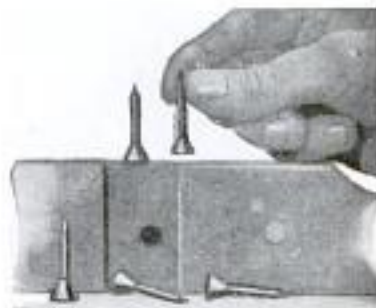
Heat Quickly Restored to Soldering Iron in Constant Use by Keeping It in Milk Bottle

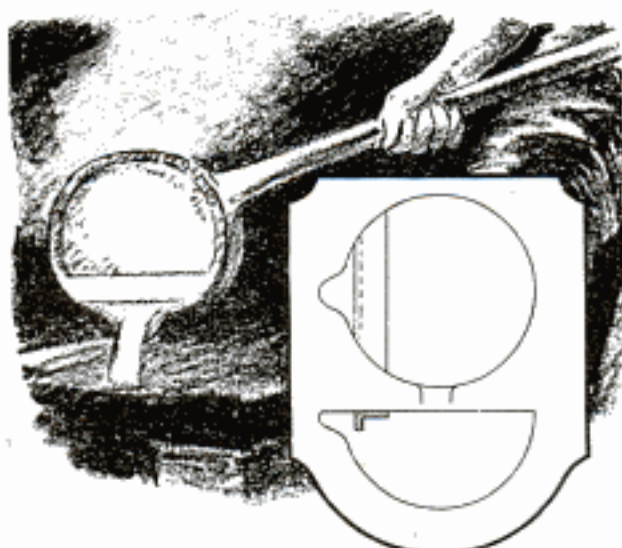
Bottle Prevents Rapid Cooling of Soldering Iron

When a soldering iron is in constant use, the heat lost by contact with the work can be quickly restored if the iron is placed in a container. A quart milk bottle, with a piece of asbestos slipped inside, is suitable for this purpose. A wire rack can be improvised to hold the bottle, while the sheet of asbestos prevents the hot iron from coming in contact with the glass. A shallow cup of solder inside is handy for determining whether the iron is hot enough for use.

Golf Tees Plug Screw Holes

Wooden golf tees will be found useful for plugging old screw holes. The tapering heads of the tees fit snugly into the enlarged hole made by the screw head, while the shank fills the remainder. It is a good idea to grind the head of the tee flat so that it will not be chipped while it is being tapped down with a hammer.





Strip of Sheet Metal across Top of Babbitt Ladle Retains Scum When Pouring

Sheet-Metal Scum Guard Improves the Babbitt Ladle

Placed across the top of a babbitt ladle near the spout, a sheet-metal bridge will prevent the scum from coming out when pouring the babbitt. The edge of the guard is bent over at right angles, as indicated, to increase its effectiveness.

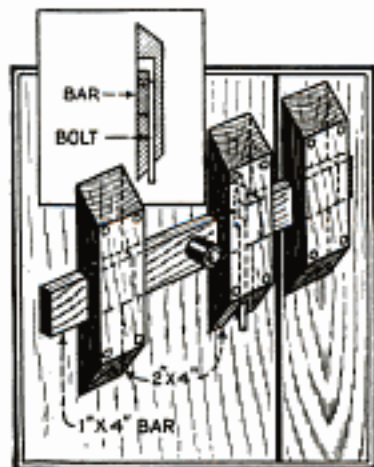
Remote-Control Switch to Operate Elevator Car

In order to operate an elevator from the top of the car for the purpose of cleaning the shaft, the electrician of a large hotel made a control device that is held in one hand. The instrument is fool-proof in that it is necessary for the operator to be fully conscious of what he is doing in order to

work it. The device consists of a push-button switch, a four-prong polarity cap, and a four-prong polarity receptacle. Two sets of wires connect the switch with the control switch in the elevator. In this way, anyone holding the push button in his hand, when it is connected with the car switch, can control the elevator cage when standing on top. This saves time as it ordinarily requires two men to clean the elevator shaft.—Ed Deuss, Chicago.

Safety Latch for Stock Gates

By the addition of a bolt to the sliding latch commonly used on farm gates, it can be locked so that stock rubbing against the handle cannot open it. A groove is cut in one of the vertical cleats, which carry the sliding bar, to take a rod. The latter is bent at right angles at one end and made to drop into a slot cut in the top of the bar when the latch is closed. The lower end of the rod projects beyond the bottom of the cleat so that it can be raised to clear the slot when the bar is pushed back.—B. P. Baresch, Rapid City, S. Dak.



350 BLUEPRINTS for Home Craftsmen

Model ships and airplanes, toys, smoking sets, tables and many pieces of household furniture besides numerous other practical projects. A sample print will be sent to anyone upon receipt of 6c to cover mailing costs. Complete list free. Prices of prints are 25c each, six for \$1, or a collection of thirty-five for \$5 postpaid.

Address Blueprint Dept.

Tools and Fittings for the

MODEL MAKER'S LATHE

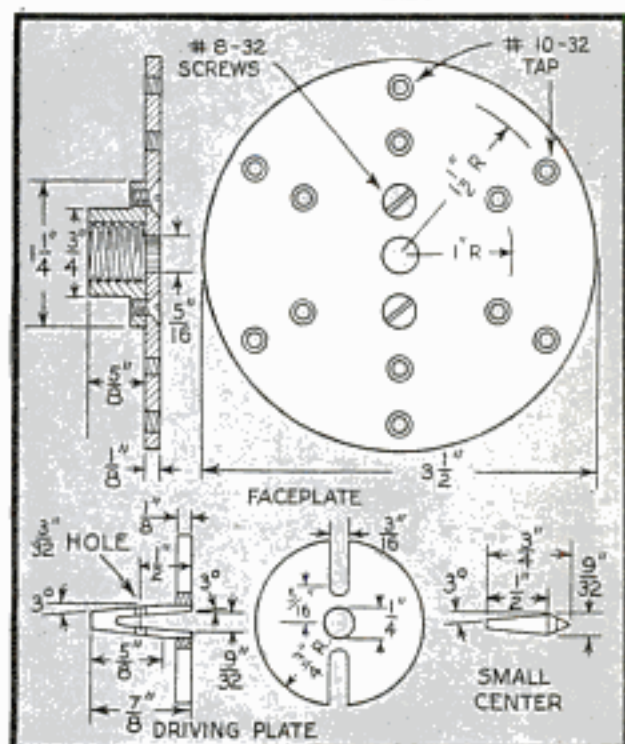
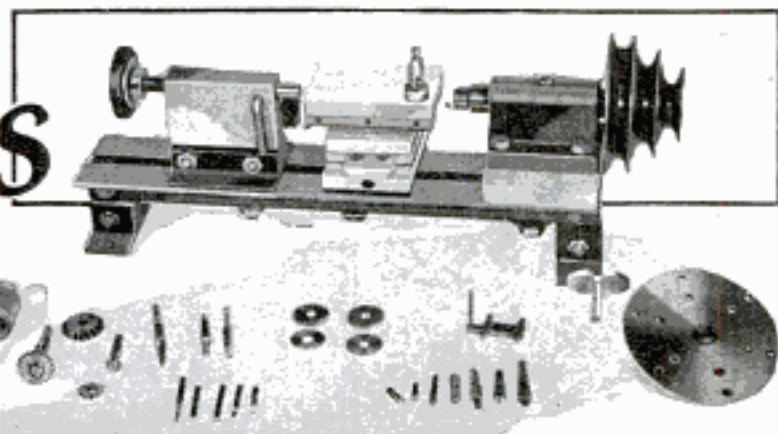
By W. R. BELL

PART II

AFTER building the small model maker's lathe described in the November issue, you will need tools and equipment. The first essential is the cutting bit. For a general-use tool, it is best to have a clearance angle of 10° , a back slope of 5° and side slope of 10° . Experience will teach just how much to vary these for different kinds of work. Material for these bits can be purchased in the form of high-speed steel bars, already hardened and ready to grind, from supply houses handling jewelers' equipment. The rough bit for the lathe described should be $\frac{1}{8}$ in. square and about 1 in. long. Of course, boring tools will have to be longer to suit each case.

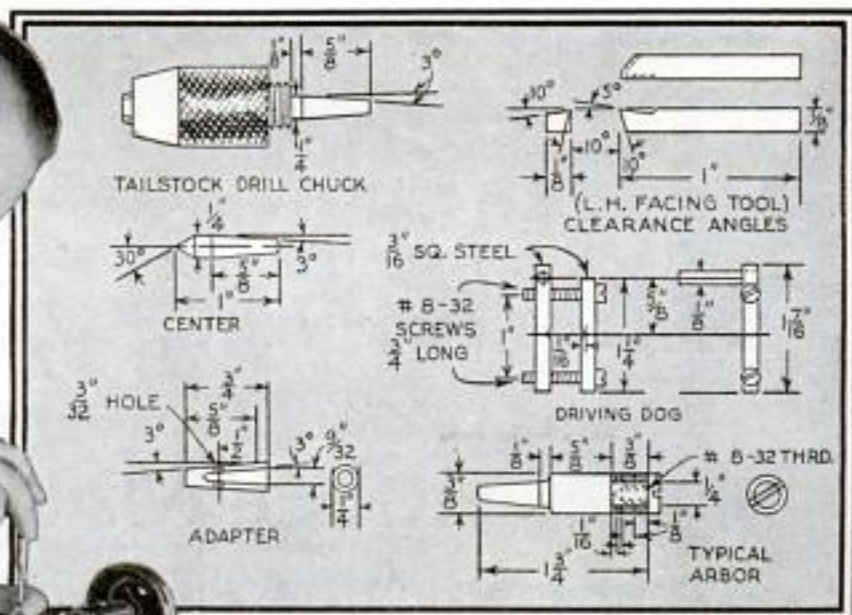
Next in importance, from the standpoint of frequent use, is a small drill chuck for the tailstock. This will be used whenever holes are drilled in a piece held in the headstock chuck. Any-type chuck of $\frac{1}{4}$ -in. capacity will suffice. Only enough of the inside threaded shaft is required to cover the full range of chuck adjustments, and a small taper shank is turned up and pressed into a hole drilled in the chuck. The taper must fit the hole in the spindle.

The faceplate is another part used frequently. This is best made in two pieces. The hub can be made from a nut, or from a similar piece, a hole being threaded to fit the shaft. The plate is laid out for the holes, and these are drilled and tapped before being mounted on the hub. Although the illustration shows the use of screws in



mounting, pressing, riveting or soldering are equally good. True up the plate by facing and turning the diameter.

Centers are made from drill rod hardened after turning. They are polished with fine emery cloth after hardening. Two sizes are shown, together with an adapter, to make the small ones fit the large taper. The larger fit the spindles, and the lesser ones are used in the small driving plates and centers. At this time a taper hole is drilled and reamed in the headstock spindle, as you now have the tailstock chuck to hold the drill and reamer for this operation. This hole is identical with that in the tailstock, so that all tapers will be interchangeable.



The driving plate and dog are used when small diameters are turned between centers. It is well to have more than one size, to suit your own conditions. The smaller size fits in the tapered hole, while the larger is screwed on like the faceplate. Arbors are used in innumerable ways, and for this reason it is advisable to have quite a range of sizes. They make good mountings for saws, small emery wheels and cutters, and may be used to hold small pieces

for turning when these have a concentric hole in them. Collars or spacers are included with each arbor to accommodate varying thicknesses to be held on them. Light milling or slotting can be done with the saws and cutters by clamping the work to the slide-rest top, with the toolpost removed; a few tapered holes in the rest top will aid in clamping. The tailstock makes a fine drillpress if provided with a plate having a taper shank. Make the plate of brass and solder the shank in. Face it true, and you will have a good surface to drill against. You are now equipped to do all kinds of ordinary metal-turning jobs of small size, and in special cases extra accessories can be made to suit.

Old Tires Fence Garage Runway

A garageman having several old tires on hand, used them to make a fence from



Garageman Utilized Old Tires to Make Novel Fence along the Drive from Highway to His Shop

the highway to his shop. The tires are partly buried in the ground and are painted white so as to be readily visible.—W. E. Stewart, Sewaren, N. J.

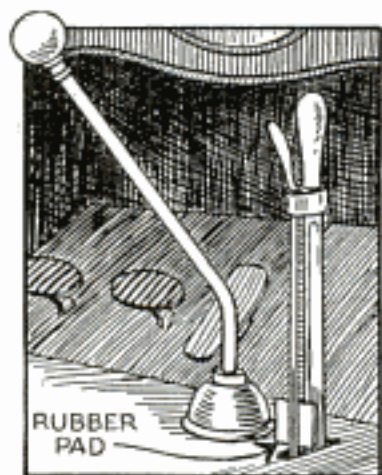
Grease Cup Dispenses Soap Paste

In shops and garages where hand soap paste is used by the mechanics, a large compression grease cup will be found handy for dispensing it. The cup is conveniently attached to the wall by means of a bracket. This method not only saves soap, but keeps the supply cleaner than it would be if it were taken out of the can with the hands.

How to Produce a Steel-Gray Plate on Brass

Brass may be given a steel-gray plating with a thin coat of metallic arsenic. High lights are produced by buffing or scratch brushing. The solution for arsenic plating is made by dissolving finely powdered arsenic trioxide, 2 oz., (deadly poison) in hydrochloric acid, 1½ oz. A few drops of nitric acid and gentle heat will aid the solution of the arsenic. Make up this solution in the open air so that any fumes liberated will be blown away. When the arsenic has dissolved, add enough water to make the total volume 1 qt. This solution is very poisonous and should be used with great care. Thoroughly clean the brass to be plated by immersing it in a boiling hot solution of lye and water. Rinse the work thoroughly and immerse it in the arsenic solution. The steel-gray plate will form in a few minutes. After plating, the work should be rinsed in running water to remove the poisonous fluid.

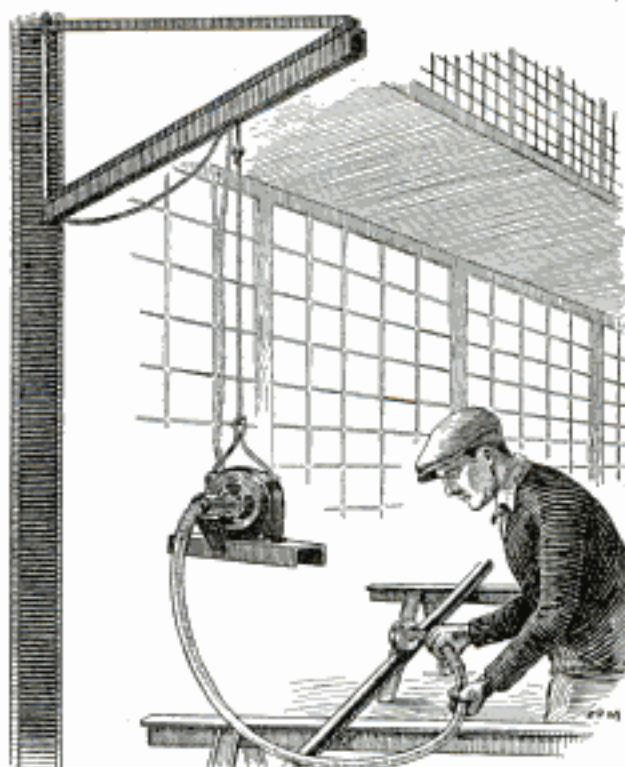
Silencing Brake-Lever Rattle with Rubber Pad



Rattling of an emergency-brake lever, when caused by the small rod that operates the ratchet, can be overcome by folding a piece of inner tube and placing it between the two parts of the lever in the position shown. While this method is only temporary, as the rubber will gradually work out, it can be made permanent by fastening the pad to the lever with fine wire.—Joseph J. Zarnowski, Olyphant, Pa.

Swinging Arm Supports Utility Motor

This handy jib support, for a motor equipped with a flexible shaft, can be swung around to accommodate jobs within a radius of 20 ft. The supporting arm, which is a length of track used for sliding

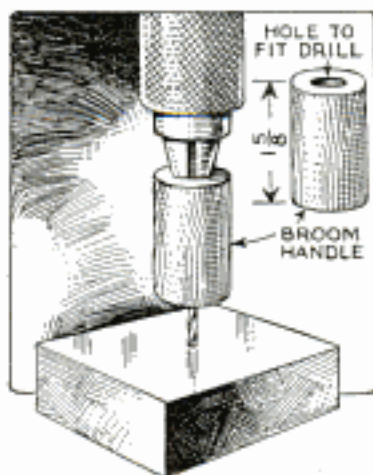


Arm Pivoted to Steel Column of Shop Provides Swinging Support for Utility Motor

doors, is welded to the underside of a similar piece of T-beam, and is braced with a length of bar stock. A rod through a pipe, which is welded to a steel column of the shop, provides a pivot for the arm.

Wooden Sleeve Strengthens Small Drill Bits

When drilling small holes in metal, a wooden sleeve placed over the bit as shown, will keep it from bending and breaking under pressure. The sleeve is made by boring a piece of broomstick or dowel rod lengthwise, so that it fits snugly on the bit. This contrivance can also be used as a depth gauge, the sleeve being made just long enough to let the bit drill the desired depth.



Gasoline applied to the rubber washer on an inner-tube valve will usually soften it enough to stop a leak in the valve.

Steel Sales Corp 33rd and Pulaski
129 S. Jefferson, Chicago

You can Design & Build

7
 Robert Tool Co. 1539
 Dayton Chicago
 6805 N. Clark Chicago

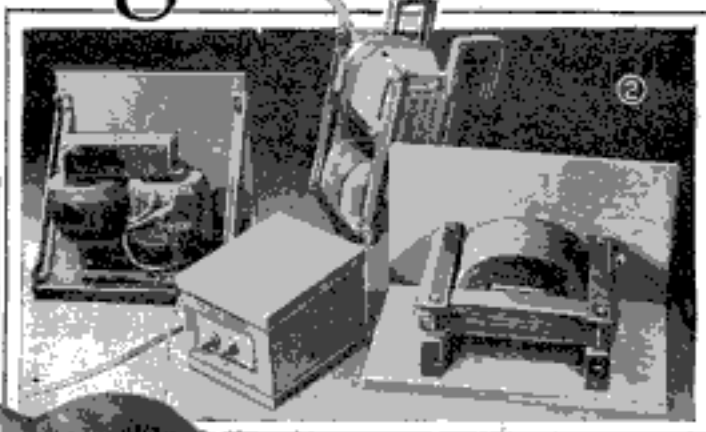


TABLE NO. 5

Size in Watts	Design No. For Use in Figuring Transformers of Sizes Not Listed in Tables 1, 2, 3 and 4	Fuse for Line		Wire Size for Primary Coil			
		110 Volts	220 Volts	Shell Type		Core Type	
				110 Volts	220 Volts	110 Volts	220 Volts
5	2.24	1	1	34	36	32	35
10	3.16	1	1	31	34	30	33
15	3.87	1	1	29	32	28	31
20	4.47	1	1	27	31	27	30
30	5.48	1	1	26	30	25	28
40	6.33	1	1	25	28	24	27
50	7.07	1	1	24	27	23	26
75	8.65	1	1	22	25	21	24
100	10.00	1	1	21	24	20	23
125	11.18	6	1	20	23	19	22
150	12.25	6	1	19	22	18	21
175	13.21	6	1	19	21	17	20
200	14.12	6	1	18	21	17	20
225	15.00	6	6	18	20	16	19
250	15.81	6	6	17	20	16	19
275	16.59	6	6	17	19	15	18
300	17.31	6	6	16	19	15	18
350	18.70	6	6	16	18	14	17
400	20.00	6	6	15	18	14	17
450	21.20	6	6	14	17	13	16
500	22.35	6	6	14	17	13	16
600	24.45	6	6	13	16	12	15
700	26.45	10	6	12	15	11	14
800	28.30	10	6	12	14	11	14
900	30.00	10	6	11	14	10	13
1000	31.60	10	6	11	14	10	13
1100	33.20	15	6	11	14	9	12
1200	34.60	15	10	10	13	9	12
1250	35.40	15	10	10	13	9	12
1300	36.00	15	10	10	13	9	12
1400	37.40	15	10	10	12	8	11
1500	38.70	15	10	9	12	8	11
1600	40.00	20	10	9	12	8	10
1700	41.20	20	10	9	12	8	10
1800	42.40	20	10	9	11	2 #10*	10
1900	43.60	20	10	8	11	2 #10*	10
2000	44.70	20	10	8	11	2 #10*	10

*Wind two #10 wires at the same time and use as 1 wire by connecting the starting ends together and the finish ends together.

TRANSFORMERS to suit any requirement can easily be built by carefully following the instructions contained in this article. There are two types of this apparatus, the shell and the core type, both shown in Fig. 2. They differ in that the former has its windings on a center cross-piece of the core and takes less copper, while the latter has the primary coil on one and the secondary on the other leg of the core. Cores may be built up from standard silicon-steel E and I-punchings, obtainable in many sizes, or assembled from strips of No. 26-gauge silicon steel, cut to size with tinner's shears.

The starting point in transformer design is the exact determination of the output required in watts, which is the product of amperes and volts. For example, a 6-volt transformer delivering 20 amp. has an output of 120 watts. Let us assume that we are going to build a shell-type transformer and that the frequency of our 110-volt supply circuit is 60 cycles. Referring to table No. 1, page 1020, you will find that the first column does not give the exact size of transformer desired, one of 120 watts, and therefore the next larger size is selected, which is 150 watts. The turns of wire required for the secondary coil is found by multiplying the turns per volt as given in table No. 1, by the volts required, which in this case is 6 volts times 1.96, or

11.76 turns. The next higher even number, or 12 turns, should be used.

Next, we should determine the size of wire needed for the secondary, which depends on the current to be passed, already known to be 20 amp. Multiply the amperes by 750 for the shell type, or by 1,000 for the core type to find the cross-sectional area of the wire in circular mils. In the example, this would be 15,000. Table No. 6 gives the wire sizes corresponding to the circular-mil area. As the figure 15,000 is not given, take the next one above it,

TRANSFORMERS

By Clyde A. Crowley

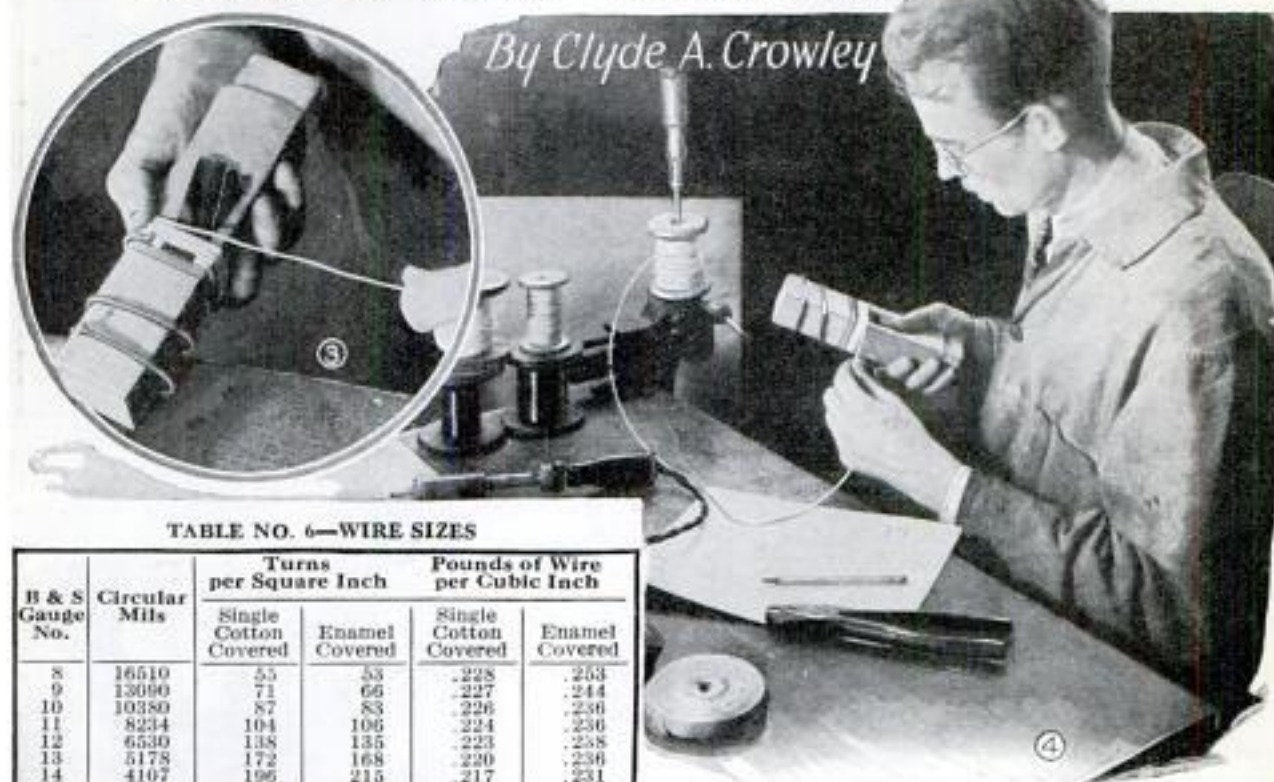


TABLE NO. 6—WIRE SIZES

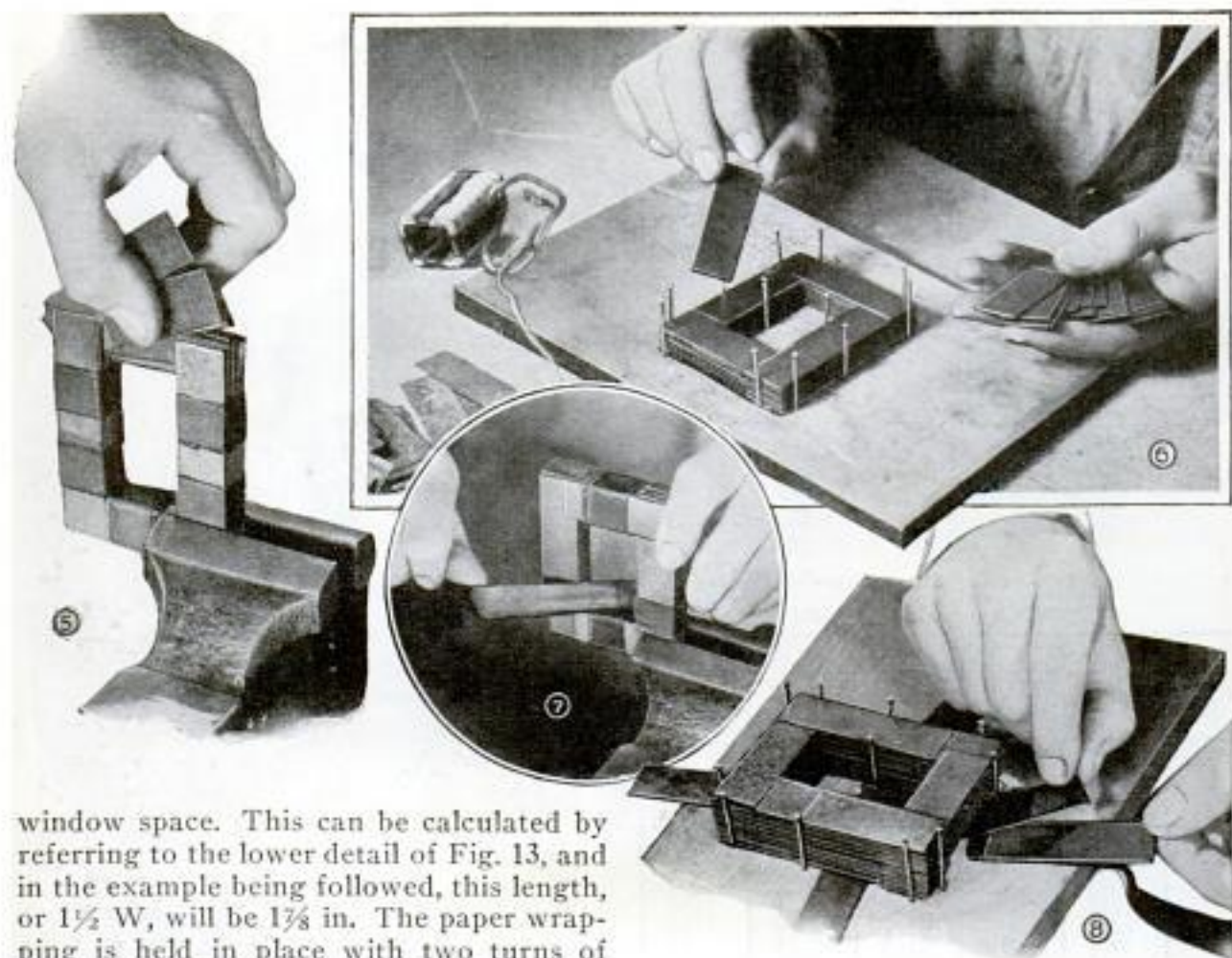
B & S Gauge No.	Circular Mils	Turns per Square Inch		Pounds of Wire per Cubic Inch	
		Single Cotton Covered	Enamel Covered	Single Cotton Covered	Enamel Covered
8	16510	55	53	.228	.253
9	13090	71	66	.227	.244
10	10380	87	83	.226	.236
11	8234	104	106	.224	.236
12	6530	138	135	.223	.238
13	5178	172	168	.220	.236
14	4107	196	215	.217	.231
15	3257	265	271	.214	.232
16	2583	331	345	.210	.226
17	2048	407	433	.207	.227
18	1624	493	545	.204	.227
19	1288	618	681	.200	.225
20	1022	719	852	.195	.223
21	810	836	1065	.190	.221
22	642	1064	1340	.183	.220
23	509	1362	1665	.177	.217
24	404	1615	2100	.170	.217
25	320	1946	2630	.164	.217
26	254	2385	3320	.157	.216
27	201	2830	4145	.150	.215
28	159	3462	5250	.143	.215
29	126	3760	6510	.135	.213
30	100	4713	8175	.128	.212
31	79	5535	10200	.120	.210
32	63	6137	12650	.110	.207
33	50	6920	16200	.101	.200
34	39	7960	19950	.093	.205
35	31	9243	25000	.083	.205
36	25	9723	31700	.075	.205

which is 16,510, corresponding to No. 8 wire, which is the correct size to use. How much wire is needed for the secondary coil depends on the size of the core on which it is to be wound, the number of turns already being known. To estimate the weight of wire needed, consult table No. 6, where we find that No. 8 s.c.c. wire will wind 55 turns per square inch. Dividing our turns, or 12, by this number we get .218 sq. in. as the cross-sectional area of the wire on the coil. Multiplying this number by the distance around the core, as found in table No. 1, we get $8\frac{1}{8}$ times .218, or 1.8, which is the number of cubic inches of wire needed for the coil. Table No. 6 also gives the number of pounds of No. 8 s.c.c. wire per cubic inch as .228. By mul-

tipling this number by 1.8 cu. in. we get .46 lb., or the approximate weight of wire for the secondary coil.

