

EXPLORING A FROZEN CONTINENT

POPULAR MECHANICS

★

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF. TRADE MARK GREAT BRITAIN No. 40426

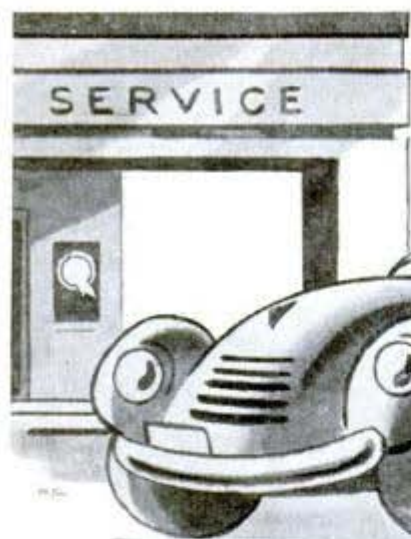
REG. U.S. PAT. OFF.

JAN.
25 CENTS
30¢ IN CANADA



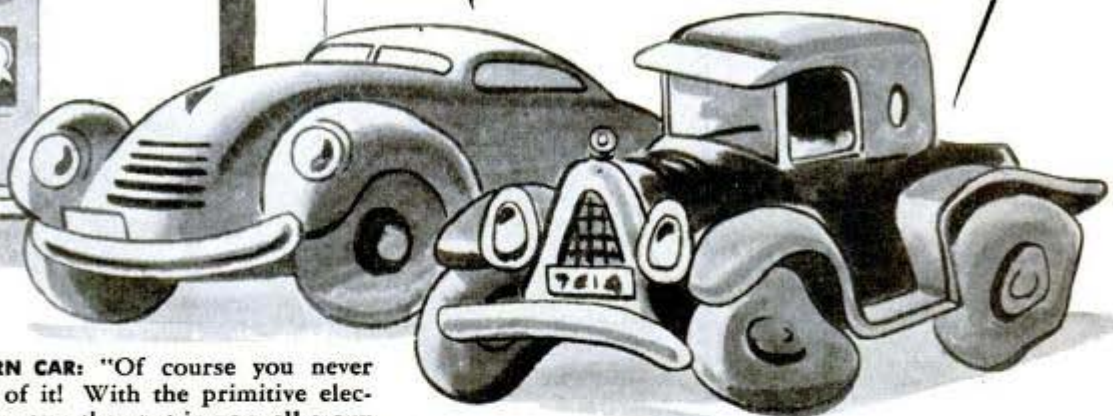
SEE PAGE 45

"HERE'S MY DOCTOR ..."



I've got an appointment for a Packard Certified Re-Wiring check-up."

"Packard Certified Re-Wiring? Never heard of it ..."



MODERN CAR: "Of course you never heard of it! With the primitive electrical system they put in you, all a guy needed was a pair of pliers, a screw-driver and a spool of chicken wire to fix you up!"

OLD CAR: "Well, I don't see what was wrong with my electrical system. It was good enough to give me a top speed of 25 miles an hour, and they could get eight or nine miles to a gallon out of me."

MODERN CAR: "Well, ain't that somethin'! Listen, you—the electrical system in us modern cars is so finely adjusted and engineered that we can make 80—90 miles an hour, and give up to 25 miles to the gallon. And believe me, it takes *expert* service to keep that electrical system tuned up. That's what Packard Certified Re-Wiring Service is for!"



PACKARD CERTIFIED RE-WIRING SERVICE IS A "MUST" FOR MODERN CARS

Your car cannot give top performance if there is a defect in the electrical system—cables, connections, or the electrical units themselves. Packard Certified Re-Wiring Service traces down these defects with accurate checking instruments, operated by a mechanic who is specially trained in the proper service procedure. He can find—and fix—the causes of hard starting, poor gasoline mileage, slow pick-up, dim headlights, and many other troubles caused by high resistance in the electrical system.

Drive into a Packard Certified Re-Wiring station today—and get more pleasure, economy and safety out of your car. Packard Electric Division, General Motors Corporation, Warren, Ohio.

Packard
REG. U.S. PAT. OFF.
TRADE MARK

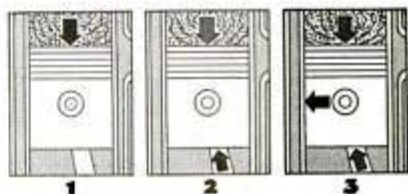
THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY

Scientific Principle Isolates Power Vibration Under the Hood of the New Plymouth

TO PREVENT power vibration from shaking the frame and body, the engine of the 1941 Plymouth is mounted high in front and low at the rear on patented Floating Power engine mountings!

Thus suspended, the Plymouth engine *rocks in balance*—"rides the punches" of torque reaction . . . to keep them from reaching you!

WHY EVERY ENGINE VIBRATES



1. Combustion forces piston downward.
2. Connecting rod resists downward piston movement from an angle.
3. Angle of resistance forces piston sideways—with the effect of a terrific punch against the side of the engine!

Floating Power makes Plymouth amazingly smooth!



WITH the silky smoothness of patented Floating Power engine mountings, Plymouth for 1941 brings you 19 big advancements!

New High-Torque Performance and power-gearing make Plymouth a "powerhouse" to drive!

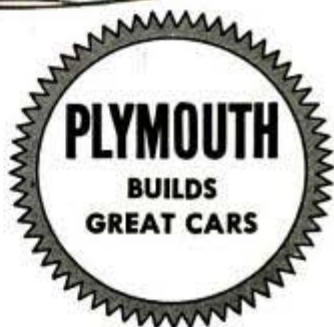
With its 117-inch wheelbase, Plymouth is impressively long and massive! And inside you'll find a sumptuous Fashion-Tone Interior!

There are new High-Duty Engine Bearings, a new Oil Bath Air Cleaner, new Safety Rims on wheels, new Body Sealing!

See your nearby Plymouth dealer, and *drive* this big new beauty! PLYMOUTH DIVISION OF CHRYSLER CORPORATION.

Tune in Major Bowes, C. B. S., Thurs.

SEE THE NEW LOW-PRICED PLYMOUTH COMMERCIAL CARS!



New Delta 10" Saw Is the *Perfect* Tool

Designed after 7 years of study, research and experiment—7 years of analyzing the defects in existing designs—of testing, re-testing—7 years of making model after model—the new Delta 10" Tilting Arbor Saw is as near the perfect tool as modern engineering can make it. Thousands of users agree that it offers numerous exclusive advantages and an operating efficiency never before attained!

Here Are Some of the Features of This Remarkable Tilting Arbor Saw

Generous sized table 20" x 27" (with wings, 27" x 36"). Handles work up to 50" wide and 3 1/2" thick. Powerful, fully enclosed motor; highly efficient Texrope drive; rigid, scientifically designed housing; perfected raising, lowering and tilting mechanism; patented, double-face, double-lock rip gauge; exclusive precision auto-set miter gauge; patented ripping extensions; "sealed-for-life" ball bearings and many other features.

Send for Latest Delta Catalog

A complete guide book to power tools which not only lists the complete line of Delta "Quality" wood and metal working tools—but shows you the important points to look for in all power tools. (Also send for Project Book No. 7 crowded with new projects, including working drawings, photographs and full instructions.)

DELTA MFG. CO.

600-634 EAST VIENNA AVENUE
MILWAUKEE, WISCONSIN



Inside Secrets of Delta Quality "PRECISION GRINDING"

All arbors, spindles, bearing seats, etc. on Delta machines where accuracy to close limits is important, are ground to size. Turning to size is "good enough" for many manufacturers

but not for Delta machines! Precision grinding to size, after turning, is an extra operation. It costs more money—and you can't see it as you can see nickel plating on the outside of the machine. But in a bearing or bearing seats, it provides a fit that is "all over" instead of only on a comparatively few high spots. This means that ball bearings do not become loose in service. Precision grinding produces a *closer* fit, to more exacting tolerances, which means that fits are uniformly good, and that true interchangeability is obtained.

The extra accuracy obtained by precision grinding may be visualized when it is realized that the *ordinary* variation or tolerance on Delta arbors and spindles is three-ten-thousandths of an inch, and in many instances this tolerance is held to one ten-thousandth.

Before you buy any light machine tool, make sure all parts that vitally affect the accuracy and life of your machine, are *precision ground* to size!

DELTA MANUFACTURING COMPANY (Dept. A 141)
600-634 E. Vienna Ave., Milwaukee, Wis.

Gentlemen: Send me the latest Delta Catalog listing the complete line of Delta Lathes, Circular Saws, Band Saws, Jointers, Scroll Saws, Shapers, Sanders and Drill Presses. I enclose 10c (stamps or coin) for which please send me the new Delta Project Book No. 7.

Name.....

Address.....

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

Check here if you are a Delta user now.

Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

January, 1941

Vol. 75, No. 1

IN THIS ISSUE

The Miracle of U-235	1
Serving Uncle Sam for Twelve Months	8
At the Controls of an Airliner - Coloroto	
Secrets of the "Magic" Theater	27
Creating Sight Effects for Television	34
Low-Cost Homes Built to Last	40
Prospecting after Dark	46
Exploring a Frozen Continent	50
Foiling "Jail Breaks" at the Zoo	56
Tuning In on the Brain Waves	62
Crashing Cars for Safety	66
Modernizing Our Coast Defense	72
Nothing's Too Big for the Super-Movers	82
Arctic Testing the Big Bombers	88
Looking for Next to Nothing	92

(Continued on next page)

Jobs from Research

FIFTEEN million Americans today have jobs that didn't exist in 1900. The decade since 1929 has brought streamline trains, synthetic vitamins, transoceanic air service, colored home movies, polarized glass, fluorescent lighting, synthetic hosiery and rubber, new plastics, plywood stronger than steel, television, sulfanilamide and many other entirely new products. Research has enabled industry to develop these, and make them at a price in reach of the people. Everett S. Lee of the General Electric engineering laboratory tells next month of the jobs research is creating.

Uncle Sam's School for Sailors

IT TAKES brains to be a sailor, to hold down a job on a \$50,000,000 battleship and run its intricate machinery and electric control and firing gear. The raw recruit has a lot to learn. The February Coloroto section, with its eight pages of color pictures, puts you through the two-months starting course at a U. S. Naval Training Station.

Next Month

TWELVE years ago the phonograph was dead as the dodo. Just then the first radio-phonograph unit appeared on the market at \$750; the same combination, vastly improved, can be had today for \$50. Radio, which killed the phonograph, has brought it back alive. With a recording unit you can store away children's voices, make sound accompaniments for home movies, record music and historical speeches coming in on the radio. Read "The Talking Machine Comes Back," in February.

Wingless War Birds

SWARMS of armed helicopters hover over an arsenal like a cloud of mosquitoes, waiting to fight off enemy bombers. Whirling blades lift an autogiro vertically from a forty-foot square on the deck of a merchant ship to watch for submarine or plane. These are the "War Birds Without Wings" described in an article next month—fighting aircraft that can go on sentry and convoy and reconnaissance duty, standing still in the sky, landing "on a dime."

Paul Bunyan's Pond

WATER is piling up back of Grand Coulee dam. Come the spring floods, it will be 340 feet deep, submerging cascades, forests and townsites. Uncle Sam is feverishly moving 5,000 townfolk and farmers, their stock, their fences, thirty-five miles of railroad, millions of feet of timber beyond reach of the rising lake. Read the story in February.

Published monthly by POPULAR MECHANICS COMPANY, 200 East Ontario Street, Chicago, U. S. A. Single copy in the United States, 25 cents; subscription rates in United States and possessions, and countries of the Pan-American Postal Union including Spain, \$2.50 a year, \$4.00 for two years, \$5.00 for three years. Single copy in Canada, 30 cents; subscription rates, \$3.00 a year, \$5.00 for two years, \$6.50 for three years. To all other countries add \$1.00 a year over United States prices for overseas postage. Changes in address must be reported to us immediately to eliminate delay. Entered as Second Class Matter, Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at the Post Office Department, Canada. Copyright 1940, by Popular Mechanics Company, in the United States, Australia, and France. Printed in the U. S. A.

You are Entitled to Know.

NOTE: Last month we told automobile owners how Pyroil protects their investment. How Pyroil safeguards the upper engine area, inducing better engine performance and longer useful engine life. Now, read about Pyroil's beneficial action in the lower engine area. Why Pyroil is needed today more than ever. How it can cut your car expenses.



PYROILO PROTECTS ENGINES

Better lubrication and reduced wear result from the use of Pyroil.

The beneficial action of Pyroil can best be understood when the particular problems of lubricating a modern engine are understood. Changes in automotive engineering have had important effects on lubrication requirements.

IMPORTANT FACTORS IN ENGINE DESIGN

One of the most significant changes in automobile engine construction is the reduction in clearances—much closer fitting—in bearings and in cylinders. With this has come a tremendous improvement in the smoothness of the finished surfaces.

This has had the effect of eliminating the necessity of breaking in a new motor by wearing the parts into a close fit. In fact, break-in of the wear-in type is totally undesirable. It destroys the accurate fit of the parts. Another change is the introduction of new alloy metals. Certain of these alloys are subject to severe corrosive attack, and require protection against acid-corrosion in order to give long service.

CHANGES IN LUBRICATION REQUIREMENTS

In many cases, properties in a lubricant which previously were looked upon merely as desirable have become absolutely essential. Tests prove the merit of Pyroil beyond question. Its unique acid-corrosion preventive ingredient gives it valuable properties. A survey will show how fully the properties of Pyroil are adapted to proper automotive lubrication.

HOW TO USE PYROILO—WHAT IT DOES

Merely use a few ounces of Pyroil in the crankcase and also in the gasoline tank. Any service station or garage can supply it. It goes right to work. It prevents acid-corrosive substances from attacking bearings, pistons and other parts. It reduces friction. *Makes starting easier in cold weather.* Reduces wear. Removes hard carbon, gum and sludge.

These benefits induce better engine operation and longer useful engine life. They offset many repairs, saving expense. Drive into a service station or garage—today—

and ask for an inexpensive Pyroil treatment. See what a difference Pyroil makes! Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 51 Pyroil Bldg., LaCrosse, Wisconsin, U. S. A.



ADD MERELY OUNCES TO GAS & OIL

DISTRIBUTORS:
CHECK AND MAIL
COUPON FOR FRANCHISE FACTS.

PYROILO COMPANY,
51 Pyroil Bldg., LaCrosse, Wisconsin.
 Please send me your Free Booklet, "Questions and Answers about the efficiency of Pyroil. Also other facts."
 Send Details of your plan for Distributors.
 Name.....
 Address.....
 City or town.....State.....

(Contents—Continued)

AUTOMOTIVE

Rearview mirror has space for keeping records.....	33
Army scout car has roller bumper.....	39
Giant-size spotlight for trucks.....	48
Safe auto driving begins at forty.....	48
Cardboard dummy helps design auto comfort.....	49
Cleaning brush and pliers for battery.....	60
Lights on car aid in speed control.....	60
Steering clamp keeps wheels aligned for towing.....	61
"Swamp buggy" defies snowdrift or bog.....	65
Oil under air pressure flushes crankcase.....	71
Lumber-handling truck on "stilts".....	76
Hot pipe holder on steering column.....	80
Roll-chart in tester tells anti-freeze needed.....	91
Rearview mirror has clearance lamp in back.....	96

AVIATION

Catapult speed tested to insure safe takeoff.....	38
"Big Bertha" cameras help army map huge areas.....	45
Door forms steps for climbing into cabin.....	54
Practice bombs filled with sand.....	91
Warplane rides trailer on first trip.....	91

CONSTRUCTION

Mobile derrick on truck erects towers quickly.....	61
Ice beam tested as temporary bridge arch.....	70
"Light-well" for low windows keeps out water.....	87
Child's playhouse is built like a real home.....	90

FARMS

Power mower cuts acre on pint of gas.....	65
Paper netting protects lawn seed until sod forms.....	71
Plants immunize selves against disease.....	96

HOUSEHOLD

Plastic grill conceals kitchen ventilator fan.....	37
Anti-clog netting for roof gutters.....	43
Chart on tie-rack shows correct colors to wear.....	44
Shoe "trees" of flexible fiber.....	65
Gas furnace circulates humidified air.....	96

MODELS

Man's conquest of sea told in models.....	78
Forest sculptor chips figures with hand ax.....	86
Model plane drops parachutist when engine stops.....	87

RADIO AND ELECTRICITY

Shifting American radio channels to improve reception.....	70
"Electric brain" solves problems over long distance.....	86
Compact 10-watt super-fidelity amplifier.....	135
Beginner's two-tube a.c.-d.c. all-wave receiver.....	136
Combination crystal receiver and test set.....	138
Helpful radio hints.....	139
Children's growth recorded in phonograph album.....	140
Compact portable battery-operated aviation radio.....	140
Portable sound system for a.c. or d.c.....	140

SCIENCE AND INDUSTRY

Powdered blood plasma may save lives in war.....	39
Knotless pine boards from upside-down pruning.....	44
Natural gas liquefied for storage.....	64
Supply of TNT assured by "cracking" process.....	81

SPORTS

Outdoor barometer helps judge "fishing weather".....	33
Muscle stretcher limbers football players.....	43
Bicycle windshield is streamlined to cut wind.....	54
Football helmet of transparent plastic.....	61
Rescue sled for injured skiers.....	77
Curved skis for indoor use.....	80

TOOLS

Drill press oscillator bobs drum for sanding.....	38
Electric hoe for garden work.....	44
Adjustable miter has several uses.....	49

(Continued to page 8A)

**Do you really Want to
get ahead in business ?**



Then here is a valuable tip for you . . .

The problem of winning promotion—of achieving the better job and better pay—is not easy. Competition is keen and the demands are high. But it is much easier—simpler—if you understand one important fact.

Business and industry always need men and women who can take on larger responsibilities—give more valuable service. Those who step up into the bigger jobs are those who have an objective and definitely prepare for it—who not only give their best to today's job, but who also plan and prepare for the jobs on ahead and train themselves to meet the greater responsibilities of the bigger job.

Pick Some Growing Field and Prepare

If you really want to get ahead, pick some field of opportunity—either your present field or some other. Find out its opportunities, and its requirements—decide whether you are fitted for it—then get busy.

Train thoroughly for it. Make yourself expert in it. Then you can compel success.

For 32 years, LaSalle has been helping ambitious men and women prepare for advancement. Hundreds of thousands now in good jobs and on the way up to better ones, owe their success to LaSalle training.

Investigate—Then Decide

Out of that long and wide experience we have compiled a wealth of knowledge about various fields of business. That knowledge is freely at your disposal. Tell us—in a letter or in the coupon below—what you want to be. We will tell you—without cost or obligation—of the opportunities and requirements in that field. We will tell you also of our complete training program for that job. Then you can decide.

The coupon below lists a number of opportunity jobs. Check the one in which you are interested—or write in some other job on the blank line. Then mail the coupon today. It can be your first step toward the success you want.

LASALLE EXTENSION UNIVERSITY **A Correspondence Institution**

Department 164-R

Chicago, Illinois

I am interested in winning to the career I have checked below. Please send me the facts about the opportunities in that field and about your training for that job.

- Business Manager
- Industrial Manager
- Factory Superintendent
- Production Manager
- Foreman
- Inspector
- Certified Public Accountant
- Comptroller
- Chief Accountant
- Auditor

- Cost Accountant
- Statistician
- Bookkeeper
- Cashier
- Salesman
- Sales Manager
- Correspondence Supervisor
- Sales Correspondent
- Collection Correspondent

- Collection Manager
- Credit Manager
- Rate Clerk
- Shipping Clerk
- Traffic Manager
- Export Manager
- Legal Counsellor
- Office Manager
- Secretary

.....
(Any other)

Name Age

Occupation

Address

City State



There's **ALWAYS**
Fun with a **FILMO**



Movie Opportunity
No. 414



Don't envy the family with a Filmo—**BE ONE!** Filmo fun never "runs out"—never grows old. There is always something happening of which you want a moving picture—and you'll be proud to show the fine movies you make with a Filmo.

With the palm-size Filmo 8, it's easy and inexpensive to take fine movies. Just press the button, and *what you see, you get*, in black-and-white or full, natural color—even in slow motion! Newsreel-length scenes cost no more than snapshots.

Precision-built by the makers of Hollywood's professional movie equipment, Filmo 8 is a basic camera that meets present and future needs. See it at your dealer's. Start now on the most intriguing of hobbies. Bell & Howell Company, Chicago; New York; Hollywood; London. *Established 1907.*



Only a Filmo 8 Offers All These Features . . .

- A lifetime guarantee!
- "Drop-in" threading . . . no sprockets.
- Built-in mechanism for slow-motion and animated cartoon filming.
- Automatic sealed lubrication . . . no oiling.
- Adaptability to grow with your skill.

\$4950

Others to \$140

Makes Movies at Snapshot Cost

For those who prefer the 16 mm. movie camera, Filmo Auto Load, priced from \$115

MAIL COUPON FOR FREE MOVIE BOOKLET

BELL & HOWELL COMPANY

1844 Larchmont Ave., Chicago, Ill.

Send free, 16-page booklet telling all about () Filmo 8 mm. Movie Cameras; () new 16 mm. Filmo Auto Load.

Name

Address

City.....State.....PM 1-41

PRECISION-MADE BY

Bell & Howell

(Contents—Continued)

Chalk-line reel applies chalk automatically.....	55
Pump operates rams to straighten bent fenders.....	77
Hole cutter for sheet metal fits drill.....	95

WAR

Knight's visor guards soldier from splinters.....	5
Model dive bomber trains aim of riflemen.....	15
Armored car patrols British factory.....	55
Anti-blast netting and mattresses guard riders.....	64
U. S. plans 70,000 miles of military highways.....	76
Goal posts train recruits in throwing hand grenades.....	95

MISCELLANEOUS

Reflector buttons on a chain form letters of sign....	5
Wire fence keeps rocks off mountain road.....	33
Buttons with removable centers.....	37
Worker's passport photo card.....	39
G-men fire tracer bullets in exhibition.....	48
Vest-pocket rubber-stamp pad.....	54
Waterproof plastic glue hardens quickly.....	54
Robot gives correct time to phone callers.....	60
Sleeve thermometer for outdoor sportsmen.....	61
Spring wire cigarette holder retains hot ash.....	64
Postcard-size duplicator prints with stencil.....	71
Boat driven by air screw causes no waves.....	76
Wood stamp pad stays free from lint.....	77
"Hot-spot detector" locates flames in wall.....	80
"Fairyland" ice palace features winter carnival.....	81
Ice-cream scoop makes mold to fit cone.....	96

Craftsman and Shop Notes

AUTOMOTIVE

Auto shortcuts.....	157
Celluloid protects work card when filling it out.....	158
Holder for car-wheel nuts.....	158
Removing battery cells from case.....	158
Simple reminder that brakes are set.....	158
Adhesive tape eliminates sticking of window glass.....	159
Freezing of door lock avoided by shield.....	159
Gas-cap cover has lock for protection.....	159
Removing push rods with electromagnet.....	159
Sawhorse made from old car springs.....	159
Departments of public garage indicated by arrows.....	160
Helpful hints for washing the car.....	160

FARM

Garden rake aids in pruning trees.....	124
Mailbox pivots out of way of snowplow.....	124
Non-slip chock keeps tractor belt tight.....	143
Barbed-wire reels made easy to unroll.....	144
Hose holds cream-test report on can.....	146
Dump manger to feed small animals.....	153
Notched plowshare cuts deep roots.....	154

HAND TOOLS

Thickness gauge for model-ship hulls.....	103
Blacksmith's tongs bent from rod.....	108
Nail set starts small drills.....	108
Universal clamps that save time for model makers.....	118
Tool kit buttons on ladder.....	154
Tool permits better work with offset screwdriver.....	154
Combination nail set and holder.....	156

HOME IMPROVEMENTS

Music box announces guests at your door.....	97
Operating smoke pipe from front of furnace.....	98
Built-in doormat keeps porch floor clean.....	112
Dome light in riser illuminates porch steps.....	113
Gas meter read through window in wall.....	128

HOUSEHOLD

Solving home problems.....	100
Towel rack with disappearing hangers.....	103
Hairpins help in stringing Christmas-tree lights.....	108
Simple device keeps books upright in case.....	112
Eliminating dust from ashes in the basement.....	113
Kerosene stove cleaned quickly with tire pump.....	114
Hand firing economically.....	119

(Continued to page 12A)

what will you be doing



MAN, there's no sense in drifting along at the same old dull, drab job! You've got one life — that's all. What you make of it is your business — but if you want to make a success of it, it's time to get going!

Listen. Some of the biggest men in this country were in your shoes once. But they knew one thing! They knew that it takes training—TRAINING—to succeed in this

world! And they got that training through the I. C. S.!

100,000 ambitious men are enrolled with the International Correspondence Schools right now. They're going places! They're getting sound, essential TRAINING by a method based on up-to-date textbooks, personal instruction, and sound vocational guidance. Here's the coupon they mailed!

INTERNATIONAL CORRESPONDENCE SCHOOLS

CELEBRATE 50 YEARS OF SERVICE TO AMBITIOUS AMERICANS

1891 * 1941

BOX 5592-J, SCRANTON, PENNA.

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

TECHNICAL AND INDUSTRIAL COURSES

- | | | | | |
|---|---|---|---|---|
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Air Brake | <input type="checkbox"/> Cotton Manufacturing | <input type="checkbox"/> Mfg. of Pulp and Paper | <input type="checkbox"/> R. R. Section Foreman |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Electrical Drafting | <input type="checkbox"/> Marine Engines | <input type="checkbox"/> R. R. Signalmen's <input type="checkbox"/> Refrigeration |
| <input type="checkbox"/> Architectural Drafting | <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Mechanical Drafting | <input type="checkbox"/> Sanitary Engineering |
| <input type="checkbox"/> Auto Engine Tune-up | <input type="checkbox"/> Fire Bosses | <input type="checkbox"/> Foundry Work | <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Sheet Metal Work |
| <input type="checkbox"/> Auto Technician | <input type="checkbox"/> Fruit Growing <input type="checkbox"/> Heating | <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Mine Foreman | <input type="checkbox"/> Steam Electric <input type="checkbox"/> Steam Engines |
| <input type="checkbox"/> Aviation <input type="checkbox"/> Boilermaking | <input type="checkbox"/> Highway Engineering | <input type="checkbox"/> House Planning | <input type="checkbox"/> Navigation | <input type="checkbox"/> Steam Fitting |
| <input type="checkbox"/> Bridge Engineering | <input type="checkbox"/> Locomotive Engineer | <input type="checkbox"/> Machinist | <input type="checkbox"/> Patternmaking | <input type="checkbox"/> Structural Drafting |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Pharmacy <input type="checkbox"/> Plumbing | <input type="checkbox"/> Poultry Farming | <input type="checkbox"/> Structural Engineering |
| <input type="checkbox"/> Chemistry | <input type="checkbox"/> College Preparatory | <input type="checkbox"/> Practical Telephony | <input type="checkbox"/> Public Works Engineering | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> Commercial | <input type="checkbox"/> Radio, General | <input type="checkbox"/> Radio Operating | <input type="checkbox"/> Telegraph Engineering |
| <input type="checkbox"/> Coal Mining | <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> Radio Servicing | <input type="checkbox"/> Managing Men at Work | <input type="checkbox"/> Textile Designing |
| <input type="checkbox"/> Concrete Engineering | <input type="checkbox"/> C. P. Accounting | | | <input type="checkbox"/> Toolmaking |
| <input type="checkbox"/> Contracting and Building | <input type="checkbox"/> First Year College | | | <input type="checkbox"/> Welding, Electric and Gas |
| | | | | <input type="checkbox"/> Woolen Manufacturing |

BUSINESS COURSES

- | | | | |
|--|--|--|--|
| <input type="checkbox"/> Accounting | <input type="checkbox"/> Advertising | <input type="checkbox"/> Foremanship | <input type="checkbox"/> Railway Postal Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> College Preparatory | <input type="checkbox"/> French <input type="checkbox"/> Grade School | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> Commercial | <input type="checkbox"/> High School <input type="checkbox"/> Illustrating | <input type="checkbox"/> Secretarial |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> Lettering Show Cards | <input type="checkbox"/> Sign Lettering <input type="checkbox"/> Spanish |
| <input type="checkbox"/> Cartooning <input type="checkbox"/> Civil Service | <input type="checkbox"/> C. P. Accounting | <input type="checkbox"/> Managing Men at Work | <input type="checkbox"/> Traffic Management |

HOME ECONOMICS COURSES

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

Name..... Age..... Address.....
 City..... State..... Present Position.....

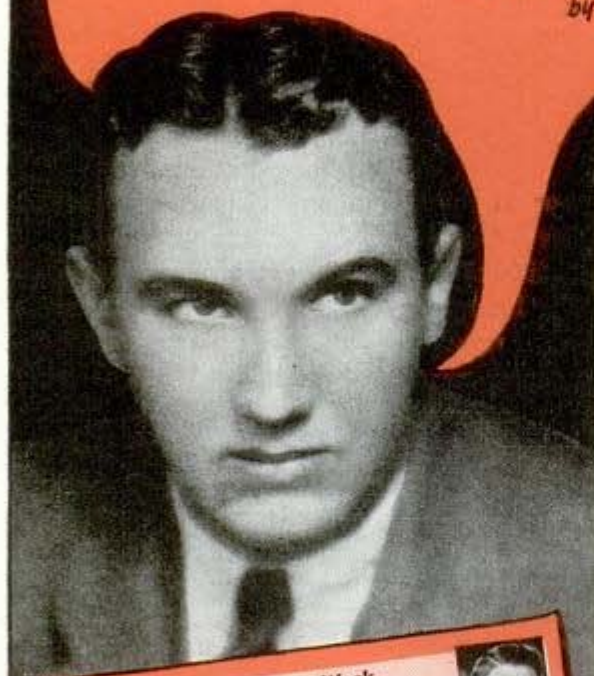
Canadian residents send coupon to International Correspondence Schools Canadian, Limited, Montreal, Canada
 British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England

I Jumped from \$18 a week to \$50

--A FREE BOOK STARTED ME TOWARD THIS

Good Pay in Radio

--- HERE'S HOW IT HAPPENED
by S.J.E. (NAME AND ADDRESS SENT UPON REQUEST)



"When I finished training I accepted a job as Radio serviceman. In three weeks I was made service manager at \$40 to \$50 a week, more than twice my shoe factory pay."

Be a RADIO

Find out How I Train

If you can't see a future in your present job, feel you'll never make much more money; if you're in a seasonal field, subject to lay offs, IT'S TIME NOW to investigate Radio. Well trained Radio Technicians make good money, and you don't have to give up your present job or leave home to learn Radio. I train you at home nights in your spare time.

Why Many Radio Technicians Make \$30, \$40, \$50 a Week

Radio broadcasting stations employ operators, technicians. Radio manufacturers employ testers, inspectors, servicemen in good-pay jobs. Radio jobbers, dealers, employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make \$30, \$40, \$50 a week. Others hold their regular jobs and make \$5 to \$10 a week fixing Radios in spare time. Automobile, Police, Aviation, Commercial Radio; Loudspeaker Systems, Electronic Devices are other fields offering opportunities for which N.R.L. gives the required knowledge of Radio. Television and Frequency Modulation promise to open good jobs soon.

Many Make \$5 to \$10 a Week Extra in Spare Time While Learning

The day you enroll, I start sending you Extra Money Job

Makes \$50 to \$60 a Week

"I am making between \$50 and \$60 a week after all expenses are paid, and I am getting all the Radio work I can take care of, thanks to N. R. I."

H. W. SPANGLER
126 1/2 S. Gay St., Knoxville, Tenn.



Operator in Broadcasting Station

"I was chief engineer of KFPW, Fort Smith, Ark., for over seven years, which position I resigned to become transmitter operator of KGKO, Fort Worth, Tex., where I am now employed."

WILLARD DOAN
496 W. First St., Arlington, Texas.



\$15 a Week Extra in Spare Time

"I am doing spare time Radio work, and I am averaging from \$700 to \$850 a year. Those extra dollars mean so much—the difference between just barely getting by and living comfortably."

JOHN WASHKO
37 New Cranberry, Hazleton, Penna.

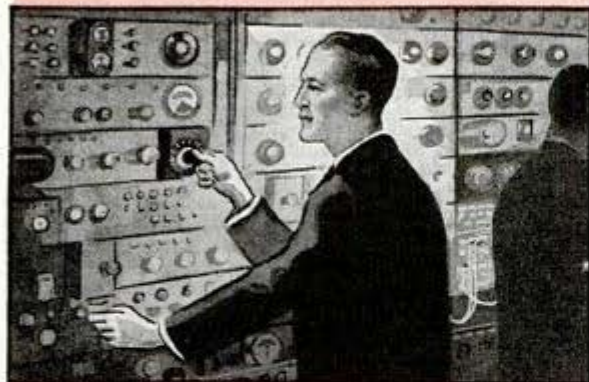




"I had an \$18 a week job in a shoe factory." He'd probably be there today if he hadn't read about the opportunities in Radio and started training at home for them.



"The training National Radio Institute gave me was so practical I was soon ready to make \$5 to \$10 a week in spare time servicing Radio sets."



"Eight months later N. R. I. Graduate Service Department sent me to Station KWCR where I became Radio Operator. Now I am Radio Engineer at Station WSUI and connected with Television Station W9XK."



"The N. R. I. Course took me out of a low-pay shoe factory job and put me into Radio at good pay. Radio has enjoyed a colorful past. It will enjoy an even greater future."

Technician You at Home



J. E. SMITH, President
National Radio Institute
Established 25 Years

He has directed the training of more men for the Radio Industry than anyone else.



Sheets—start showing you how to do Radio repair jobs. Throughout your Course I send plans and directions which have helped many make \$5 to \$10 a week extra in spare time while learning. I send special Radio equipment to conduct experiments and build circuits. This 50-50 training method makes learning at home interesting, fascinating, practical. **YOU ALSO GET A MODERN, PROFESSIONAL ALL-WAVE, ALL-PURPOSE, SET SERVICING INSTRUMENT** to help you make money fixing Radios while learning and equip you for full time work after you graduate.

Find Out What Radio, Television Offer You

Act Today! Mail the coupon for my 64-page book, "Rich Rewards in Radio." It points out Radio's spare time and full time opportunities and those coming in Television; tells about my Course in Radio and Television; shows more than 100 letters from men I have trained, telling what they are doing and earning. Read my money back agreement. **MAIL COUPON** in an envelope or paste on a penny postcard—NOW!

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

MAIL THIS NOW
Get 64 Page Book **Free**

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

Dear Mr. Smith: Mail me **FREE** without obligation, your 64-page book "Rich Rewards in Radio." (No salesman will call. Write plainly.)

Age.....

Name.....

Address.....

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

Meet some fellows who DID SOMETHING about Aviation Opportunities

PHILIP SHOEMAKER
Aeronautical Engineering graduate now in the engineering department of one of the world's largest manufacturers of transports.



JOHN HALDEMAN
Aircraft Mechanics graduate now helping build huge flying boats used by famous trans-oceanic airlines.



GEORGE KOZELISKY
Aircraft Mechanics graduate in a production division of aircraft plant building a swift new transport.



EARL TURNER
Aircraft Mechanics graduate now with holder of famous attack plane and other military aircraft.



... now they are
helping build
America's Planes

Not long ago these young men were *outside* Aviation—as you are now. They saw the big things happening in Aviation... saw the great future ahead for the industry... and for themselves... and today are *inside* Aviation.

These four men are typical of over 750 Aero ITI-trained mechanics and engineers who entered Aviation in the last year. Aero ITI training has won hundreds of men a start in Aviation... has brought them rapid advancement. Find out how Aero ITI training may be profitable to you, too. There is a course to meet your special needs and circumstances. For details, send the coupon NOW.



AERO INDUSTRIES TECHNICAL INSTITUTE

5253 W. SAN FERNANDO ROAD LOS ANGELES, CALIFORNIA
Five Courses in AIRCRAFT MECHANICS and AERONAUTICAL ENGINEERING—Including 12 Months Aircraft Mechanics Course Approved by U. S. Civil Aeronautics Board

EXECUTIVE BOARD

ROBERT E. GROSS

President Lockheed Aircraft Corporation

JOHN K. NORTHROP

President Northrop Aircraft, Inc.

C. A. VAN DUSEN
Vice-Pres., Consolidated Aircraft Corporation

Aero Industries Technical Institute, 5253 W. San Fernando Rd., Los Angeles

Please send information on Aero ITI training for Aviation careers. I am interested in the following branch of Aviation: Aircraft Mechanics; Aeronautical Engineering; Undecided. Years High School: 1, 2, 3, 4. Years College (Liberal Arts): 1, 2, 3, 4. Years Engineering College: 1, 2, 3, 4.

Name _____ Age _____

Address _____

City _____ State _____ a-25-P

(Contents—Continued)

Rack to increase capacity of clothesline.....	124
Installing illuminated wreath outside door.....	129

METALWORKING

Animated weather vanes that sell.....	123
Christmas decorations in metal.....	125
Wood strip aids in grooving metal.....	128
Shortcuts in using battery welding outfits.....	143
Inexpensive molds for casting metal novelties.....	145

OFFICE

Simple repair for compass.....	99
Hair clip holds end of tape in place.....	108
Holder for cellulose tape.....	114
Cable compass to draw spirals.....	155

PHOTOGRAPHY

Snow pictures brought to life with shadows.....	130
Envelope moistener for local control of prints.....	134
Number of camera plate holder exposed on film.....	134

POWER TOOLS

Drill press used as clamp for glue jobs.....	118
Repairing iron pulley.....	146
Make your own milling cutters and accessories.....	147

STORE AND SHOP

Basket handle slotted to hold delivery slip.....	144
Improvised boiler-flue scraper.....	144
Illuminated shelf shows beauty of glassware.....	145
Paper file from nail and hasp.....	146
Sponge-rubber strip on feed board aids printer.....	146
Keeping metal sheets stacked neatly.....	153
Tumbler serves as "spotting table".....	153
Lathe setup to machine collars.....	156

WOODWORKING

Eccentric vise saves time for woodworker.....	102
Bachelor chests in knotty pine.....	104
Curing green wood to prevent end cracking.....	114
16th century X-chair enhances the hallway.....	115
Sealing wax aids in driving tacks.....	122

MISCELLANEOUS

How to make fireproof cement.....	99
Wheels for models turned on a lathe.....	99
Novel fence ornament.....	102
Windmill keeps lake at constant level.....	102
Rubber shield to prevent padlock from freezing.....	107
Thumbtacks pulled with can lid.....	108
One-piece hand bags of canvas.....	109
Lessening fire hazard of Christmas trees.....	110
Attaching vacuum cups permanently.....	112
Repairing worn plug threads.....	112
Combination hook and bail for paint bucket.....	114
Heel clips protect soles of skate shoes.....	114
Cuts for school paper cast on chalk plates.....	117
Nails "driven" with a C-clamp.....	117
Valve in bung to vent steel drums.....	118
Keeping trouser legs over tops of overshoes.....	124
Paper clamp holds lunch bag on locker door.....	124
Fingernail polish cements brush bristles.....	128
Winter protection for evergreen trees.....	128
Economical feeder for birds.....	129
Turning and polishing plastic balls.....	141
Chuck serves as a vise.....	142
Utilizing radiated heat from steel smokestack.....	144
V-belts provide cleats for catwalks.....	144
Fertilizer for potted plants.....	145
Rubber pads keep goggles clean.....	146
Toothpicks serve as wedges when rewinding motors.....	153
Detachable bar for doorways saves janitor's time.....	154
Signal flags kept rolled with rubber bands.....	156
Workman's weight makes stone drill cut fast.....	156

IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.

Not Expensive to Learn SCIENTIFIC CRIME DETECTION

*The Steady Pay Profession
Good Times—or Bad*

FINGER PRINTING
*
FIREARMS
IDENTIFICATION
*
POLICE
PHOTOGRAPHY
*
SECRET SERVICE
METHODS



I TRAINED
THE MEN
WHO THEN
GOT THESE
BIG JOBS



"I will teach you Finger Print Identification—Firearms Identification—Police Photography—and Secret Service!" That's what I told the men who now handle the good jobs listed in the column at the right.

And now I repeat, but THIS time it's to YOU . . . "I will teach you Finger Print Identification—Firearms Identification—Police Photography—Secret Service." Just give me a chance and I'll train you to fill an important position in the fascinating field of scientific crime detection.

GET IN NOW!

But don't be misled. Scientific crime detection is not as simple as it might appear. It's not an occupation at which anyone without training might succeed. It's a science—a real science, which when mastered THROUGH TRAINING gives you something no one can EVER take from you. As long as you live—you should be a trained expert—able to make good in scientific crime detection. I teach you the real science so that you should be competent to do the work of a thoroughly trained employee in a bureau of identification.

LOOK AT THE RECORD!

Right now 47% of ALL Identification Bureaus in the United States are headed by our students and graduates. They have regular jobs—regular salaries—often collect reward money besides—and many of these men knew absolutely nothing about this work before they began their training with me.

Students or graduates of mine have complete charge of the Bureaus of Identification in the following states and cities—and, they are only a few of many!

State Bureau of Delaware
State Bureau of Florida
State Bureau of Maine
State Bureau of Michigan
State Bureau of New Mexico
State Bureau of Rhode Island
State Bureau of South Carolina
State Bureau of Texas
State Bureau of Utah
Lincoln, Nebraska
Concord, N. H.
Albany, N. Y.
Trenton, N. J.
Canton, Ohio
Tulsa, Okla.
Mobile, Ala.
Phoenix, Ariz.
Los Angeles, Calif.
Seattle, Wash.
Madison, Wis.
Miami, Florida
Leavenworth, Kas.
Annapolis, Md.
Duluth, Minn.
Vicksburg, Miss.
Hartford, Conn.
San Juan, Porto Rico
Ketchikan, Alaska
Honolulu, Hawaii

Remember!—these are only a few of many! 47% of ALL Identification Bureaus in America are run by my students or graduates. Furthermore, I'll gladly send you a list of over 600 city and state institutions in which one or more of my graduates were placed as finger print experts!

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 1351 Chicago, Ill.

MAN IN UNCERTAIN LOW PAY JOB



BECOMES HEAD OF BUREAU OF IDENTIFICATION



FREE! Blue Book of CRIME

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 1351, Chicago

Gentlemen: Without any obligation on my part, send me the "Blue Book of Crime," and complete list of bureaus employing your graduates, together with your low prices and Easy Terms Offer. (Literature will be sent ONLY to persons stating their age.)

Name

Address

..... Age

This book takes you right behind the scenes where crime and science come to grips. It's full of exciting information on scientific crime detection, including fascinating real case histories! It will show YOU how YOU, at a cost so low you shouldn't even think of it, can get started in this big important work without delay. Don't wait. Clip the coupon... send it NOW!

Inventors

FIND OUT HOW WE HELP YOU

**PATENT AND MARKET
YOUR INVENTION**

Mail Coupon for Free **PATENT GUIDE**
and **RECORD OF INVENTION** *form*

Is There a Formula for Success in Inventing?

Approximately forty thousand Patents and Patents Pending are sold, transferred, assigned or licensed every year, according to a recent survey of the Patent Office. When forty thousand such transactions take place yearly, each presumably resulting in profit or benefit to the inventor, there must be some formula to adopt for success in inventing—some procedure to follow. Here it is.

1. A good invention, simple or complex, but new and useful. 2. A good Patent Application, skillfully prepared by an experienced, registered Patent Attorney. 3. A vigorous sales campaign directed to manufacturers who should logically be interested.

Get Started on the Right Track

It is easy to follow this successful procedure under

We Give Special Attention to MILITARY Inventions

Due to the essential nature of inventions which might be considered of value to the National Defense, we are giving special attention to such matters, even to the extent of assisting in submitting your invention to the proper authorities.

our guidance and with our assistance. But it is just as easy to lose out entirely if you waste time or "experiment" with short-cuts and unapproved methods. The Patent Office advises you to engage a *competent registered patent attorney*. Patent Office rule 17 states "*the value of patents depends upon the skillful preparation of the specifications and claims.*" We have served many thousands of inventors during the past twenty years and maintain a staff of forty five experienced people here to serve you—including trained staff attorneys, expert draftsmen and competent searchers.

Simple Articles and Improvements Often Highly Profitable

Many successful inventions are relatively simple devices. Patents such as those covering the zipper, safety pin, paper clip, thumb-tack, and other small inexpensive items paid their inventors well. Improvements in machinery, articles, designs, formulas already in use, or in their manufacturing methods, are patentable if new and original, and offer a large field of opportunity for inventors.

Prompt Action Is Important

The man smart enough to be an inventor is usually smart enough to know that if he has a good idea somebody else may have nearly the same idea. Hence, inventors who want to be certain of receiv-

If you have an invention, or a good idea for one, you may profit by reading our "Patent Guide" and making a sketch and description on our "Record of Invention" form. Both are sent free. Mail the Coupon.



Act Now!

ing protection for their inventions, if patentable, act promptly in filing their Patent Applications.

This is good advice for you. Get your free copy of our "Patent Guide for the Inventor." Learn what to do, and then do it. Get your "Record of Invention" form so you can make a full disclosure of your invention, including sketch and description, and thereby establish in legal fashion evidence upon which your right to the invention may depend in the future. Remember—time is money. If you do this NOW it may not only save you trouble later on—it may be your first important step toward success.

48-Page Book of Facts Sent Free

Get straight-forward answers to these important questions: What to do first? What is a search? What goes into a patent application? What does patent pending mean? When can I sell? Can I make partial payments? How can I take in a financial backer or partner? These and many other questions are answered in our "Patent Guide." Get your Free copy now. Mail the coupon below, or send your name and address on a penny postcard. We will rush it to you by SPECIAL HANDLING.

CLARENCE A. O'BRIEN
 REGISTERED PATENT ATTORNEY
 WASHINGTON, D. C.

MAIL COUPON *Now*

CLARENCE A. O'BRIEN
 Registered Patent Attorney
 Dept. 1A1, Adams Building, Washington, D. C.

Please send me your 48-Page "Patent Guide" and your specially prepared "Record of Invention" form FREE. This request does not obligate me.

Name.....

Address.....

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

(Please write or print plainly)

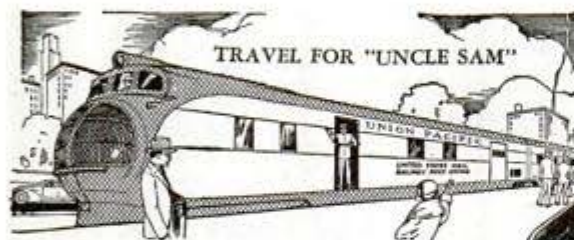


Start \$1260 to \$2100 a Year
 (\$105.00 TO \$175.00 MONTH)

Get Ready Now for Examinations

Railway Postal Clerks

Railway Postal Clerks get \$1,900 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,300 and \$2,450 in large organizations. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.) Men 18 to 35.



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 portion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100. Open to Men—Women 18 to 48.

Many Other Positions

Many other positions are obtainable. Rural Carriers—Stenographers—Typists—Assistant Statistical Clerks—Accountants—Messengers—Office Machine Operators—etc. Those wishing these positions should qualify at once.

Get Free List of Positions

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

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. L173, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "U. S. Government Positions and How to Get Them"; (3) List of U. S. Government Jobs; (4) Tell me how to qualify for one of these jobs.

Name.....

Address.....

Use This Coupon Before You Mislay It. Write or Print Plainly.

NEW YORK ELECTRICAL SCHOOL

Established 1902

FOR MEN 16 to 60

The unique school—known the world over for its distinctive method of combining "Why & How"—theory with all electrical-trades practices.

Free descriptive booklet

NEW YORK ELECTRICAL SCHOOL
 44 West 17th St. New York City



Thomas E. Lattin
 President

I WANT TO TRAIN YOU For A Big-Paying Job IN THE MEAT BUSINESS

I have trained hundreds of men like you to become expert Meat Cutters. Good pay. Steady jobs everywhere. Government figures show over 50,000 new meat markets. My school offers you quick, short, intensive training. Actual practice in big cutting rooms and retail department. Union card FREE. Pay after graduation. Valuable employment service. Write me today for my big FREE catalog and all details.

National School of Meat Cutting, Inc., Dept. U-14, Toledo, Ohio.

AVIATION
DRAFTSMEN NEEDED by makers of planes, motors, equipment. Good pay. Special Aviation Drafting course trains you QUICKLY at home in spare time. FREE Bulletin. No obligation. Address American School, Dept. A-145, Drexel at 58th, Chicago

TRI-STATE COLLEGE
 B. S. Degree in 2 1/4 Years
 World famous for technical 2 1/4-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering, Business Administration and Accounting. Special preparatory department for those who lack required high school work. Short diploma courses (36 weeks) in Surveying, Drafting. Low tuition. Low living costs. Students from every state and many foreign countries. 57th year. Graduates successful. Enter January, March, June, September. Write for catalog. 411 College Ave., ANGOLA, IND.

Learn AUTO-DIESELS

Practical, tested training. Backed by 35 years experience. Course includes Auto Mechanics, Diesel Service and Operation, Diesel Power Generation, Machine Shop Practice, Auto Electric, etc. Flexible plan to meet specific needs of those with or without jobs. Oldest, largest trade school in West qualifies you and helps you get a good pay job. Transportation allowed to L. A. Earn room and board while learning. Request Free Catalog.

NATIONAL SCHOOLS Dept. PMA-1 Los Angeles

Correspondence Courses in **RADIO and ELECTRICAL ENGINEERING** LOW AS \$25

ELECTRICAL ENGINEERING. Get good grasp of wide electrical field. Modern. Very understandable. Theory made easy.
RADIO ENGINEERING. Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Tuition ONLY \$25, either course. Deferred payment plan. Experiment kits furnished.
 Write for free copies of school catalogs, student magazines, etc.
FREE LINCOLN ENGINEERING SCHOOL, Box 931-P25, Lincoln, Nebr.

FREE! \$6.00 Full Size FOOD & HOUSEHOLD PRODUCT ASST.

SEND NO MONEY! Rush name and address for big Assortment of FOODS, GROCERIES, SOAPS, ETC.—full size packages, worth \$6.00. Yours ABSOLUTELY FREE! Show these products to friends, neighbors. Take orders for sensational values, more than 200 quality products used in every home. Earn big profits, full or spare time. No experience necessary. Write for FREE \$6.00 Assortment of Products NOW. ZANOL, 3627 Monmouth, Cincinnati, Ohio.

IS YOUR FUTURE BLURRED?

No ONE can prophesy the future, and be 100% accurate. But there *are* men — thousands of them — who can say:

"I'm going places! Five years from now, I'll have a better job. I'll be making more money. I'll own a home of my own, and drive a good car. I'll be a *successful man* — because I. C. S. is helping me to become a *trained man!*"

How about your own future? Is it blurred — by lack of the sound training that leads to advancement and prosperity? If it is, *bring your future into focus right now!* Get information on the world-famous Schools that have fitted thousands of men for success in Business and Industry.

You'll be surprised, too, to learn how little it costs to complete an I. C. S. Course. Mail this coupon now!

INTERNATIONAL CORRESPONDENCE SCHOOLS

CELEBRATE 50 YEARS OF SERVICE TO AMBITIOUS AMERICANS

1891 * 1941

BOX 5593-J, SCRANTON, PENNA.

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

TECHNICAL AND INDUSTRIAL COURSES

- | | | | | |
|---|---|---|---|--|
| <input type="checkbox"/> Agriculture | <input type="checkbox"/> Air Brake | <input type="checkbox"/> Cotton Manufacturing | <input type="checkbox"/> Mfg. of Pulp and Paper | <input type="checkbox"/> R. R. Section Foreman |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Electrical Drafting | <input type="checkbox"/> Marine Engines | <input type="checkbox"/> R. R. Signalmen's |
| <input type="checkbox"/> Architectural Drafting | <input type="checkbox"/> Electrical Drafting | <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Mechanical Drafting | <input type="checkbox"/> Refrigeration |
| <input type="checkbox"/> Architecture | <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Fire Bosses | <input type="checkbox"/> Mine Foreman | <input type="checkbox"/> Sanitary Engineering |
| <input type="checkbox"/> Auto Engine Tune-up | <input type="checkbox"/> Foundry Work | <input type="checkbox"/> Fruit Growing | <input type="checkbox"/> Navigation | <input type="checkbox"/> Sheet Metal Work |
| <input type="checkbox"/> Auto Technician | <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Highway Engineering | <input type="checkbox"/> Patternmaking | <input type="checkbox"/> Steam Electric |
| <input type="checkbox"/> Aviation | <input type="checkbox"/> House Planning | <input type="checkbox"/> Locomotive Engineer | <input type="checkbox"/> Plumbing | <input type="checkbox"/> Steam Engines |
| <input type="checkbox"/> Boilermaking | <input type="checkbox"/> Machinist | <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Poultry Farming | <input type="checkbox"/> Steam Fitting |
| <input type="checkbox"/> Bridge Engineering | <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Pharmacy | <input type="checkbox"/> Practical Telephony | <input type="checkbox"/> Structural Drafting |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Radio, General | <input type="checkbox"/> Public Works Engineering | <input type="checkbox"/> Radio Operating | <input type="checkbox"/> Structural Engineering |
| <input type="checkbox"/> Chemistry | <input type="checkbox"/> Radio Servicing | <input type="checkbox"/> Radio Servicing | <input type="checkbox"/> Radio Servicing | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Civil Engineering | | | | <input type="checkbox"/> Telegraph Engineering |
| <input type="checkbox"/> Coal Mining | | | | <input type="checkbox"/> Textile Designing |
| <input type="checkbox"/> Concrete Engineering | | | | <input type="checkbox"/> Toolmaking |
| <input type="checkbox"/> Contracting and Building | | | | <input type="checkbox"/> Welding, Electric and Gas |
| | | | | <input type="checkbox"/> Woolen Manufacturing |

BUSINESS COURSES

- | | | | | |
|--|---|--|---|---|
| <input type="checkbox"/> Accounting | <input type="checkbox"/> Advertising | <input type="checkbox"/> College Preparatory | <input type="checkbox"/> Foremanship | <input type="checkbox"/> Railway Postal Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Commercial | <input type="checkbox"/> Commercial | <input type="checkbox"/> French | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> C. P. Accounting | <input type="checkbox"/> High School | <input type="checkbox"/> Secretarial |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> C. P. Accounting | <input type="checkbox"/> First Year College | <input type="checkbox"/> Illustrating | <input type="checkbox"/> Sign Lettering |
| <input type="checkbox"/> Cartooning | <input type="checkbox"/> Civil Service | <input type="checkbox"/> First Year College | <input type="checkbox"/> Lettering Show Cards | <input type="checkbox"/> Spanish |
| | | | <input type="checkbox"/> Managing Men at Work | <input type="checkbox"/> Traffic Management |

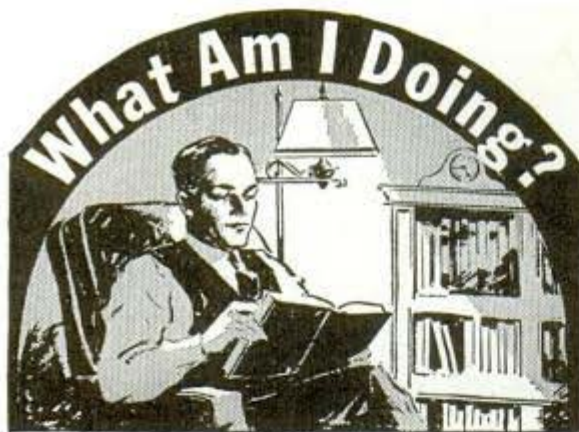
HOME ECONOMICS COURSES

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

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

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

Canadian residents send coupon to International Correspondence Schools Canadian, Limited, Montreal, Canada
British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England



I'm Getting Ready to Earn More ... Preparing for a Bigger Job

I am a student of the American School, Chicago. A little more than half way through my course—already my increased knowledge has brought me promotion as a result of the hour or so a day I have been spending getting acquainted with the principles of the work I enjoy. I use only part of my spare time, so it doesn't interfere with my home and social life, and certainly helps me on the job.

And I Like It, Too

I have been surprised at the practical manner in which even advanced work is explained. It is a lot easier than I had expected. I only wish I had started this plan of getting ahead a few years earlier. But when I was 18 to 20 I felt pretty sure of myself. I didn't take enough stock in what more experienced people told me about the importance of being thoroughly trained for the job I wanted.

Write Us—We'll TELL You What Line He Is Studying

There is ONE line of work today in which you can feel SURE of steady work, good pay and constant promotion as merited. Actual research shows that this field pays FAR BETTER wages than the average—has fewer lay-offs—offers an OPEN ROAD to really responsible positions.

Write for FREE details concerning this wonderful, established occupation; what it is, how to get into it, what BIG POSITIONS it leads to. Tell us your age, what work you are doing or have done, how far you went in school, and we'll RUSH the facts to you IMMEDIATELY. No obligation.



Promotion Begins at HOME

Pay raises depend largely on what you do in SPARE time. Make it pay you dividends!

American School, Dept. V-145, Drexel at 58th, Chicago

Gentlemen: Without obligating me in any way, tell me WHAT line of work you think offers MOST advantages today. Tell me how to get into it and describe your Selective Employment Service.

Name _____ Age _____

Address _____

City _____ State _____

Education _____
(Tell how far you went in school)

Occupation _____
(Tell us in what work you've had most experience)

Easy to Play

THE SMALLEST, LIGHTEST, FULL-VOLUMED 90 BASS ACCORDION EVER DESIGNED. IT'S THE NEW SOPRANI AMPLIPHONIC MIDGET

● Think of it! 34 treble, and 90 bass keys, beautiful tone, amazing volume. See and try this wonderful new Soprani at your dealer's, or write for FREE booklet.

FREE BOOK

SOPRANI, INC. Dept. 129
630 S. Wabash, Chicago, Ill.

AVIATION APPRENTICES

AIRMINDED YOUNG MEN INTERESTED IN TECHNICAL TRAINING FOR ENTERING THE WELL PAID FIELD OF AVIATION AS APPRENTICES—Write immediately, enclosing stamp.

MECHANIX UNIVERSAL AVIATION SERVICE CO.
Wayne County Airport, Box 857, Dept. E, Detroit, Mich.

ENGINEERING

DEGREE IN TWO YEARS

TECHNICAL AND APPLIED COURSES. Nonessentials omitted. TIME AND MONEY SAVED. Degree 2 yrs., diploma 1 yr. Electrical, Mechanical, Architectural, Structural, Civil, Aeronautical, including Air Conditioning, Refrigeration, Diesel, Interior courses, 3 and 4 months in Electricity, Power Plant, Diesel, Refrigeration, Drafting. Extensive shop equipment. LOW TUITION. Part-time work for room and board. Thousands successful graduates in U. S. and foreign lands. Approved by industry, endorsed by educators, recommended by alumni. One and two-year courses open Sept. 18 to Oct. 18, short courses start specified dates, beginning Sept. 18. 41st Year. No home study courses. Catalog free.

FINLAY ENGINEERING COLLEGE
1001 Indiana Ave., Kansas City, Mo.

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 and requirements.

Page-Davis School of Advertising
Dept. 1351, 3581 Mich. Av., Chicago

CARTOONING PAYS WELL

Exclusive instruction by an internationally known cartoonist makes it easy to learn at home. Write for Free booklet describing details of the course. State age.

NATIONAL SCHOOL OF CARTOONING
437 Penton Bldg. Cleveland, Ohio

PHOTO-ENGRAVING TASOPE SINCE 1931

FREE—a copy of the Tasope Magazine, monthly treasure chest of photographic and photo-engraving information. Learn why Aurora, Mo., is the photo-engraving, photographic center of America . . . how hundreds of amateurs, free-lance photographers are making money with pictures. No-obligation postcard brings your copy.

TASOPE, DEPT. PM-24, AURORA, MO.

MONEY for MEN ALL DATA FREE

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods and Novelties in Plastex and Marble imitation. Experience unnecessary. Lac material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. WE ARE NOW PLACING BIG CHAIN STORE ORDERS WITH MANUFACTURERS. Ambitious men have chance for real prosperity. Our FREE booklet will interest and benefit you. PLASTEX INDUSTRIES, Dept. P, 1085 Washington Ave., New York, N. Y.

Here I Am At WORK

Making
GOOD MONEY
thanks to this



DRAFTING

Yes, this free lesson **proved** that drafting is easy, mighty interesting work . . . convinced me I didn't need special talent to get into this well-paid profession . . . **proved** beyond a doubt that Drafting by the fascinating C. T. C. method can be mastered easily **AT HOME IN SPARE TIME.**

So I enrolled. Today I feel secure in my job. The National Preparedness program and rising business have increased the demand for Machine Draftsmen, Architectural Draftsmen, Electrical Draftsmen,

Structural Draftsmen and Aircraft Draftsmen. For draftsmen always come first on any new project in manufacturing and industry . . . and in those new Aviation, Diesel and Air Conditioning Plants, Draftsmen can't be replaced with machines! What's more, I'm slated for promotion—but if I wish, I can be independent . . . go into business.

Here's a tip: Mail the coupon or drop a card for the free trial lesson. Do this today—and drafting will take care of you tomorrow.



YOU GET THIS COMPLETE DRAWING OUTFIT

without a penny extra. These are quality instruments—the kind that professional draftsmen use. With them you can put your ideas on paper quickly and with accuracy. With training, you're all set to master draftsmanship in months—not years—at home, and you can use these very same instruments some day as draftsman.

CHICAGO TECHNICAL COLLEGE

A-202 Tech Bldg., 118 E. 26th Street, Chicago, Illinois

LEARN AT HOME IN SPARE TIME

A few hours of pleasant home study every week—that's all! No interference with your present job! With Chicago Tech's help, you train yourself step by step. This tested method—developed over 37 years of C. T. C. progress—will fit you for a job in months—just the kind of job you've wanted.

Get this: Terms are low. You can't honestly say "I can't afford it." There isn't a reason why you shouldn't mail us the coupon today. When you get your **FREE TRIAL LESSON**, you'll say, "I never knew learning could be so easy and enjoyable."

MAIL THIS COUPON

CHICAGO TECHNICAL COLLEGE
A-202 Tech Bldg., 118 E. 26th Street, Chicago.

Please send me **FREE Trial Lesson** in **DRAFTING** and show me how I can prepare for a good position in **spare time AT HOME.** No cost or obligation for this Trial Lesson either now or later.

Name _____ Age _____

Address _____

City _____ State _____



DRAFTING

BOOKS SENT FREE!

ON APPROVAL
5 VOLUMES—SECOND EDITION

For Beginners or Experts

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

Only 15 minutes a day with these WONDER BOOKS can prepare you for a good drafting job. 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 information on blue print reading for building and machine trades.

Big Field Big Demand Big Pay
Competent draftsmen are urgently needed in all building and manufacturing lines at \$50.00 to \$75.00 a week. That's just the beginning—FOR DRAFTSMEN HAVE GOOD CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for a set and see for yourself.

[A year's consulting service now given to all buyers of this famous cyclopedia of drafting]
Be prompt and we will include a brand new circular slide rule to carry in coat pocket. Invaluable in solving all kinds of engineering problems.

AMERICAN TECHNICAL SOCIETY
Publishers—Home Study Courses.

American Technical Society, Dept. D115, Drexel at 58th St., Chicago, Ill.
Send for 10 days' trial, 5 volumes set of drafting. I will pay the delivery charge only. If I wish, I may return books in 10 days and owe you nothing, but if I decide to keep them, I will send \$2.00 after 10 days, then only \$3.00 a month until \$24.50, the total price in cash. Send latest edition and include slide rule and consulting Service Certificate.]

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

PLUMBERS & STEAM FITTERS

Audels Plumbers and Steamfitters Guides



4 Vols. \$6

A practical, illustrated, Reference Library and Study-Course for Master Plumbers, Journeymen and Apprentice Steamfitters, Gas Fitters and Helpers, Sheet Metal Workers, Draughtsmen, Master Builders, Engineers and all Building Trade Students. This valuable set of handy, pocket-size Guides explains in practical concise language and well-done illustrations all the principles, advances and short cuts of the Plumbing and Heating trade—based on modern practice. Contains careful, detailed instructions on how to figure and estimate various jobs. Use FREE COUPON below to examine, without obligation, this valuable work.

INSIDE TRADE INFORMATION ON:

Soldering, tinning, Joint wiping, bending, heating. Pipe—iron—steel, threading. Mathematics, tables, physics. Materials—iron, steel, copper, brass, lead, tin, antimony, etc. Sheet metal—galvanized—plate. Sanitation, spygonage, tanks. Drainage, sewage, purification. Fixtures—bath—kitchen. Pipe fittings, soil pipe, tools. Laying out work. Roughing. Screwed fittings, flanges, joints. Pipe bending, examples. Elbows. Heating, ventilation, air conditioning, refrigeration. Water supply, mains, wells, tanks. Gas-fittings. Sheet metal work, problems, methods. Brazing, lancing, lead burning. Welding, various welds, methods. Blacksmithing, forges, tools. Air Conditioning.

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

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

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



When writing please mention Popular Mechanics

PARKS AIR COLLEGE

PARKS AIRPORT EAST ST. LOUIS, ILL.

Offers YOU COLLEGE and PROFESSIONAL TRAINING Majoring in AVIATION

Accredited by the Illinois Superintendent of Public Instruction, U.S. approved as a Commercial Ground and Flying School and Mechanics' School. Accredited by and cooperating with the United States Army Air Corps in giving flight and mechanical training. Open to high school graduates.

FOUR courses lead to B.S. degrees in Professional Piloting, Aviation Operations, Maintenance Engineering, Aeronautical Engineering. EIGHTEEN TRAINING PLANES are used in professional flight training which prepares graduates for airline flight operations. 75,000 hours flight training given, 3900 hours being flown monthly. FACULTY of 82 specialists in various fields of aviation. 1569 graduates. Enrollment limited to a total of 300 commercial aviation students. Total enrollment 560. 100-acre airport, 25 buildings devoted to school purposes exclusively. Dormitories and dining hall at the College. Winter Term January 6. Send postcard for new 64-page catalog.

14th YEAR Registrar, Dept. PM-1
PARKS AIR COLLEGE, East St. Louis, Ill.

RADIO-TELEVISION

Oldest, largest Radio-Television school in West trains you for good pay job. Complete instruction including Radio Construction and Service, Broadcast Operating, Sound, Talking Pictures, Television, Public Address, etc. Flexible plan to meet specific needs of those with or without jobs. Transportation allowed to L.A. Earn room and board while learning. Request Free Catalog.

NATIONAL SCHOOLS Dept. PMR-1
Los Angeles

ENGINEERING DEGREE IN TWO YEARS

B. S. Degree courses in engineering: Electrical, Civil, Chem., Mechanical, Radio or Aeronautical. 1 yr. Mech. Drafting. Approved by Civil Aeronautics Authority, participation in Pilot Training Program. Large industrial center. Prep courses without extra charge. Earn board if desired. Low tuition. Enter March, June, September, December. Write for Catalog. 511 E. Washington Blvd., Fort Wayne, Ind.

INDIANA TECHNICAL COLLEGE

EARN A DEGREE AT HOME

From A Chartered Institution of Higher Learning
Employers Now Demand College Graduates With Degrees

28 Degree Courses in Arts; Sciences; Philosophy; Education; Public Health; Medical Jurisprudence; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Business Training; Accounting; Statistics; Agriculture; Electrical, Civil, Mechanical, Drafting, Architectural, Automobiles, Steam, Diesel, Aeronautical, Radio, Structural, Industrial, Highway, Petroleum, Mining, Marine Refrigeration, Air Conditioning, Chemical Engineering. Founded 1908. Chartered, McKinley-Roosevelt Graduate College, 4610-P Sheridan Road, Chicago

Get into the BAKING BUSINESS

Bakers make good money! Now 7th industry in wages! Nearly depression-proof. New home study Baking Course qualifies you. Common school education sufficient. If you're ambitious, write for FREE BOOK, "Opportunities in Baking." National Baking Institute, 3601 Michigan, Dept. 1351, Chicago



Minstrels

Unique First Parts for complete show with special songs and choruses. Make-up. Catalog Free.

T. S. Denison & Co., 203 N. Wabash, Dept. 19, Chicago



Learn CARTOONING

FREE TRIAL LESSON! Cash in on your sense of humor—AT HOME—BY MAIL. Have fun! Make money! No experience needed to start. Write today for FREE LESSON, unexpired postpaid. No obligation. Moon Gag-Cartoon School, Dept. A, Fall Creek, Wis.

MAKE MONEY AT HOME

RUBBER MOLDS Low as 6¢ EA.

Amazing rubber mold-making outfit makes perfect flexible molds of plaques, ash trays, book-ends, etc. Molds cost from 6¢ to 25¢ each. Each mold makes hundreds of novelties and gifts to sell up to \$1.00 apiece! No experience necessary. Quick and easy. Start profitable business in your home—sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. "Molders Handy Book" and list of buyers FREE. Write

SO-LO WORKS
Dept. R-827 Cincinnati, Ohio



68 pages of facts for INVENTORS



Look Ahead

These books were prepared for men of ideas—men who have an article in mind that will make money, save labor or give pleasure. Now is the time—if you have such an idea—to see about protecting it. **Many Little Ideas May Have Big Commercial Possibilities.** Don't think that, to be patentable, an idea needs to be complicated. Simple articles have often proved highly profitable; the crinkly hair pin, the metal tip for shoe laces, the wire paper clip are good examples.

DON'T DELAY
Send for these **FREE** books Now

Many a man has waited until too late to protect his idea by a United States Patent. Remember,—someone else may be thinking along the same lines that you are—and the Patent Laws favor the man who files his application for a patent first. Delays of even a few days can sometimes mean the loss of a patent. So,—learn the important facts about Patent Protection at once.

43 YEARS OF PROVEN SERVICE

This is one of the World's Largest Firms of Registered Patent Attorneys—Established 1898. Our large staff of patent specialists gives you expert and prompt service. Our fees are reasonable; deferred payments arranged if desired.



THESE 2 FREE BOOKS ARE FOR INVENTORS AND OTHER MEN WITH IDEAS

To make money on your idea
PATENT and SELL
your **INVENTION**

You want to cash in quickly on that original idea of yours. Both the U. S. Supreme Court and the Patent Office have made it clear that you need the assistance of a competent patent attorney to safe-guard your chances for success. The two plainly written books offered you **FREE** below tell you exactly how to go about applying for patent protection—and suggest ways to commercialize your patent rights.

Mail Coupon Today For Your Copies

VICTOR J. EVANS & Co.

Merlin M. Evans

REGISTERED PATENT ATTORNEYS

**MAIN OFFICE: 410-A VICTOR BUILDING
WASHINGTON, D. C.
Pittsburgh Office, 514-N Empire Building**

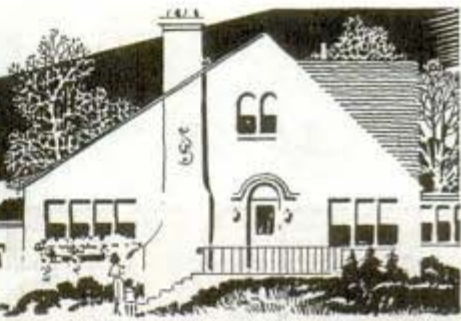
Rush by return mail, Free copies of your books "Patent Protection" and "When and How to Sell an Invention"—also important "Evidence of Invention" Form.

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

MAIL COUPON TODAY FOR YOUR COPIES

POPULAR INVENTIONS

For Your Home



Best novelty mfg Co 155 N. Wabash Ave Chicago

'Dust Light' Signals When to Empty Sweeper

Clean. Air. \$49.95 \$59.95

Flashing a bright red light as soon as the dust bag needs emptying, this vacuum cleaner saves the bother of frequently inspecting the bag. The "telltale" signal, on top of the cleaner, is seen instantly when it lights.

Non-Spatter Shield for Sliced Lemon Controls Juice

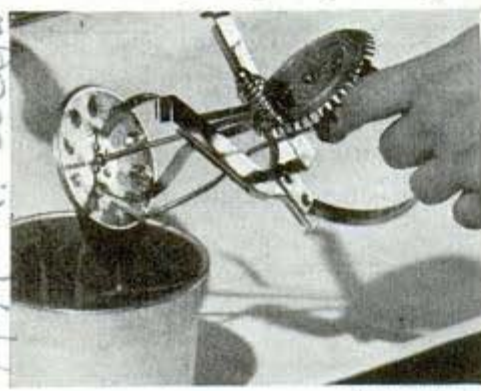
Cellophane shields for serving lemon slices permit the diner to squeeze the juice out with impunity. The transparent shield is wrapped around the slice, keeping the fingers dry when squeezing juice into a beverage or seafood, and stopping the spattering of stray drops. It also keeps the lemon from drying out after it has been sliced.



K1084

Egg Beater Has High-Speed Splashless Disk

For beating eggs and other foods in a shallow dish or platter without spilling or spattering, an egg beater having a high-speed whirling disk works twice as fast as the average whipper. Made of stainless steel, the beater cleans easily, and it is claimed the working parts do not get out of order. It is fitted with side clamps for fastening to the edge of a pan if desired.



(More Popular Inventions on page 28A)

*Edward Katzinger Co
1949 N. Cicero Ave
Chicago
Lauders Tracy Clark
New Britain Conn*

K1158

IMAGINE THEIR JOY WHEN THEY FOUND THEY COULD PLAY

This easy-as-ABC way!



LEARNED QUICKLY AT HOME
I didn't dream I could actually learn to play without a teacher. Now, when I play for people they hardly believe that I learned to play so well in so short a time.
*HSC., Calif.



SURPRISED FRIENDS
My friends are surprised at the different pieces I can already play. I am very happy to have chosen your method of learning.
*B. F., Bronx, N. Y.



PLAYS ON RADIO
I am happy to tell you that for four weeks I have been on the air over our local radio station. So thanks to your institution for such a wonderful course.
*W. H. S., Alabama.

What Instrument Would You Like to Play?

JUST name your instrument and we'll show you how you can learn to play it—quickly, easily, in spare time at home. Never mind if you don't know one note of music from another—don't worry about "special talent". And forget all you've ever heard about music's being hard to learn.

The truth of the matter is that *thousands now play who never thought they could!* Yes, men and women everywhere have discovered this amazingly easy way to learn music at home. Now they are enjoying the thrilling satisfaction of playing the piano, violin, guitar, saxophone or other favorite instruments. Some of them are playing in orchestras and over the radio; others are teaching music, making money in spare or full time. And thousands are having the time of their lives playing for their own enjoyment and the entertainment of their friends.

LEARN TO PLAY BY NOTE

Piano Guitar
Violin Saxophone
Organ Mandolin
Tenor Banjo
Hawaiian Guitar
Piano Accordion
Or Any Other Instrument

No tedious study and practice, no tiresome exercises. You learn to play *by playing*—start right in with the melody of a simple tune! It takes only a few minutes a day; the cost is trifling. Does it sound too good to be true? Mail the coupon and get the FREE PROOF!

FREE PRINT AND PICTURE SAMPLE

Fascinating illustrated booklet answers all your questions; free Print and Picture Sample shows how method works. If interested, just mail coupon. (Instruments supplied when needed, cash or credit.) *Actual pupils' names on request. Pictures by professional models. U. S. School of Music, 71 Brunswick Bldg., N. Y. C., N. Y.

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

I am interested in music study, particularly in the instrument indicated. Please send me your free illustrated booklet, "How to Learn Music at Home" and the Free Print and Picture Sample.

Name.....
Address.....
Instrument..... Have you Instrument?.....



With "Baffle Flued" Fire-Box. (Flue — not plate.)

LACO Prices Slashed to Make Way for New Models. Buy Now...SAVE!

Here's your greatest chance of the year to get a genuine LACO Oil-Burning Heater—AT A SACRIFICE! Big, full-sized 1940 models that heat 5 to 6 rooms! Remaining stocks must be moved to make way for the new 1941 models. You get LACO's "Baffle-Flued" heating unit that circulates heat without a fan. Baffle flue extends through the fire-box—flame and hot gases move against and around it and are rapidly cooled by room air rushing through baffle flue. More heat in the room—less up the chimney. Heat comfort, very low fuel cost.

WRITE See your local LACO dealer, or send name for Free Folder and Special Low Prices!

DEALERS: Beat chain store and mail order competition. Ask about LACO's "Direct-to-Dealer" plan—lowers prices one-third! Write Today!

LACO OIL BURNER CO., 111 UNION AVE., GRISWOLD, IOWA

GUN-TYPE

For your furnace. Nationally advertised parts. Efficient. Low Prices.



See your dealer or write today.

U. S. GOVERNMENT JOBS

START

\$1260 to \$2100 Year

(\$105.00 TO \$175.00 MONTH)

Mail Coupon Before You Lose It

FRANKLIN INSTITUTE, Dept. L196,
Rochester, N. Y.

Sirs: Rush to me without charge—copy of 32-page book, "How to Get U. S. Government Jobs," with list of positions and full particulars telling how to qualify for them.

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

Railway Postal Clerks



Many Other Government Jobs
Mail Carriers—Office Clerks—
Post Office Clerks—Stenographers, Etc.



AUTO

BOOKS SENT FREE

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

GET A BETTER JOB

A better job—in the gigantic auto industry. BIGGER PAY—a chance to go into business for yourself and get a share of the profits, are waiting for any man who even half tries to improve himself. Learn auto engineering with these wonder books a new way—a quick reference method. Simply use the JIFFY INDEX to look up the answer to any auto problem. Built by eleven of America's great automobile engineers, and written in simple language so you can understand it.

Privilege of consulting Automobile Engineers for one year without extra cost if you mail coupon immediately.

Send promptly and we will include a New EXTRA volume with over 300 pages including late cars with wiring diagrams and data sheets on each.

CAN YOU FIX IT?

These wonder books tell step by step HOW to take out "play" in differential—to kill the shimmy in steering—to set TIMING—how to put your finger on engine trouble and the expert way to FIX it.

6 BIG VOLUMES
2500 pages, 2000 illustrations, wiring diagrams, etc., including Marine Engines, Aviation Motors, Diesel engines, etc. In Luxe edition, gold-stamped flexible binding.

AMERICAN TECHNICAL SOCIETY (Publishers—Home Study Courses), Drexel Ave. & 58th St., Dept. A119, Chicago, Illinois
I would like to see the 6-volume edition of your AUTO BOOKS. I will pay the delivery charges only, but if I choose to, I may return them express collect. If after 10 days use I prefer to keep them, I will send you \$2 and pay the balance at the rate of only \$3 a month, until \$24.80 is paid. Please include consulting service and extra Volume No. 7, as per your offer above.

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

AUDELS Carpenters and Builders Guides 4 vols. \$6



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

Inside Trade Information On:

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



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

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

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

Say you saw it in Popular Mechanics!

"They Made the Grade" ... SO CAN YOU!



Big names in the musical world, like ARTIE SHAW and NICK FATOOL, are usually associated with GRETSCH DRUMS, because they know that these famous instruments have led the drum world for 57 years. A money-making career may be awaiting you as a star drummer in a big band... but start with the best, a GRETSCH, chosen above all other drums by dozens of the greatest drummers in America.

ARTIE SHAW and his drummer NICK FATOOL

EASY TO PLAY EASY TO PAY

Send penny postcard for literature and FREE photograph of your favorite drummer; also full information about EASY-PAYMENT PLAN and FREE trial. Give street number; address Dept. PM 12.

The FRED. GRETSCH MFG. CO.
Musical Instrument Makers Since 1883
60 BROADWAY, BROOKLYN, N. Y.

GRETSCH also offers SUPER VALUES in Guitars, Saxophones, Trumpets, Trombones, Accordions. Send for FREE catalogue. Mention instrument.

THIS VALUABLE BOOK

FREE



LEARN CARTOONING AT HOME IN SPARE TIME

Send for this FREE book containing money-making tips, cartooning charts, idea creating methods, list of cartoon buyers, and other valuable information. Read about the money-making opportunities in one of the most fascinating of all professions—CARTOONING. With this booklet we will include a complete portfolio describing our easy Course in Cartooning and explaining our new Marionette Method of Instruction. We will also tell you how to get the Cartoonists' Exchange Laugh Finder FREE of extra cost. This amazing device actually helps create and originate humorous ideas. Send name at once and mention your age.

CARTOONISTS' EXCHANGE

Dept. 91 Pleasant Hill, Ohio

WELDERS WANTED!



ELECTRIC ARC-OXY-ACETYLENE
Skilled Welders earn \$8 to \$15 a day. The demand now greater than the supply. Learn this highly paid trade in 3 weeks by actual shop work. One of America's leading schools. Established 1902. 7 floors of shops. Endorsed by welding industry. Limited number of students. 3 weeks course in Electric Arc or Acetylene Welding, including room and board, only \$105. Write or wire for reservation. Ask for "Welding Facts." State age. GREER COLLEGE, Dept. 111, 2024 S. Wabash Ave., Chicago

LATEST SCIENTIFIC CRIME DETECTION METHODS



Read This Amazing Book 30 DAYS FREE

Explains with real cases latest methods of Scientific Crime Detection—finger printing—fire-arms identification—police photography. Takes you on the inside. Informative—exciting—valuable. Read 30 days free—then send only a dollar if you want to keep this amazing book. Your age must be stated.

T. G. Cooke, Dept. 1351, 1920 Sunnyside Ave., Chicago
POPULAR MECHANICS

FOR A GOOD JOB IN AVIATION TRAIN AT LINCOLN



This LINCOLN GOVERNMENT APPROVED SCHOOL OF AVIATION wants to immediately get in touch with men interested in preparing NOW for good-pay positions as Commercial Pilots, as Airline and Airport Maintenance Mechanics, as Airplane Factory Mechanics, as Aeronautical Engineers.

BIG DEMAND FOR LINCOLN TRAINED MEN—BIG PAY. Our graduates stepping into these good-pay positions. Opportunities for hundreds more. No previous experience necessary. Courses from 8 weeks to 2 years. We train you and assist Graduates in locating positions. Now offering part-time employment for board and room while in training. **WRITE TODAY** for complete information.

LINCOLN AERONAUTICAL INSTITUTE
581 Aircraft Bldg., Lincoln, Nebraska



PLAY A SAW!

Produce wonderful music in 5 days... quickly play popular and classical numbers. No notes to read, no dreary practice—success guaranteed. Since 24 thousands of my students have amazed friends, starred in shows and broadcasting orchestras. Without obligation, write for 5 DAY TRIAL OFFER now.

MUSSEHL & WESTPHAL
145 W. Water St., Fort Atkinson, Wis.

Regain Perfect Speech, If You

STAMMER

Every stammerer should have the new 287 page book "Stammering, Its Cause and Correction." Sent free to stammerers. It describes the Bogue Unit Method for the scientific correction of stammering and stuttering. Method successfully used at Bogue Institute for 39 years—since 1901. Endorsed by physicians. Write for full information. No obligation. Benjamin N. Bogue, Dept. 1322 Circle Tower, Indianapolis, Indiana.

A BIG-PAY JOB AWAITS YOU

Industry demands more draftsmen and designers. Salaries of \$175 to \$375 per month and up offered to men who qualify. Train for one of these High-income jobs in your spare time. No experience needed. Step-by-step lessons. Complete, Practical Training. Prepare yourself under the direction of former Ohio State Univ. and Capital Univ. faculty member. No useless theory. Instruments furnished. Act Today! Learn how to get a salary boost by writing for free catalog.

OHIO INSTITUTE OF TECHNOLOGY
Room 1-K, Greenville, Ohio

DRAFTING & DESIGN ENGINEERING

RADIO
ing course equivalent to three years' college radio work. School established 1874. All expenses low. Catalog free.

Dodge's Institute, Ada St., Valparaiso, Ind.

TOOL & DIE MAKING DESIGNING

Machinists Trade, Machine Drafting and Design. Practical shop training in the world's industrial center. Write today for full information.
NATIONAL SCHOOL OF MECHANICAL TRADES
Dept. 25 628 W. Lake St. Chicago, Ill.

ARTISTS MAKE MONEY

Find out your ability. Send name, age, occupation and address for Free Vocational Art Test.
Federal Schools, Inc., 1131 Federal Schools Bldg., Minneapolis, Minn.

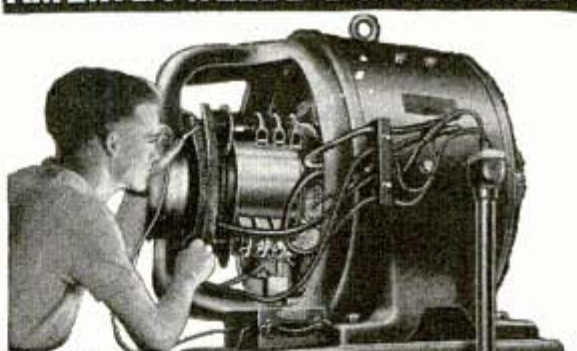


WILL YOU WEAR THIS SUIT

and Make up to \$12 in a Day!

Let me send you a fine all-wool union tailored suit FREE OF ONE PENNY COST. Just follow my easy plan and show the suit to your friends. Make up to \$12 in a day easily. **Partial Payment Plan. No experience—no house-to-house canvassing necessary. SEND FOR SAMPLES—FREE OF COST** Write today for FREE details. ACTUAL SAMPLES and "sure-fire" money-getting plans. Send no money. **H. J. COLLIN, PROGRESS TAILORING COMPANY**
500 So. Throop Street, Dept. N-216, Chicago, Illinois

AMERICA NEEDS SKILLED MEN!



TRAIN FOR A GOOD PAY JOB IN ELECTRICITY ON REAL MOTORS, GENERATORS, ETC.

12 WEEKS'

"Learn-By-Doing" Training

Where do you fit in today's gigantic defense program and industrial expansion? You CAN play an important part. Good-pay jobs will open up for thousands of TRAINED MEN. Now is the time to get YOUR training in Electricity—the mighty power that makes the whole program possible. Electricity is absolutely essential to this program. This means thousands of new jobs and opportunities for men who are properly trained to do electrical work. This is your big opportunity. Get ready NOW for your place in Electricity.

QUICKER, EASIER WAY

Here at Coyne you can get 12 weeks of practical shop training on real electrical machinery similar to that used in many defense factories. You learn airplane ignition, wind armatures, do house-wiring, learn power plant operation, etc. I make it easy for you to learn. You "Learn By Doing", not by books... not a correspondence course. You don't need previous experience or advanced education. Expert instructors guide your every step.

All Finance Your Training

I not only give you the RIGHT KIND OF TRAINING, but I go much further: I make it easy to get that training NOW. You can get Coyne training today even if you don't have a lot of money. You can get your training first—then pay for it in 12 monthly payments starting 60 days after your training period ends. If you need part-time work to help out with living expenses my employment department will help you get it. Lifetime employment service after you graduate.

GET MY STORY

Don't let lack of money keep you from sending the coupon NOW. My Big FREE Book is full of facts and photographs which tell all about Coyne training and what it can mean to YOU... how you can get this training NOW, and pay for it later. I want to send you this free book. I want you to know how Coyne has helped others and how it can help you even if you don't have much money. Send for all the facts. No obligation. No salesman will call. Don't delay—Mail coupon today.

H. C. LEWIS, COYNE ELECTRICAL SCHOOL
President
500 S. Paulina St. Dept. 11-72 Chicago, Illinois

NOW Extra 4-Weeks' RADIO Course At No Extra Tuition Charge

MAIL THIS COUPON TODAY

H. C. LEWIS, President, COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 11-72, Chicago, Ill.

Please send me your Big FREE Book and all the facts about Coyne, and tell me about your plans to help fellows like me get ahead.

NAME.....

ADDRESS.....

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

Say you saw it in Popular Mechanics!

SPRAYBERRY RADIO TRAINING

Includes FULL EQUIPMENT!



Experience Easily Acquired at Home

Over 100 Experiments plus Many Other Special Features . . . ALL Designed To Help You Make Fast Progress

SPRAYBERRY Training starts right at the beginning of Radio . . . unfolds each subject in a simplified, logical, understandable style. You easily learn Television, Frequency Modulation, Signal Tracing, Mobile Radio (Auto-Talk), Aviation Radio, Electronics, Facsimile Radio, Radio Set Repair and Installation work.

Training Prepares You For A Business Of Your Own . . . Or Good Radio Jobs at Excellent Pay

The great fascinating and progressive field of Radio offers many opportunities to the man who wants to get ahead. My Training is designed to give you quick access to these opportunities. SPRAYBERRY Methods are thorough and practical. Your Training will not interfere with your present work.

No Previous Experience Needed

It makes no difference what your education has been. I can fit you quickly for a good-paying Radio job. I make it easy for you to grasp Radio principles and remember them. Your success is my full responsibility.

You Get Professional Test Equipment Plus Experimental Outfit

. . . Includes 146 RADIO PARTS (to build complete Receiver), RADIO TOOLS and a modern TESTER-ANALYZER. You also receive 8 BIG SHIPMENTS OF RADIO EQUIPMENT for conducting actual experiments with your own hands.

Earn While You Learn

My BUSINESS BUILDERS show you how to put your equipment to actual use in handling money-making Radio Service Jobs shortly after you begin Training. THE SPRAYBERRY COURSE IS SOLD UNDER MONEY-BACK AGREEMENT



RUSH COUPON for BIG FREE BOOK

SPRAYBERRY ACADEMY OF RADIO
F. L. Sprayberry, President
419-A University Place, N. W.
Washington, D. C.

Please rush my FREE copy of "HOW TO MAKE MONEY IN RADIO."

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

(Mail in envelope or paste coupon on penny postcard)

146 RADIO PARTS



RADIO TOOLS



TESTER-ANALYZER



Easiest

OF INSTRUMENTS TO PLAY

. . . yet Richest in Opportunity

Why be just one of the crowd? Enjoy the thrill of the spotlight, the praise of friends, the lifelong pleasure of creating your own music. It's easy with the Deagan Marimba, fastest-growing instrument in the music world today. The ideal home instrument—in demand at dances, clubs, radio stations, etc.—and yet easiest of all instruments to play. Models and terms to suit every budget. Convincing FACTS on request—write for them today!



J. C. DEAGAN Inc. DEPT. 5451, CHICAGO



Chemical-Kits & Apparatus-Outfits!

NEW IDEA! BIG VALUE! FOR CHEMISTRY STUDENTS

Send for FREE Literature and CATALOG OF REFILLS. Scientific Books at Big Discount.

J. H. WINN MFG. CO.
Dept. 401, 124 W. 23 St., N. Y. C.

TOOL & DIE MAKERS

Machinists, Screw Machine Men

EARN BIG PAY

Skilled metal workers earn up to \$50-\$60 a week. Learn these trades by actual work in ALLIED SHOPS. Fully equipped. State Approved. Low Fee. Enter any time. Day and Evening classes. FREE Employment Service. Write for NEW Illustrated Catalography. Personal Attendance and Home Study Courses. Booklet FREE!

ALLIED SCREW MACHINE CO., (School Division)
Dept. PM-1, 609 W. Lake Street, Chicago, Illinois



There's Quicker, Bigger MONEY for YOU-in POULTRY

MAKE MONEY ON SIDE—SPARE TIME—OR BUILD A BUSINESS OF YOUR OWN

Poultry raising pays good profits and I can show you how to get them — with Eggs — Poultry Meat — Broilers — Roasters — Capons — Baby Chicks. My Home Study Training System, successful for twenty years, includes latest scientific methods used by world's leading poultrymen. Shows how to make Poultry Business pay—avoid losses, prepares you for a good paying job in large poultry plant or for a business of your own.

FREE BOOK TELLS HOW

Mail coupon below TODAY for new big 1940 edition of my FREE BOOK "How To Raise Poultry for Profit". Whether you keep chickens now or are merely thinking about it, this book is an eye opener to the real success that may be yours.

CASH IN Spare Time or Full Time

No matter where you live or what you do now, my proved course will show you what to do with poultry from the start. If you choose to start a business of your own, I'll show you how to make a small investment grow, show you how to expand. Send for the FACTS today.

Mail NOW for FREE Book

Harry M. Lamon, President
NATIONAL POULTRY INSTITUTE
Dept. 50-S, Adams Center, N. Y.

Dear Mr. Lamon: Send me your FREE book, "HOW TO RAISE POULTRY FOR PROFIT". I want to know more about my opportunity in this business to make money spare or full time.

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

EXPERT PHOTOGRAPHY MADE EASY

Successful photography as a career, for spare-time earnings or as a hobby—made easy through N.Y.I. Training! Personal coaching by leading photographers. Fascinating field. Splendid opportunities. Commercial, News, Portrait, Motion Picture, Advertising and Color Photography. Personal Attendance and Home Study Courses. Booklet FREE!

N. Y. INSTITUTE OF PHOTOGRAPHY
Dept. 49, 10 West 33rd St., New York, N. Y. (30th Year)

LOOK! Baby Chicks

THOUSANDS WEEKLY ALL YEAR. Finest quality & Layers in 40 breeds. Hybrid Baby Pullets and Cockerels, B. W. D. Fested, Ducklings, Goslings, Baby Turkeys, Guineas. In business 30 years. Catalog free. ORDER NOW. Make BIG money raising NABOB QUALITY CHICKS.

NABOB HATCHERIES, BOX M, GAMBIER, OHIO

WELDING ACETYLENE & ELECTRIC

Tool & Die Making. Body & Fender Repair. 17th year. Unlimited training period without extra charge. Write today for free circular.

Wolverine School of Trades, 1412 W. Fort, Detroit, Mich. FREE CIRCULAR

LEARN CARTOONING!

Let an internationally famous cartoonist teach you this WELL PAYING—fascinating profession. PERSONAL instruction by mail. Recommended by America's foremost cartoonists. Send for FREE booklet. (State age)

DORMAN H. SMITH, Box C597, San Rafael, Calif.

Learn to Write

Begin today. Write for our New Free Book, "How to Become a Good Penman." It contains specimens and tells how others learned to write in spare time. Enclose 10c for a Professional Pen Point and your name beautifully written. Write today.

THE TAMBLYN SCHOOL OF PENMANSHIP
441 Ridge Building Kansas City, Mo.

5¢ EACH LITTLE BLUE BOOKS

Send postcard for our free catalogue. Thousands of bargains. Address: HALDEMAN-JULIUS CO., Catalogue Dept., Desk M-365, GIRARD, KANSAS



Easier THAN EVER

To Master, this New 1941 P-A
21 Major Improvements

• Just touch a key and blow normally; you can't miss. So easy, and such beautiful tone. Nothing to compare with these new P-A Saxes, Clarinets, Trumpets, and other P-A instruments. Fully guaranteed; your success assured. See your music dealer or write direct for beautiful FREE BOOK. No obligation. Easy terms. Greatest fun, easiest with P-A.

PAN-AMERICAN 1420
103 P-A Bldg. Elkhart, Ind.

Have You Tried a P-A in the Last 30 Days?

LAW

STUDY AT HOME

Legally trained men win higher positions and bigger success in business and public life. Greater opportunities now than ever before. Big corporations are headed by men with legal training.

More Ability: More Prestige: More Money

We guide you step by step. You can train at home during spare time. Degree of LL. B. Successful graduates in every section of the U. S. We furnish

all text material, including 14-volume Law Library. Low cost, easy terms. Get our valuable 48-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept. 164-L Chicago
A Correspondence Institution

High School Course at Home Many Finish in 2 Years



Go as rapidly as your time and abilities permit. Course equivalent to resident school work—prepares you for entrance to college. Standard H. S. texts supplied—Diploma. Credit for H. S. subjects already completed. Single subjects if desired. High school education is very important for advancement in business and industry and socially. Don't be handicapped all your life. Be a High School graduate. Start your training now. Free Bulletin on request. No obligation.

American School, Dept. H-145, Drexel at 58th, Chicago

LEARN WATCH REPAIRING



AT HOME You can learn by our modern and original system of instruction every part of the Watch Repairing Trade at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the Wisconsin School of Watch Repairing 524 E. Mason St., MILWAUKEE, WIS.

NEW YORK SCHOOL OF MECHANICAL DENTISTRY

Learn how to make Crowns, Bridges, Plates in this OLDEST Laboratory Center. Practical training. Day, Eve, Easy terms. Ask for free Catalog, F and look offer. N. Y. SCHOOL OF MECHANICAL DENTISTRY, 125 W. 31 St., N. Y. C.

Learn Public Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence and increase earning power, this easy way. Write for free booklet, *How to Work Wonders With Words* and requirements. North American Institute, Dept. 1251 3601 Michigan Ave., Chicago, Illinois



WHY NOT earn money every spring, summer, fall, gathering butterflies, insects. I buy for collections. Price list in my instructions, pictures, shows the prices I pay for 750 different kinds. Some \$1 to \$7 each. Send 10¢ (not stamps) for illustrated prospectus, before sending butterflies. Write today. (204-1912). Mr. Sinclair, Dealer in Insects, Dept. 6, Box 1830, San Diego, Calif.

CASH IN ON SENSATIONAL NEW TAILORING LINE



Sensational news! Show friends complete line men's made-to-measure suits—low as \$33.50—and pocket big CASH PROFITS on easy-payment-plan orders. Scores of rich quality woolsens, tailored-to-measure. Newest styles. Guaranteed: YOUR OWN SUITS FREE as a Bonus! No money, no experience necessary. We send complete money-making sample outfit FREE and amazing FREE BONUS SUIT offer. POWER TAILORING CO., Dept. R-1116, Chicago

EARN BIG MONEY EASY!

DRAFT-AGE MEN! Work in a VITAL industry is an important consideration. In the Military Forces, men with technical training and ability have opportunities for higher ratings and pay!

LEARN AUTO MECHANICS

Authorities say there's greatest demand in history for TRAINED men. Good mechanics earn up to \$50 a week or more. Good practical training will fit you for a job that's waiting. Read how McSweeney-trained men make good. Hundreds of others will tell you facts equally as interesting. Don't look for a job! TRAIN for it!

8 weeks shop Course

No books, no lessons, the McSweeney practical way. First we show you, then you do the job yourself under competent instructors. You work on real equipment with real tools. Quickly you are TRAINED to hold down a permanent BIG PAY job. Any man 16 to 50 can learn. Write today for New Low Tuition Offer!

McSweeney Men Make Good!

Mesopotamia, Ohio

Mt. Vernon, Ill.

Dear Mac: After graduating, received job one week later. Three raises in the first year. End of 3 years, was assistant Service Manager. I quit at the end of 4 years to take a better job. Worked one year when I quit to go into business for myself. Your training along with practical work sure does help.—L. E. Bates.

Dear Mac: Been working for dealer here for fifteen months. I will have to give you credit for starting me out on the road to success. I feel that I owe you a debt that cannot be paid.—Loren Brown.

AVIATION & DIESEL COURSE!

Aviation is here! Each plane needs many mechanics on the ground. McSweeney's Auto Mechanical course is combined with Aviation and Diesel engine mechanical course.

LOW TUITION COST!

Learn Now—Pay for Part of Course Later!

In a few weeks of intensive training, actual shop work with real tools on real equipment qualify you to accept a Big Pay Job as a mechanic.

FREE! Write today for Big Free Book on AUTOS, AVIATION, DIESEL. Get the facts about jobs, and Low Tuition Offer. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in a few weeks! WRITE TODAY!

McSWEENEY SCHOOLS

AUTO - AVIATION - DIESEL
WELDING - BODY & FENDER

DETROIT, MICH. Address Your Nearest School KANSAS CITY, MO.

Mail Coupon for Free Book NOW!

McSWEENEY SCHOOLS, DEPT. A-7.

Without cost or obligation, send me your BIG FREE BOOK on Autos, Aviation, Diesel Mechanics, etc., also full information about your Low Tuition Offer.

NAME.....

STREET.....

TOWN.....STATE.....AGE.....

In answering advertisements always write name and full address clearly.

Progressive Novelty
Industries Co.

Increased
production
means more



Jobs for MACHINISTS

and bigger pay for men who know their work

This home-study course gives you the practical facts on modern machines, up-to-date methods, you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency, with

The NEW AMERICAN MACHINISTS' LIBRARY

5 volumes—2014 pages—1853 illustrations

(A combined home-study course and reference library)

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

No money down—special price—easy payments.

EXAMINATION COUPON

McGRAW-HILL BOOK CO., 330 W. 42nd St., New York

Send me for ten days' examination the new American Machinists' Library. If satisfactory I will send you \$1.50 in 10 days and \$3.00 monthly until the price of \$16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name.....
Home Address.....
City and State.....
Position.....
Name of Company.....PM-1-41

Learn this Profitable Profession



in 90 Days at Home

Hundreds of men and women of all ages 18-50 make \$10.00 to \$20.00 in a single day giving scientific Swedish Massage and Hydro-Therapy treatments. There is a big demand from Hospitals, Sanitariums, Clubs, Doctors and private patients as well as opportunities for establishing your own office.

Learn this interesting money-making profession in your own home by mail, through our home study course. Some instructors as in our NATIONALLY KNOWN resident school. A diploma is awarded upon completion of the course. Course can be completed in 3 to 4 months. High School training is not necessary. Many earn big money while learning.



Anatomy Charts & Booklet FREE

Enroll now and we will include uniform cost, medical dictionary, patented reducing roller and Hydro-Therapy supplies without extra cost. The reducing course alone may be worth many times the modest tuition fee.

Send coupon now for Anatomy Charts and booklet containing photographs and letters from successful graduates. These will all be sent postpaid—FREE.

THE College of Swedish Massage
Dept. 164—30 E. Adams St., Chicago
You may send me FREE and postpaid, Anatomy Charts, booklet containing photographs and letters from graduates, and complete details of your offer.

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

POPULAR INVENTIONS

For Your Home

(Continued from page 22A)

Plastic Corer Splits an Apple into Eight Segments



One thrust of a new apple corer and the heart of the apple is neatly cut out, leaving eight segments sliced ready to serve. Made of a plastic and having no metal parts, it cannot rust or tarnish and is easily cleaned.

Flour Sifter with Cone Bottom Fits over Measuring Cup



Made with a cone-shaped bottom, a flour sifter will sift directly into a measuring cup. There is no spilling, and the extra handling for measurement is eliminated. After sifting a cupful the sifter can be used to level it off.

Send your inquiry, with a stamped, self-addressed envelope, to our Bureau of Information to learn the name of the maker of any article described in this department.

ZOOM into AVIATION



AN AVIATION CAREER OFFERS YOU A GREAT FUTURE!

The greatest opportunity of your lifetime exists today. There never was such an opportunity in AVIATION for you. There may never be another. Aviation desperately needs trained men; they are at a premium and advancements for them are rapid. You can get in on the ground floor by training now. BUT you must choose the right school for your training. This is imperative, since your choice of a school in which to take your training will determine your whole future in Aviation and how much money you will make all the rest of your life. Curtiss-Wright Tech's career training is carefully designed to do just one thing—**MAKE MORE MONEY FOR YOU.** Our hundreds of successful graduates have proven that our training gets results and always pays. It has provided them with a profitable occupation and secure future, since it trained them in advance for the highest position they could ever expect to occupy. It can make you independent and self-supporting for life. Curtiss-Wright Tech is located on Grand Central Air Terminal in the heart of the Aircraft Industry. Established in 1929, this famous school is recognized as the nation's leading institution for the training of **MASTER AVIATION MECHANICS and AERONAUTICAL ENGINEERS.** (No flying involved.) We honestly believe that every student who enrolls here will be able to obtain immediate employment upon graduation. A position awaits you. **WARNING!—DON'T "MISS THE BOAT!"** Send for catalog today. Give age and course desired. Dept. PM-1.



**CURTISS WRIGHT
TECHNICAL INSTITUTE**

Glendale (Los Angeles)
California

THIS TOWER OVERLOOKS AVIATION'S MOST DISTINGUISHED SCHOOL OF AERONAUTICS

WELDING

Get in Line Now for a Good Job in Welding



The national emergency program brings new opportunities in the technical fields,—especially in **Welding (including Aircraft).** Industry demands capable, trained welding operators, technicians, engineers and mechanics. The application of gas and electric welding in all lines of business is almost unlimited,—aircraft, automobiles, diesels, building, etc.

TWO PLANS OF TRAINING

Choose the one that suits you best.

- Day and Evening Classes** at the College in Chicago. Start any Monday. Train in modern shops completely equipped. Rapid progress through short intensified courses.
- Home Training** combined with shorter course at our shops in Chicago, thus permitting you to earn while learning in your spare time.

FREE BLUE BOOK Send post card today for Free Blue Book. Contains helpful information about Welding and other technical fields. Please state which training plan you favor.

CHICAGO TECHNICAL COLLEGE

A-601 Tech Bldg., 118 East 26th St., Chicago, Ill.

WIRING

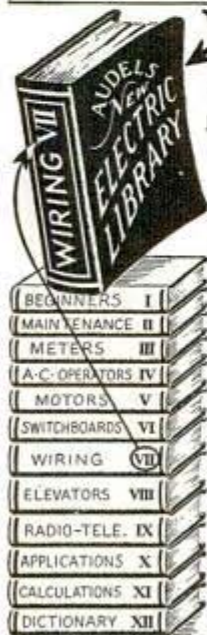
VOL. VII AUDELS NEW ELECTRIC LIBRARY—A MASTER BOOK ON WIRING
728 Pages, 1200 Illustrations. \$1.50
House and Power Wiring
Diagrams—Problems
and Calculations

fully explained in clear practical language, easy to use and understand including helps and hints for all electrical workers that will save time, trouble and money.

AUDELS NEW ELECTRIC LIBRARY—
A progressive Home Study and Reference Course in applied electricity. Easy to understand. Questions and answers plainly written for a complete working knowledge of modern electrical practice, necessary to every electrician, engineer, mechanic and student.

LEARN THE AUDEL WAY! You ask the question—Audels New Electric Library gives the answer—9500 simplified outlines, graphic illustrations and precise explanations covering Construction, Operation and Machine Maintenance.

BOOK A MONTH PLAN—Order the volume that interests you—today! We will send that volume on 7 days' free trial. If the book helps you, send us \$1.50. If it does not help you, mail book back to us.



FREE EXAMINATION COUPON

Theo. Audel & Co., 49 W. 23rd St., New York City
Mail Vol. VII on 7 days free trial. If O.K. I will remit \$1.50 otherwise I will return it. Also please send further information about the Electric Library—no obligation unless I am satisfied.

Name.....
Address.....
Occupation.....
Reference..... PM



START \$1260 to \$2100 YEAR

Thousands appointments
each year

Get ready now for
1941 Examinations

32 Page
Civil Service
Book

Mail Coupon
Today—
SURE

Franklin Institute
Dept. L183
Rochester, N. Y.

Gentlemen: Rush to me
FREE of charge, list of
U. S. Government big pay
jobs. Send me FREE 32-page
book describing salaries, vaca-
tions, hours and work. Tell me
how to qualify for one of these
jobs.

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

DRAW

YOUR WAY TO SUCCESS!
\$5 \$10 \$15 FOR ONE DRAWING



Learn at Home in Your Spare Time

The fascinating field of Art offers commercial opportunities to men and women. Trained Artists are capable of earning \$30, \$50, \$75 a week. We teach you right at home for a successful career in—

COMMERCIAL ART ILLUSTRATING CARTOONING

For 26 years W. S. A. graduates have been "making good" in Art—WHY NOT YOU? No previous Art experience necessary—our instruction is practical and thorough. Write for Booklet—"Art for Pleasure and Profit," fully describes course. TWO ART OUTFITS included with training. Clip coupon—mail today.



FREE BOOK gives details!

Washington School of Art, Studio 121T
1115—15th St., N. W., Washington, D. C.

Yes! I am interested in learning to draw. Please send me information in your Free Book, "Art for Pleasure and Profit."

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



MACHINE SHOP MEN

Learn to set up and run ANY kind of machine; MAKE MORE MONEY NOW by learning quickly HOW TO DO THINGS which usually take years of study and practice. The demand for SKILLED men is ALREADY ahead of the supply, then what WILL IT BE a month or two from now?

Needed NOW!

Bigger Pay Don't miss this chance to qualify for promotion, don't miss this Big Opportunity which is yours almost for the asking. Eight Big Books checkfull of important mechanical facts told simply and clearly. Over 3000 pages, nearly 3000 illustrations cover every subject fully, including Tool Making, Pattern Making, Foundry Work, Mechanical Drawing, Forging, Machine Shop Practice and Management, and hundreds of other subjects.

8 Big Books (1940 Edition) Sent FREE

to you for examination. With them we send a Big Binder of nearly 800 pages with 267 original shop tickets with 1200 illustrations. These show, step by step, how to set up and run almost any kind of job and are in addition to the 8 books. Decide in your own home or place of business whether or not you want to keep them, check up on any facts you want to. Note their great MONEY MAKING value, then, if you want them, pay on the easiest kind of payments. Send NOW and we will include a year's consulting service without extra charge.

American Technical Society, Publishers—Home Study Courses.

American Technical Society, Dept. 5119, Drexel at 58th St., Chicago. You may send me the 8 big NEW books and binder of shop tickets for free examination. I will pay the delivery charges only, unless I decide to keep them in which case I will send \$2.00 in ten days and \$3.00 per month until the total price of only \$34.80 is paid. If I return them in 10 days I will owe you nothing. Because I send now you agree to give me a certificate entitling me to consulting privileges with your experts for one year.

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

See you saw it in Popular Mechanics!

U.S. GOV'T JOBS

SHORT HOURS—GOOD PAY —VACATIONS—PENSIONS

Stop worrying about strikes, layoffs, hard times! Get on the government payroll. No special education or experience usually required. Short hours; steady work; vacations. Open to men and women citizens, of ages 18 to 50.

SEND FOR FREE BOOK

It tells about government positions; what to do to get job you want. Mail letter or postal card now for FREE book "How to Secure a Government Position". Address PATTERSON SCHOOL, 81 Mercantile Bldg., Rochester, N. Y.

RAILWAY POSTAL CLERK
Start at \$1850 a year

INSPECTOR OF CUSTOMS
Start at \$2100 a year

RURAL MAIL CARRIER
Start at \$1800 a year

POST OFFICE CLERK
Start at \$1700 a year

AERONAUTICAL ENGINEERING LEARN AT LINCOLN

This Lincoln School wants to immediately get in touch with men interested in preparing now for positions as Aeronautical Engineers. Two year course adjustable to High School or College Graduates includes wide practical experience in Airplane Design and construction. Next class starts January. Write today for complete information.

NOW IS THE TIME

LINCOLN AERONAUTICAL INSTITUTE (INC)
581-A Aircraft Building Lincoln, Nebraska

SUCCEED IN LANDSCAPING

Send for FREE book with full details about landscape training. Study at home, earn while learning. Profitable, healthful career; interesting hobby; men, women. Give age, occupation.

AMERICAN LANDSCAPE SCHOOL
6212 Grand Avenue Des Moines, Iowa

RAILWAY PASSENGER TRAFFIC INSPECTOR
BUS
Our home-study training prepares you quickly for necessary job in transportation. We help place graduates or refund tuition. Many good opportunities. Graduates earn up to \$135 per month plus expense to start. Established 1918.
Standard Business Training Institute, Div. 201, Buffalo, N. Y.

Write FREE BOOKLET

NOW YOU CAN GET A HEAVY DUTY INDUSTRIAL WELDER

Works Off 110-Volt Light Socket
This marvelous DYNAMIC Power Welder will do the work of much higher types. It is really portable. WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, and etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as \$5.00 on a one hour repair job. Go into business—Open a Welding Shop NOW. AGENTS—Make big profits selling to garages, factories, janitors and machine shops. Write TODAY for our 10-DAY TRIAL OFFER.

for Only \$19.75 RETAIL



DYNAMIC WELDER COMPANY, 2226-PB Silverton Road, Chicago, Illinois

CHOOSE YOUR LIFE WORK IN ELECTRICITY

The trained man will find opportunities in electricity. Consider the recent progress in radio, air conditioning, television. Is electricity the field for YOU? Our vocational chart of 60 electrical jobs will help you decide. Free on request to ambitious men. Look it over and pick the work you would like to do. We will show you how to prepare. Bliss Electrical School has trained thousands for successful careers in electrical industries. One-year course gives fundamental theory, broad practical work. Write for chart today.

BLISS ELECTRICAL SCHOOL

131 Takoma Ave., Washington, D. C.

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



AMAZING NEW ELECTRIC ARC WELDER

FULLY GUARANTEED

RETAILS ONLY \$2.95 COMPLETE



Plugs Into Light Socket

Amazing new HANDIWELD Electric Arc Welder—operates from 110 volt A.C. or D.C. much as other arc welders higher priced—generates tremendous heat to weld all kinds of metal. Not a toy welder that uses carbons, but actually uses standard coated rods—sizes 1/16" and 3/32". Generous supply furnished with welder. Guaranteed not to burn out. Requires leads, auto bodies, radiators, pre-heated small castings and machinery parts. Take HANDIWELD anywhere to job, operate from light socket. Sturdily built of finest materials to last years. Fully guaranteed by Big Manufacturer.

SEND NO MONEY! You'll find a thousand uses for the HANDIWELD around your home, garage, work shop. Also by garages, factories, repair shops, mechanics, farmers, inventors, tin shops, plumbers, etc. Order HANDIWELD now. Send no money. We'll rush one to you, complete with rods and goggles. Pay postman only \$2.95 plus few cents postage. If not delighted, return HANDIWELD in 5 days from receipt and money paid for it will be refunded instantly. Rush your order now.

KUMFY PRODUCTS INC.,

Dest. M-202. Cincinnati, Ohio.

THERE'S MONEY IN CARTOONS!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS, at home, you may SELL! Cost is unusually low. Write for FREE details, miniature lesson plates, and addresses of successfully trained students. State age. RAYE BURNS SCHOOL, Studio M, Box 3583, Cleveland, O.

RELIABLE MEN

Wanted to operate movie circuits in theatreless communities. Earn \$50.00 to \$100.00 weekly. No experience necessary. Everything furnished. Write Southern Visual, Dept. PM-11-4, Box 2404, Memphis, Tenn.

MECHANICS-WELDERS - COLLISION MEN

GOOD JOBS and MIGHTY GOOD PAY

Do you want to earn big money? If so let us know which of the following trades you prefer. You learn by doing. Practical work. Expert teachers. Low tuition. Personal attention. It will pay you to investigate AT ONCE. Just check the courses you'd like to take and mail today. You will receive full information, absolutely without cost or obligation. But don't delay.

Check the Trade You'd Like to Learn

- | | |
|---|---|
| <input type="checkbox"/> Complete Auto Mechanics (including Diesel) | <input type="checkbox"/> Electric Arc and Acetylene Welding |
| <input type="checkbox"/> Auto Collision | <input type="checkbox"/> Spray Painting |
| <input type="checkbox"/> Metal Finishing | <input type="checkbox"/> Body and Fender Bumping |

Ask about our "Pay After Graduation Plan"

Name.....

Address.....

Mail the above at once to

MICHIGAN TRADE SCHOOL **FREE 32 PAGE CATALOG**
3758 Woodward Ave. Detroit, Mich.

IMPORTANT Message To INVENTORS

We Will Send You Our **FREE BOOKLET**

"HOW TO PROTECT YOUR INVENTION" and Invention Record Form



Our laws favor the inventor who makes a dated record of his invention, and who is diligent in filing his patent application.

You owe it to yourself, if you value your invention, to make an accurate, dated, and witnessed record of your invention, and then take steps to apply for a patent just as quickly as possible.

PERSONAL SERVICE

Hence, our service can be important to you: As soon as you write us, we send, by return mail, an "Invention Record" form for you to fill out. And then, when you return it to us, our prompt and personal service begins: We personally direct the search of the Patent Office Records. Personally report to you. Personally supervise the preparation and filing of your application and the handling of your case. There is no lost motion, no lost time.

PATENT AND SELL YOUR INVENTION

We handle your case skillfully and thoroughly with a view to securing the best possible patent for you—giving you the full benefit of our training as patent attorneys and our years of experience serving hundreds of inventors. We make personal calls at the Patent Office when required. And beyond this, we will endeavor to give you useful hints and suggestions on selling your invention.

WRITE US TODAY...

When your invention comes to us it is strictly confidential. All correspondence is handled personally by us. We take a personal interest in your success, so you can write us fully.

IMPORTANT TO GET STARTED RIGHT

Know how the laws protect you, and what steps to take. We will send you Complete FREE Booklet "How To Protect Your Invention", and FREE "Invention Record" Form. Write us, or mail this coupon today—McMorrow and Berman, Registered Patent Attorneys, 135-D Barrister Building, Washington, D. C.

MAIL COUPON NOW

McMORROW & BERMAN

REGISTERED PATENT ATTORNEYS BEFORE U. S. PATENT OFFICE
135-D Barrister Building Washington, D. C.

Send me your NEW FREE Book and specially prepared "Invention Record" form at once. I understand that this request does not obligate me.

Name

Address

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

Write or Print Name Clearly

Always write your name and full address clearly when answering advertisements.

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.; American Lawyers Annual, Cleveland, Ohio; Bankers Service Legal Directory, published by Bankers Service Co., Boston, Mass.; and the Snow-Church Directory Co. Lawyers List, published in New York City.

WATSON E. COLEMAN, Victor Building, 724 Ninth Street, N. W.
REGISTERED PATENT LAWYER **WASHINGTON, D. C.**

INVENTORS PATENT YOUR IDEAS SEND FOR FREE BOOK



HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form.

CARL MILLER

REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

Woolworth Bldg., 35th Floor, Dept. 11-A, New York City
MILLER BUILDING, Dept. 11-A, WASHINGTON, D. C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME

ADDRESS

PATENTS SEND FOR FREE BOOKLET

Of Costs and Other Useful Information About Patents

EUGENE H. PURDY, Registered Patent Attorney
1906 INTERNATIONAL BLDG. WASHINGTON, D. C.

NAME

ADDRESS

BENJAMIN AIR PISTOL WITH HAND PUMP



For Target—Small Game—Camping—Etc. Guaranteed—Accurate—Practical—Economical—Safe—Clean—Quiet. Adjustable Force—Amazing Maximum Velocity. No Smoke or Fumes. Bolt Action—Hammer Fire—Hair Trigger—Safety Lock—Hand Pump. Single Shot BB \$8.50; Nipple Shot cal. 177 or 22 with rifled barrel \$8.50; BB 8-Shot \$19.00; Holster \$2.00. Also a complete line of Benjamin Genuine Compressed Air Rifles for BB and cal. 177 or 22. No license required from dealer or factory. Write today for complete specifications and free targets.

BENJAMIN AIR RIFLE CO., 890 Marion St., St. Louis, Mo., U. S. A.

PATENTS—TRADE MARKS

All cases submitted given personal attention
Form "Evidence of Conception" with instructions
for use and "Schedule of Government
and Attorneys' Fees"—FREE!

LANCASTER, ALLWINE & ROMMEL

Patent Law Offices

412 Bowen Bldg. Washington, D. C.

New Ideas now Salable Before Patenting

Practical, useful inventions may now be safely marketed without patenting expense. Write us for particulars, if you have an unpatented (or patented) idea for sale.

Chartered Institute of American Inventors
Dept. 4, Barrister Building, Washington, D. C.

INVENTORS who derive largest profits know and heed certain simple but vital facts before applying for patents. Our book, Patent-Sense, gives those facts; sent free. Trade Marks—Copyrights.
LACEY & LACEY, Est. 1869, 635 F St., N. W., Dept. 5, WASHINGTON, D. C.

INVENTOR'S UNIVERSAL EDUCATOR

contains 999 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1 postpaid in U. S. A. Address
Albert E. Dieterich, 511-B Colorado Bldg., Washington, D. C.

BUCHSTEIN'S FIBRE LIMB

Walk naturally—with this light, strong, correct fit. **COMFORTABLE** limb. Braces for all deformities. Fair terms.

D. BUCHSTEIN CO.
610—3rd Ave. So.
Minneapolis, Minn.

we-do-it-with SQUABS

Raised in **ONLY 23 DAYS**. Why breed for small-profit trade when luxury markets want all the squabs you can ship, every day in year? **NEW BOOK** tells how; personal detailed accounts of large profits. Write postcard, ask for **FREE** 1941 poultry eye-opening book.
RICE FARM, 640 H ST. MELROSE, MASS.

MONEY IN RABBITS—CAVIES

WE BUY and put you in touch with other markets. Catalog and copy of magazine 10c. Or send 25c for Book Catalog and Price List and Year's Subscription to the **AMERICAN SMALL STOCK FARMER.**
OUTDOOR ENTERPRISE CO., BV 919, PEARL RIVER, N. Y.

To PROTECT Your INVENTION We this coupon, NOW

Delays are dangerous and may be very costly. My personal service assures prompt action, strict confidence, and a minimum of expense. I suggest that you send me a model or drawing, or sketch and description of your invention, and \$5.00. I will make a search and report

promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, mail the attached coupon at once. I will also send my "Record of Invention" form. (Over 38 years experience as a Registered Patent Attorney.)

L. F. Randolph, 302-D Victor Bldg., Washington, D. C.
Please send me at once, free of charge, your 72 page booklet and "Record of Invention" form.

Name

Address

A PERSONAL CONFIDENTIAL PATENT SERVICE

RUPTURED?

Get Relief This Proven Way

Why try to worry along with trusses that gouge your flesh—press heavily on hips and spine—enlarge opening—fail to hold rupture? You need the Cluthe. No leg-straps or cutting belts. Automatic adjustable pad holds at real opening—follows every body movement with instant increased support in case of strain. Cannot slip whether at work or play. Light. Waterproof. Can be worn in bath. Send for amazing FREE book, "Advice To Ruptured" and details of liberal truthful 60-day trial offer. Also endorsements from grateful users in your neighborhood. Write: **CLUTHE SONS, Dept. 31, Bloomfield, New Jersey**



ARE YOU A STRANGER- To Yourself?

Do you know what you are best fitted for? Can you interpret your moods—know the mental influences—behind your whims and fancies? Let the Rosicrucians (not a religious organization) show you how to discover yourself and master your life. Send for the free "Sealed Book" that tells how to receive these facts. Address Scribe .I.H.S.

The ROSICRUCIANS

SAN JOSE (AMONG) CALIFORNIA

Auto-Diesel

Master a real trade. Auto Mechanics, Diesel Mechanics, Arc Welding, Acetylene Welding, etc. Let us train you to be an expert Auto-Diesel Mechanic and help you get a good job. The cost to you is reasonable. Learn on modern equipment with tools under experienced instructors. Real shop work. Steam heated building. Room and board in our clean heated dormitory. We pay your fare to Nashville. For free catalog write

Nashville Auto-Diesel School, Dept. 75 Nashville, Tenn.



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 illustrations sent to anyone under 17 years unless signed by parent. **PERFECT VOICE INSTITUTE, Studio 1351 64 E. Lake St., Chicago**

NEW WAY TO CHOOSE A CAREER

LET SCIENCE PICK A JOB FOR YOU!

TODAY, getting a job or choosing a career is no longer a hit-or-miss task. Science can now accurately determine for you, in advance, just what type of work or profession you are best suited for. **FREE** Send your name on a penny postcard for FREE booklet explaining this new proven way to greater success. Vocational Guidance Associates, Dept. 11, Tucson, Ariz.

Learn PHOTOGRAPHY at Home

Splendid opportunities. Prepare in spare time. Easy plan. No previous experience needed, common school education sufficient. Send for free booklet "Opportunities in Photography", particulars and requirements. **American School of Photography 3501 Michigan Ave., Dept. 1351, Chicago, Ill.**

Learn

MECHANICAL DENTISTRY 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.** Low tuition. Easy terms. Write for FREE BOOK about this money making profession that is not affected by machine age.

McCARRIE SCHOOL OF MECHANICAL DENTISTRY 207 N. Broad St., Dept. 764, Philadelphia, Pa.

INVENTORS: KNOW HOW TO

GUARD YOUR RIGHTS

MAIL COUPON TODAY FOR FREE BOOKS!



Take this first free step to protect your ideas! We will send you without cost or obligation the C. A. Snow & Co. special "Certification of Invention" form, which, when properly filled out and witnessed, can be offered in support of your claims. We invite you to avail yourself of our 66 years experience in serving inventors and helping them patent and commercialize their ideas. Your idea is actually an investment and deserves protection. Don't put it off—there are valuable ideas now lying in attics and desk drawers. Make up your mind to get complete patent facts at once. Your inquiry treated in strict confidence.

FREE! C.A. SNOW & CO

Registered Patent Attorneys Since 1875

111 SNOW BLDG., WASH., D. C.

Gentlemen: Please send me—without cost or obligation—your FREE books, "Suggestions on How to Commercialize Your Invention" and "How We Protect You." Also Certification of Invention form.

NAME _____

ADDRESS _____



BROOKLYN YMCA TRADE SCHOOL

YMCA

Unlimited Instruction without extra charge until you have mastered every part of the Course. **Full Shop Equipment** Unexcelled Instruction Fireproof Dormitories. Special Privileges. **Check your interests** on coupon to receive free literature.

- Aviation Mechanic
- Machinist
- Mechanical Pre-Engineering
- Diesel Engines
- Diesel Pre-Engineering
- Aeronautical Pre-Engineering
- Auto Mechanic
- Refrigeration
- Television and Radio Mechanic
- Architectural-Mechanical Drafting
- Armature Winding
- Welding
- Tool and Die Making
- Oil Burner
- Talking Pictures
- Electrical

MAIL COUPON

1117 Bedford Ave., Dept. P.M. Brooklyn, New York City, N. Y.

Name _____

Address _____

Business Demands Accountancy

—because Accountants Command Business

ACCOUNTANTS are usually in demand—at better than average earnings.

But today—more than ever before—the competent accountant finds his services at an increasing premium.

In the depression, business tightened up the reins and is watching costs—prices—every move — striving to operate on that basis of close control so essential to profits.

Then too, progressive business is building now for future prosperity — laying plans for expansion, for new processes, new markets — getting ready for the opportunities of the next ten years.

The Home Study Way to Accountancy Success

Thousands upon thousands of men have trained for Accountancy with LaSalle — at night — at home.

Their success — their progress — is a matter of record.

Whether their goal was a C. P. A. degree or advancement in business, our files are full of letters reporting income increases far out of line with the time and cost investment.

Note for instance, these four cases chosen out of many more we might cite. (Names on request.)

F. F. A. was a railroad yard clerk at \$112 a month when he began accountancy training with LaSalle. Five years later, his income was 500% larger and he was a Certified Public Accountant and attorney. F. C. was 22 years of age and general all-around man in an Arkansas lumber yard at \$75 a month. Five months later, his firm made him manager at \$125, and ten months later promoted him to a larger yard at \$250 plus a commission on sales.

O. D. always thought stories about LaSalle training were fairy tales until the training helped him—a clerk at \$75 a month—move up in six months to \$125, and within four years to \$250. He became General Auditor of a large national organization—with his income more than seven times his starting salary.

As an assistant bookkeeper in a great Western bank, C. F. H. looked forward to slow progress. But LaSalle accountancy training speeded up his climb to Assistant Trust Officer and to a salary increase of 400 per cent.

These Men Won Success in Ordinary Times — You Will Profit by Coming Prosperity

Remarkable as is the success of these men—you will have an advantage over them—you will be entering accountancy when unusual business conditions work with you for success.

Present conditions not only call for more capable accountants—but offer unusual opportunities for both quick and permanent success. The accounting student of 1941 will face real opportunity in 1942 and the accounting leaders of 1945-1950 will be largely determined in 1941-1942.

—If You Can Qualify

Ask yourself three questions:

1. Are you ambitious?
2. Have you determination?
3. Can you see and grasp an opportunity?

If you have determination; if you are ambitious; if you can take advantage of circumstances—*prove it* by investigating. A three-cent stamp, sixty seconds time, and the coupon below will bring you full information regarding Accountancy training and the opportunities to which such training leads. Then you can judge intelligently.

LaSalle Extension University

A Correspondence Institution

Dept. 164-HR

CHICAGO

Opportunities in Accountancy—Check below and we will send you a free copy of "Accountancy, the Profession that Pays," also information about our new training in Higher Accountancy, all without obligation.

Higher Accountancy

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

- | | | |
|--|--|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Law: LL.B. Degree | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Expert Bookkeeping | <input type="checkbox"/> Commercial Law | <input type="checkbox"/> Stenotypy |
| <input type="checkbox"/> C. P. A. Coaching | <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Modern Salesmanship |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Modern Foremanship | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Effective Speaking | | |

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

Present Position.....

Address.....

**WORLD'S
BEST
WANT AD
MEDIUM**

CLASSIFIED Advertisements



Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance
To be inserted under proper classification in February issue, copy should be in our office December 8th
February issue on sale January 1st
Popular Mechanics Magazine, 200 East Ontario Street, Chicago, Illinois

YOU'LL PROFIT

By reading and answering the classified ads in this section. Hundreds of opportunities to make and save money.

AUTOMOBILES—MIDGET CARS

KUNS' Fifth edition Automobile Racing Book. Tells how to build dirt track bodies, frames, engines. Records, superchargers, rules, formula, plans, stock conversions, roadster racing, fast Fords. \$1.00 postpaid; \$1.15 C.O.D. Ray Kuns, Department 25, Madisonville, Cincinnati, Ohio.

SPEED Warning indicator \$1.00. Anderson, Box 78, Audubon, New Jersey.

INCREASE The horsepower of your Ford V8 from 85 to 128 hp.—without supercharging. Send \$1.00 for detailed, simple instructions. Power Associates, P.O. Box 501, Wilmington, Delaware.

SAVE Your battery. Don't let cold weather starting stall your auto or truck. Now starting made easy and quick. Complete instructions 25c. Advance Laboratories, 2112 West 51st, Chicago.

MIDGETS. Racers, motorscooters. Build now while prices lowest. Catalog finest plans, parts, building kits, 10c. New list 100 used motors, midgets, parts, 20c. Shippo's Midgets, Box 543-H, Zanesville, O.

PROFESSIONAL Midget racers, two-passenger roadsters. Midget motorcycles, motorscooters. Guaranteed motors, wheels, parts, plans. Handbook catalog—90 illustrations—20c. Midwest, Box 1959-CH, Chicago.

BUILD This powerful, inexpensive supercharger for any automobile. Adds up to 8 horsepower. Complete plans 35c coins. Box 43, East San Diego, California.

AUTOMOBILE Superchargers \$3. Guaranteed mileage increase 20%; power 10%. University of Detroit test. Any car; give make, year. Wrench installs 15 minutes. John Hanley, Manufacturer, 5719 Loraine, Detroit, Mich.

AUTOMOBILE Books—Latest titles—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

AUTO SUPPLIES AND EQUIPMENT

KIRBY'S Muffler saves 10% to 40% gas and oil. More power. Less ping. Cooler motor. Less fumes. P.O. Box 365, Monterey, California.

1941 **IGNITION** Supercharger. E. G. Sales & Mfg. Co., New York.

BARGAINS—Welders, compressors, battery chargers, car washers. Liberal trial terms. Write Hobart Equipment, Box M-113, Troy, Ohio.

UNLOCK Practically any General Motors car quicker than a key. Saves time and labor on lockout calls. Necessary tool for garagemen, repairmen, skintracers. \$1.25 postpaid. Vogue Spec., Room 1514 Stevens Bldg., Chicago, Ill.

FREE Bargain catalogue, auto supplies, tires, tubes, tools. Garage, shop, service station equipment. For dealers only. American, 1211 Bedford Ave., Brooklyn, N. Y.

Popular Mechanics Magazine,
Chicago, Illinois
Gentlemen:

Have used Popular Mechanics Classified for ten years and it still leads the lot for returns.

I have sold stamps to one customer secured through Popular Mechanics for an amount in excess of all I have paid in advertising in your magazine for ten years, not to mention the thousands of other smaller buyers.

(Original letter on file in our office)

Very truly yours,
R. D. DAVIS

PISTON Rings—Steel seal design. Quick seating, stops oil pumping. For all cars. Send for circular. Piston Ring Sales Co., 4022 West Lake Street, Chicago.

RECLEAN Used oil without cost. Particulars. F. Gerwin, Fairview, Okla.

PLATING Outfits for auto parts. Connect to a battery. No tanks used. Free particulars and proofs. Gunmetal Co., Ave. J, Decatur, Ill.

AUTO TRAILERS

READY Now—Plans for nine new Jim Dandy Trailers including six modern house trailers. Catalog 10c. Also new edition of Trailer Builders Manual and catalog of parts, supplies and equipment. Price 25c. Both 35c postpaid. Trailer Supply Co., 5120-A Fulton St., Wausau, Wis.

MOTORCYCLES, BICYCLES, MOTOR SCOOTERS AND SUPPLIES

MOTORIZED Your bicycle with Mico 4-cycle power unit. Fits any standard bicycle. Send dime for installation instructions and price. Mico Manufacturing & Distributing Company, South 13th and Kentucky Ave., Sheboygan, Wisconsin.

BICYCLE Motor—Outboard, rides on own pneumatic wheel, Junior and heavy duty models. Richardson Mfg. Co., Dept. MP, Aurora, Missouri.

BUILD Power scooters, midget cars. We supply tires, wheels, motors. Lowest prices. Send 10c for plans, etc. Build-Your-Own Devices, Dept. 1-A, 536 North Parkside, Chicago.

MOTORCYCLISTS. Let's get acquainted. We can save you money on parts and accessories. List and deal free. Triangle, 1111 Washington, Chicago.

SAVE 70%! Thousands assembling own Comet motorscooter! It's easy. We supply parts, tires, wheels, motors. World's best. Literature, drawing 10c. Comet Cycle Co., Box 3032, Madison, Wisconsin.

LATEST Illustrated Pink-O-Gram describes sport, pleasure and racing motorcycles, midget cars, racing fuel, crash helmets, goggles and accessories. Full year's subscription 10c. Reggie Pink, 2077 Southern Boulevard, New York City.

MOTORSCOOTERS. Midget cars. Easily built. Complete plans and literature on wheels, tires, motors, clutches, transmissions, etc., 10c. Honsaker, Masontown, Penna.

MOTORCYCLES. Reconditioned. New, used, parts and accessories. All makes. Large stock. Bargains. Illustrated catalog, 15c. Indian Motorcycle Sales, Kansas City, Mo.

MOTORCYCLE. Parts, accessories. Most complete stock. New and used. We specialize on mail orders. What do you need? 35 page catalog 10c. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

ALLOY Pistons \$3.00—Harley, Indian, Henderson, Excelsior, Cleveland. Cylinder grinding, rings, bearings, gaskets, chains, sprockets, helmets, goggles, accessories, parts new and used for less. Catalogue and wings pin 10c. Ballak, 811 N. 9th, St. Louis, Mo.

MOTOR Scooters, engines, parts. Literature 5c. Goldi Motor Scooters, Niles, Michigan.

AVIATION

MOTORCYCLE Engines with air propeller \$18. Storms, 199 Broadway, Asheville, N. C.

PROPELLERS For aircraft, sleds, boats, etc. Propeller repairing, sled blueprints, hubs, face plates, snow sled skis. World's largest propeller catalog 10c. Banks Propeller Co., Love Field, Dallas, Texas.

PROPELLERS. \$1.75 Up. Lists, stamp. Watson, Box 632, Jacksonville, Florida.

PROPELLERS. Special sled Airliner type, all sizes, priced right, quality, quick service, literature free. Model A aircoil conversion, diagrams, instructions 25c. Standard Aero-Craft, Ft. Worth, Texas.

AIRPLANE And engine mechanics examinations. New authentic 1940 quiz book in question and answer form. Why fail? Only \$3.00 for both examinations, and C.A.R. Postpaid or C.O.D. Quiz System, Dept. M, 1435 Flower St., Glendale, Calif.

AVIATION Apprentices — Airminded young men interested in technical training for entering aviation as apprentice see ad on page 18A.

100 **AIRPLANES** \$45 Up. Terms, trades. Complete catalogue 25c. Used Aircraft Directory, Athens, Ohio.

AVIATION Wants more Lincoln trained men for positions as airline mechanics, aeronautical engineers, airplane factory mechanics, commercial pilots. This Lincoln Government Approved School of Aviation placing graduates in fine big pay positions. Opportunities for many more. Courses from 8 weeks to 2 years prepares for immediate employment. Reasonable rates. Write today for information. Lincoln Aeronautical Institute (Inc.), 2008 Aircraft Building, Lincoln, Nebraska.

BUILD World famous warships, airplanes, race cars. Tremendous selection; complete kits. No extras to buy. Free literature and picture sheet. Write today. Aircraft, 4028 Elston, Chicago.

AVIATION Books—Latest titles—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

AIR CONDITIONING

FURNACE Blowers—\$22.50 up; attic blowers, cooling blowers and air conditioning blowers—all sizes. Guaranteed. Write for literature. Reynolds Mfg. Co., Grand Rapids, Mich.

ELECTRIC Refrigerators—all makes. Used. Sold as is. \$12.00 f.o.b. Chicago. Dealers Refrigeration, 3321 Ogden, Chicago.

AIR Conditioning books—Latest titles—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

BATTERIES, GENERATORS, ETC.

EDISON Storage batteries for light-power systems. Non-acid. Odorless. Fifteen year life. Five year unconditional guarantee. Bargains in complete lighting systems. Low prices. Free illustrated literature. "See-Jay" Battery Co., 82 Sterling Ave., Yonkers, N. Y.

1/2 HORSE Repulsion induction, heavy duty 3400 speed motors \$9.75. Butler Electric Company, 1885 Milwaukee, Chicago.

BUILD Electric plant operated by wind from old generator. Complete plans and 1941 catalog 10c. LeJay Manufacturing, 447 LeJay Building, Minneapolis, Minn.

ELECTRICAL SUPPLIES—EQUIPMENT

FLUORESCENT Fixtures—Any type. Get our prices first! Wholesale Distributors Company, Manufacturers, 5800 N. Broadway, Chicago, Illinois.

FLUORESCENT Lights: Make your own from our kits. All parts furnished, 18" \$2.80, 24" \$2.95, 36" \$5.24, 48" \$5.60. Other electric fixtures at factory prices. Send for catalogue. Aurora Mfg. Co., 123 So. Robertson Blvd., Beverly Hills, Calif.

HEALTH Lamp: Dual ray—ultra violet—infra red. AC-DC. Sun-Tan vitamin "D". \$3.90 postpaid. Beyer Mfg., 4515-H Cottage Grove, Chicago.

TRANSFORMERS Rewound. coil winding. direct reading Wheatstone bridges. Free circular. Thomas Company, 321 Caroline, Neenah, Wis.

GENERAL Electric washing machines. Model AWS14. Retail \$69.00. Our price \$39.00. F.O.B. Chicago. Beers Appliance Co., 3319 Ogden, Chicago.

ELECTRIC Pencil: Write-engraves all metals. \$1.00 postpaid. Beyer Mfg., 4515-H Cottage Grove, Chicago.

ELECTRIC FENCING

ELECTRIC Fencer. Brand new. \$5.00 postpaid. Bond, 13139 Hamilton, Detroit.

WELDING—SOLDERING—PLATING

MELTOMATIC Paste solder—self-cleaning and fluxing—simply apply and heat. Send 5c cents for four ounce can postpaid. Wayne Chemical Products Co., 9400 Copeland, Detroit, Mich.

SPOT-WELDERS \$60, 16 Gauge. Gale Hollinger, Glen Ellyn, Illinois.

200 TO 600 Amperes d.c. arc-welder built from d.c. vehicle motors. (No rewinding.) Plans \$1.00. Welders Club, AB-3432 M-Mart, Chicago. For sale: Vehicle motors \$20.00 each.

ENGINEERED Blueprint plans for constant duty, arc welders, spot welders, and combinations, coils, laminations, wire and insulation material. Write Hal Hubertz, Engineer, 410 S. Hoyne Avenue, Chicago, Illinois.

25-200 AMPERES d.c. arc-welder built from farm light plant. (No rewinding.) Plans \$1.00. Welders Club, AB-3432 M-Mart, Chicago.

BUILD 60-200 Amp. a-c welder for \$10. Several plans \$1.00. Information dime. Hi-Point Electric Products, Dept. W, Bellefontaine, Ohio.

SEASON'S Greetings to all my friends, F. Gage, Welders Club, Chicago.

BARGAINS. Demonstrator arc welders, gasoline and electric drive. Build your own portable, save \$500. Liberal trial, easy terms. Write Hobart Welder Exchange, Box M-112, Troy, Ohio.

ELECTROPLATE Small parts, novelties, baby shoes. Make money. Low priced outfit. Choate Manufacturing Company, 3464-L Principio Ave., Cincinnati, Ohio.

GENUINE Dodge d.c. arc-welder. Build it yourself. (No armature winding.) One generator 125 amperes. (Two 200). Plans \$1.00. Welders Club, AB-3432 M-Mart, Chicago.

A.C. Welders, plans, material. Free literature. Holgerson's Service, Canton, Kas.

ACETYLENE Welding generators, latest type. \$25.00. Johnson Generator Co., Brookfield, Missouri.

ENGINES, MOTORS, DYNAMOS

"PEPY" Governors make automobile engines power units. Sensitive and accurate. Low price. \$9.50 postpaid. Trial and refund guarantee. Circulars. Harris Machinery, Minneapolis, Minnesota.

BARGAINS—Welders, electroplating motor generators, guaranteed, liberal terms. Write Hobarts, Box M-114, Troy, Ohio.

600 NEW Motor diagrams, tables, and controller connections for the practical electrician. Makes dual-voltage, multi-speed, star and Delta circuits clear and simple. Also includes all standard split phase, repulsion, induction compensated series, two and three phase. Data for re-winding and reconnecting all types. Over 100 valuable tables. Money-back guarantee. Price \$2.00 prepaid. Educational Advancement Company, Lakewood, New York.

ALTERNATING 1/2 Horse, 110 volt, induction motors. Rebuilt, guaranteed, \$7.25. Wilmut Auto Supply, 2247 St. Paul Ave., Chicago.

AIR Compressors 1 1/2x1 3/4 \$8.00; 2x2 \$7.00; 2 1/2x2 \$8.00. electric drills 1/2 in. \$5.95. Free folder. National, 1915 S. State, Chicago.

ALTERNATING And direct current generators, motors, converters; bargain prices. State your needs. Queen City Electric, 519 South California, Chicago.

MOTOR Winding data, diagrams, winding lessons. Particulars, stamp. Motor Data Company, Box 7631, Kansas City, Mo.

GUARANTEED Merchandise. Motors; grinders; drills; home workshop tools. Bargain pricelist. Mallorider Electric, 707 South Dearborn, Chicago.

MACHINERY, TOOLS AND SUPPLIES

10 IN. Screw cutting metal lathes, 1/4 price. Picture, dime. Lindie, 508, Abilene, Texas.

HANDYCRAPTERS! All the parts you're always seeking. 10 pound plated assortment of screws, bolts, nuts, washers, springs, rivets, brackets, etc. 1000 handy gadgets! No junk. \$7.50 value, yours for \$1.98. Satisfaction guaranteed. Manufacturers Products, 218 W. Hubbard St., Chicago.

GUARANTEED Nonbreakable chisel handles. 3 for \$1.00. Box 11, West Springfield, Mass.

FLEXIBLE Shaft fittings. 1/2 hp. capacity. 4 ft. \$8.00, 5 ft. \$10.00, 6 ft. \$12.00, 100 only. Flexible, 607 W. Scott St., Chicago, Ill.

BUILD Your own machine tools. Equip your shop at big savings. We furnish castings, materials, blue prints for milling machine shaper, band saw, and 21 other metal and woodworking tools. Send 10c for new 1941. 32-page, illustrated catalog. Lewis Machine Tool Co., Dept. M-12, Box 116, Station A, Los Angeles.

WE Buy complete plants, lathes, shapers, milling machines, drills, presses, motors, etc. Steinberg Machinery Company, 1132 Lake Street, Chicago, Illinois.

MACHINISTS Tool chests at bargain prices. Circular free. Cepuder, 3602 Wesley, Berwyn, Ill.

CONCRETE Building block machines and molds. Easy payments. Catalog free. Concrete Machine Co., 5129 South Compton Ave., St. Louis, Mo.

6 FT. Flexible shaft mounted on 1/2 horse alternating motor \$19.50. Butler Electric Company, 1885 Milwaukee, Chicago.

13" x5" WILLARD Lathe with gap. No. 2 Pratt & Whitney hand milling machine. four step cone drive. Write for full particulars. Cincinnati Machinery & Supply Company, 217 E. Second St., Cincinnati, Ohio.

BOATS, OUTBOARD MOTORS, ETC.

TEN Plywood boat plans 50c. Free catalog boatbuilding plans. The Rudder, 15 Murray Street, New York.

OUTBOARD Motors, all makes. Used motors and parts. Stamp brings motor list. Outboard Headquarters, 305 Atlantic Ave., Boston, Mass.

FORD-Mercury-Zephyr marine conversions. Catalog 10c. Lehman Engineering Company, Dept. D, Newark, N. J.

MARINE Power—Easily convert any Ford motor (domestic and foreign) with Osce parts and kits. Complete catalogue 25c (coin). Osmithson, 3644 Lawrence St., Philadelphia, Penna.

MARINE Conversion parts for all auto engines. Buy here and save. Conversion Parts Co., 278 Adams St., Boston, Mass.

FULL Size, cut-to-shape boat patterns—blueprints—specifications. Big selection. Designed by naval architects. Real bargains. Send 10c (coin) for illustrated catalog. Book "How to Build Boats," \$1.00 postpaid. Cleveland Boat Blueprint Co., Station A-68, Cleveland, Ohio.

OUTBOARDS—Save 1/2. Good used parts, all makes and models. Bargains rebuilt motors. Crandall Hicks Co., 959 Commonwealth, Boston, Mass.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY, TRAPPING

IF You're a sportsman you need our catalogue. Mershon Company, Glendale, Calif.

SPEED Actions for Enfields \$8.00, Krags \$5.00. Adjustable trigger. Enfield cocks on opening. K. Clark, Madera, Calif.

TARGET-TENNIS! Make-sell. Just invented. Keeps score. Plans 50c. Box 663, Pittsburgh, Penna.

LIKE To hunt or shoot? Send 6c stamps sample copy 64-page monthly magazine, exclusively about guns. The American Rifleman, 1610 Rhode Island Ave., Washington, D. C.

SHIP Your furs to the house professional trappers prefer. Expert grading gets you every cent of their value. No commission charged. Send postcard for free catalog, tags. Hill Bros. Fur Co., Dept. 325, St. Louis, Mo.

GET Fur-Fish-Game. Subscribe now—save 80c. Buy a whole year's pleasure for yourself and sportsmen friends—twelve monthly copies of Fur-Fish-Game packed with fascinating, true, hunting, trapping, fur farming, dog, fishing experiences, fur markets, questions. Christmas special—one year (regular \$1.80 newsstand value) for \$1.00, including free gift card, or 6 months for 50c. Clip ad, send with name, address, remittance to Fur-Fish-Game, 168 E. Long St., Columbus, Ohio.

BARGAINS! Gun catalog 5c, camera catalog 10c, archery catalog 5c, ski catalog 5c, medal-award catalog 10c. Warshal's, First-Madison-PM, Seattle.

ARCHERY Equipment—Catalogue free. Mid-West Archery, 2209-A East 75th, Chicago.

SEND For free illustrated catalog of Lawrence leathers, belts, holsters, gun cases and other sporting equipment. George Lawrence Company, Portland, Oregon.

COMPLETE Camping, hunting, outdoor equipment, used guns. Catalog. Howe Fur Company, Coopers Mills, Maine.

INDOOR And outdoor sports—Latest books—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

BODY BUILDING COURSES

EXERCISE Equipment, courses. Special offers! Free booklet. Good Barbell Co., Dept. PM, Reading, Penna.

ATHLETIC EQUIPMENT

NEW Improved barbells \$5.00 each 100 lbs. Guaranteed unconditionally against breakage. International sleeve sets for competition. Barbells, 5742 Woodrow, Detroit, Michigan.

FIELD GLASSES, TELESCOPES AND MICROSCOPES

TELESCOPES, Microscopes, binoculars; bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

ANTIQUES, RELICS, INDIAN GOODS, CURIOS

WAR Relics, famous regiment buttons, insignia, medals, confederate items, coins, curios. List 8c. Uncle Abner's, St. Petersburg, Florida.

AUTHENTIC Pattern glass and unusuals reasonable. Laura E. Horton, Stafford, Kansas.

SWORDS, Pistols, daggers, armor list 10c. Robert Abels, 860A Lexington Ave., New York.

WANTED—Old slot machines, nickel slot pianos, arcade machines. Boyer, 2700 Wabash, Chicago.

GLASS. Books, minerals, curios, catalog 5c. Junies Antiques, Northbranch, Kansas.

30 GENUINE Indian arrowheads, \$1.00. Catalog. Geo. Holder, Glenwood, Ark.

\$100.00 PAID For certain Indian relics. Illustrated identification chart 25c. Glen Groves, 6601 Oakwood, Chicago, Ill.

INDIAN Relics, coins, bills, gems, crystals, curios, etc. Illustrated catalog 5c. 100 ancient arrowheads \$3.00. H. Daniel, Hot Springs, Ark.

CHINQUILLA'S Indian Craft Museum. Handwork of all Indian tribes, Jamaica, N. Y.

INDIAN Relics, beadwork, coins, curios, minerals, old glass. Catalog 6c. Indian Museum, Osborne, Kansas.

TAXIDERMY

GLASS Eyes—Imitation concave convex for deer. Sample pair, 55c. "Silver Line" headforms, supplies. Send for catalog No. 3. Penn Taxidermy, Hazleton, Penna.

GLASS Eyes, taxidermists', furriers' supplies. Big catalog free. Elwood Company, 222 Smith Bldg., Omaha, Nebr.

DOGS, PETS, BIRDS

PUPPIES. All kinds; free details! Book 104 photos recognized breeds 25c. Royal Kennels, Chazy, N. Y.

FLYING Squirrels. Make ideal pets. \$5 pair. Shuler Horne, Charleston, S. C.

FOR Sale: Raccoons, ferrets, skunks, squirrels, covies. A. Tippman, LaCrosse, Wis.

BIRDS? Get American Canary Magazine monthly. Year, \$1.00. 2839-P North Halsted, Chicago.

BEAUTIFUL Pure white police dogs. Ansonia Kennels, Mose, N. Dak.

SPORTSMEN: 200 Pointers, setters, straight cooners, combination hunters, rabbit and fox hounds. Reasonable. List free. Ramsey Creek Kennels, Ramsey, Illinois.

TREES, SHRUBS, ROOTS, HERBS

CACTUS. 60 Varieties illustrated. Catalog 10c. Robinsons, Richmond, Calif.

JUST Out! World's greatest "Herbalist Almanac." Beautifully illustrated in natural colors. Contains over 200 old fashioned herb medicine recipes for home use. 10c (coin) postpaid. Botanicals, Box 1109, Evergreen Park, Ill.

POULTRY AND FARM SUPPLIES

COLONIAL Chicks low as \$5.40 per 100. Time payments. World's largest hatcheries. Leading breeds. Also sexed and hybrids. Big chick almanac free. Colonial Poultry Farms, Pleasant Hill, Mo.

MAKE More money raising poultry. Colored pictures of poultry and most common poultry diseases supplement valuable information. Six months 10c, two years 25c. American Poultry Journal, 575 South Clark, Chicago.

MORE Chicks for less money. Highest quality, low price. Can make immediate shipment. Dubois County Hatchery, Box 912, Huntingburg, Indiana.

DO You want chicks that are bred to make money? Then order my Champion chicks—7 years matings with ROP and pedigreed stock. Hatches every week. Sexed or unsexed chicks. Write for free catalog—early order discount. Salem Hatchery, Box 81, Salem, Indiana.

MAKE More money from your broilers and layers by buying Hinkle chicks which have been especially bred for years for broilers and layers. Immediate shipment—sexed or unsexed chicks. Catalog free. Hinkle's Greensburg Hatchery, Box 40, Greensburg, Indiana.

DON'T Buy chicks from peddlers. Order Davis chicks—save money and be protected. Write for free catalog. Davis Poultry Farm, Route 34, Ramsey, Indiana.

WE loan you a brand new brooder if you raise Carney sexed or unsexed chicks this year. Hatches each week. Write for catalog and details. Carney Hatchery, Box 36, Shelbyville, Indiana.

MONEY To be made in poultry this year. Poultry Item tells why and how. This leading poultry magazine 4 months 10c. Highly illustrated. Best writers. Get big bargain winter issues. The Poultry Item, Box 71, Sellersville, Penna.

MAKE More money raising fast growing embryo fed chicks. Hatches every week. Can make immediate shipment. Catalogue free. Jackson County Hatchery, Box 32, Seymour, Indiana.

LEADING Turkey magazines, devoted exclusively to turkey raising. Explains newest methods. \$1.00 a year. Turkey World, Desk 70, Mount Morris, Illinois.

LOW Factory prices on poultry equipment. Wire fabrics. Free 100-page catalog. Bussey Pen Products, 5151 West 65th Street, Chicago.

MAKE Money with poultry. Read America's leading poultry magazine. Five years \$1.00; one year 25c. Poultry Tribune, Dept. E-60, Mount Morris, Illinois.

FARM MACHINERY AND SUPPLIES

GARDEN And small farm tractors, $\frac{3}{4}$ to 8 horse-power. \$75.00 and up. Ride or walk. Catalog free. Shaw Mfg. Co., Dept. FM-12, Galesburg, Kansas.

BUILD A tractor of used parts. Buick motor. Fordson tractor axle. Starter. Lights. Pulls regular equipment. Drawings, instructions \$1.50. L. C. Zellers, Route 1, Rochester, Michigan.

FARMS, FARM LANDS, REAL ESTATE

THE Highlands of Louisiana where winter brings no idle acres. Low prices. Liberal terms. Descriptive book sent upon request. Long-Bell Farm Land Corporation, 869 R. A. Long Bldg., Kansas City, Mo.

GOOD Farms available. Washington, Minnesota, Idaho, western Montana, Oregon. Dependable crops, favorable climate. Write for impartial advice, literature and list of typical bargains. Specify state. J. W. Haw, 119 Northern Pacific Ry., St. Paul, Minn.

DESIRABLE Farms, Griggs county, N. Dak. Good improvements. Good groves. Close to good towns. \$6.00 per acre and up, quick sale. R. S. Lunde, Cooperstown, N. Dak.

\$30,000 FROM Five acres—\$22,000 from $6\frac{1}{2}$ acres. Many others. Details mailed free without obligation. Clifton J. Lamb, 539 Broad Street, Meriden, Conn.

CANADIAN Tax sale lands for a dollar an acre and up. Small monthly payments. Farms, timber, hunting and fishing camps, minerals. Limited number of properties. Write at once for free illustrated booklet. Tax Sale Service, Room 613, 72 Queen St. W., Toronto, Canada.

103 ACRE Equipped tractor farm. Handy town; 8-room stone and frame house. Basement barn 40x80; stream, fruit, only \$3150 including tractor, machinery, 6 cattle, hens, lot crops; terms; pg. 67 big free catalog. Strout Realty, 255-P 4th Ave., New York City.

FLORIDA Lakefront tracts \$100.00. Five acre highway fronts \$50.00. Ten acre citrus and tung oil land \$50.00. \$5.00 down \$5.00 monthly. R. W. Stewart, Inverness, Florida.

GOVERNMENT Land—10c acre up. Information all states 25c. Nat. Tax Service Bureau, 1037A Maletic Bldg., Detroit.

40 ACRES. Near White River, unimproved; poultry land. \$175. \$5 down. \$5 monthly. Free list and literature. Hubbard, 216 Grossman Bldg., Kansas City, Kans.

PROFITABLE OCCUPATIONS

ANNOUNCING New home study course in commercial baking. Good field. Nearly depression proof. Common school education sufficient. Send for free booklet "Opportunities in the Baking Industry" and requirements. National Baking Institute, 3601 Michigan, Dept. 3431, Chicago.

MOLD-MAKING. Plaster casting, money-making home business. Valuable folder free. Kemico, 100, Park Ridge, Ill.

OPERATE Steady business resilvering mirrors. Making chipped glass nameplates, signs. Write Sprinkle, Plater, 288, Marion, Indiana.

SIGNS. Showcards, gold window letters easily made with Master Patterns and free copyrighted instructions. Big profits. Samples 10c. Catalogue free. Economical Signs, 1572-74 North Halsted, Chicago.

MEN—Women, operate "Specialty Candy Factory" home. All or spare time. Opportunity for good steady income. (Our 32d year.) Ragsdale Candies, Dept. 62, East Orange, N. J.

RAISE Angora rabbits. Wool brings \$5.00 pound—steady demand! Particulars free. Grinstead's, Carrollton, Illinois.

\$40.00 WEEKLY Growing mushrooms for us, fresh or dried. Dominion patent 331583, free spawn. North American, 169P Youve, Toronto, Canada.

DOMESTIC Rabbits pay. Read Small Stock Magazine—America's leading magazine devoted to commercial and fancy rabbit industry. Introductory year 50c; sample 10c. Dept. 5, Lamoni, Iowa.

RAISE Rabbits and covies for us. Full details. Catalog contract and magazine 10c. Or send 25c for book, catalog and year's subscription to Small Stock Farmers Magazine, Stahl's, Box 10, Holmes Park, Missouri.

WILL You give us 5¢ first \$600 you make? Afternoons free! Work home. \$1,000 month reported (exceptional—full-time). Expect surprise! National, Box 1240-C, San Bernardino, Calif.

ANGORA Wool rabbits pay. America's fastest growing industry. Start now. Dakota Rabbitry, Oakes, North Dakota.

GAMES—ENTERTAINMENT

BINGO Games and equipment, lowest prices. Warwick Press, Conimicut, R. I.

PLAYS. Operettas, musical comedies, complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologs, dialogs, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 203 N. Wabash, Dept. 11, Chicago.

BOOKS, PERIODICALS, PICTURES, POSTCARDS

BOOKS For model railroaders—contains invaluable detailed information, profusely illustrated. Send for free illustrated list. Kalmbach Publishing Company, 1566 W. Pierce St., Milwaukee, Wis.

EXCELLENT Sparetime profits taking subscriptions—2500 magazines. Agents confidential catalogue, complete starting supplies free! Dept. 17, Pines, 583 Monroe, Brooklyn, N. Y.

NOVELTIES. Photos, books, Big assortment \$1.00. Catalog 10c. E. G. Specialties, W. Carnegie, Penna.

BOOKS. Fiction, home-study, religious, reference, bargain list free. W. W. McCully, Louisville, Miss.

MOVIE Star photos, one cent up. Free catalog. Irving P. Klaw, 209 East 14th St., N. Y. City.

MAGAZINES. Back numbers, list 3c. Magazine Mart, Roslyn, N. Y.

THRILLING Cuban, Mexican, art pictures, books, miscellaneous. Samples, lists, 50c. Jordan Art, Cedarlane 16, Boston.

BOOKS (Fiction, non-fiction) formerly \$2.50-\$3.50, now only 50c. Illustrated lists free. American Guild, 26 North Broadway, Yonkers, N. Y.

ELECTRICITY—Practical information. Explains principles, application, troubles, meters, etc. in non-technical terms. Rural electrification users should have "Electricity—What About It." Sent postpaid for 50c. Sine Curve Co., Bensenville, Illinois.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

HOUSE Of 1000 Mysteries! Professional magic! Pocket tricks! Jokes! Puzzles! Novelties! Giant surprise catalog! Bigger-better than ever! Only 10c! Vick Lawton, Dept. J9, Queens Village, N. Y.

GET This big new catalog of magic, 228 pages, 500 illustrations. World's largest line of quality magic. Send 35 cents for catalog. Your money refunded with first \$2.00 order. National Magic Company, 119 S. State St., Chicago, Ill.

BE A magician. Large professional magic catalogue of latest tricks 25c. Cash paid for complete Tarbell Magic Courses. Write, Ireland, C-109 North Dearborn, Chicago.

TRICKS And Joker's novelties. 3c stamp brings sample and catalog. Ess-Jay, 5019-P Winthrop, Chicago.

TRICKS You can do! For pocket, parlor, stage. With coins, cards, cigarettes, ropes, balls, thimbles, watches! Escapes, mindreading, spirit and mental magic! Illusions, magical books and stage supplies! Largest assortment; lowest prices! 100 page catalog 500 popular tricks 10c. 80 page catalog larger stage magic 10c. Write today! Lyle Douglas, Station A-5, Dallas, Texas.

HOLLYWOOD Special! Magicians button, catalogue, ghost illusion and free trick for 25c. Magic House of Charles, Box 888, Hollywood, California.

MAGICIANS' Headquarters, 216-page catalog pocket, parlor, professional tricks, 25c. Kanter's, 1311 Walnut, Philadelphia.

EARN Money in any crowd. Call names of strangers, tell unspoken questions. Professional course mind reading, spirit writing, etc., \$1. Henderson, Box 341, San Bernardino, Calif.

WORLD'S Largest professional magic shop keeps you in touch with latest tricks. To receive mailings send 25c for 1940 catalog. Holden, 220 W. 42nd St., New York.

LARGE Magic catalog 25c. Hundreds of tricks. Chicago Magic Company, 2300 N. Mason Avenue, Chicago.

RARE COINS

OLD Money wanted. Will pay fifty dollars for nickel of 1913 with Liberty head (no buffalo). We pay cash premiums for all rare coins. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 20, Fort Worth, Texas.

BUY By mail! U. S. and foreign coins. Collectors' accessories. Illustrated catalogue 10c. 3000 quotations. Dime refunded first order. James D. Randall, 37 West Van Buren, Chicago.

UNCIRCULATED 1940-5 Cent and catalogue 10c. London, 4410-A Lankershim, North Hollywood, Calif.

SENSATIONAL Prices paid. Catalogue 10c. Sibert, 17 Middaugh, Brooklyn, N. Y.

GET Profit and pleasure in collecting old coins. Send 10c for 56-page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 370 Mehl Building, Fort Worth, Texas. Largest rare coin establishment in U. S. Established 41 years.

FREE! Foreign coin, banknote and large 36 page illustrated coin catalogue to approval service applicants. Send 3c postage. Tatham Coinco, Springfield-125, Mass.

COMMEMORATIVE \$1's. Columbus, Stone-Mountain, Cleveland, Illinois, \$1.00 ea. New catalogue 10c. Norman Shultz, Salt Lake, Utah.

I MAY Have just the scarce U. S. coins you want. Send me list. "Meet me by mail." William H. Kenworthy, Waterville, Maine.

RARE U. S. foreign coins, war medals. Catalogue 10c. Mengelle, Colorado Springs, Colo.

15 DIFFERENT Coins 25c. Oddehon, Box 44, Overland, St. Louis, Mo.

SENSATIONAL Offer. Certain cents worth \$750.00; nickels \$1000.00. Biggest value coin book published. 1941 edition, 36 pages illustrated with actual photographs. Special price 10c. American Coins, Box 3507-A, Cleveland, Ohio.

WILL Pay \$12 each for certain Lincoln pennies! Indianheads \$200; dimes \$1000. Catalogue 10c. Federal Coin Exchange, Columbus, Ohio.

INDIAN Coins, 32 different dates including album, \$2.00; Lincoln cent set complete, including album, special \$3.00 postpaid. Koepfel Coin Shop, 8th at Broadway, Los Angeles.

SAN FRANCISCO Mint coins for sale. H. Barrill, 2709 Sacramento, San Francisco, Calif.

STAMP COLLECTING

NEW Collectors outfit—Here's a fine new stamp outfit everyone can use! It contains a stamp wallet—worth 10c; 1000 peelable stamp hinges—worth 10c; special magnifying glass—worth 10c; 25 sheets for duplicates—worth 10c; newest style perforation gauge worth 10c; efficiency watermark detector—worth 10c; 10 glassine envelopes—worth 5c. Purchased separately, you'd have to spend 65c, but as a special offer we'll send the complete outfit for only 10c to new approval applicants. Frasek Co., Dept. 55, White Plains, N. Y.

SPECIAL—Airmails—23 different, including triangles, zeppelin, Latin-America, etc. 5c to applicants for best value, attractively priced approvals. Continental Stamp Co., Dept. B, Sandy Hook, Conn.

FINE Approvals, freshly filled books and sheets. Tell me what you want and I will send them. Skinner, 306 East Fourth, Long Beach, Calif.

50 DIFFERENT U. S. commemoratives 10c to approval applicants. Budic, 6929 W. Greenfield, West Allis, Wis.

SENSATIONAL Combination offer! Big packet 105 all different including Greenland (new country), Congo, Manchukuo, Costa Rica triangle, air-mails, commemoratives, giant diamond-shaped stamp, \$4 United States; complete set United States telegrams, cataloging 20c, scarce set Siberia cataloging 50c. Packet British colonies including Gwalior, Hyderabad, Burma (new country), Jubilee and coronations. Total catalog price over \$3.00! Everything for only 5c to approval applicants! World-Wide Stamp Company, Department 600, Camden, New York.

GARGARTUAN Packet—Kwanschowian, Azerbaijan, Manchukuo, natives, air, vanished nation. \$4.00, \$5.00 U. S., 67 others. All for 5c with approvals. Humphrey, 310P Cloverleaf, San Antonio, Texas.

ART Mounts for stamp collectors. New, beautiful, fascinating. 12 different countries \$1.00; sample mount 10c; stamp Journal one year \$1.00; sample 10c. W. Moore, 111 Oak Terrace, Merchantville, N. J. Dealers wanted.

BARGAINS! 1000 Foreign, over 500 varieties 50c. Star, 148 Forbell, Brooklyn, New York.

SARAJEVO Assassination issue, complete, and valuable packet, 10c. Approvals. Rmsco, Highlands, Box 85x, Denver, Colorado.

300 DIFFERENT Stamps (catalog over \$6.) 10c to applicants for our profit sharing foreign approvals. Official Stamp Company, Box 301-J, Fairlawn, N. J.

DEALERS! South American bank mixture on small clippings, many high values. "A used new issue service." 1000 stamps \$5.00 (trial lot 360 stamps \$2.00.) Used air-mail lots at \$1.00, \$2.00 and \$5.00. Satisfaction guaranteed, write for mixture list. Yale Stamp Company, 226 West Longwood, Detroit, Michigan.

PREGANCELS On approval at 1c each and less. Gardella, Camino, California.

PORTUGAL 100 All different 25c. Approvals. Hermes Stamp Company, Box 278, Hempstead, N. Y.

WORLDWIDE Packet free with approvals. Monjar, 1542 Waverly, Cincinnati, Ohio.

50 DIFFERENT Foreign free with approvals. N. Greenstreet, 1233 W. 5th St., Port Angeles, Washington.

FIFTY Different Canada, many commemoratives 10c. Approvals. Killam, 159 Leinster, Saint John, New Brunswick, Canada.

U. S. price list free, postage 3c. Mark G. Hanna, 335 Fifth Avenue, Pittsburgh, Penna.

PREMIUMS. Lists, approvals—3c. Station "C." Box 4542, Kansas City, Mo.

CANADIANS 25 Different, large list of packets and sets 5c to approval applicants. Star Stamp Company, Gibson's Landing, B. C., Canada.

SEYCHELLES, Neid, Caymans, Manchukuo, Brunel, Turks Caicos, British Solomon (Cannibaland). Everything 3c with approvals, Viking, 130-Z Clinton St., Brooklyn, N. Y.

100 UNITED States revenues, 5c to approval service applicants. Tatham Stamp Co., Springfield-125, Mass.

SET Animal scenery stamps. Postage. Approvals. Gobrecht, 205 Anderson, Joliet, Ill.

U. S. Lindberg air mail 5c to approval applicants. E. P. Johnson, Box 267, Morgan Hill, Calif.

FREE! Canadian royal visit. Dobres, 4108 Garrison Boulevard, Baltimore, Md.

UNITED States approvals—selected copies at reasonable prices. Write today. Seminole Stamp Studio, Box 416, Miami Beach, Florida.

1941 STAMP Annual free. Lists British North America, United States, foreign. Free. Gray Stamp, Dept. PM, Toronto, Canada.

U. S. five different dollar stamps, gauge, pricelist, 10c. Seidenberg, Baroda, Mich.

FREE! Dollar value stamp collection. Iowa Stamp Company, Oskaloosa, Iowa.

MEXICAN \$20 Bill and 50 stamps from 50 different countries 10c. Nagles, 346 North 12th, Reading, Penna.

50 DIFFERENT 10c. approvals. Free gift. Pageboy, Box 282, El Monte, Calif.

FAMOUS Americans—Six sets complete, 30 stamps 45c. Pioneer Stamps, Caxton Building, Cleveland, Ohio.

25 DIFFERENT—Romania or Czecho or Poland—3 cents to approval applicants only. Reimers, Fort Worth, Texas.

50 U. S. including commemoratives, air-mails, perforce, approvals 10c. Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

AIRMAILS—Seven different U. S. air-mails 10c. Elsea, Bowling Green, Ohio.

VALUE! 10 Stamps, catalog over \$1.00 for 10c with approvals. Box No. 5105, Chicago, Ill.

20 MEXICO 3c. With approvals 1/2c up. Josiab Babcock, St. Joseph, Michigan.

250 MIXED. Good grade, worldwide 5c. Approvals. McCurdy, 2505 Highland Drive, Salt Lake City, Utah.

CZECHOSLOVAKIA—100 Different 19c. Approvals. Niederstadt, 4727 West Beloit, Milwaukee, Wisconsin.

142 JAIPUR Somalis, Bolivia, Selangor, Mauritania, Palestine, etc. 5c. Lufbery, Middletown, Connecticut.

DIAMOND! Mexican, 3c (worth 10c). Approvals. Lake Co., R3, Manitowoc, Wis.

WALDO Traders Exchange, Box 266, Dallas, Texas, has British colonial pictorials and old U.S.A. to trade for mixed U.S.A. stamps.

FAMOUS Americans—Complete artists or inventors 3c either set with approvals. Stanley Melzer, 3120 South Adams Ave., Milwaukee, Wisconsin.

20 DIFFERENT Cuban stamps for 25c. Leon, Linea 707 Vedado, Havana, Cuba.

1000 DIFFERENT Stamps from world \$1.00. Catalogue value about \$25.00. 500—50c. DeMers, Dept. M11, Box 1033, Milwaukee, Wis.

FREE! Complete United States catalog with 1,000 illustrations. Harris & Co., 137 Transit Building, Boston.

PACKETS Any country. Cheapest list. Schoemann, 1933 Washington Boulevard, Chicago.

SELANGOR Perak, Albania, Haiti, Bhopal, Palestine, Johore, Manchukuo, Congo, Kadah, Cochin, Kookaburra-bird and 200 different stamps only 10c with approvals. Reich Stamp Co., 4647 Kenmore, Chicago, Dept. M.

1000 MIXED U. S. 20c postpaid. Potter, 1314-P McGee, Kansas City, Mo.

BARGAIN Priced, Scott numbered, non-duplicating, interesting approvals. Puffer, Box 2, Station H, Buffalo, N. Y.

12 DIFFERENT U. S. 1862-1908. 3c. Weston, Box 383, Ponca City, Okla.

EXCELLENT, Unpicked U. S. mission mixtures, two pounds \$1.00. Al Johnson, 727 Foote, Colorado Springs, Colorado.

EXCHANGE Your duplicates. Stamp brings seven plans. Ahlmann, 3151 Los Feliz, Los Angeles.

AIRMAILS 25 Different 5c with approvals, 100 \$1.00. Paltra, 3204 Hull Avenue, New York.

URUGUAY 10 Different free with approvals. Ephriam, 1103 Oak, Evanston, Illinois.

SPECIAL U. S. album—free. The "Famous American" issue of the U. S. Government is too new to be represented in regular albums. We therefore offer a special album for these xx series, giving the history and achievements of each famous American under the space reserved for each stamp. This album can be completely filled at little cost. Just what you need! We will send it free for 5c handling expense, but only to sincere approval applicants. Approval Headquarters, Globus Stamp Company, 268 - 4th Ave., New York City, Dept. 201.

111 DIFFERENT With trading plan 5c. Aspen Trader, Richmond, Missouri.

BARGAINS In approvals—Tanganyika, Uganda premiums included. Dealing, Mound, Minnesota.

U. S. and foreign penny approvals. Lenott Stamp Company, Oxford, Maryland.

FINE Presidentials: \$2.00 Harding—40c; \$5.00 Coolidge—60c; 100 U. S. revenues on documents—10c! Vanvooris, Hyndman, Penna.

FREE! Canada royal visit complete with approvals. Chester, Box 545-P, Utica, N. Y.

AFGHANISTAN To Zanzibar; also Abyssinia, North Borneo, triangles, airmails, British Colonies, U. S. commemoratives and possessions. All in our "generous" packet for only 10c to approval applicants. Vogelmann, 404-P South Western, Chicago.

2000 STAMPS (U. S. and foreign) \$1. Lukesh, 145 West 79th St., New York.

FREE! Diamonds, triangle, others. Approvals. Stevenson, 500 Nicoll, Baltimore, Md.

U. S. revenues on approval. Max Kaye, 78 Beaumont, Springfield, Mass.

USED Airmail and pictorials on approval. Neatly mounted, correctly catalogued, fairly priced. Nutmeg Collectors' Mart, P.O. Box 294, Beacon Falls, Conn.

POSITIVELY Greatest free offer—Latest Scott's International \$3.50 stamp album—covering entire world—contains 33,000 illustrated descriptive spaces; Scott's 1941 standard \$3.00 catalogue "Philately's Encyclopedia"—Both absolutely free to applicants for foreign approvals becoming customers. Bargain Stamp Service, San Bernardino, California.

12 AIR Beauties 5c. Approvals. Herrfelds, 551 Clinton Ave., Newark, N. J.

FREE—Five beautiful airmails including triangle to approval applicants. Green and Company, Norwood, Ohio.

JOBBERS List of wholesale and retail bargain lots, free. James Randell, 37 West Van Buren, Chicago.

10,000 VARIETIES 1c Each! Gordon Davison, Box 568, Manchester, N. H.

UNITED States stamps on approval. Lowest net prices in America. Stamp Company, Albany, New York.

HIGHEST Value Brazilian postage and airmail stamps (10,000 reis)—both for only 20c to approval applicants. W. Torgesen, West Englewood, N. J.

175 U. S. commemoratives, etc., 10c. 500 25c. P.O. Box 457, Newark, N. J.

50 DIFFERENT, 3c. With approvals. Turbyll, 513W 29th, Norfolk, Virginia.

CANADA—25 Different and royal visit set 6 cents. Approvals. Gago Stamp Co., Box 1544, Muskogee, Oklahoma.

ABYSSINIA, Barbados, Haiti, Cyprus, Bolivia, Finland, Greece, Jamaica, Luxembourg, Malta, Mauritius, Natal, Netherlands, Nigeria, Queensland, Victoria. Everything only 5c with approvals. Stamp Service, 53-M Webster Avenue, Brooklyn, N. Y.

PENNY Approvals by country. M. H. Hoerning, Merriam, Kansas.

U. S. commemoratives—75 different, 25c. Crystal Stamp Co., Racine, Wis.

1,111 ASSORTED—25c. Approvals. Premiums, Utechts, 1143J North Keeler, Chicago.

U. S. mixture 50c pound. Holmes Stamp Co., New Albany, Ind.

LOW Priced U. S. approvals. Postage paid both ways. Kaiser Stamp Co., 302 Hurley, St. Paul, Minn.

15 DIFF. Famous Americans, 15 diff. presidentials, plus illustrated U. S. price list. Only 5c to U. S. approval applicants. Metropolitan Stampco, 198-P Broadway, New York City.

COSTA Rica airmails 1930-32; 5c to 40c; worth 50c—only 5c. Approvals. Stamp tons free to customers. Treasure Chest, 1416 N. Lockwood, Chicago.

LATEST Canadian air mail, with Canadian commemoratives. Newfoundland, British Colonies, etc. Large packet of 50 different for only 10 cents. Approvals will be included. Affects, 96 Agnes Street, Oshawa, Ontario, Canada.

UNITED States best mixtures 50c lb. Canada 70c. Foreign \$1.00. Mission, 4512 North Racine, Chicago.

YOU can now have famous Spanish Goya nude stamp, world's largest diamond stamp and world's largest triangle. These beauties sent for only 5c to collectors requesting approvals. To make this the year's biggest bargain, we will include absolutely free collection of 100 varieties containing weird scarce stamps from Transcaucasia, Georgia, Azerbaijan, etc. Cactus Junior, Box 1870-B, Tucson, Ariz.

FREE—The Stamp Finder! Send today for big new edition, fully illustrated, enabling you instantly to identify all difficult stamps! Also fine packet strange, fascinating stamps from Bosnia-Herzegovina, Monaco, Patiala, Cyprus, etc., including maps, ships, animals and strange scenes. All free to approval applicants enclosing 3c postage. Barcelona Stamp Co., Box 900, Calais, Maine.

DEALERS! Philatelic forms. Samples for stamp. Keelerprint, 3822-W Ogden, Chicago.

50 DIFFERENT Finland 15 cents with approvals. Pocono Stamp Company, Dept. P, Box 512, Wilkes-Barre, Penna.

APPROVAL Sheets. Frederick B. Driver, 401 Finance Bldg., Philadelphia, Penna.

NEW Pan American set. Ecuador 10c to approval applicants. Wilson, Box 2232, Tulsa, Okla.

150 GOOD Mixed foreign stamps, 5c coin. Stanton, Niantic, Conn.

40000 VARIETIES Available on approvals 1/4c up. Large selections, low prices. Adults only. P. Keigwin Stamp Company, Vineland, N. J.

EXCHANGE With collectors everywhere. Dime brings list and application. Modern, Box 995-S, New Haven, Conn.

50 FREE Catalogued \$1. Album 3c. Bullard, 13 Winter Hill, Mass.

UNITED States approvals—At half catalogue. Ireton, Box 92, Station "A," Los Angeles, California.

300 DIFFERENT 20c; 600, 50c; 1000, \$1.00; 2,000, \$3.00. Fred Onken, 630 79th St., Brooklyn.

50 DIFFERENT U. S. to approval applicants only. 5c. Theodore Stevens, 3576 Maryland Ave., Detroit, Mich.

SCARCE Diamond airmail! Wonderful packet 115 different from strange countries. British colonies, Haiti, Tasmania, pictorials, etc. 5c to approval applicants. Reliable Co., Box 139, Dept. 3, Church Annex, New York.

SEND Postage for free United States price list. Stanley Gibbons, 38-P Park Row, New York.

FREE! Pony Express set (facsimiles). Postage 3c. Roberts, 406 Shearer Bldg., Baxcity, Michigan.

FOUR Star approvals! Nothing like them! Write today 312 mixed U. S. 10c. Kessels, Tucson, Arizona.

SOUTH American—100 different 10c—with approvals. Davis, Silver Lake, Ind.

FREE! Austria war set. Postage 3c. Williams, 606 Archer Bldg., Bay City, Mich.

WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

200 DIFFERENT 10c. Big 50% approvals. Covert Stamp, 39 State, Rochester, N. Y.

CANADA 100 Different 25c—approvals all countries. Lists, Victoria Stamp Co., London, 4, Canada.

PENNY Approvals, that satisfy. Neil Gronberg, Box 5441-P, Philadelphia, Penna.

25 UNITED States, including \$4 and \$5 stamps free to approval applicants. 3c postage. Brownie Stamp Shop, Flint, Mich.

SMOKY Mountain commemorative sheet, largest U. S. stamp issued, and 33 U. S. including commemoratives, airmail, revenues, etc. Catalogue 75c—To approval applicants for 5c. Curhan Stamp Company, Gloucester, Mass.

WHOLESALE Dealer's catalog. Illustrated. Postage 5c. Frank's, 4900 Chalmers, Baltimore, Md.

WHOLESALE Supplements to dealers for 10c postage. Hundreds of bargains. Grossman Stampco, 102 West 42nd, New York.

GIANT Packet 200 all different from Africa, South America, Asia, South Sea Islands, etc. Includes world's smallest stamp; triangle and diamond-shaped stamps; animal stamps. Nicaragua "Will Rogers" airmail; many others. Also packet 17 different United States (catalogue 50c)—all obsolete, including \$4 denomination, commemoratives, etc. Total catalogue price over \$5.00! Everything for only 5c to approval applicants! Mystic Stamp Company, Dept. 80-N, Camden, New York.

STAMP Dealers, your ad here will bring wonderful returns. Ask me for proof. F. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HOBBIES AND COLLECTIONS

NATIONAL Wildlife poster stamps—latest issue. Set of 24, animals, birds, fish, flowers and trees. Beautifully lithographed in four colors. Complete with special story telling album—only 35c. Send for complete list. National Wildlife Federation, 1212 16th St., Northwest, Washington, D. C.

TWENTY Different cactus plants postage \$1.00. Eulalia Turner, Azusa, Calif.

TWELVE Hollywood night spot book matches 30c. E. Jewell, 315 South 57, Omaha.

EXCHANGE Your duplicate stamps, match covers, etc. with collectors everywhere. List, swappers, dime. (Mention hobby.) Secretary, Box 2166, Denver, Colo.

MATCH Book hobby. "Bulletin" membership blank, stamp, B-1111, Rochester, N. Y.

UNUSED Book match covers, 100 all different, \$1.00. Free list. Charles Edelman, 1311C East 84, Cleveland, Ohio.

WATER And pebbles from the historic Pascagoula Singing River. Souvenir vial 50c. Burleigh Cowart, 549 Polk Street, Pascagoula, Miss.

MATCH Book albums—no paste needed—make swell Christmas gifts. 75c and \$2 prepaid. Matchless Album, G. C., P. O. Box 120, New York.

HOBBY Books—Latest titles—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

CAMERAS, PHOTO SUPPLIES

MAKE Money in photography. Learn quickly at home. Easy plan. Previous experience unnecessary. Common school education sufficient. Booklet and requirements free. American School of Photography, 3601 Michigan, Dept. 3431, Chicago.

CAMERAS And supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book—just out! Limited edition. Hurry! Central Camera Co., (Photographic Headquarters since 1899), 230 S. Wabash, Dept. A-16Z, Chicago, Ill.

ENLARGER \$1.59. Enlarges eight times size of small negatives. Fully guaranteed. Paramount Sales Company, 89 Dudley Street, Boston, Mass.

CAMERA Repairing. Bellows made to order. Shutters repaired. Bellows made to fit all standard cameras! United Camera Co., Inc., A-1515 Belmont, Chicago.

BASS Says: Shrewd buyers, write Bass. For 30 years headquarters for everything in photography. 72-page Bargaingram No. 242 is interesting and free. Write for your copy. Don't trade until you write Bass Camera Company, Dept. AG, 179 West Madison St., Chicago, Ill.

HAVE You a camera? Send ten cents for recent number of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, 17, Mass.

CAMERAS, Films, paper 25% to 35% discount. Paramount Photo Division, 327 East 92nd St., New York.

PHOTOGRAPHIC Books—Latest titles—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

PHOTO FINISHING

PHOTOGRAPHY For pleasure and profit. Prepare at home. Common school education sufficient. Write for information and requirements. American School of Photography, 3601 Michigan, Dept. 3452, Chicago.

IMMEDIATE Service! Pictures returned same day order is received. Sixteen guaranteed deckled-edge prints from roll, 25c. One colored or two plain enlargements plus 8 deckled-edge Velox prints only 25c. Special! Coupon for 8x10 enlargement given with each 25c order. Any 35 exposure 35mm. film fine-grain developed. Vaporate treated and each good negative enlarged to 3x4 on deckled-edge Velox paper, only \$1.00! Reprints: 35 exposure, 50c; 18 exposure, 35c. 3x4 deckled-edge reprints, 4c each, 24 hour service. Details, sample and mailers free on request. American Studios, Box 51, LaCrosse, Wis.

TWO Free samples! New panel-print prints. This ad and two negatives brings samples, premium and price list, mailer in pocket packet. Synchronas Process, Box 137-B Utica, New York.

IDEAL Photos beautifully finished with wide border, deckled edge. 25c per roll of 8 and free enlargement. Ideal Photos, Box 2255, Paterson, N. J.

FREE! Eight chromium finish enlargements with every roll developed. 25c. Same day service. Giant Fotos, Box 632, Lincoln, Neb., Dept. PM.

35MM. Rolls developed in Champlin No. 17, each frame enlarged to 3 1/2 x 5, \$1.25, 18 exposures 65c. The MM Shop, 618 E. Lamme, Bozeman, Montana.

ENLARGING Specialist. Negatives enlarged toned. Any beautiful color desired. 8x10, 50c; 11x14, 75c; 14x16, \$1.50; 16x20, \$2.00. Heelia Photographic Laboratories, Cannon Avenue, Albemarle, N. C.

OIL Coloring photographs a fascinating hobby or profitable business. Learn at home. Easy simplified method. Previous experience unnecessary. Send for free information and requirements. National Art School, 3601 Michigan, Dept. 3432, Chicago.

ROLL Developed and 8 lustrous distinct finish permanent Velox glossy prints 25c—reprints 3c each. Fotoprint Service, Box I, Roanoke, Virginia.

FIXING Bath troubles solved. 50c. Wier, Box 4398, Fort Worth, Texas.

EXTRA Special: Five 5x7 enlargements, 25c. Cardinal Photos, Summit, New Jersey.

SEND Us your favorite kodak negative for a beautiful 8x10 colored and framed enlargement. Only 98c plus postage. C.O.D. Satisfaction guaranteed. Mosher Photo Service, Vineyard, Haven, Mass.

18 LIFETIME Prints, 3 sparkling Hollywood enlargement coupon, each roll 25c. 21 reprints 25c. 100—\$1.00. Finished 3 hours. 25 other bargains. Overnight Studio, A'banu, Ws.

JUMBO Pictures, double size from 116 size roll or smaller, 8 exposures one each 25c. 16 exposures 50c. Jumbo Picture Co., Box T3, St. Paul, Minn.

4 ENLARGEMENTS 10c. Twelve beautiful deckle border enlargements plus free Leathertone frame and negative holder, only 25c. Send rolls or negatives. Lifetone Studios, X-39, Des Moines, Iowa.

STAMP-SIZE Gummed, perforated photoprints. Negative unnecessary, 100—\$1.00. 25—50c. Wardwoode, MP-2, Wallingford, Connecticut.

TECHNIFINISH—35MM. 36 exposure rolls (including "Mercury") fine grain developed and beautifully enlarged to 3"x4" glossy prints, 85c. Cartridge reloaded with Eastman Plus X, 30c. One day service. Satisfaction guaranteed. Write for free mailing bags, information and sample print. Technifinish Laboratory, 641-645 Brown St., Rochester, N. Y.

FREE Beautiful album with cellophane envelopes plus roll developed and two sets of prints, 25c. Same-day service. Photo-Pho, Box 24-F1, Highland Park, Mich.

ENLARGEMENTS From negatives, 5x7, 5 for 25c coin; 8x10, 3 for 50c. Photo Service, Newcastle, Ind.

20 REPRINTS 25c. Hundred reprints \$1.00. Rolls developed and 10 prints or 8 prints and 2 enlargements—25c. Mercury Studios, Dept. L, 109 N. Dearborn, Chicago.

8 ENLARGEMENTS And films developed, 116 size or smaller, 25c coin. Special offer, enclose this ad and negative for double weight hand colored enlargement free. Enlarge Photo, Box 791, Dept. PM, Boston, Mass.

FREE: To Popular Mechanics readers: Any roll developed, 16 sparkling Nu-Art neverfade enameled prints plus two beautiful Hollywood enlargements and two free Leathertone frames only 25c. 20 reprints 25c; 100—\$1.00. Overnight service. NuArt Studios, F-39, Des Moines, Ia.

FREE Trial—16 sparkling Lifetime prints, three lovely Hollywood enlargements, and free Leathertone frame with roll—25c. 20 reprints 25c. 100—\$1.00. Overnight service. Lifetone Studios, L-39, Des Moines, Iowa.

FOR The discriminating amateur—8 exposure rolls, 2 prints each 25c. Miniature rolls enlarged 3 to 6 times. 8 exposures 25c, 16 exposures 50c. 35mm, 36 exposures, 3x4 enlargements \$1.00. Christmas cards from your negative, embossed, deckled, 10 for 49c, sample 5c. Unexcelled quality, prompt service. Paramount Photo, 327 E. 92nd Street, New York.

PRINT Your photos on fabrics, cards, etc., use any negative. No experience required. Complete outfit \$1.00. Trial size 25c. Lynmore Co., 1869 West 9th, Brooklyn, N. Y.

ROLL Developed and 8 beautiful enlargements 2 to 6 times larger—high gloss—deckled edge. Any 8 exposure roll 25c coin. Reprint enlargements 3c each. Aiden Photos, 94-B Astor Sta., Boston, Mass.

OVERSIZE Prints. Your roll developed and 8 oversize prints 25c; from 116, 120, or 127 size negatives you receive 4x6 inch prints. All smaller sizes receive 3 1/2"x4 1/2" inch prints. Reprints 3c each. Overnight service. Pacific Photo Service, Box 666, San Francisco, Calif.

ROLL Developed, 16 guaranteed prints, enlargement coupon, 25c. Reprints 2c each. Bay Photo, 838 Broadway, Bayonne, N. J.

FREE 3 Professional 5x7 enlargements of your own choice, 2 guaranteed sets of prints with your roll film developed—all for 25c, original order only. Aro Studios, Dept. 12, Des Moines, Iowa.

100 REPRINTS \$1.00, 116 or smaller, Rex Photo, Oden, Utah.

FREE—One roll developed and printed free. Just to get acquainted, we will beautifully develop and print your first 8 to 16 exposure roll free plus 5x7 inch enlargement free, also sensational, new folding folio to frame your prints, all free with this ad. (Enclosing 10c for handling and mailing appreciated.) Dean Studios, Dept. 1038, Omaha, Nebraska.

PROMPT Service—Quality work; 2 beautiful doubleweight gloss enlargements, 8 guaranteed neverfade prints each roll 25c. Excel Photos, Dubuque, Iowa.

FINER Finishing specials 25c, 6—8 exposure rolls developed, your choice—16 prints or 8 prints with 2 professional enlargements or 8 prints and one colored enlargement. Genuine nationally known Moentone superior quality, Moen Photo Service, 431 Moen Bldg., La Crosse, Wis.

CANDID Special, 35mm, rolls enlarged to 3 1/2"x4 1/2", \$1.00. 18mm, rolls 60c. 3 1/2"x4 1/2" reprints 3c. Brown Photo Company, 1910-61 Emerson, Minneapolis, Minn.

ONE 6 1/2"x8 1/2" Plate sunk enlargement or one 5x7 hand colored enlargement with each roll developed and 8 prints 25c. 36 exposure roll developed and 36—3 1/2"x4 1/2" enlargements \$1.35. 18 exposure roll 75c. Vidor, 321-P Hennepin, Minneapolis, Minn.

ROLL Developed—16 guaranteed prints, two coupons on enlargements, 25c. Smart Photo, Winona, Minnesota.

PROMPT Service! Rolls developed, two Velox prints each negative 25c. Hench Studios, Harrisburg, Penna.

ROLLS Developed, two prints each and two free enlargement coupons, 25c; reprints, 2c each; 100 or more, 1c. Summers' Studio, Unionville, Mo.

THREE Prints each good negative in roll 25c. Reprints 3c. Fred D. Eastman, Bode, Iowa.

MOTION PICTURES AND SOUND EQUIPMENT

BASS Says: Shrewd buyers send for the new Bass Cine Bargaingram No. 245, an 84-page catalog exclusively cine. The new Revere Double 8 with Bausch & Lomb F/3 lens at \$37.50 is the buy. The RCA 16mm. SOP news reel camera at \$275.00. Write Cine Headquarters for your copy of this great free book. Bass Camera Company, Dept. A, 179 W. Madison St., Chicago, Ill.

16MM. Laboratory. Color, black and white. Sound recording. Titles. Send for list. Film Associates, Dayton, Ohio.

8 MM. And 16 mm. bargains. Free list. Lewis Films, 105 East First, Wichita, Kan.

16MM., 35MM. rentals, sales, lists. Independent Motion Picture Exchange, Cudahy, Wisconsin.

LOOK! Nationally advertised movie cameras, projectors, films, accessories. Payments low as \$2.50 monthly. Send 10c for large two color catalog. Don Elder's, Dept. 23, 739 Boylston Street, Boston, Mass.

SILENT 35MM. films. Projectors. Cheap. Demsey, 1223 Berkley, Youngstown, Ohio.

WRITE Now for free catalog of movie equipment and film subjects. We are never undersold. Paramount Mfg. Company, Dept. G-99, Box 224, Back Bay, Boston, Mass.

35MM. Sound programs \$7.50. Silent features \$5.00. Bargain equipment list. Simpson, 1275 So. Broadway, Dayton, Ohio.

HOME Movie bargains galore. No-Wat Ka, 11 River Dr., Passaic, N. J.

8MM. Projector, camera, screen \$10.00 complete. Free 8mm., 16mm. bargain lists. Home Movies, Box 216, Easton, Penna.

SAVE 60% On movie films. Bargain lists free. Genera Company, Davenport, Iowa.

FREE Sample and lists, all kinds movies. Goodwill Company, Jackson, Tennessee.

LEARN Motion picture theatre projection, management. Free catalog. Give age. Theatre Institute, Elmira, N. Y.

8-16MM. Films silent and sound. "All subjects." Sold-rented-exchanged. Bargains in equipment, 400 foot subjects sold at \$5. Free illustrated catalogue (with sample art 10c). Garden Film, 317 West 50th, New York.

ART Films, Lists free. Sample 10c. Parkway Exchange, 961 Eastern Parkway, Brooklyn.

NICKELODEONS, 16mm. — Chaplins, Pickfords. (Catalogs, 3c.) Megifilms, 340-Y West 29th, New York.

BULK Film 8-16mm. \$1.20 100 ft., cameras, projectors, processing; free lists. Corona Laboratories, 200 E. 34, Brooklyn, N. Y.

16MM. Velotex, \$1.95-100'. Sample free. Velotex, 600E, Gary, Indiana.

HIGHEST Exchange values for your used films against our new subjects, 8mm, or 16mm., silent and sound. Large rental library. Stamp for catalog. Abbe Films, 1265 Broadway, New York City.

FREE—Sample copy Hollywood's newest movie magazine, Cin-O-Grams, 317 N. Vermont Ave., Hollywood, California.

WRITE Now for free catalog of movie equipment and film subjects. We are never undersold. Paramount Mfg. Company, Dept. G-101, Box 224, Back Bay, Boston, Mass.

AMERICA'S Largest rental library. Film sent anywhere. Also religious. New, used equipment bought, sold, exchanged. Time payment plan. Catalog free. Mosull's, 66 West 48th, New York.

16MM. Silent and sound film, sold and exchanged; also 8mm. Cine Film Mart, 110 West 34th, New York.

RELIGIOUS Films, 16mm. sound. Screenart, 729 7th Ave., New York.

UNUSUAL Art catalog; sample film dime. Erwine's Laboratories, Allentown, Penna.

"ALL-AROUND" Reflector Company's new motion picture reflector guaranteed to increase screen illumination 40%. 10111 Euclid, Cleveland, Ohio.

ART Films. Sample dime. Titles word 3c. Sound 50c. Used films \$5.00 400 feet. Bulk film 100 feet \$1.00. Processing 50c. Aircraft Laboratories, 1219 East 6th Ave., Gary, Indiana.

SELLING Out. Lists 3c. Clifford Hoffman, 57 Broad, Albany, N. Y.

GUARANTEED 8mm., 16mm., 24-hour reversal processing. Eso-S, 3945 Central, Kansas City, Missouri.

MONEYMAKER! "The World's Greatest Passion Play" 16mm. and 35mm. Specify sound or silent. Rent or purchase. Superior than Oberammergau play. Hemenway Film Co., 37F Church Street, Boston, Mass.

15% TO 25% Discount on still or movie cameras. Free circular. Paramount Co., 327 E. 92nd St., New York City.

RADIOS, SUPPLIES, INSTRUCTION

RADIO Tubes—Send numbers on old tubes for prices. Ballard's, Box 430-A, Elizabeth, New Jersey.

CONDENSERS 1c Up. Tubes 10c up. Free lists. 6 crystal radio diagrams and crystal 25c. Potter, 1314-P McGee, Kansas City, Mo.

A STATIC Resisting radio circuit, my own design, has been tested by and demonstrated through the violet ray interference, to broadcasting engineers, dealers, technicians, and met with their approval. I am selling diagrams of this circuit for one dollar each, it may mean money to you; send currency or money order, to S. Lovejoy, Radio Designer, Rockdale, Texas.

ONE Tube radio kit \$1.00 postpaid. Bond, 13139 Hamilton, Detroit.

RADIOS: Deal direct. Free catalog. Autocrat-A, 3855 North Hamilton, Chicago.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Ames St., Valparaiso, Ind.

RADIO Service men and experimenters send for our giant radio catalog. Save dollars. United Radio Co., 1009 M. Newark, N. J.

RADIOS—\$3.95 Up. Save 50%. Wind-changers, electric fences, power plants. Home agents wanted. Catalog free. Marco-P-30, Kansas City, Mo.

RADIO Books—Latest—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

MUSIC AND MUSICAL INSTRUMENTS

MUSIC Composed to words, piano arrangement, guitar chords, only \$4. Charles Brandon, Cannington, Ont., Can.

SONGS, Poems considered for publication. Royalty basis. Free advice. Department M. Radio Music Company, 5517 Carlton Way, Hollywood.

POEMS Wanted. Radio information. Publishing. Great Eastern. "D271." Thomaston, Maine.

SONGS: Song-poems: bought, composed, published, recorded, radio broadcasted. Best offer. Free advice. Metro-Melody Music Publishing Company, San Francisco.

SONGWRITERS—Melody composed to your poems \$1.00. Frank Jugan, Jr., Signal, Ohio.

ORIGINAL Music composed to your words \$5. Song recording, printing, orchestrating. Reinald Belcher, Chatham, New Jersey. 30 years church organist.

PUBLISHERS Need new songs. Poems wanted immediately for musical settings. Five Star Music Masters, 633 Beacon Building, Boston.

ENTER Tommy Dorsey's contest! Send poem for musical setting. Lew Tobin, Box 51, Belmont, Mass.

SONGS—Song poems wanted. No charge for melodies. Free examination. Hollywood Recording Studios, 8703 Preuss Sta., Los Angeles.

BROADCASTERS Need songs. Write one. Music, words or complete. Send to Radio Music Publishers, 117 W. Harrison, Chicago.

PIANOSCORE. Guitar diagrams, 11 part orchestration, to melody or lyric, all for \$15.50. McManus, 86 Colvin Station, Syracuse, N. Y.

SONGWRITERS. Write for free booklet. Profit sharing plan. Allied Music, Box 507, Cincinnati, Ohio.

SONG Poems solicited. A different proposition. Richard Broughton, Sioux Falls, S. D.

WANTED! Original song poems. Richard Brothers, 24 Woods Building, Chicago.

SONGWRITERS! Poems, melodies. Amazing offer. Hibbeler, C-5, 2157 N. Avers, Chicago.

WANTED—New songwriters. Big opportunity. Free booklet. Write today. Songwriters Institute, 43-C Park Place, Brooklyn, N. Y.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

ORCHESTRATIONS—Popular back numbers. 10—\$1.00. Silverman, 3303 Lawrence, Chicago.

FREE Book to songwriters—Original poems, songs wanted. Variety, Dept. V, Salem, Indiana.

SONG Poems wanted. Free examination. McNeil, Master of Music, 510-PM South Alexandria, Los Angeles, Calif.

MUSIC Composed to words. Rhyming pamphlet on request. Phonograph recording of completed songs. Send poem for consideration. Keenan's Studios, Dept. PM, Box 2140, Bridgeport, Conn.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

SONG Writers. Send for publishing agreement. McKinley Music Publishers, 1501 E. 55th St., Chicago.

BUSINESS OPPORTUNITIES

MEN Now calling on farmers, poultry raisers! Materially increase your income taking orders for Big Boy Chicks. "America's Finest." Full or part time basis. Backed by extensive national advertising. Restricted territory franchise includes the famous Big Boy Chick Raising Plan. Get details immediately. Illinois State Hatcheries, 204 Jefferson, Springfield, Illinois.

SMALL Capital starts "route" coin operated peanut, gum and amusement machines. Particulars free. Robbins Co., 1141P DeKalb Ave., Brooklyn, N. Y.

THE Knack of making money in any business. Job or profession easily mastered if you know how. Send stamp for details. Pleasant Products, Box 27, San Bernardino, Calif.

POPCORN Machines, caramelcrisp crisettes, cheese coat, potato chips. Long Bakins, 2035-A High St., Springfield, Ohio.

SOAPMAKING: Money-making home business. No machinery. Formulas, complete instructions \$1.50. Ideal Co., 1793, Park Ridge, Ill.

FOR Free information concerning an extremely profitable, lifetime business, write, Cole Associates, Syracuse, N. Y., immediately.

MAILORDER Plans, business secrets, three hundred tested ways to make money. 25 cents. Postpaid, George Gundrum, LeRoy, Michigan.

START Home business making statuary, plaques, art goods, novelties, souvenirs, concrete pottery, garden furniture, artificial marble flooring, liquid marble. Make your own flexible molds. Amazing profits. Valuable folder free. Creative Publishers, (P1) Glencoe, Illinois.

HOME Business. Free literature shows way. Vosacek Press, 1634-6 Monroe, Chicago.

FREE. Many mail order opportunities. Smith, 619 Barre St., Ogdensburg, N. Y.

OPERATE Steady business resilvering mirrors. Making chipped glass nameplates, signs. Write Sprinkle, Plater, 127, Marion, Indiana.

INVENTORS—Patent your invention. Secure booklet "How to Protect Your Invention." No obligation. McMorrow and Berman, Registered Patent Attorneys, 134-F Barrister Building, Washington, D. C.

WE Successfully sell inventions, patented and unpatented. Write us, if you have a practical, useful idea for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

MAIL Order business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-catching schemes. Free details. Nelson Company, 500 Sherman, Dept. 404-A, Chicago.

MONEYMAKING Opportunities, spare time plans. Valuable tips! Literature free. H. Flury, 1602 Locust, Des Moines, Iowa.

SALESBOARDS For spare time earnings. Write, Johnson's, Box 1562, Baltimore.

DOLLARS Daily! Operate independent business! Details dime. Heidorn, 440 West 124th, New York.

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

SINGLE-INGREDIENT Formulas. No manufacturing! Information free. B. Kinford, Wayne, Penna.

MAKE Plaster artware and novelties. Materials available your locality. Commercial methods fully explained. Complete illustrated course \$1.00. Ideal Service, 40-M, Park Ridge, Ill.

FOOLPROOF Rubber, mold making, plaster casting, tremendous market, large profits, 24 page instructive catalogue free. Plastic Arts, 711 Neely, Muncie, Indiana.

FREE—200 Clever mailorder, homework, local business, agency offers—all snappy moneymakers. Lewis Co., 828-C Carpenter, Oak Park, Ill.

GREAT Money making opportunities! Vassar Service, 332-2 Washington, Hoboken, New Jersey.

MAIL Order opportunities. Send name-postal. Loftus's, 1129 4th N. E., Washington, D. C.

OWN Profitable health food mail business! Gardena System, Station S, Los Angeles.

FOR Big profits and pleasant business, sell advertising in own mediums and other ad-propositions. Choice of 34 grand ideas in our new folio. Any one can begin on practically no capital. All or part time. Grow enormously. Fine income, real independence, easy to do. Free circular "My Game Is Advertising." Edward Langley, Publisher, 631 Roscoe Street, Chicago, Ill.

CAN You wield paint brush or do small carpentering? Then learn office furniture renovation. Plenty work at fine pay for spare hours. Or thousands dollars yearly in permanent trade-business. Send 10c for valuable illustrated employment booklet. Dime refunded if asked. Opportunity Book Company, Planned Jobs Department, 2712 - 150th St., Flushing, New York.

TURN Tin cans into money. Instructions 25c. H. Chaney, 1130 E. 16th St., Jacksonville, Fla.

EARN \$25-\$50 Weekly collecting accounts for others. Literature free. Morrison, Pontotoc, Miss.

OPERATE A lettershop. Splendid profession home or office. Start now. Creative Lettershop, Rhinebeck, N. Y.

HANDY Men—Earn money home operating Community "Fix-It" Shop. Stafford, 708 Rawlings, Carbondale, Illinois.

EARN Up to \$500.00 back-yard gardening. Stamp brings particulars. Lightning Seeds, Streator, Illinois.

DOLLARS Daily! Sell real estate without charging commission to either buyer or seller. Complete instructions 25c. Gommels, New Lexington, Ohio.

START Manufacturing business. Write, Sweeper, 101 Monmouth St., Newark, N. J.

EXTRA Money, at home, it's easy. Collier's "Master" lesson teaches, professional technique. Four page folder free. Write Successful Income Builders, Hollywood, California.

MAKE Sell luminous paint. Literature free. Gordon Laboratories, 1265-H Broadway, New York.

WANT To increase your income? Profitable ideas one dime. Granor, Box 213, L-wiston, Maine.

"INDEPENDENT Operator"—Professional mailorder magazine—10c. Kraft Publications, Syracuse, New York.

SIGNS And showcards easily and expertly painted with letter patterns. Many sizes and styles. Write for descriptive folder. John Rahn, A1330 Central Ave., Chicago.

CALIFORNIA Product. Easily makes you big income. Full or part time. No selling. Be in business for yourself. Only \$100 capital necessary. Write Reliable, 1827 South Hope, Los Angeles, California.

WE Help start you in business, furnishing outfits and instruction, operating "Specialty Candy Factory" home. Men, women, opportunity to earn good steady income, all or spare time. (Our 32d year.) Booklet free. Ragsdale Candies, Dept. 4, East Orange, N. J.

METALLIZING Baby shoes makes you money! Simple! Big market, profits! Inquire. Novelty Metallizers, Box 933 Church St Annex, New York.

LEARN Real estate through home study course by twelve experts. High commissions, easy, reasonable, new; college education not necessary. Write Morrison School, 100 North LaSalle, Chicago.

SNAPPIEST. Quick return, dollar pulling proposition, included with business starters booklet; 25c (silver). Wildor, 434 E. 117th St., New York City.

FORMULA Messengers listing 1000 newest specialties. Stamp. Miller's Laboratories, Tampa, Florida.

NOW—Only 2c daily pays for New York office under your own name. Co-operative Offices, 126 Lexington Avenue, New York.

EARN Money at home compiling names. Complete instructions 10c. Golliday Company, 1514 Long, Columbus, Ohio.

CASH For butterflies, insects. See Similar display advertisement page 27A.

SELL By mail! Books, novelties, bargains! Big profits! Large catalog free! Elfco, B-438 North Wells, Chicago.

MAKE Your mail order business pay! Use genuine original letters of mail order buyers. Particulars free! Crown Mail Order, 164MP Monroe Street, New York.

START Photo finishing business: develop films; make money. Details, stamp. Photo Promotion Service, 126-B, Grandy, Minn.

MAKE Money easily! New 924 page illustrated instruction book for making 10,000 profitable products, \$1.50 postpaid. C.O.D. Adam Brown Company, Chestnut Hill, Massachusetts.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. We are now placing big chain store orders with manufacturers. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

OWN And operate a general appliance repair shop. Small capital establishes you in profitable steady repeat business. Complete illustrated course enables mechanically inclined men to have lifetime business. All phases of general appliance repairing, how to secure business, etc., covered. Send today for free literature. Christy Supply Co., 2835 N. Central Ave., Chicago.

FIVE Income-increaser suggestions, dime. Dick's Agency, Twin Bluffs, (MP), Wisconsin.

SWISS Music box works \$1.25 to \$2.10. Suitable for many novelties. Mermoid Manufacturers, 147 West 46th Street, New York.

START Your own manufacture. Free particulars how to build your own independent business. With little working space. Art Rubber Mold, 3012 Fletcher, Chicago, Illinois.

WILL You give us 5% first \$600 you make? Afternoons free! Work home. \$1,000 month reported (exceptional—full-time). Expect surprise! National, Box 1240-B, San Bernardino, Calif.

LIQUID Marble—Marvelous, colorful! Brushed, molded, sprayed. Rubberlike molds! Composition flooring! Particulars free. Marbleizing Service, Edwardsville, Illinois.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

EARN Money at home making imitation diamond jewelry, bracelets, bairpins, millinery ornaments, religious medals, etc. High prices now paid on account of German and French jewelry shortage. Exceptional spare or full time opportunity. Write, United Jewelry Manufacturers, Dept. A, 1692 Boston Road, New York City.

"MAILMONEY Facts." Outstanding mailorder magazine. Copy, opportunity offers, 10c. Vernon Publishers, West Fairview, Penna.

OPERATE Profitable "route" four compartment vendors. Small investment. Penny King, 1233 Chouteau, St. Louis.

OPERATE Mail order business at home. Details dime. Maples, 3418 South Marshfield, Chicago, Illinois.

OWN A cash business? No selling. Operate "Silver King" vendors, \$3.95 up. Free instructions. Automatic, 2422-A Fullerton, Chicago.

MAKE Color-glazed concrete pottery, gravestones, tiles, floors, walls. Basement waterproofing, etc. Booklet 3c stamp. National Potteries, Minneapolis, Minnesota.

INVENTION Finance Magazine, 80-G Wall Street, New York. Important particulars free.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. P. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 E. 21st, Philadelphia.

A REAL Future for you with Red Comet fire control products. Low prices. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick, 766 Red Comet Building, Littleton, Colorado.

SUCCEED With your products. Make-sell them. Formulas, Processes, Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

GOOD Paying business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures by late method. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

ELITE Collection of business plans, contains 127 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 5-P West 24th, New York.

127 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 214 Grand St., New York.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

MAKE Money by mail, the way we do. Free information. Maywood, P-1107 Broadway, New York.

MONEYMAKING OPPORTUNITIES

GET Squab checks weekly. Eye-opening poultry guide free. Rice, Box 639, Melrose, Mass.

MAILORDER Opportunities galore! Stamp appreciated. Schroeder, 803 Wisconsin, Peoria, Illinois.

AMATEUR Cartoonists, earn cash, spare time, copying advertising cartoons. Service-Ads, Arkyle, Wis.

TWENTY-SEVEN Money-making publications. Comprehensively catalogued. Opportunity Book Company, Flushing, New York.

MONEYMAKING Opportunities, three issues dime. Sunflower Mailers, 107 West Second, Wichita, Kansas.

CONVERT Old lawn mowers into electric mowers. Low costs make it profitable work. Complete plans \$1.00. Wheeler Merchantile, St. Petersburg, Fla.

"LUMINOUS Paint" shines in dark. Easily made, 300 other formulas, plans—all 25c. Ideal Service, 300P1, Park Ridge, Ill.

INVESTIGATE—Making money by mail. Read "Mail Trade" magazine—you get everything; "money-making" ideas, plans, tips, trade secrets, counsel advice and articles—opportunities for everybody. Keep posted. Sample copy 10c or stamps. Langley Pub., 631 Roscoe St., Chicago.

BOOKKEEPERS—Operate entirely "new plan" public bookkeeping service. Ralph Lee, Vicksburg, Michigan.

OPERATE Steady business resilvering mirrors. Making chipped glass nameplates, signs. Write Sprinkle, Plater, 287, Marion, Indiana.

MAKE Money! Plans galore. Dime and stamp. Earl Prignitz, Buffalo, Iowa.

\$25,000 REPORTED Using schemes from Schemer Magazine, Alliance, Ohio. Year, \$1.00; trial six months, 30c.

MAIL Order spare-time or full-time business enterprise. Gather, "edit" and sell names for advertisers. Details free. C. N. Schroeder, 56 West Washington, Chicago, Illinois.

HELP Employment. Valuable instructions 25c (silver). Homecraft Arts, Lakeside, Calif.

MILLION Articles. Buy wholesale. Valuable directory 10c. Ideal Service, D-1, Park Ridge, Ill.

YOUR Name on 5,000 mailing-lists—25c. Get free samples, opportunities galore, from all over world. Eastern, P-961-46th, Brooklyn, N. Y.

300 WAYS To make extra money in spare time—proved profitable mail order plans that require practically no capital—other tested ideas. Send 25c for complete book. Satisfaction guaranteed. Paul Breidinger, Santa Claus, Indiana.

HOME Built mailorder business. Like mine. Start you. Information, Stamp, Frank H. Battles, Ann Arbor, Michigan.

PROFITABLE Business, \$1.50 capital. Details dime. Refunded, Alexander, Box 367, Hannibal, Missouri.

GROW Plants without soil. Folder free. Gordon Laboratories, 1265-J Broadway, New York.

CASH For butterflies, insects. See Sinclair display advertisement page 27A.

MAKE Big money in own business. Refrigeration repairing instructions, postpaid \$1.00. Consulting service. Appliance, 5200 Delancey, Philadelphia.

BE Funny for money. Write cartoon ideas. Complete instructions 25c. Ush Studios, 8518 Wrightwood, Chicago.

BIG Mail for you. Latest money-making offers, opportunities, catalogs, magazines. Name listed in directory 10c. Ideal Service, 112-M, Park Ridge, Ill.

MAILORDER Opportunities, publication, plans, sell by mail. Harvey Teeple, Decatur, Indiana.

PAYING Home business. Make-sell honey nut bars. Formula, instructions 25c. Schultz, Noel, Mo.

"PORT Of Opportunities" published monthly—66 pages—offering latest mail-order projects; services; business starters. Copy 10c. Farm & Home Publishers, Gardenville, New York.

MAKE Money repairing scales. Big opportunities. We show you how. Send stamped envelope. Ackerman, Box 1653, Charlotte, N. C.

BUY Wholesale—Sell by mail or local. Wetzel, Valhalla, N. Y.

WHOLESALE Sources, 500,000 articles. Free directory. Maywood, 1107 Broadway, New York.

WILL You give us 5% first \$600 you make? Afternoons free! Work home. \$1,000 month reported (exceptional—full-time). Expect surprise. National, Box 1240-A, San Bernardino, Calif.

MONEYMAKING Ideas—Latest books—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

MOULDS. Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Send \$1.00 for large sample mould. Henry C. Schiercke, 645 Spencer, Ghent, N. Y.

BE A professional scrapbooker. Big fees. Unlimited opportunities. Can be done at home. No competition. No capital needed. Write to Scrapbookers Guild, 59 Park Place, New York, N. Y.

FORMULAS, PLANS, ETC.

2000 FORMULAS In book form \$1.00. Real money makers. No expensive equipment needed. J. Clumser, 100 E. Valley, Stream Blvd., Valley Stream, New York.

MAKE Fast selling products. "Chemist Approved Formulas." Catalog free. Kemico, 12-M, Park Ridge, Illinois.

SINGLE-INGREDIENT Formulas. No manufacturing! Information free. A. Kinford, Wayne, Penna.

OPPORTUNITY. Prospectus of 700 ways to make money. Only 10c. Robinsons, San Pablo, Calif.

FORMULAS. Chemist approved book \$1.00. Free botanic list. One thousand words. George Warren, Pittsfield, Penna.

DRAWING Salve for boils. Best formula 50c. Virgiano, Druggist, 6551 Shetland, Pittsburgh, Penna.

NEW Uptodate formulas and trade secrets. Not re-hashes but new money-making processes and manufacturing secrets. Write for new lists PM. Waychoff, Box 3714, Phoenix, Arizona.

PROFITABLE Formulas. Particulars free. Garda, 264 Ninth Avenue, Paterson, N. J.

SULPHOLENE Cleaners: 6 best, selected formulas 25c. Baran, Bay City, Mich.

FORMULA Messengers listing 1000 newest specialties. Stamp. Millar's Laboratories, Tampa, Florida.

THAXLY Formulas, processes, for successful products. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Avenue, Syracuse, N. Y.

ELITE Formulas and plans; make and sell your own products. Descriptive booklet free. Elite Co., 214 Grand St., New York.

FORMULAS—All kinds. Real money-makers. Lowest prices. Catalog free. Clover Formulary, 108-PM, Niles Center, Ill.

AUTHENTIC Formulary. Used by leading manufacturers, formula dealers. Instructions for easily making 10,000 profitable products. Supply sources. Complete book—934 pages. \$1.50. Postpaid-C.O.D. Adams Brown Company, Chestnut Hill, Massachusetts.

FORMULAS—Latest, best. Analysis. Literature free. Belfort, Engineering Building, Chicago.

NEW. Money making formulas book tells how to go into business for yourself. Send for free details. Popular Mechanics, 200 E. Ontario, Chicago.

CHEMISTRY

FREE! Catalog chemicals, laboratory supplies for students, new idea chemical-kits, apparatus-outfits. Scientific books at discounts, telescopes, microscopes, biological needs, photographic chemicals, scales. Write Winn Mfg., Dept. JE1, 124 W. 23 St., New York.

FREE Catalog: Chemistry, mineralogy, biology binoculars, microscopes. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And laboratory apparatus at lowest prices. List free. Pioneer Scientific Co., 5962 Winthrop Ave., Chicago, Ill.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

CHEMICALS, Laboratory, glassware, apparatus. Send 3c for catalog CP1. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

SPECTROSCOPE For quick chemical analysis \$2.50. Kutting Sons, Campbell, California.

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Medford, Mass.

FREE—Big list of helpful books. Popular Mechanics Press, 200 E. Ontario St., Chicago.

HELP WANTED

LOCAL Agents wanted to wear and demonstrate suits to friends. No canvassers. Partial payment plan. Up to \$12 in a day. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Stonefield, 1300 Harrison, Dept. N-817, Chicago.

MAKE Big money demonstrating amazing Handyman Tool, 101 uses. Pulls posts, roots, small stumps; jacks up trucks, tractors, wagons; lifts buildings; stretches fences; splices wire; makes cider press; dandy auto bumper jack, etc. Lifts, pulls, pushes with 3-ton power. Write, Harrah, Dept. M-61, Bloomfield, Indiana.

CALL On service stations, factories, restaurants, businesses, professions; with lettered advertising uniforms, shirts, work suits, etc. 100 styles. Exclusive features. Big advance commissions. Free outfit. Topps, Dept. S-7, Rochester, Ind.

ORGANIZER To secure local members for Executives' National Association, (X), Washington, D. C.

LOCAL Representatives. Home study school. Davison Tech. 7 Grand Avenue, Detroit.

EARN Money in your spare time taking subscriptions to Popular Mechanics. Unlimited possibilities, every family a prospect. Easy to sell. Bonus paid in addition to liberal commission. Send postcard for further details today. Circulation Dept., Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

AGENTS WANTED

MEN—Women. Sell amazing, popular priced shampoo. Large profits. Build permanent repeat business. Eldore, 299 Madison Ave., New York.

SELL Dresses low as \$1.24. Hundreds sensational bargains. Actual samples free. Send dress size, age. Harford, Dept. R-242, Cincinnati, Ohio.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools. Stores will make you \$250.00 monthly. Carter Products Corp., 901 Front Ave., Cleveland, Ohio.

MAGIC Clothes brush. Revolutionary invention. "Erases" dirt like magic. Saves drycleaning. Sensational seller. Samples sent on trial. Rush name. Kristee, 123, Akron, Ohio.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8¹/₂c. Razor blades 10 for 8¹/₂c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, P.O. St. Louis, Mo.

DEALERS Wanted: Pinkham metal window screen frames. On the market for over 30 years. Can be installed for the price of wood. Send for descriptive literature. Lato Products Company, Box 215, Texarkana, U. S. A.

AGENTS Wanted for men's reversible for-in-hand neckties. Ward's Novelty Shop, P.O. Box 542, Albany, New York.

MAN Wanted to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary to start. Pleasant, profitable, dignified work. Write today. Rawleigh's, Dept. A-53-PPM, Freeport, Ill.

OPERATE Steady business resilvering mirrors. Making chipped glass nameplates, signs. Write Sprinkle, Plater, 128, Marion, Indiana.

FREE Water and our concentrates make 68 products. We supply labels, bottles. Enormous profits. Qualco, E-20030 Russell, Detroit.

"REFLECTO-FLAG"—Patriotic carded specialty supreme. Service stations, stores, etc., buy quantities. Make \$25.00 daily. Sales plan and sample, 25c. U. S. Association, Golden, Colorado.

MAN in every factory, sell gritless hand soap. No chap. Trial size quarter. T. L. DeCamp, Sta. "A," Cincinnati, Ohio.

SCHOOL Seniors—Sell graduation cards. America's largest, fastest selling display, 30% commission. Free cards. Universal Engraving & Printing, Box 745-M, Pittsburgh, Penna.

ADAMS New roach gum to kill cockroaches. Tremendous market. Sensational profits. Territory information. Send 10 cents. Adams Products, Whittier, Calif.

HIGH School seniors: Make good money selling our graduation name cards. Biggest commission. Season starting. Hurry! Craftcards, Box 235, Pittsburgh.

AGENTS—Men's suits 88c. pants 23c. overcoats 41c. ladies' coats 36c. dresses 10c. sweaters 25c. Other used clothing bargains. Catalog free. Portnoy, 566-P Roosevelt, Chicago.

FULL Size, visible total adding machine, only \$9.95. Unlimited market. Big commission. Addomatic, Dept. E-19, 430 N. Oakley, Chicago, Ill.

WYBEMADILITY Sample, prices—dime postpaid. Slade, Box 251, Tampa, Florida.

HUGE Profits in 1941. Perfected self starting cigar lighter. No flint or friction. Lights in wind. Sample lighter with can of fluid and sales plan 25c. New Method Co., Box PM-97, Bradford, Penna.

NEW Business necessity. Merchants waiting. Repeats. Act now! Simplex, 251 Seventh Ave., New York.

SELL Mr. Magic, 100% profit. We finance you. Address Geo. H. Hans, 428 S. Halsted, Chicago, Ill.

BE A specialty agent. Particulars 10c. Johnson, Box 713, Emory University, Georgia.

AGENTS Wanted. Sell vanilla flavoring powder. Nonalcoholic. Package 10c. make 4 oz. bottle. Box 83, Bath Beach Sta., Brooklyn, N. Y.

HUGE Profits selling new "20-in-1" kitchen necessity. Retail 25c. Costs you \$1.00 a dozen or \$7.20 a gross F.O.B. here. Sample 10c. New Method Co., Box PMM-97, Bradford, Penna.

SELL Used clothing bargains from home, store, auto. Shoes 15c. men's suits, overcoats 75c. dresses 10c. Experience unnecessary. Free wholesale catalog. Superior Jobbing, 1250-BG Jefferson, Chicago.

SELL 1941 Income and Tax Record. Huge profit. Records Company, 2626 N. Irving, Minneapolis, Minn.

PATRIOTIC Goods sell fast. Amazing new items. Sell something different. Make good profits. Literature free. W. H. Waldron, Huntington, West Virginia.

JUST Out! Beautiful Christmas tinsel signs. 11x14, cardboard. Retail 35c, cost \$4.50, 100, \$1.00 brings 15 samples, postpaid. Achy, 306 Bowery, New York.

BRAND New money-saving auto product. 150 to 500 percent profit. Tremendous market. Millions need it. Territory guaranteed. Thermo Exoprofit, Peoria, Ill.

GOOD Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also make money applying initials on automobiles. Free samples. "Ralco," 1305 Washington St., Boston, Mass.

"ALADDIN'S Magic Lamp!" Glows brightly in darkness. No batteries or wires. Eternal light, 1000 uses. Sample 25c. 15 for \$1.00 postpaid. Western, 432 Climax Bldg., Cleveland, Ohio.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-U Dodder, St. Louis, Mo.

ONE Reference and 25c stamps bring you sample outfit to start making money immediately with Mexican art goods. Tremendous market. Big profits. Marquex Company, Apartado 1176, Mexico City.

WINDOW Sign letters. Penny each, large sizes. New styles. Absolutely beautiful. Free samples. Atlas, 7941 Halsted, Chicago.

CALL On service stations. New item, necessity, big profits. Knipp, Long Beach, California.

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., 303 Degraw St., Brooklyn, N. Y.

FREE Sample—Amazing cleaner: sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

SUCCEED With your products. Make-sell them. Formulas, Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 5-P West 24th, New York.

AGENTS—300% Profit selling gold leaf letters: stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

ENGRAVED Name plates, bumpers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

AGENTS! Two a day—keeps the poor-house away. See advertisement page 133A. National Laboratories.

GOOD Paying business silvering mirrors, plating apartments, reflectors, bicycles, bathroom fixtures by late method. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

AGENTS—Opportunity make money; book containing 127 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

INVESTIGATE Tremendous money-making possibilities taking orders for baby chicks from farmers, back-yard raisers, commercial poultry plants. One 500-chick order can pay you to \$15.00 commission. Many agents take several orders in a day. Make big money immediately. Liberal bonus checks later. No investment, samples, or experience needed. We deliver. Write today for complete details and free sales kit. Babsy Poultry Farm, Box 1005-A, Sedalia, Missouri.

REVOLUTIONARY Loud speaking inter-communication system. Talk privately, back and forth to one or any number of stations, even 2,000 feet away. Any station originates calls. One electrical connection. No servicing. Easily installed. Guaranteed. Technical experience unnecessary. Two-minute spectacular demonstration. Thousands prospects, factories, offices, stores, auto dealers, lumber yards, restaurants, etc. We carry the accounts. Free trial to customers—sells itself. New low price. Men earning high as \$150 week. Protected territory available. Free demonstrator offer. Inter-Communication System of America, Dept. 312, 2440 Lincoln Ave., Chicago.

CHANCE To build regular income obtaining customers for high grade smoking tobacco. Once used, repeat business assured. Sample kit provided. Pleasant Gap, Male, female. M. J. Conway, Inc., Gap, Penna.

ADVERTISING Book matches. America's largest manufacturer of union label book matches. Fast selling line. Large sales producing kit. Sample matches. Complete cut catalog, 13 color combinations makes selling easy. Commission in advance. Superior Match Company, 7530 Greenwood, Dept. M-1, Chicago.

SELL Complete line calendars and printing at cut prices. 100 four color calendars \$1.95; 2,000 business cards \$1.50; 1,000 envelopes or statements, etc. \$1.75; 25 printed sales books \$1.50; 1,000 process embossed cards \$1.50; 2,000 two-color labels, free holder \$1.50; 2,500 printed handbills \$1.75. One-third comm. Free outfit. Bargain Ptg. Co., 189-F W. Madison, Chicago.

MERCHANTS Wall signs. Quick sales; big profit. 3 samples, particulars 15c. Richards the Printer, Indianapolis.

ADVERTISING Cigar lighters—Two models, quick profits, don't fail to investigate. Write today. Richardson Mfg. Co., Dept. ML, Aurora, Missouri.

BIG Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

NEW Patriotic business cards. Sweeping country. Over 2,000 business necessities, printing, calendars, Xmas greetings. Lowest prices. Commissions advanced. Samples free. Northwestern, 625-TK Jackson, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write F. E. Armstrong, President, Dept. FM, Mobile, Ala.

"GALLOPING Ivorys"—Nicknamed by salesmen. It's really hot! Plenty immediate repeat commissions. Every retailer—service station wants it. Hurry! Universal, 2223 Diversey, Dept. C513, Chicago.

EXPERIENCED Salesmen for direct selling of patented made to measure form fitted shirts. Cannot be purchased in stores. Excellent side line for tailoring salesmen. Prices \$2.00 to \$5.00. Very attractive proposition. Bona-Fit Shirt Co., Paterson, N. J.

SELL Business cards, stationery, book matches, gummed tape, restaurant necessities, salesbooks, adv. specialties, pencils, picture cards, calendars, Christmas cards. Lowest prices, 40% comm. Experience unnecessary. Free deals. Sales portfolio free. Willens, 2130 Gladys, Dept. 41, Chicago.

REVOLUTIONARY New invention. Thousands prospects everywhere. Men earning high as \$100.00-\$150.00 week. Placed on free trial. Sells itself. Orders financed by factory. Protected territory available. Free demonstrator offer. P. Williams, Salesmanager, 75 East Wacker, Dept. SV, Chicago.

ADVERTISING Book matches—World's largest "direct selling" book match factory offers advance cash earnings calling on every type of business. Experience unnecessary; full, part time. Low prices for high quality; quick deliveries, help you get orders. Good repeat profits. Free kit, instructions, Match Corp. of America, 3343 West 48th Pl., Dept. E-1, Chicago.

\$300 PROFIT Next month on \$425 sales. America's finest automatic fire protection. Largest commissions. Complete line. Territories. PyroTecFor, Bradley Beach, N. J.

CALENDARS—Beautiful complete line, all sizes, including Jumbos. Samples free. Also Christmas cards, Fleming Calendar Company, 5539 Cottage Grove, Chicago.

BLADES—Big profits. Best quality. Factory prices. Postpaid. Ace Blades, Buffalo, N. Y.

A REAL Future for you with Red Comet fire control products. Low prices. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Building, Littleton, Colorado.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

EDUCATIONAL AND INSTRUCTION

NEW Opportunities in air conditioning, electric refrigeration and auto body-fender including metal work, welding, painting. Many trained men earn up to \$35-\$50 weekly. Start preparing now. Get free facts. Utilities Engineering Institute, 1314 Belden, Dept. 111, Chicago.

LEARN Watchmaking. Material instructions for start and wholesale supply catalog, all \$1.00. Refund not O.K. Stewart's, 721 Olive St. Louis, Mo.

"HOW To Break and Train Horses"—A book every farmer and horseman should have. It is free; no obligation. Simply address Beery School of Horsemanship, Dept. 1101, Pleasant Hill, Ohio.

DRAFTSMEN Wanted! Big-pay jobs. Train at home. Simplified, thorough, inexpensive instruction. Room 1-D Ohio Institute Technology, Greenville, Ohio.

LEARN About finer printing while playing new game G-man playing cards. Dime brings information. Refund coupon. Tell-Tale, Kenosha, Wisconsin.

MEN—Women. Get U. S. government jobs. Commence \$105-\$175 month. Prepare immediately at home for 1941 examinations. Full particulars—list positions, free. Write today. Franklin Institute, Dept. M3, Rochester, N. Y.

VOCATIONAL Guidance will help you get a job or a better one. Not an employment agency. National Service, Dept. No. G, 330 S. Wells St., Chicago, Ill.

ARITHMETIC Simplified. Free information. Arith-Magic, Dept. 22, Maywood, Illinois.

WATCH Repairing is steady profitable work. Experts usually in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., 500 Sherman, Dept. A-2001, Chicago.

WELDING—Electric arc. Learn profitable trade quickly through actual practice. Individual welder instruction at bare cost of materials. Full particulars free. Valuable welding lessons book 50c. Hobart Welding School, Box M-115, Troy, Ohio.

"INSURANCE Agency Accounting" only \$2.00. Details free. R. E. White, 704 South Spring, Los Angeles.

INVESTIGATION Pays big. Detective experience unnecessary. Study under former federal special agent. Write. American, Room A, 908 14th Street, N. W., Washington, D. C.

BLUEPRINT Reading. Lay-out, Drafting. Home taught, Davison Tech, 7 Grand Avenue, Detroit.

LEARN Watchmaking. Material instructions for start and wholesale supply catalog, all \$1.00. Refund not O.K. Stewart's, 721 Olive St. Louis, Mo.

NEW Road to education. Instruction book in understandable language. \$1.00. MacEndree, 5042 N. Wolcott, Chicago, Ill.

NEW Copyrighted instructions for obtaining government positions. Details free. Edmar Publishing Co., Box M-245, Baltimore, Md.

DRAFTSMEN. Increase income. Introductory instruction, 25c. Draftsmen's Foundation, West Medford, Mass.

U. S. government jobs now open. Name job interested in complete research furnished for 10 cents only, including free sample test. Test yourself before investing. Civil Research Service, 871 North Wells Street, Chicago, Illinois.

LEARN Big pay trades in a few weeks. Decorating, paperhanging, graining, marbling, sign and pictorial painting. Catalog free. Chicago Painting School, 102 West Lake Street, Chicago.

LEARN Auto mechanics, body, repairing, welding electricity, refrigeration. Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

CLINICAL Laboratory technic taught in your own home. Practice outfit supplied. Bulletin free. Imperial Technical Institute, Box 494-E, Elkhart, Indiana.

HIGHER Arithmetic teaches shortest methods of figuring. Frederick A. Smith, 2410 Bernard Street, Chicago.

LEARN Telegraphy! Opportunities now available to beginners due to new railroad retirement act. Expenses low. Catalog free. Dodge's Institute, Hiatt Ave., Valparaiso, Ind.

U. S. Gov't jobs pay up to \$40 a week to start. Get ready for next examinations; railway postal, rural carrier, mail carrier, office help and others. Free book tells how you may qualify. Write quick. Patterson School, Dept. P. M., Rochester, N. Y.

SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

GET A better job. Our books will help you advance. Barrain catalog free. Popular Mechanics, 533 St. Clair, Chicago.

PLAYS, STORIES, MANUSCRIPTS

PUBLISHERS Want booklength manuscripts. Particulars. Rensb-PM, 30 Church, New York City.

FREE Test for writers! Send postcard for free market test. Hundreds of paying markets seek stories and articles. Learn the markets best suited to you—and sell. We help you! No obligation! Comfort Writer's Service, Dept. 577, St. Louis, Mo.

SHORT Stories revised, typewritten, marketed. Hursh, Box P-1013, Harrisburg, Penna.

WRITERS—Competent revision, typing, marketing direction. Welton Tinney, Winnsboro, Texas.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

HAVE Your own money making business. Learn show card writing, sign painting. Write for details. Begley Specialty, 1472P Broadway, New York.

ANIMATED Cartooning! Fascinating! Illustrated! Professional! Home method! (Copyrighted) simplified course! Price \$5, complete! Cosmopolitan Studio, Animation, Box 246, Hollywood, Calif.

MONEY in portrait sketching. Progressive steps teach you. 30 complete lessons \$1.00. Harold Parks, R. 3, Ypsilanti, Mich.

CHALK Talks. Laugh producing program. \$1.00. Catalog 10c. Baida, the Cartoonist, Oshkosh, Wisconsin.

AMATEUR Cartoonists, earn cash, spare time, copying advertising cartoons. Ad-Service, Arzyle, Wis.

ART Magazine including directory art books—free! Send 10c postage. Art Headquarters, Doty Street, Madison, Wisconsin.

PEN And ink drawings. Let us draw your advertising and catalogue illustrations, from photos, copies or objects. Best work and fair prices. Heraldic Studios, 1914P Oakdale Avenue, Chicago, Ill.

CARTOONING Course—30 illustrated lessons, over 500 sketches, drawing paper, pens and pencils. \$1.00 complete postpaid. Montes Studio, Box 985, Pasadena, Calif.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

ADVERTISING—Placed in any publication, anywhere. Copy written. No charge for our services. Write for special combination offers; tell us what you want to advertise. LeGrand Advertising Agency, (Established 1923), 34 West 33rd Street, New York.

ADVERTISE Profitably: \$15 reaches 5,000,000 Sunday newspaper readers with 24-word ad. Newspaper, magazine, mail-in-list ratebook, free. Chicago Advertising Agency, 20-PA West Jackson, Chicago.

LEARN Advertising at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3431, Chicago.

INCH Display advertisement fifty magazines, year \$15. Wood's Popular Services, Atlantic City, (N. J.)

FREE—New Advertisers Rate Guide. 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, Merchandise Mart, Chicago.

ADVERTISE—24 Word in 71 newspapers \$2.04. Classified and display ads placed in all publications. Lowest rates. Complete direct mail campaigns. Outline proposition for free suggestions. Kirkpatrick Advertising, 540 North Michigan, Chicago.

CHICAGO (Downtown) mail address \$1 monthly. Your mail reforwarded daily. General Business, 56 West Washington; (established 1919.)

1,000,000 NAMES. Various kinds. State your needs. Q Service, 330 South Wells, Chicago.

ADVERTISE: 24 Words, 149 newspapers \$5.50. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

ADVERTISING Placed all magazines, newspapers, radio. Lowest rates. Free service. 54 page rate book free. Baker Advertising Agency, A-189 West Madison, Chicago. Successors to Ankrum. Established 28 years.

BUSINESS SERVICE

WASHINGTON, D. C., downtown "branch office." Mail reforwarded daily. Hawkins Mail Service, 908 Fourteenth.

1,000 ORIGINAL Letters—Agents and mail order buyers—\$4.00. Particulars free. Crown Mail Order, 104-PM Monroe Street, New York.

RUBBER STAMPS AND OFFICE SUPPLIES

SUPERIOR. Indexed. Cushioned. Two lines. 25c; three 35c; four 50c; signatures \$1.50. Stocum, 814 Bradley, Peoria, Ill.

2 LINES 25c, 3—35c. Signatures \$1.50. Stamp Works, Indianapolis, Ind.

KNOB Handle, cushioned. 2 lines 25c. 3—35c. Stamp Works, Centerport, N. Y.

CUSHION Handle, 2 lines 25c; 3, 35c. Schultz, Pleasant Ave., Bergenfield, New Jersey.

2 LINES 25c, 3 Lines 35c. Stamp Works, Auburn, Nebr.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

INCREASE Business now. "Excelloraph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors, \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

TYPEWRITERS. Adder, mimeograph, multigraph, addressograph. Send for free lists of machines that will help you at half price. Fruit, 28 Fruit Bldg., Chicago.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

DISTINCTIVE Printing that you'll be proud to use. Samples free. Herbert Hickman, R-11, High Soire, Penna.

\$1.00 EACH—1000 Business cards, 125 letterheads, 200 statements, 250 3 1/2 x 6 1/2 envelopes. Larger quantities proportionately lower. Eaton Press, 1317 Main, Gardner, Kansas.

1000 6x9 CIRCULARS \$2.25 Postpaid. Vosacek Press, 1634A Monroe, Chicago.

POPULAR MECHANICS

HAMMERMILL Letterheads, envelopes, all colors. 32 styles type. Free particulars. Woodruff's, 217A Lewis, Duluth, Minn.

\$1.00 POSTPAID—100 8 1/2 x 11 Bond letterheads and 100 envelopes. Benneville, 907 West Roosevelt, Philadelphia.

500 STICKERS, 3/4 x 2 1/2, Four lines. 25c. Catalog free. Reed's Press, Spiro, Okla.

250 6 1/2 HAMMERMILL Bond envelopes \$1.15 postpaid. Weddell's Printing, Hillsville, Virginia.

125 BOND 8 1/2 x 11 Letterheads, 125 envelopes, \$1.00. Cettel-Endrey, 601-C West 151st, New York.

DEVIL Cards, 8 for dime. Stasen, 5347 Priscilla, Philadelphia, Penna.

500 HAMMERMILL Quality letterheads \$1.99. Attractively printed. Nixen's, Stevens Point, Wis.

PRINT Anything, reasonable. State requirements. Hamilton Press, 4341-P Meade, Chicago.

ATTRACTIVE. Low cost printing, multi-graphing. State requirements. Cables, Norton, Kansas.

ENVELOPES—1000, 6 1/2, Sub. 24, \$2.00. Pohle Press, Honesdale, Penna.

BUSINESS CARDS \$1.25 per 1000. Wisbith Printing Co., Wampum, Penna.

RAISED—100 Letterheads and 100 envelopes \$1.00. Perry Press, Albion, Maine.

1000 MODERN Thimplate business cards (twenty words) \$1.00 postpaid. Golden Rule Printers, Peoria, Illinois.

5000 ELEGANT Envelope slips, \$3.90 prepaid. Circulars, folders, stationery, cards—all printing—low prices. Samples, Goodprint, Harrisonburg, Va.

MULTIGRAPHING. Mimeographing, letterheads—lowest prices. Irving Letter Service, 4123 N. Kildare, Chicago.

BLOTTER Business cards. Check-book size. 500—\$1.00 postpaid. "Carey-print," 17 Chester Pike, Collingsdale, Pennsylvania.

SILVER Gummed labels, low priced, samples. Jobey Press, H-184 West Washington, Chicago.