The next step is to find the size of the core and its weight. From table No. 1 we find that the width of the core leg on which the coil is wound should be $1\frac{1}{4}$ in. This table also gives the thickness of the core as $2\frac{1}{16}$ in., and the approximate weight of silicon steel required as 5.8 lb. Fig. 13 shows how all the core dimensions are based on the width of the core leg which is indicated by W. It only remains to determine the turns, wire size and weight of wire required for the primary or input coil. Referring again to table No. 1 you will find that there are to be 212 turns, and that the winding will weigh about .9 lb. Refer to table No. 5 to find the size of wire needed, which in this case is No. 19.

The coils are wound on a wooden form, as in Fig. 4. The primary is wound first. The form is cut to a width and thickness slightly greater than the dimensions of the core, which in this case is $1\frac{1}{4}$ by $2\frac{1}{16}$ in., and is covered with two or three layers of heavy brown paper for a distance equal to the length of the coil, which in turn is made $\frac{1}{4}$ in. less than the length of the



window space. This can be calculated by referring to the lower detail of Fig. 13, and in the example being followed, this length, or $1\frac{1}{2} W$, will be $1\frac{1}{8}$ in. The paper wrapping is held in place with two turns of friction tape. If the first and last three turns of each layer of wire are wound over a length of friction tape, and this is doubled back over the coil, as shown in Fig. 3, the end turns will be securely held in place. A thin sheet of tough paper should be wound between layers of wire if space permits. If there is not room for this, use a sheet between every other, or every third, layer. When the primary coil has been completed, cover it with two layers of heavy brown paper and wind on the secondary coil. Great care should be taken to prevent contact between the two coils. When completed, they are slipped off the form and bound with tape, as in Fig. 1. The core is then slipped into the coils, as shown in Fig. 12. After the core and coil have been assembled, they should be impregnated with orange shellac or electrical-coil varnish. If orange shellac is used, dilute it with an equal volume of alcohol. A large can will serve as a dipping tank. Allow the assembly to soak for about 12 hours, after which it is left to dry thoroughly for an equal period. To complete the drying, bake the transformer at a low

heat for 2 or 3 hours. Shell-type transformers may be completed by bolting on a pair of standard pressed-steel end plates obtainable in various sizes corresponding to the core punchings shown in Fig. 12.

Core-type transformers are easily assembled in a jig, as in Fig. 6, the strips being piled alternately, as shown in the detail above table No. 7. The cores must be bound together and securely taped while held in a vise to avoid hum. Figs. 7 and 8 show the steps for binding a core of this type. The coils are wound separately and slipped on each leg of the core, as in Fig. 10. To do this, remove the laminations from one side of the core, as shown in Fig. 5, replacing these, as in Fig. 9, after the coils have been placed in position. A mallet or block is used, as in Fig. 11, to force the laminations down evenly, after which they are taped securely. The transformer may be clamped with channel iron or angle-iron brackets, as shown in Fig. 14, and mounted in a metal box, as in Fig. 16. The cord, which connects the transformer to the supply circuit should be

brought into the can through a porcelain bushing. Low-voltage secondary connections are made to brass screws or binding posts mounted on a fiber or bakelite strip, as in Figs. 16 and 18. Then the can is filled with melted insulating tar, Fig. 17, obtainable at battery-service stations.

If you need a size of transformer not covered in the tables, refer to table No. 5. Locate the desired size, or the nearest one of higher value, in the first column. Opposite this size is a design number needed for figuring the other values. This table also gives the wire size to be used for the primary coil. Let us assume that you want to build a core-type transformer to convert 110 volts to 220 volts on a 60-cycle circuit, and that you will need 5 amp. from the secondary. The watts will be 5 times 220 or 1,100. Consulting table No. 5,

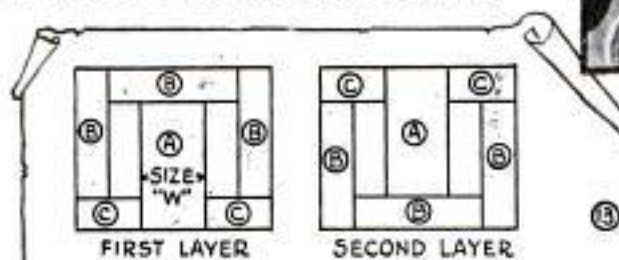
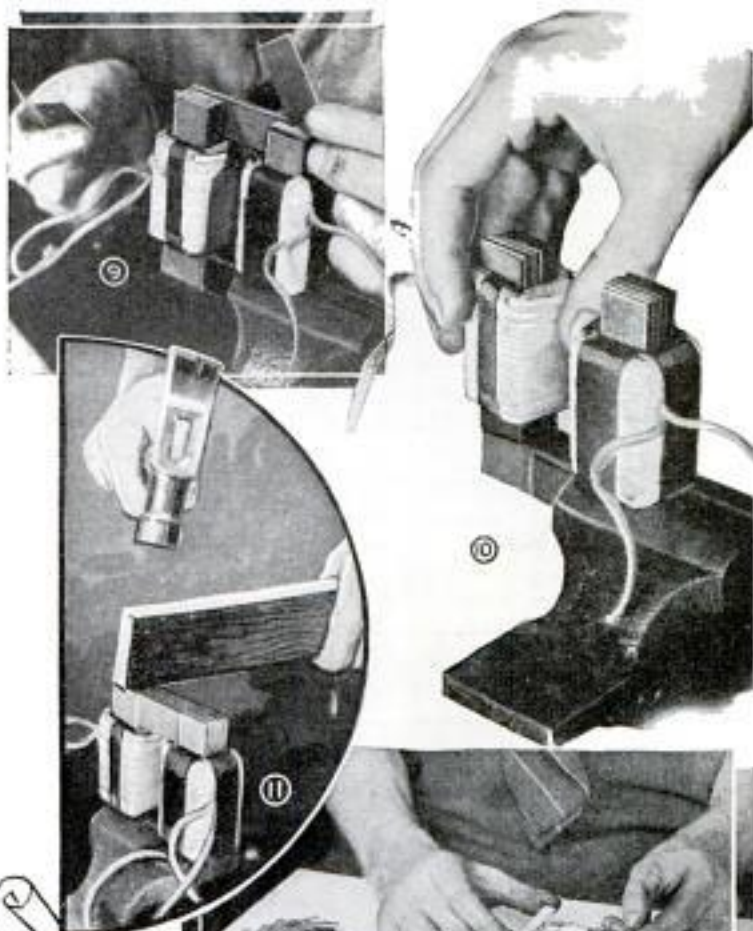


TABLE NO. 7

DIMENSIONS FOR SHELL TYPE OF TRANSFORMER STEEL		
Size "W"	Area of 1 Window In Sq. In.	Weight of Core 1" Thick Lb.
3/8	.29	.50
3/4	.42	.73
1	.57	.99
1 1/4	.75	1.30
1 1/2	.92	1.65
1 3/4	1.16	2.03
1 7/8	1.41	2.46
2	1.68	2.92
2 1/8	1.97	3.44
2 1/4	2.27	3.96
2 1/2	2.62	4.58
2 3/4	3.00	5.20
3	4.22	6.63
3 1/4	4.70	8.25
3 1/2	5.60	9.90
3 3/4	6.70	11.70
4	9.20	15.90
4 1/4	12.00	20.80
4 1/2	15.20	26.40

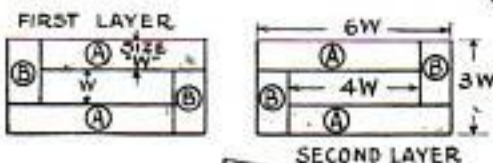
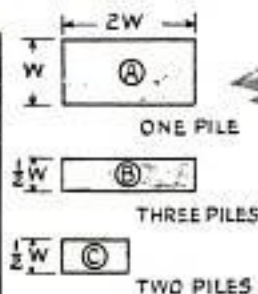
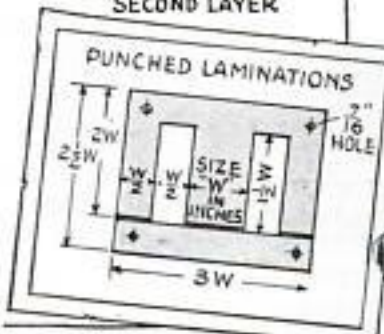
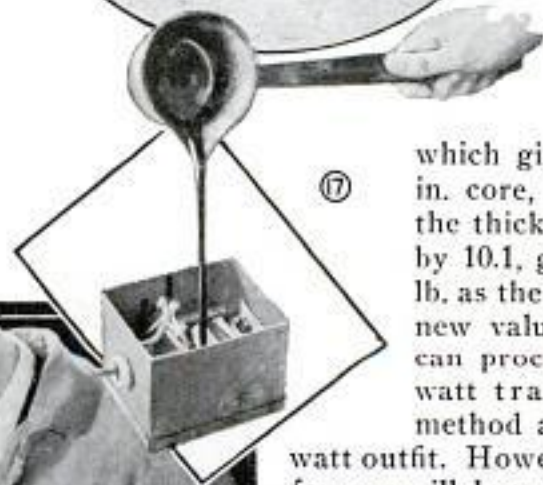
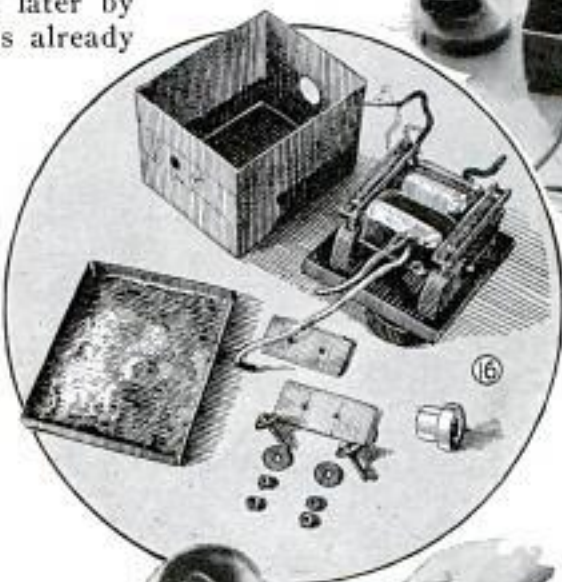
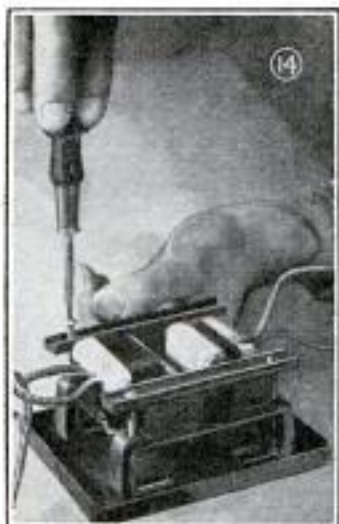


TABLE NO. 8

DIMENSIONS FOR CORE TYPE TRANSFORMER STEEL				
Size "W"	Dimensions of Core		Area of Window Sq. In.	Wt. of 1" Thick Core
	A	B		
3/8	3/8 x 4 3/4	3/8 x 1 1/4	3.06	2.9
1.0	1 x 5	1 x 2	4.00	3.8
1 1/4	1 1/4 x 5 3/4	1 1/4 x 2 1/4	5.06	4.8
1 1/2	1 1/2 x 6 3/4	1 1/2 x 2 1/2	6.25	5.9
1 3/4	1 3/4 x 6 3/4	1 3/4 x 2 3/4	7.55	7.2
1 7/8	1 7/8 x 7 3/4	1 7/8 x 3	9.00	8.6
2	1 7/8 x 8 3/4	1 7/8 x 3 1/4	10.60	10.1
2 1/8	1 3/4 x 8 3/4	1 3/4 x 3 3/4	12.5	11.6
2 1/4	1 3/4 x 9 3/4	1 3/4 x 3 3/4	14.1	13.3
2 1/2	2 x 10	2 x 4	16.0	15.2
2 3/4	2 1/4 x 11 1/4	2 3/4 x 4 1/4	20.25	19.1



you find the design number for 1,100 watts to be 33.20, and that the primary coil should be wound with No. 9 wire. Remembering this, you turn to table No. 3, which contains formulas for calculating 60-cycle, core-type transformers. In the space under the first column listing the size in watts, write 1,100, which you have already found. For the second column divide the design number, or 33.20, as found in table No. 5, into 8,200 and you will get 247 for the number of primary turns. The weight of primary wire for the next column, and the weight of secondary wire may be calculated later by the same method as has already been outlined. The secondary turns per volt is next determined by dividing 75 by the design number, in this case 33.20, which gives 2.25. Likewise, multiplying .093 of the next column by 33.20 gives 3.08 for the cross-sectional area of the core. To decide on a core size, look up the column and select a size proportional to those given for other sizes of transformers. In this case $1\frac{5}{8}$ in. will be satisfactory. The thick-



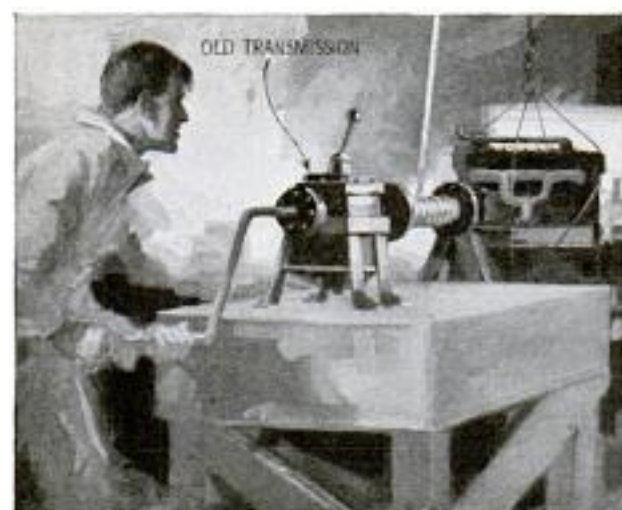
ness of core needed can now be figured by dividing the area already found, or 3.08, by the core size, or $1\frac{5}{8}$ in., which gives 1.89, although we can use a $1\frac{5}{16}$ -in. core to make it even. The weight of steel needed can be found by referring to table No. 8,

which gives the weight of a $1\frac{5}{8}$ -in. core, 1 in. thick. Multiplying the thickness of the core, or $1\frac{5}{16}$ by 10.1, gives approximately $19\frac{1}{2}$ lb. as the core weight. With these new values for table No. 3, you can proceed to design the 1,100-watt transformer by the same method as was used for the 150-

watt outfit. However, the 1,100-watt transformer will have more turns on the secondary than on the primary, and is therefore a step-up transformer. Special care should be used to assure good insulation when high-voltage coils are built.

When designing transformers, one should always check the window space of the core to make sure that it is large enough. If the coil requires more space,

(Continued to page 140A)



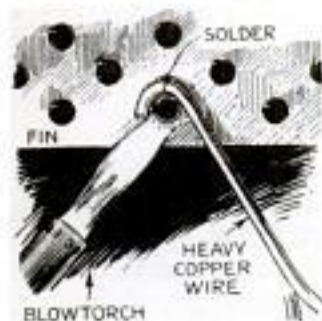
This Three-Speed Hoist Handles Heavy Loads with Ease, and Light Loads Speedily

Hoist Improvised from Transmission Has Three Speeds

A three-speed hoist can be improvised from an old auto transmission. A large crank is fitted to the front end of the transmission, leaving the driveshaft and universal joint on the other end. The shaft is cut off, allowing enough to project to serve as a drum for the hoisting cable. A bearing is provided for the outer end of the shaft. When mounted on a heavy table as shown, and used in connection with a pulley or a block and tackle, this hoist will handle heavy loads in low gear, or by changing to high gear, light loads can be raised speedily.

Soldering Tool for Radiator Tubes

In order to repair one of the tubes in my radiator that could not be reached with a soldering iron, I made the illustrated tool. It is a length of heavy copper wire with one end bent to form a hook which will fit the curvature of the tubes. In use, the fins of the radiator are spread apart, the tube is scraped clean and solder is applied. When the solder melts it is spread over the hole with the wire tool, the hook having been previously tinned.—Arnie Hongo, McNeal, Arizona.



Suggested Thicknesses for Applying Cork Insulation

After considerable experimenting, I have found molded cork to be best as an insulator to prevent water pipes from sweating. The correct thickness of the cork depends on the degree of humidity in the air. The greater the humidity, the greater will be the thickness of cork required. For average conditions, a thickness of $1\frac{1}{2}$ in. is satisfactory, but where the humidity is high, $2\frac{1}{2}$ in. is frequently necessary. There is no rule which will take care of all conditions because of other factors involved, such as the temperature of the air and of the liquid in the pipe, etc. Computation of correct thickness should take into consideration all of these factors.—W. F. Schaphorst, M. E., Newark, N. J.

Coil Springs Protect Sensitive Devices Against Vibration

In engine rooms where a steady vibration is set up by the machinery, it is a good idea to mount such devices as clocks, thermometers and meters on springs. Three long nails will serve as pivots for attachment of the springs. This method is also useful in boat cabins, where the vibration is severe, for mounting chronometers and barometers, or other sensitive instruments.



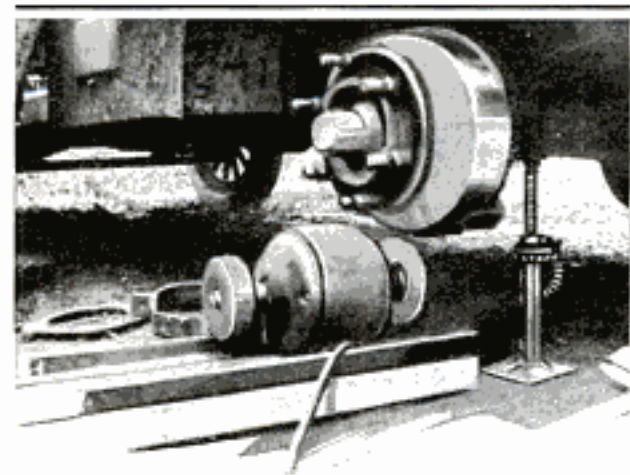
Spring Tail Skid Substituted for Shock Cord on Airplane

Inconveniences, arising from broken shock cords on tail skids of airplanes, can be overcome by substituting a spring for the regular skid. An old semielliptical car spring will do for this purpose, using three or four leaves $1\frac{1}{2}$ to 2 in. wide. After removing the old skid, weld a plate of $\frac{1}{4}$ or $\frac{1}{2}$ -in. stock between the frames close to the tail post, to prevent tube distortion and to provide a means of attaching the

spring. Then perforate the center of the plate to take a $\frac{3}{8}$ -in. bolt, drilling similar holes in the spring to correspond with those in the plate and the old skid bracket. When the necessary alinements have been made, bolt the spring in place temporarily. Then, resting the tail on it, determine the tension necessary to provide the proper clearance between the plane and the ground, taking into consideration such stress as occurs when "revving up" with a back stick or when taking off from or landing on rough ground. The spring is then removed and bent to the proper shape, forming a shoe on the thinner end, after which a spring clip is riveted or brazed 1 in. from the end of the main leaf of the spring, to provide a guide and prevent ground looping. Casehardened bolts should be used for attaching the skid to the tail frame.—Leo May, Chicago.

Portable Setup for Grinding Brake Drums without Removing Them

Faced by the problem of truing up rough brake drums, an Arkansas mechanic devised the following method of doing the job without even removing the drums. He screwed two strips of light angle iron to a heavy board to form ways for a small bench grinder. After jacking up one side of the axle and removing the wheel and outer brake band, he placed the grinder in position directly under the drum. The car motor was then run in low or reverse while the grinder was worked back and forth across the surface of the drum. Ground in this manner, the drums will be concentric with the axles.



Truck and Car Brake Drums Can Be Trued with a Small Portable Grinder



Sturdy Rack for Welding Torch Is Fitted with Pilot Light and Flame Guard

Rack Equipped with Pilot Light Holds Welder's Torch

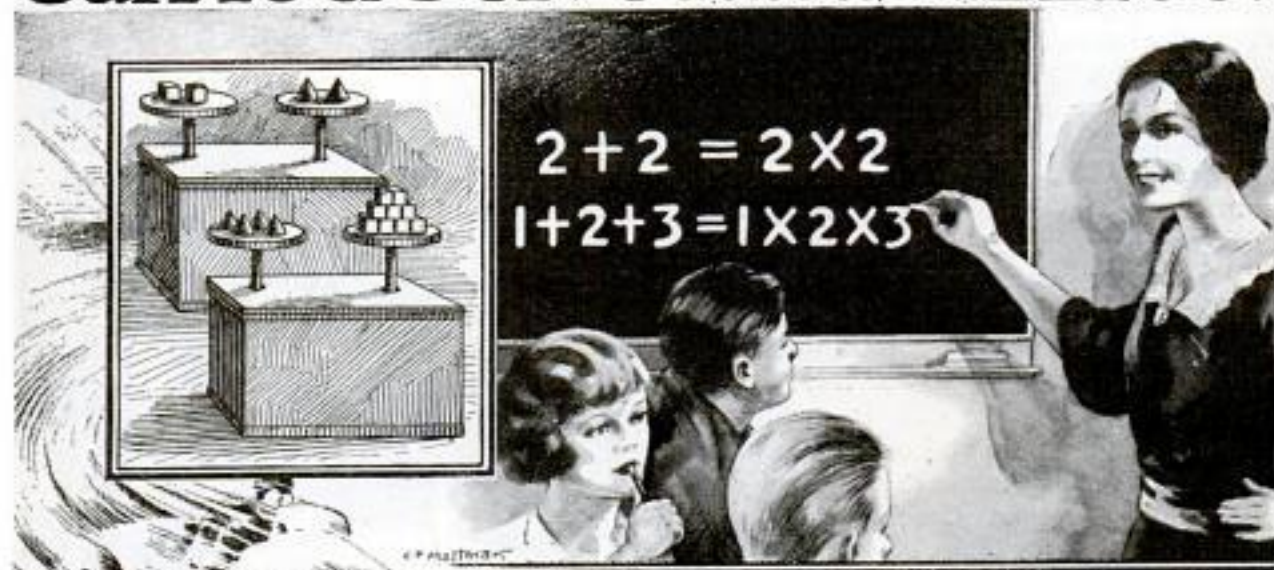
Fitted with a pilot light, this rack will be found handy for holding a welding torch. The base is a gear or a wheel, which supports a vertical length of pipe. Two small rods are bent as shown and inserted into the end of the pipe to hold the torch, while a large ring, clamped near the top, serves as a guard around the flame. The light, which is clamped to the vertical pipe, is a piece of tubing plugged at the lower end and fitted with a wick at the top. One filling of denatured alcohol will keep the light burning for hours.

Scale on Paper Hanger's Brush Saves Time

Paper hangers will find that considerable time spent in picking up and using a yardstick can be saved by providing a scale on both sides of the smoothing brush. This can be done by first marking the lines with a pencil and then sawing them out deep enough so they will not be obliterated. Numerals may be stamped in with steel dies.—S. E. Schofield, Indianapolis, Ind.

031310

Can You Solve *these* Puzzles?



By SAM LOYD
1531 Baseq at Brooklyn

OUR sketch shows two views of the same pair of "doctored" scales, the fulcrum having been shifted so that one side has greater leverage than the other. To keep the pans in balance when empty, the shorter arm is weighted. The scales are set in a box to mask this. In the upper view are two cubes in balance with two cones. In the lower, four cones balance against nine cubes. The problem for you to solve is to determine how many of those cubes it would take to balance with six cones, if weighed on a pair of true scales.

"ALTHOUGH two is an even figure, it is quite an oddity," said Mrs. Terwilliger to her class, "two being the only digit which, added to or multiplied by itself will give the same result. If we wish to produce that effect with three figures, we have to take one, two and three. Multiplied or added together they produce six. Now, I have led you to the puzzle: What four digits, either added or multiplied together, will produce the same result? Two or more of the four figures may be alike."

TUNING up for a big race, a driver was on the track for exactly one hour. He raced the first quarter of his entire run at a speed of 100 miles an hour; covered the second fourth at ninety miles an hour; the third at eighty miles an hour, and the last part at the rate of sixty miles an hour. Note that the quarters indicate distance and not time. What was his total mileage for the hour?

Answers to Last Month's Puzzles

While the triangles are not numbered in the puzzle picture, their general shape plainly indicates to which each set of dimensions applies. The lengths of their sides expressed in feet are: (1) 48, 140 and 148; (2) 80, 84 and 116; (3) 30, 224 and 226.

The solution of the problem regarding the cost of each bidder's work is: The paperhanger's estimate amounted to \$440; the painter's was \$750; the plumber's, \$1,400; the electrician's \$660; the carpenter's \$3,325, and the mason's \$1,275.

Eastman announces a New *Ciné-Kodak*..\$29⁵⁰

using a **NEW FILM**
that cuts movie costs

nearly $\frac{2}{3}$

CINÉ-KODAK EIGHT—
a real, full-fledged
movie camera, Eastman-
made. Takes beautiful, clear,
sharp movies. Only \$29.50
(you pay no federal tax; East-
man pays it).

The new film does four
times the work. A 25-foot
roll at \$2.25 runs as long on
the screen as the usual 100-
foot roll at \$6. You save ex-
actly 62½%. No extra cost
for finishing.

You show your films in the
new Kodoscope **EIGHT** . . .
throws strong, steady movies
. . . only \$22.50.

Don't fail to visit your
Ciné-Kodak dealer. See the
actual movies on the screen.
Eastman Kodak Company,
Rochester, New York.

● **THE NEW PRINCIPLE**

Ciné-Kodak Eight makes a special 25-foot film, 16 mm. wide, do the work of 100 feet. It runs the film past the lens twice, leaving two separate rows of images along its full length. Eastman finishes this 25-foot 16 mm. film, slits it, splices it, and returns it to you as a single 50-foot 8 mm. film, ready to project in *Kodoscope Eight*. Cost of finishing is included in the price of the film.

It is this Eastman invention that brings you home movies at 62½% saving.

CINÉ-KODAK EIGHT is a real full-fledged movie camera. Price only \$29.50.

Ciné-Kodak EIGHT

Eastman's NEW-PRINCIPLE *Movie Camera*

When writing to advertisers please mention *Popular Mechanics*

A plain statement ANTI-

IMPORTANT INFORMATION FOR THE

In an effort to clear up the confusion regarding anti-freeze, which appears to exist in the minds of many consumers, we give below the outstanding facts. The following statements are guaranteed to be correct and accurate in every particular. They are supported by the highest scientific authorities.

THE problem of preventing freezing in the cooling-systems of automobiles during the cold weather months was one that taxed the ingenuity of car owners for many years. Salt, honey, alcohol, kerosene, glycerine and many other products and by-products were used with varying success. Within the past few years, however, there has been developed a new product, a product specially designed for this one use and purpose.

That product is Eveready Prestone. It is not a general commodity used principally for other purposes: it is an anti-freeze, and nothing else. It is a scientific development, thoroughly approved by all car manufacturers; a product which embodies all the advantages of all materials previously used, with none of their inherent weaknesses.

In developing Eveready Prestone, the laboratories of Union Carbide and Carbon Corporation, keeping in mind the requirements of the U. S. Bureau of Standards for an ideal anti-freeze, worked toward a product which would satisfy the following specifications:

1. It must not boil away. A boil-away anti-freeze is both an inconvenience and a

poor protector against sudden changes in the weather. Such anti-freeze requires frequent renewals, and leaves the car unprotected when a cold snap follows warm weather.

2. It must be harmless to the cooling-system. An anti-freeze which corrodes the cooling-system is a poor product to put in a car.

3. It must be effective in preventing freezing. The effectiveness of the materials commonly used before the advent of Eveready Prestone varied over a wide range. Some were effective in preventing freezing; others were not.

4. It must not affect the car finish. The fumes of boil-away products were a source of danger to the finish of fine cars. This was a weakness which those who developed Eveready Prestone were anxious to avoid.

5. It must circulate freely at the lowest operating temperatures. A heavy, viscous material, which is not free-flowing, is obviously a poor cooling agent.

When writing to advertisers please mention Popular Mechanics

Copyrighted material

of facts concerning FREEZE

PROTECTION OF CAR OWNERS

6. It must be non-inflammable and odorless. Winter driving was often made unpleasant by smelly fumes, while inflammable mixtures held the possibility of causing serious accidents.

7. It must not "creep." Certain materials in common use had a strong tendency to leak out of systems which were tight enough to hold water but not tight enough to hold these materials. The new product, it was felt, must have *less tendency to leak than water*. Consequently, if a car could hold water it would hold the anti-freeze.

8. It must be packaged as a concentrated product. Many of the products which the public was using, because of their thick, heavy nature in the concentrated form, were sold as water-diluted solutions. The cost of canning and shipping plain water was thus borne by the public. Obviously, if a concentrated product could be packaged and sold the user could be saved that expense. Furthermore, the public had no way of telling how much of these diluted solutions was anti-freeze material and how much was ordinary water. Some brands contained as much as 55% plain water; others contained less. It was decided, therefore, that the new product must be concentrated. Thus the public could be sure of buying a standard product, always the same and always of known value.

9. It must be economical. The laboratories which developed the new product were not interested in low first-cost per

gallon. They *were* interested in low cost per season. It was felt that car owners who had been buying boil-away anti-freeze on the installment plan, a few quarts at a time, would not object to a relatively high first-cost if the *all-season* cost were low. The new product, therefore, was priced to cost, for an average winter season, no more than the cost of boil-away anti-freeze.

Thus was developed Eveready Prestone, the only anti-freeze which meets *all* these requirements. But laboratory effort did not stop with that.

A NEW AND IMPROVED PRODUCT AT A LOWER PRICE

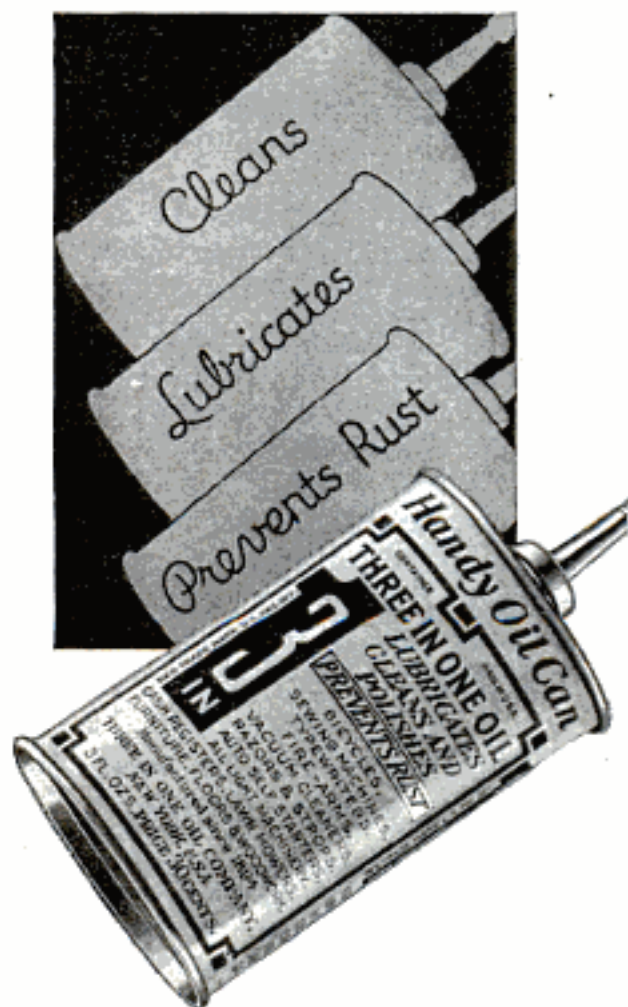
Further research developed the product to a point where it gave protection, not only against freezing but also against rust and corrosion in the cooling-system. And such is the *new* Eveready Prestone. Its use reduces the corrosive action of water on the metals of the cooling-system as follows: brass, copper, solder, aluminum and zinc, 75%; cast iron, 95%; No other "treated" anti-freeze compares with Eveready Prestone for the prevention of rust and corrosion.

The new Eveready Prestone has been reduced in price. It now offers by far the safest and most economical protection against both freezing and corrosion. The car owner who uses Eveready Prestone is assured of complete protection through all weather changes, freedom from rust and the trouble of replacements, and a clean, free radiator. He insures his car, not only against a freeze-up, but also against the corrosion that follow a rust-clogged and corroded cooling system. He prolongs the life of his car.

National Carbon Company, Inc.
Carbide and Carbon Corporation

TRIPLE PROTECTION

against Unnecessary
Shop Expense



Here's an oil that saves you many a repair and replacement bill by providing *triple protection* for all shop equipment.

Three-in-One is specially blended from three good oils, so it does three good jobs. As it *lubricates* it *cleans* gum-forming dirt from working parts, then *prevents rust*. No ordinary oil can provide this protection so effectively. Handy cans and bottles, at stores everywhere.

Three-in-One Oil Company, New York

THREE-IN-ONE OIL

SECRETS OF THE LION MEN

(Continued from page 925)

burning branches with their spears so we could pass through. Xipooso, calm and proud as ever, welcomed me with poise, but the rest of his family huddled about me weeping and shrieking.

Xipooso had no notion of what was to be done except that he intended to fight the lions until they killed him. What could I do? The fire was rapidly destroying the fence and I could not defend a circular front of some 300 yards single-handed. Then I saw the milling cattle and I had an idea—and it was time to get one.

I gave an order which was at once executed: A fat cow was led through the gap made by our entrance and turned loose. It was cruel, of course, but the sacrifice of this unlucky animal appeared our only salvation. The cow trotted about for a moment, bawled piteously and stood still. I did not have the heart to see the living creature torn to pieces, so fired a merciful bullet into its head. It had not struck the ground before four, five, ten bodies hurtled through the air and pounced upon it, fighting, snarling and roaring.

The scene, only fifty paces distant, was illuminated by the flames and the lions were perfect targets. I fired once, twice, three times and with each shot a beast spun around and dropped. Two more, badly wounded, tried to hurl themselves in our direction, but lost courage and fled. The flames were dying down, but the continued shooting, the noise and the fire discouraged the circle of beasts about the inclosure, and finally, pair after pair of eyes vanished as the animals retreated to the bush.

Even before I stopped shooting, the chief's family sensed victory and pounced on me with pathetic protestations of gratitude, hailing me as the "big hunter who killed all the lions in the world." Meanwhile the tom-tom was pounding out into space I don't know what extraordinary and exaggerated account of the affair.

Partly as a reward for this exploit, Xipooso made a most unexpected proposal. I was to become a member of the Bantu-Simba Voodoo—the secret society of the lion men—made up of the most intrepid lion hunters in the country. The

(Continued to page 126A)

Life's greatest THRILL

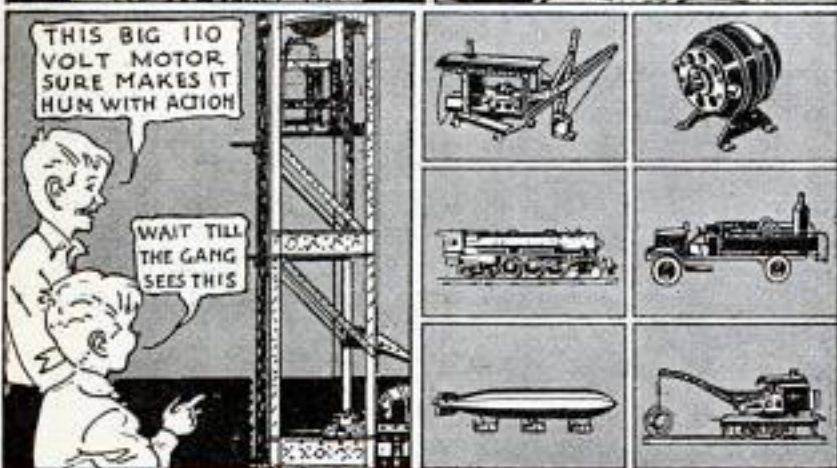
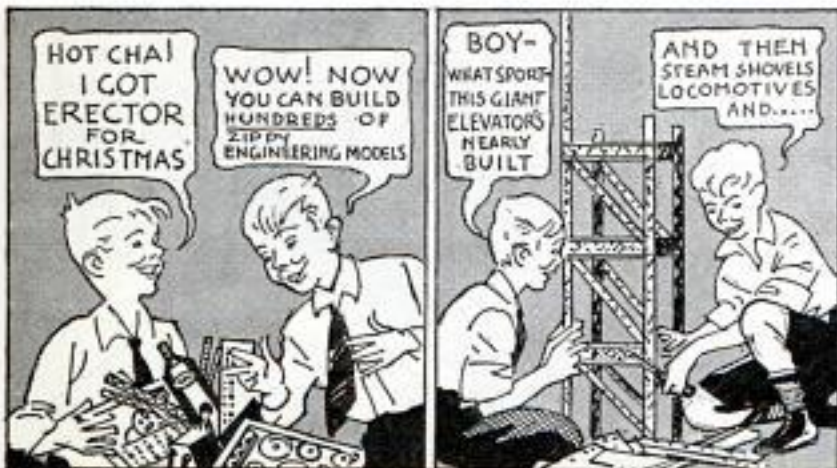


A.C. Gilbert

HELLO BOYS 350 ACTION TOYS IN ONE

Hello Boys! 350 Christmas gifts in one. Tell your dad you want Erector. A galaxy of exciting sets, \$1 and up. Send for the big Erector catalog and pick out the one you want. Mail coupon today. Greatest values in the history of Erector. A big thrill for every day in the year!

A.C. Gilbert



Boy, look at those realistic operating models built with



TUNE IN
"Bring 'Em
Back Alive" 

FRANK BUCK

Hair raising thrills from Malay jungles. Frank Buck himself in blood curdling adventure dramas showing how man-eaters are captured alive.

SUNDAYS 5:45 P.M. E.S.T.
WEAF NETWORK
See Local Program Listing

ERECTOR

"THE WORLD'S CHAMPION TOY"

FREE CATALOG Shows Just What You Get * * * * *

THE A. C. GILBERT CO.

333 Erector Square, New Haven, Conn.

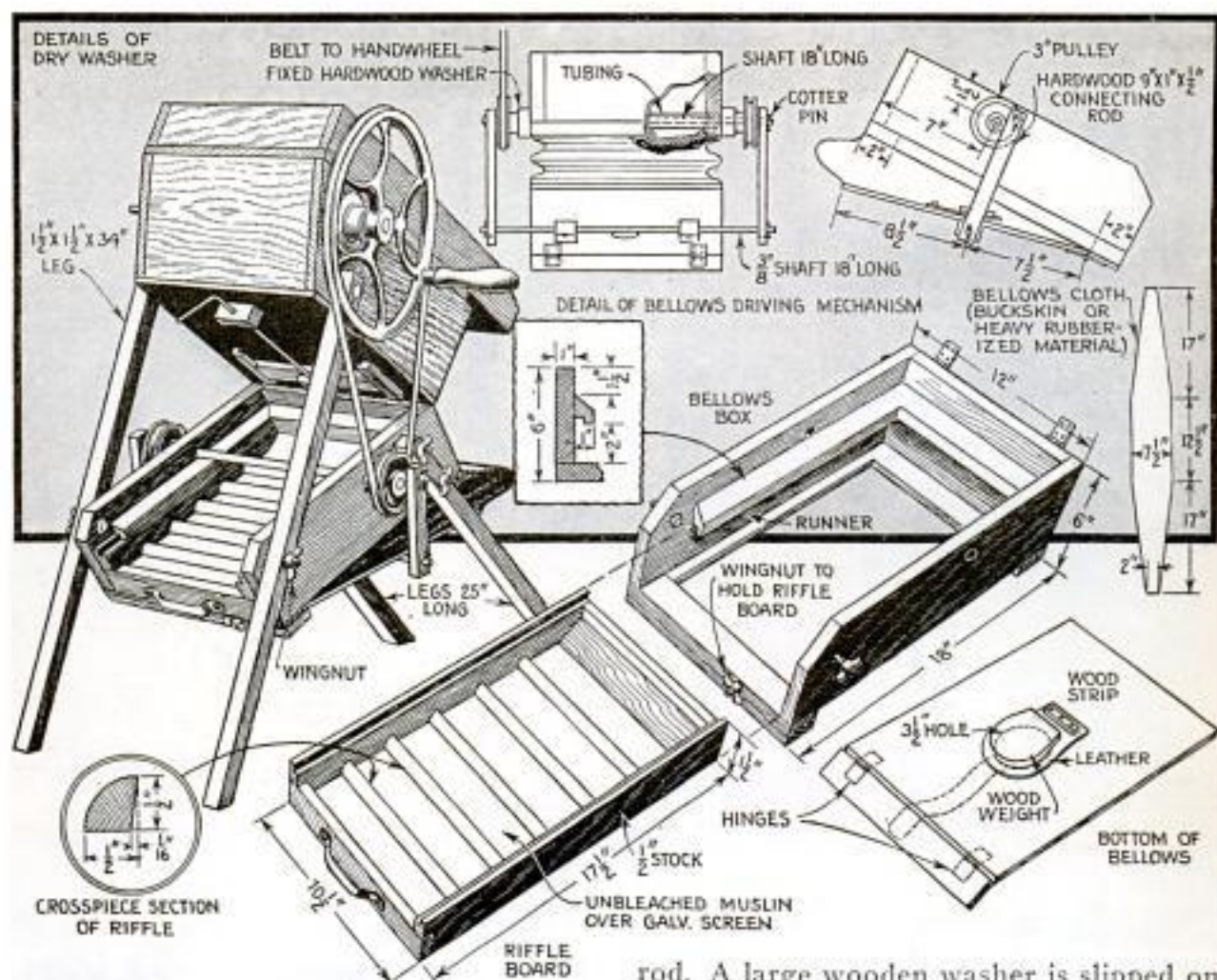
Send me the big colored Erector "Look-Em-Over Book," Free.

Name _____

Street _____

City _____ State _____

When writing to advertisers please mention Popular Mechanics



GOLD WASHERS INCREASE PROSPECTORS' EARNINGS

(Continued from page 1009)

recovery of the gold. The quantity of gold that can be recovered from a cubic yard of dirt by panning is first estimated. If the machine does not collect this amount, change the slant of the riffle board and the distance between the riffles. Several hours spent in experimenting will be well repaid.

The dry washer has the advantages of light weight and portability. In use, the dirt is moved over the riffle board by air forced up from a bellows. The assembly is fastened together with 1-in. brass screws. Half hinges are placed both at the top and bottom of the unslanted end of the hopper. An adjustable opening in the bottom of the hopper controls the amount of dirt that descends to the riffle board, the width of the slot being governed by a gate which is operated with a rod. Two 1/2-in. holes are drilled through the sides of the hopper, for a 12-in. length of brass tubing, which serves as bearing for a steel

rod. A large wooden washer is slipped on each end of the rod, while a sewing-machine treadle wheel, fitted with a handle, is keyed to one end of the shaft and a collar is setscrewed on the other end. A hopper cover, having three sides, is fitted with a bottom made of 1/4-in.-mesh galvanized screen. Half hinges, to meet the half hinges on the front of the hopper, are attached, and the two parts are united with a long wire through both hinges. The bellows frame, in which the riffle board is to be placed, is made of 1-in. stock. Hinges at the top of the back connect with the half hinges on the bottom of the hopper. The two sides and back of the bellows frame are mounted on a frame of 1-in. stock, 2 in. wide. Runners are nailed inside the box to hold the riffle board when air is forced up from below. Holes are drilled through the sides of the bellows box, and a brass tube, shaft, washers and two 3-in. pulleys are fitted on, while a wingbolt is attached to the front of the bellows box to keep the riffle board from sliding out. The bottom of the bellows box consists of a 1/4-in. board with a 3 1/2-in. clapper hole.

(Continued to page 142A)

NEW ANTI-FREEZE GIVES 4-WAY PROTECTION



★ **Won't evaporate . . . fill now for the winter**

★ **Leaks less than water**

★ **Stops rusting and corrosion**

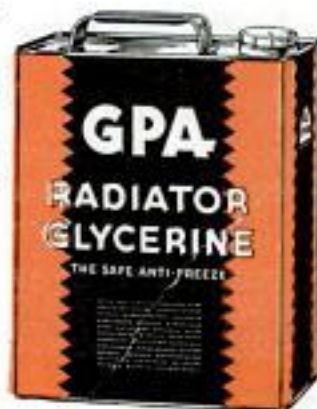
★ **Positively will not clog or gum**

PLUS lower price . . . more economical than ever

14 ADVANTAGES OF G. P. A.

1. Gives complete protection against freeze-ups to 30° below zero.
2. Will not evaporate—not even on the warmest days. One filling lasts all winter.
3. Leaks less than water.
4. Protects all metals of the cooling system against corrosion and the rust caused by tap water. This protection continues after G. P. A. is drained out.
5. Retards disintegration of rubber hose.
6. Positively will not clog or gum radiator.
7. Mixes quickly and permanently with water.
8. Never overheats motor—even on warmest days.
9. Does not injure Duco or other automobile finishes.
10. No unpleasant odors or dangerous fumes.
11. Absolutely safe—non-poisonous, non-inflammable.
12. Permits better operating temperatures.
13. Made to G. P. A. quality standards.
14. Lower in price. More economical than ever.

THE *new* **G.P.A.**
RADIATOR GLYCERINE



GLYCERINE PRODUCERS' ASSOCIATION, 45 EAST 17th STREET, NEW YORK, N. Y.



\$9⁷⁵ COMPLETE (Ready to Install)

TOBE Engineers — after years of research and development in perfecting products for eliminating radio noises, or man-made static, now bring you for better radio enjoyment—a radio strainer—the "Filterizer."



ON THE AERIAL

TO GET MORE STATIONS AND ENJOY THEM MORE INSTALL THE "FILTERIZER"

NO matter what make radio you have or where you live the "Filterizer" quickly installed at your receiver without any further attention definitely removes all unwelcome radio noises and only pure music and speech come through your loud speaker.



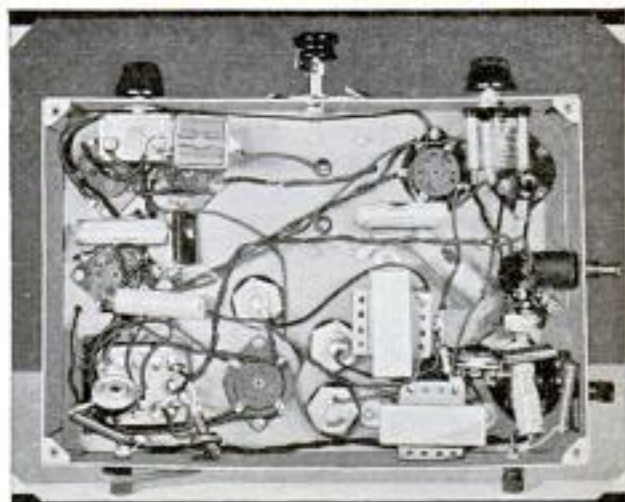
ON THE SET

The acknowledged authority on Radio Interference—makers of FILTERETTES, the accepted remedy.

TOBE DEUTSCHMANN CORPORATION
 FILTERETTE DIVISION
 CANTON, MASS.

MAGIC BOX MAKES SENSITIVE SHORT-WAVE SUPER

(Continued from page 967)



Underside View of the Improved Magic Box Shows the Wiring and Arrangement of Parts

sum, Holland; LSG—Monte Grande, Argentina, S. A., and DJD—Konigs Wusterhausen, Germany.

It is quite easy to build, the parts being mounted on a simple metal subbase with all wiring underneath. The variable condenser used in this model was made by removing alternate plates from a two-gang .00035-mfd. capacity variable condenser. A unit of this type may be purchased, however, if desired. The total capacity of each section should be between 75 and 100 mmfd.

The intermediate-frequency transformer is a Litz-wound r.f. broadcast coil, shielded in a can. Any r.f. broadcast coil would probably answer the purpose, but the Litz variety is recommended. The cap lead for the r.f. tube should be connected to G-lug on the intermediate-frequency transformer. Any good vernier dial may be used. The one employed in the model is of the two-speed type, having a ratio of 5 to 1 and 40 to 1, and is quite helpful when tuning for weak signals.

The schematic circuit diagram is given in Fig. 1, and the simplified wiring diagram in Fig. 2. The simplicity of the parts layout will be noted in the photo above Fig. 2. These parts are all clearly indicated and named in Fig. 3. The metal chassis may be made of either eraydo or aluminum. All parts are standard and available at low cost.

The plug-in coils are shown in the pho-

(Continued to page 122A)

FITTING NEW FLOORING

(Continued from page 979)

surface, as shown in Fig. 24. When a linoleum floor in good condition has one or more worn spots, these can be neatly patched as shown in Figs. 21 and 23. With linoleum cement and small remnants of material, you can often produce a colorful effect which will actually improve the original flooring. To do this, carefully cut out the worn section in a perfect square, triangle or circle. Cut out one or two other sections throughout the room to balance the new design. Then take two or three squares of different-colored linoleum of the same thickness and carefully fasten them together with rubber cement. Draw a design on the top square, and saw out this design on the triple thickness, as shown in Fig. 25, using a fine hand or power-driven scrollsaw. After that has been done, clean off the rubber cement and you are ready to make the inset. The various pieces of the three layers will fit together perfectly to make a tri-colored design. There is not any waste, as the remaining cut-outs can be assembled in a different color scheme to the other balancing insets.

THE ART OF PICKING LOCKS

(Continued from page 893)

most effective, in especially difficult situations, are the sometimes crude tools made by the locksmith on the spot. One of them once prevented a suicide by using a closet hook and a short iron rod, curved at one end, to open the door of a room in which a woman was about to kill herself by jumping out of the window. It so happened that the window did not work easily, and by the time she had got it up, the door was thrown open and she was saved.

Another time the twisted prongs of an ordinary fork and the stub of a dinner knife, filed down to a triangle, served to open half a dozen locked doors in a burning building, thus saving the lives of people who had become too dazed by the smoke to open the doors from the inside.

In the ordinary course of business, the principal reasons why locksmiths are summoned, are carelessness, forgetfulness and sometimes the stupidity of the owners or their employes.

Kill a COLD before It Takes Root!

TREAT a cold quickly and treat it *decisively!* Don't depend on half-way measures. Half-way measures only lead to half-cured colds.

Take a COLD remedy for a cold and not a remedy good for half a dozen things. Take a remedy that gets a cold from the *inside*, and not merely a surface treatment.

4 EFFECTS!

The wise thing to do is to take Grove's Laxative Bromo Quinine as soon as you catch a cold. Grove's Laxative Bromo Quinine is effective and reliable because it is specifically a cold remedy and because it does the four things necessary to relieve a cold.

First, it opens the bowels. Second, it kills the cold germs in the system and reduces the fever. Third, it relieves the headache and that grippy feeling. Fourth, it tones the entire system and fortifies against further attack. Grove's Laxative Bromo Quinine is safe to take! It contains no narcotics and produces no bad after-effects. Taken promptly, it will usually expel a cold overnight. So in its use lies safety. Every drug store in America sells Grove's Laxative Bromo Quinine. Convenient, pocket-size box, cellophane-wrapped. Get it today.



*"I Couldn't Write
a Better Prescription
Myself"*



GROVE'S LAXATIVE BROMO QUININE

**Ease that sore spot
and SLEEP**



"A little Sloan's will soon put an end to that twitching pain."

"I hope so. I've hardly slept since this last damp spell started."

DAMP-DAY PAINS

—stiff joints

Don't let pain keep you awake during damp weather. Warm those stiff sore joints with Sloan's—and you'll sleep soundly. For Sloan's rushes fresh blood to the sore spot, kills the pain, relaxes the stiffness. No rubbing is needed with Sloan's—simply pat it on. Gives the quickest relief in the world . . . and costs only 35¢!

SLOAN'S

**World Famous Liniment used
by 133 Nations**



25¢ FOR PINS-RINGS \$1²⁵

Class pins—any letters, any year, any colors.
Silver plated, 12 or more, 25¢ each; 1 to 11, 50¢. Gold
plated, 40¢; sterling, 45¢. Class rings, medals, etc.
BIG CATALOG FREE

METAL ARTS CO., Inc. Factory 44, Rochdale, N. Y.

THIS FRAME is FREE
with each PHOTO or
SNAPSHOT
ENLARGEMENT
for only 98¢



Simply send us your PHOTO,
SNAPSHOT, or TINTYPE,
with your name and address
and in about one week you
will receive a BEAUTIFUL
ENLARGEMENT completely
framed in an ARTISTIC
5x6 Frame as illustrated.

Send No Money! Just pay postman 98¢ plus postage, or send \$1
advance of this amazing offer and send Photo today. DO IT NOW.
Alton Art Studios, Dept. 16, 5707 Lake St., Chicago, Ill.

MAGIC BOX MAKES SENSITIVE SHORT-WAVE SUPER

(Continued from page 120A)

to on page 966. The oscillator coils are to be made first, and then the detector coils are made to match. The approximate number of turns will be given, but they will vary with the intermediate frequency used. This means that they will have to conform to the dial setting of the broadcast receiver which has been selected for best results. The detector coils may be made with a few extra turns on the grid winding L_2 . Then tune in a station and take off a turn at a time until the best signal strength is obtained. The coil connections to the prongs in the bases of the plug-in forms are detailed at the lower left in Fig. 1. The two sets of small coils can be wound on tube bases, but the larger coil will require a regular plug-in form,

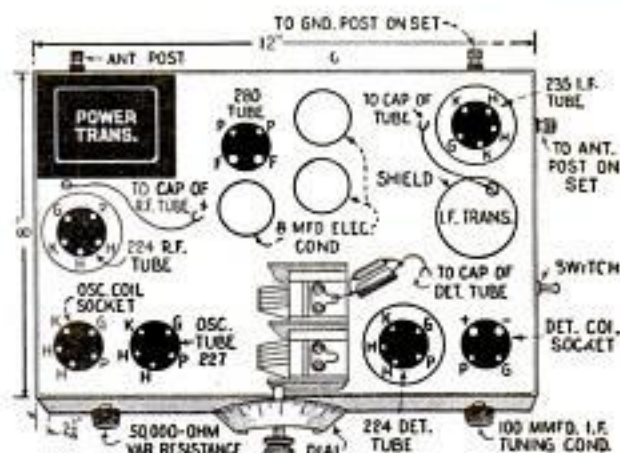


Fig. 3

or a 2¼-in. length of bakelite tubing may be fitted over tube bases to obtain the required length. The detector coil has a four-prong and the oscillator coil a five-prong base. The wire size is not critical, silk-enamel wire of any size between Nos. 24 and 30 being satisfactory. Readers who made the magic box, described in 1931, can use the same oscillator coils in this converter.

For the 15 to 40-meter detector coil, L_1 has five turns and L_2 five. For the oscillator coil, L_3 has five turns and L_4 consists of 7 turns tapped 2 turns from the bottom end. The 35 to 80-meter detector coil, L_1 has 12 and L_2 13 turns. For the oscillator coil, L_3 has 12 turns and L_4 17 turns tapped 2 turns from the bottom end. The 75 to 150-meter detector coil L_1

(Continued to page 124A)

Be a Boy Chemist!

Master the Mysteries of Modern Chemistry!



Work marvelous experiments and astonish your friends with mysterious tricks of chemical magic. Learn useful facts about the Wonders of Chemical Science and surprise everybody with your knowledge of chemistry. You can make lots of chemical compositions like soap, ink and paint; analyze food, soil, water, metals and other substances; test many things and produce hundreds of changes and reactions that will show you interesting facts, give you useful information and help you lead your class in science and chemistry.



REGISTERED TRADE MARK
CHEMCRAFT
 THE CHEMICAL OUTFIT

Will Show You the Wonders of Chemical Science!

No. 1.—Contains 20 chemicals and pieces of apparatus, with more than 125 experiments explained in the Manual of Instruction. A knowledge of chemistry can be obtained with this outfit and much interesting and useful information secured from the Manual.
Price \$1.00



No. 3½.—Contains 43 different chemicals and pieces of apparatus, and the Manual of Instruction tells how to perform more than 265 experiments and tricks, many of them in advanced chemistry. This outfit offers greater value and a larger and more useful assortment of materials.
Price \$3.50



No. 5.—Comes in a strong wooden cabinet which provides a place to keep the 60 chemicals and pieces of apparatus which the outfit contains. More than 375 experiments and tricks are explained in the Manual of Instruction. This is a complete chemical laboratory and offers exceptional value.
Price \$5.00



No. 8.—PORTABLE—a beautiful outfit packed in a strong compact carrying case with everything arranged in trays. Contains 67 chemicals and pieces of apparatus and the Manual of Instruction explains more than 430 experiments and tricks.
Price \$8.00

These outfits give accurate, scientific information and cover all branches of chemistry. Experiments in hundreds of different subjects are included: Organic and Inorganic Chemistry, Glass Blowing, Metallurgy, Electro Chemistry, Mineralogy, Industrial Chemistry, Photographic, Food, Rubber, Household and Farm Chemistry—all these and many more are explained and demonstrated by actual experiments.

Each Chemcraft outfit contains a liberal assortment of safe chemicals, all necessary apparatus and a Manual of Instruction. Quantities permit each experiment and trick to be repeated many times. No skill is required, everything is explained clearly. Chemcraft offers more for the money in every way; larger outfits, strong wooden cabinets, more chemicals and apparatus, more real scientific experiments and accurate information.

Eight Big-Value Sets to Select from:

No. 1—\$1.00 No. 3½—\$3.50 No. 8—\$ 8.00 No. 15—\$15.00
 No. 2— 2.00 No. 5— 5.00 No. 10—10.00 No. 25— 25.00

(Nos. 1, 3½, 5 and 8 are illustrated here)

(Nos. 5, 10, 15 and 25 come in handsome wooden cabinets)

Plan now to get a Chemcraft outfit this Christmas! Look for Chemcraft in any store where toys are sold. Look for the name Chemcraft on the Box. If the Set you want is not obtainable in your local store, we will send it, fully prepaid, upon receipt of price.

Try Chemistry for 25c

Get Chemcraft Junior; you can do lots of experiments and tricks with it. Send 25 cents for yours now.

The Porter Chemical Co.
 1412 Washington Street
 Hagerstown Maryland

Send this Coupon for FREE Chemical Surprise

Tell us the name and address of the store near your home which sells toys, and we will send you a Free Chemical Surprise and full information about Chemcraft. Fill in this coupon and send it to The Porter Chemical Company, 1412 Washington Street, Hagerstown, Md. (If insufficient space write in margin below.)