QUALITY Printing, lowest prices. Samples. Churchill, 123 Oakdale, Syracuse, N. Y.

HAMMERMILL Bond at new low prices. Samples. Western Stationery, Topeka, Kansas.

LETTERHEADS, 6 1/2 Envelopes, shipping labels, statements—250, \$1.00 postpaid. Franklin Printery, Box 5063, Chicago.

500 2 1/2 x 3 1/2 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

MIMEOGRAPHING—500 Postcards or 300 letters \$1.00. Additional hundreds, 10c. No lineage limit. Samples free. Dollar Letter Service, 180 W. Washington, Chicago.

PRINTING OUTFITS AND SUPPLIES

ATP Foundry type, lines, sorts, Lino-type. Ornaments. Box 4464, Philadelphia.

NEW Type reasonably priced. M. R. Landis Co., Richland, Penna.

STEREOCAST Cuts—Sample 25c. Flint, 2311 Sixth Ave., Chattanooga, Tennessee.

PRINT Your own cards, stationery, circulars, advertising. Save money. Simple rules furnished. Print for others, nice profit. Junior outfit \$8.25, senior outfits \$16.55. Details free. Kelsey, Inc., T-11, Meriden, Conn.

PRINT At home, 10c will bring a complete catalog of presses, type and supplies. P. Peiffer & Company, 6 Columbia St., Newark, N. J.

BARGAINS—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

USED Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

PATENT ATTORNEYS

PERSONAL Patent counsel—I assume complete responsibility for each case I accept. I give your invention my personal attention throughout to obtain maximum protection which your invention warrants. I advise you each step to take—tell you plainly what costs will be. Fees reasonable; deferred payments if desired. Write me confidentially for preliminary advice. Merlin M. Evans, 718-A 9th Street, N. W., Washington, D. C.

L. F. RANDOLPH, 302-B Victor Bldg., Washington, D. C. Low cost. Book and information free.

INVENTORS—Patent your invention—Send now for our new free copyrighted booklet "How to Protect Your Invention" and "Invention Record" form. This booklet guides the inventor from the first step toward patent protection to final profit making from his invention. Reasonable fees, conscientious counsel. McMorro and Berman, Registered Patent Attorneys, 134-G Barrister Building, Washington, D. C.

PATENT Your idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, 43 years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 411-A Victor Building, Washington, D. C.

INVENTORS—Before disclosing your invention to anyone send for form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 411 Bowen Building, Washington, D. C.

INVENTORS: Take first step toward protecting your rights to your invention—without obligation. Write today for free "Record of Invention" form and complete instructions for making legal disclosure of invention and establishing date. We also send free—48 page book, "Patent Guide for the Inventor"—telling importance of prompt action; how to sell and market your invention; how to make application for patent; examples of successful inventions. Also details of how a patent protects you; our reasonable charges for preparing applications including official drawings and technical specifications; confidential search service to be reasonably certain invention is patentable; prompt service; strict secrecy; plan for you to pay in small payments as your application progresses; other facts you want to know about patent protection. Send for free "Patent Guide" and "Record of Invention" form today. See page 15A for further information. Clarence A. O'Brien, Registered Patent Attorney, 1A1B Adams Building, Washington, D. C.

PATENTS. Protect your idea by securing free "Proof of Invention" folder. Exceptional personal service. Established 1906. E. E. Vrooman, 871 Woodard Bldg., Washington, D. C.

"INVENTOR'S Guide" free; full information about patenting, selling inventions. Frank W. Ledermann, 154 Nassau Street, New York.

INVENTORS—Send for free booklet "Patent-Sense." Information based on 64 years experience. Lacey & Lacey, Dept. 5A, 635 F St., Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

FOR INVENTORS

NOTICE! War inventions! New government agency—National Inventors Council—now functioning. Made up of industrial executives experienced in development and utilization of inventions. Purpose is to study and recommend military or naval adoption of inventions submitted by civilian inventors and valuable to country's defenses. We are prepared to expedite preparation of patent application on any war invention. Send at once for our two free advisory books on patent procedure. Act now to insure prompt disposition of your invention by this new board. Write today—Victor J. Evans & Co., Registered Patent Attorneys, 412-A Victor Building, Washington, D. C.

INVENTORS: "Making Inventions Pay" our 32-page illustrated book mailed absolutely free. Crescent Tool Co., Dept. ZS, Cincinnati, Ohio.

SALES Company with excellent contacts in automobile industry is prepared to market new inventions or improvements on commission basis. Sales Co., Fenobscot Bldg., Detroit, Mich.

I SELL Patents. Established in 1900. Charles A. Scott, 773PM Garson Ave., Rochester, N. Y.

INVENTORS—A complete national service—Patent searches, models, drawings, engineering, testing. Ideas commercialized and sold. Write for free booklet, "Inventing for Profit." Camco Institute of Invention, Camco Bldg., Grand Rapids, Mich.

INVENTORS: Take first step toward protecting your invention—without obligation. Write for free "Record of Invention" form for establishing date of invention and free "Patent Guide for the Inventor"—telling importance of prompt action, confidential search service; how to sell and market inventions; details of convenient payment plan. Send for "Patent Guide" and "Record of Invention" form today. See page 15A for additional information. Clarence A. O'Brien, Registered Patent Attorney, 1A1A Adams Building, Washington, D. C.

SEVERAL New inventions we recently developed have been placed successfully by us for sale in department and chain stores. New items needed. Items manufactured on cooperative basis. We design and develop your invention; obtain patents; manufacture tools, dies, stampings. We specialize in plastics. Write for free estimates. R & S Engineering Co., Dept. CF-1, 17 East 42nd Street, New York City.

INVENTORS: Profit by your invention. A practical talk to inventors by an experienced manufacturer. Our 68 page booklet "Mind vs. Matter" mailed upon receipt of 25c. Rex Engineering Co., Cincinnati, Ohio, Dept. D.

CASH For practical ideas and inventions. Mr. Ball, AB-9441 Pleasant, Chicago.

MANUFACTURERS Addresses—25 any line \$1. Many buy unpatented inventions. Manufacturers Directory, 35B North Ninth, Columbus, Ohio.

INVENTORS! Unpatented inventions completely protected at total cost \$1.50. Show valuable ideas to prospective buyers safeguarded against theft. Also protects songs, short stories, scenarios before copyright. Send \$1.00 for Inventor's Protection Plan. Moroney, 321A 92nd St., Brooklyn, N. Y.

PERMANENT Invention, showroom, economical; quick results! Invention Showroom, 1240 Lexington Ave., New York City.

HAVE You a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 4-A, Washington, D. C.

WE Locate buyers meritorious patented, unpatented inventions. If we sell, reply immediately. Descriptive booklet, references, free. Invention Reporter, 5A-11236 South Fairfield, Chicago.

INVENTORS—Send for 72-page book on patents. Reasonable terms. Conscientious treatment to inventors. L. F. Randolph, Registered Patent Attorney, 302-E Victor Bldg., Washington, D. C.

INVENTIONS WANTED

MAKE Your inventions pay. We help you. 36 year old firm offers complete services, free estimates. Ample facilities regardless size of invention. Stampings, metal specialties, dies, models, etc. Catalog giving "inside" information free. Crescent Tool Co., Dept. W, Cincinnati, Ohio.

PATENTS, Inventions, sold, manufactured, financed. Perrin Co., 409 Pontiac Bank, Pontiac, Michigan.

INVENTIONS Wanted: Have you an invention to sell? Write for free booklet describing amazing low-cost service offering specialized list of manufacturers seeking patented, unpatented inventions. Inventors Information Service, 10 E. 43rd Street, New York, Dept. M.

INVENTIONS Wanted. Cash or royalty. Colburn Enterprises, Dept. A, 1209 Continental Bldg., Los Angeles, Calif.

CHAIN Store items patented or pending purchased outright or royalty. Warren, 90 North Washington, St., Boston, Mass.

INVENTIONS Wanted on royalty basis. Laule, Box 848, Hollywood, Calif.

INVENTIONS Sold. Patented, unpatented. Guaranteed service. Helpful information. Brohrer, 831 - 32 Avenue, Seattle.

SIMPLE, Practical inventions wanted by manufacturers, patented or unpatented. For information write Chartered Institute of American Inventors, Dept. 4-D, Washington, D. C.

CASH For inventions—Patented or unpatented. Mr. Ball, A-9441 Pleasant, Chicago.

WANTED—Meritorious patented, unpatented inventions! Booklet, references, free. Invention Reporter, 5B11236 South Fairfield, Chicago.

INVENTION Finance Magazine, 80-G Wall Street, New York. Important particulars free.

SMALL Inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. Stanley Hull, 7829-K Euclid Avenue, Cleveland, Ohio

PATENTS FOR SALE

MANUFACTURERS Attention! Pliers, latest invention. Unlimited market. Investigate. (M-1), 3855 Beatrice, Vancouver, B. C.

FOR Sale—Patent on pneumatic tire valve. Eliminates valve trouble. John Rhodes, LeGrand, Iowa.

128 INVENTIONS For sale, unpatented or pending. List 25c. Farris, Derry, New Mexico.

MANUFACTURERS. New self using electric hair clipper. Patent for sale, or royalty. Write Harry Kins, International Falls, Minn.

SELL Your patent through a small classified ad in Popular Mechanics. Many inventors have found buyers in this way. Ask me for proof—I'll gladly send it to you. F. W. Johnson, Manager Classified Advertising, 206 E. Ontario St., Chicago.

MANUFACTURING

INVENTIONS—Manufactured in any quantity at low cost by old-established reputable company. No branches anywhere. Stampings, metal specialties, dies, molds, etc. Free estimates. Free catalog. Crescent Tool Co., Dept. X-S, Cincinnati, Ohio.

TECHNICAL information on mechanical, electrical, chemical problems. Compiled from every known source. Choate Engineering Company, 152 West 42nd Street, New York.

INVENTIONS Manufactured by an experienced company, in any quantity at low cost. Metal specialties, novelties, stampings, dies, and models. Free estimates. Our booklet "Mind vs. Matter" sent upon receipt of 25c. Rex Engineering Co., Cincinnati, Ohio, Dept. C.

MANUFACTURING. Any material, any quantity, inventions developed. Milburn, Burlington, Kentucky.

INVENTIONS Developed and manufactured. Send us your ideas. Model Engineering, Osgood, Ind.

MODELS AND MODEL SUPPLIES

THE Model Railroader Magazine will show you how to build your own road with a maximum of fun and a minimum of cost. Contains detailed construction plans, instruction, photos of completed roads and advertising of reputable manufacturers. 10c per copy, \$2.00 per year. The Model Railroader Magazine, 1568 W. Pierce St., Milwaukee, Wis.

NEW Sensational model airplane motor, 1/4 h.p., \$8.95. Free literature. Barker Engineering Company, Box 3558, Cleveland Heights, Ohio.

TRACK. Scale—Tinplate, "O" gauge. Gardner, 2261 Dewey, Rochester, N. Y.

SUBMARINE—Beautiful 15" model—kit 35c postpaid. Spotts Models, 3141 N. Broad, Philadelphia, Penna.

IMMENSE 52 Page Mini-Train railroad catalog. 1277 different items. Send 25c. Vanden Boom's, 3821 Broadway, Kansas City, Mo.

GOOD Working models with eye appeal. We have spent 36 years developing ideas into practical working models! Let us help you! Free catalog. Crescent Tool Co., Dept. Y-SA, Cincinnati, Ohio.

WORKING Models of anti-aircraft, naval and railroad guns. Circulars and photos 25c. William Gregory, 229 Sixth Ave., Newark, N. J.

GAS Motors traded. Old motor, \$9.95 sets \$16.50 Tiger motor, Steinke Motors, Waterford, Wis.

POWER Models. Electric railways, steam locomotives, steam and gasoline engines, all accessories, metal, tools. 84 page catalog 35c. Chas. Cole, Ventura, Calif.

BRASS Gears, models and model supplies. Send 3c for catalog. Pierce Model Works, Tinley Park, Ill.

MINIATURE Steam locomotives, new catalog listing all builders' needs 25c. Little Engines, Wilmington, California.

RAILROAD Model Shop, Dept. PM, Dunellen, New Jersey. Catalog 10 cents.

THOUSANDS Ship fittings, hundreds kits, catalog 10c. Polk's, 429 Seventh Ave., New York, N. Y.

MODELS—Practical models put over your ideas. We develop models from the crude to perfect working devices. Your idea might have large commercial value. Services confidential. Bank references. Registered graduate engineers at your service. Send 25c for our 68 page booklet "Mind vs. Matter." Rex Engineering Co., Cincinnati, Ohio, Dept. B.

GAS Motor power airplane catalog 6c. Polk's, 429 Seventh Ave., New York.

CARVED Hull ship model kits. Ship and yacht model fittings; model yacht sails. Illustrated catalog 20c. A. J. Fisher, 1002-M Etowah Ave., Royal Oak, Mich.

BLUEPRINTS AND PLANS

HOUSE Plan books—Latest titles—Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

HOME CRAFTSMEN

SENSATIONAL Nu-Chrome paint. Gives chrome plate finish to any surface. Brush or spray, more brilliant than ordinary aluminum paint. Guaranteed satisfactory. \$1.20 pint, post paid. Presto Products Co., 4650 Chene St., Detroit, Mich.

CONSTRUCTION Kits—English royal coach, western stage coach, flower holder tea wagon, interlocking, 1/4" clear plywood. Marked, ready to cut out. Choice \$1.00 postpaid. Plans 10c each. Satisfaction guaranteed. Hobby Supply Co., 4935 W. 32nd, Denver, Colorado.

GREEK Temple! Bird feeding station. Beauty. Make-sell. Plans 35c. Box 663, Pittsburh, Penna.

BUILDSAW—Save 50%. Enjoy constructing this accurate, man-sized workshop saw. 24x30 table. Send \$1.00 for plans, instructions. Paxson Company, Prairie Street, Dowagiac, Michigan.

VENETIAN Blinds, supplies, machinery, wholesale catalog 10c. "Manufacturing Booklet" \$1.00. "Roberta," Box 260, Gloversville, New York.

SQUAREKNOTTERS! Make belts, handbags, etc. Quality cord samples with catalog, free. Beginners book, catalog and samples, 10c. Special! Regular \$1 book with 50c beginners outfit, all for \$1. P. C. Herwig Co., Dept. J-25, 121 Sands St., Brooklyn, N. Y.

GET Free leathercraft instruction pamphlets, prices of leathers, tools, projects. Make extra money. Beautiful gifts. Leather samples 5c. Wilder & Company, 1038 Crosby, Dept. 1F, Chicago, Illinois.

PATTERNS—20 Novelty 25c, 15 gift and toy 30c, 6 what-not shelves 25c. Kranz Novelties, 1730 Wayside Road, Cleveland, Ohio.

SHELF Brackets, 15 full size patterns 30c (coin). Albright Service, 6901 Railroad Ave., Omaha, Nebr.

KNOCKDOWN Cedar chest, lumber, veneers, illustrated catalog 10c. Giles Kendall Co., Decatur, Ala.

22 Lawn Ornament patterns 25c. Other patterns: 15"-20" high; Dutch girl, Dutch boy, pirate, bull terrier, Mexican girl, Mexican boy, dwarf, penguin, flower girl, 10c each; 3 for 25c. 25 novelty patterns 30c. All 56 full size patterns \$1.00 postpaid. Strother, Box 383-BW, Bellington, West Virginia.

CHROME Tubular steel table legs make beautiful up-to-date tables. Leg sets for all types. Make your top from wide variety of materials. Send dime for lists and prints. Ellwood Products Co., 927 Lawrence Avenue, Ellwood City, Penna.

LEATHERCRAFTSMEN: Send 10c for handbook and catalogue of tools and supplies. E. A. Sweet Company, Inc., Leathercraft Division, Dept. A-42, 143 State St., Binghamton, N. Y.

LIKE To make things? Latest craft books tell how. Bargain catalog free. Popular Mechanics, 633 St. Clair, Chicago.

BEAUTIFULLY Grained select walnut. Priced circular free. Special: Twelve feet 1/2" select walnut \$2.95. Boyle Company, Berkley Road, Indianapolis, Indiana.

PLASTICS—Bakelite, Catalin, sufficient for cigarette or powder box, four rings, two bracelets, five ornaments, five jewelry findings. Twenty pieces \$1.25 cash with order. Dependable Machy. Co., 1011 Harrison, Oakland, Calif.

PATTERN Catalog finely illustrating 250 plywood novelties, silhouettes, lawn ornaments, decal transfer decorations, and other lines. Wo-Met Shop, Ashburn, Georgia.

PROFITABLE, interesting, inexpensive. Make aluminum castings from scrap aluminum. Instructions 50c. Elden L. Creed, Northfield, Vermont.

WOODWORKERS—Send for valuable new data book with complete line plywood veneers. Save up to 33% buying from direct mill representatives. See our offers. Send 10c to cover mailing (refunded on first order). S. Beck Plywood & Lumber Co., 1309 N. Halsted, Chicago.

80 PATTERNS, 20 Lawn ornaments, 20 silhouettes, 20 novelties, 20 lawn ornaments, 30c each set, all for \$1.00. Modern Woodcraft, Saginaw, Mich.

WOODWORKING Power tools—Make them yourself. Lathe, scroll saw, saw table, drill press, portable sander, bandsaw, motorized plane. Complete details only 25c. Popular Mechanics Press, 200 E. Ontario Street, Chicago.

WATCHES, JEWELRY, OLD GOLD, ETC.

WATCHES—Hamilton, Elgin, Waltham, Bulova as low as \$2.75. Diamond rings at lowest prices. Postal brings free illustrated catalog. Quaker City Jewelry Company, Wholesale Jewelers, 801 Walnut St., Philadelphia, Penna. Dept. "S."

GEMS, Agates, minerals, 20 rough gemstones \$1.00. Pricelist free. Hill, Route 7, Salem, Oregon.

REBUILT Watches, guaranteed, Pontiac Watch Co., Box 576-P, Pontiac, Mich.

WATCHMAKERS' Materials—Tools, watches, bought—sold. Best prices for old gold, diamonds. Free catalog, Ben Segal Company, 5 South Wabash, Chicago.

GOLD \$35 Ounce. Ship old gold teeth, crowns, jewelry, watches—receive cash by return mail. Satisfaction guaranteed. Free information. Dr. Weisberg's Gold Refining Co., 1500-Q Hennepin, Minneapolis, Minn.

HIGHEST Prices for old gold—Mail your teeth, watches, jewelry. 100% full cash value mailed day shipment received. Satisfaction guaranteed or articles cheerfully returned. Information free. Chicago Gold Smelting Company, 300-P Champlain Building, Chicago.

AUSTRALIA'S Lovely opals. Illustrated catalogue free. Good selection \$3.00. Norman Seward, Melbourne, Australia.

ELGIN, Waltham watches \$3.50. Make big money. Free watch and jewelry catalog. Plymouth Jewelry Exchange, 163-A Canal St., New York.

AGATES—Fossil woods, three pounds \$1.25 postpaid. Jay Ransom, Aberdeen, Wash.

5000 REBUILT Watches! Free catalogue—Diamonds, jewelry, (3c postage). The New York Jobbers, 74 Bowery, Dept. M, New York, N. Y.

TOBACCO

GOLDEN Leaf guaranteed, cigarette, pipe or chewing, 5 lbs. \$1.00, ten \$1.75. Pay when received. Pipe, box cigars free. Reeves Tobacco Co., Paducah, Ky.

RAZORS, BLADES, SHARPENING

ELECTRIC Razors—Guaranteed, \$1.25 postpaid. The Pioneers Co., 5962 Winthrop Ave., Chicago, Ill.

FOR SALE—MISCELLANEOUS

1c HAND Lotion vendor machines used one season. \$17.50 each prepaid. O. Vorkamp, R. 5, Kalamazoo, Mich.

FOR SALE OR EXCHANGE

SWAP-SHOP—Write for our list. Specialty Shop, Centreville, Alabama.

WANTED—MISCELLANEOUS

MANUFACTURERS—Wanted, model made of an electric hair clipper. Harry King, International Falls, Minn.

CASH Paid for used microscopes, binoculars, slide rules, drawing sets, scientific instruments, tools, cameras, transits. Satisfaction guaranteed. Elman's, 108-MA South Clark, Chicago.

WANTED—False teeth, crowns, bridges, jewelry, gold, silver, mercury. Returned if price is not satisfactory. Western Metals Co., Bloomington, Illinois.

MERCURY. Cash paid. Ship express. Details sent. Wholesale Terminal, Norwood, Massachusetts.

CASH Paid for old automobile radiator name plates. Write Rudolph Zak, 2509 East 89th, Cleveland, Ohio.

TRANSPORTATION Tokens. Top prices. Laible, 1018 West 49th, Los Angeles, Calif.

CASH For your odds and ends. 100 unusual markets 25c. Vincent's, 193 Jefferson, Hartford, Conn.

CASH For anything. Justice Jewelry Jobbers, 59-P East Madison, Chicago.

MERCURY (Quicksilver). Tungsten, molybdenum, cadmium, nickel anodes, tin, pewter, rare and semi-rare metals, metallic residues purchased in any quantity. Write for quotations. Metallurgical Products Company, 35th and Moore Streets, Philadelphia, Penna.

PERSONAL

PIANO—By ear. No notes. Beginners. Complete method \$1.00 prepaid. Arthur Studios, Sheepshead, Box 41, Brooklyn, N. Y.

STAMMERING Scientifically corrected. Normal Speech Mail Course, 236 Palmer, Grand Rapids, Mich.

WIN Prize money: Booklet—"Successful Contesting" shows how. 10c postpaid. Bulletin listing \$100,000.00 prizes included. World Publishers, 4515-B Cottage Grove, Chicago.

REMOVE Your own tattoos. Start profitable business. Write Tattoo Supply House, 651 South State, Chicago.

ROSICRUCIAN Secret teachings are offered to those who seek to use them solely for the perfection of their inner faculties, and in the mastering of the daily obstacles of life: the International Organization of Rosicrucians will be happy to receive the requests of those who believe that worthiness and sincerity determine the right for one to have such wisdom; to them, a copy of "The Secret Heritage," a fascinating book, will be given without price; let this book guide you to the conservative plan whereby you may widen your scope of personal power. Simply address your letter to Scribe I.H.T., Amore Temple, Rosicrucian Park, San Jose, California.

MEXICAN Legal matters. Wm. A. Cocke, American Attorney, El Paso, Texas.

MISCELLANEOUS

ORANGES, Grapefruit, or mixed. Bush-el \$1.50 cash. McCants, Weslaco, Texas.

LEARN Business permanship! Complete course 30c. Simplex, Box 222, Watseka, Illinois.

STOP Cigarette burns furniture, rugs. New safety ash trays, 30c. Box 663, Pittsburgh, Penna.

FISHERMAN'S Rule, a rare novelty. 6 for 25c. Wickman, 744 Brooklyn Ave., Dept. B, Dayton, Ohio.

LIGHTNING-FAST Structural design alignment charts for architects and engineers. 25c. Tabatchnik, 44 Court, Brooklyn, N. Y.

CHRIST'S Coming soon. Absolute proofs free. Scheall, 263-X, Duluth, Minnesota.

5c BUYS Back-dated magazines. Domestic, foreign, art. 100,000 used, new books. Catalog 10c (refunded). Cleorone's, 863(M) First Avenue, New York City.

MAIL Order business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-catching schemes. Free details. Nelson Company, 500 Sherman, Dept. 408-A, Chicago.

PERSONALIZED Buying service gives tremendous savings to individuals. Jewelry, watches, clocks, electrical appliances, radios, sporting goods, etc., at wholesale savings up to 50%. What do you need? Confidential price list "P" available. Harry Sault, 5723 Warrington Ave., Philadelphia, Penna.

FROG Raising! Book for \$1.00. Roberts Frog Farm, Orange, Texas.

KEYS Duplicated 15c. Locksmith-Brannon, 1628 Caldwell, Conway, Ark.

WIN Money! Prizes! Contest bulletin 10c. Butler, 473PM, Sebring, Florida.

BARGAIN, (\$1.00 Complete), 8 standard gears, 1 1/2" bore, different sizes. Goodhouse, 627 Magenta St., New York City.

YOUR Old fountain pen and \$1 brings one new guaranteed pen. Orville Earhart, Hollenberg, Kansas.

TATTOOING And engraving outfits. Free literature. Tatuco, 651 South State, Chicago.

DEAFNESS, Why? Good hearing without mechanical aids. No drugs. Relieving deafness. Johnston, Postal Station C, Vancouver, Canada.

LATEST Stunt! Own part of Pacific ocean. Water, sand. 50c. Pacifica, Moss Beach, California.

HIGHEST Prices for used cameras, microscopes, binoculars, drawing sets, tools, any optical or scientific instruments. Write Gordon's 162-M Madison, Chicago.

FREE—Big list of helpful books. Popular Mechanics Press, 200 E. Ontario St., Chicago.

INFORMATION. Any subject. Moderate fee. The Roxbys (formerly International Research), 2737 Francis Ave., Los Angeles.

SAVE Money cutting the children's hair or earn extra money as your neighborhood barber. Complete home barbering outfit with complete easy way course on all types of haircuts. Postpaid \$3.00. Specialties, Post Office Box No. 253, Niagara Falls, N. Y.

SURPRISE Your friends. Mail them letters from Hawaii! We handle everything. Hawaii Mailing Service, Box 2017, Honolulu, Hawaii.

CODE Machines \$5-25. Folder. Omni-graph, 810 East 39, Brooklyn, N. Y.

COCOONS, Butterflies, collectors' supplies, free lists. Maynard, 1192 Lewiston, Rochester, N. Y.

FIFTY Inventors names and addresses. National Employment Foundation, Marietta, Ohio.

COATS Of arms and crests, correctly painted in colors or black and white, from heraldic description or furnished copy. \$10.00 and up. Highest grade work. Heraldic Studios, 1914P Oakdale Avenue, Chicago, Ill.

TATTOOING. Engraving outfits. Illustrated list free. Percy Waters, Anniston, Ala.

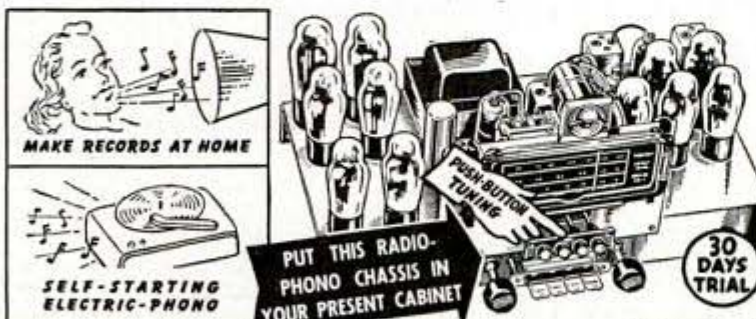
1001 WAYS to Use Concrete. Send for large free illustrated folder describing new Popular Mechanics book covering every known use of concrete for the home, farm, building, business and industry. Popular Mechanics Press, Room (C40), 200 E. Ontario St., Chicago.

Home Recorder FREE!

FACTORY-TO-YOU SAVES UP TO 50%

15-TUBE MIDWEST RADIO-PHONO COMBINATION

with **FREQUENCY MODULATION** and **TELEVISION ADAPTATION**



MAKE RECORDS AT HOME

SELF-STARTING ELECTRIC-PHONO

PUT THIS RADIO-PHONO CHASSIS IN YOUR PRESENT CABINET

30 DAYS TRIAL

THRILLING WORLD-WIDE FOREIGN NEWS DIRECT!

15-TUBE TILT-FRONT

CABINET MODEL **RADIO-PHONO COMBINATION**

\$29.95 COMPLETE

UP \$25. TRADE-IN ON YOUR OLD RADIO OR TO CHASSIS (on Many Models up to 18 Tubes) - EASY TERMS

YOU'LL enjoy listening to fine recordings on this new Y type, electric phonograph, and you'll be delighted with this amazing, ocean-spanning radio. Make your own records on the Home Recorder (sent FREE for a limited time) with this Radio-Phono Combination. Big FREE catalog pictures many beautiful 1941 factory-to-you radio chassis and console values—from 6 to 18 tubes—up to 5 bands—including automatic record-changing, radio-phonograph, home recorder, etc. Get our **LIBERAL TRADE-IN PLAN** and 30-day home trial offer. Write for **FREE** catalog today.

MIDWEST RADIO CORPORATION USER AGENTS WANTED
DEPT. 15-HH CINCINNATI, OHIO

ONLY \$22.50

COMPLETE RADIO-PHONO CHASSIS with TUBES and SPEAKER

HOME RECORDER FREE

There's MONEY IN ARC WELDING!



Defence Industries

desire men to learn Electric Arc Welding and get practical experience under actual production conditions in the laboratories of the School of Engineering. Moderate training fee. Accepted applicants will be fully trained until ready to pass standard tests and assisted in securing employment.

AIRCRAFT WELDING

"We need more planes!" That's the demand on every side. No wonder there is a shortage of aircraft welders. Other industries need welders, too. There's almost no limit to what Milwaukee School of Engineering trained welders can do. They can "flow and why" of Welding, Metallurgy, Drawing, Blueprint Reading, Set-up Work and Fabrication—and they enable manufacturers to cut production costs. Remember—industries need practical trained Aircraft Welders. Arc Welding Operators, Technicians and Welding Engineers and Air Conditioning and Refrigeration Technicians. Don't be satisfied to struggle along on ordinary, hit-or-miss jobs with poor pay—when in a short time you can become a trained specialist. Send coupon today—classes begin within a month.

MILWAUKEE SCHOOL of ENGINEERING

Institute of Electrotechnics

P.M. 141 North Broadway and E. State, Milwaukee, Wis.

Without obligation send Free Booklet "The Dawn of a Gigantic Industry and its Outstanding Opportunity." Also tell me How to Become an Arc Welding Operator (3 mo.), Air Conditioning & Refrig. Tech. (4 mo.), Air Craft Welder (3 mo.), Radio Serviceman (6 mo.), Welding Technician (5 mo.), Commercial Electrical Engineer (1 yr.), Welding Engineer (1 yr.), Commercial Radio Engineer (1 yr.), Electrical Engineer (B. S. Degree (4 yrs.)), Earn Part Expense Plan.

Name.....Address.....
City & State.....Age.....P.M. 141

Now is the time for you to get into DRAFTING



—Learn at home from an Engineer

With industry working feverishly on rearmament, new products, new production methods—the field for DRAFTSMEN is bigger than ever! Get into a better job with more pay and fascinating, pleasant work. I will train you at home in your spare time until you are ready for a better paying position by my practical applied method—on actual jobs—as I have done with many hundreds of successful students.

Complete Outfit Furnished
All necessary tools, including drawing table, sent to you at once—without extra charge.

Industrial Designing Included

My practical training in drafting also includes a working course in Industrial Designing as applied to new products, improving, restyling and modernizing — all extremely valuable to draftsmen. Send coupon for complete details on "Drafting and Industrial Designing". Engineer Dobe, Libertyville, Illinois.

"GET THE FACTS!"

Please send me full facts on "Drafting and Industrial Designing". Also how you assist your graduates to good positions in these fields.

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

Say you saw it in Popular Mechanics!

LET ME PROVE I CAN MAKE YOU A NEW MAN

I changed myself from a 97-lb. weakling to winner of title, "World's Most Perfectly Developed Man." Let me prove that my secret of Dynamic Tension can give you powerful muscles, smashing strength, a handsome build! All I ask is a 7 DAY TRIAL. Write for my 48-page FREE BOOK. CHARLES ATLAS, Dept. 8A, 115 East 23rd Street, New York City.



SEND FOR MY FREE BOOK

Put PUNCH in Your SPEECH

Be a Personality! Speech is the American weapon. CONQUER in business and social affairs through Your Effective Speech. COMMAND in the march of life! WIN personal victories by mastering 12 easy lessons in your own home, free from embarrassment while learning. These lessons have been prepared for YOU by an author-lecturer, an authority on Personality Development. Write for information.

KILDARE INSTITUTE, Dept. A-141, 205 West 57th St., N. Y. City

RADIO REPAIR HINTS

Learn how to test and fix all radio sets. Hundreds of service short-cuts for all circuits. Get this new 32 page Radio Book for only a dime. Supreme Publications, 3727 W. 13th St., Chicago, Ill. **10c**

TOOL & DIE MAKING MACHINIST

Acety & Arc Welding, Body & Fender Repair, Practical Shop Training. Michigan's Oldest & Largest Trade School. Unlimited training period without extra charge. Wolverine School of Trades, 1408 W. Fort, Detroit, Mich. **FREE CIRCULAR**

DIESEL ENGINES are Vital to NATIONAL DEFENSE PROGRAM

The Diesel Engine is in the headlines today, more than ever before. Tanks—Trucks—Airplanes—Ships, all vital implements of National Defense, are now being powered with Diesels. Millions of dollars of government contracts have been let for Diesel-powered equipment...and Hemphill Diesel Schools are training men to operate and service modern Diesel engines.

HEMPHILL DIESEL SCHOOLS

A NATION-WIDE INSTITUTION
NEW YORK 31-25 Queens Blvd., L. I. C.
CHICAGO 517 South Western Avenue
MEMPHIS 417 Monroe Avenue
LOS ANGELES 2120 San Fernando Road
VANCOUVER, B. C. 1363 Granville Street

HEMPHILL DIESEL SCHOOLS (use nearest address)
*Please send data on your Diesel courses, also free copy of illustrated booklet "March of Diesel."

NAME.....AGE.....
STREET.....
CITY.....STATE.....m-51p

SEE
The Rings
of Saturn
—
The Moons
of Jupiter



ONLY
\$395

50 POWER
REFLECTING TELESCOPE
Amazingly Low Priced

Study the wonders of the heavens—the mountains of the Moon, the planets, comets, stars. Strange thrills! Hours of fun—with this big powerful reflecting telescope. EARN MONEY FOR YOURSELF. Charge 10¢ for a look at the moon. NOT A KIT. A splendid instrument, sturdily built in three inch, heavy metal tube with machine ground, hand finished reflecting lens—18 inches long finished in black crystallized enamel. Will last lifetime. Guaranteed that you see the Moons of Jupiter. Can be used to take telescopic pictures and as a spotting scope for target practice. Complete and ready for use. Nothing else to buy. TEN DAYS FREE TRIAL. Rush only \$1.00 now. Pay balance (\$2.95) plus postage when postman delivers. Keep ten days. If not more than delighted, return telescope and money will be refunded.

KUMFY PRODUCTS, INC., Dept. M-500
4033 Eastern Ave. Cincinnati, Ohio

STUDY **ENGINEERING** AT HOME

Earn a Degree at Home
From A Chartered Institution of Higher Learning
Employers Demand Degree Men For Key Positions
25 Degree Courses in Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering, Arts, Sciences, Philosophy, Education, Public Health, Medical Jurisprudence, Psychology, Sociology, Physics, Chemistry, Geology, Pol. Science, Theology, Law, Agriculture, Business Training, Accounting, Statistics. Founded 1908. Chartered McKinley-Roosevelt Graduate College, 4610-R Sheridan Road, Chicago

LEARN MONEY-MAKING CARTOONING
Fame Simplified Method that has helped train creators of "Terry & Pirates," "Wash, Tubbs," "Out Our Way," "Wizoo Winkie," "Raglar Fellers," "Strange As It Seems," "Secret Agent X-9," and many others. Earn while learning. Rush 10¢ for Picture Chart (to test your ability) and full details. (State age.)
THE LANDON SCHOOL, 15-J National Bldg., Cleveland, Ohio

MECHANICS

KNOW YOUR CAR

You Need this Book JUST OUT!

Ask to See it!

Every operator and mechanic needs AUDELS NEW AUTO GUIDE. This book saves time, money and worry. Highly endorsed. It presents the whole subject of auto mechanics: 1—Basic principles, 2—Construction, 3—Operation, 4—Service, 5—Repair. Easily understood. Over 1500 pages—1540 illustrations showing inside views of modern cars, trucks and buses with instructions for all service jobs. Diesel Engines fully treated, 4 fully illustrated. To Get This Assistance for Yourself Simply **4** Fill in and Mail Coupon Today.

COMPLETE • PAY ONLY \$1. A MONTH
THEO. AUDEL & CO., 49 WEST 23rd STREET, NEW YORK
Please send me postpaid AUDELS NEW AUTOMOBILE GUIDE (\$4) for free examination. If I decide to keep it, I will send you \$1 within 7 days; then remit \$1 monthly until purchase price of \$4 is paid. Otherwise, I will return it to you promptly.

Name _____
Address _____
Occupation _____
Reference _____ PM

Say you saw it in Popular Mechanics!

JANUARY, 1941

LEARN AVIATION
In Los Angeles
NATION'S AVIATION CAPITAL



Aviation Mechanics
4 to 12 Months



Aeronautical Engineering
—Drafting 4 to 14 Months



Airline & Commercial
Pilotage 10 to 24 Months

THIS TRAINING PLACES YOU IN AVIATION IN 4 TO 14 MONTHS

Huge increases in Los Angeles aviation activity insuring splendid positions, rapid advancement for California Flyers graduates. Train at one of America's most modern equipped, strategically located schools. Training fleet of 15 modern planes, Link Trainer, latest instrument flying equipment. Government approved shops. Located on famous Los Angeles Airport, C.A.A. test field, plant and airline proving ground. Career training courses in Airline and Commercial Pilotage (10 months to 2 years), Aeronautical Engineering (14 months), Master Mechanics (12 months), Production Mechanics (4 months), Aircraft Drafting (4 months), Instrument Technician (6 months). Flying optional with Engineering and Mechanics training. Government approved for Flight, Ground and Master Mechanics courses. Low tuition, living costs. Dormitories. Write for new 64 page Catalog and Vocational Guide. State age.

WE CAN'T SUPPLY THE DEMAND FOR GRADUATES



SEND FOR THIS FREE CATALOG

CALIFORNIA FLYERS
SCHOOL OF AERONAUTICS DEPT. PM-1
LOS ANGELES MUNICIPAL AIRPORT • INGLEWOOD, CALIF.



Know Electricity as Experts
Know It—and Get an Expert's Pay!

What about your future? Who is safe today? Surely not the man who is contented to stand still! Know your job thoroughly—prepare yourself for jobs ahead. To do just this thousands of men have used

The Croft Library of Practical Electricity

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 50,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, transformers, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

**6 volumes, 2155 pages — New low price
No money down — Easy payments.**

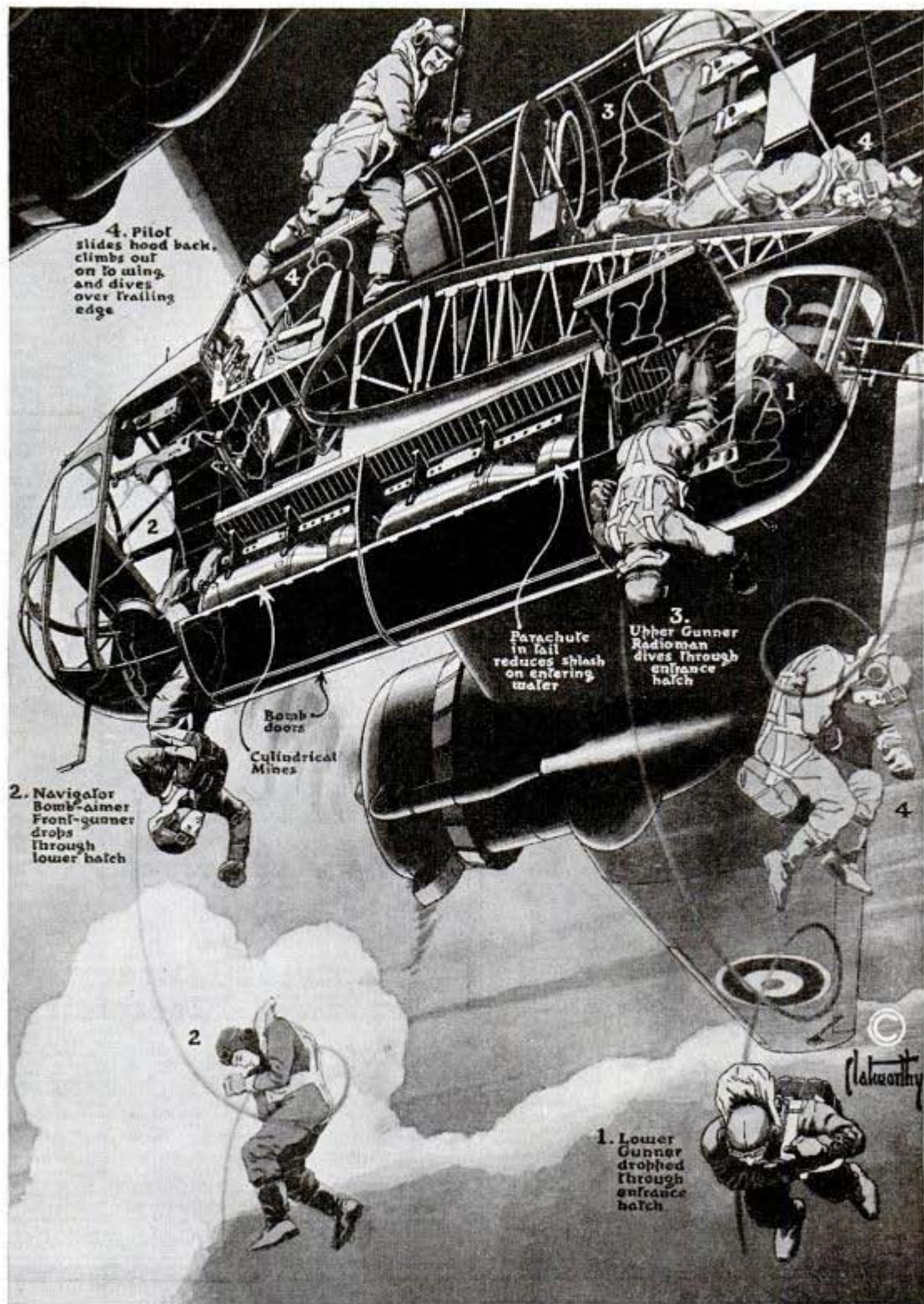
Fill in and mail the coupon attached and we will send you the entire set of six volumes for ten days' examination on approval. We take all the risk—you assume no obligation. If you decide to keep the books, send \$1.50 in ten days and the balance at the rate of \$3.00 a month. Send the coupon NOW and see the books for yourself.

EXAMINATION COUPON

McGRAW-HILL BOOK CO., 330 W. 42nd St., New York, N. Y.
Send me for ten days' examination on approval the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$3.00 monthly until the price of \$16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)
Name _____
Home Address _____
City and State _____
Position _____
Name of Company _____ PM-1-41

123/.

How Crew Escapes from a Crippled Bomber



Here is a typical example of how the crew of a disabled bombing plane escapes in ten seconds and parachutes to earth. The method is practiced on the ground, with the aid of large straw-filled mattress, until each man is letter-perfect in what he must do in an emergency. Figures 1 to 4 designate the crew members, their original positions in the bomber and their movements in getting out of the craft quickly. Each dives out head first, gripping the 'chute release in one hand. After a three-second drop, the release is pulled and the 'chute opens. This plane is a British Hampden equipped for laying mines

S. W. Clatworthy, 84, Lewin Road, S.W. 16 England.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

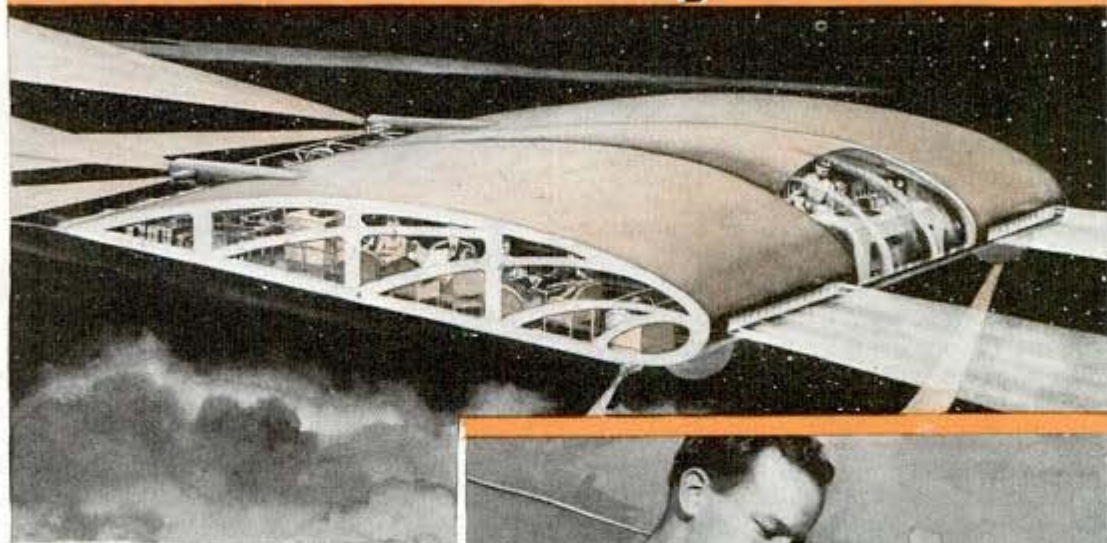
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 75

JANUARY, 1941

No. 1

The MIRACLE of U-235



By Dr. R. M. Langer

Page
Editor's Note—One of the country's eminent physicists in this article paints a picture of the world as he visualizes it when U-235, a possible new source of power, emerges from the laboratory. Dr. Langer, now at the California Institute of Technology, has been doing uranium atom research and has been connected with leading laboratories in this country and abroad

Pasadena Calif
SEVERAL months ago you read in Popular Mechanics that the secret of atomic power is close to solution and that possibly within a decade civilization will be using the tremendous amounts of energy contained in U-235, an isotope of uranium.

Since then, additional research has opened up greater possibilities than ever. At first we thought that a heavy power plant weighing tons would be required to extract the power; now it appears that a pound or even a single ounce of



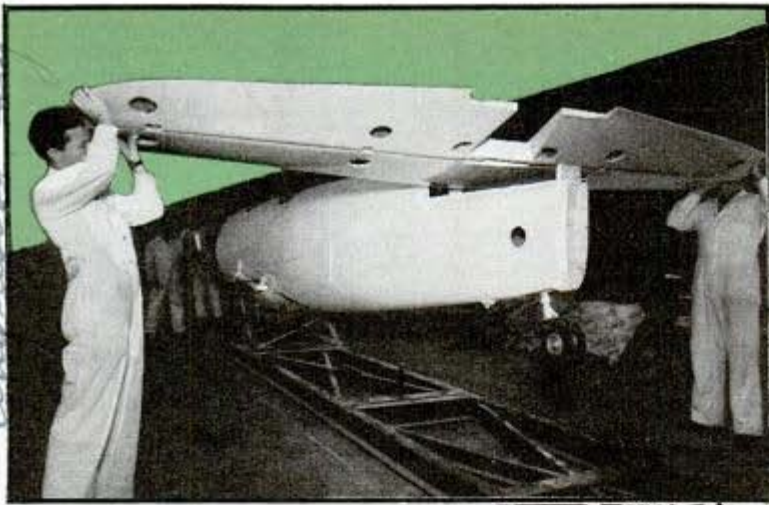
Top, author's idea of U-235 plane, a flying wing with propelling jets at rear and lifting jets underneath. Cross-section treatment gives view of interior. Bottom, giant electron microscope developed as result of atomic studies

JANUARY, 1941

1

991

Developed by W. E. Van Dorn
J. C. Lindvall, C. J. Hill, B. O. S. 548
and others



Above, assembling plastic plane. Bottom of page, left, examining spring suspension in pendulum railway car shown in cutaway sketch at right. Auto of uranium age will be constructed similarly, the author believes

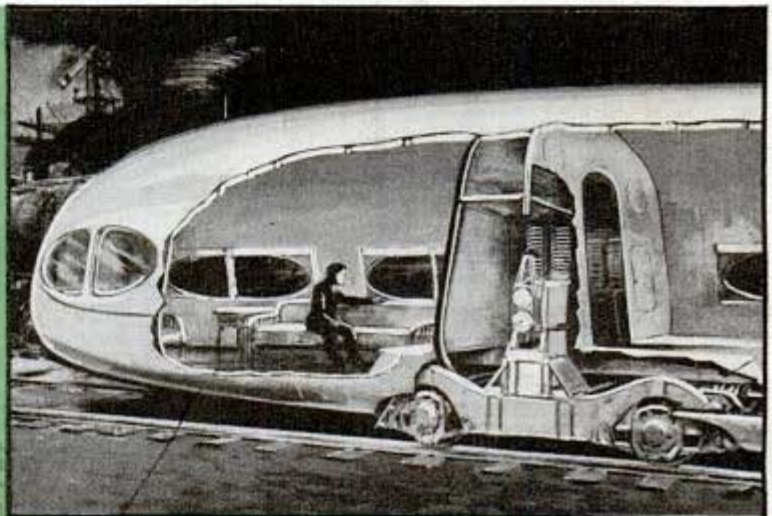
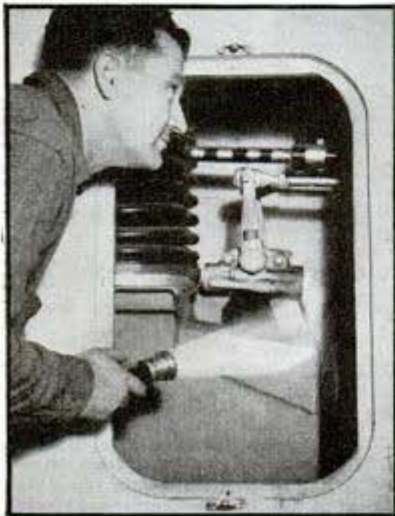


see June 1942 p. 79.

U-235 can be made to deliver energy. A power plant the size of a typewriter will be available. Its heart will be a one-pound package of uranium that contains the same amount of power that we extract from 250,000 gallons of gasoline. With such a power pack in a car you could drive 5,000,000 miles without refueling. Obviously, at \$1,000 a pound, U-235 will be cheap.

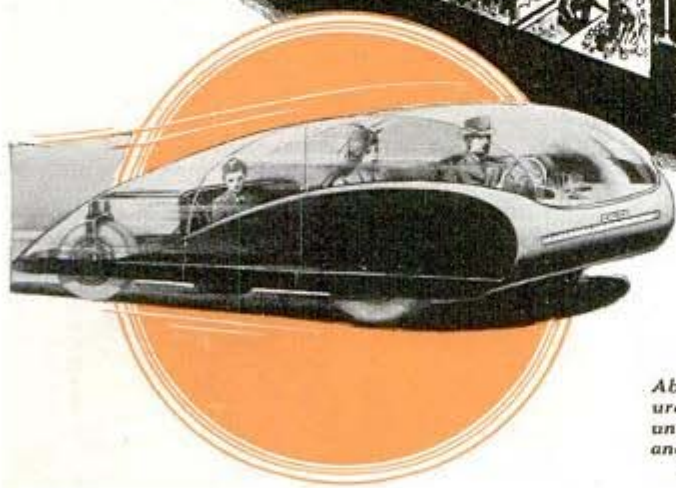
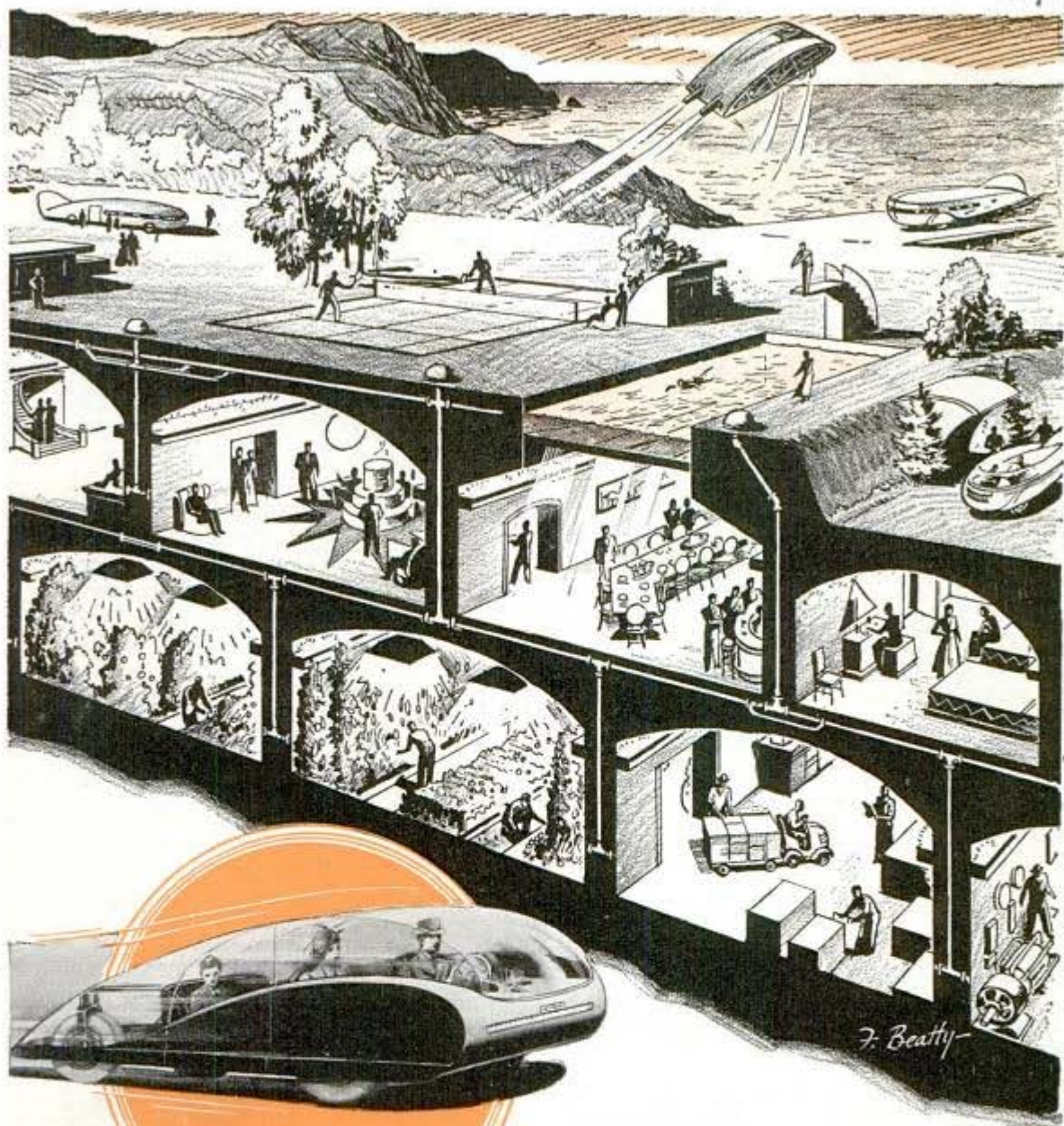
But more miles per dollar is only one minor advantage foreseen for the uranium age. We can look forward to universal comfort, practically free transportation, and unlimited supplies of materials. Power will be cheap in every home and factory, without distribution lines, and electricity will cost less than one-tenth of a cent per kilowatt-hour.

It is not too early today to consider the changes that this power source suggests. Jet propulsion will free the airplane from earth. For both local low-altitude trips and long-range flights at high altitudes we will probably always use the simple airfoil or flying-wing design. We will use the principle of rocket power but there will be no need to employ the bullet shape of present rockets. We will fly several thousand miles per hour at several hundred thousand feet above the surface and will have to slow down in descending to the surface



see Oct. 1938-48

K999

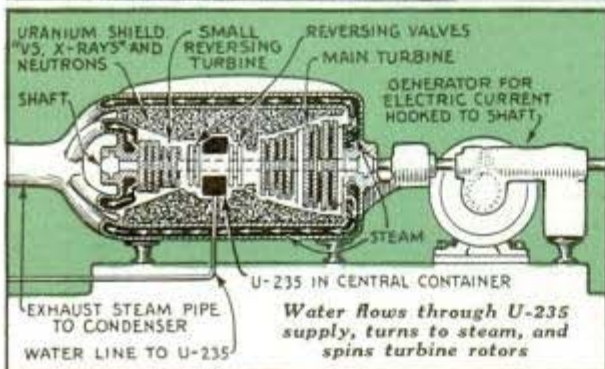
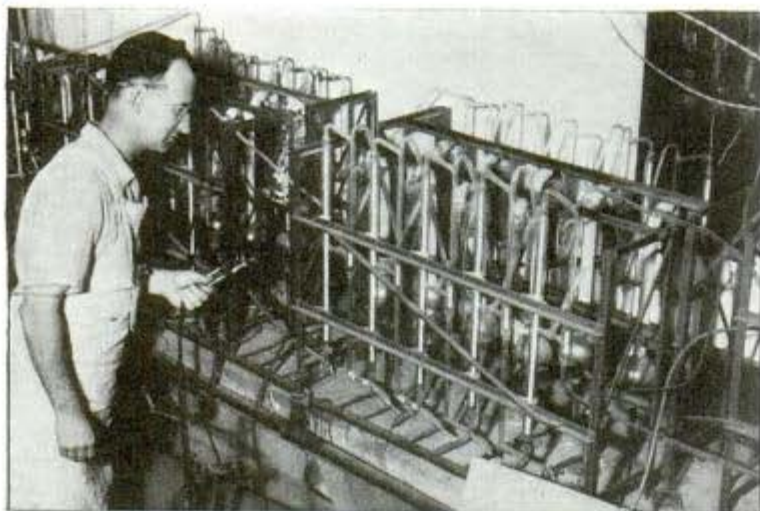


Above, author's ideas of what life may be like in uranium age. Note that most activities are located underground—even farming. Only transportation and recreation are above the surface. Left, Dr. Langer's conception of the U-235 automobile

to avoid being burned up like a meteor. The flying-wing driver will have a gyroscope, the main propulsion jets, and a few directable control jets at his command. Compressed air or steam for the jets might do for landing or leaving the ground but for greater efficiency we might very well use steel vapor for propulsion at higher altitudes. Vapor from boiling steel would have powerful thrust and would condense as fine harmless dust.

The concept of neighborhood changes in a world where no two points are more than seven flying hours apart. It is all one big community and there is no excuse for differences in material welfare. If you feel like cold weather, some afternoon, you can go and get it. If you want a tropical swim the day before Christmas, that is easily arranged, and you can be back in time for Santa Claus. You can choose night or day according to your mood and you may have

1991



your choice between yesterday and tomorrow, because a speed of 2,000 miles per hour is about twice as fast as the rotation of the earth.

The automobile, like the airplane, will be of plastic material and built like an insect, with the skeleton outside. This monocoque construction provides lightness and strength and has a functional architectural beauty. Transparent portions can be made integral parts of the surface so that special window frames are avoided. The whole is molded in one process and the assembly job becomes as easy as cooking a waffle. The body is supported at the top so that when the car goes into a turn the bottom swings out to provide an automatic bank. The chassis has overhead frames from which the body is slung. The whole structure is, however, en-

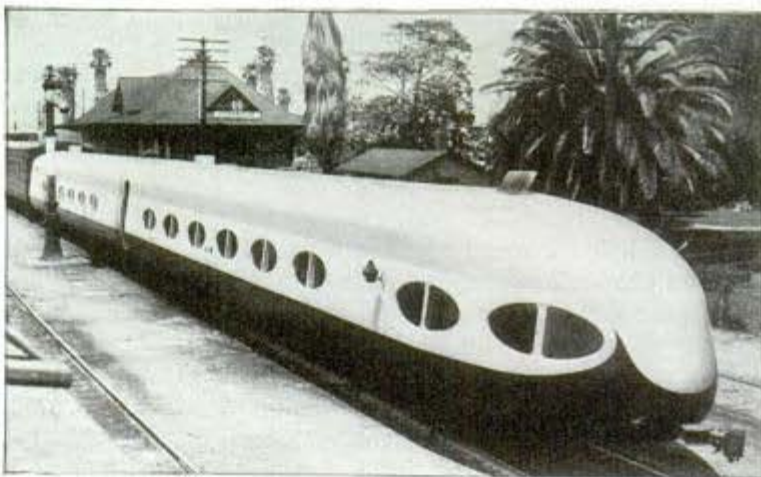
closed within a streamline shell. The Santa Fe railroad soon will have in service some passenger coaches built according to this principle. They are called pendulum cars by Hill, Van Horn, and Lindval, the three young men mainly responsible for this important new invention.

Because of the stability and smoothness of our future cars, all sorts of work can be carried on in the interior compartments. The automatic character of control

should make it possible to drive the car from almost any position, simply holding the remote-control panel in your hand. On a main highway cars can be kept in lanes by buried pilot cables similar to the electrical devices used to guide ships into harbors.

The most important unit of the new era is the motor that will supply energy for all rotating shafts. It is already complete in principle although many improvements probably will be made. This "butterfly" motor, or U-235 engine, is capable of any speed or torque that is likely to be demanded of it. Its other qualities are ease of manufacture, simplicity of operation and control, versatility of performance, and portability.

Postponing explanations for awhile, it is pointed out that water passed over U-235



Top, apparatus for separating elements into their isotopes. This can be used to produce U-235, but the method is too slow for practical production purposes. Below, "butterfly" engine that would use U-235 and water. Bottom, pendulum coach, already built, employs overhead suspension

K 991

can be brought almost instantly to a very high temperature and a correspondingly high steam pressure. To utilize this property one need only take over the principle of the flash boiler. Water is passed through a small chamber which contains U-235 in porous form. The chamber may be less than six inches in diameter. The water emerges as high-pressure steam into a series of turbine wheels all solid to the same shaft. Speed depends on the rate at which the steam passes through. A reversing valve may be used to divert the steam flow to an opposite-turning turbine on the same shaft to obtain a braking or reversing action. Complete control is obtained by throttling down or opening up the water supply and exhaust to get less or more power at the same operating pressure.

The driving mechanism of the automobile is now clear. Under the body is a water tank that helps shield the occupants from radiations emitted by the uranium and also puts the center of gravity low. Each wheel hub has on it a very small reversible turbine motor such as the one described. This car needs no differential or clutch. The uranium must be detachable because it probably will outlast the car. Recovering its own exhaust steam, such a car could travel without stopping until it wore out its tires or needed other servicing. Using the newly developed vertical propellers, such a vehicle might be converted into a high-speed, long-range vessel to travel on water, and might be furnished with unfolding wings for travel through the air.

U-235 at \$1,000 per pound would be the same as buying aviation gasoline at 250 gallons per dollar, not including taxes. Really the efficiency of uranium power is much greater than this comparison indicates. It is a heat engine possibly fifty per cent efficient as compared to the less than ten-per-cent efficiency of present internal-combustion engines.

Let's study the process by which this fabulous amount of energy can be released from U-235. It is not a perpetual-motion scheme. It happens that U-235 is a special kind of uranium so near the point of instability that any neutron entering it breaks it down into entirely different substances, such as bromine, iodine, barium, krypton, and many others. In the transmutation these products take on rapid mo-

(Continued to page 149A)

JANUARY, 1941

K 1151

Soldier Dons Knight's Visor to Guard His Eyes



W. H. Wood
Eyeshield worn by modern soldier for protection from flying splinters looks like visor from suit of armor

Visors resembling those worn by the armor-clad knights of old are appearing as important equipment of modern warriors. The purpose of the visor, as used today, is to protect the soldier's face and eyes from fragments hurled by exploding shells.

K 1013 *English*

Reflector Buttons on a Chain Form Letters of Sign

Reflector buttons mounted flexibly in the form of a chain are available for making any kind of reflecting sign from small house numbers or initials to large displays. The links can be nailed like tape to wood, or fastened with screws to sheet metal or plastic. The reflectors are visible from wide angles and at considerable distance.



Making a "stop" sign visible at night by tacking the chain of reflector buttons over the letters

The Star-Lite Co.
312 E. Market St.

Indianapolis, Ind.

R 1169.

'Stinger' Gun in Plane's Tail Guards Vulnerable Spot



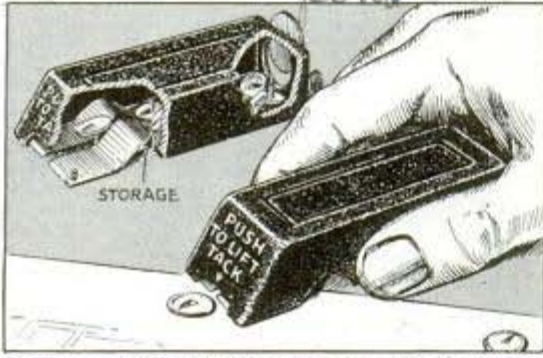
This shows the gun protruding from tail of bomber. The gunner lies prone in firing

Operated by a gunner lying prone, a fifty-caliber machine gun in the tail of the army's latest medium bomber guards what formerly was regarded as the most vulnerable part of a warplane. Thus, the bomber has a real "stinger" for enemy planes approaching the tail. Other armament on the craft includes machine guns in the wings, and turrets in the sides and top.

R 1146

Handy Lifter Stores Thumbtacks As It Pulls Them Out

Thumbtacks are stored automatically in its receptacle by a lifter especially handy



Cutaway sketch, left, illustrates thumbtack chamber and opening at back. Right, one push lifts up tack

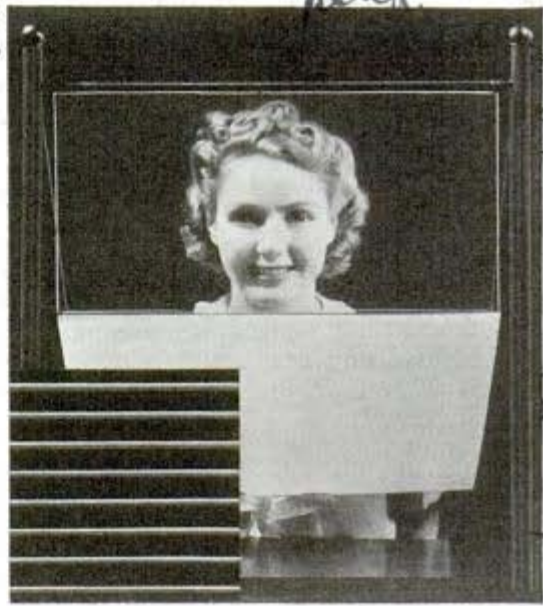
Hoane Products Co
Meriden, Conn

for drafting boards and bulletin boards. Simply push it over the tack to be removed and the tack tumbles back into the storage compartment, thus saving many thumbtacks as well as keeping them off the floor. Made for long service, the puller has a steel bottom and the body is die-cast.

R 1178

Louvers in Transparent Plastic Hide Bright Light from Eyes

Indirect lighting is combined with the efficiency of direct lighting by development of a new type sheeting, called Louverglast. Very thin, translucent louvers that may be likened to the slats of a venetian blind are built into a sheet of transparent Plastacele, a cellulose acetate plastic. These louvers are arranged parallel and at right angles to the surfaces of the clear sheeting, so when you look directly through the Louverglast it appears as a



Louverglast, clear in vertical position, is translucent if tilted; inset, enlarged section shows lines

clear sheet with fine, parallel hair lines running through it. View it obliquely, across the louvers, and you see a completely translucent surface, since the louvers then overlap one another. In a ceiling-light fixture the "slats" permit direct rays to pass between them toward the area which it is desired to illuminate, but they prevent the rays from penetrating downward. From below, the fixture appears as a translucent globe, yet there is no hindrance to transmission of light upward.

Douglas Aircraft Co. Santa Monica, Calif.

Plashes Dept. via post.

95 Madison Ave. New York City

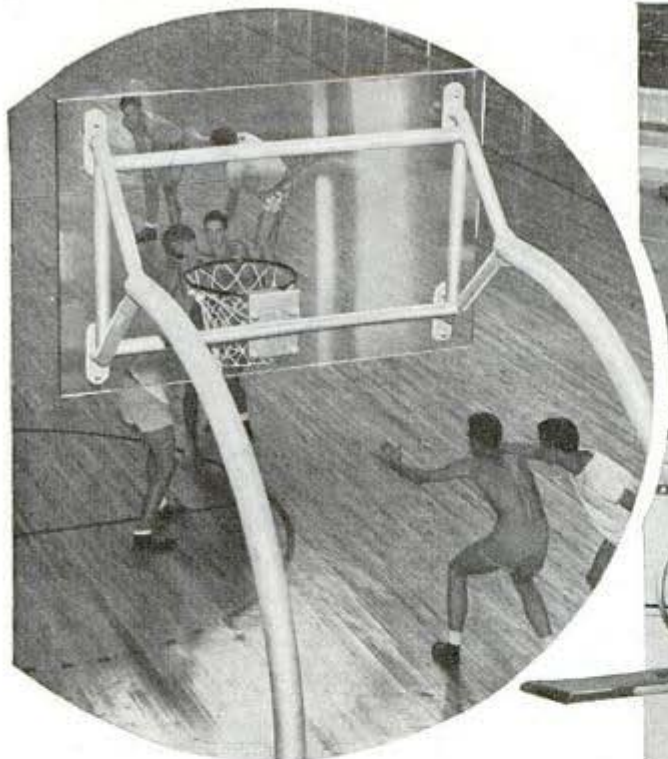
I am Johnson Co. dist. Sole agent

20 Trib. Jan 6 1933

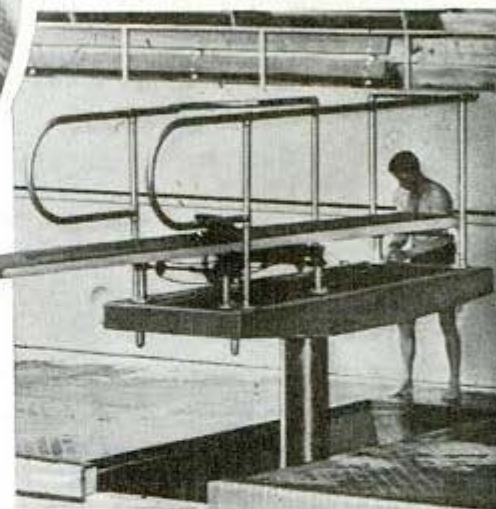
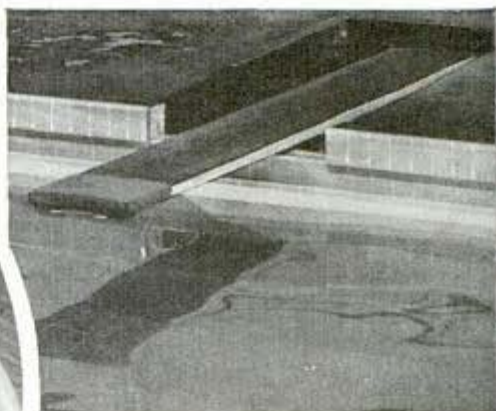
M. R. Weigel Co. 7165 Sedgwick Chicago

K1110.

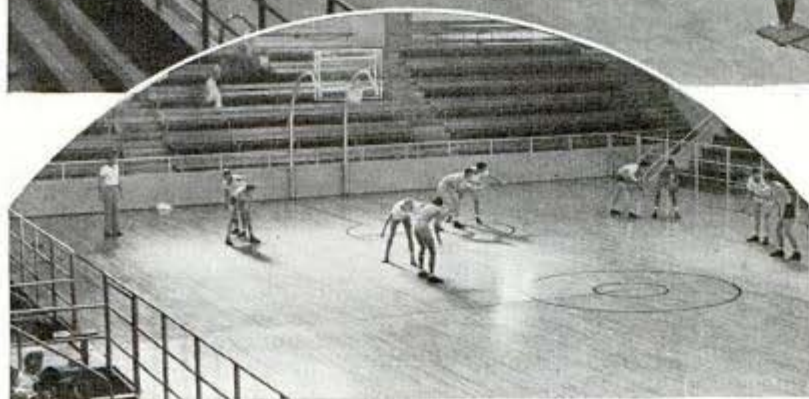
Vanishing Gym Floor Covers Swimming Pool



There's no blind spot for the spectators in the gallery of this basketball court. The glass backboard permits a clear view, and the players say it neither helps nor hinders their shots at the basket. The photograph above was taken from the end zone gallery. At the right the adjustable diving board is seen in its lowered and raised positions



241 Moreno Drive, Beverly Hills, Calif



Take your choice—water polo or basketball. Either game can be played in this convertible arena; views above show pool and floor from the same angle

When the whistle ends a basketball game in the gymnasium of Beverly Hills, Calif., high school they can roll away the floor and go for a swim. The floor is in two sections on rollers, each section three feet six inches deep, weighing forty tons. It is moved electrically, covering the entire pool. There are other interesting features—a glass backboard for basketball; adjustable diving boards raised or lowered on hydraulic hoists, dropped beneath the floor when it is moved into position; and showers thermostatically kept at the proper temperature and photo-electrically turned on and off as the athlete enters or leaves the stall

JANUARY, 1941

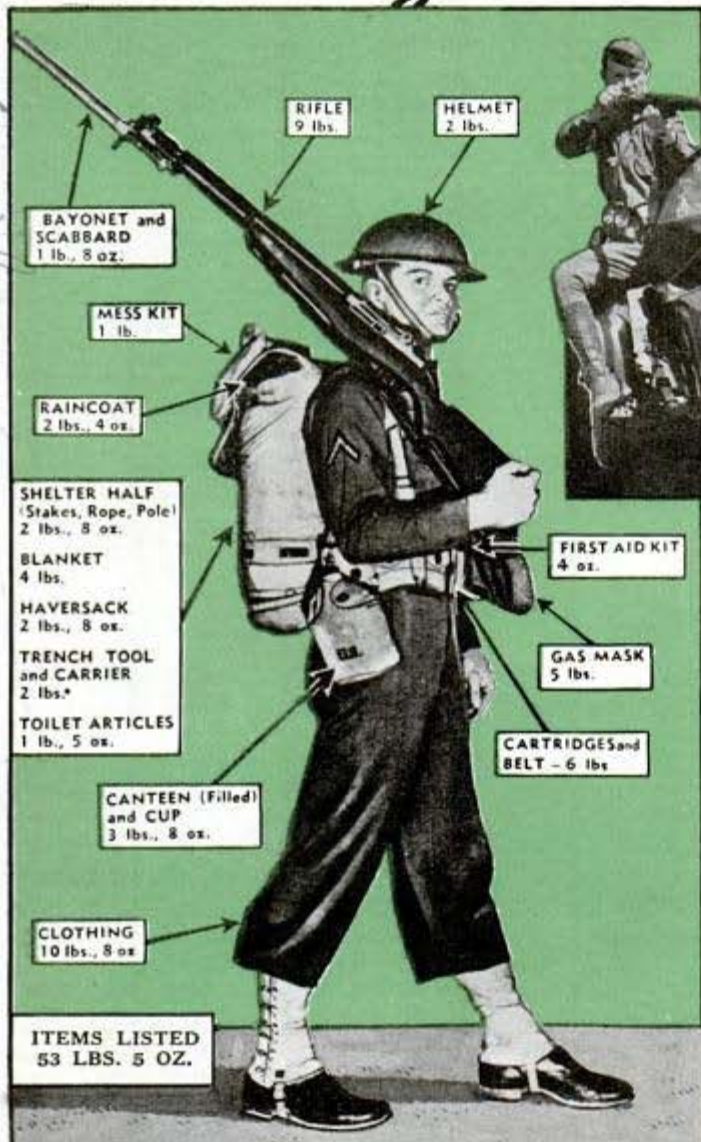
Cont.

Marshall Berham
1128 Stearns Drive

Los Angeles
Calif

Serving UNCLE SAM

Coffey Hall
 Private (alleges)
 Harold Campbell
 R1126
 5-1-36



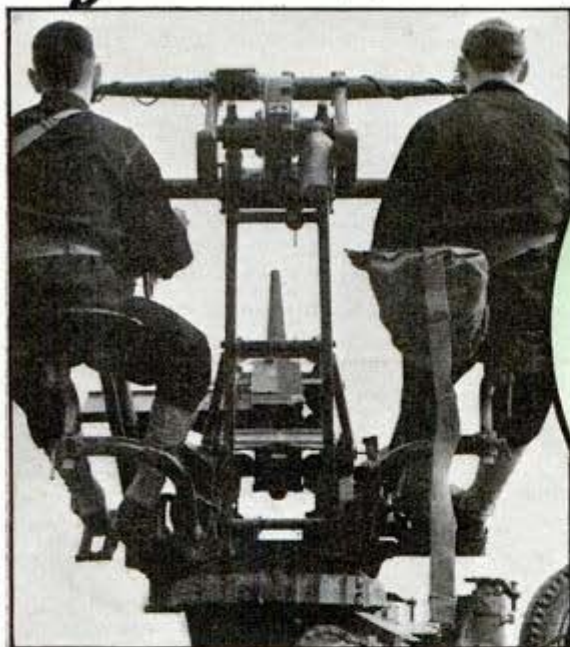
Acme
 Left, part of the load the selectee will carry. Additional items including more ammunition, bring the total to around sixty-four pounds—more with winter clothing. Above, crew of motorcycle and sidecar in firing position. Bottom, dismounting machine gun

LET'S suppose your number has been drawn, the local board's examination has resulted in orders for you to report for the twelve months' training required by the Selective Service Act and you're wondering what comes next. Mister, you're in the army now, although you will go through three or four days of preliminaries before you become fully conscious of it. You, and others called at the same time by your local board, are on your way to one of the 100 induction stations—similar to recruiting offices—set up throughout the United States. From there you will go to a reception center for your first real contact with the U. S. Army. Your records will be completed, uniform issued, vaccinations administered and you will be interviewed to determine the military duty for which you may be best fitted. Then comes assignment to a particular organization.



K 1126

for TWELVE MONTHS



Photos by
U. S. Army
Signal Corps

Left, rear of thirty-seven millimeter anti-aircraft gun. Right, new training gas mask. Bottom, on the march after being fitted out

When the bugler—you'll learn to love him—awakens you that first morning in the army, you'll discover that every man in the unit is a selectee, just like yourself. So there will be none of the self-consciousness that you'd be sure to experience if you, a rookie, found yourself among veteran soldiers. Uncle Sam is keeping the

selectees together until they are trained thoroughly in the fundamentals.

Your training will be divided into three phases which might be compared to grade school, high school and college. For thirteen weeks you will be in "grade school." You will be hardened gradually to develop endurance and you will be taught to march,



R1126



to handle the weapons of your organization and to care for yourself and your means of transportation in the field. Drill formations, as well as other exercises, will be limited to the platoon and the company. Moving up to "high school," you will learn the combined use of the different weapons and equipment found in the battalion, which is composed of 699 officers and men in wartime, about five times as many as your largest "grade school" unit—the company



Top, machine gunners in gas masks. Center, operating range-finder, altitude finder and three-inch anti-aircraft gun. Bottom, crew of scout car in firing position

—had. And here you'll stay until you are well trained and ready to graduate to the "college" course in which you will participate in regimental exercises and in maneuvers involving the coordinated use of the combined arms. At this point, you and your fellow selectees will be developing into real fighting men.

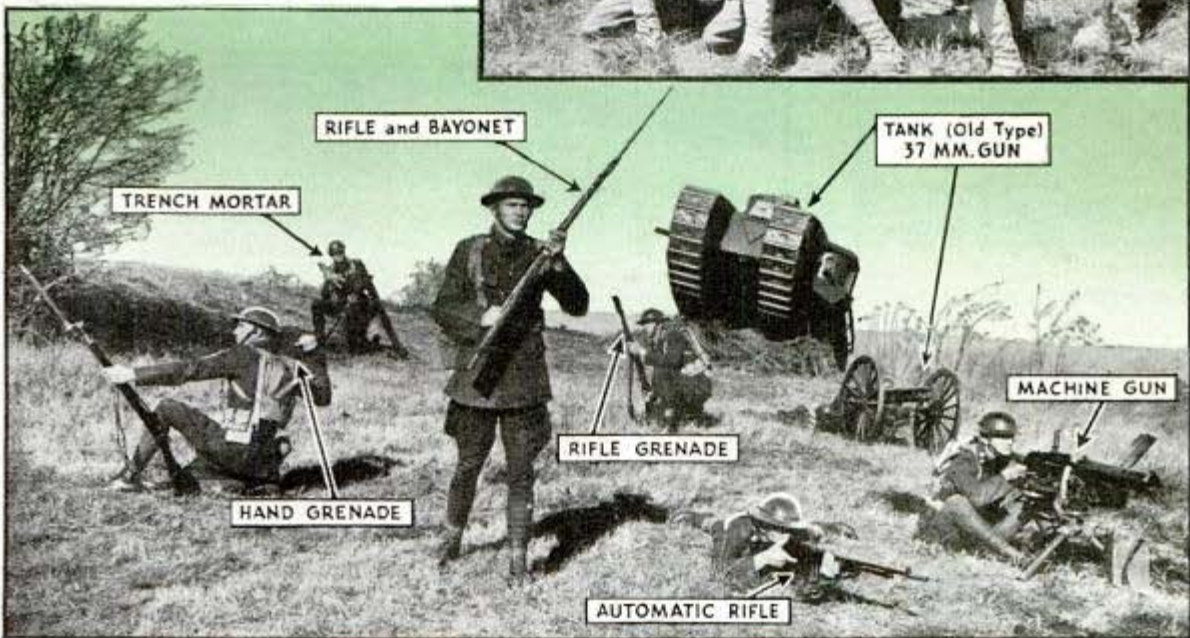
Since that branch is the main fighting part of an army, you are more likely to go into the infantry than any other branch. It fights on foot. In battle, infantry usually has the main task. With the support of other units, it moves against the enemy and overcomes him or it stands firm and halts his attack, then drives him back. In time you

K 1126

may become a member of a streamline infantry division, about which you probably have heard a lot concerning its fire power and its ability to wage war successfully in the modern manner. Made up of three infantry regiments, two regiments of supporting field artillery, one battalion each of engineer, medical and quartermaster troops and a company of signal-corps troops, it contains about 14,000 officers and men, of which fifty-seven per cent are infantrymen.

In "grade school" you must learn all about your weapons. The infantry's chief weapons are the shoulder rifle with its bayonet, and the machine gun. How to take them apart, clean them and reassemble properly is as important to know as how to shoot accurately, so you will learn those things first; then go to the target range. Your other weapons — highly important in warfare — are the hand

Top, big "ears" of the army—a sound locator—and sixty-inch searchlight. Center, squad wearing gas masks and aiming new semi-automatic rifles. Below, old-type weapons of the infantry. Tanks now operate in a separate arm



K-1126



coat or coat and overcoat; mess kit; canteen and cup in a carrier and first-aid kit on your belt; pack containing blanket, trench tool, shelter tent, poles, pins and toilet articles; gas mask and reserve ration, as well as a weapon and ammunition. The rifleman has rifle, bayonet, 136 round of ammunition and a hand grenade; the automatic rifleman or light machine gunner has the automatic rifle or light machine gun and 180 rounds of am-



Top, medium tank of type found in special corps, recently organized. Few, if any, selectees will serve in this arm, because experience is considered highly necessary here. Center, rolling fifty-caliber machine gun into position. Below, army truck loaded with men fords stream

grenade, the thirty-caliber automatic rifle, the pistol, the fifty-caliber and the thirty-seven millimeter anti-tank guns and sixty and eighty-one millimeter mortars.

It's no joke when the army says you should be able to endure prolonged and arduous physical exertion. For instance, your combat clothing and equipment is quite a load at the start and it gets heavier every step of a long march. Here's what you, the infantry soldier, will carry: field uniform, consisting of steel helmet, shirt, trousers, leggings, shoes, underclothes and, according to the season, rain-



munition in nine magazines. The machine gunner, ammunition carrier, communications man and tanker each carries a pistol and twenty-one rounds of ammunition.

The rifleman's load is approximately sixty-four pounds; the automatic rifleman's or machine gunner's is seventy-four

R 1126, K 1139

pounds. Those armed with pistols carry forty-five pounds, but they often have to carry machine guns and other heavy loads for considerable distances. Winter clothing adds seven pounds more. So if you think the modern "army on wheels" provides a "joy ride" for you and your equipment, the first long march with your man-size load will dispel any such idea. It is true that the infantry frequently is transported by truck over long distances and in cases where speed is paramount to attack or defense, but the soldier usually must depend upon his feet under simulated or actual war conditions.

If the officer who interviews you at the reception center finds you better fitted for some arm other than the infantry, you may be assigned to the cavalry, the field artillery, corps of engineers of the signal corps, or to one of the supply branches such as the ordnance department or quartermasters corps. The cavalry, which offers plenty of action, is divided into two kinds, horse cavalry and mechanized cavalry. Horse cavalry, when it comes in contact with the enemy, usually dismounts and fights on foot like infantry. Charging while mounted is reserved for surprise attack on small groups of the enemy.

Your boyhood complex of wanting to make a loud noise—usually exercised on the Fourth—would get a lot of satisfaction in the field artillery, which employs guns and howitzers to support the infantry and the cavalry. The light artillery includes the seventy-five millimeter gun, the seventy-five millimeter howitzer and the 105-millimeter howitzer, all of which can be moved rapidly from place to place and can be put into position, ready to fire, in less than one minute. Medium artillery units use the 155-millimeter howitzer and heavy artillery the 155-millimeter guns, eight-inch howitzers and 240-millimeter howitzers. It takes one to six hours to emplace and prepare these heavy weapons for firing and they are moved by large tractors. A problem of major importance to the field artillery during combat is replenishment of ammunition. A single seventy-five-millimeter gun, firing continuously throughout a three-hour battle, used more than 500 rounds of ammunition weighing more than five tons. Hence the field artillery requires large truck trains.

Since the men at the guns almost never

(Continued to page 144A)

JANUARY, 1941

Card File for Top of Desk Combined in Blotter Set



Any card in handy top-of-desk file is turned up immediately for reference during phone conversation

Readily accessible at a slight touch, a handy file of record cards forms part of a desk blotter set. Any individual card can be found at a glance, and by flicking it up with the finger tip all the information entered on it becomes available. An extension flap conceals the card index file when it is not in use.

K 1160. Four-Light Flash Synchronizer Aids on Action Pictures

Four flash bulbs can be fired simultaneously by two battery flash synchronizers mounted on the camera and hooked up to operate as one unit. Pressing the button of



Two flash synchronizers connected together supply powerful floodlight for action or color pictures

either battery case sets off the lights in a single flare. This arrangement provides an abundance of concentrated light for making difficult shots, such as through smoke and dust, and action pictures in color.

Heiland Research Corp. 13
7th floor Club Bldg. Colo.
Newport Specialty Co. 130 E. 13th New York

K1152.

Body-Heater Burns Candle to Keep Wearer Warm

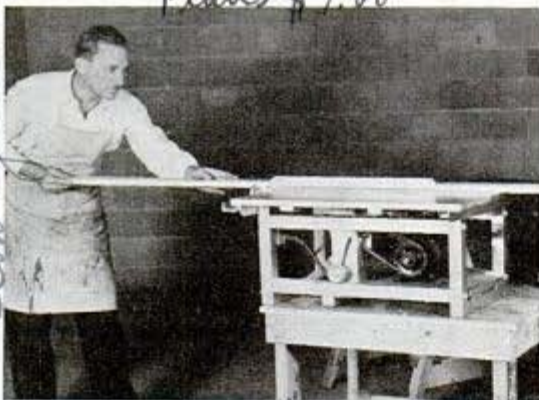


Heat generated in lantern by candle is sent through hose in sufficient quantity to keep the wearer warm

Burning nothing but a candle for fuel, an individual heating plant, invented by a Swiss engineer, produces enough heat to keep the wearer comfortable. The candle is housed in a lantern which serves as a stove. A hose made of rubber and light metal connects with the lantern and is wrapped about the body.

Power Saw That You Can Build Sold in Kit of Parts

Any craftsman may build his own power saw either from plans or from a complete kit of parts now on the market. Included in the kit are all of the wood and metal parts necessary for assembling the machine. However, if the craftsman wishes to



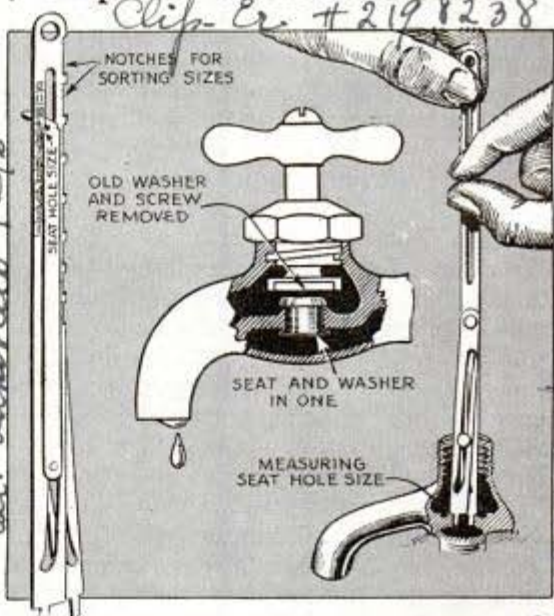
Purchaser of plans for assembling this power saw has choice of buying the parts or making them himself

H + H Sales Corp
232 Seaver St

make the wood parts himself, there is a kit of metal parts only, with plans and instructions for doing the other. Also the plans, without any parts, are available for making and assembling the complete saw. Motors from one-quarter to one horsepower can be accommodated. Kits include ball-bearing arbors, eight-inch combination rip and cut-off saw, V-belt, also miter gauge, ripping fence, saw guard and metal assembly for raising and lowering the saw. A tilting ripping fence is available for making angle or bevel cuts. Top measures twenty-four by thirty inches, and although it is unusually large and sturdy the outfit weighs only sixty-five pounds, minus the motor, and can be carried by one man. The saw is practical and accurate for such work as making boats, furniture, general repairs and smaller projects.

Don't buy. Make

New Valve Seat for Worn Faucet Replaces Washer and Screw



Faucet sketch shows position of new washer; left and right, tool to measure seat and insert washer

Faucet leaks caused by worn valve seats can be stopped by placing in the seat opening a tubular insert having a collar that closes over the seat. It is made of material that swells tightly in place after it absorbs moisture, and closes every irregularity of the faucet seat area. Applied to either hot or cold faucet it does away with the usual washer and screw. A special measuring tool is used to determine which size insert will fit the seat opening, and it also serves as a holder for placing it in the faucet.

Chicago Broadway

POPULAR MECHANICS

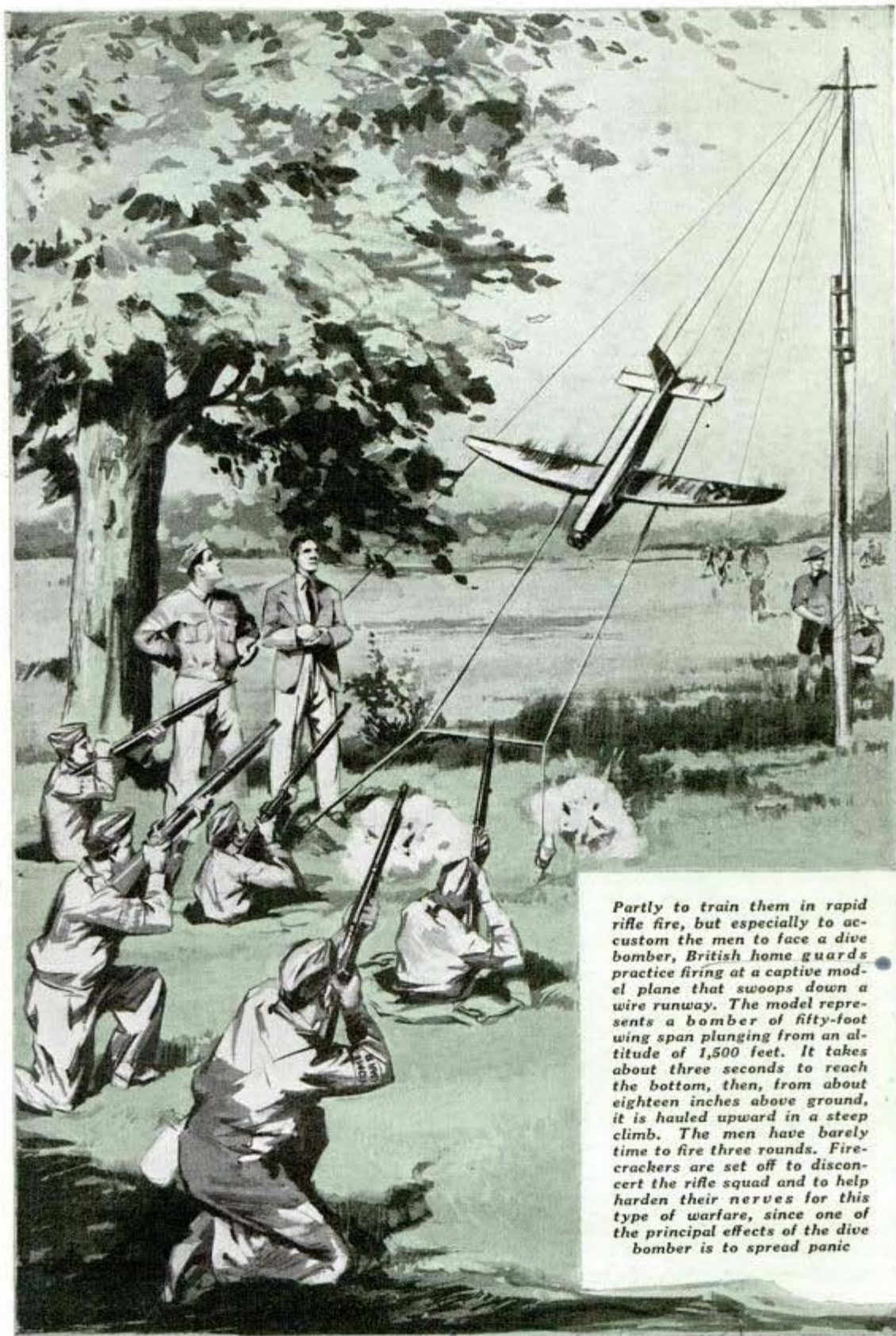
Wm. Clifford 3356

The Parson Co. Longview, Mich

Pat. 2,489,949

K1199.

Model Dive Bomber Trains Aim of Riflemen



Partly to train them in rapid rifle fire, but especially to accustom the men to face a dive bomber, British home guards practice firing at a captive model plane that swoops down a wire runway. The model represents a bomber of fifty-foot wing span plunging from an altitude of 1,500 feet. It takes about three seconds to reach the bottom, then, from about eighteen inches above ground, it is hauled upward in a steep climb. The men have barely time to fire three rounds. Firecrackers are set off to disconcert the rifle squad and to help harden their nerves for this type of warfare, since one of the principal effects of the dive bomber is to spread panic

JANUARY, 1941

London Electrical Agency, Ltd.
23, 24 Fleet Street, London E.C. 4, Eng.

15

K 114 4.

Bomb Turns Night into Day for Air Pictures



under the direction of Major George W. Goddard, photographic expert, to prove the ability of new secret equipment to penetrate camouflage that could hide an enemy's military objectives from the camera's eye in ordinary daylight. Various colored flashes, it was determined, work best with certain types of color film, and camouflage that cannot be detected in the light of one color may be revealed plainly in another. Then, too, light coming from a single source produces shadows which bring ground objects into better relief than they appear in diffused daylight coming in all directions from the sky.

Left, Major George W. Goddard and an assistant preparing to test photographic bomb; below, night view of Rochester made with billion-candlepower flash

Wide World

High in the night sky over Rochester, N. Y., a billion-candlepower light bomb exploded with a flash that illuminated a five-mile area with brightness approaching the light of day. The instant that this light reached its peak, a photoelectric cell tripped the shutter of an aerial camera housed in an observation plane flying a mile above the city, resulting in a remarkably clear picture of the area. This was one of recent tests conducted by the U. S. Army



K 1170

X-Ray-and-Microscope Photographs Show Hidden Flaws in Metal

Hidden flaws in metals may be revealed by a method in which the microscope and the X-ray are combined. First an X-ray picture the same size of a thin sliver of the metal under test is taken. Then, with light, a magnified photograph of the tiny X-ray negative is taken through a microscope. Film with extremely small grains is best.

otherwise the grains, when magnified, might mask details being studied. By using a special emulsion, magnification up to 200 diameters, without losing detail, is possible. Ordinary photos of metal through the microscope are made of the surface, by light reflected from it. With the X-ray, a three-dimensional view is obtained.

Science Service Oct. 16.

16

Mr. L. S. Clark, U. of Delaware
Herbanna, et al.
Mr. W. M. Shaper, et al. State Teachers College, Cedar Falls, Iowa

POPULAR MECHANICS

16957

AT THE CONTROLS *with an* AIRLINE PILOT



16957

From high above the gateway to the new world an air liner looks down on the sight that has thrilled many a homecoming traveler and immigrant—the Statue of Liberty.

19

*La Guardia Airport,
New York City*

By Ernest Gann
American Airlines Pilot

Condensed from "Sky Roads," T. Y. Crowell, Publishers.

WE are going to fly a giant air liner from Chicago to New York. You will string right along with the pilots just as if you were one of them. As a privileged observer, you'll ride in that always locked sanctum—the cockpit of a commercial transport.

At eleven in the morning we report to the flight desk in the operations office. The room is a hive of activity. Teletype machines are ticktacking ceaselessly, their staccato rhythm controlled by some distant hand. Through occasional crashes of static, a loud speaker in one wall rattles out flight reports. Phones are ringing importantly, the banter of incoming pilots mingles with the high



R-757

"Cleveland to Flight Ten!" Into the earphones of the sky liner's crew crackles a call from the Cleveland radio operator, above, bringing a late weather bulletin or requesting a report of the plane's position, speed, weather conditions aloft and probable arrival time at destination.



Here's the takeoff! As the big ship roars down the runway at ninety miles an hour and climbs into the air, the captain (left) raises his hand palm upward to give the signal for wheels up; the first officer is reaching for the retraction valve and guarding the throttles at the same time. Above, as the plane glides down for a landing, each pilot indicates in the sign language of the cockpit that he has visually checked to see that the two wheels are properly latched. The finger says: "I have a wheel."



K 957

Below, the plane has pulled itself off the ground and is starting the long climb to cruising altitude. The captain (left) is handling the controls and the first officer signals with three fingers that he is switching the fuel supply to the number three tank. There are four on a Douglas liner. At right, the "run-up" just before the actual takeoff. The captain is revving up the engines for a final test, and the first officer is contacting the airport control tower by radio for clearance. In a moment the tower's green light will show.

19



mind the use of an alternate airport. We always pick one that will remain in the clear. It will be our "out" if the New York weather should go contrary to predictions and fall below the weather limits.

The flight plan finished, we pick up our bags and walk out across the windswept ramp to the ship. The mechanic has finished his final engine check. The propellers are ticking over easily now. We walk around to the tail where another mechanic holds the door open for us. We start the long walk up the aisle to the cockpit. Now prepare

whine of the wireless in the radio room. This is a busy, confusing, friendly place.

"Ceiling and visibility unlimited as far as Cleveland," says the chief meteorologist. "From there on, straight instrument weather all the way to New York." We walk over to the big weather map with him. The chief and his assistants have been checking reports constantly to keep it up to the minute.

"There's a strong cold front, clearly defined just east of Cleveland," he explains. "Flight four came through there an hour ago and reported light icing up to ten thousand feet." With this and more detailed information concerning the winds aloft we prepare our flight plan. We know just what speed we will make, just what the temperature will be, and figure how much gasoline we will require. We study the weather carefully at every airport along the way and particularly that of our alternate. Keep in

yourself for a shock. Though you already know something of basic flight instruments, and have some knowledge of the problems we must handle and the size of the ship we must fly, you've yet to see the interior of an air liner's cockpit. Now don't throw up your hands in despair. We know just how you feel.

This is home to us. This is where we go to work. Take it easy and we'll absorb things one at a time. These instruments and levers and gauges are your friends, but you must understand their language. Air-line pilotage is a hard school. It takes years of experience to handle a big ship like this.

The captain releases the brakes and shoves the red-knobbed throttles forward slightly. The propellers whirl faster. We move slowly, majestically, across the concrete runway. It seems a long way down to the ground and remember our wings spread out forty-four feet on each



Through the broad windows of the airport control tower, top, the traffic directors have a clear view of the runways and the skies. They must keep in touch by radio with all aircraft leaving or approaching the field and signal them up or down—a busy job at "rush hours" when planes come and go seconds apart. Below, the captain at his post in the cockpit of a big transport.

side. We must taxi carefully. We pull up to the ramp and cut off the engines. In a few minutes the passengers will be aboard. While we're waiting, the first officer tests each radio. Before we reach New York, we'll need them all.

A loud speaker at the terminal commands attention.

"American Airlines flight ten for New York City, non-stop twelve o'clock departure is loading at gate three. Please give your name to Miss Smallwood, your stewardess, as you board the ship."

The plane is all activity again. Waving good-bye, the passengers walk up the gangplank. The porters load luggage, mail, and express into the cargo bins. Then the signal: a mechanic on the ground below makes a circular motion with his hand.

"Clear left and right!" A grinding noise, the great propellers turn slowly

K 957

over, then suddenly snap into action as each engine fires. A uniformed young man on the ramp below salutes smartly. The first officer moves the controls through their arcs.

"Take it away, Captain! The controls are free!" From now on things happen quickly, so watch closely.

"American flight ten to the Chicago Control Tower. . . . Is it clear to taxi out on the northwest runway?" The first officer is speaking into his microphone. The answer comes back immediately.

21



"Clear down the runway, American ten. Wind northwest nineteen and still gusty. Keep your eye on the small ship now circling just north of the airport."

We're at the end of the runway. The captain stops the ship, then slowly moves up the left throttle. Like a giant clearing his throat, a deafening roar comes from the left motor. Now the right. The same procedure, then both are ticking over slowly again.

"American ten to the Tower. Is it clear to go?"

"Take her away, American ten!" The captain swings the ship around. We are heading directly down the runway. Now watch the hands fly. Watch the marvelous precision and teamwork with which these two pilots work. You'll see again how thoroughly they must be



At top the first officer hangs out the flag on the "Tennessee," one of the transcontinental flagships of American Airlines. Center, captain studies weather conditions along his route before plotting flight plan. Bottom, before he takes a liner up on his own responsibility the captain must be satisfied with mechanical reports and the cargo weight.





At left, the New York Airways Traffic Control, which has "chaperoned" the liner by radio as it approached New York, clears American's Flight Ten to the LaGuardia airport tower and it is now up to the traffic men in that tower to signal the ship to a landing. Below, one of the powerful twin engines singing its steady, sweet tune, in harmonious duet with the port engine as they pull the 24,000-pound air liner at 180 miles an hour.

R 757

trained. This cockpit seemed complicated and fearsome before—wait until you see her moving, literally racing down the concrete at eighty miles an hour!

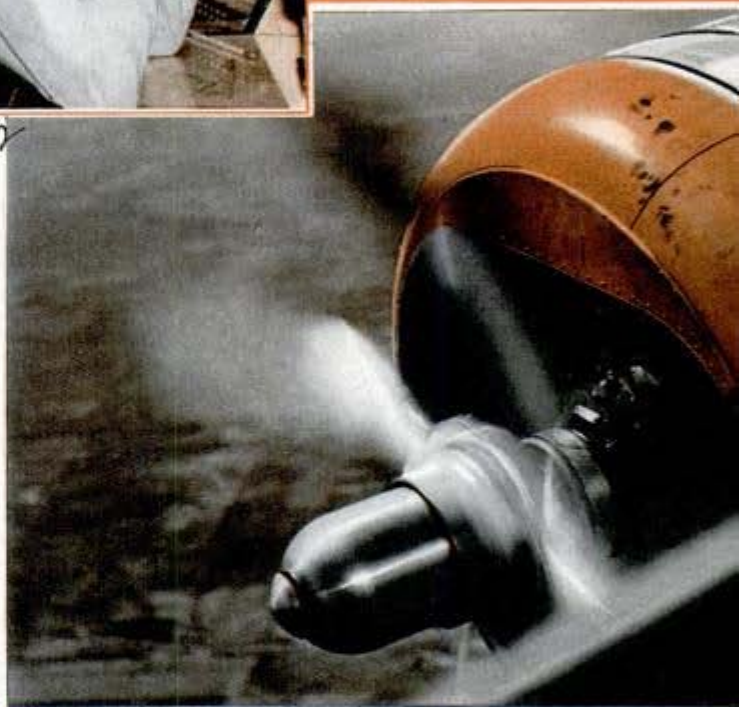
The captain and the first officer make a last minute check of each instrument. Every control is checked verbally.

"Cross feed on!"

"Full rich."

"Flag down."

"Left Main." Click, click, click—the crisp commands ring out smartly. Now all is in order. There is a second's tense quiet as if the ship were gathering its incredible strength—a giant about to spring. Now hang on! The captain's hand is moving forward slightly. We are beginning to move. His hand goes full forward. A shudder goes through the ship. Our heads snap back. The pull of the howling propellers is terrific! The instruments are beginning to dance. Watch them. Watch everything. Boost pressure . . . forty-three inches of mercury . . . fuel pressure five pounds . . . wobble the pump a bit . . . head temperatures . . . oil pressures . . . tachometers . . . air speed already forty miles per hour. Faster . . . faster . . . how can anyone think in such a tempest of noise? . . . stick forward . . . tail up . . . we can feel it . . . now faster . . . yet faster, seventy . . . eighty . . . eighty-five miles an hour



. . . the end of the field coming up at an appalling rate . . . a gentle tug at the wheel . . . then suddenly . . . we're off the ground. It hardly seems possible. It was so smooth we hardly knew when we actually started to fly. The captain's thumb is up. The first officer pulls the landing gear valve lever. The pressure gauges move slowly to zero. We're free now. Not even mechanical legs hold us from the earth. Only wings support us. They are great metal wings, strong and beautifully molded. We have become a part of them and they of us. We've long ago lost track of the half hundred quick, sure movements of the pilots.

We're in the air, flying to New York! We're climbing steadily upward. The

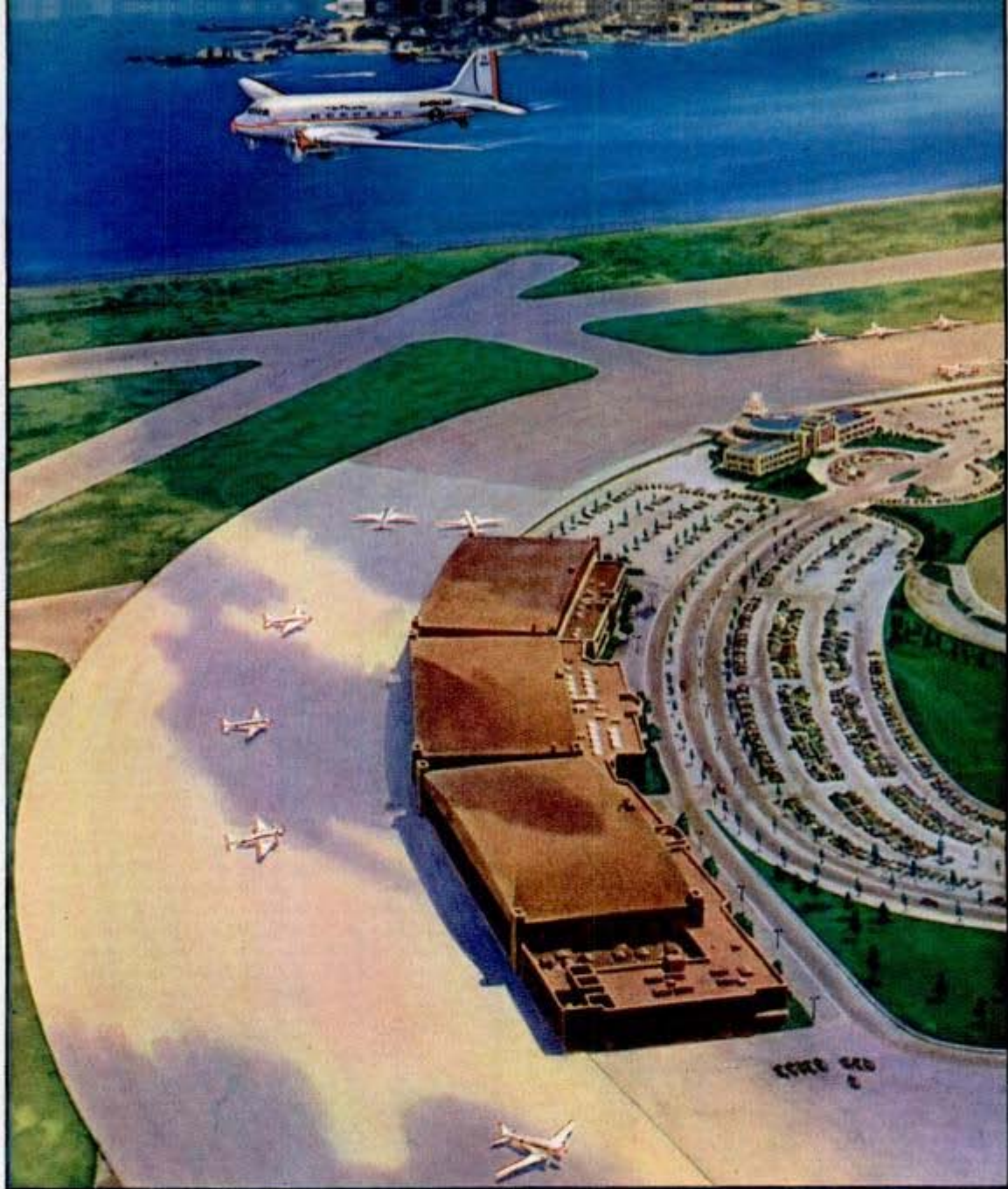


10757 23
 air has already become perfectly smooth. The lower end of Lake Michigan merges with the blue horizon on our left, the vast farmlands of Illinois stretch to infinity on our right. We're at four thousand feet. The rate of climb holds steadily at six hundred feet per minute. The first officer makes a note of the outside air temperature and takes out his horsepower calculator. He slides it quickly back and forth, then adjusts the throttles accordingly. This will insure our motors an exact supply of fuel at this altitude and temperature.

The altimeter indicates seven thousand feet, our cruising altitude. The captain levels the ship off. Our air speed climbs rapidly. We're really on our way now. Although we seem to be hanging almost motionless in space we're creeping up on that two hundred and twenty miles per hour called for in the flight plan. The engines, two big, fat, round friends on each side, settle down to a steady "hrumph growl growl — hrumph growl

Weather man, above, goes over the possibilities of local disturbances along his route with the pilot. Below, the propellers snap into action, the captain of the flagship "Albany" takes a salute from uniformed officer, and the big transport glides off to the runway for a takeoff.





Over busy LaGuardia field the flagship circles, waiting for the "come on in" signal from the control tower; below nearly a dozen ships rest on the concrete area of the terminal.

growl." Somehow they each seem to achieve a distinct personality, a sort of dignified assertion of their might.

We're flying along the west leg of the Goshen range. Gradually the high whine in our earphones increases as we approach a position above the station itself. As we get closer and closer the captain cuts the volume down. The big ship never varies five degrees from its course. The altimeter moves slightly. Either the stewardess or a passenger is walking back in the cabin. Even the weight of

one person will disturb the delicate balance of our twenty-four-thousand-pound air liner.

At twelve forty-four, the whine in our earphones reaches a peak, then drops off to silence. We're directly over the Goshen range station. It took us a minute longer than our original estimate. The first officer picks up his microphone again.

"Flight ten to Chicago."

"Chicago."

(Continued on page 128A)

K1191 Chicago Wheel & Mfg Co. 110-1 W.
see ad Feb 1941 6a
Handee Artisan
Price \$29.50

Power Tool Speeds Metal and Leather Crafts



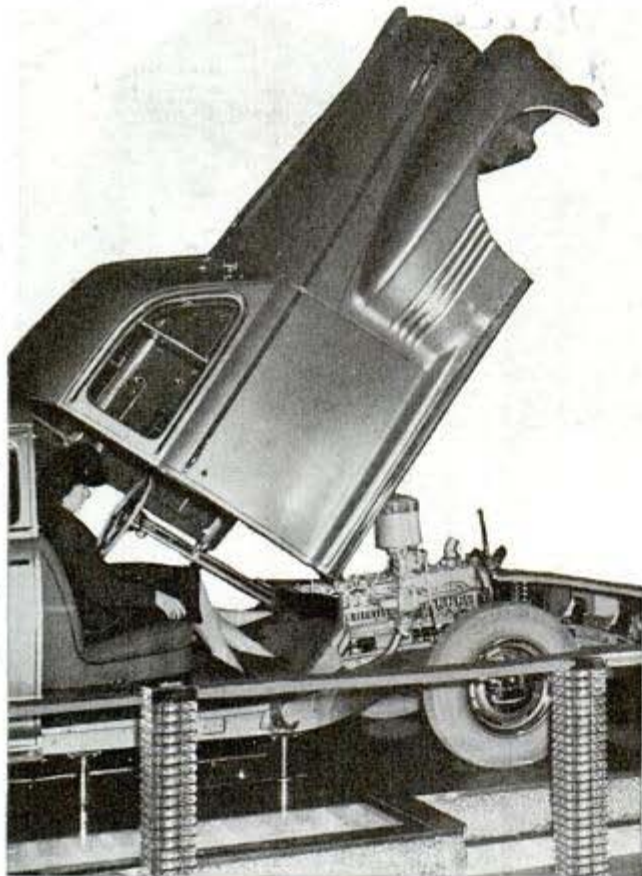
Three uses for electric plunger tool; top, left, hammering copper plate; right, tooling piece of leather and, below, filing opening in pen tray. Bottom, left, the tool with various heads and special holders

Performing functions for the craftsman and hobbyist previously done only by slow hand methods or specialized machines, an electric hand tool produces reciprocating plunger strokes to speed up art-metal working, leather tooling, and showcard and stencil cutting. Weighing one and one-half pounds, it hammers at the rate of 800 strokes a minute, the length of the stroke being adjustable from three-eighths to one and one-eighth inch. The tool accommodates a wide variety of interchangeable heads, points, files and other attachments for hammering, sinking, piercing, filing, chasing and engraving soft metals such as

copper, brass, silver, aluminum and pewter. It files metal rapidly and with ease. A special set of stamping points and punch designs is available for tooling leather. Operation is simple. Attach the proper head, press it against the material, turn on the switch, and the tool does all the pounding. Power from the motor is delivered to the plunger through an intermediate spring mounted in such a way that the hammering action continues even if the tool is jammed forcefully against the work. For work requiring close guidance, a holder keeps the head from jarring out of position, and another serves as file guard.

K1175

Car Body Splits Wide Open to Show Engine and Interior



Pressing button lifts entire front part of auto body to permit inspection by spectators of engine and seat arrangements

At the touch of a button, a tricky exhibition automobile raises half of its body, including the hood, so visitors may examine its engine and interior construction. The body pivots on a hinge at the roof just above the backrest of the front seat.

K1208

Electric Plant of Modern Sky Liner Could Light a Row of Homes

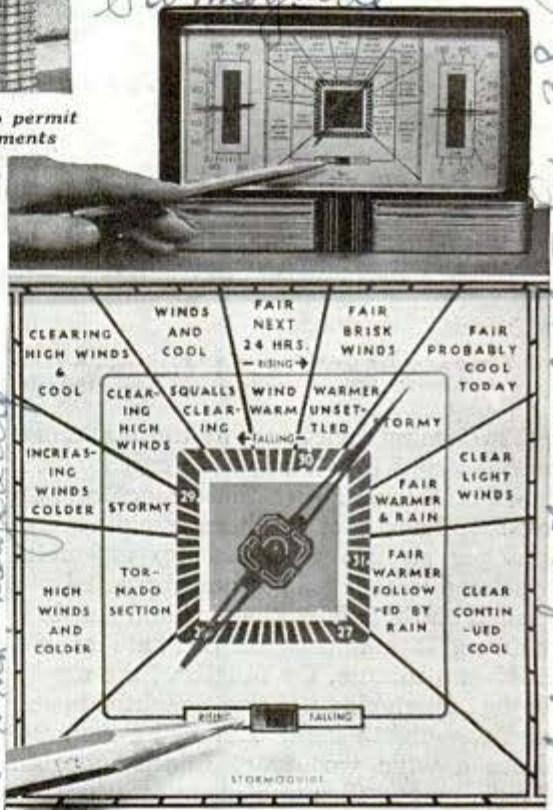
Modern passenger planes use enough electric power to supply the needs of a row of houses. Power requirements of the sky liner have risen from two kilowatts in 1929 to fifteen kilowatts in the Douglas DC-3, typical transport plane of today. Two generators attached to the engines provide twelve-volt current to charge the storage batteries. About seven per cent of the electric power is used for operating the ship, seventy-three per cent for navigation—radio, de-icers, etc.—and the rest for serv-

ice, chiefly lighting. In the hundred-passenger plane of the future engineers say there will be four engines driving four 7.5-kilowatt generators delivering alternating current at 115 volts.

K1141

Home "Weather Bureau" Makes Forecasts

Weather conditions are predicted by a home "weather station" combining a thermometer, humidity gauge and barometer in one unit. It is the barometer, mounted in the center, that acts as prognosticator. In addition to indicating the degree of atmospheric pressure, its needle points to two different predictions, one to be read in a falling barometer, and the other when it is rising. To tell the direction of the barometer, you first note the position of a red signal below the center of the dial. This signal shifts from side to side between two openings marked with the words, "rising" and "falling."



Top, "forecaster" consists of three instruments to indicate weather; bottom, close-up view of barometer

Ref. P.C. Sandretto
Supt. Communications Laboratory, United Airlines

Pontiac - General Motors Corp
Detroit, Mich

Service Service
10/26/48

Stormo-weather
Taylor Instrument Co., 38 Ames, Rochester, N.Y.

SECRETS of the "MAGIC" THEATER

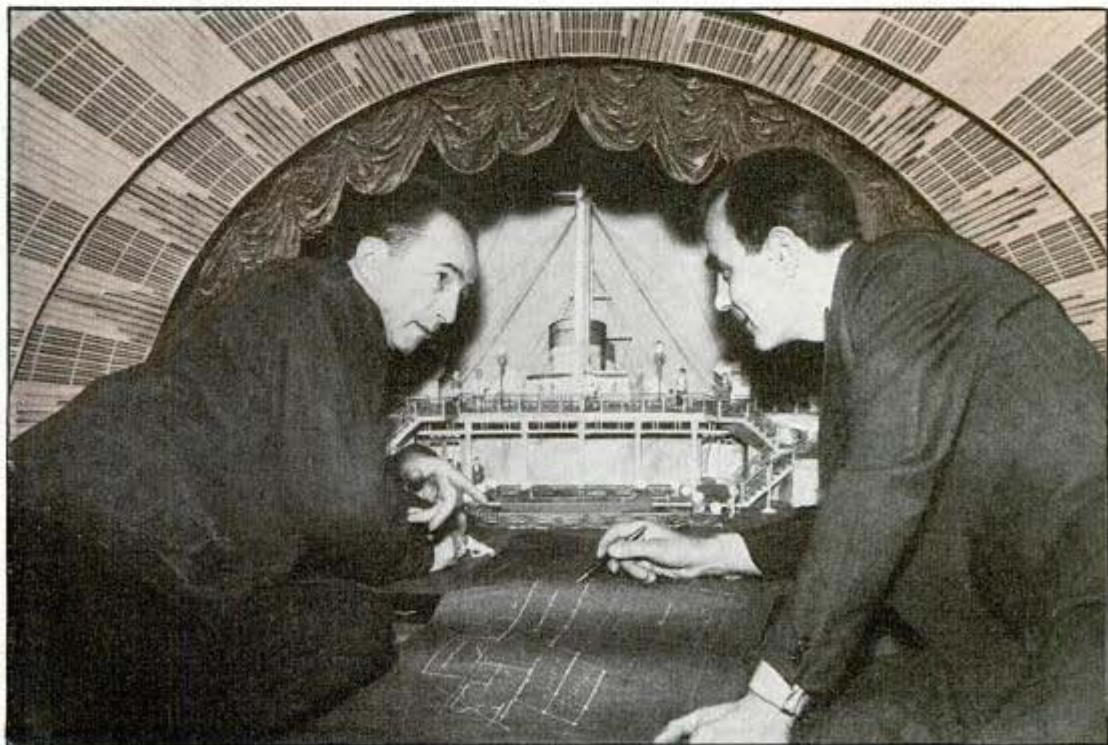


COMPARATIVELY few of the patrons who have purchased more than 48,000,000 admission tickets in eight years have walked out of Radio City Music Hall in New York City's Rockefeller Center without wondering: "How do they do it?"