Your Name.....

Your Address.....City.....State.....

Toy Store Name.....Address.....

GO AHEAD! Send Today
for **FREE TRAIN BOOK**



**MOST
FUN FEATURES**
Better Built • Cost Less
American Flyer Trains

American Flyer leads in size, speed, fun-features, and real design. Catalog shows newest design die cast steam type locomotives with *patented ringing bell* and *lighted fire box*—also fun-making automatic signals, bridges, stations, tunnels, etc. It is the only train book you can write for that is *absolutely free*.

**DADS, too, make
railroading a hobby**

American Flyer Mfg. Co.,
2248 S. Halsted St., Chicago.
Send Free Train Book.

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

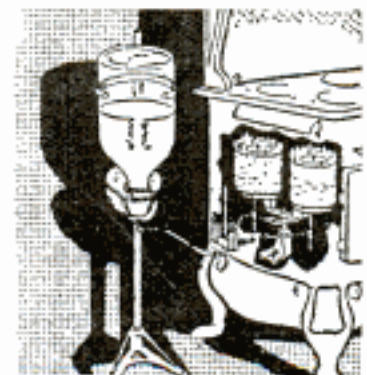
American Flyer Trains



BUILD FOR PROFIT!

You too can earn money in spare time by making a decorative model. 32 1/4" long, of Drake's "Golden Hind." Hull comes fully shaped and mated with decks in place. Clear drawings show you how to add fittings, guns, chocks, masts, rigging, sails. As a special offer, paints and brushes for decorating model is included in "Golden Hind" set, \$9.75 (plus 6 lbs. parcel post). Send 15c (refund) for catalog of quality models.

ROY HANCOCK
393 Douglas Ave., Portsmouth, Va.



DEALERS WANTED
Write for Details

Big Money
Selling and Installing
OIL BURNERS
in Stoves, Ranges, etc.
Sells ON SIGHT
Anyone Can Install
Lasts a Lifetime
WRITE

**OIL KING
BURNER CO.**

P. O. Drawer 1201
NEW HAVEN, CONN.

**MAGIC BOX MAKES SENSITIVE
SHORT-WAVE SUPER**

(Continued from page 122A)

has 16 and L₂ 30 turns. For the oscillator coil, L₃ has 10 turns and L₄ 21, tapped 2 turns from the bottom end. The coil chart together with enlarged layout and wiring diagrams are available in blueprint form for those who wish them.

To put the converter in operation, place it near the broadcast receiver and plug in a set of coils. Connect a wire to the binding post indicated for the antenna-connection post on the receiver. The regular antenna is disconnected from the receiver and this wire is used instead. The regular antenna is then connected to the antenna post on the converter at the left in the rear. The regular ground is left on the receiver, but a wire should also be connected from this ground post to that on the converter. The receiver and converter are now turned on and the tubes allowed to heat. The dial of the broadcast receiver should be set at the high-frequency end, 1,500 kilocycles, as the short-wave coil-turn data given are best for this position of the broadcast receiver dial. The intermediate-frequency stage of the converter is now tuned to resonance as indicated by the background noise. When this noise is loudest, the stage is in resonance. Now tune the converter dial until a signal is heard, then adjust the variable resistor until the converter goes in and out of oscillation smoothly. This resistor may be left undisturbed when once adjusted for the best position.

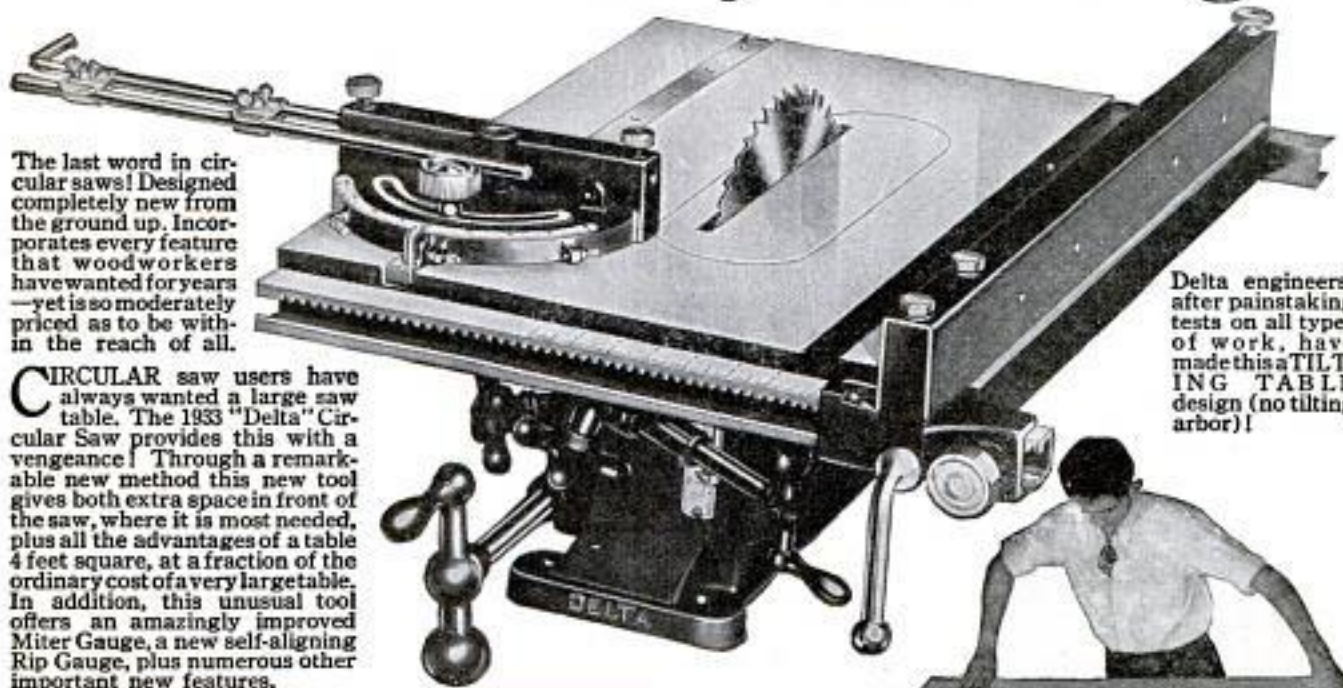
If the broadcast receiver seems to work better at the low-frequency end of the dial, it will be necessary to connect a .00025-mfd. fixed condenser across the 100-mmf. variable condenser that tunes the intermediate-frequency coil. Further information and a complete material list are available upon application. The entire cost of this highly efficient short-wave converter will range from \$15 to \$20. It may be housed in a midget cabinet.

Ⓢ In damp climates or during rainy seasons, the radio receiver may be kept free from moisture and in good operating condition if a 100-watt lamp on an extension cord is placed within the console and burned for several hours each day.

New "Delta" Circular Saw Revolutionary in Design!

The last word in circular saws! Designed completely new from the ground up. Incorporates every feature that woodworkers have wanted for years—yet is so moderately priced as to be within the reach of all.

CIRCULAR saw users have always wanted a large saw table. The 1933 "Delta" Circular Saw provides this with a vengeance! Through a remarkable new method this new tool gives both extra space in front of the saw, where it is most needed, plus all the advantages of a table 4 feet square, at a fraction of the ordinary cost of a very large table. In addition, this unusual tool offers an amazingly improved Miter Gauge, a new self-aligning Rip Gauge, plus numerous other important new features.



Delta engineers, after painstaking tests on all types of work, have made this a **TILTING TABLE** design (no tilting arbor)!

A Complete Line of Efficient Motor-Driven Woodworking Tools



"Delta" Woodworking Units are convenient, portable and compact. All are available in a large variety of combinations and at prices to fit all needs. The "Delta" line includes Jointers, Circular Saws, Band Saws, Woodturning Lathes, Drill Presses, Scroll Saws, Boring, Routing, Sanding and Mortising Attachments, and a complete line of accessories.

New "Delta" DRILL PRESS

The new "Delta" Drill Press, measuring 68 inches high and provided with heavy floor base, is a precision tool—built to meet the most exacting demands of production work, and yet priced unbelievably low. It incorporates numerous new features. Is really two machines in one—as the head can be reversed and used efficiently as a Shaper. Hollow Chisel Mortising Attachments available.

New "Delta" SCROLLSAW

Runs at full motor speed—1800 strokes per minute—all springing and twisting eliminated, with perfect balance and absence of vibration. Produces fine, smooth and accurate work. Has 24 inch throat capacity and will saw wood 2 inches thick! Works on metal and fibre as well as wood. It can be used for filing, sanding and honing.



New Woodturning LATHE

This unusual machine incorporates numerous new ideas in construction and design that give it extraordinary strength and rigidity, plus the accuracy and convenience ordinarily found only in lathes selling for many times its price.

10-Day Trial!

Easy Terms Because "Delta" Woodworking Tools are efficient and practical under actual working conditions, they are always available for a 10-Day Trial without the slightest risk. Satisfaction is guaranteed. For full details of this liberal offer and also of "Delta" Easy Payment Plans, fill in and mail the convenient coupon which appears below—TODAY!

Catalog Free

Every man who works with wood—in factory or home workshop—will want to see this FREE 1933 "Delta" Catalog of Quality Woodworking Tools. It shows the complete line of latest "Delta" Tools. It is packed full of interesting illustrations and descriptions. It describes the latest developments in motor-driven equipment at the astonishingly low 1933 price levels. Fill out the coupon below and mail it TODAY!

**DELTA MFG. CO., 3775 N. Holton St.
Dept. A1232, Milwaukee, Wis.**

DELTA MFG. CO., 3775 N. Holton St.,
Dept. A1232 Milwaukee, Wisconsin

Please place me, without obligation, on mailing list to receive the FREE 1933 "Delta" Catalog of Quality Woodworking Tools. Also send full details of your 10-Day Trial Offer and Easy Payment Plans.

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

Address.....

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

When writing to advertisers please mention Popular Mechanics

MAKE LEAD SOLDIERS BY THE DOZEN!



INDIANS, SAILORS, CAVALRY TROOPS

In an hour with one of my new Kaster Kits you can produce a whole regiment of men, each just as perfectly finished as professionally cast toys. Any live boy can make enough money in a week or two to pay for his entire Kaster Kit. Easy to operate. Entirely electric. Have a complete toy factory right in your own home. Kaster Kit complete with 1 mold, 8 bars of lead, instruction book and complete set of handling and die-cleaning tools, only \$5.

A.C. Gilbert

GILBERT KASTER KIT

FREE—Kaster Kit Carnival Book. Just fill in the coupon and mail today for the most interesting toy book ever published.

The A. C. Gilbert Company,
318 Erector Square, New Haven, Conn.
Please send me a FREE copy of the new KASTER KIT CARNIVAL BOOK.

Name.....

Address.....

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



DUO-FLEX REEDS

1204 First Ave., EVANSVILLE, IND.
FOR CLARINETS and SAXOPHONES

Trade **DUO-FLEX**—Mark Reg. U. S. Pat. Off.

Pat. 5-2-31—No. L.788,819—Foreign Patents Pending

ELIMINATE your reed troubles, get cleaner tones

with ease. Enjoy more popularity and increase

your earnings with this marvelous reed.

Three strengths: No. 1—Soft; No. 2—Medium; No. 3—

Strong. Specify which you prefer. All water proof

leaves that mellow tone. Circular Free.

Bb-Clarinet Reeds, Packed six \$3.40

Soprano Sax Reeds, Packed six 1.50

E♭ Alto Sax Reeds, Packed six 1.50

C Melody Sax Reeds, Packed six 1.45

B♭ Tenor Sax Reeds, Packed six 1.50

Baritone Sax Reeds, Packed six 2.20

\$18.85 Now buys a genuine
MEAD Bicycle

RANGERS cost a few dollars more. Do not buy until
you get our astonishing new prices and terms.

30 Days' Trial We ship on ap-
proval. If not

satisfied after trial return the bicycle at our expense.

Tires lamps, wheels, equipment at half usual prices.
Write for marvelous new prices and terms.

Mead CYCLE COMPANY Write us
DEPT X-112, CHICAGO today for
free catalog



AMAZING NEW WAY TO
COOK Without COAL
OR WOOD



HERE'S an amazing new invention
that makes any range a gas stove
in just a few minutes without connec-
tion to gas lines! The Diamond Range
Burner makes its own gas of 96% air
and 4% cheap fuel oil or kerosene.
Hotter—faster—cleaner and easier to
use than coal or wood and costs less.
Steady, even heat for perfect baking
and cooking. Burns all smoke, dust,
dirt, soot and ashes from home for-
ever. Cuts housewife's work in half!
Write at once for special low intro-
ductory offer.

UP TO \$25 IN A DAY!
Enjoy the convenience of a Diamond
Burner and make **EASY MONEY** be-
sides! Amazing home demonstration
plan pays up to \$25 in a day. Write to-
day sure for full details and how to
get one on 30 days' **FREE TRIAL**—
AKRON LAMP AND MFG. CO.
272 Bartges St. Akron, Ohio

SECRETS OF THE LION MEN

(Continued from page 116A)

natives believe these men have the ability to transform themselves into lions, and remarkable tales of their powers were circulated. I was to be the only white man ever thus honored.

A few nights later I was awakened by a series of terrific roars and jumped up, gun in hand, to be confronted by a native dressed in the skin of a lion doing a savage dance. Outside my tent more roars and more lion-robed figures greeted me. They were the lion men come for the initiation ceremony.

Xipooso covered me with a magnificent lion skin, the head fitting over my head and the legs passing over my shoulders. I was led for miles, it seemed to me, until we came to a glen whose towering rocks shut it off from the rest of the world.

Then, all in chorus, the natives gave a leonine roar that could have been heard for miles. Almost immediately it was answered, and a large male lion came cautiously out of the bush to be met by an avalanche of spears. By sheer instinct, I too, threw a spear. The lion attacked, hurling himself twenty feet through the air, but he fell on the upraised shields of the lion men and was pierced to the heart by their spears.

Each warrior extracted his spear, the chest was cut open and the witch doctor removed the heart. Then, with the bloody point of the spears the witch doctor made a voodoo sign upon the forehead of each warrior and rubbed each chest with the still warm lion heart, leaving a shining smear on each black breast. As each warrior passed from the ceremony, he shouted his lion roar and began a grotesque dance.

When my turn came, I shrank from fulfilling my part, but was pushed forward by Xipooso and received the voodoo sign in blood on my forehead. Then, with a look of inspiration, the witch doctor ripped off my shirt and rubbed the lion's heart across my chest. I shouted myself a very proud roar, and tried to imitate the motions of the savage dance, meanwhile struggling frantically to keep my lion skin from falling off.

At last I was a member of the society of lion men with "a voice of command to make men and beasts shiver," so the witch doctor solemnly informed me.

INVENTORS

Write today
for this

FREE BOOK ON PATENTS

Small Ideas May Have Large Commercial Possibilities

Don't let delay rob you of your invention. **ACT AT ONCE!** Remember that *inventing* is one thing and *owning* is another. Unless you have a patent on your idea, it may be difficult for you to prevent some other inventor from patenting it or some commercial concern from exploiting it. Failure to secure the proper patent protection has meant disheartening loss to many inventors.

I Can Serve You Promptly, Efficiently, Secretly

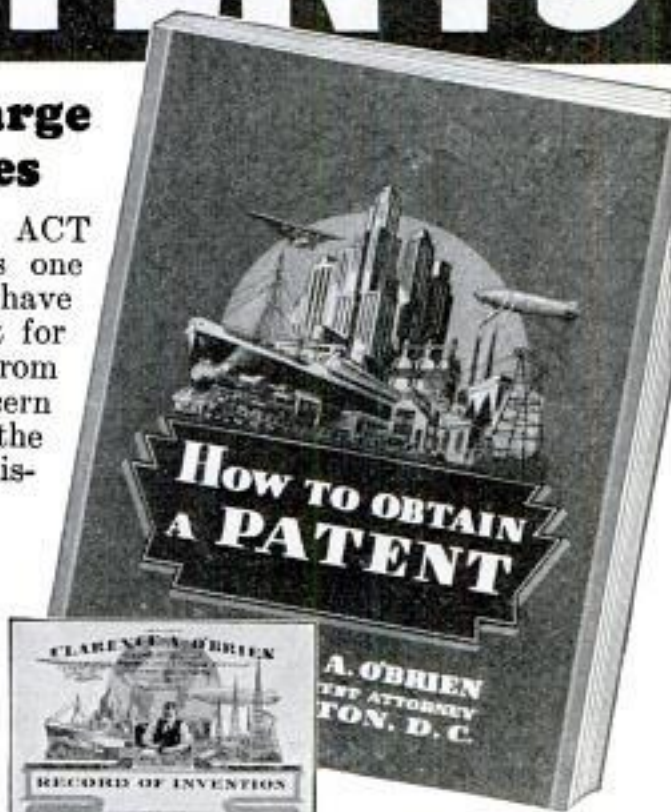
Prompt, efficient, secret service may be expected from my large organization of patent lawyers, solicitors, and draftsmen of long experience, all of whom devote their entire time and attention to patent and trade-mark cases.

Reasonable Fees and Convenient Terms

I have served thousands of inventors in all parts of the United States, and I am able to serve you very reasonably and extend liberal terms of payment. So don't waste valuable time.

Get the Facts Today

Send at once for my FREE BOOK, "How to Obtain a Patent." It gives you all the vital facts about patents and about my service, tells what to do and how to do it. No inventor should be without this book, so, for your own sake, **SEND THE COUPON TODAY.**



A. O'BRIEN
PAT. ATTORNEY
WASH., D. C.

ALSO FREE

"Record of Invention" Blank

On request I will send you FREE a copy of my "Record of Invention" blank. On this blank you can sketch and describe your invention and have it witnessed in such manner that it may be of value to you as evidence. Send coupon now and receive this form together with my free book.

CLARENCE A. O'BRIEN REGISTERED PATENT ATTORNEY WASHINGTON, D. C.

Clarence A. O'Brien
Registered Patent Attorney
705, Adams Building, Washington, D. C.

Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form, without any cost or obligation on my part.

NAME.....

ADDRESS.....

(Important: Please Write or Print Plainly.)

My Washington Location

Above is a view of my drafting and specification offices, where a large staff of experienced experts is in my constant employ. My offices in Washington are convenient to the Patent Office and I and my assistants can, therefore, appear promptly before the officials and examiners.

When writing to advertisers please mention Popular Mechanics

LISTEN TO THE WORLD!

Great New
LAFAYETTE
DUAL-WAVE Superhet
Tunes 15-600 meters!



**10
TUBES**

featuring **AUTOMATIC**
Noise Suppressor

This great new 10 tube Superhet, with new HIGH-GAIN tubes, features radio's latest discovery, **AUTOMATIC NOISE SUPPRESSOR**, which rejects electrical interference from vacuum cleaners, refrigerators, etc. and other "between-station-noises." New heights of performance are made possible by **AUTOMATIC VOLUME CONTROL, PUSH-PULL OUTPUT, A PERFECTED SUPERHETERODYNE CIRCUIT DEVELOPED TO UTILIZE THE NEW HIGH-GAIN TUBES TO THEIR GREATEST MAXIMUM, CALIBRATED DIAL, TUNING CONTROL, AND PHONO ATTACHMENT.** A special new type two-speed dial is used, calibrated in the four bands covered. Single station selector tunes all wave band. Tunes 15 to 600 meters—special model available for 12 to 2,000 meters. The finest dual wave receiver ever developed—at a new, amazingly low price!

30 DAYS free trial



Try this great new LAFAYETTE in your OWN HOME on our 30 days free trial offer. Judge for yourself. Listen to this set perform. Hear it cover the world. Discover the fine tone quality and amazing power developed by this great superhet. We'll be glad to send you complete description and prices, together with details of our 30 days Free Trial Offer. Just mail the coupon below!

BIG CATALOG FREE!

Our new 1933 WHOLESALE RADIO SERVICE COMPANY catalog is ready! In it you will find full details of the great 10 Tube Lafayette Dual-Wave together, with the finest selection of radio merchandise we have ever offered—at the lowest prices in radio history. Send for your FREE copy today!

WHOLESALE RADIO SERVICE COMPANY

100 Sixth Ave., Dept. M-11, New York, N. Y.

Request new 1933 Catalog, absolutely FREE, with complete information and prices on the new LAFAYETTE 10 Tube Dual Wave Superhet and your 30 Days Free Trial Offer.

NAME.....
ADDRESS.....
TOWN.....STATE.....

TUBES BRING IN SILENT TONES

(Continued from page 969)

to lower transformer costs and satisfy the power requirements of the new type C-46 tube. The third tube is the C-58, which is similar in appearance to the C-57. This tube is known as a triple-grid super-control amplifier. It produces less hiss and greater plate-voltage swing without distortion than the former type-35. In this respect, the C-57, previously mentioned, has the same advantage over the former type-24 tube. The fourth tube in the upright line is known as the C-46 and is a dual-grid power-output amplifier. It has great power output at relatively low plate voltage and is also capable of full volume range without overloading, or "blasting." It has excellent fidelity at high volume and allows tone compensation in speaker circuits. For multiple-speaker installations, the C-46 is ideal. Many of the new receivers are equipped with two or more special-range speakers to take full advantage of the tone range now possible. This tube makes such sets practical.

The large tube lying on the table at the extreme right is of special interest to amateur radio operators, as it is a new variety of the well-known 210 tube. It is designed to carry a maximum of 800 volts on the plate, as compared with 425, and the plate terminal is located at the top keeping it well separated from the grid. It is possible to use this new variety of the 10-tube in transmitting circuits that were not practical for it previously.

Another of the new tube family, not shown in the photos, is the C-55. It is known as a duplex-diode triode, and is a sort of double detector, or two tubes in one. It is adaptable to a number of circuit arrangements. Either single or double detection may be obtained, and one stage of audio amplification may be combined with one C-55. More new tubes may be coming, but this new group will be sufficient to keep the experimenters and set manufacturers busy for some time.

Ⓢ When shifting tubes in an a.c. receiver, always do so with the set turned off as the removal of a tube from the circuit will throw an extra load on the filter condensers in the power unit and may result in damage.

Delays May Be Costly PATENT Your Idea Now

Little Ideas May Have Big Commercial Possibilities



Mail the coupon today, and in addition to the free book, we'll send you without charge a Record of Invention Blank. This form, when properly filled out may be of value to you as evidence should occasion require it. There is no charge or obligation for this service. Mail the coupon NOW.

Don't Lose Time—Send for Big Free Book

ACT AT ONCE—and protect your idea. Remember, to get the benefits of your invention, you not only have to invent it—you have to PATENT it. Many men spend years perfecting an invention, only to find that someone else thinking along the same lines has already received a patent on the idea. When we think of all such cases that have come under our personal observation, we cannot urge too strongly that you take steps to protect your idea IMMEDIATELY. Delays of only a few days may be vitally important to you. Do not lose all the benefits of your hard work in planning and perfecting your invention.

Mail the Coupon for FREE Book Today

It is of tremendous importance that you file your application for a patent at once. Our free book tells you how to proceed, what you need to know about patents in general and gives you an estimate of our reasonable fees. We also send you a "Record of Invention" blank free. Take the first step toward getting your patent now. Mail the coupon at once. If you send along a sketch and description of your invention, we will promptly write you what, in our opinion, ought to be done in order to protect it, and for which service there will be no charge.

Highest References—Strictest Secrecy 33 Years of Proven Service

The members of the firm of Victor J. Evans & Co. are registered Patent Attorneys. Our legal and technical forces include lawyers, registered patent attorneys, patent draftsmen and searchers. Our Patent Office and Federal Court practice is confined to patents and trademarks. We specialize in these two subjects to the exclusion of all others. In our 33 years of patent practice, we have successfully served thousands of inventors to whom we can refer. It is a distinct advantage to an inventor to employ an attorney located in Washington as the U. S. Patent Office has no branches.

Here's How We Operate

As soon as the description of your invention comes into our office it is immediately put in charge of an attorney, who is particularly familiar with the kind of invention you have perfected. Under his close personal supervision, patent searchers and skilled draftsmen work. He personally sees your case through to its conclusion. You have the advantage of highly skilled and experienced service. Reasonable charge. Deferred payments.

Here's What the Coupon Brings Mail It Now

Mail the coupon today and take the first step toward protecting your idea. You will receive the FREE Book, a FREE Record of Invention Blank, and information on our fees. You create no obligation by mailing this coupon. Our service is complete, our fees reasonable, and our terms convenient. Don't waste priceless time; mail the coupon NOW.

**MAIL
THIS
TODAY**

VICTOR J. EVANS & CO. Established 1898 REGISTERED PATENT ATTORNEYS

MAIN OFFICE, 600M Victor Building, Washington, D. C.

BRANCH OFFICES: 1640 M Conway Building, Chicago; 233 M Broadway, New York; 828 M Fidelity Philadelphia Trust Building, Philadelphia; 514 M Empire Building, Pittsburgh; 1010 M Hobart Building, San Francisco.

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention Blank."

Name.....

Street and No.....

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

When writing to advertisers please mention Popular Mechanics

Copyrighted material

AERO INTERNATIONAL ALL WAVE 11-TUBE SUPER-HETERODYNE DE LUXE



Completely Assembled With 2
Matched Full Dynamic Speakers **\$29.75**

At last! World wide reception at a sane price. 15 to 550 meters. Besides the regular broadcast band, it brings in foreign programs, amateurs, police calls, ships at sea and aeroplanes. One dial control. No plug in coils. Latest super-phonics tubes.

AERO 4-TUBE MIDGET

**\$10.95 less tubes
2.95 kit of tubes**

The lowest priced quality Midget Receiver on the market today. Very selective, brings in long distance like local stations.

AERO 5-TUBE MIDGET **\$11.90**
AERO 6-TUBE MIDGET..... **18.50**

AERO WORLD WIDE

1-Tube SHORT WAVE SET for
Headphone
\$5.95 Operation

Listen in DIRECT to London, Paris, Berlin, Buenos Aires and other broadcasting stations throughout the world via short waves. Your ordinary receiver cannot tune in these low wave stations. WORLD-WIDE RECEIVER gets 15 to 500 meters. Aero 2-Tube Short Wave Set \$8.75. The same as above set but it has 1 stage of Audio Frequency added to it.

Write for Complete Catalogue.

CHARLES HOODWIN CO.

4240 Lincoln Ave.

Dept. Z-2

Chicago

PATENTS

PROTECT YOUR IDEAS

Write today for FREE BOOKLET, HOW TO OBTAIN A PATENT and RECORD OF INVENTION—or send Drawing or Model of your invention for Examination.

Promptness Assured with Best Results

MILLER & MILLER REGISTERED PATENT ATTORNEYS

Former Members Examining Corps U. S. Patent Office
Dept. A-1006 Woolworth Bldg. New York
200 Earle Building Washington, D. C.

AGENTS: \$ 6 A DAY



Here's a wonderful chance to make \$6 a day taking orders for No-Frost—the amazing new preparation that keeps rain, snow, frost, mist and steam off auto windshields, show windows, mirrors, etc. A sensation everywhere. No hunting for prospects. Auto owners, bus drivers, store-keepers, housewives buy on sight. Big profits. Steady repeat business.

\$110 PROFIT A WEEK

No-Frost is only one of our 350 profitable Household Necessities in big demand everywhere. With this fast-selling line, Korenblit made \$110 a week. Hall made \$24 first day—Mrs. Haekett, \$33 in 7 hours. This shows the unusual possibilities. No capital or experience needed. Earnings start at once. Write quick for Profit-Sharing Offer.



ZANOL PRODUCTS CO.
569 Monmouth Ave., CINCINNATI, O.



Print Your Own

Cards, stationery, circulars, tags, labels, advertising, etc. Save money. Print for Others, Big Profits; easy rules sent. Will do popular Raised Printing like Engraving. Junior press \$2.50, job press \$11 up, power \$140. Send for free catalog and all details. THE KELSEY COMPANY, B-37, Meriden, Conn.

INVENTORS

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

Our book *Patent-Sense* gives these facts; sent free. Write LACEY & LACEY, 615 F Street N. W., Dept. 5, Washington, D. C. Estab. 1863.

PATENTS—TRADE MARKS

All cases submitted given personal attention by members of the firm.

Information and Booklet Free

LANCASTER, ALLWINE & ROMMEL

Patent Law Offices

815-15th St. N. W. Suite 412 Washington, D. C.

PATENTS—TRADE-MARKS

Terms reasonable. Personal attention.

Send model or drawing for FREE advice.

Book "HOW TO GET YOUR PATENT" sent on request.

L. F. RANDOLPH, formerly RANDOLPH & CO.

Registered Patent Lawyer

303 Victor Building WASHINGTON, D. C.

NERVES?

Are you always Excited? Fatigued? Worried? Gloomy? Bashful? Pessimistic? Constipation, indigestion, sleeplessness, cold sweats and dizzy spells are very often caused by NERVE EXHAUSTION. Drugs, tonics, exercises and medicine cannot always help weak sick nerves! Learn how to regain Vigor, Health and Calmness. Send 25 cts. for my book "New Nerves For Old," containing full particulars. RICHARD BLACKSTONE, N-4712 Flatiron Bldg., N. Y. CITY

PATENTS

Booklet Free Highest References
Promptness Assured Best Results

Send drawing or model.

ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

Listed Patent Lawyer in the latest editions of the Rand-McNally Directory of Bankers and Bank-Recommended Attorneys, published by Rand-McNally & Co., Chicago, Ill.; The Baggott & Ryall Directory of Guaranteed Attorneys, published by Legal Directory Corporation, Boston, Mass.; Flugel's Law List, published by Legal Directory Publishing Co., St. Louis, Mo.; American Lawyers Annual, published in Cleveland, Ohio; Bankers Service Legal Directory, published by Bankers Service Co., Boston, Mass.; Eyre's Law List, 9 Park Place, New York City; Walters Legal Directory, Omaha, Nebraska, and the National Directory of Attorneys, Baltimore, Maryland.