Amazing theatrical effects have caused thousands to call it the "magic" theater. Apparently instantaneous changes of elaborate spectacles occur. Huge stage settings rise or disappear at unpredictable moments. Whole scenes including large

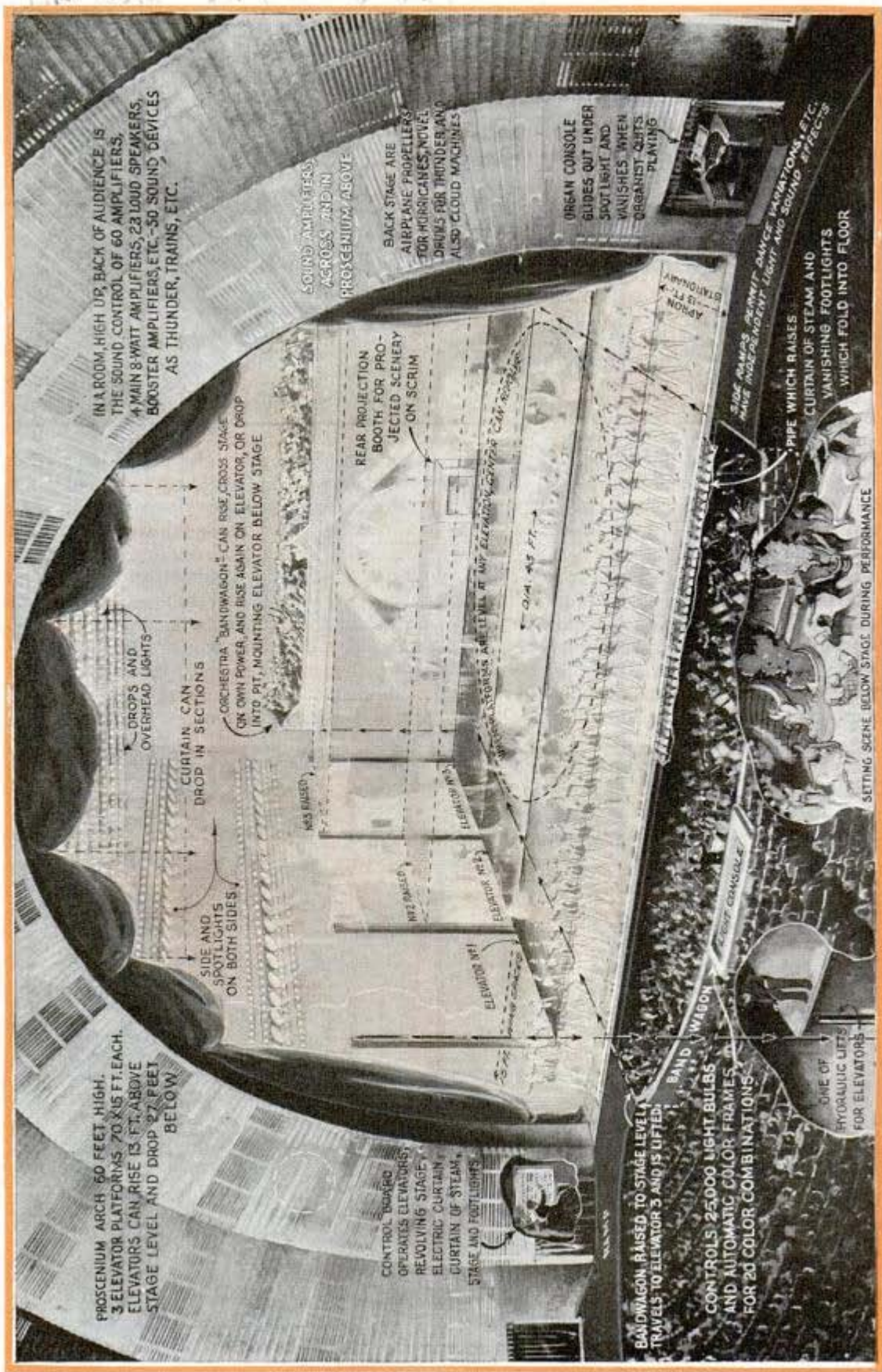
numbers of dancers take a sudden notion to whirl in circles while up in the air. An orchestra of 100 pieces drops out of sight and reappears backstage a little later high above the bewildered audience. A bandwagon rises from orchestra pit to stage level, rolls back and seemingly floats in the air while the musicians continue playing.

Puzzling the audience is good showmanship and is worth money. So for years the management of the largest theater in the world kept secret many of the methods



Top, sound mixer at panel which controls sixty microphones, sixty amplifiers, four main amplifiers, twenty-three loud speakers and other equipment. Bottom, planning scene with model of the vast stage

R996



PROSCENIUM ARCH 60 FEET HIGH.
 3 ELEVATOR PLATFORMS, 70 X 15 FT. EACH.
 ELEVATORS CAN RISE 13 FT. ABOVE
 STAGE LEVEL AND DROP 27 FEET
 BELOW

IN A ROOM, HIGH UP, BACK OF AUDIENCE IS
 THE SOUND CONTROL OF 60 AMPLIFIERS,
 4 MAIN 8-WATT AMPLIFIERS, 28 LOUD SPEAKERS,
 BOOSTER AMPLIFIERS, ETC.—50 SOUND DEVICES
 AS THUNDER, TRAINS, ETC.

SIDE AND SPOTLIGHTS
 ON BOTH SIDES

CURTAIN CAN
 DROP IN SECTIONS

ORCHESTRA "BANDWAGON" CAN RISE, CROSS STAGE
 ON OWN POWER, AND RISE AGAIN ON ELEVATOR OR DROP
 INTO PIT, MOUNTING ELEVATOR BELOW STAGE

SOUND AMPLIFIERS,
 AGROSS ZERDIN
 PROSCENIUM ABOVE

CONTROL BOARD
 OPERATES ELEVATORS,
 REVOLVING STAGE,
 ELECTRIC CURTAIN,
 CURTAIN OF STEAM,
 STAGE AND FOOTLIGHTS

REAR PROJECTION
 BOOTH FOR PRO-
 JECTED SCENERY
 ON SCRIM

BACK STAGE ARE
 AIRPLANE PROPELLERS
 FOR HORRIFICS, NOVEL
 DRUMS FOR THUNDER, AND
 ALSO CLOUD MACHINES

BANDWAGON RAISED TO STAGE LEVEL,
 TRAVELS TO ELEVATOR 3 AND IS LIFTED

CONTROLS 25,000 LIGHT BULBS
 AND AUTOMATIC COLOR FRAMES
 FOR 20 COLOR COMBINATIONS

ONE OF
 HYDRAULIC LIFTS
 FOR ELEVATORS

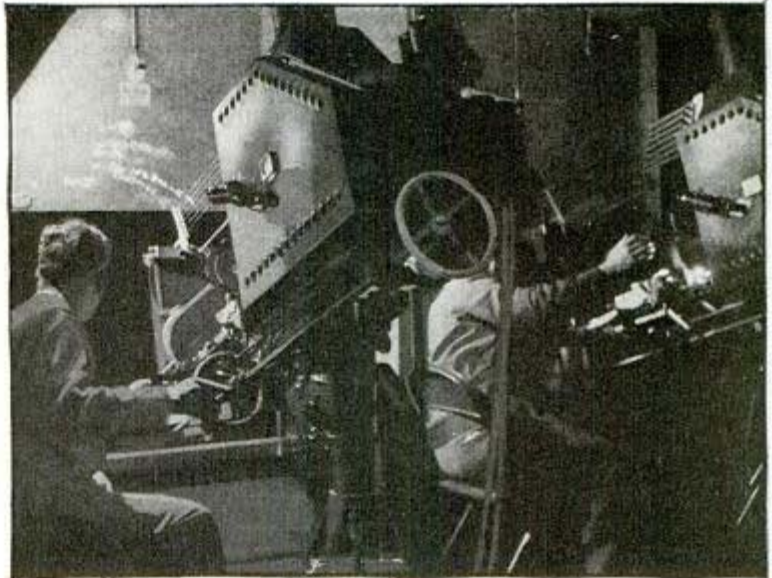
ORGAN CONSOLE
 GLIDES OUT UNDER
 SPOTLIGHT AND
 VANISHES WHEN
 ORGANIST QUITS
 PLAYING

SIDE RAMPS BEAR WITH DANCE VARIATIONS, ETC.,
 WHICH FOLD INTO FLOOR

SETTING SCENE BELOW STAGE DURING PERFORMANCE

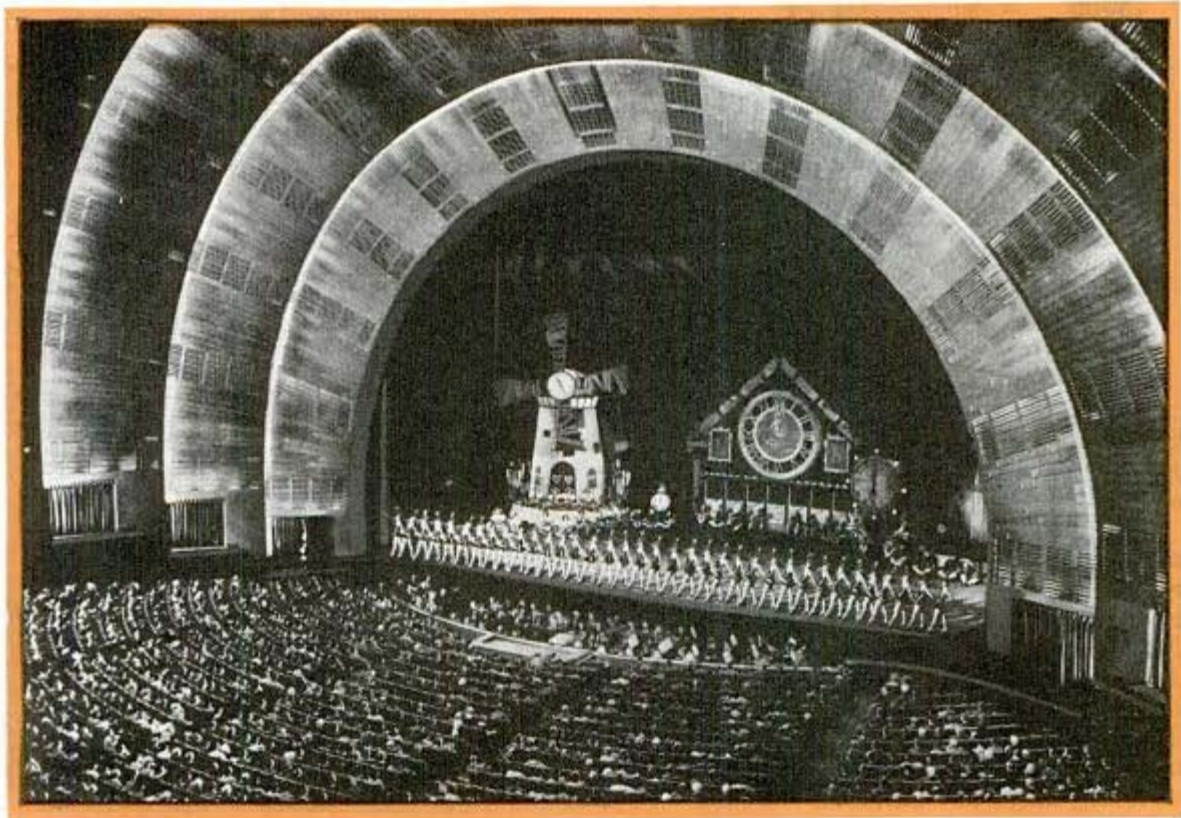
K996

used. Some they are still shielding. However, they are now willing to reveal that the theory behind all of the apparent magic is simply this: modern mechanical devices are faster than the hand and the hand is faster than the eye. So, with a wealth of mechanical equipment aided by unusual lighting effects, a whole stage scene may be figuratively snatched right from under the noses of the audience time and again without the patrons discovering exactly how it is done.



The secret of the trick stage lies in the fact that it is not a stage at all in the ordinary sense, but instead consists of three fifty-ton hydraulic plunger elevators, seventy feet wide and fifteen feet deep. These elevators may be lifted thirteen feet above "stage level" or dropped twenty-seven feet below, singly or together. Thus, for example, while two

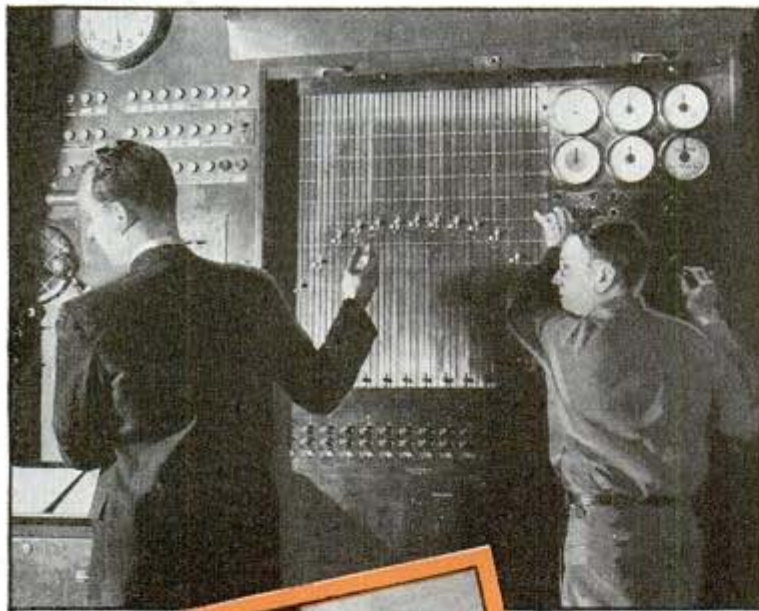
rows of dancing girls might be performing on two of the elevators, the third might be loading up with a third group down below. A quick and complete blackout for a very short time would permit the stage director to drop two elevators and raise the third so that when the lights came on, an entirely different group of girls in different cos-



Top, giant spotlights used in the theater. Some are handled by individual electricians, but most are controlled from master console. Bottom, view of great stage, with a scene being presented

JANUARY, 1941

Radio City Music Hall
Kochette



and a partial turn while the elevators rise not only produces a new setting, but puts it at a different height, which is confusing as well as entertaining to the audience.

To the three stage elevators, add one more: the elevator in front of the stage which supports the orchestra "bandwagon." This lift may be brought to stage level, or above. Again, it may be dropped twenty-seven feet under the audience. The huge bandwagon, in turn, is self-propelled by electric motors and batteries so that, lifted to stage level, it can move back onto one

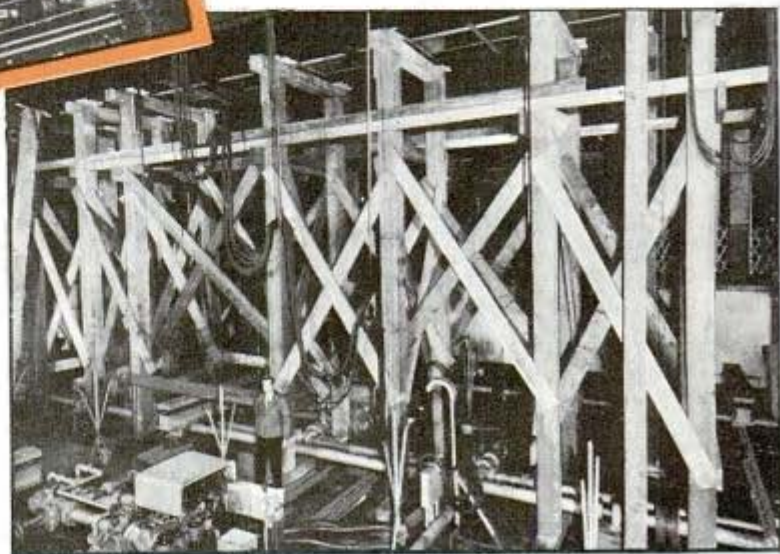
of the stage elevators and then continue its journey upward. Or, it can be dropped below, into the pit, shunted to the rear and placed on a lowered stage elevator, then lifted high above the stage. Accomplished in the dark, it is a very effective stunt.

Since practically all stage and scene legerdemain depends upon the slowness with which the eye accustoms itself to darkness following brilliant light, a complete blackout is necessary for the trick effects. This again is accomplished by clever mechanics. In addition to 25,000 light bulbs, any



tumes and in a different setting might be doing a different routine.

To make the possibilities more intricate, a sectional revolving stage forty-three feet in diameter is built into the three elevators. Thus with the three rectangular elevators locked, they can move up and down together while the revolving stage turns. Since the revolving stage can be made to hold a number of complete scenes and casts, a blackout



Top, control board for handling three-ton curtain. Center, console controls more than 25,000 light bulbs. Bottom, backstage

K996

number of which may be lighted at one time, 206 spotlights are used. Thirty-six of these spotlights are of the huge arc type capable of throwing a "spot" 190 feet and require about thirty seconds for the carbons to cool. Obviously unless all of these lights were extinguished instantaneously and the glow from the huge carbons was halted, there could be no blackout.

To douse thousands of light bulbs and 206 spotlights in an instant, the theater uses a remarkable piece of mechanical equipment called a light-control console which looks like an oversize telephone switchboard. By pre-setting the 4,305 vari-colored handles on this board, the throwing of a single switch performs what seems to be miracles of illumination. If a blackout is needed, a switch not only turns off the light bulbs in unison, but also causes thirty-six little motors to drop thirty-six shutters over the arc spotlight lenses. The same board regulates changes of light colors throughout the whole auditorium, whether it is to shift one spotlight from blue to purple, or to produce fifty combinations.

Each of the 25,000 light bulbs, which range from two to 5,000 watts and total 3,500,000 watts, has a tiny track running in front of it. Hundreds of little motors cause thousands of gelatin color frames to travel in these tracks. By setting a group of handles on the control machine and throwing a switch, the electrician at the light-control console can move color frames in front of thousands of bulbs and the whole light scheme can be changed.

The machine, through thermionic control, which works on a principle similar to that of radio tubes, will also regulate the dimming or brightening of the lights at will.

To the trick stage and trick lighting system, add such novel mechanical equipment as vanishing footlights which become a part of the stage floor, permanent fixtures which produce torrential rainstorms, fireproof snow storms, a hurricane effect by the use of airplane propellers and clouds from an imported cloud machine. The combinations of magical effects become numberless.

Even the curtain, the largest in the world, weighing three tons, is a puzzler. Normally it closes the proscenium, a gap sixty feet high by 100 feet wide. Yet, without the curtain being lowered, sections can be dropped independently to frame a single performer, or two groups.

(Continued to page 146A)

JANUARY, 1941

Automatic Reel for Leash Locked by Brake Lever

Chrome \$4.00 silver \$6.00
Gold \$10.00

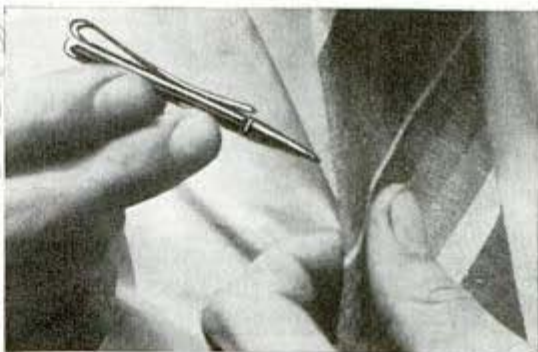


Aluminum reel, conveniently attached to wrist strap, has brake and release levers controlling leash

With your dog's leash wound on an automatic reel, you can hold him in check or give him the reins by simply flicking a lever. The brake lever is pressed to grip the leash firmly, and pressing the release lever permits the dog to run without restraint. The aluminum reel contains six and one-half feet of waterproof cord. A wrist strap gives it a comfortable grip.

Combination Pencil and Tie Clip Does Double Duty

Without losing any attractiveness, but doubling its usefulness, a tie clip made in gold-plated metal contains a mechanical pencil which uses standard leads. It is available in several styles. While not in use the pencil is concealed inside the shirt.



Pencil is behind shirt when the tie clip is in place

B. Altman's 31
34th St. and 5th Ave
New York

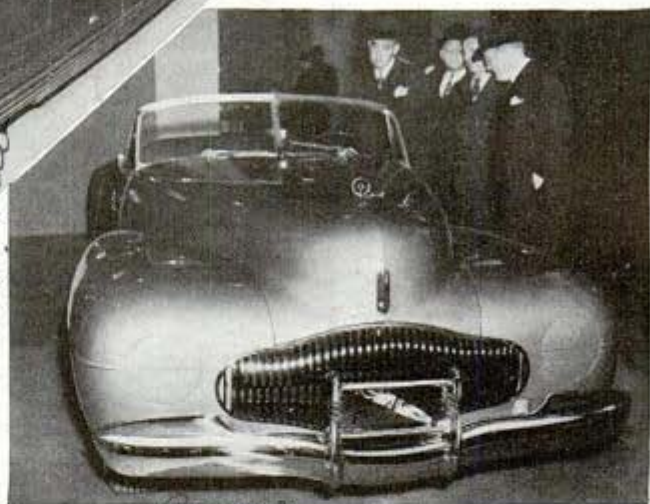
See description on page 146A

Patented by B. Altman's
145 E. 57th St. New York City

Specially Built Cars Hint Tomorrow's Designs



Automobile stylists swung far toward ultra-streamlining in designing these two cars, giving a "preview" of the car of tomorrow. Left, Chrysler's special Thunderbolt, and, below, the Fireball made by Buick



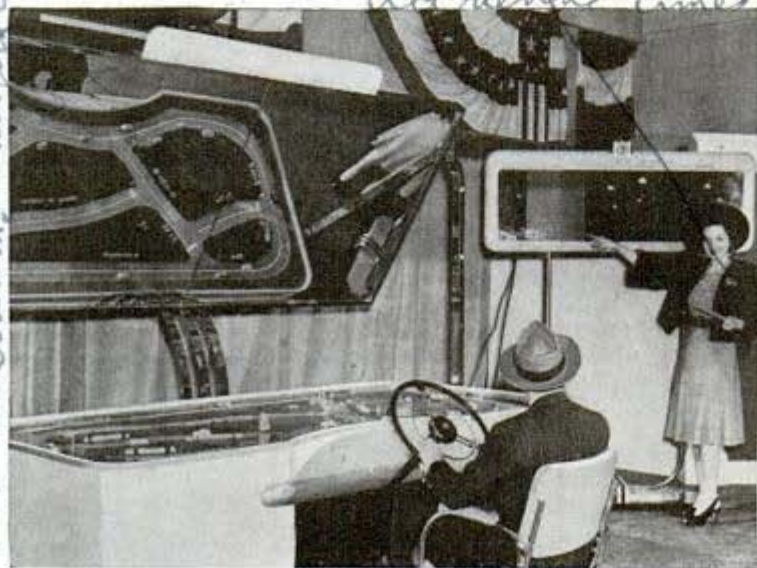
Acme
 Automobile designs have turned to the extreme in streamlining at no sacrifice to beauty of style. One example is the model fifty Buick Fireball, designed by Harley Earle, supervisor of General Motors styling section. This car has a 125-horsepower engine. Ultra-streamlining for the car of tomorrow is forecast in the 143-horsepower Chrysler Thunderbolt, an eight-cylinder car, costing \$8,250, designed by Ralph Roberts and built by LeBaron. The

all-metal top folds forward and backward automatically. All windows are opened and closed by power from a hydraulic pump.

Miniature Course Tests Drivers for Faults at the Wheel

Unsuspected weaknesses in the driving technique of individuals are often disclosed through tests with a miniature driving

course that indicates in detail the ability of the man seated at the wheel. Spread out before the driver submitting to a test is the Aetna "Drivorama," a complete maze of highways, streets and intersections covering a flat surface seven by eight feet. As he manipulates the controls, the driver guides a tiny car over this traffic system, where he meets all sorts of hazards and obstacles like those encountered in actual driving. It takes only one and one-half minutes to complete the test, and from results shown on the scoreboard the driver learns his faults and limitations so he may correct them or compensate for them in handling his car.



After driver takes the one-and-one-half-minute test on this tiny driving course he glances at scoreboard to learn his faults in handling the wheel

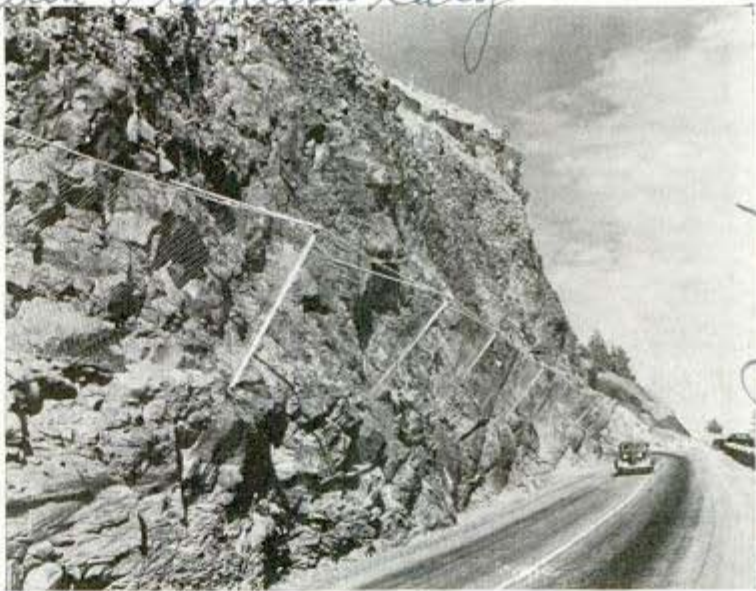
Aetna Casualty and Surety Co. 100 William Wackerly

X1064 Cont: Leon Bodack, 538 G
East Cantonment, Precinct of
San Francisco, Calif.

Fence Guards Mountain Highway from Rocks

Taylor Instrument Co Rochester N.Y.

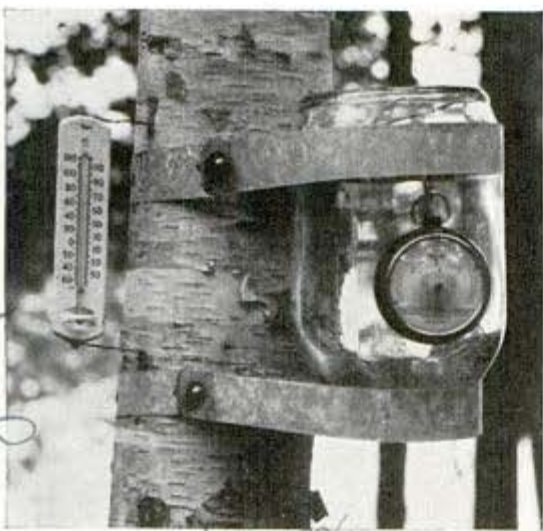
To protect motorists from danger of rocks falling on mountain roads, a new type of highway fencing is being tried out in California. A heavy wire mesh, similar to that used on large estates, is stretched on steel posts set in concrete approximately at right angles to the rocky slopes. Not expected to stop massive slides, the fence halts large stones and keeps debris off the roadway.



Stones tumbling down mountain are caught by wire fence to keep them from endangering cars on road

Ludwig's Wild Acres Resort, Wildwood Lake, Wis.

'Fishing Weather' Barometer Is Hung on Tree at Resort

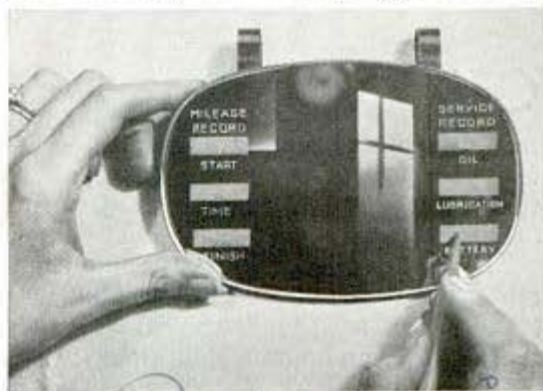


Anglers who like to fish "on a rising barometer" can estimate their chances of a good day's catch with the aid of a barometer hanging on a birch tree at one Wisconsin resort. To protect it from ravages of the elements, the proprietor suspended the instrument inside an inverted glass jar, which is clamped to the tree by two galvanized-iron bands. A coiled wire clinging to the inner surface of the jar by spring pressure, serves as a bracket to hold the barometer. There is also a thermometer mounted on the opposite side of the tree.

Barometer suspended in glass jar and fastened to a tree aids fishermen in judging if weather is right for fishing

Writing Space on Automobile Mirror Handy for Keeping Records

Auto drivers can keep daily records of trips and car servicing on the face of a rearview mirror that may be attached to the holder already in the car. To left and right of the mirror surface are ground-glass sections which will take pencil markings, one side consisting of a mileage record including date of the trip and gas consumed, the other side having space for data on oil, lubrication and battery service.



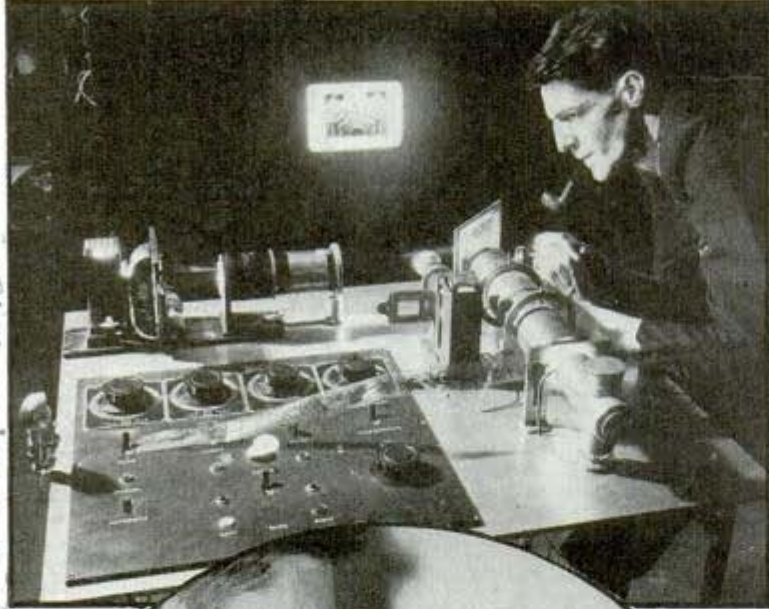
Oblong white spaces on rearview mirror are ground so information about trips and service can be written with pencil

Sears Roebuck & Co
Chicago

1927

William Eddy
NBC

Creating SIGHT EFFECTS



destroyed. There was a gripping realism to the scene, so much so, in fact, the televiewer felt as if he were watching history in the making, not merely a preparedness-day demonstration involving toy ships floating in a tub of water against a backdrop of skyscrapers nine inches high.

Here, as in scores of telecasts, the miniature—more familiarly minnie—has proved its worth. For years, the minnie has done wonders for Hollywood, making possible submarine disasters, hurricanes, aerial dog fights, bridge collapses—spectacles that would not be possible to do in any



Top, projection kaleidoscope for sight symphonies during intermissions. Circle, animated figure for television cartoon. Below, model church burns for television spectacle

Cont: James Mc. Swearing 4600 W. 83rd St. Chittenden Park, Conn.

ON THE television screen, a cordon of battleships could be seen bottling up the busy, unprotected harbor. From a vantage point a military commander described their maneuvers as they jockeyed into firing position.

The harbor was doomed. Ships, tugs, and wharfs were about to be blasted to smithereens and the city reduced to a shambles. In an hour or so its cloud-scraping buildings would be shell-pocked or



Ref: National Broadcasting Co R 9.27
R. C. A. Bldg. Radio City, New York City

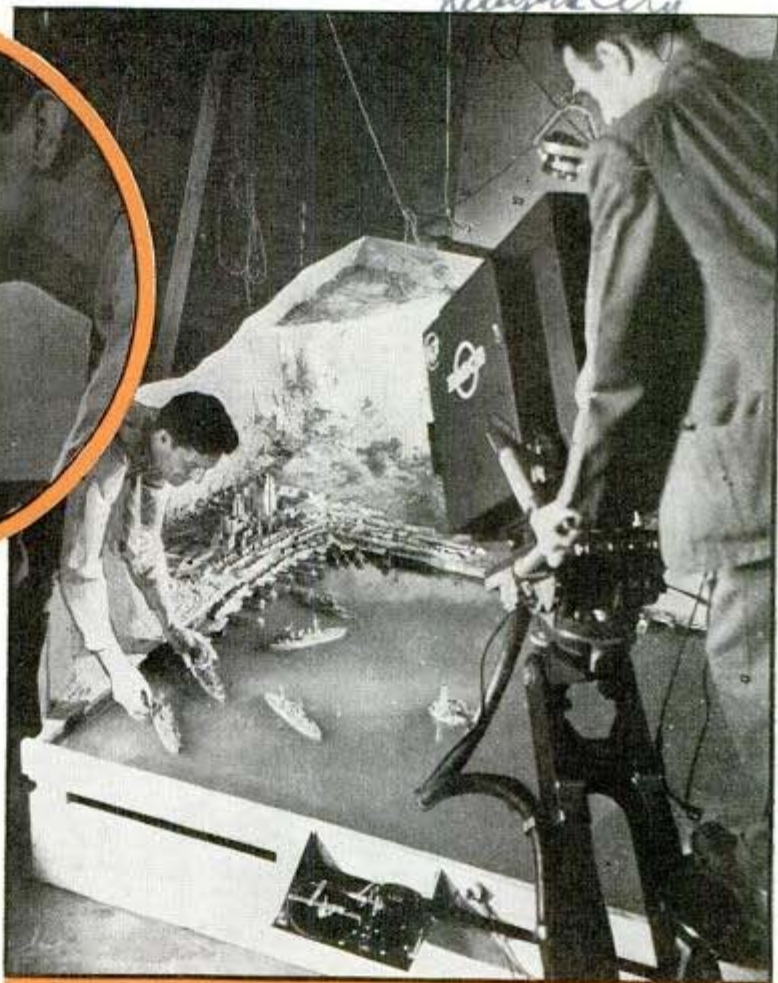
for TELEVISION

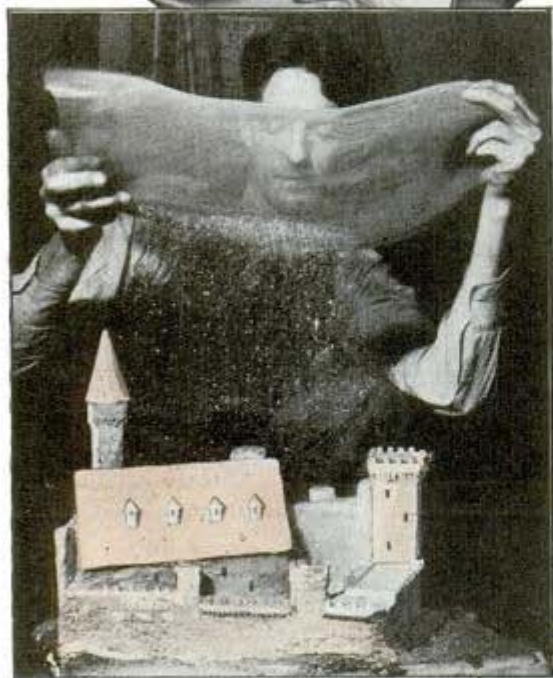


Above, an optical mechanical dissolve—titling device for television—reproduces dissolves and wipes for camera. Right, battleships maneuver in a "minnie" seaport. Bottom, building a miniature set

other manner. Now the rapidly crystallizing technique of television production is counting heavily on the minnie to do some of its most difficult jobs.

Building these effects, coupled with kindred chores peculiar to the medium, has given rise to a new profession: the sight-effects man. He's a key man in television, more important in his sphere than the sound-effects man is in broadcasting. Even in the ham-and-egg period that lies ahead for television in its struggle to gain a foothold, the video-effects man will be much in demand, and officials close to the picture intimate the rewards will be great for those well grounded in mechanics, modelmak-





Animated by a flexible shaft, the frog (top) "breathes" with a rubber bag pulsed with air. Center, William Eddy "makes rain." Right, animated donkey carries intermission sign across screen

ing, cartooning, and the like, yet possessing a showman's touch—imagination and enterprise.

First full-time practitioner in this field is NBC's William C. Eddy. Movie-effects men spend months of time, and money by the barrel in making their miniatures—to cite but one case, \$25,000 was poured into the one that was used

to film the Chicago fire of 1871—but Eddy can't. His budget wouldn't permit spending a fraction of that amount on his effects. So out of sponges, iron filings, kitchen matches, corn flakes, plaster of paris and whatever else happens to be handy, he turns out scale model towns, houses, and other exteriors that would be both impossible and impractical to build within the studio.

Since the days when television was only a laboratory infant, the fundamental problems of programming have been apparent. Chief among these has been the size of the screen, which, roughly, is the equivalent of a man's handkerchief folded once. By the deft use of the three cameras at his disposal, the director can shift from set to set in the Hollywood manner, go in for trick angle shots, close-ups and other artifices so that the viewer remains unaware of the limitations of the television set.

A condensed version of the opera "Tristan and Isolde" set the pattern for one of the most widely adopted uses of the minnie to tie in with this camera procedure. Eddy built a scale model of a conventional set, placed two figures on a bench to one side of it. When it came time for the love scene, the director began the sequence by having one camera, mounted on a moving-picture dolly, make a full shot of the model. The camera then was moved in closer to the set, and in so doing, was set to make a horizontal sweep in order to center attention on the bench. When the camera had advanced



K927

K1067

to a point where the figures began to dominate the screen, a switch was made to a second camera, this one registering the two principals in a similar position on a full-scale duplicate of that part of the set that had been in the No. 1 camera's range an instant before.

Though there are three cameras trained on a set at one time, only one's output is on the air at any time. By switching from one to the other, the director, in effect, edits the telecast much as a movie cutter does when a picture's shooting schedule is completed.

For the operetta, "Pirates of Penzance," a miniature castle was used as a curtain raiser, and from this the camera cut to the interior of a regular castle set where the action began. A model in the proper perspective supplies a convincing illusion but its showing on the screen must be very brief, otherwise it's apt to be detected and illusion destroyed.

A play based on life on the Erie Canal in the 1850's indicated the possibilities of combining models with stock film shots. A canal resembling the Erie of old was spotted in Pennsylvania and a camera crew was dispatched there to shoot documentary material, including some footage on its antiquated wooden locks opening and closing. Upon their return the special-effects crew set to work on a small-scale reproduction of a portion of the canal with a boat and working locks. Overlooking the locks was built the Hennessy Hotel in accordance with the description furnished in the novel from which the play was taken. When the voice of a narrator began a historical prologue, picturesque shots of the canal in Pennsylvania were shown, following which, the ike camera focused itself on the working minnie, going from there to a full-scale set inside the Hennessy Hotel.

An exciting bit of air drama was incorporated into a Pacific coast program, "Vine Street," television's first serial. In one scene, the audience saw the players in a regular plane but in the subsequent scene the ship was supposed to go into a tailspin and crack-up, so the camera switched to a miniature controlled by wires.

In radio, when the hero shoots a black-guard, it's a relatively simple matter for a sound-effects man to whack a leather cushion with a stick, whereas in television the sound must be supplemented with

(Continued to page 127A)

JANUARY, 1941

Removable Button Center Changed to Match Dress



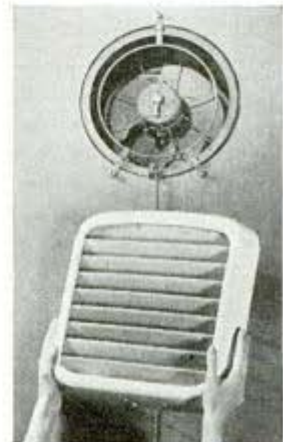
Center portion of button comes off easily so different color may be substituted to match shade of dress

Many choices of two-color combinations are made possible with buttons having removable centers. Both the center section and outer part are available in about twenty shades which may be combined to match colors of the dress. The center portion may be attached or unfastened without removing the button from the garment, so the wearer may change the color combination to harmonize with a change of trimmings or accessories.

K1082

Plastic Grill over Kitchen Fan Slips Off for Cleaning

Adding a decorative note to the kitchen, one type of ventilator fan has the unsightly blower concealed by an attractive grill. Made of white plastic, this cover may be lifted off easily to clean it by washing with soap or to oil and service the motor and fan.



General Electric Co 37
1285 Boston Ave.
Dorchester, Conn.

13 Altman's Fifth Ave at 34th New York City

K1121 designed by H. P. Kuetni,
Plane Catapult Made Safer by Speed Indicator

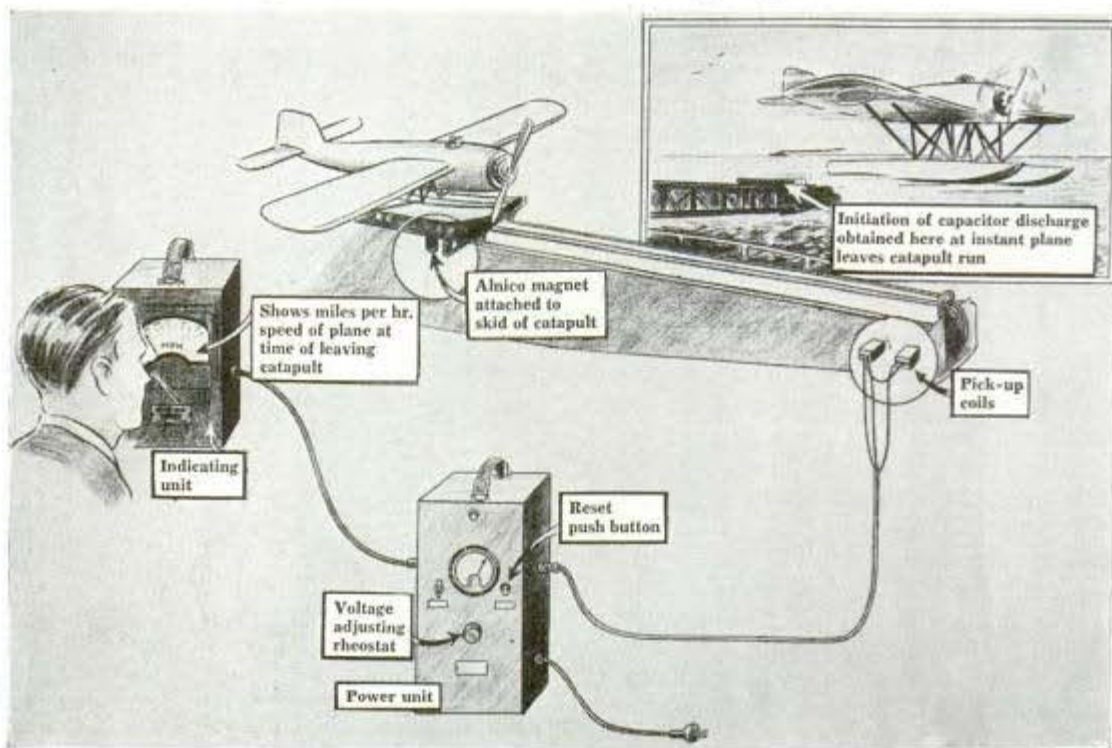


Diagram shows operation of speed indicator, including magnet on catapult skid, two pick-up coils, power unit and instrument that gives speed in miles per hour. Inset, seaplane leaving catapult

Much of the hazard in catapulting airplanes from ships is eliminated by a speed indicator that shows how fast the skid travels so proper adjustment may be made. The tester, designed in General Electric laboratories, includes two coils mounted a foot apart at the end of the catapult runway and a permanent magnet attached to a skid on the catapult. As the skid, carry-

ing its magnet, whizzes past the two coils, voltage impulses are set up first in one coil and then in the other. The time interval between these two impulses is registered by a needle on a connected instrument indicating the rate of speed, which should be great enough to hurl the plane into the air, yet slow enough to avoid injury to pilot, and unnecessary strain on the plane.

K1078 \$13.85 Recipro
Drill-Press Attachment Oscillates the Spindle for Sanding



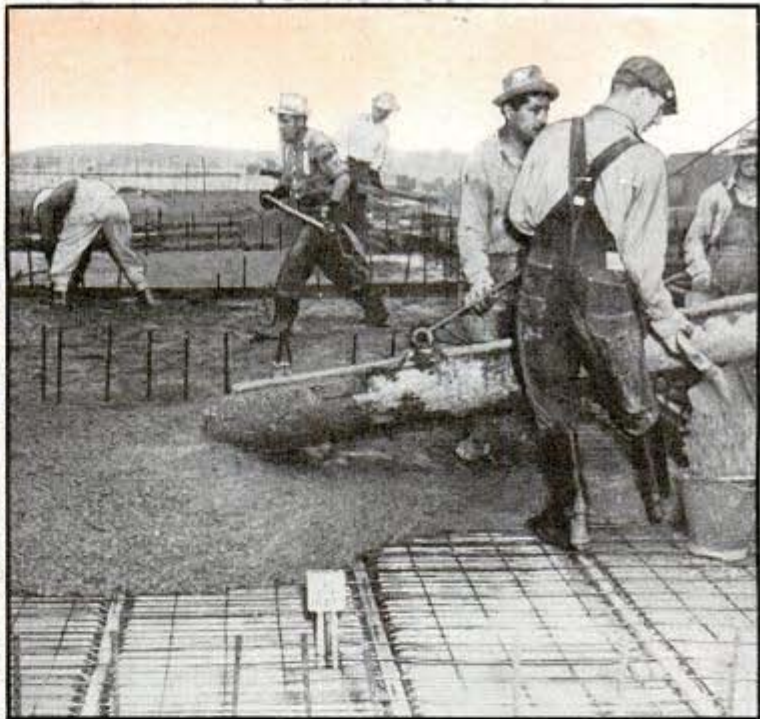
Gear reducer mounted below motor at extreme right motor shaft. An adjustable connecting rod

Any standard commercial drill press can be converted to perform the work of an oscillating drum sander by equipping it with an oscillating unit that imparts an up-and-down motion to the spindle. Thus, instead of remaining stationary the spindle is given 200 working strokes a minute, which can be adjusted to any length between one-quarter and seven-eighths inch. This eliminates the usual grooves and ridges resulting from ordinary spindle sanding, and gives the stock a satin-smooth finish that requires no subsequent hand work. The mechanism consists of a gear reducer run by a belt from the lower idle

Schenck, N.Y.

K 1046

Cont Marshall Perham 1128 Stearns Drive
Los Angeles Calif



LOW COST HOMES



Left, leveling up pre-fabricated door jamb, one source of large savings. Right, pouring first floor over wrinkled metal forms. (Photo courtesy Fabrilorm Concrete Products Co.) Below, spraying precast stairs with sealing compound

production methods totally new had to be devised—and as a result, true line production has been applied to housing at last.

Just how long these steel-ribbed structures will last is a matter of conjecture, for there never were such houses before, and therefore no tests on which to base estimates. Officials say

that if they last sixty years they will have been profitable, but unofficial experts have predicted their duration for centuries.

The houses are being built as great apartment cities, to be rented by the county, but there is no reason why the same methods should not cut the cost of private homes until everyone may own one, pass it to his children, and their children, for generations. Apartments contain an average

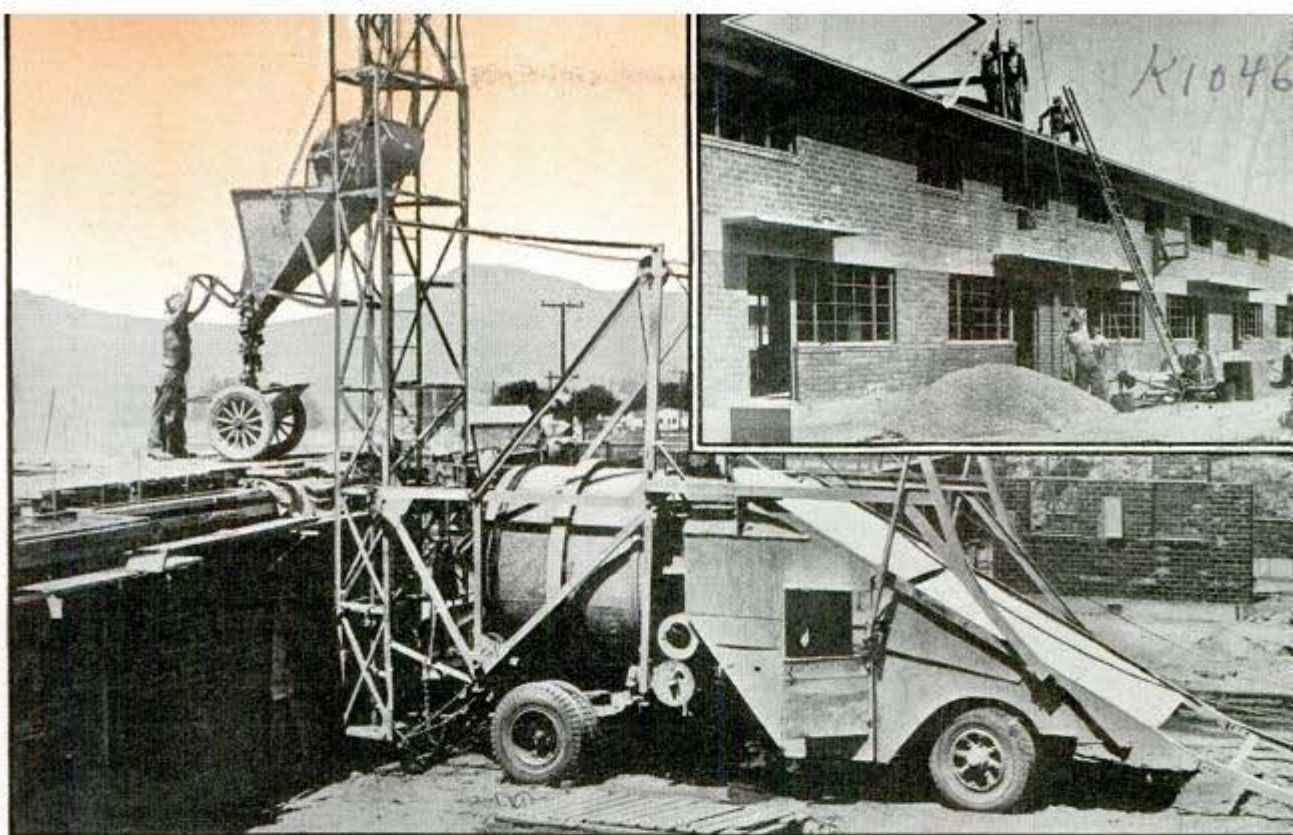
HOUSES built to last like medieval castles but at a cost comparable to that of cheap, flimsy shanties—this is what Los Angeles county is now doing in a vast program of slum clearance.

The expected longevity is due to the durable materials—steel, concrete, and brick—which compose almost everything but the doors and windowpanes. To get these expensive materials at such low cost, mass-

Housing Authority
1031 S. Broadway Los Angeles

Attn. Mr. Carpenter

4900 Ceiba Bell
Caulking Compound Casey
305 E 32nd Ave
La. W. Howell



BUILT to LAST

of four and one-half rooms per family unit. Cost of the first of these was \$2,700 per unit. It slipped to \$2,600 on the second, \$2,100 on the third, and is expected to drop below \$2,000 on the fourth.

Let's have a look at the construction to see how this miracle is possible. Foundation trenches, made by machine, are filled with concrete. Then the first mass-made units—precast concrete joists—go into place. These are factory cast on a production line by pouring dry, high-grade concrete into metal forms, which are vibrated constantly to insure smooth surfacing. As soon as the forms are filled, joists are extruded and sprayed with a sealing compound to prevent water evaporation.

These joists span the foundations. Across them



Top, concrete being hoisted from mixer to second floor. Inset, exterior of structure. Note huge beam separating floors. Circle, extruding precast joists from their forms

R-1046



are placed great metal form sheets, factory stamped out in mass-made lots. They are twenty-six-gauge metal, and "wrinkled" for greater strength. They make a solid surface over which is poured concrete for the ground floor. Second floors use a somewhat different technique. Supporting beams are poured in place, for weight would be a considerable factor in handling them if they were precast. However, mass-production methods are still used. The forms for them are all numbered, and after they have been used, they can be removed and taken to the next building. For the second-story concrete floors, forms are placed



Top, putting section of partition in place. Center, one of the completed apartments. Bottom, space between inner and outer walls of brick is filled with moist concrete which flows into joints

below, to be removed when the "mud" has set. These forms are metal, and can be used repeatedly without sign of wear.

When the main structural walls are of concrete, the same type of forms is used. Reinforcing bars that support floor and wall concrete, too, are factory joined. They come as panels to the jobs, and are placed in a few minutes.

In some cases, the main walls are brick. Here there is little evidence of line production, but there is a new method being used which will make these brick last longer than any have before. This process is known as groutlocking. Each wall contains an inside and an outside thickness of brick, slightly spaced between each thickness.

K1046

This space contains many vertical steel reinforcing bars, which tie to the foundation, and as every few rows of brick are laid, a rich, wet concrete is poured into the crevice. This makes a wall that will withstand almost anything short of artillery fire.

Extremely interesting are the stairways, for here mass production has reached a high perfection with enormous savings. When the reinforced concrete walls of the stair-well are poured, special forms provide reinforced concrete stair foundations, which protrude three inches from the main wall itself, and are anchored top and bottom to concrete floors. Over these are placed mass-produced, precast concrete steps.

These steps are cast similarly to the joists, by pouring dry concrete into forms, vibrating vigorously, extruding quickly, and spraying with a sealing compound. But they obtain a much finer surface. When they have been extruded, they are like glass; there is not a rough spot on them.

High cost of openings has been cut to the bone by more line production. Door and window frames are all prefabricated metal, delivered from the factory ready to be put in place. When the walls are brick, they are anchored between the crevices provided for groutlocking; when concrete, the frames are placed, and the "mud" is poured around them.

Interior partitions are made cheaper than ever before by erecting sections of studded metal lath, which have been mass produced by machine to fit exactly the dimensions of the room, and covering them with two inches of solid cement plaster, tinted in attractive tones. These walls are not only cheap and sturdy, but they have an important sanitary feature. When a family moves out, the apartment may be cleansed by washing it down with a hose.

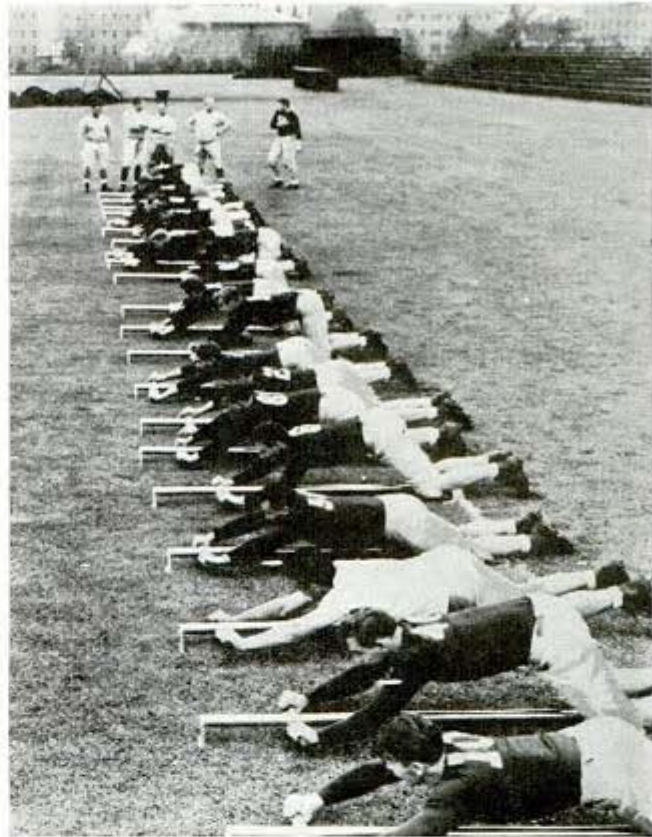
Floors are covered with patent flooring that can be replaced oc-

(Continued to page 126A)

JANUARY, 1941

K1061

Muscle Stretcher Hardens Players for Football Game



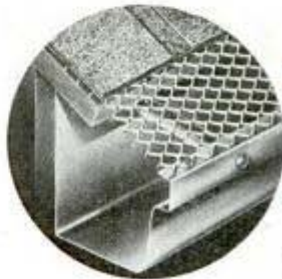
Football players take exercise by arching bodies on muscle stretcher that weighs but sixteen pounds and is easy to store

To limber up their body, arm and leg muscles, football players at Fordham University take exercise with a muscle stretcher consisting of sliding grip-bar supported by a chrome-plated metal tube. It is claimed that two minutes a day with this machine is equivalent to several hours of exercise by other means. The apparatus weighs sixteen pounds and dismounts for storing in closets at home.

K1092.

Anti-Clog Netting over Roof Gutters Stops Twigs and Leaves

Stoppage of roof gutters can be prevented with a special netting that forms a screen extending from the eave to the outer edge of the gutter to keep leaves and other obstructive debris from entering the trough and becoming lodged in the downspout.



It also guards against birds building nests in the gutters. The netting is made to fit any gutter.

The Car-Tex Co. 1109 Esarfield Ave. Pa. 43
Wesley Slaby

John Tolchyn, Editor, New York City
251 Third Ave.
The Car-Tex Co.
1109 Esarfield Ave. Pa.

Electric Hoe for Garden Work Is Built from Standard Parts



At left is the electric hoe with its mast connected to a power outlet in the field. The drawing above shows how the weight and pulley arrangement keeps the wire out of the operator's way and permits cultivation over 100-foot square areas

An electric hoe that takes much of the work out of farming and gardening has been developed by a Seattle power company, and although not on the market in finished form it can be built in the home shop from standard mechanical parts. Designed to take the place of the ordinary hand cultivator, it draws power from electric poles set every 100 feet through the field, and with a supply wire connected with proper pulley and weight arrangement it will cultivate 100 feet square. The motor is a one-half horsepower, 110-volt, 1,725 revolutions-per-minute, dustproof type connected to the reduction gear by a heavy-duty flexible coupling. Motor, reduction gear and cutter wheels are mounted on a frame with two fourteen-inch cultivator wheels.

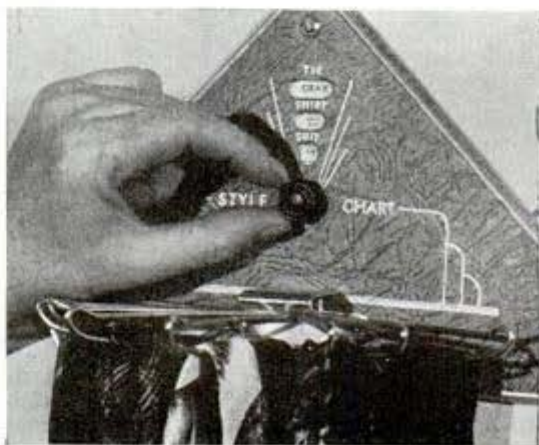
"Upside-Down" Pruning of Trees Yields Knotless Boards

By pruning young pines and other evergreen trees in an "upside-down" fashion, a Russian experimenter claims he can produce logs twenty or more feet long that yield boards entirely free from knots. He permits the tree to develop a bushy growth near the ground until it is about eight years old. From that point its central growth axis, or leader, is prevented from

producing any more branches above this ground-hugging bush, simply by pinching off all side buds. Thus the leader grows into a slender, pole-like sprout, deriving its nourishment from the bushy branches near the ground. When it has reached a height that will yield a log about twenty feet long the tree is allowed to branch out and form a normal top. Growing in this way, the central portion of the trunk leaves no branches embedded within to become knots when the log is finally sawed into boards.

Chart Helps Match Colors of Suit, Shirt and Tie

Offering a quick method of determining how to be well dressed, a dial embodied in a necktie rack indicates the correct color combinations to observe in selecting your suit, shirt and necktie. For instance, knowing the color suit you will wear, you simply turn the dial to find what shades of shirt and necktie will make a proper ensemble.



You can learn whether the colors of your shirt, tie and suit are properly matched by turning the knob

POPULAR MECHANICS

Forest Products Laboratory, Madison Wis. Puget Sound Power and Light Co. Seattle, Wash. Laboratory, Municipal, Chicago.

1070.

K1140

K1156

Mr. Lee Mfg. Co. 674. N. Kingbury Ave.

K1091

Charles J. Bauer of Dayton Herald Dayton Ohio

Army's 'Big Bertha' Cameras Map Huge Areas



Army photographers capture thirty-six square miles of terrain with a single snap of their latest aerial mapping cameras from their photographic plane at four miles altitude. Right, "Big Bertha" camera—a forty-inch focal length camera being directed from pear-shaped opening in door of plane. Above, cameraman inhaling oxygen as he operates wide-angle aerial camera in plane high above ground

Above, photographer directing pilot through telephone in order to position plane above area to be mapped. Bottom, latest photographic plane in flight. Its cabin is electrically heated so the crew may operate in comfort at 25,000 feet. Pilot, navigator and cameraman use throat microphones which pick up laryngeal vibrations and do not interfere with supply of oxygen from cylinders on walls



reader says cost is over \$100.00

PROSPECTING

K-1050
Ultraviolet Product Co.
6158 Santa Monica Blvd.
Los Angeles
Calif.



OUT in the desert these nights you'll find men exploring rock outcroppings with the almost invisible purple light of an ultraviolet torch, searching for signs of tungsten, Number One hardening metal for modern armament steel.

Prices are rising steadily and mining men remember how, during the World War, tungsten jumped from \$7.50 per unit of twenty pounds to as much as \$128. That's what is drawing prospectors to old workings and the dumps and tailings piles of gold mines, searching for a metal neglected since the last war boom.

Modern prospectors work at night, using a new technique, because tungsten literally announces itself before their eyes. If the purplish light from a cold quartz tube strikes scheelite, ore of tungsten, an intense blue glow shines out. If they're panning, they may find a heavy, light-brown sand collected in the bottom of the pan, along with the black sand, the gold and the garnets. When they turn a quartz lamp on it the sand may glisten with myriad brilliant points of blue light. That's scheelite dust, and they know they're on the track of tungsten.

More than 300 minerals share this queer



Top, left, examining abandoned mine tunnel with quartz lamp. Right, light portable outfit contains battery and high-voltage transformer for operating quartz lamp. Below, testing pan of concentrates with black-light lamp. A blue glow reveals presence of tungsten ore

Cont. Tom Brennan
1022 S. Cochran Ave. K1050

AFTER DARK

Los Angeles
Calif



Above, prospecting for tungsten with big ultraviolet lamp outfit. Power is supplied by gasoline-driven generator on stretcher. Right, examining pan for trace of tungsten ore

property of glowing, or "fluorescing," under black light, and their colors range from primrose to lavender. Tungsten-laden scheelite usually shines blue, but now and then it is cream or yellow. Sometimes a prospector is fooled by a bright blue or creamy gleam which suddenly streaks away when he reaches for it. Lizards, horned toads, and snakes fluoresce, and so do old bones and teeth.

Usually the engineer expects tungsten only where a limestone-granite contact exists, but even these locations are hard to trace. Experienced miners, following a vein, often find they can't tell which is ore and which is country rock. It costs money to dig out tons of barren rock and run it through the mill, but now the foreman runs his torch over the face of the drift and marks out the vein. The muckers can discard the worthless rock as they go along,

(Continued to page 114A)



K1130.

Tracer Bullets Show Marksmanship of G-Men



Glowing paths made by tracer bullets show expert marksmanship of G-men in night exhibition

Tracer bullets fired from machine guns by federal bureau of investigation agents gave a visible demonstration of marksmanship in a recent night exhibition of

shooting at the Quantico, Va., range. The fusillade drew sharp lines of light against the darkness, which were caught by a camcraman, indicating the paths of bullets.

K1041

Giant Stoplight on Rear of Truck Reduces Collision Peril

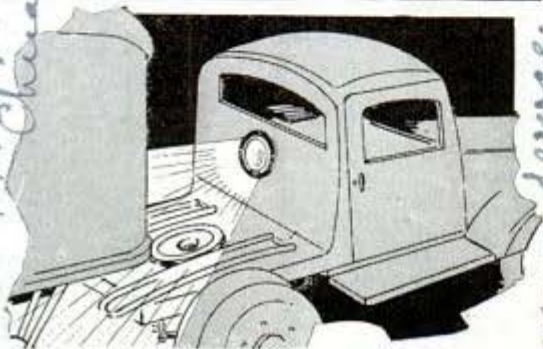
Esau's Note: \$4.00



Better protection against collision is afforded by an enlarged stoplight for trucks. Clearly visible for a distance of 1,000 feet, the lens shows a bright warning signal seven inches in diameter. It is available either for flush-type mounting or with an angle bracket. Fitted with a special white lens, the lamp may be used as a backing light for a truck cab, and also spreads a brilliant light to aid in connecting the truck with a trailer at night.

Safe Auto Driving Begins at Forty, Accident Figures Indicate

Drivers in their forties have the lowest accident rate, but this does not mean, according to an analysis by Dr. Harry R. DeSilva, of Yale University, that they have more skill than younger drivers. In his opinion, they have learned that it is easy to slip into a speed beyond the limits of their capabilities and that it pays to resist this temptation. A greater accident rate exists among elderly persons, which Dr.



Seven-inch stoplight, above, on back of truck; bottom, white light on truck helps connect trailer

Ray Lamp Co
1413 Michigan
Chicago

new Conn.
et al
Science 4/24/48

Relations.

POPULAR MECHANICS
Director, Research
Center, Institute of Human

K1143

DeSilva attributes to a failure to recognize the slowing of their sensory and motor faculties. The peak of accidents is found in the twenties, probably because many young persons have the confidence of an expert driver but not his experience and ability; nor do they possess the necessary insight into their own defects and the ability to compensate for them.

K1127

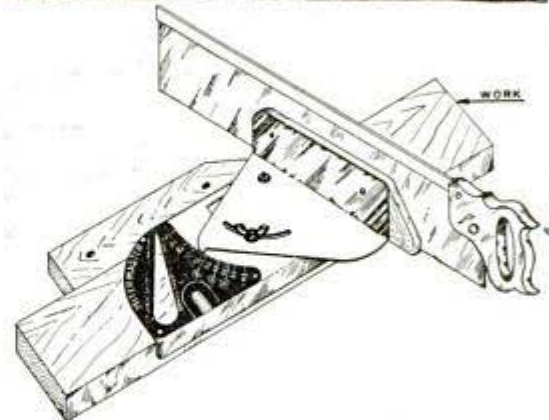
Dummy of Average-Size Driver Helps Build Comfort in Cars

With the help of a cardboard figure representing the average-size driver, automobile designers fashion cars to fit the small man weighing 120 pounds and an over-size heavyweight with equal comfort. The dummy, called Johnny Q. Cardboard, was created by Ford engineers who studied government statistics on human proportions to find a pattern for America's average motorist. His dimensions are as follows: Height, five feet eight inches; arm length, thirty-two and three-fourths inches; leg length, thirty-two inches; sitting height, thirty-five and three-fourths inches, and location of knee, two inches above the middle of the total leg length. Johnny has joints at the shoulders, elbows, wrists, hips, knees and ankles. When a new car model is in the making, he aids in locating seats to the best advantage, and in determining the proper foot-pedal reach, leg room, knee clearance and arm spread in reaching the instrument panel.



Cardboard man, hinged at ankle, knee, hip and shoulder, helps test new car models for seating comfort

Adjustable Miter for Sawing Has Drill and Rod Gauge



Top, sawing an angle with aid of adjustable miter; bottom, sketch shows details of special features

Serving many purposes besides marking and sawing angles, an adjustable miter is available for carpenters, woodworkers and home craftsmen. The scale plate for setting the mitering guide is marked in degrees from forty-five to ninety, and indicates the exact setting to fit corners for five, six and eight-sided figures. With the pointer set at forty-five degrees it is a square-corner miter; at ninety, it serves as a carpenter's square. There is a square hole which helps locate center of round work, and a tapered slot finds the diameter of drills, dowels and rods up to one inch. A series of holes are used as guides for drawing straight lines along a board from one-sixteenth to one inch from the edge.

☐ Railway coaches and sleeping cars of the United States have a total seating capacity of nearly 1,800,000 persons.

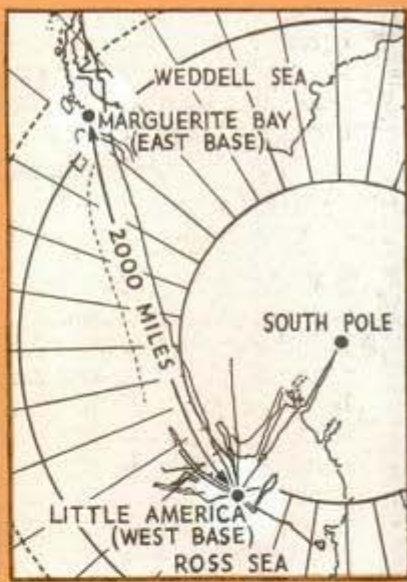
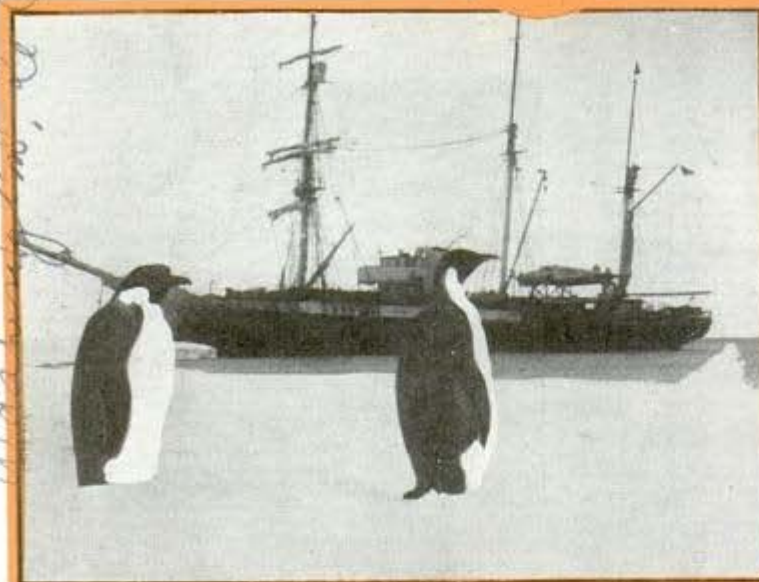
Master of Specialty Co. 515.7 South Ave. Minneapolis, Minn. E.

JANUARY, 1941

Ford Motor Co.
Dearborn, Mich

Pullman Inc. 49.

EXPLORING

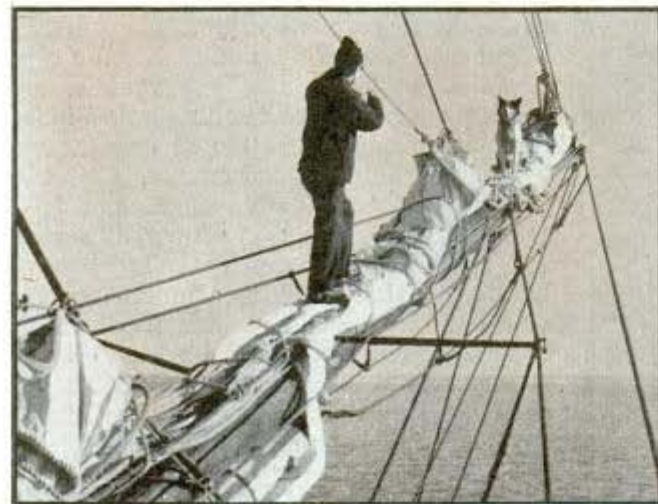


DOWN at the bottom of the world, by the light of a midsummer sun that runs twenty-four-hour shifts, sixty hardy Americans are finishing up an eighteen-months job that ranks with the world's toughest. Aerial explorers and cameramen are touring the bleak Antarctic on thousand-mile flights over lands and waters never seen by man—wastes where a forced landing far from base might mean blackout in a crevasse or a glacier or a deep-drifted mountain.

From two bases 2,000 miles apart, planes

and dog sleds and skis and snow cruiser and tractor are carrying scientists deep into the polar regions. Meteorologists are sampling the weather. Geologists are sampling cores of the ocean bottom and of Antarctic earth in search of mineral resources. Physicists are sampling the cosmic rays, other specialists are studying terrestrial magnetism, the aurora, ocean and land life, glaciers, while every air and shore party is mapping the unknown continent for Uncle Sam.

Aboard the "North Star" and the his-

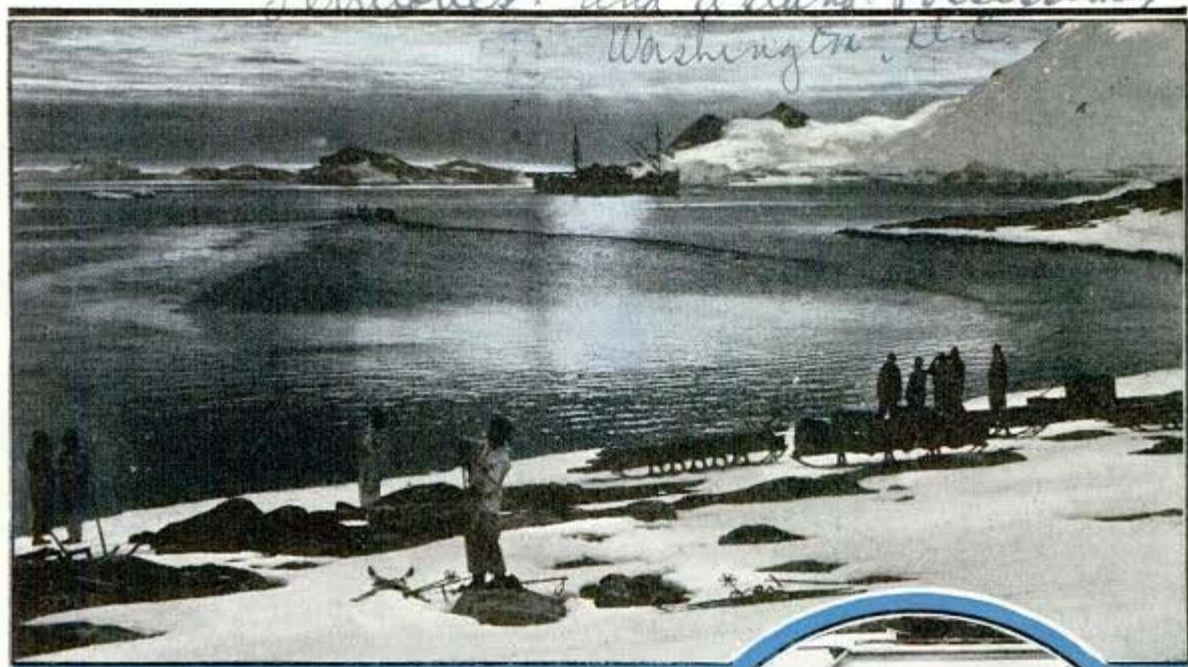


Top, left, penguins greet the U.S.S. "Bear." Right, map shows location of expedition's two bases. Below, left, one of the dogs finds his way far out on the bowsprit of the "Bear." Right, raising flag at East Base

K 100 B.
 Mrs. Joy Dwight Hancock
 Director of American Navy Dept.
 1125 1/2 St. N.W., Wash., D.C.
 Deakin and Peckay • Cont.

Ref: Dept. of Interior, Division of R 1008
a FROZEN CONTINENT

Territories and Island Possessions,
 Washington, D.C.



toric, sixty-five-year-old "Bear," the expedition put out from Boston for the south seas in November, 1939, under command of Rear Admiral Richard E. Byrd. Two months later, the "Bear" nosed through a smothering snowstorm to make fast to shore close by the "North Star" in the Bay of Whales.

In a matter of minutes the monoplane had been lifted with slings from the



Top, "North Star" in Marguerite Bay, East Base site in foreground. Circle, assembling dog sledges. Bottom, left, pulling tractor out of crevasse. Right, hoisting seaplane aboard the "Bear"

R100
Ashley
E. B. Perce
co pilot. Radioman



"Bear's" deck and eased to the water, and Chief Pilot Ashley Snow and E. B. Perce, his assistant pilot and radioman, were off on a test hop. Unloading other tons of vehicles and provisions, however, was not as simple as that. There was a lot of laborious hauling from the foot of the Ross Ice Barrier to safe ice high above. When the 75,000-pound snow cruiser was crawling ashore over a sixty-foot steel and wood ramp there was a terrific splintering and the "wheeled dinosaur" crashed to the ice, saved only by the sudden application of full speed ahead, which took it roaring from the brink of the ice barrier to safety a mile inland. And a sixty-five-mile gale whipping across Marguerite Bay on the coast of Palmer Land halted the landing of supplies at the East Base, 700 miles south of Cape Horn, where two Diesel ships had taken part of the expedition in March after establishing West Base near the original site of Byrd's "Little America" base on two previous visits.

Dileigh Crew of Barkley Sound.



Reach near West Base

Reconnoitering in the air, Admiral Byrd in January had found openings through the ice floes and helped the "Bear" work farther east of Little America than any vessel had ever reached. Pushing through a howling blizzard, the "Bear" sighted a score of unknown ice islands, capes and bays which altered the maps of Jacob Rupert coast. Officers spent sleepless watches on the bridge charting the coast and jotting notes of distant mountain peaks. Maps of this region mention explorers as far back as Cook in 1773, but none penetrated into this inland passage discovered by Byrd's seaplane and the "Bear." On one flight, described by Admiral Byrd as "the most productive flight geographically speaking that I have



Top, Rear Admiral Byrd, seated, confers with flight crew. Center, dog team hauling supplies from ship to base. Bottom, "dog town" at East Base. Here each dog has its own little "house" for protection against Antarctic blasts

K1008

K1008

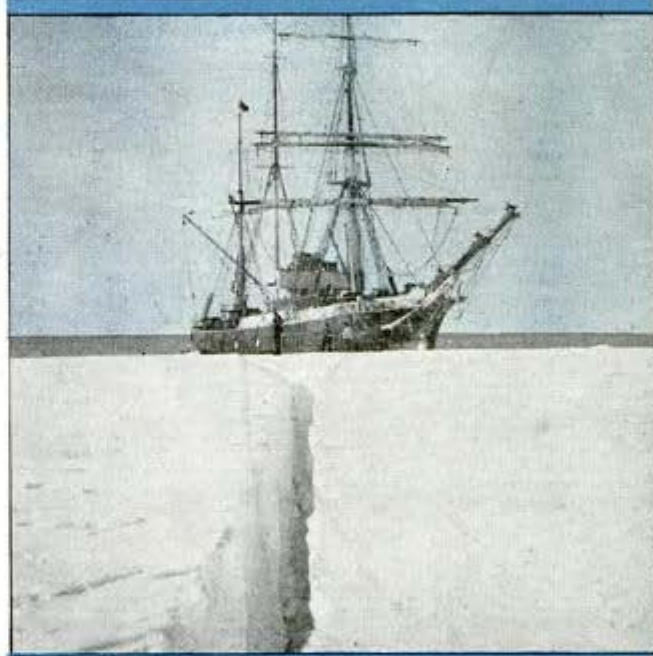
ever made," more than 300 miles of coastline were charted and 30,000 square miles of unknown territory mapped.

Late in their first Antarctic summer Dr. Paul A. Siple, west base leader, and Dr. F. Alton Wade made a long flight of eleven hours and nine minutes from Little America to Beardmore Glacier in the twin-motored navy transport plane. They waited days for clear weather. Finally the skies opened, and with a full load of 924 gallons of gas, and five men aboard, the plane headed into the wind and Pilot James C. McCoy lifted it off the soft snow. The course was laid out over paths never before traveled. The first leg extended southwestward for 350 miles across the jagged Ross Ice Barrier. After cruising about two hours a pyramidal mountain peak was sighted to the south. Two hours later the plane reached the eastern portal of Beardmore Glacier, and beyond it could be seen the fascinating Mount Cloudmaker, flecks of cloud forming about its peak. The plane climbed to 9,500 feet, and Navy Photographer Charles Shirley clicked the big camera trained through a porthole in the door.

The aerial explorers pushed down beyond the 85th parallel near the 165th meridian and then headed north and east. The radio from Little America reported weather there still clear. It was near midnight. The northward movement of the plane approximated so nearly the apparent rate of the rising sun that for more than an hour the same segment remained on the horizon.

At 12:15 a.m. Roosevelt Island was sighted, and an hour later Pilot McCoy brought the big yellow ship down at Little America, ending a journey of 1,150 miles. While the air voyagers enjoyed

(Continued to page 142A)



All photos courtesy U. S. Antarctic Service

Top, taking magnetic observations with "dip circle" on Drygal's Ice Tongue, South Victoria Land. Center, the "Bear" moored to the ice in Sulzberger Bay. Bottom, rescuing a dog from crevasse into which it has fallen

K 1107

Plane Door Forms Stairway for Climbing into Cabin



Cabin door of big fighting plane converted into convenient stairway by sliding it down built-in tracks

With a cabin entrance door that can be converted into a "stairstep," the new U. S. army Bell "Airacuda," multi-place twin-engine fighting plane, does away with the need for extra stepladder equipment for entering and leaving the cabin. The door, opened by sliding it downward on tracks, fits flush with the fuselage when closed. Built into the door are three "trap-door" leaves hinged at the top, which are folded back by pressing a lever to form the steps.

Vest-Pocket Rubber-Stamp Pad Handy for Bill Collectors



Small enough to fit conveniently in the vest pocket, a round pad for inking rubber stamps is useful for bill collectors, attorneys and investigators in receipting bills. There is no danger of ink leaking through

Weldwood Div.
United States Plywood
the casing or soiling the clothes. A wide rim at the base offers a good grip for opening it, and the hinged cover lifts easily. The pad will take any kind of stamping ink.

Waterproof Glue Made of Plastic Hardens in Four Hours

Glue made of materials that will stand up under conditions which only a genuine plastic can endure is being offered for home use. It is said to be bacteria-proof, rot-proof, stain-free and waterproof. Supplied in powder form, it can be made ready for immediate use by simply mixing with a small amount of water. Jobs can be handled within two hours after gluing, and worked after four hours. In laboratory tests it is claimed to have withstood severe strains with no failures at the glue line, although wood failure occurred in every test. Because of the limited amount of water used, shrinkage of both wood parts and the glue line is minimized, making it especially suitable for doweling or joining.

Streamline Body Shield on Bicycle Gives Little Wind Resistance



Streamline bicycle shield protects rider's entire body, and "window" cuts glare from auto headlights

Fastened to the bicycle by straps quickly applied, a removable windshield protects the rider from wind, rain, snow and dust. Due to streamlining, the waterproof shield offers negligible resistance to the wind, therefore does not cut down speed. It also is designed to reduce glare from headlights.

POPULAR MECHANICS

P.A. - 100 N.Y.C.
Shelbyville, Ind.

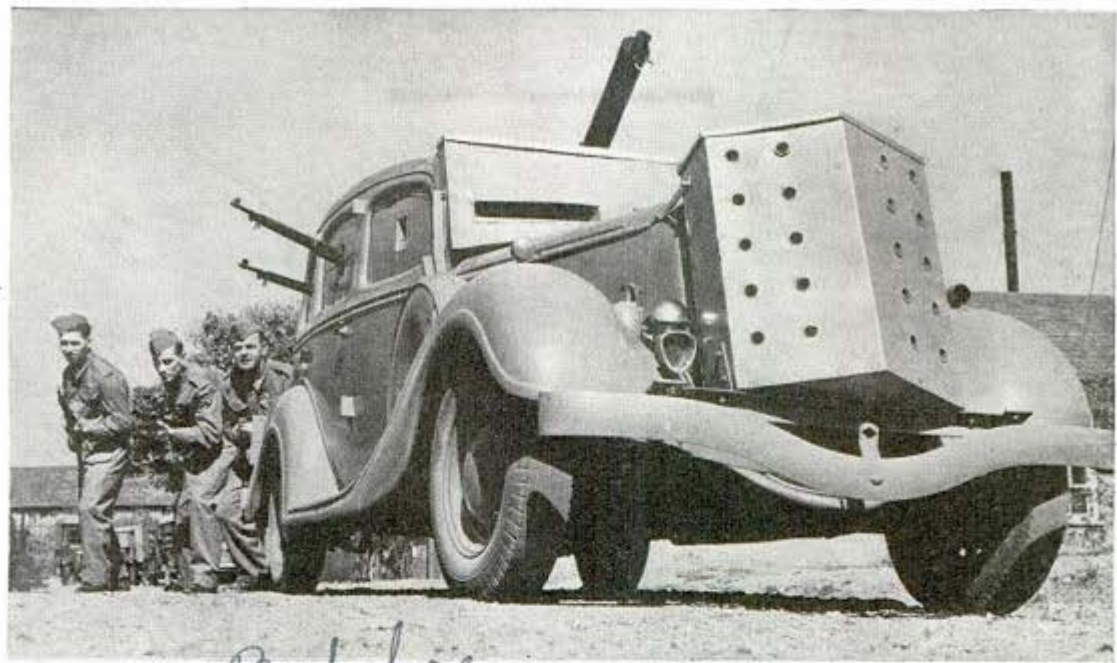
Bell Aircraft Corp. Buffalo, N.Y.
2050 Elmwood Ave. N.Y.
Dunrite Products, Chicago, 1029 S. Wabash.

We can do hardware stores

Corp. 616 W. 46 St. New York

X1124

Armored Cars Guard Factories in War Area



in Berkshire

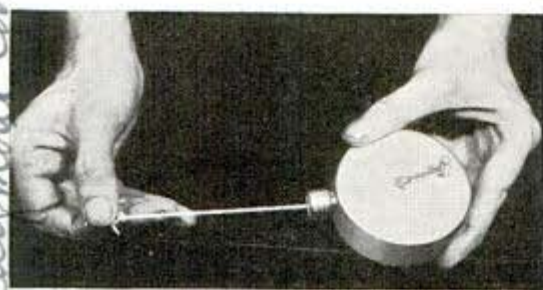
To carry on their work despite grueling attacks from the air and threatened invasion by parachutists, English factories arm their home guards to meet the most severe emergencies. One famous preserving factory maintains an armored car to patrol the vicinity constantly, while lookouts posted on the roof are watchful for possible assailants.

Ready for action, above, armored car has firing ports at sides and slots in front; here it is backed by three members of home guard unit. Right, roof of car opens for machine gunner ready to blast any attempted attack upon the factory



British Combined Photos

Reel Chalks Line Automatically as Carpenter Pulls Cord



Just pull carpenter's line from reel and chalk, inclosed in waterproof case, is applied automatically

Saving time for the carpenter, a specially equipped reel applies chalk evenly over the entire length of the chalk line as the carpenter pulls out the line. The chalk is inclosed with the reel in a waterproof casing of non-rusting metal.

German fliers are said to carry an emerald-green dye in their life belts which stains the water if they are forced down at sea and helps attract rescuers.

New York Times

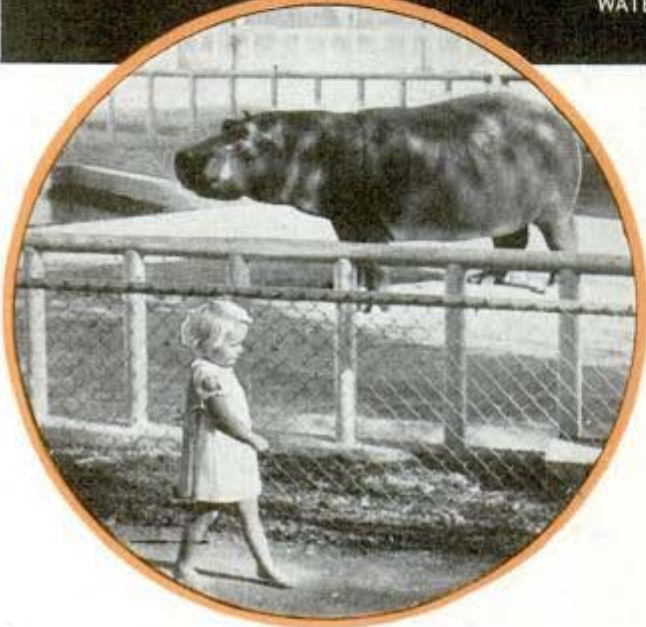
*Seymour Product Co 1937 Lightfoot
Seymour Product Co
Seymour Co*

X1096

Mr. Thomas E. Stinson, Jr. 3872 Franklin Ave
Los Angeles, Calif

R1047

FOILING "JAIL BREAKS"

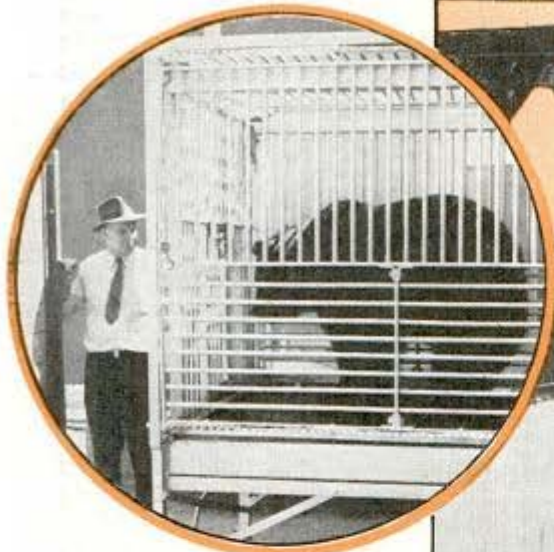


Top, as spectators see bear and as bear sees spectators from its quarters. Sketch shows cross-section of zoo grotto. Below, hippo cannot step over low barricade

PREVENTING wild animals from escaping, once they have been safely placed in a zoo, is a job that often requires more planning and ingenuity than was used in capturing them.

Many animals live contentedly in captivity because they receive all the fresh air and exercise they need, plenty of food, and privacy when they wish it. Others spend much of their time trying to get away. Monkeys are natural escape artists and of these the orangutans are the worst culprits. These apes are born mechanics which understand the principle of leverage and they delight in taking things apart. An iron rod, if it can be reached, will be used as a

at the ZOO

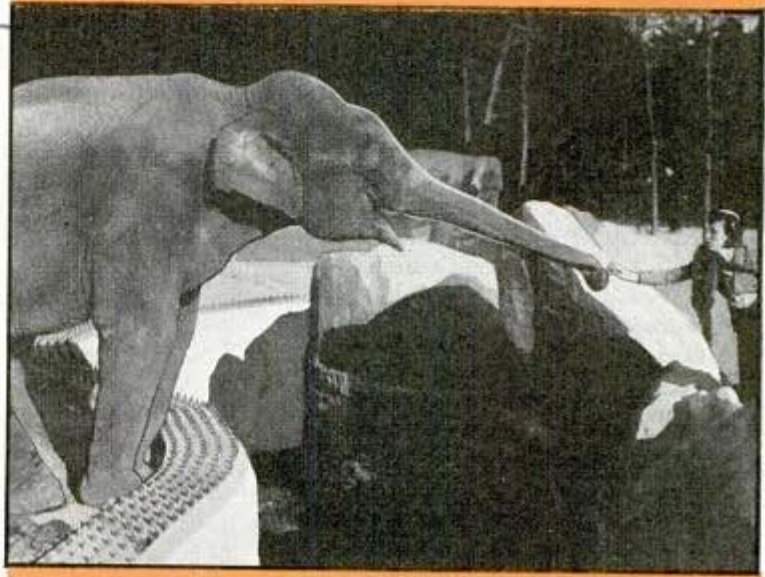
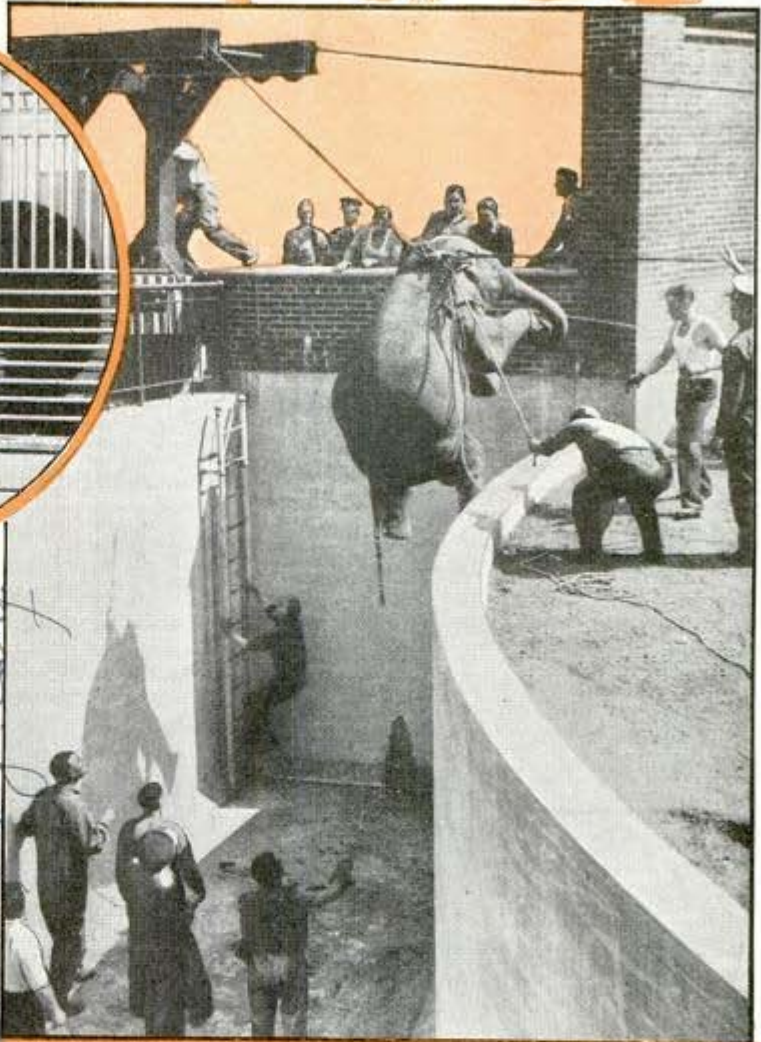


Circle, bear in hospital squeeze cage. Right, lifting elephant from moat into which it had fallen. Bottom, moat separates elephant from spectators

pry to force loose the wire netting of an enclosure. An orangutan will spend days picking and twisting at an iron nut projecting from its cage, trying to work it loose from the bolt. Often it succeeds.

To avoid trouble like that Ralph Virden, construction superintendent of the San Diego zoo, welds his cages together, and in places where he must use bolts he peens the metal down to lock the nuts securely in place. There are no knobs to the doors of the monkey cages because these would be twisted off in a few days. Door locks would be picked or stuffed with mud if the apes could reach them, so the padlocks are protected by steel plates around which the apes can't reach.

A 600-pound mountain gorilla is a different problem. What it lacks in me-



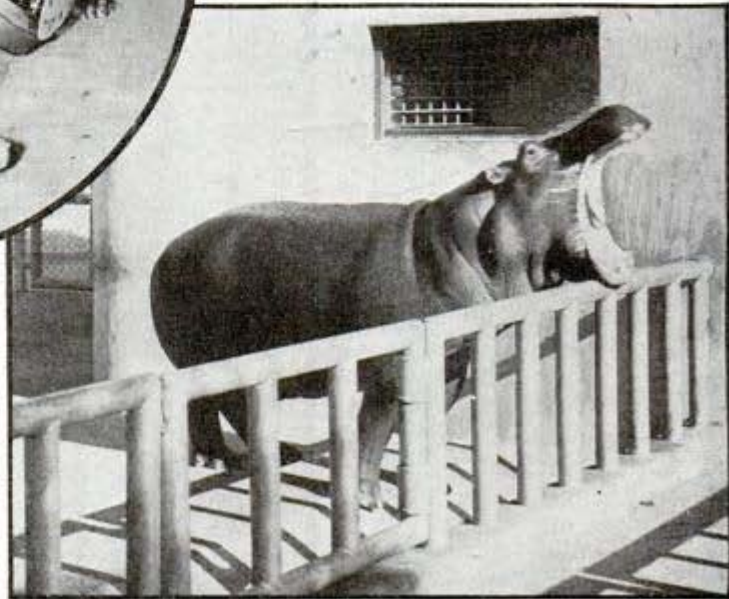
K1047



chanical sense it makes up for in terrific strength. Eight tons of steel, fifty cubic yards of concrete, and 5,000 square feet of heavy wire screen were required to build the San Diego gorilla cage and even then it wasn't complete. Besides the main arena there are two sleeping rooms with steel doors to permit locking the two gorillas into one room while the rest of their quarters are being cleaned. One of the rooms is lined with steel

bars and can be converted into a squeeze cage so that if one of the gorillas injures itself it may be confined and treated in safety. Each sleeping quarter has an exterior entrance door that consists of strong steel bars. Each door locks at three points for stiffness and is operated by remote control. It takes a special key to get into the room in which the steel doors are operated, to make it impossible for unauthorized persons to open or close the doors to the cage.

Next to the monkeys, elephants need special watching in a zoo. They, too, have a mechanical sense and they try to pick things apart with their trunks. They unlock doors and gates by pulling the pins from the hinges, then use a pin as a hammer to smash anything breakable. Keepers prevent this by welding a nut to the bottom of the hinge pins. In the elephant house at San Diego there are no swinging doors, vertical steel doors being used with electric motors for raising and lowering them. During bad weather or when their field and pool need cleaning, the elephants are lured into their house with food and the steel doors are then dropped behind them.

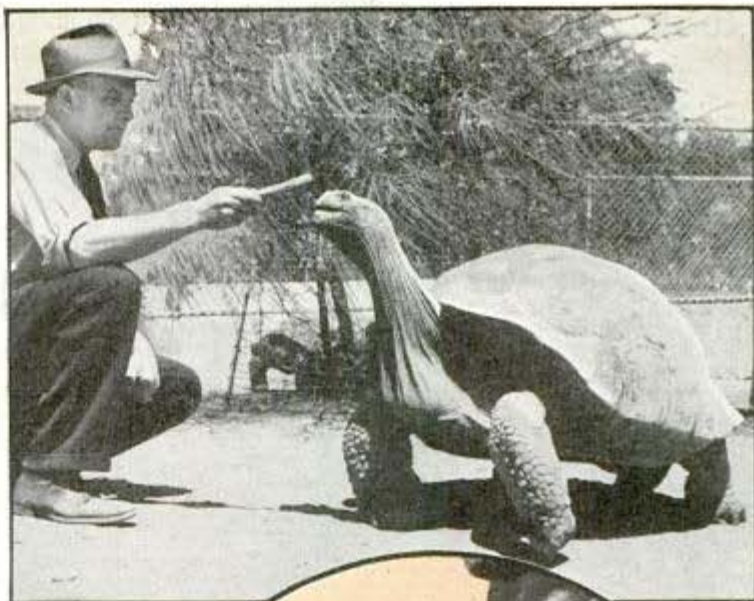


Top, lion takes its medicine at Gay's Lion Farm, Los Angeles. Circle, monkey taking a clock apart—just for curiosity. Bottom, low fence, but hippo is unable to get over it

A modern zoo is a triumph of protective engineering. Children skip along a path that is separated only by a low fence from hippopotamuses and toss fruit to grizzly bears that appear to roam around at will. Cages and heavy stockades have been replaced by open grottoes and fields except for a few birds and animals. An untamed lion in his grotto seems to be as free as in his native jungle. Nothing but thin air separates him from the spectators, yet the people are safe because the lion can neither leap the moat in front nor scale the overhanging walls on the sides of his arena.

Each animal is confined in a way to give it as much freedom as its characteristics permit. Hippos can't raise their front feet much more than a foot, hence a low but strong steel pipe fence holds these monsters in. Elephants can't take long steps, hence a narrow moat prevents them from wandering away. Iguanas and other fierce-appearing lizards are restrained to

(Continued to page 137A)



Top, only a fence strong enough to resist their weight is needed for big turtles. Circle, monkey recaptured with net. Bottom, left, American eagles in huge flight cage. Right, opening interior door by remote control so leopard may enter runway

R1088.

Robot Gives Correct Time as Service to Phone Callers



© Milwaukee Journal
Self-contained instrument automatically gives correct time to customers who call the business house by telephone

With a robot that gives the correct time to telephone callers, time service can be made available for their customers by business firms. Working automatically, a black steel box filled with flashing bulbs, gears and photoelectric cells remains on duty twenty-four hours a day. When a call comes in, a film that contains a recording of every hour and minute begins to function. First a bell rings and then a voice says: "The correct time is 2:39 p.m.," or whatever the time happens to be. To this announcement may be added the name of the company extending the service.

Lights on Car Change with Speed to Aid Traffic Control

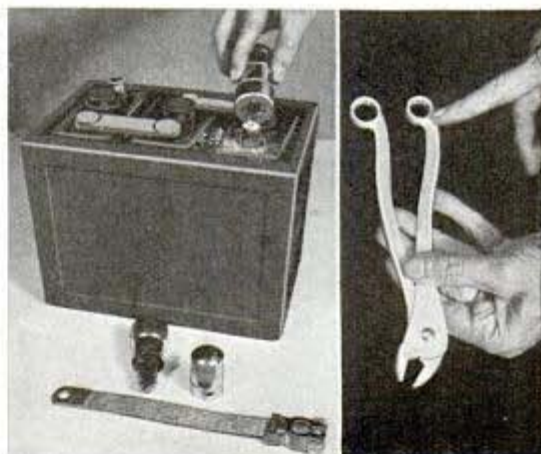
Regulating the speed of trucks, buses, taxicabs and other motor vehicles is simplified by using outside lights, recently

announced, which indicate the car's speed. Their operation is automatic and cannot be controlled by the driver. On top of the vehicle are two brackets, one facing forward and the other backward, each fitted with a set of three purple lights. Another small bracket, mounted on the instrument board, carries three pilot lights connected in series with the others. When the vehicle attains a speed of twenty-five miles an hour, the first purple light on each of the three brackets starts to burn. At thirty-five miles, a second purple light comes on, and at fifty all three lights burn, continuing until speed is reduced. If the vehicle speeds up to fifty-five miles an hour, the horn automatically starts to blow and does not let up until speed is cut below that rate.

X1039

Pliers and Post Scrubber Simplify Battery Work

Servicing automobile batteries can be done faster with a pair of special tools now available. The first is two tools in one, consisting of battery pliers with two box end wrenches built into the handles. Wrench openings are five-eighths inch and nine-tenths inch, respectively, and form a comfortable grip that is virtually slipproof. The other tool comprises two wire brushes in one unit for cleaning battery posts and terminals. One



Battery brush is slipped over post and rotated to clean it; right, pliers have wrenches in handles

POPULAR MECHANICS

Andichron Co Atlanta, Ga.

4645 W. Van Curen Ave.

Traffic Eng. Div.
Chicago, Ill.
Indianapolis, Ind.

Balden Mfg Co

Ernest Holmes Co. Chattanooga, Tenn.

brush, located at the end, has its bristles extending inward so when it is placed over the battery post and rotated it quickly removes corrosion. The second brush, for cleaning battery terminal connections, has a metal cap to guard it when not in use.

K 1197
Clamp Keeps Wheels Lined Up While Car Is Being Towed



Front wheels can be kept in alignment for towing a car backward, with a steering-gear clamp now on the market. Adjustable for length, it fastens to the steering column and one of the steering-wheel spokes, being attached and removed easily by a wing nut. Pads protect the car's finish at the points of contact.

Emp. Shop. H. Withorn, Doylestown, Pa.

K 1117
Transparent Football Headguard Made of Lightweight Plastic

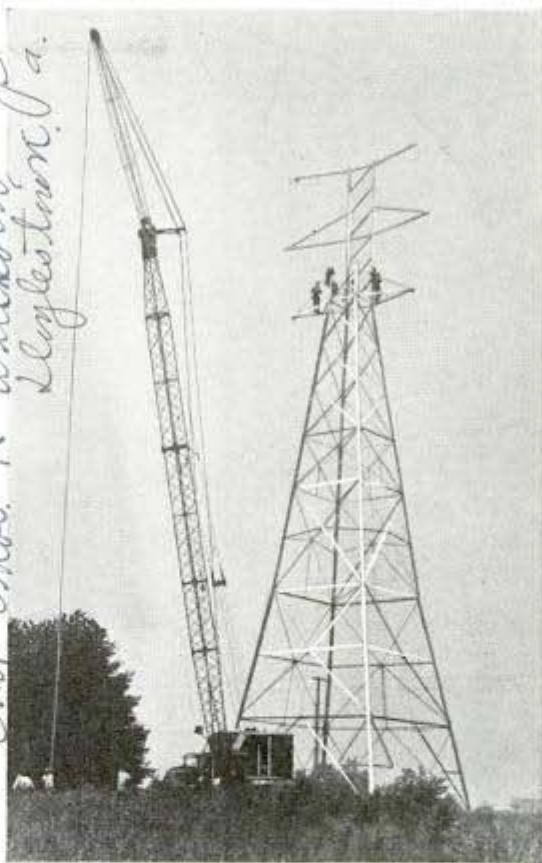
Football helmets of molded Tenite, a tough, lightweight plastic, offer players increased protection. Snug-fitting webbing on the inside prevents the headgear from coming in contact with the wearer's head, giving added comfort and safety. The college colors painted on the inner surface show through the transparent material, which is washable.



Acme
Football helmet made of tough, transparent plastic has fabric webbing inside so it won't rest on head

K 1076

Mobile Derrick on a Truck Erects Towers Quickly



Public Service Co. New Jersey
new Jersey Trenton
Ten-wheeled truck mounting 112-foot derrick sets up power-line tower in half the time normally required

Steel towers to carry power lines in New Jersey were erected at double the normal speed with the aid of a derrick mounted on a ten-wheeled truck with pneumatic tires. The power line required 150 towers, and two were erected each day instead of one a day by the former method.

K 1038

Clip-On Sleeve Thermometer Useful in Outdoor Sports

Handy for hikers, fishermen, hunters and other outdoor sportsmen is a thermometer which fastens to the coat sleeve by means of a strong, spring-steel clip. Enclosed in a metal case with a shatterproof glass face, the



thermometer will withstand hard knocks.

Illuminite Products Co. 1629 S. Wabash Chicago 61

R936

5902 Magnolia Ave.
Chicago

TUNING IN on the

By

Dr. Arthur C. Bachmeyer
*Associate Dean of the Division
of the Biological Sciences,
University of Chicago*

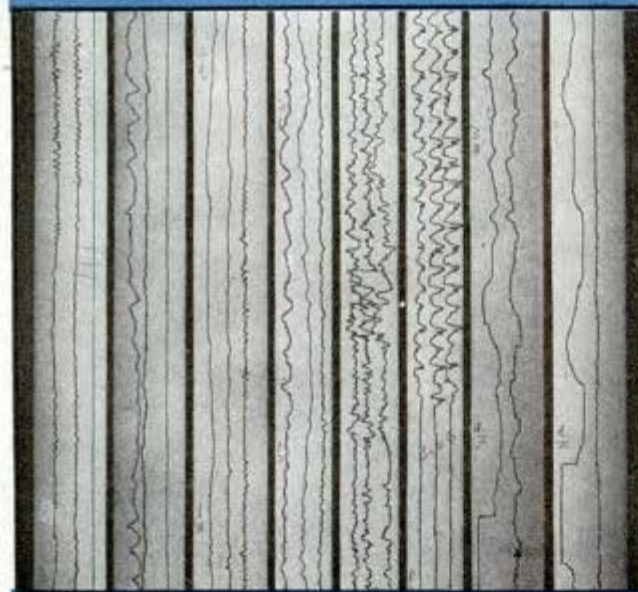
AS TOLD TO
DICKINSON MORRIS

EVERY living being is a broadcasting station in miniature. Sleeping or waking, minute electrical currents are at play within the body at all times. Those from the heart muscles and the brain are of sufficient strength, and present such other recognizable characteristics, as to be of definite value to physicists and researchers, and analysis of the currents through proper laboratory apparatus has enabled the medical profession to increase the accuracy of its diagnosis of ailments within the heart and brain.

The particular interest of the Otho S. A. Sprague Institute at the University of Chicago lies in the field

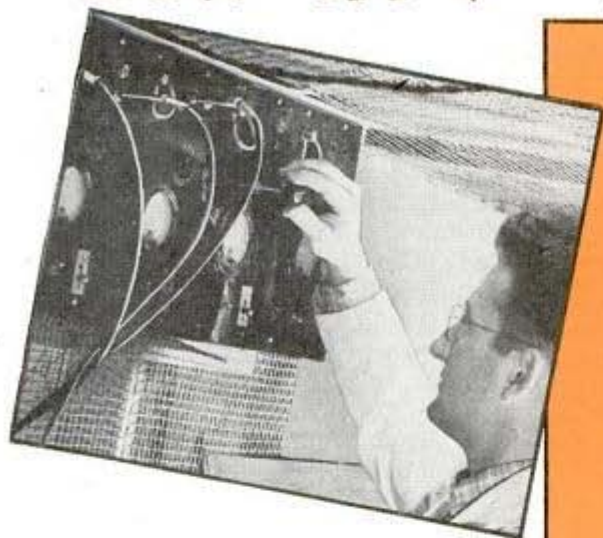


Above, a patient lies inside screened cage for electrical brain test. Below, the story of the brain is read from records made on the ink-writing oscillograph

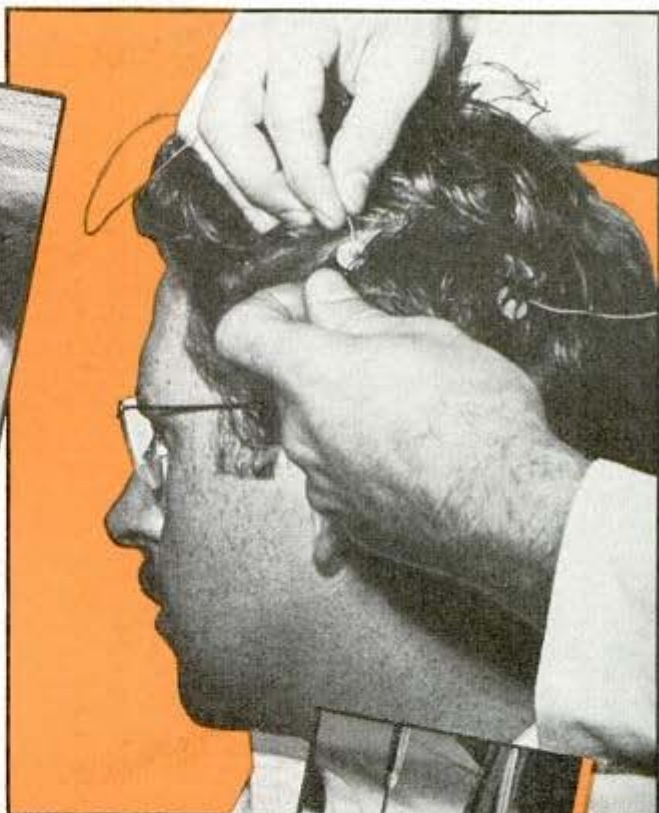


K93.6

BRAIN WAVES



Above, controls for balancing amplifiers, assuring symmetrical amplification to incoming waves from patient's brain. Right, attaching silver disk. Inset, pens tracing brain waves on tape. Bottom, oscillograph on which brain waves are recorded

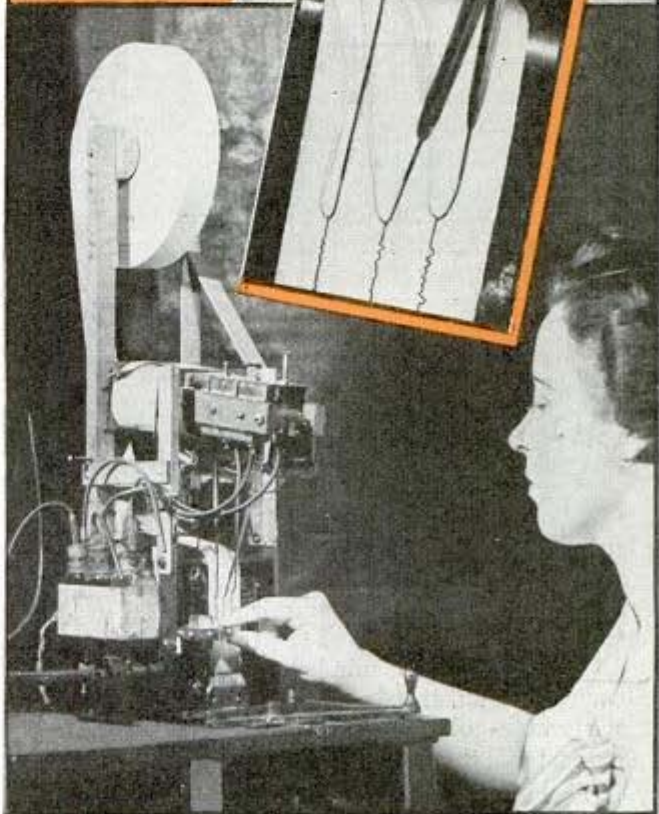


of the brain, and an important phase of this field is the examination of patients, the recording of their brain waves, and the interpretation of the records of those waves from the standpoint of the neurologist and the psychiatrist. This is known as electroencephalography, which means a charting of the electric phenomena of the brain. It is a method of examination only; it is not a method of treatment.

Electroencephalography has proven valuable in examinations for epilepsy (convulsions) and brain tumors, as well as in accurately locating other forms of brain lesions and degenerative brain diseases.

Such an examination takes about an hour's time for laboratory technicians to secure a visual record, on a tape or camera film, or both, that tells the facts in the case. It may be a case of epilepsy, or a brain tumor, or, nothing more than a condition of hysteria.

The ability of science to utilize the brain waves in this way goes



(Continued to page 116A)

K 1118

Anti-Blast Netting and Mats Guard London Motorists



Netting applied to bus windows, and mattresses on tops of cars, guard Londoners from bomb splinters

Windows of London buses and tramcars are being covered with adhesive netting as an experiment to make the glass more resistant to shattering when bombs explode near by. If the netting stands up under wear and tear, it probably will be applied to all similar vehicles. Individual automobile owners likewise are taking precautions, some of them fastening mattresses to the tops of their cars to protect themselves against flying debris thrown by bombs and the shower of steel caused by bursting anti-aircraft shells.

Natural Gas Liquefied for Storage to Save Space in Cities

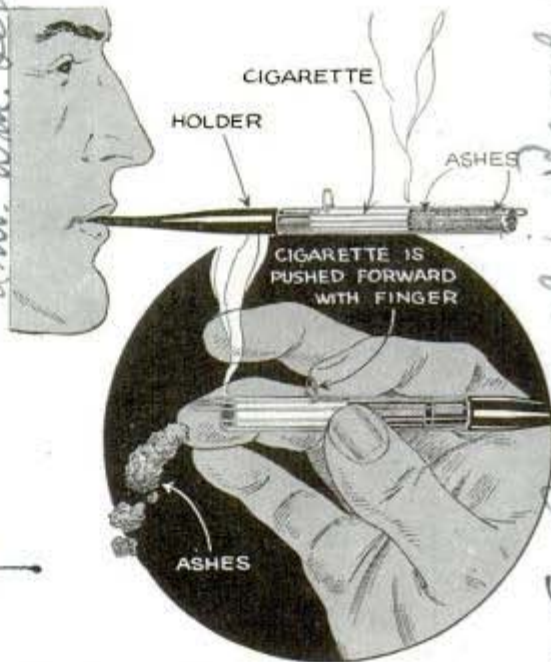
Huge gas tanks would disappear from the horizons of great cities if all natural gas were liquefied for storage under a method announced by engineers of the Hope Natural Gas company. Cooled to 250 degrees below zero, Fahrenheit, natural gas turns into a water-colored fluid so greatly reduced in bulk that all the gas in a dome of 15,000,000 cubic feet capacity could be

Chicago Tribune
10/28/40

stored in a tank only thirteen feet in each dimension. In the cooling process, ammonia takes the temperature down to twenty-seven degrees below zero, then ethylene reduces the cold to minus 150. This is followed by two final steps which have not been revealed, but several substances, including liquid oxygen, are available. To prepare the liquid fuel for heating and cooking purposes and feed it into the mains, it is changed back into gas by warming with steam. The first cold-storage gas tank, erected at Cleveland, O., is surrounded by a three-foot thickness of cork insulation to keep it cold. Since steel becomes brittle at this low temperature, it was necessary to use a special nickel steel in constructing the tank.

Spring Wire "Cage" for Cigarette Guards Clothes from Hot Ash

Hot sparks from cigarettes are prevented from damaging clothing, auto seats and rugs by using a cage-like holder that retains the burning ashes. The butt and ash are removed by sliding an ejector toward the end of the wires. Made of steel spring wire, the holder cleans easily by brushing with soap and water. The metal portion may be removed from its hard rubber mouthpiece and fitted into any cigarette holder of standard size.



Hot cigarette ashes remain between parallel wires, above, until they are ejected with stub, as below

545 Wm. Penn Way
Pittsburgh, Pa.

K 1128

J. W. Clark and R. W. Miller, engineers

525 Roseville Road Chicago

M 1080. Gari Products, 2938 Pillsbury Minneapolis Minn. \$150.00

Power Mower Cuts One Acre on Pint of Gas

Economy and ease of handling are combined in a power mower now on the market. In cutting an acre of heavy grass or light shrubbery, its three-quarter horsepower engine uses only a pint of gasoline. Strong enough to slash through small tree growths, the thirty-four-inch cutting shears mow close to the ground. When stones or other obstructions are encountered the operator can raise the blades by pushing down on the handles. The two wheels are set close together, making it easy to turn sharply around trees or posts and also permitting the cutter to be used in swampy ground. The mower weighs about 100 pounds.

Despite lightness, this mower cuts heavy weed growths on rough or marshy ground



Wayne W. Light Co 11 W. 42nd New York

Gari Paper Sayre

see ad April 1941-132

Shoe "Trees" of Flexible Fiber Conform to Shape of Toe



Unlike conventional shoe trees, a new device for shaping shoes is made of a latex-saturated fiber, and folds flat for convenient packing when not in use. These fiber inserts are sufficiently rigid to give positive support to the shoe, yet flexible enough to conform to the shape of the individual toe. They are especially useful for drying out wet shoes without letting them shrink or stretch.

Dist: Chas E Leuber Co

Inserting flexible shoe "tree" that yields to lines of shoe, yet has enough rigidity to hold it in shape.

Lord and Taylor, New York. Saks Fifth Ave, New York. Field's, Chicago

"Swamp Buggy" for the Rural Mail Carrier Defies Snowdrift or Bog

To "get the mail through" on the rural roads despite winter blizzard and spring thaw, a manufacturer has designed an all-weather delivery car of tractor type. With huge back wheels to gain traction on any surface and a high front axle to navigate deep snow, the vehicle can travel at twenty miles an hour and get safely through swampy or snowdrifted roads. The cab is inclosed. On each side of the engine and in front are mail racks, easily accessible and high above the road.

Raised high by rear wheels and front axle, body of postman's car rides clear of snowdrifts or deep mud



JANUARY, 1941

Minneapolis Moline Power Complement Co 1939 Esussing St. Minneapolis, Minn.