WATSON E. COLEMAN, REGISTERED PATENT LAWYER

Victor Building, 724 Ninth Street, N. W.
WASHINGTON, D. C.

SOVEREIGN OF THE SEAS

(Continued from page 986)

solder it in place. Then, cut off one end of the pin flush with the edge of the fitting, and allow about $\frac{1}{8}$ in. of the pin to project beyond the opposite edge. These pin fittings are to be attached to the rudder. The other seven, with open eyelets, are fastened in the notches on the sternpost. Place the respective fittings over the rudder first with the pins down. One at a time, clamp each fitting in place and, with a No. 70 pin drill or a needle ground flat at one end, pierce a hole entirely through the metal and wood. Press a lill through the hole, and solder the pin in place with just a touch of solder on each side. For the smoothest job, have your iron very hot so that the solder will flow around the pin freely. Then cut off the pin close to the fitting and file flush. Attach the sternpost fittings the same way. With the point of a knife, you can slot the hull on each side of the sternpost in line with the fittings so that their forward ends can be inserted slightly before pinning and soldering in place. This will make them more secure and strong to take any strains when the rudder is swung from side to side.

With the rudder completed and fittings in place, you will now hang the former. Line up a $\frac{3}{16}$ -in. drill along the vertical center of the sternpost and drill a hole straight up into the overhanging curve of No. 5 hull lift. The hole may be about 1 in. deep. Press the rounded upper section of the rudder far enough into this hole to let the rudder fitting pins clear the tops of the sternpost-fitting eyelets. Then, swing the rudder forward so that pins and eyelets are in line, and pull the rudder downward with the pins through the eyelets. Bend the pins slightly below the eyelets so that the rudder cannot move upward. Last, trim off the bottom edge of the rudder on a line with the keel. This completes the rudder assembly.

Preventing Front-Wheel Shimmy from Blow-Out Patch

When a blow-out patch is used in a front-wheel tire of an auto, it is thrown out of balance by the weight of the patch, which may cause it to shimmy. This is overcome by using a patch of the same weight on the opposite side of the wheel.

Genuine
UNDERWOOD
Below $\frac{1}{2}$ Mfg's. Original PRICE
(Refinished)

Yours
for
10
Day
Trial



Famous
Model No. 5

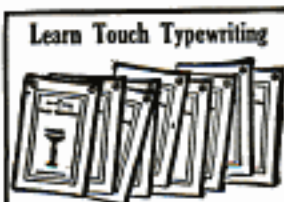
NOW ONLY



Think of it—over 2 million buyers paid \$102.50 (cash) for this model No. 5 now offered direct-to-you at way below $\frac{1}{2}$ original price—and on easiest terms besides. Positively the greatest bargain ever offered. Accept the special 10 day trial offer and be convinced. See the neat, perfect work it does—compare its bright, shiny newness without risk. Recognized as the finest, strongest typewriter built.

Easy Terms—only 10c a day

Here is positively the chance of a lifetime to own a World-famous Standard Underwood No. 5 completely refinished like new at the very lowest price and easiest terms.



Learn Touch Typewriting

Learn touch typewriting free! Complete (home study) course of famous Van Sant System given with this offer. Fully illustrated—easily learned.

Make Money At Home

Wonderful spare-time opportunities to make money at home. Also, saving \$60 by quick action. These genuine guaranteed Underwoods now only \$39.90 (cash) while limited supply lasts. Only \$1.00 down brings 10-days' trial. If you keep it—only 10c a day soon pays for your Underwood on our new low price and easy terms. Send at once, before this special offer is withdrawn. Remember every machine fully guaranteed and sent on 10-day trial.

INTERNATIONAL TYPEWRITER EXCHANGE
231 W. Monroe St., Chicago, Dept. 1201.

I enclose \$1 deposit. Send Underwood No. 5 (F.O.B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect and get my deposit back. If I keep it I will pay \$3 a month until I have paid \$44.90 (terms price) in full.

Name.....

Address.....

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

OLD MONEY and stamps WANTED



POST YOURSELF! It pays! I paid J. D. Martin, Virginia, \$200 for a single copper cent. Mr. Manning, New York, \$2,500 for one silver dollar. Mrs. G. F. Adams \$740 for a few old coins. I want all kinds of old coins, medals, bills and stamps. I pay big cash premiums.

WILL PAY \$100 FOR DIME
1894 S. Mint; \$50 for 1913 Liberty Head Nickel (not buffalo) and hundreds of other amazing prices for coins. Get in touch with me. Send 4c for Large Illustrated Coin Folder and further particulars. It may mean much profit to you. Write today to

NUMISMATIC COMPANY OF TEXAS
Dept. 324 FORT WORTH, TEXAS
[Largest Rare Coin Establishment in U. S.]

SIX JIG SAW PUZZLES

4 pcs.: $\frac{1}{8}$ " x 9" x 12" 3-Ply Basswood panel. 4 Beautiful Colored Pictures: 9 x 12. 2 pcs.: $\frac{1}{8}$ " x 12" x 16" 3-Ply Basswood panel. 2 Beautiful Colored Pictures: 12 x 16. $\frac{1}{4}$ -lb. pkg. moisture-proof glue—1 doz. jig saw blades specially made for Puzzle Sawing. Eight-page folder of instructions on how to make Jig Saw Puzzles.

\$1.75

Delivered.
Cost
in Store

\$11 to \$16
West of Rockies
10c additional.

Big 60-Page Catalog E—full of bargains

Home woodworking book—color illustrations—inlay bandings—scroll patterns—blue prints—various wood grains, crotch, butt, quartered, burl, fiddleback, plain sawn, etc.—tells how to finish woods natural—foreign woods—17 blue prints of articles you can make—desks, tables, book shelves, etc. Send for it today—only 10c, or FREE with \$1.00 or more order.

CRAFTSMAN WOOD SERVICE COMPANY
7351 Vincennes Ave. Chicago, Ill.

SOMETHING NEW
No Lights Out. No Service Calls. No Interrupted Radio Programs. No Main Fuse Blown When Using It.

THE DUPLEX FUSE SAFETY ATTACHMENT PLUG
SAFETY FUSE can be changed in 1 minute without tools.

Protect your home from fire, due to defective cords and appliances. It should be used with all electrical appliances, between cord plug and outlet, as a safety measure. A pleasure to use it. Sells at a glance.

No home complete without it. Agents wanted. Send 50c for sample and proposition. **EXTRA FUSE 5c**

BROWN & HOFFMAN
2068 W. 85th St., Cleveland, Ohio

Forms to cast Lead Soldiers, Indians, Trappers, Hunters, Wild and Farm Animals. 239 different forms to select from. Every form guaranteed to cast perfect figures. Send 5c stamp for illustrated catalogue.

HENRY C. SCHIERCKE Spencer Rd. GHENT, N. Y.

SILVER WHITE PLATING POWDER

Plates Iron, Steel, Nickel, Copper and Brass without electricity. Dispenses with polishing. Half pint can \$1.50 prepaid. Free particulars.

GUNMETAL CO., Ave. T, DECATUR, ILL.

VEST POCKET ADDING MACHINE
Adds, Subtracts, Multiplies, Divides. Does work of \$200 machine. Not a toy. Million dollar capacity. Simple and accurate. Guaranteed 5 years.

FREE TRIAL \$2.50
—SEND NO MONEY— Total Cost

Just name and address. We will ship Calculator immediately. On delivery pay postman \$2.50 (plus few cents postage). (If outside U. S. send cash.) 10c additional in Leatherette Case. If not satisfied after 10 days' trial you get your money back. **THOUSANDS OF SATISFIED USERS.** Write for Agents' Proposition. **BABY CALCULATOR MACHINE CO.** (Mrs.) P. O. Box 1118, Dept. 31, CHICAGO, ILLINOIS

SPYING ON THE INSECT WORLD

(Continued from page 240)

one man might devote a lifetime to the study of a single species and yet be unable to answer some of the questions that come pouring out a child's mouth about insects. They love. They fight. They even die in defense of that which is important to them. Do they also think?

Let us see if such a question arouses the contempt of Doctor Lutz after he has spent a week in the tropics contemplating the behavior of a colony of leaf-cutting ants. These creatures prepare a mold of their harvest of leaf pieces and in this soil grow a crop of fungi which they feed their young.

"Occasionally an ant carrier would get into trouble with its burden," he said. "At such times both outgoing ants and those that are returning to the nest unloaded gather round and pull the leaf this way and that. In the mix-up, the original carrier sometimes loses its piece of leaf, one of the others carrying it off. In these circumstances, the original ant, having been on its way to the nest, would have been expected on the chain-instinct theory to continue going there, but instead usually returned to the tree.

"In order to get enough observations to be fairly certain of this point, I robbed twenty carriers, pulling the leaf away with fine forceps. Usually the robbed ant would run about a bit as though looking for what it had lost and would spend a few seconds cleaning itself before setting out in earnest. Two of the twenty went on to the nest unburdened, but the other eighteen started back for the tree. To me it seems that these creatures think."

Here is a matter which fascinates entomologists. How, if these creatures do not think, can we explain the subterranean architecture of an ant city. Stone-age man was a reasoning creature, but his cave was a poor thing beside an ant queen's palace.

In defense of insects, any entomologist can muster an array of arguments perfectly astounding to persons who ordinarily think of them as mere pests to be exterminated. In the one fact that most plants are pollinated by insects and without them would be sterile, the strongest of these arguments is complete. Literally, the insect inhabitants of the world feed us.

(Continued to page 134A)

Say "MELBOURNE" on MONDAY

AND MAKE YOUR
**ST. LOUIS
TRIP**
A BIG SUCCESS

Get your own personal comfort provided for first, and you can strike out after business with an easy mind. The salesman who makes the Melbourne Hotel his St. Louis home puts his best into every day because he knows that at night there's an easy chair and a luxurious room with a comfortable bed waiting for him.



RATES FROM \$2.50 WITH BATH

Unusually Good Food in Dining Room and Coffee Shop

MELBOURNE HOTEL

O. P. GREATHOUSE, Manager

ON U. S. HIGHWAYS 40 AND 61

Lindell Blvd. at Grand Ave., ST. LOUIS

AGENTS! SELLS LIKE WILD FIRE

FILL INTERIOR WITH WATER. HOLDS ENOUGH TO CLEAN 40 WINDOWS.

WATER FEELS THRU FELT TO WINDOW FRAME.



REACHABLE RUBBER SQUEEGEE BRUSH. CLEANS, POLISHES WITH ONE STROKE.

JUST PEEK. FOOL-PROOF. LASTS FOR YEARS.

REMOVE CAR AND HEAVY BROOD HANDLE FOR HIGH WINDOWS.

5388 monthly selling 10 improved patented Carter Window Washers daily. Cleans, dries, polishes. Eliminates all mists. Good Housekeeping approval. Restricted territory. Write today. CARTER PRODUCTS CORPORATION 998 Front Ave., Cleveland, O.

RIDE AND SAVE!

Motorcycling—the Greatest Sport on Wheels—costs so little! Send for Catalog of 1933 Models. New lower prices. Only \$187.50 for thrifty Single—at factory. Write today.

Harley-Davidson Motor Co. Dept. P Milwaukee, Wis.

HARLEY-DAVIDSON
Motorcycles



Catch Fish!

Eels, Mink, Muskrats with our new folding galvanized STEEL WIRE TRAP. Write for our FREE TRAP OFFER and Bargain Catalog. \$1 Box of our famous Fish Bait FREE to introduce our traps. WALTON SUPPLY CO., 3502 JUNIATA AVE., ST. LOUIS, MO.



DEAFNESS IS MISERY



Many people with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor, himself deaf.



A. O. LEONARD, Inc., Suite 639, 70 5th Ave., New York



BOYS, HERE IS FUN!

The Only Electric Aeroplane That Flies and Does Stunts

Just move the switch and your Rittenhouse Electric Aeroplane warms up—starts to taxi slowly—gathers speed—takes off—then whirls around the air-port in a 5-foot circle, just like U. S. Mail planes. Shut off the current and the propeller dies, the plane circles slowly towards the hangar and makes a perfect 3-point landing. You can keep this up for hours.

Plane has 10-inch wing-spread; hangar 12½ x 10 inches, and 6 inches high; both painted in brilliant colors. Simple to set up. Plug cord into any light socket, and you are all set. Price \$10 postpaid, or have your toy store order it for you. Mail coupon below and we'll send a folder that tells Dad why he should buy it for you.

A. E. Rittenhouse Co., Inc., Dept. 65, Honeye Falls, N.Y. (Est. 1910)
Of course I want to learn more about the Rittenhouse Electric Air Toys. Send me full particulars by return mail.

Name.....

Street or R. F. D. No.....

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

Xmas present for your workshop \$79

ATLAS 9" Lathe; screw-cutting; 18" capacity; motor driven; money-back guarantee; Accurate to 1/1000"; write

Complete as shown, less motor

Easy terms

ATLAS PRESS CO.

1843 No. Pitcher St., KALAMAZOO, MICH.



This Book Sent FREE



TELLS how to prepare in your own home delicious, inexpensive new wheat dishes with the FULL flavor and nourishment not found in ordinary wheat foods.

Make meals more healthful, tastier, at tremendous savings by a simple, new method of Krinkling natural wheat. Write Now.

THE WHEAT KRINKLER CORP.

102 A. I. U. Building

COLUMBUS, OHIO

**Cash Daily
Making Do-Nuts!**

**Earn
up to \$50-\$75
a week in your own
business at home**



You can make steady, daily profits of 100% to 250% making electric-baked, GREASELESS do-nuts at home with the Ringer Electric Do-Nut Machine. It makes delicious, large do-nuts that SELL!

"The only business I know of that pays a profit the first day. I now have two Ringer machines," writes H. H. Liesenfelder, Wis. C. H. Barr of Ky. writes, "After searching the city for work, I bought a Ringer Do-Nut Machine. Now I supply steady customers that buy every week. It is a paying business." Mrs. T. A. Lay, Fla., writes, "Have all the business I care to handle. The machine makes a beautiful tasty do-nut."

No Canvassing — Grocers, drug stores, lunch counters buy all you make. Many operators have regular routes to private customers or sell by boys.

Free Plan shows you how to start this fine-paying repeat business. No experience needed. Less than \$60 investment. Begin at home in your spare time. Send a post-card today for full information.

RINGER DO-NUT COMPANY

150 Main Street, N. E. Minneapolis, Minn.



BUILD A FRONT DRIVE!

The details of construction of a Real Baby Front Wheel / rice Auto as this are now in blueprint and available to you.

Known as the "Silver Bullet," this car powered by a 4 cyl. motor and equipped with 4 wheel brakes, is made of old car parts as Model T, etc. all so cheaply obtained now, and best of all a machine shop is not a necessity for making such a fast one. Data on using 2 cyl. motorcycle motors is also included. Send stamp for further details and immediate reply.

Edw. A. Borntraeger, 3450 N. Marshall Ave., Chicago, Ill.



FREE RADIO CATALOG

Write for this Big Free Book today. The most complete line of radio sets, service men's supplies, replacement parts, test equipment at the lowest wholesale prices.

ALLIED RADIO CORPORATION
839 W. Jackson Dept. A Chicago

Red Top OIL BURNER

BUY DIRECT FROM FACTORY ONLY \$ 17⁵⁰

Red Top is 100% safe. Burns No. 1 Furnace Oil. Guaranteed to equal heat of coal. Easily installed. Warranted five years. Furnished complete with Regulator and automatic Safety Valve. Very efficient unit. Thousands now in use.

Reg. U. S. Pat. Off.

No. 1 BURNER for Stoves, Arcoles, Circulators with 8 to 12 inch firepots and Hot Water Heaters—63 to 120 gal. tanks, only \$17.50.
No. 2 BURNER for Furnaces, Hot Water and Steam Plants, 4-6 rooms, and Hot Water Heaters—120 to 180 gal. tanks, \$27.50.
No. 3 BURNER for Furnaces 6-10 rooms, Hot Water and Steam Plants, 6-8 rooms, and Hot Water Heaters—180 to 250 gal. tanks, \$45.00.

Dealers—Big money selling and installing Red Tops.
Discount to dealers on 8 or more burners ordered at one time.

RED-TOP OIL BURNER MANUFACTURERS
6644 Cottage Grove Avenue Dept. 19 CHICAGO



SPYING ON THE INSECT WORLD

(Continued from page 132A)

Among the mounted insects at the museum are several hundred thousand specimens of butterflies and moths under the direct supervision of Mr. F. E. Watson. In these gorgeous creatures there is a considerable traffic. There are many amateur collectors. Consequently there are dealers who quote surprising prices. For a pair of the Argema Mittrei from Madagascar, with their wings shaped at the bottom in long tail-like pieces, from \$50 to \$60; for a pair of Coscinocora Hercules from New Guinea, with wings nine inches from top to bottom, \$25 up; for a death's-head moth, around \$2 each.

In such matters, the scientists profess to be totally uninterested. They are much more concerned with solving a mystery concerning the habits of a common American butterfly for which no dealer would give as much as two cents. This is the Monarch, a flyer of terra-cotta color which goes southward at the end of summer. Is it a true migrant? Do the same individuals that go south fly north in the spring to the scenes of former adventures? Scientists are determined to find an answer. One caught about 900 and punched a small round hole in the wing of each before releasing it. None of the marked specimens was returned. Doctor Lutz now has a scheme for staining the wings with some aniline dye. It is his belief that if this is done with thousands of Monarchs, and the purpose widely published, it may result in disclosing where these long-distance butterflies go and whether it is they who return next year or merely their progeny.

The eyes of a collector, alert to much that escapes most of us as we motor swiftly over rural highways, sees in a single day a bewildering and fascinating universe of passion. He sees a mantis, as dreadful to her victims as a crouching tiger to an unarmed man, waiting with trap-like front legs bent to seize a hapless insect crawling toward it. He sees splendid enterprises as when he focuses his gaze on the industry of leaf-cutting ants. He gazes down upon frightful and savage raids as when a band of army ants capture the citadel of wasps. He looks upon admirable industry and wonderful and diverse mechanisms of existence.

Only \$2.50Complete
Postpaid**TROJAN No. 50 Complete SCROLL SAW OUTFIT**

With the Trojan Kit which is complete, you have nothing more to buy. Really \$3.00 value for only \$2.50 postpaid. Kit contains one 12" depth, highly nicked finish Scroll Saw and 12 blades, one bracket, one clamp and four 8 3/4 x 8 3/4-inch 100-piece puzzles on 3-ply, 3/8" thick wood all ready to cut. Jig Saw puzzle cutouts is a fascinating hobby. All the members of the family will be tickled with the Trojan Kit.

THE NEWEST FAD IS MAKING JIG SAW PUZZLES

There are no tricks in sawing out puzzles, toys and novelties. Just clamp the wood bracket to your kitchen table or bench. Start to saw at any point, cutting free hand as there are no set patterns to be followed—you can turn any angle and saw any design.

YOUR BOY

has a desire to create things; with this saw his hands will develop skill and his mind will grow more imaginative.

GET YOURS TODAY

If you are unable to find Trojan Kits on sale at your local hardware store we will mail direct postpaid, upon receipt of \$2.50 for the Kit or \$1.00 for the 8" scroll saw and one dozen blades.

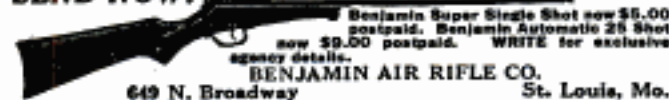
ACKERMANN STEFFEN

4534 Palmer St.

CHICAGO, ILL.

**FREE**

Get BB Magic at once. A wonderful shooter's digest—tells how to hold, aim and handle rifles; become a crack shot. The principle of compressed air action that made the Benjamin Single Shot world famous has been applied to 25 shot automatic firing. Learn all about both rifles. **SEND NOW!**



649 N. Broadway

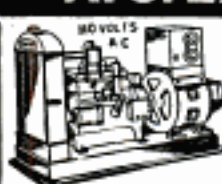
St. Louis, Mo.

**BB
MAGIC**
THE
SHOOTER'S
DIGEST**MOST EASILY BUILT MODEL ON THE MARKET**

Simplified construction makes this realistic 12-in. copy of the fast single-engine British Sopwith lighter the most easily built scale model sold. A steady flyer. Will rise from ground by own power and fly 100 ft. or more. Gives more real satisfaction than expensive models. Set includes aluminum propeller, brass shaft, special rubber motor, streamlined disc wheels, lath-turned nose block, ready-cut struts, etc., with full building and flying directions. No tools needed. Milled in unbreakable container, postpaid in U. S., only 50c. Canada 65c. Order yours today.

**THE MIDLAND MODEL WORKS, Dept. S, Chillicothe, Ohio**

(No stamps. No o. o. d's. No catalogue. Please give full address.)

A. C. Electric Plants

ONAN A. C. PLANTS furnish the same current as city service—110 volt, 60 cycle A. C. Operate Radio, Water Systems, Refrigerators, all Household Appliances. Sizes 300 to 10,000 Watts Available from stock. No battery used except to start the engine. Ideal for farms, camps and lake homes. Also a complete line of D. C. Motors. **D. W. ONAN & SONS** 915 Royalston Ave., Minneapolis, Minn.

DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address **Stephenson Laboratory, 1 Rack Bay, Boston, Mass.**

ELECTRIC TRAIN

A complete Electric Train for 25c. For only 25c we send you all of the parts necessary for complete construction, together with full printed directions for assembling. Takes but a few minutes to completely assemble. Requires no tracks nor transformer—a big saving. Runs equally well indoors or outdoors. Runs on one or two dry cells. Double engines like those that run over the Rockies can be made. Sent complete for only 25c, or 5 for \$1.00 postpaid. For 25c extra we will send a cover as shown in illustration, complete with tender, 3 pullman cars, observation cars, dining car, complete railway station, baggage trucks, waiting booth, block house, two semaphores, two railway crossing signals, which can be assembled in a few minutes.

The BOY ELECTRICIAN 10c

Add 10c and we will send you a book all about electricity in simple language. Tells how to make batteries, dynamos, motors, radios, telegraph apparatus, telephones, lights, electric bells, alarm coils, electric engines, etc. Written especially for boys, by electrical experts so anyone can understand it. 64 pages, 100 illustrations.

WORLD ELECTRIC CO., Dept. 21, MADISON, WIS.**THEY LOVE IT****PLAY
your way to
BIGGER
PAY**

Make real money! Be popular. You can do it as sure as you can pick out "Home, Sweet Home" with one finger, at the piano. All you have to do is press one key and blow normally. Many play tunes first week, join a dance band in 90 days. You'll love it.

EASY TO PLAY, EASY TO PAY

But only with a Buescher is rapid progress, and fine musicianship assured. Your local Buescher dealer will be glad to let you try any instrument, Saxophone, Clarinet, Trumpet, or Trombone. Test yourself. See what you can do. Or send coupon for free catalog. Mention favorite instrument. Easy terms. Get started now for big future.

BUESCHER**BUESCHER BAND INSTRUMENT CO.**

1210 Buescher Bldg. Elkhart, Indiana B158

Without obligating me in any way, please send catalog of

[] Saxophones [] Trumpets [] Trombones

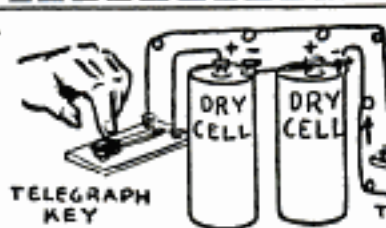
Mention any other: _____

Name _____

Street Address: _____

Town _____

State _____

ELECTRIC TELEGRAPH OUTFIT

TELEGRAPH KEY

TELEGRAPH SOUNDER

10c

Add 5c for postage and packing.

An Electric Telegraph Outfit for 10c. All parts necessary for the construction of this unique outfit are sent complete with full instructions. Ready to use fifteen minutes after received. Very simple to construct and operate. Works singly or in pairs. Get two sets and communicate with your friend. Lots of fun having your own wires to your friend's house and communicating with him secretly. Many novel tricks and experiments can be devised and invented by you that will add hours to your enjoyment. The principle of the telegraph is made clear and is easily understood with this outfit. Sent complete for 10c., with 5c extra for postage and packing. Nothing more to pay or buy.

START to PLAY Very First Day!

YOU CAN PLAY THE XYLOIMBA

Extra Money—Hosts of Friends—Loads of Fun Within Your Reach



Fame and Money Broadcasting



Center of Attraction at Gatherings



Big Money at Dances

HAPPY DAYS are in store for you if you will only act on this suggestion! Cheery evenings playing catchy music alone or with sweetheart, wife or sister; proud moments as center of interest at gatherings; nights of joy making \$5 to \$25 for work that is "play."

The Deagan Xyloimba is your Opportunity! Wonderful for home, in demand at dances and entertainments, yet easiest of all instruments to play. No teacher necessary—you actually play simple melodies the very first day even if you cannot read a note of music right now!

Earns \$60 a Week—Ralph Smith, Chicago, says: "Played 20 minutes at wedding. Received \$20." L. E. Hallmann, Reading, Pa., writes: "Made \$60 in 5 weeks, spare time. Had never played instrument before."

SEND FOR BIG FREE BOOK! Our new book tells all about the delightful lessons furnished with each instrument! The five-day trial that removes risk; the wonderful Deagan easy-payment plan. No obligation—simply fill in and mail the coupon.

J. C. Deagan, Inc., Dept. 5459, 1770 Berteau Ave., Chicago
Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xyloimba.

Name _____

Address _____

Send for free catalog

JEWELRY—CASH OR CREDIT

Diamonds, Watches, Jewelry .. Catalog Gives

Full Particulars of Our Easy Credit Plan

No. 972—Solid 18-K white gold wedding ring, 5 blue white Diamonds .. \$18.75

No. 884—Five blue white Diamonds; solid 18-K white gold ring, \$50. EASY TERMS

LOFTIS JEWELRY CO. Dept. G894
30 N. State Street Chicago, Illinois

Makes FLOODLIGHTS of AUTO HEADLIGHTS



This amazing invention eliminates all the dangers of night driving. Lights both sides of the road, pierces fog, rain and snow and does not blind the eyes of the approaching motorists. Flood lites can be installed in a jiffy by anyone. They fit all standard size bulbs and do not wear out. Exclusive cooling feature prevents burning out of bulbs. They are worth many times their retail price of only 75c per set to any motorist. Liberal Commissions to Agents and Distributors.

AGENTS MAKE UP TO \$100 A WEEK

Make money supplying the demand for this automotive necessity. Every car owner a prospect. Write for FREE information. Sample set on 10 Day Free Trial 50c. Postage prepaid. Satisfaction guaranteed or money refunded. **SEND TODAY.**

FLOOD-LITE REFLECTOR CO., Dept. 960, Racine, Wis.

HOW TO BECOME A CHAMPION

(Continued from page 909)

the Garden, Hack won. He was the new champion. He had a splendid physique, no doubt about it. He weighed 215 pounds and was the most agile man of his size I have ever known. I have seen him take a fifty-pound dumb-bell in each hand and do a forward somersault over a kitchen table. He was like a panther; also he was dignified, well educated and a fine character. Unfortunately he knew how to quit.

"Jenkins, from whom Hack had won the championship, had previously beaten Frank Gotch, so when Hack was matched with Gotch, I guess he thought it would be easy. He did not train as carefully as he should. When I was training him, he used to work out hours every day, wrestling and lifting heavy weights. Then, to limber up, he would fool around with light dumb-bells and skip the rope.

"If you have been lifting any heavy weights, it is always a good idea to relax by finishing up with light dumb-bells. The rope skipping is designed to make a man light on his feet. All these things are important in the conditioning of an athlete. Champions can't do without condition. You've got to work for that. It does not come wrapped up in a package.

"Well, when Hack, having neglected his training, got on the mat with Gotch out in Chicago, he found himself grappling with the roughest, toughest man he had ever met. At Hack's best, I think he might have beaten Gotch, but he was not at his best, and, then too, he lacked something that a champion must have. Gotch got a toe hold on him. Rather than have his leg broken Hack rolled over on his back and ceased to be the champion. Thereafter he was called yellow."

John L. Sullivan was another acquaintance of Bill Brown's who threw away a championship by neglecting the rules of training.

"That fellow," said Bill, "need not have been licked for years if he had taken care of himself and learned how to box. He was a natural fighter who depended on his strength to beat down lesser men. Corbett was too clever for him. The first time I met old John L. was right after he had lost the championship to Corbett. Bothner and I were giving an exhibition at Grand

(Continued to page 138A)

AMAZING BURNER

BURNS
ORDINARY OIL

The most startling heat producing burner ever made. Indispensable on the farm, in factory, for boiling, cooking, and heating. Ideal for butchers, dairies, repair shops, stoves, boilers, ovens, cooking equipment and numerous other uses. Will boil any quantity desired in half the usual time.

BOILS 50 GALLONS IN LESS THAN AN HOUR

TERRIFIC HEAT!

SILENT BLUE FLAME

**NO NOISE
NO MELL
NO SMOKE
NO OTT**

Think of it! Twice the heat of city gas at half the cost. Regulate to any heat desired. Easily installed and operated. Nothing to wear out. Starts in a jiffy. Last a lifetime. Every burner guaranteed to give complete satisfaction. Also burners for Cook Stoves and Heaters. Write for catalog and special factory prices. **HOME MFG. CO., Dept. 213, 20 E. Kinzie St., Chicago** Agents, Dealers, Distributors Wanted.

New Ideas now Salable Before Patenting

Our manufacturer-clients want improved inventions to meet keen competition. Write **Chartered Institute of American Inventors** 555 Barrister Building Washington, D. C. "World's Largest Organization of Inventors"

Dutch Windmills Latest in Model Making

Build beautiful Windmill models for pleasure or profit, from our blueprints, completely detailed with instructions. Model B-10, 30" high, 75¢. Also Ship Model, Dell House, Lava Animals and other plans. Send for illustrated price list.