R926

Bobbie Maynard
Sarahanna
art

Court of
Peace
municipal
Fair



CRASHING

Above, car in air crashing into one on ground in crowd-thrill act. Below, teaching drivers some ambulance-handling tricks to use at war front

Lynch



By Jimmie Lynch

Auto Stunt Driver

222A Mayoria

THE speedometer needle was registering exactly seventy miles per hour when the dynamite cap blew my right rear tire. The car swayed as centrifugal force tore at it. Then suddenly it was bowled over and over.

Sitting behind the wheel, I was straining so hard against my safety belt that the strap cut into my body. For a split second I was looking straight up at the floor. Then the roll-over was completed and the car skidded and lurched to a

POPULAR MECHANICS

Sarahanna Jones
Материя...
Томас

R926 cont. *Emile C. Schaurmacher*
 108 E-66th New York



WRONG



RIGHT

CARS *for* SAFETY

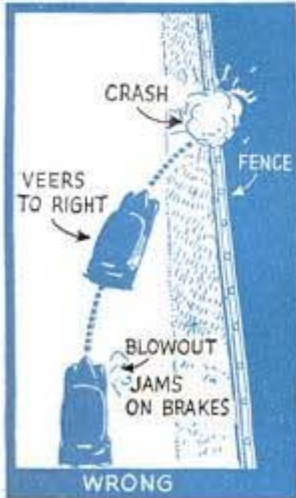
Don. Walker *Levee Chicago*

stop. Unbuckling my safety belt, I squeezed out of the buckled door as officials of the National Safety Council gathered to inspect the wreck. One of them poked the blown-out tire and said: "I guess you've settled the argument all right, Jimmie. The best tires should go on the rear wheels!"

For more than six years I've been settling questions involving safe driving just like that. It's a lot less dangerous for the motorists to let a stunt driver who knows how to take crashes disprove their mistaken ideas about safe driving than it is to



Top, wrong and right grips for taking curve. Right, crashes like this often upset old driving theories. Below, diagram at left shows what not to do when front tire blows out. Diagram at right shows what to do. Photo shows car after front tire has blown out

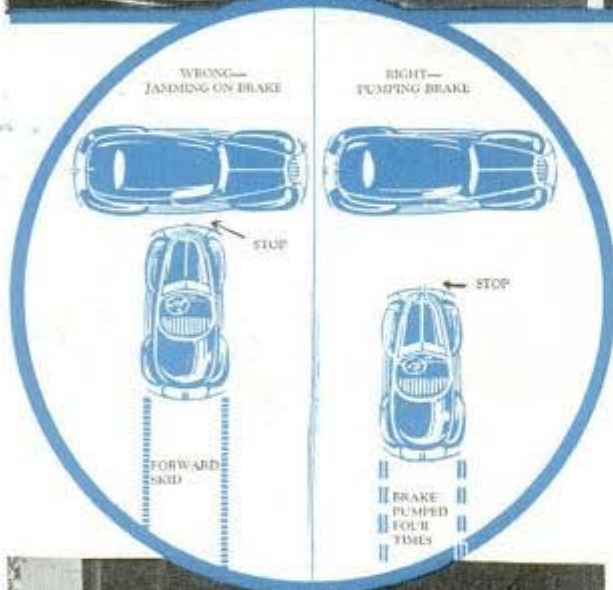


WRONG



RIGHT

1936



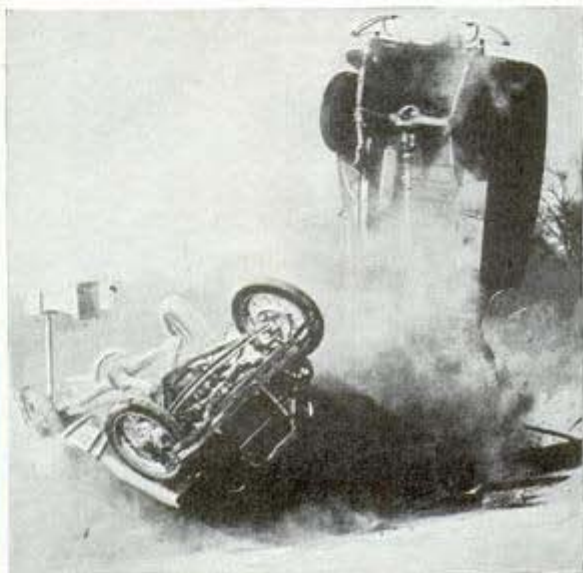
let them stick to such theories and perhaps have a serious accident.

There are a lot of these wrong ideas which have been handed down from the early days of the automotive era. Some of these mistaken ideas didn't matter much when the legal speed of an automobile was twenty or even thirty miles an hour. But since the legal automobile speed has been raised to forty, fifty, and in some states, sixty miles an hour, every driver, no matter how careful or experienced he may be, should check over his own driving and see if it has been modernized to meet present-day conditions.

This modernizing overhaul should include tossing some of the old "horseless carriage" safety myths



Top, right and wrong things to do in skid. Turn front wheels in direction of skid. Circle, pumping brake (right) stops car quicker and is less apt to cause shidding than if brake is jammed on (left). Bottom, left, note skid marks resulting from jamming brakes. Right, in crashes, the author says, leave the ignition on. If fire starts under hood, flames will be drawn into motor by carburetor suction and extinguished



K926



Left, gaining control on flat curve by braking with left foot and accelerating with right. What may happen if brake alone is used in going into curve is shown in photo at right. Diagram illustrates proper method of rounding curve. Below, right and wrong grip for straightaway driving

into the discard in favor of really scientific rules. And I've skidded, rolled over, crashed and wrecked a great many cars to prove that very point. To begin with, there's the belief of nine out of ten motorists that the best tires should be on the front wheels of their car. Ask a driver why he follows this practice and he'll probably say: "If the front tire blows, the steering wheel will be twisted out of my hand. I'll lose control and may wreck the car. On the other hand if a rear tire blows, I can come to a stop all right."

Thousands of spectators have seen me prove that it's much less safe to have the weaker or worn tires on the rear wheels. Traction is very important to combat centrifugal force and when a rear tire blows out that traction is lost. Thus a car is more liable to roll over when a rear tire blows out, and the car's grip on the road is destroyed, than when a front tire blows.

Most drivers believe that the safest thing to do when a tire does blow out is to bring the car to a stop as fast as possible. "Besides that," many of them will add, "it saves the rubber."

Well, it may save the rubber all right but it may not save your life, for here you are playing right into the hands of cen-

(Continued to page 138A)

CENTRIFUGAL FORCE



APPLY GAS AND BRAKE

GET TRACTION



GOING AROUND FLAT CURVE CORRECTLY

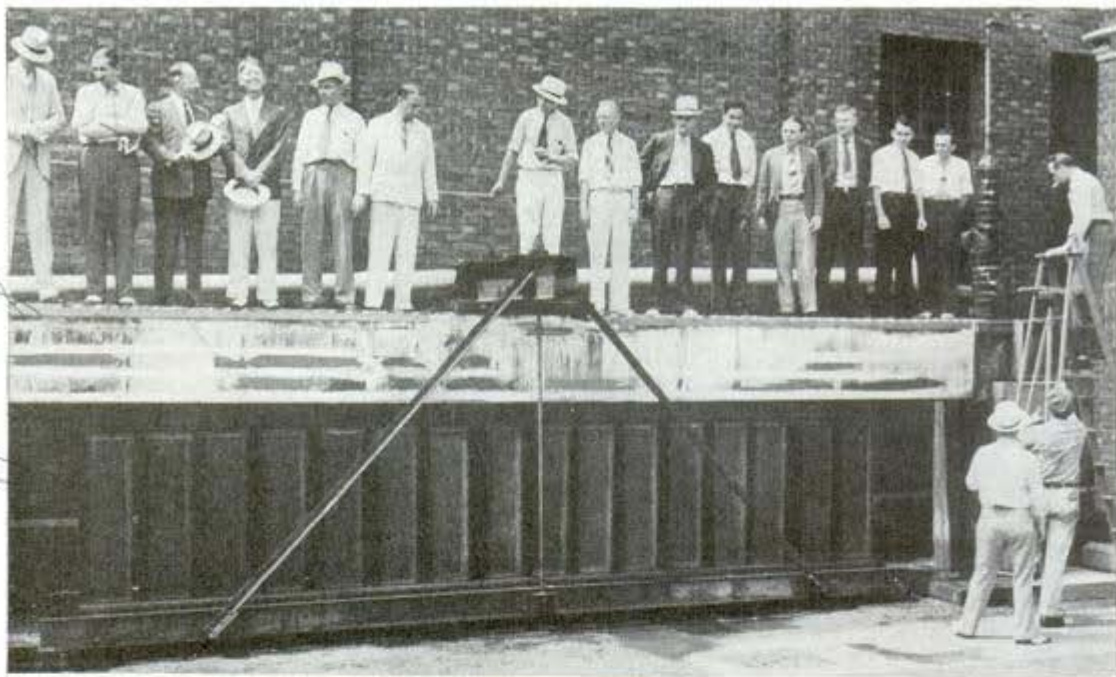


TURN SAFELY

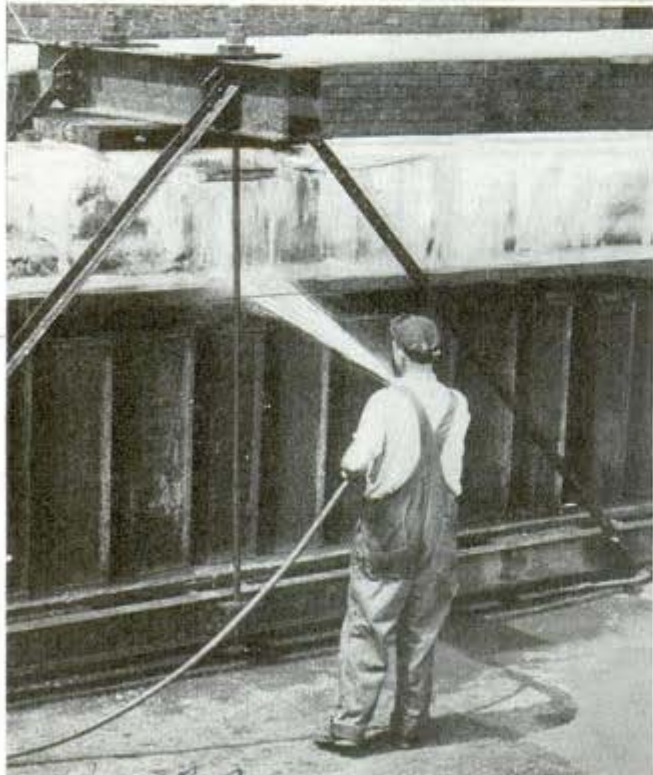


Ice Beam Tested as Temporary Bridge Arch

K 10 2!
Karl P. Billmar, 50 Rockefeller Plaza
New York City



Testing pillar of ice, above, group of men stand on it and water tanks are suspended from cradle in center; note freezing coils in ice beam. Left, spraying coils with pre-chilled water



Use of reinforced ice beams as temporary arches in bridge building is proposed by a New York industrial scientist as an economical substitute for the costlier concrete supports. In a demonstration recently he built a thirty-foot beam of ice, twenty-five inches square in cross section, by forcing a refrigerant through pipes which formed the reinforcement of the ice girder, then spraying them with cold water. The resulting beam sagged only one-quarter inch under nine and one-half tons pressure. The engineer believes ice can be used in many building processes where temporary support is needed, the girder or pillar being removed simply by melting when the permanent structure is completed.

Shifting of Radio Channels in United States to Improve Reception

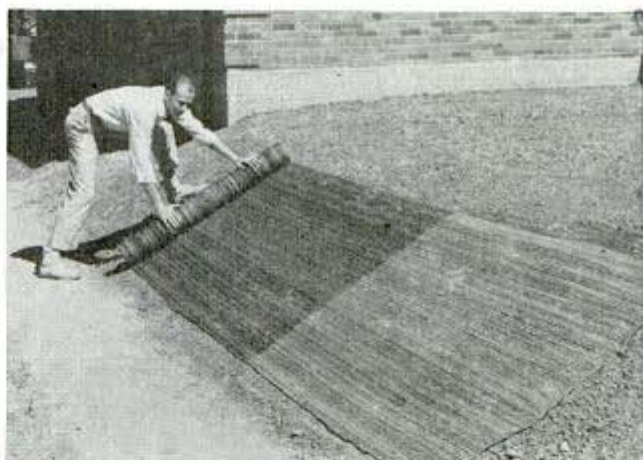
Considerable improvement in reception is expected to result from a wholesale shift of the radio broadcast channels of the United States on March 29, 1941. Listeners, after that date, will find many favorite sta-

tions at positions different on the dial from those to which they have been accustomed. The frequency changes will vary from ten to thirty kilocycles from present dial setting, depending on the location of the sta-

New York Journal Sept. 12.

R 1058

Paper Netting Protects Lawn Seed from Rain until Sod Forms



Rolling carpet of paper netting on lawn to keep newly sown seeds from washing away in heavy rain before they take root

Newly seeded lawns can be protected from erosion in heavy rains by covering them with an inexpensive paper netting. It is made of tightly twisted paper twine, its quarter-inch square meshes forming hundreds of tiny dams that hold the seed and sod firmly in place. Rot-resistant, the net can be removed for future use after the grass has grown two and one-half inches high. It is available by the yard in forty-five inch widths.

R 1042

Postcard-Size Duplicator Run by Hand Prints with an Inked Stencil

Speedy printing and illustrating of postcards are achieved with a simplified duplicator unit including a heavy geared roller, stencil, ink, writing and drawing pen, and the base plate. Stencils may be typewritten or handwritten, and illustrations of all kinds can be copied or traced on the stencil. Cards are set in the base for printing, and the gears at the sides of the base assure good register.



Compact case, left, holds duplicator and all parts. Right, stencil on curved ink-drum prints as it is rolled over card

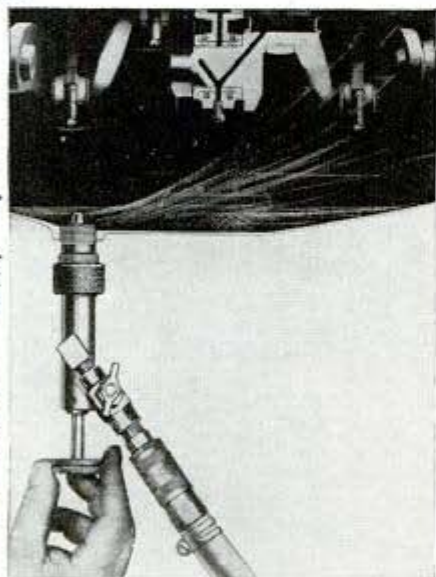
Cardmaster Co.
311 W. Hubbard
Chicago

Bliss Bros. Day Co.
601 S. 4th. St. Lincoln, Neb

tion in the present broadcasting setup. The changes affect 777 out of the 862 stations in this country. For those owning receivers having no automatic or push-button tuning devices, the only difference will lie in learning the new position of a station on the dial. But where the sets are of the push-button type, readjustments will be necessary, in some cases by servicemen, before the sets will bring in a program desired by pushing a button. The purpose of the changes is to eliminate interference due to clashing of adjacent waves and overcrowding of channels with too many stations. Another result will be greater signal strength, according to radio engineers.

R 1027

Air Pressure Sprays Oil to Flush Crankcase



Compressed air shoots shower of oil into crankcase, knob being used to direct it

Attached to a compressed-air line, a small and compact flusher cleans sludge and gum from the automobile crankcase with a strong spray of oil. It takes only four quarts of flushing oil for each job, and since the flusher and not the motor creates the washing action it is not necessary to race the engine. Direction of the oil spray is controlled by a knurled knob on the outside.

The Electric Heat Control Co. 9123 I amon Ave. Ohio Cleveland

MODERNIZING



Top, left, officer watching target at sea. Note end of gun at left. Top, right, 155-millimeter gun on ocean cliff. Center (on this and opposite page), giant rifle firing. Circle, anti-aircraft gun with crew at work

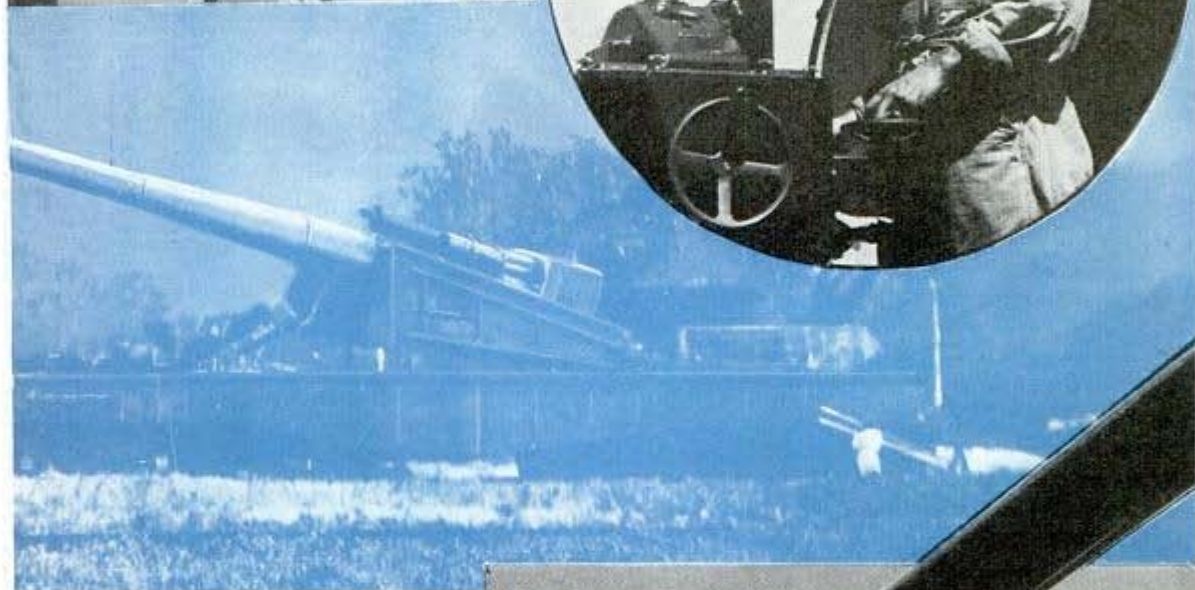
EVERY three seconds the anti-aircraft gun crew was slamming another shell at the target. At 20,000 feet the towing airplane was a tiny speck and the silk sleeve target, half a mile behind the plane, was invisible to the unaided eye. But even if the target had been visible the eighteen men who were serving the three-inch gun and the three other gun crews of the battery were too busy to watch it.

Studying the shell bursts through his glasses, an observer on the other side of the hill

5K
477
Capt. Thomas E. Stinson, Jr.
3872 Franklin Ave., Los Angeles

K797

OUR COAST DEFENSE



called a correction into his field telephone. At the director station near the guns a man turned a pointer of the mechanical brain that was directing the fire, and the new data went out by electric cable to the gun crews.

An anti-aircraft battery can blanket a section of sky with 100 shells a minute. One shell is enough if it hits the target, but the target is so small, so high, and is moving so fast that an effective hit would be sheer luck if it were not for the mechanical director that tells the gunners where to aim. The director is a \$25,000 mathematics machine that digests



Top, left, anti-aircraft battery commander's telescope. One man turns elevation setting, the other moves horizontal setting to follow target. Right, searchlight command post. Bottom, railroad rifle

Ref.: Major U.C. Snell, Adjutant 3rd Coast Artillery, Fort MacArthur, San Pedro, Calif.

K7 77



such information as the altitude and speed of the target, the wind, barometric pressure, and temperature of the air and powder, and from these data determines the point in space at which a shell should burst to score a hit. The firing data are automatically transmitted to the guns where the crews "match dials" to keep the guns trained continuously in front of the target.

Defense against airplanes has become a vital part of harbor defense. Harbors have to be defended to maintain them as safe havens for merchant and naval vessels and to prevent an enemy from using them as landing places. Our important harbors on each coast are fortified against attack by surface vessels, but even the powerful sixteen-inch rifles of the forts are vulnerable from the air. The first thing an invader would do before attacking with his fleet would be to bomb the big guns. Against such a possibility mobile anti-aircraft batteries of the Coast Artillery are constantly practicing.

At Fort MacArthur, overlooking Los Angeles harbor, the anti-aircraft batteries of the 63rd Coast Artillery conduct day and night practice against towed aerial targets. Shrapnel

and high-explosive shells with an effective radius of 100 yards are fired at targets that are towed straight to simulate the sighting run of a bomber, and against targets that are dived or moved in sinuous courses in efforts to spoil the aim.

Loaded on their heavy trucks, the batteries can move along the highways at ordinary road speeds and the six-wheel-drive trucks can carry guns and equipment across rough terrain to get into position.

Part of the present rearmament program of the United States includes large numbers of anti-aircraft guns of heavier caliber with greater range and hitting power than the present equipment. This will help



Top, left, twelve-inch mortar in fortified coast-defense area. Right, firing at night. Bottom, fourteen-inch railway gun commanding approach to Los Angeles harbor

X797

compensate for the advantage that bombers at present seem to enjoy over ground forces. An anti-aircraft battery and a bomber cost about the same and the bombers have the advantage of being able to select one out of many possible targets while the batteries on the ground are impotent against aircraft except those that cross near by.

In a recent maneuver over the Panama Canal a fleet of naval bombers, dropping flares



and dummy bombs instead of real projectiles, made a simulated night attack at 8,000 feet, simultaneously striking at half a dozen points. The invaders won a paper victory and in theory several of the locks were destroyed, due to the lack of adequate numbers of defending guns.

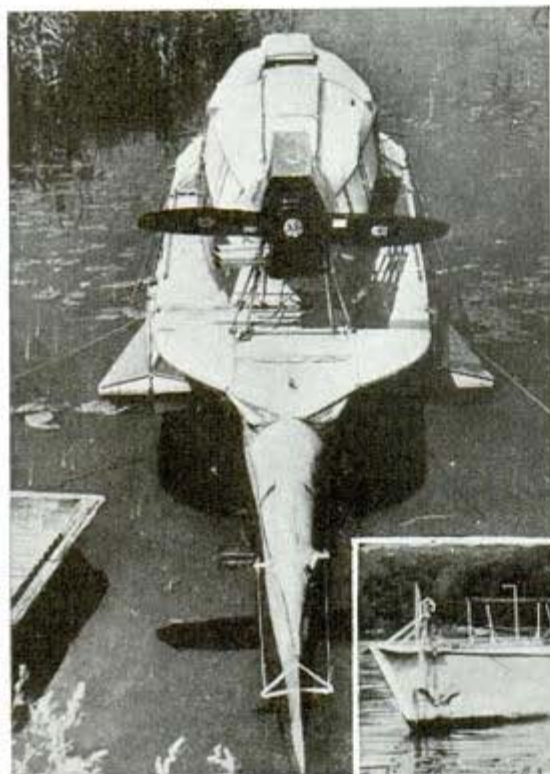
(Continued to page 123A)



Top, gunner pulling firing lanyard on anti-aircraft gun. Circle, airplane sound detector. Bottom, guns of anti-aircraft battery trained on target towed by plane

K1101

Boat Driven by Air Screw Causes No Waves



Driven by an air propeller turned by a small airplane motor, a glider boat developed in Germany is said to cause no waves even when traveling at full speed. The invention of a Cologne engineer, the speedboat is about forty-five feet long. Its streamline cabin is built over a slender hull with a long tail resembling a submarine.

Two views of Germany's "waveless" gliding boat. Left, engine and pusher air-propeller mounted at rear of streamline cabin; note long, tapering tail and broad deck. Below, bow and portside view illustrates overhanging cabin with pontoons at sides to balance ship on narrow hull



Wide World

Long-Legged Lumber Truck Straddles Load to Pick It Up

Loading and unloading is expedited by a lumber handler that picks up a pile of lumber, carries it to the unloading point and

sets it down, all with its own power. Built on four high "stilts" and powered by a V-eight engine, the truck runs over the pile and drops two arms that close underneath the lumber and raise it in one continuous motion. At west-coast yards, where the cut lumber is stacked in specified dimensions as it comes from the saws, it handles huge quantities, individual loads weighing about five tons. Where runs are short, as in loading a ship, it can handle several hundred loads in an eight-hour shift.



Head-on view of self-loading truck equipped to scoop up pile of lumber, haul it away, and set it down under its own power

76 The Dallas Machine and Locomotive Works Dallas, Oregon

U. S. Plans 70,000 Miles of Military Highways

Plans for the construction or improvement of more than 70,000 miles of strategic military highways in the United States are being made by the Public Roads administration with the advice of the War Department. Having observed the efficiency of swift mechanized transport on the German system of mili-

K1083

tary roads, military men in this country want to improve the facilities for high-speed transport of armies and goods in the event war comes to this hemisphere. Already construction of more than 3,000 miles of roads to army cantonments and bases has begun. The new Pennsylvania Turnpike, built for hundred-mile-an-hour travel uninterrupted by cross traffic, probably will serve as a model in the planning of other main arteries. Besides the domestic improvements, completion of the Pan-American international highway linking North and South America is being urged.

K1085

Rescue Sled Helps Injured Skiers Needing "Lift" Back to Camp

Rangers on duty in Yosemite national park in California have a new rescue sled which they affectionately call "The Bath-tub," because of its troughlike shape. Of all-metal construction, it replaces the wooden toboggan for hauling skiers who suffer injuries on the ski slopes. Not only can the sled be pulled both forward and backward, but it may be swung sidewise if required by the terrain. Giving an even distribution of the weight of his body, the shell-type design assures the greatest possible comfort for the injured person.



Metal sledge replaces toboggan for rescuing skiers injured on snow slides of Yosemite national park

Pump Runs Hydraulic Ram to "Iron Out" Dented Cars



Electric pump in foreground provides hydraulic power for tool being used on crushed back panel

Hydraulic power supplied by a portable electric pump operates rams used for straightening bodies and fenders of demolished automobiles. Working on any 115-volt circuit, the equipment includes a kit of rams for various types of work. The pump weighs only thirty-two pounds but powers any ram from four to fifty tons capacity. Its operating button can be pressed with the foot if both hands are occupied.

K1017

Wood Ink Pad for Rubber Stamps Keeps Free of Lint and Gum

Made of specially treated wood, a stamp pad that always retains the same texture and never catches lint nor gets gummy is available. When pressed on the wood, stamps get an even distribution of ink without becoming smeared. Additional ink is easily applied when the pad dries. The base is of thick rubber.



JANUARY, 1941

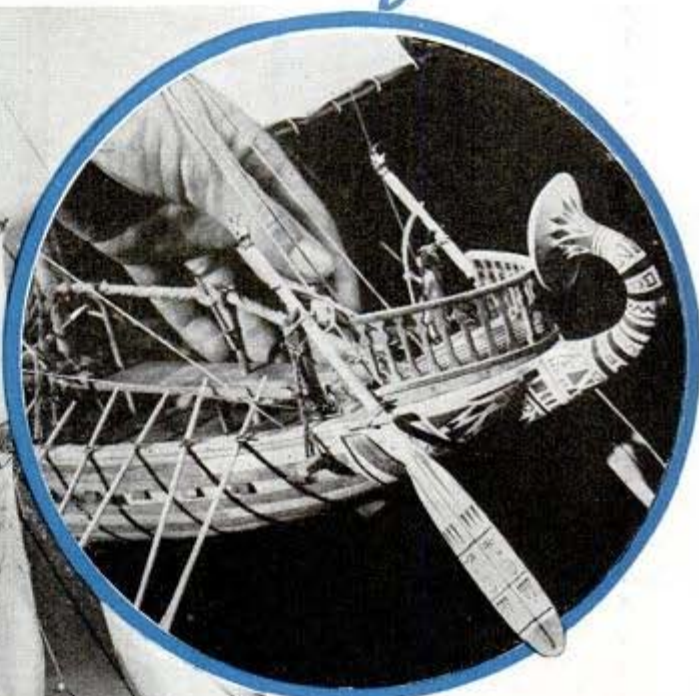
Mr. Bartley Leavelle

Lunette Products, 1029 S. Wabash, Chicago

Blackhawk Mfg. Co. - Milwaukee Wis
53225 W. Rogers

MAN'S CONQUEST of SEA

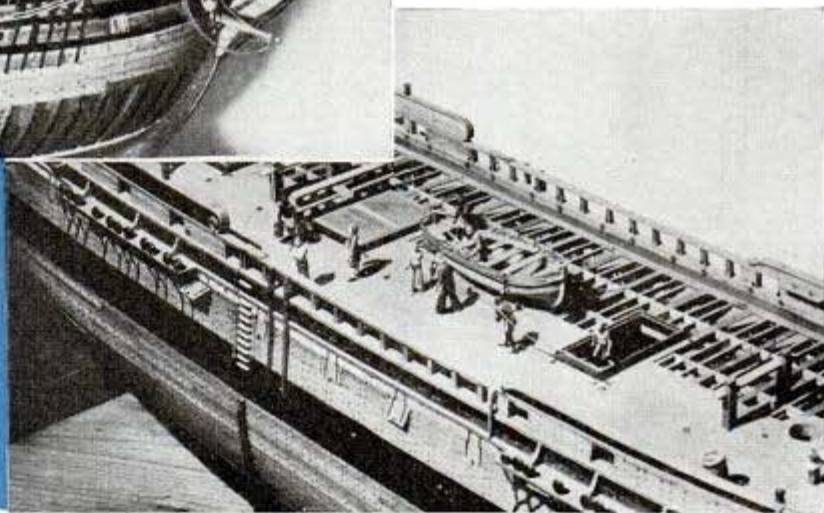
R933
 Mrs. R. de Witt Miller 457 S. Ferrano Ave
 Los Angeles Calif



Los Angeles
 226 1/2 Hill

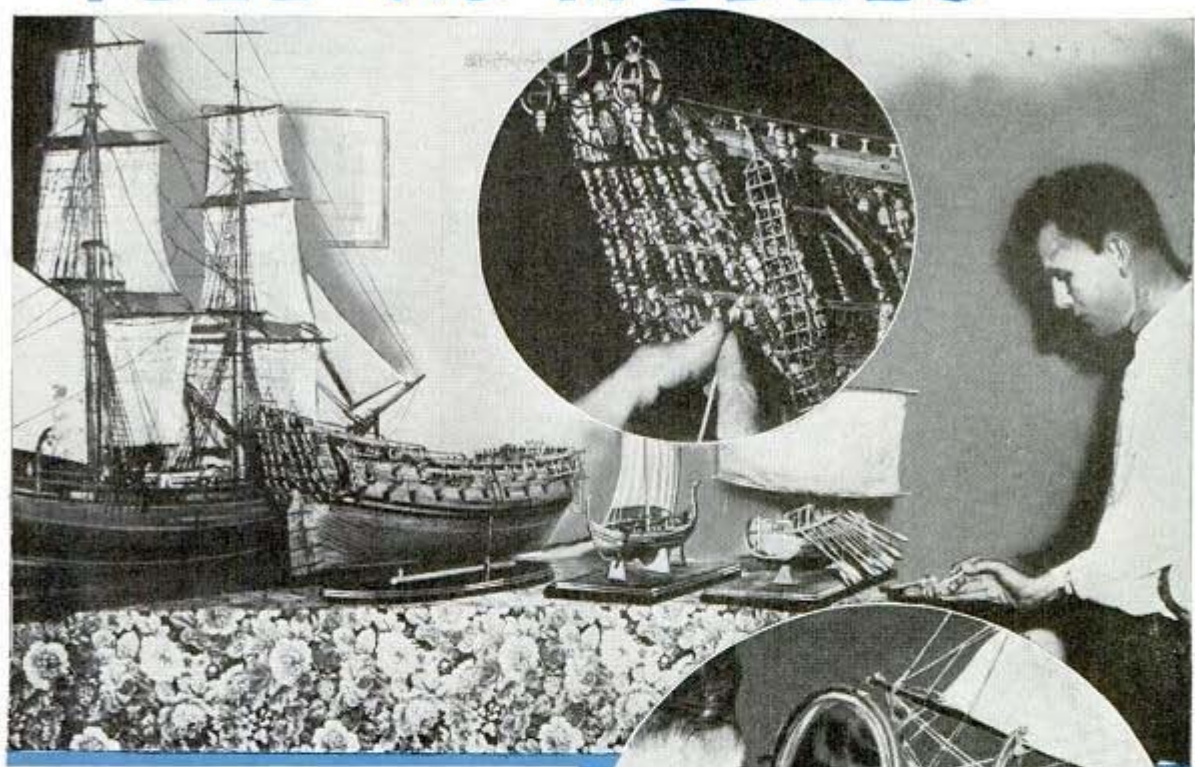
For fifteen years August Crabtree, sculptor, has been reconstructing in models, all in identical scale, the story of man's conquest of the sea. Raft, dugout, Egyptian galley, the "Mora" in which William the Conqueror sailed to invade England, and on through history. He used 140 kinds of wood, building keel, ribs, timbers, planking and deck of individual timbers just as original ships were constructed

Above, model of U. S. brig "Lexington" used to plot action in filming movie "Captain Caution." In circle, prow of Egyptian galley, with enameled designs on figurehead and oars. Part of the "Britannia" of 1805 (right) was left open to show internal construction

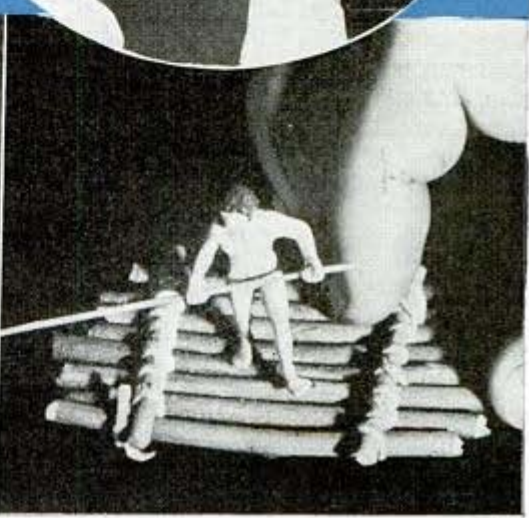
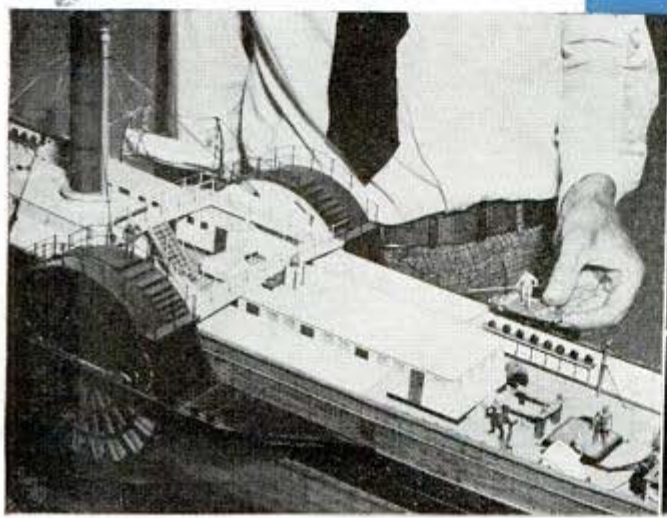


K933

TOLD *in* MODELS



Above, left to right, the "Lexington," 1775; the British "St. Alban's," 1685; William the Conqueror's "Mora," and Egyptian galley of 1600 B.C. Stern of "St. Alban's," in circle at top, shows some of more than 300 carved figures on the model. Right, adjusting rigging on the "Lexington" under a magnifying glass. Below (left), the side-wheel steamer "Britannia" of 1840 took a year to build, has 1,400 copper plates on its hull; (right) tiny model raft with its sculptured primitive figure represents man's first step toward navigation. All models are built after painstaking research into the originals



K.1087

Curved Skis for Indoor Use Put You in Shape for Winter

European invention



Pair of "rockers" enable skier to put in some pre-season practice at home, conditioning the muscles and improving "balance" for winter sport

Before skiing weather arrives you can practice in the parlor. Novices who are just learning the fundamentals, and experts who want to limber up their muscles in advance of the winter sports season can put in some preliminary training with a pair of narrow, curved pieces of wood with straps for the feet. With this equipment, and at no risk to the furniture, you can practice the start, the turn-stop, the Christiania, the about-face, and perform a variety of hardening exercises.

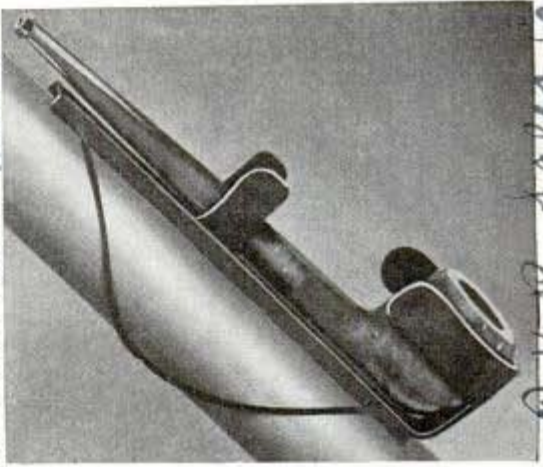
Flames between Walls Located with "Hot-Spot Detector"

Millions of dollars in fire losses may be saved annually with a heat detector, resembling an elongated camera, that flashes a light when its "eye" is pointed at walls behind which a fire is burning. Variations in the wall's temperature bring into action a thermal cell developed by Dr. Hammond Vinton Hayes, electrical engineer, with

collaboration of Philip N. Smith, electronic expert. It was tested at a recent fire when walls were ripped open after applying the "hot-spot detector." Wherever it responded with warning flashes, flames were found behind the walls; but at points where the instrument failed to respond, there was no fire. A reliable method of detecting flames within walls would reduce damage caused by ax work necessary under present conditions and by fires breaking out anew after firemen leave.

Clip Holds Hot Pipe on Steering Post of Automobile

Solving the pipe smoker's problem of finding a safe place to put a hot pipe while driving, a holder now available fastens to the steering column where it is convenient to reach. Made of metal with suede-like finish that protects the pipe and steering post from scratches, the holder is adjustable to take any size or shape bowl.



Driver can stow hot smoking pipe in this holder on steering column where it is safely out of the way

not on market in U. S.

253 Summer St. Boston, Mass.

K1056

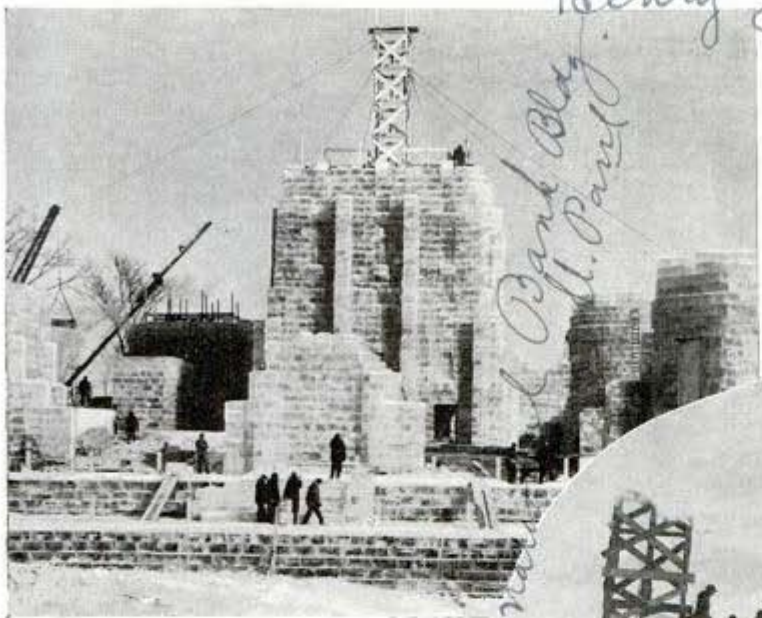
Boston, Mass.

K1043

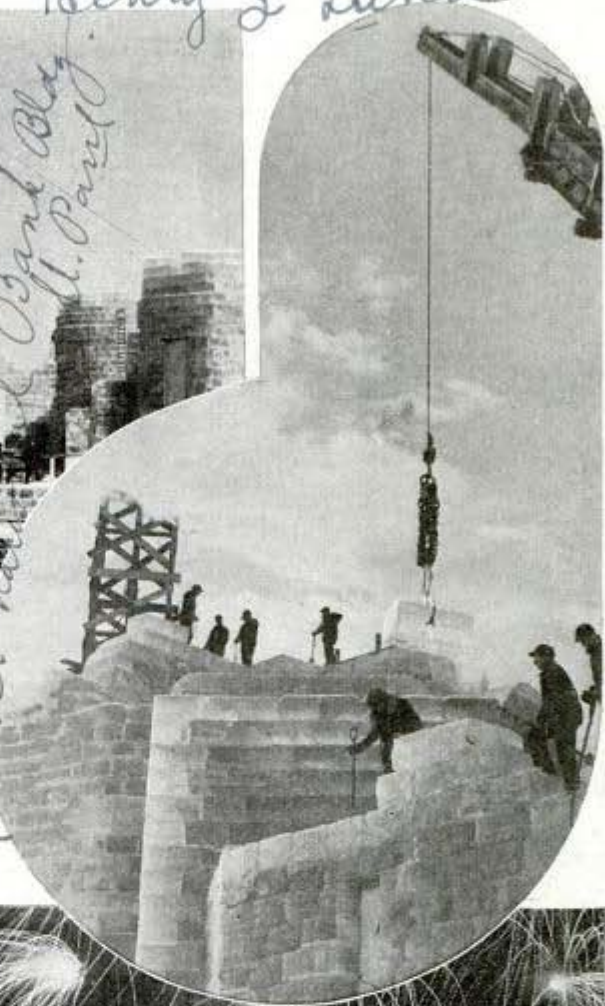
Managing Director

'Fairyland' Ice Palace Erected for Winter Fete

Henry J. Lund



W. J. Paul
O. Paul
H. Paul



Above, palace of ice going up; derricks and tower hoisting heavy ice blocks to top of walls where men (at right) set them in place. Bottom, fireworks breaking over resplendent palace add blaze of color to winter carnival

As a special feature of the annual winter carnival in St. Paul, Minn., there is erected a magnificent ice palace as amazing as a page from some fairy tale come to life. Built of approximately 20,000 blocks of ice weighing some 5,000 tons, the structure is replete with battlements, towers and pennants. At night hundreds of concealed, varicolored lights illuminate the translucent blocks. It requires ten days of laborious work for 600 men to construct the palace, at a cost near \$20,000. The ice blocks are held together by cutting grooves in the lower block and filling them with watery slush. In some cases chicken wire is used to reinforce the bond.



K123

Large Supply of TNT Assured by Discovery of "Cracking" Process

Mass production of toluol, basic raw material of TNT, is made possible by a revolutionary process that uses petroleum as the source. Heretofore, toluol, a liquid of the benzene family, has been obtained from by-products of coke and from ordi-

nary illuminating gas, and during the first World War there was a shortage of the material. The new method, involving the "cracking" of petroleum under pressure somewhat as gasoline is made, promises ample quantities in the future.

JANUARY, 1941

Humble Oil and Refining Co. 81
Houston, Texas

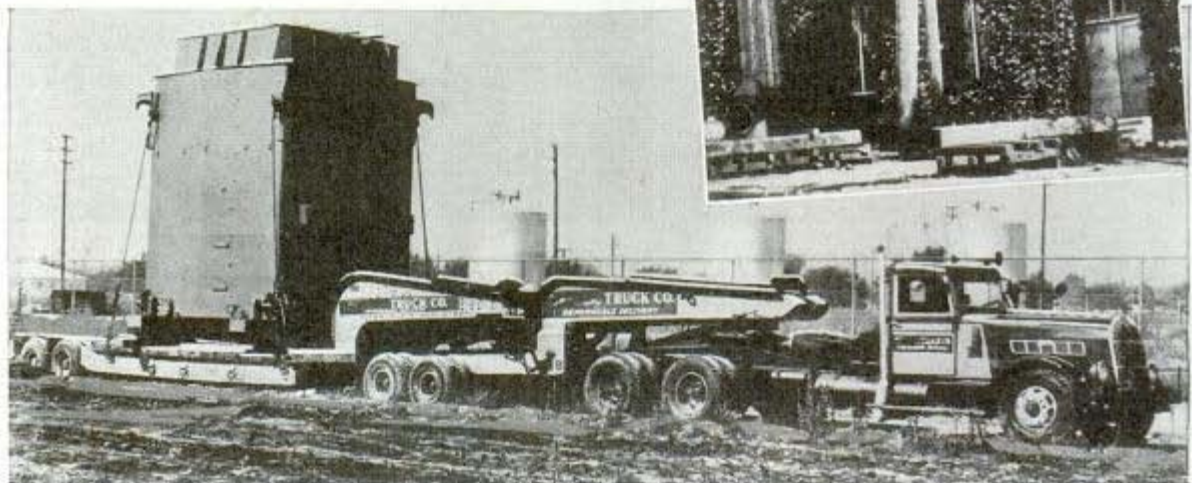
NOTHING'S TOO BIG



Easing 150-ton load from flatcars to barge (above) without a splash was a ticklish job. Right, hoisting forty-ton sugar dryer into third floor. Below, the seventy-nine foot "Jeep" rig with forty-two wheels hauls a big transformer

PAUL BUNYAN'S big blue ox, Babe, is credited in lumberjack legends with ability to lift anything that had a top to it, and to pull anything with two ends. But Babe died because she wouldn't drink petroleum, which is the only fodder that counts nowadays, and her reputation for deeds of dexterous strength has come down to a big trucking and rigging company that operates on the Pacific coast.

If there were thirteen Statues of Liberty, in-



Cont. William Lawton Wright, 580 Market St. San Francisco, Calif.

2907

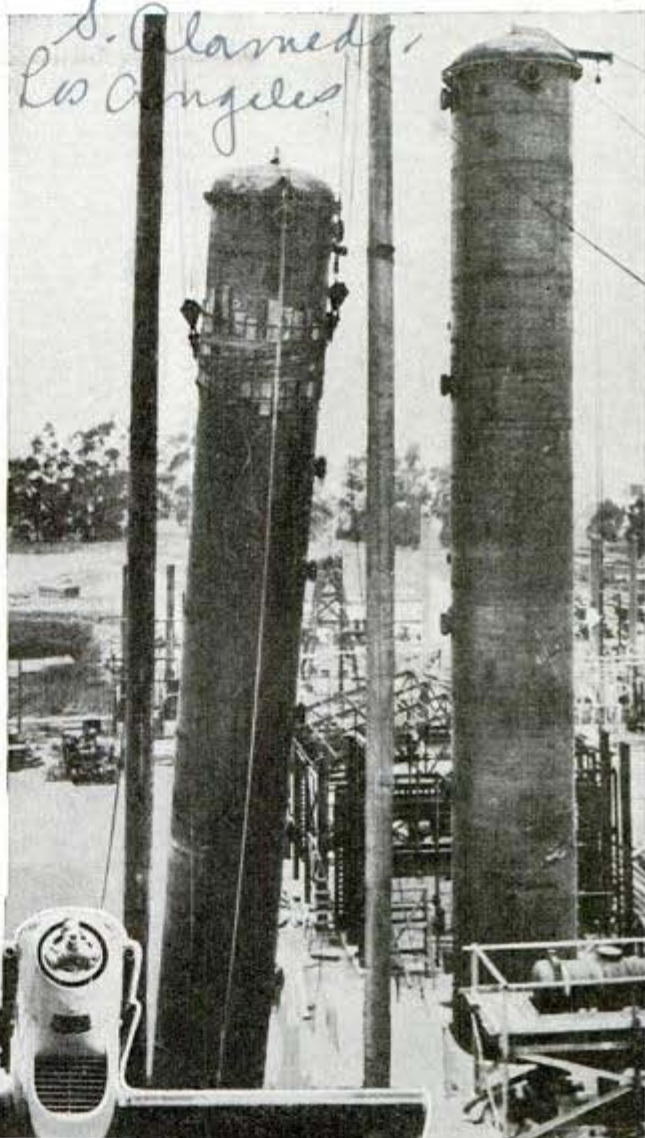
Belyea Truck Co K947
6800 S. Alameda, Los Angeles

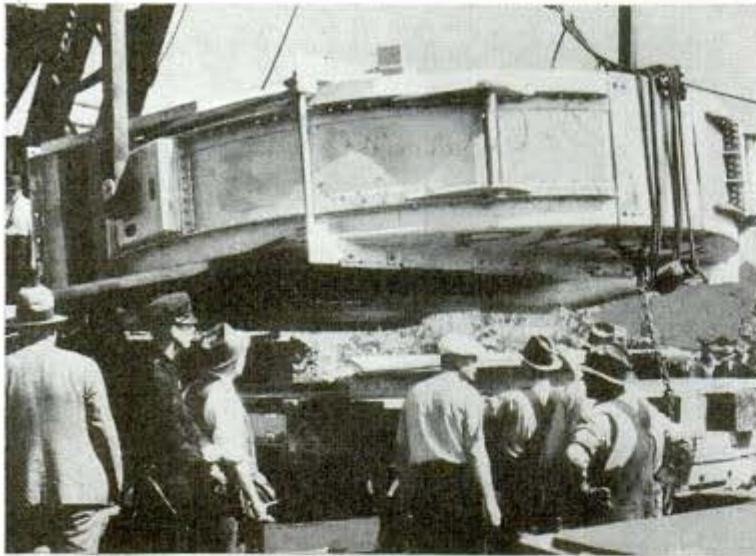
for the SUPER-MOVERS

stead of only one, the four Belyea brothers and their three corporations could lift or haul all of them at once, pound for pound. They have combined modern truck transportation with the ancient science of rigging, on a grand scale that makes them unique. Experts say no other concern can tie them at moving the crushingly heavy, ponderously unshapely pieces of equipment which are coming into increasing industrial use.

This fame roots back to 1930, when (because nobody else would try it) the brothers trucked a huge plastic-cooking kiln 110 feet long, 115 tons heavy, for twenty-six miles and winched it down a twenty-per-cent grade for half a mile. The winching alone took days, for they had only 220 square inches of leg-powered brake lining on their truck-trailer. Today, riding 3,000 square inches of air-brakes, they would forget the

Top, setting up "reaction columns" in a refinery. They weigh 110 tons each and are 100 feet high. Below, the Soviet trans-polar plane, after its Moscow-California flight, travels the last 100 miles by road





river beds with water swamping the cab floors.

They'll unload a 150-ton refinery reaction column for you, rolling it from three flatcars direct to a barge—and the barge won't upset, either. With the weight always on dead center, transferred from centered skids to centered bolsters, it will just sink deeper into the water. Or they will haul that column into a refin-



At top, the priceless 200-inch mirror for Mt. Palomar telescope is gently transferred from flatcar to trailer. Below, an eighty-five ton dragline rolls along on the "Jeep." The slender boom is seventy-five feet long

winching and roll down that hill in fifteen minutes.

The four brothers—Brynn, Bob, Jack and George—specialize in these "screw-ball" jobs, the big stuff that nobody else can handle. They keep 287 pieces of heavy equipment and an average of nearly 300 men busy at it. If your eighty-ton dragline shovel falls into the river, they will fish it out for you that same afternoon. If the railroads are paralyzed by floods, they will even carry the mail. They did it once in Los Angeles, for five whole days, jamming their trucks through flooded

ery and set it up on end, just a few feet from a live butane plant, where a single spark or a "drop" would overwork fire departments from miles around.

They'll move a high-tension power-line tower without even asking you to shut off the 66,000 volts that are zipping through the lines. They did this in 1940 for Southern California Edison, when there was no convenient detour for that river of electrical energy. It was a two-legged tower, weighing fifty-five tons and carrying thirty-three "hot" wires—nine circuits of 66,000 volts each, and two 16,000-volt cir-

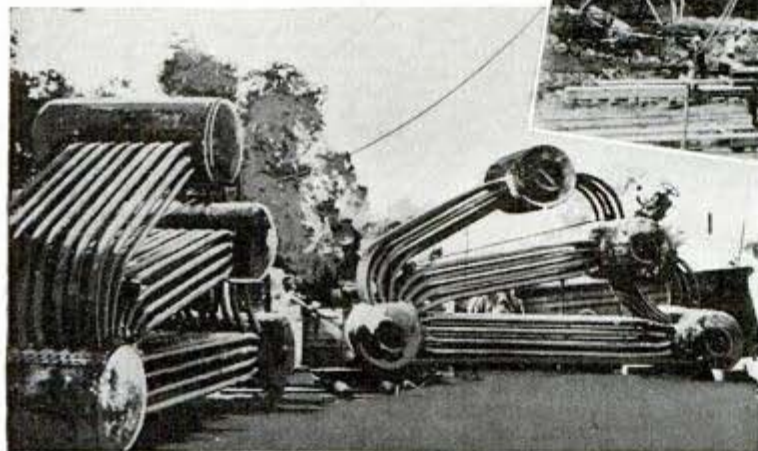
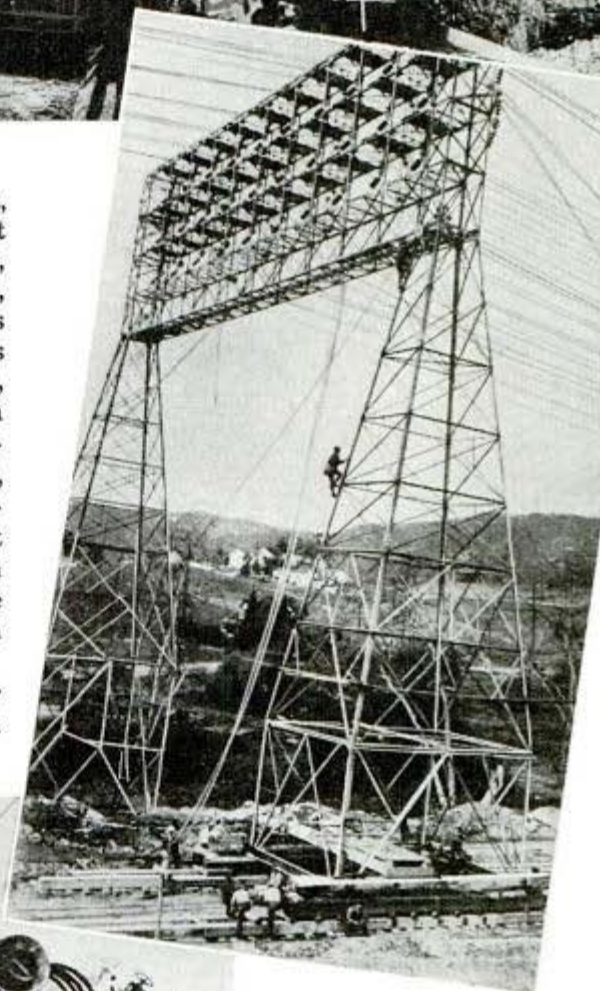
cuits—on the high bridge between the legs. The job had everybody scared.

Edison linemen rode the top of the 130-foot tower, rigging insulated pulleys for the wires and easing them through, but the movers were in charge up to ten feet off the ground. For two weeks crews laid smooth timber tracks to the new base. They set the tower on sixty tough orangewood rollers, and guyed it in every direction. When all was ready they moved it, 212 feet in four hours, so gently that the top of the spidery structure was never more than a quarter inch off its true course.

If it's highway transport you want, these movers will haul 148-foot girders, weighing fifty-four tons, through downtown Los Angeles, squeezing them around corners with inches to spare. They do this at night, to avoid scrambling traffic, and the long load is festooned with red lanterns. An electrical transformer that weighs at least 100 tons, on the other hand, rolls to its destination almost as casually as a suit of your clothes comes home from the cleaners, for these men have developed rolling stock to match the size of their freight.

Star of the moving fleet is their "Jeep," a dolly trailer with sixteen

(Continued to page 118A)



Palm trees forty feet high and weighing up to thirty-three tons (top) travel in traffic to decorate new Los Angeles union station grounds. Center, 130-foot tower carrying live 66,000-volt lines was moved 212 feet in four hours. Weird tangle of boiler tubing at left is typical of odd cargo

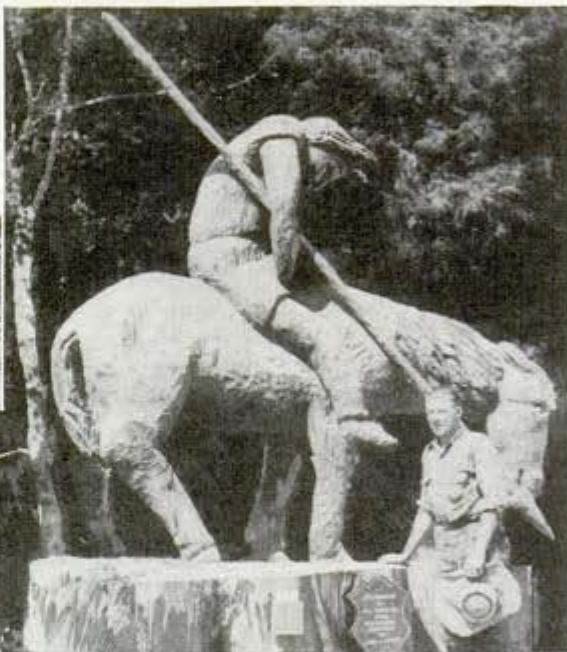
Blackburn's
Crescent Park

Forest Sculptor Chips Figures with Hand Ax

With only a Boy Scout hand ax, and on rare occasions a knife, a twenty-three-year-old sculptor on the Pacific coast carves giant figures from the native woods. Chipping rapidly in a cupping motion, he turns out familiar figures of the movies, radio, and comic strips; deer, bears, frogs,

Indians, owls and fishes, covered wagons and stagecoaches. At Crescent City, Calif., he hewed a 120-foot totem pole. In one park is a huge horse and rider, the "End of the Trail," carved from a solid piece of redwood except for the spear, which was hewn separately. He works with pine, palm, eucalyptus, fir and redwood. Shaping a gorilla or a mule from redwood, he sticks shredded bark on the figure with waterproof glue to give an almost natural appearance of hide or hair. In six years the ax sculptor has carved 2,800 pieces.

Ambrose Bernierke
Eashevville, Calif.



Top, left, young carver hacking at redwood log that is taking shape of an Alaskan owl. "End of the Trail" group, above, was hewn from solid piece of redwood, with exception of spear which was fashioned separately. At left are toad and toadstools also carved from redwood with a Boy Scout hand ax. Hundreds of samples of his handiwork may be seen on estates along highways of the west coast

"Electric Brain" Solves Complex Problems by Long-Distance Wire

Complex mathematical problems punched into a keyboard recently in Hanover, N. H., were solved by an "electrical brain" located in New York City and the answers sent back quickly over a teletype. The new long-distance computing robot,

made up of standard telephone-dial switching equipment, was developed in the Bell Telephone laboratories to help in designing thousands of intricate circuits and pieces of apparatus involving knotty mathematical processes. Instead of being made mechani-

Science Service
Sept. 4

Ind. Div. of R. G. Stibitz
Bell Telephone Laboratories
463 West St. New York

K964.

cally out of wheels, cams and gears, its mechanism consists of intricate electrical relays and crossbar switches; the keyboard is like the one that an operator of a manual exchange uses for dialing a number on a dial exchange. With this robot calculator the average problem is solved in a third of the time taken by conventional computing machines, multiplication is twice as fast and division about four times as fast. The computing work necessary on problems in connection with a long-distance line, usually requiring six months, will be done in six weeks.

K982

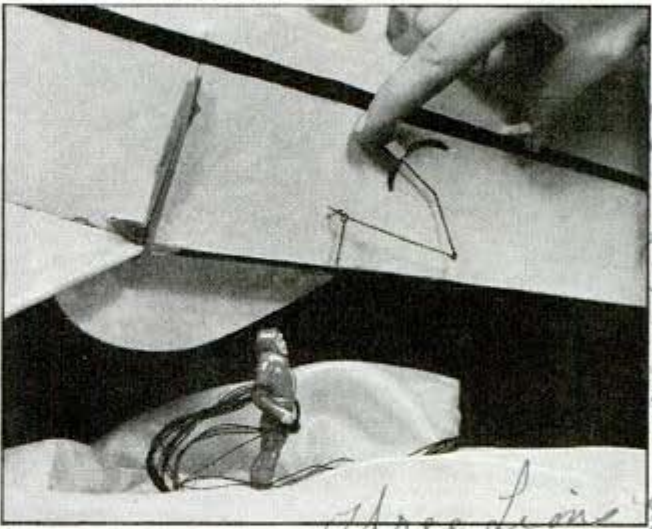
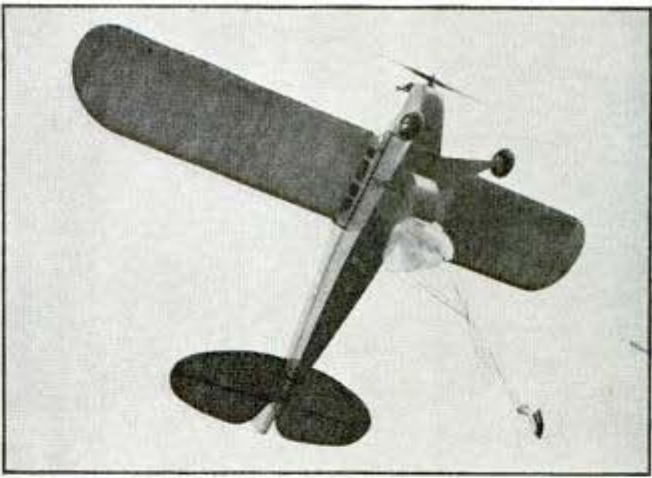
'Light Wells' for Windows Keep Basement Dry

Foundation lines of homes with windows at ground level are improved in appearance with corrugated metal area walls, now on the market, which prevent water from entering the basement but admit more light through the windows. The half-circle wall fits into a well dug outside the window, being attached to the house by means of masonry nails.



Corrugated metal walls keep water from entering at windows and let in daylight

Model Plane Drops Parachutist When Timer Stops Engine



Top, tiny parachute jumper leaving plane as trap door springs open. Bottom, this wire stops engine and releases parachutist

Inside the gas-engined model plane a tiny parachute soldier is waiting to make his jump. The plane buzzes up into the air, and as it levels off in full flight a timer suddenly cuts off the motor. At the same instant the timer presses a lever on the side of the fuselage to the point where it releases a wire, and the hinged trap door in the floor of the plane drops open. Out plunges the two-and-one-half ounce soldier, to drift down by parachute as his plane floats to earth. The plane and its parachutist were built by a young Syracuse, N. Y., mechanic, who has been a model-plane fan from childhood. Copied after a popular high-wing monoplane, the model weighs three and one-half pounds; its silk parachute is three feet in diameter.

Paper Cut

In 1900 it cost the average driver thirty cents a mile to own and operate his automobile; today the average is under three cents a mile.

Auto Manufacturers Assn. 87
Transportation Bldg
Washington D.C.

Saint Paul Corrugating Co., South end

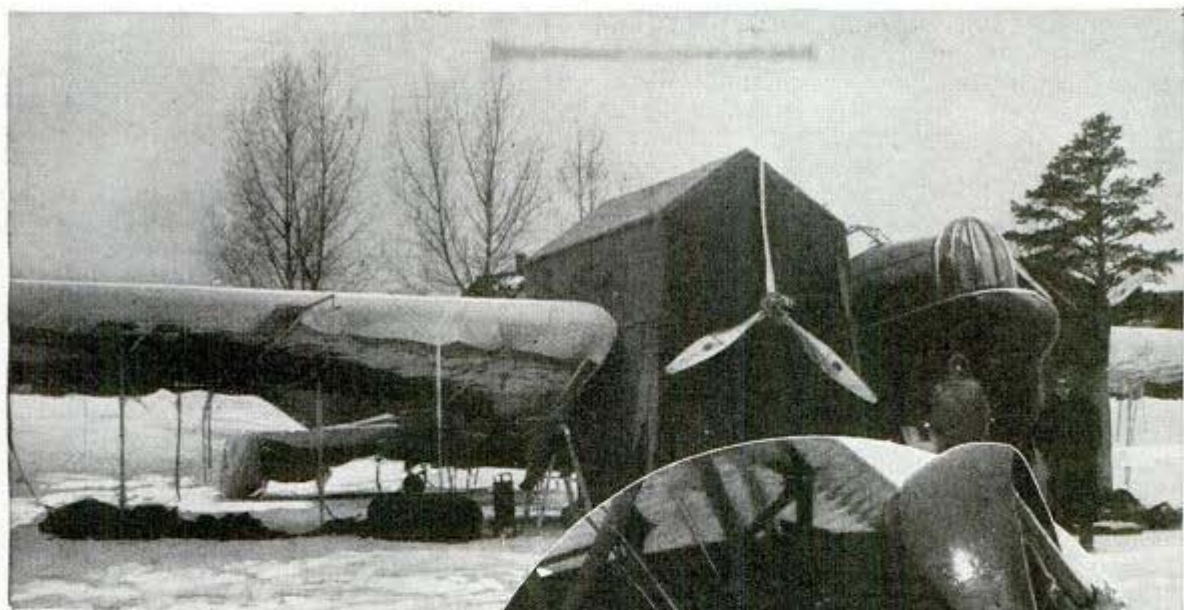
Wabash Bldg
St. Paul Minn

Charles Brennan, Syracuse
Apprentice Training School

Built by

X1024

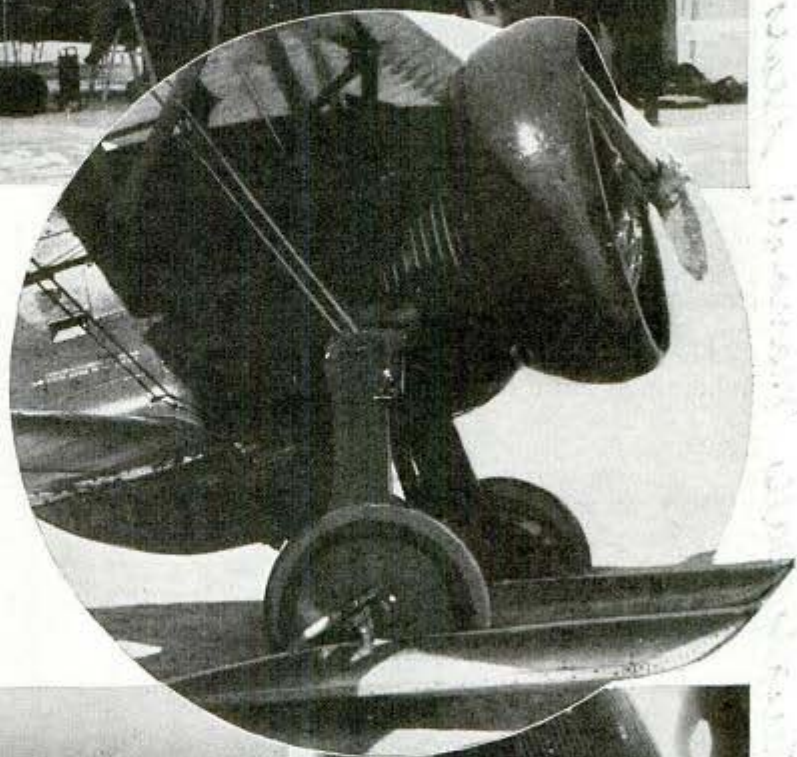
the BIG BOMBERS



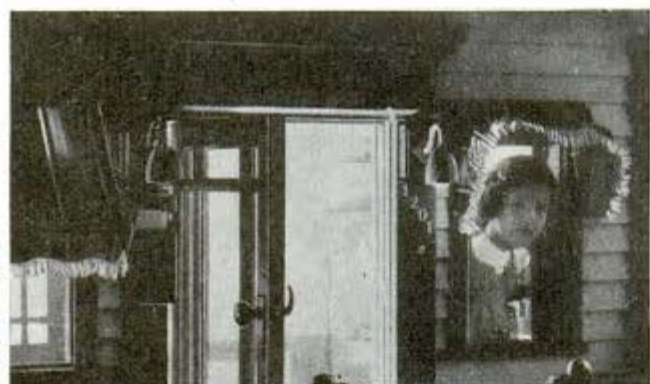
*Above, plane in "overcoat."
Circle, bomber on skis.
Bottom, left, snowplow
clearing flying field. Right,
tire with built-in "chains"*

which reduces the adhesion between the ice and the rubber. Within the shoe are air ducts to which a pulsating air pressure is applied, alternately inflating and deflating the shoe, thus causing the ice to break off as it forms.

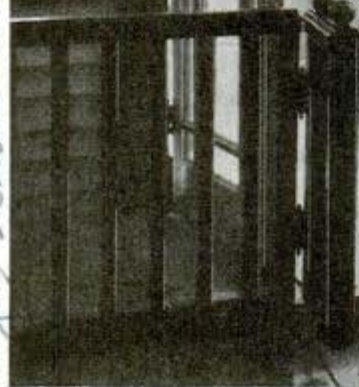
(Continued to page 131A)



Child's Playhouse Is Built Like a Real Home



At left, the owner lifts the awning for a peek out the front window. Below, Mr. Sundheim sits on the front porch checking over his plans with the finished playhouse. Notice the radio and dropleaf table in the interior scene, bottom



When he decided to build a playhouse for his small daughter, Harry G. Sundheim of Chicago had only a home workshop without power tools and a set of plans for a tiny doll house which he had obtained from Popular Mechanics. He "blew up" the doll house plans to the size of a playhouse and went to work. A year later the job was done—a one-room house six feet by six and one-half feet, including its open porch with swinging gate, and four feet high with a glassed door three feet high. It is built like a real home, with a sturdy frame, standard composition roofing laid over tarred felt, a colored rubber tile floor on a felt base, and even foil insulation within the walls. On each side are nine-light glass windows opening outward, except the front windows which, shaded by awnings, open in. The inner walls are ply-

wood, and there are corner cabinets and niches in the walls for the midget radio, doll furniture, pictures and bric-a-brac. The house is wired, being lighted with tube lamps and lamps on each side of the front door. There is even a doorbell and a mailbox. No detail was neglected. Al-

Built by: H. G. Sundheim, Building Materials Sales, Sears Roebuck & Co., Chicago

though the playhouse is indoors, nearly filling a sunroom, it has eaves, and a drainpipe which was made from an apartment speaking tube. On one inner wall is a small crank. Give it a turn and you hear a toy music box, built into the wall. Under one window, indoors, is a dropleaf table.

K1113
Roll-Chart in Tester Tells Anti-Freeze Needed by Auto

Anti-freeze solutions in automobile radiators may be tested quickly with a self-calculating instrument that shows at a glance how much full-strength fluid should be added for complete protection. It automatically calculates the freezing temperature and specific gravity of the liquid. If



protection is inadequate a roll chart, drawn out from the side of the instrument, tells in quarts just how much more anti-freeze is needed for any desired temperature. Besides alcohol and methanol mixtures, the chart includes Trek anti-freeze, Prestone, Zerone and Zerex.

K1113
Sand-Filled Practice Bombs Help Train Flying Raiders



"Duds" being loaded with sand through big funnels to give them the same weight as real bombs. They are used by army bombers in target practice

Hundred-pound bombs that never "go boom" are used for target practice by bomber crews of the U. S. army air corps. Before loading them on airplanes, army men fill the "dummy" bombs with sand, using large funnels.

K1108
New Army Warplane Rides a Trailer on Its First Trip to the Airport

Some of the fighting planes built for the U. S. army make their first trip in a trailer carriage designed to transport a complete unassembled airplane. The distance traveled is eight miles from the factory to Buffalo airport, where the airplanes are assembled and delivered to the army.



Still grounded, new planes for U. S. army "hitch-hike" on trailers to airport for assembly. Here a Curtiss P-40 pursuit ship is being towed

Caehlmann, 2332 W. Logan Blvd. Chicago

*Arrangement of pieces
 The Arnold Smallwood Hawaii Corp.
 Sgt. Leung
 Lt. Seeger*

March Field Riverside Calif

March Field Riverside Calif

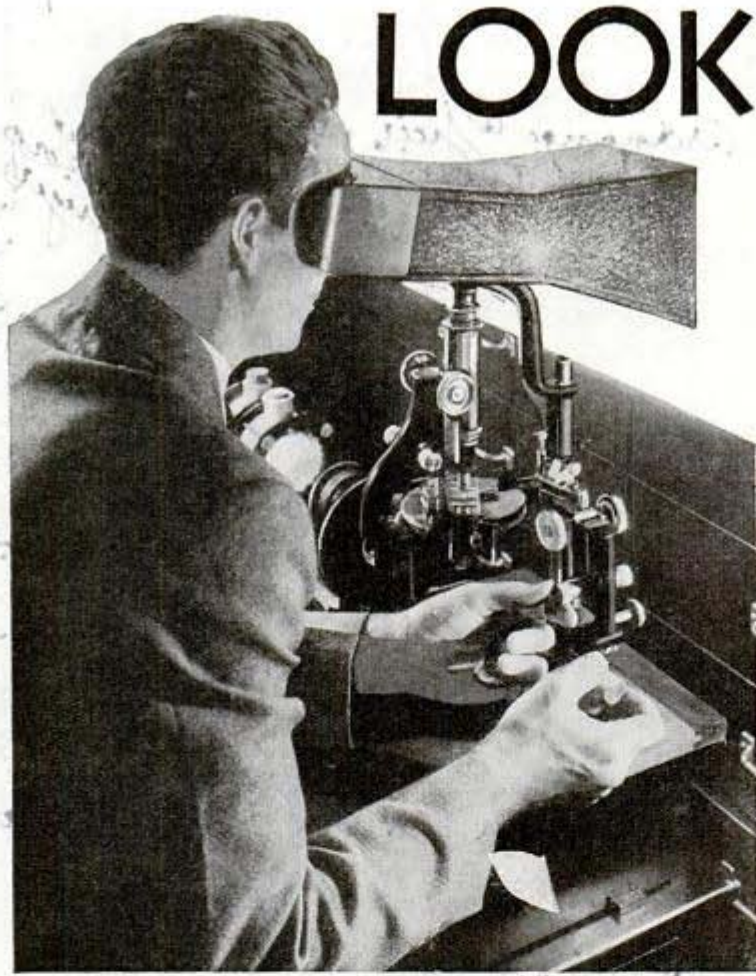
Curtiss Wright Corp. Buffalo, N.Y. Vulcano

R 693

463 West of
New York

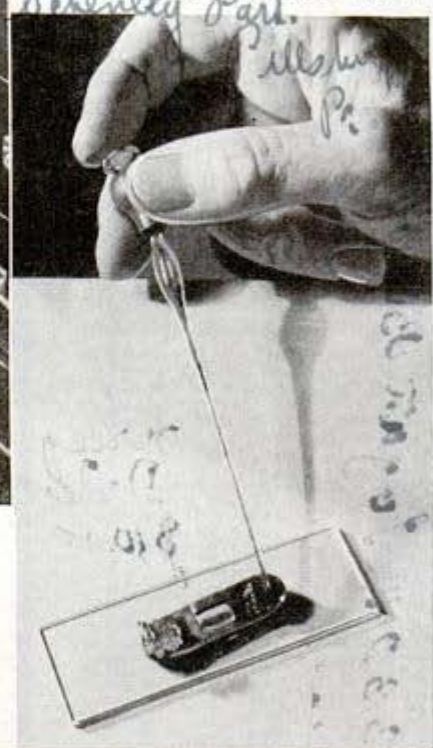
LOOKING for

Subjects



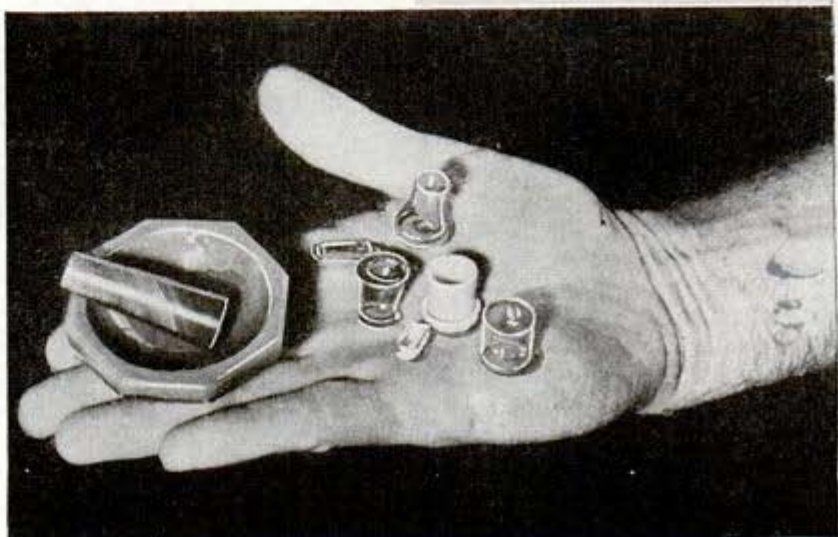
Micromanipulator, left, in use in detecting thin films in Bell Telephone laboratory. Below, material being drawn up from electric contact by capillary action into micro-pipette, and typical micro-chemical apparatus held in palm of hand

Bottom photo: Courtesy Coal Analysis Laboratory, Carnegie Institute of Technology



IMAGINE, if you can, a drop of water one five-billionth as large as a drop from a leaking faucet. Far too small to be seen with the human eye, that drop is large enough for the scientist to detect in it as little as one-millionth of a microgram of iron.

To get some idea of just how small that amount of iron really is, suppose we visualize one ton of coal. Let's divide the ton into one million parts. Each part weighs one gram. Then we split the gram into one million parts, each of which weighs one microgram. If your imagination isn't stretched to the breaking point yet, let's now divide the microgram into one million parts—and here we have the answer. One of these invisible specks of coal dust—literally next to nothing—is equal to the infinitesimal amount of



K69.3

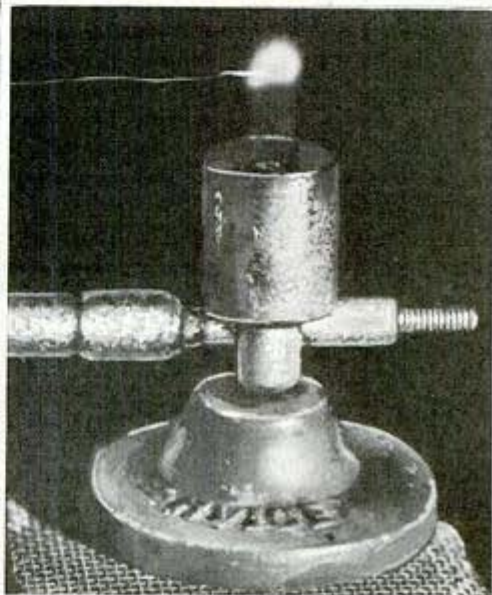
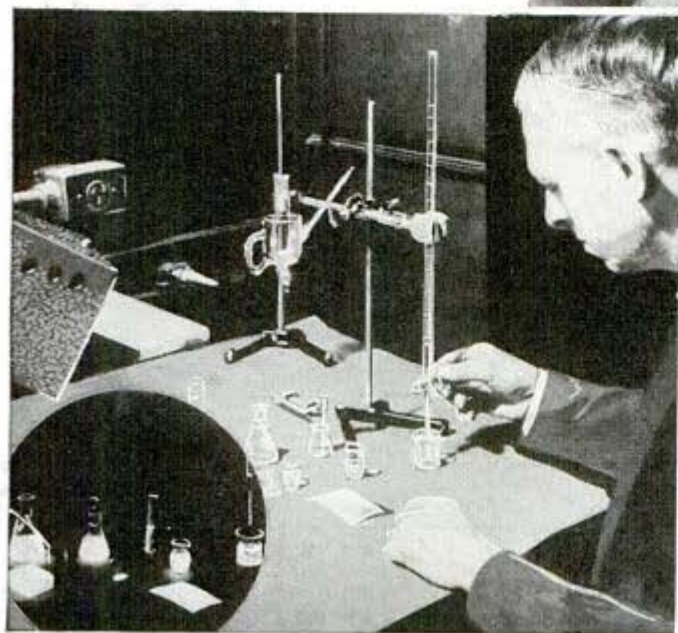
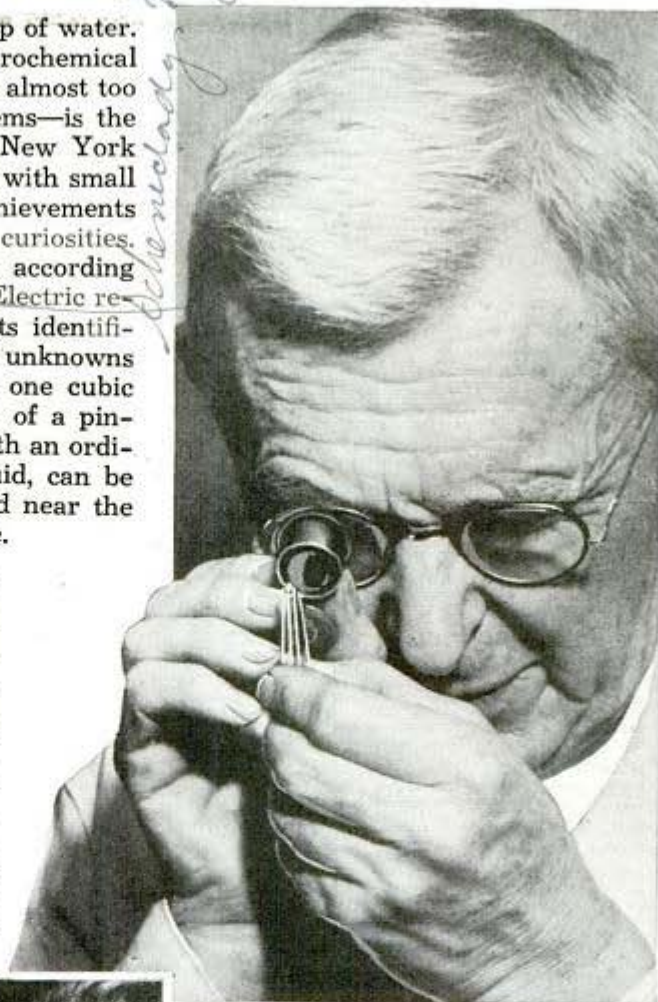
NEXT *to* NOTHING

iron found in the infinitesimal drop of water.

This sample of work in the microchemical field—in which scientists use tools almost too small to see in solving big problems—is the feat of Dr. Benedetti-Pichler of New York University. A record for working with small quantities, it is among those achievements still in the realm of laboratory curiosities. Common applied microchemistry, according to Charles Van Brunt of General Electric research laboratory, seldom attempts identification or classification of complex unknowns in solution volumes smaller than one cubic millimeter, or approximately that of a pinhead. On the other hand, work with an ordinary drop of water, or other liquid, can be rated as comparatively coarse and near the upper limit of the true micro range.

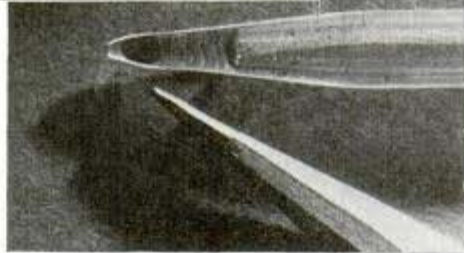
Why work with such small amounts? Well, larger amounts may not be available, as in a study of the debris surrounding a pin-hole leak formed in an experimental electric refrigerator. Or, the substance may be so precious that the amount consumed in

Right, comparing solutions in microcentrifuge tubes. Below, left, Western Electric scientist testing substance under ultraviolet; inset shows what is seen by black light after ordinary lights are turned off; right, bead containing specimen being heated in microburner





Top, portable printing equipment used for study of contact in a telephone central office. Metals make their mark by a certain color on special paper when an electric current is passed through them. Prints made by this method are studied by micro instruments



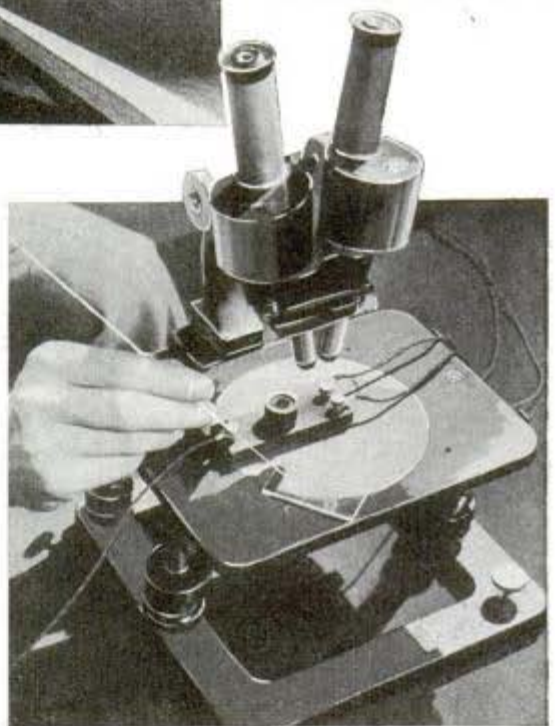
occupies so much less space than the ordinary laboratory that small factories may carry on important research and analyses without sacrificing valuable floor area.

Aside from the small-scale operations involved, microchemistry holds the attention of the layman with the extreme sensitivity and smallness of the tools with which the scientists work. For instance, says Dr. Herman Liebhafsky of General Electric research laboratory, it long has been known that the ordinary chemist's balance is so sensitive that it will weigh a person's signature. Recently, Dr. Liebhafsky performed a similar experiment on the microbalance, a more sensitive instrument. Describing the experiment, he says:

"Instead of my full name, I used only a period made on a sheet of paper with a sharply pointed pencil. This period weighed ten micrograms (one microgram weighing approximately a hundredth as much as a

analysis must be kept at a minimum—substances like vitamins and hormones whose initial preparation or isolation often requires almost unbelievable amounts of time and labor. If one desires to establish the composition of an heirloom or an antique, smashing it in a mortar to obtain a large sample is scarcely advisable. Old masters' paintings have been identified by removing and analyzing pigment so small as to escape the keenest human eye. Many substances, like explosives or poisons, that are dangerous or obnoxious to handle in gram amounts can be studied conveniently in amounts much smaller.

In addition, time can be saved by microchemical methods with no loss in accuracy; a few drops of solution can be evaporated much more rapidly than a cupful. Money can be saved in analyses requiring expensive chemicals or equipment; small platinum crucibles cost less than large ones. And finally, a microchemical laboratory



Center, microchemical analysis specimen in apex of centrifuge tube compared with a pencil. Bottom, a minute electrolytic cell used in Bell Telephone laboratories to separate metallic substances

grain of salt)—or enough to be very easily noticeable on the balance. Each time you dot an "i" your pencil becomes several micrograms lighter. Each time a raindrop falls, some fifty to one hundred thousand micrograms strike. One cent will buy nearly 10,000 micrograms of gold. So a microgram cannot be very large.

"However, a microgram of gasoline contains enough molecules so that these might reach well across the Atlantic ocean if they could be laid end to end. Atoms or molecules in such large crowds are good law-abiding citizens; catch them alone and their behavior is not always predictable. Because the microgram contains so many molecules, the microchemist knows that the laws which are valid for ordinary amounts of matter hold also in the realm of microchemistry."

Beakers the size of a thimble and test tubes as small as one-fiftieth inch in diameter—so tiny that solutions cannot be poured out of them—are used in this work. The microchemist transfers his solutions by using small loops at the end of a wire or by employing tubes small enough to fill themselves by capillary action when dipped into a liquid. Heating is often accomplished by means of a steam bath, for heating with any flame usually blows the sample right out of the test tube. When flames are used they are so small a lighted match appears a roaring inferno by comparison.

An ordinary chemist observes how a precipitate forms in a test tube. The microchemist frequently obtains the same information by carrying out observations under a microscope. This evidence is the more convincing because in many cases it magnifies each crystal so that its characteristic form can be observed—it literally signs its name. Exceedingly small amounts can be detected by their chemical action on a substance in spots on filter paper, or on single fibers.

(Continued to page 120A)

JANUARY, 1941

"Goal Posts" Train Recruits in Throwing Hand Grenades

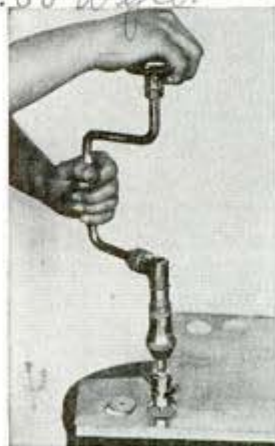


Soldiers practice throwing hand grenades through the squares at top of "goal posts" to acquire efficient aim

Tossing a grenade is not quite like throwing a baseball, U. S. army recruits are told. Having delayed-action fuses, the grenades must be hurled with an upward looping, overhand motion. If pitched straight to the target, the enemy might have time to pick up the grenade and fling it back. So the soldiers practice throwing grenades through high wooden frames resembling football goal posts.

Tool to Cut Large Holes in Sheet Metal Fits Electric Drill or Hand Brace

Working efficiently with any electric drill, drill press or carpenter's brace with a half-inch drill chuck, a simple tool cuts round holes up to four and one-half inches, in sheet metal, Bakelite or fiber. Cutter bits are adjusted for size by sliding up or down, no clamps, wedges or set-screws being needed, since the bits are self-tightening. The hardened center pilot pin may be replaced by a pilot drill if desired. One size tool is adjustable from seven-eighths to two and one-half inches, and another from one and three-quarters to four and one-half. Cutters are sharpened easily or can be replaced when needed.



Wynnebeck - Staff chg.

838 Hubbard

Perfection Stove Co 7609 Platt Ave
 Cleveland Ohio
 K 1044
 K 1011
 K 1018
 K 1094
 Sturdy Built
 Chicago
 1458 Michigan
 Ho-Ray Lamp Co

Electric Fan in Gas Heater Circulates Humidified Air

Superior Gas Stove



Arrows indicate hot gases zigzagging among baffles to aid transfer of heat through walls of chamber

Heated and conditioned air is circulated continuously by a gas-burning furnace designed to maintain "balanced comfort" in small homes, stores, offices and schools. It takes little space, measuring twenty-two by twenty-four and one-half inches at the base. Instead of a single combustion chamber, this heater has two high, narrow chambers made of welded plate steel with eight baffles in each to provide extra surface for radiation of heat. Whether or not the thermostat calls for heat, the gas never shuts off during cold weather, the electric blower runs all the time, and a drip-type humidifier assures constant humidity. Two burners, one under each of the two chambers, work together to give the highest degree of heat. Medium heat delivery is the low, or coasting, fire which burns most of the time during average winter weather. Then there is the lowest stage of operation when a pilot keeps the furnace in readiness for instant firing.

Plants Found to Immunize Selves against Some Diseases

While testing the destructive sugar-beet curly-top disease on tobacco, Dr. James M. Wallace, of the U. S. Department of Agri-

culture, found that the plants acquire immunity to disease much as animals do. The evidence was seen when severely affected plants recovered, or showed very few signs of the malady while the disease was known to remain in the plant. Dr. Wallace grafted healthy scions on diseased stocks, and diseased scions on healthy stocks. The healthy portion became diseased, but mildly, depending on the length of time the disease-masking "something" had had to develop

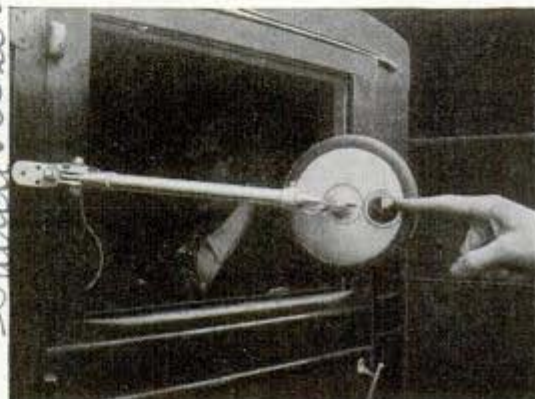
Ice Cream Molded to Fit Cone with Handy Scoop

Ice-cream cones are filled to the bottom with a special scoop that packs the cream into the shape of a cone. This prevents children from dropping their ice cream, which happens frequently when ball-shaped scoops are used. A lever in the new scoop slides the cream free so it may fall into the cone.



Side Clearance Lamp for Truck Built in Rearview Mirror

A rearview mirror with safety lamp built into its back, designed for use on trucks, performs double service at night by telling oncoming drivers the extreme width of the truck. By staying clear of the side light, drivers keep their cars a safe distance from the truck.



Electric light at back of rearview mirror indicates extreme-width of truck for drivers moving toward it

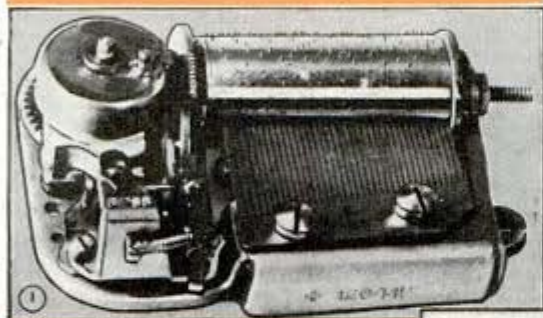
Ho-Ray Lamp Co



The CRAFTSMAN

MUSIC BOX

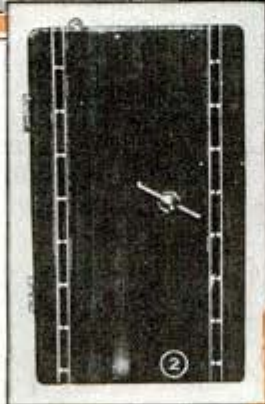
announces guests
AT YOUR DOOR



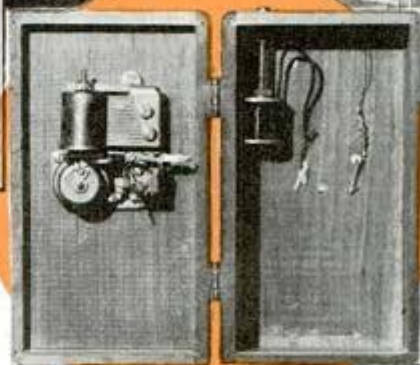
By R. E. O'BRIEN

EMITTING a soft, pleasing tune instead of the usual loud, startling noise accompanying a door buzzer, this little musical "doorbell" should fill the desire of those wishing a less disturbing means of announcing the arrival of guests. It consists of a simple electromagnet and a standard music works, both of which are enclosed in a small decorative sounding box. Fig. 1 shows a music-box movement of the type used in musical powder boxes, jewelry cases, etc. Such type works are commercially available.

The kind having a release trip is used for the purpose. Almost any box having a hinged lid and catch can be used. One may be made of thin resonating wood as shown in Fig. 4, or a fancy Bakelite box of the type used for gloves, trinkets, etc., will do.



Pressing the door button causes an electromagnet to start the mechanism. After playing a tune it will automatically stop



An electromagnet is required to trip the stop arm of the movement when the door button is pressed. This is made by winding about 375 turns of No. 24-ga. enameled magnet wire around a soft-iron core. Or, the magnet from a doorbell or buzzer may

JANUARY, 1941

Kuempel Co. Suttnerberg, Iowa

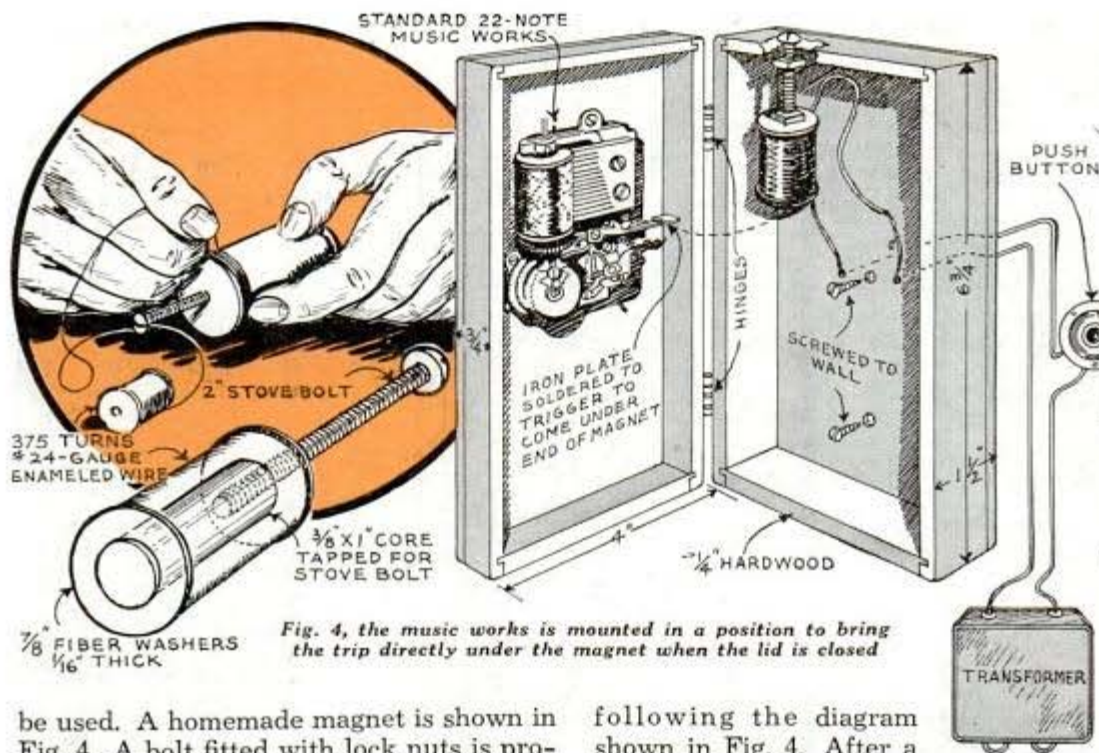


Fig. 4, the music works is mounted in a position to bring the trip directly under the magnet when the lid is closed

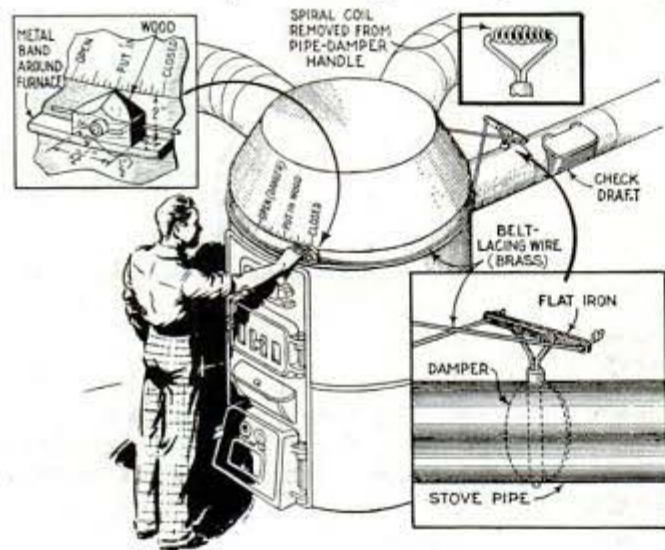
be used. A homemade magnet is shown in Fig. 4. A bolt fitted with lock nuts is provided to permit the magnet to be adjusted properly above the trip arm of the movement. A little iron plate is soldered on the trip arm and then the music-box mechanism is mounted on the underside of the lid, allowing the winding stem to project through the front as shown in Figs. 2 and 3. You will have to experiment in adjusting the magnet by raising or lowering it on the bolt until the proper setting is found.

Connections to the original bell circuit are made from each end of the magnet coil,

following the diagram shown in Fig. 4. After a tune has been played the trip automatically stops the mechanism until the magnet again pulls the trip up. While the mechanism is operating, intermittent pressing of the door button will not interrupt the music. Only upon completion of the tune will contact of the button restart the mechanism. A two-tune musical movement will play about eight or nine times on one winding. Located centrally, this little music box will be surprisingly audible above common room noises.

See Hyde Park N.Y. also high release.

Furnace Pipe Damper Operated from Front of Fire Door



If you have to keep the butterfly damper in the smoke pipe of your furnace closed at all times yet must open it wide when firing, the arrangement shown in the sketch will save you many steps, as it permits the draft to be operated from the front of the furnace. All you need to do for this is to provide the damper handle with a short arm and from this run a light piece of wire entirely around the furnace where the bonnet connects to the jacket. In approximately the center of this wire install a knob similar to the one shown in the upper left-hand detail. Then open the damper wide,

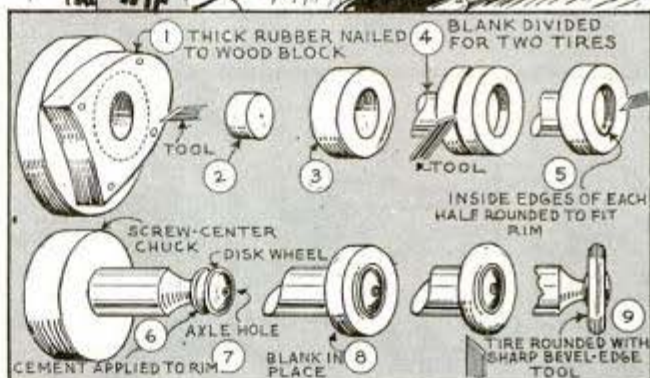
mark the position of the knob on the furnace bonnet, then open it to the position that you normally use in firing and mark this point, and then close it and mark that point on the bonnet. Thereafter, all you have to do is to slide the knob to the desired position, thus saving steps in walking around to operate the damper by hand.

—George D. Vonada, Keene, N. H.

Making Fireproof Cement

Cement suitable for insulating electrical heating elements and for other purposes where resistance to heat is needed, may be made from finely powdered asbestos and water glass. Mix the asbestos flour with the water glass until the mass becomes thick enough to mold into the desired shape. Pack the cement tight and allow it to dry. When it has become hard and free from moisture, treat the surface with a solution made by dissolving calcium chloride, $\frac{1}{2}$ lb., in water, 1 qt. If some finely powdered glass is added to the water glass before the asbestos, in the proportions of a pound of glass to a half gallon of water glass, the cement will become extremely hard and impervious after heating. Old bottles and scraps of glass may be powdered readily after heating and dropping into a bucket of cold water. This will shatter the glass so that it can be reduced to a powder with an iron mortar and pestle.

Rubber-Tired Wheels for Models Are Turned on a Lathe

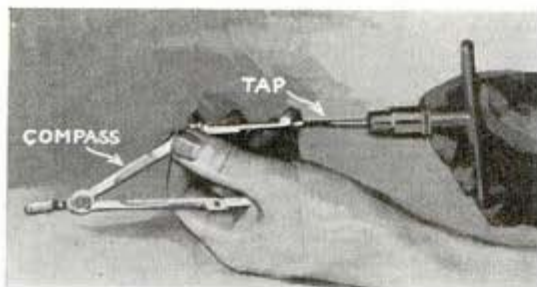


While rubber-tired wheels for models and toys can be purchased inexpensively, it is not always possible to obtain just the size desired. At such times, you can turn them on a lathe as shown in the detail. Old shoe heels are a good source for the rubber to make the tires, and the wheel itself can be turned from hardwood.

—Roy S. MacNeill, Shelley, B. C.

Repairing Draftsman's Compass to Keep the Lead from Wobbling

After considerable use, the lead in a compass may become loose and wobbly due to the wear in the threads on the small setscrew. This results in unsatisfactory



and inaccurate work. In most cases, the instrument may be made as good as new by running a small machine-screw tap inside the lead slot. A number 4-36 tap is correct for most instruments as it is slightly larger than the slot and will make sharp scores in the metal without cutting a full-sized thread. As an additional aid, remove the setscrew and dip it in soldering flux and then into molten solder. Remove from the solder bath and immediately rap it against a hard surface to knock off all but a thin film. This enlarges the screw slightly and allows it to hold more tightly.

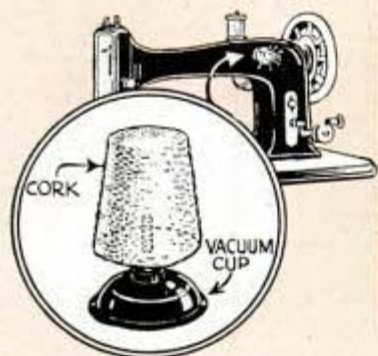
Solving HOME



Cutting a notch in one side of a clothes pole makes it easy to remove ice from the line



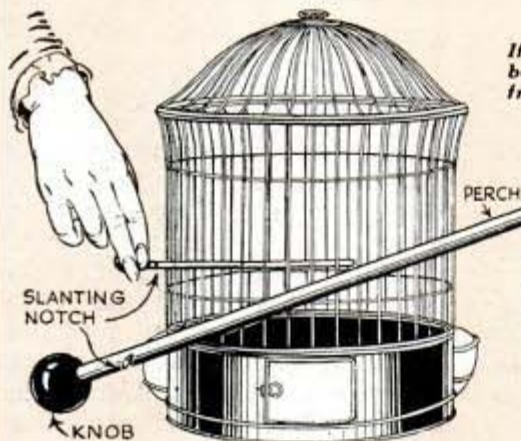
A friction lid is removed easily from a full can if the latter is set on a small object and pushed down to bulge the bottom slightly



Attached to a vacuum cup, a cork provides a pincushion that can be stuck on a sewing machine within easy reach, and removed quickly



If your electric-iron cord sometimes slips from the board and drops the plug on the floor when detached from the iron, drive a small screw hook into the board and slip the cord under it

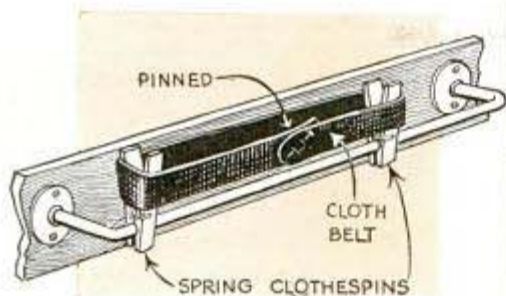


Birdcage perches that may be removed, replaced or adjusted without opening the cage are made as shown above. The knob at the outer end is optional

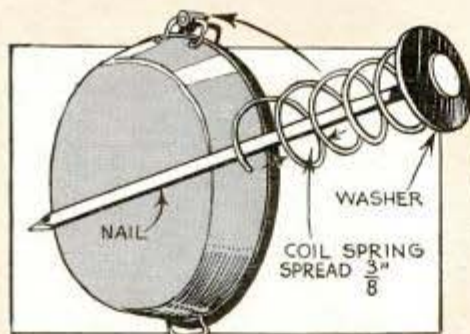
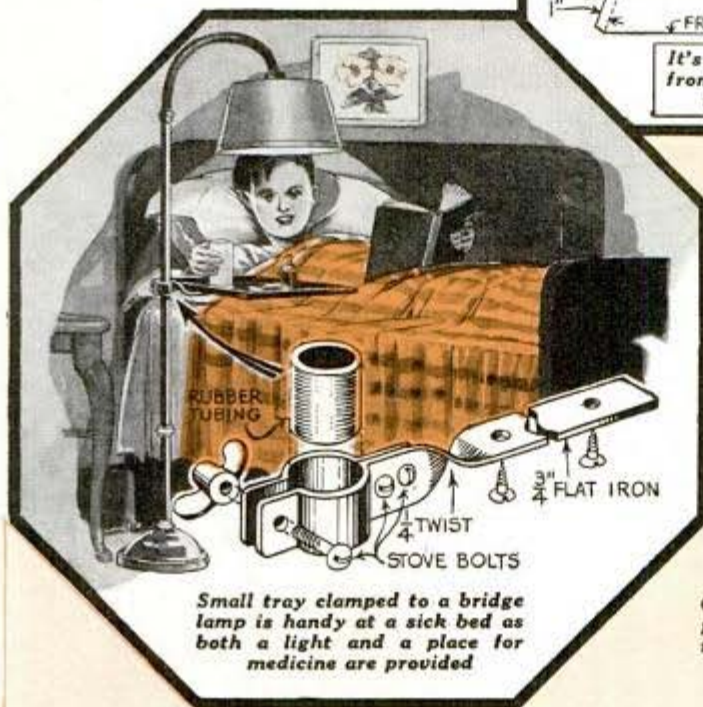


When a cake is to be cut while it is hot, use a thread instead of a knife. Score the cake across the top with a sharp knife and then finish with the thread, working it saw fashion

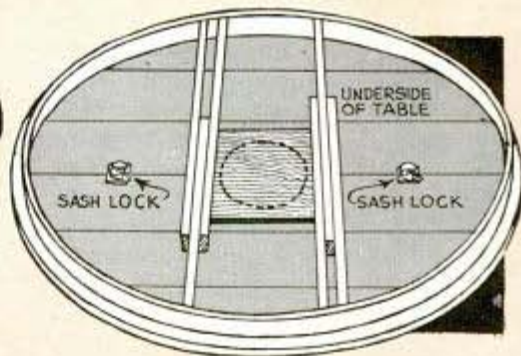
PROBLEMS



To dry a cloth belt, stretch it over a couple of clothespins attached to the bar of a bathroom towel rack



Large pans hung over nails in a wall will not be knocked off accidentally if you slip an open-coil spring over the nail as above. The pan handle fits between the coils to prevent slipping



Two window-sash locks placed on the underside of a dining-room table will hold the two halves of the top firmly together after the leaves have been removed

Eccentric Woodworking Vice Saves Time for Carpenters



One carpenter finds that a simple vise made like the one shown saves considerable time when working at the bench in his shop, and he also finds a number of uses for it on construction jobs. The vise consists of two pieces of hardwood, one tapered to serve as a stop and provided with two dowels which fit in holes in the workbench. The other piece of hardwood is made in the shape of a cam and is provided with a short dowel which serves as a pivot.

—E. F. Folger, San Fernando, Calif.

Black Cat Has Your Number



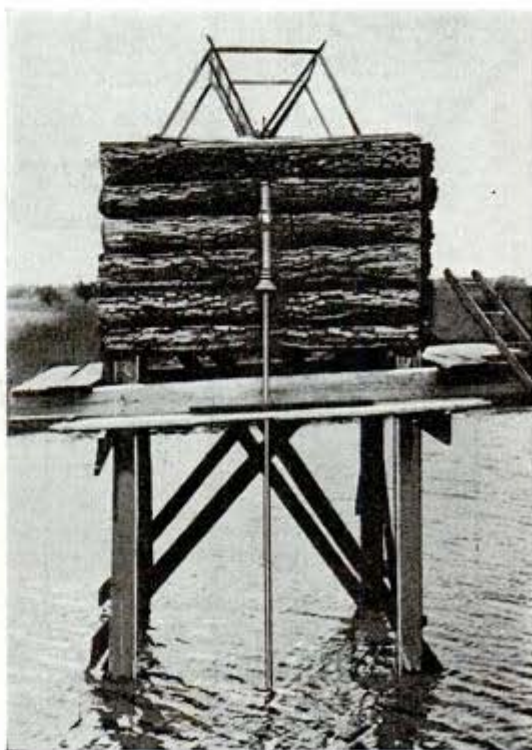
A black cat on the back-yard fence, or at the front gate, is more ornamental than objectionable if it is made of plywood and carries your house numerals on its side. The head is cut out separately and the ears hollowed slightly after painting to make them look more natural. Eyes are made from green license-plate fasteners. The head is pivoted to the body with a small stove bolt, the

end being countersunk and covered with putty so that the head may be turned to various angles, thus changing expression. Whiskers, made from fine wire, are attached with a thumbtack.

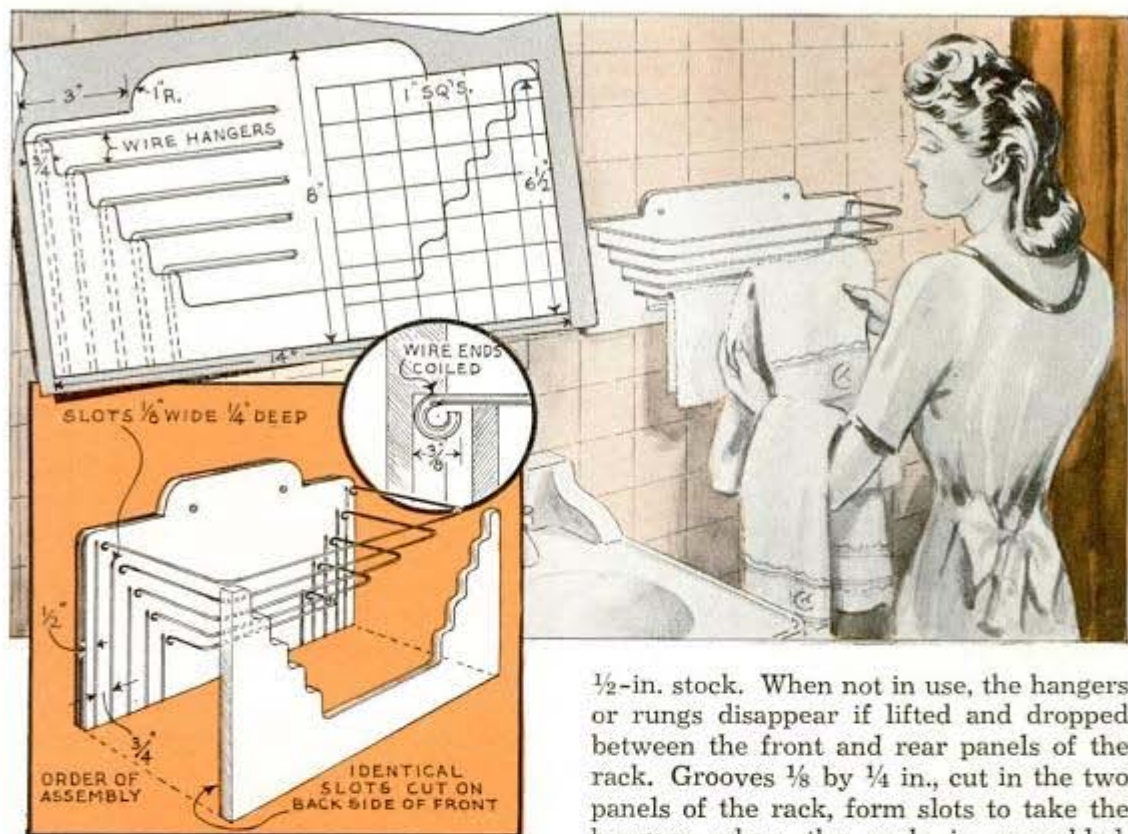
—Jos. C. Coyle, Yuma, Ariz.

Windmill Keeps Small Lake at Constant Level

The "Izaak Waltonians" of a Nebraska city have a small lake which is kept at constant level by the simple wind-power plant shown. A large wind-wheel contrivance is set in a box mounted on piling, with half of the wheel exposed above the top so that the prevailing—north and south—winds will strike the blades squarely. A point is driven into the bed of the lake, and is connected by pipe to a pump set on the side of the box. A short pitman mechanism connects the wind wheel with the pump to give a 5-in. stroke. The pump is working more than half the time. To make the box more rustic, it is covered with slab pieces to which the bark still adheres.



This Towel Rack Has Disappearing Hangers

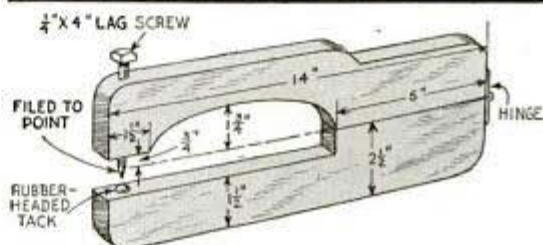


Having a dainty, streamline appearance, this easily made rack is designed to blend in well with modern kitchens and bathrooms. It is made of two 14-in. lengths of

1/2-in. stock. When not in use, the hangers or rungs disappear if lifted and dropped between the front and rear panels of the rack. Grooves 1/8 by 1/4 in., cut in the two panels of the rack, form slots to take the hangers when the rack is assembled. Heavy wire is used for the hangers, which have eyes formed on the ends. The hangers are held in a horizontal position as shown in the circular detail.

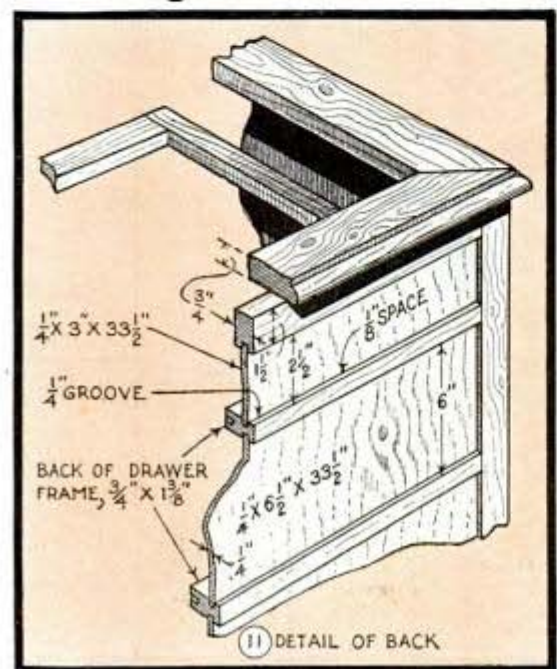
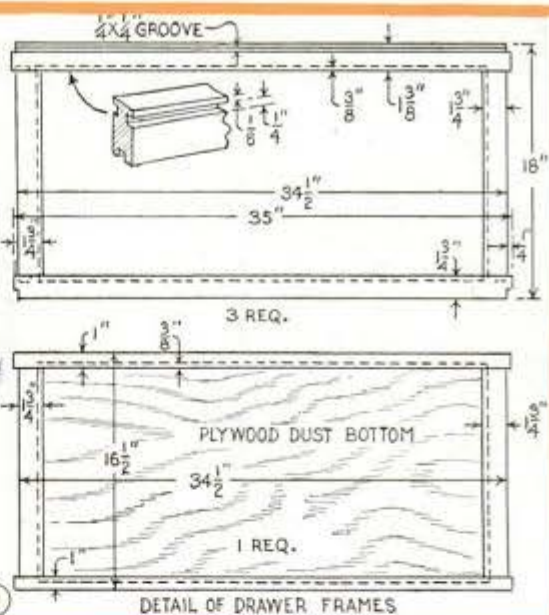
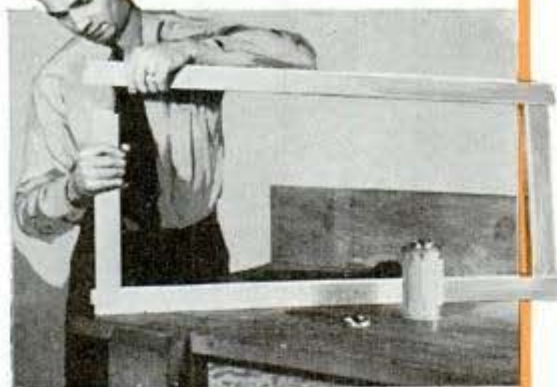
Thickness Gauge Aids You in Shaping Model-Ship Hulls

With the aid of this gauge, it is easy to obtain uniform thickness when shaping the hull of a model boat, or any other work where thickness is hard to measure directly. It consists of two jaws, one carrying an adjustable point, the other a rubber anvil. In use, the anvil is pressed against the trued outside of the hull, and the point is brought down with rapid strokes, while being moved from place to place. The inside is then gouged out until the point pricks disappear. When the hull has been trimmed almost to the desired thickness, the point will penetrate to exact depth, being prevented from pricking deeper because of the flat sections of the jaws meeting.—E. M. Love, Monterey Park, Calif.



☛ Turpentine will soften shoe polish that has hardened in the can.