CRAFTSMAN'S MODEL CO., 2030 N. 41st St., Milwaukee, Wis.



HOME FUN GALORE!

MIKE 98¢

TALK YOUR OWN VOICE
FOR BROADCASTING /
POOL POON FABRICS /
AN EFFICIENT FILE /
WITH FULL DETAILING /
"Mike" Marko 2005 BOSTON BLVD /
DETROIT, MICH.

No JOKE TO BE DEAF

—EVERY DEAF PERSON KNOWS THAT George P. Way made himself hear, after being deaf for 25 years, with Artificial Ear Drums—his own invention. He wore them day and night. They stopped head noises and ringing ears. They are invisible and perfectly comfortable. No one sees them. Write for his true story, "How I Got Deaf and Made Myself Hear." Also booklet on Deafness. Address



Artificial Ear Drum

George P. Way, Inc., 729 Hofmann Building, Detroit, Michigan

STOP Your Rupture Worries!



C. E. Brooks, Inventor

Why worry and suffer with that rupture any longer? Learn about my perfected invention. It has brought ease, comfort and happiness to thousands by assisting in relieving and curing many cases of reducible hernia. It has Automatic Air Cushions which bind and draw the broken parts together as you would a broken limb. No obnoxious springs or pads. No salves or plasters. Durable, cheap. Sent on trial to prove it. Beware of imitations. Never sold in stores nor by agents. Write today for full information sent free in plain, sealed envelope.

H. C. BROOKS, 526-C State St., Marshall, Michigan

When writing please mention Popular Mechanics

STOP LEAKS STEAM—WATER—GAS—OIL

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 and holds in any metal, concrete, masonry, tile or wood. Making these repairs yourself avoids expense and delays and is easy if you follow instructions in the Smooth-On Repair Book which will be mailed on request.



Write for
FREE BOOK



Get the booklet from us and Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. tins from any hardware store.

SMOOTH-ON MFG. CO.
Dept. 37, 574 Communipaw Ave.
JERSEY CITY, N. J.

Do it with SMOOTH-ON

NOW YOU CAN MAKE MORE MONEY

in the new business-profession of correcting foot troubles without medicine, surgery or chiropody. Learn at home in spare time. Easy Terms. Earn while you learn. No capital needed. Write today for full information free.

A. L. LARSON, 50 W. Illinois St., Chicago, Ill.

FREE SAMPLE PANTS MATCHED

Don't Throw Away That Coat and Vest!

Let us match your coat and vest with new trousers tailored to your measure. Save the price of a new suit. Over 100,000 patterns. Mail sample of suit, or your vest which will be returned with FREE sample for your approval.

Match Pants Co., 20 W. Jackson Blvd., Room 1106, Chicago

\$1.00 Jig Saw

15" long—9" high. 6 1/2" table. All metal construction. Sent postpaid on receipt of \$1.00. (Canada, \$1.35.) All C.O.D.'s 25¢ extra. FREE booklet "Make Your Own Jig Saw Puzzles" with every saw.

J. & H. METAL PRODUCTS CO., Dept. 12, Rochester, N. Y.



Make money selling this newest pocket screw driver. "POWERFUL PETE." Fits the pocket, watch chain or key ring, turns almost any screw. Nine out of ten people will gladly pay a dime for this neat, practical little tool. Make a nice profit and give real value. Send a dollar for 20 postpaid. Trimont Mfg. Co., 55 Amory St., Boston, Mass. Established 60 years.

1933 FREE Catalog

DRIVER TOOLS



SMOOTH—Your Buy Word!

Smooth in operating, smooth in appearance! New 24 in. Driver Jig Saw. Has grooved roller guide, spring hold-down, heavy tilting table. Arm removable for sabre sawing, sanding, filing. Ask your dealer for demonstration and prices or send the coupon furnished at the left to us.

WALKER-TURNER CO., INC. PLAINFIELD, N. J.
DEPT. AA Please send 1933 catalog of all new tools.

ARMATURE REWINDING



Complete rewinding to original factory specifications. All work **unconditionally guaranteed**. 24 hour service. Vacuum cleaner, electric fan and portable electric drill armatures a specialty, at low prices. Special! Re-New Western Electric Cleaner, retailed new, \$60, our low price, \$7. Complete attachments, \$3. Special! Renewed vacuum cleaners—Hoover, Premier-Duplex, Royal, Kinska, etc.—guaranteed one year—\$4.75 and up. Attachments and replacement parts for all makes. Write today for free folder and price list.

Dealers—Agents—Get Our Money-Making Plant

RE-NEW SWEEPER CO.

Factory—2260 Gratiot Avenue, Detroit, Michigan

\$1.65 Ea.
In quantities
of 5 or more
\$1.50 Ea.

Master Home Mike

New 1933 Model, Complete with Mike Ring and Handle

95¢

POSTPAID

Master Mike Co., 4608 Grand River, Detroit, Mich.

Reproduces your own voice through your radio. Fools your friends. A million dollars' worth of fun. Easy to connect. Fits any radio. A real microphone—not a toy. Mailed postpaid, only 95¢. Send today.



ONLY \$5.00

Down for a

3 H. P. WITTE

(Throttling Governor)

EASY On Best TERMS Engine Built.

LOWEST PRICES IN 20 YEARS

Uses Gasoline, Kerosene, Distillate or Natural Gas. Removable Die-Cast Bearings, Grease Cup Lubrication. Waterproof-Troubleproof Magneto. Easy starting device. Big surplus power with lowest fuel and oil expense. Other sizes and styles, 1½ to 30 H.P. Also 3 styles Saw Rigs.

SHIPPED FROM KANSAS CITY OR PITTSBURGH

FREE Write today for My Big Engine Book—No Obligation.

209-p Carson St.
Pittsburgh, Pa.

**WITTE
ENGINE WORKS**

1749 Oakland Av.
Kansas City, Mo.

HOW TO BECOME A CHAMPION

(Continued from page 136A)

B1459
Central Palace—some benefit performance. The ex-champ was on the bill and shared our dressing room. I came back from our match with my tongue hanging out, and the big fellow offered me some of the beer he was drinking. I thanked him and explained I had never tasted it in my life. Then the ex-champ gave me a sorrowful look, saying: 'I wish John L. could say that.'

Bill Brown, for whom gameness is a fetish, wants that quality in his horses and dogs. About six or eight years ago he made the acquaintance of a ragged terrier breed, the Kerry Blues. Since that time he has had little use for other breeds. Now there must be a couple of dozen of these tough little fellows running about his farm.

"If one of those dogs dives in the duck pond after a muskrat," said Bill, "you can be sure he won't come up without the rat. If they get in a fight, and they'd rather fight than eat, they keep tearing in as long as they can stand or until the other dog is dead or whipped. They are champions in their hearts. There are men like that."

"After all, Bill" I argued one day, "everybody can't be a champion."

"No," conceded Bill, "everybody can't be a champion. What I'm trying to tell you is that anybody can be a champion who wants to be strongly enough to let nothing interfere with his desire. You know very few men in the world have ever developed their powers to the utmost."

It was not until the end of my week of training that Bill Brown gave me the real recipe for becoming a champion. It seems to me to be one any young fellow ought to paste in his hat.

"Look," said Bill, "becoming a champion is not just a matter of whipping half a dozen fellows that are supposed to be better than you. The one you must lick is yourself. That's a fight you must win every day, time after time. Will that chocolate soda or that glass of beer put on fat you are trying to take off? Will that party rob you of sleep and strength? Those are the kind of fights I mean. No one who regularly loses battles with himself can ever be a champion. But the beauty of winning is that your will power develops with use just like the muscles of your body."

Save on Your Christmas Gifts



MAKE three friends happy on Christmas and all the rest of the year—besides saving \$1.50 for yourself. A gift subscription to Popular Mechanics Magazine is a reminder every month for 12 months and can't be beaten as a gift for a man or boy.

Every issue of this entertaining and valuable magazine contains 176 pages and over 400 pictures of fascinating events in every corner of the world. The Romance of Modern Progress is told in pictures and simple language. Radio enthusiasts, home craftsmen and practical shopmen are shown countless "easy-to-make" conveniences that save time, labor and money.

Order three subscriptions, save \$1.50. Price for one year is \$2.50 but until January 1, 1933, you may order 3 one-year subscriptions for only \$6.00—and an engraved Christmas card will be sent to each subscriber for you.

3—one-year subscriptions \$6.00
1—two-year subscription \$4.00
1—one-year subscription \$2.50

Foreign and Canadian subscriptions 50c a year additional.

Mail your order to:

Xmas Gift Dept., Popular Mechanics Magazine
200 East Ontario St., Chicago, Ill.

\$7.50 for \$6.00

Santa Fe Smashes!

ALL WATCH PRICES
And in Addition We Give You

Your Choice of

A Beautiful Blanket
A Diamond Ring or
A Chest of Silver

FREE!

(Thirty Days Only)



With Each Purchase As Explained in Our Sensational Offer Now Ready to Mail! Send Coupon for It NOW!

Our "Direct To You" unheard of low wholesale prices are absolutely at rock bottom, and our special distribution plan will mean huge savings to you. This is all explained in our new catalog just off the press. Send for it at once—don't miss grasping this sensational offer which is startling the country.

We Sell Nationally Advertised Watches, Diamonds and Silverware on Terms and at Prices That Will Astonish You

Think of it! We sell the best jewelry at such prices and on such terms that there is no reason now why you cannot own jewelry which you know is the best, and which you can be proud to own through the years to come.

\$3.50 a Month Makes It Easy for You to Own a Valuable Watch or Diamond

We trust the people who buy here, and as a result you can enjoy the pride of owning a really fine watch or diamond while you pay by our special easy "Santa Fe Way." We have removed every obstacle. Send now for our catalog before this offer expires.

Write for Catalog and Beautiful Circular Illustrating Free Gifts

SANTA FE WATCH COMPANY

C-6 Thomas Bldg., Topeka, Kansas

SANTA FE WATCH CO.

C-6 Thomas Bldg., Topeka, Kansas

Please send me the catalog I have checked.

Railroad and Dress Pocket Watches.....
Ladies' and Men's Wrist Watches.....
Ladies' and Men's Diamond Rings.....
Special Circular Illustrating Free Gift.....

NAME.....

ADDRESS.....

When writing to advertisers please mention Popular Mechanics

Copyrighted material

LIFE INSURANCE 3 1/2¢ a day

Amazing Policy Of Old Line Company Does Away With Agents and Medical Examination

ONE of America's strongest old line life insurance companies now brings life insurance within the reach of all. They are offering a liberal policy which, for 3 1/2¢ a day up, depending on your age, covers death from any cause and pays full benefits of \$1000.00; also pays \$5000.00 for accidental death. Anyone from ten to sixty years may be eligible. This new policy provides full coverage based on the net cost without medical examination or agents' fees and saves 60% of ordinary selling expense of life insurance. Send in the coupon below to the Union Mutual Life Company of Iowa, Dept. 7-0012, Teachout Bldg., Des Moines, Ia., and you will receive absolutely free, a copy of their wonderful policy that thousands of people have already taken. Send today.—Adv.

Dated.....193....

UNION MUTUAL LIFE COMPANY of Iowa.

I will be glad to have you send me, without any obligation on my part, one of your policies for my free inspection and I will tell you within 10 days if I want it.

Age nearest birthday..... Name of Beneficiary.....

Your name..... Local Address.....

Town..... State.....

Check here the indemnity desired.

\$5,000.00 \$4,000.00 \$3,000.00 \$2,000.00 \$1,000.00

A NEW



EMPIRE LEVEL

Ideal Xmas Gift

No workshop is complete without a level. The new Empire Torpedo Level is ideal for the homecraftsman. Its shape eliminates all sharp corners. The frame is die-cast aluminum, 9" long. Weighs only four ounces. Bottom is grooved to fit on pipes and shafting. In addition to plumb and level, it has a 45-degree glass. Pitch graduations on level glass. **Special Introductory Offer!** Send us only \$1.25 and we will ship you one of these levels. Test it out. Then if not satisfied, return the level and we'll refund your money. Literature Free!

EMPIRE LEVEL MFG. CO. 716 So. Sixth St., Milwaukee, Wis.




IDEAL Spad Vought Corsair Lockheed Sirius
15 in. Size

BUILD 3 MODELS FOR \$1.65 Postpaid

Biggest value ever offered: IDEAL 3-in-1 Kit contains everything required to build these 3 Flying Models, including Plans and Instructions. Easy to build. Send 5c for NEW catalogue. Mail Aeroplane & Supply Co., 28 W. 18th St., N. Y. City

NEW!



MAGIC CARD DEALER

SELLS ON SIGHT!

The greatest novelty in a decade! Deals 4 bridge hands in a jiffy—just turn the little lever! Every bridge player wants one. Makes a dandy gift; a fine bridge prize. Beautifully finished in nickel and duo. Attractively priced.

BIG MONEY FOR AGENTS

A real opportunity to those who act quick. Live sales prospects everywhere. Write today—right now—for descriptive literature, agent's low prices and full particulars.

THE J. H. MACE CO., 350 Mace Bldg., Kansas City, Missouri



HOME-BUILT TRANSFORMERS

(Continued from page 1021)

select a core of the next larger size. In changing the core size, divide the cross-sectional area of the core, as given in tables No. 1 to 4, by the width of the new core, to find the proper thickness to use. For low-voltage transformers, where the amperage is high, it is best practice to wind several small wires side by side at the same time, connecting them together at each end, instead of using a single large wire. The total circular-mil area of the small wires must be equal to that of the single wire for which they are substituted. Welding transformers, passing several hundred amperes, should have secondary windings of heavy copper ribbon or strips of sheet copper. To figure the number of amperes a strip of copper can carry safely, multiply the width by the thickness to get the cross-sectional area in square inches, and multiply this product by 1,275. Copper ribbon or strips of sheet copper are insulated before winding by wrapping them with plain linen tape or strips of varnished cloth. All splices must be well soldered.

WOODCRAFT IN THE WOODS

(Continued from page 201)

And here is one from the north country. You are following three moose. Quite evidently one is a bull. A very large and less pointed hoof mark shows this. The three walk behind each other. Suddenly the bull leaves the trail and swings around two trees while the cows remain on it. This is an excellent illustration of the fascination of this game of woodcraft. Why does the bull move off in order to pass two trees standing opposite each other and about six feet apart?

The answer is easy when you know how to figure it. The bull must have had a dandy set of horns. When he came to the trees, he had to think about getting his wide spread of antlers between them. If he had been a young bull or even an old one with a small set of horns, there would have been no such problem. We followed this trio in the hope of getting a shot at the bull. We knew that he must have a magnificent set of horns.

So the woods offer many challenges to the man who uses his eyes.

NEW MECHANICAL DEVICE SAVES YOU MONEY WHEN YOU STOP AT

The Sinton-St. Nicholas

The hotel of character in a city of character

Alert! Up-to-date! Modern. Even the economy of a painting device which saves the hotel \$20,000.00 a year is passed right on to you—giving you the finest accommodations at lower prices.

You'll find the Sinton-St. Nicholas a pleasant place to live on your next Cincinnati visit.

750 ROOMS
with bath, shower & servidor
from **\$2.50**



JOHN L. HORGAN..... Managing Director

CINCINNATI

DO YOU WANT TO STOP TOBACCO?



Banish the craving for tobacco as thousands have. Make yourself free and happy with Tobacco Reliever. Not a substitute, not habit forming. Write for free booklet telling of injurious effect of tobacco and dependable, easy way to relieve the craving many men have.

FREE BOOK

Newell Pharmacal Co.
Dept. 900 St. Louis, Mo.

SHIP MODEL FITTINGS Build the Royal Sovereign

New construction sets for — Ocean Cargo Steamer — Battleship, and "Royal Sovereign." Send for illustrated catalog of our extensive line of construction sets, books, blueprints and model supplies.

CATALOG 15¢

A. J. FISHER 1002-1 Etowah Ave. Royal Oak, Mich.

CRESCENT **4" BENCH JOINTER**

Only **\$22.40**
with $\frac{1}{2}$ h.p. motor **\$36.00**

An ideal machine for small work, either for shop, school or amateur work. Has every feature of design and construction that makes for accuracy, speed and convenience. Portable, takes power from lamp socket. Two-knife round safety head mounted in ball bearings. Satisfaction guaranteed or money refunded. Get all the facts before buying.

The Crescent Machine Co.
93 Columbia Street, LEETONIA, OHIO

Send for FREE BULLETINS

MONEY-MAKING MACHINE

SOLVES MAN'S GREATEST PROBLEM

30 Day's Trial

Let me send you world's greatest shaving invention on 30 days' trial and show you how you can actually "earn" money with it. I'll prove it means keener, smoother shaves and 90% saving in blades. I'll show you how to **MAKE UP TO \$75 WEEKLY** merely handing it out on **FREE TRIAL**. Send no money—just name and address. Our new guarantee offer enabled Clifford to make \$22 in one day. No risk! Write at once. **SALES MANAGER, 1418 Pendleton Ave., Bm W-317, St. Louis, Mo.**

IN COLD WEATHER

PYROIL

(Simply Add to Gas and Oil)



Pyroil guarantees quick, easy starting in coldest weather. It establishes its own self-lubricating surface on all frictional parts—proof against cold, against heat, wear and dilution. When oil is sluggish, congealed, the Pyroil self-lubricating surface protects against damage until circulation is freely effected. Builds lubrication into the metal. Pyroil increases power, frees valves, seals rings. Saves on oil and gas.

DISTRIBUTORS

Make money from the start with Pyroil. No big investment. The greatest Money Making Opportunity today. Write today for **FREE** copy of new Pyroil Brochure.

Genius Pyroil is Patented in U. S. and Possessions by W. V. Kidder, its inventor, and is identified by the winged Pyroil trademark (see) and signature of W. V. Kidder on every label.

W. V. Kidder
President
(Other U.S. and Foreign Pat. Pend.)
Manufactured, Patented and Guaranteed by



PYROIL COMPANY

W.V. KIDDER, President
5122 PYROIL BLDG. LA CROSSE WIS. U.S.A.

Inventor Gets New Soles from Tin Cans



1¢ Mends a Hole | **New Half Soles 4½¢** as Low as **4½¢ Ea.**

New—Improved—"mystery discovery" called **Re-sole** ends high cost of shoe repairs. Anyone can now put on brand new soles and heels and repair holes. Spreads on in a minute with knife. No nails or tools needed. Dries hard and smooth. Wears better than most leather. Flexible, waterproof, comfortable. Guaranteed.

AGENTS I PAY YOU JUST FOR SHOWING RE-SOLE

if you don't make a single sale. **Re-sole** is a hard time seller. Millions need it to save money. Agents make up to \$10—\$15—\$25 a day. Wilson of Wisc. made \$76.50 in one day. Hundreds smashing profit records. Send for **FREE offer of Full Size Can**

—enough for 20 soles. Send no money. No obligation. Free Sample on leather will be sent with proof of big money other agents are making. The hottest seller of the age. New "million dollar" plan for Agents. Rush coupon or postal card today.

Mail for FREE SAMPLE

Universal Laboratories, Inc., 431 W. Randolph St., Dept. 754 Chicago
Send offer of full size can and sample on leather. No obligation. Also send proof of big profits and new plan for agents.

Name.....

Address.....

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

When writing please mention Popular Mechanics

RE-SEAT VALVES While Motor Runs

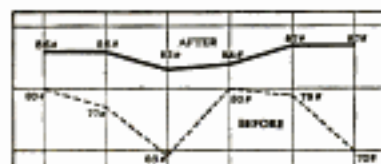


This is the simple new treatment that makes valve grinding unnecessary, described on page 752 of November Popular Mechanics. Latest offering of A. P. Warner, inventor of the automobile speedometer.

WARNERIZE

Any one can apply to motor in a few minutes. Saves \$6 to \$20. Leaky valves lose power, waste gas, cause poor performance. WARNERIZE re-seats every valve, while the car is running. Users say it brings back all the "pep" the car had when new. More power, greater speed, better pick-up. Indianapolis Fire Department uses WARNERIZE in fire equipment and chief's car. Cannot harm motor in any way.

Increases and Equalizes Compression



WARNERIZE increases compression as much as 32%. Graph shows typical compression improvement. See "Battle of the Octanes" Page 698, November Popular Mechanics explaining how increasing compression increases horse power.

We guarantee improved performance from WARNERIZE or money back. If dealer cannot supply, send us One Dollar with your name and address for a package of WARNERIZE, postage prepaid. If not satisfied with results, return the can and we will refund your dollar.

WARNER-PATTERSON COMPANY, 939 S. Michigan Ave., Chicago



NEW ARMY PURSUIT "FLIES 1300 FEET!"

75c Easily built, flies great! A real Army lighter in black, orange and red! Sensational. COMPLETE kit in box; 75c prepaid!

FREE! "Flew 900 Ft."

Balsa Glider Free with each kit! Post Office order!

EASY TO BUILD
Dipper flies off ground, has down 900 ft., weighs 1/3 oz. COMPLETE kit in big box, 50c prepaid! Satisfaction guaranteed or money back! Cash or C.O.D. Catalog, 3c stamp.



50¢
COMET MODEL AIRPLANE CO.
3114 Harrison, Dept. PM-122, CHICAGO

WOODCARVING



ONLY \$3.50
Postpaid

New WHITT-L- KRAFT Knife!



Not just another knife—it's a whittling tool. 4 blades, each for a particular type of whittling. Has big blade, small blade with 45° angle point, "hollow-chisel" blade and scraper blade. Price only \$1.50 postpaid.

NEW... At last you can get a complete set of wood, soap and linoleum carving tools never before available except in expensive, imported sets at five times the cost.

Designed by professional woodcarvers. Set contains 6 tools: 1 Upright Flat Chisel with 45° angle point for outlining and as a veiner; 1 Flat Curved Chisel for leveling flat background work and bas-relief; 1 Gouge 1/4" for preliminary work and finer cuts; 1 Gouge 1/8" for slightly deeper work; 1 Gouge 3/8" for deep relief, etc.; 1 Slip Stone for sharpening, shaped to fit all tools. All tools are forged, electrically hardened and carefully ground and finished. Boxed in polished hardwood—a permanent kit for the tools.

This wonderful set, judged by professionals as equal to other sets costing \$15.00, costs you only \$3.50 postpaid. Send C. O. D. if desired. Satisfaction guaranteed.

**CATTARAUGUS
CUTLERY COMPANY**
Dept. P. M.
Little Valley, N. Y., U.S.A.

GOLD WASHERS INCREASE PROSPECTORS' EARNINGS

(Continued from page 118A)

The clapper is a 5½-in. bell-shaped piece of soft leather, fastened with a wooden strip and weighted with a ¼-in. piece of wood large enough to cover the hole. A strip of canvas is tacked to the bottom of the frame and around and over the bottom board before putting on the hinges, to prevent loss of air through this crack. The bellows cloth, applied next, consists of a piece of buckskin or heavy rubberized cloth, cut to the shape and size indicated. It should be tacked firmly, with covering strips, to the bellows frame and to the sides of the bottom board. Wooden blocks, screwed to the bottom of the bellows, hold a 3/8-in. steel rod, to the ends of which 9-in. hardwood connecting rods are attached, their upper ends being fastened to the pulleys eccentrically. The frame of the riffle board is covered with a sheet of standard-mesh window screen, on top of which is placed a layer of unbleached muslin, both layers being tacked to the frame. The side walls are shouldered to fit under the cleats inside of the bellows box. Riffler, consisting of ½-in. quarter-round molding, are nailed down to fit over the muslin. The riffler point toward the back, so that heavy material cascading down the board will be caught on the undercut faces. A handle is attached to the front of the riffle board for convenience in removing it. Four legs are attached to the bellows box and hopper with wingbolts for ease in dismantling. To operate the dry washer, the dirt is shoveled into the hopper screen, the fine material passing through and falling into the hopper. Turning the handwheel causes the bellows to force air up through the cloth bottom of the riffle board, vibrating the light material up and over the riffler until it falls on the ground. To make a clean-up, remove the riffle board and submerge it in water, pounding it until all the material that has collected behind the riffler has been freed.

Like the wet rocker, the dry washer requires careful adjustment to separate all the gold dust out of different soils and sands. The adjustments consist in changing the slope of the riffle board by propping up either end of the machine, and controlling the flow of material from the hopper by means of the cut-off gate.

STOP GASOLINE THEFT!

Agents Earn **\$100** A Week
Up to **\$100** A Week **PAT.**

IDEAL XMAS GIFT

Just show any car owner how to foil gas tank tappers and the sale is made. Fits all cars.

Automatic Gas-Lok

New, necessary invention. Millions of gallons of gasoline are siphoned out of tanks in private and public garages, parking places, at curbs, etc. Thousands of cars are lost, too. This siphoning cap positively prevents such losses. It stays locked. Beautifully finished. Sells for \$1.95 with two keys. Big discount to agents. Send \$1.95 for sample. Credit for sample allowed on first order for a dozen.

AUTOMATIC GAS-LOK MFG. CO., 21 E. Van Buren, Dept. 41, Chicago, Ill.



NEW Kind of Shoe Sole!



STRANGE "MAGNETIC" SHOE SOLE applies itself without nailing or sewing. Low priced. Outwears leather. Cuts shoe bills in half. Comfortable. Water-proof. Scientific Non-Skid Tread. Banishes costly shoe repair bills. Everyone buys. 700 agents wanted at once. **AGENTS!** Hustlers make to \$90 weekly. No experience needed. We show you how. *Outfit Free.* Territories going fast. *Write quick!* **Kristee Mfg. Co., 1362 Bar St., Akron, O.**

Outfit FREE

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

PROTECT YOUR TOOLS FROM THEFT
Write with electricity any name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil. Complete Outfit \$3.50—Proprietor Agents Interesting Illustrated circular free. Write today. Agents wanted. **ARKOGRAF PEN CO., 1171 E. Stark St., Portland, Oregon**

**GEARS**

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

Write for Catalog No. 10

CHICAGO GEAR WORKS
769-773 W. Jackson Blvd., CHICAGO, ILL.

FREE! NEW! WHOLESALE CATALOGUE

SHOWING OVER 2000 FAST SELLERS FROM ALL PARTS OF THE WORLD... SEND FOR YOUR COPY NOW... **SPORTS IMPORTING CO.**

1032 Main St.

Le Center, Minn.

Radio Noises and Their Cure

62 ARTICLES—200 ILLUSTRATIONS—Send 50c for your copy today (75c for Canada and foreign countries).

Newark Electric Co., 230 W. Madison St., Chicago, Ill.

You're not Experimenting when you buy **NORTHLAND SKIS**

They're acknowledged as superior in speed, durability, and ease of handling. Skilled Norwegian craftsmen fashion them from choicest selected woods. Models for every purpose. Northland's famous deerhead trademark identifies them.

Write for booklet, "How to Ski".

Northland Ski Mfg. Co.

World's Largest Ski Manufacturers

95 Merriam Pk.

St. Paul, Minn.

**SAIL on SKATES**

Tacks into wind or sails before it. 32 sq. ft. of strong canvas on light weight Ash frame. Folds to carry. Patent pending. Price \$7 complete.

WOLVERINE NOVELTY COMPANY
124 N. College Ave., Grand Rapids, Mich.

**100% PROFIT**

Genuine Neon, Hammond Electric Advertising Display. Sells for \$15.00. Write for money making proposition.

NEON PRODUCTS, Inc.
404 E. Market Street
LIMA - OHIO

LET THIS XMAS BRING YOU THE GENUINE THRILLS

AK FIGHTER F9C-2
1/2" scale. Span 10 1/8"; length 15 1/8"; weight 2.2 oz. Colored silver, blue & black. Complete kit \$F-27, only \$1.95

that come only with building authentic Cleveland-Designed Flying Models



GEE-BEE—1/2 in. scale. Colored yellow and black. Span 17 1/2"; length 17 in.; weight 1.3 oz. Speedy line. Complete kit \$F-27, ONLY \$1.50



LAIRD Super Solution
1/2" scale. Flies 20 m.p.h. Span 15 1/4"; yellow and green. Complete kit \$F-28, including everything needed. \$2.50

GREAT!

"Cleveland Model Engineers News" Everybody's reading it. Nothing ever like it before. Rush your name, address and \$2 (no stamps) for your copy.



HOWARD RACER—1/2" scale. Colored with Cleveland's new white dope. Span 15"; length 13 1/4"; weight 1.3 oz. Complete kit \$F-18 with everything needed. \$1

If your dealer can't supply you, order direct
CLEVELAND MODEL & SUPPLY CO., 1699-P12 West 57th St., CLEVELAND, OHIO, U. S. A.

PROFITS \$160 to \$300 Monthly—WITHOUT INVESTMENT**AUTOMATIC AIR SERVICE**

Drives Mezer business to you without investment. Bellows, space saving, always ready. \$12 Monthly.

**ARC WELDER**

Profits \$300 to \$400 monthly with ease—using new "BIM-FLYER" Welder. Electric, belt, gas engine drive.

**8-HOUR BATTERY CHARGING**

Put your shop above competition. Halves electric bills. Doubles profits. Only \$10 Monthly.

**20 MINUTE Car Washer**

Big profits washing cars—saves 2-3 times, does better job. Saver \$2.95 for \$2. Only \$17 Monthly.

Tear out and mail this ad. Check items of interest—no obligation.

HOBART BROTHERS
Box M-122, Troy, Ohio

WRITE TODAY » Only \$16 Monthly—30 Days Trial to Prove it « NO OBLIGATION

MEND ANYTHING

Amazing New Way

METALLIC-X

Strange Liquid Metal Holds Like GRIM DEATH!

THE universal fixer has been discovered at last! A strange metallic liquid called METALLIC-X binds any materials together as if welded—wood to wood, metal to glass—metal to metal—glass to metal—glass to glass and scores of others! Nothing like it for repair jobs of every description or for new work. Easier to use and stronger than glue, solder or cement. No heat, acids, clamps, or tools of any kind. Unaffected by heat, water, oil or atmospheric conditions. Will not crack, soften or dry out—and wild horses cannot tear it apart! Write today for full information and FREE SAMPLE of work done with METALLIC-X showing the tremendous strength of this amazing discovery.

Write Today for FREE SAMPLE

AGENTS... DISTRIBUTORS

Your Chance to Make up to \$200 in a Week!

Unquestionably, METALLIC-X provides the greatest money-making opportunity in generations! Sell to stores or direct to homes. Tremendous earnings either way—up to \$20 and \$30 in a day—\$250 and up in a week! Automatic repeat orders. Exclusive territory. Write TODAY for FREE SAMPLE and sensational BIG-MONEY plans. Give name, address, county and state.

LUX-VISEL, INC. Elkhart, Ind.
Dept. W-5001



MORE THAN 100 SHAVES From One Blade!



Greatest Invention in years
A \$1.00 Hone FOR ONLY 50c

Superior to anything on market. New Razor Blade Sharpener, taking country by storm. Not made of glass, fibre, celluloid, etc., but the finest abrasive obtainable which is absolutely essential for the sharpening of steel. Puts a hair splitting edge

on the dulled razor blade—any make—in a few seconds. Made by the well known Goodrich Company, Manufacturers of barber hones and sharpening stones since 1884.

MONEY BACK IF NOT SATISFIED

Send 50c with order and we will mail you one Hone, regular value \$1.00. If not satisfied we will gladly refund your money. Ideal Xmas gift for any man. Shipped in Holly Boxes if desired.

Goodrich Manufacturing Co., 1500 W. Madison, Dept. P.M. CHICAGO
Attractive Proposition for Agents and Distributors

NEW! HANDEE GRINDER

SPEED UP—TOUCH OFF—DRESS UP

JUST plug in and grind electrically. Save time on jobs where filing would take hours. Grind things that can't be touched with a file. Only machine of its kind on the market.

Operates on A. C. or D. C., develops 10,000 R. P. M. on 110-volt, 60-cycle. Press button control as you grip tool. Weighs only 1 lb. Fits the hand.

IDEAL XMAS GIFT

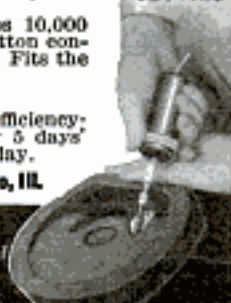
Replace hand work with mechanical efficiency; Money returned if not satisfactory after 5 days' trial. Three wheel shapes free. Order today.

M. C. TOOL CO., 108 S. Aberdeen St., Chicago, Ill.

100 SHAPES AVAILABLE



\$1000
POST PAID



COLD ROOMS made WARM & COZY

New HEAT Booster Cures Sick HOT AIR SYSTEMS—Cuts Fuel Bills!



Sensational new fan installed just below register pulls heat to cold room instantly. Pays for itself in few days on fuel saved. Keeps any room comfortable in coldest weather.

ONLY **\$3.95** Guaranteed Results!

This new Victor Heat Booster is positively guaranteed to give you amazing results. Try it for ten days and, if not completely satisfied, money will be refunded. Send for your heat booster now—remitted by money order or check or we will ship C. O. D. plus postage.

Order at least one today!
VICTOR ELECTRIC PRODUCTS, INC.
Dept. 301, 712 Reading Rd.
Cincinnati, Ohio

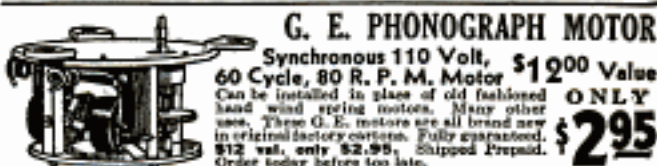
AGENTS

Marvelous money-making opportunity for dependable representatives—write immediately for complete details!



Give your boy the home woodworking shop he's always dreamed about. Let him learn and create history in spare hours turning out new and original designs in levers, clocks, ash stands, candle sticks, chairs. This complete Blue Star Lathe includes Motor Case Pulley, V-Belt, Face Plate, Long Tool Rest, Turning Chisel, Grinding Wheel Collar, and Grinding Wheel. High quality equipment. Capacity, 8 x 30 inches. Fast, accurate, and absolutely safe. The perfect Xmas gift. Only \$9.95 f. o. b. Fairfield, Iowa. Shipping weight 40 pounds. Order direct and save. Send no money. Simply pay postman on arrival. Satisfaction Guaranteed. Literature Free. BLUE STAR LATHE, 612 PARK AVE., FAIRFIELD, IOWA.

9.95 ONLY



G. E. PHONOGRAPH MOTOR

Synchronous 110 Volt, 60 Cycle, 80 R. P. M. Motor \$12.00 Value
Can be installed in place of old fashioned hand wind spring motors. Many other uses. These G. E. motors are all brand new in original factory cartons. Fully guaranteed. \$12 val. only \$2.95. Shipped Prepaid. Order today before too late.

NATIONAL ELEC. TOOL CO. | 111 W. Lake St., Dept. 1012 CHICAGO



WONDERFUL NEW BOOK FREE

NATION'S GREAT POULTRY MANUAL! facts about housing, feeding, diseases. BERRY'S TESTED CERTIFIED CHICKS GUARANTEED TO LIVE 20 DAYS or replacement at 75 cents. 52 VARIETIES. (NEW LOW PRICES) chicks, feeds, supplies and equipment. BERRY'S POULTRY FARM, Box 29, Clarinda, Iowa

200% to 600% PROFIT

Invisible, gold-plated Layrite keeps soft collars tidy, smooth and free of wrinkles. Fastest seller in years. Low cost brings big returns selling as low as 10c. Some get up to 25c. Millions being sold. Mounted on individual card. Big flash. Send 10c for sample and get our money making proposition.

L. CREST, 629 Wash. Blvd., Dept. L.39, Chicago



24 Karat Gold Plated

STARTLE YOUR FRIENDS!!



Wisecrack "over the air" thru your own radio. Cut in on radio broadcasts—talk from another room. Easily connected, always ready for action. Postpaid \$1.00. . . 22c extra C. O. D. Don't be fooled by cheaper imitations.

WORLD MICROPHONE COMPANY

718 Mission St. Dept. 135 San Francisco, Calif

Copyrighted material

POWERFUL MICROSCOPE

See fascinating new worlds right under your nose! Tiny living creatures... hair on insect legs... plant cells... countless other marvels. Fun and education with the

JUNIOR LAB MICROSCOPE
Magnifies 3600 Times Surface Area

Not a toy... a scientific instrument, precision made. Heavy cast base. Fine lens. Sharp focus. Adjustable mirror. Magnifies 60 diam., 3600 areas. Never before available under \$6.00. Money back if not exactly as described. Ideal Xmas gift. Order today.

THE NEWMAN-STERN CO., 1742 E. 12th St., Cleveland, Ohio

4400 VALUE
\$2.98
POST PAID

BUILD A SHIP MODEL

A COACH MODEL OR A SPINNING WHEEL

Pleasant Work and a Profitable Pastime

We send you all the parts cut exactly to fit and ready to put together, including genuine California Redwood hull fully shaped and sanded, numbered diagrams and detailed instructions—Flying Cloud \$4.00, Santa Maria and others \$4.50, Spinning Wheel \$1.00.

Send 2c stamp for illustrated catalog.
DEPT. RT, PERKASIE, PA.
90 King St. W, Toronto, Ont.

TWO FAMOUS TOOLS..\$1.00

Limited SPECIAL offer—these two tools. \$1.75

VALUE, only \$1.00 postpaid in U.S.A.

Xeel is the only Adjustable Socket—the handiest tool you ever saw. Fits anything—HEX, SQUARE, burled or battered. Precision made, finely finished. Regular \$1.50.

A pocket-size, genuine Xeel Shockless Screwdriver with a 5000 volt resisting handle that you can drop or hammer without danger of breakage. Regular 25c. Two ideal, everyday tools for amateur and professional mechanics. Money-back guarantee. Act Now!

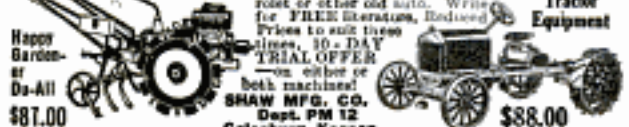
Park Metalware Co., Inc. Dept. P-12
ORCHARD PARK, N. Y.

DEPENDABLE POWER—Lower Prices!

Costs 3c per hour to run SHAW DU-ALL GARDEN TRACTOR Does all farm work

plows, seeds, harvests, runs belt machinery, etc. Shaw Tractor Equipment makes powerful tractor of old Ford, Chrysler or other old auto. Write for FREE literature. Reduced Prices to suit these times. 10-DAY TRIAL OFFER—on either or both machines!

SHAW MFG. CO. Dept. PM 12
Galesburg, Kansas

**\$3.99 22 CAL. REPEATER BLANK AUTOMATIC**

With Box of Cartridges Free

No license required to own this blank automatic. Absolutely safe, harmless and fool-proof. Makes powerful load report. Built like real automatic. Fool your friends. Used as an alarm pistol. Frightens away trespassers, burglars, dogs. Used for farm, camping, etc., for fun or emergencies. Reloads quickly. SEND NO MONEY. Pay on delivery \$3.99 plus delivery charges. Box of cartridges free.

NATIONAL CO., Box 307, RED LION, PA.

A New CURVE for DRAFTSMEN - METAL & WOOD WORKERS - ARTISTS

Form any irregular curve perfectly. No guess-work, knots, fits or arcs. Foolproof.

3 Sizes: 8"-\$2.00, 12"-\$2.50, 16"-\$3.00 at your local dealer or direct. Write for free descriptive circular!

WADE INSTRUMENT COMPANY 2274-A BROOKLYN STATION, CLEVELAND, OHIO.

Make Money at Home!

Earn up to \$25 a week or more, growing mushrooms in your cellar or shed. Big demand. We tell you how. Illustrated book and details free. Start NOW—write today.

AMERICAN MUSHROOM INDUSTRIES, Ltd., Dept. 388, Toronto, Ont.

Big 3 ft. Telescope

Five Sections. Brass bound. Powerful 8-X Lenses. 10-Mile range. Special Eye Piece for looking at the Sun, included FREE. Can be used as a Microscope. Guaranteed. Big value. Postpaid. \$1.75. C. O. D. 15c extra. **Banner & Company, 1-45, Trenton, N.J.**

FOR CHRISTMAS A GERSTNER Tool Chest

Machinists—Toolmakers

Send for Free Catalog

H. GERSTNER & SONS, 412 Columbia St., DAYTON, OHIO

"BOATS" Assemble a Boat this Winter!

We furnish the completely assembled frames and machined parts. 44 models, all easily assembled at home. Have a better craft and save 3/4rds the cost. A "WELCH BOAT" is the finest you can own. Send 10 cents for 30 page catalog. **WELCH BOAT COMPANY, 3142C North 31st Street, Milwaukee, Wisconsin.**

When writing please mention Popular Mechanics

Send 10c for the REG'LAR FELLERS DOORSTOP**MAKE IT YOURSELF**

Here's one of the Reg'lar Fellers from the famous comic strip come to life as a doorstop. Jimmie Dugan is 10 inches high, wonderfully colored and you can put him together yourself. He shows, too, what a swell time you can have with this big ten-pin bowling game!

REG'LAR FELLERS BOWLING GAME

Here's the whole gang—10 of 'em—in big cut-out ten pins to bowl over—bang! Jimmie Dugan, and 5 others. Each figure 10 inches high. Full color. Mounted on heavy board with wooden base to stand upright. 3 colored maple balls are included.

ONLY \$1.00

REG'LAR FELLERS PUZZLE

Here's the gang in 4 of their grand adventures. And you will have a grand time puzzling out just what they are doing. Here are 4 puzzles to put together into 4 complete adventure pictures. Each puzzle in full colors. All 4 for only 50c.

At all Stores or Direct
Selchow & Righter Co., 200 Fifth Ave., New York, D. I. M-12

Send { } Reg'lar Fellers Bowling Set \$1.
{ } Reg'lar Fellers Puzzle 50c.
{ } Parables, America's Favorite Game \$1.
{ } Money enclosed. { } Send C. O. D.
{ } I enclose 10 cents for Doorstop.

Name.....

Address.....

HEAT 1 1/2¢ Per Hour!

AMAZING INVENTION—New Radiant Heater. Burns 96% air. Makes its own gas. No piping. No installation. Gives roomful of clean, healthful, penetrating heat, like sunshine, for 1 1/2 cents an hour. Hotter than gas or electricity, at 1-10th the cost. Easy to light and operate. No smoke. No soot or ashes. No odor. Portable—carry it anywhere. Low priced. Guaranteed.

30-DAYS' TRIAL

Liberal Offer. Try it 30 days at our expense. Write at once for special, introductory, low-price offer and no-risk trial opportunity. No obligation. Send today.

THE AKRON LAMP CO.
1202 High Street, Akron, Ohio

KILLS ICE BOX "HALITOSIS" New "Breathing" Machine

DESTROYS ODORS..ENDS WASTE

NO more ice box odors, tainted foods, waste! Revolutionary new discovery—PURATOR—actually "breathes" air and kills odors. Nothing like it anywhere. Makes covering foods unnecessary—any foods may be put in the ice box. Automatic, requires no attention. Guaranteed—pays for itself. Sells on sight to homes, hotels, restaurants, etc. Big demand. Agents pocket up to \$5 in an hour. Repeat profits. Get AMAZING TEST OFFER and full details at once! Big season now—so hurry!

St. Louis Mfg. Co., Dept. W-676, Carter and Warne Aves., St. Louis, Missouri.

AGENTS! AMAZING TEST OFFER!

NOW— you can build a Center Wing



Smarter looking, faster than any stock ship Heath has ever offered, this new model C.N. Center wing has all the lines, style, and beauty of high priced racing ships. With her Continental motor she clocks 90 m.p.h.—fast enough to get you anywhere in a hurry and to win first prize money in many a race. Spend these long winter evenings profitably. Buy the parts for one of these splendid new ships and build by the Heath Kit plan. You can start for only \$16.00 and get the balance of the parts as fast as you are ready for them. Parts for Model C.N. come drilled and welded ready for assembly. Complete Kit for Heath C.N. only \$399.00. Eligible for Dept. of Commerce license. Continental A-40 Motor, extra, \$450.00. Flyaway price, \$1,224.00. Operating and maintenance cost extremely low. A wonderful ship at an extremely modest price. Write for det. lbs.

HEATH AIRCRAFT CORPORATION

Dept.
P-212

Niles,
Michigan

HEATH AIRCRAFT

Be kind to your face and pocketbook!
ZIG ZAG RAZOR SHARPENER GUARANTEES
More and Better
Shaves per Blade



The
Unique
Design
does
the
Work

Crystal Glass, Gold Krypton,
Peach Bls. Amber, Royal
Blue, Forest Green. Colors
make attractive Gifts —
Bridge Prizes.

HONES and STROPS Safety Razor
Blades in one operation. Prolongs
life and smooth-shaving activity of old and
new blades. Saves Money. Sanitary.
Regular Price \$1.00. Agents sample 50c
Postpaid. Quantity prices on request.

ZIG ZAG SHARPENER CO.

P. O. Box 357
Muskogee, Oklahoma

Thompson Building,
Tulsa, Oklahoma



\$12.00 MODEL MAKERS LATHE
Complete with slide rest
3 1/4 ins. Swing, 6 ins. Between Centers

Send stamp for catalog

ADEPT TOOL CO.

1242 Hampton Rd., E. Cleveland, Ohio

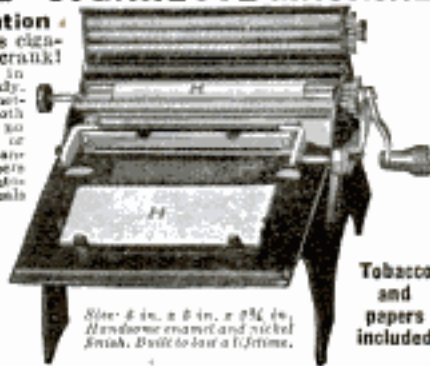
NEW! HOME AUTOMATIC CIGARETTE MACHINE

Amazing Invention
Automatically rolls cigar-
rettes. Turn the crank!
Easy—simple. Low in
price. Saves cost quickly.
Guaranteed. Sturdy all metal
construction. No skittish
shadows to wear out. No
special food, gummed or
tube papers required. Sanitary.
No wetting papers
with tongue or lips. Auto-
matically feeds and seals
papers.

Ask for Illustrated
Folder.

AGENTS!

Big demand for this
remarkable machine.
Marvelous big money
making plan. Good
gift article. Don't de-
lay.



Tobacco
and
papers
included

Size: 8 in. x 8 in. x 9 1/2 in.
Handsome enamel and nickel
finish. Built to last a lifetime.

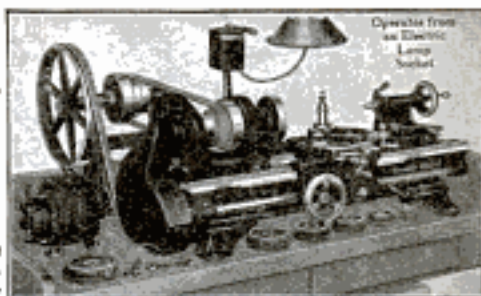
AUTOMATIC CIGARETTE MACHINE WORKS
1085-57 Sheridan Road Dept. 12 CHICAGO

\$34⁰⁰ Down for this **8" Bench Lathe**

A
Back-Geared
Screw Cutting
Precision
Lathe

Wt. 240 lbs.

Price includes
1 phase Re-
versing Motor
and Reversing
Switch.



8" x 24" Horizontal Motor Drive Bench
Lathe Complete.....\$132.25
\$34.00 down, \$9.00 a month.

The South Bend 8" Lathe shown above has back-geared headstock—six spindle speeds—hollow spindle—tailstock set-over for taper turning—reverse for feeds and threads—power feeds .0208" to .0053". Cuts screw threads 4 to 96 per inch. Built in bed lengths up to 48".

Factory Rebuilt Lathes

Bargain prices on a few
Factory Rebuilt South
Bend Lathes in sizes
from 9-in. swing to 18-
in. swing. Countershaft
and Motor Drive. All
carry our regular guar-
antee. Bargains while
they last. Write for List.

Used by U. S. Govt., by manu-
facturing plants, machine,
automotive, electrical and
home shops for all classes of
accurate machine work.

Write for Catalog No. 8

Showing all 8" Lathes; also
Catalog No. 93 showing 96
other lathes 9" to 42" swing,
countershaft and motor drive.

SOUTH BEND LATHE WORKS

612E. Madison St., South Bend, Ind.

Lathe Builders for 26 yrs.—Over 55,000 Users

BE YOUR OWN RADIO STATION Hook the WIZARD Mike into your radio set and hear your own voice come out of the loud speaker as if broadcast by a distant station. Fool your friends. Put on trick programs. Talk, sing, play. Easy with the WIZARD HAND MIKE. An efficient well-made radio microphone, rubber packed diaphragm, pat'd carbon granule microphone cap. Used also for home-made telephones, public address systems. \$2.50 value for only 99c post paid. Complete wiring diagrams. Order now and do some real entertaining. **THE NEWMAN-STERNE CO., 1742 E. 12th St., CLEVELAND, OHIO**

GIANT TELESCOPE \$1.75

See Miles Away! Distant people and objects seem close. Over 3 ft. long, brass bound. Made in Europe. Bbbs. of fun. Thousands pleased.

Send No Money! On arrival pay Postman special price, only \$1.75, plus postage. Two for \$3.25. (Or send price and we pay postage.) Satisfaction guaranteed or money back. Send today. **Bargain House, 427 Randolph St., Dept. 15, Chicago**

FREE With Order
Strong leatherette Carrying Case and Solar Eye Piece to view the sun.



MAKE MONEY SPARE OR PART TIME

SELLS FOR FIVE TIMES COST

Make Colorcrete Products. A complete home industry. Profitable. Offers quick returns and future growth. You have a waiting market, protected by franchise. Easily made. Only small workroom required. Your materials cost little and are easily obtained locally.

HOME MANUFACTURING

Turn your spare time into profit now by making personal Pottery, Vases, Boxes, Birdbaths, Garden Seats, Flagstones, Fireplaces, Porches, etc. With Colorcrete you can supply these in 30 Colors and Shades. Beautiful and exclusive designs that sell quickly. We start you right. Molds cost \$20.00 and up. Write today for complete information. Also ask for machinery catalog for making Blocks, Brick and Tiles.

Colorcrete Industries, Inc.
570 Ottawa Avenue
Holland Michigan



"What a CHRISTMAS!"

"AND WHAT A SAX. It's my biggest thrill since I used to believe in Santa Claus. Now I can join the band and get in on all their good times."

Every live boy wants to play in a band. And parents are glad to help such dreams come true. Older folks, too, find pleasure and popularity by learning to play a band instrument.

Saxophone, trumpet, trombone—no matter what instrument you prefer—choose a Conn for quicker progress and greater success. Choice of world's greatest artists. Conns are easier to play. More brilliant and beautiful in tone. Many exclusive features. Yet they cost no more than other so-called standard makes.

SENSATIONAL NEW MODELS

The new Conqueror models—now on display at leading music stores—offer the most revolutionary improvements in years. Stepped up in style and performance as radically as are the newest motor car sensations.

Be sure to see these wonderful new instruments. Home trial. Easy payments if desired. Or write for FREE booklet on whichever instrument interests you most. Mention instrument.

C. G. CONN, Ltd., 1231 Conn Building, Elkhart, Indiana

IF CONN IS NOT ON THE INSTRUMENT IT IS NOT A GENUINE CONN



CONN

BAND INSTRUMENTS



Cut Coal Bills
1/3 to 1/2

Home-Owners! Landlords!
Let "STOKE-RITE"
the Automatic Coal Burner
make life easier for you. Auto-
matically fires your furnace. Burns
cheaper coal, slack or screenings
yet maintains an even, healthful
heat at all times. No smoke. No

soot. No ashes. Foolproof. Inexpensive. Fits into your present furnace. 70% cheaper than oil. Factory to you at a big saving. Write for details. **STOKE-RITE CORP., 803 Insurance Bldg., Indianapolis, Ind.**

60 day
Free trial

Do Your PRINTING

Cards, stationery, circulars, tags, labels, advertising, etc. Save money. Print for others, big profits; easy rules sent. Will do popular Raised Printing like Engraving. Junior Press, \$5.90. Job Presses \$11 up. Power \$149. Write for free catalog. **THE KELSEY CO., Y-37, Meriden, Conn.**

CROSMAN SILENT .22

ACCURATE

NOISELESS

No Cleaning Required. Recoil and Bullet Splatter Absolutely Eliminated. Low Cost Ammunition.

The Crosman Silent .22 Single Shot and the Crosman Silent .22 Repeater pneumatic rifles are a decided improvement over the noisy old-fashioned powder guns because of their absolute and unflinching accuracy.

FREE

We will mail to you, absolutely free, our booklet containing full information about target and game shooting . . . also Crosman catalog.

CROSMAN ARMS CO.

401 St. Paul Street

Rochester, New York



Do Better Sawing the Tilting Arbor Way

In operation the Boice-Crane Tilting and Lowering Saw is unsurpassed. It is the fastest—most convenient—safest—most accurate bench saw ever offered for the money. Table remains fixed, level, and rigidly attached to four massive legs. The saw arbor tilts, raises and lowers—not the table.

Send for Catalog "F" of Entire Line

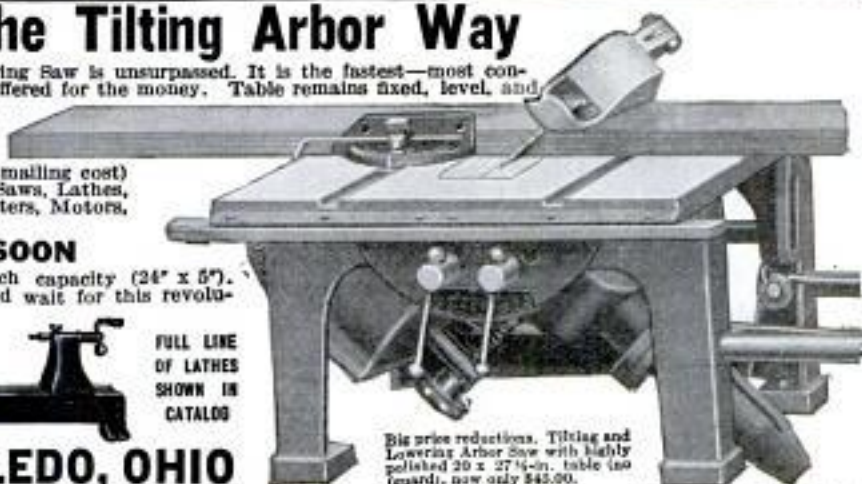
Send 10c, stamps or coin (which only partly pays mailing cost) for 52-page catalog with information on Circular Saws, Lathes, 12", 14" Band Saws, Shapers, Sanders, 4", 6" Jointers, Motors, Workshops and Accessories.

COMING—NEW JIG SAW—SOON

Never before so many startling features or such capacity (24" x 5"). Special provision for puzzle cutting. Watch and wait for this revolutionary machine.



FULL LINE
OF LATHES
SHOWN IN
CATALOG



Big price reductions. Tilting and Lowering Arbor Saw with highly polished 20 x 27 1/2-in. table (no guard), now only \$45.00.

W. & J. BOICE, Dept. PM-12H TOLEDO, OHIO

BOYS! THROW YOUR VOICE



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

THE VENTRILO

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

JOHNSON SMITH & CO. Dept. 835 RACINE, WIS.



Little Wonder Crystal Radio Receiver

\$1.00



Say what you will about Electrical and Battery Sets, a CRYSTAL set has them all beat for simplicity and clearness of tone. There is absolutely no noise and no distortion—no batteries to buy—no tubes to wear out—no maintenance expense whatsoever. Cost nothing to operate and will last indefinitely. Reception is loud and clear. This Receiver is constructed to work equal to the most expensive Crystal Set you can buy. Has a receiving radius of over 25 miles, or under favorable conditions up to 100 miles. Constructed of the finest materials throughout, including super-sensitive crystal, accurate tuning coils, and a speaker.

ing quick results. PRICE of receiver only \$1.00 postpaid. Or complete with Ear Phone and Aerial Kit—everything all complete—only \$2.95 postpaid. JOHNSON SMITH & CO., Dept. 835, RACINE, WIS.

BOY AMATEUR ELECTRICIAN 10c



The HOW and WHY of electricity fully told in simple language that any boy can understand. Scores of plans and instructions for making—dry batteries, dynamos, electric motors, telegraph apparatus, telephones, electric lights, electric door bells, alarms, electric engine, rheostat, mail box alarm, electro-magnets, automatic incandescent flash, electric shocking machine, wireless telegraph apparatus, induction coil, arc light, current reverser, etc. Tells all about electric wiring, static electricity, magnets and magnetism, conductors and insulators, electrostatic induction, electroscopes, electrocathode, condensers, Leyden jar dynamic electricity, the voltaic cell, electromagnets, electrolysis, electro-plating, electrotyping, how to build a radio for a few cents, etc. 64 pages, 100 illustrations. 10c. postpaid.

JOHNSON SMITH & CO., Dept. 835, RACINE, WIS.

MAKE YOUR OWN RADIO



Enjoy the pleasure of base ball games, market reports, latest news, etc. This copyrighted book "EFFICIENT RADIO SETS" shows how to make and operate inexpensive Radio Sets, the materials for which can be purchased for a mere trifle. Also tells how to build a short-wave Receiver for listening in foreign stations, police calls, ships at sea, etc. ONLY 15c p.pd.

RADIO SETS" shows how to make and operate inexpensive Radio Sets, the materials for which can be purchased for a mere trifle. Also tells how to build a short-wave Receiver for listening in foreign stations, police calls, ships at sea, etc. ONLY 15c p.pd.

MIDGET BIBLE

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



Without bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices 15 Bills 10c, 40 Bills 20c, 120 for 50c or \$3.50 per thousand postpaid.

STAGE MONEY



Without bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices 15 Bills 10c, 40 Bills 20c, 120 for 50c or \$3.50 per thousand postpaid.

Without bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices 15 Bills 10c, 40 Bills 20c, 120 for 50c or \$3.50 per thousand postpaid.



Good Luck Ring

Very striking, spirit and uncommon. Silver finish skull and crossbones device, two brilliant, flashing gems sparkle out of the eyes. Held to bring good luck. Only 25c p.pd.

250 Magic Tricks

An excellent little book containing nearly 250 tricks for parlor or stage that anyone can do. Tricks with cards, coins, handkerchiefs, eggs, bottles, string, etc. Also Second Sight, Shadowgraphy, etc. Profusely illustrated. 10c p.pd.

125 CARD TRICKS and sleight of hand. Contains all the latest and best card tricks as performed by celebrated magicians, with exposure of card tricks used by professional gamblers. Price 25c postpaid.

SNAPPY JOKES. A splendid collection of rich and rare jokes, compiled by a jolly bartender for stag parties, smokers, etc. 64 pages. PRICE 10c postpaid.

BOOK ON RABBITS. How to breed and raise rabbits. Belgian hares for pleasure or profit. Many boys have earned a good living through the aid of this book. Illustrated. 15c.

HOW TO PITCH CURVES. Contains lessons by "Matty," Ed. Walsh, "Doc" White, Walter Johnson, "Nap" Buckner, "Smoky Joe" Wood, Pitch the Fades-away, Spitter, Knacker, Snake Ball, etc. Clearly described, 56 illustrations. 25c postpaid. JOHNSON SMITH & CO.