The frames are assembled with glue and clamped squarely to dry before they are fitted between the ends



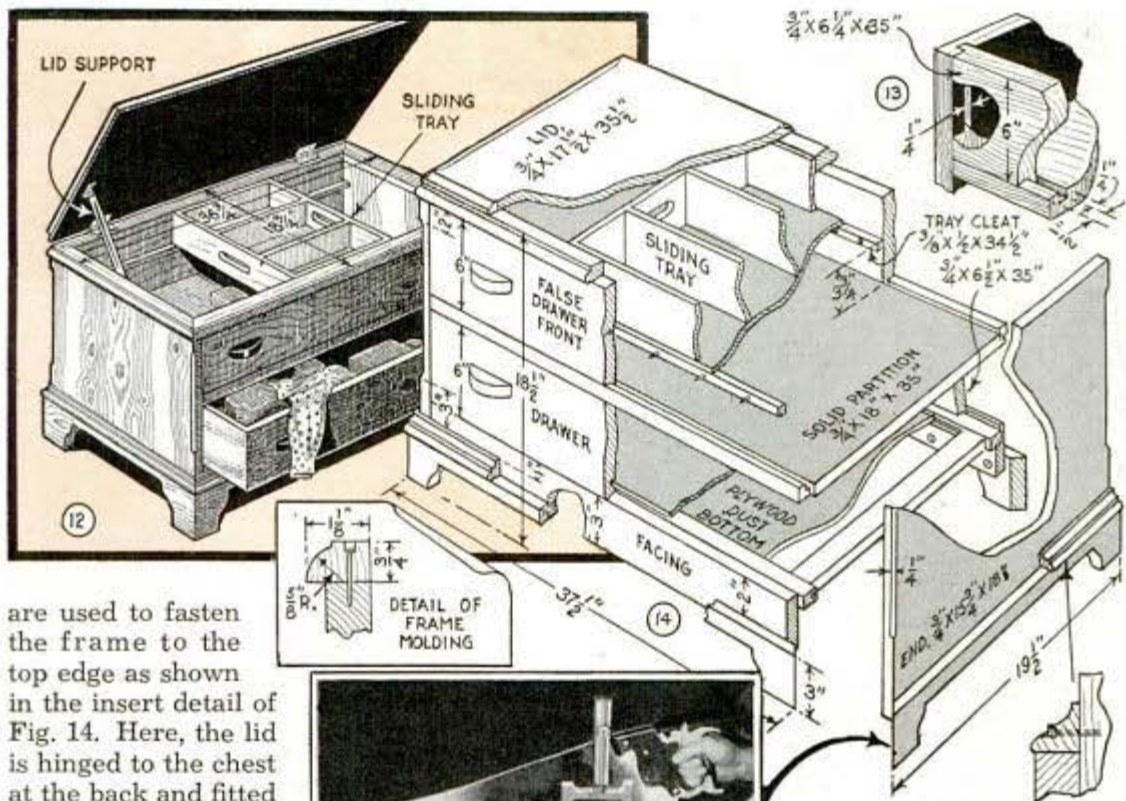
back panels as shown in Figs. 9 and 11. The lower panel is housed in a groove cut in the rear facing piece as in Fig. 8.

The three drawers are of equal size and are made as shown in Fig. 10. Nails and glue are used to fasten the sides to the back and front. The bottom fits in a groove and is glued only at the front edge to allow for expansion. The handles may be made of pine or purchased in metal.

The arrangement for partitioning the pigeonhole tray is shown in the lower detail of Fig. 1. After cutting the pieces to exact size, the assembling, which is done with fine brads, is begun with the small partitions at the center. This is important as difficulty in nailing will be encountered later if this procedure is not followed. When the unit is completed, it is slipped in place and fastened with brads driven through the outside frame. The tray should fit accurately between the top frame pieces, yet loose enough to permit easy removal.

The low chest, Fig. 12, has only one drawer, which is the same size as those in the desk chest. The top, facing and base are assembled in the manner previously described. Only one drawer frame is required as the bottom of the tray compartment is made solid. Note that grooves are run in the solid partitions and ends to house the back panels and the false drawer front, Fig. 13. The back facing piece also carries a rabbet for the same purpose.

The frame around the top is similar except that it is 1 1/8 in. wide. Nails and glue



are used to fasten the frame to the top edge as shown in the insert detail of Fig. 14. Here, the lid is hinged to the chest at the back and fitted with a chest-lid support. The inside of the upper compartment is fitted with a tray, which slides on two cleats screwed to the front and back of the chest. The dimensions for the sliding tray are given in Fig. 1. Handholes are cut in the side pieces.

Now for a few general suggestions in regard to the finishing of the chests. Nail heads in an exposed surface should be set carefully about $\frac{1}{8}$ in. below the surface. The holes should be filled with a mixture consisting of fine sandpaper dust and thin

liquid glue to form a paste of putty consistency. After the glue has set, the surface over the holes should be sanded well.

A simple method to follow in finishing the wood is to apply a mixture consisting of a combination of wax and rich-brown stain which is available in several shades. Two or three coats rubbed well with a soft cloth will produce a beautiful finish.

Rubber Shield for Exposed Padlock to Prevent Freezing

A piece cut from the heel of a rubber to the shape shown makes a dandy cover for small padlocks to keep rain from freezing in them. The rubber is tacked above the lock as indicated so that it hangs down over it unless lifted up.

—Frank Bentley, Council Bluffs, Ia.

☞ Cakes of chocolate should be kept in a cool, dry place to prevent the white coating that usually forms when they are stored in a warm place.



Simple Tongs for Blacksmith Tend to Reduce Shocks

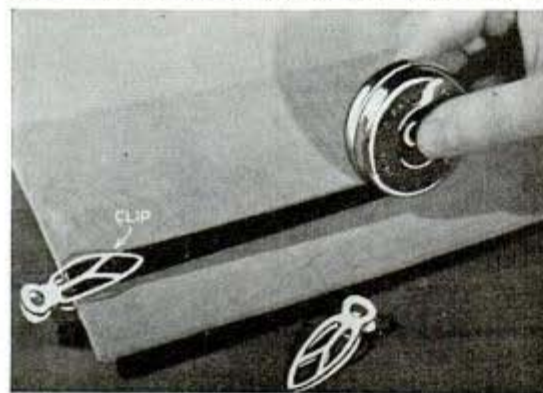


Amateur blacksmiths and others who have use for a light pair of tongs will find the ones shown easy to make. Because they are bent from two lengths of rod, they are quite springy so that they tend to absorb shocks from the hammer blows. The jaws are formed by bending over the ends of the rods, and the holes for the pivot rivet are formed by bending eyes in the rods at the correct location.

—Luther Strosnider, Havensville, Kan.

End of Tape Held in Place by Clip Used in Hair

A ladies' hair clip of the type shown in the photo is just the thing for holding the end of a steel tape measure to the end of your work when doing the job single-



handed. The jaws of the clip are long so that they will fit over fairly thick work, and the spring in the clip provides sufficient tension to keep the assembly in place.

Christmas-Tree Lights Strung Neatly with Hairpins

If you experience difficulty in attaching strings of Christmas-tree lights to the slender branches, use hairpins to hold the lights in place. Just slip the pins over the branches where desired and then twist the ends around the light wires on each side of the socket, as shown.



Thumbtack Puller from Can Lid

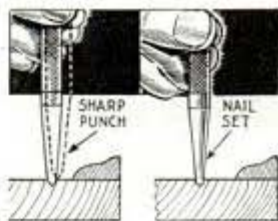


Instead of using a fingernail to pull thumbtacks, try the top of a tin can that has a lid that slips down over the upper edge. You will be surprised at the ease with which even stubborn tacks can be removed.

Nail Set Starts Small Drills

Errors in drilling wood and starting screws can be avoided if instead of punching the starting holes with a nail or sharp punch a nail set is used. The cupped point of the nail set cuts through hard and soft areas alike, whereas a conical or pyramid point such as on nails and punches is diverted from the harder veins into the softer rings between them.

—R. A. Carrier, Jr., Asheville, N. C.



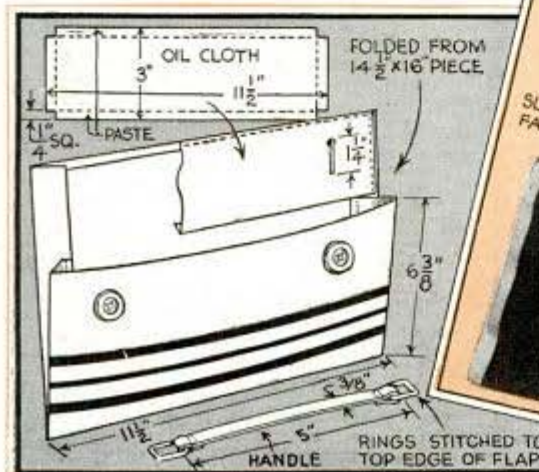
One-piece



of canvas

BESIDES plain canvas, colorfully striped awning cloth, denim and imitation leather provide other suitable materials from which to fold these attractive personalized hand bags. Two types are shown: one with a buttoned flap, the other a slide fastener. Steps at the right show clearly how the initialed bag below is folded from a single piece of rectangularly shaped cloth. As the folding progresses, the stiff edges of the material are pressed flat with a warm iron. In the case of leather, a pressing cloth should be used over the material. Initials may be cut from either oil-cloth or leather. Best results will be had in attaching them if they are pasted in place first, before stitching by machine. The bag shown directly below and in the photo above, is similarly folded. If a striped material is used, fold the cloth so that the stripes will run horizontally.

—Helene Lemberger, Chicago.



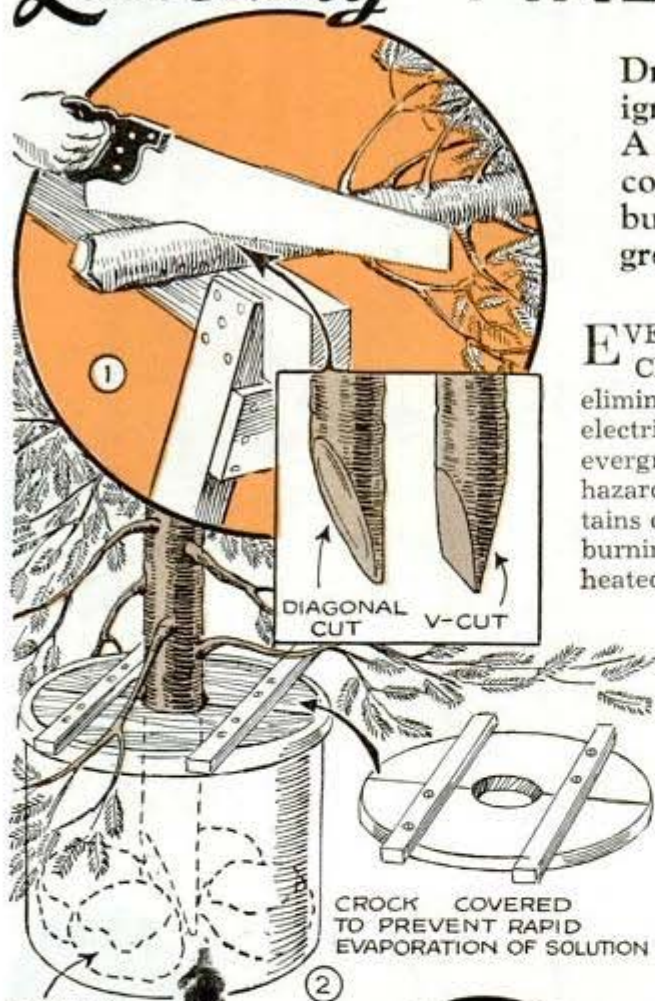
Lessening FIRE HAZARD

Dry, resin-filled evergreens ignite easily and burn fast. A short circuit in the light cords may start a serious fire, but you can lessen the hazard greatly by simple precautions

EVEN though the use of candles on Christmas trees has been practically eliminated because of danger of fire, and electric lights have been substituted, dried evergreens in the home are a serious fire hazard. While a tree is still "green" it contains enough water which prevents it from burning readily, but when placed in a heated room for a number of days, it quickly dries out and becomes inflammable.

You can treat a freshly cut tree to make it fire resistant, taking advantage of the fact that even after it has been cut, the trunk will continue to absorb water for some time. Many people keep the trunks immersed in water in order to keep the tree "green" and retard drying of the needles, which reduces the fire hazard somewhat. But a chemical, ammonium sulphate, dissolved in the water to be circulated through the tree makes it still more resistant to fire. To do the job right, get the tree about four or five days before you intend to put it up, and keep it where the

temperature ranges from 55° to 65° F., as the treatment is most effective at this temperature. Now weigh the tree, Fig. 3, and then purchase ammonium sulphate equal to one-fourth of the tree's weight. Dissolve it in water, 1 qt., to the chemical, 2 lbs. Pour the solution into a crock or jar into which



FILLED WITH LARGE STONES

Absorption method



of CHRISTMAS TREES

the trunk of the tree is to be set, and fit it with a cover, Fig. 2. Then prepare the lower end of the tree trunk for maximum absorption by sawing it off at a slant or cutting it to a V-shape as shown in Fig. 1. For best results, all the solution should be absorbed by the tree, which may require four or five days. After the treated tree has been set up, it is best to continue keeping the trunk immersed in water. Added resistance to fire can be had by external spraying, using the formula given in Fig. 4. You can use an ordinary insect sprayer, applying the solution two or three times, allowing each application to dry before the next.

It should be remembered that while these measures decrease fire hazard greatly, they do not render a tree entirely fireproof in the event considerable flame is applied directly. The practice of using untreated absorbent cotton on the branches of the tree to represent snow is a source of potential danger, as a short circuit in the wiring of the lights may ignite the cotton and cause a blaze. However, cotton can be made fire resistant by sprinkling it with a solution consisting of borax, 7 oz., boric acid, 3 oz., and hot water, 2 qts. The cotton is spread out on a paper over the basement floor. Do not soak the cotton as this causes it to lose its natural fluffiness.

Before stringing the lights, test each cord, especially at the sockets, to be sure that there are no defects in the insulation, or any loose connections. When stringing the cords in the tree, avoid wrapping them around branches, Fig. 5, as this is apt to damage the insulation, causing a short.

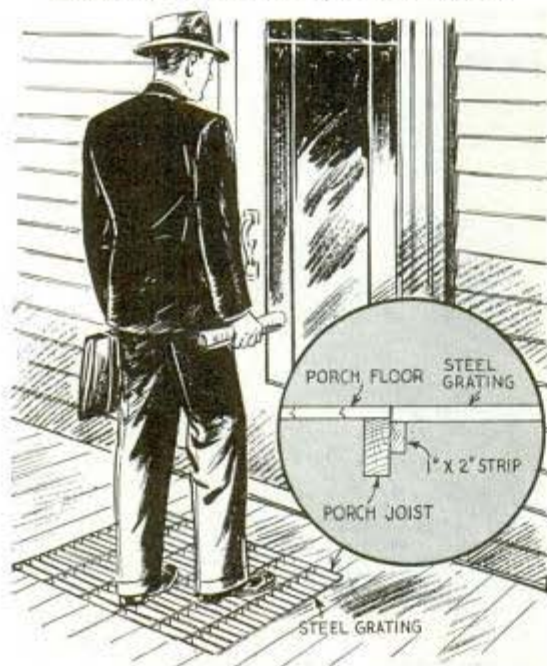


EXTERNAL SPRAY SOLUTION
 BORIC ACID ---- 5 PARTS
 BORAX ----- 6 PARTS
 WATER ----- 100 PARTS

④



Steel Grate Built in Porch Floor Serves as Sanitary Door Mat



A section of steel grating set in an opening in the porch floor in front of the door provides a "mat" that allows dirt scraped from the shoes to fall through to the ground. This helps to keep the porch floor clean, and also it can be used in combination with the regular door mat to automatically dispose of the dust and sand that works through the mat. Furthermore, the grating provides good ventilation if the lower part of the porch is closed in.

—Axel E. Ogren, Chicago, Ill.

Books Kept Upright in Case



This handy little device is not conspicuous and will keep the books vertical and in neat order on shelves. It is made from a telescoping curtain rod and two slip-on erasers. The rod can be purchased

for a nickel in most stores and after being cut to the proper length for the shelves it will be used on, it is assembled with a compression spring inside as indicated. When the erasers are slipped over the ends, the spring forces them against the

two shelves so that they stay in a vertical position and hold the books in place.

—Arthur R. Burns, Los Angeles, Calif.

Repairing Worn Plug Threads

It is often possible to repair worn threads on filler plugs from gas torches, furnaces and similar tanks. First drill a hole part way into the plug as indicated. Then fasten the plug in a vise, place a center punch in the hole and hit lightly with a hammer. It is important to try the plug in the



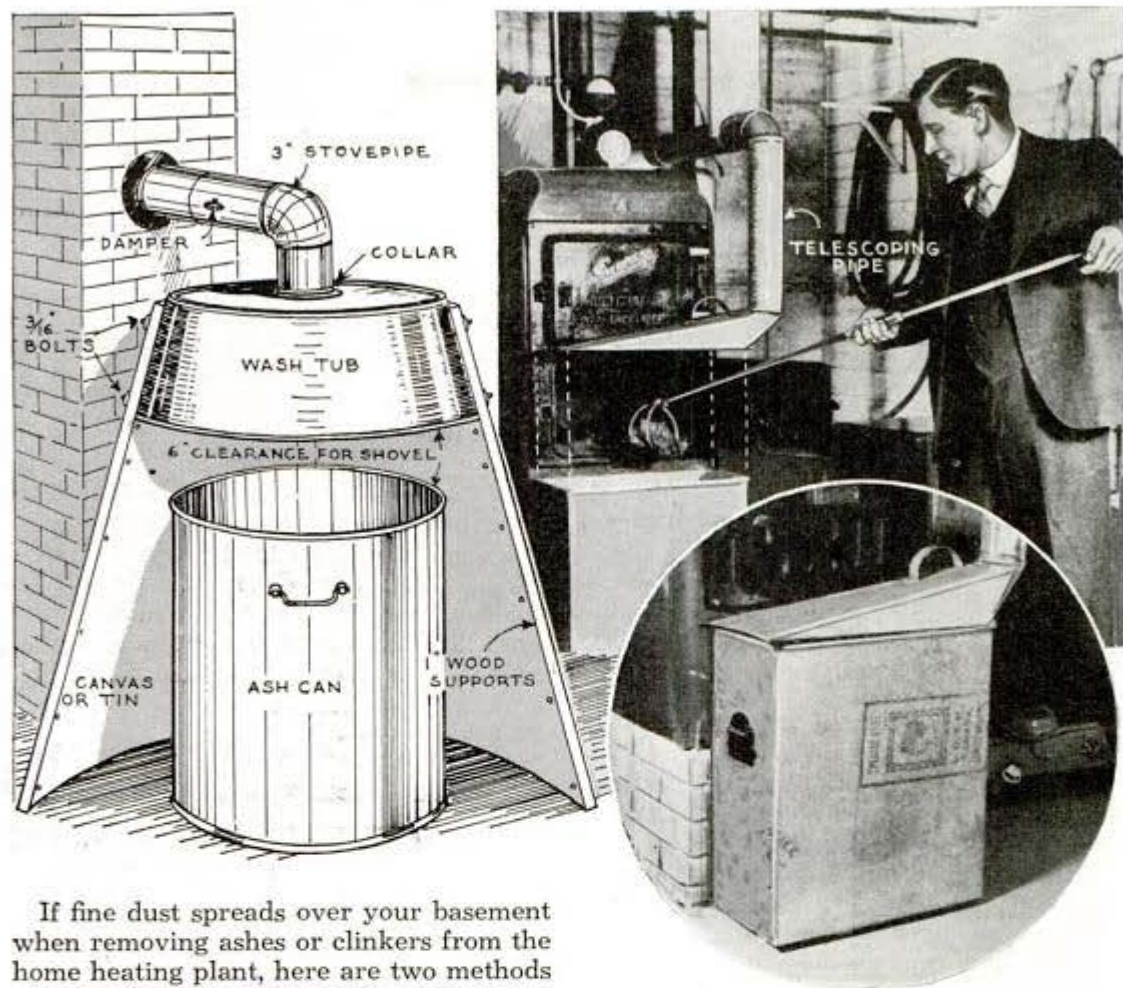
tank after every few blows so that it will not be expanded too much. This method of repairing is good only when threads are worn, not stripped.—George W. Niedermair, West New Brighton, S. I., N. Y.

Attaching Vacuum Cups

Ordinary rubber vacuum cups can be attached permanently to glass, porcelain and similar surfaces if they are first given a thin coating of liquid fingernail polish and pressed into place before the polish dries. The polish will prevent air from seeping in and breaking the vacuum. When it is necessary to remove the cups, pry them up with the point of a knife, then peel off the thin film of dried polish.



Eliminating Dust from Ashes in the Basement

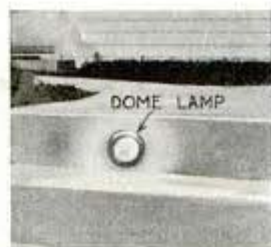


If fine dust spreads over your basement when removing ashes or clinkers from the home heating plant, here are two methods of reducing this nuisance to a minimum. With both methods, the dust is carried out through the chimney as it arises from the ashes. The method shown on the right is best suited to stoker-fired plants where the residue is removed from the firepot in clinker form. A sheet-metal container is placed directly under the fire door to receive the clinkers as they are removed. A lid for the container is shaped as shown, and is connected to the chimney by means of a small-diameter smoke pipe. The two

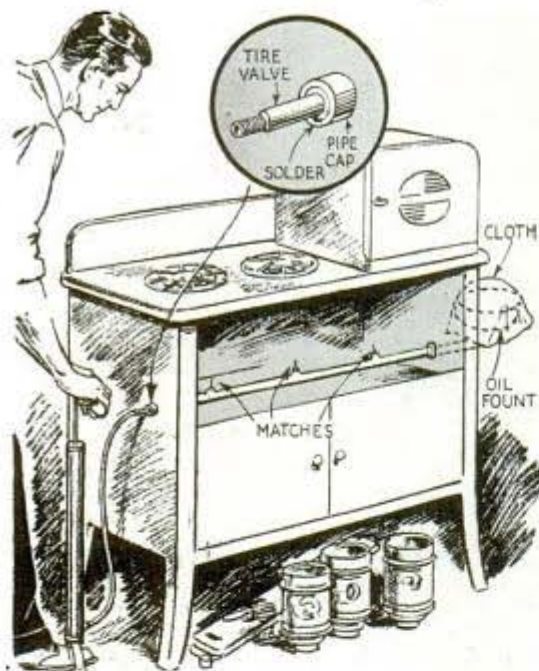
vertical sections of the pipe telescope to permit raising the lid. On the left, an ash can is set under an inverted wash tub, which is also connected to the chimney by a smoke pipe, and partly surrounded by an apron. Dust arising when dumping ashes into the can is sucked up the chimney. Dampers must be used in the pipes of both installations, and must be kept closed when not in use to prevent loss of draft to the heating plants.

Concrete Porch Steps Illuminated by Dome Light Installed in Riser

A dome light from the interior of a sedan-type car is just the thing to illuminate dark porch steps. If the steps are already built, you can chisel out an opening in the riser of the upper one and install a light. Also, it can be used in wooden steps. When used in concrete, cut off the reflector so that just a rim is left to set in the concrete. Then, using a small wooden box to house it, connect it to a waterproof outlet and wire this to your porch light switch by means of waterproof lead-covered cable.



Kerosene Stove Cleaned in a Jiffy with Auto Tire Pump



When the fuel pipe of a kerosene stove becomes clogged, you can clean it in a jiffy with a tire pump, thus making it unnecessary to strip the stove of everything and turn it upside down to drain the pipe. Just remove the burner, plug the openings with matches, take off the fuel fount and tie a piece of cloth over the receptacle in which it sets. Then remove the pipe cap at the end of the fuel line, drill a hole in it to take the shank of an old tire valve and you are ready to clean the pipe. To do this, connect the pump to the valve and you can blow out all sediment with a few strokes.

Green Wood Cured in Sawdust to Prevent End Cracking



Home workshop owners who like to cut burl and other fancy-grained pieces from green logs and cure them for future use, will

find that the sawdust method of curing prevents the wood from checking as it dries. The pieces are simply buried in the center of a box of sawdust, which is then soaked thoroughly with water and covered with a blanket. The box is stored in a dry,

cool place and left for a time ranging from six months to a year. During this period, the sawdust and wood both dry out slowly, and the shrinkage, which causes cracking, is reduced to a minimum.

Holder for Cellulose Tape

With a small block of wood and three angle brackets you can make a neat holder for rolls of cellulose tape. Screw two of the angle brackets to the block, spacing them as far apart as the width of the tape. The third bracket is soldered to one of the others to form a cutting knife. The edge should be filed sharp and serrated to form a sawlike edge. It will be necessary to drill a bolt hole through the first roll of tape, but the metal sides of this roll can be transferred to succeeding ones.



Sole Stitching on Skate Shoes Protected by Heel Clips

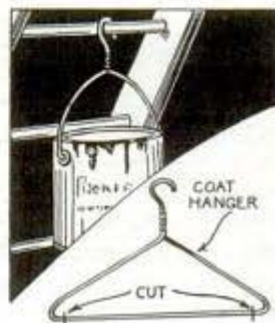


If the soles of your skate shoes rub on the ice during quick turns and wear the stitches, tack several women's heel clips over the stitching as shown. Two clips on each side will usually

provide protection, but you may need an extra one if the soles are worn badly.

Wire Coat Hanger Provides Bail and Hook for Paint Pail

A combined bail and hook for a paint pail, which replaces the bail commonly provided, may be made from a coat hanger. Cut it at the points indicated and bend to the proper shape.



16th Century X-CHAIR Enhances the hallway

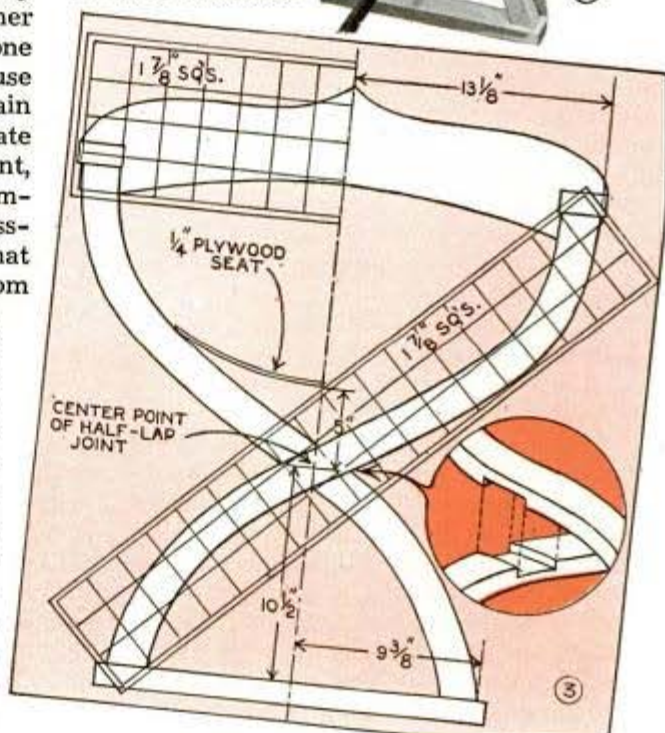
By
G. E. BASICH

MODERNIZED by a brightly striped cushion of satin damask to contrast pleasingly with a walnut, mahogany or maple finish, this 16th-century occasional chair, Fig. 1, is an attractive piece of furniture for hallway or living room.

The legs are bandsawed from 1½-in. stock, following the squared pattern given in Fig. 3. Identical pieces for each assembly may be had by stacking the stock, tacking it together temporarily, and sawing both at one time. After making the first cut, use a marking gauge set 1⅞ in. to obtain a true parallel guide line. To locate the position of the half-lap joint, mark a centerline on the floor or similar flat surface. Place the legs crosswise, one on top of the other, so that the lower ends will be 9⅜ in. from the centerline and even with a baseline, which is drawn at right angles to the centerline. Then draw a pencil line along the edges of the stock where the two pieces intersect. Take care to make a snug-fitting joint. Saw within the guide marks and pare down the waste gradually with a chisel until both surfaces are perfectly flush. A good fit will require tapping in place. Then the joint is glued and clamped. Crosspieces are screwed to the lower ends of the legs, Figs.

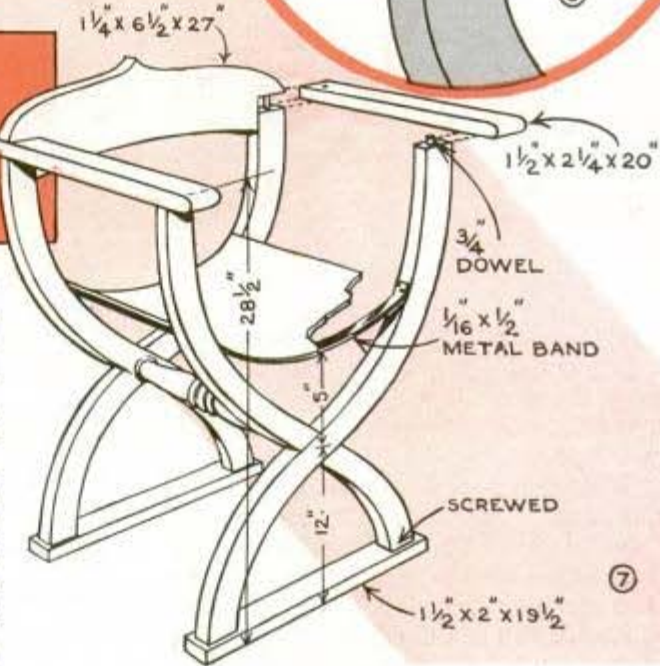
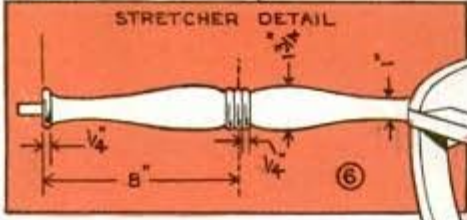
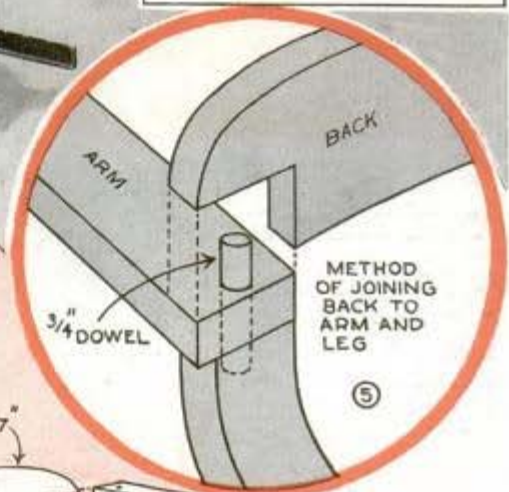


Simplicity of line makes this cross-legged chair exceedingly easy to construct. Beautifully finished, it will go well with most furnishings





MATERIAL LIST	
2 pcs.	1 1/2 x 8 x 34 1/4 in.—Legs
1 pc.	1 1/4 x 6 1/2 x 27 in.—Back
1 pc.	2 x 2 x 18 in.—Stretcher
2 pcs.	1 1/2 x 2 x 19 1/2 in.—Base
2 pcs.	1 1/2 x 2 1/4 x 20 in.—Arms
1 pc.	1/4 x 18 x 19 in.—Seat board



3 and 7, after which the two assemblies are joined together with a turned stretcher, dimensions for which are given in Fig. 6. Holes to receive the 1-in. long tenons of the stretcher are bored in adjacent facing surfaces of the half-lap joint. Care should be taken to prevent the spur of the bit from piercing through the outer face. Set the assembly upright on a level surface and glue the stretcher in place, using a bar clamp as in Fig. 2 to draw the work together tightly.

Dowels are used to attach the arms as shown in Figs. 5 and 7. At the front they enter blind holes, while at the rear they extend completely through the arm and enter the notched end of the back. Apply glue to all surfaces of the joint and clamp crosswise as in Fig. 4. The seat board is supported at the front and back edges with a curved metal strip. The plywood is cut to extend slightly beyond the ends of the strips at which point it is screwed to the legs. The cushion is simply a down-filled pillow covered with fabric.

The beauty of this chair depends a great deal upon the finish. If an open-grained wood has been used, such as walnut, mahogany or oak, the pores must be filled with a prepared paste filler of the proper color. This is mixed to a creamy consistency and applied with a soft-bristled brush, flowing it on with the grain. After it has set for about 15 minutes, the filler is wiped off across the grain so as to leave it packed in the pores. When hard, sand the surface lightly, dust clean and continue with a coat of stain, or 2 coats of high-grade rubbing varnish if a natural finish is desired.

Cuts for School Paper Cast on Chalk Plates



This simple chalk-plate method of making stereotypes will solve the problem of providing line cuts for high-school papers and similar publications, where linoleum-block prints are not always satisfactory, and zinc cuts or halftones are too expensive. While delicate cross-hatching cannot be used, ordinary drawings, cartoons and diagrams can be reproduced. To make a cut, get a steel plate of the desired size and not over $\frac{1}{16}$ in. thick. Around this make a form of cardboard strips to hold a "chalk" paste made by mixing plaster of paris, 1

teaspoonful, with water, 8 teaspoonfuls for each 12 sq. in. of surface to be covered. After transferring the illustration to the chalk surface, the lines are cut through the chalk to the steel plate. A dull phonograph needle stuck in the end of a dowel makes a good graver for this purpose. Next clean off the loose chalk and pour the metal to form a type-high stereotype. As there is no danger of burning the chalk, the metal can be poured hotter than with a matrix, thus assuring exact reproduction of all lines.—M. Van Dyke, Portales, N. Mex.

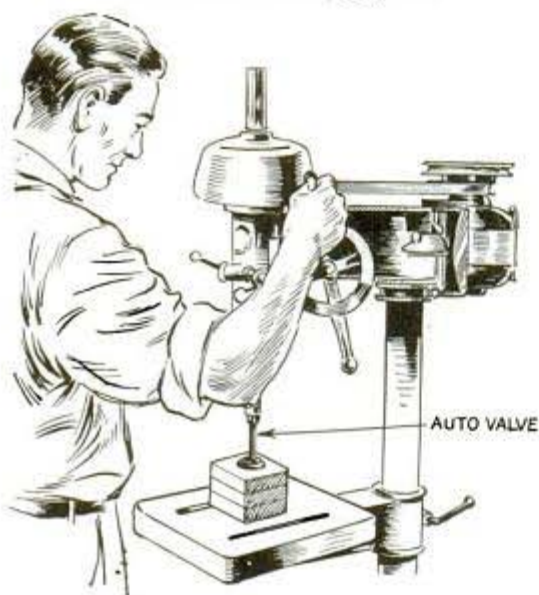
C-Clamp Pushes Small Nails into Strips and Moldings

To do a neat job of placing small nails into the back of a picture frame, or in places where it is difficult to use a hammer, try forcing them in place with a C-clamp. Used in the manner shown in the photograph, the clamp will push nails into the wood with less chance of marring or splitting it, or cracking the glass.

☞ When preserving fruits, the jar rubbers always should be tested before placing them on jars. Stretch and bend them, then keep them in a pan of boiling water for at least 10 minutes.



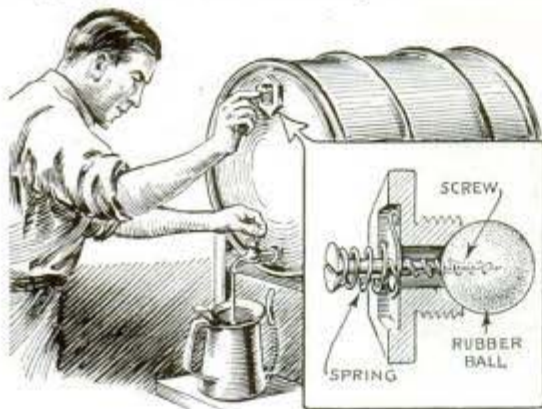
Drill Press Applies Pressure on Small Gluing Jobs



Having several thicknesses of wood to glue up for a lathe turning project and having no clamp large enough to hold them, I inserted a discarded valve stem in a chuck of my drill press. Then the blocks were placed on the table beneath it and the stem brought down firmly against the work, where it was held by locking the spindle.—G. E. Hendrickson, Argyle, Wis.

Valve in Bung of Gasoline Drum to Vent It Easily

Farmers and others who keep gasoline and other volatile liquids in large barrels will find this simple homemade valve just the thing for venting the barrels when removing some of the contents. The valve always stays closed except when compressed and thus there is no chance of its staying open and allowing some of the



contents to evaporate, which often happens when the bung cap is loosened to vent the barrel. The valve is made from the regular bung, which is counterbored on the threaded end to take a small rubber ball. The bung, of course, is drilled through for the insertion of a wood screw which is driven into the ball. A coil compression spring under the head of a screw to bear against the bung completes the job. In use, just press on the head of the screw, which pushes the valve away from the bottom of the bung and allows air to enter the barrel as the contents are drained out.

Modelmaker's Universal Clamp Made from Small Vise

A twenty-five-cent vise plus a block of wood provides an efficient clamp for modeling. The block is cut to the shape shown



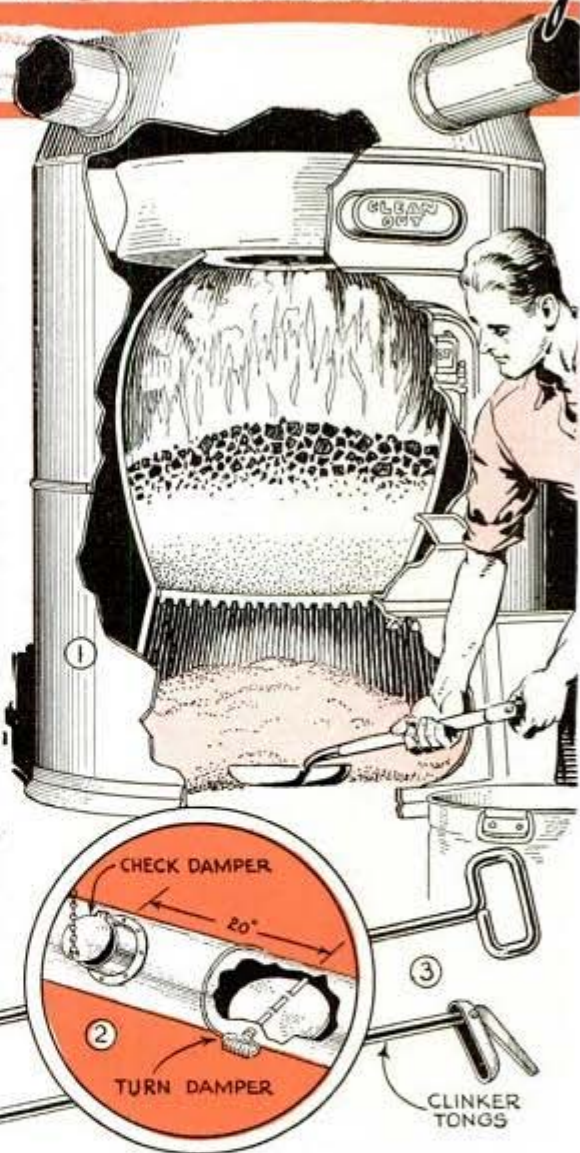
and is held on the bench by a hand screw, the vise being clamped to the block as indicated. By tilting the vise or block, angle adjustments can be made in any direction. In addition to this, the two surfaces of the vise jaws can be fitted with small pins, as shown in the circular detail, for clamping thin, flat irregular work. Small finishing nails with the heads cut off will provide the pins, which should project above the jaws approximately $\frac{1}{8}$ in.

HAND FIRING *Economically*



By W. CLYDE LAMMEY

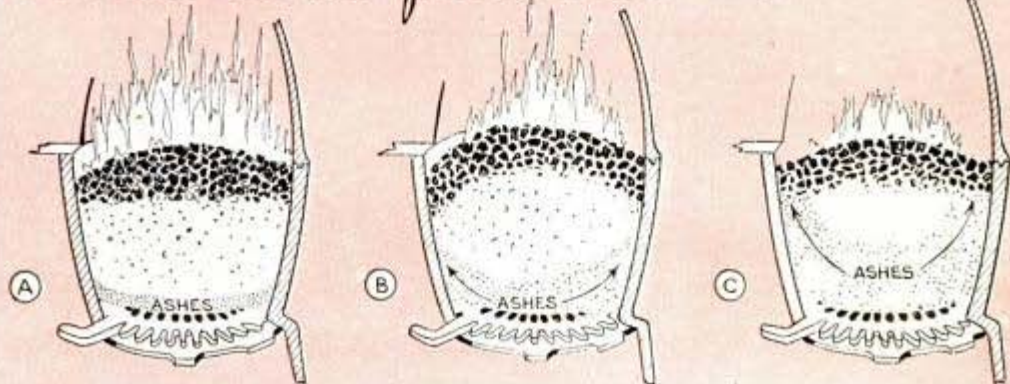
FIRING your heating plant with a shovel is not just a matter of following a set of rules. Rather it means a close observation of the fire over a period of time and adapting the schedule to conditions that are variable, such as fuels, atmosphere on different days, and the peculiarities of the heating system. In the long run, it is nearly always more economical of fuel to keep the fire continuously "alive," that is, burning slowly, than it is to bring it to the maximum heat delivery, then close the direct draft, open the check and allow the fire to die away slowly to a low bed of coals before adding fresh fuel. In building up again, the necessary forcing will result in a smoky fire and a loss of combustible gases. A bright fire, burning any of the various grades of "soft" fuels and manually controlled, will maintain a more uniform room temperature with less fluctuation throughout the season. No two home heating plants will perform exactly alike, even though they be identical in such structural details as size and type, sectional size and height of the chimney.



CURVED-END POKER

CLINKER TONGS

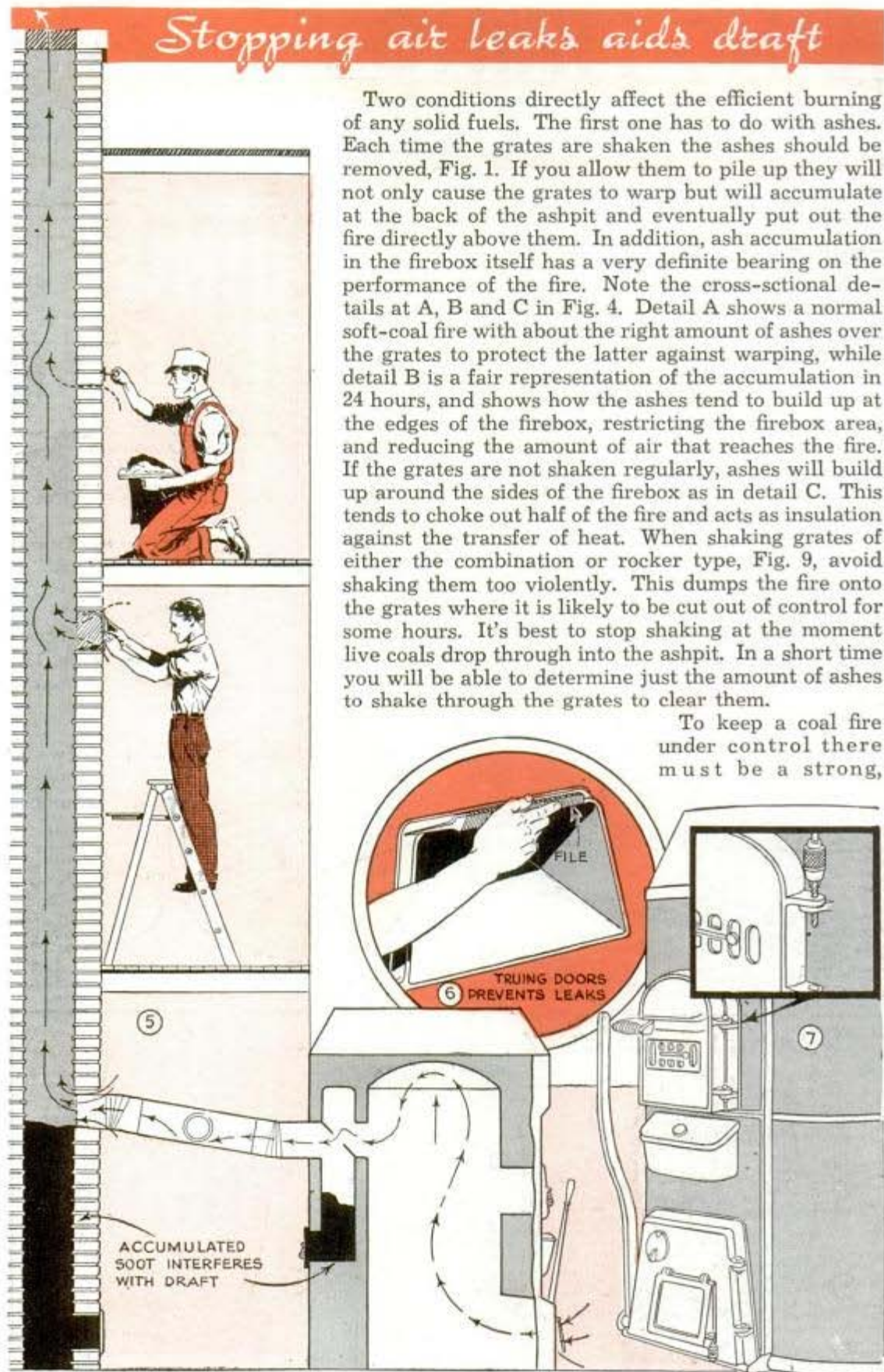
④ *Ashes restrict firebox area - - -*



Stopping air leaks aids draft

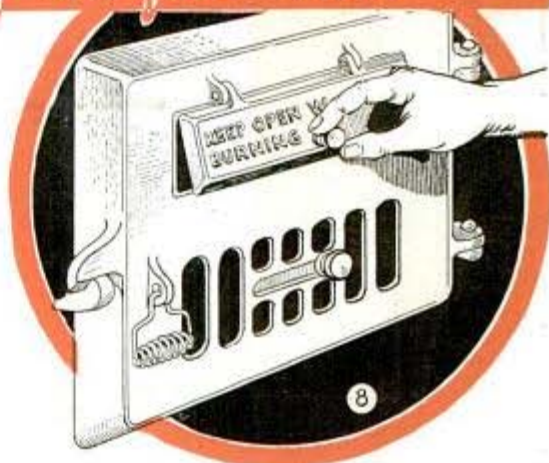
Two conditions directly affect the efficient burning of any solid fuels. The first one has to do with ashes. Each time the grates are shaken the ashes should be removed, Fig. 1. If you allow them to pile up they will not only cause the grates to warp but will accumulate at the back of the ashpit and eventually put out the fire directly above them. In addition, ash accumulation in the firebox itself has a very definite bearing on the performance of the fire. Note the cross-sectional details at A, B and C in Fig. 4. Detail A shows a normal soft-coal fire with about the right amount of ashes over the grates to protect the latter against warping, while detail B is a fair representation of the accumulation in 24 hours, and shows how the ashes tend to build up at the edges of the firebox, restricting the firebox area, and reducing the amount of air that reaches the fire. If the grates are not shaken regularly, ashes will build up around the sides of the firebox as in detail C. This tends to choke out half of the fire and acts as insulation against the transfer of heat. When shaking grates of either the combination or rocker type, Fig. 9, avoid shaking them too violently. This dumps the fire onto the grates where it is likely to be cut out of control for some hours. It's best to stop shaking at the moment live coals drop through into the ashpit. In a short time you will be able to determine just the amount of ashes to shake through the grates to clear them.

To keep a coal fire under control there must be a strong,

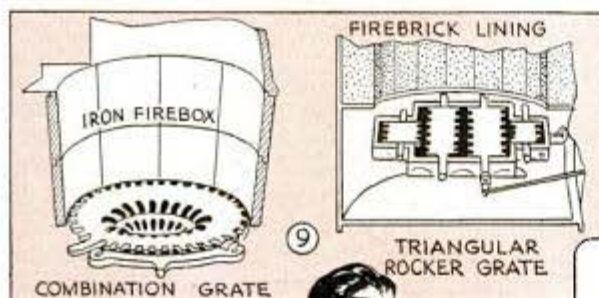


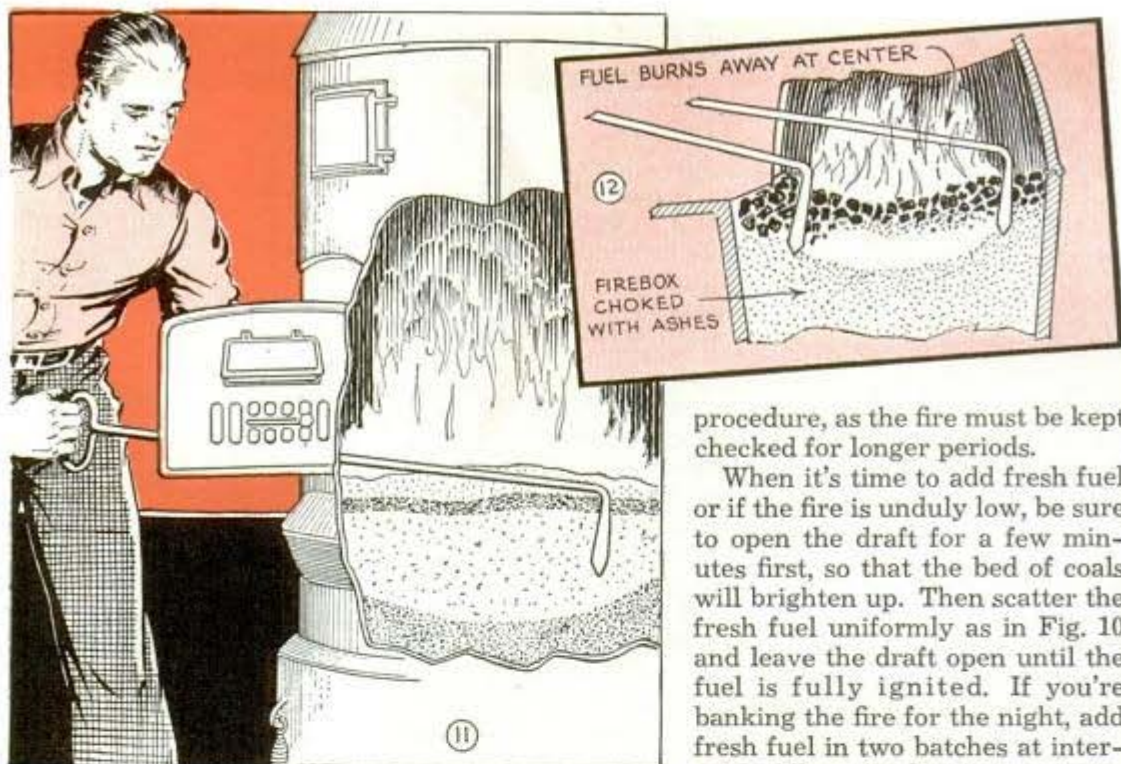
To save fuel, keep the fire "alive"

steady draft. A clear and tightly sealed chimney is important. A look at Fig. 5 will show why it is essential that the chimney be tight and clean. The arrows indicate possible air leaks. Not only are these openings unsafe, but each one of them, admitting only a small quantity of air, is really a tiny check damper. A number of such leaks will admit air equal to that of the regular check damper wide open, and have the same effect on the fire. As a remedy, point up all openings in the chimney with regular mortar. A stovepipe opening can be sealed with furnace cement if it is required for other purposes, at any time the furnace is not in operation. Be sure that the inner end of the smoke pipe does not project into the flue space. If you're putting up a new smoke pipe, the distance between the turn and check dampers, Fig. 2, should be at least 20 in. The fire and asphalt doors and the cover of the check damper should fit tightly so that they do not admit air when closed. On new furnaces all these surfaces are ground, but



where rust has roughened the meeting faces they can be smoothed up with a file as in Fig. 6. If the doors sag when opened, ream out the holes in the hinge halves and put in new pins as in Fig. 7. On most furnaces, an opening is provided either in the fire door or directly below it for admitting air to the combustion chamber. This aids in combustion of the gases when burning soft coals. On some furnaces the opening is provided with a hinged cover fitted with an adjusting screw as in Fig. 8. Be sure this door is open when burning soft fuels.





Firing routine from day to day depends on the individual heating system, its location in the building, the type of fuel, outside temperature fluctuations and the time you have available. In general, the trick is to keep the fire burning slowly, which means that the drafts must be regulated often enough during the day to keep it "alive." This is true when burning any of the soft coals, hard coal or coke, although in any firing schedule the latter two will require attention less often. Atmospheric conditions also have something to do with the way the fire burns. Foggy days and nights when the air is "heavy" generally mean a rather slow, sluggish fire, a time when it's important to keep the ashpit and grates clear. On the other hand cold, clear days and nights require a change in the

procedure, as the fire must be kept checked for longer periods.

When it's time to add fresh fuel or if the fire is unduly low, be sure to open the draft for a few minutes first, so that the bed of coals will brighten up. Then scatter the fresh fuel uniformly as in Fig. 10 and leave the draft open until the fuel is fully ignited. If you're banking the fire for the night, add fresh fuel in two batches at intervals. Allow the first one to ignite

then add a second and leave the draft open until the flames appear. In this way, there will be less smoke and the minimum loss of combustible gases. If you have trouble holding a fire over night a light sprinkling of fine ashes over the second batch of fresh fuel will help. However, if you are using fine coal of the grade known as "mine run" this is not advisable as it tends to form clinkers. As a general rule, it is best to avoid poking or disturbing the fire in any way, especially when burning lump fuels. Mine-run coals frequently tend to "crust" over as in Fig. 11 and should be broken up occasionally with a curved-end poker like that shown in Figs. 3 and 12. Clinker tongs, Fig. 3, are also useful. They enable you to pick out clinkers that are almost impossible to remove by other methods.

Hammer Face Rubbed on Wax Holds Tacks for Driving

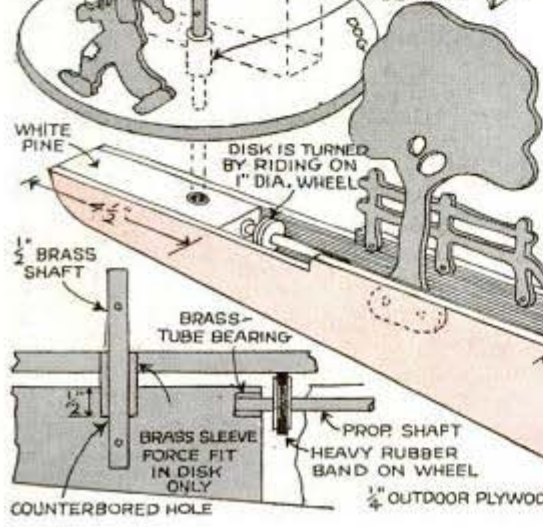
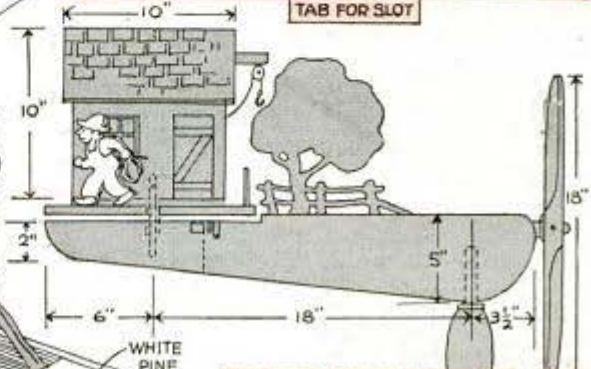
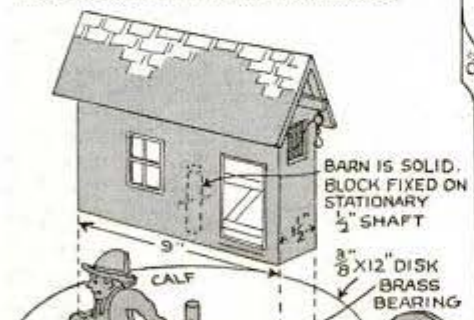
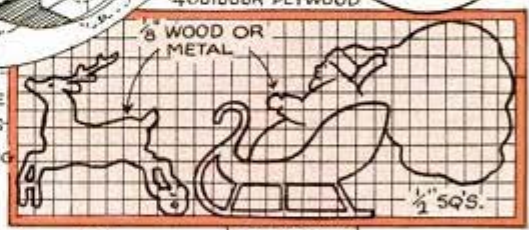
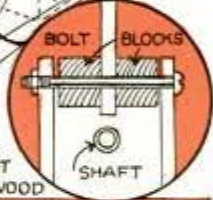
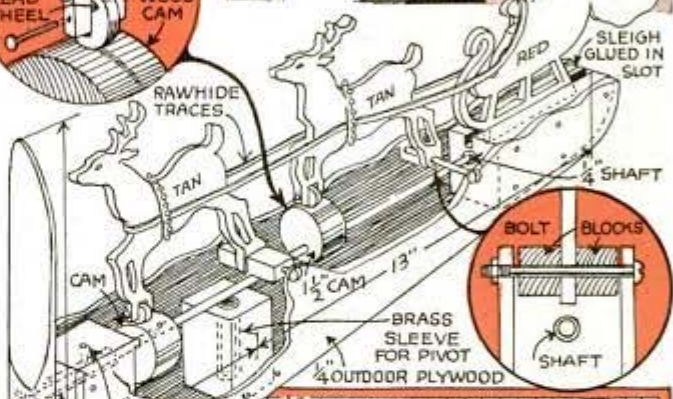


You will not need a magnetic hammer in order to drive tacks quickly if you use a cake of ordinary yellow beeswax. Rub the face of the hammer on the wax to cover it with a thin film, which will hold tacks in position until they are driven home.

☐ You can save many steps if casters are put on your kitchen table so that it can be moved about easily.

Animated WEATHER VANES that sell

Santa is off with the wind, while farmer Hawkins tries vainly to round up his irisky calf—that's the lifelike action provided by these two amusing weather vanes. The figures may be cut of either thin waterproof plywood, or sheet metal. Leaping action of the reindeer is produced realistically by two off-centered disks pinned to the propeller shaft in a reversed position to give an alternate upward motion to each animal. Movement of the figures shown below is provided by a rubber-covered pulley fitted to the propeller shaft to bear near the outer edge of a rotating disk, to which the figures are attached as indicated



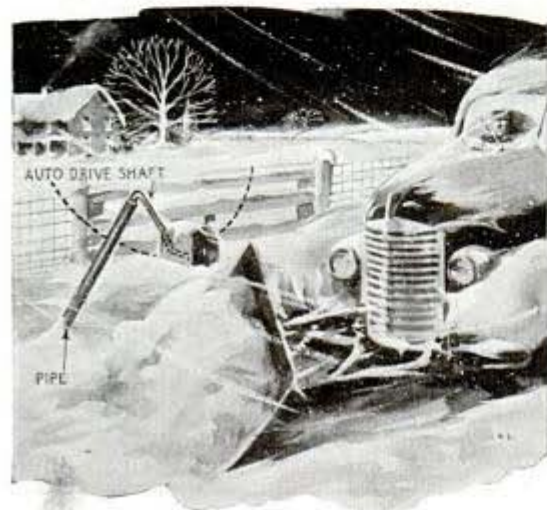
Garden Rake Steadies Tree Limb for Cutting with Saw



When an extension saw is used in the orchard for cutting large limbs at a distance from the ground, the limbs may be kept from swinging and pinching the saw by using a garden rake as a holder. It is necessary to put a tension on the limbs by pulling down slightly with the rake.

Slanting Post Protects Mailbox from Damage by Snowplow

After the post supporting his mailbox had been knocked over several times by a snowplow, one farmer mounted the box



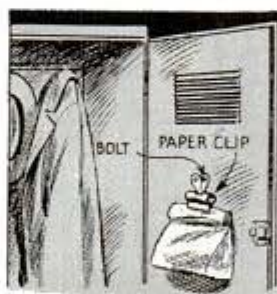
on a length of auto drive shaft, bent as indicated, and inserted loosely into a length of pipe driven into the ground at an angle. With this mounting, the box will swing to one side if struck by a plow or a road maintainer, yet swing back to its normal position when the plow has passed.

Rubber Band Keeps Trouser Legs over Tops of Overshoes

Trouser legs tucked into the tops of overshoes do not prevent snow from entering around the edges. However, snow can be kept out if the trousers are fastened down over the overshoes with a rubber band cut from an inner tube. Split the band on one side, as shown.



Paper Clamp Holds Lunch Bag on Door of Locker



Instead of tossing his lunch bag on the floor of his locker among rubbers and other miscellaneous articles, one worker hangs it on the door of the locker with a paper clamp. This is

merely slipped over the folded end of the bag and hung over a bolt in the door.


Increasing Clothesline Space

If you have insufficient space for stretching a line to dry clothes on bad days, you can increase the capacity of the available line by using one



or more racks like the one shown. It is made from a couple of wooden coat hangers and several dowel rods. Holes are drilled in the hangers to take the rods, which are glued in place.




Christmas
DECORATIONS
in metal

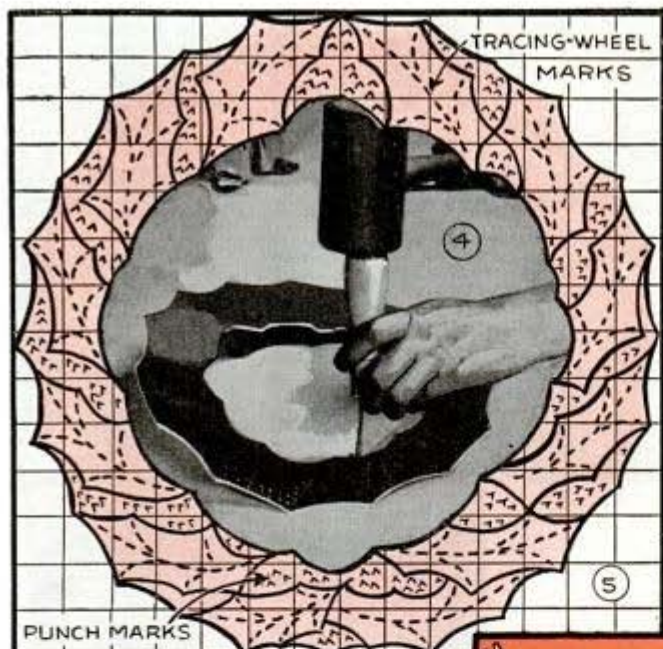


By Edna McGrew

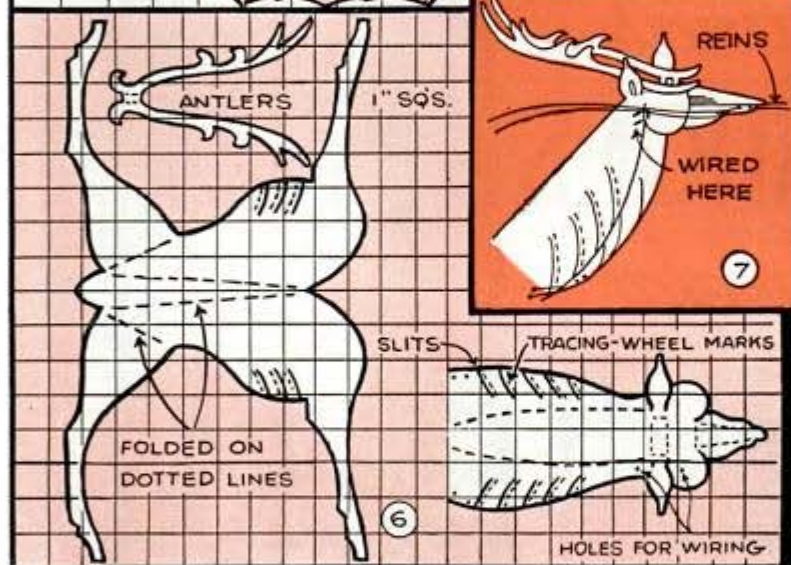
HERE are a number of striking table decorations, Figs. 1 to 4 inclusive, which will add cheer to the home during the holidays. You can make any of these easily in gleaming aluminum, using common household tools to shape the metal.

The wreath shown in Figs. 4 and 5 may be enlarged to any desired size. It may be cut with a pair of scissors from a single piece of .008-in. semi-hard sheet aluminum. When cutting, you will find it easier to follow the lines if the paper pattern is attached directly to the metal with tabs of gummed tape, instead of scribing the outlines off on the work. The holly leaves are raised in relief by tooling the solid lines, and denting the area between the leaves with a blunt-pointed ice pick at the points





one-piece head and neck is attached upright in the V-shaped opening of the body with a piece of No. 26-gauge galvanized wire inserted through small holes punched on each side. A pair of long-nose pliers will aid in twisting the ends of the wire in hard-to-reach places. Form the feet by turning the metal under at right angles, and wire the antlers to the top of the head. The smaller deer is assembled in the same manner. The pattern shown at the left in Fig. 13 forms the bottom and sides of the sleigh. To the sides of this are attached the scrolled runner pieces, which first have been strengthened by running a tracing



indicated in Fig. 5. The dents are made on the face side of the work. A dress-maker's tracing wheel is run on the back side of the wreath to form the veins of the leaves. A large bow of metal can be attached at the bottom.

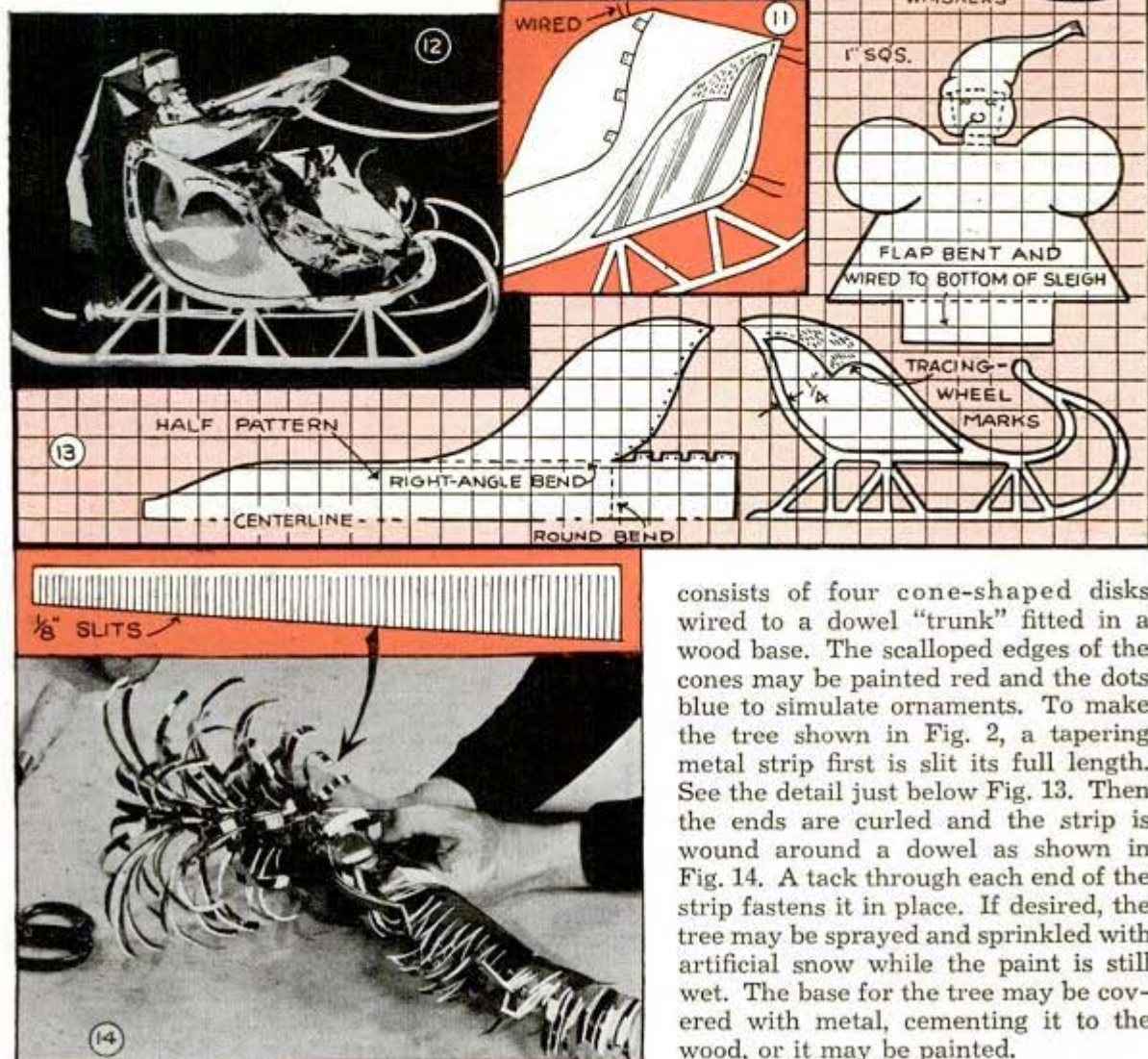
The Santa Claus and sleigh drawn by three reindeer, shown in Fig. 1 and detailed in Figs. 6 to 8 and 10 to 13 inclusive, make an attractive decoration for a mantel. Enlarge one deer pattern on 1-in. squares and another for the smaller deer on $\frac{3}{4}$ -in. squares. Form the body of the deer by bending it on the dotted lines indicated in the pattern. Studying Fig. 8 will enable you to determine the approximate contour. The



wheel over the back side. Santa is wired to the floor of the sleigh in a sitting position, with hands outstretched, as in Fig. 12. The robe is cut from gold foil, crushed and spread over Santa's knees. Narrow strips of cloth serve as reins.

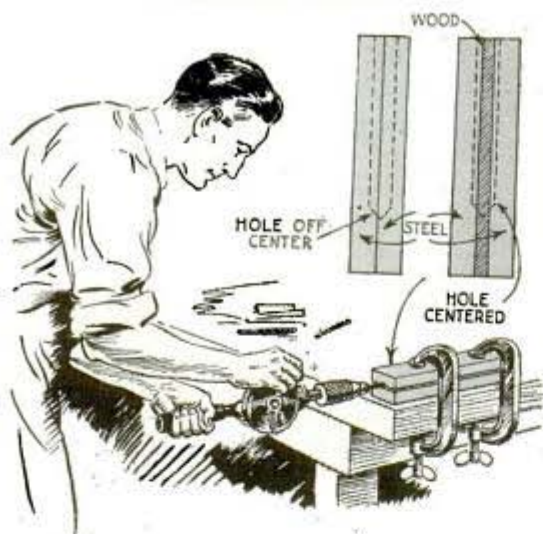
The pattern shown in Fig. 10 is used also for the large standing Santa shown in Fig. 3. The parts simulating the waist, boots and trousers are wired together at the back. The mustache and whiskers are curled and the tabs inserted under the nose. After the figure has been shaped properly, the coat and cap are painted red, leaving the skirt, cuffs, face, hat band and trousers natural. The belt and boots are black.

The table tree in Figs. 3 and 9



consists of four cone-shaped disks wired to a dowel "trunk" fitted in a wood base. The scalloped edges of the cones may be painted red and the dots blue to simulate ornaments. To make the tree shown in Fig. 2, a tapering metal strip first is slit its full length. See the detail just below Fig. 13. Then the ends are curled and the strip is wound around a dowel as shown in Fig. 14. A tack through each end of the strip fastens it in place. If desired, the tree may be sprayed and sprinkled with artificial snow while the paint is still wet. The base for the tree may be covered with metal, cementing it to the wood, or it may be painted.

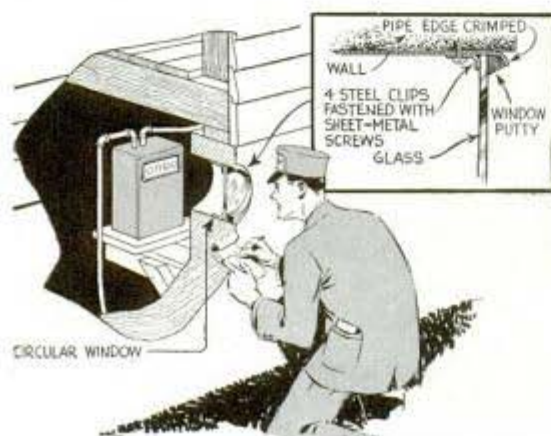
Wood Strip Aids in Grooving Pieces of Metal



Having several pieces of metal that were to have duplicate grooves made in their surfaces, one man did the job with a hand drill. The metal pieces were clamped together tightly with a wood strip between them, after which a small drill was run into the wood to make a shallow groove in both pieces of metal. Then a larger drill was used to cut the grooves to the desired depth. The wood strip serves as a pilot for the drill, which follows the path of least resistance and does not tend to drift to one side into the metal.

Gas Meter Read from Outside Through Window in Wall

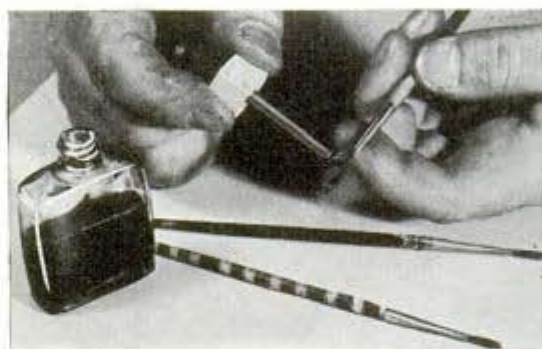
Finding it inconvenient to be at home at certain times to let in the gas man to read the meter, one home owner installed a window in the basement wall so that the meter could be read from outside. It may



be necessary to have the meter turned around so that the dials face the wall. Then in front of them, make a circular opening in the wall to take a sleeve of 8 or 10-in. sheet-metal pipe, cementing it in place carefully. The window is completed by fitting a glass disk behind the crimped edges. Steel clips keep the glass from slipping back, and putty between it and the edge provides a watertight seal.

Nail Polish Cements Bristles in Small Brushes

The use of inexpensive brushes practically always means that loose bristles will become detached and adhere to the work, but the bristles can be anchored securely with fingernail polish. Just apply a drop to



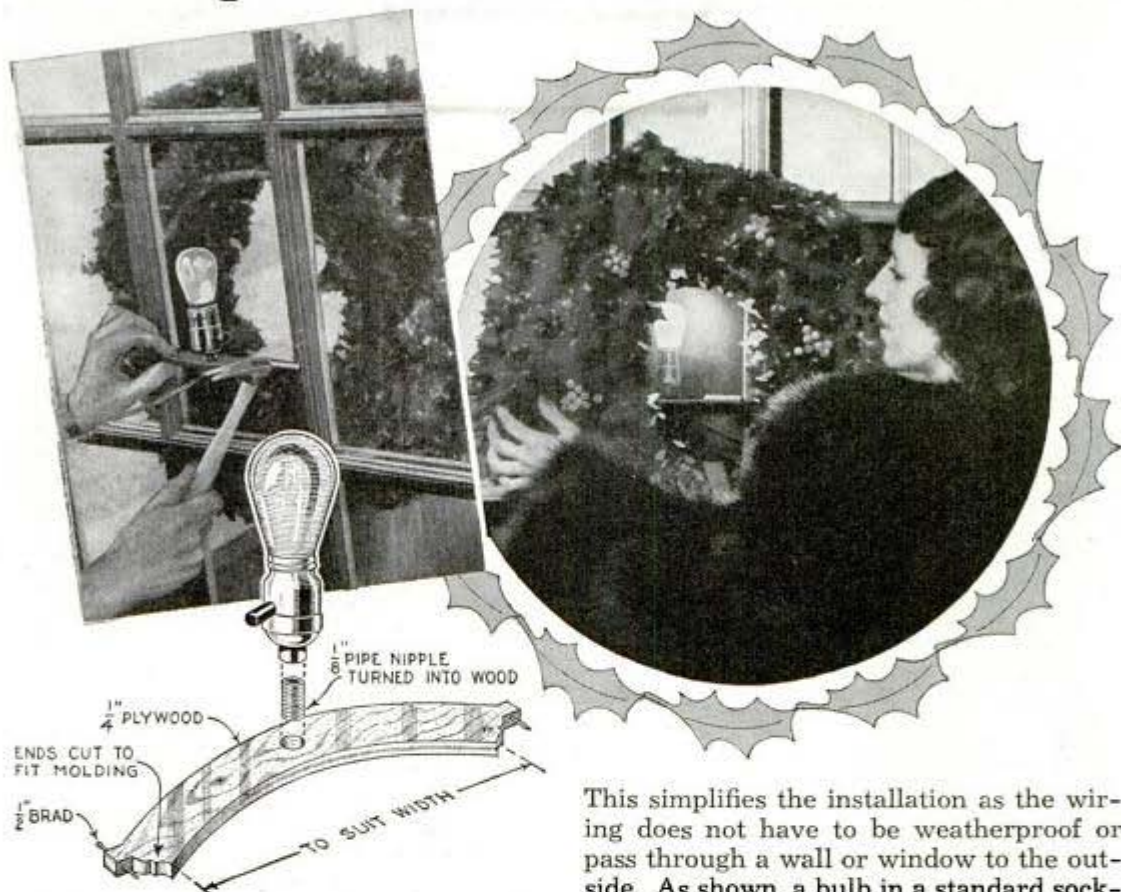
the ends of the bristles, where they enter the handle and metal binding. With large brushes, it will be necessary to part the bristles and treat the tufts separately. Do not use the brushes in lacquer or paints containing lacquer solvents.

Protecting Evergreen Trees During the Winter

For protecting evergreen trees that are subject to damage due to snow filtering and weighting down the branches, fine electrical wire will answer the purpose a great deal better than cloth or strings. Start at the bottom of the evergreen and wrap the wire around as shown. In the spring, the wire can be removed quickly and, if desired, can be stored away for use the following winter.



Installing Illuminated Wreath Outside Door

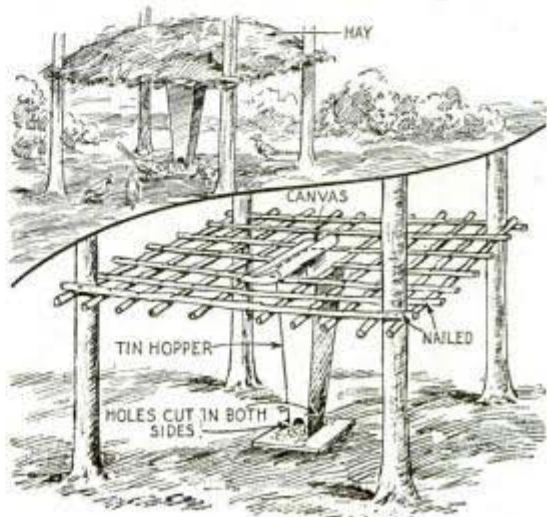


Here is a simple method of illuminating a holly or evergreen wreath for the yule season. With this arrangement, the wreath is hung outside a door or window so that it stays fresh, and the bulb is placed inside so that the light shines through the glass.

This simplifies the installation as the wiring does not have to be weatherproof or pass through a wall or window to the outside. As shown, a bulb in a standard socket is supported on the inside surface of the door by means of a simple plywood bracket and plugged into an outlet. The light cord should be long enough to allow the door to be opened as usual, and a curtain to be hung across the glass.

Fountain-Type Bird Feeder Delivers Food as Required

Desiring a feeder for game birds that would reduce waste of the food to a minimum, one sportsman found that the one shown did the trick. Working on the principle of automatic feeders used for domestic animals and poultry, it consists of a latticework suspended between four trees or posts with the tin feeder in the center. The lattice is covered with straw, hay or cornstalks, the mouth of the feeder being covered with canvas to keep out chaff and other foreign matter. The lower end of the feeder rests on a stone or wood block, which serves as a feeding platform.



☐ A strawberry huller is ideal for removing pin feathers from poultry.



SNOW PICTURES brought

By THOMAS P. LAKE



Photo, Fig. 1, was taken with an A-filter (red). Light-meter reading was twice as high as that usually obtained in summer with bright sun on water scenes. If in doubt as to what filter to use, inspect the scene through several colors, Fig. 2, above

A MATEUR photography is too often a summer pastime, and the principles learned then—perhaps unconsciously—prove to be a snare in the unusual conditions that prevail in the typical winter landscape. Snow appears white because it reflects most of the light rays. In comparison, the ground in summer is an exceedingly poor reflector. Rocks, earth, grass, etc., Fig. 9, all serve to reflect greatly varying amounts of the sun's rays. The snow is quite different, Fig. 10, for it produces no such recognizable pattern.

Sunlit winter snowscapes, with at least twice the light available, in even a brightly lighted summer water scene, call for exposures that are relatively shorter, or made through heavier filters. The over-exposure of snow, coupled with failure to handle shadows properly, usually accounts for the "white-wash" appearance of the snow in so many winter pictures.

Also, there exists a vast difference between the amounts of light reflected from the snow and from such dark objects as tree trunks and a person's clothing. Therefore, an exposure must be some-



Photo at left taken with a G-filter (orange). Backlighting is three-quarter to emphasize shadows outlining ski tracks



to life with shadows

what of a compromise, with the most important element receiving the proper exposure.

Snow detail consists of shadows and brilliant reflections from individual crystals. Of these two, shadows are by far the more usable as their light value is reasonably close to that of dark objects, and they can therefore be reproduced easily in varying tones of gray in the negative. Shadows are illuminated by blue-sky light, and this we have learned to control by the use of yellow, orange, and red filters. Since much of the blue-sky light reflected from snow shadows can be absorbed by these filters (yellow least, red most), the use of such a filter, Fig. 5, will darken shadows. See Figs. 1, 3, 4 and 7.

Shadows are necessary to give some indication of the contours of the snow, and the best time to get snowscapes is when the shadows are as long as is compatible with good light—early morning and late afternoon. While it is true that the winter sun at noon is about as far above the horizon as the summer sun in midmorning and in midafternoon, the winter noon shadows are still too short to be very useful, Fig. 12. It is best to wait until after 3 o'clock in the afternoon, or to get out before 9 o'clock in

Photo at left taken with A-filter, directly against sunlight to get reflections from ice and snow. A low viewpoint keeps shadow of the sail short



Photo, Fig. 6, was taken with a yellow filter combined with a Polaroid screen to darken the sky. The figure was outlined against the sky by choosing a low viewpoint at the foot of a small hill

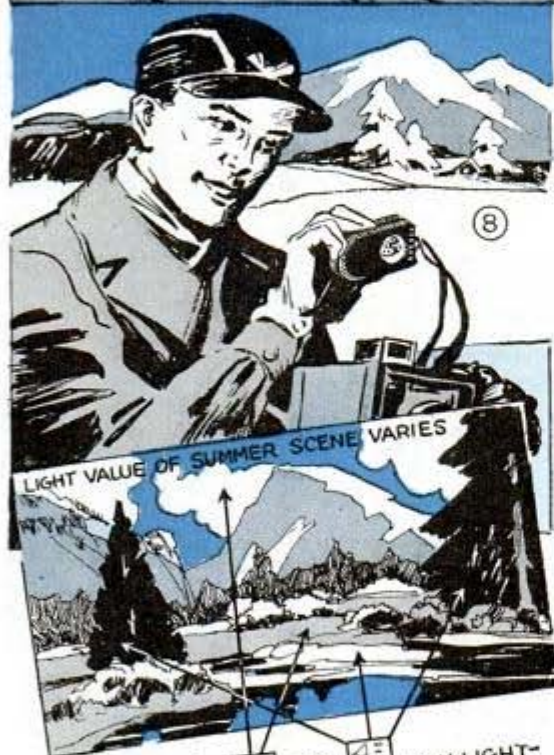
the morning. At this time shadows are quite long even on comparatively level ground.

Another factor that affects the apparent length of shadows is the direction in which they run in relation to the way the camera faces. Shadows running toward the camera, as in backlighting, Fig. 13, will appear much longer and be far more prominent than those which run away from the camera, Fig. 14. But shadows which come directly toward the camera fail to give the best idea of contour. For this reason it is usually best to have them running diagonally toward the camera, as in Figs. 11 and 13, or possibly at right angles, as in Fig. 1.

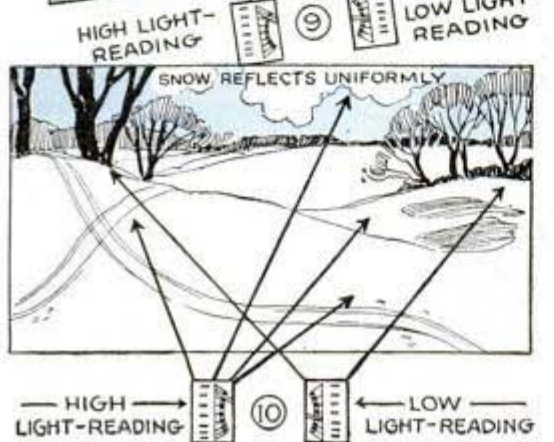


By taking this photo almost directly against the sun, shadows outlined each prominence. Frontlighting (as if taken from opposite side) would have lost shadows through flat lighting

The picture in Fig. 15 was taken with most shadows running directly toward the camera, yet the perspective of the wide angle of view makes the side shadows become diagonal. The reflections of the sun on the ice-covered stream were of first importance in this photo, and account for the necessity of a few shadows running into the camera.



Good results in winter photography require the following camera equipment: A red-sensitive panchromatic film; many of the fast "pan" films have high sensitivity in the red. Some do not, however, and should be avoided. A high red sensitivity is indicated by a fairly low filter-factor for a red filter. A factor of 4 is excellent. This allows the use of the filter without too great an increase (only 4 times) in the exposure. Also you will need a red filter, a lens hood, a light meter, either photoelectric or extinction type, Fig. 8. A carrying case or bag for the camera. This is essential. Also a tripod and light leather gloves to be worn under heavier mittens, or shooting mittens that have slots through which the fingers may project to operate shutter also help. Before leaving home, clean the lens carefully. It is usually best to let the camera cool to outside temperature. Condensation is the enemy of winter photography. Once the camera has cooled to outside temperature, keep it out of your pockets where it might condense some of the moisture given off by the skin. Carry the camera in a case outside of the clothing.



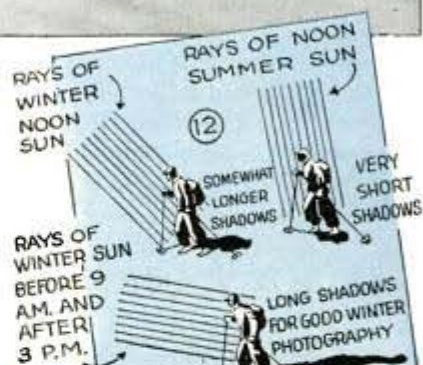
Keep the bare hands away from a cold lens. Wear thin leather gloves when working close to the lens. If the lens can be covered with a cap, or the film covered with a slide, make it a practice to trip the shutter several times to loosen any congealed oil that otherwise might prolong the exposure. Most shutters are supposed

Drawings at left show that a summer scene has wide variation of light reflection with most portions giving fairly low readings on light meter, while a snow scene gives high readings from most portions

Three-quarter backlighting gives interest to the photo at right, which was taken with a G-filter, permitting detail of tree trunks besides bright reflections from snow in foreground

to be oilless, and if yours sticks completely in cold weather, take to a repairman and have it cleaned for winter use. The diaphragm control is often assembled in light oil. If this hardens in cold weather, be careful to avoid forcing it in changing the stop. Keep a slight, steady pressure, and it will generally move, though slowly. If it still resists setting, surround the barrel with gloved hands for a minute or two. This will usually warm the mechanism sufficiently so it can be moved. Leave the camera in its case after going out into the cold for at least half an hour, to allow the lens and mechanism to cool slowly. When going back into a warm room, leave the camera untouched in the case for several hours, to allow it to warm slowly. The cold air within the camera will expand on warming, and prevent the entry of any moisture-laden air if the camera is not exposed to currents.

Don't make the mistake of breathing on the lens of your camera when you are out of doors on a cold winter day. The moisture from the breath will freeze almost immediately and must then be allowed to evaporate. It is best to clean the lens thoroughly before leaving home, but once outside, don't touch it.



Angle of sun's rays varies from summer to winter. Photos taken before 9:00 a.m. and after 3:00 p.m. have long shadows. Figs. 13 and 14 show how to get good shadow effects from backlighting and the result if the same scene were taken with frontlighting

Number of Camera Plate Holder Exposed on Film



Photographers who use plate cameras can expose the number of the plate holder on the film when a picture is taken so that it shows on each print. First, number each plate holder and then on a small piece of clear celluloid duplicate the number with

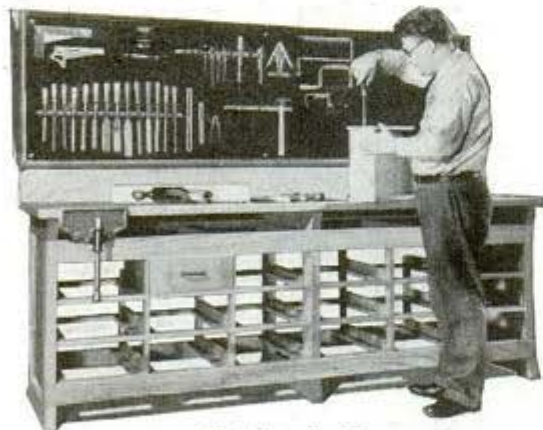
India ink. Fasten the celluloid piece to one corner of the cut-film sheath with colodion or fingernail polish.

Envelope Moisteners Are Handy for Local Control of Prints

Filled with concentrated developer, reducer, intensifier or plain hot water, celluloid envelope moisteners are convenient in the darkroom for local control of prints. If the moistener you use has a copper ring which holds the sponge in place on a rubber stopper, it is best to remove this and sew the sponge to the stopper with thread.—Edwin L. Bond, Baltimore, Md.



It's a Pleasure to Use Motorized Tools



Cabinet Bench—898

DRILL PRESS—895: Pipe fittings. $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

WOODTURNING LATHE—1056: Self-contained unit, mounted on stand. 4-speed belt drive—25c.

CIRCULAR SAW TABLE—910: Angle-iron frame. 24 by 36-in. table. 10-in. blade—25c.

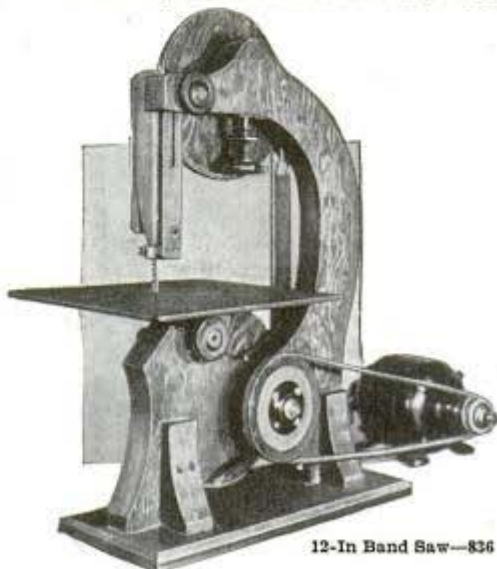
22-IN. SCROLL SAW—771: Pipe fittings and hardwood. Has sewing-machine drive—25c.

"STROKER" BELT SANDER—1057: Ideal for wide boards. Wooden framework. Table adjustable—25c.

VERTICAL SPINDLE SANDER—560: Wood table 10 by 17 in. Has $2\frac{1}{2}$ by 4-in. sanding drum—25c.

You'll save time and labor by equipping your shop with these low-cost homemade machines, and 20-drawer workbench. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need

CABINET BENCH—898: Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.
12-IN. BANDSAW—836: Smooth running and sturdy. Cuts 2-in. stock easily—25c.



12-In Band Saw—836

Any six of these plans (not projects) will be sent postpaid upon receipt of \$1.00. Catalog listing over 400 plans included free with your order if specified, or sent separately for 3 cents to cover mailing

Address—Plan Service, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



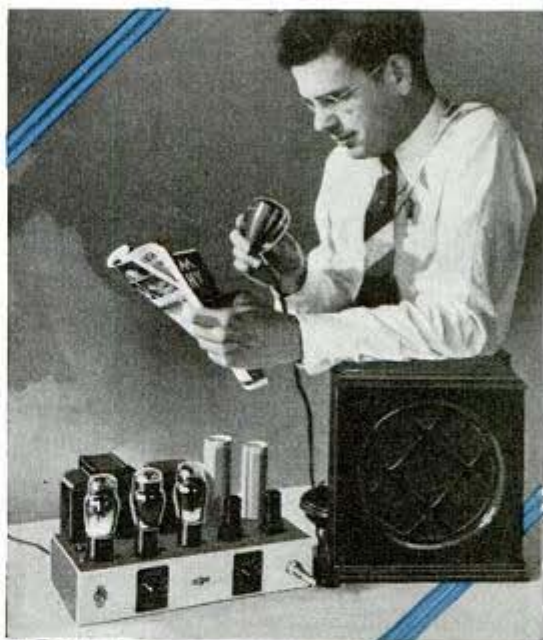
Radio

Compact Ten-Watt Super-Fidelity Amplifier

DESIGNED for a wide variety of experimental and practical applications, this compact 10-watt general purpose unit, originally intended for laboratory bench use, has seen satisfactory service in public-address work, in experiments with reception of frequency-modulated signals and in home recording.

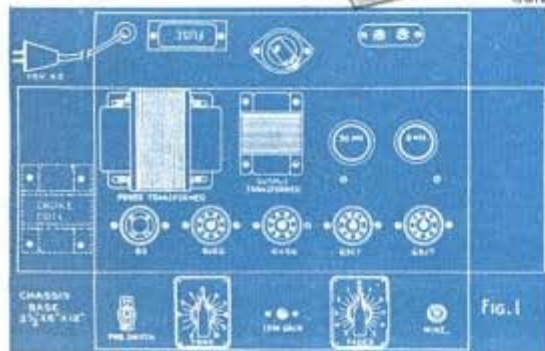
Five tubes are employed; these include a 6SJ7 high-gain voltage amplifier, 6SC7 high-mu dual triode as amplifier and phase inverter, two 6V6G's in push-pull as the power stage, and a type-80 rectifier. The high-gain input provides ample gain for full loud-speaker output from any of the standard types of microphones. A low-gain input skips the 6SJ7 voltage amplifier stage and feeds high-level inputs, such as radio tuner, phono pickup and similar units directly into the 6SC7 stage.

The use of a phase inverter circuit eliminates the need for a coupling transformer at the input of the push-pull stage, thus reducing the cost of parts. Some idea of the effectiveness of this coupling system is found in the fact that the frequency response of the low-gain channel is flat



within less than 2 db. over the range of 25 to 15,000 cycles. This range, incidentally, coincides almost exactly with that of the human ear and exceeds the requirements for regular radio and phono reproduction, and is utilized fully only by frequency-modulated broadcasting of

highest quality. All wiring diagrams and instruction sheets are included in the complete inexpensive kit now available to students and experimenters. The simple chassis layout is shown in Fig. 1 and Photo A. Front panel controls include a power switch, tone control and fader-volume control. The latter control permits two inputs to be connected to the amplifier and selects either phono or "mike" at will.



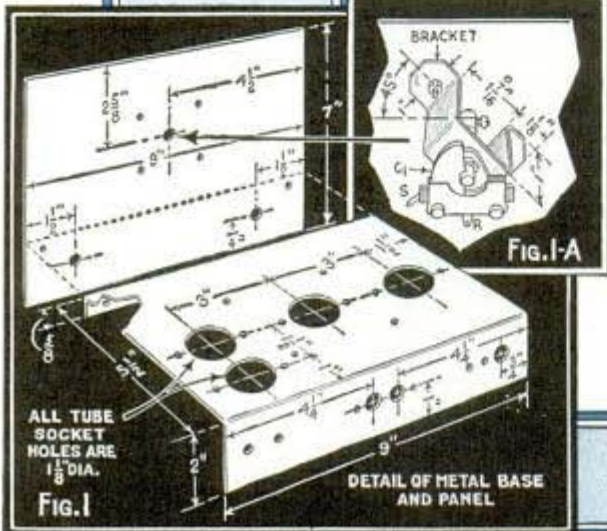
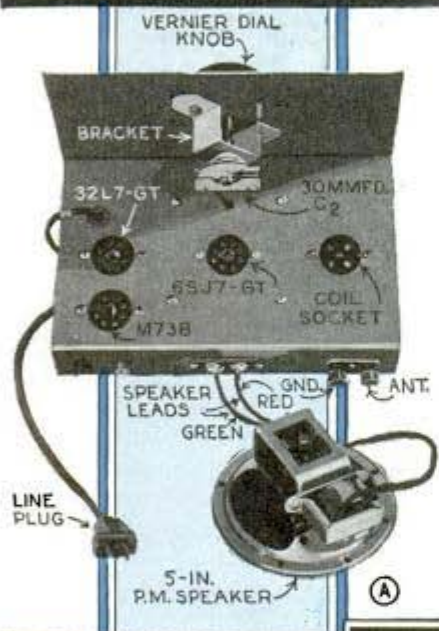
Beginner's TWO-TUBE



HERE is an excellent inexpensive all-wave receiver that works efficiently on any 110-volt a.c. or d.c. line. No A or B-batteries are required, there are no coils to wind and construction details have been simplified for beginners. It will operate a loud speaker on the more powerful broadcast stations and is a real "distance getter" on short waves.

Continued effort in tube development has made a 2-tube set of this description possible, and practical, for the experimenter and student. Surprisingly good results are obtained by means of a simple circuit. The type 6SJ7-GT tube is a triple-grid, glass-envelope variety, and operates as a detector amplifier. The control grid comes out the bottom instead of the top as in the capped types, the screen being used in the usual manner. Employed as a detector-amplifier, of the regenerative electron-coupled type, the tube is very stable and capable of delivering large audio-frequency output voltage with relatively small input voltage. The 32L7-GT is also an octal-base glass type. This tube is a combination beam-power amplifier and rectifier. In other words, these two dual-purpose tubes really provide 4-tube set efficiency. What appears to be a third tube in this set is merely a Raytheon type M73B plug-in ballast resistor used to reduce the 110-volt line voltage to the proper value for the tube-heater terminals (2H) and (7H), which are wired in series. This ballast resistor eliminates the usual line-cord resistor commonly used in a.c.-d.c. sets.

Two ICA No. 1473 plug-in coils are used to cover the broadcast band from 190 to 550 meters, and a set of four ICA No. 1471 short-wave coils cover from 9½ to 217 meters, thus meeting the requirements of an all-wave receiver for any broadcast or short-wave lis-



Crystal Receiver and Test-Set Combination

By M. N. Beitman

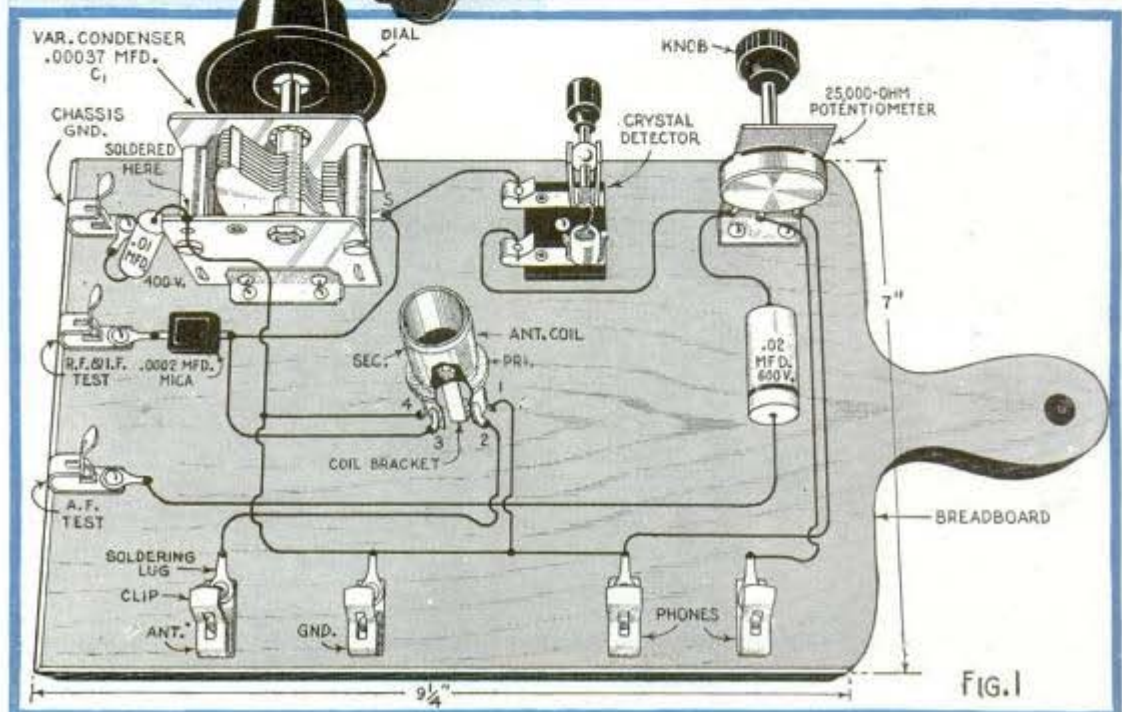
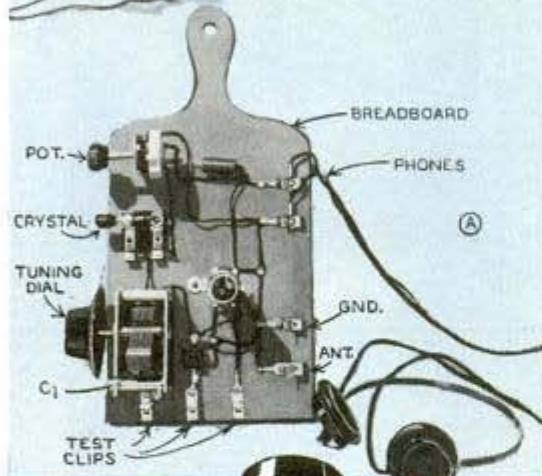


BUILD this breadboard style, efficient crystal set, and use it also as a testing instrument. The highly selective crystal-detector circuit will provide good reception from local stations and requires only a handful of inexpensive parts.

If the unit is used for receiving regular radio stations, the three terminals provided for test purposes are not employed. When you wish to use the unit for tracking down trouble in any faulty radio set, follow these simple instructions: Remove the antenna and ground wires. Connect the chassis ground terminal directly to the metal chassis base of the radio set to be tested, by means of a short length of wire, and prepare to trace the signal to the actual fault in the receiver. If you are testing the circuit after the detector tube, use the A.F. test terminal for the "tracer wire." The volume control of the crystal set is adjusted to keep the response in the headphones at a comfortable level. For tracking the signal in the R.F. or 456 k.c. I.F. sections, use the terminal marked R.F.

When working with the A.F. connection you will hear the signal best with the cat's whisker off the crystal. However, when

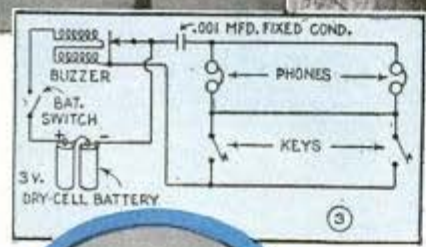
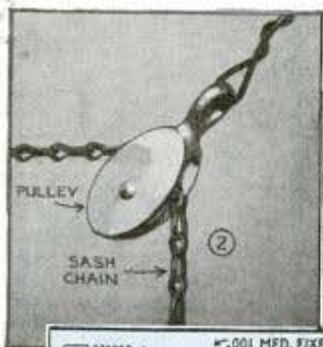
(Continued to page 136A)



Esalvita Int'l. Corp.
4545 W. Augusta Chicago

Helpful RADIO HINTS

(1) Changing records automatically and playing them through your own radio without any wires or connections between the instruments, this easily portable wireless unit plugs into any light socket and utilizes your radio's speaker. Record changer handles eight 10-in. records or seven 12-in. ones at a time. Crystal pickup, tangent tone arm and automatic "reject" button are featured. Makes an automatic phono-radio combination out of any radio regardless of age, make or model

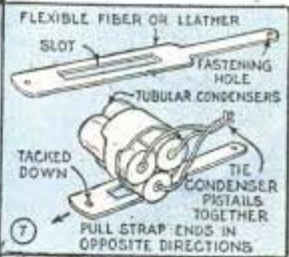


(2) Copper-plated steel sash chain makes good non-stretch antenna halyard; eliminates need for tension springs or counterweights. The No. 8 size is claimed to have a breaking strain of about 350 pounds, more than sufficient for average antenna installations. (3) Buzzer connected for group code practice. Any junk-box condenser can be used, as capacity is not critical. Keying through condenser, buzzer is easily adjusted to hold pleasing note. (4) Shielded microphone switch easily installed in "mike" line; switch button on side short-circuits microphone, eliminating open-circuit grid howls



(6) Small insulated "thru-bushings" for 1/4-in. holes in metal-chassis bases. (7) Easily made strap for assembling several tubular-type condensers. Narrow strip is pulled through slot, and tacked to baseboard

(5) Staple driver aids servicemen when installing long speaker leads; permits stapling in corners, moldings and hard surfaces such as mortar, plaster and brick. Tool has magazine which holds about two dozen staples; feed is controlled by a trigger so handle can be struck several times without placing staples on top of each other



American Phonic Corp. 1250 W. Van Buren Chicago
 James Miller
 Prof. Co. Inc. 150 Exchange St. Malden Mass

Walter L. Schott Co.
5264 W. Pico Blvd.
Los Angeles

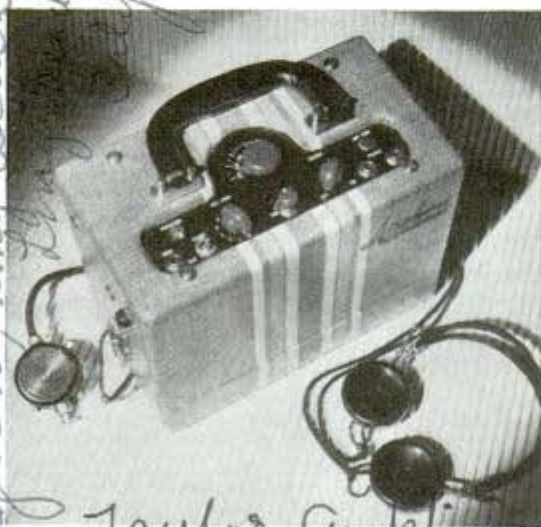
Children's Growth Is Recorded in Phonograph Album



Recording children's growth audibly in records is latest use made of home-recording equipment. Junior and sister are shown here preparing for a recording, and mother acts as master of ceremonies at the recorder-radio-phono unit.

Compact Portable Aviation Radio

Including all the features of a transmitter and receiver, this portable battery-



NEXT MONTH—How to Build a T.R.F. High-Fidelity Tuner. Suitable for use with any good 8 or 10-watt audio amplifier; easily built, uses low-priced standard parts. A high quality local broadcast radio tuner for particular listeners. Also—**How to Wind a Complete Set of Broadcast and Short-Wave Coils**

operated aviation unit also includes a complete interphone system. Two headphones are provided, one for the instructor and the other for the student or passenger. The receiver employs a superheterodyne circuit and the transmitter has a separate oscillator, push-pull modulation, and class-C output. Power output of the transmitter is about 1 watt.

A.C.-D.C. Sound System

Designed for general-purpose use in schools, advertising agencies, recording studios and public-address rental work, this unit combines into one compact, port-



able cabinet, a transcription player and public-address system for 110-volt a.c.-d.c. operation. Built-in amplifier delivers 20 watts output. A 10-in. P.M. dynamic speaker is mounted in the lid, and the microphone is supplied with a 25-ft. cable and plug. Turntable is 16 in. cast aluminum, and extra record storage space is provided.

Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.



SHOP NOTES

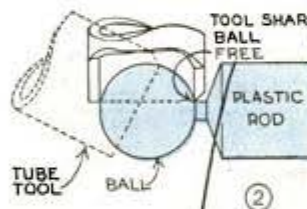
Turning and Polishing PLASTIC BALLS

USED extensively in novelties, plastic balls are easy to form with a simple tool made of tubing, with which the plastic is turned to shape. With this method, balls up to 1 in. in diameter are made quickly.

Start by chucking a length of plastic rod of the required diameter in a lathe. Rods up to $\frac{5}{8}$ in. in diameter can be worked through the hollow headstock, making it



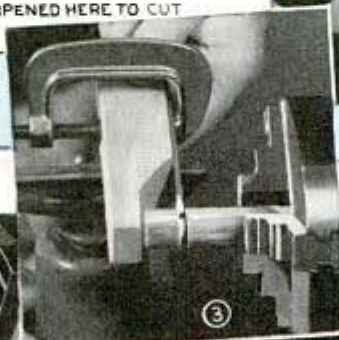
BALL MILL OFFERS SIMPLE AND ACCURATE METHOD OF POLISHING BALLS



②



TUBE TOOL GIVES PERFECT SHAPE



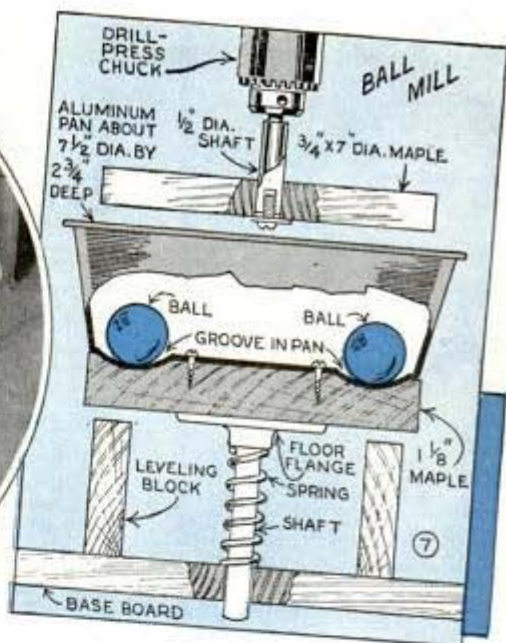
SPACING BLOCK SETS CUT

LARGE BALLS ARE BEST TURNED IN SERIES FROM CYLINDER STOCK



⑤

convenient to turn one ball at a time on the free end of the rod. A wooden spacer block clamped to the parting tool offers a convenient method of setting the roughing cut, Fig. 3. Then the ball is roughed down with the diamond tool or flat-nose chisel. Final shaping is done with a piece of pipe or steel tubing, the inside diameter of which should be a trifle less than the diameter of the ball. The tube tool is not sharpened in any way other than a perfectly square cut across the end. The tool is held freehand over the ball as shown in Fig. 4. If desired, one edge of the tool can be ground to a sharp bevel and toothed. This will permit cutting the ball free from the rod, Fig. 2. Larger balls, that cannot be worked through the headstock, are best turned in se-



ries, Fig. 5, using the same method as before. With a little care in using the tube tool, very clean work can be done, requiring only sanding to give a good polish.

Where a number of balls are being worked, a ball mill, Fig. 1, offers an excellent means of polishing. Construction of the mill is shown in Fig. 7. In making the mill, the groove for the balls is first turned in a disk of hard maple. The pan is screwed to the disk and the bottom spun into the groove, as shown in Fig. 6. This operation can be done with a hardwood stick if you do not have spinning equipment. The balls ride in a groove in an aluminum pan, and are held under spring tension by a maple disk, which presses the pan down to almost touch the leveling blocks. The pan is charged with a half cupful of No. 100 silicon-carbide grains for the first polish, after

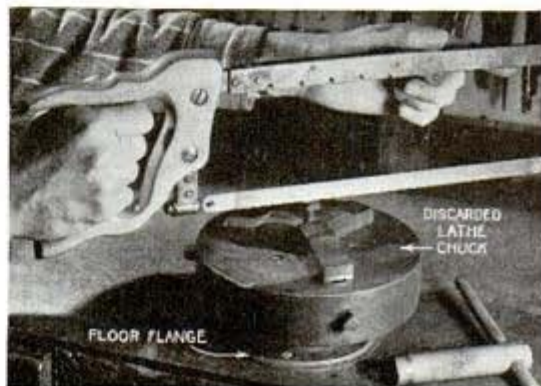
which successively finer abrasives are used.

The ball mill works best with a full load. Glass marbles of slightly lesser diameter than the work can be used as fillers if the work itself does not fill the race. The rotating maple disk bears on the balls just sufficiently to put the spring under slight tension. A small amount of play should be allowed between the base of the pan and the leveling blocks. A satisfactory polishing schedule calls for No. 100 silicon carbide mixed with water to a thin paste for the first run, which will require about 20 min. Then the pan and balls are washed carefully with benzine, after which a charge of No. 150 or 180-grit abrasive is used for about 10 min. The final luster can be obtained with No. 2F pumice or any other mild abrasive. The speed of the drill press should be about 400 r.p.m.

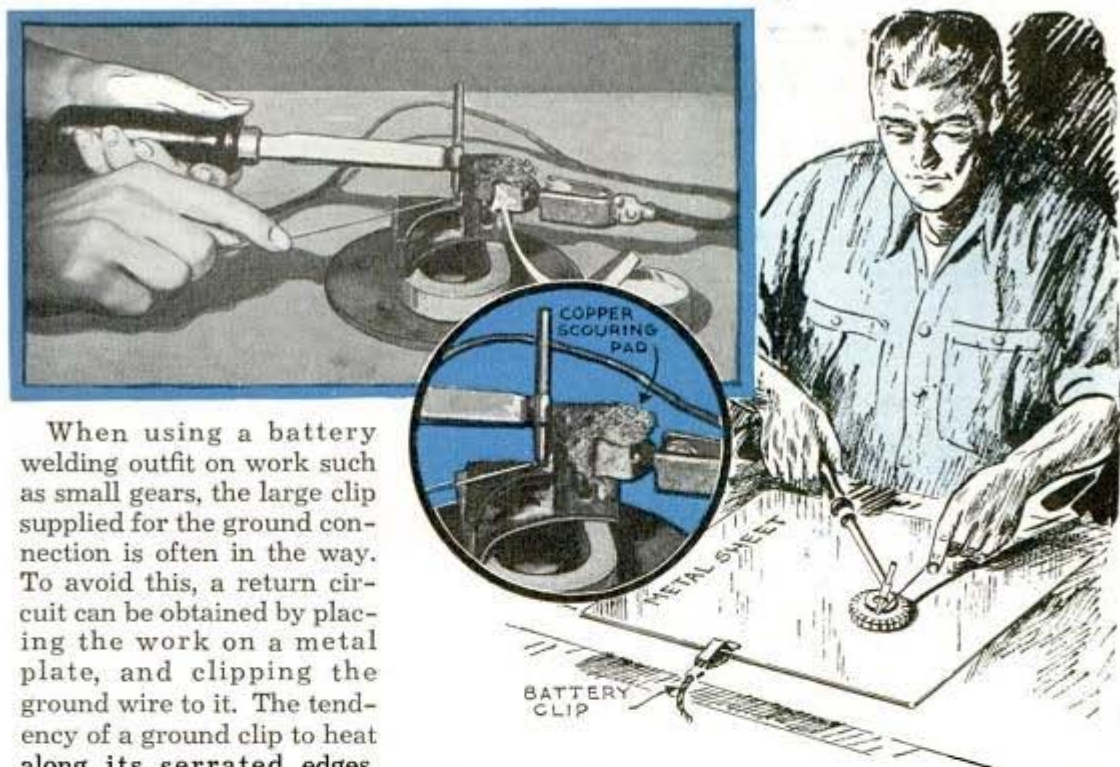
Old Lathe Chuck Provides a Good Vise for Round Stock

An old lathe or milling-machine chuck of the universal type makes an excellent vise for round stock when mounted on a workbench. Obtain a large floor flange from a plumbing-supply dealer, and screw or bolt it to the bench top. Then thread a short piece of pipe or round bar to connect the chuck and the floor flange.

☐ When canning fruits, label your jars with a wax crayon while jars are hot. The crayon will not rub off when cold but can be washed off with hot water.



Shortcuts in Using Battery Welding Outfits



When using a battery welding outfit on work such as small gears, the large clip supplied for the ground connection is often in the way. To avoid this, a return circuit can be obtained by placing the work on a metal plate, and clipping the ground wire to it. The tendency of a ground clip to heat along its serrated edges, especially when gripping a flat surface, can be avoided by placing a wad of copper or steel wool under the clip. Be sure that the wool is clean, and that it is wadded tightly to get maximum contact with the surface of the work and clip. This will provide a

larger contact area, and lower the resistance of the connection so that more current will be available for useful work. The result is a hotter carbon point to do better welding without making it necessary to increase the voltage.

Non-Slip Angle Block Keeps Long Tractor Belt Tightened

To tighten a heavy belt on tractor-driven machinery sometimes causes considerable trouble in backing and blocking the tractor. One mechanic has simplified the job, however, by cutting a wood block as shown, and fitting a couple of wood pegs in the underside. In use, the tractor is backed to tighten the belt, the location marked and the tractor driven forward. The block is placed in the position indicated, and the tractor backed over it. As the wheel drops over the apex of the incline and down the short side, the belt is tightened and held securely.

❏ If you use a screwdriver to hold a spool of wire while winding a coil, clamp the blade end in a vise. This avoids marring the handle, which then prevents the spool from slipping off so that the screwdriver can be held at an angle.



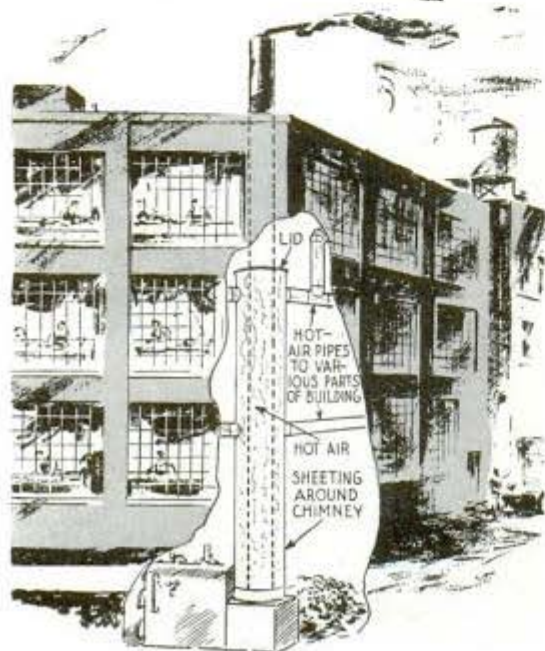
Hack-Saw Blades on a Broomstick Clean Flues of Small Boiler



Needing a flue cleaner for his small steam boiler when none was at hand, the operator of a dry-cleaning plant made one from a broomstick and a couple of hack-saw blades. These were attached with bolts near one end of the stick as shown, the blades being bent so that they scraped tightly against the sides of the flues.

Sleeve Around Large Smokestack Utilizes Waste Heat

In a large factory building, the heat radiated from a steel smokestack was circulated through the building by fitting a



sheet-metal sleeve around the stack. Conductor pipes carried the heat to the desired parts of the building with the aid of a fan. A lid or cap placed over the top of the sleeve could be removed during warm weather to allow the radiated heat to escape in the usual manner.

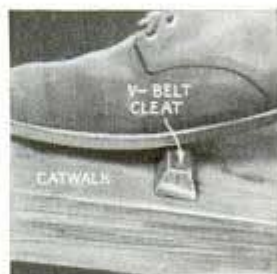
Wheel Rim on Barbed-Wire Reel Makes It Easy to Unroll

The X-shaped ends on reels of barbed wire make it difficult to unroll them when putting in new fences. One farmer avoided this by fitting old auto-wheel rims over the ends of the reels. Holes were drilled



through the rims so nails could be driven through them into the ends of the reel.