STAR TOY MAKER

Greatest boys' book written. Tells how to make a Pinhole Camera, a Cannon, model Railroad, a Telephone, Secorgram, Talking Kit, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Raft, a pair of Skis, a Dog sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. PRICE 10c.

BOY'S OWN TOYMAKER. A new book. Tells how to make chemical toys, electrical toys, galvanic toys, mechanical toys, paper toys, cardboard toys, boats, traps, etc. 100 illustrations. Price 25c postpaid.

BOOK ON BOATS. How to build rowing, sailing boats. Everything pertaining to boats explained in plain terms so anyone can understand. Illustrated. 10c p.pd.

5-MINUTE HARMONICA COURSE. A new easy self-teaching method. Teaches how to play, to use the tongue, tongue, fully illustrated. Price 15c postpaid.

MONEY MAKING SECRETS. Golden opportunities for everyone. 64 page copyrighted book chock full of money-making ideas, recipes, formulas, wrinkles, trade secrets, etc. Businesses that can be started with little or no capital at home in spare time. 10c postpaid.

WONDERFUL X-RAY TUBE

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the back of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other striking illusions. Price 10c, 3 for 25c.

Repeating and Single Shot Air Pistols

Just what you've always wanted. A powerful high grade Air Pistol, shaped like an Automatic, pocket size. Fires B. B. shot obtainable anywhere. Very powerful yet perfectly safe for boys to handle. Two styles—Single Shot Pistol or Repeater. The Repeater fires 50 shots in one loading. The Single Shot Pistol shoots Air Rifle Darts in addition to B. B. Shot. Well made and durable; all metal parts nickel plated; natural grain wood stocks. Front and rear sights. Weights about 10 ounces. Better than an air rifle. By Express only. Not prepaid.



Uses BB. Shot

PRICES: Single Shot Pistol... \$2.50
50-Shot Repeating Pistol... \$3.95
JOHNSON SMITH & CO. Dept. 835 RACINE, WIS.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps and Dogs Prices 50c



Well made and effective; modified on latest type of Revolver; appearance alone is enough to ward a burglar. When loaded it may be as effective as a real revolver without danger to life. It looks standard 22 Cal. Blank Cartridge obtainable everywhere. Price 50c. Superior quality, \$1.00. Blank Cartridges, 50c per 100. Holster (Cowboy type) for Blank Cartridge Pistol, 50c. Shipped by Express only. JOHNSON SMITH & CO. Dept. 835 RACINE, WIS.

\$1.00

Shipped by Express only. Not prepaid.

BIG ENTERTAINER



180 Jokes and Riddles, 34 Magic Tricks, 54 Parlor Games, 73 Toasts, 15 Tricks with Cards, 50 Money-making Secrets, 37 simple scientific experiments, 10 Funny Readings, 3 Monologues, 21 Puzzles and Problems, 5 Comic Recitations, 1 Gypsy Fortune Teller, 13 Flirtations, Cut-outs for Checkers and Chess, Dominoes, Fox and Geese, 9 Men Morris, Spanish Prison Puzzle, Game of Anagrams, etc. ALL for 15c postpaid.

JOHNSON SMITH & CO., Dept. 835, Racine, Wis.

MICROSCOPE and FLOROSCOPE



There are few things so interesting and valuable as a Microscope. It enables you to minutely examine mineral animal and vegetable specimens, to test cotton, wool, silk, seeds, water, sour, clover, milk, and in fact nearly all articles of food. Unwholesome meat can be readily detected and ferments can be closely watched. It is exceedingly interesting to examine the spores of ferns, molds, sugar, salt, alum and other crystals, the dust (collected from moth and butterfly wings, human hair, skin and insects, while the animalcules in water are a never-failing source of wonder. Most interesting experiments can be performed with an instrument such as this. Place a small piece of cheese in a box and allow insects to feed on it for a day or two. Then examine a tiny portion of the cheese under the Microscope and you will see little animals, magnified to the size of large beetles; you can count their legs and the joints in them, the talons or claws upon each foot, also the hair or bristles upon their bodies. Or, obtain some stagnant water; deposit a small portion of seeds upon the object glass of the Microscope with a pin's head, and you will see beautiful animalcules swimming about with as much freedom as though they were fish in the broadest ocean. It is a truly wonderful sight and an endless source of interest and enjoyment for everybody. The Microscope is made of brass and is capable of magnifying 150 surface areas, and although small and compact it will cover a very wide range of microscopic research. PRICE 50c Add 25c for new booklet on MICROSCOPY—a study of microscopic world. Use it in conjunction with above. 20 chapters tell all about microscope, how to examine all kinds of foods, fibers, textiles, paper, wool, silk, cotton, plants, flowers, insect life, mold, fungi, pond scum, etc., microscopic examination of many compounds in pantry and medicine cabinet, etc. Fascinating and absorbing. 50 illustrations. 25c. postpaid. JOHNSON SMITH & CO. Dept. 835 RACINE, WIS.

JOHNSON SMITH & CO.
Dept. 835 RACINE, WIS.

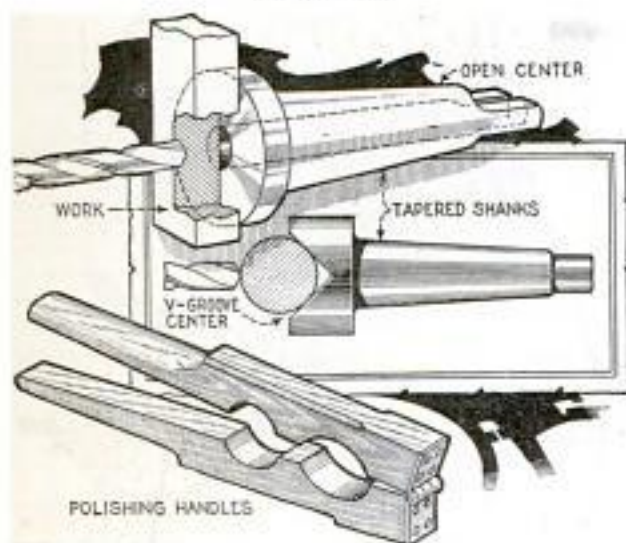
A copy of our NEW CATALOG mailed on receipt of 10c, or the De Luxe Edition with cloth binding 25c. Bigger and better than ever. Only book of its kind in existence. Nearly 800 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unobtainable elsewhere. Remit by Cash, Money Order, Check or untraced U. S. Postage Stamps, for all articles listed above. Canadian money, stamps and Postal Notes accepted if 10% added for Exchange.

LATEST CATALOG

JOHNSON SMITH & CO. RACINE, WIS.

SHOP NOTES

(Continued)



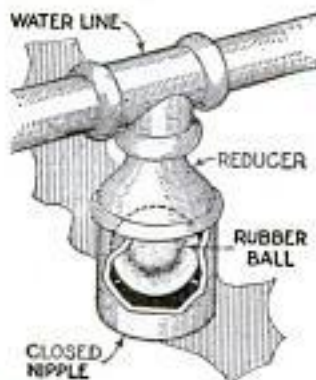
When Drilling or Polishing Work in a Lathe, These Three Tools Will Save Much Time

Three Timesaving Tools for a Lathe

Here are three tools for use on a lathe that will be found to save much time. Two of them are used in connection with drilling, one being made with a flat face and an open drilling center for use with flat stock, while the other has a V-grooved face for round stock. Both tools are provided with tapered shanks to fit into the tailstock. The third tool consists of two wood handles hinged together and grooved to fit the contour of the work as shown. This tool is used to hold emery cloth, when polishing the work.

Rubber Ball Prevents Bursting of Frozen Water Pipes

Installed in a water line as shown, a hollow rubber ball takes up the expansion caused by freezing of the water and keeps the pipes from bursting. The ball is placed in a closed pipe nipple and attached to the line by a tee and reducer.



Ⓛampblack mixed in oil is a good substitute for graphite in sealing pipe-flange gaskets.

Mathematics Training Is Job Insurance Today

—and Bigger Success Tomorrow

The man equipped with practical training is the safe man today and the key man tomorrow. There are jobs and contracts only for trained men—the men who have the basic knowledge that enables them to master the practical technique of their jobs. In every line of business or mechanical, scientific, or technical work, mathematics training is essential to success, for without mathematics a man can work only with his hands—and today he must work with his head as well if he is to secure his job.

Now—Mathematics Self Taught—Easily, Quickly, Inexpensively

An expert who has been instructing practical men all his life has prepared an extremely interesting group of books which at last removes the mystery of mathematics and makes it possible for you to apply it profitably to your own work.



MATHEMATICS FOR SELF STUDY

By J. E. Thompson, B. S. in E. E., A. M.,
Dept. of Mathematics, Pratt
Institute, Brooklyn.

These books start right from the beginning with a review of arithmetic that gives you many short-cuts and "trick" methods of calculation that clip many hours from your working time. Then they go right into higher mathematics and you see how clear it is when an expert explains it for you. In a short time you will be tackling successfully the most difficult problems.

An Expert Gives You These Simplified Methods

Mr. Thompson, the author of these books, has had many years' experience in mathematical training. He presents each practical method and problem in the clearest, simplest way. He gets right down to the kind of information that you need in your daily work.

A Complete Course and Reference Work on Mathematics in These Four Inexpensive Books

Arithmetic for the Practical Man
Algebra for the Practical Man
Trigonometry for the Practical Man
Calculus for the Practical Man
4 Volumes—1240 Pages—Illustrated

Send No Money

EXAMINE THESE BOOKS FOR 10 DAYS FREE

Mail This Coupon

D. VAN NOSTRAND CO., Inc.
250 Fourth Ave., New York.

Send me MATHEMATICS FOR SELF STUDY in 4 volumes. Within 10 days I will either return the books or send you \$1.65 as first payment and \$2.00 per month for 3 months—total \$7.65 (5% discount for cash).
(Pop. Mech. 12-32)

Name.....

Address.....

City and State.....

Business Connection.....

Reference.....



"I'm giving service and making extra money with OHIOHM RESISTORS"

Quality, Accuracy, Straight Wire Leads

Free!

With initial order of First-Aid Kits
OHM DIAL for determining resistance values.
Resistor Replacement Guide.
Labels for your own reminder advertising.

Let us send you data on how to check resistors for quality and accuracy. • • OHIOHMS fulfill every need perfectly.. they're protect-o-packed.. their value is stamped on every piece. There's money for you in OHIOHMS.



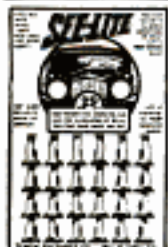
Something New! CLEANAIRE DEODORIZER

for ice boxes and refrigerators. A 50c item that you can sell when servicing radios. Write

THE OHIO CARBON CO., Cleveland, O.

ALL-PURPOSE SUPER DRILL

This 13 1/4" "Buffalo" Simplex Drill combines many new and special features: four spindle speeds—revolving head locks in any position, providing radial features—extreme high and low range—ball-bearing spindle—Almond Chuck, 3/8" cap—precision built thruout. Limited special offer \$32.00, freight paid, complete with 60 cycle, S.P., 110 V., 1/2 H.P. Motor. Other motors available. Write for Bulletin 2844F.
BUFFALO FORGE CO., BUFFALO, N. Y.
Building Better Drills Since 1878



SEE-LITE

This Number does not require salesmanship to sell. You can see from driver's seat, if lights are in working order. Do you like to meet one-eyed cars? Avoid arrests, accidents and humiliation of being told by an officer to turn on your lights! SEE-LITES are just as essential as a speedometer, gas gauge or starter. Sample pair 25c. Long profit to agents in quantities.

ZENITH FACTORIES CO.

3635 S. Lyndale Ave., Minneapolis, Minn.

NEW LINE OF 10¢ TO 50¢ SELLERS

Pays Incredible Profits to Agents!

Men and women everywhere are simply dumbfounded by their amazing success with Rite-Way's sensational new line and revolutionary merchandising plan. Brings to direct selling the same time-tested principles that made millions for owners of 5c & 10c or 25c to \$1.00 stores. Compact line of hot-selling specialties that everybody can afford means many small profits which total big by each day's end. Write at once for description of articles and new selling idea.

RITE-WAY PRODUCTS CO.

Dept. W-286, 4307 Warne Ave., St. Louis, Mo.

**LIBERAL
No-Risk
OFFER**

Now! A TRUSS THAT HOLDS



This is the truss endorsed by surgeons and hospitals. Different from all others. Spring and pads made of one continuous wire of nickel silver; nothing to work loose. Holds severest rupture safely, gently, on youngest child or oldest adult, either sex. Cool, really comfortable and surprisingly light. No pressure on back or hips. No understraps, yet never moves. Lets you lift, jump, etc. Write for name of nearest dealer. American Silver Truss Corporation, Dept. 7, Coudersport, Pa., makers of fine Trusses, Elastic Hosiery, Abdominal and Athletic Supporters, Suspensories, Crutches, etc.

FREE CLASS & CLUB PIN CATALOG

Shows over 200 handbags, smart, up-to-the-minute designs. Many color illustrations. Write right now.
EASTIAN BROS. CO. 67 Eastan Bldg., Rochester, N.Y.

35¢ up

LOWEST PRICES - BIGGEST CHOICE - QUALITY MADE

Quit Tobacco

Don't try to banish unaddled the hold tobacco has upon you. Thousands of inveterate tobacco users have, with the aid of the Keeley Treatment, found it easy to quit.

KEELEY TREATMENT FOR TOBACCO HABIT Quickly banishes craving for tobacco. Successful for over 50 years. Write today for FREE BOOK and our MONEY BACK GUARANTEE.

Home of the famous Keeley Treatment for Limer and Drugs. Booklet sent on request. Correspondence strictly confidential.
KEELEY INSTITUTE, Dept. V-702, Dwight, Illinois



BUCHSTEIN'S FIBRE LIMB



Send for Catalog Today

is soothing to your stump—strong, cool, neat, light. Easy payments. Brace for all deformities.
D. BUCHSTEIN CO., 600 3rd Ave., So., MINNEAPOLIS, MINN.

RAISE FUR RABBITS FOR US

CHINCHILLAS & NEW ZEALAND WHITES
WE BUY WHAT YOU RAISE—HIGHEST PRICES PAID—Established 19 years. Illustrated book, catalog and Fur Farming Magazine, also Monthly Market Bulletin showing prices we pay. All for 10c. Two large rabbitries, address one nearest you.
STAHL'S OUTDOOR ENTERPRISE COMPANY
Dept. 141D, NEW CITY, N. Y. or HOLMES PARK, MO.



BIG FREE SQUAB BOOK

Make money breeding PR Royal WK Squabs, cream of poultry, getting double chick on triplets. Raised in 4 weeks. Send four cents stamps for postage on free big 68-page book, how to breed and profit 1938. Our 33d year. See how our Racing Homers are winning.
Plymouth Rock Squab Co., 634 N St., Melrose, Massachusetts



POULTRY PAPER 12 BIG ISSUES 25¢

Paste or pin this ad on a letter with your name and address and mail it to us with 25c. (stamps or coin) for the next 12 issues. American Poultry Journal
532 So. Clark Street Chicago, Illinois

When writing please mention Popular Mechanics

Hotter than Coal and no dirt

**A New
Invention**

Do away forever with the drudgery of wood and coal. The most simple and economical invention on the market is now giving perfect satisfaction to enthusiastic users everywhere. This new invention is a new type of oil burner that takes the place of wood or coal and automatically and silently changes cheap oil into one of the quickest and hottest fires known.

Burns 96% Air and 4% Cheap Oil

The International Oil Burner fits in the fire box of your present range, stove, or furnace. It can be installed in a few minutes by anyone. There is nothing complicated about the International Oil Burner. It gives you all the heat you want—when you want it. Starts instantly with a match. No soot, smoke, or odor. Costs less than coal.

Costs Only a Few Dollars

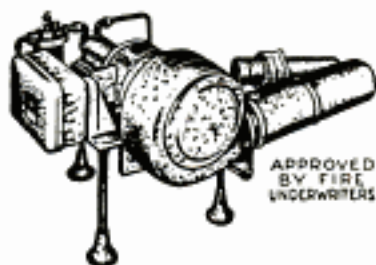
International Oil Burners heat just as well as burners costing \$400 or \$500. Simply turn 1 valve and you have all the heat you want. Cleaner and better for heating or cooking. Approved by the National Underwriters' Laboratories and engineers everywhere. Over 150,000 have been sold.

30 Days' TRIAL OFFER

Try this wonderful automatic oil burner right in your own home at our risk. Act quickly and get our special low introductory price. Sold under absolute money-back guarantee. Write at once for free booklet on home heating and our free burner offer.



Double Blue Flame Burner for cook stoves, ranges, and parlor circulators. Burns with beautiful clean blue flame.



All-Electric Power Burner designed for larger houses, apartments, etc.

APPROVED
BY FIRE
UNDERWRITERS

The Burner Advertised Coast to Coast
Over World's Leading Radio Stations

AGENTS—DEALERS— DISTRIBUTORS

Our free burner offer starts you in business. Big money to be made. Demand is enormous. We also want spare or full time workers immediately. If \$500 a month and more interests you, write or wire us for protected territory offer.

INTERNATIONAL OIL HEATING CO.

3800-10 Park Ave., Dept. 501-D, St. Louis, Mo.

10 YEAR GUARANTEE

CLIP THIS COUPON

International Oil Heating Co.,
3800-10 Park Ave., St. Louis, Mo.
Dept. 501-D

Send your free booklet and free details on home heating for stove.....furnace..... Also free burner offer.

Date.....

Name.....

Address.....

City and State.....

Check if interested in making money as an International representative with protected territory.

"He used to work at a machine"



"That man is head of our engineering department. He worked at a machine for a long time. One day he told me he didn't want to do that kind of work all his life and that he had enrolled for an International Correspondence Schools course to get the training he figured he needed.

"In less than a year the superintendent had chosen him as his assistant. And when the superintendent left he stepped right into his shoes. That course was certainly what he needed to get going and to help put him where he is today."

Spare-time study has helped many men advance from routine jobs to executive positions. Their promotions do not come by luck—they are the rewards of practical training and hard work. You, too, can get ahead—can earn more money! Find out what an hour or two of spare-time study each week will do for you.

Mark and mail the coupon today

INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University" Box 5632-C, 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"/> Automobile Mechanic |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation |
| <input type="checkbox"/> Wood Millworking | <input type="checkbox"/> Sheet Metal Worker |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Steam Electric Engineer |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Civil Engineer |
| <input type="checkbox"/> Electric Wiring | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Refrigeration |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> R. R. Locomotives |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> R. R. Bridge and Building Foreman |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Air Brakes <input type="checkbox"/> Train Operation |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Highway Engineering |
| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Coal Mining Engineer |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Navigation <input type="checkbox"/> Boilermaker |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Textile Overseer or Supt. |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Pipelitter <input type="checkbox"/> Tinsmith | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Bridge and Building Foreman | <input type="checkbox"/> Poultry Farming <input type="checkbox"/> Radio |
| <input type="checkbox"/> Gas Engines <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Aviation Engines | |

BUSINESS TRAINING COURSES

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

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

Address.....

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

Occupation.....

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

POPULAR MECHANICS PRESS, PRINTED IN U. S. A.

NEW LOW PRICES

ON GOOD YEAR - U.S. Firestone-Goodrich AND OTHER TIRES

REAL SUPER VALUES

This old reliable company is first choice with thousands of motorists who demand highest quality at lowest cost.

Actual tests on roughest roads prove that standard brand tires constructed by the scientific Midland process deliver 60 to 65% more service. Order today, save money!

12 Month Written Warranty Bond WITH EACH TIRE ORDERED

BALLOON TIRES		Reg. CORD TIRES	
Size Rim	Tires Tubes	Size	Tires Tubes
29x4.40-21"	\$2.30 \$0.55	30x3 1/2	\$2.20 \$0.80
29x4.50-20"	2.40 .55	31x4	2.25 .85
30x4.50-21"	2.45 .55	32x4	2.35 .95
29x4.75-19"	2.45 1.00	32x4 1/2	2.20 1.35
29x4.75-20"	2.50 1.00	33x4 1/2	2.25 1.35
29x5.00-19"	2.55 1.20	34x4 1/2	3.20 1.35
29x5.00-20"	2.55 1.20	34x4 3/4	3.20 1.35
29x5.25-19"	2.55 1.25	34x5	3.45 1.35
29x5.25-20"	2.55 1.25	35x5	3.60 1.60
31x5.25-19"	3.10 1.25	35x5 1/2	3.60 1.60
31x5.50-19"	3.20 1.30	All Other Sizes	
31x5.50-20"	3.20 1.30	ALL TIRES NEW GUARANTEED	
31x5.75-19"	3.20 1.30	Order 2 Tires Get Guaranteed Tube FREE	
31x5.75-20"	3.20 1.30	Send \$1.00 Deposit with each tire ordered. Balance U. S. D. If you send cash in full deduct 5%. You are guaranteed a year's service or replacement at 75 price.	
32x6.00-20"	3.50 1.65	2.30	

MIDLAND TIRE & RUBBER CO., Dept. 1765
1000-10 West Sixty-Third Street, Chicago, Illinois

ALL THIS FOR 49c

Wonderful German Invention. See this complete seven instrument article, No. 1. A Microscope, very powerful lenses; study work of nature, etc. No. 2. A magnifying Mirror for examining complexion, eyes, etc. No. 3. An Opera Glass with four strong adjustable lenses. No. 4. A watch Style Compass for land and sea use. No. 5. A Fine Reading Instrument with powerful double enlarging lenses. No. 6. A Traveler's Stereoscope with set of 20 real movie pictures. No. 7. A Field Telescope with focusing feature that brings distance right to you. This compact instrument packed in a strong box with opening clasp, showing 115 uses that amaze and fascinate. Best only by insured parcel post for 49c. Your money back without question if not satisfied.

National Exchange, 815 S. Hill St., Los Angeles, Cal.

Free Catalog

BARGAINS in Army and Outdoor Supplies: Clothing, Shoes, Boots, Blankets, Guns, Tents, Harness, Tools, Etc., for Hunters, Trappers, Farmers, Mechanics, Tourist. Write for copy.

ARMY AND NAVY SUPPLY CO.
ESTABLISHED 1906
4772 Lester St., Richmond, Va.

BUILD YOUR OWN

AUTOMATIC ELECTRIC REFRIGERATOR

Why pay \$200.00 and upwards? Use your present ice-box. We supply parts. Can be built for only \$34.50. Easily made. No special tools necessary. Operating cost, quality and size of machine same as well known makes. Complete blueprints and instructions—\$1.00. New Parts List "B" FREE.

B. & L. ENGINEERING CO., 704 Bergen Ave., Jersey City, N. J.

— COMPLETE — MOVIE OUTFIT

Get this complete outfit to take and show home movies. Only \$7.50 Postpaid. Regular \$20.00 value. Gives pleasure to the whole family—simple to operate.

CAMERA—takes clear, brilliant pictures. Uses 16mm. film, 50 ft. roll.

PROJECTOR—shows pictures, big, clear and life-like. Uses 16mm. film. Operates from any light socket.

\$7.50

Postpaid

DON'T MISS THIS BARGAIN

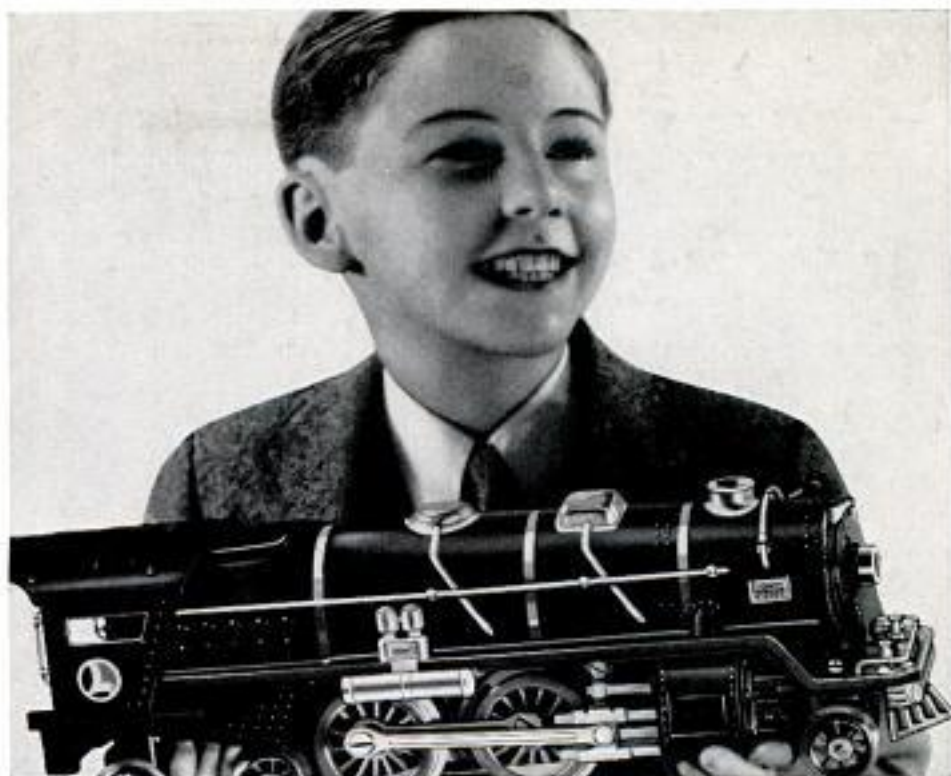
We also have a complete list of film subjects for any projector. Write NOW for 64c FREE Catalogue of Movie supplies.

PARAMOUNT MFG. CO., Dept. G-55
Boston, Mass.

Read what a famous rail-roader says:—I teach my grandsons railroading with Lionel equipment. They learn the principles of railroad operation — the switching and movement of trains. They learn something of mechanics, something of electricity, and they have a world of fun besides. Lionel trains are the only trains I would select."

Robert E. Butterfield

Engineer "20th Century"
New York Central R. R.



How to make your son THE HAPPIEST OF BOYS

IT is not the amount of money you spend on your boy's Christmas gift that counts—it is the amount of thought you put into the proper selection of your gift. The secret of giving your boy *lasting happiness* can be summed up in one word—*helpfulness*.

Help your boy by giving him a gift that will not only bring him fascinating fun, but, at the same time, help him become keen-witted, quick-thinking, resourceful. You can do both these things if you give him a Lionel Electric Train. For Lionel Trains are more than toys. They teach boys how to develop skill with their hands and skill with their brains—and, above all, they help boys form the habit of thinking problems out for themselves because

they make these problems a fascinating game.

For instance, your boy will not only have the fun of building his railroad and operating it; he will have the opportunity to tackle actual problems of railroad operation that give him training in both electricity and mechanics.

Help him learn as he plays

Give him this help. You can now buy your boy these sturdy trains for as little as \$5.95—and they last for years and years. Clip the coupon below. Take it to a Lionel dealer. He will give you, **FREE**, the new 52-page *Lionel Model Railroad Planning Book* that shows (1) how to plan and build a model railroad system and (2) what to get to make it true-to-life to the last detail. Note: If it is not easy for you to go to a Lionel dealer's store—mail the coupon to us and we will send you this expensive book if you send 10c to cover handling and mailing costs.

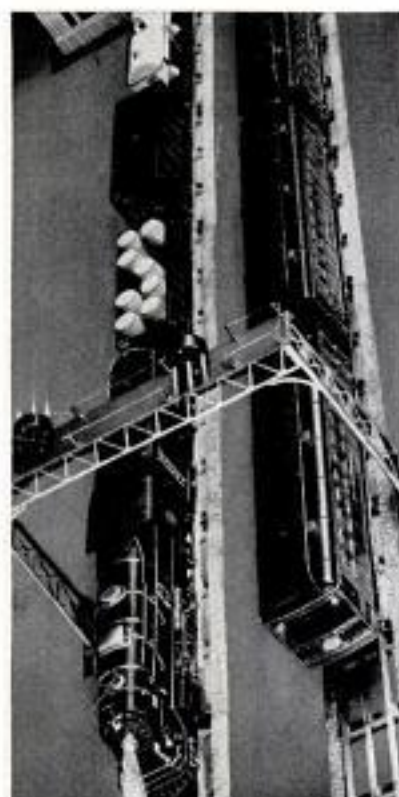
NOTICE TO ALL AUTHORIZED LIONEL DEALERS. The bearer of this coupon is entitled to receive, **ABSOLUTELY FREE**, one copy only of the new 1932 *Lionel Model Railroad Planning Book*.

NOTICE TO THE PUBLIC. If your dealer cannot supply you with a *Lionel Railroad Planning Book*, or if it is not easy to go to his store, mail this coupon to the **LIONEL CORPORATION**, Dept. 6, 15 E. 26th St., New York City. We will send you this expensive book if you enclose 10c to cover handling and mailing costs.

NAME _____

STREET _____

CITY _____ STATE _____



LIONEL
Electric
TRAINS



*"Nature in the Raw"
is seldom MILD"*

THE KING OF BEASTS
"Nature in the Raw"—inspired by the
brute force and savage cunning which
has made the lion ruler of the African
jungle. "Nature in the Raw is Seldom
Mild"—and raw tobaccos have no place
in cigarettes.



Copyright,
1932,
The
American
Tobacco
Co.

No raw tobaccos in Luckies —that's why they're so mild

WE buy the finest, the very finest tobaccos in all the world—but that does not explain why folks everywhere regard Lucky Strike as the mildest cigarette. The fact is, we never overlook the truth that "Nature in the Raw is Seldom Mild"—so these fine tobaccos, after proper aging and mellow-

ing, are then given the benefit of that Lucky Strike purifying process, described by the words—"It's toasted". That's why folks in every city, town and hamlet say that Luckies are such mild cigarettes.

"It's toasted"
That package of mild Luckies