V-Belts Provide Good Cleats for Catwalk



When catwalks and gangplanks are used where it is necessary to put cleats on them to provide safe footing, strips of V-belts are better for cleats than wood strips. They

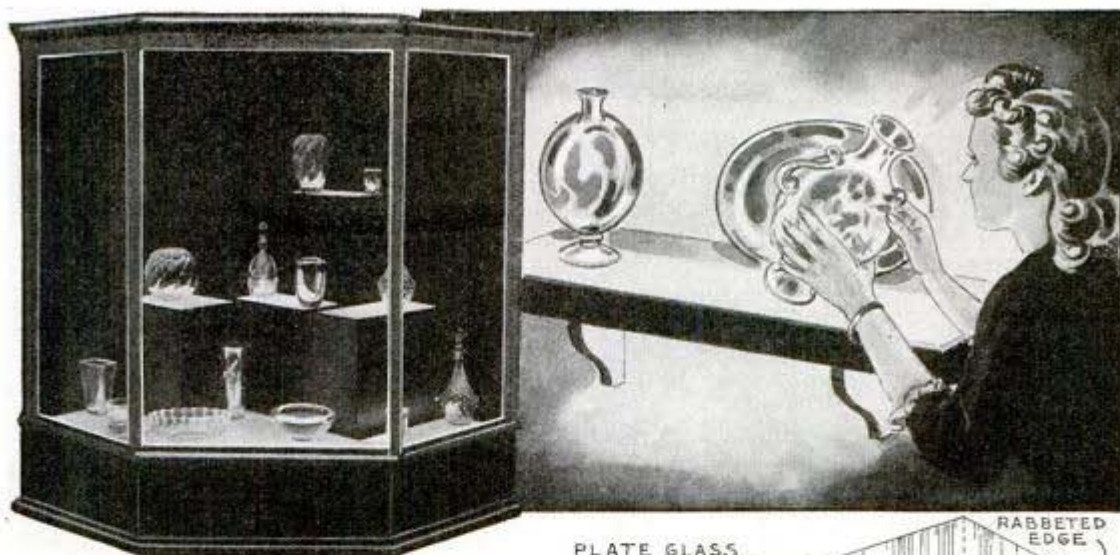
are less likely to become slick when wet, and if ice or snow collects on them it can be knocked off without damaging them, whereas wood cleats are likely to split.

Slot in Handle of Delivery Basket Holds Order Slip

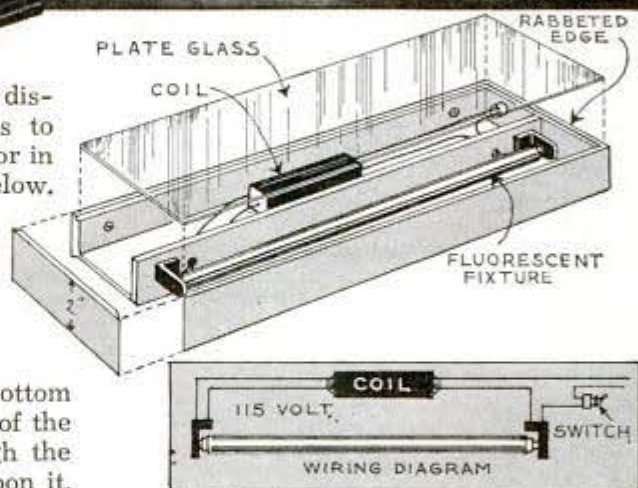
To hold order slips on delivery baskets for easy checking, one grocer saws slots in the handles into which the slips are inserted. The slot is made by drilling a hole and then using a keyhole saw.



Illuminated Shelf Shows Beauty of Glassware



One of the most effective ways of displaying the beauty of glassware is to place it on either a plate-glass shelf or in a cabinet that is illuminated from below. Use of fluorescent lamps makes this possible without the danger of too much heat. A 15-watt fluorescent lamp can be arranged for this purpose as shown. The shelf consists of a rectangular frame, having a piece of plate glass for a top, and a bottom extending halfway across the width of the frame. Light passes upward through the glass to illuminate objects placed upon it.



Molds to Cast Small Metal Objects Are Made with Cement



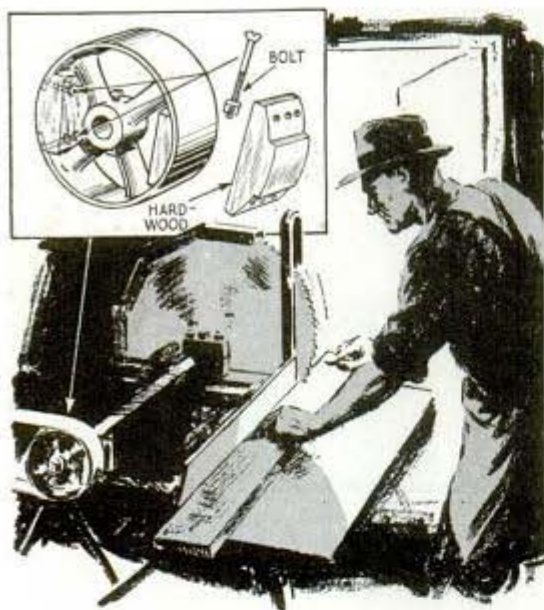
In casting small objects from soft metals, I have found that portland cement mixed with silicate of soda provides good molds for the work. Enough soda is used to make a mixture of the right consistency for easy shaping of the molds. Such molds stand up well for casting toys, small statuary, etc. I also have used them for casting aluminum and zinc as well as brass.

—A. H. Waychoff, Phoenix, Ariz.

Fertilizer for Potted Plants

Potted plants may be invigorated by sprinkling, after sundown, with a liquid fertilizer made by dissolving one teaspoon of the following preparation in water, 1 gallon: Ammonium sulphate, 1 lb., potassium nitrate, $\frac{1}{2}$ lb., sugar, $\frac{1}{4}$ lb.

Broken Iron Pulley Repaired with Wood Block



After breaking a piece out of the cast-iron pulley on his buzz saw, the owner repaired it temporarily with a wood block so that it could be used while a new one was being ordered. The block was cut to the shape shown and attached with bolts. It is best to put a block of the same weight on the opposite side of the pulley to counterbalance it, otherwise it is likely to vibrate.—James Vick, Church Road, Va.

Keeping Inside of Goggles Clean

If your work requires the intermittent use of a pair of goggles and you are annoyed by having the inner surfaces of the lens become dirty or greasy when not wearing them, two sponge-rubber disks will solve your problem. They are cut to a size to fit snugly and are fastened together by means of a piece of string as indicated.



ed. When wearing the goggles, the disks can be slipped into the pocket and quickly put in place when the goggles are not in use.—Frank Bentley, Clinton, Iowa.

Hose Holds Cream-Test Report on Each Can

One produce buyer used a number of sections of discarded lawn hose to attach the cream-test reports to each can as the work was completed. These were slit along one side and attached by wire to the handles of the milk cans. The report slip for each can was rolled up and inserted in the hose section.



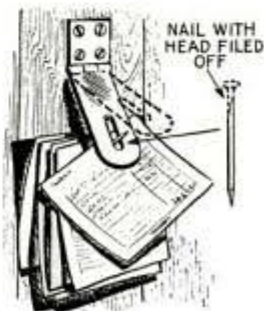
Sponge Rubber on Feed Board of Press Aids Printer



To hold a packet of letterhead paper on the vibrating feed table of his job press and to keep the sheets from curling upward so that they would be hard to fit under the gauge pins, one printer employed a strip of sponge rubber which was tacked to the table, as shown. The friction of the rubber holds the packet from sliding, and the flexed sheets are easy to grasp.

Nail and Hasp Make Paper File

An ordinary hasp and a nail with the head removed and a point filed in place of the head, make a handy retainer for notes in the shop, or orders in a store or shipping room. The nail receives the papers and the hasp prevents them from dropping off or being knocked loose.—W. F. Robinson, Savannah, Ga.

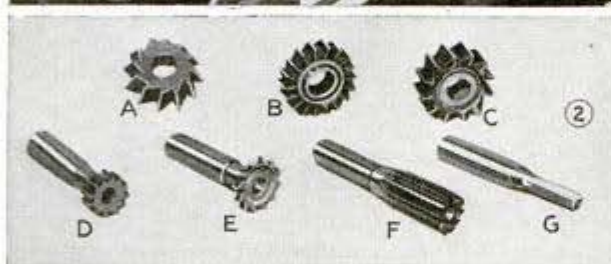


Make Your Own MILLING CUTTERS and Accessories



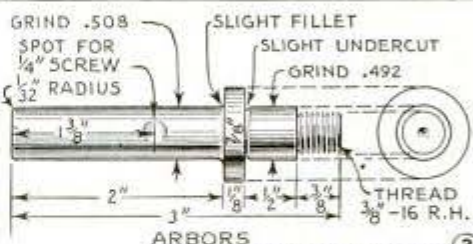
ACCESSORIES

- | | |
|-----------------|--------------------|
| A—Draw-in rod | D—Collet |
| B—Faceplate | E—Cutter and arbor |
| C—Index fixture | F—Index arbor |



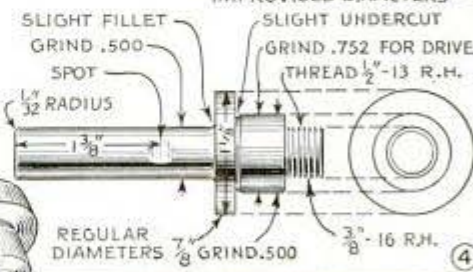
CUTTERS

- | | |
|---------------------------------|--------------------------------|
| A—Angular cutter | D—T-slot cutter |
| B— $\frac{3}{8}$ -in. Side mill | E—Keyway cutter |
| C— $\frac{1}{4}$ -in. Side mill | F— $\frac{3}{4}$ -in. End mill |
| G— $\frac{3}{8}$ -in. End mill | |



ARBORS

IMPROVED DIAMETERS

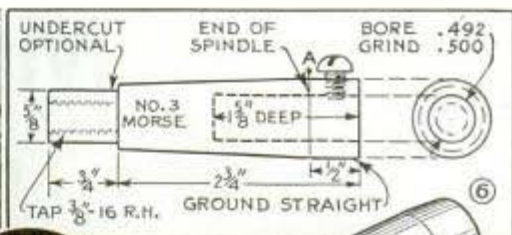
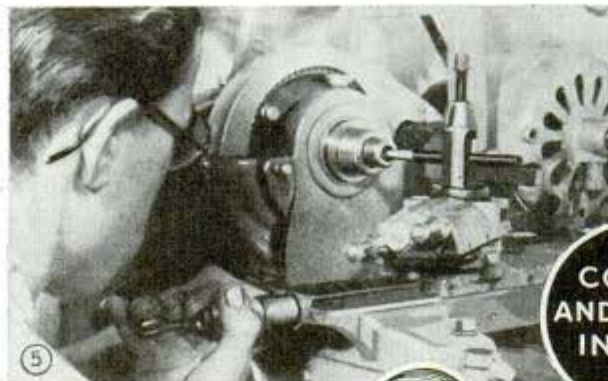


By H. J. CHAMBERLAND

Mechanics in small shops where machines are limited, and home craftsmen who have metal-turning lathes can equip them to do milling jobs by making their own milling cutters and accessories, Figs. 1 and 2. To make cutters, you should have at least one that is ready-made before you can proceed. In this case, you require a right-hand angular cutter with a 45° included angle. This will cut a single angle of $22\frac{1}{2}^\circ$ with measurements taken horizontally. However, the angle of the cutter itself will be $67\frac{1}{2}^\circ$, measured from its side. New cutters of this type are too large in diameter for bench-lathe milling, but this is to your advantage as you can easily obtain a used one, inexpensively,

from a local machine shop. One worn to $1\frac{3}{4}$ or $1\frac{5}{8}$ in. from successive grinds is just right.

Making the accessories: Your improvised cutter is likely to have no less than a $\frac{3}{4}$ -in. bore, so you will require the arbor described in Fig. 4. As designated, it is first turned to suitable diameters for immediate use and refinished to suit cutters to be made. The arbor in Fig. 3 is to hold the side mills and angular cutter to mill the teeth. Note that the shank diameter is finished .508 in. As a milling cutter and its arbor must be held rigidly in the spindle, your next requisite is the collet and draw-in rod combination described in Figs. 6 and



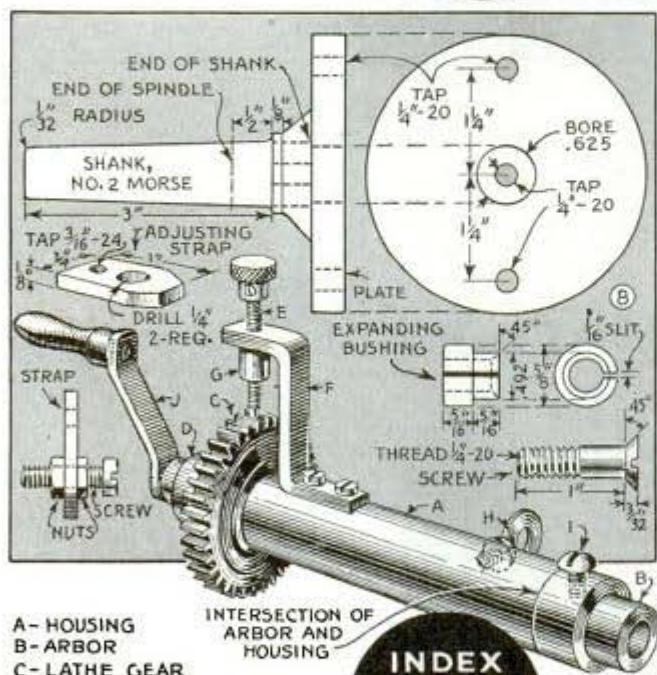
COLLET AND DRAW-IN ROD



After turning the collet, grind it carefully to fit the taper of the lathe spindle. It must be held in the spindle while boring it out, after which it is ground to .500 in.

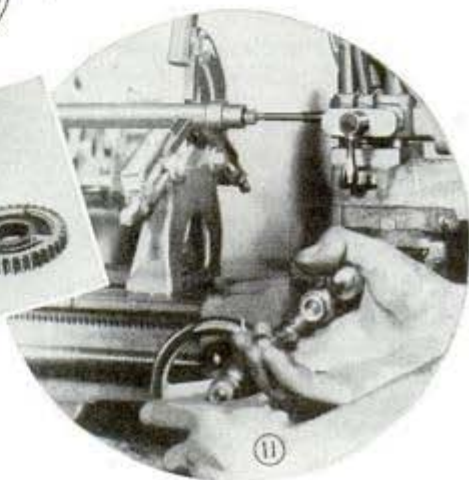
7. Turn the collet and grind the taper carefully to fit spindle bore. No. 3 Morse taper requires a .735-in. diameter at line A. The collet must be bored in the spindle, Fig. 5, and, of course, ground to .500 in. The draw-in rod is simplicity itself. Make the bushing to lathe requirements and pin to the thread at one end for the handle nut and at the other end to screw into the collet. The hand wheel is held against the back plate with nut.

For cutter-grinding purposes, the small faceplate described in Fig. 8 will be found convenient for numerous occasions besides this particular time. It is made in two parts. The shank is made first and then driven into the bore of the plate blank. Then, the assembly is held in the spindle for facing, counterboring and tapping. The expanding bushing is for holding cutters while grinding the sides



- A-HOUSING
- B-ARBOR
- C-LATHE GEAR
- D-GEAR-HOLDING BUSHING
- E-INDEXING SCREW
- F-BRACKET
- G-SCREW-HOUSING BUSHING
- H-FORWARD-LOCKING SCREW
- I-WORK-LOCKING SCREW
- J-INDEXING CRANK

INDEX FIXTURE AND PARTS

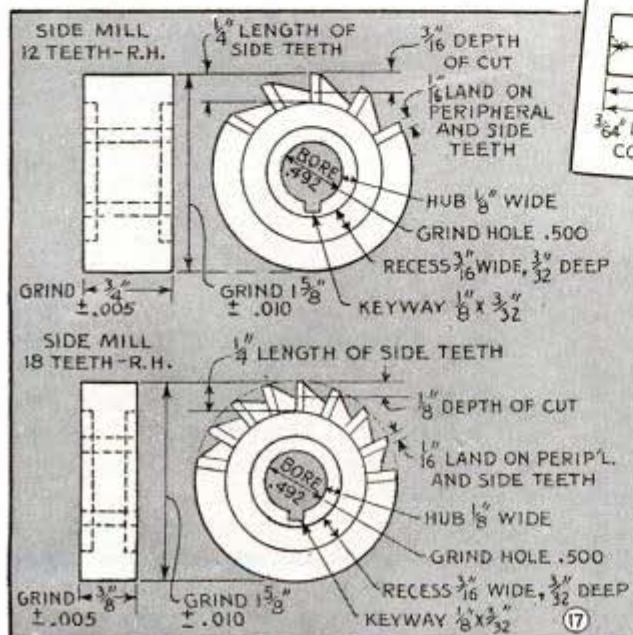
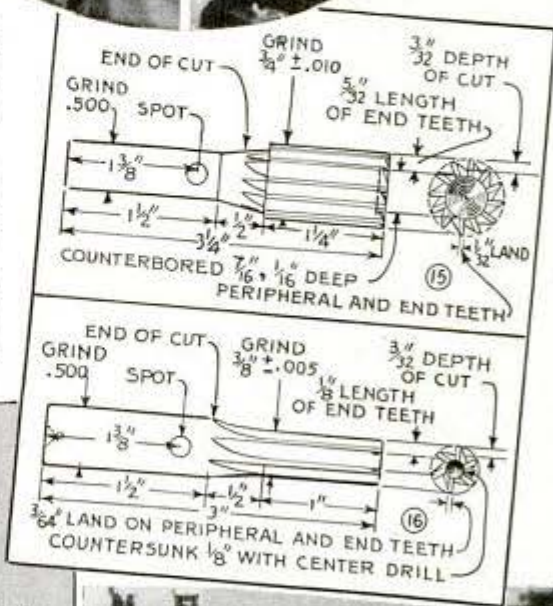
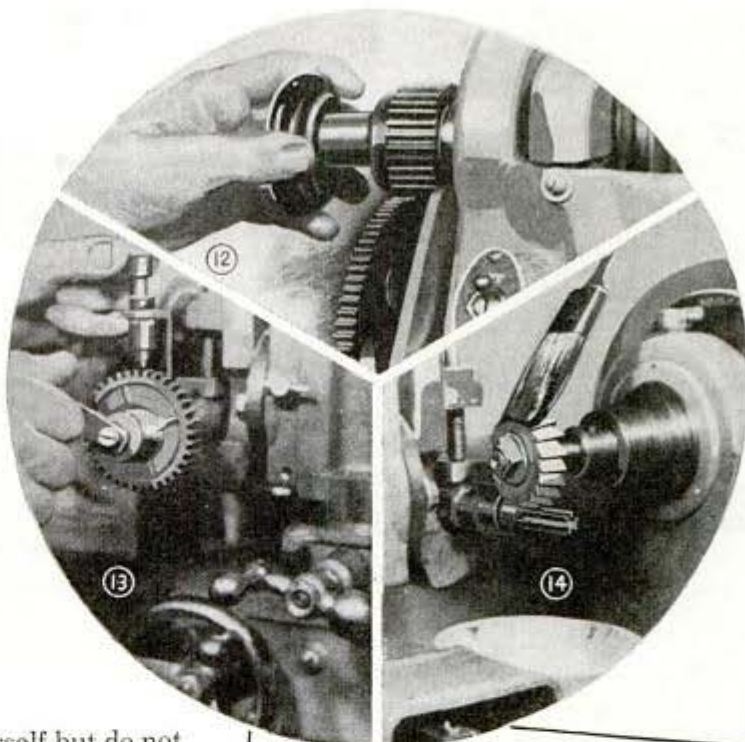


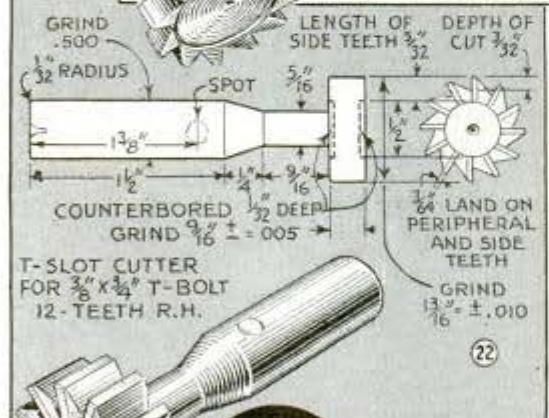
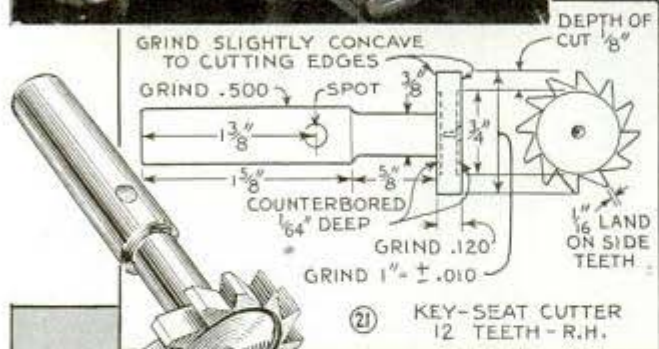
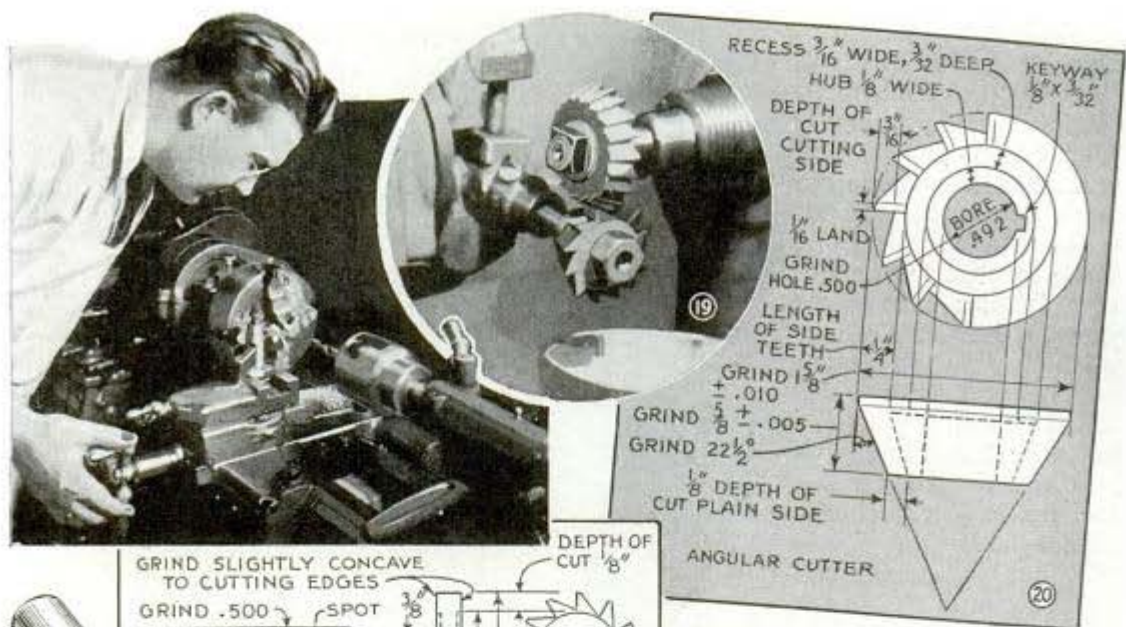
parallel, and the adjustable straps for holding them to grind the bores.

Of utmost importance is the indexing fixture. You will need it to divide the teeth accurately in all mills. Made entirely of scrap, except for one of the lathe's threading gears, it has done a surprisingly fine job as you note in Fig. 2. Clearly detailed in Fig. 9 with the parts illustrated in Fig. 10, you can duplicate this tool easily. Use steel tubing for the housing if possible, but brass piping will do in a pinch. Spline the lathe gear to the bushing. This assembly bolted to the arbor takes care of end-play adjustment.

Make the fixture to suit yourself but do not omit the thumbscrew as it is your positive rigidity for milling. Fig. 11 shows grinding the bore of the arbor to .508 in. Fig. 13 is the end view of the fixture.

Making the cutters: You are now well equipped to mill teeth. To simplify and economize, you must standardize. In this instance we have 1/2-in. shanks and 1/2-in. bores. Use practical diameters for all tools and give the preference to 12 teeth, exclusive of two items. Machine the blanks and



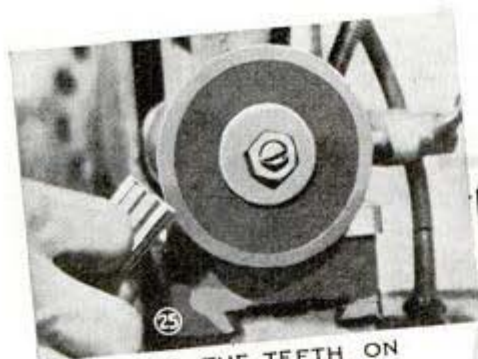


CUTTING KEYWAYS

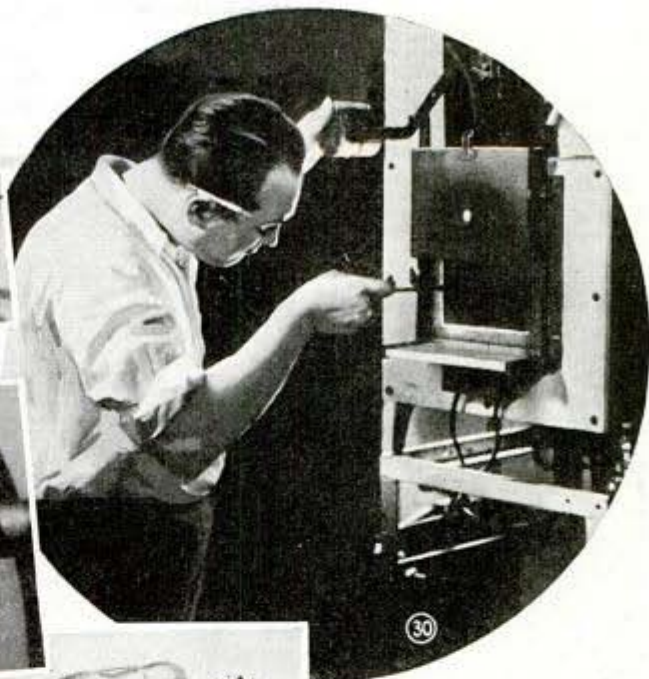


allow .007 to .008 in. for grinding, where so specified. If you use a cutter similar to the one mentioned, use the same number of teeth and depth of cut recommended in the individual sketches. See that the cutter is sharp, has a $\frac{1}{32}$ -in. flat or radius at the point, and the arbor tightly drawn in, Fig. 12.

Milling peripheral teeth: For milling all peripheral teeth, the 36-tooth gear is used because 6, 12 and 18 divisions go into that number of teeth. You must, of course, make the bracket of the indexing fixture to suit a few other gears with different pitches. Eliminate all play in both index fixture and milling attachment and lock the carriage securely. You must necessarily reverse direction of spindle as all teeth are right-hand cut, and the feed must be away from you with the cutter milling bottom coming. Use the conventional procedure to locate your center and take a light cut to obtain desired land with the next index. Fig. 14 shows this operation on the $\frac{3}{8}$ -in. end mill. These teeth and those of the $\frac{3}{4}$ -in. mill are milled with a single cut. Figs. 15 and 16 describe, respectively, the $\frac{3}{4}$ and $\frac{3}{8}$ -in. end mills. The $\frac{3}{4}$ -in. side mill in Fig. 17 has 12 teeth, while the $\frac{3}{8}$ -in. mill has 18 teeth with the same circumference. While the teeth in the $\frac{3}{8}$ -in. side mill can be derived with one setting, although I advise splitting the depth of cut with two indexings, you must follow a different course to cut the teeth in the $\frac{3}{4}$ -in.

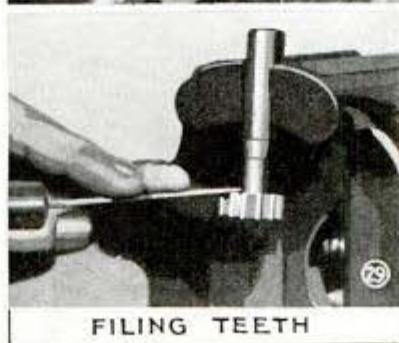
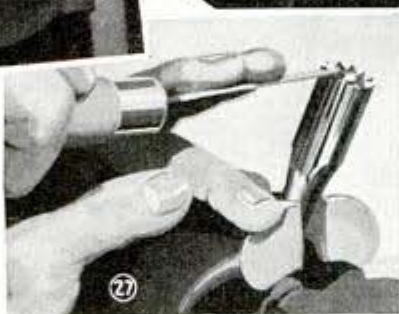


SPACING THE TEETH ON CUTOFF GRINDING WHEEL



side mill, the reason being that if you milled deep enough to get a practical deep land for the teeth, the depth of cut would be abnormal and quite out of proportion. The procedure here is to mill to required depth first, preferably taking a double cut. Now instead of skipping three teeth on the indexing gear, you only go two for adjusting to a third cut. With this change in angle, you can obtain your land without milling any deeper. Obviously, this means changing the radial line, and, of course, the two-teeth change is for the initial indexing only. Fig. 18 shows taking this final cut on the $\frac{3}{4}$ -in. side mill. Note that the line resulting from a change in angle is quite visible.

The problem of milling the peripheral teeth of the angular cutter in Fig. 20 is more complicated but not hard to solve. The fact is that you are faced with two diameters and must still obtain a uniform width of land. After setting the vise component of the



FILING TEETH

milling attachment to a related angle so the cutter to be milled represents a straight surface, you get the desired depth on the cutting side with a double cut. The depth on the opposite side, of course, varies with the amount of angle. The rest is up to you to figure out. Besides duplicating the secondary setup of the $\frac{3}{4}$ -in. side mill, you will have to readjust the graduation slightly to mill heavier at the front of the tooth. By proceeding carefully, you will succeed in obtaining good-looking teeth and uniformly straight lands. You can judge by Fig. 19 how the radial position has been altered to obtain a worthwhile shape of tooth for this mill. Milling the teeth in a key-seat cutter, Fig. 21, and the T-slot cutter, Fig. 22, should cause you little inconvenience.

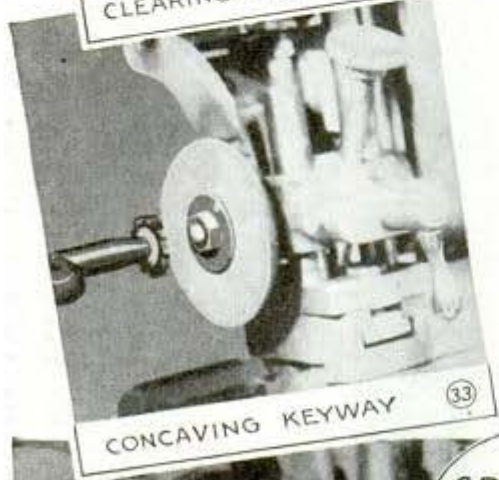
Making keyways: Here is an improvised method that makes keyway cutting easy. First, drive soft steel plugs into the under-



TESTING ACCURACY (31)



CLEARING SIDE TEETH (32)



CONCAVING KEYWAY (33)



GRINDING SIDES AND BORE OF SIDE MILL (35)

size cutter bores and drill a $\frac{3}{32}$ -in. hole anywhere on the intersecting line, Fig. 23. The results are a $\frac{3}{64}$ -in. radius, which is a guiding line to file keyways $\frac{1}{8}$ to $\frac{3}{32}$ in., Fig. 24.

Cutting end and side teeth: The next step is to divide accurately the end and side teeth so that they can be filed to shape. The easiest and quickest way is to mount a 3 or 4 by $\frac{1}{16}$ -in. cutoff wheel in the lathe grinder. Then line up the face of peripheral teeth against the side of the wheel and cut across to recess or counterbore and equal depth. The end of $\frac{3}{4}$ -in. end mill is shown being cut in this manner in Fig. 25. A similar operation is shown being performed on the side teeth of the angular cutter, in Fig. 26.

Filing: The end and side teeth are produced by filing at an angle that corresponds to the required lands and depths of the previous dividing grinds. Fig. 27 shows the correct hand position for filing end teeth on end mills. In this particular case, it is advisable to file the 3° clearance angle to within $\frac{1}{64}$ in. of the cutting edges. For filing side teeth on side mills and angular cutters, they are held to a wood block sawed as per Fig. 28. The inner side teeth of the T-slot cutter are filed as in Fig. 29. Also, it is best to file the clearance angle on the side teeth of this mill.

Hardening the tools: To harden the tools, the instructions given in articles of this type, published previously in Popular Mechanics, fit this case perfectly. Don't forget to file all burrs, and stamp to suit, unless you intend etching them. If you burn coke in your home heating plant, a good hardening job can be done by placing one or two of the tools on a $\frac{1}{4}$ -in. steel plate previously heated to a red color. However, nothing can replace an electric or gas furnace, Fig. 30.

Grinding the tools: Cylindrically grind the shanks to size and give the peripheral teeth a 5° clearance angle, stoning the end teeth of the end mills to a sharp cutting edge. Fig. 31 illustrates a reliable method to test the end teeth on a small plate. If the mill rocks it

won't cut good. An internal-grinding wheel is safest to clear side teeth of angular cutters and side mills, Fig. 32. The key-seat cutter has no side teeth but is ground concaved on both sides, Fig. 33. Both sides of side mills and angular cutters are ground parallel with their respective bores as in Fig. 34. The expansion bushing holds the cutters securely to the small faceplate. The bores of these mills are then ground to .500 in. after centralizing with the tailstock and strapping to the faceplate, Fig. 35. A plug gauge is most convenient for testing bore size.

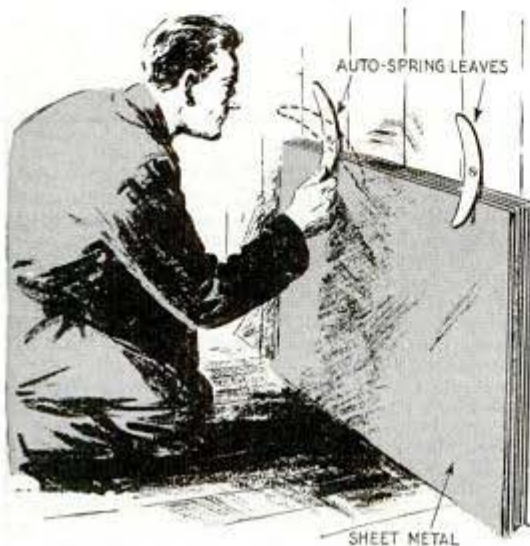
Toothpicks Serve as Wedges When Rewinding Motors

When I replaced the starting winding of an electric motor, using cotton-covered enamel wire, there was not much room to drive wedges to hold windings in place, as the original winding was plain enamel wire. To overcome this, I used round toothpicks which did not damage the insulation on the wire, as might have been the case if a straight wedge had been used.

—C. J. Umphenour, Beatrice, Nebr.

Sheet Metal Kept Against Wall With Large Turnbuttons

In order to hold sheet metal against a wall, where it can be removed conveniently as needed, attach a couple of short leaves from a discarded auto spring to the wall above the stock to serve as turnbuttons. These hold the metal securely in place but are easily swung to one side.



JANUARY, 1941

Rake Teeth Make Dump Manger That Is Cleaned Easily



Two hay-rake teeth and some narrow boards were used to make this round-bottom manger for calves. It may be tipped over to empty out all chaff and residue. Each of the bottom boards was fastened to the teeth with large staples, and the ends nailed to them. The coiled ends of the teeth fit in holes in the supporting posts.

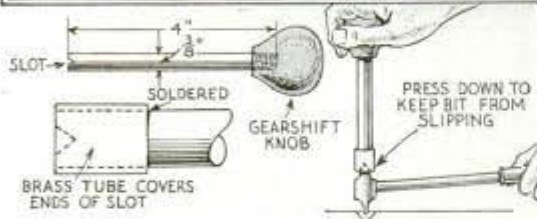
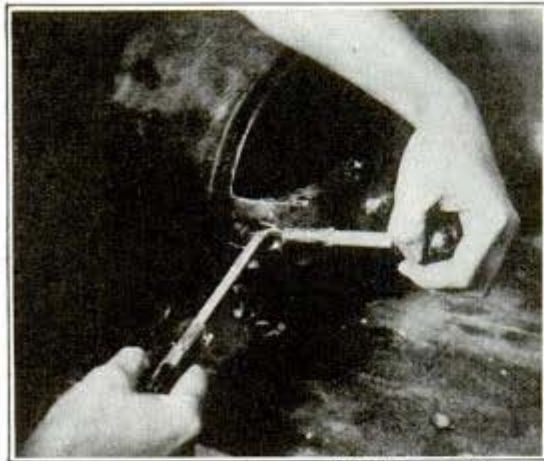
Tumbler Used as 'Spotting Table' for Garment Cleaning

To hold thin fabrics for treatment of spots and stains with chemicals, one dry cleaner employs a glass tumbler. This is inverted under the garment and the fabric spread over it to bring the spot in working position. A rubber band may be snapped around the cloth to keep it from slipping while the work is in progress.



▣ Rub the reflector and lens of a flashlight with carbon paper that has been heated and it will give a blue, white light.

Pressure Tool Permits Good Work with Offset Screwdriver



In several instances I found that my offset screwdriver could not be used to full advantage on account of its tendency to slip upward out of the screw slot, especially when the slot was not perfectly formed. Finally, I devised the pressure tool shown to hold the bit in the slot while turning the handle. This tool consists of a length of steel rod with a V-slot filed in one end and an auto gearshift knob threaded onto the other. A short piece of brass tubing soldered over the rod, stopping the ends of the filed slot, prevents the tool from slipping off the screwdriver bit while applying pressure.—W. C. Wilhite, Carlinville, Ill.

Canvas Kit Buttoned on Ladder Keeps Tools Handy



Disliking the nuisance of carrying small tools in the pockets of his work clothes when working from a ladder, one electrician had a tool kit made from canvas. To hold this opened and in a convenient position, he had buttonholes cut in the end flaps of the fabric and these buttoned over small screw eyes, which were

driven into the ladder standards. When not in use, the kit is removed quickly from the ladder, rolled up and stored conveniently in the tool chest.

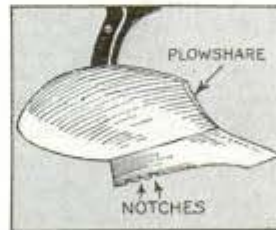
Detachable Bar for Doorways Saves Janitor's Time

Instead of closing and locking doors to keep people from walking over freshly waxed or oiled floors, one school janitor suggests this detachable bar. It consists of a broomstick with short lengths of garden hose slipped and fastened over the ends. The hose projects sufficiently to wedge firmly in the opening. Warning cards may be suspended for additional assurance against trespass.



Notched Plowshare Cuts Roots

To overcome the difficulty in plowing old and deep-rooted sods such as alfalfa or sweet clover, one farmer filed a row of notches near the heel of each plowshare. Large, woody roots are sheared off readily by the short serrated edge formed by the notches.



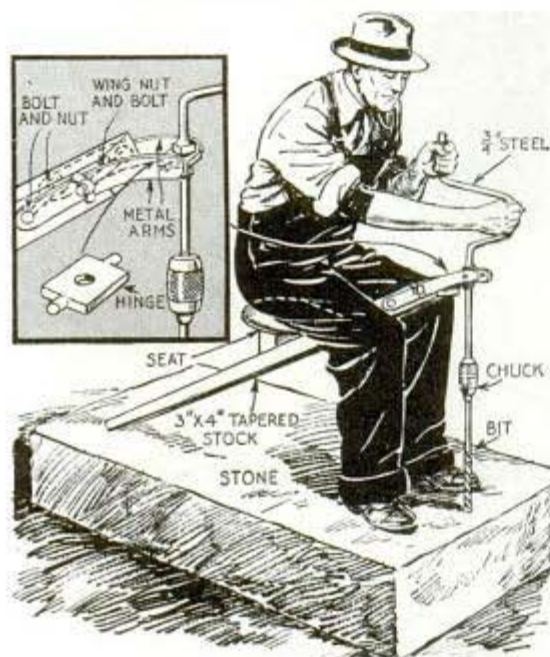
The latter should be about 1 in. apart and need not be more than $\frac{3}{8}$ to $\frac{1}{2}$ in. deep.

—W. C. Lammey, Naperville, Ill.

Cash for Your Ideas!

Have you or one of your friends accomplished something new and different along mechanical lines, which saves time, labor and money, or provides greater convenience? This may pertain to home improvement or craftwork; may be something connected with a popular hobby or sport; may be of juvenile application or it may be something pertaining to your work or profession. If it's a handy kink that many other readers might be interested in doing themselves, don't fail to send us a photo or sketch giving full details and a brief but complete description. If we can use it we will send you a check. Unused material is returned promptly. Address Homecraft Editor, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

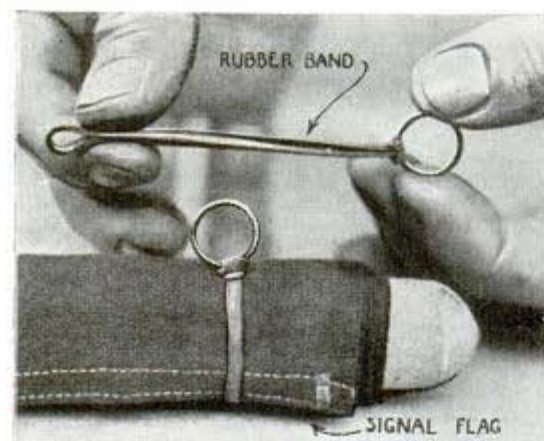
Operator "Rides" Stone Drill to Make It Cut Fast



As considerable pressure must be exerted against a stone drill to make it cut, one workman found that he could utilize the weight of his body for this purpose, and at the same time, be in a comfortable working position. This was accomplished by rigging up a drill as shown. The assembly comes apart easily for storage, and it can be folded instantly for carrying.

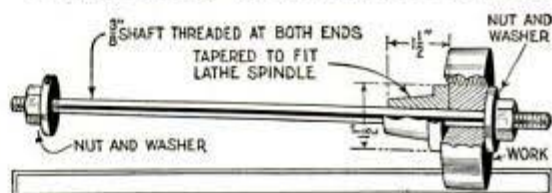
Signal Flares Are Kept Rolled by Rubber Bands

One contractor who has to use a number of signal flags on some of his construction jobs, keeps them, when not in use, rolled neatly around their standards with rub-



ber bands. Each band is looped through a small ring as shown. In use, the flag is rolled, the band placed around it and the end slipped over the ring. If the band is stretched fairly tight, it will not slip off the ring, yet it can be removed from the flag without difficulty.

Lathe Setup to Machine Collars



Having a number of collars to machine, I used the setup shown in the lathe and saved considerable time. With this setup, collar could be completely machined without removing it, whereas the use of a chuck would have made it necessary to machine one half of the collar and then remove it, turn it around and re-chuck it to machine the other half. The attachment fits in the headstock, the assembly being tightened in place by turning the nut on the rod, which projects from the rear of the headstock.

—Wm. Paczkowski, Peabody, Mass.

Combination Nail Set and Holder

When driving small finishing nails in a place where it is hard to reach, this combination tool will both hold and set them. It is made from a piece of cold-rolled steel turned to the shape shown and drilled through the center to take a plunger, the pointed end being counter-bored to hold the nail. The plunger is made from a piece of hard-steel rod and fitted on the upper end with the head, which is struck with the hammer. A leather washer placed between the plunger head and body absorbs shock of the hammer blows if the nail is driven a little too far.

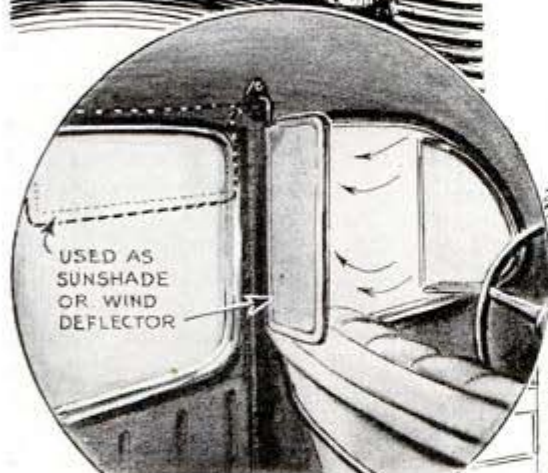


—W. Bundschuh, St. Louis, Mo.

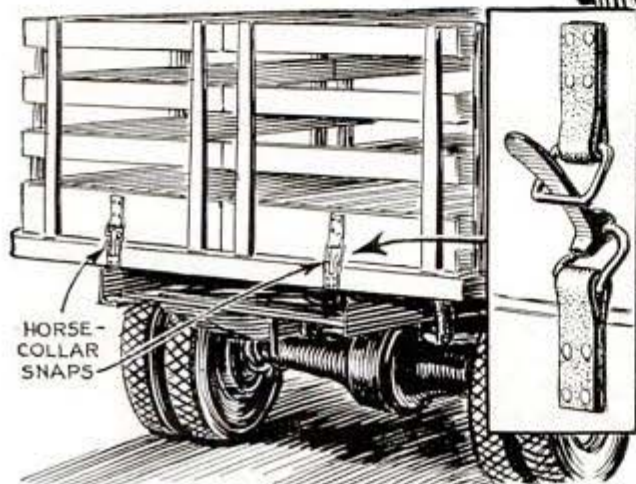
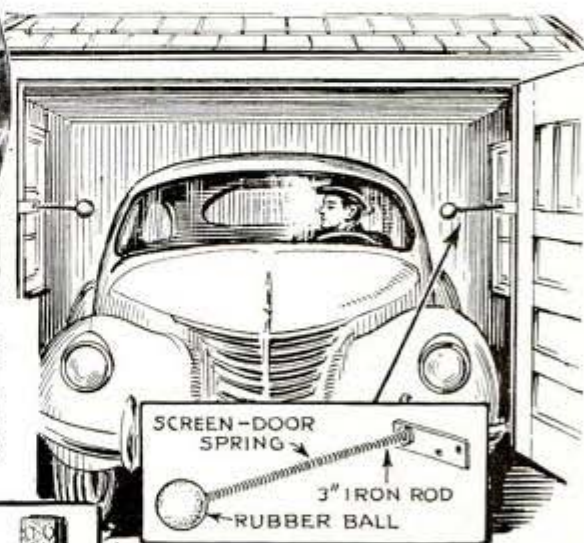
AUTO SHORTCUTS



Desiring illumination to check up on her appearance in a mirror on the back of a sun visor, one motorist had a dome light installed in the roof behind the visor as above. Left, a small cone-shaped metal shade fitted to the guard of a trouble lamp keeps light out of the eyes and helps direct it on the work

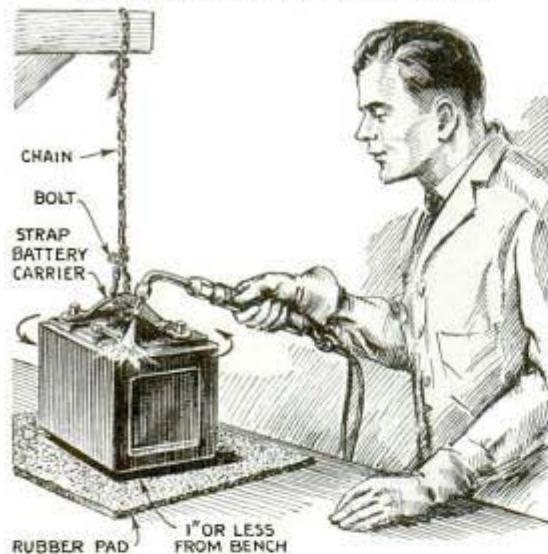


To keep cold drafts out of the faces of rear-seat passengers when the window is lowered for signaling, a driver installed a visor as above. Also, it can be swung upward to serve as a window sunshade. Right, flexible guides projecting from the walls aid driver in backing straight into a narrow garage



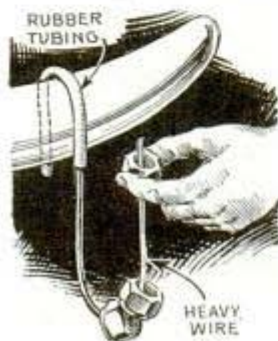
Left, tailboards of stake-body trucks held in place by fastening them down with quickly operated snaps of the type used on horse collars. Above, leaks between a valve stem and an air-hose chuck avoided by piece of cloth placed between them to provide a seal

Preventing Injury to Battery Cells While Melting Compound



Unless the operator has had a great deal of experience he is likely to apply too much heat while melting the sealing compound of a storage battery to be taken down, burning the hard-rubber cell tops or the edges of the case. When melting with an acetylene flame, try raising the battery off the bench about an inch, using a strap battery carrier and a chain as shown. Place a rubber or thick cloth matting under the battery. When the compound has been heated to exactly the right melting temperature the case will fall away from the suspended cell assembly onto the cushion beneath. This fall is not great enough to injure the case in any way or to cause the electrolyte to splash up.

Holder Clamped on the Bumper Keeps Nuts from Being Lost



A length of large galvanized iron wire having a piece of small rubber tubing slipped over one end and bent as shown, will be found useful to hold wheel nuts while repairing a tire on the road. The rubber-

covered hook holds the wire on the bumper bar at the most convenient place without danger of marring the surface. With the

nuts slipped over the vertical part of the holder there is no chance of losing one or more of them on the ground.

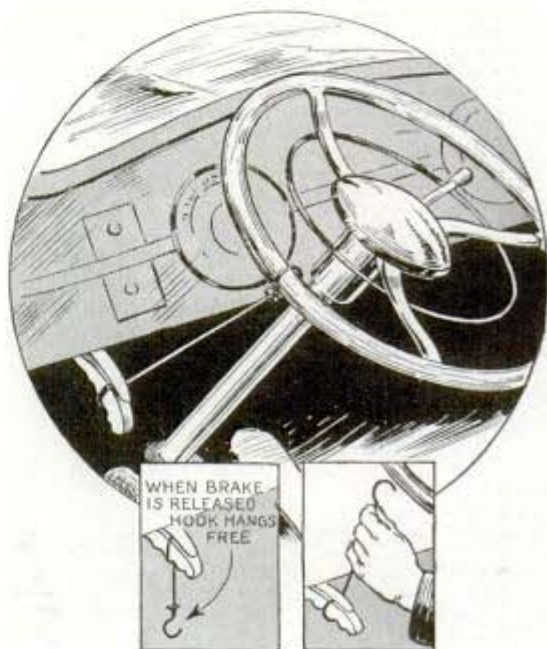
Celluloid Shields Work Card When Filling It Out

To keep work cards clean, one garage foreman uses a celluloid shield over the cards while filling them out. The celluloid is folded in the center and a window is cut in one side.



Driving with Brake Set Avoided by Reminder on Steering Wheel

After driving several times with the brakes set, one motorist improvised this reminder. It consists simply of a cord tied to the hand-brake lever and fitted with a wire hook to slip over the steering wheel. When setting the brake after parking the car, the string dangling from the lever reminds him to slip it over the steering wheel. Then when he starts to drive the car, the hook sliding over the rim of the steering wheel serves as a reminder that the brake is set. The hook, of course, is removed when driving.



Push Rods Removed with Magnet



Difficulty of removing the push rods from a Ford V-8 motor without using special tools, which he did not have, was overcome by one home mechanic by lifting them out with an electromagnet. The car battery

was used as a current supply for the magnet, which is just of a size to slip through the valve guides.

Sticking of Auto-Window Glass Eliminated by Tape

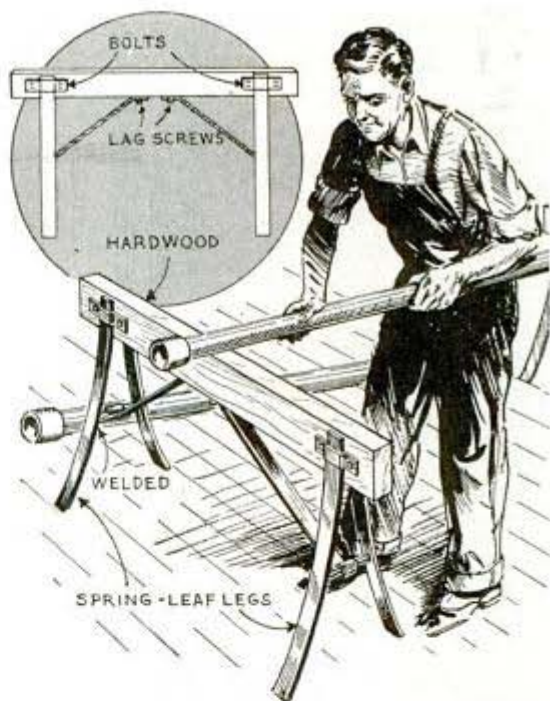
If your car has a rubber strip at the top of each window frame and the glass sticks to it after being up for some time, the trouble can be remedied by placing a strip of adhesive tape over the rubber strip. The glass should be cleaned thoroughly and then turned up to force the tape into the groove, taking care that it is not displaced by the glass.

Lock Installed on Fender Flap Covering Gas-Tank Cap



Hinged gas-cap covers built into the fenders of some cars are readily adapted to the installation of a simple cylinder lock for protection against theft of gasoline. A cylinder lock can be installed easily by drilling a hole of proper size at a point near the edge of the cap cover to permit the catch of the lock to fasten securely to the fender.

—Arnold S. Lutes, Pasadena, Calif.



Sawhorses for Use in Garage Made from Old Car Springs

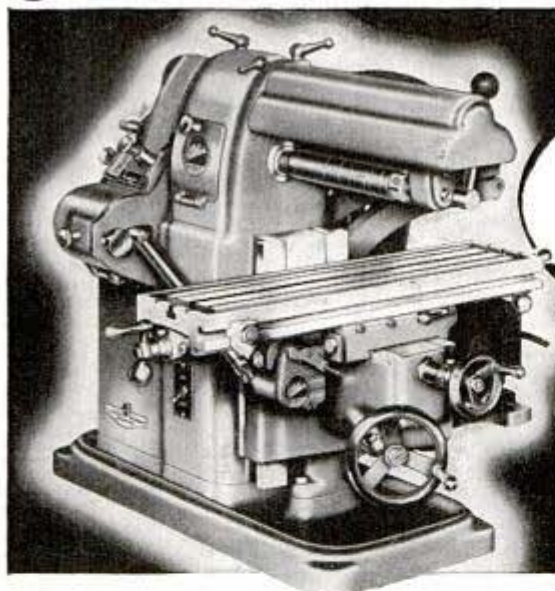
One mechanic made a number of these sawhorses, which he finds useful in supporting drive-shaft and rear-axle assemblies, and for other applications about the shop. The legs of the horses are old spring leaves of equal length. These are clamped to the top bar with spring shackles and bolts, one assembly being used for each pair of legs. A 3/8-in. iron rod, tapering at each end to fit the center hole of the leaves and welded in place, keeps the legs from spreading under load. Two other iron rods bolted to the center of the top bar, and welded to the centers of the spreader rods, prevent the legs from shifting laterally.

Freezing of Door Lock Avoided by Shield over Handle

If water gets into your car-door lock and freezes on cold, wet days, slip a thin rubber shield over the door handle as shown. A finger cut from an old rubber glove is just the thing for this purpose.



Atlas Brings You A Sensational NEW MACHINE TOOL!



For the First Time!

A Popular Priced PRECISION MILLING MACHINE

\$175⁰⁰ and up less motor

Shown is Model MF with *Change-O-Matic* Feed
Simply turning knob gives choice of Four Feeds

It's the biggest news of the season!—a compact, precision bench Milling Machine as low as \$175! Model-makers, inventors, experimental shops, and all types of metal working shops will find many uses for this rugged, accurate, efficient machine.

**FREE...
1941 CATALOG**



It handles the full range of milling work. Table working surface is $4\frac{1}{2}$ " x 18", longitudinal travel 12" (manual) or 10" (with "Change-O-Matic" feed), cross travel $3\frac{1}{2}$ ", vertical travel 6". There are 16 spindle speeds between 54 and 3225 RPM. Timken tapered roller bearings. Operates from $\frac{1}{3}$ HP 1740 RPM motor.

These are just the highlights. For full details see your Atlas dealer and send the coupon for your 1941 Atlas Catalog.

ATLAS PRESS CO. 143 N. PITCHER ST. KALAMAZOO, MICH.

CHICAGO
35 E. Wacker
at Wabash
NEW YORK
130 W. 42nd St.
PHILADELPHIA
113 N. Third St.

**MAIL
COUPON
TODAY**

ATLAS PRESS CO., 143 N. Pitcher St., Kalamazoo, Mich.

Please put my name down to receive your new 1941 Catalog on:

- | | |
|--|---|
| <input type="checkbox"/> New Milling Machine | <input type="checkbox"/> 10" Metal Lathes |
| <input type="checkbox"/> Drill Presses | <input type="checkbox"/> 6" Metal Lathes |
| <input type="checkbox"/> Arbor Presses | <input type="checkbox"/> 7" Metal Shaper |

Name

Address

City and State

F-SERIES 10" LATHES



Power cross feed, V-belt drive, precision-ground bed, custom-bored bearings, back-gear power, wide screw-cutting range, 16 speeds—these are but a few of the many modern features of Atlas Lathes at \$99.75 less motor.

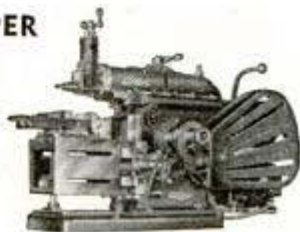


DRILL PRESSES

For smoothness and long accurate service buy a floating-drive Atlas. SKF ball bearings. 4 sizes, 4 prices—\$17.25 to \$44.75 less motor.

7" SHAPER

Has all the precision of large machines, 4 speeds, 5 automatic cross feeds. \$245 less motor.



K105 D

Prospecting After Dark

(Continued from page 47)

following the pay shoot regardless of where it branches off or changes direction.

In the mill, the superintendent flashes a quartz lamp across the jigs and sees how much of the pulverized ore in the riffles is tungsten. Outside, on the dump, the tailings are carefully scrutinized, for if the mill is letting good tungsten get by, a blue glow will reveal the wastage.

One western gold mine had been operated for fifty years before black-light prospectors went over the tailings pile and discovered that the owners had discarded enough tungsten ore to have paid all expenses to date. Another company tunneled well into a mountain after gold, only to find a fortune in scheelite already had been thrown on the dump. The biggest tungsten strike of the black-light prospectors came partly through accident. Out in the Mojave desert of California, Oliver P. Adams found some tungsten prospectors digging at a small outcropping near Shadow Mountain. Adams persuaded Thomas Warren of the Ultraviolet Products company to construct the largest night-prospecting kit ever built—one so large he could simply point it as he traveled, without having to stoop. Warren rigged up a power generator, mounted on a stretcher and driven by a small gasoline engine, and the party set out for Shadow Mountain. On the opposite side, they ran into a strong showing in a gravelly wash. Up the wash they walked, two men carrying the generator on its stretcher while a third pointed the lamp. Brighter and brighter grew the showings, until an entire strip revealed scheelite for many feet.

Geologists mapped out the entire district. At night they would use the lamp, driving a stake with a white rag attached to it so they could locate the showings in daylight. Soon they had marked out a deposit nearly half a mile long, estimated at many millions of tons.

Tungsten mines aren't the only ones to use the black rays of the quartz tube. Some gold mines have been using the lamp to save the penalty which the mill charges if incoming gold ore contains zinc. By running the torch over the rock, they can pick out chunks of hydrozincite and be sure their gold ore is free from the impurity.

Your KODAK

KODAK 35

with Coupled Range Finder

All the Kodak 35 precision features—plus coupled range finder. Kodak Anastigmat Special $f/3.5$ lens; 1/200-second Kodamatic shutter. Modern photofinishing leads to black-and-white prints $2\frac{3}{4} \times 4$ inches. Also takes Kodachrome (full-color) Film.



\$47⁵⁰

CINE-KODAK EIGHT Model 20

Gives you 20 to 30 black-and-white movie scenes—each as long as the average newsreel scene—on a roll of film costing \$2, finished, ready to show. Also loads with Kodachrome (full-color) Film.



\$29⁵⁰

DEALER presents five Holiday Headliners

KODAK MONITOR SIX-16 (Special $f/4.5$) Supermatic Shutter

One of the greatest cameras for $2\frac{1}{2} \times 4\frac{1}{4}$ -inch pictures. Kodak Anastigmat Special $f/4.5$ lens; $1/400$ -second Supermatic shutter. Double-exposure prevention. Film-centering device. Exposure counter.



\$48⁵⁰

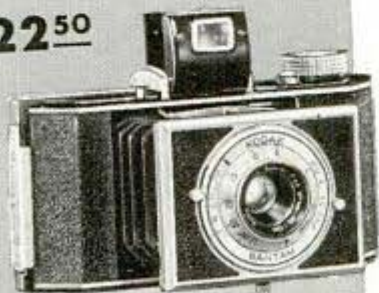
KODAK VIGILANT SIX-16 (Special $f/4.5$) Supermatic Shutter

An instant hit—with self-erecting front, retracting body shutter release, two view finders. Precise Kodak Anastigmat $f/4.5$ Special lens, $1/400$ -second high-speed Supermatic shutter. Pictures, $2\frac{1}{2} \times 4\frac{1}{4}$ inches.



\$42⁵⁰

\$22⁵⁰



KODAK BANTAM $f/4.5$

Gives you the speed and precision of the Kodak Anastigmat Special $f/4.5$ lens, $1/200$ -second shutter. Modern photofinishing methods lead to black-and-white pictures $2\frac{3}{4} \times 4$ inches. Also takes full-color Kodachrome Film.

Kodaks from \$3.95; Ciné-Kodaks from \$29.50. At your dealer's... Eastman Kodak Company, Rochester, N. Y.

Only EASTMAN makes the KODAK

WANTED

THE 57,256 MISSING PIPE SMOKERS



**Whose thumb prints
are on the wrong
packages of pipe tobacco!**

A high percentage of exacting pipe smokers literally *rave* about BOND STREET once they try it. Our experience proves this.

We find 57,256 pipe-smoking readers of this magazine are still "missing." Because they have yet to *discover* this delightfully *different*—truly *aromatic* blend!

BOND STREET contains a *rare aromatic tobacco never before used in a popular priced mixture*. It smokes clean—cool—rich as a custom blend. Leaves no tobacco odors in the room—even the ladies approve it!

Buy and *try* a tin—today!

15¢ GENEROUS SIZE
POCKET TIN

**BOND
STREET**
PIPE TOBACCO

A Product of Philip Morris



Tuning in on the Brain Waves

(Continued from page 63)

back only about a decade, although Galvani discovered "animal" electricity in the eighteenth century. To Hans Berger goes the credit of studying, for more than ten years, electrical potentials, obtained by placing electrodes on the scalps of human beings. He announced his findings in 1929, and it was several years later before they were widely accepted.

A "brain wave" examination is painless for the patient. The only inconvenience is the cutting away of small patches of hair, so that the electrodes—thin round plates of silver or other suitable metal about half an inch in diameter, with voltage-conducting wires affixed—may be fastened to the scalp, using collodion to make them adhere.

The patient then lies on a bed in the room or wire-screened cubicle used for that purpose, for the prescribed time, and he feels nothing as the waves from his brain are being recorded.

Reverting to the broadcasting analogy, everyone knows that radio waves are present about us all the time, but we are insensible to them. However, when those waves are picked up by the proper apparatus, then amplified and sent on into a loud speaker, the result is audible sound. Brain waves are likewise extremely faint, ranging from as low as two microvolts to, as a rule, no higher than 1,000 microvolts. (A microvolt is one-millionth of a volt, which is not much, when you consider that the average electric current in your home is 115 volts.)

The brain currents are detected in the patient via the electrodes and wire leads affixed thereto, run through amplifiers, and their strength pushed up to a maximum of around 800 to 1,000 volts. Then ink-writing pens in an oscillograph make a permanent record of their characteristics. The pens trace lines of varying forms that tell the story of the brain that started the waves on their way.

Strictly speaking, the examinations are of the cerebrum, or larger portion of the brain. The efforts of this branch of science to get measurable results as regards the cerebellum, or smaller portion of the brain, have not reached a successful point. In fact, difficulty is found in attaining exactitude as regards the parietal and occipital

12936

lobes of the cerebrum, due to their smallness.

Here it is of interest to point out something of the basic principles followed in these examinations. The cerebrum of the brain consists of eight lobes—two of them designated as frontal, two as the temporal, two parietal, and two occipital. In making an examination a vertex four-wire lead is fastened to the top center of the head and run into the amplifiers. The six other single leads are affixed over six of the lobes, thus adequately overlapping, so to speak, the four pairs of lobes in the cerebrum, and enabling each pair to be given a test as to its normality. These single leads, of course, also are run into the amplifiers.

Epileptic disorders are productive of the greatest departure from normal of the activity of the cortex, the gray matter of the brain. Under such a seizure the resultant waves change in form, frequency, duration and amplitude. The latter may increase to ten to twenty times those present in a normal state.

A brain functioning normally emits what is known as an "alpha" wave. Experiments have been conducted to show the behavior of the brain waves while awake and asleep. These have shown that the discharges of a slumbering subject occasionally bear resemblance to those of a patient with a tumor, the alpha waves being large when the eyes are closed and the patient relaxed, and disappearing when the eyes are open or the patient tense.

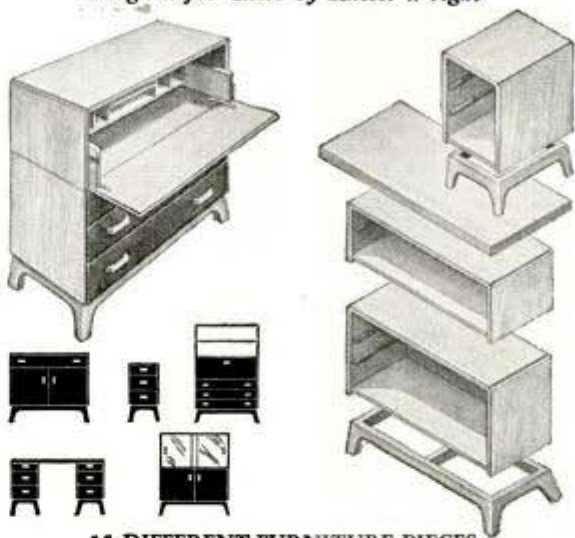
It has been found also that identical twins show very similar principal wave patterns, and that women have a higher wave frequency than men. Increasing use is being made of examinations through electrical phenomena in all brain, nerve and muscle diseases.

Not everything possible has been discovered in connection with the electroencephalographic technique. The surface has only been scratched. Electroencephalography itself, while it need make no apologies for its accomplishments, is only a relatively minor activity in the immense amount of research that has been done and must still be done concerning the human brain.

☐ If you will send stamped, self-addressed envelope to our Bureau of Information, you will be given the name and address of the manufacturer of or dealer in any article described in this magazine.

Build this new, modern UNIT FURNITURE

designed for Casco by Russel Wright



15 DIFFERENT FURNITURE PIECES FROM 6 BASIC DESIGNS!

UNIT Furniture brings "assembly line" speed to your workshop. Build any number of units you need. Assemble them to make the furniture you want for living room, dining room or bed room. Each piece of furniture brings you the finest in modern design, by a famous industrial designer!

Complete working plans and directions for building Unit Furniture and 21 other *professionally-planned* projects are available free to Casco users. Free book offered below tells how you get them. Send for your copy *now*. It's more fun to build better-designed, better-planned Casco Projects.

FREE... BOOK OF NEW CASCO PROJECTS FOR 1941

16 pages. Illustrates 24 modern and traditional pieces by Gilbert Rohde, Russel Wright and Herman Hjorth. Tells how to get free plans. Includes other helpful home workshop information.



Casco Projects are sponsored by Casco Powdered Casein Glue, the standard for heavy-duty wood gluing. 10¢ to 65¢ at Hardware, Paint and Lumber Dealers.

CASEIN COMPANY OF AMERICA, Dept. PM-141
350 Madison Avenue, New York, N. Y.

Send me a copy of the new, free "CASCO PROJECTS" by return mail.

Name _____

Address _____

City _____ State _____



Save 2c... stick coupon on penny post card

POWER

FOR STUBBORN SCREWS

Here's just the tool you need to handle *big* screws, *frozen* screws, *hidden* screws. Millers Falls Offset Screw Driver reaches into awkward corners, provides tremendous leverage, conquers stubborn screws *easily* even when only $\frac{1}{8}$ turn is available. Full $5\frac{3}{4}$ " polished handle, mounted with four fine manganese steel bits—two at each end at 90° to each other and at 45° to pair at opposite end. Good for a lifetime. If your hardware dealer can't supply you, use coupon below. Satisfaction guaranteed or money back.

ONLY 50¢

FREE with Screw Driver

Tool Book 42, 240 pages crammed with pictures and details of hundreds of fine tools, sent promptly for 10c to cover postage and handling—or FREE with screw driver. Send for yours *now*.



MILLERS FALLS CO.

PM4 GREENFIELD, MASS.

Enclosed is: 50c () Send me Offset Screw Driver and Tool Book
10c () Send only Tool Book

Name _____

Address _____



**LOST DIRECTIONS
ARE WORSE IN
WINTER**

KNOW YOUR WAY WITH A
HULL Streamline AUTO COMPASS
SAPPHIRE BEARING • BUILT-IN COMPENSATOR
ONLY \$2.95 AT YOUR DEALER

Write for Circular

HULL MFG. CO. WARREN, O. P. O. Box 246-D1



New WITTE 40HP DIESELECTRIC



Your present power bill will buy a WITTE that produces power and light for 1c a K.W.H. Save up to 75%—a size for every need. 2500 to 30000 watts; 1, 2 and 4 cylinders.

Write today for finance plan, literature and name of dealer.
WITTE ENGINE WORKS 1741 OAKLAND AVE. KANSAS CITY, MO.



**HERE I AM!
To Fix That Broken Chair**

Just apply Rogers Glue to broken section—place piece, joint or splinter in position—clamp . . . then chipped, splintered and broken articles will become, look and remain like new when repaired with Rogers Glue . . . *incredibly* strong—easy to apply. Sells 10c and up in tube, jar or can at hardware stores *only*, or send 10c for full size jar plus free illustrated book giving new ideas, new plans for making useful articles—New 1940 sets of free projects sheets are also available—write Dept. A-1.

ROGERS GLUE, GLOUCESTER, MASS.

ROGERS

"A TON OF STRENGTH IN EVERY DROP"

THE BEST
LIQUID
FISH GLUE

118A

Nothing's Too Big

(Continued from page 85)

balloon-tired wheels. Fitted between a tractor-truck with ten wheels, and a goose-neck semi-trailer with sixteen more, the Jeep puts a total of forty-two wheels under the load and spreads its weight over seventy-nine feet of pavement; even the front wheels feel it. This huge highway freight train was built in the company shops, to move heavy burdens at passenger-car speed. Two Jeeps once hauled twenty-five power shovels in forty-eight hours, over distances up to forty miles, when Los Angeles streets were buried under flood debris.

Nearly half of their jobs, and all jobs that roll on a Jeep, require special highway permits for excess weight, width, length or height, or all four. Heavy bonds protect city and state from any damage to highway structures, and they have charted pavements, bridges and overhead clearances throughout the Southwest. Before a Jeep ever rolls, its driver knows how to reach his destination over a route that will take the load.

Naturally the Jeeps, rated to carry 100 tons with legal axle loading, haul the heaviest concentrated loads—transformers, power shovels, cranes, yachts, small locomotives and the like. It's a good bet that a Jeep will haul the 200-inch mirror up Palomar mountain when it's polished and ready; the brothers carted it from rail-side to the grinding shop, and they were packing twelve-ton loads of building materials up that mountain while the road was little better than a cow path.

Perhaps its most spectacular "passenger" was a ninety-five-ton oak tree, 100 feet high, guyed to two caterpillar tractors to keep the wind from blowing it over. For three miles across soft fields these "anchors" crept alongside the Jeep, and delivered the goods. The Jeeps helped move 800 tons of mining machinery hundreds of miles to new diggings in twenty-five days, after twenty miles of desert road had been widened for them.

The brothers soon learned that heavy hauling was only half the business. At first they had to sublet the installation contract, or else resort to "gyppo" rigging, which means main strength and hopefulness. Since 1933, however, they have employed

POPULAR MECHANICS

K947

three top-ranking riggers—the men who salvaged those U. S. Navy destroyers which drove ashore in a fog at Honda, Calif. They will tell you that hoisting a dinky thirteen-ton sprinkler tank to its tower on a skyscraper roof is the worst job of all.

"It's much worse than wrangling these 140-ton 'cans' on the ground," said one. "With only the sky to hook onto, plenty of things can happen. Funny thing about rigging—every job is different, but there's only one right way to do any of them. It hasn't changed in my forty years, or maybe in the thousands since the Egyptian pyramids were built. Loads are heavier, tackle and power have improved to match, but still it's the way you hook on that counts, and that has to be born into a man."

Skipping the soft jobs, tackling the tough ones, these four men in twenty-five years have built their original one-horse wagon into 25,000 horsepower, which can lift or carry 3,000 tons any moment. They build many of their trucks themselves, sometimes shuffling seven old ones into one special-duty monster, and even a new truck usually is strengthened in the company shops. They pride themselves upon turning out instantly for rescue work after earthquakes, floods, or any emergency.

It has required a world of long hours, hard work, and ingenious short-cutting to keep trucking costs below the landslide in trucking freight rates. What with regulation, competition and taxation there is neither the adventure nor the profit there used to be in plain hauling. That's why the brothers are so fond of the "freak" jobs.

They like it so well, and do it so well, that they even have time for monkey business now and then. Like the time they sent a truck-crane with a ninety-foot boom out to Sherwood Forest near Los Angeles, and stuck the boom over a fence into an arena full of wild animals. It was a "Tarzan" picture, and Johnny Weissmuller, swinging in long looping arcs from tree to tree with his ape brethren, derived much comfort and support (not to mention distance) from that crane and its sturdy rope.

☐ If you will send stamped, self-addressed envelope to our Bureau of Information, you will be given the name and address of the manufacturer of or dealer in any article described in this magazine.

THERE IS A SANTA CLAUS



AMERICA'S Santa Claus is the genius of modern production. That's what makes possible Univex high-quality instruments at prices like these—prices so low they fairly shout: "It's a gift!"

"GUARANTEED" MOVIE CAMERA



ONLY **12.95**

Movies that Cost less than snapshots!
World's lowest-priced 8mm. movie camera with built-in optical view finder! f5.6 lens. Uses 69¢ Univex Ciné film. Written guarantee. Model P-8 projector, \$16.50.

NEW, FAST "CORSAIR" with built-in photoflash synchronizer

ONLY **16.75**



Imagine a double-frame 35mm. candid with f4.5 lens, stopping to 1/200th second — at so low a price! Mistake-proof features — it "thinks for itself!"

FAMOUS "UNIFLASH"



4.95

complete with detachable flash unit

Positive synchronization, Automatic Bulb Ejector, 60mm. Vitar lens. An all-purpose camera for night or day, indoors or out!

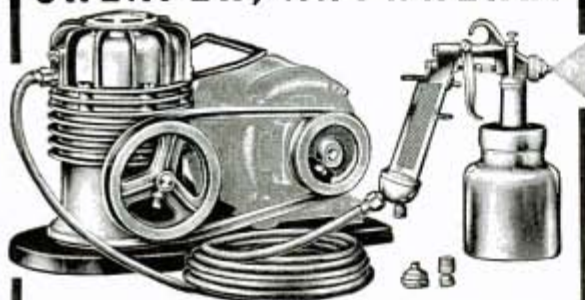
UNIVEX MERCURY—Only candid with guaranteed accurate shutter speeds of 1/20th to 1/1000th second—features usually found only in cameras at \$100 and up—for \$29.75! *Special Christmas Offer*—FREE with every Mercury—a daylight film winder and 2 daylight loading cartridges, permitting use of any type 35mm. bulk film.

UNIVERSAL CAMERA CORPORATION
New York — Chicago — Hollywood

Univex AMERICA'S GREATEST CAMERA VALUES

SPEEDY SPRAYERS

SPRAY PAINT BETTER,
CHEAPER, ANYWHERE!



New 100% portable low cost outfit No. 885 sprays paint, enamel, lacquer, varnish, water paint, insecticides. Special chuck inflates tires. Never needs oiling.

SEND FOR ILLUSTRATED PRICE LIST

Portable low-cost Speedy Sprayers. Electric or gasoline models \$7.85 up. Auto or tractor motor models \$2.70 up. DEALERS: Write for catalog, price list and discounts on Speedy electric and auto-power spray outfits. Sold at dealers only.

W. R. BROWN CORPORATION

5726 Armitage Avenue, Chicago, Ill., U. S. A.

DOES OIL WEAR OUT?

U. S. Bureau of Standards states: "Oil does NOT wear out mechanically and may be used over and over again." (After reclaiming).

Thousands of car, truck and tractor owners have proven the truth of this statement with the use of 'RECLAIMO.' This revolutionary device filters and reclaims crankcase oil as you drive.

Saves Time, Trouble and Money! Our 36-page illustrated booklet, "OIL FACTS," contains complete details and startling oil truths that will amaze you.

Write for your copy today—It's FREE. (Sold direct and by reliable dealers everywhere.) RECLAIMO MFG. CO., 2306 N. Western, Dept. 51.



RECLAIMS AS IT FILTERS



FREE BOOKLET

FOR YOUR CLUB

PINS 30¢

RINGS \$1.50

Knit your group closer together and enhance pride of membership with pins or rings. Bastian's big selection, low prices, traditional clean-cut quality work has led the field for 46 years.

WRITE TODAY FOR NEW FREE CATALOG!
BASTIAN BROS. Dept. 73, Rochester, N. Y.

NEVERSLIP PULLEY

Transmits more power with less belt wear; unaffected by weather. No pulley covering, no belt dressing required. Replace troublesome pulleys with NEVERSLIPS. All sizes. Money-back guarantee. Ask for NEVERSLIP Pulleys on ALL power machinery you buy. Write for folder and prices.

ROSENTHAL CORN HUSKER CO.
Box 16-141 Milwaukee, Wisconsin



EASIEST TOOL TO USE

BECAUSE IT HAS A Flexible SHAFT AND Pencil-Size HANDPIECE

New skill, new ease for experienced craftsmen and newcomers to the homerent hobby. FOREDOM "finger-tip" control for precision work in hard-to-reach-places and for delicate jobs. Note the flexible shaft—the lightweight, pencil-size handpiece. Versatile, can use over 200 accessories. Hundreds of uses: grinding, polishing, milling, engraving, sharpening, slotting, gun-setting, sawing, carving, cleaning, sanding, glass etching, finishing dies, molds, castings, etc., etc. Only \$14.95 for the complete Portable Workshop, as illustrated.

YOURS ON 10-DAY FREE TRIAL
Order this Model 45 FOREDOM Flexible Shaft Workshop today. Enclose \$14.95 check or M.O.—or, we can ship C.O.D. Try it for 10 days. If not completely satisfied, return set—we refund money at once. FOREDOM—fine tools since 1922.

Write for complete catalog.
FOREDOM ELECTRIC CO., Dept. 157,
27 Park Place, New York, N. Y.

ONLY \$14.95
Including 50-piece Accessory Set



Looking for Next to Nothing

(Continued from page 95)

Some of the microscopes used in examination of tiny particles are of the binocular type, having two eyepieces spaced a few inches apart so that each of the observer's eyes sees the specimen from a slightly different point of view. Such a system makes the speck of material appear three-dimensional, the effect being much like a picture viewed in the stereoscope so popular a few decades ago. For unusually delicate work, Dr. E. B. Ashcraft and fellow analysts at Westinghouse use several highly complicated microscopes. The spectrograph detects the presence of an element by means of that element's distinguishing colors in the spectrum. Dr. Ashcraft's weighing machine is so sensitive that it is used in a heat-insulated room and is thrown out of adjustment by the heat radiated from a person entering the room. To keep the balance in readiness, he burns an electric lamp over the scale when he is not working in the room. The lamp creates about the same heat energy as a human body and when the balance is used, the lamp is turned off.

In industry, substances which cause damage are criminals and the microchemist turns detective, hunting down these "criminals," often with no more substantial clues than a few flakes of faulty mica, metal scrapings from a refrigerator or a trace of unknown substance removed from the commutator of a generator that has failed. One example is that of a broken wire in an electrical resistance unit in a steel plant. At first the wire was suspected of being defective, but analysis of minute particles near the break revealed the presence of sulphate. The trail finally led to a blast furnace which gave off sulphurous fumes.

During operation, the walls of some vacuum tubes, like those we use in our radio receivers, become discolored—but so slightly that they remain transparent. By microchemical methods it is possible to show that this discoloration is due to several metals that evaporate from the filament, and it is possible to determine accurately the amounts of each. Evidence of this kind helps engineers to understand the reactions occurring on the filament and guides them in building better tubes.

(Continued to page 122A)

\$148 My First Week



... Now in my OWN Business.

Would you like to own a business where it was possible to take in as much as \$148 the first week, as did L. A. Rowe in his new business?

We want more reputable, honest men. These men need not have any special experience or more than ordinary ability, but they must be honest and courteous.

To such a man we offer an opportunity to start in business for himself. If you are that man you can make far above average profits in the rug washing business—a high grade business all your own.

NO SHOP NECESSARY

The rug washer cleans rugs like new on the customer's floor. Anyone can run it. Electricity does the work. A quick, thorough and highly efficient method that removes dirt and grime, thus bringing out the natural beauty of floor coverings.

There are hundreds of customers in your vicinity and nearby towns. The business should grow steadily. Simply wash a few rugs or carpets. These customers tell others as well as giving you their work in the future. Soon you should have a prosperous, money making business. Send coupon for booklet explaining everything.

PROFITS ENOUGH TO PAY FOR HOME

Men take in \$100 to \$150 in a single week. R. E. Traynor took in \$56 in one day and nearly \$800 in one month. W. F. Drake took in \$186 in three days and \$152 one Saturday night and Sunday. You, too, should be able to enjoy a large income.

VON SCHRADER MFG. CO., 101 PL., RACINE, WIS.

Free Book!
MAIL COUPON now

VON SCHRADER MFG. CO.,
101 PL., Racine, Wis.

Send at once (no obligation) your free booklet illustrating rug washer and telling how I can own my own permanent business; how I can earn large profits at prices below other methods; how I can become financially independent in a short time; and how I can pay on easy terms.

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



"NEVER A COMPLAINT"

C. J. Wright wrote, "Did \$100 business in six days with never a complaint." That is the nicest part of this business. Customers are more than satisfied because of the fine cleaning job you do, and because you do the work right in the home, so they do not have to be without rugs and carpets.

EVERY MACHINE GUARANTEED

You take no risk. These machines have been manufactured since 1918 and are used by the United States Government and by many of the world's largest hotels. They are fully guaranteed.

EASY TERMS

The complete equipment is inexpensive. A reasonable down payment brings everything to you and the balance is paid monthly. From the start you have your own business—one that is profitable and of which you can be proud.



MAIL COUPON Today

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—Priced Anywhere
Interesting illustrated circular free. Write today.
Agents wanted.

ARKOGRAF PEN CO., 3927 S.E. Stark St., Portland, Ore.



110 Volt AC ELECTRICAL EXPERIMENTAL KIT

Wire up thief detector, arc welder, 1/2-mile arc light, elec. furnace, stove, tester, rectifier, A.C. motor, transformer, spark coil, suntan rays, and hundreds other experiments. Use regular 110-volt power 25-Piece Deluxe Kit and 3 Electrical Books.

Send 15c stamp for bargain catalog and book "How to Build Home Experimental Bench."
ELECTRICAL SALVAGE CO. Box 524-J2 Lincoln, Nebr.



XMASPECIAL \$3.99 COMPLETE

POWERlite

AMERICA'S FINEST—MOST POWERFUL ELECTRIC LANTERN

80 to 100 HOURS LIGHT
On One 6-Volt Dry Battery

● TWO LIGHTS on a double action switch. 800 ft. spot beam from front reflector; broad floodlight from top. Handle reverses. Unbreakable lens. 6 1/2" high. At sport, hardware, electrical dealers or write for literature.

DELTA ELECTRIC COMPANY
300 W. 33rd ST., MARION, INDIANA



\$3.35 Less Battery

Buy Only a GENUINE DELTA

REAL ENGINE VALUE

G.H.Q. GASOLINE ENGINE KIT ONLY \$4.95



This is a miniature gasoline engine that really operates. Mass production methods and enthusiastic reception have enabled us to reduce the price from \$35.00 originally to the NEW LOW PRICE OF \$4.95. Over 15,000 sold this year—over 55,000 in use today. The NEW IMPROVED 1941 MODEL KIT is absolutely complete with coil, plug, simple illustrated instructions, gas tank, etc. 1/5 H.P. All parts finished and ready to assemble; only a screw-driver and 30 minutes needed. For use in boats, planes, midget cars, etc. Send for FREE literature or 6c for jumbo catalog.

ORDER TODAY—24-HOUR SERVICE!!

G.H.Q. MOTORS, Dept. B, 40 East 21 St., New York, N. Y.

SEND ONLY **\$1.00**
Shipped Coll. C.O.D.

K693

(Continued from page 120A)

THE GIFT HE'LL LIKE Best AND USE Longest

INSIST ON A GENUINE MOTO-TOOL

100 TOOLS in ONE

The genuine Dremel Moto-Tool is the ideal gift for a craftsman's Christmas. Grinds, polishes, sharpens, drills, engraves, etc., etc. Saves time, cuts cost, does finer work. Owners find it the handiest tool in the home or shop... use it daily. Same tool as used on precision jobs in factories. Over 25,000 r.p.m. (the speed necessary to cut-serve cutters, do fine work). Has oil-less (oil sealed) bearings... dynamically balanced armature, vibrationless, 110 v. universal (AC-DC)... has built-in cooling fan.

6 oz. Model 1 Moto-Tool complete with chuck and 1/8" collet, only \$9.85. Master Model 2, faster, heavier, more powerful, with chuck and 1/8" collet only \$16.50.

Only \$9.85 POST PAID

10-DAY MONEY TRIAL BACK

See genuine Dremel Moto-Tools and complete kits at better dealers or order direct from factory on 10-day money back trial. Send only \$5.00 with order. We ship C.O.D. for balance.

DREMEL MFG. CO., Dept. T111-A, Racine, Wis.

Modern Craftsman's Kits
 KIT NO. 1 with 23 high grade accessories and Model 1 Moto-Tool in hard-wood case... \$17.50
 KIT NO. 2, same as above with Master Model 2... \$23.50

MASTER MODEL \$16.50

WRITE FOR FREE CATALOG!




TRAILER BUILDERS • BUYERS • OWNERS

TRAILER Send 25c for this Big Book Today

Over 80 pages! Beautifully Printed and Illustrated! Trailer Suggestions and Ideas galore! Catalog shows America's greatest line of Trailer Parts and Equipment at lowest prices. Everything from wheels to top. Rush 25c (in U.S.) today. Satisfaction guaranteed!

TRAILER SUPPLY CO., Box 368-A WAUSAU, WIS.



PLANS TRAILERS Ready

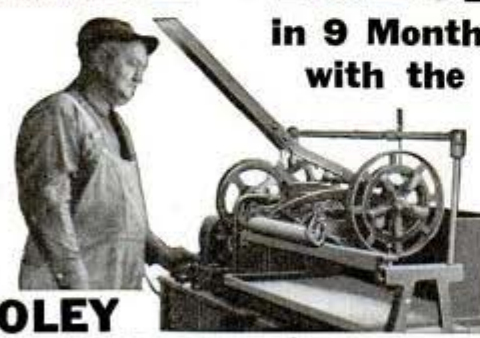
FOR NINE NEW JIM DANDY TRAILERS

Build your own trailer! Send 10c for Jim Dandy's interesting new TRAILER PLAN CATALOG which illustrates and describes NINE new models including 4 modern house trailers, plus sport, camp, and utility trailers. Rush 10c (in U.S.) for Catalog today to **JIM DANDY, BOX 125-A, WAUSAU, WIS.**

MADE \$1025.00

in 9 Months with the

FOLEY LAWN MOWER SHARPENER



"A substantial increase in grind jobs each year, proves beyond any doubt that Foley Grinders do very satisfactory work. We have ground 723 mowers since February 1 to date, November 9. Our total receipts on lawn mower service alone during that period has grossed us \$1,025.00. The prevailing price of grinding and adjusting service is \$1.00 and \$1.25—repairs and parts extra."
 —W. A. Tullip, Phoenix, Ariz.

You Too Can Make Big Money

Free plan tells you how to start. The Foley Lawn Mower Sharpener turns out perfect work quickly and easily, no experience needed. Simply put the mower in the machine and turn on the power. Uses same system as lawn mower factories. Sharpens all sizes and types in 15 or 20 minutes.

Special Offer: Attachment for grinding axes, hatchets, knives, etc., included FREE with Foley Lawn Mower Sharpener on our Special Offer, brings you business the year around. Send coupon today.

FOLEY MFG. CO., 107-1 Foley Bldg., Minneapolis, Minn.

Send Free Plan for making money sharpening lawn mowers, and Special Offer on the Foley Lawn Mower Sharpener.

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

Corrosion on cables and telephone parts, and dust and its effects on dial switching apparatus, are problems made easier to solve by the use of microchemical methods in Bell Telephone Laboratories. Special devices have been developed for the collection of "evidence" for the studies. For instance, an "impinger" is used to remove dust from the extremely localized area represented by a single relay contact point. The particles are picked up by suction and projected at high velocity against a microscope slide coated with adhesive, on which a detailed microscopic examination can be made readily. One of the Bell system's newest pieces of trouble-shooting equipment is a traveling "suitcase" laboratory. Housed in a wooden case no larger than a Gladstone bag, this complete micro-workshop may be taken to the scene of trouble. It contains an electric furnace, testing fluids, absorbent paper and other materials.

As modern machines grow larger and more complex their chances of being damaged or stopped by things that in themselves are insignificant are continually increasing. Not long ago an experimental refrigerator refused to operate. The trouble was found in the needle valve, through which the refrigerant expands to produce cooling. When the valve was examined in the laboratory, it was discovered that the cause—the "criminal"—was a piece of metal which had stuck in the seat of the valve and was so small it could not be identified with the human eye. Micro-analysis revealed this to be a piece of silver solder used in building the refrigerator.

At Western Electric company, microchemists analyze atmospheres carrying small amounts of dust or chemical fumes, so that contaminants may be kept well within safe limits. By bubbling the air through purified water, a sample is obtained which may be analyzed for absorbed fumes or examined under a microscope for suspended dust particles. One solution with which they work is known as the "shotgun reagent" that will react with ten different metals which may be present in a drop of water. Each of these metals forms a different type of crystal by which it may be identified under the microscope.

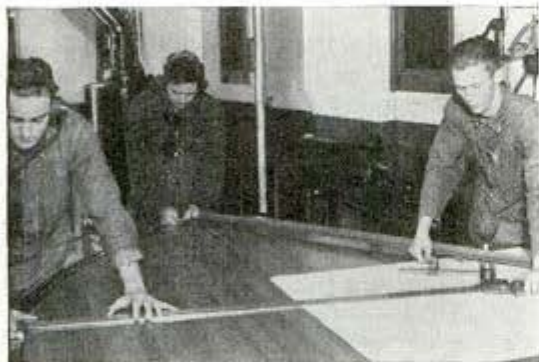
Thus, industry is coming more and more to value the microchemist—the man looking for next to nothing.

8977

Modernizing Our Coast Defense

(Continued from page 75)

A properly organized bombing raid includes flights of low-flying attack planes whose mission it is to put the anti-aircraft batteries out of action with machine-gun fire or bombs, or to curtain the guns with smoke screens. The attack planes are fought off with fifty-caliber machine guns and with heavier thirty-seven-millimeter guns that fire clips of one-pound explosive shells. In their camouflaged locations, the anti-aircraft guns play 'possum until the bombers are in range, and even if smoke screens have been laid the guns can fire through the smoke effectively. The spotters at the director and not the men at the guns have to see the target, so the director is often moved some distance away, outside the area where smoke screens are apt



Plotting board on which angles of target from observing stations are recorded for computing firing data

to be laid. An offset adjustment is made to the mechanism, and the firing data remain as accurate as if the director were alongside the guns. On night raids the oncoming bombers are first detected by big mechanical ears and then searchlights are pointed to the same section of the sky. The 800,000,000-candlepower beams pick up and follow the planes so that the men at the stereoscopic height-finding device and the spotters at the director can track them.

Instead of depending on armored forts to defend its harbors the United States uses fortified areas in which fixed and mobile guns are trained to cover the channels and adjacent ocean. The Gibraltar-like headlands of San Francisco and Los Angeles harbors are fortified and in these cases the ammunition storage rooms, machine shops, and the plotting and control

(Continued to page 124A)



Satin-smooth sanding

New GuildSander

10 Times Faster Sanding

Earns
LEADERSHIP
by
PROVED Performance



Refinishing Old Furniture Use in any position

THOUSANDS of craftsmen say this easy-to-use electric belt sander has ended irksome hand-sanding for them. You, too, can easily see how GuildSander's clean-cutting abrasive belt sands *ten times faster*. Gives you an expert finish . . . with-the-grain . . . on either curved or flat surfaces. Quick belt change for any degree of finish fineness. Uses standard-size 21" x 2" belts. Works on wood, metal, stone or plastics. *Removes old paint or varnish*. Levels glued joints, trues miters, resurfaces furniture, fits doors and windows, sharpens tools.

GuildSander is *completely* guaranteed. Plugs into any light socket. Weighs only 9 lbs. Sold by most good tool dealers. Write for dealer nearest you, who will gladly demonstrate GuildSander without obligation. Ask us for **FREE** instructive Folder **TODAY!**

**SYRACUSE
GUILD TOOL
COMPANY**
1741-1C No. Salina St.
Syracuse, New York

ONLY
\$46.50

2777

(Continued from page 123A)

MAKE BIG MONEY at HOME!

NEW INVENTION

Electroplates by Brush



New, patented invention makes possible big earnings AT HOME. Replate auto-parts—worn articles in homes, stores, hotels, restaurants, etc., with durable, sparkling, new coat of metal—with stroke of brush. Easy, simple, quick. Genuine Gold, Silver, Nickel, Cadmium, etc. Everything furnished. Outfit complete, ready for use. No shop required. Clear from \$2 to \$5 an hour in lifetime business. Small investment starts you in business. Steady repeat. Machine can pay for itself in week. Send TODAY for FREE SAMPLE and illustrated BOOKLET how you can have a life income from a business of YOUR OWN built upon satisfied customers. Act at once!

FREE SAMPLE and BOOKLET EXPLAINS ALL

WARNER ELECTRIC COMPANY
350 N. Michigan Ave., Chicago, Ill., Dept. 5-J

MICROMETERS



Adjustable anvil, solid spindle, polished chrome plated cast alloy frame; $\frac{1}{2}$ "—\$1.50; 1"—\$1.00, Heavy Duty model with friction stop—1"—\$1.50; 0-25 m.m. metric—\$2.00. Leatherette covered metal pocket case—\$.25. Postpaid or C.O.D. Money Back Guarantee.

JAY J. STAHELIN
6046 Wentworth Avenue Chicago, Illinois

ACTION! THRILLS! ADVENTURE!



Explore distant places, see new sights, visit pleasure spots at little cost. Pal with fun-loving riders at exciting motorcycle events. See new 1941 models at your Harley-Davidson dealer's. Write for FREE copy of "Enthusiast" motorcycle magazine. Harley-Davidson Motor Co., Dept. P, Milwaukee, Wis.

HARLEY-DAVIDSON

MOTORCYCLES

NEW BENJAMIN AIR RIFLES WITH HAND PUMP

MADE IN U.S.A.



HARD ACCURATE SHOOTING WITH CHAMBERED AIR

You can use new model BENJAMIN AIR RIFLES WITH LEVER HAND PUMP anywhere, for practice firing or just plinking, around the house or camping, fishing, hunting, etc., at lowest cost. Shooting force is adjustable with amazing maximum power and accuracy—no recoil or forward lunge to disturb your aim. Belt Action-Hammer Fire-Hair Trigger-Safety Lock-Hand Pump. Single Shot BB \$7.50; Single Shot Cal. 177 or .22 with rifled barrel \$8.50; BB 25 Shot \$9.00. Also a complete line of BENJAMIN GENUINE COMPRESSED AIR PISTOLS from dealer or factory. Write Today for details and Targets. BENJAMIN AIR RIFLE CO., 855 Marion St., St. Louis, Mo., U. S. A.

100X TELESCOPE

LENS KIT \$1.95

100 Power Complete Lens Kit



Make your own high powered telescope in one evening of easy work. All optical parts completely finished for 6 ft. long refracting telescope. Kit contains 3" diameter 75" F. L. ground and polished objective lens and 2 astronomical eyepieces 50X and 100X. See the mountains and craters on the moon, the ringed planet Saturn, the moons of Jupiter, double stars, etc. Complete lens kit with full directions for mounting at the special price of only \$1.95 postpaid.

BROWSCOPE CO. Dept. 41A, 5 W. 27th St., New York

BUILD YOURSELF A MIDGET CAR



WE SPECIALIZE IN WHEEL SETS, ENGINES, ETC., for building Cars, Scooters, Trucks, etc. We carry only the best at the lowest prices. Send 10c for parts catalog and plans for three Midget Racers, Scooters and other vehicles. If you wish to use only reliable standard parts—We guarantee satisfaction. BIRD-OWN Devices, 536 North Parkside, Dept. PM-2, Chicago

ITCH STOPPED QUICKLY

Quick relief from itching of eczema, rashes and other externally caused skin troubles

Use **D.D.D.** Prescription

35c bottle, at druggists, proves it or money back

rooms are buried below ground. Besides the anti-aircraft guns, a thoroughly fortified area contains three and six-inch rapid-fire guns that are effective against light small craft and destroyers, long-range high penetration eight and ten-inch rifles to be used against light armored cruisers, and mortars and rifles ranging from twelve to sixteen inches that are adequate against heavily armored battleships.

Army experts figure that one gun on shore is equal to ten guns of similar caliber and range on board ship. A gun emplacement is a much smaller target than a ship and it would take a direct hit to put a gun out of action while a hit on any part of a ship is apt to cripple it. Another reason why the shore batteries have the edge is that they can be aimed simply and accurately while the gunners afloat must reckon with the speed, roll and pitch of their ships in aiming their guns.

When an airplane is used for fire control the pilot carries a map on which the adjacent ocean is divided into 1,000-foot squares. He locates the target in one of the squares and radios the number of the square back to the plotting room. One shot is fired at the middle of the same square and the pilot, watching where the shell hits, radios down a correction.

Coast defense is a joint duty of the army and navy, and the work of the Coast Artillery regiments is coordinated with the defense tactics of the navy and the Army Air Corps. The navy lays mines offshore and the Coast Artillery lays the strings of mines that protect the narrow entrances of harbors. Instead of always exploding upon contact with a hull, such mines are controlled from shore. Thus friendly vessels can pass in and out unscathed. Harbors are protected also by underwater anti-submarine nets. The Coast Artillery operates railroad rifles that in case of emergency would be moved to positions commanding beaches where attempts to put landing parties ashore might be made.

Practically unimproved since the World War, our coast defenses on both sides of the continent and in Alaska and Panama are soon to be modernized by increasing the number of fortified areas and the number of guns in each area, and by building bombproof and gasproof shelters for the gun crews.

Took in \$279.50!

on first jobs

in my



Own NEW Business!..

Here is a NEW FIELD for live wire men which offers a fine opportunity for a man like you to get into business for yourself. You don't need special training—you don't need a lot of money. We can start you in this business where you will be your own boss and where

No Rent to Pay

Your home is your office, therefore you have no extra rent to pay. TAKE THE MACHINE TO THE JOB and do the work in your customer's home, then collect your money the same day. Think of these amazing opportunities. Barrett says, "Took in \$28.00 in 8 hours—on another job took in \$5.00 an hour." O. W. Harris says a contract with one of their biggest hotels will run about \$1500.

Earn a Home—Earn a Car—Earn Big Pay

Even in spare time you can earn a lot of money with this new invention. If you want a new car, if you need extra money to buy a home or if you want to pay yourself a handsome salary, get into this fascinating money making business NOW. The work is easy to do, opportunities are almost limitless and you should be able to take in big profits the VERY FIRST DAY. Send the coupon for FREE BOOK telling you how you can have a business of your very own.

"Have just taken in \$40.00 for 7 hours' work with my Deterger cleaning wrestling pads for high school athletic department. The coach said that this was the only method of doing a satisfactory job."
R. D. M.

"My profits with the Deterger have been more than satisfactory. One job paid \$18.00 for 7 hours' work, another \$28.00 for 8 hours and my customers report 'Looks like new', 'Just wonderful', etc."
J. W. B.

"Many of my jobs run from \$35.00 to \$50.00, for work which I can do in one day without any extra help. Besides every customer has become a booster for me."
A. F. N.

"Have often taken in as high as \$37.00 in a single day. My best profit for one week was \$270.75."
E. R. W.

FREE VON SCHRADER MFG. CO., 551 PL, Racine, Wis.
Send me (without obligation) your free booklet telling me how I can own my own business and become financially independent and how I can pay for the DETERGER on easy terms.

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

money comes in faster and easier than from an ordinary job. This business is NEW but letters are already pouring in, telling of tremendous profits earned the very first week. Our new electric furniture cleaning machine washes upholstered furniture right in your customer's home. Think of the millions of pieces of furniture which need cleaning. There are thousands and thousands of customers everywhere. Hotels, clubs, hospitals, public institutions of all kinds, as well as homes, are all your prospects. They are ready to PAY BIG for this service. One of our men reported taking in \$150.00 by cleaning automobile interiors alone. Here is a vast field with tremendous opportunities

Customers All Satisfied . . .

Your customers are always satisfied. They send their friends to you and thus business should roll in and help you to make still more money. REMEMBER the work is done in your customer's home. This makes everybody happy. YOU don't have to cart the work back and forth and YOUR CUSTOMERS can use the furniture almost as soon as it is cleaned. Our machine does a beautiful job of removing dirt and grime, leaving furniture fresh and clean.



Guarantee

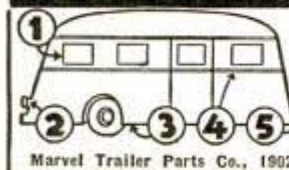
Every machine is made in our own factory and we fully guarantee the quality of materials and workmanship. We also help you get started and make it possible for you to earn a lot of money. The entire outfit comes to you ready to use.

Easy Terms

The price is very reasonable and a down payment brings everything to you complete, the balance you can pay just a few dollars monthly. From the very day you receive the machine, you should be able to start making money. OWN YOUR OWN BUSINESS, let us help you start now. Send the coupon above for FREE BOOK "Your Own Business, Profits Instead of Wages" NOW.

VON SCHRADER MFG. CO., 551 Pl., Racine, Wis.

"MARVEL-OUS" TRAILER PARTS



- "Famous" Marvel Windows.
- tall lights.
- complete undercarriage equipment.
- body moldings.
- couplers. Also refrigerators, stoves, lighting fixtures, everything you need in highest quality. Largest trailer equipment stock in U. S. Immediate delivery, low prices. Send 10c coin for 44-page illustrated catalog.

Marvel Trailer Parts Co., 19020 Celestine Ave., Detroit, Mich.

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 Back Bay, Boston, Mass.

GOLDENTONE...50% OFF

Agents Wanted

Deal Direct, Factory Prices Over 60 models to choose from—4 to 12 tubes. Portables \$8.00 up. Farm sets \$8.95 up. Car sets \$8.98 up. Foreign hand sets \$8.08 up. Samples 50% off. Quantity discounts. Free 1941 bargain catalog gives details of 10 day FREE trial, agent's proposition and discounts. No obligation. All orders to GOLDENTONE RADIO CO. Dept. P. M., Dearborn, Mich.

Free Catalog RCA

10 DAY TRIAL 49¢ 8 UP READY TO PLAY YEAR GUARANTEE



DASH CONTROLLED GAS TANK LOCK

NO KEYS—FITS ALL CARS. Attractive, convenient, dependable, stops loss of gas and caps. The finest, the fastest-selling, and the most PERFECT CHRISTMAS GIFT out. Distributors, dealers, jobbers, here is a year round seller with a good profit. Write today. SNAP-UP GAS CAP CO. DEPT. 7 ASHLAND, KY.

PISTON TYPE COMPRESSOR

Paint walls, ceilings, screens, furniture, radiators, machinery faster, better! 1/4 H. P. motor 110 Volt 60 Cycle AC, complete with Spray Gun, 15 ft. hose. Weighs only 44 lbs. Carry anywhere. FULLY GUARANTEED. Complete with motor only \$31.15, or only \$25.00 less motor, f. o. b. Chicago. \$5 Deposit, Balance C.O.D. or SEE YOUR DEALER. Circular FREE. Get started making money NOW! \$25.00 Less Mar

Ideal Automatic Pump Co. Dept. PM-1, 801 Washington Blvd., Chicago, Illinois

BUILD THE DESTROYER PRESTON

Complete Kit \$2.50 Post Paid

Includes! 24" Super Detail Model

Catalog—10c

IDEAL AEROPLANE & SUPPLY CO., Inc., 26 W. 19 St., New York

Makes perfect building easy

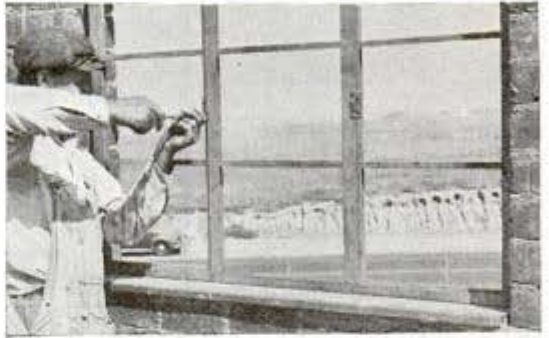
X1046

Low Cost Homes Built to Last

(Continued from page 43)

casionally. One would never guess the walls were concrete. They look like fine stucco outside, like plaster inside.

On the three present projects completed or nearing completion, Los Angeles county has spent nearly \$6,500,000, and will house 1,500 low-income families. As soon as apartments are ready for occupation, 1,500 sub-standard dwellings will be destroyed. Capital investment is to be repaid by renters—but the cost for them will be unbelievably low. Units with living room, bedroom, kitchen, and bath will be restricted



Bolting in place the pre-fabricated window frame—another way of saving money

to families of two or three, and a maximum income of \$950. Rental will be \$14.71 per month. Two-bedroom units take families up to five, and cost \$15.96. Three-bedroom units admit families up to seven, and cost \$16.71. For two and three-bedroom units, families are limited to maximum incomes of \$1,260. In addition to rental charges, all families pay flat utility rates of \$4.79 per month, covering all gas, lights, and water.

Tenants must have their own furniture, but electric refrigerators, gas stoves, gas water heaters, gas room heaters, laundry tubs, and sinks are part of the houses.

With line production applied to housing, these methods open for the first time the possibility that families may buy homes cheaper than they can rent. According to most estimates, the average house costs its owner twice the original price in thirty years or less, and at that time becomes sub-standard. These apartments will not cost double the original investment until they are from fifty to sixty years old. If private homes could be put on that basis, ownership would be much cheaper than current rentals.

THE PRIZE GIFT for



JUNIOR, DAD and GRANDPA

■ Does just about everything on metals, wood, alloys, plastics, horn, bone, glass, etc. Uses 300 different accessories to grind, drill, polish, cut, carve, rout, saw, sand, sharpen, engrave.

ORIGINAL AND FINEST HOBBY TOOL. Nothing like a Handee to keep boys happy. Gives men a real hobby making useful and beautiful gifts or things to sell—ship, train or plane models, costume jewelry, wood carvings, puppets, initialed tumblers, engraved trays, etc. Why—with a Handee a fellow can set up shop wherever there is an electric outlet. Be sure to give a Handee this Christmas, or get one for yourself.

ORDER ON 10-DAYS MONEY BACK TRIAL De Luxe Model 25,000 r.p.m. with 7 accessories \$18.50 postpaid. Standard Model 18,000 r.p.m. with 3 accessories \$10.75 postpaid.

HANDEE HOBBIES—Scale drawing plans of fascinating new projects. 25c for portfolio of 10.

SEND FOR FREE 64-PAGE CATALOG about Handee Products and their wide application in crafts and industry all over the world.

CHICAGO WHEEL & MFG. CO.
108 S. Aberdeen St. Chicago, Ill.



Save Hours of Hand Work

HANDEE

TOOL OF 1001 USES

\$13.95 Full Set MICROMETERS



Six piece set, in velvet lined leather case. Special price, only \$13.95. Precision machined in one thousandths, up to 4" outside and 3 3/4" inside measurements. Guaranteed accurate, easy to read and adjust. Satisfaction guaranteed or money back. This is your opportunity to get one at a Bargain Price if you act now. Shipped prepaid on receipt of remittance. On C.O.D. shipments, send deposit of \$2.00.

FREE FOLDER

MICRO PRODUCTS, 211 Jos. Campau, Detroit, Mich.

NEW Grinding Attachment

For 8" to 16" Metal Lathes. Build it Yourself. At last, a precision grinder within your means. You save 2/3 by finishing our semi-machined castings, on your own lathe. HURON handles both internal and external grinding. Accuracies to .00025". Mirror finish easily obtained. Grinds valves, pistons, bushings, shafts, hard or soft, lathes, lathe centers. Sharpens reamers, milling cutters. Does eccentric drilling; lams; polishes; scores of other uses, for home workshops, garages, machine shops. Write for FREE illustrated folder and full information.



Semi-Machined Castings Only \$5.95

RAILROAD FANS Send for **FREE** 48-page illustrated book on spectacular American Flyer Scale Model Trains and Equipment. **AMERICAN FLYER TRAINS**, 423 Erector Square, New Haven, Conn.



WORLD'S LOWEST PRICED ADDING MACHINE

IDEAL XMAS GIFT GUARANTEED ACCURATE. Not a toy. Operates with only a finger flick. Adds, subtracts, multiplies, divides. Counts up to ten million. Pays for itself over and over. Ideal Gift—for Business, Income Tax and School use. **MONEY BACK GUARANTEE.** Send name and address. Pay postman only \$2.50 plus postage. (Send full cash if outside U. S.) Money back in 10 days if not delighted. **AGENTS WRITE.** **CALCULATOR MACHINE COMPANY (Mfrs.)**
DEPT. 113, P. O. BOX 1118 CHICAGO, ILLINOIS

Vest Pocket Size FREE TRIAL ONLY \$2.50 TOTAL COST SEND NO MONEY

K 927

Creating Sight Effects

(Continued from page 37)

smoke spewing from a gun. The two have to be synchronized or the show is botched. For this reason, the issue of smoke as well as the report, are controlled from a point off stage. The smoke doesn't actually come out of the gun but by setting off a charge between the two actors and near the gun, it can be made to appear so.

To achieve the effect of a machine gun plunking out a window, then mowing down a row of glass jars, Eddy hooked up a series of eight mousetraps on a board so that by yanking a wire they could be made to go off one after the other. The glass jars were etched on the inside so they'd shatter simultaneously with the popping of the mousetrap.

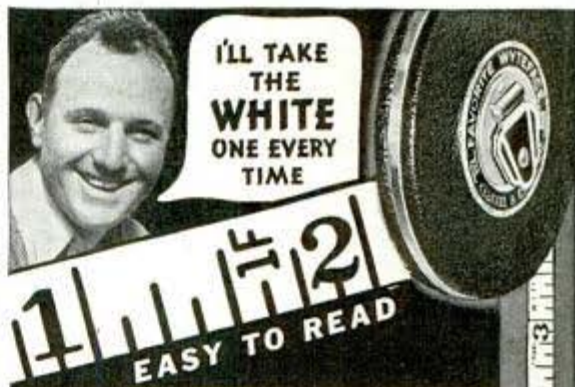
The bombardment of a mountain village was effected by making the shell holes in the "ground" first, covering them with thin material and hooking them up to rubber bulbs by means of hose. A squeeze on the bulbs was sufficient to send dust and debris flying out of the holes in realistic fashion.

Preparation of titles is highly important, for with these the mood for a play is frequently established. The projected telecast of "Sleeping Beauty" brought forth a strange requisition: "spiders working on real spinning wheels." With a few metal hooks, wire, some cork, felt remnants, and stray beads, the assignment was carried out without a hitch. Invisible wires and rigging gave the technician control of the spider's movements from a point outside the camera range.

For intermission interludes, a projection kaleidoscope has been perfected by Eddy, which presents harmonious, ever-changing figures of an abstract nature. These are to the eye what music is to the ear, and can be keyed to any mood.


Perhaps the most novel contribution to television Eddy has made is "Li'l Joe," a puppet capable of fifteen different motions, all remotely controlled. With several of these comic automatons, he hopes to launch an animated television cartoon.

Ever since its escape from laboratories, television has been borrowing heavily from radio, screen, and stage-production experience, but Eddy feels the medium is distinctly new and will come into its own only by developing its own technique.



Black-on-white! The crack-proof white surface is bonded to the steel—protects it from rust. Favorite Wyteface is easy to clean, hard to kink, durable. *Unconditionally guaranteed!* 25, 50, 75 and 100 ft. lengths. Mail coupon today for free sample of the line and illustrated folder.

K&E FAVORITE WYTEFACE
STEEL MEASURING TAPES

LOOK FOR THIS DISPLAY 

KEUFFEL & ESSER CO., Est. 1867
Dept. 129, Hoboken, N. J.

Name _____
Address _____
City _____ State _____

For Your Class or Club

Class pins, club pins, rings and emblems. Finest quality Reasonable prices from 30c up. Write today for our attractive, free catalog.

Dept. N, METAL ARTS CO., Inc., Rochester, N. Y.

A Revelation—Our new 1941 Catalog of "HARD-TO-GET" MATERIALS

For Industrial Arts Departments in Schools, Institutions, etc., Furniture Repair Men, Cabinet Makers, Souvenir and Antique Shops, Homecrafters, etc. Send 10c cash or stamps for this new catalog.

A few of the items we sell: Chest hardware, locks, hinges, supports, tray lifts, copper trim, also mouldings, overlays, etc. Finishing materials, glue, stain, varnish, abrasive papers, sanding blocks, stick shellac, etc. Upholstering supplies, coverings and tools. Electrical findings for lamp manufacture, also chokers and indirect fixtures. Chair cane, spines, reeds, craft fibre cord, etc. Tins and glass liners for smoking stands. Large line electric and spring clock movements, with and without dials. Complete line Venetian Blind hardware, cord, tapes, etc. Table slides and supports. Tea wagon wheels and casters. Wood dowels, also dowel screws, dowel centers, wood screw hole buttons. Large line card table leg supports. Bed hardware of every description. Desk pens complete with barrels and fastening without base. Water transfers, inlays, small mouldings, etc. Glides and casters, office chair spiders, wood legs and K. D. chair frames. Small box hardware of every description. Large selection pulleys, knobs, handles, hinges, locks, casters, etc. Perforated steel panels, chair braces, revolving chair fixtures, rocker springs, candle-stick sockets, billboard clamps, banquet table hardware, metal drawer slides, brass jack chain, drawer follower blocks, etc. Many styles corner braces, bolts, etc. Step ladder braces, planer strips, sliding track and shelves. Typewriter desk hardware, brass/brass, mirrors, nut bowl hardware, salt and pepper inserts, music box movements, etc. Bar pins for novelties, dress clips, etc. Catkin plastics, crib hardware, swivel top table fasteners, sectional bookcase hardware, clamp nails, electric pens for burning, etc.

THURSTON SUPPLY COMPANY, Dept. PM, Anoka, Minnesota


ONAN ELECTRIC PLANTS
ALTERNATING AND DIRECT CURRENT

Produce Current, same as City Power Lines, for FARMS, SCHOOLS, THEATRES, PUBLIC BUILDINGS . . . Operate Lights, Radios, Motors, All Appliances.

Over 40 STOCK MODELS—250 to 50,000 Watts.
Any Voltage—Any Frequency.
Combination A. C. - D. C. Types.
Manual, Full Automatic and Self-Starting. 197 up.
Shipped—COMPLETE, READY FOR OPERATION.
THOUSANDS IN USE IN ALL PARTS OF THE WORLD.

Write for Complete Details.

D. W. ONAN & SONS
1053 Royalston Avenue - MINNEAPOLIS, MINN.



71957

VALUABLE TREATISE ON PHOTO ENLARGING
 Tells you how to transform your ordinary negatives into big, beautiful pictorial enlargements. Written by experts in the amateur's language. 36 pages, profusely illustrated. Loaded with meaty information on enlarging, diffusing, dodging, double printing, photomontages, toning, spotting and mounting.

Send 10c coin to cover cost of mailing, etc. Big photo catalog free. Write Dept. PO141. Act now.

BURKE & JAMES, Inc.
 223 W. MADISON ST. • CHICAGO, ILLINOIS

CLAMPS

The biggest need in most home workshops is more good clamps—clamps for gluing, holding, drawing-up and for setting-up work. They are the extra hands for the 1-man shop. Don't spoil or delay work for want of clamps. From over 40 types of clamps we have selected those as the first for homecraft use.

ADJUSTABLE CLAMP CO.
 "The Clamps Folks"
 421 N. Ashland Ave., Chicago, U. S. A.

PONY Mini-clamps 9 types 1" to 3 1/2" esp. Not toys but fine tools with 100 uses.

PONY "50" Fittings go on ordinary 1/2" pipe. Any length. Send \$2.00 plus postage (6 lbs.) for fittings for two "50" Clamps. Also "Pony" No. 52 Fittings for 1/2" pipe—2 sets for \$2.00 plus postage.

Jorgensen Hand-screws
 Genuine "Jorgensen" Hand-screws grip at all angles, never slip, split or loosen. All sizes. Send \$3.25 plus postage (7 lbs.) for 2 No. 1 Hand-screws—opens 6".

Catalog FREE Ask your Dealer

Big Money for Workers In Home or Shop

MONEY-MAKING PROJECTS. Color-glazed concrete lawn, cemetery pottery made without molds or cores. New, Patented method. Use only sand, cement, cheap materials. Tiles, walls, gravestones. Statuary, giftware. Basement waterproofing. Booklet, details 3c stamp.

NATIONAL POTTERIES COMPANY
 Dept. 6. 13 W. 26th St. Minneapolis, Minn.

LOG SAWS

Make Money—Wood now in big demand—start a sawing business. Turn timber into cash. Low factory prices—Easy Terms. Write for Log-saw and Engine Catalog.

WITTE ENGINE WORKS
 4741 OAKLAND AVE. KANSAS CITY, MO.

Calling All Cars

A MYSTERIOUS DISCOVERY SAVES UP TO 30% ON GASOLINE or Costs Nothing to Try

Stop wasting Gas!—trim dollars off gas bills—get more power—quicker pickup—faster acceleration! **AUTO OWNERS everywhere praise VACU-MATIC!** Proven so efficient, it is guaranteed to satisfy, or the trial costs you nothing.

Automatic Supercharge Principle
 Vacu-matic is entirely different! It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air into the heart of the gas mixture. It is entirely automatic and allows the motor to "breathe" at the correct time, opening and closing as required. Saves up to 30% on gas costs, with better motor performance.

AGENTS Get Yours FREE

FOR INTRODUCING. Here's a splendid opportunity for unusual sales and profits. Every car, truck, tractor owner a prospect. Send name and address now for big money making offer and how you can get yours Free. The Vacu-matic Co., 7617-539 W. State Street, Wauwatosa, Wis.

At the Controls with a Pilot

(Continued from Coloroto Section)

"Over Goshen at forty-four . . . four four. Seven thousand. We estimate Toledo at seven thousand at nineteen . . . one nine." The Chicago operator repeats the contact.

Two hours later we're flying through a clammy gray mist that whips and tears at the windshields and occasionally spews water into the cockpit. The captain and first officer have exchanged duties. Far below us, somewhere underneath, lie the Pennsylvania mountains. There are towns down there with people living in them. They are going to work, they are stopping for lunch, they are buying things, selling things, eating and sleeping and playing and planning. Their world stretches to the farthest horizon, their feet are on the solid earth where they were originally designed to be. Our horizon is a few feet, a vista of dancing needles and staring dials. Our life is bounded by a sheet of aluminum and a plate-glass window. We are moving very fast. We are existing in a tiny complicated world of our own. Our only contact with the past is an unseen voice we've never heard before. Only two things are reassuring, the steady drumming of the motors and the attitude of our pilots. Apparently they've done this before.

The pilots are at ease in this mysterious new world because they know with minute accuracy just what is going on. The gyro says our course is one hundred and ten degrees. The compass agrees with it. We know in what direction we're going. The rate of climb shows three hundred feet per minute descent. We know our ship is pointed slightly down, already on the long slide into New York. The altimeter says sixty-five hundred feet. Well, we know how high we are. The turn and bank indicator is straight up and down. We're going in a straight line. The little airplane in the artificial horizon is level. So are our wings. In our ears the steady hum of the Mercer range is receding. There's a slight dot-dash "A" in it. We know just where we are. What more can anyone ask? We are a lot surer of our position in the scheme of things than many people on earth.

Bellefonte, Sunbury, then Allentown, mile after mile of impenetrable white. The first officer watches the instruments. He

K 757

reads their messages and maneuvers the ship according to what they have to say. At three o'clock another call comes on the radio, another voice this time, another man in another city.

"New York Airways Control clears you to cross the southwest leg of the Newark range at twenty-five hundred, cross Coney Island at two thousand. You are number three to land. No delay expected. Clear?"

"Okay . . . flight ten." There's our clearance. We're closing in on New York. Our aerial voyage is almost finished.

The New York range is on. Again an "A" merges with an "N." We are over Coney Island. Somewhere in the murk below us is the shoreline of the Atlantic ocean and the entrance to New York harbor. The captain slowly turns the ship. The first officer speaks into his microphone.

"Flight ten to New York. We're over Coney Island at fourteen . . . two thousand."

"New York to flight ten. You're cleared for a standard instrument approach. Shift to night frequency and work the tower when contact."

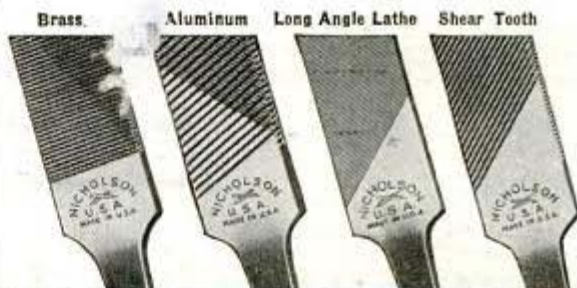
We're heading right for the New York range station . . . course forty-four degrees. We're going down again—three hundred feet per minute. The captain switches on the "Seat Belt" sign in the cabin. The first officer puts the landing gear down.

"Pressure . . . green light . . . latched . . . I have a wheel." He's calling off each check on his action. The New York range whines louder and louder in our ears. Our air speed is down to a hundred and twenty miles an hour.

"Low pitch . . . left main . . . full rich . . . cross feed on . . ." More check orders ring out crisply. Our altitude is twelve hundred. The range is louder than ever. There's a faint "N." The captain turns the ship slightly. Look out the window now. Watch carefully. We should see the ground in a minute. A light glows brilliantly on the instrument panel. We've seen that same light over Goshen, Cleveland, Allentown, each time we passed over a range station. This is New York. Silence in the phones, then a burst of sound. We're over!

The captain cuts the motors back a bit, noses our ship down. Whoof! We're out of the clouds! There are the roofs of a thousand buildings! There's the airport beacon

(Continued to page 131A)



THE vast differences in file-tooth construction, as indicated by the four files above, show the importance of selecting the right file for the job. Example: For the brass-filing job pictured here, the specially designed Nicholson Brass file is being used . . . because its short-angle upcut teeth prevent the file running off the work and keep the file clear of chips, while the long-angle overcut breaks up the filings.

Nicholson makes a file for every purpose—from the tiniest jewelers' to the largest foundry file . . . from general-purpose to special Nicholson or Black Diamond files for working on various metals and other materials toward variously desired results. Consult your hardware dealer or mill-supply house about the files you need.

NICHOLSON FILE CO., Providence, R. I., U. S. A.

(Also Canadian Plant, Port Hope, Ont.)



NICHOLSON FILES

FOR EVERY PURPOSE

SEND FOR any of the interesting items of file information listed in coupon below (check ones wanted).

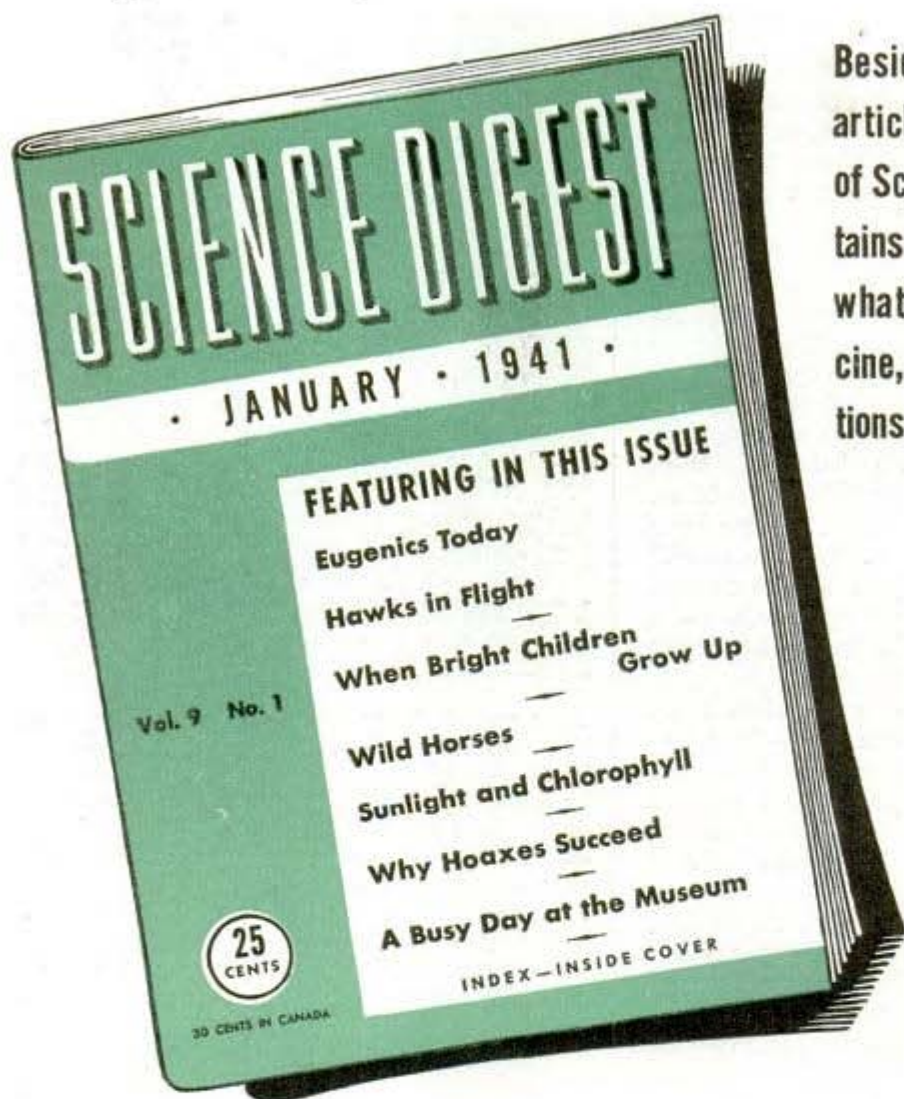
NICHOLSON FILE CO., 22 Acorn St., Providence, R. I., U. S. A.

Send me Free book, "A File for Every Purpose." Technical Bulletin on files for Brass Aluminum Foundry Castings Die Castings Lathe Filing Die and Model Making (X. F. Swiss Pattern).

Name _____

Address _____

Eugenics, Humor, Chemistry!



Besides its featured articles, each issue of Science Digest contains sections telling what's new in medicine, in patents, inventions and processes.

Ever wonder why you are just what you are? How much of you is due to heredity and how much to environment? That ever interesting subject is discussed in "Eugenics Today" and there's more about it in the article "When Bright Children Grow Up". The American Museum of Natural History sounds serious but the men there get many a laugh out of the foolish questions put to them. So will you, if you read "A Busy Day at the Museum". Scientists feel they are close to answering the ques-

tion as to how plants live and grow. The latest thought is in "Sunlight and Chlorophyll". And read "Hawks in Flight" and "Wild Horses" for some new ideas. You'll see for example why the wild horse of Tartary would be a fitting symbol for Freedom. Yes, there's a big quarter's worth for everybody in the ninety-six pages of the January issue of Science Digest.

SCIENCE DIGEST, INC.
631-643 St. Clair St., Chicago

ON NEWSSTANDS NOW—25 CENTS

30 CENTS IN CANADA

K 757

flashing in the haze ahead. The first officer immediately cranks the frequency shift and speaks into his microphone.

"American ten to LaGuardia control tower. Just over the range station at eight hundred now and contact." The reply is snappy, cheerful, and good to hear.

"Okay American ten. You're cleared straight in. Surface wind is northeast five."

"Okay . . . American ten." The runway's dead ahead. There's a job of navigation! We've come three hundred miles at great speed, literally without seeing anything, and hit a spot three hundred feet wide . . . on the nose!

Now the final glide. Flaps down . . . our motors barely surging over. The air speed drops to ninety, then eighty as we swoop over the edge of the airport. A tense moment as the big ship seems to hang in the air, twelve tons balanced to a hair point, then a tiny squeak as the tires hit the asphalt. We're down. The big ship rolls easily to a stop. We're in New York exactly three minutes ahead of time. That's airline flying. That's the modern pilot's way of doing things.

K10 24

Arctic-Testing the Big Bombers

(Continued from page 89)

The aircraft overcoats consist of fabric coverings for planes standing in the open. These coverings protect the motor and other parts from severe cold and are used where hangars are not available. In the latest experimental idea for insuring safe landings and takeoffs in snow and on ice, tiny strips of steel are incorporated into the airplane tires, giving an exceptional grip such as that imparted to the automobile tire by chains. Skis also are used successfully on the big bombers for landing and taking off.

Establishment of weather stations is another way in which flying of military aircraft may be made easier. The weather stations will keep Air Corps pilots in constant touch with changing meteorological conditions, thus enabling them to avoid areas where there is danger of ice formation. Still another aid is found in big snowplows which will keep the flying fields clear for the Air Corps so that flights may be conducted throughout the winter.

JANUARY, 1941

Man-what a Xmas Gift

DURO HAND GRINDERS

For **YEAR AROUND PLEASURE AND SERVICE**

HEAVY DUTY

STREAMLINE

\$15 95

\$9 95

Duro Hand Grinders make the finest gift for your friend or yourself. It's the handiest power tool available for delicate drilling, polishing, carving, routing, shaping, grinding, sanding, cleaning, sawing, etc. Not only highly praised and used by craftsmen but also indorsed and used by industry. Duro Grinders are outstanding for their streamlined shape—their extra power furnished by G. E. Motors—their extra speed and smoothness. You can do better work every time with a Duro Grinder. There is available a complete grinder kit with accessories. Also equipment to convert the Heavy Duty Grinder into a Lathe—Drillpress—Shaper—Carver—Router and Bench Stand. If your dealer can't supply you, send order to factory. Also ask for Grinder literature.

DURO METAL PRODUCTS CO.
DEPT. PM-1, 2653 N. KILDARE AVE., CHICAGO, ILLINOIS

Hobbycrafts **LARGEST AND MOST COMPLETE**

132 page Catalog **ONLY 10¢**

MODEL
• AIRPLANES
• SHIPS
• RAILROADS

MEGOW

Dept. PM., Howard & Oxford Sts., Phila., Pa.
or 217 N. Desplaines St., Chicago, Ill.

POWELL
"SETS THE PACE"

100 miles per gal. 35 miles per hour. 2 1/2 H.P. 4-cycle engine. Centri-matic clutch. Hill-climber transmission. Foot brake, foot throttle. Welded alloy steel, shock-absorbing frame. Easy riding, dependable, durable, beautiful. Many Powell Streamliners ridden over 40,000 miles a year.

Write for free folder. Powell Mfg. Co., Compton, Cal., Dept. PM-8

MANUFACTURING OPPORTUNITIES

IN BUILDING INDUSTRY—with machine and process producing permanent construction with savings of 1/3 labor, 1/2 mortar, and 1/3 material costs—ashlar, hollow, veneer or solid walls—plain or 49 colors.

WE EQUIP YOU with Automatic Machinery—large production only one or two men. Equipment costs but fraction of other processes with equal capacity.

INVESTIGATE—let us show you why building today offers you the greatest opportunity for growth, expansion and profit in a business of your own, using raw materials available in your territory. Write today.

W. E. DUNN MFG. CO.
600 West 24th St. Holland, Mich.

FREE

1941's
Greatest

212 PAGES

ALLIED RADIO

GET THIS
BIG FREE BOOK
OF
**EVERYTHING
NEW IN
RADIO!**

AMAZING LOW PRICES

You'll want this Great Radio Catalog—it's not only the Biggest but the Best! Send coupon for FREE copy today! **85 New Radios!** Real "hits"—now "Camera" and 3-way portables; Recorders; Phono Combinations; Plastic sets; world-wide models; Auto Sets; Amateur Receivers—all at lowest prices! **24 New Sound Systems!** For every P. A. application—7 to 75 watts. New features—low prices. **Time Payments—15 Day Trial Offer.** **New Builders' Kits!** Dozens of new Radio Kits; new diagrams; everything for the Builder and Experimenter. Learn Radio—let ALLIED help you! **Fluorescent Lighting.** For Home, Workshop, Office, etc. See our complete listing: 15,000 items! Everything in radio—service test equipment—replacement parts—amateur gear—everything you need at lowest prices!



LEARN RADIO!

A DICTIONARY OF RADIO TERMS

RADIO BUILDERS' HANDBOOK

New Radio Dictionary! Just out—compiled by leading authorities under ALLIED supervision. Gives concise, easy-to-understand definitions of all commonly used radio words and terms. Only..... **10c**

Radio Builders' Handbook—New 6th edition—revised and enlarged, valuable beginners' book on radio; tells how to select circuits, read diagrams, build sets, etc. Illustrated; worth having. Order by coupon below. Only..... **10c**

ELECTRONIC LABS
FOR RADIO BUILDERS AND EXPERIMENTERS



SPECIAL OFFER! Radio Builders, Beginners, Experimenters—get these brand new genuine RCA kits at less than half the regular price! Learn radio by practical construction!

2 TUBE KIT. Same as kit at right; makes all projects but builds a two tube set instead of one tube set. Shpg. wt., 7 lbs. Regular price, \$8.95. Now only..... **\$3.75**

1-TUBE KIT. Build a real 1-Tube Receiver, an electronic burglar alarm, Home Broadcaster, Morse Code Practice Set, etc. Kit includes: 1 RCA tube, sockets, condensers, resistors, coils, soldering iron and solder, wire, transformer, headphones, microphone, electric relay, telegraph key, wiring diagrams, 15-page instruction book. Shpg. wt., 7 lbs. Regular price \$7.50. For limited time **\$2.95** only.....

ALLIED RADIO

833 W. Jackson Blvd., Dept. 5-A-1
Chicago, Illinois

FREE CATALOG

Rush me your FREE 1941 Fall Radio Catalog.

I enclose 10c for Radio Builders' Handbook.

I enclose 10c for New Radio Dictionary.

I enclose \$2.95 (plus postage) for 1 Tube RCA Kit.

I enclose \$3.75 (plus postage) for 2 Tube RCA Kit.

Name

Address

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

Beginner's All-Wave Receiver

(Continued from page 137)

The 5-in. speaker with transformer to match 2,500-ohm tube impedance, is connected externally to the twin insulated screw terminals using the red and green leads of the speaker output transformer which is mounted directly on the speaker, as shown in photo (A). If you prefer to

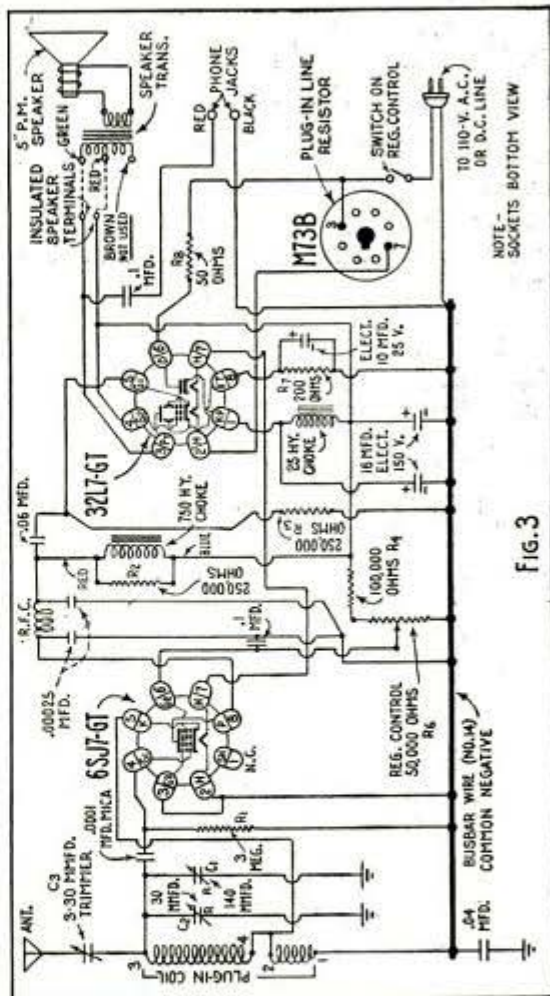


FIG. 3

use headphones exclusively, a 2,000-ohm 10-watt resistor may be connected across the speaker terminals instead of the speaker transformer. A detailed list of materials is available from Popular Mechanics radio department without charge, if desired. The 750-hy. 5-ma. choke is a plate-coupling high-impedance type to maintain full plate voltage on the 6SJ7-GT, avoiding voltage losses encountered with resistance coupling, as in usual practice. A 25-hy. 60-ma. filter choke provides adequate filtering.

(Continued to page 134A)



71 YEARS Of World Leadership behind your **STANLEY** "BAILEY" PLANE

Since 1869 the Stanley "Bailey" has been the favorite plane of carpenters, cabinet makers, manual training instructors and home craftsmen. With good reason! For this was the *first* iron plane. It has been steadily improved in design, materials, workmanship. The design of its parts and their relation with each other gives it a comfortable "feel" which has never been duplicated.

Ask for a Stanley "Bailey" Plane at your hardware store. And write for Catalog 35... your complete, **STANLEY** Trade Mark illustrated guide to good tools.

STANLEY TOOLS

DIVISION OF THE STANLEY WORKS

NEW BRITAIN, CONN., U. S. A.

"The Tool Box Of The World"

Write with Electricity

NEW MODEL ELECTROGRAF

Astonishes everyone! Writes easily on the hardest tools or instruments. Identifies & protects tools against theft. Permanent writing. Requires few seconds only. Anyone can operate. Pays for itself many times.

\$1.98

Order Yours Today—Sent C. O. D. If Desired

Agents! Are you interested in \$10.00 Daily? If so write at once to

NATIONAL LABORATORIES, Portland, Ore.

POSTPAID

KINKADE GARDEN TRACTOR

and Power Lawnmower
A Practical Power Plow and Cultivator for Gardeners, Suburbanites, Florists, Truckers, Nurserymen, Fruit Growers.

Low Prices - Easy Terms

American Farm Machine Co.
1058 33rd Av. SE. Minneapolis, Minn.

Catalog Free



TRAILER BUILDERS' GUIDE & CATALOG only 10c

Build a Trailer easily in spare time with world's best line of trailer parts, axles, hitches. Complete working blue prints only 50c. Universal Draw Bar, readily attached to any car. SEND 10c TODAY FOR CATALOG.



HAMMER BLOW TOOL COMPANY, Dept. 121, Wausau, Wis.

FLUORESCENT FIXTURES — ALL KINDS — FACTORY PRICES

Desk Lamp—\$4.85, Bench light, 40-watt—\$5.35. Complete—with lamps, Radio kits—\$3.95 up. Catalog—FREE. McGee Radio, F-22, Kansas City, Mo.

Choose from World's Largest Line of Power Tools!

FREE New 1940 Catalog covers Metal and Woodworking Tools, accessories, motors for every purse. Write Walker-Turner Co., Inc., 111 South Ave., Plainfield, N. J.

DRIVER Engineered POWER TOOLS

BUILD YOUR GRANDFATHER CLOCK

Send 25c for Simple SHOP TESTED COPYRIGHTED BLUEPRINT. The Simple Sensible Red-3. Not any as thousands have. DIME brings PLANS and sixty picture "HOW" book pricing many fine brass weight Westminster, tube chime, electric and battery movements showing nice beautiful colonial grandfather cases. Build now and save half. KUEMPEL CHIME CLOCK CO., Bldg. 48, Guttenberg, Iowa.



Say you saw it in Popular Mechanics!

ACTUAL SIZE
V-PLUG



65c

MODEL BUILDERS—ATTENTION!

Champion has designed 3 spark plugs for model gas engines which give the same dependable performance as the regular spark plugs. Sillment sealed. Sillimanite insulator. Alloy needlepoint electrodes for easy starting. One piece construction.

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	3/32	3/32	5/32
Weight, Grams	8	3 1/2	2 1/2

CHAMPION

SPARK PLUG CO.

900 Upton Ave.
Toledo • Ohio

SAVE MONEY

build your own

SMITH COMPRESSOR



We will furnish complete instructions with a **Smith Compressor Head and Accessories**

With a Ford Motor and shop facilities you can easily assemble a Smith Air Compressor. You'll have a smooth-performing, efficient compressor with 60 cu. ft. a minute capacity—all the power you need to operate rock drills and paving breakers. Pressure up to 175 lbs. a square inch. Head equipped with high speed compressor valves; automatic unloading and idling.

write today

GORDON SMITH & CO. Inc.
410 College Street
Bowling Green, Ky.

**THE GREATEST
CATALOG IN RADIO!**

**ABSOLUTELY
FREE!**

**SEND TODAY!
PASTE COUPON ON PENNY
POST CARD**

BARGAINS IN EVERYTHING

The greatest values ever offered in Radio between the covers of one great book! From the smallest part to big automatic phono-combinations, everything is here. Lafayette Radios for the home, farm, camp or car—pick the one you want and whether you'll pay \$10 or \$100 you'll be saving real money.

FOR THE EXPERIMENTER

Build-it-yourself Kits for new Frequency Modulation, or Television, Amateur transmitting sets, etc. Thrills, excitement, education—and what's more, good solid training for future big paying jobs. Get this FREE Catalog and see for yourself.

FOR THE SERVICEMEN

Thousands of parts, every type tube. Save time and money, shop Lafayette. Own up-to-the-minute test and sound equipment. Don't waste valuable hours looking around—you know you can get it from Lafayette, so rush coupon now.



64 RADIO MODELS



BUILD-IT-YOURSELF
KITS



SOUND SYSTEMS



RADIO PARTS

**MAIL THE
COUPON!**

NEW YORK, N. Y.
100 Sixth Ave.
CHICAGO, ILL.
901 W. Jackson Blvd.
ATLANTA, GA.
245 Peachtree Street
BOSTON, MASS.
BROOKLYN, N. Y.
NEWARK, N. J.
JAMAICA, L. I.

**BIG XMAS GUIDE
SAVE ON GIFTS!**

Here's the way to save money this Xmas on worthwhile gifts. This Free book lists hundreds of great "Buys" in radio, cameras, toys and appliances. All the "Big Names" at reduced prices—send for your copy now.

Lafayette Radio

LAFAYETTE RADIO CORP. Dept. 7A1
901 W. JACKSON BLVD., CHICAGO, ILL.
or 100 SIXTH AVENUE, NEW YORK, N. Y.

- Please rush FREE Catalog No. 82
- Please rush FREE XMAS Book

FREE!

NAME

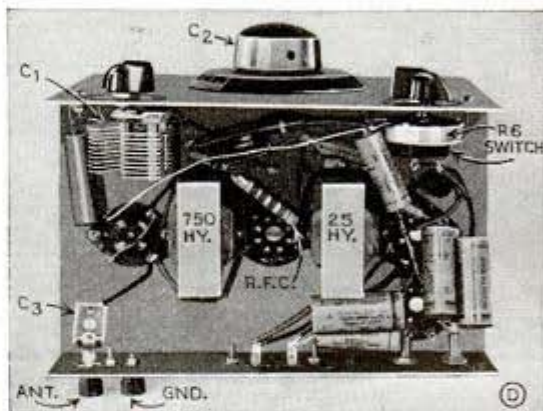
ADDRESS

CITY STATE

(Continued from page 132A)

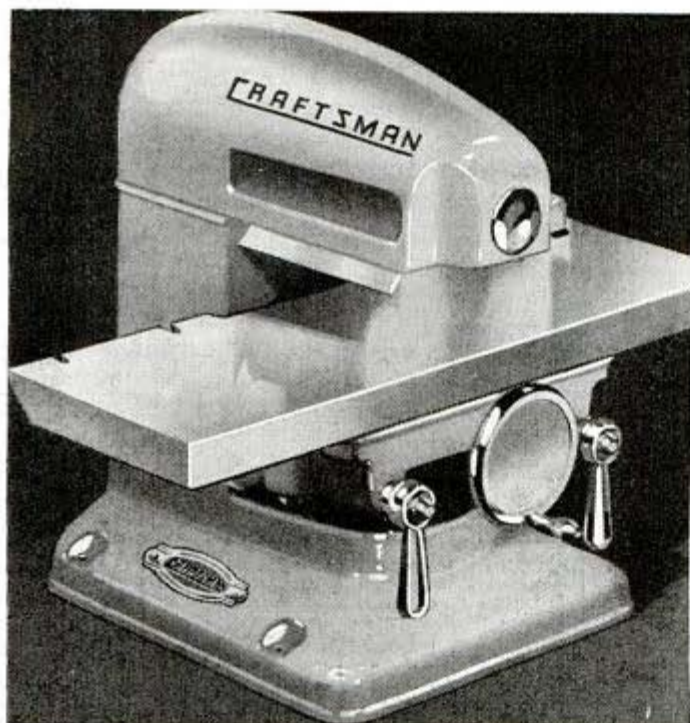
Fig. 3 shows schematic circuit diagram.

To operate the receiver, plug the cord into any 110-volt line; if your line supply is d.c. it will be necessary to check polarity, if set does not operate, reverse plug in wall socket. Use good ordinary antenna and ground connections and be sure that the tubes all fit tightly in the sockets. Tuning is done principally with the main tuning condenser C_1 , and the regeneration control R_6 . Advance the regeneration control until, when a station is tuned in, a whistle is heard. Next retard the regeneration control until the whistle just stops. This is the point of critical oscillation where the receiver is most sensitive for distant reception. Then, clear up the re-



ception by tuning with the large vernier knob in the center of the front panel and setting the regeneration control just below the critical point of oscillation. Tuning on the short-wave bands requires more careful manipulation of the controls as the stations tune sharper. For these bands the lower left-hand condenser (C_1) is used for "band -setting" or locating a group of stations. Tuning in the individual station is then done with the large vernier dial. Phone stations are best heard with the regeneration control set well below the critical point of oscillation, and code signals just above the critical point.

Trimmer condenser (C_3) adjusts antenna coupling. The screwdriver setting depends upon the antenna length, and plug-in coil used, and may require slight resetting for each coil. If oscillation cannot be maintained across the entire band, or stations tune too broadly, reduce the capacity of this trimmer. The blueprint number for this article is R-286.



New! CRAFTSMAN Thickness Planer

\$32.50

Even less
in some
territories

A sensational new tool! Big and husky . . . ball bearing construction . . . will give years of service. Priced at a typical Sears easy-to-pay low price. Ideal tool for salvaging old material . . . finishing rough sawed lumber . . . reclaiming painted or marred wood, etc. See this planer today at your nearest Sears store! Check these superior features:

Will plane material up to 6 inches wide, 2 inches thick; and as small as 4 inches long, 1/8 inch thick.

Ways milled into heavy, ribbed grey iron frame for permanent accuracy.

Safety type, solid steel cutter head, with 3 high speed steel knives.

Available on Sears Easy Payment Plan.

SEARS, ROEBUCK and CO.
Stores throughout the United States

New CRAFTSMAN Power Tool Catalog
Illustrates hundreds of tools. Ask your nearest Sears Store for your FREE copy.

FREE INSPECTION

THEY'RE EASILY WORTH TWICE THE PRICE!

SEND NO MONEY! PAY ONLY IF YOU DECIDE TO KEEP THEM

These two great books contain working plans costing thousands of dollars! Yet you pay only \$1.98!

Inspect the 1940 and 1941 Editions of "What to Make" at no risk! You are sole judge! These two wonderful books are filled with homcraft projects—384 pages packed with illustrations, diagrams and full details. They tell and show you just how to make things—things you want and need in your home and garden—outstanding furniture—craftwork novelties for gifts and for sale—things that will please children. Words can't describe them—take 5 days to examine them—without cost. If satisfied, send only \$1.98—if not return both books!

Mail No-Risk Coupon now! Get these two great values!

POPULAR MECHANICS PRESS
205 East Ontario St., Chicago
Gentlemen:

Please send me the two De Luxe Cloth Editions of "What to Make." I will inspect them for 5 days—and send \$1.98 if satisfied or return them without obligation.

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

NOTE: This offer is good only in U. S. A.

Say you saw it in Popular Mechanics!

JANUARY, 1941

Make This a Real Christmas for Yourself and Friends with CLEVELAND MODELS

Record-Breaking PLAYBOY SENIOR, Span 50". The gas model that broke world's record twice in one week! Class C. Complete Kit GP-5017 \$3.95 (except power unit)
PLAYBOY JR. Span 46". Class B. Com. \$2.50 plus Kit GP-0096 (except power unit)



CLEVELAND AIRCAR
\$4.50

Bremor Whirlwind Race Car.....\$19.50
Bullet-Polished Cast Aluminum Car... 23.75
Dooling DeLuxe-Front Wheel Drive Car 27.50

BABY PLAYBOY, Span 33". Class A. Complete Kit GP-3008 (except power unit) \$1.00
84" CONDOR Soaring Glider. Easily built. Complete \$1.00 Kit only.....
Big Catalog of Gas & Rubber Powered Model Airplanes, Race Cars, Ships, RR's, etc. Send name, address and only 5c for your copy. (None free).

CLEVELAND MODEL & SUPPLY CO. INC., 450845 Lorain Ave., Cleveland, Ohio

Manheim POCKET SLIDE RULE

With A-B-C-D Scales, Multiplies, divides, squares, takes square root, finds circumference and area of circles, 6 inches long—thin construction. NO WOOD OR CELLULOID. Fits in vest pocket. Send \$1 in cash, money order or check (\$1.25 Canada and foreign countries) and receive slide rule with genuine leather case and instructions. Box M-15.

M. MANHEIM COMPANY, Inc., 15 E. 26th St., New York, N. Y.

DIRT WON'T STICK to hands covered with the greaseless cream called Du Pont PRO-TEK. It acts like an invisible glove—prevents grime and paint adhering to the skin. To remove, just wash the hands in running water. This dissolves the protective film, and carries away the dirt with it. Write DU PONT, Wilmington, Delaware.

SHAW DU-ALL GARDEN and SMALL FARM TRACTOR

Small sizes, for gardens and lawns. Larger sizes do ALL JOBS on small farm—small jobs on ALL FARMS. Walk or ride; sizes 1/2 to 8 H.P. Write for Factory prices—Free Catalog.

SHAW MFG. CO., 4501 Front St., Galesburg, Kan.; 5812-G Magnolia Ave., Chicago, Ill.; 130-G West 42nd St., New York City; 668-G North 4th St., Columbus, Ohio.

Air-cooled engines; auto-type gear shift; many fine features.

135A

Thousands Praise Airline SOUND SYSTEMS



"Distinct, splendid tone, plenty of volume." "First proof." "By far the best and I've owned several." "Heard it distinctly 2 miles away". These are typical expressions of thousands of owners of Ward Airline Sound Systems. Some come from novices who never operated a sound system before. Some from experienced sound system users. Yet all are enthusiastic about the superb performance of the Ward Airline. How can you ignore such over-whelming endorsement!

Ward's new Sound Systems Catalog explains everything... how to select the proper sound system for your needs, how simple and easy to set up and operate, and how low are the prices. Just send name and address for your FREE copy!

NEW! FREE!
Send postcard or coupon for copy of Ward's new Sound Systems Catalog. Learn about Ward's Easy Terms, 15-Day Approval, Money-Back Guarantee.

Montgomery Ward
CHICAGO.

MONTGOMERY WARD
DEPT. TM-41, CHICAGO

Name _____
Address _____
City _____ State _____



Home Craftsmen, Schools, Hobbyists BRONZE FOUNDRY



In your own workshop allows you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STATUARY, ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1 1/2, 3, and 6 pounds weight, aluminum, copper, brass, etc., \$13.50, \$19.00, \$27.50, f.o.b. Kansas City. Domestic gas supply and 110 volt 60 cycle energy required for operation. Write for circular.

KANSAS CITY SPECIALTIES CO.
Box 6022, Dept. P-11 Kansas City, Mo.

60 POWER TELESCOPE . . . \$219

VARIABLE EYEPIECE 20X-40X-60X

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



Most powerful made for anywhere near the money. Close to less than a foot in length. Multiple lens system. 30 mm. objective lens. 3 sections. Directional included for use as a compound 4 lens microscope. American made. Prompt shipment guaranteed. We pay the postage. Only \$219.

BROWNSCOPE CO., Dept. 41, 5 W. 27th St., New York, N. Y.

Sani-Flush CLEANS OUT AUTOMOBILE RADIATORS

Cannot Injure Aluminum
Cylinder Heads and
Fittings

"GIFTMAKER, SR."

(Outside U. S. A. \$5.40; C. O. D. \$5.15)

\$150
PRIZE
CONTEST



New 24"
LATHE
\$490
POST PAID

A heavy duty, smooth running wood lathe at a remarkable price. 32" long, 7" high. Turns pieces 4 1/2" in diameter by 24". Fully adjustable. 2-speed. Weighs 10 lbs. Long and short tool rests. OILLESS bushings.

Free Catalog describing \$150 prize contest (1st prize, \$25; 2nd, \$15; 3rd, \$10; 41 other cash and merchandise prizes). Cat. illustrates complete power tool line: Jig Saw, \$1.50; Jointer, \$6.50; Shaper, Circular Saw with oilless bearings, \$3 each; Drill Press, \$2.50; 9 1/2" Lathe, \$2; Sander, \$1; etc. Sold direct only. Order today or send card for Catalog.

J & H Metal Products Co. 5 Commercial St. Rochester, N. Y.

Crystal Receiver and Test Set

(Continued from page 138)

using the R.F. connection, adjust the crystal detector for best results. It will be helpful to turn the variable condenser for the loudest response while exploring the R.F. section of any standard radio circuit. If no signal is heard when contact is made with the "tracer wire" to a section where the signal may be expected, such as the tube plate prong, or control grid cap, this portion of the circuit may be assumed to be at fault. For example, R.F. contact to the control grid of a detector-oscillator should result in a soft signal; the plate of the I.F. tube in a loud signal. Using the A.F. tracer

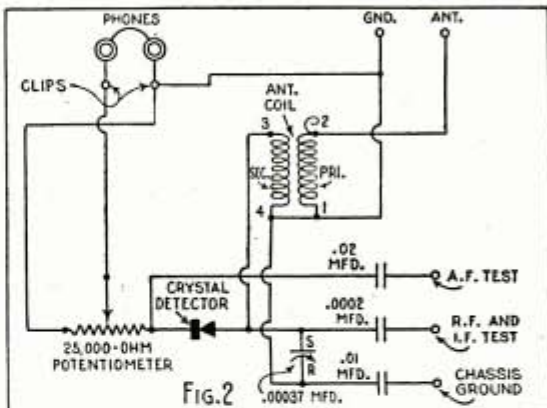


FIG. 2

connection, contact with the grid of the first audio tube would produce a soft signal in the headphones, and the plate of A.F. power-output tube a loud signal.

To start construction, obtain a small breadboard of the handy handle-type, illustrated, from any hardware or department store, and mount all parts as shown in the simplified wiring diagram Fig. 1 and photo (A). Carefully wire the circuit just as shown in Fig. 1 and check your wiring with the schematic circuit diagram Fig. 2. The antenna coil can be any good high-impedance primary type. All parts are easily identified, as shown in diagram Fig. 1. The Fahnestock clips are fastened directly to the breadboard by means of small brass wood screws. A 2 3/4-in. strip of metal 1 1/4 in. wide is bent over 1/2 in. to form a mounting bracket for the 25,000-ohm volume control, a small knob is provided for this potentiometer, and the tuning dial is a common 3-in. type. A pair of 2,000-ohm headphones, and a well insulated, long antenna and good ground complete the assembly.

Foiling "Jail Breaks" at the Zoo

(Continued from page 59)

small fields by low walls that are too smooth for them to climb. Fencing in a beaver means that the steel fence must project underground as well as up into the air, and one beaver dug down four feet before deciding that the fence probably went all the way to China and that he might as well quit.

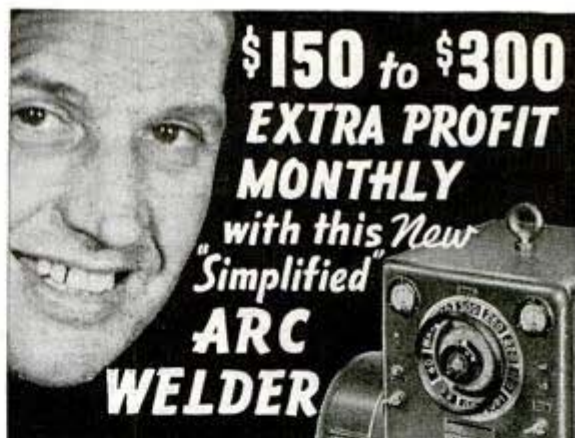
Once an adventurous bear cub escaped from its grotto without leaving any indication of how it had gotten away. The keepers finally decided that it must have climbed the walls in a corner, clutching at the rough concrete. They smoothed the walls at this point, leaving no claw holds, and no bear has gotten away since.

A critical time in the zoo is when a large and potentially dangerous animal must be moved to another grotto or to the zoo hospital. A portable shifting cage, made of timber and steel, is secured to the door of the animal's sleeping quarters, the doors are opened and the animal is lured inside the cage with a bait of food. A vertical door drops down behind it, the cage is lifted to a truck, and the shift is made. When an animal is being transferred into or from a shifting cage, the cage is lashed to the other enclosure to prevent any chance of the animal escaping. Sometimes the transfer takes only a few minutes; other times the attendants have to wait for an hour or so until the animal decides to walk through the open door. Prodding an animal into action is forbidden because the animal might be injured and in some cases the beast might grab the prod and use it to wreck the cage.

The zoo hospital can care for anything from a canary to an elephant. Most of its patients are those which have been injured in fights or which have dietary troubles induced by a change of climate or food. New arrivals at the zoo are quarantined in the hospital for several weeks, long enough to make certain that they have no disease.

The men who take care of the animals are more than guards. They have to keep their charges happy and that means hauling in a fresh log every now and then for the beaver to chew on, and building trapezes and parallel bar systems for the monkeys, to replace the trees that are used

(Continued to page 138A)



IT'S EASY TO GET BIG PROFITS WITH HOBART ARC WELDING EQUIPMENT

Because of big profits realized with the Hobart 40-Volt "Simplified" Arc Welder you can start a big paying business of your own . . . with almost no investment! Arc welder prices are the lowest in history, making it possible for even the smallest shop to own one of these money-makers. Extra profit from a single job is often more than enough to take care of the small monthly payments. Arc welding is today's profit opportunity . . . don't miss it!

Remote Control. This is an important feature you get at no extra cost with Hobart. It lets you control your welder from any working point. Saves time, temper and eliminates the need for a helper on overhead or concealed work.

Easy to Operate. Hobart Welders have "Simplified" operation. This means faster welding—with the right current for every job. Hobart is so simplified that any one of your men can weld easily and successfully. The mystery and uncertainty of obtaining correct welding current settings are removed.

60% Extra Capacity over old style 25-Volt Welders . . . necessary for welding with the new coated rods. Automatic reactance lets you handle light work without losing the arc. Users don't understand how they got along with old style welders after trying this new Hobart.

"Pays-for-Itself" Terms. You can try this complete Hobart Welder in your own shop for a liberal Trial to prove that extra earnings and savings obtainable with this improved welder makes it easy for you to own a Hobart with practically no cash outlay.

HOBART BROS. CO., Box M-11, Troy, Ohio
One of the World's Largest Builders of Arc Welders.



BUILD YOUR OWN Simplified ARC WELDER

It's easy and profitable to build your own portable electric arc welder with the aid of this complete Hobart Generator. Simply attach to old motor and mount on chassis and you have the factory equivalent of equipment costing from \$300 to \$500 more! This equipment lets you operate any place, especially on the profitable outside jobs. Check coupon for detailed information.

PAYS FOR ITSELF WITHOUT EXPENSE TO YOU...
LIBERAL TRIAL TO PROVE IT

SENSATIONAL NEW ARC WELDER
Handles repair and construction jobs—easy to operate; low current cost. Operates on 220 volt circuit. Completely equipped only **\$12.50** per month

FREE!
THIS VALUABLE BOOK ON ARC WELDING

THE ADVANCED HOBART MULTI-RANGE ARC WELDER

HOBART BROS. CO., Box M-11, TROY, OHIO

Tell me more about—

- () Building My Own Portable Welder () Complete Gas Engine Drive () New Hobart A.C. Welder
() Electric Drive Welder () Send FREE Book On Arc Welding () Liberal Trial and Easy Terms

NAME

ADDRESS

CITY STATE

K 1047

(Continued from page 137A)

I'M SO HAPPY NOW
THAT CHARLES IS
DOING SO WELL IN HIS
NEW BUSINESS



**TOOK IN \$217
in 10 DAYS
WASHING WALLS**

● Newly invented machine washes walls 6 times faster and better than by hand.

Charles Stelle took in \$217 first 10 days. We want more men to go into business for themselves. Customers everywhere—homes, schools, offices, stores, churches, lodge halls, hotels all have walls that need washing. You don't have to rent a store or office. You operate this business from your home. The expense for materials is small. What you take in is practically all profit. On a \$10 job cost for materials it is about 20c. Write now for complete facts on this Von Schrader Wall Deterger which washes paint beautifully and postpones repainting many years.

Harold Jones writes: "I landed a \$40 job the first day."

J. Crapston says: "I have several jobs to start on Monday, thanks to your help."

Clyde Brandt writes: "I made a demonstration in a public school and got a contract which will more than pay for my machine in the next few days."



Easy Payments

It takes only a few dollars to get started in this money-making profession. No experience necessary. The total price is so small and the payments so easy that anyone with ambition should get started NOW.

SEND FOR FREE INFORMATION

There is No Obligation

VON SCHRADER

MANUFACTURING CO.

771 Pl. Racine, Wisconsin.



PHOTO ENLARGEMENTS

Is Photography your hobby? Do you want a profitable new business at home? Make **PHOTO ENLARGEMENTS** for yourself and others. Your cost 5c each and less. The Ideal Photo Enlarger is **AUTOMATIC**. No experience required. Also **COPIES** any picture. **\$5.94 COMPLETE**. Interesting circular **FREE**.

5¢ ANY SIZE

Ideal-O, 148 West 23rd St., New York City

OTTAWA Log Saw \$39

BIG BOOK FREE



PUTS THIS OTTAWA to work for you. MAKE MONEY! Wood is valuable. Does more than 10 men. Easily operated. Falls trees—saws limbs. Use 6-hp. engine for other work. Write for FREE Book.

SAW 10 TO 20 CORDS A DAY

OTTAWA MFG. CO. 3927 Wood St., Ottawa, Kans.

BIGGEST LATHE VALUE EVER OFFERED!

New Streamlined Design—Ball Bearing

Now, Blue Star offers a sensational new 4 speed wood lathe with greater capacity, more refinements, better design than ever... at an amazing low price! Think! 4 1/2" structural steel bed, 10" Tool Rest. Sealed ball bearings, 4 step cone pulley. Hollow spindle with No. 2 Morse Taper Center. V-Belt. 6" face plate. Many other features, too. Complete line of accessories. Write for Blue Star bargain book of precision built woodworking machinery to-day. Save!



BLUE STAR PRODUCTS, 601 Lawn Ave., Fairfield, Iowa

Dependable Vest Pocket ADDING MACHINE



Cannot Be Duplicated at This Price. Guaranteed Accurate.

A sturdily built, practical calculator. Saves time and insures accuracy—in business and in the home. 101 uses. Adds, subtracts, multiplies, divides. Eight columns. Easy and speedy operation. Directions included.

\$1.95

10-DAY TRIAL—MONEY BACK GUARANTEE

We Pay postage. Prompt shipment. Only \$1.95. **FIDELITY PRODUCTS CO., Dept. 1PM, 277 Broadway, New York, N. Y.**

in the jungles. Parrots and macaws are housed in heavy wire cages. One of the big birds could bite right through a light wire screen. For the same reason, the birds are provided with concrete nests and are given a few armfuls of branches every week to chew up. In a week a cage of birds will produce a bushel basket full of chips and splinters. Other kinds of birds that can't find nest-making materials in their restricted quarters are provided with ready-made nests built of sticks and wire netting.

Good care and good health are two of the things that keep captive animals happy. The third is good food. Five hundred pounds of meat, 450 pounds of fish, and large quantities of hay, grain, fruit, and vegetables are the daily diet of the 3,000 animals at San Diego. So that it can buy in huge wholesale lots the zoo has just installed its own quick-freeze unit and is storing quick-frozen foods in refrigeration rooms that have a capacity of 125 tons.

K926

Crashing Cars for Safety

(Continued from page 69)

trifugal force, helping it to roll the car over. When a tire blows out the first thing you should do is check that strong impulse to jam on the brakes. Instead of doing that, increase your speed just about five miles an hour. This will give you much-needed traction. Then apply your brakes gradually and the chances are you'll bring your car to a stop, under control.

When a motorist does bring his automobile to a fast stop, as in crowded traffic, the probability is that he does it all wrong. Ever since the first car was equipped with brakes, drivers have been taught to jam them on and hold them when they want to stop quickly. To stop fast, pump down on your brake three or four times instead of holding it down continuously. Here is why. When you hold your brakes, the wheels are locked in one position and one point of contact is established between the road-bed and the rubber tire. That one point "scorches" as the tire skids forward on it. On the other hand, by pumping the brake up and down, each time the tire is locked at a fresh point of contact with the road. The forward skid and scorching are minimized, you stop faster and you save tire rubber too.

K.926

That brings up the question of what to do when a car goes into a skid. Driving at speed on a specially prepared slick-coated road in the Goodrich Arena at the New York World's Fair I demonstrated many times that the best way to work out of a skid is to turn the front wheels in the direction of the skid—and not to apply the brakes while doing so. When you turn your front wheels in the direction you are skidding, you minimize the friction of those front wheels and allow the rear wheels to apply their driving power directly ahead, giving you control of the car. In this operation, the front wheels act as a pivot. By no means turn the front wheels in the opposite direction to the skid, for in doing so you apply cross force, increasing friction on the front tires which then swing you around and makes the car spin.

While modern highways have properly banked curves for high speed, occasionally a motorist finds himself on a road that has dangerous flat curves. If he should suddenly come upon such a curve while traveling at high speed or even traveling too fast on a modern highway the driver is apt to find himself in trouble. Here again the early motorist counseled the prompt application of the brake and many present-day drivers think that this is the right thing to do. It isn't though. I've rounded flat curves at high speed hundreds of times to prove that the scientific method of coping with them is to apply the accelerator as well as the brake, pumping the latter up and down. In doing so, the left foot is shifted from the clutch to the brake pedal and the right is used for the gas. Thus, two things take place simultaneously which keeps the car under control. Stepping on the gas pedal makes the motor deliver more power, hence greater traction to the rear wheels, minimizing the effect of centrifugal force. By pumping the brake pedal the speed is reduced and the car is kept under control.

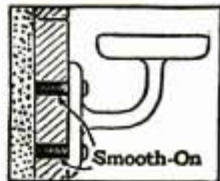
Another fallacy that persists is that of turning the ignition off immediately if the motor should catch on fire due to mechanical or other difficulties. I used to do this when I began crashing cars as an occupation. One day I happened to leave the motor on after splashing gasoline caught fire. To my surprise the fire soon went out. Then I kept a close check and after the evidence of several similar fires, there was one

(Continued to page 140A)

HOW to REPAIR Cracks, Leaks, and Loose Parts at least cost



Sealing Crack in Boiler



Tightening Loose Fixture

In every household, repair jobs are sure to be required from time to time. The boiler, heater or a radiator may leak, a pipe may split, the auto water jacket or gear case may crack, and handles of tools, utensils, doors, umbrellas, etc., are always coming loose.

A little Smooth-On No. 1 will permanently cure each of these and many similar troubles.

Protect yourself against such emergencies by getting a can of Smooth-On and keeping it handy. The first application will pay for the can many times over, and a can will last a long time to save you from many an expensive repair job.

Buy Smooth-On No. 1 in 1 3/4-oz., 1-lb. or 5-lb. cans from your hardware store or, if necessary, from us. For your protection, insist on Smooth-On, used by mechanics and repair men since 1895.

FREE



40-Page Repair Handbook which will enable any handy man to be his own repair mechanic on dozens of jobs that would otherwise mean the delay and expense of getting a professional. 170 Diagrams show ingenious and practical methods of making cracked, broken, leaky, or worn apparatus as good as new. This useful guide is literally a necessity in every home and shop, and will be sent you FREE if you fill in and return the coupon.

SMOOTH-ON MFG. CO.,
Dept. 37, 574 Communipaw Ave.,
Jersey City, N. J.

Please send Smooth-On Repair Book.

Name.....
Address.....
1-41.....



Do it with SMOOTH-ON

BIG MONEY ASSEMBLING NEW PORTABLE BOAT



For Paddle, Motor, Sail... **BOAT**
in a Few Hours

Write for big FREE Circular



OK-2, the Outboard Ki-Yak Convertible to Sail or Rowboat.

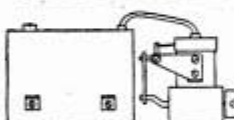
YOU can easily assemble Mead's amazing, portable KI-YAKS inexpensively at home in a few evenings from our patented, numbered, cut-to-fit construction KITS and save nearly HALF—or sell to others at big profits. Strong, seaworthy, **Portable**—easily carried anywhere on top of your auto. Thousands of "Meads" assembled from our KITS using **EXCLUSIVE** new construction principle. No experience needed. Just use simple hand tools.

Write FOR BIG LAVISHLY ILLUSTRATED **Free** CIRCULARS

5 Different Ki-Yak Kits!
New 60-lb. and 75-lb. **OUTBOARD** Ki-Yak Kits ready—for oars, sail, motor. Also 3 different **paddle-sail** Kits from 30 to 46 lbs. (Double-blade Paddle or Oars now **INCLUDED** with your Kit.) Investigate now! Write or send postcard for **FREE**, lavishly-illustrated Circulars, low **Factory-to-You** Prices!

MEAD GLIDERS

15 S. MARKET Dept. B-11 CHICAGO, U.S.A.



FOR OLDTIMERS and beginners in the Model SE-3, a two cylinder, slide-valve steam engine with burner and propeller. Bore 5/16". Stroke 1/2". Length 7". Width 3". Height 4". Price ready to run, \$3.00. Postage extra, shipping wt. 1 1/2 lb.
SHAWNEE ENGINE CO.
Box 162, Station D, Cincinnati, Ohio



Ask Bass FOR HIS New CINE BARGAINGRAM
Fascinating collection of thousands of bargains in 8-16 and 35 mm SILENT AND SOUND equipment... Get your free copy by writing to Department P
Bass CAMERA CO.
179 W. MADISON ST. CHICAGO, ILL.

Surface Buildings with Plastic Stucco

It fuses a plastic mixture to any masonry surface. It water-proofs and fills all cracks. It can be applied in any thickness desired and in 30 colors. Fully proven by over thirteen years actual use under all conditions and every climate.

BIG EARNINGS. Operators report costs of 2c and up per sq. ft. and sell up to 7c. Machine covering capacity up to 1000 sq. ft. per hour soon pays for itself. Make money by supplying the big waiting market for renewing both old and new buildings with permanent color at low cost.

Get the facts. Send for books, "Proven Business Opportunity." Write today.

COLORCRETE INDUSTRIES, INC.
570 Ottawa Ave. Holland, Michigan



conclusion to be drawn: when I left the motor running, a fire was soon extinguished; when I cut the ignition switch, it wasn't. The answer is that when the motor is left on, and preferably raced, a strong draft into the carburetor manifold is created. The fire follows the oxygen and is snuffed out in the motor.

As legal speeds of modern highways have been increased, many drivers—principally the older ones—use what they consider a "racing grip" on the wheel. Here the driver grasps the lower quarter of the wheel with both hands, the palm under and the fingers curved over the rim of the wheel. Whether you're driving fast or slowly, this grip should not be used. The safest way to hold the wheel is to place the hands on the opposite sides with the left hand slightly higher than the right—if you are going to turn to the left, or the right higher if you're going to turn in that direction. This way your upper hand acts as a "steering wheel brake" and the lower one slides and pushes.

It is my conviction that a motorist driving reasonably fast within the speed limit drives safer than when traveling slowly. Aside from the fact that the latter provides a strong temptation for the car behind to try and pass him, thus risking a sideswipe or a collision with a car coming in the opposite direction, a good driver at low speed is often lulled into a false sense of security. He reasons that the car is under such absolute control that he is not called upon to exert his vigilance and, as a result his reflexes get lazy. I've seen good drivers apply their brakes too late for this very reason. On the other hand, a driver traveling along at a faster clip is conscious of his speed, is more alert and his reflexes are brought into play much faster when an emergency does occur.

When these false ideas about safety are eliminated, driving will become really safer and a great number of accidents will be eliminated. I believe that lessons in correct driving should be taught people at an early age—when they are in high school. The movement for such teaching has been gathering momentum during the past four years. More than 200 high schools include driving instruction as part of their curriculum and more than 100,000 boys and girls have taken such a course.

**Powerful
DOUBLE-LEVER Action
LOCKS Jaws to Work
with TON-GRIP!**



World's most powerful hand-tool! Unique "Double-Lever" Action enables the grip of one hand to close the jaws with TERRIFIC, Non-Slip Pressure! Jaws LOCK to the work—remain locked with hands removed. Adjusts exactly to size, stays adjusted. NEVER SLIPS! No lost motion. Does more things than any other hand tool. "Impossible" jobs made easy. Is perfect hand-vise to hold small work for filing, grinding, sawing, drilling. Scores other uses. Is actually a portable Vise, Clamp, Super-plier, Pipe-Wrench, Open-End Wrench, Locking Wrench, Toggle Press—ALL IN ONE! Holds anything, round, square or otherwise. Works in close quarters, at any angle. Adjustable to ratchet-like or super-plier action. Light, trim, handsome. Finest alloy tool steel. Nickel finish.

TRY IT NOW! See Vise-Grip at better dealers or order direct from factory on 10-day money-back trial. 10"-\$1.95, 7"-\$1.65, C.O.D., Check or Money Order. Free Folder.

PETERSEN MFG. COMPANY Dept. PM-1 DeWitt, Nebr.

Use Your Bench Saw for Jointing and Cutting Mouldings

ATTACH THESE SIX INCH TOOL STEEL CUTTERS IN PLACE OF SAW CUT DESIGNS SHOWN AND MANY OTHERS. Moulding Cutters A1' \$1.25, A1 1/2' \$1.50. Jointing Cutters B1' \$1.25, B1 1/2' \$1.50. Groove Cutters C or D A' 1/4" or 3/8" \$1.25 Each. Cove and Quarter Cutters, E1' \$1.25, E1 1/2' (MAKES 3/4" STOCK) \$1.50.

STATE SIZE HOLE. POSTPAID
JOHN A. SANDSTROM
100 Westcott St., Jamestown, N. Y.

MONUMENT \$9.00 UP WE PAY FREIGHT

Marble & Granite Memorials. Low Prices. Lettered. Guaranteed. Erecting service. Free Catalog & Samples.

U. S. MARBLE & GRANITE CO.
A-18 Oneco, Fla.

ATLAS STICK-ON LETTERS

Beautiful Gold Colored. New Styles. 5 Year Guarantee. Large Sizes—Penny Each. Tremendous Demand. Amazing Profits. Write for FREE Samples—Starting Outfit. Hurry!

WINDOW SIGNS

ATLAS Sign Works, 7941-A Halsted, Chicago

Beautiful SHIP and COACH Models

Finest quality Redwood hulls completely shaped and finished. Kits complete in all details. Mayflower and many others, \$4.50. Constitution, \$6.00. Also smaller models at \$1.00. Send 3c stamp for catalog.

MINIATURE SHIP MODELS, Dept. R, Perkasio, Pa.

BARGAINS IN BOOKS

A GUIDE TO SUCCESS AND ADVANCEMENT

This attractive, 128-page book will not only give you the help you need in seeking personal advancement, to get a better job, to start a small business of your own, but full information on trades, professions, opportunities, crafts and hobbies. This big catalogue, just off the press, lists more than 1,700 bargain books on popular subjects and over 400 plans. It will prove invaluable to you. Don't miss it! Send post card today for your FREE copy.

POPULAR MECHANICS PRESS
DEPT. 141, 200 EAST ONTARIO STREET, CHICAGO, ILL.

Helps You EARN MORE

**MONEY MAKING FACTS!
TIME SAVING IDEAS!
A BIG BARGAIN OFFER!**

POPULAR MECHANICS SHOP NOTES never go out of date. Year after year they remain a gold mine of useful information and ideas for shop and handy men. You will find these six amazing volumes invaluable in your work and around your home and garden. While they last you can get SHOP NOTES for the past six years at the same price as the 1941 book—50 cents each, or the entire set for only **\$2.45** WRITE TODAY! YOUR SATISFACTION IS GUARANTEED!

Order now and avoid disappointment. Send no money if you live anywhere in the United States and your order is more than \$1.00. Just pay postman cost plus few cents postage. Do it NOW!

POPULAR MECHANICS PRESS, Dept. 141-E, 200 E. Ontario, Chicago



- LATHE
 - DRILL PRESS
 - CIRCLE SAW
 - EMERY WHEEL
 - SANDER
- Five power tools in one complete unit! Made of fabricated steel with smooth needle roller bearings. Lathe 37" between centers. Drill Press pulls 1/2" drill in steel. 6" or 8" circle saw. Uses 1/4 H.P. Motor. A fine practical unit. WRITE FOR LITERATURE!

Write to Demco Products, Inc., Kalamazoo, Mich.

PIONEER Model "Z" Tractor

Make time — make money with the popular-priced

New 1 H.P. machine—ideal for cultivating narrow-row crops, seeding, discing, etc. Covers 90-125 ft. a minute. High clearance, space-saving power turn. Trouble-free, economical, safe. Running parts in oil bath. No chains or belts. Save at low factory price. Two weeks trial—satisfaction guaranteed. Colorful FREE book—write today. PIONEER MFG. CO., Dept. ZV-11, West Allis, Wis.

MAKE RINGS, BRACELETS, BROOCHES, PENDANTS, Paper Knives, Cigarette Cases. AT HOME OF GEM-LIKE PLASTICS

In sixteen lustrous colors, translucent, or opaque. Easily sawed, carved, or turned. Durable, non-flammable, modern. 20 page complete, illustrated instruction book, 8 page illustrated catalog, both for 18c in stamps.

FELLOWCRAFTERS, INC., 64 STANHOPE ST., BOSTON, MASS.

READY CASH HOT POTATO CHIPS

Here's your chance—a money-making business of your own. Turn potatoes into newest kind of Potato Chips with my improved outfit. Makes delicious Chips at low cost. A few hours practice does it. Begin anywhere—city, village, town. Potatoes chosen and plentiful. Wholesale or retail. Steady year 'round business. Groceries, markets, restaurants, taverns do the retailing for you.

Start Your Own Business

Great quantities of Chips are eaten daily. Profit large—usually so. You can start this money-making business on a SMALL outlay of cash. Write for Potato Chip Booklet.

LONG-EAKINS CO.
1128-S High St., Springfield, Ohio

K1008

Exploring a Frozen Continent

(Continued from page 53)

a belated steak dinner, Dr. Siple told of exploring the magnificent mountain ranges that rise 10,000 to 15,000 feet for nearly 1,000 miles, separating the polar plateau from the low Ross Ice Barrier. Numerous great glaciers had been sighted, among them the Beardmore, conceded to be the largest in the world, 100 miles long and fifteen miles wide.

One Antarctic fall day twenty-eight men at the West Base made a holiday trip on skis and dog sleds to the old Little America base, six miles south of the present location. They marked their trail with little orange flags, since the sky was overcast and the surface such a white shadowless panorama that the marks of their skis were invisible. Protruding stovepipes and antenna poles marked the location of the old buildings. Shovels were plied, a skylight hatch was found and soon the men were climbing down into the old radio hut. Scraps of food were found, remainders of the stock Lincoln Ellsworth and his pilot, Hollick Kenyon, had salvaged from the Byrd stores when they used the building as a refuge for six weeks in the winter of 1935-36 after abandoning their plane at the end of a flight from Palmer Land. On a desk was scrawled "G. Patience, R.R.S. Discovery II, 21/1/36"—reminder of Ellsworth's rescue by the British Royal Research ship "Discovery II."

On April 21 the men of Little America gathered before their main building at attention to watch the lowering of the frozen Stars and Stripes as the sun set on West Base, southernmost habitation of the earth, for the last time of the season, ushering in the four months of Antarctic night. Not until August 21 did they again see the sun.

With end of the winter night and while the temperature persisted at forty degrees below zero or lower, the men hastened preparations for field parties by sledge, tractor and airplane as soon as the Antarctic spring should make operations possible in the direction of Rockefeller Plateau, to the east. Tons of pemmican (concentrated food) were weighed and packed, trail equipment overhauled, and the men schooled in navigation, radio communications and first aid. Uncle Sam's Antarctic explorers were ready for the trail again.

Toni Matt SKIMS TO VICTORY ON NORTHLANDS



Toni Matt, former Open Downhill "Champ" wins time and again on superb Northland skis. Toni picks Northlands, the world's finest skis, to give him a smooth, winning flight. YOU can ski better on Northlands, too. Write today for FREE "How To Ski" Folder.

NORTHLAND SKI MFG. CO.

World's Largest Ski Manufacturers

95 Merriam Park St. Paul, Minn.

LIGHT and RADIO POWER

Only 1¢ PER HOUR WITH TINY TIM Plant

Tiny Tim powered by the famous Continental Red Seal Engine is easy to own—easy to operate and easy on your pocketbook. And if you are a dealer, you'll find it easy to sell. Easily carried. Push button starting. Automatic shut off. Heavy duty generator. 7-9 hour gas tank. Write today.

CONTINENTAL MOTORS CORPORATION
MUSKEGON, MICHIGAN

Know AVIATION

<p>LATEST NEWS</p> <p>Here's fun with up-to-the-minute knowledge on AVIATION! Live wires, follow MODEL AIRPLANE NEWS because it's the technical authority on modeling and flying. Material from experts all over world. Latest on BIG SHIP news, too, and MILITARY flying.</p>	<p>MODEL PLANS</p> <p>64 or more big pages of tested designs and news. Hundreds of pictures. IT PAYS to know Aviation! It's exciting! It's fun! You can make money building scale or flying models in spare time. Knowledge may lead to big job as mechanic, engineer, flyer, or airline executive.</p>	<p>FREE SAMPLE ISSUE</p> <p>Get this big 76 page issue full of interesting news, contests, flights, records, model plans, pictures. Send FREE. Encl. 3c in stamps for mailing and handling. Write now! JAY PUBLISHING CORP. 551 Fifth Ave., New York</p>
---	--	--

Get MODEL AIRPLANE NEWS 20c at all Newsstands

THE ONLY OIL HEATER OF ITS KIND!

Warm radiant heat is directed down to warm the floor while warm air circulates around the rooms.

SUPERFLEX HEAT-DIRECTOR.
Perfection Stove Co., 7262-C Platt Ave., Cleveland, Ohio

TRAFFORD PLASTICS

For catalog, samples, 48-page Trafford Portfolio, send 25c (returned on 1st \$1.00 order). Experimental Kit \$3.00 postpd. Trafford, Dept. 792, 360 Worthington St., Springfield, Mass.

Say you saw it in
POPULAR MECHANICS

WOODWORKERS

NEW BARGAIN BOOK

"Get this new Fall 1940 Constantine Catalog listing and describing over 100 different kinds of wood in 960 different items in veneers, lumber, panels, inlay work, turning squares, and helpful woodworking aids. Printed and illustrated articles on How to Make Inlaid Pictures; How to Make Veneered Panels, How to Finish Different Kinds of Woods. A source of supply for you in small sized quantities—every kind of wood you are looking for. Send 10c today in stamps or coin."

ALBERT CONSTANTINE & SON, INC., 791-J East 135th St., N. Y. C.

Always write your name and full address clearly when answering advertisements.

OPPORTUNITY KNOCKS

a
Thousand
Times
in a



THOUSAND HELPFUL BOOKS

SELECT FROM THIS LIST. SEND FOR FREE 128-PAGE BOOK AND PLAN CATALOG

- BLUEPRINT READING**
for the Building Trades..... \$1.25
- STEEL SQUARE**
How to Figure Angles of Rafters, etc..... \$1.00
- 1000 SPARE TIME MONEY-MAKING IDEAS**
Start own business..... \$1.00
- WHAT TO MAKE**
2-Vol. Library of 400 handcraft projects (De Luxe Cloth)..... \$1.98
- MECHANICAL DRAWING**
Learn Drafting: Good Salaries..... \$1.00
- PRACTICAL MATHEMATICS**
Real help for everyone who uses figures..... \$2.00
- TURN SCRAPS INTO MONEY**
Use Old Auto Parts..... \$1.00
- AUTO BODY & FENDER REPAIRS**
New Book Covers All Details..... \$3.00
- WOOD FINISHING**
Methods, Tools..... \$2.00
- CIVIL SERVICE**
Home Study for Federal, State, City Jobs..... \$1.00
- ROPP'S CALCULATOR**
Cuts figuring to a minimum (Kraft Leather)..... \$1.00
- REWINDING ELECTRIC MOTORS**
Enables anyone to become expert..... \$1.00
- PAINTING & DECORATING**
New Book..... \$1.50
- TOYS**
Build for Amusement or Profit..... \$1.50
- UPHOLSTERY**
Always a Big Market Start Own Business..... \$2.00
- NEW SMALL HOMES**
59 Popular Designs..... \$0.50
- MONEY-MAKING FORMULAS**
New 480 Page Book..... \$4.00
- BLUEPRINT READING**
for Machine Trades..... \$1.50
- HOUSE WIRING**
Methods, Materials..... \$2.50
- SHOP NOTES LIBRARY**
Thousands of useful ideas. Set of six big volumes..... \$2.45

- CONCRETE**
1001 Ways to Use..... \$1.98
- FLEXIBLE MOLDS**
Fun and profit from casting novelties..... \$1.00
- KNOTS, TIES, SPLICES**
For Everyone Who Handles Rope..... \$1.00
- CARPENTRY**
Carpentry & Joinery in all Forms..... \$2.00
- SHEET METAL WORK**
Both light and heavy..... \$2.50
- ESTIMATING FOR BUILDING TRADES**
Material, labor, residence & moderate size bldgs..... \$4.75
- ENGINEER-CUSTODIAN MANUAL**
Aids in passing civil service exams..... \$2.50
- MACHINE SHOP WORK**
Constructing and using tools, modern methods, etc..... \$2.75
- PATTERN MAKING**
Both wood and metal..... \$2.00
- ELECTRIC WELDING**
Forge, thermite, resistance, etc..... \$1.25
- OXYACETYLENE WELDING**
Welding, cutting, burning..... \$1.25
- TOOL MAKING**
Modern tools, dies, fixtures..... \$3.50
- YOU CAN FIX IT**
Up to date encyclopedia of home repairs..... \$2.50
- FORGING PRACTICE**
Practical information..... \$1.50
- FIVE ACRES AND INDEPENDENCE**
How to operate small farm..... \$2.50
- SELF INSTRUCTION IN PIANO**
Teaches beginner to play in short time..... \$1.00
- COURSE IN WOOD TURNING**
Everything craftsman needs to know..... \$1.50
- HOW TO DRAW FROM NUDE**
Contains 34 camera studies..... \$1.00
- NEW AMERICAN HOMES**
101 designs, costing from \$3,500 to \$15,000..... \$1.00

Send No Money!

Order from above list. If in U. S. A., and order amounts to \$1.00 or more, pay postman on delivery plus small C.O.D. fee. We pay postage if remittance is sent with order. Send for big 128-page book of helpful books and plans FREE. Order today.

POPULAR MECHANICS PRESS
Room 141 200 East Ontario St., Chicago



EASY
to play

With an easy playing Conn band instrument, you can be ready for band or orchestra in 4 to 6 weeks. A sure road to popularity if you start on a Conn. Choice of the world's greatest artists. Magnificent tone. Many exclusive features—yet they cost no more.

Ask to see the marvelous new models now being displayed by Conn dealers.

WRITE FOR THIS NEW FREE BOOK

Home trial. Easy payments. Write us for free book on whichever instrument interests you most. Mention instrument.

C. G. CONN, LTD., 131 CONN BLDG. ELKHART, IND.

CONN

BAND INSTRUMENTS



SPECIAL U-50 ALNICO MAGNET

MARVELOUS lifting power of many times own weight. Marine workers find it valuable in salvaging lost tools dropped in water. Hundreds of other uses. 1 1/2" wide-2 3/4" high-3" long-2 1/4" gap. Wgt. about 2 lbs. Ready for delivery Dec. 15th. \$3.95 Postpaid. Cir. of 20 other sizes & experiment sheets—5c. TERRY SALES CO., Central Sta. P. O. Box 781, Toledo, Ohio.

Amazing Cheap OIL BURNER INVENTED

Sweeping the Country!

COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace

No Drudgery, Dirt or Ashes—Intense Heat Quick at SMALL COST.

OVER 40,000 SOLD

Beats any cheap burner ever gotten out for low cost, efficient performance. Burns ordinary low priced free flowing oil without pre-generating or clogging up. Quick intense heat by Simple Turn of Valve.

GUARANTEED

30 DAYS' TRIAL

Prove its efficiency, convenience and economical operation without risk.

Write Immediately for SPECIAL OFFER TO AGENTS

AGENTS
Salesmen
BIG MONEY

F. Silver says: "I can dispose of 250 HEAT KINGS before this year ends." Write us now for agents' offer.



Slips into Any STOVE RANGE or FURNACE

Quick HEAT At Turn of Valve!

who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now, spare or full time—mail in postpaid today. UNITED FACTORIES, A-751, Factory Bldg., Kansas City, Mo.

Power King
"TOOLS OF TESTED QUALITY"

JOINTER-PLANER



Now you can handle all kinds of edging and surfacing operations quickly and accurately at low cost. This PK Jointer-Planer is a real value-packed machine. Has a speed of 4300 RPM for smooth finishing. Handles rabbetting, relieving, chamfering. Takes cuts up to 4½" wide and ⅝" deep. Total table surface is 23" long by 5½" wide. It's a sturdily built machine, well balanced, safe. Ask to see it at your dealers and send for new 1941 Catalog.

\$19.95

less motor
Slightly higher at distant points

TABLE SAWS
JOINTER PLANER
JIG SAW
SPINDLE SHAPER
POWER HAND SAWS
DRILL PRESSES
WOOD LATHES

POWER KING TOOL CORP.
108 E. Market St., Warsaw, Ind.

Use Your XMAS CASH!
Get this New
1000-SHOT
RED RYDER
COWBOY
CARBINE

If you don't get this golden-banded RED RYDER CARBINE for Christmas—get it with your Christmas Money! At Dealers. If he hasn't it, send us \$2.95. We'll mail yours postpaid. (Duty added in Canada.)
DAISY MANUFACTURING COMPANY,
541 UNION ST., PLYMOUTH, MICH.
DAISY AIR RIFLES \$2.95

Write for **FREE**
NEW CATALOG

GERSTNER TOOL CHESTS
Start the new year with a new Gerstner Chest. Choose your style from our Free Catalog.
GERSTNER TOOL CHESTS
441 Columbia St. Dayton, Ohio

START A BUSINESS AT HOME.. LIKE JOHN LEHMAN—WHO SAYS

This popular Fyr-Fyter has provided me with a **STEADY INCOME** during the past Eight Years

We need more men like John Lehman. Are you looking for a steady and permanent connection with a nationally known company which will offer you an opportunity for independence? No capital required for store, stock or fixtures. We deliver, collect and mail profit checks each Friday and help you with Direct Mail Advertising. Write today about your past experience and we will mail you a money making plan which has brought success to hundreds of others. Address **FYR-FYTER FACTORY, Dept. 90-61, Dayton, Ohio**

FINE BUSINESS FOR MEN PAST 40

K1126

Serving Uncle Sam

(Continued from page 13)

see their targets, the firing of the field artillery is conducted from observation posts connected with the batteries by rapidly laid telephone wires and by radio. At these observation posts, the accurate computations required for directing the fire are made and the fire is adjusted on the hostile targets either by direct observation or by observers in airplanes or captive balloons who communicate by radio or telephone the data on which fire corrections are based. A recent development is the motorized observation balloon which is transported by a truck equipped with mechanism for raising or lowering the balloon.

If you should be assigned to the coast artillery, you'll really be in the big-gun division, for that arm employs sizes up to huge sixteen-inch guns that shoot an armor-piercing shell weighing more than a ton for distances exceeding twenty miles. Harbor defense is the principal duty of the coast artillery and the giant guns are either in fixed positions or on special railway cars that can be moved quickly along the coast and set up for firing out over the sea. The coast artillery also lays fields of electrically controlled submarine mines which can be exploded from shore as enemy ships pass over them. In this work, you might even become something of a sailor, for the coast artillery uses boats, ranging from ocean-going mine planters of 1,000 tons to small motorboats, to install and maintain mines.

Also in the coast artillery are anti-aircraft guns, which are supplemented by searchlights of approximately 800,000,000 candlepower which illuminate targets at night. To enable searchlight crews to find the targets quickly as they approach high in the air over the gun, you and other selectees will learn to use sound locators. These are huge aids to hearing—super-sensitive "ears"—by which trained observers can tell the direction from which the sound of approaching airplanes is coming, so the searchlights can be trained on the targets. All this equipment requires the production of considerable electric power in the field and the use of complex and delicate control instruments by highly trained personnel. You'll find your "lessons" not so easy if this is part of your year's schooling.

R1126

Perhaps you possess technical skill that will send you to the corps of engineers. There you'll learn to build, repair and maintain buildings, bridges and structures of every kind; to blow up bridges, viaducts and roads, as well as captured guns and stores; to dig tunnels under enemy fortifications and demolish them; to construct roads for the army; to operate railways, electric-light and power systems, water-supply systems and all other utilities; to survey and prepare maps for the use of all arms of the service, and to build floating bridges rapidly across rivers. Engineer units are largely motorized.

There's plenty of excitement for you in the signal corps, if that is the arm to which you are assigned. Here are trained the communication men of the army who speed messages by motorcycle, airplane, homing pigeon, telephone, teletype, telegram and radio. In warfare, field wire is laid on the ground by signal-corps cross-country trucks and from man-drawn and man-carried reels. Breaks often occur in these lines during battle and they must be repaired quickly so that commanders can keep contact with their fighting units. So linesmen must leave shelters, follow the wire and often repair the line under fire.

You've heard about the "beany, beany" diet in the army, so you'll probably be surprised at the quality and variety on the menu for the next twelve months. It will be as good—perhaps even better food than you've been getting at home, for it's a balanced diet designed to keep you healthy and strong.

There's going to be some fun scattered through the year—the army's planned it that way. There will be equipment and facilities for various sports, football, baseball, boxing and the like, and unit teams will compete with one another. Too, there will be movies, service clubs and recreation rooms where you will listen to the radio, read, write, play games and entertain the home folks when they come calling. The army wants no "dull" boys, so you'll play a lot during your twelve months service with Uncle Sam.

Stamped, self-addressed envelope, sent to our Bureau of Information, will bring you the name and address of the maker of any article described in Popular Mechanics.

JANUARY, 1941



INVEST A QUARTER YOU'LL NEVER REGRET IN A TRIAL CAN OF **WELDWOOD WATERPROOF GLUE**



Its Cold-Setting Rot-Proof, Quick-Acting, Plastic

You've never known a glue like **WELDWOOD** for strength and everlasting results—a chemical miracle in this age of plastics.

WELDWOOD Plastic Resin WATERPROOF GLUE makes a solid, permanent joint, dowel, inlay, mount, or seal stronger than the strongest material to which applied. **WELDWOOD GLUE** comes in powder form; mixes instantly with cold tap water, ready for use; no heating, no waiting, no bother. Joins any porous material to other porous or non-porous surfaces. Sets up a few hours after application.

The GLUE that doesn't know its own strength

The Glue of a Million Uses. Models, furniture, household repairs, patterns, boats, aircraft, cabinet work, inlay, overlay, dowsing, joining, mounting, makes workable wood putty.

UNITED STATES PLYWOOD CORP.

616 West 46th Street, New York

SEND 25¢ At your hardware dealer or send 25c. **SPECIAL OFFER OF LARGE CAN;** and comprehensive **GLUE MANUAL,** chock full of facts and ideas.



Standard *RIDE OR WALK*
GARDEN AND SMALL FARM Tractors *1 1/2 CYLINDERS*

Plow Seed Cultivate Mow Hay and Lawns

Powerful 1 and 2 Cylinder Tractors for Small Farms, Gardeners, Florists, Nurseries, Fruit and Poultrymen.

FOUR MODELS
 Ample Power for Field, Haying and Truck Crop Tools. Run Pumps, Saws and Belt Machines.

Steel or Rubber Tires
 High Wheels—Enclosed Gears
LOW PRICES
 Write for Easy Terms Plan and **Free Catalog**

STANDARD ENGINE CO.
 Minneapolis, Minn. New York, N.Y. Philadelphia, Pa.
 3221 Como Ave. 617 West 26 St. 2546 Market St.

BETTER WEATHERSTRIP FOR LESS
All Metal Interlocking 'E-Z-ON'
 Saves Cost Each Winter—Rustless Lasts Forever
 Preserves the Wood—Stops Rattle
 Applied Easily, Quickly on the inside or on the outside
 Without Removing Sash. No Special Tools or Mechanical Skill Needed. Smooth Opening and Closing Window.
 For Details and Prices Write
Robert N. Baltz & Co., Inc., 30 N. LaSalle, 22, Chicago

GUNSMITHING for PLEASURE or PROFIT!
WORLD'S GREATEST GUN CATALOG!
 Steeger's 1941 Edition. Only complete gun book section for amateur and professional. Finest hand tools. All American—most imported Guns, Accessories. LATEST REVISIONS & PRICES. Ballistics, Restocking, Loading. All Gun Parts, Stocks, Barrels, Targets, Shooter's Articles, etc. Send a Dollar Bill, check, coin, or stamps for this \$12 Page Volume.

512 PAGES
17,000 ITEMS
6,000 PICTURES

STOEGER ARMS CORP.
 507 FIFTH AVE. (at 42nd St.) NEW YORK, N. Y.



MOTO-SAW * * NEW Electric SCROLL SAW

CUTS ON AN AVERAGE OF 1 FT. PER MIN. UP TO 3/4 IN. MED. HARD WOOD

(Operates on 110-120 V. 50 or 60 Cycle Alternating Current—Does Not Operate on Direct Current)



More like magic than any tool you ever saw! Just imagine an electric jigsaw that takes no jiggling . . . only a trifle heavier than a hand saw, and better balanced in your hand . . . a tool that takes no effort to run, no pressure to feed, imagine a saw blade running so fast it seems to be standing still . . . that cuts a foot a minute, each cut finer than the finest sandpaper. And then imagine such a magic tool being yours for less than \$5.00. All this, and more, is yours in the new

DREMEL electric MOTO-SAW. You have such easy, complete control that you can execute the most intricate designs, just as you would with a costly, complicated electric power saw. You have all the freedom of a hand saw, yet none of the effort of hand operation. You can cut at any angle . . . even along a spiral twist, as in shaping an airplane propeller. You can work on a big assembled project or on the tiniest piece you can hold in your fingers.

SAFE AS A HAND SAW

You need no sandpaper, no oil can, no bench room or floor space. Takes no special care . . . it's safe as a hand saw. A touch of your thumb on the button sets it going . . . releasing stops it instantly. A thrill awaits you at the surge of its precision power. If your dealer can't supply you, mail coupon without delay. Send only \$4.85 for Moto-Saw and 3 blades, postpaid. Or send \$1 with order and pay postman balance plus postage. MONEY BACK if not delighted after inspection.

DREMEL MFG. COMPANY
Dept. S 111-A, Racine, Wis.



If your dealer does not handle Moto-Saw USE THIS COUPON

DREMEL MFG. CO., Dept. S 111-A, Racine, Wis.

- Enclosed find \$ (money order or draft). Ship Moto-Saw postpaid at once.
- Enclosed find \$1.00. Send Moto-Saw C.O.D. I'll pay postman balance plus postage.
- Send descriptive folder.

Name
Address
City State

A AND N SUPPLY CO.
Bargains—Military, Sport Goods, Firearms, Clothes, Shoes, etc. Send 10¢ for new catalog, to be redeemed on first order.
EST. 1868 A & N Supply Co., 4772 Lester St., Richmond, Va.

CATCH FISH!
minnows, eels, mink, muskrat, with our folding galvanized Steel Wire Traps. Walton's Automatic Hooks are so constructed that when a fish gives the slightest pull on the bait the upper hook reaches down and gets a hold that lands him. 3 for 50¢. Write for descriptive catalog of Traps, Hooks, Lures, and other specialties. Walton Supply Co., 3507 Junata Ave., St. Louis, Mo.

SENSATIONAL OIL BURNER INVENTION
Makes and burns its own clean, hot gas, when and as needed. No noise, no smoke, no soot, no ashes. Burns 60% air and 4% cheap kerosene. Millions of prospects. Sells fast to homes, restaurants, roadside stands, factories and hundreds of others. Big money-maker for agents and distributors. Write quick.
Liberty Burner Co., Dept. B161, 620 N. Michigan Ave., Chicago, Ill.

AGENTS 300% Profit SIGN LETTERS
For Store Fronts and Office Windows. Anyone can put them on. Free Samples. Liberal Offer to general agents.
METALLIC LETTER CO., 438 N. Clark St., Chicago

FREE TRAILER PARTS CATALOG
We'll save you money on—axles, springs, wheels, couplers, windows, sinks, water pumps, brakes, refrigerators, beds, lamps, inside and out, 8V lamps, furniture, jacks—everything. Special discount to mfrs. NATIONAL TRAILER EQUIPMENT CO. Successors to Kar-A-Van Industries, Inc. Dept. P. 714 W. Wisconsin Ave., Milwaukee, Wis.

FREE ABILLION IDEAS
EXCITING BOOK CATALOG!
HUNDREDS OF BOOKS!
MANY NOT SOLD IN STORES!
Send right now for this great big book catalog! Thumb through its interesting pages! Notice the tremendous selections of books on virtually every subject . . . and at money-saving prices. Notice how many books you can get that are not sold in stores—books that bring extra joys to living, books that help you increase your income—putting extra cash into your pocket! . . . Home, Farm, Garden, Photography, Nude Art are only a few of the subjects listed.
SEND NO MONEY! JUST MAIL POST CARD!
Don't send a penny. Just write your name and address on a penny post card, and mail today! This grand catalog with beautifully colored cover will be rushed to your home! Send for it now!
POPULAR MECHANICS PRESS, Dept. 141, 200 E. Ontario, Chicago

ACE LATHE TOOL SET \$14.50
Be permanently toolled-up for every operation on your Metal Cutting Lathe
The ACE Set is complete—there's nothing more to buy. Drop forged by the manufacturers of cutting tools used by 95 per cent of the plants and shops in industry, they are correctly designed, are of special steel, are finely finished and are stronger—will last a lifetime. You can cut easier, faster and more accurately with ACE TOOLS.
At your Hardware Store—Circular FREE.
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
368 N. Francisco Ave., CHICAGO, U.S.A.

BUILD AN ARC WELDER FROM OLD GENERATOR
For Light or Heavy Work. 75-200 amperes. Complete PLANS and valuable catalog 35¢. Over 900 Electrical Supply Bargains.
LeJay Mfg. Co., 1347 LeJay Building, Minneapolis, Minnesota

Print Your Own
Cards, stationery, circulars, tags, labels, photo and movie titles, advertising, etc. Save money. Print for Others. Good Profit! easy rules sent. Raised Printing like Engraving, ton. Junior outfit 58¢. Senior outfits 53¢ up. Send for free catalog and all details. **KELSEY INC., 5-37, Meriden, Conn.**

BUILD THESE PROJECTS
For garden or lawn. Easy to build. Easy to sell. Detailed Blueprints Model B-25 Dutch Windmill 50¢; Model OM-60 Old Mill, 50¢. Lawn Figure Patterns—Sunbust 50¢, Dutch Boy, Tulip Girl, Holland Fair. See each, all 4—\$1.00. Catalog illustrating many models, send 10¢, today.
CRAFTSMAN'S MODEL CO., Dept. P-43, 2030 N. 41st St., Milwaukee, Wis.

MYSTERIOUS DEVICE WELDS BRAZES AND SOLDERS ANYONE CAN OPERATE
Now, an electric welding, brazing and soldering Torch, complete with power unit, goggles and supplies. Works INSTANTLY off any light socket. Does a thousand and one repair jobs at amazingly LOW COST on aluminum, iron, steel and other metals. Indispensable for Auto, Body and Fender Repairs, and home repairs—shop, factory, farm, engineer, janitor, sheet metal, radio and bicycle repairs. Anyone can handle without previous experience with our sim- **10-DAY HOME TRIAL**
Write at once for Special Introductory Low Price Offer. Try 3 in 1 Electric Torch for 10 days at our risk or get one free by helping to introduce it. **ELECTRO-TORCH CO., 2613 McMichigan Ave., Chicago**

Why Not Do It Yourself?

SAVE TIME AND MONEY

by Using These Booklets

These booklets are written in non-technical language that you can understand. Photographs and diagrams illustrate every detail. Only simple tools are required. The cost of the booklets has been kept low so that they may be obtained by anyone. The information given will enable you to have many things you otherwise could not afford.

Only 25c Each or Five for \$1

1. PHOTO ENLARGERS—Complete plans and easy-to-follow details on how to build either a condenser lens type of enlarger which will give high illumination for critically sharp focusing, or simple vertical and horizontal enlargers.

2. OUTBOARD RUNABOUT—Here is a fast, V-bottom boat, 14 feet long and suitable for motors of 4 to 24 hp., which you can build for from \$30 to \$40.

3. ELECTROPLATING—Expert tells secrets of plating with copper, nickel, chromium, gold, silver, lead, zinc and cadmium. Also includes copper and nickel plating without cyanides and full details on electroplating leather, wood, plaster.

4. WOODWORKING POWER TOOLS—Build your own power tools; wood lathe with 4-speed, V-belt drive, rigid iron bed and a quick acting tailstock, mostly from old automobile parts at low cost. Also an efficient scrollsaw, large circular saw table, ball-bearing drill press, portable belt sander, bandsaw, hand plane, drum sander, belt sander and "stoker" belt sander.

5. WELDERS—Fully illustrated plans for building an electric arc welder which operates on 110-volt, 50 or 60 cycle alternating current, will handle sheet metal up to 1/8 inch in thickness, and rods as large as 1/4 inch in diameter. Easy to construct at low cost. Also a 110-volt, 60 cycle alternating current spot welder for the small shop.

6. COLORED CONCRETE GARDEN FURNITURE—Complete plans and simple details so you can make for fun or profit garden benches, pottery without molds, flower boxes, bird baths and sundial pedestals in beautifully colored artificial "stone." These attractive articles are permanent additions to any home. Also, how you can build a small concrete mixer.

7. BIRD HOUSES—Easy to build homes for all kinds of birds. Complete plans and illustrations, for colony houses, four-apartment log cabins and single apartment houses of rustic design. Also how to build bird baths, cages, feeding stations.

8. FARM AND GARDEN TRACTORS—Two tractors you can build from old automobile parts at low cost. The large tractor has plenty of power to pull a two-bottom plow and is ideal for truck gardeners or owners of small farms.

9. TAXIDERMY—It's fun to mount your own birds, fish and small animals. Staff taxidermist of the Field Museum of Natural History tells you exactly how to prepare the skins and obtain life-like poses.

10. AUTOMOBILE KINKS—You can easily save \$100 a year on your automobile by following the many hints on upkeep and operation described and shown. It is the little things that save money.

11. CLEANING FORMULAS—How you can make your own cleaning preparations for woodwork, automobiles, paint brushes, wallpaper, chimneys, toilets, guns, rugs, carpets and marble. Also, how to make soaps, bluing and many other things.

12. COSMETIC FORMULAS—With these formulas it is easy to make your own hand lotions, cold creams, shaving creams, rouge, depilatories, bath salts, beauty clay and lipsticks.

13. TREASURE FINDERS—Build your own treasure finder and metal locator. Details for both large and small radio types given with diagrams and directions. These devices have many practical uses such as tracing pipes, metal conduits, etc.

14. LOG CABINS AND TOURIST COTTAGES—Two distinctive types of year-round cabins of logs. One of stockade walls of vertical split logs which do away with chinking and saddle-notching. The other is made of logs with corner notching.

15. FOOD PRODUCTS FORMULAS—100 formulas for making such everyday necessities as extracts, non-alcoholic flavors, fruit syrups, saraparilla syrup, meringue powder, root beer and cheese chips.

16. GARDEN WOODWORK AND FURNITURE—Gives plans and details for fixing up your outdoor living room and beautifying your garden. In addition to ornamental structures, such as pergolas, arbors and seats, it tells how to dress up your home with trellis, fences, etc.

17. SOLDERING AND BRAZING—Tells how to use new fluxes, solders and methods in soldering aluminum, small cracks in cylinder heads, zinc alloys. Touch soldering with a carbon arc, and how stainless steel may be soldered, brazed.

18. MIRACLE PLANTS—How you can mix your own vitamin B1 solution to grow plants either in your home or garden with often amazing results. Also a formula and complete details for growing plants without soil by the new soilless method, and the secrets of success with house plants.

19. HOME WORK OPPORTUNITIES—Simple handicraft projects anyone can do to earn money in their spare time. There are crepe-paper novelties, sheet metal decorative objects, useful things made of oilcloth, such as knitting bags, waste baskets and shoe containers.

20. TELESCOPES—Complete details on a reflecting telescope you can build for less than \$10. This is a 4-inch, 48-inch focal length type. The instructions tell how to make the mirror and grind the lenses yourself. Such an instrument has detected objects 1,000,000 light years away.

21. METAL PLATING AND COLORING—This gives dozens of essential formulas for metal plating, coloring and decorating. It tells how to clean objects, polish and buff, plate by immersion and by the use of paste, copper plate without electricity.

22. FAST ICE YACHT—Build your own Class-E ice yacht. Every detail of the construction of this craft is carefully explained with sailing instructions.

23. EXTRA ROOMS IN ATTIC—Add to the value of your home by building an extra room in your attic which will serve either as a den or bedroom. Every step of the work is clearly illustrated. In addition there is a plan for a folding staircase and the installation of an attic cooling fan.

24. BASEMENT PLAYROOMS—Get away from unsightly coal bins and build an attractive playroom in your basement. It's easy if you follow these suggestions and will prove invaluable.

25. PHOTO PRINTER AND DRYER—Now you can build your own printer easily. The one featured in this booklet has an automatic switch and takes negatives up to 6 1/2 by 8 1/2 in. in size. In addition there is a split-second timer.

26. SAILING DINGHY—This 14-foot boat combines strength and light weight. It carries 140 sq. ft. of canvas and weighs about 350 pounds.

27. TRAILERS—Midget house and utility type trailers which anyone can build in spare time. The "midget" is a tear-drop type which provides sleeping quarters for two adults besides storage space.

28. METAL CRAFT—Here is one of the most interesting of all hobbies. Simple instructions are given for brass tapping and the making of many novelties.

29. MAGIC FOR EVERYBODY—Simple tricks to puzzle your friends. "Mind reading", card and match tricks, easy chemical tricks and stunts for your parties.

30. CANOEING—One of the most fascinating of all summer sports is canoeing and the cost is low. You can easily build your own 16-ft. Canadian type canoe.

31. LOWER YOUR FUEL COST—Practical little kinks that will save you hundreds of dollars in the heating of your home. How to fire your furnace, handle the drafts, avoid heat losses, weather stripping and many other important details.

32. WOOD TURNING—Tells how to use a home workshop lathe correctly. Covers use of chisels, faceplate wock and split turnings.

Popular Mechanics Press, Dept. P-141
200 East Ontario Street, Chicago, Ill.

Please send me the booklets encircled below at 25 cents each or any five for \$1, it being understood that my money will be returned if not satisfactory.

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32							

Amount enclosed..... Send C.O.D.

NAME.....

ADDRESS.....

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

Note—If order amounts to \$1 or more, booklets will be sent C.O.D. anywhere in the United States. Just pay postman cost plus few cents charges.

K991
The Miracle of U-235

(Continued from page 5)

tion which is soon transformed into heat. It would take a potential difference of almost 200,000,000 volts to duplicate the energy release. The burning of coal corresponds to about four volts on this same scale, some 50,000,000 times feebler than the uranium reaction.

The mechanism of our uranium motor is based on that reaction. A few neutrons are constantly being introduced, with the help of radium, into our small box of U-235. There is a regenerative feature that makes the reaction continuous. Clever tricks are already known to prevent the process from getting out of hand.

The prospect for finding the solution of the problem is so good that many groups have begun to tackle it. Even big industrial firms have taken up the research and new results are being turned out in quick succession. Recently in California it has been learned that the ordinary uranium atoms sometimes can be transformed by neutrons into new atoms which can be split up to give the enormous energy of uranium-235. At Westinghouse it has been discovered that photons, which are like ordinary light but have higher energy, can start the energy chain in U-235. These two discoveries mean that in the process of breaking up U-235 and deriving its energy, the by-product photons and neutrons turn right around and manufacture new material to provide new energy. It is not inconceivable that in practice each U-235 atom that splits will cause a U-238 atom to be transformed into an energy-producing variety. Translating that into simple language, a pound of U-235 would be equivalent to 500,000 gallons of gasoline instead of 250,000 indicated above. At the same time the total equivalent supply of U-235 would be doubled and the things predicted in this article would become twice as easy to attain.

Only one atom in 140 uranium atoms is of the proper kind and the hitch at present is that we haven't found the most practical method for separating these special U-235 atoms from the rest of the uranium. This is similar to many problems that have been solved in the past, and solution of the problem is foreseen.

(Continued to page 150A)

Can You Equal This Home for 975



Shipped Direct from Our Mill

Save 30% to 40% on Your New Home..

WE PAY FREIGHT

Don't pay several hundred dollars more than necessary when you build a home! Buy it direct from our mill at our low factory price. We ship you the materials—lumber cut-to-fit, ready to erect. Paint, glass, hardware, nails, etc., all included in the price—no extra charges. We pay the freight. Plans furnished—also complete building instructions. No wonder our customers write us that we saved them 30% to 40%, compared with builders' prices. Easy terms—monthly payments.

Send for **FREE BOOK** of Liberty Homes

Handsome Big CATALOGUE FREE

Pictures wonderful homes in colors at money-saving prices. Designs to suit everyone. Write for your catalogue today

LEWIS MANUFACTURING CO.
 Dept. 1211 Bay City, Michigan

Do more Earn more Work less with a



Red Universal E Tractor

You plow, disc, cultivate, mow, haul, do belt work, for about 33c a day. Safe, trouble-free long life. New plow lift, new reverse. Hundreds used. Save by buying from maker. Two weeks trial. **FREE** catalog. Write today.

PIONEER MFG. COMPANY
 Dept. V-11 West Allis, Wis.

SAW-FILING

MAKES A GOOD LIVING

J. H. Kellogg of Michigan writes: "Mortgaged my furniture and bought a Foley Filer and one year later had all my debts paid and paid \$400.00 on a new home. I file for carpenters mostly, and many days earn as much as \$16.00." Thor Nedribe, Iowa, says: "I have filed 550 saws, made \$350. As I'm a Carpenter, I just file saws in spare time—have more than I can take care of." With a



FOLEY AUTO-MATIC SAW FILER

you can do expert work easily, quickly, without eyestrain. The Foley files hand, band and circular saws better than the best hand filer. The new 1940 Model F-16 is the result of 40 years' experience in building saw filers, and is unequalled for accuracy, ease of adjustment and long life. Patented jointing principle brings uneven teeth back to uniform size.

FREE PLAN shows you how to start your own cash business in spare time with small investment—no canvassing. Send coupon now,—no obligation, no salesman will call.

See the Foley Exhibit at the **NEW YORK POWER SHOW**, Booth 299, Grand Central Palace, Dec. 2-7.

Mail Coupon for FREE PLAN

FOLEY MFG. CO., 116-1 Foley Bldg., Minneapolis, Minn.

Send Free Plan on Saw Filing business—no obligation.

NAME.....

ADDRESS.....

New! BARGAINS FOR Harold F. Hunt's Big 1941 Catalog **WOOD WORKERS**

Craftsmen! Get This Big Book of Rare Woods, Veneers, Inlays, Plywoods, Jig Saw Patterns, Tools and Supplies



Just out! Big new 1941 Bar- Harold F. Hunt gain Catalog No. 14 for PRESIDENT Woodworkers. Send for yours TODAY. 148 pages—20 color pages including rare and domestic woods in FULL NATURAL COLORS. Every page crammed with fascinating projects—new inlay methods—short-cut wood-finishing processes—hundreds of fascinating scroll saw projects for making book ends, tables, lamps, furniture and novelties.

If It's Wood—I Have It

Big bargains in rare woods from Asia, Africa, and the Indies. NEW LOW PRICES. Complete stock of American woods, veneers, inlays, ornaments, hard-to-get hardware items, tools, etc. Immediate shipment at real money-saving prices. Get this book TODAY. Send only 10¢—coin or stamps—refundable on first order.

CRAFTSMAN WOOD SERVICE CO.
2729 S. Mary St., Dept. A-4, Chicago, Ill.



148 PAGES
only 10¢

BIG BARGAINS IN—
Rare Woods • Inlays
Veneers • Bandings
Plywoods • Hardware
Jig Saw Patterns
Ornaments • Tools
All Kinds Supplies

Harold F. Hunt, President, **CRAFTSMAN WOOD SERVICE CO.**
2729 S. Mary St., Dept. A-4, Chicago, Ill.
Enclosed find 10¢ (refundable on my first order) for which please send me your big new 1941 Catalog No. 14.

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

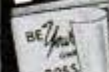
EARN A GOOD INCOME AS A PEST CONTROL OPERATOR!

EARNINGS
Start
QUICKLY



Hotels, Restaurants, Auto-Courts, Stores, Apt. Houses, Homes, etc. all over America pay regular monthly fees for Pest Control Service. If you are interested in earning \$35 to \$60 weekly, investigate this well-paying business.

FREE BOOK



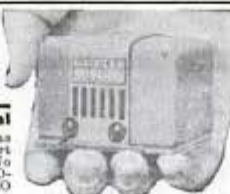
Moths, Roaches, Ants, Farm pests, etc. cost millions yearly. Protection needed now in every community. Cash in on this tremendous market! A division of the world's largest Pest Control company teaches you this money-making business at home, in your spare time. Write at once, today, for FREE ILLUSTRATED BOOKLET

MINIX INSTITUTE 542 S. Broadway, Dept. 23, Los Angeles, Calif.

WHEN YOU BUY FLASHLIGHT BATTERIES DEMAND "EVEREADY" FRESH DATED BATTERIES

The word "Eveready" is the registered trade-mark of National Carbon Co., Inc.

NEW! NO TUBES DURABLE PLASTIC CABINETS



Dual Bands — Magictenna — Microdial
Fits your pocket or purse—Wt. 6 ozs. Small as cigarette package. Receives standard & some short wave. PATENTED POWER-CRYSTAL. No tubes, batteries. Hi-ratio easy tuning slide "MICRODIAL". M. L. OF ILL. SAYS: "MIDGET RADIO WORKS FINE!"

ONE YEAR GUARANTEE!

Sent complete ready to listen with instructions & tiny phone for use in homes, offices, hotels, in bed, etc. SIMPLE TO OPERATE—NO ELECTRICITY NEEDED! SEND NO MONEY! Pay postman only \$2.99 plus postage charges on arrival or send \$2.99 (Check, M. O., Cash) and yours will be sent postpaid. A MOST UNUSUAL VALUE! ORDER NOW! FREE! PLUG IN "MAGICTENNA"—ELIMINATES OUTSIDE WIRES!

MIDGET RADIO CO. Dept. P-1 Kearney, Nebr.

The readers of Popular Mechanics will play an important part in putting U-235 to use. There is no end to the practical applications that amateurs can work out once the energy source is available. For instance, it easily may become practical to melt our highways instead of building them as we do now. With intense heat available a road-building machine would be able to fuse all the dirt in its path into lava, making in one operation a wide rock highway ideal for smooth travel. There will be many advantages to living underground, including the dead quiet.

With heat so inexpensive that we can afford to melt up any rock, aluminum will be almost as cheap as the common clay from which we could extract it. Iron ore would be reduced to metal in the veins themselves, instead of mining the ore and hauling it to a distant furnace. Manufacturing processes would be simplified. We will be able to carry our agriculture indoors, independent of soils or seasons.

When the present war ends, things may begin to happen that will make this article seem unimaginative. Until then the best we can do is to see that science continues to be free, that men have time and freedom to follow hobbies and that whatever truths are discovered are given to the public without distortion as a help to preserving freedom.

K 1097

Police Siren Carried on Belt Helps Stop Traffic Violator

Fleeing traffic violators are caught more easily by a policeman who wears a new hand-cranked siren on his belt. Nearly as loud as a car siren and built sturdily to withstand hard use, it is spun by the officer to scream a command to halt as he pursues an offender either on foot or on the running board of another car.



HOLD-E-ZEE AUTOMATIC GRIP SCREWDRIVERS



Hold, start and set-up screws in unhandy places. Gripper instantly released by spring action, sliding up out of way when not in use. Finest materials throughout, chrome vanadium blades; many have transparent, insulating unbreakable handles. (Illustrated.)

No more expensive than ordinary screw drivers. Middle for recessed-head screws. Handiest ever. Get out today. At auto-supply, hardware or electrical stores.

UPSON BROS., INC. 86 EXCHANGE ST., ROCHESTER, N. Y.

RESOLE SHOES FOR ONLY 4¢ EACH



SO-LO mends holes, worn spots in rubber, leather, cloth. Spreads like butter. Dries tough overnight. Flexible, non-skid, waterproof. Won't come off — guaranteed! 25¢ (25 repairs). At all 10¢ and hardware stores.

“Woolworth, Kresge, Newberry, Murphy, McCrory, Neisner, McLellan, Sears, Ward, Scott now featuring SO-LO.”

Start a Profitable BUSINESS of Your Own

MAKE FAST SELLING PRODUCTS AT HOME

Amazing profits making cosmetics—polishes—flavors—auto specialties—and selling through agents. No machinery needed. Our startling New Formula Book contains scores of formulas for “Easy to Make” products. Real money-makers. Sold on moneyback guarantee. Send no money. Descriptive literature free. Just send Postal.

POPULAR MECHANICS PRESS, Dept. 141, 200 E. Ontario St., CHICAGO

Say you saw it in

POPULAR MECHANICS

Extra Money From Books

SEND NO MONEY • Books Sent C.O.D. Anywhere in U. S.

These famous Pay-Raising Extra Money Books have helped thousands of others. Let them help you too. Check this list and mail with your name and address. Pay postman on delivery plus few cents postage. Send for big FREE 128 page catalog of helpful books and plans.

- SELECT FROM THIS LIST**
- BLUEPRINT READING** For Building Trades... \$1.25
 - STEEL SQUARE** Best Methods of Using... \$1.00
 - 1000 SPARE TIME MONEY MAKING IDEAS** Start Your Own Business... \$1.00
 - MECHANICAL DRAWING** Learn Drafting; Good Salary... \$1.00
 - SHEET METAL WORK** Both Light and Heavy Metal... \$2.50
 - TURN SCRAPS INTO MONEY** Use Old Auto Parts... \$1.00
 - AUTO BODY & FENDER REPAIRS** Up-to-date Information... \$3.00
 - WHAT TO MAKE** 2-Vol Library of Worth-while Projects for Craftsmen... \$0.98
 - PRACTICAL MATHEMATICS** Real Help for Everyone Who Uses Figures... \$2.00
 - REFRIGERATION** Electric, Gas. Be a Service Expert... \$5.00
 - THE BOY MECHANIC** New Edition of Famous Book... \$2.00
 - AUDEL WELDERS GUIDE** New Book. Covers Electric and Gas... \$1.00
 - MONEY MAKING FORMULAS** New 480 Page Book... \$4.00
 - PAINTING & DECORATING** New Book... \$1.50
 - UPHOLSTERY** Start Shop of Your Own... \$2.00
 - AUTO RACING** How to Build Cars, Speed Up Fords... \$1.00
 - CONCRETE** 1001 Ways to Use... \$1.98
 - BLUEPRINT READING** For Machine Trades... \$1.50
 - ROPP'S CALCULATOR** Cuts Figuring to Minimum (Kraft Leather)... \$1.00
 - ESTIMATING FOR BUILDING TRADES** Figuring Material and Labor Costs... \$4.75
 - REWINDING ELECTRIC MOTORS** Enables Anyone to become expert... \$1.00
 - SOILLESS PLANT GROWTH** Complete Directions... \$2.75
 - DIESEL ENGINE MANUAL** Practical... \$2.00
 - TRAILER BUILDING** Four Tested Plans... \$1.00

POPULAR MECHANICS PRESS
Room 141 200 E. Ontario St., Chicago

PLANE • PARALLEL • SURFACE PANEL • RABBIT • ROUT • TENON WITH ONE TOOL!



THE BARRON MULTI-PURPOSE PLANER \$7.50 COMPLETE

The Barron Multi-Purpose Planer is a sensational, time-saving, versatile, low cost shop tool. Fits any 1/4 h. p. or larger drill press. Guaranteed safe to use by anyone. Will not harm drill press. Chrome plated, inherently balanced and fitted with 3 special Hi-Speed Moly-Tung steel blades with twin cutting edges. Will even plane plywoods, painted and varnished surfaces. No other tool provides so many practical uses. Endorsed by drill press manufacturers, manual training instructors, home workshop enthusiasts, cabinet and pattern makers. Exclusive design, Pat. applied for. Be convinced. Try it out yourself in your own workshop or write for illustrated literature.

MONEY BACK FREE TRIAL OFFER Shipped prepaid post paid on receipt of check or money order for \$7.50 or sent C. O. D. in U. S. A. Use it for five days and get FULL refund if not satisfied. YOU RISK NOTHING.

FITS ANY DRILL PRESS Write for Free Dealer Or See Your Dealer

BARRON TOOL CO., 328 Architects Bldg., Detroit, Mich.

THE BARRON MULTI-PURPOSE 5-IN-1 ROTARY WOOD PLANER

NEW! All-Wave AERIAL

Fits In Your Radio! Installed In One Minute! \$1.95



Discard your old aerial. Stop those clicks and buzzes from corroded or loose, noisy connections. The AIR-O-SCOPE takes the place of expensive and unsightly poles and aerial wires. Helps reduce static and interference to a minimum. Fits in radio cabinet, so set may be moved anywhere. May be placed outside of radio, if desired. Length 8", Diam. 3". Installed in one minute. No alterations to radio. No soldering. For all radios, long or short wave. AC or DC. Tested on American and foreign reception. Makes your set complete in itself. Send for it today—only \$1.95 postpaid. Money-back guarantee. American Radio & Television Co. 13351 Elm Dale Detroit, Mich.

SpeedWay DRILL \$7.95 GRINDER \$5.95



KIT \$4.95

QUALITY TOOLS... products of SpeedWay, for 30 years leading manufacturers of electric tools. Specially wound high torque 110V universal tool motors. Improved design, correct speeds, 1000 RPM Drill with finest handle has 1/2" capacity in steel. 20,000 RPM Hand Grinder has speed essential for efficiency and collects for both 1/4" and 3/32" arbors. Drill and Grinder sold singly or together with accessories in fitted Steel Kit. Stand takes either drill or grinder. Router frame converts grinder into router. Bench Grinder is complete with motor. Write for Circulars. SpeedWay Mfg. Co., 1842 S. 32nd Ave., Cicero, Ill.

ROUTER \$3.95 **GRINDER \$9.95** **STAND \$3.95**

BRUSH PLATING OUTFITS

for autoparts, reflectors, faucets, bicycles. No tanks necessary. Free particulars.

GUNMETAL CO., AVE. M, DECATUR, ILLINOIS

FREE! WHOLESALE CATALOG

SPORS

4000 OPPORTUNITIES

Household goods, display card items, wearing apparel, cosmetics, foods, jewelry and toys are a few of the thousands of articles shown in this exciting catalog, for salesmen, agents and dealers.

260 PAGES

Chock-full of interesting money makers, Sales Ideas that may increase your earnings \$2 to \$15 a day and thrilling values, explore. Each and every item sold under a money-back guarantee. Get your copy by sending for it today.

11-40 MAIN SPORS CO., LE CENTER, MINN.



Precision is Assured IN A SOUTH BEND LATHE



HEADSTOCK. Cutaway view showing integral type bearing and the capillary oiling system.



SUPERFINISHED SPINDLE is made of alloy steel with bearing surfaces carburized, hardened, ground and superfinished.



IMPROVED SADDLE and compound rest with adjustable tapered gibs. Cross slide bridge is wide and deep, providing rigid support for the tool rest.



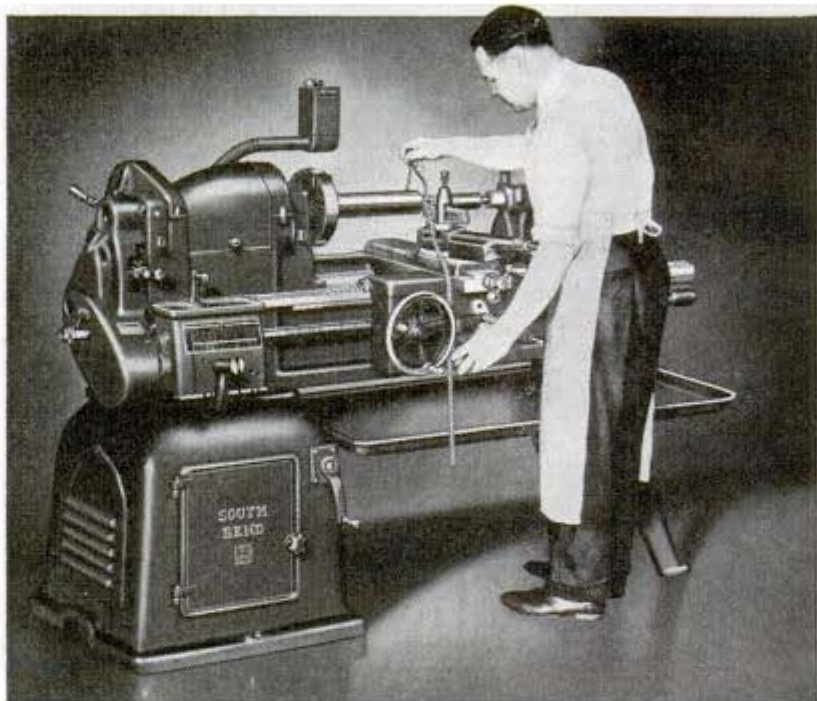
DOUBLE WALL APRON is rigid box type construction with all steel gears running in oil bath.



MULTIPLE DISC CLUTCH. Cutaway view shows alternate keyed steel disc construction.



UNDERNEATH MOTOR DRIVE. Belt drive to spindle is smooth and powerful and provides a wide range of spindle speeds.



PRECISION IS ASSURED in South Bend Lathes by combining fine workmanship with sound machine design. Expert mechanics fit each unit with an exactness known only to the machine tool builder.

South Bend Lathes are used in tool rooms of nationally known manufacturers for the most exacting classes of precision work. They are also used for production operations on interchangeable parts requiring a high degree of accuracy. Conveniently located controls assure an ease of operation which results in a uniformly efficient rate of production over a long period of time.

South Bend Lathes are manufactured in over 65 sizes and types. Popular sizes are available for delivery from dealer display stocks in important cities. Made in 9", 10", 13", 14½", and 16" swing, in 3' to 12' bed lengths, in Countershaft and Motor Drives.

ON DISPLAY IN ALL PRINCIPAL CITIES

Baltimore, Md.—Carey Machinery & Supply
Boston, Mass.—South Bend Lathe Works*
Bridgeport, Conn.—A. C. Bisgood
Buffalo, N. Y.—R. C. Neal Company, Inc.
Chicago, Ill.—South Bend Lathe Works†
Cleveland, Ohio—Reynolds Machinery Co.
Dayton, Ohio—C. H. Gosiger Mach. Co.
Detroit, Mich.—Lee Machinery Company
Los Angeles, Cal.—Eccles & Davies Mach.

New York, N. Y.—A. C. Colby Mach. Co.
Philadelphia, Pa.—W. B. Rapp, Machinery
Pittsburgh, Pa.—Tranter Manufacturing Co.
Portland, Ore.—Portland Machinery Co.
Providence, R. I.—Geo. T. Reynolds & Son
Rochester, N. Y.—Ogden R. Adams
St. Paul, Minn.—Robinson, Cary & Sands
San Francisco, Cal.—Moore Machinery Co.
Seattle, Wash.—Star Machinery Company

*Boston Sales Office: 67 Broadway, Kendall Sq., Cambridge, Mass. Tel. Trowbridge 6369.
†Chicago Sales Office: Room 308, Machinery Sales Building, Telephone State 7283.

SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

900 E. Madison St., South Bend, Ind., U. S. A.



PRINTED BY POPULAR MECHANICS COMPANY, CHICAGO, ILL., U. S. A.

Just in time for Christmas!

Genuine-Late
UNDERWOOD
NOISELESS
 Now
\$34.85
 CASH



MFRS. ORIG. SELLING PRICE

\$125.00

OR EASY TERMS While THEY Last!



Truly an outstanding offer! Only because of an exceptional purchase can I sell these rebuilt Noiseless machines at the sensation-ally low price of \$34.85 cash, or for only 70c a week on my easy term price. Each one carefully rebuilt so it looks like a new machine costing three times as much. *The mfrs. orig. selling price on this Underwood was \$125.00.* It's sent to you in Underwood packing box with Underwood book of instructions on care and operation. **Buy for Yourself! Buy for Gifts!**

A NOISELESS MACHINE

Latest achievement in typewriters! Provides writing perfection with **SILENCE**. For those who want the advantages of a quiet home or office. *This Underwood eliminates the nerve shattering clatter common to many models.* An aid to better work because it allows clear thinking, reduces fatigue, improves accuracy. This typewriter disturbs no one, for it is almost impossible to hear it operate a few feet away. You get all the features of an Underwood **PLUS Noiseless typing.**

FIRST CHOICE OF TYPISTS

Over 5,000,000 Underwoods now in use! Recognized as the finest, strongest built! Here is an office size Underwood with late modern features that give you **SILENT TYPING**. Has all standard equipment—keyboard, 2 colors, back spacer, automatic reverse, tabulator, etc. **There is no risk!** See before you buy on my 10 Day No Obligation Trial Plan. Return machine if not satisfied.

WIDE 14" CARRIAGES

Wide carriage machines for government reports, large office forms, billing, etc., only \$3.00 extra with order. Takes paper 14" wide, has 12" writing line. **A Real Buy in a rebuilt Underwood Noiseless!**

International Typewriter Exchange
 231 W. Monroe St. Dept. 101, Chicago, Ill.

EXTRA VALUE!

TYPEWRITER STAND



Big Working Surface

Two metal wings, correct working height.

All metal mounted on casters

For those who have no typewriter stand or handy place to use a machine, I make this special offer. This attractive stand that ordinarily sells for \$4.85 can be yours for only \$2.00 extra added to your account. *Quality built. Note all its convenient features.* (See Coupon)

NO MONEY DOWN
10 DAY TRIAL
 Easy Terms—10c a Day

No obligation. See before you buy on wide open 10 day trial. Pay no money until you test, inspect, compare, and use this Underwood Noiseless. *You judge for yourself.* When you are convinced that this is the biggest typewriter bargain you have ever seen then say, "I'll buy." Send only 70c a week or \$3.00 a month until term price of only \$38.85 is paid. **There is no red tape or investigation—My offer is exactly as I state it.**

2-YEAR GUARANTEE

I back this machine with my personal 2-yr. guarantee that it is in A-1 condition and will give first class service. Over 30 years of Fair Dealing backs this guarantee.

FREE!

TOUCH TYPING COURSE
 Complete Van Zandt home study course free with Underwood. It's carefully illustrated, written expressly for home use.

MAIL COUPON NOW - Limited Quantity on Sale!

International Typewriter Exchange
 231 W. Monroe St., Chicago, Ill. Dept. 101

Send Underwood Noiseless (F.O.B. Chicago) for ten days' trial. If I keep it, I will pay \$3.00 per month until easy term price (\$38.85) is paid. If not satisfied I can return it express collect.

10" carriage 14" carriage (\$3.00 extra)

Name..... Age.....
 Typewriter signatures not acceptable.

Address.....

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

CAUTION—For quick shipment give occupation and reference.

Check for typewriter stand (\$2.00 extra). Stand sent on receipt of first payment on Underwood.

"SMOKING THE WAY I DO, I SURE APPRECIATE THOSE EXTRAS IN SLOW-BURNING CAMELS,"

—says Bob Fausel, ace Curtiss test pilot



I SMOKE A LOT,
SO I SMOKE CAMELS.
THEY **BURN SLOWER**—
GIVE ME **EXTRA MILDNESS**
WITH A GRAND **EXTRA**
FLAVOR. MORE SMOKING
PER PACK IS ANOTHER
EXTRA I GO FOR IN
CAMELS

A PLANE that's never been put to the test of actual flight. What will happen in that first terrific power-dive? That's the test pilot's job to find out. It takes more than sheer nerve—it takes extra nerve and extra skill. Bob Fausel *has* those extras... *gets* the extras in his smoking, too... with Camels. He says: "It's swell to get extra smoking in a Camel. That extra flavor always hits the spot."

TRYING to tear a plane apart in mid-air is only part of test pilot Bob Fausel's job. There are long hours of engineering conferences... long hours of smoking. "That's where Camel's extra mildness and extra coolness are so important," explains Bob (*center, above*). "Camels are extra mild—easy on my throat."

It's common sense—cigarettes that burn fast burn hot. Camel's s-l-o-w way of burning means more coolness, of course, plus freedom from the irritating qualities of excess heat. Make Camels your steady smoke and enjoy extra mildness, extra coolness, extra flavor—and extra smoking (*see below*).

EXTRA MILDNESS

EXTRA COOLNESS

EXTRA FLAVOR

• In recent laboratory tests, Camels burned 25% *slower* than the average of the 15 other of the largest-selling brands tested—*slower* than *any* of them. That means, on the average, a smoking *plus* equal to

5 EXTRA SMOKES PER PACK!

R. J. Reynolds Tob. Co., Winston-Salem, N. C.

GET THE "EXTRAS" WITH SLOWER-BURNING CAMELS
THE CIGARETTE OF COSTLIER TOBACCOS

